

Complementary Silicon Power Transistors

MJ15001 (NPN), MJ15002 (PNP)

The MJ15001 and MJ15002 are power transistors designed for high power audio, disk head positioners and other linear applications.

Features

- High Safe Operating Area
- For Low Distortion Complementary Designs
- High DC Current Gain
- These Devices are Pb-Free and are RoHS Compliant*

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|----------------|-------------|--------------------------|
| Collector-Emitter Voltage | V_{CEO} | 140 | Vdc |
| Collector-Base Voltage | V_{CBO} | 140 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 5 | Vdc |
| Collector Current – Continuous | I_C | 15 | Adc |
| Base Current – Continuous | I_B | 5 | Adc |
| Emitter Current – Continuous | I_E | 20 | Adc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 200 1.14 | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | -65 to +200 | $^\circ\text{C}$ |

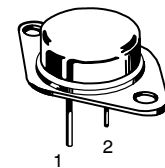
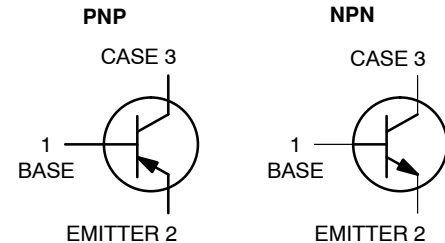
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------|---------------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.875 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering Purposes 1/16" from Case for ≤ 10 secs | T_L | 265 | $^\circ\text{C}$ |

20 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON 140 VOLTS, 250 WATTS

SCHEMATIC



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

MARKING DIAGRAM



MJ1500x = Device Code
 x = 1 or 2
 G = Pb-Free Package
 A = Location Code
 YY = Year
 WW = Work Week
 MEX = Country of Origin

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|----------|-----------------------|-----------------------|
| MJ15001G | TO-204AA (Pb-Free) | 100 Units / Tube |

DISCONTINUED (Note 1)

| | | |
|----------|-----------------------|------------------|
| MJ15002G | TO-204AA (Pb-Free) | 100 Units / Tube |
|----------|-----------------------|------------------|

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

1. **DISCONTINUED:** This device is not recommended for new design. Please contact your onsemi representative for information. The most current information on this device may be available on www.onsemi.com.

*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MJ15001 (NPN), MJ15002 (PNP)

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

| Characteristic | Symbol | Min | Max | Unit |
|--|----------------|------------|------------|-------------------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Sustaining Voltage (Note 1) ($I_C = 200\text{ mAdc}$, $I_B = 0$) | $V_{CEO(sus)}$ | 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 2.0 | 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 ($V_{CE} = 40\text{ Vdc}$, $t = 1\text{ s}$ (non-repetitive)) ($V_{CE} = 100\text{ Vdc}$, $t = 1\text{ s}$ (non-repetitive)) | $I_{S/b}$ | 5.0 0.5 | – – | Adc |
| ON CHARACTERISTICS | | | | |
| DC Current Gain ($I_C = 4\text{ Adc}$, $V_{CE} = 2\text{ Vdc}$) | h_{FE} | 25 | 150 | – |
| Collector-Emitter Saturation Voltage ($I_C = 4\text{ Adc}$, $I_B = 0.4\text{ Adc}$) | $V_{CE(sat)}$ | – | 1.0 | Vdc |
| Base-Emitter On Voltage ($I_C = 4\text{ Adc}$, $V_{CE} = 2\text{ Vdc}$) | $V_{BE(on)}$ | – | 2.0 | 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 | 2.0 | – | 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 $\leq 2\%$.

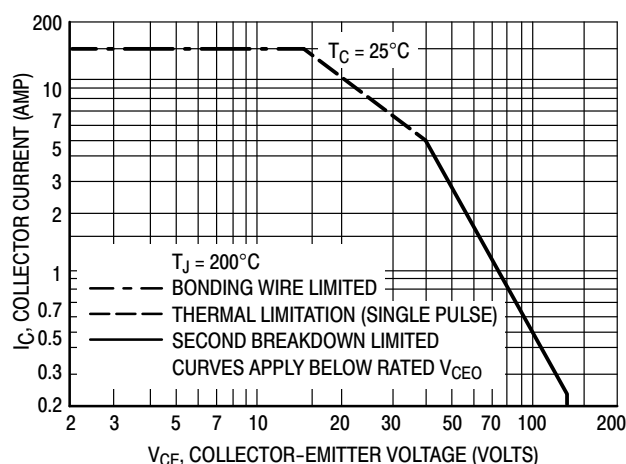


Figure 1. Active-Region Safe Operating Area

There are two limitations on the 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 $T_J(pk) = 200^\circ\text{C}$; 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.

MJ15001 (NPN), MJ15002 (PNP)

TYPICAL CHARACTERISTICS

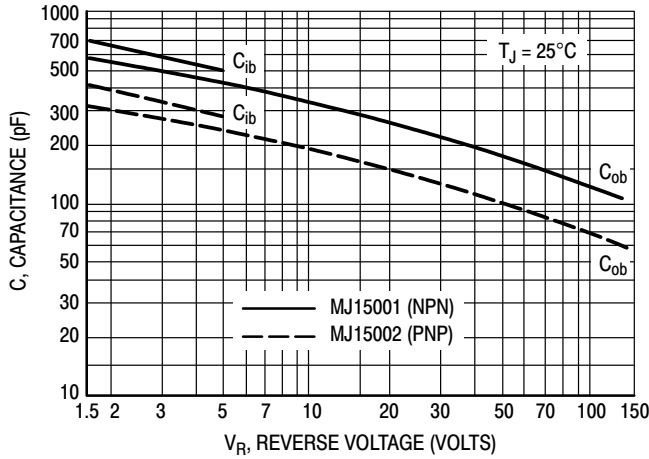


Figure 2. Capacitances

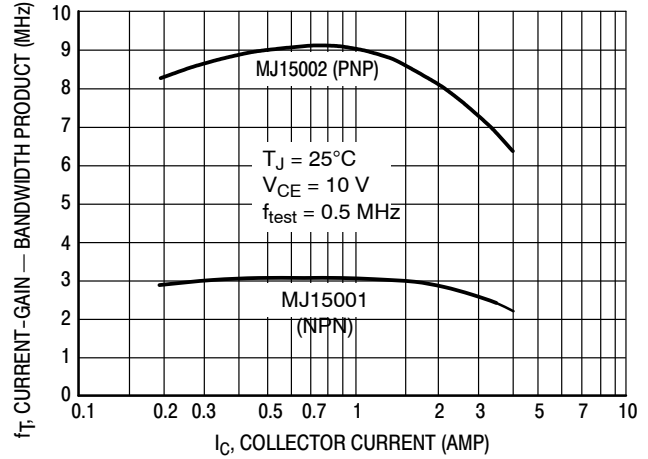


Figure 3. Current-Gain — Bandwidth Product

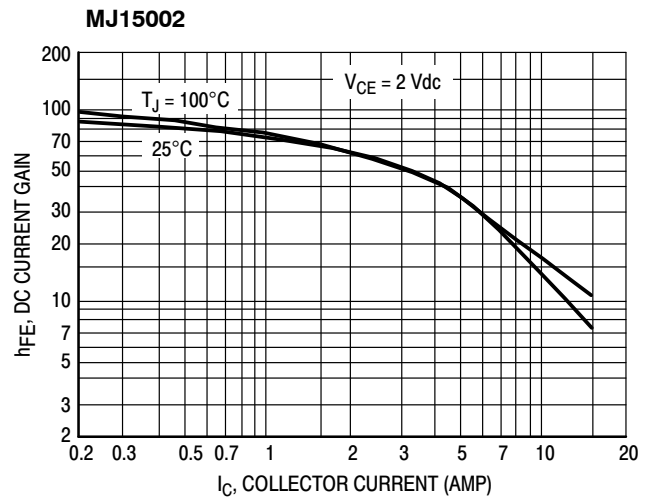
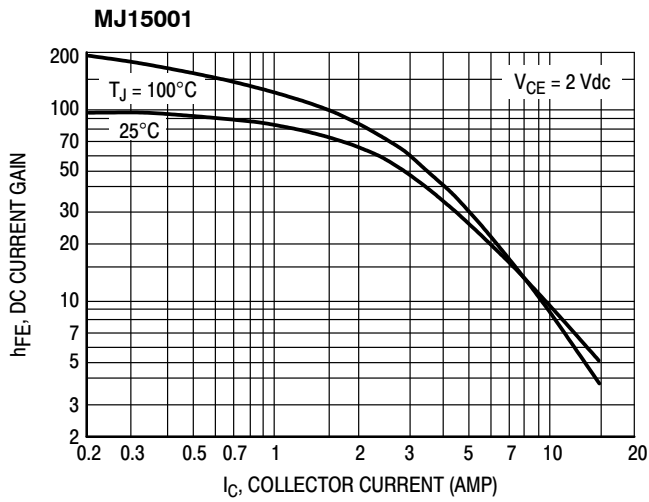


Figure 4. DC Current Gain

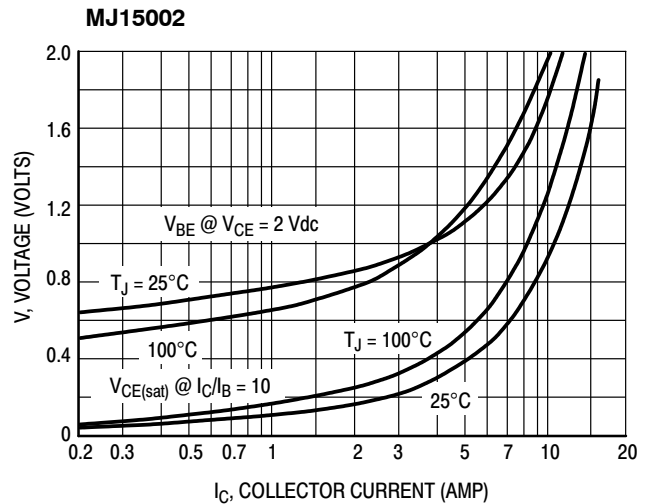
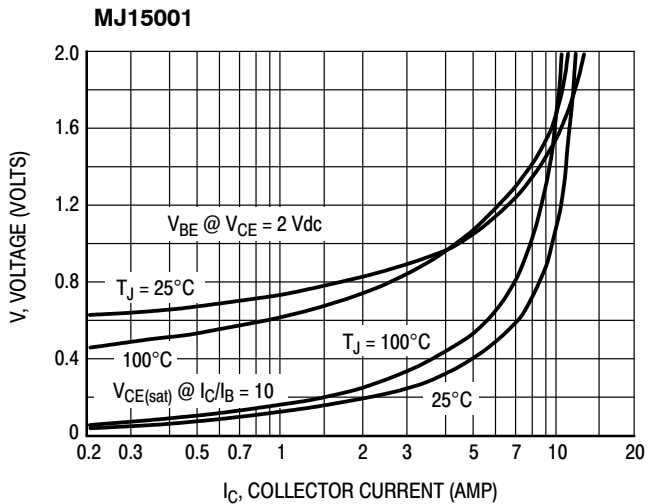
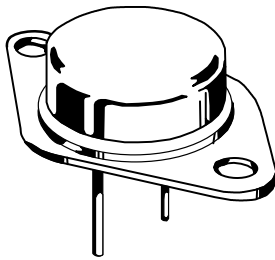


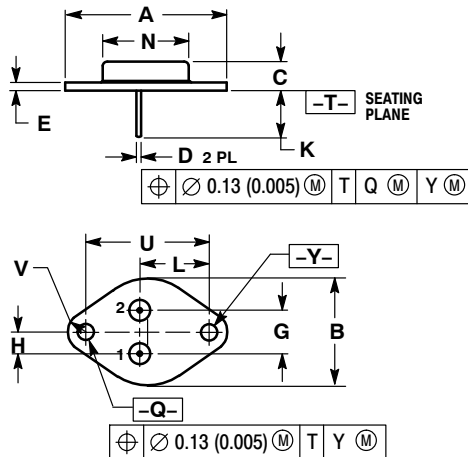
Figure 5. "On" Voltages



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

DATE 10 MAR 2000

SCALE 1:1



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

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

STYLE 3:
PIN 1. GATE
2. SOURCE
CASE: DRAIN

STYLE 4:
PIN 1. GROUND
2. INPUT
CASE: OUTPUT

STYLE 5:
PIN 1. CATHODE
2. EXTERNAL TRIP/DELAY
CASE: ANODE

STYLE 6:
PIN 1. GATE
2. EMITTER
CASE: COLLECTOR

STYLE 7:
PIN 1. ANODE
2. OPEN
CASE: CATHODE

STYLE 8:
PIN 1. CATHODE #1
2. CATHODE #2
CASE: ANODE

STYLE 9:
PIN 1. ANODE #1
2. ANODE #2
CASE: CATHODE

| | | |
|------------------|---------------|---|
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| DESCRIPTION: | TO-204 (TO-3) | PAGE 1 OF 1 |

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