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
- These are Pb−Free Devices*

ON Semiconductor®

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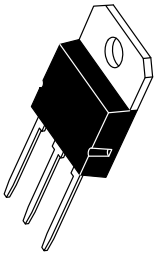
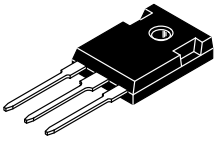
10 AMPERE
NPN SILICON
POWER TRANSISTORS
60 & 100 VOLT, 80 WATTS



SOT−93 (TO−218)
CASE 340D
STYLE 1



TO−247
CASE 340L
STYLE 3

NOTE: Effective June 2012 this device will be available only in the TO−247 package. Reference FPCN# 16827.

MAXIMUM RATINGS

Rating		Symbol	Value	Unit
Collector − Emitter Voltage	TIP33A TIP33C	V_{CEO}	60 100	Vdc
Collector − Base Voltage	TIP33A TIP33C	V_{CBO}	60 100	Vdc
Emitter − Base Voltage		V_{EBO}	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°C Derate above 25°C		P_D	80 0.64	Watts W/°C
Operating and Storage Junction Temperature Range		T_J, T_{stg}	−65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	1.56	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	35.7	°C/W

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

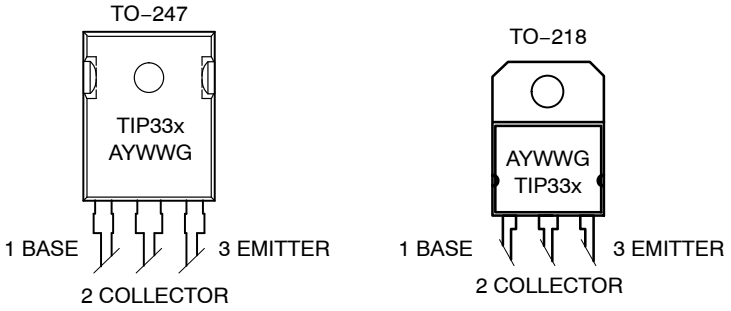
1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

MARKING DIAGRAMS



TIP33x	= Device Code
A	= Assembly Location
Y	= Year
WW	= Work Week
G	= Pb−Free Package

ORDERING INFORMATION

Device Order Number	Package Type	Shipping
TIP33AG	TO−218 (Pb−Free)	30 Units / Rail
TIP33CG	TO−218 (Pb−Free)	30 Units / Rail
TIP33AG	TO−247 (Pb−Free)	30 Units / Rail
TIP33CG	TO−247 (Pb−Free)	30 Units / Rail

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Sustaining Voltage (Note 2) (I_C = 30 mA, I_B = 0)	TIP33A TIP33C	$V_{CEO(sus)}$	60 100	− −	Vdc
Collector−Emitter Cutoff Current (V_{CE} = 30 V, I_B = 0) (V_{CE} = 60 V, I_B = 0)	 TIP33A TIP33C	I_{CEO}	−	0.7	mA
Collector−Emitter Cutoff Current (V_{CE} = Rated V_{CEO}, V_{EB} = 0)		I_{CES}	−	0.4	mA
Emitter−Base Cutoff Current (V_{EB} = 5.0 V, I_C = 0)		I_{EBO}	−	1.0	mA
ON CHARACTERISTICS (Note 2)					
DC Current Gain (I_C = 1.0 A, V_{CE} = 4.0 V) (I_C = 3.0 A, V_{CE} = 4.0 V)		h_{FE}	 40 20	 − 100	−
Collector−Emitter Saturation Voltage (I_C = 3.0 A, I_B = 0.3 A) (I_C = 10 A, I_B = 2.5 A)		$V_{CE(sat)}$	 − −	 1.0 4.0	Vdc
Base−Emitter On Voltage (I_C = 3.0 A, V_{CE} = 4.0 V) (I_C = 10 A, V_{CE} = 4.0 V)		$V_{BE(on)}$	 − −	 1.6 3.0	Vdc
DYNAMIC CHARACTERISTICS					
Small−Signal Current Gain (I_C = 0.5 A, V_{CE} = 10 V, f = 1.0 kHz)		h_{fe}	20	−	−
Current−Gain — Bandwidth Product (I_C = 0.5 A, V_{CE} = 10 V, f = 1.0 MHz)		f_T	3.0	−	MHz

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

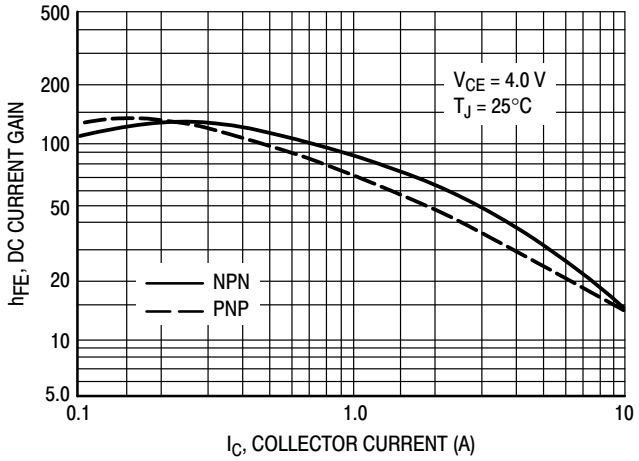


Figure 1. DC Current Gain

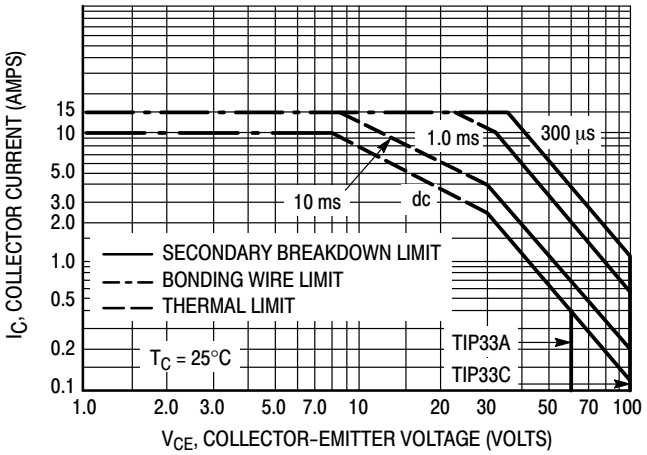


Figure 2. Maximum Rated Forward Bias Safe Operating Area

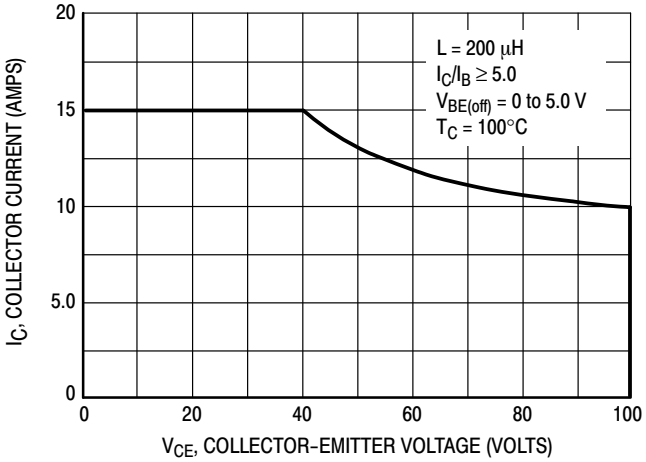


Figure 3. Maximum Rated Forward Bias Safe Operating Area

FORWARD BIAS

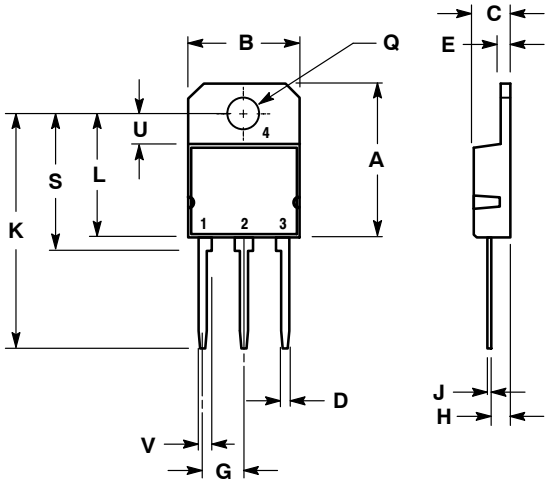
The Forward Bias Safe Operating Area represents the voltage and current conditions these devices can withstand during forward bias. The data is based on $T_C = 25°C$; $T_{J(pk)}$ is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10%, and must be derated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

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.

PACKAGE DIMENSIONS

SOT−93 (TO−218)
CASE 340D−02
ISSUE E

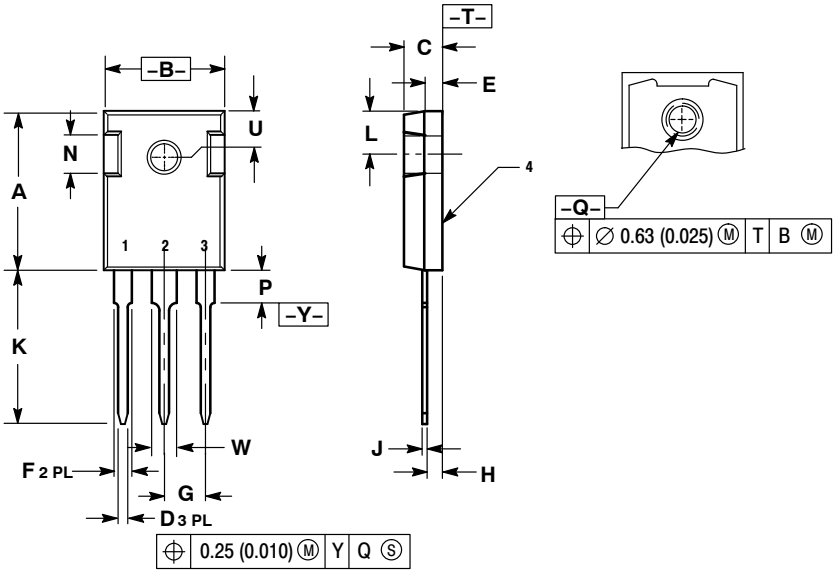


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS		INCHES	
DIM	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

TO−247
CASE 340L−02
ISSUE F



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

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	20.32	21.08	0.800	8.30
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

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

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TIP33C/D