

# TIP47G, TIP48G, TIP50G

## High Voltage NPN Silicon Power Transistors

This series is designed for line operated audio output amplifier, SWITCHMODE power supply drivers and other switching applications.

### Features

- Popular TO-220 Plastic Package
- These Devices are Pb-Free and are RoHS Compliant\*
- Complementary to the MJE5730 and MJE5731 Series

### MAXIMUM RATINGS

Rating	Symbol	TIP47	TIP48	TIP50	Unit
Collector – Emitter Voltage	$V_{CEO}$	250	300	400	Vdc
Collector – Base Voltage	$V_{CB}$	350	400	500	Vdc
Emitter – Base Voltage	$V_{EB}$	5.0			Vdc
Collector Current – Continuous	$I_C$	1.0			Adc
Collector Current – Peak	$I_{CM}$	2.0			Adc
Base Current	$I_B$	0.6			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 @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.0 0.016			W W/ $^\circ\text{C}$
Unclamped Inducting Load Energy (See Figure 8)	E	20			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.

### THERMAL CHARACTERISTICS

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

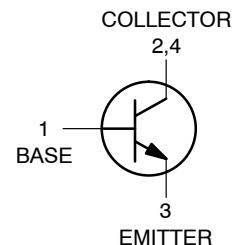
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERMM/D.



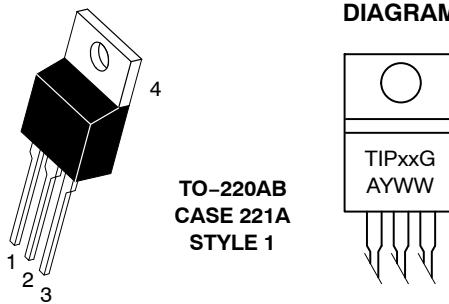
ON Semiconductor®

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### 1.0 AMPERE POWER TRANSISTORS NPN SILICON 250–300–400 VOLTS 40 WATTS



### MARKING DIAGRAM



TIPxx = Device Code  
xx = 47, 48, or 50  
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.

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Sustaining Voltage (Note 1) ( $I_C = 30 \text{ mA}_\text{dc}$ , $I_B = 0$ )	TIP47 TIP48 TIP50	$V_{\text{CEO}(\text{sus})}$	250 300 400	— — —
Collector Cutoff Current ( $V_{\text{CE}} = 150 \text{ V}_\text{dc}$ , $I_B = 0$ ) ( $V_{\text{CE}} = 200 \text{ V}_\text{dc}$ , $I_B = 0$ ) ( $V_{\text{CE}} = 300 \text{ V}_\text{dc}$ , $I_B = 0$ )	TIP47 TIP48 TIP50	$I_{\text{CEO}}$	— — —	mA <sub>dc</sub> mA <sub>dc</sub> mA <sub>dc</sub>
Collector Cutoff Current ( $V_{\text{CE}} = 350 \text{ V}_\text{dc}$ , $V_{\text{BE}} = 0$ ) ( $V_{\text{CE}} = 400 \text{ V}_\text{dc}$ , $V_{\text{BE}} = 0$ ) ( $V_{\text{CE}} = 500 \text{ V}_\text{dc}$ , $V_{\text{BE}} = 0$ )	TIP47 TIP48 TIP50	$I_{\text{CES}}$	— — —	mA <sub>dc</sub> mA <sub>dc</sub> mA <sub>dc</sub>
Emitter Cutoff Current ( $V_{\text{BE}} = 5.0 \text{ V}_\text{dc}$ , $I_C = 0$ )		$I_{\text{EBO}}$	—	1.0
<b>ON CHARACTERISTICS</b> (Note 1)				
DC Current Gain ( $I_C = 0.3 \text{ Adc}$ , $V_{\text{CE}} = 10 \text{ V}_\text{dc}$ ) ( $I_C = 1.0 \text{ Adc}$ , $V_{\text{CE}} = 10 \text{ V}_\text{dc}$ )		$h_{\text{FE}}$	30 10	150 —
Collector-Emitter Saturation Voltage ( $I_C = 1.0 \text{ Adc}$ , $I_B = 0.2 \text{ Adc}$ )		$V_{\text{CE}(\text{sat})}$	—	1.0
Base-Emitter On Voltage ( $I_C = 1.0 \text{ Adc}$ , $V_{\text{CE}} = 10 \text{ V}_\text{dc}$ )		$V_{\text{BE}(\text{on})}$	—	1.5
<b>DYNAMIC CHARACTERISTICS</b>				
Current-Gain – Bandwidth Product ( $I_C = 0.1 \text{ Adc}$ , $V_{\text{CE}} = 10 \text{ V}_\text{dc}$ , $f = 2.0 \text{ MHz}$ )		$f_T$	10	—
Small-Signal Current Gain ( $I_C = 0.2 \text{ Adc}$ , $V_{\text{CE}} = 10 \text{ V}_\text{dc}$ , $f = 1.0 \text{ kHz}$ )		$h_{\text{fe}}$	25	—

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

## ORDERING INFORMATION

Device	Package	Shipping
TIP47G	TO-220 (Pb-Free)	50 Units / Rail
TIP48G	TO-220 (Pb-Free)	50 Units / Rail
TIP49G	TO-220 (Pb-Free)	50 Units / Rail
TIP50G	TO-220 (Pb-Free)	50 Units / Rail

# TIP47G, TIP48G, TIP50G

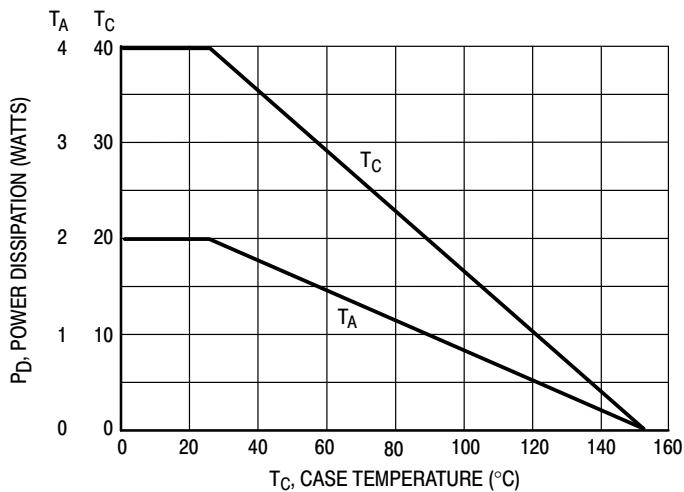


Figure 1. Power Derating

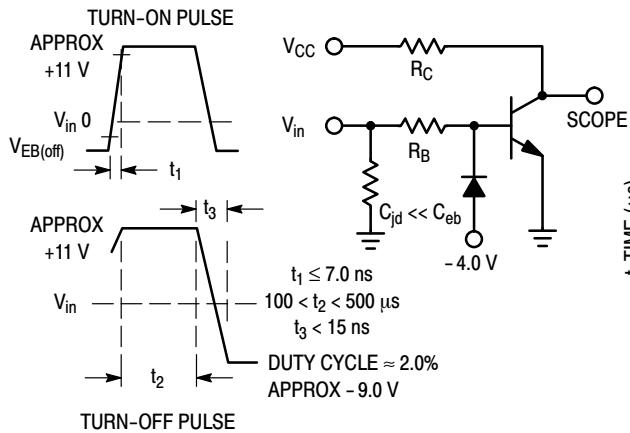


Figure 2. Switching Time Equivalent Circuit

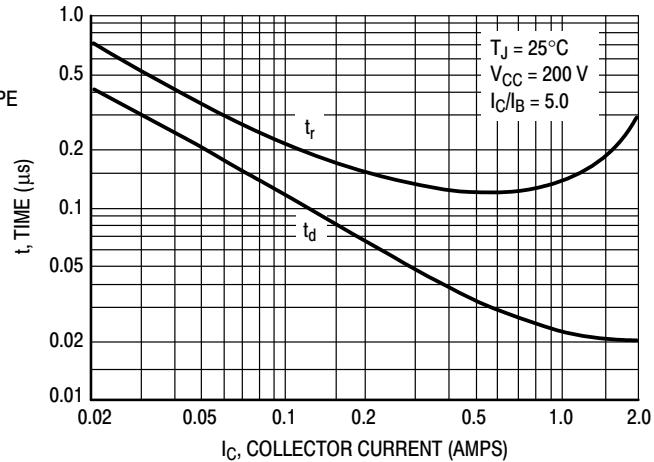


Figure 3. Turn-On Time

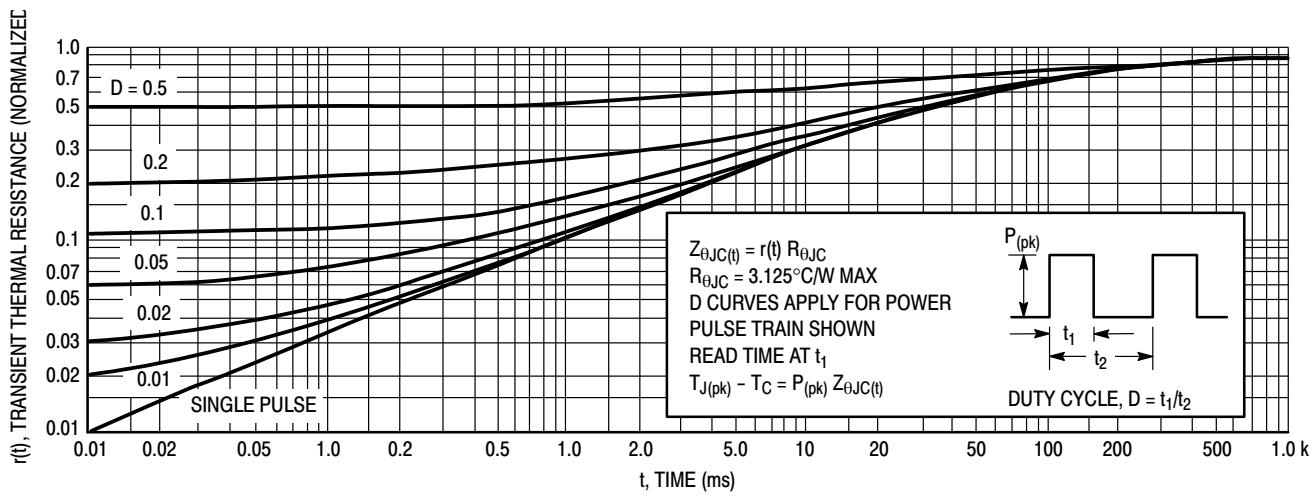


Figure 4. Thermal Response

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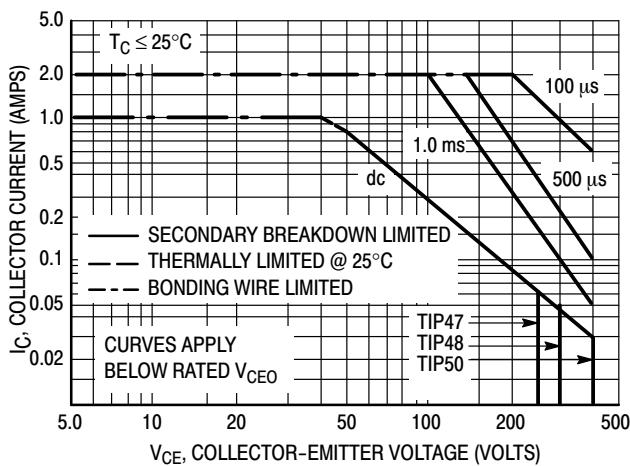


Figure 5. Active Region Safe Operating Area

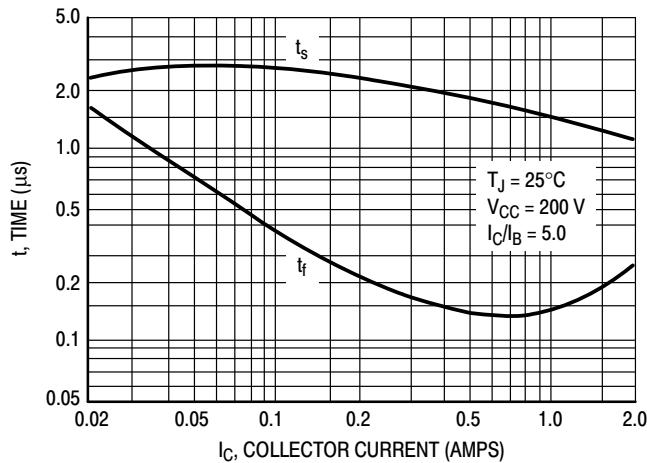


Figure 6. Turn-Off Time

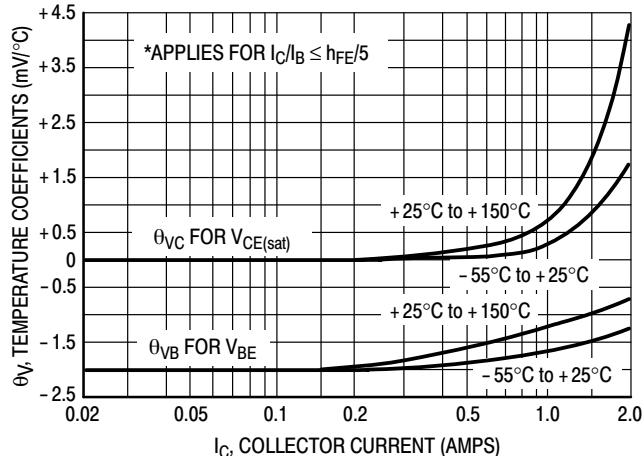
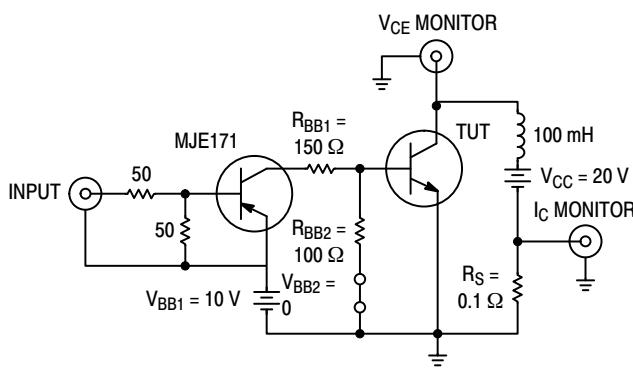


Figure 7. Temperature Coefficients



Note A: Input pulse width is increased until  $I_{CM} = 0.63$  A.

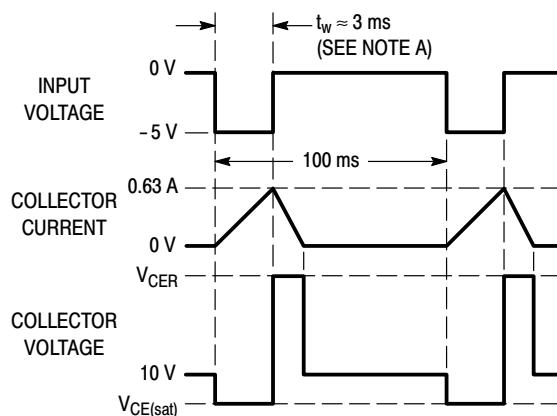


Figure 8. Inductive Load Switching

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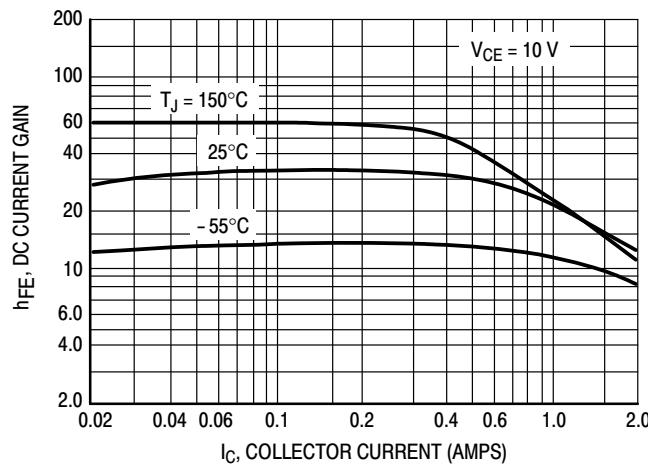


Figure 9. DC Current Gain

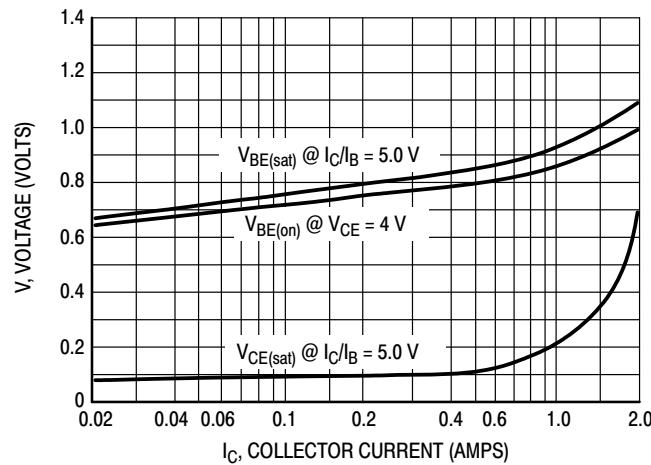
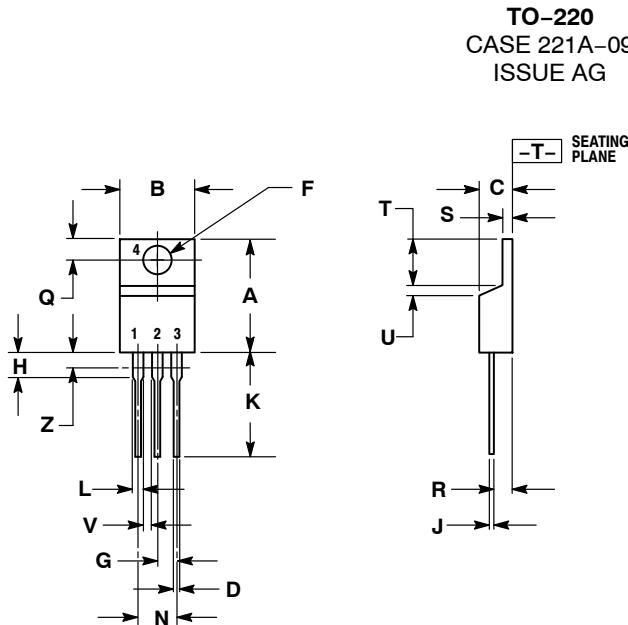


Figure 10. "On" Voltages

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## PACKAGE DIMENSIONS



TO-220  
CASE 221A-09  
ISSUE AG

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	0.036	0.64	0.91
F	0.142	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
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
2. COLLECTOR
3. Emitter
4. COLLECTOR

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