

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 @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 20 0.16 | W W/ $^\circ\text{C}$ |
| Total Power Dissipation (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 1.75 0.014 | W 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.

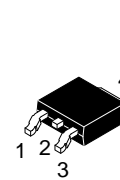
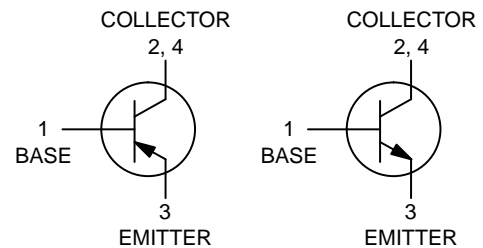


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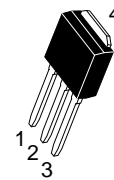
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COMPLEMENTARY

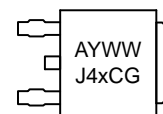


DPAK
CASE 369C
STYLE 1

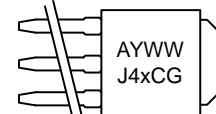


IPAK
CASE 369D
STYLE 1

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) ($I_C = 30\text{ mAdc}$, $I_B = 0$) | $V_{CE(sus)}$ | 100 | - | Vdc |
| Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$) | I_{CEO} | - | 50 | μAdc |
| Collector Cutoff Current ($V_{CE} = 100\text{ Vdc}$, $V_{EB} = 0$) | I_{CES} | - | 10 | μAdc |
| Emitter Cutoff Current ($V_{BE} = 5\text{ Vdc}$, $I_C = 0$) | I_{EBO} | - | 0.5 | mAdc |

ON CHARACTERISTICS (Note 3)

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

DYNAMIC CHARACTERISTICS

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

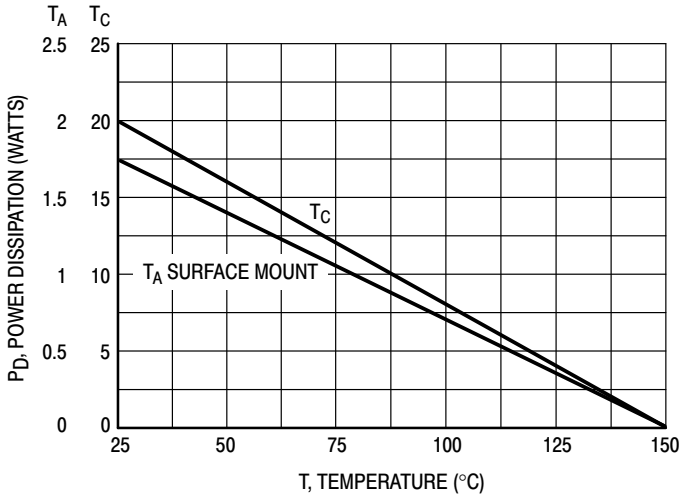
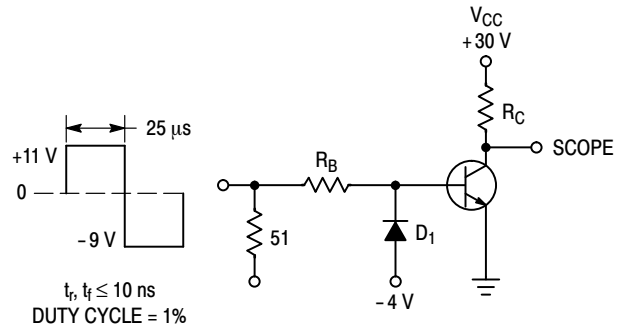


Figure 1. Power Derating



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

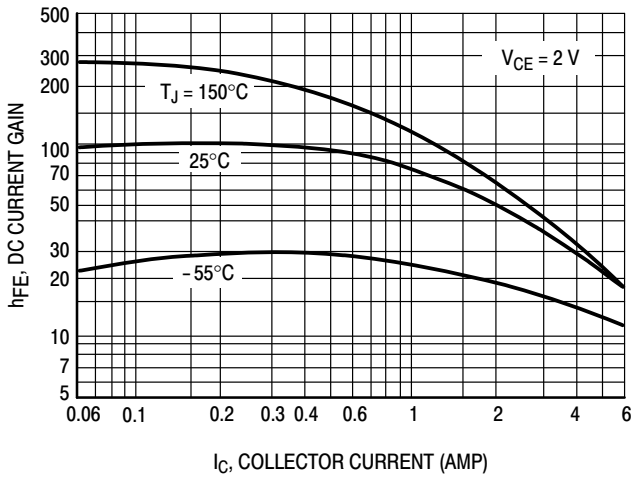


Figure 3. DC Current Gain

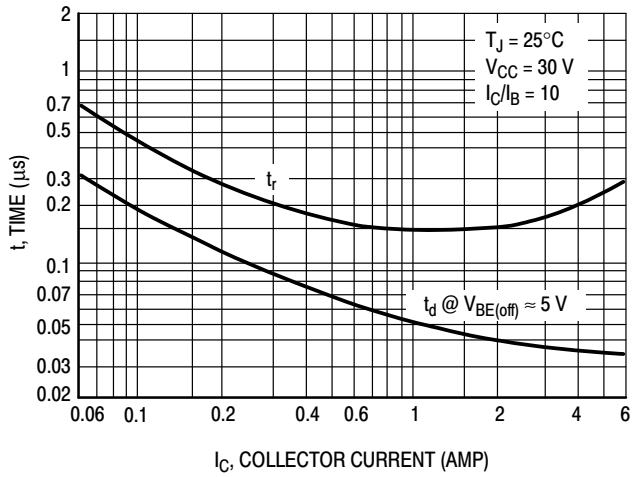


Figure 4. Turn-On Time

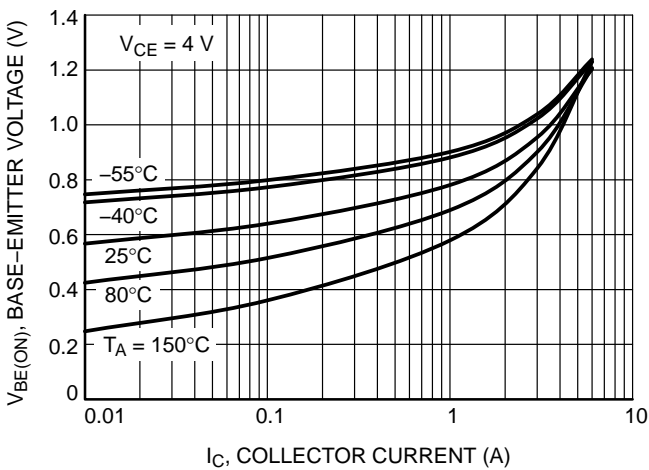


Figure 5. Base Emitter Voltage vs. Collector Current

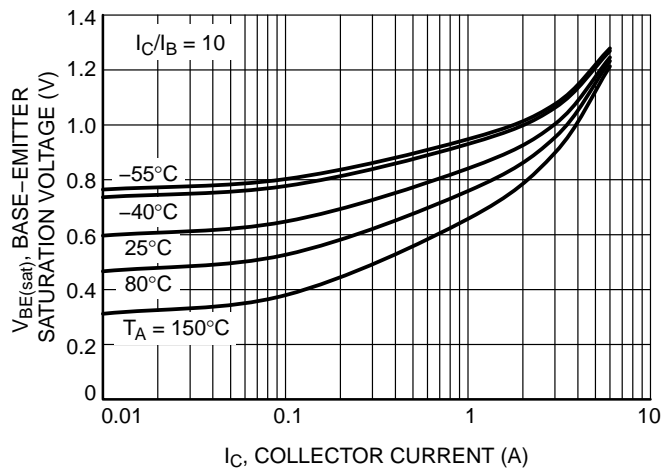


Figure 6. Base Emitter Saturation Voltage vs. Collector Current

MJD41C (NPN), MJD42C (PNP)

TYPICAL CHARACTERISTICS

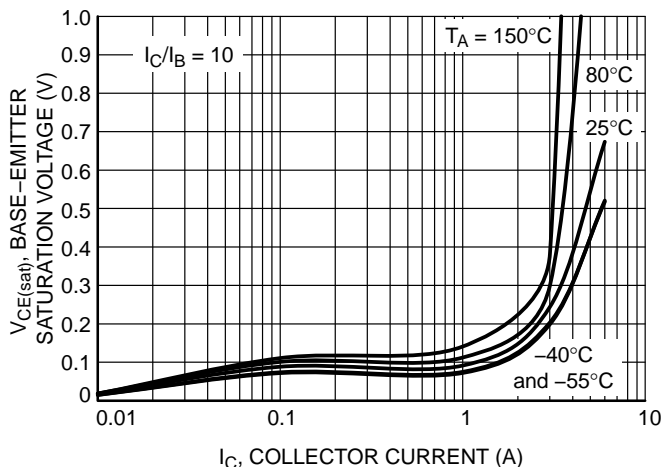


Figure 7. Collector Emitter Saturation Voltage vs. Collector Current

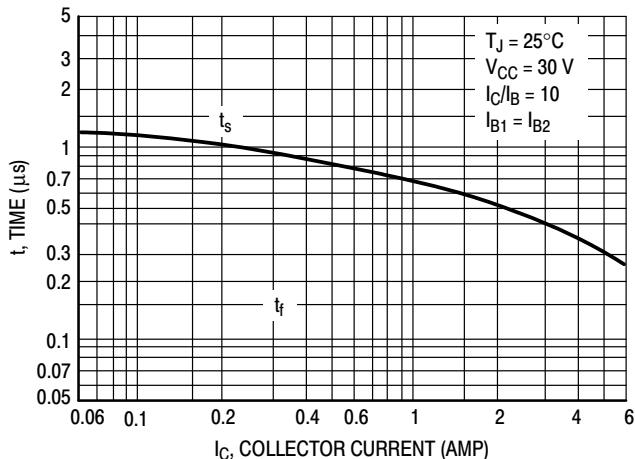


Figure 8. Turn-Off Time

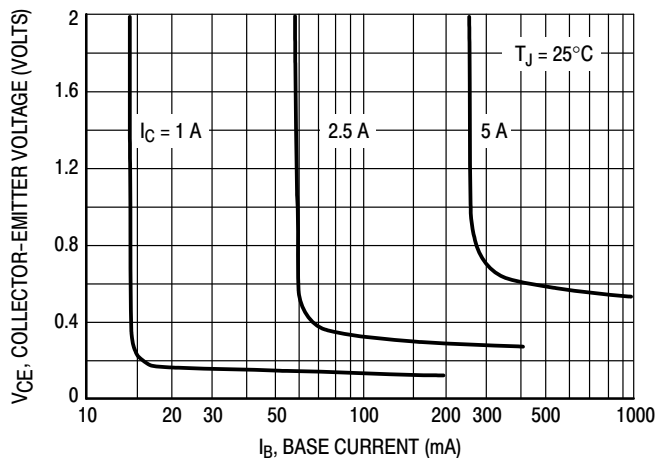


Figure 9. Collector Saturation Region

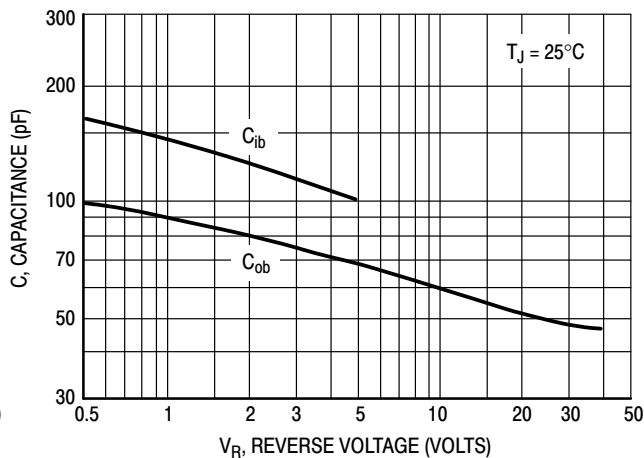


Figure 10. Capacitance

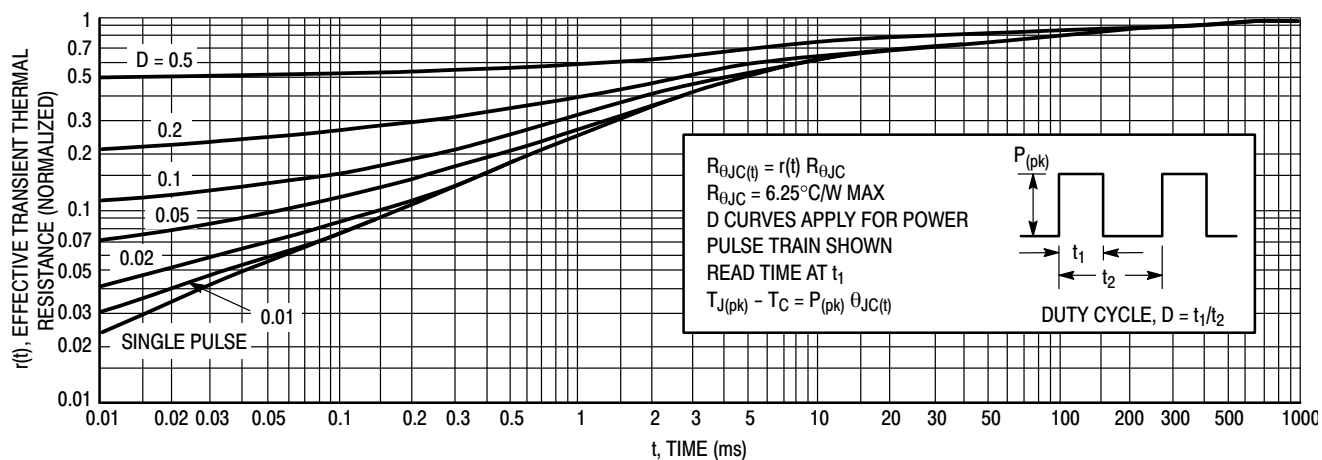


Figure 11. Thermal Response

MJD41C (NPN), MJD42C (PNP)

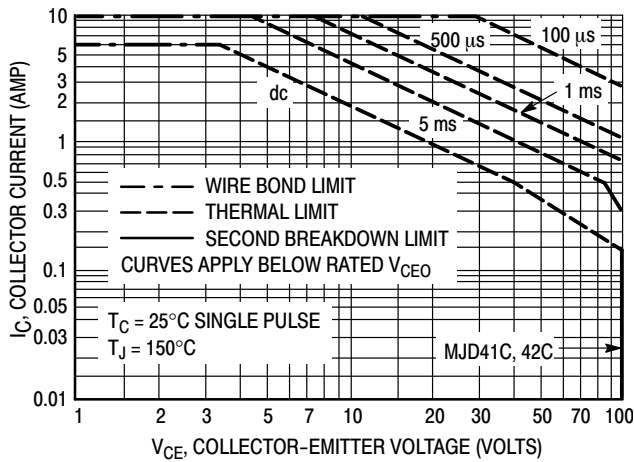


Figure 12. Maximum Forward Bias Safe Operating Area

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 [†] |
|---------------|-------------------|---------|-----------------------|
| MJD41CRLG | DPAK (Pb-Free) | 369C | 1,800 / Tape & Reel |
| MJD41CT4G | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |
| NJVMJD41CT4G* | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |
| MJD42CG | DPAK (Pb-Free) | 369C | 75 Units / Rail |
| MJD42C1G | IPAK (Pb-Free) | 369D | 75 Units / Rail |
| MJD42CRLG | DPAK (Pb-Free) | 369C | 1,800 / Tape & Reel |
| NJVMJD42CRLG* | DPAK (Pb-Free) | 369C | 1,800 / Tape & Reel |
| MJD42CT4G | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |
| NJVMJD42CT4G* | DPAK (Pb-Free) | 369C | 2,500 / Tape & Reel |

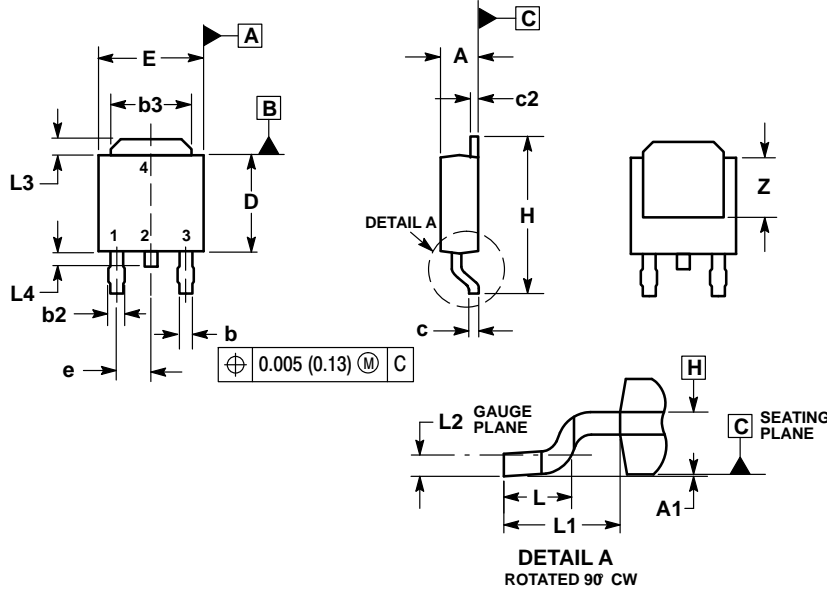
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

MJD41C (NPN), MJD42C (PNP)

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE) CASE 369C ISSUE D



NOTES:

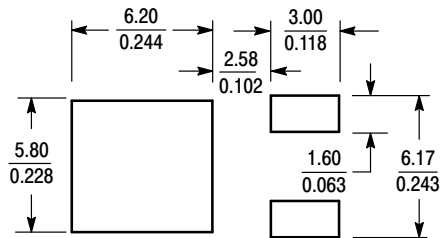
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
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 | --- |

STYLE 1:

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

SOLDERING FOOTPRINT*



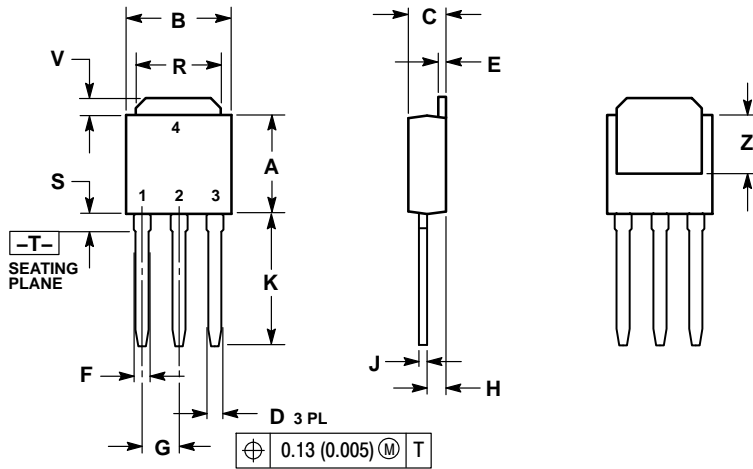
SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*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 (NPN), MJD42C (PNP)

PACKAGE DIMENSIONS

IPAK
CASE 369D
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:
PIN 1: BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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