

# Medium-Power Plastic NPN Silicon Transistors

## 2N4921G, 2N4922G, 2N4923G

These high-performance plastic devices are designed for driver circuits, switching, and amplifier applications.

### Features

- Low Saturation Voltage
- Excellent Power Dissipation
- Excellent Safe Operating Area
- Complement to PNP 2N4920G
- These Devices are Pb-Free and are RoHS Compliant\*\*

### MAXIMUM RATINGS

| Rating                                                                                   | Symbol         | Value          | Unit                      |
|------------------------------------------------------------------------------------------|----------------|----------------|---------------------------|
| Collector-Emitter Voltage<br>2N4921G<br>2N4922G<br>2N4923G                               | $V_{CEO}$      | 40<br>60<br>80 | Vdc                       |
| Collector-Emitter Voltage<br>2N4921G<br>2N4922G<br>2N4923G                               | $V_{CB}$       | 40<br>60<br>80 | Vdc                       |
| Emitter Base Voltage                                                                     | $V_{EB}$       | 5.0            | Vdc                       |
| Collector Current – Continuous (Note 2)                                                  | $I_C$          | 1.0            | Adc                       |
| Collector Current – Peak (Note 2)                                                        | $I_{CM}$       | 3.0            | Adc                       |
| Base Current – Continuous                                                                | $I_B$          | 1.0            | Adc                       |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 30<br>0.24     | W<br>mW/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                      | $T_J, T_{stg}$ | -65 to +150    | $^\circ\text{C}$          |

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.

2. The 1.0 A maximum  $I_C$  value is based upon JEDEC current gain requirements. The 3.0 A maximum value is based upon actual current handling capability of the device (see Figures 5 and 6).

### THERMAL CHARACTERISTICS (Note 3)

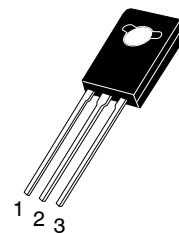
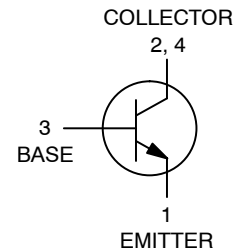
| Characteristic                       | Symbol          | Max  | Unit               |
|--------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 4.16 | $^\circ\text{C/W}$ |

3. Recommend use of thermal compound for lowest thermal resistance.

\*Indicates JEDEC Registered Data.

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

## 1.0 AMPERE GENERAL PURPOSE POWER TRANSISTORS 40–80 VOLTS, 30 WATTS



TO-225  
CASE 77-09  
STYLE 1

### MARKING DIAGRAM



- Y = Year  
WW = Work Week  
2N492x = Device Code  
x = 1, 2, or 3  
G = Pb-Free Package

### ORDERING INFORMATION

| Device  | Package             | Shipping        |
|---------|---------------------|-----------------|
| 2N4922G | TO-225<br>(Pb-Free) | 500 Units / Box |
| 2N4923G | TO-225<br>(Pb-Free) | 500 Units / Box |

### DISCONTINUED (Note 1)

|         |                     |                 |
|---------|---------------------|-----------------|
| 2N4921G | TO-225<br>(Pb-Free) | 500 Units / Box |
|---------|---------------------|-----------------|

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](http://www.onsemi.com).

# 2N4921G, 2N4922G, 2N4923G

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

| Characteristic                                                                                                                                                                                         | Symbol         | Min            | Max               | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|-------------------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                             |                |                |                   |      |
| Collector-Emitter Sustaining Voltage (Note 4)<br>( $I_C = 0.1\text{ A dc}$ , $I_B = 0$ )<br>2N4921G<br>2N4922G<br>2N4923G                                                                              | $V_{CEO(sus)}$ | 40<br>60<br>80 | –<br>–<br>–       | Vdc  |
| Collector Cutoff Current<br>( $V_{CE} = 20\text{ Vdc}$ , $I_B = 0$ )<br>2N4921G<br>( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ )<br>2N4922G<br>( $V_{CE} = 40\text{ Vdc}$ , $I_B = 0$ )<br>2N4923G          | $I_{CEO}$      | –<br>–<br>–    | 0.5<br>0.5<br>0.5 | mAdc |
| Collector Cutoff Current<br>( $V_{CE} = \text{Rated } V_{CEO}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ )<br>( $V_{CE} = \text{Rated } V_{CEO}$ , $V_{EB(off)} = 1.5\text{ Vdc}$ , $T_C = 125^\circ\text{C}$ ) | $I_{CEX}$      | –<br>–         | 0.1<br>0.5        | mAdc |
| Collector Cutoff Current<br>( $V_{CB} = \text{Rated } V_{CB}$ , $I_E = 0$ )                                                                                                                            | $I_{CBO}$      | –              | 0.1               | mAdc |
| Emitter Cutoff Current<br>( $V_{EB} = 5.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                                                    | $I_{EBO}$      | –              | 1.0               | mAdc |

## ON CHARACTERISTICS

|                                                                                                                                                                                                          |               |                |               |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|---------------|-----|
| DC Current Gain (Note 4)<br>( $I_C = 50\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 500\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 1.0\text{ A dc}$ , $V_{CE} = 1.0\text{ Vdc}$ ) | $h_{FE}$      | 40<br>30<br>10 | –<br>150<br>– | –   |
| Collector-Emitter Saturation Voltage (Note 4)<br>( $I_C = 1.0\text{ A dc}$ , $I_B = 0.1\text{ A dc}$ )                                                                                                   | $V_{CE(sat)}$ | –              | 0.6           | Vdc |
| Base-Emitter Saturation Voltage (Note 4)<br>( $I_C = 1.0\text{ A dc}$ , $I_B = 0.1\text{ A dc}$ )                                                                                                        | $V_{BE(sat)}$ | –              | 1.3           | Vdc |
| Base-Emitter On Voltage (Note 4)<br>( $I_C = 1.0\text{ A dc}$ , $V_{CE} = 1.0\text{ Vdc}$ )                                                                                                              | $V_{BE(on)}$  | –              | 1.3           | Vdc |

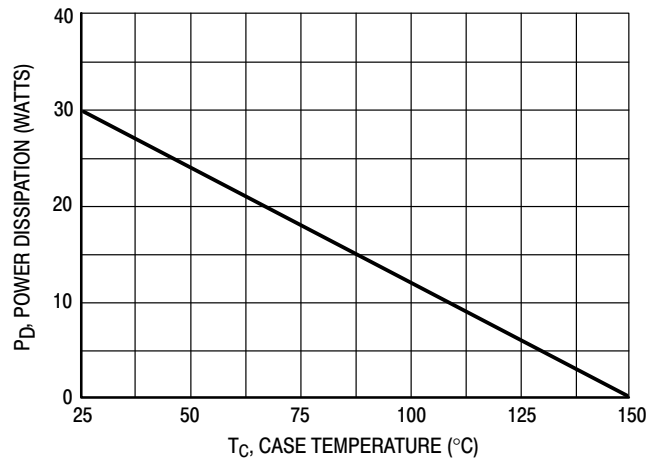
## SMALL-SIGNAL CHARACTERISTICS

|                                                                                                                   |          |     |     |     |
|-------------------------------------------------------------------------------------------------------------------|----------|-----|-----|-----|
| Current-Gain – Bandwidth Product<br>( $I_C = 250\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ MHz}$ ) | $f_T$    | 3.0 | –   | MHz |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 100\text{ kHz}$ )                             | $C_{ob}$ | –   | 100 | pF  |
| Small-Signal Current Gain<br>( $I_C = 250\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )        | $h_{fe}$ | 25  | –   | –   |

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.

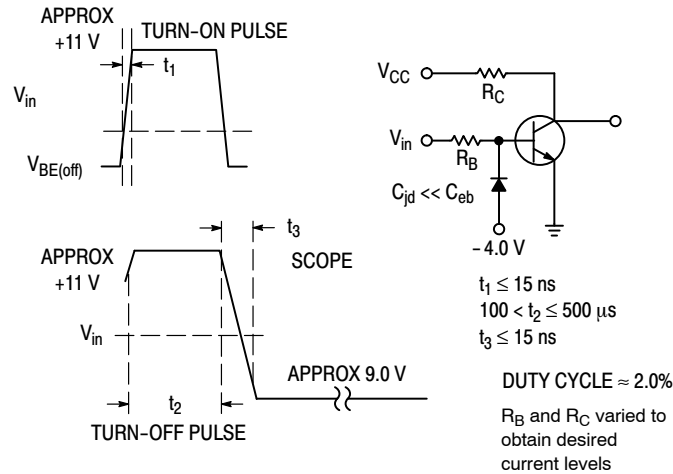
4. Pulse Test:  $PW \approx 300\text{ }\mu\text{s}$ , Duty Cycle  $\approx 2.0\%$ .

## 2N4921G, 2N4922G, 2N4923G

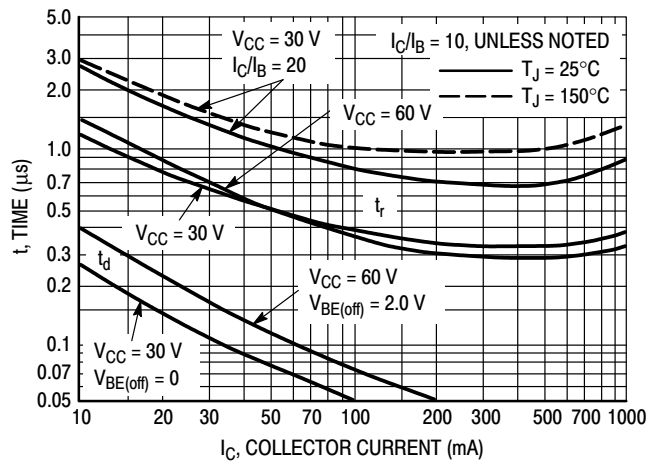


**Figure 1. Power Derating**

Safe Area Curves are indicated by Figure 5. All limits are applicable and must be observed.



**Figure 2. Switching Time Equivalent Circuit**



**Figure 3. Turn-On Time**

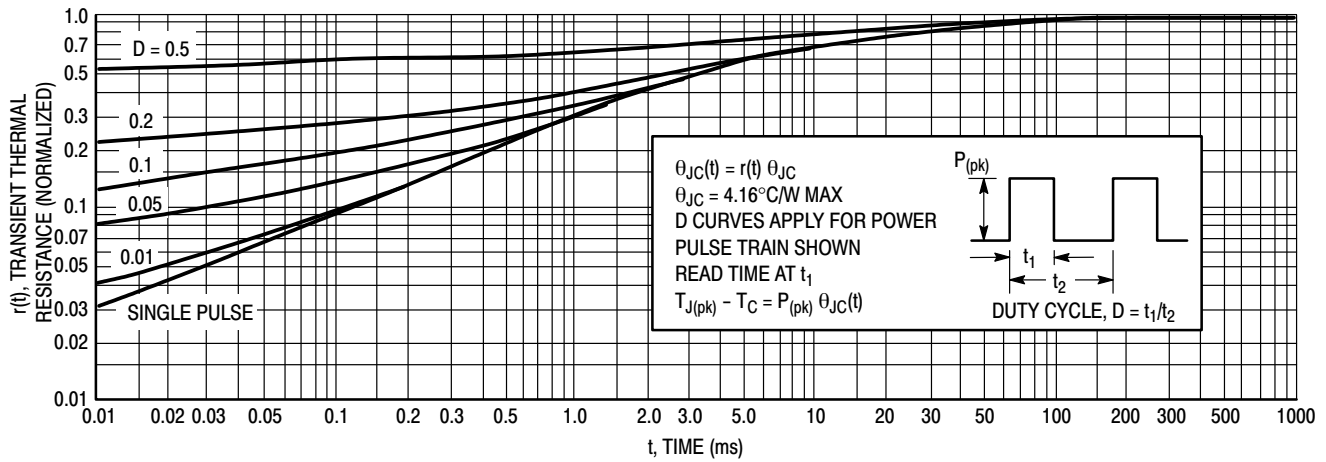


Figure 4. Thermal Response

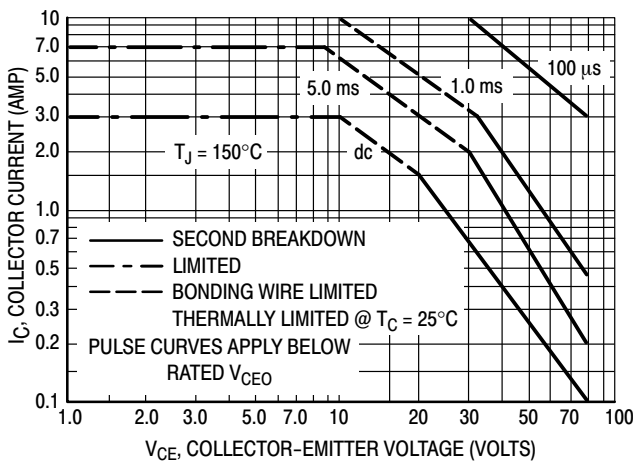


Figure 5. Active-Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  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  $T_{J(pk)} \leq 150^\circ\text{C}$ . At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

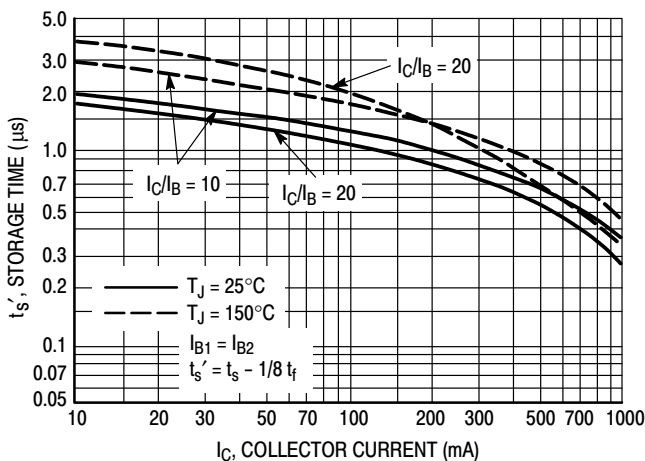


Figure 6. Storage Time

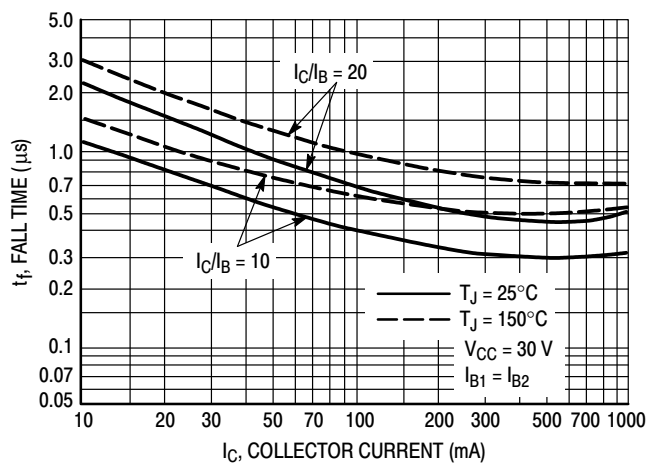


Figure 7. Fall Time

# 2N4921G, 2N4922G, 2N4923G

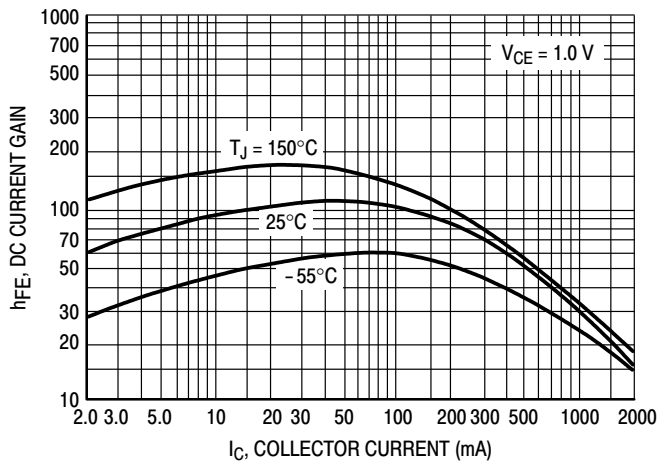


Figure 8. Current Gain

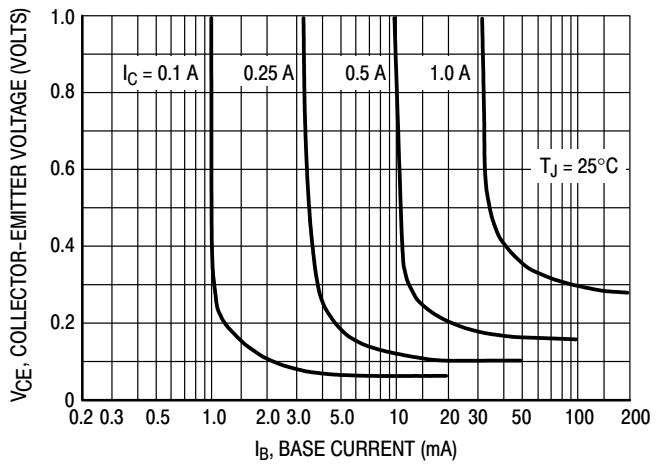


Figure 9. Collector Saturation Region

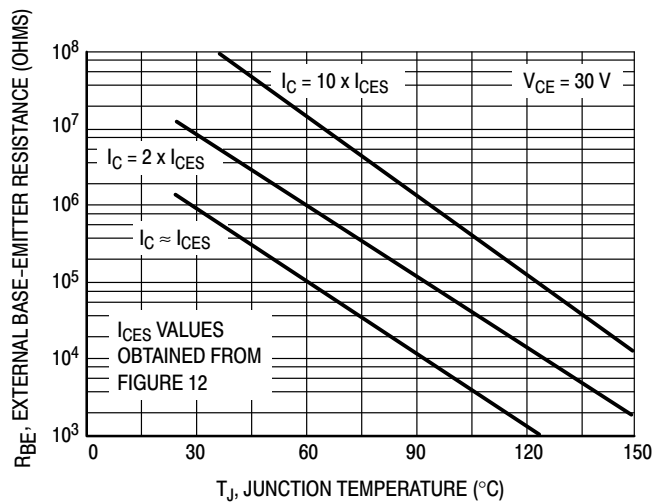


Figure 10. Effects of Base-Emitter Resistance

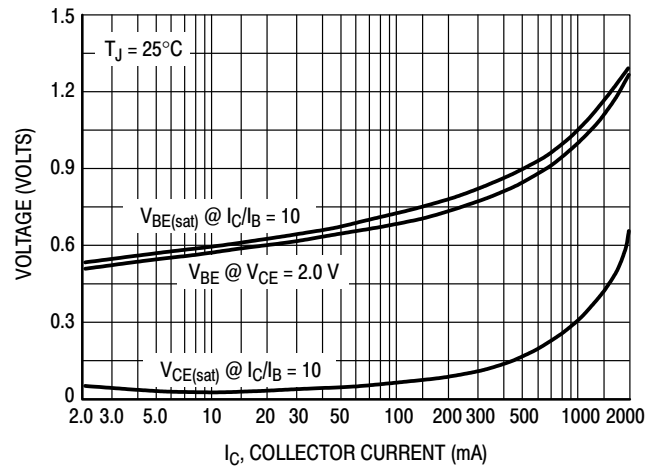


Figure 11. "On" Voltage

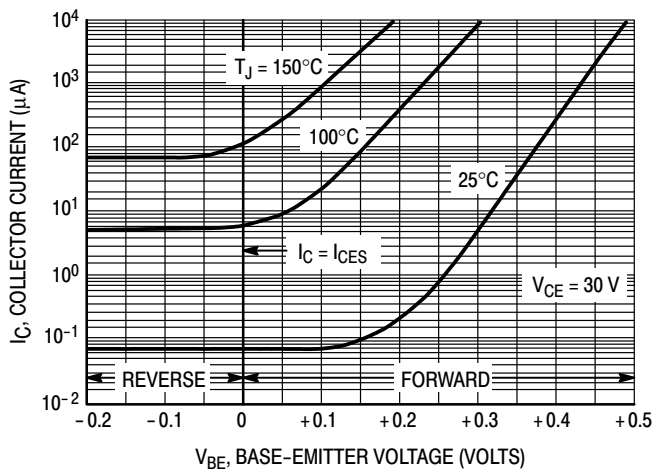


Figure 12. Collector Cut-Off Region

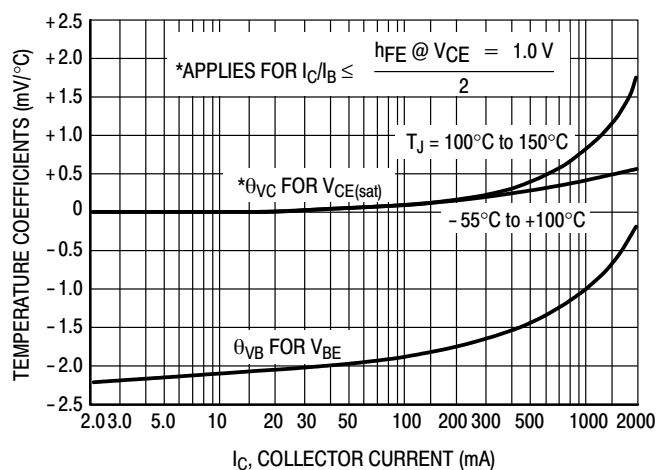
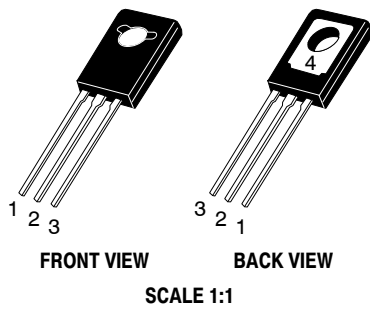
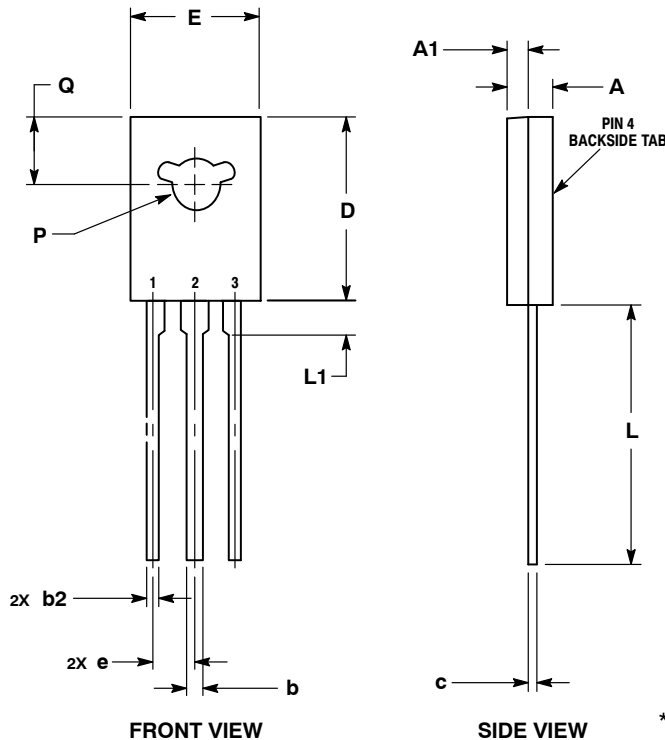


Figure 13. Temperature Coefficients



TO-225  
CASE 77-09  
ISSUE AD

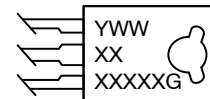
DATE 25 MAR 2015



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:<br>PIN 1. EMITTER<br>2., 4. COLLECTOR<br>3. BASE | STYLE 2:<br>PIN 1. CATHODE<br>2., 4. ANODE<br>3. GATE | STYLE 3:<br>PIN 1. BASE<br>2., 4. COLLECTOR<br>3. EMITTER | STYLE 4:<br>PIN 1. ANODE 1<br>2., 4. ANODE 2<br>3. GATE | STYLE 5:<br>PIN 1. MT 1<br>2., 4. MT 2<br>3. GATE     |
| STYLE 6:<br>PIN 1. CATHODE<br>2., 4. GATE<br>3. ANODE     | STYLE 7:<br>PIN 1. MT 1<br>2., 4. GATE<br>3. MT 2     | STYLE 8:<br>PIN 1. SOURCE<br>2., 4. GATE<br>3. DRAIN      | STYLE 9:<br>PIN 1. GATE<br>2., 4. DRAIN<br>3. SOURCE    | STYLE 10:<br>PIN 1. SOURCE<br>2., 4. DRAIN<br>3. GATE |

|                  |             |                                                                                                                                                                                     |
|------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| DESCRIPTION:     | TO-225      | PAGE 1 OF 1                                                                                                                                                                         |

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