

● General Description

This silicon carbide Power MOSFET module has been developed using ZMJ's advanced 1st generation SiC MOSFET technology. The device features a very low $R_{DS(on)}$ over the entire temperature range combined with low capacitances and very high switching operations. It improves application performance in frequency, energy efficiency, system size and weight reduction.

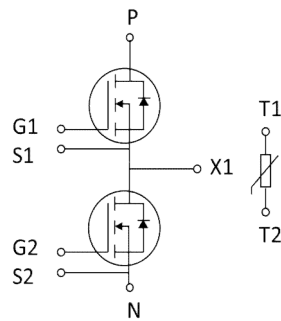
● Features

- High Blocking Voltage
- High Speed Switching With Low Capacitances
- Low $R_{DS(on)}$ to Minimize Conductive Loss
- Low Gate Charge For Fast Switching
- Low Inductive Design
- AMB Substrate for lower thermal resistance
- Pressfit Pin
- Integrated NTC Sensor

● Application

- High-frequency switching application
- DC-DC
- UPS

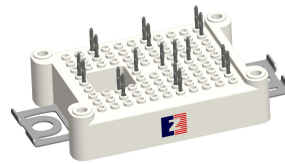
● Product Summary



$$V_{DS} = 1200V$$

$$R_{DS(on)} = 10m\Omega$$

$$I_D = 100A$$



A5D



● Ordering Information:

Part NO.	ZMC010R120Z1AAFF
Marking	ZMC010R120Z1AAFF
Packing Information	TRAY
Basic Ordering Unit (pcs)	20

● Absolute Maximum Ratings ($T_A=25^{\circ}C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Max.	Unit
Drain-Source Voltage	V_{DS}		-	1200	V
Gate-Source Voltage ^①	V_{GS}	Transient Voltage	-10	25	V
	V_{GS}	Static Voltage	-10	24	V
Recommended Turn On Gate Voltage	$V_{GS(on)}$		15	18	V
Recommended Turn Off Gate Voltage	$V_{GS(off)}$		-4	0	V
Continuous Drain Current ^②	I_D	$V_{GS}=18V, T_H=25^{\circ}C$	-	100	A
	I_D	$V_{GS}=18V, T_H=75^{\circ}C$	-	82	A
	I_D	$V_{GS}=18V, T_H=100^{\circ}C$	-	71	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu s$; $T_H = 25^{\circ}C$;	-	200	A
Total Power Dissipation	P_D	$T_C=25^{\circ}C$	-	268	W
Operating Junction Temperature	T_J		-55	175	$^{\circ}C$

Storage Temperature	T_{STG}		-55	175	°C
Single Pulse Avalanche Energy	E_{AS}	$L=0.5mH, V_{GS}=10V, R_g=25\Omega,$	-	2450	mJ
ESD Level (HBM)	CLASS 2				

•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction - Heatsink	R_{thJH}	-	-	0.56	°C/W

•Electronic Characteristics (Tj=25°C,unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=500\mu A$	1200	-	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=10mA, T_j=25^\circ C$	2	2.9	4	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=1200V, T_j=25^\circ C$	-	-	20	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=-10V, V_{DS}=0V$	-	-	-100	nA
		$V_{GS}=25V, V_{DS}=0V$	-	-	100	nA
Static Drain-Source On Resistance	$R_{DS(ON)}$	$V_{GS}=18V, I_D=100A, T_j=25^\circ C$	-	10	13	m Ω
		$V_{GS}=18V, I_D=100A, T_j=175^\circ C$	-	20	26	m Ω
		$V_{GS}=15V, I_D=100A, T_j=25^\circ C$	-	13.5	17.6	m Ω
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=100A$	-	4.2	5.2	V

•Dynamic characteristics (Tj=25°C,unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	$f=100KHz, V_{DS}=800V, V_{GS}=0V$	-	9234	-	pF
Output Capacitance	C_{oss}		-	415	-	
Reverse Transfer Capacitance	C_{rss}		-	26	-	
Output Charge	Q_{oss}	$f=100KHz, V_{GS}=0V, V_{DS}=0V \text{ to } 800V$	-	561	-	nC
Coss Stored Energy	E_{oss}		-	155	-	μJ
Gate Resistance	R_g	$f=1MHz$	-	0.8	-	Ω
Total Gate Charge	Q_g	$V_{DD}=800V, I_D=100A, V_{GS}=-4V/18V$	-	373	-	nC
Gate - Source Charge	Q_{gs}		-	121	-	
Gate - Drain Charge	Q_{gd}		-	122	-	
Turn-On Delay Time	$t_{D(on)}$	$V_{GS}=-5V/20V, V_{DS}=600V, R_{G_ON}=10\Omega, R_{G_OFF}=10\Omega, I_D=100A, L=100\mu H$	-	52	-	ns
Turn-On Rise Time	t_r		-	34	-	ns
Turn-Off Delay Time	$t_{D(off)}$		-	158	-	ns
Turn-Off Fall Time	t_f		-	38	-	ns
Turn-On Energy	E_{on}		-	1.4	-	mJ
Turn-Off Energy	E_{off}		-	1.11	-	mJ

•NTC Charateristic

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Rated Resistance	R_{25}	$T_{NTC}=25^{\circ}\text{C}$	-	5	-	k Ω
Deviation of R_{100}	$\Delta R/R$	$T_{NTC}=100^{\circ}\text{C}, R_{100}=512\Omega$	-5	-	5	%
Power Dissipation	P_{25}	$T_{NTC}=25^{\circ}\text{C}$	-	-	20	mW
B-value	$B_{25/50}$	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15 \text{ K}))]$	-	3380	-	K

•Module Charateristic

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Isolation Test Voltage	V_{ISO}	RMS, f =50Hz, t =1 min	-	3	-	kV
Internal Isolation Material			SiN			-
Stray Inductance	L_s		-	9	-	nH
Module Pin Resistance, Terminal - Chip	R_{DD-SS}	$T_H=25^{\circ}\text{C}$, Per Switch	-	2	-	m Ω
Mounting Force Per Clamp	F		20	-	50	N
Module Weight	G		-	23	-	g

Fig.1 Gate-source voltage as a function of gate charge; Typical values; $T_j=25^\circ\text{C}$

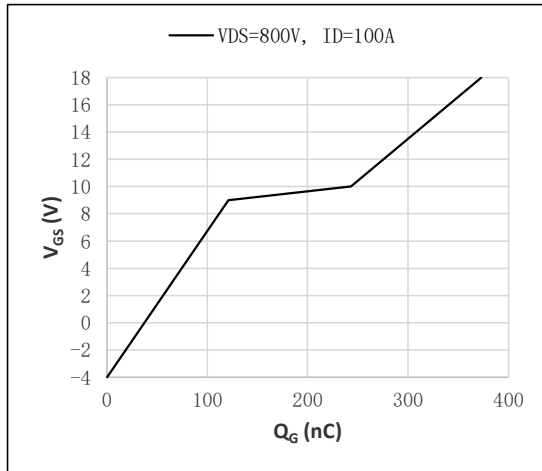


Fig.2 Input, output and reverse transfer capacitances as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$

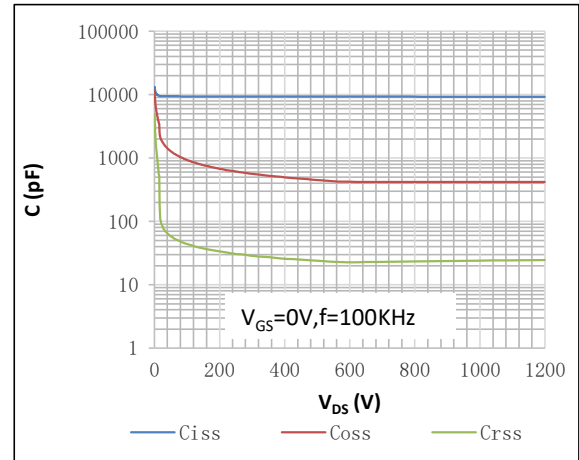


Fig.3 Output characteristics: drain current as a function of drain-source voltage; Typical values; $T_j=25^\circ\text{C}$

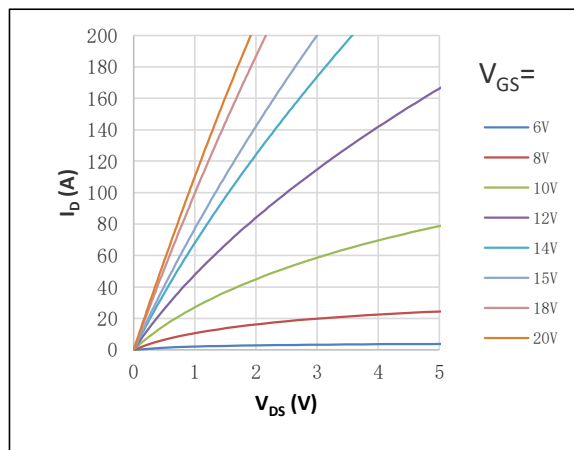


Fig.4 Output characteristics: drain current as a function of drain-source voltage; Typical values: Expanded curve; $T_j=25^\circ\text{C}$

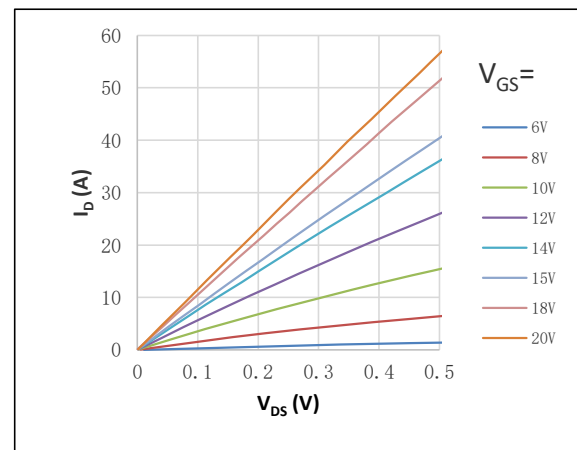


Fig.5 Gate-source threshold voltage as a function of junction temperature; Typical values

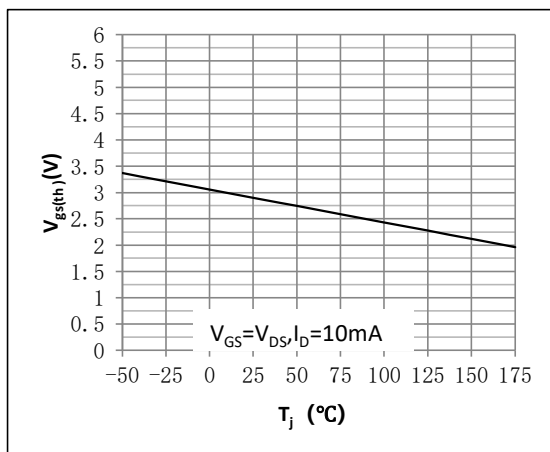


Fig.6 Drain-source on-state resistance as a function of drain current; Typical values; $T_j=25^\circ\text{C}$

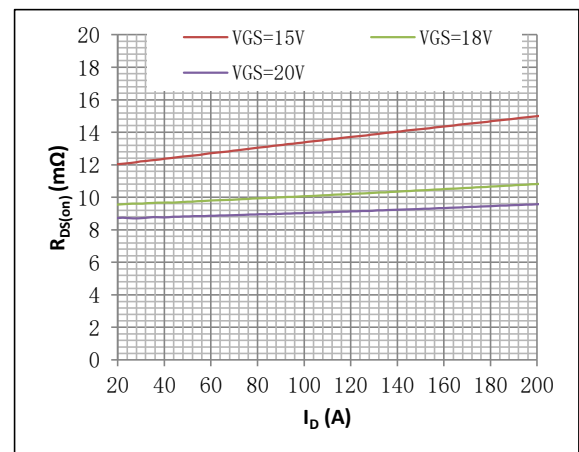


Fig.7 Drain-source on-state resistance as a function of gate-source voltage;Typical values

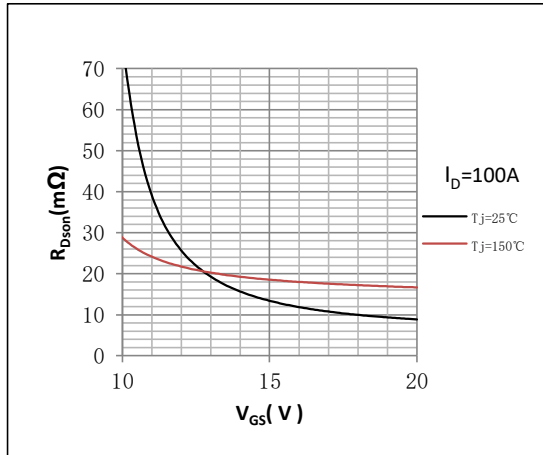


Fig.8 Normalized drain-source on-state resistance factor as a function of junction temperature;Typical values
Normalized On-Resistance= $R_{DS(on)}/R_{DS(on)}(25^{\circ}\text{C})$

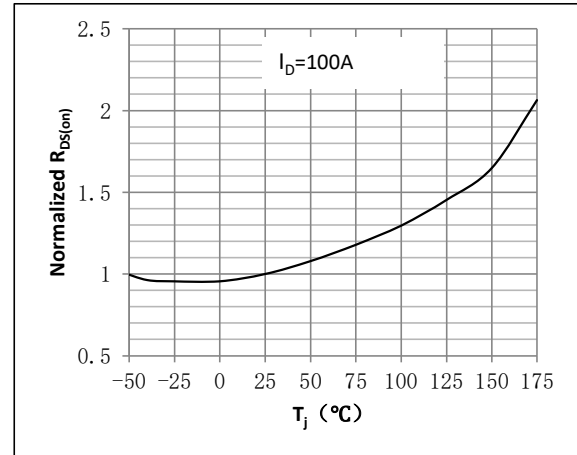


Figure 9. Source (diode forward) current as a function of source-drain (diode forward) voltage ;Typical values

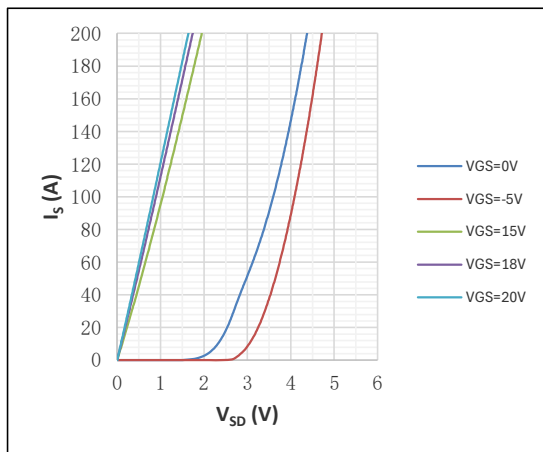


Figure 10. Transfer characteristics: drain current as a function of gate-source voltage;Typical values

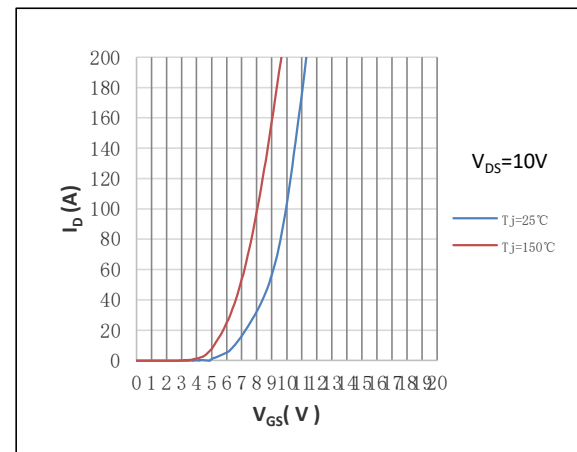


Fig.11 Safe operating area: continuous and peak drain currents as a function of drain-source voltage;Calculative values

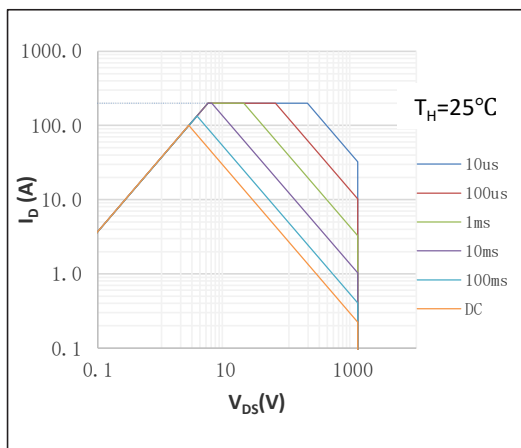


Fig.12 Continuous drain current as a function of heatsink temperature^Θ;Calculative values

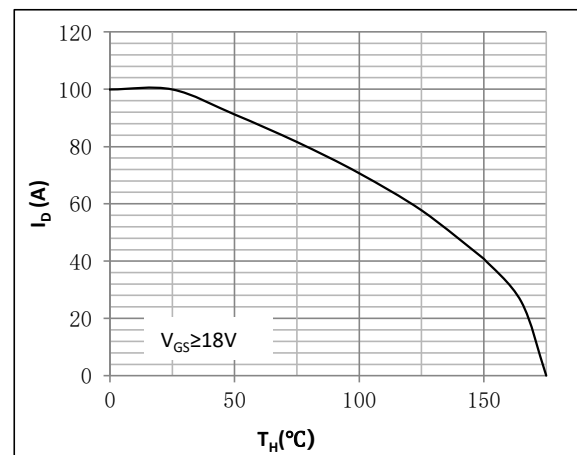


Fig.13 Drain-source breakdown voltage as a function of junction temperature;Typical values

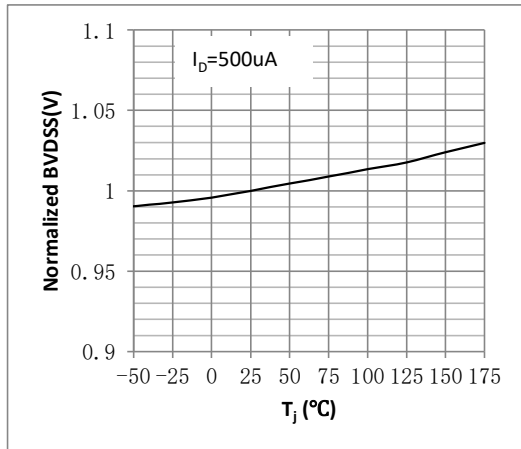


Fig.14 Normalized total power dissipation as a function of heatsink temperature;Calculative values

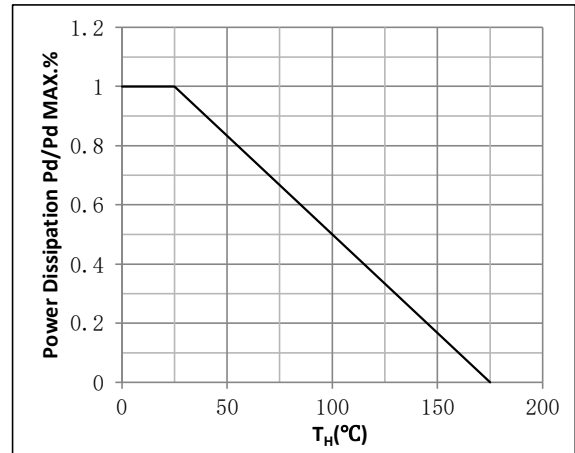
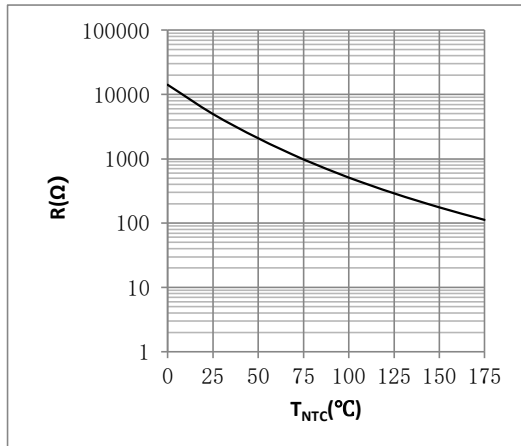
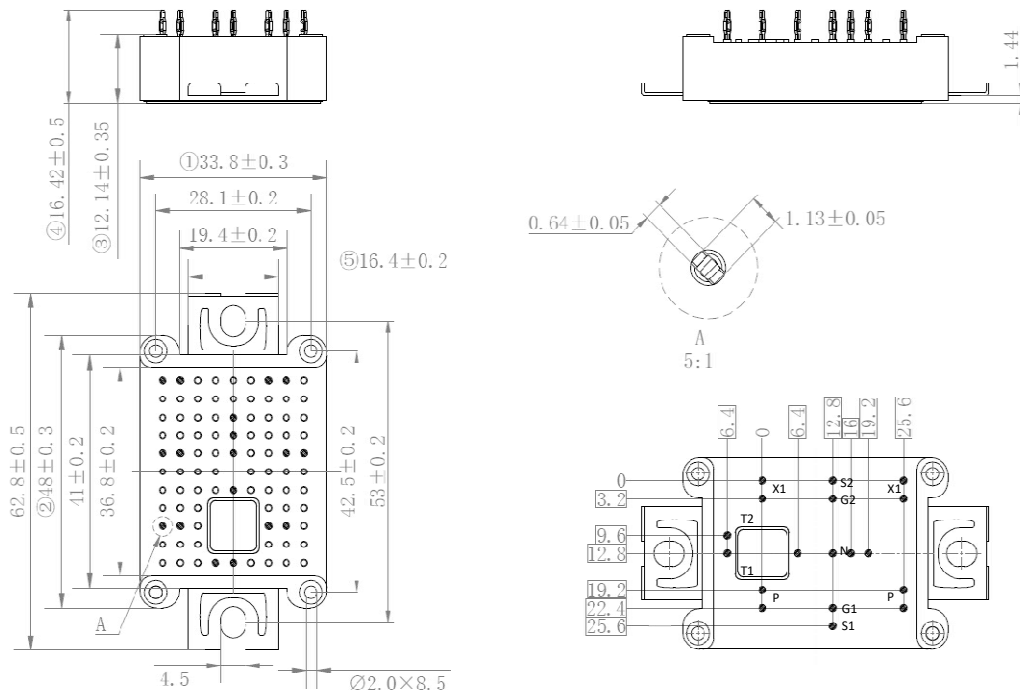


Fig.15 NTC thermistor resistance as a function of NTC temperature;Typical values



●A5D Package Outline



Pinpositions with tolerance $\varnothing 0.4$

Note:

① Pulse : VGS=+25V/-10V, Duty cycle=50%, Tj=175°C, t=1000 hours; For DC , the following test conditions can be passed: VGS=+24V/-10V, Tj=175°C, t=1000 hours;

② Practically the current will be limited by PCB, thermal design and operating temperature. VGS=18V.

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Version	Date	Change
A	2025/1/21	New