NTD3055-150, NVD3055-150

Power MOSFET
9.0 A, 60 V, N−Channel DPAK/IPAK

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

Features

- NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

Typical Applications

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

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

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	60	Vdc
Drain−to−Gate Voltage ($R_{GS} = 10$ MΩ)	V_{DGR}	60	Vdc
Gate−to−Source Voltage – Continuous – Non−repetitive ($t_p \leq 10$ ms)	V_{GS} V_{GS}	±20 ±30	Vdc
Drain Current – Continuous @ $T_A = 25°C$ – Continuous @ $T_A = 100°C$ – Single Pulse ($t_p \leq 10$ µs)	I_D I_D I_{DM}	9.0 3.0 27	Adc Apk
Total Power Dissipation @ $T_A = 25°C$ Derate above 25°C Total Power Dissipation @ $T_A = 25°C$ (Note 1) Total Power Dissipation @ $T_A = 25°C$ (Note 2)	P_D	28.8 0.19 2.1 1.5	W W/°C W W
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to 175	°C
Single Pulse Drain−to−Source Avalanche Energy – Starting $T_J = 25°C$ ($V_{DD} = 25$ Vdc, $V_{GS} = 10$ Vdc, L = 1.0 mH, $I_L(pk) = 7.75$ A, $V_{DS} = 60$ Vdc)	E_{AS}	30	mJ
Thermal Resistance – Junction−to−Case – Junction−to−Ambient (Note 1) – Junction−to−Ambient (Note 2)	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	5.2 71.4 100	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	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.
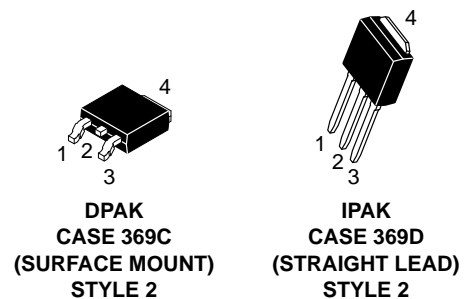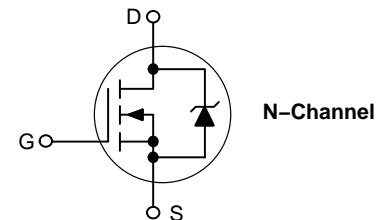1. When surface mounted to an FR4 board using 0.5 sq in pad size.
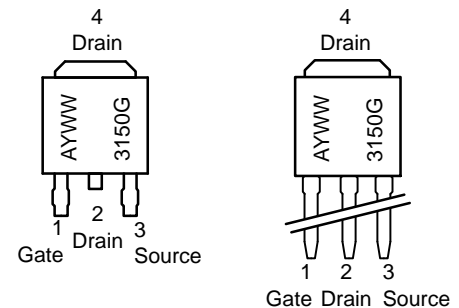2. When surface mounted to an FR4 board using minimum recommended pad size.

ON Semiconductor®

9.0 AMPERES, 60 VOLTS
$R_{DS(on)} = 122$ mΩ (Typ)

N−Channel

| DPAK
CASE 369C
(SURFACE MOUNT)
STYLE 2 | IPAK
CASE 369D
(STRAIGHT LEAD)
STYLE 2 |

MARKING DIAGRAMS & PIN ASSIGNMENTS

A	= Assembly Location*
3150	= Device Code
Y	= Year
WW	= Work Week
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 5 of this data sheet.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage (Note 3) (V_{GS} = 0 Vdc, I_D = 250 μAdc) Temperature Coefficient (Positive)		$V_{(BR)DSS}$	60 –	– 70.2	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 60 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 60 Vdc, V_{GS} = 0 Vdc, T_J = 150°C)		I_{DSS}	– –	– –	1.0 10	μAdc
Gate−Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)		I_{GSS}	–	–	±100	nAdc
ON CHARACTERISTICS (Note 3)						
Gate Threshold Voltage (Note 3) (V_{DS} = V_{GS}, I_D = 250 μAdc) Threshold Temperature Coefficient (Negative)		$V_{GS(th)}$	2.0 –	3.0 6.4	4.0 –	Vdc mV/°C
Static Drain−to−Source On−Resistance (Note 3) (V_{GS} = 10 Vdc, I_D = 4.5 Adc)		$R_{DS(on)}$	–	122	150	mΩ
Static Drain−to−Source On−Voltage (Note 3) (V_{GS} = 10 Vdc, I_D = 9.0 Adc) (V_{GS} = 10 Vdc, I_D = 4.5 Adc, T_J = 150°C)		$V_{DS(on)}$	– –	1.4 1.1	1.9 –	Vdc
Forward Transconductance (Note 3) (V_{DS} = 7.0 Vdc, I_D = 6.0 Adc)		g_{FS}	–	5.4	–	mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = 25 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}	–	200	280	pF
Output Capacitance		C_{oss}	–	70	100	
Transfer Capacitance		C_{rss}	–	26	40	
SWITCHING CHARACTERISTICS (Note 4)						
Turn−On Delay Time	(V_{DD} = 48 Vdc, I_D = 9.0 Adc, V_{GS} = 10 Vdc, R_G = 9.1 Ω) (Note 3)	$t_{d(on)}$	–	11.2	25	ns
Rise Time		t_r	–	37.1	80	
Turn−Off Delay Time		$t_{d(off)}$	–	12.2	25	
Fall Time		t_f	–	23	50	
Gate Charge	(V_{DS} = 48 Vdc, I_D = 9.0 Adc, V_{GS} = 10 Vdc) (Note 3)	Q_T	–	7.1	15	nC
		Q_1	–	1.7	–	
		Q_2	–	3.5	–	
SOURCE−DRAIN DIODE CHARACTERISTICS						
Forward On−Voltage	(I_S = 9.0 Adc, V_{GS} = 0 Vdc) (Note 3) (I_S = 19 Adc, V_{GS} = 0 Vdc, T_J = 150°C)	V_{SD}	– –	0.98 0.86	1.20 –	Vdc
Reverse Recovery Time	(I_S = 9.0 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs) (Note 3)	t_{rr}	–	28.9	–	ns
		t_a	–	21.6	–	
		t_b	–	7.3	–	
Reverse Recovery Stored Charge		Q_{RR}	–	0.036	–	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. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

Figure 1. On−Region Characteristics
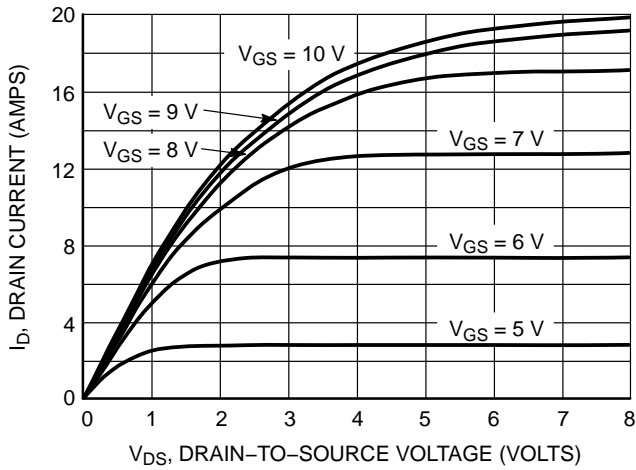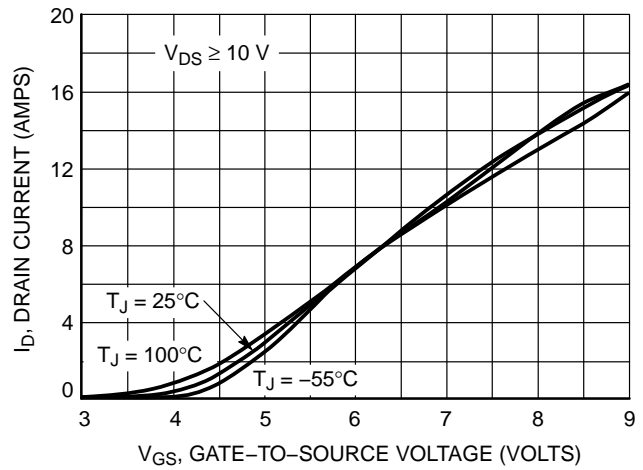
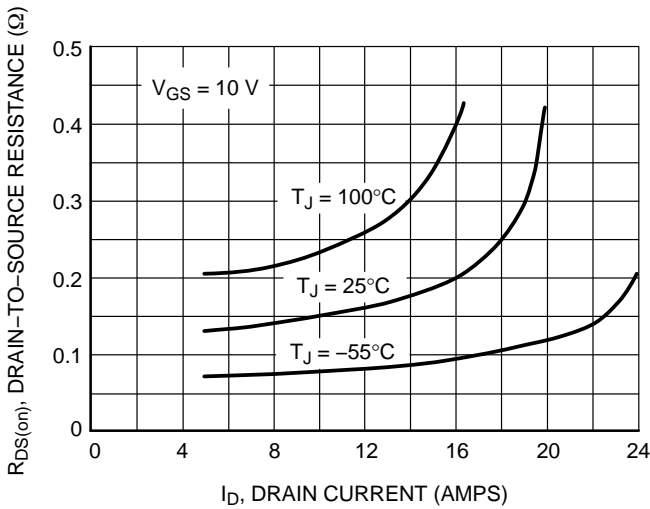**Figure 2. Transfer Characteristics**

**Figure 3. On−Resistance versus
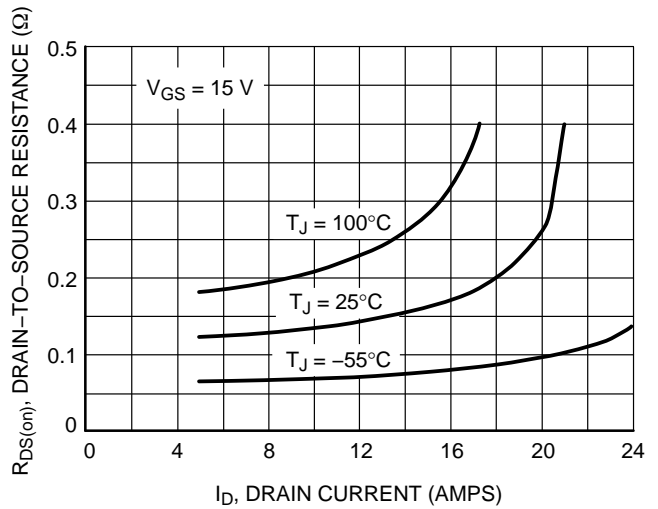Gate−To−Source Voltage**

**Figure 4. On−Resistance versus Drain Current
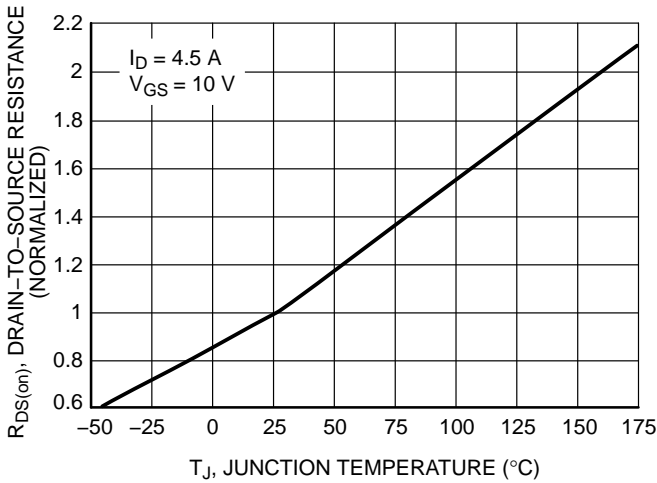and Gate Voltage**

**Figure 5. On−Resistance Variation with
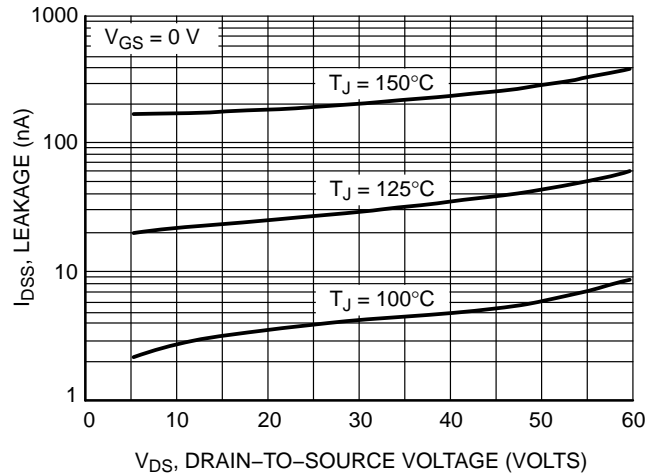Temperature**
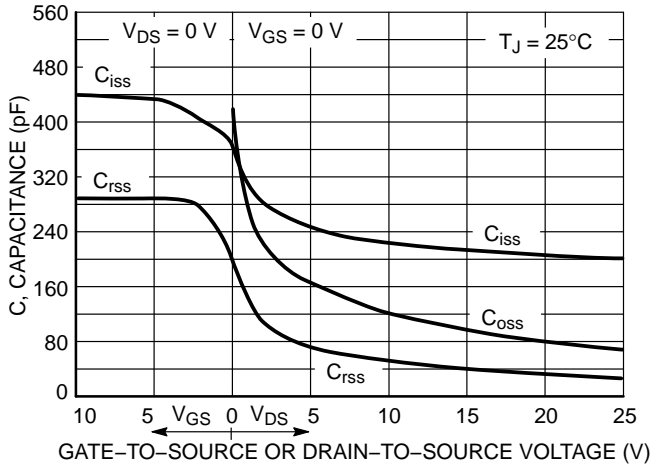
**Figure 6. Drain−To−Source Leakage
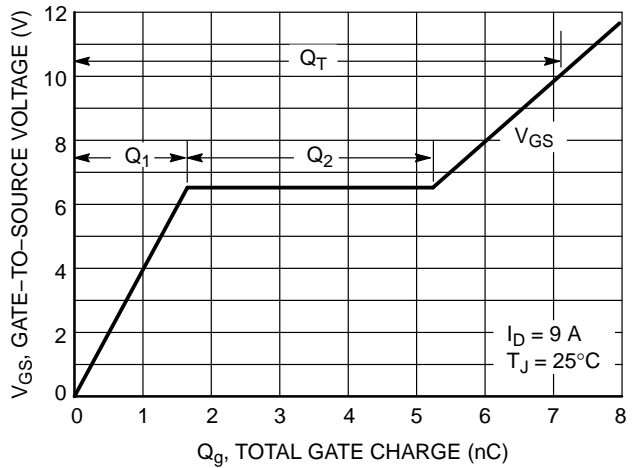Current versus Voltage**

Figure 7. Capacitance Variation

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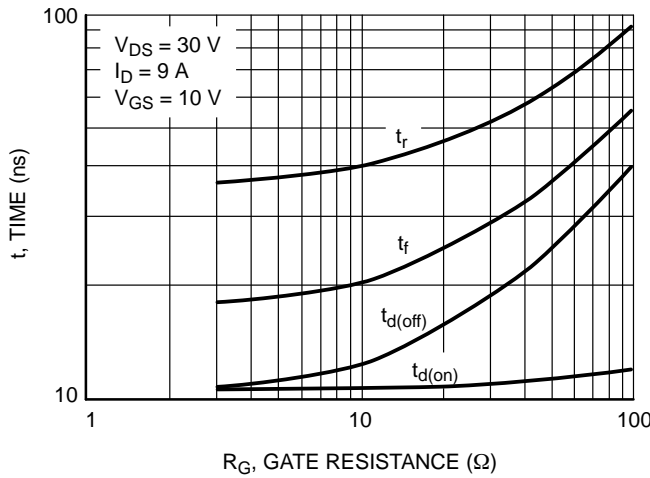Drain−to−Source Voltage versus Total Charge

Figure 9. Resistive Switching Time Variation
versus Gate Resistance
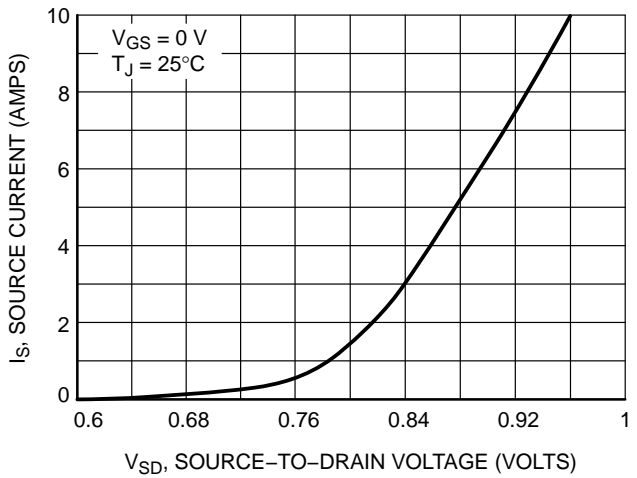
Figure 10. Diode Forward Voltage versus
Current
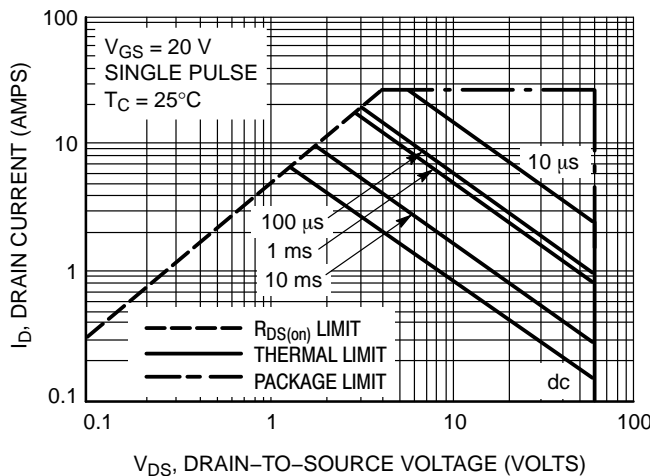
Figure 11. Maximum Rated Forward Biased
Safe Operating Area
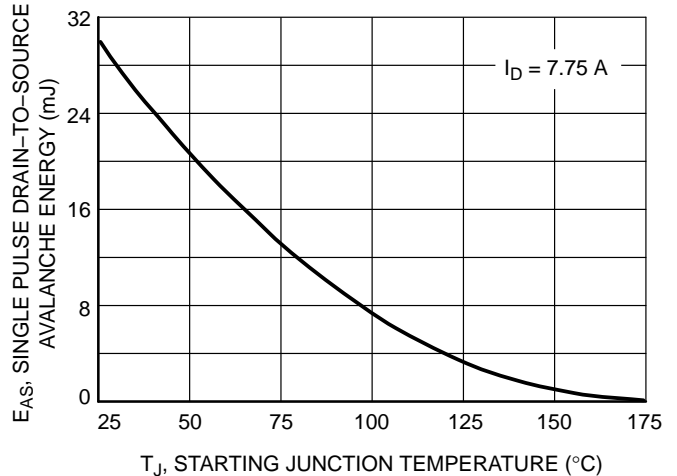
Figure 12. Maximum Avalanche Energy versus
Starting Junction Temperature
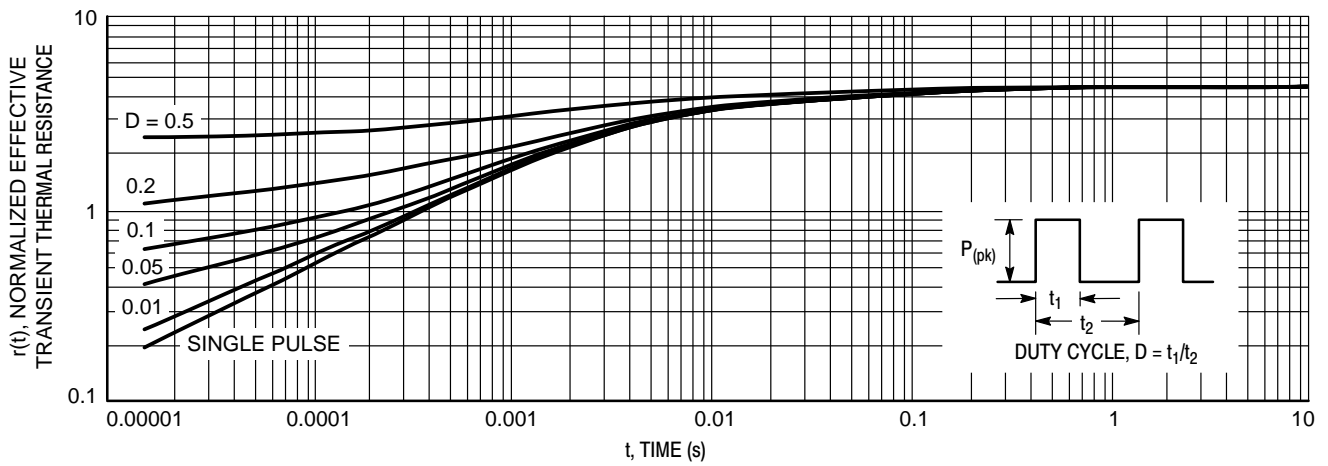
Figure 13. Thermal Response

ORDERING INFORMATION

Device	Package	Shipping†
NTD3055−150G	DPAK (Pb−Free)	75 Units / Rail
NTD3055−150−1G	IPAK (Pb−Free)	75 Units / Rail
NTD3055−150T4G	DPAK (Pb−Free)	2500 / Tape & Reel
NTD3055−150T4H	DPAK (Halide−Free)	2500 / Tape & Reel
NVD3055−150T4G*	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.

*NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE)
CASE 369C
ISSUE E

TOP VIEW

⊕ | 0.005 (0.13) Ⓜ | C

DETAIL A

SIDE VIEW

BOTTOM VIEW

BOTTOM VIEW
ALTERNATE
CONSTRUCTION

DETAIL A
ROTATED 90° CW
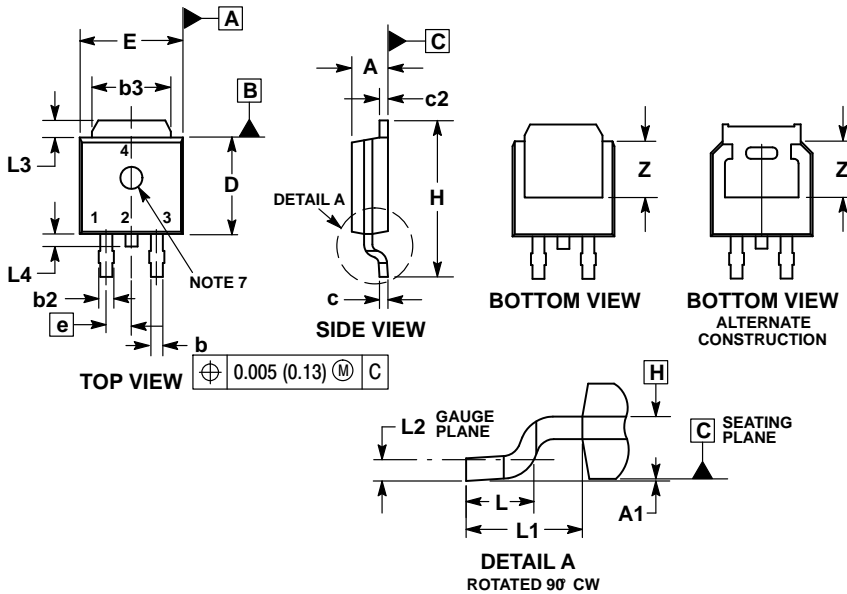
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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	0.028	0.045	0.72	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	0.114 REF		2.90 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	–––

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

SOLDERING FOOTPRINT*

6.20 / 0.244

3.00 / 0.118

2.58 / 0.102

5.80 / 0.228

1.60 / 0.063

6.17 / 0.243
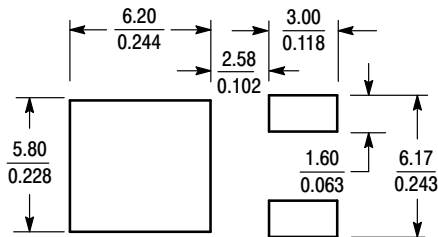
SCALE 3:1 $\left(\dfrac{mm}{inches}\right)$

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

PACKAGE DIMENSIONS

IPAK
CASE 369D
ISSUE C
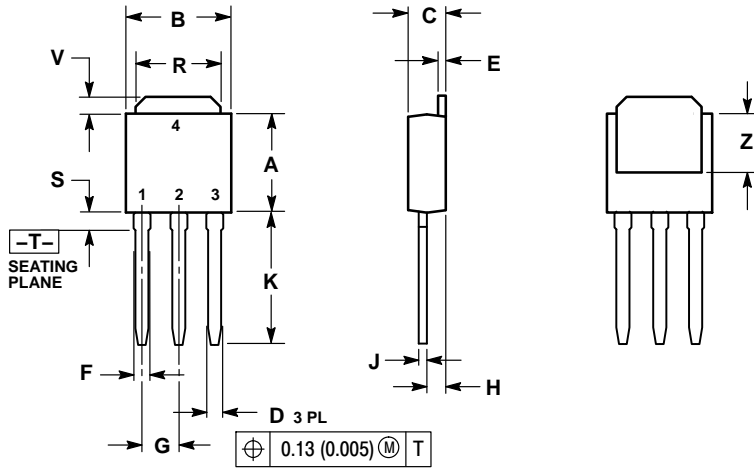
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.180	0.215	4.45	5.45
S	0.025	0.040	0.63	1.01
V	0.035	0.050	0.89	1.27
Z	0.155	–––	3.93	–––

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