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NTP2955

Power MOSFET

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



ON Semiconductor®

<http://onsemi.com>

Features

- Low $R_{DS(on)}$
- Rugged Performance
- Fast Switching
- Pb-Free Package is Available*

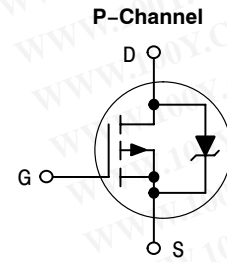
Applications

- Industrial
- Automotive
- Power Supplies

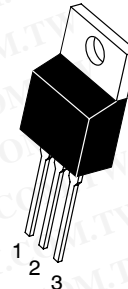
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D MAX
-60 V	156 mΩ @ -10 V	-12 A

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

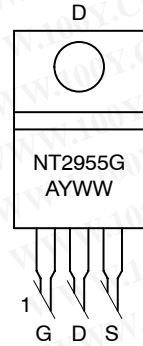
Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	-60	V
Gate-to-Source Voltage	V_{GS}	±20	V
Continuous Drain Current (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	I_D -12 A
		$T_C = 85^\circ\text{C}$	-9.0
Power Dissipation (Note 1)		$T_C = 25^\circ\text{C}$	P_D 62.5 W
Continuous Drain Current (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	$t_p = 10 \mu\text{s}$	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 ($V_{DD} = -30 \text{ V}, V_G = -10 \text{ V}, I_{PK} = -12 \text{ A}, L = 3.0 \text{ mH}, R_G = 3.0 \Omega$)	EAS	216	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	°C



MARKING DIAGRAM & PIN ASSIGNMENT



TO-220
CASE 221A
STYLE 5



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

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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- 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.

ORDERING INFORMATION

Device	Package	Shipping
NTP2955	TO-220	50 Units / Rail
NTP2955G	TO-220 (Pb-Free)	50 Units / Rail

ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			67		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = -48\text{ V}$			-1.0	μA
					-10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-2.0		-4.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			56		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -12\text{ A}$		156	196	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = -60\text{ V}, I_D = -12\text{ A}$		6.0		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -25\text{ V}$		507	700	pF
Output Capacitance	C_{OSS}			150	250	
Reverse Transfer Capacitance	C_{RSS}			48	98	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -10\text{ V}, V_{DS} = -48\text{ V}, I_D = -12\text{ A}$		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	$t_{d(on)}$	$V_{GS} = -10\text{ V}, V_{DD} = -30\text{ V}, I_D = -12\text{ A}, R_G = 9.1\ \Omega$		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}	$V_{GS} = 0\text{ V}, I_S = -12\text{ A}$	$T_J = 25^\circ\text{C}$		-1.6	-2.0	V
			$T_J = 125^\circ\text{C}$		-1.36		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = -12\text{ A}$			53		ns
Charge Time	t_a				42		
Discharge Time	t_b				12		
Reverse Recovery Charge	Q_{RR}				126		

- Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

NTP2955

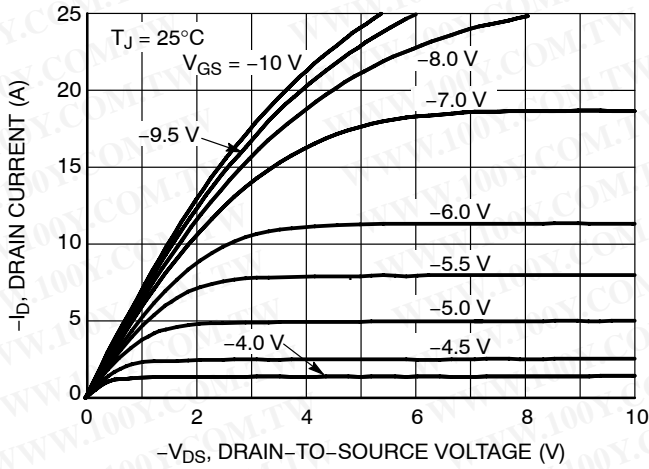


Figure 1. On-Region Characteristics

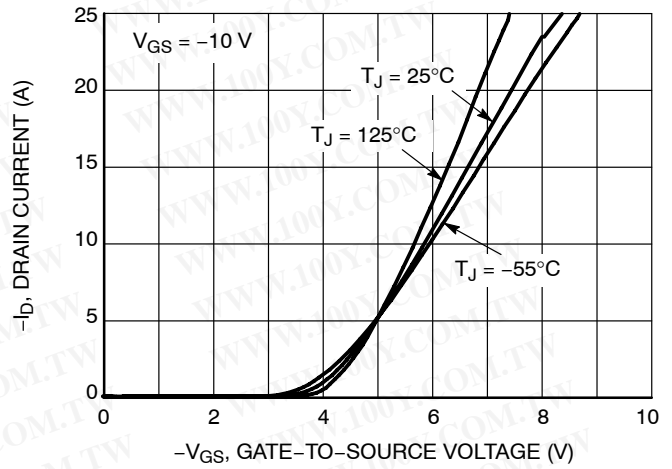


Figure 2. Transfer Characteristics

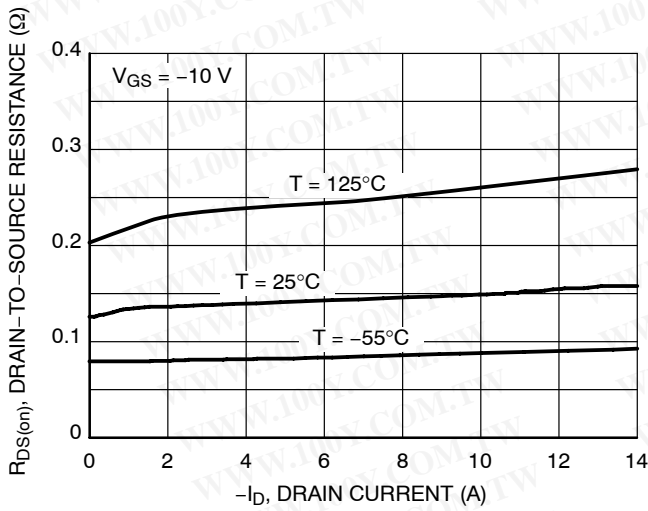


Figure 3. On-Resistance versus Drain Current and Temperature

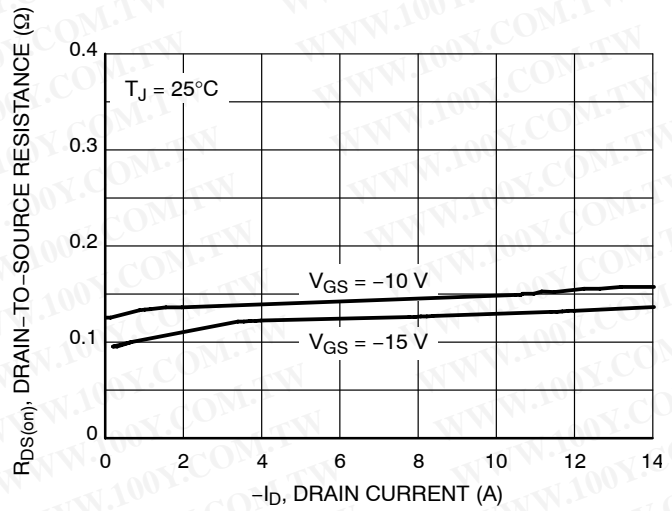


Figure 4. On-Resistance versus Drain Current and Gate Voltage

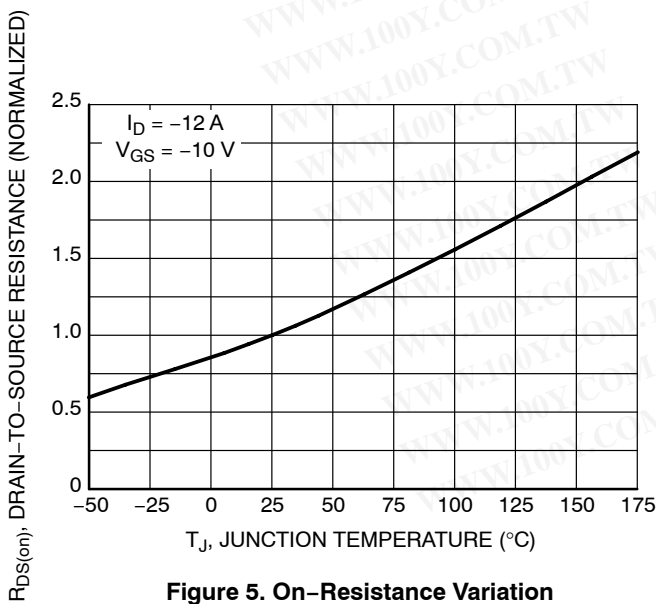


Figure 5. On-Resistance Variation with Temperature

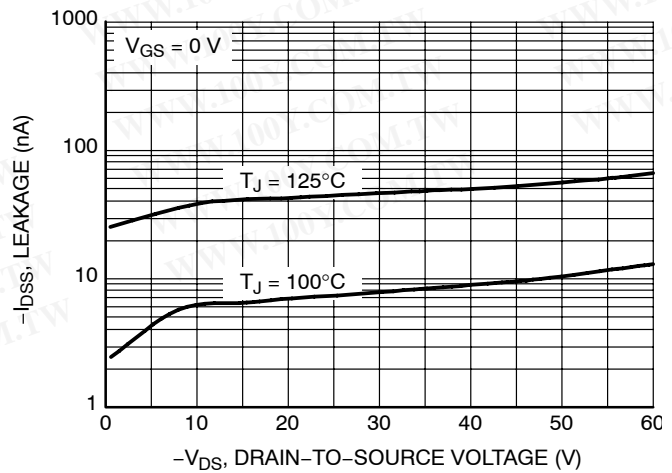


Figure 6. Drain-to-Source Leakage versus Voltage

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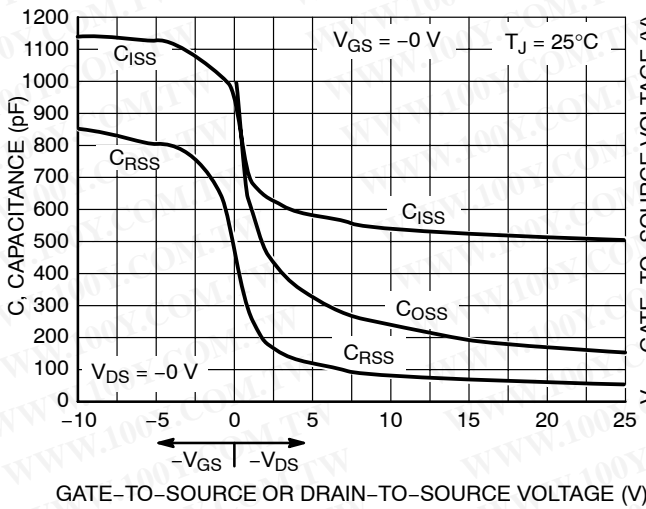


Figure 7. Capacitance Variation

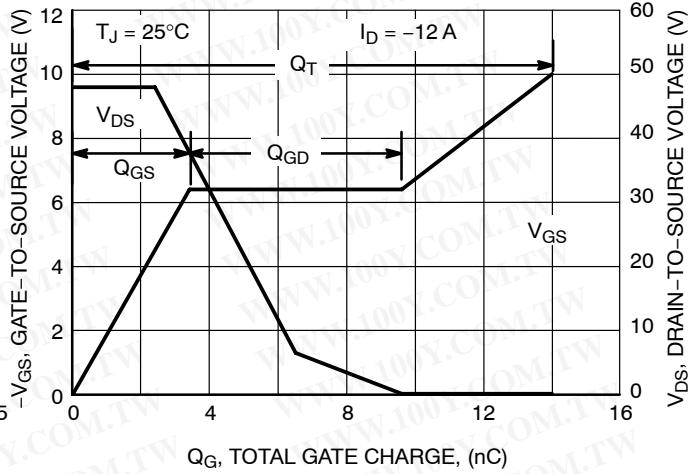


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

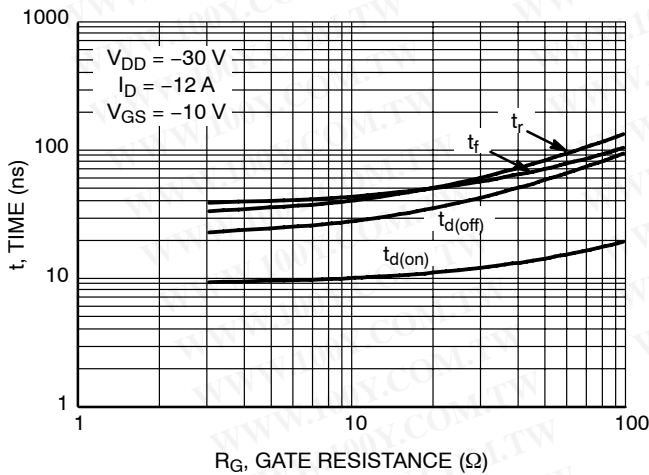


Figure 9. Resistive Switching Time Variation versus Gate Resistance

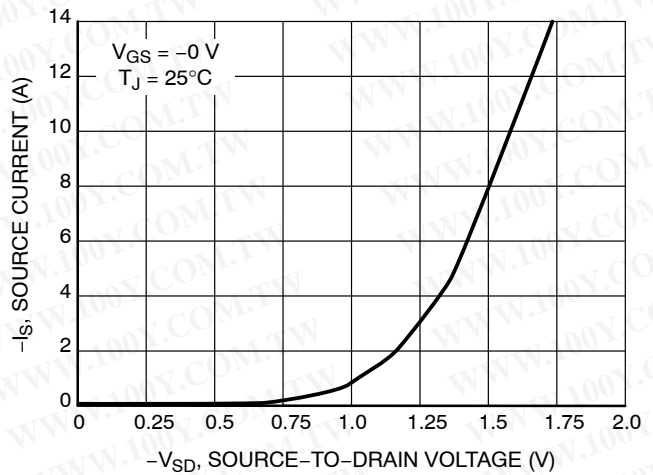


Figure 10. Diode Forward Voltage versus Current

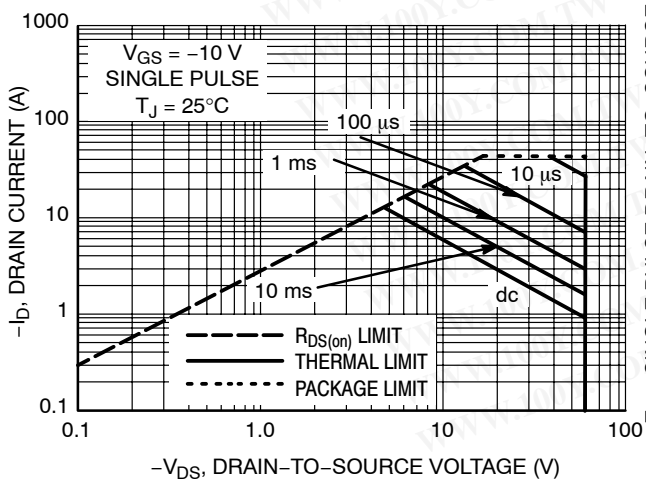


Figure 11. Maximum Rated Forward Biased Safe Operating Area

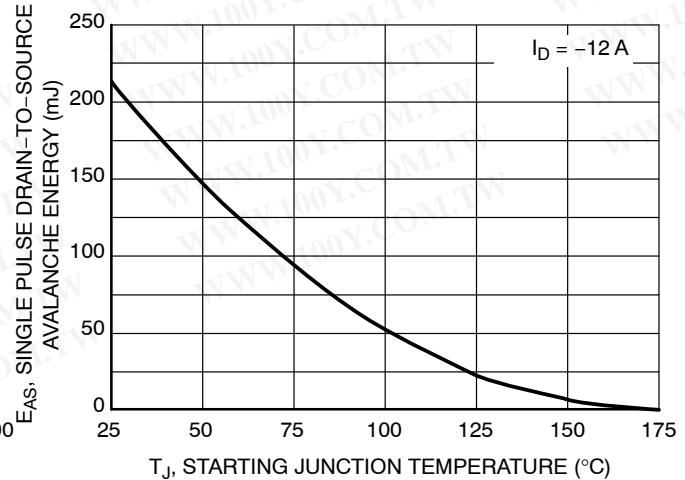


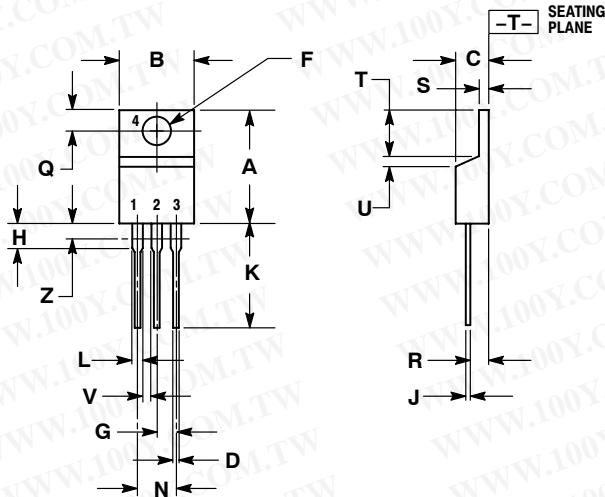
Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

NTP2955

PACKAGE DIMENSIONS

TO-220
T SUFFIX
PLASTIC PACKAGE
CASE 221A-09
ISSUE AA

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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	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
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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