

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
- Excellent Gain Linearity
- High SOA
- These Devices are Pb-Free and are RoHS Compliant

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	I_C	16	Adc
Collector Current - Peak (Note 1)	I_{CM}	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/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	- 65 to +150	°C

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 $\leq 10\%$.

THERMAL CHARACTERISTICS

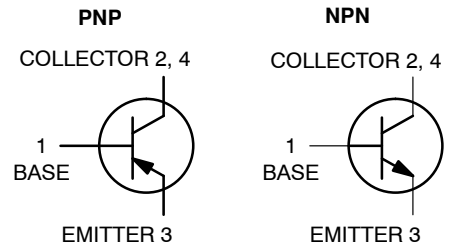
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.7	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	°C/W



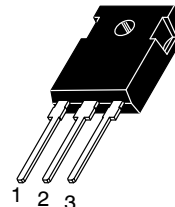
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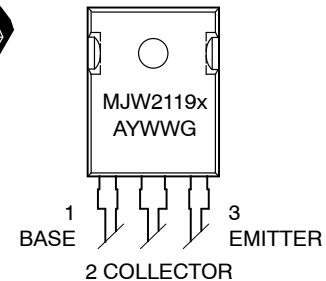
16 AMPERES COMPLEMENTARY SILICON POWER TRANSISTORS 250 VOLTS, 200 WATTS



MARKING DIAGRAM



TO-247
CASE 340L
STYLE 3



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

ORDERING INFORMATION

Device	Package	Shipping
MJW21193G	TO-247 (Pb-Free)	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 ($I_C = 100\text{ mA}$, $I_B = 0$)	$V_{CEO(sus)}$	250	-	-	Vdc
Collector Cutoff Current ($V_{CE} = 200\text{ Vdc}$, $I_B = 0$)	I_{CEO}	-	-	100	μA
Emitter Cutoff Current ($V_{CE} = 5\text{ Vdc}$, $I_C = 0$)	I_{EBO}	-	-	100	μA
Collector Cutoff Current ($V_{CE} = 250\text{ Vdc}$, $V_{BE(off)} = 1.5\text{ Vdc}$)	I_{CEX}	-	-	100	μA

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
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ON CHARACTERISTICS

DC Current Gain ($I_C = 8\text{ A}$, $V_{CE} = 5\text{ Vdc}$) ($I_C = 16\text{ A}$, $I_B = 5\text{ A}$)	h_{FE}	20 8	- -	80 -	
Base-Emitter On Voltage ($I_C = 8\text{ A}$, $V_{CE} = 5\text{ Vdc}$)	$V_{BE(on)}$	-	-	2.2	Vdc
Collector-Emitter Saturation Voltage ($I_C = 8\text{ A}$, $I_B = 0.8\text{ A}$) ($I_C = 16\text{ A}$, $I_B = 3.2\text{ A}$)	$V_{CE(sat)}$	- -	- -	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 ($I_C = 1\text{ A}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1\text{ MHz}$)	f_T	4	-	-	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 1\text{ MHz}$)	C_{ob}	-	-	500	pF

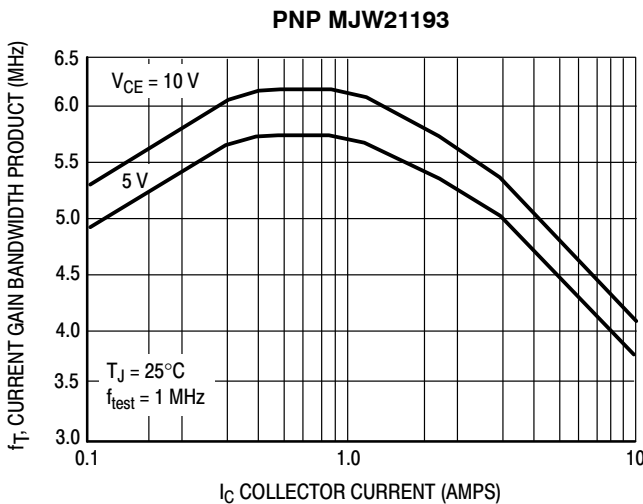


Figure 1. Typical Current Gain Bandwidth Product

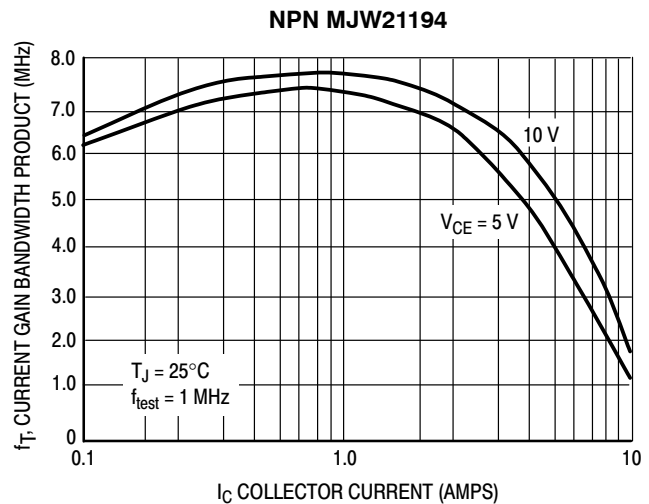


Figure 2. Typical Current Gain Bandwidth Product

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TYPICAL CHARACTERISTICS

PNP MJW21193

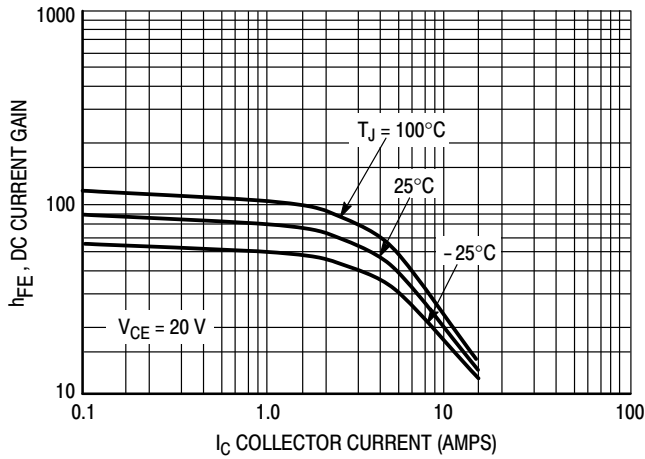


Figure 3. DC Current Gain, $V_{CE} = 20\text{ V}$

NPN MJW21194

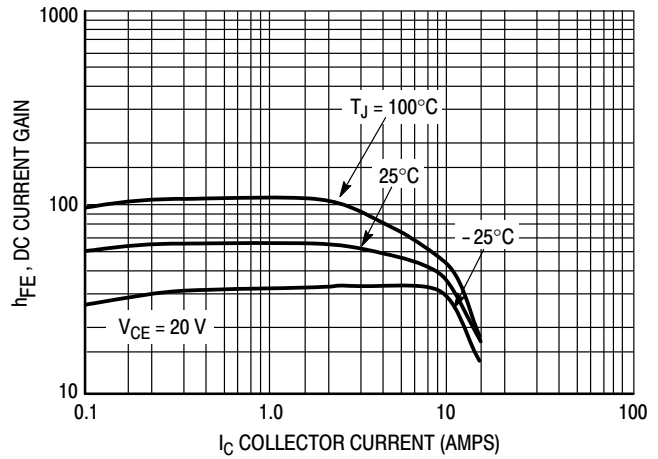


Figure 4. DC Current Gain, $V_{CE} = 20\text{ V}$

PNP MJW21193

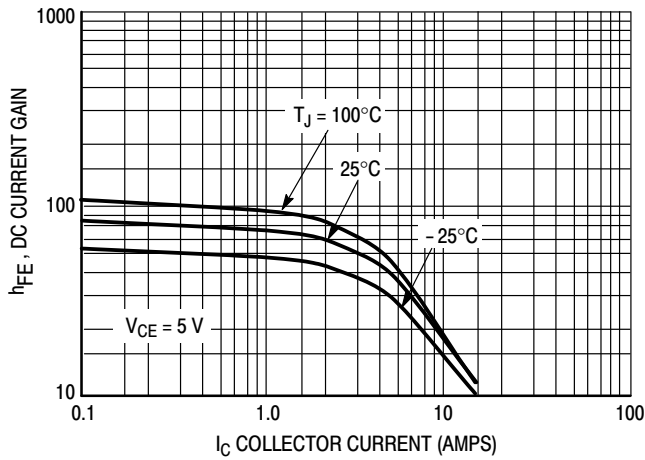


Figure 5. DC Current Gain, $V_{CE} = 5\text{ V}$

NPN MJW21194

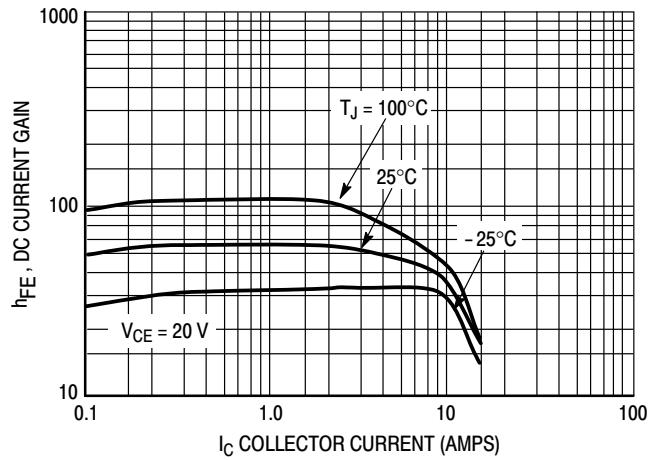


Figure 6. DC Current Gain, $V_{CE} = 5\text{ V}$

PNP MJW21193

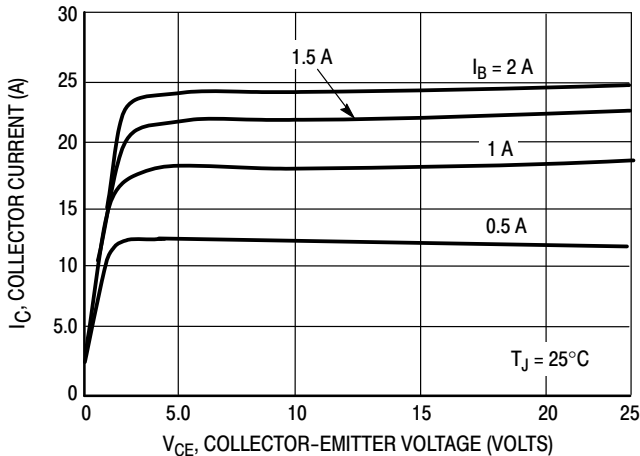


Figure 7. Typical Output Characteristics

NPN MJW21194

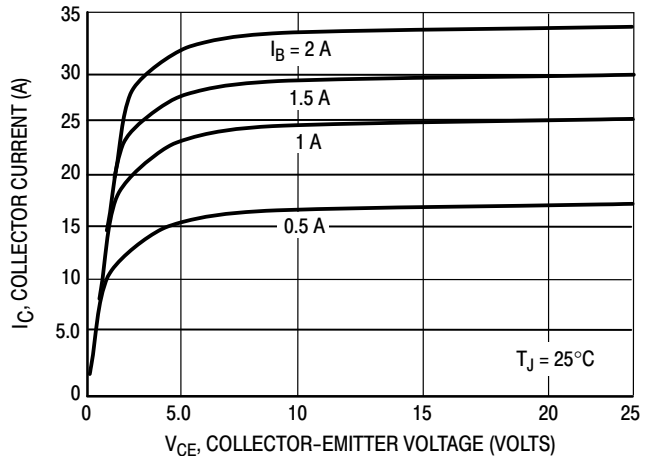


Figure 8. Typical Output Characteristics

MJW21193 (PNP) MJW21194 (NPN)

TYPICAL CHARACTERISTICS

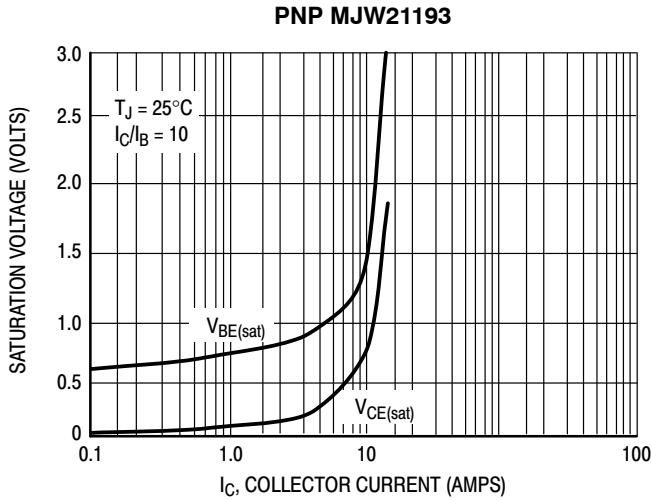


Figure 9. Typical Saturation Voltages

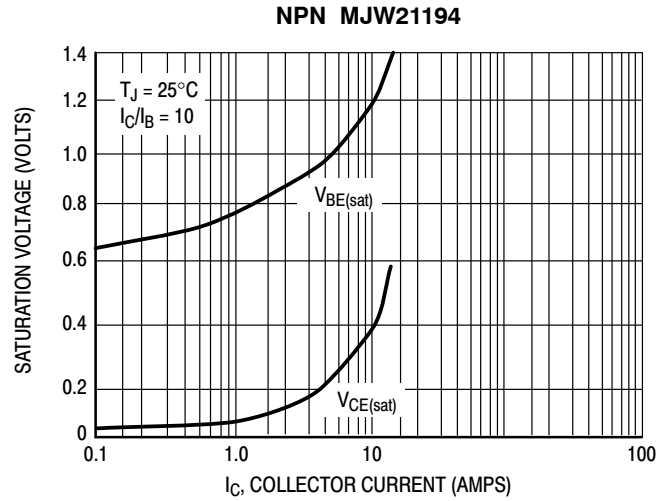


Figure 10. Typical Saturation Voltages

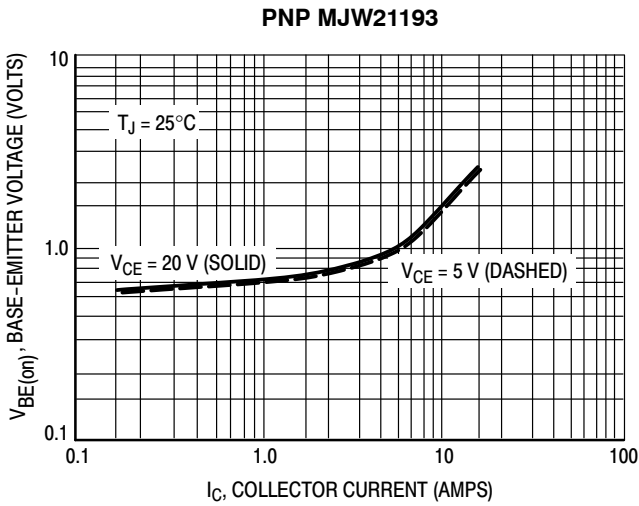


Figure 11. Typical Base-Emitter Voltage

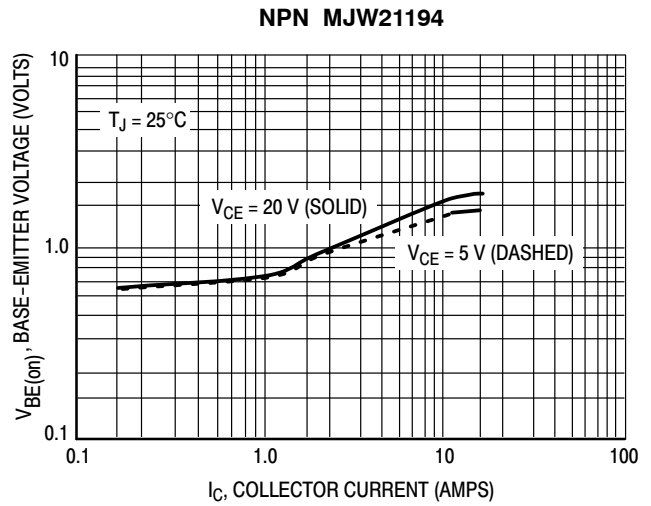


Figure 12. Typical Base-Emitter Voltage

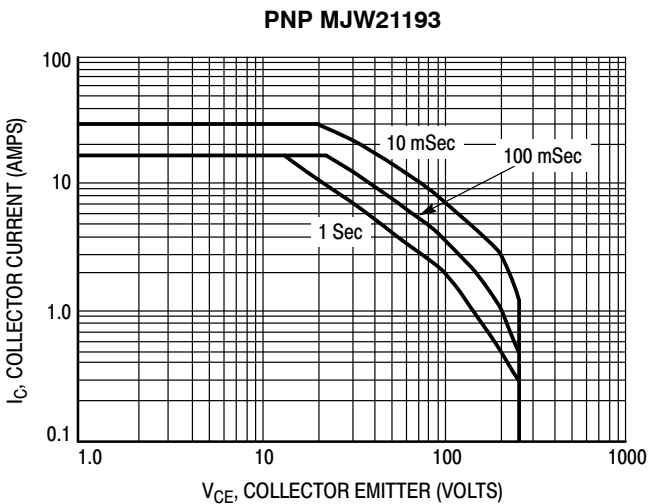


Figure 13. Active Region Safe Operating Area

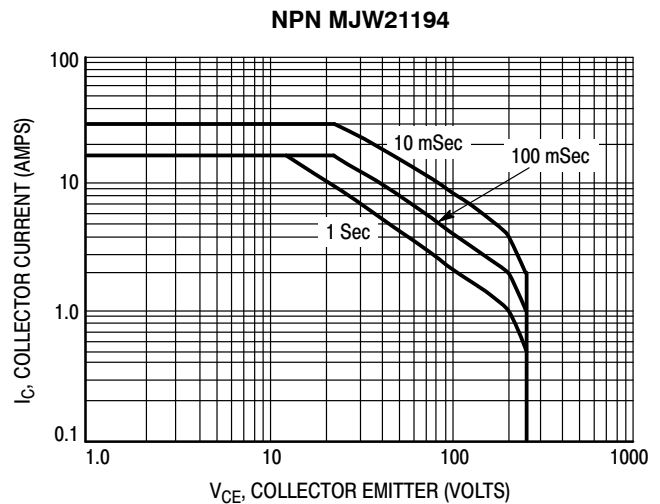


Figure 14. Active Region Safe Operating Area

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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.

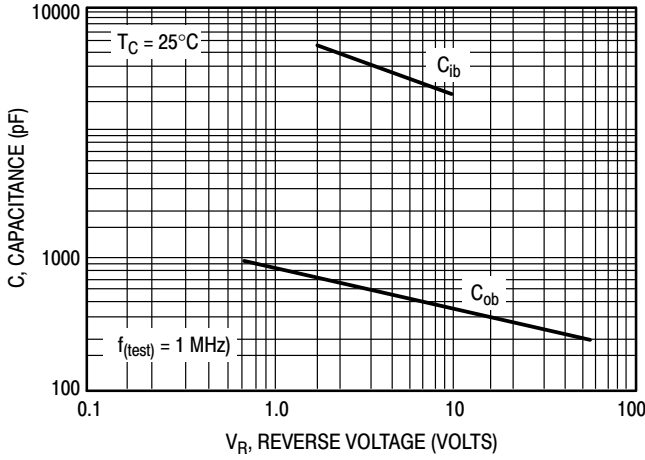


Figure 15. MJW21193 Typical Capacitance

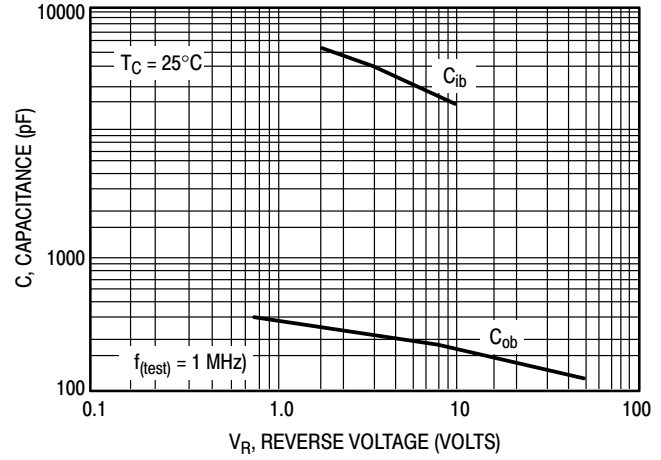


Figure 16. MJW21194 Typical Capacitance

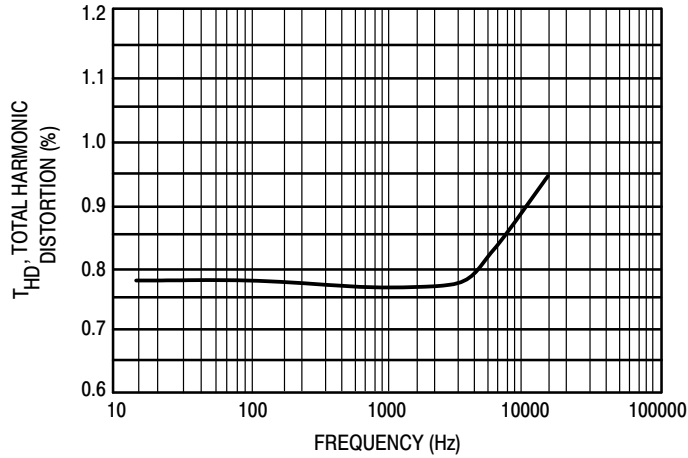


Figure 17. Typical Total Harmonic Distortion

MJW21193 (PNP) MJW21194 (NPN)

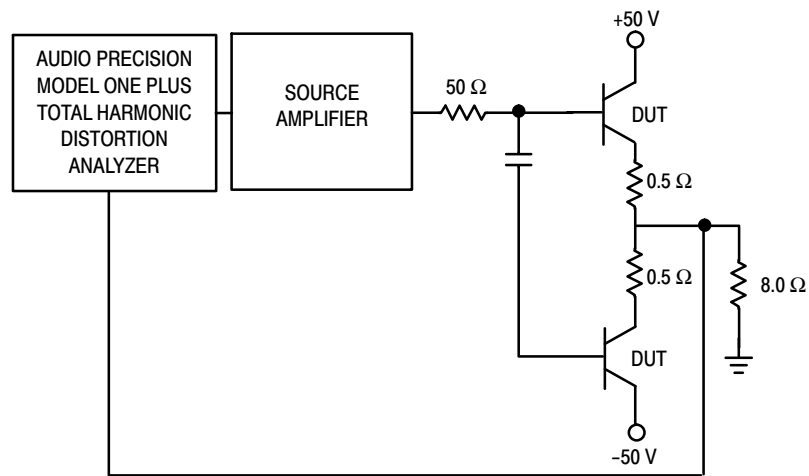
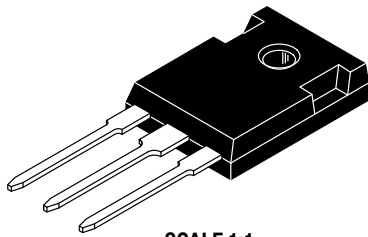


Figure 18. Total Harmonic Distortion Test Circuit

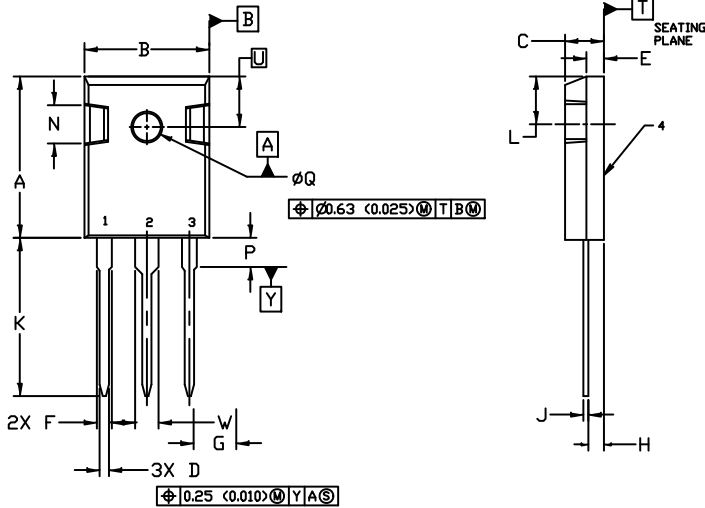
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



TO-247
CASE 340L
ISSUE G

DATE 06 OCT 2021

SCALE 1:1

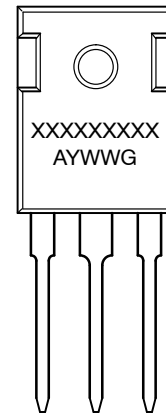


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME 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

GENERIC
MARKING DIAGRAM*



- | | | | |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <p>STYLE 1:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN</p> | <p>STYLE 2:
PIN 1. ANODE
2. CATHODE (S)
3. ANODE 2
4. CATHODES (S)</p> | <p>STYLE 3:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR</p> | <p>STYLE 4:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR</p> |
| <p>STYLE 5:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE</p> | <p>STYLE 6:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2</p> | | |

- XXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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