

# MJ15003 (NPN), MJ15004 (PNP)

## Complementary Silicon Power Transistors

The MJ15003 and MJ15004 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                                                        | $I_C$          | 20          | Adc                      |
| Base Current – Continuous                                                             | $I_B$          | 5           | Adc                      |
| Emitter Current – Continuous                                                          | $I_E$          | 25          | Adc                      |
| Total Power 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 | $^\circ\text{C}$         |

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                                                  | $R_{\theta JC}$ | 0.70 | $^\circ\text{C}/\text{W}$ |
| Maximum Lead Temperature for Soldering<br>Purposes 1/16" from Case for $\leq 10$ secs | $T_L$           | 265  | $^\circ\text{C}$          |

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

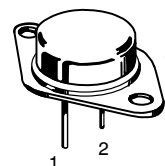
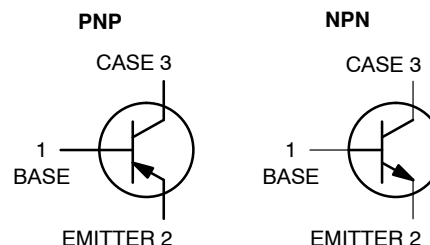


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## 20 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON 140 VOLTS, 250 WATTS

### SCHEMATIC



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

### MARKING DIAGRAM



MJ1500x = Device Code  
x = 3 or 4  
G = Pb-Free Package  
A = Location Code  
YY = Year  
WW = Work Week  
MEX = Country of Origin

### ORDERING INFORMATION

| Device   | Package               | Shipping       |
|----------|-----------------------|----------------|
| MJ15003G | TO-204AA<br>(Pb-Free) | 100 Units/Tray |
| MJ15004G | TO-204AA<br>(Pb-Free) | 100 Units/Tray |

# MJ15003 (NPN), MJ15004 (PNP)

## 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 1)<br>(I <sub>C</sub> = 200 mAdc, I <sub>B</sub> = 0)                                                                               | V <sub>CEO(sus)</sub> | 140        | –        | Vdc          |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 140 Vdc, V <sub>BE(off)</sub> = 1.5 Vdc)<br>(V <sub>CE</sub> = 140 Vdc, V <sub>BE(off)</sub> = 1.5 Vdc, T <sub>C</sub> = 150°C) | I <sub>CEX</sub>      | –          | 100<br>2 | μAdc<br>mAdc |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 140 Vdc, I <sub>B</sub> = 0)                                                                                                    | I <sub>CEO</sub>      | –          | 250      | μAdc         |
| Emitter Cutoff Current<br>(V <sub>EB</sub> = 5 Vdc, I <sub>C</sub> = 0)                                                                                                        | I <sub>EBO</sub>      | –          | 100      | μAdc         |
| <b>SECOND BREAKDOWN</b>                                                                                                                                                        |                       |            |          |              |
| Second Breakdown Collector Current with Base Forward Biased<br>(V <sub>CE</sub> = 50 Vdc, t = 1 s (non repetitive))<br>(V <sub>CE</sub> = 100 Vdc, t = 1 s (non repetitive))   | I <sub>S/b</sub>      | 5.0<br>1.0 | –<br>–   | Adc          |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                      |                       |            |          |              |
| DC Current Gain<br>(I <sub>C</sub> = 5 Adc, V <sub>CE</sub> = 2 Vdc)                                                                                                           | h <sub>FE</sub>       | 25         | 150      | –            |
| Collector Emitter Saturation Voltage<br>(I <sub>C</sub> = 5 Adc, I <sub>B</sub> = 0.5 Adc)                                                                                     | V <sub>CE(sat)</sub>  | –          | 1.0      | Vdc          |
| Base Emitter On Voltage<br>(I <sub>C</sub> = 5 Adc, V <sub>CE</sub> = 2 Vdc)                                                                                                   | V <sub>BE(on)</sub>   | –          | 2.0      | Vdc          |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                                                                 |                       |            |          |              |
| Current Gain — Bandwidth Product<br>(I <sub>C</sub> = 0.5 Adc, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 0.5 MHz)                                                          | f <sub>T</sub>        | 2.0        | –        | 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>       | –          | 1000     | pF           |

1. Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2%.

## TYPICAL CHARACTERISTICS MJ15003G (NPN)

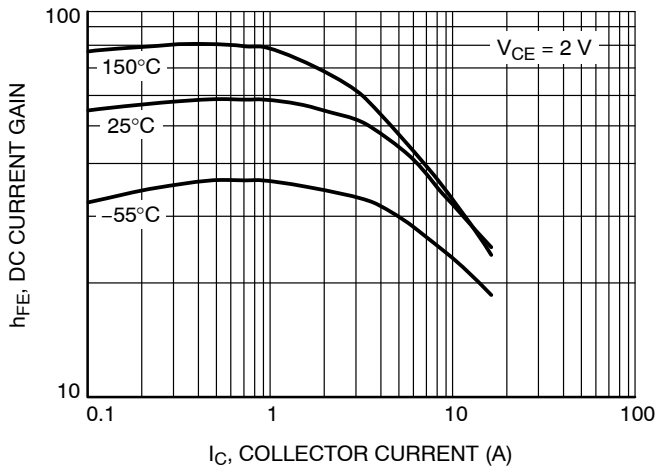


Figure 1. DC Current Gain

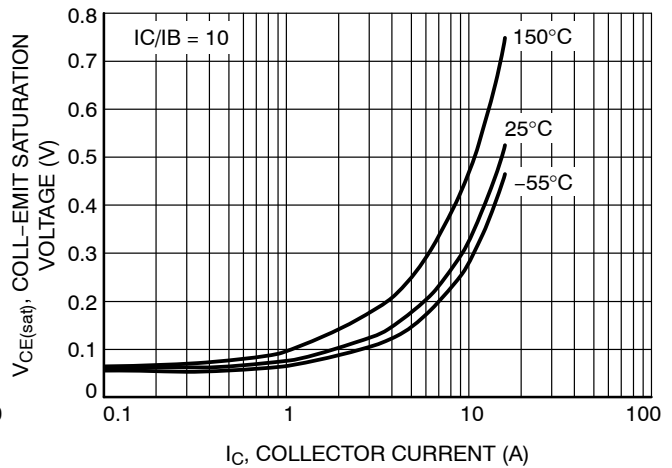


Figure 2. Collector-Emitter Saturation Voltage

# MJ15003 (NPN), MJ15004 (PNP)

## TYPICAL CHARACTERISTICS MJ15003G (NPN)

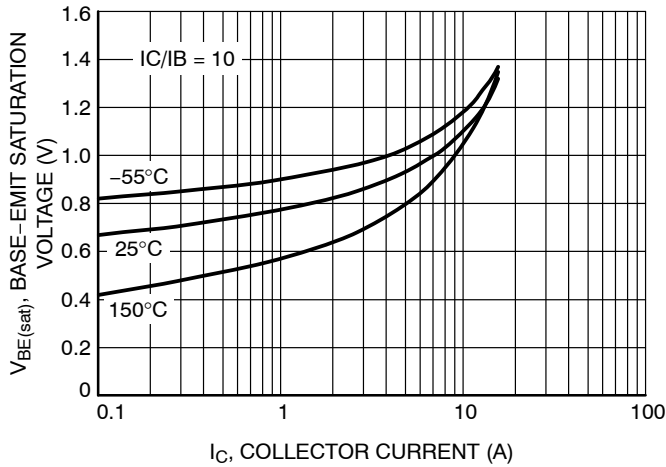


Figure 3. Base-Emitter Saturation Voltage

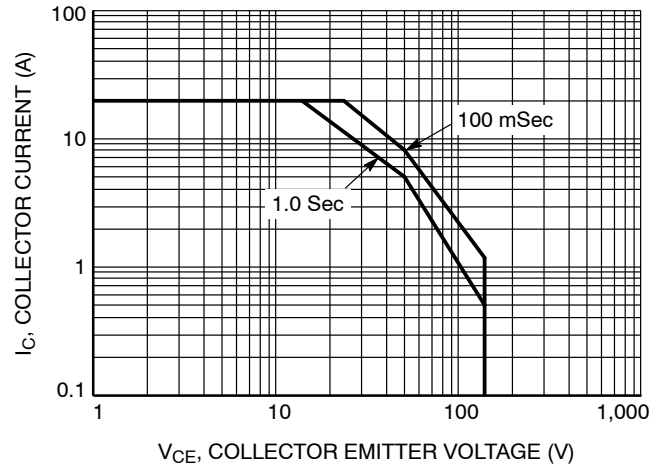


Figure 4. Safe Operating Area

## TYPICAL CHARACTERISTICS MJ15004G (PNP)

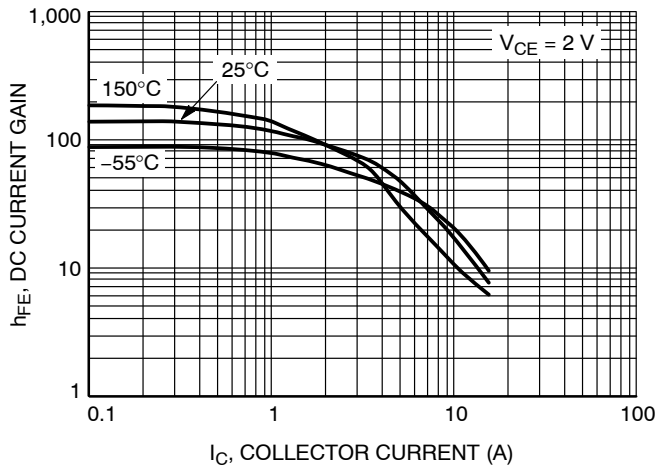


Figure 5. DC Current Gain

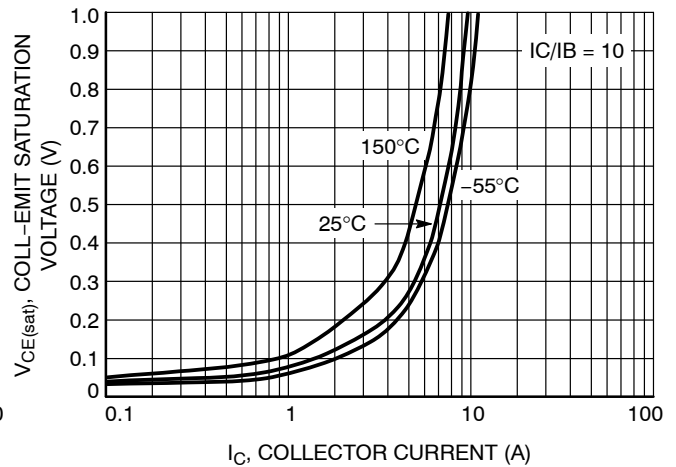


Figure 6. Collector-Emitter Saturation Voltage

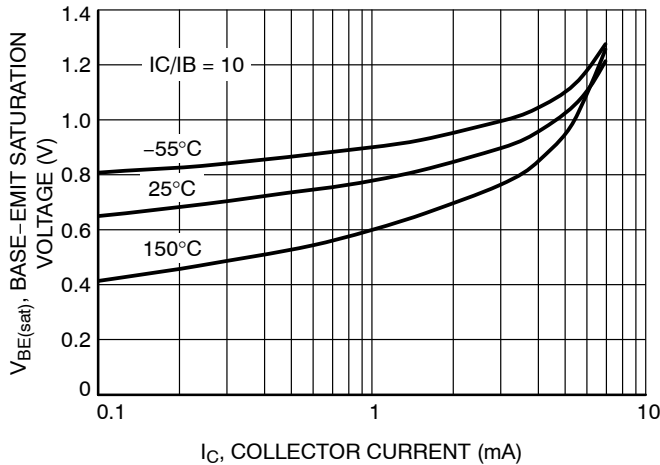


Figure 7. Base-Emitter Saturation Voltage

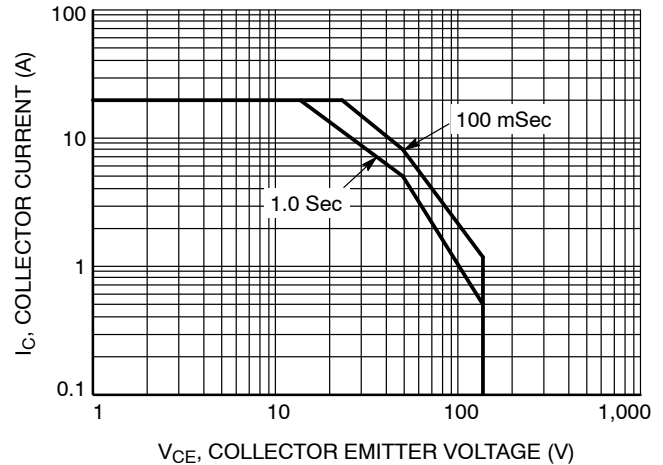
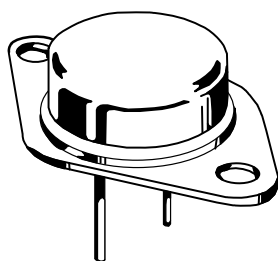


Figure 8. Safe Operating Area

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

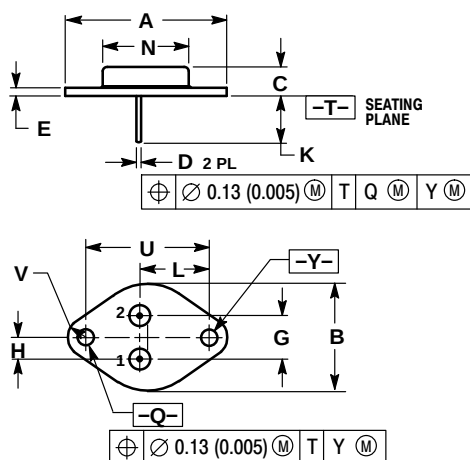
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TO-204 (TO-3)  
CASE 1-07  
ISSUE Z

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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