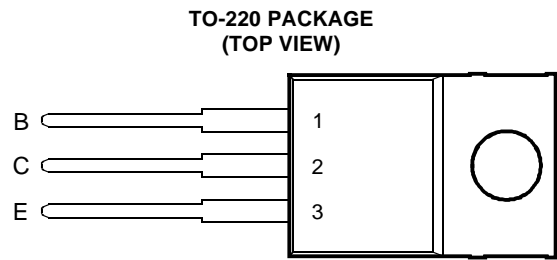


# TIPL790, TIPL790A NPN SILICON POWER DARLINGTONS

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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



Pin 2 is in electrical contact with the mounting base.

MDTRACA

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

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ( $I_E = 0$ )	TIPL790	$V_{CBO}$	150	V
	TIPL790A		200	
Collector-emitter voltage ( $V_{BE} = 0$ )	TIPL790	$V_{CES}$	150	V
	TIPL790A		200	
Collector-emitter voltage ( $I_B = 0$ )	TIPL790	$V_{CEO}$	120	V
	TIPL790A		150	
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  $\leq 2\%$ .

## PRODUCT INFORMATION

Information is current as of publication date. Products conform to specifications in accordance with the terms of Power Innovations standard warranty. Production processing does not necessarily include testing of all parameters.



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

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

NOTES: 2. Inductive loop switching measurement.

3. These parameters must be measured using pulse techniques,  $t_p = 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

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  $f = 1 \text{ MHz}$  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	$^\circ\text{C/W}$

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

PARAMETER	TEST CONDITIONS <sup>†</sup>	MIN	TYP	MAX	UNIT
$t_{si}$ Current storage time	$I_C = 10 \text{ A}$ $I_{B(on)} = 50 \text{ mA}$ $I_{B(off)} = -2.5 \text{ A}$ $V_{BE(off)} = -5 \text{ V}$ (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

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

## PRODUCT INFORMATION

## PARAMETER MEASUREMENT INFORMATION

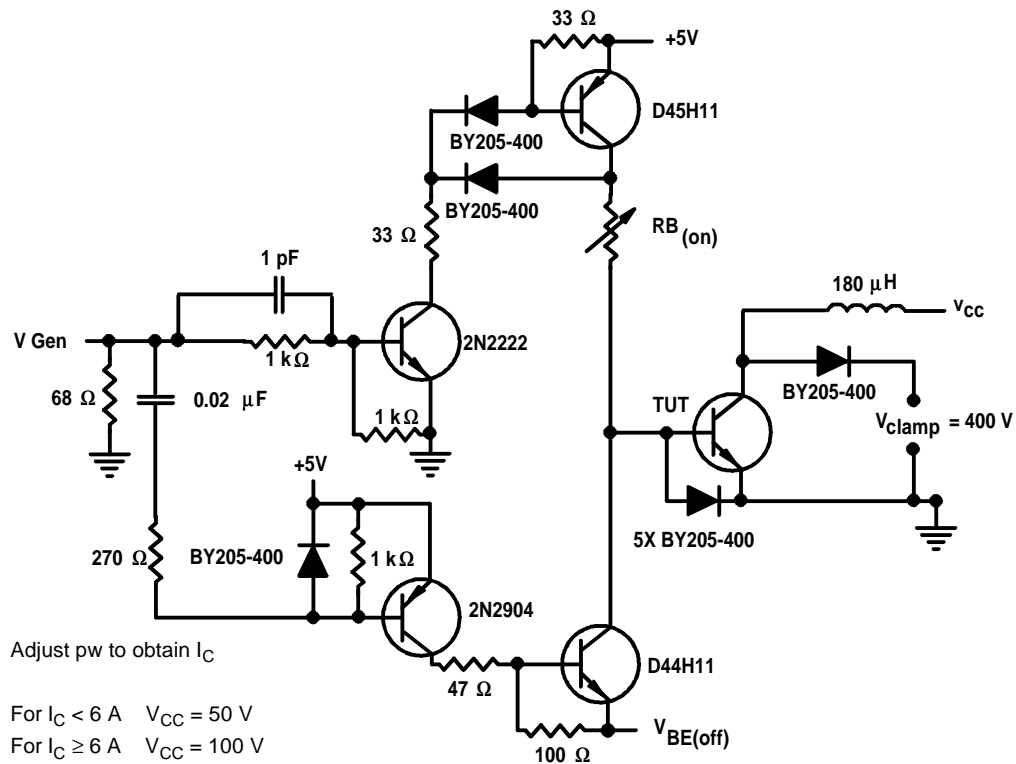
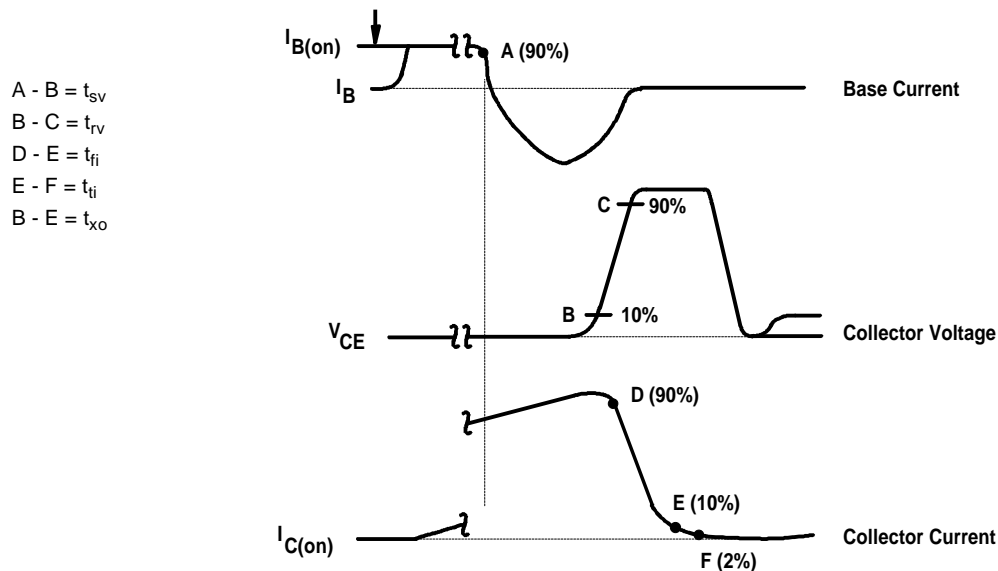


Figure 1. Inductive-Load Switching Test Circuit



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

Figure 2. Inductive-Load Switching Waveforms

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### TYPICAL CHARACTERISTICS

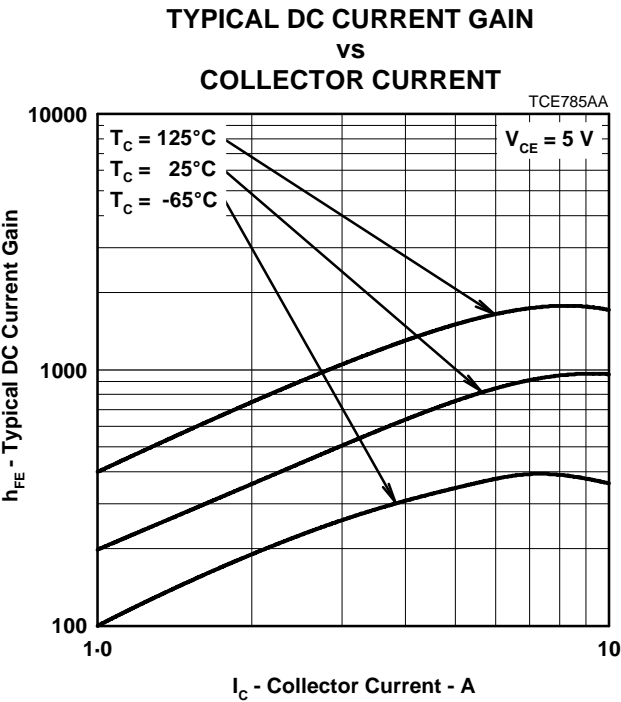


Figure 3.

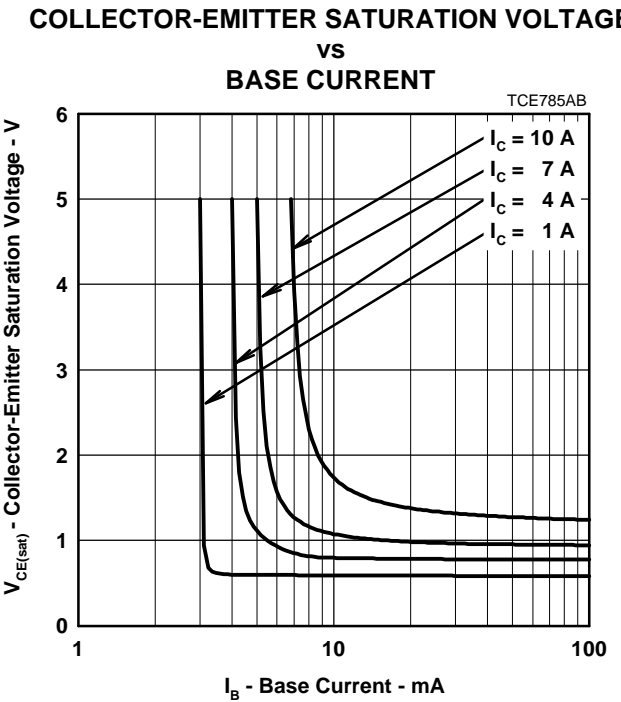


Figure 4.

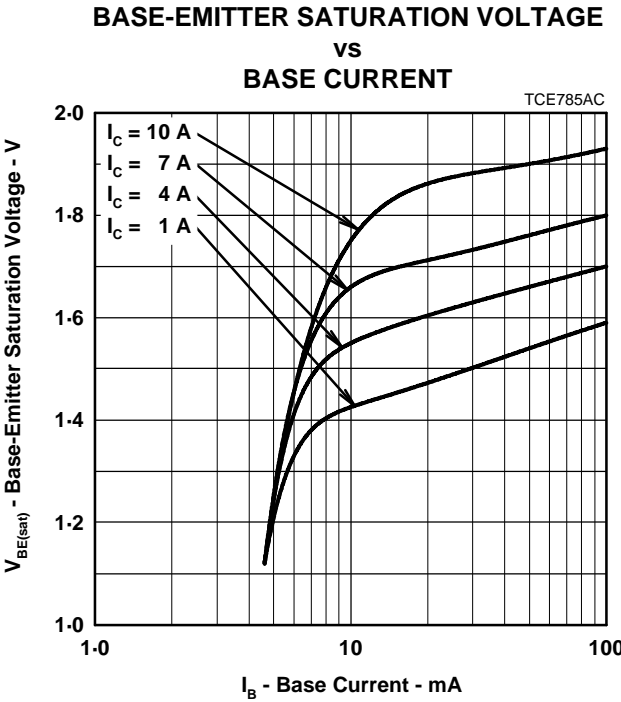


Figure 5.

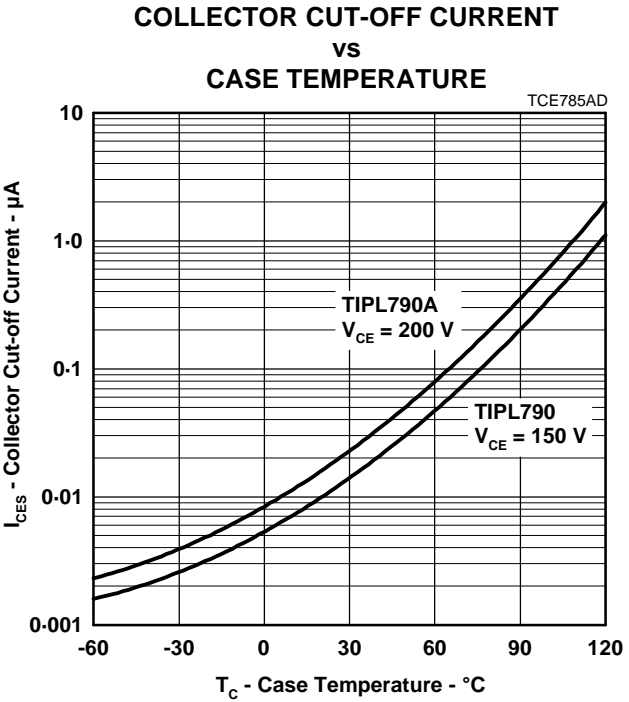


Figure 6.

MAXIMUM SAFE OPERATING REGIONS

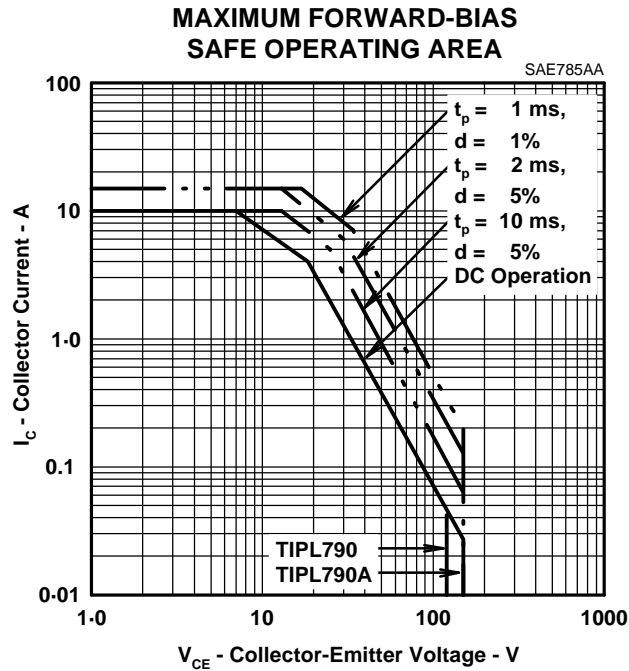


Figure 7.

# TIPL790, TIPL790A NPN SILICON POWER DARLINGTONS

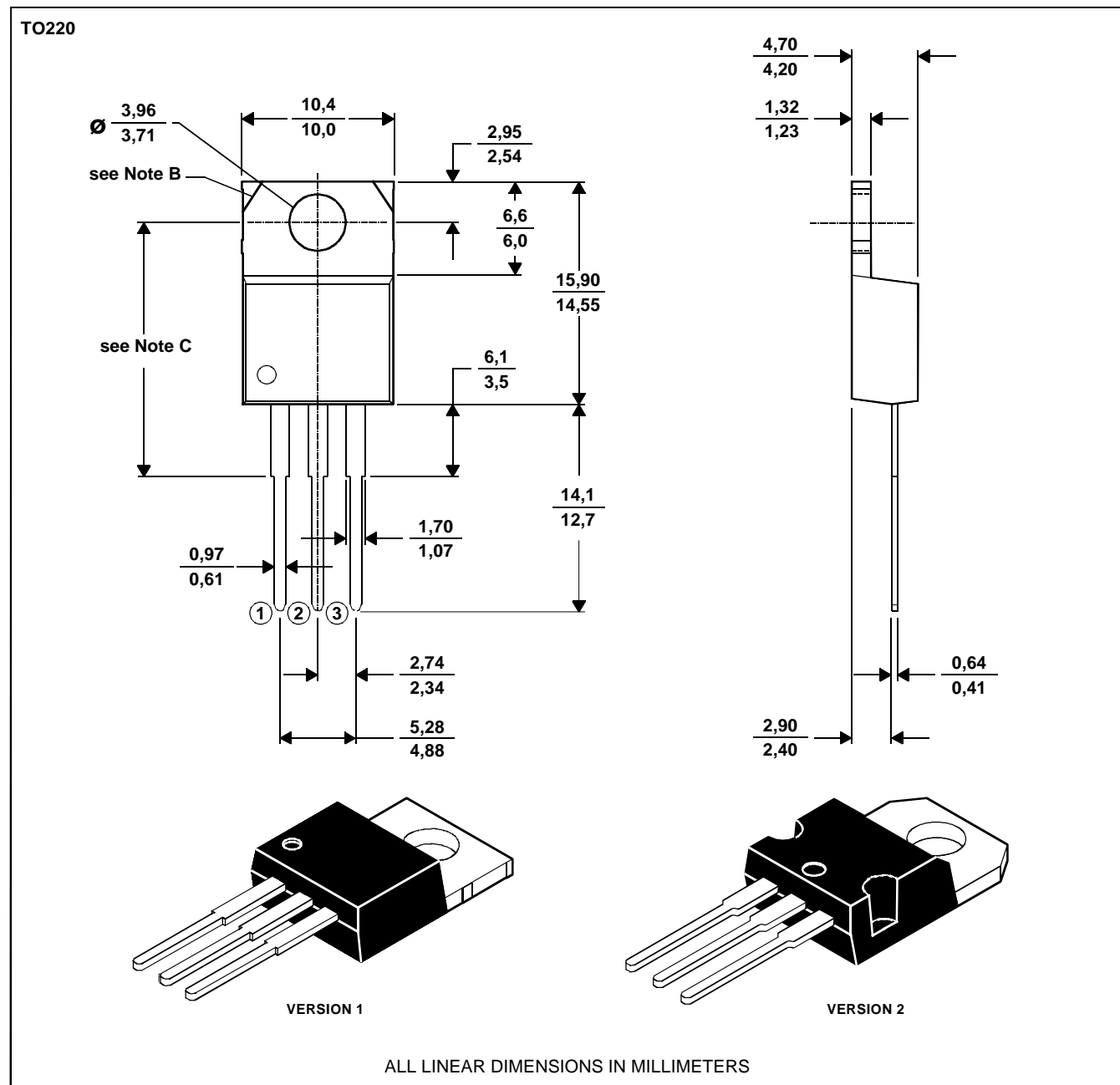
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## MECHANICAL DATA

### 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.

MDXXBE

## PRODUCT INFORMATION

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