

## Silicon Power Transistors

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

- High Safe Operating Area (100% Tested) —  
2 A @ 80 V
- High DC Current Gain —  
 $h_{FE} = 15$  (Min) @  $I_C = 8$  Adc

### MAXIMUM RATINGS

| Rating  | Symbol         | MJ15022     | MJ15024 | 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<br>Peak (1)  | $I_C$          | 16<br>30    |         | Adc                          |
| Base Current — Continuous   | $I_B$          | 5           |         | Adc                          |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 250<br>1.43 |         | Watts<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{stg}$ | –65 to +200 |         | $^\circ\text{C}$             |

### THERMAL CHARACTERISTICS

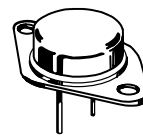
| Characteristic                       | Symbol          | Max  | Unit               |
|--------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 0.70 | $^\circ\text{C/W}$ |

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

**NPN**  
**MJ15022**  
**MJ15024 \***

\*ON Semiconductor Preferred Device

**16 AMPERE**  
**SILICON**  
**POWER TRANSISTORS**  
**200 AND 250 VOLTS**  
**250 WATTS**



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

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

# MJ15022 MJ15024

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

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

(1) Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

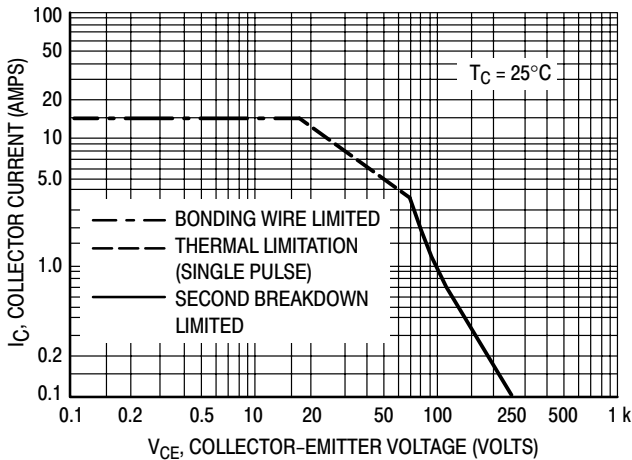


Figure 1. Active–Region Safe Operating Area

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.

TYPICAL CHARACTERISTICS

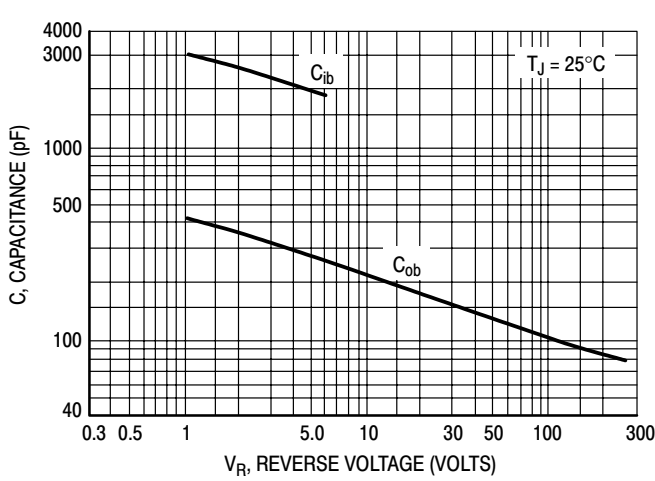


Figure 2. Capacitances

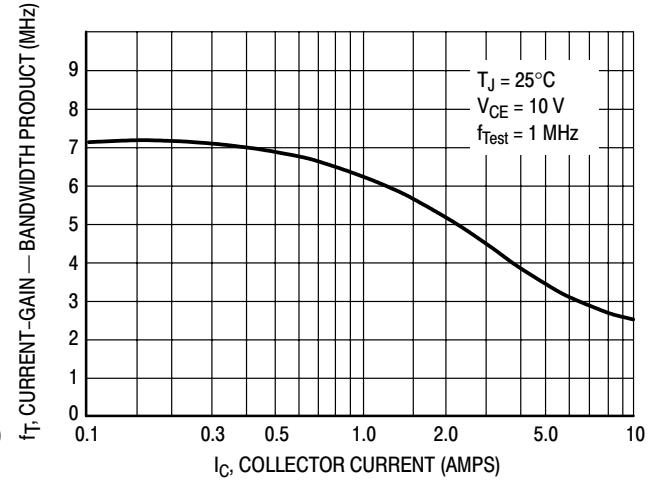


Figure 3. Current-Gain — Bandwidth Product

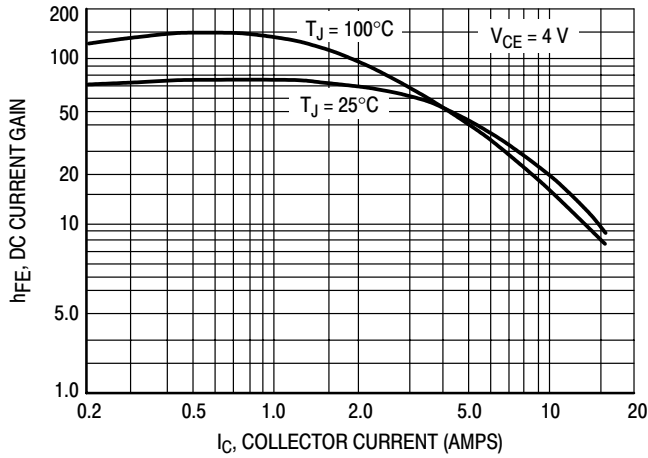


Figure 4. DC Current Gain

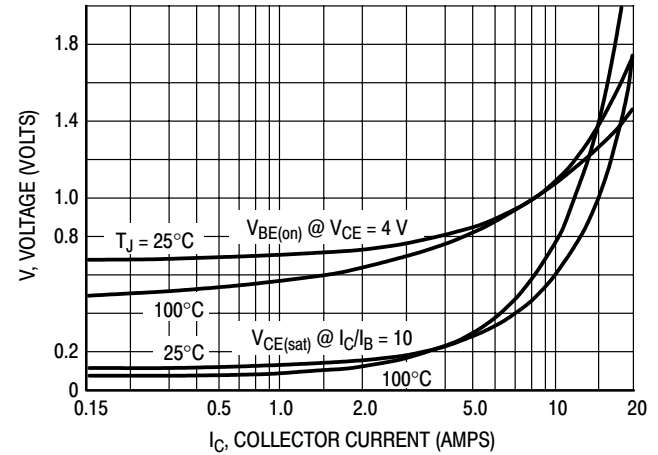


Figure 5. "On" Voltage

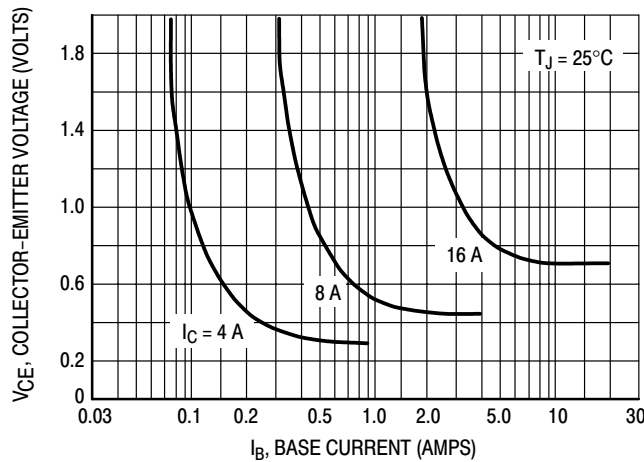
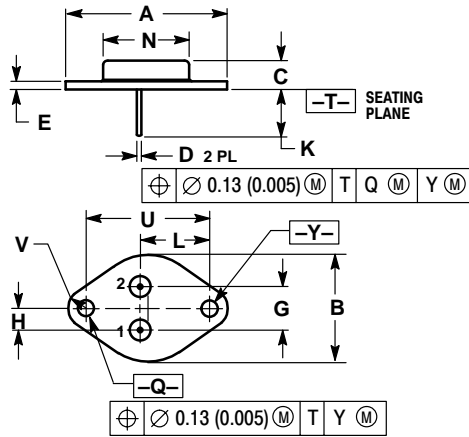


Figure 6. Collector Saturation Region

# MJ15022 MJ15024

## PACKAGE DIMENSIONS

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

**ON Semiconductor** and  are trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer.

## PUBLICATION ORDERING INFORMATION

### NORTH AMERICA Literature Fulfillment:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** ONlit@hibbertco.com  
Fax Response Line: 303-675-2167 or 800-344-3810 Toll Free USA/Canada

### N. American Technical Support: 800-282-9855 Toll Free USA/Canada

### EUROPE: LDC for ON Semiconductor – European Support

**German Phone:** (+1) 303-308-7140 (Mon-Fri 2:30pm to 7:00pm CET)  
**Email:** ONlit-german@hibbertco.com  
**French Phone:** (+1) 303-308-7141 (Mon-Fri 2:00pm to 7:00pm CET)  
**Email:** ONlit-french@hibbertco.com  
**English Phone:** (+1) 303-308-7142 (Mon-Fri 12:00pm to 5:00pm GMT)  
**Email:** ONlit@hibbertco.com

### EUROPEAN TOLL-FREE ACCESS\*: 00-800-4422-3781

\*Available from Germany, France, Italy, UK, Ireland

### CENTRAL/SOUTH AMERICA:

**Spanish Phone:** 303-308-7143 (Mon-Fri 8:00am to 5:00pm MST)  
**Email:** ONlit-spanish@hibbertco.com  
**Toll-Free from Mexico:** Dial 01-800-288-2872 for Access –  
then Dial 866-297-9322

### ASIA/PACIFIC: LDC for ON Semiconductor – Asia Support

**Phone:** 1-303-675-2121 (Tue-Fri 9:00am to 1:00pm, Hong Kong Time)  
**Toll Free from Hong Kong & Singapore:**  
**001-800-4422-3781**  
**Email:** ONlit-asia@hibbertco.com

### JAPAN: ON Semiconductor, Japan Customer Focus Center

4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031  
**Phone:** 81-3-5740-2700  
**Email:** r14525@onsemi.com

### ON Semiconductor Website: <http://onsemi.com>

For additional information, please contact your local Sales Representative.