

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*

MAXIMUM RATINGS

Rating		Symbol	Value	Unit
Collector – Emitter Voltage	TIP33A TIP33C	V_{CE0}	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 @ $T_C = 25^\circ\text{C}$ 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	$^\circ\text{C/W}$

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.

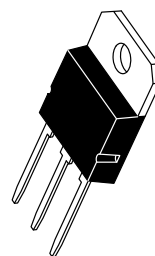
1. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$.



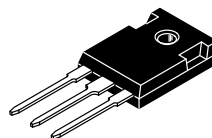
ON Semiconductor®

<http://onsemi.com>

**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.

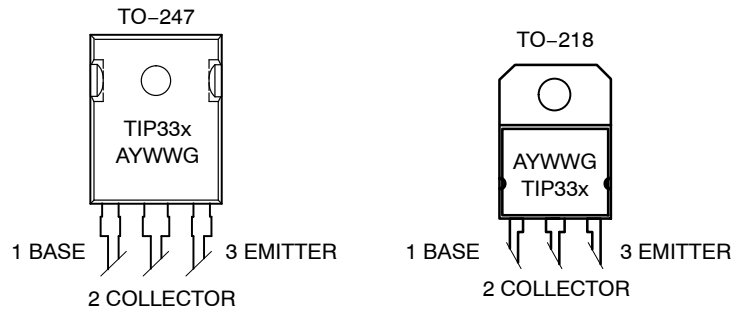
ORDERING INFORMATION

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.

TIP33A, TIP33C

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

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

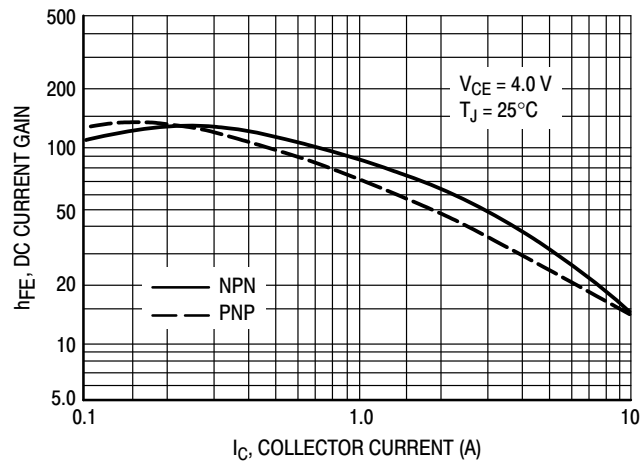


Figure 1. DC Current Gain

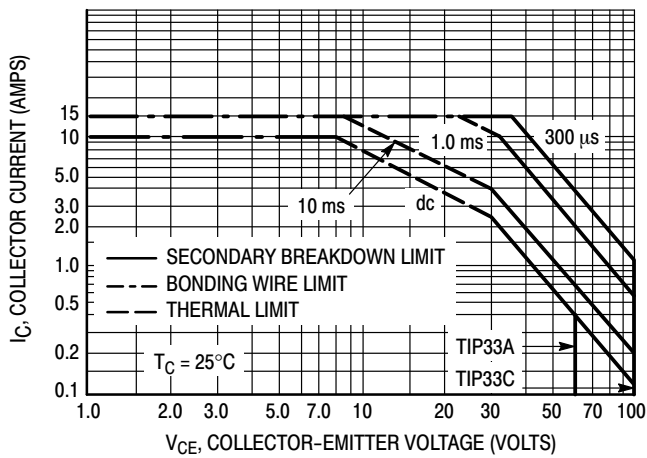


Figure 2. Maximum Rated Forward Bias Safe Operating Area

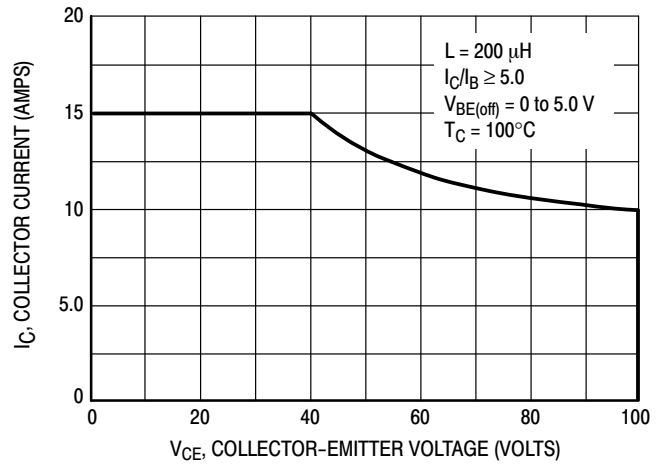


Figure 3. Maximum Rated Forward Bias Safe Operating Area

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

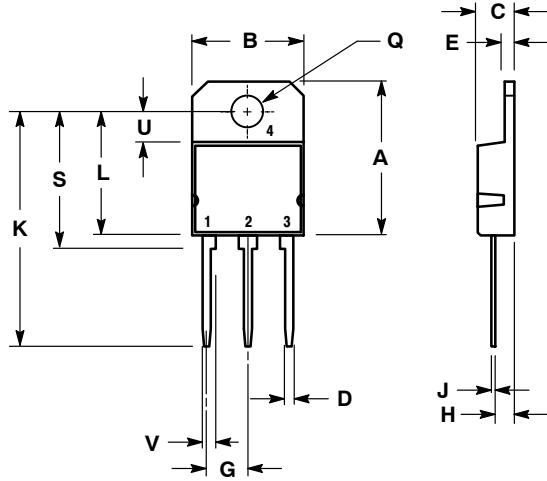
REVERSE BIAS

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:

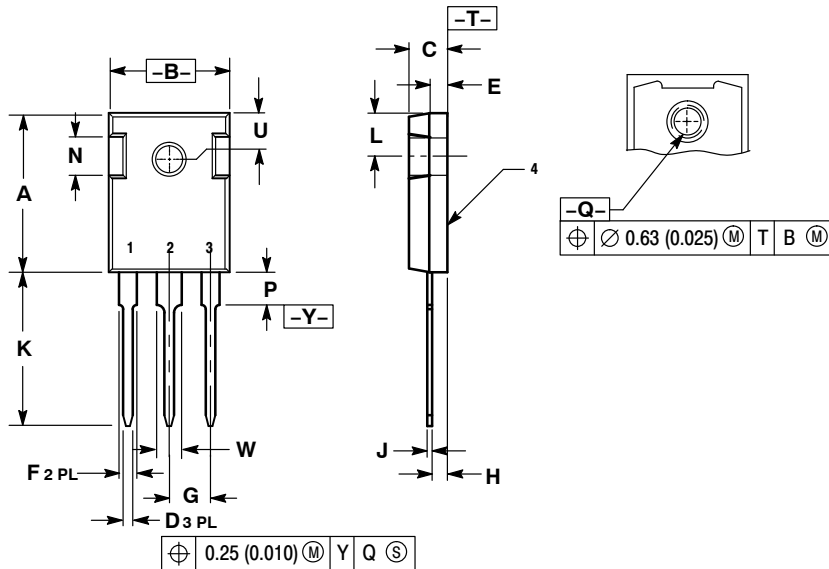
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

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

TO-247 CASE 340L-02 ISSUE F



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI 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

STYLE 3:

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

TIP33A, TIP33C

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada

Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com

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

For additional information, please contact your local
Sales Representative