

# NTD5862N, NTP5862N

## MOSFET – Power, N-Channel

60 V, 98 A, 5.7 mΩ

### Features

- Low  $R_{DS(on)}$
- High Current Capability
- 100% Avalanche Tested
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DS}$	60	V
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	V
Gate-to-Source Voltage – Non-Repetitive ( $t_p < 10 \mu\text{s}$ )	$V_{GS}$	$\pm 30$	V
Continuous Drain Current ( $R_{\theta JC}$ ) (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$ 98 A
		$T_C = 100^\circ\text{C}$	69
Power Dissipation ( $R_{\theta JC}$ )		$T_C = 25^\circ\text{C}$	$P_D$ 115 W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	335 A
Operating Junction and Storage Temperature	$T_J, T_{stg}$	-55 to 175	$^\circ\text{C}$
Source Current (Body Diode)	$I_S$	96	A
Single Pulse Drain-to-Source Avalanche Energy ( $L = 0.3 \text{ mH}$ )	$E_{AS}$	205	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)	$R_{\theta JC}$	1.3	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	37	

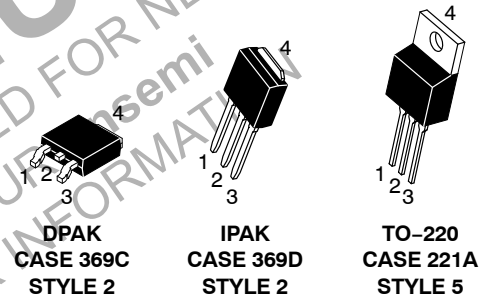
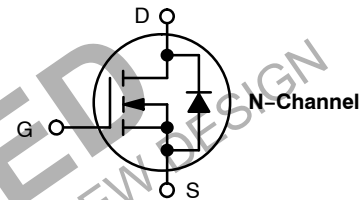
1. Limited by package to 50 A continuous.
2. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).



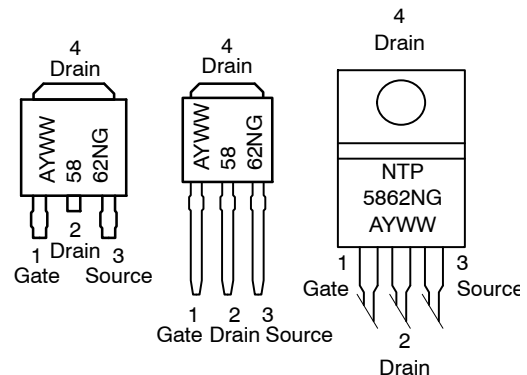
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$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
60 V	5.7 mΩ @ 10 V	98 A



### MARKING DIAGRAMS & PIN ASSIGNMENT



A = Assembly Location\*  
Y = Year  
WW = Work Week  
5862N = 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 on page 5 of this data sheet.

# NTD5862N, NTP5862N

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			47		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 60 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 3)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	2.0		4.0	V
Threshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>			-9.7		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 45 A		4.4	5.7	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10 A		18		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		5050	6000	pF
Output Capacitance	C <sub>oss</sub>			500	600	
Reverse Transfer Capacitance	C <sub>rss</sub>			300	420	
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 48 V, I <sub>D</sub> = 45 A		82		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			5.2		
Gate-to-Source Charge	Q <sub>GS</sub>			24		
Gate-to-Drain Charge	Q <sub>GD</sub>			27		
Gate Resistance	R <sub>G</sub>			0.6		Ω

### SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DD</sub> = 48 V, I <sub>D</sub> = 45 A, R <sub>G</sub> = 2.5 Ω		18		ns
Rise Time	t <sub>r</sub>			70		
Turn-Off Delay Time	t <sub>d(off)</sub>			35		
Fall Time	t <sub>f</sub>			60		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 45 A	T <sub>J</sub> = 25°C		0.9	1.2	V
			T <sub>J</sub> = 100°C		0.75		
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> = 45 A			38		ns
Charge Time	t <sub>a</sub>				20		
Discharge Time	t <sub>b</sub>				18		
Reverse Recovery Charge	Q <sub>RR</sub>				40		nC

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.

TYPICAL CHARACTERISTICS

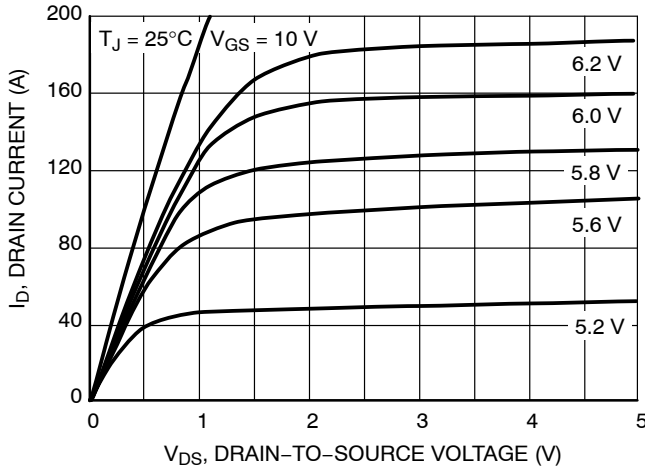


Figure 1. On-Region Characteristics

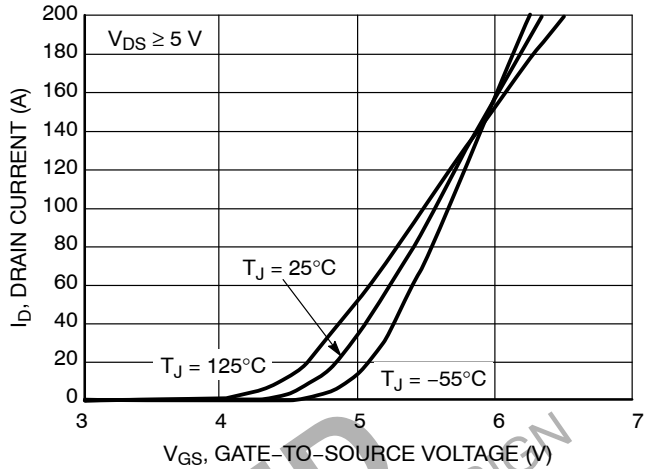


Figure 2. Transfer Characteristics

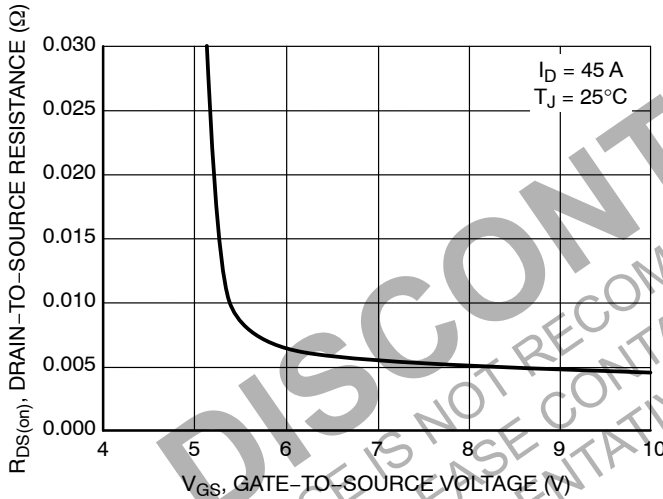


Figure 3. On-Resistance vs. Gate Voltage

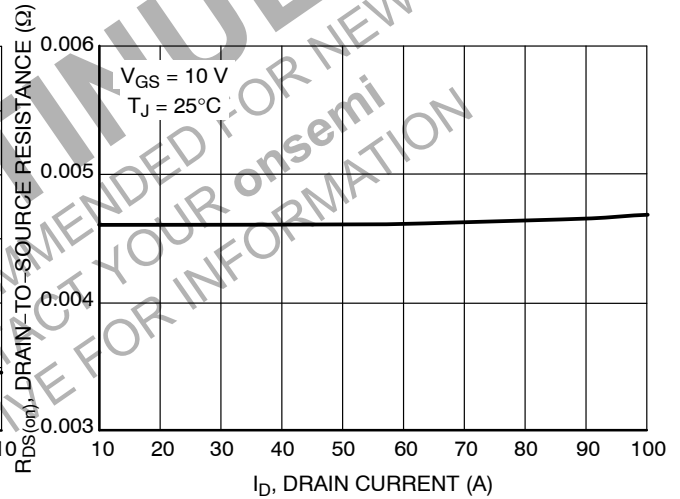


Figure 4. On-Resistance vs. Drain Current

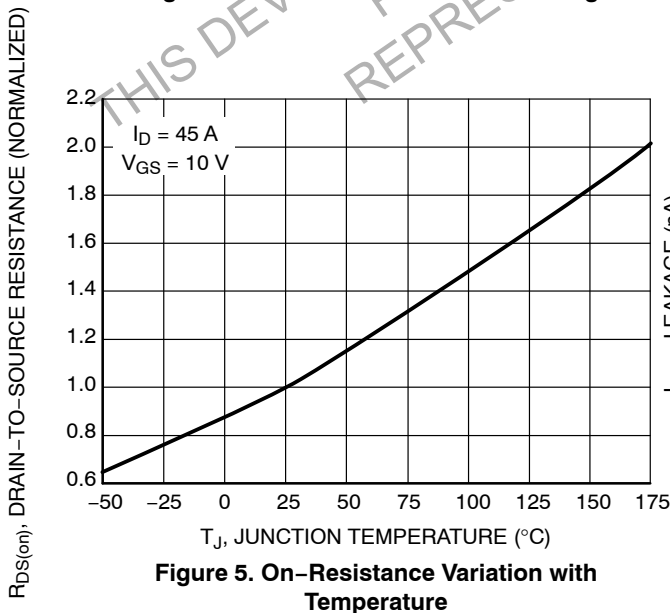


Figure 5. On-Resistance Variation with Temperature

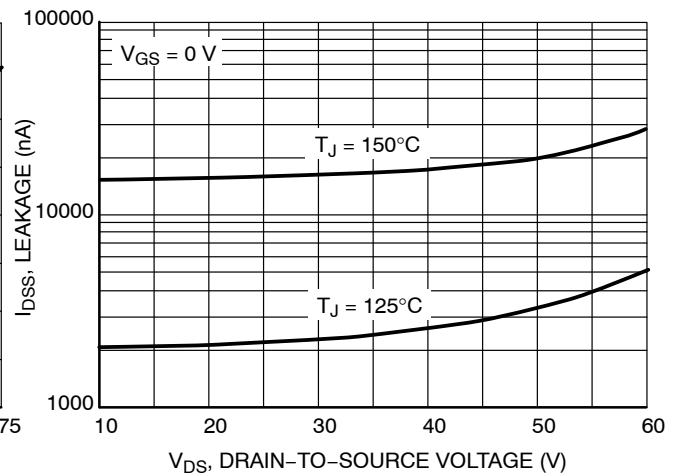


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

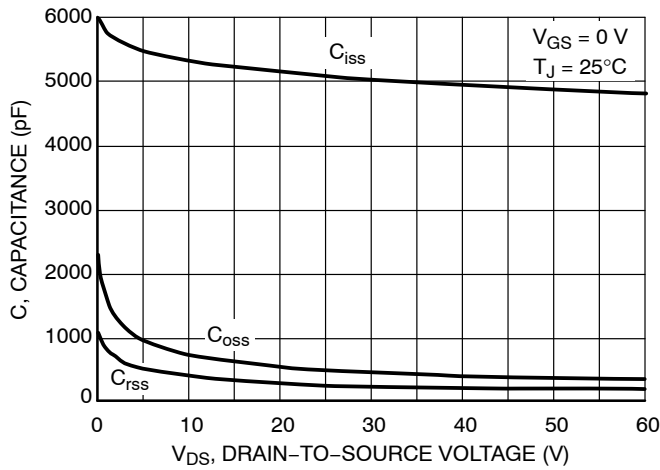


Figure 7. Capacitance Variation

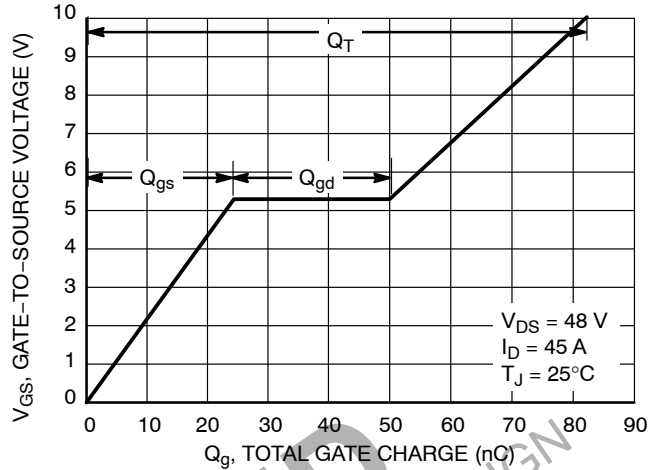


Figure 8. Gate-to-Source vs. Total Charge

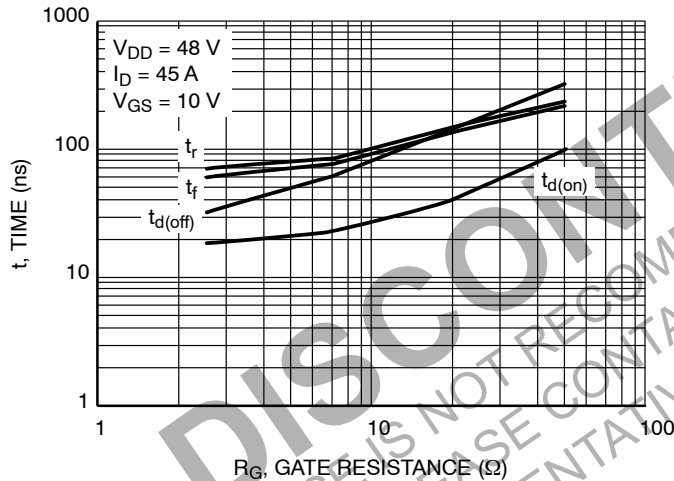


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

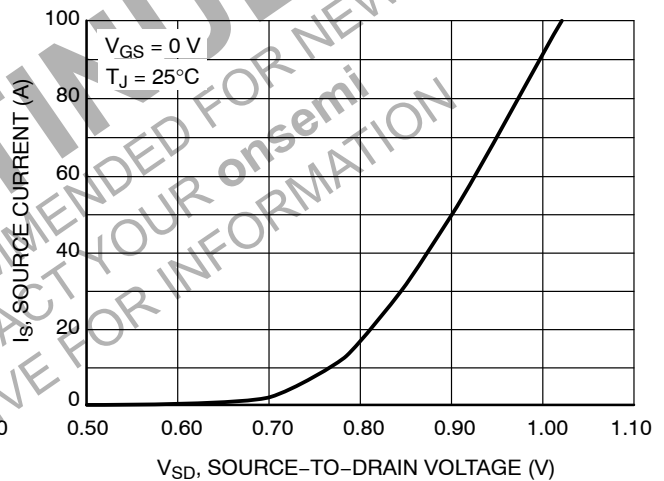


Figure 10. Diode Forward Voltage vs. Current

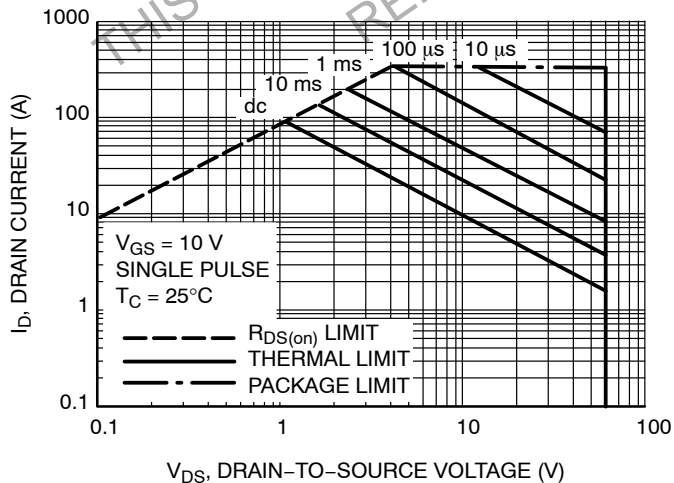


Figure 11. Maximum Rated Forward Biased Safe Operating Area

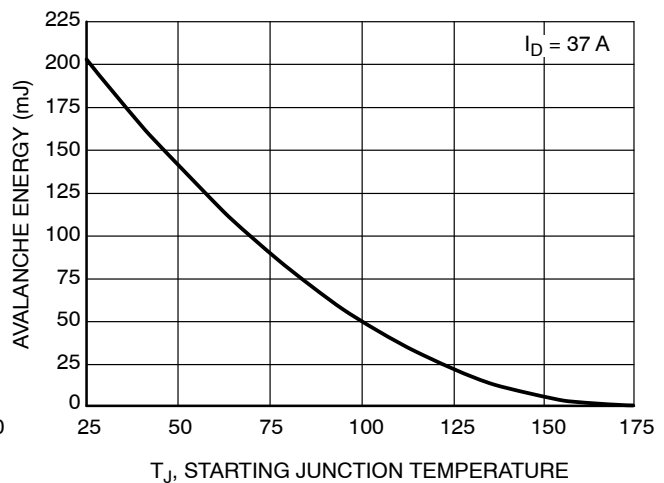


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

# NTD5862N, NTP5862N

## TYPICAL CHARACTERISTICS

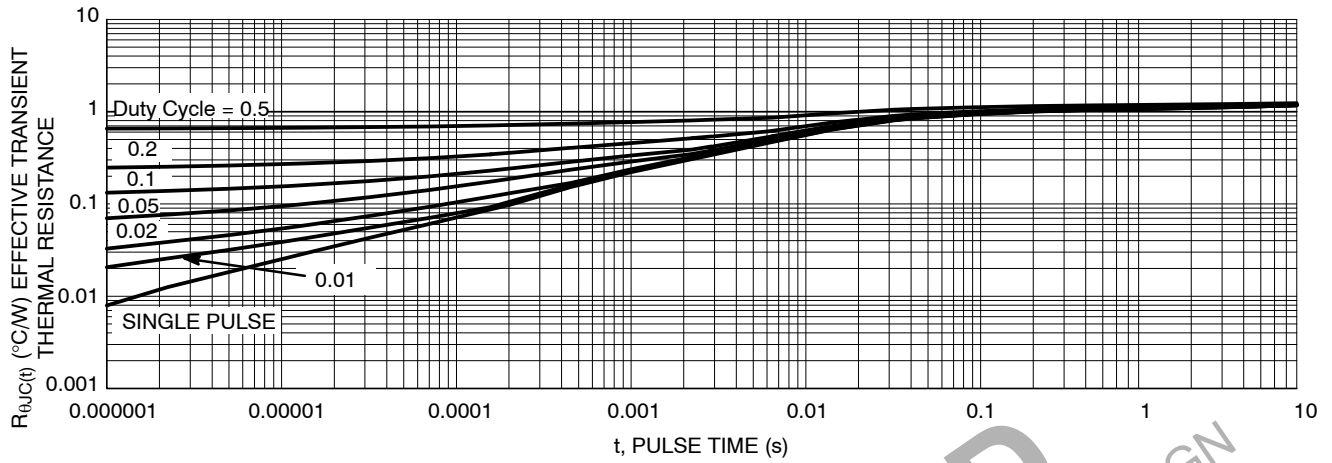
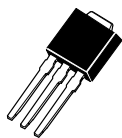


Figure 13. Thermal Response

### ORDERING INFORMATION

Order Number	Package	Shipping <sup>†</sup>
NTD5862N-1G	IPAK (Straight Lead) (Pb-Free)	75 Units / Rail
NTD5862NT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NTP5862NG	TO-220 (Pb-Free)	50 Units / Rail

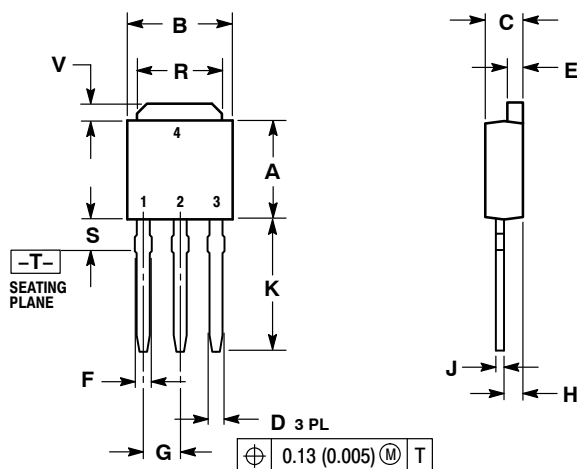
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



DPAK INSERTION MOUNT  
CASE 369  
ISSUE O

DATE 02 JAN 2000

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	0.250	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	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
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	0.175	0.215	4.45	5.46
S	0.050	0.090	1.27	2.28
V	0.030	0.050	0.77	1.27

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

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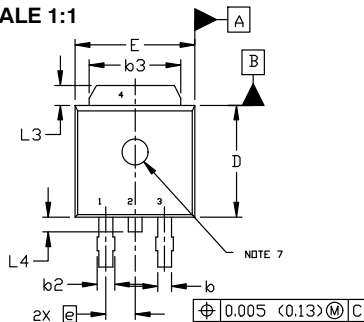
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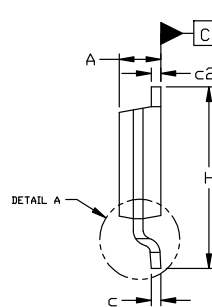
DPAK (SINGLE GAUGE)  
CASE 369C  
ISSUE G

DATE 31 MAY 2023

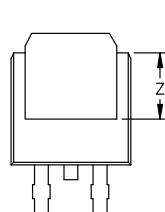
SCALE 1:1



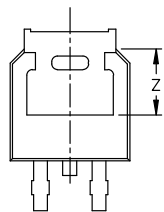
TOP VIEW



SIDE VIEW

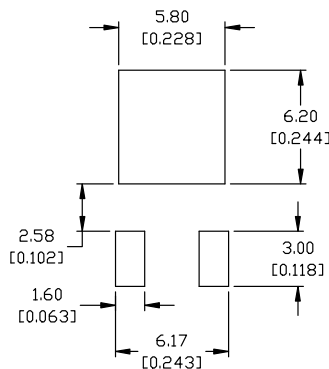


BOTTOM VIEW



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

NOTES:

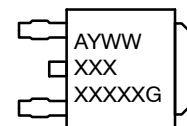
1. DIMENSIONING AND TOLERANCING ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3, AND Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. 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	---

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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