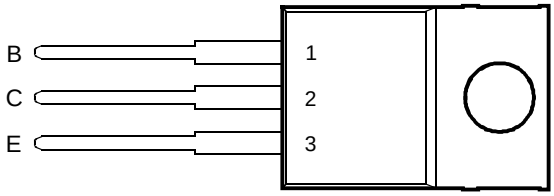
TIP100, TIP101, TIP102
NPN SILICON POWER DARLINGTONS

 AUGUST 1978 - REVISED MARCH 1997

- **Designed for Complementary Use with TIP105, TIP106 and TIP107**
- **80 W at 25°C Case Temperature**
- **8 A Continuous Collector Current**
- **Maximum $V_{CE(sat)}$ of 2.5 V at I_C = 8 A**

TO-220 PACKAGE
(TOP VIEW)



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)	TIP100	V_{CBO}	60	V
	TIP101		80	
	TIP102		100	
Collector-emitter voltage (I_B = 0)	TIP100	V_{CEO}	60	V
	TIP101		80	
	TIP102		100	
Emitter-base voltage		V_{EBO}	5	V
Continuous collector current		I_C	8	A
Peak collector current (see Note 1)		I_{CM}	15	A
Continuous base current		I_B	1	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		P_{tot}	80	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		P_{tot}	2	W
Unclamped inductive load energy (see Note 4)		$½LI_C^2$	10	mJ
Operating junction temperature range		T_j	-65 to +150	°C
Storage temperature range		T_{stg}	-65 to +150	°C
Lead temperature 3.2 mm from case for 10 seconds		T_L	260	°C

NOTES: 1. This value applies for $t_p \leq 0.3$ ms, duty cycle ≤ 10%.
2. Derate linearly to 150°C case temperature at the rate of 0.64 W/°C.
3. Derate linearly to 150°C free air temperature at the rate of 16 mW/°C.
4. This rating is based on the capability of the transistor to operate safely in a circuit of: L = 20 mH, $I_{B(on)}$ = 5 mA, R_{BE} = 100 Ω, $V_{BE(off)}$ = 0, R_S = 0.1 Ω, V_{CC} = 20 V.

electrical characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	I_C = 30 mA (see Note 5)	I_B = 0	TIP100 TIP101 TIP102	60 80 100			V
I_{CEO}	Collector-emitter cut-off current	V_{CE} = 30 V V_{CE} = 40 V V_{CE} = 50 V	I_B = 0 I_B = 0 I_B = 0	TIP100 TIP101 TIP102			50 50 50	µA
I_{CBO}	Collector cut-off current	V_{CB} = 60 V V_{CB} = 80 V V_{CB} = 100 V	I_E = 0 I_E = 0 I_E = 0	TIP100 TIP101 TIP102			50 50 50	µA
I_{EBO}	Emitter cut-off current	V_{EB} = 5 V	I_C = 0				8	mA
h_{FE}	Forward current transfer ratio	V_{CE} = 4 V V_{CE} = 4 V	I_C = 3 A I_C = 8 A	(see Notes 5 and 6)	1000 200		20000	
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_B = 6 mA I_B = 80 mA	I_C = 3 A I_C = 8 A	(see Notes 5 and 6)			2 2.5	V
V_{BE}	Base-emitter voltage	V_{CE} = 4 V	I_C = 8 A	(see Notes 5 and 6)			2.8	V
V_{EC}	Parallel diode forward voltage	I_E = 8 A	I_B = 0	(see Notes 5 and 6)			3.5	V

NOTES: 5. These parameters must be measured using pulse techniques, t_p = 300 µs, duty cycle ≤ 2%.
6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

thermal characteristics

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to case thermal resistance			1.56	°C/W
$R_{\theta JA}$	Junction to free air thermal resistance			62.5	°C/W
$C_{\theta C}$	Thermal capacitance of case		0.9		J/°C

resistive-load-switching characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS †			MIN	TYP	MAX	UNIT
t_d	Delay time	I_C = 8 A $V_{BE(off)}$ = -5 V	$I_{B(on)}$ = 80 mA R_L = 5 Ω	$I_{B(off)}$ = -80 mA t_p = 20 µs, dc ≤ 2%		35		ns
t_r	Rise time					350		ns
t_s	Storage time					1.8		µs
t_f	Fall time					2.45		µs

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

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN vs COLLECTOR CURRENT

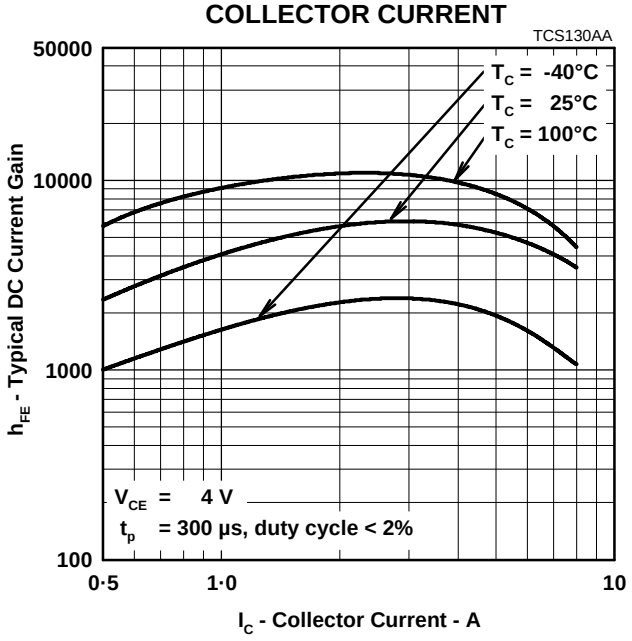


Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE vs COLLECTOR CURRENT

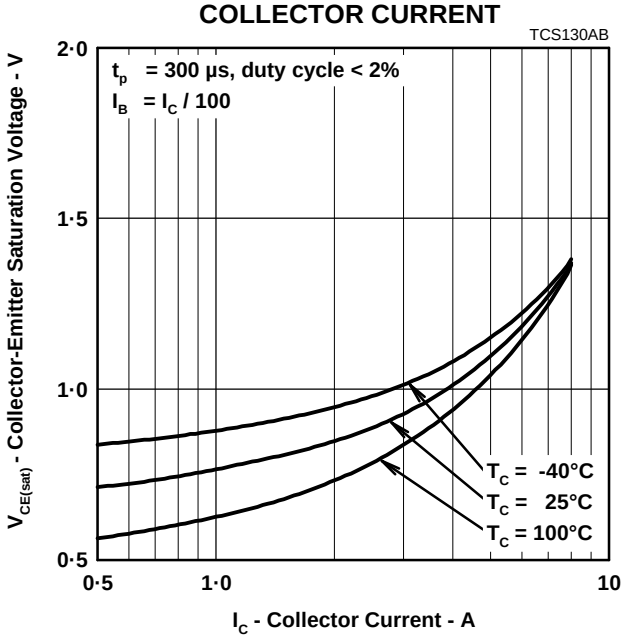


Figure 2.

BASE-EMITTER SATURATION VOLTAGE vs COLLECTOR CURRENT

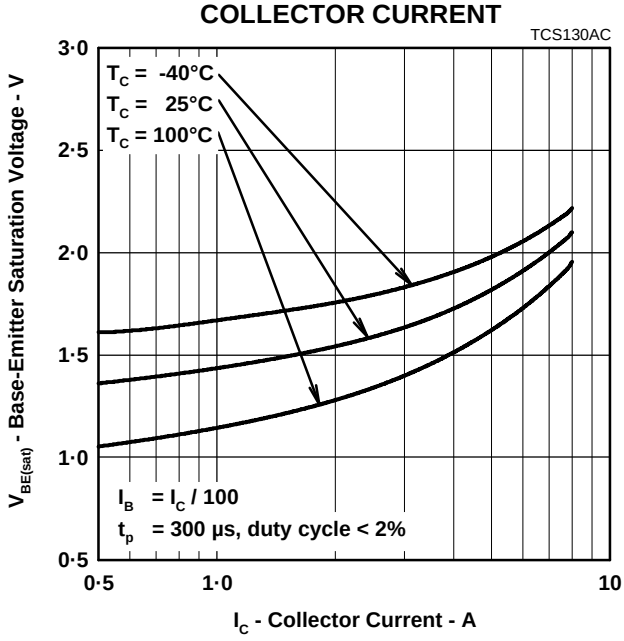


Figure 3.

MAXIMUM SAFE OPERATING REGIONS

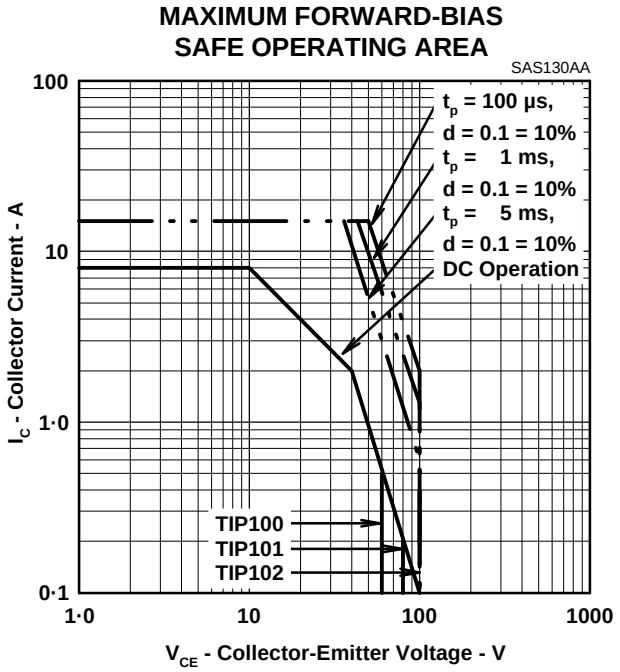


Figure 4.

THERMAL INFORMATION

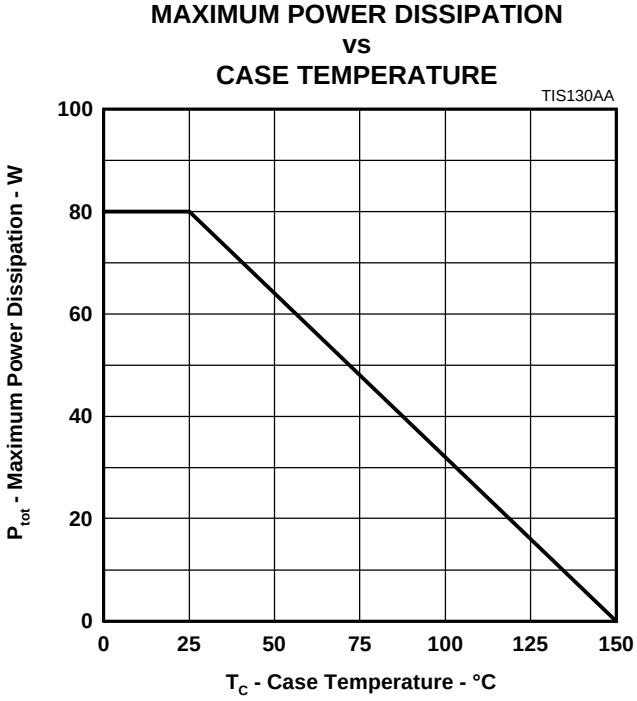


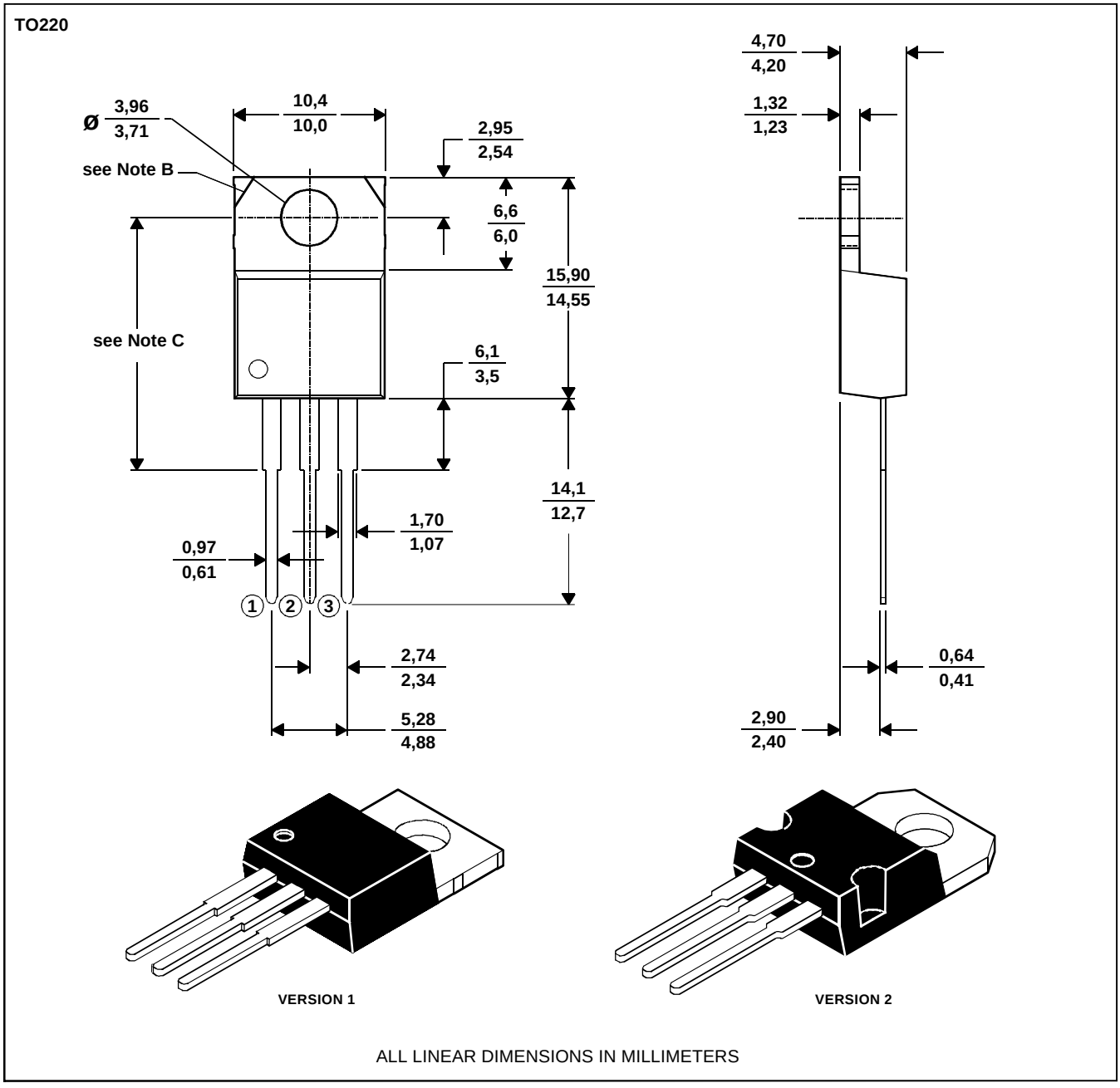
Figure 5.

PRODUCT INFORMATION

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

IMPORTANT NOTICE

Power Innovations Limited (PI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to verify, before placing orders, that the information being relied on is current.

PI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with PI's standard warranty. Testing and other quality control techniques are utilized to the extent PI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except as mandated by government requirements.

PI accepts no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor is any license, either express or implied, granted under any patent right, copyright, design right, or other intellectual property right of PI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.

PI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS.