

Complementary Silicon Power Plastic Transistors

... designed for low voltage, low-power, high-gain audio amplifier applications.

- Collector-Emitter Sustaining Voltage —
 $V_{CE(sus)} = 25 \text{ Vdc (Min) @ } I_C = 10 \text{ mAdc}$
- High DC Current Gain —
 $h_{FE} = 70 \text{ (Min) @ } I_C = 500 \text{ mAdc}$
 $= 45 \text{ (Min) @ } I_C = 2.0 \text{ Adc}$
 $= 10 \text{ (Min) @ } I_C = 5.0 \text{ Adc}$
- Low Collector-Emitter Saturation Voltage —
 $V_{CE(sat)} = 0.3 \text{ Vdc (Max) @ } I_C = 500 \text{ mAdc}$
 $= 0.75 \text{ Vdc (Max) @ } I_C = 2.0 \text{ Adc}$
- High Current-Gain — Bandwidth Product —
 $f_T = 65 \text{ MHz (Min) @ } I_C$
 $= 100 \text{ mAdc}$
- Annular Construction for Low Leakage —
 $I_{CBO} = 100 \text{ nAdc @ Rated } V_{CB}$

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CB}	40	Vdc
Collector-Emitter Voltage	V_{CEO}	25	Vdc
Emitter-Base Voltage	V_{EB}	8.0	Vdc
Collector Current — Continuous Peak	I_C	5.0 10	Adc
Base Current	I_B	1.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	15 0.12	Watts W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	1.5 0.012	Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150	$^\circ\text{C}$

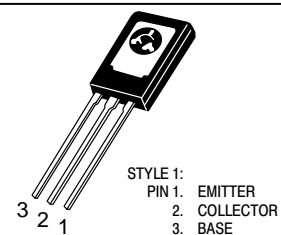
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	8.34	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	θ_{JA}	83.4	$^\circ\text{C/W}$

**NPN
MJE200*
PNP
MJE210***

*ON Semiconductor Preferred Device

**5 AMPERE
POWER TRANSISTORS
COMPLEMENTARY
SILICON
25 VOLTS
15 WATTS**



**CASE 77-09
TO-225AA**

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

MJE200 MJE210

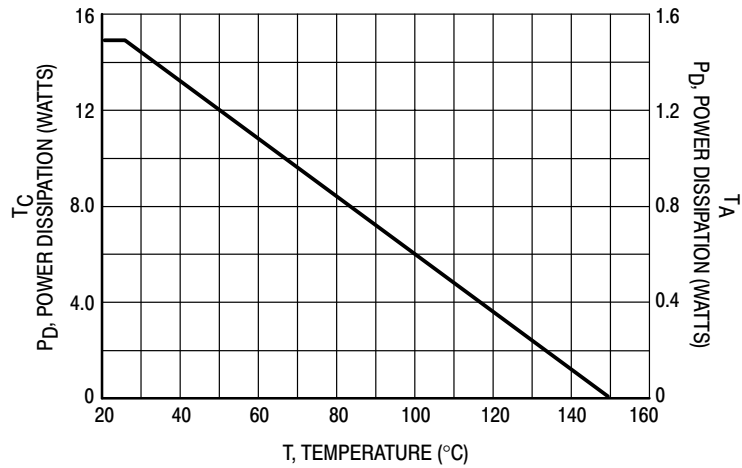


Figure 1. Power Derating

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

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector–Emitter Sustaining Voltage (1) (I _C = 10 mA _{dc} , I _B = 0)	V _{CEO(sus)}	25	—	V _{dc}
Collector Cutoff Current (V _{CB} = 40 V _{dc} , I _E = 0) (V _{CB} = 40 V _{dc} , I _E = 0, T _J = 125°C)	I _{CBO}	—	100	nA _{dc} μA _{dc}
Emitter Cutoff Current (V _{BE} = 8.0 V _{dc} , I _C = 0)	I _{EBO}	—	100	nA _{dc}

ON CHARACTERISTICS

DC Current Gain (1) (I _C = 500 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 2.0 A _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 5.0 A _{dc} , V _{CE} = 2.0 V _{dc})	h _{FE}	70 45 10	— 180 —	—
Collector–Emitter Saturation Voltage (1) (I _C = 500 mA _{dc} , I _B = 50 mA _{dc}) (I _C = 2.0 A _{dc} , I _B = 200 mA _{dc}) (I _C = 5.0 A _{dc} , I _B = 1.0 A _{dc})	V _{CE(sat)}	— — —	0.3 0.75 1.8	V _{dc}
Base–Emitter Saturation Voltage (1) (I _C = 5.0 A _{dc} , I _B = 1.0 A _{dc})	V _{BE(sat)}	—	2.5	V _{dc}
Base–Emitter On Voltage (1) (I _C = 2.0 A _{dc} , V _{CE} = 1.0 V _{dc})	V _{BE(on)}	—	1.6	V _{dc}

DYNAMIC CHARACTERISTICS

Current–Gain — Bandwidth Product (2) (I _C = 100 mA _{dc} , V _{CE} = 10 V _{dc} , f _{test} = 10 MHz)	f _T	65	—	MHz
Output Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f = 0.1 MHz)	C _{ob}	—	80	pF
		MJE200	120	
		MJE210		

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

(2) f_T = |h_{fe}| • f_{test}.

MJE200 MJE210

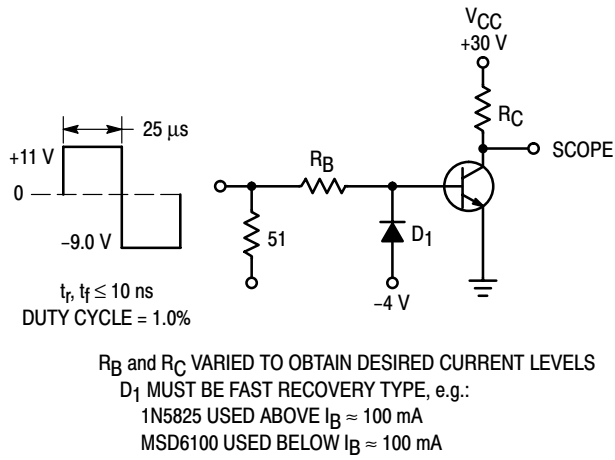


Figure 2. Switching Time Test Circuit

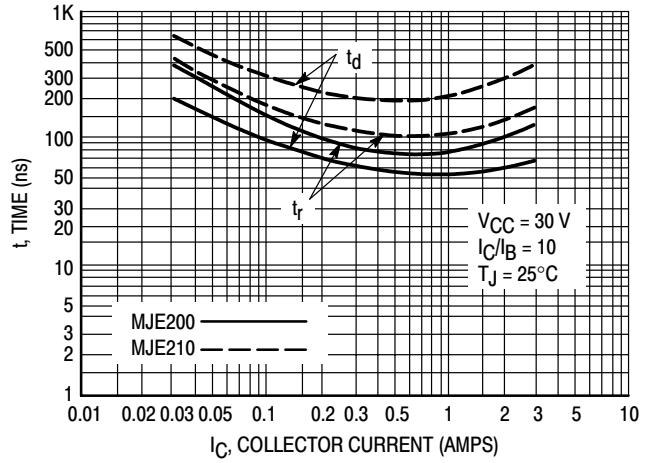


Figure 3. Turn-On Time

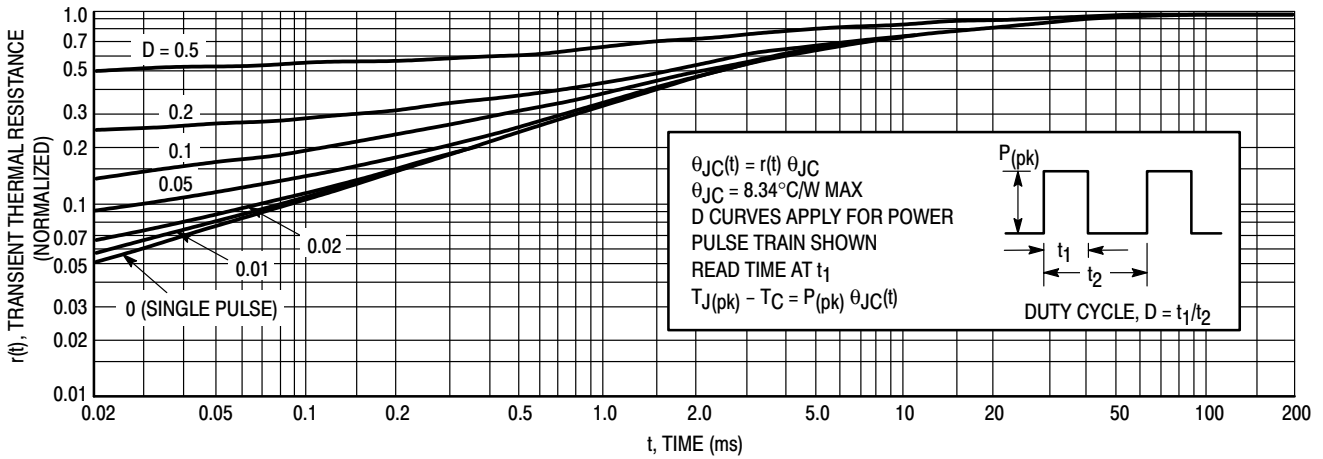


Figure 4. Thermal Response

MJE200 MJE210

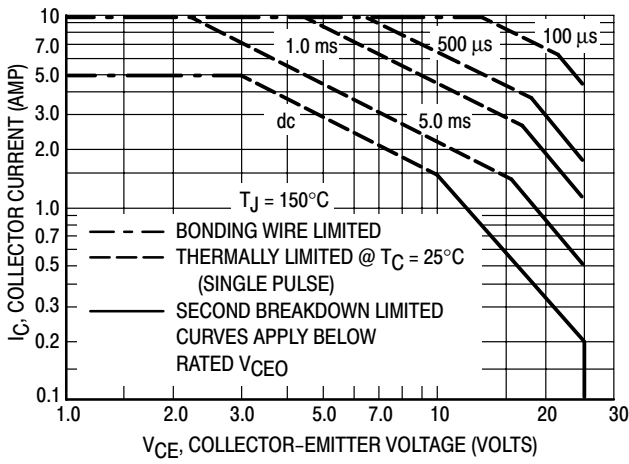


Figure 5. Active Region Safe Operating Area

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 5 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 $T_{J(pk)} \leq 150^\circ\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

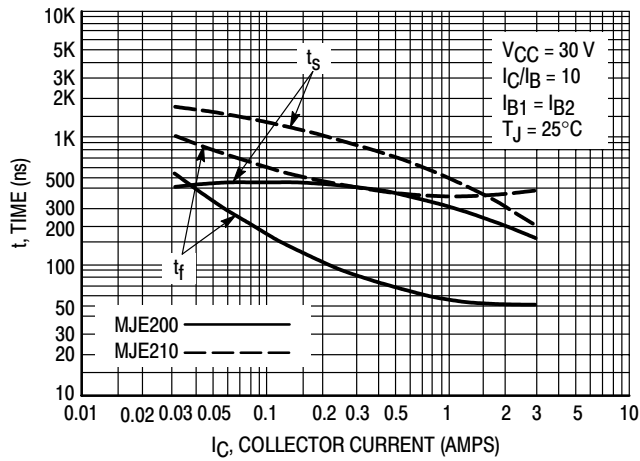


Figure 6. Turn-Off Time

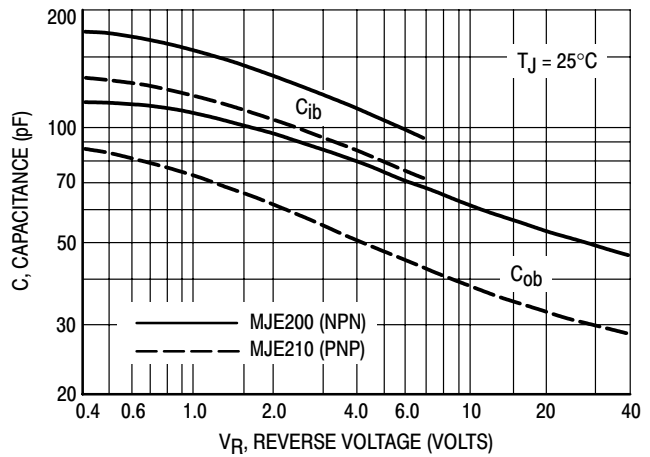
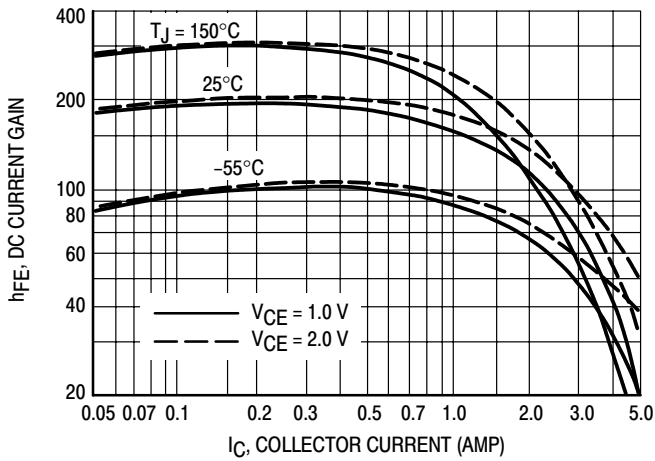


Figure 7. Capacitance

MJE200 MJE210

**NPN
MJE200**



**PNP
MJE210**

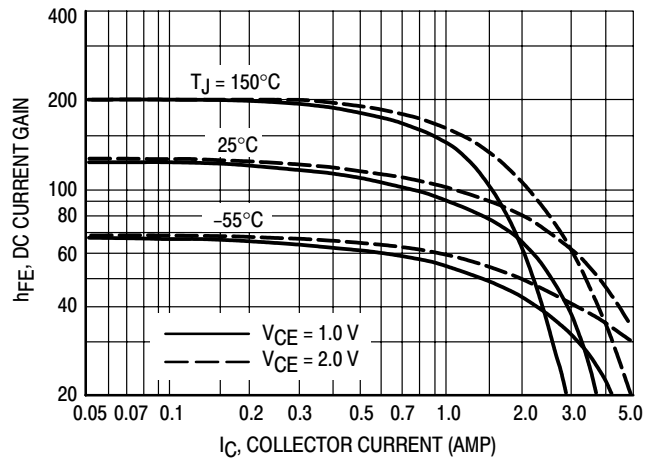


Figure 8. DC Current Gain

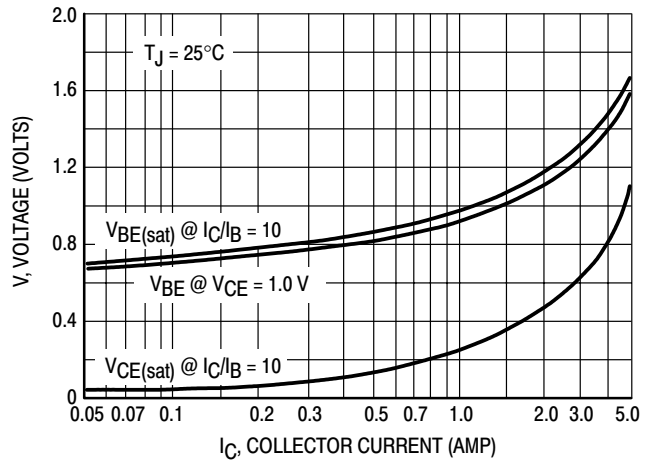
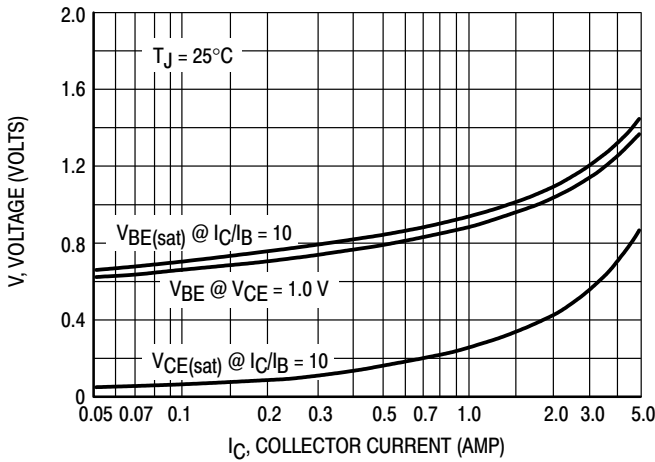


Figure 9. "On" Voltage

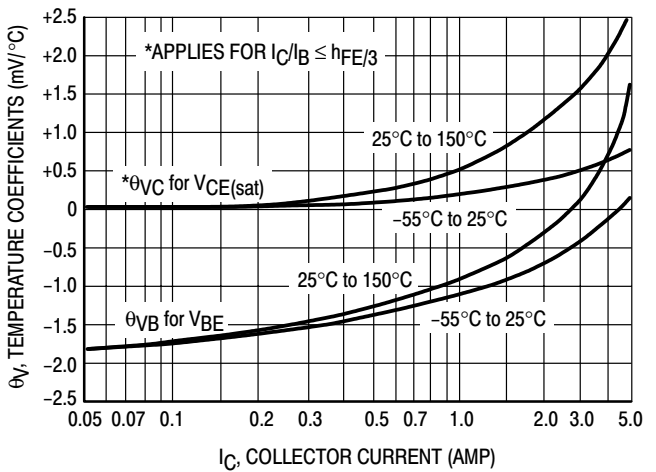
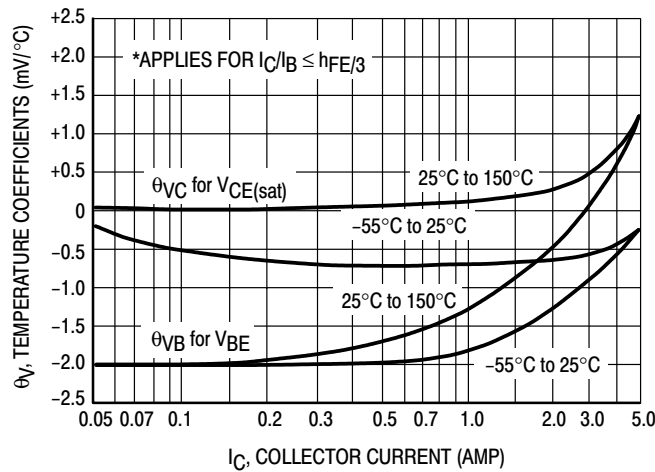
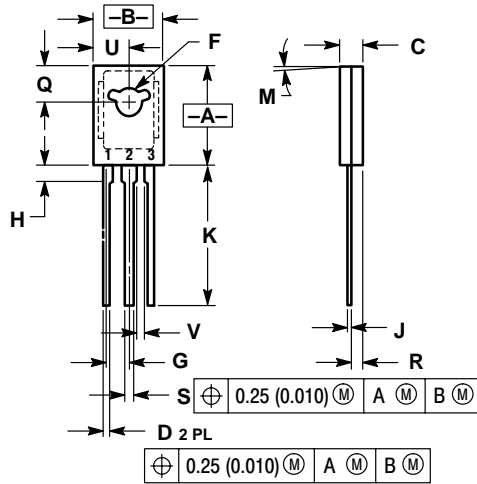


Figure 10. Temperature Coefficients

MJE200 MJE210

PACKAGE DIMENSIONS

TO-225AA
CASE 77-09
ISSUE W



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.425	0.435	10.80	11.04
B	0.295	0.305	7.50	7.74
C	0.095	0.105	2.42	2.66
D	0.020	0.026	0.51	0.66
F	0.115	0.130	2.93	3.30
G	0.094 BSC		2.39 BSC	
H	0.050	0.095	1.27	2.41
J	0.015	0.025	0.39	0.63
K	0.575	0.655	14.61	16.63
M	5° TYP		5° TYP	
Q	0.148	0.158	3.76	4.01
R	0.045	0.065	1.15	1.65
S	0.025	0.035	0.64	0.88
U	0.145	0.155	3.69	3.93
V	0.040	---	1.02	---

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

Notes

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