NTD70N03R

Power MOSFET

72 A, 25 V, N−Channel DPAK

Features

- Planar HD3e Process for Fast Switching Performance
- Low $R_{DS(on)}$ to Minimize Conduction Loss
- Low C_{ISS} to Minimize Driver Loss
- Low Gate Charge
- Pb−Free Packages are Available

MAXIMUM RATINGS (T_J = 25°C Unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	25	V_{dc}
Gate−to−Source Voltage – Continuous	V_{GS}	±20	V_{dc}
Thermal Resistance – Junction−to−Case	$R_{\theta JC}$	2.4	°C/W
Total Power Dissipation @ T_C = 25°C	P_D	62.5	W
Drain Current			
– Continuous @ T_C = 25°C, Chip	I_D	72.0	A
– Continuous @ T_C = 25°C, Limited by Package	I_D	62.8	A
– Continuous @ T_A = 25°C, Limited by Wires	I_D	32	A
– Single Pulse (t_p = 10 μs)	I_{DM}	140	A
Thermal Resistance – Junction−to−Ambient (Note 1)	$R_{\theta JA}$	80	°C/W
Total Power Dissipation @ T_A = 25°C	P_D	1.87	W
Drain Current – Continuous @ T_A = 25°C	I_D	12.0	A
Thermal Resistance – Junction−to−Ambient (Note 2)	$R_{\theta JA}$	110	°C/W
Total Power Dissipation @ T_A = 25°C	P_D	1.36	W
Drain Current – Continuous @ T_A = 25°C	I_D	10.0	A
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} = 30 V_{dc}, V_{GS} = 10 V_{dc}, I_L = 12 A_{pk}, L = 1 mH, R_G = 25 Ω)	E_{AS}	71.7	mJ
Maximum Lead Temperature for Soldering Purposes, 1/8″ from Case for 10 s	T_L	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.
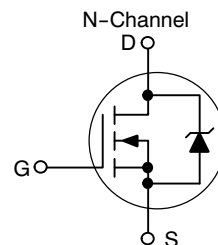
1. When surface mounted to an FR4 board using 0.5 sq. in. pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.
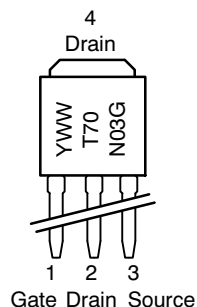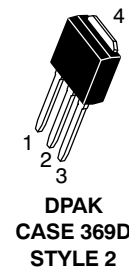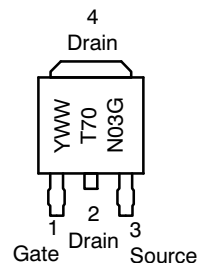
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
25 V	5.6 mΩ	72 A

N−Channel

MARKING DIAGRAMS

DPAK
CASE 369AA
STYLE 2

DPAK
CASE 369D
STYLE 2

YWW
T70
N03G

Drain

Gate   Drain   Source

70N03	= Device Code
Y	= Year
WW	= Work Week
G	= Pb−Free Package

ORDERING INFORMATION

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

NTD70N03R

ELECTRICAL CHARACTERISTICS (T_J = 25°C Unless otherwise specified)

Characteristics	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain–to–Source Breakdown Voltage (Note 3) (V_{GS} = 0 V_{dc}, I_D = 250 μA_{dc}) Temperature Coefficient (Positive)	$V_{(br)DSS}$	25 –	28 20.5	– –	V_{dc} mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 20 V_{dc}, V_{GS} = 0 V_{dc}) (V_{DS} = 20 V_{dc}, V_{GS} = 0 V_{dc}, T_J = 150°C)	I_{DSS}	 – –	 – –	 1.5 10	μA_{dc}
Gate–Body Leakage Current (V_{GS} = ±20 V_{dc}, V_{DS} = 0 V_{dc})	I_{GSS}	–	–	±100	nA_{dc}
ON CHARACTERISTICS (Note 3)					
Gate Threshold Voltage (Note 3) (V_{DS} = V_{GS}, I_D = 250 μA_{dc}) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 –	1.5 4.0	2.0 –	V_{dc} mV/°C
Static Drain–to–Source On–Resistance (Note 3) (V_{GS} = 4.5 V_{dc}, I_D = 20 A_{dc}) (V_{GS} = 10 V_{dc}, I_D = 20 A_{dc})	$R_{DS(on)}$	 – –	 8.1 5.6	 13 8.0	mΩ
Forward Transconductance (Note 3) (V_{DS} = 10 V_{dc}, I_D = 15 A_{dc})	g_{FS}	–	27	–	Mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance	C_{ISS}	–	1333	–	pF
Output Capacitance (V_{DS} = 20 V_{dc}, V_{GS} = 0 V, f = 1 MHz)	C_{OSS}	–	600	–	
Transfer Capacitance	C_{RSS}	–	218	–	
SWITCHING CHARACTERISTICS (Note 4)					
Turn–On Delay Time	$t_{d(on)}$	–	6.9	–	ns
Rise Time (V_{GS} = 10 V_{dc}, V_{DD} = 10 V_{dc}, I_D = 36 A_{dc}, R_G = 3 Ω)	t_r	–	1.3	–	
Turn–Off Delay Time	$t_{d(off)}$	–	18.4	–	
Fall Time	t_f	–	5.5	–	
Gate Charge	Q_T	–	13.2	–	nC
(V_{GS} = 5 V_{dc}, I_D = 36 A_{dc}, V_{DS} = 10 V_{dc}) (Note 3)	Q_{GS}	–	3.3	–	
	Q_{DS}	–	6.5	–	
SOURCE–DRAIN DIODE CHARACTERISTICS					
Forward On–Voltage (I_S = 20 A_{dc}, V_{GS} = 0 V_{dc}) (Note 3) (I_S = 20 A_{dc}, V_{GS} = 0 V_{dc}, T_J = 125°C)	V_{SD}	 – –	 0.86 0.73	 1.2 –	V_{dc}
Reverse Recovery Time	t_{rr}	–	27.9	–	ns
(I_S = 36 A_{dc}, V_{GS} = 0 V_{dc}, dI_S/dt = 100 A/μs) (Note 3)	t_a	–	14.8	–	
	t_b	–	13.1	–	
Reverse Recovery Stored Charge	Q_{RR}	–	19	–	nC

3. Pulse Test: Pulse Width = 300 μs, Duty Cycle = 2%.
4. Switching characteristics are independent of operating junction temperatures.
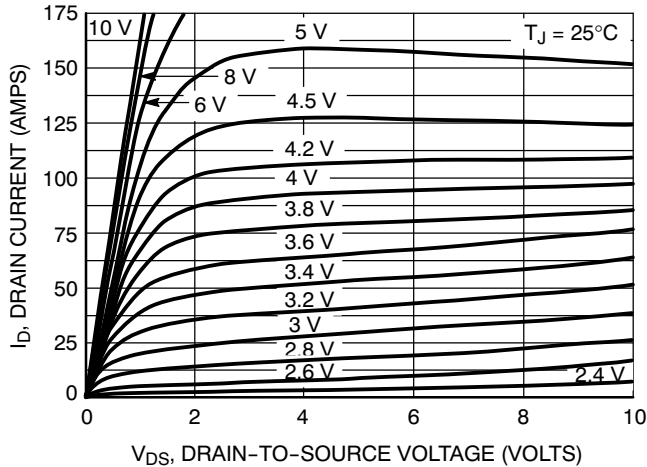
NTD70N03R

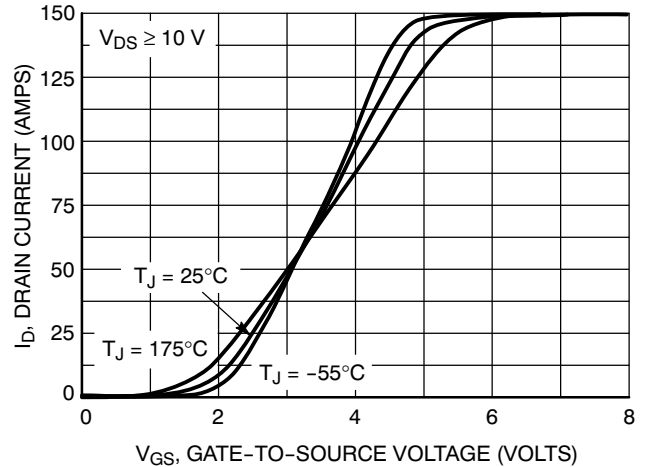**Figure 1. On−Region Characteristics**
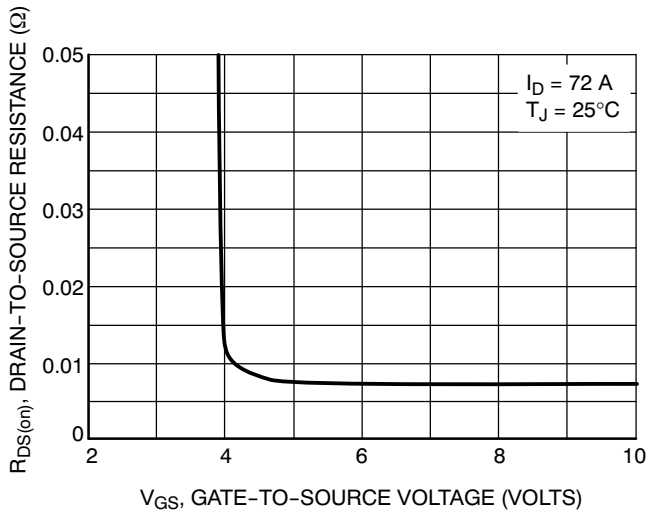
Figure 2. Transfer Characteristics

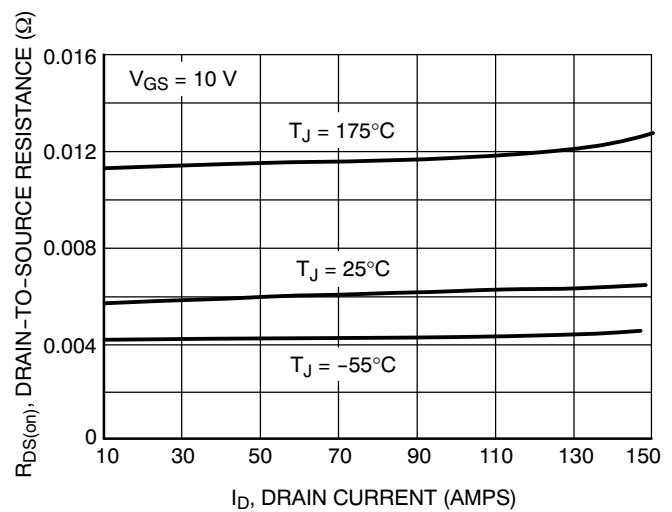**Figure 3. On−Resistance versus Gate−to−Source Voltage**

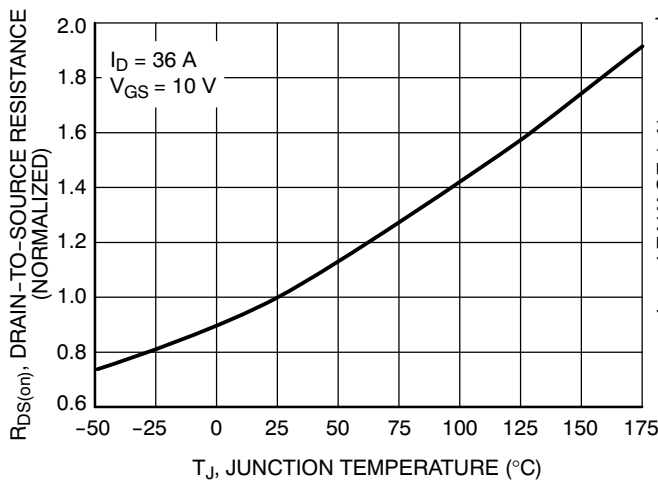**Figure 4. On−Resistance versus Drain Current and Gate Voltage**

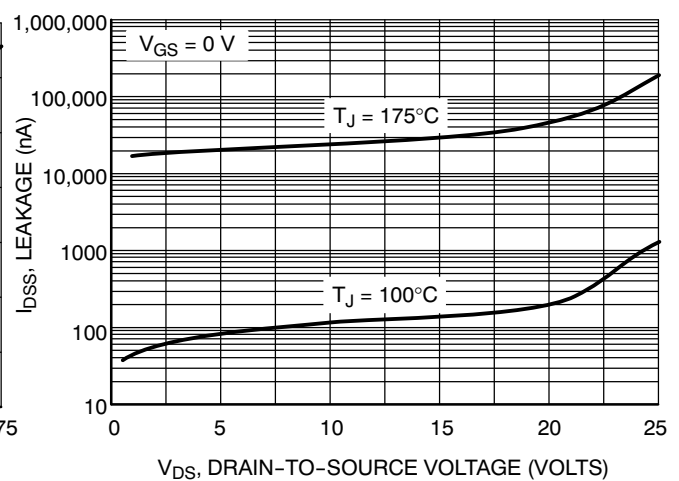**Figure 5. On−Resistance Variation with Temperature**
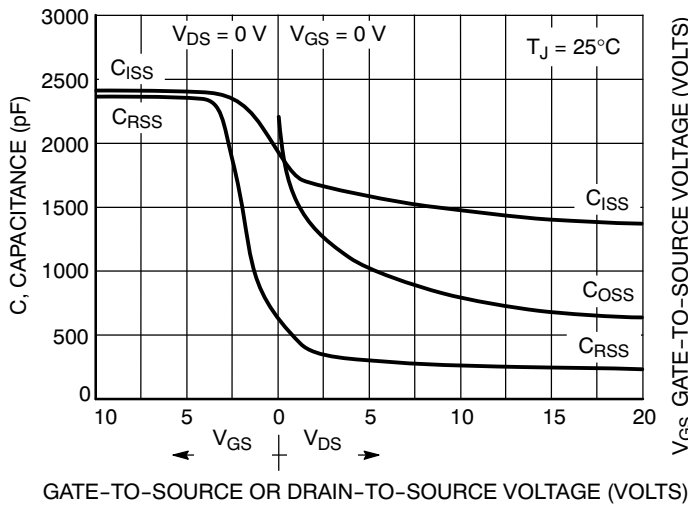
Figure 6. Drain−to−Source Leakage Current versus Voltage
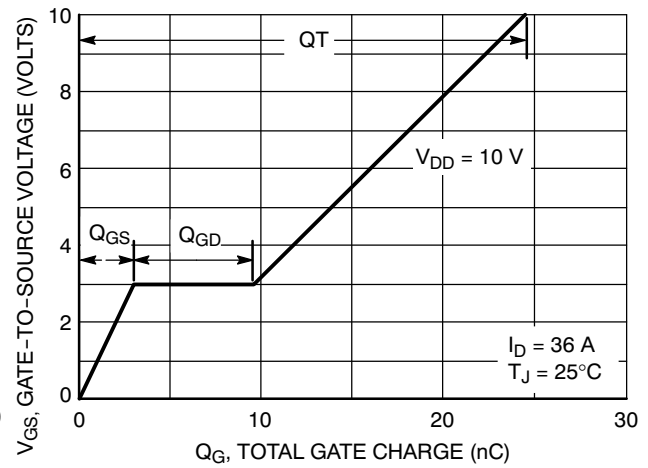
Figure 7. Capacitance Variation

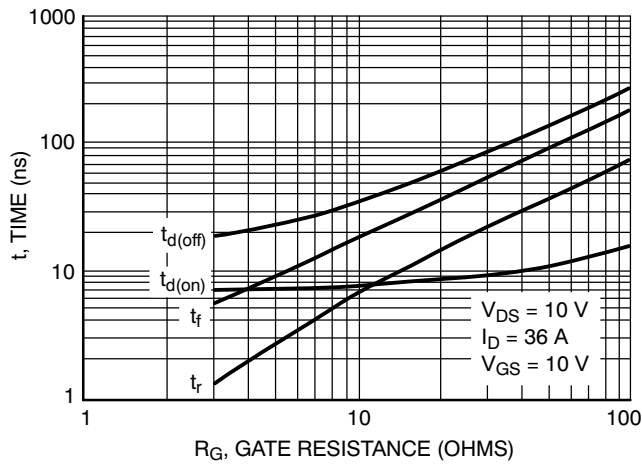**Figure 8. Gate–To–Source and Drain–To–Source Voltage versus Total Charge**

Figure 9. Resistive Switching Time Variation versus Gate Resistance
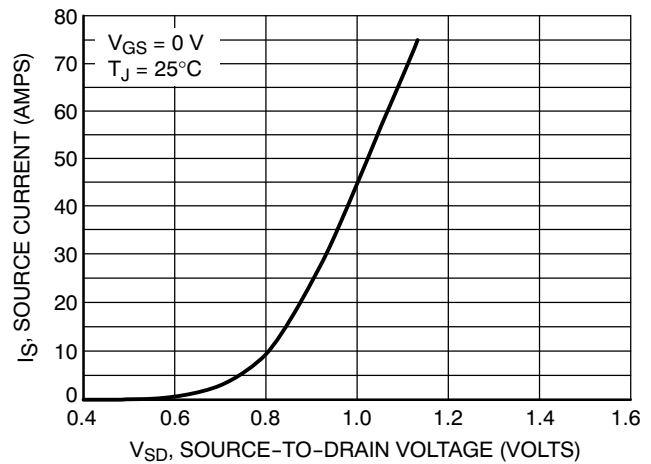
Figure 10. Diode Forward Voltage versus Current
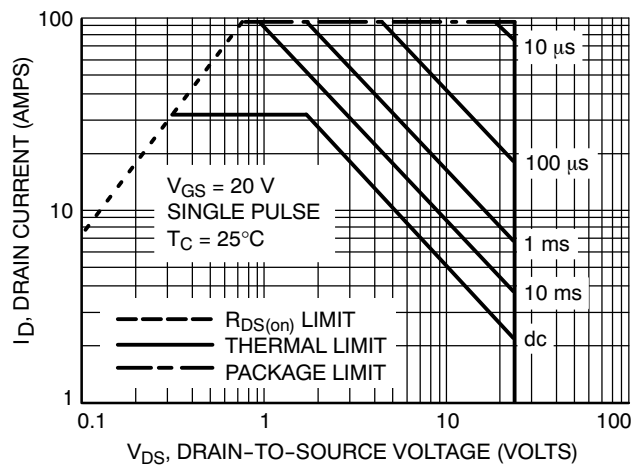
Figure 11. Maximum Rated Forward Biased Safe Operating Area
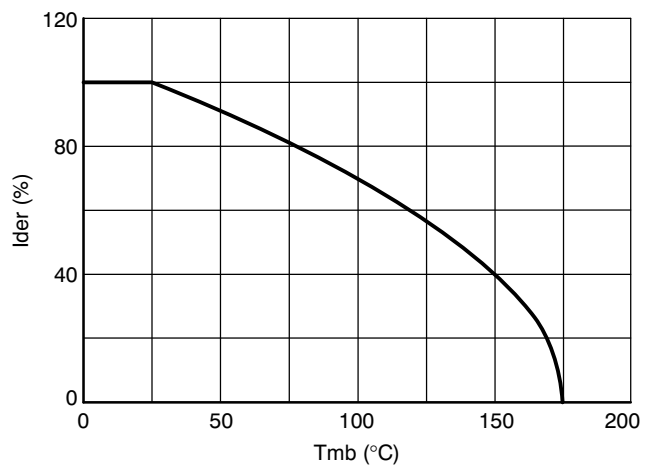
Figure 12. Normalized Continuous Drain Current as a function of Mounting Base Temperature

NTD70N03R

$$R_{\theta JC}(t) = r(t)\, R_{\theta JC}$$

D CURVES APPLY FOR POWER
PULSE TRAIN SHOWN
READ TIME AT t_1

$$T_{J(pk)} - T_C = P_{(pk)}\, R_{\theta JC}(t)$$

DUTY CYCLE, $D = t_1/t_2$
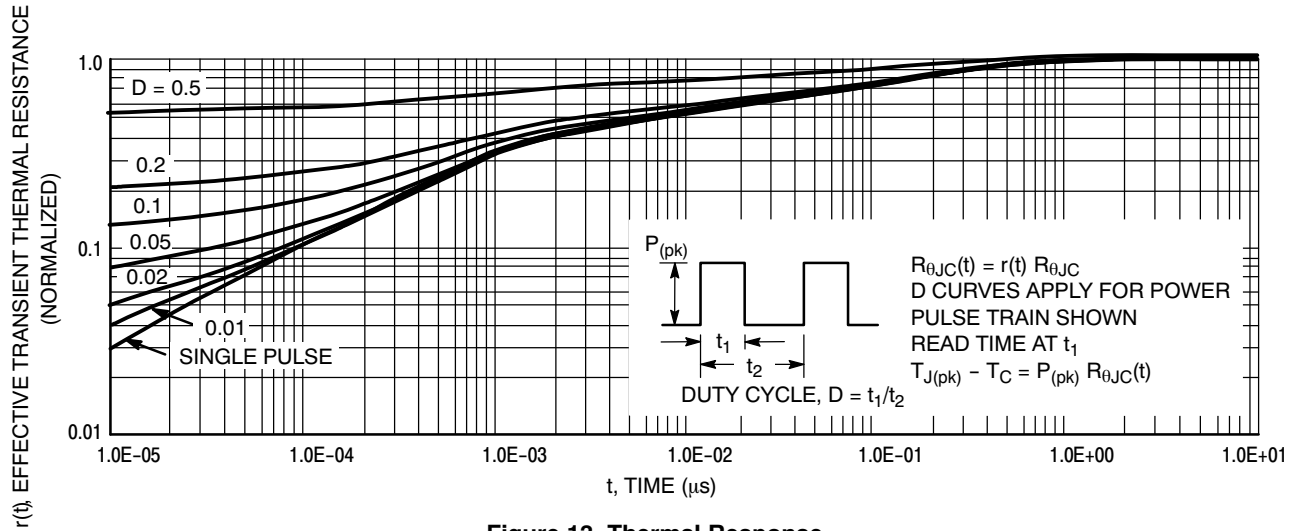
Figure 13. Thermal Response

ORDERING INFORMATION

Order Number	Package	Shipping†
NTD70N03R	DPAK–3	75 Units / Rail
NTD70N03RG	DPAK–3 (Pb–Free)	75 Units / Rail
NTD70N03RT4	DPAK–3	2500 / Tape & Reel
NTD70N03RT4G	DPAK–3 (Pb–Free)	2500 / Tape & Reel
NTD70N03R–1	DPAK–3 Straight Lead	75 Units / Rail
NTD70N03R–1G	DPAK–3 Straight Lead (Pb–Free)	75 Units / Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Spe-
cifications Brochure, BRD8011/D.
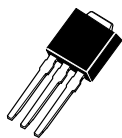
DPAK INSERTION MOUNT
CASE 369
ISSUE O

DATE 02 JAN 2000

SCALE 1:1
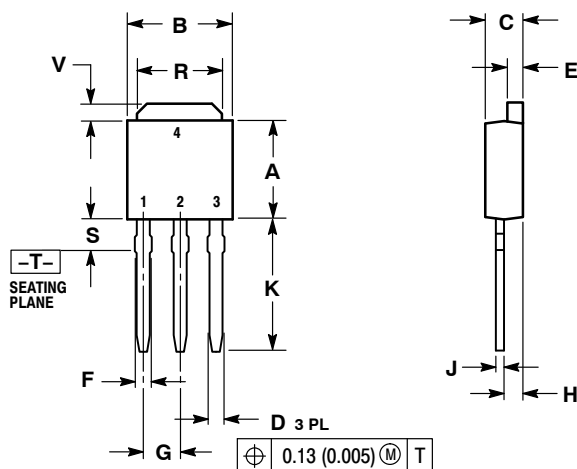
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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
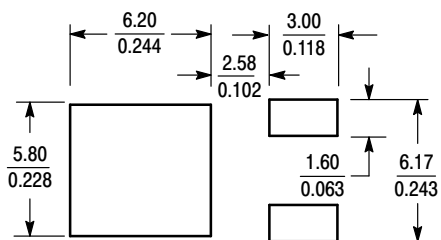
STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

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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DESCRIPTION:	DPAK INSERTION MOUNT		PAGE 1 OF 1

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DPAK (SINGLE GUAGE)
CASE 369AA
ISSUE B

DATE 03 JUN 2010

SCALE 1:1

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.

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	0.030	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	---

DETAIL A
ROTATED 90° CW

⊕ | 0.005 (0.13) Ⓜ | C

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

GENERIC MARKING DIAGRAM*

IC

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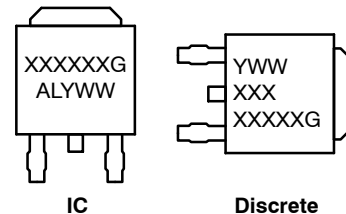
XXXXXX = Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
WW = Work Week
G = Pb–Free Package

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

SOLDERING FOOTPRINT*

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 (mm / inches)

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

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DESCRIPTION:	DPAK (SINGLE GAUGE)		PAGE 1 OF 1

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ADDITIONAL INFORMATION

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