

## Silicon Power Transistors

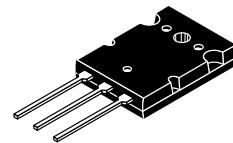
The MJL21193 and MJL21194 utilize Perforated Emitter technology and are specifically designed for high power audio output, disk head positioners and linear applications.

- Total Harmonic Distortion Characterized
- High DC Current Gain –  $h_{FE} = 25$  Min @  $I_C = 8$  Adc
- Excellent Gain Linearity
- High SOA: 2.25 A, 80 V, 1 Second

**PNP**  
**MJL21193\***  
**NPN**  
**MJL21194\***

\*Motorola Preferred Device

**16 AMPERE  
COMPLEMENTARY  
SILICON POWER  
TRANSISTORS  
250 VOLTS  
200 WATTS**



CASE 340G-02  
TO-3PBL

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	250	Vdc
Collector-Base Voltage	$V_{CBO}$	400	Vdc
Emitter-Base Voltage	$V_{EBO}$	5	Vdc
Collector-Emitter Voltage – 1.5 V	$V_{CEX}$	400	Vdc
Collector Current — Continuous Peak (1)	$I_C$	16 30	Adc
Base Current – Continuous	$I_B$	5	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	200 1.43	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	$R_{\theta JC}$	0.7	$^\circ\text{C/W}$

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

Characteristic	Symbol	Min	Typical	Max	Unit

### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ( $I_C = 100$ mAdc, $I_B = 0$ )	$V_{CEO(sus)}$	250	—	—	Vdc
Collector Cutoff Current ( $V_{CE} = 200$ Vdc, $I_B = 0$ )	$I_{CEO}$	—	—	100	$\mu\text{Adc}$

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

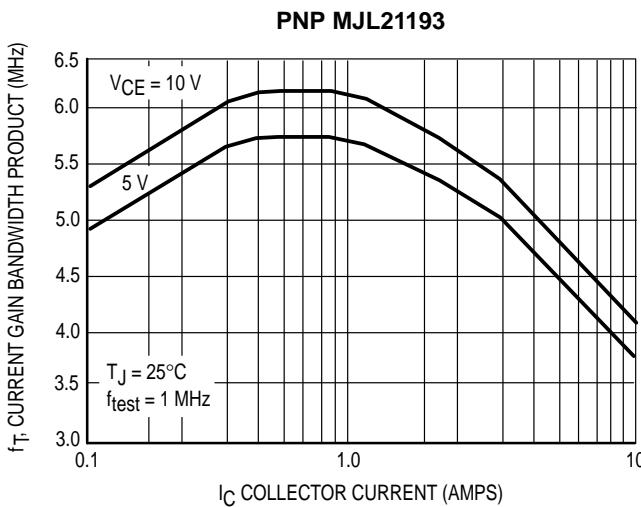
(continued)

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

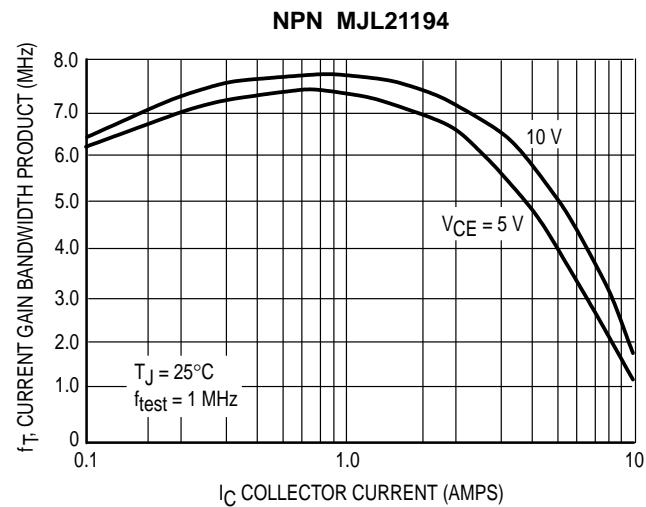
**MJL21193 MJL21194**
**ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)**

Characteristic	Symbol	Min	Typical	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Emitter Cutoff Current (V <sub>CE</sub> = 5 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	—	100	μAdc
Collector Cutoff Current (V <sub>CE</sub> = 250 Vdc, V <sub>BE(off)</sub> = 1.5 Vdc)	I <sub>CEX</sub>	—	—	100	μAdc
<b>SECOND BREAKDOWN</b>					
Second Breakdown Collector Current with Base Forward Biased (V <sub>CE</sub> = 50 Vdc, t = 1 s (non-repetitive)) (V <sub>CE</sub> = 80 Vdc, t = 1 s (non-repetitive))	I <sub>S/b</sub>	4.0 2.25	—	—	Adc
<b>ON CHARACTERISTICS</b>					
DC Current Gain (I <sub>C</sub> = 8 Adc, V <sub>CE</sub> = 5 Vdc) (I <sub>C</sub> = 16 Adc, I <sub>B</sub> = 5 Adc)	h <sub>FE</sub>	25 8	—	75	—
Base-Emitter On Voltage (I <sub>C</sub> = 8 Adc, V <sub>CE</sub> = 5 Vdc)	V <sub>BE(on)</sub>	—	—	2.2	Vdc
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 8 Adc, I <sub>B</sub> = 0.8 Adc) (I <sub>C</sub> = 16 Adc, I <sub>B</sub> = 3.2 Adc)	V <sub>CE(sat)</sub>	— —	— —	1.4 4	Vdc
<b>DYNAMIC CHARACTERISTICS</b>					
Total Harmonic Distortion at the Output V <sub>RMS</sub> = 28.3 V, f = 1 kHz, P <sub>LOAD</sub> = 100 W <sub>RMS</sub> (Matched pair h <sub>FE</sub> = 50 @ 5 A/5 V)	h <sub>FE</sub> unmatched h <sub>FE</sub> matched	T <sub>HD</sub>	0.8	—	%
Current Gain Bandwidth Product (I <sub>C</sub> = 1 Adc, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 1 MHz)	f <sub>T</sub>	4	—	—	MHz
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)	C <sub>ob</sub>	—	—	500	pF

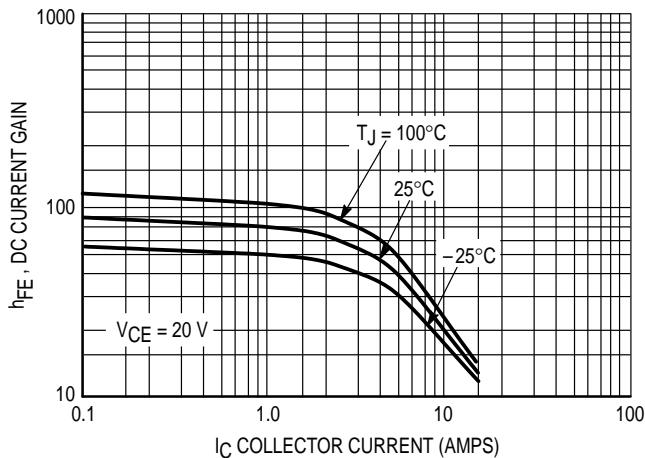
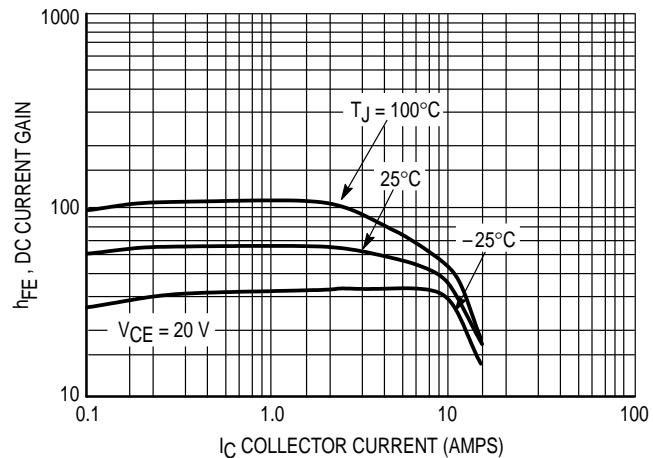
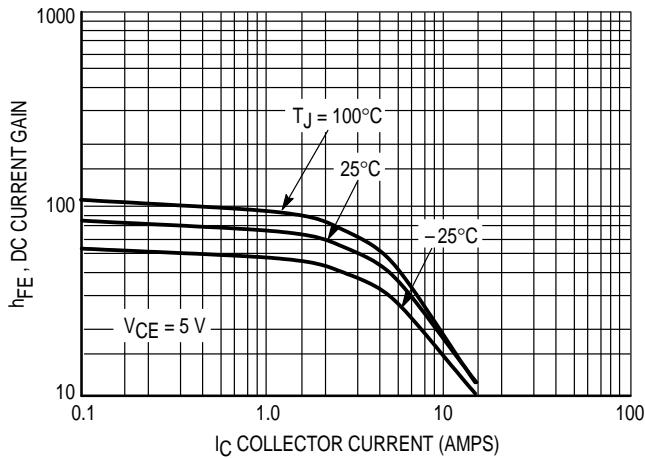
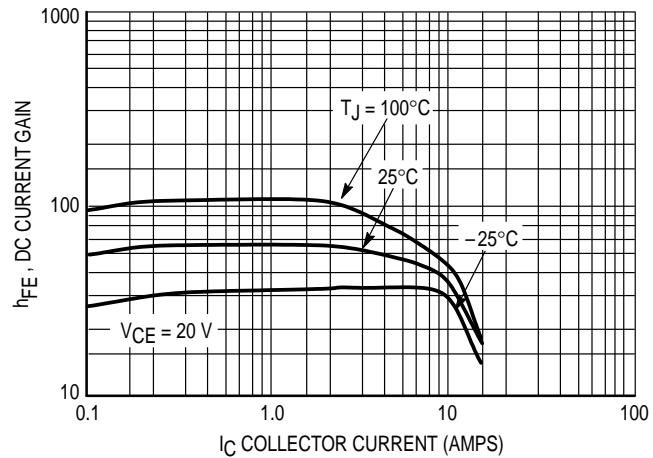
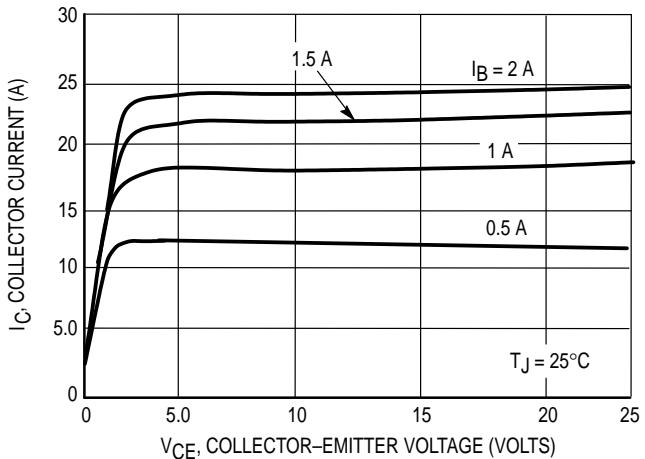
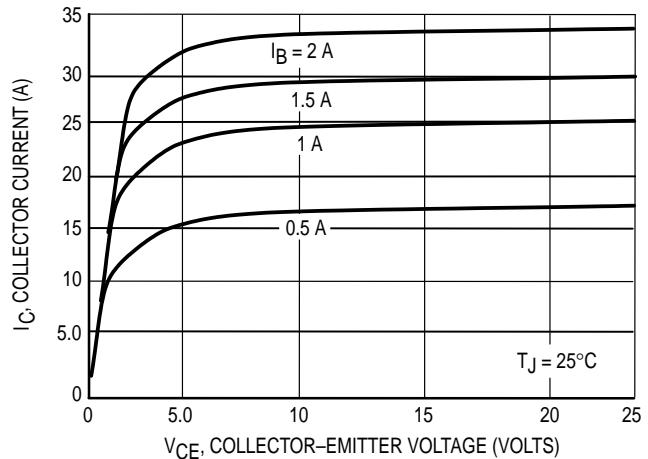
(1) Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤2%

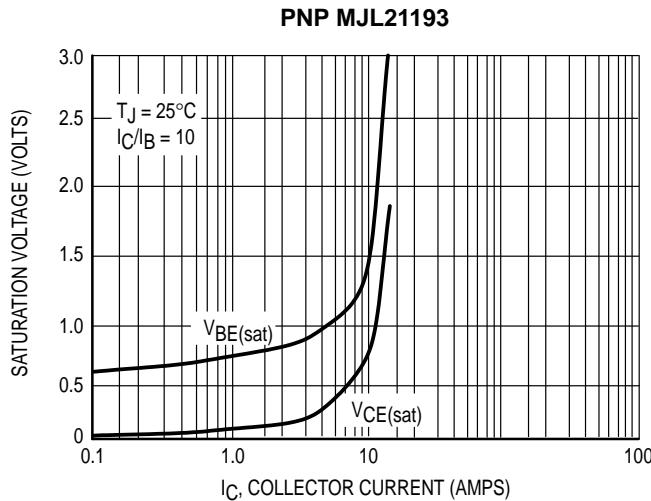
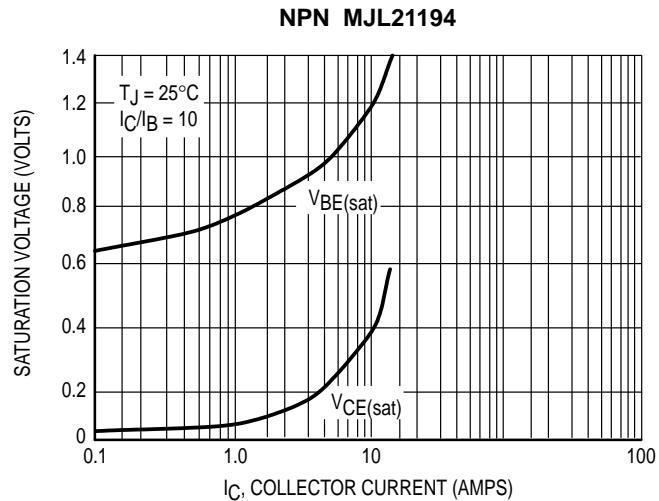
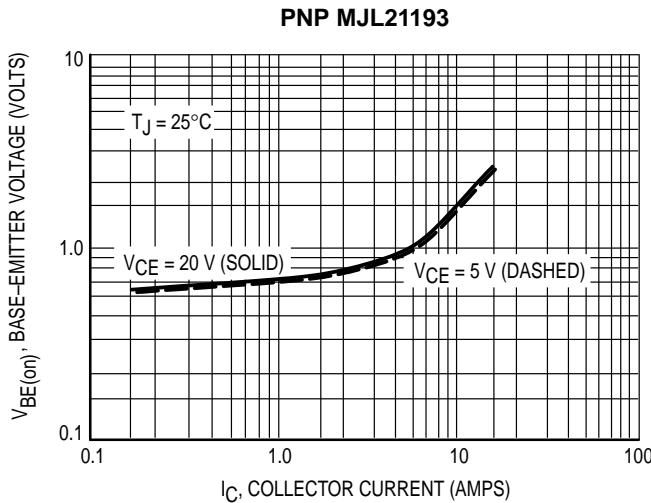
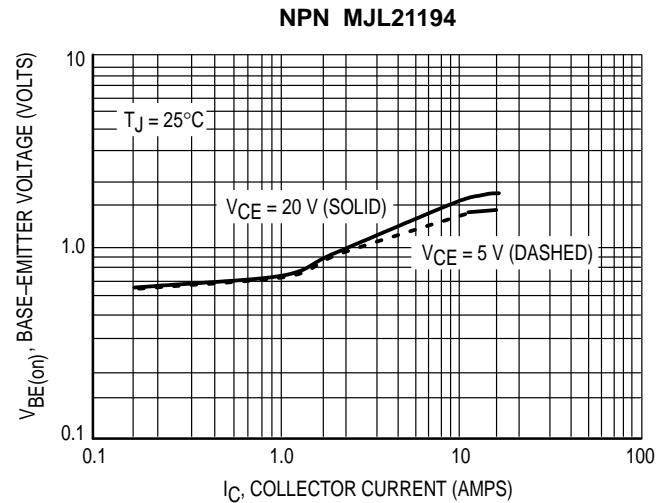
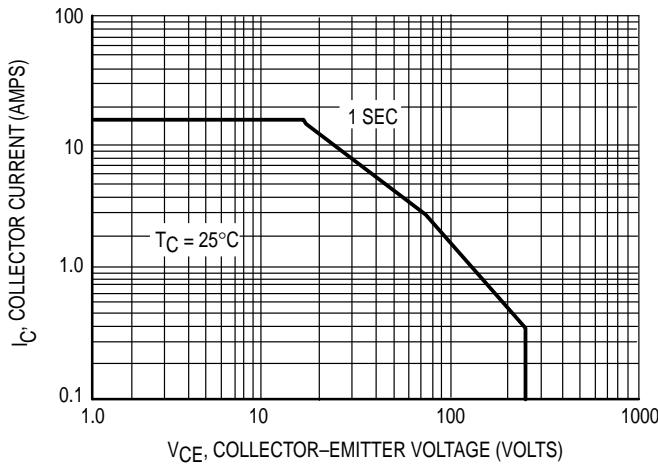


**Figure 1. Typical Current Gain Bandwidth Product**



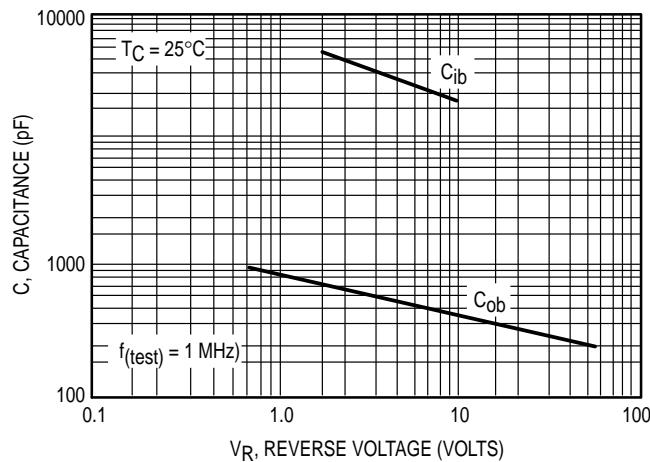
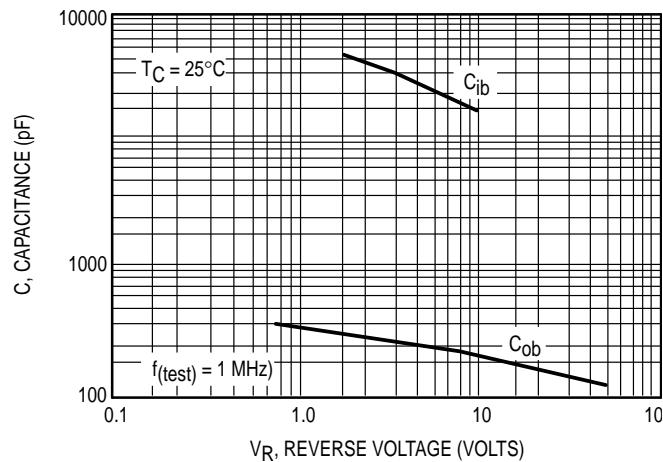
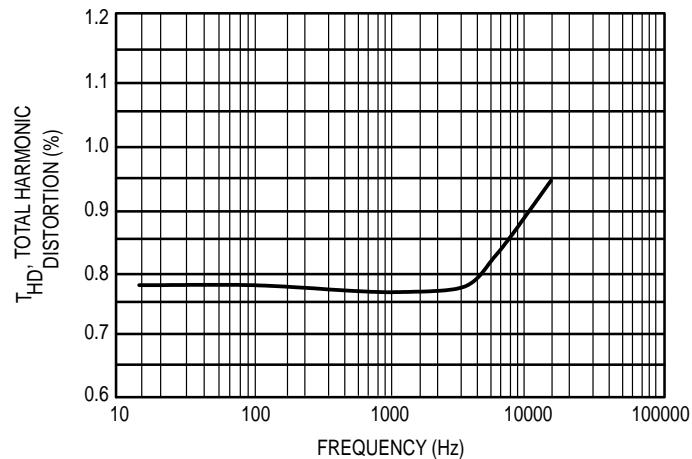
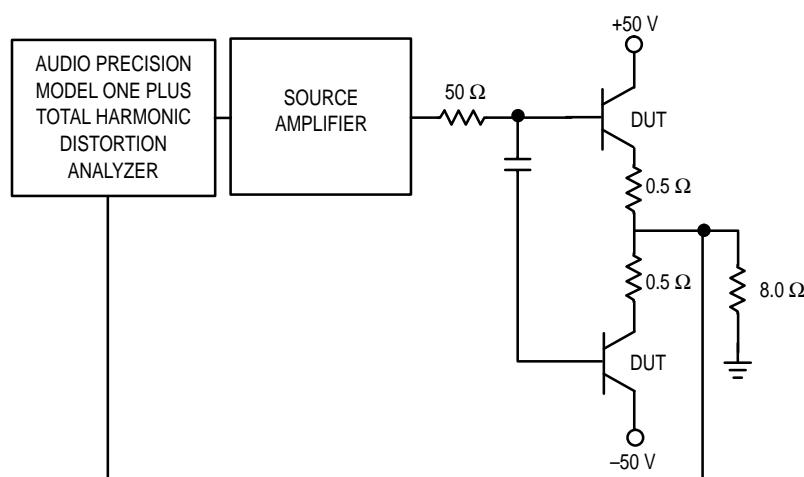
**Figure 2. Typical Current Gain Bandwidth Product**

**TYPICAL CHARACTERISTICS**
**PNP MJL21193**

**Figure 3. DC Current Gain,  $V_{CE} = 20$  V**
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**Figure 4. DC Current Gain,  $V_{CE} = 20$  V**
**PNP MJL21193**

**Figure 5. DC Current Gain,  $V_{CE} = 5$  V**
**NPN MJL21194**

**Figure 6. DC Current Gain,  $V_{CE} = 5$  V**
**PNP MJL21193**

**Figure 7. Typical Output Characteristics**
**NPN MJL21194**

**Figure 8. Typical Output Characteristics**

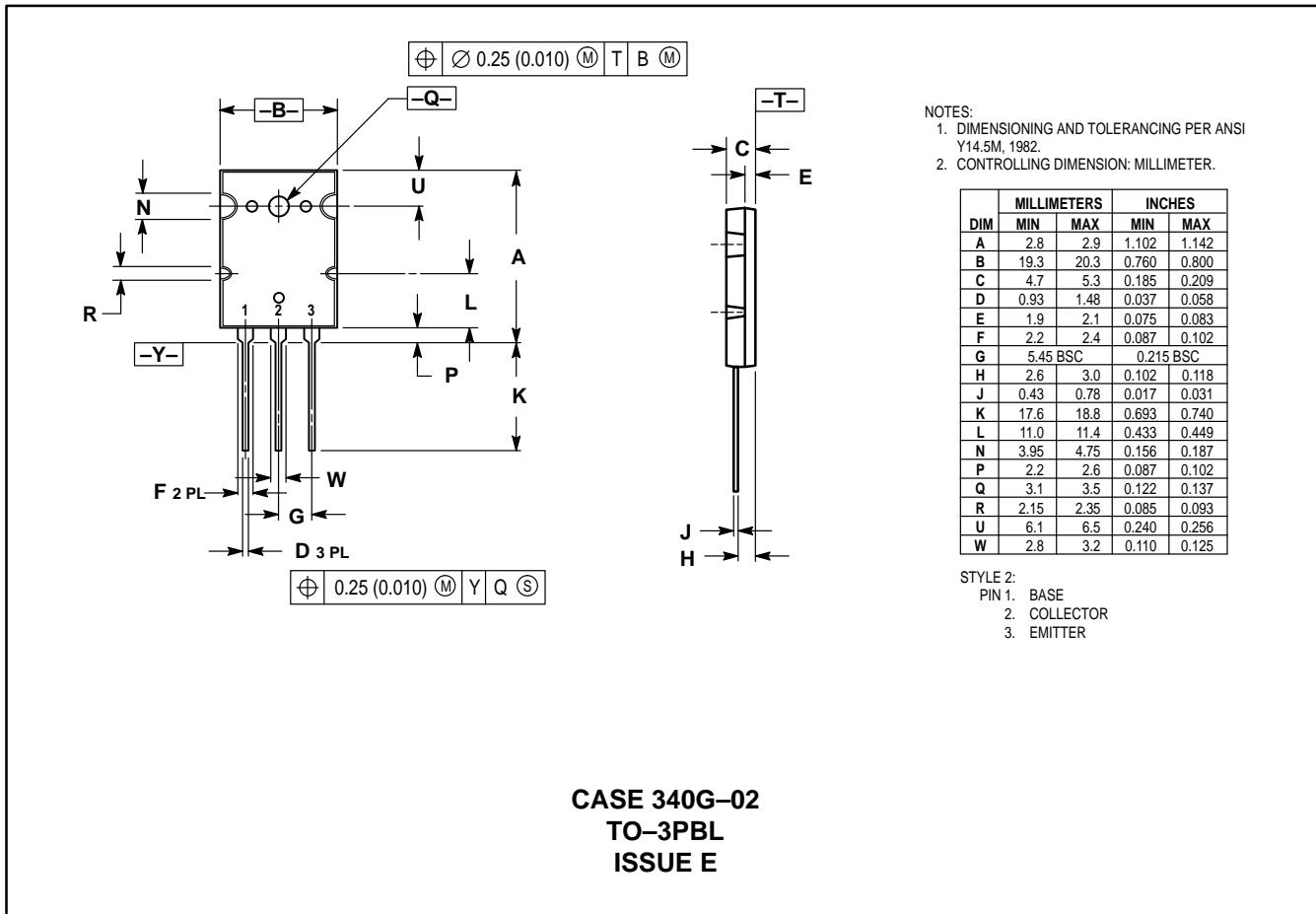
**TYPICAL CHARACTERISTICS**

**Figure 9. Typical Saturation Voltages**

**Figure 10. Typical Saturation Voltages**

**Figure 11. Typical Base-Emitter Voltage**

**Figure 12. Typical Base-Emitter Voltage**

**Figure 13. Active Region Safe Operating Area**

There are two limitations on the power handling ability of a transistor; average junction temperature and secondary 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 13 is based on  $T_J(pk) = 200^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.


**Figure 14. MJL21193 Typical Capacitance**

**Figure 15. MJL21194 Typical Capacitance**

**Figure 16. Typical Total Harmonic Distortion**

**Figure 17. Total Harmonic Distortion Test Circuit**

## PACKAGE DIMENSIONS



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