

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°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	$^\circ\text{C/W}$
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$	40	$^\circ\text{C/W}$

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.

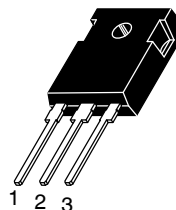
1. Pulse Test: Pulse Width = 5 μs , Duty Cycle $\leq 10\%$.



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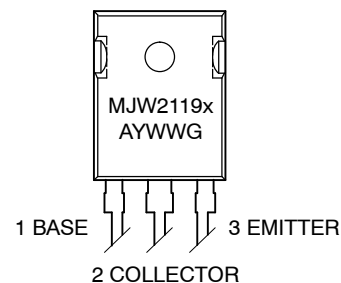
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**16 AMPERES
COMPLEMENTARY SILICON
POWER TRANSISTORS
250 VOLTS, 200 WATTS**



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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ($I_C = 100\text{ mAdc}$, $I_B = 0$)	$V_{CEO(sus)}$	250	-	-	Vdc
Collector Cutoff Current ($V_{CE} = 200\text{ Vdc}$, $I_B = 0$)	I_{CEO}	-	-	100	μAdc
Emitter Cutoff Current ($V_{CE} = 5\text{ Vdc}$, $I_C = 0$)	I_{EBO}	-	-	100	μAdc
Collector Cutoff Current ($V_{CE} = 250\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$)	I_{CEX}	-	-	100	μAdc

SECOND BREAKDOWN

Second Breakdown Collector Current with Base Forward Biased ($V_{CE} = 50\text{ Vdc}$, $t = 1\text{ s}$ (non-repetitive)) ($V_{CE} = 80\text{ Vdc}$, $t = 1\text{ s}$ (non-repetitive))	$I_{S/b}$	4.0 2.25	- -	- -	A dc
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ON CHARACTERISTICS

DC Current Gain ($I_C = 8\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 16\text{ Adc}$, $I_B = 5\text{ Adc}$)	h_{FE}	20 8	- -	80 -	
Base-Emitter On Voltage ($I_C = 8\text{ Adc}$, $V_{CE} = 5\text{ Vdc}$)	$V_{BE(on)}$	-	-	2.2	Vdc
Collector-Emitter Saturation Voltage ($I_C = 8\text{ Adc}$, $I_B = 0.8\text{ Adc}$) ($I_C = 16\text{ Adc}$, $I_B = 3.2\text{ Adc}$)	$V_{CE(sat)}$	- -	- -	1.4 4	Vdc

DYNAMIC CHARACTERISTICS

Total Harmonic Distortion at the Output $V_{RMS} = 28.3\text{ V}$, $f = 1\text{ kHz}$, $P_{LOAD} = 100\text{ W}_{RMS}$ (Matched pair $h_{FE} = 50 @ 5\text{ A}/5\text{ V}$)	T_{HD}				%
h_{FE} unmatched		-	0.8	-	
h_{FE} matched		-	0.08	-	
Current Gain Bandwidth Product ($I_C = 1\text{ Adc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1\text{ MHz}$)	f_T	4	-	-	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 1\text{ MHz}$)	C_{ob}	-	-	500	pF

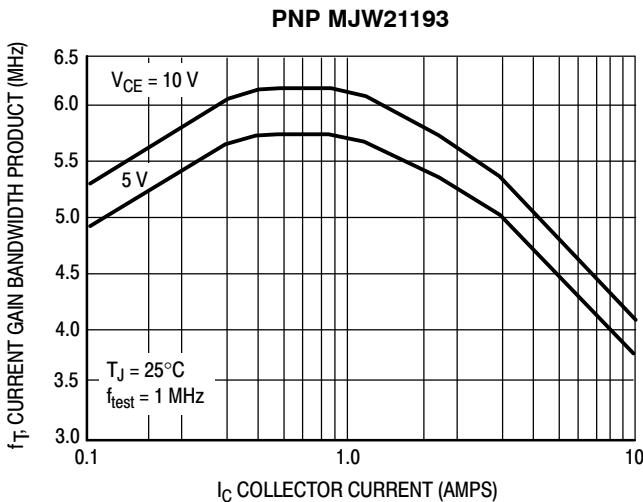


Figure 1. Typical Current Gain Bandwidth Product

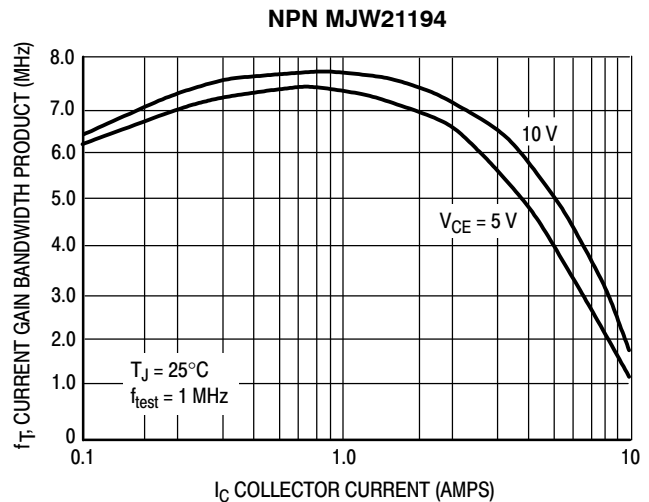


Figure 2. Typical Current Gain Bandwidth Product

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TYPICAL CHARACTERISTICS

PNP MJW21193

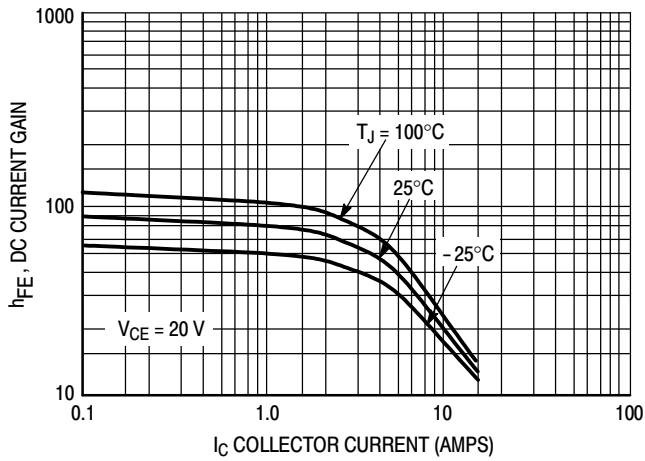


Figure 3. DC Current Gain, $V_{CE} = 20\text{ V}$

NPN MJW21194

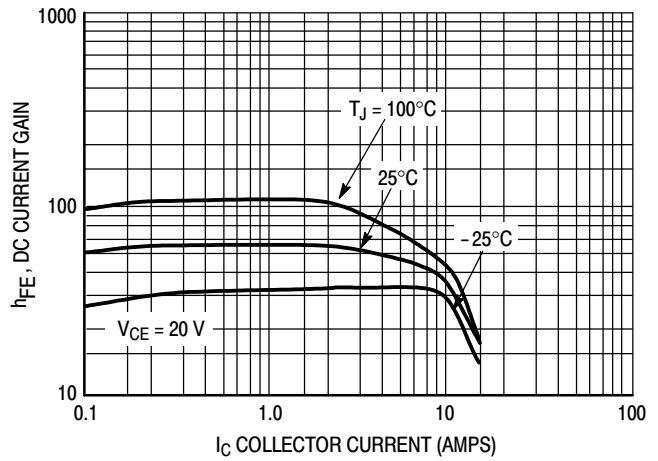


Figure 4. DC Current Gain, $V_{CE} = 20\text{ V}$

PNP MJW21193

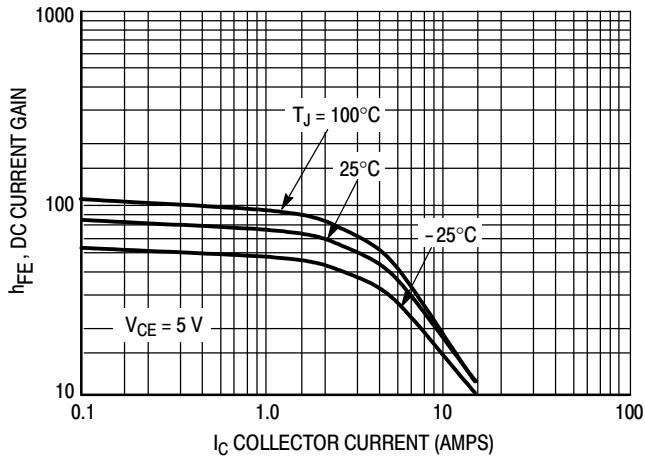


Figure 5. DC Current Gain, $V_{CE} = 5\text{ V}$

NPN MJW21194

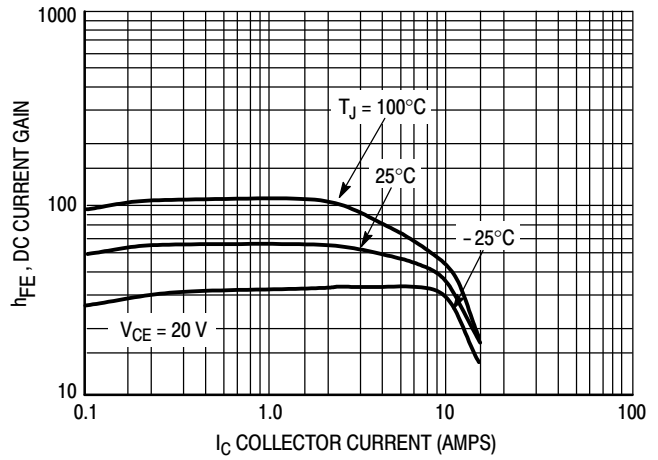


Figure 6. DC Current Gain, $V_{CE} = 5\text{ V}$

PNP MJW21193

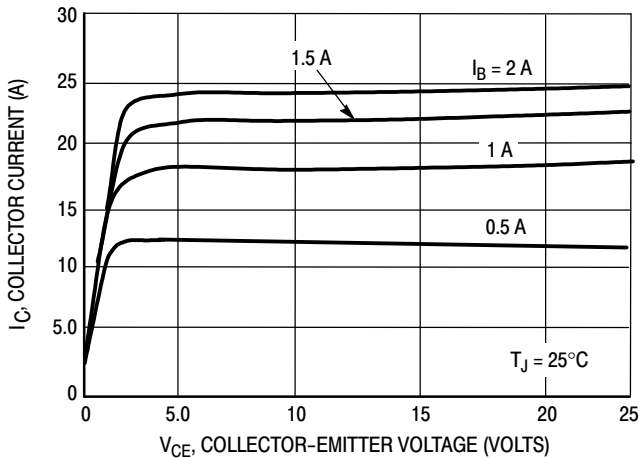


Figure 7. Typical Output Characteristics

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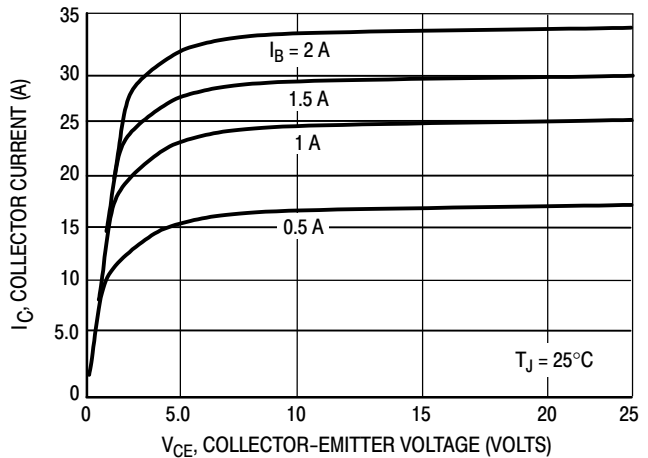


Figure 8. Typical Output Characteristics

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TYPICAL CHARACTERISTICS

PNP MJW21193

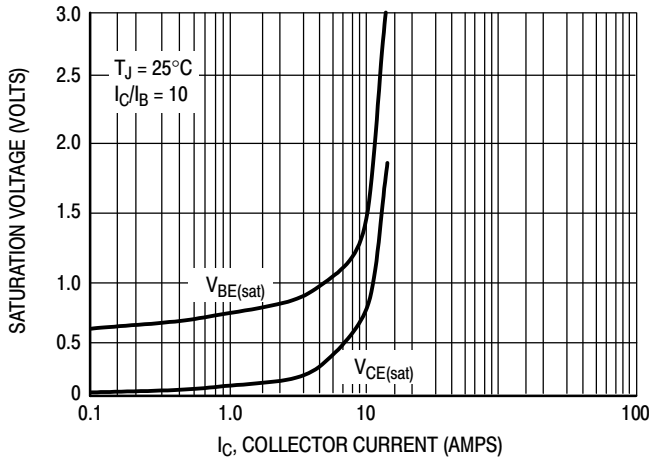


Figure 9. Typical Saturation Voltages

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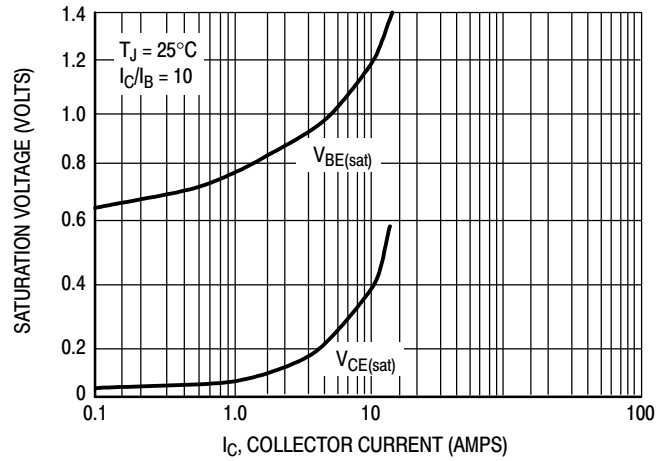


Figure 10. Typical Saturation Voltages

PNP MJW21193

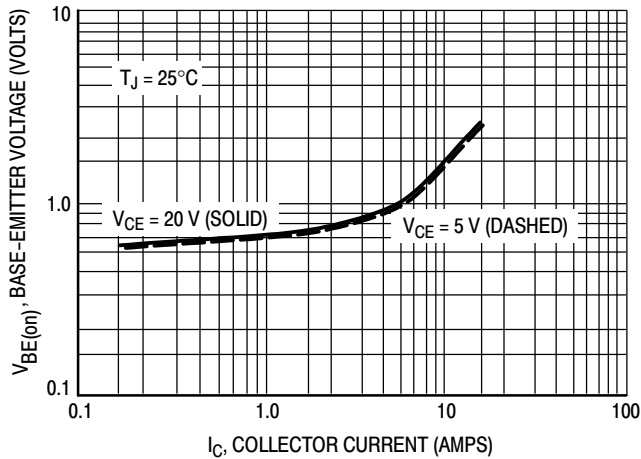


Figure 11. Typical Base-Emitter Voltage

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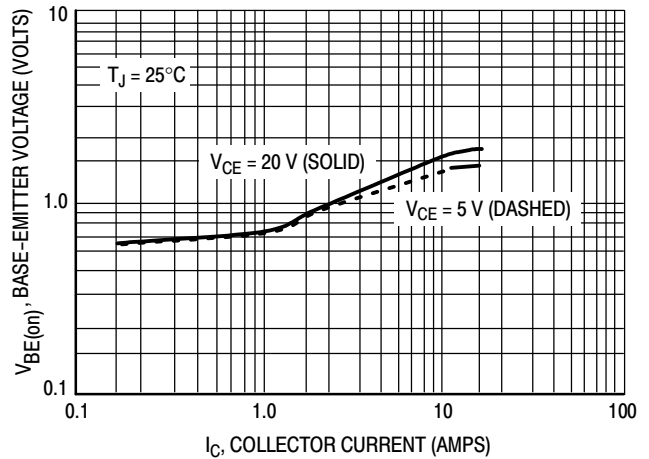


Figure 12. Typical Base-Emitter Voltage

PNP MJW21193

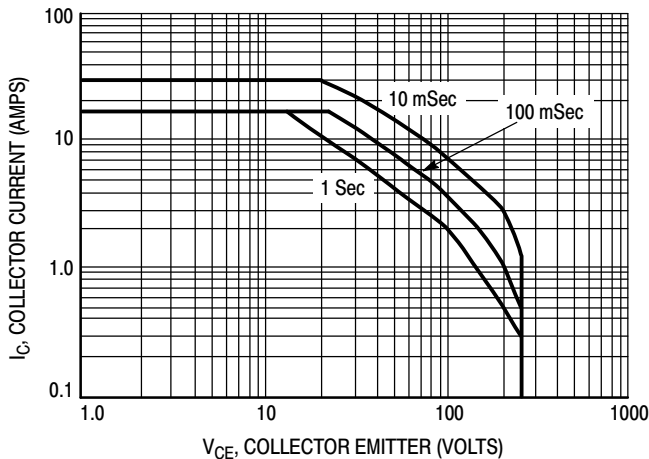


Figure 13. Active Region Safe Operating Area

NPN MJW21194

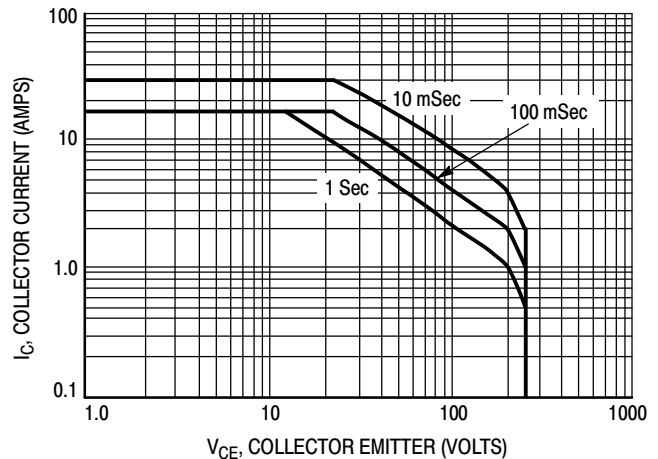


Figure 14. Active Region Safe Operating Area

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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.

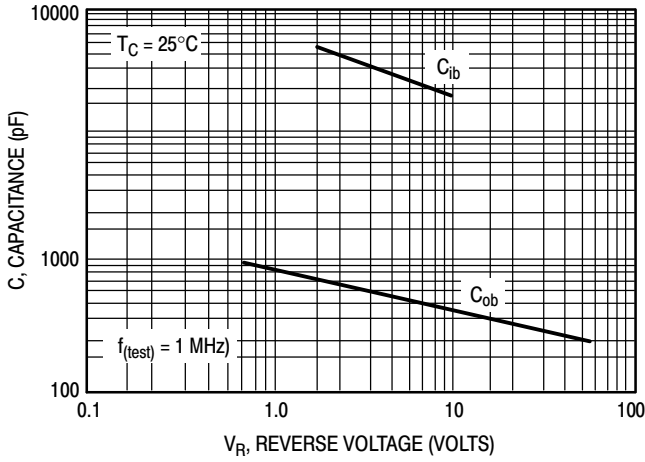


Figure 15. MJW21193 Typical Capacitance

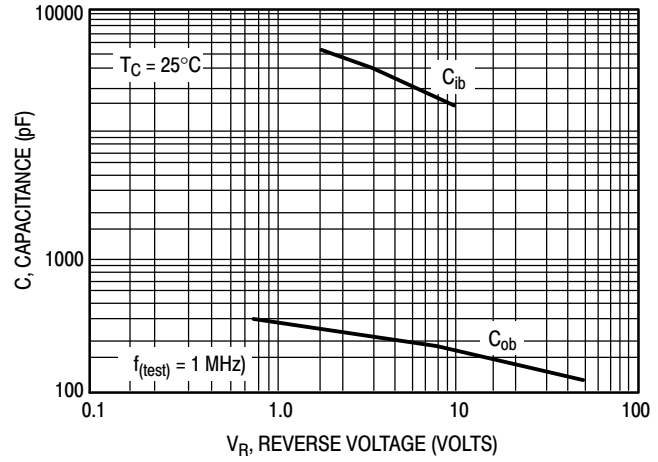


Figure 16. MJW21194 Typical Capacitance

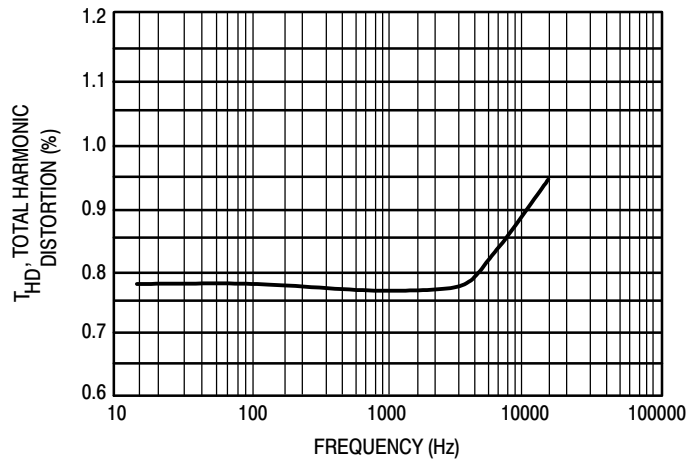


Figure 17. Typical Total Harmonic Distortion

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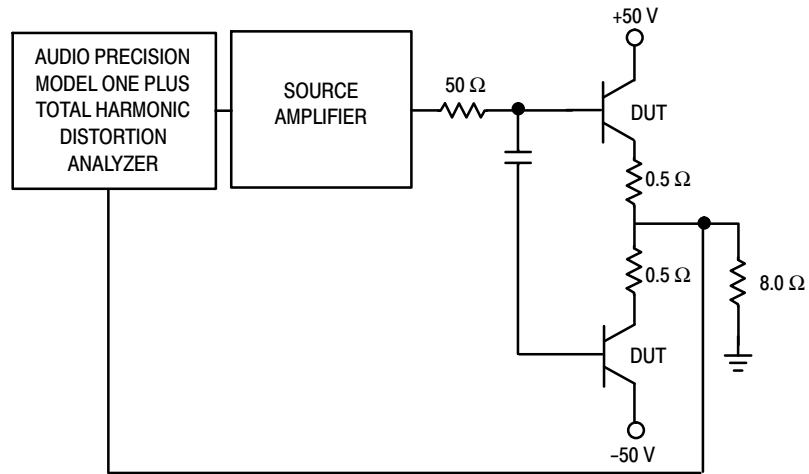
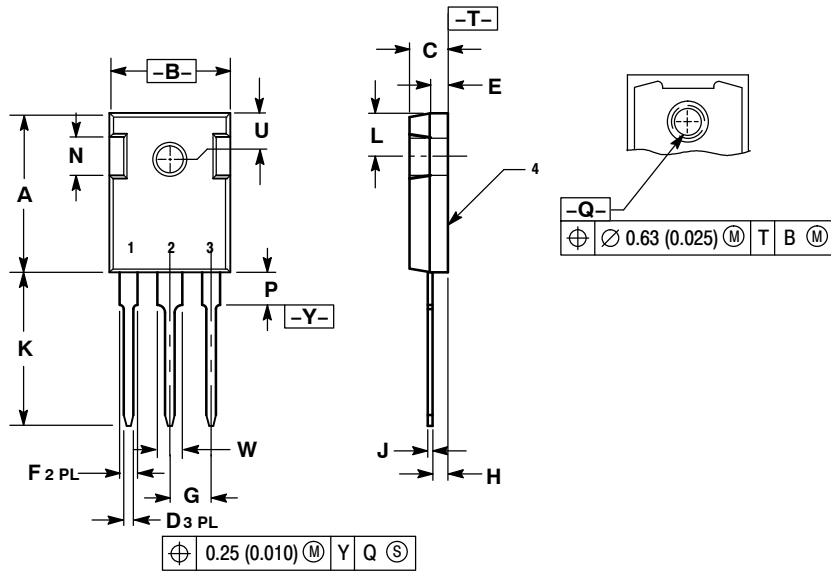


Figure 18. Total Harmonic Distortion Test Circuit

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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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