

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

## Complementary Silicon Plastic Power Transistors

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\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage TIP41G, TIP42G TIP41AG, TIP42AG TIP41BG, TIP42BG TIP41CG, TIP42CG	$V_{CEO}$	40 60 80 100	Vdc
Collector-Base Voltage TIP41G, TIP42G TIP41AG, TIP42AG TIP41BG, TIP42BG TIP41CG, TIP42CG	$V_{CB}$	40 60 80 100	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current – Continuous	$I_C$	6.0	Adc
Collector Current – Peak	$I_{CM}$	10	Adc
Base Current	$I_B$	2.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	65 0.52	W W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.0 0.016	W W/ $^\circ\text{C}$
Unclamped Inductive Load Energy (Note 1)	E	62.5	mJ
Operating and Storage Junction, Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$
ESD – Human Body Model	HBM	3B	V
ESD – Machine Model	MM	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.  $I_C = 2.5\text{ A}$ ,  $L = 20\text{ mH}$ , P.R.F. = 10 Hz,  $V_{CC} = 10\text{ V}$ ,  $R_{BE} = 100\ \Omega$ .

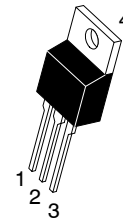
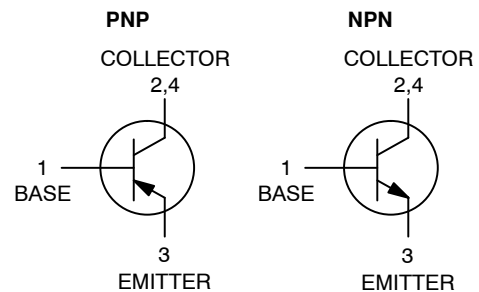
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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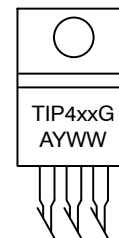
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## 6 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS 40–60–80–100 VOLTS, 65 WATTS



TO-220  
CASE 221A  
STYLE 1

### 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.

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

## THERMAL CHARACTERISTICS

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

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage (Note 2) ( $I_C = 30 \text{ mAdc}$ , $I_B = 0$ ) TIP41G, TIP42G TIP41AG, TIP42AG TIP41BG, TIP42BG TIP41CG, TIP42CG	$V_{CEO(sus)}$	40 60 80 100	– – – –	Vdc
Collector Cutoff Current ( $V_{CE} = 30 \text{ Vdc}$ , $I_B = 0$ ) TIP41G, TIP41AG, TIP42G, TIP42AG ( $V_{CE} = 60 \text{ Vdc}$ , $I_B = 0$ ) TIP41BG, TIP41CG, TIP42BG, TIP42CG	$I_{CEO}$	– –	0.7 0.7	mAdc
Collector Cutoff Current ( $V_{CE} = 40 \text{ Vdc}$ , $V_{EB} = 0$ ) TIP41G, TIP42G ( $V_{CE} = 60 \text{ Vdc}$ , $V_{EB} = 0$ ) TIP41AG, TIP42AG ( $V_{CE} = 80 \text{ Vdc}$ , $V_{EB} = 0$ ) TIP41BG, TIP42BG ( $V_{CE} = 100 \text{ Vdc}$ , $V_{EB} = 0$ ) TIP41CG, TIP42CG	$I_{CES}$	– – – –	400 400 400 400	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{BE} = 5.0 \text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	1.0	mAdc

### ON CHARACTERISTICS (Note 2)

DC Current Gain ( $I_C = 0.3 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 3.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )	$h_{FE}$	30 15	– 75	–
Collector-Emitter Saturation Voltage ( $I_C = 6.0 \text{ Adc}$ , $I_B = 600 \text{ mAdc}$ )	$V_{CE(sat)}$	–	1.5	Vdc
Base-Emitter On Voltage ( $I_C = 6.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )	$V_{BE(on)}$	–	2.0	Vdc

### DYNAMIC CHARACTERISTICS

Current-Gain – Bandwidth Product ( $I_C = 500 \text{ mAdc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f_{test} = 1.0 \text{ MHz}$ )	$f_T$	3.0	–	MHz
Small-Signal Current Gain ( $I_C = 0.5 \text{ Adc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f = 1.0 \text{ kHz}$ )	$h_{fe}$	20	–	–

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  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

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

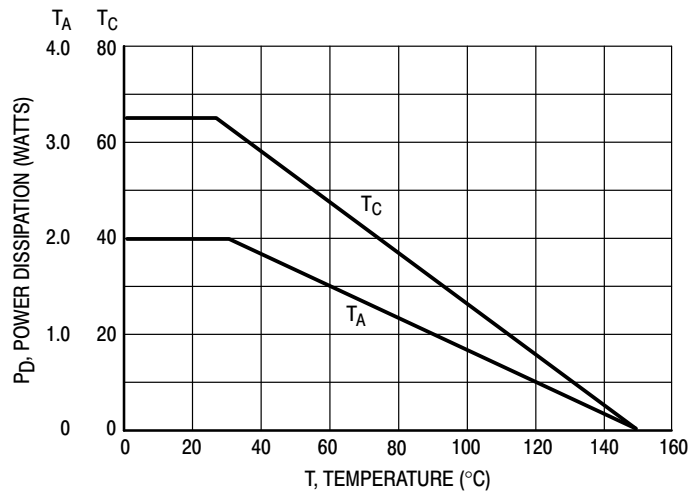
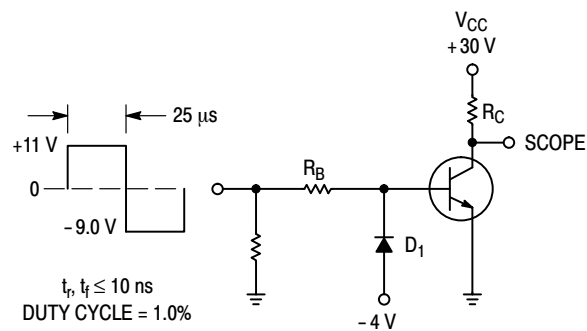


Figure 1. Power Derating



$R_B$  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

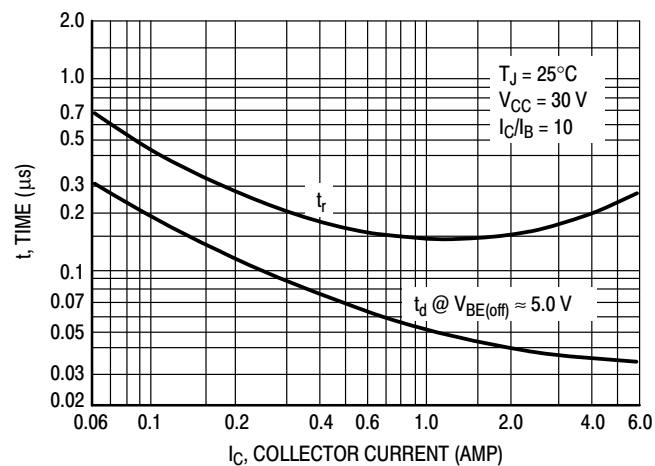


Figure 3. Turn-On Time

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

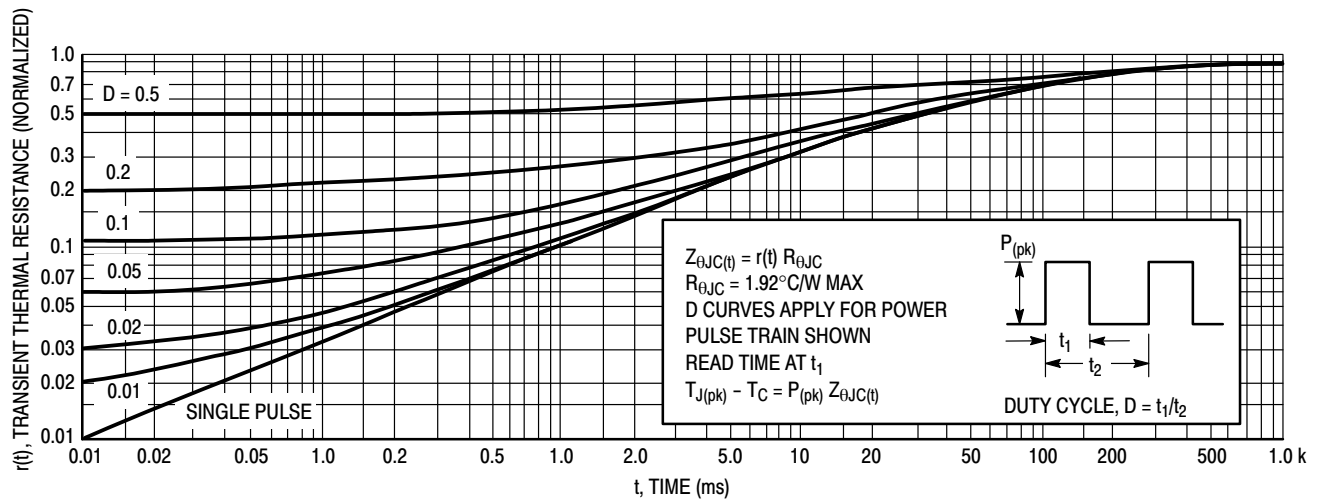


Figure 4. Thermal Response

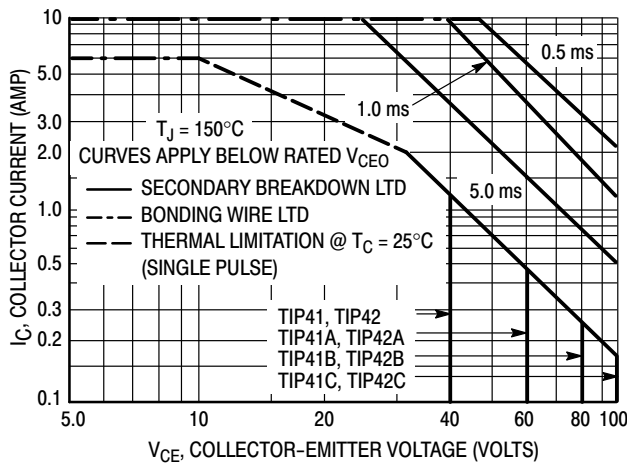


Figure 5. Active-Region Safe Operating Area

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  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  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.

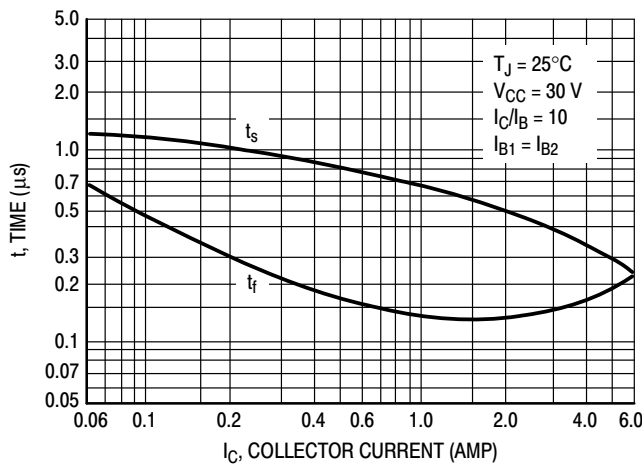


Figure 6. Turn-Off Time

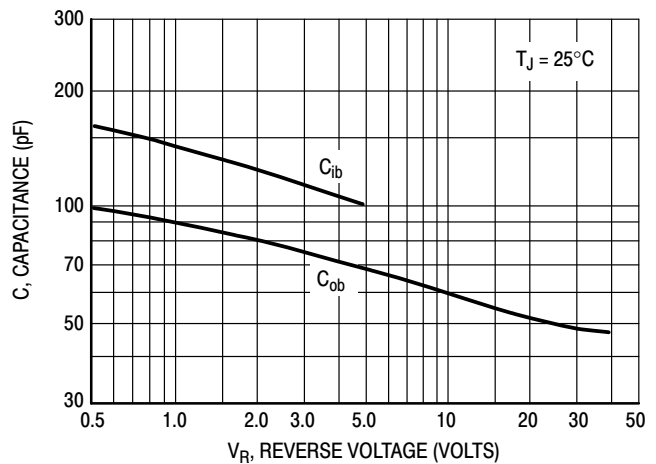
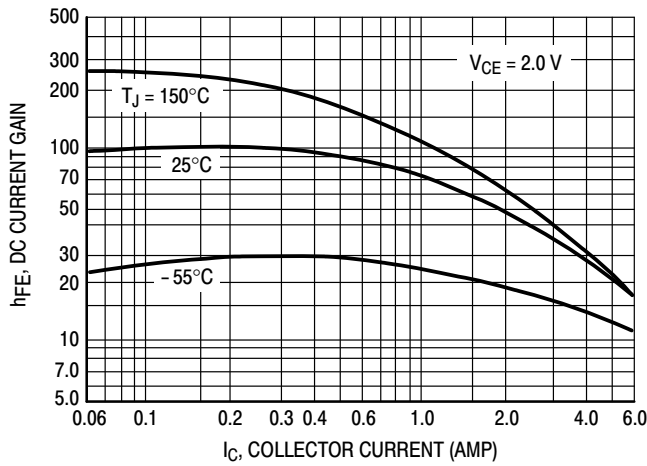
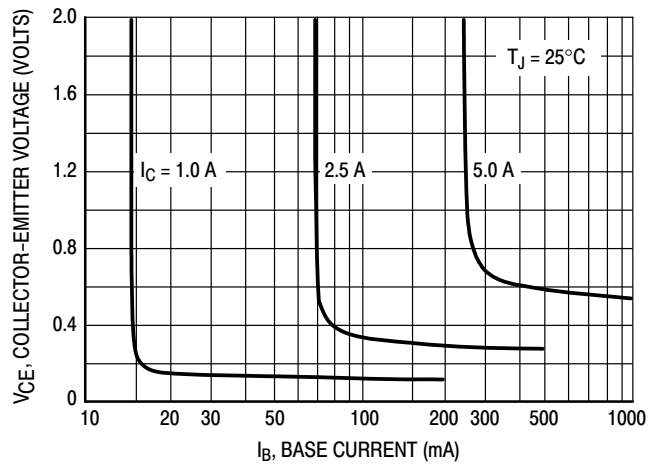


Figure 7. Capacitance

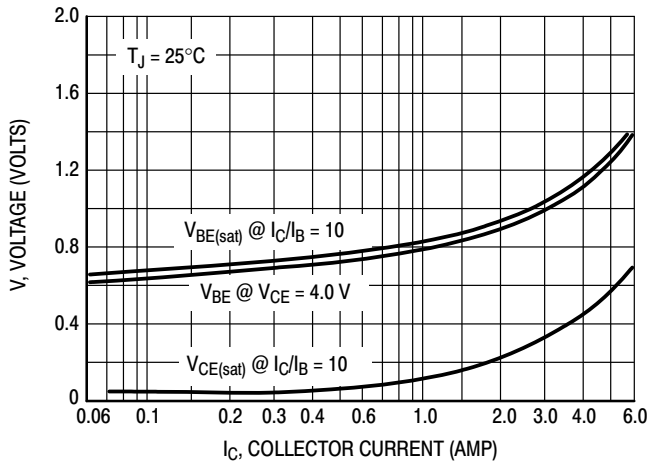
**TIP41G, TIP41AG, TIP41BG, TIP41CG (NPN), TIP42G, TIP42AG, TIP42BG, TIP42CG (PNP)**



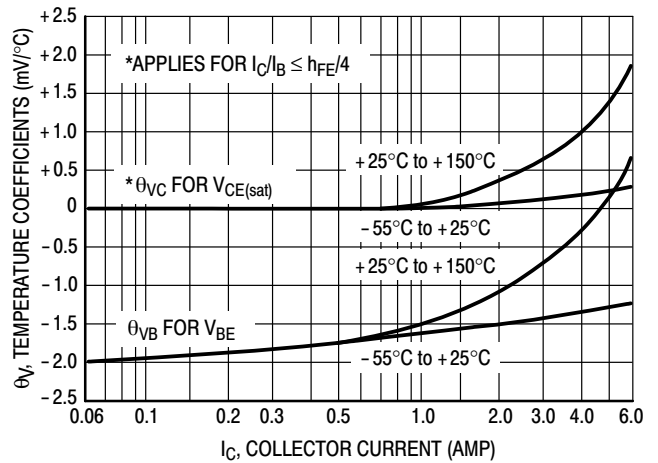
**Figure 8. DC Current Gain**



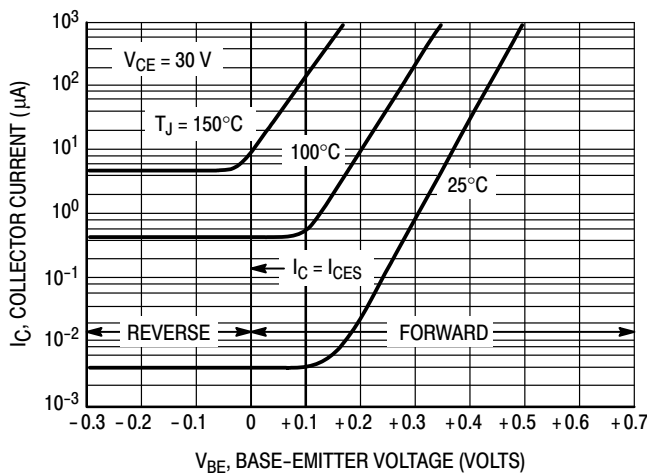
**Figure 9. Collector Saturation Region**



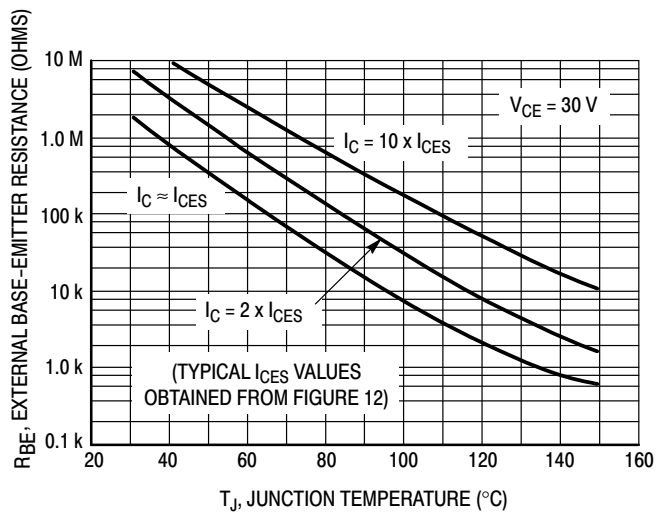
**Figure 10. "On" Voltages**



**Figure 11. Temperature Coefficients**



**Figure 12. Collector Cut-Off Region**



**Figure 13. Effects of Base-Emitter Resistance**

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

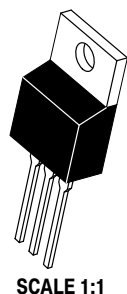
**ORDERING INFORMATION**

<b>Device</b>	<b>Package</b>	<b>Shipping</b>
TIP41G	TO-220 (Pb-Free)	50 Units / Rail
TIP41AG	TO-220 (Pb-Free)	50 Units / Rail
TIP41BG	TO-220 (Pb-Free)	50 Units / Rail
TIP41CG	TO-220 (Pb-Free)	50 Units / Rail
TIP42G	TO-220 (Pb-Free)	50 Units / Rail
TIP42AG	TO-220 (Pb-Free)	50 Units / Rail
TIP42BG	TO-220 (Pb-Free)	50 Units / Rail
TIP42CG	TO-220 (Pb-Free)	50 Units / Rail

# MECHANICAL CASE OUTLINE

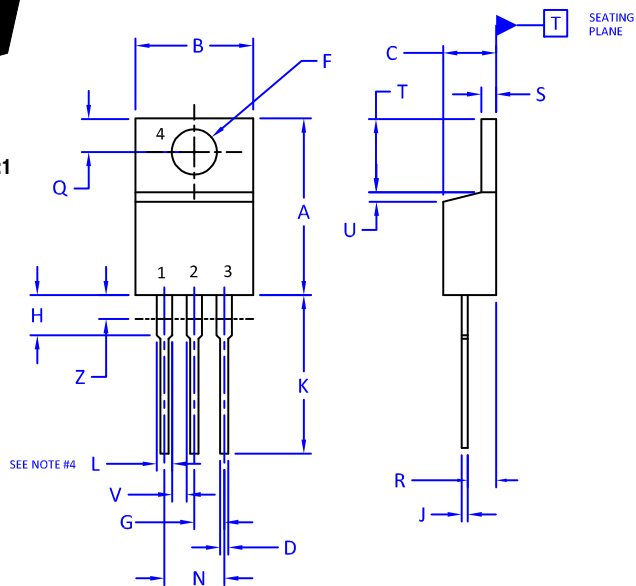
## PACKAGE DIMENSIONS

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### TO-220 CASE 221A-09 ISSUE AJ

DATE 05 NOV 2019



#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.41
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	----	1.15	---
Z	----	0.080	---	2.04

#### 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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