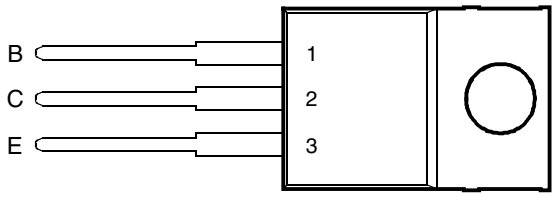
- **Designed for Complementary Use with BD646, BD648, BD650 and BD652**
- **62.5 W at 25°C Case Temperature**
- **8 A Continuous Collector Current**
- **Minimum h_{FE} of 750 at 3V, 3 A**

TO-220 PACKAGE
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

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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)		$½LI_C^2$	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 ≤ 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 Ω, $V_{BE(off)}$ = 0, R_S = 0.1 Ω, V_{CC} = 20 V.

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 mA	I_B = 0	(see Note 5)	BD645	60			V
					BD647	80			
					BD649	100			
					BD651	120			
I_{CEO}	Collector-emitter cut-off current	V_{CE} = 30 V	I_B = 0		BD645			0.5	mA
		V_{CE} = 40 V	I_B = 0		BD647			0.5	
		V_{CE} = 50 V	I_B = 0		BD649			0.5	
		V_{CE} = 60 V	I_B = 0		BD651			0.5	
I_{CBO}	Collector cut-off current	V_{CB} = 60 V	I_E = 0		BD645			0.2	mA
		V_{CB} = 80 V	I_E = 0		BD647			0.2	
		V_{CB} = 100 V	I_E = 0		BD649			0.2	
		V_{CB} = 120 V	I_E = 0		BD651			0.2	
		V_{CB} = 40 V	I_E = 0	T_C = 150°C	BD645			2.0	
		V_{CB} = 50 V	I_E = 0	T_C = 150°C	BD647			2.0	
		V_{CB} = 60 V	I_E = 0	T_C = 150°C	BD649			2.0	
		V_{CB} = 70 V	I_E = 0	T_C = 150°C	BD651			2.0	
I_{EBO}	Emitter cut-off current	V_{EB} = 5 V	I_C = 0	(see Notes 5 and 6)				5	mA
h_{FE}	Forward current transfer ratio	V_{CE} = 3 V	I_C = 3 A	(see Notes 5 and 6)		750			
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_B = 12 mA	I_C = 3 A	(see Notes 5 and 6)				2	V
		I_B = 50 mA	I_C = 5 A					2.5	
$V_{BE(sat)}$	Base-emitter saturation voltage	I_B = 50 mA	I_C = 5 A	(see Notes 5 and 6)				3	V
$V_{BE(on)}$	Base-emitter voltage	V_{CE} = 3 V	I_C = 3 A	(see Notes 5 and 6)				2.5	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			2.0	°C/W
$R_{\theta JA}$	Junction to free air thermal resistance			62.5	°C/W

TYPICAL CHARACTERISTICS

TYPICAL DC CURRENT GAIN vs COLLECTOR CURRENT

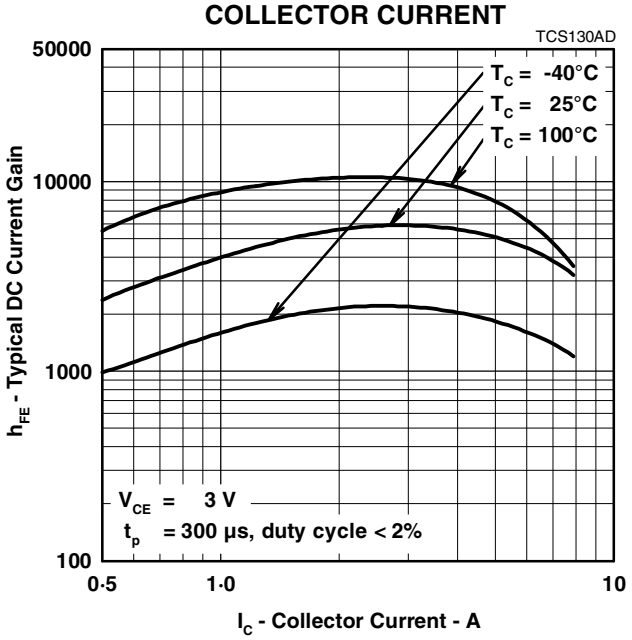

Figure 1.

COLLECTOR-EMITTER SATURATION VOLTAGE vs COLLECTOR CURRENT

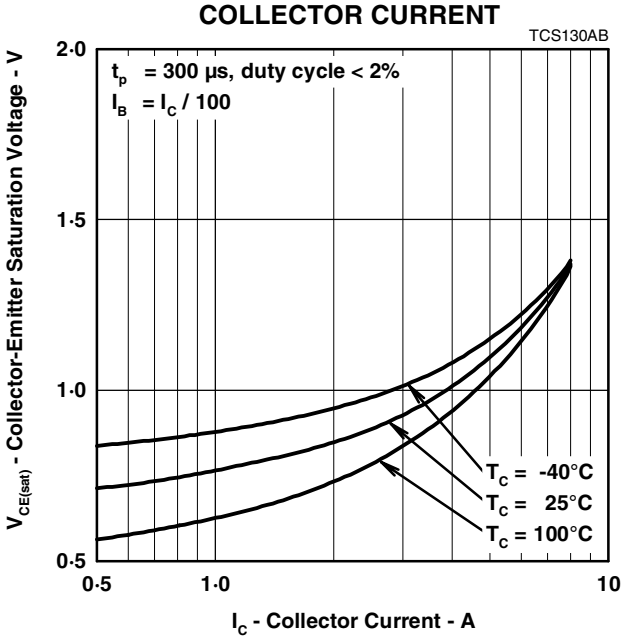

Figure 2.

BASE-EMITTER SATURATION VOLTAGE vs COLLECTOR CURRENT

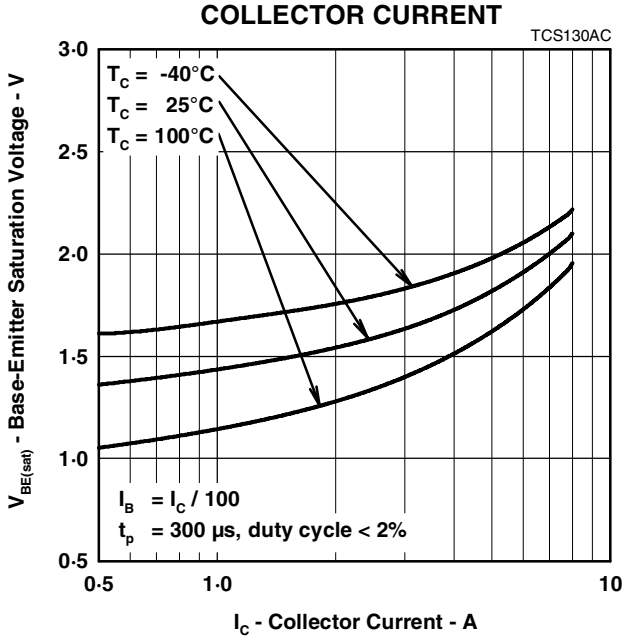

Figure 3.

MAXIMUM SAFE OPERATING REGIONS

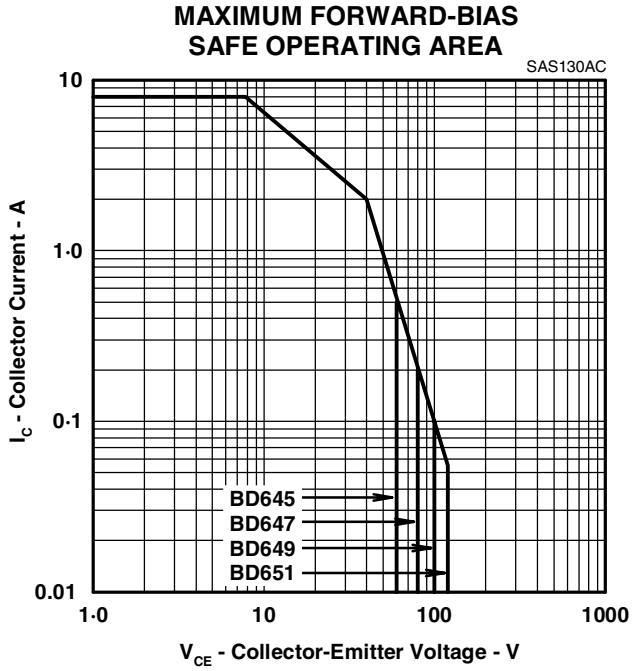

Figure 4.

THERMAL INFORMATION

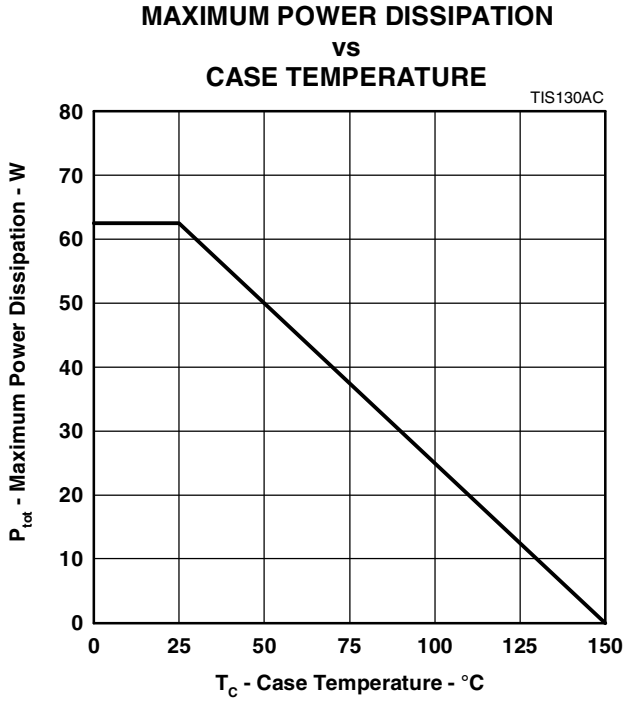

Figure 5.