

• General Description

It combines trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. It combines one N channel MOSFET and one P channel MOSFET

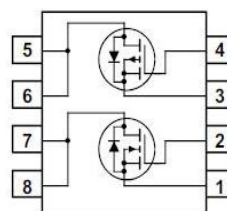
• Features

- AEC-Q101 Qualified
- Low $R_{DS(ON)}$ to minimize conductive loss
- Dual DIE in one package
- Low Thermal resistance

• Application

- BLDC Motor driver
- Load switch

• Product Summary



$$V_{DS1} = 60V$$

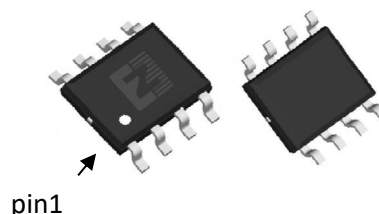
$$V_{DS2} = -60V$$

$$R_{DS(ON)1} = 30m\Omega$$

$$R_{DS(ON)2} = 57m\Omega$$

$$I_{D1} = 5.2A$$

$$I_{D2} = -3.8A$$



SOP-8



• Ordering Information:

Part NO.	ZMCA88602S
Marking	ZMC88602
Packing Information	REEL TAPE
Basic ordering unit (pcs)	4000

• N Channel Absolute Maximum Ratings ($T_C=25^{\circ}C$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		60	V
Gate-Source Voltage	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^{\circ}C$	5.2	A
	I_D	$T_C=75^{\circ}C$	5	A
	I_D	$T_C=100^{\circ}C$	4	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu s$; $T_{mb} = 25^{\circ}C$;	15.6	A
Total Power Dissipation	P_D	$T_C=25^{\circ}C$	4	W
Total Power Dissipation	P_D	$T_A=25^{\circ}C$	0.7	W
Operating Junction Temperature	T_J		-55 to +150	$^{\circ}C$
Storage Temperature	T_{STG}		-55 to +150	$^{\circ}C$
Single Pulse Avalanche Energy	E_{AS}	$L=0.1mH$, $V_{GS}=10V$, $R_g=25\Omega$,	30	mJ
		$L=0.5mH$, $V_{GS}=10V$, $R_g=25\Omega$,	63	mJ
ESD Level (HBM)	CLASS 1C			

•P Channel Absolute Maximum Ratings ($T_C=25^{\circ}\text{C}$)

Parameter	Symbol	Conditions	Value	Unit
Drain-Source Voltage	V_{DS}		-60	V
Gate-Source Voltage	V_{GS}		± 20	V
Continuous Drain Current	I_D	$T_C=25^{\circ}\text{C}$	-3.8	A
	I_D	$T_C=75^{\circ}\text{C}$	-4	A
	I_D	$T_C=100^{\circ}\text{C}$	-3	A
Pulsed Drain Current	I_{DM}	Pulsed; $t_p \leq 10 \mu\text{s}$; $T_{mb} = 25^{\circ}\text{C}$;	-11.4	A
Total Power Dissipation	P_D	$T_C=25^{\circ}\text{C}$	4	W
Total Power Dissipation	P_D	$T_A=25^{\circ}\text{C}$	0.7	W
Operating Junction Temperature	T_J		-55 to +150	$^{\circ}\text{C}$
Storage Temperature	T_{STG}		-55 to +150	$^{\circ}\text{C}$
Single Pulse Avalanche Energy	E_{AS}	$L=0.1\text{mH}$, $V_{GS}=-10\text{V}$, $R_g=25\Omega$,	30	mJ
		$L=0.5\text{mH}$, $V_{GS}=-10\text{V}$, $R_g=25\Omega$,	54	mJ
ESD Level (HBM)	CLASS 1C			

•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}		-	34	$^{\circ}\text{C/W}$
Thermal resistance, junction-ambient ^①	R_{thJA}		-	180	$^{\circ}\text{C/W}$
Soldering temperature	T_{sld}		-	260	$^{\circ}\text{C}$

•N Channel Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	60			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	1.3	1.8	2.5	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=60V$			1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.2A$		30	39	m Ω
		$V_{GS}=4.5V, I_D=4A$		36	48	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_{SD}=2A$		5		S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=5.2A$			1.3	V

•N Channel Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=25V$	-	1300	-	pF
Output capacitance	C_{oss}		-	53	-	
Reverse transfer capacitance	C_{rss}		-	31	-	
Gate Resistance	R_g	$f=1MHz$	-	1.5		Ω
Total gate charge	Q_g	$V_{DD}=25V, I_D=3A, V_{GS}=10V$	-	17	-	nC
Gate - Source charge	Q_{gs}		-	4.1	-	
Gate - Drain charge	Q_{gd}		-	2.5	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=15V, R_G=3.3\Omega, I_D=20A$	-	16	-	ns
Turn-ON Rise time	t_r		-	9	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	23	-	ns
Turn-Off Fall time	t_f		-	5	-	ns

•P Channel Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-60			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.3	-1.8	-2.5	V
Drain-Source Leakage Current	I_{DSS}	$V_{GS}=0V, V_{DS}=-60V$			1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$			100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-4.7A$		57	74	m Ω
		$V_{GS}=-4.5V, I_D=-3.7A$		80	104	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-5V, I_{SD}=-2A$		1.5		S
Diode Forward Voltage	V_{FSD}	$V_{GS}=0V, I_{SD}=-4.7A$			1.3	V

•P Channel Dynamic characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$f=1MHz, V_{DS}=-25V$	-	1380	-	pF
Output capacitance	C_{oss}		-	101	-	
Reverse transfer capacitance	C_{rss}		-	67	-	
Gate Resistance	R_g	$f=1MHz$	-	7.5		Ω
Total gate charge	Q_g	$V_{DD}=-25V, I_D=-3A, V_{GS}=-10V$	-	20	-	nC
Gate - Source charge	Q_{gs}		-	3.5	-	
Gate - Drain charge	Q_{gd}		-	3.6	-	
Turn-ON Delay time	$t_{D(on)}$	$V_{GS}=-10V, V_{DS}=-15V, R_G=3.3, I_D=-10A$	-	20	-	ns
Turn-ON Rise time	t_r		-	174	-	ns
Turn-Off Delay time	$t_{D(off)}$		-	43	-	ns
Turn-Off Fall time	t_f		-	10.4	-	ns

• N Channel characteristics curve

Fig.1 Gate-Charge Characteristics

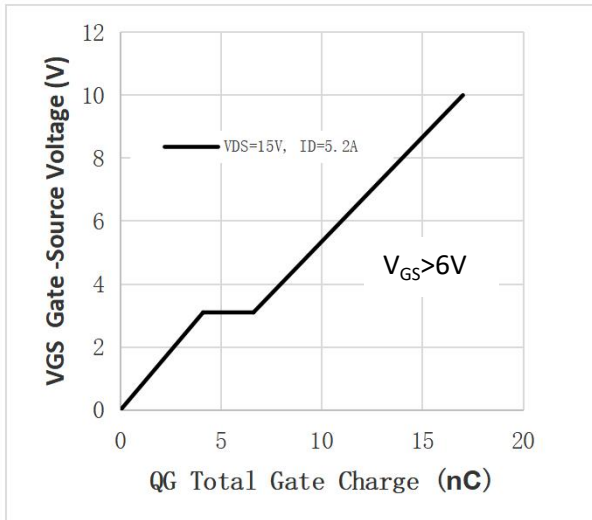


Fig.2 Capacitance Characteristics

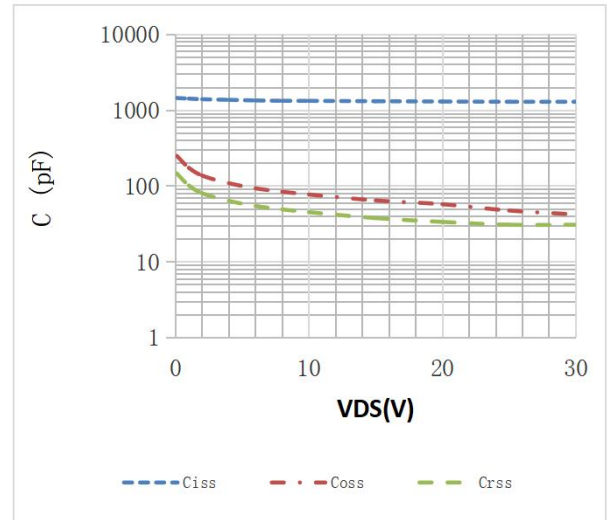


Fig.3 Power Dissipation

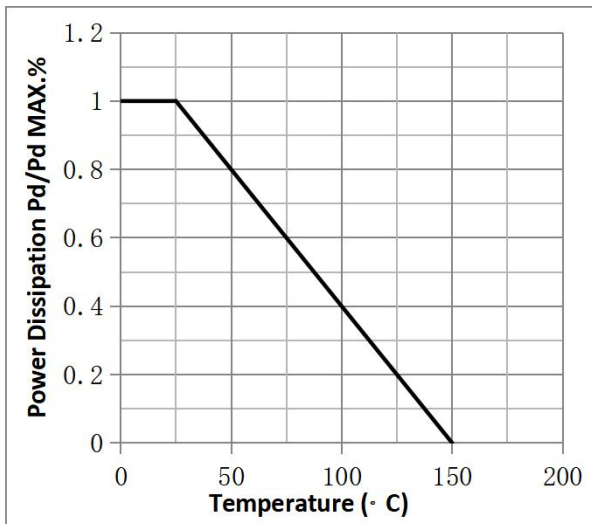


Fig.4 Typical output Characteristics

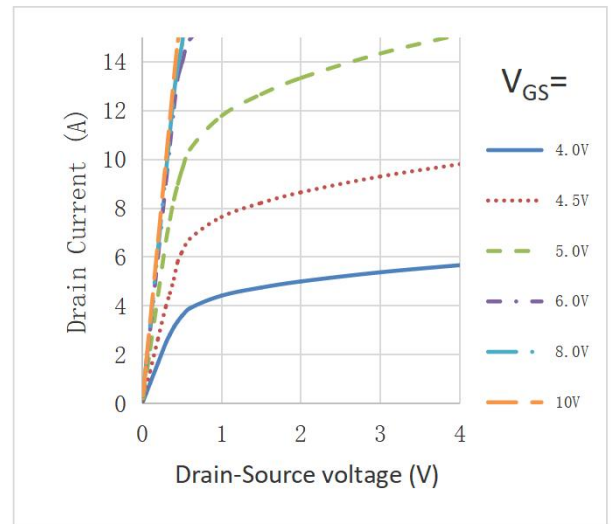


Fig.5 Threshold Voltage V.S Junction Temperature

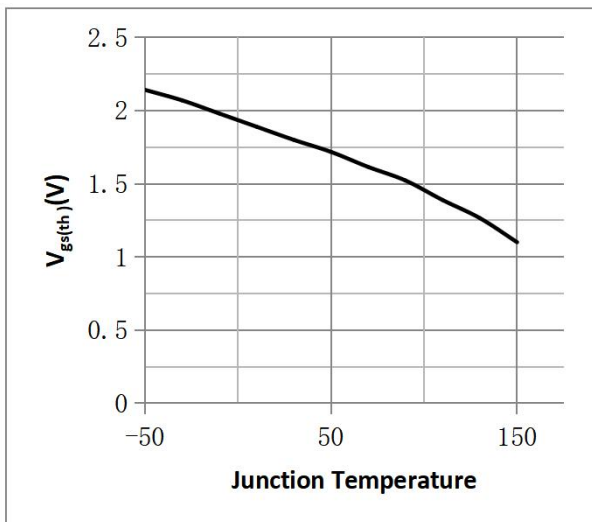


Fig.6 Resistance V.S Drain Current

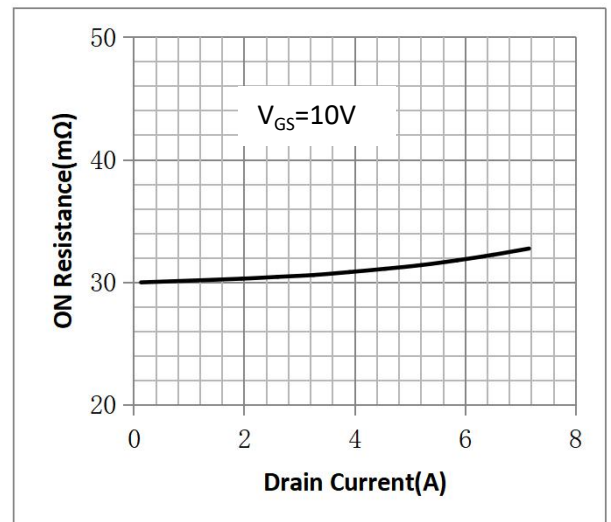


Fig.7 On-Resistance VS Gate Source Voltage

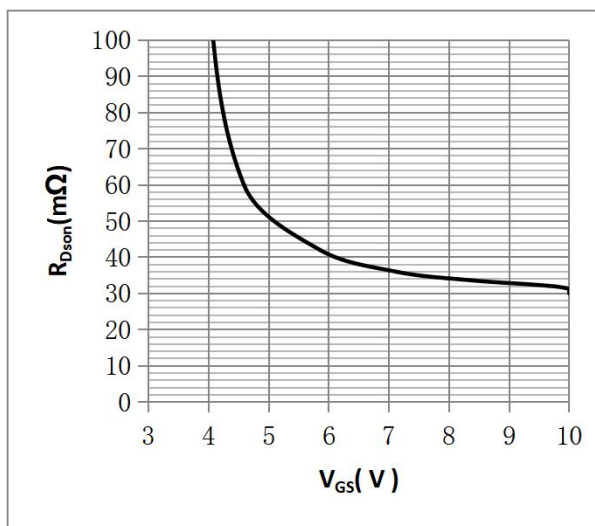


Fig.8 On-Resistance V.S Junction Temperature

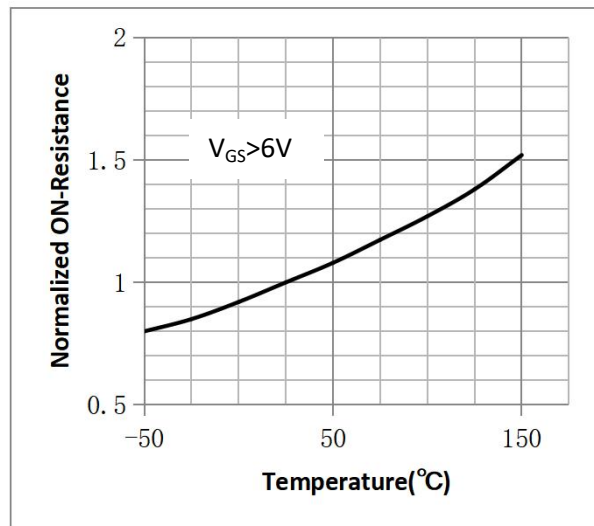


Figure 9. Diode Forward Voltage vs. Current

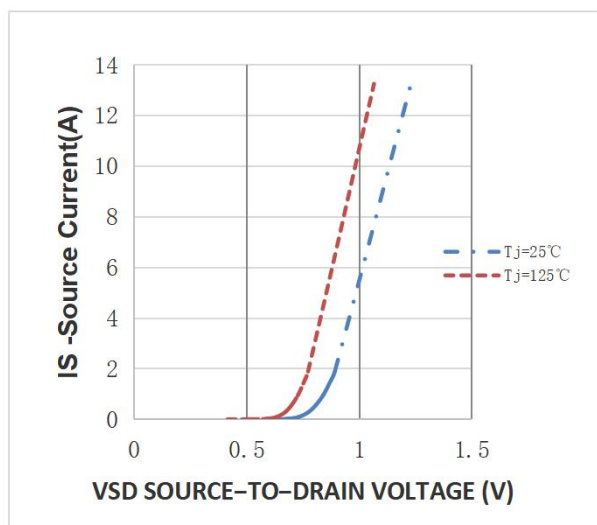


Figure 10. Transfer Characteristics

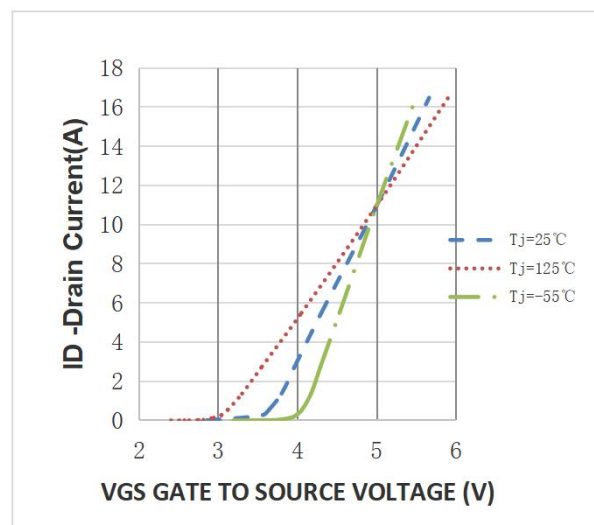


Fig.11 Safe Operating Area

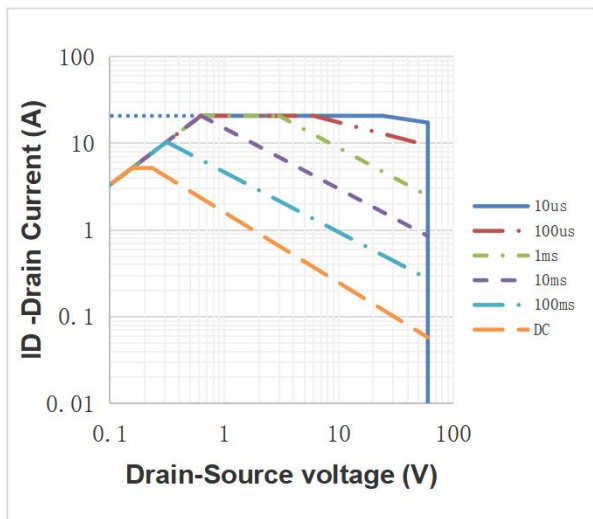
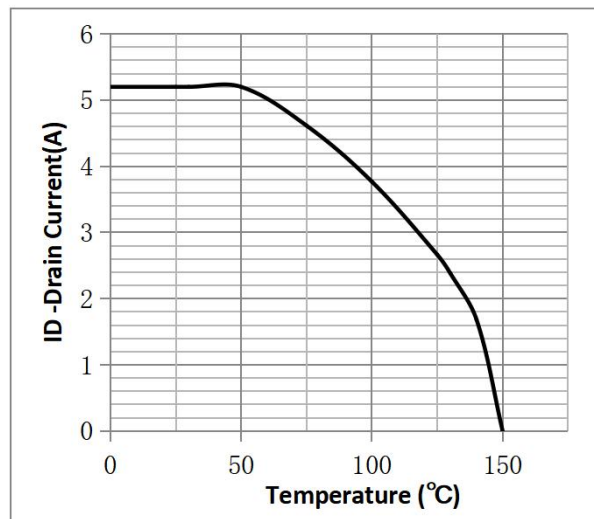


Fig.12 ID vs. Case Temperature^②



•p Channel characteristics curve

Fig.1 Gate-Charge Characteristics

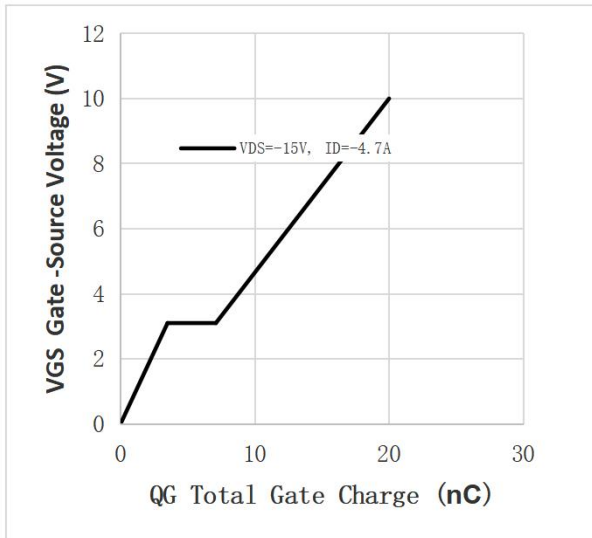


Fig.2 Capacitance Characteristics

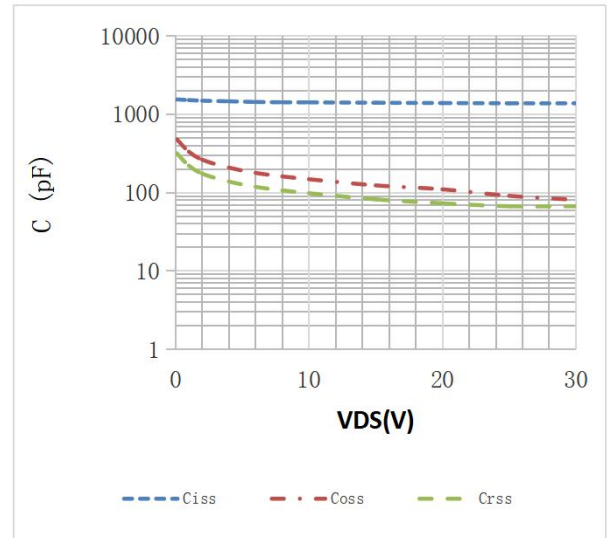


Fig.3 Power Dissipation

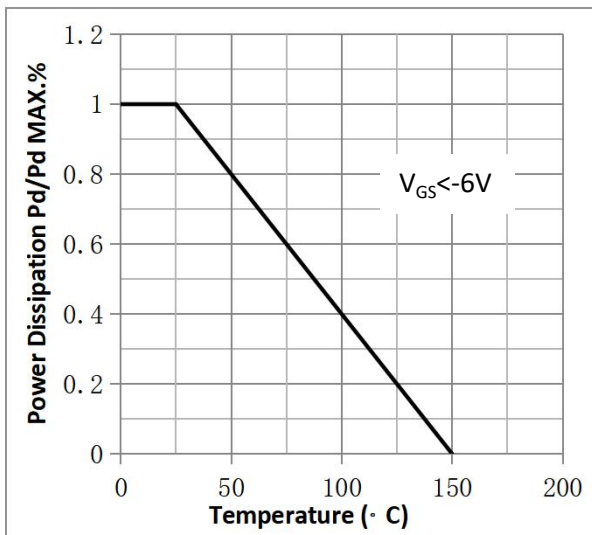


Fig.4 Typical output Characteristics

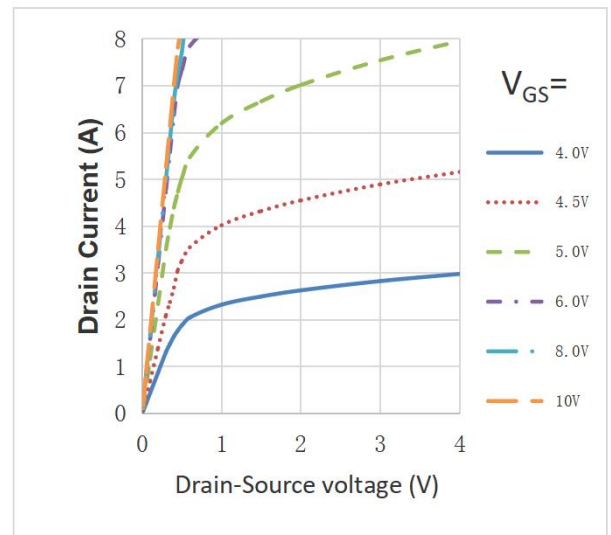


Fig.5 Threshold Voltage V.S Junction Temperature

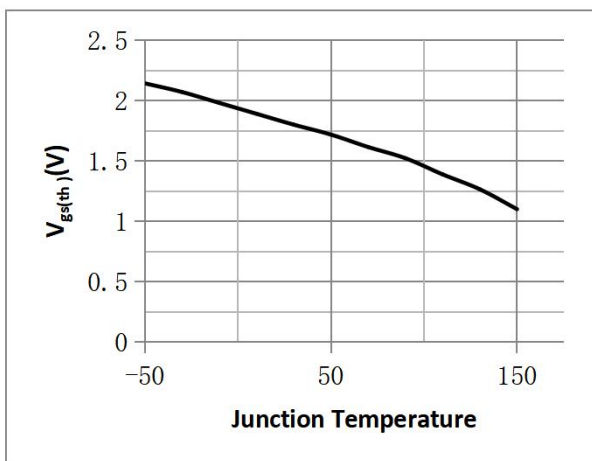


Fig.6 Resistance V.S Drain Current

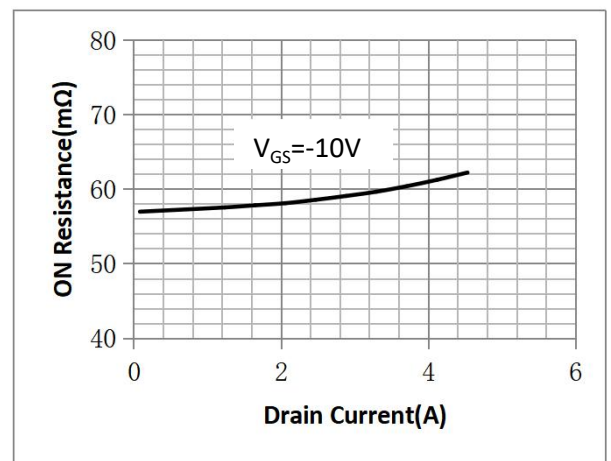


Fig.7 On-Resistance VS Gate Source Voltage

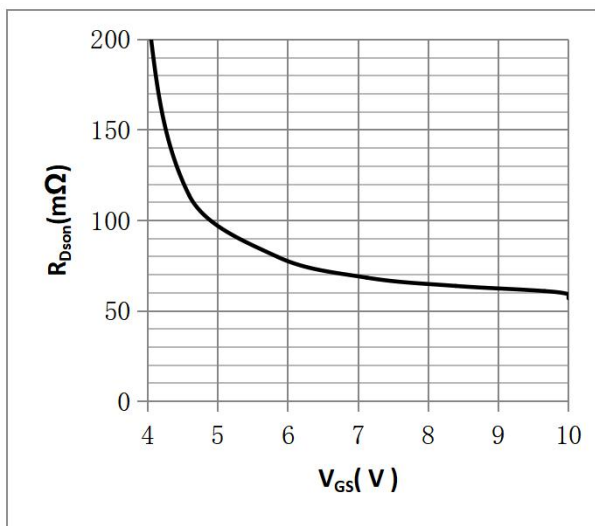


Fig.8 On-Resistance V.S Junction Temperature

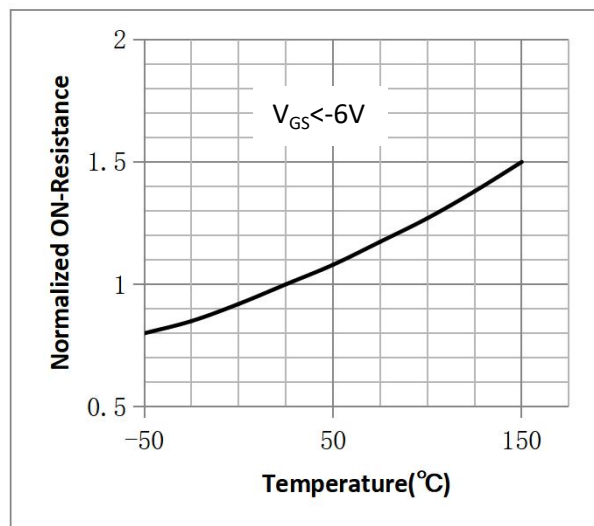


Figure 9. Diode Forward Voltage vs. Current

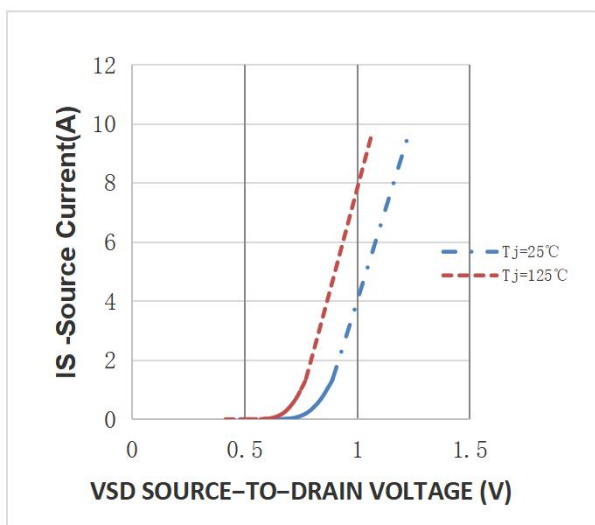


Figure 10. Transfer Characteristics

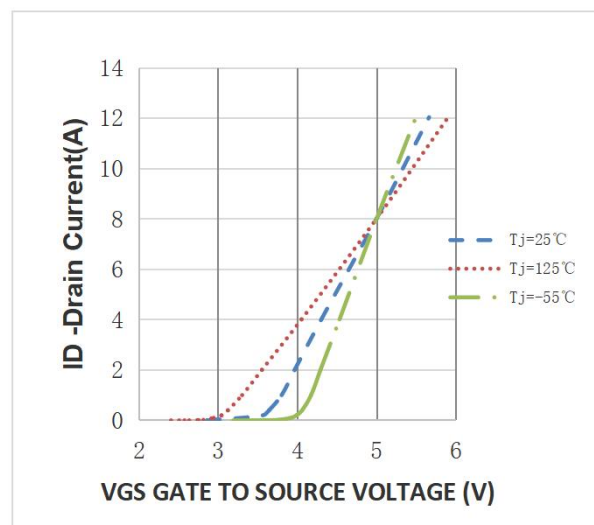


Fig.11 Safe Operating Area

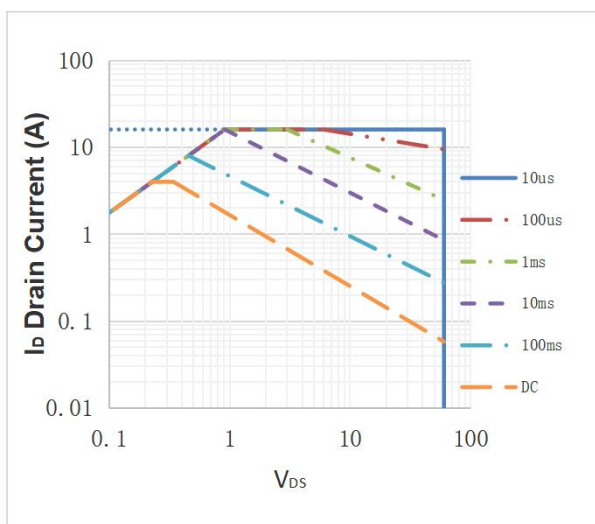
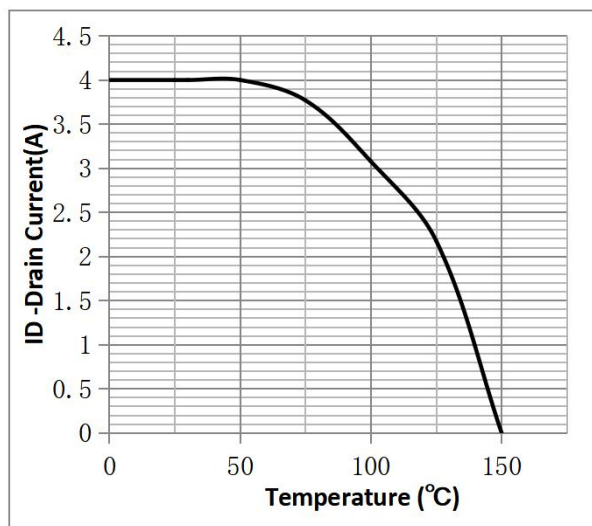
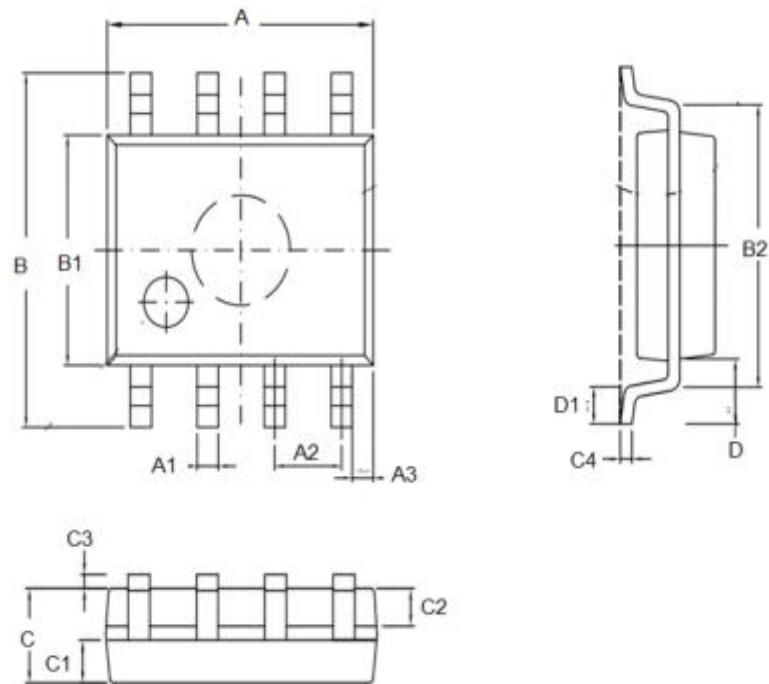


Fig.12 ID vs. Case Temperature^②



●SOP-8 Package Outline



SYMBOL	min	TYP	max	SYMBOL	min		max
A	4.80		5.25	C	1.30		1.75
A1	0.37		0.49	C1	0.55		0.75
A2		1.27		C2	0.55		0.65
A3		0.41		C3	0.05		0.20
B	5.80		6.20	C4	0.10	0.20	0.23
B1	3.80		4.10	D		1.05	
B2		5.00		D1	0.40		0.62

Note:

- ① Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;
- ② Practically the current will be limited by PCB, thermal design and operating temperature.
VGS=10V (N channel)/-10V(P channel).

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Revision History

Version	Date	Change
A	2022.2.16	NEW
B	2023.10.13	Use new version