

MOSFET - N-Channel SuperFET[®] V, FRFET[®] 600 V, 55 mΩ, 45 A

NVB055N60S5F

Features

- Ultra Low Gate Charge & Low Effective Output Capacitance
- Lower FOM ($R_{DS(on) max.} \times Q_g \text{ typ.} \times R_{DS(on) max.} \times E_{OSS}$)
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-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}	600	V
Gate-to-Source Voltage	DC	± 30	V
	AC ($f > 1 \text{ Hz}$)	± 30	V
Continuous Drain Current	$T_C = 25^\circ\text{C}$	45	A
	$T_C = 100^\circ\text{C}$	28	A
Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	275 W
Pulsed Drain Current	$T_C = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM}	159 A
Pulsed Source Current (Body Diode)		I_{SM}	159 A
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
Source Current (Body Diode)	I_S	45	A
Single Pulse Avalanche Energy	($I_L = 7 \text{ A}, R_G = 25 \Omega$)	E_{AS}	417 mJ
Avalanche Current	I_{AS}	7	A
Repetitive Avalanche Energy (Note 1)	E_{AR}	2.78	mJ
MOSFET dv/dt	dv/dt	120	V/ns
Peak Diode Recovery dv/dt (Note 2)		70	V/ns
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.

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. $I_{SD} \leq 22.5 \text{ A}, di/dt \leq 200 \text{ A}/\mu\text{s}, V_{DD} \leq 400 \text{ V},$ starting $T_J = 25^\circ\text{C}$.

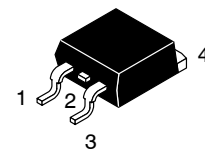
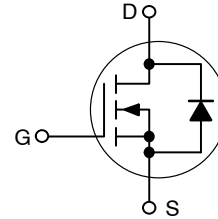
THERMAL RESISTANCE

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Notes 3, 4)	$R_{\theta JC}$	0.45	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient (Notes 3, 4)	$R_{\theta JA}$	62.5	$^\circ\text{C}/\text{W}$

3. The entire application environment impacts the thermal resistance values shown. They are not constants and are only valid for the particular conditions noted.
4. Assembled to an infinite heatsink with perfect heat transfer from the case (assumes 0 K/W thermal interface).

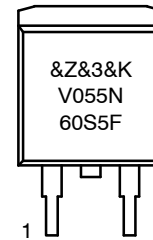
$V_{(BR)DSS}$	$R_{DS(on) TYP}$	$I_D \text{ MAX}$
600 V	55 mΩ @ $V_{GS} = 10 \text{ V}$	45 A

N-CHANNEL MOSFET



D²PAK
CASE 418AJ

MARKING DIAGRAM



&Z = Assembly Plant Code
&3 = Date Code (Year & Week)
&K = Assembly Lot
V055N60S5F = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

NVB055N60S5F

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	600			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/\Delta T_J$	$I_D = 10\text{ mA}, \text{Referenced to } 25^\circ\text{C}$		581		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V}, T_J = 25^\circ\text{C}$			10	μA
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$			±100	nA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 22.5\text{ A}, T_J = 25^\circ\text{C}$		44	55	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 5.2\text{ mA}, T_J = 25^\circ\text{C}$	3.2	4.12	4.8	V
Gate Threshold Voltage Temperature Coefficient	$V_{GS(th)}/\Delta T_J$	$V_{GS} = V_{DS}, I_D = 5.2\text{ mA}$		-6.61		mV/°C
Forward Transconductance	g_{FS}	$V_{DS} = 20\text{ V}, I_D = 22.5\text{ A}$		44.8		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 250\text{ KHz}$		4603		pF
Output Capacitance	C_{OSS}			72.9		
Energy Related Output Capacitance	$C_{OSS(er)}$		$V_{DS} = 0\text{ to } 400\text{ V}, V_{GS} = 0\text{ V}$		125	
Total Gate Charge	$Q_{G(TOT)}$	$V_{DD} = 400\text{ V}, I_D = 22.5\text{ A}, V_{GS} = 10\text{ V}$		85.2		nC
Gate-to-Source Charge	Q_{GS}			26.2		
Gate-to-Drain Charge	Q_{GD}			24.9		
Gate Resistance	R_G	$f = 1\text{ MHz}$		4.32		Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 0/10\text{ V}, V_{DD} = 400\text{ V}, I_D = 22.5\text{ A}, R_G = 4.7\text{ }\Omega$		44		ns
Rise Time	t_r			26.2		
Turn-Off Delay Time	$t_{d(OFF)}$			108		
Fall Time	t_f			2.6		

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_{SD} = 22.5\text{ A}, T_J = 25^\circ\text{C}$		1.07		V
		$V_{GS} = 0\text{ V}, I_{SD} = 22.5\text{ A}, T_J = 150^\circ\text{C}$		0.82		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, I_{SD} = 22.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_{DD} = 400\text{ V}$		128		ns
Reverse Recovery Charge	Q_{RR}			758		

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.

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Marking	Package	Packing Method	Reel Size	Tape Width	Quantity
NVB055N60S5F	V055N60S5F	D ² PAK	Tape & Reel†	330 mm	24 mm	800 Units

†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](#).

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TYPICAL CHARACTERISTICS

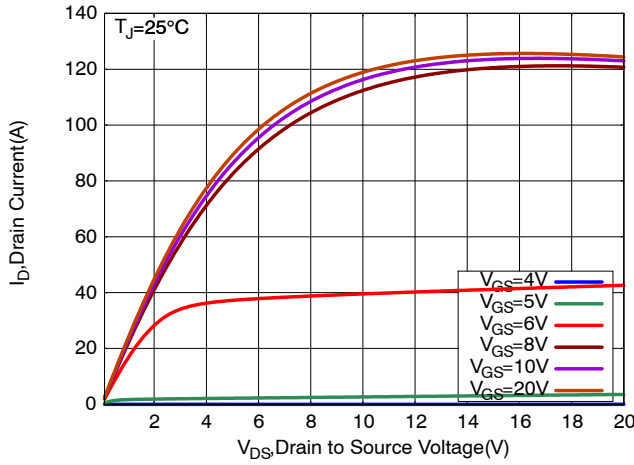


Figure 1. On-Region Characteristics

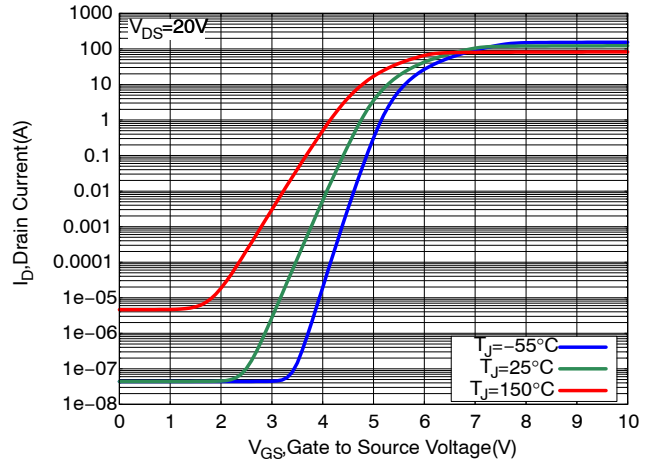


Figure 2. Transfer Characteristics

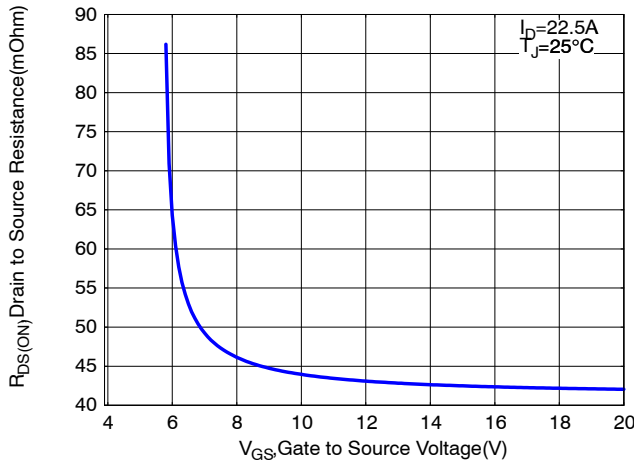


Figure 3. On-Resistance vs. V_{GS}

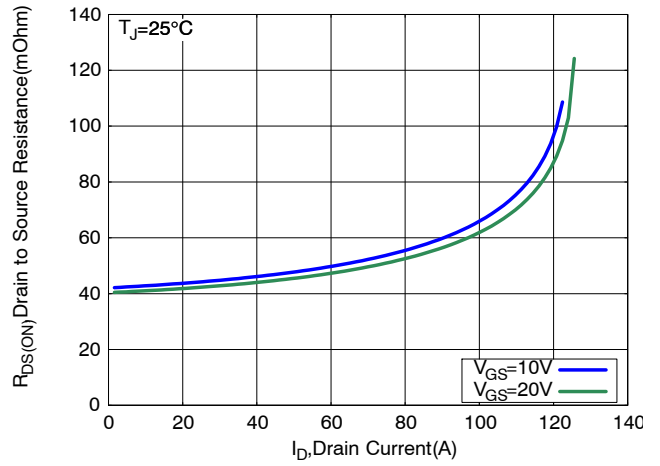


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

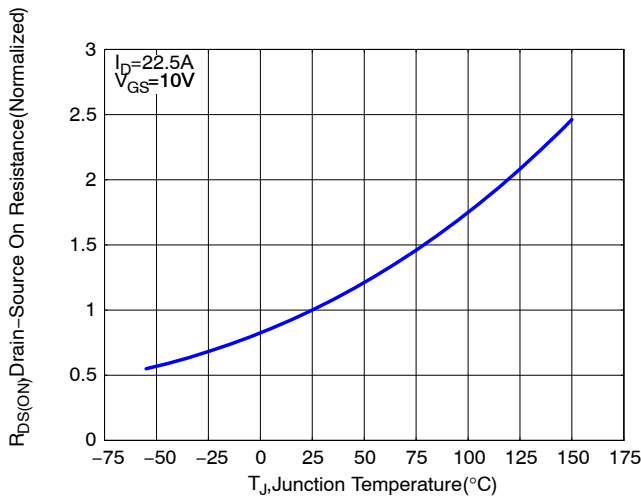


Figure 5. On-Resistance Variation with Temperature

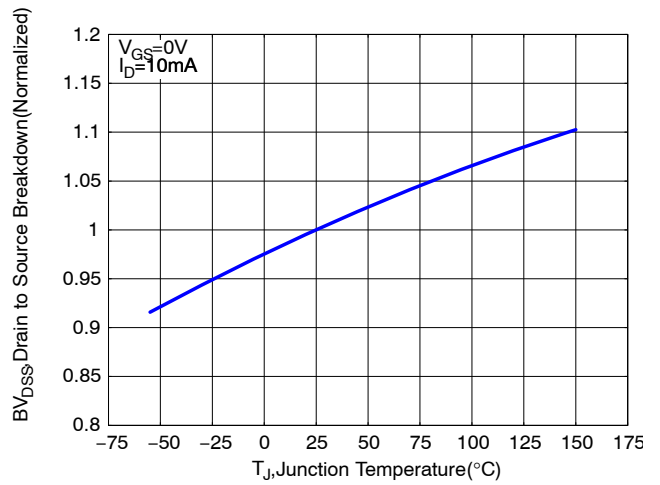


Figure 6. Breakdown Voltage Variation with Temperature

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TYPICAL CHARACTERISTICS

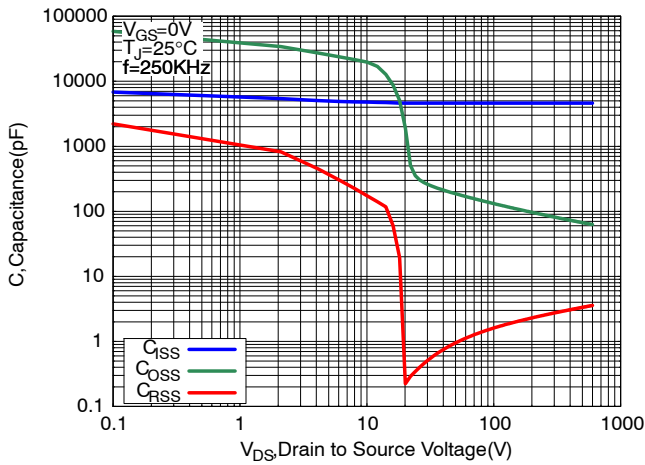


Figure 7. Capacitance Variation

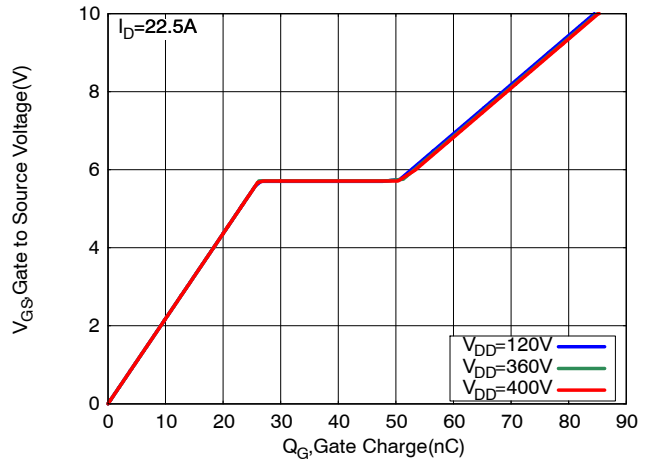


Figure 8. Gate-to-Source Voltage vs. Total Charge

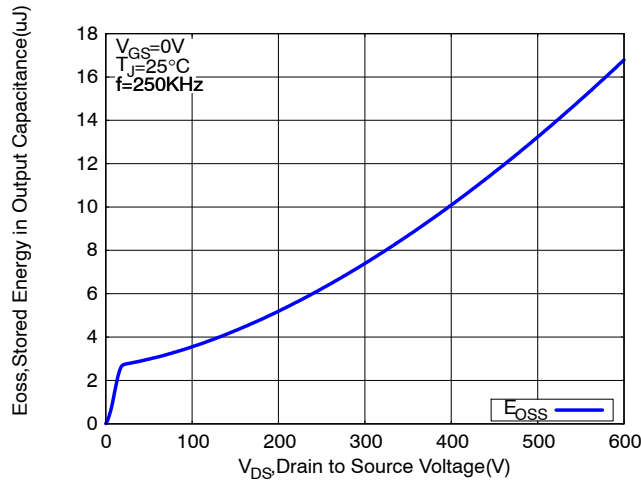


Figure 9. Eoss vs. Drain-to-Source Voltage

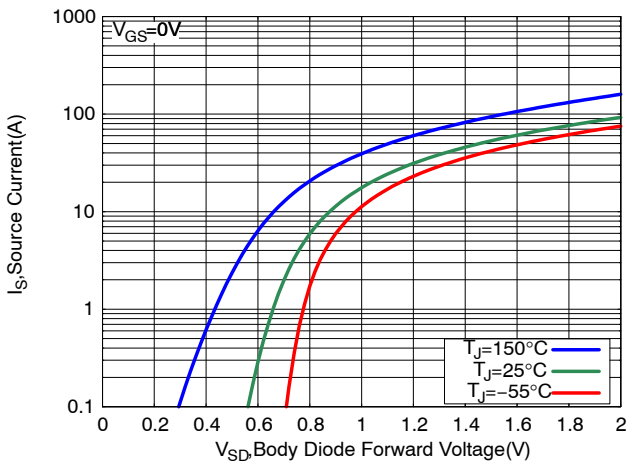


Figure 10. Diode Forward Voltage vs. Current

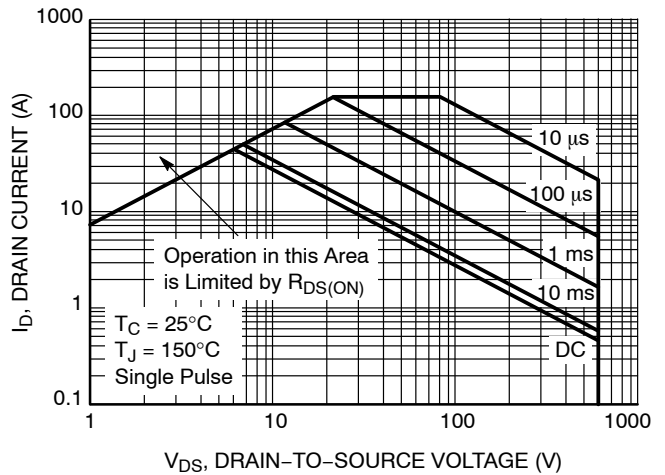


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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TYPICAL CHARACTERISTICS

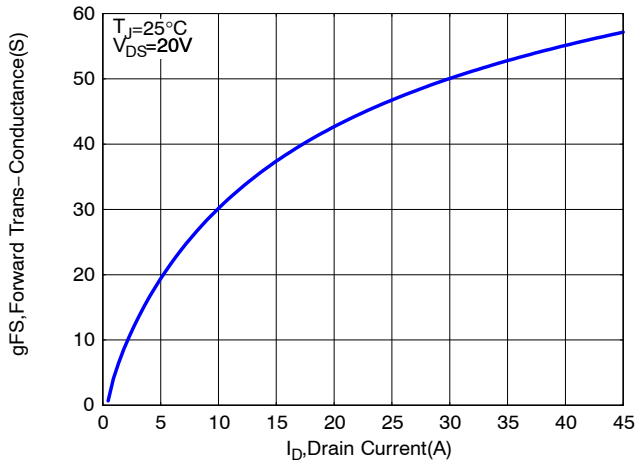


Figure 12. g_{FS} vs. I_D

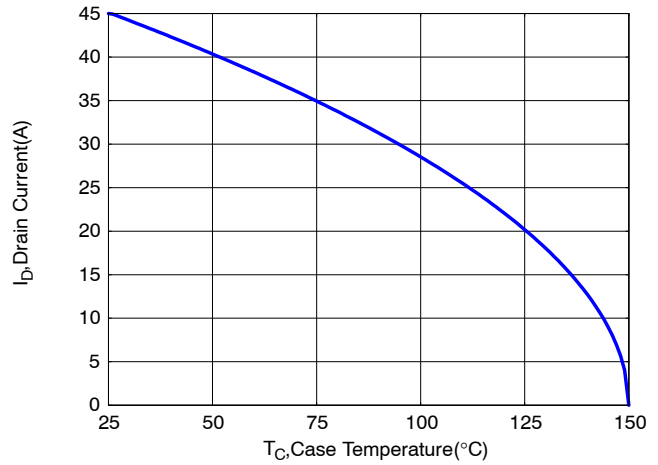


Figure 13. Maximum Current vs. Case Temperature

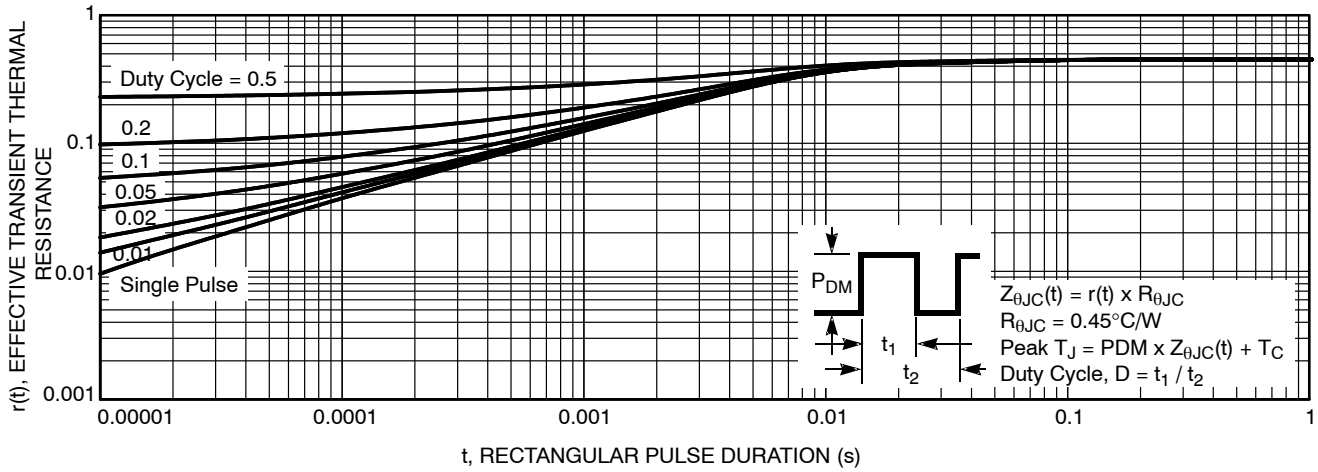
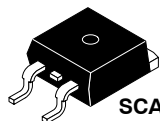


Figure 14. Thermal Response

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



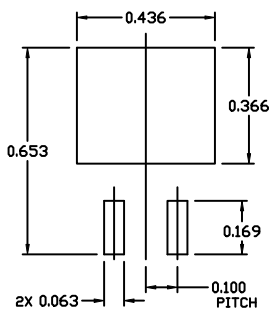
SCALE 1:1

D²PAK-3 (TO-263, 3-LEAD)

CASE 418AJ

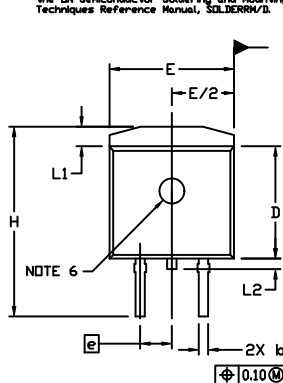
ISSUE F

DATE 11 MAR 2021



RECOMMENDED MOUNTING FOOTPRINT

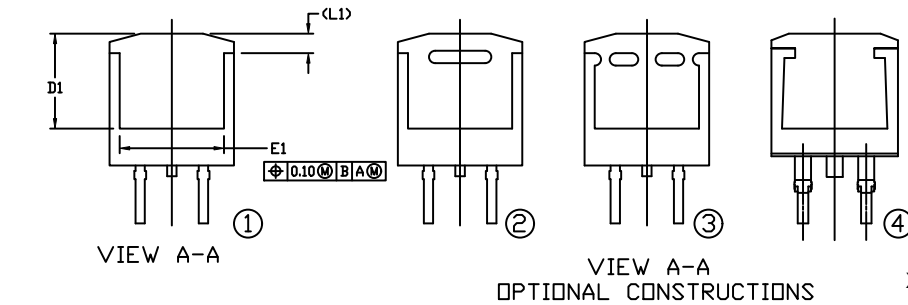
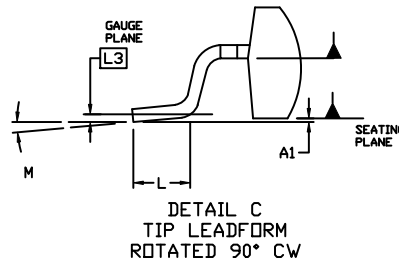
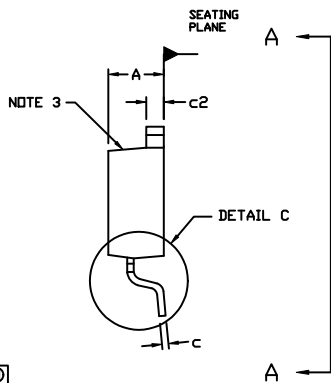
■ For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



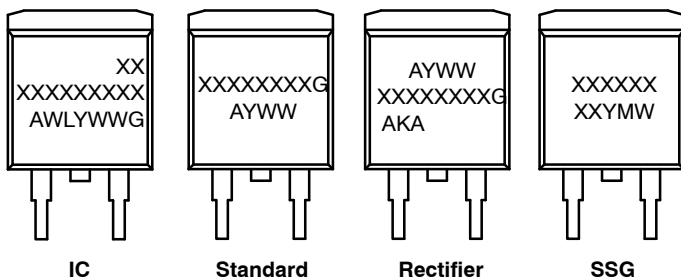
NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
- CONTROLLING DIMENSION: INCHES
- CHAMFER OPTIONAL.
- DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
- THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, AND E1.
- OPTIONAL MOLD FEATURE.
- ①, ② ... OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.160	0.190	4.06	4.83
A1	0.000	0.010	0.00	0.25
b	0.020	0.039	0.51	0.99
c	0.012	0.029	0.30	0.74
c2	0.045	0.065	1.14	1.65
D	0.330	0.380	8.38	9.65
D1	0.260	---	6.60	---
E	0.380	0.420	9.65	10.67
E1	0.245	---	6.22	---
e	0.100	BSC	2.54	BSC
H	0.575	0.625	14.60	15.88
L	0.070	0.110	1.78	2.79
L1	---	0.066	---	1.68
L2	---	0.070	---	1.78
L3	0.010	BSC	0.25	BSC
M	0*	8*	0*	8*



GENERIC MARKING DIAGRAMS*



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week
- W = Week Code (SSG)
- M = Month Code (SSG)
- G = Pb-Free Package
- AKA = Polarity Indicator

*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.

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DESCRIPTION:	D²PAK-3 (TO-263, 3-LEAD)	PAGE 1 OF 1

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