S3M008120RK-A

TriQSiC™1200V Silicon Carbide Power MOSFET G3 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

Applications

- EV motor drive
- PV string inverters
- Solar power optimizer
- Switch mode power supplies

Table 1 Key performance and package parameters

S3M008120RK-A

1200V SiC Power MOSFET

CUCAEA



2 Electrical characteris

Q_{gs}	Gate source charge	-	79	-	nC	V_{DS} = 800V, V_{GS} = -4/+18V I_D = 106A	Fig.12
Q_{gd}	Gate drain charge	-	64	-			
Q_g	Gate charge	-	257	-			

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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	-	3956	-	μJ	V_{DS} = 800V, V_{GS} = -4/+18V I_D = 106A, Rg = 2.5Ω, L = 16.7μH	
E_{off}	Turn off switching energy	-	2290	-			
$t_{d\ on}$	Turn on delay time	-	117	-	ns		
t_r	Rise time	-	30	-			
$t_{d\ off}$	Turn off delay time	-	174	-			
t_f	Fall time	-	31	-			

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	-	3.7	-	V	V_{GS} = -4V, I_{SD} = 53A	Fig.8,9, 10
		-	3.4	-	V	V_{GS} = -4V, I_{SD} = 53A T_J = 175°C	
I_S	Continuous diode forward current	-	162	-	A	V_{GS} = -4V, Tc = 25°C	Note2
t_{rr}	Reverse recovery time	-	71	-	ns	V_R = 800V, V_{GS} = -4V I_D = 106A di/dt = 1532A/μs T_J = 175°C	
Q_{rr}	Reverse recovery charge	-	990	-	nC		
I_{rrm}	Peak reverse recovery current	-	30	-	A		

Note2 : When using SiC Bo ﬁ ﬂ £ ȳ

3 Electrical characteristic diagrams

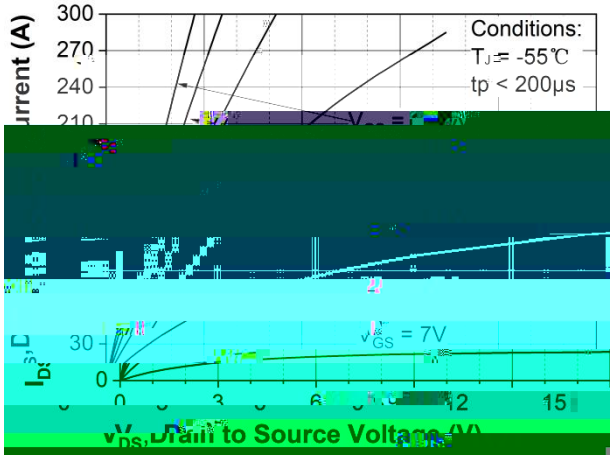


Figure 1. Output characteristics T_J = -55 ºC

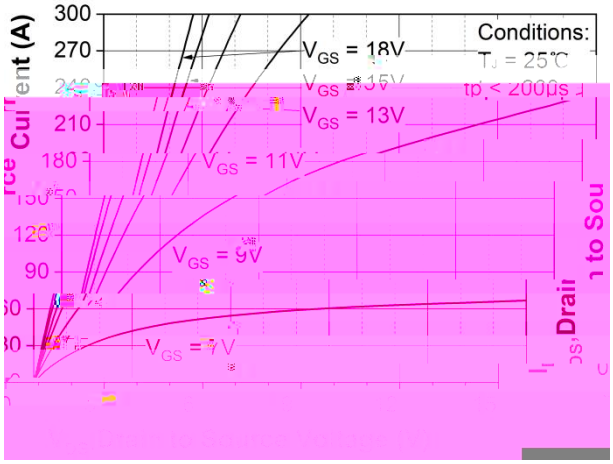


Figure 2. Output characteristics T_J = 25 ºC

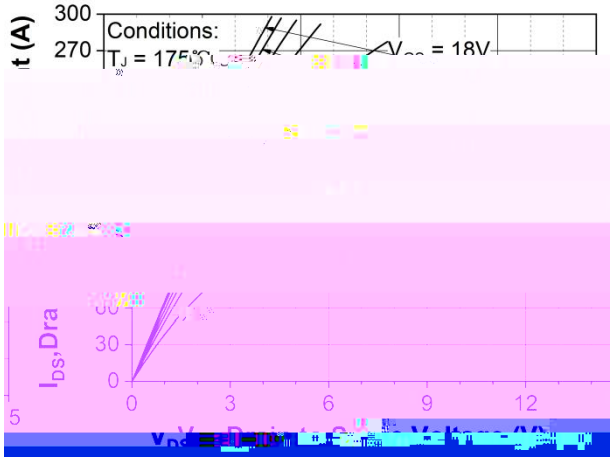


Figure 3. Output characteristics T_J = 175 ºC

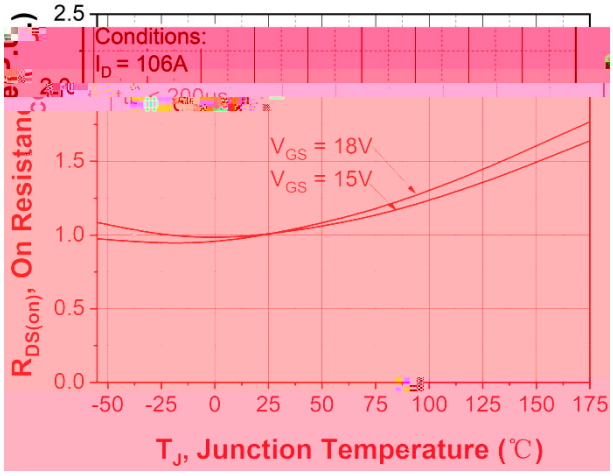


Figure 4. Normalized on-resistance vs. temperature

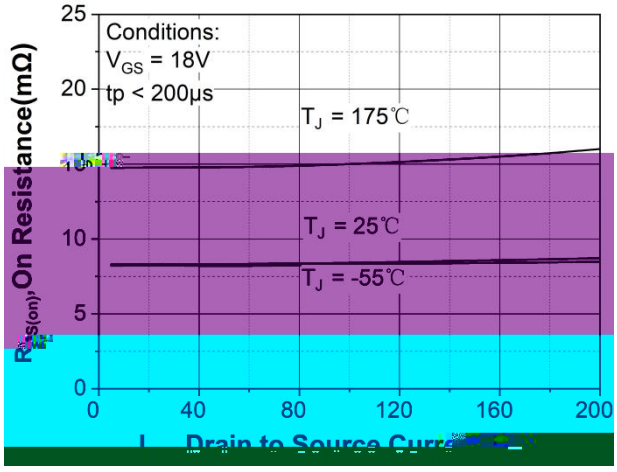


Figure 5. On-resistance vs. drain current for various temperatures

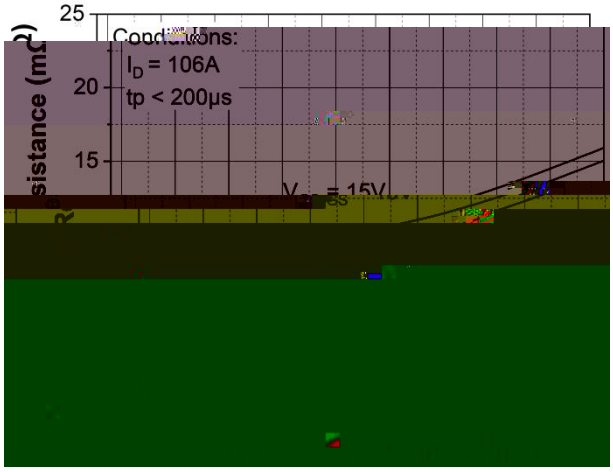


Figure 6. On-resistance vs. temperature for various gate voltages

S3M008120R

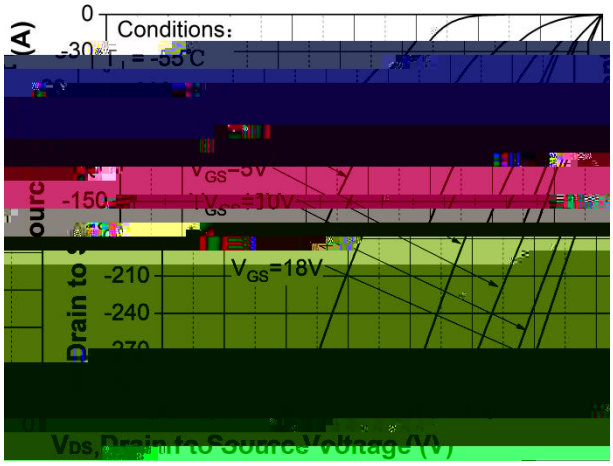


Figure 13. 3rd quadrant characteristic at T_J = -55 ºC

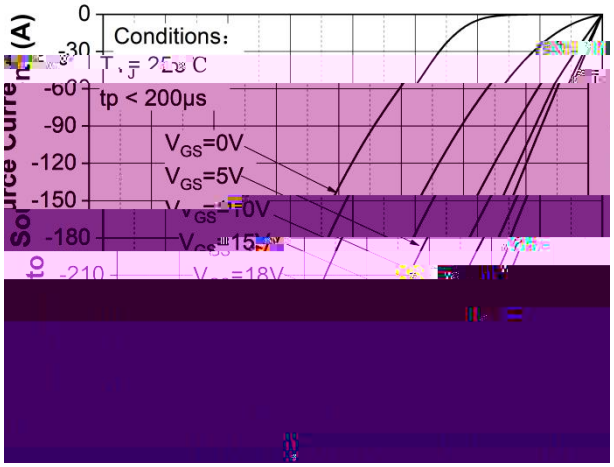


Figure 14. 3rd quadrant characteristic at T_J = 25 ºC

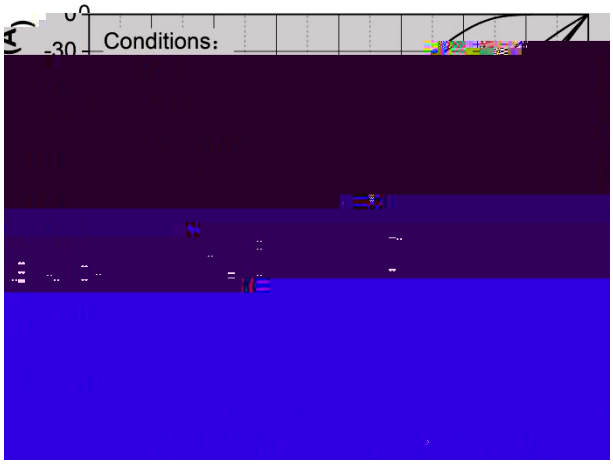


Figure 15. 3rd quadrant characteristic at T_J = 175 ºC

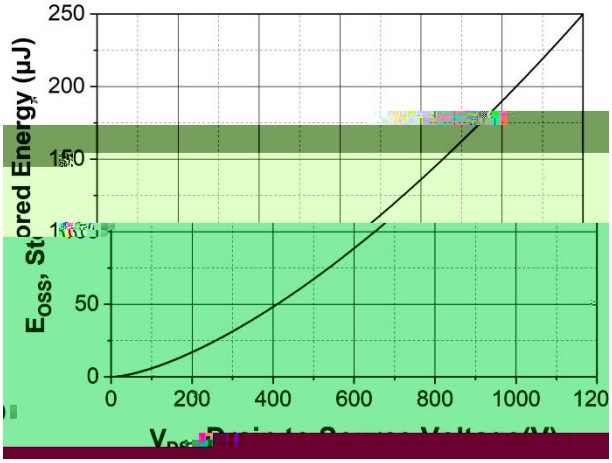


Figure 16. Output capacitor stored energy

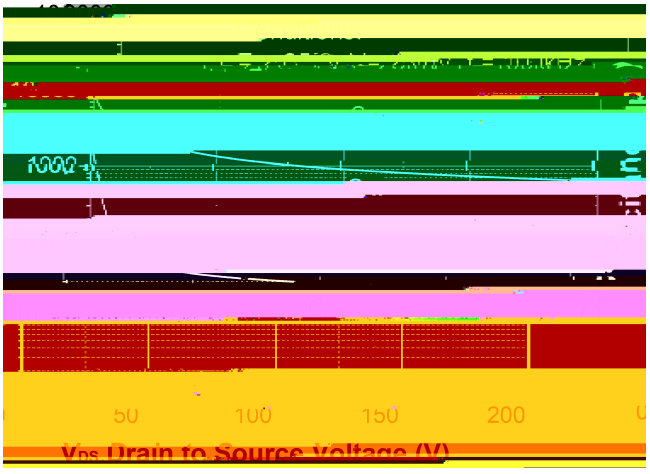


Figure 17. Capacitances vs. drain-source voltage (0 - 200V)

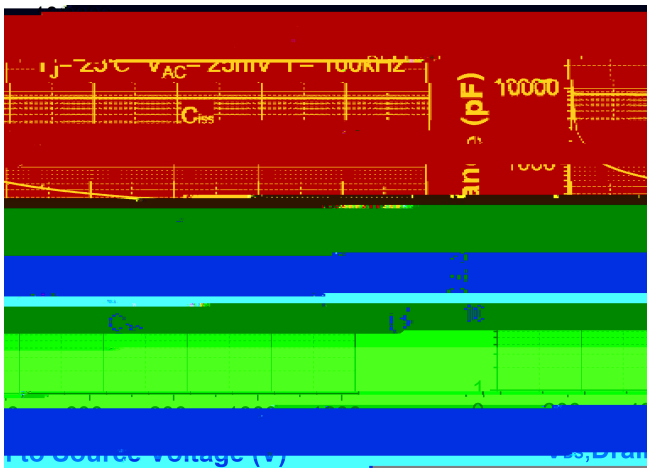


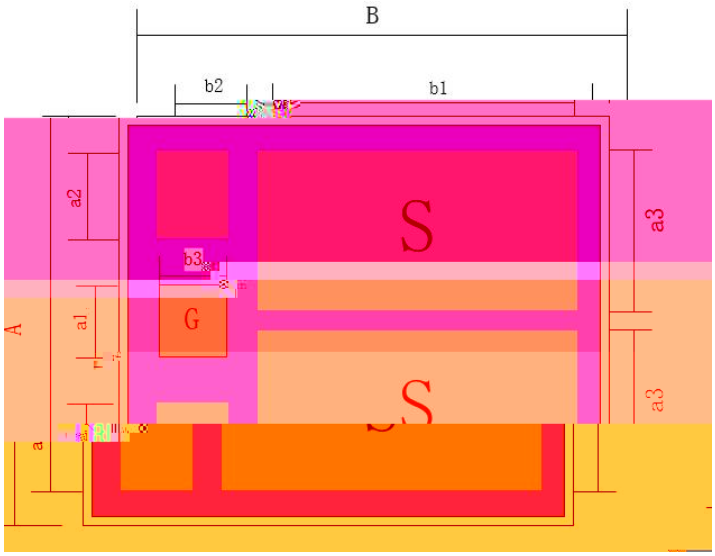
Figure 18. Capacitances vs. drain-source voltage (0 - 1200V)

4 Mechanical parameters

4.1 Dimensions and metallization

Parameter	Typical value	Unit	Metallization
Die size W x L	5.30 * 6.60	mm	
Gate pad size W x L	0.78 * 0.69	mm	
Source pad size W x L	2.05 * 4.70	mm	
Kelvin pad size W x L	1.40 * 0.70	mm	
Die thickness	150 ± 20	μm	
Top side gate & kelvin source metallization	4	μm	AlCu
Top side power source metallization	4/4/0.35/0.05	μm	AlCu/Ni/Pd/Au
Back side drain metallization	1	μm	Ag

4.2 Layout



Symbol	Dimension / mm
B	6.60
b1	4.70
b2	0.70
b3	0.69
A	5.30
a1	0.78
a2	1.40
a3	2.05

5 Test conditions

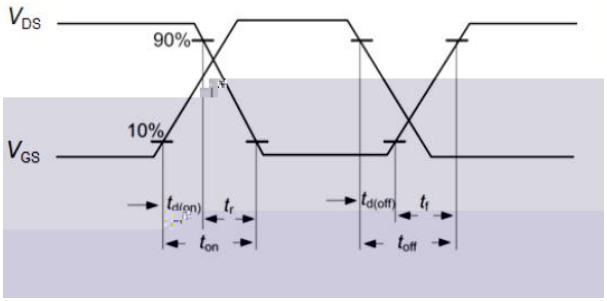


Figure A. Definition of switching times

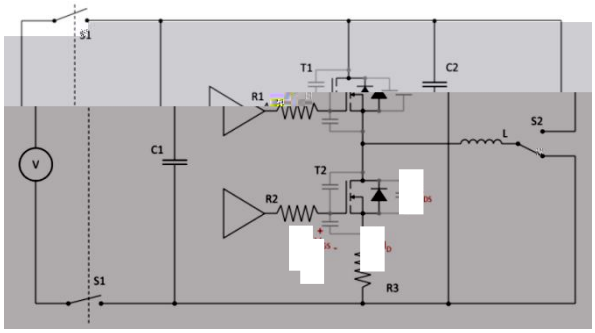


Figure B. Dynamic test circuit

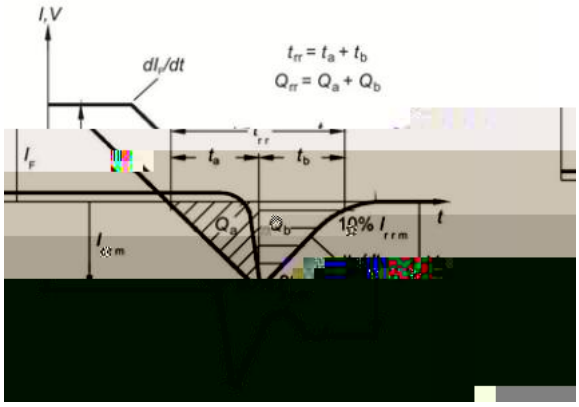


Figure C. Definition of body diode switching characteristics

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