

# Complementary Silicon Plastic Power Transistors

... designed for use in general purpose amplifier and switching applications.

- Collector–Emitter Saturation Voltage —  
 $V_{CE(sat)} = 1.5 \text{ Vdc (Max) @ } I_C = 6.0 \text{ Adc}$
- Collector–Emitter Sustaining Voltage —  
 $V_{CEO(sus)} = 60 \text{ Vdc (Min) — TIP41A, TIP42A}$   
 $= 80 \text{ Vdc (Min) — TIP41B, TIP42B}$   
 $= 100 \text{ Vdc (Min) — TIP41C, TIP42C}$
- High Current Gain — Bandwidth Product  
 $f_T = 3.0 \text{ MHz (Min) @ } I_C = 500 \text{ mAdc}$
- Compact TO–220 AB Package

## \*MAXIMUM RATINGS

Rating	Symbol	TIP41A TIP42A	TIP41B TIP42B	TIP41C TIP42C	Unit
Collector–Emitter Voltage	$V_{CEO}$	60	80	100	Vdc
Collector–Base Voltage	$V_{CB}$	60	80	100	Vdc
Emitter–Base Voltage	$V_{EB}$	5.0			Vdc
Collector Current — Continuous Peak	$I_C$	6 10			Adc
Base Current	$I_B$	2.0			Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	65 0.52			Watts 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			Watts W/ $^\circ\text{C}$
Unclamped Inductive Load Energy (1)	E	62.5			mJ
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 Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.92	$^\circ\text{C/W}$

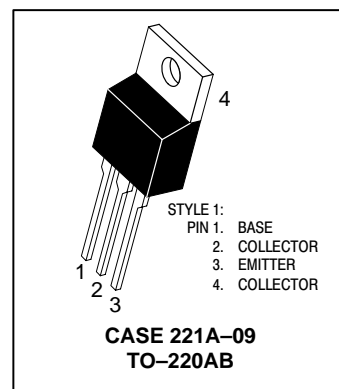
(1)  $I_C = 2.5 \text{ A}$ ,  $L = 20 \text{ mH}$ , P.R.F. = 10 Hz,  $V_{CC} = 10 \text{ V}$ ,  $R_{BE} = 100 \Omega$ .

Preferred devices are ON Semiconductor recommended choices for future use and best overall value.

**NPN**  
**TIP41A**  
**TIP41B\***  
**TIP41C\***  
**PNP**  
**TIP42A**  
**TIP42B\***  
**TIP42C\***

\*ON Semiconductor Preferred Device

**6 AMPERE**  
**POWER TRANSISTORS**  
**COMPLEMENTARY**  
**SILICON**  
**60–80–100 VOLTS**  
**65 WATTS**



# TIP41A TIP41B TIP41C TIP42A TIP42B TIP42C

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

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (1) ( $I_C = 30\text{ mAdc}$ , $I_B = 0$ )	TIP41A, TIP42A TIP41B, TIP42B TIP41C, TIP42C	$V_{CEO(sus)}$	60 80 100	— — — Vdc
Collector Cutoff Current ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )	TIP41A, TIP42A TIP41B, TIP41C TIP42B, TIP42C	$I_{CEO}$	— — —	0.7 0.7 0.7 mAdc
Collector Cutoff Current ( $V_{CE} = 60\text{ Vdc}$ , $V_{EB} = 0$ ) ( $V_{CE} = 80\text{ Vdc}$ , $V_{EB} = 0$ ) ( $V_{CE} = 100\text{ Vdc}$ , $V_{EB} = 0$ )	TIP41A, TIP42A TIP41B, TIP42B TIP41C, TIP42C	$I_{CES}$	— — —	400 400 400 $\mu\text{Adc}$
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	—	1.0 mAdc
<b>ON CHARACTERISTICS (1)</b>				
DC Current Gain ( $I_C = 0.3\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ ) ( $I_C = 3.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )		$h_{FE}$	30 15	— 75 —
Collector–Emitter Saturation Voltage ( $I_C = 6.0\text{ Adc}$ , $I_B = 600\text{ mAdc}$ )		$V_{CE(sat)}$	—	1.5 Vdc
Base–Emitter On Voltage ( $I_C = 6.0\text{ Adc}$ , $V_{CE} = 4.0\text{ Vdc}$ )		$V_{BE(on)}$	—	2.0 Vdc
<b>DYNAMIC CHARACTERISTICS</b>				
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	— —

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

TIP41A TIP41B TIP41C TIP42A TIP42B TIP42C

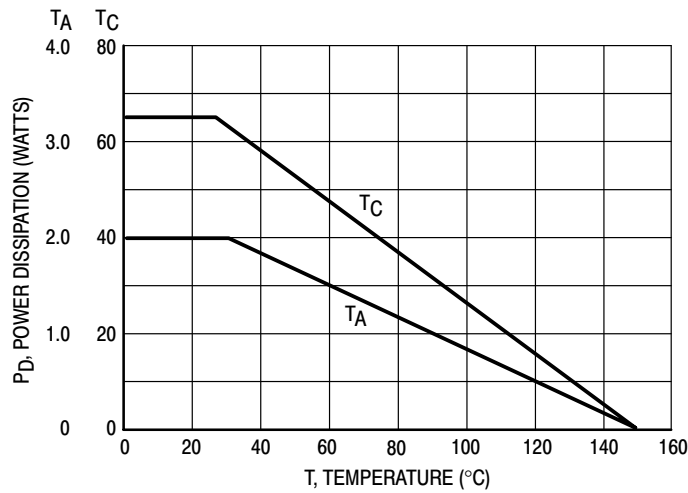


Figure 1. Power Derating

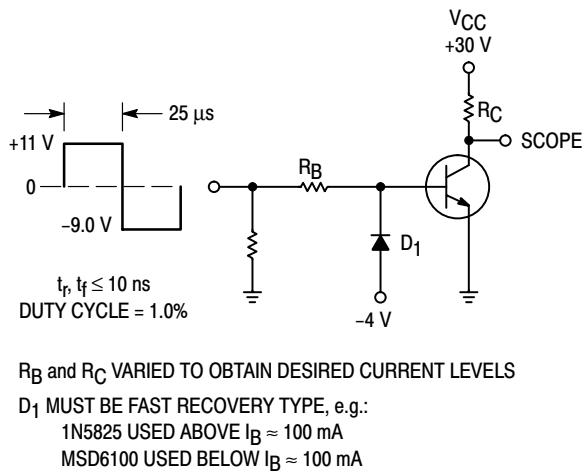


Figure 2. Switching Time Test Circuit

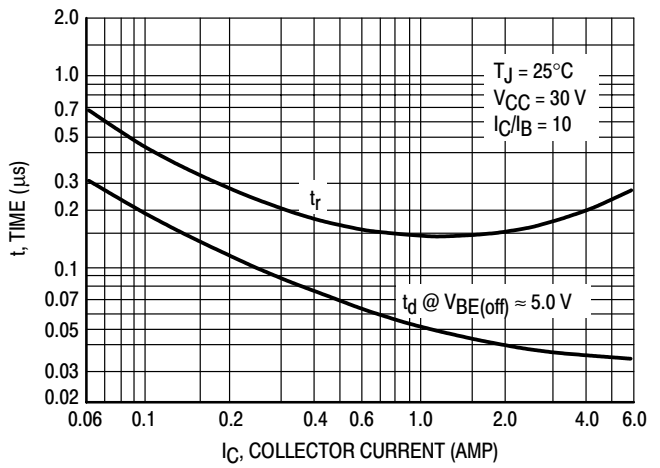


Figure 3. Turn-On Time

TIP41A TIP41B TIP41C TIP42A TIP42B TIP42C

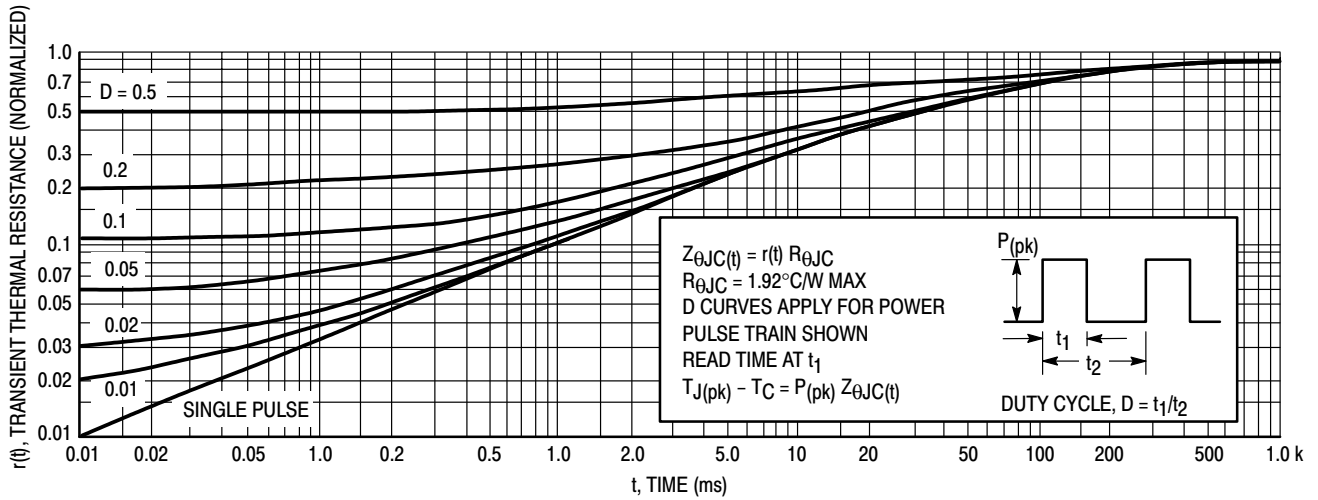


Figure 4. Thermal Response

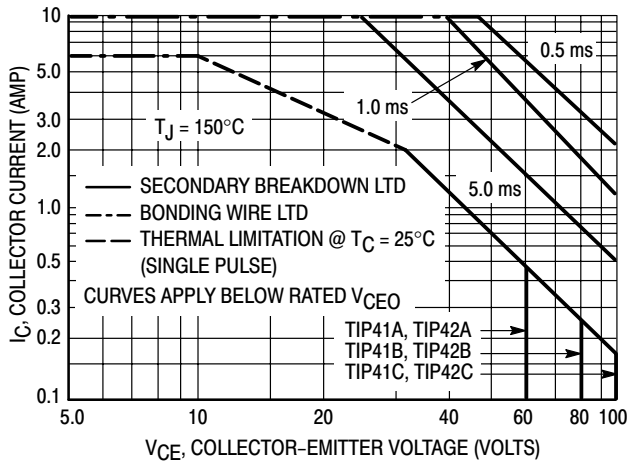


Figure 5. Active-Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

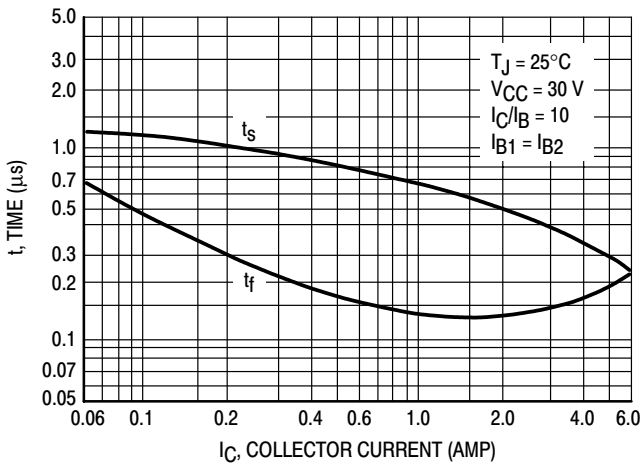


Figure 6. Turn-Off Time

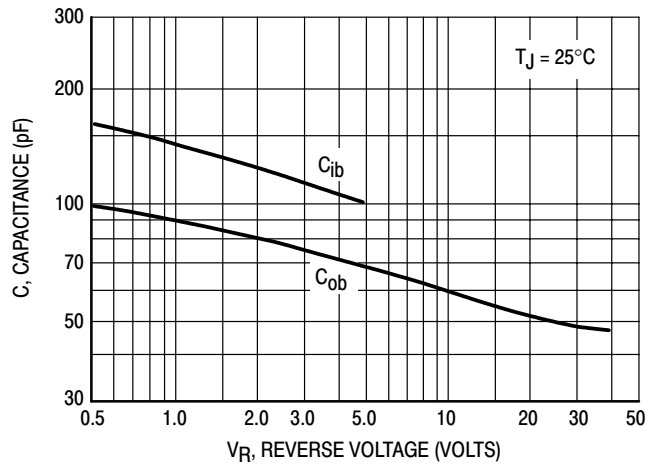


Figure 7. Capacitance

TIP41A TIP41B TIP41C TIP42A TIP42B TIP42C

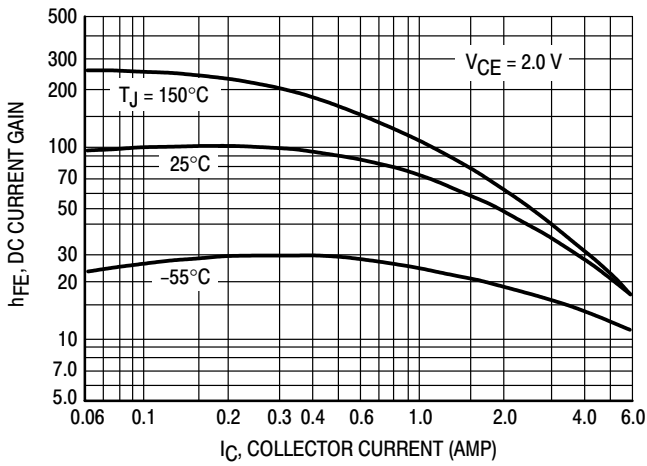


Figure 8. DC Current Gain

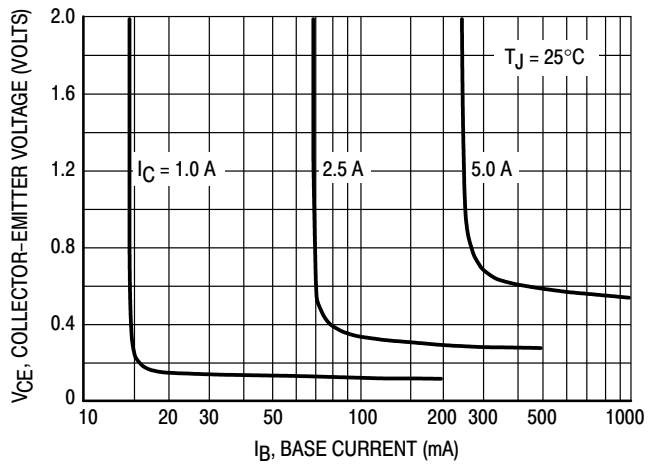


Figure 9. Collector Saturation Region

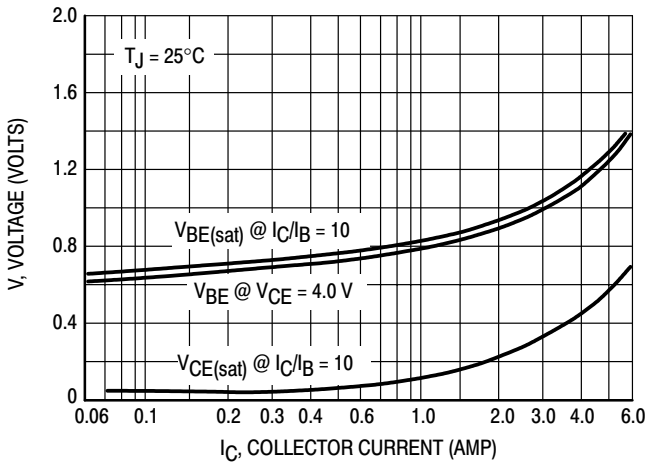


Figure 10. "On" Voltages

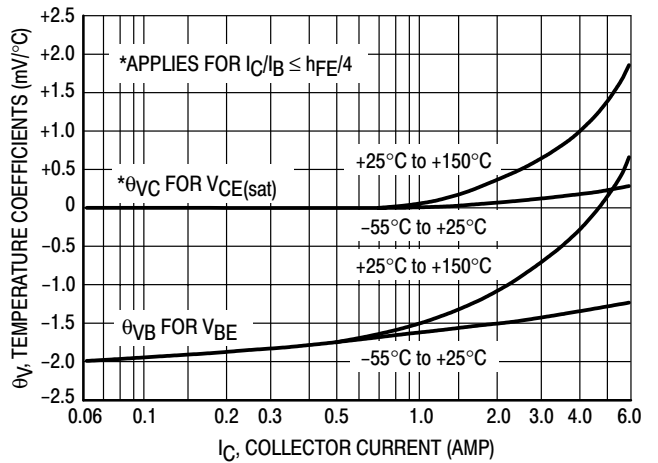


Figure 11. Temperature Coefficients

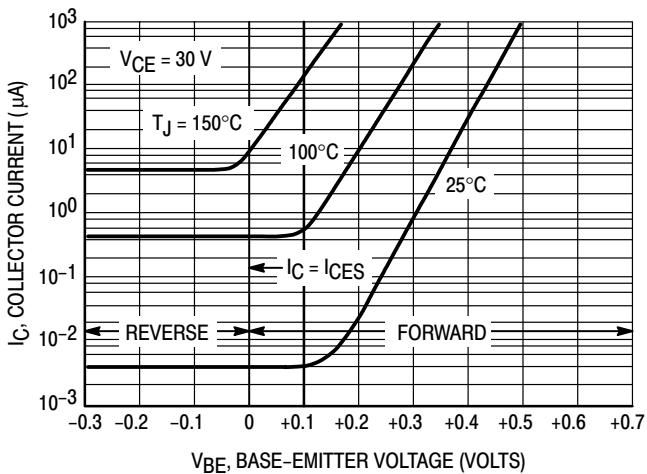


Figure 12. Collector Cut-Off Region

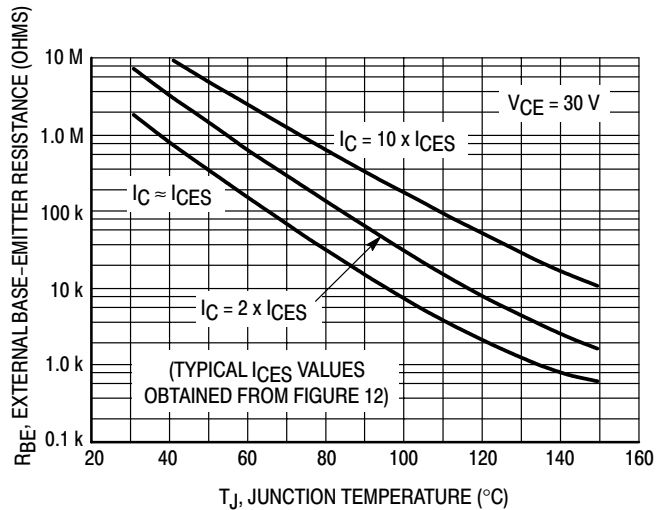
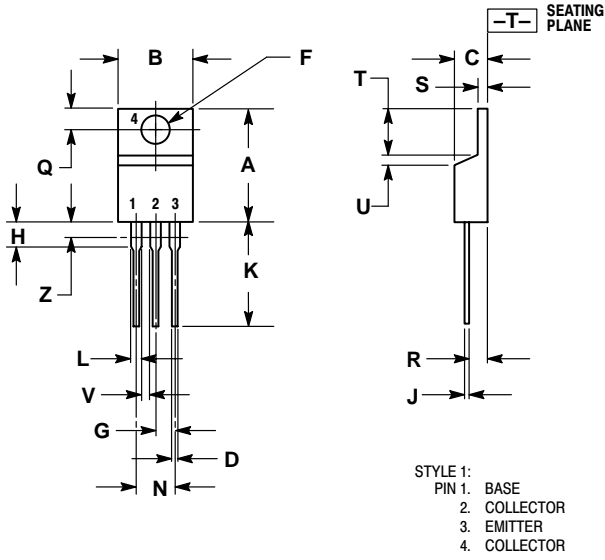


Figure 13. Effects of Base-Emitter Resistance

# TIP41A TIP41B TIP41C TIP42A TIP42B TIP42C

## PACKAGE DIMENSIONS

### TO-220AB CASE 221A-09 ISSUE AA



- 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	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	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

## Notes

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