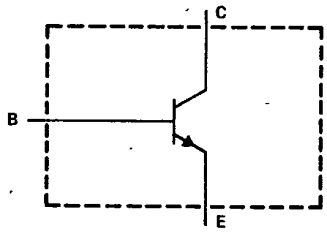
TIPL751, TIPL751A
N-P-N SILICON POWER TRANSISTORS

T-33-13

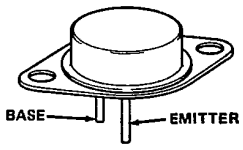
OCTOBER 1982 – REVISED OCTOBER 1984

- 120 W at 25°C Case Temperature
- 4 A Continuous Collector Current
- 8 A Peak Collector Current
- Operating Characteristics Fully Guaranteed at 100°C
- Transient Power Dissipation Guaranteed at 100°C
- I_{CES} < 100 μA at Maximum Rated V_{CE} at 100°C
- 1000 V Blocking Capability
- High Sustaining Voltage
  TIPL751 . . . 375 V Min.
  TIPL751A . . . 420 V Min.
- Designed for High-Voltage, Inductive-Load Switching Applications

device schematic



TO-3 PACKAGE



THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE CASE

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

	TIPL751	TIPL751A
Collector-base voltage (I_E = 0)	800 V	1000 V
Collector-emitter voltage (V_{BE} = 0)	800 V	1000 V
Collector-emitter voltage (I_B = 0)	375 V	420 V
Base-emitter voltage	10 V	
Continuous collector current	4 A	
Peak collector current (see Note 1)	8 A	
Continuous device dissipation at (or below) 25°C case temperature (see Figure 12)	120 W	
Operating junction and storage temperature range	−65°C to 200°C	

NOTE 1: This value applies for $t_w \leq 10$ ms, duty cycle ≤ 2%.

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

PARAMETER	TEST CONDITIONS			TIPL751		TIPL751A		UNIT
				MIN	TYP MAX	MIN	TYP MAX	
$V_{CEO(sus)}$	I_C = 100 mA,	L = 25 mH,	See Note 2	375		420		V
I_{CEO}	V_{CE} = 375 V,	I_B = 0			50			μA
	V_{CE} = 420 V,	I_B = 0					50	
I_{CES}	V_{CE} = 800 V,	V_{BE} = 0			50			μA
	V_{CE} = 800 V,	V_{BE} = 0,	T_C = 100°C		100			
	V_{CE} = 1000 V,	V_{BE} = 0					50	
	V_{CE} = 1000 V,	V_{BE} = 0,	T_C = 100°C				100	
I_{EBO}	V_{EB} = 10 V,	I_C = 0			1		1	mA
h_{FE}	V_{CE} = 5 V,	I_C = 0.5 A,	See Notes 3 and 4	20	60	20	60	
$V_{CE(sat)}$	I_C = 1 A,	I_B = 0.2 A,	See Notes 3 and 4		0.5		0.5	V
	I_C = 2.5 A,	I_B = 0.5 A,	See Notes 3 and 4		1		1	
	I_C = 4 A,	I_B = 0.8 A,	See Notes 3 and 4		2.5		2.5	
	I_C = 4 A,	I_B = 0.8 A,	See Notes 3 and 4, T_C = 100°C		5		5	
$V_{BE(sat)}$	I_C = 1 A,	I_B = 0.2 A,	See Notes 3 and 4		1		1	V
	I_C = 2.5 A,	I_B = 0.5 A,	See Notes 3 and 4		1.2		1.2	
	I_C = 4 A,	I_B = 0.8 A,	See Notes 3 and 4		1.4		1.4	
	I_C = 4 A,	I_B = 0.8 A,	See Notes 3 and 4, T_C = 100°C		1.3		1.3	
f_T	V_{CE} = 10 V,	I_C = 0.5 A,	See Note 5		12		12	MHz
C_{obo}	V_{CB} = 20 V,	I_E = 0,	f = 0.1 MHz		110		110	pF

NOTES: 2. Inductive loop switching measurement.
3. These parameters must be measured using pulse techniques, t_w = 300 μs, duty cycle ≤ 2%.
4. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 3,2 mm (0.125 inch) from the device body.
5. To obtain f_T, the $|h_{fe}|$ response is extrapolated at the rate of −6 dB per octave from f = MHz to the frequency at which $|h_{fe}| = 1$.

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$			1.46	°C/W

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

PARAMETER	TEST CONDITIONS				MIN	TYP	MAX	UNIT
t_{on}	I_C = 4 A,	V_{CC} = 200 V,	I_{B1} = 0.8 A,				0.55	μs
t_s	I_{B2} = −0.8 A,	T_C = 25°C,	See Figure 1				2.5	μs
t_f							0.5	μs
t_{on}	I_C = 4 A,	V_{CC} = 200 V,	I_{B1} = 0.8 A,				0.65	μs
t_s	I_{B2} = −0.8 A,	T_C = 100°C,	See Figure 1				3	μs
t_f							1	μs

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

PARAMETER	TEST CONDITIONS				MIN	TYP	MAX	UNIT
t_{sv}	I_C = 4 A,	I_{B1} = 0.8 A,	T_C = 25°C,				2.5	μs
t_{rv}	$V_{BE(off)}$ = −5 V,	See Figure 2					0.3	μs
t_{fi}							0.25	μs
t_{ti}							0.15	μs
t_{xo}							0.4	μs
t_{sv}	I_C = 4 A,	I_{B1} = 0.8 A,	T_C = 100°C,				3	μs
t_{rv}	$V_{BE(off)}$ = −5 V,	See Figure 2					0.5	μs
t_{fi}							0.25	μs
t_{ti}							0.15	μs
t_{xo}							0.75	μs

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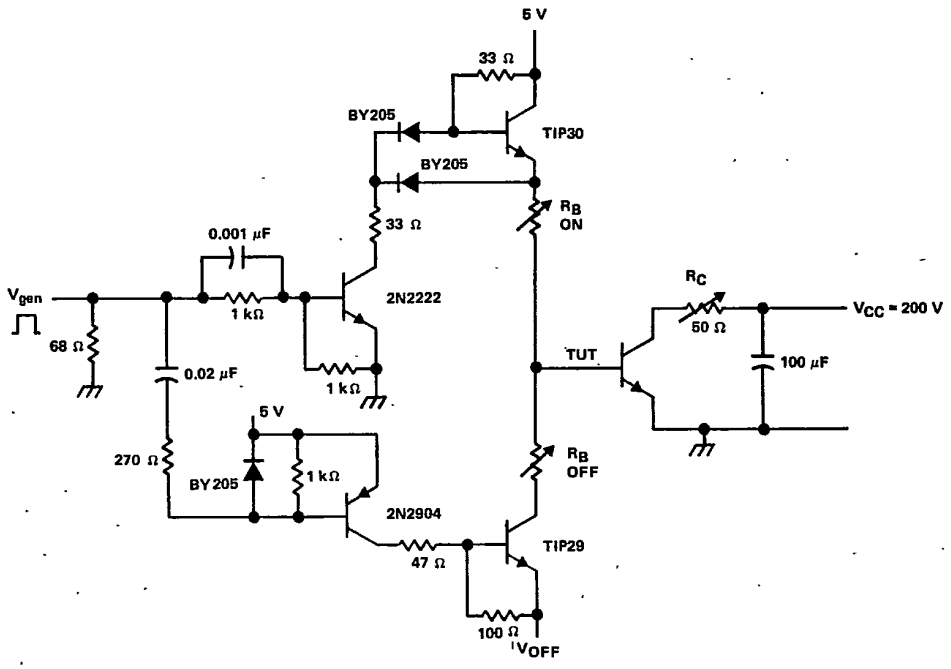
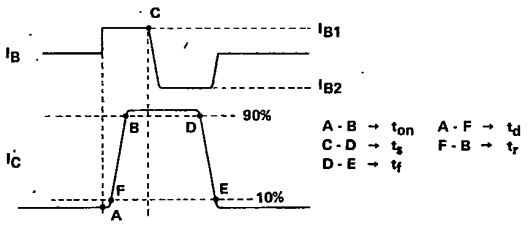
PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. 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 $\leq 2\%$.
B. 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.
C. Resistors must be noninductive types.

FIGURE 1. RESISTIVE-LOAD SWITCHING

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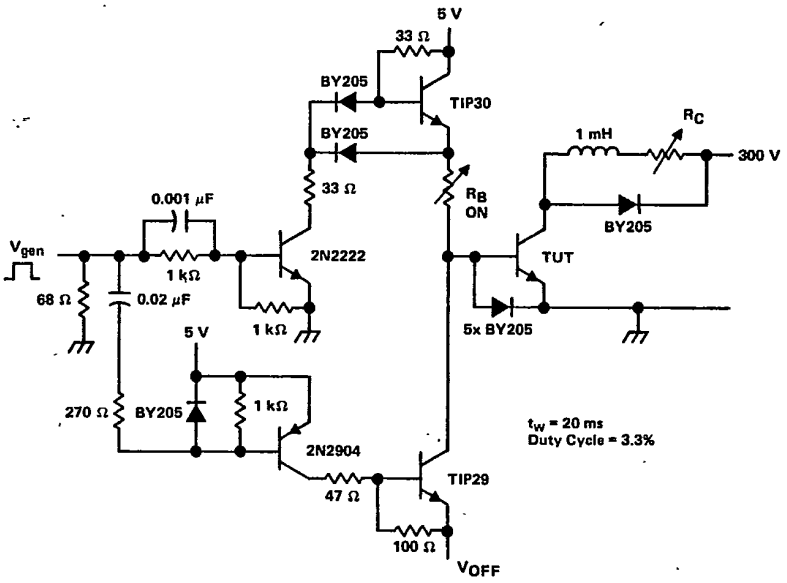
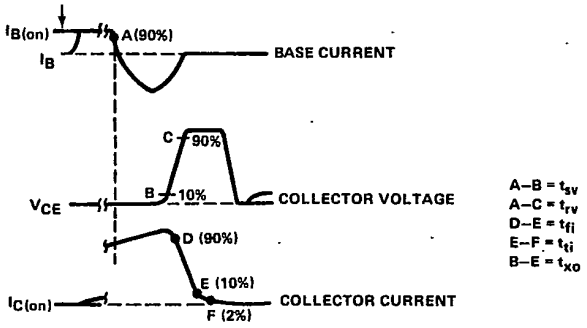
N-P-N SILICON POWER TRANSISTORS

PARAMETER MEASUREMENT INFORMATION



ADJUST R_C FOR REQUIRED I_C

TEST CIRCUIT



VOLTAGE AND CURRENT WAVEFORMS

NOTES: A. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15$ ns, $R_{in} \geq 10\,\Omega$ and $C_{in} \leq 11.5$ pF.
B. Resistors must be noninductive types.

FIGURE 2. INDUCTIVE-LOAD SWITCHING

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1283

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T-33-13

TYPICAL CHARACTERISTICS

TURN-ON TIME
vs
COLLECTOR CURRENT

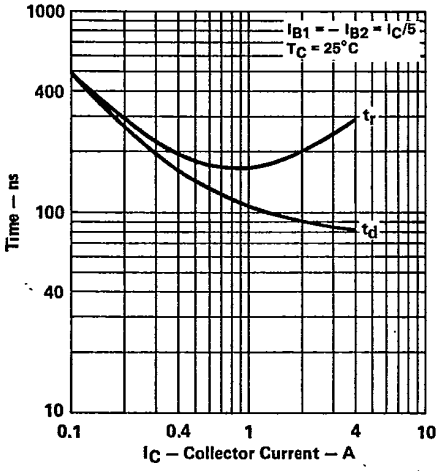

FIGURE 3

TURN-OFF TIME
vs
COLLECTOR CURRENT

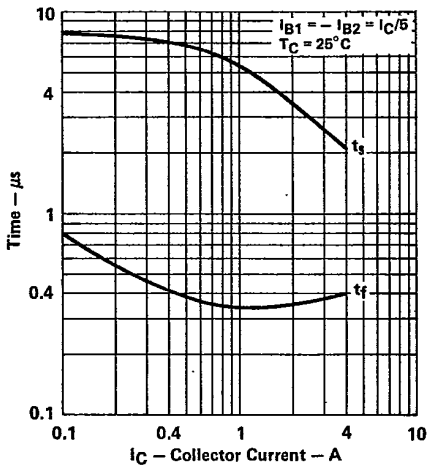

FIGURE 4

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
BASE CURRENT

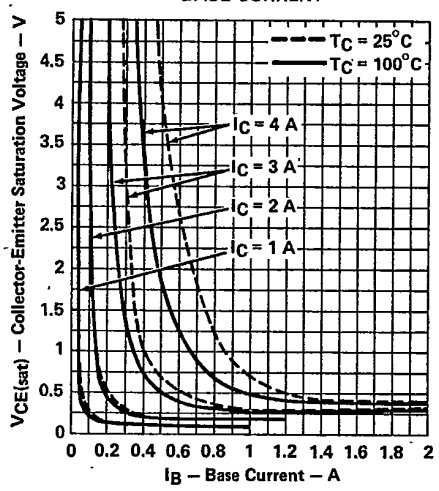

FIGURE 5

BASE-EMITTER SATURATION VOLTAGE
vs
BASE CURRENT

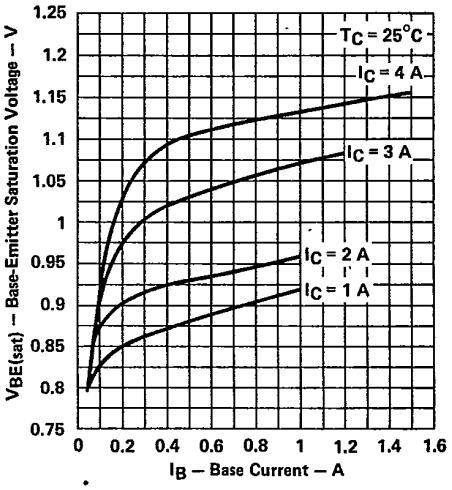

FIGURE 6

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TYPICAL CHARACTERISTICS

FORWARD CURRENT TRANSFER RATIO vs COLLECTOR CURRENT

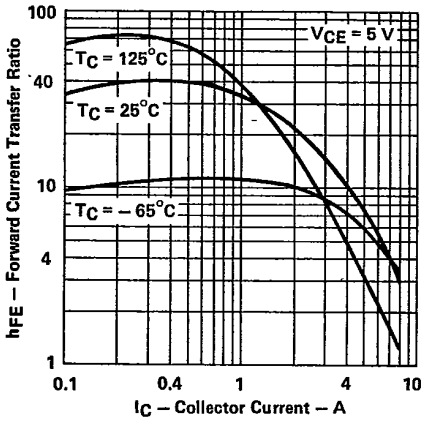

FIGURE 7

COLLECTOR CUTOFF CURRENT vs CASE TEMPERATURE

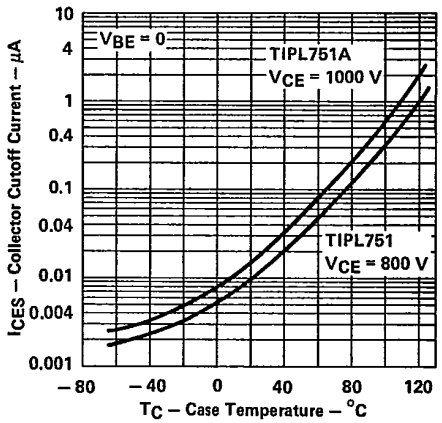

FIGURE 8

MAXIMUM SAFE OPERATING AREA

FORWARD-BIAS SAFE OPERATING AREA

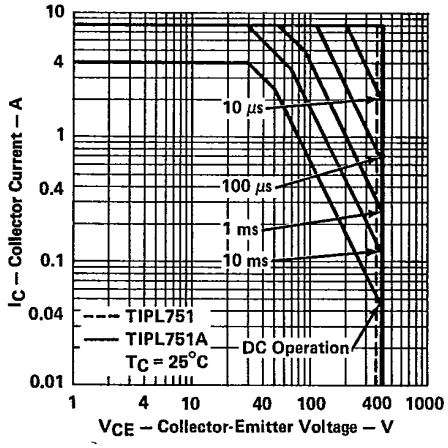

FIGURE 9

LIMITING CONDITIONS FOR POWER-DOWN TRANSIENT

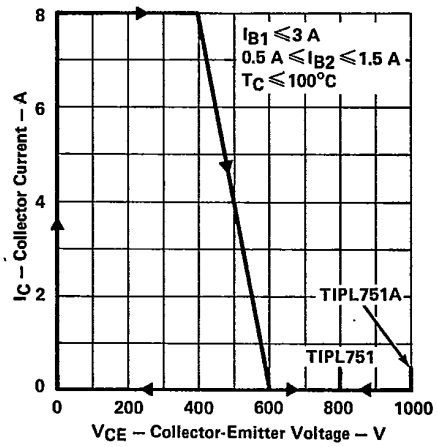

FIGURE 10

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THERMAL INFORMATION

THERMAL RESPONSE

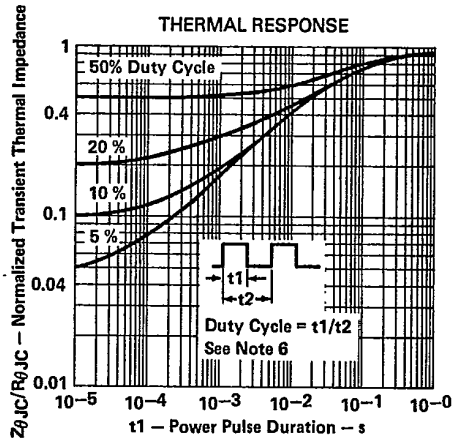

FIGURE 11

DISSIPATION DERATING CURVE

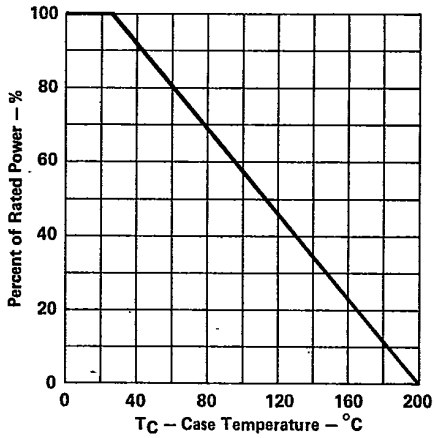

FIGURE 12

NOTE 6: Read time at end of t1, $T_{J(max)} - T_C = P_{D(peak)} \cdot \left(\frac{Z_{\theta JC}}{R_{\theta JC}}\right) \cdot R_{\theta JC(max)}$.