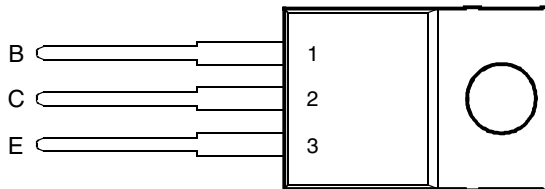




- Designed for Complementary Use with BD646, BD648, BD650 and BD652
- 62.5 W at 25°C Case Temperature
- 8 A Continuous Collector Current
- Minimum  $h_{FE}$  of 750 at 3V, 3 A

TO-220 PACKAGE  
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDTRACA

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

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ( $I_E = 0$ )	BD645	$V_{CBO}$	80	V
	BD647		100	
	BD649		120	
	BD651		140	
Collector-emitter voltage ( $I_B = 0$ )	BD645	$V_{CEO}$	60	V
	BD647		80	
	BD649		100	
	BD651		120	
Emitter-base voltage		$V_{EBO}$	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**

**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)	BD645 60 BD647 80 BD649 100 BD651 120			V
$I_{CEO}$ Collector-emitter cut-off current	$V_{CE} = 30 \text{ V}$	$I_B = 0$		BD645		0.5	mA
	$V_{CE} = 40 \text{ V}$	$I_B = 0$		BD647		0.5	
	$V_{CE} = 50 \text{ V}$	$I_B = 0$		BD649		0.5	
	$V_{CE} = 60 \text{ V}$	$I_B = 0$		BD651		0.5	
$I_{CBO}$ Collector cut-off current	$V_{CB} = 60 \text{ V}$	$I_E = 0$		BD645		0.2	mA
	$V_{CB} = 80 \text{ V}$	$I_E = 0$		BD647		0.2	
	$V_{CB} = 100 \text{ V}$	$I_E = 0$		BD649		0.2	
	$V_{CB} = 120 \text{ V}$	$I_E = 0$		BD651		0.2	
	$V_{CB} = 40 \text{ V}$	$I_E = 0$	$T_C = 150^\circ\text{C}$	BD645		2.0	
	$V_{CB} = 50 \text{ V}$	$I_E = 0$	$T_C = 150^\circ\text{C}$	BD647		2.0	
	$V_{CB} = 60 \text{ V}$	$I_E = 0$	$T_C = 150^\circ\text{C}$	BD649		2.0	
	$V_{CB} = 70 \text{ V}$	$I_E = 0$	$T_C = 150^\circ\text{C}$	BD651		2.0	
$I_{EBO}$ 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	$I_B = 12 \text{ mA}$	$I_C = 3 \text{ A}$	(see Notes 5 and 6)			2	V
	$I_B = 50 \text{ mA}$	$I_C = 5 \text{ A}$				2.5	
$V_{BE(sat)}$ 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  $\leq 2\%$ .

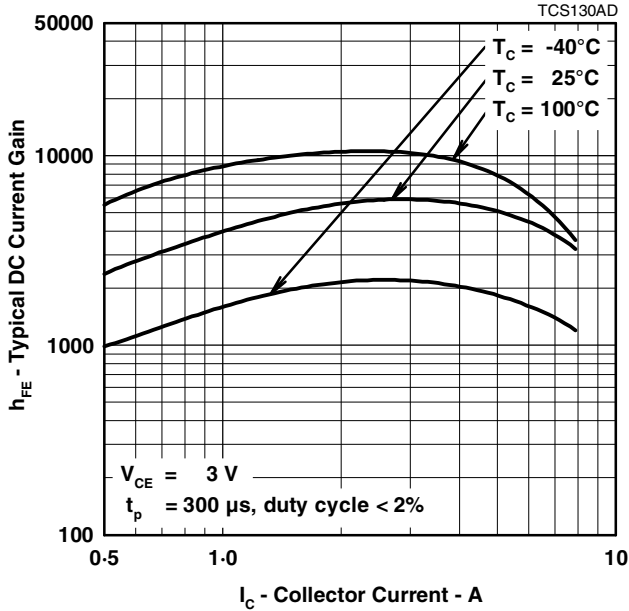
6. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

**thermal characteristics**

PARAMETER	MIN	TYP	MAX	UNIT
$R_{\theta JC}$ Junction to case thermal resistance			2.0	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$ Junction to free air thermal resistance			62.5	$^\circ\text{C}/\text{W}$

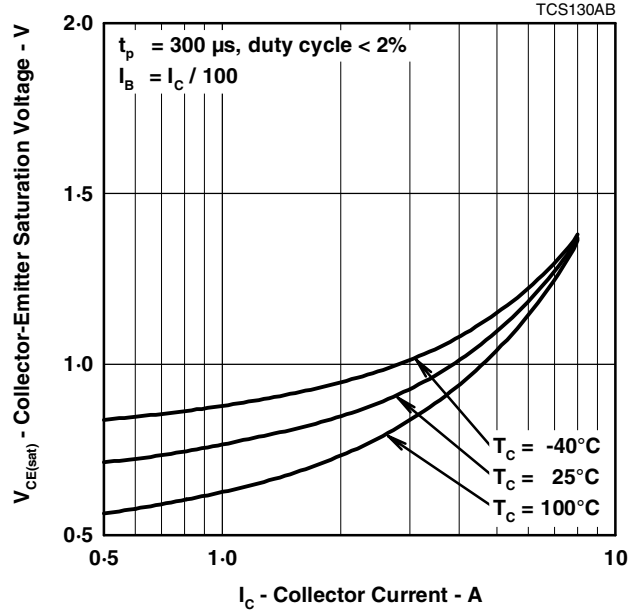
**TYPICAL CHARACTERISTICS**

**TYPICAL DC CURRENT GAIN  
VS  
COLLECTOR CURRENT**



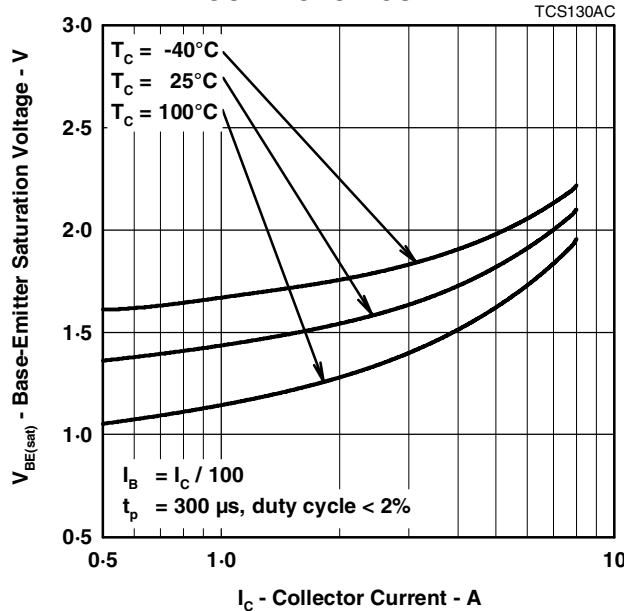
**Figure 1.**

**COLLECTOR-EMITTER SATURATION VOLTAGE  
VS  
COLLECTOR CURRENT**



**Figure 2.**

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



**Figure 3.**

**PRODUCT INFORMATION**

**MAXIMUM SAFE OPERATING REGIONS**

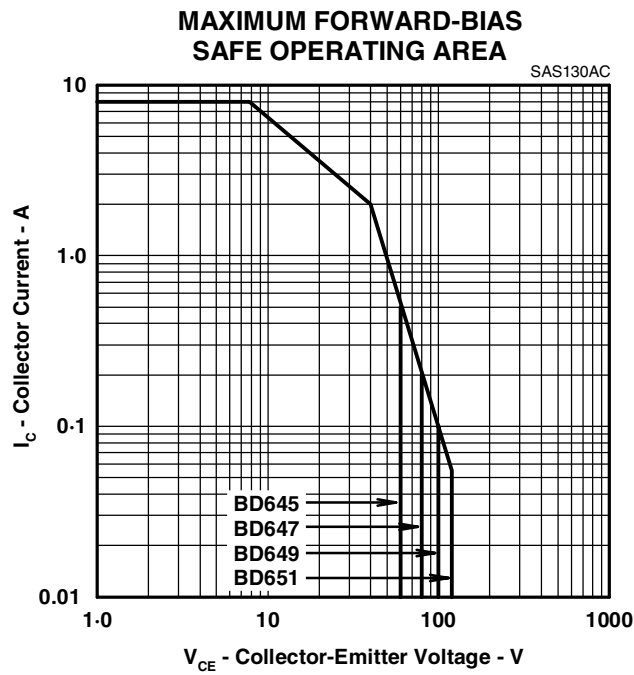


Figure 4.

**THERMAL INFORMATION**

**MAXIMUM POWER DISSIPATION  
vs  
CASE TEMPERATURE**

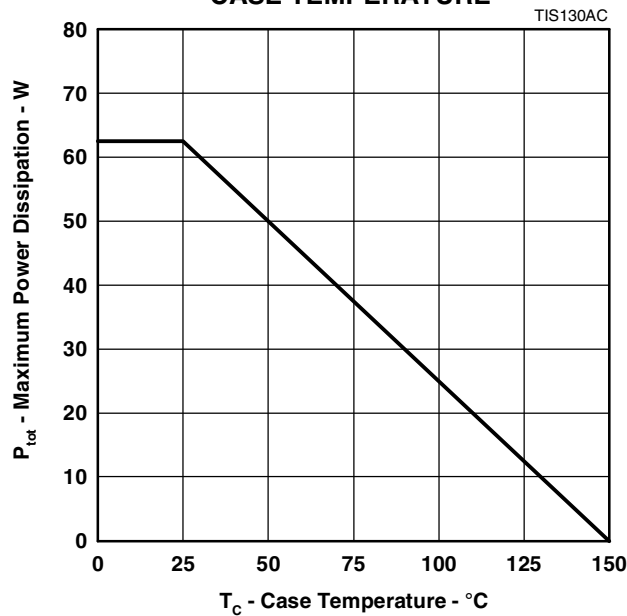


Figure 5.

**PRODUCT INFORMATION**