

General Description

This silicon carbide Power MOSFET device 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.

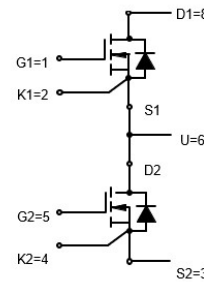
Features

- High Blocking Voltage
- High Speed Switching With Low Capacitances
- Low $R_{DS(on)}$ to Minimize Conductive Loss
- Low Gate Charge For Fast Switching
- Low Thermal Resistance
- 100% Avalanche Tested
- AEC-Q101 Qualified

Application

- Motor Drives
- On Board Charger
- DC-DC
- Auxiliary Drives

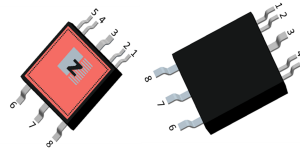
Product Summary



$$V_{DS} = 1200V$$

$$R_{DS(ON)} = 20m\Omega$$

$$I_D = 99A$$



HSOP8



Ordering Information:

Part NO.	ZMCA020R120H8
Marking	ZMC020R120
Packing Information	REEL TAPE
Basic Ordering Unit (pcs)	200

Absolute Maximum Ratings ($T_C=25^\circ C$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		1200	V
Gate-Source Voltage	V_{GS}	Transient Voltage	-10V/25V	V
	V_{GS}	Static Voltage	-10V/24V	V
Recommended Turn On Gate Voltage	$V_{GS(on)}$		15 to 18V	V
Recommended Turn Off Gate Voltage	$V_{GS(off)}$		-4V to 0V	V
Continuous Drain Current	I_D	$T_C=25^\circ C$	99	A
	I_D	$T_C=100^\circ C$	70	A
	I_D	$T_C=150^\circ C$	40	A

1200V N-Channel SiC MOSFET Module

Pulsed Drain Current ^①	I_{DM}	Pulsed; $t_p \leq 10 \mu s$; $T_{mb} = 25^\circ C$;	396	A
Total Power Dissipation	P_D	$T_C = 25^\circ C$	484	W
Total Power Dissipation	P_D	$T_A = 25^\circ C$	6.0	W
Operating Junction Temperature	T_J		-55 to +175	$^\circ C$
Storage Temperature	T_{STG}		-55 to +175	$^\circ C$
Single Pulse Avalanche Energy	E_{AS}	$L=0.5mH, V_{GS}=18V, R_g=25\Omega$	1225	mJ
ESD Level (HBM)	Class2			

• Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction - Case	R_{thJC}	-	-	0.31	$^\circ C/W$
Thermal Resistance, Junction-Ambient	R_{thJA} ①	-	-	25	$^\circ C/W$
Soldering Temperature(total time<10s)	T_{sold}	-	-	260	$^\circ C$

• Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	1200	-	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=5mA$	2	2.9	4	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=1200V$	-	-	10	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	$R_{DS(on)}$	$T_J=25^\circ C, V_{GS}=18V, I_D=39A$	-	20	26	m Ω
		$T_J=175^\circ C, V_{GS}=18V, I_D=39A$	-	38.3	-	m Ω
		$T_J=25^\circ C, V_{GS}=15V, I_D=39A$	-	26	-	m Ω
Forward Transconductance	g_{fs}	$V_{DS}=10V, I_{SD}=39A$	-	27	-	S
Diode Forward Voltage	V_{FSD}	$V_{GS}=-4V, I_{SD}=39A$	-	3.8	5	V

• Dynamic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	$f = 100KHz, V_{DS}=800V$	-	4840	-	pF
Output Capacitance	C_{oss}		-	190	-	
Reverse Transfer Capacitance	C_{rss}		-	8	-	
Output Charge	Q_{oss}	$f = 100KHz, V_{GS}=0V, V_{DS}=0V \text{ to } 800V$	-	266	-	nC
Coss Stored Energy	E_{oss}		-	72	-	μJ
Gate Resistance	R_g	$f = 1MHz$	-	1.9	-	Ω
Total Gate Charge	Q_g	$V_{DD} = 800V, I_D = 39A, V_{GS} = -4V/18V$	-	186	-	nC
Gate - Source Charge	Q_{gs}		-	65	-	
Gate - Drain Charge	Q_{gd}		-	76	-	

Turn-ON Delay Time	$t_{D(on)}$	VGS=-4V/18V, VDS=800V, RG_ON =33Ω, RG_OFF =40Ω, ID =39A, L=100uH	-	20	-	ns
Turn-ON Rise Time	t_r		-	8	-	ns
Turn-Off Delay Time	$t_{D(off)}$		-	45	-	ns
Turn-Off Fall Time	t_f		-	20	-	ns
Turn-On Energy	E_{on}		-	0.465	-	mJ
Turn-Off Energy	E_{off}		-	0.138	-	mJ
Reverse Recovery Time	t_{rr}	VDD=800V, dIS/dt = 650A/us, IS=39A	-	21	-	ns
Reverse Recovery Peak Current	I_{rrm}		-	15	-	A
Reverse Recovery Charge	Q_{rr}		-	198	-	uC

• Characteristics Diagrams

Fig.1 Gate-Charge Characteristics

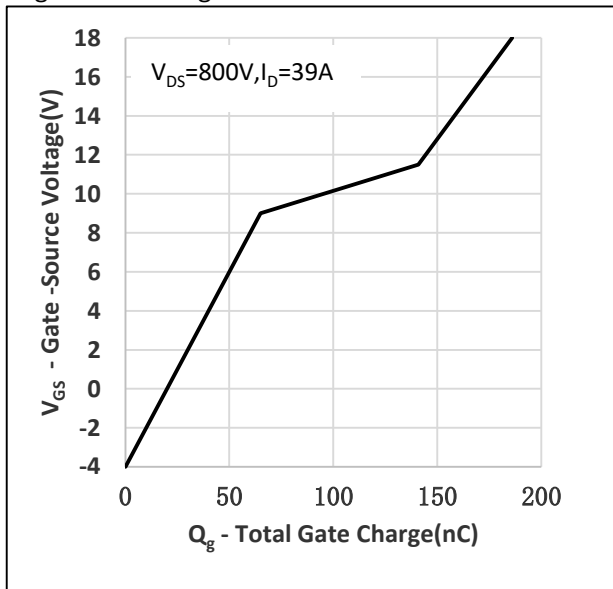


Fig.2 Capacitance Characteristics

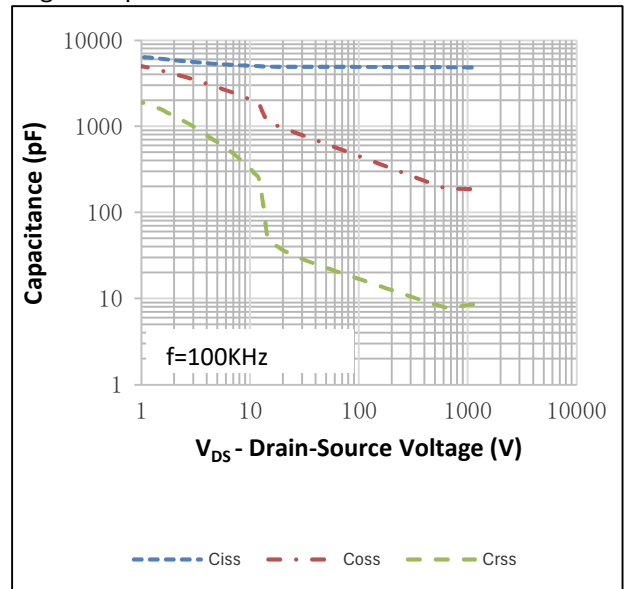


Fig.3 Power Dissipation

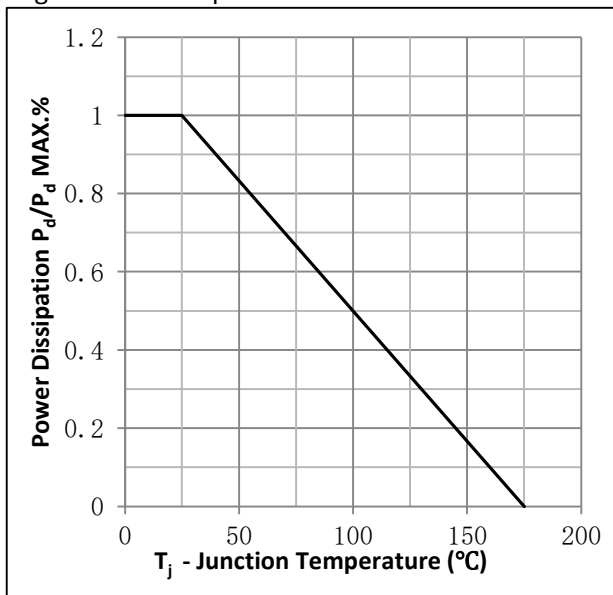


Fig.4 Typical Output Characteristics

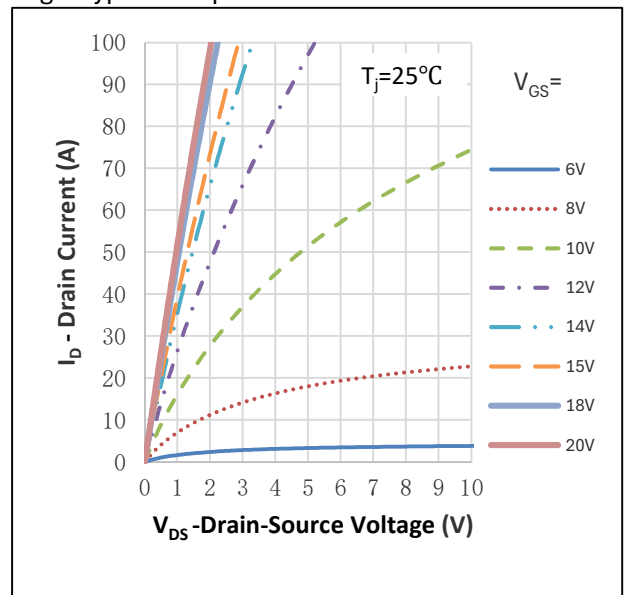


Fig.5 Threshold Voltage vs. Junction Temperature

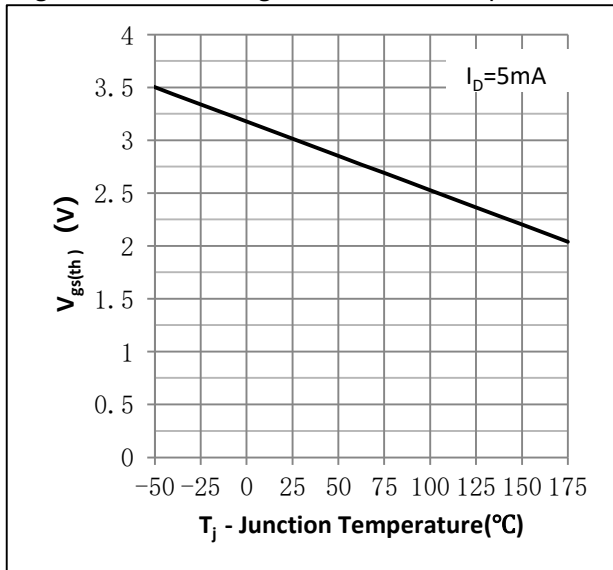


Fig.6 On-Resistance vs. Drain Current

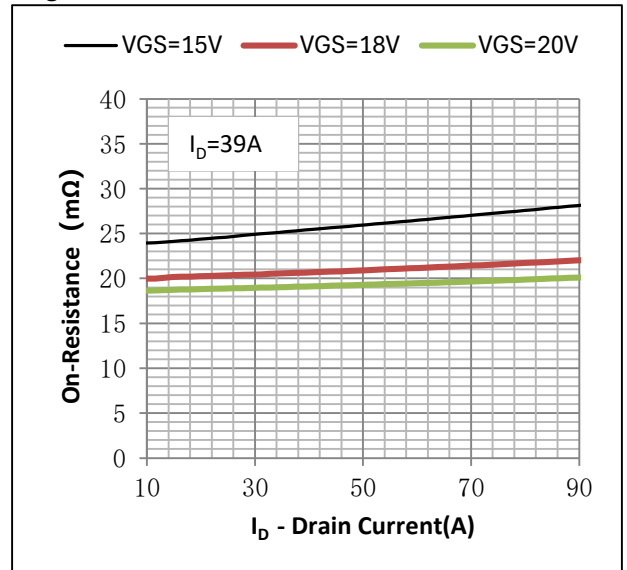


Fig.7 On-Resistance vs. Gate Source Voltage

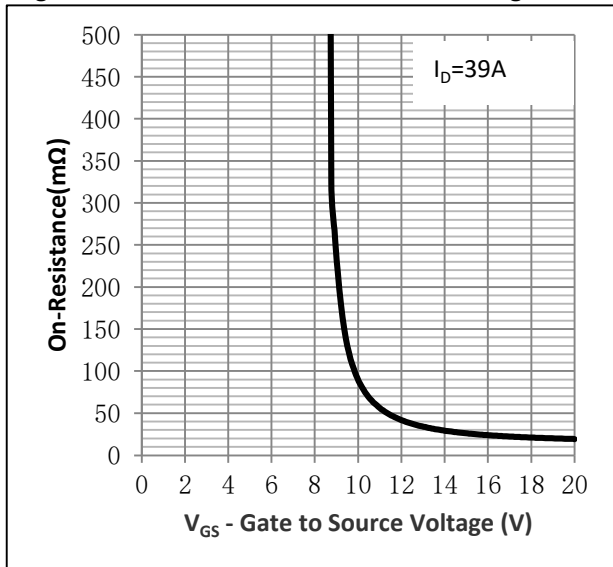


Fig.8 On-Resistance vs. Junction Temperature

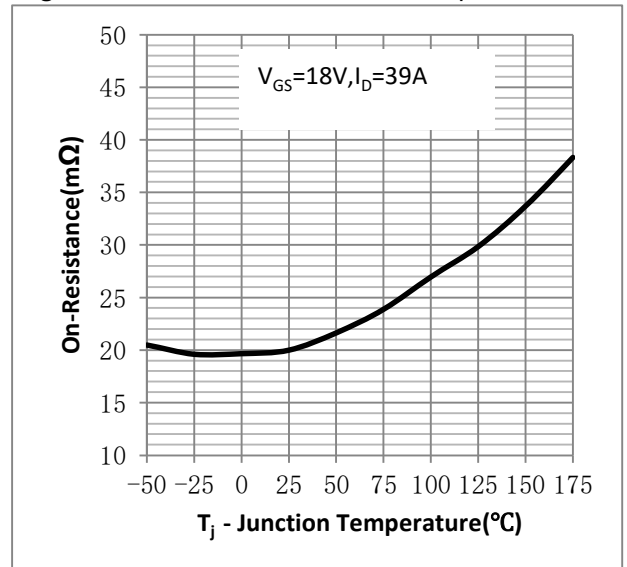


Figure 9. Diode Forward Voltage vs. Current

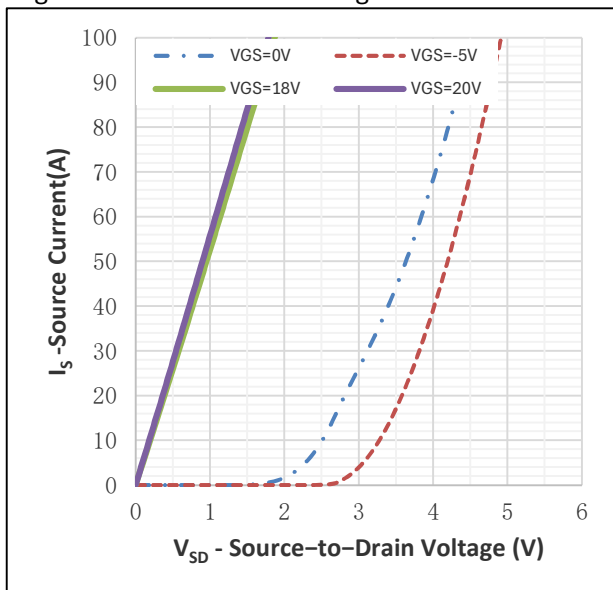


Figure 10. Transfer Characteristics

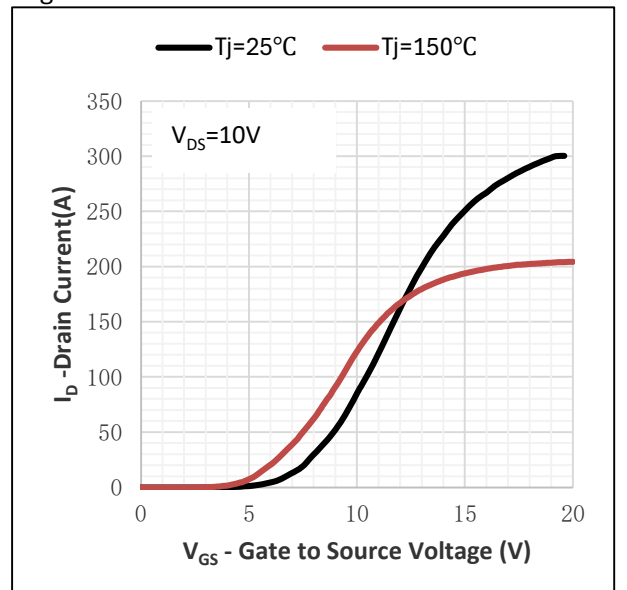


Fig.11 SOA Maximum Safe Operating Area

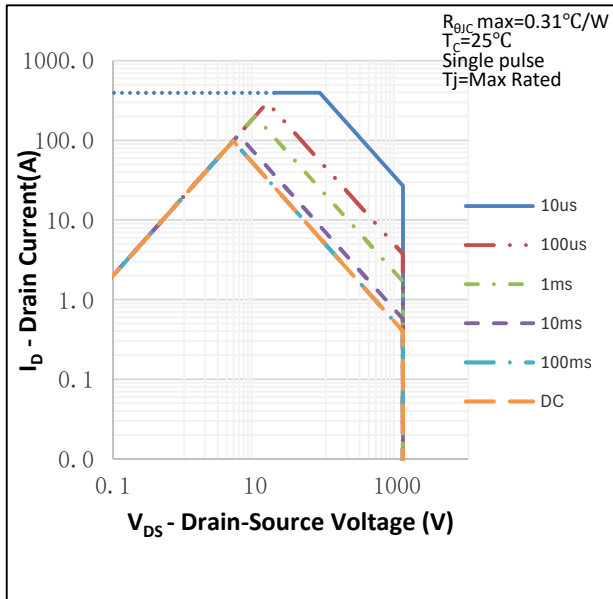


Fig.12 I_D vs. Junction Temperature②

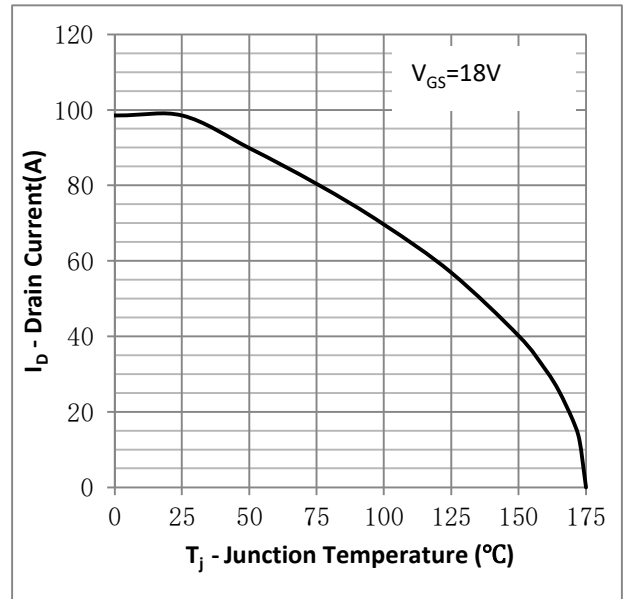


Fig.13 Output Capacitor Stored Energy

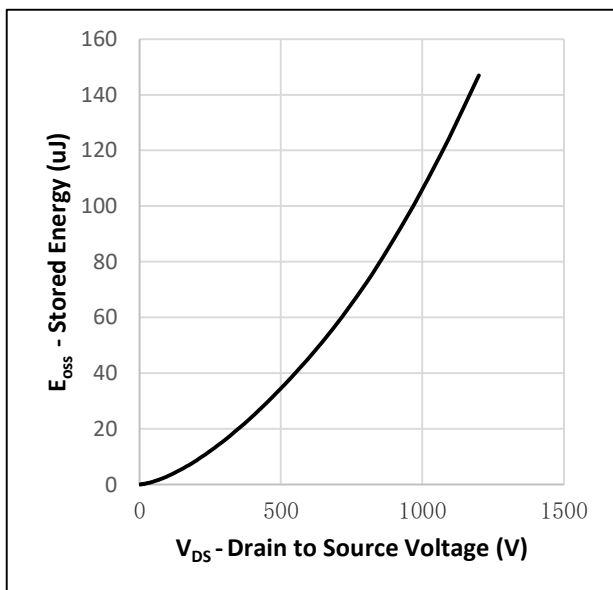
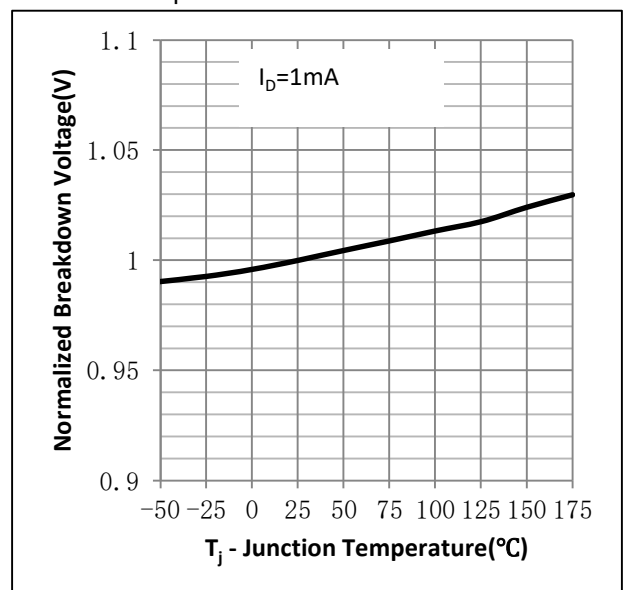
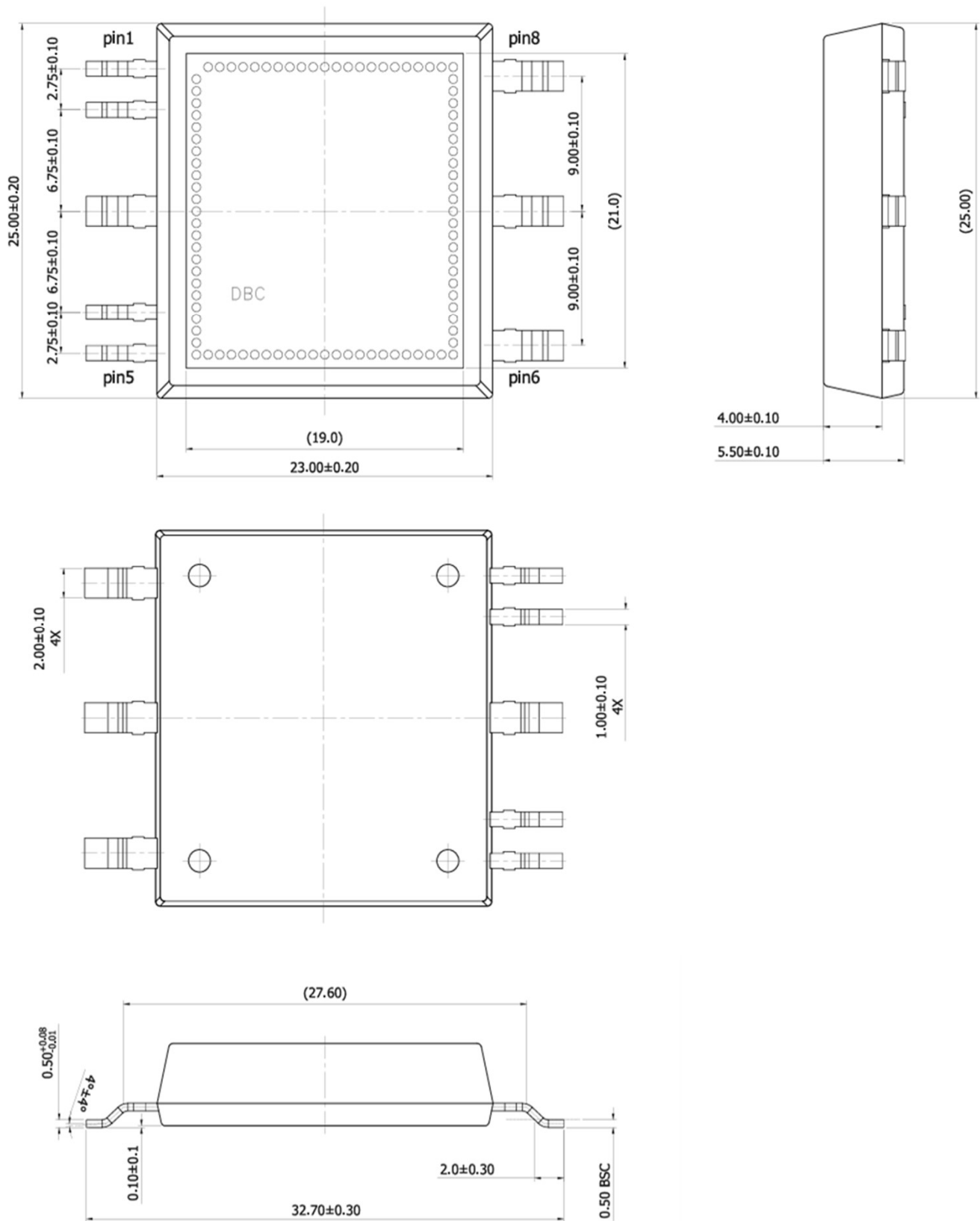


Fig.14 Normalized Breakdown Voltage vs. Junction Temperature



●HSOP8 Package Outline



Note:

- ① The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A=25^{\circ}\text{C}$
- ② Practically the current will be limited by PCB, thermal design and operating temperature. $V_{GS}=18\text{V}$.

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Revision History:

Version	Date	Change
A	2024/10/25	New
B	2024/11/22	Update VGS maximum rating and IGSS+ test condition.
C	2025/4/12	Update Fig.8 Rdson vs Tj curve.