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Complementary Silicon Power Transistors

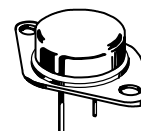
The MJ15003 and MJ15004 are PowerBase power transistors designed for high power audio, disk head positioners and other linear applications.

- High Safe Operating Area (100% Tested) —
250 W @ 50 V
- For Low Distortion Complementary Designs
- High DC Current Gain —
 $h_{FE} = 25$ (Min) @ $I_C = 5$ Adc

NPN
MJ15003*
PNP
MJ15004*

*Motorola Preferred Device

20 AMPERE
POWER TRANSISTORS
COMPLEMENTARY
SILICON
140 VOLTS
250 WATTS



CASE 1-07
TO-204AA
(TO-3)

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|----------------|-------------|------------------------------|
| Collector-Emitter Voltage | V_{CEO} | 140 | Vdc |
| Collector-Base Voltage | V_{CB0} | 140 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 5 | Vdc |
| Collector Current — Continuous | I_C | 20 | Adc |
| Base Current — Continuous | I_B | 5 | Adc |
| Emitter Current — Continuous | I_E | 25 | Adc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 250 1.43 | Watts W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | -65 to +200 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|------|---------------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 0.70 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes: 1/16" from Case for ≤ 10 seconds | T_L | 265 | $^\circ\text{C}$ |

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

REV 7

MJ15003 MJ15004

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

| Characteristic | Symbol | Min | Max | Unit |
|--|---------------|--------|----------|-------------------------|
| OFF CHARACTERISTICS | | | | |
| Collector Emitter Sustaining Voltage (1) ($I_C = 200\text{ mAdc}$, $I_B = 0$) | $V_{CE(sus)}$ | 140 | — | Vdc |
| Collector Cutoff Current ($V_{CE} = 140\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 140\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) | I_{CEX} | — — | 100 2 | μAdc mAdc |
| Collector Cutoff Current ($V_{CE} = 140\text{ Vdc}$, $I_B = 0$) | I_{CEO} | — | 250 | μAdc |
| Emitter Cutoff Current ($V_{EB} = 5\text{ Vdc}$, $I_C = 0$) | I_{EBO} | — | 100 | μAdc |

SECOND BREAKDOWN

| | | | | |
|--|-----------|--------|--------|-----|
| Second Breakdown Collector Current with Base Forward Biased ($V_{CE} = 50\text{ Vdc}$, $t = 1\text{ s}$ (non repetitive)) ($V_{CE} = 100\text{ Vdc}$, $t = 1\text{ s}$ (non repetitive)) | $I_{S/b}$ | 5 1 | — — | Adc |
|--|-----------|--------|--------|-----|

ON CHARACTERISTICS

| | | | | |
|---|---------------|----|-----|-----|
| DC Current Gain ($I_C = 5\text{ Adc}$, $V_{CE} = 2\text{ Vdc}$) | h_{FE} | 25 | 150 | |
| Collector Emitter Saturation Voltage ($I_C = 5\text{ Adc}$, $I_B = 0.5\text{ Adc}$) | $V_{CE(sat)}$ | — | 1 | Vdc |
| Base Emitter On Voltage ($I_C = 5\text{ Adc}$, $V_{CE} = 2\text{ Vdc}$) | $V_{BE(on)}$ | — | 2 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|---|----------|---|------|-----|
| Current Gain — Bandwidth Product ($I_C = 0.5\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 0.5\text{ MHz}$) | f_T | 2 | — | MHz |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 1\text{ MHz}$) | C_{ob} | — | 1000 | pF |

(1) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2\%$.

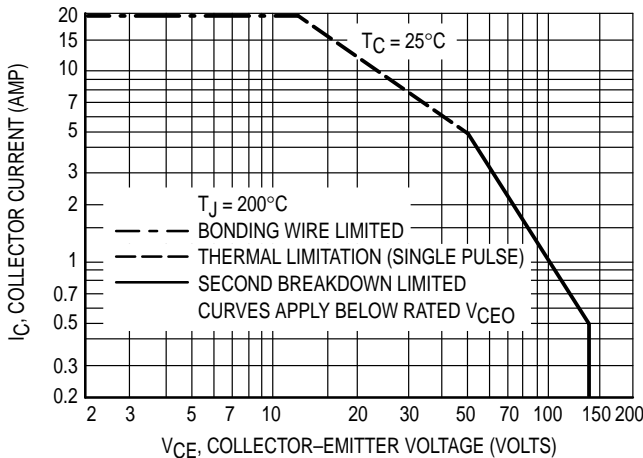
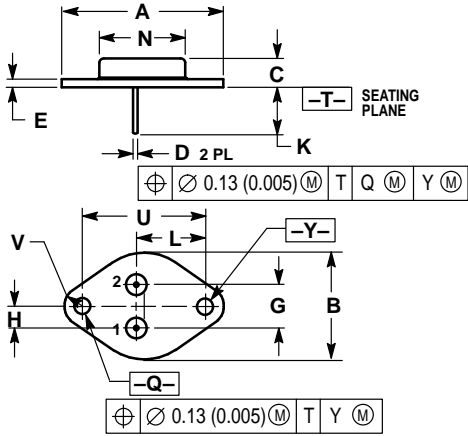


Figure 1. Active-Region Safe Operating Area

There are two limitations on the powerhandling 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 $T_{J(pk)} = 200^\circ\text{C}$; T_C is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

PACKAGE DIMENSIONS




- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. ALL RULES AND NOTES ASSOCIATED WITH REFERENCED TO-204AA OUTLINE SHALL APPLY.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.550 REF | | 39.37 REF | |
| B | — | 1.050 | — | 26.67 |
| C | 0.250 | 0.335 | 6.35 | 8.51 |
| D | 0.038 | 0.043 | 0.97 | 1.09 |
| E | 0.055 | 0.070 | 1.40 | 1.77 |
| G | 0.430 BSC | | 10.92 BSC | |
| H | 0.215 BSC | | 5.46 BSC | |
| K | 0.440 | 0.480 | 11.18 | 12.19 |
| L | 0.665 BSC | | 16.89 BSC | |
| N | — | 0.830 | — | 21.08 |
| Q | 0.151 | 0.165 | 3.84 | 4.19 |
| U | 1.187 BSC | | 30.15 BSC | |
| V | 0.131 | 0.188 | 3.33 | 4.77 |

STYLE 1:
 PIN 1: BASE
 2: EMITTER
 CASE: COLLECTOR

CASE 1-07
 TO-204AA (TO-3)
 ISSUE Z

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