

# Complementary Silicon Power Transistors

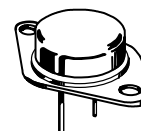
The MJ15003 and MJ15004 are PowerBase power transistors designed for high power audio, disk head positioners and other linear applications.

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

**NPN**  
**MJ15003\***  
**PNP**  
**MJ15004\***

\*Motorola Preferred Device

**20 AMPERE**  
**POWER TRANSISTORS**  
**COMPLEMENTARY**  
**SILICON**  
**140 VOLTS**  
**250 WATTS**



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

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	140	Vdc
Collector-Base Voltage	$V_{CB0}$	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	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	$^\circ\text{C}$

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

REV 7

# MJ15003 MJ15004

\*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) ( $I_C = 200\text{ mAdc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	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	$\mu\text{Adc}$

## SECOND BREAKDOWN

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 1	— —	Adc
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## ON CHARACTERISTICS

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	Vdc
Base Emitter On Voltage ( $I_C = 5\text{ Adc}$ , $V_{CE} = 2\text{ Vdc}$ )	$V_{BE(on)}$	—	2	Vdc

## DYNAMIC CHARACTERISTICS

Current Gain — Bandwidth Product ( $I_C = 0.5\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 0.5\text{ MHz}$ )	$f_T$	2	—	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  $\leq 2\%$ .

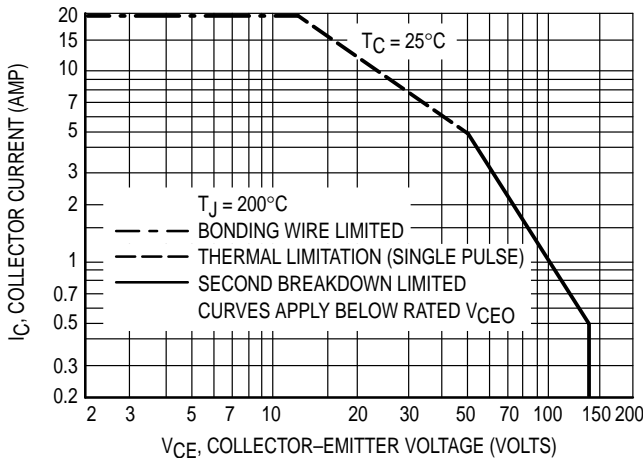
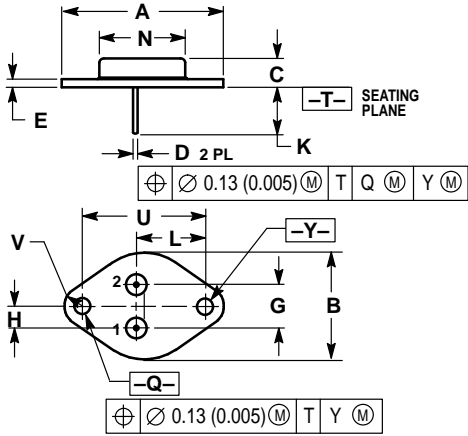


Figure 1. Active-Region Safe Operating Area

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.

PACKAGE DIMENSIONS




- 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

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

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