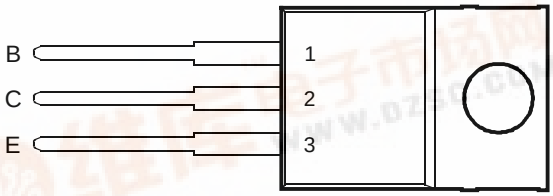
TIPL790, TIPL790A
NPN SILICON POWER DARLINGTONS

 AUGUST 1978 - REVISED MARCH 1997

- **Rugged Epitaxial Planar Construction**
- **10 A Continuous Collector Current**
- **Operating Characteristics Fully Guaranteed at 100°C**
- **t_{xo} typically 320 ns, I_C = 10 A**

TO-220 PACKAGE
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

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

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage (I_E = 0)	TIPL790 TIPL790A	V_{CBO}	150 200	V
Collector-emitter voltage (V_{BE} = 0)	TIPL790 TIPL790A	V_{CES}	150 200	V
Collector-emitter voltage (I_B = 0)	TIPL790 TIPL790A	V_{CEO}	120 150	V
Emitter-base voltage		V_{EBO}	8	V
Continuous collector current		I_C	10	A
Peak collector current (see Note 1)		I_{CM}	15	A
Continuous device dissipation at (or below) 25°C case temperature		P_{tot}	70	W
Operating junction temperature range		T_j	-65 to +150	°C
Storage temperature range		T_{stg}	-65 to +150	°C

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

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

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
$V_{CEO(sus)}$	Collector-emitter sustaining voltage	I_C = 100 mA	L = 25 mH	(see Note 2)	TIPL790	120			V
					TIPL790A	150			
V_{CBO}	Collector-base breakdown voltage	I_C = 1 mA		(see Note 3)	TIPL790	150			V
					TIPL790A	200			
I_{CES}	Collector-emitter cut-off current	V_{CE} = 150 V	V_{BE} = 0		TIPL790			0.05	mA
		V_{CE} = 200 V	V_{BE} = 0		TIPL790A			0.05	
		V_{CE} = 150 V	V_{BE} = 0	T_C = 100°C	TIPL790			1	
		V_{CE} = 200 V	V_{BE} = 0	T_C = 100°C	TIPL790A			1	
I_{CEV}	Collector cut-off current	V_{CE} = 150 V	1.5 < V_{EB} <8 V		TIPL790			50	µA
		V_{CE} = 200 V			TIPL790A			50	
I_{CEO}	Collector cut-off current	V_{CE} = 120 V	I_B = 0		TIPL790			50	µA
		V_{CE} = 150 V	I_B = 0		TIPL790A			50	
I_{EBO}	Emitter cut-off current	V_{EB} = 5 V	I_C = 0					4	mA
h_{FE}	Forward current transfer ratio	V_{CE} = 5 V	I_C = 0.5 A	(see Notes 3 and 4)		60		500	
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_B = 20 mA	I_C = 4 A					1.2	V
		I_B = 30 mA	I_C = 7 A	(see Notes 3 and 4)				1.5	
		I_B = 50 mA	I_C = 10 A					2.0	
		I_B = 50 mA	I_C = 10 A	T_C = 100°C				2.0	
$V_{BE(sat)}$	Base-emitter saturation voltage	I_B = 20 mA	I_C = 4 A					1.8	V
		I_B = 30 mA	I_C = 7 A	(see Notes 3 and 4)				1.9	
		I_B = 50 mA	I_C = 10 A					2.2	
		I_B = 50 mA	I_C = 10 A	T_C = 100°C				2.1	
V_{EC}	Parallel diode forward voltage	I_E = 10 A	I_B = 0					3	V
f_t	Current gain bandwidth product	V_{CE} = 10 V	I_C = 0.5 A	f = 1 MHz	(see Note 5)		10		MHz
C_{ob}	Output capacitance	V_{CB} = 20 V	I_E = 0	f = 0.1 MHz			90		pF

NOTES: 2. Inductive loop switching measurement.
3. These parameters must be measured using pulse techniques, t_p = 300 µs, duty cycle ≤ 2%.
4. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.
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		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to case thermal resistance			1.79	°C/W

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

PARAMETER		TEST CONDITIONS †			MIN	TYP	MAX	UNIT
t_{si}	Current storage time	I_C = 10 A $I_{B(off)}$ = -2.5 A	$I_{B(on)}$ = 50 mA $V_{BE(off)}$ = -5 V	(see Figures 1 and 2)		450	700	ns
t_{rv}	Voltage rise time					160	750	ns
t_{fi}	Current fall time					250	400	ns
t_{ti}	Current tail time					280	450	ns
t_{xo}	Cross over time					320	500	ns

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

PARAMETER MEASUREMENT INFORMATION

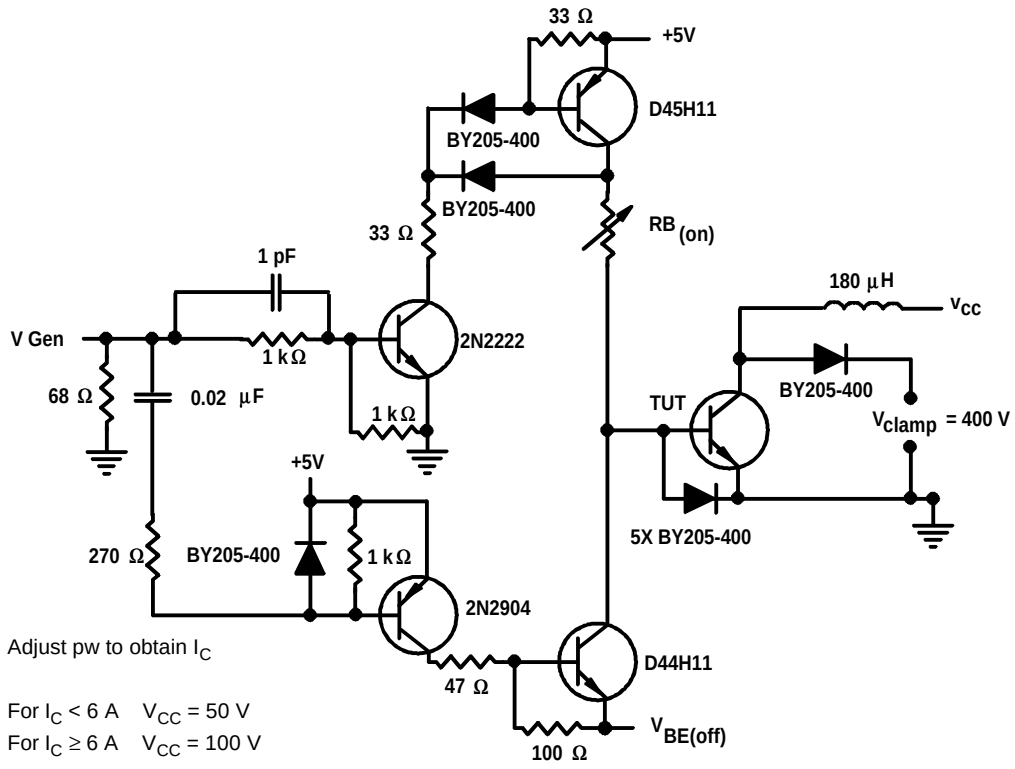
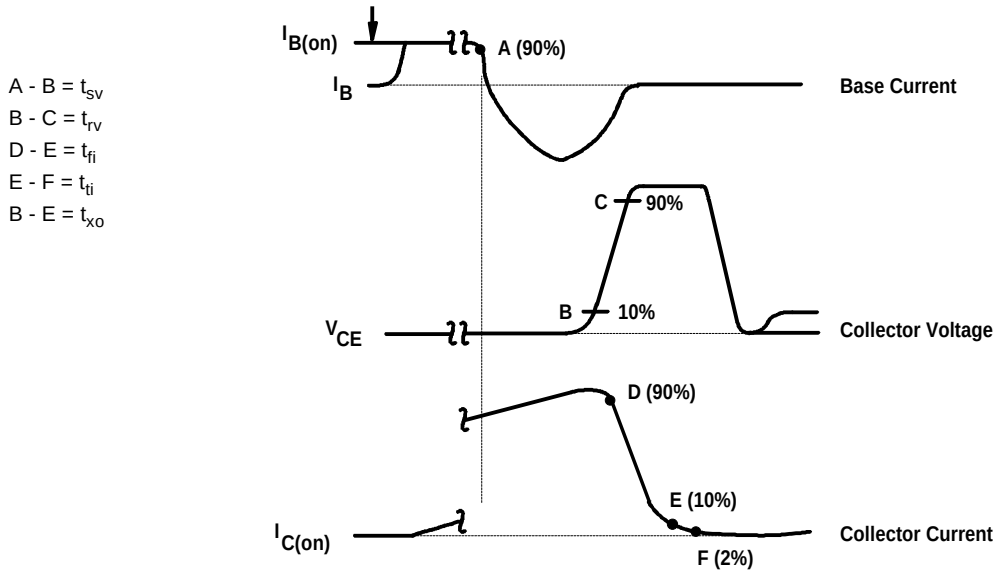


Figure 1. Inductive-Load Switching Test Circuit



NOTES: A. Waveforms are monitored on an oscilloscope with the following characteristics: t_r < 15 ns, R_{in} > 10 Ω, C_{in} < 11.5 pF.
B. Resistors must be noninductive types.

Figure 2. Inductive-Load Switching Waveforms

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN vs COLLECTOR CURRENT

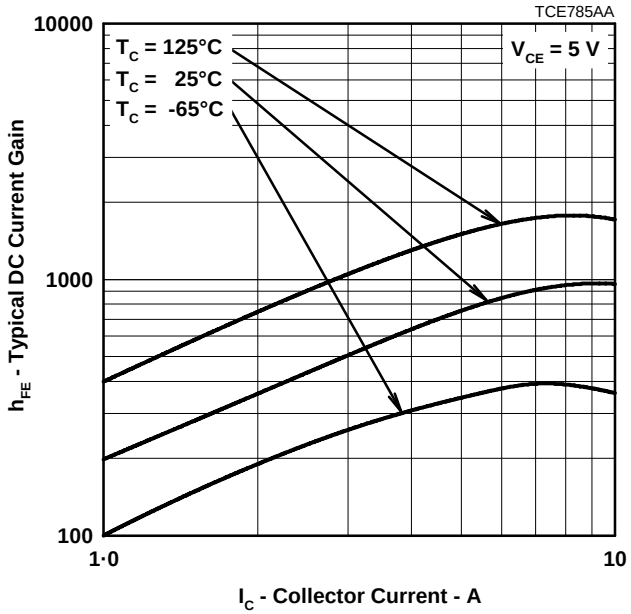


Figure 3.

COLLECTOR-EMITTER SATURATION VOLTAGE vs BASE CURRENT

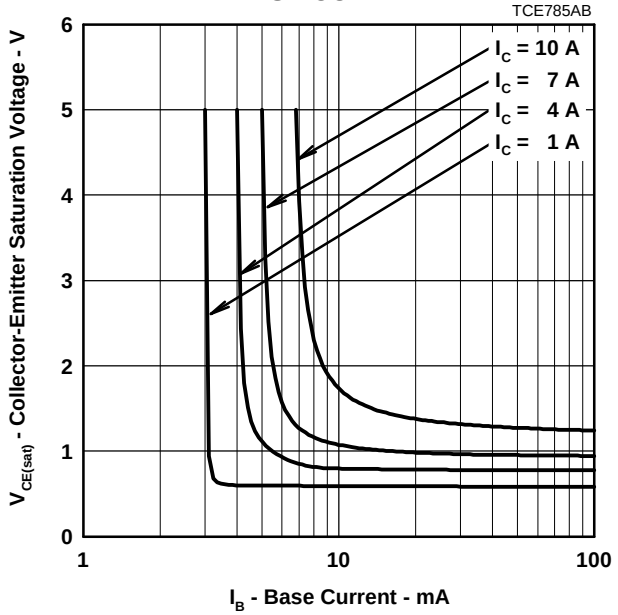


Figure 4.

BASE-EMITTER SATURATION VOLTAGE vs BASE CURRENT

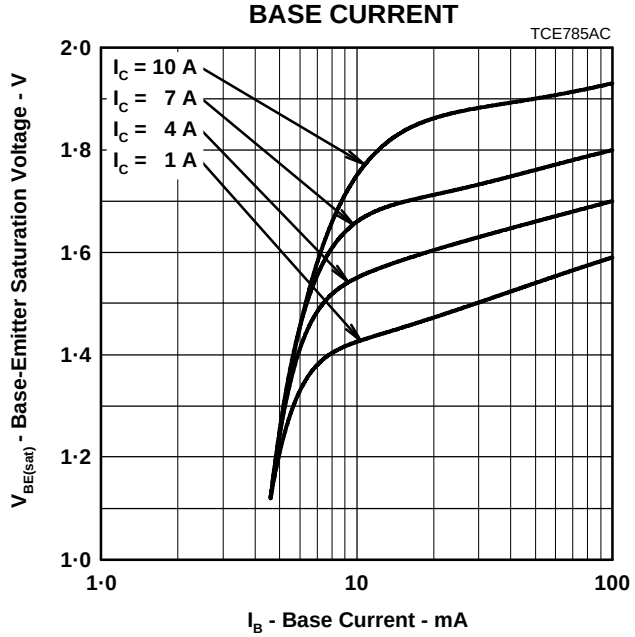


Figure 5.

COLLECTOR CUT-OFF CURRENT vs CASE TEMPERATURE

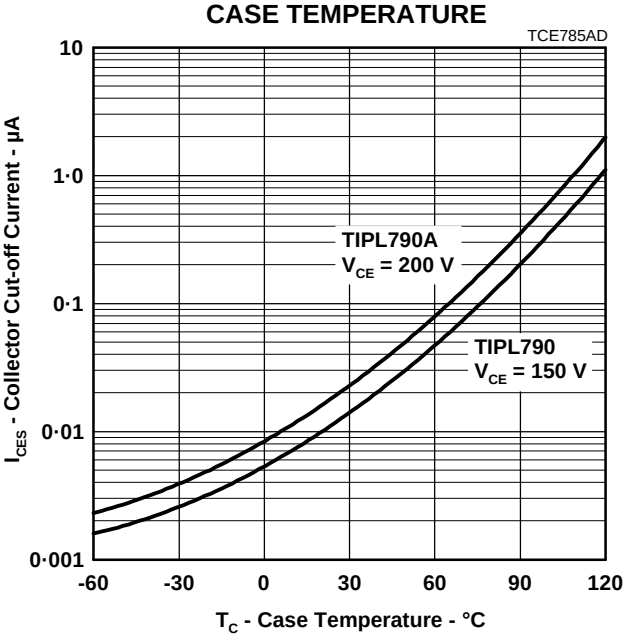


Figure 6.

MAXIMUM SAFE OPERATING REGIONS

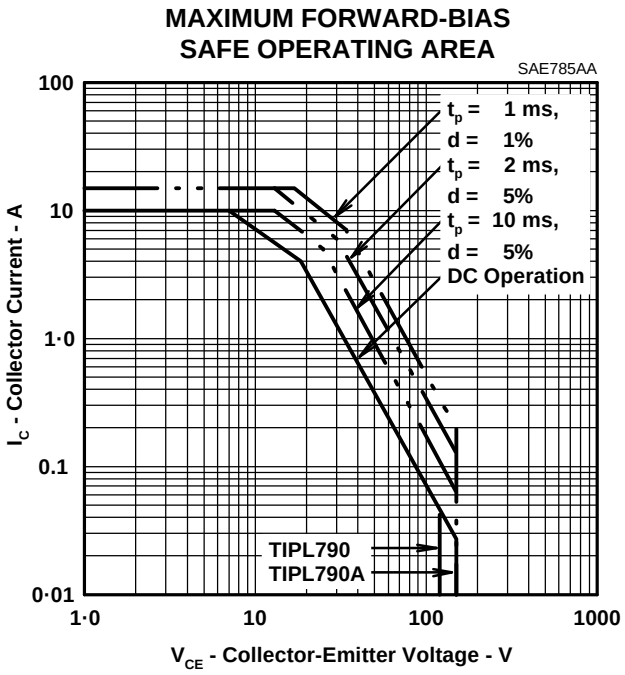


Figure 7.

TIPL790, TIPL790A
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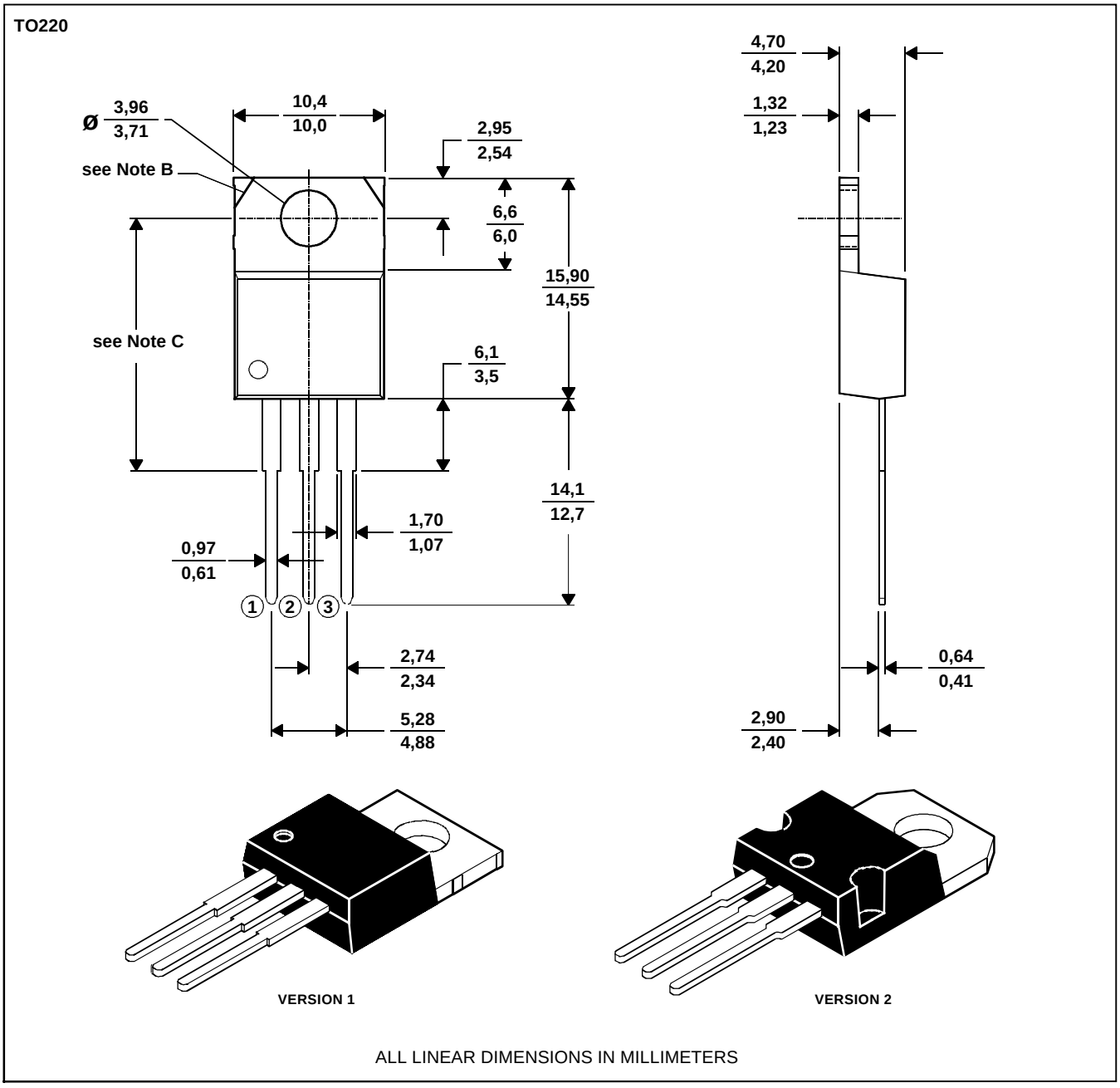
MECHANICAL DATA

TO-220
3-pin plastic flange-mount package

This single-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



NOTES: A. The centre pin is in electrical contact with the mounting tab.
B. Mounting tab corner profile according to package version.
C. Typical fixing hole centre stand off height according to package version.
Version 1, 18.0 mm. Version 2, 17.6 mm.

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