

## Silicon Power Transistors

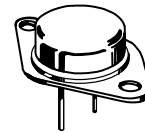
The MJ15022 and MJ15024 are PowerBase power transistors designed for high power audio, disk head positioners and other linear applications.

- High Safe Operating Area (100% Tested) —  
2 A @ 80 V
- High DC Current Gain —  
 $h_{FE} = 15$  (Min) @  $I_C = 8$  Adc

**NPN**  
**MJ15022**  
**MJ15024\***

\*Motorola Preferred Device

**16 AMPERE**  
**SILICON**  
**POWER TRANSISTORS**  
**200 AND 250 VOLTS**  
**250 WATTS**



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

### MAXIMUM RATINGS

Rating	Symbol	MJ15022	MJ15024	Unit
Collector–Emitter Voltage	$V_{CEO}$	200	250	Vdc
Collector–Base Voltage	$V_{CB0}$	350	400	Vdc
Emitter–Base Voltage	$V_{EBO}$	5		Vdc
Collector–Emitter Voltage	$V_{CEX}$	400		Vdc
Collector Current — Continuous Peak (1)	$I_C$	16 30		Adc
Base Current — Continuous	$I_B$	5		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	$^\circ\text{C/W}$

(1) Pulse Test: Pulse Width = 5 ms, Duty Cycle  $\leq$  10%.

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

REV 7

**MJ15022 MJ15024****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) ( $I_C = 100\text{ mAdc}$ , $I_B = 0$ )	MJ15022 MJ15024	$V_{CEO(sus)}$	200 250	— —
Collector Cutoff Current ( $V_{CE} = 200\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 250\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ )	MJ15022 MJ15024	$I_{CEX}$	— —	250 250 $\mu\text{Adc}$
Collector Cutoff Current ( $V_{CE} = 150\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 200\text{ vdc}$ , $I_B = 0$ )	MJ15022 MJ15024	$I_{CEO}$	— —	500 500 $\mu\text{Adc}$
Emitter Cutoff Current ( $V_{CE} = 5\text{ Vdc}$ , $I_B = 0$ )		$I_{EBO}$	—	500 $\mu\text{Adc}$

**SECOND BREAKDOWN**

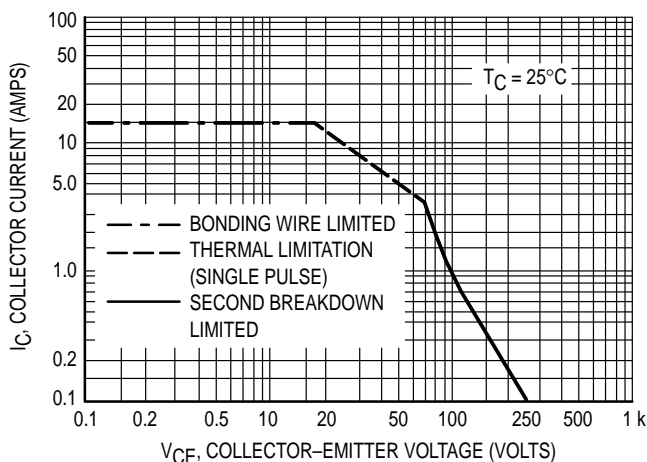
Second Breakdown Collector Current with Base Forward Biased ( $V_{CE} = 50\text{ Vdc}$ , $t = 0.5\text{ s}$ (non–repetitive)) ( $V_{CE} = 80\text{ Vdc}$ , $t = 0.5\text{ s}$ (non–repetitive))	$I_{S/b}$	5 2	— —	Adc
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**ON CHARACTERISTICS**

DC Current Gain ( $I_C = 8\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ ) ( $I_C = 16\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )	$h_{FE}$	15 5	60 —	—
Collector–Emitter Saturation Voltage ( $I_C = 8\text{ Adc}$ , $I_B = 0.8\text{ Adc}$ ) ( $I_C = 16\text{ Adc}$ , $I_B = 3.2\text{ Adc}$ )	$V_{CE(sat)}$	— —	1.4 4.0	Vdc
Base–Emitter On Voltage ( $I_C = 8\text{ Adc}$ , $V_{CE} = 4\text{ Vdc}$ )	$V_{BE(on)}$	—	2.2	Vdc

**DYNAMIC CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = 1\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 1\text{ MHz}$ )	$f_T$	4	—	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f_{test} = 1\text{ MHz}$ )	$C_{ob}$	—	500	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.

TYPICAL CHARACTERISTICS

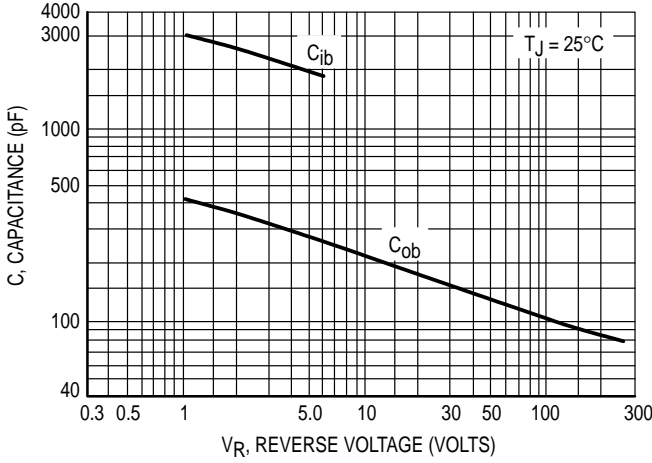


Figure 2. Capacitances

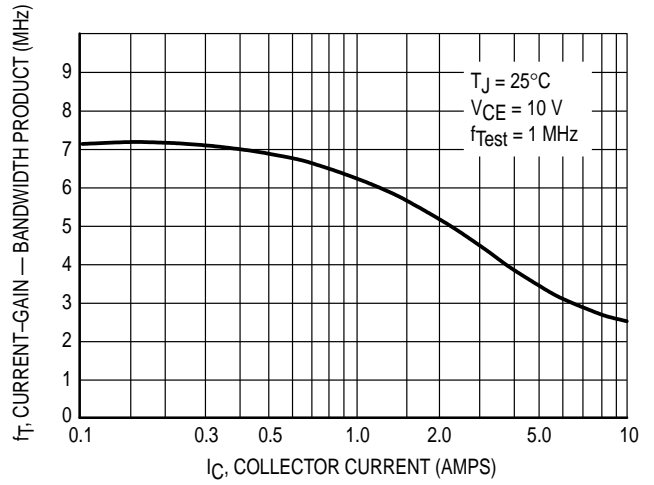


Figure 3. Current-Gain — Bandwidth Product

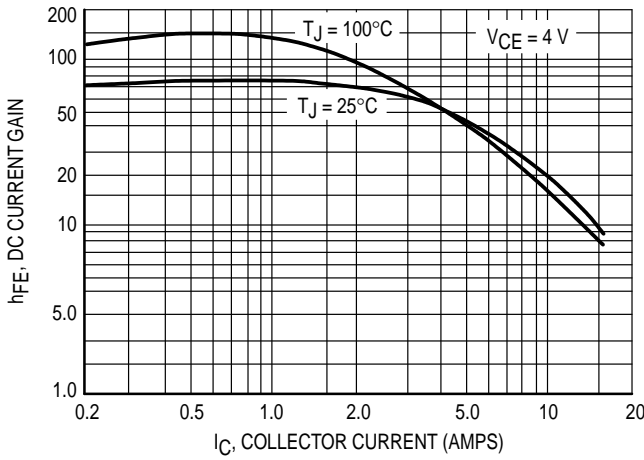


Figure 4. DC Current Gain

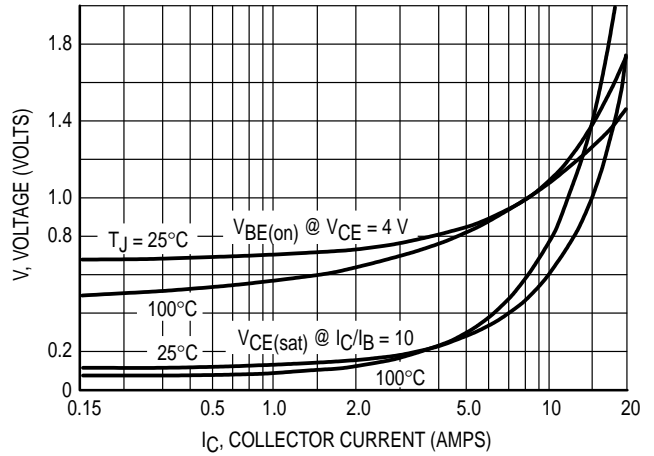


Figure 5. "On" Voltage

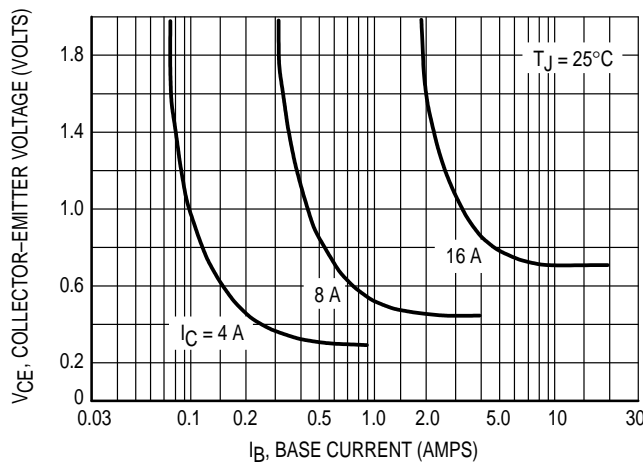
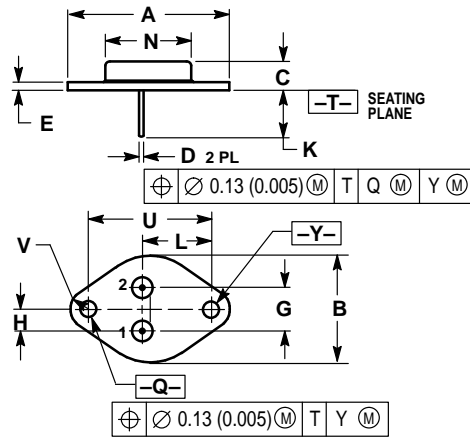


Figure 6. Collector Saturation Region

MJ15022 MJ15024

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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MJ15022/D