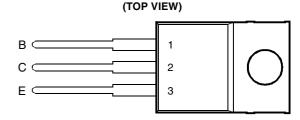
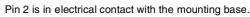
# **BOURNS®**

- 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<sub>FE</sub> of 750 at 3V, 3 A



**TO-220 PACKAGE** 



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# This series is obsolete and not recommended for new designs.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	
	BD646		-80		
Collector-base voltage (I <sub>E</sub> = 0)	BD648		-100	V	
	BD650	V <sub>СВО</sub>	-120		
	BD652		-140		
Collector-emitter voltage (I <sub>B</sub> = 0)	BD646		-60		
	BD648	V <sub>CEO</sub>	-80	V	
	BD650		-100		
	BD652		-120		
Emitter-base voltage		V <sub>EBO</sub>	-5	V	
Continuous collector current		I <sub>C</sub>	-8	Α	
Peak collector current (see Note 1)		I <sub>CM</sub>	-12	Α	
Continuous base current		I <sub>B</sub>	-0.3	Α	
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)			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)		½Ll <sub>C</sub> <sup>2</sup>	50	mJ	
Operating junction temperature range		T <sub>j</sub>	-65 to +150	°C	
Storage temperature range		T <sub>stg</sub>	-65 to +150	°C	
Lead temperature 3.2 mm from case for 10 seconds		$T_L$	260	°C	

NOTES: 1. This value applies for  $t_p \le 0.3$  ms, duty cycle  $\le 10\%$ .

- 2. Derate linearly to  $150^{\circ}$ C case temperature at the rate of  $0.4 \text{ W/}^{\circ}$ 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.



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

PARAMETER TEST CONDITIONS			MIN	TYP	MAX	UNIT			
V <sub>(BR)CEO</sub>	Collector-emitter breakdown voltage	I <sub>C</sub> = -30 mA	I <sub>B</sub> = 0	(see Note 5)	BD646 BD648 BD650 BD652	-60 -80 -100 -120			V
I <sub>CEO</sub>	Collector-emitter cut-off current	$V_{CE} = -30 \text{ V}$ $V_{CE} = -40 \text{ V}$ $V_{CE} = -50 \text{ V}$ $V_{CE} = -60 \text{ V}$	$I_{B} = 0$ $I_{B} = 0$ $I_{B} = 0$ $I_{B} = 0$		BD646 BD648 BD650 BD652			-0.5 -0.5 -0.5 -0.5	mA
Ісво	Collector cut-off current	$\begin{array}{c} V_{CB} = \ -60 \ V \\ V_{CB} = \ -80 \ V \\ V_{CB} = \ -100 \ V \\ V_{CB} = \ -120 \ V \\ V_{CB} = \ -40 \ V \\ V_{CB} = \ -50 \ V \\ V_{CB} = \ -60 \ V \\ V_{CB} = \ -70 \ V \\ \end{array}$	$I_{E} = 0$	$T_{C} = 150^{\circ}C$ $T_{C} = 150^{\circ}C$ $T_{C} = 150^{\circ}C$ $T_{C} = 150^{\circ}C$	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 <sub>EBO</sub>	Emitter cut-off current	V <sub>EB</sub> = -5 V	I <sub>C</sub> = 0	(see Notes 5 and	16)			-5	mA
h <sub>FE</sub>	Forward current transfer ratio	V <sub>CE</sub> = -3 V	· ·	(see Notes 5 and	16)	750			
V <sub>CE(sat)</sub>	Collector-emitter saturation voltage	$I_B = -12 \text{ mA}$ $I_B = -50 \text{ mA}$	•	(see Notes 5 and	6)			-2 -2.5	V
V <sub>BE(sat)</sub>	Base-emitter saturation voltage	I <sub>B</sub> = -50 mA	I <sub>C</sub> = -5 A	(see Notes 5 and	16)			-3	V
V <sub>BE(on)</sub>	Base-emitter voltage	V <sub>CE</sub> = -3 V	1 <sub>C</sub> = -3 A	(see Notes 5 and	16)			-2.5	V

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

#### thermal characteristics

	PARAMETER	MIN	TYP	MAX	UNIT
R <sub>0JC</sub> Junction to case thermal resistance				2.0	°C/W
$R_{\theta JA}$	Junction to free air thermal resistance			62.5	°C/W

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

#### **TYPICAL CHARACTERISTICS**

# **TYPICAL DC CURRENT GAIN** vs **COLLECTOR CURRENT** TCS135AD 50000 $T_c = -40^{\circ}C$ 25°C h<sub>FE</sub> - Typical DC Current Gain 7 0000 = 100°C -3 V = 300 µs, duty cycle < 2% 100 -10 -0.5 -1.0 I<sub>c</sub> - Collector Current - A

Figure 1.

# vs **COLLECTOR CURRENT** TCS135AB -2.0 = 300 μs, duty cycle < 2% $I_{\rm B} = I_{\rm C} / 100$

**COLLECTOR-EMITTER SATURATION VOLTAGE** 

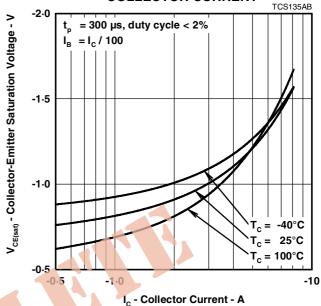


Figure 2.

## BASE-EMITTER SATURATION VOLTAGE

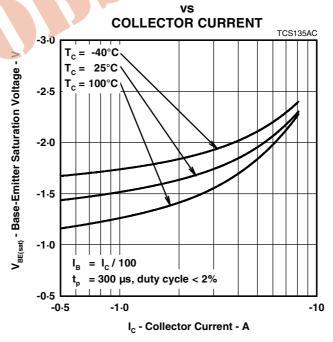
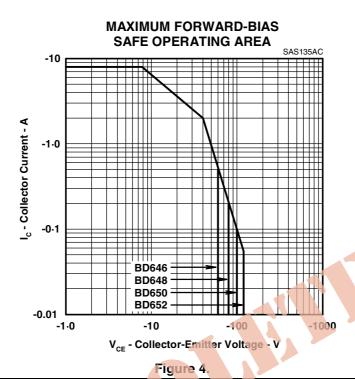


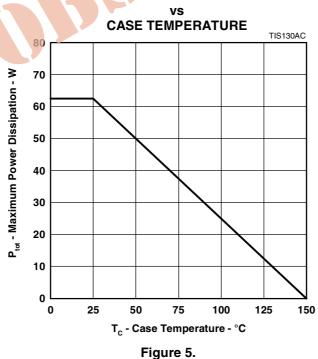
Figure 3.

#### **MAXIMUM SAFE OPERATING REGIONS**



# THERMAL INFORMATION

#### MAXIMUM POWER DISSIPATION



### PRODUCT INFORMATION