

NVD5863NL

Power MOSFET

60 V, 7.1 mΩ, 82 A, Single N-Channel

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- High Current Capability
- Avalanche Energy Specified
- AEC-Q101 Qualified
- 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 $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	82	A
		$T_C = 100^\circ\text{C}$	58	
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	96	W
		$T_C = 100^\circ\text{C}$	48	
Continuous Drain Current $R_{\theta JA}$ (Notes 1 & 2)	Steady State	$T_A = 25^\circ\text{C}$	14.9	A
		$T_A = 100^\circ\text{C}$	11.5	
Power Dissipation $R_{\theta JA}$ (Notes 1 & 2)	Steady State	$T_A = 25^\circ\text{C}$	3.1	W
		$T_A = 100^\circ\text{C}$	1.6	
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM}	500	A
Current Limited by Package (Note 3)	$T_A = 25^\circ\text{C}$	I_{Dmaxpk}	60	A
Operating Junction and Storage Temperature	T_J, T_{stg}	-55 to 175	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	82	A	
Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}, V_{DD} = 50 \text{ V}, V_{GS} = 10 \text{ V}, I_{L(pk)} = 23 \text{ A}, L = 1.0 \text{ mH}, R_G = 25 \Omega$)	E_{AS}	265	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 - Steady State (Drain)	$R_{\theta JC}$	1.6	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	48	

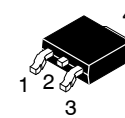
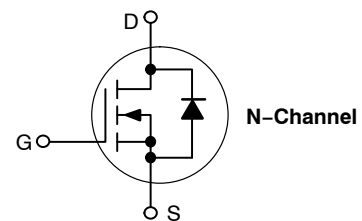
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Continuous DC current rating. Maximum current for pulses as long as 1 second are higher but are dependent on pulse duration and duty cycle.



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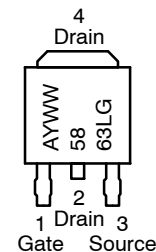
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$V_{(BR)DSS}$	$R_{DS(on)}$	I_D
60 V	7.1 mΩ @ 10 V	82 A
	9.0 mΩ @ 4.5 V	



DPAK
CASE 369AA
STYLE 2

MARKING DIAGRAMS & PIN ASSIGNMENT



- A = Assembly Location*
- Y = Year
- WW = Work Week
- 5863L = 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 bottom (molding ejector pin), the front side assembly code may be blank.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NVD5863NL

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			50		$\text{mV}/^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 48\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	μA
			$T_J = 150^\circ\text{C}$		100	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.0		3.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			6.7		$\text{mV}/^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 41\text{ A}$		5.6	7.1	m Ω
		$V_{GS} = 4.5\text{ V}, I_D = 41\text{ A}$		7.2	9.0	

CHARGES, CAPACITANCES AND GATE RESISTANCES

Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 25\text{ V}$		3850		pF
Output Capacitance	C_{oss}			350		
Reverse Transfer Capacitance	C_{rss}			220		
Total Gate Charge	$Q_G(TOT)$	$V_{GS} = 4.5\text{ V}, V_{DS} = 48\text{ V}, I_D = 41\text{ A}$		36		nC
Total Gate Charge	$Q_G(TOT)$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V}, I_D = 41\text{ A}$		70		
Threshold Gate Charge	$Q_G(TH)$			3.7		
Gate-to-Source Charge	Q_{GS}			12.3		
Gate-to-Drain Charge	Q_{GD}			19.4		

SWITCHING CHARACTERISTICS (Note 5)

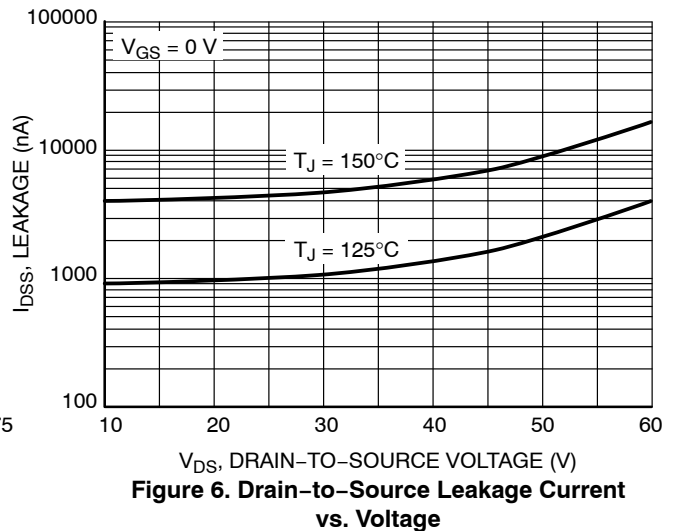
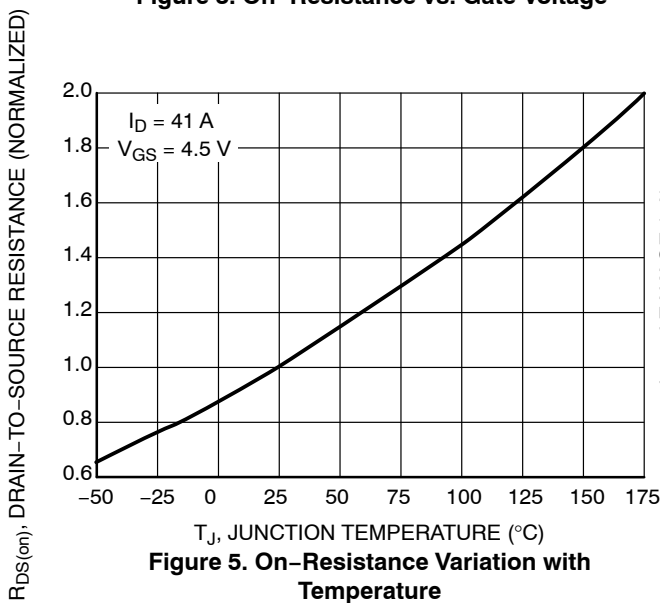
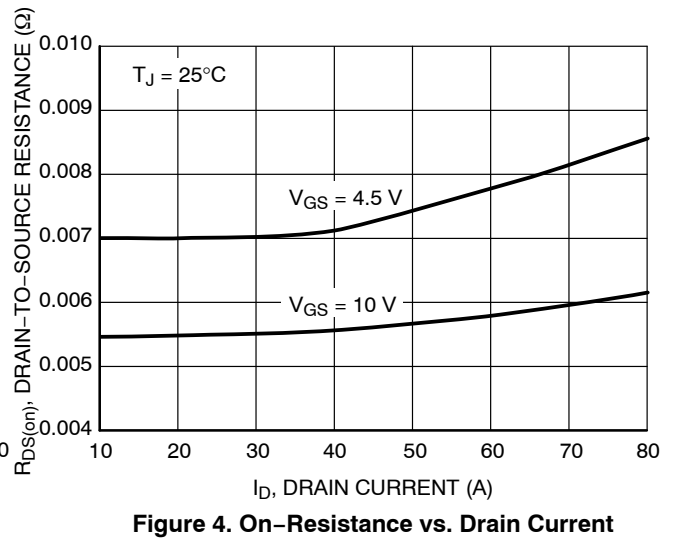
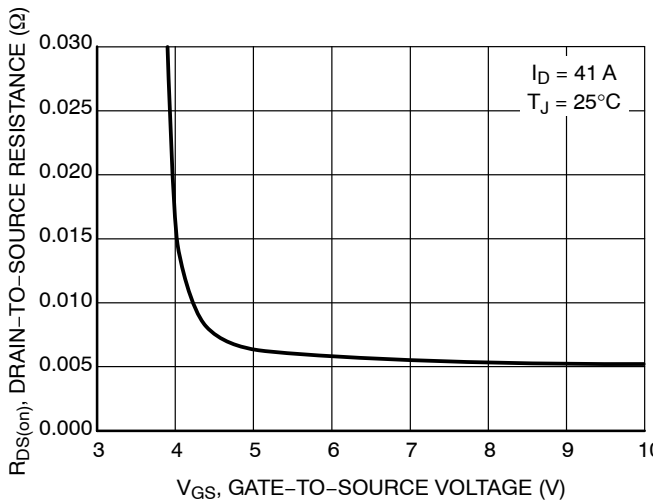
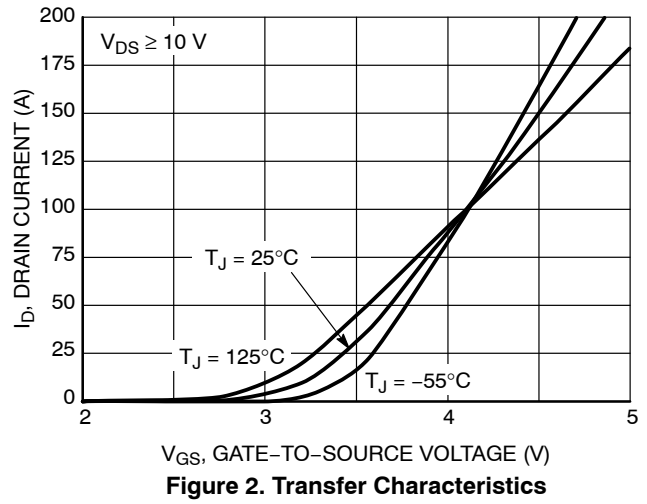
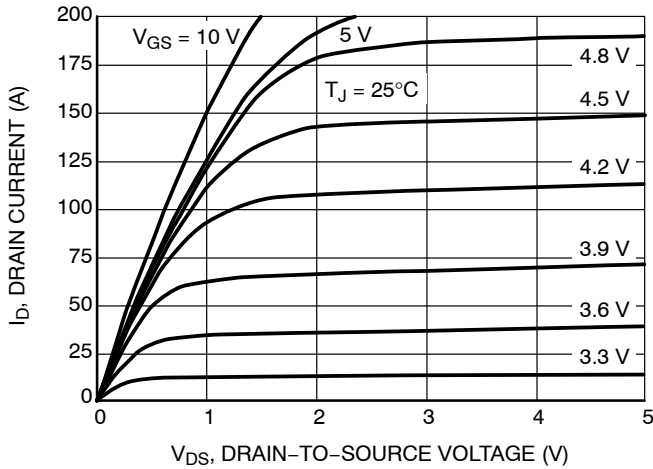
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DD} = 48\text{ V}, I_D = 41\text{ A}, R_G = 2.5\ \Omega$		12.8		ns
Rise Time	t_r			24.4		
Turn-Off Delay Time	$t_{d(off)}$			37.6		
Fall Time	t_f			55		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 41\text{ A}$	$T_J = 25^\circ\text{C}$		0.88	1.2	V
			$T_J = 150^\circ\text{C}$		0.73		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, di/dt = 100\text{ A}/\mu\text{s}, I_S = 41\text{ A}$		31		ns	
Charge Time	t_a			18			
Discharge Time	t_b			13			
Reverse Recovery Charge	Q_{RR}			31			nC

4. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.
5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

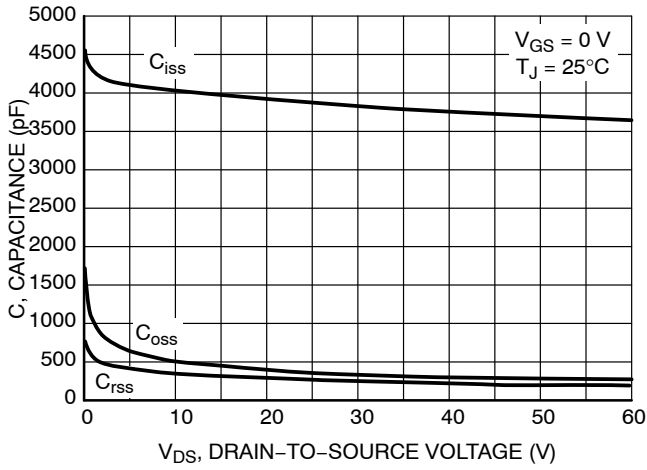


Figure 7. Capacitance Variation

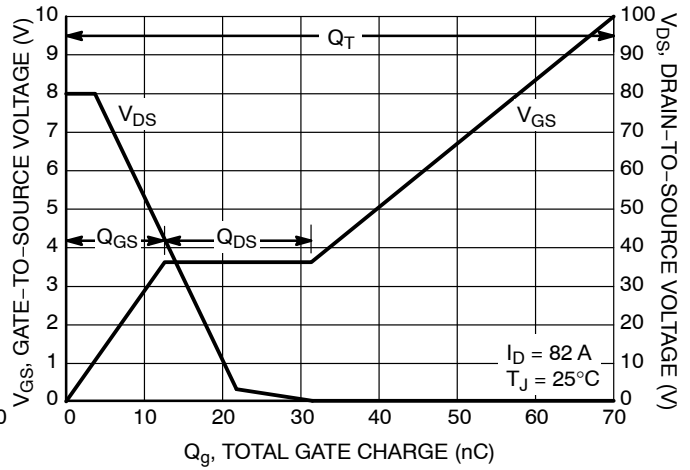


Figure 8. Gate-to-Source & Drain-to-Source vs. Total Charge

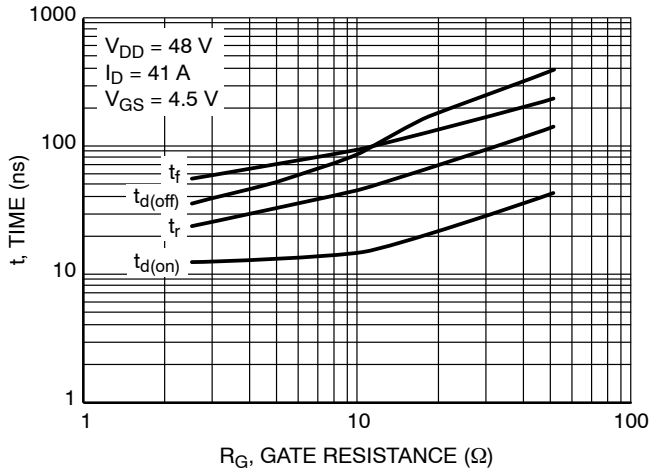


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

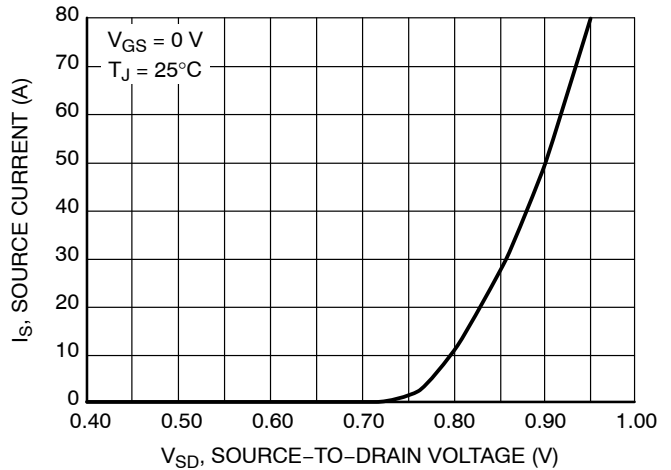


Figure 10. Diode Forward Voltage vs. Current

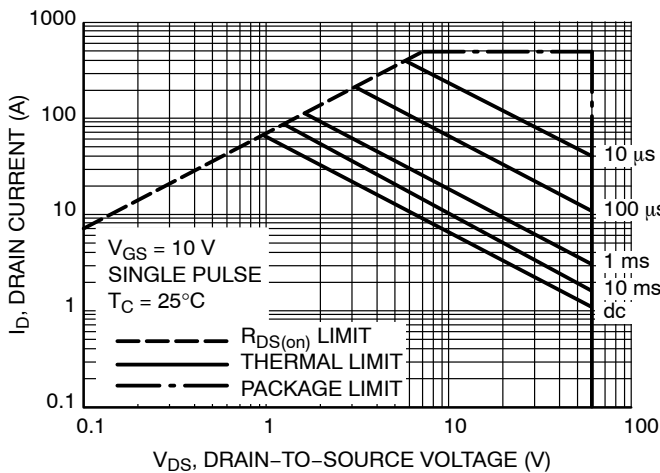


Figure 11. Maximum Rated Forward Biased Safe Operating Area

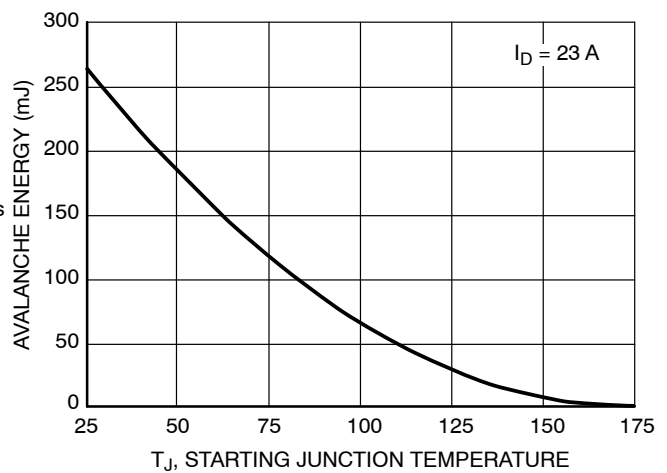


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

NVD5863NL

TYPICAL CHARACTERISTICS

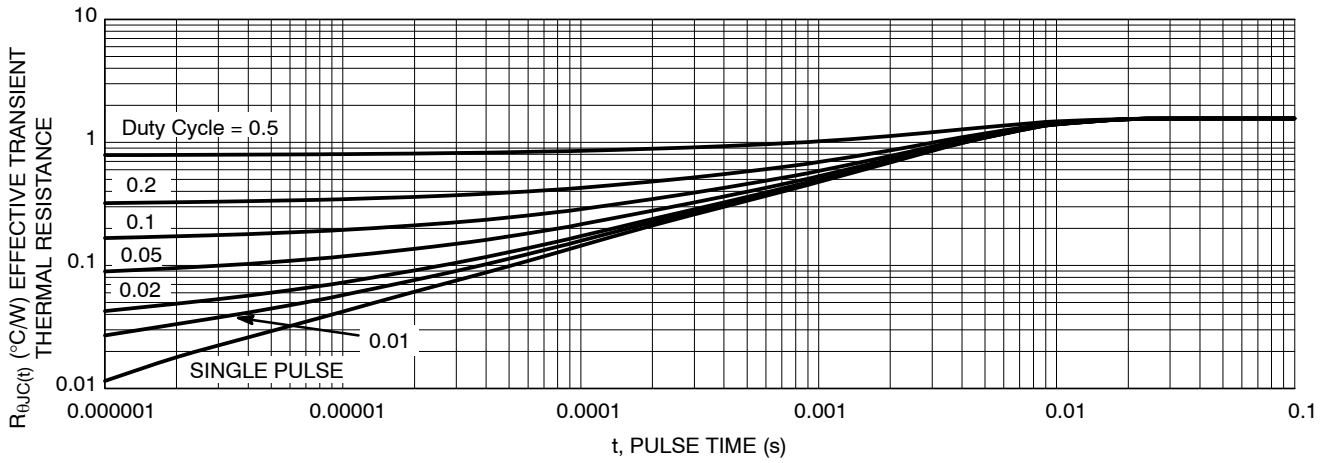


Figure 13. Thermal Response

ORDERING INFORMATION

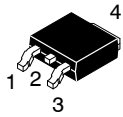
Order Number	Package	Shipping [†]
NVD5863NLT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NVD5863NLT4G-VF01	DPAK (Pb-Free)	2500 / Tape & Reel

[†]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.

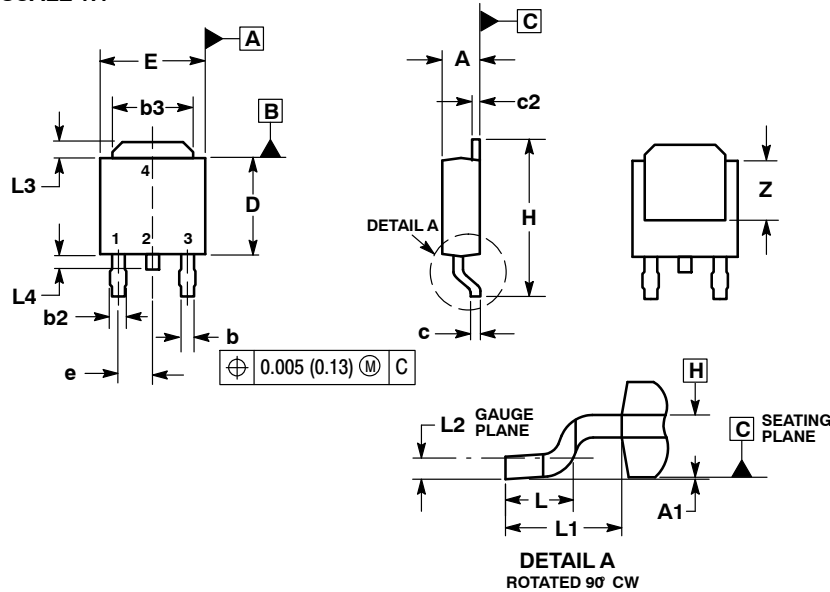
MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 1:1



DPAK (SINGLE GAUGE)

CASE 369AA-01

ISSUE B

DATE 03 JUN 2010

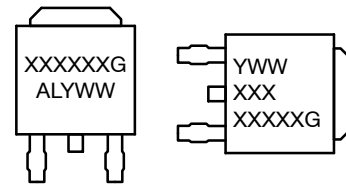
NOTES:

- 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
b ₂	0.030	0.045	0.76	1.14
b ₃	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c ₂	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
L ₁	0.108 REF		2.74 REF	
L ₂	0.020 BSC		0.51 BSC	
L ₃	0.035	0.050	0.89	1.27
L ₄	---	0.040	---	1.01
Z	0.155	---	3.93	---

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

GENERIC MARKING DIAGRAM*

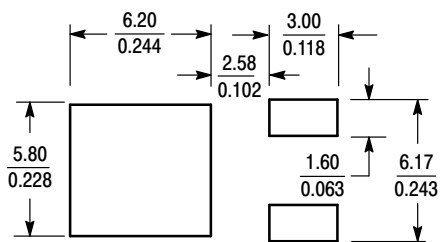


IC Discrete

- 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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