

NTF2955, NVF2955, NVF2955P

Power MOSFET

-60 V, -2.6 A, Single P-Channel SOT-223

Features

- Design for low $R_{DS(on)}$
- Withstands High Energy in Avalanche and Commutation Modes
- AEC-Q101 Qualified – NVF2955, NVF2955P
- These Devices are Pb-Free and are RoHS Compliant

Applications

- Power Supplies
- PWM Motor Control
- Converters
- Power Management

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	I_D	$T_A = 25^\circ\text{C}$	-2.6	A
			$T_A = 85^\circ\text{C}$	-2.0	
Power Dissipation (Note 1)	Steady State	P_D	2.3	W	
Continuous Drain Current (Note 2)	Steady State	I_D	$T_A = 25^\circ\text{C}$	-1.7	A
			$T_A = 85^\circ\text{C}$	-1.3	
Power Dissipation (Note 2)		P_D	1.0	W	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	-17	A	
Operating Junction and Storage Temperature		T_J , T_{STG}	-55 to 175	$^\circ\text{C}$	
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 25 \text{ V}$, $V_G = 10 \text{ V}$, $I_{PK} = 6.7 \text{ A}$, $L = 10 \text{ mH}$, $R_G = 25 \Omega$)		EAS	225	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 seconds)		T_L	260	$^\circ\text{C}$	

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Tab (Drain) – Steady State (Note 2)	$R_{\theta JC}$	14	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	65	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	150	

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.

1. When surface mounted to an FR4 board using 1 in. pad size (Cu. area = 1.127 in² [1 oz] including traces)
2. When surface mounted to an FR4 board using the minimum recommended pad size (Cu. area = 0.341 in²)

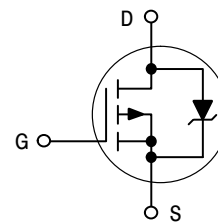


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$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
-60 V	145 m Ω @ -10 V	-2.6 A

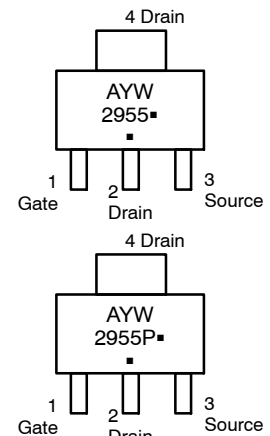
P-Channel



MARKING DIAGRAMS AND PIN ASSIGNMENT



SOT-223
CASE 318E
STYLE 3



A = Assembly Location
Y = Year
W = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping [†]
NTF2955T1G	SOT-223 (Pb-Free)	1000 /Tape & Reel
NVF2955T1G	SOT-223 (Pb-Free)	1000/ Tape & Reel
NVF2955PT1G	SOT-223 (Pb-Free)	1000/ Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			66.4		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = -60\text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	μA
			$T_J = 125^\circ\text{C}$		-50	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -1.0\text{ mA}$	-2.0		-4.0	V
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -0.75\text{ A}$		145	170	m Ω
		$V_{GS} = -10\text{ V}, I_D = -1.5\text{ A}$		150	180	
		$V_{GS} = -10\text{ V}, I_D = -2.4\text{ A}$		154	185	
Forward Transconductance	g_{FS}	$V_{GS} = -15\text{ V}, I_D = -0.75\text{ A}$		1.77		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 25\text{ V}$		492		pF
Output Capacitance	C_{OSS}			165		
Reverse Transfer Capacitance	C_{RSS}			50		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 30\text{ V}, I_D = 1.5\text{ A}$		14.3		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.2		
Gate-to-Source Charge	Q_{GS}			2.3		
Gate-to-Drain Charge	Q_{GD}			5.2		

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DD} = 25\text{ V}, I_D = 1.5\text{ A}, R_G = 9.1\ \Omega, R_L = 25\ \Omega$		11		ns
Rise Time	t_r			7.6		
Turn-Off Delay Time	$t_{d(OFF)}$			65		
Fall Time	t_f			38		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 1.5\text{ A}$	$T_J = 25^\circ\text{C}$		-1.10	-1.30	V
			$T_J = 125^\circ\text{C}$		-0.9		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = 1.5\text{ A}$		36		ns	
Charge Time	t_a			20			
Discharge Time	t_b			16			
Reverse Recovery Charge	Q_{RR}			0.139			nC

3. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

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TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

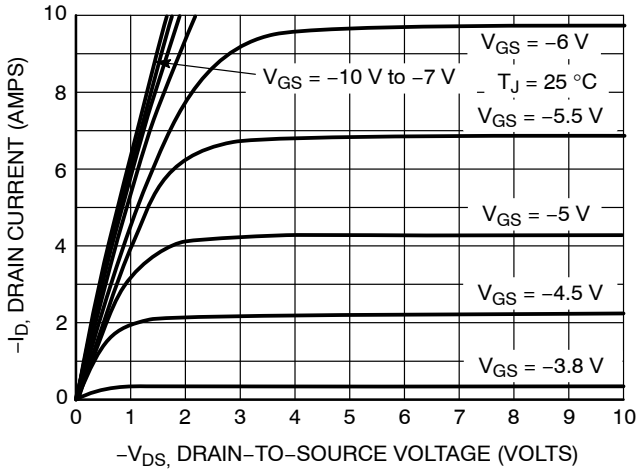


Figure 1. On-Region Characteristics

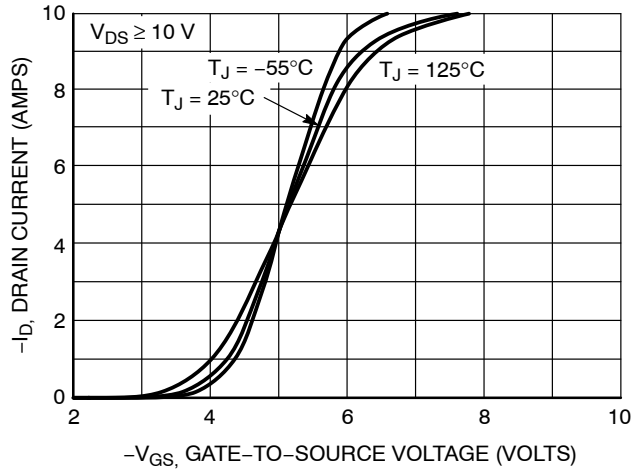


Figure 2. Transfer Characteristics

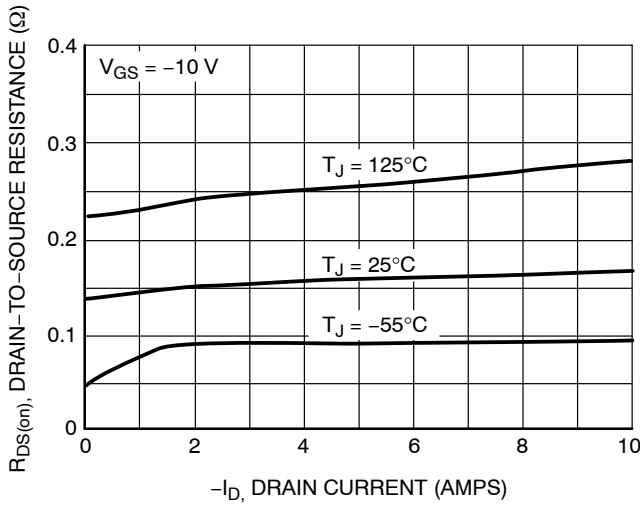


Figure 3. On-Resistance versus Drain Current and Temperature

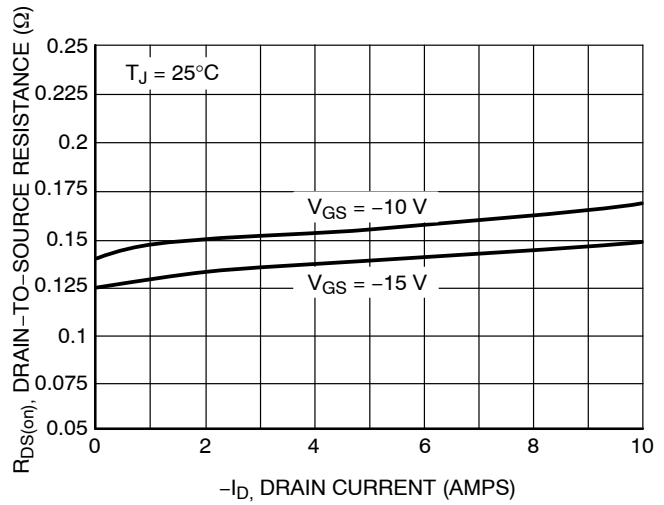


Figure 4. On-Resistance versus Drain Current and Gate Voltage

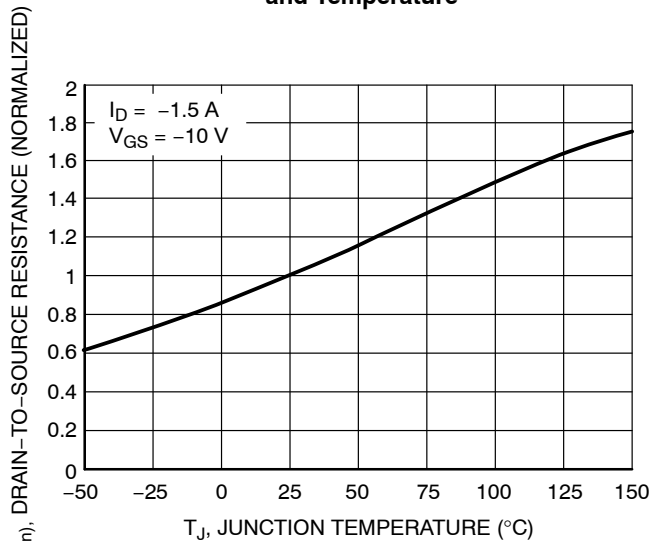


Figure 5. On-Resistance Variation with Temperature

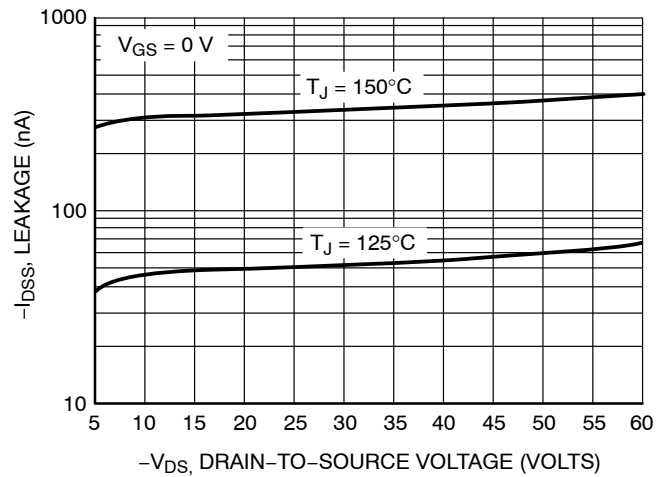


Figure 6. Drain-to-Source Leakage Current versus Voltage

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TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

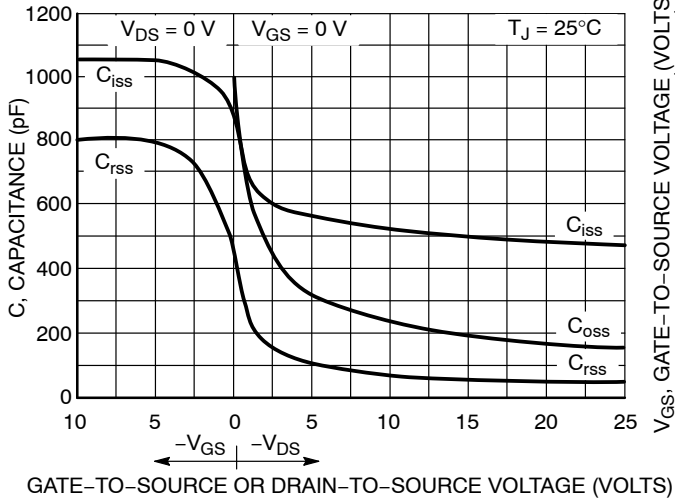


Figure 7. Capacitance Variation

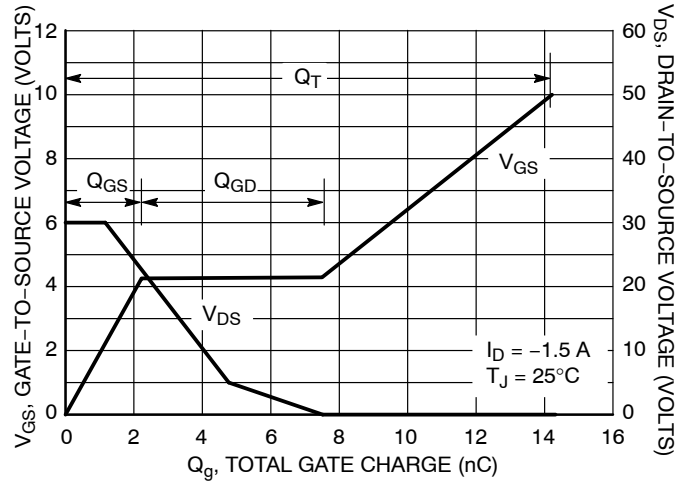


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

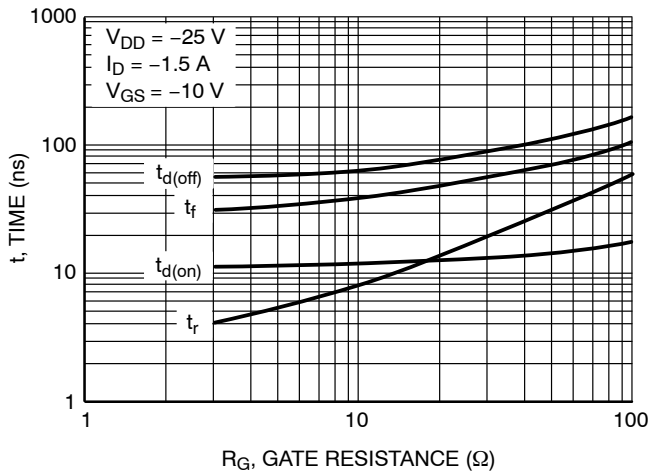


Figure 9. Resistive Switching Time Variation versus Gate Resistance

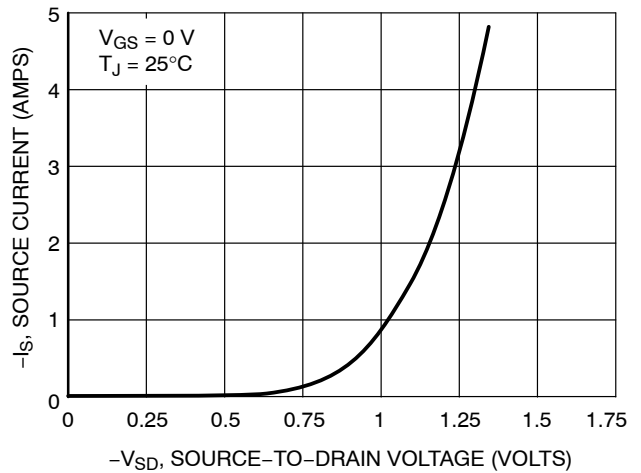


Figure 10. Diode Forward Voltage versus Current

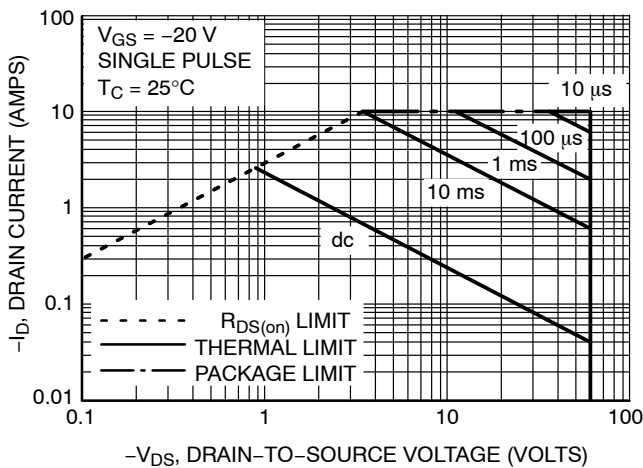


Figure 11. Maximum Rated Forward Biased Safe Operating Area

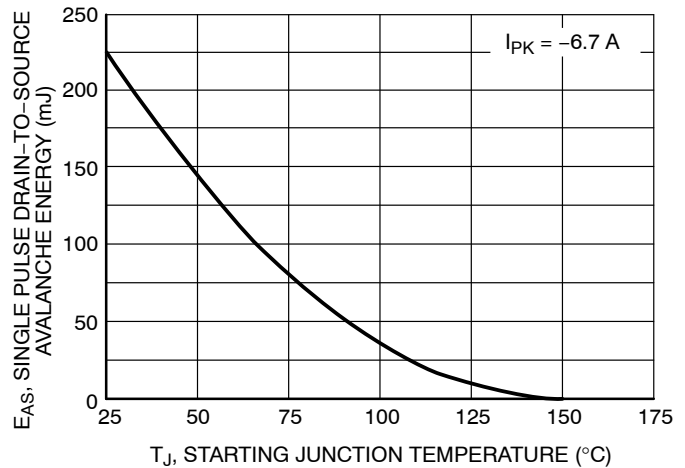
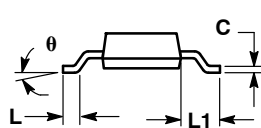
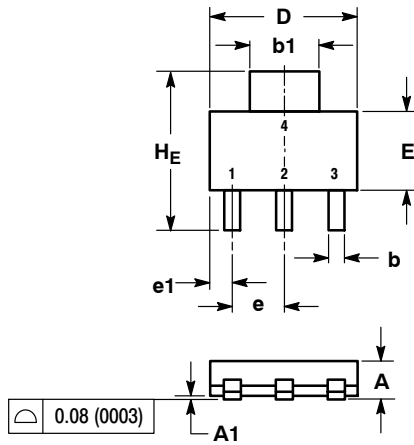


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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PACKAGE DIMENSIONS

SOT-223 (TO-261)
CASE 318E-04
ISSUE N

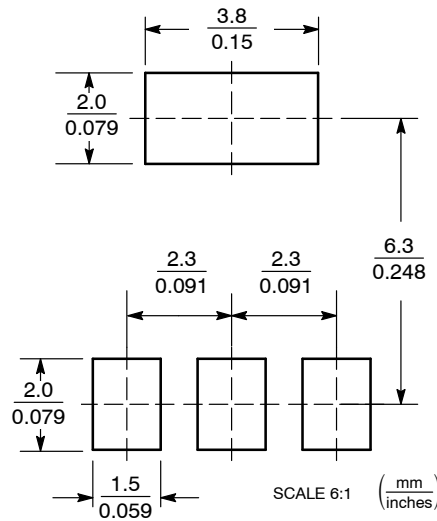


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.63	1.75	0.060	0.064	0.068
A1	0.02	0.06	0.10	0.001	0.002	0.004
b	0.60	0.75	0.89	0.024	0.030	0.035
b1	2.90	3.06	3.20	0.115	0.121	0.126
c	0.24	0.29	0.35	0.009	0.012	0.014
D	6.30	6.50	6.70	0.249	0.256	0.263
E	3.30	3.50	3.70	0.130	0.138	0.145
e	2.20	2.30	2.40	0.087	0.091	0.094
e1	0.85	0.94	1.05	0.033	0.037	0.041
L	0.20	---	---	0.008	---	---
L1	1.50	1.75	2.00	0.060	0.069	0.078
HE	6.70	7.00	7.30	0.264	0.276	0.287
θ	0°	-	10°	0°	-	10°

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

SOLDERING FOOTPRINT*



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

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