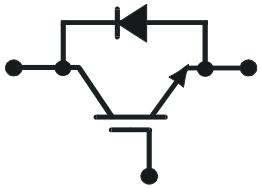
$V_{CE}$ = 2500 V
$I_C$ = 1000 A



# ABB StakPak™ H Series Press-pack IGBT

# 5SNR 10H2501

## PRELIMINARY

Doc. No. 5SYA1580-03 May. 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[1)]**

| Parameter[2)] | Symbol | Conditions | min | max | Unit |
|---|---|---|---|---|---|
| Collector-emitter voltage | $V_{CES}$ | | | 2500 | V |
| DC collector current | $I_C$ | $T_c$ = 75 °C | | 1000 | A |
| Repetitive peak collector current | $I_{CM}$ | | | 2000 | A |
| Gate-emitter voltage | $V_{GES}$ | | | ± 20 | V |
| Total power dissipation | $P_{tot}$ | $T_c$ = 25 °C, (IGBT) | | 10000 | W |
| DC forward current | $I_F$ | $T_c$ = 75 °C | | 1000 | A |
| Repetitive peak forward current | $I_{FM}$ | | | 2000 | A |
| Surge current | $I_{FSM}$ | $V_R$ = 0 V, $t_p$ = 10 ms, $T_{vj}$ = 125 °C, half-sinewave | | 12.4 | kA |
| IGBT short circuit SOA | $t_{psc}$ | $V_{CC}$ = 1500 V, $V_{CEM} \leq$ 2500 V, $V_{GE} \leq$15V | | 10 | µs |
| Junction temperature | $T_{vj}$ | | 5 | 125 | °C |
| Storage temperature | $T_{stg}$ | | -40 | 70 | °C |
| Mounting force [2)] | $F_M$ | | 40 | 75 | kN |

[1)]Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747-9

[2)]For detailed mounting instructions refer to ABB document no. 5SYA 2037-02

## IGBT Characteristic Values[3)]

| Parameter | Symbol | Conditions | | min | typ | max | Unit |
|---|---|---|---|---|---|---|---|
| Collector-emitter saturation voltage | $V_{CEsat}$ | $I_C$ = 1000 A, $V_{GE}$ = 15 V | $T_{vj}$ = 25°C | | 2.20 | 2.60 | V |
| | | | $T_{vj}$ = 125°C | | 2.70 | 3.00 | V |
| Collector cut-off current | $I_{CES}$ | $V_{CE}$ = 2500 V, $V_{GE}$ = 0 V, | $T_{vj}$ = 125 °C | | 18 | 50 | mA |
| Gate leakage current | $I_{GES}$ | $V_{CE}$ = 0 V, $V_{GE}$ = ±20 V, | $T_{vj}$ = 125 °C | | | ±500 | nA |
| Gate-emitter threshold voltage | $V_{GE(TO)}$ | $I_C$ = 180 mA, $V_{CE}$ = $V_{GE}$, | $T_{vj}$ = 25 °C | 5 | 7 | 8.5 | V |
| Turn-on energy | $E_{on}$ | $V_{CC}$ = 1250 V, $I_C$ = 1000 A, $R_G$ = 3.9 Ω, $V_{GE}$ = ±15 V, $L_\sigma$ = 200 nH inductive load | $T_{vj}$ = 25°C | | 1 | | J |
| | | | $T_{vj}$ = 125°C | | 1.5 | | J |
| Turn-off energy | $E_{off}$ | $V_{CC}$ = 1250 V, $I_C$ = 1000 A, $R_G$ = 5.6 Ω, $V_{GE}$ = ±15 V, $L_\sigma$ = 200 nH inductive load | $T_{vj}$ = 25°C | | 1.4 | | J |
| | | | $T_{vj}$ = 125°C | | 1.8 | | J |

[3)]Characteristic values according to IEC 60747-9

## Diode Characteristic Values[4)]

| Parameter | Symbol | Conditions | | min | typ | max | Unit |
|---|---|---|---|---|---|---|---|
| Forward voltage | $V_F$ | $I_F$ = 1000 A | $T_{vj}$ = 25°C | | 1.95 | 2.20 | V |
| | | | $T_{vj}$ = 125°C | | 1.90 | 2.20 | V |
| Reverse recovery current | $I_{rr}$ | $V_{CC}$ = 1250 V, $I_F$ = 1000 A, $R_G$ = 3.9 Ω, $V_{GE}$ = ±15 V, $L_\sigma$ = 200 nH inductive load | $T_{vj}$ = 25°C | | 760 | | A |
| | | | $T_{vj}$ = 125°C | | 950 | | A |
| Reverse recovery charge | $Q_{rr}$ | | $T_{vj}$ = 25°C | | 560 | | µC |
| | | | $T_{vj}$ = 125°C | | 950 | | µC |
| Reverse recovery time | $t_{rr}$ | | $T_{vj}$ = 25°C | | 1.3 | | µs |
| | | | $T_{vj}$ = 125°C | | 1.8 | | µs |
| Reverse recovery energy | $E_{rec}$ | | $T_{vj}$ = 25°C | | 0.52 | | J |
| | | | $T_{vj}$ = 125°C | | 0.86 | | J |

[4)]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 | | | | 11 | K/kW |
| Diode thermal resistance junction to case | $R_{th(j-c)}$ Diode | | | | 22 | K/kW |
| IGBT thermal resistance case to heatsink | $R_{th(c-h)}$ IGBT | Heatsink flatness : Complete module area < 100 µm Each submodule area < 20 µm Roughness : < 1.6 µm | | | 2 | K/kW |
| Diode thermal resistance case to heatsink | $R_{th(c-h)}$ Diode | | | | 4 | K/kW |
| Operating junction temperature | $T_{vjop}$ | | 5 | | 125 | °C |

## Mechanical Properties

| Parameter | Symbol | Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Dimensions | L* W* H | Typical , see outline drawing | | 236*150*26 | | mm |
| Clearance distance | $D_C$ | acc. IEC 60664-1 and EN50124-1 | 10 | | | mm |
| Surface creepage distance | $D_{SC}$ | acc. IEC 60664-1 and EN50124-1 | 23 | | | mm |
| Weight | | | | 1.9 | | kg |

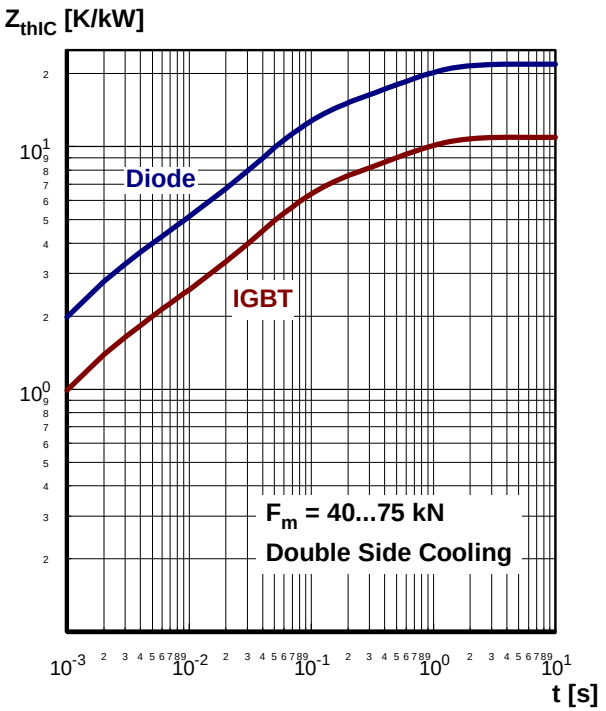



**Fig.15** Maximum thermal impedance of IGBT and diode versus time

**Analytical function for transient thermal impedance:**

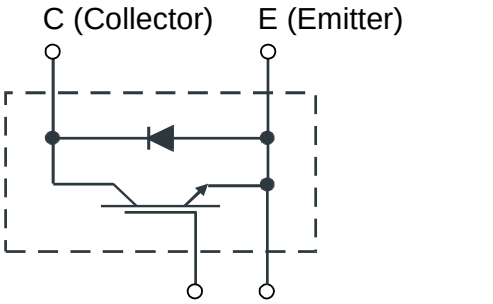
$$Z_{th\,(j-c)}(t) = \sum_{i=1}^{n} R_i\left(1 - e^{-t/\tau_i}\right)$$

| | i | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| IGBT | Ri(K/kW) | 4.569 | 4.611 | 0.945 | 0.804 |
| | $\tau_i$(ms) | 580.8 | 53.11 | 3.286 | 0.609 |
| DIODE | Ri(K/kW) | 9.137 | 9.223 | 1.889 | 1.607 |
| | $\tau_i$(ms) | 580.8 | 53.11 | 3.286 | 0.609 |

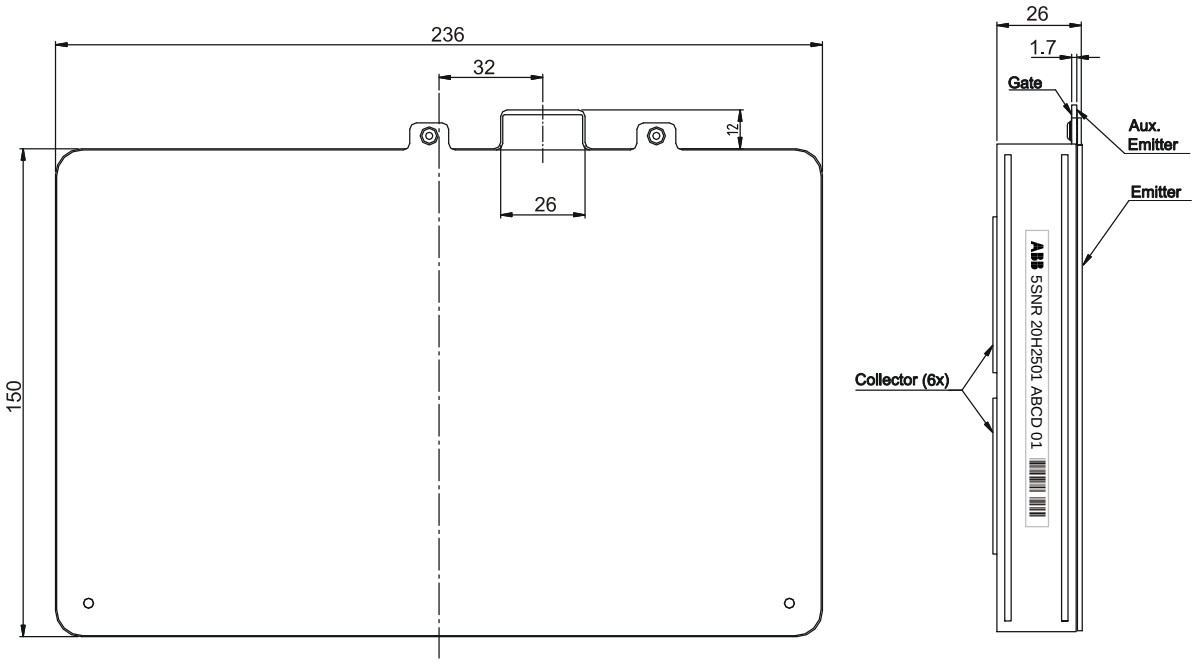
## Environmental class according to IEC 60721

| 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 H3

**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**



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