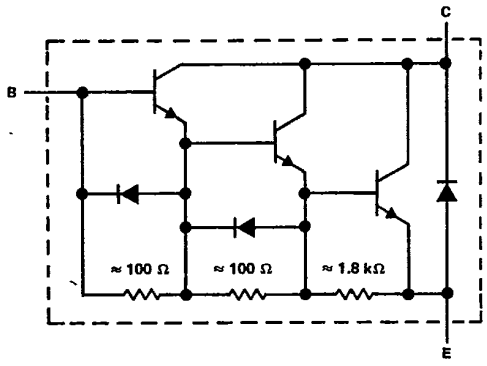
TIPL777, TIPL777A, TIPL777B
N-P-N SILICON HIGH VOLTAGE ADVANCED POWER DARLINGTONS

REVISED OCTOBER 1984

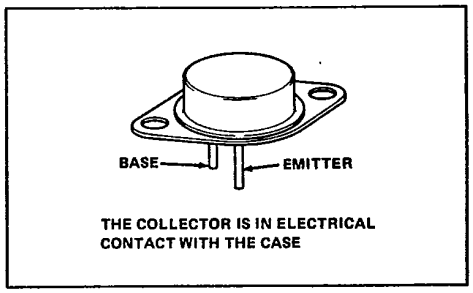
T-33-29

- 180 W at 25°C Case Temperature
- 20 A Continuous Collector Current
- 55 A Peak Collector Current
- Collector Emitter Voltage ... 1150 V
- $V_{CEX(sus)}$ TIPL 777 . . . . 910 V Min at 6 A
  TIPL 777A . . . . 860 V Min at 6 A
  TIPL 777B . . . . 970 V Min at 6 A
- $V_{CE(sat)}$ of 3 V Max at 15 A
- Typical t_f = 300 ns at 100°C
- All Major Parameters Guaranteed at 100°C
- Designed for High-Voltage Inductive Switching Applications; Removing Recovery Diode Makes TIPL777 Series Suitable for Bridge Inverter Designs

device schematic



TO-3 PACKAGE



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

	TIPL777	TIPL777A	TIPL777B
Collector-base voltage	950 V	1050 V	1150 V
Collector-emitter voltage (R_{BE} = 100 Ω)	950 V	1050 V	1150 V
Collector-emitter voltage (I_B = 0)	600 V	700 V	800 V
Emitter-collector voltage (I_B = 0)	6 V		
Base-emitter voltage (I_C = 0)	6 V		
Continuous collector current	20 A		
Peak collector current (see Note 1)	55 A		
Continuous device dissipation at (or below) 25°C free-air temperature (see Figure 6)	180 W		
Operating collector junction and storage temperature range	−65°C to 200°C		

NOTE 1: These values apply for $t_w \leq 300\ \mu s$, duty cycle ≤ 2%.

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

PARAMETER	TEST CONDITIONS				TIPL777 MIN	TIPL777 TYP	TIPL777 MAX	UNIT
$V_{CEX(sus)}$	I_C = 6 A,	I_{B2} = 1 A,	See Figure 1a		710			V
$V_{CEO(sus)}$	I_C = 0.1 A,	L = 25 mH,	See Note 2		600			V
I_{CEO}	V_{CE} = 600 V,	I_B = 0					50	μA
I_{CES}	V_{CE} = 950 V,	V_{BE} = 0					0.1	mA
	V_{CE} = 950 V,	V_{BE} = 0,	T_C = 100°C				1	mA
I_{CEV}	V_{CE} = 950 V,	V_{BE} = −1.5 V to −6 V					0.1	mA
I_{ECO}	V_{EC} = 2 V					7	15	mA
I_{EBO}	V_{EB} = 6 V,	I_C = 0					10	mA
$V_{CE(sat)}$	I_C = 3 A,	I_B = 60 mA,	See Notes 3 and 4				2	V
	I_C = 10 A,	I_B = 0.2 A,	See Notes 3 and 4				2.5	V
	I_C = 15 A,	I_B = 0.3 A,	See Notes 3 and 4				3	V
	I_C = 20 A,	I_B = 1 A,	See Notes 3 and 4				3.5	V
	I_C = 15 A,	I_B = 0.3 A,	T_C = 100°C,	See Notes 3 and 4			3	V
$V_{BE(sat)}$	I_C = 3 A,	I_B = 60 mA,	See Notes 3 and 4				3	V
	I_C = 10 A,	I_B = 0.2 A,	See Notes 3 and 4				3.5	V
	I_C = 15 A,	I_B = 0.3 A,	See Notes 3 and 4				4	V
	I_C = 15 A,	I_B = 0.3 A,	T_C = 100°C,	See Notes 3 and 4			4	V
C_{obo}	V_{CE} = 20 V,	I_E = 0,	f = 0.1 MHz			200		pF

NOTES: 2. Inductive loop switching measurement.
3. These parameters are measured using pulse techniques, $t_w \leq 300\ \mu s$, 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 inches) from the device body.

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$			0.97	°C/W

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

PARAMETER	TEST CONDITIONS			TIPL777 MIN	TIPL777 TYP	TIPL777 MAX	UNIT
t_s	I_C = 15 A,	V_{CE} = 300 V,	See Figure 1b,			2.8	μs
t_r	I_{B2} = −1.5 A,	T_C = 25°C				0.5	μs
t_f						0.2	μs
t_{xo}						0.7	μs
t_s	I_C = 15 A,	V_{CE} = 300 V,	See Figure 1b,			4.8	μs
t_r	I_{B2} = −1.5 A,	T_C = 100°C				1.5	μs
t_f						0.3	μs
t_{xo}						0.8	μs

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TIPL777A
N-P-N SILICON HIGH VOLTAGE ADVANCED POWER DARLINGTONS

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

PARAMETER	TEST CONDITIONS			TIPL777A MIN	TIPL777A TYP	TIPL777A MAX	UNIT
$V_{CEX(sus)}$	I_C = 6 A,	I_{B2} = 1 A,	See Figure 1a	860			V
$V_{CEO(sus)}$	I_C = 0.1 A,	L = 25 mH,	See Note 2	700			V
I_{CEO}	V_{CE} = 700 V,	I_B = 0				50	μA
I_{CES}	V_{CE} = 1050 V,	V_{BE} = 0				0.11	mA
	V_{CE} = 1050 V,	V_{BE} = 0				1	mA
I_{CEV}	V_{CE} = 1050 V,	V_{BE} = −1.5 V to −6 V				0.1	mA
I_{ECO}	V_{EC} = 2 V				7	15	mA
I_{EBO}	V_{EB} = 6 V,	I_C = 0				10	mA
$V_{CE(sat)}$	I_C = 2.5 A,	I_B = 50 mA,	See Notes 3 and 4			2	V
	I_C = 7.5 A,	I_B = 0.15 A,	See Notes 3 and 4			2.5	V
	I_C = 12.5 A,	I_B = 0.25 A,	See Notes 3 and 4			3	V
	I_C = 12.5 A,	I_B = 0.25 A,	T_C = 100°C, See Notes 3 and 4			3	V
$V_{BE(sat)}$	I_C = 2.5 A,	I_B = 50 mA,	See Notes 3 and 4			3	V
	I_C = 7.5 A,	I_B = 0.15 A,	See Notes 3 and 4			3.5	V
	I_C = 12.5 A,	I_B = 0.25 A,	See Notes 3 and 4			4	V
	I_C = 12.5 A,	I_B = 0.25 A,	T_C = 100°C, See Notes 3 and 4			4	V
C_{obo}	V_{CE} = 20 V,	I_E = 0,	f = 0.1 MHz		200		pF

NOTES: 2. Inductive loop switching measurement.
3. These parameters are measured using pulse techniques, $t_w \leq 300\ \mu s$, 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 inches) from the device body.

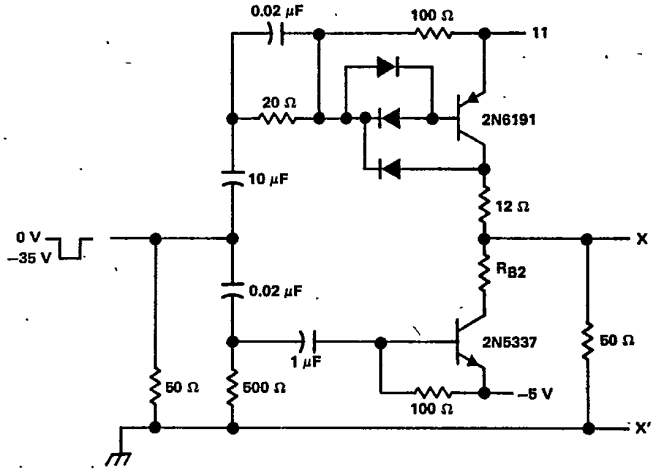
thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$			0.97	°C/W

inductive-load switching characteristics

PARAMETER	TEST CONDITIONS			TIPL777A MIN	TIPL777A TYP	TIPL777A MAX	UNIT
t_s	I_C = 12.5 A,	V_{CE} = 300 V,	See Figure 1b,			3	μs
t_r	I_{B2} = −1.5 A,	T_C = 25°C				0.5	μs
t_f						0.2	μs
t_{xo}						0.7	μs
t_s	I_C = 12.5 A,	V_{CE} = 300 V,	See Figure 1b,			5	μs
t_r	I_{B2} = −1.5 A,	T_C = 100°C				1.5	μs
t_f						0.5	μs
t_{xo}						2	μs

PARAMETER MEASUREMENT INFORMATION



BASE DRIVE CIRCUIT

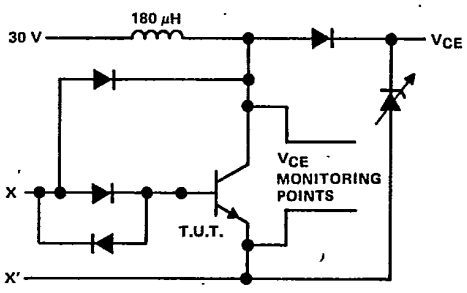


FIGURE 1a. $V_{CEX(sus)}$

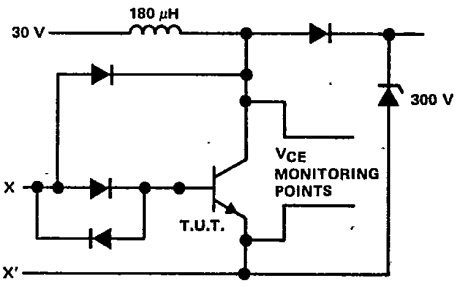


FIGURE 1b. INDUCTIVE-LOAD SWITCHING

NOTES: A. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \leq 15$ ns, $R_{in} \geq 10$ MΩ, $C_{in} \leq 11.5$ pF.
B. Resistors must be noninductive types.
C. V_{CE} waveforms to be monitored within 3,2 mm of the device body.

FIGURE 1. INDUCTIVE-LOAD SWITCHING TEST CIRCUIT

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PARAMETER MEASUREMENT INFORMATION

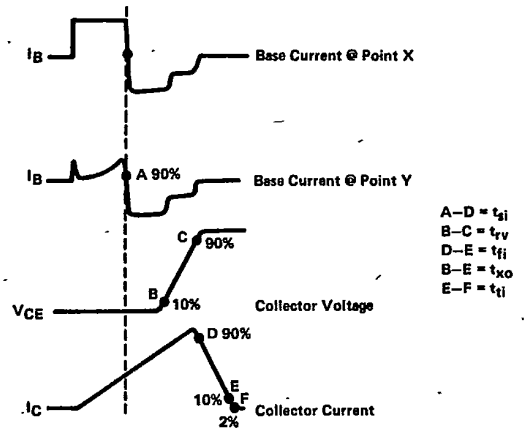

FIGURE 2. INDUCTIVE-LOAD SWITCHING WAVEFORMS

TYPICAL CHARACTERISTICS

COLLECTOR CUTOFF CURRENT
vs
TEMPERATURE

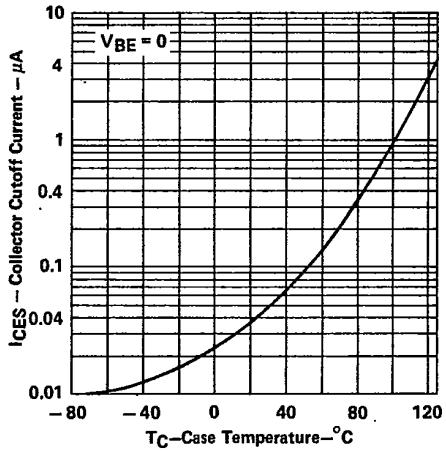

FIGURE 3

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TIPL777, TIPL777A, TIPL777B
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MAXIMUM SAFE OPERATING AREA

FORWARD-BIAS SAFE OPERATING AREA

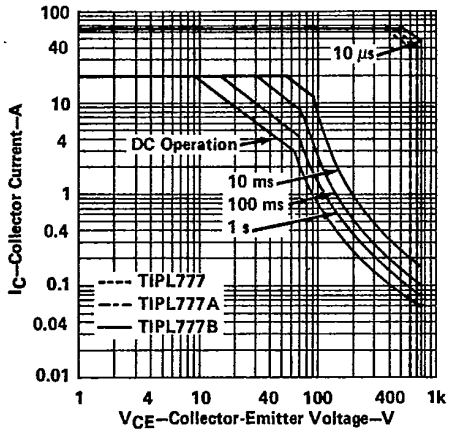

FIGURE 4

REVERSE-BIAS SAFE OPERATING AREA

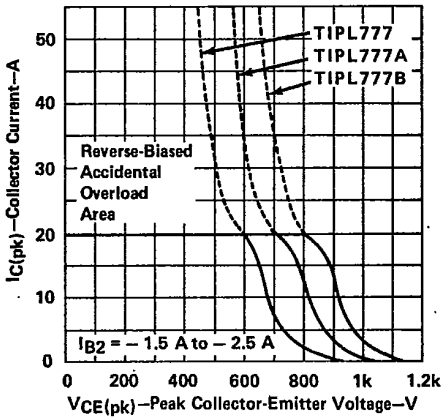

FIGURE 5

THERMAL INFORMATION

DISSIPATION DERATING CURVE

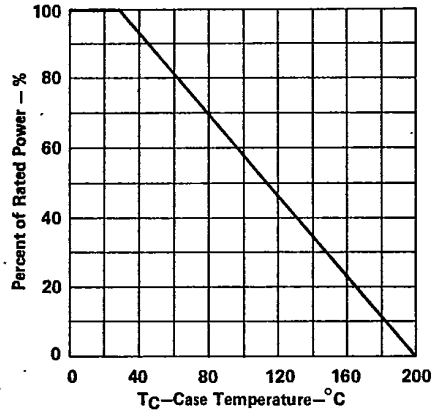

FIGURE 6