

MJ15022 (NPN), MJ15024 (NPN)

Silicon Power Transistors

The MJ15022 and MJ15024 are power transistors designed for high power audio, disk head positioners and other linear applications.

Features

- High Safe Operating Area
- High DC Current Gain
- These Devices are Pb-Free and are RoHS Compliant*
- Complementary to MJ15023 (PNP), MJ15025 (PNP)

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|----------------|-------------|--------------------------|
| Collector-Emitter Voltage | V_{CEO} | 200 250 | Vdc |
| Collector-Base Voltage | V_{CBO} | 350 400 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 5 | Vdc |
| Collector-Emitter Voltage | V_{CEX} | 400 | Vdc |
| Collector Current – Continuous | I_C | 16 | Adc |
| Collector Current – Peak (Note 1) | I_{CM} | 30 | Adc |
| Base Current – Continuous | I_B | 5 | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 250 1.43 | 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.

1. Pulse Test: Pulse Width = 5 ms, Duty Cycle \leq 10%.

THERMAL CHARACTERISTICS

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

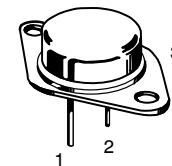
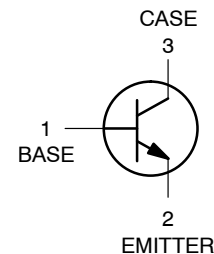


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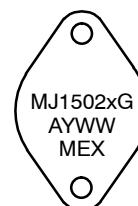
**16 AMPERES
SILICON POWER TRANSISTORS
200 – 250 VOLTS, 250 WATTS**

SCHEMATIC



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

MARKING DIAGRAM



MJ1502x = Device Code
x = 2 or 4
G = Pb-Free Package
A = Assembly Location
Y = Year
WW = Work Week
MEX = Country of Origin

ORDERING INFORMATION

| Device | Package | Shipping |
|----------|---------------------|------------------|
| MJ15022G | TO-204 (Pb-Free) | 100 Units / Tray |
| MJ15024G | TO-204 (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 2) ($I_C = 100\text{ mAdc}$, $I_B = 0$) | MJ15022 MJ15024 | $V_{CEO(sus)}$ | 200 250 | - |
| Collector Cutoff Current ($V_{CE} = 200\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) ($V_{CE} = 250\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$) | MJ15022 MJ15024 | I_{CEX} | - - | 250 250 |
| Collector Cutoff Current ($V_{CE} = 150\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 200\text{ vdc}$, $I_B = 0$) | MJ15022 MJ15024 | I_{CEO} | - - | 500 500 |
| Emitter Cutoff Current ($V_{CE} = 5\text{ Vdc}$, $I_B = 0$) | | I_{EBO} | - | 500 |
| SECOND BREAKDOWN | | | | |
| Second Breakdown Collector Current with Base Forward Biased ($V_{CE} = 50\text{ Vdc}$, $t = 0.5\text{ s}$ (non-repetitive)) ($V_{CE} = 80\text{ Vdc}$, $t = 0.5\text{ s}$ (non-repetitive)) | | $I_{S/b}$ | 5 2 | - - |
| ON CHARACTERISTICS | | | | |
| DC Current Gain ($I_C = 8\text{ Adc}$, $V_{CE} = 4\text{ Vdc}$) ($I_C = 16\text{ Adc}$, $V_{CE} = 4\text{ Vdc}$) | | h_{FE} | 15 5 | 60 - |
| Collector-Emitter Saturation Voltage ($I_C = 8\text{ Adc}$, $I_B = 0.8\text{ Adc}$) ($I_C = 16\text{ Adc}$, $I_B = 3.2\text{ Adc}$) | | $V_{CE(sat)}$ | - - | 1.4 4.0 |
| Base-Emitter On Voltage ($I_C = 8\text{ Adc}$, $V_{CE} = 4\text{ Vdc}$) | | $V_{BE(on)}$ | - | 2.2 |
| DYNAMIC CHARACTERISTICS | | | | |
| Current-Gain - Bandwidth Product ($I_C = 1\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1\text{ MHz}$) | | f_T | 4 | - |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 1\text{ MHz}$) | | C_{ob} | - | 500 |

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

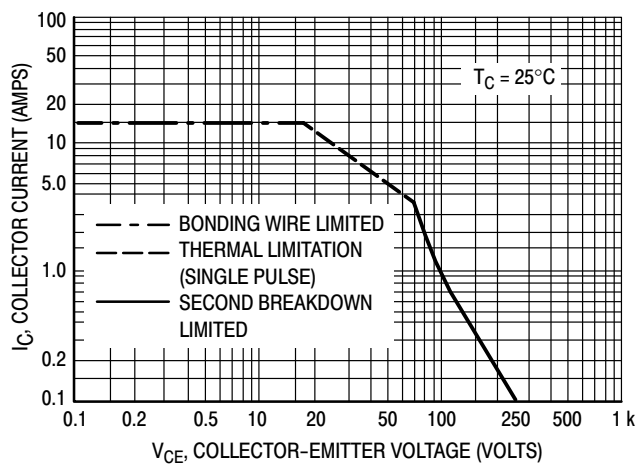


Figure 1. Active-Region Safe Operating Area

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 I_{on} than the limitations imposed by second breakdown.

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TYPICAL CHARACTERISTICS

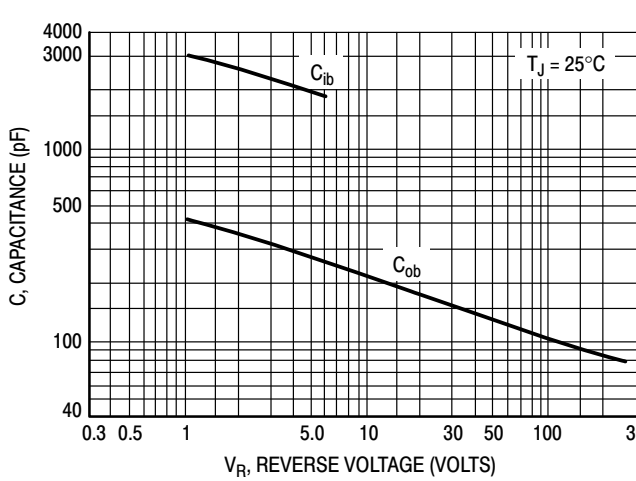


Figure 2. Capacitances

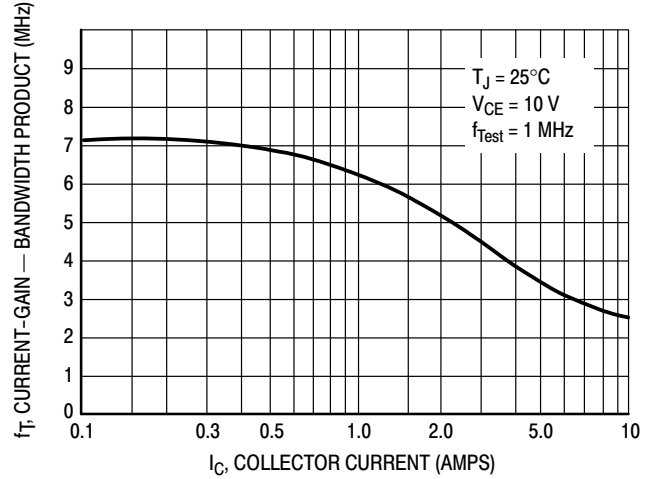


Figure 3. Current-Gain — Bandwidth Product

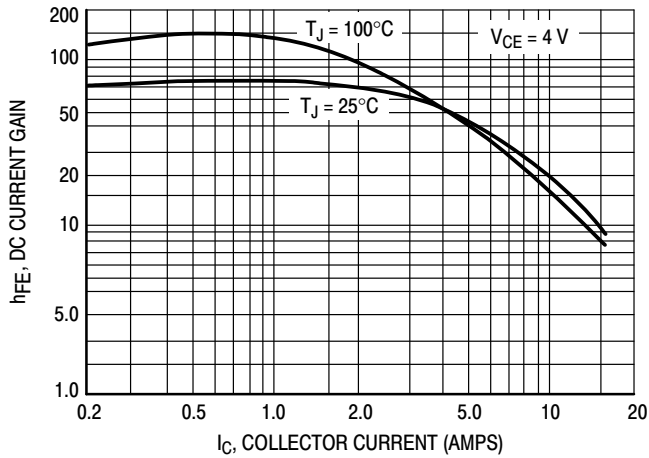


Figure 4. DC Current Gain

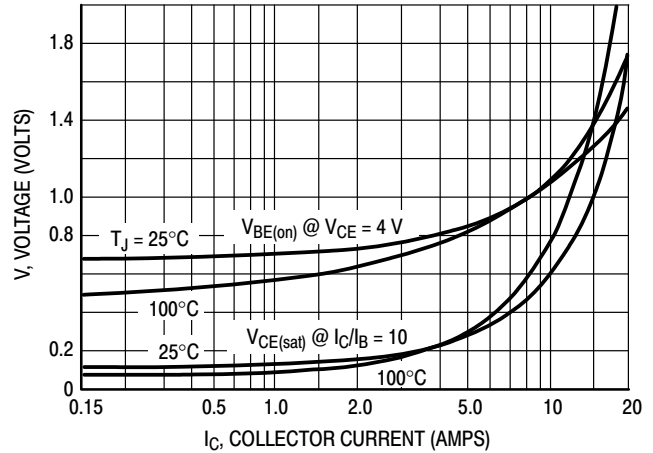


Figure 5. "On" Voltage

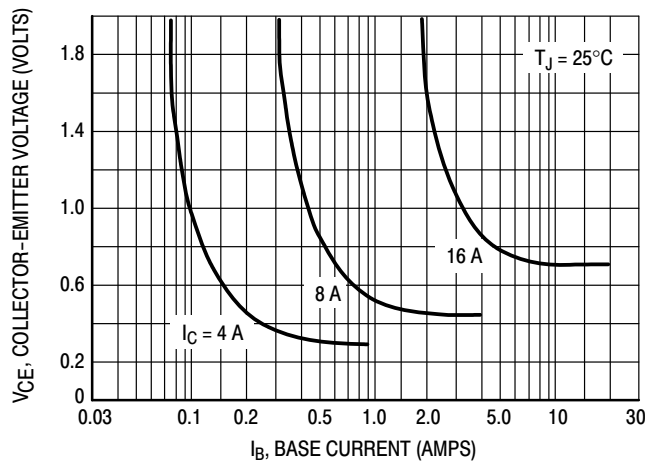
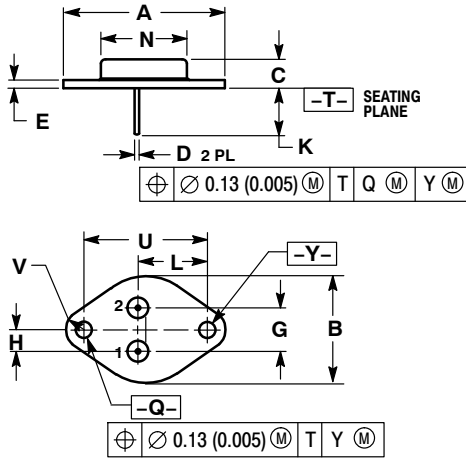


Figure 6. Collector Saturation Region

MJ15022 (NPN), MJ15024 (NPN)

PACKAGE DIMENSIONS

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



- 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

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