

## Complementary Power Transistors

### DPAK For Surface Mount Applications

Designed for general purpose amplifier and low speed switching applications.

- Lead Formed for Surface Mount Applications in Plastic Sleeves (No Suffix)
- Straight Lead Version in Plastic Sleeves ("–1" Suffix)
- Lead Formed Version Available in 16 mm Tape and Reel ("T4" Suffix)
- Electrically Similar to MJE2955 and MJE3055
- DC Current Gain Specified to 10 Amperes
- High Current Gain–Bandwidth Product —  $f_T = 2.0$  MHz (Min) @  $I_C = 500$  mAdc

#### MAXIMUM RATINGS

| Rating                                                                                    | Symbol         | Value           | Unit                         |
|-------------------------------------------------------------------------------------------|----------------|-----------------|------------------------------|
| Collector–Emitter Voltage                                                                 | $V_{CEO}$      | 60              | Vdc                          |
| Collector–Base Voltage                                                                    | $V_{CB}$       | 70              | Vdc                          |
| Emitter–Base Voltage                                                                      | $V_{EB}$       | 5               | Vdc                          |
| Collector Current                                                                         | $I_C$          | 10              | Adc                          |
| Base Current                                                                              | $I_B$          | 6               | Adc                          |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$     | $P_D^\dagger$  | 20<br>0.16      | Watts<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation (1) @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.75<br>0.014   | Watts<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                       | $T_J, T_{stg}$ | $-55$ to $+150$ | $^\circ\text{C}$             |

#### 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 (1) | $R_{\theta JA}$ | 71.4 | $^\circ\text{C/W}$ |

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

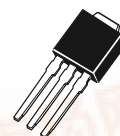
$^\dagger$ Safe Area Curves are indicated by Figure 1. Both limits are applicable and must be observed.

**NPN**  
**MJD2955**  
**PNP**  
**MJD3055**

**SILICON**  
**POWER TRANSISTORS**  
**10 AMPERES**  
**60 VOLTS**  
**20 WATTS**

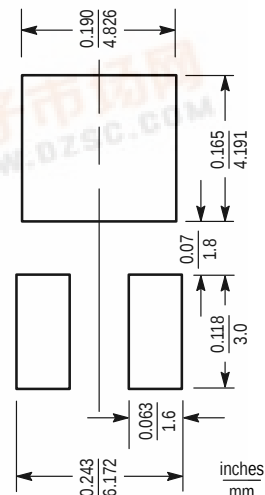


CASE 369A-13



CASE 369-07

#### MINIMUM PAD SIZES RECOMMENDED FOR SURFACE MOUNTED APPLICATIONS



## MJD2955 MJD3055

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

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

#### OFF CHARACTERISTICS

|                                                                                                                                                                                        |                |        |           |                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------|-----------|-----------------|
| Collector–Emitter Sustaining Voltage (1)<br>( $I_C = 30\text{ mAdc}$ , $I_B = 0$ )                                                                                                     | $V_{CEO(sus)}$ | 60     | —         | Vdc             |
| Collector Cutoff Current ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ )                                                                                                                      | $I_{CEO}$      | —      | 50        | $\mu\text{Adc}$ |
| Collector Cutoff Current<br>( $V_{CE} = 70\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )<br>( $V_{CE} = 70\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ ) | $I_{CEX}$      | —<br>— | 0.02<br>2 | mAdc            |
| Collector Cutoff Current<br>( $V_{CB} = 70\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 70\text{ Vdc}$ , $I_E = 0$ , $T_C = 150^\circ\text{C}$ )                                           | $I_{CBO}$      | —<br>— | 0.02<br>2 | mAdc            |
| Emitter Cutoff Current ( $V_{BE} = 5\text{ Vdc}$ , $I_C = 0$ )                                                                                                                         | $I_{EBO}$      | —      | 0.5       | mAdc            |

#### ON CHARACTERISTICS

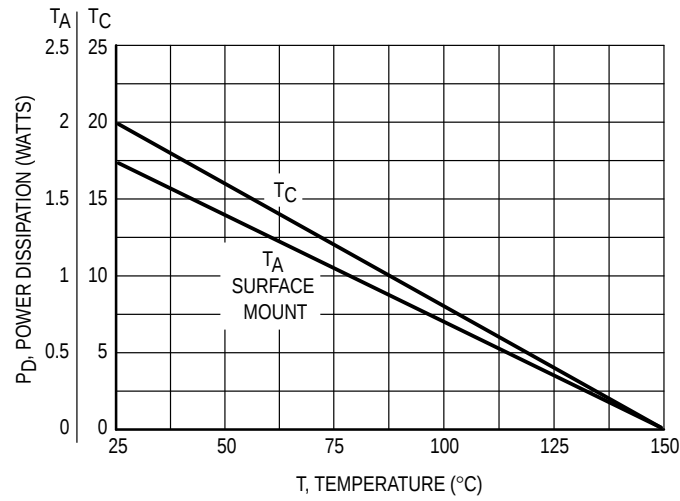
|                                                                                                                                                     |               |         |          |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|----------|-----|
| DC Current Gain (1)<br>( $I_C = 4\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )<br>( $I_C = 10\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )                    | $h_{FE}$      | 20<br>5 | 100<br>— | —   |
| Collector–Emitter Saturation Voltage (1)<br>( $I_C = 4\text{ Adc}$ , $I_B = 0.4\text{ Adc}$ )<br>( $I_C = 10\text{ Adc}$ , $I_B = 3.3\text{ Adc}$ ) | $V_{CE(sat)}$ | —<br>—  | 1.1<br>8 | Vdc |
| Base–Emitter On Voltage (1)<br>( $I_C = 4\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )                                                                   | $V_{BE(on)}$  | —       | 1.8      | Vdc |

#### DYNAMIC CHARACTERISTICS

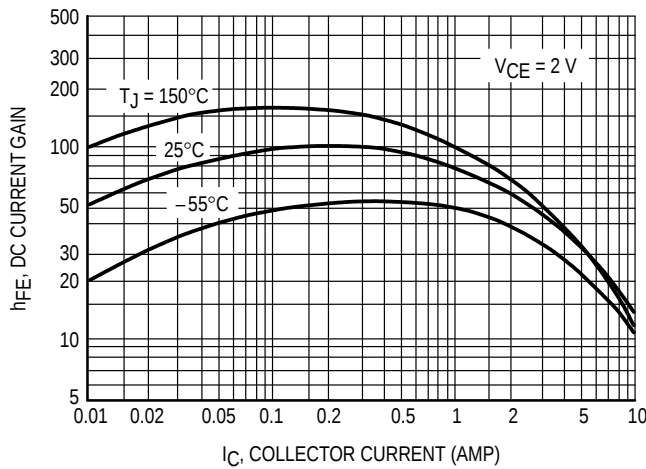
|                                                                                                                   |       |   |   |     |
|-------------------------------------------------------------------------------------------------------------------|-------|---|---|-----|
| Current–Gain — Bandwidth Product<br>( $I_C = 500\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 500\text{ kHz}$ ) | $f_T$ | 2 | — | MHz |
|-------------------------------------------------------------------------------------------------------------------|-------|---|---|-----|

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

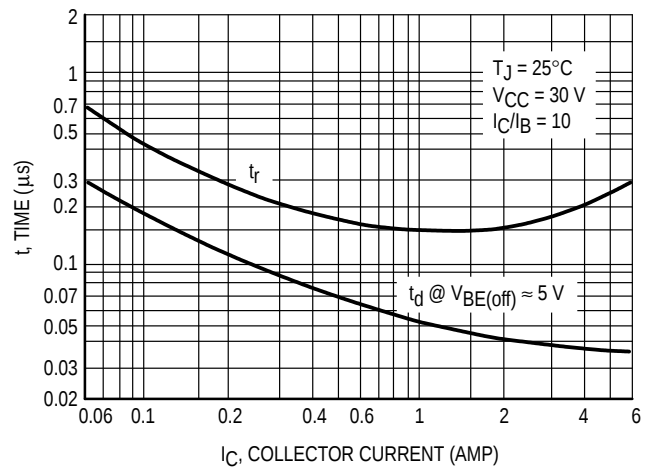
**TYPICAL CHARACTERISTICS**



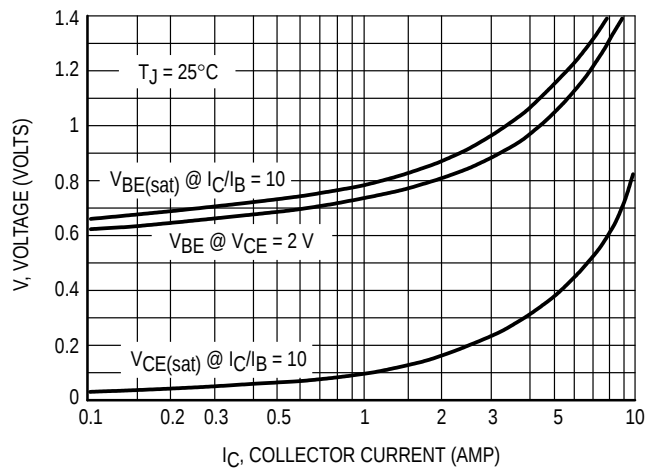
**Figure 1. Power Derating**



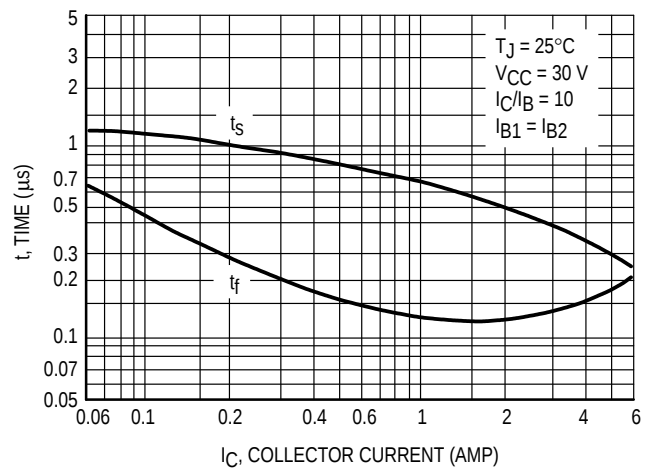
**Figure 2. DC Current Gain**



**Figure 3. Turn-On Time**



**Figure 4. "On" Voltages, MJD3055**



**Figure 5. Turn-Off Time**

## MJD2955 MJD3055

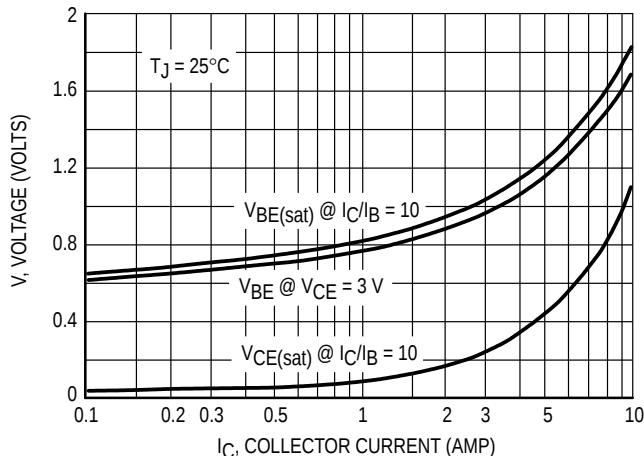


Figure 6. "On" Voltages, MJD2955

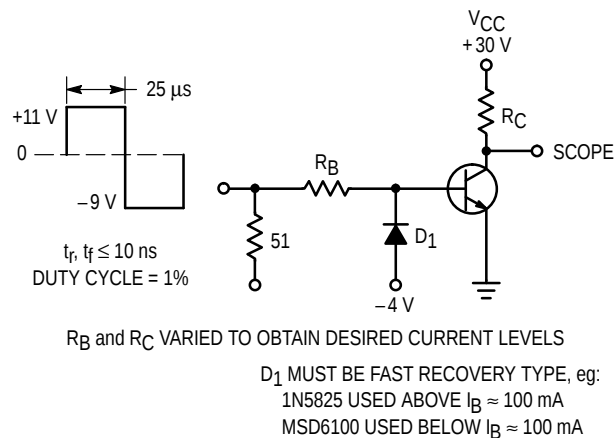


Figure 7. Switching Time Test Circuit

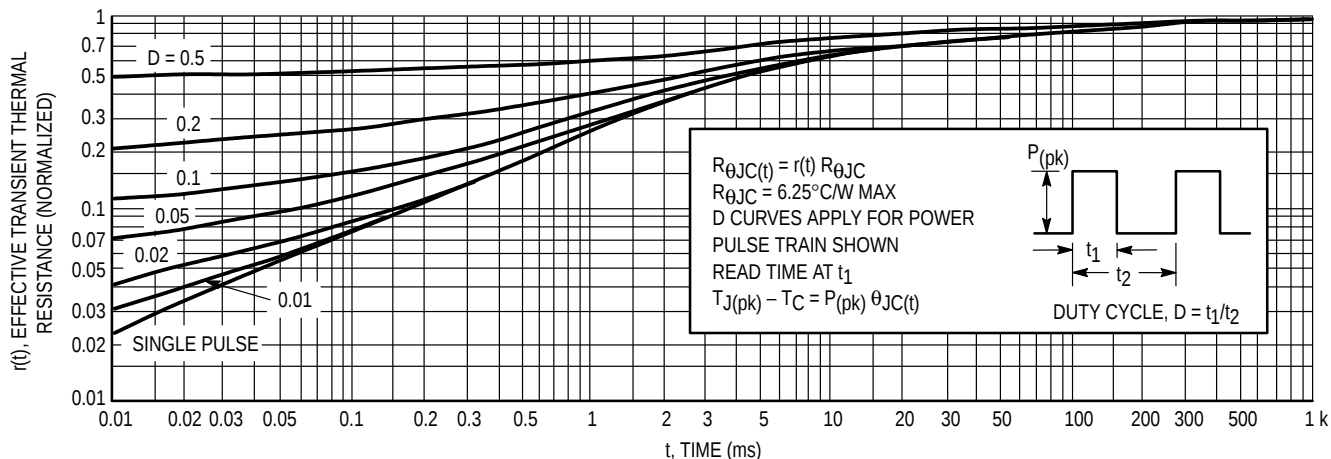


Figure 8. Thermal Response

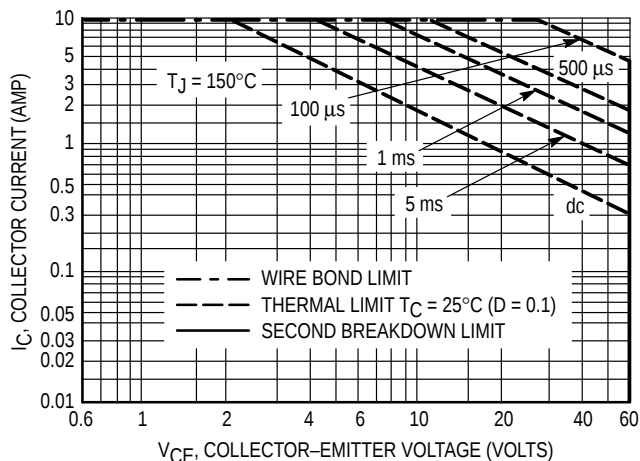


Figure 9. Maximum Forward Bias Safe Operating Area

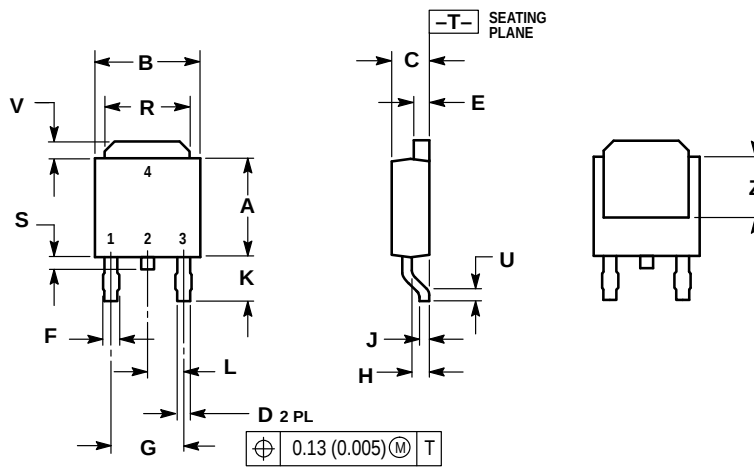
## FORWARD BIAS SAFE OPERATING AREA INFORMATION

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

# MJD2955 MJD3055

## PACKAGE DIMENSIONS

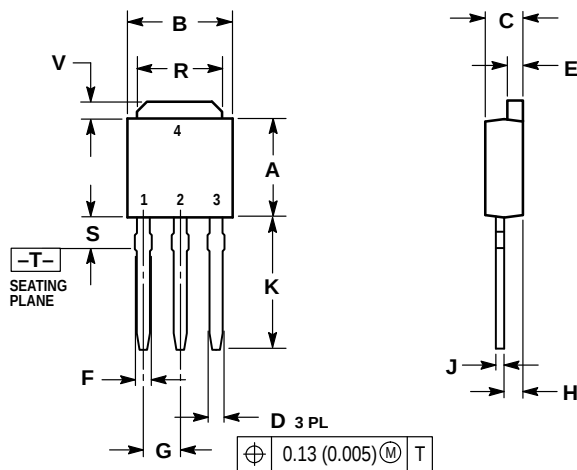


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | MIN       | MAX   | MIN         | MAX  |
| A   | 0.235     | 0.250 | 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   | 0.180 BSC |       | 4.58 BSC    |      |
| H   | 0.034     | 0.040 | 0.87        | 1.01 |
| J   | 0.018     | 0.023 | 0.46        | 0.58 |
| K   | 0.102     | 0.114 | 2.60        | 2.89 |
| L   | 0.090 BSC |       | 2.29 BSC    |      |
| R   | 0.175     | 0.215 | 4.45        | 5.46 |
| S   | 0.020     | 0.050 | 0.51        | 1.27 |
| U   | 0.020     | —     | 0.51        | —    |
| V   | 0.030     | 0.050 | 0.77        | 1.27 |
| Z   | 0.138     | —     | 3.51        | —    |

- STYLE 1:
1. BASE
  2. COLLECTOR
  3. EMITTER
  4. COLLECTOR

## CASE 369A-13 ISSUE W



- NOTES:
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  2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | 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:
1. BASE
  2. COLLECTOR
  3. EMITTER
  4. COLLECTOR

## CASE 369-07 ISSUE K

## MJD2955 MJD3055

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