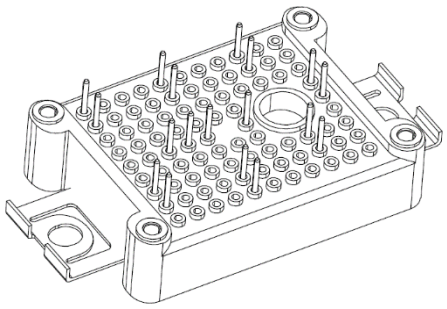
S1P10R120HBA（Preliminary）

1200V / 100A All-Silicon Carbide MOSFET Half-Bridge Module

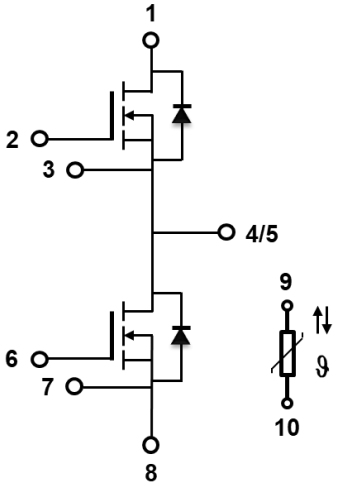
Features



- Electrical features
  V_{DSS} = 1200V
  I_D nom = 100A
- High-speed Switching Possible
- High Power Density
- High Frequency Operation
- Ultra-low Losses

Applications

- Servo drives
- UPS system
- Motor drives
- High power converters
- Photovoltaics, wind power generation
- Induction heating equipment



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1、Maximum ratings

Table 1 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 = 100 μA	
$V_{GS,max}$	Gate source voltage	-8 /+19	V	Absolute maximum values	
V_{GSop}	Gate source voltage	-4 /+15	V	Recommended operational values	
I_D	Continuous drain current	100	A	V_{GS} = 15V, T_C = 100˚C	
$I_{D(pulse)}$	Pulsed drain current	200	A	Pulse width tp limited by T_j,max	
T_J , T_{stg}	Operating Junction and storage temperature	-55 to +175	˚C		

2、 Packaging characteristics

Table 2 Package characteristics

Symbol	Description	Value	Unit	Note
R_{HS}	High-side Resistance	10.5	mΩ	
R_{LS}	Low-side Resistance	10.5		
$R_{th(J-H)}$	Junction to heatsink thermal resistance	0.229	℃/W	
Ls	Stray inductance	9.0	nH	
V_{ISO}	Isolation Test Voltage RMS, f=50Hz, t=1min	3.0	kV	
Distance	Terminal to Heatsink Creepage Distance	11.5	mm	
	Terminal to Terminal Creepage Distance	6.3	mm	
	Terminal to Heatsink Clearance	10.0	mm	
	Terminal to Terminal Clearance	5.0	mm	
T_{jmax}	Maximum Junction Temperature	175	˚C	
T_{jop}	Operation Junction Temperature	-40 to +175	˚C	
T_{STG}	Storage Temperature Range	-40 to +175	˚C	
W	Weight	23.5	g	
Ms	Mounting Torque	2.0	N·m	

3、Electrical characteristics

Table 4 SiC MOSFET 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 = 200μA	
$V_{GS(th)}$	Gate threshold voltage	2.3	2.8	4.0	V	V_{DS} = V_{GS}, I_D = 35.4mA	
		-	2.0	-	V	V_{DS} = V_{GS}, I_D = 35.4mA, T_J = 175°C	
I_{DSS}	Zero gate voltage drain current	-	2	20	μA	V_{DS} = 1200V, V_{GS} = 0V	
I_{GSS}	Gate source leakage current	-	-	200	nA	V_{GS} = 15V, V_{DS} = 0V	
$R_{DS(on)}$	Current drain-source on-state resistance	-	10.5	14	mΩ	V_{GS} = 15V, I_D = 100A	
		-	18.5	-		V_{GS} = 15V, I_D =100A, T_J = 175°C	
gfs	Transconductance	-	72	-	S	V_{DS} = 20V, I_D = 100A	
		-	68	-		V_{DS} = 20V, I_D = 100A, T_J = 175°C	
$R_{g,int}$	Internal gate resistance	-	1.4	-	Ω	V_{AC} = 25mV, f = 1MHz, open drain	
C_{iss}	Input capacitance	-	9.088	-	nF	V_{DS} = 1000V, V_{GS} = 0V T_J = 25°C, V_{AC} = 25mV f = 100KHz	
C_{oss}	Output capacitance	-	0.374	-			
C_{rss}	Reverse capacitance	-	0.012	-			
Q_{gs}	Gate source charge	-	108	-	nC	V_{DS} = 800V, V_{GS} = -4/+15V I_D = 100A	
Q_{gd}	Gate drain charge	-	84	-			
Q_g	Gate charge	-	288	-			
E_{on}	Turn on switching energy	-	0.52	-	mJ	V_{DS} = 800V, V_{GS} = -4/+15V I_D = 100A, Rg = 5Ω, L = 20μH	
E_{off}	Turn off switching energy	-	2.77	-			

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode forward voltage	-	4.0	-	V	V_{GS} = -4V, I_{SD} = 100A	
		-	3.5	-	V	V_{GS} = -4V, I_{SD} = 100A T_J = 175°C	
I_S	Continuous diode forward current	-	100	-	A	V_{GS} = -4V, Tc = 25°C	
t_{rr}	Reverse recovery time	-	25	-	ns	V_R = 800V, V_{GS} = -4V I_D = 100A di/dt=3000A/μs, T_J = 175°C	
Q_{rr}	Reverse recovery charge	-	1072	-	nC		
I_{rrm}	Peak reverse recovery current	-	80	-	A		

Table 6 NTC-Thermistor Characteristic

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
R_{25}	Rate Resistance	-	4.7	-	kΩ	Tc=25°C	
ΔR/R	Deviation of R_{100}	-5	-	5	%	Tc=100°C, R_{100} = 450Ω	
P_{25}	Power Dissipation	-	-	150	mW	Tc=25°C	
$B_{25/50}$	B-value	-	3500	-	K	$R_{NTC}=R_{25}\exp[B_{25/85}(1/T_{NTC} - 1/(298.15K))]$	

4、Electrical characteristic diagram

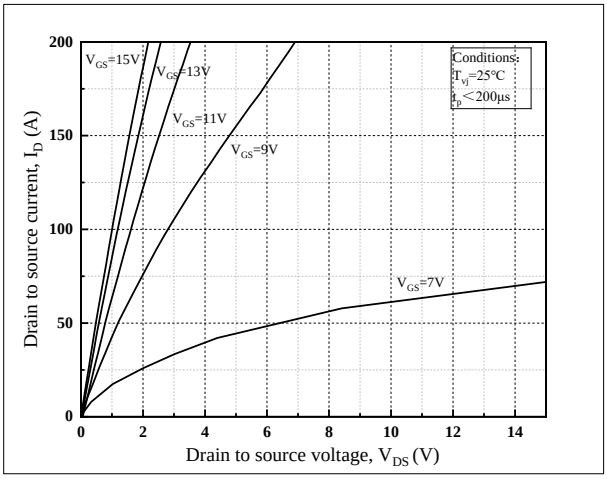


Figure 1. Output Characteristic, T_{vj}=25℃

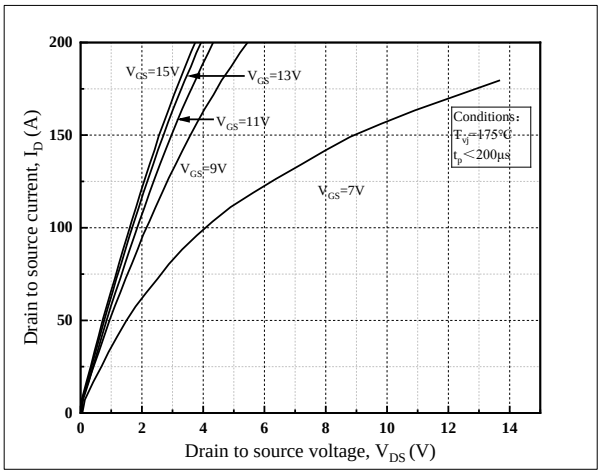


Figure 2. Output Characteristic, T_{vj}=175℃

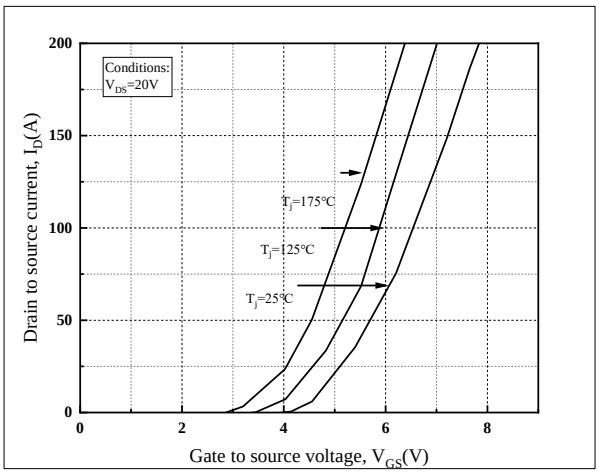


Figure 3. Transfer Characteristic

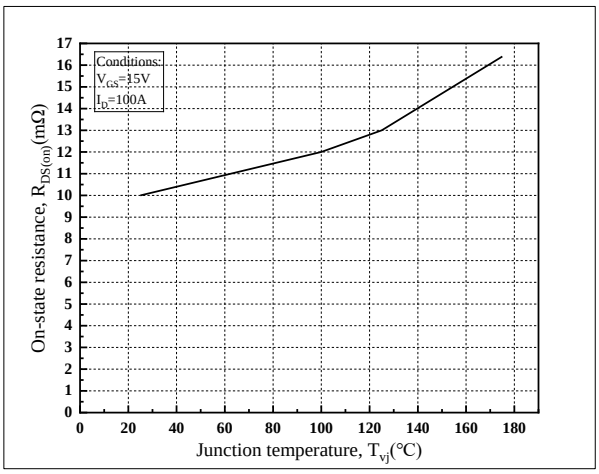


Figure 4. On-resistance VS. Junction Temperature

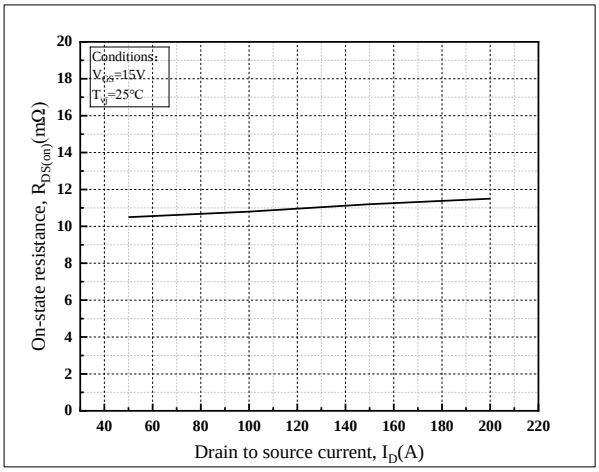


Figure 5. On-resistance VS. Drain to Source Current

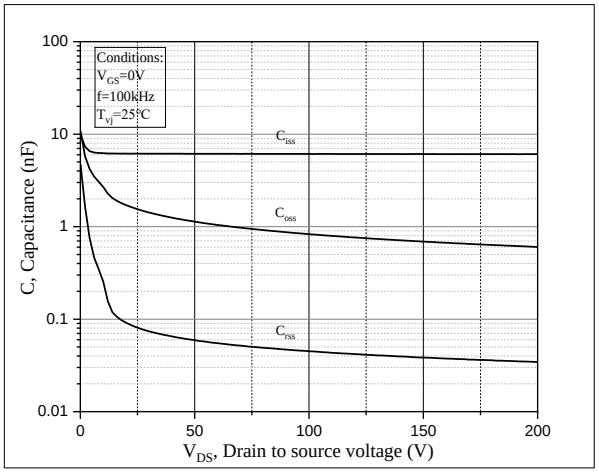


Figure 6. Capacitance VS. V_{DS}

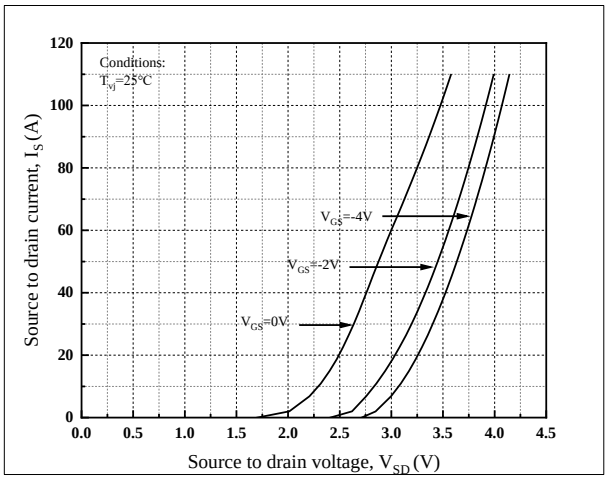


Figure 7. 3rd Quadrant Characteristic

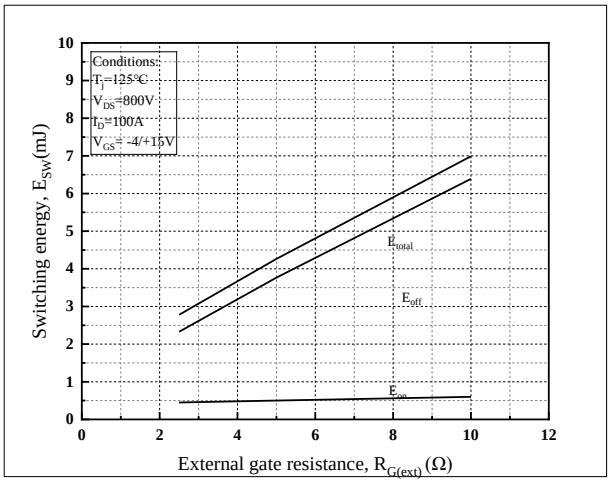


Figure 8. MOSFET Switching Energy vs. External Gate Resistance

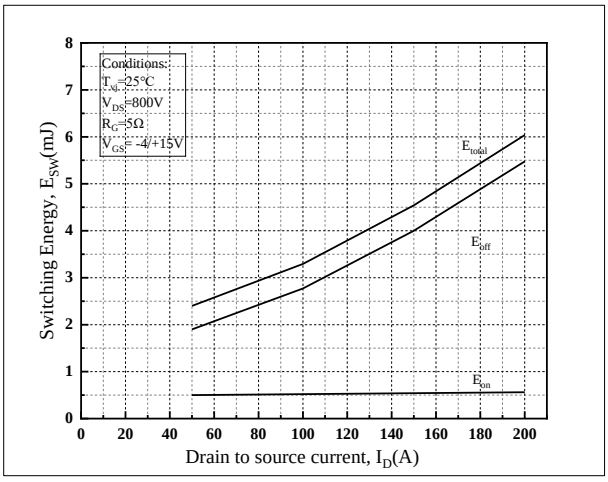


Figure 9. MOSFET Switching Energy vs. Drain to Source Current

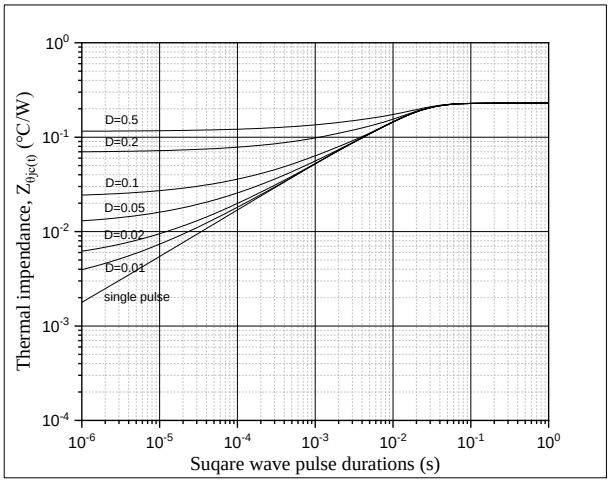
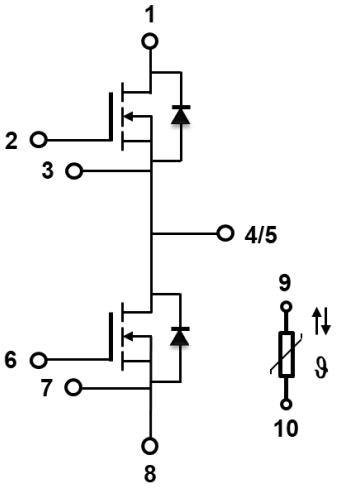
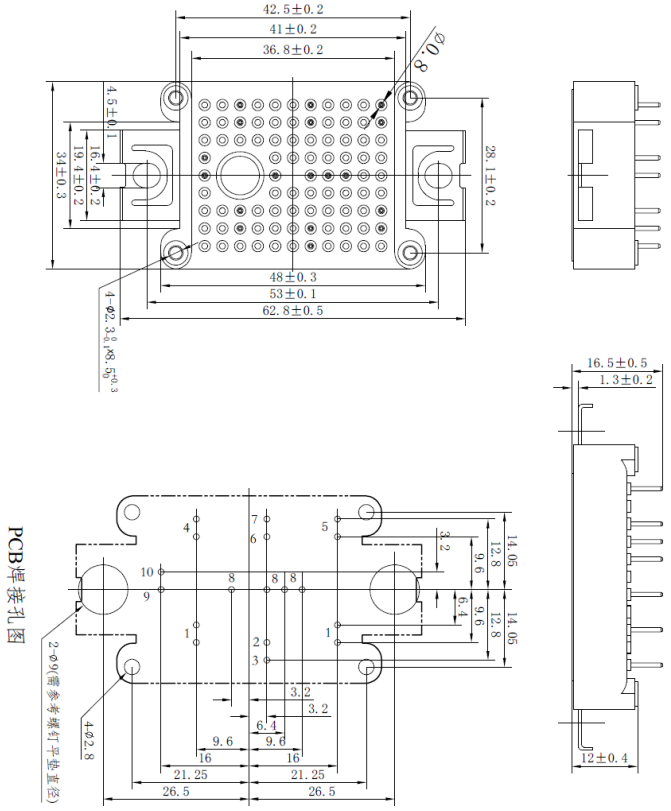


Figure 10. Transient Thermal Impedance (junction to case)

5、Package drawing





6、Test conditions

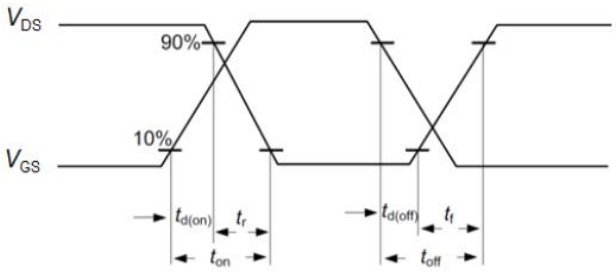


Figure A. Definition of switching times

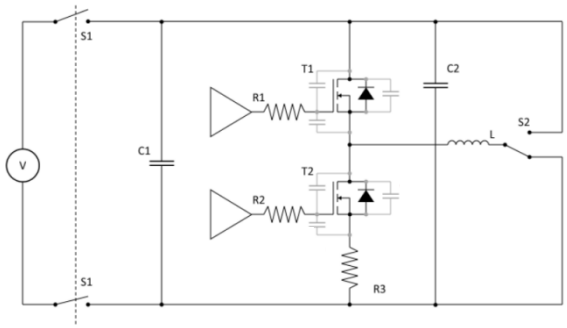


Figure B. Dynamic test circuit

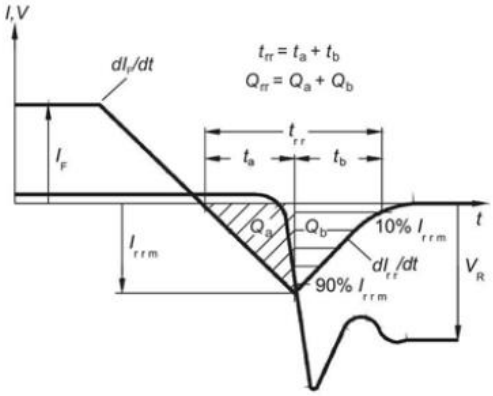


Figure C. **Definition of diode switching characteristics**

Figure C. Definition of body diode switching characteristics

Revision history

Document version	Date of release	Description of changes	
V01_00	2024-06-21	——	

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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