● 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.

● Features

■ Advance high cell density Trench technology

■ Low $R_{DS(ON)}$ to minimize conductive loss

■ Low Gate Charge for fast switching
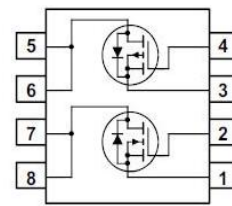
■ Dual DIE in one package

● Application

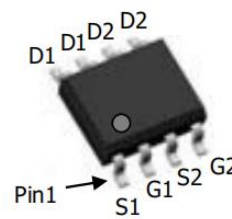■ Power Management in Notebook Computer

■ BLDC Motor driver

● Product Summary

$V_{DS1}=60V$
$V_{DS2}=-60V$
$R_{DS(ON)1}=30mΩ$
$R_{DS(ON)2}=57mΩ$
$I_{D1}=5.2A$
$I_{D2}=-3.8A$

SOP8

● Ordering Information:

Part NO.	ZMC88602S
Marking	ZMC88602
Packing Information	REEL TAPE
Basic ordering unit (pcs)	4000

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

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current	I_D@T_C =25℃	5.2	A
	I_D@T_C =75℃	4.2	A
	I_D@T_C=100℃	3.3	A
Pulsed Drain Current [①]	I_{DM}	15.6	A
Total Power Dissipation	P_D@T_C=25℃	3.7	W
Total Power Dissipation	P_D@T_A=25℃	0.69	W
Operating Junction Temperature	T_J	-55 to 150	℃
Storage Temperature	T_{STG}	-55 to 150	℃
Single Pulse Avalanche Energy	E_{AS}	30	mJ
ESD Level (HBM)		Class 1C	

●P Channel Absolute Maximum Ratings (T$_C$ =25℃)

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V$_{DS}$	-60	V
Gate-Source Voltage	V$_{GS}$	±20	V
Continuous Drain Current	I$_D$@T$_C$ =25℃	-3.8	A
	I$_D$@T$_C$ =75℃	-2.8	A
	I$_D$@T$_C$=100℃	-2.4	A
Pulsed Drain Current ①	I$_{DM}$	-11.4	A
Total Power Dissipation	P$_D$@T$_C$=25℃	3.7	W
Total Power Dissipation	P$_D$@T$_A$=25℃	0.69	W
Operating Junction Temperature	T$_J$	-55 to 150	℃
Storage Temperature	T$_{STG}$	-55 to 150	℃
Single Pulse Avalanche Energy	E$_{AS}$	30	mJ
ESD Level (HBM)		Class 1C	

●Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R$_{thJC}$	-	-	34	°C/W
Thermal resistance, junction - ambient	R$_{thJA}$	-	-	180	°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	60			V
Gate Threshold Voltage	V$_{GS(TH)}$	V$_{GS}$ =V$_{DS}$, I$_D$ =250uA	1.3	1.8	2.5	V
Drain-Source Leakage Current	I$_{DSS}$	V$_{DS}$=60V, V$_{GS}$ =0V			1.0	uA
Gate- Source Leakage Current	I$_{GSS}$	V$_{GS}$=±20V, V$_{DS}$ =0V			±100	nA
Static Drain-source On Resistance	R$_{DS(ON)}$	V$_{GS}$=10V, I$_D$=5.2A		30	39	mΩ
		V$_{GS}$=4.5V, I$_D$=4A		36	48	mΩ
Forward Transconductance	g$_{FS}$	V$_{DS}$ =5V, I$_D$=2A		5		s
Source-drain voltage	V$_{SD}$	Is=5.2A			1.28	V

●**N Channel Dynamic Characteristics**

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Gate Risistance	Rg	f = 1MHz		1.5		Ω
Input capacitance	Ciss	f = 1MHz V_{DS}=25V	-	1300	-	pF
Output capacitance	Coss		-	53	-	
Reverse transfer capacitance	Crss		-	31	-	
Total gate charge	Qg	V_{DD} = 20V I_D = 5.2A V_{GS} = 10V	-	17	-	nC
Gate - Source charge	Qgs		-	4.1	-	
Gate - Drain charge	Qgd		-	2.5	-	

●**P Channel Electronic Characteristics**

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} =0V, I_D =-250uA	-60			V
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} =V_{DS}, I_D =-250uA	-1.3		-2.5	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=-60V, V_{GS} =0V			-1.0	uA
Gate- Source Leakage Current	I_{GSS}	V_{GS}=±20V, V_{DS} =0V			±100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-4.7A		57	74	mΩ
		V_{GS}=-4.5V, I_D=-3.7A		80	104	mΩ
Forward Transconductance	g_{FS}	V_{DS} =-5V, I_D=-2A		1.5		s
Source-drain voltage	V_{SD}	Is=-4.7A			-1.28	V

●**P Channel Dynamic Characteristics**

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Gate Risistance	Rg	f = 1MHz		7.5		Ω
Input capacitance	Ciss	f = 1MHz V_{DS}=25V	-	1380	-	pF
Output capacitance	Coss		-	101	-	
Reverse transfer capacitance	Crss		-	67	-	
Total gate charge	Qg	V_{DD} = 20V I_D = 4.7A V_{GS} = 10V	-	20	-	nC
Gate - Source charge	Qgs		-	3.5	-	
Gate - Drain charge	Qgd		-	3.6	-	

●**N Channel characteristics curve**

Fig.1 Gate-Charge Characteristics

Fig.2 Capacitance Characteristics
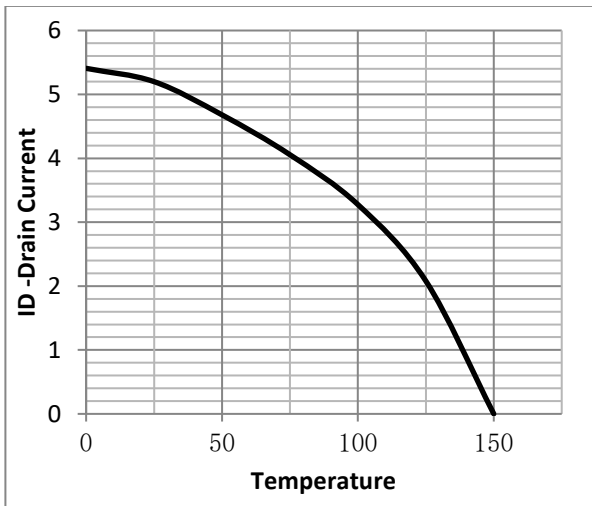
Fig.3 Maximum Continuous Drain Current
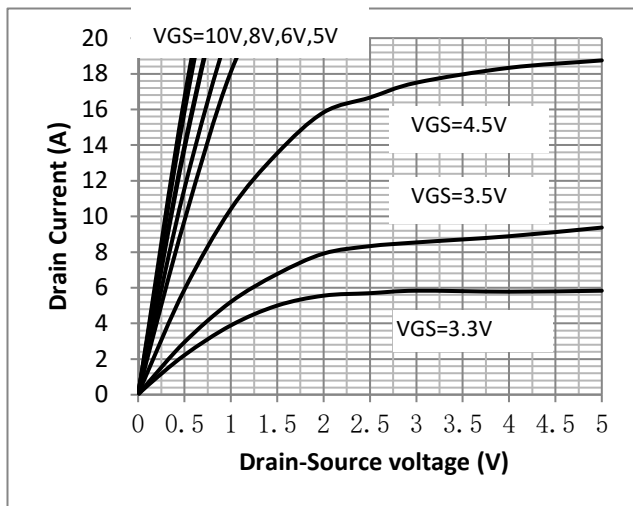
Fig.4 Typical output Characteristics

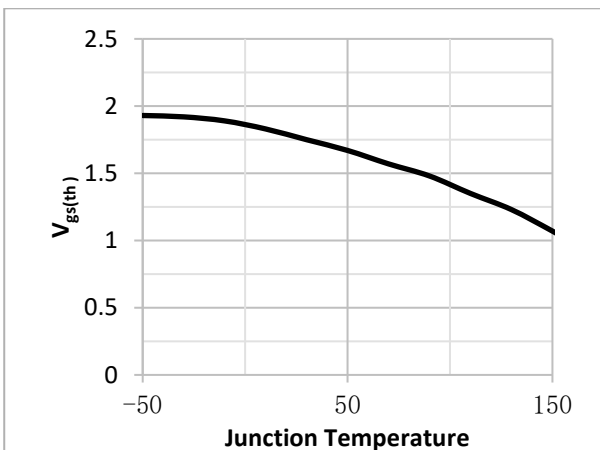Fig.5 Threshold Voltage V.S Junction Temperature
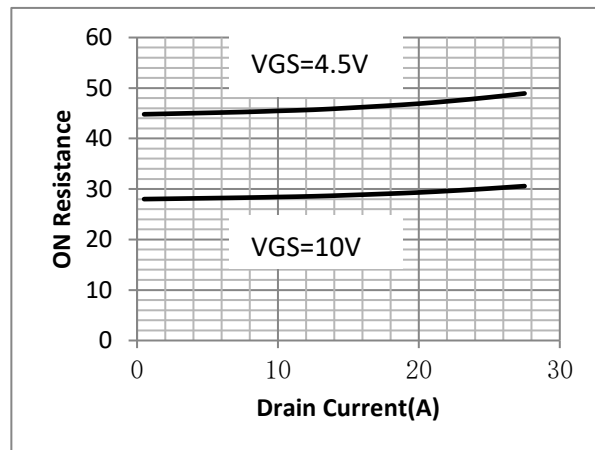
Fig.6 Resistance V.S Drain Current
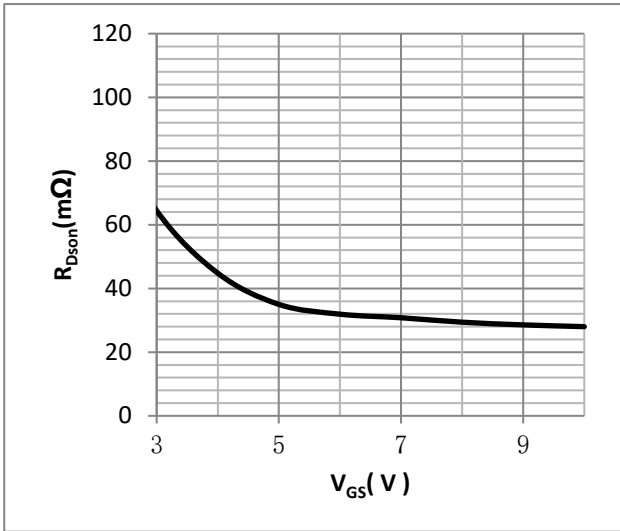
Fig.7 On-Resistance VS Gate Source Voltage
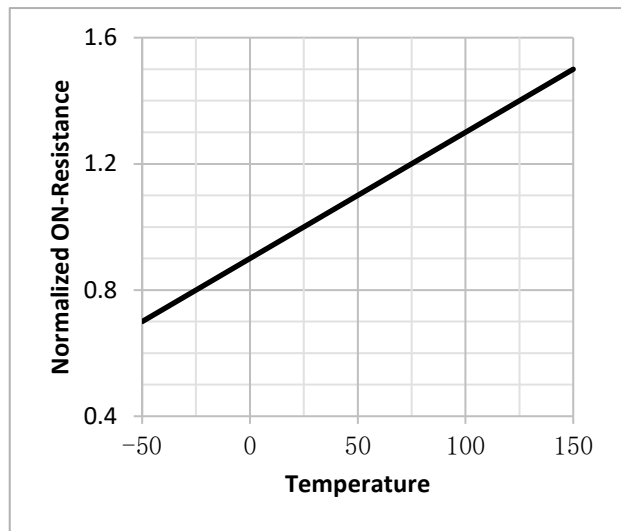

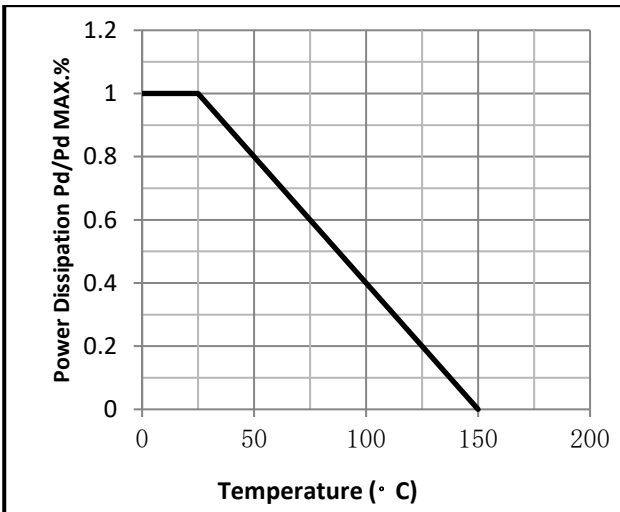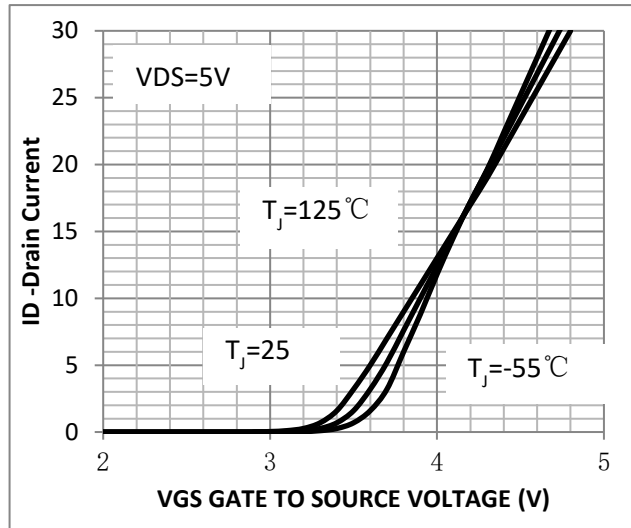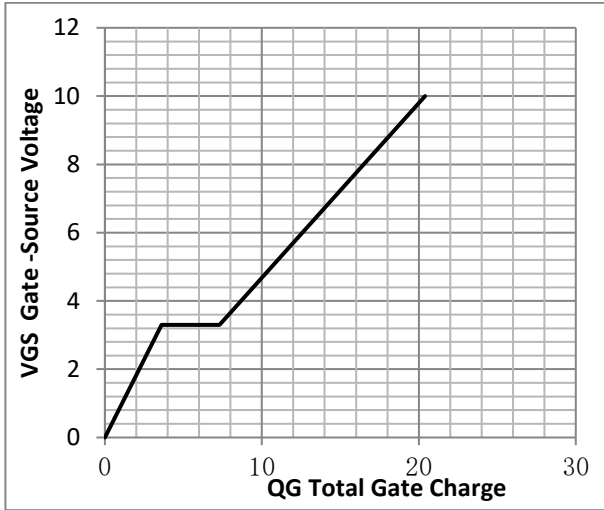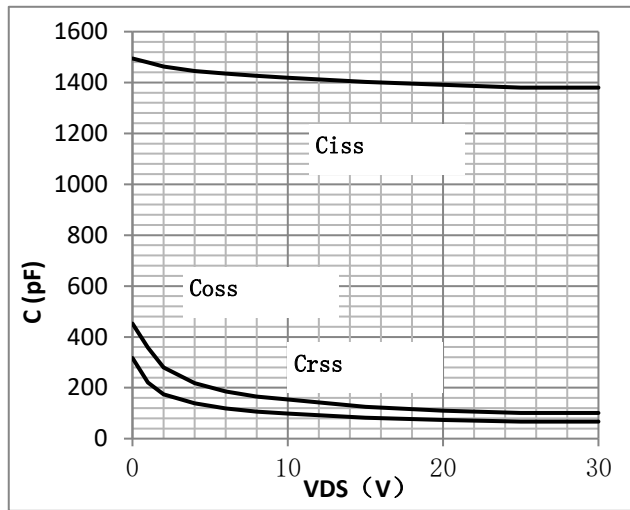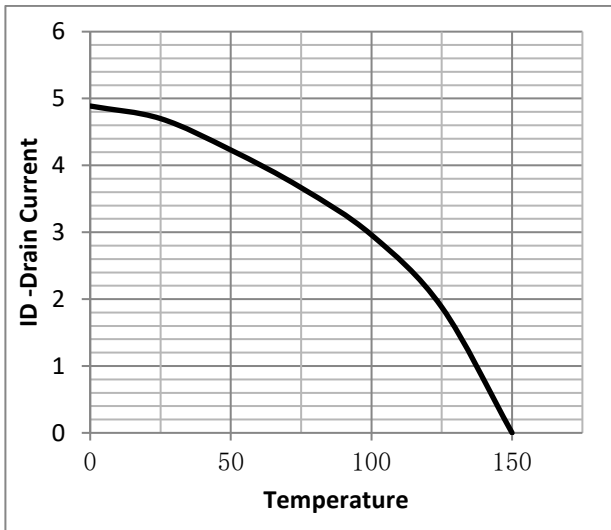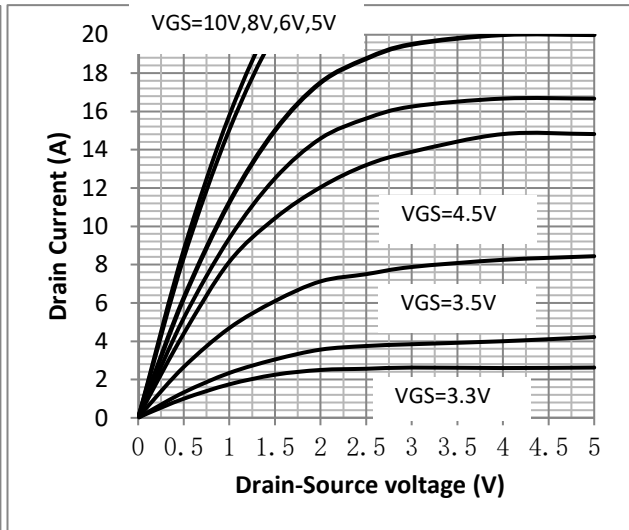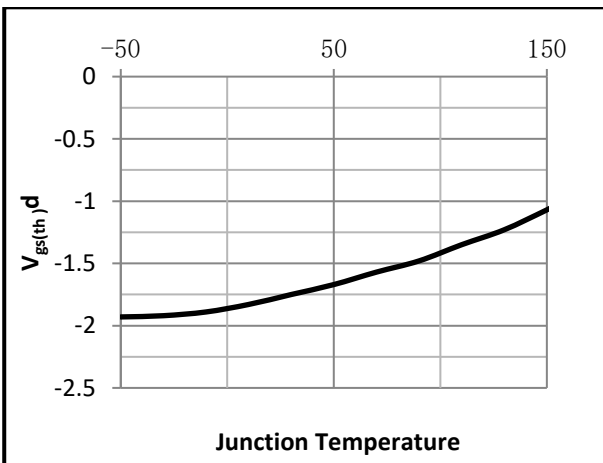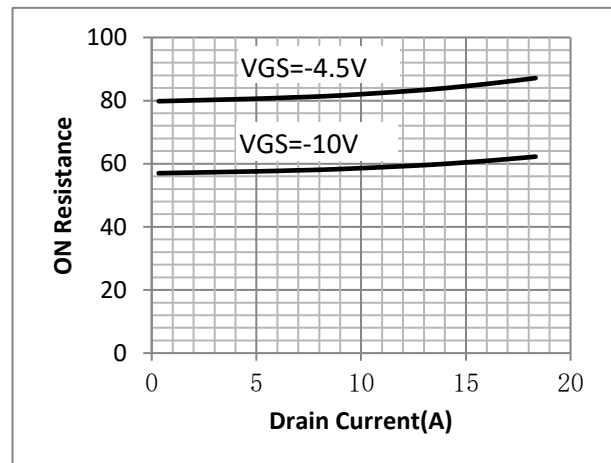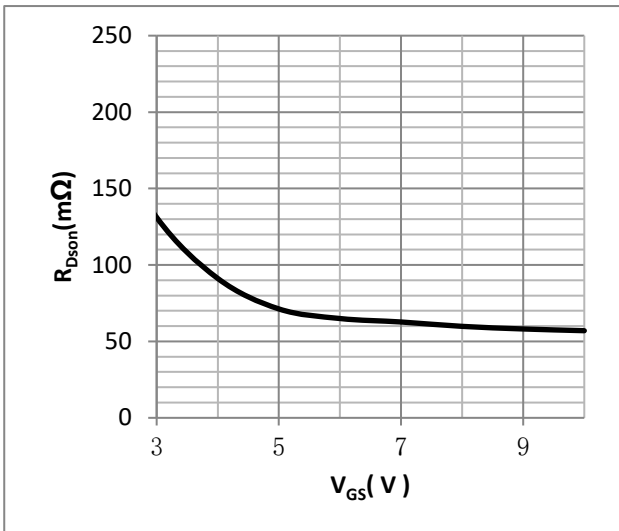Fig.8 On-Resistance V.S Junction Temperature

Fig.9 Power Dissipation
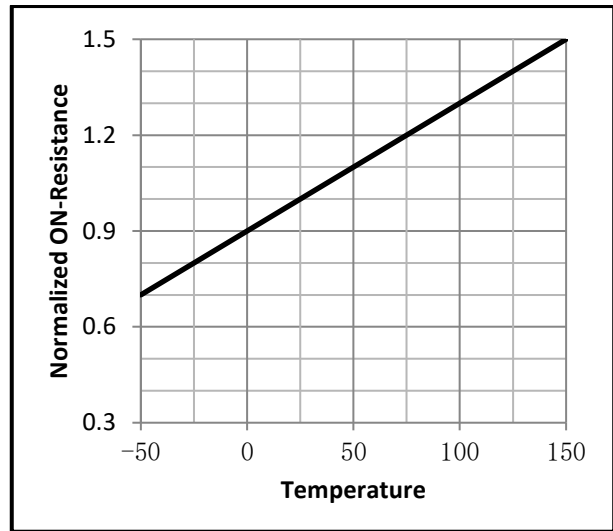

Fig.10 Transfer Characteristics

●P Channel characteristics curve

Fig.1 Gate-Charge Characteristics

Fig.2 Capacitance Characteristics

Fig.3 Maximum Continuous Drain Current

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

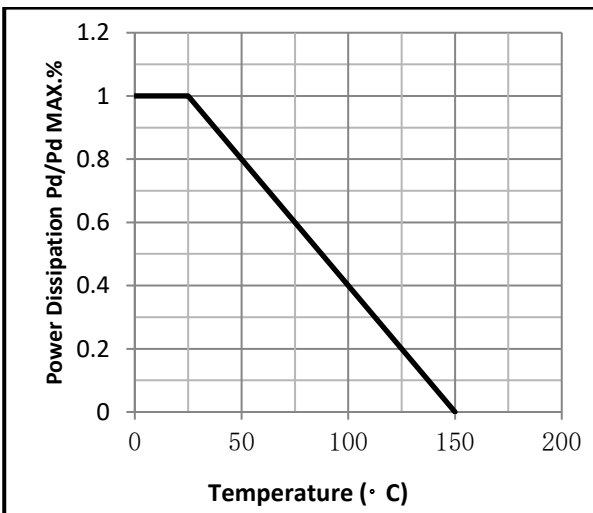Fig.8 On-Resistance V.S Junction Temperature
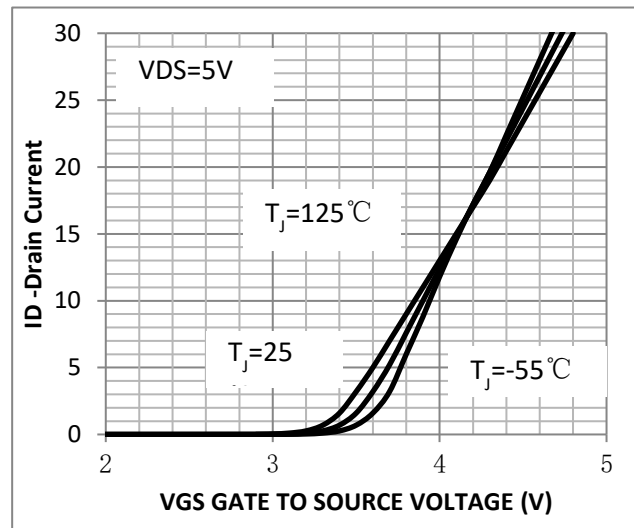
Fig.9 Power Dissipation

Fig.10 Transfer Characteristics

●Test Circuit

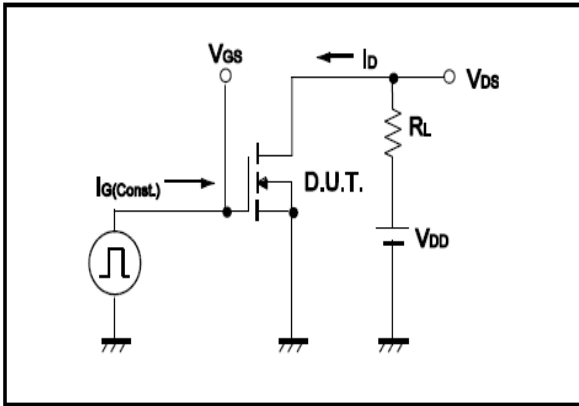Fig.1 Switching Time Measurement Circuit
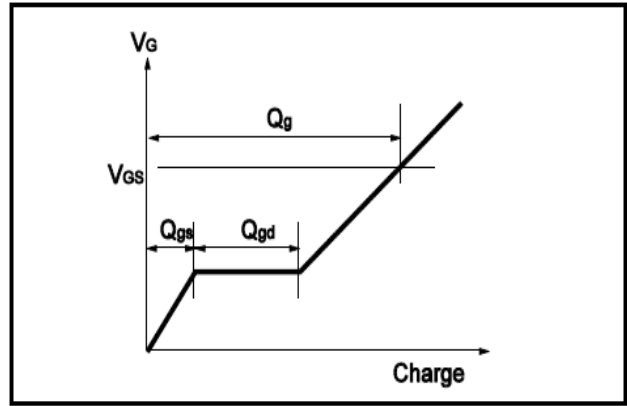

Fig.2 Gate Charge Waveform
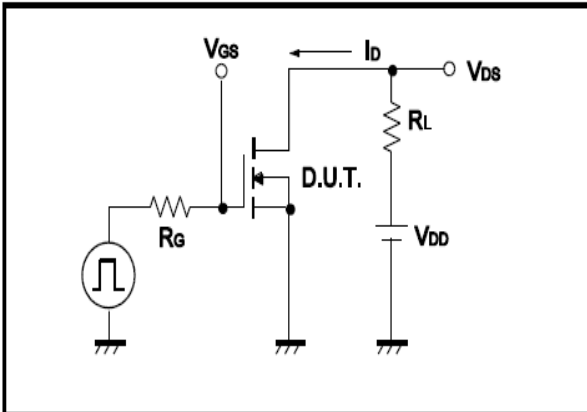

Fig.3 Switching Time Measurement Circuit

Fig.4 Gate Charge Waveform

Fig.5 Avalanche Measurement Circuit

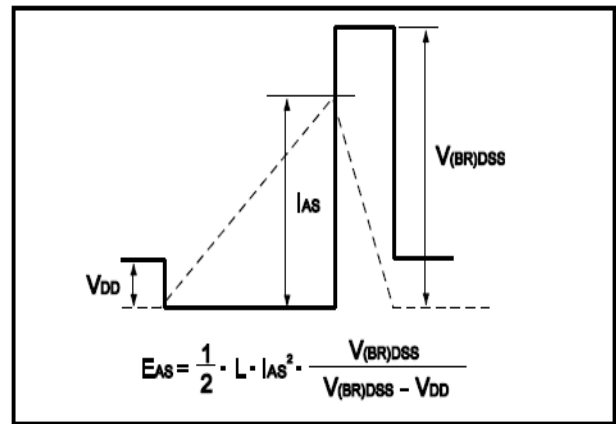
Fig.6 Avalanche Waveform

$$E_{AS} = \frac{1}{2} \cdot L \cdot I_{AS}^2 \cdot \frac{V_{(BR)DSS}}{V_{(BR)DSS} - V_{DD}}$$

●Dimensions(SOP8)

Unit: mm

SYMBOL	min	TYP	max	SYMBOL	min		max
A	4.80		5.00	C	1.30		1.50
A1	0.37		0.47	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	0.19	0.20	0.23
B1	3.80		4.00	D		1.05	
B2		5.00		D1	0.40		0.62