NTP2955

MOSFET – Power, Single, P-Channel, TO-220

-60 V, -12 A

Features

- Low $R_{DS(on)}$
- Rugged Performance
- Fast Switching
- These are Pb−Free Devices*

Applications

- Industrial
- Automotive
- Power Supplies

ON Semiconductor®

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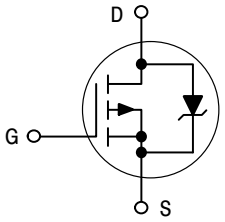
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D MAX
−60 V	156 mΩ @ −10 V	−12 A

P−Channel



MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

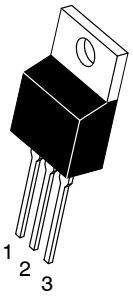
Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	−60	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current (Note 1)	Steady State	T_C = 25°C	I_D	−12	A
		T_C = 85°C		−9.0	
Power Dissipation (Note 1)		T_C = 25°C	P_D	62.5	W
Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	I_D	−2.4	A
		T_A = 85°C		−1.8	
Power Dissipation (Note 1)		T_A = 25°C	P_D	2.4	W
Pulsed Drain Current	t_p = 10 μs		I_{DM}	−42	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to 175	°C
Source Current (Body Diode)			I_S	−12	A
Single Pulse Drain−to−Source Avalanche Energy (V_{DD} = −30 V, V_G = −10 V, I_{PK} = −12 A, L = 3.0 mH, R_G = 3.0 Ω)			EAS	216	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	°C

THERMAL RESISTANCE RATINGS

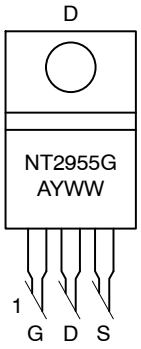
Parameter	Symbol	Max	Unit
Junction−to−Case	$R_{\theta JC}$	2.4	°C/W
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	62.5	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

MARKING DIAGRAM & PIN ASSIGNMENT



TO−220
CASE 221A
STYLE 5



A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

ORDERING INFORMATION

Device	Package	Shipping
NTP2955G	TO−220 (Pb−Free)	50 Units / Rail

1. When surface mounted to an FR4 board using 1 in pad size (Cu. area = 1.127 in sq [1 oz] including traces).

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

ELECTRICAL CHARACTERISTICS (T_J=25°C unless otherwise stated)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = −250 μA		−60			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				67		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = −48 V	T_J = 25°C			−1.0	μA
			T_J = 125°C			−10	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 μA		−2.0		−4.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				56		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = −10 V, I_D = −12 A			156	196	mΩ
Forward Transconductance	g_{FS}	V_{DS} = −60 V, I_D = −12 A			6.0		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −25 V			507	700	pF
Output Capacitance	C_{OSS}				150	250	
Reverse Transfer Capacitance	C_{RSS}				48	98	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −10 V, V_{DS} = −48 V, I_D = −12 A			14		nC
Threshold Gate Charge	$Q_{G(TH)}$				1.6	2.5	
Gate−to−Source Charge	Q_{GS}				3.4		
Gate−to−Drain Charge	Q_{GD}				6.2		
SWITCHING CHARACTERISTICS (Note 3)							
Turn−On Delay Time	$t_{d(on)}$	V_{GS} = −10 V, V_{DD} = −30 V, I_D = −12 A, R_G = 9.1 Ω			10	20	ns
Rise Time	t_r				41	80	
Turn−Off Delay Time	$t_{d(off)}$				27	47	
Fall Time	t_f				45	85	
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = −12 A	T_J = 25°C		−1.6	−2.0	V
			T_J = 125°C		−1.36		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = −12 A			53		ns
Charge Time	t_a				42		
Discharge Time	t_b				12		
Reverse Recovery Charge	Q_{RR}				126		nC

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

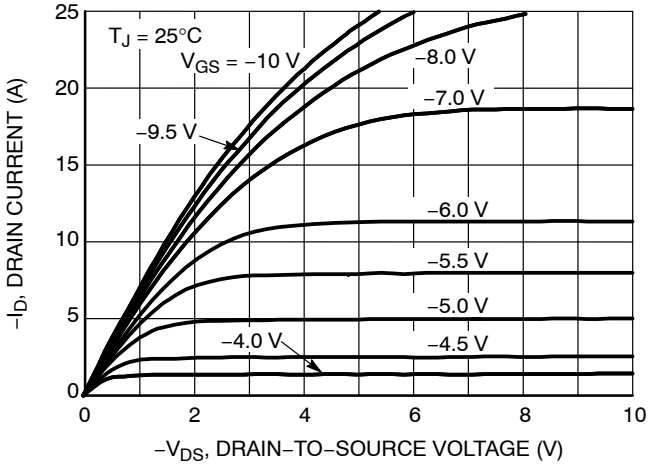


Figure 1. On−Region Characteristics

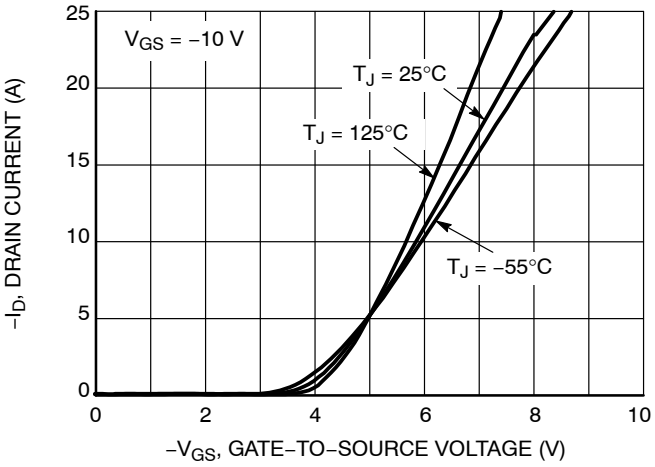


Figure 2. Transfer Characteristics

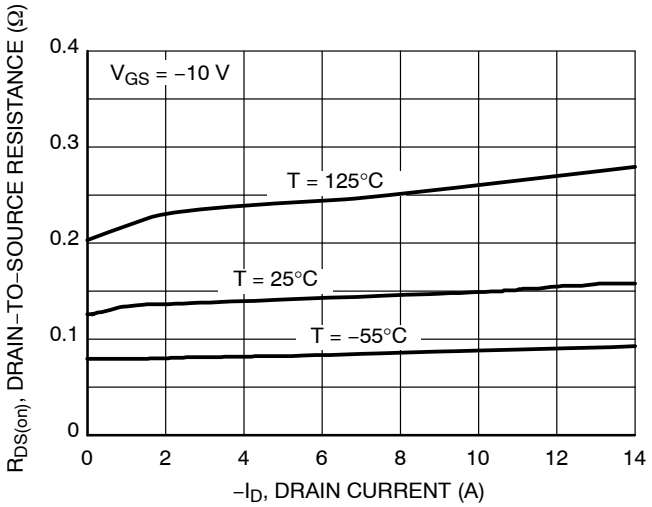


Figure 3. On−Resistance versus Drain Current and Temperature

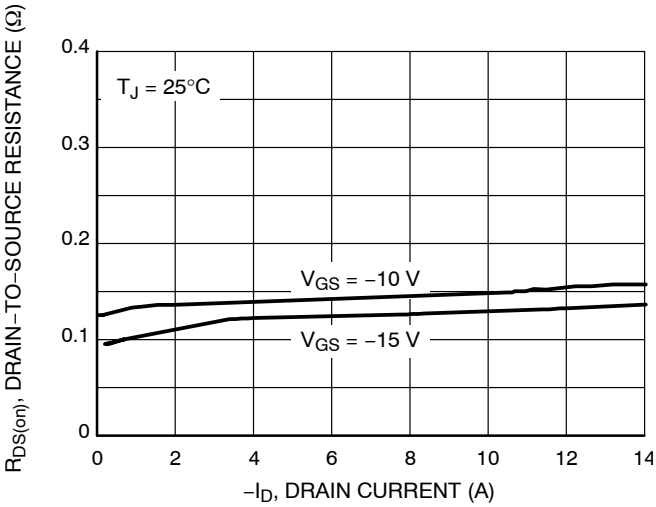


Figure 4. On−Resistance versus Drain Current and Gate Voltage

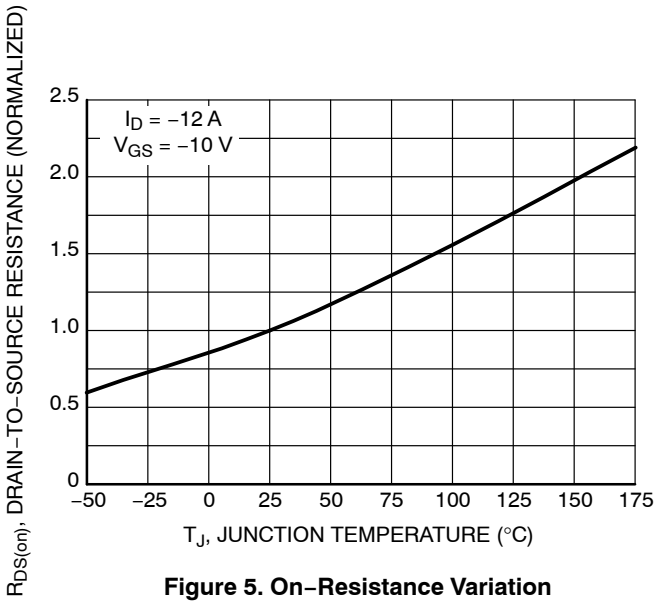


Figure 5. On−Resistance Variation with Temperature

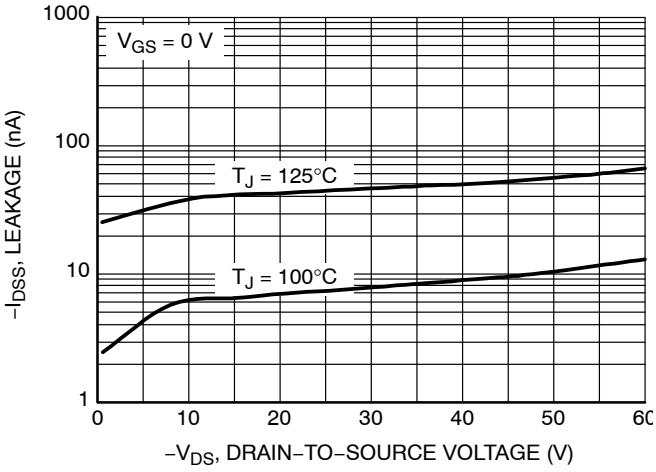


Figure 6. Drain−to−Source Leakage versus Voltage

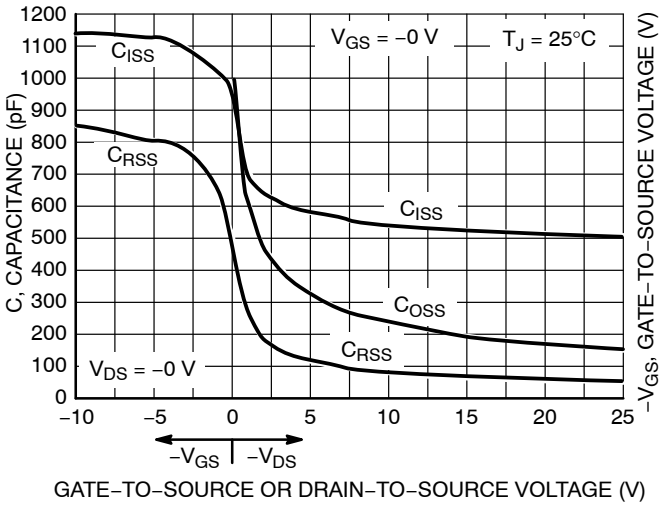


Figure 7. Capacitance Variation

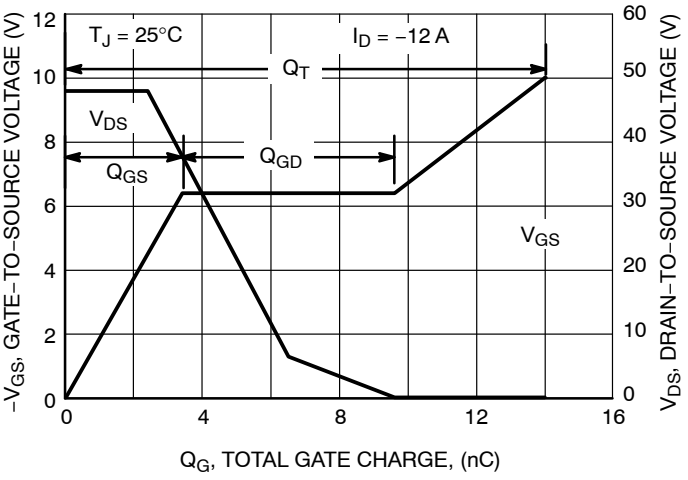


Figure 8. Gate−to−Source and Drain−to−Source Voltage versus Total Charge

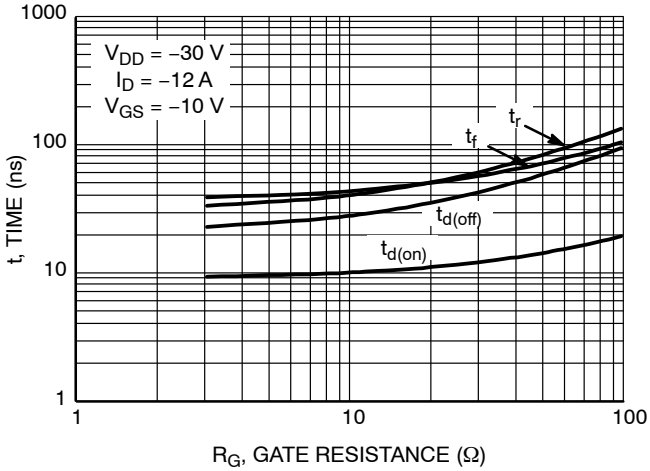


Figure 9. Resistive Switching Time Variation versus Gate Resistance

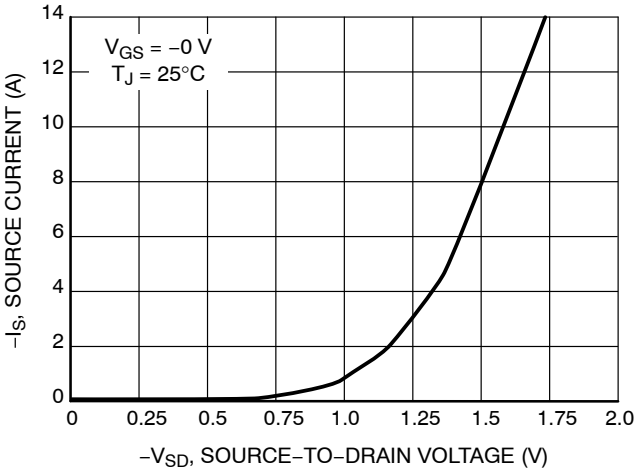


Figure 10. Diode Forward Voltage versus Current

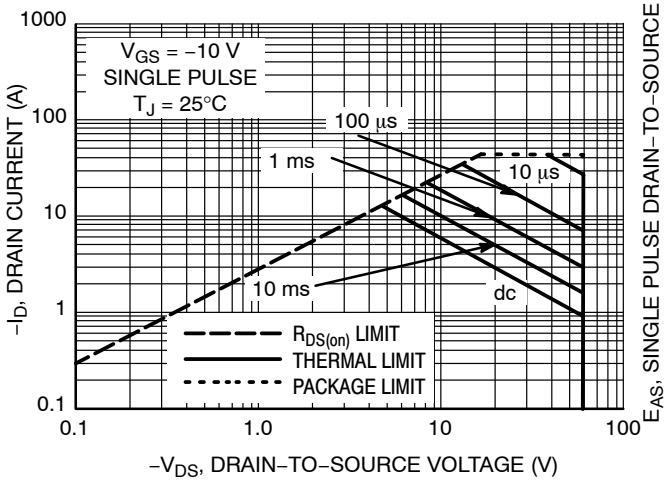


Figure 11. Maximum Rated Forward Biased Safe Operating Area

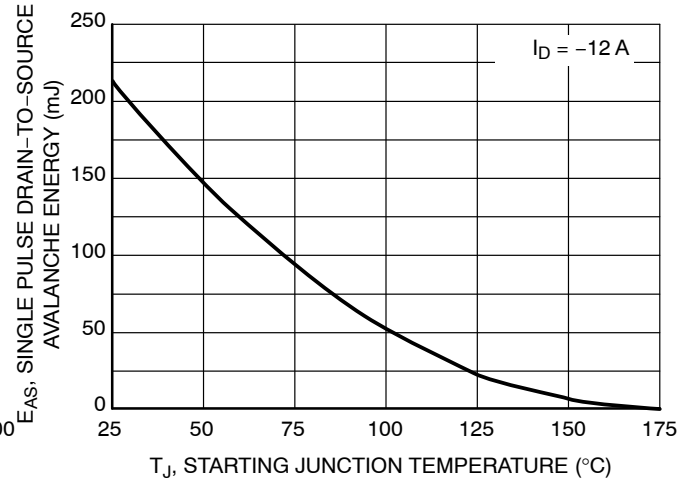


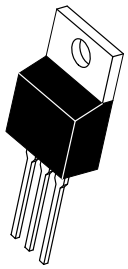
Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

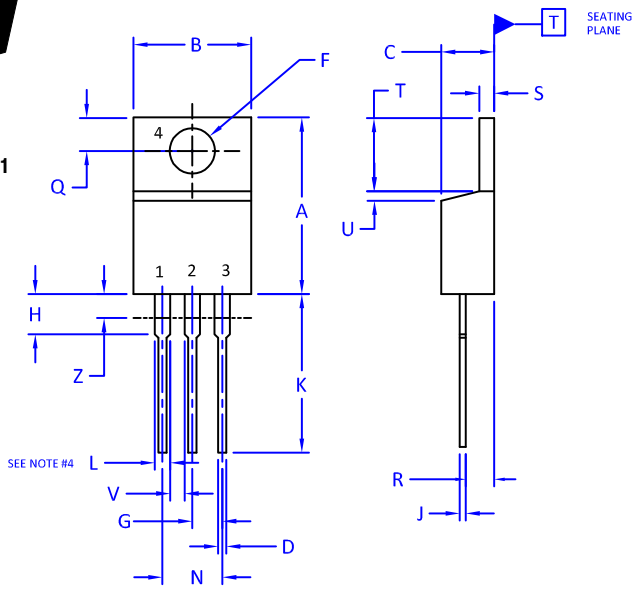
ON Semiconductor®

TO−220
CASE 221A−09
ISSUE AJ

DATE 05 NOV 2019



SCALE 1:1



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

	INCHES		MILLIMETERS	
DIM	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.41
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	----	1.15	---
Z	----	0.080	---	2.04

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. BASE
2. EMITTER
3. COLLECTOR
4. EMITTER

STYLE 3:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE

STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 10:
PIN 1. GATE
2. SOURCE
3. DRAIN
4. SOURCE

STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED

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