NTD70N03R

Power MOSFET

72 A, 25 V, N−Channel DPAK

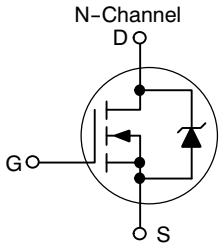
Features

- 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

ON Semiconductor®

http://onsemi.com

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



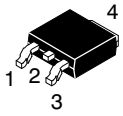
MAXIMUM RATINGS (T_J = 25°C Unless otherwise specified)

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 Total Power Dissipation @ T_C = 25°C Drain Current − Continuous @ T_C = 25°C, Chip − Continuous @ T_C = 25°C, Limited by Package − Continuous @ T_A = 25°C, Limited by Wires − Single Pulse (t_p = 10 μs)	$R_{\theta JC}$ P_D I_D I_D I_D I_{DM}	2.4 62.5 72.0 62.8 32 140	°C/W W A A A A
Thermal Resistance − Junction−to−Ambient (Note 1) Total Power Dissipation @ T_A = 25°C Drain Current − Continuous @ T_A = 25°C	$R_{\theta JA}$ P_D I_D	80 1.87 12.0	°C/W W A
Thermal Resistance − Junction−to−Ambient (Note 2) Total Power Dissipation @ T_A = 25°C Drain Current − Continuous @ T_A = 25°C	$R_{\theta JA}$ P_D I_D	110 1.36 10.0	°C/W W 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

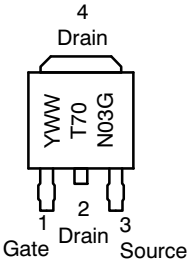
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

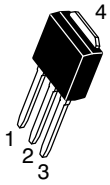
1. When surface mounted to an FR4 board using 0.5 sq. in. pad size.
2. When surface mounted to an FR4 board using minimum recommended pad size.

MARKING DIAGRAMS

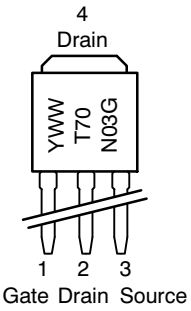


DPAK
CASE 369AA
STYLE 2





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.

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	(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.

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

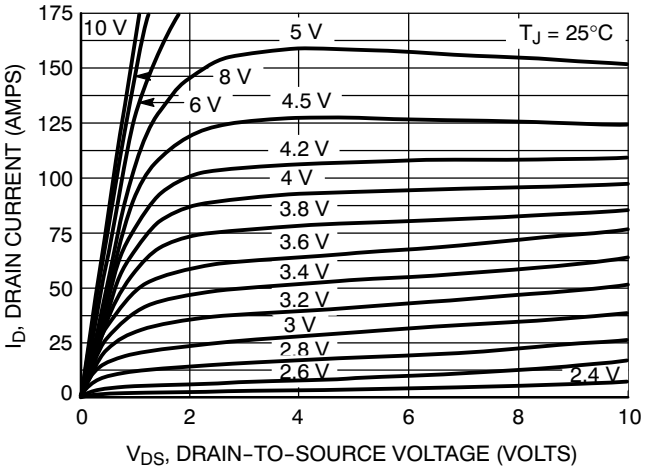


Figure 1. On−Region Characteristics

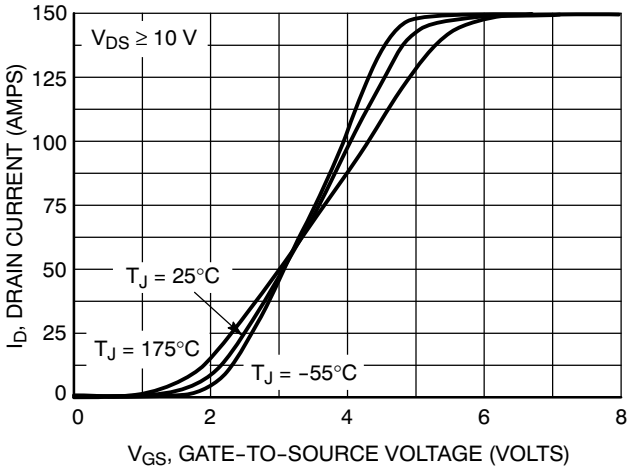


Figure 2. Transfer Characteristics

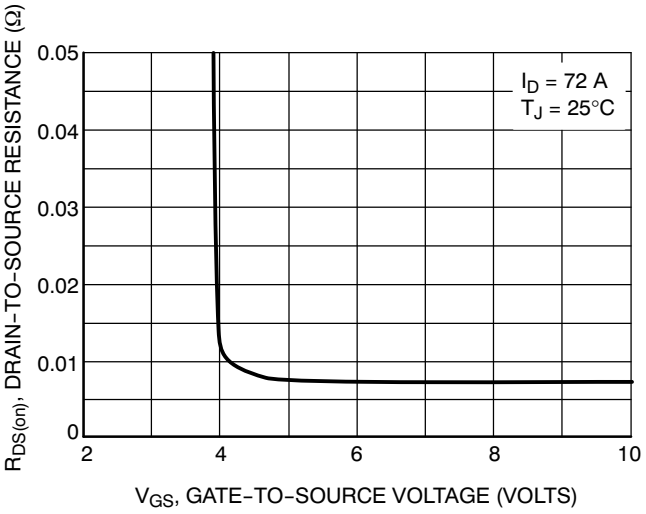


Figure 3. On−Resistance versus Gate−to−Source Voltage

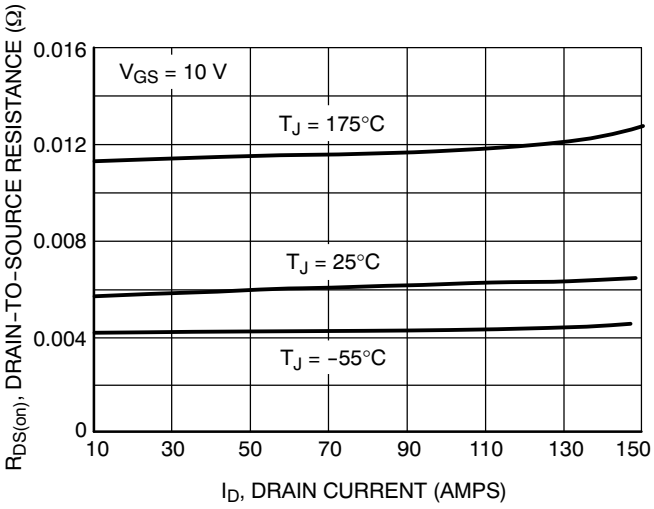


Figure 4. On−Resistance versus Drain Current and Gate Voltage

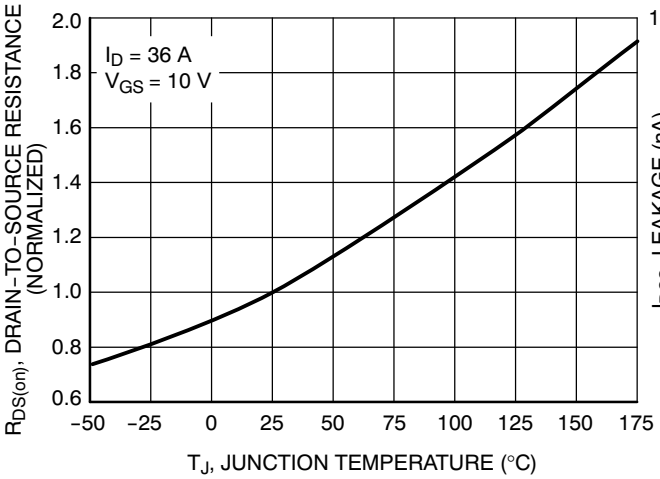


Figure 5. On−Resistance Variation with Temperature

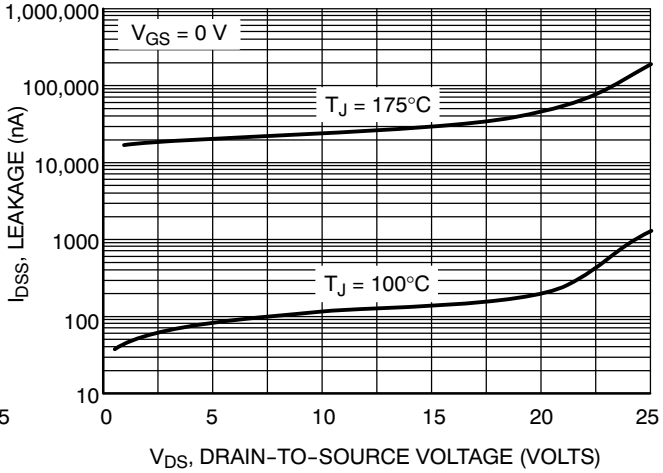


Figure 6. Drain−to−Source Leakage Current versus Voltage

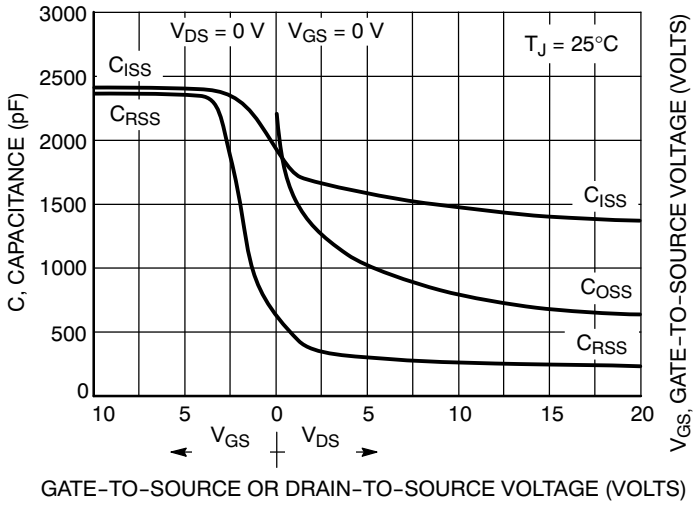


Figure 7. Capacitance Variation

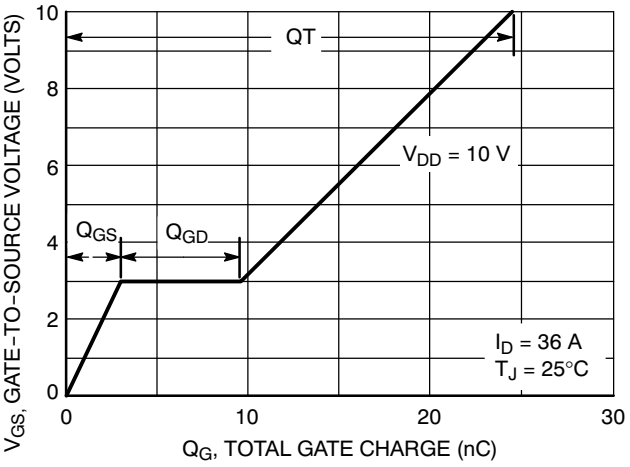


Figure 8. Gate−To−Source and Drain−To−Source Voltage versus Total Charge

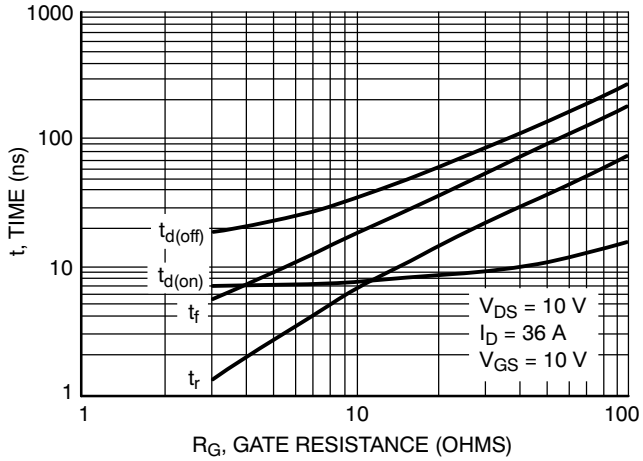


Figure 9. Resistive Switching Time Variation versus Gate Resistance

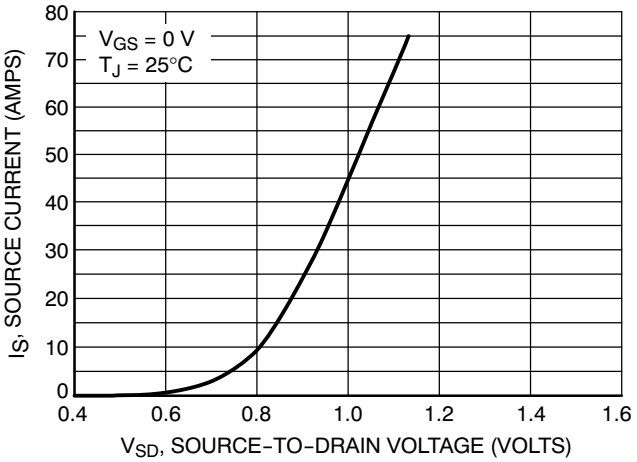


Figure 10. Diode Forward Voltage versus Current

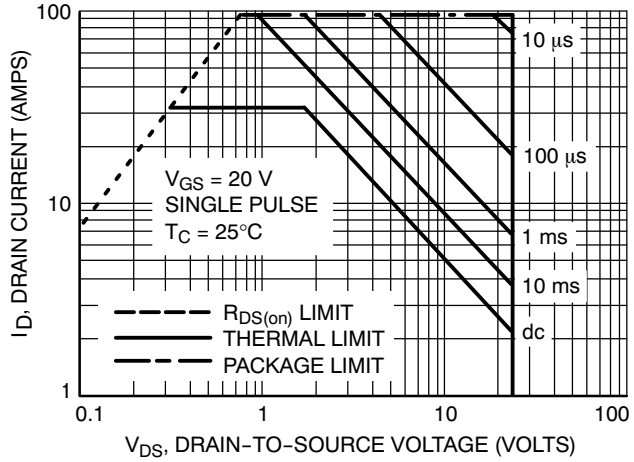


Figure 11. Maximum Rated Forward Biased Safe Operating Area

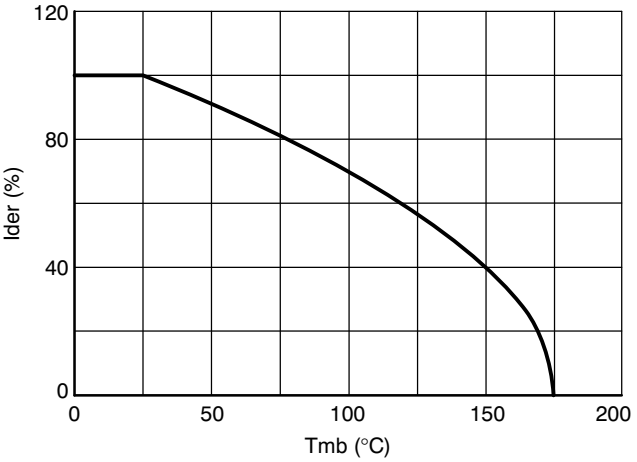


Figure 12. Normalized Continuous Drain Current as a function of Mounting Base Temperature

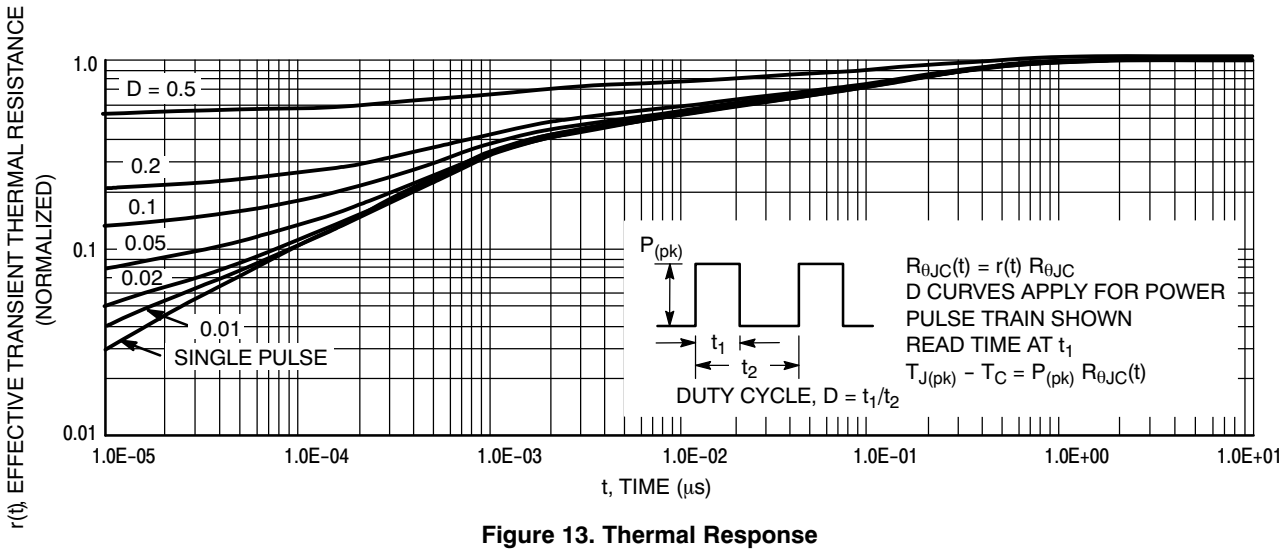


Figure 13. Thermal Response

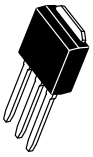
ORDERING INFORMATION

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

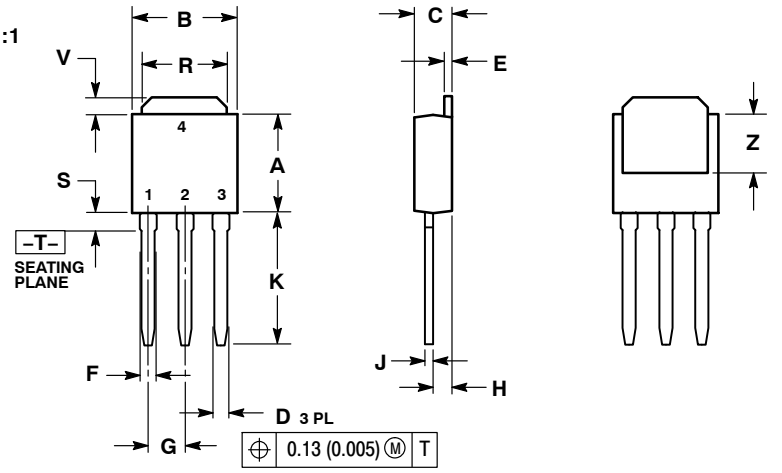
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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.

	INCHES		MILLIMETERS	
DIM	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 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

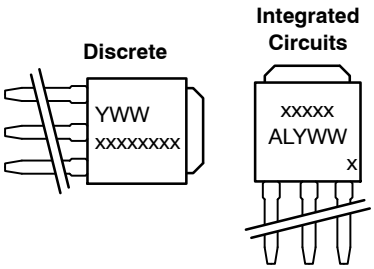
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

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

MARKING DIAGRAMS

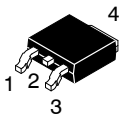


xxxxxxxxx = Device Code
A = Assembly Location
IL = Wafer Lot
Y = Year
WW = Work Week

DOCUMENT NUMBER:	98AON10528D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	IPAK (DPAK INSERTION MOUNT)	PAGE 1 OF 1

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

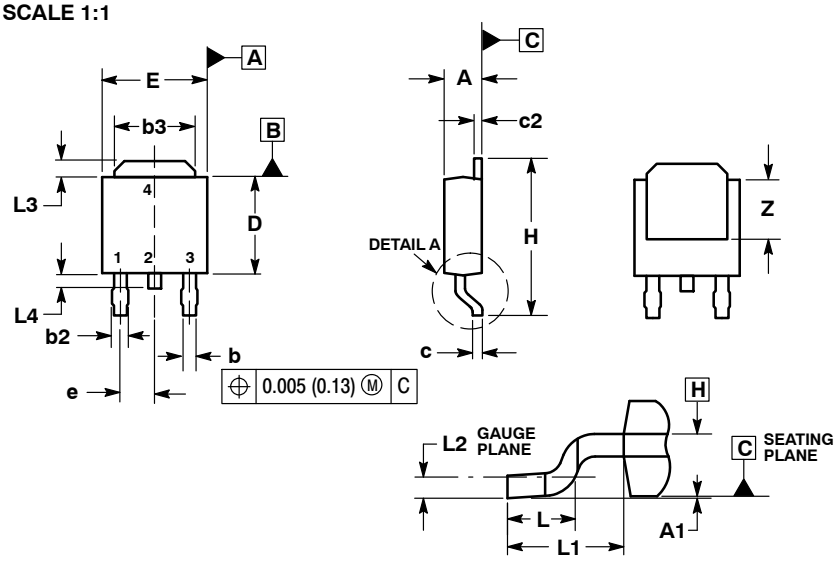
ON Semiconductor®



SCALE 1:1

DPAK (SINGLE GUAGE)
CASE 369AA−01
ISSUE B

DATE 03 JUN 2010



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.

	INCHES		MILLIMETERS	
DIM	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	−−−

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
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2. DRAIN
3. SOURCE
4. DRAIN

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

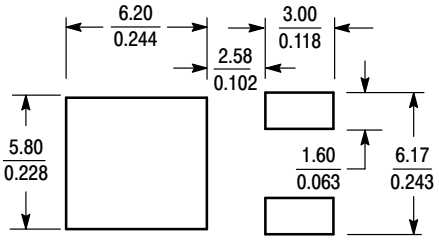
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

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

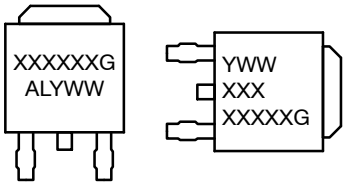
SOLDERING FOOTPRINT*



SCALE 3:1 (mm / inches)

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

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.

DOCUMENT NUMBER:	98AON13126D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	DPAK (SINGLE GAUGE)	PAGE 1 OF 1

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
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onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

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