

Target specification 5SFG 1100A07500x

## 750 V, 1100 A\*

### RoadPak SiC phase-leg module



- $V_{DSS} = 750\text{ V}$
- $I_D = 2 \times 1100\text{ A}^*$
- Molded package optimized for EV application
- Pin-fin structure for lowest thermal resistance
- lowest losses thanks to Silicon Carbide chip-set
- main terminals with holes (screw connection) or without holes for welding

\*Current rating based on chip rating times number of chips

#### Maximum rated values <sup>1)</sup>

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-source voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $T_{vj} \geq 25\text{ °C}$		750	V
DC drain current	$I_D$	$T_{Cool} = 55\text{ °C}$ , $T_{vj} = 175\text{ °C}$		1100	A
Peak drain current	$I_{DM}$	$t_p = 1\text{ ms}$ , duty cycle = 20%, $T_{Cool} = 55\text{ °C}$ , $T_{vj} = 175\text{ °C}$		2200	A
Gate-source voltage	$V_{GSS}$		-4	15	V
Transient gate-source voltage <sup>2)</sup>	$V_{GSS,max}$	Maximum values under transient events < 50 ns	-8	19	V
DC reverse drain current (body diode)	$I_{DR}$	$V_{GS} = -4\text{ V}$ , $T_{Cool} = 55\text{ °C}$ , $T_{vj} = 175\text{ °C}$		tbd	A
Peak reverse drain current (body diode)	$I_{DRM}$	$V_{GS} = -4\text{ V}$ , $t_p = 1\text{ ms}$		tbd	A
Surge source current (body diode)	$I_{SSM}$	$V_{GS} = -4\text{ V}$		tbd	A
DC reverse drain current (channel open)	$I_{DRS}$	$V_{GS} = 15\text{ V}$ , $T_{Cool} = 55\text{ °C}$ , $T_{vj} = 175\text{ °C}$		1100	A
Surge source current (channel open)	$I_{SSX}$	$V_{GS} = 15\text{ V}$		tbd	A
Isolation voltage	$V_{isol}$	1 min, $f = 50\text{ Hz}$		2500	V
Junction temperature	$T_{vj}$			175	°C
Junction operating temperature	$T_{vj(op)}$		-40	175	°C
Storage temperature	$T_{stg}$		-40	150	°C
Mounting torque	$M_s$	Module to cooler with M4 screws		2.8	Nm

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

<sup>2)</sup> Based on chip capability

**MOSFET characteristic values <sup>3)</sup>**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$	$T_{vj} = 175\text{ °C}$	750		V	
			$T_{vj} = 25\text{ °C}$	750		V	
			$T_{vj} = -40\text{ °C}$	750		V	
Static drain-source on-state resistance <sup>4)</sup>	$R_{DS(on)}$	$I_D = 600\text{ A}, V_{GS} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		1.1	1.4	m $\Omega$
			$T_{vj} = 175\text{ °C}$		1.5		m $\Omega$
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 750\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		10		$\mu\text{A}$
			$T_{vj} = 175\text{ °C}$		tbd	tbd	$\mu\text{A}$
Gate-source leakage current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = 15\text{ V}, T_{vj} = 25\text{ °C}$			500	nA	
Gate threshold voltage <sup>2)</sup>	$V_{GS(th)}$	$I_D = 180\text{ mA}, V_{DS} = V_{GS}, T_{vj} = 25\text{ °C}$	1.8	2.4	3.6	V	
Gate charge <sup>2)</sup>	$Q_G$	$I_D = 800\text{ A}, V_{DS} = 400\text{ V}, V_{GE} = -4\text{ V} \dots +15\text{ V}$		2		$\mu\text{C}$	
Input capacitance <sup>2)</sup>	$C_{ISS}$	$V_{DS} = 750\text{ V}, V_{GS} = 0\text{ V}, T_{vj} = 25\text{ °C}, f = 100\text{ kHz}$		55.2		nF	
Internal gate resistance <sup>2)</sup>	$R_{Gint}$			0.32		$\Omega$	
Turn-on switching energy	$E_{on}$	$V_{DD} = 400\text{ V}, I_D = 700\text{ A}, R_G = 1.0\ \Omega, C_G = 94\text{ nF}, V_{GS} = -4 / +15\text{ V}, L_\sigma = 10\text{ nH}, \text{inductive load}$	$T_{vj} = 25\text{ °C}$		22.5		mJ
			$T_{vj} = 175\text{ °C}$		22.5		mJ
Turn-off switching energy	$E_{off}$	$V_{DD} = 400\text{ V}, I_D = 700\text{ A}, R_G = 1.0\ \Omega, C_G = 94\text{ nF}, V_{GS} = -4 / +15\text{ V}, L_\sigma = 10\text{ nH}, \text{inductive load}$	$T_{vj} = 25\text{ °C}$		15		mJ
			$T_{vj} = 175\text{ °C}$		15		mJ

<sup>2)</sup> Based on chip capability

<sup>3)</sup> Characteristic values according to IEC 60747 – 8

<sup>4)</sup>  $R_{DS(on)}$  is given at chip level

**Body diode characteristic values <sup>5)</sup>**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Diode forward voltage <sup>2) 6)</sup>	$V_{SD}$	$I_S = 320 \text{ A}$ , $V_{GS} = -4 \text{ V}$	$T_{vj} = 25 \text{ }^\circ\text{C}$	4.2		V
			$T_{vj} = 175 \text{ }^\circ\text{C}$		3.8	V
Reverse recovery current	$I_{rr}$		$T_{vj} = 25 \text{ }^\circ\text{C}$	169		A
			$T_{vj} = 175 \text{ }^\circ\text{C}$		275	A
Recovered charge	$Q_{rr}$	$V_R = 400 \text{ V}$ , $I_F = 700 \text{ A}$ , $V_{GS} = -4 / +15 \text{ V}$ , $R_G = 1 \text{ }^\Omega$ , $di/dt = 20 \text{ kA}/\mu\text{s}$ , $L_\sigma = 10 \text{ nH}$ inductive load	$T_{vj} = 25 \text{ }^\circ\text{C}$	16		$\mu\text{C}$
			$T_{vj} = 175 \text{ }^\circ\text{C}$		20	$\mu\text{C}$
Reverse recovery time	$t_{rr}$		$T_{vj} = 25 \text{ }^\circ\text{C}$	27		ns
			$T_{vj} = 175 \text{ }^\circ\text{C}$		40	ns
Reverse recovery energy	$E_{rec}$		$T_{vj} = 25 \text{ }^\circ\text{C}$	2.5		mJ
			$T_{vj} = 175 \text{ }^\circ\text{C}$		2.5	mJ

<sup>2)</sup> Based on chip capability

<sup>5)</sup> Characteristic values according to IEC 60747 – 2

<sup>6)</sup> Forward voltage is given at chip level

**Package properties <sup>7)</sup>**

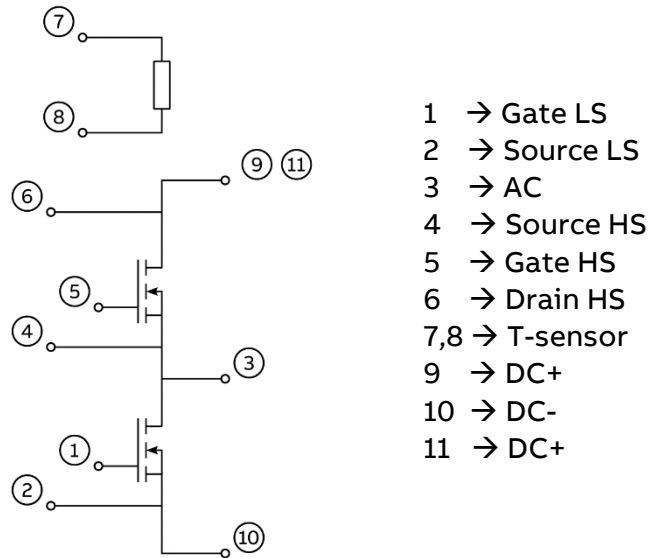
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
thermal resistance junction to fluid	$R_{th(j-f)}$	$T_{in} = 55^\circ\text{C}$ , Coolant: 50% glycol/ 50% water, per switch, 10 l/min, $dP < 120 \text{ mbar}$ water-glycol		79	83	K/kW
Comparative tracking index	CTI		400			V
Module stray inductance	$L_{\sigma DS}$			5		nH
Resistance, terminal-chip	$R_{DD+SS}$	$T_C = 25 \text{ }^\circ\text{C}$		0.117		m $\Omega$
		$T_C = 150 \text{ }^\circ\text{C}$		0.227		m $\Omega$

**Mechanical properties <sup>7)</sup>**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dimensions	L	AC terminal to DC terminal		110		mm
	W	Mold width		69		mm
	H	Baseplate cooler surface to middle of PCB/pressfit		17.35		mm
Clearance distance in air	$d_a$	According to IEC 60664-1	Term. to base:	6.9		mm
			Term. to term:	3.3		mm
Surface creepage distance	$d_s$	According to IEC 60664-1	Term. to base:	8.5		mm
			Term. to term:	8		mm
Mass	m			300		g

<sup>7)</sup> Package and mechanical properties according to IEC 60747 – 15

**Electrical configuration**



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