

# MOSFET – Power, N-Channel with ESD Protection

100 V, 1.33 A

NVNJWS0K9N10MCL

## Features

- Low  $R_{DS(on)}$
- ESD Protected Gate
- AEC-Q101 Qualified and PPAP Capable
- Wettable Flank for Enhanced Optical Inspection
- This is a Pb-Free Device

## Applications

- Load Switch

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			$V_{DS}$	100	V
Gate-to-Source Voltage			$V_{GS}$	$\pm 20$	V
Continuous Drain Current $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	1.33	A
		$T_C = 100^\circ\text{C}$		0.94	
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$P_D$	4.66	W
		$T_C = 100^\circ\text{C}$		2.33	
Continuous Drain Current $R_{\theta JA}$ (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	0.85	A
		$T_A = 100^\circ\text{C}$		0.60	
Power Dissipation $R_{\theta JA}$ (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	1.91	W
		$T_A = 100^\circ\text{C}$		0.95	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$		$I_{DM}$	10.18	A
Operating Junction and Storage Temperature			$T_J, T_{STG}$	-55 to 175	$^\circ\text{C}$
Source Current (Body Diode)			$I_S$	3.88	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			$T_L$	260	$^\circ\text{C}$

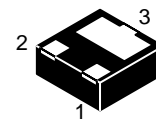
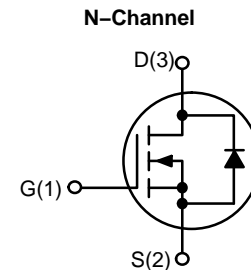
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Ambient – Steady State	$R_{\theta JA}$	79	$^\circ\text{C/W}$
Junction-to-Case – Steady State	$R_{\theta JC}$	32.2	$^\circ\text{C/W}$

1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).

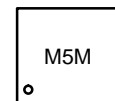
$V_{(BR)DS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ Max}$
100 V	1170 m $\Omega$ @ 10 V	1.33 A
	1820 m $\Omega$ @ 4.5 V	



XDFNW3  
CASE 521AC

M5 = Specific Device Code  
M = Month Code

## MARKING DIAGRAM



## ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# NVNJWS0K9N10MCL

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise stated)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		100	–	–	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\text{ }\mu\text{A}$ , ref to 25°C		–	73	–	mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V},$ $V_{DS} = 80\text{ V}$	$T_J = 25^\circ\text{C}$	–	–	1.0	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$	–	–	100	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$		–	–	$\pm 10$	$\mu\text{A}$

### ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 2 μA	1.0	–	3	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>		–	–6.7	–	mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 370 mA	–	810	1170	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 300 mA	–	1010	1820	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 370 mA	–	0.88	–	S

### CHARGES AND CAPACITANCES

Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 50 V	–	31	–	pF
Output Capacitance	C <sub>OSS</sub>		–	7.9	–	
Reverse Transfer Capacitance	C <sub>RSS</sub>		–	0.3	–	
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 50 V, I <sub>D</sub> = 370 mA	–	0.9	–	nC
Threshold Gate Charge	Q <sub>G(TH)</sub>		–	0.3	–	
Gate-to-Source Charge	Q <sub>GS</sub>		–	0.4	–	
Gate-to-Drain Charge	Q <sub>GD</sub>		–	0.2	–	

### SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DD</sub> = 50 V, I <sub>D</sub> = 370 mA, R <sub>G</sub> = 2.5 Ω	–	3.4	–	ns
Rise Time	t <sub>r</sub>		–	2.3	–	
Turn-Off Delay Time	t <sub>d(off)</sub>		–	6.5	–	
Fall Time	t <sub>f</sub>		–	9.2	–	

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 370 mA	T <sub>J</sub> = 25°C	–	0.85	1.2	V
			T <sub>J</sub> = 125°C	–	0.71	–	

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.

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

3. Switching characteristics are independent of operating junction temperatures.

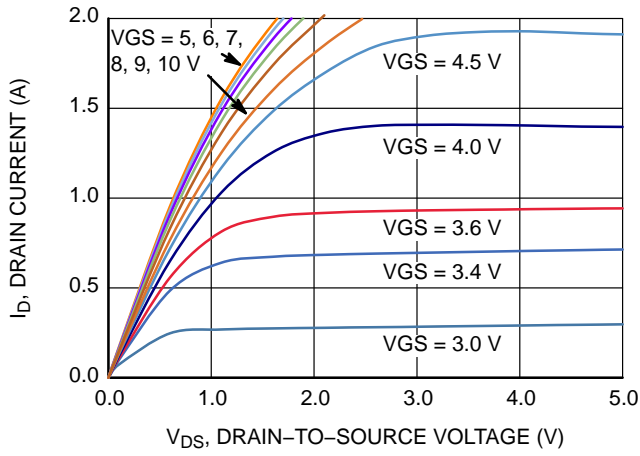


Figure 1. On-Region Characteristics

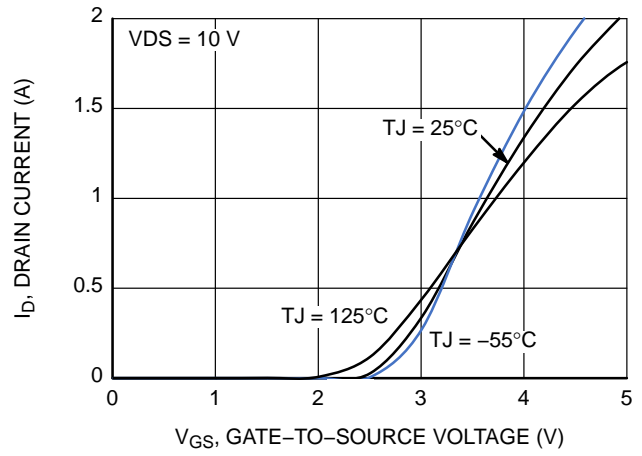


Figure 2. Transfer Characteristics

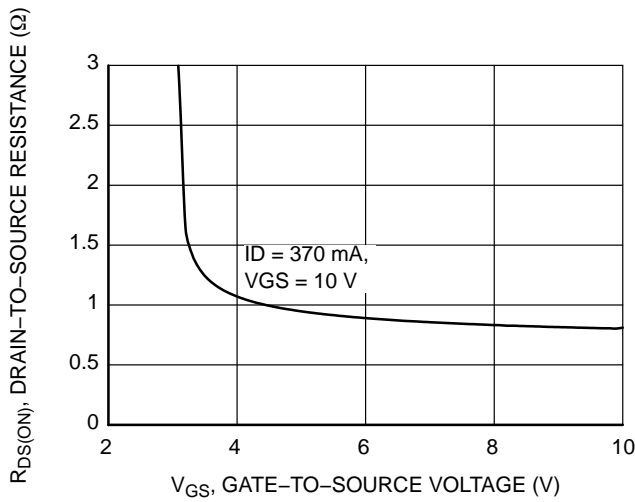


Figure 3. On-Resistance vs. Gate-to-Source Voltage

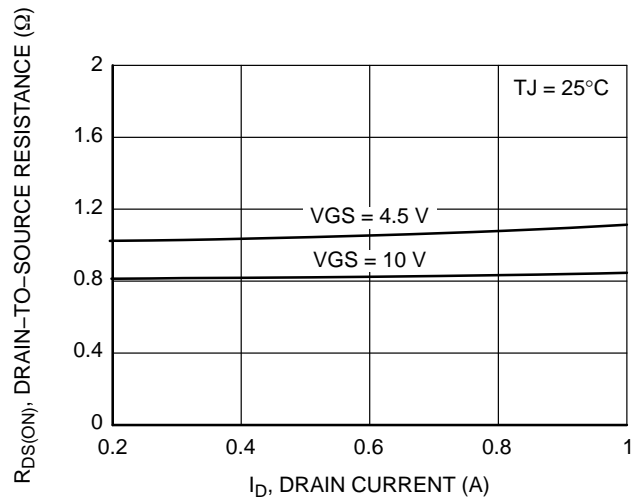


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

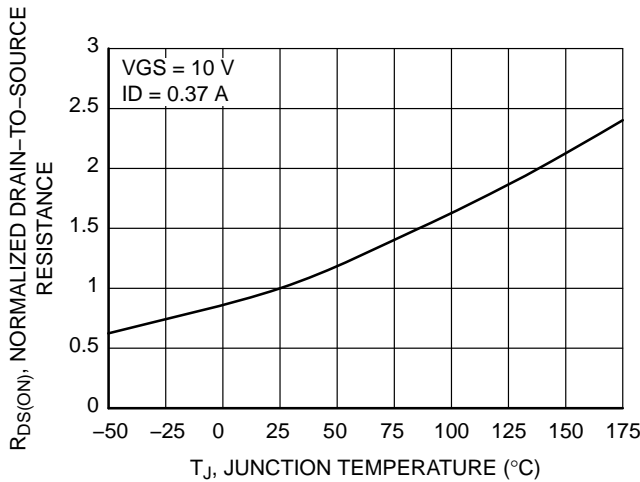


Figure 5. On-Resistance Variation with Temperature

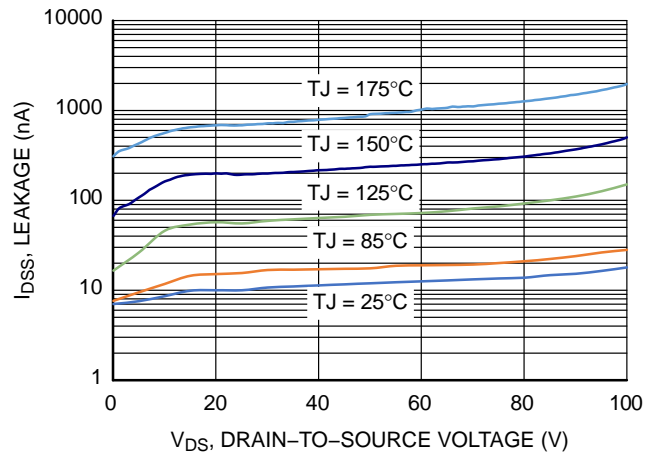


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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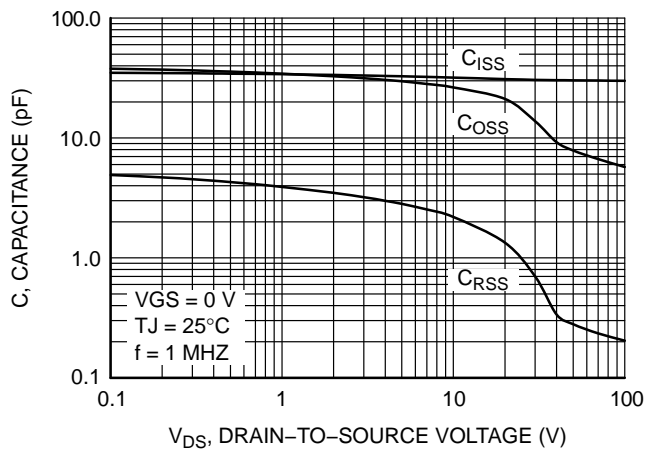


Figure 7. Capacitance Variation

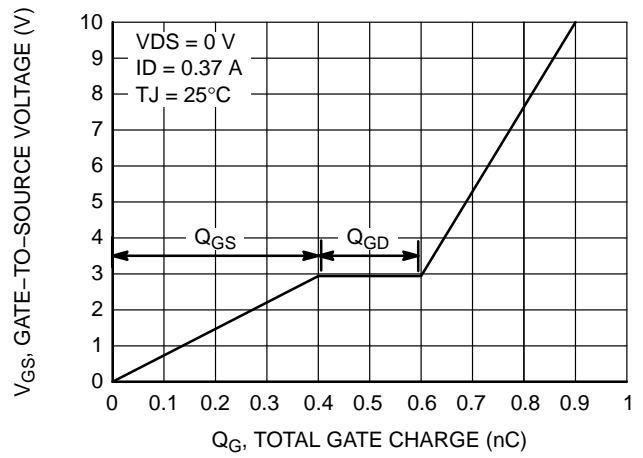


Figure 8. Gate-to-Source vs. Total Charge

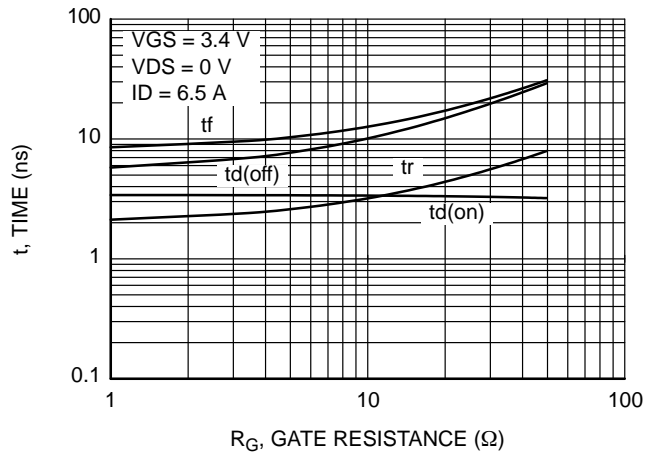


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

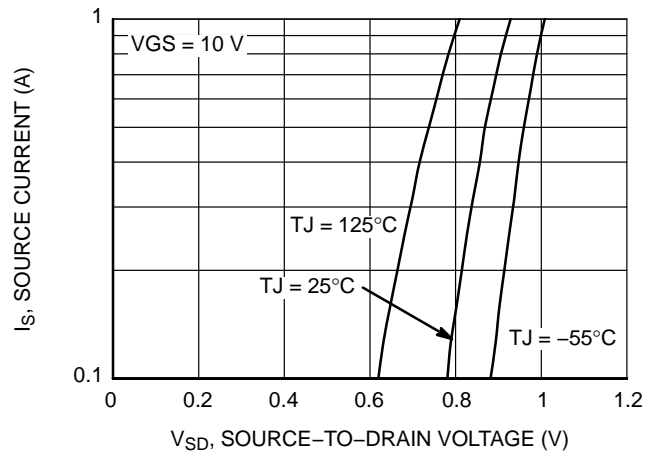


Figure 10. Diode Forward Voltage vs. Current

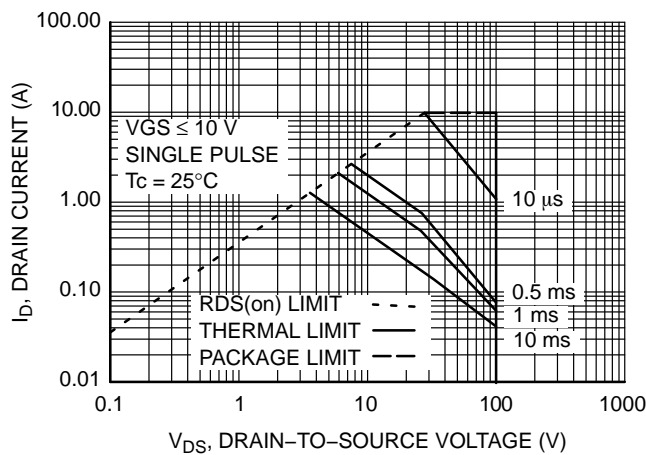


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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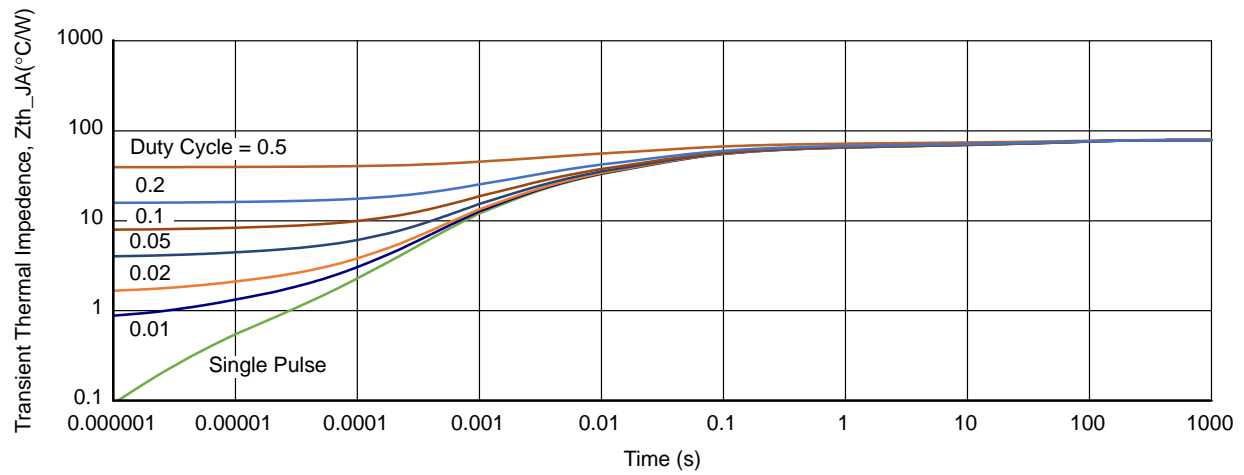
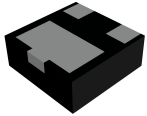


Figure 12. Thermal Characteristic

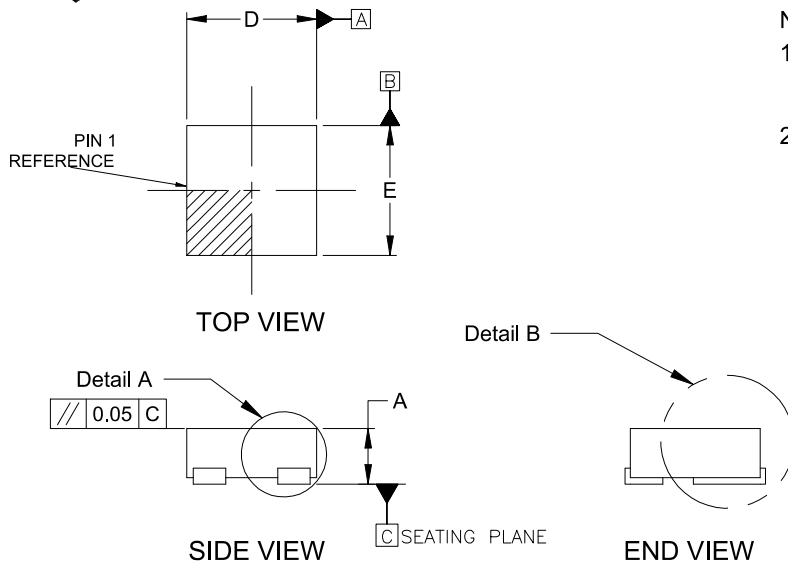
Table 1. ORDERING INFORMATION

Part Number	Marking	Package	Shipping <sup>†</sup>
NVNJWS0K9N10MCLTAG	M5	XDFNW3 (Pb-Free)	3000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

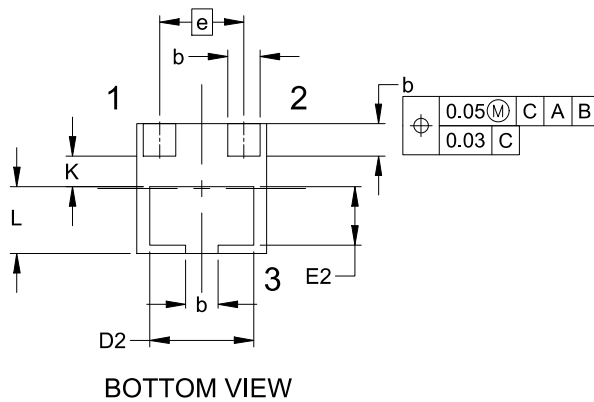
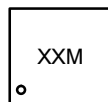

**XDFNW3 1.00x1.00x0.38 0.65P**  
CASE 521AC  
ISSUE B

DATE 07 MAY 2024

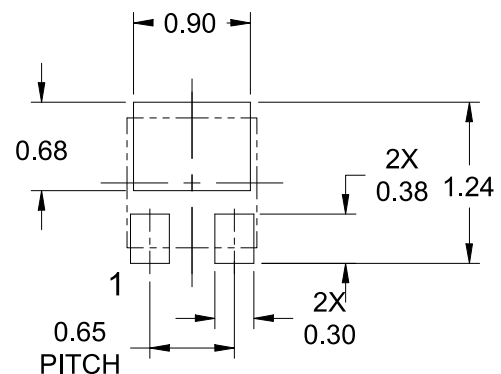
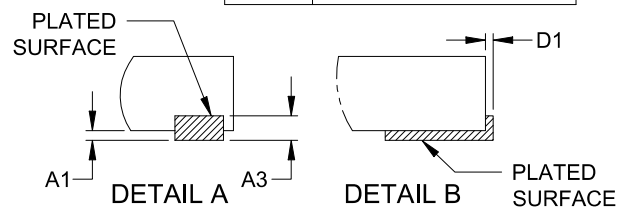

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.32	0.38	0.44
A1	0.00	---	0.04
A3	0.125 REF		
b	0.20	0.25	0.30
D	0.90	1.00	1.10
D1	0.00	---	0.04
D2	0.75	0.80	0.85
E	0.90	1.00	1.10
E2	0.40	0.45	0.50
e	0.65 BSC		
L	0.465	0.515	0.565
K	0.23 REF		


**GENERIC MARKING DIAGRAM\***

XX = Specific Device Code  
M = Month Code

\*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, S•LDERRM/D.

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