High-Voltage — **High Power Transistors**

... designed for use in high power audio amplifier applications and high voltage switching regulator circuits.

• High Collector-Emitter Sustaining Voltage -

NPN **PNP**

VCEO(sus) = 160 Vdc — MJE4343 MJE4353

• High DC Current Gain — @ I_C = 8.0 Adc

 $h_{FF} = 35 (Typ)$

• Low Collector-Emitter Saturation Voltage -

VCE(sat) = 2.0 Vdc (Max) @ IC = 8.0 Adc

MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector–Emitter Voltage	VCEO	160	Vdc
Collector-Base Voltage	VCB	160	Vdc
Emitter–Base Voltage	VEB	7.0	Vdc
Collector Current — Continuous Peak (1)	lC	16 20	Adc
Base Current — Continuous	lΒ	5.0	Adc
Total Power Dissipation @ T _C = 25°C	PD	125	Watts
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	$R_{ heta JC}$	1.0	°C/W

(1) Pulse Test: Pulse Width $\leq 5.0 \,\mu\text{s}$, Duty Cycle $\geq 10\%$.

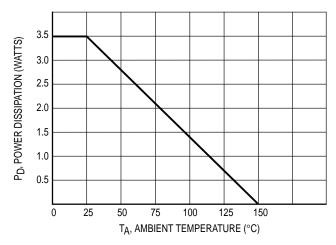
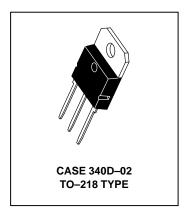


Figure 1. Power Derating **Reference: Ambient Temperature**

NPN **MJE4343 MJE4353**

16 AMPERE **POWER TRANSISTORS COMPLEMENTARY SILICON 160 VOLTS**

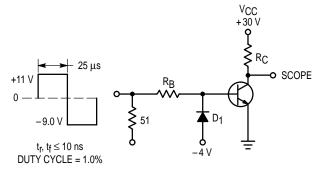


ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage (1) (IC = 200 mAdc, IB = 0)	VCEO(sus)	160	_	Vdc
Collector–Emitter Cutoff Current (V _{CE} = 80 Vdc, I _B = 0)	ICEO	_	750	μAdc
Collector–Emitter Cutoff Current (VCE = Rated VCB, VEB(off) = 1.5 Vdc) (VCE = Rated VCB, VEB(off) = 1.5 Vdc, TC = 150°C)	I _{CEX}	_	1.0 5.0	mAdc
Collector–Base Cutoff Current (V _{CB} = Rated V _{CB} , I _E = 0)	ICBO	_	750	μAdc
Emitter–Base Cutoff Current (VBE = 7.0 Vdc, IC = 0)	I _{EBO}	_	1.0	mAdc
ON CHARACTERISTICS (1)				
DC Current Gain (I _C = 8.0 Adc, V _{CE} = 2.0 Vdc) (I _C = 16 Adc, V _{CE} = 4.0 Vdc)	hFE	15 8.0	35 (Typ) 15 (Typ)	
Collector–Emitter Saturation Voltage (I _C = 8.0 Adc, I _B = 800 mA) (I _C = 16 Adc, I _B = 2.0 Adc)	VCE(sat)		2.0 3.5	Vdc
Base–Emitter Saturation Voltage (I _C = 16 Adc, I _B = 2.0 Adc)	VBE(sat)	_	3.9	Vdc
Base–Emitter On Voltage (I _C = 16 Adc, V _{CE} = 4.0 Vdc)	VBE(on)	_	3.9	Vdc
DYNAMIC CHARACTERISTICS	•		•	
Current–Gain — Bandwidth Product (2) (I _C = 1.0 Adc, V _{CE} = 20 Vdc, f _{test} = 0.5 MHz)	fT	1.0	_	MHz
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 0.1 MHz)	C _{ob}	_	800	pF
1 ' '	C _{ob}	_	800	pF

⁽¹⁾ Pulse Test: Pulse Width \leq 300 $\mu s,$ Duty Cycle \geq 2.0%.

⁽²⁾ $f_T = |h_{fe}| \cdot f_{test}$.



 R_B and R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS D_1 MUST BE FAST RECOVERY TYPE, e.g.: 1N5825 USED ABOVE $I_B\approx 100$ mA MSD6100 USED BELOW $I_B\approx 100$ mA

 $\textbf{Note:} \ \mathsf{Reverse} \ \mathsf{polarities} \ \mathsf{to} \ \mathsf{test} \ \mathsf{PNP} \ \mathsf{devices}.$

Figure 2. Switching Times Test Circuit

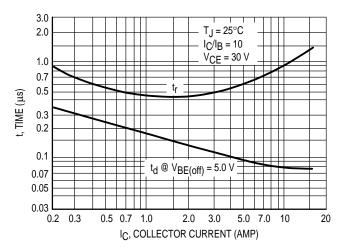


Figure 3. Typical Turn-On Time

TYPICAL CHARACTERISTICS

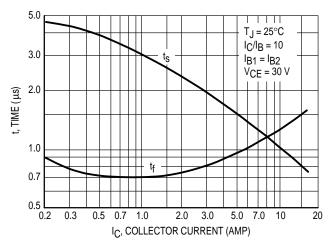


Figure 4. Turn-Off Time

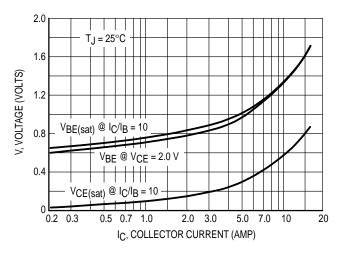


Figure 5. On Voltages

DC CURRENT GAIN

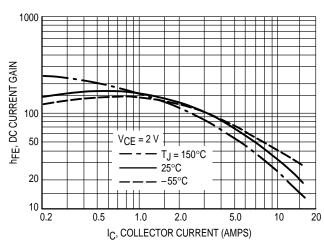


Figure 6. MJE4340 Series (NPN)

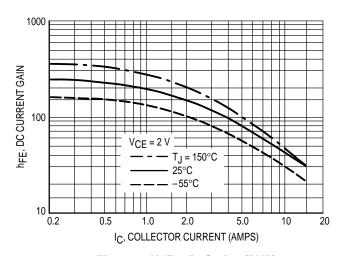


Figure 7. MJE4350 Series (PNP)

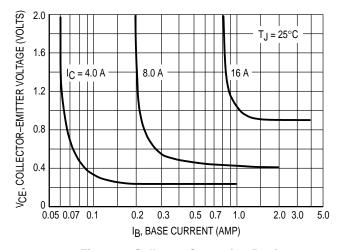


Figure 8. Collector Saturation Region

MJE4343 MJE4353

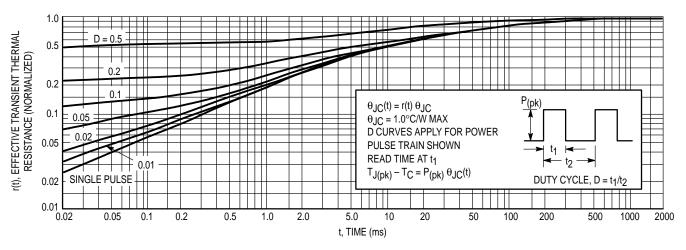


Figure 9. Thermal Response

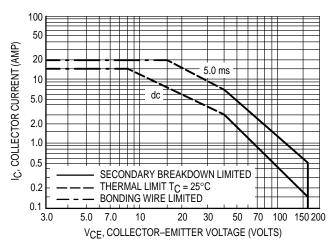


Figure 10. Maximum Forward Bias Safe
Operating Area

REVERSE BIAS

For inductive loads, high voltage and high current must be sustained simultaneously during turn-off, in most cases, with the base to emitter junction reverse biased. Under these conditions the collector voltage must be held to a safe level at or below a specific value of collector current. This can be accomplished by several means such as active clamping, RC snubbing, load line shaping, etc. The safe level for these devices is specified as Reverse Bias Safe Operating Area and represents the voltage-current conditions during reverse biased turn-off. This rating is verified under clamped conditions so that the device is never subjected to an avalanche mode. Figure 11 gives RBSOA characteristics.

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 10 is based on $T_C = 25^{\circ}C$; $T_{J(pk)}$ is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% but must be derated when $T_C \ge 25^{\circ}C$. Second breakdown limitations do not derate the same as thermal limitations. Allowable current at the voltages shown on Figure 10 may be found at any case temperature by using the appropriate curve on Figure 9.

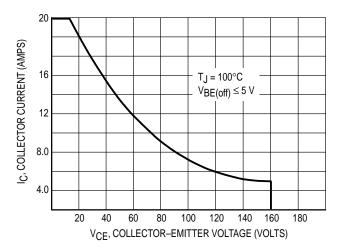
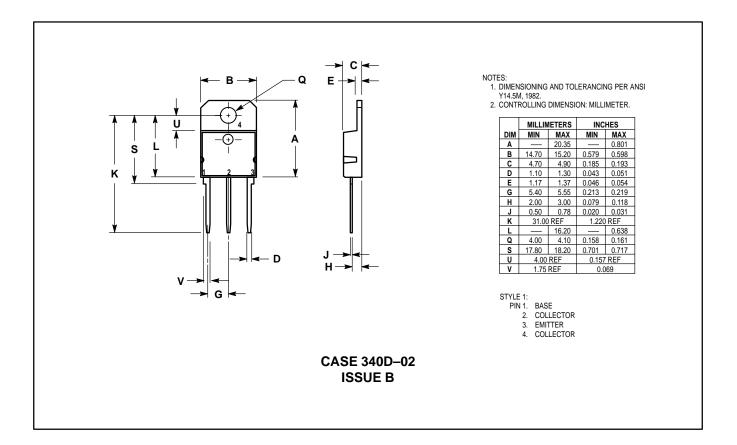


Figure 11. Maximum Reverse Bias Safe Operating Area

PACKAGE DIMENSIONS



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