

MJ15001 (NPN), MJ15002 (PNP)

Complementary Silicon Power Transistors

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 | $^\circ\text{C}$ |

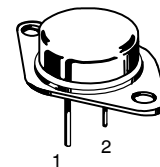
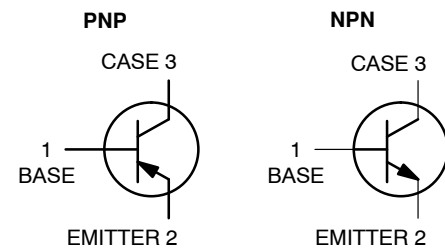


ON Semiconductor®

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

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

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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 $\leq 2\%$.

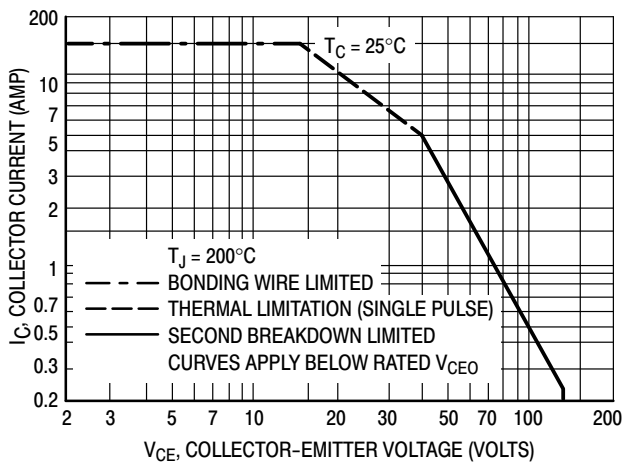


Figure 1. Active-Region Safe Operating Area

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

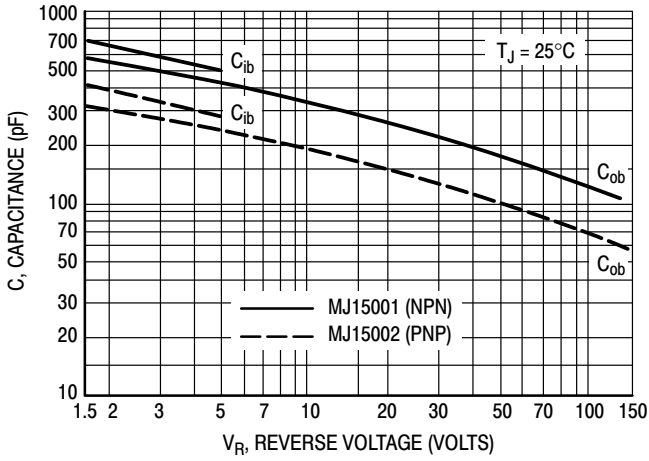


Figure 2. Capacitances

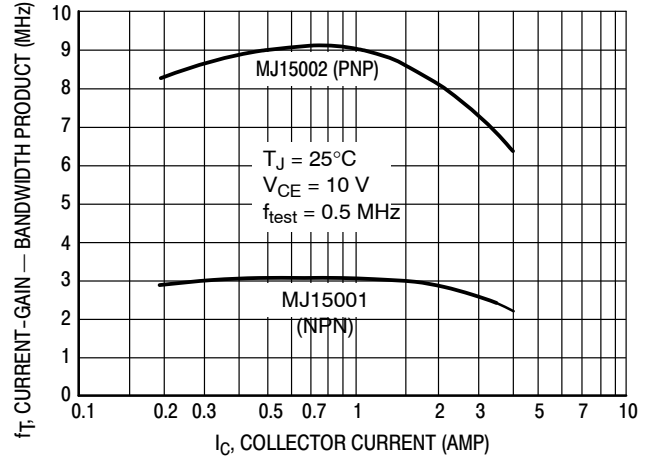


Figure 3. Current-Gain — Bandwidth Product

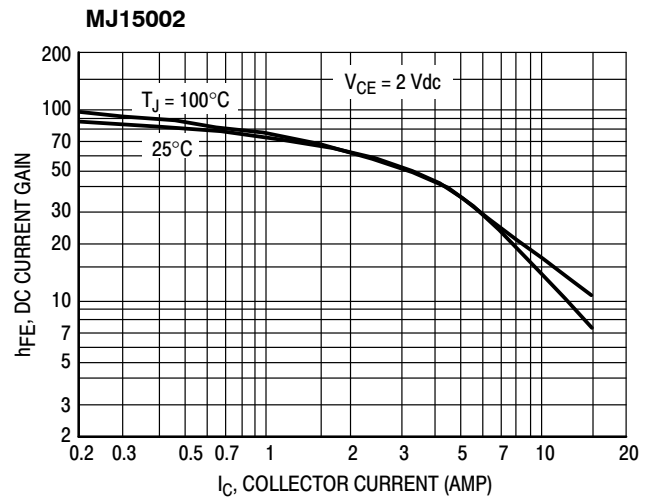
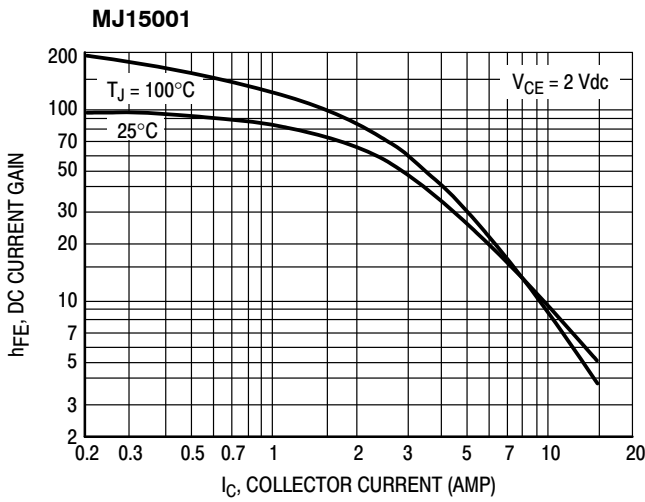


Figure 4. DC Current Gain

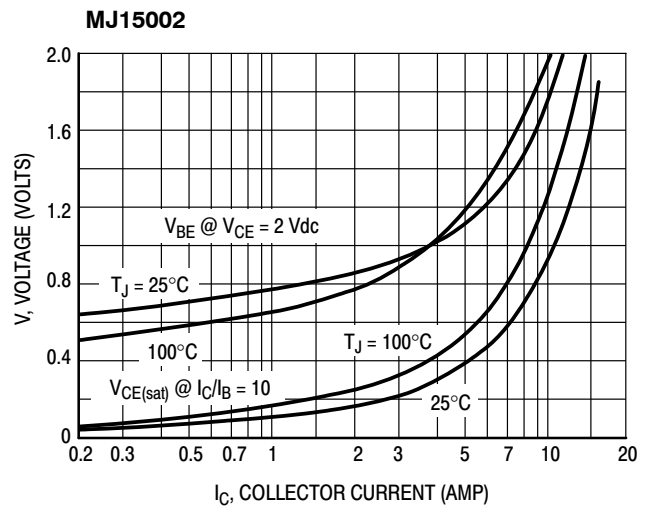
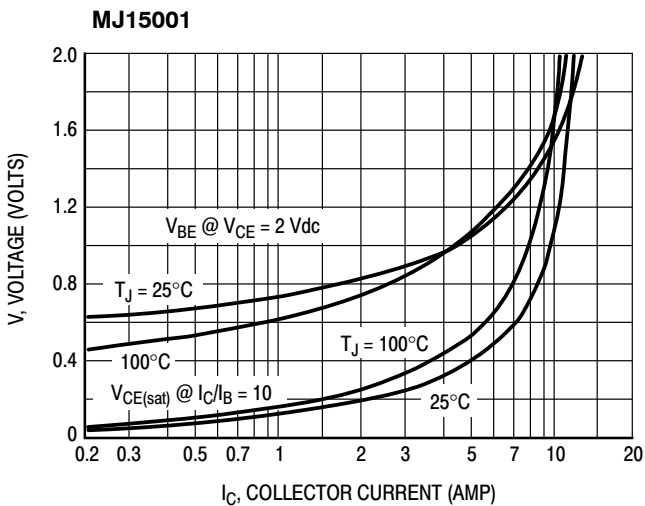


Figure 5. "On" Voltages

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



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

DATE 05/18/1988



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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