

# NPN High-Power Transistors

## TIP33C

Designed for general-purpose power amplifier and switching applications.

### Features

- ESD Ratings: Machine Model, C; > 400 V  
Human Body Model, 3B; > 8000 V
- Epoxy Meets UL 94 V-0 @ 0.125 in
- These Devices is Pb-Free\*

### MAXIMUM RATINGS

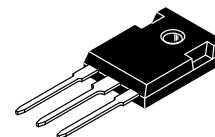
| Rating                                                                                 | Symbol         | Value          | Unit                         |
|----------------------------------------------------------------------------------------|----------------|----------------|------------------------------|
| Collector – Emitter Voltage                                                            | $V_{CEO}$      | 60             | Vdc                          |
| Collector – Base Voltage                                                               | $V_{CBO}$      | 60             | Vdc                          |
| Emitter – Base Voltage                                                                 | $V_{EBO}$      | 5.0            | Vdc                          |
| Collector Current<br>– Continuous<br>– Peak (Note 1)                                   | $I_C$          | 10<br>15       | Adc<br>Apk                   |
| Base Current – Continuous                                                              | $I_B$          | 3.0            | Adc                          |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 80<br>0.64     | Watts<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$ | -65 to<br>+150 | $^\circ\text{C}$             |

### THERMAL CHARACTERISTICS

| Characteristic                          | Symbol          | Max  | Unit               |
|-----------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 1.56 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 35.7 | $^\circ\text{C/W}$ |

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.

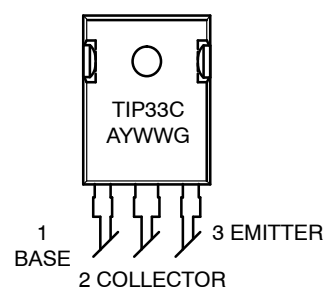
1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .



TO-247  
CASE 340L  
STYLE 3

## 10 AMPERE NPN SILICON POWER TRANSISTORS 60 & 100 VOLT, 80 WATTS

### MARKING DIAGRAM



TIP33C = Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

| Device  | Package             | Shipping†       |
|---------|---------------------|-----------------|
| TIP33CG | TO-247<br>(Pb-Free) | 30 Units / Rail |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](http://www.onsemi.com/BRD8011/D).

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

# TIP33C

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                   |                |    |        |     |
|-------------------------------------------------------------------------------------------------------------------|----------------|----|--------|-----|
| Collector–Emitter Sustaining Voltage (Note 2) ( $I_C = 30\text{ mA}$ , $I_B = 0$ )                                | $V_{CEO(sus)}$ | 60 | –<br>– | Vdc |
| Collector–Emitter Cutoff Current<br>( $V_{CE} = 30\text{ V}$ , $I_B = 0$ ) ( $V_{CE} = 60\text{ V}$ , $I_B = 0$ ) | $I_{CEO}$      | –  | 0.7    | mA  |
| Collector–Emitter Cutoff Current<br>( $V_{CE} = \text{Rated } V_{CEO}$ , $V_{EB} = 0$ )                           | $I_{CES}$      | –  | 0.4    | mA  |
| Emitter–Base Cutoff Current<br>( $V_{EB} = 5.0\text{ V}$ , $I_C = 0$ )                                            | $I_{EBO}$      | –  | 1.0    | mA  |

### ON CHARACTERISTICS (Note 2)

|                                                                                                                                           |               |          |            |     |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|------------|-----|
| DC Current Gain<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )<br>( $I_C = 3.0\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )               | $h_{FE}$      | 40<br>20 | –<br>100   | –   |
| Collector–Emitter Saturation Voltage<br>( $I_C = 3.0\text{ A}$ , $I_B = 0.3\text{ A}$ )<br>( $I_C = 10\text{ A}$ , $I_B = 2.5\text{ A}$ ) | $V_{CE(sat)}$ | –<br>–   | 1.0<br>4.0 | Vdc |
| Base–Emitter On Voltage<br>( $I_C = 3.0\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )<br>( $I_C = 10\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )        | $V_{BE(on)}$  | –<br>–   | 1.6<br>3.0 | Vdc |

### DYNAMIC CHARACTERISTICS

|                                                                                                              |          |     |   |     |
|--------------------------------------------------------------------------------------------------------------|----------|-----|---|-----|
| Small–Signal Current Gain<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$ )        | $h_{fe}$ | 20  | – | –   |
| Current–Gain — Bandwidth Product<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ ) | $f_T$    | 3.0 | – | MHz |

2. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## TIP33C

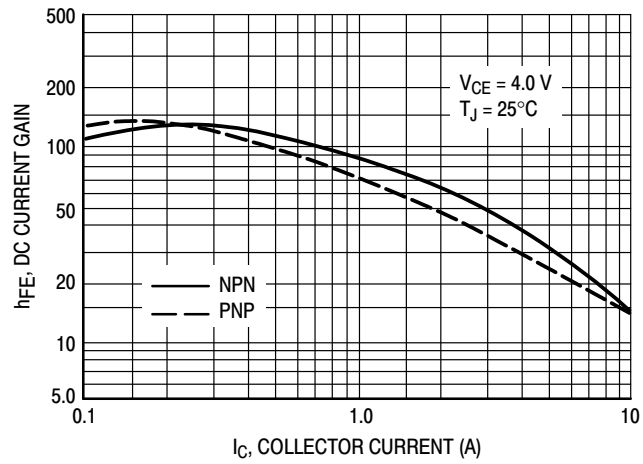


Figure 1. DC Current Gain

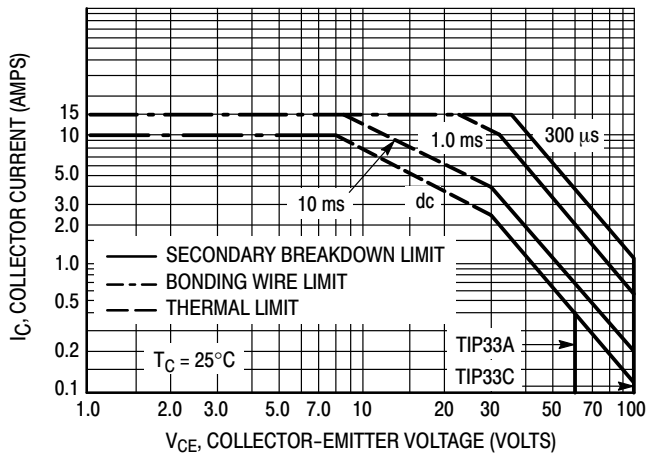


Figure 2. Maximum Rated Forward Bias Safe Operating Area

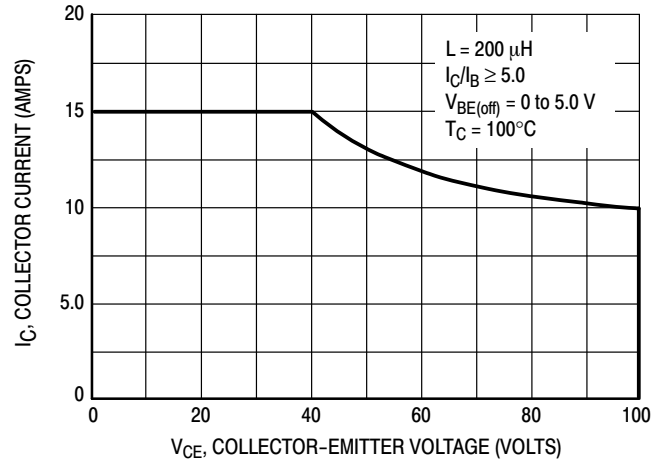


Figure 3. Maximum Rated Forward Bias Safe Operating Area

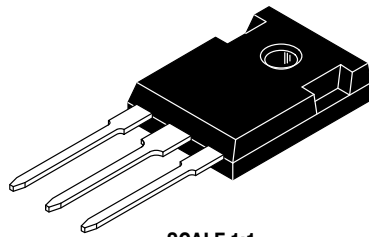
### FORWARD BIAS

The Forward Bias Safe Operating Area represents the voltage and current conditions these devices can withstand during forward bias. The data is based on  $T_C = 25^\circ\text{C}$ ;  $T_{J(pk)}$  is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10%, and must be derated thermally for  $T_C > 25^\circ\text{C}$ .

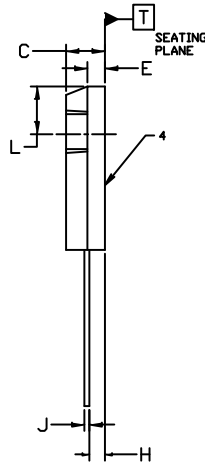
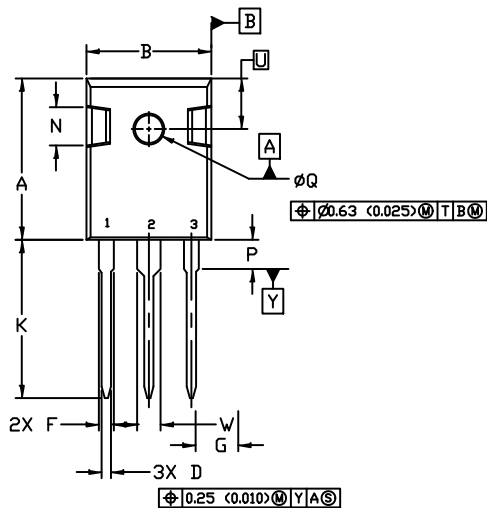
### REVERSE BIAS

The Reverse Bias Safe Operating Area represents the voltage and current conditions these devices can withstand during reverse biased turn-off. This rating is verified under clamped conditions so the device is never subjected to an avalanche mode.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1



TO-247  
CASE 340L  
ISSUE G

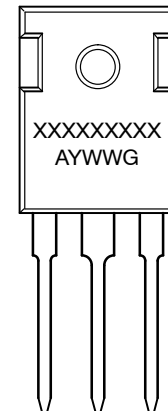
DATE 06 OCT 2021

## 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:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE<br>4. DRAIN  | STYLE 2:<br>PIN 1. ANODE<br>2. CATHODE (S)<br>3. ANODE 2<br>4. CATHODES (S)               | STYLE 3:<br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | STYLE 4:<br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR |
| STYLE 5:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE<br>4. ANODE | STYLE 6:<br>PIN 1. MAIN TERMINAL 1<br>2. MAIN TERMINAL 2<br>3. GATE<br>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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| DESCRIPTION:     | TO-247      | PAGE 1 OF 1                                                                                                                                                                      |

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