

# NTD3055-150, NVD3055-150

## MOSFET – Power, N-Channel, DPAK/IPAK 9.0 A, 60 V

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<sub>J</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	60	Vdc
Drain-to-Gate Voltage (R <sub>GS</sub> = 10 MΩ)	V <sub>DGR</sub>	60	Vdc
Gate-to-Source Voltage	V <sub>GS</sub>	±20	Vdc
– Continuous	V <sub>GS</sub>	±30	Vdc
– Non-repetitive (t <sub>p</sub> ≤ 10 ms)			
Drain Current	I <sub>D</sub>	9.0	Adc
– Continuous @ T <sub>A</sub> = 25°C	I <sub>D</sub>	3.0	
– Continuous @ T <sub>A</sub> = 100°C	I <sub>DM</sub>	27	Apk
– Single Pulse (t <sub>p</sub> ≤ 10 μs)			
Total Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	28.8	W
Derate above 25°C		0.19	W/°C
Total Power Dissipation @ T <sub>A</sub> = 25°C (Note 1)		2.1	W
Total Power Dissipation @ T <sub>A</sub> = 25°C (Note 2)		1.5	W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	–55 to 175	°C
Single Pulse Drain-to-Source Avalanche Energy – Starting T <sub>J</sub> = 25°C (V <sub>DD</sub> = 25 Vdc, V <sub>GS</sub> = 10 Vdc, L = 1.0 mH, I <sub>L(pk)</sub> = 7.75 A, V <sub>DS</sub> = 60 Vdc)	E <sub>AS</sub>	30	mJ
Thermal Resistance	R <sub>θJC</sub>	5.2	°C/W
– Junction-to-Case	R <sub>θJA</sub>	71.4	
– Junction-to-Ambient (Note 1)	R <sub>θJA</sub>	100	
– Junction-to-Ambient (Note 2)			
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T <sub>L</sub>	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.

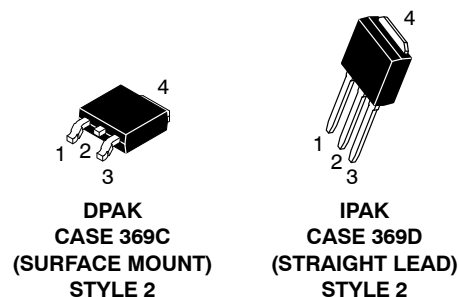
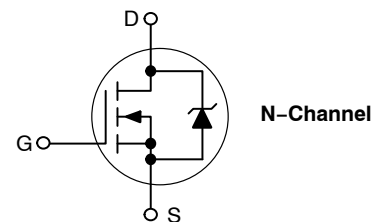
1. When surface mounted to an FR4 board using 0.5 sq in pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.



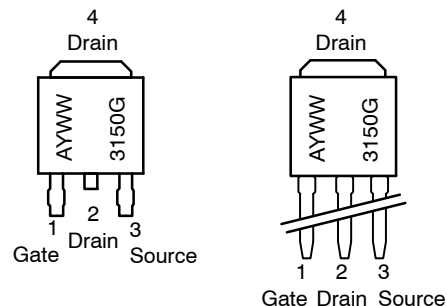
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9.0 AMPERES, 60 VOLTS  
R<sub>DS(on)</sub> = 122 mΩ (Typ)



### 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.

# NTD3055-150, NVD3055-150

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-to-Source Breakdown Voltage (Note 3) (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc) Temperature Coefficient (Positive)	V <sub>(BR)DSS</sub>	60 -	- 70.2	- -	Vdc mV/°C
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 60 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 60 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 150°C)	I <sub>DSS</sub>	- -	- -	1.0 10	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	-	-	±100	nAdc

## ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc) Threshold Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	2.0 -	3.0 6.4	4.0 -	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 3) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 4.5 Adc)	R <sub>DS(on)</sub>	-	122	150	mΩ
Static Drain-to-Source On-Voltage (Note 3) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 9.0 Adc) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 4.5 Adc, T <sub>J</sub> = 150°C)	V <sub>DS(on)</sub>	- -	1.4 1.1	1.9 -	Vdc
Forward Transconductance (Note 3) (V <sub>DS</sub> = 7.0 Vdc, I <sub>D</sub> = 6.0 Adc)	g <sub>FS</sub>	-	5.4	-	mhos

## DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 25 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	-	200	280	pF
Output Capacitance		C <sub>oss</sub>	-	70	100	
Transfer Capacitance		C <sub>rss</sub>	-	26	40	

## SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V <sub>DD</sub> = 48 Vdc, I <sub>D</sub> = 9.0 Adc, V <sub>GS</sub> = 10 Vdc, R <sub>G</sub> = 9.1 Ω) (Note 3)	t <sub>d(on)</sub>	-	11.2	25	ns
Rise Time		t <sub>r</sub>	-	37.1	80	
Turn-Off Delay Time		t <sub>d(off)</sub>	-	12.2	25	
Fall Time		t <sub>f</sub>	-	23	50	
Gate Charge	(V <sub>DS</sub> = 48 Vdc, I <sub>D</sub> = 9.0 Adc, V <sub>GS</sub> = 10 Vdc) (Note 3)	Q <sub>T</sub>	-	7.1	15	nC
		Q <sub>1</sub>	-	1.7	-	
		Q <sub>2</sub>	-	3.5	-	

## SOURCE-DRAIN DIODE CHARACTERISTICS

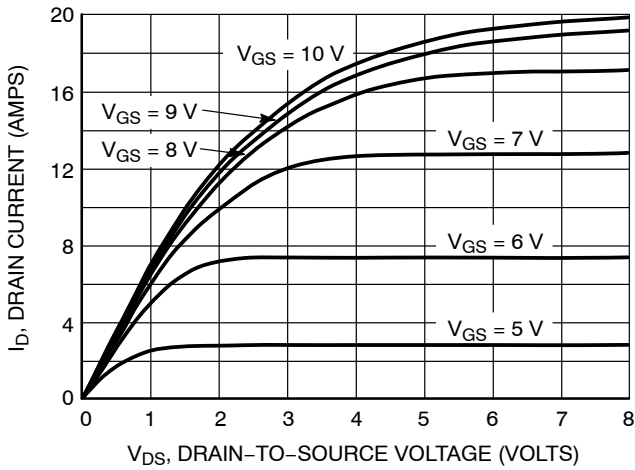
Forward On-Voltage	(I <sub>S</sub> = 9.0 Adc, V <sub>GS</sub> = 0 Vdc) (Note 3) (I <sub>S</sub> = 19 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 150°C)	V <sub>SD</sub>	- -	0.98 0.86	1.20 -	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 9.0 Adc, V <sub>GS</sub> = 0 Vdc, di <sub>S</sub> /dt = 100 A/μs) (Note 3)	t <sub>rr</sub>	-	28.9	-	ns
		t <sub>a</sub>	-	21.6	-	
		t <sub>b</sub>	-	7.3	-	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	-	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.

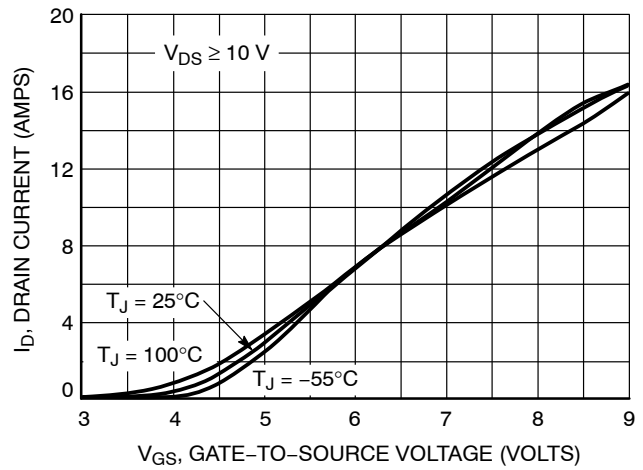
3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

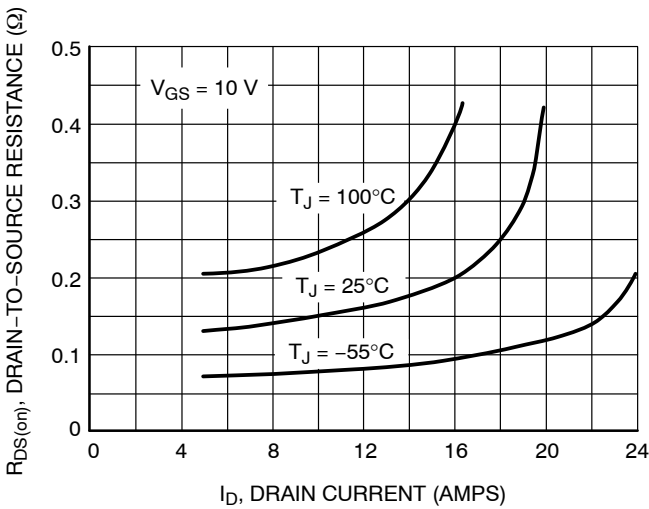
# NTD3055-150, NVD3055-150



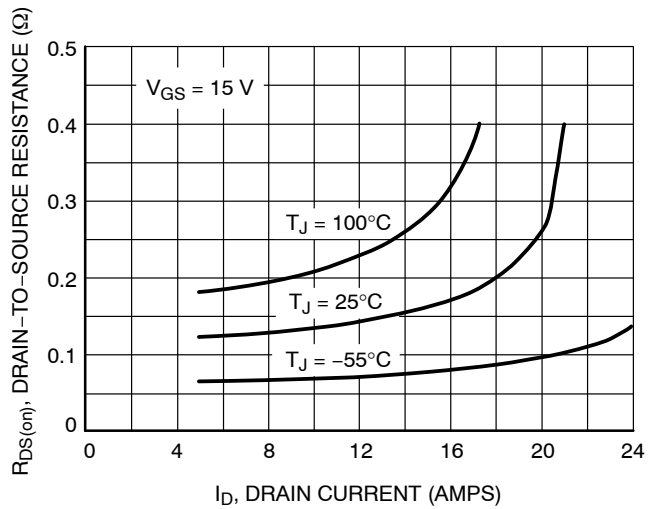
**Figure 1. On-Region Characteristics**



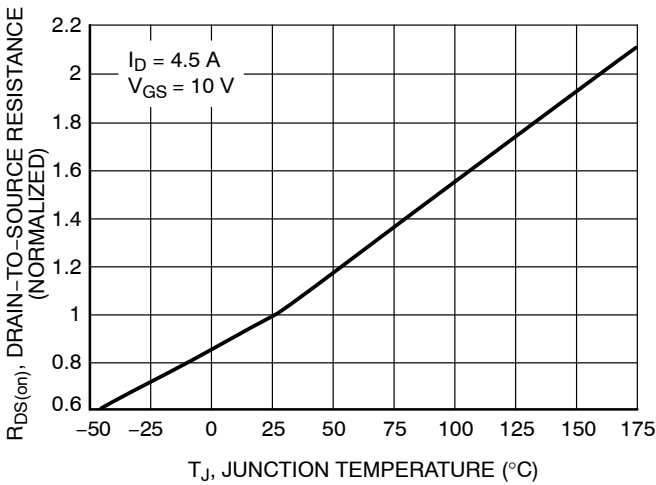
**Figure 2. Transfer Characteristics**



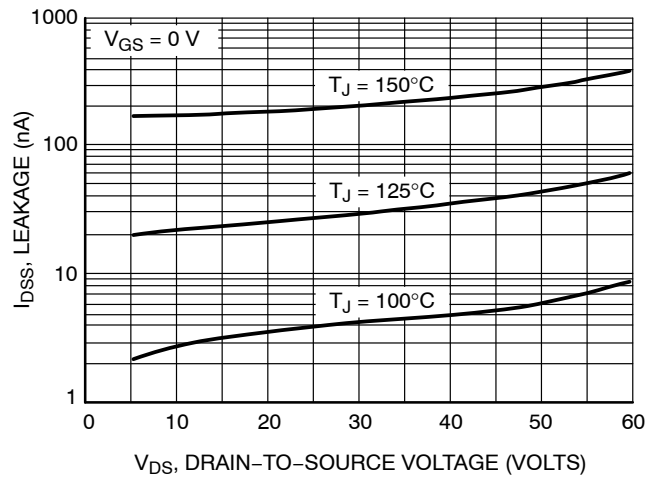
**Figure 3. On-Resistance versus Gate-to-Source Voltage**



**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**

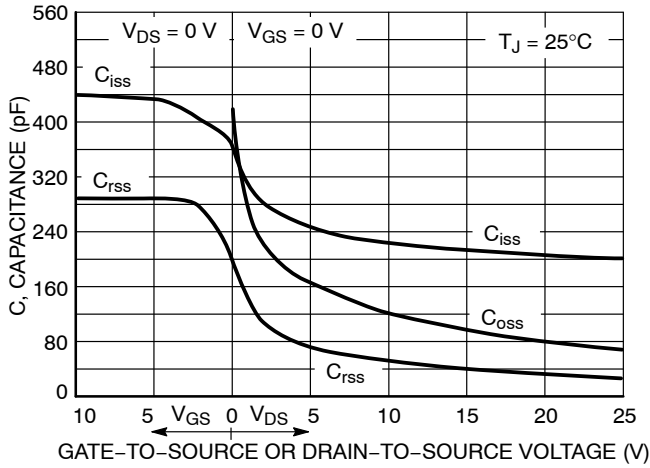


Figure 7. Capacitance Variation

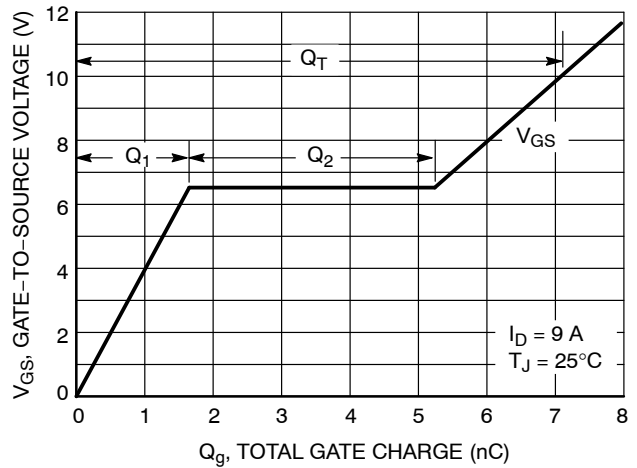


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

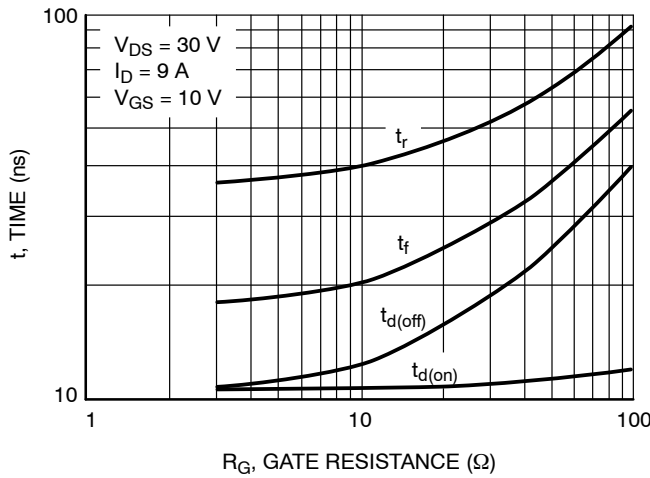


Figure 9. Resistive Switching Time Variation versus Gate Resistance

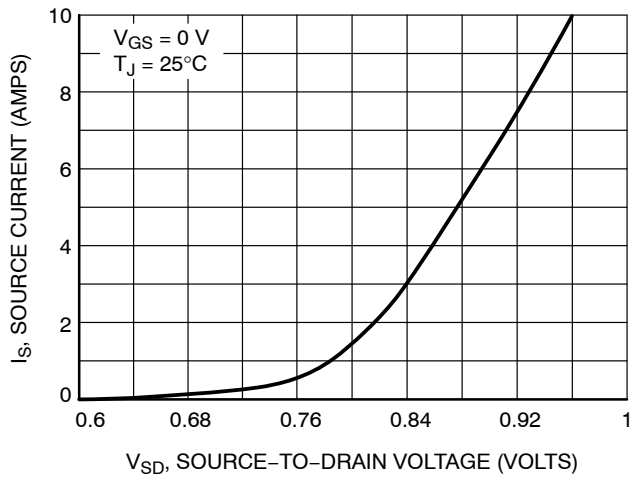


Figure 10. Diode Forward Voltage versus Current

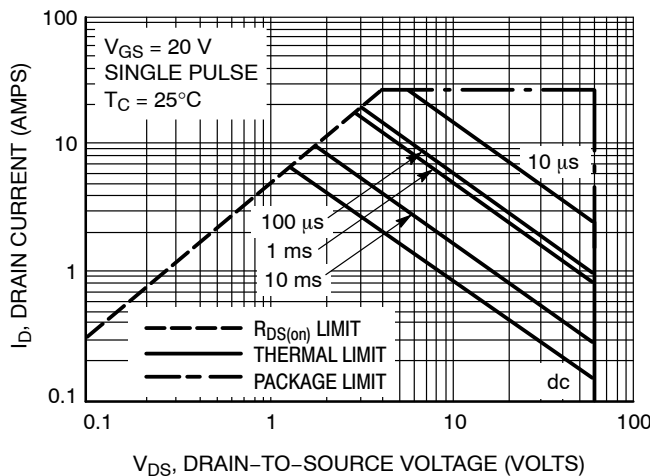


Figure 11. Maximum Rated Forward Biased Safe Operating Area

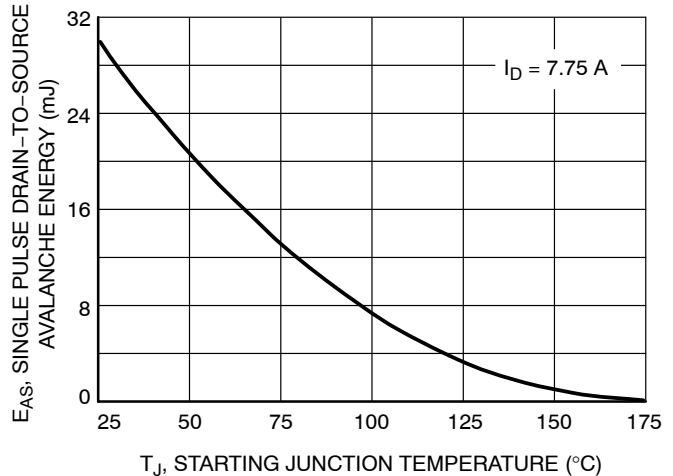
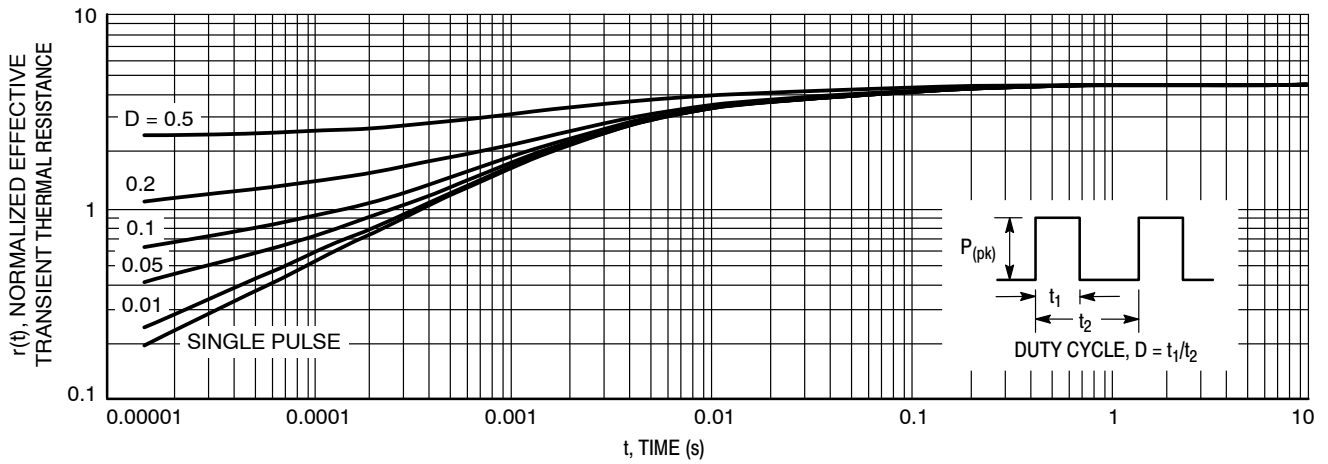


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

## NTD3055-150, NVD3055-150



**Figure 13. Thermal Response**

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
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
NVD3055-150T4G-VF01	DPAK (Pb-Free)	2500 / Tape & Reel

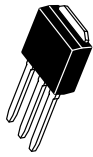
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

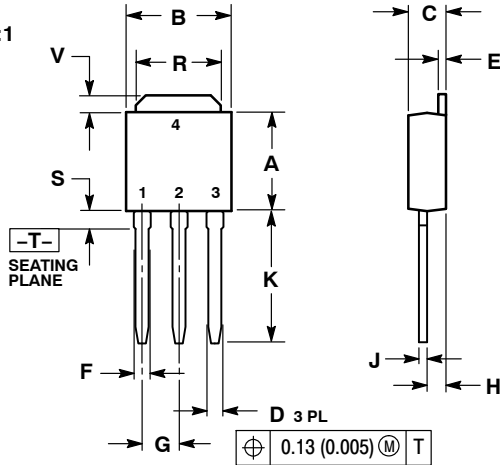
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### IPAK CASE 369D-01 ISSUE C

DATE 15 DEC 2010

SCALE 1:1



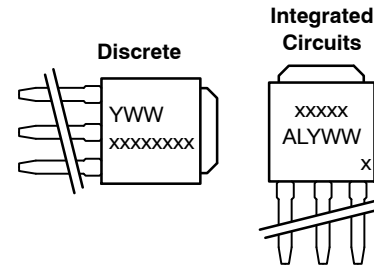
NOTES:

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	---

- |  |   |  |  |
|--|---|--|--|
| <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> |  |

### MARKING DIAGRAMS

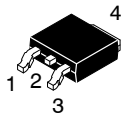


- xxxxxxxx = Device Code
- A = Assembly Location
- IL = Wafer Lot
- Y = Year
- WW = Work Week

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<b>DESCRIPTION:</b>	<b>IPAK (DPAK INSERTION MOUNT)</b>	<b>PAGE 1 OF 1</b>

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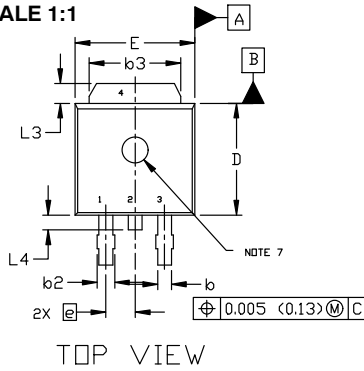
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



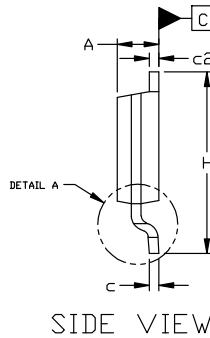
## DPAK (SINGLE GAUGE) CASE 369C ISSUE G

DATE 31 MAY 2023

SCALE 1:1



TOP VIEW

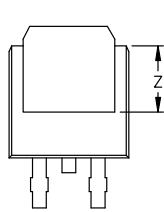


SIDE VIEW

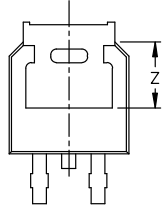
NOTES:

1. DIMENSIONING AND TOLERANCING 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		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	0.028	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	---

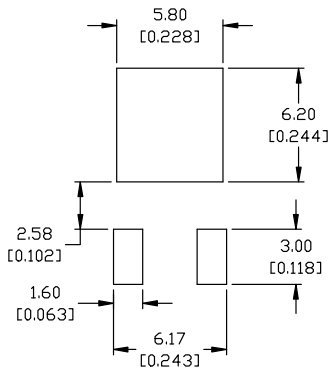


BOTTOM VIEW



BOTTOM VIEW

ALTERNATE CONSTRUCTIONS



### 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.

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. CATHODE
- 2. ANODE
- 3. GATE
- 4. ANODE

STYLE 5:

- PIN 1. GATE
- 2. ANODE
- 3. CATHODE
- 4. ANODE

STYLE 6:

- PIN 1. MT1
- 2. MT2
- 3. GATE
- 4. MT2

STYLE 7:

- PIN 1. GATE
- 2. COLLECTOR
- 3. EMITTER
- 4. COLLECTOR

STYLE 8:

- PIN 1. N/C
- 2. CATHODE
- 3. ANODE
- 4. CATHODE

STYLE 9:

- PIN 1. ANODE
- 2. CATHODE
- 3. RESISTOR ADJUST
- 4. CATHODE

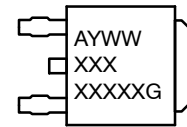
STYLE 10:

- PIN 1. CATHODE
- 2. ANODE
- 3. CATHODE
- 4. ANODE

### 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. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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