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ON Semiconductor
NJVMJD243T4G

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# MJD243 (NPN), MJD253 (PNP)

# Complementary Silicon Plastic Power Transistors

## DPAK−3 for Surface Mount Applications

Designed for low voltage, low−power, high−gain audio amplifier applications.

### Features

- High DC Current Gain
- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves (“−1” Suffix)
- Low Collector−Emitter Saturation Voltage
- High Current−Gain − Bandwidth Product
- Annular Construction for Low Leakage
- 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 | Value | Unit |
|---|---|---|---|
| Collector−Base Voltage | $V_{CB}$ | 100 | Vdc |
| Collector−Emitter Voltage | $V_{CEO}$ | 100 | Vdc |
| Emitter−Base Voltage | $V_{EB}$ | 7.0 | Vdc |
| Collector Current − Continuous | $I_C$ | 4.0 | Adc |
| Collector Current − Peak | $I_{CM}$ | 8.0 | Adc |
| Base Current | $I_B$ | 1.0 | Adc |
| Total Device Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 12.5<br>0.1 | W<br>W/°C |
| Total Device Dissipation @ $T_A$ = 25°C (Note 2)<br>Derate above 25°C | $P_D$ | 1.4<br>0.011 | W<br>W/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | −65 to +150 | °C |
| ESD − Human Body Model | HBM | 3B | V |
| ESD − Machine Model | MM | C | V |

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.

1. When surface mounted on minimum pad sizes recommended.

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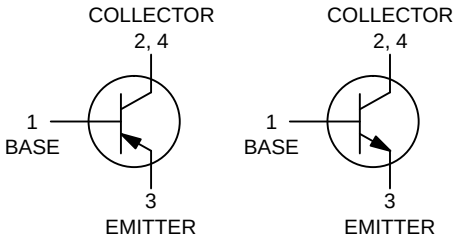
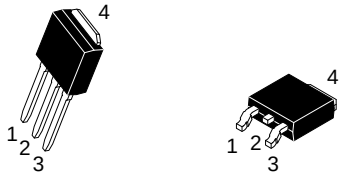
**4.0 A, 100 V, 12.5 W**
**POWER TRANSISTOR**

**COMPLEMENTARY**

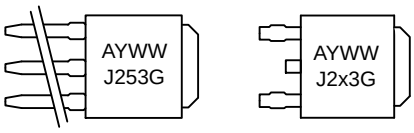



**IPAK**
**CASE 369D**
**STYLE 1**

**DPAK−3**
**CASE 369C**
**STYLE 1**

**MARKING DIAGRAMS**




IPAK DPAK

A = Assembly Location
Y = Year
WW = Work Week
x = 4 or 5
G = Pb−Free Package

**ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

# MJD243 (NPN), MJD253 (PNP)

## THERMAL CHARACTERISTICS

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance<br>Junction−to−Case<br>Junction−to−Ambient (Note 2) | <br>$R_{\theta JC}$<br>$R_{\theta JA}$ | <br>10<br>89.3 | °C/W |

2. When surface mounted on minimum pad sizes recommended.

## ELECTRICAL CHARACTERISTICS ($T_C$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | |
| Collector−Emitter Sustaining Voltage (Note 3)<br>($I_C$ = 10 mAdc, $I_B$ = 0) | $V_{CEO(sus)}$ | 100 | − | Vdc |
| Collector Cutoff Current<br>($V_{CB}$ = 100 Vdc, $I_E$ = 0)<br>($V_{CB}$ = 100 Vdc, $I_E$ = 0, $T_J$ = 125°C) | $I_{CBO}$ | −<br>− | 100<br>100 | nAdc<br>μAdc |
| Emitter Cutoff Current<br>($V_{BE}$ = 7.0 Vdc, $I_C$ = 0) | $I_{EBO}$ | − | 100 | nAdc |
| DC Current Gain (Note 3)<br>($I_C$ = 200 mAdc, $V_{CE}$ = 1.0 Vdc)<br>($I_C$ = 1.0 Adc, $V_{CE}$ = 1.0 Vdc) | $h_{FE}$ | <br>40<br>15 | <br>180<br>− | − |
| Collector−Emitter Saturation Voltage (Note 3)<br>($I_C$ = 500 mAdc, $I_B$ = 50 mAdc)<br>($I_C$ = 1.0 Adc, $I_B$ = 100 mAdc) | $V_{CE(sat)}$ | <br>−<br>− | <br>0.3<br>0.6 | Vdc |
| Base−Emitter Saturation Voltage (Note 3)<br>($I_C$ = 2.0 Adc, $I_B$ = 200 mAdc) | $V_{BE(sat)}$ | − | 1.8 | Vdc |
| Base−Emitter On Voltage (Note 3)<br>($I_C$ = 500 mAdc, $V_{CE}$ = 1.0 Vdc) | $V_{BE(on)}$ | − | 1.5 | Vdc |
| **DYNAMIC CHARACTERISTICS** | | | | |
| Current−Gain − Bandwidth Product (Note 4)<br>($I_C$ = 100 mAdc, $V_{CE}$ = 10 Vdc, $f_{test}$ = 10 MHz) | $f_T$ | 40 | − | MHz |
| Output Capacitance<br>($V_{CB}$ = 10 Vdc, $I_E$ = 0, f = 0.1 MHz) | $C_{ob}$ | − | 50 | pF |

3. Pulse Test: Pulse Width = 300 μs, Duty Cycle ≈ 2%.
4. $f_T = |h_{FE}| \bullet f_{test}$.

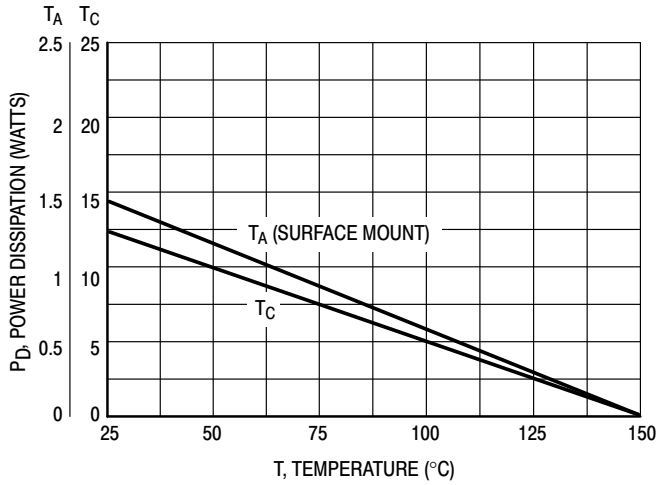



**Figure 1. Power Derating**

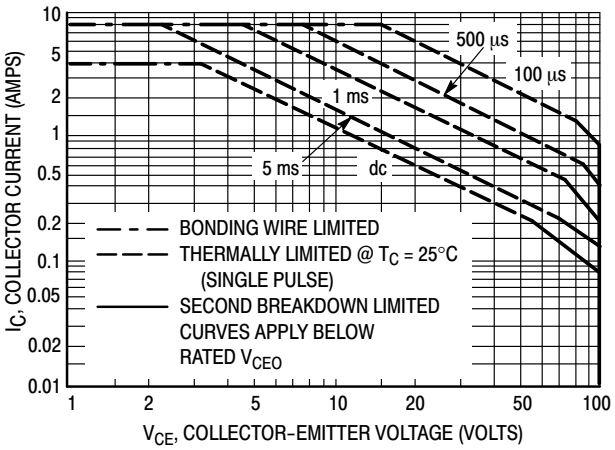



**Figure 2. Active Region Maximum Safe Operating Area**

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 2 is based on $T_{J(pk)}$ = 150°C; $T_C$ is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ may be calculated from the data in Figure 3. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

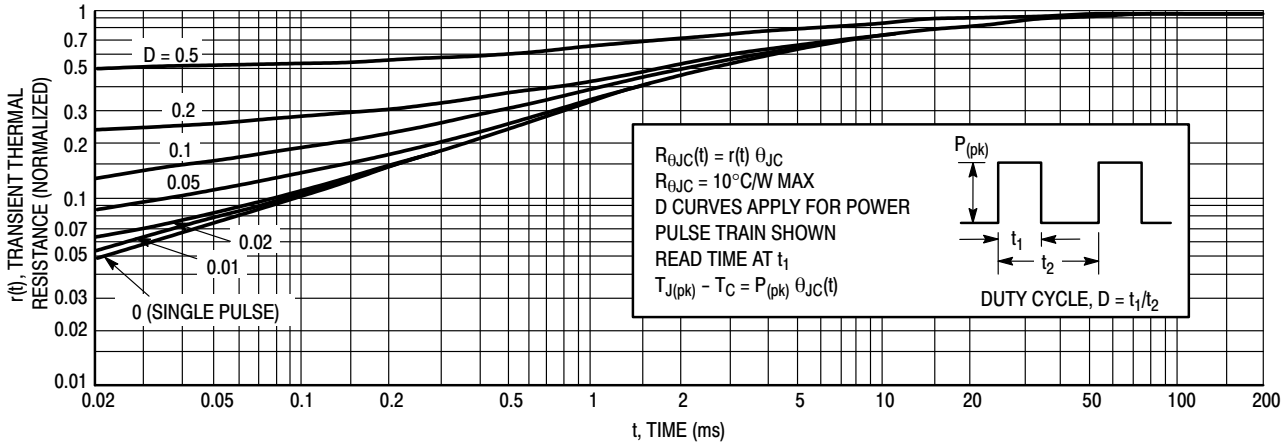
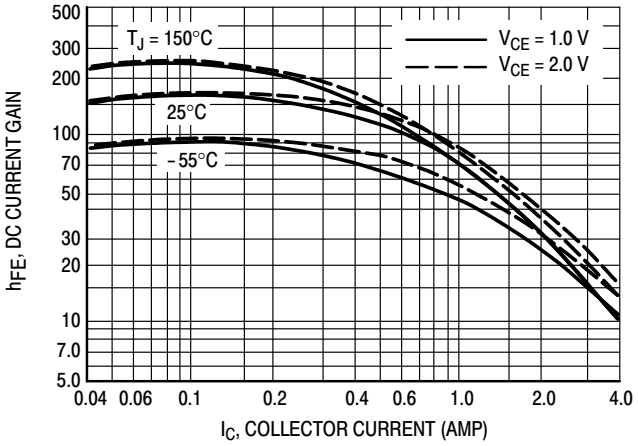



**Figure 3. Thermal Response**

## MJD243 (NPN), MJD253 (PNP)

**NPN**
**MJD243**




**PNP**
**MJD253**

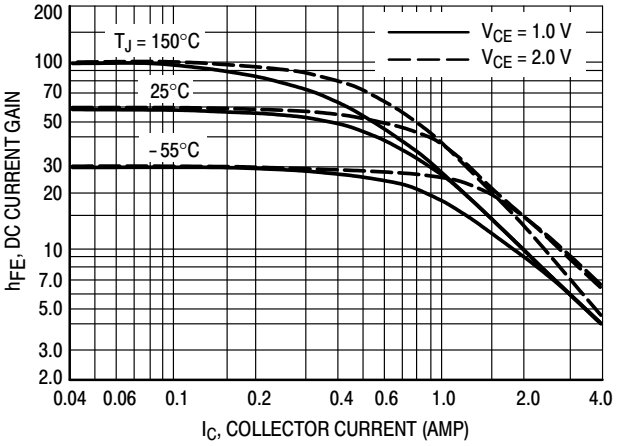
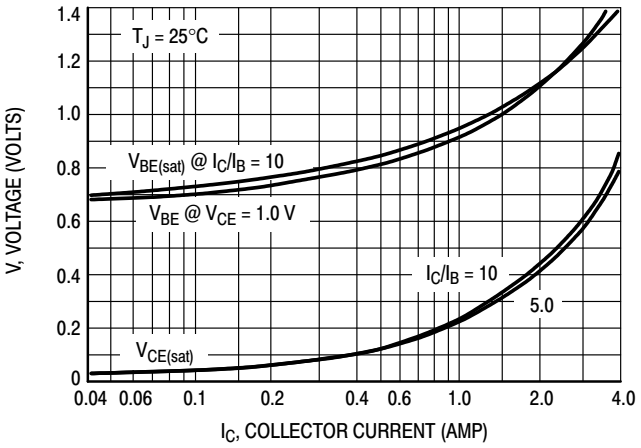



**Figure 4. DC Current Gain**



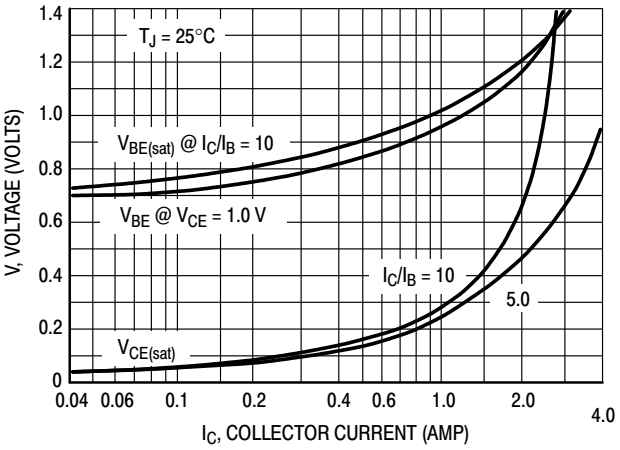
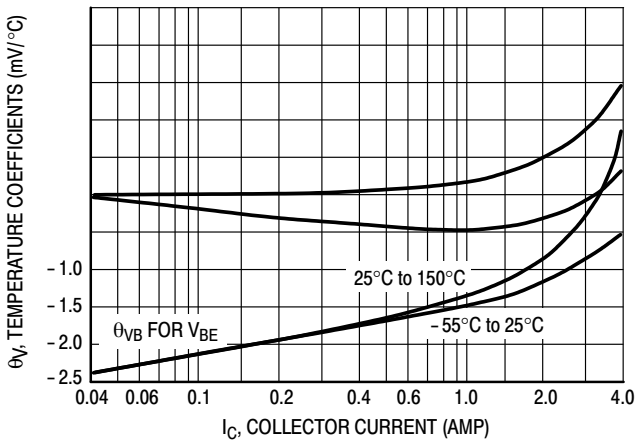




**Figure 5. “On” Voltages**



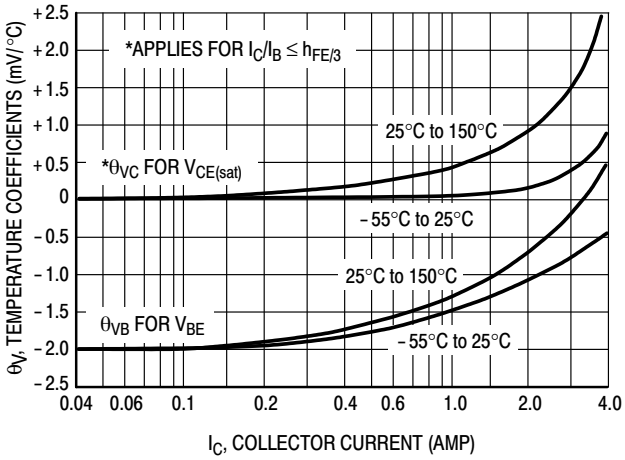
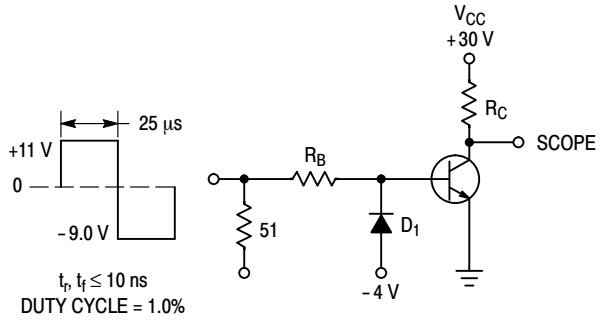




**Figure 6. Temperature Coefficients**




$R_B$ and $R_C$ VARIED TO OBTAIN DESIRED CURRENT LEVELS
$D_1$ MUST BE FAST RECOVERY TYPE, e.g.:
1N5825 USED ABOVE $I_B \approx$ 100 mA
MSD6100 USED BELOW $I_B \approx$ 100 mA
FOR PNP TEST CIRCUIT, REVERSE ALL POLARITIES

**Figure 7. Switching Time Test Circuit**

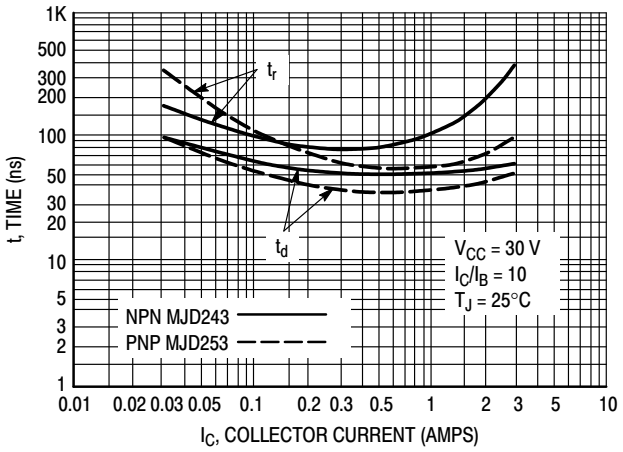



**Figure 8. Turn−On Time**

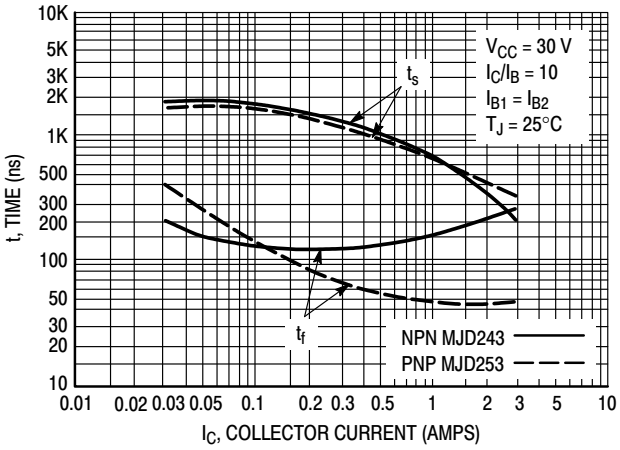



**Figure 9. Turn−Off Time**

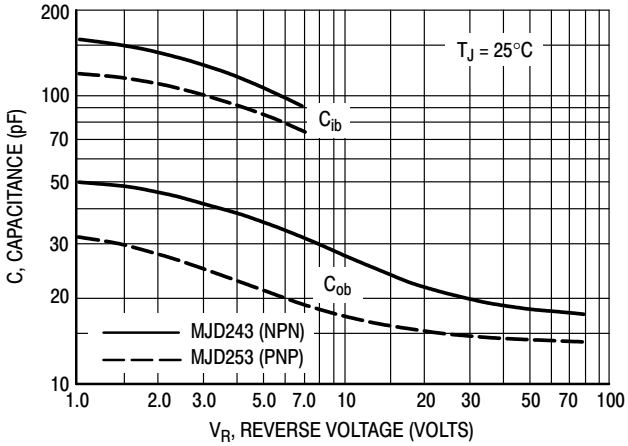



**Figure 10. Capacitance**

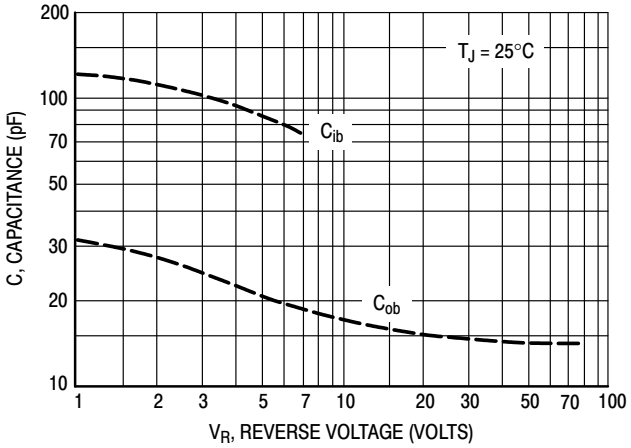



**Figure 11. Capacitance**

**ORDERING INFORMATION**

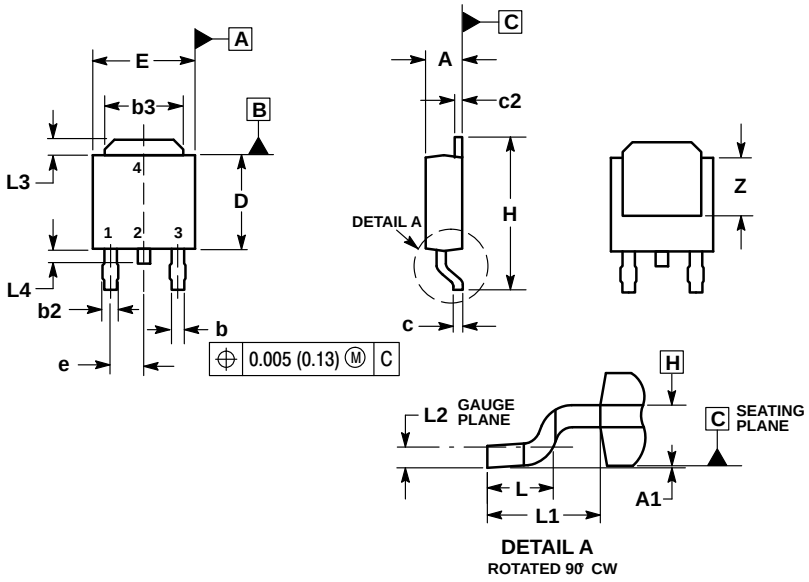
| Device | Package Type | Package | Shipping† |
|---|---|---|---|
| MJD243G | DPAK−3 (Pb−Free) | 369C | 75 Units / Rail |
| MJD243T4G | DPAK−3 (Pb−Free) | 369C | 2,500 / Tape & Reel |
| NJVMJD243T4G* | DPAK−3 (Pb−Free) | 369C | 2,500 / Tape & Reel |
| MJD253−1G | IPAK (Pb−Free) | 369D | 75 Units / Rail |
| MJD253T4G | DPAK−3 (Pb−Free) | 369C | 2,500 / Tape & Reel |
| NJVMJD253T4G* | DPAK−3 (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

# MJD243 (NPN), MJD253 (PNP)

## PACKAGE DIMENSIONS

**DPAK−3**
CASE 369C
ISSUE D

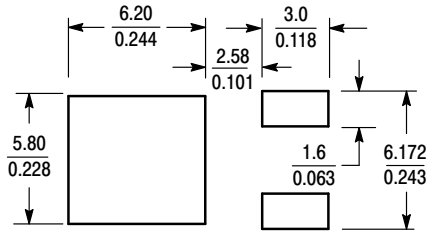



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES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

| | 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

## SOLDERING FOOTPRINT*



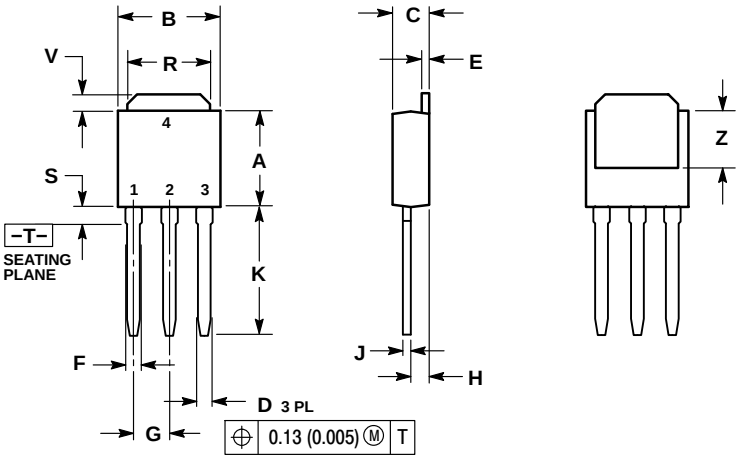

SCALE 3:1 (mm / inches)

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

# MJD243 (NPN), MJD253 (PNP)

## PACKAGE DIMENSIONS

**IPAK**
CASE 369D
ISSUE C




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



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