B-TRAN™

Bi-directional Bipolar Transistor Engineering Prototype Information Sheet

Maximum Ratings

Parameter	Symbol	Value	Unit
Emitter-emitter voltage	V_{EE}	1200	V
DC emitter current T_c = 25°C T_c = 100°C	I_E	 50 25	 A A
Pulsed emitter current	I_{Epuls}	100	A
Emitter-base voltage	V_{EB}	60	V
Short circuit withstand time	t_{SC}	10	µs
Power dissipation T_C = 25°C Power dissipation T_C = 100°C	P_{tot}	400 100	W
Operating junction temperature	T_{vj}	-40…+125	°C

Static Characteristics (T_j = 25°C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Emitter-emitter breakdown voltage	$V_{(BR)EE}$	I_E = 1mA	1200	-	-	V
Emitter-emitter saturation voltage	V_{EEsat}	V_{BE} = 0.7V I_E = 50A	0.3	0.6	0.9	V
Base-emitter voltage (on-state)	V_{BE}	B-TRAN ON	0.5	0.7	1	V
Emitter-base voltage (off-state)	$V_{(R)EB}$	B-TRAN OFF	40	60	80	V
Emitter cut-off current	I_{EBO}	V_{EE} = V_{EEmax}		10	100	µA
DC current gain	h_{FE}	I_E = 1 A		5	8	
	$h_{FE(sat)}$	I_E = 25 A		3	4	

Switching Characteristics, Inductive Load (T_j = 25°C)

Parameter	Symbol	Conditions	Value	Unit
Turn-on delay time	$T_{d(on)}$	T_j = 25°C	50	ns
Rise time	T_r	V_{EE} = 600 V, I_E = 50 A	100	ns
Turn-off delay time	$T_{d(off)}$	V_{BE} = 0.7 V	400	ns
Fall time	T_f		200	ns
Turn-on energy	E_{on}		2	mJ
Turn-off energy	E_{off}		4	mJ
Total switching energy	E_{ts}		6	mJ

Switching Characteristics, Inductive Load with Pre-turn-off Mode (T_j = 25ºC)

Parameter	Symbol	Conditions	Value	Unit
Turn-on delay time	$T_{d(on)}$	T_j = 25ºC	50	ns
Rise time	T_r	V_{EE} = 600 V, I_E = 50 A	100	ns
Turn-off delay time	$T_{d(off)}$	V_{BE} = 0.7 V	300	ns
Fall time	T_f	Pre-turn-off time = 2 µs	150	ns
Turn-on energy	E_{on}		2	mJ
Turn-off energy	E_{off}		3	mJ
Total switching energy	E_{ts}		5	mJ

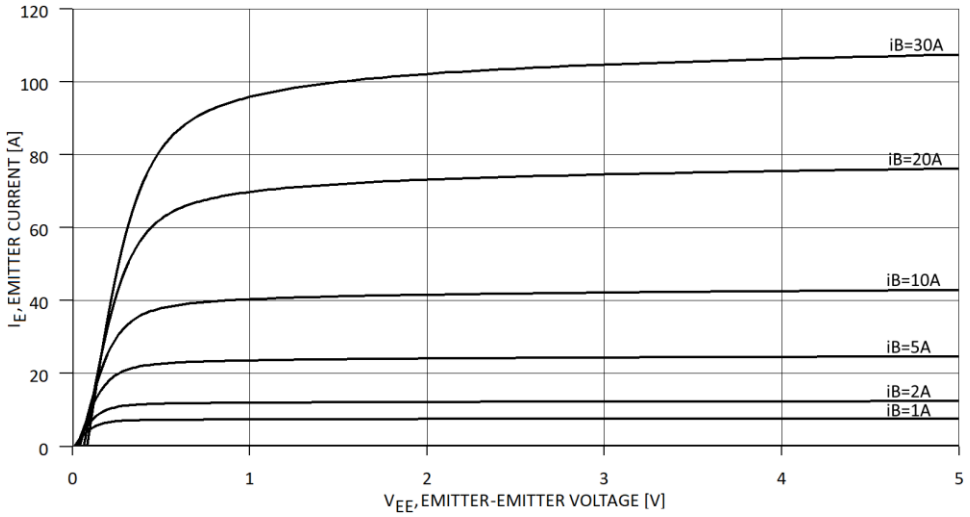


Figure 1. **Typical output characteristics (T_j=25°C)**

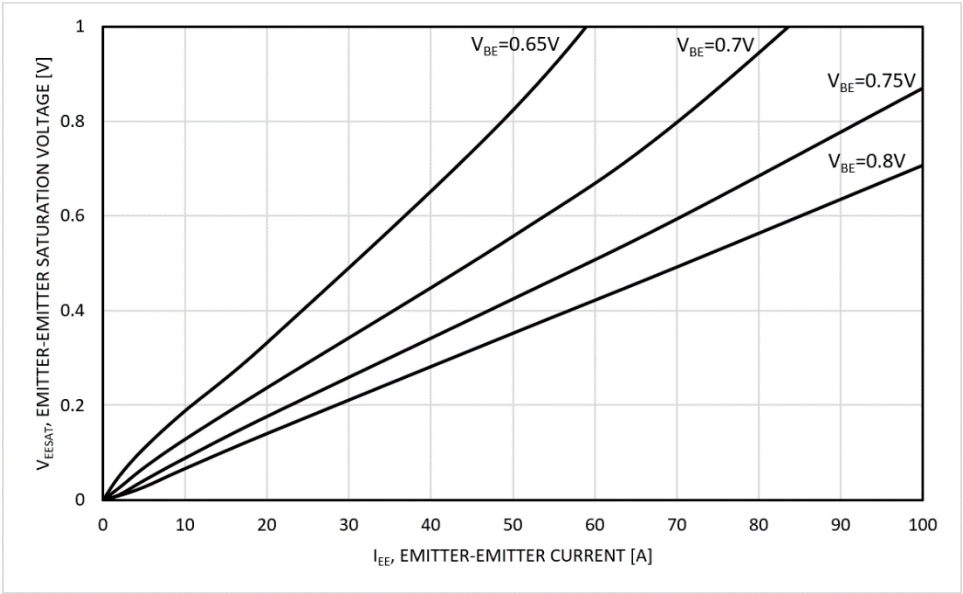
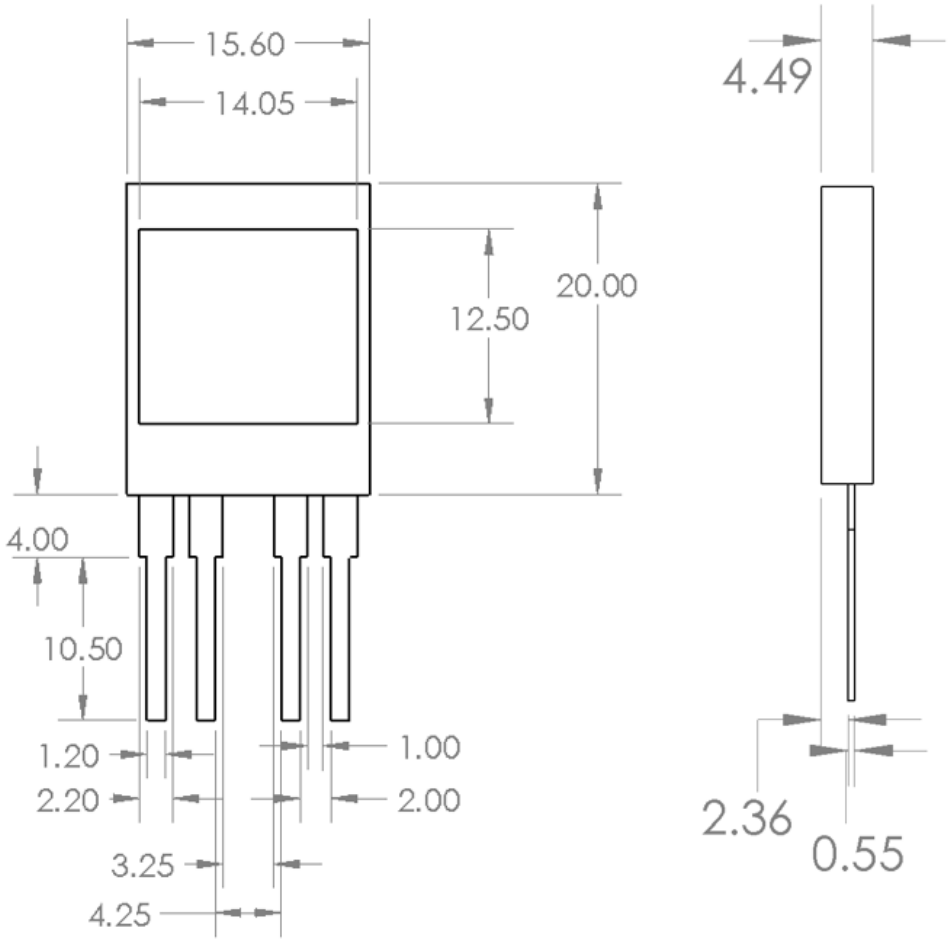


Figure 2. **Typical emitter-emitter saturation voltage as a function of emitter-emitter current (T_j=25°C)**

The information shown above is preliminary and subject to change.

B-TRAN Package: TO-247 with Double-sided Cooling

Package Drawing

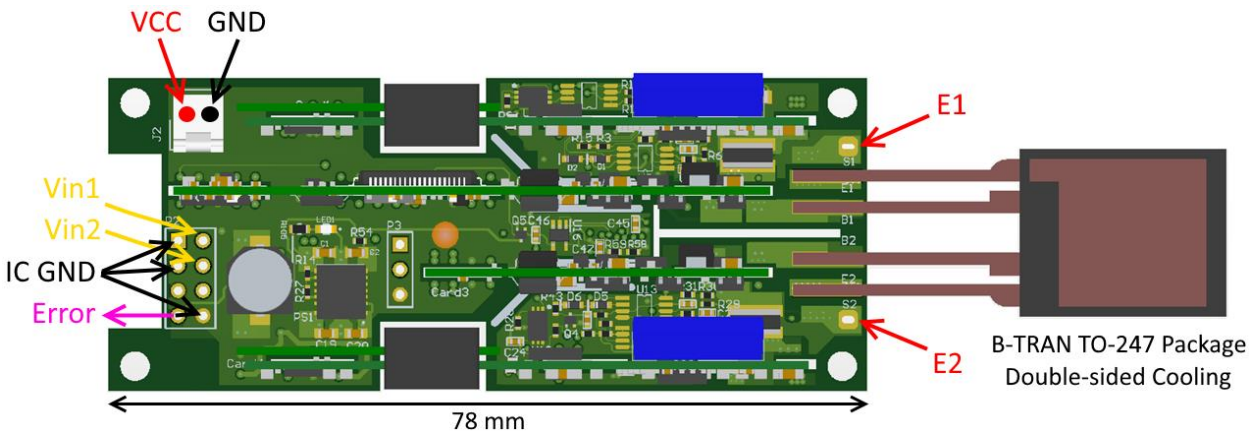


All dimensions are in mm. Package is symmetrical on both sides.

B-TRAN™

B-TRAN Driver

External Connections

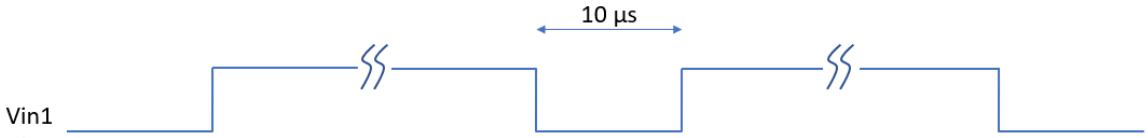


E1 and E2 are separate emitter pins (EE) of the B-TRAN.

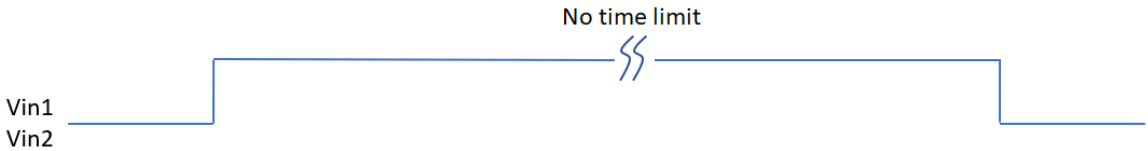
Driver Ratings

Parameter	Symbol	Value	Unit
DC voltage	V_{CC}	20 - 24	V
DC current (Natural Cooling)	I_{CC}	2	A
Buck output voltage = Base-emitter voltage	V_{BE}	0.5 – 1.5	V
Buck output current = base current	i_B	< 20	A
Input-to-output isolation voltage	V_{iso}	< 1500	V
Input pulses (2 inputs)	V_{in1}, V_{in2}	3 - 12	V
Input switching frequency	f_{sw}	< 30	kHz
Input duty cycle	D_{in}	0 - 100	%

Input Pulse Limit



For switching applications with D_{in} < 100%,
the pulse must be 10 µs low between a falling edge and a rising edge.



For continuous applications with D = 100%, DC pulse is accepted.

Error Pin

The error-pin is set to low (<0.5V) which shows normal driver operation. It goes to high (5V) in case of over temperature (>125degC) or over current (>30A) conditions in which the driver will turn off the B-TRAN. The error-pin will be set to low (normal operation) after 0.5 seconds the BTRAN driver is powered up and self-check is passed.