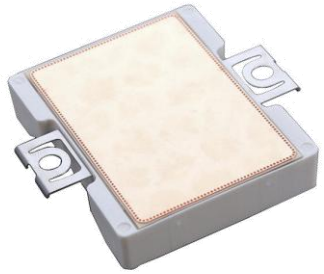
TARGET DATASHEET 初版规格书

SCSD0033ES120m23

ES-Type phase-leg 1.2kV SiC module



V_{DSS} = 1200 V
R_{DSon} = 3.3 mOhm

- *m23 generation SiC MOSFET chips; m23 SiC MOSFET 芯片*
- *Ultra-low R_{DSon}; 超低 R_{DSon}*
- *Low switching losses, Qg and Crss; 开关损耗低*
- *T_{vj_op} = 175°C*
- *Compact design; 设计紧凑*
- *Integrated NTC temperature sensor; 集成式 NTC 温度传感器*
- *RoHS compliant; 符合 RoHS 标准*

Maximum ratings 最大额定值[1]

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件	MIN 最小值	MAX 最大值	UNIT 单位
Drain – source voltage 漏极 – 源极电压	V_{DSS}	V_{GS} </= 0 V, T_{vj} = 25 °C		1200	V
Continuous drain and source current 漏极和源极连续电流	I_D, I_S	T_H = 100 °C, V_{GS} = 18 V, T_{vj} = 175 °C		250	A
Peak drain and source current 漏极和源极峰值电流	I_{DM}, I_{SM}	t_p = 1 ms, limited by T_{vjmax}		800	A
Gate-source voltage (DC) 栅源电压（直流）	V_{GSS}		-8	22	V
Gate-source surge voltage 栅源浪涌电压	$V_{GSS\ surge}$	t_{surge} < 300ns	-10	25	V
Recommended gate voltage 建议栅极电压	V_{GS}		-5	18	V
Surge current 浪涌电流				TBD	A
MOSFET SCSOA	t_{psc}	V_{DS} = 800 V, V_{GSon} = 18 V, T_{vj} < 175 °C		1.5	µs
Isolation voltage绝缘电压	V_{isol}	RMS, 1 s, f = 50 Hz		3000	V
Junction operating temperature 运行结温	$T_{vj(op)}$		-40	175	°C
Storage temperature 存储温度	T_{stg}		-40	125	°C
Mounting force	M		40	80	N

[1] Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747; 根据标准IEC 60747要求，最大额定值表示超过该限值可能会对器件造成损坏

MOSFET[2]

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件		MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
Drain-source breakdown voltage 漏极-源极击穿电压	$V_{(BR)DSS}$	V_{GS} </= 0 V, I_D= 1.5 mA, T_{vj} = -40 .. 25°C		1200			V
Static drain-source on-state resistance[3] 静态漏极-源极导通电阻	$R_{DS(on)}$	I_D = 400 A, V_{GS} = 18 V	T_{vj} = 25 °C		3.3	4.3	mΩ
			T_{vj} = 175 °C		6		mΩ
Zero gate voltage drain current 零栅极电压漏极电流	I_{DSS}	V_{DS} = 1200 V, V_{GS} = 0 V	T_{vj} = 25 °C		4	60	µA
			T_{vj} = 175 °C		40		µA
Gate leakage current 栅极漏电流	I_{GSS}	V_{GS} = +22 / -10 V		-300		300	nA
Gate-emitter threshold voltage 栅极-发射极阈值电压	$V_{GS(th)}$	V_{GS} = V_{DS}, I_D = 20 mA	T_{vj} = 25°C	2.25	2.75	3.5	V
			T_{vj} = 175°C		2		V
Gate charge 栅极电荷	Q_G	I_D = 400 A, V_{DS} = 800 V, V_{GS} = -5 V ... 18 V			0.82		µC
Input capacitance 输入电容	C_{iss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, T_{vj} = 25 °C			20		nF
Output capacitance 输出电容	C_{oss}				1.6		nF
Reverse tansfer capacitance 反向传输电容	C_{rss}				0.11		nF
Internal gate resistor 栅极内阻	R_{Gint}	Per switch			0.62		Ω
Turn-on delay time 开通延迟	$t_{d(on)}$	V_{CC} = 600 V, I_D = 200 A, R_G = 1.25 Ω, V_{GS} = -5 / +18 V, L_s =10 nH, inductive load	T_{vj} = 25 °C		28		ns
			T_{vj} = 125 °C				ns
			T_{vj} = 175 °C		24		ns
Rise time 上升时间	t_r		T_{vj} = 25 °C		52		ns
			T_{vj} = 125 °C				ns
			T_{vj} = 175 °C		68		ns
Turn-off delay time 关断延迟	$t_{d(off)}$	V_{CC} = 600 V, I_D = 200 A, R_G = 1.25 Ω, V_{GS} = -5 / +18 V, L_s =10 nH, inductive load	T_{vj} = 25 °C		76		ns
			T_{vj} = 125 °C				ns
			T_{vj} = 175 °C		94		ns
Fall time 下降时间	t_f		T_{vj} = 25 °C		28		ns
			T_{vj} = 125 °C				ns
			T_{vj} = 175 °C		30		ns
Turn-on switching energy 开通损耗	E_{on}	V_{CC} = 600 V, I_D = 200 A, R_G = 1.25 Ω, V_{GS} = -5 / +18 V, L_s = 10 nH, inductive load t_{dead} = 100 ns	T_{vj} = 25 °C		3.1		mJ
			T_{vj} = 125 °C				mJ
			T_{vj} = 175 °C		3.5		mJ
Turn-off switching energy 关断损耗	E_{off}	V_{CC} = 600 V, I_D = 200 A, R_G = 1.5 Ω, V_{GS} = -5 / +18 V, L_s = 10 nH, inductive load	T_{vj} = 25 °C		1.67		mJ
			T_{vj} = 125 °C				mJ
			T_{vj} = 175 °C		2.45		mJ
Short circuit current 短路电流	I_{SC}	t_{pcs} ≤ 1.5 µs, V_{GE} = 18 V, T_{vj} = 175 °C, V_{CC} = 800 V, $V_{DSM\ Chip}$ ≤ 1200 V			4400		A

[2] Characteristic values according to IEC 60747-9
[3] Given at chip level

Body Diode (MOSFET)[4]

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件		MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
Drain-source reverse voltage[5] 漏源反向电压	V_{SD}	I_D = -200 A, V_{GS} = 18 V	T_{vj} = 25 °C		4.5		V
			T_{vj} = 175 °C		4.1		V
MOSFET peak forward recovery current 峰值正向恢复电流	I_{frm}	V_R = 600 V, I_{SD} = 200 A, dI/dt = 14 kA/µs, R_G = 1.5 Ω, V_{GS} = -5 / +18 V, L_s =30 nH, inductive load t_{dead} = 100 ns	T_{vj} = 25 °C		110		A
			T_{vj} = 125 °C				A
			T_{vj} = 175 °C		90		A
MOSFET forward recovery charge 远期恢复费用	Q_f		T_{vj} = 25 °C		1.6		µC
			T_{vj} = 125 °C				µC
			T_{vj} = 175 °C		7.6		µC
MOSFET forward recovery time 正向恢复时间	t_{fr}		T_{vj} = 25 °C		48		ns
			T_{vj} = 125 °C				ns
			T_{vj} = 175 °C		74		ns
MOSFET forward recovery energy 正向恢复能量	E_{fr}		T_{vj} = 25 °C		0.65		mJ
			T_{vj} = 125 °C				mJ
			T_{vj} = 175 °C		0.98		mJ

Package properties 封装特性[6]

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件		MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
Thermal resistance junction to heatsink 热阻 结点至流体	$R_{th(j-f)}$	Per switch,			0.200		K/W
Comparative tracking index 相对漏电起痕指数	CTI			200			
Module stray inductance 模块自身杂散电感	$L_{s\,CE}$	Per switch			6		nH
Resistance, terminal chip 端子到芯片之间的阻抗	$R_{CC'+EE'}$	Per switch	T_{vj} = 25 °C		1.4		mΩ
			T_{vj} = 125 °C				mΩ
			T_{vj} = 175 °C				mΩ
Internal isolation 内部绝缘		Al_2O_3 Basic insulation (class 1, IEC 61140)					

[4] Characteristic values according to IEC 60747-8
[5] Given at chip level
[6] Package and mechanical properties according to IEC 60747-15

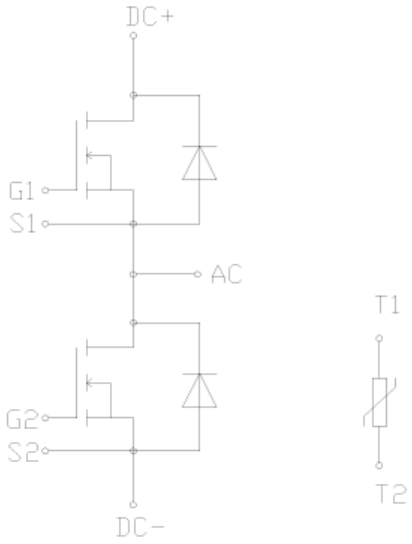
Mechanical properties 机械特性

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件		MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
Dimensions	L x W x H	Typical		56.7 x 48 x 12			mm^3
Clearance distance in air 电气间隙	da	According to IEC 60664-1 and EN 50124-1	Terminal to base:	10			mm
			Terminal to terminal:	5			mm
Surface creepage distance 爬电距离	ds	According to IEC 60664-1 and EN 50124-1	Terminal to base:	6.3			mm
			Terminal to terminal:	11.5			mm
Mass重量	m				40		g

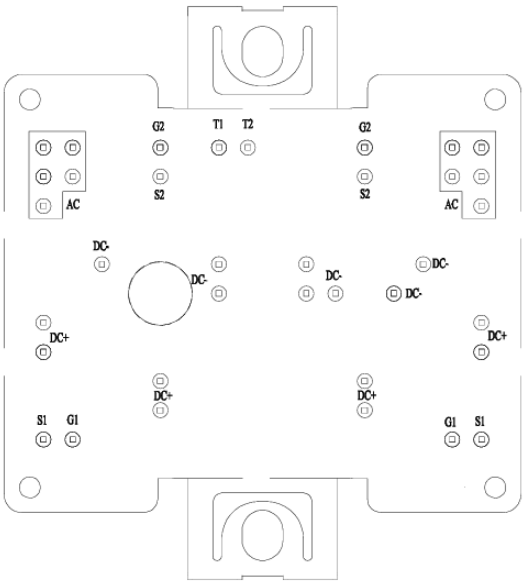
NTC Thermistor

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件	MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
Rated resistance 额定电阻	R_{25}	T_C = 25 °C		5		kΩ
R100	R_{100}	T_C = 100 °C	468		518	Ω
B-value B值	$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15K))]$		3375		K
B-value B值	$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298.15K))]$		3411		K
Rated resistance 额定电阻	$B_{25/100}$	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298.15K))]$		3433		K

Electrical configuration 电气图



Outline drawing 外形图



This is an electrostatic sensitive device. 本产品对静电特别敏感
This product has been designed and qualified for industrial level.