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DATA SHEET
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Silicon PNP Power Transistors

2N5194G, 2N5195G

These devices are designed for use in power amplifier and switching circuits; excellent safe area limits.

Features

- Complement to NPN 2N5191, 2N5192
- These Devices are Pb−Free and are RoHS Compliant*

MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Collector−Emitter Voltage 2N5194G 2N5195G	V_{CEO}	 60 80	Vdc
Collector−Base Voltage 2N5194G 2N5195G	V_{CB}	 60 80	Vdc
Emitter−Base Voltage	V_{EB}	5.0	Vdc
Collector Current	I_C	4.0	Adc
Base Current	I_B	1.0	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	 40 320	 W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°C/W

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

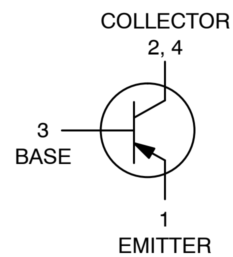
1. Indicates JEDEC registered data.

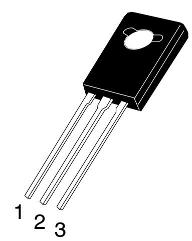
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	3.12	°C/W

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

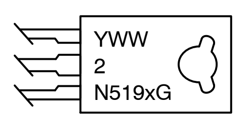
4 AMPERE POWER TRANSISTORS PNP SILICON 60 − 80 VOLTS





TO−225
CASE 77−09
STYLE 1

MARKING DIAGRAM



Y	=	Year
WW	=	Work Week
2N519x	=	Device Code x = 4 or 5
G	=	Pb−Free Package

ORDERING INFORMATION

Device	Package	Shipping
2N5195G	TO−225 (Pb−Free)	500 Units / Bulk

DISCONTINUED (Note 1)

2N5194G	TO−225 (Pb−Free)	500 Units / Bulk

1. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on www.onsemi.com.

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted) (Note 2)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector−Emitter Sustaining Voltage (Note 3) (I_C = 0.1 Adc, I_B = 0) 2N5194G 2N5195G	$V_{CEO(sus)}$	 60 80	 – –	Vdc
Collector Cutoff Current (V_{CE} = 60 Vdc, I_B = 0) 2N5194G (V_{CE} = 80 Vdc, I_B = 0) 2N5195G	I_{CEO}	 – –	 1.0 1.0	mAdc
Collector Cutoff Current (V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc) 2N5194G (V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc) 2N5195G (V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C) 2N5194G (V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C) 2N5195G	I_{CEX}	 – – – –	 −0.1 0.1 2.0 2.0	mAdc
Collector Cutoff Current (V_{CB} = 60 Vdc, I_E = 0) 2N5194G (V_{CB} = 80 Vdc, I_E = 0) 2N5195G	I_{CBO}	 – –	 0.1 0.1	mAdc
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)	I_{EBO}	 –	 1.0	mAdc
ON CHARACTERISTICS				
DC Current Gain (Note 3) (I_C = 1.5 Adc, V_{CE} = 2.0 Vdc) 2N5194G 2N5195G (I_C = 4.0 Adc, V_{CE} = 2.0 Vdc) 2N5194G 2N5195G	h_{FE}	 25 20 10 7.0	 100 80 – –	–
Collector−Emitter Saturation Voltage (Note 3) (I_C = 1.5 Adc, I_B = 0.15 Adc) (I_C = 4.0 Adc, I_B = 1.0 Adc)	$V_{CE(sat)}$	 – –	 0.6 1.4	Vdc
Base−Emitter On Voltage (Note 3) (I_C = 1.5 Adc, V_{CE} = 2.0 Vdc)	$V_{BE(on)}$	 –	 1.2	Vdc
DYNAMIC CHARACTERISTICS				
Current−Gain – Bandwidth Product (I_C = 1.0 Adc, V_{CE} = 10 Vdc, f = 1.0 MHz)	f_T	 2.0	 –	MHz

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Indicates JEDEC registered data.
3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

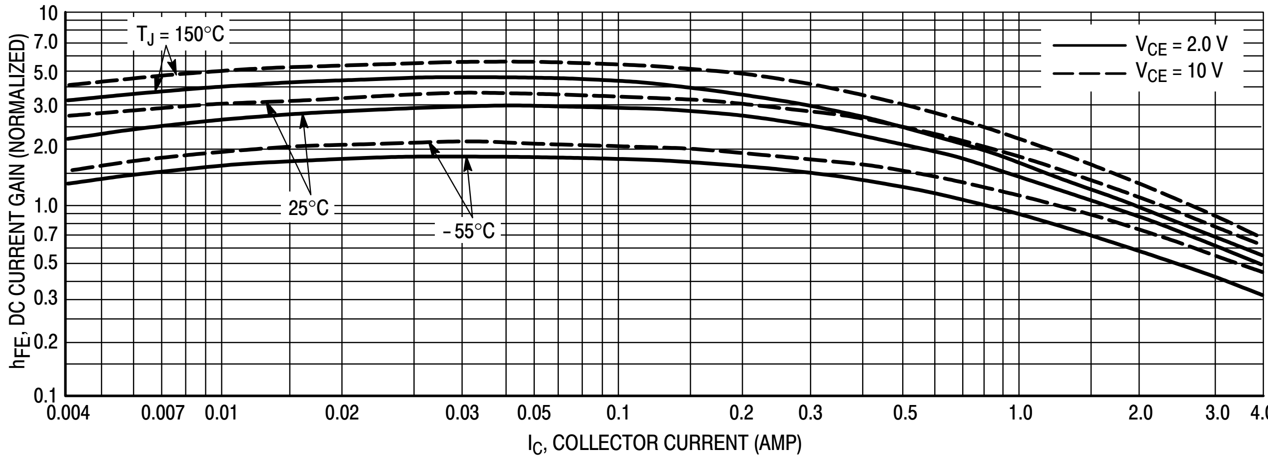


Figure 1. DC Current Gain

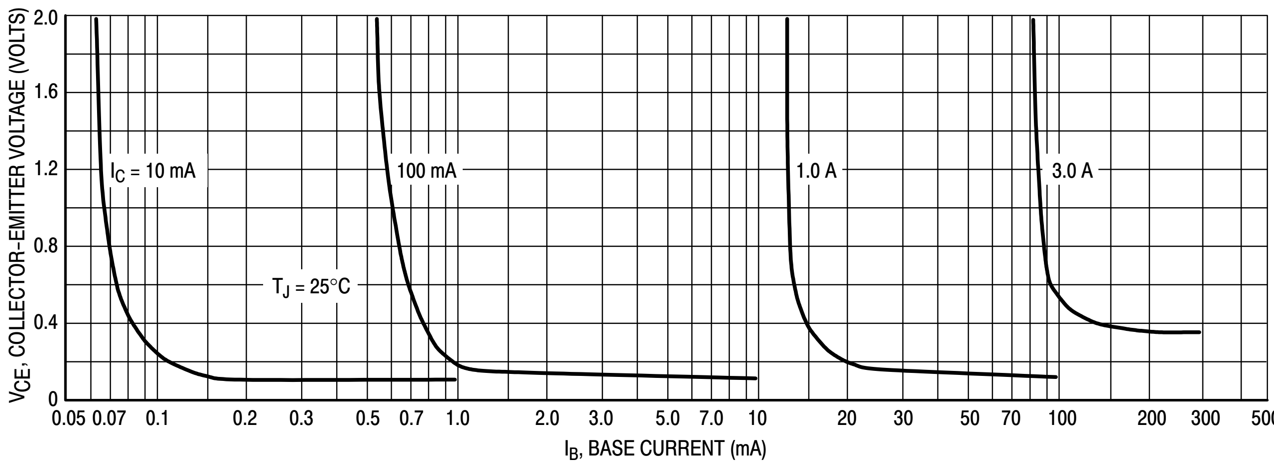


Figure 2. Collector Saturation Region

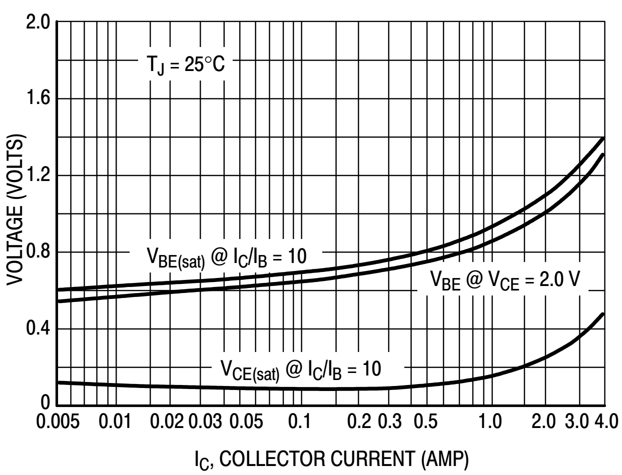


Figure 3. "On" Voltage

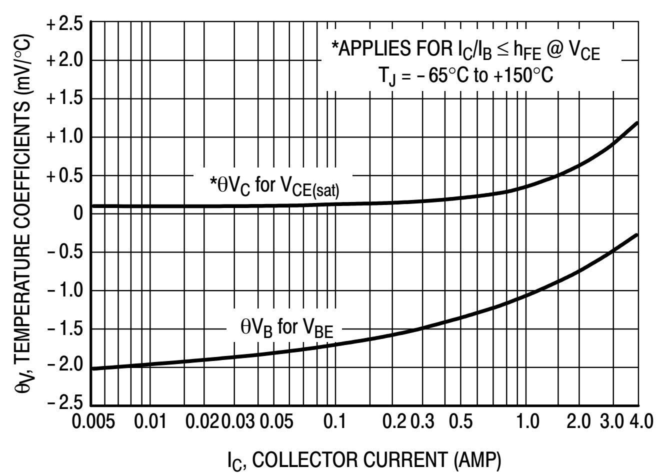


Figure 4. Temperature Coefficients

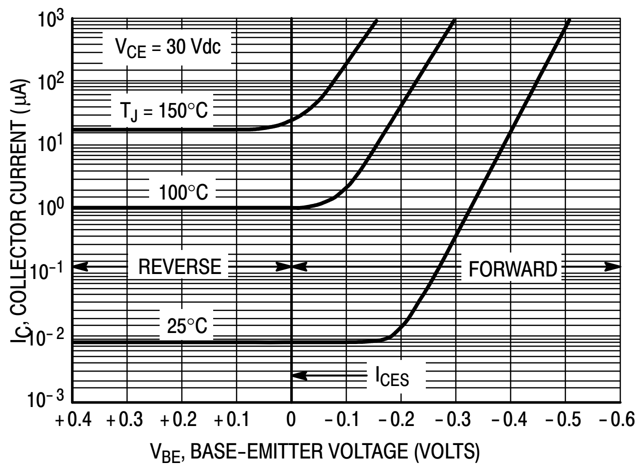


Figure 5. Collector Cut-Off Region

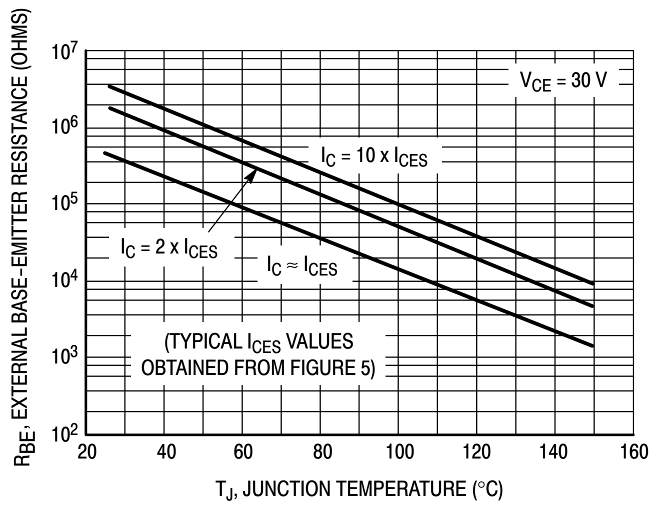


Figure 6. Effects of Base-Emitter Resistance

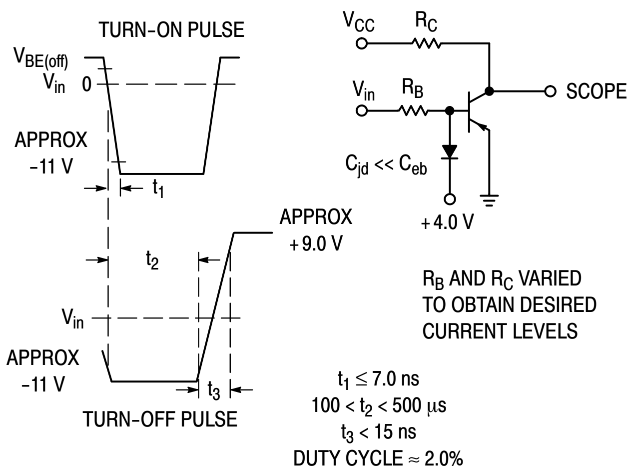


Figure 7. Switching Time Equivalent Test Circuit

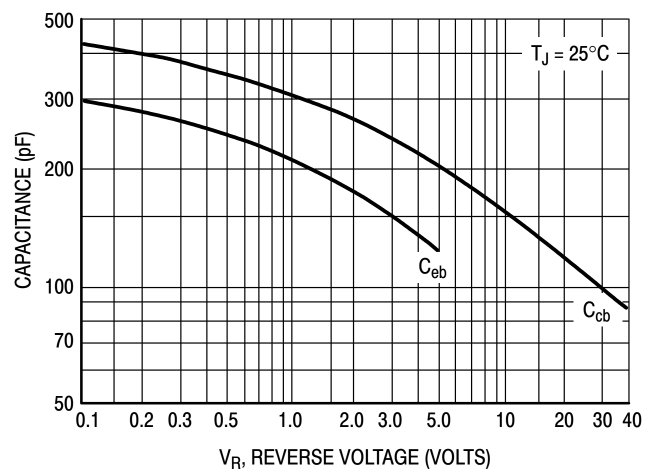


Figure 8. Capacitance

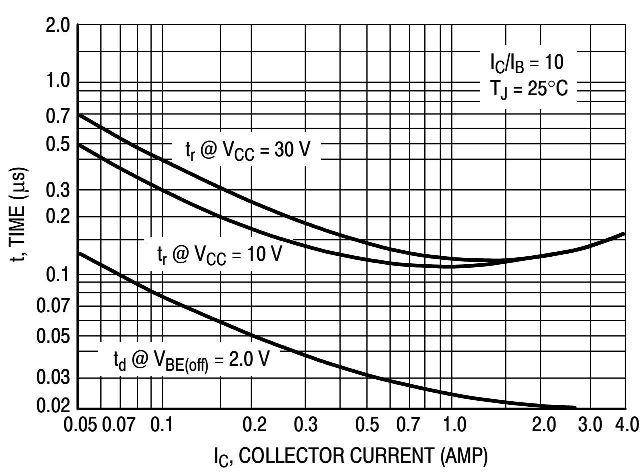


Figure 9. Turn-On Time

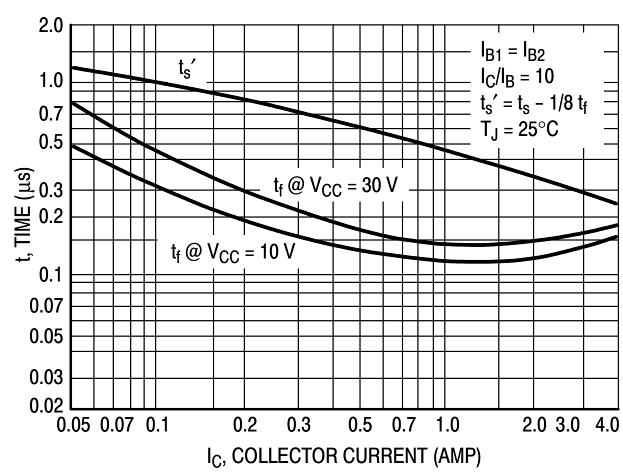


Figure 10. Turn-Off Time

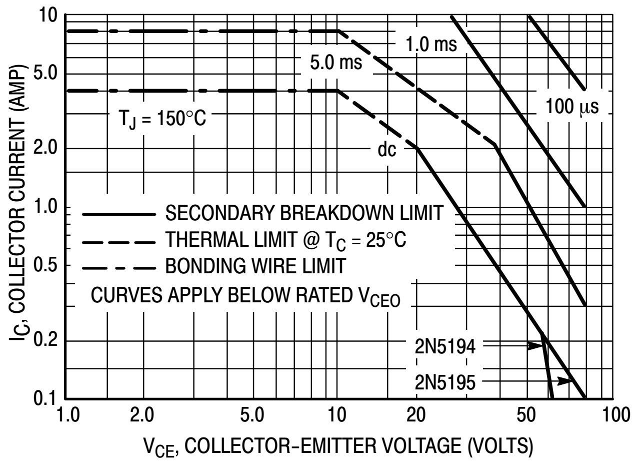


Figure 11. Rating and Thermal Data Active−Region Safe Operating Area

Note 1:

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 11 is based on $T_{J(pk)} = 150°C$. T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \le 150°C$. At high−case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

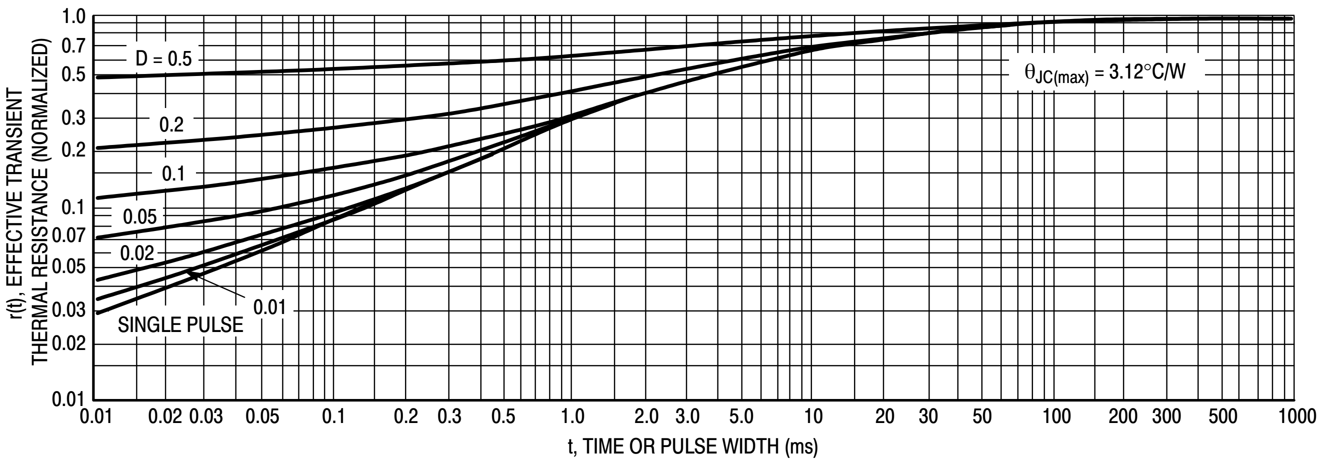


Figure 12. Thermal Response

DESIGN NOTE: USE OF TRANSIENT THERMAL RESISTANCE DATA

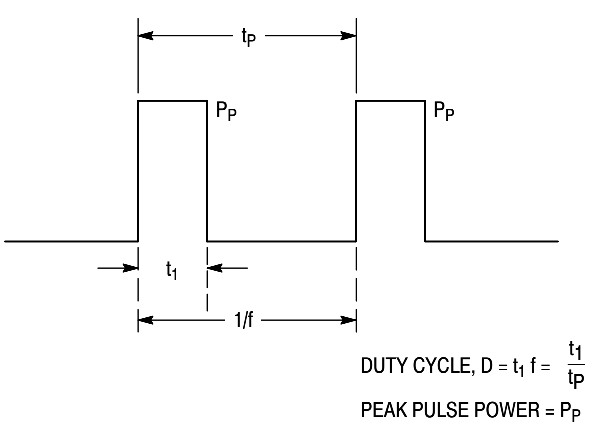


Figure 13.

A train of periodical power pulses can be represented by the model shown in Figure 13. Using the model and the device thermal response, the normalized effective transient thermal resistance of Figure 12 was calculated for various duty cycles.

To find $\theta_{JC}(t)$, multiply the value obtained from Figure 12 by the steady state value θ_{JC}.

Example:

The 2N5193 is dissipating 50 watts under the following conditions: $t_1 = 0.1$ ms, $t_p = 0.5$ ms. ($D = 0.2$).

Using Figure 12, at a pulse width of 0.1 ms and D = 0.2, the reading of $r(t_1, D)$ is 0.27.

The peak rise in junction temperature is therefore:

$$\Delta T = r(t) \times P_P \times \theta_{JC} = 0.27 \times 50 \times 3.12 = 42.2°C$$

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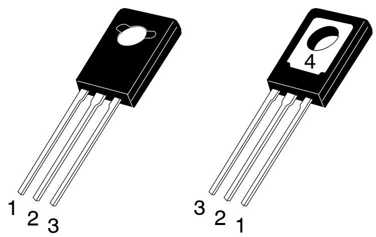
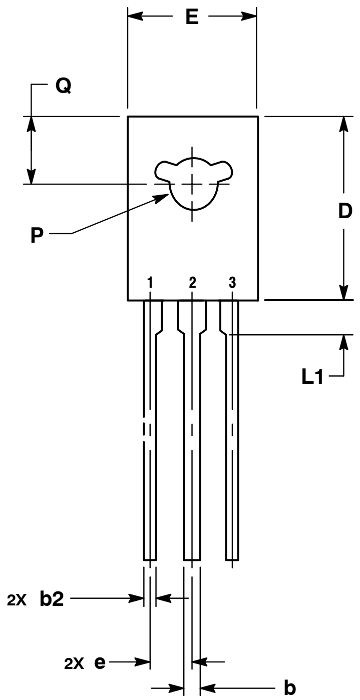
ISSUE AD

DATE 25 MAR 2015

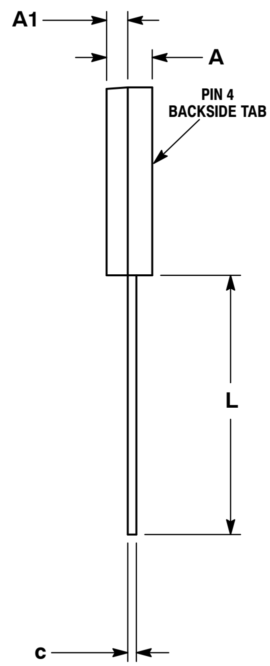


FRONT VIEW **BACK VIEW**

SCALE 1:1



FRONT VIEW

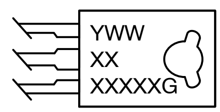


SIDE VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NUMBER AND SHAPE OF LUGS OPTIONAL.

	MILLIMETERS	
DIM	MIN	MAX
A	2.40	3.00
A1	1.00	1.50
b	0.60	0.90
b2	0.51	0.88
c	0.39	0.63
D	10.60	11.10
E	7.40	7.80
e	2.04	2.54
L	14.50	16.63
L1	1.27	2.54
P	2.90	3.30
Q	3.80	4.20

GENERIC MARKING DIAGRAM*



Y = Year
WW = Work Week
XXXXX = Device Code
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.

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

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

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

STYLE 4:
PIN 1. ANODE 1
2., 4. ANODE 2
3. GATE

STYLE 5:
PIN 1. MT 1
2., 4. MT 2
3. GATE

STYLE 6:
PIN 1. CATHODE
2., 4. GATE
3. ANODE

STYLE 7:
PIN 1. MT 1
2., 4. GATE
3. MT 2

STYLE 8:
PIN 1. SOURCE
2., 4. GATE
3. DRAIN

STYLE 9:
PIN 1. GATE
2., 4. DRAIN
3. SOURCE

STYLE 10:
PIN 1. SOURCE
2., 4. DRAIN
3. GATE

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