

Target specification 5SFG 0780B12000x

1200 V, 780 A*

RoadPak SiC phase-leg module



- $V_{DSS} = 1200\text{ V}$
- $I_D = 2 \times 780\text{ A}^*$
- 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 ¹⁾

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-source voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $T_{vj} \geq 25\text{ °C}$		1200	V
DC drain current	I_D	$T_{Cool} = 55\text{ °C}$, $T_{vj} = 175\text{ °C}$		780	A
Peak drain current	I_{DM}	$t_p = 1\text{ ms}$, duty cycle = 20%, $T_{Cool} = 55\text{ °C}$, $T_{vj} = 175\text{ °C}$		1560	A
Gate-source voltage	V_{GSS}		-4	15	V
Transient gate-source voltage ²⁾	$V_{GSS,max}$	Maximum values under transient events < 50 ns	-8	19	V
DC reverse drain current (body diode)	I_{DR}	$V_{GS} = -4\text{ V}$, $T_{Cool} = 55\text{ °C}$, $T_{vj} = 175\text{ °C}$		330	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}	$V_{GS} = 15\text{ V}$, $T_{Cool} = 55\text{ °C}$, $T_{vj} = 175\text{ °C}$		780	A
Surge source current (channel open)	I_{SSX}	$V_{GS} = 15\text{ V}$		tbd	A
Isolation voltage	V_{iscl}	1 min, $f = 50\text{ Hz}$		4000	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

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

²⁾ Based on chip capability

MOSFET characteristic values ³⁾

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$	$T_{vj} = 175\text{ °C}$	1200		V	
			$T_{vj} = 25\text{ °C}$	1200		V	
			$T_{vj} = -40\text{ °C}$	1200		V	
Static drain-source on-state resistance ⁴⁾	$R_{DS(on)}$	$I_D = 540\text{ A}, V_{GS} = 15\text{ V}$	$T_{vj} = 25\text{ °C}$		2.4	2.6	mΩ
			$T_{vj} = 175\text{ °C}$		4.2	4.8	mΩ
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	$T_{vj} = 25\text{ °C}$		2	10	μA
			$T_{vj} = 175\text{ °C}$		5	20	μA
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 ²⁾	$V_{GS(th)}$	$I_D = 180\text{ mA}, V_{DS} = V_{GS}, T_{vj} = 25\text{ °C}$	1.7	2.4	3.5	V	
Gate charge ²⁾	Q_G	$I_D = 800\text{ A}, V_{DS} = 800\text{ V}, V_{GE} = -4\text{ V} \dots +15\text{ V}$		1.47		μC	
Input capacitance ²⁾	C_{ISS}	$V_{DS} = 1000\text{ V}, V_{GS} = 0\text{ V}, T_{vj} = 25\text{ °C}, f = 100\text{ kHz}$		39		nF	
Internal gate resistance ²⁾	R_{Gint}			0.51		Ω	
Turn-on switching energy	E_{on}	$V_{DD} = 800\text{ V}, I_D = 540\text{ A}, R_G = 0.47\text{ Ω}, C_G = 94\text{ nF}, V_{GS} = -4 / +15\text{ V}, L_\sigma = 10\text{ nH}, \text{ inductive load}$	$T_{vj} = 25\text{ °C}$		15		mJ
			$T_{vj} = 175\text{ °C}$		24		mJ
Turn-off switching energy	E_{off}	$V_{DD} = 800\text{ V}, I_D = 540\text{ A}, R_G = 1.5\text{ Ω}, C_G = 94\text{ nF}, V_{GS} = -4 / +15\text{ V}, L_\sigma = 10\text{ nH}, \text{ inductive load}$	$T_{vj} = 25\text{ °C}$		13		mJ
			$T_{vj} = 175\text{ °C}$		14		mJ

²⁾ Based on chip capability

³⁾ Characteristic values according to IEC 60747 – 8

⁴⁾ $R_{DS(on)}$ is given at chip level

Body diode characteristic values ⁵⁾

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Diode forward voltage ^{2) 6)}	V _{SD}	I _S = 160 A, V _{GS} = -4 V	T _{vj} = 25 °C	4.6		V
			T _{vj} = 175 °C	4.2		V
Reverse recovery current	I _{rr}	V _R = 800 V, I _F = 540 A, V _{GS} = -4 / +15 V, R _G = 0.47 Ω, di/dt = 20 kA/μs L _σ = 10 nH inductive load	T _{vj} = 25 °C	130		A
			T _{vj} = 175 °C	250		A
Recovered charge	Q _{rr}	V _R = 800 V, I _F = 540 A, V _{GS} = -4 / +15 V, R _G = 0.47 Ω, di/dt = 20 kA/μs L _σ = 10 nH inductive load	T _{vj} = 25 °C	13		μC
			T _{vj} = 175 °C	18		μC
Reverse recovery time	t _{rr}	V _R = 800 V, I _F = 540 A, V _{GS} = -4 / +15 V, R _G = 0.47 Ω, di/dt = 20 kA/μs L _σ = 10 nH inductive load	T _{vj} = 25 °C	30		ns
			T _{vj} = 175 °C	50		ns
Reverse recovery energy	E _{rec}	V _R = 800 V, I _F = 540 A, V _{GS} = -4 / +15 V, R _G = 0.47 Ω, di/dt = 20 kA/μs L _σ = 10 nH inductive load	T _{vj} = 25 °C	2		mJ
			T _{vj} = 175 °C	4		mJ

²⁾ Based on chip capability

⁵⁾ Characteristic values according to IEC 60747 – 2

⁶⁾ Forward voltage is given at chip level

Package properties ⁷⁾

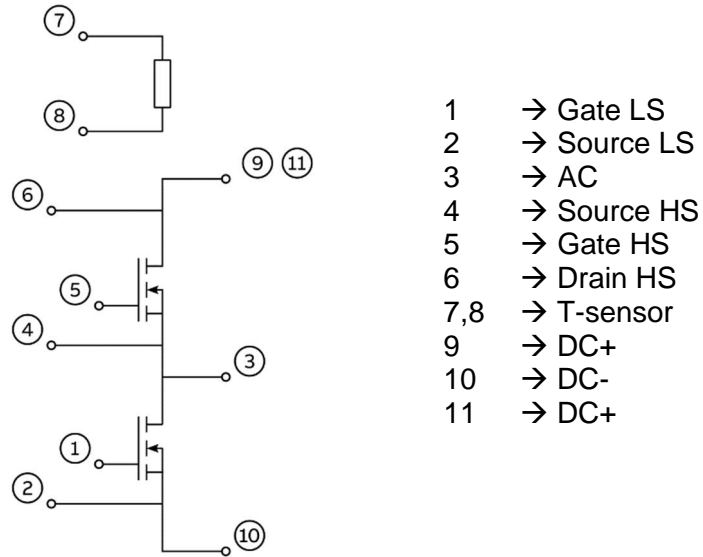
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
thermal resistance junction to fluid	R _{th(j-f)}	T _{in} = 55°C, Coolant: 50% glycol/ 50% water, per switch, 10 l/min, dP < 120 mbar water-glycol		99	104	K/kW
Comparative tracking index	CTI		400			V
Module stray inductance	L _{σ DS}			5		nH
Resistance, terminal-chip	R _{DD'+SS'}	T _C = 25 °C		0.117		mΩ
		T _C = 150 °C		0.227		mΩ

Mechanical properties ⁷⁾

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

⁷⁾ Package and mechanical properties according to IEC 60747 – 15

Electrical configuration



- 1 → Gate LS
- 2 → Source LS
- 3 → AC
- 4 → Source HS
- 5 → Gate HS
- 6 → Drain HS
- 7,8 → T-sensor
- 9 → DC+
- 10 → DC-
- 11 → DC+

