V_{CE} = 4500 V
I_C = 650 A

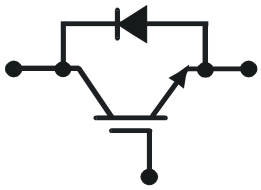


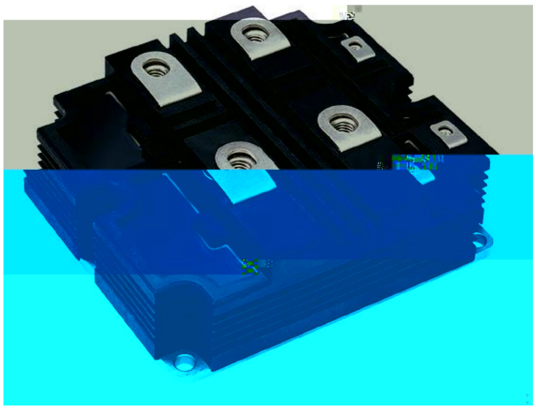
ABB HiPak™

IGBT Module

5SNA 0650J450300

Doc. No. 5SYA 1598-02 Jan 09

- **Ultra low-loss, rugged SPT+ chip-set**
- **Smooth switching SPT+ chip-set for good EMC**
- **Industry standard package**
- **High power density**
- **AlSiC base-plate for high power cycling capability**
- **AlN substrate for low thermal resistance**



Maximum rated values [1)]

Parameter	Symbol	Conditions	min	max	Unit
Collector-emitter voltage	V_{CES}	V_{GE} = 0 V		4500	V
DC collector current	I_C	T_c = 85 °C		650	A
Peak collector current	I_{CM}	t_p = 1 ms, T_c = 85 °C		1300	A
Gate-emitter voltage	V_{GES}		-20	20	V
Total power dissipation	P_{tot}	T_c = 25 °C, per switch (IGBT)		6670	W
DC forward current	I_F			650	A
Peak forward current	I_{FRM}			1300	A
Surge current	I_{FSM}	V_R = 0 V, T_{vj} = 125 °C, t_p = 10 ms, half-sinewave		6000	A
IGBT short circuit SOA	t_{psc}	V_{CC} = 3400 V, $V_{CEM\,CHIP} \leq$ 4500 V $V_{GE} \leq$ 15 V, $T_{vj} \leq$ 125 °C		10	µs
Isolation voltage	V_{isol}	1 min, f = 50 Hz		7400	V
Junction temperature	T_{vj}			125	°C
Junction operating temperature	$T_{vj(op)}$		-40	125	°C
Case temperature	T_c		-40	125	°C
Storage temperature	T_{stg}		-40	125	°C
Mounting torques [2)]	M_s	Base-heatsink, M6 screws	4	6	Nm
	M_{t1}	Main terminals, M8 screws	8	10	
	M_{t2}	Auxiliary terminals, M4 screws	2	3	

[1)] Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747
[2)] For detailed mounting instructions refer to ABB Document No. 5SYA2039

Diode characteristic values [5]

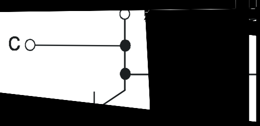
Parameter	Symbol	Conditions		min	typ	max	Unit
Forward voltage [6]	V_F	I_F = 650 A	T_{vj} = 25 °C		3.1		V
			T_{vj} = 125 °C		3.4		
Reverse recovery current	I_{rr}	V_{CC} = 2800 V, I_F = 650 A, V_{GE} = ±15 V, R_G = 2.2 Ω, C_{GE} = 150 nF, L_σ = 150 nH inductive load	T_{vj} = 25 °C		830		A
			T_{vj} = 125 °C		930		
Recovered charge	Q_{rr}		T_{vj} = 25 °C		560		µC
			T_{vj} = 125 °C		930		
Reverse recovery time	t_{rr}		T_{vj} = 25 °C		1180		ns
			T_{vj} = 125 °C		1700		
Reverse recovery energy	E_{rec}		T_{vj} = 25 °C		910		mJ
			T_{vj} = 125 °C		1610		

[5] Characteristic values according to IEC 60747 – 2
[6] Forward voltage is given at chip level

Package properties [7]

Parameter	Symbol	Conditions	min	typ	max	Unit
IGBT thermal resistance junction to case	$R_{th(j-c)IGBT}$				0.015	K/W
Diode thermal resistance junction to case	$R_{th(j-c)DIODE}$				0.030	K/W
IGBT thermal resistance case to heatsink [2]	$R_{th(c-s)IGBT}$	IGBT per switch, λ grease = 1W/m x 0.0				

Electr



...ifications without notice.

Outline drawing 2)

For mounting instructions refer to ABB Document No. 5SYA2039

Note: all dimensions are shown in mm

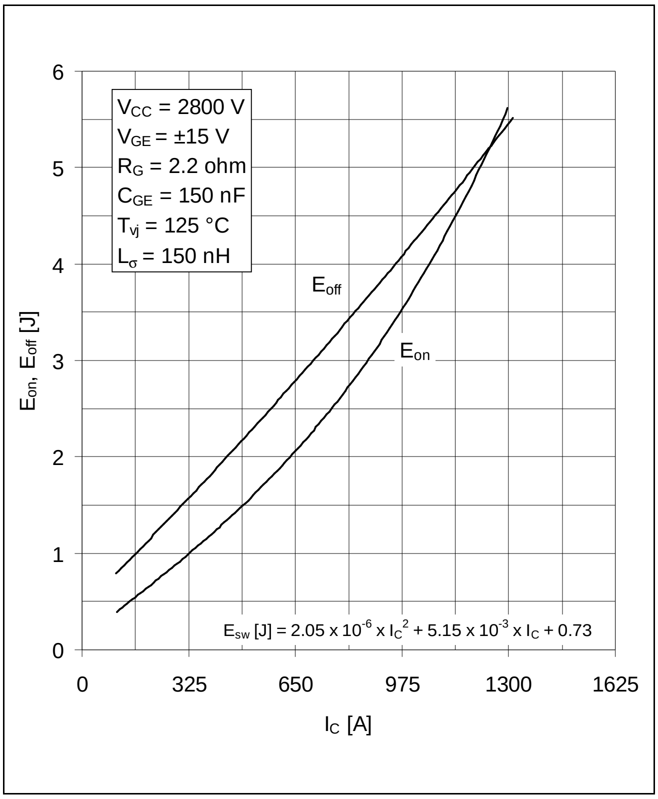


Fig. 5 Typical switching energies per pulse vs collector current

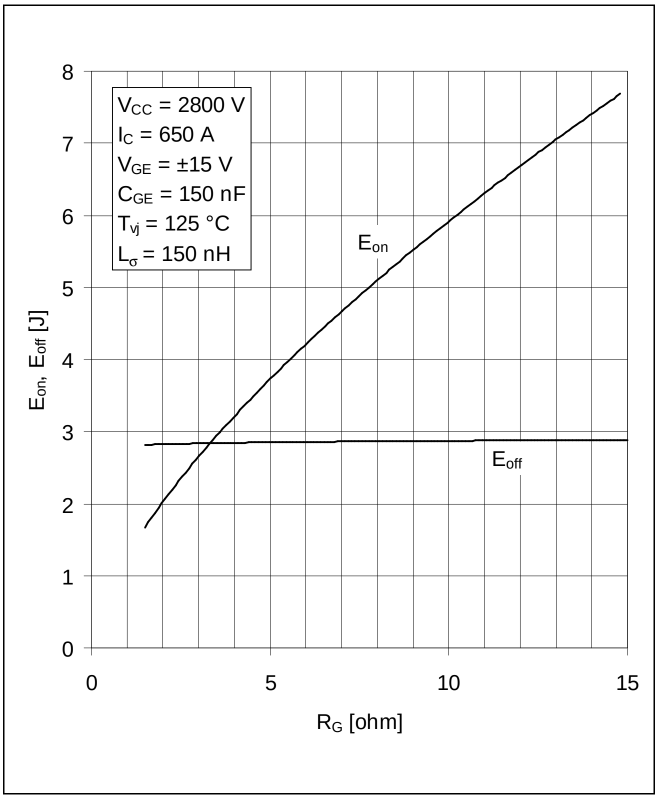
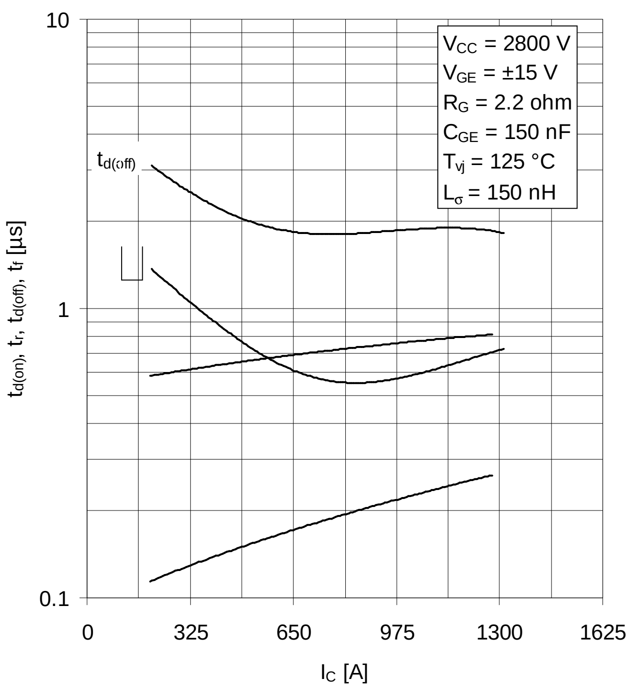
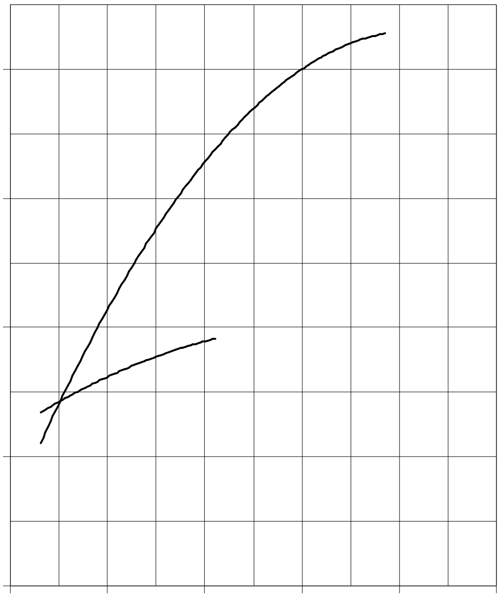


Fig. 6 Typical switching energies per pulse vs gate resistor





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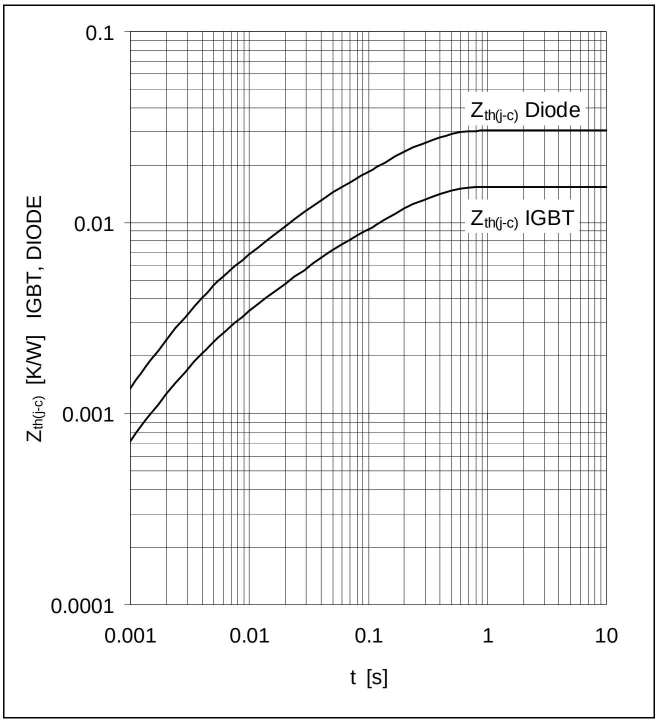

Fig. 16 Thermal impedance vs time

Analytical function for transient thermal impedance:

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

	i	1	2	3	4	5
IGBT	R_i(K/kW)	10.3	3.42	1.68		
	τ_i(ms)	192.6	21.4	2.78		
DIODE	R_i(K/kW)	20	7.01	3.46		
	τ_i(ms)	191.5	22.6	3.1		

For detailed information refer to:

- 5SYA 2042 Failure rates of HiPak modules due to cosmic rays
- 5SYA 2043 Load – cycle capability of HiPaks
- 5SYA 2045 Thermal runaway during blocking
- 5SYA 2058 Surge currents for IGBT diodes
- 5SZK 9120 Specification of environmental class for HiPak

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