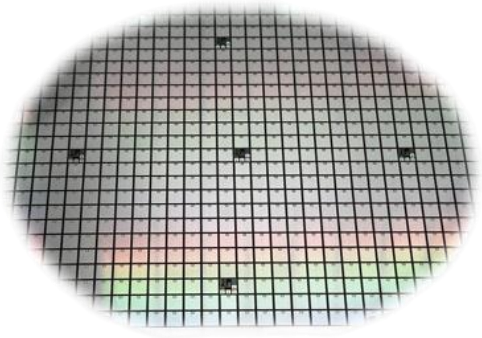
PRELIMINARY DATASHEET

SCS0013C120m23

M23 SiC power MOSFET, 5.75 mm x 5.05 mm



V_{DSS} = 1200 V
$R_{DS(on)}$ = 13 mΩ

- positive temperature coefficient
- easy paralleling

Maximum ratings[1]

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
Drain-source voltage	V_{DSmax}	V_{GS} = 0 V, T_{vj} ≥ 25°C		1200	V
Continuos DC drain current	I_D	V_{GS} = 18V, T_{vj} = 25°C		100	A
Peak drain current	I_{DM}	Pulse width t_p limited by T_{jmax}		200	A
Gate-source voltage (DC)	V_{GSS}		-8	22	V
Gate-source surge voltage	$V_{GS\ surge}$	t_p ≤ 300ns, D < 1%	-10	25	V
DC reverse drain current	I_S	V_{GS} = -5V, T_c = 25°C,			A
Peak reverse drain current	I_{SM}	V_{GS} = 0V, limited by T_{jmax}		200	A
Junction operating temperature	$T_{vj(op)}$		-55	175	°C

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[1] Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747-8

MOSFET[2]

Recommended values

PARAMETER	SYMBOL	CONDITIONS	VALUE	UNIT
Gate-source turn-on voltage	$V_{GS(on)}$		18	V
Gate-source turn-off voltage	$V_{GS(off)}$		-5	V

Characteristic values

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} <= 0 V, I_D= 250 µA, T_{vj} = 25°C		1200			V
Drain-source on-state resistance[3]	$R_{DS(on)}$	I_D = 100 A, V_{GS} = 18 V	T_{vj} = 25 °C		13		mΩ
			T_{vj} = 175 °C		24		mΩ
Drain leakage current	I_{DSS}	V_{DS} = 1200 V, V_{GS} = 0 V	T_{vj} = 25 °C		1	50	µA
			T_{vj} = 175 °C		10		µA
Gate leakage current	I_{GSS}	V_{GS} = +22 / -10V, V_{DS} = 0 V, T_{vj} = 25°C		-50		50	nA
Gate-source threshold voltage	$V_{GS(th)}$	I_D = 5 mA, V_{DS} = V_{GS}	T_{vj} = 25°C	2.25	2.75	3.5	V
			T_{vj} = 175°C		2		V
Transconductance	g_{fs}	V_{DS}=20V, I_D=100A			70		S
		V_{DS}=20V, I_D=100A, T_j=175°C			58		S
Input capacitance	C_{iss}	V_{DS} = 800 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV T_{vj} = 25 °C			5.1		nF
Output capacitance	C_{oss}				410		pF
Reverse tansfer capacitance	C_{rss}				28		pF
Internal gate resistor	R_{Gint}				2.5		Ω
Total gate charge	Q_G	I_D = 100 A, V_{DS} = 800 V, V_{GS} = -5 V ... 18 V			204		nC
Gate to source charge	Q_{GS}	I_D = 100 A, V_{DS} = 800 V, V_{GS} = -5 V ... 18 V			57		nC
Gate to drain charge	Q_{GD}	I_D = 100 A, V_{DS} = 800 V, V_{GS} = -5 V ... 18 V			147		nC

[2] Characteristic values according to IEC 60747-8
[3] Given at chip level

Characteristic values (continued)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Turn-on delay time	$t_{d(on)}$	V_{CC} = 800 V, I_D = 100 A, R_G = 5 Ω, V_{GS} = -5 / +18 V, Ls = 35nH	T_{vj} = 25 °C		24		ns
			T_{vj} = 175 °C		18		ns
Rise time	t_r		T_{vj} = 25 °C		26		ns
			T_{vj} = 175 °C		25		ns
Turn-off delay time	$t_{d(off)}$	V_{CC} = 800 V, I_D = 100 A, R_G = 5 Ω, V_{GS} = -5 / +18 V, Ls = 35nH	T_{vj} = 25 °C		76		ns
			T_{vj} = 175 °C		94		ns
Fall time	t_f		T_{vj} = 25 °C		52		ns
			T_{vj} = 175 °C		68		ns
Turn-on switching energy	E_{on}	V_{CC} = 800 V, I_D = 100 A, R_G = 5 Ω, V_{GS} = -5 / +18 V, dI/dt = 3200 A/ µs (175°C), Ls = 35nH	T_{vj} = 25 °C		4080		µJ
			T_{vj} = 175 °C		4700		µJ
Turn-off switching energy	E_{off}	V_{CC} = 800 V, I_D = 100 A, R_G = 5 Ω, V_{GS} = -5 / +18 V, dV/dt = 20700 V/ µs (175°C), Ls = 35nH	T_{vj} = 25 °C		1130		µJ
			T_{vj} = 175 °C		1620		µJ
Short circuit current	I_{SC}	t_{pcs} ≤ 1.5 µs, V_{GS} = 18 V, T_{vj} = 150 °C, V_{CC} = 800 V, $V_{DSS\ Chip}$ ≤ 1200 V			1100		A

Body Diode (MOSFET)[4]

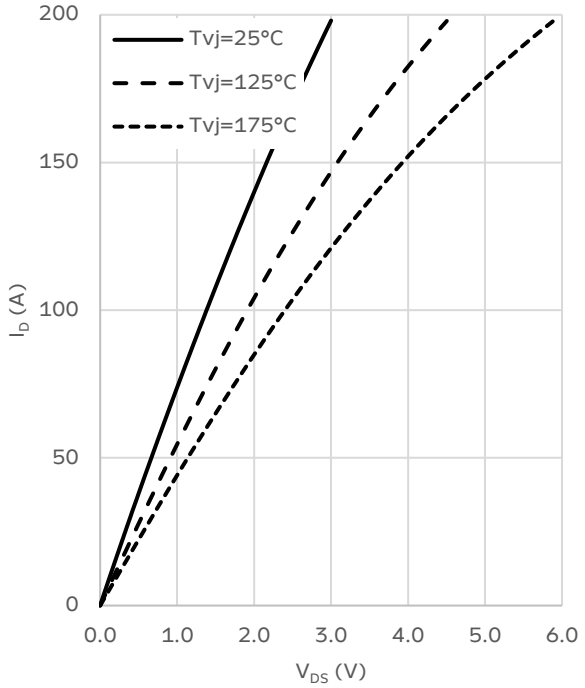
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Drain-source reverse voltage[5]	V_{SD}	V_{GS}=-5 V, I_S = 100 A	T_{vj} = 25 °C		5.4		V
			T_{vj} = 175 °C		4.8		V
MOSFET peak forward recovery current	I_{frm}	V_{DS} = 800 V, I_S = 100 A, dI/dt = 3200 A/ µs (175°C), R_G = 5 Ω, V_{GS} = -5 / +18 V	T_{vj} = 25 °C		55		A
			T_{vj} = 175 °C		44		A
MOSFET forward recovery charge	Q_f		T_{vj} = 25 °C		0.4		µC
			T_{vj} = 175 °C		1.9		µC
MOSFET forward recovery time	t_{fr}		T_{vj} = 25 °C		48		ns
			T_{vj} = 175 °C		74		ns
MOSFET forward recovery energy	E_{fr}		T_{vj} = 25 °C		430		µJ
			T_{vj} = 175 °C		650		µJ

[4] Characteristic values according to IEC 60747-8
[5] Given at chip level

Characteristics

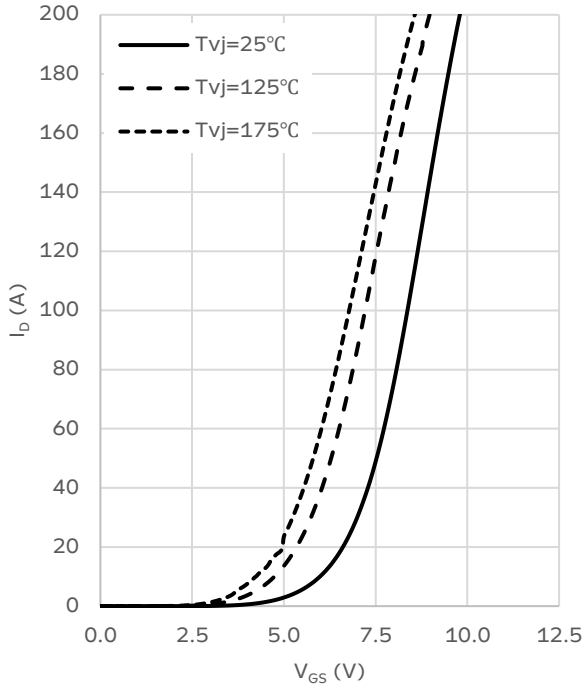
MOSFET on-state characteristics (typical)

$I_D = f(V_{DS})$
$V_{GS} = 18$ V



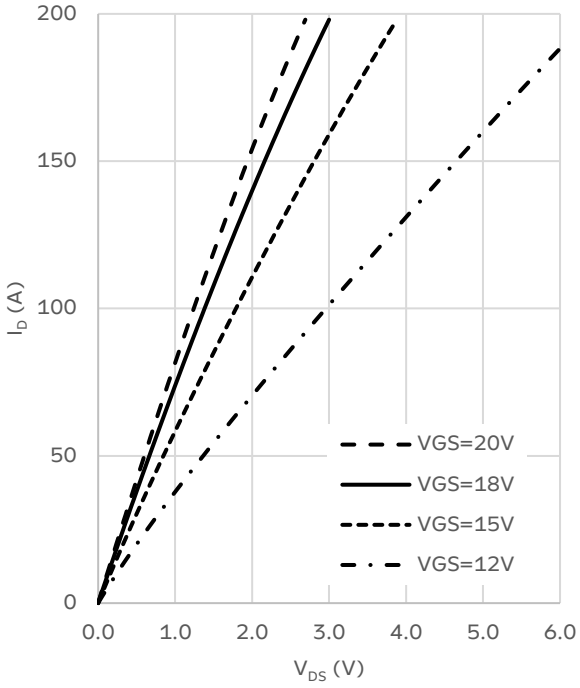
MOSFET transfer characteristics (typical)

$I_D = f(V_{GS})$
$V_{DS} = 20$V



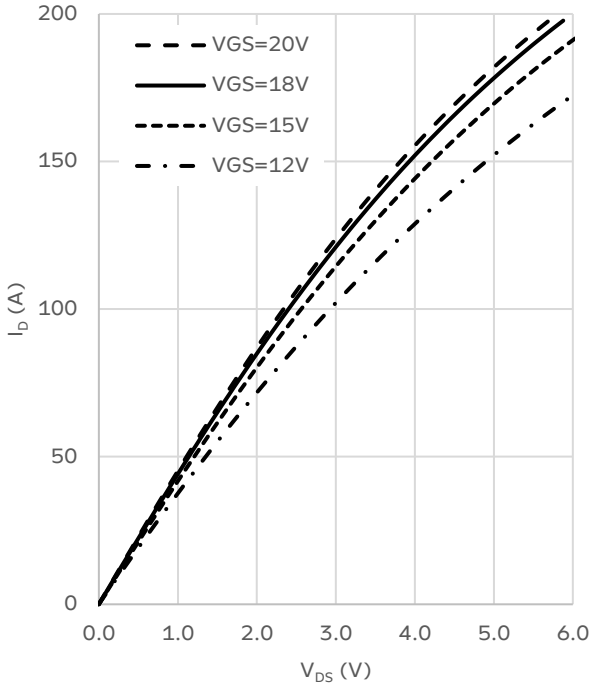
MOSFET output characteristics (typical)

$I_D = f(V_{DS})$
$T_{vj} = 25$ °C



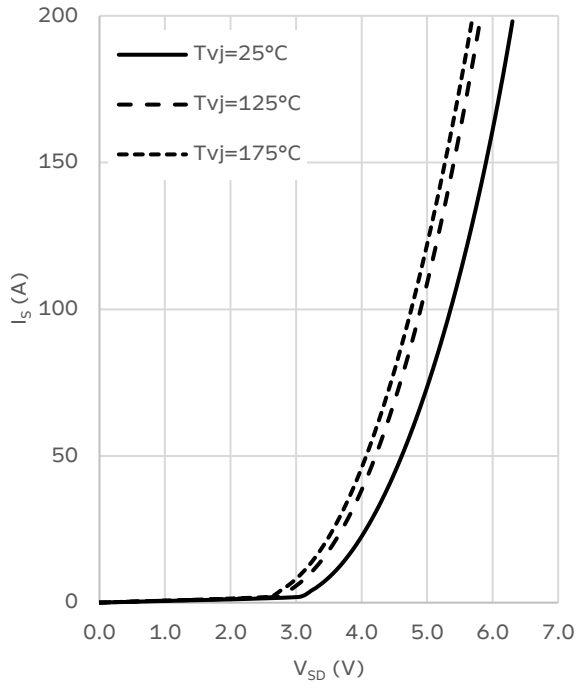
MOSFET output characteristics (typical)

$I_D = f(V_{DS})$
$T_{vj} = 175$ °C



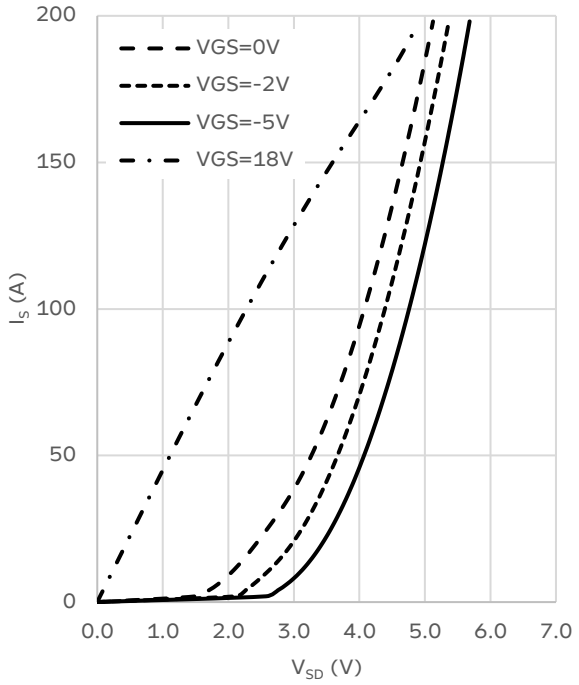
Body diode characteristic (typical)

$I_S = f(V_{SD})$
$V_{GS} = -5$ V



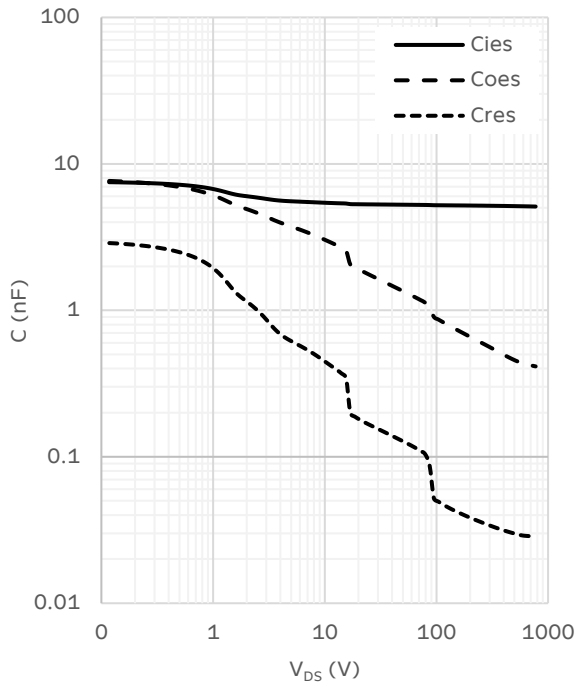
Body diode characteristic (typical)

$I_S = f(V_{SD})$
$T_{vj} = 175$ °C



Capacitance characteristics (typical)

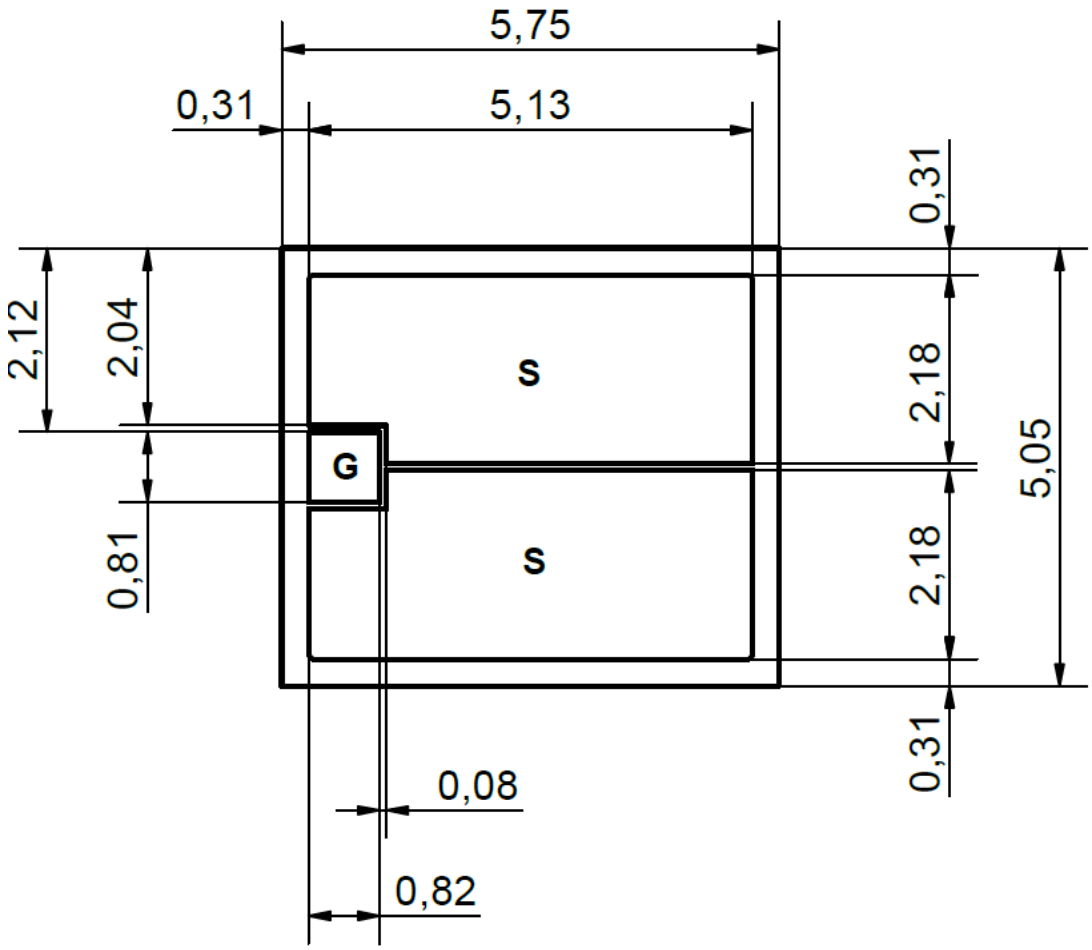
$C = f(V_{DS})$, $T_{vj} = 25$ °C
$f = 100$ kHz, $V_{GS} = 0$ V



Mechanical properties[6]

PARAMETER		UNIT
Die size	(5.75 ± 0.01) x (5.05 ± 0.01)	mm^2
Gate pad size	0.81 x 0.82	mm^2
Thickness	180 ± 5	µm
Wafer diameter	150	mm
Maximum chips per wafer	470	pcs
Frontside passivation	Polyimide	
Frontside metal (pads)	AlCu, 4000	nm
Backside metal	Ti:Ni:Ag, 100:400:1000	nm

Chip drawing



This is an electrostatic sensitive device.

Ordering Information

OPTION		ARTICLE NUMBER
Frontside metal (gate and source pads)	AlCu (_F00)	SCS0013C120m23**_F00**
	Cu (_F04)	SCS0013C120m23**_F04**
Packaging Method	Sawn on tape (_O10)	SCS0013C120m23_XXX**_O10**
	Wafer unsawn (_O20)	SCS0013C120m23_XXX **_O20**
	Waffle pack (_O30)	SCS0013C120m23_XX**_O30**