

8961726 TEXAS INSTR (OPT0)

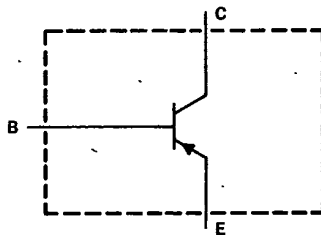
62C 36784 D

TIP34, TIP34A, TIP34B, TIP34C,
TIP34D, TIP34E, TIP34F
P-N-P SILICON POWER TRANSISTORS
JULY 1988 - REVISED OCTOBER 1984

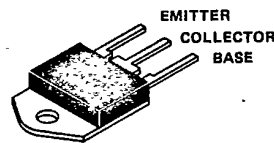
- Designed for Complementary Use With TIP33 Series
- 80 W at 25°C Case Temperature
- 10 A Continuous Collector Current
- 15 A Peak Collector Current
- Minimum f_T of 3 MHz at 10 V, 0.5 A

T-33-23

device schematic



TO-218AA PACKAGE



THE COLLECTOR IS IN ELECTRICAL
CONTACT WITH THE MOUNTING TAB

absolute maximum ratings at 25°C case temperature (unless otherwise noted)

	TIP34	TIP34A	TIP34B	TIP34C
Collector-base voltage	-80 V	-100 V	-120 V	-140 V
Collector-emitter voltage ($I_B = 0$)	-40 V	-60 V	-80 V	-100 V
Emitter-base voltage	-5 V			
Continuous collector current	-10 A			
Peak collector current (see Note 1)	-15 A			
Continuous base current	-3 A			
Safe operating area at 25°C case temperature	See Figure 4			
Continuous device dissipation at 25°C case temperature (see Note 2)	80 W			
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)	3.5 W			
Unclamped inductive load energy (see Note 4)	62.5 mJ			
Operating collector junction and storage temperature range	-65°C to 150°C			
Lead temperature 3,2 mm (0.125 inch) from case for 10 seconds	250°C			

- NOTES: 1. This value applies for $t_W = 0.3$ ms, duty cycle $\leq 10\%$.
 2. Derate linearly to 150°C case temperature at the rate of 0.64 W/°C.
 3. Derate linearly to 150°C free-air temperature at the rate of 28 mW/°C.
 4. This rating is based on the capability of the transistor to operate safely in the circuit in Figure 2.

5

TIP Devices

8961726 TEXAS INSTR (OPTO)

62C 36785 D

T-33-23

TIP34, TIP34A, TIP34B, TIP34C,
TIP34D, TIP34E, TIP34F
P-N-P SILICON POWER TRANSISTORS

absolute maximum ratings at 25°C case temperature (unless otherwise noted)

	TIP34D	TIP34E	TIP34F
Collector-base voltage	-160 V	-180 V	-200 V
Collector-emitter voltage ($I_B = 0$)	-120 V	-140 V	-160 V
Emitter-base voltage		-5 V	
Continuous collector current		-10 A	
Peak collector current (see Note 1)		-15 A	
Continuous base current		-3 A	
Safe operating area at 25°C case temperature	See Figure 4		
Continuous device dissipation at 25°C case temperature (see Note 2)		80 W	
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)		3.5 W	
Unclamped inductive load energy (see Note 4)		62.5 mJ	
Operating collector junction and storage temperature range		-65°C to 150°C	
Lead temperature 3.2 mm (0.125 inch) from case for 10 seconds		250°C	

- NOTES: 1. This value applies for $t_W = 0.3$ ms, duty cycle $\leq 10\%$.
2. Derate linearly to 150°C case temperature at the rate of 0.64 W/°C.
3. Derate linearly to 150°C free-air temperature at the rate of 28 mW/°C.
4. This rating is based on the capability of the transistor to operate safely in the circuit in Figure 2.

electrical characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	TIP34			TIP34A			TIP34B			TIP34C			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CEO}$	$I_C = -30$ mA, $I_B = 0$, See Note 5	-40			-60			-80			-100			V
I_{CEO}	$V_{CE} = -30$ V, $I_B = 0$, $V_{CE} = -60$ V, $I_B = 0$		-0.7			-0.7			-0.7			-0.7		mA
I_{CES}	$V_{CE} = -80$ V, $V_{BE} = 0$		-0.4											mA
	$V_{CE} = -100$ V, $V_{BE} = 0$					-0.4								
	$V_{CE} = -120$ V, $V_{BE} = 0$							-0.4						
	$V_{CE} = -140$ V, $V_{BE} = 0$										-0.4			
I_{EBO}	$V_{EB} = 5$ V, $I_C = 0$		-1			-1			-1			-1		mA
h_{FE}	$V_{CE} = -4$ V, $I_C = -1$ A, See Notes 5 and 6	40			40			40			40			
	$V_{CE} = -4$ V, $I_C = -3$ A, See Notes 5 and 6	20	100		20	100		20	100		20	100		
V_{BE}	$V_{CE} = -4$ V, $I_C = -3$ A, See Notes 5 and 6		-1.6			-1.6			-1.6			-1.6		V
	$V_{CE} = -4$ V, $I_C = -10$ A, See Notes 5 and 6		-3			-3			-3			-3		
$V_{CE(sat)}$	$I_B = -0.3$ A, $I_C = -3$ A, See Notes 5 and 6		-1			-1			-1			-1		V
	$I_B = -2.5$ A, $I_C = -10$ A, See Notes 5 and 6		-4			-4			-4			-4		
h_{fe}	$V_{CE} = -10$ V, $I_C = -0.5$ A, $f = 1$ kHz	20			20			20			20			
$ h_{fe} $	$V_{CE} = -10$ V, $I_C = -0.5$ A, $f = 1$ MHz	3			3			3			3			

- NOTES: 5. These parameters must be measured using pulse techniques, $t_W = 300$ μ s, duty cycle $\leq 2\%$.
6. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

8961726 TEXAS INSTR (OPT0)

62C 36786 D

TIP34, TIP34A, TIP34B, TIP34C,
TIP34D, TIP34E, TIP34F
P-N-P SILICON POWER TRANSISTORS

electrical characteristics at 25°C case temperature

T-33-23

PARAMETER	TEST CONDITIONS	TIP34D			TIP34E			TIP34F			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CEO}$	$I_C = -30 \text{ mA}$, $I_B = 0$, See Note 5	-120			-140			-160			V
I_{CEO}	$V_{CE} = -90 \text{ V}$, $I_B = 0$		-0.7			-0.7			-0.7		mA
I_{CES}	$V_{CE} = -160 \text{ V}$, $V_{BE} = 0$		-0.4								mA
	$V_{CE} = -180 \text{ V}$, $V_{BE} = 0$					-0.4					
	$V_{CE} = -200 \text{ V}$, $V_{BE} = 0$								-0.4		
I_{EBO}	$V_{EB} = -5 \text{ V}$, $I_C = 0$		-1			-1			-1		mA
h_{FE}	$V_{CE} = -4 \text{ V}$, $I_C = -1 \text{ A}$, See Notes 5 and 6	40			40			40			
	$V_{CE} = -4 \text{ V}$, $I_C = -3 \text{ A}$, See Notes 5 and 6	20			20			20			
V_{BE}	$V_{CE} = -4 \text{ V}$, $I_C = -3 \text{ A}$, See Notes 5 and 6		-1.6			-1.6			-1.6		V
	$V_{CE} = -4 \text{ V}$, $I_C = -10 \text{ A}$, See Notes 5 and 6		-3			-3			-3		
$V_{CE(sat)}$	$I_B = -0.3 \text{ A}$, $I_C = -3 \text{ A}$, See Notes 5 and 6		-1			-1			-1		V
	$I_B = -3.3 \text{ A}$, $I_C = -10 \text{ A}$, See Notes 5 and 6		-4			-4			-4		
h_{fe}	$V_{CE} = -10 \text{ V}$, $I_C = -0.5 \text{ A}$, $f = 1 \text{ kHz}$	20			20			20			
$ h_{fe} $	$V_{CE} = -10 \text{ V}$, $I_C = -0.5 \text{ A}$, $f = 1 \text{ MHz}$	3			3			3			

NOTES: 5. These parameters must be measured using pulse techniques, $t_w = 300 \mu\text{s}$, duty cycle $\leq 2\%$.

6. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$			1.56	°C/W
$R_{\theta JA}$			35.7	

resistive-load switching characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS †	MIN	TYP	MAX	UNIT
t_{on}	$I_C = -6 \text{ A}$, $I_{B1} = -0.6 \text{ A}$, $I_{B2} = 0.6 \text{ A}$		0.4		μs
t_{off}	$V_{BE(off)} = 4 \text{ V}$, $R_L = 5 \Omega$, See Figure 1		0.7		

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.



TIP Devices

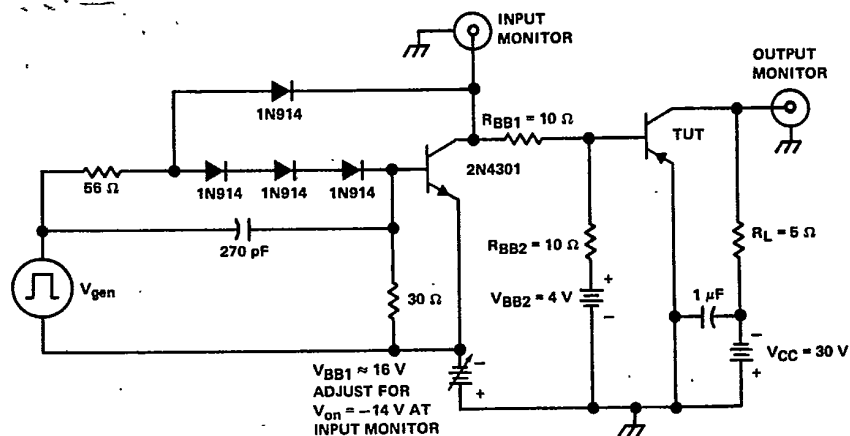
8961726 TEXAS INSTR (OPTO)

62C 36787 D

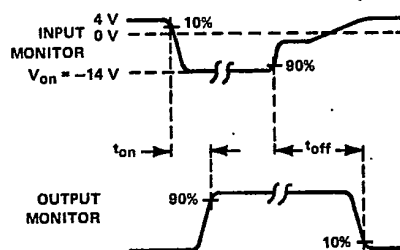
T-33-23

TIP34, TIP34A, TIP34B, TIP34C,
TIP34D, TIP34E, TIP34F
P-N-P SILICON POWER TRANSISTORS

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES:
- V_{gen} is a 30-V pulse into a 50 Ω termination.
 - The V_{gen} waveform is supplied by a generator with the following characteristics: $t_r \leq 15\text{ ns}$, $t_f \leq 15\text{ ns}$, $Z_{out} = 50\ \Omega$, $t_w = 20\ \mu\text{s}$, duty cycle $\leq 2\%$.
 - Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15\text{ ns}$, $R_{in} \geq 10\text{ M}\Omega$, $C_{in} \leq 11.5\text{ pF}$.
 - Resistors must be noninductive types.
 - The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1. RESISTIVE-LOAD SWITCHING

TIP Devices

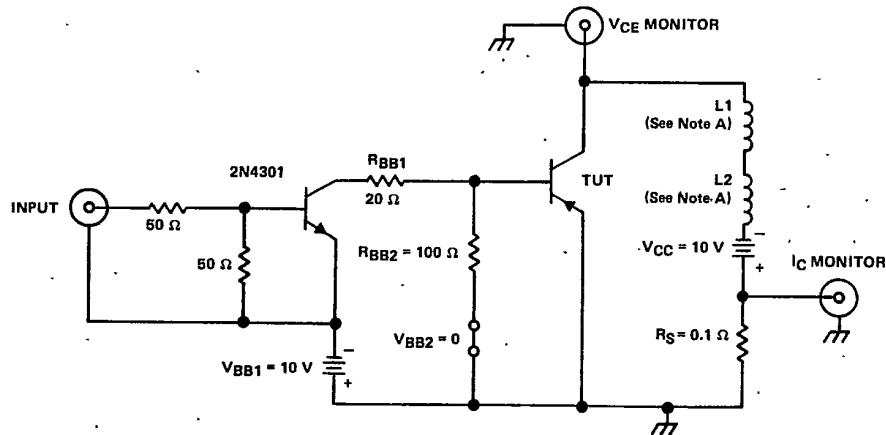
8961726 TEXAS INSTR (OPT0)

62C 36788 D

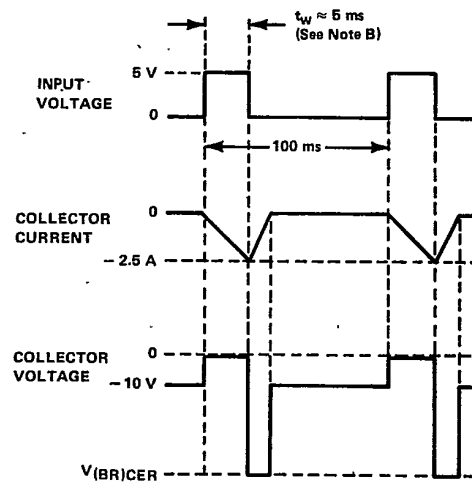
TIP34, TIP34A, TIP34B, TIP34C,
TIP34D, TIP34E, TIP34F
P-N-P SILICON POWER TRANSISTORS

PARAMETER MEASUREMENT INFORMATION

T-33-23



TEST CIRCUIT



VOLTAGE AND CURRENT WAVEFORMS

NOTES: A. L1 and L2 are 10 mH, 0.11 Ω , Chicago Standard Transformer Corporation C-2688, or equivalent.
B. Input pulse duration is increased until $I_{CM} = -2.5$ A.

FIGURE 2. INDUCTIVE-LOAD SWITCHING

5

TIP Devices

8961726 TEXAS INSTR (OPT0)

62C 36789 D

TIP34, TIP34A, TIP34B, TIP34C,
TIP34D, TIP34E, TIP34F
P-N-P SILICON POWER TRANSISTORS

T-33-23

TYPICAL CHARACTERISTICS
STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

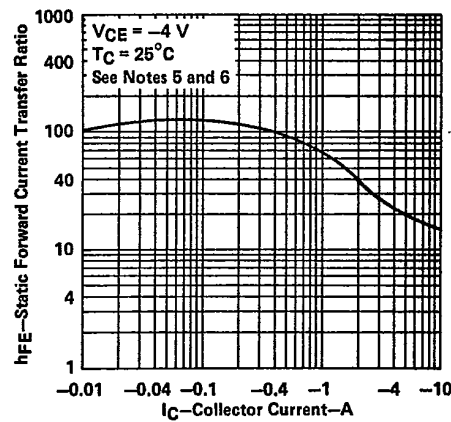


FIGURE 3

- NOTES: 5. These parameters must be measured using pulse techniques, $t_w = 300 \mu s$, duty cycle $\leq 2\%$.
6. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

MAXIMUM SAFE OPERATING AREA
FORWARD-BIAS SAFE OPERATING AREA

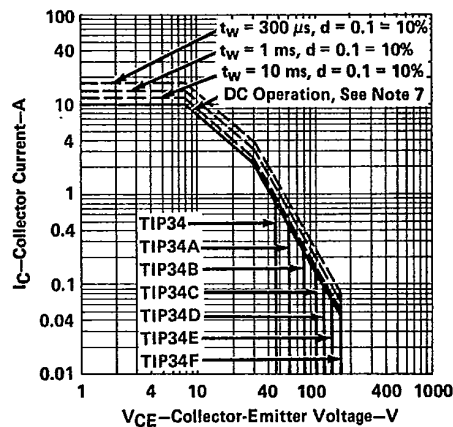


FIGURE 4

NOTE 7: This combination of maximum voltage and current may be achieved only when switching from saturation to cutoff with a clamped inductive load.

TIP Devices

8961726 TEXAS INSTR (OPT0)

62C 36790 D

TIP34, TIP34A, TIP34B, TIP34C,
TIP34D, TIP34E, TIP34F
P-N-P SILICON POWER TRANSISTORS

THERMAL INFORMATION
DISSIPATION DERATING CURVE

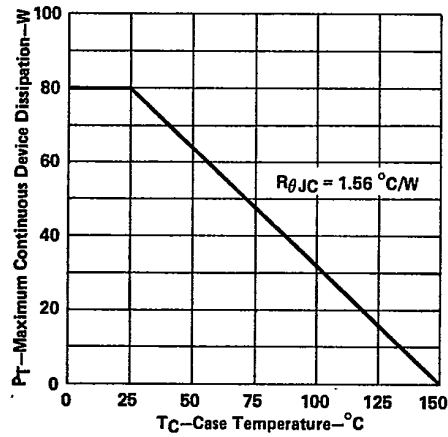
T-33-23

FIGURE 5

5

TIP Devices