Datasheet 5SYA Aug 2020

5SLD 1000J650300

HiPak Diode module

Target Specification

- V_{RRM} = 6500 V
- I_F =2 x 1000 A
- Ultra-low-loss, rugged SPT^{++} diode
- Exceptional ruggedness and highest current rating
- High insulation package, 2 Diodes in 1 package
- AlSiC base-plate and AlN substrate for low thermal resistance and high power cycling capability

Maximum rated values [1)]

Parameter	Symbol	Conditions	min	max	Unit
Repetitive peak reverse voltage	V_{RRM}	T_{vj} ≥ 25 °C		6500	V
DC forward current	I_F			1000	A
Peak forward current	I_{FRM}	t_p = 1 ms, per Diode		2000	A
Total power dissipation	P_{tot}	T_C = 25 °C, T_{vj} = 125 °C, per Diode		tbd	W
Surge current	I_{FSM}	V_R = 0 V, T_{vj} = 125 °C, t_p = 10 ms, half-sinewave, per Diode		9000	A
Isolation voltage	V_{isol}	1 min, f = 50 Hz		10200	V
Junction temperature	T_{vj}			150	°C
Junction operating temperature	$T_{vj(op)}$		-50	150	°C
Case temperature	T_C		-50	125	°C
Storage temperature	T_{stg}		-50	125	°C
Mounting torques	M_s	Base-heatsink, M6 screws	4	6	Nm
	M_{t1}	Main terminals, M8 screws	8	10	
	M_{t1}	Auxiliary terminals, M4 screws	2	3	

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

Diode characteristic values [4]

Parameter	Symbol	Conditions		min	typ.	max	Unit
Forward voltage [5]	V_F	I_F = 1000 A	T_{vj} = 25 °C		3.05	3.5	V
			T_{vj} = 125 °C		3.4	3.9	V
			T_{vj} = 150 °C		3.35		V
Reverse recovery current	I_{rr}	V_{CC} = 3600 V, I_F = 1000 A, di/dt=-8 kA/µs L_σ = 150 nH inductive load switch: 5SNA 1000G650300 Per Diode	T_{vj} = 25 °C		1710		A
			T_{vj} = 125 °C		2230		A
			T_{vj} = 150 °C		2490		A
Recovered charge	Q_{rr}		T_{vj} = 25 °C		1210		µC
			T_{vj} = 125 °C		1950		µC
			T_{vj} = 150 °C		2260		µC
Reverse recovery time	t_{rr}		T_{vj} = 25 °C		1400		ns
			T_{vj} = 125 °C		1400		ns
			T_{vj} = 150 °C		1380		ns
Reverse recovery energy	E_{rec}		T_{vj} = 25 °C		2300		mJ
			T_{vj} = 125 °C		4150		mJ
			T_{vj} = 150 °C		4900		mJ

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

Package properties [6]

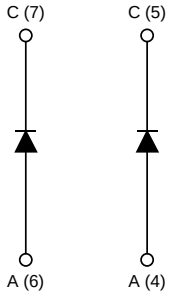
Parameter	Symbol	Conditions		min	typ.	max	Unit
Diode thermal resistance junction to case	$R_{th(j-c)DIODE}$					0.016	K/W
Diode thermal resistance case to heatsink [2]	$R_{th(c-s)DIODE}$	Diode per switch, λ grease = 1W/m x K			0.011		K/W
Partial discharge voltage	V_e	f = 50 Hz, Q_{PD} ≤ 10pC (acc. to IEC 61287)		5100			V
Comparative tracking index	CTI			600			V
Module stray inductance	$L_{\sigma AC}$	per Diode			36		nH
Resistance, terminal-chip	$R_{AA'+CC'}$	per Diode	T_C = 25 °C		0.2		mΩ
			T_C = 125 °C		0.3		mΩ
			T_C = 150 °C		0.33		mΩ

Mechanical properties [6]

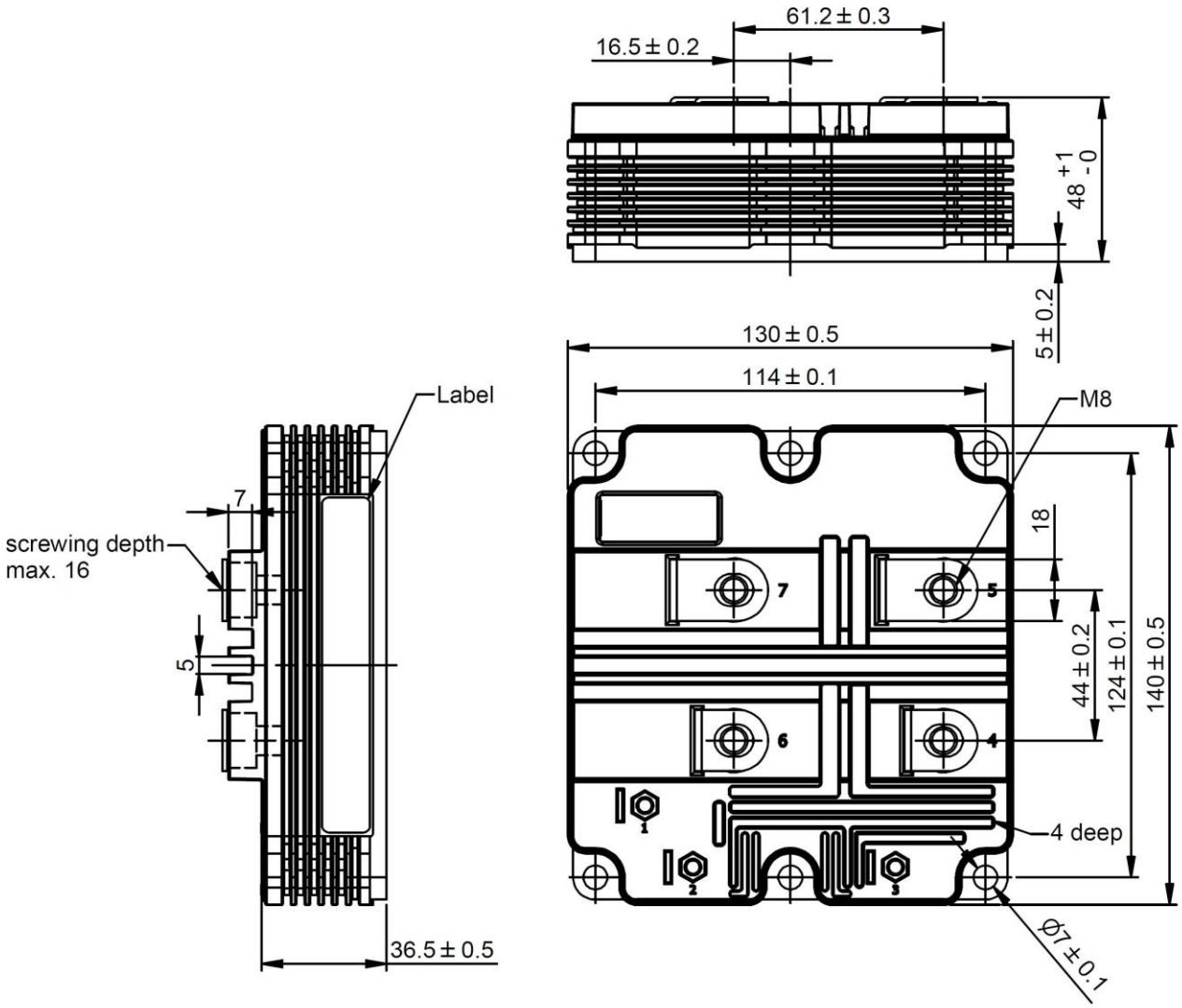
Parameter	Symbol	Conditions		min	typ.	max	Unit
Dimensions	L x W x H	Typical			130 x 140 x 48		mm
Clearance distance in air	d_a	According to IEC 60664-1 and EN 50124-1	Term. to base:	40			mm
			Term. to term:	26			mm
Surface creepage distance	d_s	According to IEC 60664-1 and EN 50124-1	Term. to base:	64			mm
			Term. to term:	56			mm
Mass	m				980		g

[6] Package and mechanical properties according to IEC 60747 – 15

Electrical configuration



Outline drawing (mm)



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

Fig. 11 Typicial diode forward characteristics chip level

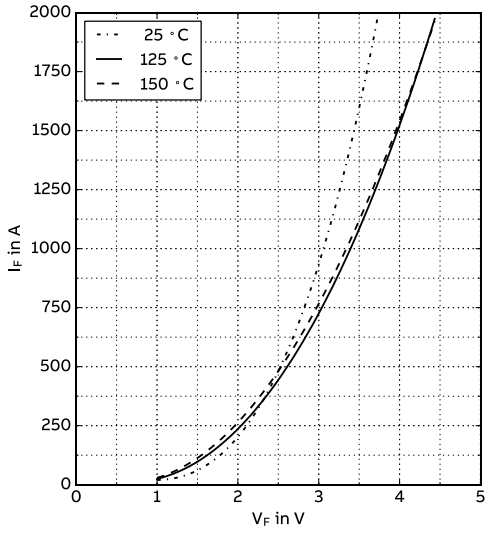


Fig. 12 Typical reverse recovery characteristics vs. forward current

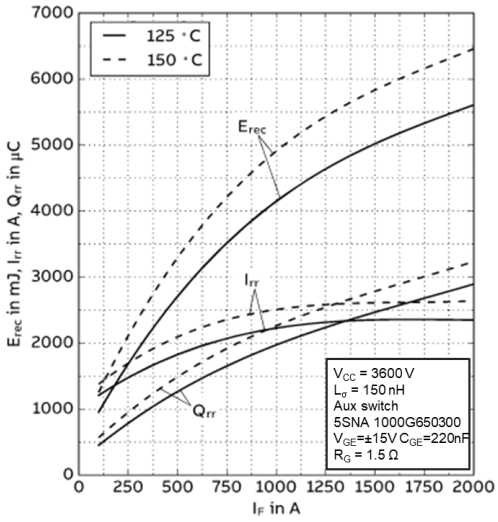


Fig. 13 Typical reverse recovery characteristics vs. di/dt

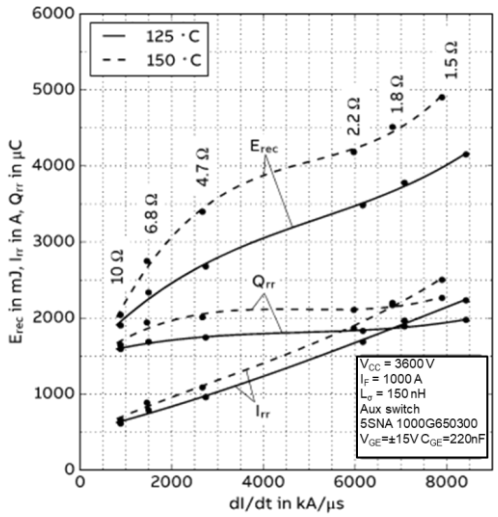
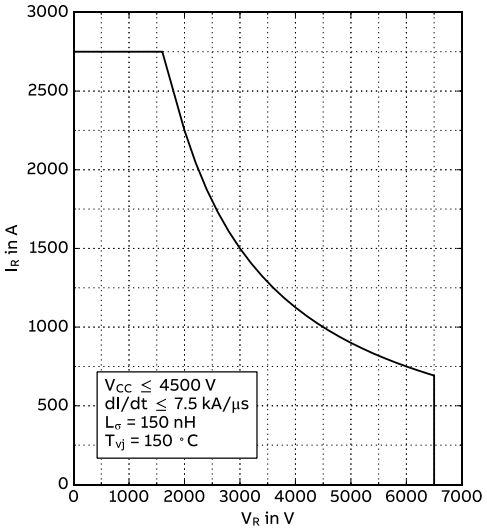
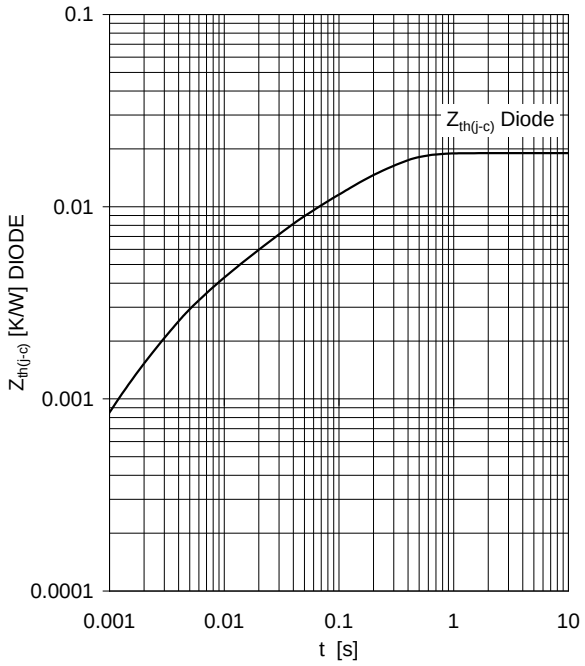


Fig. 14 Safe operating area diode (SOA)





Analytical function for transient thermal impedance:

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

DIODE	i	1	2	3	4	5
	R_i(K/kW)	12.5	4.37	2.16		
	τ_i(ms)	192	22.6	3.1		

Related documents:

- 5SYA 2039 Mounting Instructions for HiPak modules
- 5SYA 2042 Failure rates of IGBT modules due to cosmic rays
- 5SYA 2043 Load – cycle capability of HiPaks
- 5SYA 2045 Thermal runaway during blocking
- 5SYA 2053 Applying IGBT
- 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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