

$V_{RRM} = 4500 \text{ V}$

$I_F = 2 \times 650 \text{ A}$

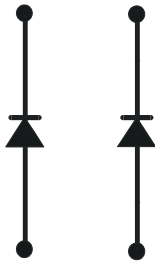


ABB HiPak

DIODE Module

5SLD 0650J450300

Doc. No. 5SYA 1599-05 09-2016

- Ultra low-loss, rugged SPT⁺ diode
- Smooth switching SPT⁺ diode for good EMC
- Industry standard package
- High power density
- AlSiC base-plate for high power cycling capability
- AlN substrate for low thermal resistance
- Improved high reliability package
- Recognized under UL1557, File E196689



Maximum rated values ¹⁾

Parameter	Symbol	Conditions	min	max	Unit
Repetitive peak reverse voltage	V_{RRM}			4500	V
DC forward current	I_F			650	A
Peak forward current	I_{FRM}	$t_p = 1 \text{ ms}$		1300	A
Total power dissipation	P_{tot}	$T_c = 25 \text{ }^\circ\text{C}$, per diode		3350	W
Surge current	I_{FSM}	$V_R = 0 \text{ V}$, $T_{vj} = 125 \text{ }^\circ\text{C}$, $t_p = 10 \text{ ms}$, half-sinewave		5300	A
Isolation voltage	V_{isol}	1 min, $f = 50 \text{ Hz}$		10.2	kV
Junction temperature	T_{vj}			125	$^\circ\text{C}$
Junction operating temperature	$T_{vj(op)}$		-50	125	$^\circ\text{C}$
Case temperature	T_c		-50	125	$^\circ\text{C}$
Storage temperature	T_{stg}		-50	125	$^\circ\text{C}$

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

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Diode characteristic values ²⁾

Parameter	Symbol	Conditions	min	typ	max	Unit
Forward voltage ³⁾	V_F	$I_F = 650 \text{ A}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	3.1		V
			$T_{vj} = 125 \text{ }^\circ\text{C}$		3.4	
Continuous reverse current	I_R	$V_R = 4500 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$		10	mA
			$T_{vj} = 125 \text{ }^\circ\text{C}$		16	
Reverse recovery current	I_{rr}	$V_R = 2800 \text{ V}$, $I_F = 650 \text{ A}$,	$T_{vj} = 25 \text{ }^\circ\text{C}$	830		A
			$T_{vj} = 125 \text{ }^\circ\text{C}$		930	
Recovered charge	Q_{rr}	$V_{GE} = \pm 15 \text{ V}$, $di/dt = 4200 \text{ A}/\mu\text{s}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	560		μC
			$T_{vj} = 125 \text{ }^\circ\text{C}$		930	
Reverse recovery time	t_{rr}	$L_\sigma = 150 \text{ nH}$ inductive load, switch: 5SNA 0650J450300	$T_{vj} = 25 \text{ }^\circ\text{C}$	1180		ns
			$T_{vj} = 125 \text{ }^\circ\text{C}$		1700	
Reverse recovery energy	E_{rec}		$T_{vj} = 25 \text{ }^\circ\text{C}$	910		mJ
			$T_{vj} = 125 \text{ }^\circ\text{C}$		1610	
Module stray inductance	$L_{\sigma AC}$	per diode		36		nH
Resistance, terminal-chip	$R_{AA'+CC'}$	per diode	$T_C = 25 \text{ }^\circ\text{C}$	0.2		m Ω
			$T_C = 125 \text{ }^\circ\text{C}$		0.3	

²⁾ Characteristic values according to IEC 60747 – 2

³⁾ Forward voltage is given at chip level

Package properties ⁴⁾

Parameter	Symbol	Conditions	min	typ	max	Unit
Diode thermal resistance junction to case	$R_{th(j-c)DIODE}$				0.030	K/W
Diode thermal resistance ⁵⁾ case to heatsink	$R_{th(c-s)DIODE}$	diode per switch, λ grease = $1\text{W}/\text{m} \times \text{K}$		0.027		K/W
Partial discharge extinction voltage	V_e	$f = 50 \text{ Hz}$, $Q_{PD} \leq 10\text{pC}$ (acc. to IEC 61287)	5100			V
Comparative tracking index	CTI			≥ 600		

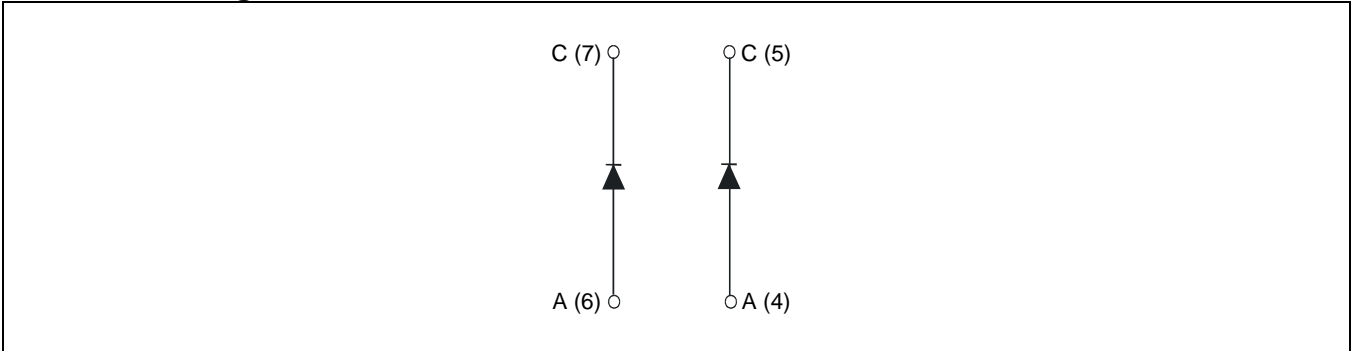
Mechanical properties ⁴⁾

Parameter	Symbol	Conditions	min	typ	max	Unit
Dimensions	$L \times W \times H$	Typical , see outline drawing	130 x 140 x 48			mm
Clearance distance in air	d_a	according to IEC 60664-1 and EN 50124-1	Term. to base:	40		mm
			Term. to term:	26		
Surface creepage distance	d_s	according to IEC 60664-1 and EN 50124-1	Term. to base:	64		mm
			Term. to term:	56		
Mounting torques ⁵⁾	M_s	Base-heatsink, M6 screws	4		6	Nm
	M_{t1}	Main terminals, M8 screws	8		10	
Mass	m			980		g

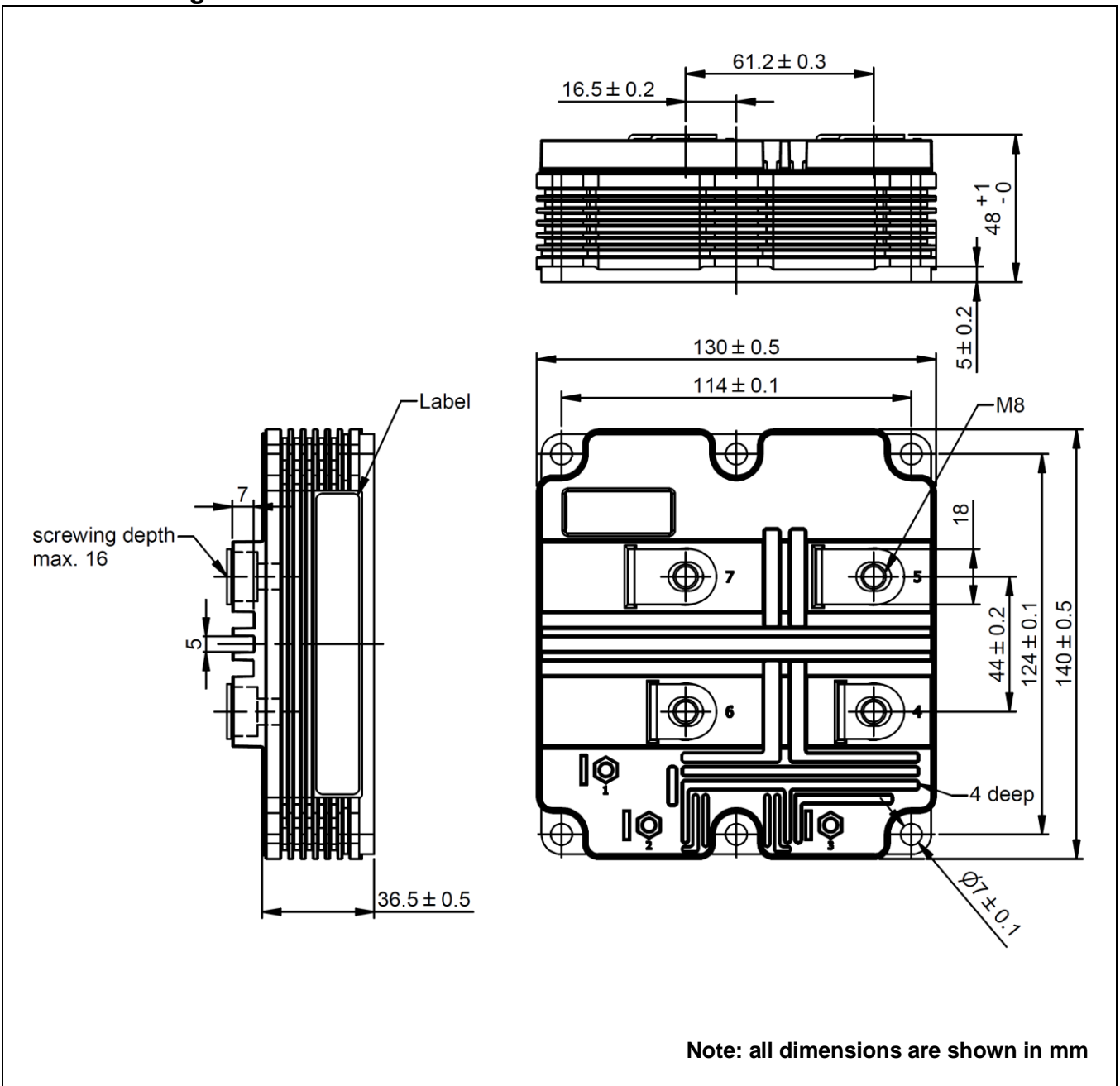
⁴⁾ Package and mechanical properties according to IEC 60747 – 15

⁵⁾ For detailed mounting instructions refer to ABB document no. 5SYA 2039 - 01

Electrical configuration



Outline drawing ⁵⁾



⁵⁾ For detailed mounting instructions refer to ABB document no. 5SYA 2039 - 01

This is an electrostatic sensitive device, please observe the international standard IEC 60747-1, chap. VIII. This product has been designed and qualified for industrial level.

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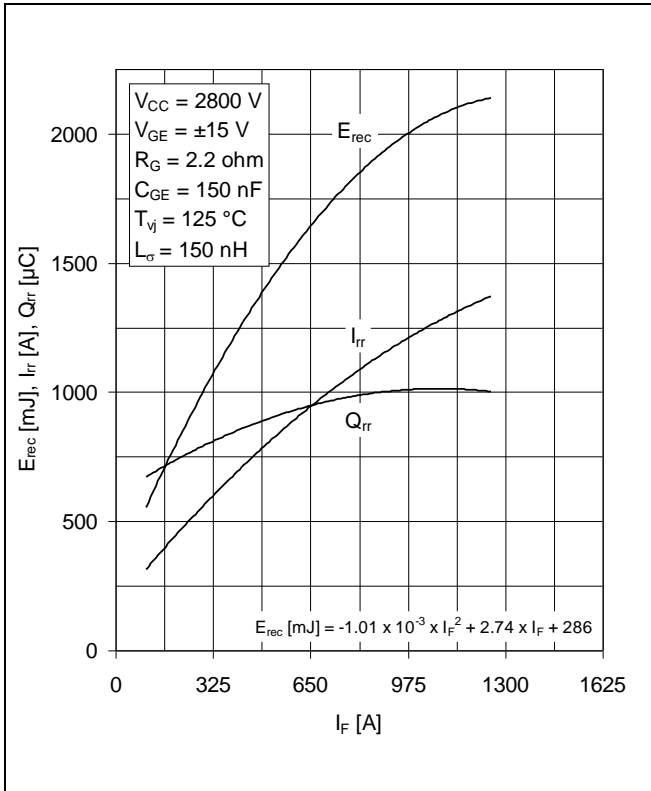


Fig. 1 Typical reverse recovery characteristics vs forward current

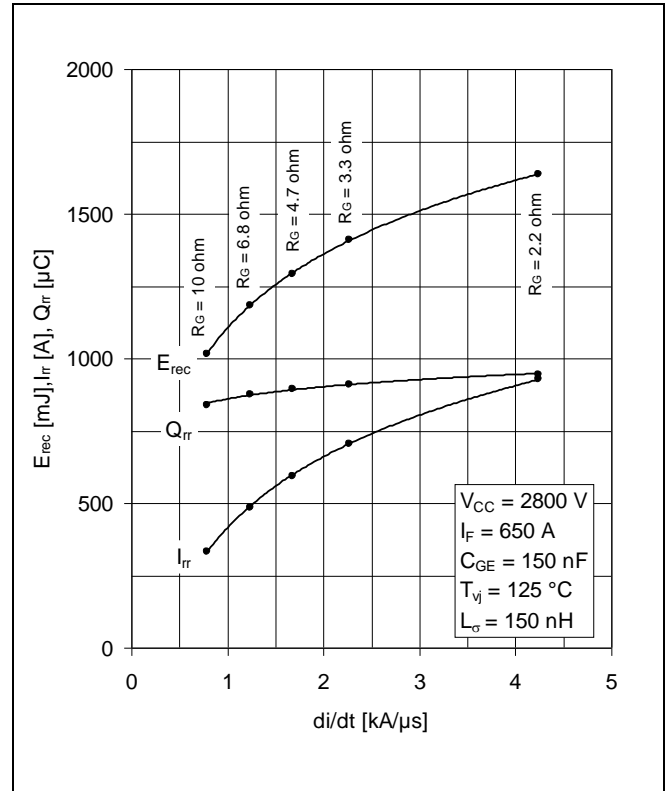


Fig. 2 Typical reverse recovery characteristics vs di/dt

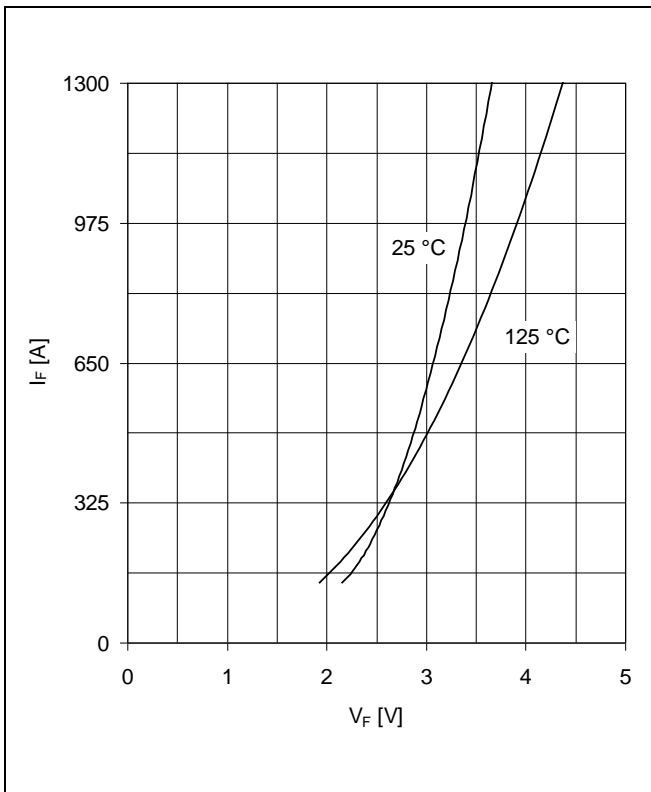


Fig. 3 Typical diode forward characteristics, chip level

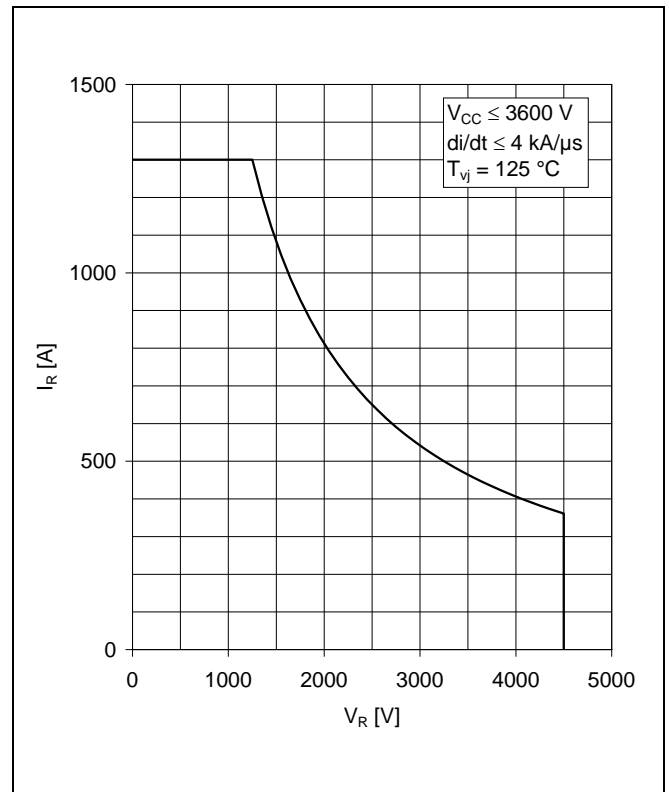


Fig. 4 Safe operating area diode (SOA)

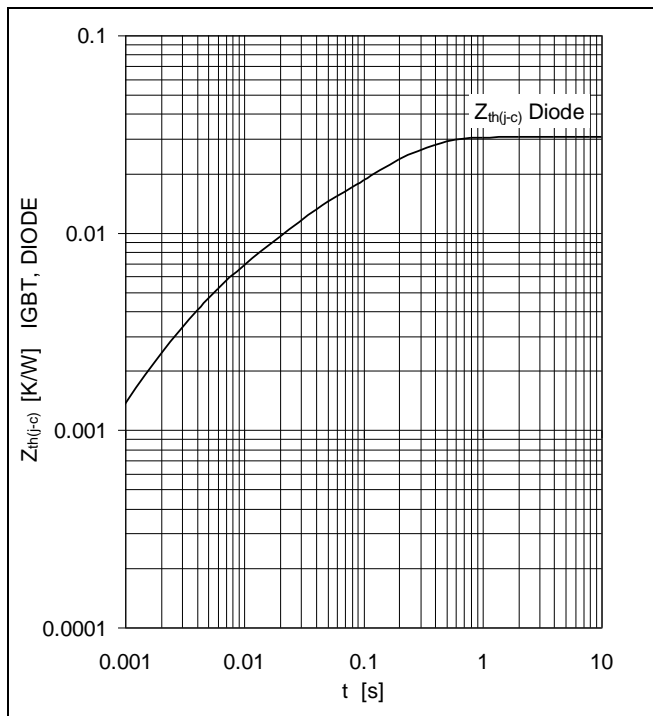


Fig. 5 Thermal impedance vs time

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	5
DIODE	R _i (K/kW)	20	7.01	3.46		
	τ _i (ms)	191.5	22.6	3.1		

Related documents:

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 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
 5SZK 9111 Specification of environmental class for HiPak Storage
 5SZK 9112 Specification of environmental class for HiPak Transportation
 5SZK 9113 Specification of environmental class for HiPak Operation (Industry)
 5SZK 9120 Specification of environmental class for HiPak

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