

NTP2955

Power MOSFET

–60 V, –12 A, Single P–Channel, TO–220

Features

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

Applications

- Industrial
- Automotive
- Power Supplies

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ 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	$T_C = 25^{\circ}\text{C}$	I_D	-12	A
		$T_C = 85^{\circ}\text{C}$		-9.0	
Power Dissipation (Note 1)		$T_C = 25^{\circ}\text{C}$	P_D	62.5	W
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^{\circ}\text{C}$	I_D	-2.4	A
		$T_A = 85^{\circ}\text{C}$		-1.8	
Power Dissipation (Note 1)		$T_A = 25^{\circ}\text{C}$	P_D	2.4	W
Pulsed Drain Current	$t_p = 10\text{ }\mu\text{s}$		I_{DM}	-42	A
Operating Junction and Storage Temperature			T_J , T_{STG}	-55 to 175	$^{\circ}\text{C}$
Source Current (Body Diode)			I_S	-12	A
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = -30\text{ V}$, $V_G = -10\text{ V}$, $I_{PK} = -12\text{ A}$, $L = 3.0\text{ mH}$, $R_G = 3.0\text{ }\Omega$)			EAS	216	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	$^{\circ}\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction–to–Case	$R_{\theta JC}$	2.4	$^\circ\text{C/W}$
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.

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

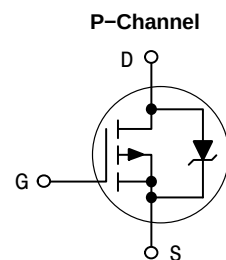
*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



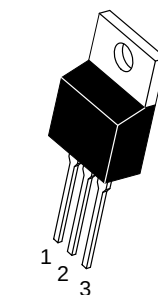
ON Semiconductor®

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



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

NTP2955

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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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.

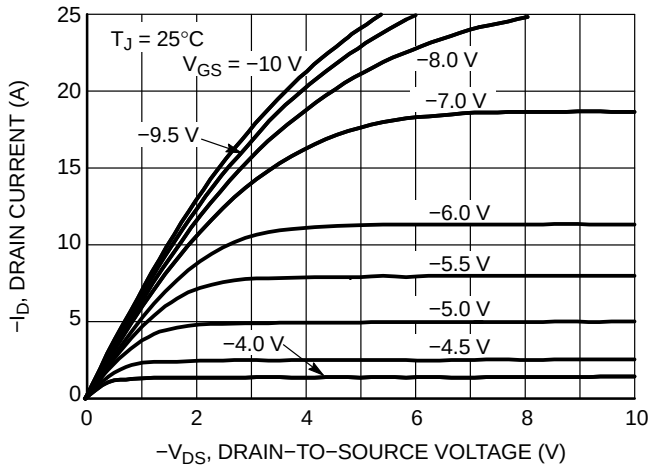


Figure 1. On-Region Characteristics

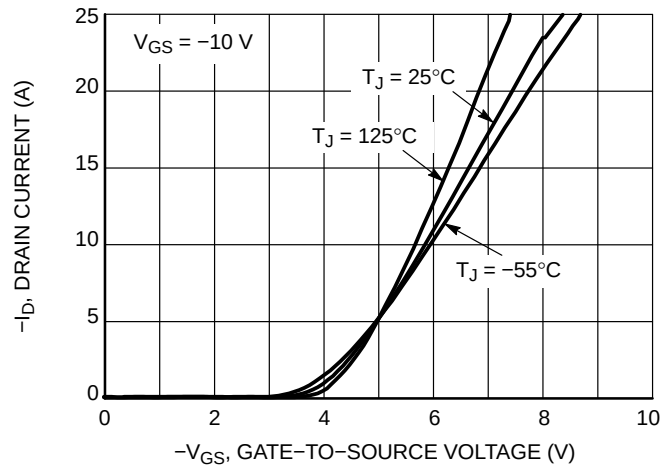


Figure 2. Transfer Characteristics

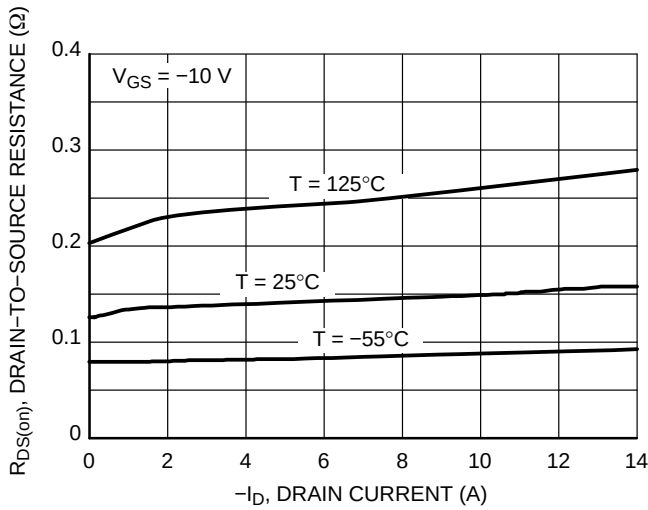


Figure 3. On-Resistance versus Drain Current and Temperature

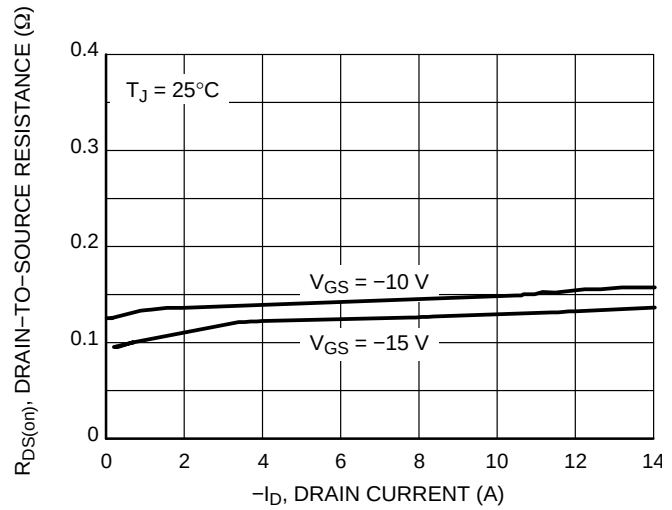


Figure 4. On-Resistance versus Drain Current and Gate Voltage

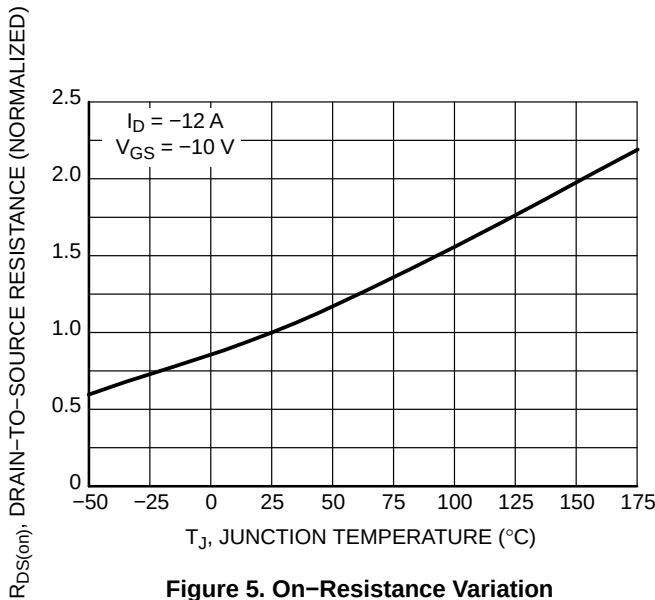


Figure 5. On-Resistance Variation with Temperature

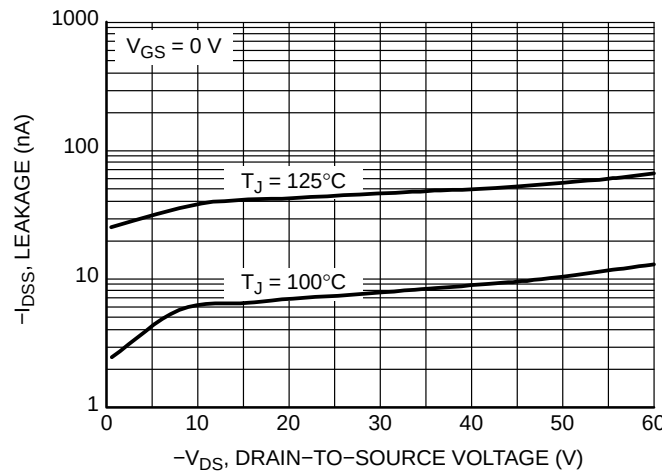


Figure 6. Drain-to-Source Leakage versus Voltage

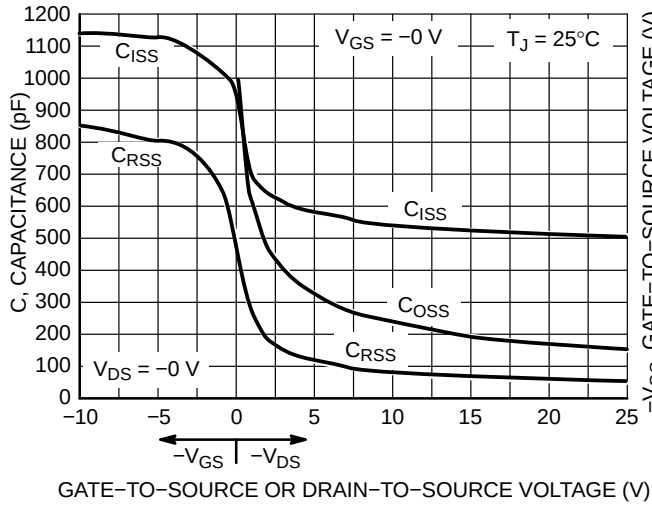


Figure 7. Capacitance Variation

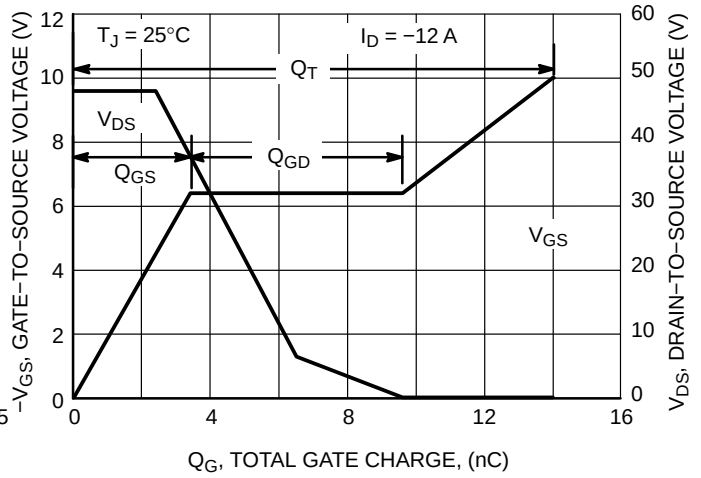


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

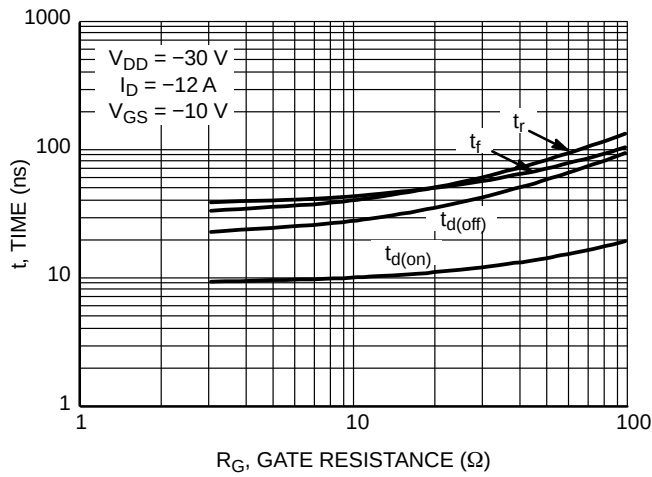


Figure 9. Resistive Switching Time Variation versus Gate Resistance

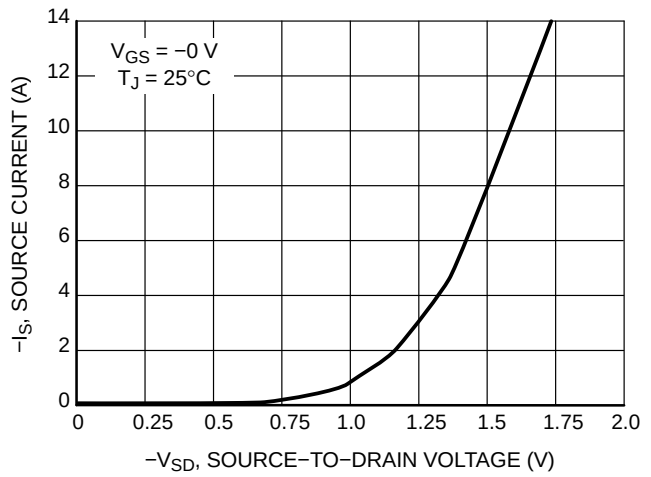


Figure 10. Diode Forward Voltage versus Current

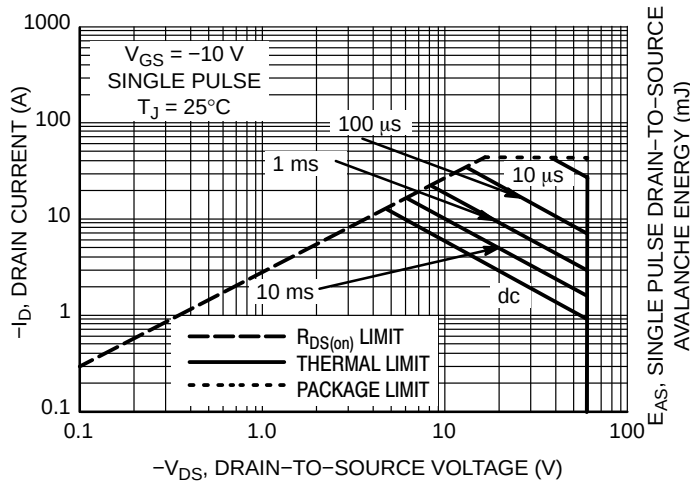


Figure 11. Maximum Rated Forward Biased Safe Operating Area

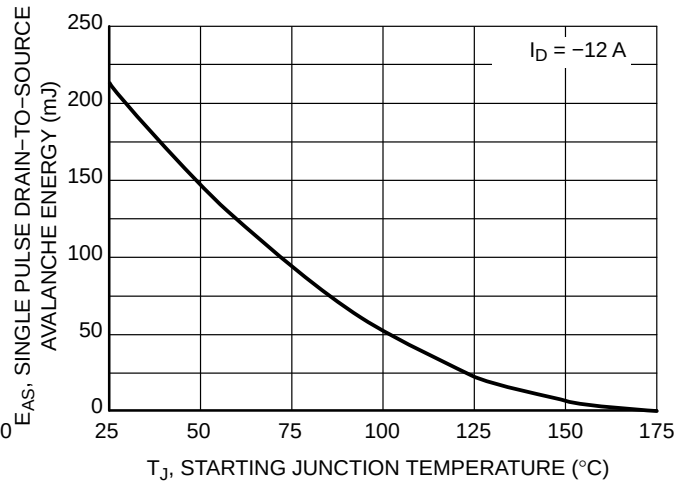
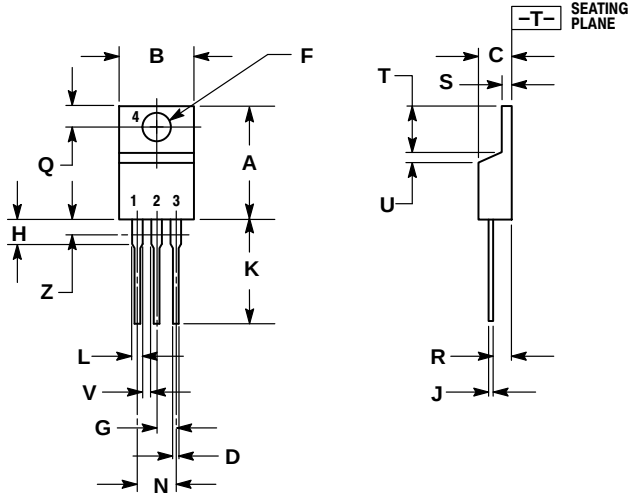


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

NTP2955

PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AH



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	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	3.61	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	1.39
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 5:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

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