

# MJ15011 (NPN), MJ15012 (PNP)

Preferred Devices

## Complementary Silicon Power Transistors

The MJ15011 and MJ15012 are PowerBase power transistors designed for high-power audio, disk head positioners, and other linear applications. These devices can also be used in power switching circuits such as relay or solenoid drivers, dc-to-dc converters or inverters.

- High Safe Operating Area (100% Tested)  
1.2 A @ 100 V
- Completely Characterized for Linear Operation
- High DC Current Gain and Low Saturation Voltage  
 $h_{FE} = 20$  (Min) @ 2 A, 2 V  
 $V_{CE(sat)} = 2.5$  V (Max) @  $I_C = 4$  A,  $I_B = 0.4$  A
- For Low Distortion Complementary Designs
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

| Rating  | Symbol            | Value          | Unit                         |
|---|-------------------|----------------|------------------------------|
| Collector-Emitter Voltage   | $V_{CEO}$         | 250            | Vdc                          |
| Collector-Emitter Voltage   | $V_{CEX}$         | 250            | Vdc                          |
| Emitter-Base Voltage  | $V_{EB}$          | 5              | Vdc                          |
| Collector Current – Continuous<br>– Peak (Note 1)                                     | $I_C$<br>$I_{CM}$ | 10<br>15       | Adc                          |
| Base Current – Continuous<br>– Peak (Note 1)  | $I_B$<br>$I_{BM}$ | 2<br>5         | Adc                          |
| Emitter Current – Continuous<br>– Peak (Note 1)                                       | $I_E$<br>$I_{EM}$ | 12<br>20       | Adc                          |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 200<br>1.14    | Watts<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{stg}$    | -65 to<br>+200 | $^\circ\text{C}$             |

### 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<br>Soldering Purposes | $T_L$           | 265   | $^\circ\text{C}$          |

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%.

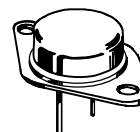
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



ON Semiconductor®

<http://onsemi.com>

**10 AMPERE  
COMPLEMENTARY  
POWER TRANSISTORS  
250 VOLTS  
200 WATTS**



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

### MARKING DIAGRAM



MJ1501x = 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       |
|----------|-----------------------|----------------|
| MJ15011  | TO-204AA              | 100 Units/Tray |
| MJ15011G | TO-204AA<br>(Pb-Free) | 100 Units/Tray |
| MJ15012  | TO-204AA              | 100 Units/Tray |
| MJ15012G | TO-204AA<br>(Pb-Free) | 100 Units/Tray |

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

# MJ15011 (NPN), MJ15012 (PNP)

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

| Characteristic  | Symbol        | Min | Max | Unit            |
|---|---------------|-----|-----|-----------------|
| <b>OFF CHARACTERISTICS</b>  |               |     |     |                 |
| Collector–Emitter Breakdown Voltage (Note 2)<br>( $I_C = 100\text{ mA}$ )                 | $V_{(BR)CEO}$ | 250 | –   | Vdc             |
| Collector Cutoff Current<br>( $V_{CE} = 200\text{ Vdc}$ )                                 | $I_{CEO}$     | –   | 1   | mAdc            |
| Collector Cutoff Current<br>( $V_{CE} = 250\text{ Vdc}$ , $V_{BE(off)} = 15\text{ Vdc}$ ) | $I_{CEX}$     | –   | 100 | $\mu\text{Adc}$ |
| Emitter Cutoff Current<br>( $V_{BE} = 5\text{ Vdc}$ )                                     | $I_{EBO}$     | –   | 10  | $\mu\text{Adc}$ |

## ON CHARACTERISTICS (Note 2)

|  |               |          |            |     |
|--|---------------|----------|------------|-----|
| DC Current Gain<br>( $I_C = 2\text{ Adc}$ , $V_{CE} = 2\text{ Vdc}$ )<br>( $I_C = 4\text{ Adc}$ , $V_{CE} = 2\text{ Vdc}$ )                    | $h_{FE}$      | 20<br>15 | 120<br>–   | –   |
| Collector–Emitter Saturation Voltage<br>( $I_C = 2\text{ Adc}$ , $I_B = 0.2\text{ Adc}$ )<br>( $I_C = 4\text{ Adc}$ , $I_B = 0.4\text{ Adc}$ ) | $V_{CE(sat)}$ | –<br>–   | 0.6<br>1.0 | Vdc |
| Base–Emitter On Voltage<br>( $I_C = 4\text{ Adc}$ , $V_{CE} = 2\text{ Vdc}$ )  | $V_{BE(on)}$  | –        | 1.8        | Vdc |

## DYNAMIC CHARACTERISTICS

|   |          |   |     |    |
|---|----------|---|-----|----|
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $f = 1\text{ MHz}$ ) | $C_{ob}$ | – | 750 | pF |
|---|----------|---|-----|----|

## SECOND BREAKDOWN

|  |           |          |        |     |
|--|-----------|----------|--------|-----|
| Second Breakdown Collector Current with Base Forward Biased<br>( $V_{CE} = 40\text{ Vdc}$ , $t = 0.5\text{ s}$ )<br>( $V_{CE} = 100\text{ Vdc}$ , $t = 0.5\text{ s}$ ) | $I_{S/b}$ | 5<br>1.4 | –<br>– | Adc |
|--|-----------|----------|--------|-----|

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

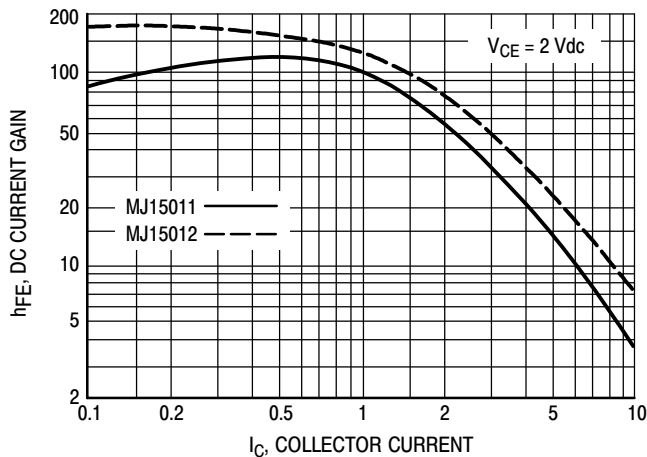


Figure 1. DC Current Gain

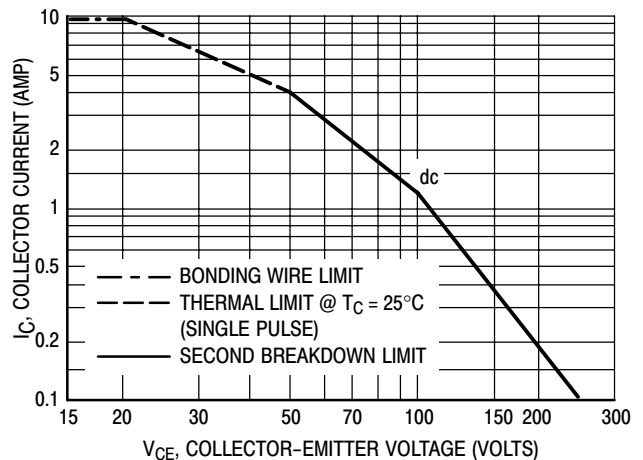
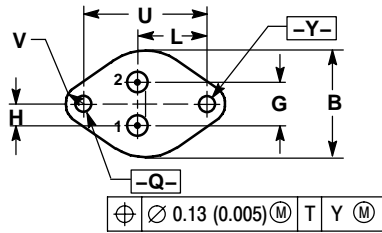
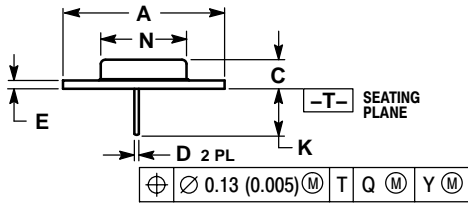


Figure 2. Active Region Safe Operating Area

# MJ15011 (NPN), MJ15012 (PNP)

## 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

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor



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

DATE 05/18/1988



SCALE 1:1



NOTES:

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| V   | 0.131     | 0.188 | 3.33        | 4.77  |

- |  |  |   |   |   |
|--|--|---|---|---|
| <p>STYLE 1:<br/>PIN 1. BASE<br/>2. EMITTER<br/>CASE: COLLECTOR</p> | <p>STYLE 2:<br/>PIN 1. BASE<br/>2. COLLECTOR<br/>CASE: EMITTER</p> | <p>STYLE 3:<br/>PIN 1. GATE<br/>2. SOURCE<br/>CASE: DRAIN</p>           | <p>STYLE 4:<br/>PIN 1. GROUND<br/>2. INPUT<br/>CASE: OUTPUT</p>       | <p>STYLE 5:<br/>PIN 1. CATHODE<br/>2. EXTERNAL TRIP/DELAY<br/>CASE: ANODE</p> |
| <p>STYLE 6:<br/>PIN 1. GATE<br/>2. EMITTER<br/>CASE: COLLECTOR</p> | <p>STYLE 7:<br/>PIN 1. ANODE<br/>2. OPEN<br/>CASE: CATHODE</p>     | <p>STYLE 8:<br/>PIN 1. CATHODE #1<br/>2. CATHODE #2<br/>CASE: ANODE</p> | <p>STYLE 9:<br/>PIN 1. ANODE #1<br/>2. ANODE #2<br/>CASE: CATHODE</p> |   |

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