Complementary Silicon Plastic Power Transistors

NPN
MJE15028*

MJE15030*

PNP
MJE15029*

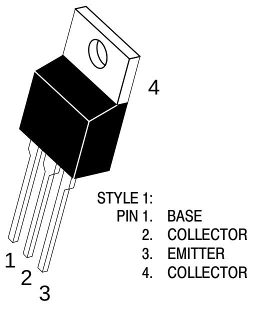
MJE15031*

*ON Semiconductor Preferred Device

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

. . . 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 —
  $V_{CEO(sus)}$ = 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



CASE 221A–09
TO–220AB

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°C Derate above 25°C	P_D	50 0.40		Watts W/°C
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	2.0 0.016		Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to +150		°C

THERMAL CHARACTERISTICS

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

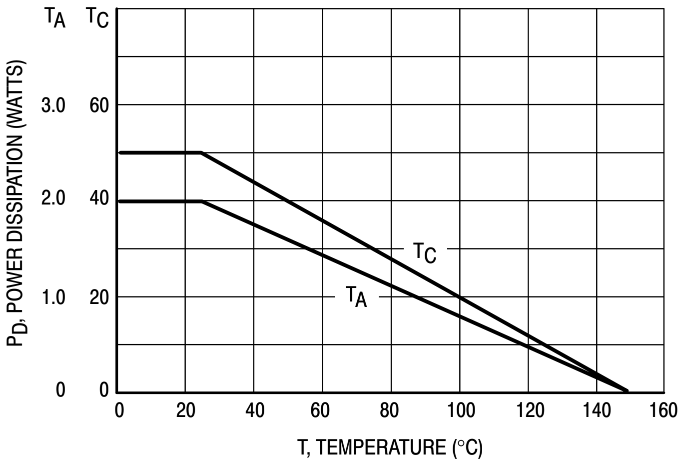


Figure 1. Power Derating

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

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (1) (I_C = 10 mAdc, I_B = 0)	 MJE15028, MJE15029 MJE15030, MJE15031	$V_{CEO(sus)}$	 120 150	 — —	Vdc
Collector Cutoff Current (V_{CE} = 120 Vdc, I_B = 0) (V_{CE} = 150 Vdc, I_B = 0)	 MJE15028, MJE15029 MJE15030, MJE15031	I_{CEO}	 — —	 0.1 0.1	mAdc
Collector Cutoff Current (V_{CB} = 120 Vdc, I_E = 0) (V_{CB} = 150 Vdc, I_E = 0)	 MJE15028, MJE15029 MJE15030, MJE15031	I_{CBO}	 — —	 10 10	μAdc
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)		I_{EBO}	—	10	μAdc
ON CHARACTERISTICS (1)					
DC Current Gain (I_C = 0.1 Adc, V_{CE} = 2.0 Vdc) (I_C = 2.0 Adc, V_{CE} = 2.0 Vdc) (I_C = 3.0 Adc, V_{CE} = 2.0 Vdc) (I_C = 4.0 Adc, V_{CE} = 2.0 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 Adc, I_B = 0.1 Adc)		$V_{CE(sat)}$	—	0.5	Vdc
Base–Emitter On Voltage (I_C = 1.0 Adc, V_{CE} = 2.0 Vdc)		$V_{BE(on)}$	—	1.0	Vdc
DYNAMIC CHARACTERISTICS					
Current Gain — Bandwidth Product (2) (I_C = 500 mAdc, V_{CE} = 10 Vdc, f_{test} = 10 MHz)		f_T	30	—	MHz

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

(2) $f_T = |h_{fe}| \bullet f_{test}$.

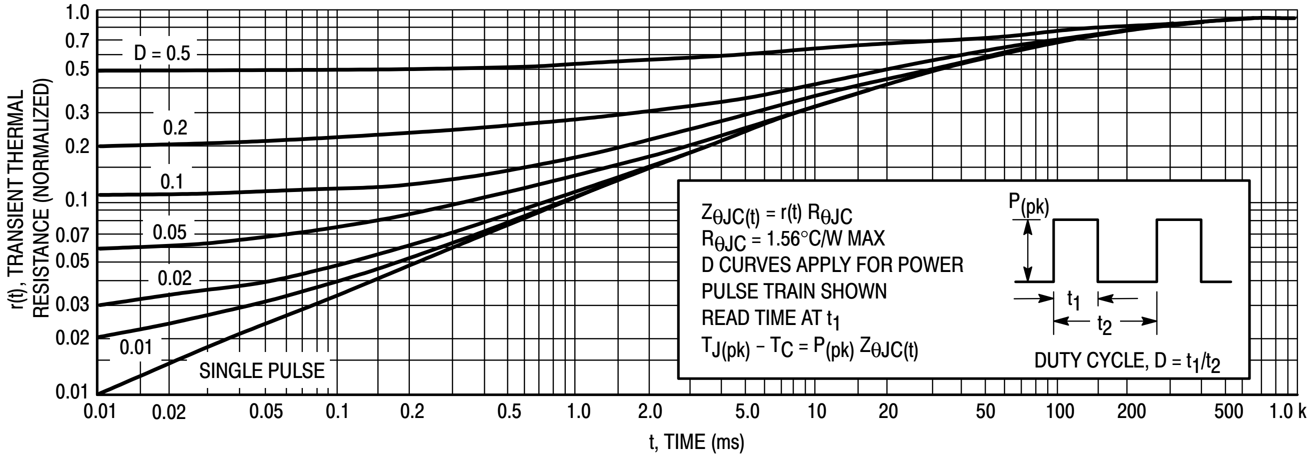


Figure 2. Thermal Response

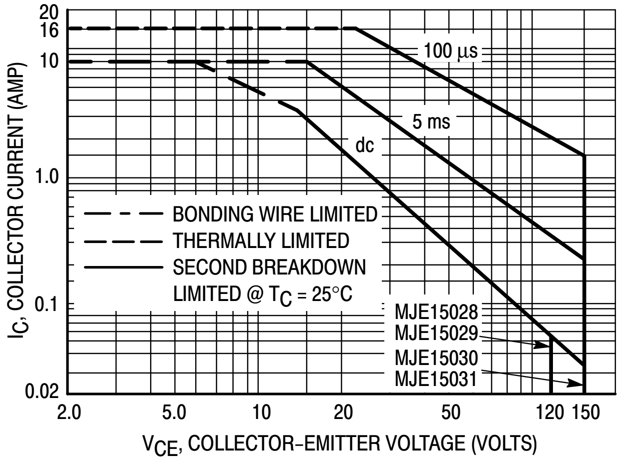


Figure 3. Forward Bias Safe Operating Area

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 then the curves indicate.

The data of Figures 3 and 4 is based on $T_{J(pk)} = 150°C$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150°C$. $T_{J(pk)}$ 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.

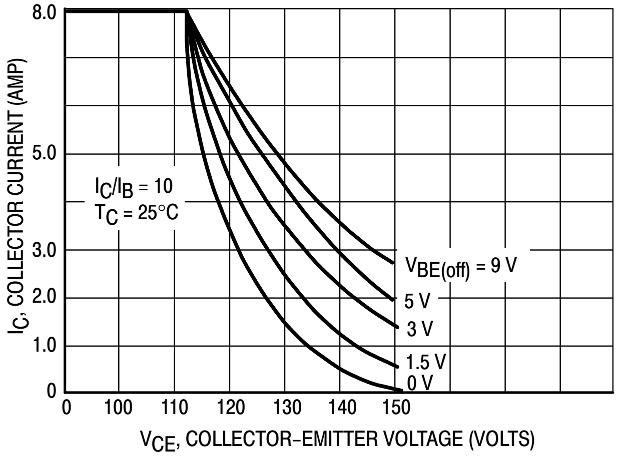


Figure 4. Reverse−Bias Switching Safe Operating Area

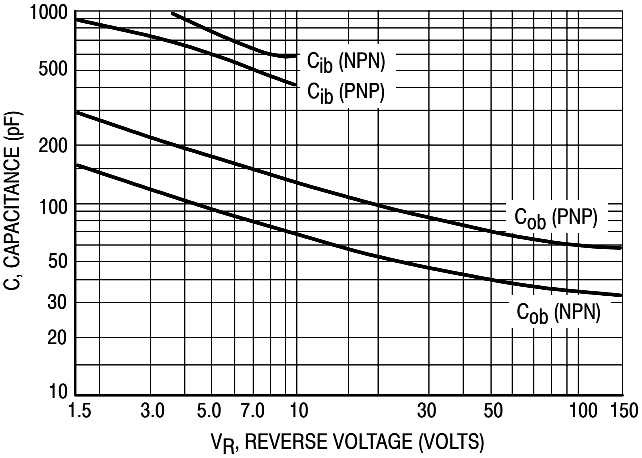


Figure 5. Capacitances

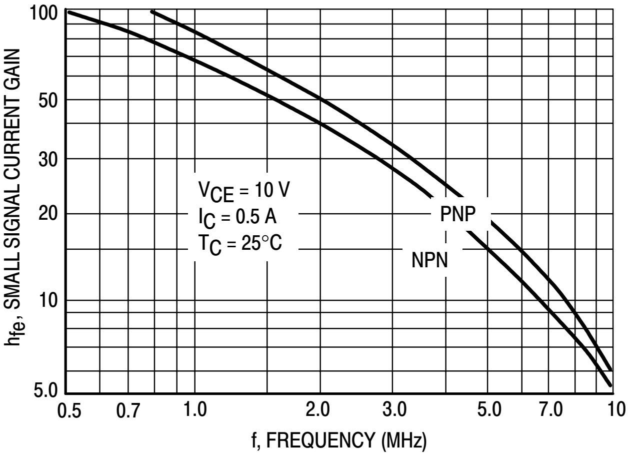


Figure 6. Small−Signal Current Gain

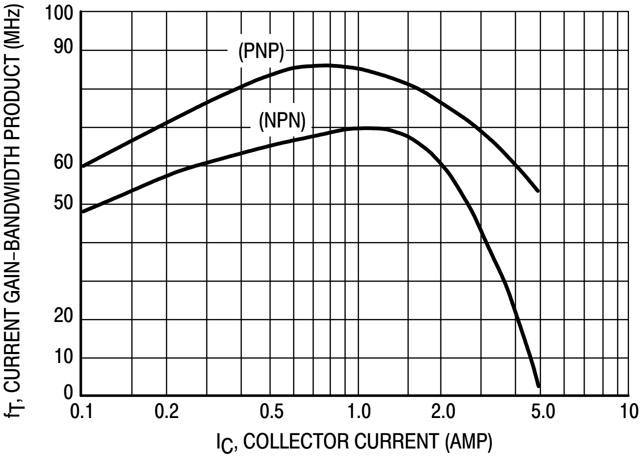
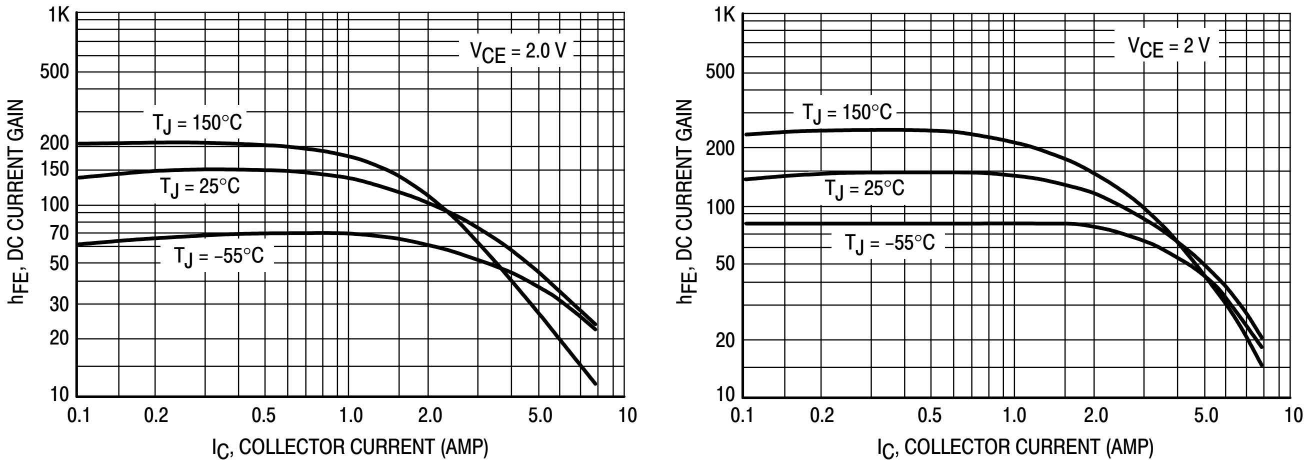
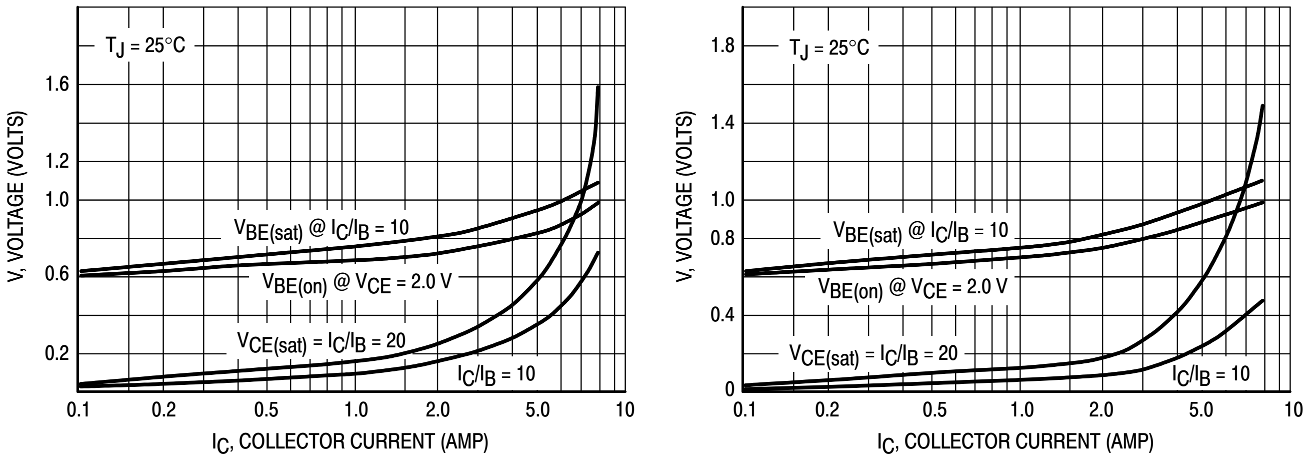


Figure 7. Current Gain−Bandwidth Product


NPN — MJE15028 MJE15030

PNP — MJE15029 MJE15031

Figure 8. DC Current Gain


NPN

PNP

Figure 9. “On” Voltage

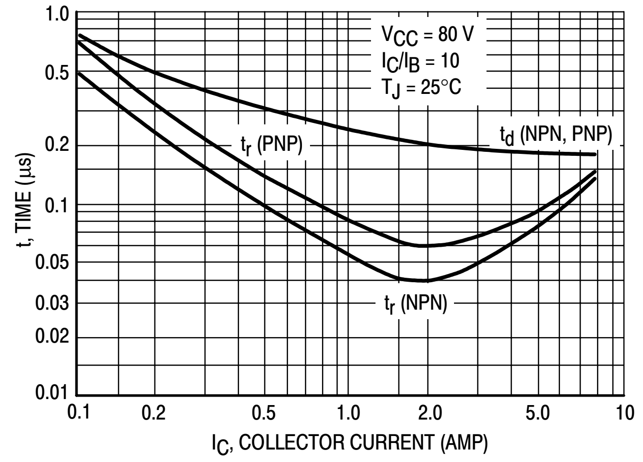


Figure 10. Turn–On Times

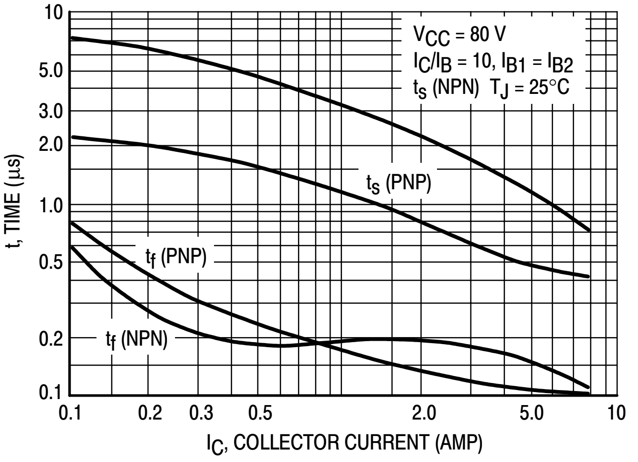
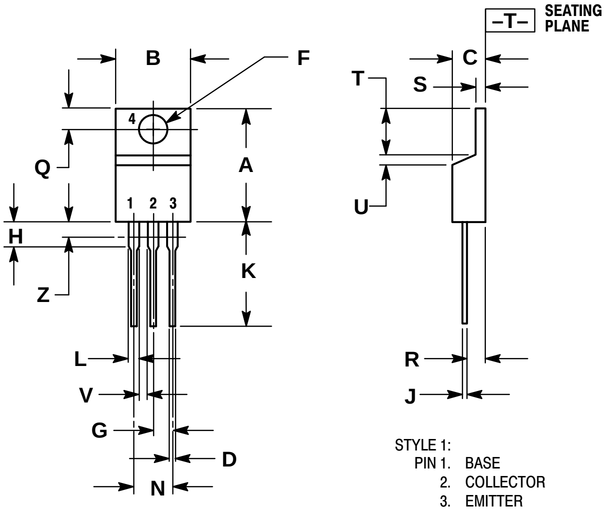


Figure 11. Turn–Off Times

PACKAGE DIMENSIONS

TO–220AB
CASE 221A–09
ISSUE AA



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

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.

	INCHES		MILLIMETERS	
DIM	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

Notes

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