

Target Specification February 2024

5SNG 0750R170500

LoPak phase leg IGBT module

- $V_{CE} = 1700\text{ V}$
- $I_C = 2 \times 750\text{ A}$
- Ultra low-loss rugged Trench IGBT chipset
- NTC thermistor for temperature sensing
- Cu baseplate for low thermal resistance
- Pre-Applied Thermal Interface Material (TIM) to improve thermal conductivity between module and heat sink
- Industry standard package



Maximum rated values ¹⁾

Parameter	Symbol	Conditions	Min.	Max.	Unit
Collector-emitter voltage	V_{CES}	$V_{GE} = 0\text{ V}$, $T_{vj} \geq 25\text{ °C}$		1700	V
DC collector current	I_C			750	A
Peak collector current	I_{CM}	$t_p = 1\text{ ms}$		1200	A
Gate-emitter voltage	V_{GES}		-20	20	V
DC forward current	I_F			750	A
Peak forward current	I_{FRM}	$t_p = 1\text{ ms}$		1200	A
Surge current	I_{FSM}	$T_{vj\text{ start}} = 175\text{ °C}$, $t_p = 10\text{ ms}$, half-sinewave		TBD	A
IGBT short circuit SOA	t_{psc}	$V_{GE} \leq 15\text{ V}$, $V_{CC} = 1300\text{ V}$ $V_{CE,max} \leq 1700\text{ V}$	$T_{vj\text{ start}} \leq 150\text{ °C}$	8	μs
			$T_{vj\text{ start}} \leq 175\text{ °C}$	6	
Isolation voltage	V_{isol}	1 min, $f = 50\text{ Hz}$		4000	V
Max Junction temperature	T_{vj}		-40	175	°C
Junction operating temperature	$T_{vj(op)}$		-40	175	°C
Case temperature	T_c		-40	125 ²⁾ / 150	°C
Storage temperature	T_{stg}		-40	125	°C
Mounting torques ³⁾	M_s	Base-heatsink, M5 screws	3	6	Nm
	M_{t1}	Main terminals, M6 screws	3	6	

¹⁾ Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747

²⁾ For UL1557 compliance T_{Cmax} must be limited to 125°C

³⁾ For detailed mounting instructions refer to application note 5SYA 2142

IGBT characteristic values ⁴⁾

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE} = 0\text{ V}$, $I_C = \text{TBD}$	$T_{vj} = 25\text{ °C}$	1700		V
Collector-emitter ⁵⁾ saturation voltage	V_{CEsat}	$I_C = 750\text{ A}$, $V_{GE} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$	2.11		V
			$T_{vj} = 125\text{ °C}$			V
			$T_{vj} = 175\text{ °C}$	2.74		V
Collector cut-off current	I_{CES}	$V_{CE} = 1700\text{ V}$, $V_{GE} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		0.1	mA
			$T_{vj} = 125\text{ °C}$	0.4		mA
			$T_{vj} = 175\text{ °C}$	6.8		mA
Gate leakage current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$	$T_{vj} = 125\text{ °C}$	-150	150	nA
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 16$, $V_{CE} = V_{GE}$	$T_{vj} = 25\text{ °C}$	5.5		V
Gate charge	Q_G	$I_C = 750\text{ A}$, $V_{CE} = 600\text{ V}$, $V_{GE} = -15\text{ V} \dots 15\text{ V}$		TBD		μC
Input capacitance	C_{ies}	per switch	$T_{vj} = 25\text{ °C}$	TBD		nF
Internal gate resistance	$R_{g,int}$	per switch		TBD		Ω
Turn-on switching energy	E_{on}	$V_{CC} = 900\text{ V}$, $I_C = 750\text{ A}$, $R_G = \text{TBD}$, $C_{GE} = 0\text{ nF}$, $V_{GE} = \pm 15\text{ V}$, $L_\sigma = 30\text{ nH}$, inductive load	$T_{vj} = 25\text{ °C}$	190		mJ
			$T_{vj} = 125\text{ °C}$			mJ
			$T_{vj} = 175\text{ °C}$	307		mJ
Turn-off switching energy	E_{off}	$V_{CC} = 900\text{ V}$, $I_C = 750\text{ A}$, $R_G = \text{TBD}$, $C_{GE} = 0\text{ nF}$, $V_{GE} = \pm 15\text{ V}$, $L_\sigma = 30\text{ nH}$, inductive load	$T_{vj} = 25\text{ °C}$	154		mJ
			$T_{vj} = 125\text{ °C}$			mJ
			$T_{vj} = 175\text{ °C}$	233		mJ
Short circuit current	I_{SC}	$V_{CC} = 1300\text{ V}$, $V_{GE} = 15\text{ V}$, $V_{CEM\text{ CHIP}} \leq 1700\text{ V}$	$T_{vj} = 175\text{ °C}$	TBD		A

⁴⁾ Characteristic values according to IEC 60747 – 9

⁵⁾ Collector-emitter saturation voltage is given at chip level

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail.

Hitachi Energy Ltd. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of Hitachi Energy Ltd.

Diode characteristic values ⁶⁾

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward voltage ⁷⁾	V _F	I _F = 750 A	T _{vj} = 25 °C	1.91		V
			T _{vj} = 125 °C			V
			T _{vj} = 175 °C	2.03		V
Peak reverse recovery current	I _{rm}		T _{vj} = 25 °C	TBD		A
			T _{vj} = 125 °C	TBD		A
			T _{vj} = 175 °C	TBD		A
Recovered charge	Q _{rr}	V _{CC} = 900 V, I _F = 750 A, V _{GE} = ±15 V, R _G = TBD, C _{GE} = 0 nF, L _σ = 30 nH, di/dt = TBD, inductive load	T _{vj} = 25 °C	TBD		μC
			T _{vj} = 125 °C	TBD		μC
			T _{vj} = 175 °C	TBD		μC
Reverse recovery time	t _{rr}		T _{vj} = 25 °C	TBD		ns
			T _{vj} = 125 °C	TBD		ns
			T _{vj} = 175 °C	TBD		ns
Reverse recovery energy	E _{rec}		T _{vj} = 25 °C	57		mJ
			T _{vj} = 125 °C			mJ
			T _{vj} = 175 °C	145		mJ

⁶⁾ Characteristic values according to IEC 60747 – 2

⁷⁾ Forward voltage is given at chip level

NTC Thermistor

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Rated resistance	R ₂₅	T _c = 25 °C		5		kΩ
R100	R ₁₀₀	T _c = 100 °C	468		517	Ω
B-value	B _{25/85}	R ₂₅ = R ₂₅ exp [B _{25/85} (1/T ₂ – 1/(298.15K))]		3375		K
B-value	B _{25/100}	R ₂₅ = R ₂₅ exp [B _{25/100} (1/T ₂ – 1/(298.15K))]		3433		K

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail.

Hitachi Energy Ltd. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of Hitachi Energy Ltd.

Package properties

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
IGBT thermal resistance junction to case	$R_{th(j-c)IGBT}$	per switch			0.08	K/W
Diode thermal resistance junction to case	$R_{th(j-c)DIODE}$	per switch			0.17	K/W
IGBT thermal resistance case to heatsink ⁸⁾	$R_{th(c-s)IGBT}$	IGBT per switch, $\lambda_{Grease} = 1 \text{ W/m} \times \text{K}$		0.031		K/W
Diode thermal resistance case to heatsink ⁸⁾	$R_{th(c-s)DIODE}$	Diode per switch, $\lambda_{Grease} = 1 \text{ W/m} \times \text{K}$		0.038		K/W
Comparative tracking index	CTI		200			
Module stray inductance	$L_{\sigma CE}$	per switch		20		nH
Resistance, terminal-chip	R_{CC-EE}	per switch	$T_C = 25 \text{ }^\circ\text{C}$	0.95		mΩ
			$T_C = 125 \text{ }^\circ\text{C}$	1.35		
			$T_C = 175 \text{ }^\circ\text{C}$	1.55		

⁸⁾ Depends on heatsink design

Mechanical properties ⁹⁾

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dimensions	L x W x H	Typical		152 x 62 x 17		mm
Clearance distance in air	d_a	According to IEC 60664-1 and EN 50124-1	Term. to base:	12.5		mm
			Term. to base:	10		
Surface creepage distance	d_s		Term. to base:	14.5		mm
			Term. to base:	13		
Mass	m			350		g

⁹⁾ Package and mechanical properties according to IEC 60747 – 15

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

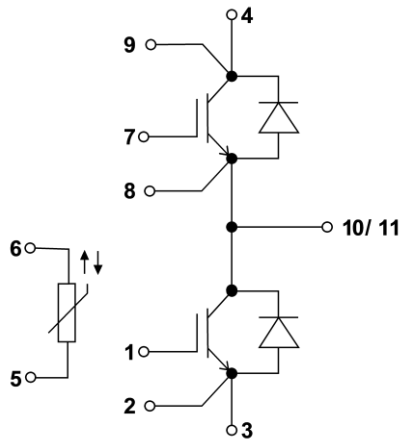
E-Mail: salesdesksem@hitachienergy.com

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail.

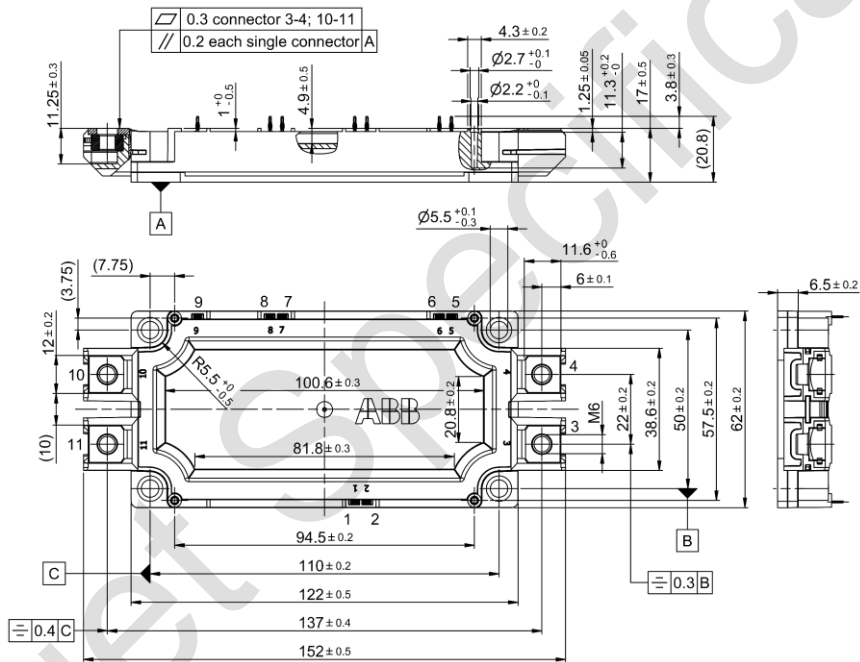
Hitachi Energy Ltd. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of Hitachi Energy Ltd.

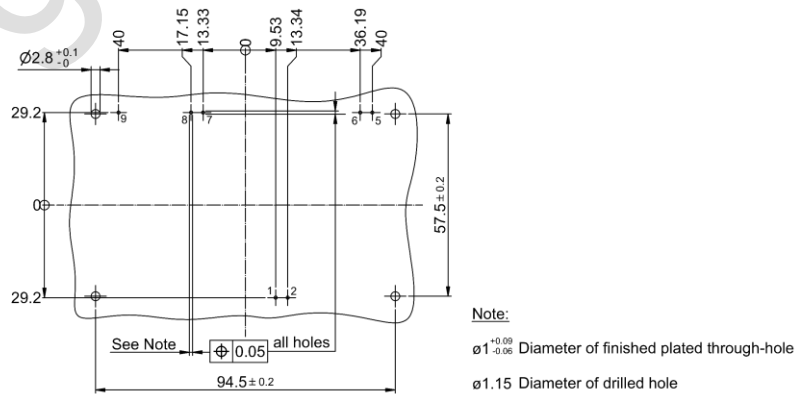
Electrical configuration



Mechanical drawing



PCB drill hole pattern for press-fit



Note: all dimensions are shown in millimeters

Hitachi Energy Switzerland Ltd
 Semiconductors
 Fabrikstrasse 3
 5600 Lenzburg
 Switzerland
 Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail.

Hitachi Energy Ltd. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of Hitachi Energy Ltd.

Related documents:

5SYA 2042 Failure rates of IGBT modules due to cosmic rays
5SYA 2045 Thermal runaway during blocking
5SYA 2053 Applying IGBT
5SYA 2057 IGBT diode safe operating area (SOA)

5SYA 2058 Surge currents for IGBT diodes
5SYA 2093 Thermal design of IGBT modules
5SYA 2098 Paralleling of IGBT modules
5SYA 2142 LoPak modules use and installation

Target Specification

Hitachi Energy Switzerland Ltd
Semiconductors
Fabrikstrasse 3
5600 Lenzburg
Switzerland
Tel: +41 58 586 10 00

E-Mail: salesdesksem@hitachienergy.com

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail.

Hitachi Energy Ltd. does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of Hitachi Energy Ltd.