

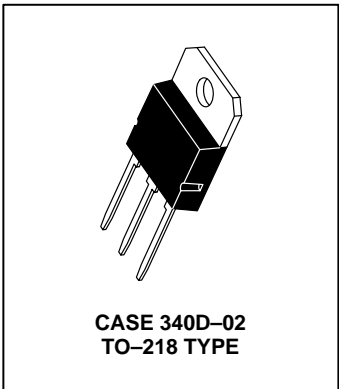
High-Voltage — High Power Transistors

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

- High Collector–Emitter Sustaining Voltage —
 $V_{CEO(sus)} = 160 \text{ Vdc}$ — NPN MJE4343 PNP MJE4353
- High DC Current Gain — @ $I_C = 8.0 \text{ Adc}$
 $h_{FE} = 35 \text{ (Typ)}$
- Low Collector–Emitter Saturation Voltage —
 $V_{CE(sat)} = 2.0 \text{ Vdc (Max) @ } I_C = 8.0 \text{ Adc}$

**NPN
MJE4343
PNP
MJE4353**

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



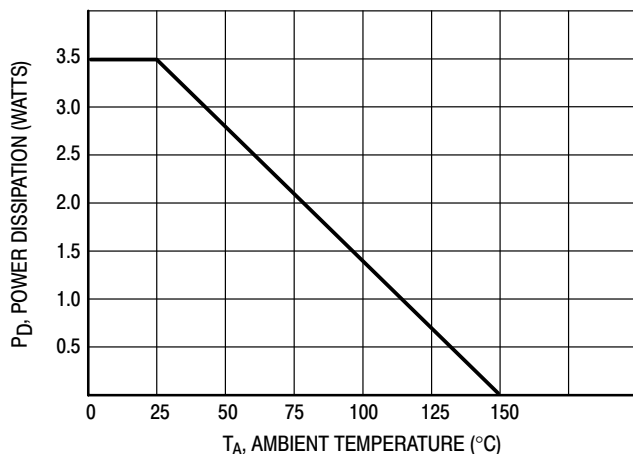
MAXIMUM RATINGS

| Rating | Symbol | Max | Unit |
|---|----------------|-------------|------------------|
| Collector–Emitter Voltage | V_{CEO} | 160 | Vdc |
| Collector–Base Voltage | V_{CB} | 160 | Vdc |
| Emitter–Base Voltage | V_{EB} | 7.0 | Vdc |
| Collector Current — Continuous Peak (1) | I_C | 16 20 | A dc |
| Base Current — Continuous | I_B | 5.0 | A dc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | P_D | 125 | Watts |
| 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 | $R_{\theta JC}$ | 1.0 | $^\circ\text{C/W}$ |

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



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

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ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | |
|--|----------------|--------|------------|-----------------|
| Collector–Emitter Sustaining Voltage (1) ($I_C = 200\text{ mAdc}$, $I_B = 0$) | $V_{CEO(sus)}$ | 160 | — | Vdc |
| Collector–Emitter Cutoff Current ($V_{CE} = 80\text{ Vdc}$, $I_B = 0$) | I_{CEO} | — | 750 | μAdc |
| Collector–Emitter Cutoff Current ($V_{CE} = \text{Rated } V_{CB}$, $V_{EB(off)} = 1.5\text{ Vdc}$) ($V_{CE} = \text{Rated } V_{CB}$, $V_{EB(off)} = 1.5\text{ Vdc}$, $T_C = 150^\circ\text{C}$) | I_{CEX} | — — | 1.0 5.0 | mAdc |
| Collector–Base Cutoff Current ($V_{CB} = \text{Rated } V_{CB}$, $I_E = 0$) | I_{CBO} | — | 750 | μAdc |
| Emitter–Base Cutoff Current ($V_{BE} = 7.0\text{ Vdc}$, $I_C = 0$) | I_{EBO} | — | 1.0 | mAdc |

ON CHARACTERISTICS (1)

| | | | | |
|--|---------------|-----------|----------------------|-----|
| DC Current Gain ($I_C = 8.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 16\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) | h_{FE} | 15 8.0 | 35 (Typ) 15 (Typ) | — |
| Collector–Emitter Saturation Voltage ($I_C = 8.0\text{ Adc}$, $I_B = 800\text{ mA}$) ($I_C = 16\text{ Adc}$, $I_B = 2.0\text{ Adc}$) | $V_{CE(sat)}$ | — — | 2.0 3.5 | Vdc |
| Base–Emitter Saturation Voltage ($I_C = 16\text{ Adc}$, $I_B = 2.0\text{ Adc}$) | $V_{BE(sat)}$ | — | 3.9 | Vdc |
| Base–Emitter On Voltage ($I_C = 16\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$) | $V_{BE(on)}$ | — | 3.9 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|---|----------|-----|-----|-----|
| Current–Gain — Bandwidth Product (2) ($I_C = 1.0\text{ Adc}$, $V_{CE} = 20\text{ Vdc}$, $f_{test} = 0.5\text{ MHz}$) | f_T | 1.0 | — | MHz |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$) | C_{ob} | — | 800 | pF |

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

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

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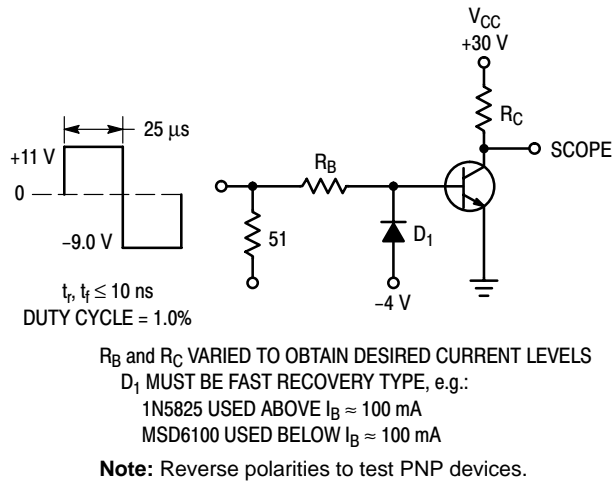


Figure 2. Switching Times Test Circuit

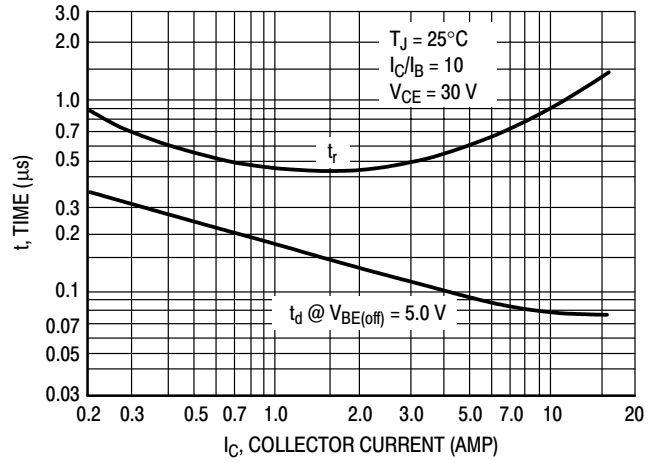


Figure 3. Typical Turn-On Time

TYPICAL CHARACTERISTICS

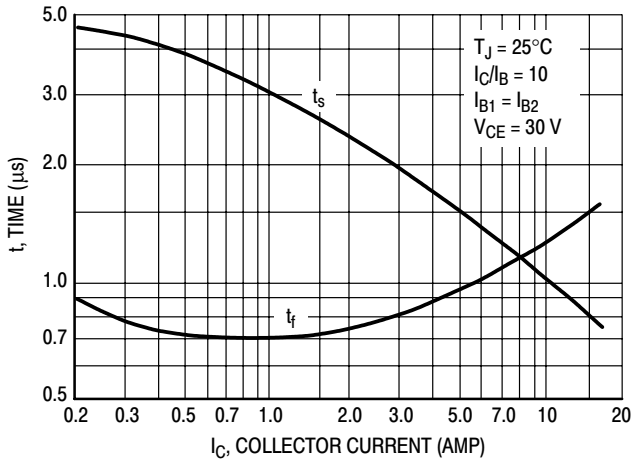


Figure 4. Turn-Off Time

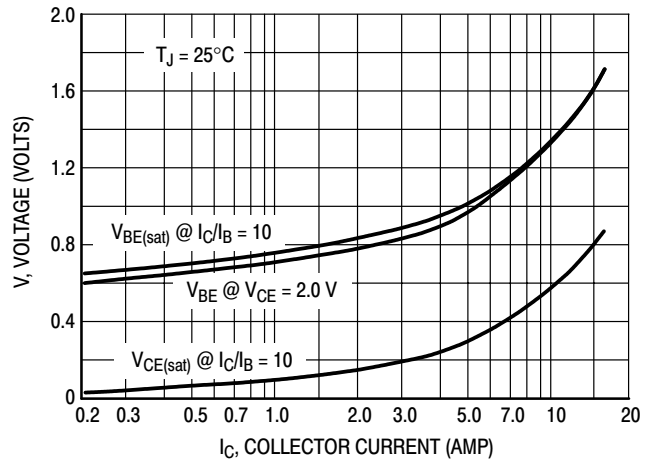


Figure 5. On Voltages

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DC CURRENT GAIN

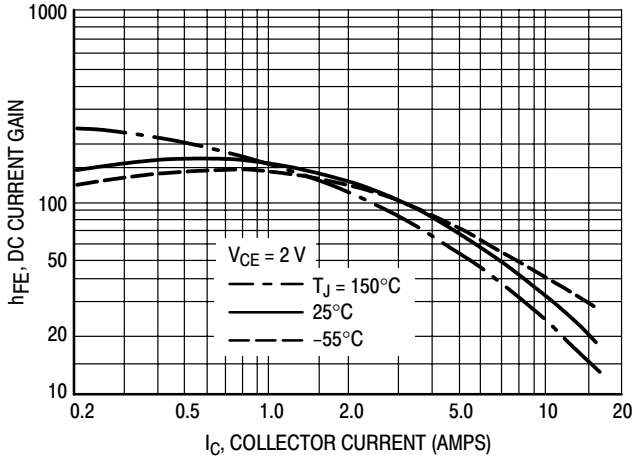


Figure 6. MJE4340 Series (NPN)

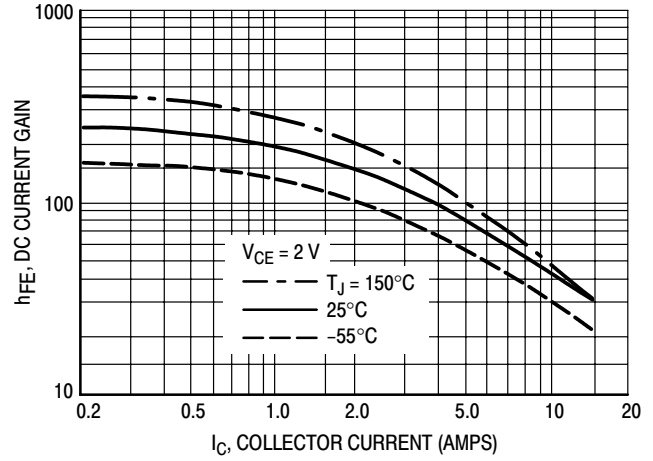


Figure 7. MJE4350 Series (PNP)

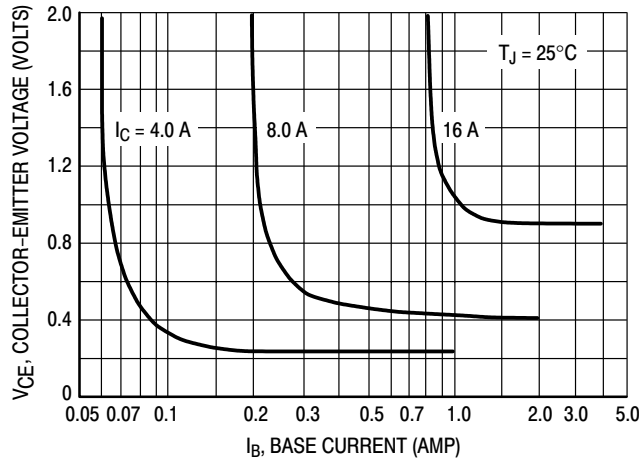


Figure 8. Collector Saturation Region

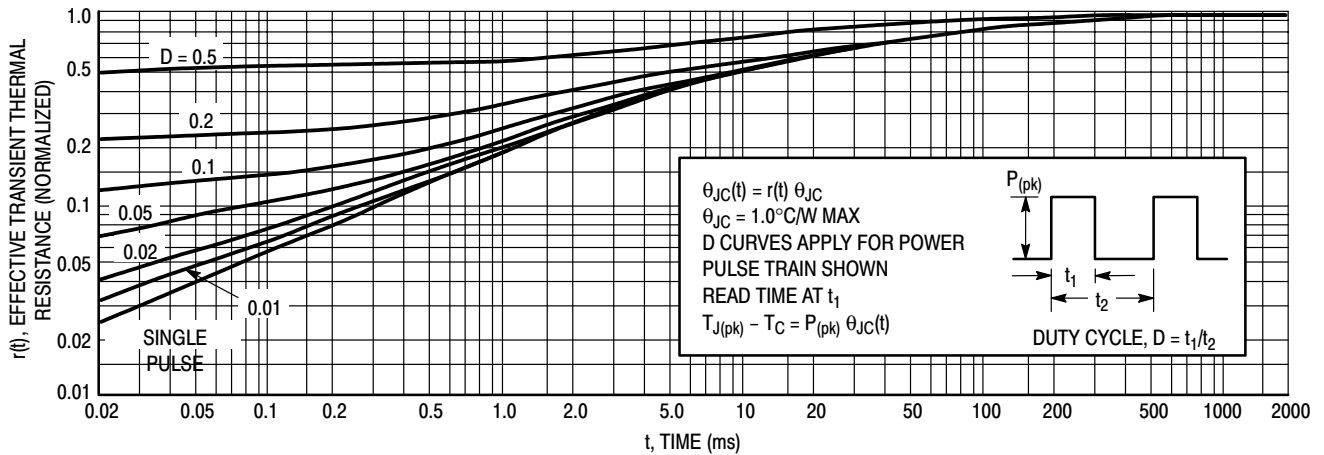


Figure 9. Thermal Response

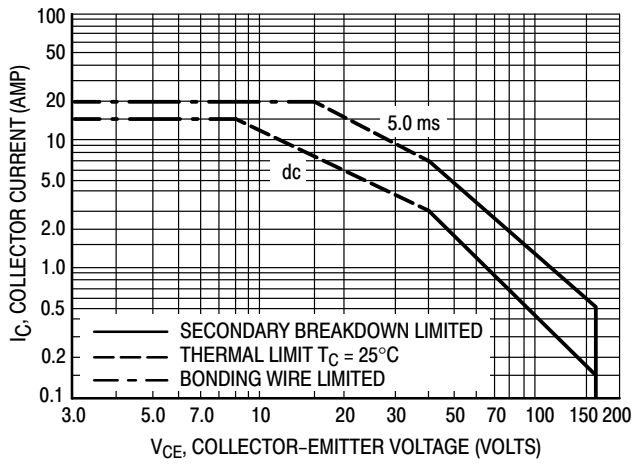


Figure 10. Maximum Forward Bias Safe Operating Area

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 $T_C = 25^\circ\text{C}$; $T_{J(pk)}$ is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% but must be derated when $T_C \geq 25^\circ\text{C}$. 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.

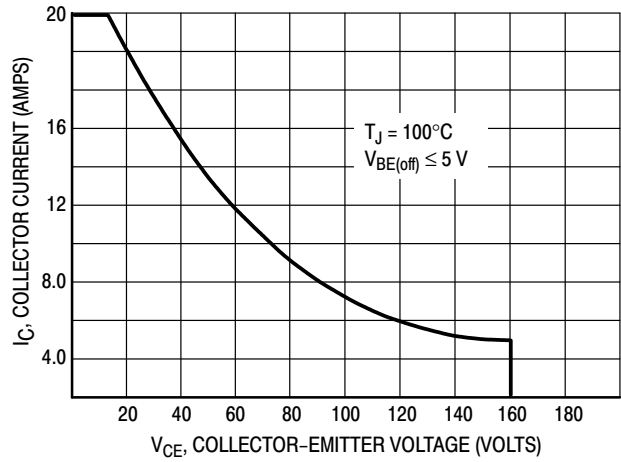
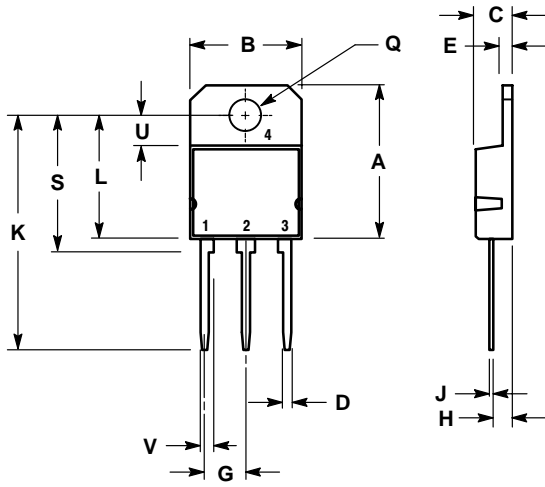


Figure 11. Maximum Reverse Bias Safe Operating Area

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PACKAGE DIMENSIONS

CASE 340D-02 ISSUE E



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

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | --- | 20.35 | --- | 0.801 |
| B | 14.70 | 15.20 | 0.579 | 0.598 |
| C | 4.70 | 4.90 | 0.185 | 0.193 |
| D | 1.10 | 1.30 | 0.043 | 0.051 |
| E | 1.17 | 1.37 | 0.046 | 0.054 |
| G | 5.40 | 5.55 | 0.213 | 0.219 |
| H | 2.00 | 3.00 | 0.079 | 0.118 |
| J | 0.50 | 0.78 | 0.020 | 0.031 |
| K | 31.00 REF | | 1.220 REF | |
| L | --- | 16.20 | --- | 0.638 |
| Q | 4.00 | 4.10 | 0.158 | 0.161 |
| S | 17.80 | 18.20 | 0.701 | 0.717 |
| U | 4.00 REF | | 0.157 REF | |
| V | 1.75 REF | | 0.069 | |

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

Notes

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