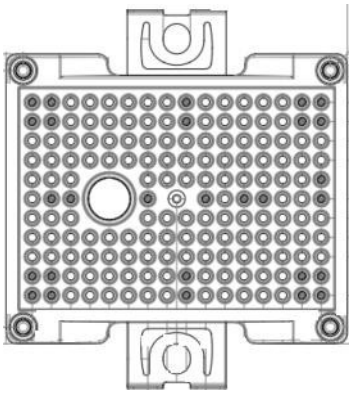
Silicon Carbide (SiC)
2300V 5mohm
Half Bridge MOSFET Module
Easy2B
SC240HB23B2

The SC240HB23B2 is a power module containing 5mΩ / 2300V SiC MOSFET half-bridge and a thermistor with AlN AMB in an B2 package.



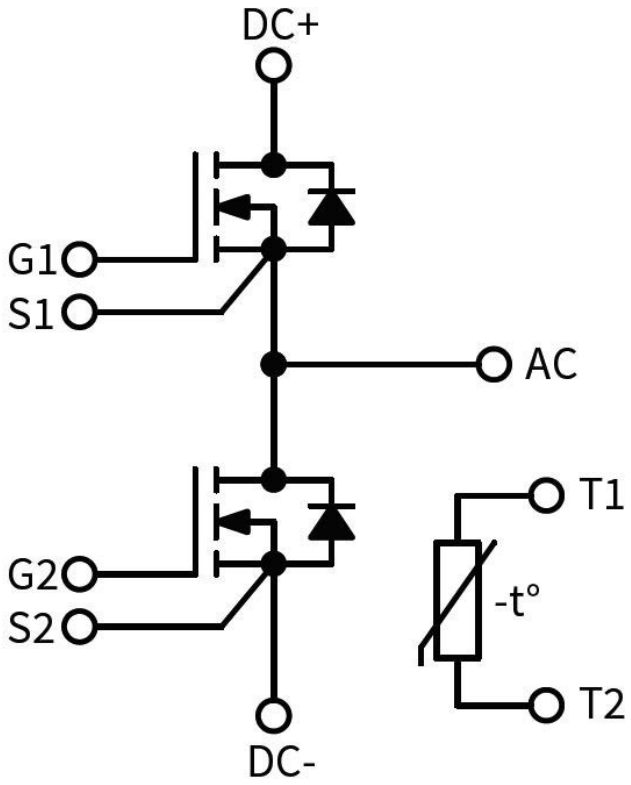
Easy2B, 56.7 × 62.8 × 16.4

Features

- 5mΩ / 2300 V SiC MOSFET Half−Bridge
- AlN AMB
- NTC Thermistor
- Low Inductive Layout
- Press-Fit Pins (Solderable)
- Isolated Base Plate

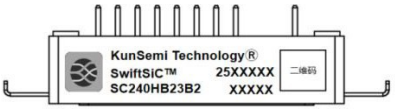
Typical Applications

- Motor Drives
- Vehicle Fast Chargers
- Renewable energy
- Uninterruptible Power Supply Systems (UPS)



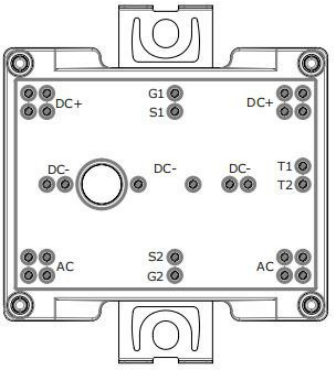
Schematic

MARKING DIAGRAM



SC240HB23B2 = Device Code
XXXXXXX = Year, week and batch Code
XXXXX = Flow code

PIN ASSIGNMENTS



ORDERING INFORMATION

Device	Package
SC240HB23B2	Easy2B

PIN DESCRIPTION

Pin	Name	Description
1	AC	Center Point of Half Bridge
2	DC-	DC Negative Bus Connection
3	DC+	DC Positive Bus Connection
4	G1	T1 Gate
5	S1	T1 Source
6	G2	T2 Gate
7	S2	T2 Source
8	T1	NTC Thermistor Terminal 1
9	T2	NTC Thermistor Terminal 2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
SiC MOSFET			
Drain−Source Voltage	V_{DSS}	2300	V
Gate−Source Voltage	V_{GS}	+22/− 10	V
Continuous Drain Current @ T_c = 80°C (T_J = 175°C)	I_{DS}	240	A
Pulsed Drain Current (T_J = 175°C)	I_{DPulse}	300	A
Maximum Power Dissipation @ T_c = 80°C (T_J = 175°C)	P_{tot}	710	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C

ELECTRICAL CHARACTERISTICS (T_j = 25℃ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS						
Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 1200V	I_{DSS}	-	-	1	mA
Drain−Source On Resistance	V_{GS} = 18V, I_{DS} = 240A, T_J = 25°C	$R_{DS(on)}$	-	5	7	mΩ
	V_{GS} = 18V, I_{DS} = 240A, T_J = 125°C		-	10	-	
	V_{GS} = 18V, I_{DS} = 240A, T_J = 150°C		-	11	-	
Gate−Source Threshold Voltage	V_{GS} = V_{DS}, I_{DS} = 148mA	$V_{GS(TH)}$	-	3	-	V
Gate Resistance	V_{GS} = 0V, f= 1MHz	R_g	-	1.5	-	ohm
Gate Leakage Current	V_{GS} = −10V / 20V,V_{DS} = 0 V	I_{GSS}	-800	-	+800	nA
Input Capacitance	V_{DS} = 1500V, V_{GS} = 0V, f = 100kHz	C_{iss}	-	30	-	nF
Reverse Transfer Capacitance		C_{rss}	-	50	-	pF
Output Capacitance		C_{oss}	-	600	-	pF

ELECTRICAL CHARACTERISTICS (T_j = 25℃ unless otherwise noted) (continued)

Parameter	Test Conditions		Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS							
Total Gate Charge	V_{DS} = 1500V, V_{GS} = −5/20V, I_D = 240A		$Q_{G(TOTAL)}$	-	0.88	-	µC
Gate−Source Charge			Q_{GS}	-	0.54	-	µC
Gate− Drain Charge			Q_{GD}	-	0.13	-	µC
Turn−on Delay Time	V_{DS} = 1200V, I_{DS} = 200A, V_{GS} = -3/18V, R_G = 7.5Ω	T_j = 25°C	$T_{d(on)}$	-	82.1	-	ns
		T_j = 125°C		-	73.3	-	ns
		T_j = 175°C		-	64.5	-	ns
Rise Time		T_j = 25°C	t_r	-	156.1	-	ns
		T_j = 125°C		-	123.8	-	ns
		T_j = 175°C		-	140.4	-	ns
Turn−off Delay Time	V_{DS} = 1200V, I_{DS} = 200A, V_{GS} = -3/18V, R_G = 4.7Ω	T_j = 25°C	$T_{d(off)}$	-	217.4	-	ns
		T_j = 125°C		-	265.3	-	ns
		T_j = 175°C		-	234.7	-	ns
Fall Time		T_j = 25°C	t_f	-	153.2	-	ns
		T_j = 125°C		-	152.4	-	ns
		T_j = 175°C		-	163.1	-	ns
Turn−on Switching Loss per Pulse	V_{DS} = 1200V, I_{DS} = 200A, V_{GS} = -3/18V, R_G = 7.5Ω	T_j = 25°C	E_{on}	-	4.2	-	mJ
		T_j = 125°C		-	3.5	-	mJ
		T_j = 175°C		-	7.7	-	mJ
Turn−off Switching Loss per Pulse	V_{DS} = 1200V, I_{DS} = 200A, V_{GS} = -3/18V, R_G = 4.7Ω	T_j = 25°C	E_{off}	-	2.3	-	mJ
		T_j = 125°C		-	2.6	-	mJ
		T_j = 175°C		-	5.6	-	mJ

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS						
Diode Forward Voltage	I_{SD} = 200A, T_J = 25°C	V_{SD}	-	4.37	4.67	V
	I_{SD} = 200A, T_J = 125°C		-	4.06	-	
	I_{SD} = 200A, T_J = 150°C		-	4.01	-	
Diode Reverse Recovery Charge	V_R = 1200V, I_{SD} = 200A V_{GS} = −5V, R_G = 4.7Ω T_J = 25°C	Q_r	-	10.2	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	289.4	-	A
Reverse Recovery Energy		E_{rr}	-	0.13	-	mJ
Diode Reverse Recovery Charge	V_R = 1200V, I_{SD} = 200 A V_{GS} = −5 V, R_G = 4.7Ω T_J = 125°C	Q_r	-	13.6	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	306.8	-	A
Reverse Recovery Energy		E_{rr}	-	0.89	-	mJ
Diode Reverse Recovery Charge	V_R = 1200V, I_{SD} = 200A V_{GS} = −5V, R_G = 4.7Ω T_J = 150°C	Q_r	-	14.3	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	324.4	-	A
Reverse Recovery Energy		E_{rr}	-	3.1	-	mJ
Thermal Resistance − Chip−to−Case		R_{thJC}	-	-	-	°C/W
Thermal Resistance − Chip−to−Heatsink		R_{thJH}	-	0.07	-	°C/W
THERMISTOR CHARACTERISTICS						
Rated Resistance		R_{25}	-	5.0	-	kΩ
Deviation of R_{100}	T_C = 100°C, R_{100} = 493.3Ω	ΔR/R	-5	-	5	%
Power Dissipation		P_{25}	-	-	10	mW
B-value	$R_2 = R_{25}\exp[B_{25/50}(1/T_2 - 1/(298.15K))]$	$B_{25/50}$	-	3375	-	K
B-value	$R_2 = R_{25}\exp[B_{25/80}(1/T_2 - 1/(298.15K))]$	$B_{25/80}$	-	3436	-	K

MODULE

Storage Temperature Range	T_{stg}	−40 to 175	°C
Module Operating Junction Temperature	T_J	−40 to 175	°C
Isolation Test Voltage, t =1 min, 50 Hz	V_{iso}	5000	V_{RMS}
Weight of Module	G	41	g

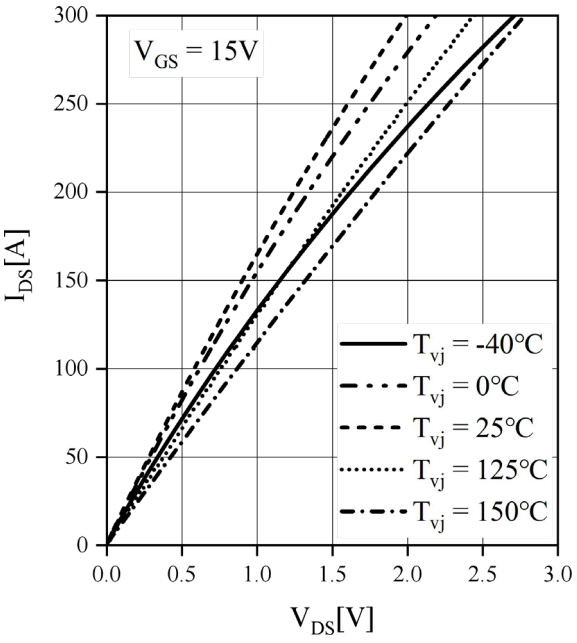


Figure 1. Output Characteristics for Various Junction Temperatures

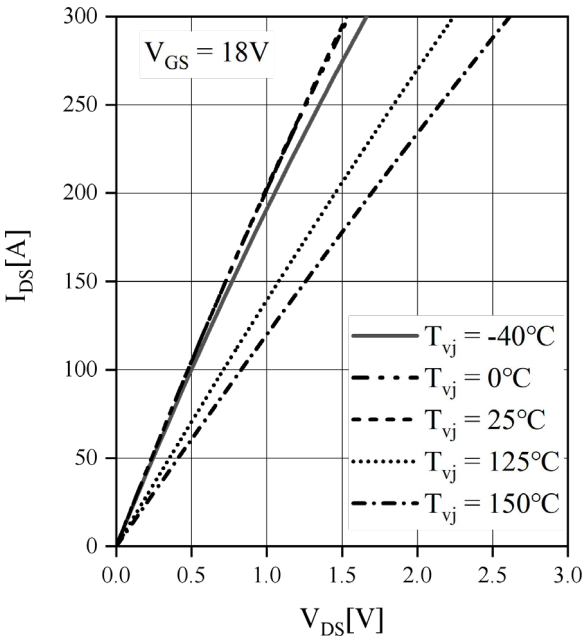


Figure 2. Output Characteristics for Various Junction Temperatures

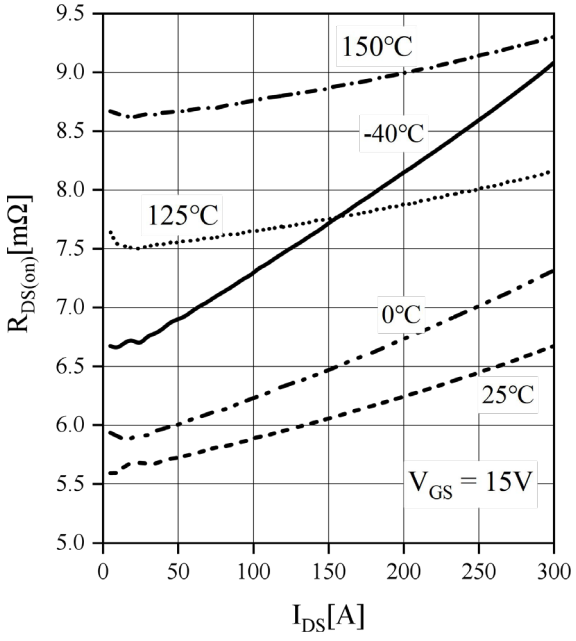


Figure 3. On-State Resistance vs. Drain Current for Various Junction Temperatures

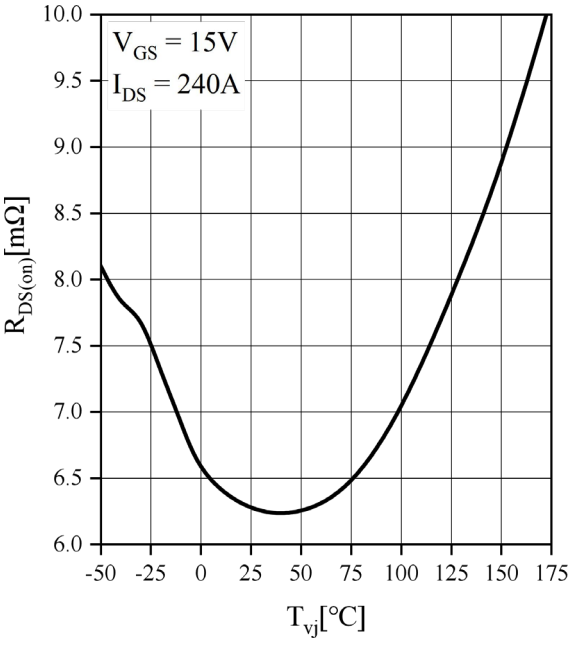


Figure 4. On-State Resistance vs. Junction Temperature

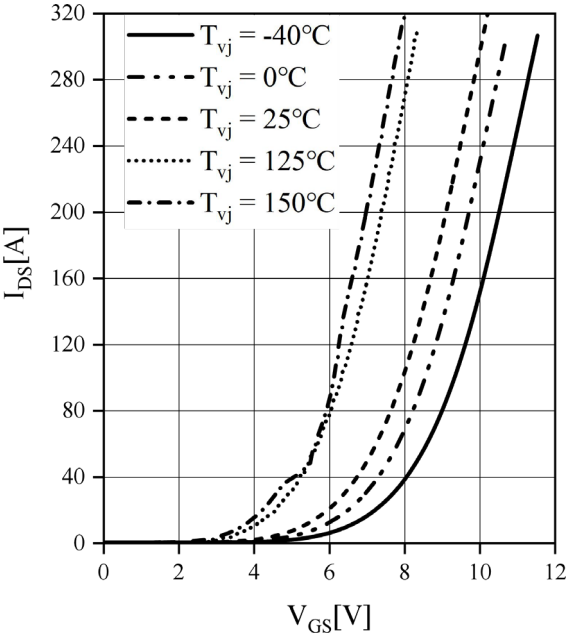


Figure 5.Transfer Characteristic for Various Junction Temperatures

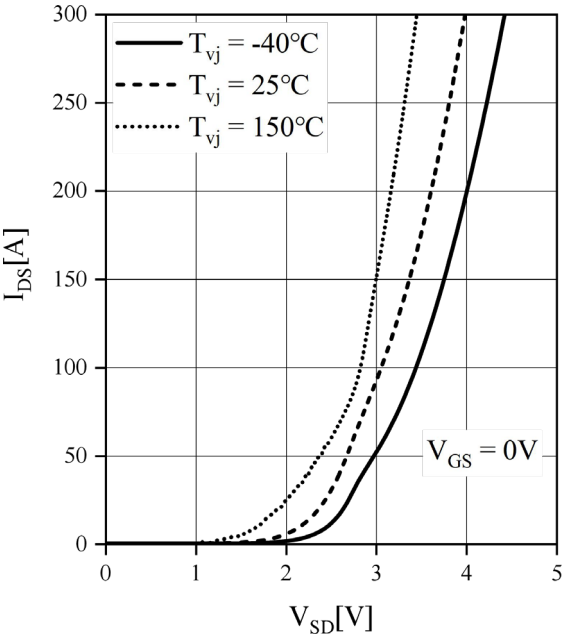


Figure 6. 3rd Quadrant Characteristic vs. Junction Temperatures at VGS = 0 V (Body Diode)

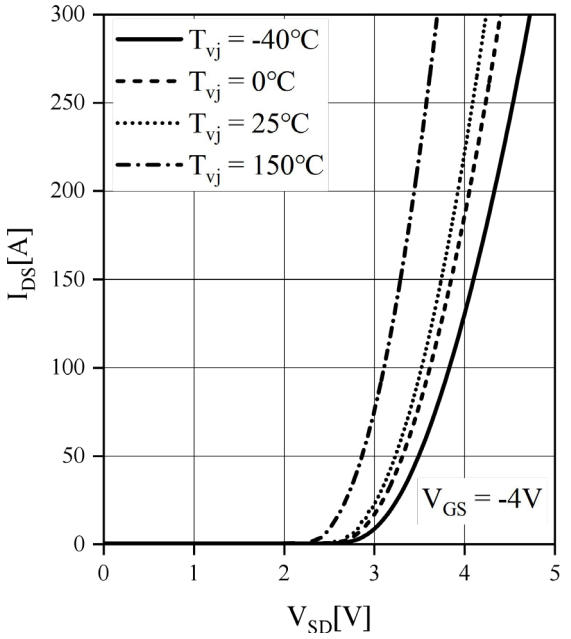


Figure 7. 3rd Quadrant Characteristic vs. Junction Temperatures at VGS = - 4 V (Body Diode)

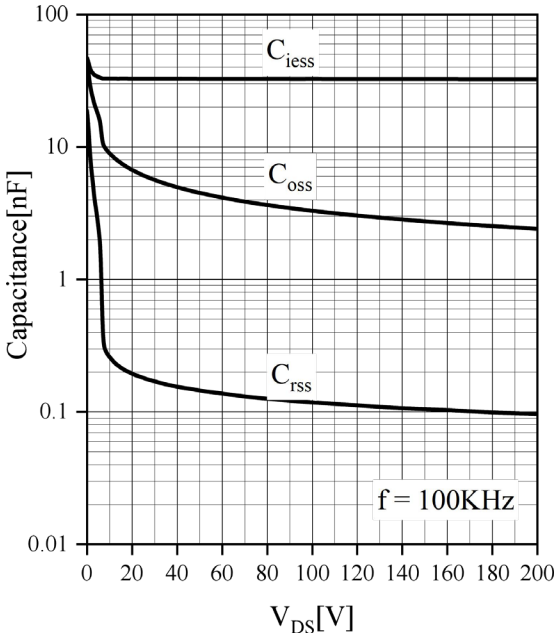


Figure 8. Typical Capacitances vs. Drain to Source Voltage (0 - 200V)

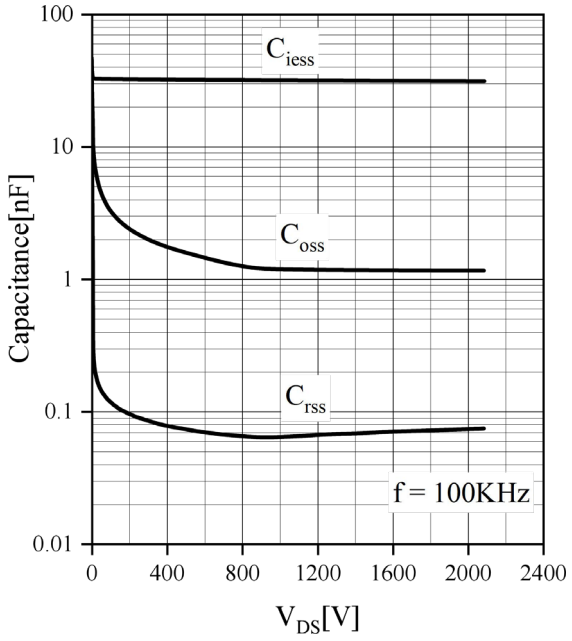


Figure 9. Typical Capacitances vs. Drain to Source Voltage (0 - 2300V)

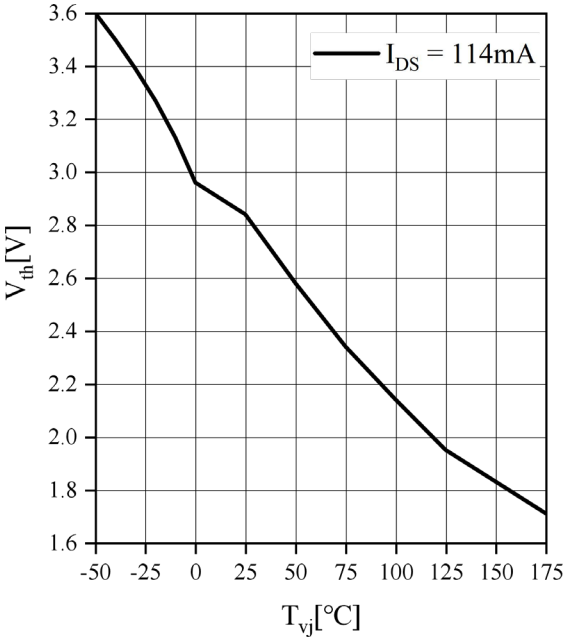


Figure 10. Threshold Voltage vs. Junction Temperature

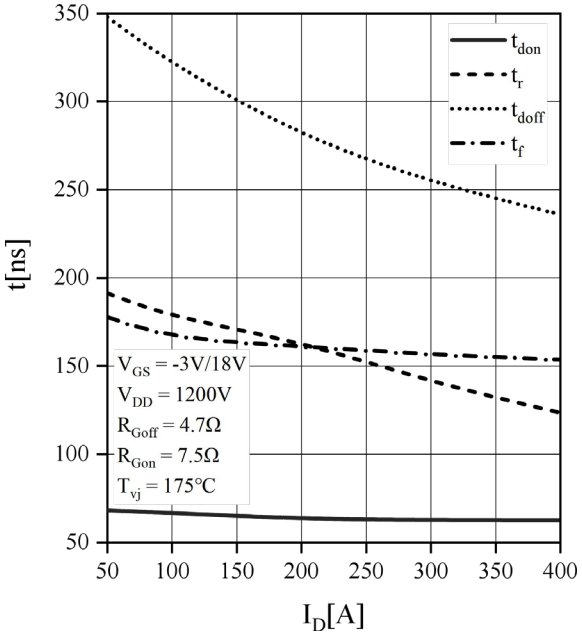


Figure 11.Switching times

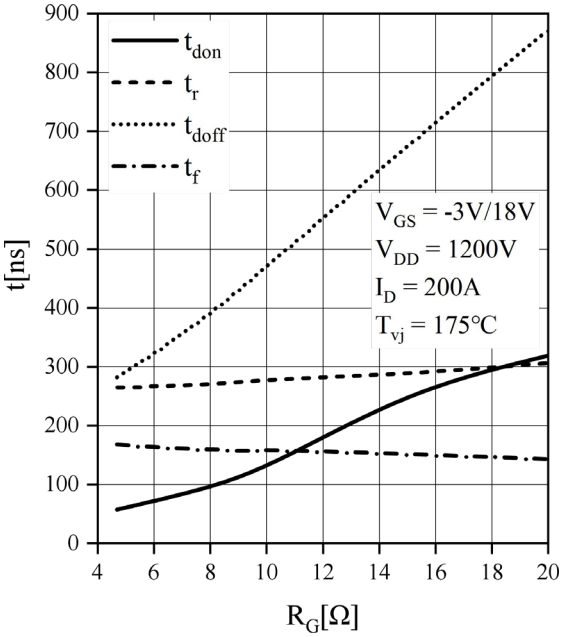


Figure 12. Switching times

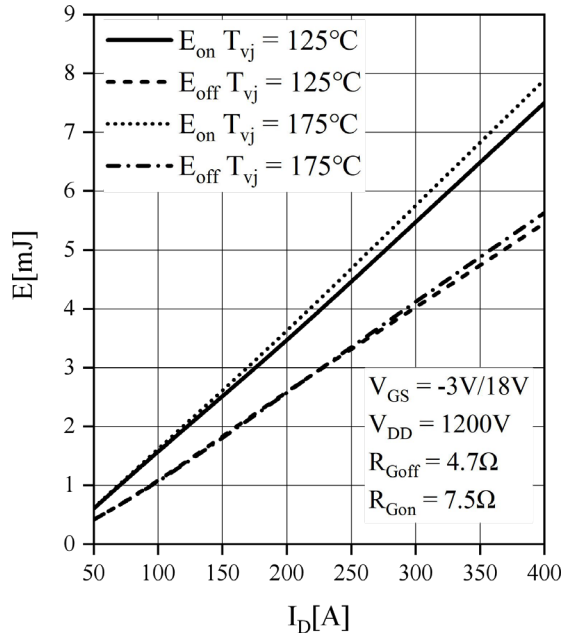


Figure 13. Switching losses

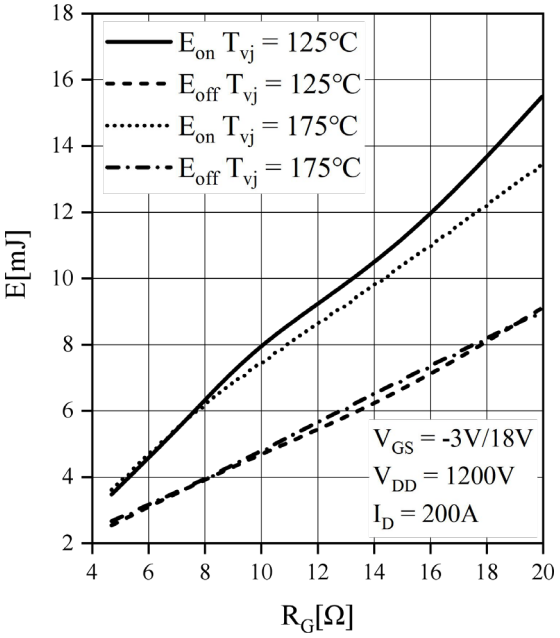


Figure 14. Switching losses

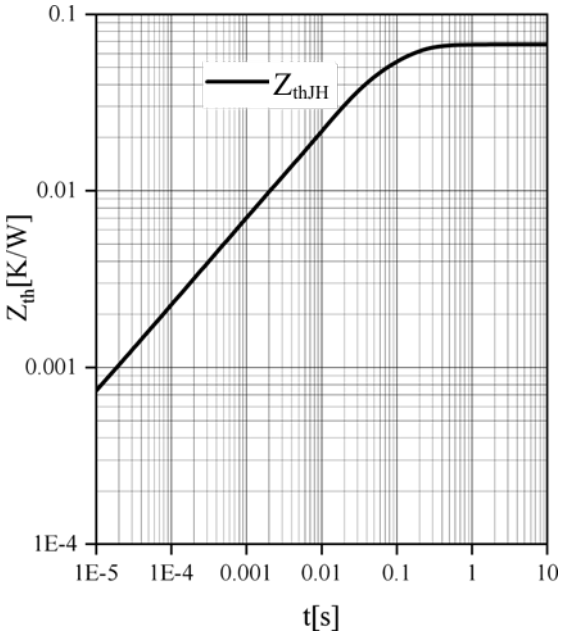


Figure 15. MOSFET Junction to Heastsink Transient Thermal Impedance, $Z_{th\,JHS}$ (°C/W)

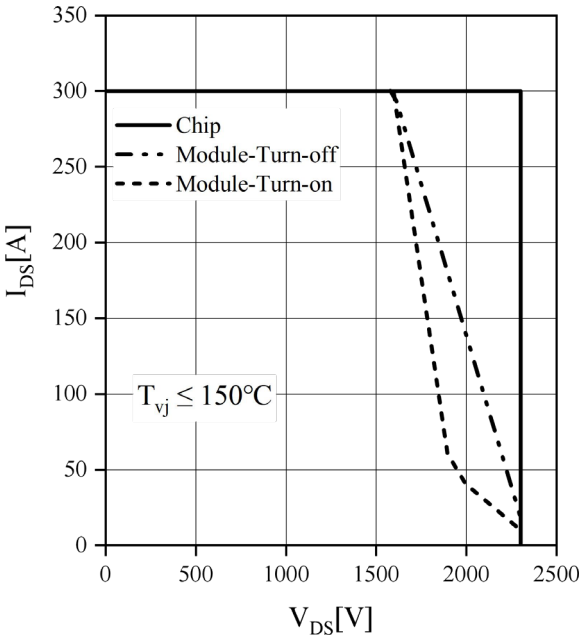


Figure 16. Switching Safe Operating Area

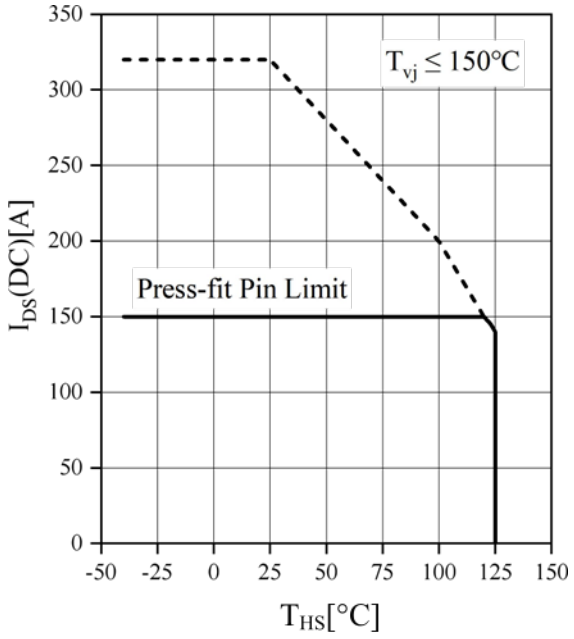


Figure 17. Continuous Drain Current Derating vs. Heatsink Temperature

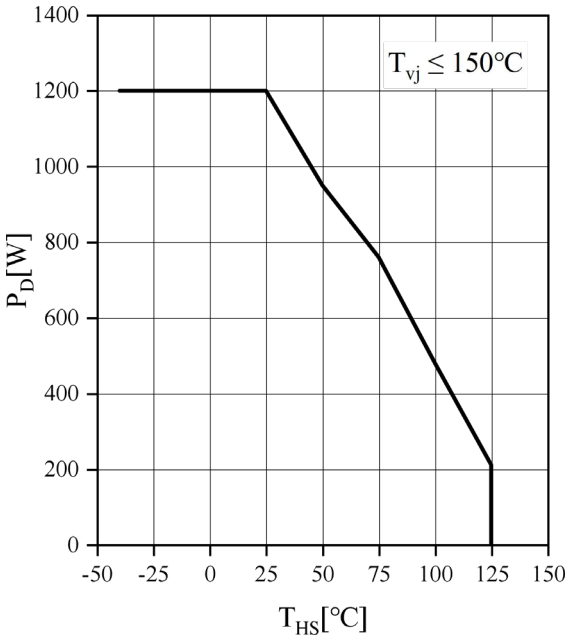


Figure 18. Maximum Power Dissipation Derating vs. Heatsink Temperature

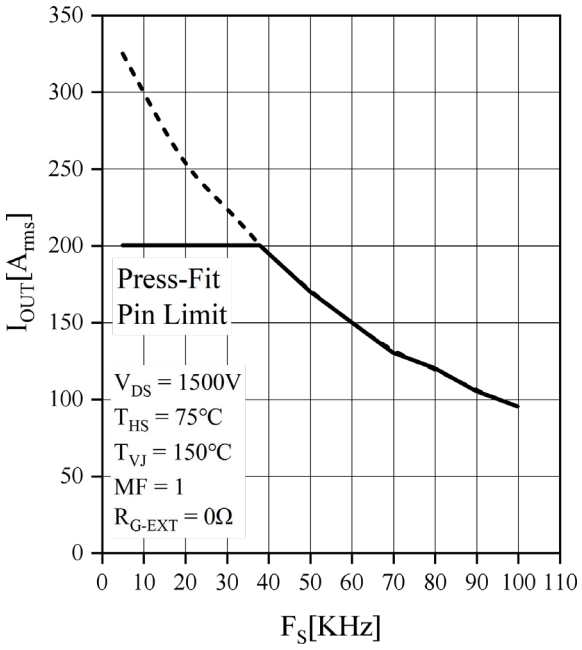


Figure 19. Typical Output Current Capability vs. Switching Frequency (Inverter Application)

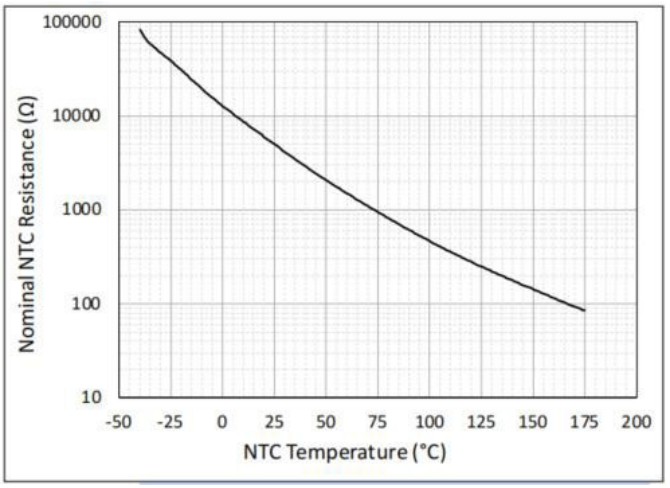
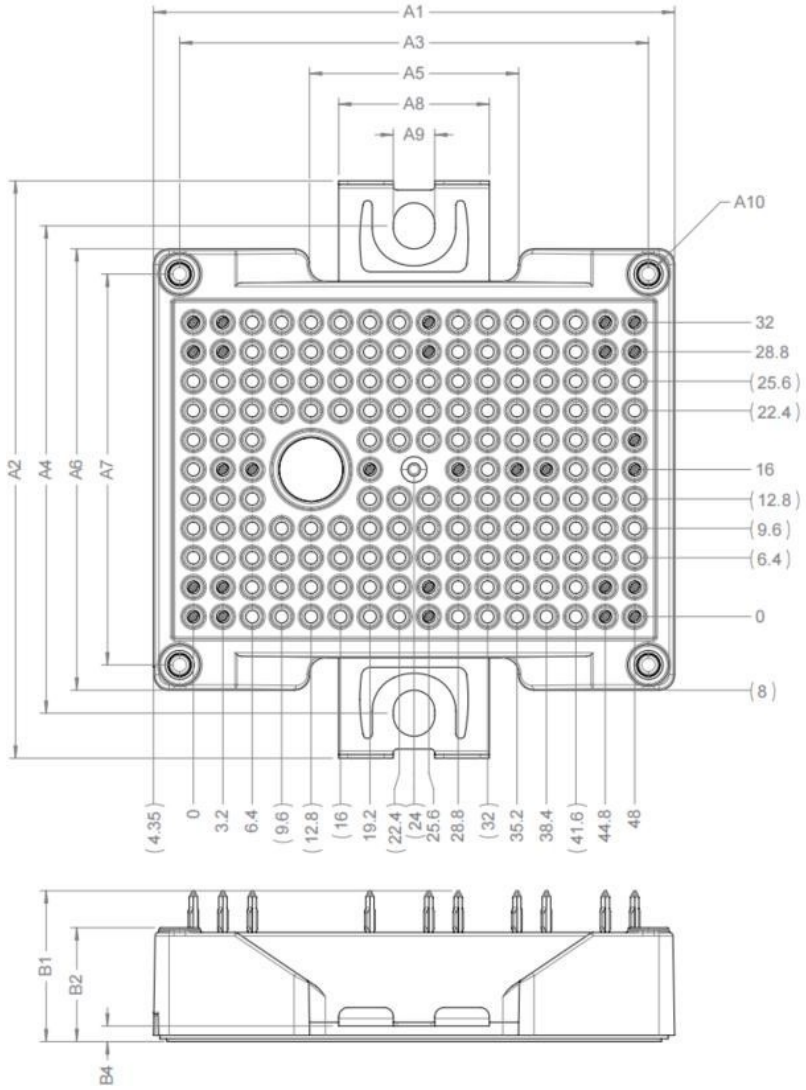


Figure 20. Nominal NTC Resistance vs. NTC Temperature

Package Drawing



DIMENSION TABLE		
SYMBOL	DIMENSION	TOLERANCE
A1	56.7	±0.30
A2	62.8	±0.50
A3	51	±0.15
A4	(53)	REF.
A5	22.7	±0.30
A6	48	±0.30
A7	42.5	±0.15
A8	16.4	±0.20
A9	4.5	±0.10
A10	⌀2.3 ↧8.5	⌀: $^{+0}_{-0.10}$ ↧: ±0.30
B1	16.4	±0.50
B2	12.33	±0.35
B4	1.8	±0.20
ALL PIN LOCATIONS		±0.40

UNIT:mm