

MOSFET – Power, N-Channel

100 V, 17 A, 81 mΩ



ON Semiconductor®

<http://onsemi.com>

NTD6416AN, NVD6416AN

Features

- Low $R_{DS(on)}$
- High Current Capability
- 100% Avalanche Tested
- NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX (Note 1)
100 V	81 mΩ @ 10 V	17 A

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

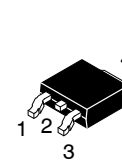
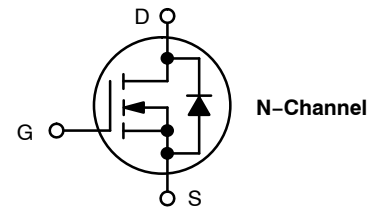
Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	100	V
Gate-to-Source Voltage – Continuous			V_{GS}	± 20	V
Continuous Drain Current	Steady State	$T_C = 25^\circ\text{C}$	I_D	17	A
		$T_C = 100^\circ\text{C}$		11	
Power Dissipation	Steady State	$T_C = 25^\circ\text{C}$	P_D	71	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$		I_{DM}	62	A
Operating and Storage Temperature Range			T_J, T_{stg}	-55 to +175	$^\circ\text{C}$
Source Current (Body Diode)			I_S	17	A
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 50 \text{ Vdc}$, $V_{GS} = 10 \text{ Vdc}$, $I_{L(pk)} = 17 \text{ A}$, $L = 0.3 \text{ mH}$, $R_G = 25 \Omega$)			E_{AS}	43	mJ
Lead Temperature for Soldering Purposes, 1/8" from Case for 10 Seconds			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.

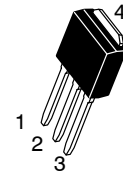
THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Case (Drain) Steady State	$R_{\theta JC}$	2.1	$^\circ\text{C/W}$
Junction-to-Ambient (Note 1)	$R_{\theta JA}$	40	

1. Surface mounted on FR4 board using 1 sq in pad size, (Cu Area 1.127 sq in [2 oz] including traces).

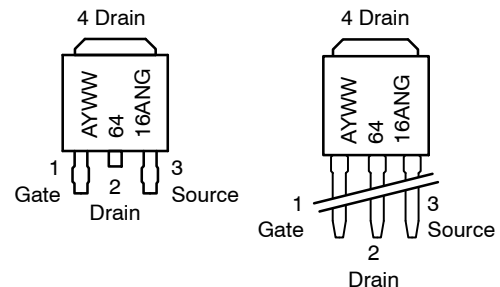


DPAK
CASE 369AA
STYLE 2



IPAK
CASE 369D
STYLE 2

MARKING DIAGRAM & PIN ASSIGNMENTS



A = Assembly Location*
 Y = Year
 WW = Work Week
 6416AN = 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.

NTD6416AN, NVD6416AN

ELECTRICAL CHARACTERISTICS (T_J = 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 _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	100			V	
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			112		mV/°C	
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 100 V	T _J = 25°C			1.0	μA
			T _J = 125°C			10	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±20 V			±100	nA	

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	2.0		4.0	V
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J			7.7		mV/°C
Drain-to-Source On-Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 17 A		73	81	mΩ
Forward Transconductance	g _{FS}	V _{DS} = 5 V, I _D = 10 A		12		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C _{ISS}	V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 25 V		620		pF
Output Capacitance	C _{OSS}			110		
Reverse Transfer Capacitance	C _{RSS}			50		
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 10 V, V _{DS} = 80 V, I _D = 17 A		20		nC
Threshold Gate Charge	Q _{G(TH)}			1.0		
Gate-to-Source Charge	Q _{GS}			3.6		
Gate-to-Drain Charge	Q _{GD}			10		
Plateau Voltage	V _{GP}			5.8		
Gate Resistance	R _G			2.4		Ω

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	t _{d(on)}	V _{GS} = 10 V, V _{DD} = 80 V, I _D = 17 A, R _G = 6.1 Ω		9.2		ns
Rise Time	t _r			22		
Turn-Off Delay Time	t _{d(off)}			24		
Fall Time	t _f			20		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 17 A	T _J = 25°C		0.85	1.2	V
			T _J = 125°C		0.7		
Reverse Recovery Time	t _{rr}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 17 A		56		ns	
Charge Time	t _a			41			
Discharge Time	t _b			15			
Reverse Recovery Charge	Q _{RR}			135			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.

2. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

NTD6416AN, NVD6416AN

TYPICAL CHARACTERISTICS

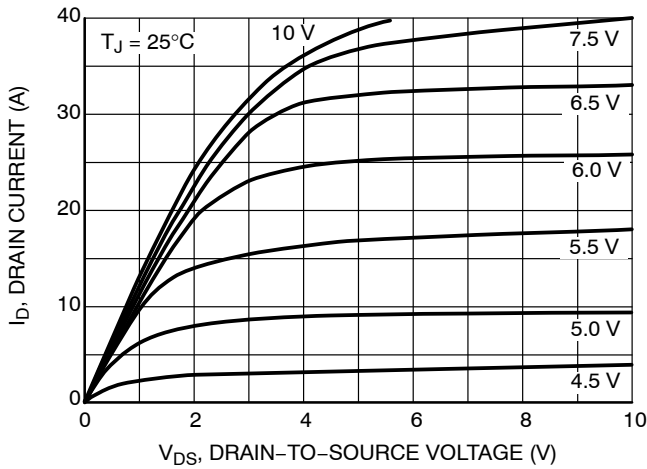


Figure 1. On-Region Characteristics

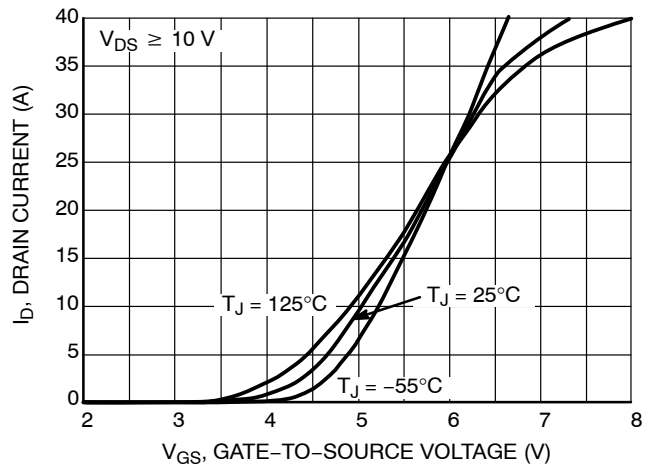


Figure 2. Transfer Characteristics

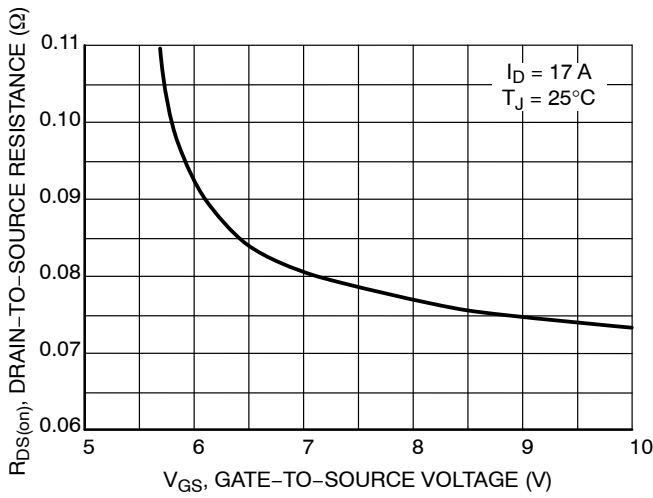


Figure 3. On-Region versus Gate Voltage

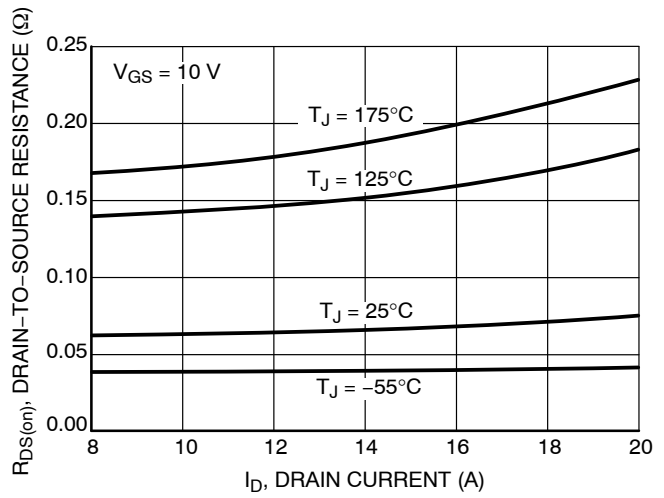


Figure 4. On-Resistance versus Drain Current and Gate Voltage

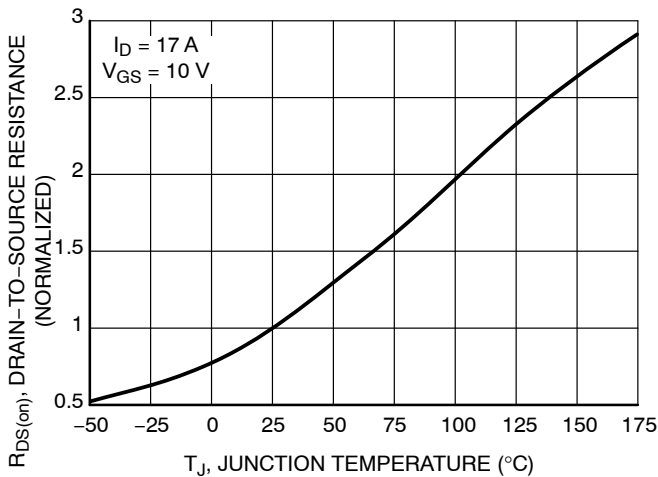


Figure 5. On-Resistance Variation with Temperature

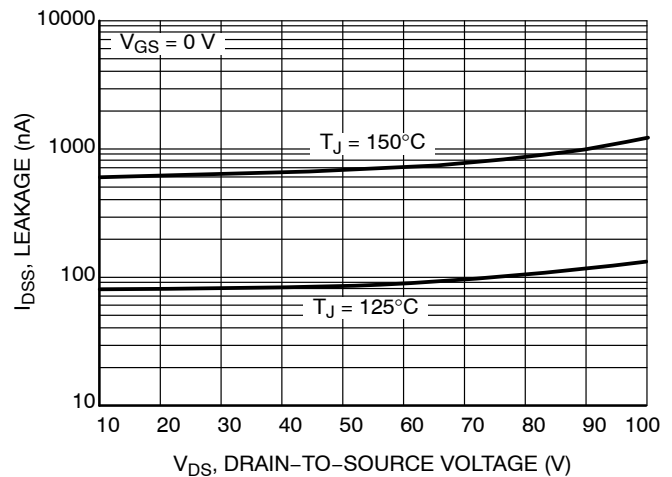


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTD6416AN, NVD6416AN

TYPICAL CHARACTERISTICS

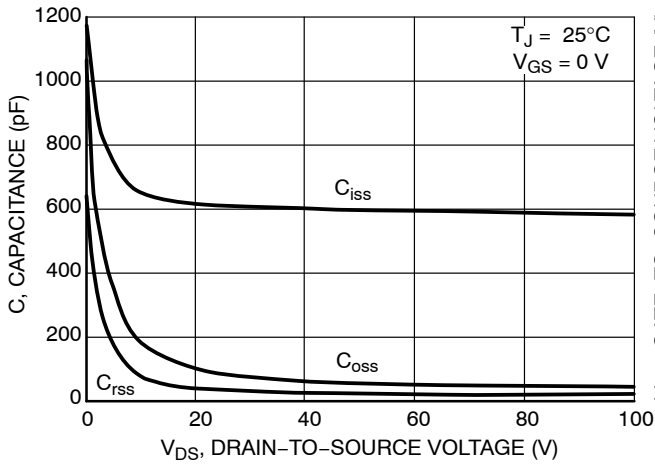


Figure 7. Capacitance Variation

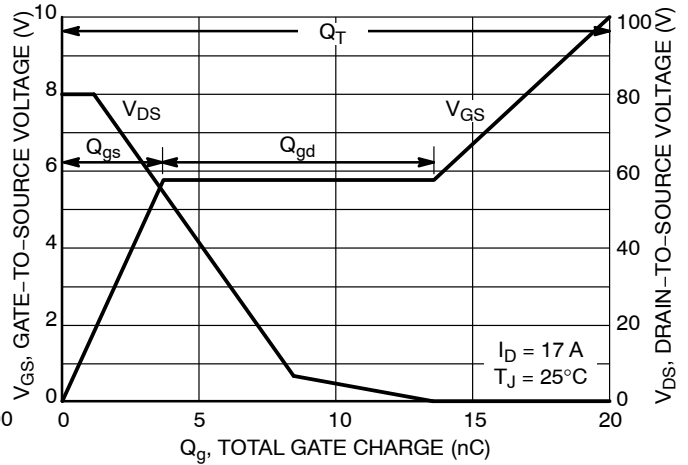


Figure 8. Gate-to-Source Voltage and Drain-to-Source Voltage versus Total Charge

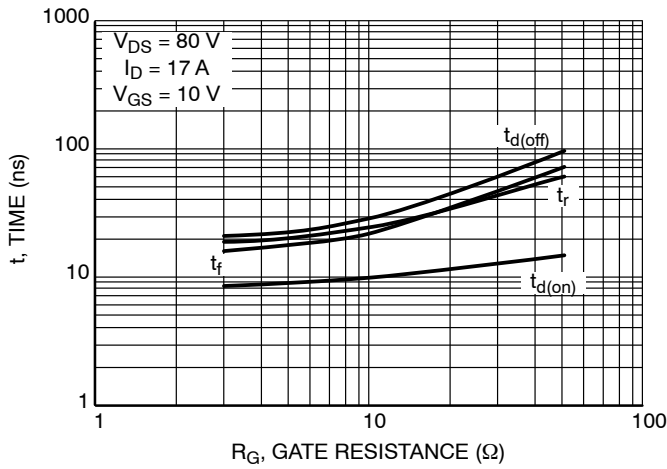


Figure 9. Resistive Switching Time Variation versus Gate Resistance

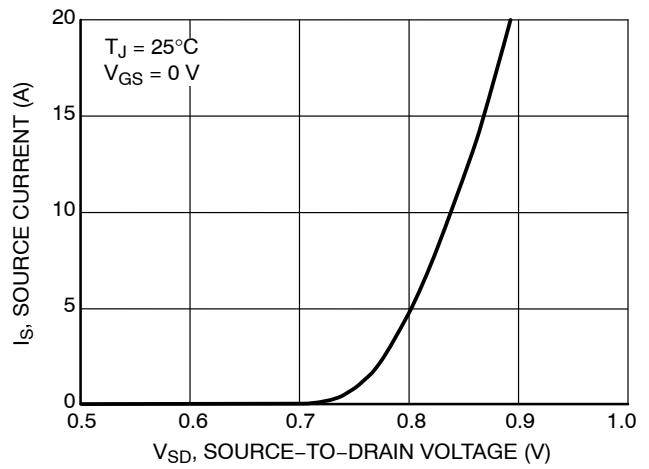


Figure 10. Diode Forward Voltage versus Current

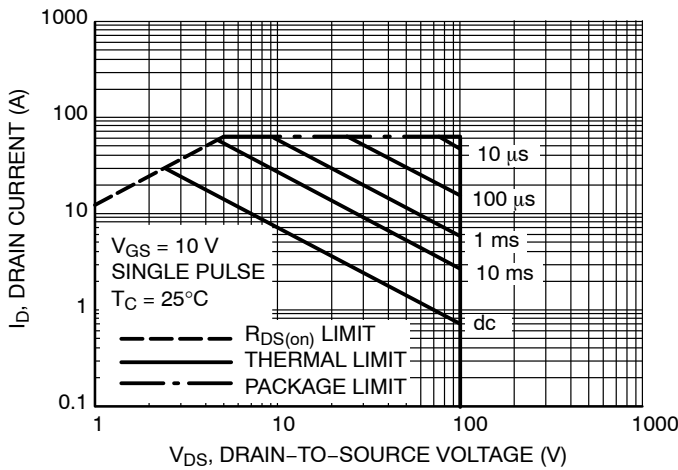


Figure 11. Maximum Rated Forward Biased Safe Operating Area

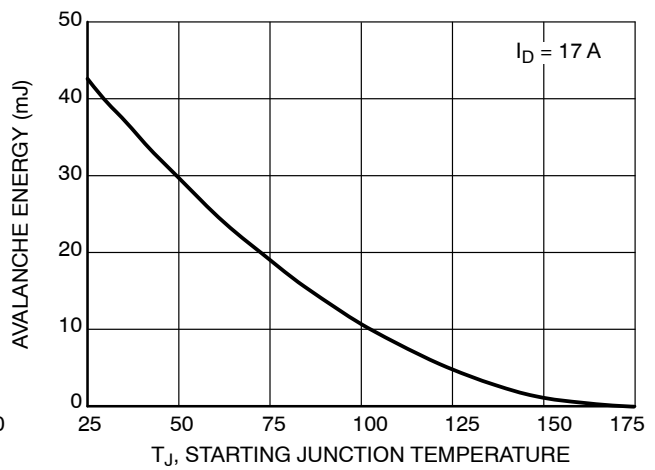


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

NTD6416AN, NVD6416AN

TYPICAL CHARACTERISTICS

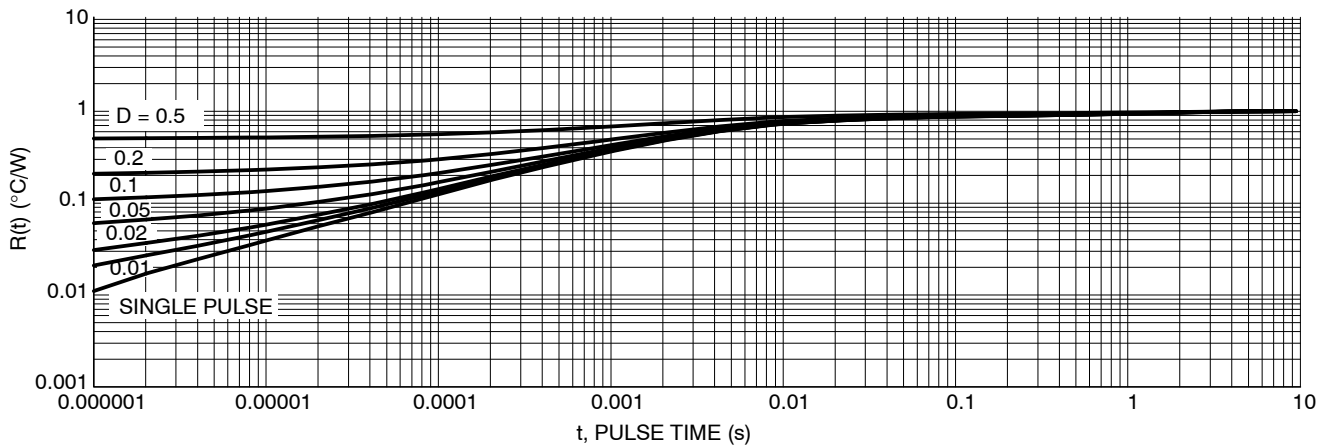


Figure 13. Thermal Response

ORDERING INFORMATION

Device	Package	Shipping†
NTD6416ANT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NTD6416AN-1G	IPAK (Pb-Free)	75 Units / Rail
NVD6416ANT4G*	DPAK (Pb-Free)	2500 / Tape & Reel
NVD6416ANT4G-VF01*	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 Specification Brochure, BRD8011/D.

*NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

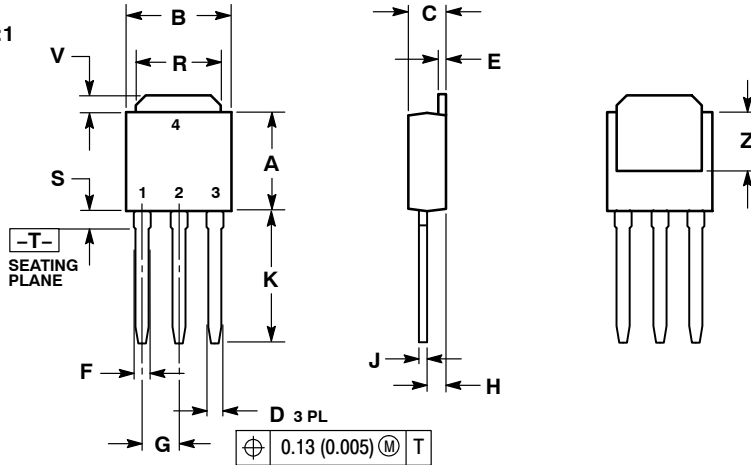
ON Semiconductor®



IPAK CASE 369D-01 ISSUE C

DATE 15 DEC 2010

SCALE 1:1

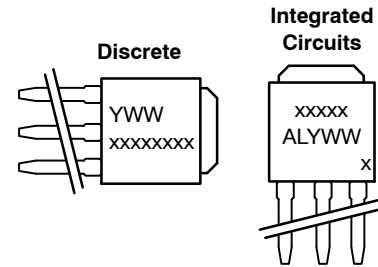


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	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

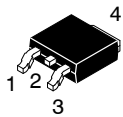
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DESCRIPTION:	IPAK (DPAK INSERTION MOUNT)	PAGE 1 OF 1

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

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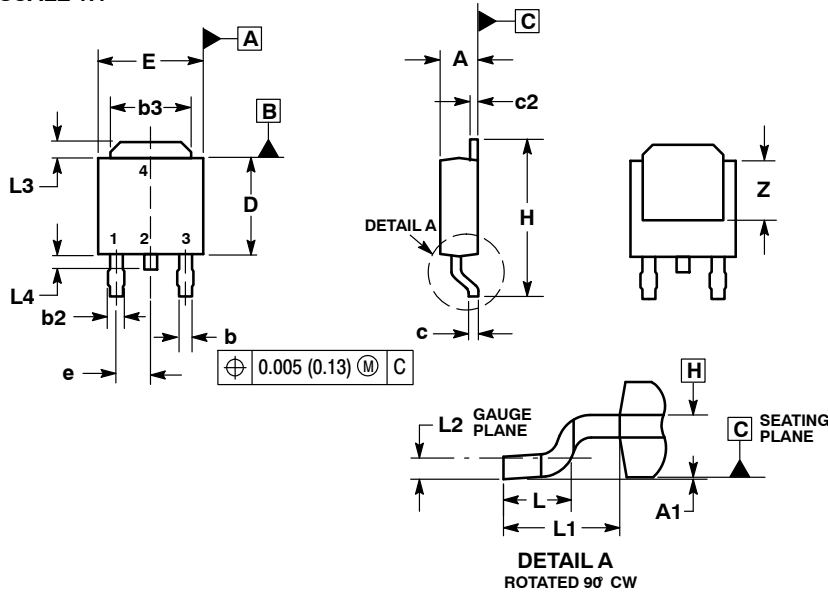
SCALE 1:1

DPAK (SINGLE GAUGE)

CASE 369AA-01

ISSUE B

DATE 03 JUN 2010



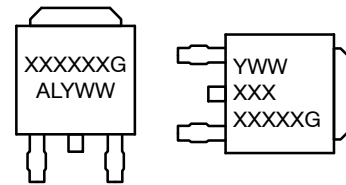
NOTES:

- 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	---

- | | | | |
|--|---|--|--|
| <p>STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR</p> | <p>STYLE 2:
PIN 1. GATE
2. DRAIN
3. SOURCE
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2. ANODE
3. GATE
4. ANODE</p> |
| <p>STYLE 5:
PIN 1. GATE
2. ANODE
3. CATHODE
4. ANODE</p> | <p>STYLE 6:
PIN 1. MT1
2. MT2
3. GATE
4. MT2</p> | <p>STYLE 7:
PIN 1. GATE
2. ANODE
3. EMITTER
4. COLLECTOR</p> | |

GENERIC MARKING DIAGRAM*

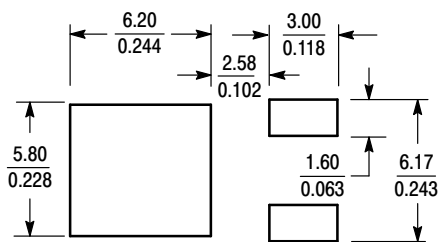


IC Discrete

- 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*



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.

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