



## ZDS020N60

Nch 600V 0.63A Power MOSFET

Datasheet

$V_{DSS}$	600V
$R_{DS(on)}$ (Max.)	5.0Ω
$I_D$	0.63A
$P_D$	2.0W

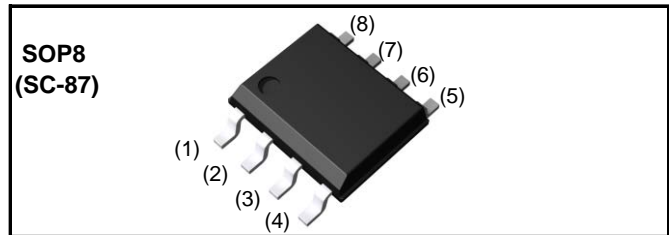
### ●Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Gate-source voltage ( $V_{GSS}$ ) guaranteed to be  $\pm 30V$ .
- 4) Drive circuits can be simple.
- 5) Parallel use is easy.
- 6) Pb-free lead plating ; RoHS compliant

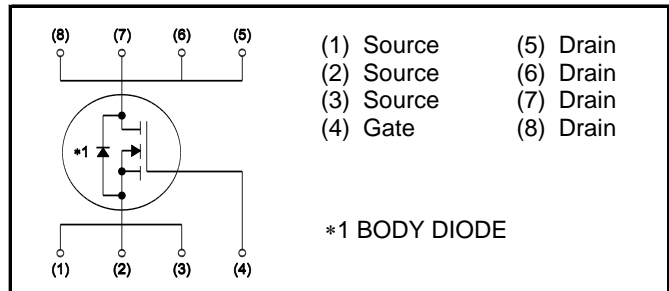
### ●Application

Switching Power Supply

### ●Outline



### ●Inner circuit



### ●Packaging specifications

Type	Packaging	Taping
	Reel size (mm)	330
	Tape width (mm)	12
	Basic ordering unit (pcs)	2,500
	Taping code	TB
	Marking	ZDS020N60

### ●Absolute maximum ratings( $T_a = 25^\circ C$ )

Parameter	Symbol	Value	Unit
Drain - Source voltage	$V_{DSS}$	600	V
Continuous drain current	$I_D$ *1	$\pm 0.63$	A
Pulsed drain current	$I_{D,pulse}$ *2	$\pm 2.5$	A
Gate - Source voltage	$V_{GSS}$	$\pm 30$	V
Power dissipation ( $T_c = 25^\circ C$ )	$P_D$	2.0	W
Junction temperature	$T_j$	150	$^\circ C$
Range of storage temperature	$T_{stg}$	-55 to +150	$^\circ C$

## ●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	$R_{thJA}$	-	-	62.5	°C/W

●Electrical characteristics( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	600	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 600V, V_{GS} = 0V$	-	-	100	$\mu\text{A}$
Gate - Source leakage current	$I_{GSS}$	$V_{GS} = \pm 30V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 1mA$	2.0	-	4.0	V
Static drain - source on - state resistance	$R_{DS(on)}^{*3}$	$V_{GS} = 10V, I_D = 0.5A$	-	4.4	5.0	$\Omega$

**●Electrical characteristics**( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	$g_{fs}^{*3}$	$V_{DS} = 10\text{V}, I_D = 0.5\text{A}$	0.05	0.5	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{V}$	-	310	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = 10\text{V}$	-	145	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1\text{MHz}$	-	40	-	
Turn - on delay time	$t_{d(on)}^{*3}$	$V_{DD} \approx 200\text{V}, V_{GS} = 10\text{V}$	-	25	-	ns
Rise time	$t_r^{*3}$	$I_D = 600\text{mA}$	-	20	-	
Turn - off delay time	$t_{d(off)}^{*3}$	$R_L = 333\Omega$	-	65	-	
Fall time	$t_f^{*3}$	$R_G = 50\Omega$	-	65	-	

**●Gate Charge characteristics**( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_g^{*3}$	$V_{DD} \approx 450\text{V}$	-	12	20	nC
Gate - Source charge	$Q_{gs}^{*3}$	$I_D = 600\text{mA}$	-	3	-	
Gate - Drain charge	$Q_{gd}^{*3}$	$V_{GS} = 10\text{V}$	-	5	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} \approx 450\text{V}, I_D = 600\text{mA}$	-	5	-	V

\*1 Limited only by maximum temperature allowed.

\*2  $P_w \leq 10\mu\text{s}$ , Duty cycle  $\leq 1\%$

\*3 Pulsed

**●Body diode electrical characteristics (Source-Drain)( $T_a = 25^\circ\text{C}$ )**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	$I_S^{*1}$	$T_c = 25^\circ\text{C}$	-	-	0.63	A
Inverse diode direct current, pulsed	$I_{SM}^{*2}$		-	-	2.5	A
Forward voltage	$V_{SD}^{*3}$	$V_{GS} = 0\text{V}, I_S = 1\text{A}$	-	-	1.5	V

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

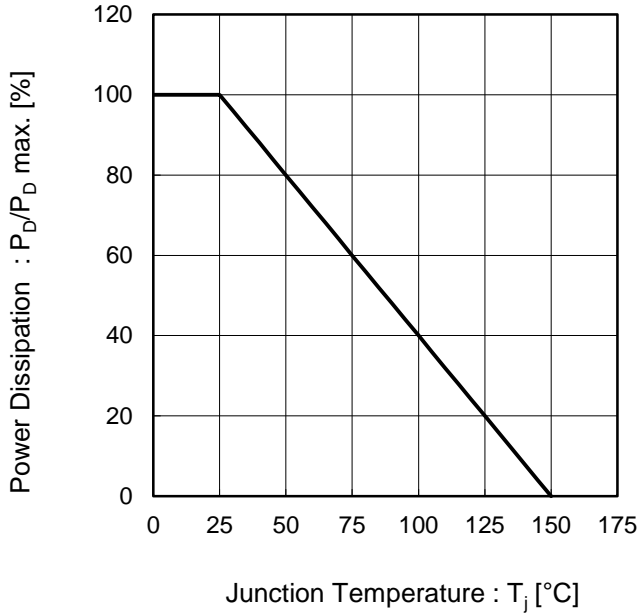


Fig.2 Maximum Safe Operating Area

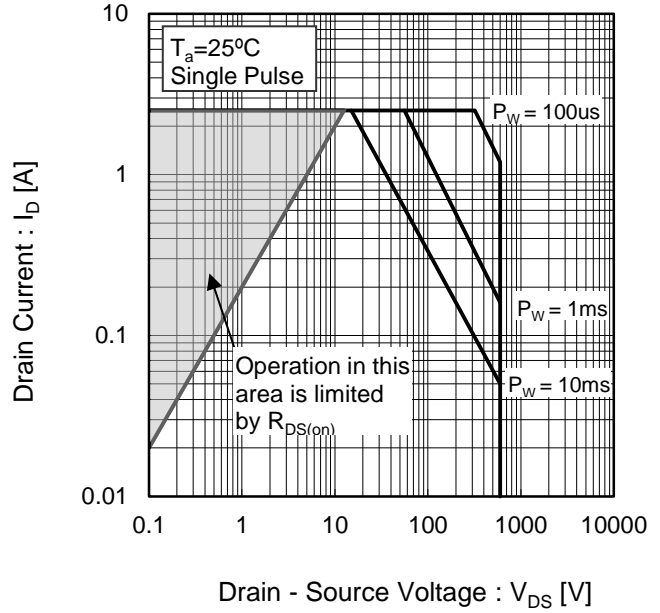
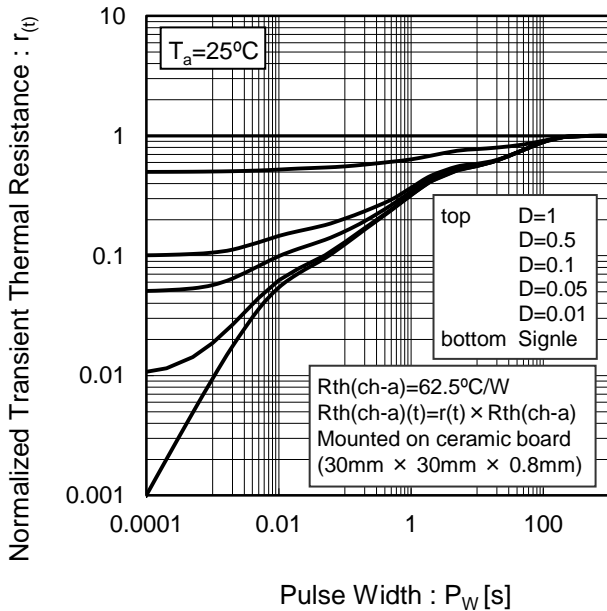


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

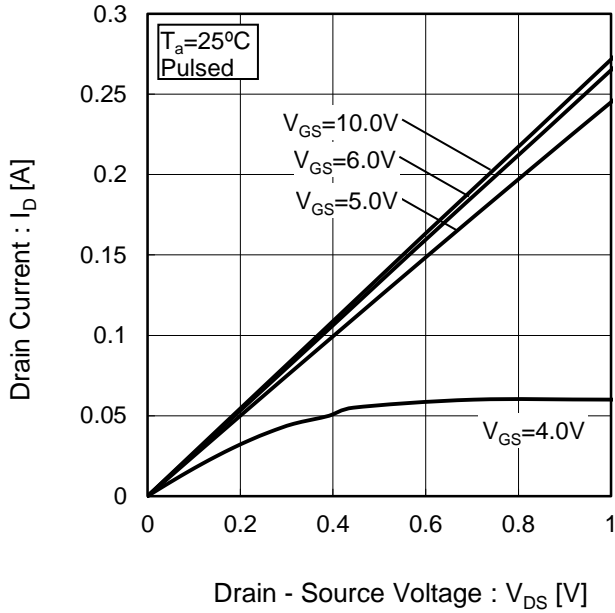


Fig.5 Typical Output Characteristics(II)

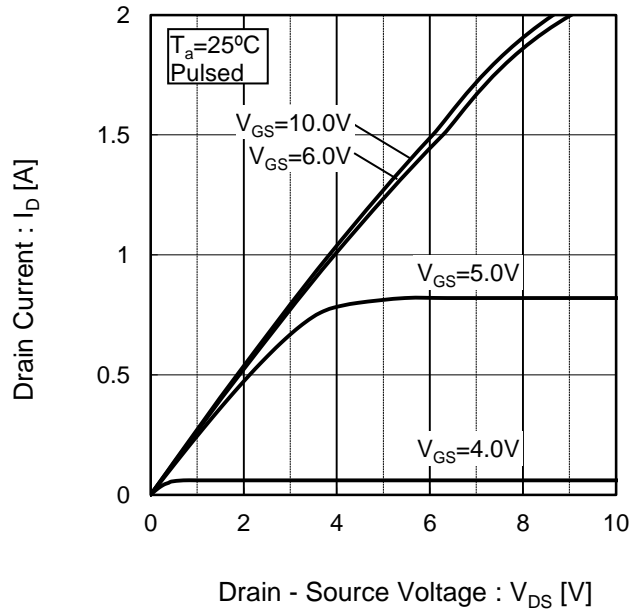


Fig.6 Breakdown Voltage vs. Channel Temperature

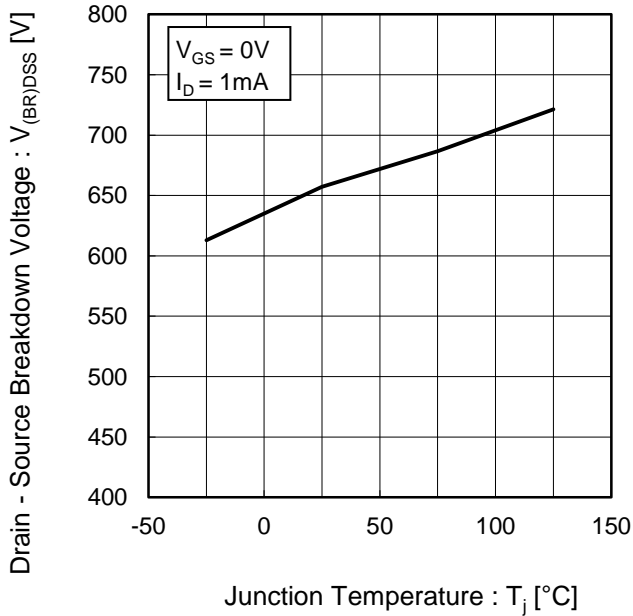
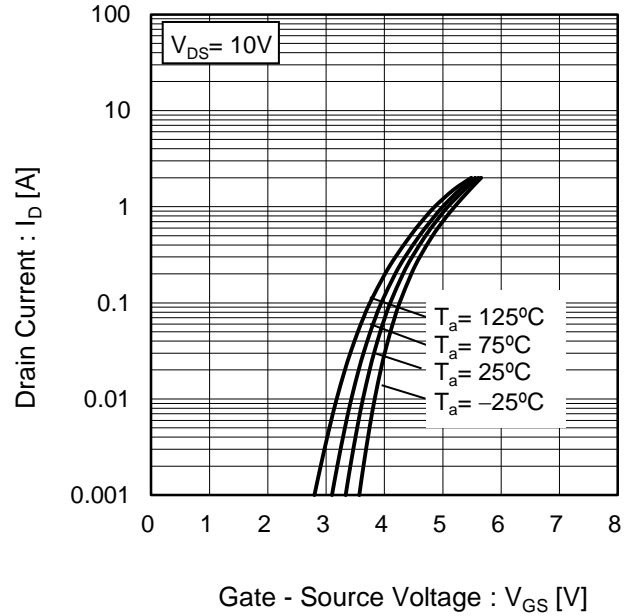


Fig.7 Typical Transfer Characteristics



●Electrical characteristic curves

Fig.8 Gate Threshold Voltage vs. Channel Temperature

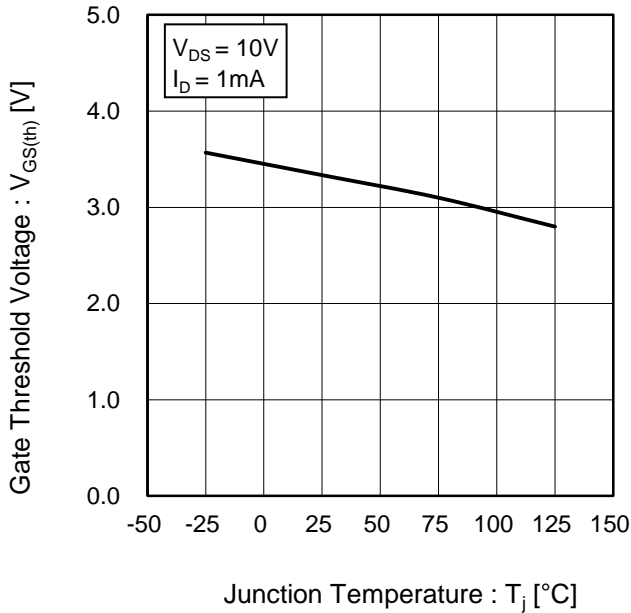


Fig.9 Transconductance vs. Drain Current

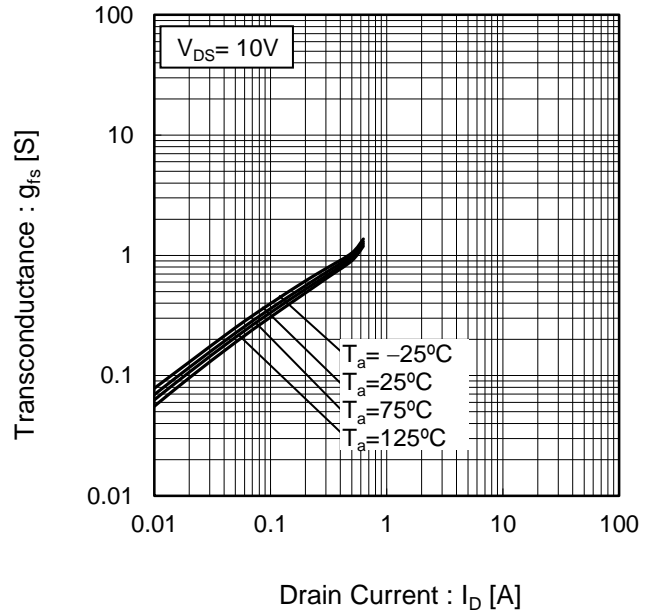
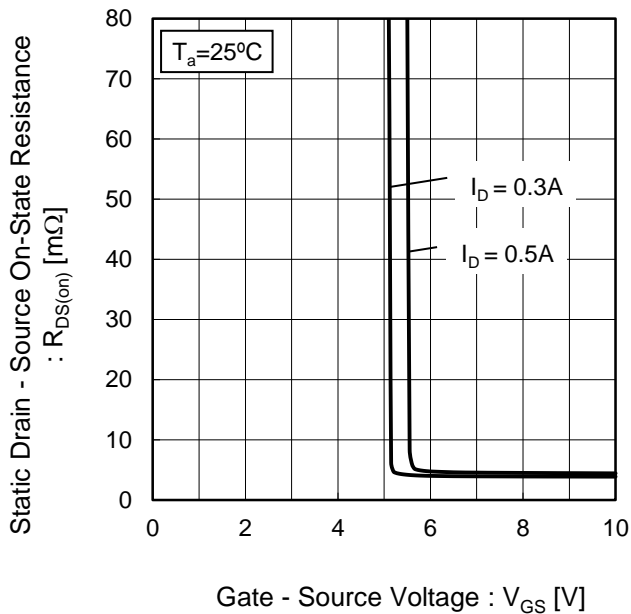


Fig.10 Static Drain - Source On - State Resistance vs. Gate Source Voltage



●Electrical characteristic curves

Fig.11 Static Drain - Source On - State Resistance vs. Drain Current(II)

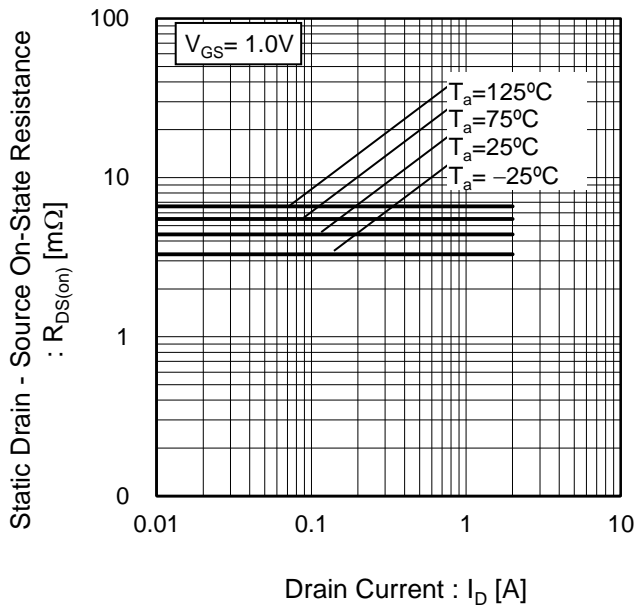
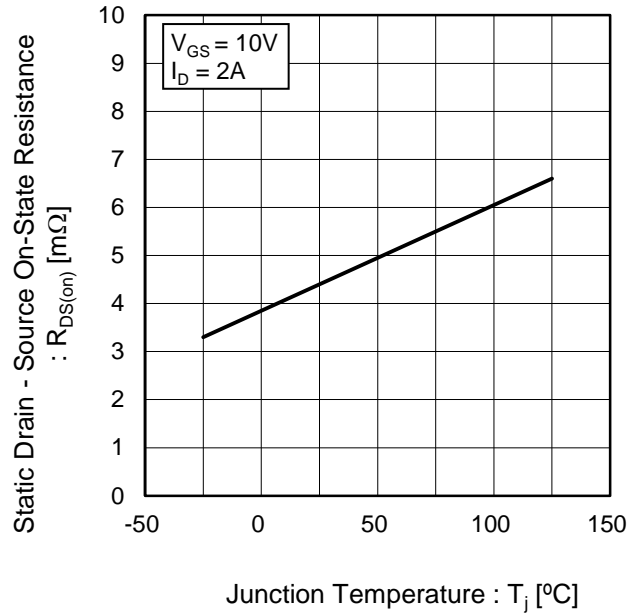


Fig.12 Static Drain - Source On - State Resistance vs. Junction Temperature





●Electrical characteristic curves

Fig.13 Typical Capacitance vs. Drain - Source Voltage

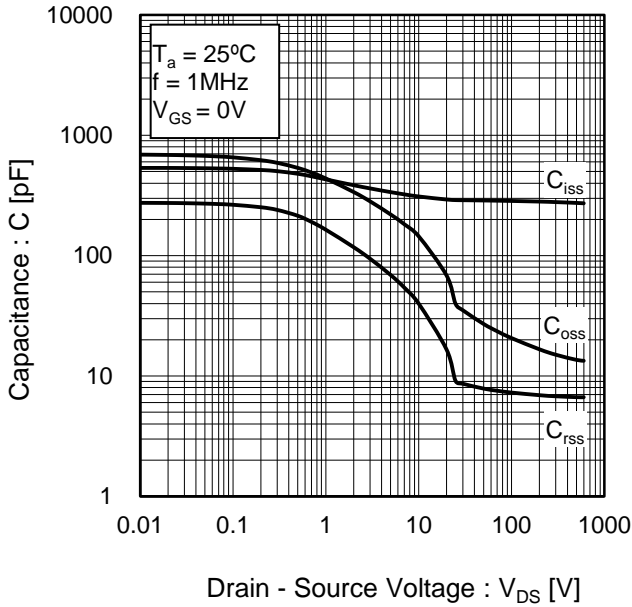


Fig.14 Switching Characteristics

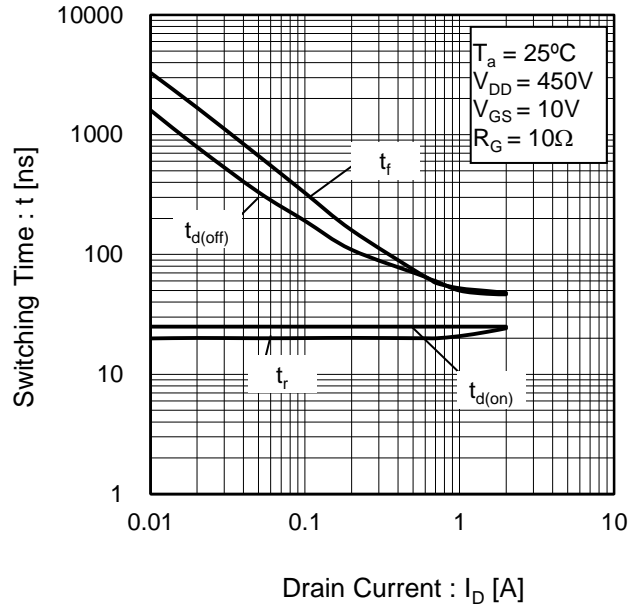


Fig.15 Dynamic Input Characteristics

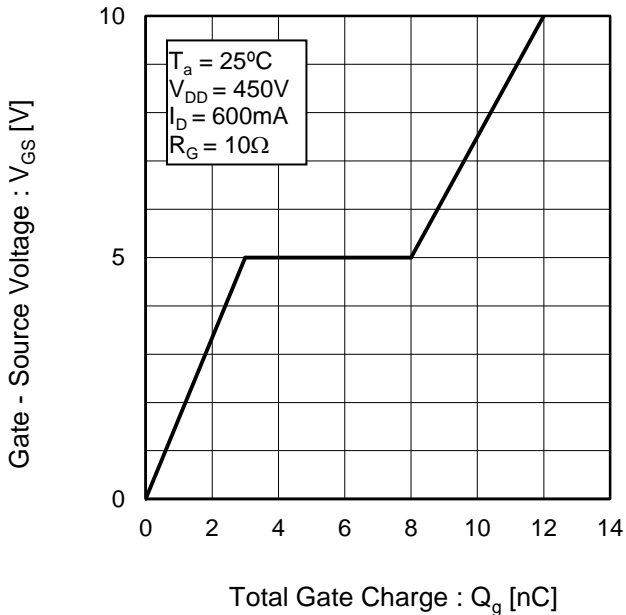
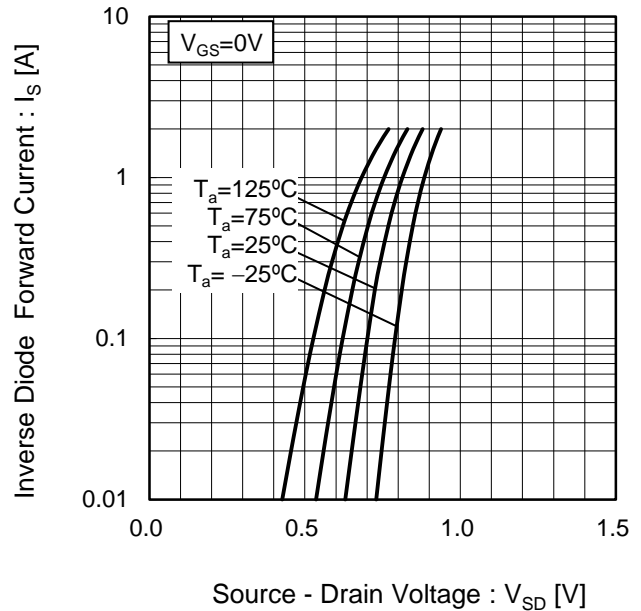


Fig.16 Inverse Diode Forward Current vs. Source - Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

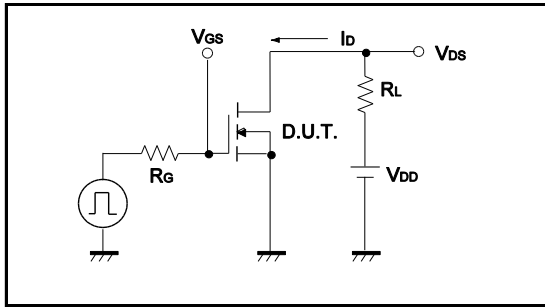


Fig.1-2 Switching Waveforms

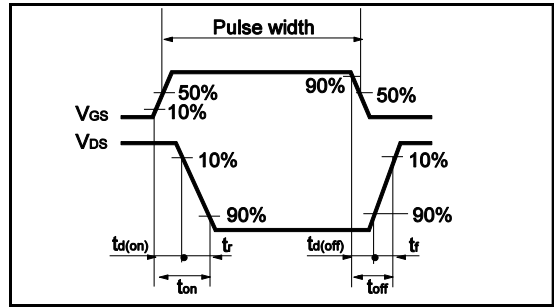


Fig.2-1 Gate Charge Measurement Circuit

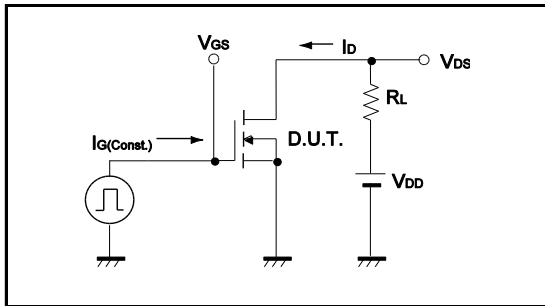
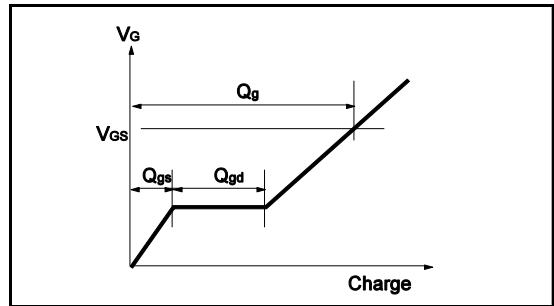
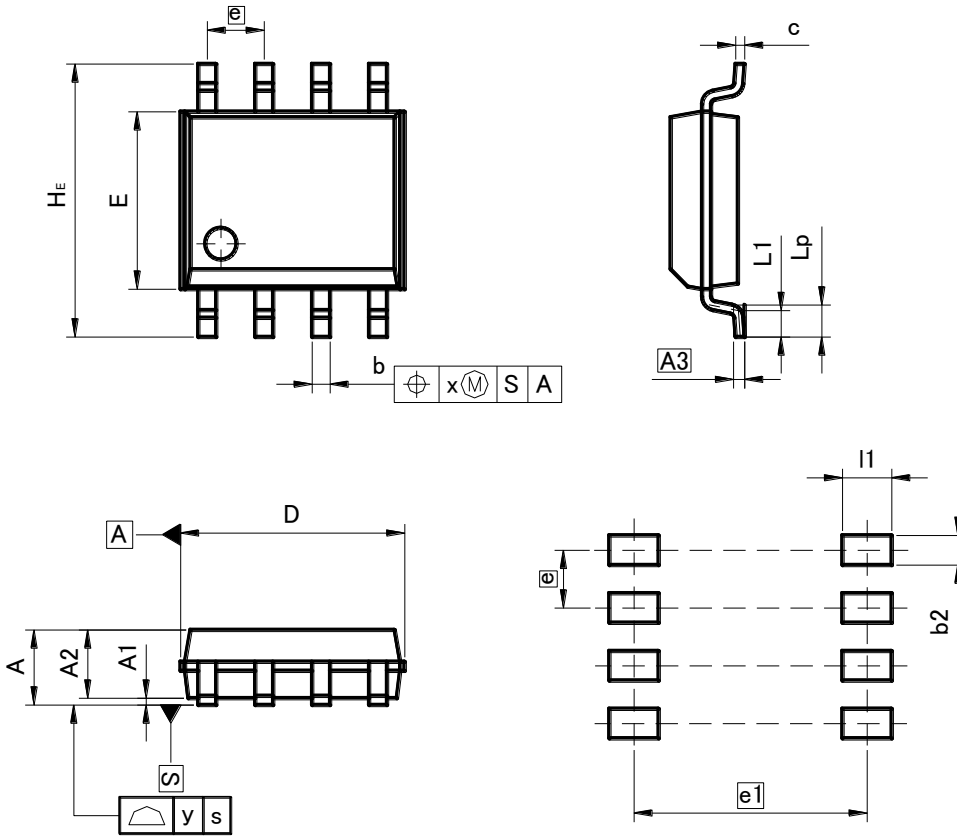


Fig.2-2 Gate Charge Waveform



●Dimensions (Unit : mm)

SOP8



Pattern of terminal position areas

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	-	1.75	-	0.069
A1	0.15		0.006	
A2	1.40	1.60	0.055	0.063
A3	0.25		0.01	
b	0.30	0.50	0.012	0.02
c	0.10	0.30	0.004	0.012
D	4.80	5.20	0.189	0.205
E	3.75	4.05	0.148	0.159
e	1.27		0.05	
HE	5.70	6.30	0.224	0.248
Lp	0.65	0.85	0.026	0.033
x	0.15		0.006	
y	0.10		0.004	

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.65	-	0.026
e1	5.15		0.203	
l1	-	1.15	-	0.045

Dimension in mm/inches

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