

# MJD41C (NPN), MJD42C (PNP)

## Complementary Power Transistors

### DPAK for Surface Mount Applications

Designed for general purpose amplifier and low speed switching applications.

#### Features

- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves ("1" Suffix)
- Electrically Similar to Popular TIP41 and TIP42 Series
- Epoxy Meets UL 94 V-0 @ 0.125 in
- NJV 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

#### MAXIMUM RATINGS

| Rating  | Symbol         | Max           | Unit                     |
|---|----------------|---------------|--------------------------|
| Collector-Emitter Voltage   | $V_{CEO}$      | 100           | Vdc                      |
| Collector-Base Voltage  | $V_{CB}$       | 100           | Vdc                      |
| Emitter-Base Voltage  | $V_{EB}$       | 5             | Vdc                      |
| Collector Current - Continuous  | $I_C$          | 6             | Adc                      |
| Collector Current - Peak  | $I_{CM}$       | 10            | Adc                      |
| Base Current  | $I_B$          | 2             | Adc                      |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$          | $P_D$          | 20<br>0.16    | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation (Note 1)<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.75<br>0.014 | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range  | $T_J, T_{stg}$ | -65 to +150   | $^\circ\text{C}$         |
| ESD - Human Body Model  | HBM            | 3B            | V                        |
| ESD - Machine Model   | MM             | C             | V                        |

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.

1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

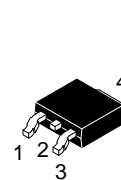
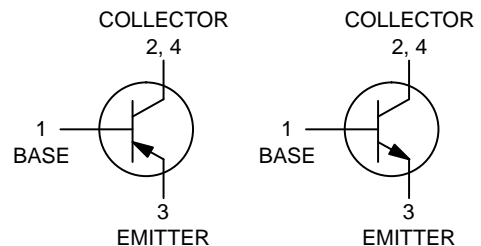


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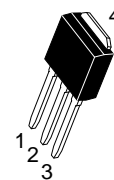
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### SILICON POWER TRANSISTORS 6 AMPERES 100 VOLTS, 20 WATTS

#### COMPLEMENTARY

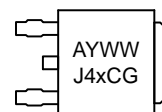


**DPAK  
CASE 369C  
STYLE 1**



**IPAK  
CASE 369D  
STYLE 1**

#### MARKING DIAGRAMS



DPAK



IPAK

A = Assembly Location  
Y = Year  
WW = Work Week  
J4xC = Device Code  
x = 1 or 2  
G = Pb-Free Package

#### ORDERING INFORMATION

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

# MJD41C (NPN), MJD42C (PNP)

## THERMAL CHARACTERISTICS

| Characteristic                                   | Symbol          | Max  | Unit |
|--|-----------------|------|------|
| Thermal Resistance, Junction-to-Case             | $R_{\theta JC}$ | 6.25 | °C/W |
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 71.4 | °C/W |

2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

### OFF CHARACTERISTICS

|   |               |     |     |                 |
|---|---------------|-----|-----|-----------------|
| Collector-Emitter Sustaining Voltage (Note 3)<br>( $I_C = 30\text{ mAdc}$ , $I_B = 0$ ) | $V_{CE(sus)}$ | 100 | -   | Vdc             |
| Collector Cutoff Current<br>( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )                    | $I_{CEO}$     | -   | 50  | $\mu\text{Adc}$ |
| Collector Cutoff Current<br>( $V_{CE} = 100\text{ Vdc}$ , $V_{EB} = 0$ )                | $I_{CES}$     | -   | 10  | $\mu\text{Adc}$ |
| Emitter Cutoff Current<br>( $V_{BE} = 5\text{ Vdc}$ , $I_C = 0$ )                       | $I_{EBO}$     | -   | 0.5 | mAdc            |

### ON CHARACTERISTICS (Note 3)

|   |               |          |         |     |
|---|---------------|----------|---------|-----|
| DC Current Gain<br>( $I_C = 0.3\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )<br>( $I_C = 3\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ ) | $h_{FE}$      | 30<br>15 | -<br>75 | -   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 6\text{ Adc}$ , $I_B = 600\text{ mAdc}$ )                                    | $V_{CE(sat)}$ | -        | 1.5     | Vdc |
| Base-Emitter On Voltage<br>( $I_C = 6\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )   | $V_{BE(on)}$  | -        | 2       | Vdc |

### DYNAMIC CHARACTERISTICS

|   |          |    |   |     |
|---|----------|----|---|-----|
| Current Gain – Bandwidth Product (Note 4)<br>( $I_C = 500\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 1\text{ MHz}$ ) | $f_T$    | 3  | - | MHz |
| Small-Signal Current Gain<br>( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1\text{ kHz}$ )                         | $h_{fe}$ | 20 | - | -   |

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.

3. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

4.  $f_T = |h_{fe}| \cdot f_{test}$ .

# MJD41C (NPN), MJD42C (PNP)

## TYPICAL CHARACTERISTICS

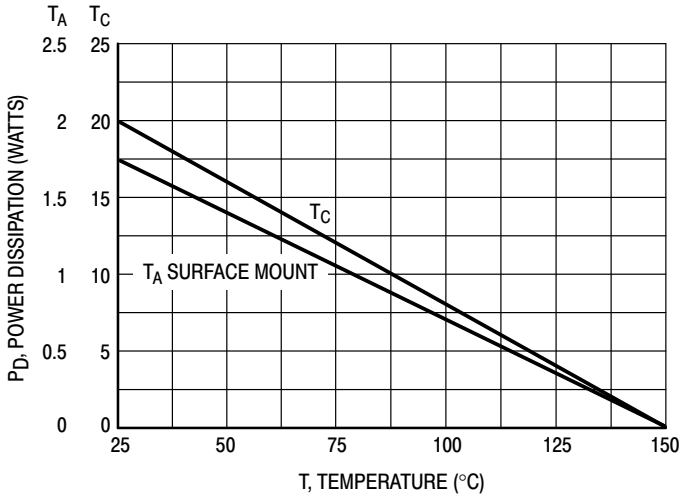
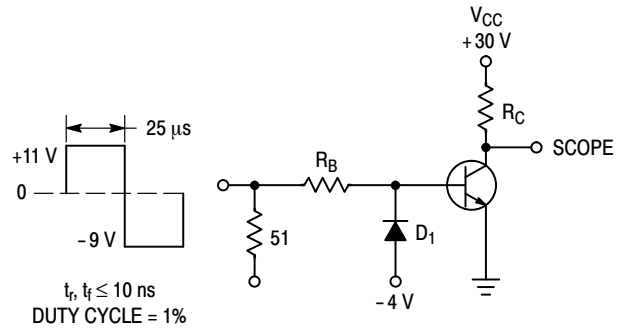


Figure 1. Power Derating



$R_B$  and  $R_C$  VARIED TO OBTAIN DESIRED CURRENT LEVELS  
 $D_1$  MUST BE FAST RECOVERY TYPE, e.g.:  
 MSB5300 USED ABOVE  $I_B \approx 100$  mA  
 MSD6100 USED BELOW  $I_B \approx 100$  mA  
 REVERSE ALL POLARITIES FOR PNP.

Figure 2. Switching Time Test Circuit

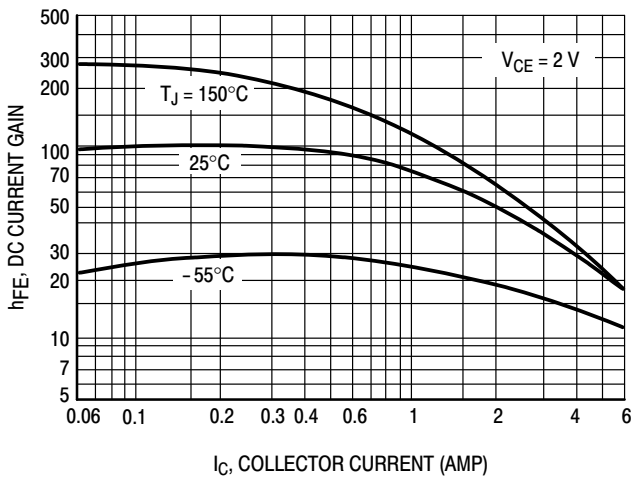


Figure 3. DC Current Gain

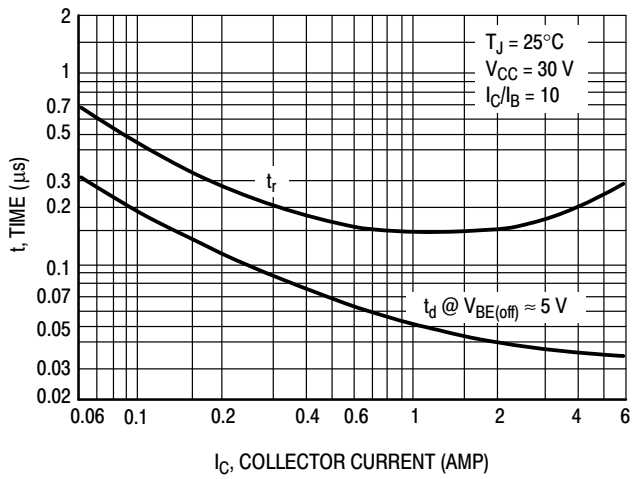


Figure 4. Turn-On Time

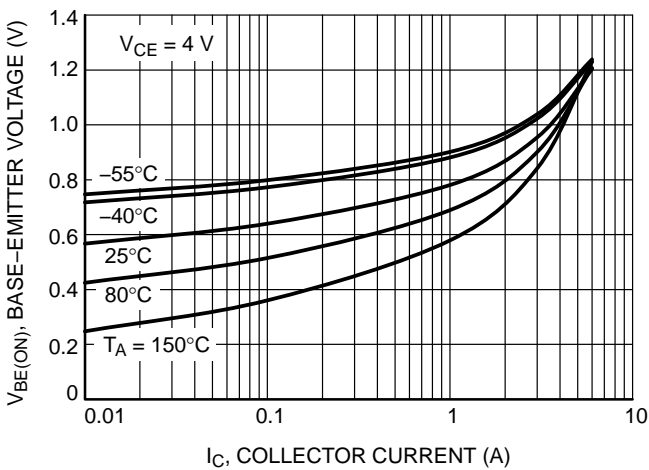


Figure 5. Base Emitter Voltage vs. Collector Current

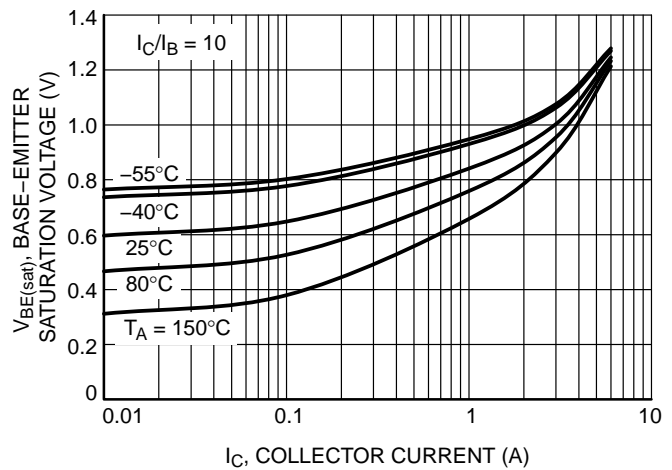
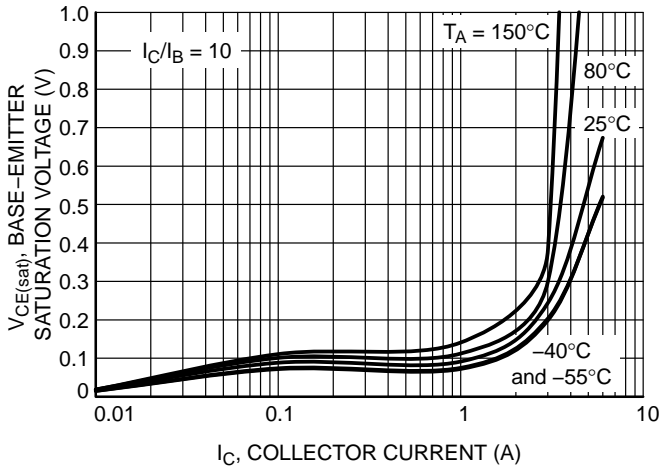


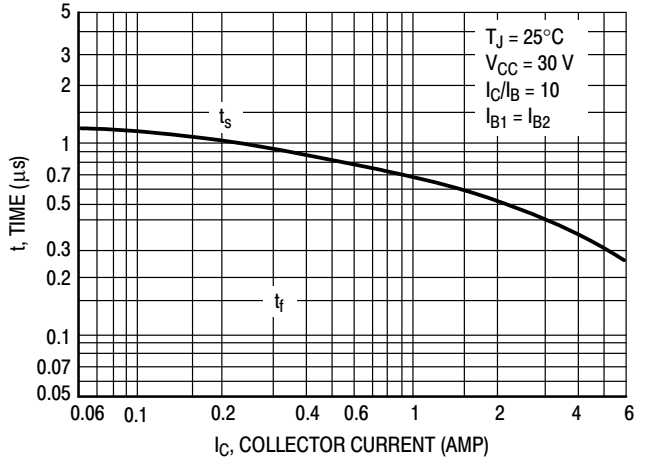
Figure 6. Base Emitter Saturation Voltage vs. Collector Current

# MJD41C (NPN), MJD42C (PNP)

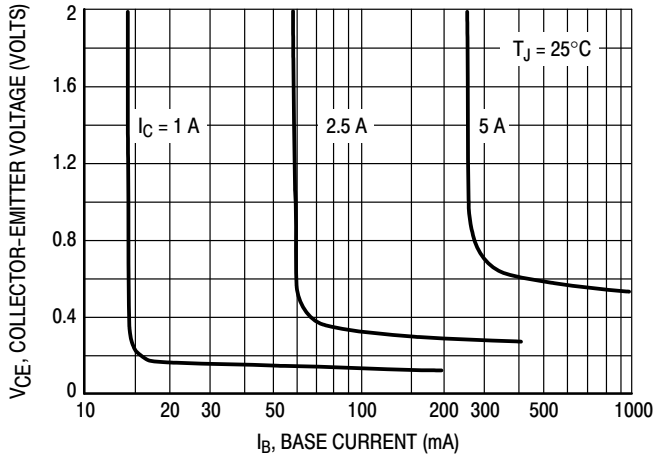
## TYPICAL CHARACTERISTICS



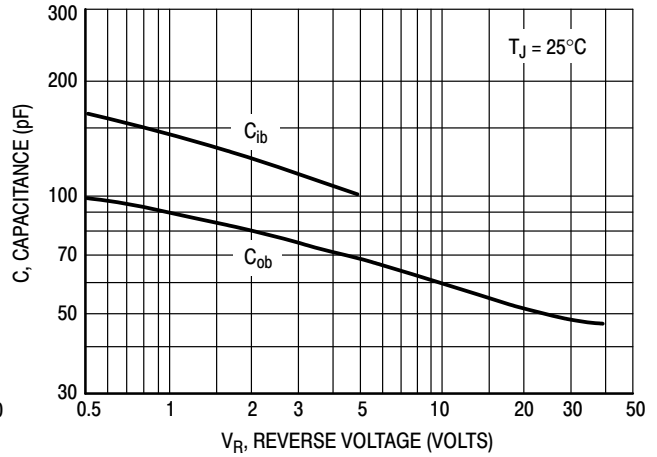
**Figure 7. Collector Emitter Saturation Voltage vs. Collector Current**



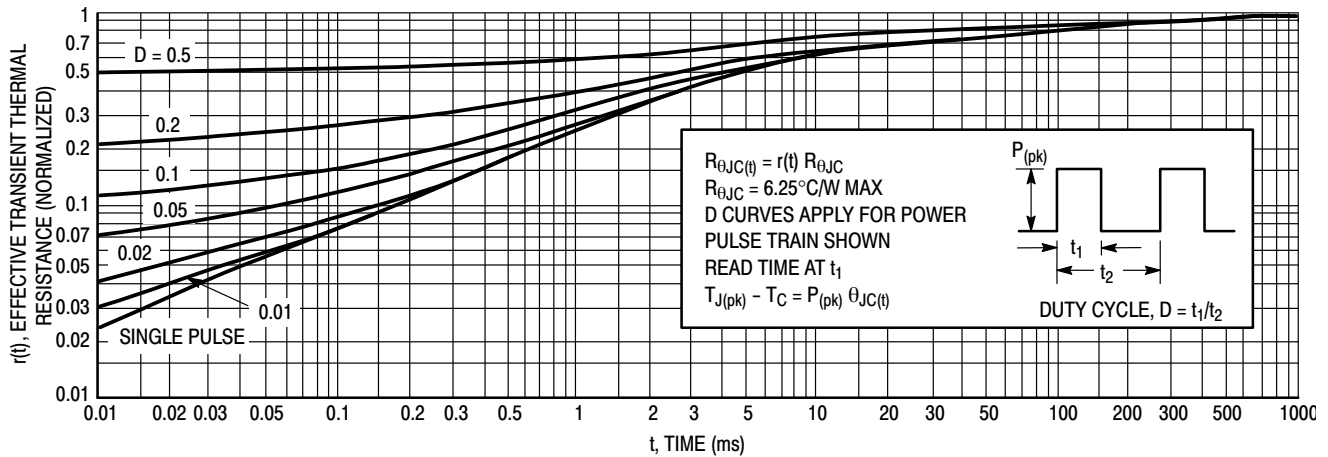
**Figure 8. Turn-Off Time**



**Figure 9. Collector Saturation Region**

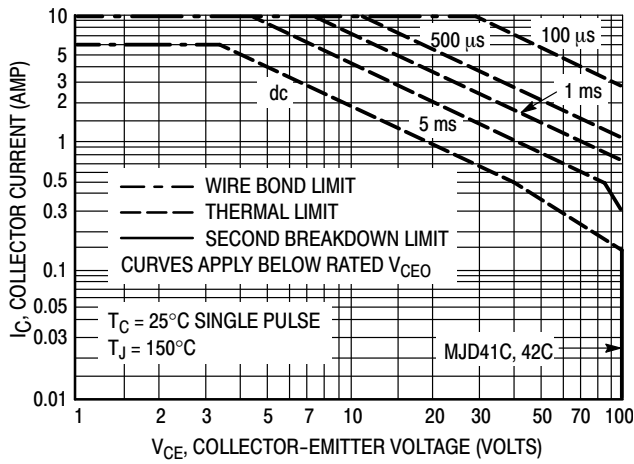


**Figure 10. Capacitance**



**Figure 11. Thermal Response**

## MJD41C (NPN), MJD42C (PNP)



**Figure 12. Maximum Forward Bias Safe Operating Area**

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 12 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 11. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

### ORDERING INFORMATION

| Device        | Package Type      | Package | Shipping <sup>†</sup> |
|---------------|-------------------|---------|-----------------------|
| MJD41CRLG     | DPAK<br>(Pb-Free) | 369C    | 1,800 / Tape & Reel   |
| MJD41CT4G     | DPAK<br>(Pb-Free) | 369C    | 2,500 / Tape & Reel   |
| NJVMJD41CT4G* | DPAK<br>(Pb-Free) | 369C    | 2,500 / Tape & Reel   |
| MJD42CG       | DPAK<br>(Pb-Free) | 369C    | 75 Units / Rail       |
| MJD42C1G      | IPAK<br>(Pb-Free) | 369D    | 75 Units / Rail       |
| MJD42CRLG     | DPAK<br>(Pb-Free) | 369C    | 1,800 / Tape & Reel   |
| NJVMJD42CRLG* | DPAK<br>(Pb-Free) | 369C    | 1,800 / Tape & Reel   |
| MJD42CT4G     | DPAK<br>(Pb-Free) | 369C    | 2,500 / Tape & Reel   |
| NJVMJD42CT4G* | DPAK<br>(Pb-Free) | 369C    | 2,500 / Tape & Reel   |

<sup>†</sup>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.

\*NJV 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        | ---  |

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

### MARKING DIAGRAMS



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

|                         |                                    |  |
|-------------------------|------------------------------------|--|
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| <b>DESCRIPTION:</b>     | <b>IPAK (DPAK INSERTION MOUNT)</b> | <b>PAGE 1 OF 1</b>   |

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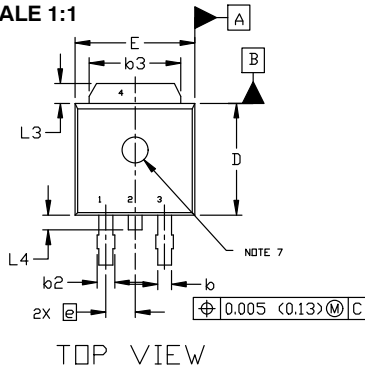
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



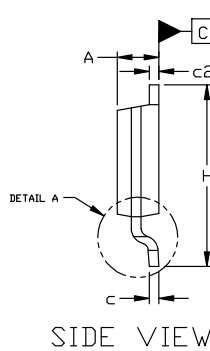
## DPAK (SINGLE GAUGE) CASE 369C ISSUE G

DATE 31 MAY 2023

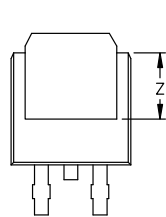
SCALE 1:1



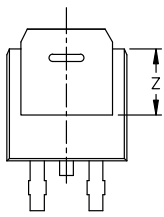
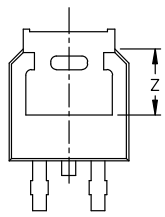
TOP VIEW



SIDE VIEW



BOTTOM VIEW



BOTTOM VIEW

ALTERNATE CONSTRUCTIONS



### RECOMMENDED MOUNTING FOOTPRINT\*

\*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

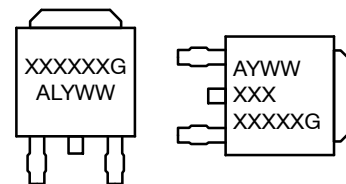
- |  |  |   |   |  |
|--|--|---|---|--|
| <p>STYLE 1:<br/>PIN 1. BASE<br/>2. COLLECTOR<br/>3. EMITTER<br/>4. COLLECTOR</p> | <p>STYLE 2:<br/>PIN 1. GATE<br/>2. DRAIN<br/>3. SOURCE<br/>4. DRAIN</p>          | <p>STYLE 3:<br/>PIN 1. ANODE<br/>2. CATHODE<br/>3. ANODE<br/>4. CATHODE</p> | <p>STYLE 4:<br/>PIN 1. CATHODE<br/>2. ANODE<br/>3. GATE<br/>4. ANODE</p>              | <p>STYLE 5:<br/>PIN 1. GATE<br/>2. ANODE<br/>3. CATHODE<br/>4. ANODE</p>     |
| <p>STYLE 6:<br/>PIN 1. MT1<br/>2. MT2<br/>3. GATE<br/>4. MT2</p>                 | <p>STYLE 7:<br/>PIN 1. GATE<br/>2. COLLECTOR<br/>3. EMITTER<br/>4. COLLECTOR</p> | <p>STYLE 8:<br/>PIN 1. N/C<br/>2. CATHODE<br/>3. ANODE<br/>4. CATHODE</p>   | <p>STYLE 9:<br/>PIN 1. ANODE<br/>2. CATHODE<br/>3. RESISTOR ADJUST<br/>4. CATHODE</p> | <p>STYLE 10:<br/>PIN 1. CATHODE<br/>2. ANODE<br/>3. CATHODE<br/>4. ANODE</p> |

### NOTES:

- DIMENSIONING AND TOLERANCING 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.
- OPTIONAL MOLD FEATURE.

| 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  | 0.028  | 0.045 | 0.72        | 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  | 0.114  | REF   | 2.90        | 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\*



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. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

|                  |                     |   |
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| DESCRIPTION:     | DPAK (SINGLE GAUGE) | PAGE 1 OF 1   |

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