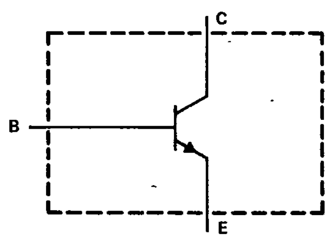
TIPL753, TIPL753A
N-P-N SILICON POWER TRANSISTORS

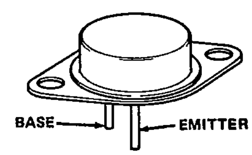
OCTOBER 1982 – REVISED OCTOBER 1984

- 150 W at 25°C Case Temperature
- 8 A Continuous Collector Current
- 14 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
- High Sustaining Voltage
  TIPL753 . . . 350 V Min.
  TIPL753A . . . 400 V Min.
- 1000 V Blocking Capability
- Specifically 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)

	TIPL753	TIPL753A
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)	350 V	400 V
Base-emitter voltage	10 V	
Continuous collector current	8 A	
Peak collector current (see Note 1)	14 A	
Continuous device dissipation at (or below) 25°C case temperature (see Figure 12)	150 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			TIPL753 MIN	TIPL753 TYP	TIPL753 MAX	TIPL753A MIN	TIPL753A TYP	TIPL753A MAX	UNIT
$V_{CEO(sus)}$	I_C = 100 mA,	L = 25 mH,	See Note 2	350			400			V
I_{CEO}	V_{CE} = 350 V,	I_B = 0				50				μA
	V_{CE} = 400 V,	I_B = 0							50	
I_{CES}	V_{CE} = 800 V,	V_{BE} = 0				50				μA
	V_{CE} = 1000 V,	V_{BE} = 0							50	
	V_{CE} = 800 V,	V_{BE} = 0,	T_C = 100°C			100				
	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	15		60	15		60	
$V_{CE(sat)}$	I_C = 2 A,	I_B = 0.4 A,	See Notes 3 and 4			0.5			0.5	V
	I_C = 5 A,	I_B = 1 A,	See Notes 3 and 4			1			1	
	I_C = 8 A,	I_B = 1.6 A,	See Notes 3 and 4			2.5			2.5	
	I_C = 8 A, See Notes 3 and 4	I_B = 1.6 A,	T_C = 100°C,			5			5	
$V_{BE(sat)}$	I_C = 2 A,	I_B = 0.4 A,	See Notes 3 and 4			1.1			1.1	V
	I_C = 5 A,	I_B = 1 A,	See Notes 3 and 4			1.3			1.3	
	I_C = 8 A,	I_B = 1.6 A,	See Notes 3 and 4			1.6			1.6	
	I_C = 8 A, See Notes 3 and 4	I_B = 1.6 A,	T_C = 100°C,			1.5			1.5	
f_T	V_{CE} = 10 V,	I_C = 0.5 A,	See Note 5		8			8		MHz
C_{obo}	V_{CB} = 20 V,	I_E = 0,	f = 0.1 MHz		105			105		pF

NOTES: 2. Inductive loop switching measurement.
3. These parameters must be measured using pulse techniques, pulse duration = 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 = 1 MHz to the frequency at which $|h_{fe}|$ = 1.

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thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$			1.17	°C/W

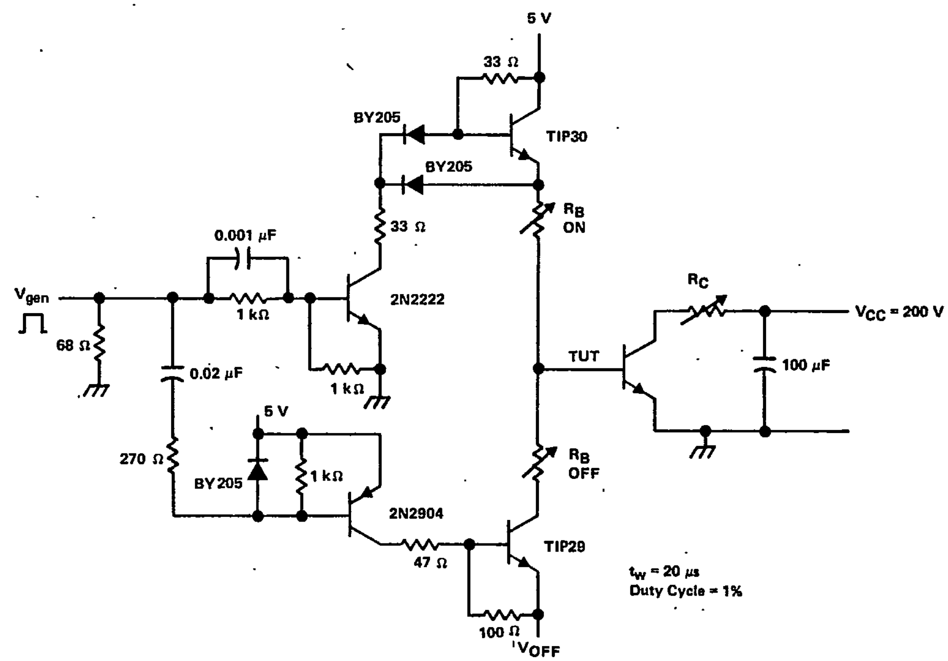
resistive-load switching characteristics

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{on}	I_C = 8 A, V_{CC} = 200 V, $I_{B(1)}$ = 1.6 A, I_{B2} = −1.6 A, T_C = 25°C, See Figure 1			0.8	μs
t_s				2.5	μs
t_f				0.45	μs
t_{on}	I_C = 8 A, V_{CC} = 200 V, I_{B1} = 1.6 A, I_{B2} = −1.6 A, T_C = 100°C, See Figure 1			1.4	μs
t_s				3	μs
t_f				1	μs

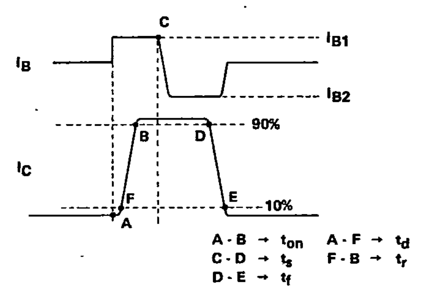
inductive-load switching characteristics

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{sv}	I_C = 8 A, I_{B1} = 1.6 A, $V_{BE(off)}$ = −10 V, T_C = 25°C, See Figure 2			2.5	μs
t_{rv}				200	ns
t_{fi}				150	ns
t_{ti}				50	ns
t_{xo}				300	ns
t_{sv}	I_C = 8 A, I_{B1} = 1.6 A, $V_{BE(off)}$ = −10 V, T_C = 100°C, See Figure 2			3	μs
t_{rv}				300	ns
t_{fi}				150	ns
t_{ti}				50	ns
t_{xo}				500	ns

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



CURRENT WAVEFORMS

NOTES: A. The V_{gen} waveform is supplied by the following characteristics: $t_r \leqslant 15$ ns, $t_f \leqslant 15$ ns, $Z_{out} = 50\ \Omega$, $t_w = 20\ \mu s$, duty cycle $\leqslant 2\%$.

B. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leqslant 15$ ns, $R_{in} \geqslant 10\ M\Omega$, $C_{in} \leqslant 11.5$ pF.

C. Resistors must be noninductive types.

FIGURE 1. RESISTIVE-LOAD SWITCHING

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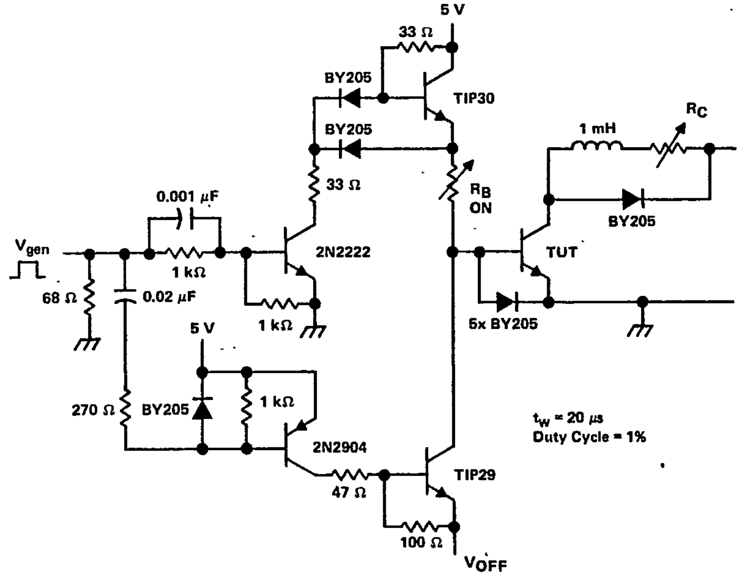
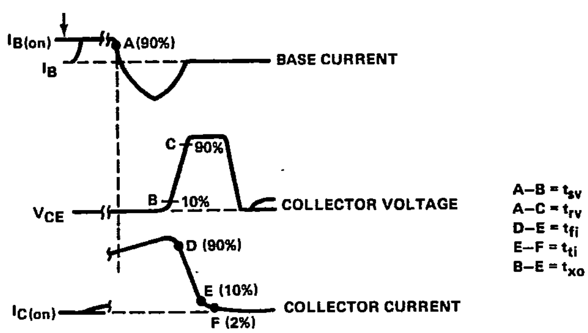
PARAMETER MEASUREMENT INFORMATION



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, $R_{in} \geq 10\ \Omega$, $C_{in} \leq 11.5$ pF.
B. Resistors must be noninductive types.

FIGURE 2. INDUCTIVE-LOAD SWITCHING

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TYPICAL CHARACTERISTICS

TURN-ON TIME
vs
COLLECTOR CURRENT

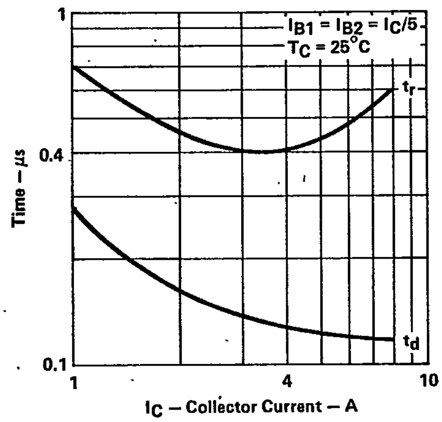

FIGURE 3

TURN-OFF TIME
vs
COLLECTOR CURRENT

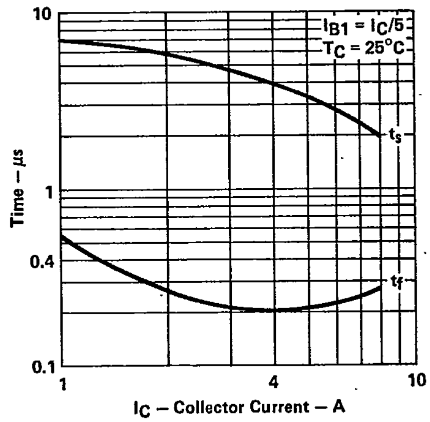

FIGURE 4

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
BASE CURRENT

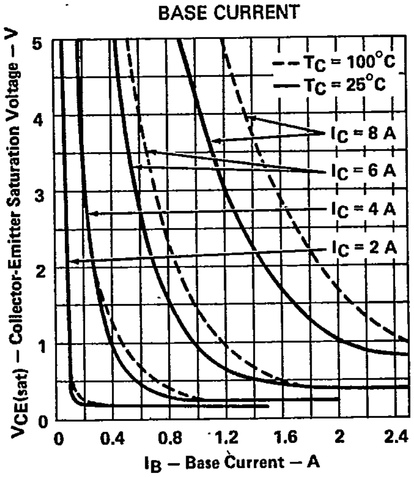

FIGURE 5

BASE-EMITTER SATURATION VOLTAGE
vs
BASE CURRENT

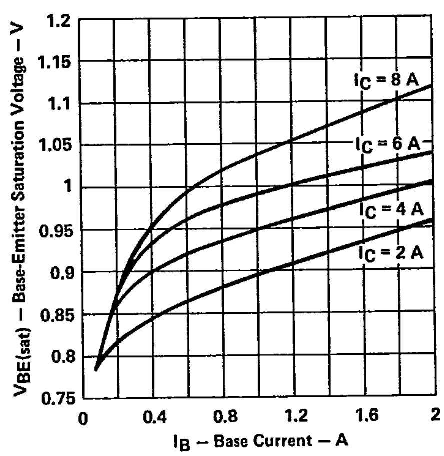

FIGURE 6

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TYPICAL CHARACTERISTICS

FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

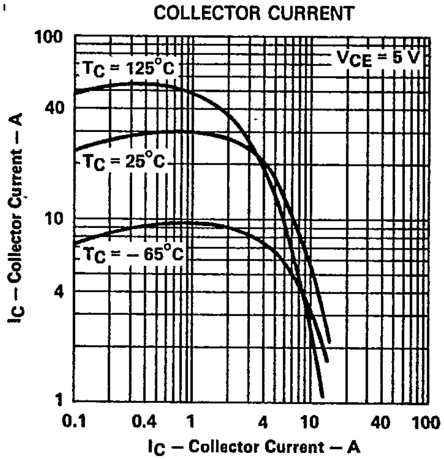

FIGURE 7

COLLECTOR CUTOFF CURRENT
vs
CASE TEMPERATURE

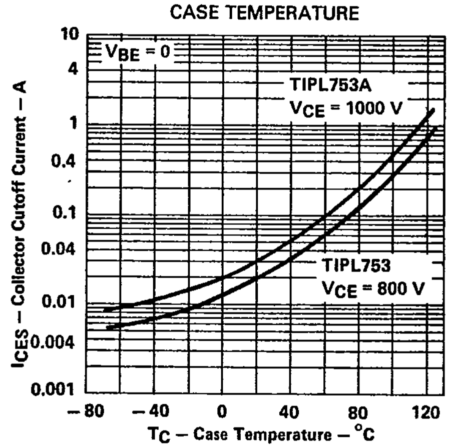

FIGURE 8

MAXIMUM SAFE OPERATING AREA

FORWARD-BIAS SAFE OPERATING AREA

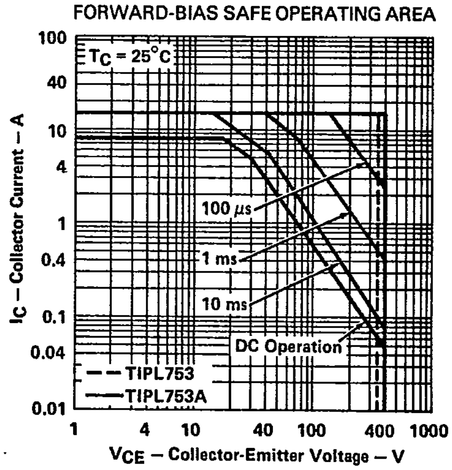

FIGURE 9

LIMITING CONDITIONS
FOR POWER-DOWN TRANSIENT

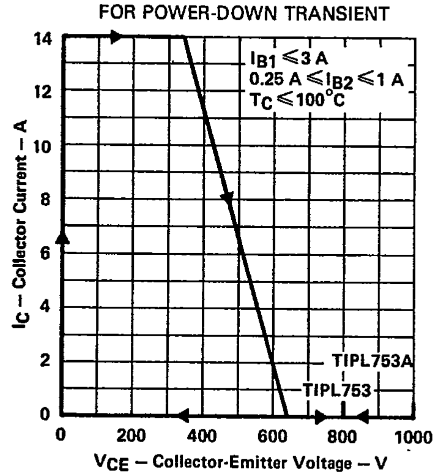

FIGURE 10

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THERMAL INFORMATION

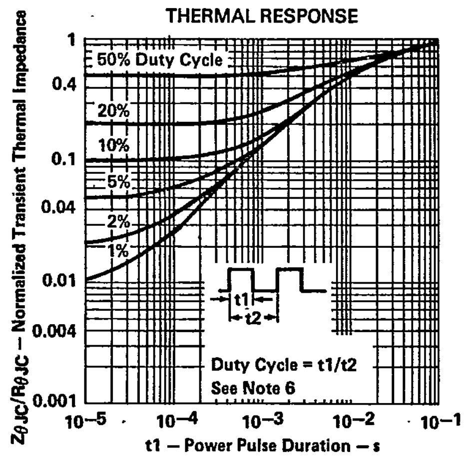

FIGURE 11

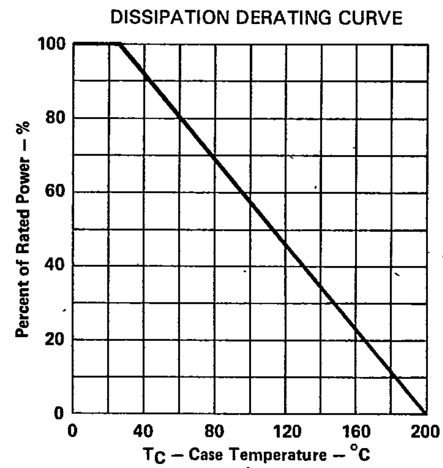

FIGURE 12

NOTE 6: Read time at end of t_1, $T_{J(max)} - T_C = P_{D(peak)} \cdot \left(\frac{Z_{\theta JC}}{R_{\theta JC}}\right) \cdot R_{\theta JC(max)}$.

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