

# MJD41C, NJVMJD41CT4G (NPN), MJD42C, NJVMJD42CT4G, NJVMJD42CRLG (PNP)

## Complementary Power Transistors

### DPAK For Surface Mount Applications

Designed for general purpose amplifier and low speed switching applications.

#### Features

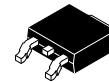
- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves ("1" Suffix)
- Electrically Similar to Popular TIP41 and TIP42 Series
- Epoxy Meets UL 94 V-0 @ 0.125 in
- ESD Ratings:
  - ♦ Human Body Model, 3B > 8000 V
  - ♦ Machine Model, C > 400 V
- NJV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These are Pb-Free Packages\*



**ON Semiconductor®**

<http://onsemi.com>

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

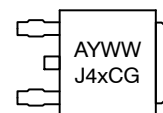


**DPAK  
CASE 369C  
STYLE 1**

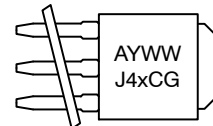


**DPAK-3  
CASE 369D  
STYLE 1**

#### MARKING DIAGRAMS



**DPAK**



**DPAK-3**

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 3 of this data sheet.

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

# MJD41C, NJVMJD41CT4G (NPN), MJD42C, NJVMJD42CT4G, NJVMJD42CRLG (PNP)

## 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<br>Continuous<br>Peak                                                           | $I_C$          | 6<br>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   | $^\circ\text{C}$         |

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.

## THERMAL CHARACTERISTICS

| Characteristic                                   | Symbol          | Max  | Unit               |
|--------------------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction–to–Case             | $R_{\theta JC}$ | 6.25 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction–to–Ambient (Note 1) | $R_{\theta JA}$ | 71.4 | $^\circ\text{C/W}$ |

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

# MJD41C, NJVMJD41CT4G (NPN), MJD42C, NJVMJD42CT4G, NJVMJD42CRLG (PNP)

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

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

### OFF CHARACTERISTICS

|                                                                                                 |                       |     |     |      |
|-------------------------------------------------------------------------------------------------|-----------------------|-----|-----|------|
| Collector–Emitter Sustaining Voltage (Note 2)<br>(I <sub>C</sub> = 30 mAdc, I <sub>B</sub> = 0) | V <sub>CEO(sus)</sub> | 100 | –   | Vdc  |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0)                      | I <sub>CEO</sub>      | –   | 50  | μAdc |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 100 Vdc, V <sub>EB</sub> = 0)                    | I <sub>CES</sub>      | –   | 10  | μAdc |
| Emitter Cutoff Current<br>(V <sub>BE</sub> = 5 Vdc, I <sub>C</sub> = 0)                         | I <sub>EBO</sub>      | –   | 0.5 | mAdc |

### ON CHARACTERISTICS (Note 2)

|                                                                                                                             |                      |          |         |     |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------|----------|---------|-----|
| DC Current Gain<br>(I <sub>C</sub> = 0.3 Adc, V <sub>CE</sub> = 4 Vdc)<br>(I <sub>C</sub> = 3 Adc, V <sub>CE</sub> = 4 Vdc) | h <sub>FE</sub>      | 30<br>15 | –<br>75 |     |
| Collector–Emitter Saturation Voltage<br>(I <sub>C</sub> = 6 Adc, I <sub>B</sub> = 600 mAdc)                                 | V <sub>CE(sat)</sub> | –        | 1.5     | Vdc |
| Base–Emitter On Voltage<br>(I <sub>C</sub> = 6 Adc, V <sub>CE</sub> = 4 Vdc)                                                | V <sub>BE(on)</sub>  | –        | 2       | Vdc |

### DYNAMIC CHARACTERISTICS

|                                                                                                                               |                 |    |   |     |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------|----|---|-----|
| Current Gain – Bandwidth Product (Note 3)<br>(I <sub>C</sub> = 500 mAdc, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 1 MHz) | f <sub>T</sub>  | 3  | – | MHz |
| Small–Signal Current Gain<br>(I <sub>C</sub> = 0.5 Adc, V <sub>CE</sub> = 10 Vdc, f = 1 kHz)                                  | h <sub>fe</sub> | 20 | – |     |

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

3. f<sub>T</sub> = |h<sub>fe</sub>| • f<sub>test</sub>.

## 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     | DPAK–3<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.

# TYPICAL CHARACTERISTICS

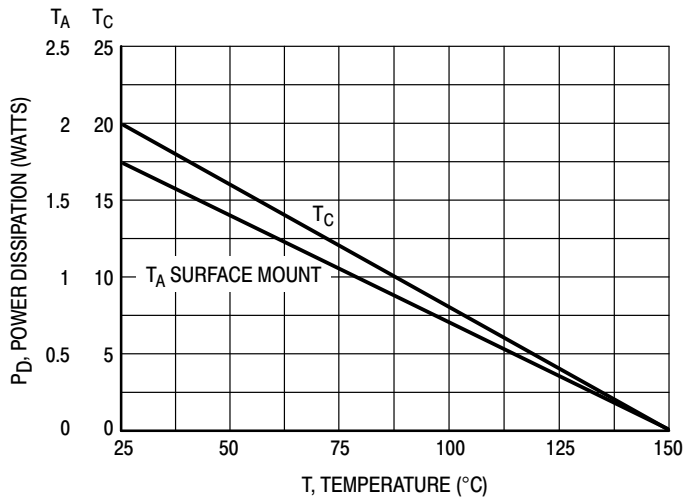
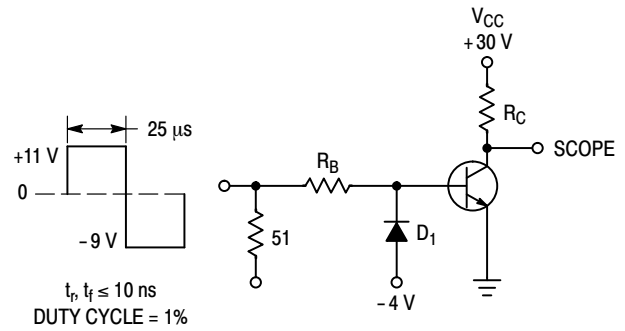


Figure 1. Power Derating



$R_B$  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

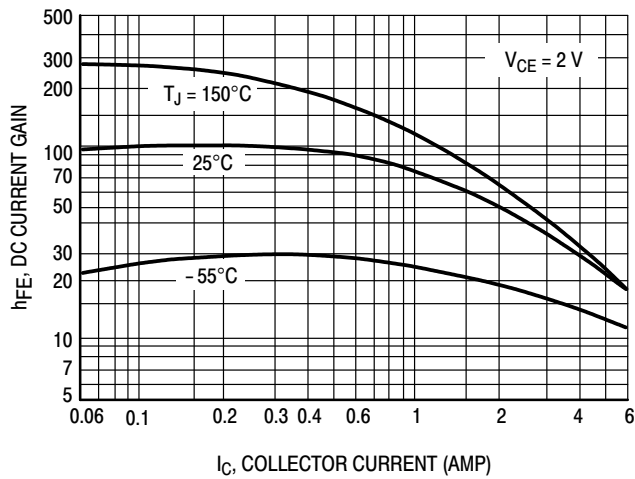


Figure 3. DC Current Gain

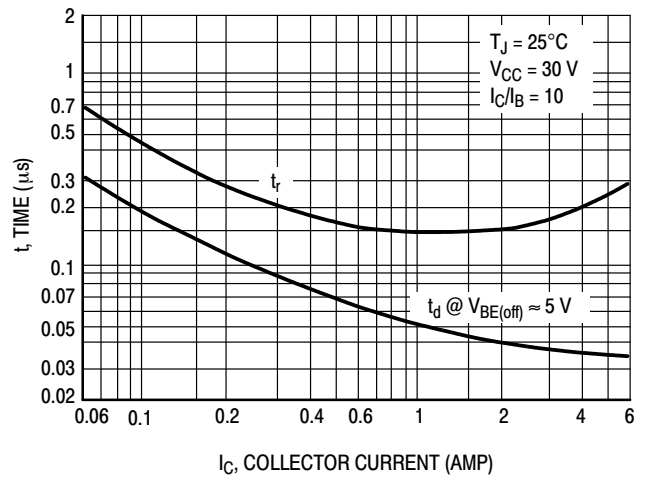


Figure 4. Turn-On Time

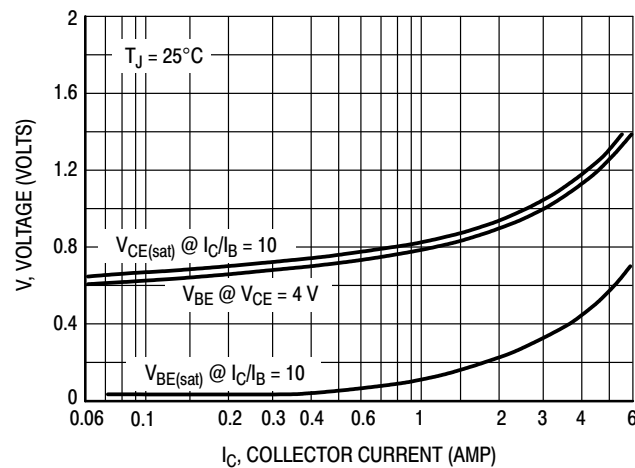


Figure 5. "On" Voltages

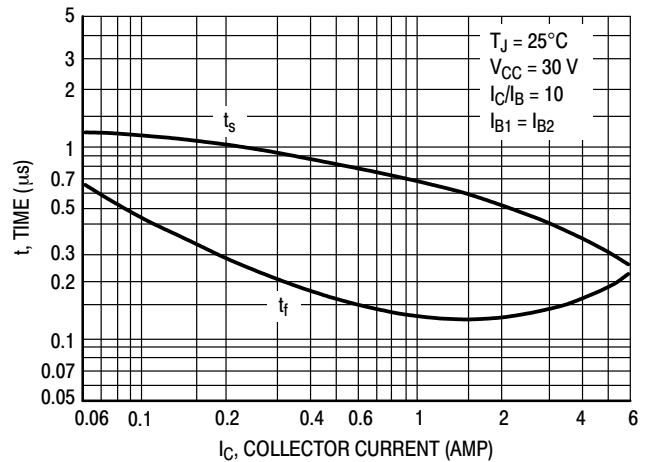


Figure 6. Turn-Off Time

# MJD41C, NJVMJD41CT4G (NPN), MJD42C, NJVMJD42CT4G, NJVMJD42CRLG (PNP)

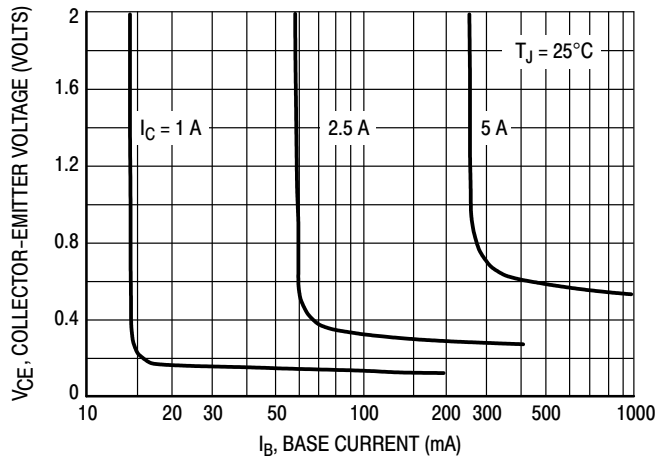


Figure 7. Collector Saturation Region

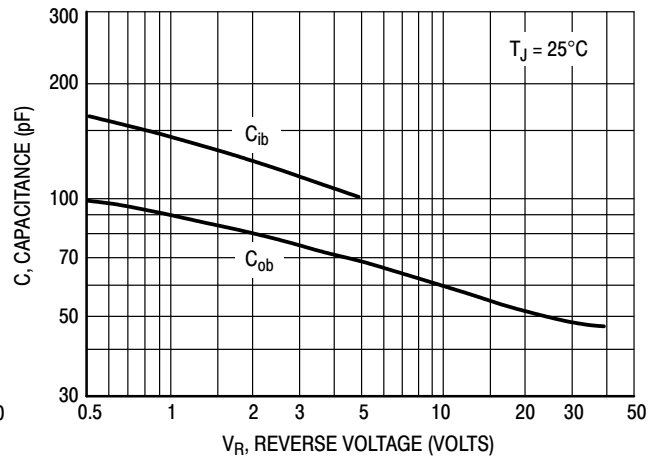


Figure 8. Capacitance

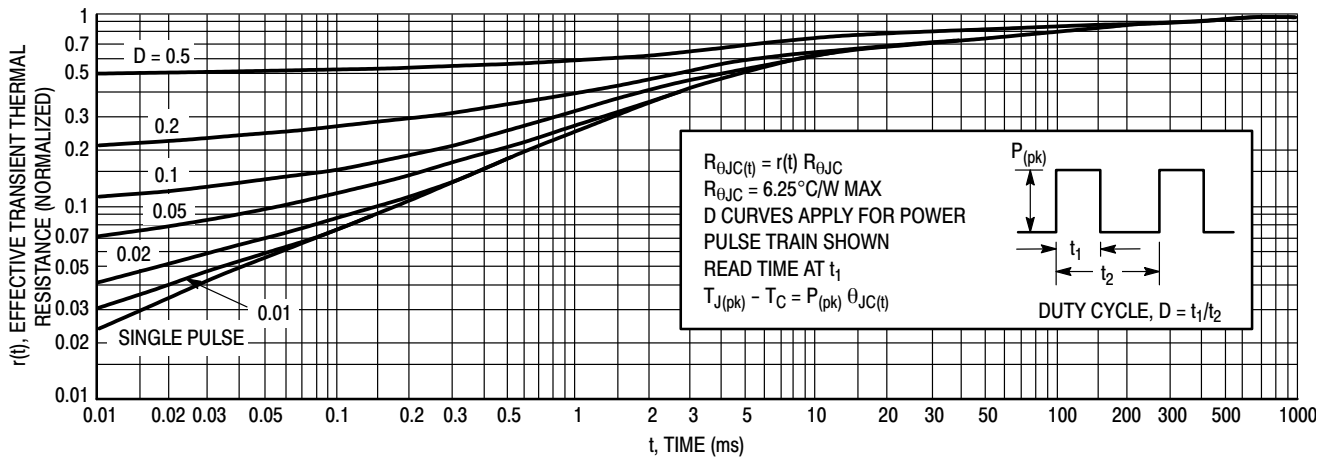


Figure 9. Thermal Response

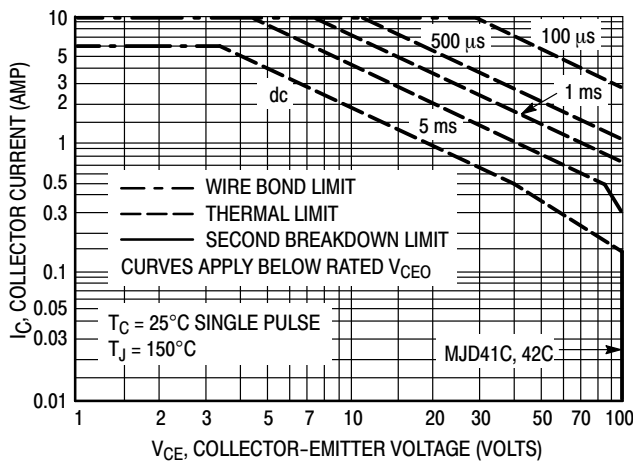


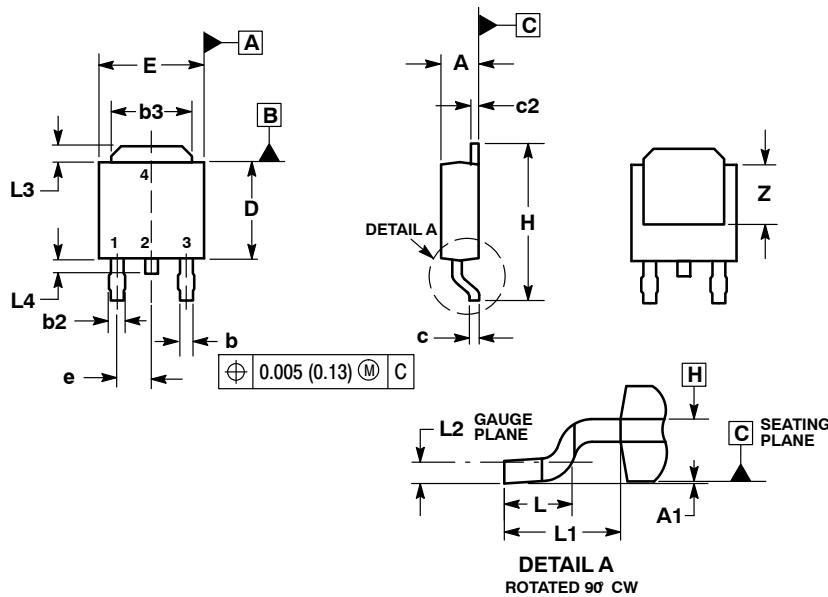
Figure 10. Maximum Forward Bias Safe Operating Area

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 10 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 9. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

PACKAGE DIMENSIONS

DPAK  
CASE 369C-01  
ISSUE D

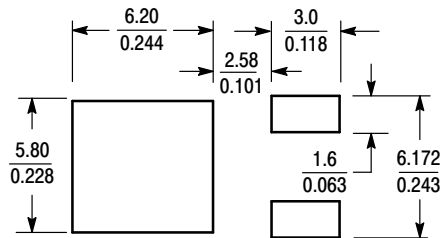


NOTES:

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.

| 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        | ---   |

SOLDERING FOOTPRINT\*



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

STYLE 1:

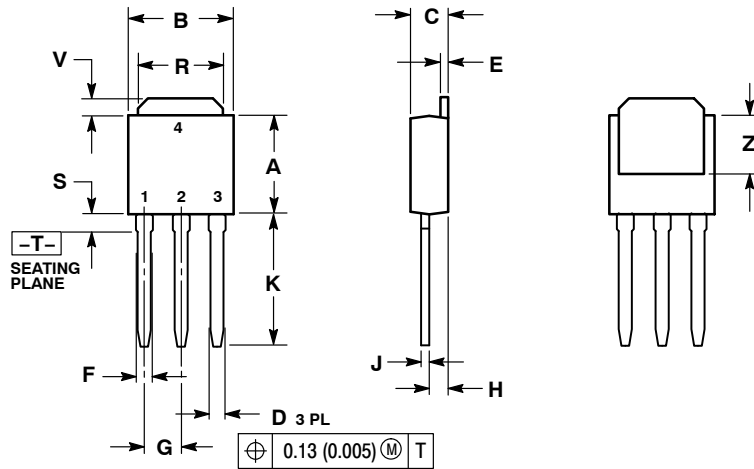
1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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

# MJD41C, NJVMJD41CT4G (NPN), MJD42C, NJVMJD42CT4G, NJVMJD42CRLG (PNP)

## PACKAGE DIMENSIONS

### IPAK CASE 369D-01 ISSUE C



#### 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:

1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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