



# MJ21193G/MJ21194G



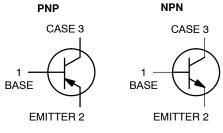


## 250 Watt Silicon Type Metal Package Power Transistor

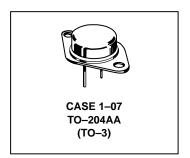
The MJ21193 and MJ21194 utilize Perforated Emitter technology and are specifically designed for high power audio output, disk head positioners and linear applications.

- Total Harmonic Distortion Characterized
- High DC Current Gain hFE = 25 Min @ IC = 8 Adc
- Excellent Gain Linearity
- High SOA: 2.5 A, 80 V, 1 Second

## SCHEMATIC







#### **MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	VCEO	250	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	400	Vdc
Emitter–Base Voltage	VEBO	5	Vdc
Collector–Emitter Voltage – 1.5 V	VCEX	400	Vdc
Collector Current — Continuous Peak (1)	IC	16 30	Adc
Base Current — Continuous	lВ	5	Adc
Total Power Dissipation @ T <sub>C</sub> = 25°C Derate Above 25°C	PD	250 1.43	Watts W/°C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>Stg</sub>	- 65 to +200	°C

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.7	°C/W

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

Characteristic	Symbol	Min	Typical	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (IC = 100 mAdc, IB = 0)	VCEO(sus)	250	_	_	Vdc
Collector Cutoff Current (VCE = 200 Vdc, IB = 0)	ICEO	1	1	100	μAdc

<sup>(1)</sup> Pulse Test: Pulse Width =  $5 \mu s$ , Duty Cycle  $\leq 10\%$ .

(continued)



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

Characteristic		Symbol	Min	Typical	Max	Unit
OFF CHARACTERISTICS						
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)		ICEX	_	_	100	μAdc
SECOND BREAKDOWN				•		
Second Breakdown Collector Current with Base Fore (VCE = 50 Vdc, t = 1 s (non-repetitive) (VCE = 80 Vdc, t = 1 s (non-repetitive)	vard Biased	I <sub>S/b</sub>	5 2.5	_ _		Adc
ON CHARACTERISTICS						
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)		hFE	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
DYNAMIC CHARACTERISTICS						
(Matched pair h <sub>FE</sub> = 50 @ 5 A/5 V)	h <sub>FE</sub> unmatched	T <sub>HD</sub>	_	0.8	_	%
	h <sub>FE</sub> matched		-	0.08	_	
Current Gain Bandwidth Product (I <sub>C</sub> = 1 Adc, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 1 MHz)		fΤ	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

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

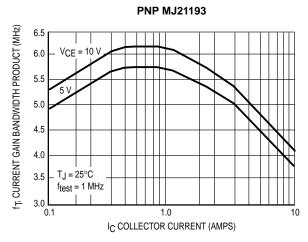


Figure 1. Typical Current Gain Bandwidth Product

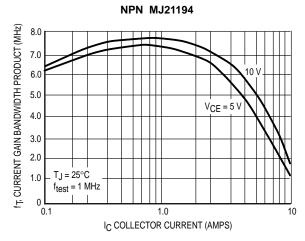


Figure 2. Typical Current Gain Bandwidth Product

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#### **TYPICAL CHARACTERISTICS**

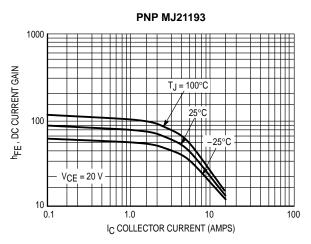


Figure 3. DC Current Gain, VCE = 20 V

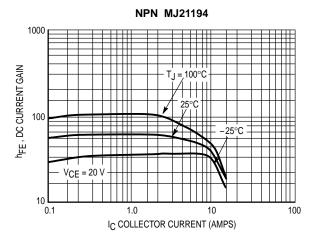


Figure 4. DC Current Gain, VCE = 20 V

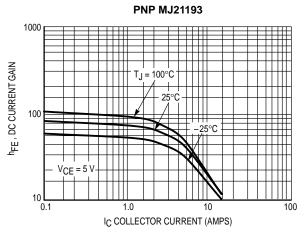


Figure 5. DC Current Gain, VCE = 5 V

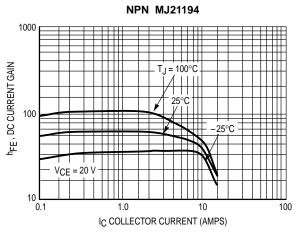


Figure 6. DC Current Gain, V<sub>CE</sub> = 5 V

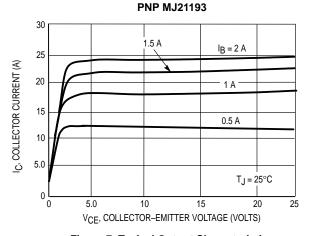


Figure 7. Typical Output Characteristics

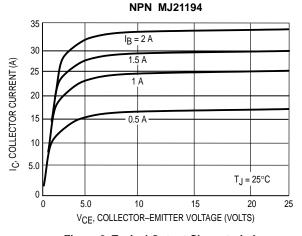


Figure 8. Typical Output Characteristics

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#### **TYPICAL CHARACTERISTICS**

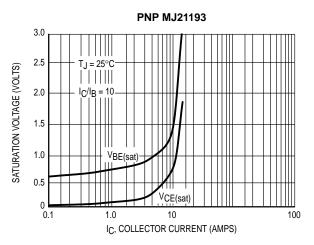


Figure 9. Typical Saturation Voltages

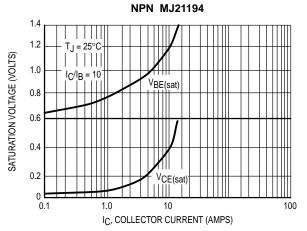


Figure 10. Typical Saturation Voltages

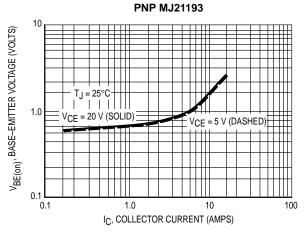


Figure 11. Typical Base-Emitter Voltage

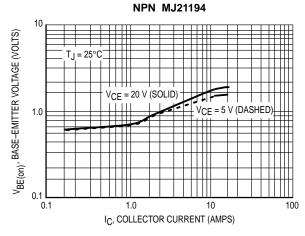


Figure 12. Typical Base-Emitter Voltage

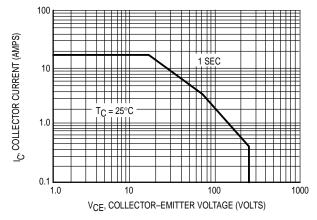


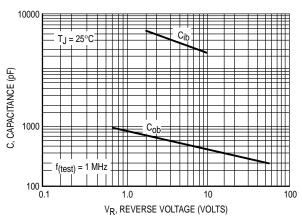
Figure 13. Active Region Safe Operating Area

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  $T_{J(pk)} = 200^{\circ}C$ ;  $T_{C}$  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.

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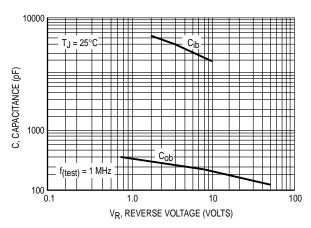
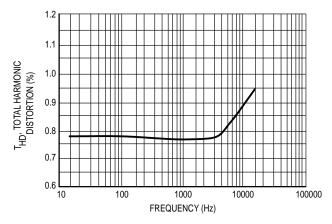


Figure 14. MJ21193 Typical Capacitance

Figure 15. MJ21194 Typical Capacitance



**Figure 16. Typical Total Harmonic Distortion** 

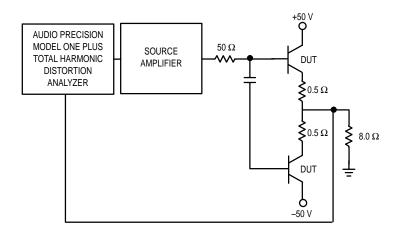


Figure 17. Total Harmonic Distortion Test Circuit