Ideal Power

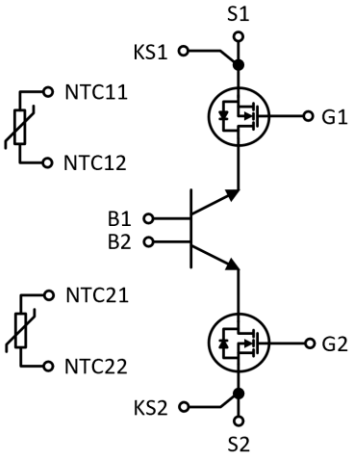
Technical Specifications

SymCool® V2 Power Module, 1200V/200A
Bidirectional, Double-Sided Cooled

Part Number : IPAM01220C22

Description

SymCool® V2 is a second generation of SymCool® double-sided cooled (DSC) power modules. IPAM01220C22 is a bidirectional switch power module in a DSC package for superior thermal performance and efficiency. It is based on Ideal Power's innovative Si B-TRAN™ bidirectional switch with ultra-low on-state voltage drop. It incorporates NTC temperature sensing, integrated gate resistors and kelvin source connections which reduce parasitic impedance and enhance protection. Cascode MOSFETs are embedded into 42mm x 42mm package for normally off operation.



Device Circuit Symbol

Key Features

- Bidirectional Switching Operation
- Ultra-Low On-State Voltage Drop
- Double-Sided Cooling
- Low Parasitic Inductance and Capacitance
- Substrate: AMB with AlN Ceramic for High Temperature Reliability

SymCool® Package

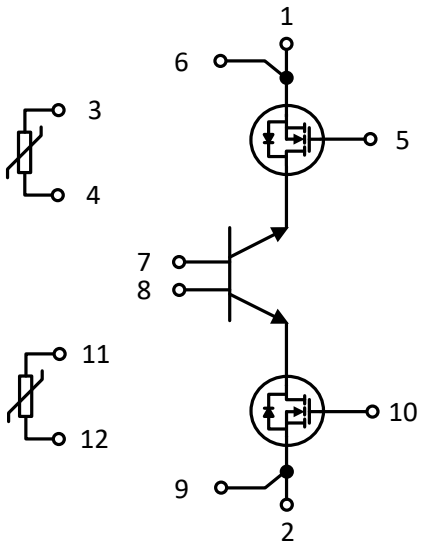
Applications

- Solid-State Circuit Breaker
- Electric Vehicle Contactor
- Battery Disconnect Switch
- AC Switch
- T-Type / Vienna Rectifier

idealpower.com | (512)264-1542 | 5508 Highway 290 West, Suite 120 Austin, TX 78735

Ideal Power

1 Pin Description

Pin No	Pin Name	Description	Pin Arrangement
1	S1	First power terminal of the bidirectional switch	
2	S2	Second power terminal of the bidirectional switch	
3	NTC11	Top side temp sense NTC terminal	
4	NTC12	Top side temp sense NTC terminal	
5	G1	Gate terminal of top side cascode MOSFET	
6	KS1	Kelvin sense for the top side cascode MOSFET source	
7	B1	B-TRAN™ base driving for top side	
8	B2	B-TRAN™ base driving for bottom side	
9	KS2	Kelvin sense for the bottom side cascode MOSFET source	
10	G2	Gate terminal of bottom side cascode MOSFET	
11	NTC21	Bottom side temp sense NTC terminal	
12	NTC22	Bottom side temp sense NTC terminal	

2 DC Electrical Characteristics

Maximum Ratings

Parameter	Symbol	Value	Unit
Blocking voltage (Off-state: short G1, B1, KS1 and short G2, B2, KS2)	$V_{S\_S\_}$	1200	V
Continuous DC emitter current T_C = 25°C, $T_{vj\ max}$ = 150°C	$I_{S\_S\_}$	200	A
Pulsed emitter current	I_{pulse}	400	A
Short circuit withstand time	t_{SC}	12	µs
Power dissipation T_C = 25°C, $T_{vj\ max}$ = 150°C	P_{tot}	3125	W
Operating junction temperature	T_{vj}	-40...+150	°C
Gate source voltage	$V_{G\_KS\_}$	-20 to +20	V

Ideal Power

Static Characteristics (T_j = 25°C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
On-state voltage drop	$V_{S1S2(on)}$	I_{B1}=40A, V_{B1S1}=1.5V, I_{S1S2}=200A, $V_{G\_KS\_}$=12V	-	0.6	0.72	V
	$V_{S2S1(on)}$	I_{B2}=40A, V_{B2S2}=1.5V, I_{S2S1}=200A, $V_{G\_KS\_}$=12V	-	0.6	0.72	V
Leakage current	$I_{Lkg(S1S2)}$	V_{S1S2}=1200V, $V_{G\_KS\_}$=0V		5		µA
	$I_{Lkg(S2S1)}$	V_{S2S1}=1200V, $V_{G\_KS\_}$=0V		5		µA
DC current gain	h_{FE}	I_{S1S2} <= 100A		7	9	
	h_{FE}	I_{S1S2} > 100A		5	7	
Base-Emitter voltage (on-state)	$V_{B1S1(on)}$	I_{B1S1}=40A, V_{G1KS1}=12V	1.4	1.5	1.6	V
	$V_{B2S2(on)}$	I_{B2S2}=40A, V_{G2KS2}=12V	1.4	1.5	1.6	
Emitter-Base breakdown voltage (off-state)	$V_{B1S1(off)}$	I_{S1B1}=1mA	52	65	78	V
	$V_{B2S2(off)}$	I_{S2B2}=1mA	52	65	78	
Gate threshold voltage	$V_{GKS(TH)}$		1.1		2.3	V
Internal gate resistance	$R_{G\_(int)}$			25		Ω

Thermal Characteristics (T_j = 25°C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Thermal resistance, junction - case	B-TRAN™ R_{thJ-C}		-	-	0.04	K/W

3 Switching Electrical Characteristics

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

Parameter	Symbol	Conditions	Value	Unit
Turn-on delay time	$t_{d(on)}$	V_{S1S2} = 600 V, I_{S1S2} = 200 A	450	ns
Rise time	t_r		100	ns
Turn-off delay time	$t_{d(off)}$		600	ns
Fall time	t_f		200	ns
Turn-on energy	E_{on}		3.0	mJ
Turn-off energy	E_{off}		25	mJ
Total switching energy	E_{ts}		28	mJ

Ideal Power

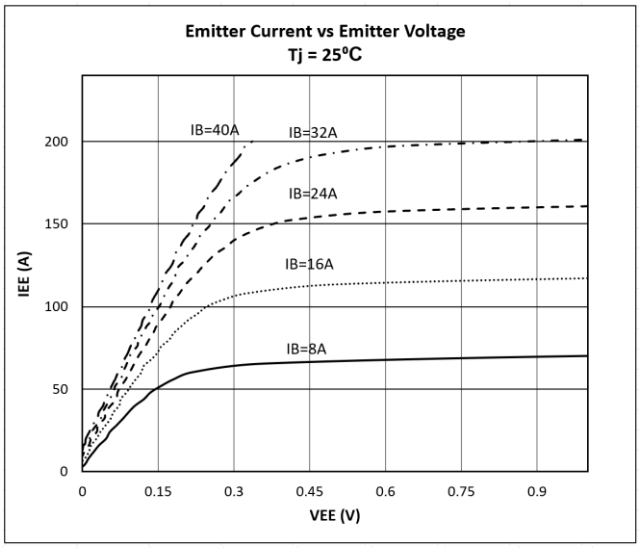
4 NTC – Thermistor Characteristics

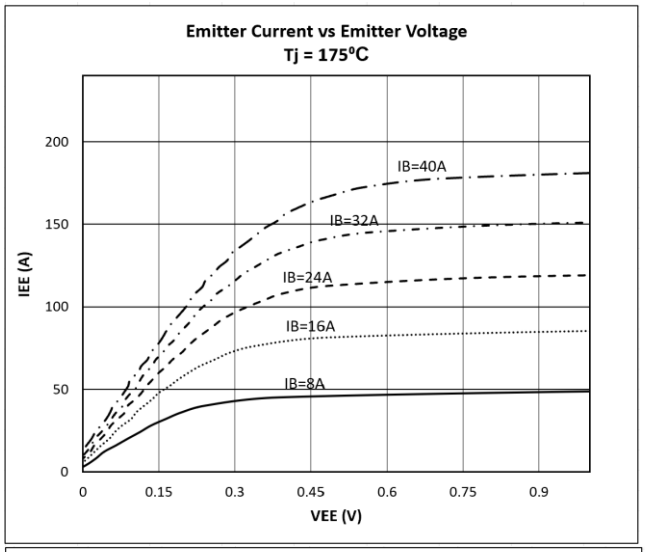
Parameter	Value	Unit
Resistance value at 25 °C	5K	Ω
Tolerance on R25-value	± 1	%
$B_{25/85}$-value	3480	K
Tolerance on $B_{25/85}$-value	± 1	%
Maximum dissipation at 25 °C	125	mW
Thermal time constant τ	≈ 8	s
Dissipation factor D	3.0	mW/K
Operating temperature range at zero power	-40 to +150	°C
Weight	≈ 0.006	g

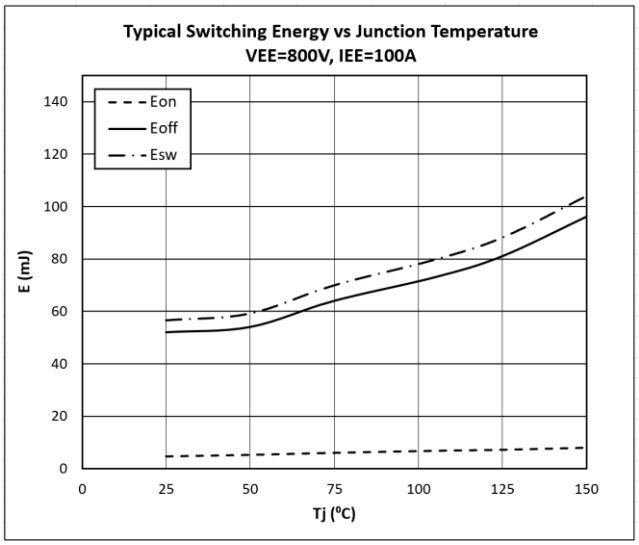
5 Module Characteristics

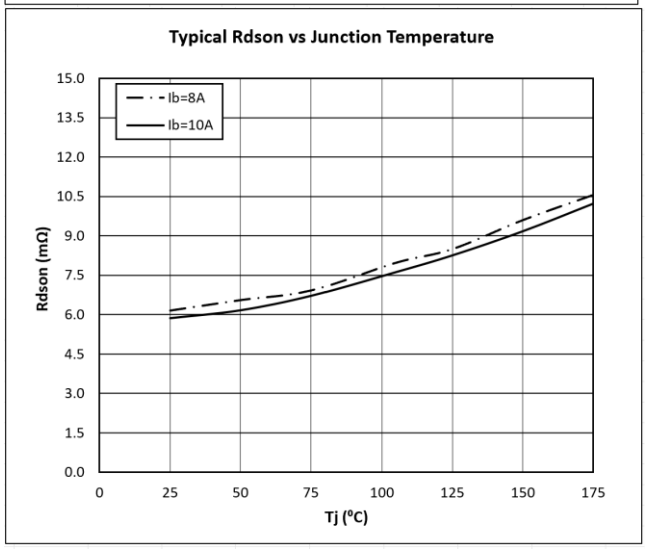
Parameter	Symbol	Conditions	Value	Unit
Isolation test voltage	V_{ISOL}	RMS, f = 50Hz, t = 1min	4.2	kV
Storage temperature			-40 to 125	°C
Continuous operating junction temperature			-40 to 150	°C
Creepage		Terminal to Terminal	6.3	mm
Clearance		Terminal to Terminal	6.3	mm
CTI		Comparative Tracking Index	>600	
Module weight			68	g

6 Characteristics Diagrams









7 Switching Time Definition and Test Circuit

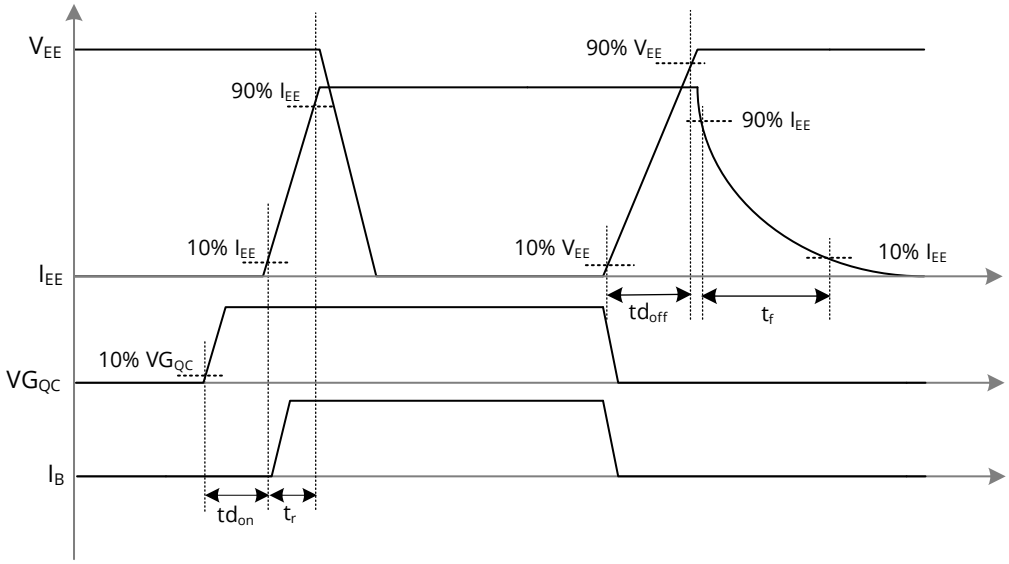


Figure 1 B-TRAN™ Switching Time Definition

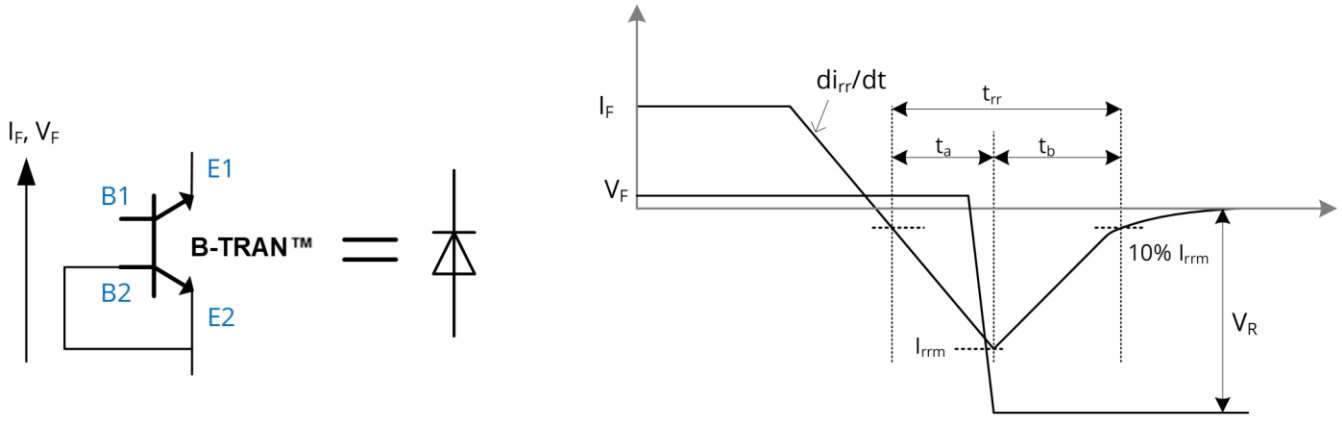
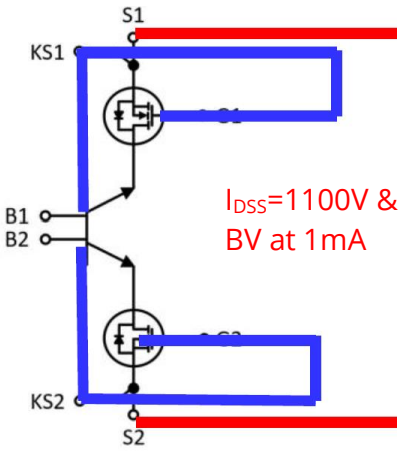
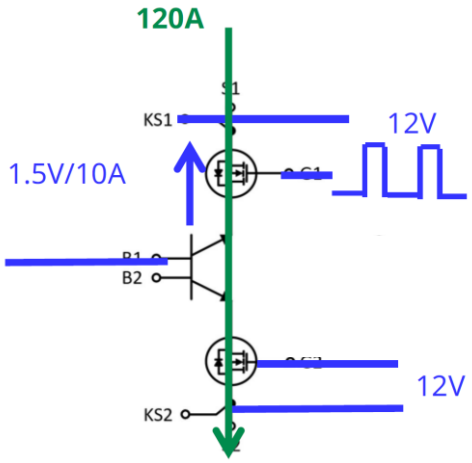


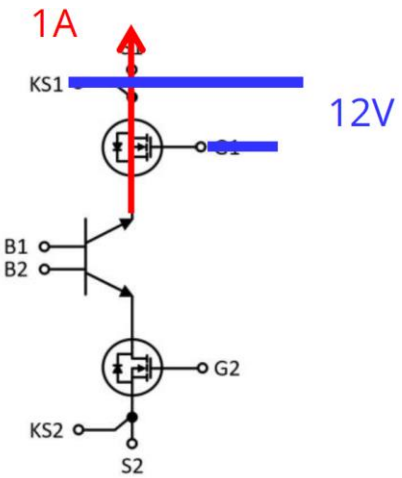
Figure 2. B-TRAN™ body diode switching time definition and equivalent circuit.



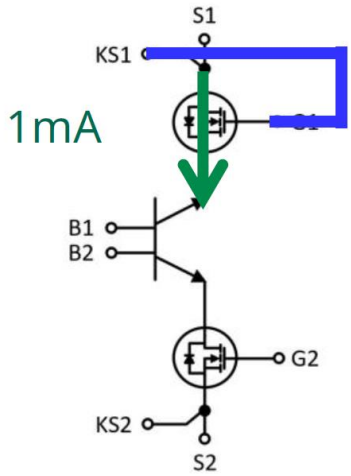
(a) Blocking voltage & Emitter leakage current



(b) Emitter-Emitter saturation voltage



(c) Base-Emitter voltage (on-state)



(d) Emitter-Base breakdown voltage (off-state)

Figure 3. Functional test circuit for B-TRAN™ performance measurement.

8 Package Information

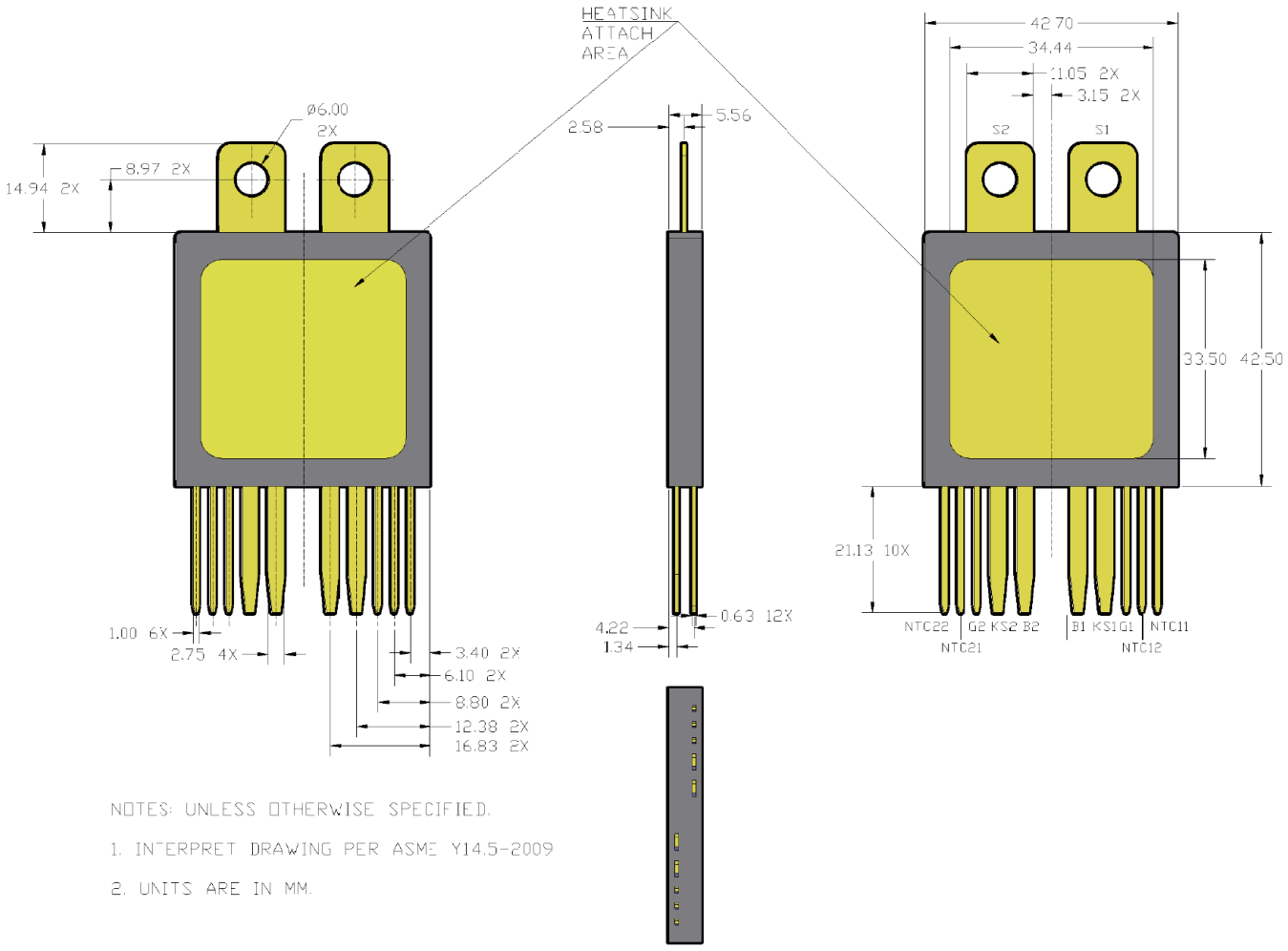


Figure 4: Mechanical outline of SymCool® Power Module

Ideal Power

Important Notices

SymCool® Power Module specifications are subject to change. Ideal Power reserves the right to change limits, test conditions, and dimensions without notice. Information contained in this document are typical values and shall in no event be regarded as a guarantee of characteristics. With respect to any information regarding the application of the product, Ideal Power hereby disclaims all warranties and liabilities of any kind.

The information in this document is exclusively for trained technical staff. It is the responsibility of the customer's technical department to decide the suitability of the product in the customer's application and Ideal Power assumes no responsibility or liability whatsoever for the use of the information contained in this document.

For further information, please contact sales@idealpower.com