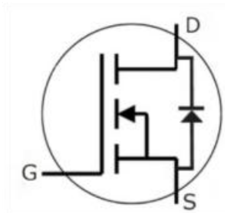
SG2M027120BJ

TriQSiC™ 1200V Silicon Carbide Power MOSFET G2 （ N Channel Enhancement ）

Features

- High speed switching
- Very low switching losses
- Fully controllable dv/dt
- High blocking voltage with low on-resistance
- Fast intrinsic diode with low reverse recovery (Qrr)
- 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
SG2M027120BJ	3.390*4.725

Applications

- On-board charger/PFC
- EV battery chargers
- Booster/DC-DC converter
- Switch mode power supplies

Table 1 Key performance and package parameters

Type	V_{DS}	I_{DS} (T_C=25°C, $R_{th\,(j\text{-}c),max}$ ≤0.44°C/W)	$R_{DS(on),\,typ}$ (V_{GS} = 18V, I_D = 40A, T_J = 25°C)	$T_{J,max}$
SG2M027120BJ	1200V	85A	26mΩ	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	1200	V	V_{GS} = 0V, I_D = 100μA	
$V_{GS,max}$	Gate source voltage	-8 /+22	V	Absolute maximum values	Note1
$V_{GSpulse}$	Gate-source voltage,max. transient voltage	-10 /+25	V	t_p≤0.5μs, D<0.01	
V_{GSop}	Gate source voltage	-4 /+18	V	Recommended operational values	
I_D	Continuous drain current	85	A	V_{GS} = 18V, T_C = 25°C	
		60		V_{GS} = 18V, T_C = 100°C	
I_D(pulse)	Pulsed drain current	220	A	Pulse width t_P =100μs 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 4 Static characteristics (Tc = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-source breakdown voltage	1200	-	-	V	V_{GS} = 0V, I_D = 100μA	
$V_{GS(th)}$	Gate threshold voltage	2.3	2.8	3.6	V	V_{DS} = V_{GS}, I_D = 11mA	Fig.11
		-	2.1	-	V	V_{DS} = V_{GS}, I_D = 11mA T_J = 175°C	
I_{DSS}	Zero gate voltage drain current	-	1	10	μA	V_{DS} = 1200V, 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	-	30	45	mΩ	V_{GS} = 15V, I_D = 40A	Fig.4,5, 6
		-	49	-		V_{GS} = 15V, I_D = 40A, T_J = 175°C	
		-	26	36		V_{GS} = 18V, I_D = 40A	
		-	47	-		V_{GS} = 18V, I_D = 40A, T_J = 175°C	
g_{fs}	Transconductance	-	30	-	S	V_{DS} = 20V, I_D = 40A	Fig.7
		-	27	-		V_{DS} = 20V, I_D = 40A, T_J = 175°C	
$R_{g,int}$	Intenal gate resistance	-	3	-	Ω	V_{AC} = 25mV, f = 1MHz, open drain	

2.2 Dynamic characteristics

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
C_{iss}	Input capacitance	-	2280	-	pF	V_{DS} = 1000V, V_{GS} = 0V T_J = 25°C, V_{AC} = 25mV f = 100kHz	Fig.17, 18
C_{oss}	Output capacitance	-	129	-			
C_{rss}	Reverse capacitance	-	6.6	-			
E_{oss}	Coss stored energy	-	71	-	μJ		Fig.16

Q_{gs}	Gate source charge	-	24	-	nC	V_{DS} = 800V, V_{GS} = -4/+18V I_D = 40A	Fig.12
Q_{gd}	Gate drain charge	-	22	-			
Q_g	Gate charge	-	73	-			

2.3 Switching characteristics

Table 6 Dynamic characteristics(Tc = 25°C unless otherwise specified,the data comes from TO-247-4L)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
E_{on}	Turn on switching energy	-	378	-	μJ	V_{DS} = 800V, V_{GS} = -4/+18V I_D = 40A, Rg = 2.5Ω L = 16.7μH	
E_{off}	Turn off switching energy	-	108	-			
$t_{d(on)}$	Turn on delay time	-	15	-	ns		
t_r	Rise time	-	16	-			
$t_{d(off)}$	Turn off delay time	-	31	-			
t_f	Fall time	-	9	-			

Table 7 Body diode characteristics(The data comes from TO-247-4L)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode forward voltage	-	3.8	-	V	V_{GS} = -4V, I_{SD} = 20A	Fig.8,9,10
		-	3.3	-	V	V_{GS} = -4V, I_{SD} = 20A T_J = 175°C	
I_S	Continuous diode forward current	-	82	-	A	V_{GS} = -4V, Tc = 25°C	Note2
t_{rr}	Reverse recovery time	-	35	-	ns	V_R = 800V, V_{GS} = -4V I_{SD} = 40A di/dt = 2827A/μs T_J = 175°C	
Q_{rr}	Reverse recovery charge	-	681	-	nC		
I_{rrm}	Peak reverse recovery current	-	33	-	A		

Note 2: When using SiC Body Diode the maximum recommended V_{GS} = -4 V

3、Electrical characteristic diagrams

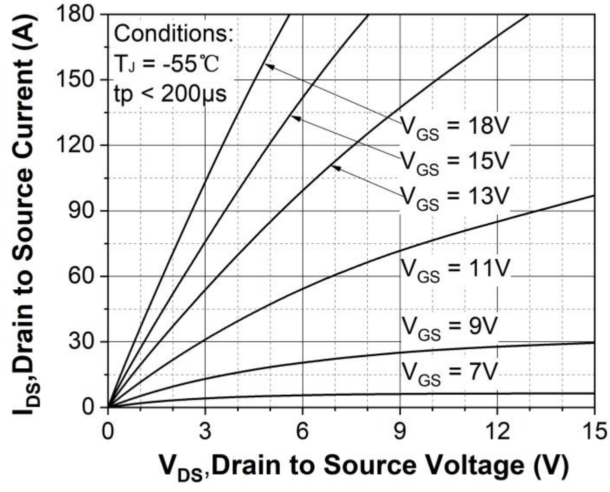


Figure 1. Output characteristics T_J = -55 ºC

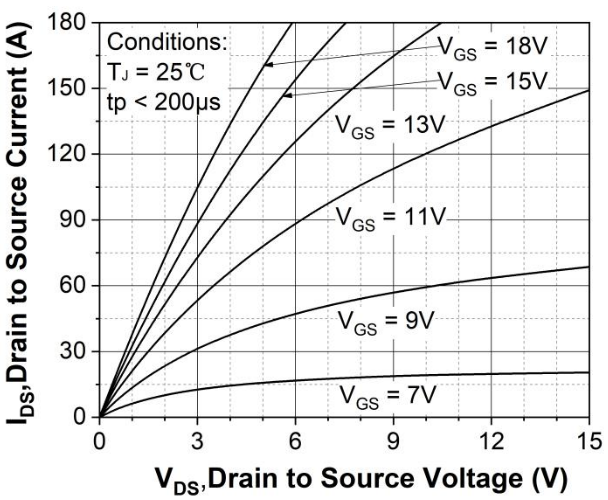


Figure 2. Output characteristics T_J = 25 ºC

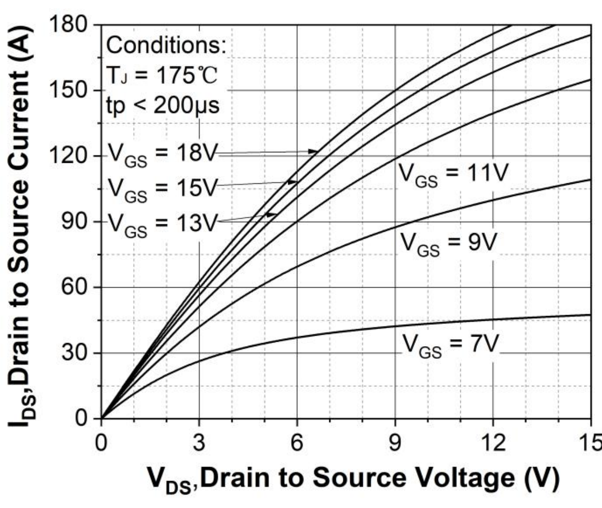


Figure 3. Output characteristics T_J = 175 ºC

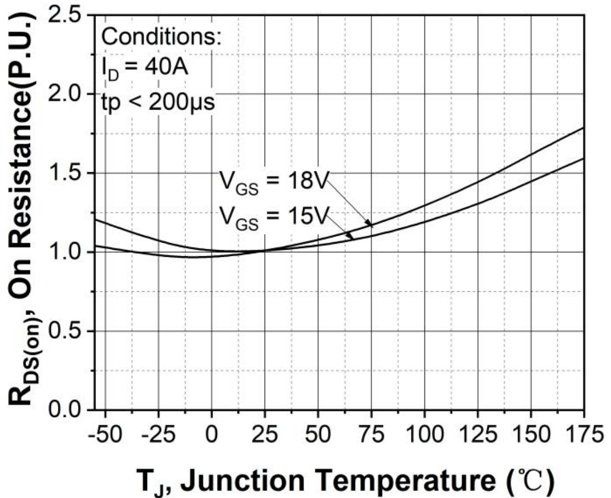


Figure 4. Normalized on-resistance vs. temperature

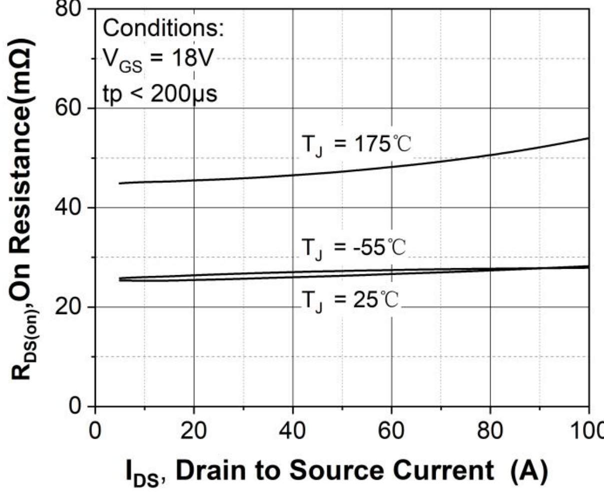


Figure 5. On-resistance vs. drain current for various temperatures

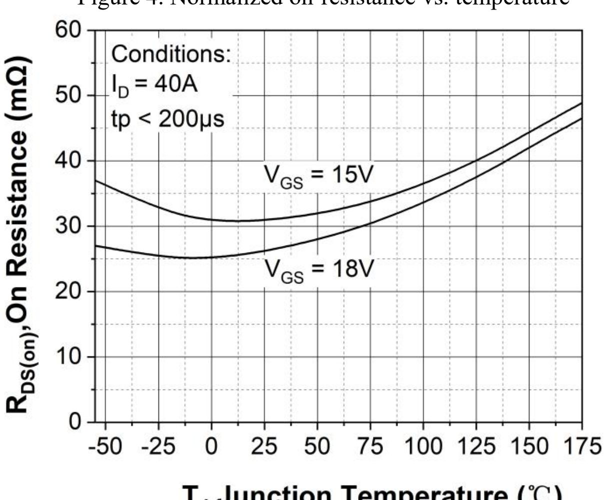


Figure 6. On-resistance vs. temperature for various gate voltages

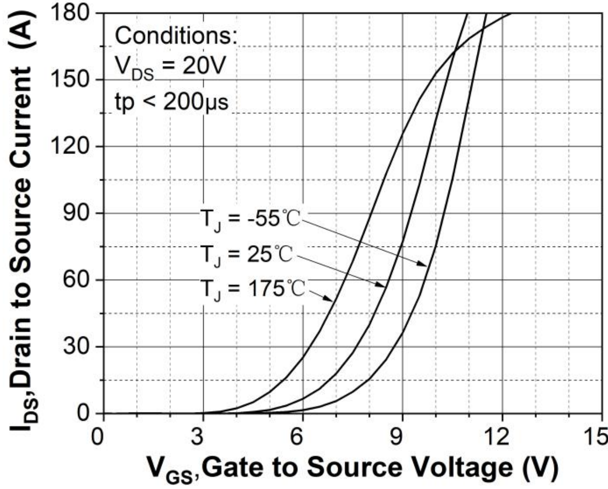


Figure 7. Transfer characteristic for various junction temperatures

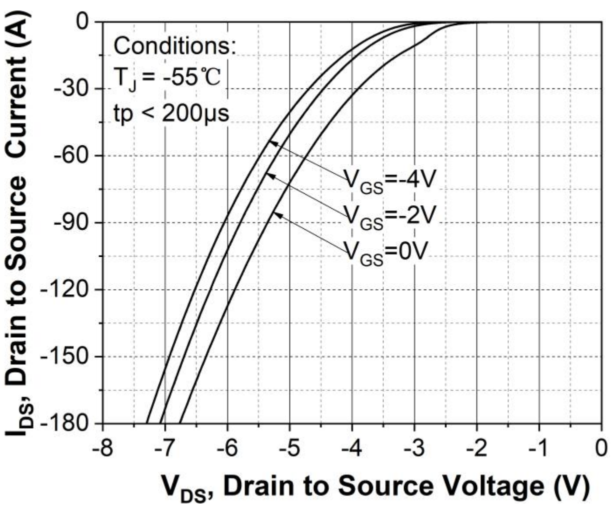


Figure 8. Body diode characteristic at T_J = -55 ºC

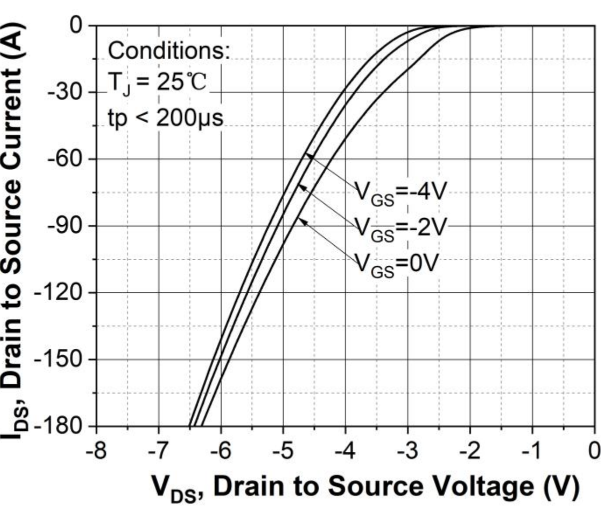


Figure 9. Body diode characteristic at T_J = 25 ºC

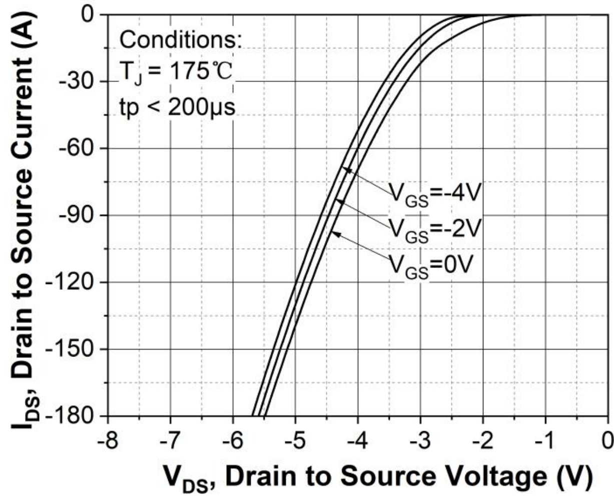


Figure 10. Body diode characteristic at T_J = 175ºC

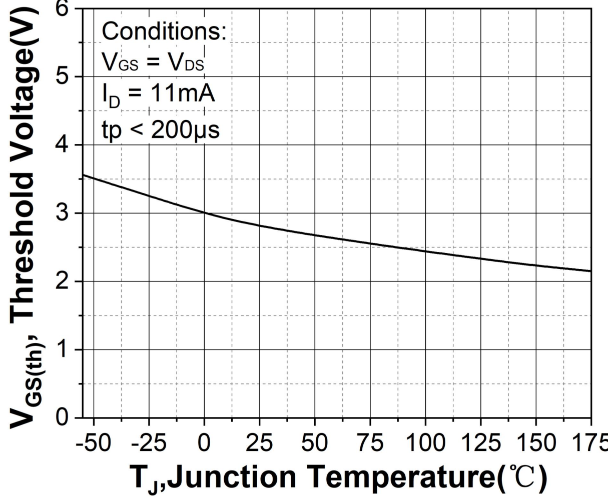


Figure 11. Threshold voltage vs. temperature

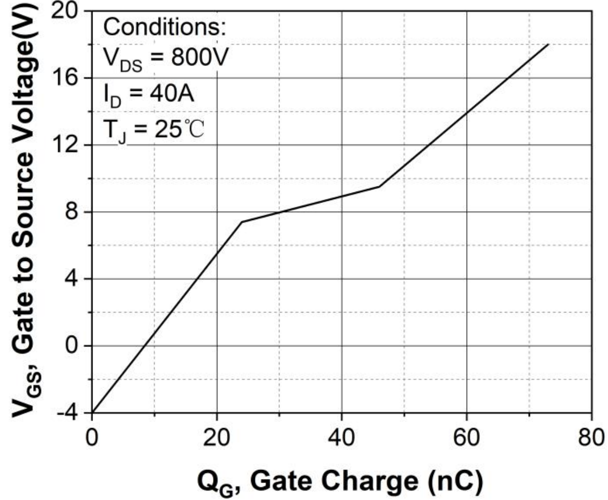


Figure 12. Gate charge characteristic

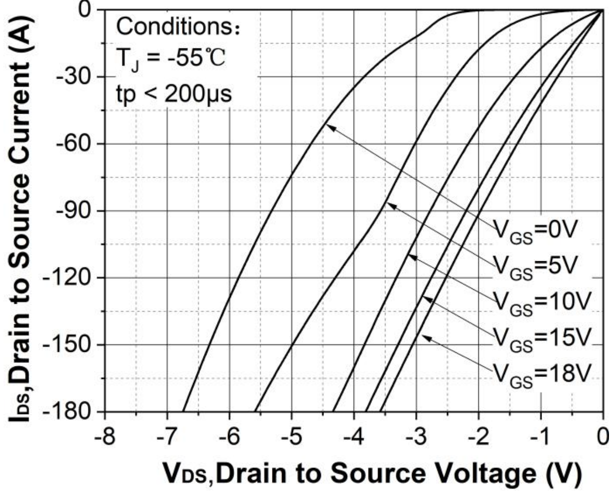


Figure 13. 3rd quadrant characteristic at T_J = -55 ºC

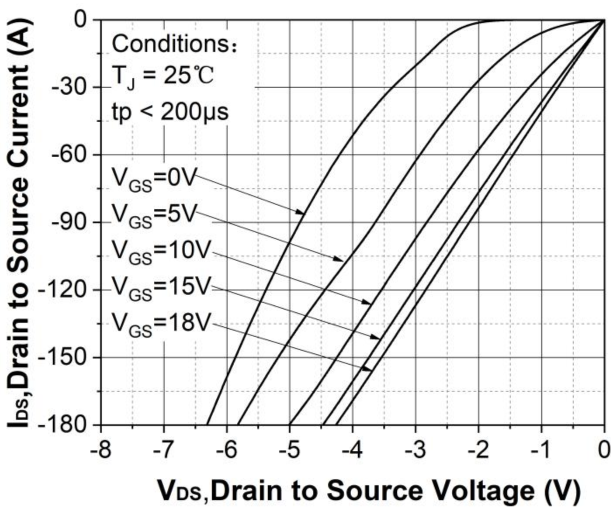


Figure 14. 3rd quadrant characteristic at T_J = 25 ºC

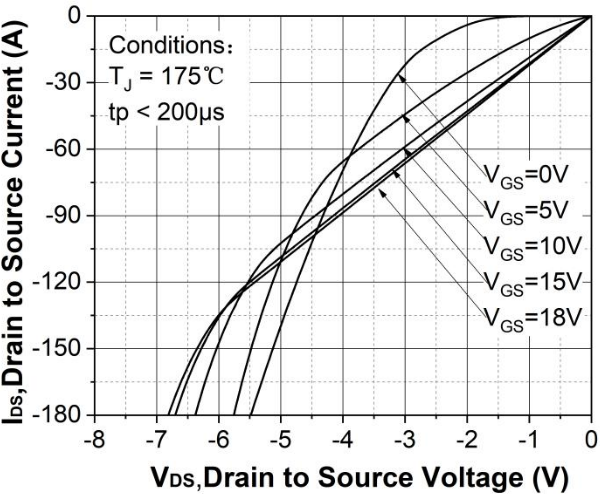


Figure 15. 3rd quadrant characteristic at T_J = 175 ºC

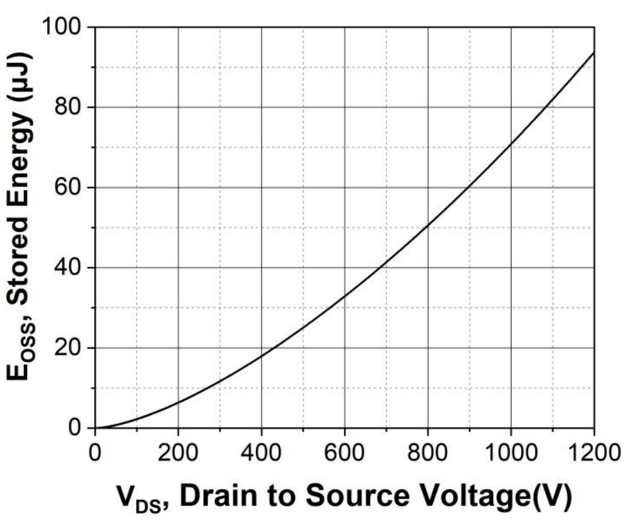


Figure 16. Output capacitor stored energy

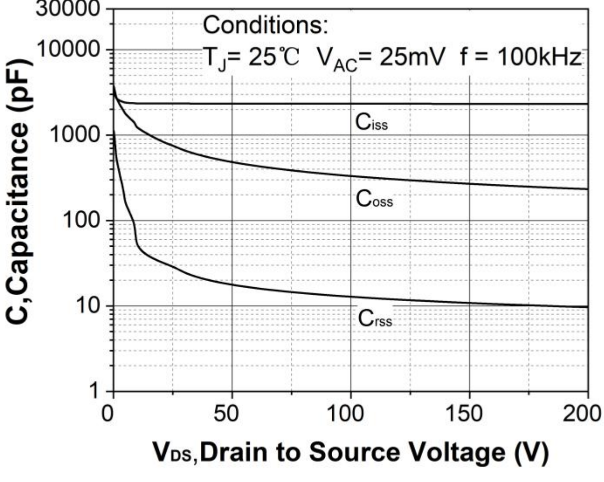


Figure 17. Capacitances vs. drain-source voltage (0 - 200V)

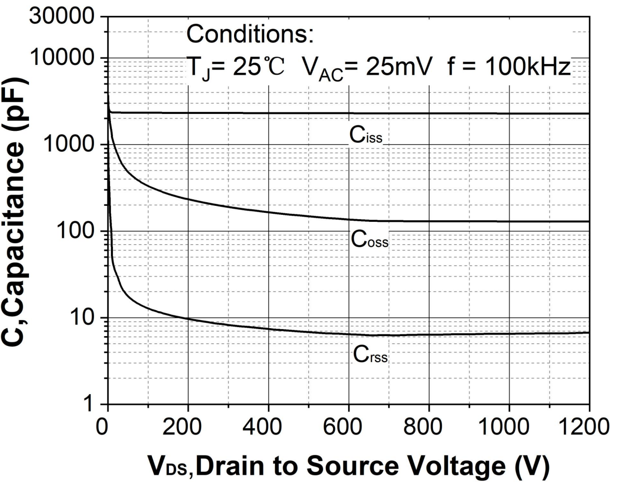


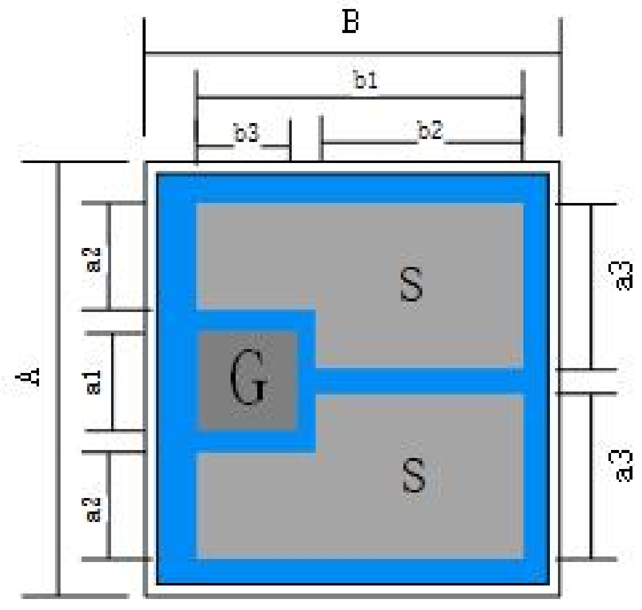
Figure 18. Capacitances vs. drain-source voltage (0 - 1200V)

4、Mechanical parameters

4.1 Dimensions and metallization

Parameter	Typical value	Unit	Metallization
Die size（W x L）	3.390*4.725	mm	
Gate pad size（W x L）	0.800*0.800	mm	
Die thickness	175	µm	
Top side（source gate）metallization	4	µm	Al
Back side （drain）metallization	1	µm	Ag

4.2 Layout



Symbol	Dimension / mm
B	4.725
b1	4.025
b2	3.075
b3	0.800
A	3.390
a1	0.800
a2	0.795
a3	1.270

5、Test conditions

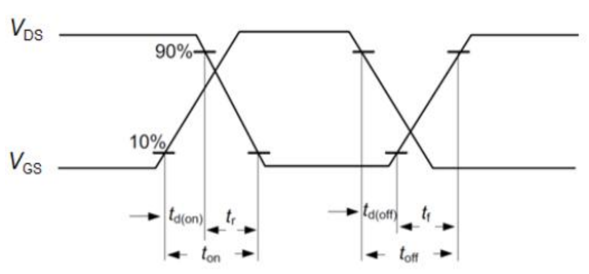


Figure A. Definition of switching times

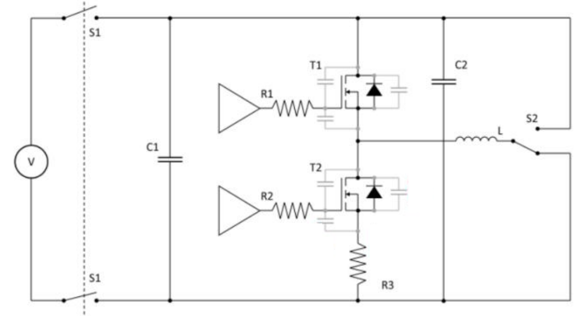


Figure B. Dynamic test circuit

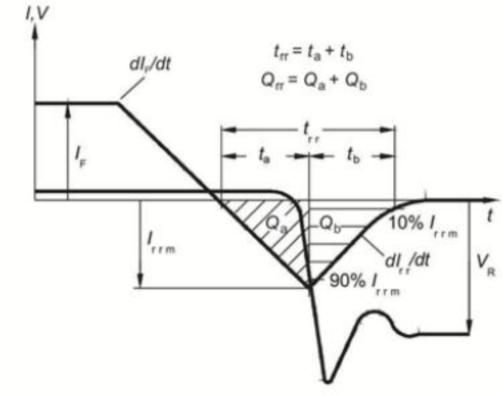


Figure C. Definition of body diode switching characteristics

Revision history

Document version	Date of release	Document stage	Description of changes
V01_00	2025-06-11	——	——
V01_01	2025-09-08	——	——
V01_02	2025-12-08	——	——
V02_00	2025-12-10	Final	——

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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