

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 ($T_J = 25^\circ\text{C}$ Unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	25	V_{dc}
Gate-to-Source Voltage - Continuous	V_{GS}	± 20	V_{dc}
Thermal Resistance - Junction-to-Case	$R_{\theta JC}$	2.4	$^\circ\text{C/W}$
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	62.5	W
Drain Current			
- Continuous @ $T_C = 25^\circ\text{C}$, Chip	I_D	72.0	A
- Continuous @ $T_C = 25^\circ\text{C}$, Limited by Package	I_D	62.8	A
- Continuous @ $T_A = 25^\circ\text{C}$, Limited by Wires	I_D	32	A
- Single Pulse ($t_p = 10 \mu\text{s}$)	I_{DM}	140	A
Thermal Resistance - Junction-to-Ambient (Note 1)	$R_{\theta JA}$	80	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.87	W
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$	I_D	12.0	A
Thermal Resistance - Junction-to-Ambient (Note 2)	$R_{\theta JA}$	110	$^\circ\text{C/W}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.36	W
Drain Current - Continuous @ $T_A = 25^\circ\text{C}$	I_D	10.0	A
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 175	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy - Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 30 V_{dc}$, $V_{GS} = 10 V_{dc}$, $I_L = 12 A_{pk}$, $L = 1 \text{ mH}$, $R_G = 25 \Omega$)	E_{AS}	71.7	mJ
Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 10 s	T_L	260	$^\circ\text{C}$

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.

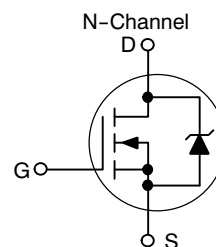
1. When surface mounted to an FR4 board using 0.5 sq. in. pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.



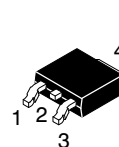
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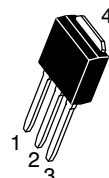
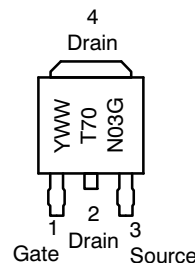
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
25 V	5.6 m Ω	72 A



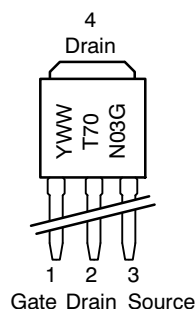
MARKING DIAGRAMS



DPAK
CASE 369AA
STYLE 2



DPAK
CASE 369D
STYLE 2



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
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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	(V _{DS} = 20 V _{dc} , V _{GS} = 0 V, f = 1 MHz)	C _{ISS}	–	1333	–	pF
Output Capacitance		C _{OSS}	–	600	–	
Transfer Capacitance		C _{RSS}	–	218	–	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V _{GS} = 10 V _{dc} , V _{DD} = 10 V _{dc} , I _D = 36 A _{dc} , R _G = 3 Ω)	t _{d(on)}	–	6.9	–	ns
Rise Time		t _r	–	1.3	–	
Turn-Off Delay Time		t _{d(off)}	–	18.4	–	
Fall Time		t _f	–	5.5	–	
Gate Charge	(V _{GS} = 5 V _{dc} , I _D = 36 A _{dc} , V _{DS} = 10 V _{dc}) (Note 3)	Q _T	–	13.2	–	nC
		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	(I _S = 36 A _{dc} , V _{GS} = 0 V _{dc} , dI _S /dt = 100 A/μs) (Note 3)	t _{rr}	–	27.9	–	ns
		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

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

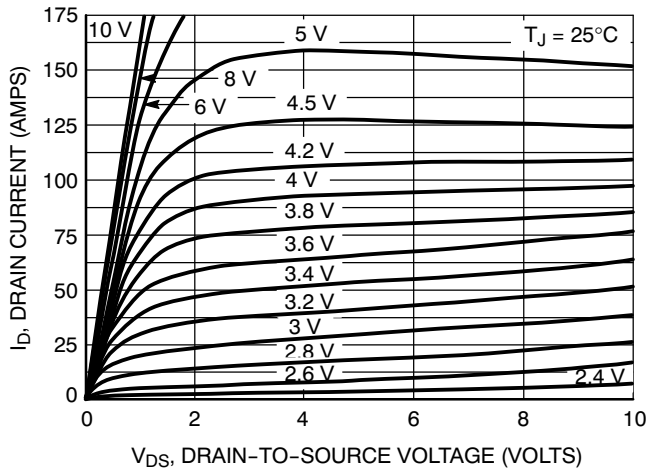


Figure 1. On-Region Characteristics

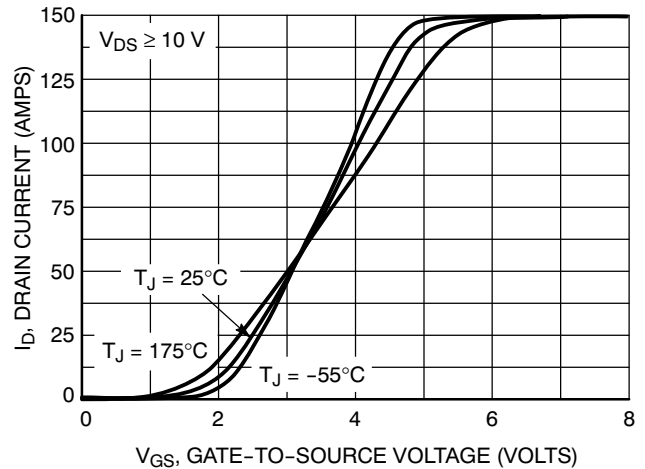


Figure 2. Transfer Characteristics

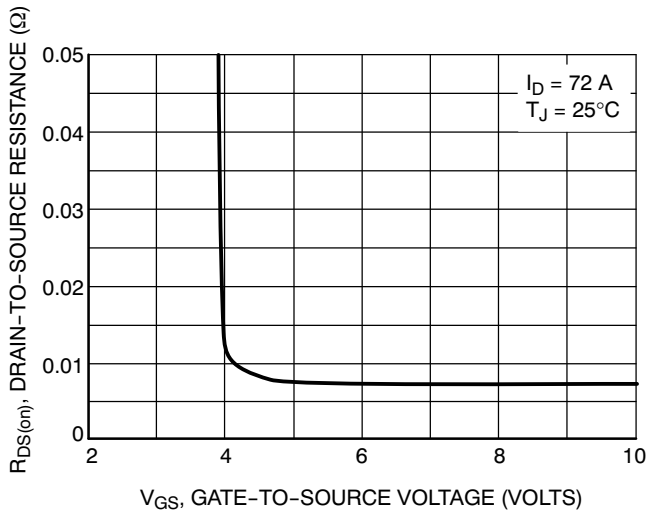


Figure 3. On-Resistance versus Gate-to-Source Voltage

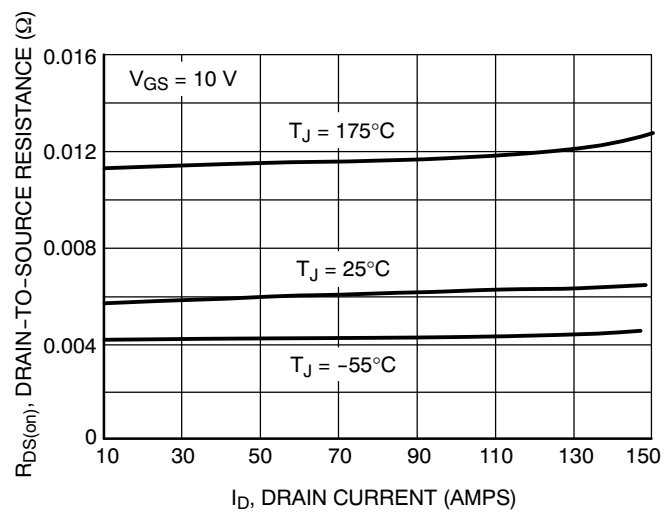


Figure 4. On-Resistance versus Drain Current and Gate Voltage

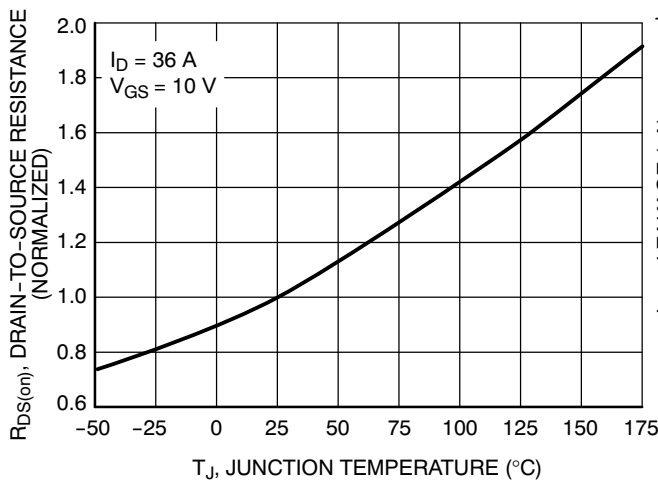


Figure 5. On-Resistance Variation with Temperature

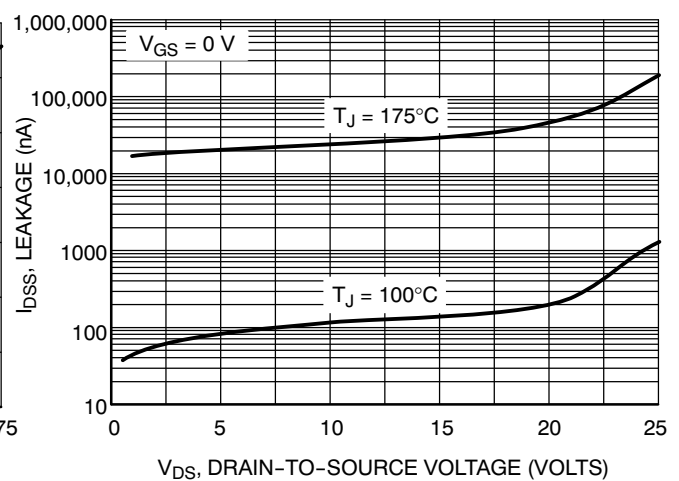


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTD70N03R

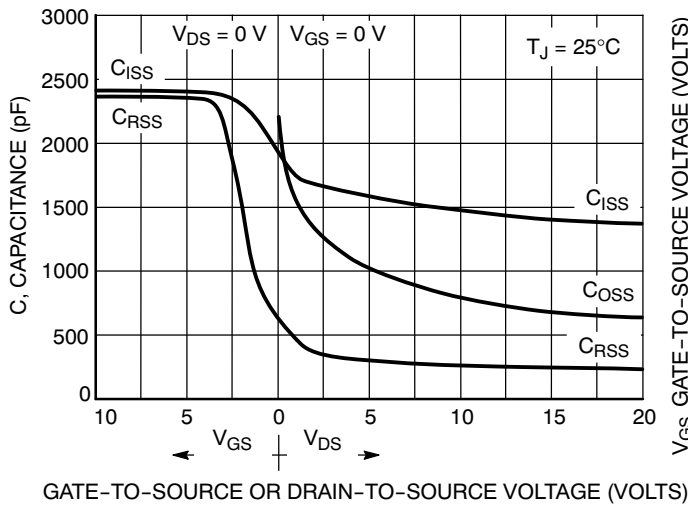


Figure 7. Capacitance Variation

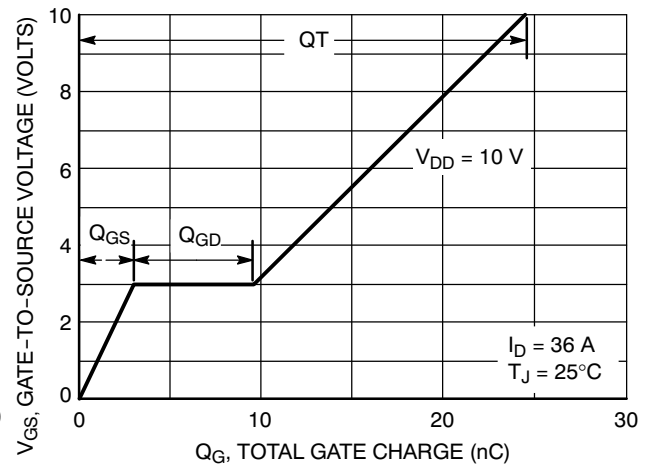


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

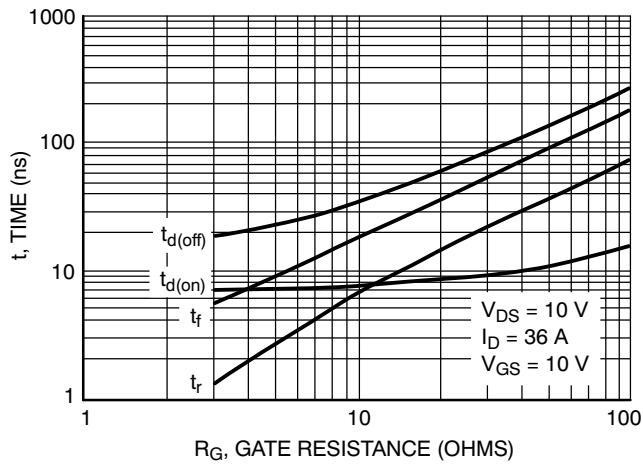


Figure 9. Resistive Switching Time Variation versus Gate Resistance

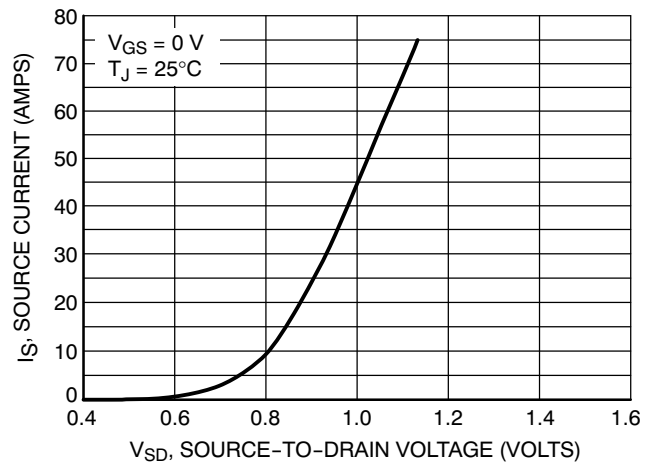


Figure 10. Diode Forward Voltage versus Current

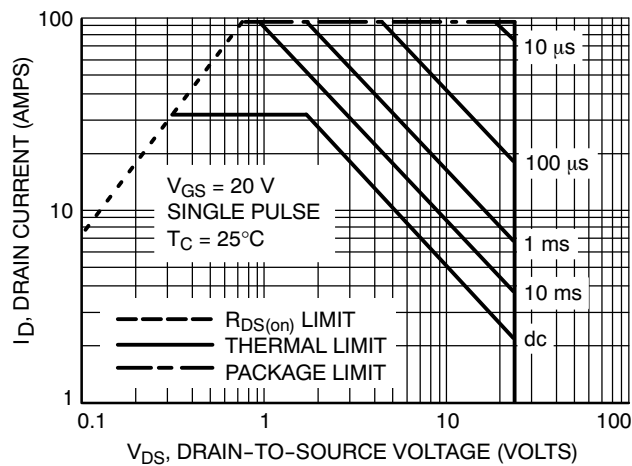


Figure 11. Maximum Rated Forward Biased Safe Operating Area

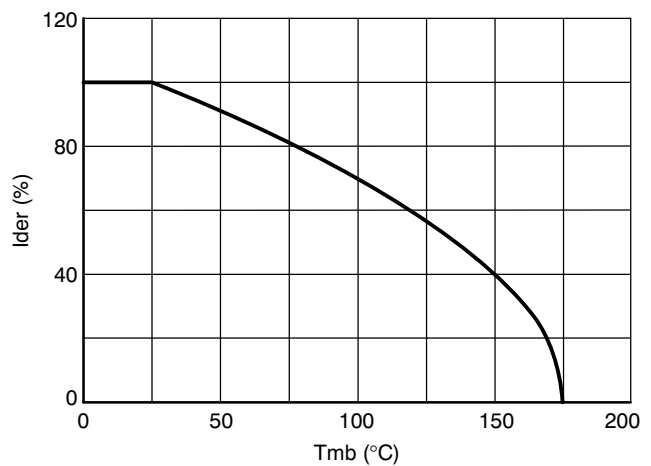


Figure 12. Normalized Continuous Drain Current as a function of Mounting Base Temperature

NTD70N03R

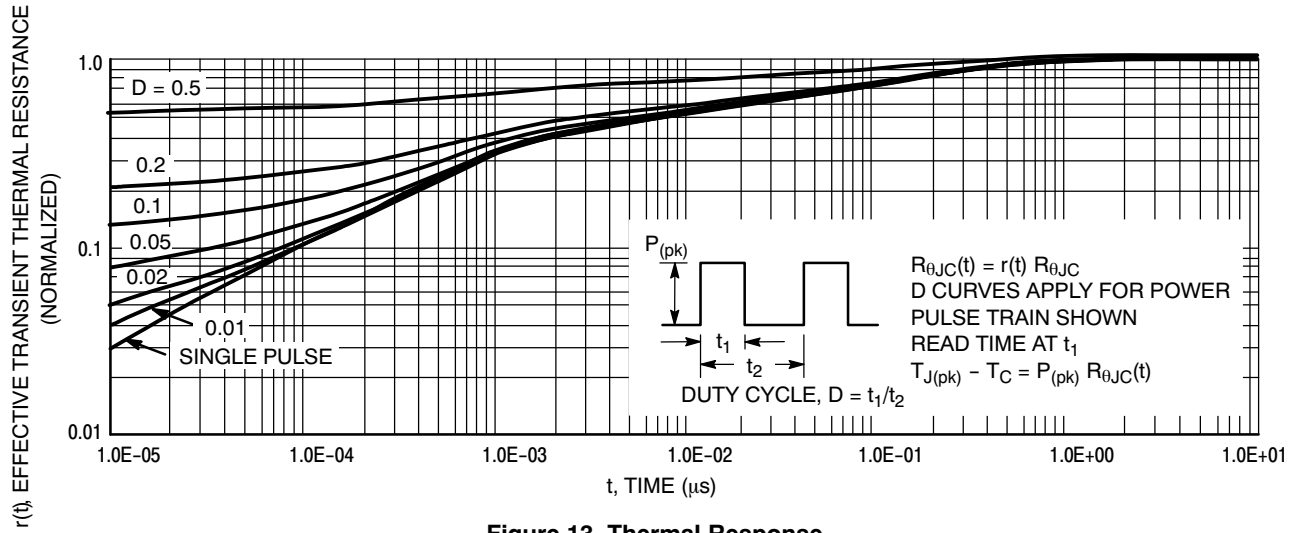
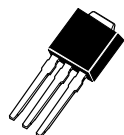


Figure 13. Thermal Response

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

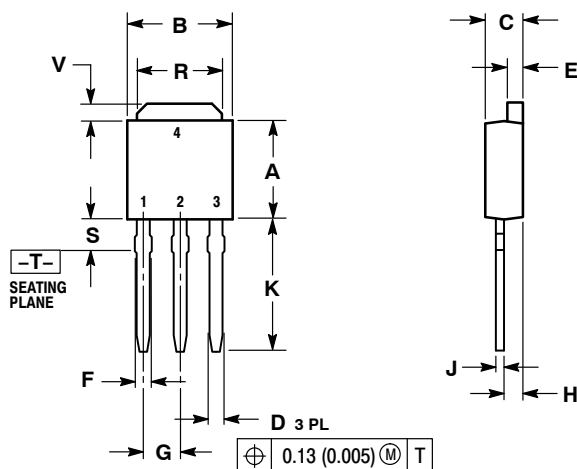
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



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

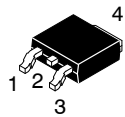
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 5:
PIN 1. GATE
2. ANODE
3. CATHODE
4. ANODE

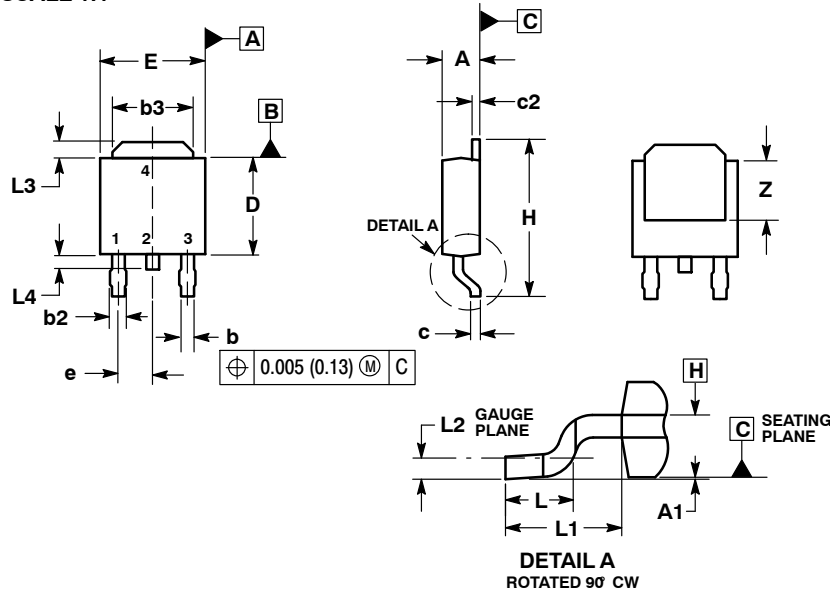
STYLE 6:
PIN 1. MT1
2. MT2
3. GATE
4. MT2

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SCALE 1:1



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

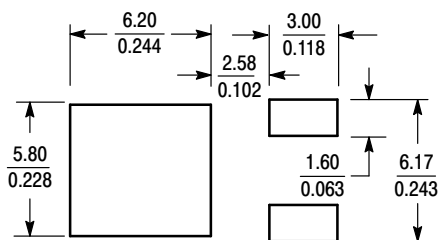
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

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

SOLDERING FOOTPRINT*



SCALE 3:1 (mm/inches)

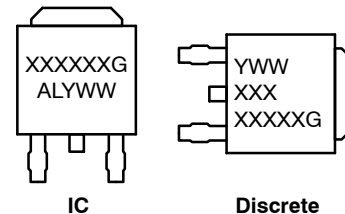
*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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
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	

GENERIC MARKING DIAGRAM*



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.

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