

MJH6284 (NPN), MJH6287 (PNP)

Darlington Complementary Silicon Power Transistors

These devices are designed for general-purpose amplifier and low-speed switching motor control applications.

Features

- Similar to the Popular NPN 2N6284 and the PNP 2N6287
- Rugged RBSOA Characteristics
- Monolithic Construction with Built-in Collector-Emitter Diode
- These are Pb-Free Devices*

MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Collector-Emitter Voltage	V_{CEO}	100	Vdc
Collector-Base Voltage	V_{CB}	100	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current – Continuous – Peak	I_C	20 40	Adc
Base Current	I_B	0.5	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	160 1.28	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	$R_{\theta JC}$	0.78	$^\circ\text{C/W}$

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.

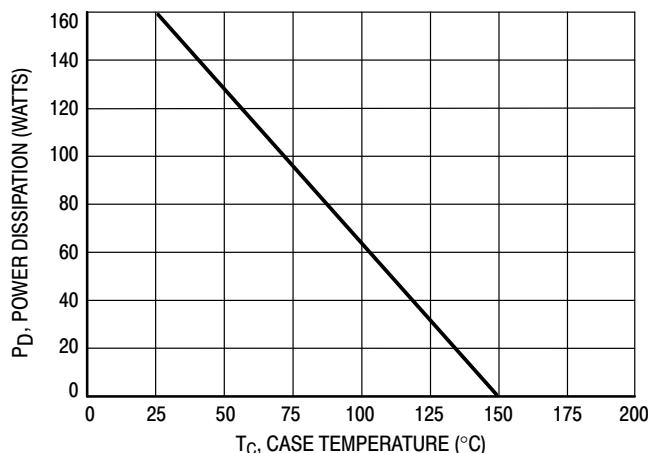


Figure 1. Power Derating

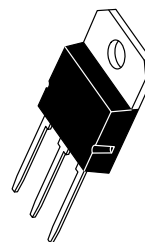
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



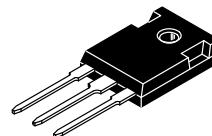
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DARLINGTON 20 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 100 VOLTS, 160 WATTS



SOT-93
(TO-218)
CASE 340D



TO-247
CASE 340L
STYLE 3

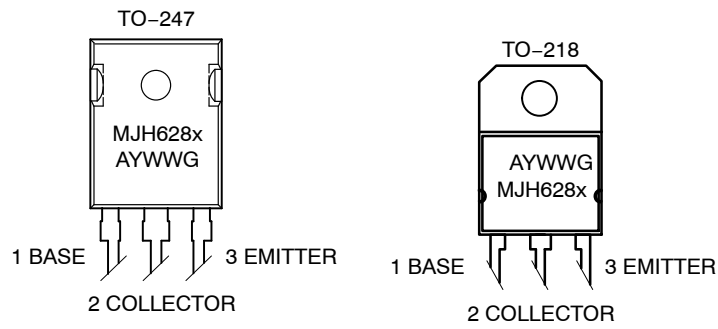
NOTE: Effective June 2012 this device will be available only in the TO-247 package. Reference FPCN# 16827.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

MJH6284 (NPN), MJH6287 (PNP)

MARKING DIAGRAMS



MJH628x = Device Code
x = 4 or 7
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

Device Order Number	Package Type	Shipping
MJH6284G	TO-218 (Pb-Free)	30 Units / Rail
MJH6287G	TO-218 (Pb-Free)	30 Units / Rail
MJH6284G	TO-247 (Pb-Free)	30 Units / Rail
MJH6287G	TO-247 (Pb-Free)	30 Units / Rail

MJH6284 (NPN), MJH6287 (PNP)

ELECTRICAL CHARACTERISTICS (T_G = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Sustaining Voltage ($I_C = 0.1 \text{ Adc}$, $I_B = 0$)	$V_{CEO(sus)}$	100	–	Vdc
Collector Cutoff Current ($V_{CE} = 50 \text{ Vdc}$, $I_B = 0$)	I_{CEO}	–	1.0	mAdc
Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CB}$, $V_{BE(off)} = 1.5 \text{ Vdc}$) ($V_{CE} = \text{Rated } V_{CB}$, $V_{BE(off)} = 1.5 \text{ Vdc}$, $T_C = 150^\circ\text{C}$)	I_{CEX}	– –	0.5 5.0	mAdc
Emitter Cutoff Current ($V_{BE} = 5.0 \text{ Vdc}$, $I_C = 0$)	I_{EBO}	–	2.0	mAdc

ON CHARACTERISTICS (Note 1)

DC Current Gain ($I_C = 10 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$) ($I_C = 20 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$)	h_{FE}	750 100	18,000 –	–
Collector–Emitter Saturation Voltage ($I_C = 10 \text{ Adc}$, $I_B = 40 \text{ mAdc}$) ($I_C = 20 \text{ Adc}$, $I_B = 200 \text{ mAdc}$)	$V_{CE(sat)}$	– –	2.0 3.0	Vdc
Base–Emitter On Voltage ($I_C = 10 \text{ Adc}$, $V_{CE} = 3.0 \text{ Vdc}$)	$V_{BE(on)}$	–	2.8	Vdc
Base–Emitter Saturation Voltage ($I_C = 20 \text{ Adc}$, $I_B = 200 \text{ mAdc}$)	$V_{BE(sat)}$	–	4.0	Vdc

DYNAMIC CHARACTERISTICS

Current–Gain Bandwidth Product ($I_C = 10\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	f_T	4.0	–	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$) MJD6284 MJD6287	C_{ob}	– –	400 600	pF
Small–Signal Current Gain ($I_C = 10\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	300	–	–

SWITCHING CHARACTERISTICS

Resistive Load		Symbol	Typical		Unit
			NPN	PNP	
Delay Time	$V_{CC} = 30 \text{ Vdc}$, $I_C = 10 \text{ Adc}$ $I_{B1} = I_{B2} = 100 \text{ mA}$ Duty Cycle = 1.0%	t_d	0.1	0.1	μs
Rise Time		t_r	0.3	0.3	
Storage Time		t_s	1.0	1.0	
Fall Time		t_f	3.5	2.0	

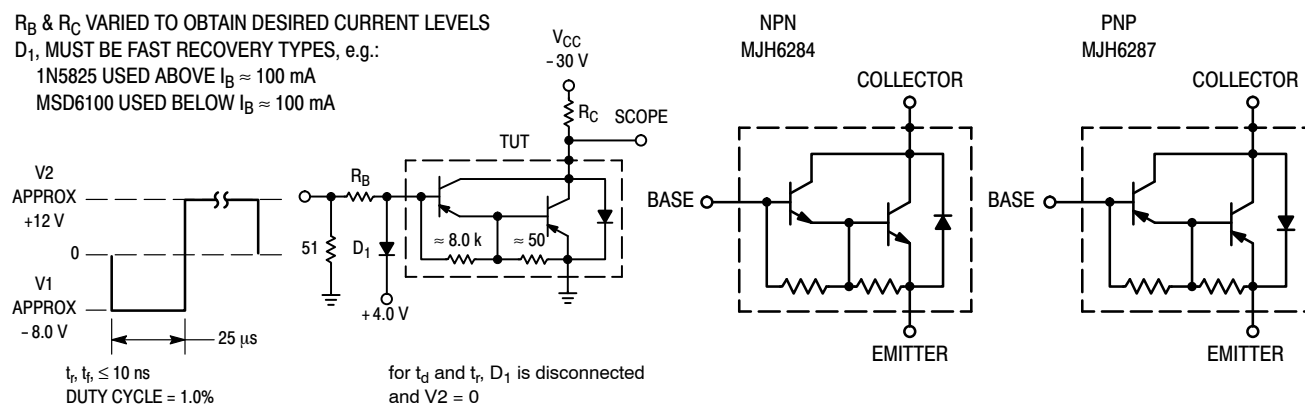
1. Pulse test: Pulse Width = 300 μ s, Duty Cycle = 2.0%.

R_B & R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS

D₁, MUST BE FAST RECOVERY TYPES, e.g.:

1N5825 USED ABOVE $I_B \approx 100$ mA

MSD6100 USED BELOW $I_B \approx 100$ mA



For NPN test circuit reverse diode and voltage polarities.

Figure 2. Switching Times Test Circuit

Figure 3. Darlington Schematic

MJH6284 (NPN), MJH6287 (PNP)

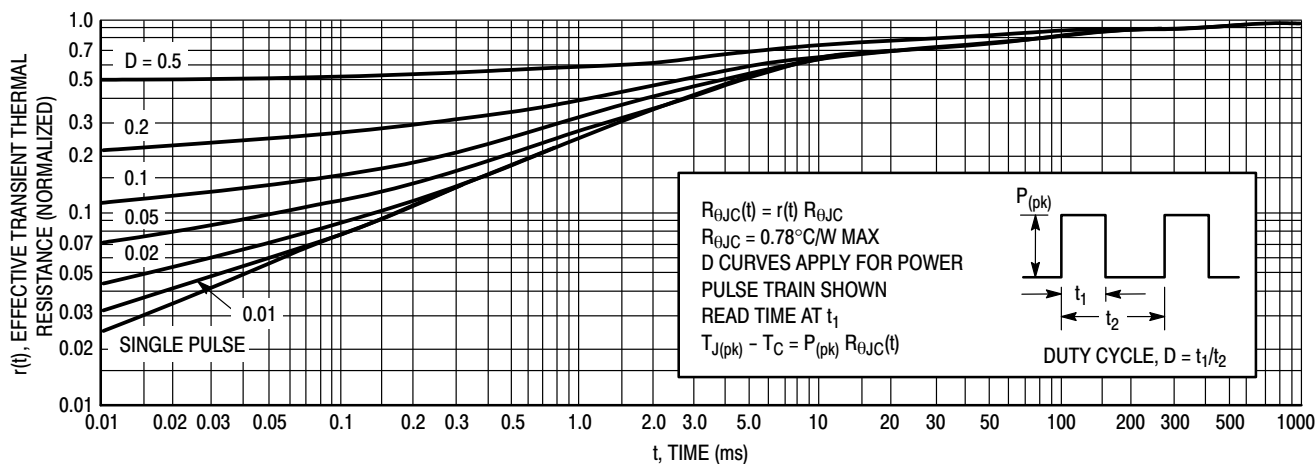


Figure 4. Thermal Response

FBSOA, FORWARD BIAS SAFE OPERATING AREA

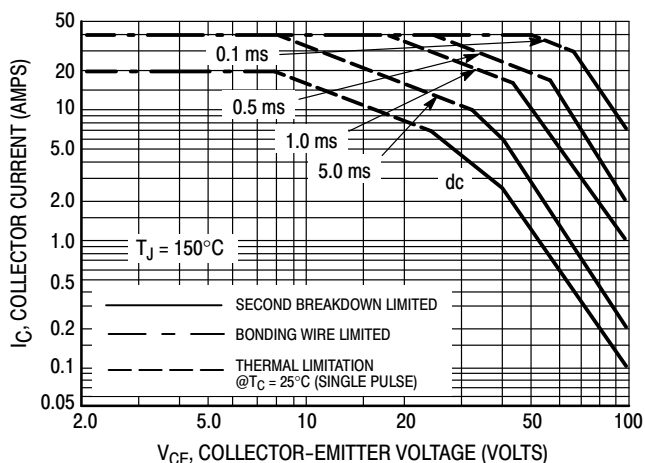


Figure 5. MJH6284, MJH6287

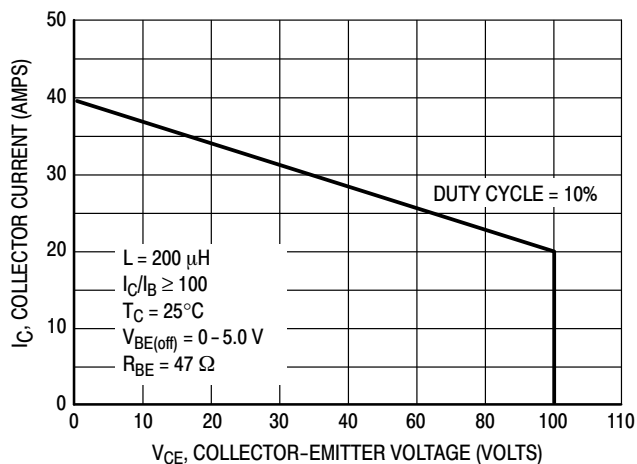


Figure 6. Maximum RBSOA, Reverse Bias Safe Operating Area

FORWARD BIAS

There are two limitations on the power handling ability of a transistor: average junction temperature and second 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 5 is based on $T_{J(pk)} = 150^{\circ}\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^{\circ}\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

MJH6284 (NPN), MJH6287 (PNP)

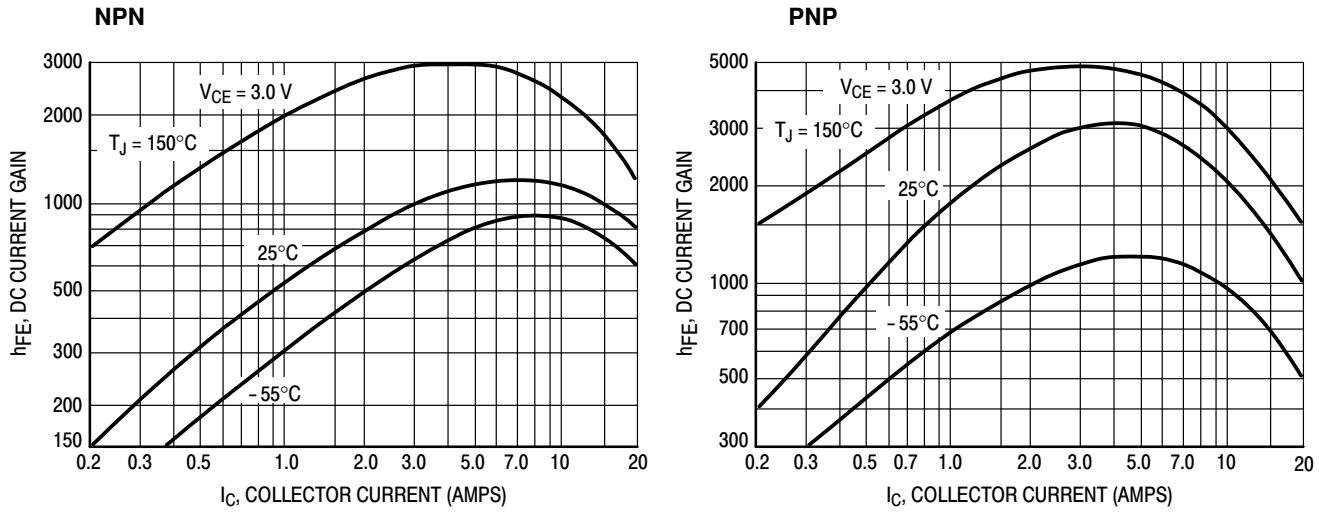


Figure 7. DC Current Gain

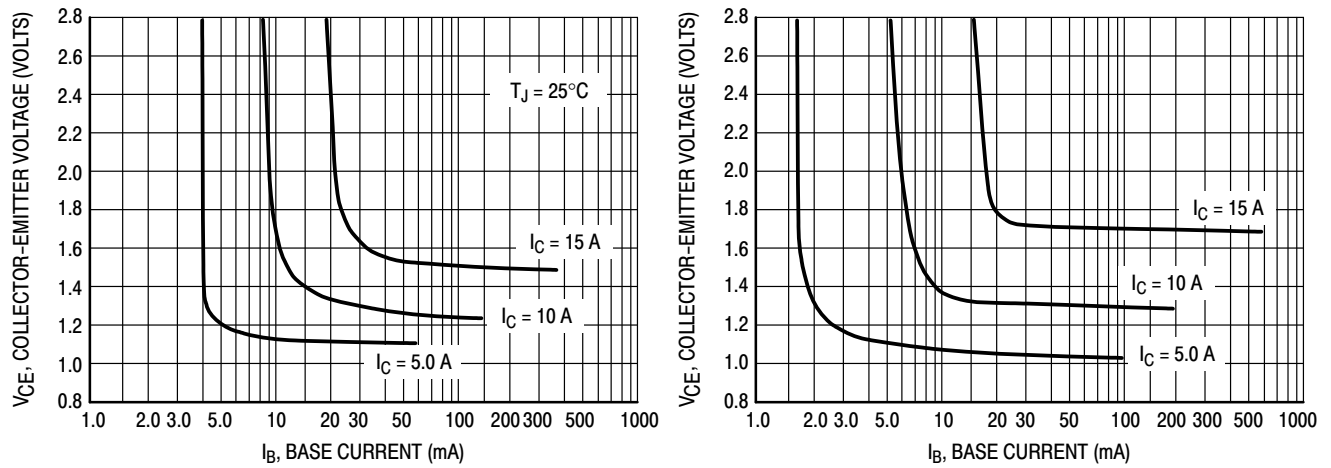


Figure 8. Collector Saturation Region

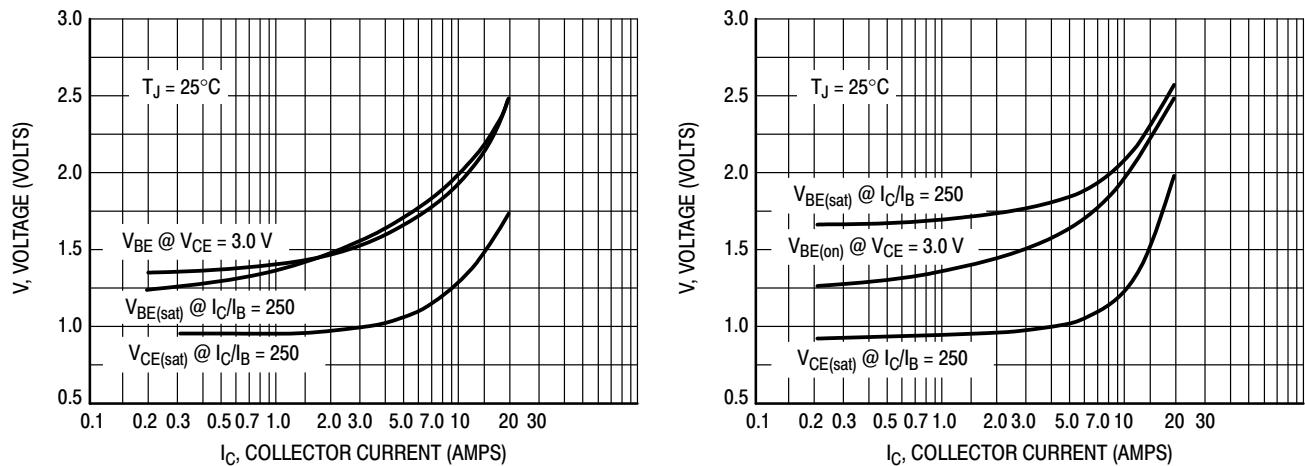


Figure 9. "On" Voltages

MECHANICAL CASE OUTLINE

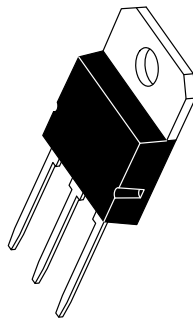
PACKAGE DIMENSIONS

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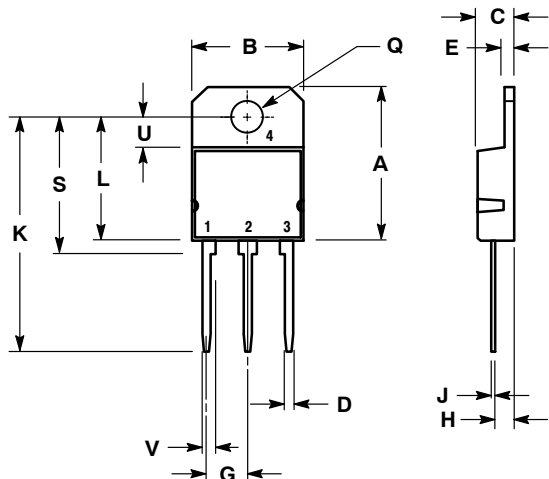


SOT-93 (TO-218) CASE 340D-02 ISSUE E

DATE 01/03/2002



SCALE 1:1



STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	20.35	---	0.801
B	14.70	15.20	0.579	0.598
C	4.70	4.90	0.185	0.193
D	1.10	1.30	0.043	0.051
E	1.17	1.37	0.046	0.054
G	5.40	5.55	0.213	0.219
H	2.00	3.00	0.079	0.118
J	0.50	0.78	0.020	0.031
K	31.00 REF		1.220 REF	
L	---	16.20	---	0.638
Q	4.00	4.10	0.158	0.161
S	17.80	18.20	0.701	0.717
U	4.00 REF		0.157 REF	
V	1.75 REF		0.069	

MARKING DIAGRAM

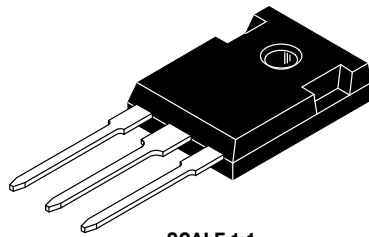


A = Assembly Location
Y = Year
WW = Work Week
xxxxx = Device Code

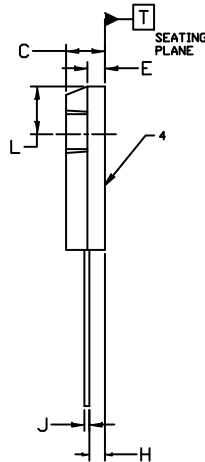
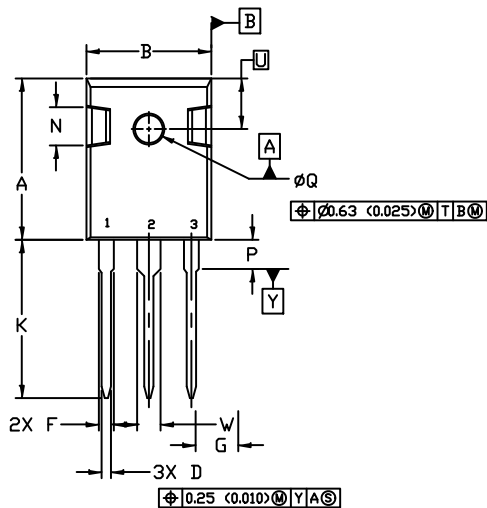
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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1



TO-247
CASE 340L
ISSUE G

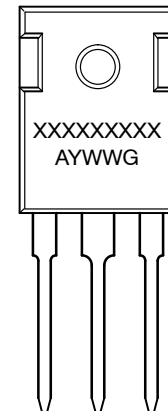
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NOTES:

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*



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

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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