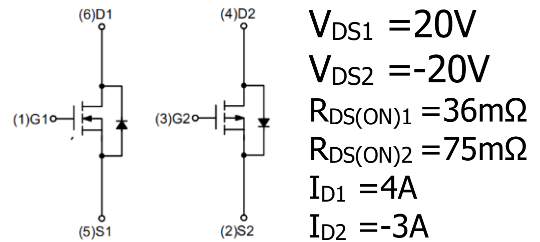
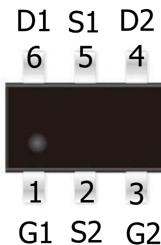
● General Description

It combines advanced 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.

● Product Summary





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● Features

- ■ Advance high cell density Trench technology
- ■ Low $R_{DS(ON)}$ to minimize conductive loss
- ■ Low Gate Charge for fast switching
- ■ Dual DIE in one package

●Application

- ■ Power Management in Notebook Computer
- ■ BLDC Motor driver

●Ordering Information:

Part NO.	ZMC88212U
Marking	88212
Packing Information	REEL TAPE
Basic ordering unit (pcs)	3000

●N Channel Absolute Maximum Ratings (T_C =25℃)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	±12	V
Continuous Drain Current	I_D@T_C=25℃	4	A
	I_D@T_C=75℃	3	A
	I_D@T_C=100℃	2.5	A
Pulsed Drain Current ①	I_{DM}	12	A
Total Power Dissipation	P_D@T_C=25℃	2.1	W
Total Power Dissipation	P_D@T_A=25℃	1.25	W
Operating Junction Temperature	T_J	-55 to 150	℃
Storage Temperature	T_{STG}	-55 to 150	℃
Single Pulse Avalanche Energy	E_{AS}	5	mJ

•P Channel Absolute Maximum Ratings (T_C =25℃)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	±12	V
Continuous Drain Current	I_D@T_C=25℃	-3	A
	I_D@T_C=75℃	-2.3	A
	I_D@T_C=100℃	-1.9	A
Pulsed Drain Current ①	I_{DM}	-9	A
Total Power Dissipation	P_D@T_C=25℃	9	W
Total Power Dissipation	P_D@T_A=25℃	0.45	W
Operating Junction Temperature	T_J	-55 to 150	℃
Storage Temperature	T_{STG}	-55 to 150	℃
Single Pulse Avalanche Energy	E_{AS}	5	mJ

•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	60	° C/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	100	° C/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	° C

•N Channel Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} =0V, I_D =250uA	20			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} =V_{DS}, I_D =250uA	0.5	0.8	1.2	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=20V, V_{GS} =0V			1.0	uA
Gate- Source Leakage Current	I_{GSS}	V_{GS}=±12V, V_{DS} =0V			±100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=4A		36	50	mΩ
		V_{GS}=2.5V, I_D=3A		50	65	mΩ
Forward Transconductance	g_{FS}	V_{DS} =10V, I_D=1A		2		s

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit

Input capacitance	Ciss	f = 1MHz	-	293	-	pF
Output capacitance	Coss		-	28	-	
Reverse transfer capacitance	Crss		-	25	-	

•Gate Charge characteristics(T_a = 25℃)

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Total gate charge	Qg	VDD =15V ID = 4A VGS = 10V	-	8	-	nC
Gate - Source charge	Qgs		-	0.4	-	
Gate - Drain charge	Qgd		-	1.5	-	

•P Channel Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} =0V, I_D =-250uA	-20			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} =V_{DS}, I_D =-250uA	-0.5	-0.8	-1.2	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=-20V, V_{GS} =0V			-1.0	uA
Gate- Source Leakage Current	I_{GSS}	V_{GS}=±12V, V_{DS} =0V			±100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	V_{GS}=-4.5V, I_D=-3A		75	100	mΩ
		V_{GS}=-2.5V, I_D=-2.5A		95	120	mΩ
Forward Transconductance	g_{FS}	V_{DS} =-10V, I_D=-1A		1.5		s

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Input capacitance	Ciss	f = 1MHz	-	430	-	pF
Output capacitance	Coss		-	74	-	
Reverse transfer capacitance	Crss		-	68	-	

•Gate Charge characteristics(T_a = 25℃)

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Total gate charge	Qg	V_{DD} = -15V I_D = -3A V_{GS} = -10V	-	10.7	-	nC
Gate - Source charge	Qgs		-	0.6	-	
Gate - Drain charge	Qgd		-	2.2	-	

•N Channel characteristics curve

Fig.1 Power Dissipation

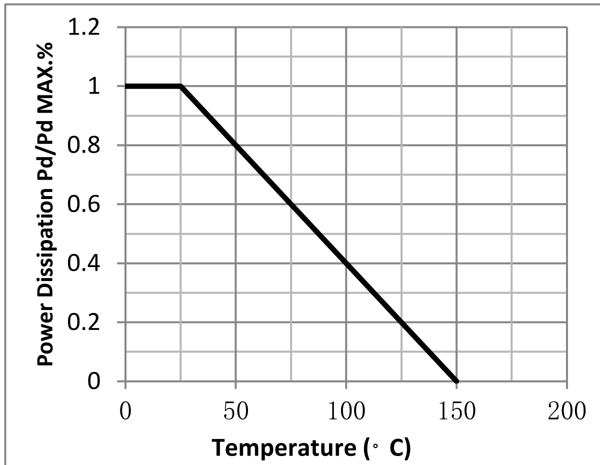


Fig.2 Typical output Characteristics

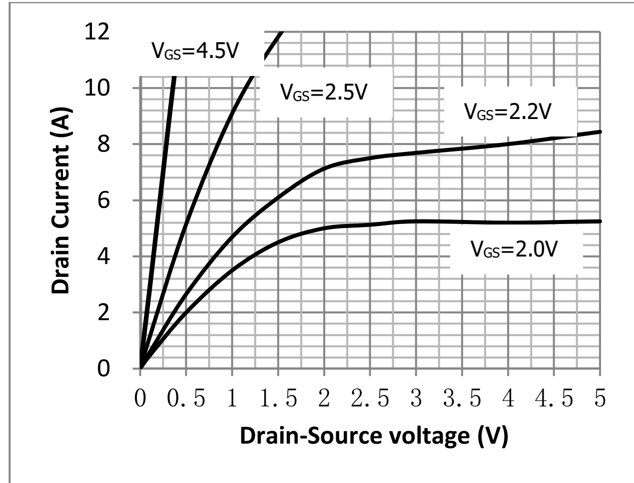


Fig.3 Threshold Voltage V.S Junction Temperature

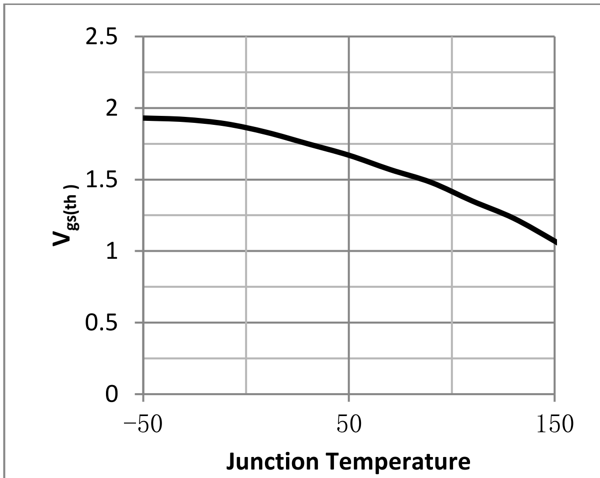


Fig.4 Resistance V.S Drain Current

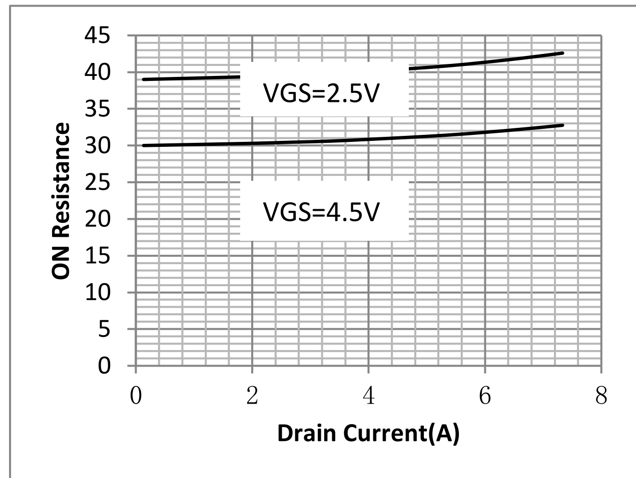


Fig.5 On-Resistance VS Gate Source Voltage

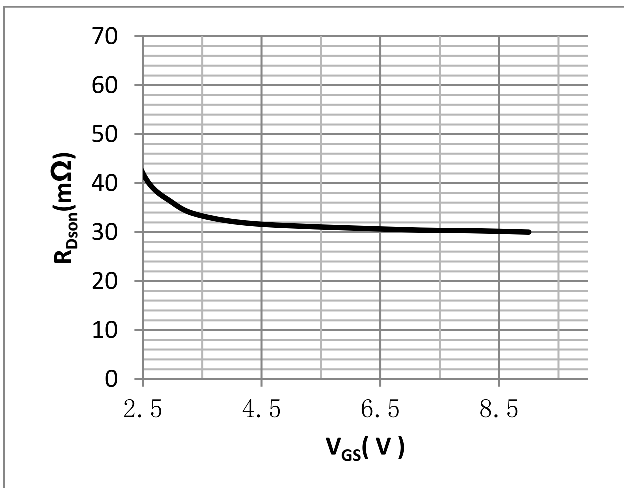


Fig.6 On-Resistance V.S Junction Temperature

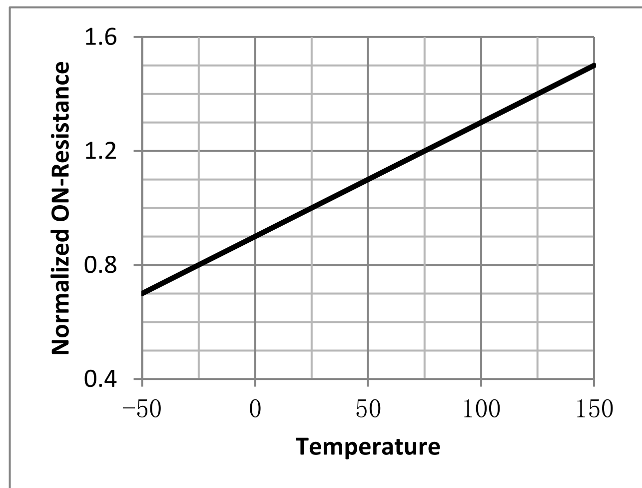


Fig.7 Gate-Charge Characteristics

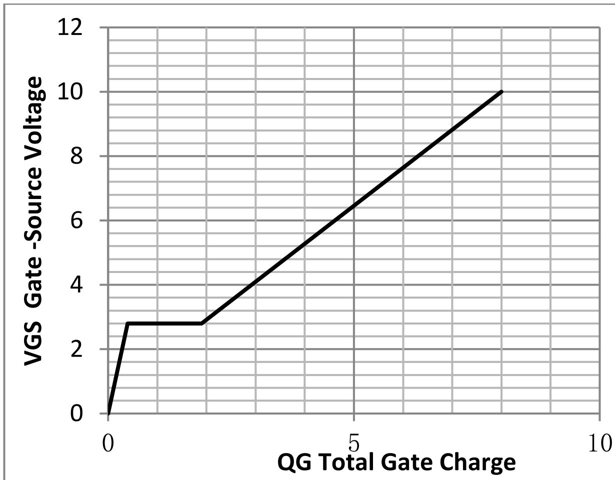


Fig.8 Capacitance Characteristics

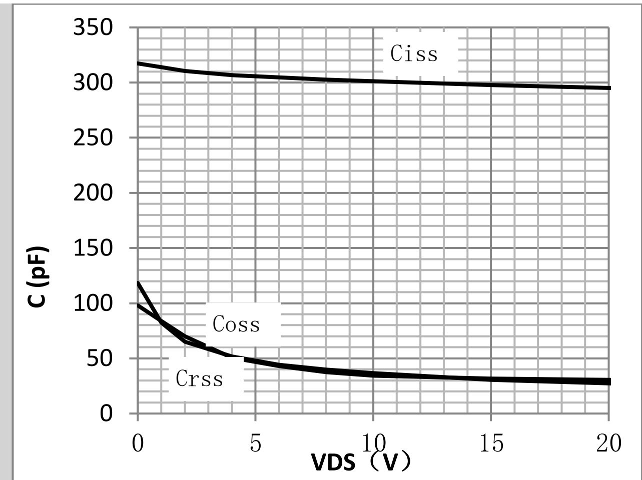


Fig.9 SOA Maximum Safe Operating Area

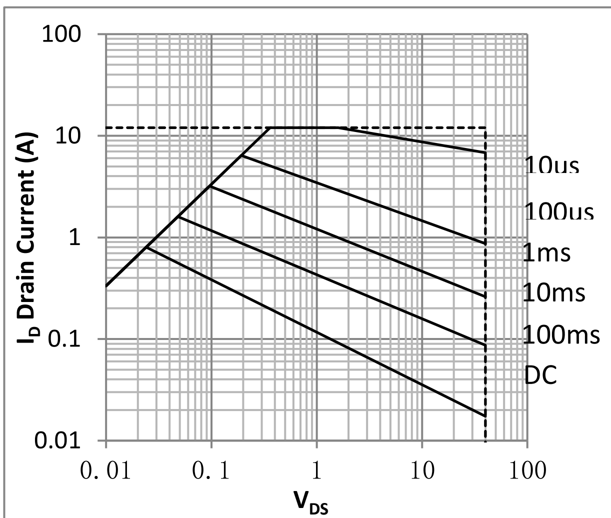
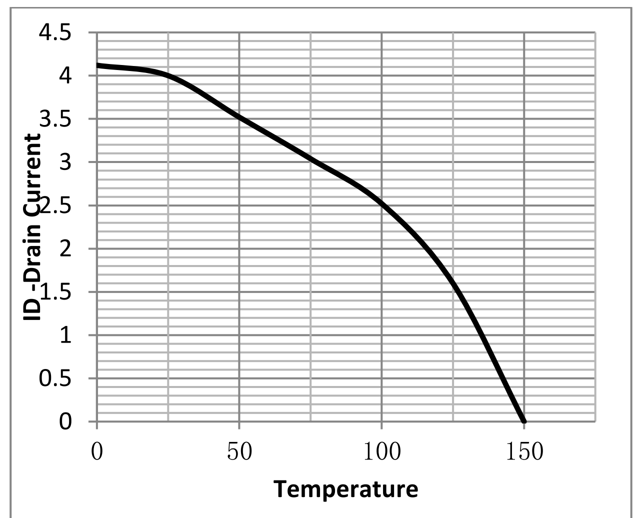


Fig.10 ID-Junction Temperature



•P Channel characteristics curve

Fig.1 Power Dissipation Derating Curve

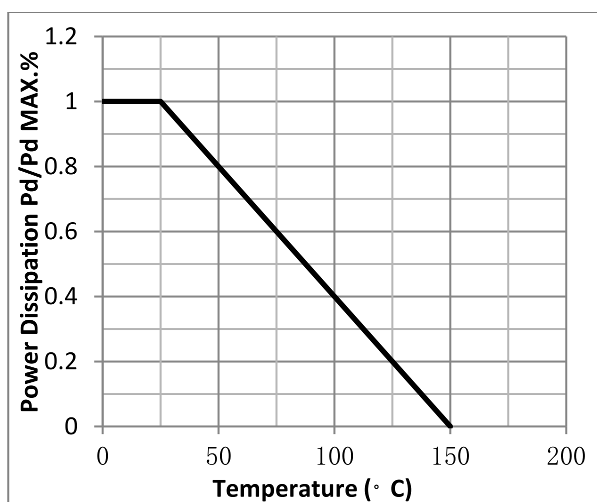


Fig.2 Typical output Characteristics

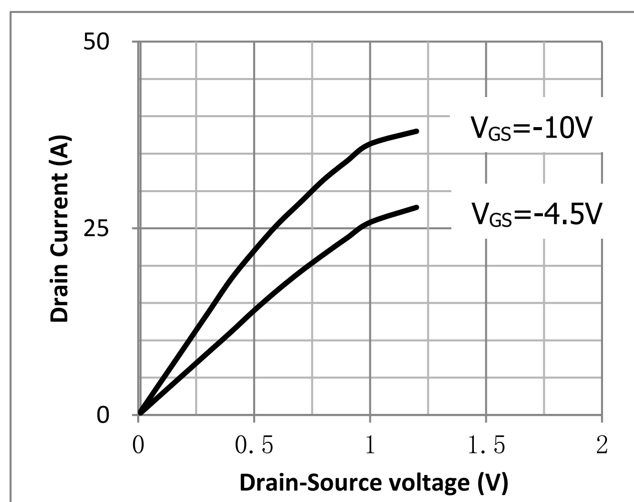


Fig.3 Threshold Voltage V.S Junction Temperature

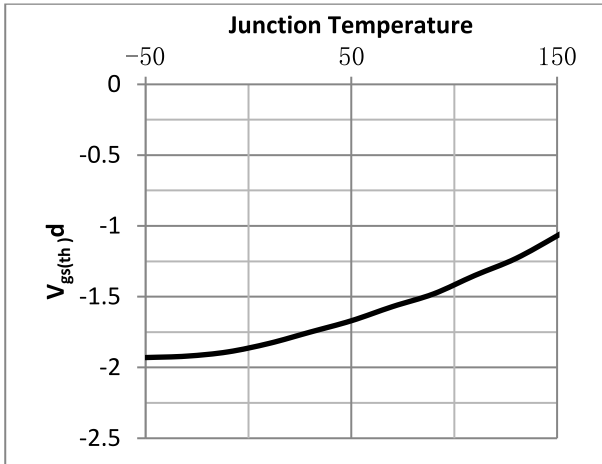


Fig.4 Resistance V.S Drain Current

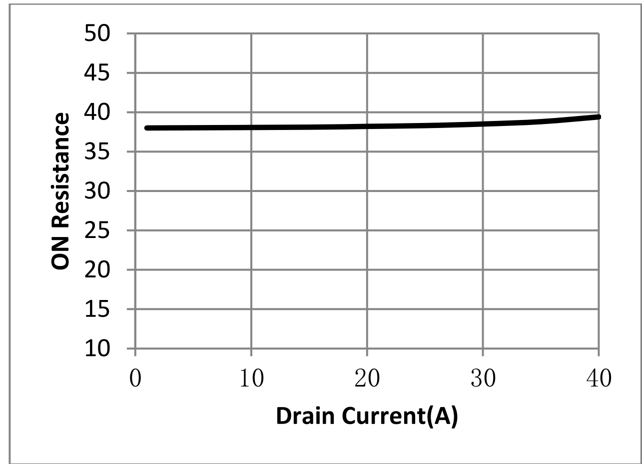


Fig.5 On-Resistance VS Gate Source Voltage

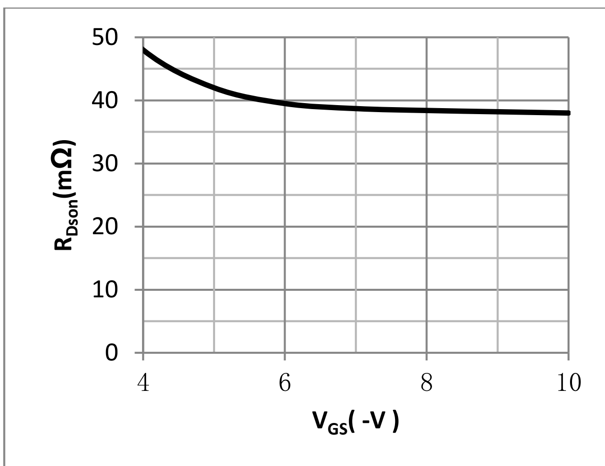


Fig.6 On-Resistance V.S Junction Temperature

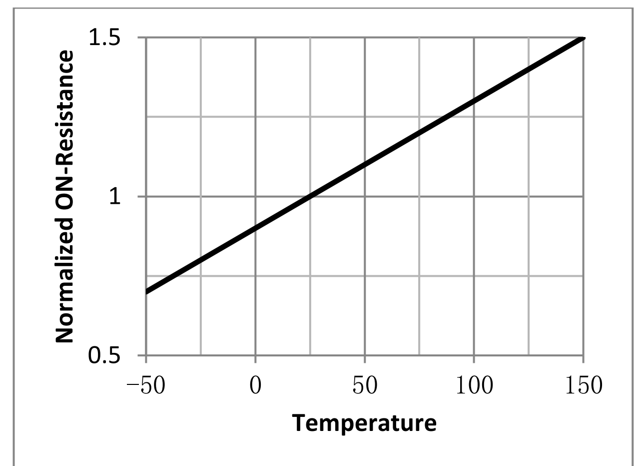


Fig.7 Gate-Charge Characteristics

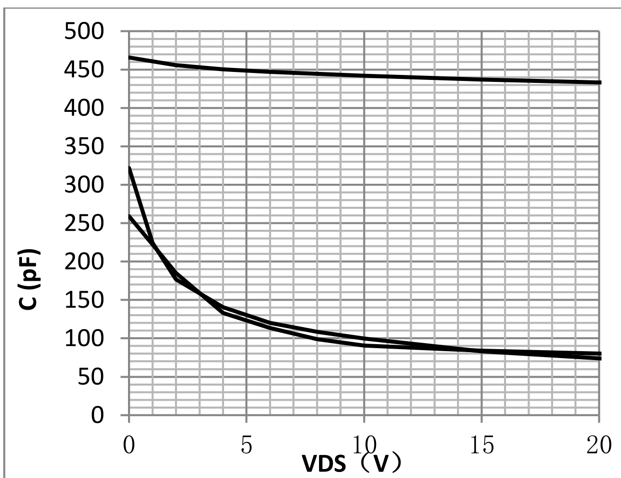


Fig.8 Capacitance Characteristics

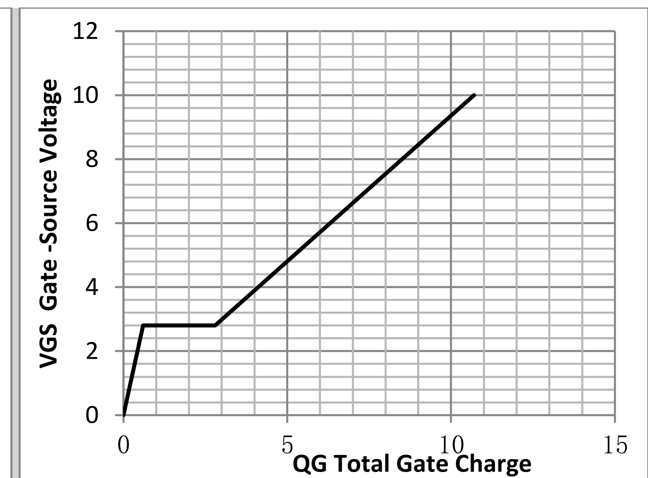


Fig.9 SOA Maximum Safe Operating Area

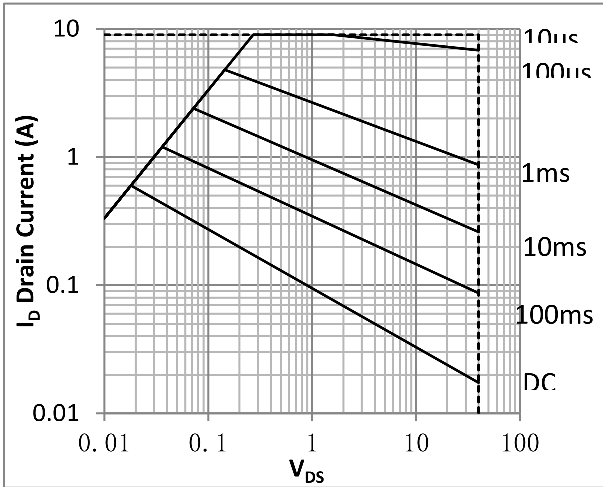
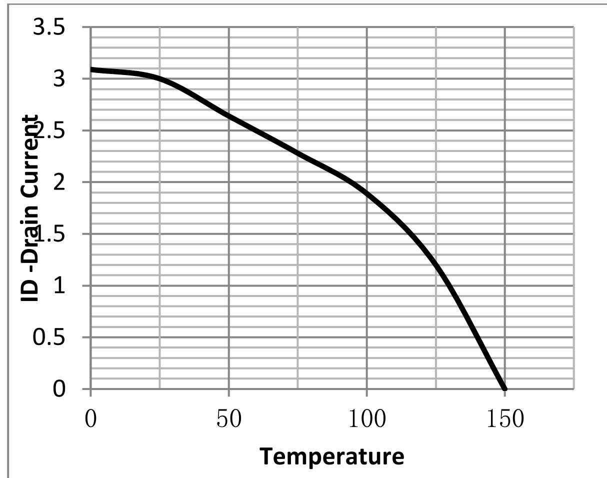


Fig.10 ID-Junction Temperature



●Test Circuit

Fig.1 Switching Time Measurement Circuit

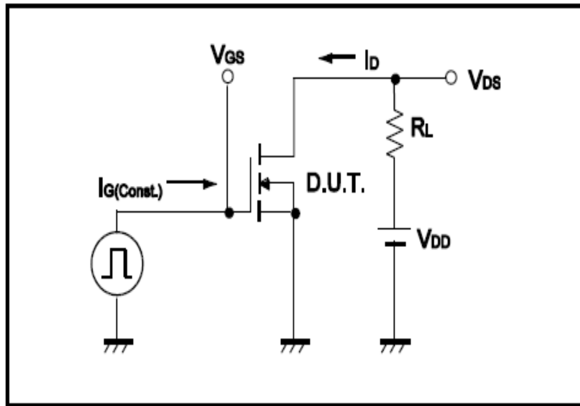


Fig.2 Gate Charge Waveform

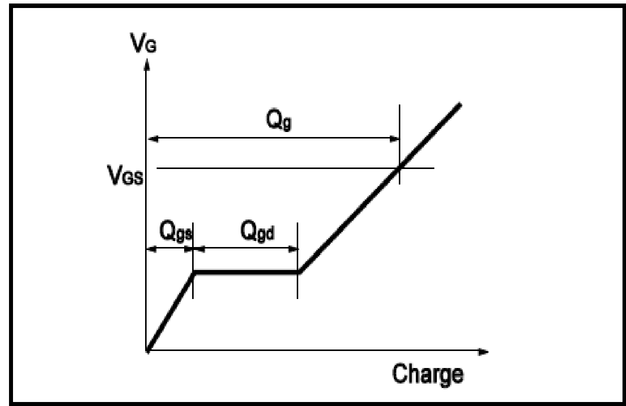


Fig.3 Switching Time Measurement Circuit

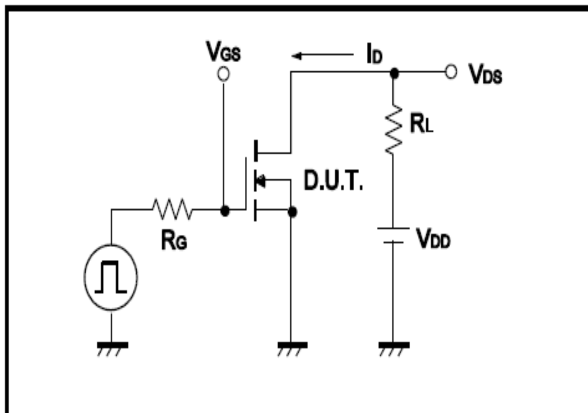


Fig.4 Gate Charge Waveform

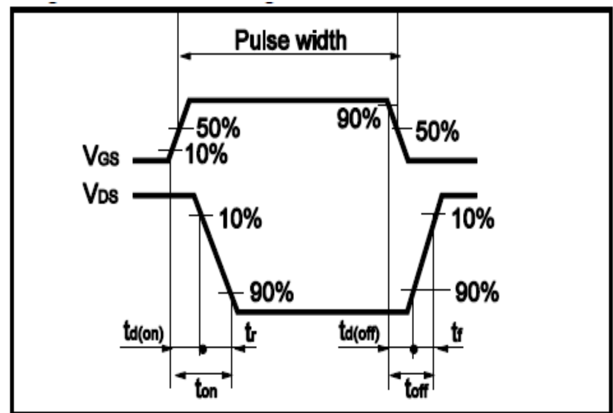


Fig.5 Avalanche Measurement Circuit

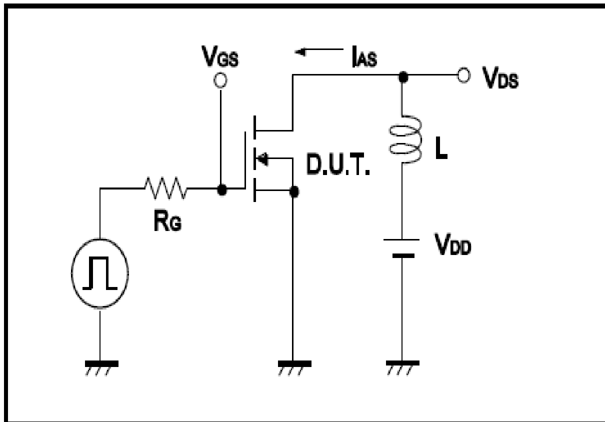
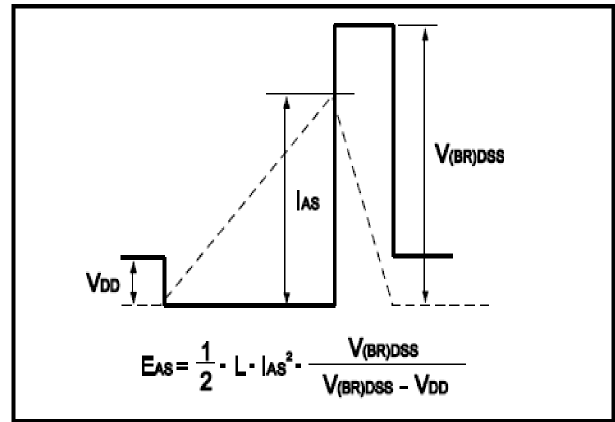
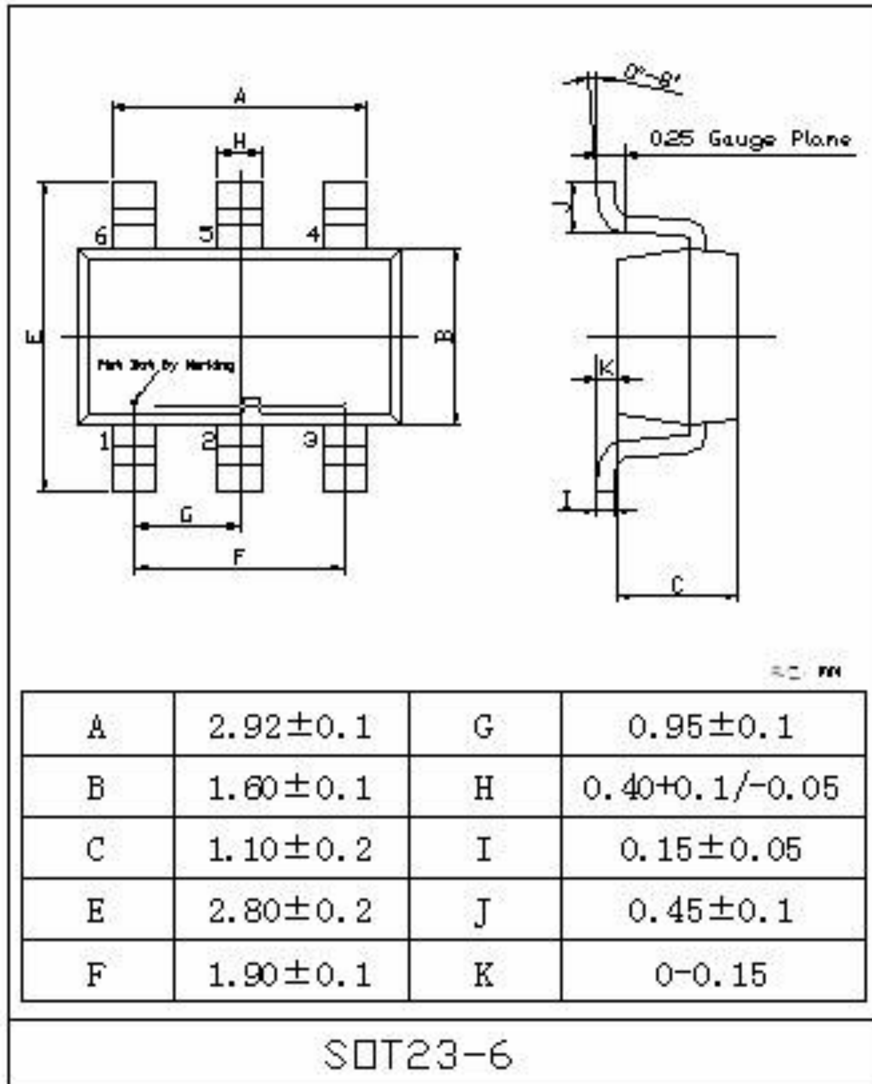


Fig.6 Avalanche Waveform



●Dimensions(SOT23-6)

Unit: mm



A	2.92±0.1	G	0.95±0.1
B	1.60±0.1	H	0.40+0.1/-0.05
C	1.10±0.2	I	0.15±0.05
E	2.80±0.2	J	0.45±0.1
F	1.90±0.1	K	0-0.15

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