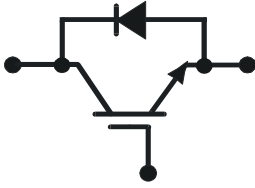


$V_{CE} = 2500 \text{ V}$

$I_C = 1300 \text{ A}$



# ABB StakPak™ H Series Press-pack IGBT

## 5SNR 13H2501 PRELIMINARY

Doc. No. 5SYA1517-03 Mar. 07

- High SOA
- Fails into stable shorted state
- High tolerance to uneven mounting pressure
- Designed for series connection
- Explosion resistant package
- Modular design concept, available for a wide range of current ratings
- SPT chip set



### Maximum Rated Values<sup>1)</sup>

Parameter <sup>2)</sup>	Symbol	Conditions	min	max	Unit
Collector-emitter voltage	$V_{CES}$			2500	V
DC collector current	$I_C$	$T_c = 75 \text{ °C}$		1300	A
Repetitive peak collector current	$I_{CM}$			2600	A
Gate-emitter voltage	$V_{GES}$			$\pm 20$	V
Total power dissipation	$P_{tot}$	$T_c = 25 \text{ °C}$ , (IGBT)		12000	W
DC forward current	$I_F$	$T_c = 75 \text{ °C}$		1300	A
Repetitive peak forward current	$I_{FM}$			2600	A
Surge current	$I_{FSM}$	$V_R = 0 \text{ V}$ , $t_p = 10 \text{ ms}$ , $T_{vj} = 125 \text{ °C}$ , half-sinewave		16.5	kA
IGBT short circuit SOA	$t_{psc}$	$V_{CC} = 1500 \text{ V}$ , $V_{CEM} \leq 2500 \text{ V}$ , $V_{GE} \leq 15 \text{ V}$		10	$\mu\text{s}$
Junction temperature	$T_{vj}$		5	125	$^{\circ}\text{C}$
Storage temperature	$T_{stg}$		-40	70	$^{\circ}\text{C}$
Mounting force <sup>2)</sup>	$F_M$		50	80	kN

<sup>1)</sup>Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747-9

<sup>2)</sup>For detailed mounting instructions refer to ABB document no. 5SYA 2037-02

ABB Switzerland Ltd, Semiconductors reserves the right to change specifications without notice.



IGBT Characteristic Values<sup>3)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit	
Collector-emitter saturation voltage	$V_{CEsat}$	$I_C = 1300 \text{ A}$ , $V_{GE} = 15 \text{ V}$	$T_{vj} = 25^\circ\text{C}$	2.20	2.60	V	
			$T_{vj} = 125^\circ\text{C}$	2.70	3.00	V	
Collector cut-off current	$I_{CES}$	$V_{CE} = 2500 \text{ V}$ , $V_{GE} = 0 \text{ V}$ ,	$T_{vj} = 125^\circ\text{C}$	25	65	mA	
Gate leakage current	$I_{GES}$	$V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$ ,	$T_{vj} = 125^\circ\text{C}$		$\pm 500$	nA	
Gate-emitter threshold voltage	$V_{GE(TO)}$	$I_C = 240 \text{ mA}$ , $V_{CE} = V_{GE}$ ,	$T_{vj} = 25^\circ\text{C}$	5	7	8.5	V
Turn-on energy	$E_{on}$	$V_{CC} = 1250 \text{ V}$ , $I_C = 1300 \text{ A}$ , $R_G = 3.9 \Omega$ , $V_{GE} = \pm 15 \text{ V}$ , $L_\sigma = 200 \text{ nH}$ inductive load	$T_{vj} = 25^\circ\text{C}$	1.5		J	
			$T_{vj} = 125^\circ\text{C}$	2.0		J	
Turn-off energy	$E_{off}$	$V_{CC} = 1250 \text{ V}$ , $I_C = 1300 \text{ A}$ , $R_G = 3.9 \Omega$ , $V_{GE} = \pm 15 \text{ V}$ , $L_\sigma = 200 \text{ nH}$ inductive load	$T_{vj} = 25^\circ\text{C}$	1.6		J	
			$T_{vj} = 125^\circ\text{C}$	2.0		J	

<sup>3)</sup>Characteristic values according to IEC 60747-9Diode Characteristic Values<sup>4)</sup>

Parameter	Symbol	Conditions	min	typ	max	Unit
Forward voltage	$V_F$	$I_F = 1300 \text{ A}$	$T_{vj} = 25^\circ\text{C}$	1.95	2.20	V
			$T_{vj} = 125^\circ\text{C}$	1.90	2.20	V
Reverse recovery current	$I_{rr}$	$V_{CC} = 1250 \text{ V}$ , $I_F = 1300 \text{ A}$ , $R_G = 3.9 \Omega$ , $V_{GE} = \pm 15 \text{ V}$ , $L_\sigma = 200 \text{ nH}$ inductive load	$T_{vj} = 25^\circ\text{C}$	900		A
			$T_{vj} = 125^\circ\text{C}$	1100		A
Reverse recovery charge	$Q_{rr}$	$V_{CC} = 1250 \text{ V}$ , $I_F = 1300 \text{ A}$ , $R_G = 3.9 \Omega$ , $V_{GE} = \pm 15 \text{ V}$ , $L_\sigma = 200 \text{ nH}$ inductive load	$T_{vj} = 25^\circ\text{C}$	700		$\mu\text{C}$
			$T_{vj} = 125^\circ\text{C}$	1200		$\mu\text{C}$
Reverse recovery time	$t_{rr}$	$V_{CC} = 1250 \text{ V}$ , $I_F = 1300 \text{ A}$ , $R_G = 3.9 \Omega$ , $V_{GE} = \pm 15 \text{ V}$ , $L_\sigma = 200 \text{ nH}$ inductive load	$T_{vj} = 25^\circ\text{C}$	1.3		$\mu\text{s}$
			$T_{vj} = 125^\circ\text{C}$	1.6		$\mu\text{s}$
Reverse recovery energy	$E_{rec}$	$V_{CC} = 1250 \text{ V}$ , $I_F = 1300 \text{ A}$ , $R_G = 3.9 \Omega$ , $V_{GE} = \pm 15 \text{ V}$ , $L_\sigma = 200 \text{ nH}$ inductive load	$T_{vj} = 25^\circ\text{C}$	0.65		J
			$T_{vj} = 125^\circ\text{C}$	1.1		J

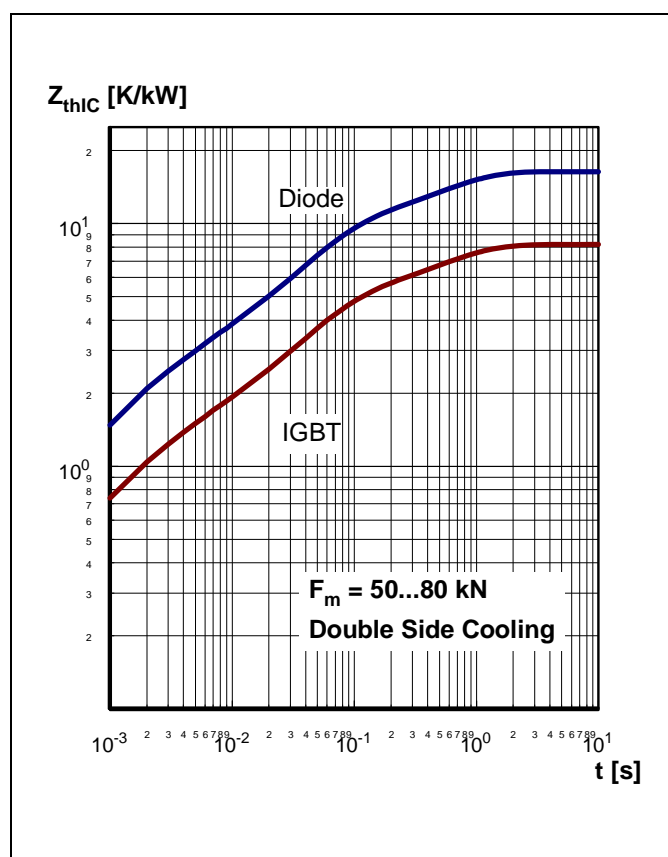
<sup>4)</sup>Characteristic values according to IEC 60747-2

## Thermal Properties

Parameter	Symbol	Conditions	min	typ	max	Unit
IGBT thermal resistance junction to case	$R_{th(j-c)}$ IGBT				8.2	K/kW
Diode thermal resistance junction to case	$R_{th(j-c)}$ Diode				16.4	K/kW
IGBT thermal resistance case to heatsink	$R_{th(c-h)}$ IGBT	Heatsink flatness : Complete module area < 100 $\mu\text{m}$			1.5	K/kW
Diode thermal resistance case to heatsink	$R_{th(c-h)}$ Diode	Each submodule area < 20 $\mu\text{m}$ Roughness : < 1.6 $\mu\text{m}$			3	K/kW
Operating junction temperature	$T_{vjop}$		5		125	$^\circ\text{C}$

## Mechanical Properties

Parameter	Symbol	Conditions	min	typ	max	Unit
Dimensions	L* W* H	Typical , see outline drawing	236*150*26			mm
Clearance distance	D <sub>C</sub>	acc. IEC 60664-1 and EN50124-1	10			mm
Surface creepage distance	D <sub>SC</sub>	acc. IEC 60664-1 and EN50124-1	23			mm
Weight				2.1		kg



**Fig.15** Maximum thermal impedance of IGBT and diode versus time

Analytical function for transient thermal impedance:

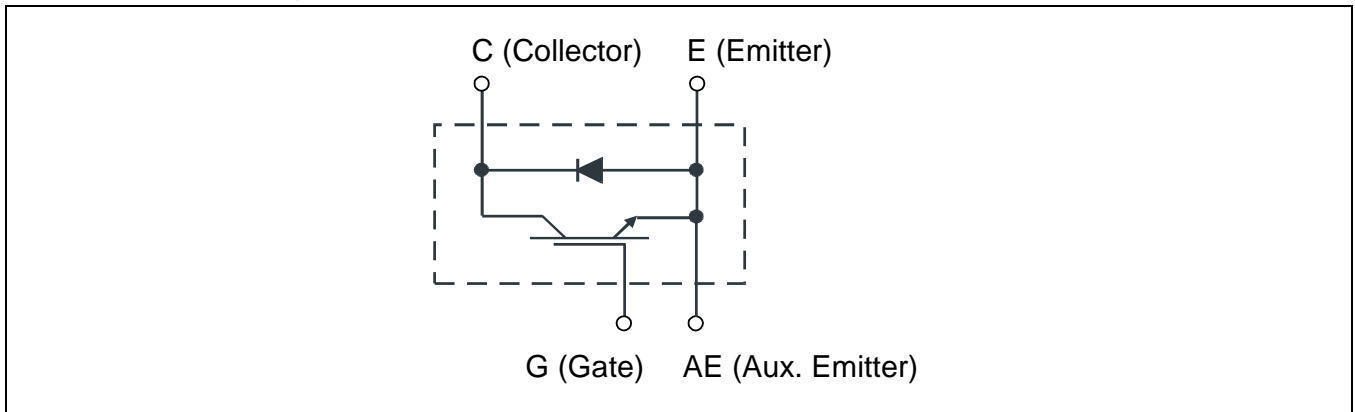
$$Z_{th(j-c)}(t) = \sum_{i=1}^n R_i (1 - e^{-t/\tau_i})$$

	i	1	2	3	4
IGBT	R <sub>i</sub> (K/kW)	3.426	3.459	0.709	0.603
	τ <sub>i</sub> (ms)	580.8	53.11	3.286	0.609
DIODE	R <sub>i</sub> (K/kW)	6.853	6.917	1.417	1.206
	τ <sub>i</sub> (ms)	580.8	53.11	3.286	0.609

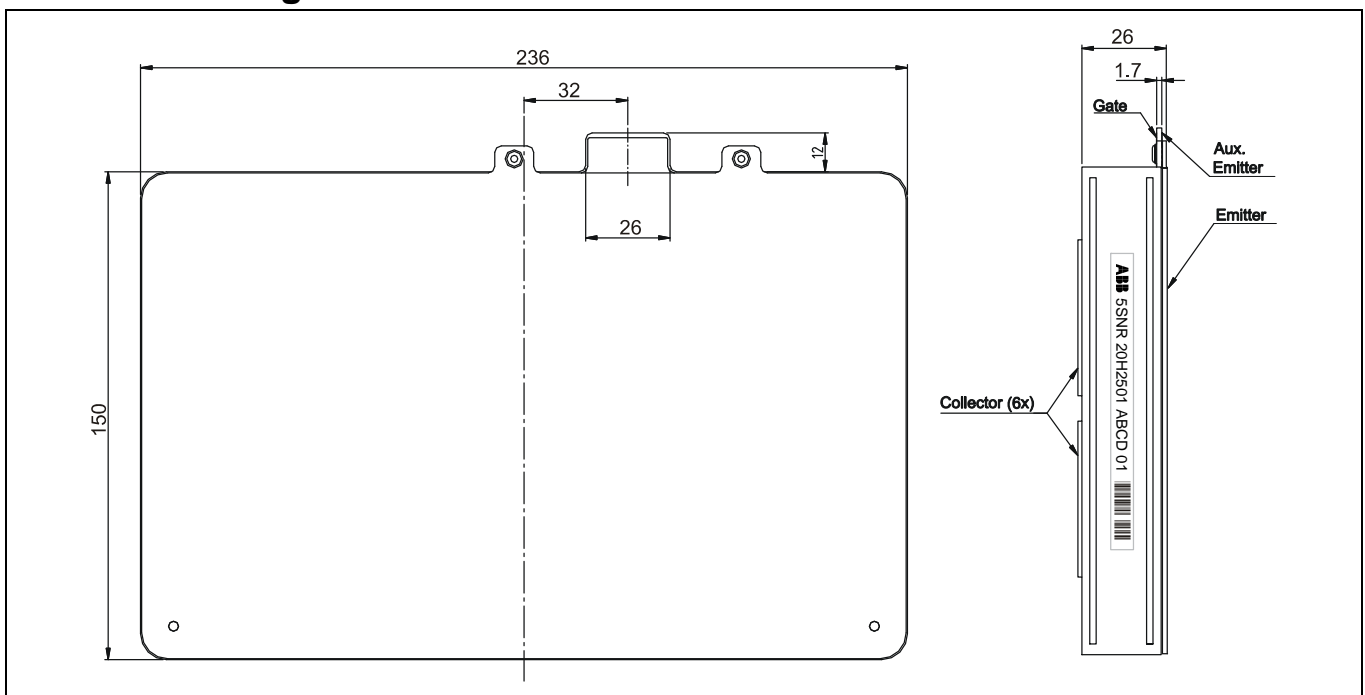
## Environmental class according to IEC 60721

Mode	Class	Document - no.
Storage	IE 11	5 SZK 9101-01
Transportation	IE 23	5 SZK 9102-01
Operation	IE 33	5 SZK 9103-01

## Electrical configuration



## Outline drawing



StakPak H4

**This is an electrostatic sensitive device.**  
**Please observe the international standard IEC 60747-1, chapter IX.**  
**This product has been designed and qualified for Industrial Level**

ABB Switzerland Ltd, Semiconductors reserves the right to change specifications without notice.

# ABB

**ABB Switzerland Ltd**  
**Semiconductors**  
 Fabrikstrasse 3  
 CH-5600 Lenzburg, Switzerland

Telephone +41 (0)58 586 1419  
 Fax +41 (0)58 586 1306  
 Email [abbsem@ch.abb.com](mailto:abbsem@ch.abb.com)  
 Internet [www.abb.com/semiconductors](http://www.abb.com/semiconductors)