NTD40N03R

Power MOSFET
45 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
- Optimized for High Side Switching Requirements in High−Efficiency DC−DC Converters
- These are Pb−Free Devices

ON Semiconductor®

45 AMPERES, 25 VOLTS
$R_{DS(on)} = 12.6$ mΩ (Typ)

N−CHANNEL
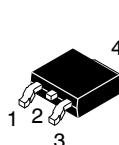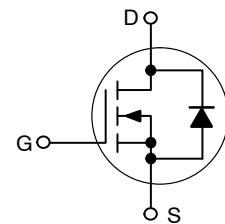
CASE 369AA	**CASE 369D**
DPAK	DPAK
(Surface Mount)	(Straight Lead)
STYLE 2	STYLE 2
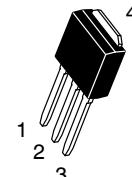
MARKING DIAGRAM & PIN ASSIGNMENTS
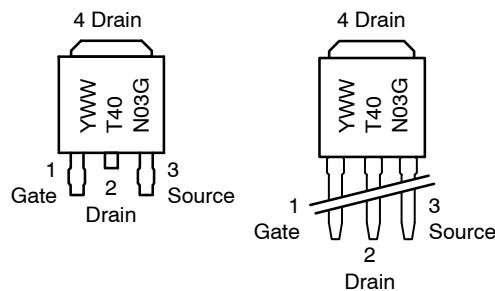
Y	= Year
WW	= Work Week
T40N03	= Device Code
G	= Pb−Free Package

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

Parameter	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	25	Vdc
Gate−to−Source Voltage − Continuous	V_{GS}	±20	Vdc
Thermal Resistance − Junction−to−Case Total Power Dissipation @ T_C = 25°C Drain Current – Continuous @ T_C = 25°C, Chip – Continuous @ T_A = 25°C, Limited by Wires – Single Pulse (tp ≤ 10 μs)	$R_{\theta JC}$ P_D I_D I_D I_D	3.0 50 45 32 100	°C/W W 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	71.4 2.1 9.2	°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	100 1.5 7.8	°C/W W A
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to 175	°C
Maximum Lead Temperature for Soldering Purposes, 1/8 in from case for 10 seconds	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.

ORDERING INFORMATION

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

NTD40N03R

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 Vdc, I_D = 250 μAdc) Temperature Coefficient (Positive)	$V_{(br)DSS}$	25 –	28 –	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc, T_J = 150°C)	I_{DSS}	 – –	 – –	 1.0 10	μAdc
Gate–Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	–	–	±100	nAdc
ON CHARACTERISTICS (Note 3)					
Gate Threshold Voltage (Note 3) (V_{DS} = V_{GS}, I_D = 250 μAdc) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	1.0 –	1.7 –	2.0 –	Vdc mV/°C
Static Drain–to–Source On–Resistance (Note 3) (V_{GS} = 4.5 Vdc, I_D = 10 Adc) (V_{GS} = 10 Vdc, I_D = 10 Adc)	$R_{DS(on)}$	 – –	 18.6 12.6	 23 16.5	mΩ
Forward Transconductance (Note 3) (V_{DS} = 10 Vdc, I_D = 10 Adc)	g_{FS}	–	20	–	Mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance		C_{iss}	–	584	–	pF
Output Capacitance	(V_{DS} = 20 Vdc, V_{GS} = 0 V, f = 1 MHz)	C_{oss}	–	254	–	
Transfer Capacitance		C_{rss}	–	99	–	
SWITCHING CHARACTERISTICS (Note 4)					
Turn–On Delay Time		$t_{d(on)}$	–	4.5	–	ns
Rise Time	(V_{GS} = 10 Vdc, V_{DD} = 10 Vdc, I_D = 10 Adc, R_G = 3 Ω)	t_r	–	19.5	–	
Turn–Off Delay Time		$t_{d(off)}$	–	16.7	–	
Fall Time		t_f	–	3.5	–	
Gate Charge		Q_T	–	5.78	–	nC
	(V_{GS} = 4.5 Vdc, I_D = 10 Adc, V_{DS} = 10 Vdc) (Note 3)	Q_1	–	2.1	–	
		Q_2	–	2.5	–	
SOURCE–DRAIN DIODE CHARACTERISTICS					
Forward On–Voltage	(I_S = 10 Adc, V_{GS} = 0 Vdc) (Note 3) (I_S = 10 Adc, V_{GS} = 0 Vdc, T_J = 125°C)	V_{SD}	– –	0.85 0.71	1.2 –	Vdc
Reverse Recovery Time		t_{rr}	–	20.4	–	ns
	(I_S = 10 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs) (Note 3)	t_a	–	8.25	–	
		t_b	–	12.1	–	
Reverse Recovery Stored Charge		Q_{RR}	–	0.007	–	μC

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

# NTD40N03R
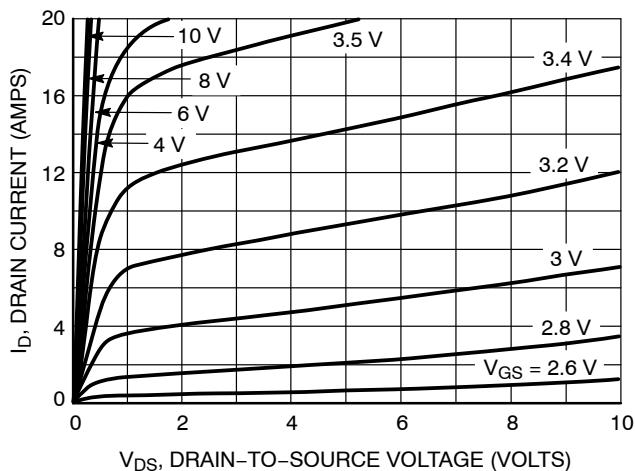
Figure 1. On−Region Characteristics
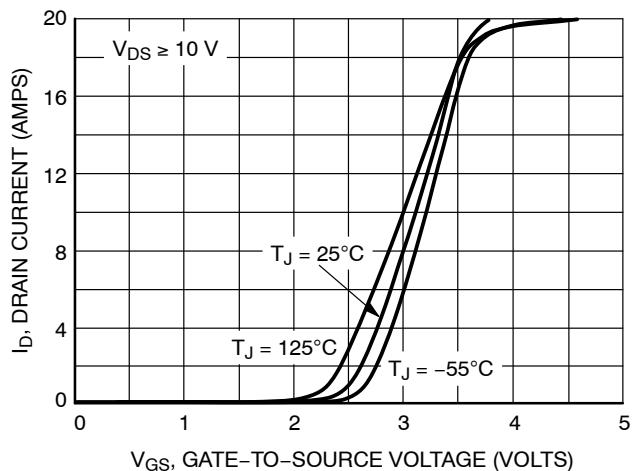
Figure 2. Transfer Characteristics
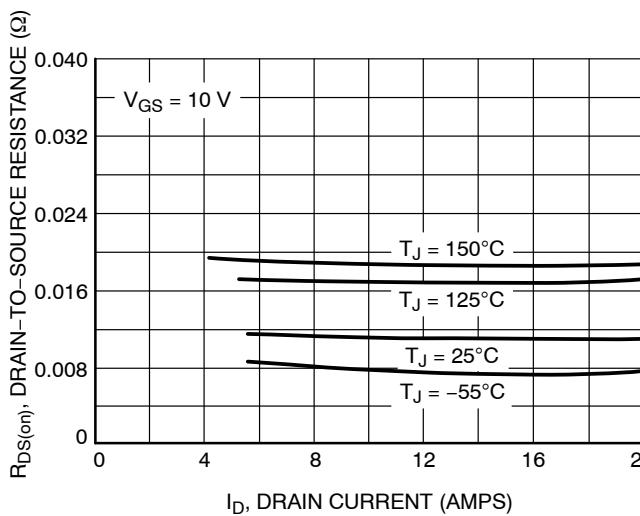
Figure 3. On−Resistance versus Drain Current
and Temperature
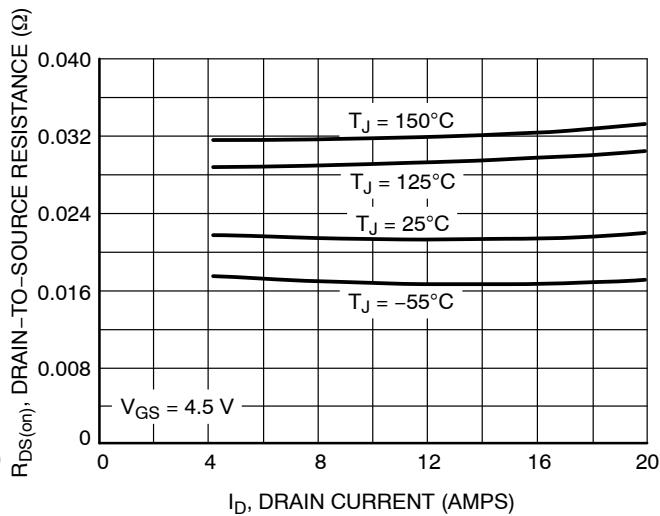
Figure 4. On−Resistance versus Drain Current
and Temperature
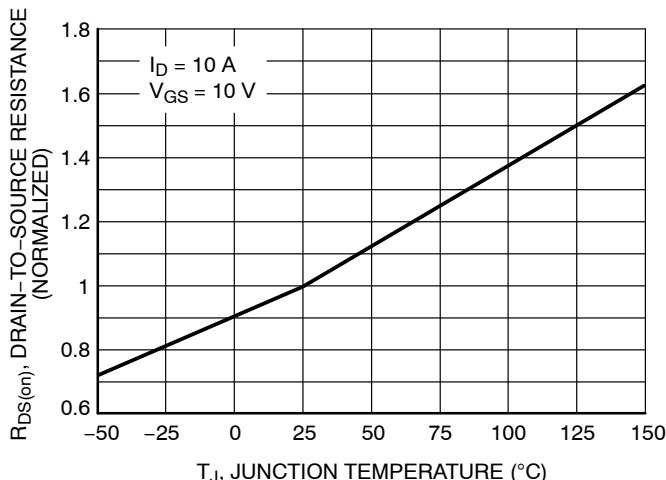

Figure 5. On−Resistance Variation with
Temperature
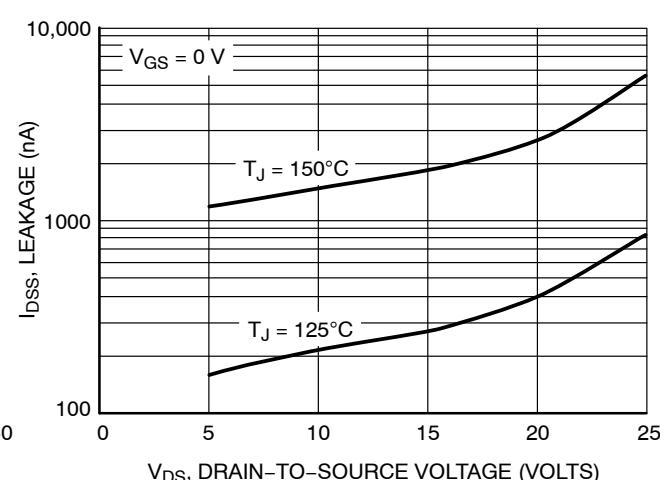
Figure 6. Drain−to−Source Leakage Current
versus Voltage
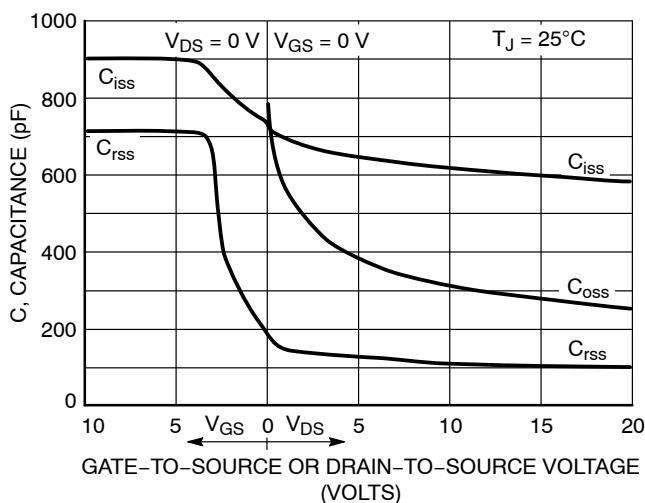
Figure 7. Capacitance Variation
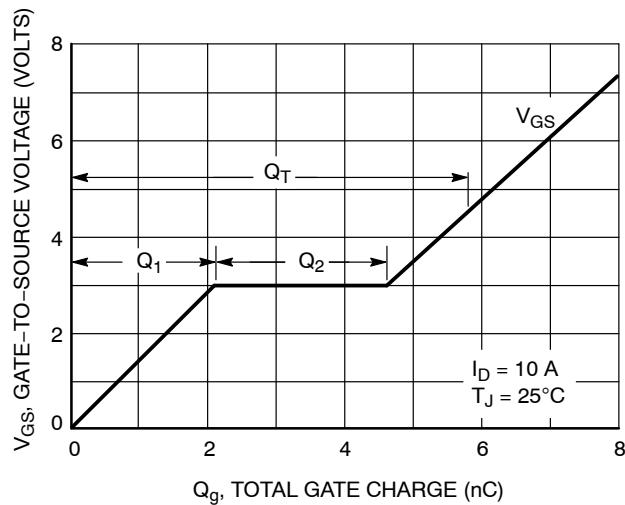
**Figure 8. Gate−to−Source and Drain−to−Source Voltage versus Total Charge**
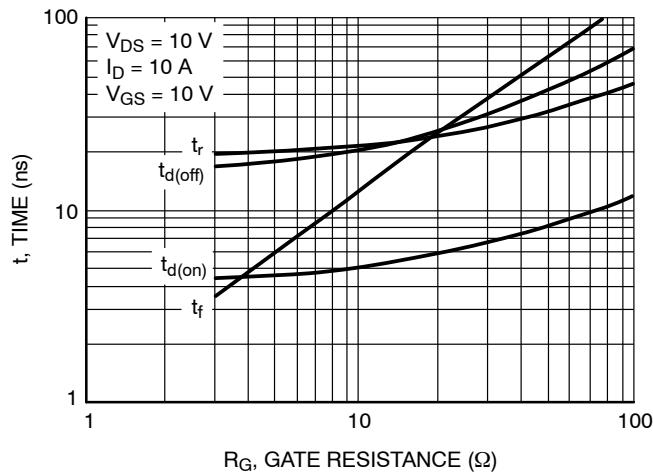
Figure 9. Resistive Switching Time Variation versus Gate Resistance
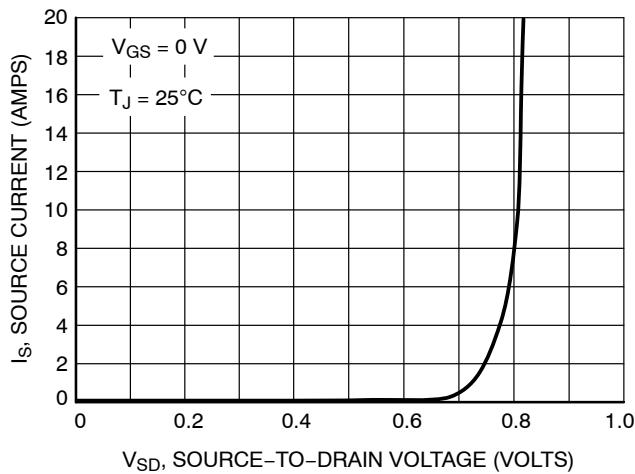
Figure 10. Diode Forward Voltage versus Current
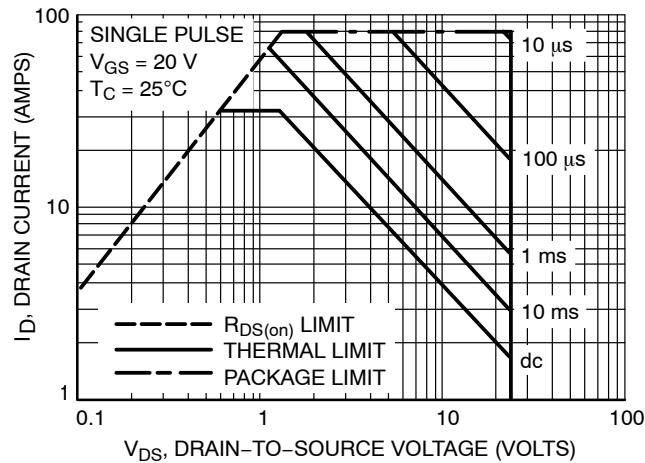
Figure 11. Maximum Rated Forward Biased Safe Operating Area
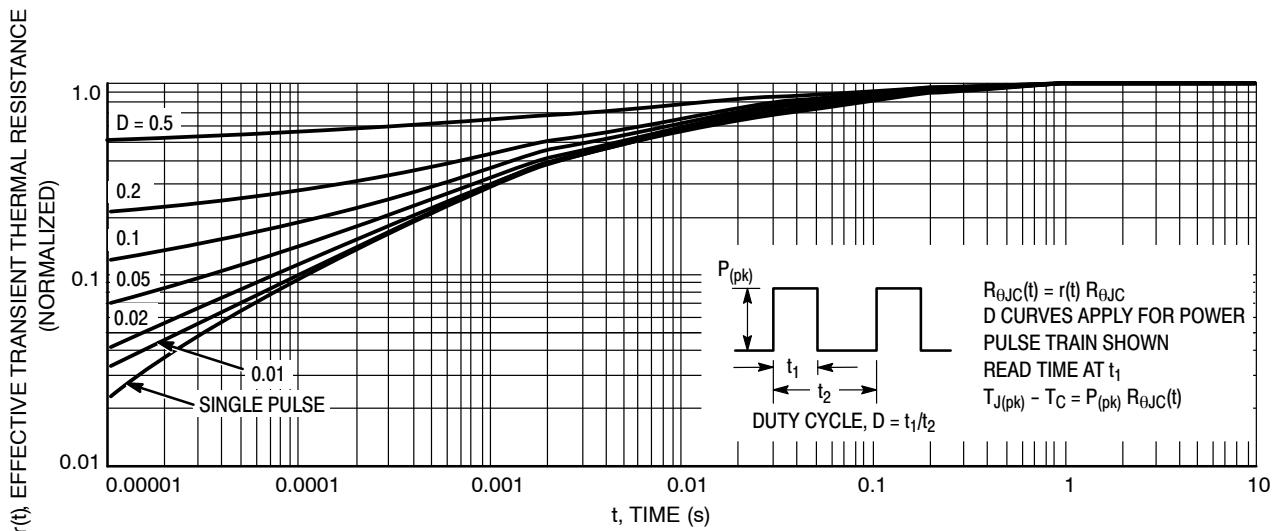
Figure 12. Thermal Response

ORDERING INFORMATION

Device	Package	Shipping[†]
NTD40N03R−1G	DPAK (Straight Lead) (Pb−Free)	75 Units/Rail
NTD40N03RT4G	DPAK (Pb−Free)	2500 Tape & Reel

†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.
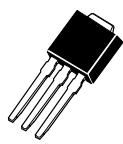
DPAK INSERTION MOUNT
CASE 369
ISSUE O

DATE 02 JAN 2000

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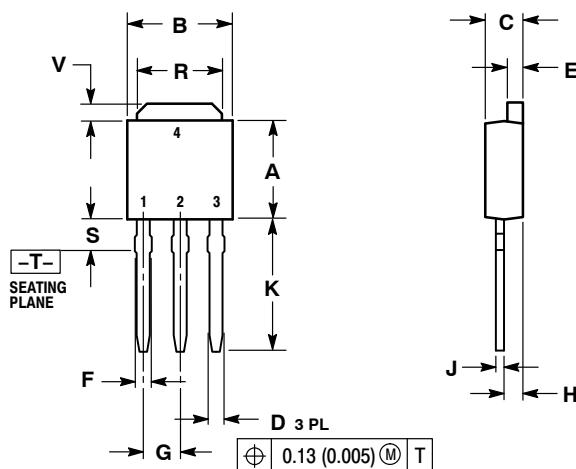
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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

–T– SEATING PLANE

⊕ 0.13 (0.005) Ⓜ T

D 3 PL

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

DOCUMENT NUMBER:	98ASB42319B	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 INSERTION MOUNT		PAGE 1 OF 1

onsemi

DPAK (SINGLE GUAGE)
CASE 369AA
ISSUE B

DATE 03 JUN 2010

4
1 2
3

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.

DETAIL A
ROTATED 90° CW

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	---

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*

XXXXXXG
ALYWW

YWW
XXX
XXXXXG
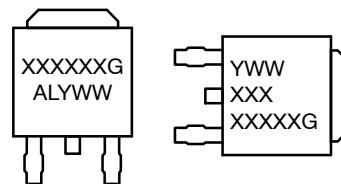
IC   **Discrete**

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
2.58 / 0.102
3.00 / 0.118
5.80 / 0.228
1.60 / 0.063
6.17 / 0.243

SCALE 3:1 $\left(\dfrac{mm}{inches}\right)$

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

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

ADDITIONAL INFORMATION

◊