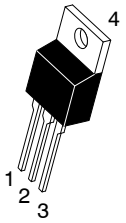
Complementary Silicon Plastic Power Transistors

TIP41G, TIP41AG, TIP41BG, TIP41CG (NPN), TIP42G, TIP42AG, TIP42BG, TIP42CG (PNP)

Designed for use in general purpose amplifier and switching applications.

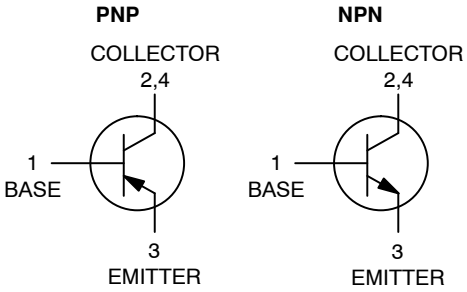
Features

- Epoxy Meets UL 94 V−0 @ 0.125 in
- These Devices are Pb−Free and are RoHS Compliant*



TO−220
CASE 221A
STYLE 1

6 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 40−60−80−100 VOLTS, 65 WATTS



MAXIMUM RATINGS

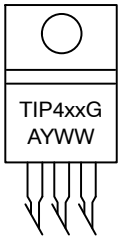
Symbol	Rating	Value	Unit
V_{CEO}	Collector−Emitter Voltage TIP41G, TIP42G TIP41AG, TIP42AG TIP41BG, TIP42BG TIP41CG, TIP42CG	 40 60 80 100	Vdc
V_{CB}	Collector−Base Voltage TIP41G, TIP42G TIP41AG, TIP42AG TIP41BG, TIP42BG TIP41CG, TIP42CG	 40 60 80 100	Vdc
V_{EB}	Emitter−Base Voltage	5.0	Vdc
I_C	Collector Current − Continuous	6.0	Adc
I_{CM}	Collector Current − Peak	10	Adc
I_B	Base Current	2.0	Adc
P_D	Total Power Dissipation @ T_C = 25°C Derate above 25°C	 65 0.52	 W W/°C
P_D	Total Power Dissipation @ T_A = 25°C Derate above 25°C	 2.0 0.016	 W W/°C
E	Unclamped Inductive Load Energy (Note 1)	62.5	mJ
T_J, T_{stg}	Operating and Storage Junction, Temperature Range	−65 to +150	°C
HBM	ESD − Human Body Model	3B	V
MM	ESD − Machine Model	C	V

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. I_C = 2.5 A, L = 20 mH, P.R.F. = 10 Hz, V_{CC} = 10 V, R_{BE} = 100 Ω.

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

MARKING DIAGRAM



TIP4xx	=	Device Code
xx	=	1, 1A, 1B, 1C 2, 2A, 2B, 2C
A	=	Assembly Location
Y	=	Year
WW	=	Work Week
G	=	Pb−Free Package

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 6.

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THERMAL CHARACTERISTICS

Symbol	Characteristic	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case	1.67	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient	57	°C/W

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

Min	Characteristic	Symbol	Max	Unit
OFF CHARACTERISTICS				
	Collector−Emitter Sustaining Voltage (Note 2) (I_C = 30 mAdc, I_B = 0)	$V_{CEO(sus)}$		Vdc
40	TIP41G, TIP42G		–	
60	TIP41AG, TIP42AG		–	
80	TIP41BG, TIP42BG		–	
100	TIP41CG, TIP42CG		–	
	Collector Cutoff Current (V_{CE} = 30 Vdc, I_B = 0)	I_{CEO}		mAdc
–	TIP41G, TIP41AG, TIP42G, TIP42AG		0.7	
	(V_{CE} = 60 Vdc, I_B = 0)			
–	TIP41BG, TIP41CG, TIP42BG, TIP42CG		0.7	
	Collector Cutoff Current (V_{CE} = 40 Vdc, V_{EB} = 0)	I_{CES}		μAdc
–	TIP41G, TIP42G		400	
	(V_{CE} = 60 Vdc, V_{EB} = 0)			
–	TIP41AG, TIP42AG		400	
	(V_{CE} = 80 Vdc, V_{EB} = 0)			
–	TIP41BG, TIP42BG		400	
	(V_{CE} = 100 Vdc, V_{EB} = 0)			
–	TIP41CG, TIP42CG		400	
–	Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)	I_{EBO}	1.0	mAdc
ON CHARACTERISTICS (Note 2)				
	DC Current Gain	h_{FE}		–
30	(I_C = 0.3 Adc, V_{CE} = 4.0 Vdc)		–	
15	(I_C = 3.0 Adc, V_{CE} = 4.0 Vdc)		75	
–	Collector−Emitter Saturation Voltage (I_C = 6.0 Adc, I_B = 600 mAdc)	$V_{CE(sat)}$	1.5	Vdc
–	Base−Emitter On Voltage (I_C = 6.0 Adc, V_{CE} = 4.0 Vdc)	$V_{BE(on)}$	2.0	Vdc
DYNAMIC CHARACTERISTICS				
3.0	Current−Gain − Bandwidth Product (I_C = 500 mAdc, V_{CE} = 10 Vdc, f_{test} = 1.0 MHz)	f_T	–	MHz
20	Small−Signal Current Gain (I_C = 0.5 Adc, V_{CE} = 10 Vdc, f = 1.0 kHz)	h_{fe}	–	–

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. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

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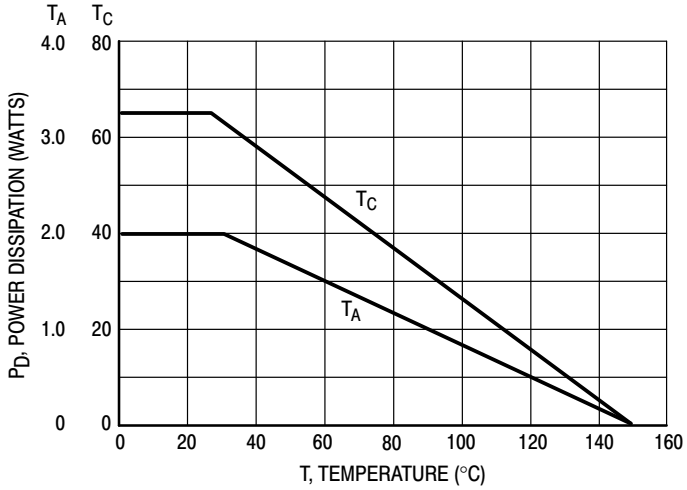
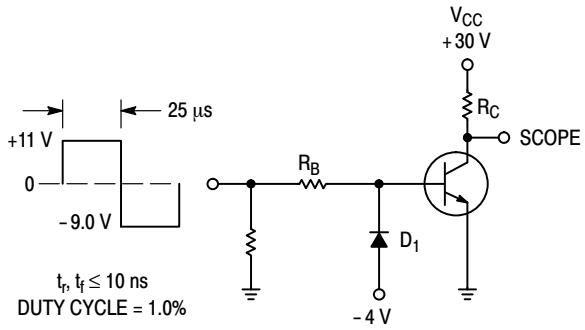


Figure 1. Power Derating



R_B and R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS

D_1 MUST BE FAST RECOVERY TYPE, e.g.:
1N5825 USED ABOVE $I_B \approx 100$ mA
MSD6100 USED BELOW $I_B \approx 100$ mA

Figure 2. Switching Time Test Circuit

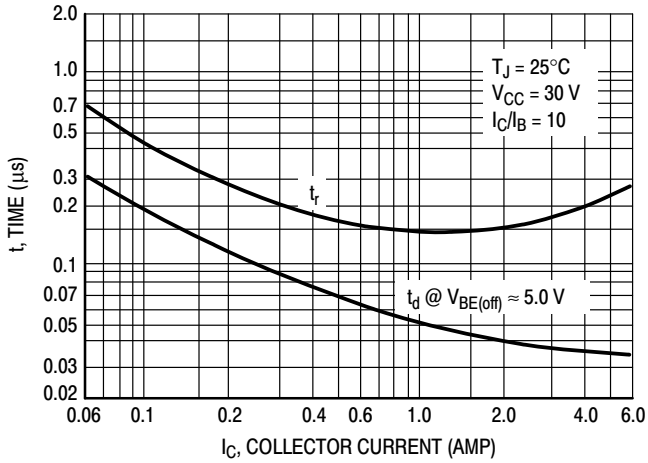


Figure 3. Turn−On Time

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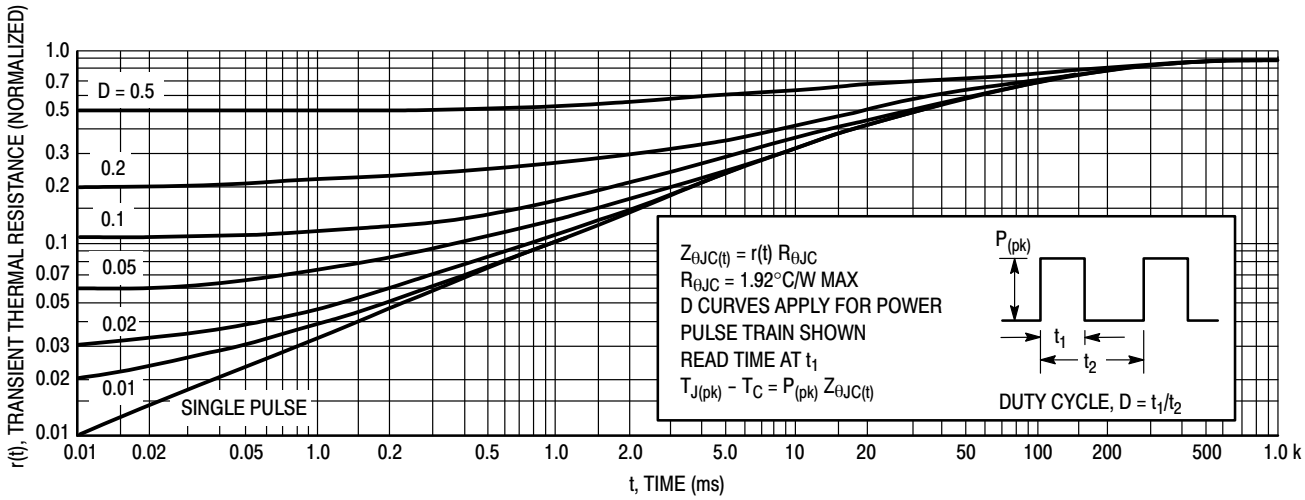

Figure 4. Thermal Response

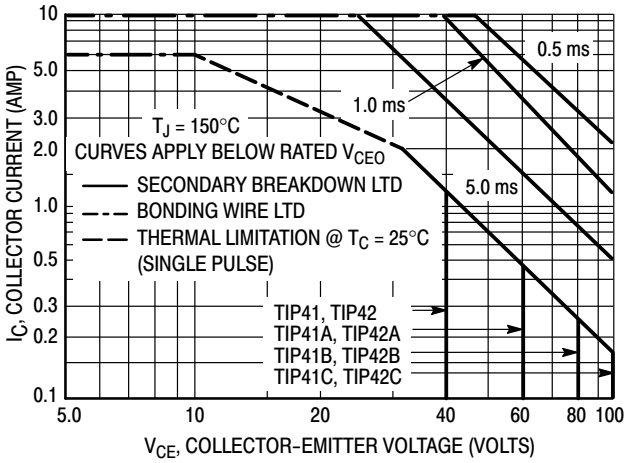

Figure 5. Active−Region Safe Operating Area

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°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ 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.

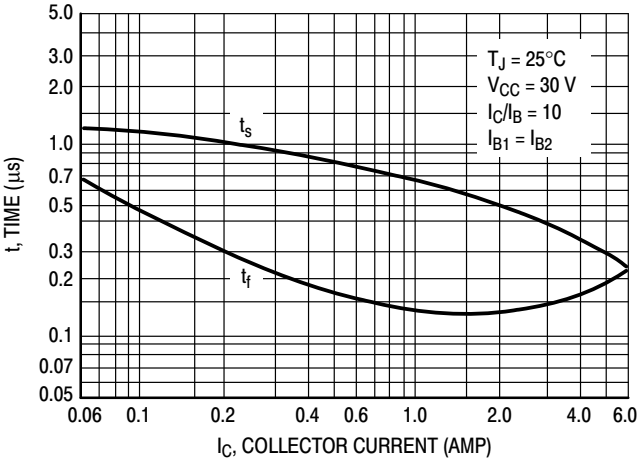

Figure 6. Turn−Off Time

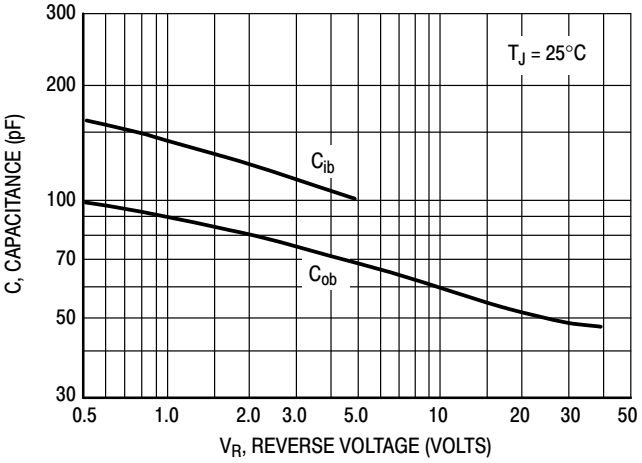

Figure 7. Capacitance

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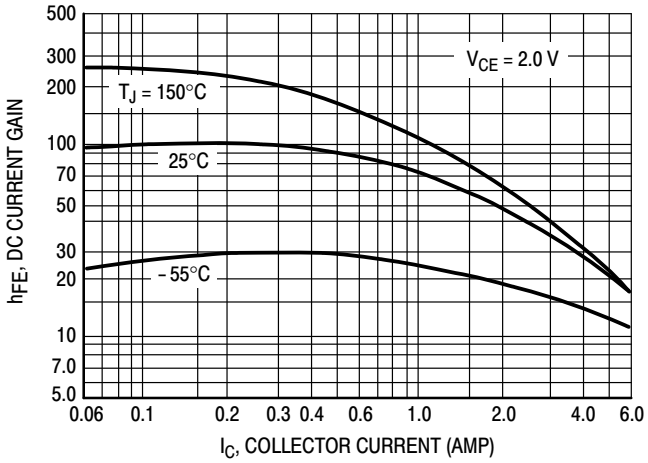

Figure 8. DC Current Gain

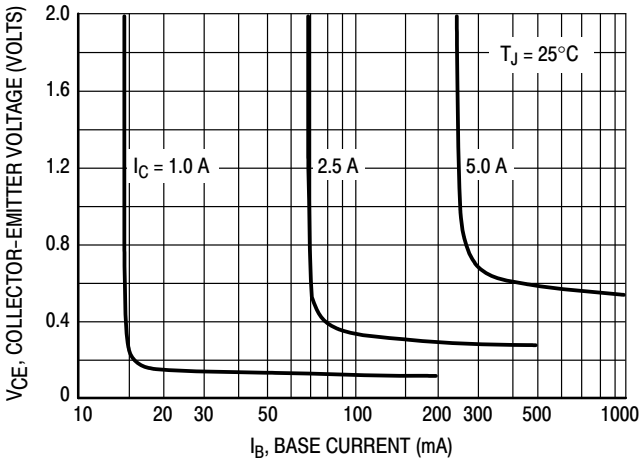

Figure 9. Collector Saturation Region

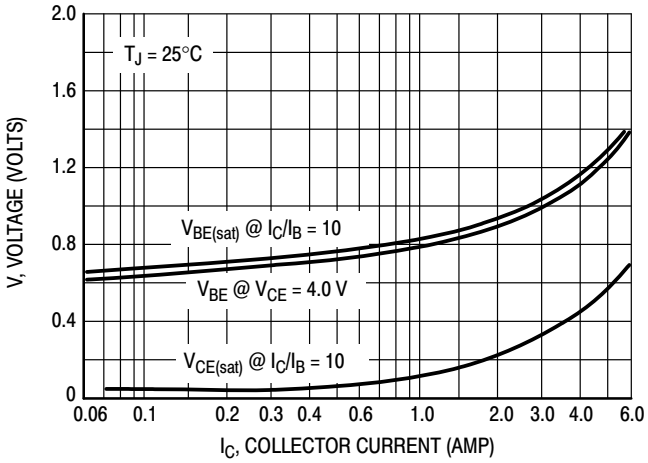

Figure 10. “On” Voltages

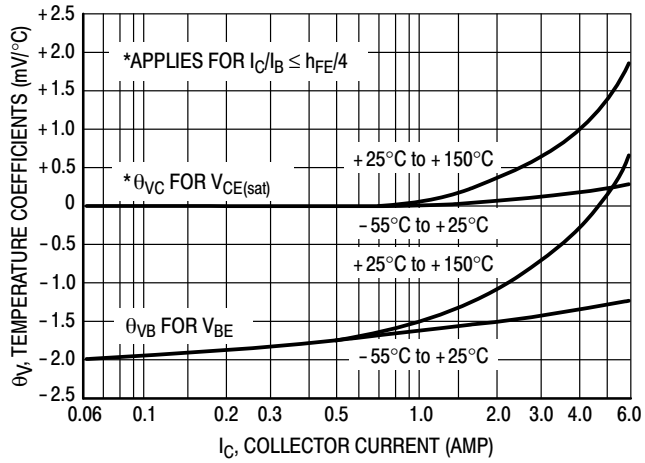

Figure 11. Temperature Coefficients

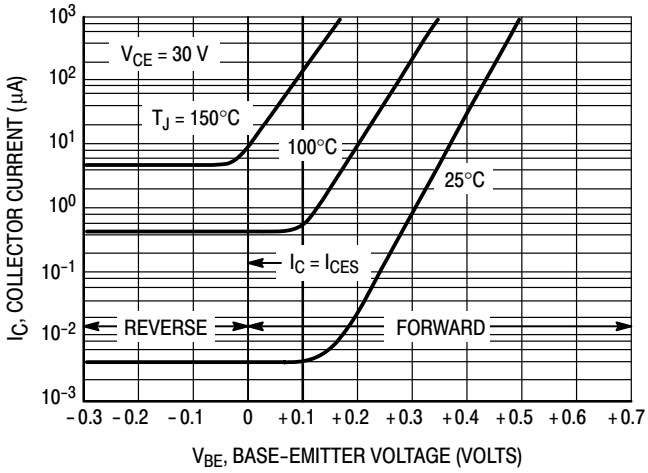

Figure 12. Collector Cut−Off Region

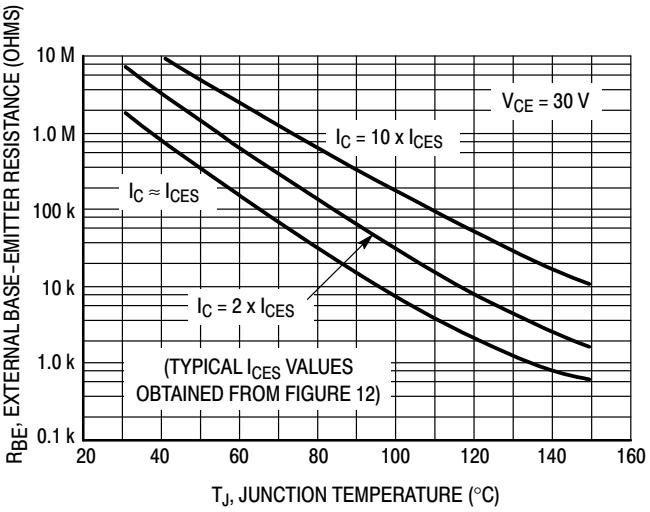

Figure 13. Effects of Base−Emitter Resistance

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ORDERING INFORMATION

Device	Package	Shipping
TIP41BG	TO−220 (Pb−Free)	50 Units / Rail
TIP41CG	TO−220 (Pb−Free)	50 Units / Rail
TIP42AG	TO−220 (Pb−Free)	50 Units / Rail
TIP42CG	TO−220 (Pb−Free)	50 Units / Rail

DISCONTINUED (Note 3)

TIP41G	TO−220 (Pb−Free)	50 Units / Rail
TIP41AG	TO−220 (Pb−Free)	50 Units / Rail
TIP42G	TO−220 (Pb−Free)	50 Units / Rail
TIP42BG	TO−220 (Pb−Free)	50 Units / Rail

3. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

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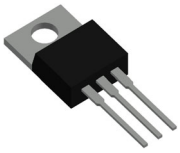
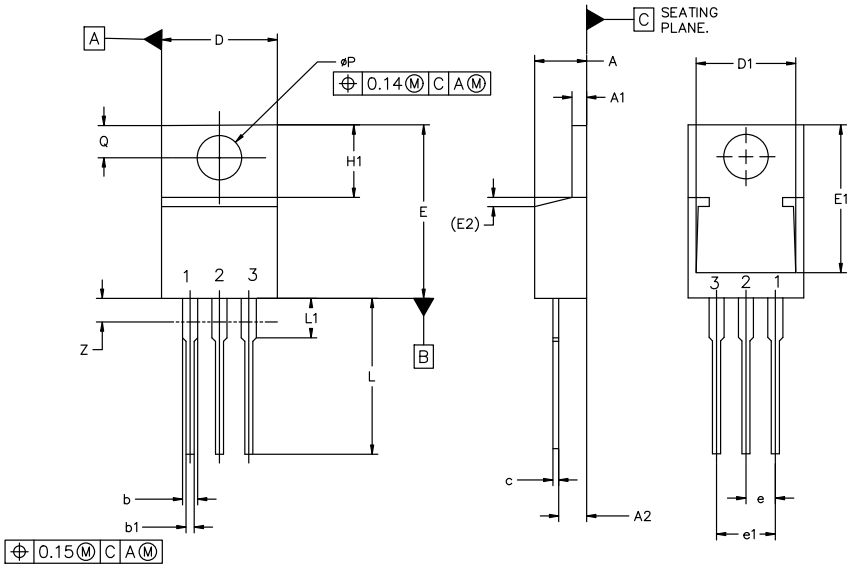


TO−220−3 10.10x15.12x4.45, 2.54P
CASE 221A
ISSUE AL

DATE 05 FEB 2025



MILLIMETERS			
DIM	MIN	NOM	MAX
A	4.07	4.45	4.83
A1	1.15	1.28	1.41
A2	2.04	2.42	2.79
b	1.15	1.34	1.52
b1	0.64	0.80	0.96
c	0.36	0.49	0.61
D	9.66	10.10	10.53
D1	8.43	8.63	8.83
E	14.48	15.12	15.75
E1	12.58	12.78	12.98
E2	1.27 REF		

MILLIMETERS			
DIM	MIN	NOM	MAX
e	2.42	2.54	2.66
e1	4.83	5.08	5.33
H1	5.97	6.22	6.47
L	12.70	13.49	14.27
L1	2.80	3.45	4.10
Q	2.54	2.79	3.04
øP	3.60	3.85	4.09
Z	–.––	–.––	3.48

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

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

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

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

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

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

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE

STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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

STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED

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