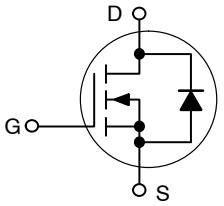
MOSFET – Power, N-Channel

100 V, 19 A, 74 mΩ

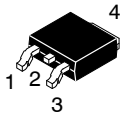
NTD6416ANL, NVD6416ANL

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
100 V	74 mΩ @ 10 V	19 A

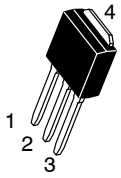


Features

- 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



DPAK
CASE 369AA
STYLE 2



IPAK
CASE 369D
STYLE 2

MAXIMUM RATINGS (T_J = 25 °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 °C	I_D	19	A
		T_C = 100 °C		13	
Power Dissipation	Steady State	T_C = 25 °C	P_D	71	W
Pulsed Drain Current	t_p = 10 μs		I_{DM}	70	A
Operating and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode)			I_S	19	A
Single Pulse Drain-to-Source Avalanche Energy (V_{DD} = 50 Vdc, V_{GS} = 10 Vdc, $I_{L(pk)}$ = 18.2 A, L = 0.3 mH, R_G = 25 Ω)			E_{AS}	50	mJ
Lead Temperature for Soldering Purposes, 1/8″ from Case for 10 Seconds			T_L	260	°C

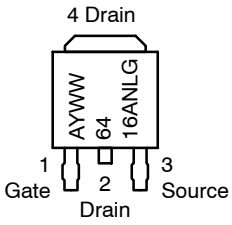
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

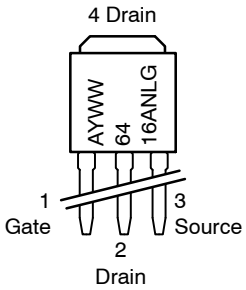
THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Case (Drain) – Steady State	$R_{\theta JC}$	2.1	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	47	

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

MARKING DIAGRAM & PIN ASSIGNMENTS





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

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 5.

ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise noted)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
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	$V_{(BR)DSS}/T_J$				120		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 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.0		2.2	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				5.4		mV/°C
Drain-to-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 10 A			70	80	mΩ
		V_{GS} = 10 V, I_D = 10 A			62	74	
		V_{GS} = 10 V, I_D = 19 A			68	74	
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 10 A			18		S
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 25 V			700	1000	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 = 19 A			25	40	nC
Threshold Gate Charge	$Q_{G(TH)}$				0.7		
Gate-to-Source Charge	Q_{GS}				2.4		
Gate-to-Drain Charge	Q_{GD}				9.6		
Plateau Voltage	V_{GP}				3.2		V
Gate Resistance	R_G				2.4		Ω
SWITCHING CHARACTERISTICS (Note 3)							
Turn-On Delay Time	$t_{d(on)}$	V_{GS} = 10 V, V_{DD} = 80 V, I_D = 19 A, R_G = 6.1 Ω			7.0		ns
Rise Time	t_r				16		
Turn-Off Delay Time	$t_{d(off)}$				35		
Fall Time	t_f				40		
DRAIN-SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 19 A	T_J = 25 °C		0.9	1.2	V
			T_J = 125 °C		0.72		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = 19 A			50		ns
Charge Time	T_a				38		
Discharge Time	T_b				14		
Reverse Recovery Charge	Q_{RR}				112		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. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

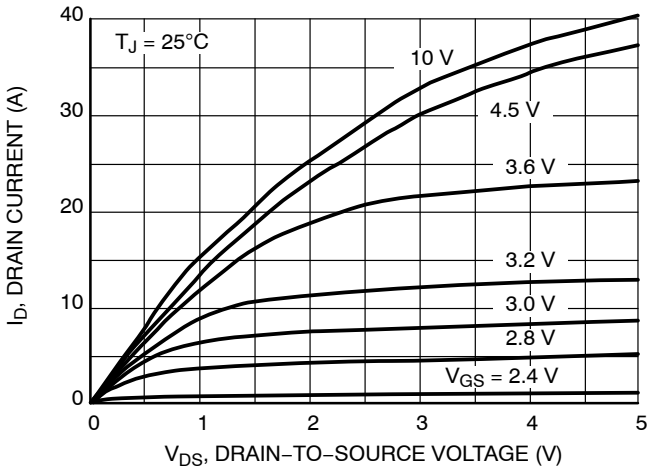


Figure 1. On−Region Characteristics

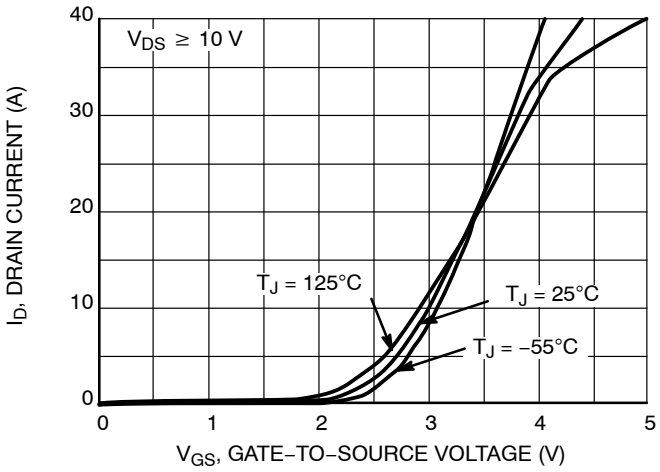


Figure 2. Transfer Characteristics

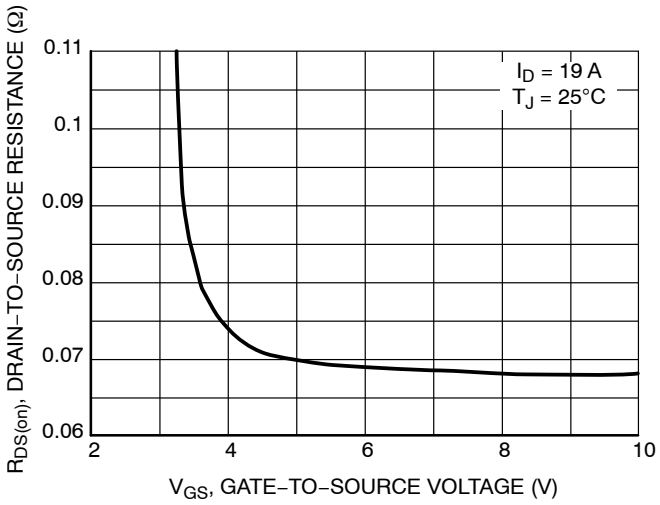


Figure 3. On−Region versus Gate−To−Source Voltage

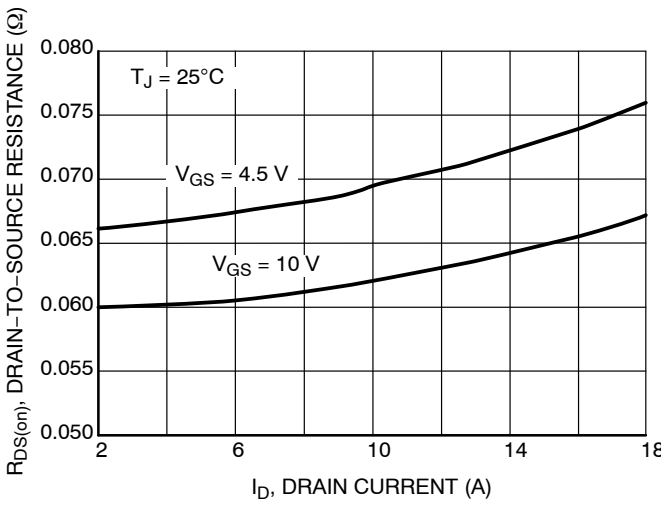


Figure 4. On−Region versus Drain Current and Gate−To−Source Voltage

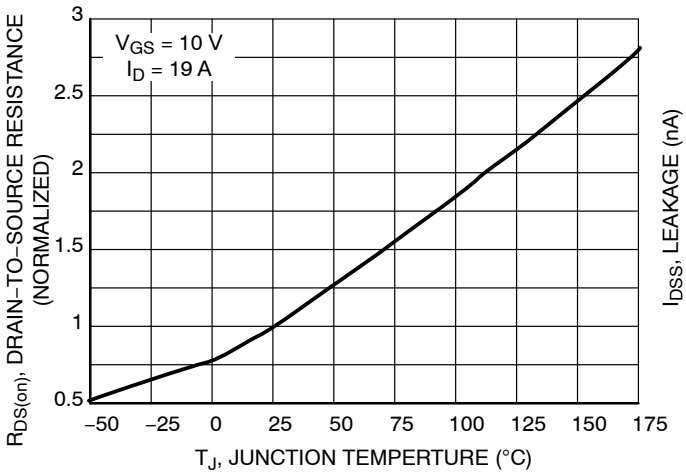


Figure 5. On−Resistance Variation with Temperature

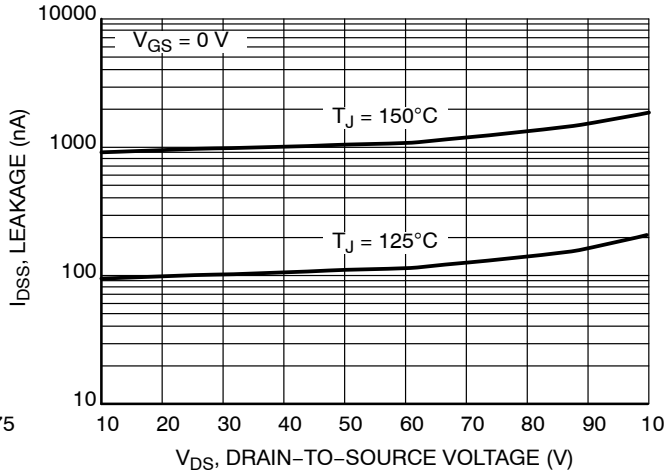


Figure 6. Drian−to−Source Leakage Current versus Voltage

TYPICAL CHARACTERISTICS

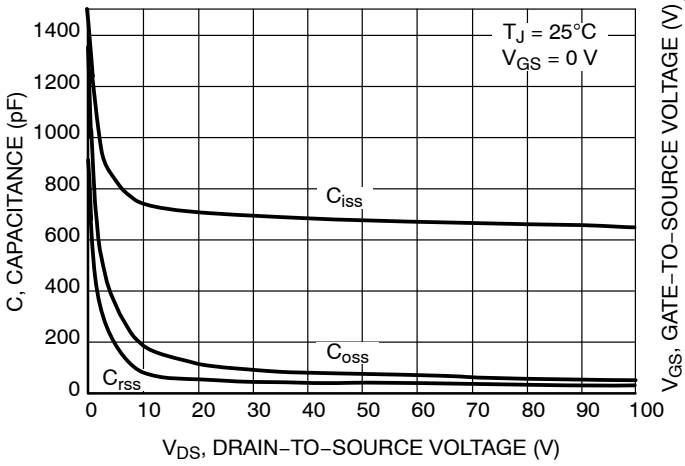


Figure 7. Capacitance Variation

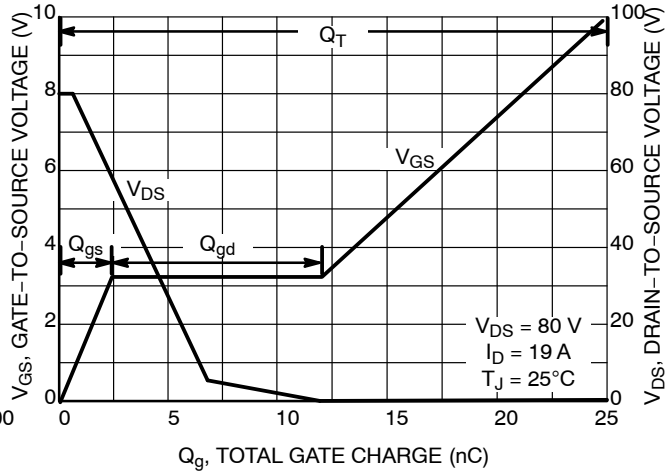


Figure 8. Gate−to−Source Voltage and Drain−to−Source Voltage versus Total Charge

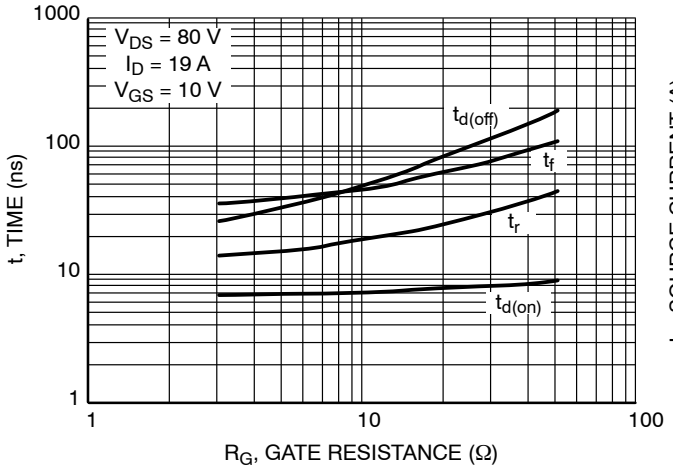


Figure 9. Resistive Switching Time Variation versus Gate Resistance

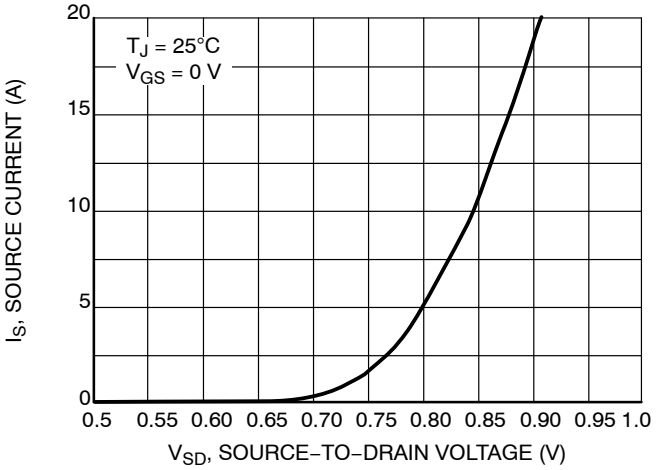


Figure 10. Diode Forward Voltage versus Current

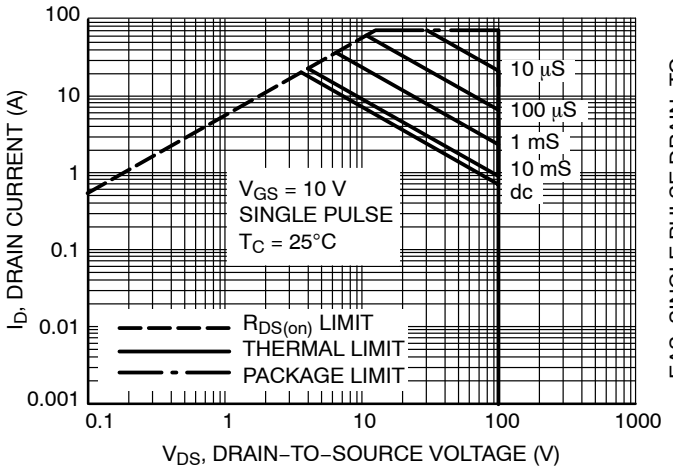


Figure 11. Maximum Rated Forward Biased Safe Operating Area

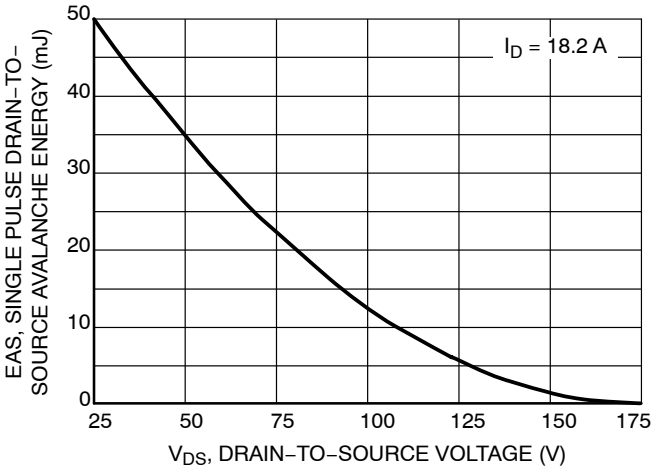


Figure 12. Resistive Switching Time Variation versus Gate Resistance

TYPICAL CHARACTERISTICS

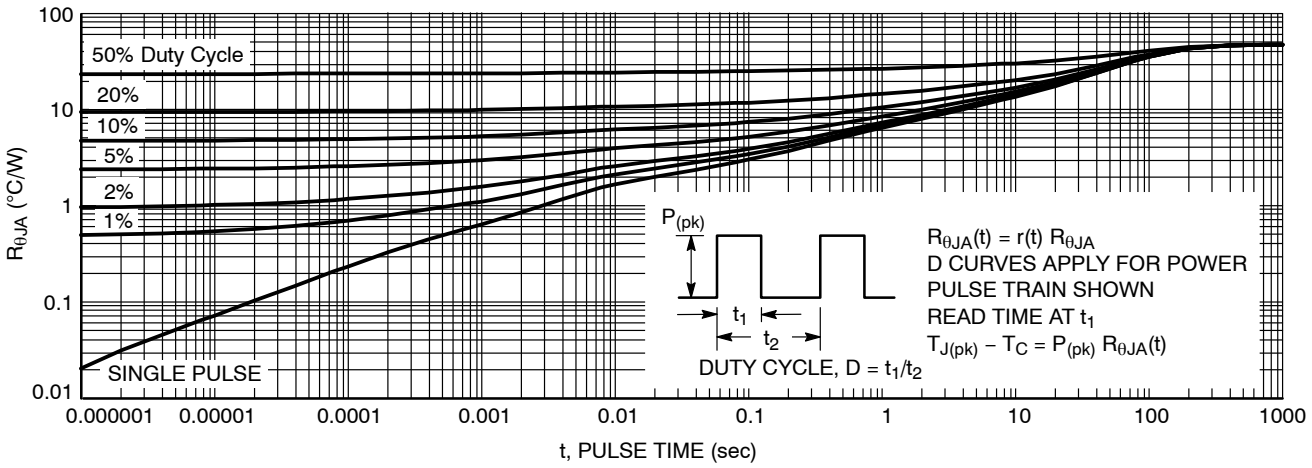


Figure 13. Thermal Response (NTD6416ANL DPAK PCB Cu Area 720 mm^2 PCB Cu thk 2 oz)

ORDERING INFORMATION

Device	Package	Shipping†
NTD6416ANLT4G	DPAK (Pb-Free)	2500 / Tape & Reel
NVD6416ANLT4G-VF01*	DPAK (Pb-Free)	2500 / Tape & Reel

DISCONTINUED (Note 4)

NTD6416ANL-1G	IPAK (Pb-Free)	75 Units / Rail
NVD6416ANLT4G*	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.

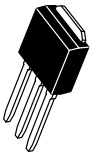
*NVD Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

4. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

PACKAGE DIMENSIONS

IPAK
CASE 369D
ISSUE C

DATE 15 DEC 2010



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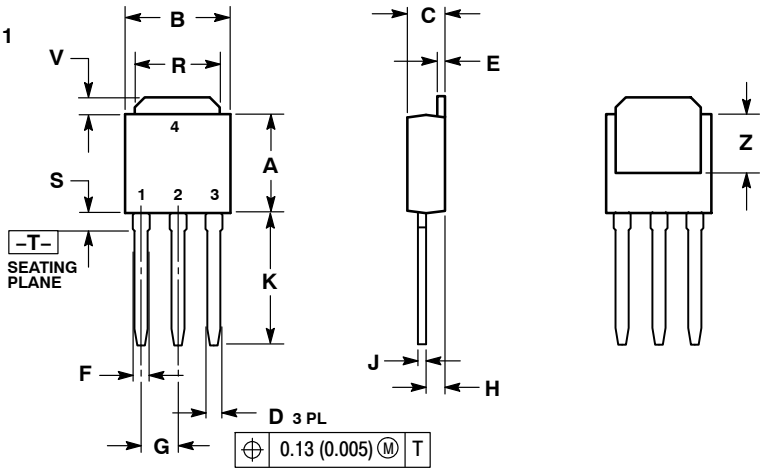


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	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

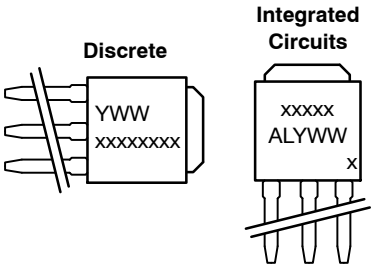
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

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

GENERIC MARKING DIAGRAMS

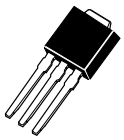


xxxxxxxxx = Device Code
A = Assembly Location
IL = Wafer Lot
Y = Year
WW = Work Week

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

DPAK INSERTION MOUNT
CASE 369
ISSUE O

DATE 02 JAN 2000



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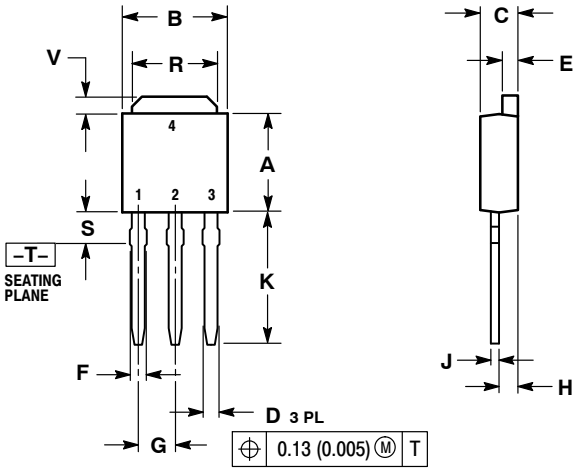


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.250	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

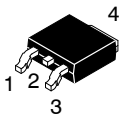
STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

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

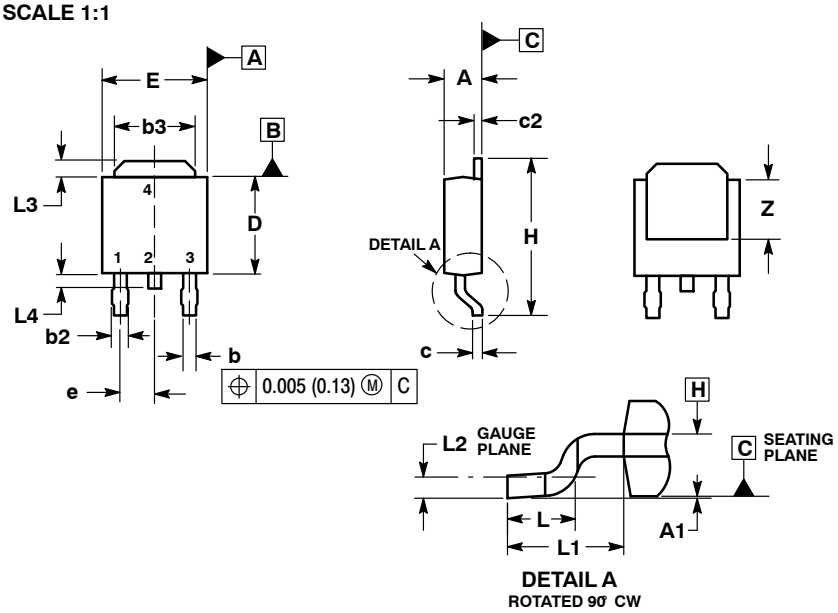
DOCUMENT NUMBER:	**98ASB42319B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**DPAK INSERTION MOUNT**	**PAGE 1 OF 1**



SCALE 1:1

DPAK (SINGLE GUAGE)
CASE 369AA
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:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

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

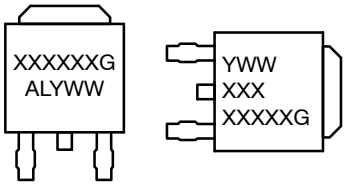
STYLE 4:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

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*

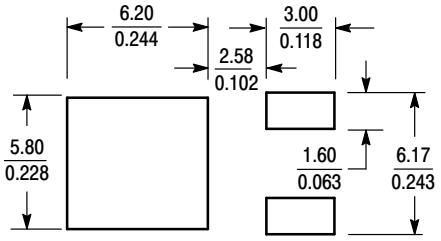


IC **Discrete**

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*



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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