

# NPN - MJ15022, MJ15024\*

\*MJ15024 is a Preferred Device

## Silicon Power Transistors

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

### Features

- High Safe Operating Area (100% Tested) – 2 A @ 80 V
- High DC Current Gain –  $h_{FE} = 15$  (Min) @  $I_C = 8$  Adc
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

| Rating                                                                                 | Symbol         | Value       | Unit                     |
|----------------------------------------------------------------------------------------|----------------|-------------|--------------------------|
| Collector-Emitter Voltage<br>MJ15022<br>MJ15024                                        | $V_{CEO}$      | 200<br>250  | Vdc                      |
| Collector-Base Voltage<br>MJ15022<br>MJ15024                                           | $V_{CBO}$      | 350<br>400  | Vdc                      |
| Emitter-Base Voltage                                                                   | $V_{EBO}$      | 5           | Vdc                      |
| Collector-Emitter Voltage                                                              | $V_{CEX}$      | 400         | Vdc                      |
| Collector Current – Continuous<br>– Peak (Note 1)                                      | $I_C$          | 16<br>30    | Adc                      |
| Base Current – Continuous                                                              | $I_B$          | 5           | Adc                      |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 250<br>1.43 | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$ | -65 to +200 | $^\circ\text{C}$         |

### THERMAL CHARACTERISTICS

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

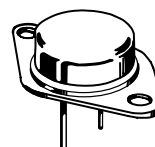
1. Pulse Test: Pulse Width = 5 ms, Duty Cycle  $\leq 10\%$ .



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



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         |
|----------|---------------------|------------------|
| MJ15022  | TO-204              | 100 Units / Tray |
| MJ15022G | TO-204<br>(Pb-Free) | 100 Units / Tray |
| MJ15024  | TO-204              | 100 Units / Tray |
| MJ15024G | TO-204<br>(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.

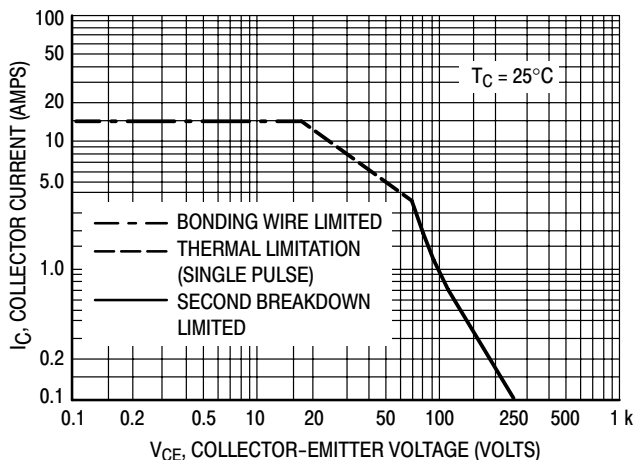
Preferred devices are recommended choices for future use and best overall value.

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## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

| Characteristic                                                                                                                                                                  | Symbol                                      | Min        | Max        | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------|------------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                      |                                             |            |            |      |
| Collector–Emitter Sustaining Voltage (Note 2)<br>(I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 0)                                                                                | MJ15022<br>MJ15024<br>V <sub>CEO(sus)</sub> | 200<br>250 | –<br>–     | –    |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 200 Vdc, V <sub>BE(off)</sub> = 1.5 Vdc)<br>(V <sub>CE</sub> = 250 Vdc, V <sub>BE(off)</sub> = 1.5 Vdc)                          | MJ15022<br>MJ15024<br>I <sub>CEX</sub>      | –<br>–     | 250<br>250 | μAdc |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 150 Vdc, I <sub>B</sub> = 0)<br>(V <sub>CE</sub> = 200 vdc, I <sub>B</sub> = 0)                                                  | MJ15022<br>MJ15024<br>I <sub>CEO</sub>      | –<br>–     | 500<br>500 | μAdc |
| Emitter Cutoff Current<br>(V <sub>CE</sub> = 5 Vdc, I <sub>B</sub> = 0)                                                                                                         | I <sub>EBO</sub>                            | –          | 500        | μAdc |
| <b>SECOND BREAKDOWN</b>                                                                                                                                                         |                                             |            |            |      |
| Second Breakdown Collector Current with Base Forward Biased<br>(V <sub>CE</sub> = 50 Vdc, t = 0.5 s (non–repetitive))<br>(V <sub>CE</sub> = 80 Vdc, t = 0.5 s (non–repetitive)) | I <sub>S/b</sub>                            | 5<br>2     | –<br>–     | Adc  |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                       |                                             |            |            |      |
| DC Current Gain<br>(I <sub>C</sub> = 8 Adc, V <sub>CE</sub> = 4 Vdc)<br>(I <sub>C</sub> = 16 Adc, V <sub>CE</sub> = 4 Vdc)                                                      | h <sub>FE</sub>                             | 15<br>5    | 60<br>–    | –    |
| Collector–Emitter Saturation Voltage<br>(I <sub>C</sub> = 8 Adc, I <sub>B</sub> = 0.8 Adc)<br>(I <sub>C</sub> = 16 Adc, I <sub>B</sub> = 3.2 Adc)                               | V <sub>CE(sat)</sub>                        | –<br>–     | 1.4<br>4.0 | Vdc  |
| Base–Emitter On Voltage<br>(I <sub>C</sub> = 8 Adc, V <sub>CE</sub> = 4 Vdc)                                                                                                    | V <sub>BE(on)</sub>                         | –          | 2.2        | Vdc  |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                                                                  |                                             |            |            |      |
| Current–Gain – Bandwidth Product<br>(I <sub>C</sub> = 1 Adc, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 1 MHz)                                                               | f <sub>T</sub>                              | 4          | –          | MHz  |
| Output Capacitance<br>(V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)                                                                                 | C <sub>ob</sub>                             | –          | 500        | pF   |

2. Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 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<sub>C</sub> – V<sub>CE</sub> 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<sub>J(pk)</sub> = 200°C; T<sub>C</sub> is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values I<sub>on</sub> than the limitations imposed by second breakdown.

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## TYPICAL CHARACTERISTICS

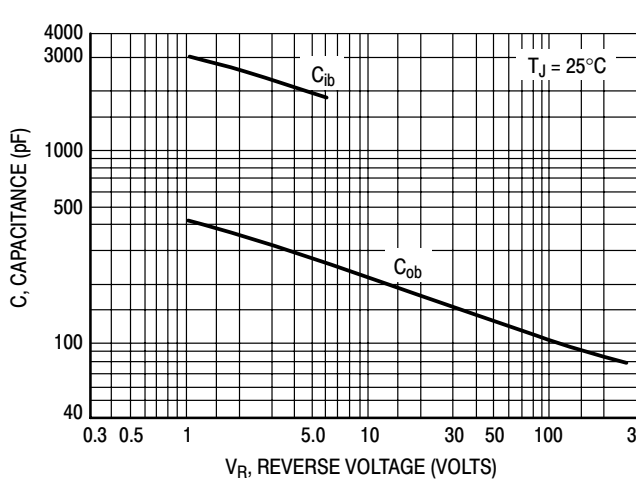


Figure 2. Capacitances

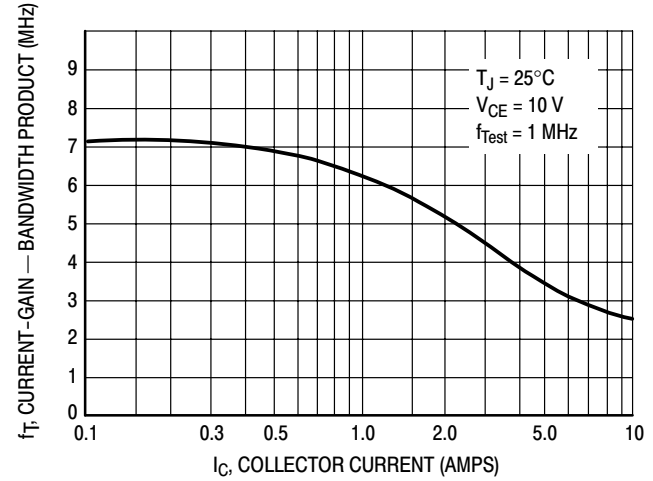


Figure 3. Current-Gain — Bandwidth Product

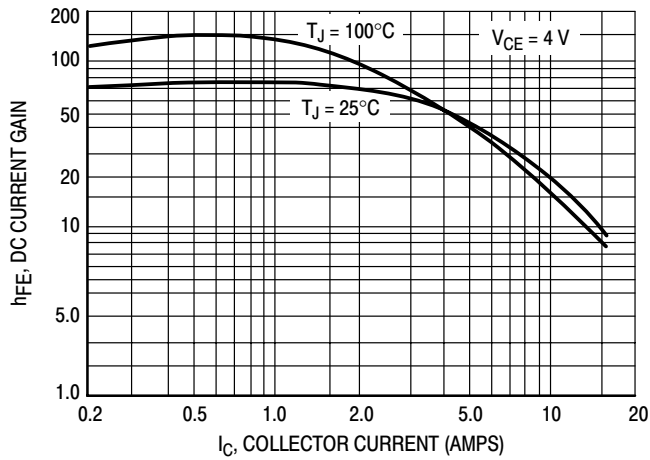


Figure 4. DC Current Gain

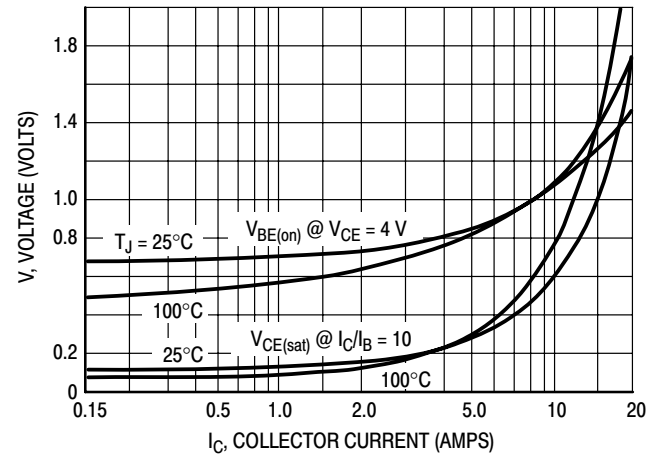


Figure 5. "On" Voltage

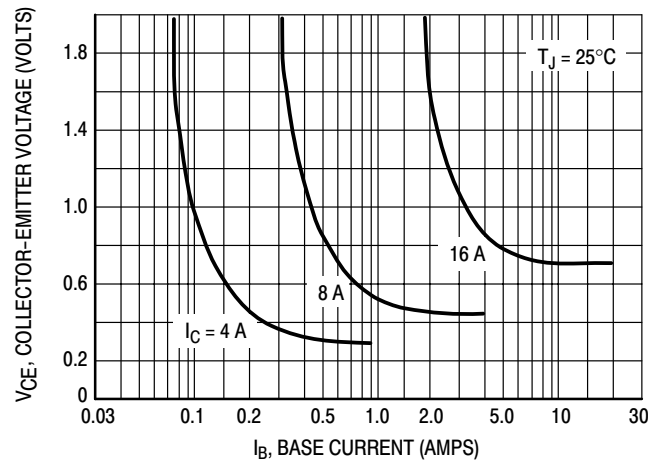
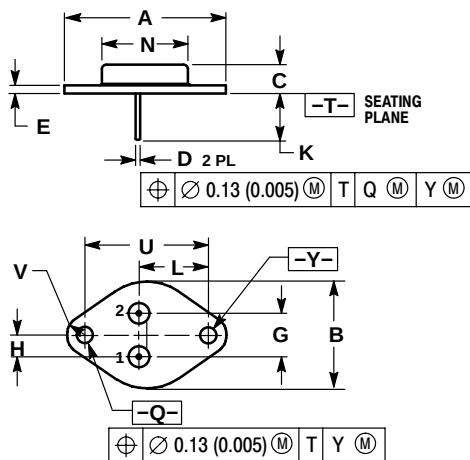


Figure 6. Collector Saturation Region

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## 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:

1. BASE
  2. EMITTER
- CASE: COLLECTOR

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