

8961726 TEXAS INSTR (OPT0)

62C-36744 D

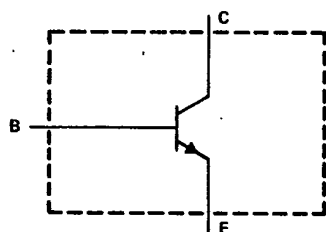
T-33-09

TIP29, TIP29A, TIP29B, TIP29C,
TIP29D, TIP29E, TIP29F
N-P-N SILICON POWER TRANSISTORS

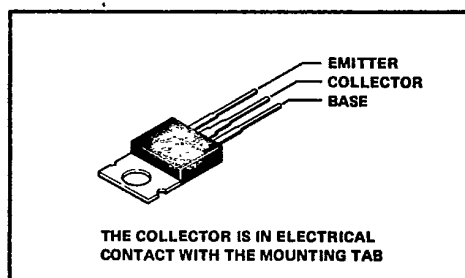
JULY 1968 - REVISED OCTOBER 1984

- Designed for Complementary Use With TIP30 series
- 30 W at 25°C Case Temperature
- 1 A Continuous Collector Current
- 3 A Peak Collector Current
- Minimum f_T of 3 MHz at 10 V, 0.2 A
- Customer-Specified Selections Available

device schematic



TO-220AB PACKAGE



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

	TIP29	TIP29A	TIP29B	TIP29C
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	1 A			
Peak collector current (see Note 1)	3 A			
Continuous base current	0.4 A			
Safe operating areas at 25°C case temperature	See Figure 4			
Continuous device dissipation at 25°C case temperature (see Note 2)	30 W			
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)	2 W			
Unclamped inductive load energy (see Note 4)	32 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 $t_W \leq 0.3$ ms, duty cycle $\leq 10\%$.
 2. Derate linearly to 150°C case temperature at the rate of 0.24 W/°C.
 3. Derate linearly to 150°C free-air temperature at the rate of 16 mW/°C.
 4. This rating is based on the capability of the transistor to operate safely in the circuit in Figure 2.

TIP Devices

8961726 TEXAS INSTR (OPT0)

62C 36745 D

T-33-09

TIP29, TIP29A, TIP29B, TIP29C,
TIP29D, TIP29E, TIP29F
N-P-N SILICON POWER TRANSISTORS

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

	TIP29D	TIP29E	TIP29F
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	1 A		
Peak collector current (see Note 1)	3 A		
Continuous base current	0.4 A		
Safe operating areas at 25°C case temperature	See Figure 4		
Continuous device dissipation at 25°C case temperature (see Note 2)	30 W		
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)	2 W		
Unclamped inductive load energy (see Note 4)	32 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 $t_W \leq 0.3$ ms, duty cycle $\leq 10\%$.
 2. Derate linearly to 150°C case temperature at the rate of 0.24 W/°C.
 3. Derate linearly to 150°C free-air temperature at the rate of 16 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	TIP29			TIP29A			TIP29B			TIP29C			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, $I_B = 0$	0.3			0.3					0.3			0.3	mA
	$V_{CE} = 60$ V, $I_B = 0$													
I_{CES}	$V_{CE} = 80$ V, $V_{BE} = 0$	0.2												mA
	$V_{CE} = 100$ V, $V_{BE} = 0$				0.2									
	$V_{CE} = 120$ V, $V_{BE} = 0$							0.2						
	$V_{CE} = 140$ V, $V_{BE} = 0$									0.2				
I_{EBO}	$V_{EB} = 5$ V, $I_C = 0$	1			1			1			1			mA
h_{FE}	$V_{CE} = 4$ V, $I_C = 0.2$ A, See Notes 5 and 6	40			40			40			40			
	$V_{CE} = 4$ V, $I_C = 1$ A, See Notes 5 and 6	15	75		15	75		15	75		15	75		
V_{BE}	$V_{CE} = 4$ V, $I_C = 1$ A, See Notes 5 and 6		1.3			1.3			1.3			1.3		V
$V_{CE(sat)}$	$I_B = 125$ mA, $I_C = 1$ A, See Notes 5 and 6		0.7			0.7			0.7			0.7		V
h_{fe}	$V_{CE} = 10$ V, $I_C = 0.2$ A, $f = 1$ MHz	20			20			20			20			
$ h_{fe} $	$V_{CE} = 10$ V, $I_C = 0.2$ A, $f = 1$ MHz	3			3			3			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.

TIP Devices

8961726 TEXAS INSTR (OPTO)

62C 36746 D

TIP29, TIP29A, TIP29B, TIP29C,
TIP29D, TIP29E, TIP29F
N-P-N SILICON POWER TRANSISTORS

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

T-33-09

PARAMETER	TEST CONDITIONS	TIP29D			TIP29E			TIP29F			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CEO}$	$I_C = 30\text{ mA}$, See Note 5				120			140			V
I_{CEO}	$V_{CE} = 90\text{ V}$, $I_B = 0$				0.3			0.3			mA
I_{CES}	$V_{CE} = 160\text{ V}$, $V_{BE} = 0$			0.2							mA
	$V_{CE} = 180\text{ V}$, $V_{BE} = 0$						0.2				
	$V_{CE} = 200\text{ V}$, $V_{BE} = 0$									0.2	
I_{EBO}	$V_{EB} = 5\text{ V}$, $I_C = 0$			1			1			1	mA
h_{FE}	$V_{CE} = 4\text{ V}$, See Notes 5 and 6 $I_C = 0.2\text{ A}$		40			40			40		
	$V_{CE} = 4\text{ V}$, See Notes 5 and 6 $I_C = 1\text{ A}$		15			15			15		
V_{BE}	$V_{CE} = 4\text{ V}$, See Notes 5 and 6 $I_C = 1\text{ A}$			1.3			1.3			1.3	V
$V_{CE(sat)}$	$I_B = 125\text{ mA}$, See Notes 5 and 6 $I_C = 1\text{ A}$			0.7			0.7			0.7	V
h_{fe}	$V_{CE} = 10\text{ V}$, $f = 1\text{ MHz}$ $I_C = 0.2\text{ A}$		20			20			20		
$ h_{fe} $	$V_{CE} = 10\text{ V}$, $f = 1\text{ MHz}$ $I_C = 0.2\text{ A}$		3			3			3		

NOTES: 5. These parameters must be measured using pulse techniques, $t_w = 300\text{ }\mu\text{s}$, 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
$R_{\theta JC}$			4.17	$^{\circ}\text{C/W}$
$R_{\theta JA}$			62.5	

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

PARAMETER	TEST CONDITIONS†			MIN	TYP	MAX	UNIT
t_{on}	$I_C = 1\text{ A}$, $I_{B1} = 0.1\text{ A}$, $I_{B2} = -0.1\text{ A}$, $V_{BE(off)} = -4.3\text{ V}$, $R_L = 30\text{ }\Omega$, See Figure 1				0.5		μs
t_{off}					2		

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

TIP Devices

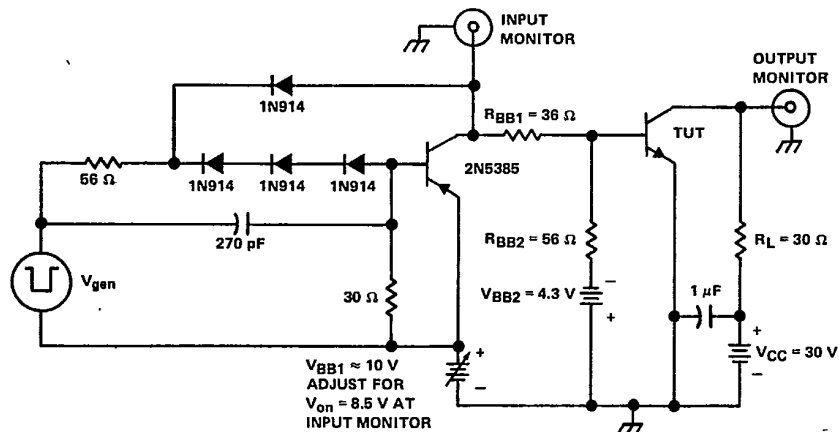
8961726 TEXAS INSTR (OPT0)

62C 36747 D

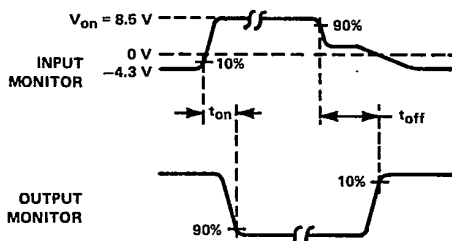
T-33-09

TIP29, TIP29A, TIP29B, TIP29C,
TIP29D, TIP29E, TIP29F
N-P-N SILICON POWER TRANSISTORS

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. V_{gen} is a -30-V pulse into a 50Ω termination.
B. 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 $\leq 2\%$.
C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15 \text{ ns}$, $R_{in} \geq 10 \text{ M}\Omega$, $C_{in} \leq 11.5 \text{ pF}$.
D. Resistors must be noninductive types.
E. The d-c power supplies may require additional bypassing in order to minimize ringing.

FIGURE 1. RESISTIVE-LOAD SWITCHING

TIP Devices

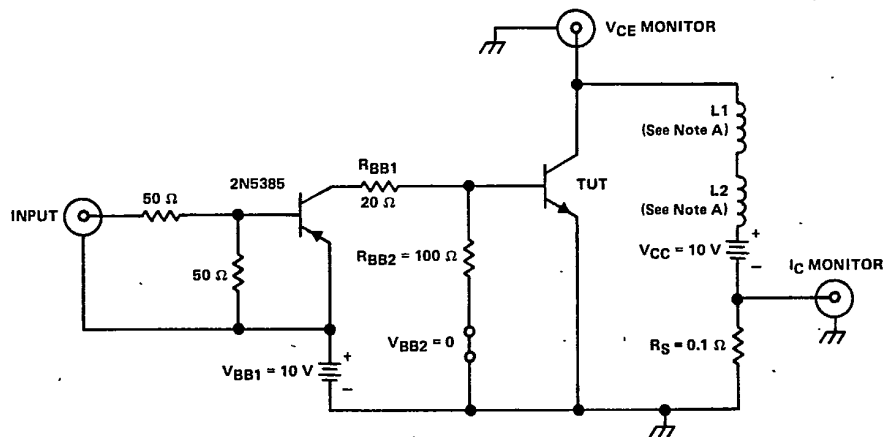
8961726 TEXAS INSTR (OPTO)

62C 36748 D

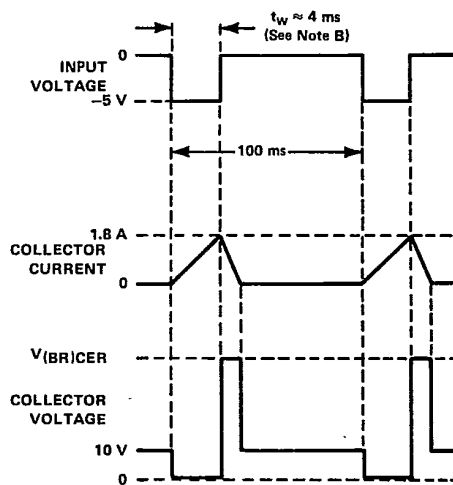
TIP29, TIP29A, TIP29B, TIP29C,
TIP29D, TIP29E, TIP29F
N-P-N SILICON POWER TRANSISTORS

PARAMETER MEASUREMENT INFORMATION

T-33-09



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 $I_{CM} = 1.8\text{ A}$.

FIGURE 2. INDUCTIVE-LOAD SWITCHING

8961726 TEXAS INSTR (OPTO)

62C 36749 D

T-33-09

TIP29, TIP29A, TIP29B, TIP29C,
TIP29D, TIP29E, TIP29F
N-P-N SILICON POWER TRANSISTORS

TYPICAL CHARACTERISTICS

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

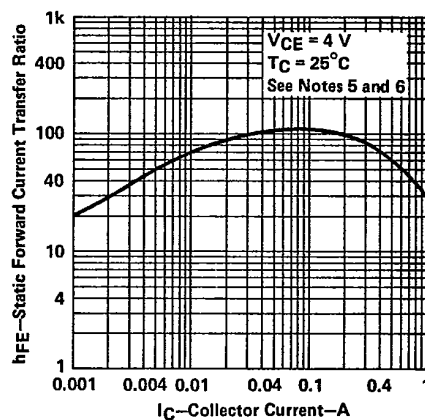


FIGURE 3

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

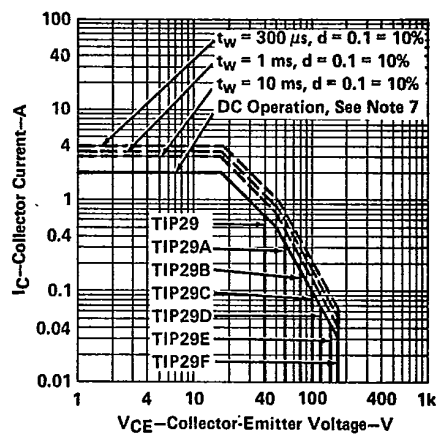


FIGURE 4

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 (OPTO)

62C 36750 D

TIP29, TIP29A, TIP29B, TIP29C,
TIP29D, TIP29E, TIP29F
N-P-N SILICON POWER TRANSISTORS

THERMAL INFORMATION

7-33-09

DISSIPATION DERATING CURVE

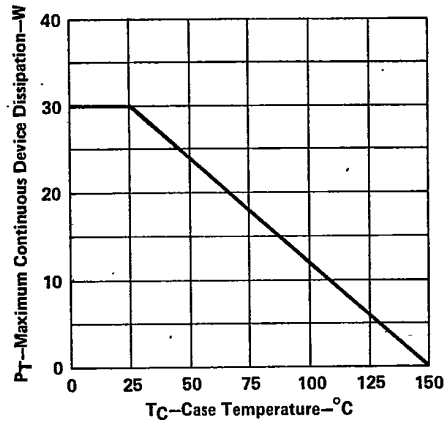


FIGURE 5

5

TIP Devices