

# Complementary Silicon Plastic Power Transistors

... designed for use in general-purpose amplifier and switching applications.

- DC Current Gain Specified to 10 Amperes
- High Current Gain — Bandwidth Product —  
 $f_T = 2.0 \text{ MHz (Min) @ } I_C = 500 \text{ mA dc}$

## MAXIMUM RATINGS

| Rating  | Symbol          | Value       | Unit                         |
|---|-----------------|-------------|------------------------------|
| Collector-Emitter Voltage   | $V_{CEO}$       | 60          | Vdc                          |
| Collector-Base Voltage  | $V_{CB}$        | 70          | Vdc                          |
| Emitter-Base Voltage  | $V_{EB}$        | 5.0         | Vdc                          |
| Collector Current   | $I_C$           | 10          | Adc                          |
| Base Current  | $I_B$           | 6.0         | Adc                          |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$<br>MJE3055T, MJE2955T | $P_{D\ddagger}$ | 75<br>0.6   | 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

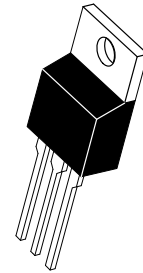
| Characteristic                       | Symbol        | Max  | Unit               |
|--------------------------------------|---------------|------|--------------------|
| Thermal Resistance, Junction to Case | $\theta_{JC}$ | 1.67 | $^\circ\text{C/W}$ |

†Safe Area Curves are indicated by Figure 1. Both limits are applicable and must be observed.

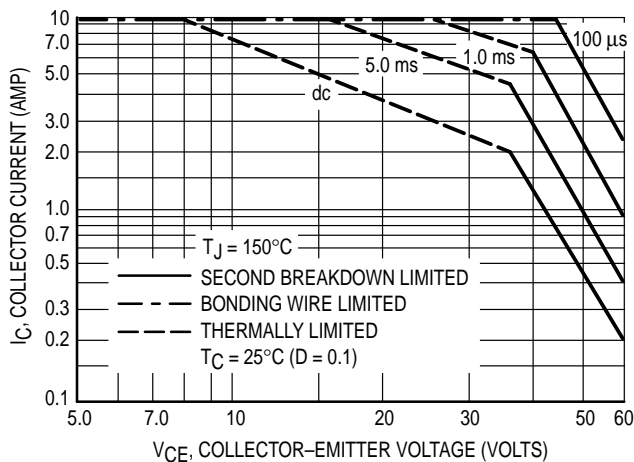
**PNP**  
**MJE2955T\***  
**NPN**  
**MJE3055T\***

\*Motorola Preferred Device

**10 AMPERE**  
**COMPLEMENTARY**  
**SILICON**  
**POWER TRANSISTORS**  
**60 VOLTS**  
**75 WATTS**



**CASE 221A-06**  
**TO-220AB**



**Figure 1. Active-Region 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 1 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  $T_{J(pk)} \leq 150^\circ\text{C}$ . At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown. (See AN415A)

Preferred devices are Motorola recommended choices for future use and best overall value.

# MJE2955T MJE3055T

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

| Characteristic   | Symbol         | Min       | Max        | Unit            |
|--|----------------|-----------|------------|-----------------|
| <b>OFF CHARACTERISTICS</b>   |                |           |            |                 |
| Collector–Emitter Sustaining Voltage (1) ( $I_C = 200\text{ mAdc}$ , $I_B = 0$ )   | $V_{CEO(sus)}$ | 60        | —          | Vdc             |
| Collector Cutoff Current ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ )  | $I_{CEO}$      | —         | 700        | $\mu\text{Adc}$ |
| Collector Cutoff Current<br>( $V_{CE} = 70\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )<br>( $V_{CE} = 70\text{ Vdc}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ ) | $I_{CEX}$      | —         | 1.0<br>5.0 | mAdc            |
| Collector Cutoff Current<br>( $V_{CB} = 70\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 70\text{ Vdc}$ , $I_E = 0$ , $T_C = 150^\circ\text{C}$ )   | $I_{CBO}$      | —         | 1.0<br>10  | mAdc            |
| Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )   | $I_{EBO}$      | —         | 5.0        | mAdc            |
| <b>ON CHARACTERISTICS</b>  |                |           |            |                 |
| DC Current Gain (1)<br>( $I_C = 4.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )<br>( $I_C = 10\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )   | $h_{FE}$       | 20<br>5.0 | 100<br>—   | —               |
| Collector–Emitter Saturation Voltage (1)<br>( $I_C = 4.0\text{ Adc}$ , $I_B = 0.4\text{ Adc}$ )<br>( $I_C = 10\text{ Adc}$ , $I_B = 3.3\text{ Adc}$ )                                  | $V_{CE(sat)}$  | —         | 1.1<br>8.0 | Vdc             |
| Base–Emitter On Voltage (1) ( $I_C = 4.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )   | $V_{BE(on)}$   | —         | 1.8        | Vdc             |
| <b>DYNAMIC CHARACTERISTICS</b>   |                |           |            |                 |
| Current–Gain–Bandwidth Product ( $I_C = 500\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 500\text{ kHz}$ )   | $f_T$          | 2.0       | —          | MHz             |

(1) Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 20\%$ .

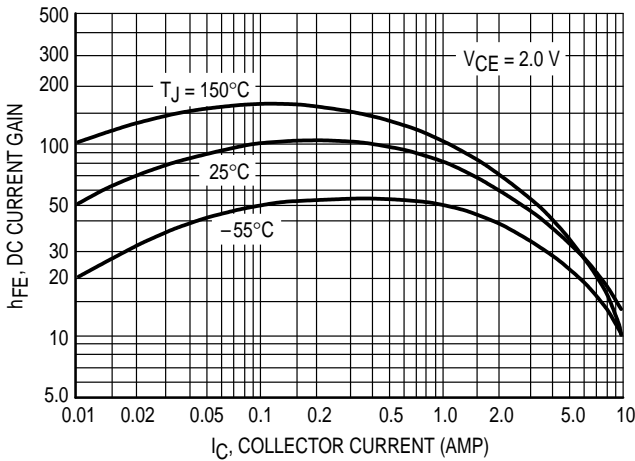


Figure 2. DC Current Gain

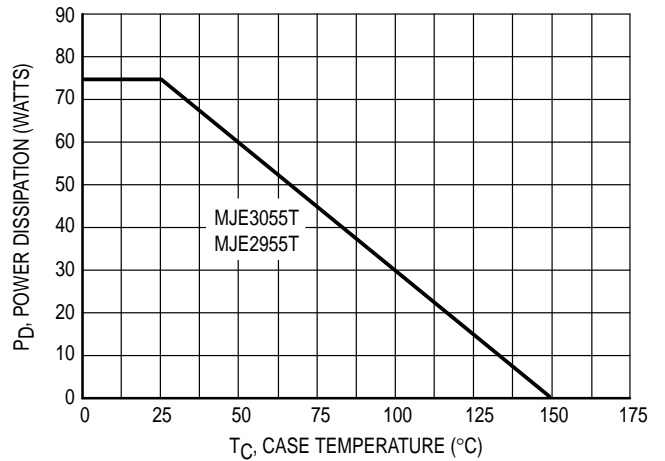


Figure 3. Power Derating

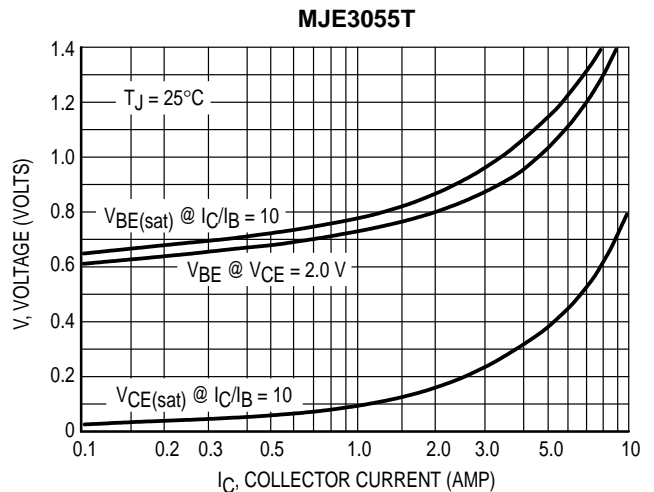
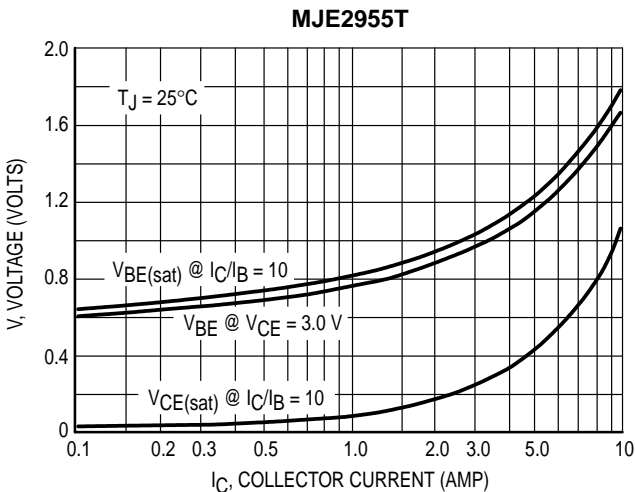
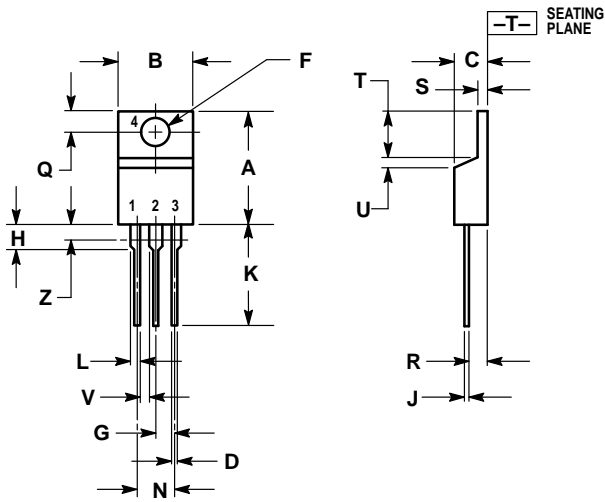


Figure 4. "On" Voltages

PACKAGE DIMENSIONS




- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.570  | 0.620 | 14.48       | 15.75 |
| B   | 0.380  | 0.405 | 9.66        | 10.28 |
| C   | 0.160  | 0.190 | 4.07        | 4.82  |
| D   | 0.025  | 0.035 | 0.64        | 0.88  |
| F   | 0.142  | 0.147 | 3.61        | 3.73  |
| G   | 0.095  | 0.105 | 2.42        | 2.66  |
| H   | 0.110  | 0.155 | 2.80        | 3.93  |
| J   | 0.018  | 0.025 | 0.46        | 0.64  |
| K   | 0.500  | 0.562 | 12.70       | 14.27 |
| L   | 0.045  | 0.060 | 1.15        | 1.52  |
| N   | 0.190  | 0.210 | 4.83        | 5.33  |
| Q   | 0.100  | 0.120 | 2.54        | 3.04  |
| R   | 0.080  | 0.110 | 2.04        | 2.79  |
| S   | 0.045  | 0.055 | 1.15        | 1.39  |
| T   | 0.235  | 0.255 | 5.97        | 6.47  |
| U   | 0.000  | 0.050 | 0.00        | 1.27  |
| V   | 0.045  | —     | 1.15        | —     |
| Z   | —      | 0.080 | —           | 2.04  |

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

CASE 221A-06  
 TO-220AB  
 ISSUE Y

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