

# NVD5803N

## Power MOSFET 40 V, 85 A, Single N-Channel, DPAK

### Features

- Low  $R_{DS(on)}$
- High Current Capability
- Avalanche Energy Specified
- AEC-Q101 Qualified
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- DC Motor Drive
- Reverse Battery Protection
- Glow Plug

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	40	V
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $R_{\theta JC}$ ) (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$ 85 A
		$T_C = 100^\circ\text{C}$	61
Power Dissipation ( $R_{\theta JC}$ ) (Note 1)		$T_C = 25^\circ\text{C}$	$P_D$ 83 W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	228 A
Operating Junction and Storage Temperature	$T_J, T_{stg}$	-55 to 175	$^\circ\text{C}$
Source Current (Body Diode)	$I_S$	85	A
Single Pulse Drain-to-Source Avalanche Energy ( $V_{DD} = 50 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $R_G = 25 \Omega$ , $I_{L(pk)} = 40 \text{ A}$ , $L = 0.3 \text{ mH}$ )	$E_{AS}$	240	mJ
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 MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	1.8	$^\circ\text{C/W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	42	

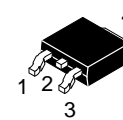
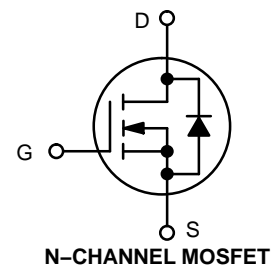
1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).



ON Semiconductor®

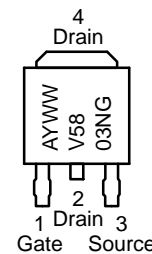
[www.onsemi.com](http://www.onsemi.com)

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
40 V	5.7 m $\Omega$ @ 10 V	85 A



DPAK  
CASE 369AA  
(Surface Mount)  
STYLE 2

### MARKING DIAGRAM & PIN ASSIGNMENT



- A = Assembly Location\*
- Y = Year
- WW = Work Week
- 5803N = Device Code
- G = Pb-Free Package

\* The Assembly Location code (A) is front side optional. In cases where the Assembly Location is stamped in the package, the front side assembly code may be blank.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NVD5803N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			40		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 40 V	T <sub>J</sub> = 25°C		1.0	μA
			T <sub>J</sub> = 150°C		100	
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA

## ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.5		3.5	V
Negative Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			-7.4		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 50 A		4.9	5.7	mΩ
		V <sub>GS</sub> = 5.0 V, I <sub>D</sub> = 30 A		6.7		
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 15 A		13.6		S

## CHARGES, CAPACITANCES AND GATE RESISTANCES

Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 25 V		3220		pF
Output Capacitance	C <sub>oss</sub>			390		
Reverse Transfer Capacitance	C <sub>riss</sub>			270		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 20 V, I <sub>D</sub> = 50 A		51		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			3.8		
Gate-to-Source Charge	Q <sub>GS</sub>			12.7		
Gate-to-Drain Charge	Q <sub>GD</sub>			12.7		

## SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DD</sub> = 32 V, I <sub>D</sub> = 50 A, R <sub>G</sub> = 2.0 Ω		12.6		ns
Rise Time	t <sub>r</sub>			21.4		
Turn-Off Delay Time	t <sub>d(off)</sub>			28.3		
Fall Time	t <sub>f</sub>			6.6		

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 30 A	T <sub>J</sub> = 25°C		0.88	1.2	V
			T <sub>J</sub> = 150°C		0.73		
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = 30 A		27.2		ns	
Charge Time	t <sub>a</sub>			14			
Discharge Time	t <sub>b</sub>			13.2			
Reverse Recovery Charge	Q <sub>RR</sub>			17		nC	

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

## ORDERING INFORMATION

Order Number	Package	Shipping†
NVD5803NT4G	DPAK (Pb-Free)	2500 / Tape & Reel
SVD5803NT4G	DPAK (Pb-Free)	2500 / Tape & Reel

†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.

TYPICAL CHARACTERISTICS

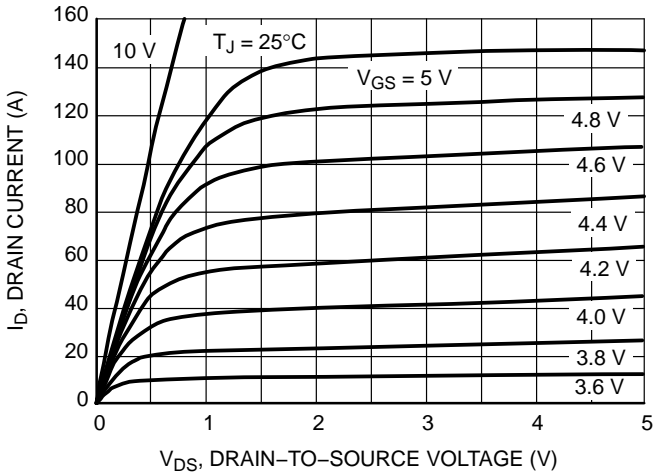


Figure 1. On-Region Characteristics

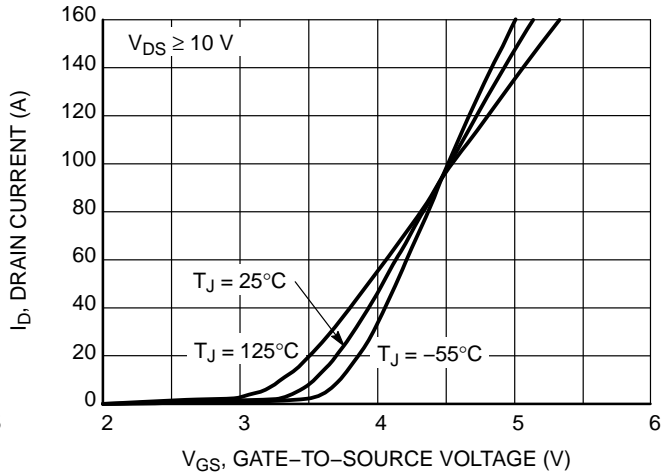


Figure 2. Transfer Characteristics

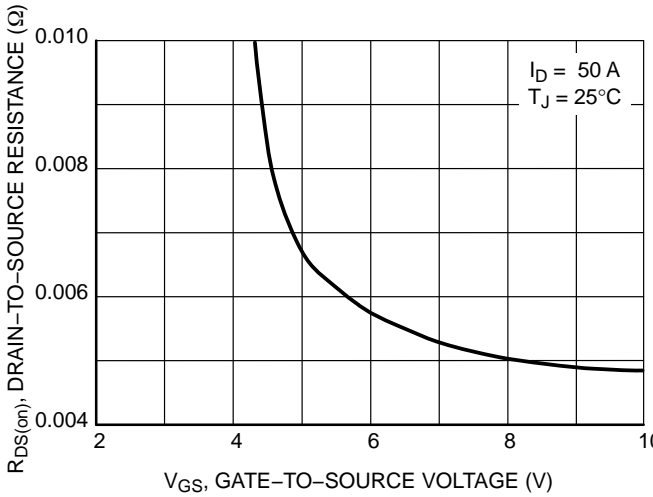


Figure 3. On-Resistance vs. Gate-to-Source Voltage

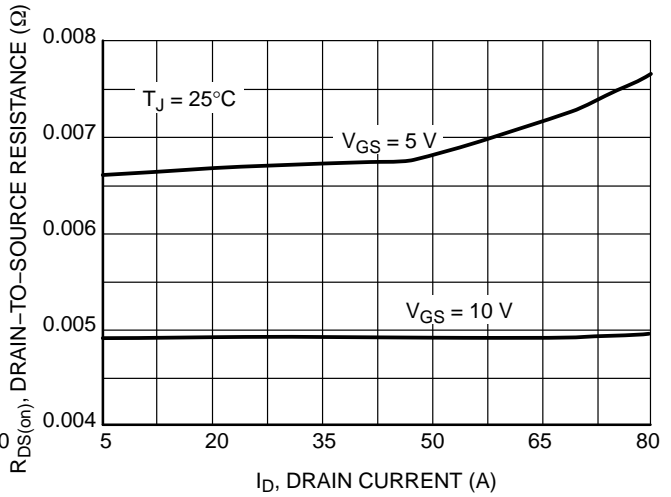


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

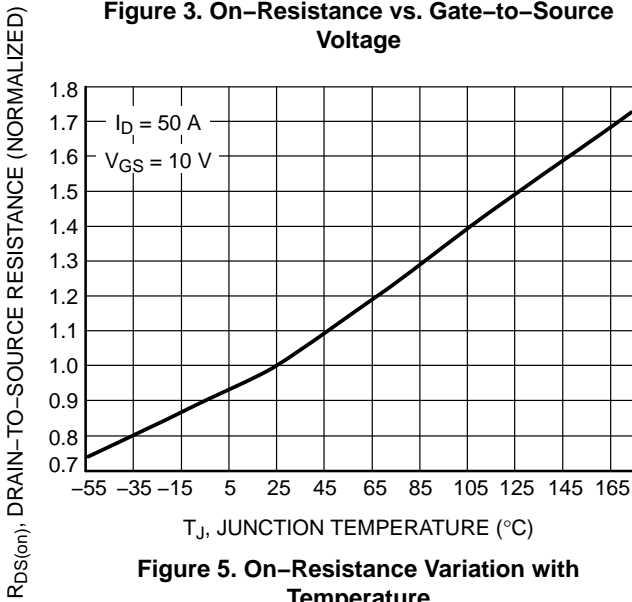


Figure 5. On-Resistance Variation with Temperature

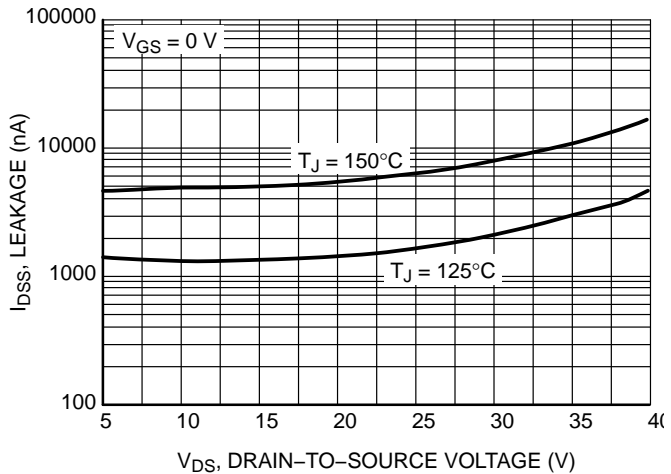


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

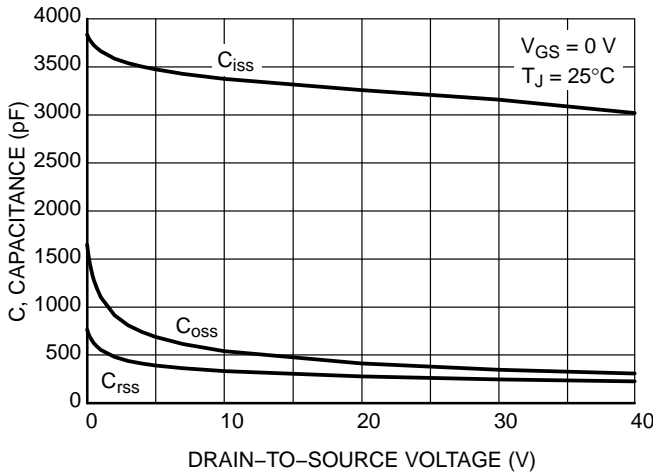


Figure 7. Capacitance Variation

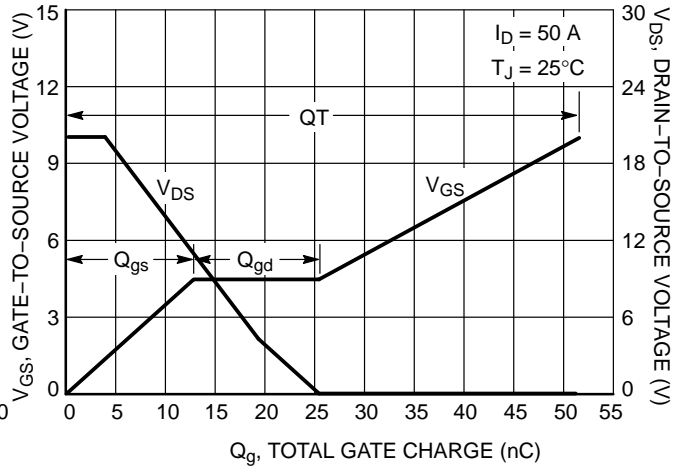


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

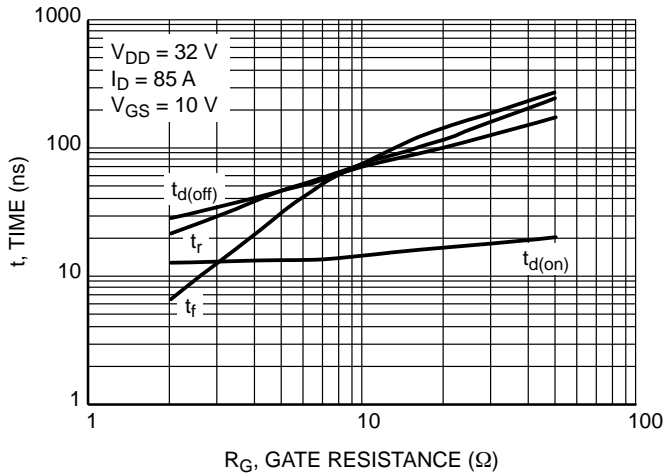


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

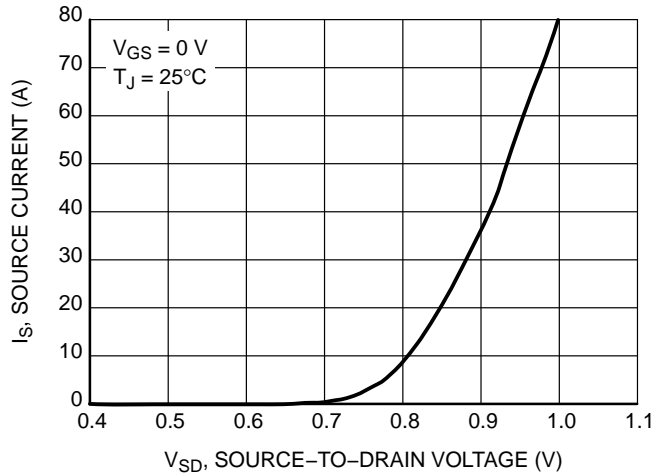


Figure 10. Diode Forward Voltage vs. Current

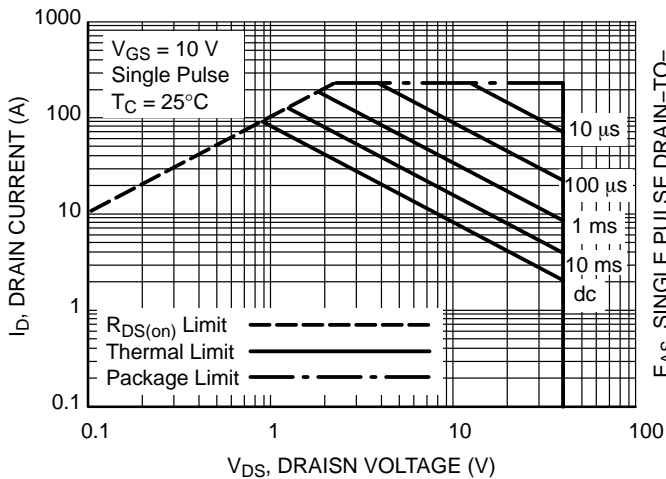


Figure 11. Maximum Rated Forward Biased Safe Operating Area

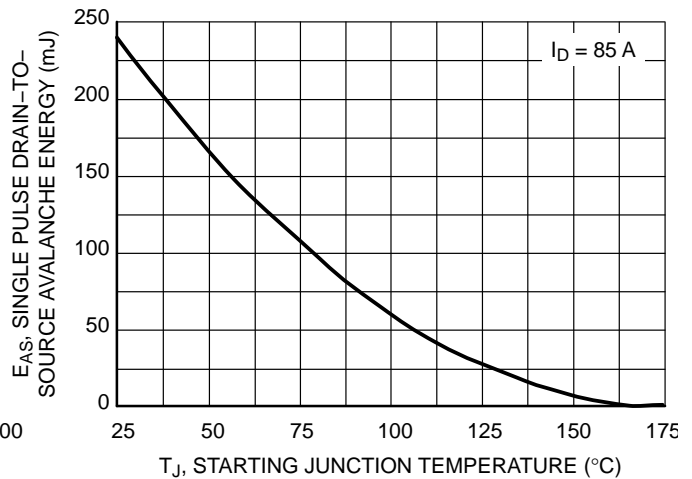


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

# NVD5803N

## TYPICAL CHARACTERISTICS

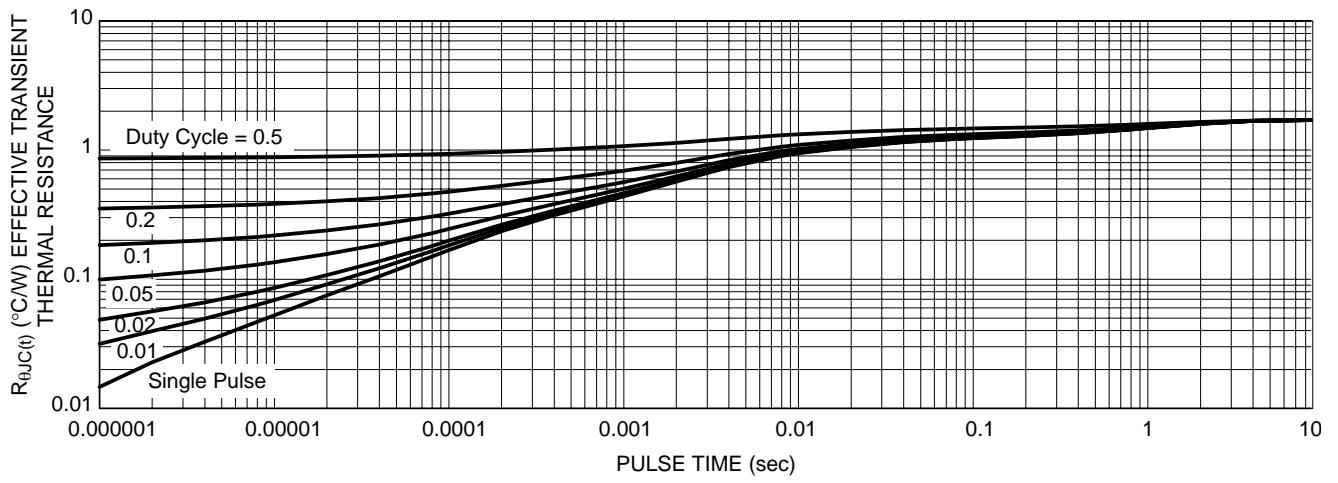


Figure 13. Thermal Response

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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SCALE 1:1

### DPAK (SINGLE GAUGE)

#### CASE 369AA-01

#### ISSUE B

DATE 03 JUN 2010



NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
- CONTROLLING DIMENSION: INCHES.
- THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
- DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
- DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29 BSC	
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108 REF		2.74 REF	
L2	0.020 BSC		0.51 BSC	
L3	0.035	0.050	0.89	1.27
L4	---	0.040	---	1.01
Z	0.155	---	3.93	---

- |  |   |  |  |
|--|---|--|--|
| <p>STYLE 1:<br/>PIN 1. BASE<br/>2. COLLECTOR<br/>3. EMITTER<br/>4. COLLECTOR</p> | <p>STYLE 2:<br/>PIN 1. GATE<br/>2. DRAIN<br/>3. SOURCE<br/>4. DRAIN</p> | <p>STYLE 3:<br/>PIN 1. ANODE<br/>2. CATHODE<br/>3. ANODE<br/>4. CATHODE</p>      | <p>STYLE 4:<br/>PIN 1. CATHODE<br/>2. ANODE<br/>3. GATE<br/>4. ANODE</p> |
| <p>STYLE 5:<br/>PIN 1. GATE<br/>2. ANODE<br/>3. CATHODE<br/>4. ANODE</p>         | <p>STYLE 6:<br/>PIN 1. MT1<br/>2. MT2<br/>3. GATE<br/>4. MT2</p>        | <p>STYLE 7:<br/>PIN 1. GATE<br/>2. COLLECTOR<br/>3. EMITTER<br/>4. COLLECTOR</p> |  |

### GENERIC MARKING DIAGRAM\*



IC Discrete

- XXXXXX = Device Code
- A = Assembly Location
- L = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking.

### SOLDERING FOOTPRINT\*



SCALE 3:1 (mm/inches)

\*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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DESCRIPTION:	DPAK (SINGLE GAUGE)	PAGE 1 OF 1

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