MOSFET - P-Channel, D²PAK

-60 V, -27.5 A

NTB25P06, NVB25P06

Designed for low voltage, high speed switching applications and to withstand high energy in the avalanche and commutation modes.

Features

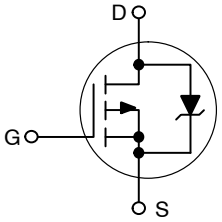
- AEC Q101 Qualified – NVB25P06
- These Devices are Pb–Free and are RoHS Compliant

Typical Applications

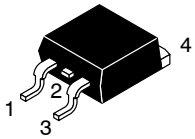
- PWM Motor Controls
- Power Supplies
- Converters
- Bridge Circuits

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
–60 V	65 mΩ @ –10 V	–27.5 A

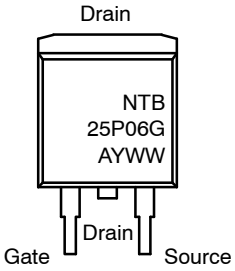
P–Channel



MARKING DIAGRAM & PIN ASSIGNMENT



D²PAK
CASE 418B



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

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain–to–Source Voltage	V_{DSS}	–60	V
Gate–to–Source Voltage – Continuous – Non–Repetitive ($t_p \le 10$ ms)	V_{GS} V_{GSM}	±15 ±20	V Vpk
Drain Current – Continuous @ T_A = 25°C – Single Pulse ($t_p \le 10$ μs)	I_D I_{DM}	27.5 80	A Apk
Total Power Dissipation @ T_A = 25°C	P_D	120	W
Operating and Storage Temperature Range	T_J, T_{stg}	–55 to +175	°C
Single Pulse Drain–to–Source Avalanche Energy – Starting T_J = 25°C (V_{DD} = 25 V, V_{GS} = 10 V, $I_{L(pk)}$ = 20 A, L = 3 mH, R_G = 25 Ω)	E_{AS}	600	mJ
Thermal Resistance – Junction–to–Case – Junction–to–Ambient (Note 1) – Junction–to–Ambient (Note 2)	 $R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	 1.25 46.8 63.2	°C/W
Maximum 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. When surface mounted to an FR4 board using 1″ pad size (Cu Area 1.127 in²).
2. When surface mounted to an FR4 board using the minimum recommended pad size (Cu Area 0.412 in²).

ORDERING INFORMATION

Device	Package	Shipping†
NTB25P06T4G	D²PAK (Pb–Free)	800 / Tape & Reel
NVB25P06T4G	D²PAK (Pb–Free)	800 / 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_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage (Note 3) (V_{GS} = 0 V, I_D = −250 μA) (Positive Temperature Coefficient)		$V_{(BR)DSS}$	−60 −	− 64	− −	V mV/°C
Zero Gate Voltage Drain Current (V_{GS} = 0 V, V_{DS} = −60 V, T_J = 25°C) (V_{GS} = 0 V, V_{DS} = −60 V, , T_J = 150°C)		I_{DSS}	− −	− −	−10 −100	μA
Gate−Body Leakage Current (V_{GS} = ±15 V, V_{DS} = 0 V)		I_{GSS}	−	−	±100	nA
ON CHARACTERISTICS (Note 3)						
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = −250 μA) (Negative Threshold Temperature Coefficient)		$V_{GS(th)}$	−2.0 −	−2.8 6.2	−4.0 −	V mV/°C
Static Drain−Source On−State Resistance (V_{GS} = −10 V, I_D = −12.5 A) (V_{GS} = −10 V, I_D = −25 A)		$R_{DS(on)}$	− −	0.065 0.070	0.075 0.082	Ω
Forward Transconductance (V_{DS} = −10 V, I_D = −12.5 A)		gFS	−	13	−	Mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = −25 V, V_{GS} = 0 V, F = 1.0 MHz)	C_{iss}	−	1200	1680	pF
Output Capacitance		C_{oss}	−	345	480	
Reverse Transfer Capacitance		C_{rss}	−	90	180	
SWITCHING CHARACTERISTICS (Notes 3 & 4)						
Turn−On Delay Time	(V_{DD} = −30 V, I_D = −25 A, V_{GS} = −10 V R_G = 9.1 Ω)	$t_{d(on)}$	−	14	24	ns
Rise Time		t_r	−	72	118	ns
Turn−Off Delay Time		$t_{d(off)}$	−	43	68	ns
Fall Time		t_f	−	190	320	ns
Gate Charge	(V_{DS} = −48 V, I_D = −25 A, V_{GS} = −10 V)	Q_T	−	33	50	nC
		Q_1	−	6.5	−	
		Q_2	−	15	−	
BODY−DRAIN DIODE RATINGS (Note 3)						
Diode Forward On−Voltage	(I_S = −25 A, V_{GS} = 0 V) (I_S = −25 A, V_{GS} = 0 V, T_J = 150°C)	V_{SD}	− −	−1.8 −1.4	−2.5 −	V
Reverse Recovery Time	(I_S = −25 A, V_{GS} = 0 V, dI_S/dt = 100 A/μs)	t_{rr}	−	70	−	ns
		t_a	−	50	−	
		t_b	−	20	−	
Reverse Recovery Stored Charge		Q_{RR}	−	0.2	−	μC

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.

3. Indicates Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

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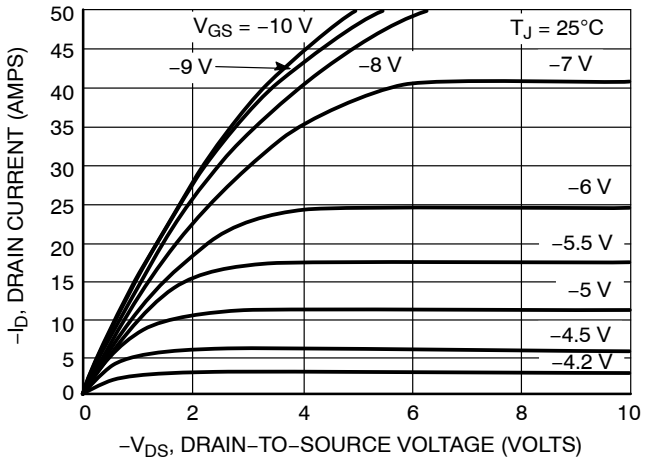

Figure 1. On−Region Characteristics

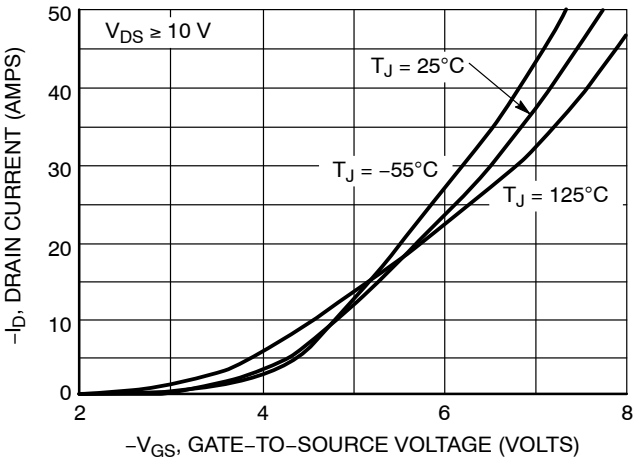

Figure 2. Transfer Characteristics

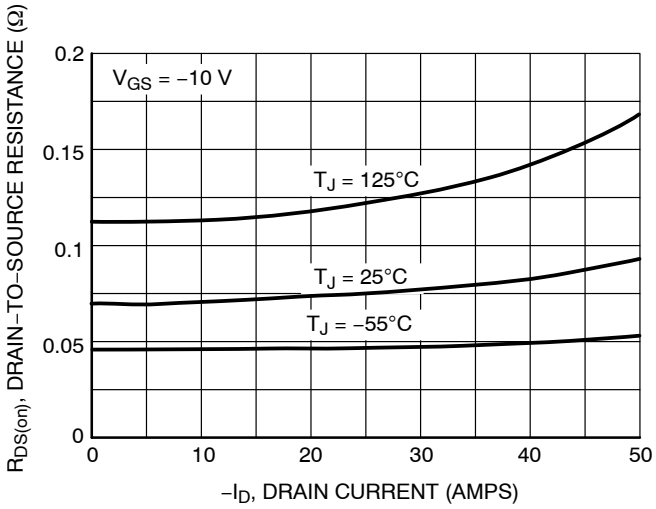

Figure 3. On−Resistance vs. Drain Current and Temperature

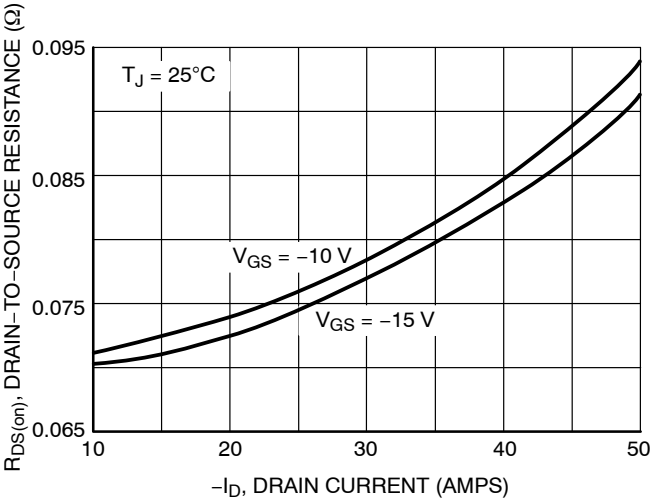

Figure 4. On−Resistance vs. Drain Current and Gate Voltage

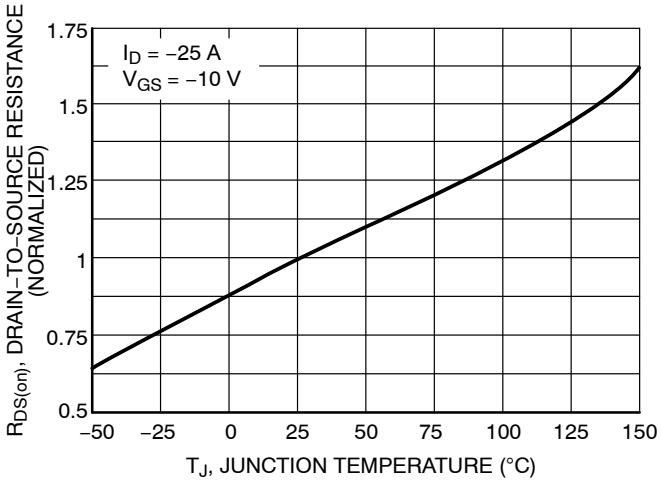

Figure 5. On−Resistance Variation with Temperature

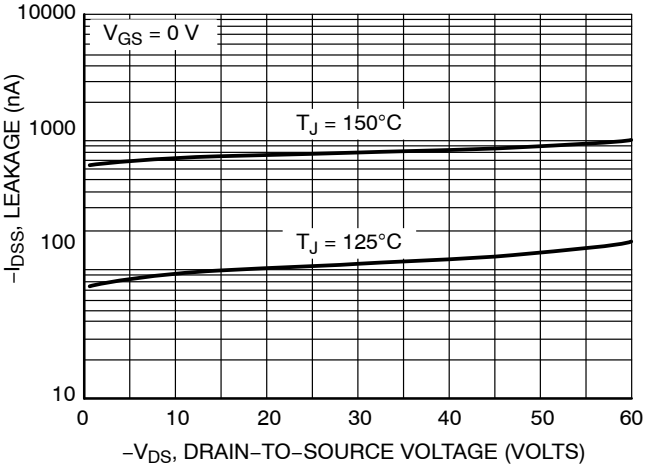

Figure 6. Drain−to−Source Leakage Current vs. Voltage

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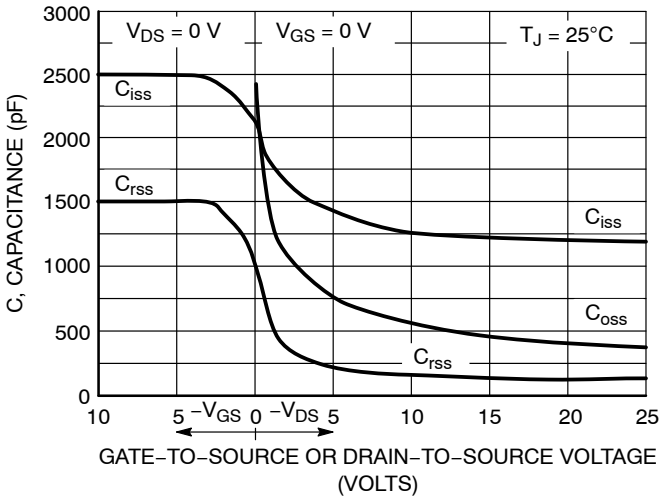

Figure 7. Capacitance Variation

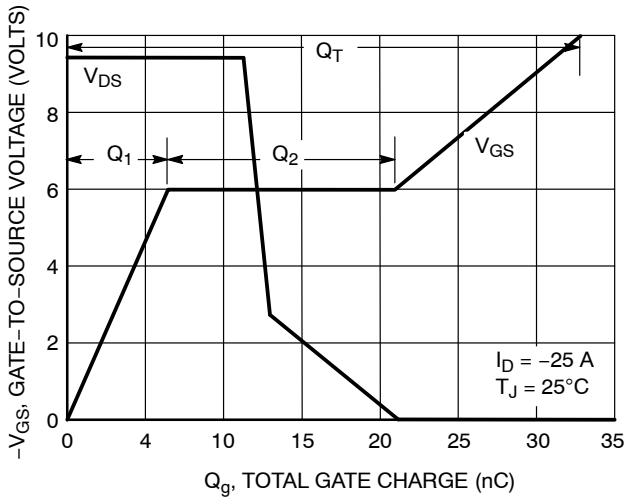

Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

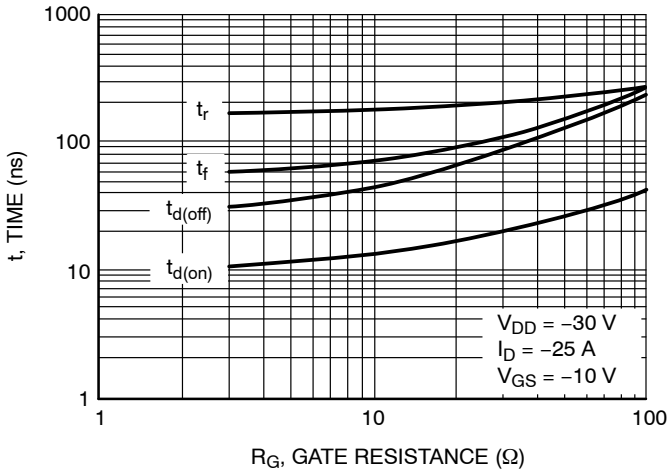

Figure 9. Resistive Switching Time Variation vs. Gate Resistance

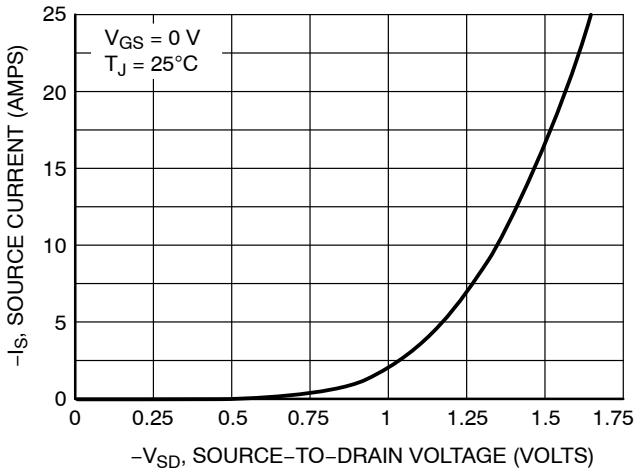

Figure 10. Diode Forward Voltage vs. Current

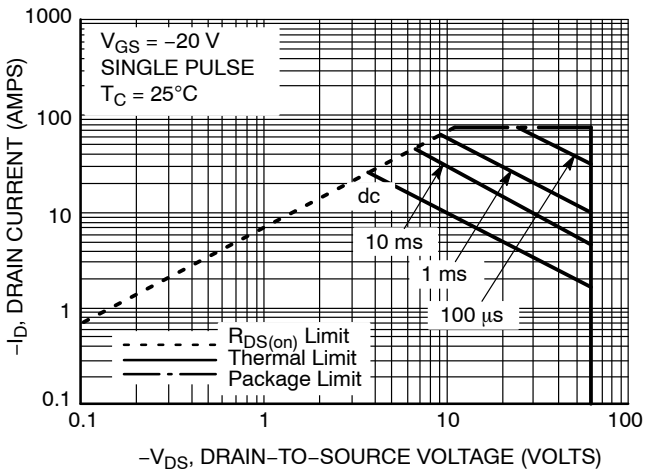

Figure 11. Maximum Rated Forward Biased Safe Operating Area

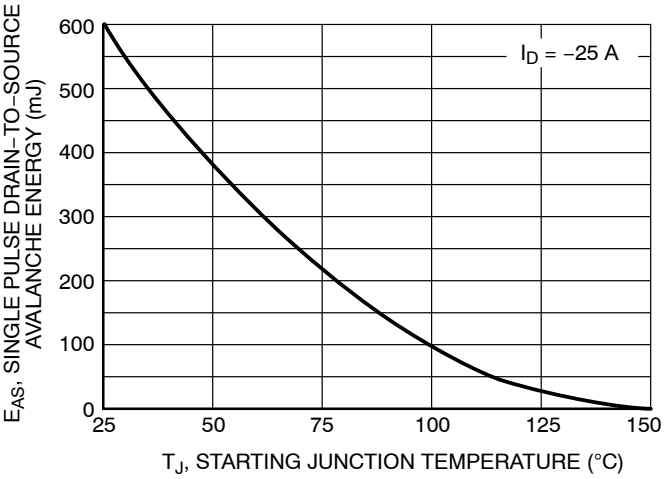

Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

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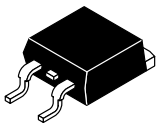
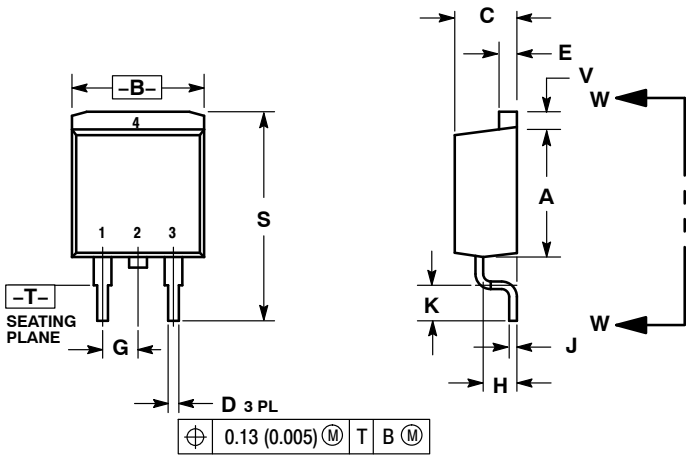


SCALE 1:1

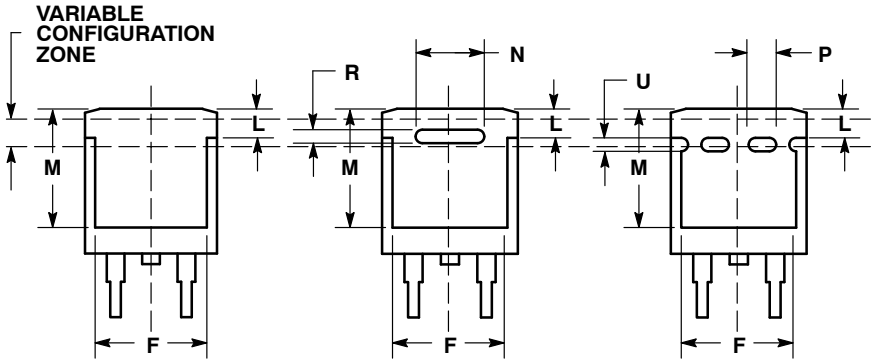
D²PAK 3
CASE 418B–04
ISSUE L

DATE 17 FEB 2015



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418B–01 THRU 418B–03 OBSOLETE, NEW STANDARD 418B–04.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
F	0.310	0.350	7.87	8.89
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197 REF		5.00 REF	
P	0.079 REF		2.00 REF	
R	0.039 REF		0.99 REF	
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40



VIEW W–W 1 | VIEW W–W 2 | VIEW W–W 3

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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

STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 4:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 5:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 6:
PIN 1. NO CONNECT
2. CATHODE
3. ANODE
4. CATHODE

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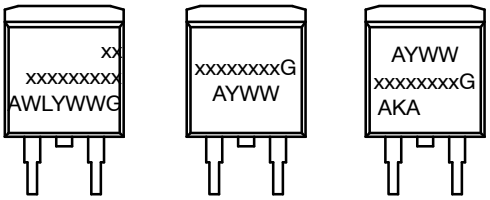
D²PAK 3
CASE 418B−04
ISSUE L

DATE 17 FEB 2015

GENERIC MARKING DIAGRAM*

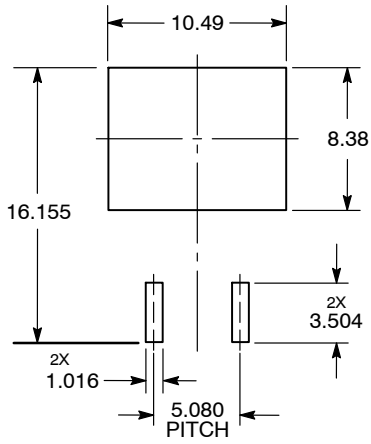


IC **Standard** **Rectifier**

xx	= Specific Device Code
A	= Assembly Location
WL	= Wafer Lot
Y	= Year
WW	= Work Week
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.

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

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