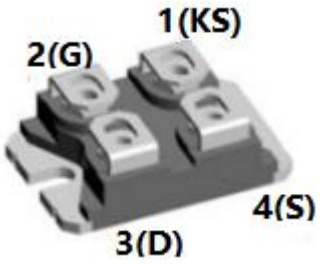
Technical Data
Data Sheet N2652, REV.-

RoHS

S2M0040120N2
1200V SIC POWER MOSFET+20A SiC SBD

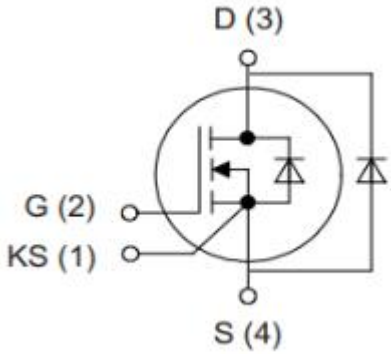


V_{DS} = 1200 V
I_{DS} = 57 A
R_{DS}(on) = 40 mΩ

Description

S2M0040120N2 is SiC Power MOSFET Module packaged in SOT-227 case. The device is a high voltage n-channel enhancement mode MOSFET that has very low total conduction losses and very stable switching characteristics over temperature extremes. The S2M0040120N2 is ideal for energy sensitive, high frequency applications in challenging environments.

Circuit Diagram



Features

- Positive temperature characteristics, easy to parallel.
- Low on-resistance Typ. RDS(on) = 40mΩ .
- Fast switching speed and low switching losses.
- Very fast and robust intrinsic body diode.
- Process of non-bright Tin electroplatin

Applications

- EV Fast Charging Modules
- EV On Board Chargers
- Solar Inverters
- Online UPS/Industrial UPS
- SMPS (Switch Mode Power Supplies)
- DC-DC Converters
- ESS (Energy Storage Systems)

Technical Data
Data Sheet N2652, REV.-

RoHS

Maximum Ratings(T=25℃ unless otherwise specified)

Characteristics	Symbol	Condition	Max.	Units
SiC MOSFET				
Drain Source Voltage	V_{DSS}	V_{GS} = 0V, I_{DS} = 100uA, T_C = 25°C	1200	V
Gate Source Voltage	V_{GSS}	T_C = 25 ° C, Absolute maximum values, AC (f>1Hz)	-10 to 25	V
Gate Source Voltage	V_{GSOP}	T_C = 25°C Recommended Operational Values	-5 to 20	V
Continuous Drain Current	I_D	V_{GS} = 20V, T_C = 25°C	57	A
	I_D	V_{GS} = 20V, T_C = 100°C	40	A
Pulsed Drain Current	$I_{D,pulse}$	Pulse width tP limited by T_J max	160	A
Power Dissipation	PD	T_C=25˚C, T_J = 175 ˚C	312.5	W
SiC SBD				
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	-	1200	V
Average Rectified Forward Current	$I_{F\ (AV)1}$	T_C =25°C	57	A
	$I_{F\ (AV)2}$	T_C =150°C	20	A
Peak One Cycle Non-Repetitive Surge Current	I_{FSM1}	10ms, Half Sine pulse, T_C =25°C	248	A
	I_{FSM2}	10ms, Half Sine pulse, T_C =110°C	205	A
Repetitive Peak Forward Surge Current	I_{FRM1}	10ms, Half Sine pulse , T_C =25°C	86	A
	I_{FRM2}	10ms, Half Sine pulse , T_C =110°C	56	A
Power Dissipation	P_{tot1}	T_C =25℃	245.9	W
	P_{tot2}	T_C =110℃	106.6	W

Technical Data
Data Sheet N2652, REV.-

RoHS

Electrical Characteristics(T=25℃ unless otherwise specified)

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Units
Drain Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 100uA	1200			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 10mA	1.8	2.0	4	V
		V_{DS} = V_{GS}, I_D = 10mA, T_J = 175 °C		1.4		V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 1200V, V_{GS} = 0V		1	100	uA
Gate Source Leakage Current	I_{GSS}	V_{GS} = 20V, V_{DS} = 0V			250	nA
Drain Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 20V, I_D = 40A		44	52	mΩ
		V_{GS} = 20V, I_D = 40A, T_J = 175 °C		82		mΩ
Transconductance	gfs	V_{DS} = 20 V, I_{DS} = 40 A		14		S
		V_{DS} = 20 V, I_{DS} = 40 A, T_J = 175 °C		11		S
Input Capacitance	C_{ISS}	V_{GS} = 0V, V_{DS} = 1000V V_{AC} = 25mV f = 1MHz		2748		pF
Output Capacitance	C_{OSS}			169		
Reverse Transfer Capacitance	C_{RSS}			5		
C_{OSS} Stored Energy	E_{OSS}			84		uJ
Turn-On Switching Energy	E_{ON}	V_{DS} = 800V, V_{GS} = -5/20V I_D = 40A, $R_{G(ext)}$ = 2.5Ω, L= 99uH		1.2		mJ
Turn-Off Switching Energy	E_{OFF}			0.4		
Turn-On Delay Time	$t_{d(on)}$	V_{DS} = 800V, V_{GS} = -5/20V I_D = 40A, $R_{G(ext)}$ = 2.5Ω Inductive Load Timing relative to VDS Per IEC60747-8-4 pg 83		43		ns
Rise Time	t_r			14		
Turn-Off Delay Time	$t_{d(off)}$			30		
Fall Time	t_f			18		
Internal Gate Resistance	$R_{G(int)}$	f = 1MHz, VAC = 25 mV		4.5		Ω
Gate to Source Charge	Q_{gs}	V_{DS} = 800V, V_{GS} = -5/20V I_D = 40A Per IEC60747-8-4 pg 21		4.5		nC
Gate to Drain Charge	Q_{gd}			34		
Total Gate Charge	Q_g			42		

Reverse Diode Characteristics:

Characteristics	Symbol	Condition	Typ.	Max.	Units
Diode Forward Voltage	V_{SD}	V_{GS} = -5V, I_{SD} = 20A	4.1		V
		V_{GS} = -5V, I_{SD} = 20A, T_J =175℃	3.6		V
Continuous Diode Forward Current	Is	T_C = 25℃		63	A
Reverse Recovery Time	t_{rr}	V_{GS} = -5V, I_{SD} = 40A, T_J = 25°C V_R = 800V dif/dt = 1047A/μs	63		ns
Reverse Recovery Charge	Q_{rr}		301		nC
Peak Reverse Recovery Current	I_{mm}		9.3		A

SiC SBD:

Characteristics	Symbol	Condition	Typ.	Max.	Units
Forward Voltage Drop*	V_{F1}	@ 20A, Pulse, T_J = 25 °C	1.5	1.8	V
	V_{F2}	@ 20A, Pulse, T_J = 175 °C	2.2	3.0	V
Reverse Current*	I_{R1}	@V_R = rated V_R T_J = 25 °C	1	25	uA
	I_{R2}	@V_R = rated V_R T_J = 175 °C	10	150	uA
Junction Capacitance	C_T	VR=0V, Tj=25℃,f=1MHz	1620	-	pF
Reverse Recovery Charge	Q_c	I_F = 20A, di/dt = 200A/μs VR = 800 V, T_J =25°C	124.89	-	nC
Capacitance Stored Energy	EC	VR = 800 V	64.20	-	μJ

* Pulse width < 300 μs, duty cycle < 2%

Technical Data
Data Sheet N2652, REV.-

RoHS

Module Characteristics:

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Units
Isolation test voltage	VISOL	RMS, f=50Hz, t=1min			2.5	kV
Terminal connection torque	M	Screw M4	1.1		1.5	N • m
Mounting torque		Screw M4	1.1		1.5	N • m
Weight of module	G			27		g
Creepage distance		Terminal to heatsink		10.61		mm
		Terminal to terminal		10.37		mm
Clearance		Terminal to heatsink		6.7		mm
		Terminal to terminal		4.05		mm

Thermal-Mechanical Specifications:

Characteristics	Symbol	Condition	Specification	Units
Junction Temperature	T_J	-	-55 to +175	°C
Storage Temperature	T_{stg}	-	-55 to +175	°C
Typical Thermal Resistance Junction to Case	$R_{\theta JC}$	per MOS*	0.363	°C/W
Typical Thermal Resistance Junction to Case	$R_{\theta JC}$	per SBD*	0.700	°C/W

* By simulation

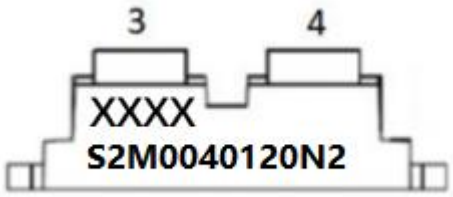
Ordering Information:

Device	Package	Shipping
S2M0040120N2	SOT-227	36pcs /BULK

Technical Data
Data Sheet N2652, REV.-

RoHS

Marking Diagram

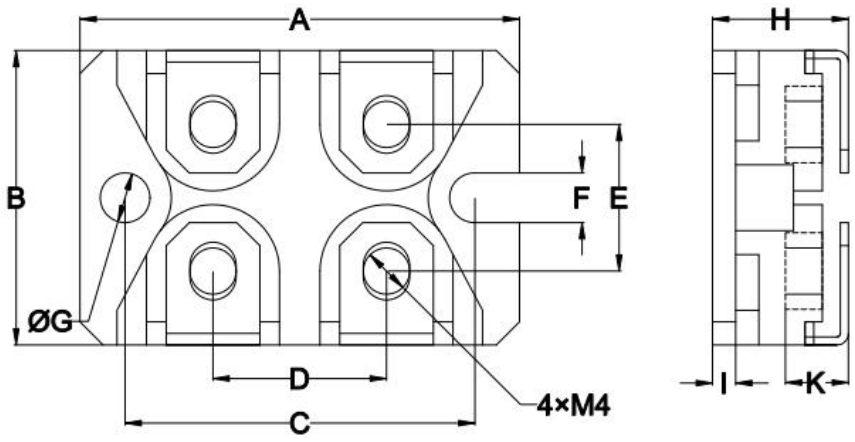


Where XXXXX is YYWWL

S2M = Device Type
0040 = R_{DS}(on)
120 = Reverse Voltage (1200V)
N = Package
SSG = SSG
YY = Year
WW = Week
L = Lot Number

Cautions: Molding resin
Epoxy resin UL:94V-0

Mechanical Dimensions SOT-227



SYMBOL	Dimensions in millimeters	
	Min.	Max.
A	37.8	38.2
B	24.8	25.2
D	14.5	15.5
E	12.2	13.2
F	4.1	4.31
G	φ4.1	φ4.31
H	11	12.5
I	1.9	2.1
K	4.3	6.5

Technical Data
Data Sheet N2652, REV.-

RoHS

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