

8961726 TEXAS INSTR (OPT0)

62C 37077 D

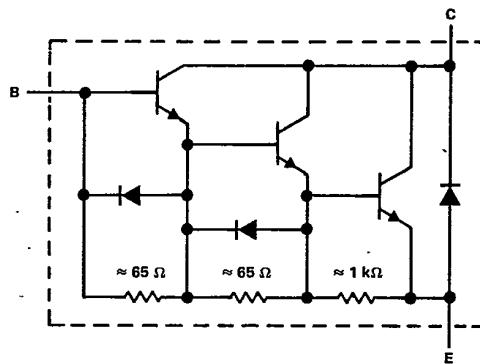
**TIPL773, TIPL773A, TIPL773B**  
**N-P-N SILICON TRIPLE TRANSISTOR**  
**ADVANCED POWER DARLINGTONS**

REVISED OCTOBER 1984

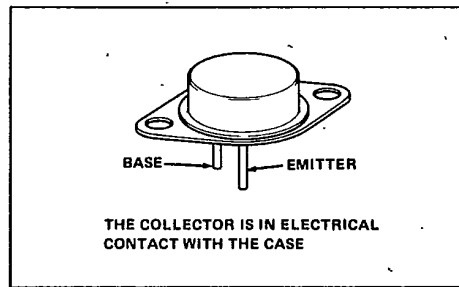
T-33-29

- 180 W at 25°C Case Temperature
- 20 A Continuous Collector Current
- 55 A Peak Collector Current
- Large RBSOA (up to 20 A at 800 V) Permits Snubberless Operation
- All Major Parameters Specified at 100°C

device schematic



TO-3 PACKAGE



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

	TIPL773	TIPL773A	TIPL773B
Collector-base voltage ( $I_E = 0$ )	950 V	1050 V	1150 V
Collector-emitter voltage ( $V_{BE} = 0$ )	950 V	1050 V	1150 V
Collector-emitter voltage ( $I_B = 0$ )	600 V	700 V	800 V
Base-emitter voltage	6 V	6 V	6.5 V
Continuous collector current	20 A		
Peak collector current (see Note 1)	55 A		
Continuous base current	3 A		
Peak parallel diode forward current (see Note 1)	55 A		
Continuous device dissipation at 25°C case temperature (see Figure 27)	180 W		
Operating junction and storage temperature range	-65°C to 200°C		

NOTE 1: This value applies for  $t_W \leq 300 \mu s$ , duty cycle  $\leq 2\%$ .

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**TIPL773**  
**N-P-N SILICON TRIPLE TRANSISTOR**  
**ADVANCED POWER DARLINGTON**

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

PARAMETER	TEST CONDITIONS	TIPL773			UNIT
		MIN	TYP	MAX	
V <sub>CEX(sus)</sub>	I <sub>C</sub> = 6 A, I <sub>B2</sub> = 1 A, See Figures 1 and 1a	710			V
V <sub>CEO(sus)</sub>	I <sub>C</sub> = 0.1 A, L = 25 mH, See Note 2	600			V
I <sub>CEO</sub>	V <sub>CE</sub> = 600 V, I <sub>B</sub> = 0			50	μA
I <sub>CES</sub>	V <sub>CE</sub> = 950 V, V <sub>BE</sub> = 0			0.1	mA
	V <sub>CE</sub> = 950 V, V <sub>BE</sub> = 0, T <sub>C</sub> = 100°C			1	
I <sub>CEV</sub>	V <sub>CE</sub> = 950 V, V <sub>BE</sub> = -1.5 V to -6 V			0.1	mA
I <sub>EBO</sub>	V <sub>EB</sub> = 6 V, I <sub>C</sub> = 0			10	mA
V <sub>CE(sat)</sub>	I <sub>C</sub> = 3 A, I <sub>B</sub> = 60 mA, See Notes 3 and 4			2	V
	I <sub>C</sub> = 10 A, I <sub>B</sub> = 0.2 A, See Notes 3 and 4			2.2	
	I <sub>C</sub> = 15 A, I <sub>B</sub> = 0.3 A, See Notes 3 and 4			2.5	
	I <sub>C</sub> = 15 A, I <sub>B</sub> = 0.3 A, T <sub>C</sub> = 100°C, See Notes 3 and 4			2.5	
V <sub>BE(sat)</sub>	I <sub>C</sub> = 3 A, I <sub>B</sub> = 60 mA, See Notes 3 and 4			3	V
	I <sub>C</sub> = 10 A, I <sub>B</sub> = 0.2 A, See Notes 3 and 4			3.5	
	I <sub>C</sub> = 15 A, I <sub>B</sub> = 0.3 A, See Notes 3 and 4			4	
	I <sub>C</sub> = 15 A, I <sub>B</sub> = 0.3 A, T <sub>C</sub> = 100°C, See Notes 3 and 4			4	
V <sub>F</sub>	I <sub>F</sub> = 15 A, See Notes 3 and 4			2	V
h <sub>FE</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.5 A	50			
C <sub>obo</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0, f = 0.1 MHz			185	pF

- NOTES: 2. Inductive loop switching measurement.  
 3. These parameters must be measured using pulse techniques, t<sub>w</sub> < 300 μs, duty cycle < 2%.  
 4. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts located within 3.2 mm (0.125 inch) from the device body.

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
R <sub>θJC</sub>		0.97		°C/W

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

PARAMETER	TEST CONDITIONS	TIPL773			UNIT
		MIN	TYP	MAX	
t <sub>on</sub>	I <sub>C</sub> = 15 A, V <sub>CE</sub> = 250 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 25°C, See Figures 1 and 1c		1.25		μs
t <sub>s</sub>			3		μs
t <sub>f</sub>				1	
t <sub>on</sub>	I <sub>C</sub> = 15 A, V <sub>CE</sub> = 250 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 100°C, See Figures 1 and 1c		2		μs
t <sub>s</sub>			4		μs
t <sub>f</sub>				2	

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

PARAMETER	TEST CONDITIONS	TIPL773			UNIT	
		MIN	TYP	MAX		
t <sub>sv</sub>	I <sub>C</sub> = 15 A, V <sub>CE</sub> = 300 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 25°C, See Figures 1, 1b, and 2		2.8		μs	
t <sub>rv</sub>			0.5		μs	
t <sub>fl</sub>				0.3		μs
t <sub>xo</sub>				0.8		μs
t <sub>tl</sub>				0.1		μs
t <sub>sv</sub>				4.8		μs
t <sub>rv</sub>	I <sub>C</sub> = 15 A, V <sub>CE</sub> = 300 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 100°C, See Figures 1, 1b, and 2		1.5		μs	
t <sub>fl</sub>				0.5		μs
t <sub>xo</sub>				2		μs
t <sub>tl</sub>				0.15		μs

TIPL Devices



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**TIPL773A**  
**N-P-N SILICON TRIPLE TRANSISTOR**  
**ADVANCED POWER DARLINGTON**

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

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PARAMETER	TEST CONDITIONS	TIPL773A			UNIT
		MIN	TYP	MAX	
V <sub>CEX(sus)</sub>	I <sub>C</sub> = 6 A, I <sub>B2</sub> = 1 A, See Figures 1 and 1a	860			V
V <sub>CEO(sus)</sub>	I <sub>C</sub> = 0.1 A, L = 25 mH, See Note 2	700			V
I <sub>CEO</sub>	V <sub>CE</sub> = 700 V, I <sub>B</sub> = 0			50	μA
I <sub>CES</sub>	V <sub>CE</sub> = 1050 V, V <sub>BE</sub> = 0			0.1	mA
	V <sub>CE</sub> = 1050 V, V <sub>BE</sub> = 0, T <sub>C</sub> = 100°C			1	
I <sub>CEV</sub>	V <sub>CE</sub> = 1050 V, V <sub>BE</sub> = -1.5 V to -6 V			0.1	mA
I <sub>EBO</sub>	V <sub>EB</sub> = 6 V, I <sub>C</sub> = 0			10	mA
V <sub>CE(sat)</sub>	I <sub>C</sub> = 2.5 A, I <sub>B</sub> = 50 mA, See Notes 3 and 4			2	V
	I <sub>C</sub> = 7.5 A, I <sub>B</sub> = 0.15 A, See Notes 3 and 4			2.2	
	I <sub>C</sub> = 12.5 A, I <sub>B</sub> = 0.25 A, See Notes 3 and 4			2.5	
	I <sub>C</sub> = 12.5 A, I <sub>B</sub> = 0.25 A, T <sub>C</sub> = 100°C, See Notes 3 and 4			2.5	
V <sub>BE(sat)</sub>	I <sub>C</sub> = 2.5 A, I <sub>B</sub> = 50 mA, See Notes 3 and 4			3	V
	I <sub>C</sub> = 7.5 A, I <sub>B</sub> = 0.15 A, See Notes 3 and 4			3.5	
	I <sub>C</sub> = 12.5 A, I <sub>B</sub> = 0.25 A, See Notes 3 and 4			4	
	I <sub>C</sub> = 12.5 A, I <sub>B</sub> = 0.25 A, T <sub>C</sub> = 100°C, See Notes 3 and 4			4	
V <sub>F</sub>	I <sub>F</sub> = 15 A, See Notes 3 and 4			2	V
h <sub>FE</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.5 A	50			
C <sub>obo</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0, f = 0.1 MHz			185	pF

- NOTES: 2. Inductive loop switching measurement.  
 3. These parameters must be measured using pulse techniques, t<sub>w</sub> ≤ 300 μs, duty cycle ≤ 2%.  
 4. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts located within 3.2 mm (0.125 inch) from the device body.

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
R <sub>θJC</sub>			0.97	°C/W

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

PARAMETER	TEST CONDITIONS	TIPL773A			UNIT
		MIN	TYP	MAX	
t <sub>on</sub>	I <sub>C</sub> = 12.5 A, V <sub>CE</sub> = 250 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 25°C, See Figures 1 and 1c			1.25	μs
t <sub>s</sub>				3.5	μs
t <sub>f</sub>				1	μs
t <sub>on</sub>	I <sub>C</sub> = 12.5 A, V <sub>CE</sub> = 250 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 100°C, See Figures 1 and 1c			2	μs
t <sub>s</sub>				5	μs
t <sub>f</sub>				2	μs

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

PARAMETER	TEST CONDITIONS	TIPL773A			UNIT
		MIN	TYP	MAX	
t <sub>sv</sub>	I <sub>C</sub> = 12.5 A, V <sub>CE</sub> = 300 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 25°C, See Figures 1, 1b, and 2			3	μs
t <sub>rv</sub>				0.5	μs
t <sub>fl</sub>				0.3	μs
t <sub>xo</sub>				0.8	μs
t <sub>tl</sub>				0.1	μs
t <sub>sv</sub>				5	μs
t <sub>rv</sub>	I <sub>C</sub> = 12.5 A, V <sub>CE</sub> = 300 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 100°C, See Figures 1, 1b, and 2			1.5	μs
t <sub>fl</sub>				0.5	μs
t <sub>xo</sub>				2	μs
t <sub>tl</sub>				0.5	μs

TIPL Devices



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**TIPL773B**  
**N-P-N SILICON TRIPLE TRANSISTOR**  
**ADVANCED POWER DARLINGTON**

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

PARAMETER	TEST CONDITIONS	TIPL773B			UNIT
		MIN	TYP	MAX	
V <sub>CEX(sus)</sub>	I <sub>C</sub> = 6 A, I <sub>B2</sub> = 1 A, See Figures 1 and 1a	970			V
V <sub>CEO(sus)</sub>	I <sub>C</sub> = 0.1 A, L = 25 mH, See Note 2	800			V
I <sub>CEO</sub>	V <sub>CE</sub> = 800 V, I <sub>B</sub> = 0			50	μA
I <sub>CES</sub>	V <sub>CE</sub> = 1150 V, V <sub>BE</sub> = 0			0.1	mA
	V <sub>CE</sub> = 1150 V, V <sub>BE</sub> = 0, T <sub>C</sub> = 100°C			1	
I <sub>CEV</sub>	V <sub>CE</sub> = 1150 V, V <sub>BE</sub> = -1.5 V to -6 V			0.1	mA
I <sub>EBO</sub>	V <sub>EB</sub> = 6 V, I <sub>C</sub> = 0			10	mA
V <sub>CE(sat)</sub>	I <sub>C</sub> = 1 A, I <sub>B</sub> = 20 mA, See Notes 3 and 4			2	V
	I <sub>C</sub> = 5 A, I <sub>B</sub> = 0.1 A, See Notes 3 and 4			2.2	
	I <sub>C</sub> = 10 A, I <sub>B</sub> = 0.2 A, See Notes 3 and 4			2.5	
	I <sub>C</sub> = 10 A, I <sub>B</sub> = 0.2 A, T <sub>C</sub> = 100°C, See Notes 3 and 4			2.5	
V <sub>BE(sat)</sub>	I <sub>C</sub> = 1 A, I <sub>B</sub> = 20 mA, See Notes 3 and 4			3	V
	I <sub>C</sub> = 5 A, I <sub>B</sub> = 0.1 A, See Notes 3 and 4			3.5	
	I <sub>C</sub> = 10 A, I <sub>B</sub> = 0.2 A, See Notes 3 and 4			4	
	I <sub>C</sub> = 10 A, I <sub>B</sub> = 0.2 A, T <sub>C</sub> = 100°C, See Notes 3 and 4			4	
V <sub>F</sub>	I <sub>F</sub> = 15 A, See Notes 3 and 4			2	V
h <sub>FE</sub>	V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.5 A	50			
C <sub>obo</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0, f = 0.1 MHz			185	pF

- NOTES: 2. Inductive loop switching measurement.  
 3. These parameters must be measured using pulse techniques, t<sub>w</sub> ≤ 300 μs, duty cycle ≤ 2%.  
 4. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts located within 3.2 mm (0.125 inch) from the device body.

thermal characteristics

PARAMETER	MIN	TYP	MAX	UNIT
R <sub>θJC</sub>		0.97		°C/W

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

PARAMETER	TEST CONDITIONS	TIPL773B			UNIT
		MIN	TYP	MAX	
t <sub>on</sub>	I <sub>C</sub> = 10 A, V <sub>CE</sub> = 250 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 25°C, See Figures 1 and 1c			1.25	μs
t <sub>s</sub>				4	μs
t <sub>f</sub>				1	μs
t <sub>on</sub>	I <sub>C</sub> = 10 A, V <sub>CE</sub> = 250 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 100°C, See Figures 1 and 1c			2	μs
t <sub>s</sub>				6	μs
t <sub>f</sub>				2	μs

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

PARAMETER	TEST CONDITIONS	TIPL773B			UNIT
		MIN	TYP	MAX	
t <sub>sv</sub>	I <sub>C</sub> = 10 A, V <sub>CE</sub> = 300 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 25°C, See Figures 1, 1b, and 2			3.2	μs
t <sub>rv</sub>				0.5	μs
t <sub>fl</sub>				0.3	μs
t <sub>xo</sub>				0.8	μs
t <sub>tl</sub>				0.1	μs
t <sub>sv</sub>				5.2	μs
t <sub>rv</sub>	I <sub>C</sub> = 10 A, V <sub>CE</sub> = 300 V, I <sub>B2</sub> = -1.5 A, T <sub>C</sub> = 100°C, See Figures 1, 1b, and 2			1.5	μs
t <sub>fl</sub>				0.5	μs
t <sub>xo</sub>				2	μs
t <sub>tl</sub>				0.15	μs
t <sub>tl</sub>				0.15	μs

TIPL Devices



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N-P-N SILICON TRIPLE TRANSISTOR  
ADVANCED POWER DARLINGTONS

PARAMETER MEASUREMENT INFORMATION

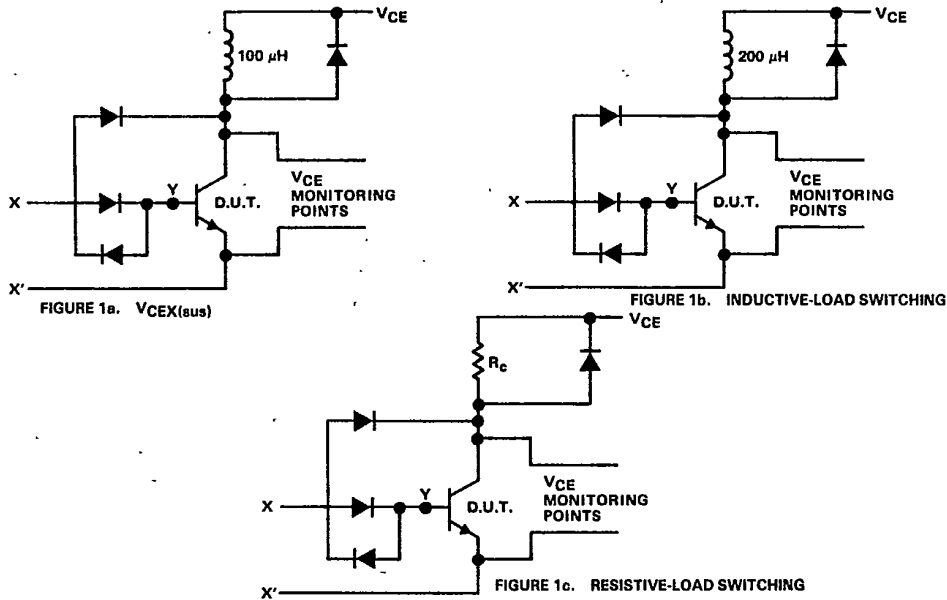
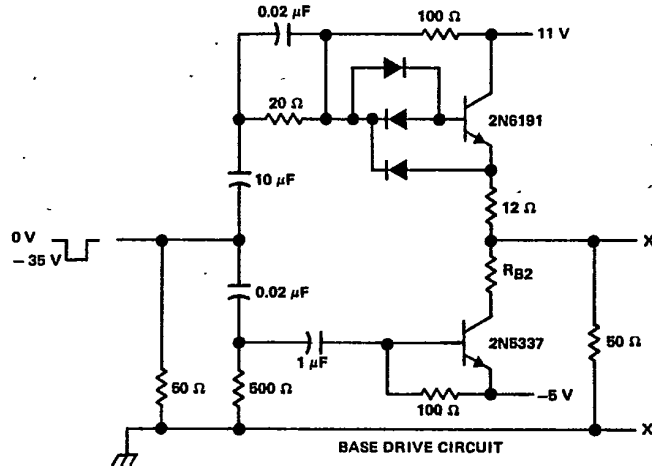


FIGURE 1. SWITCHING TEST CIRCUITS

- NOTES: A. Waveforms are monitored on an oscilloscope with the following characteristics:  $t_r \leq 15$  ns,  $R_{in} < 10$  MΩ,  $C_{in} < 11.5$  pf.  
 B. Resistors must be noninductive types.  
 C. V<sub>CE</sub> waveforms to be monitored within 3.2 mm (0.125 inch) of the device body.

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TIPL773, TIPL773A, TIPL773B  
N-P-N SILICON TRIPLE TRANSISTOR  
ADVANCED POWER DARLINGTONS

PARAMETER MEASUREMENT INFORMATION

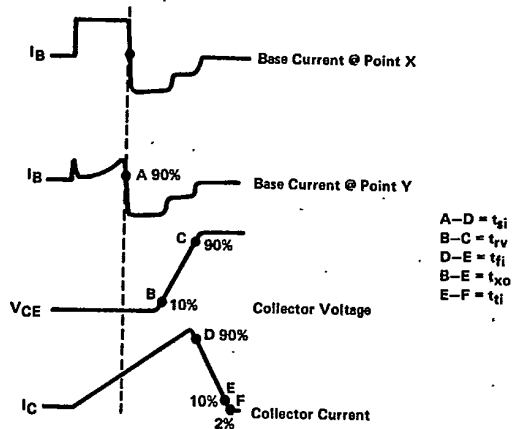


FIGURE 2. INDUCTIVE SWITCHING WAVEFORMS

TIPL Devices



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N-P-N SILICON TRIPLE TRANSISTOR  
ADVANCED POWER DARLINGTONS

TYPICAL CHARACTERISTICS

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TIPL773  
INDUCTIVE-LOAD TURN-OFF TIMES  
vs  
OFF-STATE BASE CURRENT

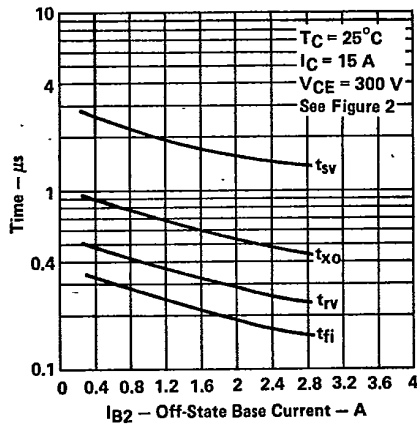


FIGURE 3

TIPL773A  
INDUCTIVE-LOAD TURN-OFF TIMES  
vs  
OFF-STATE BASE CURRENT

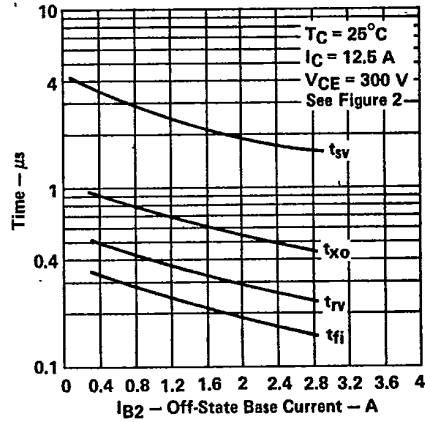


FIGURE 4

TIPL773B  
INDUCTIVE-LOAD TURN-OFF TIMES  
vs  
OFF-STATE BASE CURRENT

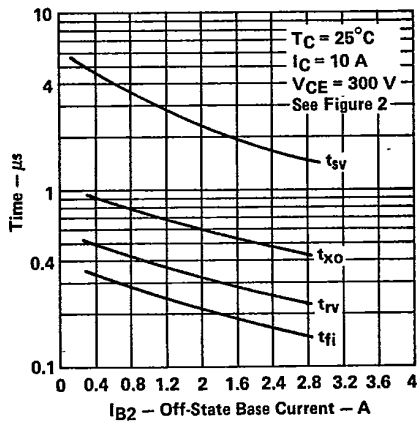


FIGURE 5

TIPL773  
INDUCTIVE-LOAD TURN-OFF TIMES  
vs  
COLLECTOR CURRENT

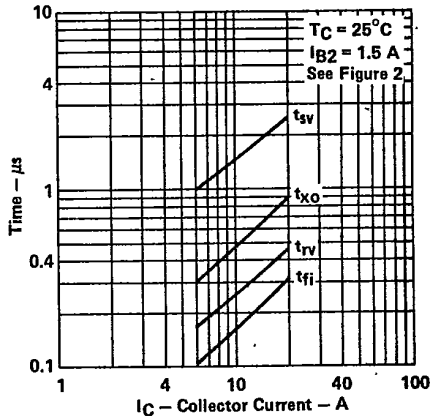


FIGURE 6

TIPL Devices



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TIPL773, TIPL773A, TIPL773B  
 N-P-N SILICON TRIPLE TRANSISTOR  
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TYPICAL CHARACTERISTICS

TIPL773A  
 INDUCTIVE-LOAD TURN-OFF TIME  
 vs  
 COLLECTOR CURRENT

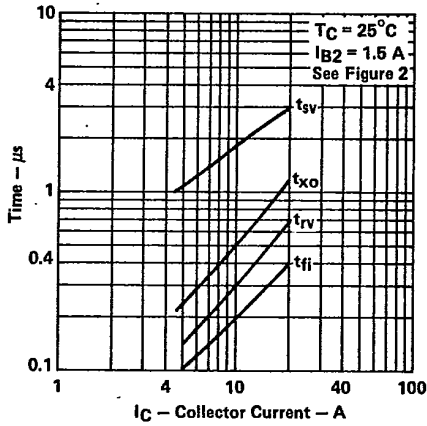


FIGURE 7

TIPL773B  
 INDUCTIVE-LOAD TURN-OFF TIME  
 vs  
 COLLECTOR CURRENT

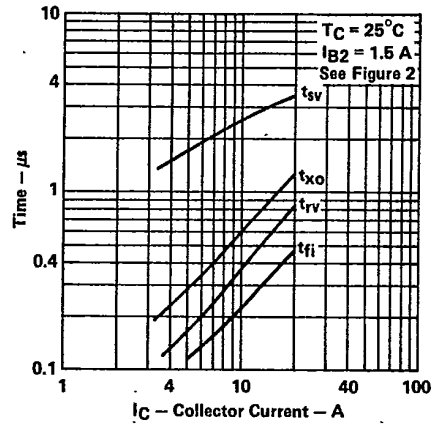


FIGURE 8

TIPL773  
 MAXIMUM COLLECTOR-EMITTER  
 SATURATION VOLTAGE  
 vs  
 BASE CURRENT

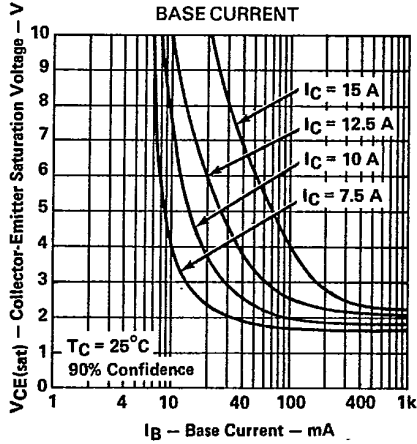


FIGURE 9

TIPL773A  
 MAXIMUM COLLECTOR-EMITTER  
 SATURATION VOLTAGE  
 vs  
 BASE CURRENT

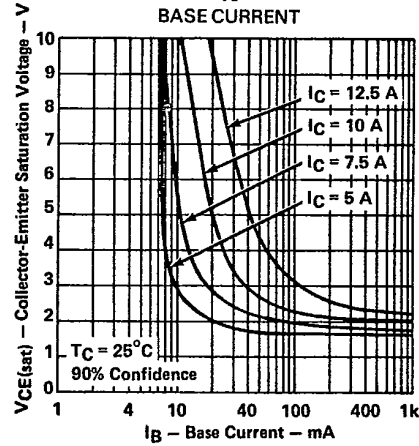


FIGURE 10

TIPL Devices





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TIPL773, TIPL773A, TIPL773B  
N-P-N SILICON TRIPLE TRANSISTOR  
ADVANCED POWER DARLINGTONS

TYPICAL CHARACTERISTICS

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TIPL773B  
MAXIMUM COLLECTOR-EMITTER  
SATURATION VOLTAGE  
vs  
BASE CURRENT

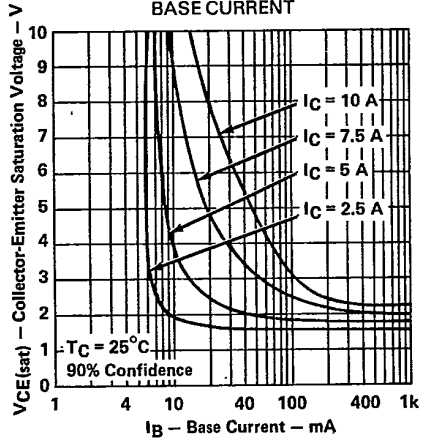


FIGURE 11

TIPL773  
BASE-EMITTER SATURATION VOLTAGE  
vs  
BASE CURRENT

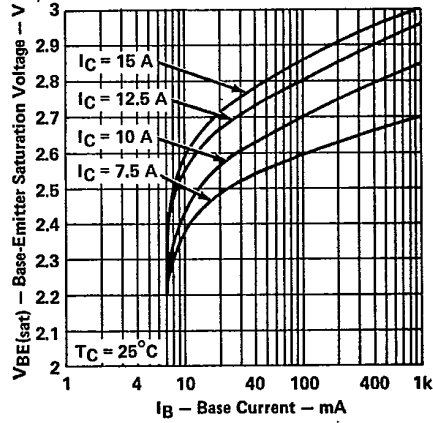


FIGURE 12

TIPL773A  
BASE-EMITTER SATURATION VOLTAGE  
vs  
BASE CURRENT

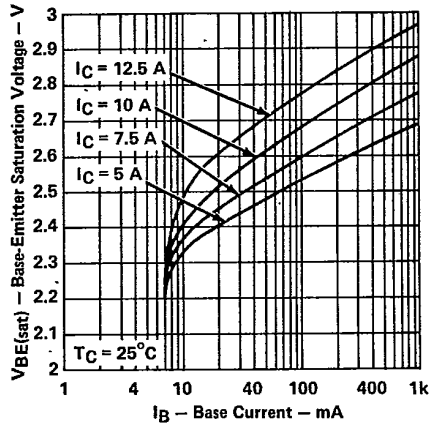


FIGURE 13

TIPL773B  
BASE-EMITTER SATURATION VOLTAGE  
vs  
BASE CURRENT

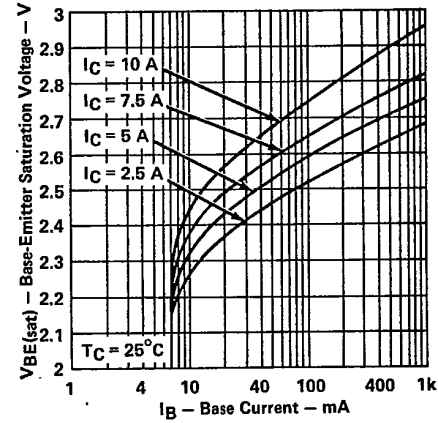


FIGURE 14

TIPL Devices



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TIPL773, TIPL773A, TIPL773B  
N-P-N SILICON TRIPLE TRANSISTOR  
ADVANCED POWER DARLINGTONS

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TYPICAL CHARACTERISTICS

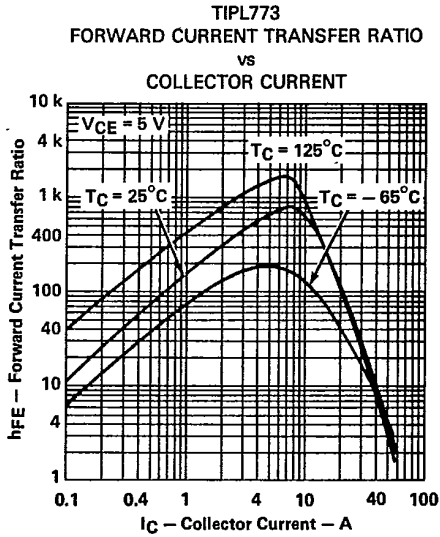


FIGURE 15

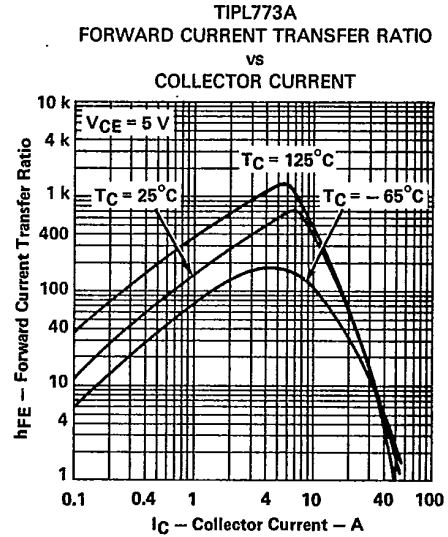


FIGURE 16

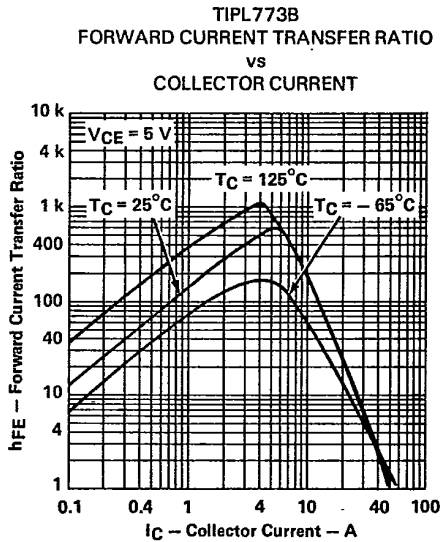


FIGURE 17

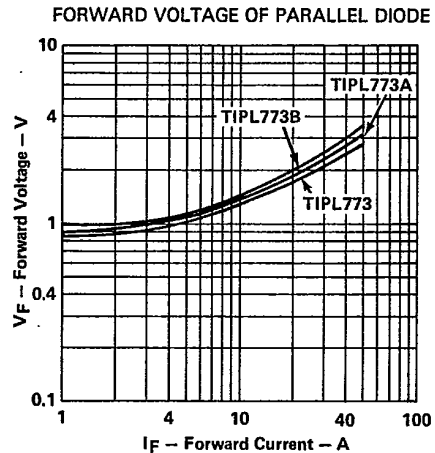


FIGURE 18

TIPL Devices



8961726 TEXAS INSTR (OPTO)

62C 37087 D

TIPL773, TIPL773A, TIPL773B  
N-P-N SILICON TRIPLE TRANSISTOR  
ADVANCED POWER DARLINGTONS

TYPICAL CHARACTERISTICS

T-33-29

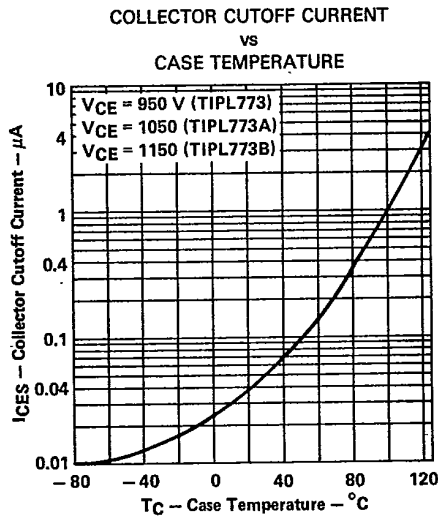


FIGURE 19

MAXIMUM SAFE OPERATING AREA

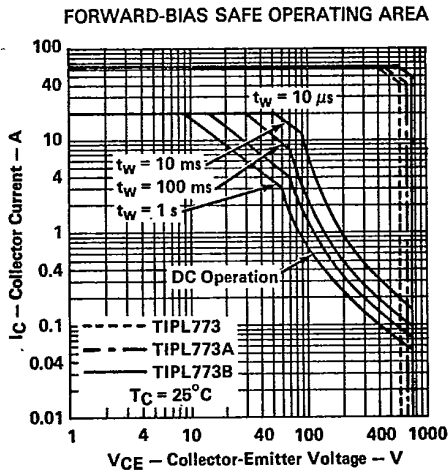


FIGURE 20

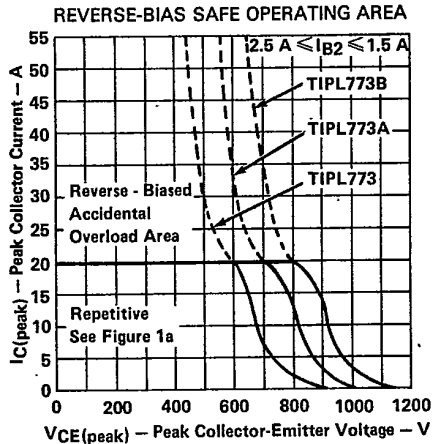


FIGURE 21

TIPL Devices



8961726 TEXAS INSTR (OPTO)

62C 37088 D

TIPL773, TIPL773A, TIPL773B  
N-P-N SILICON TRIPLE TRANSISTOR  
ADVANCED POWER DARLINGTONS

T-33-29

MAXIMUM SAFE OPERATING AREA

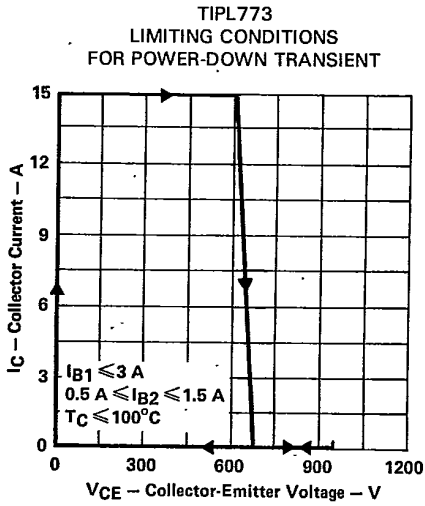


FIGURE 22

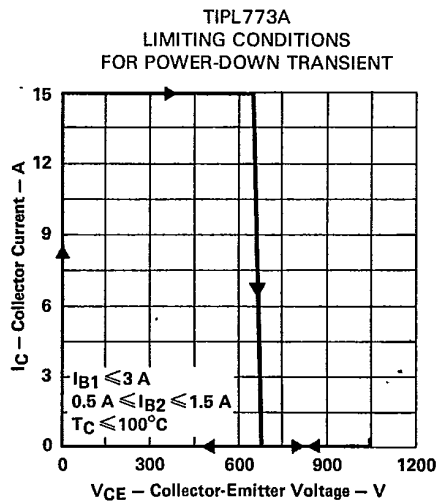


FIGURE 23

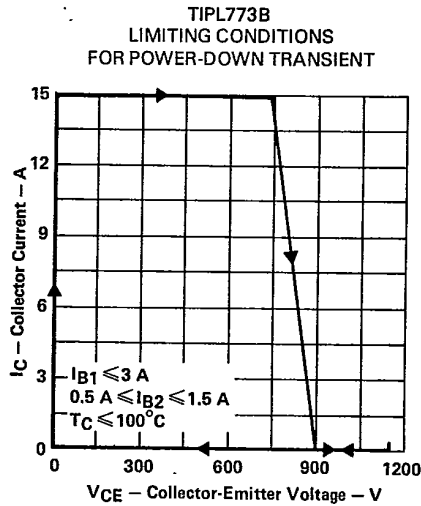


FIGURE 24

TIPL Devices



8961726 TEXAS INSTR (OPTO)

62C 37089 D

TIPL773, TIPL773A, TIPL773B  
N-P-N SILICON TRIPLE TRANSISTOR  
ADVANCED POWER DARLINGTONS

MAXIMUM SAFE OPERATING AREA

T-33-29

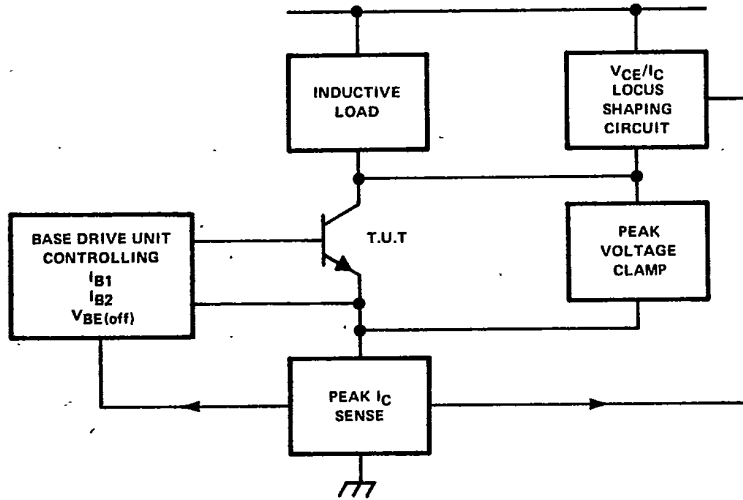


FIGURE 25 TEST CIRCUIT FOR POWER-DOWN TRANSIENT

THERMAL INFORMATION  
DISSIPATION DERATING CURVE

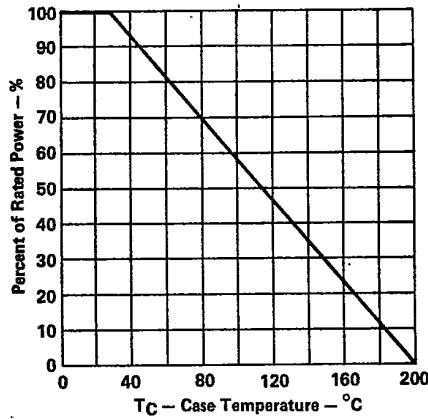


FIGURE 26

TIPL Devices

