

# MJ15003 (NPN), MJ15004 (PNP)

Preferred Device

## Complementary Silicon Power Transistors

The MJ15003 and MJ15004 are PowerBase™ power transistors designed for high power audio, disk head positioners and other linear applications.

- High Safe Operating Area (100% Tested) –  
5.0 A @ 50 V
- For Low Distortion Complementary Designs
- High DC Current Gain –  
 $h_{FE} = 25$  (Min) @  $I_C = 5$  A

### 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	A
Base Current – Continuous	$I_B$	5	A
Emitter Current – Continuous	$I_E$	25	A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	250 1.43	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–65 to +200	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

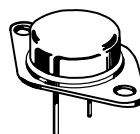
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction–to–Case	$R_{\theta JC}$	0.70	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes: 1/16" from Case for $\leq 10$ seconds	$T_L$	265	$^\circ\text{C}$



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## 20 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON 140 V 250 W



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

### MARKING DIAGRAM



xx = Specific Device Code  
A = Assembly Location  
WL, L = Wafer Lot  
YY, Y = Year  
WW, W = Work Week

### ORDERING INFORMATION

Device	Package	Shipping
MJ15003	TO-204AA (TO-3)	100 Foams
MJ15004	TO-204AA (TO-3)	100 Foams

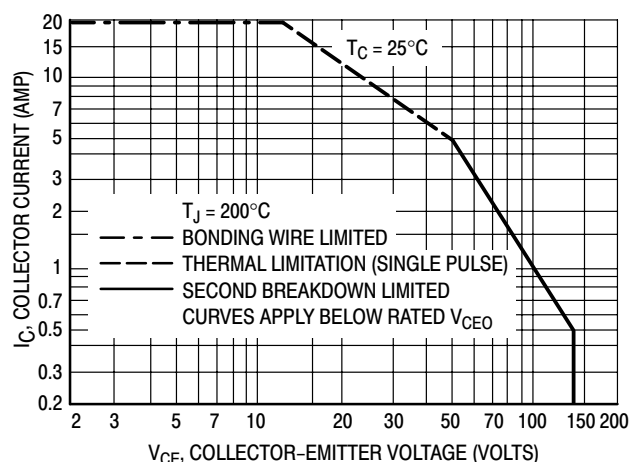
Preferred devices are recommended choices for future use and best overall value.

# MJ15003 (NPN), MJ15004 (PNP)

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector Emitter Sustaining Voltage (Note 1) ( $I_C = 200\text{ mAdc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	140	—	Vdc
Collector Cutoff Current ( $V_{CE} = 140\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 140\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ , $T_C = 150^\circ\text{C}$ )	$I_{CEX}$	— —	100 2	$\mu\text{Adc}$ mAdc
Collector Cutoff Current ( $V_{CE} = 140\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	—	250	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = 5\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	100	$\mu\text{Adc}$
<b>SECOND BREAKDOWN</b>				
Second Breakdown Collector Current with Base Forward Biased ( $V_{CE} = 50\text{ Vdc}$ , $t = 1\text{ s}$ (non repetitive)) ( $V_{CE} = 100\text{ Vdc}$ , $t = 1\text{ s}$ (non repetitive))	$I_{S/b}$	5.0 1.0	— —	Adc
<b>ON CHARACTERISTICS</b>				
DC Current Gain ( $I_C = 5\text{ Adc}$ , $V_{CE} = 2\text{ Vdc}$ )	$h_{FE}$	25	150	
Collector Emitter Saturation Voltage ( $I_C = 5\text{ Adc}$ , $I_B = 0.5\text{ Adc}$ )	$V_{CE(sat)}$	—	1.0	Vdc
Base Emitter On Voltage ( $I_C = 5\text{ Adc}$ , $V_{CE} = 2\text{ Vdc}$ )	$V_{BE(on)}$	—	2.0	Vdc
<b>DYNAMIC CHARACTERISTICS</b>				
Current Gain — Bandwidth Product ( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 0.5\text{ MHz}$ )	$f_T$	2.0	—	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f_{test} = 1\text{ MHz}$ )	$C_{ob}$	—	1000	pF

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



**Figure 1. Active-Region Safe Operating Area**

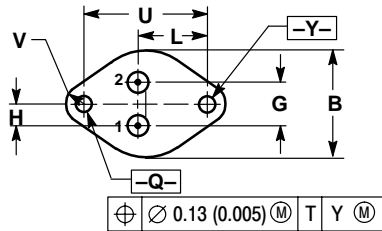
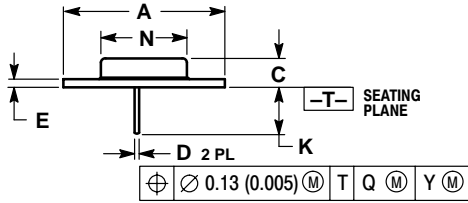
There are two limitations on the powerhandling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater 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 less than the limitations imposed by second breakdown.

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## 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

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