

# TIP31, TIP31A, TIP31B, TIP31C, (NPN), TIP32, TIP32A, TIP32B, TIP32C, (PNP)



ON Semiconductor®

## Complementary Silicon Plastic Power Transistors

Designed for use in general purpose amplifier and switching applications.

### Features

- Collector–Emitter Saturation Voltage –  
 $V_{CE(sat)} = 1.2 \text{ Vdc (Max) @ } I_C = 3.0 \text{ Adc}$
- Collector–Emitter Sustaining Voltage –  
 $V_{CEO(sus)} = 40 \text{ Vdc (Min) – TIP31, TIP32}$   
 $= 60 \text{ Vdc (Min) – TIP31A, TIP32A}$   
 $= 80 \text{ Vdc (Min) – TIP31B, TIP32B}$   
 $= 100 \text{ Vdc (Min) – TIP31C, TIP32C}$
- High Current Gain – Bandwidth Product  
 $f_T = 3.0 \text{ MHz (Min) @ } I_C = 500 \text{ mAdc}$
- Compact TO–220 AB Package
- Pb–Free Packages are Available\*

### MAXIMUM RATINGS

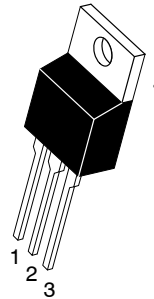
Rating	Symbol	Value	Unit
Collector – Emitter Voltage TIP31, TIP32 TIP31A, TIP32A TIP31B, TIP32B TIP31C, TIP32C	$V_{CEO}$	40 60 80 100	Vdc
Collector–Base Voltage TIP31, TIP32 TIP31A, TIP32A TIP31B, TIP32B TIP31C, TIP32C	$V_{CB}$	40 60 80 100	Vdc
Emitter–Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current Continuous Peak	$I_C$	3.0 5.0	Adc
Base Current	$I_B$	1.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	40 0.32	W W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.0 0.016	W W/ $^\circ\text{C}$
Unclamped Inductive Load Energy (Note 1)	E	32	mJ
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–65 to +150	$^\circ\text{C}$

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.  $I_C = 1.8 \text{ A, } L = 20 \text{ mH, P.R.F.} = 10 \text{ Hz, } V_{CC} = 10 \text{ V, } R_{BE} = 100 \Omega$

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

## 3 AMPERE POWER TRANSISTORS COMPLEMENTARY SILICON 40–60–80–100 VOLTS, 40 WATTS



TO–220AB  
CASE 221A  
STYLE 1

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

### MARKING DIAGRAM



TIP3xx = Device Code  
xx = 1, 1A, 1B, 1C,  
2, 2A, 2B, 2C,  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb–Free Package

### ORDERING INFORMATION

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

# TIP31, TIP31A, TIP31B, TIP31C, (NPN), TIP32, TIP32A, TIP32B, TIP32C, (PNP)

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.125	°C/W

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage (Note 2) ( $I_C = 30 \text{ mAdc}$ , $I_B = 0$ )	TIP31, TIP32 TIP31A, TIP32A TIP31B, TIP32B TIP31C, TIP32C	$V_{CE(sus)}$	40 60 80 100	- - - -	Vdc
Collector Cutoff Current ( $V_{CE} = 30 \text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 60 \text{ Vdc}$ , $I_B = 0$ )	TIP31, TIP32, TIP31A, TIP32A TIP31B, TIP31C, TIP32B, TIP32C	$I_{CEO}$	- -	0.3 0.3	mAdc
Collector Cutoff Current ( $V_{CE} = 40 \text{ Vdc}$ , $V_{EB} = 0$ ) ( $V_{CE} = 60 \text{ Vdc}$ , $V_{EB} = 0$ ) ( $V_{CE} = 80 \text{ Vdc}$ , $V_{EB} = 0$ ) ( $V_{CE} = 100 \text{ Vdc}$ , $V_{EB} = 0$ )	TIP31, TIP32 TIP31A, TIP32A TIP31B, TIP32B TIP31C, TIP32C	$I_{CES}$	- - - -	200 200 200 200	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{BE} = 5.0 \text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	-	1.0	mAdc

### ON CHARACTERISTICS (Note 2)

DC Current Gain ( $I_C = 1.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ ) ( $I_C = 3.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )		$h_{FE}$	25 10	- 50	-
Collector-Emitter Saturation Voltage ( $I_C = 3.0 \text{ Adc}$ , $I_B = 375 \text{ mAdc}$ )		$V_{CE(sat)}$	-	1.2	Vdc
Base-Emitter On Voltage ( $I_C = 3.0 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )		$V_{BE(on)}$	-	1.8	Vdc

### DYNAMIC CHARACTERISTICS

Current-Gain - Bandwidth Product ( $I_C = 500 \text{ mAdc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f_{test} = 1.0 \text{ MHz}$ )		$f_T$	3.0	-	MHz
Small-Signal Current Gain ( $I_C = 0.5 \text{ Adc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f = 1.0 \text{ kHz}$ )		$h_{fe}$	20	-	-

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

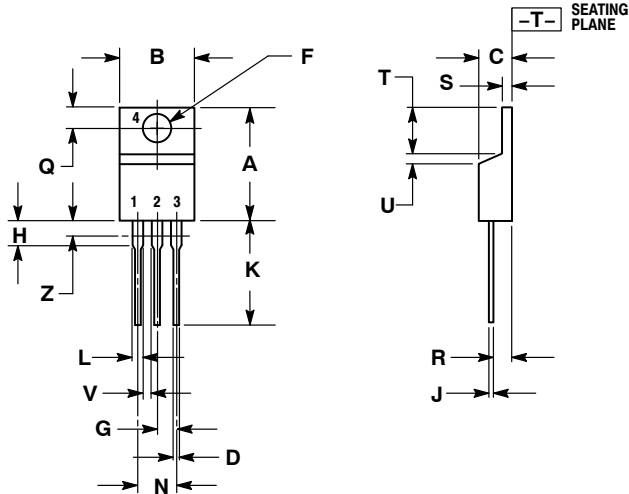
## ORDERING INFORMATION

Device	Package	Shipping
TIP31	TO-220	50 Units / Rail
TIP31G	TO-220 (Pb-Free)	50 Units / Rail
TIP31A	TO-220	50 Units / Rail
TIP31AG	TO-220 (Pb-Free)	50 Units / Rail
TIP31B	TO-220	50 Units / Rail
TIP31BG	TO-220 (Pb-Free)	50 Units / Rail
TIP31C	TO-220	50 Units / Rail
TIP31CG	TO-220 (Pb-Free)	50 Units / Rail
TIP32	TO-220	50 Units / Rail
TIP32G	TO-220 (Pb-Free)	50 Units / Rail
TIP32A	TO-220	50 Units / Rail
TIP32AG	TO-220 (Pb-Free)	50 Units / Rail
TIP32B	TO-220	50 Units / Rail
TIP32BG	TO-220 (Pb-Free)	50 Units / Rail
TIP32C	TO-220	50 Units / Rail
TIP32CG	TO-220 (Pb-Free)	50 Units / Rail

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## PACKAGE DIMENSIONS

TO-220  
CASE 221A-09  
ISSUE AF



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.025	0.36	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 1:

- PIN 1. BASE
- COLLECTOR
- EMITTER
- COLLECTOR