

HCS05FH230E2B2

2300V/5mΩ Half Bridge SiC MOSFET Module

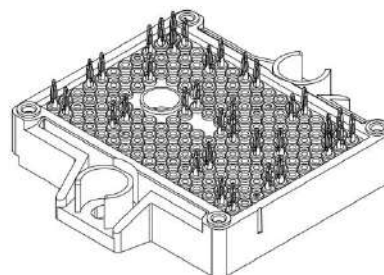
The HCS05FH230E2B2 is a power module containing 5 mΩ /2300V SiC MOSFET half-bridge and a thermistor with Si₃N₄ AMB in a B2 package.

Features

- 5 mΩ / 2300 V SiC MOSFET Half-Bridge
- Si₃N₄ AMB
- NTC Thermistor
- Low Inductive Layout
- Solderable Pins
- Isolated Base Plate

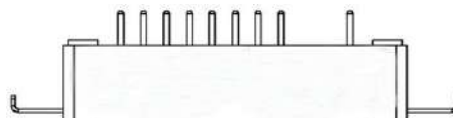
Typical Applications

- Motor Drives
- Servo Drives
- Solar Drives
- Uninterruptible Power Supply Systems (UPS)

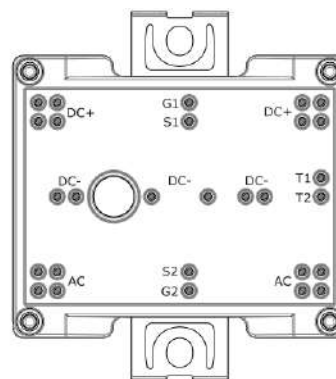


PIM36 56.7x42.5 (PRESS FIT)
CASE 180BY

MARKING DIAGRAM



PIN ASSIGNMENTS



ORDERING INFORMATION

Device	Package
SC240HB23B2	Easy2B

PIN DESCRIPTION

Pin	Name	Description
	DC+	Positive Bus Connection
	G1	Gate
	S1	Source
	AC	Center Point of Half Bridge
	G2	Gate
	S2	Source
	DC-	Negative Bus Connection
	TH1	Thermistor Connection 1
	TH2	Thermistor Connection 2

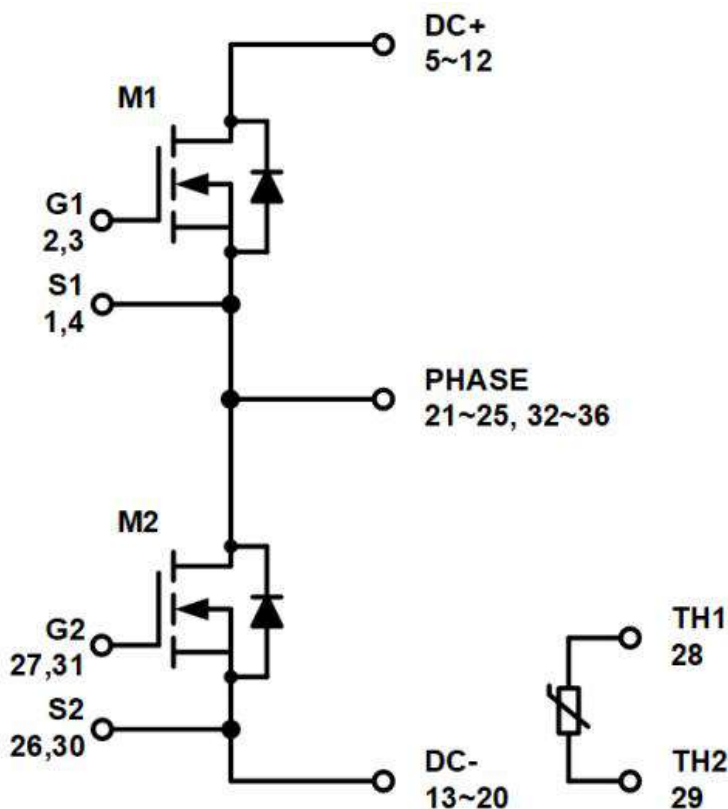


Figure 1. Schematic

HCS05FH230E2B2

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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
SiC MOSFET			
Drain-Source Voltage	V_{DS}	2300	V
Gate-Source Voltage	V_{GS}	+22/-10	V
Continuous Drain Current @ $T_c = 80^{\circ}\text{C}$ ($T_J = 175^{\circ}\text{C}$)	I_{DS}	240	A
Pulsed Drain Current ($T_J = 175^{\circ}\text{C}$)	I_{DPulse}	300	A
Maximum Power Dissipation @ $T_c = 80^{\circ}\text{C}$ ($T_J = 175^{\circ}\text{C}$)	P_{tot}	800	W
Minimum Operating Junction Temperature	T_{JMIN}	-40	$^{\circ}\text{C}$
Maximum Operating Junction Temperature	T_{JMAX}	175	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS						
Zero Gate Voltage Drain Current	$V_{GS} = 0\text{V}, V_{DS} = 1200\text{V}$	I_{DSS}	-	-	115	nA
Drain-Source On Resistance	$V_{GS} = 18\text{V}, I_{DS} = 240\text{A}, T_J = 25^{\circ}\text{C}$	$R_{DS(on)}$	-	5	7	mΩ
	$V_{GS} = 18\text{V}, I_{DS} = 240\text{A}, T_J = 125^{\circ}\text{C}$		-	10	-	
	$V_{GS} = 18\text{V}, I_{DS} = 240\text{A}, T_J = 150^{\circ}\text{C}$		-	11	-	
Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_{DS} = 148\text{mA}$	$V_{GS(TH)}$	-	2.8		V
Gate Resistance	$V_{GS} = 0\text{V}, f = 1\text{MHz}$	R_g	-	1.5	-	ohm
Gate Leakage Current	$V_{GS} = -10\text{V} / 20\text{V}, V_{DS} = 0\text{V}$	I_{GSS}	-800	-	+800	nA
Input Capacitance	$V_{DS} = 1500\text{V}, V_{GS} = 0\text{V}, f = 100\text{kHz}$	C_{iss}	-	25.1	-	nF
Reverse Transfer Capacitance		C_{rss}	-	50	-	pF
Output Capacitance		C_{oss}	-	600	-	pF

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}\text{C}$ unless otherwise noted) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
SiC MOSFET CHARACTERISTICS						
Total Gate Charge	$V_{DS} = 1500\text{V}, V_{GS} = -5/20\text{V}, I_D = 240\text{A}$	$Q_{G(TOTAL)}$	-	0.88	-	uC
Gate-Source Charge		Q_{GS}	-	0.54	-	nC
Gate-Drain Charge		Q_{GD}	-	0.13	-	nC
Turn-on Delay Time	$V_{DS} = 1500\text{V}, I_{DS} = 240\text{A}$ $V_{GS} = -5\text{V} / 18\text{V}, R_G = 4.7\Omega$ $L_S = 16\mu\text{H}, T_J = 25^{\circ}\text{C}$	$T_{d(on)}$	-	74.2	-	ns
Rise Time		t_r	-	94.7	-	ns
Turn-off Delay Time		$T_{d(off)}$	-	282.5	-	ns
Fall Time		t_f	-	59.8	-	ns
Turn-on Switching Loss per Pulse		E_{on}	-	4.1	-	mJ
Turn-off Switching Loss per Pulse		E_{off}	-	4.1	-	mJ
Turn-on Delay Time	$V_{DS} = 1500\text{V}, I_{DS} = 240\text{A}$ $V_{GS} = -5\text{V} / 18\text{V}, R_G = 4.7\Omega$ $L_S = 16\mu\text{H}, T_J = 125^{\circ}\text{C}$	$T_{d(on)}$	-	57.6	-	ns
Rise Time		t_r	-	91.8	-	ns
Turn-off Delay Time		$T_{d(off)}$	-	305.6	-	ns
Fall Time		t_f	-	56.3	-	ns
Turn-on Switching Loss per Pulse		E_{on}	-	4.9	-	mJ
Turn-off Switching Loss per Pulse		E_{off}	-	4.2	-	mJ
Turn-on Delay Time	$V_{DS} = 1500\text{V}, I_{DS} = 240\text{A}$ $V_{GS} = -5\text{V} / 18\text{V}, R_G = 4.7\Omega$ $L_S = 16\mu\text{H}, T_J = 150^{\circ}\text{C}$	$T_{d(on)}$	-	54.1	-	ns
Rise Time		t_r	-	89.6	-	ns
Turn-off Delay Time		$T_{d(off)}$	-	332.8	-	ns
Fall Time		t_f	-	58.8	-	ns
Turn-on Switching Loss per Pulse		E_{on}	-	5.0	-	mJ
Turn-off Switching Loss per Pulse		E_{off}	-	4.5	-	mJ

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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} = 240A 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} = 240 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} = 240A 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	M1, M2	R _{thJC}	-	0.121	-	°C/W
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2 Mil +2%, A = 2.8 W/mK	R _{thJH}	-	0.331	-	°C/W

THERMISTOR CHARACTERISTICS

Rated Resistance		R ₂₅	-	5.0	-	K Ω
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

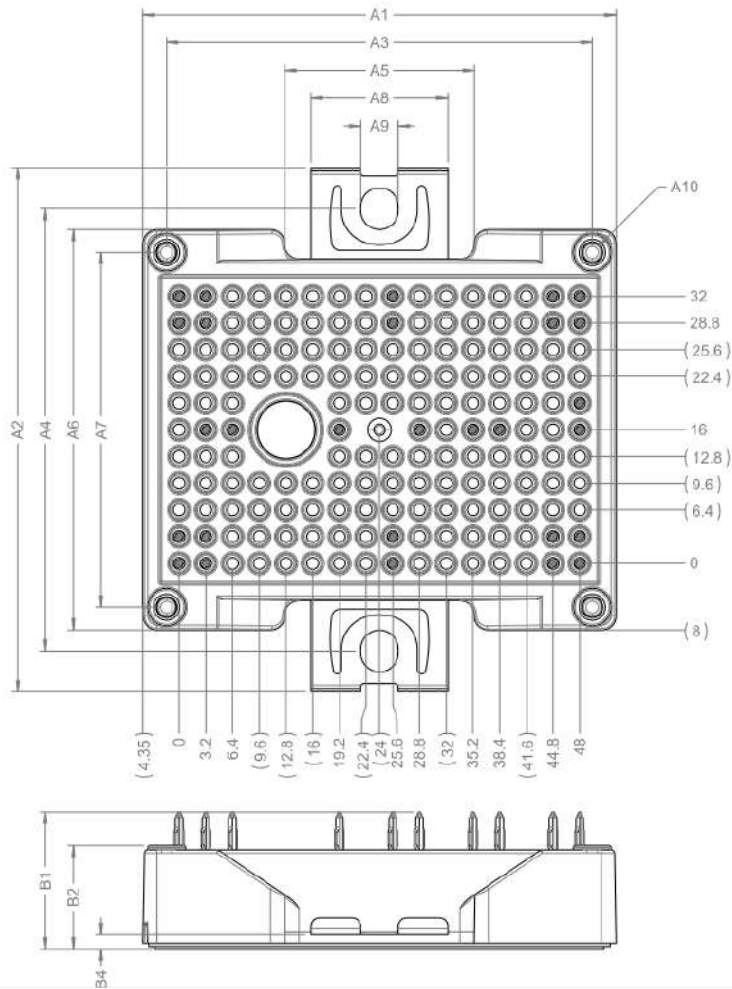
MODULE

Storage Temperature Range	T _{stg}	-40 to 150	°C
Module Operating Junction Temperature	T _J	-40 to 150	°C
Isolation Test Voltage, t = 1s, 50 Hz	V _{iso}	5000	V _{RMS}
Weight of Module	G	41	g

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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 √3.5	∅: ⁺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