

MOSFET – Power, Single N-Channel, Logic Level, SOT-23 60 V, 155 mΩ



NVR5198NL

Features

- Small Footprint Industry Standard Surface Mount SOT-23 Package
- Low $R_{DS(on)}$ for Low Conduction Losses and Improved Efficiency
- NVR Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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 $R_{\Psi, Jmb}$ (Notes 1, 2, 3, and 4)	I_D	2.2	A
		1.6	
Power Dissipation $R_{\Psi, Jmb}$ (Notes 1 and 3)	P_D	1.5	W
		0.6	
Continuous Drain Current $R_{\theta, JA}$ (Note 1, 2, 3, and 4)	I_D	1.7	A
		1.2	
Power Dissipation $R_{\theta, JA}$ (Notes 1 and 3)	P_D	0.9	W
		0.4	
Pulsed Drain Current	I_{DM}	27	A
Operating Junction and Storage Temperature	T_J, T_{stg}	-55 to 150	°C
Source Current (Body Diode)	I_S	1.9	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	°C

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.

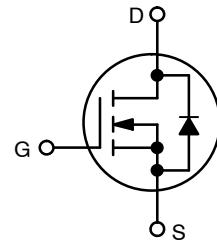
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Psi (Ψ) is used as required per JEDEC51-12 for packages in which substantially less than 100% of the heat flows to single case surface.
3. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
4. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

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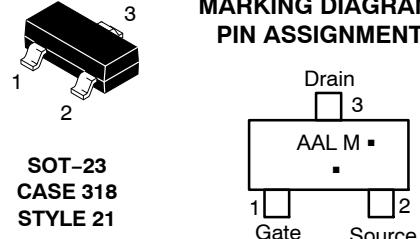
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$V_{(BR)DSS}$	$R_{DS(on)} \text{ TYP}$	$I_D \text{ MAX}$
60 V	155 mΩ @ 10 V	2.2 A
	205 mΩ @ 4.5 V	

N-Channel



MARKING DIAGRAM/ PIN ASSIGNMENT



AAL = Device Code

M = Date Code*

▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

Device	Package	Shipping [†]
NVR5198NLT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
NVR5198NLT3G	SOT-23 (Pb-Free)	10000 / 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.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Lead #3 – Drain (Notes 2 and 3)	$R_{\Psi Jmb}$	86	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	139	°C/W

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(\text{BR})\text{DSS}}/T_J$	Reference to 25°C , $I_D = 250 \mu\text{A}$		70		$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}$, $V_{\text{DS}} = 60 \text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}$, $V_{\text{GS}} = \pm 20 \text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}$, $I_D = 250 \mu\text{A}$	1.5		2.5	V
Threshold Temperature Coefficient	$V_{\text{GS}(\text{TH})}/T_J$	Reference to 25°C , $I_D = 250 \mu\text{A}$		-6.5		$\text{mV}/^\circ\text{C}$
Drain-to-Source On-Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}$, $I_D = 1 \text{ A}$		107	155	$\text{m}\Omega$
		$V_{\text{GS}} = 4.5 \text{ V}$, $I_D = 1 \text{ A}$		142	205	
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 5.0 \text{ V}$, $I_D = 1 \text{ A}$		3		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{iss}	$V_{\text{GS}} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$, $V_{\text{DS}} = 25 \text{ V}$		182		pF
Output Capacitance	C_{oss}			25		
Reverse Transfer Capacitance	C_{rss}			16		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$	$V_{\text{DS}} = 48 \text{ V}$, $I_D = 1 \text{ A}$	$V_{\text{GS}} = 4.5 \text{ V}$	2.8		nC
			$V_{\text{GS}} = 10 \text{ V}$	5.1		
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$	$V_{\text{DS}} = 48 \text{ V}$, $I_D = 1 \text{ A}$ $V_{\text{GS}} = 10 \text{ V}$		0.3		
Gate-to-Source Charge	Q_{GS}			0.8		
Gate-to-Drain Charge	Q_{GD}			1.5		
Plateau Voltage	V_{GP}			3.1		V
Gate Resistance	R_{G}			8		Ω

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{\text{d}(\text{on})}$	$V_{\text{DS}} = 30 \text{ V}$, $V_{\text{GS}} = 10 \text{ V}$, $I_D = 1 \text{ A}$, $R_{\text{G}} = 10 \Omega$		5		ns
Rise Time	t_r			7		
Turn-Off Delay Time	$t_{\text{d}(\text{off})}$			13		
Fall Time	t_f			2		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 1 \text{ A}$	$T_J = 25^\circ\text{C}$		0.8	1.2	V
			$T_J = 125^\circ\text{C}$		0.6		
Reverse Recovery Time	t_{rr}	$I_S = 1 \text{ A}_{\text{dc}}$, $V_{\text{GS}} = 0 \text{ V}_{\text{dc}}$, $dI_S/dt = 100 \text{ A}/\mu\text{s}$			12		ns
Charge Time	t_a				9		
Discharge Time	t_b				3		
Reverse Recovery Stored Charge	Q_{RR}				6		nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

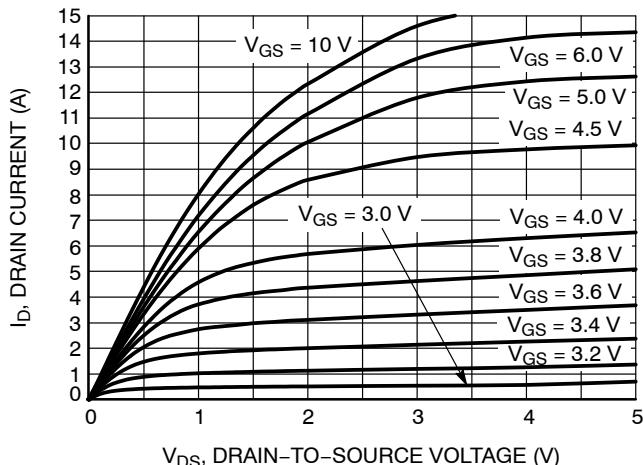


Figure 1. On-Region Characteristics

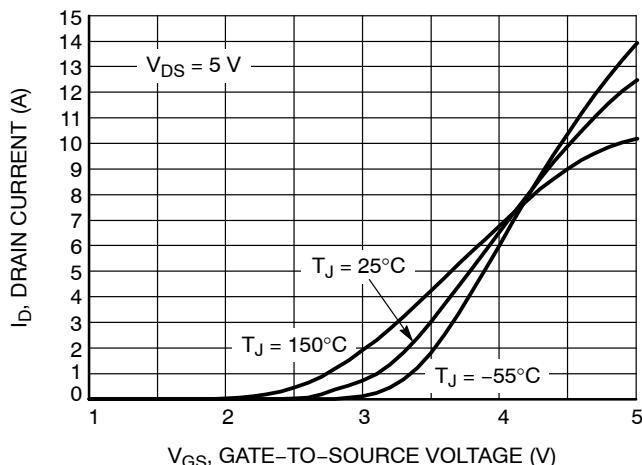


Figure 2. Transfer Characteristics

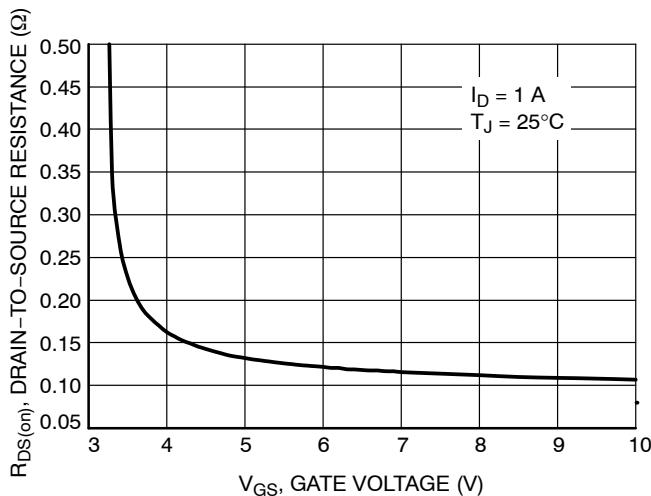


Figure 3. On-Resistance vs. Gate-to-Source Voltage

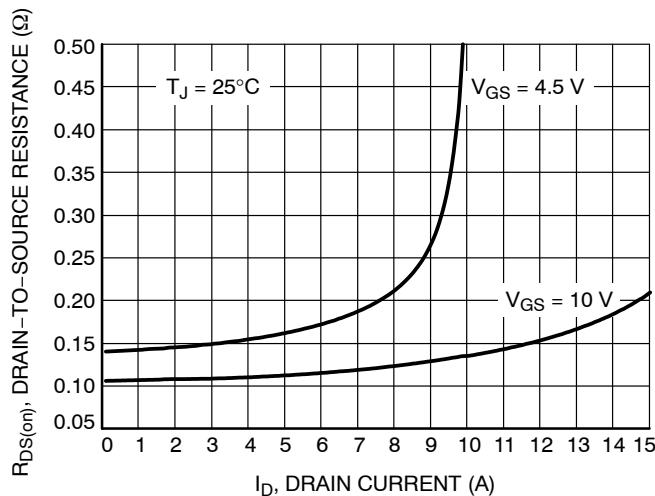


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

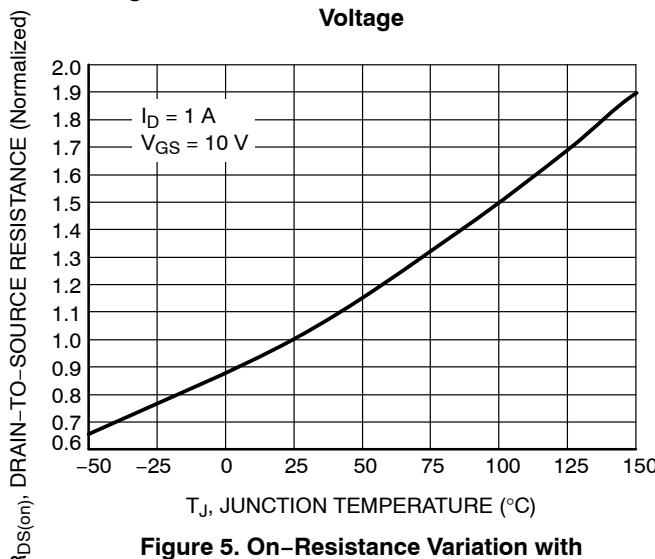


Figure 5. On-Resistance Variation with Temperature

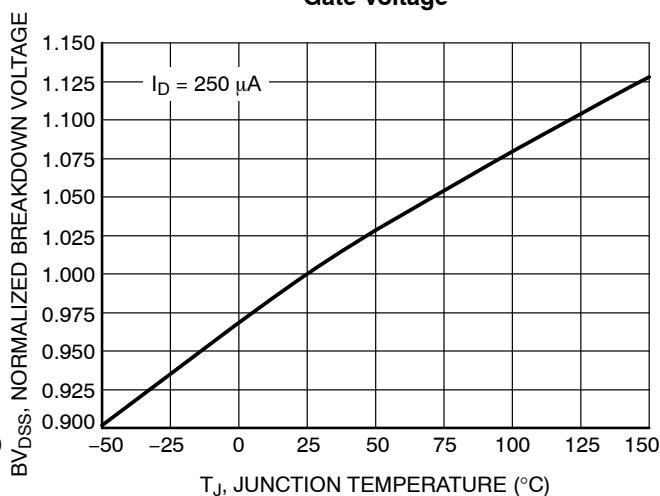


Figure 6. Breakdown Voltage Variation with Temperature

TYPICAL CHARACTERISTICS

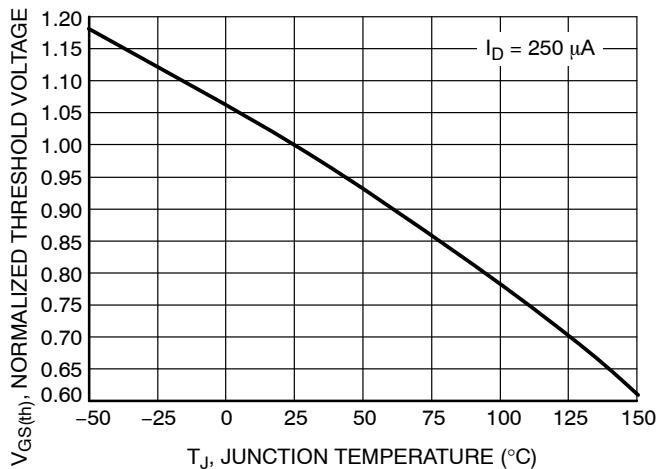


Figure 7. Threshold Voltage Variation with Temperature

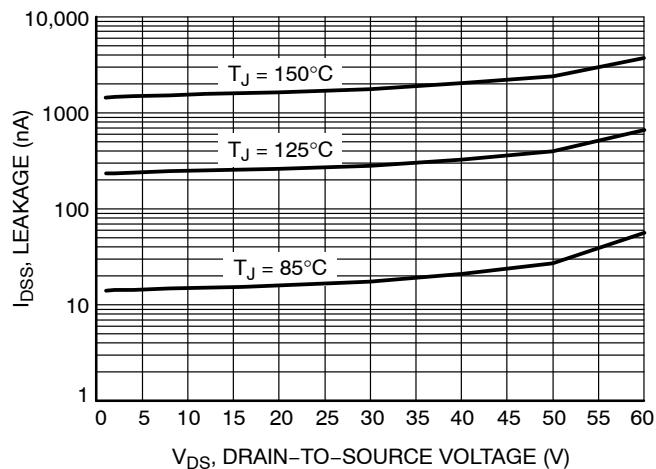


Figure 8. Drain-to-Source Leakage Current vs. Voltage

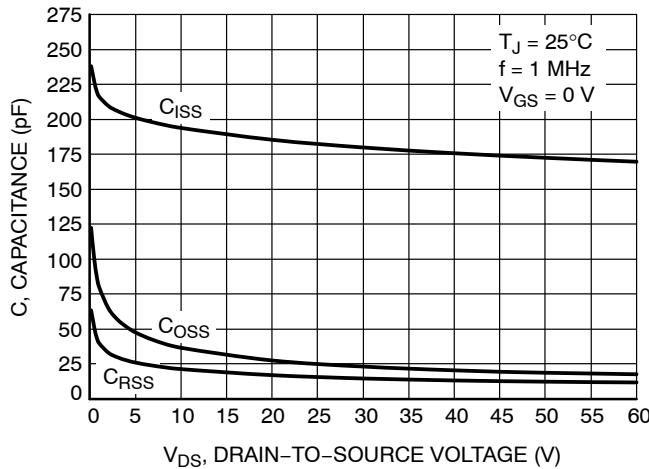


Figure 9. Capacitance Variation

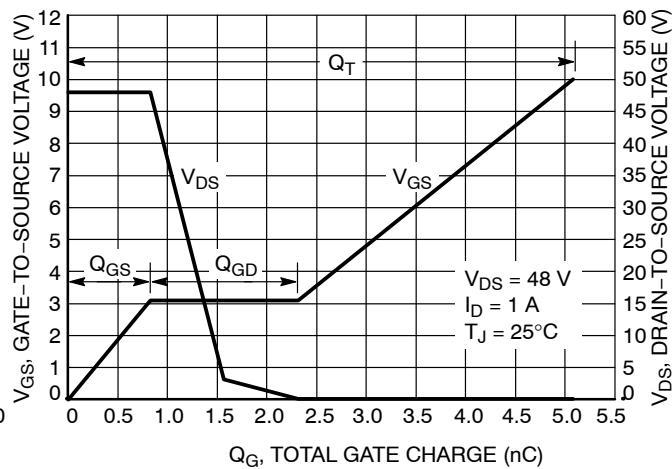


Figure 10. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

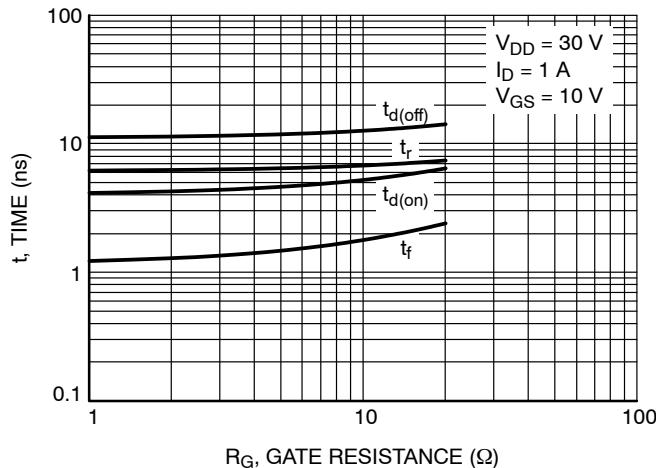


Figure 11. Resistive Switching Time Variation vs. Gate Resistance

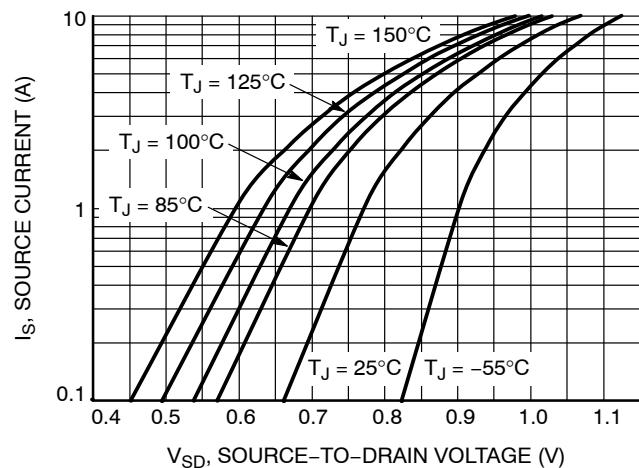


Figure 12. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS

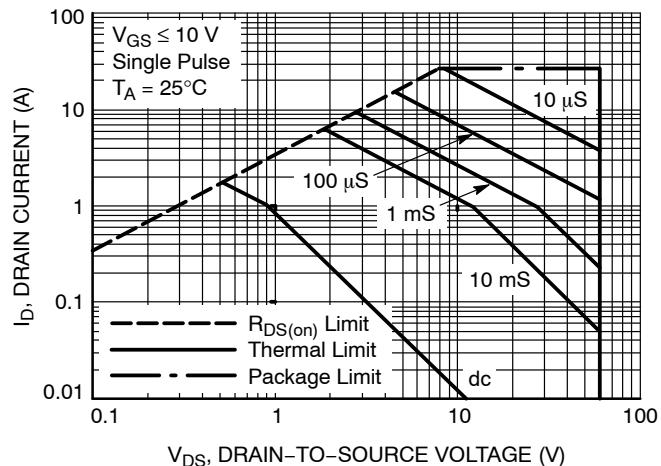


Figure 13. Maximum Rated Forward Biased Safe Operating Area

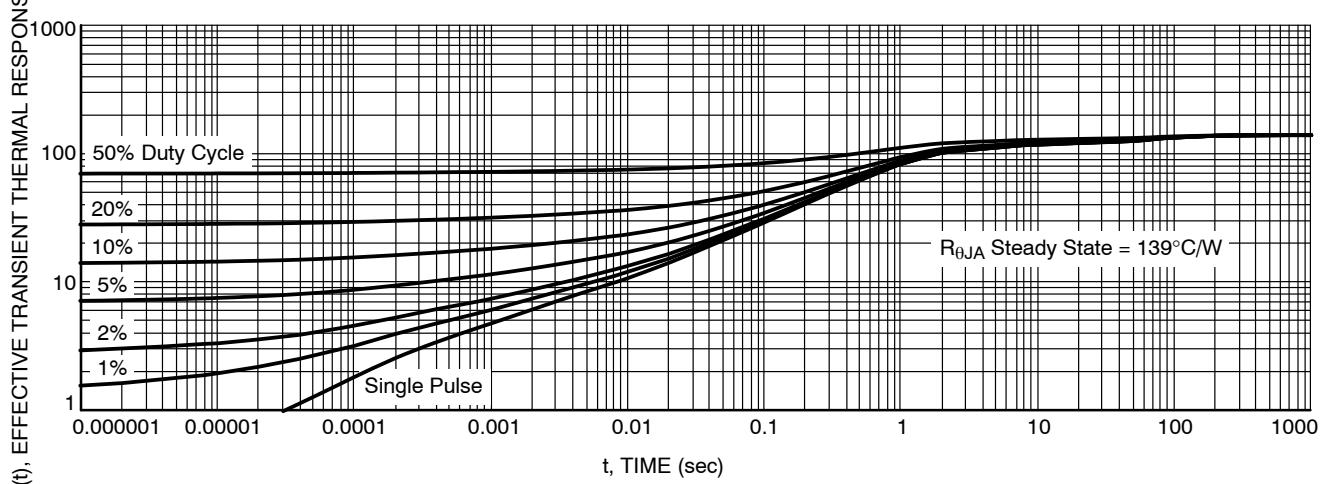
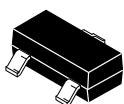


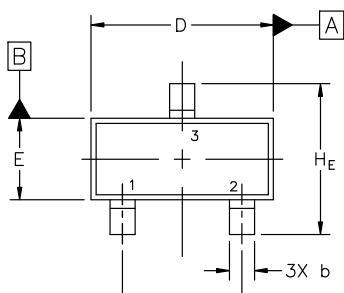
Figure 14. Thermal Impedance (Junction-to-Ambient)



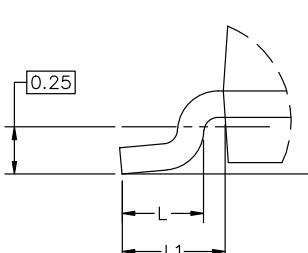
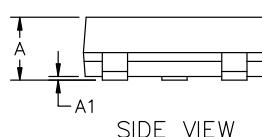
SCALE 4:1

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CASE 318
ISSUE AU

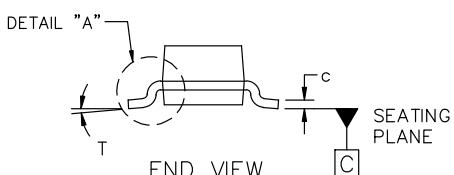
DATE 14 AUG 2024



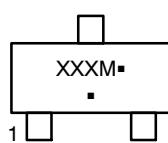
TOP VIEW

DETAIL "A"
Scale 3:1

SIDE VIEW



END VIEW

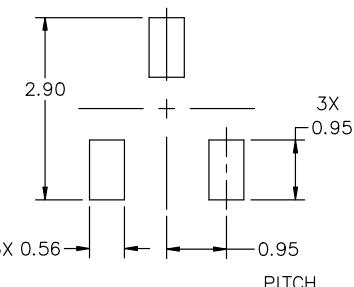
GENERIC
MARKING DIAGRAM*

XXX = Specific Device Code

M = Date Code

■ = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED
MOUNTING FOOTPRINT

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

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
H _E	2.10	2.40	2.64
T	0°	---	10°

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

STYLES ON PAGE 2

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CASE 318

ISSUE AU

DATE 14 AUG 2024

STYLE 1 THRU 5:
CANCELLEDSTYLE 6:
PIN 1. BASE
2. Emitter
3. CollectorSTYLE 7:
PIN 1. Emitter
2. Base
3. CollectorSTYLE 8:
PIN 1. Anode
2. No Connection
3. CathodeSTYLE 9:
PIN 1. Anode
2. Anode
3. CathodeSTYLE 10:
PIN 1. Drain
2. Source
3. GateSTYLE 11:
PIN 1. Anode
2. Cathode
3. Cathode-AnodeSTYLE 12:
PIN 1. Cathode
2. Cathode
3. AnodeSTYLE 13:
PIN 1. Source
2. Drain
3. GateSTYLE 14:
PIN 1. Cathode
2. Gate
3. AnodeSTYLE 15:
PIN 1. Gate
2. Cathode
3. AnodeSTYLE 16:
PIN 1. Anode
2. Cathode
3. CathodeSTYLE 17:
PIN 1. No Connection
2. Anode
3. CathodeSTYLE 18:
PIN 1. No Connection
2. Cathode
3. AnodeSTYLE 19:
PIN 1. Cathode
2. Anode
3. Cathode-AnodeSTYLE 20:
PIN 1. Cathode
2. Anode
3. GateSTYLE 21:
PIN 1. Gate
2. Source
3. DrainSTYLE 22:
PIN 1. Return
2. Output
3. InputSTYLE 23:
PIN 1. Anode
2. Anode
3. CathodeSTYLE 24:
PIN 1. Gate
2. Drain
3. SourceSTYLE 25:
PIN 1. Anode
2. Cathode
3. GateSTYLE 26:
PIN 1. Cathode
2. Anode
3. No ConnectionSTYLE 27:
PIN 1. Cathode
2. Cathode
3. CathodeSTYLE 28:
PIN 1. Anode
2. Anode
3. Anode

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