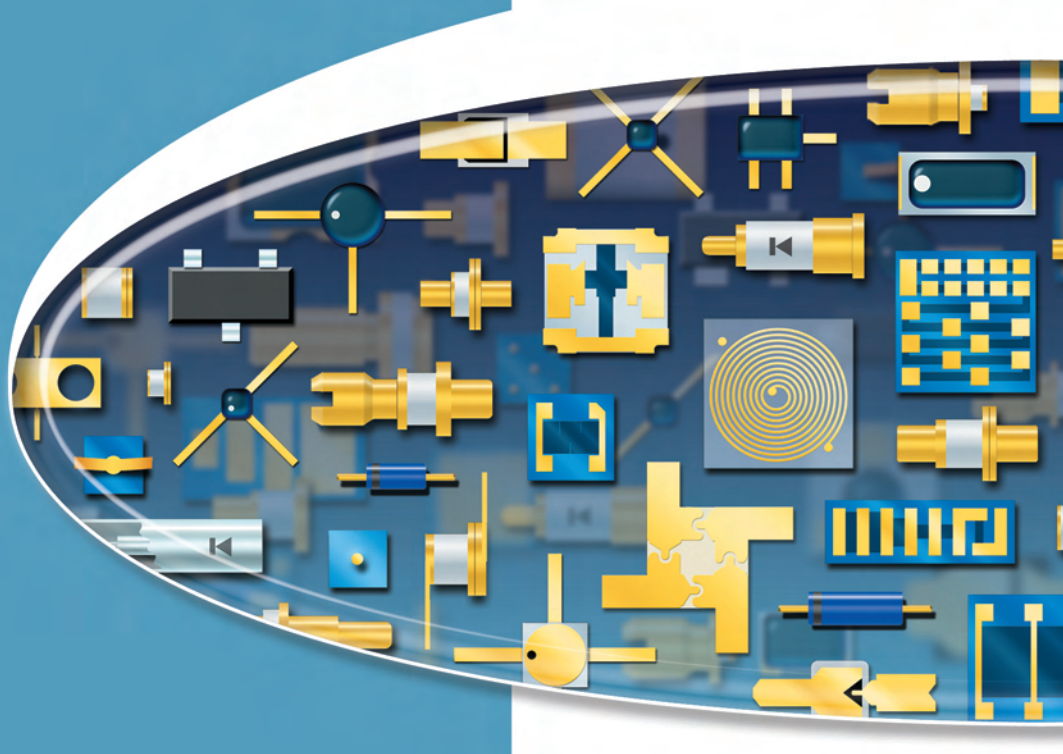
AEROFLEX
METELICS

# Microwave Diodes & Passive Semiconductor Devices



## Short Form Catalog
2008

## Endless capabilities and a team you can depend on

On April 12th, 2007 Aeroflex / Metelics purchased the ongoing operations of MicroMetrics, Inc. of Londonderry, New Hampshire. The new combined entity going forward will be known as Aeroflex / Metelics and operate out of two USA based locations—Sunnyvale, California and Londonderry, New Hampshire.

The combined resources of our two locations will provide customers with new technically advanced products, enhanced applications and engineering support, and continued quality and reliability. Both of our facilities have full capability in wafer fabrication, manufacturing and sales. To enhance our manufacturing capabilities and to provide cost effective parts for the fast paced commercial market, we have also expanded our assembly operations to Nanjing, China.

Our team of scientists, device physicists and process engineers on both coasts work together to optimize our designs and deliver repeatable high quality devices, as well to introduce new and exciting products. We have the capability to provide low cost commercial solutions for demanding markets as well as space qualified components for very advanced satellite and military applications.

Our capabilities are endless and our new combined business unit offers continued quality devices, impeccable customer service and support, and the foundation to be the supplier you turn to for all your microwave diode needs. This new catalog provides a design guide of our capabilities. We welcome your questions and comments and look forward to servicing your requirements well into the 21st century.

### Using this Catalog

Use this short form catalog to down-select to a device that closely fits your needs. You can then request additional electrical and pricing information by e-mailing our sales department at Metelics-sales@aeroflex.com.

Please note: Some previously published catalog part numbers from each company have been removed when performance characteristics were redundant. We continue to support both company's legacy part numbers and any house part numbers that have been assigned.

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- Very low 1/f Noise
- Detector applications to 40 GHz
- Chip, beam lead or packaged devices

The Aeroflex / Metelics diodes are fabricated on P-Type substrates for low 1/f noise and are optimized for zero-bias operation. Zero-biased devices are processed to yield two distinct video impedance classes, one 1,500 Ohms typical and the other 4,000 Ohms typical. Applications requiring maximum stability and sensitivity will favor the higher video impedance. Biased detector operation offers the designer improved temperature stability and video impedance flexibility via bias current selection.

**$V_{BR}$ @ 100 µA = 0.8 V min.** Chip and Beam Lead

| Model | $C_J$ | | $\gamma$ | $R_V$ | | $T_{SS}$ | Frequency | Package |
|---|---|---|---|---|---|---|---|---|
| | TYP pF | MAX pF | TYP mV / mW | TYP Ω | MAX Ω | TYP dBm | TYP GHz | |
| MSS20,046-C15 | 0.08 | 0.10 | 5,000 | 1,500 | 2,000 | -58 | 18 | C15p |
| MSS20,047-C15 | 0.08 | 0.10 | 8,000 | 4,000 | 6,000 | -59 | 18 | C15p |
| MSS20,050-C15 | 0.12 | 0.15 | 5,000 | 1,500 | 2,000 | -58 | 12 | C15p |
| MSS20,051-C15 | 0.12 | 0.15 | 8,000 | 4,000 | 6,000 | -59 | 12 | C15p |
| MSS20,054-C15 | 0.18 | 0.20 | 5,000 | 1,500 | 2,000 | -58 | 8 | C15p |
| MSS20,055-C15 | 0.18 | 0.20 | 8,000 | 4,000 | 6,000 | -59 | 8 | C15p |
| MSS20,140-B10D | 0.06 | 0.08 | 5,000 | 1,500 | 2,000 | -58 | 40 | B10D |
| MSS20,141-B10D | 0.06 | 0.08 | 8,000 | 4,000 | 6,000 | -59 | 40 | B10D |
| MSS20,142-B10D | 0.08 | 0.10 | 5,000 | 1,500 | 2,000 | -58 | 26 | B10D |
| MSS20,143-B10D | 0.08 | 0.10 | 8,000 | 4,000 | 6,000 | -59 | 26 | B10D |
| MSS20,145-B10D | 0.10 | 0.12 | 5,000 | 1,500 | 2,000 | -58 | 18 | B10D |
| MSS20,146-B10D | 0.10 | 0.12 | 8,000 | 4,000 | 6,000 | -59 | 18 | B10D |
| **Test Conditions** | $V_R$ = 0.5 V<br>F = 1 MHz | | F = 10 GHz $P_{IN}$ = -30 dBm $R_L$ = 1 MΩ<br>Video BW = 500 KHz NF = 3 dB | | | | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Reverse Voltage | Rated $V_{BR}$ |
| | Forward Current | 35 mA |
| | Operation Temperature | -65° C to + 150° C |
| | Storage Temperature | -65° C to + 150° C |
| | CW Power Dissipation | 100 mW, derated linearly to zero at $T_A$ = +150° C |
| | Soldering Temperature (Packaged) | +230° C for 5 sec. |
| | Absolute Maximum Power Rating | 150 mW per junction |

# Silicon Schottky P-Type Diodes: Zero Bias

**$V_{BR}$ @ 100 µA = 0.8 V min.** — Packaged

| Model | $C_T$ | | γ | $R_V$ | | $T_{SS}$ | $C_P$ | $L_P$ | Frequency | Package |
|---|---|---|---|---|---|---|---|---|---|---|
| | TYP pF | MAX pF | TYP mV / mW | TYP Ω | MAX Ω | TYP dBm | TYP pF | TYP nH | MAX GHz | |
| MSS20,140-0402 | 0.12 | 0.15 | 5,000 | 1,500 | 2,000 | -58 | 0.05 | 0.25 | 26 | 0402 |
| MSS20,141-0402 | 0.12 | 0.15 | 8,000 | 4,000 | 6,000 | -59 | 0.05 | 0.25 | 26 | 0402 |
| MSS20,142-0402 | 0.15 | 0.18 | 5,000 | 1,500 | 2,000 | -58 | 0.05 | 0.25 | 20 | 0402 |
| MSS20,143-0402 | 0.15 | 0.18 | 8,000 | 4,000 | 6,000 | -59 | 0.05 | 0.25 | 20 | 0402 |
| MSS20,145-0402 | 0.18 | 0.20 | 5,000 | 1,500 | 2,000 | -58 | 0.05 | 0.25 | 18 | 0402 |
| MSS20,146-0402 | 0.18 | 0.20 | 8,000 | 4,000 | 6,000 | -59 | 0.05 | 0.25 | 18 | 0402 |
| MSS20,046-H27 | 0.20 | 0.25 | 5,000 | 1,500 | 2,000 | -58 | 0.12 | 0.4 | 18 | H27 |
| MSS20,046-E25 | 0.15 | 0.20 | 5,000 | 1,500 | 2,000 | -58 | 0.07 | 0.4 | 18 | E25 |
| MSS20,046-T86 | 0.26 | 0.31 | 5,000 | 1,500 | 2,000 | -58 | 0.18 | 1.0 | 12 | T86p |
| MSS20,046-0805-2 | 0.14 | 0.20 | 5,000 | 1,500 | 2,000 | -58 | 0.06 | 0.4 | 20 | 0805-2 |
| MSS20,047-H27 | 0.20 | 0.25 | 8,000 | 4,000 | 6,000 | -59 | 0.12 | 0.4 | 18 | H27 |
| MSS20,047-E25 | 0.15 | 0.20 | 8,000 | 4,000 | 6,000 | -59 | 0.07 | 0.4 | 18 | E25 |
| MSS20,047-T86 | 0.26 | 0.31 | 8,000 | 4,000 | 6,000 | -59 | 0.18 | 1.0 | 12 | T86p |
| MSS20,047-0805-2 | 0.14 | 0.20 | 8,000 | 4,000 | 6,000 | -59 | 0.06 | 0.4 | 20 | 0805-2 |
| MSS20,050-H27 | 0.24 | 0.30 | 5,000 | 1,500 | 2,000 | -58 | 0.12 | 0.4 | 12 | H27 |
| MSS20,050-E25 | 0.20 | 0.25 | 5,000 | 1,500 | 2,000 | -58 | 0.07 | 0.4 | 12 | E25 |
| MSS20,050-T86 | 0.30 | 0.36 | 5,000 | 1,500 | 2,000 | -58 | 0.18 | 1.0 | 12 | T86p |
| MSS20,050-0805-2 | 0.18 | 0.25 | 5,000 | 1,500 | 2,000 | -58 | 0.06 | 0.4 | 18 | 0805-2 |
| MSS20,051-H27 | 0.24 | 0.30 | 8,000 | 4,000 | 6,000 | -59 | 0.12 | 0.4 | 12 | H27 |
| MSS20,051-E25 | 0.20 | 0.25 | 8,000 | 4,000 | 6,000 | -59 | 0.07 | 0.4 | 12 | E25 |
| MSS20,051-T86 | 0.30 | 0.36 | 8,000 | 4,000 | 6,000 | -59 | 0.18 | 1.0 | 12 | T86p |
| MSS20,051-0805-2 | 0.18 | 0.25 | 8,000 | 4,000 | 6,000 | -59 | 0.06 | 0.4 | 18 | 0805-2 |
| MSS20,054-H27 | 0.30 | 0.35 | 5,000 | 1,500 | 2,000 | -58 | 0.12 | 0.4 | 8 | H27 |
| MSS20,054-E25 | 0.25 | 0.30 | 5,000 | 1,500 | 2,000 | -58 | 0.07 | 0.4 | 8 | E25 |
| MSS20,054-T86 | 0.36 | 0.41 | 5,000 | 1,500 | 2,000 | -58 | 0.18 | 1.0 | 8 | T86p |
| MSS20,054-0805-2 | 0.24 | 0.30 | 5,000 | 1,500 | 2,000 | -58 | 0.06 | 0.4 | 12 | 0805-2 |
| MSS20,055-H27 | 0.30 | 0.35 | 8,000 | 4,000 | 6,000 | -59 | 0.12 | 0.4 | 8 | H27 |
| MSS20,055-E25 | 0.25 | 0.30 | 8,000 | 4,000 | 6,000 | -59 | 0.07 | 0.4 | 8 | E25 |
| MSS20,055-T86 | 0.36 | 0.41 | 8,000 | 4,000 | 6,000 | -59 | 0.18 | 1.0 | 8 | T86p |
| MSS20,055-0805-2 | 0.24 | 0.30 | 8,000 | 4,000 | 6,000 | -59 | 0.06 | 0.4 | 12 | 0805-2 |
| **Test Conditions** | $V_R$ = 0.5 V<br>F = 1 MHz | | F = 10 GHz $P_{IN}$ = -30 dBm $R_L$ = 1 MΩ<br>Video BW = 500 KHz NF = 3 dB | | | | | | | |

# Silicon Schottky P-Type Diodes: Low Barrier

- Superior 1/f noise
- Better temperature stability than zero bias Schottky diode
- Low barrier height
- Passivated with silicon nitride

The Aeroflex / Metelics Schottky diodes are optimized for superior 1/f noise on P-type silicon epitaxial substrate with proprietary process. In general they require a small forward bias (5 ~ 50 µA) for small power levels below -20dm when used as microwave detectors.

**$V_F$ @ 1 mA = 220 ~ 330 mV, $V_{BR}$ @ 10 µA = 3 V min.** Chip and Beam Lead

| Model | $V_F$ | | $C_J$ | | $R_D$ | F opt | Package |
|---|---|---|---|---|---|---|---|
| | TYP | MAX | TYP | MAX | MAX | MAX | |
| MSS25,047-C15c | 260 | 300 | 0.08 | 0.10 | 65 | 18 | C15c |
| MSS25,049-C15c | 220 | 260 | 0.10 | 0.12 | 52 | 12 | C15c |
| MSS25,141-B10D | 280 | 330 | 0.06 | 0.08 | 65 | 40 | B10D |
| MSS25,143-B10D | 260 | 300 | 0.08 | 0.10 | 60 | 26 | B10D |
| MSS25,145-B10D | 220 | 260 | 0.10 | 0.12 | 52 | 18 | B10D |
| **Test Conditions** | $I_F$ = 1 mA | | $V_R$ = 0.2 V<br>F = 1 MHz | | $I_F$ = 5 mA | GHz | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Operation Temperature | -65° C to 150° C |
| | Storage Temperature | -65° C to 150° C |
| | Power Dissipation | 150 mW per junction at 25° derate linearly to zero at $T_A$ = +150° C |
| | Soldering Temperature | 230° C for 5 sec. |

# Silicon Schottky P-Type Diodes: Medium Barrier

- Very low 1/f Noise
- Detector applications to 40 GHz
- Chip, beam lead or packaged devices

The Aeroflex / Metelics MSS39,000 series of Schottky diodes is fabricated on P-Type epitaxial substrates for superior 1/f noise performance in microwave based-detector applications up to 40 GHz.

## $V_F$ @ 1 mA = 380 ~ 480 mV — Chip and Beam Lead

| Model | $V_{BR}$ | $C_J$ | | $\gamma$ | $T_{SS}$ | Frequency | Package |
|---|---|---|---|---|---|---|---|
| | MIN V | TYP pF | MAX pF | TYP mV / mW | TYP dBm | TYP GHz | |
| MSS39,045-C15 | 5.0 | 0.08 | 0.10 | 5,000 | -58 | 18 | C15p |
| MSS39,048-C15 | 5.0 | 0.12 | 0.15 | 5,000 | -58 | 12 | C15p |
| MSS39,144-B10B | 3.5 | 0.06 | 0.08 | 5,000 | -58 | 40 | B10Bp |
| MSS39,146-B10B | 3.5 | 0.08 | 0.10 | 5,000 | -58 | 26 | B10Bp |
| MSS39,148-B10B | 3.5 | 0.10 | 0.12 | 5,000 | -58 | 20 | B10Bp |
| MSS39,152-B10B | 3.5 | 0.15 | 0.18 | 5,000 | -58 | 18 | B10Bp |
| **Test Conditions** | $I_R$ = 10 µA | $V_R$ = 0 V, F = 1 MHz | | F = 10 GHz DC BIAS = 20 µA, Video BW = 2 MHz $R_L$ = 100 kΩ | | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Reverse Voltage | Rated $V_{BR}$ |
| | Forward Current | 50 mA |
| | Operation Temperature | -65° C to +150° C |
| | Storage Temperature | -65° C to +150° C |
| | Power Dissipation | 150 mW, derated linearly to zero at $T_A$ = +150° C |
| | Soldering Temperature (Packaged) | +230° C for 5 sec. |
| | Beam Lead Pull Strength, Min | 4 grams |

## $V_F$ @ 1 mA = 380 ~ 480 mV — Packaged

| Model | $C_T$ | | $\gamma$ | $T_{SS}$ | $C_P$ | $L_P$ | Package |
|---|---|---|---|---|---|---|---|
| | TYP pF | MAX pF | TYP mV / mW | TYP dBm | TYP pF | TYP nH | |
| MSS39,045-P55 | 0.21 | 0.26 | 5,000 | -58 | 0.13 | 0.35 | P55p |
| MSS39,045-P86 | 0.23 | 0.23 | 5,000 | -58 | 0.15 | 1.0 | P86p |
| MSS39,048-P55 | 0.25 | 0.31 | 5,000 | -58 | 0.13 | 0.35 | P55p |
| MSS39,048-P86 | 0.27 | 0.33 | 5,000 | -58 | 0.15 | 1.0 | P86p |
| MSS39,144-H27 | 0.18 | 0.24 | 5,000 | -58 | 0.12 | 0.4 | H27 |
| MSS39,144-0402 | 0.11 | 0.16 | 5,000 | -58 | 0.05 | 0.25 | 0402 |
| MSS39,144-0805-2 | 0.12 | 0.17 | 5,000 | -58 | 0.06 | 0.4 | 0805-2 |
| MSS39,146-H27 | 0.20 | 0.25 | 5,000 | -58 | 0.12 | 0.4 | H27 |
| MSS39,146-0402 | 0.13 | 0.18 | 5,000 | -58 | 0.05 | 0.25 | 0402 |
| MSS39,146-0805-2 | 0.14 | 0.20 | 5,000 | -58 | 0.06 | 0.4 | 0805-2 |
| MSS39,148-E25 | 0.17 | 0.22 | 5,000 | -58 | 0.07 | 0.4 | E25 |
| MSS39,148-H20 | 0.28 | 0.33 | 5,000 | -58 | 0.18 | 0.5 | H20 |
| MSS39,148-0402 | 0.15 | 0.20 | 5,000 | -58 | 0.05 | 0.25 | 0402 |
| MSS39,148-0805-2 | 0.16 | 0.22 | 5,000 | -58 | 0.06 | 0.4 | 0805-2 |
| MSS39,152-E25 | 0.22 | 0.28 | 5,000 | -58 | 0.07 | 0.4 | E25 |
| MSS39,152-H20 | 0.33 | 0.39 | 5,000 | -58 | 0.18 | 0.5 | H20 |
| MSS39,152-0402 | 0.20 | 0.25 | 5,000 | -58 | 0.05 | 0.25 | 0402 |
| MSS39,152-0805-2 | 0.21 | 0.27 | 5,000 | -58 | 0.06 | 0.4 | 0805-2 |
| **Test Conditions** | $V_R$ = 0 V, F = 1 MHz | | F = 10 GHz DC BIAS = 20 µA, Video BW = 2 MHz $R_L$ = 100 kΩ | | | | |

# Silicon Schottky N-Type Diodes: Low Barrier

- $V_F$, $R_D$ and $C_J$ matching options
- Chip, beam lead or packaged devices
- Hi-Rel screening per MIL-PRF-19500 and MIL-PRF-38534 available

The Aeroflex / Metelics MSS30,000 Series of Schottky diodes are fabricated on N-Type epitaxial substrates using proprietary processes that yield the highest FCOs in the industry. Optimum mixer performance is obtained with LO power of -3 dBm to +3 dBm per diode. These can also be used in doubler, limiter, detector and sampler applications.

**VF @ 1 mA = 230 ~ 350 mV, VBR @ 10 μA = 2 V min.** Chip and Beam Lead

| Model | Configuration | $C_J$ TYP pF | $C_J$ MAX pF | $R_D$ MAX Ω | $R_S$ TYP Ω | $F_{CO}$ TYP GHz | Package |
|---|---|---|---|---|---|---|---|
| MSS30,046-C15 | Single Junction | 0.10 | 0.12 | 18 | 10 | 160 | C15 |
| MSS30,050-C15 | Single Junction | 0.15 | 0.18 | 15 | 6 | 175 | C15 |
| MSS30,142-B10B | Single Junction | 0.07 | 0.10 | 22 | 13 | 175 | B10B |
| MSS30,148-B10B | Single Junction | 0.12 | 0.15 | 15 | 7 | 190 | B10B |
| MSS30,154-B10B | Single Junction | 0.22 | 0.25 | 12 | 3 | 240 | B10B |
| MSS30,242-B20 | Series Tee | 0.07 | 0.10 | 22 | 13 | 175 | B20 |
| MSS30,248-B20 | Series Tee | 0.12 | 0.15 | 15 | 7 | 190 | B20 |
| MSS30,254-B20 | Series Tee | 0.22 | 0.25 | 12 | 3 | 240 | B20 |
| MSS30,346-B21 | Anti-Parallel Pair | 0.27 | 0.30 | 16 | 11 | 55 | B21 |
| MSS30,442-B42 | Ring Quad | 0.07 | 0.10 | 22 | 13 | 175 | B42 |
| MSS30,448-B42 | Ring Quad | 0.12 | 0.15 | 15 | 7 | 190 | B42 |
| MSS30,454-B40 | Ring Quad | 0.22 | 0.25 | 12 | 3 | 240 | B40 |
| MSS30,B46-B45 | Bridge Quad | 0.10 | 0.125 | 25 | 15 | 80 | B45 |
| MSS30,B53-B45 | Bridge Quad | 0.20 | 0.25 | 15 | 5 | 80 | B45 |
| MSS30,CR46-B49 | Crossover Ring Quad | 0.09 | 0.125 | 22 | 10 | 118 | B49 |
| MSS30,CR53-B49 | Crossover Ring Quad | 0.15 | 0.250 | 15 | 5 | 106 | B49 |
| MSS30,PCB46-B48 | Coplanar Bridge Quad | 0.08 | 0.12 | 20 | 7 | 166 | B48 |
| MSS30,PCR46-B47 | Coplanar Ring Quad | 0.07 | 0.13 | 22 | 10 | 152 | B47 |
| MSS30,PCR53-B47 | Coplanar Ring Quad | 0.15 | 0.25 | 15 | 5 | 106 | B47 |
| **Test Conditions** | | $V_R = 0$ V, F = 1 MHz | | $I_F = 5$ mA | | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Reverse Voltage | Rated $V_{BR}$ |
| | Forward Current | 50 mA |
| | Operation Temperature | -65° C to +150° C |
| | Storage Temperature | -65° C to +150° C |
| | Power Dissipation | 150 mW per junction at $T_A = 25°$ C, derate linearly to zero at $T_A = +150°$C |
| | Soldering Temperature (Packaged) | +260° C for 5 sec. |
| | Beam Lead Pull Strength | 4 grams minimum |

# Silicon Schottky N-Type Diodes: Low Barrier

**$V_F$ @ 1 mA = 230 ~ 350 mV, $V_{BR}$ @ 10 µA = 2 V min.** — Packaged

| Model | Configuration | $C_T$ TYP pF | $C_T$ MAX pF | $R_D$ MAX Ω | $C_P$ TYP pF | $L_P$ MAX nH | Package |
|---|---|---|---|---|---|---|---|
| MSS30,046-P55 | Single Junction | 0.23 | 0.30 | 18 | 0.13 | 0.35 | P55 |
| MSS30,046-P86 | Single Junction | 0.25 | 0.33 | 18 | 0.15 | 1.0 | P86 |
| MSS30,050-P55 | Single Junction | 0.28 | 0.35 | 15 | 0.13 | 0.35 | P55 |
| MSS30,050-P86 | Single Junction | 0.30 | 0.38 | 15 | 0.15 | 1.0 | P86 |
| MSS30,142-E25 | Single Junction | 0.14 | 0.26 | 22 | 0.07 | 0.4 | E25 |
| MSS30,142-H20 | Single Junction | 0.25 | 0.31 | 22 | 0.18 | 0.5 | H20 |
| MSS30,148-E25 | Single Junction | 0.21 | 0.31 | 15 | 0.07 | 0.4 | E25 |
| MSS30,148-H20 | Single Junction | 0.30 | 0.36 | 15 | 0.18 | 0.5 | H20 |
| MSS30,154-E25 | Single Junction | 0.30 | 0.41 | 12 | 0.07 | 0.4 | E25 |
| MSS30,154-H20 | Single Junction | 0.40 | 0.46 | 12 | 0.18 | 0.5 | H20 |
| MSS30,242-E35 | Series Tee | 0.15 | 0.21 | 22 | 0.07 | 0.4 | E35 |
| MSS30,242-H30 | Series Tee | 0.25 | 0.31 | 22 | 0.18 | 0.5 | H30 |
| MSS30,248-E35 | Series Tee | 0.20 | 0.25 | 15 | 0.07 | 0.4 | E35 |
| MSS30,248-H30 | Series Tee | 0.30 | 0.36 | 15 | 0.18 | 0.5 | H30 |
| MSS30,254-E35 | Series Tee | 0.30 | 0.35 | 12 | 0.07 | 0.4 | E35 |
| MSS30,254-H30 | Series Tee | 0.40 | 0.46 | 12 | 0.18 | 0.5 | H30 |
| MSS30,346-E25 | Anti-Parallel Pair | 0.35 | 0.40 | 16 | 0.07 | 0.4 | E25 |
| MSS30,346-H20 | Anti-Parallel Pair | 0.45 | 0.50 | 16 | 0.18 | 0.5 | H20 |
| MSS30,442-E45 | Ring Quad | 0.15 | 0.21 | 22 | 0.07 | 0.4 | E45 |
| MSS30,442-H40 | Ring Quad | 0.25 | 0.33 | 22 | 0.18 | 0.5 | H40 |
| MSS30,448-E45 | Ring Quad | 0.20 | 0.26 | 15 | 0.07 | 0.4 | E45 |
| MSS30,448-H40 | Ring Quad | 0.30 | 0.35 | 15 | 0.18 | 0.5 | H40 |
| MSS30,454-E45 | Ring Quad | 0.30 | 0.35 | 12 | 0.07 | 0.4 | E45 |
| MSS30,454-H40 | Ring Quad | 0.40 | 0.46 | 12 | 0.18 | 0.5 | H40 |
| MSS30,B46-E45 | Bridge Quad | 0.17 | 0.25 | 25 | 0.07 | 0.4 | E45 |
| MSS30,B46-H40 | Bridge Quad | 0.28 | 0.35 | 25 | 0.18 | 0.5 | H40 |
| MSS30,B53-E45 | Bridge Quad | 0.27 | 0.35 | 15 | 0.07 | 0.4 | E45 |
| MSS30,B53-H40 | Bridge Quad | 0.38 | 0.46 | 15 | 0.18 | 0.5 | H40 |
| MSS30,CR46-E45 | Crossover Ring Quad | 0.16 | 0.22 | 22 | 0.07 | 0.4 | E45 |
| MSS30,CR46-H40 | Crossover Ring Quad | 0.27 | 0.33 | 22 | 0.18 | 0.5 | H40 |
| MSS30,CR53-E45 | Crossover Ring Quad | 0.22 | 0.35 | 15 | 0.07 | 0.4 | E45 |
| MSS30,CR53-H40 | Crossover Ring Quad | 0.33 | 0.45 | 15 | 0.18 | 0.5 | H40 |
| **Test Conditions** | | $V_R$ = 0 V, F = 1 MHz | | $I_F$ = 5 mA | | | |

# Silicon Schottky N-Type Diodes: Medium Barrier

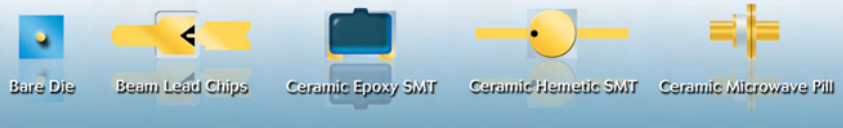
- $V_F$, $R_D$ and $C_J$ matching options
- Chip, beam lead or packaged devices
- Hi-Rel screening per MIL-PRF-19500 and MIL-PRF-38534 available

The Aeroflex / Metelics MSS40,000 Series of Schottky diodes are fabricated on N-Type epitaxial substrates using proprietary processes that yield the highest FCOs in the industry. Optimum mixer performance is obtained with LO power of 0 dBm to +6 dBm per diode. These can also be used in doubler, limiter, detector and sampler applications.

**$V_F$ @ 1 mA = 350 ~ 450 mV, $V_{BR}$ @ 10 µA = 3 V min.** Chip and Beam Lead

| Model | Configuration | $C_J$ | | $R_D$ | $R_S$ | $F_{CO}$ | Package |
|---|---|---|---|---|---|---|---|
| | | TYP pF | MAX pF | MAX Ω | TYP Ω | TYP GHz | |
| MSS40,045-C15 | Single Junction | 0.09 | 0.12 | 15 | 7 | 253 | C15 |
| MSS40,048-C15 | Single Junction | 0.12 | 0.15 | 15 | 7 | 190 | C15 |
| MSS40,141-B10B | Single Junction | 0.06 | 0.10 | 22 | 10 | 265 | B10B |
| MSS40,148-B10B | Single Junction | 0.12 | 0.15 | 17 | 7 | 190 | B10B |
| MSS40,155-B10B | Single Junction | 0.25 | 0.30 | 13 | 5 | 127 | B10B |
| MSS40,244-B20 | Series Tee | 0.08 | 0.12 | 22 | 19 | 105 | B20 |
| MSS40,248-B20 | Series Tee | 0.12 | 0.15 | 17 | 10 | 133 | B20 |
| MSS40,255-B20 | Series Tee | 0.25 | 0.30 | 15 | 5 | 127 | B20 |
| MSS40,448-B42 | Ring Quad | 0.12 | 0.15 | 17 | 7 | 190 | B42 |
| MSS40,455-B40 | Ring Quad | 0.25 | 0.30 | 17 | 5 | 127 | B40 |
| MSS40,B46-B45 | Bridge Quad | 0.10 | 0.13 | 25 | 15 | 106 | B45 |
| MSS40,B53-B45 | Bridge Quad | 0.20 | 0.25 | 15 | 5 | 160 | B45 |
| MSS40,CR46-B49 | Crossover Ring Quad | 0.09 | 0.125 | 22 | 10 | 177 | B49 |
| MSS40,CR53-B49 | Crossover Ring Quad | 0.15 | 0.25 | 15 | 5 | 212 | B49 |
| MSS40,PCR46-B47 | Coplanar Ring Quad | 0.07 | 0.13 | 22 | 10 | 227 | B47 |
| MSS40,PCR53-B47 | Coplanar Ring Quad | 0.15 | 0.25 | 15 | 5 | 212 | B47 |
| MSS40,PCB46-B48 | Coplanar Bridge Quad | 0.08 | 0.12 | 20 | 7 | 190 | B48 |
| **Test Conditions** | | $V_R = 0$ V, F = 1 MHz | | $I_F = 5$ mA | | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Reverse Voltage | Rated $V_{BR}$ |
| | Forward Current | 50 mA |
| | Operation Temperature | -65° C to +150° C |
| | Storage Temperature | -65° C to +150° C |
| | Power Dissipation | 150 mW per junction at $T_A = 25°$ C, derate linearly to zero at $T_A = +150°$C |
| | Soldering Temperature (Packaged) | +260° C for 5 sec. |
| | Beam Lead Pull Strength | 4 grams minimum |



# Silicon Schottky N-Type Diodes: Medium Barrier

| $V_F$ @ 1 mA = 350 ~ 450 mV, $V_{BR}$ = @ 10 µA 3 V min. | | | | | | | Packaged |
|---|---|---|---|---|---|---|---|
| **Model** | Configuration | $C_T$ | | $R_D$ | $C_P$ | $L_P$ | Package |
| | | TYP pF | MAX pF | MAX Ω | TYP pF | TYP nH | |
| MSS40,045-P55 | Single Junction | 0.22 | 0.28 | 15 | 0.13 | 0.35 | P55 |
| MSS40,045-P86 | Single Junction | 0.24 | 0.30 | 15 | 0.15 | 1.0 | P86 |
| MSS40,048-P55 | Single Junction | 0.25 | 0.30 | 15 | 0.13 | 0.35 | P55 |
| MSS40,048-P86 | Single Junction | 0.27 | 0.33 | 15 | 0.15 | 1.0 | P86 |
| MSS40,141-E25 | Single Junction | 0.13 | 0.22 | 18 | 0.07 | 0.4 | E25 |
| MSS40,141-H20 | Single Junction | 0.24 | 0.30 | 18 | 0.18 | 0.5 | H20 |
| MSS40,141-0402 | Single Junction | 0.11 | 0.18 | 18 | 0.05 | 0.25 | 0402 |
| MSS40,148-E25 | Single Junction | 0.19 | 0.28 | 15 | 0.07 | 0.4 | E25 |
| MSS40,148-H20 | Single Junction | 0.30 | 0.36 | 15 | 0.18 | 0.5 | H20 |
| MSS40,148-0402 | Single Junction | 017 | 0.24 | 15 | 0.05 | 0.25 | 0402 |
| MSS40,155-E25 | Single Junction | 0.32 | 0.41 | 14 | 0.07 | 0.4 | E25 |
| MSS40,155-H20 | Single Junction | 0.43 | 0.51 | 14 | 0.18 | 0.5 | H20 |
| MSS40,155-0402 | Single Junction | 030 | 0.38 | 14 | 0.05 | 0.25 | 0402 |
| MSS40,244-E35 | Series Tee | 0.15 | 0.24 | 28 | 0.07 | 0.4 | E35 |
| MSS40,244-0805-4 | Series Tee | 0.29 | 0.36 | 28 | 0.06 | 0.4 | 0805-4 |
| MSS40,248-E35 | Series Tee | 0.19 | 0.28 | 18 | 0.07 | 0.4 | E35 |
| MSS40,248-0805-4 | Series Tee | 0.18 | 0.25 | 18 | 0.06 | 0.4 | 0805-4 |
| MSS40,255-E35 | Series Tee | 0.32 | 0.41 | 14 | 0.07 | 0.4 | E35 |
| MSS40,255-0805-4 | Series Tee | 0.17 | 0.40 | 14 | 0.06 | 0.4 | 0805-4 |
| MSS40,448-E45 | Ring Quad | 0.19 | 0.25 | 15 | 0.07 | 0.4 | E45 |
| MSS40,448-H40 | Ring Quad | 0.30 | 0.36 | 15 | 0.18 | 0.5 | H40 |
| MSS40,455-E45 | Ring Quad | 0.32 | 0.40 | 14 | 0.07 | 0.4 | E45 |
| MSS40,455-H40 | Ring Quad | 0.42 | 0.52 | 14 | 0.18 | 0.5 | H40 |
| MSS40,B46-E45 | Bridge Quad | 0.17 | 0.24 | 25 | 0.07 | 0.4 | E45 |
| MSS40,B53-E45 | Bridge Quad | 0.27 | 0.36 | 15 | 0.07 | 0.4 | E45 |
| MSS40,CR46-E45 | Crossover Ring Quad | 0.16 | 0.23 | 15 | 0.07 | 0.4 | E45 |
| MSS40,CR46-H40 | Crossover Ring Quad | 0.27 | 0.35 | 15 | 0.18 | 0.5 | H40 |
| MSS40,CR53-E45 | Crossover Ring Quad | 0.22 | 0.35 | 15 | 0.07 | 0.4 | E45 |
| MSS40,CR53-H40 | Crossover Ring Quad | 0.33 | 0.46 | 15 | 0.18 | 0.5 | H40 |
| **Test Conditions** | | $V_R$ = 0 V F = 1 MHz | | $I_F$ = 5 mA | | | |

# Silicon Schottky N-Type Diodes: High Barrier

- $V_F$, $R_D$ and $C_J$ matching options
- Chip, beam lead or packaged devices
- Hi-Rel screening per MIL-PRF-19500 and MIL-PRF-38534 available

The Aeroflex / Metelics MSS50,000 Series of Schottky diodes are fabricated on N-Type epitaxial substrates using proprietary processes that yield the highest FCOs in the industry. Optimum mixer and detector performance is obtained with LO power of +2 dBm to +8 dBm per diode. These can also be used in doubler, limiter, detector and sampler applications.

**$V_F$ @ 1 mA = 450 ~ 550 mV, $V_{BR}$ @ 10 µA = 4 V min.** Chip and Beam Lead

| Model | Configuration | $C_J$ | | $R_D$ | $R_S$ | $F_{CO}$ | Package |
|---|---|---|---|---|---|---|---|
| | | TYP pF | MAX pF | MAX Ω | TYP Ω | TYP GHz | |
| MSS50,046-C26 | Single Junction | 0.10 | 0.12 | 20 | 10 | 190 | C26 |
| MSS50,048-C15 | Single Junction | 0.12 | 0.15 | 15 | 7 | 190 | C15 |
| MSS50,062-C16 | Single Junction | 0.50 | 0.55 | 12 | 2 | 160 | C16 |
| MSS50,146-B10B | Single Junction | 0.07 | 0.12 | 18 | 9 | 253 | B10B |
| MSS50,155-B10B | Single Junction | 0.25 | 0.30 | 15 | 7 | 90 | B10B |
| MSS50,244-B20 | Series Tee | 0.15 | 0.20 | 16 | 7 | 183 | B20 |
| MSS50,341-B21 | Anti-Parallel Pair | 0.20 | 0.26 | 16 | 7 | 114 | B21 |
| MSS50,448-B40 | Ring Quad | 0.20 | 0.25 | 14 | 6 | 133 | B40 |
| MSS50,B46-B45 | Bridge Quad | 0.10 | 0.13 | 20 | 10 | 159 | B45 |
| MSS50,B53-B45 | Bridge Quad | 0.20 | 0.25 | 15 | 5 | 159 | B45 |
| MSS50,CR46-B49 | Crossover Ring Quad | 0.09 | 0.125 | 22 | 10 | 177 | B49 |
| MSS50,CR53-B49 | Crossover Ring Quad | 0.15 | 0.25 | 15 | 5 | 212 | B49 |
| MSS50,PCB46-B48 | Coplanar Bridge Quad | 0.08 | 0.12 | 20 | 7 | 284 | B48 |
| MSS50,PCR46-B47 | Coplanar Ring Quad | 0.07 | 0.13 | 22 | 10 | 227 | B47 |
| MSS50,PCR53-B48 | Coplanar Ring Quad | 0.15 | 0.25 | 15 | 5 | 212 | B47 |
| **Test Conditions** | | $V_R = 0$ V, F = 1 MHz | | $I_F = 5$ mA | | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Reverse Voltage | Rated $V_{BR}$ |
| | Forward Current | 50 mA |
| | Operation Temperature | -65° C to +150° C |
| | Storage Temperature | -65° C to +150° C |
| | Power Dissipation | 150 mW per junction at Ta = 25° C, derate linearly to zero at Ta = +150°C |
| | Soldering Temperature (Packaged) | +260° C for 5 sec. |
| | Beam Lead Pull Strength | 4 grams minimum |

# Silicon Schottky N-Type Diodes: High Barrier

**$V_F$ @ 1 mA = 450 ~ 550 mV, $V_{BR}$ @ 10 µA = 4 V min.** — Packaged

| Model | Configuration | $C_T$ TYP pF | $C_T$ MAX pF | $R_D$ MAX Ω | $C_P$ TYP pF | $L_P$ MAX nH | Package |
|---|---|---|---|---|---|---|---|
| MSS50,046-P55 | Single Junction | 0.23 | 0.28 | 20 | 0.13 | 0.35 | P55 |
| MSS50,046-P86 | Single Junction | .025 | 0.30 | 20 | 0.15 | 1.0 | P86 |
| MSS50,048-P55 | Single Junction | 0.25 | 0.31 | 15 | 0.13 | 0.35 | P55 |
| MSS50,048-P86 | Single Junction | 0.27 | 0.33 | 15 | 0.15 | 1.0 | P86 |
| MSS50,062-P55 | Single Junction | 0.63 | 0.75 | 12 | 0.13 | 0.35 | P55 |
| MSS50,062-P86 | Single Junction | 0.65 | 0.78 | 12 | 0.15 | 1.0 | P86 |
| MSS50,146-E25 | Single Junction | 0.14 | 0.24 | 18 | 0.07 | 0.4 | E25 |
| MSS50,146-H20 | Single Junction | 0.25 | 0.34 | 18 | 0.18 | 0.5 | H20 |
| MSS50,146-0402 | Single Junction | 0.11 | 0.20 | 18 | 0.05 | 0.25 | 0402 |
| MSS50,146-0805-2 | Single Junction | 0.12 | 0.22 | 18 | 0.06 | 0.4 | 0805-2 |
| MSS50,155-E25 | Single Junction | 0.32 | 0.41 | 15 | 0.07 | 0.4 | E25 |
| MSS50,155-H20 | Single Junction | 0.43 | 0.51 | 15 | 0.18 | 0.5 | H20 |
| MSS50,155-0402 | Single Junction | 0.30 | 0.38 | 15 | 0.05 | 0.25 | 0402 |
| MSS50,155-0805-2 | Single Junction | 0.31 | 0.40 | 15 | 0.06 | 0.4 | 0805-2 |
| MSS50,244-E35 | Series Tee | 0.22 | 0.31 | 16 | 0.07 | 0.4 | E35 |
| MSS50,244-H30 | Series Tee | 0.33 | 0.42 | 16 | 0.18 | 0.5 | H30 |
| MSS50,244-0805-4 | Series Tee | 0.34 | 0.44 | 16 | 0.06 | 0.4 | 0805-4 |
| MSS50,341-E25 | Anti-Parallel Pair | 0.27 | 0.36 | 16 | 0.07 | 0.4 | E25 |
| MSS50,341-H20 | Anti-Parallel Pair | 0.38 | 0.48 | 16 | 0.18 | 0.5 | H20 |
| MSS50,448-E45 | Ring Quad | 0.27 | 0.36 | 10 | 0.07 | 0.4 | E45 |
| MSS50,448-H40 | Ring Quad | 0.38 | 0.48 | 10 | 0.18 | 0.5 | H40 |
| MSS50,448-0805-4 | Ring Quad | 0.26 | 0.35 | 10 | 0.06 | 0.4 | 0805-4 |
| MSS50,B46-E45 | Bridge Quad | 0.17 | 0.25 | 20 | 0.07 | 0.4 | E45 |
| MSS50,B46-H40 | Bridge Quad | 0.28 | 0.35 | 20 | 0.18 | 0.5 | H40 |
| MSS50,B53-E45 | Bridge Quad | 0.27 | 0.36 | 15 | 0.07 | 0.4 | E45 |
| MSS50,B53-H40 | Bridge Quad | 0.38 | 0.48 | 15 | 0.18 | 0.5 | H40 |
| MSS50,CR46-E45 | Crossover Ring Quad | 0.16 | 0.25 | 22 | 0.07 | 0.4 | E45 |
| MSS50,CR46-H40 | Crossover Ring Quad | 0.27 | 0.36 | 22 | 0.18 | 0.5 | H40 |
| MSS50,CR53-E45 | Crossover Ring Quad | 0.22 | 0.36 | 15 | 0.07 | 0.4 | E45 |
| MSS50,CR53-H40 | Crossover Ring Quad | 0.33 | 0.46 | 15 | 0.18 | 0.5 | H40 |
| **Test Conditions** | | $V_R$ = 0 V, F = 1 MHz | | $I_F$ = 5 mA | | | |

# Silicon Schottky N-Type Diodes: Extra High Barrier

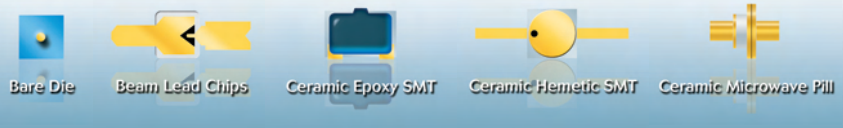
- $V_F$, $R_D$ and $C_J$ matching options
- Chip, beam lead or packaged devices
- Hi-Rel screening per MIL-PRF-19500 and MIL-PRF-38534 available

The Aeroflex / Metelics MSS60,000 Series of Schottky diodes are fabricated on N-Type epitaxial substrates using proprietary processes that yield the highest FCOs in the industry. Optimum mixer and detector performance is obtained with LO power of +6 dBm to +12 dBm per diode. These can also be used in doubler, limiter, detector and sampler applications.

**$V_F$ @ 1 mA = 550 ~ 700 mV, $V_{BR}$ @ 10 μA = 3.5 V min.** Chip and Beam Lead

| Model | Configuration | $C_J$ TYP pF | $C_J$ MAX pF | $R_D$ MAX Ω | $R_S$ TYP Ω | $F_{CO}$ TYP GHz | Package |
|---|---|---|---|---|---|---|---|
| MSS60,046-C26 | Single Junction | 0.10 | 0.12 | 18 | 10 | 190 | C26 |
| MSS60,048-C26 | Single Junction | 0.12 | 0.15 | 16 | 8 | 190 | C26 |
| MSS60,144-B10B | Single Junction | 0.08 | 0.10 | 25 | 15 | 153 | B10B |
| MSS60,148-B10B | Single Junction | 0.12 | 0.15 | 18 | 10 | 133 | B10B |
| MSS60,153-B10B | Single Junction | 0.20 | 0.25 | 12 | 5 | 159 | B10B |
| MSS60,244-B20 | Series Tee | 0.08 | 0.10 | 25 | 15 | 133 | B20 |
| MSS60,248-B20 | Series Tee | 0.12 | 0.15 | 18 | 7 | 133 | B20 |
| MSS60,253-B20 | Series Tee | 0.20 | 0.25 | 12 | 5 | 159 | B20 |
| MSS60,444-B42 | Ring Quad | 0.08 | 0.10 | 25 | 15 | 133 | B42 |
| MSS60,448-B42 | Ring Quad | 0.12 | 0.15 | 18 | 7 | 133 | B42 |
| MSS60,453-B41 | Ring Quad | 0.25 | 0.30 | 12 | 5 | 159 | B41 |
| MSS60,841-B80 | 8 Junction Ring Quad | 0.06 | 0.08 | 28 | 18 | 133 | B80 |
| MSS60,846-B80 | 8 Junction Ring Quad | 0.10 | 0.12 | 23 | 12 | 106 | B80 |
| MSS60,848-B80 | 8 Junction Ring Quad | 0.12 | 0.15 | 18 | 7 | 133 | B80 |
| MSS60,B46-B45 | Bridge Quad | 0.10 | 0.13 | 25 | 15 | 106 | B45 |
| MSS60,B53-B45 | Bridge Quad | 0.20 | 0.25 | 18 | 7 | 114 | B45 |
| MSS60,CR46-B49 | Crossover Ring Quad | 0.09 | 0.125 | 22 | 10 | 177 | B49 |
| MSS60,CR53-B49 | Crossover Ring Quad | 0.15 | 0.25 | 15 | 7 | 152 | B49 |
| MSS60,PCB46-B48 | Coplanar Bridge Quad | 0.08 | 0.12 | 20 | 7 | 284 | B48 |
| MSS60,PCR46-B47 | Coplanar Ring Quad | 0.07 | 0.13 | 22 | 10 | 227 | B47 |
| MSS60,PCR53-B47 | Coplanar Ring Quad | 0.15 | 0.25 | 15 | 7 | 152 | B47 |
| **Test Conditions** | | $V_R$ = 0 V F = 1 MHz | | $I_F$ = 5 mA | | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Reverse Voltage | Rated $V_{BR}$ |
| | Forward Current | 50 mA |
| | Operation Temperature | -65° C to +150° C |
| | Storage Temperature | -65° C to +150° C |
| | Power Dissipation | 150 mW per junction at Ta = 25° C, derate linearly to zero at Ta = +150°C |
| | Soldering Temperature (Packaged) | +260° C for 5 sec. |
| | Beam Lead Pull Strength | 4 grams minimum |



# Silicon Schottky N-Type Diodes: Extra High Barrier

| $V_F$ @ 1 mA = 550 ~ 700 mV, $V_{BR}$ @ 10 µA = 3.5 V min. | | | | | | | Packaged |
|---|---|---|---|---|---|---|---|
| **Model** | Configuration | $C_T$ | | $R_D$ | $C_P$ | $L_P$ | Package |
| | | TYP pF | MAX pF | MAX Ω | TYP pF | TYP nH | |
| MSS60,046-P55 | Single Junction | 0.23 | 0.28 | 18 | 0.13 | 0.35 | P55 |
| MSS60,046-P86 | Single Junction | 0.25 | 0.30 | 18 | 0.15 | 1.0 | P86 |
| MSS60,048-P55 | Single Junction | 0.25 | 0.31 | 16 | 0.13 | 0.35 | P55 |
| MSS60,048-P86 | Single Junction | 0.27 | 0.33 | 16 | 0.15 | 1.0 | P86 |
| MSS60,144-E25 | Single Junction | 0.15 | 0.22 | 25 | 0.07 | 0.4 | E25 |
| MSS60,144-H20 | Single Junction | 0.26 | 0.31 | 25 | 0.18 | 0.5 | H20 |
| MSS60,148-E25 | Single Junction | 0.19 | 0.28 | 18 | 0.07 | 0.4 | E25 |
| MSS60,148-H20 | Single Junction | 0.30 | 0.38 | 18 | 0.18 | 0.5 | H20 |
| MSS60,153-E25 | Single Junction | 0.27 | 0.36 | 12 | 0.07 | 0.4 | E25 |
| MSS60,153-H20 | Single Junction | 0.38 | 0.48 | 12 | 0.18 | 0.5 | H20 |
| MSS60,244-E35 | Series Tee | 0.15 | 0.22 | 25 | 0.07 | 0.4 | E35 |
| MSS60,244-H30 | Series Tee | 0.26 | 0.36 | 25 | 0.18 | 0.5 | H30 |
| MSS60,248-E35 | Series Tee | 0.19 | 0.28 | 18 | 0.07 | 0.4 | E35 |
| MSS60,248-H30 | Series Tee | 0.30 | 0.40 | 18 | 0.18 | 0.5 | H30 |
| MSS60,253-E35 | Series Tee | 0.27 | 0.37 | 12 | 0.07 | 0.4 | E35 |
| MSS60,253-H30 | Series Tee | 0.38 | 0.48 | 12 | 0.18 | 0.5 | H30 |
| MSS60,444-E45 | Ring Quad | 0.15 | 0.22 | 25 | 0.07 | 0.4 | E45 |
| MSS60,444-H40 | Ring Quad | 0.26 | 0.33 | 25 | 0.18 | 0.5 | H40 |
| MSS60,448-E45 | Ring Quad | 0.19 | 0.27 | 18 | 0.07 | 0.4 | E45 |
| MSS60,448-H40 | Ring Quad | 0.30 | 0.38 | 18 | 0.18 | 0.5 | H40 |
| MSS60,453-E45 | Ring Quad | 0.32 | 0.42 | 12 | 0.07 | 0.4 | E45 |
| MSS60,453-H40 | Ring Quad | 0.43 | 0.53 | 12 | 0.18 | 0.5 | H40 |
| MSS60,841-E45 | 8 Junction Ring Quad | 0.13 | 0.20 | 28 | 0.07 | 0.4 | E45 |
| MSS60,841-H40 | 8 Junction Ring Quad | 0.24 | 0.31 | 28 | 0.18 | 0.5 | H40 |
| MSS60,846-E45 | 8 Junction Ring Quad | 0.17 | 0.24 | 23 | 0.07 | 0.4 | E45 |
| MSS60,846-H40 | 8 Junction Ring Quad | 0.28 | 0.35 | 23 | 0.18 | 0.5 | H40 |
| MSS60,848-E45 | 8 Junction Ring Quad | 0.19 | 0.27 | 18 | 0.07 | 0.4 | E45 |
| MSS60,848-H40 | 8 Junction Ring Quad | 0.30 | 0.38 | 18 | 0.18 | 0.5 | H40 |
| MSS60,B46-E45 | Bridge Quad | 0.17 | 0.25 | 25 | 0.07 | 0.4 | E45 |
| MSS60,B46-H40 | Bridge Quad | 0.28 | 0.36 | 25 | 0.18 | 0.5 | H40 |
| MSS60,B53-E45 | Bridge Quad | 0.27 | 0.37 | 18 | 0.07 | 0.4 | E45 |
| MSS60,B53-H40 | Bridge Quad | 0.38 | 0.48 | 18 | 0.18 | 0.5 | H40 |
| MSS60,CR46-E45 | Crossover Ring Quad | 0.16 | 0.25 | 22 | 0.07 | 0.4 | E45 |
| MSS60,CR53-E45 | Crossover Ring Quad | 0.22 | 0.37 | 15 | 0.07 | 0.4 | E45 |
| **Test Conditions** | | $V_R$ = 0 V<br>F = 1 MHz | | $I_F$ = 5 mA | | | |

# Silicon Schottky Diodes: General Purpose

- Fast switching
- High breakdown voltage
- Low cost

The Aeroflex / Metelics MGR-700 Series are general purpose Schottky Barrier diodes specially designed to achieve a high voltage breakdown. This series of diodes can be used in the UHF and VHF frequency bands for pulse shaping, sampling and as fast logic gates.

Chip

| Model | Breakdown Voltage $I_R$ 10 µA | Forward Voltage 1mA | Junction Capacitance @0 Vdc 1 MHz | Leakage Current 80% $V_B$ |
|---|---|---|---|---|
| | MIN V | TYP V | MAX pF | MAX nA |
| MGR700 | 8.0 | 0.34 | 1.2 | 100.0 |
| MGR701 | 8.0 | 0.34 | 1.0 | 100.0 |
| MGR702 | 20.0 | 0.55 | 1.2 | 100.0 |
| MGR703 | 20.0 | 0.41 | 1.0 | 100.0 |
| MGR704 | 70.0 | 0.41 | 2.0 | 200.0 |
| MGR705 | 70.0 | 0.41 | 1.2 | 200.0 |
| 1N5711 | 20.0 | 0.41 | 1.0 | 100.0 |
| 1N5712 | 70.0 | 0.41 | 1.2 | 200.0 |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Operating Temperature | -55° C to + 150° C |
| | Storage Temperature | -65° C to + 200° C |
| | Reverse Voltage | See Voltage Ratings |

# Silicon Schottky Diodes: General Purpose

## SOT23 & SOD323

| Model | Configuration | $V_{BR}$ MIN V | $V_F$ TYP mV | $C_T$ MAX pF | $R_D$ MAX Ω | Package |
|---|---|---|---|---|---|---|
| SMST3012-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 2.0 | 270 | 0.25 | 15 | SOT23 |
| SMST4012-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 2.0 | 350 | 0.25 | 15 | SOT23 |
| SMST6012-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 2.0 | 630 | 0.25 | 15 | SOT23 |
| SMST3004-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 2.0 | 270 | 0.60 | 10 | SOT23 |
| SMST4004-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 2.0 | 350 | 0.60 | 10 | SOT23 |
| SMST6004-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 2.0 | 600 | 0.60 | 10 | SOT23 |
| SMSD3012-SOD323 | – | 2.0 | 270 | 0.25 | 15 | SOD323 |
| SMSD4012-SOD323 | – | 2.0 | 350 | 0.25 | 15 | SOD323 |
| SMSD6012-SOD323 | – | 2.0 | 630 | 0.25 | 15 | SOD323 |
| SMSD3004-SOD323 | – | 2.0 | 270 | 0.60 | 10 | SOD323 |
| SMSD4004-SOD323 | – | 2.0 | 350 | 0.60 | 10 | SOD323 |
| SMSD6004-SOD323 | – | 2.0 | 600 | 0.60 | 10 | SOD323 |
| **Test Conditions** | | $I_R = 10\ \mu A$ | $I_F = 1$ mA | $V_R = 0$ V F = 1 MHz | $I_F = 10$ mA | |

## SOT143

| Model | Configuration | $V_{BR}$ MIN V | $V_F$ TYP mV | $C_T$ MAX pF | $R_D$ MAX Ω | Package |
|---|---|---|---|---|---|---|
| SMSP3012-SOT143 | Split Pair | 2 | 270 | 0.40 | 15.0 | SOT143 |
| SMSP3004-SOT143 | Split Pair | 2 | 270 | 0.65 | 10.0 | SOT143 |
| SMSRQ1200-SOT143 | Ring Quad | 2 | 270 | 0.40 | 15.0 | SOT143 |
| SMSCQ1200-SOT143 | Crossover Quad | 2 | 270 | 0.40 | 15.0 | SOT143 |
| SMSRQ1500-SOT143 | Ring Quad | 2 | 270 | 0.65 | 8.0 | SOT143 |
| SMSCQ1500-SOT143 | Crossover Quad | 2 | 270 | 0.65 | 8.0 | SOT143 |
| SMSRQ2500-SOT143 | Ring Quad | 2 | 400 | 0.65 | 10.0 | SOT143 |
| SMSCQ2500-SOT143 | Crossover Quad | 2 | 400 | 0.65 | 10.0 | SOT143 |
| SMSRQ4500-SOT143 | Ring Quad | 3 | 600 | 0.65 | 8.0 | SOT143 |
| SMSCQ4500-SOT143 | Crossover Quad | 3 | 600 | 0.65 | 8.0 | SOT143 |
| SMSRQ5500-SOT143 | Ring Quad | 3 | 1,100 | 0.55 | 16.0 | SOT143 |
| SMSCQ5500-SOT143 | Crossover Quad | 3 | 1,100 | 0.55 | 16.0 | SOT143 |
| **Test Conditions** | | $I_R = 10\ \mu A$ | $I_F = 1$ mA | $V_R = 0$ V F = 1 MHz | $I_F = 10$ mA | |

# Tunnel Diodes: MBD Series

- Rugged Germanium Planar Construction
- Excellent temperature stability
- No DC Bias Required
- Wide Video Bandwidth
- MIL-STD-19500 & 883 Capability

The Aeroflex / Metelics MBD series of Planar Back (Tunnel) Diodes are fabricated on germanium substrates with passivated, planar construction and all gold metallization for reliable operation up to +110 ºC. Unlike the standard tunnel diode $I_P$ is minimized for detector operation and binned in five values offering varying degrees of sensitivity and video impedance. The back detector is generally operated with zero bias and is known for its excellent temperature stability and fast video rise times.

## Chips

| Model | $I_P$ | | $C_J$ | $\gamma$ | $R_V$ | $I_P$ / $I_V$ | $V_R$ | $V_F$ | Package |
|---|---|---|---|---|---|---|---|---|---|
| | MIN μA | MAX pF | MAX pF | TYP mV / mW | TYP Ω | MIN | MIN mV | MAX mV | |
| MBD1057-C18 | 100 | 200 | 0.30 | 1,000 | 180 | 2.5 | 420 | 135 | C18 |
| MBD2057-C18 | 200 | 300 | 0.30 | 750 | 130 | 2.5 | 410 | 130 | C18 |
| MBD3057-C18 | 300 | 400 | 0.30 | 500 | 80 | 2.5 | 400 | 125 | C18 |
| MBD4057-C18 | 400 | 500 | 0.30 | 275 | 65 | 2.5 | 400 | 120 | C18 |
| MBD5057-C18 | 500 | 600 | 0.30 | 250 | 60 | 2.5 | 400 | 110 | C18 |
| Test Conditions | | | $V_R = V_V$ F =100 MHz | $P_{IN}$ = -20 dBm $R_L$ = 10 KΩ F = 10 GHz | | | $I_R$ = 500 μA | $I_F$ = 3 mA | |

## Packaged

| Model | $I_P$ | | $C_T$ | $\gamma$ | $R_V$ | $I_P$ / $I_V$ | $V_R$ | $V_F$ | Package |
|---|---|---|---|---|---|---|---|---|---|
| | MIN μA | MAX pF | MAX pF | TYP mV / mW | TYP Ω | MIN | MIN mV | MAX mV | |
| MBD1057-E28 / 28X | 100 | 200 | 0.40 | 1,000 | 180 | 2.5 | 420 | 135 | E28 / 28X |
| MBD1057-H20 | 100 | 200 | 0.50 | 1,000 | 180 | 2.5 | 420 | 135 | H20 |
| MBD1057-T54 | 100 | 200 | 0.55 | 1,000 | 180 | 2.5 | 420 | 135 | T54p |
| MBD1057-T80 | 100 | 200 | 0.65 | 1,000 | 180 | 2.5 | 420 | 135 | T80p |
| MBD1057-0805-2 | 100 | 200 | 0.40 | 1,000 | 180 | 2.5 | 420 | 135 | 0805-2 |
| MBD2057-E28 / 28X | 200 | 300 | 0.40 | 750 | 130 | 2.5 | 410 | 130 | E28 / 28X |
| MBD2057-H20 | 200 | 300 | 0.50 | 750 | 130 | 2.5 | 410 | 130 | H20 |
| MBD2057-T54 | 200 | 300 | 0.55 | 750 | 130 | 2.5 | 410 | 130 | T54p |
| MBD2057-T80 | 200 | 300 | 0.65 | 750 | 130 | 2.5 | 410 | 130 | T80p |
| MBD2057-0805-2 | 200 | 300 | 0.40 | 750 | 130 | 2.5 | 410 | 130 | 0805-2 |
| MBD3057-E28 / 28X | 300 | 400 | 0.45 | 500 | 80 | 2.5 | 400 | 125 | E28 / 28X |
| MBD3057-H20 | 300 | 400 | 0.55 | 500 | 80 | 2.5 | 400 | 125 | H20 |
| MBD3057-T54 | 300 | 400 | 0.60 | 500 | 80 | 2.5 | 400 | 125 | T54p |
| MBD3057-T80 | 300 | 400 | 0.70 | 500 | 80 | 2.5 | 400 | 125 | T80p |
| MBD3057-0805-2 | 300 | 400 | 0.45 | 500 | 80 | 2.5 | 400 | 125 | 0805.2 |
| MBD4057-E28 / 28X | 400 | 500 | 0.50 | 275 | 65 | 2.5 | 400 | 120 | E28 / 28X |
| MBD4057-H20 | 400 | 500 | 0.60 | 275 | 65 | 2.5 | 400 | 120 | H20 |
| MBD4057-T54 | 400 | 500 | 0.65 | 275 | 65 | 2.5 | 400 | 120 | T54p |
| MBD4057-T80 | 400 | 500 | 0.75 | 275 | 65 | 2.5 | 400 | 120 | T80p |
| MBD4057-0805-2 | 400 | 500 | 0.5 | 275 | 65 | 2.5 | 400 | 120 | 0805-2 |
| MBD5057-E28 / 28X | 500 | 600 | 0.55 | 250 | 60 | 2.5 | 400 | 110 | E28 / 28X |
| MBD5057-H20 | 500 | 600 | 0.65 | 250 | 60 | 2.5 | 400 | 110 | H20 |
| MBD5057-T54 | 500 | 600 | 0.70 | 250 | 60 | 2.5 | 400 | 110 | T54p |
| MBD5057-T80 | 500 | 600 | 0.80 | 250 | 60 | 2.5 | 400 | 110 | T80p |
| MBD5057-0805-2 | 500 | 600 | 0.55 | 250 | 60 | 2.5 | 400 | 110 | 0805-2 |
| Test Conditions | | | $V_R = V_V$ F = 30 MHz | $P_{IN}$ = -20 dBm $R_L$ = 10 KΩ F = 10 GHz | | | $I_R$ = 500 μA | $I_F$ = 3 mA | |

# Tunnel Diode Detectors: MTD Series

- Low temperature drift
- Excellent flatness
- High sensitivity
- Low VSWR

The Aeroflex / Metelics MTD series of Planar Back (Tunnel) Diode Detectors include a variety of options for your commercial and broadband applications. Commercial products operate between 0.5 to 14.5 GHz and offer low temperature drift, high sensitivity, low VSWR, and excellent flatness. Both positive and negative output polarities are available. Broadband products offer high sensitivity and low VSWR.

## Commercial

| Model | Frequency Range | Sensitivity | MAX VSWR | Flatness | TYP $R_V$ | Output Capacitance |
|---|---|---|---|---|---|---|
| | GHz | MIN mV / mW | | dB | | TYP Pf |
| MTDL-8015P | 0.8 – 14.5 | 600 | 3.50:1 | ± 1.0 | 250 | 50 |
| MTDL-8015N | 0.8 – 14.5 | 600 | 3.50:1 | ± 1.0 | 250 | 50 |
| MTDH-8015P | 0.8 – 14.5 | 700 | 2.75:1 | ± 0.75 | 250 | 50 |
| MTDH-8015N | 0.8 – 14.5 | 700 | 2.75:1 | ± 0.75 | 250 | 50 |
| MTDL-8007P | 0.8 – 7.0 | 600 | 1.75:1 | ± 0.5 | 250 | 50 |
| MTDL-8007N | 0.8 – 7.0 | 600 | 1.75:1 | ± 0.5 | 250 | 50 |
| MTDH-8007P | 0.8 – 7.0 | 700 | 1.50:1 | ± 0.3 | 250 | 50 |
| MTDH-8007N | 0.8 – 7.0 | 700 | 1.50:1 | ± 0.3 | 250 | 50 |
| MTDL-0611P | 6.0 – 11.0 | 700 | 2.50:1 | ± 0.5 | 250 | 50 |
| MTDL-0611N | 6.0 – 11.0 | 700 | 2.50:1 | ± 0.5 | 250 | 50 |
| MTDH-0611P | 6.0 – 11.0 | 800 | 2.25:1 | ± 0.3 | 250 | 50 |
| MTDH-0611N | 6.0 – 11.0 | 800 | 2.25:1 | ± 0.3 | 250 | 50 |
| MTDL-1015P | 10.0 – 14.5 | 700 | 3.50:1 | ± 0.5 | 250 | 50 |
| MTDL-1015N | 10.0 – 14.5 | 700 | 3.50:1 | ± 0.5 | 250 | 50 |
| MTDH-1015P | 10.0 – 14.5 | 700 | 2.75:1 | ± 0.35 | 250 | 50 |
| MTDH-1015N | 10.0 – 14.5 | 700 | 2.75:1 | ± 0.35 | 250 | 50 |

Package
(contact factory)
2514T / 2540T

## Broadband

| Model | Frequency Range | Sensitivity | MAX VSWR | Flatness | TYP $R_V$ | Output Capacitance |
|---|---|---|---|---|---|---|
| | GHz | MIN mV / mW | | dB | | TYP Pf |
| MTD-1002N | 0.1 – 2.0 | 700 | 2.0:1 | ± 0.5 | 200 | 100 |
| MTD-0208N | 2.0 – 8.0 | 700 | 2.0:1 | ± 0.8 | 130 | 20 |
| MTD-0818N | 8.0 – 18.0 | 400 | 2.3:1 | ± 1.2 | 100 | 10 |
| MTD-0218N | 2.0 – 18.0 | 400 | 2.5:1 | ± 1.5 | 100 | 10 |

# Capacitors: MNOS Series

- Low leakage current
- Low insertion loss
- Excellent long-term stability

The Aeroflex / Metelics MIS capacitors utlize a silicon nitride dielectric over a thermally grown silicon dioxide base. The resultant composite dielectric exhibits low leakage current and insertion loss with excellent long-term stability. The temperature coefficient of capcitance is typically +55 ppm / ºC.

**Chips**

| Model | Capacitance Range | | DWV | IR | $T_{CC}$ | Dimensions | |
|---|---|---|---|---|---|---|---|
| | MIN pF | MAX pF | MIN V | MIN MΩ | TYP ppm / ºC | D1 mils | D2 mils |
| MC2DXXX010-010 | 0.10 | 5.0 | 50 | 1,000 | +55 | 10 | 10 |
| MC2DXXX015-015 | 1.5 | 15 | 50 | 1,000 | +55 | 15 | 15 |
| MC2DXXX020-020 | 5.0 | 50 | 50 | 1,000 | +55 | 20 | 20 |
| **Test Conditions** | F = 1 MHz | | | V = 25 V | -55 ºC to +200 ºC | | |

See Figure 1 in Outline Drawings
(XXX = Three digit capacitance code, ex. 005 = 5 pF , 082 = 82 pF, 1.5 = 1.5 pF)

**Chips**

| Model | Capacitance Range | | DWV | IR | $T_{CC}$ | Dimensions | |
|---|---|---|---|---|---|---|---|
| | MIN pF | MAX pF | MIN V | MIN MΩ | TYP ppm / ºC | D1 mils | D2 mils |
| MC2RXXX010-015 | 2.0 | 20 | 50 | 1,000 | +55 | 10 | 15 |
| MC2RXXX015-020 | 5.0 | 42 | 50 | 1,000 | +55 | 15 | 20 |
| MC2RXXX015-032 | 5.0 | 62 | 50 | 1,000 | +55 | 15 | 32 |
| MC2RXXX022-042 | 15 | 120 | 50 | 1,000 | +55 | 22 | 42 |
| MC2RXXX097-107 | 100 | 999 | 50 | 1,000 | +55 | 97 | 107 |
| MC2RXXX099-138 | 100 | 999 | 50 | 1,000 | +55 | 99 | 138 |
| MC2RXXXX127-145 | 200 | 1,800 | 50 | 1,000 | +55 | 127 | 145 |
| MC2RXXXX142-160 | 200 | 2,200 | 50 | 1,000 | +55 | 142 | 160 |
| **Test Conditions** | F = 1 MHz | | | V = 25 V | -55 ºC to +200 ºC | | |

See Figure 2 in Outline Drawings
(XXX = Three or four digit capacitance code, ex. 005 = 5 pF , 082 = 82 pF, 2.5 = 2.5 pF)

# Capacitors: MNOS Series

## Chips

| Model | Capacitance Range | | DWV | IR | $T_{CC}$ | Dimensions | |
|---|---|---|---|---|---|---|---|
| | MIN pF | MAX pF | MIN V | MIN MΩ | TYP ppm / °C | D1 mils | D2 mils |
| MC2SXXX010-010 | 0.25 | 8.0 | 50 | 1,000 | +55 | 10 | 10 |
| MC2SXXX011-011 | 1.0 | 12 | 50 | 1,000 | +55 | 11 | 11 |
| MC2SXXX015-015 | 3.0 | 30 | 50 | 1,000 | +55 | 15 | 15 |
| MC2SXXX016-016 | 3.0 | 35 | 50 | 1,000 | +55 | 16 | 16 |
| MC2SXXX020-020 | 5.0 | 55 | 50 | 1,000 | +55 | 20 | 20 |
| MC2SXXX022-022 | 5.0 | 60 | 50 | 1,000 | +55 | 22 | 22 |
| MC2SXXX025-025 | 10 | 100 | 50 | 1,000 | +55 | 25 | 25 |
| MC2SXXX030-030 | 10 | 120 | 50 | 1,000 | +55 | 30 | 30 |
| MC2SXXX035-035 | 15 | 150 | 50 | 1,000 | +55 | 35 | 35 |
| MC2SXXX040-040 | 20 | 200 | 50 | 1,000 | +55 | 40 | 40 |
| MC2SXXX050-050 | 25 | 250 | 50 | 1,000 | +55 | 50 | 50 |
| MC2SXXX055-055 | 25 | 300 | 50 | 1,000 | +55 | 55 | 55 |
| MC2SXXX060-060 | 35 | 375 | 50 | 1,000 | +55 | 60 | 60 |
| MC2SXXX070-070 | 50 | 550 | 50 | 1,000 | +55 | 70 | 70 |
| MC2SXXX080-080 | 70 | 700 | 50 | 1,000 | +55 | 80 | 80 |
| MC2SXXX100-100 | 100 | 999 | 50 | 1,000 | +55 | 100 | 100 |
| **Test Conditions** | F = 1 MHz | | | V = 25 V | -55 °C to +200 °C | | |

See Figure 3 in Outline Drawings
(XXX = Three digit capacitance code, ex. 005 = 5 pF , 082 = 82 pF)

## Binary Chips

| Model | Capacitance Range | | | | | DWV | IR | $T_{CC}$ | Package |
|---|---|---|---|---|---|---|---|---|---|
| | $C_T$ ±20% pF | C1 NOM pF | C2 NOM pF | C3 NOM pF | C4 NOM pF | MIN V | MIN MΩ | TYP ppm / °C | |
| MC2B0.8020-020 | 1.5 | 0.1 | 0.2 | 0.4 | 0.8 | 50 | 1,000 | +55 | C20 |
| MC2B002020-020 | 3.75 | 0.25 | 0.5 | 1.0 | 2.0 | 50 | 1,000 | +55 | C20 |
| MC2B004020-020 | 8.0 | 0.5 | 1.0 | 2.0 | 4.0 | 50 | 1,000 | +55 | C20 |
| MC2B008020-020 | 15 | 1.0 | 2.0 | 4.0 | 8.0 | 50 | 1,000 | +55 | C20 |
| MC2B016020-020 | 30 | 2.0 | 4.0 | 8.0 | 16 | 50 | 1,000 | +55 | C20 |
| **Test Conditions** | F = 1 MHz | | | | | | V = 25 V | -55 °C to +200 °C | |

See Figure 4 in Outline Drawings

# Capacitors: MNOS Series

Beam Lead

| Model | $C_T$ ±20% pF | DWV MIN V | IR MIN mΩ | $T_{CC}$ TYP ppm / °C | Package |
|---|---|---|---|---|---|
| MBC50-1B12 | 1.0 | 50 | 1,000 | +55 | B12 |
| MBC50-2B12 | 2.0 | 50 | 1,000 | +55 | B12 |
| MBC50-3B12 | 3.0 | 50 | 1,000 | +55 | B12 |
| MBC50-4B12 | 4.0 | 50 | 1,000 | +55 | B12 |
| MBC50-6B12 | 6.0 | 50 | 1,000 | +55 | B12 |
| MBC50-8B12 | 8.0 | 50 | 1,000 | +55 | B12 |
| MBC50-10B12 | 10 | 50 | 1,000 | +55 | B12 |
| MBC50-15B12 | 15 | 50 | 1,000 | +55 | B12 |
| MBC50-20B12 | 20 | 50 | 1,000 | +55 | B12 |
| MBC50-33B13 | 33 | 50 | 1,000 | +55 | B13 |
| MBC50-47B13 | 47 | 50 | 1,000 | +55 | B13 |
| MBC50-68B13 | 68 | 50 | 1,000 | +55 | B13 |
| MBC50-82B13 | 82 | 50 | 1,000 | +55 | B13 |
| MBC50-100B13 | 100 | 50 | 1,000 | +55 | B13 |
| MBC50-0.2B14 | 0.2 | 50 | 1,000 | +55 | B14 |
| MBC50-1.0B14 | 1.0 | 50 | 1,000 | +55 | B14 |
| MBC50-1.5B14 | 1.5 | 50 | 1,000 | +55 | B14 |
| MBC50-2.0B14 | 2.0 | 50 | 1,000 | +55 | B14 |
| **Test Conditions** | F = 1 MHz | | V = 25 V | -55 °C to +200 °C | |

# GaAs Schottky Diodes

- Passivated mesa construction
- Tri-metallization
- Supports limiter, mixer, multiplier and sampler designs
- Operating to 60+ GHz

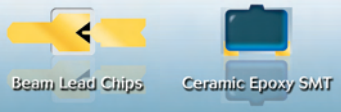
Millimeter wave performance in twelve configurations featuring passivated mesa construction and Aeroflex / Metelics' tri-metallization for ultra-reliable operation in the most demanding environments. Topologies supporting limiter, mixer, multiplier and sampler designs operating to 60+ GHz are available in flip chip, beam lead and packaged form. Screening per MIL-PRF-19500 and MIL-PRF-38534 is available.

## Flip Chip

| Model | Configuration | $V_F$ | | $\Delta V_F$ | $V_{BR}$ | $C_J$ | $\Delta C_J$ | $R_S$ | Package |
|---|---|---|---|---|---|---|---|---|---|
| | | MIN mV | MAX mV | MAX mV | MIN V | MAX pF | MAX pF | MAX Ω | |
| MGS801 | Single Junction | 650 | 750 | N/A | 5 | 0.06 | N/A | 7 | GC110 |
| MGS801A | Single Junction | 650 | 750 | N/A | 5 | 0.075 | N/A | 5 | GC110 |
| MGS802 | Anti-parallel Pair | 650 | 750 | 20 | – | 0.10 | N/A | 7 | GC210 |
| MGS802A | Anti-Parallel Pair | 650 | 750 | 20 | – | 0.15 | N/A | 5 | GC210 |
| MGS803 | Series Tee | 650 | 750 | 20 | 5 | 0.06 | 0.02 | 7 | GC310 |
| **Test Conditions** | | $I_F = 1$ mA | | | $I_R = 10\ \mu A$ | $V_R = 0$ V F = 1 MHz | | $I_F = 5$ mA | |

## Beam Lead

| Model | Configuration | $V_F$ | | $\Delta V_F$ | $V_{BR}$ | $C_J$ | $\Delta C_J$ | $R_S$ | Package |
|---|---|---|---|---|---|---|---|---|---|
| | | MIN mV | MAX mV | MAX mV | MIN V | MAX pF | MAX pF | MAX Ω | |
| MGS901 | Single Junction | 650 | 750 | N/A | 5 | 0.06 | N/A | 7 | GB110 |
| MGS902 | Anti Parallel Pair | 650 | 750 | 20 | – | 0.10 | N/A | 7 | GB210 |
| MGS903 | Series Tee | 650 | 750 | 20 | 5 | 0.06 | 0.02 | 7 | GB310 |
| MGS904 | 4 Junction Ring Quad | 650 | 750 | 20 | – | 0.06 | 0.02 | 7 | B85 |
| MGS904A | 4 Junction Ring Quad | 650 | 750 | 20 | – | 0.08 | 0.02 | 5 | B85 |
| MGS905 | 4 Junction Bridge Quad | 650 | 750 | 20 | 5 | 0.06 | 0.02 | 7 | B86 |
| MGS906 | 4 Junction Series Tee | 1300 | 1500 | 40 | 10 | 0.04 | 0.02 | 14 | B90 |
| MGS907 | 8 Junction Ring Quad | 1300 | 1500 | 40 | – | 0.04 | 0.02 | 14 | B85 |
| MGS907A | 8 Junction Ring Quad | 1300 | 1500 | 40 | – | 0.06 | 0.02 | 12 | B85 |
| MGS907B | 8 Junction Ring Quad | 1300 | 1500 | 40 | – | 0.08 | 0.02 | 10 | B85 |
| MGS908 | 8 Junction Bridge Quad | 1300 | 1500 | 40 | 10 | 0.04 | 0.02 | 14 | B86 |
| MGS909 | 6 Junction Series Tee | 1800 | 2100 | 60 | 15 | 0.10 | 0.03 | 21 | B90 |
| MGS910 | 12 Junction Ring Quad | 1800 | 2100 | 60 | – | 0.10 | 0.03 | 21 | B87 |
| MGS911 | 12 Junction Bridge Quad | 1800 | 2100 | 60 | 15 | 0.10 | 0.03 | 21 | B88 |
| MGS912 | Four Junction | 2500 | 2900 | N/A | 20 | 0.03 | N/A | 28 | B89 |
| **Test Conditions** | | $I_F = 1$ mA | | | $I_R = 10\ \mu A$ | $V_R = 0$ V F = 1 MHz | | $I_F = 5$ mA | |



# GaAs Abrupt Varactor Diodes

- Passivated mesa construction
- Applications in tunable filters and oscillators up to 40 GHz
- Die and packaged devices available

The Aeroflex / Metelics MGV series of abrupt varactor diodes feature passivated mesa construction for low leakage and excellent post tuning drift. These diodes will find application in tunable filters and oscillators up to 40 GHz. Optimum performance is obtained using die however packaged devices are available as well diodes screened per MIL-PRF-19500 and MIL-PRF-38534. Contact your representative for these and other options.

**$V_{BR}$ = 22 V min.** — Chips

| Model | Γ TYP | $C_J$ MIN pF | $C_J$ TYP pF | $C_J$ MAX pF | Tuning Ratio MIN | Tuning Ratio TYP | Tuning Ratio MAX | Q MIN | Package |
|---|---|---|---|---|---|---|---|---|---|
| MGV050-18 | 0.50 | 0.25 | 0.30 | 0.35 | 4.0 | 4.7 | 5.5 | 4,000 | C01A |
| MGV050-20 | 0.50 | 0.50 | 0.55 | 0.61 | 4.0 | 4.7 | 5.5 | 4,000 | C01A |
| MGV050-22 | 0.50 | 0.90 | 1.00 | 1.10 | 4.0 | 4.7 | 5.5 | 3,000 | C01A |
| MGV050-24 | 0.50 | 1.35 | 1.50 | 1.65 | 4.0 | 4.7 | 5.5 | 3,000 | C01A |
| MGV050-26 | 0.50 | 1.80 | 2.00 | 2.20 | 4.0 | 4.7 | 5.5 | 3,000 | C01A |
| **Test Conditions** | $V_R$=2to 22V | $V_R$ = 4 V F = 1 MHz | | | $V_R$ = 0 to 22 V | | | $V_R$ = 4 V F = 50 MHz | |

**$V_{BR}$ = 22 V min.** — Packaged

| Model | Γ TYP | $C_J$ MIN pF | $C_J$ TYP pF | $C_J$ MAX pF | Tuning Ratio MIN | Tuning Ratio TYP | Tuning Ratio MAX | Q MIN | Package |
|---|---|---|---|---|---|---|---|---|---|
| MGV050-18-E28 / 28X | 0.50 | 0.31 | 0.38 | 0.45 | 3.0 | 3.4 | 3.9 | 4,000 | E28 / 28X |
| MGV050-18-H20 | 0.50 | 0.41 | 0.48 | 0.55 | 2.0 | 2.6 | 3.2 | 4,000 | H20 |
| MGV050-18-0805-2 | 0.50 | 0.29 | 0.36 | 0.43 | 3.0 | 3.6 | 4.2 | 4,000 | 0805-2 |
| MGV050-20-E28 / 28X | 0.50 | 0.55 | 0.63 | 0.71 | 3.3 | 3.9 | 4.5 | 4,000 | E28 / 28X |
| MGV050-20-H20 | 0.50 | 0.64 | 0.73 | 0.82 | 2.8 | 3.2 | 3.7 | 4,000 | H20 |
| MGV050-20-0805-2 | 0.50 | 0.53 | 0.61 | 0.69 | 3.4 | 4.0 | 4.8 | 4,000 | 0805-2 |
| MGV050-22-E28 / 28X | 0.50 | 0.95 | 1.08 | 1.21 | 3.6 | 4.2 | 5.0 | 3,000 | E28 / 28X |
| MGV050-22-H20 | 0.50 | 1.04 | 1.18 | 1.32 | 3.2 | 3.7 | 4.4 | 3,000 | H20 |
| MGV050-22-0805-2 | 0.50 | 0.93 | 1.06 | 1.19 | 3.7 | 4.3 | 5.1 | 3,000 | 0805-2 |
| MGV050-24-E28 / 28X | 0.50 | 1.40 | 1.58 | 1.76 | 3.7 | 4.2 | 5.3 | 3,000 | E28 / 28X |
| MGV050-24-H20 | 0.50 | 1.49 | 1.68 | 1.87 | 3.4 | 3.7 | 4.7 | 3,000 | H20 |
| MGV050-24-0805-2 | 0.50 | 1.38 | 1.56 | 1.74 | 3.8 | 4.3 | 5.3 | 3,000 | 0805-2 |
| MGV050-26-E28 / 28X | 0.50 | 1.85 | 2.08 | 2.31 | 3.8 | 4.4 | 5.3 | 3,000 | E28 / 28X |
| MGV050-26-H20 | 0.50 | 1.94 | 2.18 | 2.42 | 3.5 | 4.0 | 4.9 | 3,000 | H20 |
| MGV050-26-0805-2 | 0.50 | 1.83 | 2.06 | 2.29 | 3.8 | 4.5 | 5.4 | 3,000 | 0805-2 |
| **Test Conditions** | $V_R$=2to 22V | $V_R$ = 4 V F = 1 MHz | | | $V_R$ = 0 to 22 V | | | $V_R$ = 4 V F = 50 MHz | |

# GaAs Hyperabrupt Varactor Diodes

- Passivated mesa construction
- Available in three constant gamma families
- Applications in tunable filters and oscillators up to 40 GHz
- Die and packaged devices available

The Aeroflex / Metelics MGV series of hyperabrupt varactor diodes feature passivated mesa construction for low leakage and excellent post tuning drift. Available in three constant gamma families of 0.75, 1.0 and 1.25. These diodes will find application in tunable filters and oscillators up to 40 GHz. Optimum performance is obtained using die however packaged devices are available as well diodes screened per MIL-PRF-19500 and MIL-PRF-38534. Contact your representative for these and other options.

Chips

| Model | Γ TYP | $C_J$ | | | Tuning Ratio | | | Q | Package |
|---|---|---|---|---|---|---|---|---|---|
| | | MIN pF | TYP pF | MAX pF | MIN | TYP | MAX | MIN | |
| MGV075-08* | 0.75 | 0.25 | 0.30 | 0.35 | 2.2 | 2.8 | 3.5 | 4,000 | C01A |
| MGV075-09* | 0.75 | 0.35 | 0.40 | 0.45 | 2.2 | 2.8 | 3.5 | 4,000 | C01A |
| MGV075-10* | 0.75 | 0.45 | 0.50 | 0.55 | 2.2 | 2.8 | 3.5 | 3,000 | C01A |
| MGV075-11* | 0.75 | 0.63 | 0.70 | 0.77 | 2.2 | 2.8 | 3.5 | 3,000 | C01A |
| MGV075-12* | 0.75 | 0.72 | 0.80 | 0.88 | 2.2 | 2.8 | 3.5 | 3,000 | C01A |
| MGV075-13* | 0.75 | 0.90 | 1.00 | 1.10 | 2.2 | 2.8 | 3.5 | 3,000 | C01A |
| MGV075-14* | 0.75 | 1.08 | 1.20 | 1.32 | 2.2 | 2.8 | 3.5 | 3,000 | C01A |
| MGV075-15* | 0.75 | 1.35 | 1.50 | 1.65 | 2.2 | 2.8 | 3.5 | 3,000 | C01A |
| MGV075-16* | 0.75 | 1.62 | 1.80 | 1.98 | 2.2 | 2.8 | 3.5 | 3,000 | C01A |
| MGV075-17* | 0.75 | 1.80 | 2.00 | 2.20 | 2.2 | 2.8 | 3.5 | 3,000 | C01A |
| MGV100-08 | 1.00 | 0.30 | 0.35 | 0.40 | 2.7 | 3.4 | 5.0 | 4,000 | C01A |
| MGV100-09 | 1.00 | 0.40 | 0.45 | 0.50 | 2.7 | 3.4 | 5.0 | 4,000 | C01A |
| MGV100-20 | 1.00 | 0.50 | 0.55 | 0.61 | 2.7 | 3.4 | 5.0 | 4,000 | C01A |
| MGV100-21 | 1.00 | 0.58 | 0.65 | 0.72 | 2.7 | 3.4 | 5.0 | 4,000 | C01A |
| MGV100-22 | 1.00 | 0.72 | 0.80 | 0.88 | 2.7 | 3.4 | 5.0 | 3,000 | C01A |
| MGV100-23 | 1.00 | 0.90 | 1.00 | 1.10 | 2.7 | 3.4 | 5.0 | 3,000 | C01A |
| MGV100-24 | 1.00 | 1.08 | 1.20 | 1.32 | 2.7 | 3.4 | 5.0 | 3,000 | C01A |
| MGV100-25 | 1.00 | 1.35 | 1.50 | 1.65 | 2.7 | 3.4 | 5.0 | 3,000 | C01A |
| MGV100-26 | 1.00 | 1.53 | 1.70 | 1.87 | 2.7 | 3.4 | 5.0 | 3,000 | C01A |
| MGV100-27 | 1.00 | 1.80 | 2.00 | 2.20 | 2.7 | 3.4 | 5.0 | 3,000 | C01A |
| MGV125-08 | 1.25 | 0.25 | 0.30 | 0.35 | 4.0 | 5.0 | 8.4 | 4,000 | C01A |
| MGV125-09 | 1.25 | 0.35 | 0.40 | 0.45 | 4.0 | 5.0 | 8.5 | 4,000 | C01A |
| MGV125-20 | 1.25 | 0.45 | 0.50 | 0.55 | 4.0 | 5.0 | 8.6 | 4,000 | C01A |
| MGV125-21 | 1.25 | 0.63 | 0.70 | 0.77 | 4.0 | 5.0 | 8.8 | 4,000 | C01A |
| MGV125-22 | 1.25 | 0.90 | 1.00 | 1.10 | 4.0 | 5.0 | 9.0 | 3,000 | C01A |
| MGV125-23 | 1.25 | 1.08 | 1.20 | 1.32 | 4.0 | 5.0 | 9.5 | 3,000 | C01A |
| MGV125-24 | 1.25 | 1.35 | 1.50 | 1.65 | 4.0 | 5.0 | 10 | 3,000 | C01A |
| MGV125-25 | 1.25 | 1.53 | 1.70 | 1.87 | 4.0 | 5.0 | 10 | 3,000 | C01A |
| MGV125-26 | 1.25 | 1.80 | 2.00 | 2.20 | 4.0 | 5.0 | 10 | 3,000 | C01A |
| **Test Conditions** | $V_R$ = 2 to 20 V * Vr = 2 to 18 V | $V_R$ = 4 V F = 1 MHz | | | $V_R$ = 2 to 12 V | | $V_R$ = 2 to 20 V * Vr = 2 to 18 V | $V_R$ = 4 V F = 50 MHz | |

Note: MGV075 Series is Vbr = 18 V min. and MGV100 and MGV125 Series are Vbr = 22 V min.

# GaAs Beam Lead Detector Diodes: Zero Bias

- Low junction capacitance
- Lower temperature coefficient than silicon
- Operation to 110 GHz

The Aeroflex / Metelics MZBD-9161 is a GaAs beam lead detector diode. This diode is designed for zero bias detecting applications at frequencies through 110 GHz.

**$T_A$ = 25° C** — Beam Lead

| Model | $C_L$ | $R_V$ | | $\gamma$ |
|---|---|---|---|---|
| | TYP pF | MIN K Ω | MAX K Ω | mV / μW |
| MZBD-9161 | .035 | 2.5 | 7.5 | 0.5 |
| **Test Conditions** | Juncition Capacitance F = 1 MHz | Video Reisistance Zero Bias | | Voltage Sensitivity Zero Bias, 10GHz shunt 50 Ω input matching resistor |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Operating Temperature | -65° C to + 175° C |
| | Storage Temperature | -65° C to + 200° C |
| | Burnout Power | 20 dBm |
| | Beam Lead Strength | 3 grams |

| Parameter | Units | D1 | D2 |
|---|---|---|---|
| $B_V$ | V | 10 | 10 |
| $C_{JO}$ | pF | 0.030 | 0.030 |
| $E_G$ | eV | 1.42 | 1.42 |
| $I_{BV}$ | A | 10E-12 | 10E-12 |
| $I_S$ | A | 12 x 10E-6 | 84 x 10E-6 |
| N | | 1.2 | 40.0 |
| $R_S$ | OHM | 50 | 10 |
| $P_S(V_J)$ | V | 0.26 | 0.26 |
| $P_T$(XTI) | | 2 | 3 |
| M | | 0.5 | 0.5 |

Note: D1 represents the characteristic of the MZBD-9161 under forward bias and D2 (in the forward direction) gives the V-I curve of the MZBD-9161 under reverse bias.

# GaAs Detector/Mixer Diodes

- Low capacitance and low resistance
- Passivated with silicon dioxide
- Protected with polyimide

The Aeroflex / Metelics low cost surface mount single and anti-parallel pairs of gallium arsenide Schottky diodes in QFN package 0503 (1.37 x 0.86 mm) can be used through millimeter wave frequencies as they have low capacitance and low resistance. They are passivated with silicon nitride and protected with polyimide for high reliability. Typical applications include detectors and single ended mixer on SMGS11 and single balanced and subharmonic pumped mixers and limiters on SMGS21 in instruments, microwave radios, VSAT, and police radar detectors.

Surface Mount

| Model | Configuration | $V_F$ | | $\Delta V_F$ | $C_T$ | | $R_D$ | $R_S$ | $V_{BR}$ |
|---|---|---|---|---|---|---|---|---|---|
| | | MIN mV | MAX mV | MAX mV | TYP pF | MAX pF | MAX Ω | TYP Ω | MIN V |
| SMGS11 | single | 620 | 760 | N/A | 0.10 | 0.13 | 13 | 4 | 4.5 |
| SMGS21 | anti-parallel pairs | 620 | 760 | 20 | 0.15 | 0.18 | 13 | 4 | 4.5 |
| **Test Conditions** | | @ 1mA | | @ 1mA | @ 0V, 1MHz | | @ 5mA | | @ 10 μA |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Operating Temperature | -40° C to + 85° C |
| | Storage Temperature | -65° C to + 125° C |
| | Incident Power | 20 dBm (at 25° C) |
| | Soldering Temperature | 260° C for 5 seconds |

# Step Recovery Diodes

- Wide Selection of Tightend Capacitance Ranges
- Low Transition Times
- High Efficiencies

The Aeroflex / Metelics MSD-700 Series Step Recovery Diodes are epitaxial silicon varactors which provide high output power and efficiencies in harmonic generator applications. Strict material and process controls result in high reproducibility. A unique silicon dioxide passivation process assures greater stability, reliability and low leakage currents at high temperatures.

Diodes are available in various capacitance ranges for each of the 4 voltage ratings. These diodes represent the lowest transition times (snap time) available for each voltage rating. Unless otherwise specified, capacitance will be within the range shown above for each type. A capacitance tolerance of ± 10% is available at an additional charge. Diodes can be optimized for custom electrical or mechanical specifications. Custom parameters for capacitance, voltage, transition time, series resistance, etc. are available upon request.

**Chips**

| Model | $C_J$ MIN V | $V_B$ MIN V | $T_L$ MIN nS | $T_T$ MAX pS | $R_S$ MAX OHMS | $\Theta C_J$ MAX °C/W |
|---|---|---|---|---|---|---|
| MSD700 | 0.2 - 0.4 | 15 | 8 | 60 | 1.20 | 125 |
| MSD701 | 0.4 - 0.6 | 15 | 8 | 60 | 1.00 | 100 |
| MSD702 | 0.6 - 0.8 | 15 | 8 | 60 | 0.70 | 100 |
| MSD703 | 0.8 - 1.0 | 15 | 8 | 60 | 0.50 | 75 |
| MSD704 | 1.0 - 1.4 | 15 | 8 | 60 | 0.40 | 75 |
| MSD705 | 1.4 - 2.0 | 15 | 8 | 60 | 0.30 | 60 |
| MSD706 | 2.0 - 3.0 | 15 | 8 | 60 | 0.25 | 60 |
| MSD710 | 0.2 - 0.4 | 20 | 11 | 70 | 1.00 | 100 |
| MSD711 | 0.4 - 0.6 | 20 | 11 | 70 | 0.70 | 75 |
| MSD712 | 0.6 - 0.8 | 20 | 11 | 70 | 0.60 | 75 |
| MSD713 | 0.8 - 1.0 | 20 | 11 | 70 | 0.50 | 75 |
| MSD714 | 1.0 - 1.4 | 20 | 11 | 70 | 0.40 | 75 |
| MSD715 | 1.4 - 2.0 | 20 | 11 | 70 | 0.30 | 60 |
| MSD716 | 2.0 - 3.0 | 20 | 11 | 70 | 0.25 | 60 |
| MSD720 | 0.2 - 0.4 | 30 | 17 | 100 | 0.80 | 75 |
| MSD721 | 0.4 - 0.6 | 30 | 17 | 100 | 0.60 | 60 |
| MSD722 | 0.6 - 0.8 | 30 | 17 | 100 | 0.50 | 60 |
| MSD723 | 0.8 - 1.0 | 30 | 17 | 100 | 0.40 | 60 |
| MSD724 | 1.0 - 1.4 | 30 | 17 | 100 | 0.30 | 60 |
| MSD725 | 1.4 - 2.0 | 30 | 17 | 100 | 0.25 | 50 |
| MSD726 | 2.0 - 3.0 | 30 | 17 | 100 | 0.20 | 50 |
| MSD730 | 0.2 - 0.4 | 40 | 21 | 150 | 0.80 | 50 |
| MSD731 | 0.4 - 0.6 | 40 | 21 | 150 | 0.60 | 50 |
| MSD732 | 0.6 - 0.8 | 40 | 21 | 150 | 0.50 | 50 |
| MSD733 | 0.8 - 1.0 | 40 | 21 | 150 | 0.40 | 50 |
| MSD734 | 1.0 - 1.4 | 40 | 21 | 150 | 0.30 | 50 |
| MSD735 | 1.4 - 2.0 | 40 | 21 | 150 | 0.25 | 40 |
| MSD736 | 2.0 - 3.0 | 40 | 21 | 150 | 0.20 | 40 |
| **Test Conditions** | @ -6 V, 1 MHz | @ 10 µA | IF 6 mA / IR 10mA | | @ 25 mA | pulsed |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Storage Temperature | -65° C to + 200° C |
| | Operating Temperature | -55° C to + 150° C |
| | Minimum Voltage Breakdown | 15, 20, 30 and 40 V at 10 µA |

# Beam Lead Step Recovery Diodes

- Low Inductance
- Rugged Beam Lead construction
- Transition times down to 30 picoseconds in 50 Ω system
- Oxide and polymide passivation

The Aeroflex / Metelics Silicon Mesa Beam Lead Step Recovery diodes provide low capacitance, very fast transition times, and low inductance along with low parasitic capacitance compared to packaged or chip devices.

The fast transition times make these devices useful for fast sampling gate drivers, frequency multipliers and comb generators to 40 GHz and beyond.

## Beam Lead

| Model | $V_{BR}$ Volts | | $C_T$ pF | | $\tau$ nS | $T_T$ pS | |
|---|---|---|---|---|---|---|---|
| | MIN | MAX | TYP | MAX | TYP | TYP | MAX |
| MMDB30-B11 | 14 | 25 | 0.15 | 0.25 | 4 | 30 | 38 |
| MMDB35-B11 | 16 | 30 | 0.13 | 0.20 | 4 | 35 | 45 |
| MMDB45-B11 | 25 | 40 | 0.11 | 0.20 | 8 | 45 | 58 |
| **Test Conditions** | $I_R = 10\ \mu A$ | | $V_R = 6V$ $F = 1$ MHz | | $I_F = 10$ mA $I_R = 6$ mA | $I_F = 3$ mA $V_R = 7$ V | |

## Packaged

| Model | $V_{BR}$ Volts | $C_T$ pF | | $\tau$ nS | | $T_T$ pS | | $C_P$ pF | $L_P$ nH | Package |
|---|---|---|---|---|---|---|---|---|---|---|
| | MIN | MIN | MAX | MIN | TYP | TYP | MAX | TYP | TYP | |
| MMDB30-E28 / 28X | 14 | 0.28 | 0.36 | 1.0 | 4.0 | 30 | 38 | 0.08 | 0.4 | E28 / 28X |
| MMDB30-0402 | 14 | 0.25 | 0.32 | 1.0 | 4.0 | 30 | 38 | 0.05 | 0.2 | 0402 |
| MMDB30-0805-2 | 14 | 0.26 | 0.33 | 1.0 | 4.0 | 30 | 38 | 0.06 | 0.4 | 0805-2 |
| MMDB35-E28 / 28X | 16 | 0.25 | 0.31 | 1.0 | 4.0 | 35 | 45 | 0.08 | 0.4 | E28 / 28X |
| MMDB35-0402 | 16 | 0.22 | 0.28 | 1.0 | 4.0 | 35 | 45 | 0.05 | 0.2 | 0402 |
| MMDB35-0805-2 | 16 | 0.23 | 0.29 | 1.0 | 4.0 | 35 | 45 | 0.06 | 0.4 | 0805-2 |
| MMDB45-E28 / 28X | 25 | 0.24 | 0.31 | 3.0 | 8.0 | 45 | 58 | 0.08 | 0.4 | E28 / 28X |
| MMDB45-0402 | 25 | 0.21 | 0.28 | 3.0 | 8.0 | 45 | 58 | 0.05 | 0.2 | 0402 |
| MMDB45-0805-2 | 25 | 0.22 | 0.29 | 3.0 | 8.0 | 45 | 58 | 0.06 | 0.4 | 0805-2 |
| **Test Conditions** | $I_R = 10\ \mu A$ | $V_R = 6V$ $F = 1$ MHz | | $I_F = 10$ mA $I_R = 6$ mA measured at 50% recovery | | $I_F = 3$ mA $V_R = 7$ V | | | | |

Beam Lead Chips

# Sampling Phase Detector

- Phase locking to 22 GHz
- Broadband capability
- Fully integrated module
- Phase locks DRO's and VCO's

The Aeroflex / Metelics MSPD Series Integrates an SRD reference frequency multiplier, coupling capacitors and a Schottky diode microwave sampler / phase detector in a 0.075" by 0.100" hybrid. They are used to phase lock microwave oscillators up to 22 GHz to a much lower reference frequency by deriving a locking voltage from the sampled RF and the multiplied reference.

**Packaged**

| Model | Step Recovery Diode | | | | Cap. | Schottky Diode | | | $F_{MW}$ | Package |
|---|---|---|---|---|---|---|---|---|---|---|
| | $V_{BR}$ | $C_J$ | $\tau$ | $T_T$ | $C_T$ | $C_J$ | $V_F$ | $R_D$ | | |
| | MIN V | TYP pF | TYP ns | MAX ps | TYP pF | TYP pF | TYP mV | TYP Ω | TYP GHz | |
| MSPD1000-E50 / E50SM | 15 | 1.0 | 35 | 95 | 20 | 0.4 | 270 | 7.0 | 0.50 | E50 / E50SM |
| MSPD1000-H50 | 15 | 1.0 | 35 | 95 | 20 | 0.4 | 270 | 7.0 | 0.50 | H50 |
| MSPD1002-E50 / E50SM | 15 | 0.5 | 20 | 70 | 3.5 | 0.22 | 270 | 8.0 | 2.0 | E50 / E50SM |
| MSPD1002-H50 | 15 | 0.5 | 20 | 70 | 3.5 | 0.22 | 270 | 8.0 | 2.0 | H50 |
| MSPD1012-E50 / E50SM | 15 | 0.5 | 10 | 70 | 2.5 | 0.18 | 270 | 9.0 | 12 | E50 / E50SM |
| MSPD1012-H50 | 15 | 0.5 | 10 | 70 | 2.5 | 0.18 | 270 | 9.0 | 12 | H50 |
| MSPD2018-E50 / E50SM* | 15 | 0.35 | 5 | 55 | 0.6 | 0.10 | 430 | 16.0 | 22 | E50 / E50SM |
| MSPD2018-H50* | 15 | 0.35 | 5 | 55 | 0.6 | 0.10 | 430 | 16.0 | 22 | H50 |
| **Test Conditions** | $I_R = 10\ \mu A$ | $V_R = 6V$ $F = 1$ MHz | $I_F = 10$ mA $I_R = 6$ mA | $I_F = 10$ mA $V_R = 10$ V *$I_F = 3$ mA $V_R = 7$ V | $F = 1$ MHz | $V_R = 0$ V $F = 1$ MHz | $I_F = 1$ mA | $I_F = 5$ mA | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Storage Temperature** | -65 to +150° C |
| | **Operating Temperature** | -65 to +150° C |
| | **Soldering Temperature** | 230° C for 5 sec. |


(Package styles E50, E50SM & H50 only.)

# Silicon PIN Diodes

- High Temperature Passivation for Reliability
- Grown Junction for sharp "I" Region Interface
- Full Area Gold Contact for the Lowest Capacitance and Largest Bonding Pad Available
- Lot Traceability and Lot Control, Assuring High Reproducibility

The Aeroflex / Metelics MPN-7000 Series and MMP-7000 Series PIN diodes are manufactured using very high resistivity silicon epitaxial material grown on a highly doped low resistivity substrate. Combined with a grown junction P++ layer, MMP-7000 Series PIN diodes yield a very abrupt structured "I" region with minimum outdoping and low voltage punch-through characteristics.

Our high temperature passivation and state-of-the-art metallization produce diodes that are designed to cover a wide range of applications that fall into the general categories of switching, phase switching, attenuating and limiting. These devices are rugged and able to meet all visual criteria in space and military applications.

## High Power Switching and Attenuation — Chips

| Model | $V_{BR}$ | $C_J$ | | $R_S$ | | $\tau$ | I-layer | Contact | $\theta_{JC}$ | Package |
|---|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP pF | MAX pF | TYP Ω | MAX Ω | TYP μs | NOM microns | MIN mils | MAX °C / W | |
| MPN7330 | 300 | 0.30 | 0.40 | 0.3 | 0.5 | 0.5 | 30 | 10 | 10 | C40 |
| MPN7345 | 300 | 0.30 | 0.40 | 0.3 | 0.5 | 0.5 | 45 | 10 | 10 | C40 |
| MPN7453A | 300 | 0.10 | 0.15 | 0.7 | 1.0 | 0.7 | 60 | 8 | 20 | C22 |
| MPN7453B | 400 | 0.15 | 0.2 | 0.6 | 0.9 | 2.5 | 60 | 8 | 20 | C22 |
| MPN7453C | 300 | 0.18 | 0.25 | 0.4 | 0.7 | 1.0 | 60 | 8 | 15 | C22 |
| MPN7360 | 600 | 0.80 | 1.0 | 0.2 | 0.4 | 2.5 | 60 | 20 | 7 | C37 |
| MPN7370 | 700 | 2.00 | 2.3 | 0.2 | 0.3 | 5.0 | 70 | 40 | 5 | C39 |
| MPN7380 | 800 | 0.40 | 0.60 | 0.3 | 0.5 | 2.5 | 80 | 24 | 7 | C38 |
| MPN7420 | 400 | 0.06 | 0.08 | 1.0 | 1.5 | 1.0 | 100 | 5 | 30 | C12 |
| MPN73100 | 600 | 0.20 | 0.30 | 0.5 | 0.8 | 2.2 | 100 | 12 | 10 | C32 |
| MPN73120 | 700 | 0.30 | 0.40 | 0.5 | 0.8 | 3.5 | 120 | 15 | 10 | C32 |
| Test Conditions | $I_R$ = 10 μA | $V_R$ = 50 V F = 1 MHz | | $I_F$ = 100 mA F = 100 MHz | | $I_F$ = 10 mA $I_R$ = 6 mA | | | | |

## SOT23 & SOD323 — Surface Mount

| Model | Configuration | $V_{BR}$ | $C_T$ | | $R_S$ | | TYP ns | Package |
|---|---|---|---|---|---|---|---|---|
| | | MIN V | TYP pF | MAX pF | TYP Ω | MAX Ω | | |
| SMPN7453-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 200 | 0.25 | 0.35 | 4.0 | 4.5 | 2500 | SOT23 |
| SMPN7380-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 200 | 0.25 | 0.35 | 4.0 | 4.5 | 1500 | SOT23 |
| SMPN7310-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 100 | 0.40 | 0.50 | 0.60 | 1.2 | 120 | SOT23 |
| SMPN7316-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 100 | 0.25 | 0.55 | 0.60 | 1.0 | 200 | SOT23 |
| SMPN7335-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 200 | 0.30 | 0.40 | 1.50 | 2.0 | 500 | SOT23 |
| SMPN7320-SOT23 | -0S, 1S, 2ST, 3CA, 4CC | 100 | 0.20 | 0.30 | 2.00 | 4.5 | 170 | SOT23 |
| SMPN7453-SOD323 | – | 200 | 0.25 | 0.35 | 4.0 | 4.5 | 2500 | SOD323 |
| SMPN7380-SOD323 | – | 200 | 0.25 | 0.35 | 4.0 | 4.5 | 1500 | SOD323 |
| SMPN7310-SOD323 | – | 100 | 0.40 | 0.50 | 0.60 | 1.2 | 120 | SOD323 |
| SMPN7316-SOD323 | – | 100 | 0.25 | 0.55 | 0.60 | 1.0 | 200 | SOD323 |
| SMPN7335-SOD323 | – | 200 | 0.30 | 0.40 | 1.50 | 2.0 | 500 | SOD323 |
| SMPN7320-SOD323 | – | 100 | 0.20 | 0.30 | 2.00 | 4.5 | 170 | SOD323 |
| Test Conditions | | $I_R$ = 10 μA | $V_R$ = 10 V $V_R$ = 50 V F = 1 MHz | | $I_F$ = 10 mA F = 100 MHz | | $I_F$ = 10 mA $I_R$ = 6 mA | |

# Silicon PIN Diodes

## MicroStrip PIN Diodes

| Model | Configurations | $I_R$ | $V_{BR}$ | Insertion Loss | Return Loss | Isolation | Package |
|---|---|---|---|---|---|---|---|
| | | MAX nA | MIN V | MAX | TYP | MIN | |
| MMPN080150 | MicroStrip PIN | 100 | 200 | 4.0 | 12 | -50 | C51 |
| MMPN080045 | MicroStrip PIN | 100 | 200 | 1.0 | 12 | -30 | C50 |
| **Test Conditions** | | $V_R = 30$ V | $I_R = 10$ µA | $V_R = 30$ V<br>F = 2 – 35 GHz<br>F = 2 – 20 GHz | | $I_F = 40$ mA<br>F = 2 – 35 GHz<br>F = 2 – 20 GHz | |

## Low Capacitance, Fast Switching

Chips

| Model | $V_{BR}$ | $C_J$ | | $R_S$ | | $\tau$ | Contact | $\theta_{JC}$ | Package |
|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP pF | MAX pF | TYP Ω | MAX Ω | TYP ns | MIN mils | MAX °C / W | |
| MPN7302 | 20 | 0.08 | 0.12 | 1.2 | 1.5 | 8 | 1.5 | 60 | C11 |
| MPN7304 | 40 | 0.06 | 0.08 | 2.2 | 2.7 | 15 | 1.5 | 60 | C11 |
| MPN7304A | 40 | 0.12 | 0.15 | 1.0 | 1.5 | 30 | 2.0 | 50 | C12 |
| MPN7306 | 70 | 0.08 | 0.10 | 1.2 | 1.2 | 50 | 2.0 | 50 | C12 |
| MPN7310 | 100 | 0.05 | 0.07 | 1.5 | 2.0 | 100 | 2.0 | 50 | C12 |
| MPN7310A | 100 | 0.18 | 0.25 | 0.6 | 1.0 | 200 | 4.0 | 35 | C12 |
| MPN7312A | 120 | 0.08 | 0.10 | 1.2 | 1.5 | 150 | 2.0 | 50 | C12 |
| MPN7312B | 120 | 0.18 | 0.25 | 0.8 | 1.0 | 250 | 4.0 | 35 | C12 |
| MPN7315 | 150 | 0.08 | 0.12 | 1.2 | 1.5 | 180 | 2.0 | 50 | C12 |
| MPN7320* | 150 | 0.02 | 0.03 | 3.0 | 4.0 | 120 | 1.5 | 60 | C01 |
| **Test Conditions** | $I_R = 10$ µA | $V_R = 10$ V<br>F = 1 MHz<br>*$V_R = 50$ V | | $I_F = 10$ mA<br>F = 500 MHz | | $I_F = 10$ mA<br>$I_R = 6$ mA | | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Power Dissipation | 0.5 Watts at 25° C derate to zero at +175° C |
| | Operating Temperature | -65° C to +175° C |
| | Storage Temperature | -65° C to +200° C |
| | Voltage | $V_{BR}$ Rating |

# Silicon PIN Diodes

## Low Capacitance, Fast Switching — Packaged

| Model | $V_{BR}$ | $C_J$ | | $R_S$ | | $\tau$ | $C_P$ | $L_p$ | Package |
|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP pF | MAX pF | TYP Ω | MAX Ω | TYP ns | TYP pF | MAX nH | |
| MPN7302-E28 / 28X | 20 | 0.16 | 0.24 | 1.2 | 1.5 | 8 | 0.08 | 0.4 | E28 / 28X |
| MPN7302-H20 | 20 | 0.26 | 0.35 | 1.2 | 1.5 | 8 | 0.18 | 0.5 | H20 |
| MPN7302-0805-2 | 20 | 0.14 | 0.22 | 1.2 | 1.5 | 8 | 0.06 | 0.4 | 0805-2 |
| MPN7304-E28 / 28X | 40 | 0.14 | 0.22 | 2.2 | 2.7 | 15 | 0.08 | 0.4 | E28 / 28X |
| MPN7304-H20 | 40 | 0.24 | 0.30 | 2.2 | 2.7 | 15 | 0.18 | 0.5 | H20 |
| MPN7304-0805-2 | 40 | 0.18 | 0.26 | 2.2 | 2.7 | 15 | 0.06 | 0.4 | 0805-2 |
| MPN7304A-E28 / 28X | 40 | 0.20 | 0.27 | 1.0 | 1.5 | 30 | 0.08 | 0.4 | E28 / 28X |
| MPN7304A-H20 | 40 | 0.30 | 0.38 | 1.0 | 1.5 | 30 | 0.18 | 0.5 | H20 |
| MPN7304A-0805-2 | 40 | 0.18 | 0.23 | 1.0 | 1.5 | 30 | 0.06 | 0.4 | 0805-2 |
| MPN7306-E28 / 28X | 70 | 0.16 | 0.22 | 1.2 | 1.2 | 50 | 0.08 | 0.4 | E28 / 28X |
| MPN7306-H20 | 70 | 0.26 | 0.33 | 1.2 | 1.2 | 50 | 0.18 | 0.5 | H20 |
| MPN7306-0805-2 | 70 | 0.14 | 0.20 | 1.2 | 1.2 | 50 | 0.06 | 0.4 | 0805-2 |
| MPN7310-E28 / 28X | 100 | 0.13 | 0.18 | 1.5 | 2.0 | 100 | 0.08 | 0.4 | E28 / 28X |
| MPN7310-H20 | 100 | 0.23 | 0.29 | 1.5 | 2.0 | 100 | 0.18 | 0.5 | H20 |
| MPN7310-0805-2 | 100 | 0.11 | 0.17 | 1.5 | 2.0 | 100 | 0.06 | 0.4 | 0805-2 |
| MPN7310A-E28 / 28X | 100 | 0.26 | 0.36 | 0.6 | 1.0 | 200 | 0.08 | 0.4 | E28 / 28X |
| MPN7310A-H20 | 100 | 0.36 | 0.57 | 0.6 | 1.0 | 200 | 0.18 | 0.5 | H20 |
| MPN7310A-0805-2 | 100 | 0.24 | 0.35 | 0.6 | 1.0 | 200 | 0.06 | 0.4 | 0805-2 |
| MPN7312A-E28 / 28X | 120 | 0.16 | 0.21 | 1.2 | 1.5 | 150 | 0.08 | 0.4 | E28 / 28X |
| MPN7312A-H20 | 120 | 0.26 | 0.32 | 1.2 | 1.5 | 150 | 0.18 | 0.5 | H20 |
| MPN7312A-0805-2 | 120 | 0.14 | 0.20 | 1.2 | 1.5 | 150 | 0.06 | 0.4 | 0805-2 |
| MPN7312B-E28 / 28X | 120 | 0.26 | 0.36 | 0.8 | 1.0 | 250 | 0.08 | 0.4 | E28 / 28X |
| MPN7312B-H20 | 120 | 0.36 | 0.57 | 0.8 | 1.0 | 250 | 0.18 | 0.5 | H20 |
| MPN7312B-0805-2 | 120 | 0.24 | 0.35 | 0.8 | 1.0 | 250 | 0.06 | 0.4 | 0805-2 |
| MPN7315-E28 / 28X | 150 | 0.16 | 0.23 | 1.2 | 1.5 | 180 | 0.08 | 0.4 | E28 / 28X |
| MPN7315-H20 | 150 | 0.26 | 0.34 | 1.2 | 1.5 | 180 | 0.18 | 0.5 | H20 |
| MPN7315-0805-2 | 150 | 0.14 | 0.21 | 1.2 | 1.5 | 180 | 0.06 | 0.4 | 0805-2 |
| MPN7320-E28 / 28X* | 150 | 0.10 | 0.14 | 3.0 | 4.0 | 120 | 0.08 | 0.4 | E28 / 28X |
| MPN7320-H20* | 150 | 0.20 | 0.24 | 3.0 | 4.0 | 120 | 0.18 | 0.5 | H20 |
| MPN7320-0805-2* | 150 | 0.08 | 0.12 | 3.0 | 4.0 | 120 | 0.06 | 0.4 | 0805-2 |
| **Test Conditions** | $I_R = 10\ \mu A$ | $V_R = 10$ V<br>F = 1 MHz<br>*$V_R = 50$ V | | $I_F = 10$ mA<br>F = 500 MHz | | $I_F = 10$ mA<br>$I_R = 6$ mA | | | |

## Ultra Fast Switching

| Model | $V_{BR}$ | $C_J$ | $T_L$ | Øjc | $T_S$ | $R_s$ | $R_s$ |
|---|---|---|---|---|---|---|---|
| | MIN V | MAX pF | TYP nS | MAX °C/W | MAX nS | MAX Ohms | TYP Ohms |
| MMP7010 | 25 | 0.1 | 10 | 60 | 1.5 | 0.7 | 1.0 |
| MMP7011 | 25 | 0.15 | 10 | 50 | 1.5 | 0.55 | 0.8 |
| MMP7012 | 25 | 0.2 | 10 | 40 | 1.5 | 0.45 | 0.7 |
| MMP7013 | 25 | 0.25 | 10 | 35 | 1.5 | 0.4 | 0.6 |
| **Test Conditions** | @ 10 µA | @ -10 V, 1 MHz | IF = 10 mA<br>IR = 6 mA | pulsed | 90% to 10% and 10% to 90% transmission. Drive output = +2- mA and -4 V, 200 mA spike with a rise time of 2 nS | 50 mA @ 1 GHz | 10 mA @ 1 GHz |

# Silicon PIN Diodes

## Fast Switching, Low Power

| Model | $V_{BR}$ MIN V | $C_J$ MAX pF | $T_L$ TYP nS | Δjc MAX °C/W | TS MAX nS | $R_s$ MAX Ohms | $R_s$ TYP Ohms |
|---|---|---|---|---|---|---|---|
| MMP7020 | 70 | 0.05 | 60 | 80 | 5 | 0.9 | 1.2 |
| MMP7021 | 70 | 0.1 | 60 | 70 | 5 | 0.7 | 1.0 |
| MMP7022 | 70 | 0.15 | 60 | 60 | 5 | 0.6 | 0.9 |
| MMP7023 | 70 | 0.2 | 60 | 55 | 5 | 0.5 | 0.7 |
| MMP7024 | 70 | 0.25 | 60 | 50 | 5 | 0.45 | 0.5 |
| MMP7025 | 100 | 0.03 | 100 | 90 | 10 | 1.2 | 1.9 |
| MMP7026 | 100 | 0.07 | 100 | 80 | 10 | 0.9 | 1.5 |
| MMP7027 | 100 | 0.1 | 100 | 70 | 10 | 0.7 | 1.2 |
| MMP7028 | 100 | 0.15 | 100 | 60 | 10 | 0.6 | 1.0 |
| MMP7029 | 100 | 0.2 | 100 | 55 | 10 | 0.5 | 0.9 |
| MMP7030 | 100 | 0.3 | 100 | 50 | 15 | 0.45 | 0.8 |
| MMP7031 | 200 | 0.03 | 225 | 90 | 15 | 1.9 | 3.0 |
| MMP7032 | 200 | 0.07 | 225 | 80 | 15 | 1.2 | 2.2 |
| MMP7033 | 200 | 0.1 | 225 | 70 | 15 | 0.9 | 1.6 |
| MMP7034 | 200 | 0.15 | 225 | 60 | 15 | 0.8 | 1.0 |
| MMP7035 | 200 | 0.2 | 225 | 55 | 15 | 0.7 | 0.8 |
| MMP7036 | 200 | 0.3 | 225 | 50 | 15 | 0.6 | 0.7 |
| **Test Conditions** | @ 10 µA | @ -10 V, 1 MHz | IF = 10 mA IR = 6mA | pulsed | 90% to 10% and 10% to 90% transmission. Drive output = +2- mA and -4 volts, 200 mA spike with a rise time of 2 nS | 75 mA @ 1 GHz | 20 mA @ 1 GHz |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Operating Temperature | -55° C to + 150° C |
| | Storage Temperature | -65° C to + 200° C |
| | Reverse Breakdown | from 25 volts to 500 volts |
| | Voltage | volts at 10 mA |
| | Junction Capacitance | ($C_J$-10) from 0.03 pF to 0.5 pF at 10 volts |
| | Switching Speed | from 1 nS to 25 nS |
| | Lifetime | from 5 nS to 6.0 µS |
| | Chip Thickness | .004 – .007" thick |

# Silicon PIN Diodes

## High Power Switching & Attenuation

| Model | $V_{BR}$ | $C_J$ | $T_L$ | RS | RS | RS | Øjc |
|---|---|---|---|---|---|---|---|
| | MIN V | MAX pF | TYP µs | MAX Ohms | MAX Ohms | MAX Ohms | MAX °C/W |
| MMP7060 | 250 | 0.05 | 1.0 | 25 | 10.0 | 2.0 | 20 |
| MMP7061 | 250 | 0.08 | 1.0 | 20 | 8.0 | 1.5 | 20 |
| MMP7062 | 250 | 0.1 | 1.0 | 15 | 6.0 | 1.2 | 20 |
| MMP7063 | 250 | 0.2 | 1.0 | 8 | 3.5 | 1.0 | 15 |
| MMP7064 | 250 | 0.3 | 1.5 | 6 | 2.0 | 0.8 | 15 |
| MMP7065 | 500 | 0.08 | 1.5 | 40 | 8.0 | 1.5 | 15 |
| MMP7066 | 500 | 0.1 | 1.5 | 15 | 5.0 | 1.2 | 15 |
| MMP7067 | 500 | 0.2 | 1.5 | 10 | 4.0 | 1.0 | 12 |
| MMP7068 | 500 | 0.3 | 2.0 | 8 | 3.5 | 0.8 | 10 |
| MMP7069 | 500 | 0.5 | 2.0 | 6 | 2.0 | 0.7 | 10 |
| **Test Conditions** | @ 10 µA | @ -10V 1 MHz | IF = 10 mA IR = 10 mA | @ 1 mA 100 MHz | @ 10 mA 100 MHz | @ 100 mA 100 MHz | pulsed |

## High Average Power PIN Diode

| Model | $V_B$ | $C_T$ | $T_L$ | RS | VF | Reverse Leakage Current | $R_P$ |
|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN usec | MAX Ohms | TYP | TYP nA | MIN Ohms |
| MMP7070 | 100 | 2.20 | 6.00 | 0.50 | 1.00 | 100 | 20k |
| MMP7071 | 100 | 2.00 | 8.00 | 1.00 | 1.20 | 100 | 50k |
| MMP7072 | 100 | 0.7 | 3.00 | 0.8 | 1.00 | 100 | 200k |
| MMP7073 | 100 | 1.0 | 2.50 | 0.5 | 1.00 | 100 | 100k |
| MMP7074 | 200 | 2.20 | 6.00 | 0.5 | 1.00 | 100 | 20k |
| MMP7075 | 200 | 2.0 | 8.00 | 1.00 | 1.20 | 100 | 50k |
| MMP7076 | 200 | 0.7 | 3.00 | 0.8 | 1.00 | 100 | 200k |
| MMP7077 | 200 | 1.0 | 2.50 | 0.5 | 1.00 | 100 | 100k |
| MMP7078 | 400 | 1.0 | 2.50 | 0.5 | 1.00 | 100 | 100k |
| MMP7079 | 600 | 2.20 | 6.00 | 0.5 | 1.00 | 100 | 20k |
| MMP7080 | 600 | 0.7 | 3.00 | 0.8 | 1.00 | 100 | 200k |
| **Testing Conditions** | @ 10 µA | @ 100 V F = 1 MHz | IF = 10 mA IR = 6 mA | 100 mA 100 MHz | @ 100 mA | | @ 0 V, 100 MHz |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Operating Temperature** | -55° C to + 150° C |
| | **Storage Temperature** | -65° C to + 200° C |
| | **Reverse Breakdown** | from 25 volts to 1500 volts |
| | **Voltage** | volts at 10 µA |

# Silicon PIN Diodes

## Medium Power, General Purpose

| Model | $V_{BR}$ | $C_J$ | $T_L$ | Δjc | TS | RS | RS |
|---|---|---|---|---|---|---|---|
| | MIN V | MAX pF | TYP nS | MAX °C/W | MAX NS | OHMS MAX | OHMS TYP |
| MMP7040 | 200 | 0.03 | 400 | 65 | 20 | 2.6 | 3.5 |
| MMP7041 | 200 | 0.07 | 400 | 60 | 20 | 1.5 | 2.2 |
| MMP7042 | 200 | 0.1 | 400 | 55 | 20 | 1.3 | 2.0 |
| MMP7043 | 200 | 0.15 | 400 | 50 | 20 | 1.0 | 1.9 |
| MMP7044 | 200 | 0.2 | 400 | 45 | 20 | 0.8 | 1.7 |
| MMP7045 | 200 | 0.3 | 400 | 40 | 20 | 0.7 | 1.4 |
| MMP7046 | 200 | 0.5 | 400 | 20 | 20 | 0.6 | 1.2 |
| MMP7047 | 200 | 0.03 | 600 | 60 | 25 | 2.6 | 3.5 |
| MMP7048 | 200 | 0.07 | 600 | 55 | 25 | 1.6 | 3.2 |
| MMP7049 | 200 | 0.1 | 600 | 50 | 25 | 1.2 | 2.0 |
| MMP7050 | 200 | 0.15 | 600 | 45 | 25 | 0.9 | 1.9 |
| MMP7051 | 200 | 0.2 | 600 | 40 | 25 | 0.8 | 1.7 |
| MMP7052 | 200 | 0.3 | 600 | 35 | 25 | 0.7 | 1.4 |
| MMP7053 | 200 | 0.5 | 600 | 15 | 25 | 0.6 | 1.2 |
| **Test Conditions** | @ 10 µA | @ 40 V 1 MHz | IF = 10 mA IR = 6 mA | pulsed | RF Switching speed measured from 90% to 10% and 10% to 90% transmission | @ 75 mA, 1 GHz | @ 20 mA, 1 GHz |

## PIN Chips

| Model | $V_B$ | $C_T$ | $T_L$ | RS | Thermal Resistance |
|---|---|---|---|---|---|
| | MIN | MAX pF | MIN usec | MAX Ohms | TYP C/W |
| MMP7092 | 500 | 0.20 | 1.00 | 0.60 | 20 |
| MMP7093 | 500 | 0.35 | 2.00 | 0.45 | 15 |
| MMP7094 | 500 | 0.70 | 3.00 | 0.30 | 10 |
| MMP7095 | 1000 | 0.30 | 3.00 | 1.00 | 15 |
| MMP7096 | 1000 | 0.60 | 4.00 | 0.70 | 10 |
| MMP7097 | 1000 | 1.30 | 5.00 | 0.40 | 7 |
| **Test Conditions** | @ 10 µA | @ -100 V 1 MHz | IF = 10 mA IR = 6 mA | @ 100 mA, 100 MHz | |

## Kilovolt Pin Pill pkg

| Model | $V_B$ | $C_T$ | $T_L$ | RS | Thermal Resistance | Thermal Resistance |
|---|---|---|---|---|---|---|
| | MIN Volts | MAX pF | MIN usec | MAX Ohms | TYP C/W | TYP C/W |
| MMP7098 | 2000 | 3.20 | 10 | 0.20 | 1.20 | 1.00 |
| MMP7099 | 3000 | 4.00 | 20 | 0.25 | 1.20 | 1.00 |
| **Test Conditions** | @ 10 µA | @ -100 V 1 MHz | IF = 10 mA IR = 6 mA | @ 500 mA, 4 MHz | | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Operating Temperature** | -55° C to + 150° C |
| | **Storage Temperature** | -65° C to + 200° C |
| | **Reverse Breakdown** | from 25 volts to 1500 volts |
| | **Voltage** | volts at 10 µA |

# Silicon MELF PIN Diodes

- Voltage breakdowns up to 1,000 Volts
- Typical lifetime speeds of 1.0 to 8.0 µsec
- Resistances at 100 mA of 0.5 to 2.0 ohms

The Aeroflex / Metelics high power MELF PIN diodes are produced with a propriety glassing process. This creates large, full-face bonding surfaces on the anode and cathode, delivers low electrical and thermal resistance, and allows for power handling up to 100 Watts.

## Low Loss Switching

| Model | $V_B$ | $C_T$ | $T_L$ | RS | $V_F$ | Reverse Leakage Current | $R_P$ |
|---|---|---|---|---|---|---|---|
| | MIN Volts | MAX pF | MIN usec | MAX Ohms | TYP Volts | TYP | MIN Ohms |
| MMP7081-127 | 50 | 1.20 | 4.00 | 0.75 | 1.00 | 1.00 | 5k |
| MMP7082-127 | 50 | 1.50 | 4.00 | 0.75 | 1.00 | 1.00 | 6k |
| MMP7083-127 | 50 | 2.50 | 4.00 | 0.75 | 1.00 | 1.00 | 5k |
| **Test Conditions** | @ 10 µA | @ 50 V 1 MHz | IF = 10 mA IR = 6 mA | @ 50 mA 100 MHz | @100mA | @80 of rated $V_B$ | |

## General Purpose Switching Diodes

| Model | $V_B$ | $C_T$ | $T_L$ | RS | Power Dissipation Rating Watts |
|---|---|---|---|---|---|
| | MIN | MAX pF | MIN usec | MAX Ohms | |
| MMP7084-127 | 35 | 1.20 | 0.30 | 0.50 | 1.00 |
| MMP7085-127 | 200 | 0.50 | 1.50 | 3.00 | 1.00 |
| MMP7086-127 | 200 | 1.50 | 3.00 | 0.60 | 2.00 |
| MMP7087-127 | 200 | 0.50 | 2.00 | 6.00 | 1.00 |
| MMP7088-127 | 200 | 0.80 | 6.00 | 25.00 | 2.00 |
| **Test Conditions** | @ 10 µA | @ -50, 1MHz | IF = 10 mA IR = 6 mA | @ 50 mA 100 MHz | |

## High Voltage Pin

| Model | $V_B$ | $C_T$ | $T_L$ | RS | Power Dissipation Rating Watts |
|---|---|---|---|---|---|
| | MIN Volts | MAX pF | MIN usec | MAX Ohms | |
| MMP7089-127 | 500 | 0.50 | 1.00 | 0.60 | 1.50 |
| MMP7090-127 | 500 | 0.65 | 2.00 | 0.45 | 1.50 |
| MMP7091-127 | 500 | 1.00 | 3.00 | 0.30 | 1.50 |
| **Test Conditions** | @ 10 µA | @ -100, 1 MHz | @ 10 mA 100 MHz | @ 10 mA 100 MHz | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Operating Temperature** | -55° C to + 150° C |
| | **Storage Temperature** | -65° C to + 200° C |
| | **Reverse Breakdown** | from 25 volts to 1500 volts |
| | **Voltage** | volts at 10 µA |

Ceramic MELF

# Silicon NIP Diodes

- Four different I-layers
- Fully passivated
- Low leakage and reliability

The Aeroflex / Metelics MNP00XX series of NIP diodes are offered in four different I-layers and feature fully passivated, mesa construction for low leakage and reliability. Screening per MIL-PRF-19500 and MIL-PRF-3534 are available.

## Chips

| Model | $V_{BR}$ | $C_J$ | | $R_S$ | | $\tau$ | Contact | I-Layer | $\theta_{JC}$ | Outline |
|---|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP V | MAX pF | TYP Ω | MAX Ω | TYP ns | MIN mils | NOM microns | MAX °C/W | |
| MNP0008 | 100 | 0.08 | 0.12 | 2.0 | 2.5 | 150 | 2.0 | 10 | 50 | C12p |
| MNP0010 | 150 | 0.08 | 0.12 | 2.0 | 2.5 | 300 | 3.0 | 20 | 50 | C12p |
| MNP0012 | 300 | 0.08 | 0.12 | 3.5 | 4.0 | 350 | 4.0 | 40 | 40 | C12p |
| MNP0012A | 350 | 0.18 | 0.22 | 0.55 | 0.80 | 650 | 6.0 | 40 | 25 | C22p |
| MNP0014 | 500 | 0.12 | 0.18 | 1.3 | 1.6 | 750 | 8.0 | 80 | 20 | C22p |
| MNP0014A | 500 | 0.18 | 0.22 | 0.8 | 1.2 | 1,400 | 10.0 | 80 | 10 | C32p |
| **Test Conditions** | $I_R = 10\ \mu A$ | $V_R = 10$ V<br>$V_R = 50$ V<br>* F = 1 MHz | | $I_F = 10$ mA<br>$I_F = 100$ mA<br>F = 500 MHz | | $I_F = 10$ mA<br>$I_R = 6$ mA<br>50% rec. | | | | |

## Packaged

| Model | $V_{BR}$ | $C_T$ | | $R_S$ | | $\tau$ | $C_P$ | $L_P$ | Outline |
|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP pF | MAX pF | TYP Ω | MAX Ω | TYP ns | TYP pF | TYP nH | |
| MNP0008-ET47P | 100 | 0.48 | 0.60 | 2.0 | 2.5 | 150 | 2 x 0.20 | 2 x 0.25 | ET47p |
| MNP0008-T54P | 100 | 0.28 | 0.37 | 2.0 | 2.5 | 150 | 0.20 | 0.4 | T54p |
| MNP0008-T55P | 100 | 0.21 | 0.29 | 2.0 | 2.5 | 150 | .013 | 0.25 | T55p |
| MNP0008-T89P | 100 | 0.33 | 0.43 | 2.0 | 2.5 | 150 | 0.25 | 0.4 | T89p |
| MNP0010-ET47P | 150 | .048 | 0.60 | 2.0 | 2.5 | 300 | 2 x 0.20 | 2 x 0.25 | ET47p |
| MNP0010-T54P | 150 | 0.28 | 0.37 | 2.0 | 2.5 | 300 | 0.20 | 0.4 | T54p |
| MNP0010-T55P | 150 | 0.21 | 0.29 | 2.0 | 2.5 | 300 | .013 | 0.25 | T55p |
| MNP0010-T89P | 150 | 0.33 | 0.43 | 2.0 | 2.5 | 300 | .025 | 0.4 | T89p |
| MNP0012-ET47P | 300 | 0.48 | 0.60 | 3.5 | 4.0 | 350 | 2 x 0.20 | 2 x 0.25 | ET47p |
| MNP0012-T54P | 300 | 0.28 | 0.37 | 3.5 | 4.0 | 350 | 0.20 | 0.4 | T54p |
| MNP0012-T55P | 300 | 0.21 | 0.29 | 3.5 | 4.0 | 350 | 0.13 | 0.25 | T55p |
| MNP0012-T89P | 300 | 0.33 | 0.43 | 3.5 | 4.0 | 350 | 0.25 | 0.4 | T89p |
| MNP0012A-ET47P | 350 | 0.58 | 0.72 | 0.55 | 0.8 | 650 | 2 x 0.20 | 2 x 0.25 | ET47p |
| MNP0012A-T54P | 350 | 0.36 | 0.47 | 0.55 | 0.8 | 650 | 0.20 | 0.4 | T54p |
| MNP0012A-T55P | 350 | 0.31 | 0.39 | 0.55 | 0.8 | 650 | 0.13 | 0.25 | T55p |
| MNP0012A-T89P | 350 | 0.43 | 0.53 | 0.55 | 0.8 | 650 | 0.25 | 0.4 | T89p |
| MNP0014-ET47P | 450 | 0.52 | 0.58 | 0.8 | 1.2 | 750 | 2 x 0.20 | 2 x 0.25 | ET47p |
| MNP0014-T54P | 450 | 0.32 | 0.48 | 0.8 | 1.2 | 750 | 0.20 | 0.4 | T54p |
| MNP0014-T55P | 450 | 0.25 | 0.35 | 0.8 | 1.2 | 750 | 0.13 | 0.25 | T55p |
| MNP0014-T89P | 450 | 0.37 | 0.50 | 0.8 | 1.2 | 750 | 0.25 | 0.4 | T89p |
| **Test Conditions** | $I_R = 10\ \mu A$ | $V_R = 10$ V<br>$V_R = 50$ V<br>F = 1 MHz | | $I_F = 10$ mA<br>$I_F = 100$ mA<br>F = 500 MHz | | $I_F = 10$ mA<br>$I_R = 6$ mA<br>50% rec. | | | |

# Broadband, Mesa & Planar Beam Lead PIN Diodes

- Fast Switching Speed
- Low Capacitance
- Low Resistance
- Rugged Construction

The Aeroflex / Metelics MMP-1000 Series Beam Lead PIN diodes features a unique glass and beam construction which allows for mechanical strength and stability during assembly. They are designed for low resistance, low capacitance and fast switching time.

The Aeroflex / Metelics Mesa Beam Lead PINs are suitable for microstrip or stripline circuits and for circuits requiring high isolation from series mounted diodes as in broadband multi-throw switches, phase shifters, attenuators, limiters and modulators.

## Mesa Beam Lead PIN Diodes

| Model | $V_B$ | $C_J$ | Rs | Rs | $T_L$ | Ts |
|---|---|---|---|---|---|---|
| | MIN V | MAX pF | MAX Ohms | MAX Ohms | TYP nS | MAX nS |
| MPN1000-12 | 100 | .020 | 6.5 | 4.0 | 80 | 5 |
| MPN1001-12 | 100 | .027 | 6.0 | 3.5 | 80 | 5 |
| MPN1002-12 | 100 | .030 | 5.5 | 3.2 | 80 | 5 |
| MPN1003-12 | 100 | .035 | 5.0 | 2.9 | 80 | 5 |
| MPN1004-12 | 100 | .040 | 5.0 | 2.7 | 80 | 5 |
| MPN1005-12 | 100 | .048 | 5.0 | 2.5 | 80 | 5 |
| MPN1006-12 | 100 | .055 | 4.0 | 2.3 | 80 | 5 |
| MPN1007-12 | 100 | .065 | 4.0 | 2.1 | 80 | 5 |
| MPN1100-12 | 50 | .025 | 6.0 | 3.7 | 50 | 3 |
| MPN1101-12 | 50 | .030 | 5.0 | 3.5 | 50 | 3 |
| MPN1102-12 | 50 | .040 | 4.5 | 2.9 | 50 | 3 |
| MPN1103-12 | 50 | .060 | 4.0 | 2.5 | 50 | 3 |
| **Test Conditions** | @ 10 µA | @ -10 V, 1 MHz | @ 10 mA, 1 GHz | @ 50 mA, 1 GHz | IF = 10 mA IR = 6 mA | 20% - 80% |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Operating Temperature** | -55° C to + 150° C |
| | **Storage Temperature** | -65° C to + 200° C |
| | **Power Dissipation** | 250 mW |
| | **Typical Lead Strength** | 6 grams |

## Planar Beam Lead

| Model | $V_{BR}$ | $C_J$ | | $R_S$ | | $\tau$ | $T_{RR}$ | $P_{DISS}$ | Package |
|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP pF | MAX pF | TYP Ω | MAX Ω | TYP ns | TYP ns | MAX MW | |
| MPND4005-B15 | 100 | 0.018 | 0.020 | 5.5 | 6.5 | 125 | – | 250 | B15 |
| MPND4005-B16 | 100 | 0.018 | 0.020 | 5.5 | 6.5 | 125 | – | 250 | B16 |
| MPND4005-0402 | 100 | 0.070 | 0.090 | 5.5 | 6.5 | 125 | – | 250 | 0402 |
| **Test Conditions** | $I_R$ = 10 µA | $V_R$ = 10 V F = 15 GHz $C_T$ | | $I_F$ = 20 mA F = 3 GHz | | $I_F$ = 10 mA $I_R$ = 6 mA | $I_F$ = 10 mA $V_R$ = 10 V | $T_C$ = +25 °C, Derate Linearly to +175 °C | |

Beam Lead Chips

# Silicon Limiter Diodes

- Low Loss
- Greater Bandwidth
- Fast Turn on Time

The Aeroflex / Metelics MLP-7100 Series Limiter diodes are specially processed PIN diodes with a thin intrinsic region designed for use in passive or active limiters over the entire range of frequencies from 100 MHz to beyond 20 GHz. The different "I" region thicknesses and capacitances provide variable threshold and leakage power levels and power handling capability.

## MLP7130 – MLP7122

| DC PARAMETERS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Model** | $V_B$ | $C_J$ | $C_J$ | $R_S$ | $R_S$ | $T_L$ | Pulsed Thermal Resistance | Thermal Resistance |
| | TYP V | TYP pF | MAX pF | TYP Ω | TYP Ω | TYP nS | TYP C/W | MAX °C/W |
| MLP7130 | 15-30 | 0.12 | 0.10 | 2.0 | 4.0 | 5 | 30.0 | 120 |
| MLP7131 | 15-30 | 0.20 | 0.15 | 1.5 | 3.0 | 5 | 20.0 | 80 |
| MLP7100 | 20-45 | 0.20 | 0.15 | 1.5 | 5.0 | 5 | 20.0 | 100 |
| MLP7101 | 20-45 | 0.50 | 0.30 | 1.2 | 4.5 | 10 | 12.0 | 80 |
| MLP7102 | 20-45 | 0.70 | 0.50 | 1.0 | 4.0 | 10 | 10.0 | 55 |
| MLP7140 | 30-60 | 0.12 | 0.10 | 2.0 | 4.0 | 7 | 20.0 | 100 |
| MLP7141 | 30-60 | 0.20 | 0.15 | 1.5 | 4.0 | 7 | 15.0 | 70 |
| MLP7110 | 45-75 | 0.20 | 0.15 | 1.5 | 4.0 | 10 | 15.0 | 80 |
| MLP7111 | 45-75 | 0.50 | 0.30 | 1.2 | 3.5 | 15 | 10.0 | 60 |
| MLP7112 | 45-75 | 0.70 | 0.50 | 1.0 | 3.0 | 20 | 6.0 | 40 |
| MLP7120 | 120-180 | 0.20 | 0.15 | 1.5 | 3.5 | 50 | 1.2 | 40 |
| MLP7121 | 120-180 | 0.60 | 0.30 | 1.0 | 3.0 | 50 | 0.5 | 20 |
| MLP7122 | 120-180 | 0.80 | 0.50 | 0.5 | 3.0 | 100 | 0.3 | 15 |
| **Test Conditions** | @ 10 µA | @ 0 V, 1 MHz | @ -6 V, 1 MHz | @ 10 mA 1 GHz | @ 1 mA 1 GHz | IF = 10 MA IR = 6 MA | 1 usec pulse | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Operating Temperature** | -55° C to + 150° C |
| | **Maximum Leakage Current** | 0.5 mA at 88% of minimum rated breakdown |

## MLP7130 – MLP7122

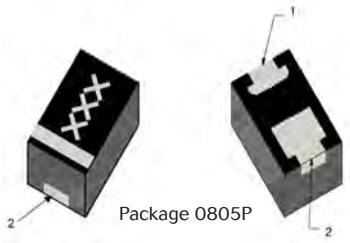
| RF CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|
| **Model** continued | Peak Power In | Threshold | Leakage Pout | Insertion Loss | CW Power In | Recovery Time |
| | MAX dBm | TYP dB | TYP dBm | TYP dB | MAX W | TYP nS |
| MLP7130 | +47 | +7 | +19 | 0.1 | 2 | 5 |
| MLP7131 | +50 | +7 | +22 | 0.1 | 3 | 5 |
| MLP7100 | +50 | +10 | +22 | 0.1 | 2 | 10 |
| MLP7101 | +53 | +10 | +24 | 0.2 | 3 | 10 |
| MLP7102 | +56 | +10 | +25 | 0.2 | 4 | 10 |
| MLP7140 | +47 | +12 | +24 | 0.1 | 3 | 10 |
| MLP7141 | +50 | +12 | +27 | 0.1 | 4 | 10 |
| MLP7110 | +53 | +15 | +27 | 0.1 | 3 | 20 |
| MLP7111 | +56 | +15 | +29 | 0.2 | 4 | 20 |
| MLP7112 | +59 | +15 | +31 | 0.2 | 5 | 20 |
| MLP7120 | +60 | +20 | +39 | 0.1 | 5 | 50 |
| MLP7121 | +63 | +20 | +41 | 0.2 | 10 | 50 |
| MLP7122 | +66 | +20 | +44 | 0.2 | 15 | 50 |
| **Test Conditions** | Pulsed thermal impedance is given for 1 µ pulse. CW thermal impedance presumes infinite heat sink. | Threshold input power produces 1 dB increase in insertion loss. 1 GHz | Threshold input power produces 1 dB increase in insertion loss. 1 GHz | Chip loss can be respresented as a resistance in shunt with the junction capacitance. 3 GHz, zero Bias. Loss data shown for 10 GHz for 0.15 and 0.30 pF chips, 5 CHz for 0.50 pF chips. Measured at -10 dBm input. | Note that CW power and average power are not synonymous. Power ratings are computed in terms of a peak junction temperature of 200° C, for short pulses, an average junction temperature of 125° C, and an ambient of 25° C. Duty factor 0.001 assumed for maximum pulse power input. | Recovery time is measured with ground return (less than 1.0 Ohms) to 1 dB excess loss, at 1 GHz. |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Operating Temperature** | -55° C to + 150° C |
| | **Maximum Leakage Current** | 0.5 mA at 88% of minimum rated breakdown |

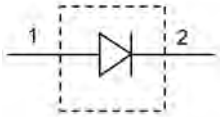
# PIN Diode: Medium Power Series Switch Element

- Supports up to 40 watts power when cold switched
- Low insertion loss 0.25 dB typical up to 2.7 GHz
- Medium isolation 11 dB typical up to 2.7 GHz

The Aeroflex / Metelics' broadband, high linearity, medium power series switch element in a 2.0 X 1.3 mm to QFN package 0805P. This device is designed for WiMax, Wibro, WLAN, TD-SCDMA and other wireless infrastructure applications. It is also suited for 0.1 ~ 3 GHz applications with up to 40 watts of power.



Package 0805P




## MSWSE-040-10, $T_A$ = +25° C

| Model | $V_{BR}$ | $V_F$ | $C_J$ | $R_S$ | $R_S$ | | Switching Speed | IL | | IL | | IRL | | IRL | | Iso | | Iso | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP mV | MAX pF | TYP Ω | TYP Ω | MAX Ω | MAX µS | TYP dB | MAX dB | TYP dB | MAX dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB |
| MSWSE-040-10 | 300 | 900 | 0.12 | 3.0 | 1.2 | 2.0 | 1.0 | 0.12 | 0.20 | 0.25 | 0.35 | 15 | 25 | 15 | 20 | 10 | 14 | 9 | 11 |
| **Test Conditions** | $I_R$ = 10 µA | $V_F$ = 50 mA | $V_R$ = 50 V | $I_F$ = 10 mA, F = 500 MHz | $I_F$ = 50 mA F = 500 MHz | | | $I_F$ = 50 mA F = 2.025 GHz | | $I_F$ = 50 mA F = 2.3 ~ 2.7 GHz | | $I_F$ = 50 mA F = 2.025 GHz | | $I_F$ = 50 mA F = 2.3 ~ 2.7 GHz | | $V_R$ = 10 V F= 2.025 GHz | | $V_R$ = 10 V F= 2.3 ~ 2.7 GHz | |

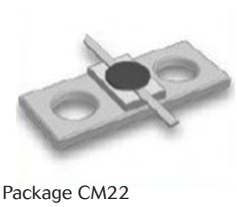
| Maximum Ratings | Rating | Limits |
|---|---|---|
| | $V_R$ | 300 V |
| | $I_F$ | 100 mA |
| | $\Theta_{JC}$ | 20° C/W |
| | $T_J$ | +150° C |
| | **Storage Temperature** | -65° C to +125° C |
| | **Soldering Temperature** | +260° C per JEDEC J-STD-20C |

(Package style 0805P only.)

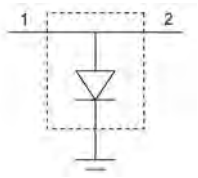
# PIN Diode: High Power Shunt Switch Element

- Supports up to 100 watts power when hot switched
- Supports up to 300 watts power when cold switched
- Low insertion loss 0.15 dB typical up to 2.7 GHz
- High isolation 31 dB typical up to 2.7 GHz

The Aeroflex / Metelics' broadband, high linearity, high power shunt switch element in a 10 X 4 mm bolt channel metal package CM22. This device is designed for WiMax, Wibro, WLAN, TD-SCDMA and other wireless infrastructure applications. It is also suited for 0.1 ~ 6 GHz applications with up to 100 watts of power.



Package CM22




## MSWSH-100-30, $T_A$ = +25° C

| Model | $V_{BR}$ | $V_F$ | $C_J$ | $R_S$ | | Switching Speed | IL | | IL | | IRL | | IRL | | Iso | | Iso | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP mV | TYP pF | TYP Ω | MAX Ω | MAX µS | TYP dB | MAX dB | TYP dB | MAX dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB |
| MSWSH-100-30 | 700 | 850 | 0.4 | 0.4 | 0.6 | 1.0 | 0.15 | 0.25 | 0.35 | 0.45 | 15 | 22 | 10 | 15 | 28 | 31 | 23 | 26 |
| **Test Conditions** | $I_R$ = 10 µA | $I_F$ = 100 mA | $V_R$ = 50 V, F = 1 MHz | $I_F$ = 100 mA F = 500 MHz | | | $V_R$ = 50 V F = 2.3 ~ 2.7 GHz | | $V_R$ = 50 V F = 6.0 GHz | | $V_R$ = 50 V F = 2.3 ~ 2.7 GHz | | $V_R$ = 50 V F = 6.0 GHz | | $I_F$ = 100 mA F = 2.3 ~ 2.7 GHz | | $I_F$ = 100 mA F = 6.0 GHz | |

| Maximum Ratings | Rating | Limits |
|---|---|---|
| | $I_F$ | 1 Amp |
| | $\Theta_{JC}$ | 5.0° C/W |
| | $T_J$ | +175° C |
| | **Storage Temperature** | -65° C to +150° C |
| | **Soldering Temperature** | +230° C for 30 seconds |

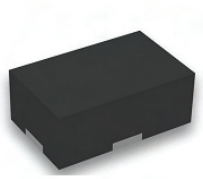
Specialty Packages

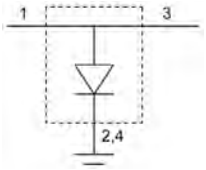
(Package style CM22 only.)

# **PIN Diode:** Medium Power Shunt Switch Element

- Supports up to 20 watts power when cold switched
- Low insertion loss 0.25 dB typical out to 2.7 GHz
- High Isolation 31 dB typical up to 2.7 GHz

The Aeroflex / Metelics' broadband, high linearity, medium power shunt switch element in a 1.9 X 1.1 mm QFN package. This device is designed for WiMax, Wibro, WLAN, TD-SCDMA and other wireless infrastructure applications. It is also suited for 0.1 ~ 6 GHz applications with up to 20 watts of power.






Package 2012

## MSWSH-020-30, $T_C$ = +25° C

| Model | $V_{BR}$ | $C_J$ | $R_S$ | | Switching Speed | IL | | IL | | IRL | | IRL | | Iso | | Iso | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN V | TYP pF | TYP Ω | MAX Ω | MAX nS | TYP dB | MAX dB | TYP dB | MAX dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB |
| MSWSH-020-30 | 100 | 0.13 | 0.6 | 0.9 | 500 | 0.25 | 0.35 | 0.35 | 0.45 | 15 | 19 | 10 | 14 | 26 | 31 | 25 | 27 |
| **Test Conditions** | $I_R$ = 10 µA | $V_R$ = 10 V, F = 1 MHz | $I_F$ = 50 mA F = 500 MHz | | | $V_R$ = 10 V F = 2.3 ~ 2.7 GHz | | $V_R$ = 10 V F = 6.0 GHz | | $V_R$ = 10 V F = 2.3 ~ 2.7 GHz | | $V_R$ = 10 V F = 6.0 GHz | | $I_F$ = 50 mA F = 2.3 ~ 2.7 GHz | | $I_F$ = 50 mA F = 6.0 GHz | |

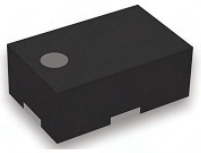
| Maximum Ratings | Rating | Limits |
|---|---|---|
| | $V_R$ | 100 V |
| | $I_F$ | 100 mA |
| | $\Theta_{JC}$ | 30° C/W |
| | $T_J$ | +150° C |
| | **Storage Temperature** | -65° C to +125° C |
| | **Soldering Temperature** | +260° C per JEDEC STD-J-20C |


(Package style 2012 only.)

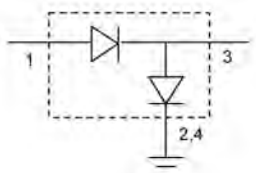
# PIN Diode: Series Shunt Integrated Switch Element

- Supports up to 20 watts power when cold switched
- Low insertion loss 0.4 dB typical out to 2.7 GHz
- High isolation 45 dB typical up to 2.7 GHz

The Aeroflex / Metelics' broadband, high linearity, medium power series shunt integrated switch element in a 1.9 X 1.1 mm QFN package. This device is designed for WiMax, Wibro, WLAN, TD-SCDMA and other wireless infrastructure applications. It is also suited for 0.1 ~ 6 GHz applications with up to 20 watts of power.



Package 2012




## MSWSS-020-40, $T_C$ = +25° C

| Model | $V_{BR}$ | Switching Speed | IL | | IL | | IRL | | IRL | | ORL | | ORL | | Iso | | Iso | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN V | MAX µS | TYP dB | MAX dB | TYP dB | MAX dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB | MIN dB | TYP dB |
| MSWSS-020-40 | 100 | 1.0 | 0.3 | 0.5 | 0.6 | 0.8 | 15 | 21 | 10 | 13 | 15 | 22 | 10 | 13 | 40 | 50 | 30 | 35 |
| **Test Conditions** | $I_R$ = 10 µA | | I = -50 mA* F = 2.3 ~ 2.7 GHz | | I = -50 mA* F = 6.0 GHz | | I = -50 mA* F = 2.3 ~ 2.7 GHz | | I = -50 mA* F = 6.0 GHz | | I = -50 mA* F = 2.3 ~ 2.7 GHz | | I = -50 mA* F = 6.0 GHz | | I = +50 mA* F = 2.3 ~ 2.7 GHz | | I = +50 mA* F = 6.0 GHz | |

| Maximum Ratings | Rating | Limits |
|---|---|---|
| | $V_R$ | 100 V |
| | $I_F$ | 100 mA |
| | $\Theta_{JC}$ | 30° C/W |
| | $T_J$ | +150° C |
| | **Storage Temperature** | -65° C to +125° C |
| | **Soldering Temperature** | +260° C per JEDEC STD-J-20C |

* Positive current is defined as current going into PIN 3.


(Package style 2012 only.)

# Silicon Abrupt Tuning Varactors

- Available in Tape and Reel
- Small and High Volume Commercial Applications
- High Q
- Wide Selection of Capacitance Ranges

The Aeroflex / Metelics abrupt tuning varactors provide extremely high Q and low series resistance available in a 30 volt Silicon diode. These devices are available in single junction, common anode and common cathode configurations. Consult factory for availability.

## Single and Common Cathode

| Model | $C_T$ pF | | Capacitance Ratio | $R_S$ Ω | Q |
|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN |
| MSV1400-08-001 | 1.62 | 1.98 | 4.1 | 0.60 | 2900 |
| MSV1400-108-004 | 1.62 | 1.98 | 4.1 | 0.60 | 2900 |
| MSV1400-09-001 | 1.98 | 2.42 | 4.1 | 0.50 | 2800 |
| MSV1400-109-004 | 1.98 | 2.42 | 4.1 | 0.50 | 2800 |
| MSV1400-10-001 | 2.43 | 2.97 | 4.2 | 0.45 | 2600 |
| MSV1400-110-004 | 2.43 | 2.97 | 4.2 | 0.45 | 2600 |
| MSV1400-11-001 | 2.97 | 3.63 | 4.2 | 0.40 | 2500 |
| MSV1400-111-004 | 2.97 | 3.63 | 4.2 | 0.40 | 2500 |
| MSV1400-13-001 | 3.51 | 4.29 | 4.2 | 0.35 | 2400 |
| MSV1400-113-004 | 3.51 | 4.29 | 4.2 | 0.35 | 2400 |
| MSV1400-14-001 | 4.23 | 5.17 | 4.2 | 0.30 | 2200 |
| MSV1400-114-004 | 4.23 | 5.17 | 4.2 | 0.30 | 2200 |
| MSV1400-15-001 | 5.04 | 6.16 | 4.3 | 0.27 | 2100 |
| MSV1400-115-004 | 5.04 | 6.16 | 4.3 | 0.27 | 2100 |
| MSV1400-16-001 | 6.12 | 7.48 | 4.3 | 0.24 | 2000 |
| MSV1400-116-004 | 6.12 | 7.48 | 4.3 | 0.24 | 2000 |
| MSV1400-17-001 | 7.38 | 9.02 | 4.3 | 0.22 | 1800 |
| MSV1400-117-004 | 7.38 | 9.02 | 4.3 | 0.22 | 1800 |
| MSV1400-19-001 | 9.00 | 11.0 | 4.4 | 0.20 | 1600 |
| MSV1400-20-001 | 10.8 | 13.2 | 4.4 | 0.18 | 1500 |
| MSV1400-21-001 | 13.5 | 16.5 | 4.4 | 0.18 | 1200 |
| MSV1400-22-001 | 16.2 | 19.8 | 4.4 | 0.18 | 1000 |
| **Test Conditions** | @ 4 V, 1 MHz | | $C_T0/C_T30$ | @ -4 V, 50 MHz | @ -4 V, 50 MHz |

# Silicon Abrupt Tuning Varactors

## Single and Common Cathode

| Model | Capacitance pF | Quality Factor Q | Capacitance Ratio |
|---|---|---|---|
| | | MIN | MIN |
| SMV2101 | 6.8 | 450 | 2.5 |
| SMV2102 | 8.2 | 450 | 2.5 |
| SMV2103 | 10.0 | 400 | 2.5 |
| SMV2104 | 12.0 | 400 | 2.5 |
| SMV2105 | 15.0 | 400 | 2.5 |
| SMV2106 | 18.0 | 350 | 2.5 |
| SMV2107 | 22.0 | 350 | 2.5 |
| SMV2108 | 27.0 | 300 | 2.5 |
| SMV2109 | 33.0 | 200 | 2.5 |
| SMV2110 | 39.0 | 150 | 2.5 |
| SMV2111 | 47.0 | 150 | 2.5 |
| SMV2112 | 56.0 | 150 | 2.6 |
| SMV2113 | 68.0 | 150 | 2.6 |
| SMV2114 | 82.0 | 100 | 2.6 |
| SMV2115 | 100.0 | 100 | 2.6 |
| **Test Conditions** | @ -4V, 1 MHz | @ +4 V, 50 MHz | $C_J$ -2V / $C_J$ -30V, 1 MHz |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **DC Power Dissipation** | @$T_A$ = 25° C 250 mW |
| | **Reverse Breakdown Voltage** | @10mA 30 V Min |
| | **Max Reverse Current** | @$T_A$ = 25° C 0.1 mA @25 Vdc |
| | **Operating Temperature** | -55 to + 125° C |
| | **Storage Temperature** | -65 to + 150° C |
| | **Capacitance Tolerance** | ±10% |

# Silicon Abrupt Tuning Varactors: 30 Volt

- Low Series Resistance-High Q
- Extensive Selection of Capacitance Values

The Aeroflex / Metelics MTV-4030 Series Tuning Varactors are silicon abrupt junction devices. They offer the highest Q and lowest resistance available in 30 volt tuning diodes.

A unique silicon dioxide passivation process assures greater stability, reliability and low leakage currents at higher temperatures.

| Model | Junction Capacitance $C_T$ | Capacitance Ratio | Quality Factor Q |
|---|---|---|---|
| | pF | MIN | MIN |
| MTV4030-01 | 0.4 | 5.0 | 5000 |
| MTV4030-02 | 0.6 | 5.0 | 5000 |
| MTV4030-03 | 0.8 | 5.0 | 4800 |
| MTV4030-04 | 1.0 | 5.0 | 4800 |
| MTV4030-05 | 1.2 | 5.0 | 4600 |
| MTV4030-06 | 1.4 | 5.0 | 4400 |
| MTV4030-07 | 1.6 | 5.0 | 4400 |
| MTV4030-08 | 1.8 | 5.0 | 4200 |
| MTV4030-09 | 2.2 | 5.0 | 4000 |
| MTV4030-10 | 2.7 | 5.0 | 3800 |
| MTV4030-11 | 3.3 | 5.0 | 3600 |
| MTV4030-12 | 3.6 | 5.0 | 3400 |
| MTV4030-13 | 3.9 | 5.0 | 3400 |
| MTV4030-14 | 4.7 | 5.0 | 3200 |
| MTV4030-15 | 5.6 | 5.0 | 3000 |
| MTV4030-16 | 6.8 | 5.0 | 2800 |
| MTV4030-17 | 8.2 | 5.0 | 2600 |
| MTV4030-18 | 10.0 | 5.0 | 2400 |
| MTV4030-19 | 12.0 | 5.0 | 2200 |
| MTV4030-20 | 15.0 | 5.0 | 2000 |
| MTV4030-21 | 18.0 | 5.0 | 1800 |
| MTV4030-22 | 22.0 | 5.0 | 1600 |
| MTV4030-23 | 27.0 | 5.0 | 1400 |
| MTV4030-24 | 33.0 | 5.0 | 1400 |
| MTV4030-25 | 39.0 | 5.0 | 1200 |
| MTV4030-26 | 47.0 | 5.0 | 1000 |
| **Test Conditions** | @ -4 V, 1MHz | $C_T0/C_T$ -30 V | @ -4V, 50 MHz |

| Maximum Ratings | Parameter | Rating |
|---|---|---|
| | **Operating Temperature** | -55 to + 150 °C |
| | **Storage Temperature Range** | -65 to + 200 °C |
| | **Reverse Voltage** | 30 V |
| | **Device Dissipation at $T_A$ = 25°C** | 250 mW |

# Silicon Abrupt Tuning Varactors: 45 Volt

- Low Series Resistance-High Q
- Extensive Selection of Capacitance Values

The Aeroflex / Metelics MTV-4045 Series Tuning Varactors are silicon abrupt junction devices. They offer the highest Q and lowest resistance available in 45 volt tuning diodes.

A unique silicon dioxide passivation process assures greater stability, reliability and low leakage currents at higher temperatures.

| Model | Junction Capacitance | Capacitance Ratio | Quality Factor, Q |
|---|---|---|---|
| | pF | MIN | MIN |
| MTV4045-01 | 0.4 | 7.0 | 3000 |
| MTV4045-02 | 0.6 | 7.0 | 3000 |
| MTV4045-03 | 0.8 | 7.0 | 2800 |
| MTV4045-04 | 1.0 | 7.0 | 2800 |
| MTV4045-05 | 1.2 | 7.0 | 2600 |
| MTV4045-06 | 1.4 | 7.0 | 2400 |
| MTV4045-07 | 1.6 | 7.0 | 2400 |
| MTV4045-08 | 1.8 | 7.0 | 2300 |
| MTV4045-09 | 2.2 | 7.0 | 2200 |
| MTV4045-10 | 2.7 | 7.0 | 2200 |
| MTV4045-11 | 3.3 | 7.0 | 2100 |
| MTV4045-12 | 3.6 | 7.0 | 2000 |
| MTV4045-13 | 3.9 | 7.0 | 2000 |
| MTV4045-14 | 4.7 | 7.0 | 2000 |
| MTV4045-15 | 5.6 | 7.0 | 1900 |
| MTV4045-16 | 6.8 | 7.0 | 1800 |
| MTV4045-17 | 8.2 | 7.0 | 1700 |
| MTV4045-18 | 10.0 | 7.0 | 1600 |
| MTV4045-19 | 12.0 | 7.0 | 1500 |
| MTV4045-20 | 15.0 | 7.0 | 1400 |
| MTV4045-21 | 18.0 | 7.0 | 1300 |
| MTV4045-22 | 22.0 | 7.0 | 1200 |
| **Test Conditions** | @ -4 V, 1MHz | $C_T0/C_T$ -45 V | @ -4V, 50 MHz |

| Maximum Ratings | Parameter | Rating |
|---|---|---|
| | **Operating Temperature** | -55 to + 150 °C |
| | **Storage Temperature Range** | -65 to + 200 °C |
| | **Reverse Voltage** | 45 V |
| | **Device Dissipation at TA = 25°C** | 250 mW |

# Silicon Abrupt Tuning Varactors: 60 Volt

- Low Series Resistance-High Q
- Extensive Selection of Capacitance Values

The Aeroflex / Metelics MTV-4060 Series Tuning Varactors are silicon abrupt junction devices. They offer the highest Q and lowest resistance available in 60 volt tuning diodes.

A unique silicon dioxide passivation process assures greater stability, reliability and low leakage currents at higher temperatures.

| Model | Junction Capacitance | Capacitance Ratio | Quality Factor |
|---|---|---|---|
| | pF | MIN | MIN |
| MTV4060-01 | 0.8 | 8.0 | 2100 |
| MTV4060-02 | 1.0 | 8.0 | 2100 |
| MTV4060-03 | 1.2 | 8.0 | 2100 |
| MTV4060-04 | 1.4 | 8.0 | 2000 |
| MTV4060-05 | 1.6 | 8.0 | 2000 |
| MTV4060-06 | 1.8 | 8.0 | 2000 |
| MTV4060-07 | 2.2 | 8.0 | 2000 |
| MTV4060-08 | 2.7 | 8.0 | 1900 |
| MTV4060-09 | 3.3 | 8.0 | 1800 |
| MTV4060-10 | 3.6 | 8.0 | 1700 |
| MTV4060-11 | 3.9 | 8.0 | 1700 |
| MTV4060-12 | 4.7 | 8.0 | 1600 |
| MTV4060-13 | 5.6 | 8.0 | 1500 |
| MTV4060-14 | 6.8 | 8.0 | 1400 |
| MTV4060-15 | 8.2 | 8.0 | 1300 |
| MTV4060-16 | 10.0 | 8.0 | 1200 |
| MTV4060-17 | 12.0 | 8.0 | 1100 |
| MTV4060-18 | 15.0 | 8.0 | 1000 |
| **Test Conditions** | @ -4 V, 1MHz | $C_T0/C_T$ -60 V | @ -4 V, 50 MHz |

| Maximum Ratings | Parameter | Rating |
|---|---|---|
| | **Operating Temperature** | -55 to + 150 °C |
| | **Storage Temperature Range** | -65 to + 200 °C |
| | **Reverse Voltage** | 60 V |
| | **Device Dissipation at TA = 25°C** | 250 mW |

# Silicon Abrupt Tuning Varactors: 90 Volt

- Low Series Resistance-High Q
- Extensive Selection of Capacitance Values

The Aeroflex / Metelics MTV-4090 Series Tuning Varactors are silicon abrupt junction devices. They offer the highest Q and lowest resistance available in 90 volt tuning diodes.

A unique silicon dioxide passivation process assures greater stability, reliability and low leakage currents at higher temperatures.

| Model | Total Capacitance | Capacitance Ratio | Quality Factor |
|---|---|---|---|
| | pF | MIN | MIN |
| MTV4090-01 | 0.8 | 8.0 | 1000 |
| MTV4090-02 | 1.0 | 8.0 | 1000 |
| MTV4090-03 | 1.2 | 8.0 | 900 |
| MTV4090-04 | 1.4 | 8.0 | 900 |
| MTV4090-05 | 1.6 | 8.0 | 850 |
| MTV4090-06 | 1.8 | 8.0 | 850 |
| MTV4090-07 | 2.2 | 8.0 | 850 |
| MTV4090-08 | 2.7 | 8.0 | 850 |
| MTV4090-09 | 3.3 | 8.0 | 800 |
| MTV4090-10 | 3.6 | 8.0 | 800 |
| MTV4090-11 | 3.9 | 8.0 | 800 |
| MTV4090-12 | 4.7 | 8.0 | 800 |
| MTV4090-13 | 5.6 | 8.0 | 800 |
| MTV4090-14 | 6.8 | 8.0 | 750 |
| MTV4090-15 | 8.2 | 8.0 | 750 |
| MTV4090-16 | 10.0 | 8.0 | 750 |
| **Test Conditions** | @ -4 V, 1MHz | $C_T0/C_T$ -90 V | @ -4V, 50 MHz |

| Maximum Ratings | Parameter | Rating |
|---|---|---|
| | **Operating Temperature** | -55 to + 150 °C |
| | **Storage Temperature Range** | -65 to + 200 °C |
| | **Reverse Voltage** | 90 V |
| | **Device Dissipation at TA = 25° C** | 250 mW |

# Silicon Abrupt Varactors: General Purpose

## Ultra-Low Leakage

| Model | Total Capacitance pF | Capacitance Ratio | Working Voltage Vdc | Breakdown Voltage Vdc |
|---|---|---|---|---|
| | | TYP | MAX | MIN |
| V907 | 7 | 4.1 | 25 | 28 |
| V910 | 10 | 4.1 | 25 | 28 |
| V912 | 12 | 4.2 | 25 | 28 |
| V915 | 15 | 4.2 | 25 | 28 |
| V920 | 20 | 3.9 | 20 | 22 |
| V927 | 27 | 4.0 | 20 | 22 |
| V933 | 33 | 4.1 | 20 | 22 |
| V939 | 39 | 4.1 | 20 | 22 |
| V947 | 47 | 3.9 | 20 | 22 |
| V956 | 56 | 3.5 | 15 | 17 |
| V968 | 68 | 3.5 | 15 | 17 |
| V982 | 82 | 3.5 | 15 | 17 |
| V900 | 100 | 3.5 | 15 | 17 |
| V907E | 7 | 6.9 | 100 | 110 |
| V910E | 10 | 6.9 | 100 | 110 |
| V912E | 12 | 7.5 | 100 | 110 |
| V915E | 15 | 7.5 | 100 | 110 |
| V920E | 20 | 7.9 | 90 | 99 |
| V927E | 27 | 7.4 | 65 | 72 |
| V933E | 33 | 6.5 | 60 | 66 |
| V939E | 39 | 6.3 | 55 | 61 |
| V947E | 47 | 6.1 | 50 | 55 |
| V956E | 56 | 5.7 | 40 | 44 |
| V968E | 68 | 4.6 | 30 | 33 |
| V982E | 82 | 4.0 | 20 | 22 |
| V900E | 100 | 4.0 | 20 | 22 |
| **Test Conditions** | @ -4 V, 1MHz | C•0.5V / C•MWV | | $I_R$ = 100 µA |

| Maximum Ratings | Parameter | Rating |
|---|---|---|
| | **Forward Voltage Drop** | 1.0 Vdc |
| | **DC Power Dissipation** | 400 mW |
| | **Max Reverse Current** | 5 nA |
| | **Operating Temperature** | -65° to +150 °C |
| | **Storage Temperature** | -65° to +200 °C |
| | **Capacitance Tolerance** | +20% |

# Silicon Abrupt Varactors: General Purpose

| KSV2101 – KSV2115 | | | | Glass Axial Leaded |
|---|---|---|---|---|
| **Model** | Total Capacitance | Quality Factor Q | Capacitance Ratio | |
| | pF | MIN | MIN | MAX |
| KSV2101 | 6.8 | 450 | 2.5 | 3.2 |
| KSV2102 | 8.2 | 450 | 2.5 | 3.2 |
| KSV2103 | 10.0 | 400 | 2.5 | 3.2 |
| KSV2104 | 12.0 | 400 | 2.5 | 3.2 |
| KSV2105 | 15.0 | 400 | 2.5 | 3.2 |
| KSV2106 | 18.0 | 350 | 2.5 | 3.2 |
| KSV2107 | 22.0 | 350 | 2.5 | 3.2 |
| KSV2108 | 27.0 | 300 | 2.5 | 3.2 |
| KSV2109 | 33.0 | 200 | 2.5 | 3.2 |
| KSV2110 | 39.0 | 150 | 2.5 | 3.2 |
| KSV2111 | 47.0 | 150 | 2.5 | 3.2 |
| KSV2112 | 56.0 | 150 | 2.6 | 3.3 |
| KSV2113 | 68.0 | 150 | 2.6 | 3.3 |
| KSV2114 | 82.0 | 100 | 2.6 | 3.3 |
| KSV2115 | 100.0 | 100 | 2.6 | 3.3 |
| **Test Conditions** | @ -4 V, 1MHz | @ -4 V, 50 MHz | $C_T$ -2 / $C_T$ -30 V, 1 MHz | |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **DC Power Dissipation** | 400 mW |
| | **Reverse Breakdown Voltage** | 30 V min |
| | **Max Reverse Current @ Ta = 25° C** | 0.1 µA @ 25 Vdc |
| | **Operating Temperature** Topr | -65° to 175° C |
| | **Storage Temperature** Tstg | -65° to 200° C |
| | **Capacitance Tolerance:** | +10% |

# Silicon Abrupt Varactors: General Purpose

## MV830 – MV840

Glass Axial Leaded

| Model | $C_T$ Diode Capacitance pF | | | Quality Factor Q | | Tuning Ratio $T_R$ | |
|---|---|---|---|---|---|---|---|
| | MIN | TYP | MAX | MIN | TYP | MIN | TYP |
| MV830 | 13.5 | 15.0 | 16.5 | 30 | 35 | 1.8 | 2.00 |
| MV831 | 6.2 | 18.0 | 19.8 | 25 | 30 | 1.8 | 2.00 |
| MV832 | 19.8 | 22.0 | 24.2 | 25 | 30 | 1.8 | 2.10 |
| MV833 | 24.3 | 27.0 | 29.7 | 25 | 30 | 1.8 | 2.10 |
| MV834 | 29.7 | 33.0 | 36.3 | 20 | 25 | 1.9 | 2.12 |
| MV835 | 35.1 | 39.0 | 42.9 | 20 | 25 | 1.9 | 2.12 |
| MV836 | 42.3 | 47.0 | 51.7 | 15 | 20 | 1.9 | 2.15 |
| MV837 | 50.4 | 56.0 | 61.6 | 15 | 20 | 1.9 | 2.15 |
| MV838 | 61.2 | 68.0 | 74.8 | 15 | 20 | 2.0 | 2.18 |
| MV839 | 73.8 | 82.0 | 90.2 | 10 | 15 | 2.0 | 2.18 |
| MV840 | 90.0 | 100.0 | 10.0 | 10 | 15 | 2.0 | 2.18 |
| **Test Conditions** | @ -4 V, D= 1MHz | | | @ -4 V, 50 MHz | | $C_T$ -4V / $C_T$ -25V, 1 MHz | |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **DC Power Dissipation** | 400 mW | |
| | **Min Reverse Breakdown Voltage** | 30 Vdc | |
| | **Max Reverse Current** | @ 25 Vdc | 0.2 µA |
| | **Operating Temperature** | | -65° to +150° C |
| | **Storage Temperature** | | -65° to +200° C |
| | **Junction Temperature** | +175° C | |

# Silicon Abrupt Varactors: General Purpose

## MV1620 – MV1650

| Model | Diode Capacitance $C_T$ pF | | | Quality Factor Q | Tuning Ratio $T_R$ | |
|---|---|---|---|---|---|---|
| | MIN | TYP | MAX | MIN | MIN | TYP |
| MV1620 | 6.1 | 6.8 | 7.5 | 300 | 2.0 | 3.2 |
| MV1622 | 7.4 | 8.2 | 9.0 | 300 | 2.0 | 3.2 |
| MV1624 | 9.0 | 10.0 | 11.0 | 300 | 2.0 | 3.2 |
| MV1626 | 10.8 | 12.0 | 13.2 | 300 | 2.0 | 3.2 |
| MV1628 | 13.5 | 15.0 | 16.5 | 250 | 2.0 | 3.2 |
| MV1630 | 16.2 | 18.0 | 19.8 | 250 | 2.0 | 3.2 |
| MV1632 | 18.0 | 20.0 | 22.0 | 250 | 2.0 | 3.2 |
| MV1634 | 19.8 | 22.0 | 24.2 | 250 | 2.0 | 3.2 |
| MV1636 | 24.3 | 27.0 | 29.7 | 200 | 2.0 | 3.2 |
| MV1638 | 29.7 | 33.0 | 36.3 | 200 | 2.0 | 3.2 |
| MV1640 | 35.1 | 39.0 | 42.9 | 200 | 2.0 | 3.2 |
| MV1642 | 42.3 | 47.0 | 51.7 | 200 | 2.0 | 3.2 |
| MV1644 | 50.4 | 56.0 | 61.6 | 150 | 2.0 | 3.2 |
| MV1646 | 61.2 | 68.0 | 74.8 | 150 | 2.0 | 3.2 |
| MV1648 | 73.8 | 82.0 | 90.2 | 150 | 2.0 | 3.2 |
| MV1650 | 90.0 | 100.0 | 110.0 | 150 | 2.0 | 3.2 |
| **Test Conditions** | $V_R = 4$ Vdc, F = 1 MHz | | | @ 4 Vdc, F = 50 MHz | $C_T$ -2 V / $C_T$ -20V, 1 MHz | |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **DC Power Dissipation** | @ TA = 25° C | 400 mW |
| | **Min Reverse Breakdown Voltage** | @ Ir = 10 µA | 20 Vdc |
| | **Max Reverse Current** | @ 15 Vdc | 0.1 µA Max |
| | **Operating Temperature** | | -65° to +150° C |
| | **Storage Temperature** | | -65° to +200° C |
| | **Junction Temperature** | | 175° C |

## MV1652 – MV1666

| Model | Diode Capacitance $C_T$ pF | | | Quality Factor Q | Capacitance Ratio | | Reverse Voltage Vdc |
|---|---|---|---|---|---|---|---|
| | MIN | TYP | MAX | MIN | TYP | TYP | MIN |
| MV1652 | 108 | 120 | 135 | 250 | 2.6 | | 20 |
| MV1654 | 132 | 150 | 165 | 250 | 2.6 | | 20 |
| MV1656 | 162 | 180 | 198 | 200 | 2.6 | | 20 |
| MV1658 | 180 | 200 | 220 | 200 | 2.6 | | 20 |
| MV1660 | 198 | 220 | 242 | 200 | 2.6 | | 20 |
| MV1662 | 225 | 250 | 275 | 150 | | 2.3 | 15 |
| MV1664 | 243 | 270 | 300 | 100 | | 2.3 | 15 |
| MV1666 | 297 | 330 | 363 | 100 | | 2.3 | 15 |
| **Test Conditions** | $V_R = 4$ Vdc, F = 1 MHz | | | 1 $V_B = 4$ Vdc, F = 20 MHz | $C_T$ -2 V / $C_T$ -20 V | $C_T$ -2 V / $C_T$ -15 V | @ 10 µA |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **DC Power Dissipation** | @ TA = 25° C | 475 mW |
| | **Max Reverse Current** | @ 15 Vdc | 0.1 µA (MV1652-MV1660) |
| | **Max Reverse Current** | @ 10 Vdc | 0.1 µA (MV1662-MV1666) |
| | **Operating Temperature** | | -65° to +150° C |
| | **Storage Temperature** | | -65° to +200° C |
| | **Junction Temperature** | | 175° C |


Plastic SMT


Glass Axial Leaded

# Silicon Abrupt Varactors: General Purpose

## 1N5139 – 1N5148, 1N5139A – 1N5148A

| Model | Capacitance pF | | | Capacitance Ratio | Quality Factor Q |
|---|---|---|---|---|---|
| | MIN | TYP | MAX | MIN | MIN |
| 1N5139 | 6.12 | 6.8 | 7.48 | 2.7 | 350 |
| ®1N5139A | 6.46 | 6.8 | 7.14 | 2.7 | 350 |
| 1N5140 | 9.0 | 10.0 | 11.0 | 2.8 | 300 |
| ®1N5140A | 9.5 | 10.0 | 10.5 | 2.8 | 300 |
| 1N5141 | 10.8 | 12.0 | 13.2 | 2.8 | 300 |
| ®1N5141A | 11.4 | 12.0 | 12.6 | 2.8 | 300 |
| 1N5142 | 13.5 | 15.0 | 16.5 | 2.8 | 250 |
| ®1N5142A | 14.3 | 15.0 | 15.7 | 2.8 | 250 |
| 1N5143 | 16.2 | 18.0 | 19.8 | 2.8 | 250 |
| ®1N5143A | 17.1 | 18.0 | 18.9 | 2.8 | 250 |
| 1N5144 | 19.8 | 22.0 | 24.2 | 3.2 | 200 |
| ®1N5144A | 20.9 | 22.0 | 23.1 | 3.2 | 200 |
| 1N5145 | 24.3 | 27.0 | 29.7 | 3.2 | 200 |
| ®1N5145A | 25.7 | 27.0 | 28.3 | 3.2 | 200 |
| 1N5146 | 29.7 | 33.0 | 36.3 | 3.2 | 200 |
| ®1N5146A | 31.4 | 33.0 | 34.6 | 3.2 | 200 |
| 1N5147 | 6.1 | 39.0 | 42.9 | 3.2 | 200 |
| ®1N5147A | 37.1 | 39.0 | 40.9 | 3.2 | 200 |
| 1N5148 | 42.3 | 47.0 | 51.7 | 3.2 | 200 |
| ®1N5148A | 44.7 | 47.0 | 49.3 | 3.2 | 200 |
| **Test Conditions** | @ -4 Vdc, 1 MHz | | | $C_T$ -2 V / $C_T$ -60 V | @ 4 Vdc F = 50 MHz |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **DC Power Dissipation** | 400 mW | |
| | **Forward Current** | 250 mA | |
| | **Min Reverse Breakdown Voltage** | @ $I_R$ = 10 µAdc | 65 Vdc |
| | **Max Reverse Current** | @ $V_R$ = 55 Vdc | 20 µAdc |
| | **Max Reverse Current** | @ $V_R$ = 55 Vdc; Ta = 150° C | 20 µAdc |
| | **Temp Coefficient of Capacitance** | @ $V_R$ = 4 Vdc; Ta -40 to +85° C | 03% / °C |
| | **Operating Temperature Range** | -65° to +175° C | |
| | **Storage Temperature Range** | -65° to +200° C | |
| | **Voltage Tolerance** | Standard Device | +10% |
| | **Suffix A** | +5% | |

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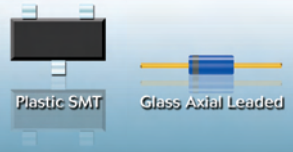

# Silicon Abrupt Varactors: General Purpose

## 1N5441 – 1N5456

| Model | Capacitance pF | Tuning Ratio | | Quality Factor Q |
|---|---|---|---|---|
| | | MIN | MAX | MIN |
| 1N5441 | 6.8 | 2.5 | 3.1 | 450 |
| 1N5442 | 8.2 | 2.5 | 3.1 | 450 |
| 1N5443 | 10.0 | 2.6 | 3.1 | 400 |
| 1N5444 | 12.0 | 2.6 | 3.1 | 400 |
| 1N5445 | 15.0 | 2.6 | 3.1 | 400 |
| 1N5446 | 18.0 | 2.6 | 3.1 | 350 |
| 1N5447 | 20.0 | 2.6 | 3.1 | 350 |
| 1N5448 | 22.0 | 2.6 | 3.2 | 350 |
| 1N5449 | 27.0 | 2.6 | 3.2 | 350 |
| 1N5450 | 33.0 | 2.6 | 3.2 | 350 |
| 1N5451 | 39.0 | 2.6 | 3.2 | 300 |
| 1N5452 | 47.0 | 2.6 | 3.2 | 250 |
| 1N5453 | 56.0 | 2.6 | 3.3 | 200 |
| 1N5454 | 68.0 | 2.7 | 3.3 | 175 |
| 1N5455 | 82.0 | 2.7 | 3.3 | 175 |
| 1N5456 | 100.0 | 2.7 | 3.3 | 175 |
| **Test Conditions** | @ 4 Vdc, 1 MHz | $C_T$ -2 V / $C_T$ -30 V F=1-MHz | | @ 4 Vdc F = 50 MHz |


# Silicon Abrupt Varactors: General Purpose

## 1N5461– 1N5476

| Model | Capacitance pF | Tuning Rati | | Quality Factor Q |
|---|---|---|---|---|
| | | MIN | MAX | MIN |
| ®1N5461 | 6.8 | 2.7 | 3.1 | 600 |
| ®1N5462 | 8.2 | 2.8 | 3.1 | 600 |
| ®1N5463 | 10.0 | 2.8 | 3.1 | 550 |
| ®1N5464 | 12.0 | 2.8 | 3.1 | 550 |
| ®1N5465 | 15.0 | 2.8 | 3.1 | 550 |
| ®1N5466 | 18.0 | 2.9 | 3.1 | 500 |
| ®1N5467 | 20.0 | 2.9 | 3.1 | 500 |
| ®1N5468 | 22.0 | 2.9 | 3.2 | 500 |
| ®1N5469 | 27.0 | 2.9 | 3.2 | 500 |
| ®1N5470 | 33.0 | 2.9 | 3.2 | 500 |
| ®1N5471 | 39.0 | 2.9 | 3.2 | 450 |
| ®1N5472 | 47.0 | 2.9 | 3.2 | 400 |
| ®1N5473 | 56.0 | 2.9 | 3.3 | 300 |
| ®1N5474 | 68.0 | 2.9 | 3.3 | 250 |
| ®1N5475 | 82.0 | 2.9 | 3.3 | 225 |
| ®1N5476 | 100.0 | 2.9 | 3.3 | 200 |
| **Test Conditions** | @ 4 Vdc, 1 MHz | $C_T$ -2 V / $C_T$ -30 V F = 1 -MHz | | @ 4 Vdc F = 50 MHz |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **DC Power Dissipation (Pd)** | @ Ta = 25° C | 400 mW |
| | **Min Reverse Breakdown Voltage** | @ Ir = 10 µA | 30 V |
| | **Max Reverse Current** | @ 25 Vdc | 0.02 µA |
| | **Max Reverse Current** | @ 25 Vdc 150° C | 20 µA |
| | **Temp Coefficient of Capacitance** | @ Vr = 4 Vdc; Ta -65 to +85° C | .04%/°C |
| | **Operating Temperature Range** | | -65° to +175° C |
| | **Storage Temperature Range** | | -65° to +200° C |
| | **Capacitance Tolerance** | Standard Device | +20% |
| | **Suffix A** | +10% | |
| | **Suffix B** | +5% | |
| | **Suffix C** | +2% | |

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# Silicon Abrupt Varactors: General Purpose

## 1N5681– 1N5709

| Model | Capacitance pF | Quality Factor Q | Capacitance Ratio | | | | Working Voltage Vdc | Reverse Breakdown Voltage |
|---|---|---|---|---|---|---|---|---|
| | | MIN | MIN | TYP | MIN | TYP | MAX | MIN |
| 1N5681 | 6.8 | 600 | 3.1 | 3.3 | | | 40 | 45 |
| 1N5682 | 8.2 | 600 | 3.1 | 3.3 | | | 40 | 45 |
| 1N5683 | 10.0 | 550 | 3.2 | 3.4 | | | 40 | 45 |
| 1N5684 | 12.0 | 550 | 3.2 | 3.4 | | | 40 | 45 |
| 1N5685 | 15.0 | 550 | 3.2 | 3.4 | | | 40 | 45 |
| 1N5686 | 18.0 | 500 | 3.2 | 3.4 | | | 40 | 45 |
| 1N5687 | 22.0 | 500 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5688 | 27.0 | 500 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5689 | 33.0 | 500 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5690 | 39.0 | 450 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5691 | 47.0 | 400 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5692 | 56.0 | 300 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5693 | 68.0 | 250 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5694 | 82.0 | 225 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5695 | 100.0 | 200 | 3.3 | 3.5 | | | 40 | 45 |
| 1N5696 | 6.8 | 450 | | | 2.7 | 2.9 | 60 | 65 |
| 1N5697 | 8.2 | 450 | | | 2.7 | 2.9 | 60 | 65 |
| 1N5698 | 10.0 | 400 | | | 2.8 | 3.0 | 60 | 65 |
| 1N5699 | 12.0 | 400 | | | 2.8 | 3.0 | 60 | 65 |
| 1N5700 | 15.0 | 400 | | | 2.8 | 3.0 | 60 | 65 |
| 1N5701 | 18.0 | 375 | | | 2.8 | 3.0 | 60 | 65 |
| 1N5702 | 22.0 | 375 | | | 3.2 | 3.4 | 60 | 65 |
| 1N5703 | 27.0 | 350 | | | 3.2 | 3.4 | 60 | 65 |
| 1N5704 | 33.0 | 350 | | | 3.2 | 3.4 | 60 | 65 |
| 1N5705 | 39.0 | 325 | | | 3.2 | 3.4 | 60 | 65 |
| 1N5706 | 47.0 | 300 | | | 3.2 | 3.4 | 60 | 65 |
| 1N5707 | 56.0 | 225 | | | 3.2 | 3.4 | 60 | 65 |
| 1N5708 | 68.0 | 175 | | | 3.2 | 3.4 | 60 | 65 |
| 1N5709 | 82.0 | 150 | | | 3.2 | 3.4 | 60 | 65 |
| **Test Conditions** | @ 4Vdc 1 MHz | @ 4 Vdc F = 50 MHz | $C_T$ -2 V / $C_T$ -40 V | | $C_T$ -4 V / $C_T$ -60 V | | | @ 10μA |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **DC Power Dissipation** | 400 mW | |
| | **Max Reverse Current** | @ Ta = 25° C | 20 nA @ MWV |
| | **Max Reverse Current** | @ Ta = 150° C | 20 μA @ MWV |
| | **Operating Temperature Range** | -65° to +175° C | |
| | **Storage Temperature Range** | -65° to +200° C | |
| | **Capacitance Tolerance:** | Standard Device | +20% |
| | **Suffix A** | +10% | |
| | **Suffix B** | +5% | |


# Low Cost Silicon Hyperabrupt Tuning Varactors

- Low Inductance
- Wide Capacitance Swing
- High Q
- Superior Reproducibility

The Aeroflex / Metelics Low Cost Hyperabrupts offer high Qs. These diodes are excellent for octave tuning up to 800 MHZ and for straight-line frequency tuning between 3 and 8 Volt of bias. They achieve high Q values when tuned between 9 and 20 volts.

## TV3201, TV3901, TV 3902

| Model | $C_T$ Diode Capacitance pF | | $T_R$ Tuning Ratio | | Q | | $V_{BR}$ Vdc | $I_R$ nA | Cathode Strip | Case Style |
|---|---|---|---|---|---|---|---|---|---|---|
| | MIN/MAX | MIN/MAX | MIN | MAX | MIN | TYP | MIN | MAX | | |
| TV3201 | 9/13 | 2.0/2.3 | 4.5 | 5.8 | 300 | 415 | 30 | 50 | White | DO34 |
| TV3901 | 26/32 | 4.5/6.0 | 5.0 | 6.5 | 200 | 280 | 30 | 50 | Yellow | DO34 |
| TV3902 | 22.5/27.5 | 2.9/3.5 | 6.8 | 8.9 | 115 | 160 | 30 | 50 | Green | DO34 |
| **Test Conditions** | @ -3 Vdc F = 1 MHz | @ -25 Vdc F = 1 MHz | $C_T$ -3 / $C_T$ -25 F = 1 MHz | | @ -3 Vdc F = 50 MHz | | @ 10 µA | @ -28 Vdc | | |

| Maximum Ratings | Parameter | Value |
|---|---|---|
| | **Reverse Voltage** | 30 Vdc |
| | **Forward Current** | 200 mAdc |
| | **Power Dissipation at TA = 25° C** | 400 mW |
| | **Derate Above 25° C** | 4.0 mW / °C |
| | **Maximum Junction Temperature** | +125 °C |
| | **Storage Temperature** | -65 to +200 °C |

## KSV1401–KSV1412

| Model | Diode Capacitance $C_T$ pF | | | | Tuning Ratio $T_R$ | | Quality Factor Q |
|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MIN | MIN |
| KSV1401 | 440 | 660 | | | 14:1 | | 200 |
| KSV1402 | | | 45 | 69 | | 10:1 | 200 |
| KSV1403 | | | 140 | 210 | | 10:1 | 200 |
| KSV1404 | | | 96 | 144 | | 10:1 | 200 |
| KSV1405 | | | 200 | 300 | | 10:1 | 200 |
| KSV1406 | | | 80 | 120 | | 10:1 | 200 |
| KSV1407 | | | 54 | 82 | | 10:1 | 200 |
| KSV1408 | | | 37 | 57 | | 10:1 | 200 |
| KSV1409 | | | 26 | 40 | | 10:1 | 200 |
| KSV1410 | | | 17 | 27 | | 9.5:1 | 200 |
| KSV1411 | | | 12 | 18 | | 8.5:1 | 200 |
| KSV1412 | | | 8 | 12 | | 7.5:1 | 200 |
| **Test Conditions** | @ -1 V, F =1 MHz | | @ -2 V, F = 1 MHz | | $C_T$ -1V / $C_T$ -10V @ F = 1 MHz | $C_T$ -2V / $C_T$ -10V @ F = 1 MHz | @ -2 V F = 1 MHz |

| Maximum Ratings | Parameter | Value |
|---|---|---|
| | **Device Dissipation TA = 25° C** | 400 mW |
| | **Junction Temperature** | 175 °C |
| | **Reverse Breakdown Voltage** | 10 µAdc, 12 Vdc Min |
| | **Max Reverse Leakage Current** | Vr = 10 Vdc, 0.1 µVdc |
| | **Operating Temperature** | -55° to + 150 °C |
| | **Storage Temperature** | -65° to + 200 °C |
| | **Capacitance Tolerance** | + 20% |
| | **Suffix A** | + 10% |
| | **Suffix B** | + 5% |

To order devices screened to MIL-PRF-19500 JANTX level, Appendix E, Table IV add suffix H.

# Silicon Hyperabrupt Tuning Varactors: Portable

- Available in Tape and Reel
- Small and High Volume Commercial Applications
- Wide Selection of Capacitance Ranges

The Aeroflex / Metelics Hyperabrupt Varactors come in a wide variety of capacitance values and high capacitance ratios. These devices are available in single junction, common anode and common cathode configurations.

## Single and Common Cathode — Surface Mount

| Model | Capacitance pF | | Capacitance RATIO | | Capacitance RATIO | | RS Ω | Q |
|---|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX |
| MSV1104-33-323 | 3.00 | 3.60 | 1.40 | 1.90 | 2.60 | 3.30 | 1.20 | 1200 |
| MSV1204-33-001 | 3.00 | 3.60 | 1.40 | 1.90 | 2.60 | 3.30 | 1.20 | 1200 |
| MSV1204-133-004 | 3.00 | 3.60 | 1.40 | 1.90 | 2.60 | 3.30 | 1.20 | 1200 |
| MSV1104-34-323 | 5.8 | 7.15 | 1.60 | 2.00 | 2.80 | 3.40 | 0.80 | 1000 |
| MSV1204-34-001 | 5.85 | 7.15 | 1.60 | 2.00 | 2.80 | 3.40 | 0.80 | 1000 |
| MSV1204-134-004 | 5.85 | 7.15 | 1.60 | 2.00 | 2.80 | 3.40 | 0.80 | 1000 |
| MSV1104-35-323 | 10.35 | 12.65 | 1.60 | 2.00 | 2.90 | 3.40 | 0.60 | 750 |
| MSV1204-35-001 | 10.35 | 12.65 | 1.60 | 2.00 | 2.90 | 3.40 | 0.60 | 750 |
| MSV1204-135-004 | 10.35 | 12.65 | 1.60 | 2.00 | 2.90 | 3.40 | 0.60 | 750 |
| MSV1104-36-323 | 15.50 | 18.50 | 1.60 | 2.00 | 3.00 | 3.50 | 0.50 | 700 |
| MSV1204-36-001 | 15.50 | 18.50 | 1.60 | 2.00 | 3.00 | 3.50 | 0.50 | 700 |
| MSV1204-136-004 | 15.50 | 18.50 | 1.60 | 2.00 | 3.00 | 3.50 | 0.50 | 700 |
| MSV1204-37-001 | 45.00 | 54.00 | 1.60 | 2.00 | 3.00 | 3.50 | 0.25 | 500 |
| **Test Conditions** | $C_T$ @ -1 Vdc, F = 1 MHz | | $C_T$ 1 V / $C_T$ 3 V | | $C_T$ 1 V / $C_T$ 6 V | | @ 50 MHz | @ 3 V, 50 MHz |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Reverse Breakdown Voltage** | 10 mA: 15 V MIN |
| | **Reverse Leakage Current** | 12 V: 50 nA MAX |

# Silicon Hyperabrupt Tuning Varactors: Wideband

- Available in Tape and Reel
- Small and High Volume Commercial Applications
- Wide Selection of Capacitance Ranges

The Aeroflex / Metelics Hyperabrupt Varactors come in a wide variety of capacitance values and high capacitance ratios. These devices are available in single junction, common anode and common cathode configurations.

## Single and Common Cathode Super Hyperabrupt Varactors For VCXOs

DESIGNED FOR 3 AND 5 VOLT CIRCUITS

| Model | $C_T$ pF | $C_T$ pF | | $C_T$ pF | RS |
|---|---|---|---|---|---|
| | MIN | MIN | MAX | MAX | MAX |
| SMV30222 | 18 | 5 | 7 | 2.4 | 4.0 Ω |
| SMV30223 | 36 | 10 | 14 | 4.8 | 2.3 Ω |
| SMV30224 | 54 | 15 | 21 | 7.2 | 1.9 Ω |
| SMV30225 | 72 | 20 | 28 | 9.6 | 1.5 Ω |
| **Test Conditions** | @ -1 Vdc, F = 1 MHz | @ 2.5 Vdc, F = 1 MHz | | @ -4 Vdc, F = 1 MHz | @ 50 Vdc, F = 50 MHz |

DESIGNED FOR 3 VOLT CIRCUITS

| Model | $C_T$ RATIO | | $C_T$ pF | | $C_T$ RATIO | | RS |
|---|---|---|---|---|---|---|---|
| | MIN | TYP | MIN | MAX | MIN | TYP | MAX |
| SMV30332 | 3.0 | 4.0 | 5.5 | 7.0 | 3.0 | 4.0 | 16.0 Ω |
| SMV30333 | 3.0 | 4.0 | 11.0 | 14.0 | 3.0 | 4.0 | 9.0 Ω |
| **Test Conditions** | $C_T$ @ 0.3 V / $C_T$ @1.65 V | | $C_T$ @ 1.65 V | | $C_T$ @ 1.65 V / $C_T$ @ 3.0 V | | @ 1.65 V 50 MHz |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **Reverse Breakdown Voltage** | 10µAdc | 8 Volt MIN |
| | **Max Reverse Leakage Current** | $V_R$ = 6 Volts | 0.1 µAdc |
| | **Device Dissipation** | Ta = 25° C | 250 mW |
| | **Operating Temperature** | | -55° to 125° C |
| | **Storage Temperature** | | -65° to 150° C |

# Silicon Hyperabrupt Tuning Varactors: Wideband

| Model | $C_T$ pF | | $C_T$ pF | | RATIO | Q @ $V_R$ 1, 50 MHz | $V_R$ 1 V | $V_R$ 2 V |
|---|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MIN | TYP | TYP |
| MSV1200-04-001 | 10.5 | 12.5 | 2.1 | 2.50 | 4.60 | 400 | 3.0 | 20 |
| MSV1200-104-004 | 10.5 | 12.5 | 2.1 | 2.50 | 4.60 | 400 | 3.0 | 20 |
| MSV1200-07-001 | 25.0 | 31.0 | 4.5 | 5.30 | 4.80 | 300 | 3.0 | 20 |
| MSV1200-107-004 | 25.0 | 31.0 | 4.5 | 5.30 | 4.80 | 300 | 3.0 | 20 |
| MSV1204-04-001 | 02.5 | 03.3 | 0.6 | 0.85 | 3.00 | 500 | 4.0 | 20 |
| MSV1204-104-004 | 02.5 | 03.3 | 0.6 | 0.85 | 3.00 | 500 | 4.0 | 20 |
| MSV1204-05-001 | 04.5 | 05.5 | 0.9 | 1.20 | 4.20 | 500 | 4.0 | 20 |
| MSV1204-105-004 | 04.5 | 05.5 | 0.9 | 1.20 | 4.20 | 500 | 4.0 | 20 |
| MSV1202-03-001 | 18.0 | 22.0 | 3.1 | 3.90 | 4.60 | 300 | 4.0 | 20 |
| MSV1202-08-001 | 45.0 | 55.0 | 7.3 | 9.20 | 5.00 | 200 | 4.0 | 20 |
| MSV1202-12-001 | 100 | 125 | 15.0 | 20.00 | 5.20 | 125 | 4.0 | 20 |
| **Test Conditions** | @ -1 $V_R$ 1, F = 1 MHz | | $C_T$ -2 @ $V_R$ 2, F = 1 MHz | | $C_T$ -1 / $C_T$ -2 | @ -1 Vdc, F = 50 MHz | | |

| Model | $V_B$ | $I_R$ nA | $C_T$ pF | | $C_T$ pF | | $C_T$ | | Q |
|---|---|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MAX | MIN | TYP | MIN |
| MSV1204-99-001 | 12 | 50 | 11 | 14 | 4.0 | 16.5 | 1.2 | 1.9 | 250 |
| MSV1204-199-004 | 12 | 50 | 11 | 14 | 4.0 | 16.5 | 1.2 | 1.9 | 250 |
| **Test Conditions** | @ 10µA | -8 Vdc | $C_T$ @ -0.2 Vdc, F = 1 MHz | | $C_T$ @ -2 Vdc, F = 1 MHz | | @ -6 Vdc, F = 50 MHz | | @ -2 Vdc, F = 50 MHz |

| Model | $C_T$ pF | | $C_T$ pF | | $C_T$ pF | | Q |
|---|---|---|---|---|---|---|---|
| | MIN | TYP | MIN | TYP | MIN | TYP | MIN |
| MSV1204-11-001 | 95.0 | 100 | 40.0 | 65.0 | 20.0 | 25.0 | 80 |
| MSV1204-12-001 | 42.0 | 50.0 | 18.0 | 27.0 | 09.0 | 12.0 | 150 |
| MSV1204-13-001 | 17.0 | 22.0 | 08.5 | 10.5 | 04.0 | 05.5 | 200 |
| MSV1204-14-001 | 14.5 | 16.0 | 06.5 | 07.8 | 03.0 | 04.8 | 300 |
| MSV1204-15-001 | 8.7 | 09.5 | 04.3 | 5.50 | 02.0 | 02.9 | 350 |
| MSV1201-97-001 | 85.0 | — | — | — | 15.0 | 30.0 | 500* |
| **Test Conditions** | @ -1 Vdc, F = 1 MHz | | @ -2.5 Vdc, F = 1 MHz | | @ -4 Vdc, F = 1 MHz | | @ -4 Vdc, F = 50 MHz |

| Model | $C_T$ pF | | $C_T$ RATIO | | $C_T$ RATIO | | Q |
|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MAX | MIN |
| MSV1204-22-001 | 18.0 | 27.0 | 01.5 | 02.0 | 1.50 | 2.00 | 150 |
| MSV1204-23-001 | 09.0 | 13.0 | 01.5 | 02.0 | 1.50 | 2.00 | 200 |
| MSV1204-24-001 | 06.0 | 80.0 | 01.5 | 02.0 | 1.50 | 2.00 | 300 |
| MSV1204-25-001 | 04.2 | 05.6 | 01.5 | 02.0 | 1.50 | 2.00 | 350 |
| **Test Conditions** | @ 2.5 Vdc, F = 1 MHz | | $C_T$ -1 V / $C_T$ -2.5 V | | $C_T$ -2.5 V / $C_T$ -4 V | | @ -4 V, F = 50 MHz |

# Silicon Hyperabrupt Tuning Varactors: Wideband

- High Capacitance Ratios
- Linear Tuning Between 2 and 8 Volts
- Available Over a Broad Range of Junction Capacitances
- Satisfies a Large Number of Wideband Applications through the VHF Frequency Band

| Model | Diode Capacitance $C_T$ pF | | Diode Capacitance $C_T$ pF | | Tuning Ratio $T_R$ | | Quality Factor Q |
|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MIN | MIN |
| SMV1401 | 440 | 660 | | | 14:1 | | 200 |
| SMV1402 | | | 45 | 69 | | 10:1 | 200 |
| SMV1403 | | | 140 | 210 | | 10:1 | 200 |
| SMV1404 | | | 96 | 144 | | 10:1 | 200 |
| SMV1405 | | | 200 | 300 | | 10:1 | 200 |
| SMV1406 | | | 80 | 120 | | 10:1 | 200 |
| SMV1407 | | | 54 | 82 | | 10:1 | 200 |
| SMV1408 | | | 37 | 57 | | 10:1 | 200 |
| SMV1409 | | | 26 | 40 | | 10:1 | 200 |
| SMV1410 | | | 17 | 27 | | 9.5:1 | 200 |
| SMV1411 | | | 12 | 18 | | 8.5:1 | 200 |
| SMV1412 | | | 8 | 12 | | 7.5:1 | 200 |
| **Test Conditions** | @ 1 Vdc, F = 1 MHz | | @ 2 Vdc, F = 1 MHz | | $C_T$ -1V/$C_T$ -10V | $C_T$ -2V/$C_T$ -10V | @ -2V, F = 50 MHz |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **Device Dissipation** | Ta - 25° C | 250 mW |
| | **Reverse Breakdown Voltage** | 10 µAdc | 12 Volt Vdc Min |
| | **Max Reverse Leakage Current** | VR = 10 Vdc | 0.1 µAdc |
| | **Junction Temperature** | | 125° C |
| | **Operating Temperature** | | -55° to + 125° C |
| | **Storage Temperature** | | -65° C to + 150° C |
| | **Capacitance Tolerance** | | Standard Device + 20% |

# Silicon Hyperabrupt Tuning Varactors: VHF/UHF

- Superior Performance in Highly Stable Oscillator Designs
- Uniform Capacitance / Temperature Coefficient
- Highly Reproducible Ion Implanted Structure

| Model | $C_T$ pF | | $C_T$ RATIO | | $C_T$ RATIO | | Q |
|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MAX | MIN |
| SMV20422 | 18.0 | 27.0 | 1.8 | 2.5 | 1.8 | 2.5 | 150 |
| SMV20423 | 9.0 | 13.0 | 1.8 | 2.5 | 1.8 | 2.5 | 200 |
| SMV20424 | 6.0 | 8.0 | 1.8 | 2.5 | 1.8 | 2.5 | 300 |
| SMV20425 | 4.2 | 5.6 | 1.8 | 2.5 | 1.8 | 2.5 | 350 |
| **Test Conditions** | @ 2.5 Vdc, F = 1 MHz | | $C_T$ @ -1 V / $C_T$ -2.5 V | | $C_T$ -2.5 V / $C_T$ -4 V | | @ -4 Vdc, F = 50 MHz |

| Model | $C_T$ pF | | $C_T$ pF | | $C_T$ pF | | Q |
|---|---|---|---|---|---|---|---|
| | MIN | TYP | MIN | MAX | TYP | MAX | MIN |
| SMV20411 | 95.0 | 100.0 | 40.0 | 65 | 20.0 | 25.0 | 80 |
| SMV20412 | 42.0 | 54.0 | 18.0 | 27 | 8.7 | 12.0 | 150 |
| SMV20413 | 17.0 | 22.0 | 8.5 | 10.5 | 4.0 | 5.5 | 200 |
| SMV20414 | 14.5 | 16.0 | 6.5 | 7.8 | 3.0 | 4.8 | 300 |
| SMV20415 | 8.7 | 11.3 | 4.3 | 5.5 | 2.2 | 2.9 | 350 |
| **Test Conditions** | @ -1 Vdc, F = 1 MHz | | @ -2.5 Vdc, F = 1 MHz | | @ -4 Vdc, F = 1 MHz | | @ -4 Vdc, F = 50 MHz |

| Maximum Ratings | Parameters | Value | Rating |
|---|---|---|---|
| | **Reverse Breakdown Voltage** | 10 µAdc | 12 Volt Min |
| | **Max Reverse Leakage Current** | Vr = 8 Volts | 20 nAdc |
| | **Power Dissipation** | @ Ta = 25° C | 250 mW |
| | **Junction Temperature** | 125° C | |
| | **Operating Temperature** | -55° to + 125° C | |
| | **Storage Temperature** | -65° C to + 150° C | |

# Silicon Hyperabrupt Tuning Varactors: HF

- High Reliability, Silicon Planar
- Large Capacitance Ratios
- High Q
- Straight-Line Frequency Performance Over a 1.5 to 4 Volt Tuning Range

The Aeroflex / Metelics High Frequency Hyperabrupt Diodes feature ion implanted epi construction. They are ideal for tuning LC resonant circuits up to 100 MHz with frequency ratios as high as 4:1. Capacitance values range from 46 pF to 270 pF at -2 Vdc.

| Model | Total Capacitance pF | | | | | | | | Tuning Ratio | | | | Q | | | | $V_{BR}$ Vdc | | $I_R$ nAdc | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN | TYP | MAX | TYP | MIN | TYP | MAX | TYP | TYP | MIN | TYP | MAX | MIN | TYP | MIN | TYP | MIN | TYP | TYP | MAX |
| TV1401 | 46 | 57 | 68 | 6.1 | 4.2 | 4.7 | 5.2 | 81.5 | 13 | 10 | 12.0 | 17.0 | – | – | 75 | 140 | 12 | 20 | 10 | 50 |
| TV1402 | 46 | 57 | 68 | 6.1 | 4.2 | 4.7 | 5.2 | 81.5 | 13 | 10 | 12.0 | 17.0 | 200 | 700 | – | – | 12 | 20 | 50 | 100 |
| TV1403 | 46 | 57 | – | 6.1 | – | 4.7 | 5.2 | 81.5 | 13 | 10 | 12.0 | – | 200 | 700 | – | – | 12 | 20 | 100 | 1000 |
| TV1501 | 100 | 125 | 150 | 13.0 | 8.6 | 9.6 | 10.6 | 180 | 14 | 10 | 13.0 | 17.5 | – | – | 50 | 130 | 12 | 20 | 10 | 50 |
| TV1502 | 100 | 125 | 150 | 13.0 | 8.6 | 9.6 | 10.6 | 180 | 14 | 10 | 13.0 | 17.5 | 200 | 500 | – | – | 12 | 20 | 50 | 100 |
| TV1503 | 100 | 125 | – | 13.0 | – | 9.6 | 10.6 | 180 | 14 | 10 | 13.0 | – | 200 | 500 | – | – | 12 | 20 | 100 | 1000 |
| TV1601 | 140 | 175 | 210 | 18.5 | 12.6 | 14.0 | 15.4 | 255 | 14 | 10 | 12.5 | 17.0 | – | – | 50 | 120 | 12 | 20 | 10 | 50 |
| TV1602 | 140 | 175 | 210 | 18.5 | 12.6 | 14.0 | 15.4 | 255 | 14 | 10 | 12.5 | 17.0 | 200 | 500 | – | – | 12 | 20 | 50 | 100 |
| TV1603 | 140 | 175 | – | 18.5 | – | 14.0 | 15.4 | 255 | 14 | 10 | 12.5 | – | 200 | 500 | – | – | 12 | 20 | 100 | 1000 |
| TV1701 | 180 | 225 | 270 | 24.0 | 16.2 | 18.0 | 19.8 | 325 | 14 | 10 | 12.5 | 17.0 | – | – | 50 | 115 | 12 | 20 | 10 | 50 |
| TV1702 | 180 | 225 | 270 | 24.0 | 16.2 | 18.0 | 19.8 | 325 | 14 | 10 | 12.5 | 17.0 | 200 | 500 | – | – | 12 | 20 | 50 | 100 |
| TV1703 | 180 | 225 | – | 24.0 | – | 18.0 | 19.8 | 325 | 14 | 10 | 12.5 | – | 200 | 500 | – | – | 12 | 20 | 100 | 1000 |
| TV1801 | – | 350 | – | 30.5/35/37.5 | – | 26.5 | – | 400/500/550 | 12/14/18 | – | 13.0 | – | – | – | – | – | 12 | 20 | 10 | 50 |
| TV1802 | – | 350 | – | 30.5/35/37.5 | – | 26.5 | – | 400/500/550 | 12/14/18 | – | 13.0 | – | – | – | – | – | 12 | 20 | 50 | 100 |
| Test Conds. | @ 2.0 Vdc, F=1 MHz | | | @ -7 Vdc, F=1 MHz | @ -10Vdc, F = 1 MHz | | | @ 1.25 Vdc, F = 1 MHz | $C_T$ 1.25/ $C_T$ -7 | $C_T$ -2 / $C_T$ -10 | | | @ -2 Vdc, F=1 MHz | | @ -2 Vdc, F= 10 MHz | | @10 µA | | @ VR -10Vdc | |

| Maximum Ratings | Parameter | Value |
|---|---|---|
| | **Reverse Voltage** | Same as $V_{BR}$ (Volts) |
| | **Forward Current** | 100 mA |
| | **Power Dissipation** | 250 mW |
| | **Operating Temperature** | -55 to + 150 °C |
| | **Storage Temperature** | -65 to + 200 °C |

# Silicon Hyperabrupt Tuning Varactors: UHF

- High Reliability, Silicon Planar
- Octave Tuning at UHF
- Octave Tuning at VHF
- Straight-Line Frequency Applications Over a 3 to 8 Volt Bias Range
- Low Cost Applications

The Aeroflex / Metelics UHF Tuning Varactors offer higher Qs than their VHF counterparts, but have slightly lower capacitance ratios. These diodes are excellent for octave tuning up to 800 MHz and for straight-line-frequency tuning between 3 and 8 volts of bias. They also achieve exceptionally high Q values and large signal capabilities when tuned between 9 and 20 volts, which extends their useful range to over 1 GHz. Closely matched sets are available, designed by suffix "A".

| Model | Total Capacitance pF | | | | | | Tuning Ratio | | | | Q | | $V_{BR}$ | | $I_R$ nAdc | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | TYP | MIN | TYP | TYP | MAX | TYP | MAX | TYP | MAX |
| TV2101 | 10.5 | 12.5 | 4.3 | 5.7 | 2.0 | 2.3 | 5.0 | 5.8 | – | – | 300 | 350 | 22 | 30 | – | – | – | – | 10 | 100 |
| TV2101A | 10.9 | 12.1 | 4.6 | 5.4 | 2.0 | 2.3 | 5.0 | 5.8 | – | – | 300 | 350 | 22 | 30 | – | – | – | – | 10 | 100 |
| TV2102 | 10.5 | 12.5 | 4.3 | 5.7 | 2.0 | 2.4 | 4.7 | 5.5 | – | – | 200 | 300 | 22 | 30 | – | – | – | – | 10 | 100 |
| TV2102A | 10.9 | 12.1 | 4.6 | 5.4 | 2.0 | 2.4 | 4.7 | 5.5 | – | – | 200 | 300 | 22 | 30 | – | – | – | – | 10 | 100 |
| TV2103 | 10.5 | 12.5 | 4.3 | 5.7 | – | – | – | – | 1.9 | 2.7 | 200 | 300 | 15 | 18 | – | – | 50 | 500 | – | – |
| TV2103A | 10.9 | 12.1 | 4.6 | 5.4 | – | – | – | – | 2.0 | 2.6 | 200 | 300 | 15 | 18 | – | – | 50 | 500 | – | – |
| TV2104 | 10.5 | 12.5 | – | – | – | – | – | – | – | – | 100 | 150 | 8 | 12 | 50 | 500 | – | – | – | – |
| TV2801 | 25.0 | 31.0 | 10.0 | 13.5 | 4.5 | 5.1 | 5.2 | 6.1 | – | – | 200 | 250 | 22 | 30 | – | – | – | – | 20 | 100 |
| TV2801A | 26.5 | 29.5 | 11.0 | 13.0 | 4.5 | 5.1 | 5.2 | 6.1 | – | – | 200 | 250 | 22 | 30 | – | – | – | – | 20 | 100 |
| TV2802 | 25.0 | 31.0 | 10.0 | 13.5 | 4.5 | 5.3 | 4.9 | 5.8 | – | – | 150 | 200 | 22 | 30 | – | – | – | – | 20 | 100 |
| TV2802A | 26.5 | 29.5 | 11.0 | 13.0 | 4.5 | 5.3 | 4.9 | 5.8 | – | – | 150 | 200 | 22 | 30 | – | – | – | – | 20 | 100 |
| TV2803 | 25.0 | 31.0 | 10.0 | 13.5 | – | – | – | – | 1.9 | 2.8 | 150 | 200 | 15 | 18 | – | – | 50 | 500 | – | – |
| TV2803A | 26.5 | 29.5 | 11.0 | 13.0 | – | – | – | – | 2.0 | 2.7 | 150 | 200 | 15 | 18 | – | – | 50 | 500 | – | – |
| TV2804 | 25.0 | 31.0 | – | – | – | – | – | – | – | – | 75 | 100 | 8 | 12 | 50 | 500 | – | – | – | – |
| **Test Conds.** | @ -3 Vdc, F = 1 MHz | | @ -8 Vdc, F = 1 MHz | | @ -20 Vdc, F = 1 MHz | | $C_T$ 3 / $C_T$ 20 | | $C_T$ 3 / $C_T$ 8 | | @ -3 Vdc, F = 50 MHz | | @ 10 µA | | @ -6 V | | @ -10 V | | @ -20 V | |

| Maximum Ratings | Parameter | Value |
|---|---|---|
| | **Reverse Voltage** | Same as $V_{BR}$ (Volts) |
| | **Forward Current** | 100 mA |
| | **Power Dissipation** | 250mW |
| | **Operating Temperature** | -55 to + 150 °C |
| | **Storage Temperature** | -65 to + 200 °C |


# Silicon Hyperabrupt Tuning Varactors: VHF

- High Reliability, Silicon Planar Hermetically Sealed
- Octave Tuning or Ultra-High Q Applications
- Straight-Line Frequency Applications Over a 3 to 8 Volt Bias Range
- Low Cost Applications

The Aeroflex / Metelics VHF Tuning Varactors are Ion-implanted highly reproducible hyperabrupt diodes which allow octave tuning of LC tanks up to 500 MHZ or, with a reduced 1.5 to 1 frequency ratio, straight-line frequency tuning over a 3 to 8 volt tuning range. These UHF diodes give a full capacitance range of 20 to 200pF at 4 volts bias, ultra high Q and excellent large signal handling capabilities, along with a 2 to 1 capacitance ratio by tuning from 9 to 20 volts of reverse bias. Closely matched sets of all VHF diodes are available along with "A" suffix versions having ± 5% capacitance tolerance at 4 volts of reverse bias.

| **Model** | Total Capacitance pF | | | | | | Tuning Ratio | | | | Q | | $V_{BR}$ Vdc | | $I_R$ nAdc | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | TYP | MIN | TYP | TYP | MAX | TYP | MAX | TYP | MAX |
| TV2001 | 18 | 22 | 7.5 | 10.5 | 3.1 | 3.9 | – | – | 5.4 | 6.6 | 160 | 220 | 22 | 30 | – | – | – | – | 15 | 100 |
| TV2001A | 19 | 21 | 7.8 | 9.2 | 3.1 | 3.9 | – | – | 5.4 | 6.6 | 160 | 230 | 22 | 30 | – | – | – | – | 15 | 15 |
| TV2002 | 18 | 22 | 7.5 | 10.5 | – | – | 1.8 | 2.7 | – | – | 160 | 220 | 15 | 18 | – | – | 15 | 100 | – | – |
| TV2002A | 19 | 21 | 7.8 | 9.2 | – | – | 2.0 | 2.7 | – | – | 160 | 220 | 15 | 18 | – | – | 15 | 100 | – | – |
| TV2004 | 18 | 22 | 7 | 11 | – | – | – | – | – | – | 80 | 120 | 8 | 12 | 50 | 250 | – | – | – | – |
| TV2201 | 45 | 55 | 18 | 25 | 7.3 | 9.2 | – | – | 5.6 | 6.9 | 125 | 165 | 22 | 30 | – | – | – | – | 20 | 100 |
| TV2201A | 47.5 | 52.5 | 18.4 | 21.6 | 7.3 | 9.2 | – | – | 5.6 | 6.9 | 125 | 165 | 22 | 30 | – | – | – | – | 20 | 100 |
| TV2202 | 45 | 55 | 18 | 25 | – | – | 1.8 | 2.8 | – | – | 125 | 165 | 15 | 18 | – | – | 20 | 100 | – | – |
| TV2202A | 47.5 | 52.5 | 18.4 | 21.6 | – | – | 2.2 | 2.8 | – | – | 125 | 165 | 15 | 18 | – | – | 20 | 100 | – | – |
| TV2204 | 45 | 55 | 17 | 26 | – | – | – | – | – | – | 65 | 100 | 8 | 12 | 50 | 250 | – | – | – | – |
| TV2301 | 100 | 120 | 39 | 55 | 15 | 19 | – | – | 5.9 | 7.3 | 80 | 110 | 22 | 30 | – | – | – | – | 30 | 100 |
| TV2301A | 105 | 115 | 41.5 | 48.6 | 15 | 19 | – | – | 5.9 | 7.3 | 80 | 110 | 22 | 30 | – | – | – | – | 30 | 100 |
| TV2302 | 100 | 120 | 39 | 55 | – | – | 1.8 | 2.8 | – | – | 80 | 110 | 15 | 18 | – | – | 30 | 100 | – | – |
| TV2302A | 105 | 115 | 41.5 | 48.6 | – | – | 2.15 | 2.8 | – | – | 80 | 110 | 15 | 18 | – | – | 30 | 100 | – | – |
| TV2304 | 100 | 120 | 36 | 58 | – | – | – | – | – | – | 40 | 60 | 8 | 12 | 50 | 250 | – | – | – | – |
| TV2401 | 140 | 170 | 55 | 80 | 22.5 | 28 | – | – | 5.8 | 7.1 | 70 | 90 | 22 | 30 | – | – | – | – | 50 | 500 |
| TV2401A | 147 | 163 | 59.8 | 70.2 | 22.5 | 28 | – | – | 5.8 | 7.1 | 70 | 90 | 22 | 30 | – | – | – | – | 50 | 500 |
| TV2402 | 140 | 170 | 55 | 80 | – | – | 1.8 | 2.8 | – | – | 70 | 90 | 15 | 18 | – | – | 50 | 500 | – | – |
| TV2402A | 147 | 163 | 59.8 | 70.2 | – | – | 2.1 | 2.7 | – | – | 70 | 90 | 15 | 18 | – | – | 50 | 500 | – | – |
| TV2404 | 140 | 170 | 50 | 85 | – | – | – | – | – | – | 35 | 50 | 8 | 12 | 50 | 500 | – | – | 70 | 500 |
| TV2501 | 180 | 220 | 70 | 105 | 29 | 36 | – | – | 5.8 | 7.1 | 60 | 80 | 22 | 30 | – | – | – | – | – | – |
| TV2501A | 190 | 210 | 78 | 92 | 29 | 36 | – | – | 5.8 | 7.1 | 60 | 80 | 22 | 30 | – | – | – | – | 70 | 500 |
| TV2502 | 180 | 220 | 70 | 105 | – | – | 1.8 | 2.8 | – | – | 60 | 80 | 15 | 18 | – | – | 70 | 500 | – | – |
| TV2502A | 190 | 210 | 78 | 92 | – | – | 2.0 | 2.7 | – | – | 60 | 80 | 15 | 18 | – | – | 70 | 500 | – | – |
| TV2504 | 180 | 220 | 65 | 110 | – | – | – | – | – | – | 30 | 45 | 8 | 12 | 50 | 500 | – | – | – | – |
| **Test Conditions** | @ -4 Vdc, F=1MHz | | @ -8 Vdc, F=1MHz | | @ -20 Vdc, F= 1 MHz | | $C_T$ 4 / $C_T$ 8 | | $C_T$ 4 / $C_T$ 20 | | @ -4 V, F = 50 MHz | | @ 10 µA | | @ -6 V | | @ -10 V | | @ -20 V | |

| **Maximum Ratings** | **Parameter** | **Value** |
|---|---|---|
| | **Reverse Voltage** | Same as $V_{BR}$ (Volts) |
| | **Forward Current** | 100 mA |
| | **Power Dissipation** | 250 mW |
| | **Operating Temperature** | -55 to + 150 °C |
| | **Storage Temperature** | °C |

# Silicon Hyperabrupt Varactors: Microwave

- All EPI Mesa Construction
- High Reliability
- Frequency Linear Profiles
- Glass Passivation
- High Q
- Wide Tuning Ratios

The Aeroflex / Metelics MHV-500 Series Microwave Hyperabrupt Tuning Varactors are silicon epitaxial mesa devices with high reliability glass passivation which ensures optimum VCO settling time and flat post tuning drift response. They offer Q values well above ion-implanted hyperabrupt diodes. These diodes offer octave tuning through 9 GHz. They are available in a wide variety of case styles for surface mount and/or cavity requirements. Chip devices are recommended for wide bandwidth performance and frequency response.

| Model | Junction Capacitance pF | | | | | | | | | Ratio | | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | MIN | MAX | |
| MHV500 | 2.25 | 2.5 | 2.75 | .70 | .80 | .90 | .13 | .20 | .30 | 3.0 | 5.5 | 2600 |
| MHV501 | 2.8 | 3.1 | 3.4 | .90 | 1.0 | 1.1 | .16 | .24 | .36 | 3.0 | 5.5 | 2500 |
| MHV502 | 3.3 | 3.7 | 4.1 | .98 | 1.2 | 1.32 | .18 | .28 | .44 | 3.0 | 5.5 | 2400 |
| MHV503 | 4.2 | 4.7 | 5.2 | 1.35 | 1.5 | 1.65 | .24 | .36 | .55 | 3.0 | 5.5 | 2300 |
| MHV504 | 5.0 | 5.6 | 6.2 | 1.63 | 1.8 | 1.98 | .30 | .43 | .66 | 3.0 | 5.5 | 2200 |
| MHV505 | 6.1 | 6.8 | 7.5 | 1.98 | 2.2 | 2.42 | .36 | .52 | .80 | 3.0 | 5.5 | 2000 |
| MHV506 | 7.2 | 8.4 | 9.2 | 2.43 | 2.7 | 2.97 | .44 | .64 | 1.0 | 3.0 | 5.5 | 1800 |
| MHV507 | 9.0 | 10.0 | 11.0 | 2.97 | 3.3 | 3.63 | .54 | .78 | 1.21 | 3.0 | 5.5 | 1500 |
| MHV508 | 10.8 | 12.0 | 13.2 | 3.51 | 3.9 | 4.29 | .64 | .93 | 1.43 | 3.0 | 5.5 | 1200 |
| MHV509 | 13.1 | 14.6 | 16.1 | 4.23 | 4.7 | 5.17 | .77 | 1.12 | 1.72 | 3.0 | 5.5 | 1000 |
| MHV510 | 15.7 | 17.4 | 19.1 | 5.04 | 5.6 | 6.16 | .91 | 1.33 | 2.05 | 3.0 | 5.5 | 800 |
| MHV511 | 18.9 | 21.0 | 23.1 | 6.12 | 6.8 | 7.48 | 1.11 | 1.62 | 2.5 | 3.0 | 5.5 | 700 |
| MHV512 | 22.9 | 25.4 | 28.0 | 7.38 | 8.2 | 9.02 | 1.34 | 1.95 | 3.0 | 3.0 | 5.5 | 650 |
| MHV513 | 27.9 | 31.0 | 34.1 | 9.0 | 10.0 | 11.0 | 1.64 | 2.38 | 3.67 | 3.0 | 5.5 | 600 |
| Test Conditions | $V_R = 0$ V, F = 1MHz | | | $V_R = 4$ V, F = 1 MHz | | | $V_R = 20$ V, F = 1 MHz | | | $C_J$ 4 / $C_J$ 20 | | |

| Maximum Ratings | Parameter | Value | Units |
|---|---|---|---|
| | Operating Temperature | -55 to + 150 °C | °C |
| | Storage Temperature Range | -65 to + 200 °C | °C |
| | Minimum Voltage Breakdown | 22 Volts | Volts |
| | Maximum Leakage Current | 50 nA | nA |

# Silicon Zener Diodes

- Sharper Breakdown
- Lower Leakage Current Characteristics in the 4–10 Volt range and the 5–9 Volt range

The family of Aeroflex / Metelics Silicon Zener Avalanche Diodes includes a variety of models in various voltage ranges. They feature sharp breakdown and low leakage LVA regulators. Certain models also feature exceptionally low noise, low impedance and sharp knees for high performance, low current applications.

## Sharp Breakdown, Low Leakage LVA Regulator, 4–10 Volt Range

| Model | Voltage Vz @ Izt Vdc | Test Current Izt mA | Zener Impedance Zzt @ Izt Ω | Reverse Leakage Current MAX | | Noise Density @ 250 µA |
|---|---|---|---|---|---|---|
| | TYP | | MAX | $I_R$ µAdc | $V_R$ Vdc | MAX |
| LVA43A | 4.3 | 20 | 18 | 4.0 | 1.5 | 4 |
| LVA47A | 4.7 | 10 | 15 | 4.0 | 2.0 | 4 |
| LVA51A | 5.1 | 5 | 15 | 0.1 | 2.0 | 4 |
| LVA56A | 5.6 | 1 | 40 | 0.05 | 3.0 | 4 |
| LVA62A | 6.0 | 1 | 50 | 0.05 | 4.0 | 4 |
| LVA68A | 6.8 | 1 | 50 | 0.05 | 5.0 | 4 |
| LVA75A | 7.5 | 1 | 100 | 0.01 | 6.0 | 4 |
| LVA82A | 8.2 | 1 | 100 | 0.01 | 6.5 | 4 |
| LVA91A | 9.1 | 1 | 100 | 0.01 | 8.0 | 4 |
| LVA100A | 10.0 | 1 | 100 | 0.01 | 9.0 | 4 |

| Maximum Rating | Parameters | Value | Rating |
|---|---|---|---|
| | **Package style** | CS85 (DO-7) | |
| | **Forward Voltage** | @ If = 200 mAdc | 1.5 Vdc |
| | **Noise Density** | @ Iz = 250 µAdc | 4.0µ V / √Hz |
| | **Power Dissipation** | @ Ta = 25° C | 400 mW |
| | **Operating Temperature** | | -65° C to + 175° C |
| | **Storage Temperature** | | -65° C to + 200° C |
| | **Voltage Tolerance** | Standard Device | ±10% |
| | **Suffix A** | ±5% | |
| | **Suffix B** | ±2% | |

Noise Density measured from 1000 to 3000 Hz.

## Sharp Breakdown, Low Leakage LVA Regulator, 5–9 Volt Range

| Model | Voltage | Zener Impedance[1] | Reverse Leakage | | Regulation Factor | | | $T_C$ | Noise Density |
|---|---|---|---|---|---|---|---|---|---|
| | TYP | TYP | µAdc MAX | Vdc MAX | DVz Vdc MAX | Izh mAdc MAX | IzL µAdc MAX | TYP | MAX |
| LVA450A | 5.0 | 700 | 10.0 | 4.00 | 0.40 | 1.0 | 100 | 0.75 | 1 |
| LVA453A | 5.3 | 250 | 5.0 | 4.24 | 0.20 | 1.0 | 100 | 1.33 | 1 |
| LVA456A | 5.6 | 100 | 1.0 | 4.48 | 0.10 | 1.0 | 50 | 1.96 | 1 |
| LVA459A | 5.9 | 100 | 0.5 | 4.72 | 0.10 | 1.0 | 10 | 2.30 | 1 |
| LVA462A | 6.2 | 100 | 0.1 | 4.96 | 0.10 | 1.0 | 10 | 2.67 | 1 |
| LVA465A | 6.5 | 100 | 0.05 | 5.20 | 0.10 | 1.0 | 10 | 3.06 | 1 |
| LVA468A | 6.8 | 100 | 0.01 | 5.44 | 0.10 | 1.0 | 10 | 3.40 | 1 |
| LVA471A | 7.1 | 175 | 0.01 | 5.68 | 0.10 | 1.0 | 10 | 3.76 | 1 |
| LVA474A | 7.4 | 175 | 0.01 | 5.92 | 0.10 | 1.0 | 10 | 4.07 | 1 |
| LVA477A | 7.7 | 175 | 0.01 | 6.16 | 0.10 | 1.0 | 10 | 4.47 | 1 |
| LVA480A | 8.0 | 175 | 0.01 | 6.40 | 0.10 | 1.0 | 10 | 4.80 | 1 |
| LVA483A | 8.3 | 175 | 0.01 | 6.64 | 0.10 | 1.0 | 10 | 5.15 | 1 |
| LVA486A | 8.6 | 175 | 0.01 | 6.88 | 0.10 | 1.0 | 10 | 5.50 | 1 |
| LVA489A | 8.9 | 175 | 0.01 | 7.12 | 0.10 | 1.0 | 10 | 5.87 | 2 |
| LVA492A | 9.2 | 175 | 0.01 | 7.36 | 0.10 | 1.0 | 10 | 6.16 | 2 |
| LVA495A | 9.5 | 175 | 0.01 | 7.60 | 0.10 | 1.0 | 10 | 6.46 | 2 |
| LVA498A | 9.8 | 175 | 0.01 | 7.84 | 0.10 | 1.0 | 10 | 6.86 | 2 |
| **Test Conditions** | @ 250 µA | @ 250 µAdc | $I_R$ @ $V_R$ | | | | | @ 250 µAdc MV/°C | @ 250 µA |

| Maximum Rating | Parameters | Value | Rating |
|---|---|---|---|
| | **Package style** | CS85 (DO-7) | |
| | **Forward Voltage** | @ If=200 mAdc | 1.5Vdc |
| | **Noise Density** | @ Iz=250 µAdc[2] | 1.0 µV / √Hz |
| | **Power Dissipation** | @ Ta=25° C | 400 mW |
| | **Operating Temperature** | -65° C to + 175° C | |
| | **Storage Temperature** | -65° C to + 200° C | |
| | **Voltage Tolerance:** | Standard Device | +0.20 Vdc |

Notes:
1. Impedance measured with 10% 60 Hz AC superimposed on Izt.
2. Noise Density on devices LVA489 to LVA498 increases to 2.0 max. Noise Density measured from 1000 to 3000 Hz.

# Silicon Zener Diodes

- Designed for Use at Low Current Levels
- Low Leakage
- Low Impedance
- Low Noise
- Sharp Knees

## IN5000 Series, Low Voltage, High Performance, Low Noise, Low Leakage

| Model | Zener Voltage Vz | Test Current Izt mA | Zener Impedance[2] Ω | Reverse Leakage Current | | | Noise Density[3] | Regulation Factor[4] | | Regulator Current Izm mAdc |
|---|---|---|---|---|---|---|---|---|---|---|
| | TYP | | MAX | Ir µAdc MAX | $V_R$[1] MAX | $V_R$[2] Volts MAX | MAX | Δ Vz Volts MAX | IzL mAdc MAX | MAX |
| 1N5518 | 3.3 | 20 | 26 | 5.0 | 0.9 | 1.0 | 0.5 | 0.90 | 2.0 | 115 |
| 1N5519 | 3.6 | 20 | 24 | 3.0 | 0.9 | 1.0 | 0.5 | 0.90 | 2.0 | 105 |
| 1N5520 | 3.9 | 20 | 22 | 1.0 | 0.9 | 1.0 | 0.5 | 0.85 | 2.0 | 98 |
| 1N5521 | 4.3 | 20 | 18 | 3.0 | 1.0 | 1.5 | 0.5 | 0.75 | 2.0 | 88 |
| 1N5522 | 4.7 | 10 | 22 | 2.0 | 1.5 | 2.0 | 0.5 | 0.60 | 1.0 | 81 |
| 1N5523 | 5.1 | 5 | 26 | 2.0 | 2.0 | 2.5 | 0.5 | 0.65 | 0.25 | 75 |
| 1N5524 | 5.6 | 3 | 30 | 2.0 | 3.0 | 3.5 | 1.0 | 0.30 | 0.25 | 68 |
| 1N5525 | 6.2 | 1 | 30 | 1.0 | 4.5 | 5.0 | 1.0 | 0.20 | 0.01 | 61 |
| 1N5526 | 6.8 | 1 | 30 | 1.0 | 5.5 | 6.2 | 1.0 | 0.10 | 0.01 | 56 |
| 1N5527 | 7.5 | 1 | 35 | 0.5 | 6.0 | 6.8 | 2.0 | 0.05 | 0.01 | 51 |
| 1N5528 | 8.2 | 1 | 40 | 0.5 | 6.5 | 7.5 | 4.0 | 0.05 | 0.01 | 46 |
| 1N5529 | 9.1 | 1 | 45 | 0.1 | 7.0 | 8.2 | 4.0 | 0.05 | 0.01 | 42 |
| 1N5530 | 10.0 | 1 | 60 | 0.05 | 8.0 | 9.1 | 4.0 | 0.10 | 0.01 | 38 |
| 1N5531 | 11.0 | 1 | 80 | 0.05 | 9.0 | 9.9 | 5.0 | 0.20 | 0.01 | 35 |
| 1N5532 | 12.0 | 1 | 90 | 0.05 | 9.5 | 10.8 | 10.0 | 0.20 | 0.01 | 32 |
| 1N5533 | 13.0 | 1 | 90 | 0.01 | 10.5 | 11.7 | 15.0 | 0.20 | 0.01 | 29 |
| 1N5534 | 14.0 | 1 | 100 | 0.01 | 11.5 | 12.6 | 20.0 | 0.20 | 0.01 | 27 |
| 1N5535 | 15.0 | 1 | 100 | 0.01 | 12.5 | 13.5 | 20.0 | 0.20 | 0.01 | 25 |
| 1N5536 | 16.0 | 1 | 100 | 0.01 | 13.0 | 14.4 | 20.0 | 0.20 | 0.01 | 24 |
| 1N5537 | 17.0 | 1 | 100 | 0.01 | 14.0 | 15.3 | 20.0 | 0.20 | 0.01 | 22 |
| 1N5538 | 18.0 | 1 | 100 | 0.01 | 15.0 | 16.2 | 20.0 | 0.20 | 0.01 | 21 |
| 1N5539 | 19.0 | 1 | 100 | 0.01 | 16.0 | 17.1 | 20.0 | 0.20 | 0.01 | 20 |
| 1N5540 | 20.0 | 1 | 100 | 0.01 | 17.0 | 18.0 | 20.0 | 0.20 | 0.01 | 19 |
| 1N5541 | 22.0 | 1 | 100 | 0.01 | 18.0 | 19.8 | 25.0 | 0.25 | 0.01 | 17 |
| 1N5542 | 24.0 | 1 | 100 | 0.01 | 20.0 | 21.6 | 30.0 | 0.30 | 0.01 | 16 |
| 1N5543 | 25.0 | 1 | 100 | 0.01 | 21.0 | 22.4 | 35.0 | 0.35 | 0.01 | 15 |
| 1N5544 | 28.0 | 1 | 100 | 0.01 | 23.0 | 25.2 | 40.0 | 0.40 | 0.01 | 14 |
| 1N5545 | 30.0 | 1 | 100 | 0.01 | 24.0 | 27.0 | 45.0 | 0.45 | 0.01 | 13 |
| 1N5546 | 33.0 | 1 | 100 | 0.01 | 28.0 | 29.7 | 50.0 | 0.50 | 0.01 | 12 |
| **Test Conditions** | @ Izt (Volts) | | Zzt @ Izt | | | | @ Iz = 250 µA ND µV / √Hz | | | |

**Notes**
1. Package style CS85 (DO-7)
2. Suffix denotes Vz tolerance: non suffix +20%, A suffix +10%: $I_R$ @ $V_R$1, Vz, + Vf only. Suffix B +5%: Ir @ Vr2, Vz, DVz, Vf, ND.
3. Measured with 10%, 60 Hz AC superimposed on Izt.
4. Measured from 1000 to 3000 Hz.
5. Difference between Vz as Izt and IzL
6. Forward Voltage (Vf): If = 200 mA, Ta = 25° C, mA = 1.1 Vdc.

MILITARY SCREENING AVAILABLE


Glass Axial Leaded

## 1N6000 Series Low Voltage, High Performance, Low Noise, Low Leakage

| Model | Zener Voltage | Test Current Izt mA | Zener Impedance[2] | Reverse Leakage Current | | Noise Density[3] | Regulation Factor[4] | | LVA TYPE[1] |
|---|---|---|---|---|---|---|---|---|---|
| | TYP | | Ω MAX | Ir µAdc MAX | Vr[2] Volts MAX | MAX | Δ Vz Volts MAX | IzL mAdc MAX | |
| 1N6082 | 4.3 | 20 | 18 | 2.0 | 1.5 | 1.0 | 0.75 | 2.0 | LVA343A |
| 1N6083 | 4.7 | 10 | 10 | 2.0 | 2.0 | 1.0 | 0.50 | 1.0 | LVA347A |
| 1N6084 | 5.1 | 5 | 10 | 2.0 | 3.0 | 1.0 | 0.30 | 0.25 | LVA351A |
| 1N6085 | 5.6 | 1 | 40 | 2.0 | 4.5 | 1.0 | 0.10 | 0.05 | LVA356A |
| 1N6086 | 6.2 | 1 | 45 | 0.5 | 5.6 | 1.0 | 0.10 | 0.01 | LVA362A |
| 1N6087 | 6.8 | 1 | 50 | 0.05 | 6.2 | 1.0 | 0.10 | 0.01 | LVA368A |
| 1N6088 | 7.5 | 1 | 50 | 0.01 | 6.8 | 1.0 | 0.10 | 0.01 | LVA375A |
| 1N6089 | 8.2 | 1 | 60 | 0.01 | 7.5 | 1.0 | 0.10 | 0.01 | LVA382A |
| 1N6090 | 9.1 | 1 | 60 | 0.01 | 8.2 | 2.0 | 0.10 | 0.01 | LVA391A |
| 1N6091 | 10.0 | 1 | 60 | 0.01 | 9.1 | 2.0 | 0.10 | 0.01 | LVA3100A |
| **Test Conditions** | Vz @ Izt Volts | | Zzt @ Izt | | | @ Iz = 250 µA (ND µV / √Hz) | | | |

**Notes:**
1. Suffix denotes Vz tolerance: non suffix +20%, A suffix +10%.
2. Measured with 10%, 60 Hz AC superimposed on Izt.
3. Measured from 1000 to 3000 Hz.
4. Difference between Vz as Izt and IzL.
5. VF @ 200mA = 1.2V max.
6. Power rating is 400 mW @ 25° C, derate linearly to zero @ 175° C.

# Silicon Zener Diodes

## Low Level, Very Low Voltage, Low Leakage

| Model | Zener Voltage Vdc | Dynamic Impedance Ω | | Reverse Current | |
|---|---|---|---|---|---|
| | | | | Ir µAdc | Vr Vdc |
| | TYP | MAX | MAX | MAX | |
| K120 | 1.2 | 20 | 125 | .05 | 0.4 |
| K150 | 1.5 | 20 | 125 | .05 | 0.5 |
| K180 | 1.8 | 20 | 125 | .05 | 0.6 |
| K210 | 2.1 | 20 | 125 | .05 | 0.9 |
| K240 | 2.4 | 20 | 125 | .05 | 1.2 |
| K270 | 2.7 | 20 | 125 | .05 | 1.7 |
| K300 | 3.0 | 20 | 125 | .05 | 1.9 |
| K330 | 3.3 | 20 | 125 | .05 | 2.2 |
| K360 | 3.6 | 20 | 125 | .05 | 2.5 |
| K390 | 3.9 | 20 | 125 | .05 | 2.7 |
| K430 | 4.3 | 25 | 135 | .05 | 3.1 |
| K470 | 4.7 | 25 | 135 | .05 | 3.5 |
| K510 | 5.1 | 25 | 135 | .05 | 3.8 |
| Test Conditions | Vz @ Iz = 10 mA | Zz @Iz = 10 mA | ZK @ Iz = 1 mA | @25° C | |

| Maximum Rating | Parameters | Value | Rating |
|---|---|---|---|
| | DC Power Dissipation | @ Ta = 50° C | 250 mW |
| | Operating Temperature ($T_{OPR}$) | -65 to + 175° C | |
| | Storage Temperature ($T_{STG}$) | -65 to + 200° C | |
| | Voltage Tolerance: | Standard Device | +10% |
| | Other package styles available | | |

# Silicon Zener Diodes

## Low Level Zener Diodes, Sharp Knee, Low Impedance

| Model | Zener Voltage Vz Vdc | Dynamic Impedance | | Reverse Current | |
|---|---|---|---|---|---|
| | TYP | Zz Ω MAX | Zzk Ω | Ir µA MAX | Vr Vdc |
| K511 | 5.1 | 50 | 15 | .05 | 2.5 |
| K561 | 5.6 | 45 | 15 | .05 | 3.5 |
| K621 | 6.2 | 35 | 18 | .05 | 5.6 |
| K681 | 6.8 | 25 | 18 | .05 | 6.4 |
| **Test Conditions** | @ Iz = 250 µA | @ Iz = 250 µA | @ Iz = 1 mA | @ 25° C | |

| Maximum Rating | Parameters | Value | Rating |
|---|---|---|---|
| | **DC Power Dissipation** | @Ta = 50° C | 250 mW |
| | **Derate above 50° C** | | 2 mW/)° C |
| | **Forward Voltage Drop** | @ If = 100 mA | 1.3 Vdc |
| | **Operating Temperature** | | -65 to + 175° C |
| | **Storage Temperature** | | -65 to + 200° C |
| | **Voltage Tolerance:** | Standard Device | +10% |

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# Silicon Zener Diodes

## Low Level Zener Diodes, Low Current: 250 µA - Low Noise

| Model | Zener Impedance Zzt Ω | Zener Impedance Zzt Ω | Reverse Leakage Current | | Zener Vol Max Noise Density Volts | Regulator Current Izm mAdc |
|---|---|---|---|---|---|---|
| | TYP | MAX | Ir µAdc MAX | Vr Vdc MAX | TYP | MAX |
| 1N4099 | 6.8 | 200 | 10.0 | 5.17 | 40 | 35.0 |
| 1N4100 | 7.5 | 200 | 10.0 | 5.70 | 40 | 31.8 |
| 1N4101 | 8.2 | 200 | 1.0 | 6.24 | 40 | 29.0 |
| 1N4102 | 8.7 | 200 | 1.0 | 6.61 | 40 | 27.4 |
| 1N4103 | 9.1 | 200 | 1.0 | 6.92 | 40 | 26.2 |
| 1N4104 | 10.0 | 200 | 1.0 | 7.60 | 40 | 24.8 |
| 1N4105 | 11.0 | 200 | 0.05 | 8.44 | 40 | 21.6 |
| 1N4106 | 12.0 | 200 | 0.05 | 9.12 | 40 | 20.4 |
| 1N4107 | 13.0 | 200 | 0.05 | 9.87 | 40 | 19.0 |
| 1N4108 | 14.0 | 200 | 0.05 | 10.65 | 40 | 17.5 |
| 1N4109 | 15.0 | 100 | 0.05 | 11.40 | 40 | 16.3 |
| 1N4110 | 16.0 | 100 | 0.05 | 12.15 | 40 | 15.4 |
| 1N4111 | 17.0 | 100 | 0.05 | 12.92 | 40 | 14.5 |
| 1N4112 | 18.0 | 100 | 0.05 | 13.67 | 40 | 13.2 |
| 1N4113 | 19.0 | 150 | 0.05 | 14.44 | 40 | 12.5 |
| 1N4114 | 20.0 | 150 | 0.01 | 15.20 | 40 | 11.9 |
| 1N4115 | 22.0 | 150 | 0.01 | 16.72 | 40 | 10.8 |
| 1N4116 | 24.0 | 150 | 0.01 | 18.25 | 40 | 9.9 |
| 1N4117 | 25.0 | 150 | 0.01 | 19.00 | 40 | 9.5 |
| 1N4118 | 27.0 | 150 | 0.01 | 20.46 | 40 | 8.8 |
| 1N4119 | 28.0 | 200 | 0.01 | 21.28 | 40 | 8.5 |
| 1N4120 | 30.0 | 200 | 0.01 | 22.80 | 40 | 7.9 |
| 1N4121 | 33.0 | 200 | 0.01 | 25.08 | 40 | 7.2 |
| **Test Conditions** | @ 250 µA | @ 250 µA | | | @ Iz = 250 µA µVz / √Hz tage Vz @ = 250 µA | |

# Silicon Zener Diodes

## Low Level Zener Diodes, Low Current: 250 µA - Low Noise

| Model | Zener Voltage Vz Volts | Zener Impedance Zzt Ω | Reverse Leakage Current | | Noise Density | Regulator Current Izm mAdc |
|---|---|---|---|---|---|---|
| | TYP | MAX | Ir µAdc MAX | Vr Vdc MAX | MAX | MAX |
| 1N4614 | 1.8 | 1200 | 7.5 | 1.0 | 1 | 120.0 |
| 1N4615 | 2.0 | 1250 | 5.0 | 1.0 | 1 | 110.0 |
| 1N4616 | 2.2 | 1300 | 4.0 | 1.0 | 1 | 100.0 |
| 1N4617 | 2.4 | 1400 | 2.0 | 1.0 | 1 | 95.0 |
| 1N4618 | 2.7 | 1500 | 1.0 | 1.0 | 1 | 90.0 |
| 1N4619 | 3.0 | 1600 | 0.8 | 1.0 | 1 | 85.0 |
| 1N4620 | 3.3 | 1650 | 7.5 | 1.5 | 1 | 80.0 |
| 1N4621 | 3.6 | 1700 | 7.5 | 2.0 | 1 | 75.0 |
| 1N4622 | 3.9 | 1650 | 5.0 | 2.0 | 1 | 70.0 |
| 1N4623 | 4.3 | 1600 | 4.0 | 2.0 | 1 | 65.0 |
| 1N4624 | 4.7 | 1550 | 10.0 | 3.0 | 1 | 60.0 |
| 1N4625 | 5.1 | 1500 | 10.0 | 3.0 | 2 | 55.0 |
| 1N4626 | 5.6 | 1400 | 10.0 | 4.0 | 4 | 50.0 |
| 1N4627 | 6.2 | 1200 | 10.0 | 5.0 | 5 | 45.0 |
| **Test Conditions** | @ = 250 µA | @ 250 µA | | | @ Iz = 250 µA µVz / √Hz | |

| | |
|---|---|
| **Maximum Rating** | Vz Tolerance ±5%. |
| | Forward Voltage (VF) Maximum 1.0 Vdc (1N4614-1N4627 IF = 100 mA; 1N4099-1N4121 IF = 200mA). |
| | Noise Density measured from 1000 to 3000 Hz. |

MILITARY SCREENING AVAILABLE

## Low Level Zener Diodes, Ultra-Low Current: 50 µA – Low Leakage

| Model | Zener Voltage Vz Volts | Reverse Leakage Current | | Regulation Factor Volts | Regulator Current Izm mAdc |
|---|---|---|---|---|---|
| | TYP | Ir µAdc MAX | Vr Vdc MAX | MAX | MAX |
| 1N4678 | 1.8 | 7.5 | 1.0 | 0.70 | 120.0 |
| 1N4679 | 2.0 | 5.0 | 1.0 | 0.70 | 110.0 |
| 1N4680 | 2.2 | 4.0 | 1.0 | 0.75 | 100.0 |
| 1N4681 | 2.4 | 2.0 | 1.0 | 0.80 | 95.0 |
| 1N4682 | 2.7 | 1.0 | 1.0 | 0.85 | 90.0 |
| 1N4683 | 3.0 | 0.8 | 1.0 | 0.90 | 85.0 |
| 1N4684 | 3.3 | 7.5 | 1.5 | 0.95 | 80.0 |
| 1N4685 | 3.6 | 7.5 | 2.0 | 0.95 | 75.0 |
| 1N4686 | 3.9 | 5.0 | 2.0 | 0.97 | 70.0 |
| 1N4687 | 4.3 | 4.0 | 2.0 | 0.99 | 65.0 |
| 1N4688 | 4.7 | 10.0 | 3.0 | 0.99 | 60.0 |
| 1N4689 | 5.1 | 10.0 | 3.0 | 0.97 | 55.0 |
| 1N4690 | 5.6 | 10.0 | 4.0 | 0.96 | 50.0 |
| 1N4691 | 6.2 | 10.0 | 5.0 | 0.95 | 45.0 |
| 1N4692 | 6.8 | 10.0 | 5.1 | 0.90 | 35.0 |
| 1N4693 | 7.5 | 10.0 | 5.7 | 0.75 | 31.8 |
| 1N4694 | 8.2 | 1.0 | 6.2 | 0.50 | 29.0 |
| 1N4695 | 8.7 | 1.0 | 6.6 | 0.10 | 27.4 |
| 1N4696 | 9.1 | 1.0 | 6.9 | 0.08 | 26.2 |
| 1N4697 | 10.0 | 1.0 | 7.6 | 0.10 | 24.8 |
| 1N4698 | 11.0 | 0.05 | 8.4 | 0.11 | 21.6 |
| 1N4699 | 12.0 | 0.05 | 9.1 | 0.12 | 20.4 |
| 1N4700 | 13.0 | 0.05 | 9.8 | 0.13 | 19.0 |
| 1N4701 | 14.0 | 0.05 | 10.6 | 0.14 | 17.5 |
| 1N4702 | 15.0 | 0.05 | 11.4 | 0.15 | 16.3 |
| 1N4703 | 16.0 | 0.05 | 12.1 | 0.16 | 15.4 |
| 1N4704 | 17.0 | 0.05 | 12.9 | 0.17 | 14.5 |
| 1N4705 | 18.0 | 0.05 | 13.6 | 0.18 | 13.2 |
| 1N4706 | 19.0 | 0.05 | 14.4 | 0.19 | 12.5 |
| 1N4707 | 20.0 | 0.01 | 15.2 | 0.20 | 11.9 |
| 1N4708 | 22.0 | 0.01 | 16.7 | 0.22 | 10.8 |
| 1N4709 | 24.0 | 0.01 | 18.2 | 0.24 | 9.9 |
| 1N4710 | 25.0 | 0.01 | 19.0 | 0.25 | 9.5 |
| 1N4711 | 27.0 | 0.01 | 20.4 | 0.27 | 8.8 |
| 1N4712 | 28.0 | 0.01 | 21.2 | 0.28 | 8.5 |
| 1N4713 | 30.0 | 0.01 | 22.8 | 0.30 | 7.9 |
| 1N4714 | 33.0 | 0.01 | 25.0 | 0.33 | 7.2 |
| **Test Conditions** | @ = 50 µA | | | 100 µAdc To 10 µAdc DVz | |

| **Maximum Rating** | **Vz Tolerance** ±5%. |
|---|---|

# Current Limiter Field Effect Diodes

- Mechanical Reliability
- Low Noise Figure

| Model | Regulator Current Ip mA | | | Regulator Impedance Zs M Ω | Knee Impedance Zk M Ω | Limiting Voltage VL MIN Volts |
|---|---|---|---|---|---|---|
| | TYP | MIN | MAX | MIN | MIN | MAX |
| 1N5283 | 0.22 | 0.198 | 0.242 | 25.00 | 2.750 | 1.00 |
| 1N5284 | 0.24 | 0.216 | 0.264 | 19.00 | 2.350 | 1.00 |
| 1N5285 | 0.27 | 0.243 | 0.297 | 14.00 | 1.950 | 1.00 |
| 1N5286 | 0.30 | 0.270 | 0.330 | 9.00 | 1.600 | 1.00 |
| 1N5287 | 0.33 | 0.297 | 0.363 | 6.60 | 1.350 | 1.00 |
| 1N5288 | 0.39 | 0.351 | 0.429 | 4.10 | 1.000 | 1.05 |
| 1N5289 | 0.43 | 0.387 | 0.473 | 3.30 | 0.870 | 1.05 |
| 1N5290 | 0.47 | 0.423 | 0.517 | 2.70 | 0.750 | 1.05 |
| 1N5291 | 0.56 | 0.504 | 0.616 | 1.90 | 0.560 | 1.10 |
| 1N5292 | 0.62 | 0.558 | 0.682 | 1.55 | 0.470 | 1.13 |
| 1N5293 | 0.68 | 0.612 | 0.748 | 1.35 | 0.400 | 1.15 |
| 1N5294 | 0.75 | 0.675 | 0.825 | 1.15 | 0.335 | 1.20 |
| 1N5295 | 0.82 | 0.738 | 0.902 | 1.00 | 0.290 | 1.25 |
| 1N5296 | 0.91 | 0.819 | 1.00 | 0.88 | 0.240 | 1.29 |
| 1N5297 | 1.00 | 0.900 | 1.100 | 0.80 | 0.205 | 1.35 |
| 1N5298 | 1.10 | 0.990 | 1.210 | 0.70 | 0.180 | 1.40 |
| 1N5299 | 1.20 | 1.080 | 1.320 | 0.640 | 0.155 | 1.45 |
| 1N5300 | 1.30 | 1.170 | 1.430 | 0.580 | 0.135 | 1.50 |
| 1N5301 | 1.40 | 1.260 | 1.540 | 0.540 | 0.115 | 1.55 |
| 1N5302 | 1.50 | 1.350 | 1.650 | 0.510 | 0.105 | 1.60 |
| 1N5303 | 1.60 | 1.440 | 1.760 | 0.457 | 0.092 | 1.65 |
| 1N5304 | 1.80 | 1.620 | 1.980 | 0.420 | 0.074 | 1.75 |
| 1N5305 | 2.00 | 1.800 | 2.200 | 0.395 | 0.061 | 1.85 |
| 1N5306 | 2.20 | 1.980 | 2.420 | 0.370 | 0.052 | 1.95 |
| 1N5307 | 2.40 | 2.160 | 2.640 | 0.345 | 0.044 | 2.00 |
| 1N5308 | 2.70 | 2.430 | 2.970 | 0.320 | 0.035 | 2.15 |
| 1N5309 | 3.00 | 2.700 | 3.300 | 0.300 | 0.029 | 2.25 |
| 1N5310 | 3.30 | 2.970 | 3.630 | 0.280 | 0.024 | 2.35 |
| 1N5311 | 3.60 | 3.240 | 3.960 | 0.265 | 0.020 | 2.50 |
| 1N5312 | 3.90 | 3.510 | 4.290 | 0.255 | 0.017 | 2.60 |
| 1N5313 | 4.30 | 3.870 | 4.730 | 0.245 | 0.014 | 2.75 |
| 1N5314 | 4.70 | 4.230 | 5.170 | 0.235 | 0.012 | 2.90 |
| **Test Conditions** | @ Vs = 25V | | | @ Vs = 25 V | @ Vk = 6 V | @ IL = 0.8 Ip |

| Maximum Rating | Parameters | Rating |
|---|---|---|
| | Operating Temperature | -55° C to + 175° C |
| | Storage Temperature | -55° C to + 175° C |
| | Package style | DO-7 |
| | DC Power Dissipation | 500 mW |
| | Peak Operating Voltage | 100 V |

# Capacitors: 9000 Series

- High Reliability Silicon Nitride/Oxide Dielectric
- Low Loss and High Q
- Long Term Reliability and Stability
- Gold Metallization Front and Back

The Aeroflex / Metelics MMI-9000 and 9100 Series Chip Capacitors feature high stand-off voltage and low dielectric loss due to our use of nitride/oxide dielectric layers. Gold bonding surfaces, top and bottom provide ease of bonding and minimum contact resistance. MIS capacitors have high insulation resistance, low dissipation factor, and low temperature coefficient, which are features that produce devices with excellent long term stability.

**HOW TO ORDER:**

- Go to CHART 1 (9100 Series > 100 Volt Working Voltage). Select capacitance range required. Check CHIP size for compatibility with your circuit.
- Go to CHART 2 (9000 Series > 50 Volt Working Voltage) for smaller chip size with lower working voltage.
- Go to CHART 3 for Beam Lead product
- Specify part number.

**CAPACITANCE (10PF)**

100V WORKING VOLTAGE

**91**

The first two digits are the SERIES

**10R**

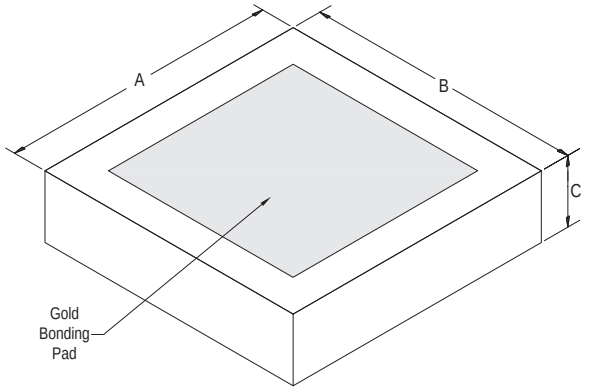
**K**

TOLERANCE K (+10%)

TOLERANCE — SEE CHART 4

The next three digits are the value of capacitance with R used as a decimal point.

EXAMPLES:
9110RK => 100 WVDC 10 pF + 10% with a .020" CHIP SIZE.
902ROJ => 50 WVDC 2.0 pF + 5% with a .010" CHIP SIZE




**Chip Outline**

# Capacitors: 9000 Series

## 9100 Series Capacitors Working Voltage > 100V

| Model | Capacitance Range | Chip Size + .002″ Dim A x Dim B x Dim C |
|---|---|---|
| 910R1 thru 911R9 | .1 pF thru 1.9 pF | .010″ x .010″ x .005″ |
| 912R0 thru 919R9 | 2.0 pF thru 9.9 pF | .015″ x .015″ x .005″ |
| 9110R thru 9129R | 10.0 pF thru 29 pF | .020″ x .020″ x .006″ |
| 9130R thru 9149R | 30.0 pF thru 49 pF | .030″ x .030″ x .006″ |
| 9150R thru 9199R | 50.0 pF thru 99 pF | .040″ x .040″ x .008″ |
| 91100 thru 91199 | 100 pF thru 199 pF | .050″ x .050″ x .008″ |
| 91200 thru 91399 | 200 pF thru 399 pF | .070″ x .070″ x .008″ |

## Chart 2 9000 Series Capacitors Working Voltage > 50V

| Model | Capacitance Range | Chip Size + .002″ Dim A x Dim B x Dim C |
|---|---|---|
| 902R0 thru 9010R | 2.0 pF thru 10.0 pF | .010″ x .010″ x .005″ |
| 9010R thru 9029R | 10.0 pF thru 29 pF | .015″ x .015″ x .005″ |
| 9030R thru 9049R | 30.0 pF thru 49 pF | .020″ x .020″ x .006″ |
| 9050R thru 9099R | 50.0 pF thru 99 pF | .030″ x .030″ x .006″ |
| 90100 thru 90199R | 100 pF thru 199 pF | .040″ x .040″ x .008″ |
| 90200 thru 90399R | 200 pF thru 399 pF | .050″ x .050″ x .008″ |
| 90400 thru 90600R | 400 pF thru 600 pF | .070″ x .070″ x .008″ |

## Chart 3 Beam Lead Capacitors 9000 Series VB > 50V

| Model | Capacitance Range | Pkg Style |
|---|---|---|
| 90R1 thru 90R9 | .1 to .9 pF | 14-1 |
| 901R0 thru 901R5 | 1.0 to 1.5 pF | 14-1 |
| 90R5 thru 901R0 | .5 to 1.0 pF | 14-2 |
| 901R0 thru 902R2 | 1.0 to 2.2 pF | 14-2 |
| 902R2 thru 904R7 | 2.2 to 4.7 pF | 14-2 |
| 905R6M | 5.6 + 20% pF | 14-2 |
| 906R8M | 6.8 + 20% pF | 14-2 |
| 908R2M | 8.2 + 20% pF | 14-2 |
| 9010R0M | 10 + 20% pF | 14-3 |
| 9015R0M | 15 + 20% pF | 14-3 |
| 9022R0M | 22 + 20% pF | 14-3 |
| 9033R0M | 33 + 20% pF | 14-3 |
| 9047R0M | 47 + 20% pF | 14-4 |
| 9068R0M | 68 + 20% pF | 14-4 |
| 9082R0M | 82 + 20% pF | 14-4 |
| 90100R0M | 100 + 20% pF | 14-4 |

## Chart 4

| Tolerance + | |
|---|---|
| A = .05 pF | G = 2% |
| B = .1 pF | J = 5% |
| C = .25 pF | K = 10% |
| D = .5 pF | M = 20% |
| F = 1% | |
| Standard Tolerance is +10% | |

# Mounting Capacitors

- High Reliability Silicon Nitride/Oxide Dielectric
- Low Loss and Very High Q
- Long Term Reliability and Stability

The Aeroflex / Metelics Mounting Capacitors are designed for transient protection for MICs and FETs. Since the capacitor substrate is silicon, it provides an optimum match both thermally and mechanically with the device to be mounted. A wide range of sizes and capacitance values are available as standard products. Our design flexibility and fast turn-around allow us to offer a custom design service with a two to four week delivery of prototypes. There is virtually no limit to size or capacitance value available.

**HOW TO ORDER:**

Capacitance (100 pF)
91100RK-SP = 100 WVDC 100 pF + 10% With a chip size of .070 x .070

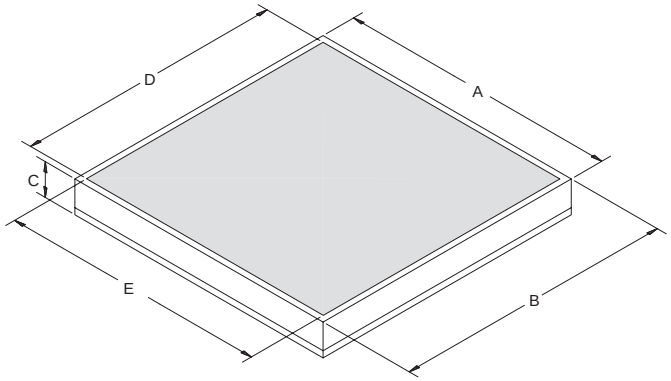
The first two digits are the SERIES

**91** **100R** **K – SPXXX**

CHIP SIZE see chart

TOLERANCE see chart 4 on page 81

The next three digits are the value of capacitance with R used as a decimal point.




**Chip Outline**

## MIC Mounting Capacitors: Special Capacitance and Chip Sizes

| Model Sufix | Capacitance Range | Chip Size | | Pad Size | | Customer Specified |
|---|---|---|---|---|---|---|
| | | A | B | D | E | C |
| -SP87 | 15.0 – 150 | 0.013 | 0.120 | 0.009 | 16 | .005 – .0207 |
| -SP49 | 5.0 – 50.0 | 0.014 | 0.034 | 0.011 | 0.031 | .005 – .020 |
| -SP06 | 10.0 – 100.0 | 0.014 | 0.055 | 0.012 | 0.053 | .005 – .020 |
| -SP51 | 8.0 – 80.0 | 0.015 | 0.045 | 0.013 | 0.043 | .005 – .020 |
| -SP81 | 17.0 – 170.0 | 0.015 | 0.090 | 0.013 | 0.088 | .005 – .020 |
| -SP80 | 13.0 – 130 | 0.016 | 0.065 | 0.014 | 0.063 | .005 – .020 |
| -SP14 | 9.0 – 90.0 | 0.020 | 0.040 | 0.016 | 0.036 | .005 – .020 |
| -SP84 | 7.0 – 70.0 | 0.020 | 0.040 | 0.016 | 0.030 | .005 – .020 |
| -SP12 | 14.0 – 140 | 0.020 | 0.055 | 0.018 | 0.053 | .005 – .020 |
| -SP89 | 12.0 – 120 | 0.020 | 0.060 | 0.014 | 0.055 | .005 – .020 |
| -SP88 | 25.0 – 250 | 0.021 | 0.121 | 0.015 | 0.115 | .005 – .020 |
| -SP34 | 9.0 – 90.0 | 0.024 | 0.034 | 0.020 | 0.030 | .005 – .020 |
| -SP22 | 24.0 – 240 | 0.025 | 0.080 | 0.021 | 0.075 | .005 – .020 |
| -SP48 | 29.0 – 290 | 0.035 | 0.065 | 0.031 | 0.061 | .005 – .020 |
| -SP64 | 75.0 – 750 | 0.055 | 0.102 | 0.051 | 0.098 | .005 – .020 |
| -SP120 | 90.0 – 900 | 0.055 | 0.120 | 0.050 | 0.115 | .005 – .020 |
| -SP07 | 100 – 1000 | 0.085 | 0.085 | 0.081 | 0.081 | .005 – .020 |
| -SP38 | 200 – 2000 | 0.094 | 0.152 | 0.091 | 0.148 | .005 – .020 |
| -SP05 | 200 – 1000 | 0.100 | 0.100 | 0.095 | 0.095 | .005 – .020 |
| -SP68 | 175 – 1750 | 0.101 | 0.124 | 0.097 | 0.120 | .005 – .020 |
| -SP40 | 200 – 2000 | 0.107 | 0.134 | 0.103 | 0.130 | .005 – .020 |
| -SP02 | 150 – 1500 | 0.110 | 0.110 | 0.100 | 0.100 | .005 – .020 |
| -SP01 | 200 – 2000 | 0.110 | 0.140 | 0.100 | 0.130 | .005 – .020 |
| -SP55 | 360 – 3600 | 0.117 | 0.220 | 0.113 | 0.216 | .005 – .020 |
| -SP77 | 300 – 3000 | 0.118 | 0.175 | 0.114 | 0.171 | .005 – .020 |
| -SP39 | 200 – 2000 | 0.120 | 0.134 | 0.110 | 0.130 | .005 – .020 |
| -SP20 | 200 – 2000 | 0.120 | 0.140 | 0.110 | 0.130 | .005 – .020 |
| -SP29 | 200 – 2000 | 0.121 | 0.121 | 0.115 | 0.115 | .005 – .020 |
| -SP52 | 300 – 3000 | 0.130 | 0.170 | 0.124 | 0.164 | .005 – .020 |
| -SP44 | 350 – 3500 | 0.140 | 0.170 | 0.135 | 0.165 | .005 – .020 |
| -SP104 | 350 – 3500 | 0.142 | 0.171 | 0.138 | 0.167 | .005 – .020 |
| -SP111 | 350 – 3500 | 0.143 | 0.180 | 0.138 | 0.167 | .005 – .020 |
| -SP37 | 350 – 3500 | 0.151 | 0.168 | 0.147 | 0.164 | .005 – .020 |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | Operating Temperature | -55° C to + 150° C |
| | Storage Temperature | -65° C to + 200° C |
| | Voltage Breakdown | >100V Dropping the working voltage to >50V will double the high capacitance range No. |

# Binary Chip Capacitors

- High Reliability Silicon Nitride-Oxide Dielectric
- Low Loss
- Long Term Reliability and Stability

The Aeroflex / Metelics BOO and BSP Series Capacitors are designed to facilitate bread-boarding or to use where a trimming capability is required. These devices feature the same dielectric layer and bonding surfaces as our 9000 and 9100 Series chip capacitors. By connecting the pads in parallel, the capacitance values are add tive, so many combinations are possible.

The BSP-1 chip offers the same capacitance values as BOO and BSP-3, but in a slightly larger chip with a more accommodating layout for ease of bonding.

| **.015 x .015** | 911R5K-BSP-3 | 913R0K-BSP-3 | 913R7K-BSP-3 | 915R6K-BSP-3 |
|---|---|---|---|---|
| PAD 1 | 0.1 pF | 0.2 pF | 0.25 pF | 0.35 pF |
| PAD 2 | 0.2 pF | 0.4 pF | 0.5 pF | 0.75 pF |
| PAD 3 | 0.4 pF | 0.8 pF | 1.0 pF | 1.5 pF |
| PAD 4 | 0.8 pF | 1.6 pF | 2.0 pF | 3.0 pF |
| TOTAL | 1.5 pF | 3.0 pF | 3.75 pF | 5.6 pF |

| **.020 x .020** | 913R7K-BOO | 917R5K-BOO | 9115ROK-BOO | 9122R5K-BOO |
|---|---|---|---|---|
| PAD 1 | 0.25 pF | 0.5 pF | 1.0 pF | 1.5 pF |
| PAD 2 | 0.5 pF | 1.0 pF | 2.0 pF | 3.0 pF |
| PAD 3 | 1.0 pF | 2.0 pF | 4.0 pF | 6.0 pF |
| PAD 4 | 2.0 pF | 4.0 pF | 8.0 pF | 12.0 pF |
| TOTAL | 3.75 pF | 7.5 pF | 15 pF | 22.5 pF |

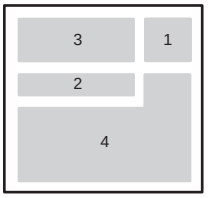
| **.030 x .020** | 913R7K-BSP-1 | 917R5K-BSP-1 | 9115ROK-BSP-1 | 9122R5K-BSP-1 |
|---|---|---|---|---|
| PAD 1 | 0.25 pF | 0.5 pF | 1.0 pF | 1.5 pF |
| PAD 2 | 0.5 pF | 1.0 pF | 2.0 pF | 3.0 pF |
| PAD 3 | 1.0 pF | 2.0 pF | 4.0 pF | 6.0 pF |
| PAD 4 | 2.0 pF | 4.0 pF | 8.0 pF | 12.0 pF |
| TOTAL | 3.75 pF | 7.5 pF | 15 pF | 22.5 pF |

| Maximum Ratings | Parameters | Rating |
|---|---|---|
| | **Operating Temperature** | -55° C to + 150° C |
| | **Storage Temperature** | -65° C to + 200° C |
| | **Temperature Coefficient** | 190 ppm/°C Max |
| | 40 ppm/°C Typical | |
| | **Voltage Breakdown** | 100 Volts |

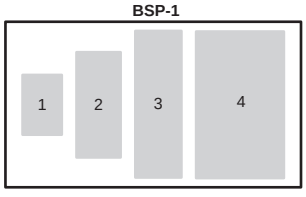
Insulation Resistance: 1012 Ohms Typ.
Thermal Conductivity: 1.2°C/cm/W
Capacitance Range: 0.1 pF to 600 pF

**SIZES**
BSP-3 = .015" x .015"
BOO = .020" x .020"
BSP-1 = .020" x .030"

**BSP-3 and BOO**




**BSP-1**




# High "Q", Thin Film, Spiral Inductors

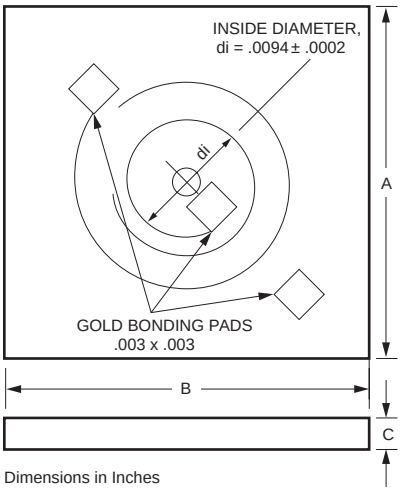
- NO need for "Staking" Coil
- Passivated Protective Coating Over Coil
- Dimensional Uniformity
- Planar Solid Structure Coil

The Aeroflex / Metelics MMI-300 Series of Spiral Inductors are formed by photolithography and plating techniques on quartz substrates. They eliminate the need for hand forming and "staking" of coil in hybrid circuits.

They provide uniformity, durability and repeatability in circuit fabrication. The coils are polyimide coated to protect from ambient contaminants, and to eliminate the need for conformal coating. Quartz substrates are rugged and reduce dielectric losses. Chips may be bonded using either conductive or non conductive epoxies, and wire bonded with gold wire or ribbon by thermocompression bonding.

## Dimensions: Inches

| Model | DIM "A" MAX | DIM "B" MAX | DIM "C" MAX |
|---|---|---|---|
| MMI297 | .030 | .030 | .012 |
| MMI298 | .030 | .030 | .012 |
| MMI299 | .040 | .040 | .012 |
| MMI300 | .040 | .040 | .012 |
| MMI301 | .040 | .040 | .012 |
| MMI302 | .045 | .045 | .012 |
| MMI303 | .055 | .055 | .012 |
| MMI304 | .065 | .065 | .012 |
| MMI305 | .075 | .075 | .012 |
| MMI306 | .085 | .085 | .012 |




Dimensions in Inches

## Spiral Inductors

| Model | # of Turns | Inductance Ls(mH) MIN/ TYP/MAX | $R_S$ DC | $R_S$ 1GHz | Q @ $F_T$ MIN/ MAX | Test Frequency, $F_T$ (GHz) | Resonant Frequency, $F_R$ (GHz) |
|---|---|---|---|---|---|---|---|
| MMI297 | 1.5 | 1.0/1.5/2.0 | 8.5 | 1.0 | 60/75 | 1.5 | 4.0 |
| MMI298 | 2.5 | 2.0/2.3/2.6 | 1.0 | 1.4 | 50/60 | 1.5 | 3.6 |
| MMI299 | 3.5 | 3.6/4.2/5.0 | 1.15 | 2.0 | 40/45 | 1.5 | 3.2 |
| MMI300 | 4.5 | 5.0/7.5/9.0 | 1.75 | 3.5 | 37/43 | 1.5 | 2.3 |
| MMI301 | 5.5 | 8.0/10/12.0 | 1.85 | 3.75 | 33/38 | 1.0 | 2.05 |
| MMI302 | 7.5 | 15/20/25 | 2.4 | 4.25 | 27/33 | 0.5 | 1.85 |
| MMI303 | 9.5 | 32/40/48 | 4.0 | 70 | 23/27 | 0.5 | 1.4 |
| MMI304 | 12.5 | 80/90/100 | 9.5 | 22 | 18/24 | 0.5 | 0.975 |
| MMI305 | 15.5 | 150/200/250 | 16.5 | 36 | 14/18 | 0.5 | 0.460 |
| MMI306 | 18.5 | 250/300/350 | 20 | 42 | 10/15 | 0.5 | 0.250 |

**Design Notes:**
Other Values and sizes available on request. Custom design services also available.

# Thin Film Resistor Chips

- Low Noise
- Excellent TCR
- Small Size
- Tight Tolerance to + .1%

The Aeroflex / Metelics Thin Film Resistors offer proven stability, low noise and excellent TCR of Tantalum Nitride in a large selection of resistance values and tolerances.

| **Parameter** | Test Condition | | |
|---|---|---|---|
| TCR | -55° C to +125° C | +150 ppm/°C (Standard value) | MAX |
| TCR | -55° C to +125° C | +100 ppm/°C | MAX |
| TCR | -55° C to +125° C | +50 ppm/°C | MAX |
| TCR | -55° C to +125° C | +10 ppm/°C (Special Request, NiCR only) | MAX |
| Operating Voltage | -55° C to 125° C | 00 Vdc | MAX |
| Power Rating (RTotal) | @ 70° C (derate linearly to zero @ 150° C) | 250 mW | MAX |
| Single Series | @ 70° C (derate linearly to zero @ 150° C) | 250 mW | MAX |
| Center-Tap | @ 70° C (derate linearly to zero @ 150° C) | 250 mW | MAX |
| Multi-Tap | @ 70° C (derate linearly to zero @ 150° C) | 250 mW | MAX |
| Thermal Shock | Method 107 MIL-STD-202 F | +0.5%@DR | MAX |
| High Temperature Exposure | 100 Hrs @ 150° C Ambient | +0.25%@DR | MAX |
| Moisture Resistance | Method 106 MIL-STD-202 F | +0.5%@DR | MAX |
| Life | Method 108 MIL-STD-202 F (125∞C/1000 hr) | +0.5%@DR | MAX |
| Noise | Method 308 MIL-STD-202 F | -20 dB | MAX |
| Insulation Resistance | @25° C | 1 X 1012 Ohms | MIN |

| **Mechanical Specification for Silicon Body Only** (all others to customer requirements) | | |
|---|---|---|
| | Substrate | Silicon 10 + 2 mils thick |
| | Isolation Layer | Si02 10,000Å thick, min |
| | Backing | Lapped surface only (no metal) |
| | Solderable | Gold Plated Backside (optional) |
| | Metallization | Gold 10,000Å thick, min, Front Contacts |
| | Gold Bonding Pads | Front Contact ⊃ .0035" Sq.) |

## Resistor Ordering System

Example

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| MTR - | 2R2K - | SR2 - | K - | NA - | G - | 1 - | T |

### 1) Is the three letter device type designation

| | |
|---|---|
| MTR | Single Value through Chip Resistor (Resistance top to bottom) |
| MIR | Single Value Pad to Pad Chip Resistor (Resistance Top pad to Top pad) |
| MCR | Dual Value Center Tap Ratio Chip Resistor (Res. #1 = Prime Value / Res. #2 = Ratio Value) |
| MMR | MultiTap Chip Resistor. |
| XXX | as needed. |

### 2) Is the resistance value in ohms

| | |
|---|---|
| 2R2K | 2,200 Ohms |
| 200R | 200 Ohms |
| 20R | 20 Ohms |
| 2R2M | 2,200,000 Ohms |
| 20R2K | 20,200 Ohms |
| 200RK | 200,000 Ohms |
| 2R | 2.0 Ohms |

### 3) is the chip substrate material and chip outline dimensions (case style) R1 thru R8

| | | | | |
|---|---|---|---|---|
| S | Silicon Body | R1 | 20 Tap Multi Tap | .038"X.038" SR1 |
| C | Ceramic (99.6% Alumina) | R2 | Dual Value | .030"X.030" CR2 |
| B | Berilium Oxide | R3 | Single Value | .020"X.020" BR3 |
| Q | Quartz | R3A* | Single Low Value | .020"X.020" QR3A |
| N | Aluminum Nitride | R4 | Six Value Ladder | .020"X.060" NR4 |
| SP | Special Material | R5 | 12 Tap Multi Tap | .030"X.030" SPR5 |
| | | R6 | Single Low Value | .030"X.030" XR6 |
| | | R7 | Single Value | .020"X.040" XR7 |
| | | R8 | | XR8 |

Please consult factory for special substrate materials (SP)
*R3A outline for resistances < 250 Ohms

### 4) Is the resistor value total % + tolerance See chart below

### 5) Is the 2nd resistor value total % ±tolerance (if applicable)

| | | | |
|---|---|---|---|
| A | + 0.5 Ohm | F | + 1% |
| B | + 1.0 Ohm | G | + 2% |
| C | + 2.5 Ohm | J | + 5% |
| D | + .01% | K | + 10% |
| E | + .1% | M | + 20% |
| NA | Not applicable | | |

A) On Dual Value Resistors, (MCR), this is the res. ratio of the 2nd resistor (Ratio Res.) To value of the 1st resistor (Prime Res.).
B) On Multi Tap Resistors (MMR). This is the tolerance of each of the small value Resistor Taps. The large value Resistor Taps are called out on (4)

### 6) Backing

| | |
|---|---|
| G | Solderable Gold |
| GS | Gold Silicon eutectic attachment |
| B | Bare |

### 7) The temperature coefficient (TCR) of the resistor, in PPM

| | |
|---|---|
| 0 | + 150 PPM |
| 1 | + 100 PPM |
| 2 | + 50 PPM |
| 3 | + 10 PPM |

### 8) Resistor Material

| | |
|---|---|
| T | Tantalum Nitride TaN (Self Passivating) |
| N | NiChrome NiCr |

**Example: Aeroflex / Metelics part no. MTR-200RK-SR3-F-NA-G-0-T**
This would be a silicon body .020" x .020" x .010" single value through chip resistor with a total resistance tolerance of + 1%, a Solderable gold back, and Tantalum Nitride as the resistor layer and a TCR of + 150PPM.

**Example: Aeroflex / Metelics part no. MCR-10RK-SR2-F-E-B-1-T**
This would be a silicon body .030" x .030" x .010" two value ratio resistor with the first value resistance tolerance of + 1%, and the second, ratio resistor, tolerance being + .1% of the first value. Resistance would be the total value of the two resistor. A Bare lapped silicon back, and Tantalum Nitride as the resistor layer and a TCR of + 100PPM.

**Example: Aeroflex / Metelics part no. MIR-2R5K-SR3-J-NA-B-2-N**
This would be a silicon body .020" x .020" x .010" single value Top pad to Top pad chip resistor with a total resistance tolerance of + 5%, a bare silicon back, with NiChrome as the resistor layer and a TCR of + 50PPM.

**Example: Aeroflex / Metelics part no. MMR-11RK-SR1-F-K-G-1-T**
This would be a silicon substrate device .038" x .038" x .010". It would have a total resistance of 11KOhms + 1%. It would have ten large tops of 1KOhm + 1% each and ten small tops of 100 Ohms + 10% each. It would have a solderable gold back with a TCR of + 100ppm and a Tantalum Nitride resistive layer.

# Thin Film Attenuator Pads

- Medium Power Handling 2W CW
- Flat Response From DC to 40 GHZ
- Return Loss > 18 dB DC to 12 GHZ
- Return Loss > 16 dB 13 to 40 GHZ
- Space Saving Footprint .030" X .030" (.762 X .762mm)
- Very Good Stability Over Temperature (TCR < 100 PPM)
- Ground Wrap to Top (No ground bonding required)

The Aeroflex / Metelics fixed attenuator chips are fabricated using our state of the art thin film metallization and advanced photolithography technology.

All devices are available in chip form with a metallized ground connection on the back. This ground is wrapped around on the four corners of the chip so additional ground bonding ribbon is not required.

The chips may be attached using conductive epoxy or solder preform. Gold contacts on the input and output pads make assembly, using standard bonding equipment, fast and reliable.

Custom values and configuration available on request.

## Attenuator Pads

| Model | Attn. (dB) | IL (dB) | RL (dB) |
|---|---|---|---|
| MAT10010 | 1.0 | +/- .30 | >18 |
| MAT10020 | 2.0 | +/- .30 | >18 |
| MAT10030 | 3.0 | +/- .30 | >18 |
| MAT10040 | 4.0 | +/- .30 | >18 |
| MAT10050 | 5.0 | +/- .30 | >18 |
| MAT10060 | 6.0 | +/- .35 | >18 |
| MAT10070 | 7.0 | +/- .35 | >18 |
| MAT10080 | 8.0 | +/- .35 | >18 |
| MAT10090 | 9.0 | +/- .35 | >18 |
| MAT10100 | 10.0 | +/- .35 | >18 |
| MAT10110 | 11.0 | +/- .40 | >18 |
| MAT10120 | 12.0 | +/- .40 | >18 |
| MAT10130 | 13.0 | +/- .40 | >18 |
| MAT10140 | 14.0 | +/- .40 | >18 |
| MAT10150 | 15.0 | +/- .40 | >18 |
| MAT10160 | 16.0 | +/- .50 | >18 |
| MAT10170 | 17.0 | +/- .50 | >18 |
| MAT10180 | 18.0 | +/- .50 | >18 |
| MAT10190 | 19.0 | +/- .50 | >18 |
| MAT10200 | 20.0 | +/- .50 | >18 |
| MAT10210 | 21.0 | +/- .60 | >18 |
| MAT10220 | 22.0 | +/- .60 | >18 |
| MAT10230 | 23.0 | +/- .60 | >18 |
| MAT10240 | 24.0 | +/- .60 | >18 |
| MAT10250 | 25.0 | +/- .60 | >18 |
| MAT10260 | 26.0 | +/- 1.0 | >18 |
| MAT10270 | 27.0 | +/- 1.0 | >18 |
| MAT10280 | 28.0 | +/- 1.0 | >18 |
| MAT10290 | 29.0 | +/- 1.0 | >18 |
| MAT10300 | 30.0 | +/- 1.0 | >18 |

**Notes:**
Resistor pattern may vary from one value to another.
Specifications are subject to change without notice or obligation.

# Custom Fabricated Device Networks

**Aeroflex / Metelics Custom Fabricated Devices and Device Networks**

In support of your ongoing device integration requirements, Aeroflex / Metelics is pleased to offer the following turnkey device fabrication services. A wide variety of substrate materials are available.

- Resistor networks
- Inductor networks
- Capacitor networks
- Integrated Resistor, Inductor and Capacitor networks and circuit layouts

We continually improve our service in these areas by building on our state of the art wafer fabrication labs, extensive device experience, and worldwide assembly capabilities.

Our application engineering team is available to assist you with integrating our products into ever smaller and more economical packages. In fact, we've made it our mission to offer unsurpassed engineering support and unrivaled customer service to offer you a total solution to your complex device integration requirements.

Please contact your Aeroflex / Metelics sales professional for a complete review of your custom application.

# InGaP HBT Amplifiers: Darlington Gain Blocks

- Flat gain response from 100 MHz up to 12 GHz
- High linearity
- RoHS compliant
- Also available as bare die and in hermetic package
- Hi-Rel screening available in accordance with MIL-PRF-38534

The Aeroflex / Metelics InGaP Heterojunction Bipolar Transistor (HBT) MMIC amplifiers are specially designed as broadband Darlington gain blocks for instruments, CATV, and wireless infrastructure applications. These gain blocks combines different levels of small signal gain, noise and bandwidth for applications where signal gain is necessary. They are also ideal for buffer IF amplifier.

## 50 Ω Input / Output Darlington Amplifiers: RF Specifications @ 2 GHz

| **Model** | Frequency Range MHz | SS Gain dB | Pout @ -1dB dBm | OIP3 dBm TYP | Noise Figure dB | VSWR | | Device Voltage V | Ic mA | Package |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INPUT | OUTPUT | | | |
| MMA500 | DC – 2000 | 20 | +17 | +28 | 3.0 | 1.30:1 | 1.30:1 | 4.0 | 45 | SOT89 |
| MMA703 | DC – 4000 | 18 | +17 | +28 | 3.5 | 1.30:1 | 1.20:1 | 5.0 | 45 | 2012 |
| MMA704 | DC – 3000 | 17 | +17 | +28 | 3.5 | 1.50:1 | 1.50:1 | 5.0 | 45 | SOT89 |
| MMA705 | DC – 4000 | 14 | +14 | +27 | 4.0 | 1.50:1 | 1.50:1 | 5.0 | 45 | SOT89 |
| MMA706 | DC – 6000 | 15 | +15 | +27 | 4.0 | 1.40:1 | 1.40:1 | 5.0 | 45 | 2012 |
| MMA708 | DC – 4000 | 13 | +20 | +38 | 6.0 | 1.40:1 | 2.00:1 | 7.0 | 95 | 2012 |
| MMA710 | DC – 4000 | 13 | +20 | +38 | 6.5 | 1.40:1 | 1.90:1 | 7.0 | 95 | SOT89 |
| MMA712 | DC – 12000 | 12 | +11 | +26 | 5.5 | 1.50:1 | 1.40:1 | 5.0 | 45 | 2012 CM22 |

# InGap HBT Amplifiers: Low and Medium Power

- High gain from 100 MHz up to 2650 GHz
- Superior MTTF resulting from low thermal resistance.
- RoHS compliant
- Also available as bare die and in hermetic package
- Hi-Rel screening available in accordance with MIL-PRF-19500

The Aeroflex / Metelics InGaP Heterojunction Bipolar Transistor (HBT) low and medium power amplifiers are specifically designed for high efficiency, Class A driver devices in wireless infrastructure applications. Their high spur free dynamic range is ideal for multi-carrier (OFDM) and digital applications. Their output power ranges from 0.25 to 4 watts. They are also ideal for high efficiency, high linearity narrow bandwidth IF amplifiers.

## Medium Power Amplifiers (MPA)

| Model | Frequency MHz | Gain dB | P1dB dBm | OIP3 dBm | NF dB | Bias Condition V/mA | Package |
|---|---|---|---|---|---|---|---|
| MMA701A | 1930~1990 | 12.5 | +27 | +47 | 4.5 | 7/130 | SOT89 |
| | 2110~2170 | 12.0 | +27 | +47 | 4.5 | | |
| MMA707 | 1930~1990 | 12.0 | +31 | +50 | 6.0 | 7/350 | 3030 SOIC8 |
| | 2110~2170 | 11.5 | +31 | +50 | 6.0 | | |
| MMA709 | 1930~1990 | 11.0 | +34 | +54 | 6.5 | 7/700 | 3030 SOIC8 |
| | 2110~2170 | 10.0 | +34 | +54 | 6.5 | | |
| MMA717 | 880~915 | 18.0 | +31 | +50 | 6.0 | 7/350 | 3030 |
| MMA718 | 880~915 | 18.0 | +34 | +54 | 6.5 | 7/700 | 3030 |
| MMA719 | 880~915 | 13.0 | +36.5 | +56 | 7.0 | 7/1400 | 6060 |
| MMA727 | 430~470 | 19.0 | +31 | +50 | 6.0 | 7/350 | 3030 |
| MMA728 | 430~470 | 18.0 | +34 | +54 | 6.5 | 7/700 | 3030 |
| MMA729 | 430~470 | 18.5 | +36.5 | +56 | 7.0 | 7/1400 | 6060 SOIC8 |

# Silicon Epitaxial Wafers

Aeroflex / Metelics is a supplier of silicon epitaxial wafers. We offer a wide range of capabilities to serve manufacturers of discrete Si devices. Our epi wafers are grown to customer-furnished specifications, based upon the following capabilities.

### Epi Capabilities

Wafer Diameter:
3", 100mm, 125mm

Silicon substrate:
Bulk Czochralski, bulk floatzone or SOI

Substrate Dopant:
FZ: Boron or Phosphorus
Cz: Boron, Phosphorus, Arsenic or Antimony

Epi Layer Dopant:
Boron, Phosphorus or Arsenic

Number of Epi Layers:
1, 2 or 3

Epi Layer Resistivity Available Range:
p-type: .009 to 1000 ohm-cm (thickness dependent)
n-type: .005 to 2000 ohm-cm (thickness dependent)

Epi Layer Thickness Available Range:
0.5 to 500 m

### Epi for a Variety of Devices

Aeroflex / Metelics is an experienced manufacturer of epi wafers tailored for the following discrete silicon devices:

- PIN diodes (RF and photodiode)
- Varactor diodes
- Schottky diodes
- Bipolar transistors
- MOSFETs
- JFETs
- IGBTs
- MEMs

### Quality Assurance

Aeroflex / Metelics is an ISO 9001 facility. Epi wafers are inspected per the relevant SEMI standards. Our in-house epi measurement equipment includes:

- FTIR for measurement of epi layer thickness;
- C-V Hg-probe for measurement of epi resistivity;
- Spreading resistance profile (SRP) for measurement of epi resistivity vs depth;
- Four point probe for measurement of epi resistivity atop a p-n junction;
- 100% visual inspection using a high intensity Yamada inspection lamp.

### Capacity

Aeroflex / Metelics can grow small quantity, one-time orders as well as high volume blanket orders. We can rapidly add production shifts in order to fulfill surge demand for epi wafers.

### Experience

Aeroflex / Metelics silicon epi group is comprised of highly skilled and experienced technical staff, some with over 25 years of experience in the silicon epi industry. Like the rest of Aeroflex / Metelics, we are highly customer focused. We conduct production / planning meetings daily in order to promote on time delivery.

# Quality and Reliability

Aeroflex / Metelics is committed to quality through interactions between engineering, manufacturing, and quality assurance groups at design, development, manufacture, test, and environmental screening levels for all Aeroflex / Metelics products.

Aeroflex / Metelics is firmly committed to producing and providing the highest level of quality products free of defects and deviations. Our primary goal is to achieve consistently high standards and Customer satisfaction based on internal and Customer expectations and requirements by:

- Documenting procedures and specifications used in the manufacturing, testing, and environmental screening of all Aeroflex / Metelics products
- Calibrating equipment with standards traceable to National Institute of Standards and Technology (NIST)
- Adhering to Aeroflex / Metelics internal Electrostatic Discharge (ESD) program requirements based on ANSI/ESD S20.20. All Aeroflex / Metelics Semiconductor and Thin Film products are treated to the most sensitive product ESDS threshold level Class 1 per MIL-STD-19500.
- Assuring all incoming materials conform to documented specifications
- Verifying process controls at fabrication, manufacturing, and test levels
- Performing environmental screening and conformance inspection up to and including space level per MIL-PRF-19500 and/or Customer specific requirements

Aeroflex / Metelics Sunnyvale, CA facility is ISO 9001 registered achieving certification to IS) 9001:2000 in March of 2004. A copy of our ISO certificate is available upon request.

Aeroflex / Metelics Londonderry, NH facility, is ISO 9001 registered achieving certification to ISO 9001:2000 in September 2003. A copy of our ISO certificate is available upon request.

### Element Evaluation, Environmental Screening, and Conformance Inspection

Aeroflex / Metelics provides standard high reliability test programs for our Semiconductor and Thin Film products. Element Evaluations are performed in accordance with MIL-PRF-38534 Class H and Class K levels for passive components and semiconductor die. Environmental Screening and Conformance Inspection are performed in accordance with MIL-PRF-19500 JAN, JANTX, JANTXV, and JANS requirements and/or per Customer specified requirements.

Tables 1 and Table 2 represent Aeroflex / Metelics standard Element Evaluation, Environmental Screening, and Conformance Inspection testing. Certain process steps may be omitted or modified due to device performance restraints, package styles, or screening levels.

**Table 1 - MIL-PRF-38534 Element Evaluation for Passive Components**

| Step | Class | | Process | Conditions | Comments |
|---|---|---|---|---|---|
| | K | H | | | |
| 1 | | | Subgroup 1 | | |
| 2 | X | X | Die Electrical | Rs(Resistors) Vr, Cj (Capacitors) | 100% electrical, remove rejects |
| 3 | | | Subgroup 2 | | |
| 4 | X | X | Die Visual | MIL-STD-883, Meth 2032 | 100% visual inspection, remove rejects |
| 5 | | | Subgroup 3 | | |
| 6 | X | | Temperature Cycling | MIL-STD-883, Meth 1010, Cond C | 10 Cycles, t= 10 minutes min, Ta= -65∞ C to +150∞ C |
| 7 | X | | Constant Acceleration | MIL-STD-883, Meth 2001, Cond D | 20,000 g's, Y1 direction |
| 8 | X | | Aging (Capacitors only) | MIL-STD-883, Meth 1015, Cond A | t= 240 hrs min, Ta= +125∞ C, Vr= _____V |
| 9 | X | X | Visual Inspection | MIL-STD-883, Meth 2017 | |
| 10 | X | X | End-point Electricals | Rs (Resistors) Vr, Ir, Ct (Capacitors) | Read & Record |
| 11 | | | Subgroup 4 | | |
| 12 | X | X | Bond Strength | MIL-STD-883, Meth 2011 Bond strength= 3.0g min | .001" Au wire or equivalent, 10(0) wires or 20 (1) wires |

**Table 2 - MIL-PRF-38534 Element Evaluation for Semiconductor Die**

| Step | Class | | Process | Conditions | Comments |
|---|---|---|---|---|---|
| | K | H | | | |
| 1 | | | Subgroup 1 | | |
| 2 | X | X | Die Electrical | | 100% electrical, remove rejects |
| 3 | | | Subgroup 2 | | |
| 4 | X | X | Die Visual | MIL-STD-883, Meth 2010 | 100% visual inspection, remove rejects |
| 5 | | | Subgroup 3 | | |
| 6 | X | X | Internal Visual | MIL-STD-883,Meth 2010 or MIL-STD-750, Meth 2072 or 2073 | |
| 7 | | | Subgroup 4 | | |
| 8 | X | | Temperature Cycling | MIL-STD-883, Meth 1010, Cond C | 10 Cycles, t= 10 minutes min, Ta= -65° C to +150° C |
| 9 | X | X | Constant Acceleration | MIL-STD-883, Meth 2001, Cond D | 20,000 g's Y1 direction |
| 10 | X | X | Pre Burn-In Electrical | | Go/No Go |
| 11 | X | | HTRB | MIL-STD-883, Meth 1015, Cond A | t= 240 hrs min, Ta= +125° C, Vr= _____V |
| 12 | X | X | Post Burn-In Electrical | | Go/No Go |
| 13 | X | | Steady State Life (when conditions provided) | MIL-STD-883, Meth 1005, Cond B | t= 1000 hrs min, Ta= +125° C, Vr= __V or If=__mA |
| 14 | X | X | Final Electricals | | Read & Record |
| 15 | | | Subgroup 5 | | |
| 16 | X | X | Bond Strength | MIL-STD-883, Meth 2011 Bond strength= 3.0g min | .001" Au wire or equivalent, 10(0) wires or 20 (1) wires |
| 17 | | | Subgroup 6 | | |
| 18 | X | | SEM | MIL-STD-883, Meth 2018 or MIL-STD-750, Meth 2077 | |

## Table 3 - MIL-PRF-19500 100% Environmental Screening Semiconductor Packaged Diodes

| Step | Process | Conditions | Comments | JANS | JANTXV | JANTX |
|---|---|---|---|---|---|---|
| 1 | Visual Inspection | MIL-STD-750, Meth 2073 | Performed at chip level prior to assembly | X | when specified | N/A |
| 2 | Pre-cap Visual | MIL-STD-750, Meth 2074 | | X | X | N/A |
| 3 | Temperature Storage | MIL-STD-750 Meth 1032 | t=___ hrs, Ta= +150° C | X | X | X |
| 4 | Temperature Cycling | MIL-STD-750 Meth 1051, Cond F | 20 Cycles, t(ext)= 10 min Ta= -65∞ C to +150° C | X | X | X |
| 5 | Constant Acceleration | MIL-STD-750 Meth 2006 | 20,000 G's min Y1 axis only (Au ribbon/wire bond only) | X | X | X |
| 6 | PIND | MIL-STD-750 Meth 2052, Cond A | Shock Pulse= 1000 +200 g's, Noise= +20mV peak to peak | X | N/A | N/ |
| 7 | FIST / BIST (axial lead diodes only) | MIL-STD-750 Meth 2081(FIST), 2082(BIST) | Acc=_, Pulse=_, t=_ms, f=_Hz _blows in_direction, V=_V,I=_A | X | N/A | N/A |
| 8 | Fine Leak | MIL-STD-750 Meth 1071, Cond H | $5x10^{-8}$ atm $cc^3/s$ max | N/A | X | X |
| 9 | Gross Leak | MIL-STD-750 Meth 1071, Cond C | | N/A | X | X |
| 10 | Inital Electricals | Ir (or as specified) | Read & Record serialeze diode | X | X | X |
| 11 | HTRB[1] | MIL-STD-750 Meth 1038, Cond A | t= 48 hrs min, Ta= +150° C, Vr= _____V | X | X | X |
| 12 | Interim Electricals | Ir (or as specified) | Read & Record w/in 16 hrs from removal of applied bias | X | X | X |
| 13 | Delta HTRB Measurements | Delta Ir= + _nA or 100% whichever is greater | Read & Record delta Ir from Initial to Interim electricals | X | X | X |
| 14 | PDA[2] | PDA = 5% max, Actual PDA = ___ | PDA = (qty rej delta Ir/qty acc delta Ir) x 100 | X | X | X |
| 15 | Forward Burn In1 | MIL-STD-750 Meth 1038, Cond B | t= 240 hrs min, Ta= + __°C, If=___ mA | X | X | X |
| 16 | Final Electricals | Ir (or as specified) | Read & Record w/in 96 hrs from removal of applied bias | X | X | X |
| 17 | Delta Forward B Measurements | Delta Ir= + __nA or 100% whichever is greater | Read & Record delta Ir from Interim to Final electricals | X | X | X |
| 18 | PDA[2] | PDA = 5% max, Actual PDA = ___ | PDA = (qty rej delta Ir/qty acc delta Ir) x 100 | X | X | X |
| 19 | Fine Leak | MIL-STD-750 Meth 1071, Cond H | $5x10^{-8}$ atm $cc^3/s$ max | X | N/A | N/A |
| 20 | Gross Leak | MIL-STD-750 Meth 1071, Cond C | | X | N/A | N/A |
| 21 | Radiography | MIL-STD-750, Meth 2076 | 2 views, X and Y | X | N/A | N/A |
| 22 | Externa Visual Inspection | MIL-STD-750 Meth 2071 | | X | N/A | N/A |

Notes:
1 - Burn-In methods and conditions to be provided by Customer and agreed upon by Aeroflex / Metelics engineering.
2 - PDA for JANTX & JANTXV level screening is +10%; PDA for JANS level screening is +5%.

**Table 4 - MIL-PRF-19500 Group A Conformance Inspection (all levels)**

| **Group A Inspection** | Sample size[1] | Conditions | Comments |
|---|---|---|---|
| **Subgroup 1** | | | |
| Visual & Mechanical Inspection | 15 | MIL-STD-750, Meth 2071 | |
| **Subgroup 2** | | | |
| Electrical Tests | 116 (45)[2] | Ta= +25˚ C | Read & Record (satisfied with 100% Post BI data) |
| **Subgroup 3** | | | |
| DC (static) tests | 116 (45)[2] | Ta= -_____˚ C | Read & Record Ta= min rated operating temperature |
| DC (static) tests | 116 (45)[2] | Ta= +_____˚ C | Read & Record Ta= max rated operating temperature |
| **Subgroup 4** | | | |
| Dynamic tests | 116 (45)[2] | Ta= +25˚ C | |

## Table 5 - MIL-PRF-19500 Group B Conformance Inspection

| Group B Inspection | Sample size[1,2] | Conditions | Comments | JANS | JANTXV | JANTX |
|---|---|---|---|---|---|---|
| Subgroup 1[4] | | | Electrical rejects may be used | | | |
| Physical Dimensions | 22 (8) | MIL-STD-750 Meth 2066 | Specified case outline dimensions | X | N/A | N/A |
| Subgroup 2[4] | | | Electrical rejects may be used | | | |
| Solderability | 15 (6) leads | MIL-STD-750 Meth 2026 | Leads from a minimum of 3 devices shall be tested | X | X | X |
| Resistance to Solvents | 15 (6) | MIL-STD-750 Meth 1022 | | X | X | X |
| Subgroup 3[4] | | | | | | |
| Temperature Cycling | 22 (6) | MIL-STD-750 Meth 1051, Cond F | 45 Cycles including screening, t(ext)= 10 min Ta= -65° C to +150° C (JANS 100 cycles) | X | X | X |
| Thermal Shock | 22 (6) | MIL-STD-750 Meth 1056, Cond B | 10 Cycles (JANS 25 cycles) (glass axial lead only) | X | X | X |
| Surge | 22 (6) | | only when specified | X | X | X |
| Fine Leak | 22(6) | MIL-STD-750, Meth 1071, Cond H | $5x10^{-8}$ atm $cc^3/s$ max | X | X | X |
| Gross Leak | 22 (6) | MIL-STD-750 Meth 1071, Cond C | | X | X | X |
| Electrical Tests[3] | 22 (6) | | Read & Record | X | X | X |
| Intermittent Operating Life | 22 (12) | MIL-STD-750 Meth 1037, 2000 cycles | submit to 6000 cycles to satisfy Grp C Subgrp 6 requirement | N/A | X | X |
| Electrical Tests[3] | 22 (12) | | Read & Record | N/A | X | X |
| De-cap Internal Visual | 6 (6) | MIL-STD-750 Meth 2075 | Decap devices | X | X | X |
| Bond Strength | 22 (12) wires or 1 (6) devices | MIL-STD-750 Meth 2037 | use for die shear | X | X | X |
| SEM | 22 (12) | MIL-STD-750, METH 2077 | when specified | X | X | X |
| Die Shear | 11 (6) | MIL-STD-750, METH 2017 | use bond pull samples | X | N/A | N/A |
| Subgroup 4[4] | | | | | | |
| Intermittent Operating Life | 22 (12) | MIL-STD-750 Meth 1037, 2000 cycles | submit to 6000 cycles to satisfy Grp C Subgrp 6 requirement | X | N/A | N/A |
| Electrical Tests | 22 (12) | | Read & Record satisfy w/Grp C Subgrp 6 | X | N/A | N/A |
| Subgroup 5[4] | | | | | | |
| Accelerated Steady State Life | 22 (12) | MIL-STD-750, Meth 1027 *Schottky= Tj max, 240 hrs | t= 96 hrs, Ta= +275° C Vr=__V(pk), Io=__mA, f=__Hz | X | N/A | N/A |
| Electrical Tests[3] | 22 (12) | | Read & Record | X | N/A | N/A |
| Subgroup 6[4] | | | | | | |
| Thermal Resistance | 22 (8) | MIL-STD-750 Meth 408 (Meth 3101 option JANS) | Read & Record | X | X | X |
| High Temp Life (Non-operating) | 22 (12) | MIL-STD-750 Meth 1032 | t= 340 hrs, Ta= T STG(MAX) | N/A | X | X |
| Electrical Tests[3] | 22 (12) | | Read & Record | N/A | X | X |

Notes:
1 - Small lot sample size defined in parentheses ( ). Inspection lot quantity shall not exceed 2,500 pcs for JANTX & JANTXV
Group A small lot sampling; inspection lot quantity shall not exceed 1,000 pcs for JANS Group A small lot sampling.
Group B small lot sampling: inspection lot quantity shall not exceed 1,000 pcs for JANS Group B small lot sampling.
2 - Electrical test parameters shall be defined by product type and specific requirements; test limits at temperature may vary from those published in this catalog.
3 - Endpoint electricals tests parameters shall be defined by product type and specific requirements.
4 - Test sequence may differ according to JAN screening level.

## Table 6 - MIL-PRF-19500 Group C Conformance Inspection (all levels)

| Group C Inspection | Sample size[1,2] | Conditions | Comments |
|---|---|---|---|
| Subgroup 1 | | | |
| Physical Dimensions | 15 (6) | MIL-STD-750, Meth 2066 | |
| Subgroup 2 | | | |
| Thermal Shock | 22 (6) | MIL-STD-750 Meth 1056, Cond A | glass axial lead only |
| Terminal Strength | 22 (6) | MIL-STD-750 Meth 2036, Cond E | leaded packages only, w=___oz, t=___sec |
| Fine Leak | 22 (6) | MIL-STD-750 Meth 1071, Cond H | 5x10-8 atm cc3/s max |
| Gross Leak | 22 (6) | MIL-STD-750 Meth 1071, Cond C | |
| Moisture Resistance | 22 (6) | MIL-STD-750, Meth 1021 | Omit initial conditioning |
| End-point Electricals[2] | 22 (6) | | Read & Record |
| Subgroup 3 | | | |
| Shock | 22 (6) | MIL-STD-750 Meth 2016 | Non-operating, 1500G, 0.5ms, 5 blows X1, Y1, Z1 |
| Variable Frequency | 22 (6) | MIL-STD-750 Meth 2056 | |
| Acceleration | 22 (6) | MIL-STD-750 Meth 2006 | 1 minute min, 20K G X1, Y1, Z1 |
| End-point Electricals[2] | 22 (6) | | Read & Record |
| Subgroup 4 | | | |
| Salt Atmosphere | 15 (6) | MIL-STD-750, Meth 1041 | Electrical rejects may be used |
| Subgroup 5 | | | |
| Thermal Resistance | 15 (6) | MIL-STD-750, Meth 4081 | Read & Record |
| Subgroup 6 | | | |
| Intermittent Operating Life | 22 (12) | MIL-STD-750, Meth 1037 6000 cycles | Units from Group B-2000 cycle test may be used to complete the 6000 cycles |
| End-point Electricals[2] | 22 (12) | | Read & Record |
| Bond Strength | 11 wires | MIL-STD-750 Meth 2037 | Only when Group B units continue to satisfy Group C requirement, Read & Record |
| Subgroup 7 | | | |
| Internal Water Vapor | 3 | MIL-STD-750, Meth 1018 | 3 devices c= 0 or 5 devices c= 1 |

Notes:
1 - Small lot sample size defined in parentheses ( ). Inspection lot quantity shall not exceed 2,500 pcs for JANTX & JANTXV Group A small lot sampling; inspection lot quantity shall not exceed 1,000 pcs for JANS Group A small lot sampling.
2 - Electrical test parameters shall be defined by product type and specific requirements; test limits at temperature may vary from those published in this catalog.

# Warranty / Ordering

### Orders

Orders may be placed with your local sales representative or directly with our sales team at:

Aeroflex / Metelics, Inc.
East Coast Operations
54 Grenier Field Road
Londonderry, NH 03053
Tel: (603) 641-3800
Fax: (603) 641-3500

**Sales: (888) 641-SEMI (7364)**
**Email: metelics-sales@aeroflex.com**

Aeroflex / Metelics, Inc.
West Coast Operations
975 Stewart Drive
Sunnyvale, CA 94085
Tel: (408)737-8181
Fax: (408) 733-7645

### Price and Delivery Information

The price and delivery of any items listed in this catalog ordered directly from the factory are quoted in U.S. Dollars, F.O.B. factory origin and are subject to change without notice. All quoted prices are exclusive of any federal, state or local taxes, and are the sole responsibility of the buyer. Terms are NET 30 days if credit has been established. Foreign payments and terms are arranged on an individual basis.

### Warranty

Aeroflex / Metelics warrants their products to be free of defects in material and workmanship for one year from the date of original shipment. Our obligation at Metelics is limited to repair, replace, or credit. This warranty shall not apply to any products which have been subjected to accident, misuse, improper installation, alteration or abuse. Metelics shall have the final determination in regard to the cause and existence of any defect under warranty.

### Applications

If you should have any application questions related to the products outlined in this catalog please contact our engineering staff. We gladly offer consultations on circuit design or application problems. We also offer special product design.

### Returned Material

When returning material for repair or replacement, it is necessary to first contact the factory for an approval and authorization number. Complete information must be included with the return shipment stating reason for return, purchase order on which the product was originally purchased, new purchase order if applicable, and address where material is to be returned.

### Specifications

Aeroflex / Metelics reserves the right to discontinue products and change specifications without notice.

### Federal Supply Code

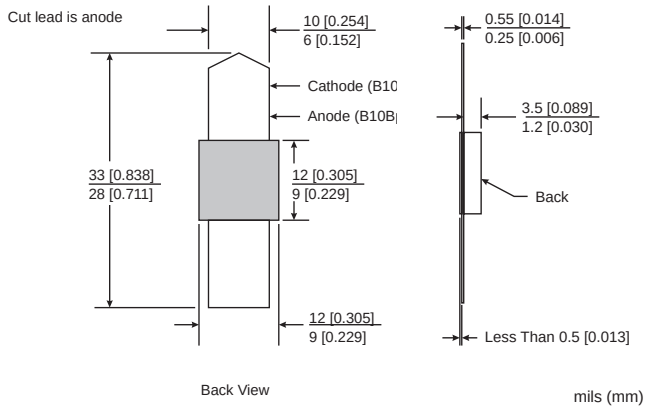
Aeroflex / Metelics, Inc. Federal Supply Code for for manufactures assigned number is:

61322 Londonderry
59365 Sunnyvale

# Outline Drawings

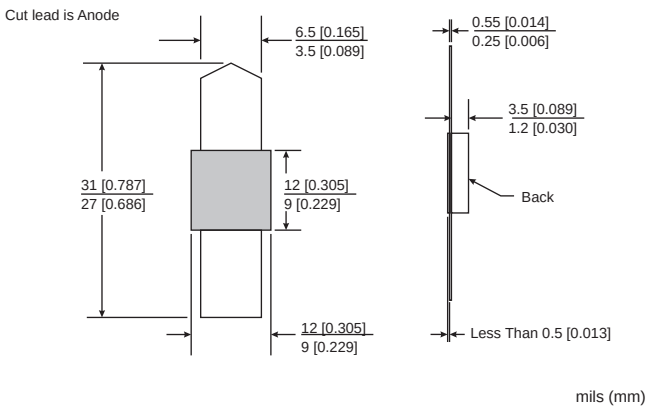
## Beam Lead

### B10B



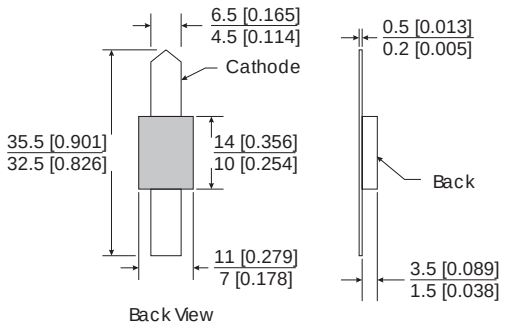

mils (mm)

### B10D




mils (mm)

### B11




mils (mm)

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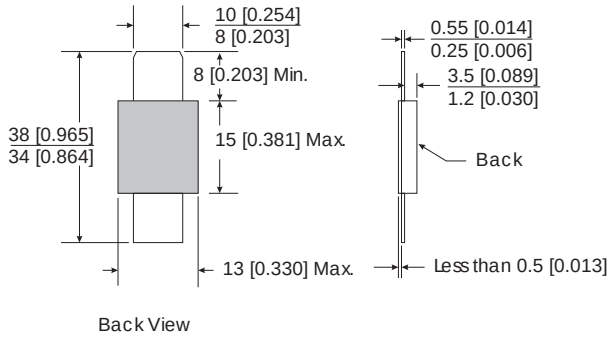


mils (mm)

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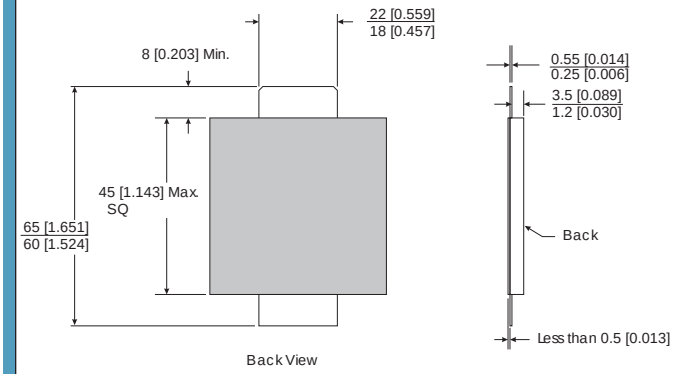


mils (mm)

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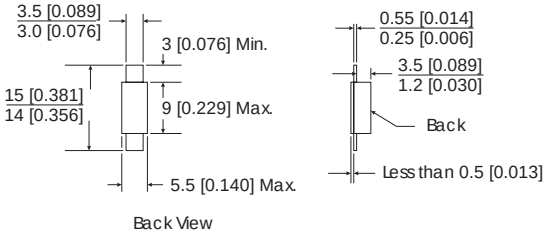
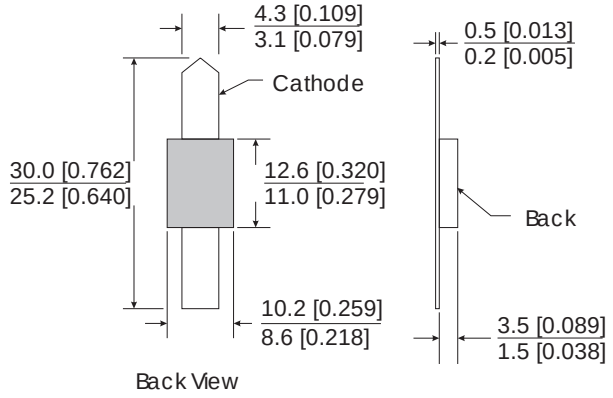



mils (mm)

# Outline Drawings

## Beam Lead

### B15




mils (mm)

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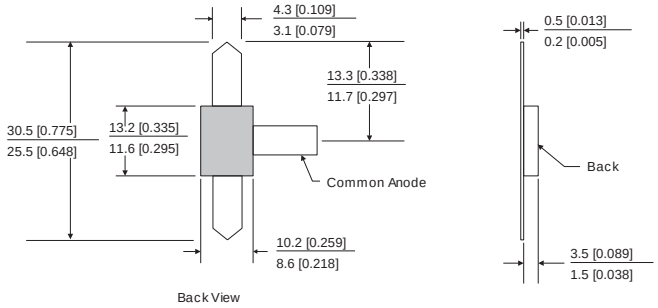


mils (mm)

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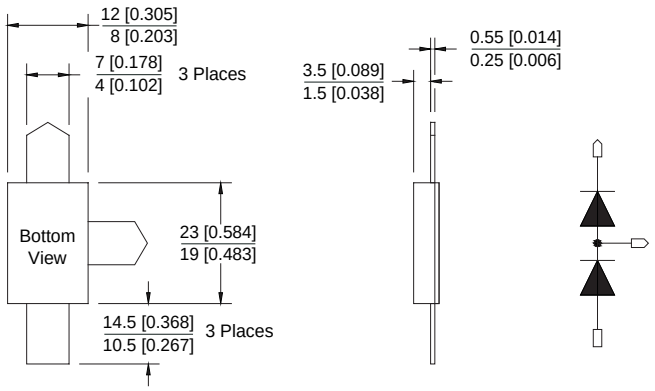


mils (mm)

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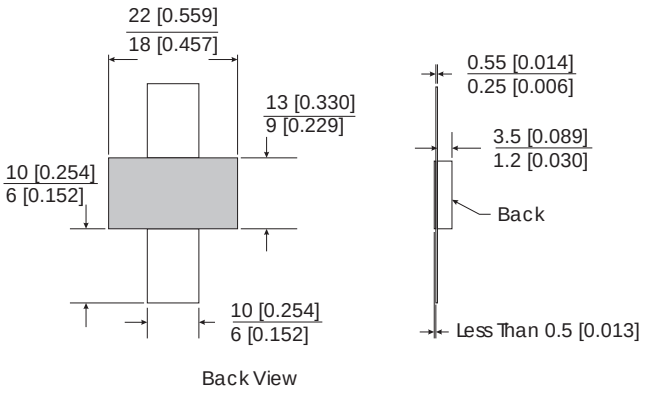


mils (mm)

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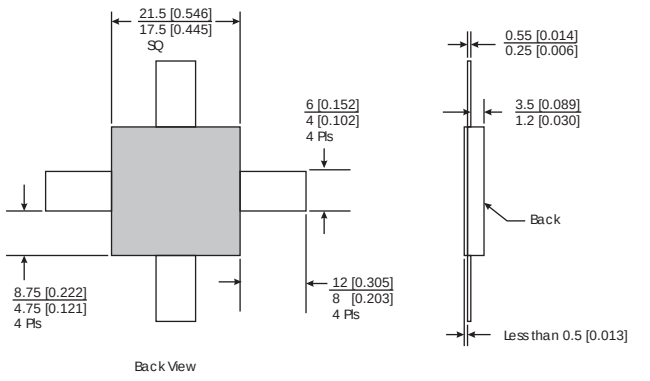


mils (mm)

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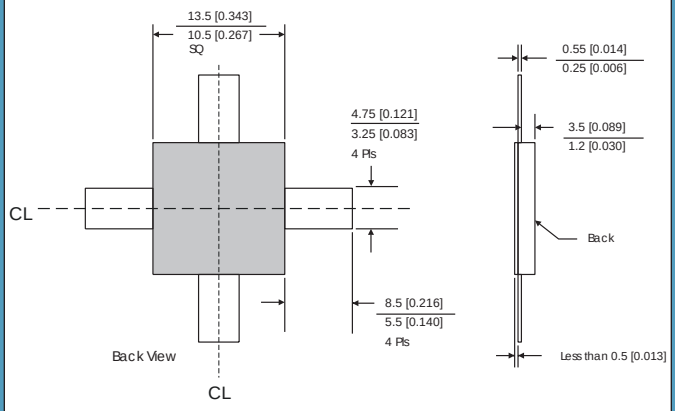
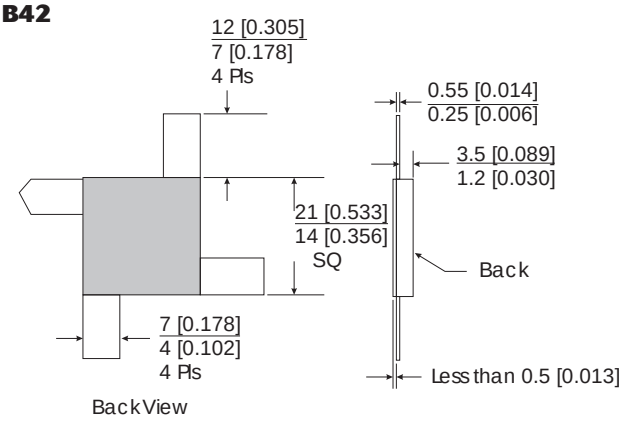



mils (mm)

# Outline Drawings

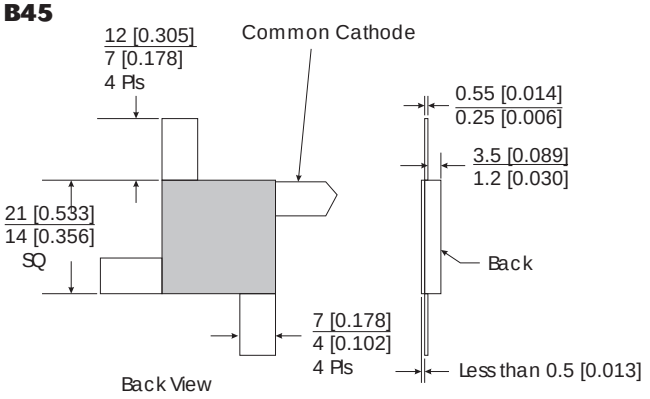
## Beam Lead

### B42




mils (mm)

### B45




mils (mm)

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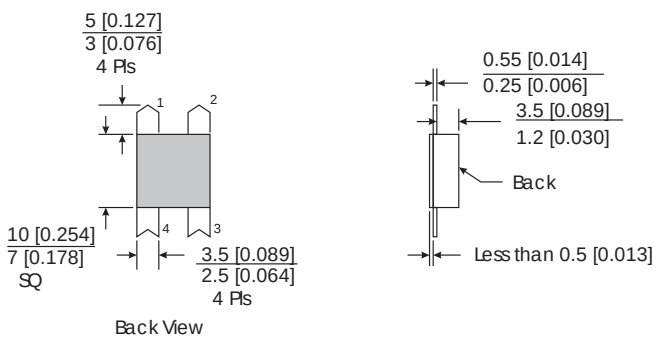


mils (mm)

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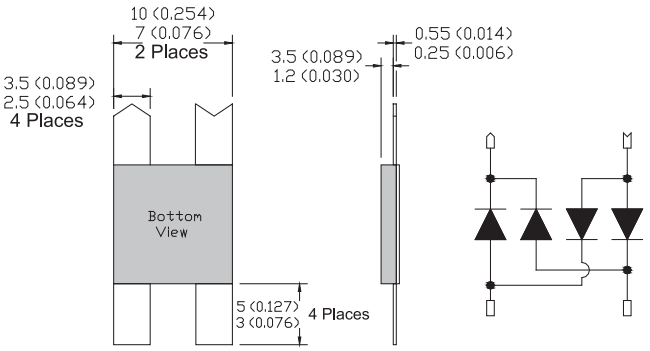


mils (mm)

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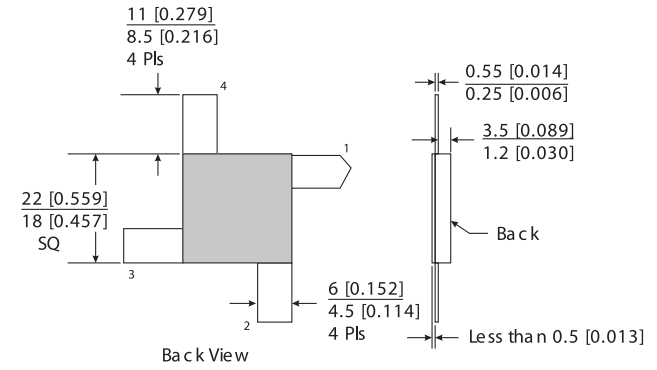


mils (mm)

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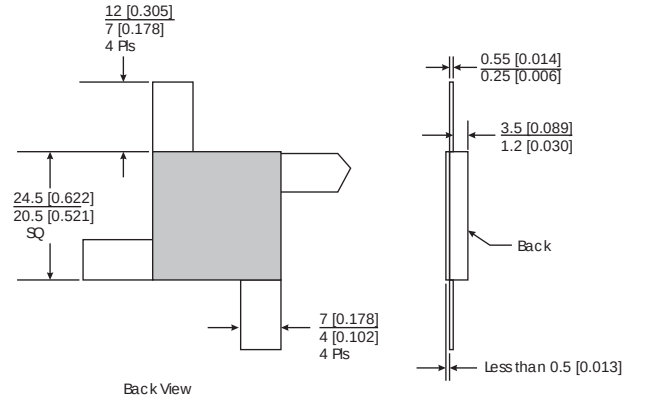


mils (mm)

# Outline Drawings

## Beam Lead

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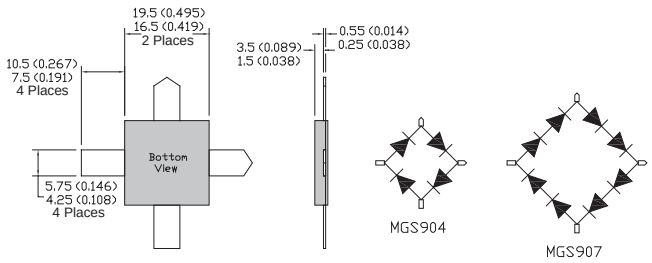


mils (mm)

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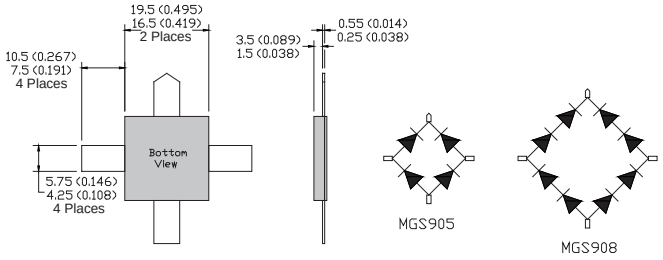


mils (mm)

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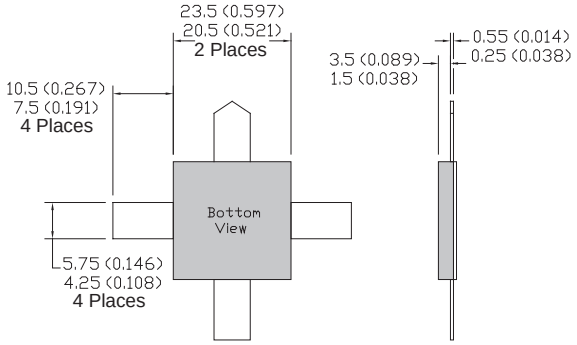


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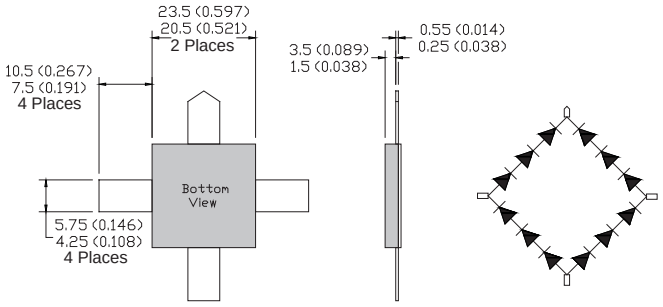


mils (mm)

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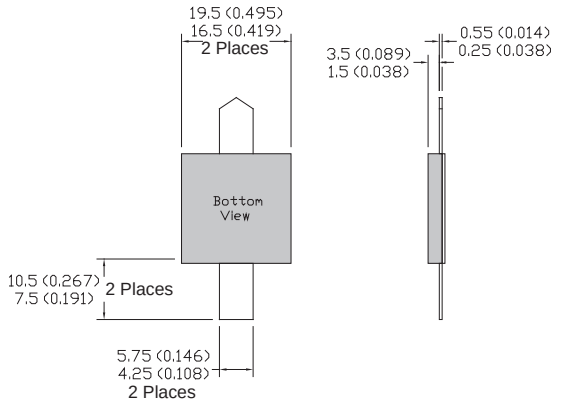


mils (mm)

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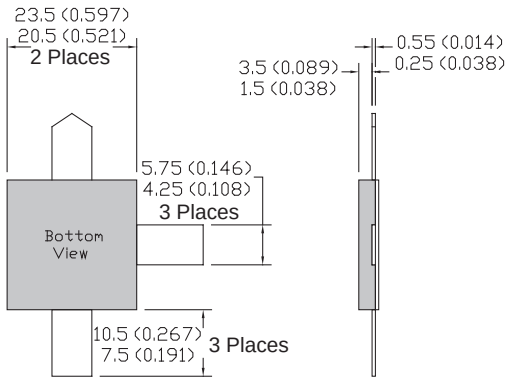
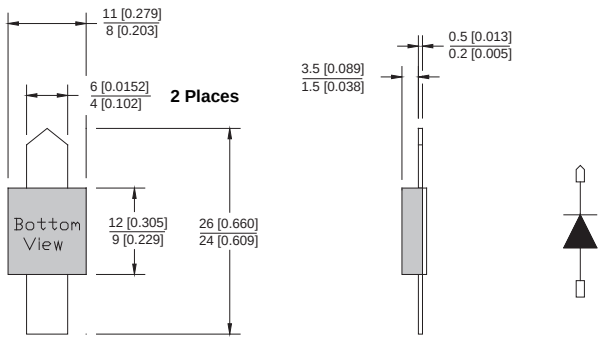



mils (mm)

# Outline Drawings

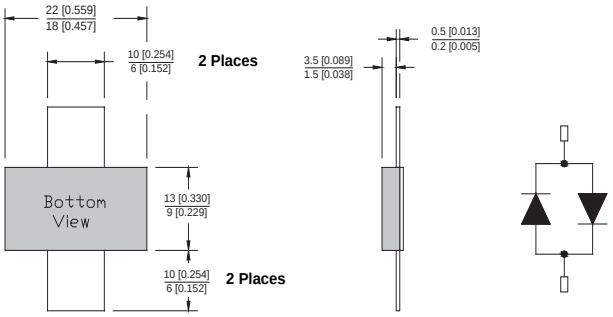
## Beam Lead

### GB110




mils (mm)

### GB210




mils (mm)

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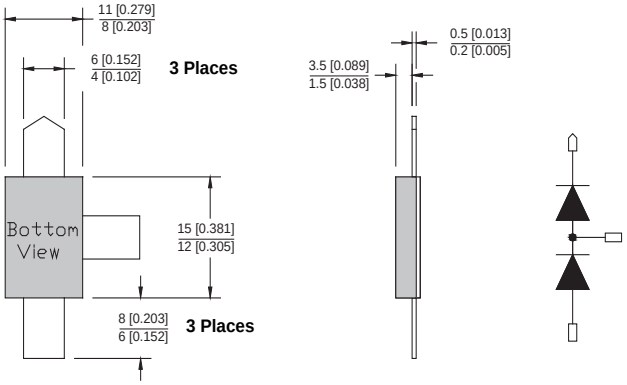
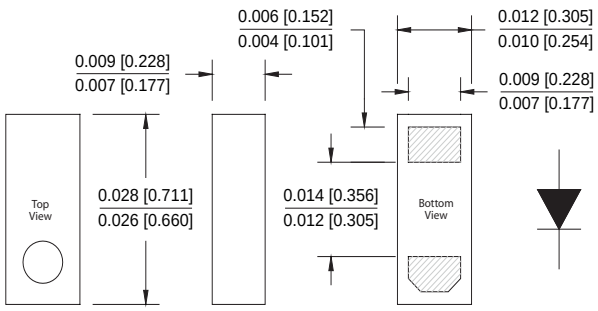



mils (mm)

## Flip Chip

### GC110




inches (mm)

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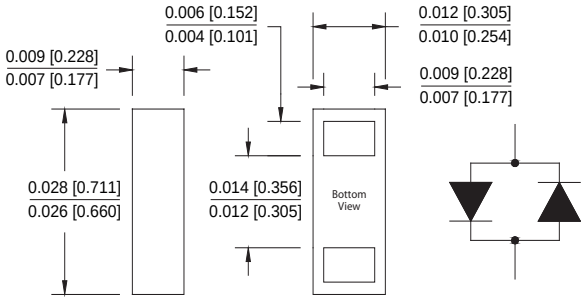


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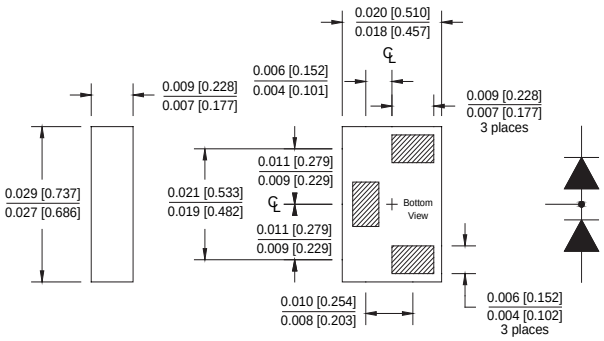
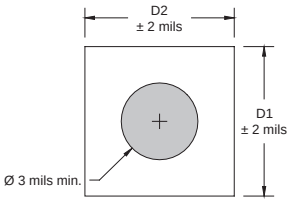



inches (mm)

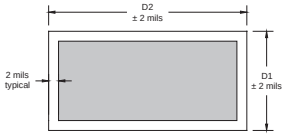
# Outline Drawings

## Bare Die

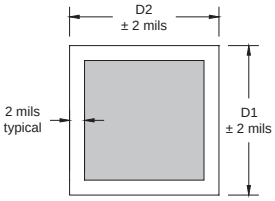
### Fig. 1



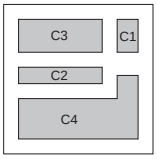

### Fig. 2



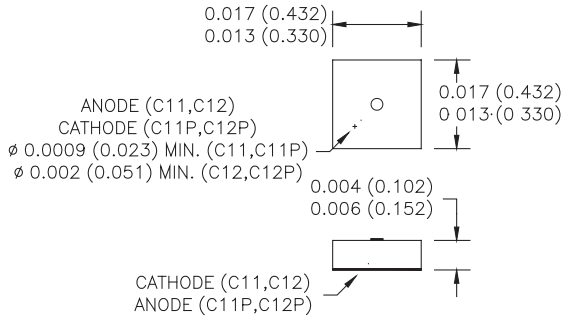

### Fig. 3




### Fig. 4

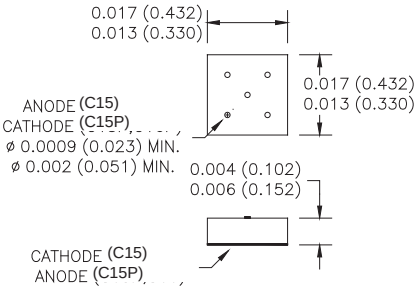



### C11 / C12




inches (mm)

### C15




inches (mm)

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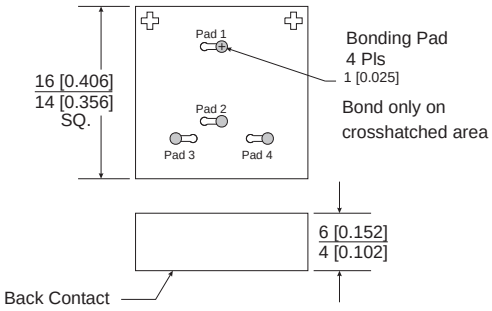
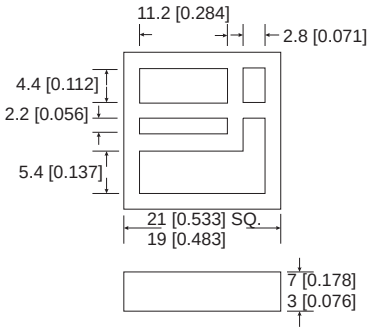


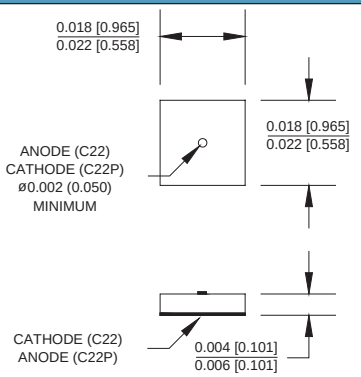

mils (mm)

### C20



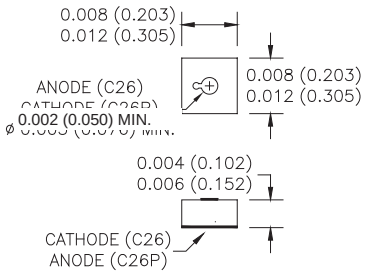

mils (mm)

### C22




inches (mm)

### C26

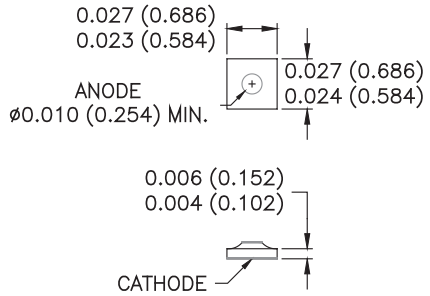



inches (mm)

# Outline Drawings

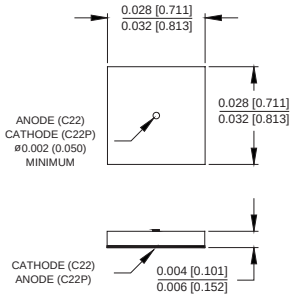
## Bare Die

### C40



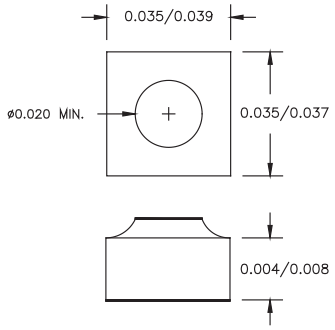

inches (mm)

### C32



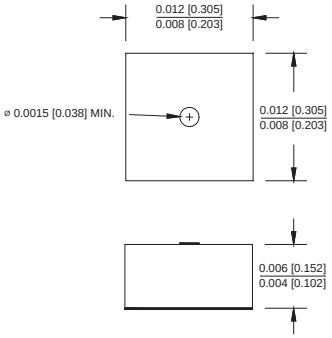

inches (mm)

### C37



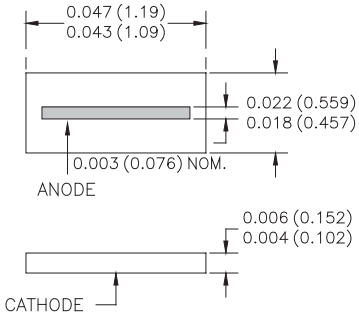

inches (mm)

### C01A



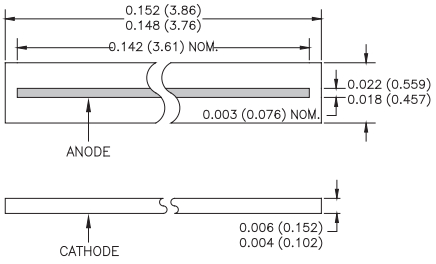

inches (mm)

### C50



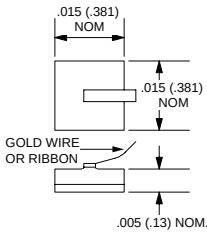

inches (mm)

### C51




inches (mm)

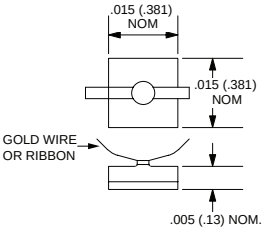
### CS08




NOTES:
1. TOP CONTACT & CHIP SIZE DEPENDS ON DIODE PARAMETERS
2. TOP AND BOTTOM CONTACTS GOLD
3. CONSULT FACTORY

inches (mm)

### CS09



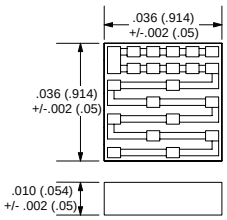

NOTES:
1. TOP CONTACT & CHIP SIZE DEPENDS ON DIODE PARAMETERS
2. TOP AND BOTTOM CONTACTS GOLD
3. CONSULT FACTORY

inches (mm)

# Outline Drawings

## Resistors

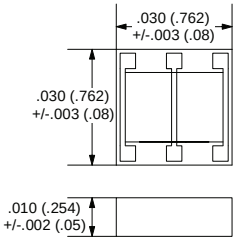
### R1




NOTES:
1. The top gold bonding pads are .004" Square Typ. (.0035 Min and 15000 A thick Min)
2. There is a min separation between the edge of the chip and any top bonding pads of .001"

inches (mm)

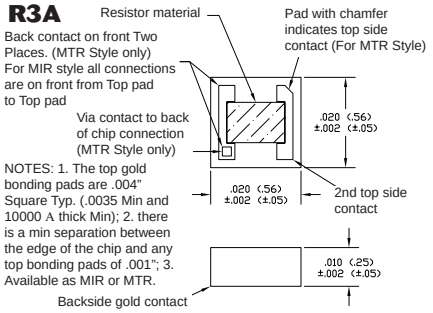
### R2




NOTES:
1. The top gold bonding pads are .004" Square Typ. (.0035 Min and 15000 A thick Min)
2. There is a min separation between the edge of the chip and any top bonding pads of .001"

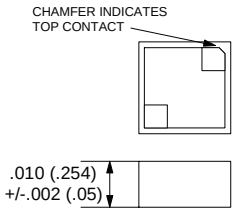
inches (mm)

### R3A




inches (mm)

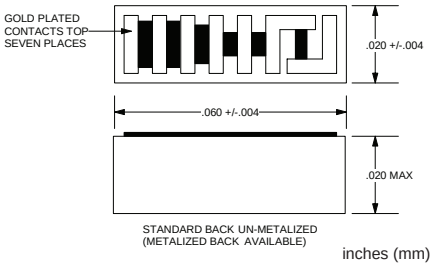
### R3




NOTES:
1. The top gold bonding pads are .004" Square Typ. (.0035 Min and 15000 A thick Min)
2. There is a min separation between the edge of the chip and any top bonding pads of .001"
3. Available as thru-chip

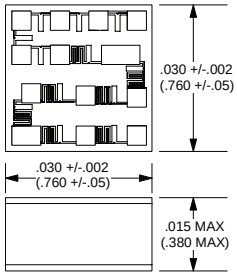
inches (mm)

### R4



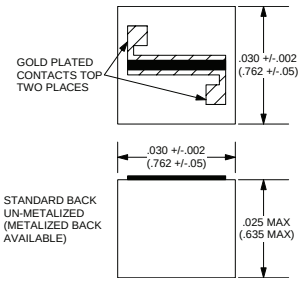

inches (mm)

### R5



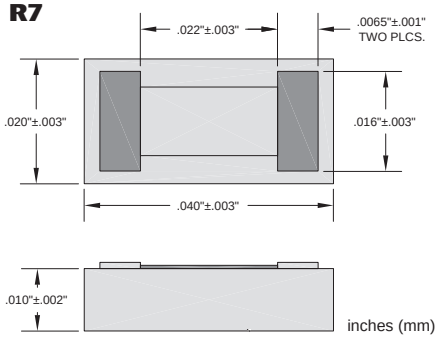

inches (mm)

### R6



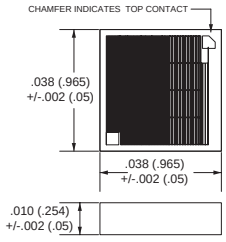

inches (mm)

### R7




inches (mm)

### R8



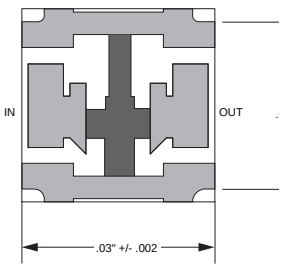

NOTES:
1. The top gold bonding pads are .004" Square Typ. (.0035 Min and 15000 A thick Min)
2. There is a min separation between the edge of the chip and any top bonding pads of .001"
3. Available as thru-chip

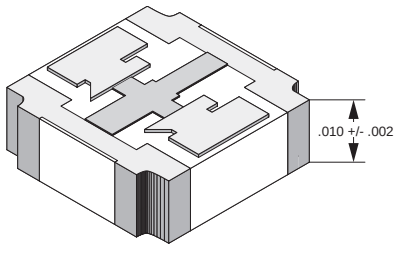
inches (mm)

## Attenuator Pad

### CS07

Front to Back Metallization in Four Places Bonding Pad Sizes and Resistor Outline may differ from value to value



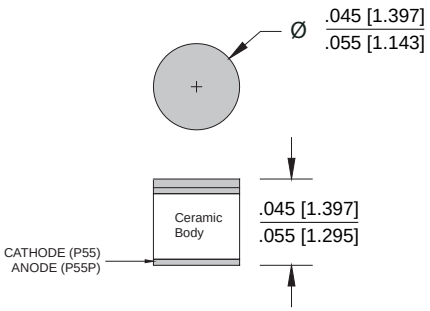




Front to Back Metallization in Four Places

# Outline Drawings

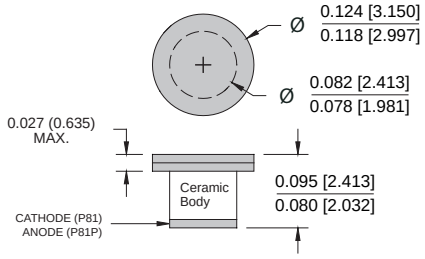
## Ceramic Microwave Pill (Hermetic)

### P55 / P55p



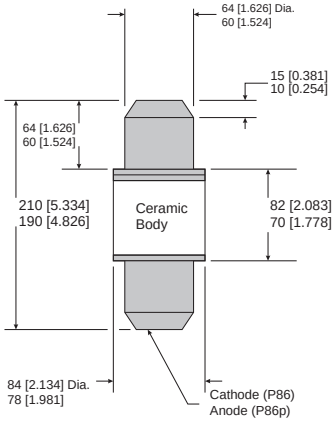

inches (mm)

### P81 / P81p



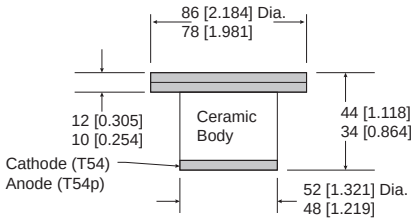

inches (mm)

### P86 / P86p



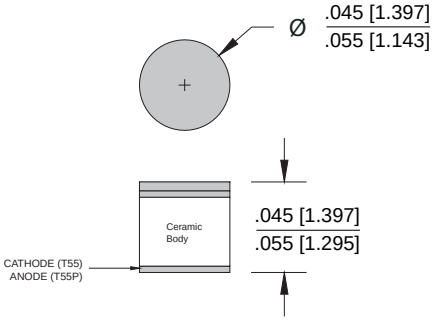

mils (mm)

### T54 / T54p



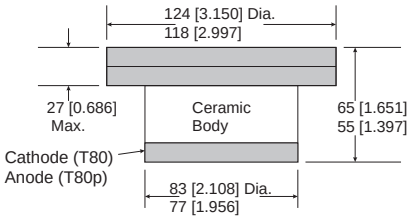

mils (mm)

### T55 / T55p



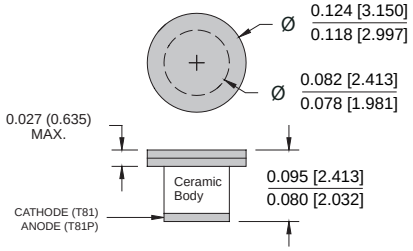

inches (mm)

### T80 / T80p



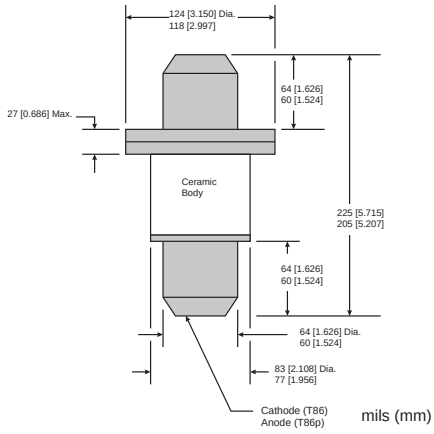

mils (mm)

### T81 / T81p



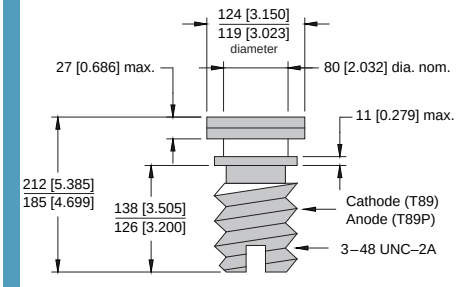

inches (mm)

### T86 / T86p




mils (mm)

### T89 / T89p

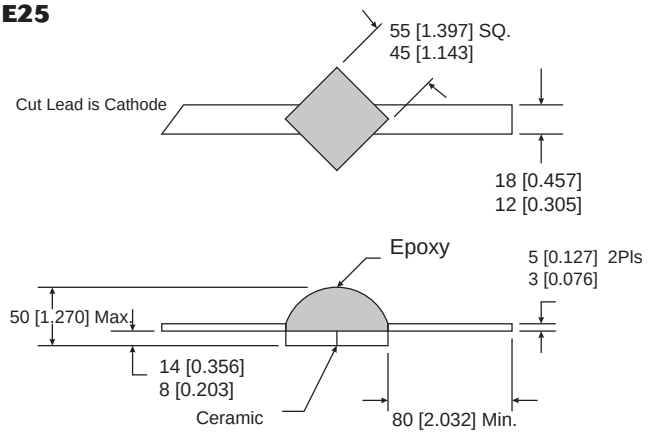



mils (mm)

# Outline Drawings

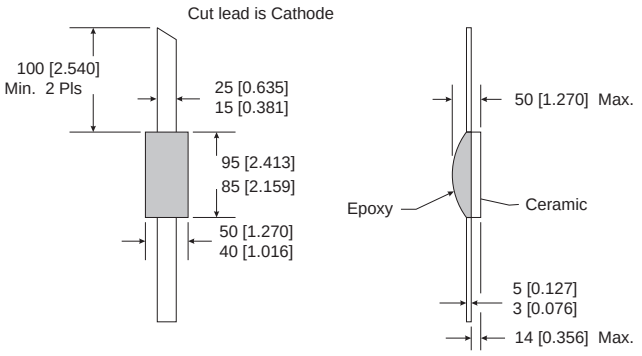
## Ceramic Epoxy SMT

### E25



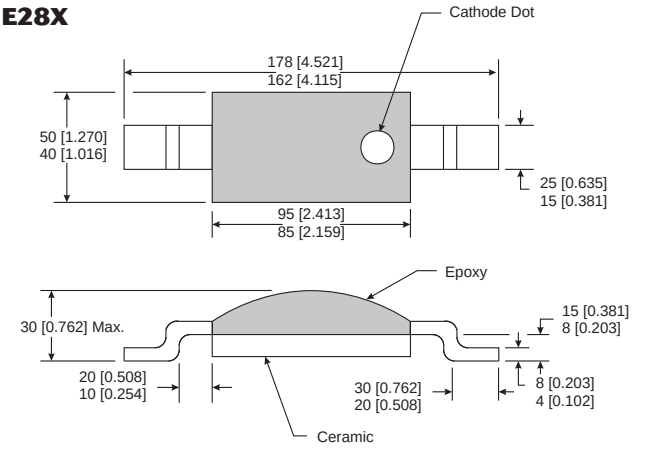

mils (mm)

### E28



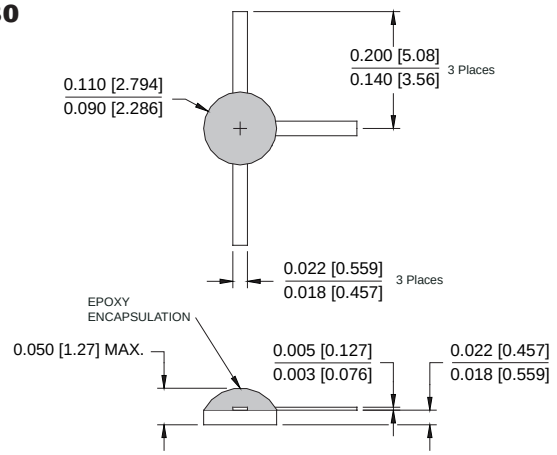

mils (mm)

### E28X



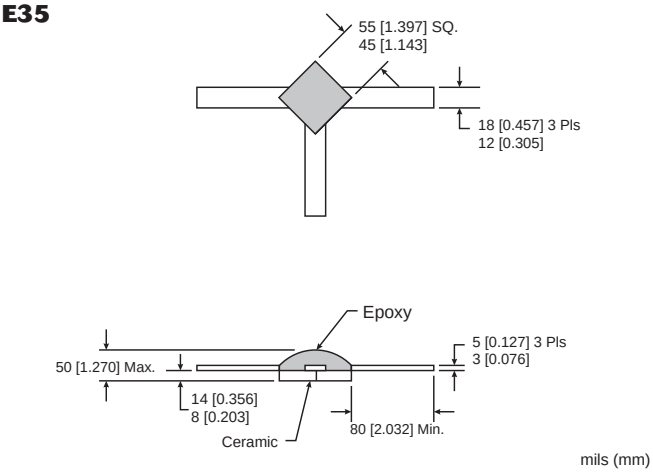

mils (mm)

### E30



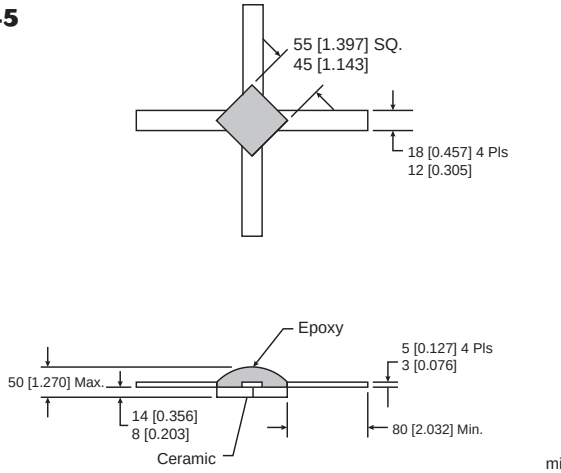

inches (mm)

### E35




mils (mm)

### E45

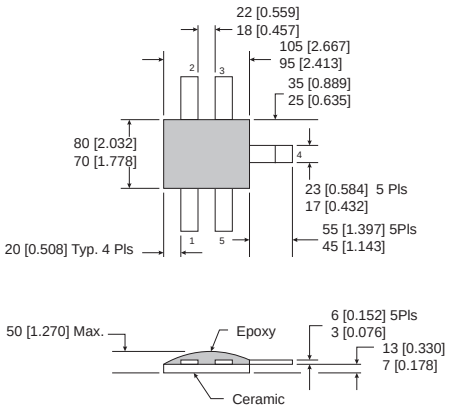



mils (mm)

# Outline Drawings

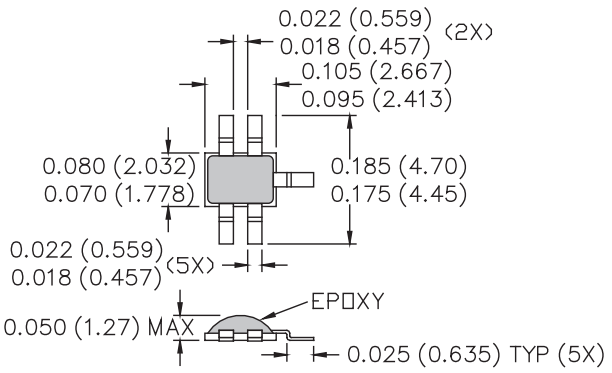
## Ceramic Epoxy SMT

### E50



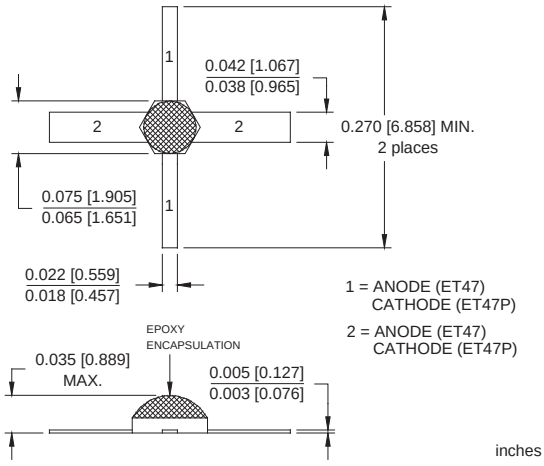

mils (mm)

### E50SM



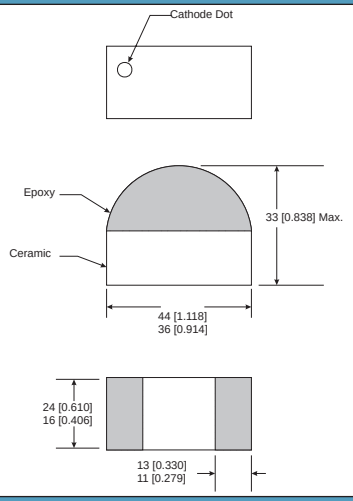

inches (mm)

### ET47



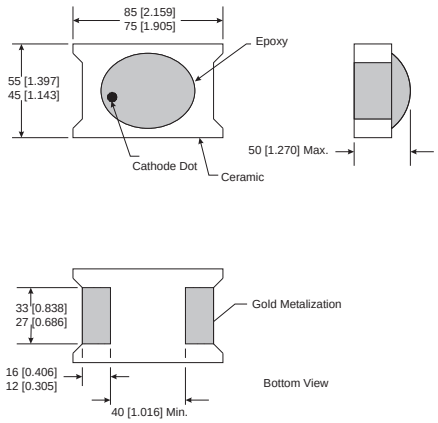

inches (mm)

### 0402



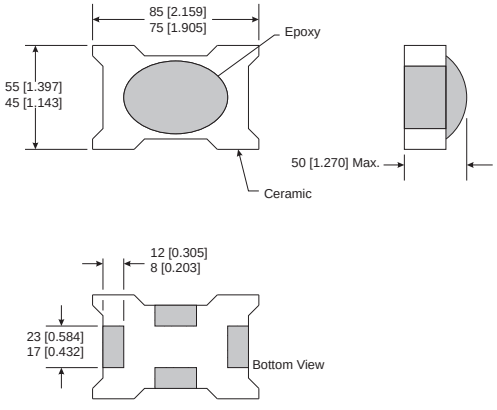

mils (mm)

### 0805-2




mils (mm)

### 0805-4

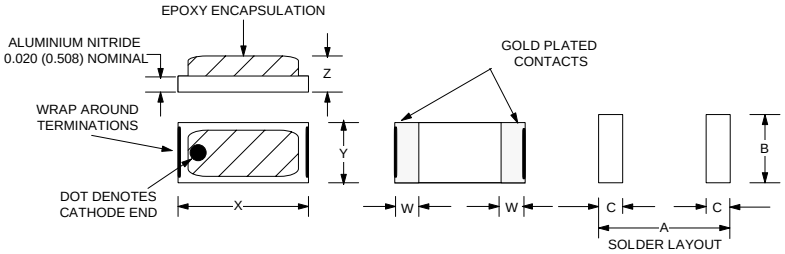



mils (mm)

# Outline Drawings

## Ceramic Epoxy SMT

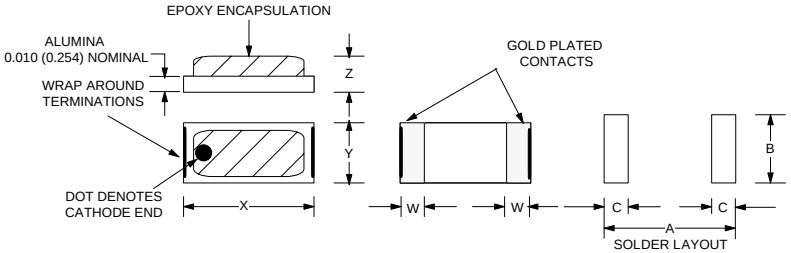
### CS16




| PKG STYLE | DIMENSIONS | | | | SOLDER LAYOUT (TYP.) | | | PACKAGE CP AND LP |
|---|---|---|---|---|---|---|---|---|
| | W DIM. | X DIM. | Y DIM. | Z DIM. | A | B | C | |
| CS16-1 | .012 (.304) | .060 (1.52) | .040 (1.01) | .050 (1.27) | .072 (1.83) | .040 (1.01) | .020 (.508) | .09 pF .35 nH |
| CS16-2 | .012 (.304) | .075 (1.91) | .050 (1.27) | .050 (1.27) | .087 (2.21) | .070 (1.78) | .020 (.508) | .11 pF .4 nH |
| CS16-3 | .012 (.304) | .100 (2.54) | .050 (1.27) | .050 (1.27) | .112 (2.84) | .070 (1.78) | .020 (.508) | .14 pF .4 nH |
| CS16-4 | .012 (.304) | .120 (3.05) | .060 (1.52) | .050 (1.27) | .132 (3.35) | .080 (2.03) | .020 (.508) | .09 pF .4 nH |
| CS16-5 | .012 (.304) | .200 (5.08) | .100 (2.54) | .050 (1.27) | .212 (5.38) | .120 (3.05) | .020 (.508) | .09 pF .5 nH |
| CS16-6 | .010 (.254) | .040 (1.01) | .020 (.508) | .050 (1.27) | .050 (1.27) | .030 (.762) | .018 (.457) | .06 pF .35 nH |
| CS16-7 | .010 (.254) | .060 (1.52) | .020 (.508) | .050 (1.27) | .070 (1.78) | .030 (.762) | .018 (.457) | .08 pF .35 nH |
| TOL. ± | .002 (.051) | .003 (.076) | .003 (.076) | MAX | NOM. | NOM. | NOM. | NOM. |

inches (mm)

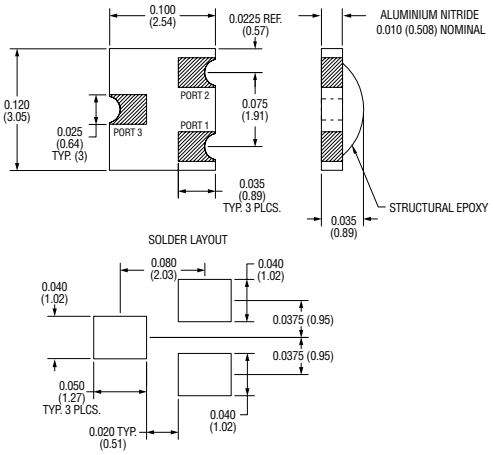
### CS19




| PKG STYLE | DIMENSIONS | | | | SOLDER LAYOUT (TYP.) | | | PACKAGE CP AND LP |
|---|---|---|---|---|---|---|---|---|
| | W DIM. | X DIM. | Y DIM. | Z DIM. | A | B | C | |
| CS19-1 | .012 (.304) | .060 (1.52) | .040 (1.01) | .030 (.762) | .072 (1.83) | .040 (1.01) | .020 (.508) | .09 pF .35 nH |
| CS19-2 | .012 (.304) | .075 (1.91) | .050 (1.27) | .035 (.889) | .087 (2.21) | .070 (1.78) | .020 (.508) | .11 pF .4 nH |
| CS19-3 | .012 (.304) | .100 (2.54) | .050 (1.27) | .035 (.889) | .112 (2.84) | .070 (1.78) | .020 (.508) | .14 pF .4 nH |
| CS19-4 | .012 (.304) | .120 (3.05) | .060 (1.52) | .035 (.889) | .132 (3.35) | .080 (2.03) | .020 (.508) | .09 pF .4 nH |
| CS19-5 | .012 (.304) | .200 (5.08) | .100 (2.54) | .035 (.889) | .212 (5.38) | .120 (3.05) | .020 (.508) | .09 pF .5 nH |
| CS19-6 | .010 (.254) | .040 (1.01) | .020 (.508) | .030 (.762) | .050 (1.27) | .030 (.762) | .018 (.457) | .06 pF .35 nH |
| CS19-7 | .010 (.254) | .060 (1.52) | .020 (.508) | .030 (.762) | .070 (1.78) | .030 (.762) | .018 (.457) | .08 pF .35 nH |
| TOL. ± | .002 (.051) | .003 (.076) | .003 (.076) | MAX | NOM. | NOM. | NOM. | NOM. |

inches (mm)

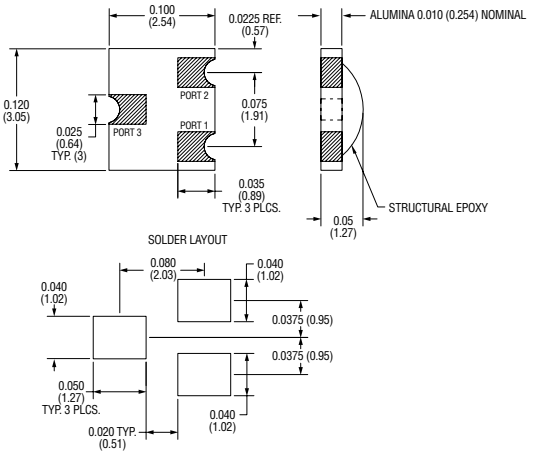
### CS23




See SOT 23 Configuration Code on page 113

inches (mm)

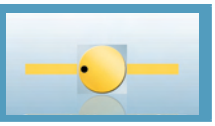
### CS223



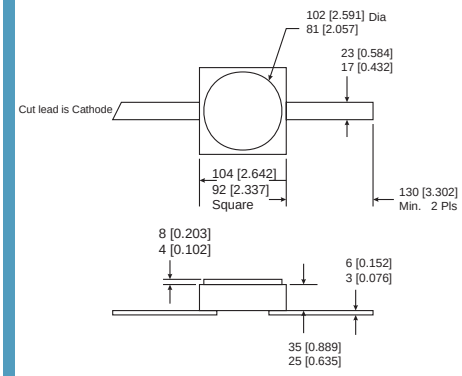

inches (mm)

# Outline Drawings

## Ceramic Hermetic SMT

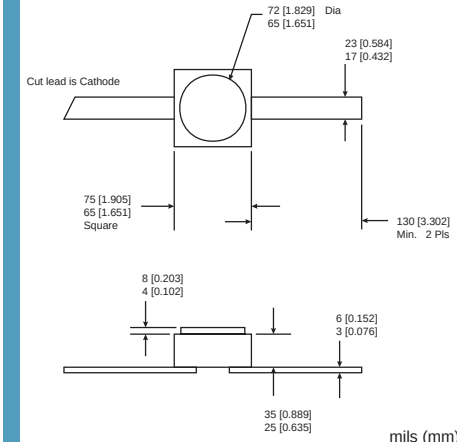


### H20



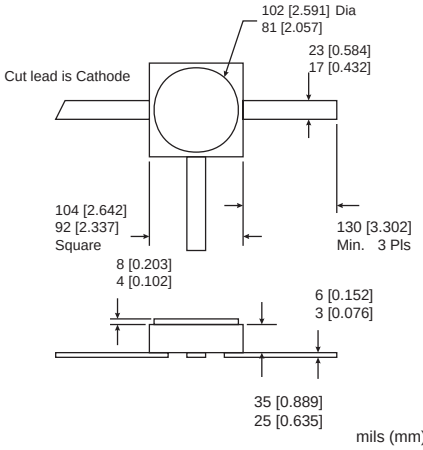

mils (mm)

### H27



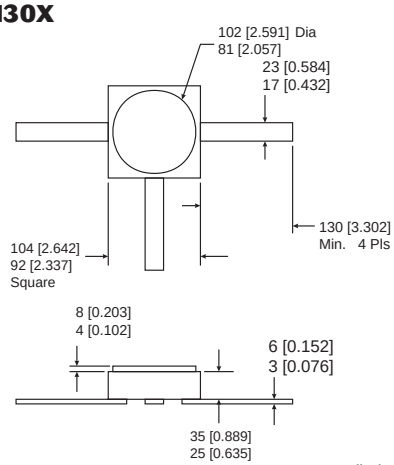

mils (mm)

### H30



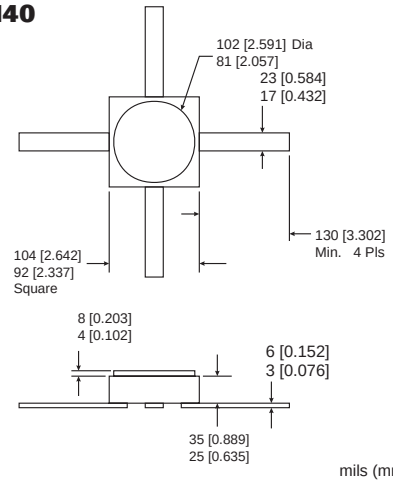

mils (mm)

### H30X



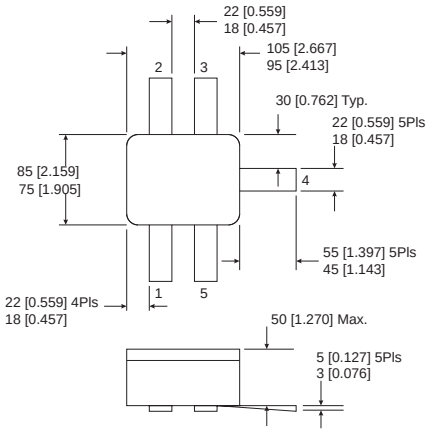

mils (mm)

### H40




mils (mm)

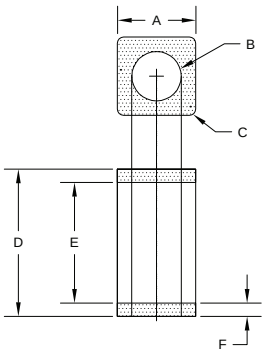
### H50




mils (mm)

## Ceramic MELF

### CS127



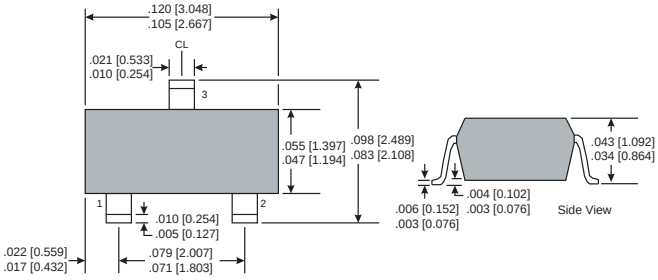

| DIMENSIONS IN MILS | | | | | | |
|---|---|---|---|---|---|---|
| CS | A | B | C | D | E | F |
| 127-1 | .080"+.004 -.002 | Ø .050" ±.002 | R.003/.005 | .112"+.003 -.002 | .096"MIN | .008"/.025 TYP. |
| 127-2 | .080"+.004 -.002 | Ø .050" ±.002 | R.003/.007 | .158"+.003 -.002 | .142"MIN | .008"/.025 TYP. |
| 127-3 | .100"+.006 -.004 | Ø .063" ±.002 | R.003/.012 | .188"+.003 -.004 | .155"MIN | .017"/.008 TYP. |
| 127-4 | .143"+.005 -.004 | Ø .097" ±.002 | R.003/.012 | .181"+.003 -.002 | .165"MIN | .025"/.008 TYP. |

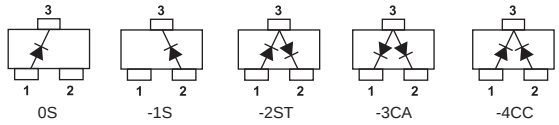
inches (mm)

# Outline Drawings

## Plastic SMT

### SOT23

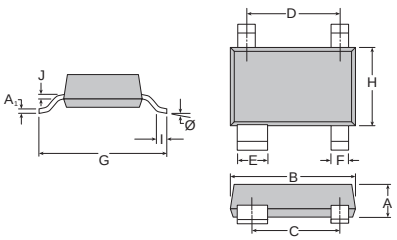


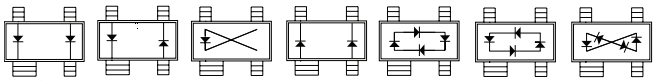




inches (mm)

### SOT143

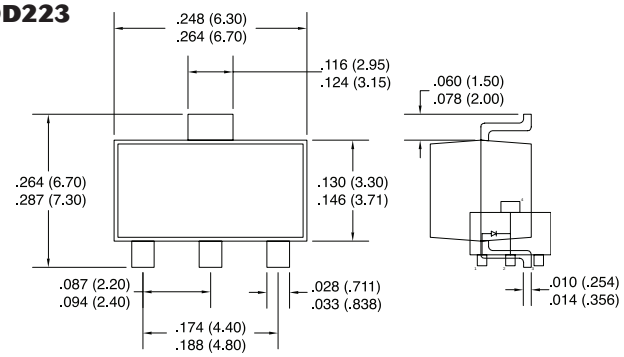
| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.79 | 1.02 | 0.031 | 0.040 |
| $A_1$ | 0.02 | 0.10 | 0.001 | 0.004 |
| B | 2.67 | 3.05 | 0.105 | 0.120 |
| C | 1.78 | 2.03 | 0.070 | 0.080 |
| D | 1.80 | 2.00 | 0.071 | 0.079 |
| E | 0.77 | 0.94 | 0.030 | 0.037 |
| F | 0.38 | 0.54 | 0.015 | 0.021 |
| G | 2.10 | 2.50 | 0.083 | 0.098 |
| H | 1.20 | 1.40 | 0.047 | 0.065 |
| I | 0.13 | 0.25 | 0.005 | 0.010 |
| J | 0.89 | 0.15 | 0.0035 | 0.0059 |
| Ø | 0.0 | 8.0 | 0.0 | 0.8 |



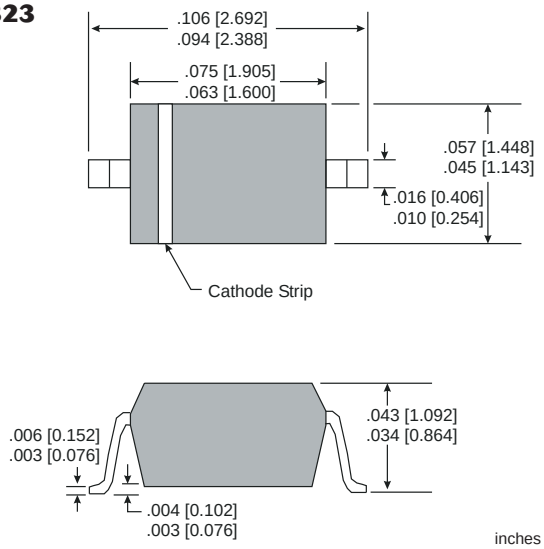

inches (mm)

### SOD223




inches (mm)

### SOD323

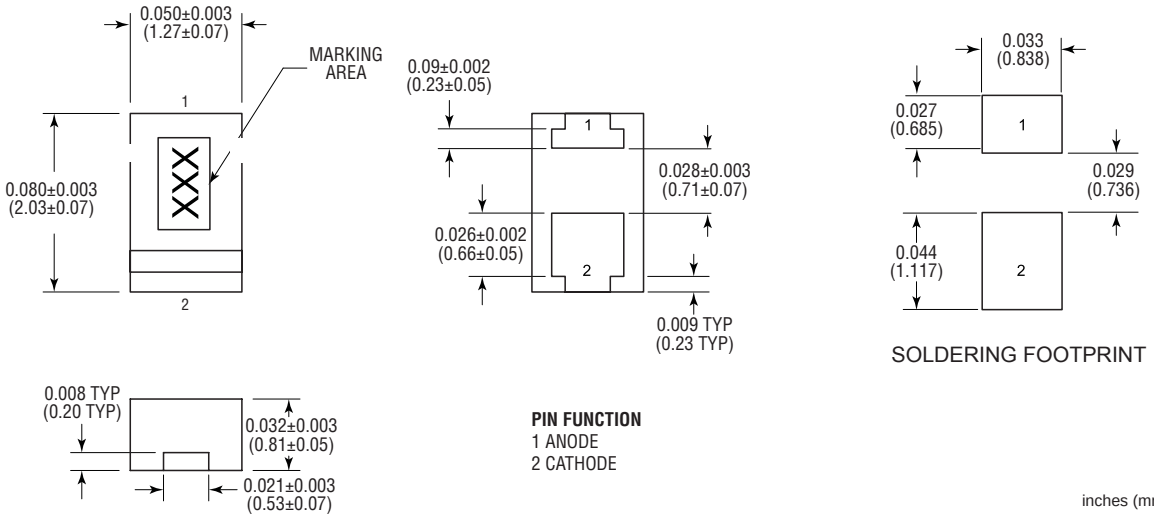



inches (mm)

# Outline Drawings

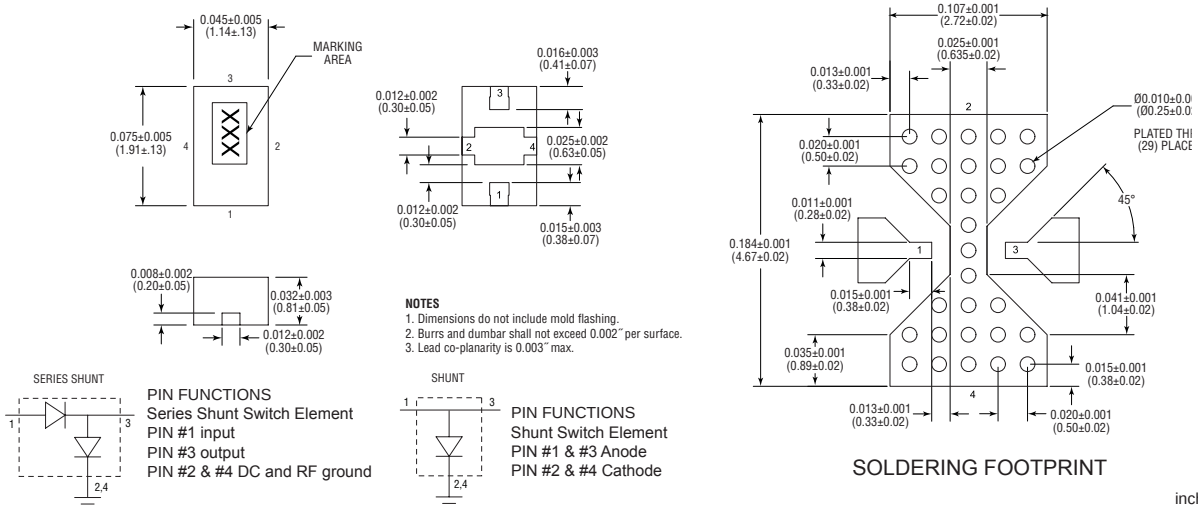
## Plastic SMT

### 0805P



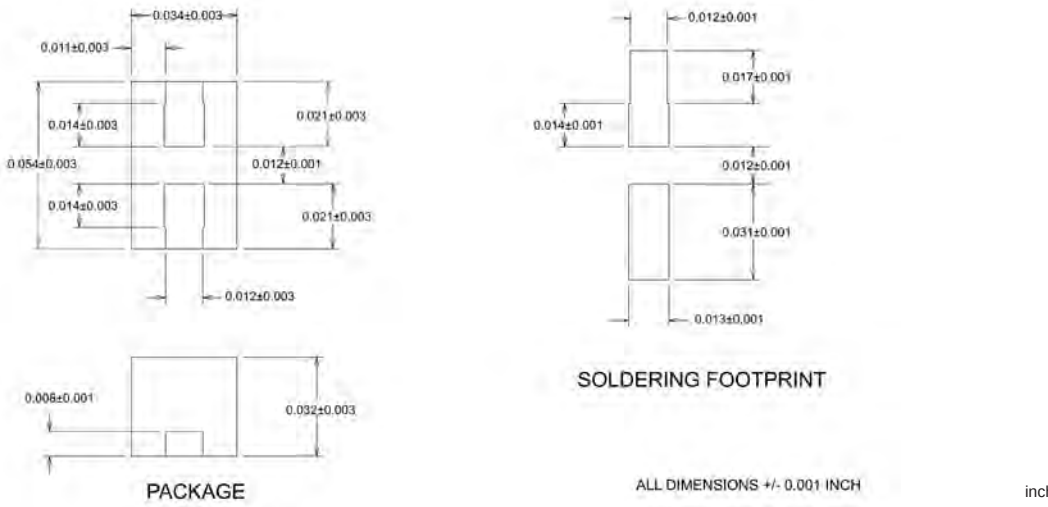

inches (mm)

### 2012




inches (mm)

### 0503

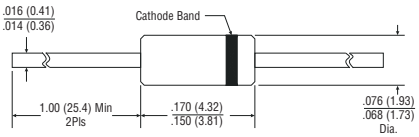



inches (mm)

# Outline Drawings

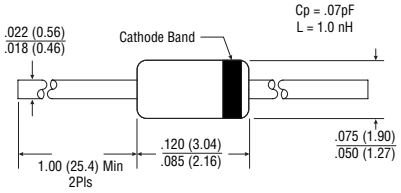
## Glass Axial Leaded

### A15
(hermetic)



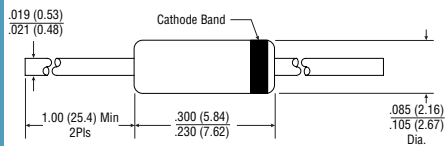

inches (mm)

### CS65




inches (mm)

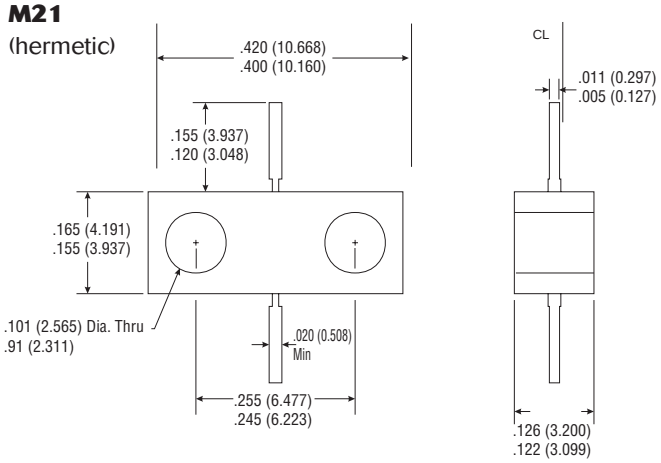
### CS85




inches (mm)

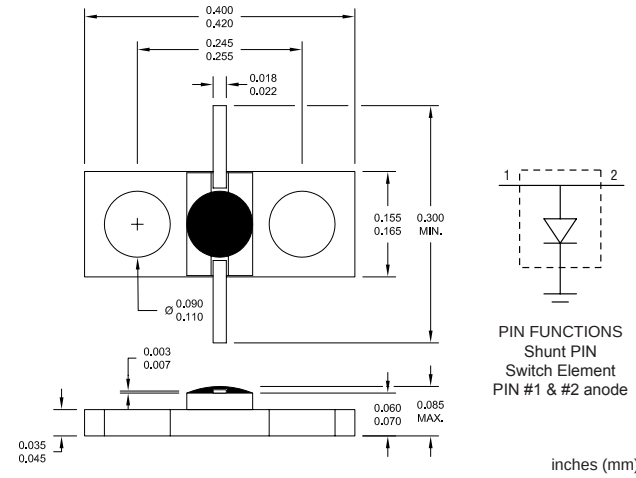
## Specialty

### M21
(hermetic)



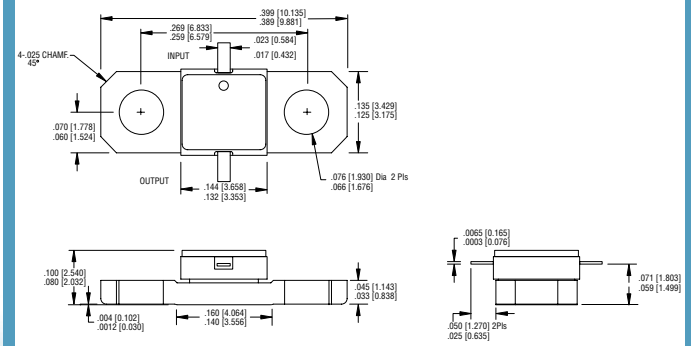

inches (mm)

### CM22



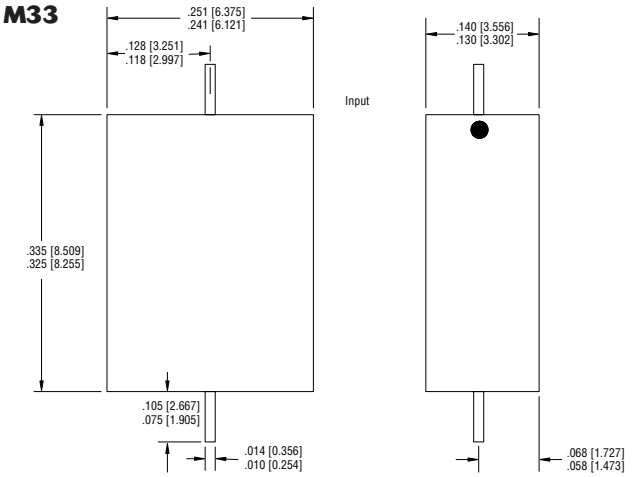

inches (mm)

### M23




inches (mm)

### M33




inches (mm)

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# Package Number Cross Reference

| Metelics | Device Description | Micrometrics |
|---|---|---|
| B 10B | Single Junction, Si, BL Schottky | CS12 |
| B 10Bp | "P" Type Single J, Si, BL Schottky | CS12 |
| B 10D | Zero Bias, Single J, Si, BL Schottky | CS12 |
| B 11 | Beam Lead PIN & SRD | CS12 |
| B 12 | Beam Lead Capacitor | CS14-1 |
| B 13 | Beam Lead Capacitor | CS14-2 |
| B 14 | Beam Lead Capacitor | CS14-3 |
| B 15 | Beam Lead PIN Diode | CS12, |
| B 16 | Series Tee Beam Lead PIN Diode | NA |
| B 20 | Series Tee, Beam Lead Schottky | NA |
| B 21 | Anti Parallel Pair, B L Schottky | NA |
| B 40 | Ring Quad, BL Schottky | CS12-4 |
| B 41 | Small, Ring Quad, BL Schottky | NA |
| B 42 | Large, Ring Quad, BL Schottky | CS12-4 |
| B 45 | Bridge Quad, BL Schottky | NA |
| B 47 | Coplanar Bridge Quad, BL Schottky | NA |
| B 48 | Coplanar Ring Quad, BL Schottky | NA |
| B 49 | Crossover Ring Quad, BL Schottky | NA |
| B 80 | 8 Junction Ring Quad Schottky BL | NA |
| B 85 | 4 Junction Ring Quad Schottky BL | NA |
| B 86 | 4 Junction Bridge Quad Schottky BL | NA |
| B 87 | 12 Junction Ring Quad Schottky | NA |
| B 88 | 12 Junction Bridge Quad Schottky | NA |
| B 89 | 4 Junction Schottky BL | NA |
| B 90 | 6 Junction Series Tee Schottky BL | NA |
| GB1 10 | GaAs, Single Junction, Beam Lead | NA |
| GB2 10 | GaAs, Anti Parallel Pair, Beam Lead | NA |

| Metelics | Device Description | Micrometrics |
|---|---|---|
| GB3 10 | GaAs, Series Tee, Beam Lead | NA |
| GC1 10 | GaAs, Single Junction, Flip Chip | NA |
| GC2 10 | GaAs, Anti Parallel Pair, Flip Chip | NA |
| GC2 10 | GaAs, Series Tee, Flip Chip | NA |
| 2012 | MSWSH-020-30 Shunt Switch Element | NA |
| C11 | 15X15 Diode chip Anode up, .0009" Min. Anode Size | CS11 |
| C11P | 15X15 Diode chip Cathode up, .0009" Min. Anode Size | CS11 |
| C12 | 15X15 Diode chip Anode up, .002" Min. Anode Size | CS11 |
| C12P | 15X15 Diode chip Cathode up, .002" Min. Anode Size | CS11 |
| C15 | 5 Anode, 15X15 Schottky Chip, Anode up, .0009" Min. Anode Size | CS10 |
| C15P | 5 Anode, 15X15 Schottky Chip, Cathode up, .0009" Min. Size | CS10 |
| C18 | 5 Anode, 15X15 Tunnel Chip | NA |
| C20 | 20X20, Binary Chip Capacitor | B00 |
| C22 | 20X20 Diode Chip, Anode up, Min. anode size .002" | CS11 |
| C20P | 20X20 Diode Chip, Cathode up, Min. anode size .002" | CS11 |
| C26 | 20X20 off set bonding pad Schottky | CS11 |
| C32 | 30X30 Diode Chip, Anode up, Min. anode size .002" | CS11 |
| C32P | 30X30 Diode Chip, Cathode up, Min. anode size .002" | CS11 |
| C37 | 37X37 Diode Chip, Cathode up, Min. anode size .020" | CS11 |
| C40 | 30X30 Diode Chip, Cathode up, Min. anode size .010" | CS11 |
| C01A | 10X10 Diode Chip, Anode up, Min. anode size .0015" | CS11 |
| NA | Chip with Lead (Series) | CS08 |
| NA | Chip with Lead (Shunt) | CS09 |
| C50 | 20 X45 Micro Strip PIN Diodes | NA |
| C51 | 20 X150 Micro Strip PIN Diodes | NA |
| NA | 100 X65 Glass Axial Lead Pkg. | CS65 |
| A15 | 160 X70 Glass Axial Lead Pkg. | CS75 DO-35 |

# Package Number Cross Reference

| Metelics | Device Description | Micrometrics |
|---|---|---|
| NA | 250 X95 Glass Axial Lead Pkg. | CS85 DO-7 |
| M21 | 400X160 Hermetic Bolt Channel Pkg. | CS111 |
| SOD323 | Two Lead 90X50 Plastic, Injection Molded Pkg. | SOD323 |
| SOT23 | Three Lead 110X90 Plastic, Injection Molded Pkg. | SOT23 |
| NA | Epoxy Top, SM, 3, Lead, Alumina, SOT23 Footprint | CS23 |
| NA | Epoxy Top, SM, 3,Lead, Aluminum Nitride, SOT23 Footprint | CS223 |
| SOT143 | Four Lead 110X55 Plastic, Injected Molded Pkg. | SOT143 |
| H20 | Two Lead, 100X100, Hermetic, Ceramic, Strip line Pkg. | CS20 |
| H27 | Two Lead, 70X70, Hermetic, Ceramic, Strip line Pkg. | NA |
| H30 | Three Lead, 100X100, Hermetic, Ceramic, Strip line Pkg. | CS21 |
| H30X | Three Lead, 100X100, Hermetic, Heat Sink Strip line Pkg. | CS21 |
| H40 | Four Lead, 100X100, Hermetic, Ceramic, Strip line Pkg. | CS22 |
| H50 | Five Lead, 100X80, Hermetic, Ceramic, Strip line Pkg. | CS99H |
| E25 | Two Lead, 50 Sq, Epoxy Top, Strip line Pkg. | CS28 |
| E28 | Two Lead, 45X90, Epoxy Top, Strip line Pkg. | NA |
| E28X | Two Lead, 45X90, Epoxy Top, Gull Wing, Strip line Pkg. | NA |
| E30 | Three Lead, 100 Round, Epoxy Top, Strip line Pkg. | CS30 |
| E35 | Three Lead, 50 Sq, Epoxy Top, Strip line Pkg. | CS29 |
| E45 | Four Lead, 50 Sq, Epoxy Top, Strip line Pkg. | CS26 |
| E50 | Five Lead, 100X75, Epoxy Top, Ceramic, Pkg. | CS99 |
| E50SM | Five Lead, 100X75, Epoxy Top, Ceramic, Gull Wing, Pkg. | NA |
| ET47 | Five Lead, 70 Round, Epoxy Top, Ceramic, Transistor Pkg. | NA |
| 0402 | SM, Epoxy top, .040"X.020"X.033" 2 lead Ceramic Body | NA |
| 0805-2 | SM, Epoxy top, .080"X.050"X.050" 2 lead Ceramic Body | NA |
| 0805-4 | SM, Epoxy top, .080"X.050"X.050" 4 lead Ceramic Body | NA |
| NA | SM, Epoxy top, .7 Sizes, 2 lead Aluminum Nitride Body | CS16 7 Sizes |
| NA | SM, Epoxy top,. 7 Sizes, 2 lead Alumina Body | CS19 7 Sizes |

| Metelics | Device Description | Micrometrics |
|---|---|---|
| P55 | 0.050" Dia. Solder Cap, Metal Ceramic Pkg., Anode up | CS32 |
| P55p | 0.050" Dia. Solder Cap, Metal Ceramic Pkg., Cathode up | NA |
| P81 | 0.120" Dia. Weld Cap, Metal Ceramic Pkg., Anode up | CS35 |
| P81p | 0.120" Dia. Weld Cap, Metal Ceramic Pkg., Cathode up | NA |
| P86 | 0.080" Dia. Solder Prong Cap, Metal Ceramic Pkg., Anode up | CS50 |
| P86p | 0.080" Dia. Solder Prong Cap, Metal Ceramic Pkg., Cathode up | NA |
| T54 | .080" Dia. Weld Cap, Metal Ceramic Pkg., Cu Base, Anode up | CS34sp |
| T54p | .080" Dia. Weld Cap, Metal Ceramic Pkg., Cu Base, Cathode up | NA |
| T55 | .050" Dia. Solder Cap, Metal Ceramic Pkg., Cu Base, Anode up | CS32sp |
| T55p | .050" Dia. Solder Cap, Metal Ceramic Pkg., Cu Base, Cathode up | NA |
| T80 | 0.120" Dia. Weld Cap, Metal Ceramic Pkg., Cu Base, Anode up | CS40sp |
| T80p | 0.120" Dia. Weld Cap, Metal Ceramic Pkg., Cathode up | NA |
| T81 | 0.120" Dia. Weld Cap, Metal Ceramic Pkg., Cu Base, Anode up | CS35sp |
| T81P | 0.120" Dia. Weld Cap, Metal Ceramic Pkg., Cu Base, Cathode up | NA |
| T86 | 0.120" Dia. Weld Cap, Metal Ceramic Pkg., Cu Base, Anode up | CS37sp |
| T86P | 0.120" Dia. Weld Cap, Metal Ceramic Pkg., Cu Base, Cathode up | NA |
| T89 | 0.120" Dia. Weld Cap, Metal Ce. Pkg., Cu Screw Base, Anode up | CS106 |
| T89p | 0.120" Dia. Weld Cap, Metal Ce. Pkg., Cu Screw Base, Cathode up | NA |
| NA | 0.080" Dia. Weld Cap, Cathode up | CS31 |
| NA | 0.080" Dia. Weld Cap, Cathode up | CS33 |
| NA | 0.080" Dia. Weld Cap, Cathode up | CS34 |
| NA | 0.120" Dia.Weld Cap, Cathode up | CS36 |
| NA | 0.120" Dia. Weld Cap, Cathode up | CS38 |
| NA | 0.120" Dia. Weld Cap, Cathode up | CS39 |
| NA | 0.120" Dia. Weld Cap, Cathode up | CS41 |
| NA | 0.120" Dia. Weld Cap, Cathode up | CS42 |
| NA | 0.120" Dia. Weld Cap, Cathode up | CS43 |

**ISO 9001: 2000**

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Revision Date: 06/12/08

A17091(-)