

TIP33A, TIP33C

NPN High-Power Transistors

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
- Pb-Free Packages are Available*

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|-------------------------------|----------------|------------------------------|
| Collector – Emitter Voltage | TIP33A TIP33C V_{CE0} | 60 100 | Vdc |
| Collector – Base Voltage | TIP33A TIP33C V_{CB0} | 60 100 | Vdc |
| Emitter – Base Voltage | V_{EB0} | 5.0 | Vdc |
| Collector Current – Continuous – Peak (Note 1) | I_C | 10 15 | Adc Apk |
| Base Current – Continuous | I_B | 3.0 | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 80 0.64 | Watts W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | -65 to +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 | $^\circ\text{C/W}$ |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

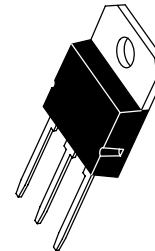
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



ON Semiconductor®

<http://onsemi.com>

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



**SOT-93 (TO-218)
CASE 340D
STYLE 1**

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
TIP33x = Device Code
x = A or C
G = Pb-Free Package

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|---------------------|-----------------|
| TIP33A | TO-218 | 30 Units / Rail |
| TIP33AG | TO-218 (Pb-Free) | 30 Units / Rail |
| TIP33C | TO-218 | 30 Units / Rail |
| TIP33CG | TO-218 (Pb-Free) | 30 Units / Rail |

TIP33A, 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) ($I_C = 30\text{ mA}$, $I_B = 0$) | TIP33A TIP33C | $V_{CEO(sus)}$ | 60 100 | – – | Vdc |
| Collector–Emitter Cutoff Current ($V_{CE} = 30\text{ V}$, $I_B = 0$) ($V_{CE} = 60\text{ V}$, $I_B = 0$) | TIP33A TIP33C | I_{CEO} | – | 0.7 | mA |
| Collector–Emitter Cutoff Current ($V_{CE} = \text{Rated } V_{CEO}$, $V_{EB} = 0$) | | I_{CES} | – | 0.4 | mA |
| Emitter–Base Cutoff Current ($V_{EB} = 5.0\text{ V}$, $I_C = 0$) | | I_{EBO} | – | 1.0 | mA |

ON CHARACTERISTICS (Note 2)

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

DYNAMIC CHARACTERISTICS

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

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

TIP33A, TIP33C

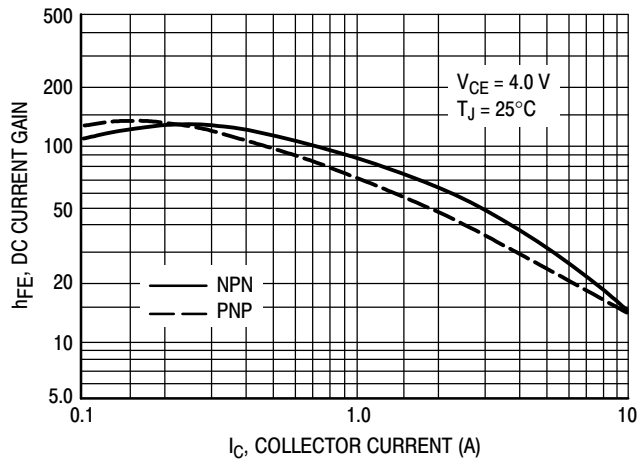


Figure 1. DC Current Gain

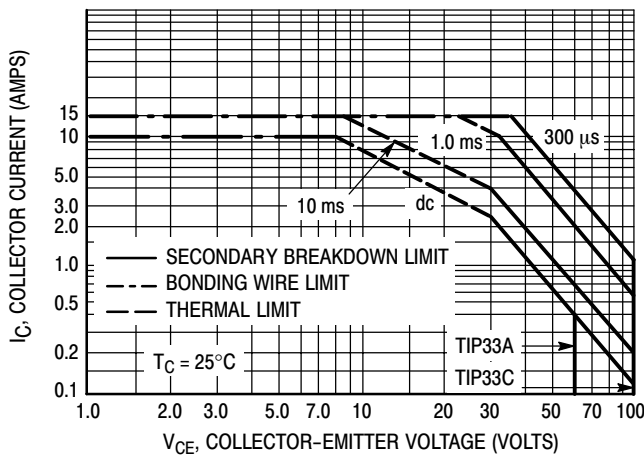


Figure 2. Maximum Rated Forward Bias Safe Operating Area

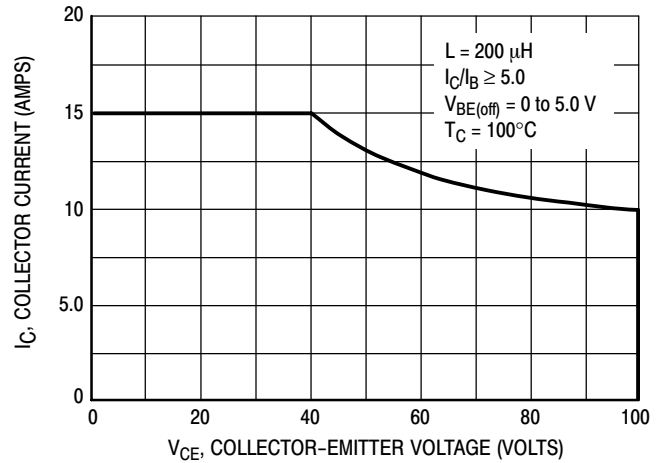


Figure 3. Maximum Rated Forward Bias Safe Operating Area

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 $T_C > 25^\circ\text{C}$.

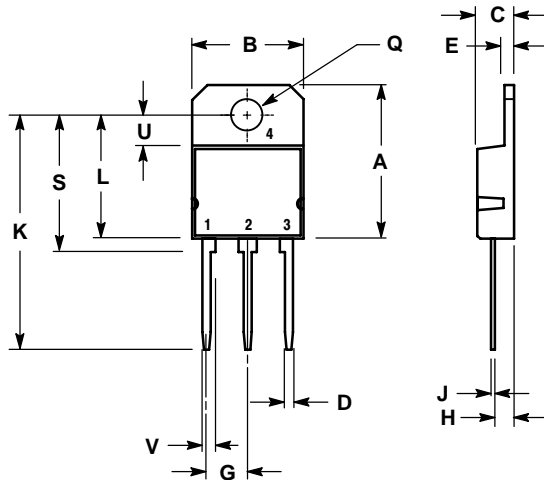
REVERSE BIAS

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.

TIP33A, TIP33C

PACKAGE DIMENSIONS

SOT-93 (TO-218)
CASE 340D-02
ISSUE E




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | --- | 20.35 | --- | 0.801 |
| B | 14.70 | 15.20 | 0.579 | 0.598 |
| C | 4.70 | 4.90 | 0.185 | 0.193 |
| D | 1.10 | 1.30 | 0.043 | 0.051 |
| E | 1.17 | 1.37 | 0.046 | 0.054 |
| G | 5.40 | 5.55 | 0.213 | 0.219 |
| H | 2.00 | 3.00 | 0.079 | 0.118 |
| J | 0.50 | 0.78 | 0.020 | 0.031 |
| K | 31.00 REF | | 1.220 REF | |
| L | --- | 16.20 | --- | 0.638 |
| Q | 4.00 | 4.10 | 0.158 | 0.161 |
| S | 17.80 | 18.20 | 0.701 | 0.717 |
| U | 4.00 REF | | 0.157 REF | |
| V | 1.75 REF | | 0.069 | |

STYLE 1:

- PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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