

Frequency Synthesizer

WSN-4G+

50Ω Very Wide Bandwidth 700 to 4000 MHz

The Big Deal

- Very wide bandwidth
- Integrated VCO + PLL
- Fast settling time
- High reliability over temperature changes
- Operating voltage (VCC VCO=+10V, VCC PLL=+22V)
- Size 1.25" x 1.75" x 0.22"



CASE STYLE: KN1368

Product Overview

The WSN-4G+ is a very wide bandwidth Frequency Synthesizer, designed to operate from 700 to 4000 MHz for jammers application. The WSN-4G+ is packaged in a metal case (size of 1.25" x 1.75" x 0.22") to shield against unwanted signals and noise.

Key Features

Feature	Advantages
Very wide bandwidth	Extremely wide frequency range 700 - 4000 MHz. This broadband synthesizer boasts output levels of +8 dBm, typical spurious performance of -80 dBc or better and low phase noise.
Fast settling time	Less than 30 μ sec within 1deg can be used for settling applications such as jammers etc.

Notes

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50Ω Very Wide Bandwidth 700 to 4000 MHz

Features

- Very wide bandwidth
- Integrated VCO + PLL
- Fast settling time
- High reliability over temperature changes
- Operating voltage (VCC VCO=+10V, VCC PLL=+22V)
- Size 1.25" x 1.75" x 0.22"



CASE STYLE: KN1368

+RoHS Compliant

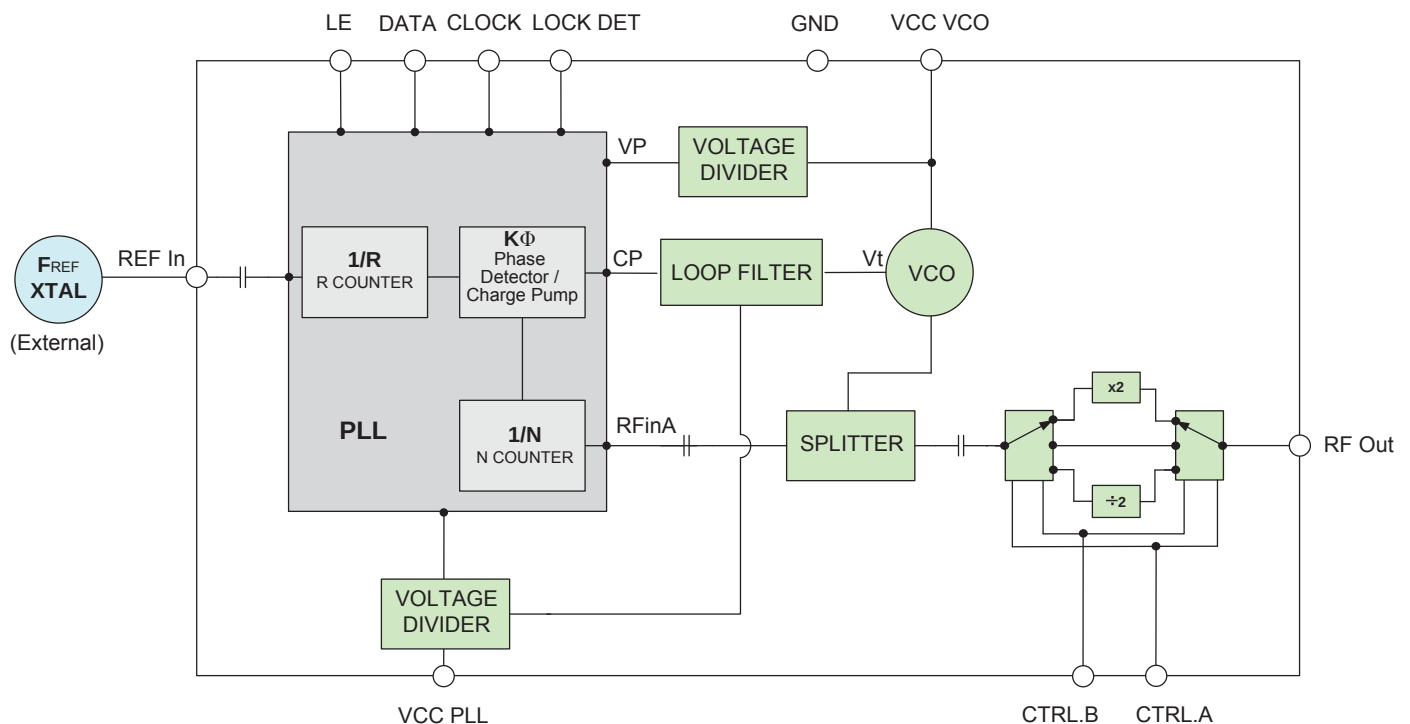
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Applications

- Jammers

General Description

The WSN-4G+ is a very wide bandwidth Frequency Synthesizer, designed to operate from 700 to 4000 MHz for jammers application. The WSN-4G+ is packaged in a metal case (size of 1.25" x 1.75" x 0.22") to shield against unwanted signals and noise.

Simplified Schematic**Notes**

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Electrical Specifications (over operating temperature -40°C to +85°C)

Parameters	Test Conditions		Min.	Typ.	Max.	Units
Frequency Range	-		700	-	4000	MHz
Step Size	-		-	10	-	MHz
Comparison Frequency	-		-	5	-	MHz
Settling Time within bands	Within ±1deg. for any 10MHz step	@ 700 to 1110 MHz	-	15	30	μSec
		@ 1120 to 2220 MHz				
		@ 2230 to 4000 MHz				
Output Power	-		+5	+8	+11	dBm
SSB Phase Noise	@ 100 Hz	@ 700 to 1110 MHz	-	-93	-	dBc / Hz
		@ 1120 to 2220 MHz	-	-88	-	
		@ 2230 to 4000 MHz	-	-83	-	
	@ 1 kHz offset	@ 700 to 1110 MHz	-	-106	-98	
		@ 1120 to 2220 MHz	-	-101	-92	
		@ 2230 to 4000 MHz	-	-95	-87	
	@ 10 kHz offset	@ 700 to 1110 MHz	-	-107	-100	
		@ 1120 to 2220 MHz	-	-102	-95	
		@ 2230 to 4000 MHz	-	-97	-90	
	@ 100 kHz offset	@ 700 to 1110 MHz	-	-104	-96	
		@ 1120 to 2220 MHz	-	-100	-90	
		@ 2230 to 4000 MHz	-	-94	-87	
	@ 1 MHz offset	@ 700 to 1110 MHz	-	-127	-119	
		@ 1120 to 2220 MHz	-	-121	-114	
@ 2230 to 4000 MHz		-	-115	-108		
Reference Spurious Suppresion	Ref. Freq. 20 MHz	@ 700 to 1110 MHz	-	-97	-75	dBc
		@ 1120 to 2220 MHz	-	-100	-75	
		@ 2230 to 4000 MHz	-	-95	-75	
Comparison Spurious Suppresion	Comp. Freq. 5 MHz	@ 700 to 1110 MHz	-	-89	-70	
		@ 1120 to 2220 MHz	-	-81	-64	
		@ 2230 to 4000 MHz	-	-86	-70	
Non - Harmonic Spurious Suppression		-	-	-90	-	
Harmonic Suppresion		-	-	-33	-10	
VCO Power Supply		-	+9.75	+10.00	+10.25	V
PLL Power Supply		-	+21.75	+22.00	+22.25	V
VCO Supply Current		-	-	140	220	mA
PLL Supply Current		-	-	16	25	mA
Reference Input (External)	Frequency	Square wave	-	20	-	MHz
	Amplitude	-	-	1	-	Vp-p
	Input impedance	-	-	100	-	KΩ
	Phase. Noise @ 1 kHz offset	-	-	-145	-	dBc/Hz
RF Output port Impedance		-	-	50	-	Ω
Input Logic Level	Input high voltage	-	2.80	-	-	V
	Input low voltage	-	-	-	0.60	V
Digital Lock Detect	Locked	-	2.75	-	3.40	V
	Unlocked	-	-	-	0.40	V
Input Logic Level for Control A & Control B	Input high voltage	-	3.50	-	-	V
	Input low voltage	-	-	-	0.50	V

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Electrical Specifications (over operating temperature -40°C to +85°C) (continued)

Frequency Synthesizer PLL				ADF4106												
PLL Programming				3-wire serial 3V CMOS												
Register Map NOTE 3,4	F_Register*			Prescaler Value	Power-Down 2	Current Setting 2*	Current Setting 1	Timer Counter Control	Fastlock Mode	Fastlock Enable	CP 3-State	PD Polarity	Muxout Control	Power-Down 1	Counter Reset	Control Bits
				00	0	XYZ	0000	0	0	0	0	001	0	0	10	
	N_Register @ 1110 MHz @ 1580 MHz @ 4000 MHz			Reserved	CP Gain	13-Bit B Counter						6-Bit A Counter			Control Bits	
				00	1	0000000110111						000100			01	
				00	1	0000000100111						000100			01	
				00	1	0000000110010						000000			01	
	R_Register			Reserved	Lock Detect Precision	Test Mode Bits	Anti-Blacklash Width	14-BIT Reference Counter								Control Bits
				000	1	00	00	00000000000100								00

* Refer to Charge Pump Settings

Band	Freq. Range [MHz]	X	Y	Z
#1	700-920	0	1	1
	930-1020	1	0	0
	1030-1040	1	0	1
	1050-1070	1	1	0
	1080-1110	1	1	1
#2	1120-1150	0	0	1
	1160-1270	0	1	0
	1280-1840	0	1	1
	1850-2040	1	0	0
	2050-2090	1	0	1
	2100-2150	1	1	0
#3	2160-2220	1	1	1
	2230-2300	0	0	1
	2310-2540	0	1	0
	2550-3680	0	1	1
	3690-4000	1	0	0

Note 1: For frequencies in the 700-1100MHz range the N Register should be programmed to a frequency which is twice the desired output frequency.
Note 2: For frequencies in the 2230-4000MHz range the N Register should be programmed to a frequency which is half the desired output frequency.
Note 3: Registers Load Sequence: Initialization Register, F Register, R Register, N Register.
Note 4: For the Initialization Register use Register F with Control Bits 11.

Frequency Bands Function

Frequency Out [MHz]	Control	
	CTRL.A (PIN # 8)	CTRL.B (PIN # 7)
700-1110	0	1
1120-2220	1	0
2230-4000	0	0
N.A	1	1

Absolute Maximum Ratings

Parameters	Ratings
VCO Supply Voltage	+12V
PLL Supply Voltage	+24V
VCO Power Supply to PLL Power Supply	Note 5
Reference Frequency Amplitude	3.6V _{P-P}
Data, Clock, LE Levels	-0.3Vmin, +3.6Vmax
Control A & Control B Levels	-0.3Vmin, +5.0Vmax
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C

Note 5: Power on/off Sequence: Power on: VCO Supply Voltage, followed by PLL Supply Voltage. Power off: PLL Supply Voltage, followed by VCO Supply Voltage.

Permanent damage may occur if any of these limits are exceeded

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Typical Performance Data

FREQUENCY (MHz)	POWER OUTPUT (dBm)			VCO CURRENT (mA)			PLL CURENT (mA)		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
700	8.45	8.53	8.37	116.97	120.03	123.15	15.48	16.91	17.88
780	8.38	8.41	8.08	117.24	120.31	123.36	15.61	17.05	18.02
860	8.31	8.21	7.77	117.49	120.55	123.61	15.75	17.18	18.15
940	8.46	8.24	7.55	117.77	120.86	123.96	15.88	17.32	18.29
1020	8.44	8.16	7.19	118.04	121.15	124.27	16.01	17.46	18.42
1100	8.29	7.98	6.79	118.16	121.32	124.55	16.14	17.59	18.55
1110	8.25	7.95	6.76	118.15	121.33	124.56	16.24	17.69	18.65
1120	8.93	8.52	8.11	106.32	108.99	111.62	15.26	16.71	17.67
1260	8.97	8.62	8.33	107.35	109.92	112.37	15.44	16.90	17.86
1420	8.08	7.98	7.74	107.89	110.45	112.85	15.57	17.04	18.00
1580	7.57	7.50	7.29	108.01	110.57	112.97	15.71	17.18	18.13
1740	7.25	7.34	7.20	108.06	110.59	113.02	15.84	17.32	18.27
1820	7.58	7.53	7.38	108.07	110.61	113.08	15.91	17.38	18.34
2220	8.36	8.12	7.48	108.59	111.41	114.13	16.24	17.72	18.71
2230	7.68	7.83	7.77	151.86	157.66	164.47	15.37	16.85	17.85
2380	6.99	7.45	7.47	155.05	160.35	166.63	15.41	16.91	17.90
2540	6.82	7.18	7.34	159.62	164.68	170.62	15.48	16.98	17.97
2780	8.61	8.23	7.93	165.64	170.67	176.20	15.58	17.09	18.08
3180	9.98	9.20	8.61	170.24	175.81	181.85	15.74	17.26	18.25
3420	9.51	8.90	8.35	171.66	177.40	183.62	15.85	17.37	18.36
4000	7.42	6.77	6.31	170.07	176.42	183.25	15.99	17.51	18.50

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FREQUENCY (MHz)	HARMONICS (dBc)								
	F0.5			F1.5			F2.5		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
2230	-54.35	-53.86	-54.03	-33.31	-25.02	-17.95	-37.57	-34.51	-31.80
2380	-47.00	-47.10	-48.10	-28.75	-25.24	-21.30	-38.48	-51.42	-44.78
2540	-41.13	-42.00	-43.30	-16.71	-16.94	-17.70	-36.25	-41.77	-44.63
2780	-36.25	-38.22	-38.85	-14.24	-16.60	-18.66	-36.33	-37.93	-40.87
3180	-29.74	-31.90	-31.17	-28.17	-28.33	-26.85	-51.45	-48.08	-47.25
3420	-25.75	-27.36	-25.97	-30.33	-28.06	-27.42	-63.03	-60.80	-61.72
4000	-22.97	-21.18	-17.62	-29.00	-28.66	-32.07	-54.15	-56.10	-59.87

FREQUENCY (MHz)	HARMONICS (dBc)					
	F2			F3		
	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
700	-15.31	-15.61	-14.89	-46.71	-48.29	-48.98
780	-21.96	-22.65	-22.81	-59.03	-62.05	-61.56
860	-36.41	-38.71	-40.30	-54.84	-54.55	-56.44
940	-41.79	-43.34	-45.36	-54.17	-55.26	-56.83
1020	-43.56	-44.65	-47.20	-54.39	-57.80	-59.07
1100	-49.47	-54.33	-56.02	-56.85	-59.35	-59.05
1110	-50.99	-53.61	-55.52	-57.57	-60.62	-59.03
1120	-14.80	-22.47	-24.64	-33.16	-35.49	-35.62
1260	-16.73	-26.38	-23.30	-55.98	-56.29	-61.23
1420	-24.11	-28.20	-23.51	-53.06	-53.28	-54.18
1580	-28.02	-29.59	-26.76	-55.96	-58.28	-54.84
1740	-35.77	-38.39	-37.22	-50.94	-51.90	-50.65
1820	-43.92	-47.83	-48.19	-52.83	-53.32	-52.60
2220	-52.64	-51.50	-49.01	-50.65	-54.10	-58.25
2230	-17.43	-18.89	-19.79	-37.67	-40.59	-46.32
2380	-21.78	-24.65	-26.06	-40.40	-45.94	-53.66
2540	-24.10	-28.59	-33.55	-40.63	-43.82	-47.47
2780	-25.56	-38.14	-34.02	-47.93	-48.91	-47.44
3180	-30.69	-29.49	-29.71	-45.37	-44.83	-45.69
3420	-36.60	-34.13	-34.87	-55.55	-54.82	-55.78
4000	-38.43	-38.60	-40.15	-56.79	-54.46	-52.39

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FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	+25°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
700	-95.47	-111.53	-110.41	-107.56	-128.68
780	-97.38	-107.46	-109.13	-105.84	-128.38
860	-92.08	-105.74	-107.36	-104.55	-128.60
940	-93.79	-104.82	-108.09	-105.43	-126.54
1020	-94.92	-106.65	-107.10	-103.92	-128.51
1100	-93.83	-103.50	-106.06	-102.79	-128.85
1110	-91.42	-104.57	-105.91	-102.18	-129.76
1120	-92.45	-103.99	-105.74	-101.33	-125.33
1260	-94.85	-106.20	-105.65	-102.19	-124.11
1420	-91.79	-103.04	-103.89	-101.12	-122.42
1580	-91.94	-100.69	-102.27	-99.35	-122.22
1740	-88.67	-101.26	-101.70	-98.57	-122.42
1820	-87.70	-100.11	-101.71	-98.70	-122.70
2220	-86.86	-100.58	-100.59	-96.52	-123.83
2230	-85.71	-97.63	-100.10	-95.67	-119.44
2380	-90.99	-96.32	-100.50	-97.02	-117.96
2540	-86.53	-96.66	-98.63	-95.30	-117.47
2780	-86.55	-94.07	-97.32	-94.97	-116.01
3180	-85.45	-94.77	-95.63	-92.76	-115.85
3420	-83.77	-95.01	-95.77	-92.46	-116.15
4000	-84.17	-94.85	-95.31	-92.16	-115.77

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	-45°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
700	-86.70	-106.41	-108.63	-105.97	-127.91
780	-85.53	-104.53	-107.50	-104.35	-128.02
860	-87.41	-104.58	-106.54	-102.35	-128.20
940	-85.54	-105.25	-105.51	-103.28	-126.04
1020	-83.21	-103.36	-105.11	-102.56	-127.35
1100	-87.16	-102.78	-105.26	-102.21	-127.59
1110	-85.33	-103.51	-105.43	-102.03	-128.35
1120	-84.57	-102.15	-104.82	-100.48	-125.86
1260	-83.46	-101.66	-104.70	-101.37	-123.55
1420	-84.15	-99.91	-103.33	-100.46	-122.31
1580	-82.04	-100.89	-101.76	-98.41	-122.36
1740	-84.14	-98.43	-100.20	-96.57	-122.63
1820	-78.27	-98.91	-99.79	-96.23	-122.30
2220	-79.95	-96.83	-98.76	-95.91	-122.29
2230	-79.16	-96.68	-99.30	-94.82	-119.83
2380	-77.19	-95.62	-99.04	-96.56	-118.10
2540	-77.63	-94.88	-97.49	-94.20	-116.72
2780	-77.94	-96.83	-96.27	-93.44	-115.23
3180	-76.11	-91.53	-95.51	-91.59	-115.73
3420	-74.37	-92.54	-94.50	-90.58	-116.42
4000	-73.50	-91.69	-94.42	-91.75	-115.40

FREQUENCY (MHz)	PHASE NOISE (dBc/Hz) @OFFSETS				
	+85°C				
	100Hz	1kHz	10kHz	100kHz	1MHz
700	-93.07	-105.42	-108.73	-106.14	-127.66
780	-90.86	-106.23	-107.68	-104.77	-127.38
860	-91.27	-106.13	-107.56	-104.29	-126.87
940	-90.26	-104.32	-106.89	-104.55	-124.73
1020	-89.73	-105.47	-106.19	-102.53	-127.26
1100	-86.71	-102.82	-104.23	-100.56	-128.54
1110	-89.80	-102.34	-104.37	-99.99	-129.35
1120	-89.72	-102.53	-105.14	-100.41	-124.38
1260	-90.62	-102.37	-104.15	-100.64	-123.13
1420	-86.13	-101.18	-102.08	-99.75	-121.40
1580	-84.47	-100.28	-101.73	-98.55	-121.07
1740	-84.81	-101.37	-101.35	-98.26	-120.83
1820	-86.44	-98.52	-100.89	-98.12	-120.90
2220	-80.50	-94.69	-98.10	-94.20	-123.53
2230	-82.34	-95.50	-99.28	-94.70	-118.41
2380	-82.32	-96.67	-98.32	-95.29	-116.88
2540	-78.68	-96.60	-97.00	-93.60	-116.47
2780	-79.11	-96.20	-96.67	-93.54	-114.89
3180	-81.25	-95.15	-95.29	-91.77	-114.64
3420	-81.12	-97.37	-95.47	-92.59	-114.95
4000	-76.13	-91.55	-94.36	-91.11	-114.90

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COMPARISON SPURIOUS ORDER	COMPARISON SPURIOUS @Fcarrier 910MHz+(0.5n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 1670MHz+(n*Fcomparison) (dBc) note 1			COMPARISON SPURIOUS @Fcarrier 3120MHz+(2n*Fcomparison) (dBc) note 1		
	n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C
-5	-124.00	-123.54	-122.01	-105.92	-110.03	-105.95	-106.89	-101.36	-102.07
-4	-101.00	-96.46	-97.93	-105.20	-110.59	-105.95	-107.73	-97.23	-96.08
-3	-122.66	-124.00	-122.69	-101.18	-104.41	-99.56	-103.55	-97.18	-113.91
-2	-81.76	-80.26	-80.66	-91.46	-92.44	-90.97	-106.21	-96.23	-113.88
-1	-121.40	-119.95	-120.98	-75.10	-74.20	-73.53	-85.54	-85.00	-84.92
0 ^{note 2}	-	-	-	-	-	-	-	-	-
+1	-120.35	-121.50	-120.51	-74.98	-73.91	-73.35	-85.91	-84.75	-85.05
+2	-81.74	-80.46	-80.38	-91.70	-90.83	-89.87	-107.45	-94.34	-114.09
+3	-124.27	-122.75	-123.25	-99.16	-100.98	-98.53	-108.67	-96.76	-109.56
+4	-102.12	-97.93	-96.83	-102.37	-104.52	-102.57	-94.99	-92.30	-90.86
+5	-125.38	-123.26	-122.62	-103.31	-105.41	-103.86	-104.58	-101.55	-102.15

Note 1: Comparison frequency 5 MHz

Note 2: All spurs are referenced to carrier signal (n=0).

REFERENCE SPURIOUS ORDER	REFERENCE SPURIOUS @Fcarrier 910MHz+(0.5n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 1670MHz+(n*Freference) (dBc) note 3			REFERENCE SPURIOUS @Fcarrier 3120MHz+(2n*Freference) (dBc) note 3			
	n	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C	-45°C	+25°C	+85°C
-5		-114.92	-113.35	-108.20	-105.31	-121.47	-108.83	-93.78	-95.21	-93.48
-4		-111.00	-109.32	-101.53	-109.68	-114.65	-110.09	-110.20	-97.20	-109.63
-3		-111.70	-122.88	-109.38	-107.53	-118.66	-112.84	-102.98	-97.93	-100.61
-2		-111.47	-112.23	-102.41	-113.75	-101.30	-99.17	-106.90	-101.56	-100.68
-1		-101.25	-97.27	-97.72	-104.98	-109.55	-105.68	-107.59	-97.38	-96.27
0 ^{note 4}		-	-	-	-	-	-	-	-	-
+1		-102.77	-98.42	-97.99	-102.38	-106.31	-102.80	-95.14	-92.33	-90.94
+2		-111.65	-117.97	-105.00	-103.56	-103.07	-97.38	-108.59	-103.21	-102.84
+3		-112.00	-114.45	-109.13	-111.62	-117.57	-116.41	-103.69	-98.91	-102.11
+4		-107.46	-106.73	-102.90	-110.99	-114.06	-111.12	-113.05	-98.64	-112.86
+5		-110.59	-109.59	-108.23	-105.66	-113.97	-114.46	-94.67	-96.00	-94.53

Note 3: Reference frequency 20 MHz

Note 4: All spurs are referenced to carrier signal (n=0).

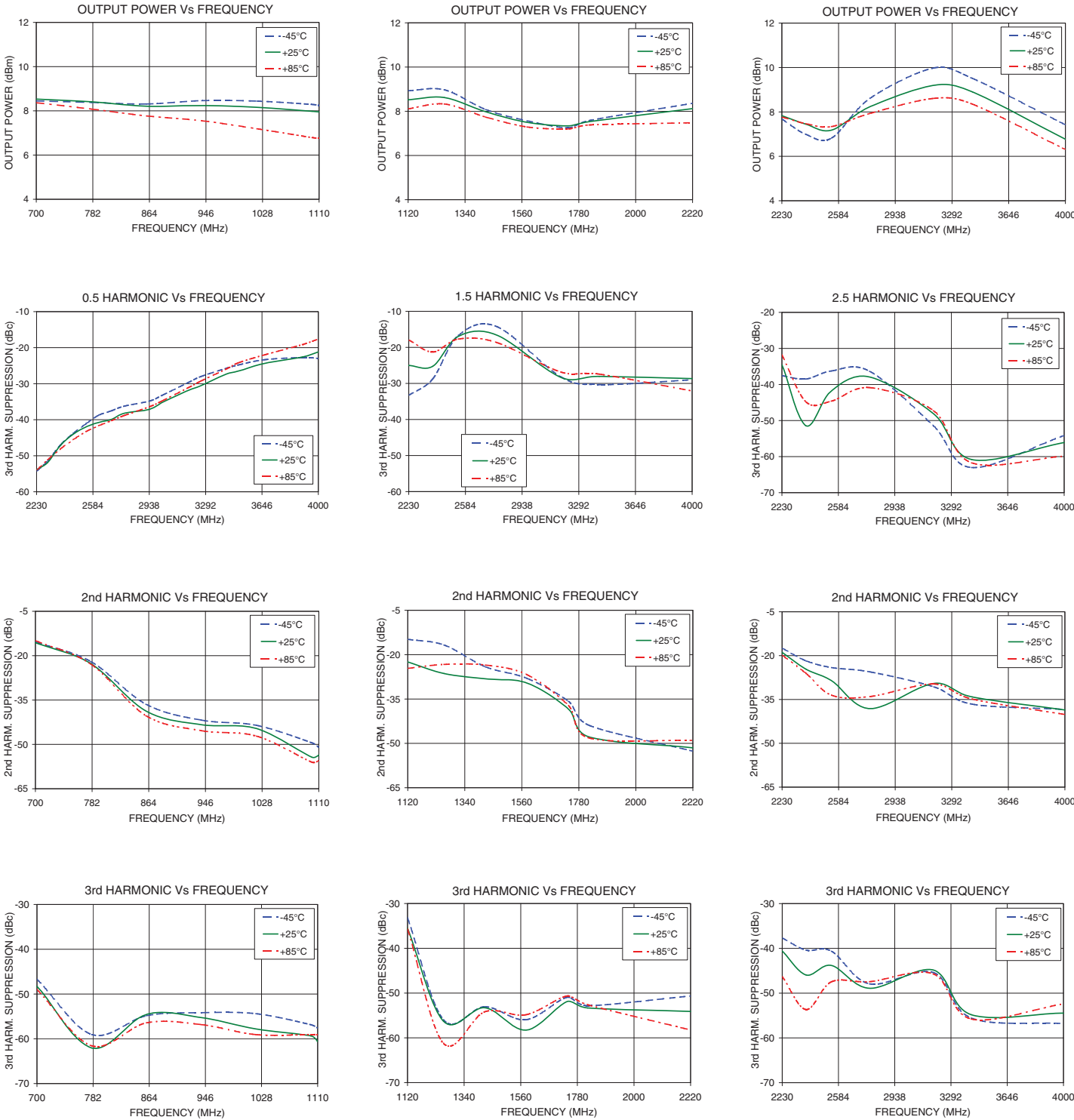
Notes

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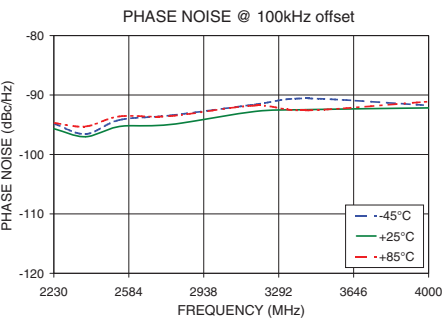
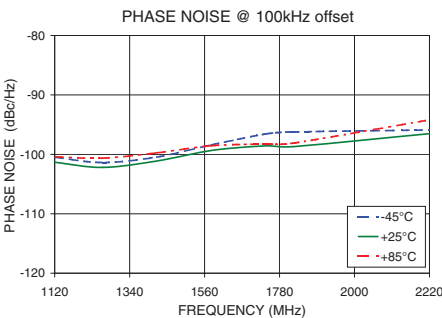
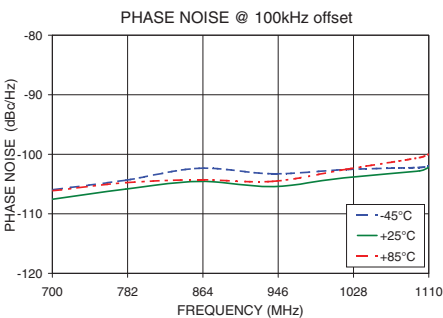
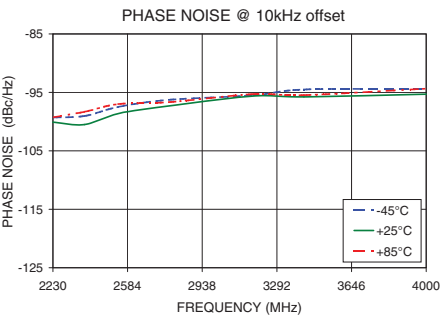
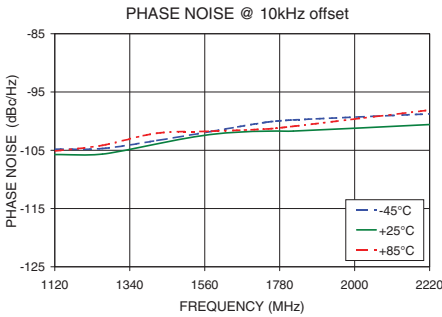
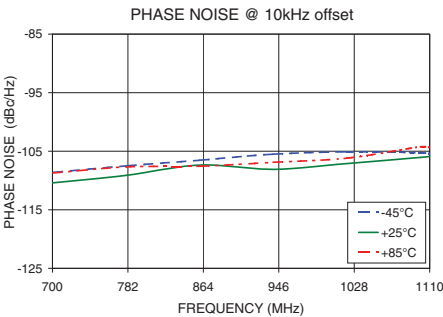
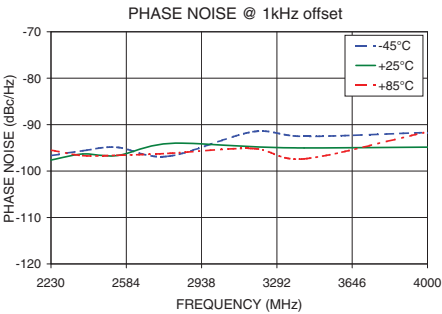
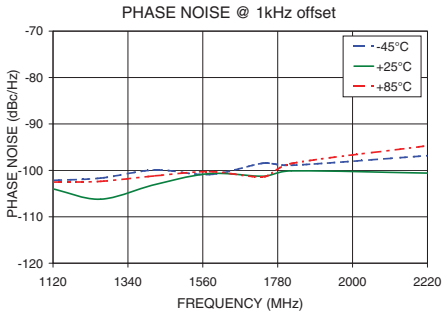
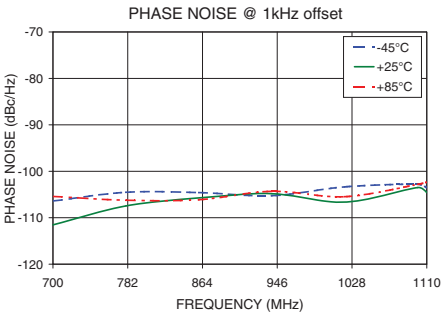
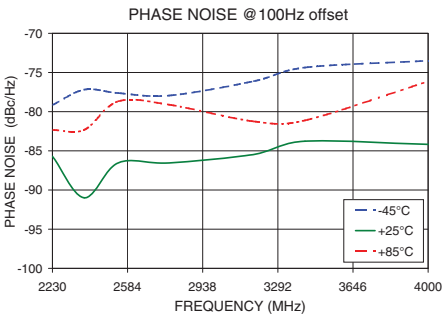
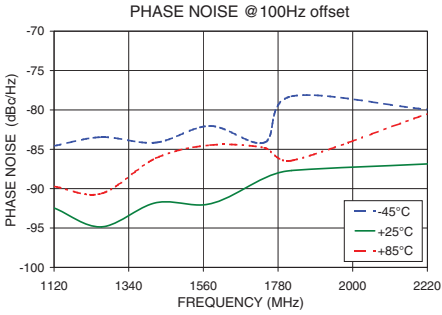
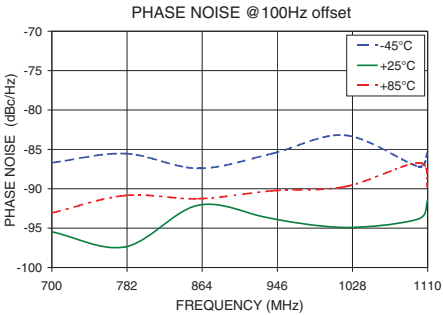
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.

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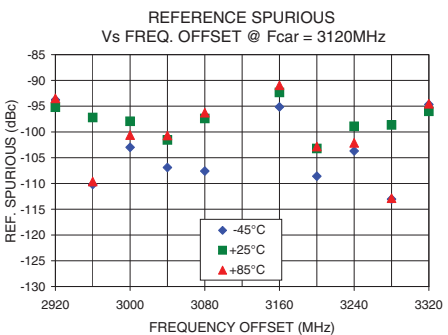
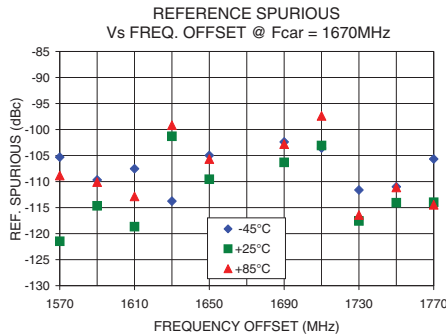
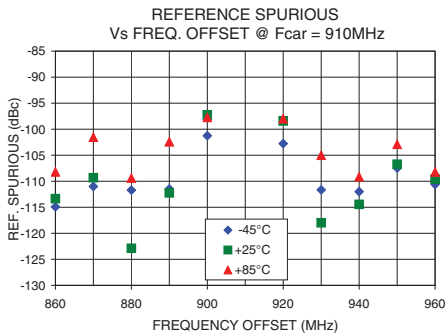
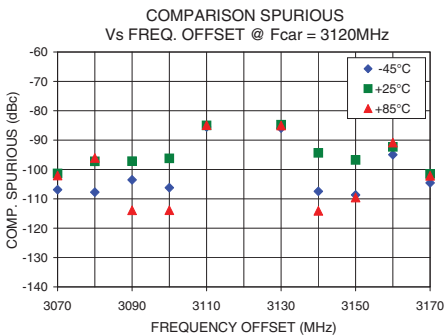
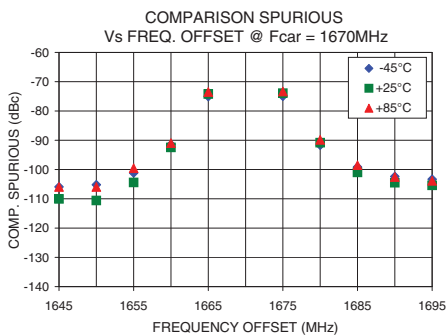
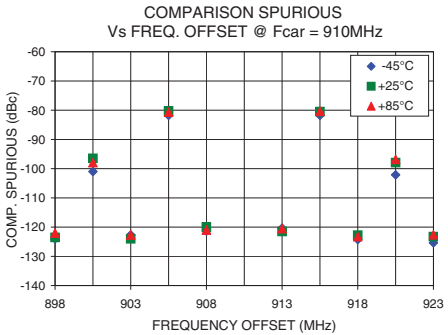
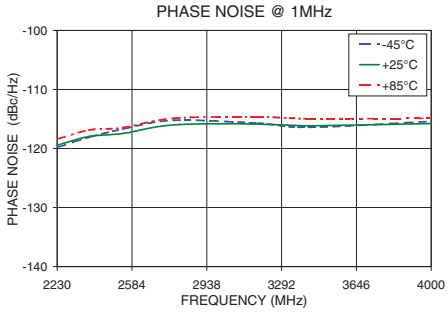
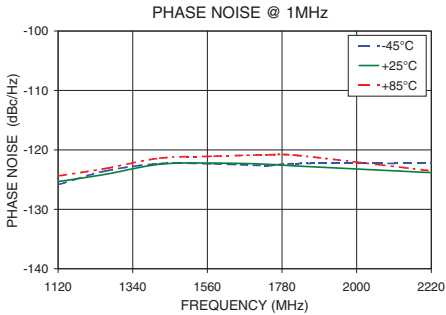
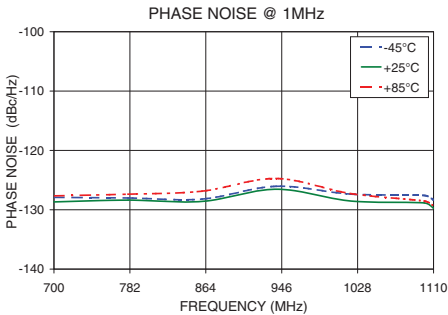
Typical Performance Curves



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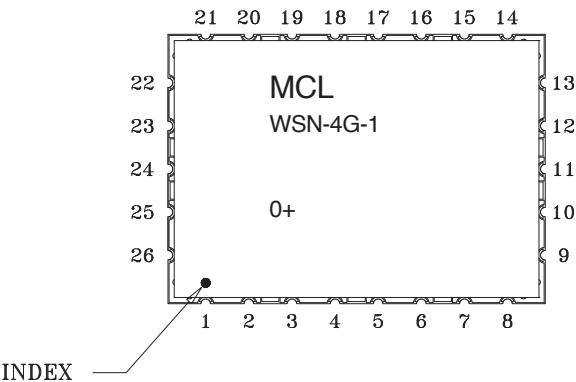
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Pin Configuration

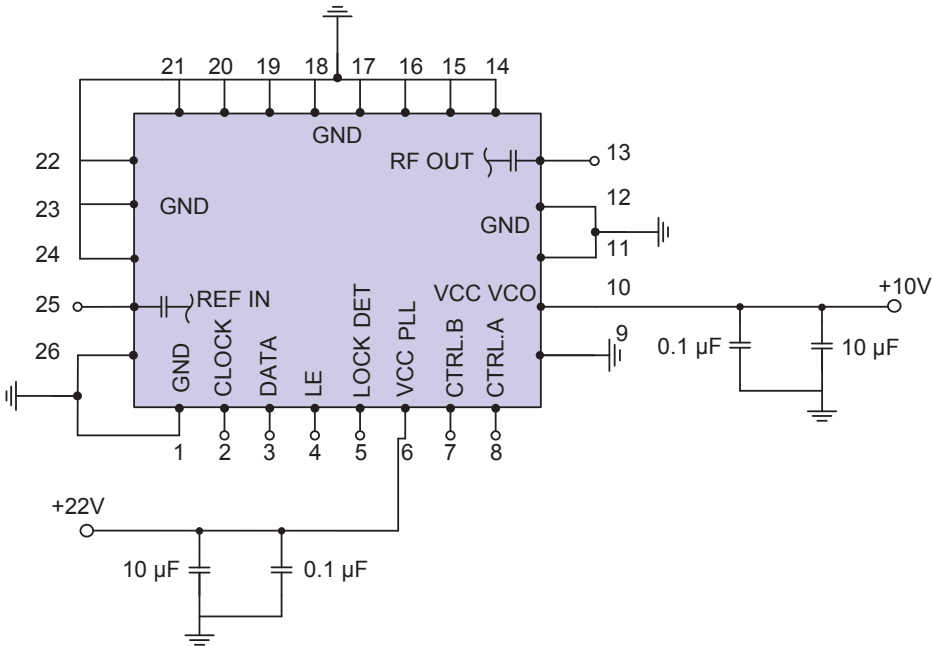


Pin Connection

Pin Number	Function	Pin Number	Function	Pin Number	Function
1	GND	10	VCC VCO	19	GND
2	CLOCK	11	GND	20	GND
3	DATA	12	GND	21	GND
4	LE	13	RF OUT	22	GND
5	LOCK DET	14	GND	23	GND
6	VCC PLL	15	GND	24	GND
7	CTRL.B	16	GND	25	REF IN
8	CTRL.A	17	GND	26	GND
9	GND	18	GND		

Recommended Application Circuit

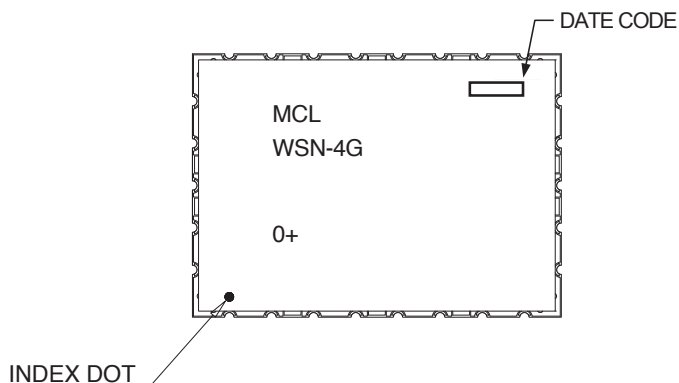
Note: REF IN and RF OUT ports are internally AC coupled.



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Device Marking

**Additional Detailed Technical Information**

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Case Style: KN1368

Tape & Reel: TR-F96

Suggested Layout for PCB Design: PL-326

Evaluation Board: TB-572+

Environment Ratings: ENV65T2

Synthesizer evaluation software to set PLL registers manually is available at http://www.minicircuits.com/support/software_download.html

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