

MOTOROLA

SEMICONDUCTOR TECHNICAL DATA

Order this document
by MJE15028/D

Complementary Silicon Plastic Power Transistors

... designed for use as high-frequency drivers in audio amplifiers.

- DC Current Gain Specified to 4.0 Amperes
 $h_{FE} = 40$ (Min) @ $I_C = 3.0$ Adc
 $= 20$ (Min) @ $I_C = 4.0$ Adc
- Collector-Emitter Sustaining Voltage —
 $V_{CE(sus)} = 120$ Vdc (Min) — MJE15028, MJE15029
 $= 150$ Vdc (Min) — MJE15030, MJE15031
- High Current Gain — Bandwidth Product
 $f_T = 30$ MHz (Min) @ $I_C = 500$ mAdc
- TO-220AB Compact Package

MAXIMUM RATINGS

Rating	Symbol	MJE15028 MJE15029	MJE15030 MJE15031	Unit
Collector-Emitter Voltage	V_{CEO}	120	150	Vdc
Collector-Base Voltage	V_{CB}	120	150	Vdc
Emitter-Base Voltage	V_{EB}	5.0		Vdc
Collector Current — Continuous — Peak	I_C	8.0 16		Adc
Base Current	I_B	2.0		Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	50 0.40		Watts W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	2.0 0.016		Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150		$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$

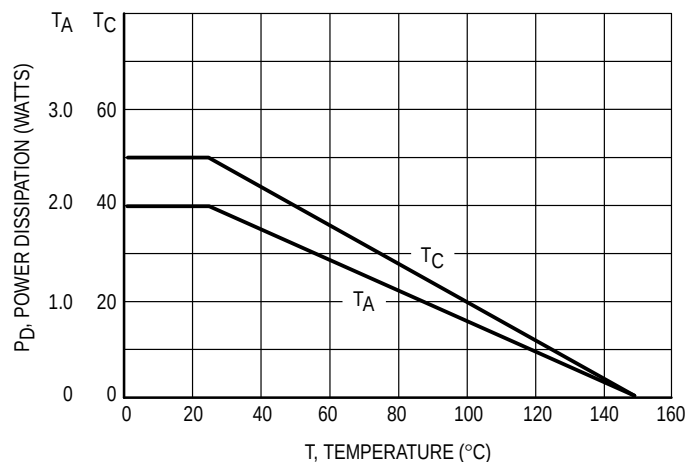


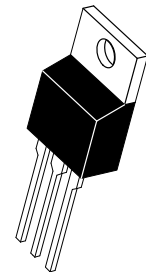
Figure 1. Power Derating

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

NPN
MJE15028*
MJE15030*
PNP
MJE15029*
MJE15031*

*Motorola Preferred Device

8 AMPERE
POWER TRANSISTORS
COMPLEMENTARY
SILICON
120-150 VOLTS
50 WATTS



CASE 221A-06
TO-220AB



MJE15028 MJE15030 MJE15029 MJE15031**ELECTRICAL CHARACTERISTICS** ($T_C = 25^\circ\text{C}$ unless otherwise noted)

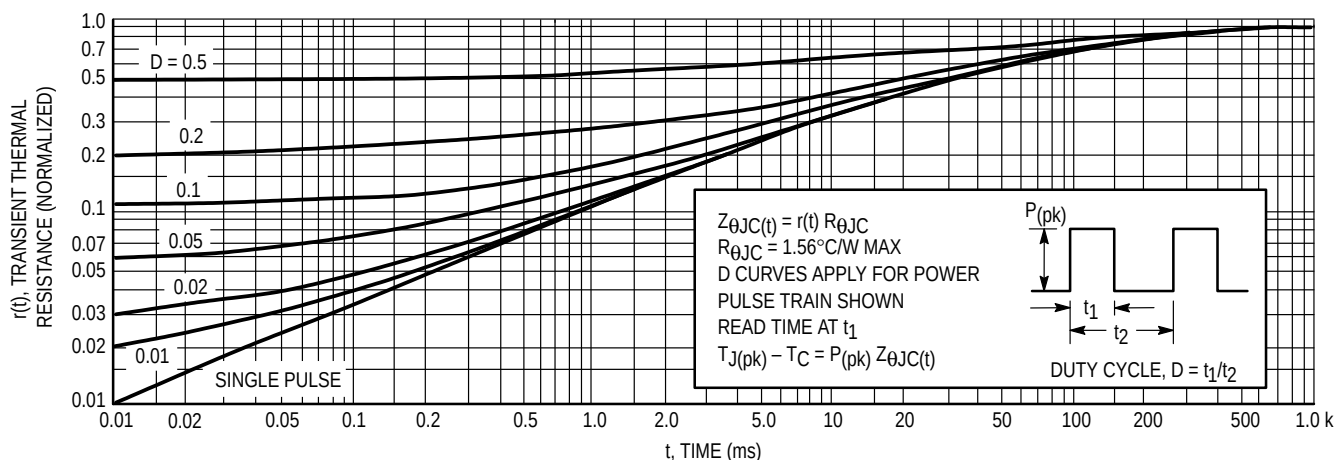
Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (1) ($I_C = 10\text{ mAdc}$, $I_B = 0$)	$V_{CEO(sus)}$	120 150	— —	Vdc
Collector Cutoff Current ($V_{CE} = 120\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 150\text{ Vdc}$, $I_B = 0$)	I_{CEO}	— —	0.1 0.1	mAdc
Collector Cutoff Current ($V_{CB} = 120\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 150\text{ Vdc}$, $I_E = 0$)	I_{CBO}	— —	10 10	μAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	10	μAdc

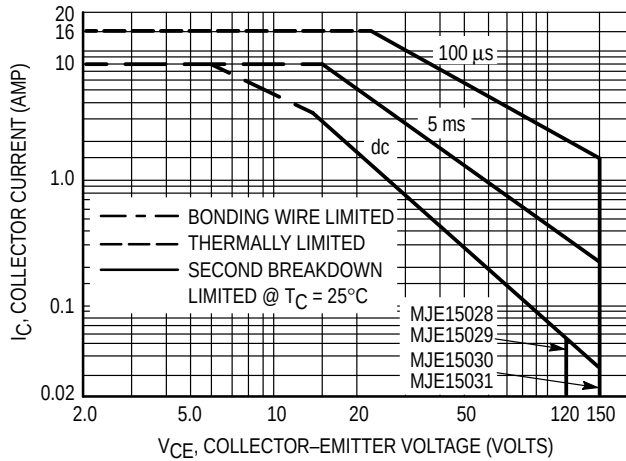
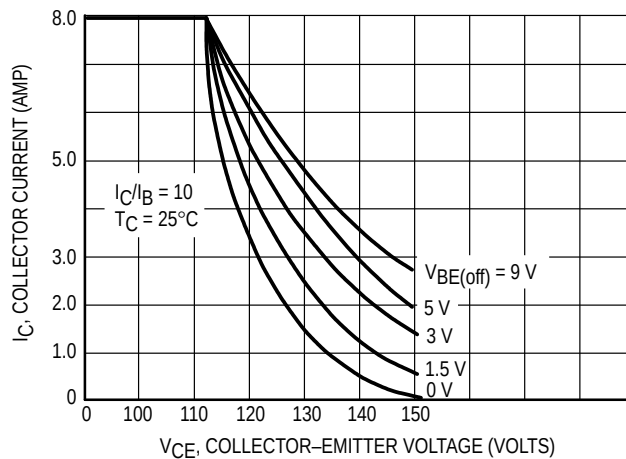
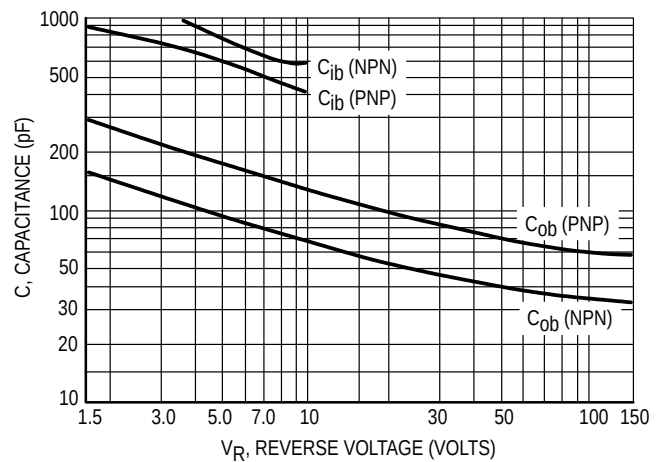
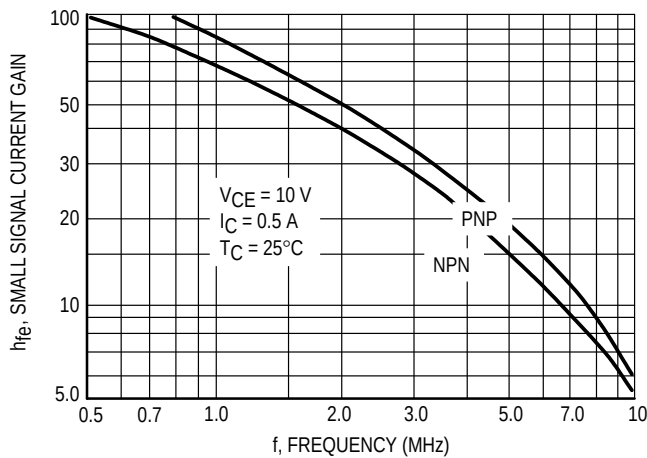
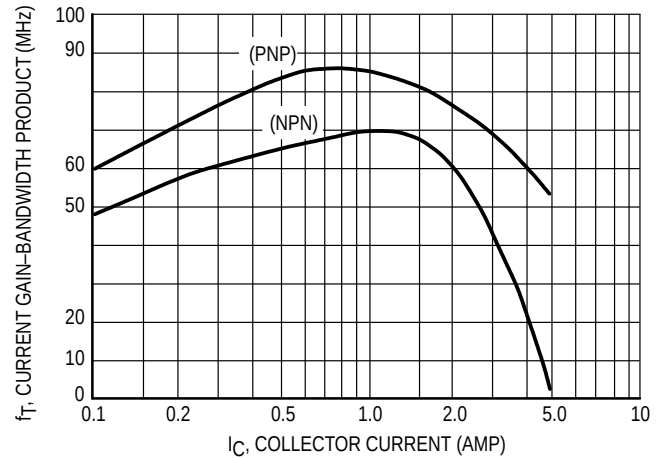
ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 0.1\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 3.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 4.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$)	h_{FE}	40 40 40 20	— — — —	—
DC Current Gain Linearity (V_{CE} From 2.0 V to 20 V, I_C From 0.1 A to 3 A) (NPN TO PNP)	h_{FE}	Typ 2 3		
Collector–Emitter Saturation Voltage ($I_C = 1.0\text{ Adc}$, $I_B = 0.1\text{ Adc}$)	$V_{CE(sat)}$	—	0.5	Vdc
Base–Emitter On Voltage ($I_C = 1.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$)	$V_{BE(on)}$	—	1.0	Vdc

DYNAMIC CHARACTERISTICS

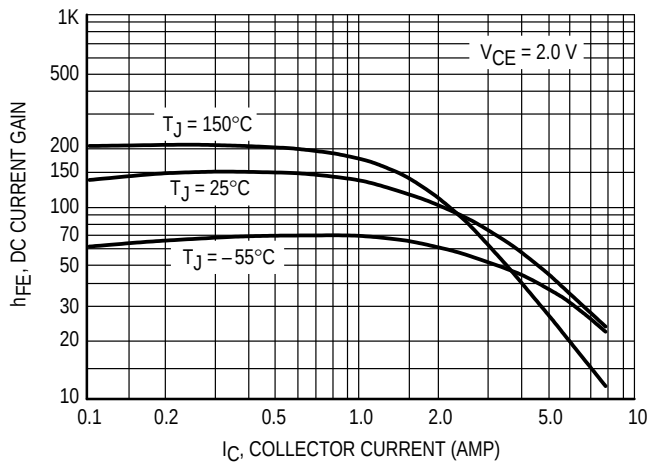
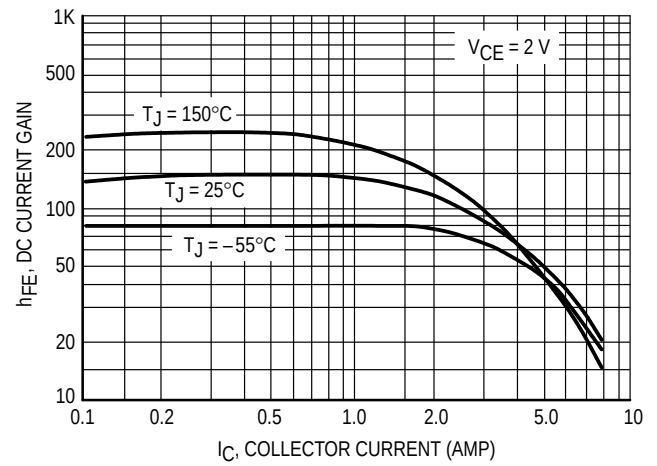
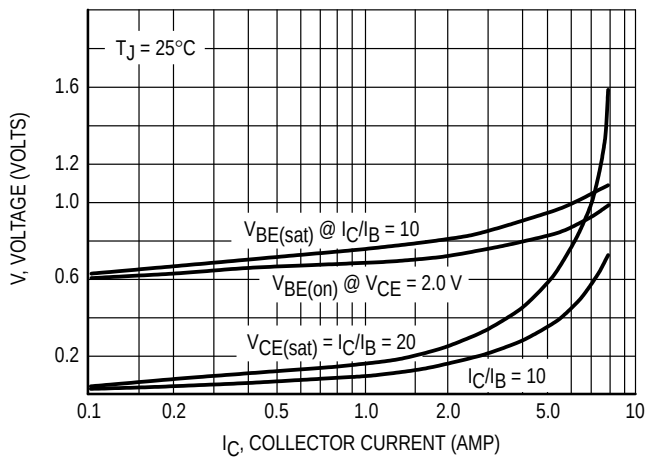
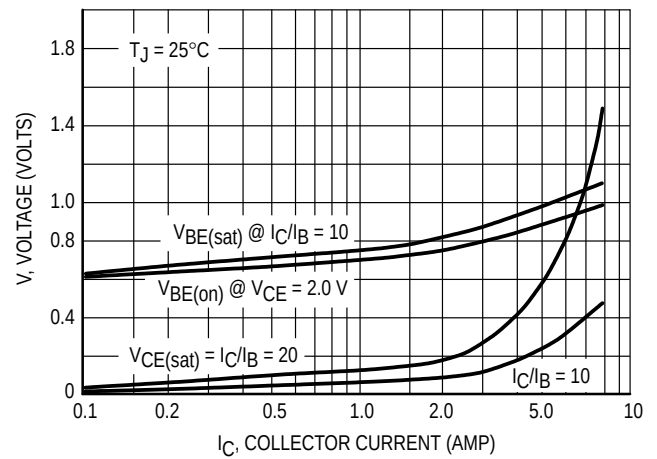
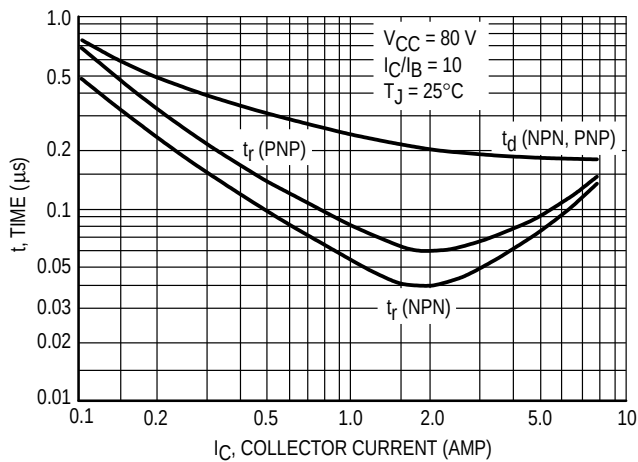
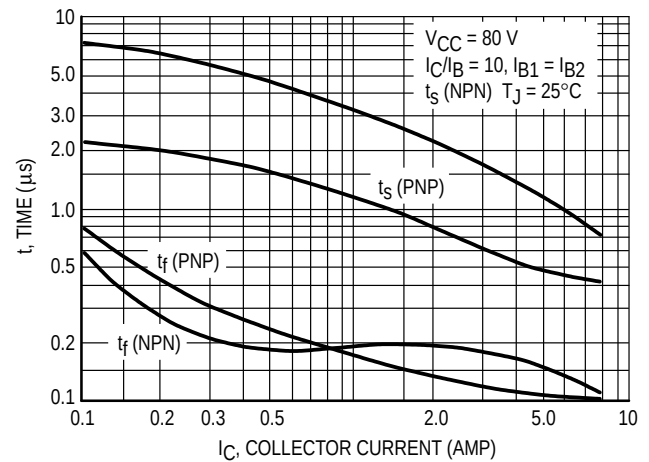
Current Gain — Bandwidth Product (2) ($I_C = 500\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 10\text{ MHz}$)	f_T	30	—	MHz
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(1) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.(2) $f_T = |h_{fe}| \cdot f_{test}$.**Figure 2. Thermal Response**

MJE15028 MJE15030 MJE15029 MJE15031**Figure 3. Forward Bias Safe Operating Area****Figure 4. Reverse-Bias Switching Safe Operating Area****Figure 5. Capacitances****Figure 6. Small-Signal Current Gain****Figure 7. Current Gain-Bandwidth Product**

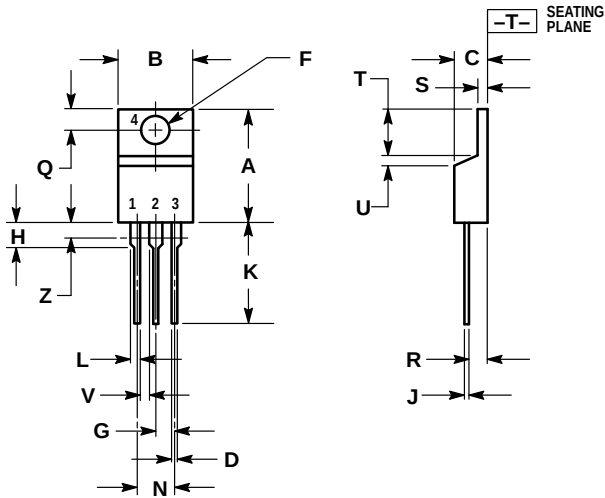
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation, i.e., the transistor must not be subjected to greater dissipation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

The data of Figures 3 and 4 is based on $T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150^\circ\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 2. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

MJE15028 MJE15030 MJE15029 MJE15031**NPN — MJE15028 MJE15030****PNP — MJE15029 MJE15031****Figure 8. DC Current Gain****NPN****PNP****Figure 9. "On" Voltage****Figure 10. Turn-On Times****Figure 11. Turn-Off Times**

MJE15028 MJE15030 MJE15029 MJE15031

PACKAGE DIMENSIONS



- NOTES:
- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - 2. CONTROLLING DIMENSION: INCH.
 - 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	—	1.15	—
Z	—	0.080	—	2.04

- STYLE 1:
- PIN 1. BASE
 - 2. COLLECTOR
 - 3. EMITTER
 - 4. COLLECTOR

CASE 221A-06
TO-220AB
ISSUE Y

MJE15028 MJE15030 MJE15029 MJE15031

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How to reach us:

USA / EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

MFAX: RMFAX0@email.sps.mot.com – TOUCHTONE (602) 244-6609
INTERNET: http://Design-NET.com

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

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