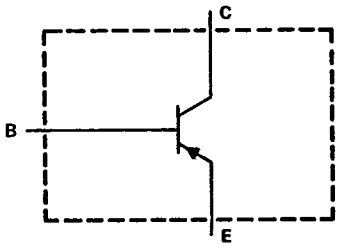
TIP42, TIP42A, TIP42B, TIP42C, TIP42D, TIP42E, TIP42F
P-N-P SILICON POWER TRANSISTORS

REVISED OCTOBER 1984

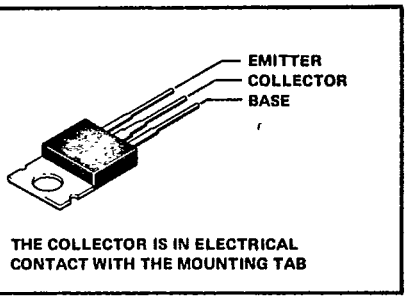
T-33-21

- Designed for Complimentary Use With TIP41 Series
- 65 W at 25°C Case Temperature
- 6 A Continuous Collector Current
- 10 A Peak Collector Current
- Minimum f_T of 3 MHz at 10 V, 0.5 A
- Customer-Specified Selections Available

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)

	TIP42	TIP42A	TIP42B	TIP42C
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	−6 A			
Peak collector current (see Note 1)	−10 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)	65 W			
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)	2 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 $t_w \leq 0.3$ ms, duty cycle ≤ 10%.
2. Derate linearly to 150°C case temperature at the rate of 0.52 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.

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TIP42, TIP42A, TIP42B, TIP42C, TIP42D, TIP42E, TIP42F
P-N-P SILICON POWER TRANSISTORS

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

	TIP42D	TIP42E	TIP42F
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	−6 A		
Peak collector current (see Note 1)	−10 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)	65 W		
Continuous device dissipation at (or below) 25°C free-air temperature (see Note 3)	2 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 $t_w \leq 0.3$ ms, duty cycle ≤ 10%.
2. Derate linearly to 150°C case temperature at the rate of 0.52 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	TIP42			TIP42A			TIP42B			TIP42C			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			−0.7			−0.7							mA
	V_{CE} = −60 V, I_B = 0									−0.7			−0.7	
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 = −0.3 A, See Notes 5 and 6	30			30			30			30			
	V_{CE} = −4 V, I_C = −3 A, See Notes 5 and 6	15		75	15		75	15		75	15		75	
V_{BE}	V_{CE} = −4 V, I_C = −6 A, See Notes 5 and 6			−2			−2			−2			−2	V
$V_{CE(sat)}$	I_B = −0.6 A, I_C = −6 A, See Notes 5 and 6			−1.5			−1.5			−1.5			−1.5	V
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 μs, duty cycle ≤ 2%.
6. These parameters are measured with voltage-sensing separate from the current-carrying contacts.

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TIP42, TIP42A, TIP42B, TIP42C, TIP42D, TIP42E, TIP42F
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electrical characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	TIP42D	TIP42E	TIP42F	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, $I_B = 0$	−0.7	−0.7	−0.7	mA
I_{CES}	$V_{CE} = -160$ V, $V_{BE} = 0$	−0.4			mA
	$V_{CE} = -180$ V, $V_{BE} = 0$		−0.4		
	$V_{CE} = -200$ V, $V_{BE} = 0$			−0.4	
I_{EBO}	$V_{EB} = -5$ V, $I_C = 0$	−1	−1	−1	mA
h_{FE}	$V_{CE} = -4$ V, $I_C = -0.3$ A, See Notes 5 and 6	30	30	30	
	$V_{CE} = -4$ V, $I_C = -3$ A, See Notes 5 and 6	15	15	15	
V_{BE}	$V_{CE} = -4$ V, $I_C = -6$ A, See Notes 5 and 6	−2	−2	−2	V
$V_{CE(sat)}$	$I_B = -1.5$ A, $I_C = -6$ A, See Notes 5 and 6	−1.5	−1.5	−1.5	V
h_{fe}	$V_{CE} = -10$ V, $I_C = -0.5$ A, f = 1 kHz	20	20	20	
$\|h_{fe}\|$	$V_{CE} = -10$ V, $I_C = -0.5$ A, f = 1 MHz	3	3	3	

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

thermal characteristics

PARAMETER	MIN TYP MAX	UNIT
$R_{\theta JC}$	1.92	°C/W
$R_{\theta JA}$	62.5	

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

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

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

TIP42, TIP42A, TIP42B, TIP42C, TIP42D, TIP42E, TIP42F
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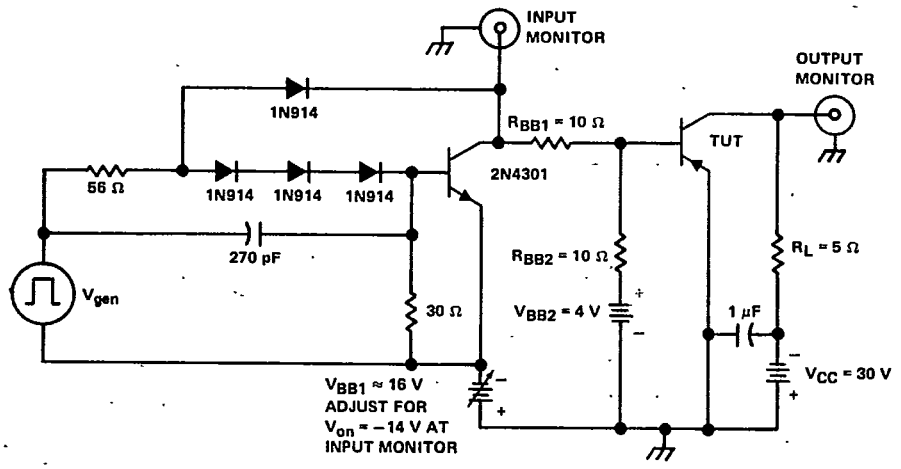
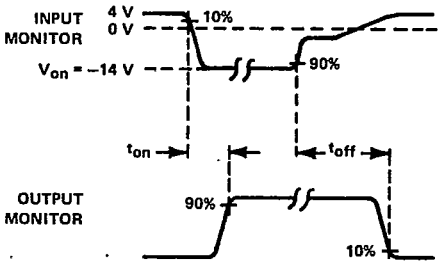
PARAMETER MEASUREMENT INFORMATION



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 a generator with 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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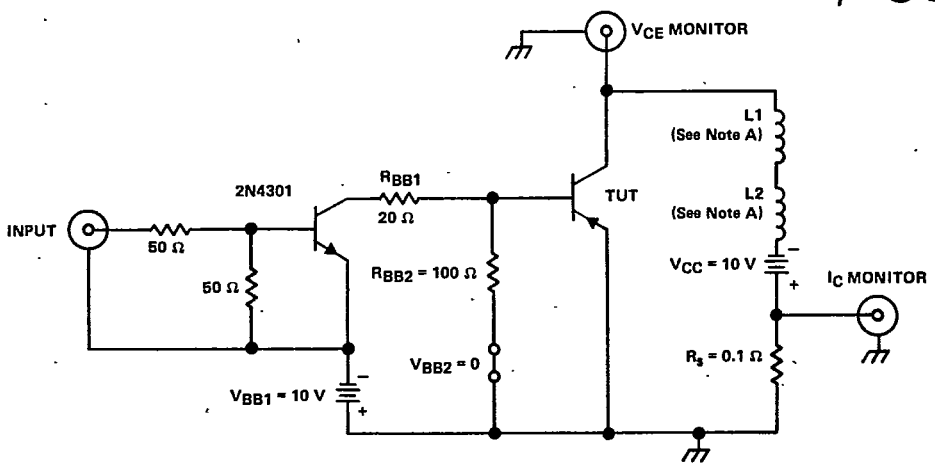
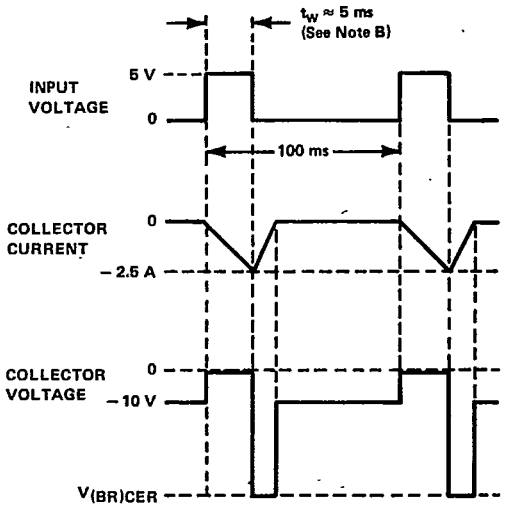
PARAMETER MEASUREMENT INFORMATION



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 $I_{CM} = -2.5$ A.

FIGURE 2. INDUCTIVE-LOAD SWITCHING

TIP42, TIP42A, TIP42B, TIP42C, TIP42D, TIP42E, TIP42F
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TYPICAL CHARACTERISTICS

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

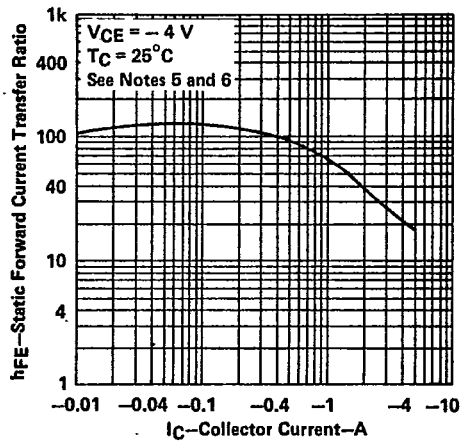

FIGURE 3

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

MAXIMUM SAFE OPERATING AREA

FORWARD-BIAS SAFE OPERATING AREA

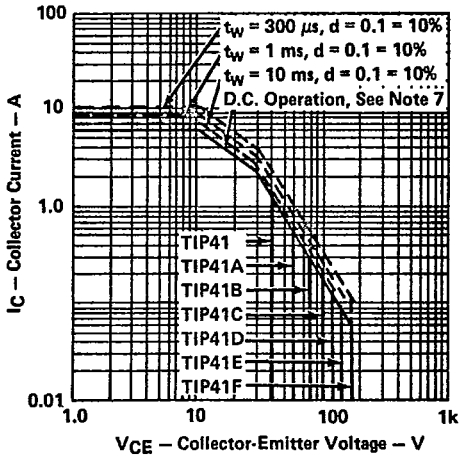

FIGURE 4

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

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THERMAL INFORMATION

DISSIPATION DERATING CURVE

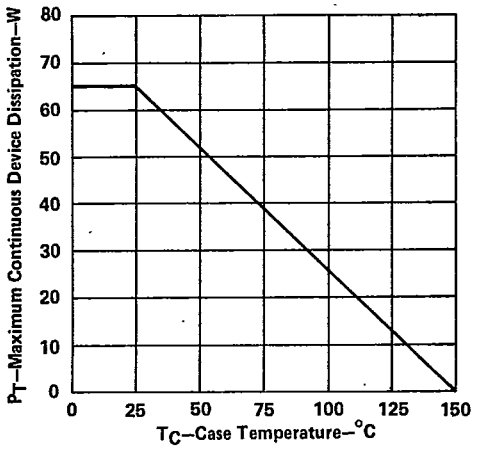

FIGURE 5