

## COMPLEMENTARY SILICON POWER TRANSISTORS

The MJ15003 and MJ15004 are power base power transistors designed for high power audio, disk head positioners, linear amplifiers, switching regulators, and other linear applications.

### FEATURES:

- \* High Power Dissipation  
 $P_D = 250 \text{ W}$  ( $T_C = 25^\circ\text{C}$ )
- \* High DC Current Gain and Low Saturation Voltage  
 $hFE = 25(\text{Min})$  @  $I_C = 5.0 \text{ A}$ ,  $V_{CE} = 2.0 \text{ V}$
- \* For Low Distortion Complementary Designs

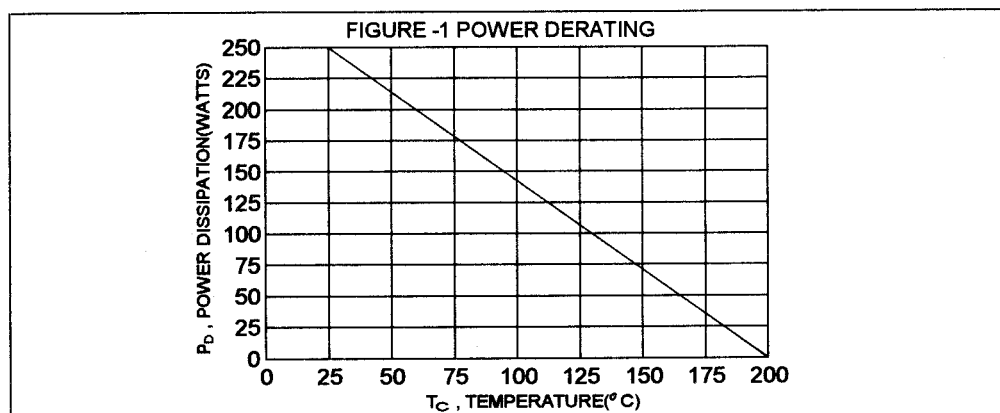
### MAXIMUM RATINGS

| Characteristic                                                                        | Symbol            | Rating      | Unit                     |
|---------------------------------------------------------------------------------------|-------------------|-------------|--------------------------|
| Collector-Emitter Voltage                                                             | $V_{CEQ(SUS)}$    | 140         | V                        |
| Collector-Base Voltage                                                                | $V_{CBO}$         | 140         | V                        |
| Emitter-Base Voltage                                                                  | $V_{EBO}$         | 5.0         | V                        |
| Collector Current-Continuous<br>Peak (1)                                              | $I_C$<br>$I_{CM}$ | 20<br>30    | A                        |
| Base Current-Continuous<br>Peak (1)                                                   | $I_B$<br>$I_{BM}$ | 5.0<br>10   | A                        |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 250<br>1.43 | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{STG}$    | -65 to +200 | $^\circ\text{C}$         |

(1) Pulse Test: Pulse width = 5 ms, Duty Cycle < 10%

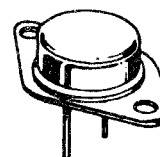
### THERMAL CHARACTERISTICS

| Characteristic                      | Symbol          | Max  | Unit               |
|-------------------------------------|-----------------|------|--------------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 0.70 | $^\circ\text{C/W}$ |

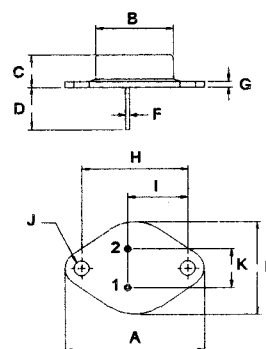


**NPN PNP**  
**MJ15003 MJ15004**

**20 AMPERE  
COMPLEMENTARY SILICON  
POWER TRANSISTORS  
140 VOLTS  
250 WATTS**



**TO-3**



PIN 1. BASE  
2. EMITTER  
COLLECTOR (CASE)

| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 38.75       | 39.96 |
| B   | 19.28       | 22.23 |
| C   | 7.96        | 9.28  |
| D   | 11.18       | 12.19 |
| E   | 25.20       | 26.67 |
| F   | 0.92        | 1.09  |
| G   | 1.38        | 1.62  |
| H   | 29.90       | 30.40 |
| I   | 16.64       | 17.30 |
| J   | 3.88        | 4.36  |
| K   | 10.67       | 11.18 |

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

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

**OFF CHARACTERISTICS**

|                                                                                                                                                                                |               |     |            |                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|------------|---------------------|
| Collector - Emitter Sustaining Voltage (2)<br>( $I_C = 200\text{ mA}$ , $I_B = 0$ )                                                                                            | $V_{CE(sus)}$ | 140 |            | V                   |
| Collector Cutoff Current<br>( $V_{CE} = 140\text{ V}$ , $I_B = 0$ )                                                                                                            | $I_{CO}$      |     | 250        | $\mu\text{A}$       |
| Collector Cutoff Current<br>( $V_{CE} = 140\text{ V}$ , $V_{BE(on)} = 1.5\text{ V}$ )<br>( $V_{CE} = 140\text{ V}$ , $V_{BE(on)} = 1.5\text{ V}$ , $T_C = 150^\circ\text{C}$ ) | $I_{CEX}$     |     | 100<br>2.0 | $\mu\text{A}$<br>mA |
| Emitter Cutoff Current<br>( $V_{EB} = 5.0\text{ V}$ , $I_C = 0$ )                                                                                                              | $I_{EBO}$     |     | 100        | $\mu\text{A}$       |

**ON CHARACTERISTICS (2)**

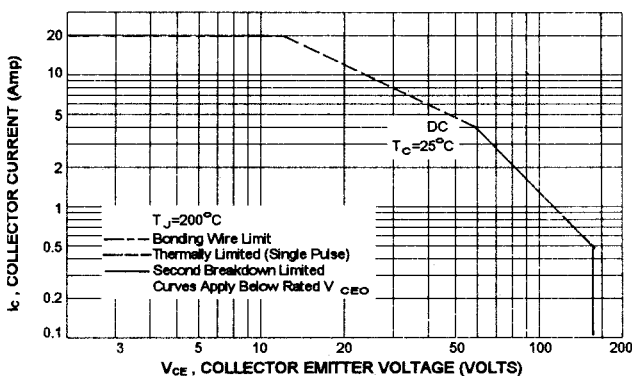
|                                                                                            |               |    |     |   |
|--------------------------------------------------------------------------------------------|---------------|----|-----|---|
| DC Current Gain<br>( $I_C = 5.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )                      | $h_{FE}$      | 25 | 150 |   |
| Collector - Emitter Saturation Voltage<br>( $I_C = 5.0\text{ A}$ , $I_B = 500\text{ mA}$ ) | $V_{CE(sat)}$ |    | 1.0 | V |
| Base - Emitter On Voltage<br>( $I_C = 5.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )            | $V_{BE(on)}$  |    | 2.0 | V |

**DYNAMIC CHARACTERISTICS**

|                                                                                                                   |          |     |      |     |
|-------------------------------------------------------------------------------------------------------------------|----------|-----|------|-----|
| Current Gain - Bandwidth Product (3)<br>( $I_C = 500\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 0.5\text{ MHz}$ ) | $f_T$    | 2.0 |      | MHz |
| Output capacitance<br>( $V_{CB} = 4.0\text{ V}$ , $I_E = 0$ , $f = 1\text{ MHz}$ )                                | $C_{ob}$ |     | 1000 | pF  |

(2) Pulse Test: Pulse width =  $300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ (3)  $f_T = |h_{fe}| \cdot f_{test}$ 

FIG-2 FORWARD BIAS SAFE OPERATING AREA



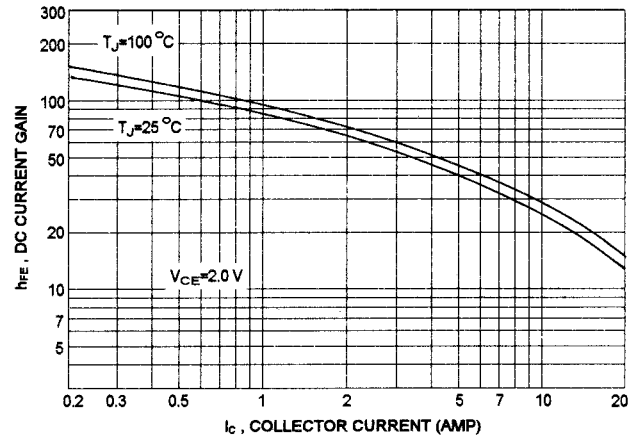
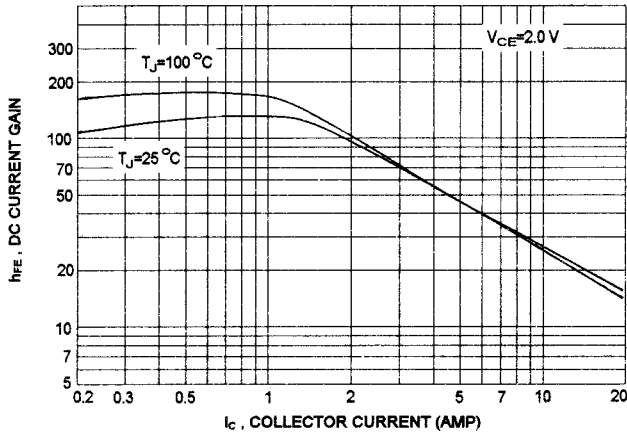
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of FIG-2 is base on  $T_{J(PK)} = 200^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

MJ15003

DC CURRENT GAIN

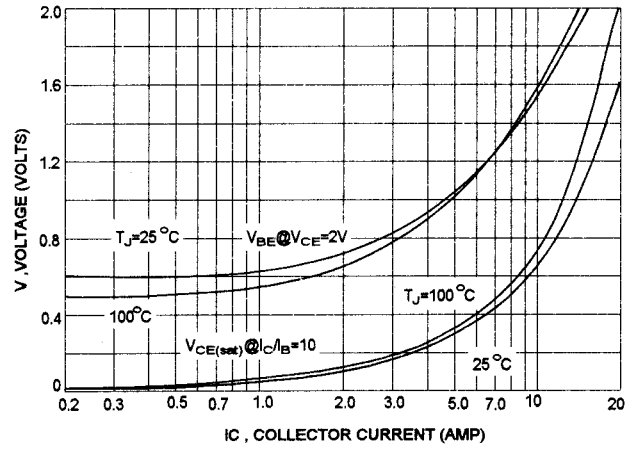
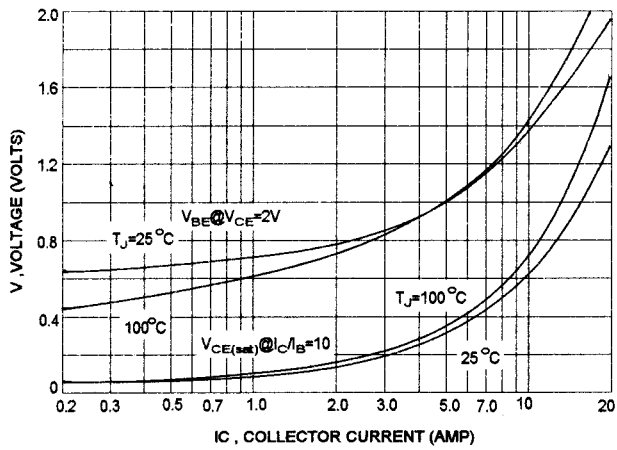
MJ15004



"ON" VOLTAGE

MJ15003

MJ15004



CAPACITANCES

CURRENT GAIN- BANDWIDTH PRODUCT

