

**MJ410**

**5 AMPERE  
POWER TRANSISTOR  
NPN SILICON  
200 VOLTS  
100 WATTS**

# High Voltage NPN Silicon Transistors

... designed for medium to high voltage inverters, converters, regulators and switching circuits.

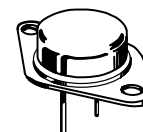
- High Collector–Emitter Voltage —  
 $V_{CEO} = 200$  Volts
- DC Current Gain Specified @ 1.0 and 2.5 Adc
- Low Collector–Emitter Saturation Voltage —  
 $V_{CE(sat)} = 0.8$  Vdc @  $I_C = 1.0$  Adc

**MAXIMUM RATINGS**

| Rating   | Symbol    | Value       | Unit             |
|--|-----------|-------------|------------------|
| Collector–Emitter Voltage  | $V_{CEO}$ | 200         | Vdc              |
| Collector–Base Voltage   | $V_{CB}$  | 200         | Vdc              |
| Emitter–Base Voltage   | $V_{EB}$  | 5.0         | Vdc              |
| Collector Current — Continuous   | $I_C$     | 5.0         | Adc              |
| — Peak   |           | 10          |                  |
| Base Current   | $I_B$     | 2.0         | Adc              |
| Total Device Dissipation @ $T_C = 75^\circ\text{C}$<br>Derate above $75^\circ\text{C}$ | $P_D$     | 100         | Watts            |
|  |           | 1.33        |                  |
| Operating Junction Temperature Range   | $T_J$     | -65 to +150 | $^\circ\text{C}$ |
| Storage Temperature Range  | $T_{stg}$ | -65 to +200 | $^\circ\text{C}$ |

**THERMAL CHARACTERISTICS**

| Characteristic                       | Symbol        | Max  | Unit               |
|--------------------------------------|---------------|------|--------------------|
| Thermal Resistance, Junction to Case | $\theta_{JC}$ | 0.75 | $^\circ\text{C/W}$ |



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

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

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

**OFF CHARACTERISTICS**

|  |                |     |      |      |
|--|----------------|-----|------|------|
| Collector–Emitter Sustaining Voltage<br>( $I_C = 100$ mAdc, $I_B = 0$ )                                | $V_{CEO(sus)}$ | 200 | —    | Vdc  |
| Collector Cutoff Current<br>( $V_{CE} = 200$ Vdc, $I_B = 0$ )  | $I_{CEO}$      | —   | 0.25 | mAdc |
| Collector Cutoff Current<br>( $V_{CB} = 200$ Vdc, $V_{EB(off)} = 1.5$ Vdc, $T_C = 125^\circ\text{C}$ ) | $I_{CEX}$      | —   | 0.5  | mAdc |
| Emitter Cutoff Current ( $V_{BE} = 5.0$ Vdc, $I_C = 0$ )   | $I_{EBO}$      | —   | 5.0  | mAdc |

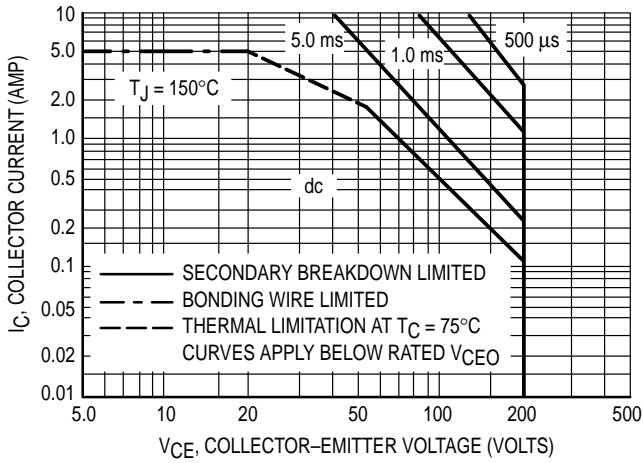
**ON CHARACTERISTICS**

|   |               |          |         |     |
|---|---------------|----------|---------|-----|
| DC Current Gain<br>( $I_C = 1.0$ Adc, $V_{CE} = 5.0$ Vdc)<br>( $I_C = 2.5$ Adc, $V_{CE} = 5.0$ Vdc) | $h_{FE}$      | 30<br>10 | 90<br>— | —   |
| Collector–Emitter Saturation Voltage<br>( $I_C = 1.0$ Adc, $I_B = 0.1$ Adc)                         | $V_{CE(sat)}$ | —        | 0.8     | Vdc |
| Base–Emitter Saturation Voltage<br>( $I_C = 1.0$ Adc, $I_B = 0.1$ Adc)                              | $V_{BE(sat)}$ | —        | 1.2     | Vdc |

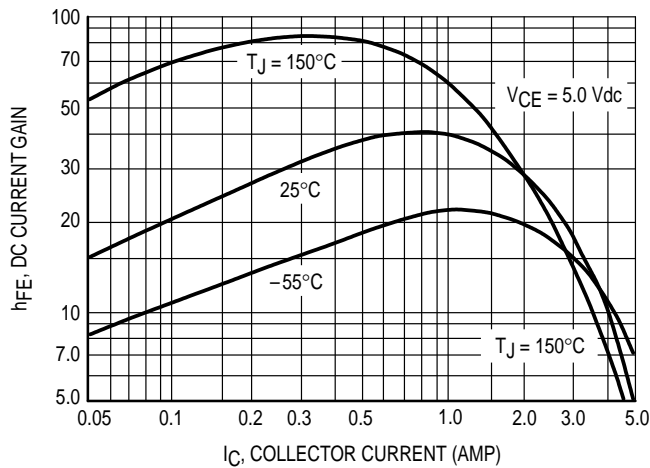
**DYNAMIC CHARACTERISTICS**

|   |       |     |   |     |
|---|-------|-----|---|-----|
| Current–Gain — Bandwidth Product<br>( $I_C = 200$ mAdc, $V_{CE} = 10$ Vdc, $f = 1.0$ MHz) | $f_T$ | 2.5 | — | MHz |
|---|-------|-----|---|-----|

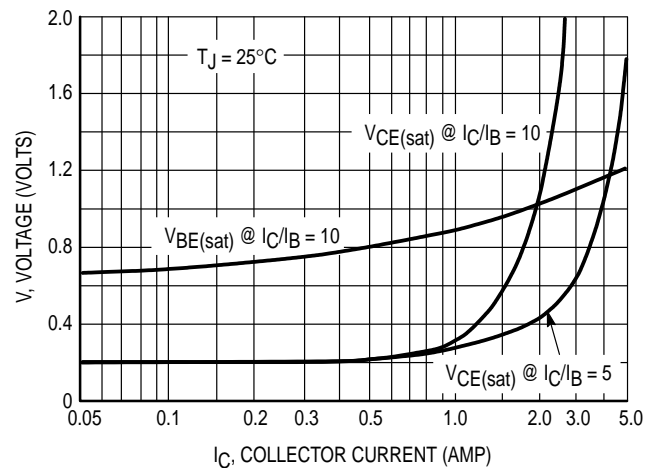
# MJ410



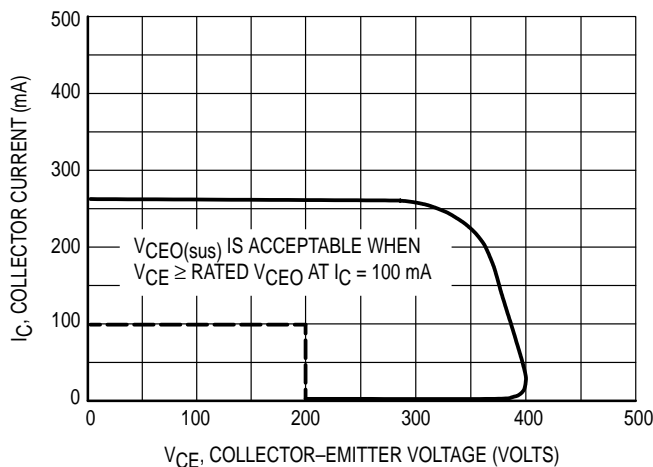
**Figure 1. Active Region Safe Operating Area**



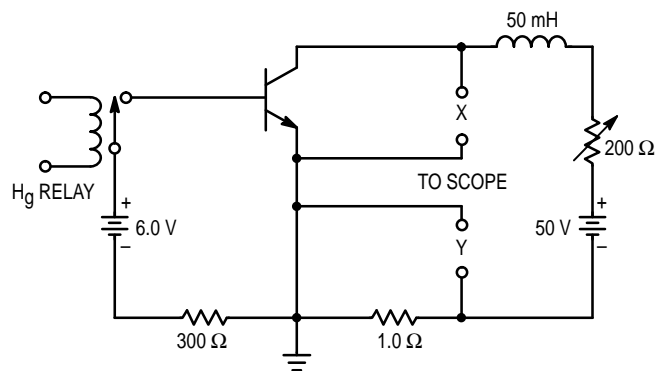
**Figure 2. DC Current Gain**



**Figure 3. "On" Voltages**



**Figure 4. Sustaining Voltage Test Load Line**

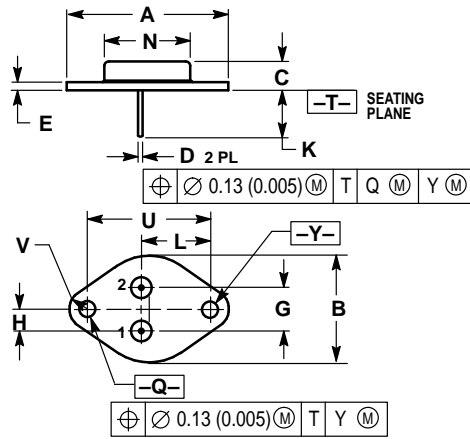


**Figure 5. Sustaining Voltage Test Circuit**

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 5 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Pulse curves are valid for duty cycles of 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 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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