MJ14001 (PNP), MJ14002* (NPN), MJ14003* (PNP)

***Preferred Devices**

High-Current Complementary Silicon Power Transistors

Designed for use in high−power amplifier and switching circuit applications.

Features

- High Current Capability − I_C Continuous = 60 Amperes
- DC Current Gain − h_{FE} = 15−100 @ I_C = 50 Adc
- Low Collector−Emitter Saturation Voltage −$V_{CE(sat)}$ = 2.5 Vdc (Max) @ I_C = 50 Adc
- Pb−Free Packages are Available*

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector−Emitter Voltage MJ14001 MJ14002/03	V_{CEO}	60 80	Vdc
Collector−Base Voltage MJ14001 MJ14002/03	V_{CBO}	60 80	Vdc
Emitter−Base Voltage	V_{EBO}	5.0	Vdc
Collector Current − Continuous	I_C	60	Adc
Base Current − Continuous	I_B	15	Adc
Emitter Current − Continuous	I_E	75	Adc
Total Power Dissipation @ T_C = 25°C Derate Above 25°C	P_D	300 1.71	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

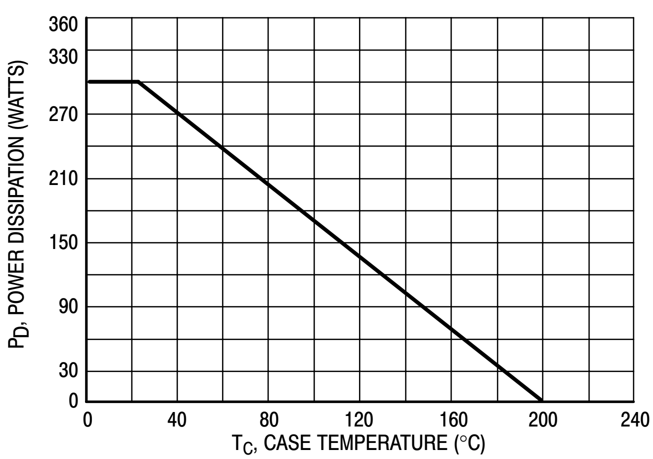

Figure 1. Power Derating

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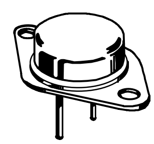
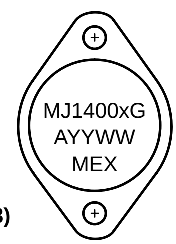
60 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 60−80 VOLTS, 300 WATTS

MARKING DIAGRAM



TO−204 (TO−3) CASE 197A STYLE 1



MJ1400x	=	Device Code xx = 1, 2, or 3
G	=	Pb−Free Package
A	=	Location Code
YY	=	Year
WW	=	Work Week
MEX	=	Country of Orgin

ORDERING INFORMATION

Device	Package	Shipping
MJ14001	TO−3	100 Units/Tray
MJ14001G	TO−3 (Pb−Free)	100 Units/Tray
MJ14002	TO−3	100 Units/Tray
MJ14002G	TO−3 (Pb−Free)	100 Units/Tray
MJ14003	TO−3	100 Units/Tray
MJ14003G	TO−3 (Pb−Free)	100 Units/Tray

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

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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	0.584	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Sustaining Voltage (Note 1)		$V_{CEO(sus)}$			Vdc
(I_C = 200 mAdc, I_B = 0)	MJ14001		60	−	
	MJ14002, MJ14003		80	−	
Collector Cutoff Current		I_{CEO}			mA
(V_{CE} = 30 Vdc, I_B = 0)	MJ14001		−	1.0	
(V_{CE} = 40 Vdc, I_B = 0)	MJ14402, MJ14003		−	1.0	
Collector Cutoff Current		I_{CEX}			mA
(V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 V)	MJ14001		−	1.0	
(V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 V)	MJ14002, MJ14003		−	1.0	
Collector Cutoff Current		I_{CBO}			mA
(V_{CB} = 60 Vdc, I_E = 0)	MJ14001		−	1.0	
(V_{CB} = 80 Vdc, I_E = 0)	MJ14002, MJ14003		−	1.0	
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	−	1.0	mA
ON CHARACTERISTICS					
DC Current Gain (Note 1)		h_{FE}			−
(I_C = 25 Adc, V_{CE} = 3.0 V)			30	−	
(I_C = 50 Adc, V_{CE} = 3.0 V)			15	100	
(I_C = 60 Adc, V_{CE} = 3.0 V)			5.0	−	
Collector−Emitter Saturation Voltage (Note 1)		$V_{CE(sat)}$			Vdc
(I_C = 25 Adc, I_B = 2.5 Adc)			−	1.0	
(I_C = 50 Adc, I_B = 5.0 Adc)			−	2.5	
(I_C = 60 Adc, I_B = 12 Adc)			−	3.0	
Base−Emitter Saturation Voltage (Note 1)		$V_{BE(sat)}$			Vdc
(I_C = 25 Adc, I_B = 2.5 Adc)			−	2.0	
(I_C = 50 Adc, I_B = 5.0 Adc)			−	3.0	
(I_C = 60 Adc, I_B = 12 Adc)			−	4.0	
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)		C_{ob}	−	2000	pF

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

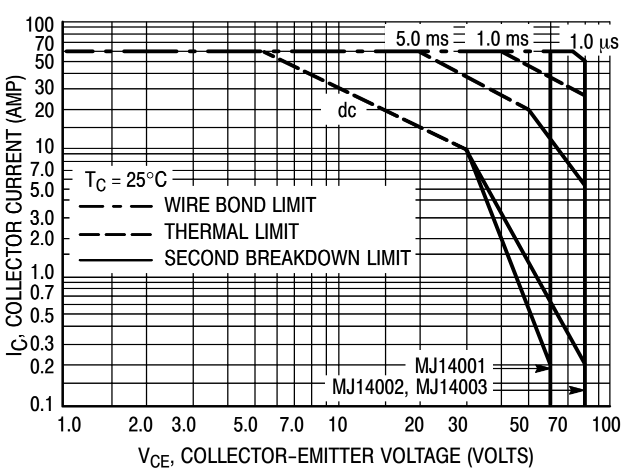


Figure 2. Maximum Rated Forward Biased Safe Operating Area

There are two limitations on the power handling 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 2 is based on $T_{J(pk)}$ = 200°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)}$ ≤ 200°C. $T_{J(pk)}$ may be calculated from the data in Figure 13. 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 ELECTRICAL CHARACTERISTICS

MJ14002 (NPN)

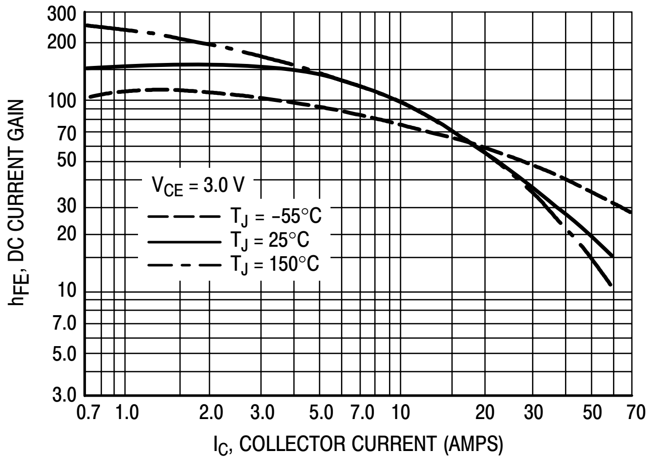


Figure 3. DC Current Gain

MJ14001, MJ14003 (PNP)

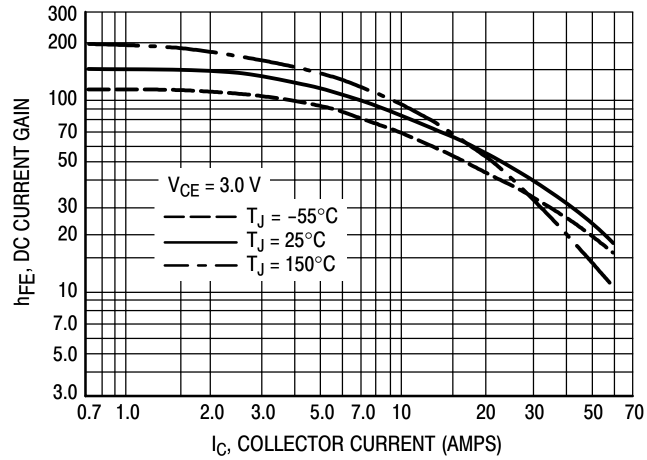


Figure 4. DC Current Gain

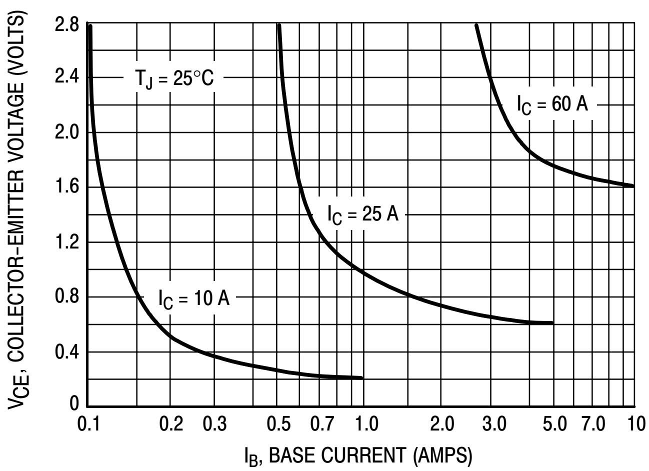


Figure 5. Collector Saturation Region

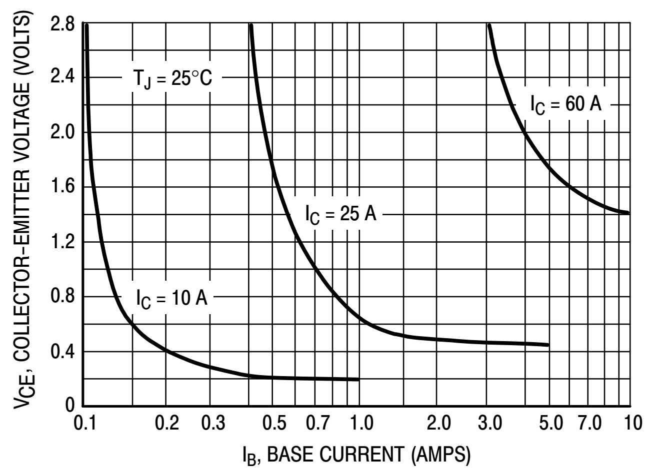


Figure 6. Collector Saturation Region

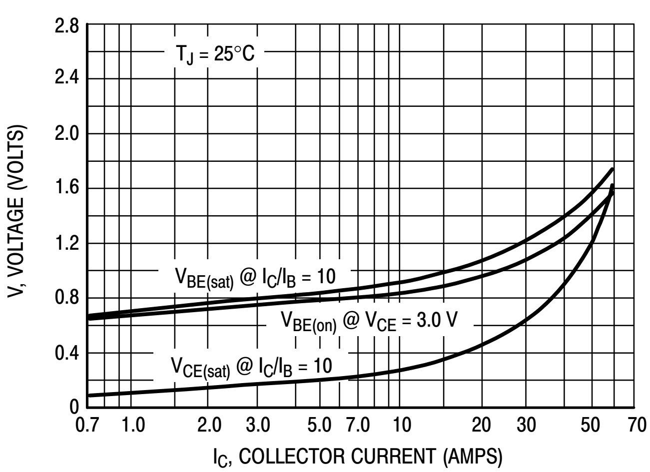


Figure 7. “On” Voltages

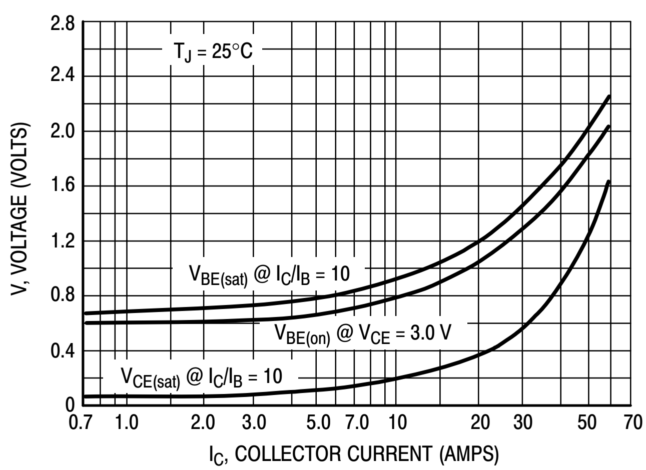


Figure 8. “On” Voltages

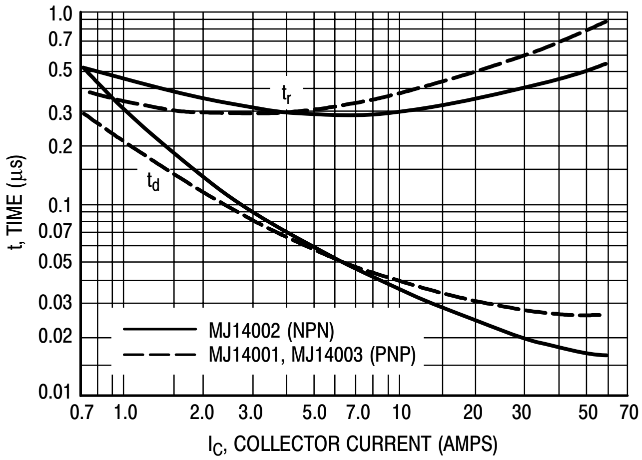


Figure 9. Turn−On Switching Times

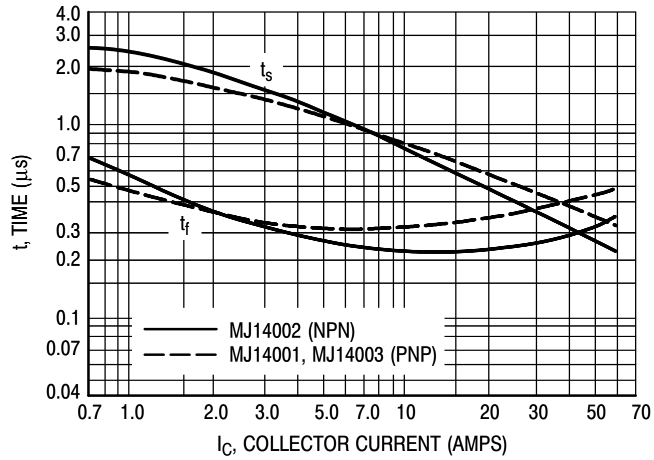


Figure 10. Turn−Off Switching Times

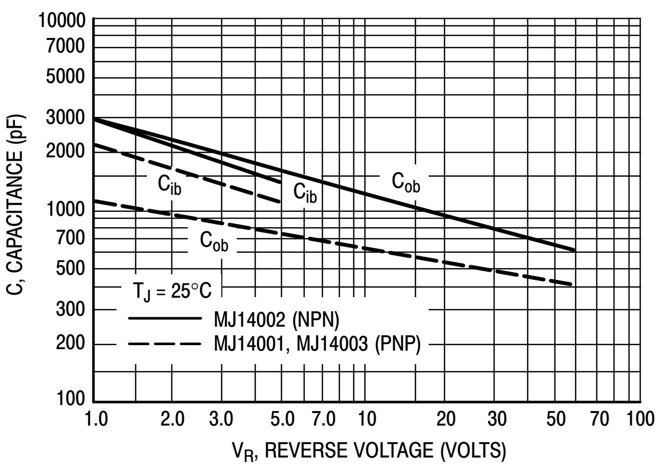


Figure 11. Capacitance Variation

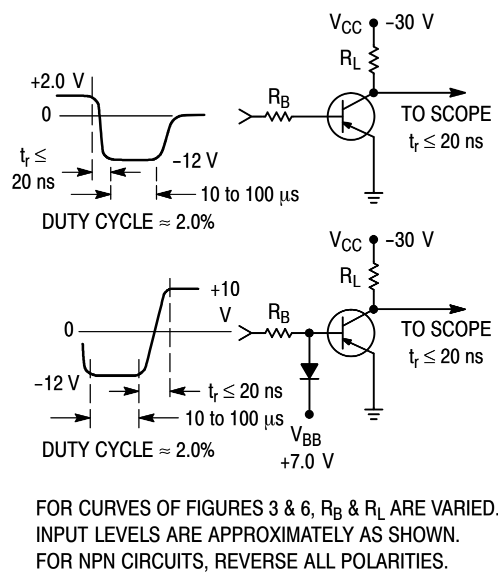


Figure 12. Switching Test Circuit

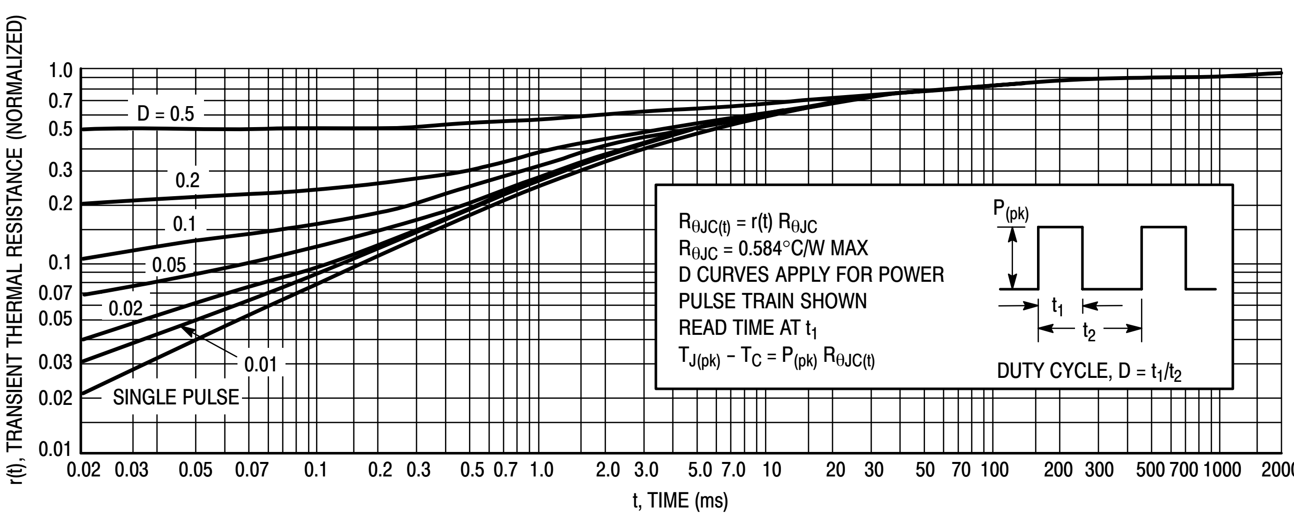
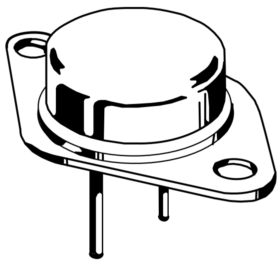


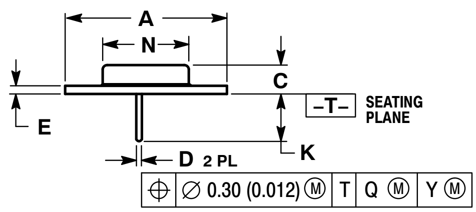
Figure 13. Thermal Response

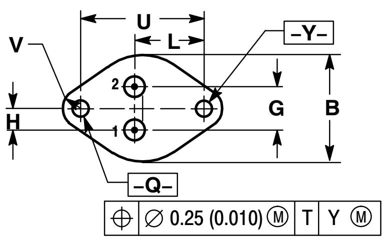


SCALE 1:1

TO−204 (TO−3)
CASE 197A−05
ISSUE K

DATE 21 FEB 2000





STYLE 1:
PIN 1. BASE
2. EMITTER
CASE: COLLECTOR

STYLE 2:
PIN 1. EMITTER
2. BASE
CASE: COLLECTOR

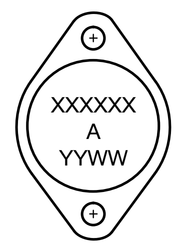
STYLE 3:
PIN 1. GATE
2. SOURCE
CASE: DRAIN

STYLE 4:
PIN 1. ANODE = 1
2. ANODE = 2
CASE: CATHODES

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.530 REF		38.86 REF	
B	0.990	1.050	25.15	26.67
C	0.250	0.335	6.35	8.51
D	0.057	0.063	1.45	1.60
E	0.060	0.070	1.53	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	0.760	0.830	19.31	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

GENERIC
MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Locationa
YY = Year
WW = Work Week

*This information is generic. Please refer to device data sheet for actual part marking.

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DOCUMENT NUMBER:
98ASB42128B

PAGE 2 OF 2

ISSUE	REVISION	DATE
K	LEGALLY CHANGED TO ON	21 FEB 2000

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