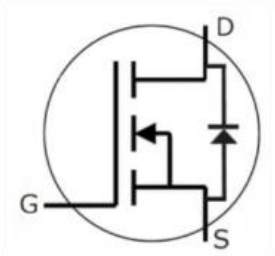
S2M12K180BJ

TriQSiC™ 1800V Silicon Carbide Power MOSFET G2（ N Channel Enhancement ）

Features

- High speed switching
- Very low switching losses
- High blocking voltage with low on-resistance
- Temperature independent turn-off switching losses
- Halogen free, RoHS compliant



Benefits

- Cooling effort reduction
- Efficiency improvement
- Reduced cooling requirements
- Increased power density
- Increased system switching frequency

Part number	Die size（W x L）mm
S2M12K180BJ	0.670*0.730

Applications

- Photovoltaic
- Auxiliary power supply
- Smart meter

Table 1 Key performance and package parameters

Type	V_{DS}	I_{DS} (T_C=25°C, $R_{th\ (j\text{-}c),max)}$≤25°C/W)	$R_{DS(on),\ typ}$ (V_{GS} = 18V, I_D = 100mA, T_J = 25°C)	$T_{J,max}$
S2M12K180BJ	1800V	0.5A	12Ω	175℃

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1、Maximum ratings

Table 2 Maximum rating (Tc = 25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{DS,max}$	Drain source voltage	1800	V	V_{GS} = 0V, I_D = 100μA	
$V_{GS,max}$	Gate source voltage	-8 /+22	V	Absolute maximum values	Note1
V_{GSop}	Gate source voltage	-4 /+18	V	Recommended operational values	
I_D	Continuous drain current	0.5	A	V_{GS} = 18V, T_C = 25˚C	
		0.37		V_{GS} = 18V, T_C = 100˚C	
$I_{D(pulse)}$	Pulsed drain current	1	A	Pulse width t_P limited by $T_{J,max}$	
T_J ,T_{stg}	Operating Junction and storage temperature	-55 to +175	˚C		

Note 1：when using MOSFET Body Diode $V_{GS,max}$ = -4 / +22V

2、Electrical characteristics

2.1 Static characteristics

Table 3 Static characteristics (Tc = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-source breakdown voltage	1800	-	-	V	V_{GS} = 0V, I_D = 100μA	
$V_{GS(th)}$	Gate threshold voltage	2.5	3.3	4	V	V_{DS} = V_{GS}, I_D = 30μA	
		-	2.5	-	V	V_{DS} = V_{GS}, I_D = 30μA T_J = 175°C	
I_{DSS}	Zero gate voltage drain current	-	100	1000	nA	V_{DS} = 1800V, V_{GS} = 0V	
I_{GSS}	Gate source leakage current	-	-	100	nA	V_{GS} = 18V, V_{DS} = 0V	
$R_{DS(on)}$	Current drain-source on-state resistance	-	12	16	Ω	V_{GS} = 18V, I_D = 100mA	
		-	22	-		V_{GS} = 18V, I_D = 100mA, T_J = 175°C	
gfs	Transconductance	-	TBD	-	S	V_{DS} = 20V, I_D = 100mA	
		-	TBD	-		V_{DS} = 20V, I_D = 100mA, T_J = 175°C	
$R_{g,int}$	Internal gate resistance	-	445	-	Ω	V_{AC} = 25mV, f = 1MHz, open drain	

2.2 Dynamic characteristics

Table 4 Dynamic characteristics (Tc = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
C_{iss}	Input capacitance	-	8.6	-	pF	V_{DS} = 1400V, V_{GS} = 0V T_J = 25°C, V_{AC} = 25mV f = 100kHz	
C_{oss}	Output capacitance	-	2.9	-			
C_{rss}	Reverse capacitance	-	2.2	-			
E_{oss}	Coss stored energy	-	1.9	-	μJ		

Q_{gs}	Gate source charge	-	TBD	-	nC	V_{DS} = 1200V, V_{GS} = -4/+18V I_D = 300mA	
Q_{gd}	Gate drain charge	-	TBD	-			
Q_g	Gate charge	-	TBD	-			

2.3 Switching characteristics

Table 5 Dynamic characteristics(Tc = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
E_{on}	Turn on switching energy	-	TBD	-	μJ	V_{DS} = 1200V, V_{GS} = -4/+18V I_D = 300mA, Rg = 2.5Ω L = 120μH	
E_{off}	Turn off switching energy	-	TBD	-			
$t_{d(on)}$	Turn on delay time	-	TBD	-	ns		
t_r	Rise time	-	TBD	-			
$t_{d(off)}$	Turn off delay time	-	TBD	-			
t_f	Fall time	-	TBD	-			

Table 6 Body diode characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode forward voltage	-	3.8	-	V	V_{GS} = -4V, I_{SD} = 50mA	
		-	3.4	-	V	V_{GS} = -4V, I_{SD} = 50mA T_J = 175°C	
I_S	Continuous diode forward current	-	TBD	-	A	V_{GS} = -4V, Tc = 25°C	Note2
t_{rr}	Reverse recovery time	-	TBD	-	ns	V_R = 1200V, V_{GS} = -4V I_{SD} = 300mA T_J = 175°C	
Q_{rr}	Reverse recovery charge	-	TBD	-	nC		
I_{rrm}	Peak reverse recovery current	-	TBD	-	A		

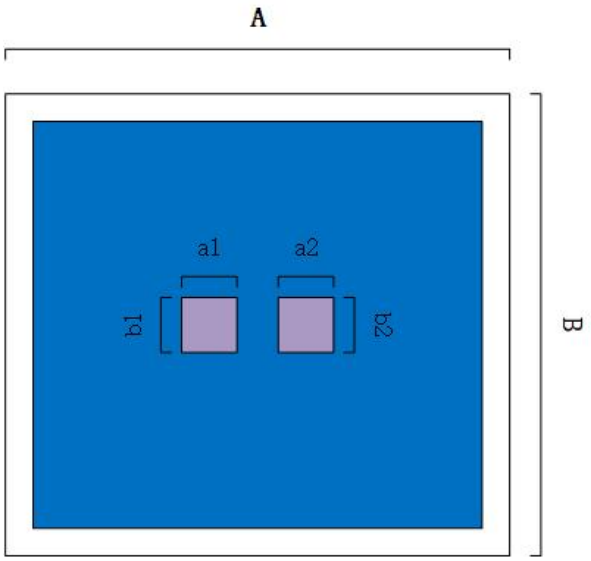
Note2 : When using SiC Body Diode the maximum recommended V_{GS} = -4 V

3、Mechanical parameters

3.1 Dimensions and metallization

Parameter	Typical value	Unit	Metallization
Die size（W x L）	0.670*0.730	mm	
Gate pad size（W x L）	0.080*0.080	mm	
Source pad size（W x L）	0.080*0.080	mm	
Die thickness	180	μm	
Top side（source gate）metallization	4.3	μm	Al
Back side （drain）metallization	1	μm	Ag

3.2 Layout



Symbol	Dimension / mm
A	0.730
a1	0.105
a2	0.105
B	0.670
b1	0.105
b2	0.105

4、Test conditions

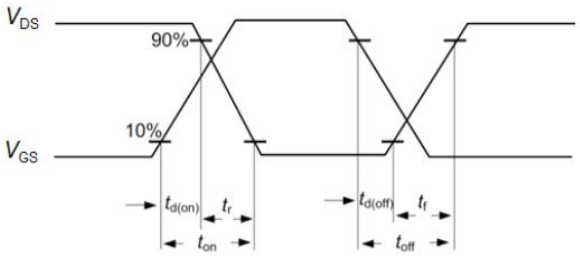


Figure A. Definition of switching times

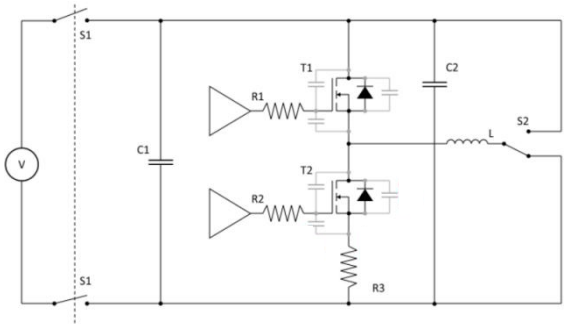


Figure B. Dynamic test circuit

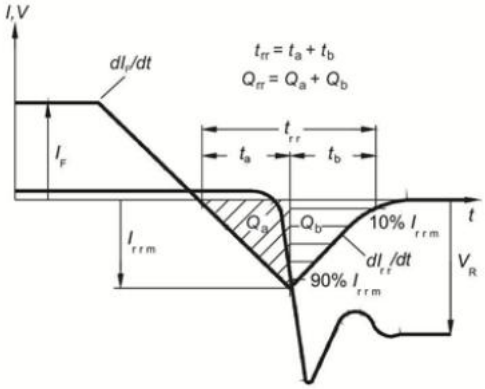


Figure C. Definition of body diode switching characteristics

Revision history

Document version	Date of release	Description of changes
V01_00	2024-12-27	——
V01_01	2025-01-02	——

Attention

1. **Rohs compliance**

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/ EC (RoHS2), as implemented January 2, 2013.

2. **REACH compliance**

REACh substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact a Sichain representative to insure you get the most up-to-date REACh SVHC Declaration. REACh banned substance information (REACh Article 67) is also available upon request.

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