

# Complementary Silicon Power Transistors

## MJ15003 (NPN), MJ15004 (PNP)

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 @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 1.43	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200	$^\circ\text{C}$

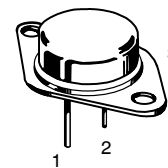
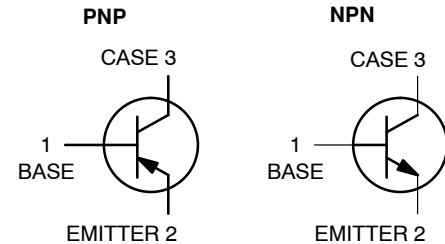
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

### 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 Purposes 1/16" from Case for $\leq 10$ secs	$T_L$	265	$^\circ\text{C}$

## 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 (Pb-Free)	100 Units/Tray
MJ15004G	TO-204AA (Pb-Free)	100 Units/Tray

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

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

# 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) (I <sub>C</sub> = 200 mAdc, I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	140	–	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 140 Vdc, V <sub>BE(off)</sub> = 1.5 Vdc) (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 2	μAdc mAdc
Collector Cutoff Current (V <sub>CE</sub> = 140 Vdc, I <sub>B</sub> = 0)	I <sub>CEO</sub>	–	250	μAdc
Emitter Cutoff Current (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 (V <sub>CE</sub> = 50 Vdc, t = 1 s (non repetitive)) (V <sub>CE</sub> = 100 Vdc, t = 1 s (non repetitive))	I <sub>S/b</sub>	5.0 1.0	– –	Adc
<b>ON CHARACTERISTICS</b>				
DC Current Gain (I <sub>C</sub> = 5 Adc, V <sub>CE</sub> = 2 Vdc)	h <sub>FE</sub>	25	150	–
Collector Emitter Saturation Voltage (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 (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 (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 (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)

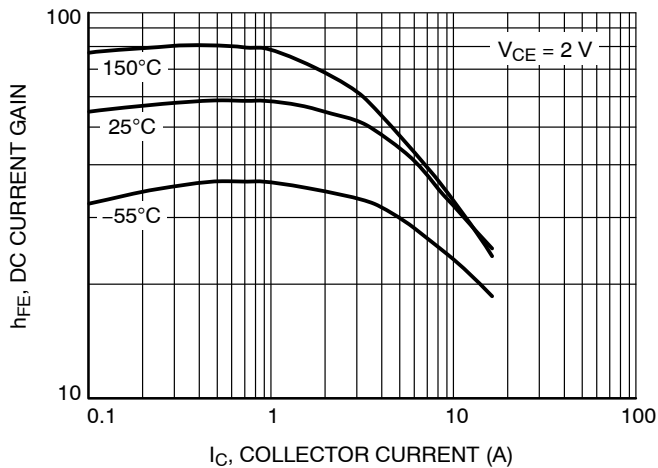


Figure 1. DC Current Gain

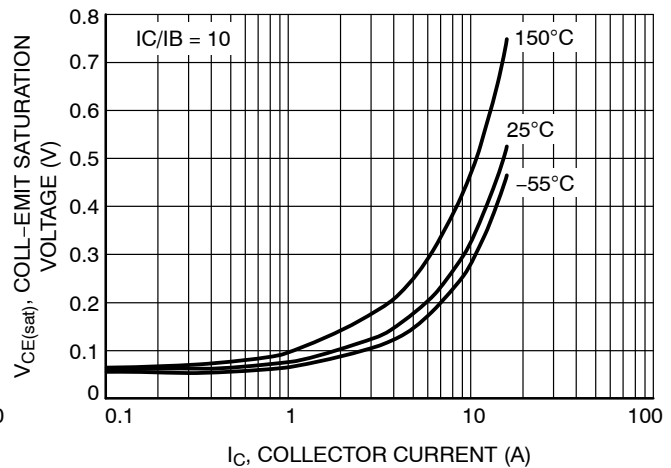
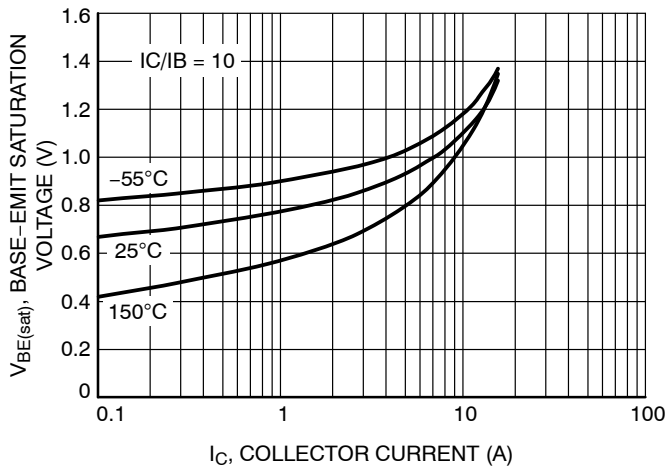


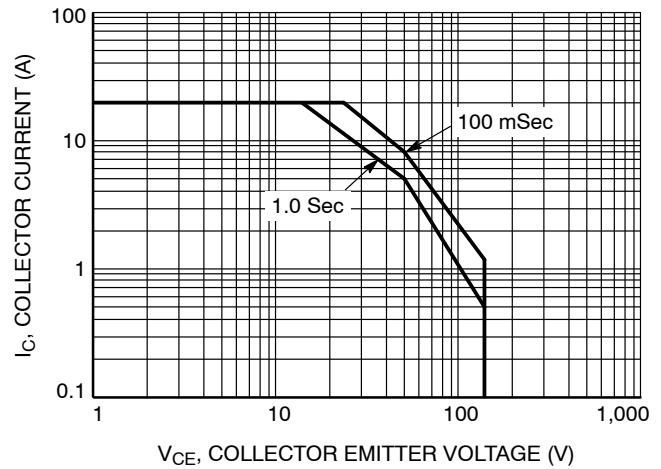
Figure 2. Collector-Emitter Saturation Voltage

# MJ15003 (NPN), MJ15004 (PNP)

## TYPICAL CHARACTERISTICS MJ15003G (NPN)

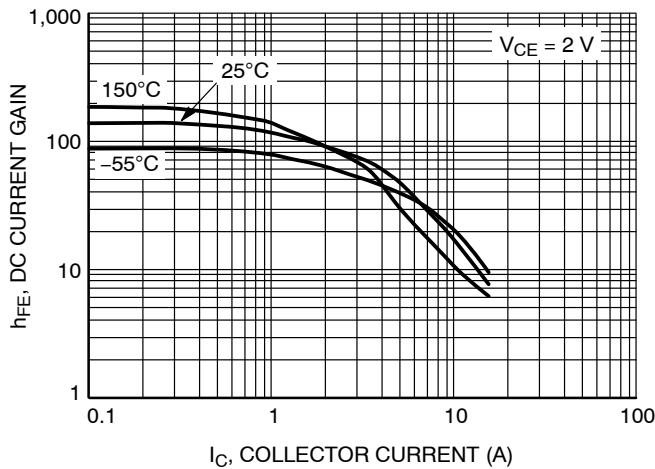


**Figure 3. Base-Emitter Saturation Voltage**

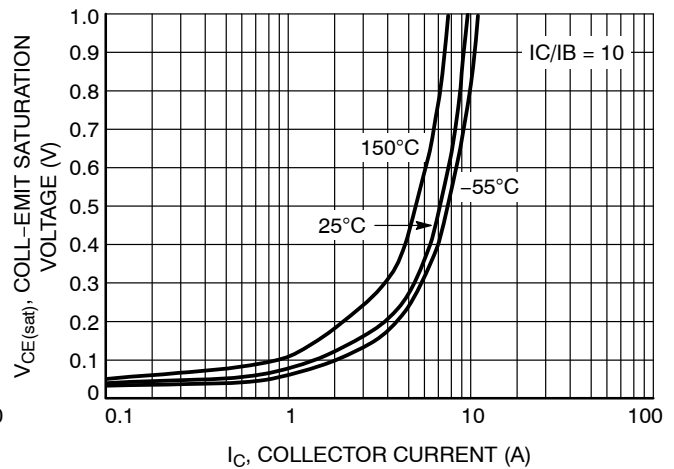


**Figure 4. Safe Operating Area**

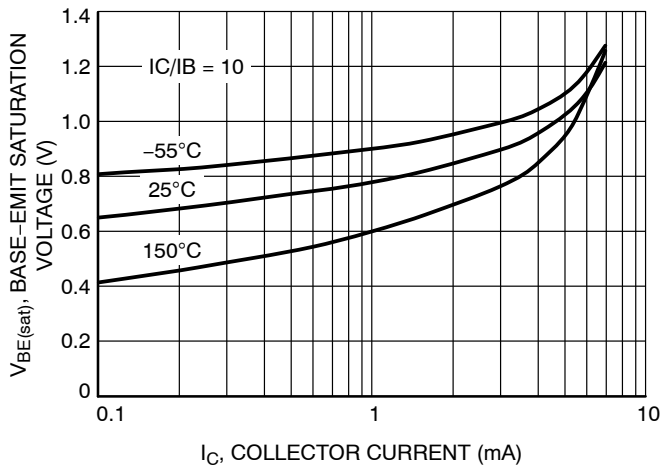
## TYPICAL CHARACTERISTICS MJ15004G (PNP)



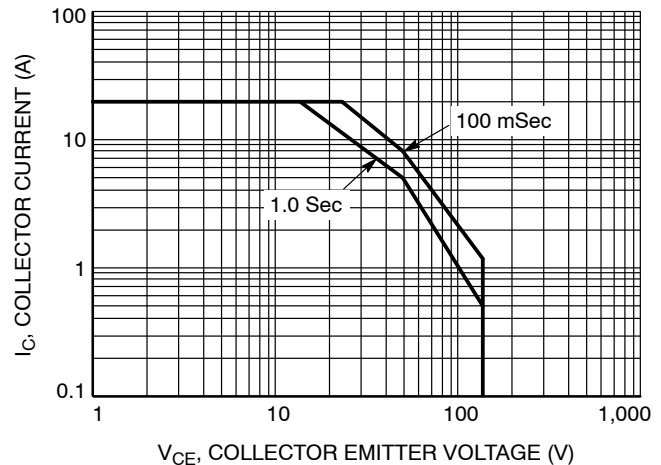
**Figure 5. DC Current Gain**



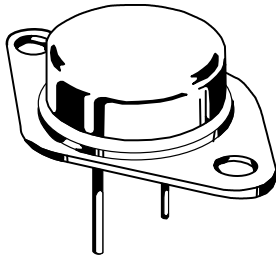
**Figure 6. Collector-Emitter Saturation Voltage**



**Figure 7. Base-Emitter Saturation Voltage**



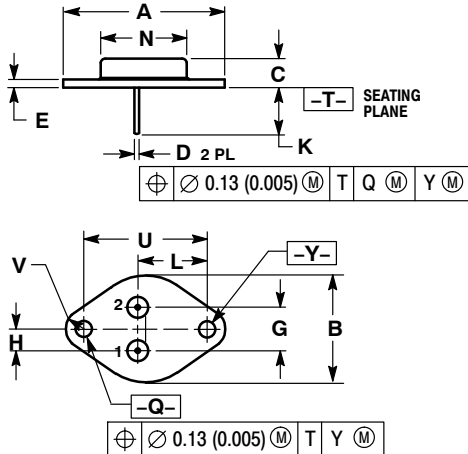
**Figure 8. Safe Operating Area**



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

DATE 10 MAR 2000

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

- |  |  |   |   |   |
|--|--|---|---|---|
| <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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