



THE DATASHEET OF BD646-S

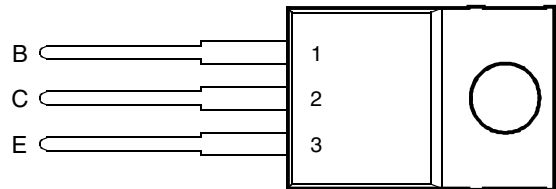


BD646, BD648, BD650, BD652 PNP SILICON POWER DARLINGTONS

BOURNS®

- Designed for Complementary Use with BD645, BD647, BD649 and BD651
- 62.5 W at 25°C Case Temperature
- 8 A Continuous Collector Current
- Minimum h_{FE} of 750 at 3V, 3 A

TO-220 PACKAGE
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDTRACA



This series is obsolete and not recommended for new designs.

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

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ($I_E = 0$)	BD646	V_{CB0}	-80	V
	BD648		-100	
	BD650		-120	
	BD652		-140	
Collector-emitter voltage ($I_B = 0$)	BD646	V_{CE0}	-60	V
	BD648		-80	
	BD650		-100	
	BD652		-120	
Emitter-base voltage		V_{EB0}	-5	V
Continuous collector current		I_C	-8	A
Peak collector current (see Note 1)		I_{CM}	-12	A
Continuous base current		I_B	-0.3	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		P_{tot}	62.5	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 0.4 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

MAY 1993 - REVISED SEPTEMBER 2002
Specifications are subject to change without notice.

BD646, BD648, BD650, BD652
PNP SILICON POWER DARLINGTONS



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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{(BR)CEO}$ Collector-emitter breakdown voltage	$I_C = -30 \text{ mA}$ $I_B = 0$ (see Note 5)	BD646 BD648 BD650 BD652	-60 -80 -100 -120		V
I_{CEO} Collector-emitter cut-off current	$V_{CE} = -30 \text{ V}$ $I_B = 0$ $V_{CE} = -40 \text{ V}$ $I_B = 0$ $V_{CE} = -50 \text{ V}$ $I_B = 0$ $V_{CE} = -60 \text{ V}$ $I_B = 0$	BD646 BD648 BD650 BD652		-0.5 -0.5 -0.5 -0.5	mA
I_{CBO} Collector cut-off current	$V_{CB} = -60 \text{ V}$ $I_E = 0$ $V_{CB} = -80 \text{ V}$ $I_E = 0$ $V_{CB} = -100 \text{ V}$ $I_E = 0$ $V_{CB} = -120 \text{ V}$ $I_E = 0$ $V_{CB} = -40 \text{ V}$ $I_E = 0$ $T_C = 150^\circ\text{C}$ $V_{CB} = -50 \text{ V}$ $I_E = 0$ $T_C = 150^\circ\text{C}$ $V_{CB} = -60 \text{ V}$ $I_E = 0$ $T_C = 150^\circ\text{C}$ $V_{CB} = -70 \text{ V}$ $I_E = 0$ $T_C = 150^\circ\text{C}$	BD646 BD648 BD650 BD652 BD646 BD648 BD650 BD652		-0.2 -0.2 -0.2 -0.2 -2.0 -2.0 -2.0 -2.0	mA
I_{EBO} Emitter cut-off current	$V_{EB} = -5 \text{ V}$ $I_C = 0$ (see Notes 5 and 6)			-5	mA
h_{FE} Forward current transfer ratio	$V_{CE} = -3 \text{ V}$ $I_C = -3 \text{ A}$ (see Notes 5 and 6)		750		
$V_{CE(sat)}$ Collector-emitter saturation voltage	$I_B = -12 \text{ mA}$ $I_C = -3 \text{ A}$ $I_B = -50 \text{ mA}$ $I_C = -5 \text{ A}$ (see Notes 5 and 6)			-2 -2.5	V
$V_{BE(sat)}$ Base-emitter saturation voltage	$I_B = -50 \text{ mA}$ $I_C = -5 \text{ A}$ (see Notes 5 and 6)			-3	V
$V_{BE(on)}$ Base-emitter voltage	$V_{CE} = -3 \text{ V}$ $I_C = -3 \text{ A}$ (see Notes 5 and 6)			-2.5	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			2.0	°C/W
$R_{\theta JA}$ Junction to free air thermal resistance			62.5	°C/W

PRODUCT INFORMATION

TYPICAL CHARACTERISTICS

**TYPICAL DC CURRENT GAIN
vs
COLLECTOR CURRENT**

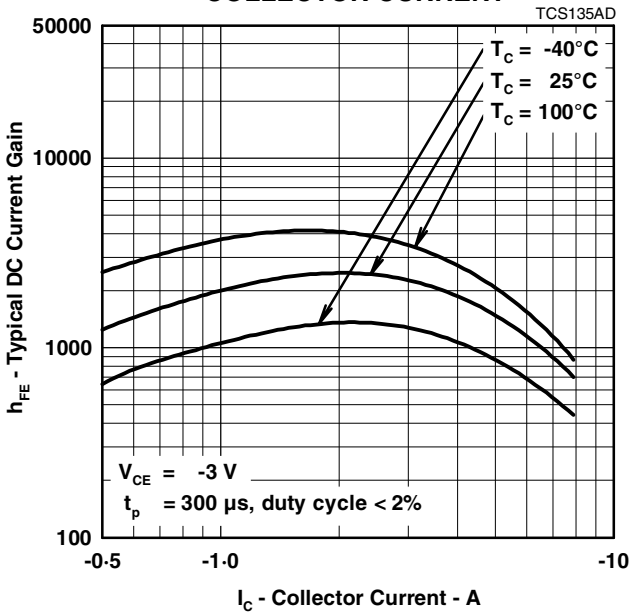


Figure 1.

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

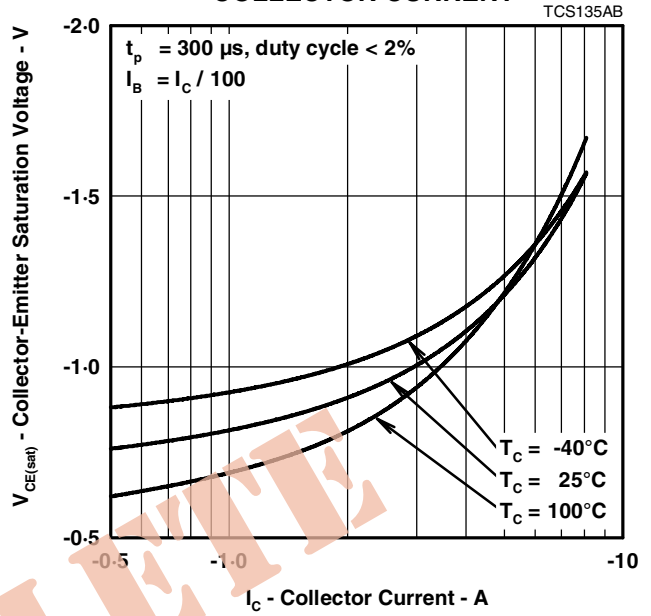


Figure 2.

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

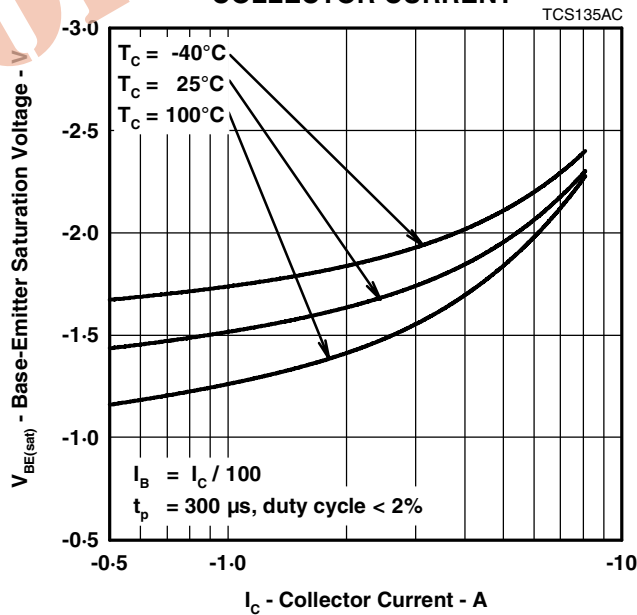


Figure 3.

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MAXIMUM SAFE OPERATING REGIONS

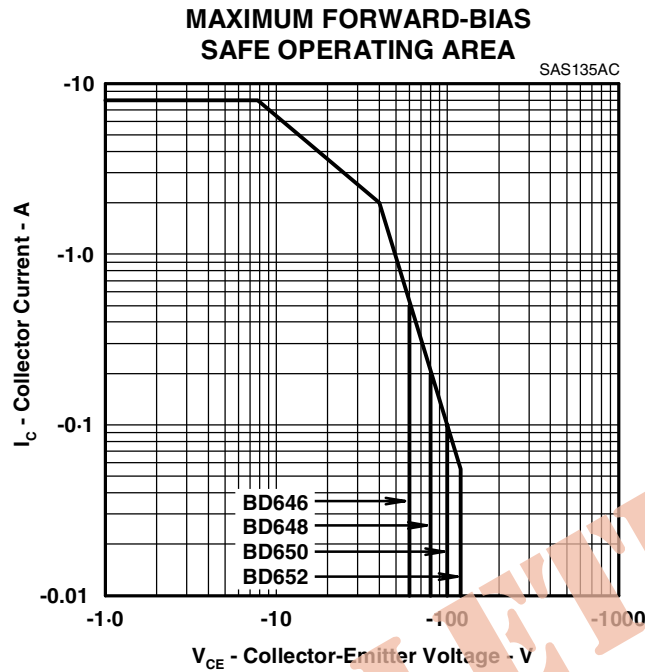


Figure 4.

THERMAL INFORMATION

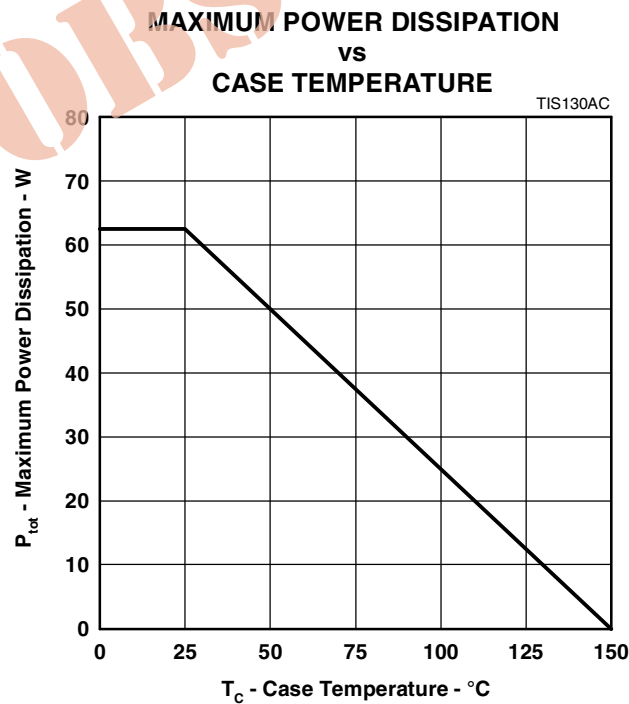




Figure 5.

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