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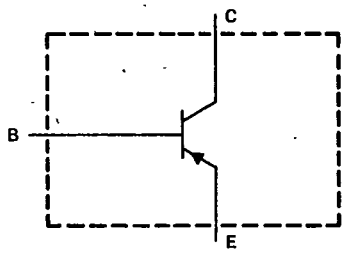
TIP30, TIP30A, TIP30B, TIP30C, TIP30D, TIP30E, TIP30F
P-N-P SILICON POWER TRANSISTORS

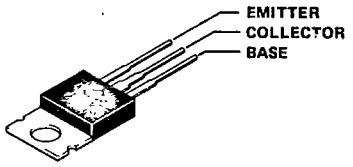
JULY 1968 – REVISED OCTOBER 1984

- Designed for Complementary Use With TIP29 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
- Designed for Power Amplifier and High-Speed Switching Applications

device schematic



TO-220AB PACKAGE



THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE MOUNTING TAB

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

	TIP30	TIP30A	TIP30B	TIP30C
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 area 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 ≤ 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 16mW/°C.
4. This rating is based on the capability of the transistor to operate safely in the circuit in Figure 2.

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TIP30, TIP30A, TIP30B, TIP30C, TIP30D, TIP30E, TIP30F
P-N-P SILICON POWER TRANSISTORS

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

	TIP30D	TIP30E	TIP30F
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 area 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 ≤ 10%.
2. Derate linearly to 150°C case temperature at the rates 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

PARAMETER	TEST CONDITIONS	TIP30			TIP30A			TIP30B			TIP30C			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							mA
	V_{CE} = −60 V, I_B = 0									−0.3			−0.3	
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 = −0.2A, See Notes 5 and 6	20			20			20			20			
	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 kHz	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 μs, duty cycle ≤ 2%.
6. These parameters are measured using voltage-sensing contacts separate from the current-carrying contacts.

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electrical characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS	TIP30D			TIP30E			TIP30F			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CEO}$	$I_C = -30$ mA, $I_B = 0$, See Note 5	−120			−140			−160			V
I_{CEO}	$V_{CE} = -90$ V, $I_B = 0$			−0.3			−0.3			−0.3	mA
I_{CES}	$V_{CE} = -90$ V, $V_{BE} = 0$			−0.2							mA
	$V_{CE} = -180$ V, $V_{BE} = 0$						−0.2				
	$V_{CE} = -200$ V, $V_{BE} = 0$									−0.2	
I_{EBO}	$V_{EB} = -5$ V, $I_C = 0$			−1			−1			−1	mA
h_{FE}	$V_{CE} = -4$ V, $I_C = -0.2$ A, See Notes 5 and 6	40			40			40			
	$V_{CE} = -4$ V, $I_C = -1$ A, See Notes 5 and 6	15			15			15			
V_{BE}	$V_{CE} = -4$ V, $I_C = -1$ A, See Notes 5 and 6			−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	V
h_{fe}	$V_{CE} = -10$V, $I_C = -0.2$ A, f = 1 kHz	20			20			20			
$\lvert h_{fe} \rvert$	$V_{CE} = -10$ V, $I_C = -0.2$ A, f = 1 MHz	3			3						

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

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$			4.17	°C/W
$R_{\theta JA}$			62.5	

resistive-load switching characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS†			MIN	TYP	MAX	UNIT
t_{on}	$I_C = -1$ A,	$I_{B1} = -0.1$ A,	$I_{B2} = 0.1$ A,		0.3		μs
t_{off}	$V_{BE(off)} = 4.3$ V,	$R_L = 30\,\Omega$,	See Figure 1		1		

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

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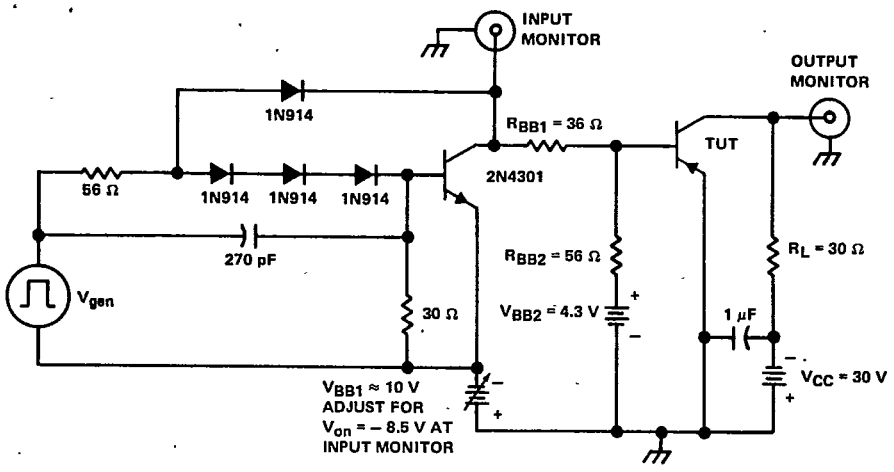
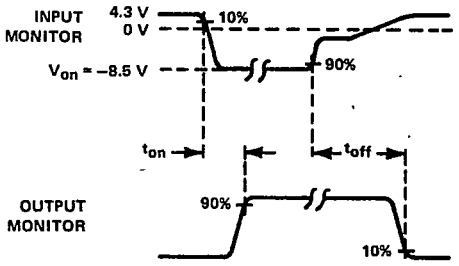
PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. V_{gen} is a 30-V pulse into a 50 Ω termination.
B. The V_{gen} waveform is supplied by the following characteristics: $t_r \leq 15$ ns, $t_f \leq 15$ ns, $Z_{out} = 50\,\Omega$, $t_w = 20\,\mu s$, duty cycle ≤ 2%.
C. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15$ ns, $R_{in} \geq 10\,M\Omega$, $C_{in} \leq 11.5$ 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

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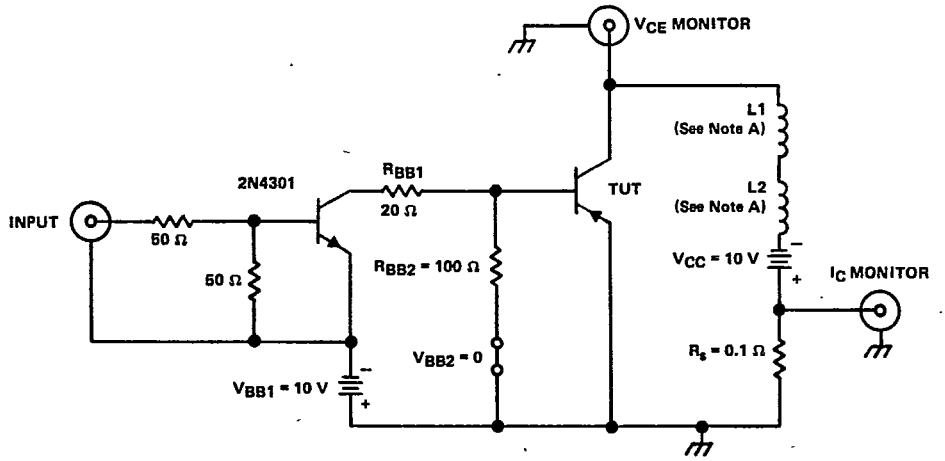
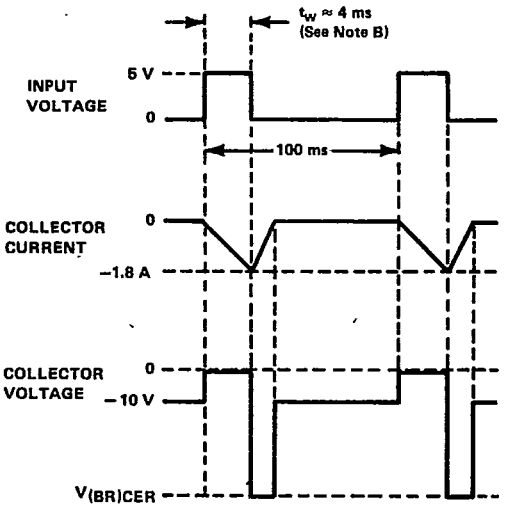
PARAMETER MEASUREMENT INFORMATION



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 $I_{CM} = -1.8$ A

FIGURE 2. INDUCTIVE-LOAD SWITCHING

TIP30, TIP30A, TIP30B, TIP30C, TIP30D, TIP30E, TIP30F P-N-P SILICON POWER TRANSISTORS

TYPICAL CHARACTERISTICS

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

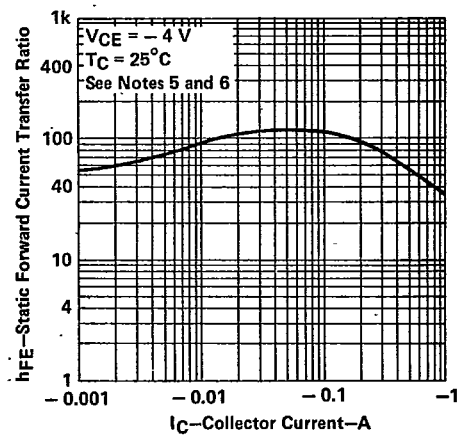


FIGURE 3

NOTES: 5. These parameters must be measured using pulse techniques, t_w = 300 μs, duty cycle ≤ 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

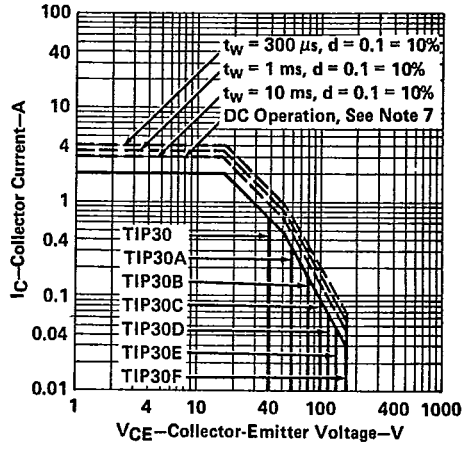


FIGURE 4

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

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THERMAL INFORMATION

DISSIPATION DERATING CURVE

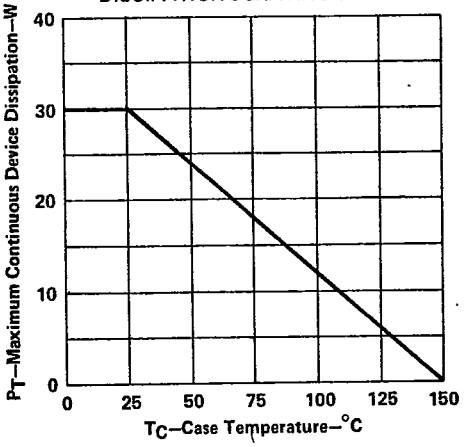

FIGURE 5