

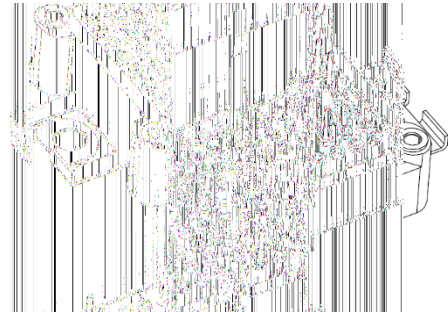
S1P10R120HBA Preliminary



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

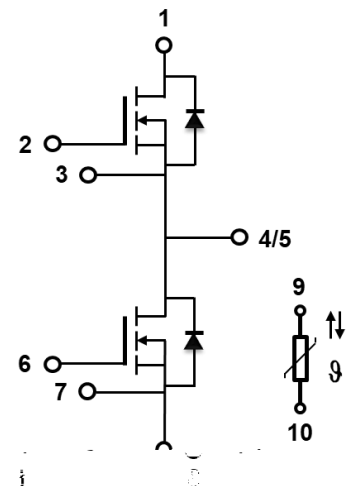
Features

- Electrical features
- $V_{DSS} = 1200V$
- $I_D \text{ nom} = 100A$
- 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 ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
$V_{DS,max}$	Drain source voltage	1200	V	$V_{GS} = 0V, I_D$	
$V_{GS,max}$	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	$V_{GS} = 15V, T_c = 100$	
$I_{D(pulse)}$	Pulsed drain current	200	A	Pulse width t_p limited by $T_{j,max}$	
T_J, T_{stg}	Operating Junction and storage temperature	-55 to +175			

2 Packaging characteristics

Table 2 Package characteristics

Symbol	Description	Value	Unit	Note
R_{HS}	High-side Resistance	10.5		
R_{LS}	Low-side Resistance	10.5		
$R_{th(J-H)}$	Junction to heatsink thermal resistance	0.229	/W	
L_S	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		
T_{jop}	Operation Junction Temperature	-40 to +175		
T_{STG}	Storage Temperature Range	-40 to +175		
W	Weight	23.5	g	
M_s	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	$V_{GS} = 0V, I_D = 2$	
$V_{GS(th)}$	Gate threshold voltage	2.3	2.8	4.0	V	$V_{DS} = V_{GS}, I_D = 35.4mA$	
		-	2.0	-	V	$V_{DS} = V_{GS}, I_D = 35.4mA,$ $T_J = 175^\circ C$	
I_{DSS}	Zero gate voltage drain current	-	2	20		$V_{DS} = 1200V, V_{GS} = 0V$	
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		$V_{GS} = 15V, I_D = 100A$	
		-	18.5	-		$V_{GS} = 15V, I_D = 100A,$ $T_J = 175^\circ C$	
gfs	Transconductance	-	72	-	S	$V_{DS} = 20V, I_D = 100A$	
		-	68	-		$V_{DS} = 20V, I_D = 100A,$ T	

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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	
Q _{rr}	Reverse recovery charge	-	1072	-	nC		
I _{rrm}	Peak reverse recovery current	-	80	-	A		T _J = 175°C

Table 6 NTC-Thermistor Characteristic

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
R ₂₅	Rate Resistance	-	4.7	-			
	Deviation of R ₁₀₀	-5	-	5	%	Tc=100 100 = 450	
P ₂₅	Power Dissipation	-	-	150	mW		
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

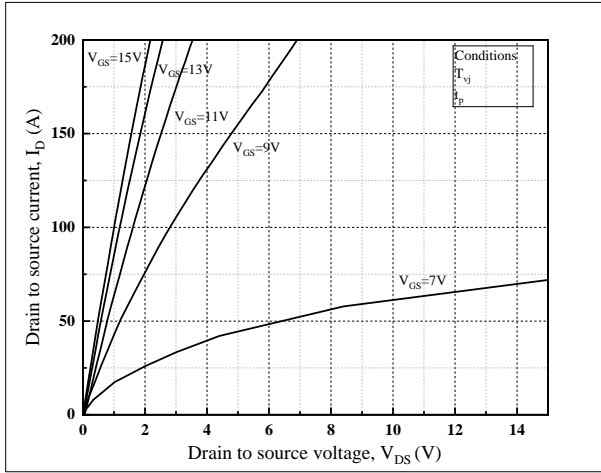


Figure 1. Output Characteristic, T_{vj}

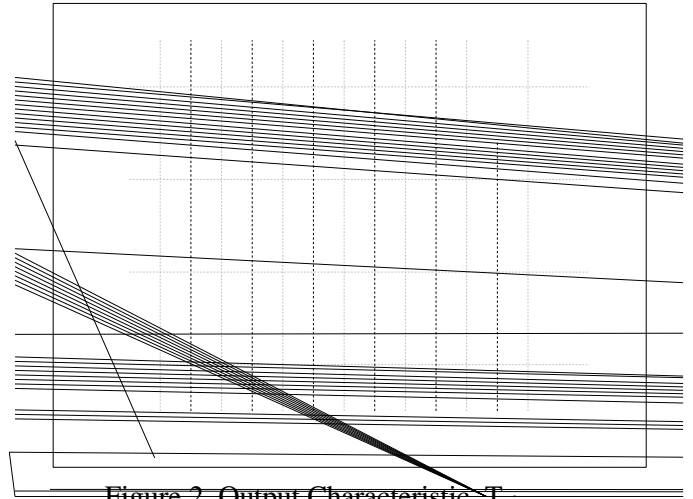


Figure 2. Output Characteristic, T_{vj}



Figure 3. Transfer Characteristic

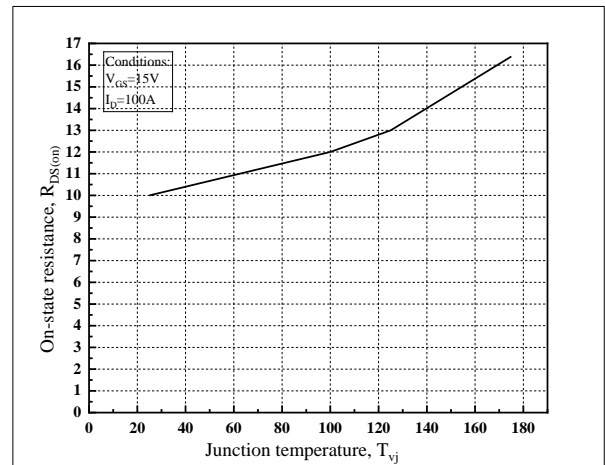


Figure 4. On-resistance VS. Junction Temperature

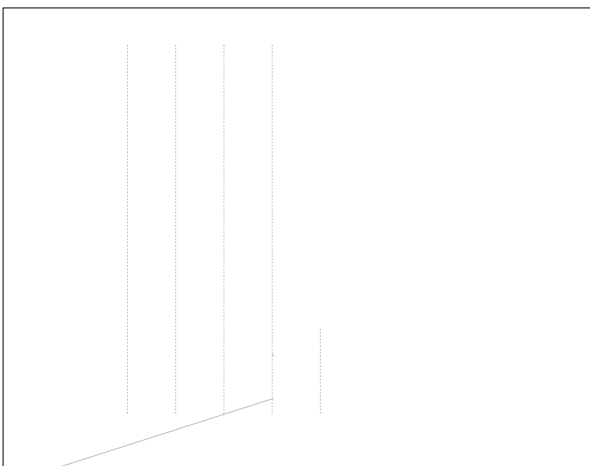


Figure 5. On-resistance VS. Drain to Source Current

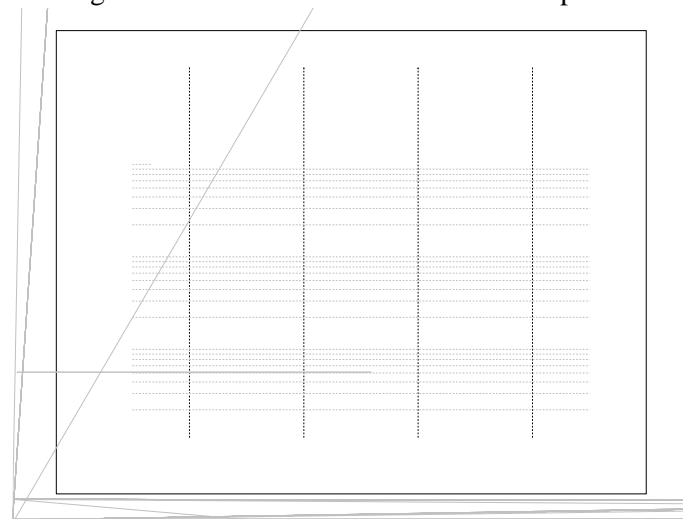


Figure 6. Capacitance VS. V_{DS}



Figure 7. 3rd Quadrant Characteristic

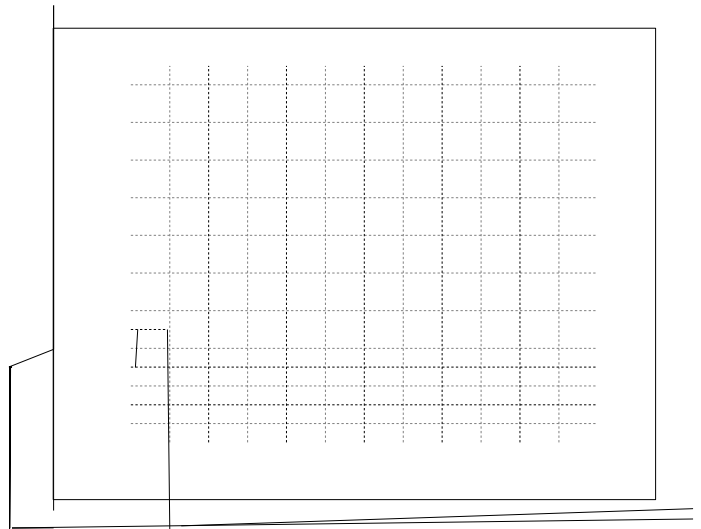


Figure 8. MOSFET Switching Energy vs. External Gate Resistance

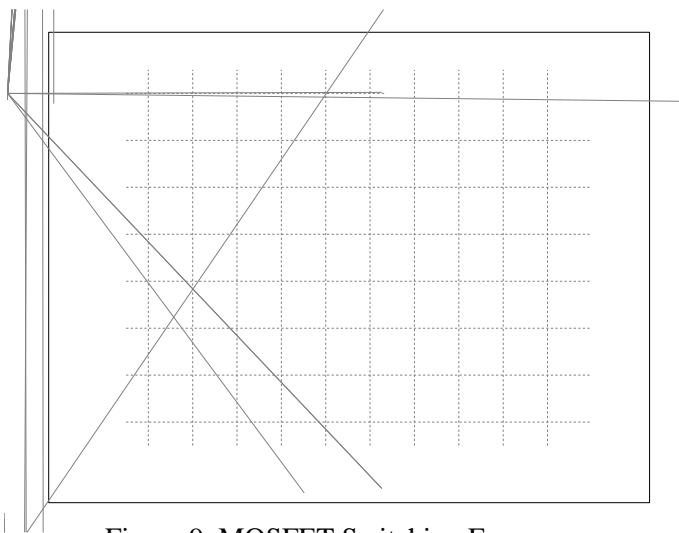


Figure 9. MOSFET Switching Energy vs. Drain to Source Current

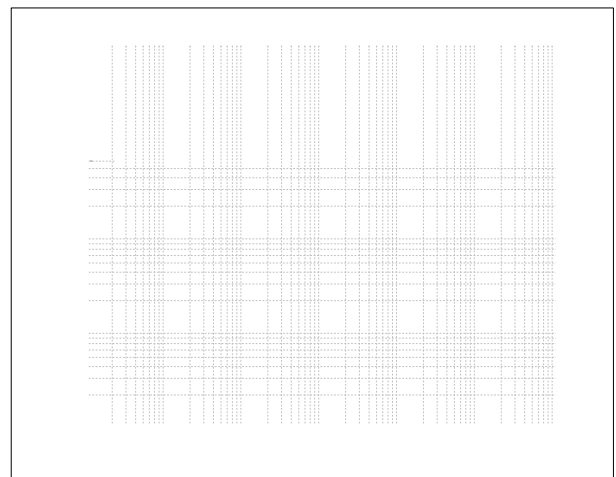


Figure 10. Transient Thermal Impedance (junction to case)

6 Test conditions

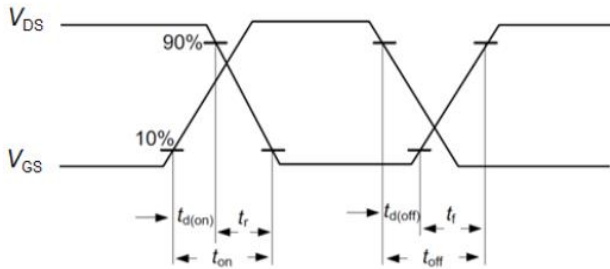


Figure A. Definition of switching times

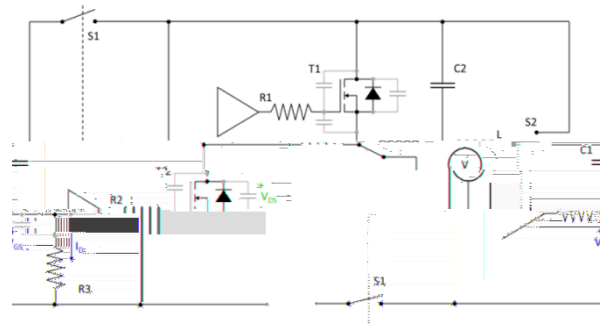


Figure B. Dynamic test circuit

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Revision history

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

