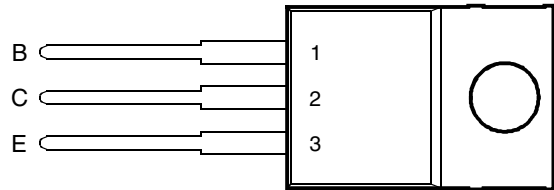


- Designed for Complementary Use with TIP125, TIP126 and TIP127
- 65 W at 25°C Case Temperature
- 5 A Continuous Collector Current
- Minimum  $h_{FE}$  of 1000 at 3 V, 3 A



This series is obsolete and not recommended for new designs.

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 ( $I_E = 0$ )	TIP120	$V_{CB0}$	60	V
	TIP121		80	
	TIP122		100	
Collector-emitter voltage ( $I_B = 0$ )	TIP120	$V_{CEO}$	60	V
	TIP121		80	
	TIP122		100	
Emitter-base voltage		$V_{EBO}$	5	V
Continuous collector current		$I_C$	5	A
Peak collector current (see Note 1)		$I_{CM}$	8	A
Continuous base current		$I_B$	0.1	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		$P_{tot}$	65	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)		$\frac{1}{2}LI_C^2$	50	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  $\leq 10\%$ .  
 2. Derate linearly to 150°C case temperature at the rate of 0.52 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,  $R_{BE} = 100 \Omega$ ,  $V_{BE(off)} = 0$ ,  $R_S = 0.1 \Omega$ ,  $V_{CC} = 20$  V.

**PRODUCT INFORMATION**

DECEMBER 1971 - REVISED SEPTEMBER 2002  
 Specifications are subject to change without notice.

# TIP120, TIP121, TIP122 NPN SILICON POWER DARLINGTONS

**BOURNS®**

## electrical characteristics at 25°C case temperature

PARAMETER	TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$ Collector-emitter breakdown voltage	$I_C = 30 \text{ mA}$ (see Note 5)	$I_B = 0$	TIP120 TIP121 TIP122	60 80 100			V
$I_{CEO}$ Collector-emitter cut-off current	$V_{CE} = 30 \text{ V}$ $V_{CE} = 40 \text{ V}$ $V_{CE} = 50 \text{ V}$	$I_B = 0$ $I_B = 0$ $I_B = 0$	TIP120 TIP121 TIP122			0.5 0.5 0.5	mA
$I_{CBO}$ Collector cut-off current	$V_{CB} = 60 \text{ V}$ $V_{CB} = 80 \text{ V}$ $V_{CB} = 100 \text{ V}$	$I_E = 0$ $I_E = 0$ $I_E = 0$	TIP120 TIP121 TIP122			0.2 0.2 0.2	mA
$I_{EBO}$ Emitter cut-off current	$V_{EB} = 5 \text{ V}$	$I_C = 0$				2	mA
$h_{FE}$ Forward current transfer ratio	$V_{CE} = 3 \text{ V}$ $V_{CE} = 3 \text{ V}$	$I_C = 0.5 \text{ A}$ $I_C = 3 \text{ A}$	(see Notes 5 and 6)	1000 1000			
$V_{CE(sat)}$ Collector-emitter saturation voltage	$I_B = 12 \text{ mA}$ $I_B = 20 \text{ mA}$	$I_C = 3 \text{ A}$ $I_C = 5 \text{ A}$	(see Notes 5 and 6)			2 4	V
$V_{BE}$ Base-emitter voltage	$V_{CE} = 3 \text{ V}$	$I_C = 3 \text{ A}$	(see Notes 5 and 6)			2.5	V
$V_{EC}$ Parallel diode forward voltage	$I_E = 5 \text{ A}$	$I_B = 0$	(see Notes 5 and 6)			3.5	V

NOTES: 5. These parameters must be measured using pulse techniques,  $t_p = 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

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			1.92	°C/W
$R_{\theta JA}$ Junction to free air thermal resistance			62.5	°C/W

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

PARAMETER	TEST CONDITIONS †			MIN	TYP	MAX	UNIT
$t_{on}$ Turn-on time	$I_C = 3 \text{ A}$	$I_{B(on)} = 12 \text{ mA}$	$I_{B(off)} = -12 \text{ mA}$		1.5		$\mu\text{s}$
$t_{off}$ Turn-off time	$V_{BE(off)} = -5 \text{ V}$	$R_L = 10 \Omega$	$t_p = 20 \mu\text{s}$ , dc $\leq 2\%$		8.5		$\mu\text{s}$

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

## PRODUCT INFORMATION

DECEMBER 1971 - REVISED SEPTEMBER 2002  
Specifications are subject to change without notice.

**TYPICAL CHARACTERISTICS**

**TYPICAL DC CURRENT GAIN  
vs  
COLLECTOR CURRENT**

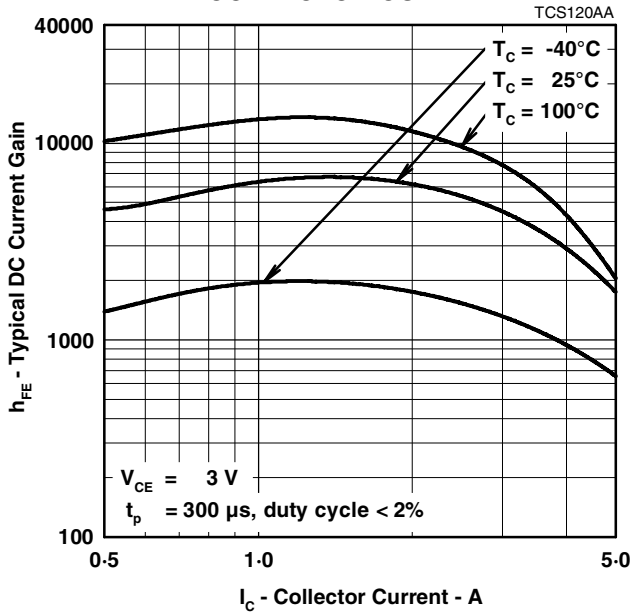


Figure 1.

**COLLECTOR-EMITTER SATURATION VOLTAGE  
vs  
COLLECTOR CURRENT**

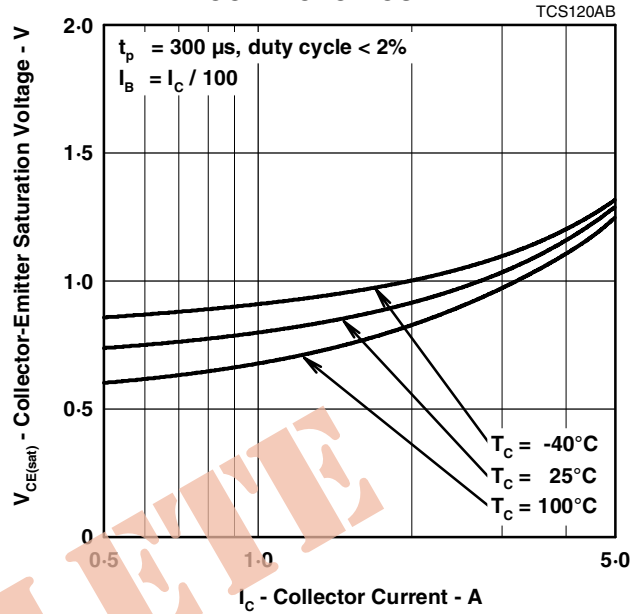


Figure 2.

**BASE-EMITTER SATURATION VOLTAGE  
vs  
COLLECTOR CURRENT**

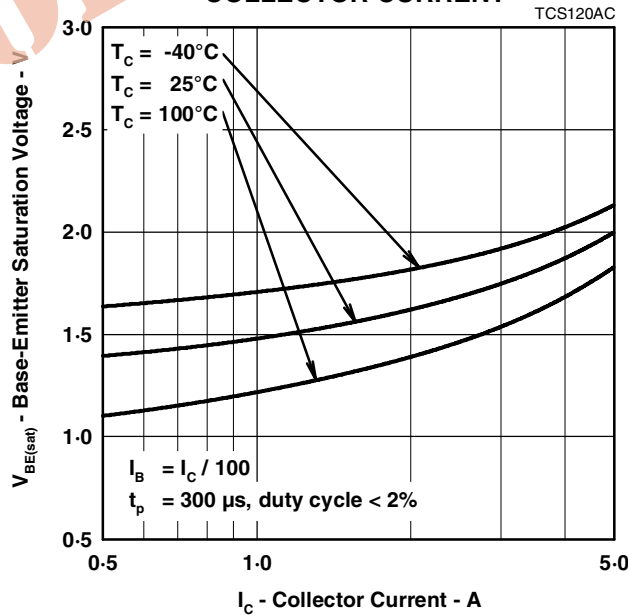


Figure 3.

**PRODUCT INFORMATION**

DECEMBER 1971 - REVISED SEPTEMBER 2002  
Specifications are subject to change without notice.

**MAXIMUM SAFE OPERATING REGIONS**

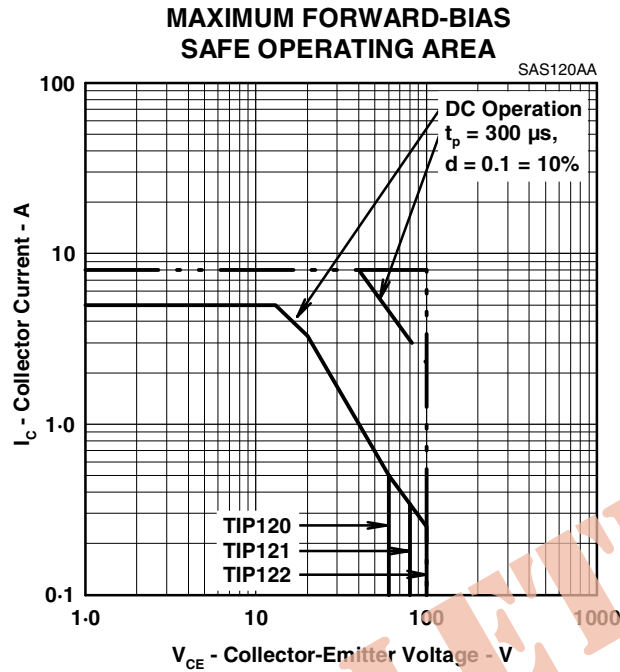


Figure 4.

**THERMAL INFORMATION**

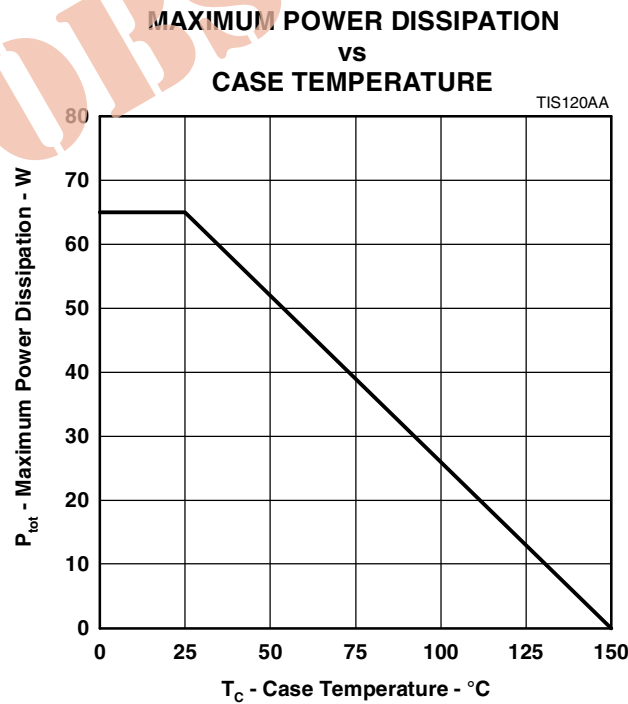


Figure 5.

**PRODUCT INFORMATION**

DECEMBER 1971 - REVISED SEPTEMBER 2002  
Specifications are subject to change without notice.