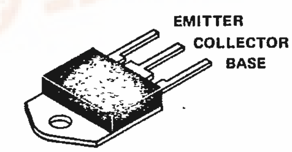
TIPL785, TIPL785A, TIPL790, TIPL790A
N-P-N MONOLITHIC DARLINGTON CONNECTED SILICON POWER TRANSISTORS

OCTOBER 1982 – REVISED OCTOBER 1984

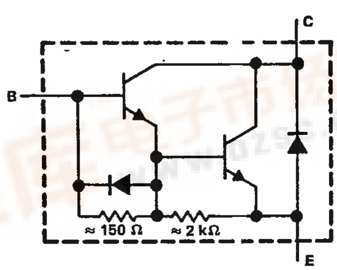
- Rugged Epitaxial Planar Construction
- Designed For Low-Loss, High-Current, High-Speed Switching Applications
- t_{xo} Typically 320 ns at I_C = 10 A
- Operating Characteristics Fully Guaranteed at 100°C
- I_{CES} < 1 mA at Maximum Rated V_{CE} at 100°C
- $V_{CEO(sus)}$:
  TIPL785, TIPL790 . . . 120 V Min
  TIPL785A, TIPL790A . . . 150 V Min

TIPL785, TIPL785A . . . TO-218AA PACKAGE

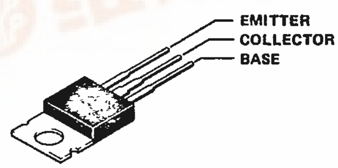


THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE MOUNTING TAB

device schematic



TIPL790, TIPL790A . . . TO-220AB PACKAGE



THE COLLECTOR IS IN ELECTRICAL CONTACT WITH THE MOUNTING TAB

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

	TIPL785	TIPL785A	TIPL790	TIPL790A
Collector-base voltage	160 V	210 V	160 V	210 V
Collector-emitter voltage (V_{BE} = 0)	150 V	200 V	150 V	200 V
Collector-emitter voltage (I_B = 0)	120 V	150 V	120 V	150 V
Continuous device dissipation at (or below) 25°C case temperature	80 W		70 W	
Base-emitter voltage	8 V			
Continuous collector current	10 A			
Peak collector current (see Note 1)	15 A			
Peak parallel diode forward current (see Note 1)	10 A			
Operating collector junction and storage temperature range	–65°C to 150°C			

NOTE 1: This value applies for t_w = 2 ms, duty cycle ≤ 2 %

TIPL Devices 6

TIPL785, TIPL785A, TIPL790, TIPL790A N-P-N MONOLITHIC DARLINGTON-CONNECTED SILICON POWER TRANSISTORS

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

PARAMETER	TEST CONDITIONS			TIPL785, TIPL785A MIN	TYP	MAX	TIPL790, TIPL790A MIN	TYP	MAX	UNIT
$V_{(BR)CBO}$	I_C = 1 mA,	See Note 3		160			210			V
$V_{CEO(sust)}$	I_C = 100 mA,	L = 25 mH,	See Note 2	120			150			V
I_{CEV}	V_{CE} = 150 V,	V_{BE} = −1.5 V to −8 V				50				μA
	V_{CE} = 200 V,	V_{BE} = −1.5 V to −8 V							50	
I_{CES}	V_{CE} = 150 V,	V_{BE} = 0				50				μA
	V_{CE} = 200 V,	V_{BE} = 0							50	
	V_{CE} = 150 V,	V_{BE} = 0,	T_C = 100°C			1				mA
	V_{CE} = 200 V,	V_{BE} = 0,	T_C = 100°C						1	
I_{CEO}	V_{CE} = 120 V,	I_B = 0				50				μA
	V_{CE} = 150 V,	I_B = 0							50	
I_{EBO}	V_{EB} = 5 V,	I_C = 0				4			4	mA
h_{FE}	V_{CE} = 5 V,	I_C = 500 mA,	See Notes 3 and 4	60		500	60		500	
$V_{CE(sat)}$	I_C = 4 A,	I_B = 0.02 A,	See Notes 3 and 4			1.2			1.2	V
	I_C = 7 A,	I_B = 0.03 A,	See Notes 3 and 4			1.5			1.5	
	I_C = 10 A,	I_B = 0.05 A,	See Notes 3 and 4			2			2	
	I_C = 10 A, See Notes 3 and 4	I_B = 0.05 A,	T_C = 100°C,			2			2	
$V_{BE(sat)}$	I_C = 4 A,	I_B = 0.02 A,	See Notes 3 and 4			1.8			1.8	V
	I_C = 7 A,	I_B = 0.03 A,	See Notes 3 and 4			1.9			1.9	
	I_C = 10 A,	I_B = 0.05 A,	See Notes 3 and 4			2.2			2.2	
	I_C = 10 A, See Notes 3 and 4	I_B = 0.05 A,	T_C = 100°C,			2.1			2.1	
V_F	I_F = 10 A,	See Notes 3 and 4				3			3	V
C_{obo}	V_{CB} = 20 V,	I_E = 0,	f = 0.1 MHz		90			90		pF
f_t	I_C = 500 mA,	V_{CE} = 10 V,	See Note 5		10			10		MHz

NOTES: 2. Inductive loop switching measurement.
3. These parameters are measured using pulse techniques pulse width = 300 μs, duty cycle = 2%.
4. These parameters are measured with voltage-sensing contacts separated from the current-carrying contacts located within 3,2 mm (0.125 inches) 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.

thermal characteristics

PARAMETER	TIPL785, TIPL785A MIN	TYP	MAX	TIPL790, TIPL790A MIN	TYP	MAX	UNIT
$R_{\theta JC}$			1.56			1.79	°C/W

TIPL785, TIPL785A, TIPL790, TIPL790A
N-P-N MONOLITHIC DARLINGTON-CONNECTED
SILICON POWER TRANSISTORS

T-33-29

inductive-load switching characteristics

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{si}	I_C = 10 A, I_{B1} = 0.05 A, I_{B2} = −2.5 A, $V_{BE(off)}$ = −5 V, See Figures 1, 2, 3 and 4		450	700	ns
t_{rv}			160	750	ns
t_{fi}			250	400	ns
t_{ti}			280	450	ns
t_{xo}			320	500	ns

PARAMETER MEASUREMENT INFORMATION

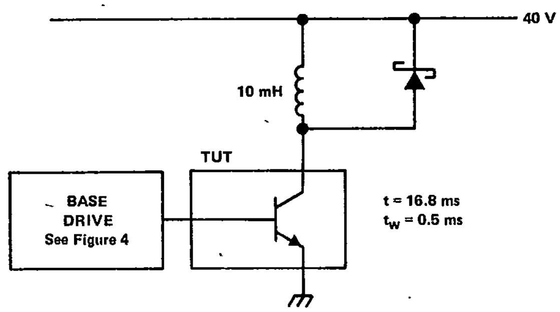


FIGURE 1. INDUCTIVE-LOAD SWITCHING – Collector Test Circuit

TIPL Devices

6

TIPL785, TIPL785A, TIPL790, TIPL790A
N-P-N MONOLITHIC DARLINGTON-CONNECTED
SILICON POWER TRANSISTORS

TYPICAL CHARACTERISTICS

DELAY TIME
vs
COLLECTOR CURRENT

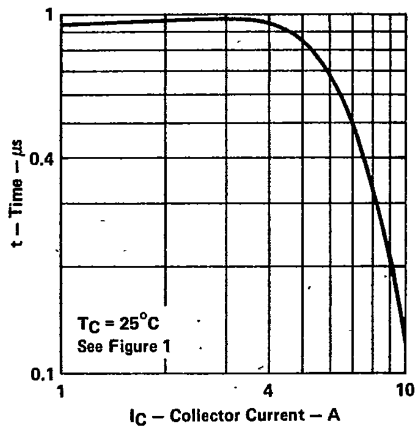


FIGURE 2

RISE TIME
vs
COLLECTOR CURRENT

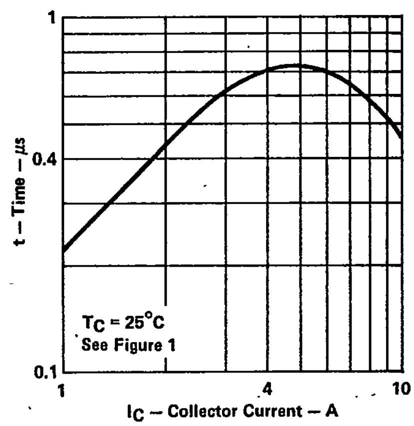


FIGURE 3

RECOMMENDED BASE DRIVE

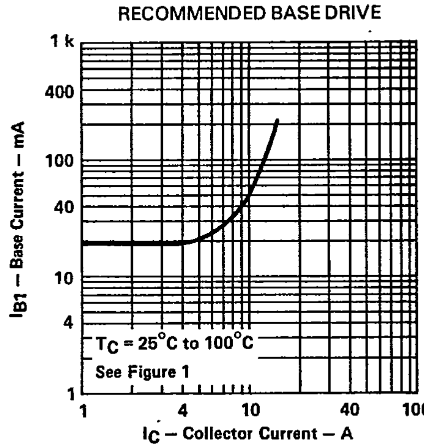


FIGURE 4

COLLECTOR-EMITTER SATURATION VOLTAGE
vs
BASE CURRENT

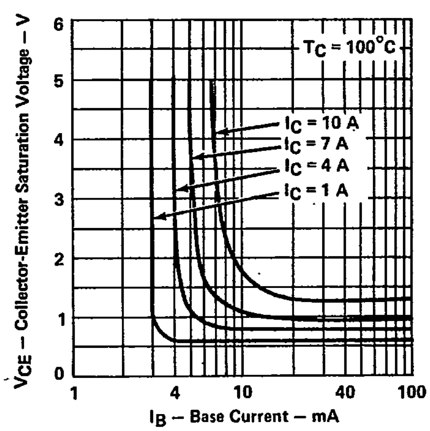


FIGURE 5

TIPL Devices 6

TIPL785, TIPL785A, TIPL790, TIPL790A
N-P-N MONOLITHIC DARLINGTON-CONNECTED
SILICON POWER TRANSISTORS

T-33-29

TYPICAL CHARACTERISTICS

BASE-EMITTER SATURATION VOLTAGE
vs
BASE CURRENT

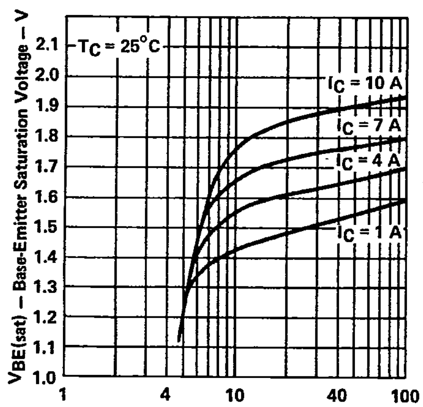


FIGURE 6

STATIC FORWARD CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

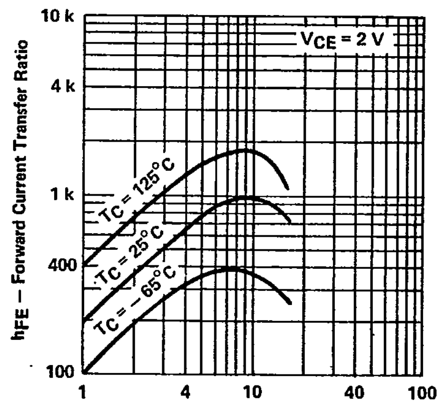


FIGURE 7

COLLECTOR CUTOFF CURRENT
vs
TEMPERATURE

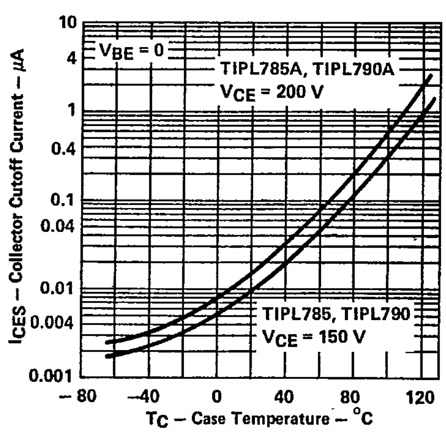


FIGURE 8

TIPL Devices

6

TIPL785, TIPL785A, TIPL790, TIPL790A
N-P-N MONOLITHIC DARLINGTON-CONNECTED
SILICON POWER TRANSISTORS

MAXIMUM SAFE OPERATING AREA

TIPL785, TIPL785A
FORWARD-BIAS SAFE OPERATING AREA

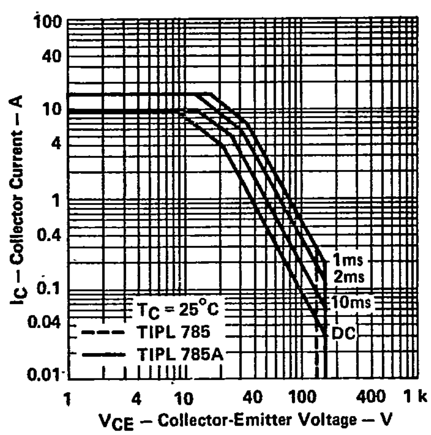


FIGURE 9

TIPL790, TIPL790A
FORWARD-BIAS SAFE OPERATING AREA

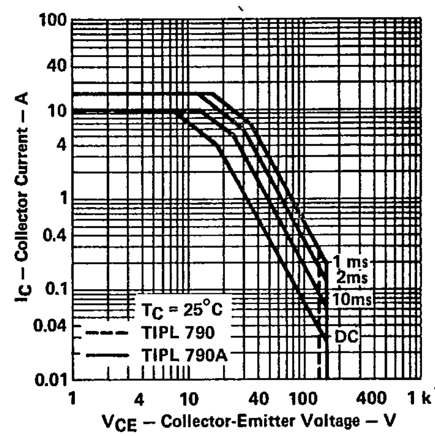


FIGURE 10

THERMAL INFORMATION

DISSIPATION DERATING CURVE

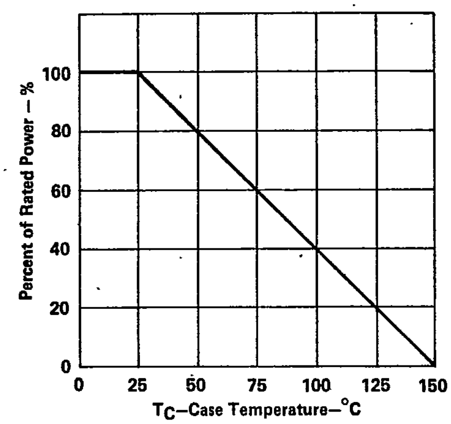


FIGURE 11