

# MJW21193 (PNP) MJW21194 (NPN)

## Silicon Power Transistors

The MJW21193 and MJW21194 utilize Perforated Emitter technology and are specifically designed for high power audio output, disk head positioners and linear applications.

### Features

- Total Harmonic Distortion Characterized
- High DC Current Gain –  
 $h_{FE} = 20 \text{ Min @ } I_C = 8 \text{ Adc}$
- Excellent Gain Linearity
- High SOA: 2.25 A, 80 V, 1 Second
- Pb-Free Packages are Available

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	250	Vdc
Collector–Base Voltage	$V_{CBO}$	400	Vdc
Emitter–Base Voltage	$V_{EBO}$	5.0	Vdc
Collector–Emitter Voltage – 1.5 V	$V_{CEX}$	400	Vdc
Collector Current – Continuous – Peak (Note 1)	$I_C$	16 30	Adc
Base Current – Continuous	$I_B$	5.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	200 1.43	W 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	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$	40	$^\circ\text{C}/\text{W}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

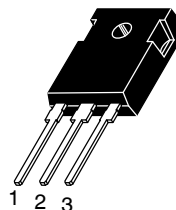
1. Pulse Test: Pulse Width = 5  $\mu\text{s}$ , Duty Cycle  $\leq 10\%$ .



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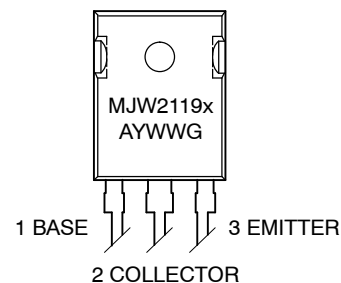
<http://onsemi.com>

**16 AMPERES  
COMPLEMENTARY SILICON  
POWER TRANSISTORS  
250 VOLTS, 200 WATTS**



TO-247  
CASE 340L  
STYLE 3

### MARKING DIAGRAM



x = 3 or 4  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

Device	Package	Shipping
MJW21193	TO-247	30 Units/Rail
MJW21193G	TO-247 (Pb-Free)	30 Units/Rail
MJW21194	TO-247	30 Units/Rail
MJW21194G	TO-247 (Pb-Free)	30 Units/Rail

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage (I <sub>C</sub> = 100 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	250	-	-	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 200 V <sub>dc</sub> , I <sub>B</sub> = 0)	I <sub>CEO</sub>	-	-	100	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>CE</sub> = 5 V <sub>dc</sub> , I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	-	100	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 250 V <sub>dc</sub> , V <sub>BE(off)</sub> = 1.5 V <sub>dc</sub> )	I <sub>CEx</sub>	-	-	100	μA <sub>dc</sub>

### SECOND BREAKDOWN

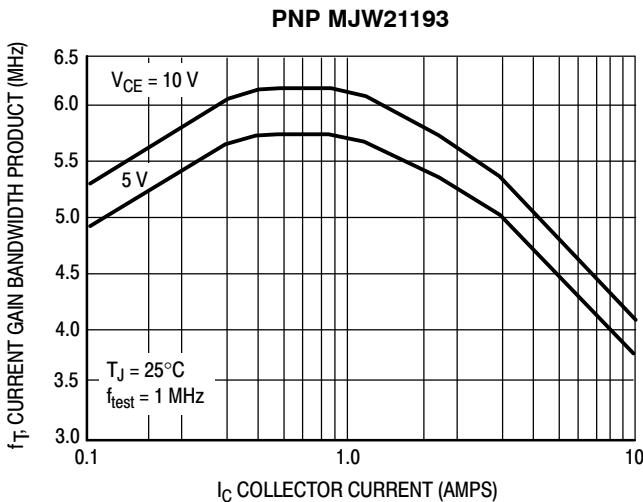
Second Breakdown Collector Current with Base Forward Biased (V <sub>CE</sub> = 50 V <sub>dc</sub> , t = 1 s (non-repetitive)) (V <sub>CE</sub> = 80 V <sub>dc</sub> , t = 1 s (non-repetitive))	I <sub>S/b</sub>	4.0 2.25	- -	- -	A <sub>dc</sub>
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### ON CHARACTERISTICS

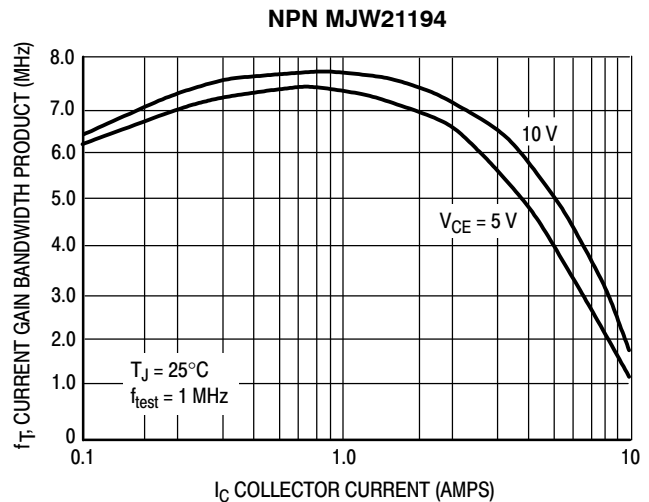
DC Current Gain (I <sub>C</sub> = 8 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> ) (I <sub>C</sub> = 16 A <sub>dc</sub> , I <sub>B</sub> = 5 A <sub>dc</sub> )	h <sub>FE</sub>	20 8	- -	80 -	
Base-Emitter On Voltage (I <sub>C</sub> = 8 A <sub>dc</sub> , V <sub>CE</sub> = 5 V <sub>dc</sub> )	V <sub>BE(on)</sub>	-	-	2.2	V <sub>dc</sub>
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 8 A <sub>dc</sub> , I <sub>B</sub> = 0.8 A <sub>dc</sub> ) (I <sub>C</sub> = 16 A <sub>dc</sub> , I <sub>B</sub> = 3.2 A <sub>dc</sub> )	V <sub>CE(sat)</sub>	- -	- -	1.4 4	V <sub>dc</sub>

### DYNAMIC CHARACTERISTICS

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 0.08	- -	%
Current Gain Bandwidth Product (I <sub>C</sub> = 1 A <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , f <sub>test</sub> = 1 MHz)		f <sub>T</sub>	4	-	-	MHz
Output Capacitance (V <sub>CB</sub> = 10 V <sub>dc</sub> , I <sub>E</sub> = 0, f <sub>test</sub> = 1 MHz)		C <sub>ob</sub>	-	-	500	pF



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



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

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## TYPICAL CHARACTERISTICS

PNP MJW21193

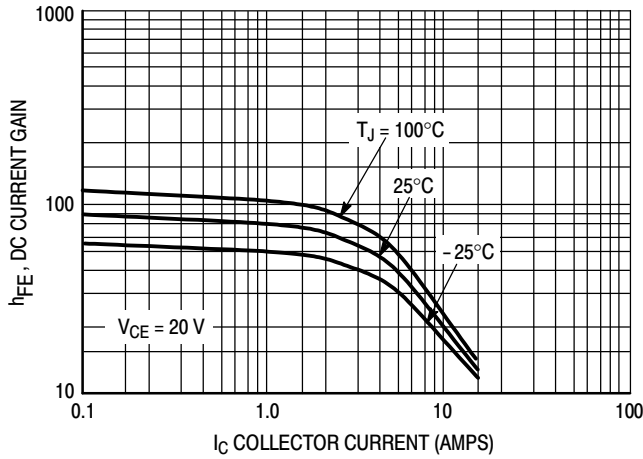


Figure 3. DC Current Gain,  $V_{CE} = 20\text{ V}$

NPN MJW21194

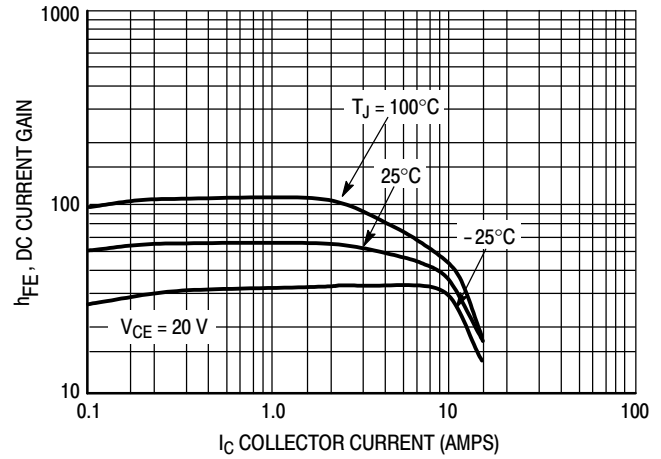


Figure 4. DC Current Gain,  $V_{CE} = 20\text{ V}$

PNP MJW21193

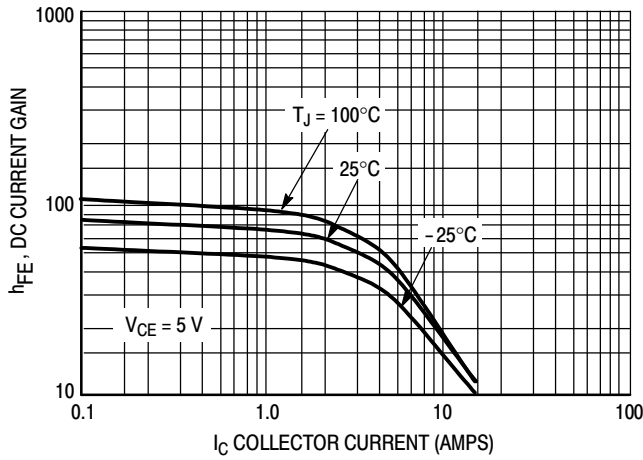


Figure 5. DC Current Gain,  $V_{CE} = 5\text{ V}$

NPN MJW21194

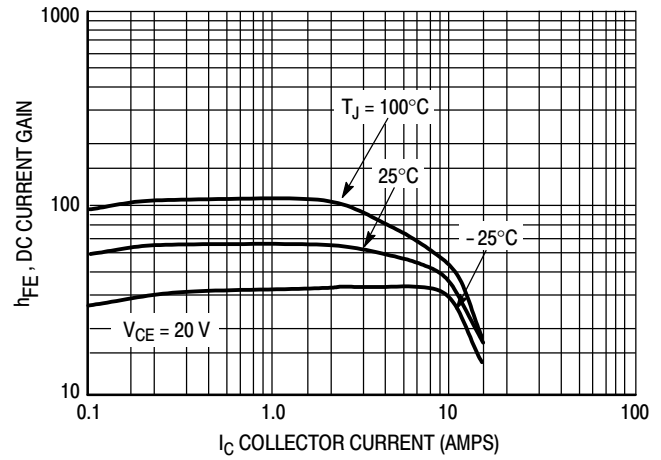


Figure 6. DC Current Gain,  $V_{CE} = 5\text{ V}$

PNP MJW21193

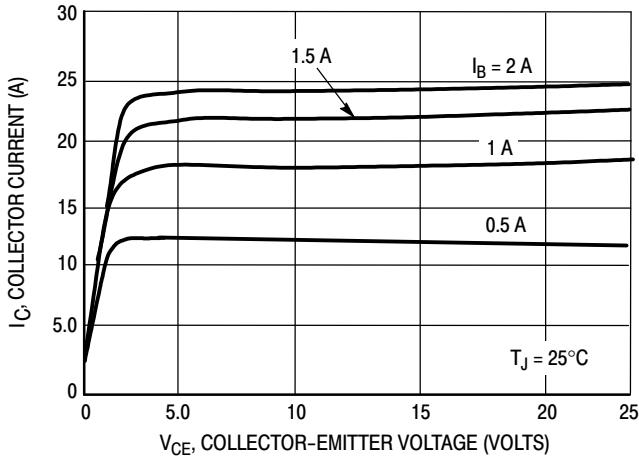


Figure 7. Typical Output Characteristics

NPN MJW21194

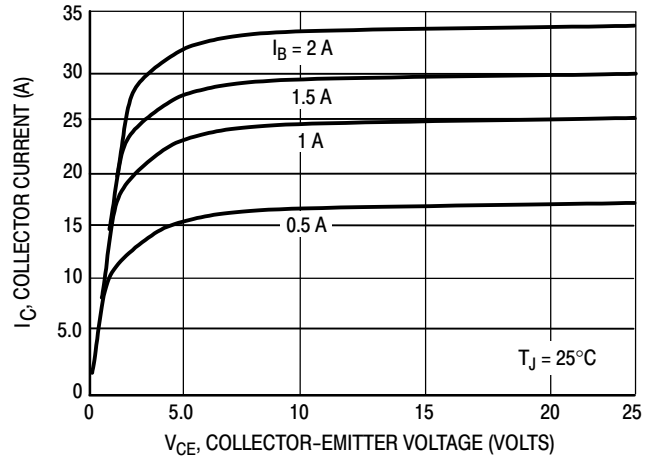
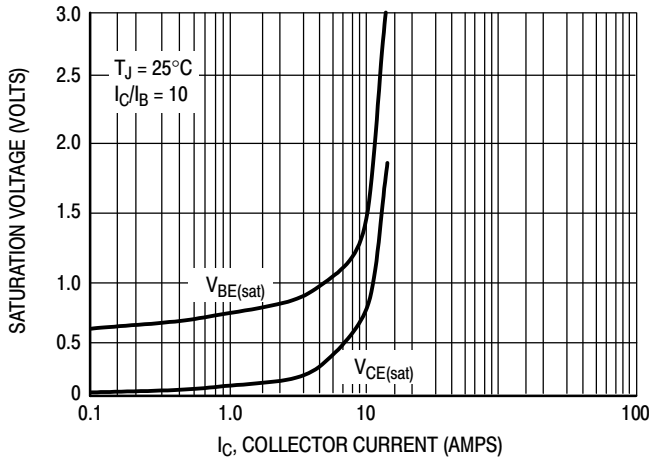


Figure 8. Typical Output Characteristics

# MJW21193 (PNP) MJW21194 (NPN)

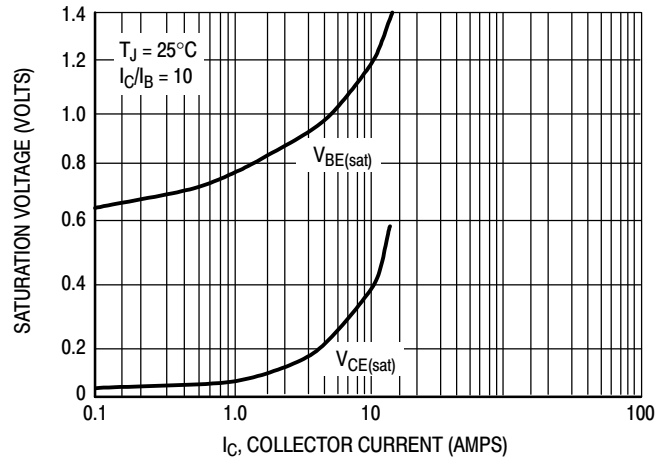
## TYPICAL CHARACTERISTICS

**PNP MJW21193**



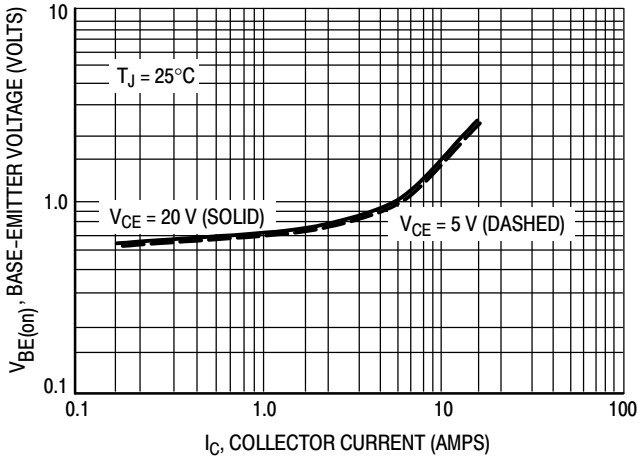
**Figure 9. Typical Saturation Voltages**

**NPN MJW21194**



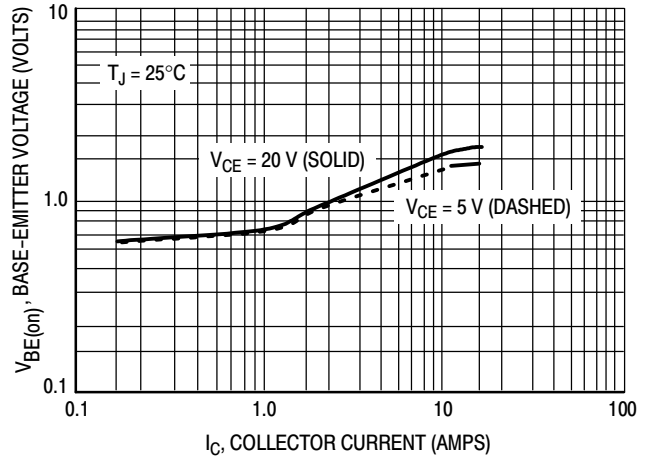
**Figure 10. Typical Saturation Voltages**

**PNP MJW21193**



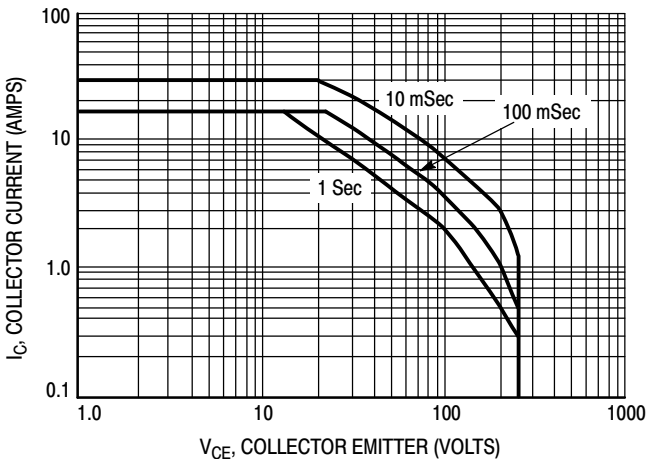
**Figure 11. Typical Base-Emitter Voltage**

**NPN MJW21194**



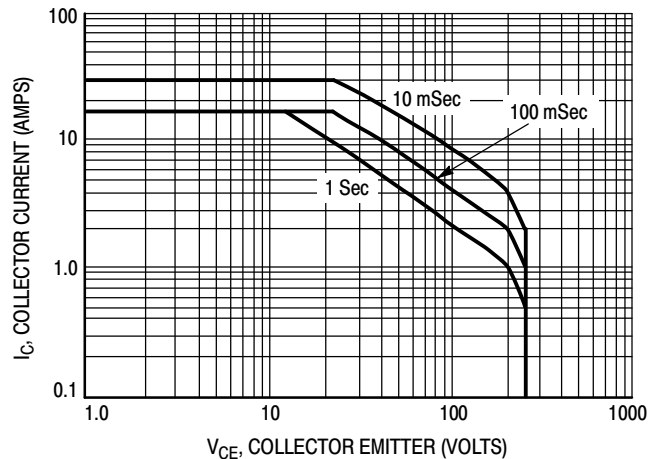
**Figure 12. Typical Base-Emitter Voltage**

**PNP MJW21193**



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

**NPN MJW21194**



**Figure 14. Active Region Safe Operating Area**

## MJW21193 (PNP) MJW21194 (NPN)

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  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

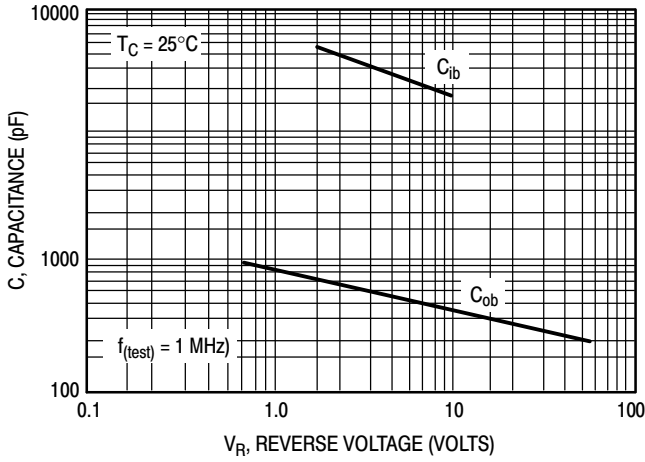


Figure 15. MJW21193 Typical Capacitance

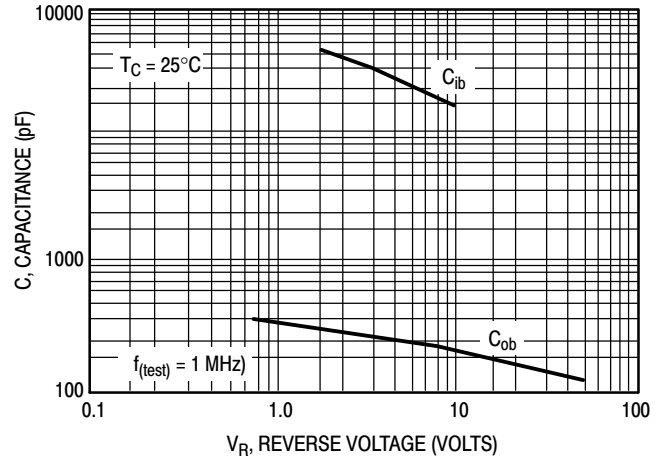


Figure 16. MJW21194 Typical Capacitance

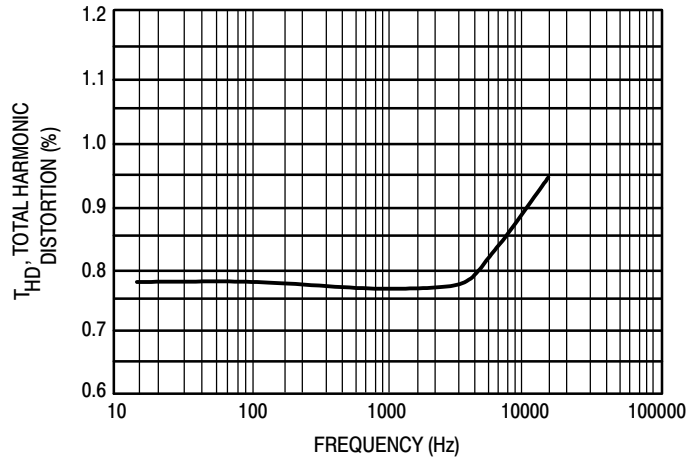


Figure 17. Typical Total Harmonic Distortion

# MJW21193 (PNP) MJW21194 (NPN)

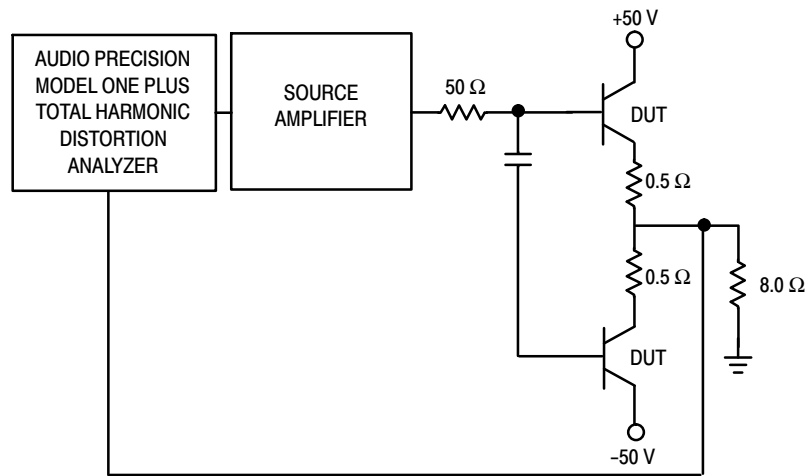
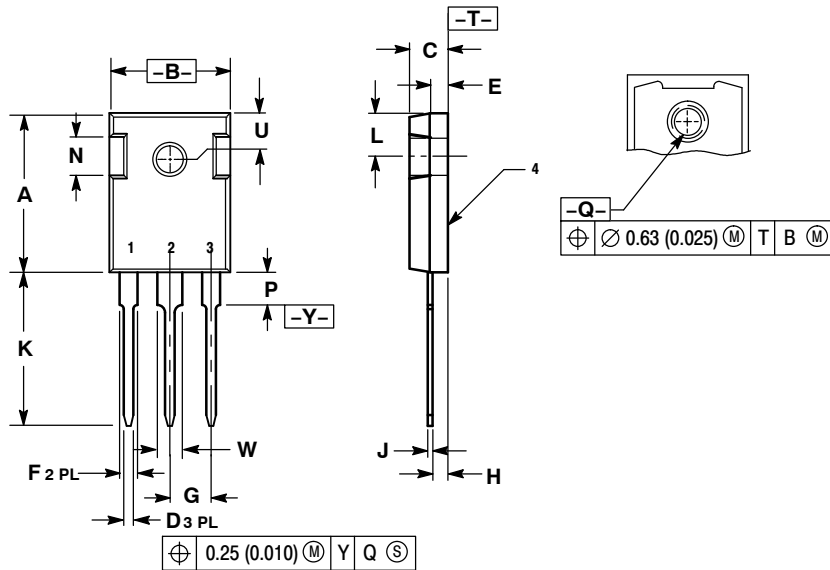


Figure 18. Total Harmonic Distortion Test Circuit

# MJW21193 (PNP) MJW21194 (NPN)

## PACKAGE DIMENSIONS

TO-247  
CASE 340L-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	20.32	21.08	0.800	0.830
B	15.75	16.26	0.620	0.640
C	4.70	5.30	0.185	0.209
D	1.00	1.40	0.040	0.055
E	1.90	2.60	0.075	0.102
F	1.65	2.13	0.065	0.084
G	5.45 BSC		0.215 BSC	
H	1.50	2.49	0.059	0.098
J	0.40	0.80	0.016	0.031
K	19.81	20.83	0.780	0.820
L	5.40	6.20	0.212	0.244
N	4.32	5.49	0.170	0.216
P	---	4.50	---	0.177
Q	3.55	3.65	0.140	0.144
U	6.15 BSC		0.242 BSC	
W	2.87	3.12	0.113	0.123

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

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