

4V Drive Nch + Pch MOSFET

SH8M13

● Structure

Silicon N-channel MOSFET/
 Silicon P-channel MOSFET

● Features

- 1) Low on-resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small Surface Mount Package (SOP8).

● Application

Switching

● Packaging specifications

Type	Package	Taping
	Code	TB
	Basic ordering unit (pieces)	2500
SH8M13		○

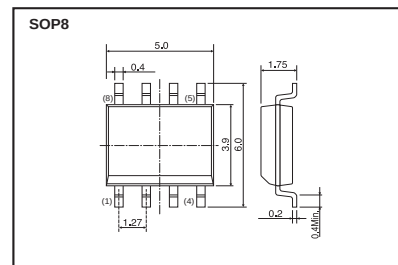
● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits		Unit
		Tr1 : N-ch	Tr2 : P-ch	
Drain-source voltage	V_{DSS}	30	-30	V
Gate-source voltage	V_{GSS}	±20	±20	V
Drain current	Continuous	I_D	±6.0	A
	Pulsed	I_{DP}^{*1}	±24	A
Source current (Body Diode)	Continuous	I_S	1.6	A
	Pulsed	I_{sp}^{*1}	24	A
Total power dissipation	P_D^{*2}	2.0		W / TOTAL
		1.4		W / ELEMENT
Channel temperature	T_{ch}	150		°C
Range of storage temperature	T_{stg}	-55 to +150		°C

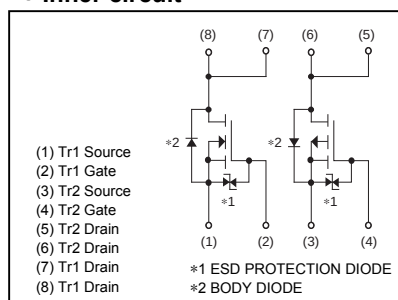
*1 $P_w \leq 10\mu s$, Duty cycle $\leq 1\%$

*2 Mounted on a ceramic board.

● Dimensions (Unit : mm)



● Inner circuit



● **Electrical characteristics** (Ta = 25°C)

<Tr1(Nch)>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	-	-	±10	μA	$V_{GS} = \pm 20V$, $V_{DS} = 0V$
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	-	-	V	$I_D = 1mA$, $V_{GS} = 0V$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS} = 30V$, $V_{GS} = 0V$
Gate threshold voltage	$V_{GS(th)}$	1.0	-	2.5	V	$V_{DS} = 10V$, $I_D = 1mA$
Static drain-source on-state resistance	$R_{DS(on)}^*$	-	22	31	mΩ	$I_D = 6.0A$, $V_{GS} = 10V$
		-	30	42		$I_D = 6.0A$, $V_{GS} = 4.5V$
		-	35	49		$I_D = 6.0A$, $V_{GS} = 4.0V$
Forward transfer admittance	$ Y_{fs} ^*$	2.5	-	-	S	$V_{DS} = 10V$, $I_D = 6.0A$
Input capacitance	C_{iss}	-	350	-	pF	$V_{DS} = 10V$
Output capacitance	C_{oss}	-	160	-	pF	$V_{GS} = 0V$
Reverse transfer capacitance	C_{rss}	-	65	-	pF	$f = 1MHz$
Turn-on delay time	$t_{d(on)}^*$	-	8	-	ns	$I_D = 3.0A$, $V_{DD} \approx 15V$
Rise time	t_r^*	-	16	-	ns	$V_{GS} = 10V$
Turn-off delay time	$t_{d(off)}^*$	-	30	-	ns	$R_L = 5\Omega$
Fall time	t_f^*	-	7	-	ns	$R_G = 10\Omega$
Total gate charge	Q_g^*	-	5.0	-	nC	$I_D = 6.0A$
Gate-source charge	Q_{gs}^*	-	1.4	-	nC	$V_{DD} \approx 15V$
Gate-drain charge	Q_{gd}^*	-	1.9	-	nC	$V_{GS} = 5V$

*Pulsed

● **Body diode characteristics** (Source-Drain) (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	V_{SD}^*	-	-	1.2	V	$I_S = 6.0A$, $V_{GS} = 0V$

*Pulsed

● **Electrical characteristics** (Ta = 25°C)

<Tr2(Pch)>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	-	-	±10	μA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source breakdown voltage	$V_{(BR)DSS}$	-30	-	-	V	$I_D=-1mA, V_{GS}=0V$
Zero gate voltage drain current	I_{DSS}		-	-1	μA	$V_{DS}=-30V, V_{GS}=0V$
Gate threshold voltage	$V_{GS(th)}$	-1.0	-	-2.5	V	$V_{DS}=-10V, I_D=-1mA$
Static drain-source on-state resistance	$R_{DS(on)}^*$	-	21.5	29.0	mΩ	$I_D=-7.0A, V_{GS}=-10V$
		-	29.0	39.0		$I_D=-3.5A, V_{GS}=-4.5V$
		-	31.0	40.8		$I_D=-3.5A, V_{GS}=-4.0V$
Forward transfer admittance	$ Y_{fs} ^*$	6.0	-	-	S	$I_D=-7.0A, V_{DS}=-10V$
Input capacitance	C_{iss}	-	1200	-	pF	$V_{DS}=-10V$
Output capacitance	C_{oss}	-	170	-	pF	$V_{GS}=0V$
Reverse transfer capacitance	C_{rss}	-	170	-	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}^*$	-	12	-	ns	$I_D=-3.5A, V_{DD}=-15V$
Rise time	t_r^*	-	40	-	ns	$V_{GS}=-10V$
Turn-off delay time	$t_{d(off)}^*$	-	80	-	ns	$R_L=4.29\Omega$
Fall time	t_f^*	-	65	-	ns	$R_G=10\Omega$
Total gate charge	Q_g^*	-	18		nC	$I_D=-7.0A$
Gate-source charge	Q_{gs}^*	-	3.5	-	nC	$V_{DD}=-15V$
Gate-drain charge	Q_{gd}^*	-	6.5	-	nC	$V_{GS}=-5V$

*Pulsed

● **Body diode characteristics** (Source-Drain) (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	V_{SD}^*	-	-	-1.2	V	$I_s=-7.0A, V_{GS}=0V$

*Pulsed

●Electrical characteristic curves (Ta=25°C)

〈Tr.1(Nch)〉

Fig.1 Typical Output Characteristics(I)

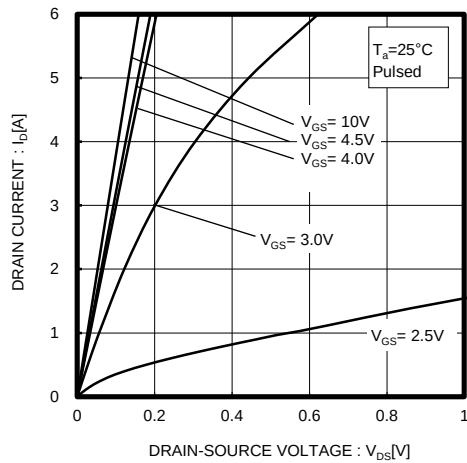


Fig.2 Typical Output Characteristics(II)

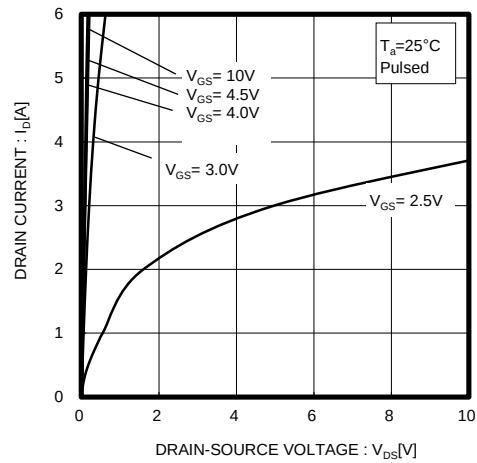


Fig.3 Typical Transfer Characteristics

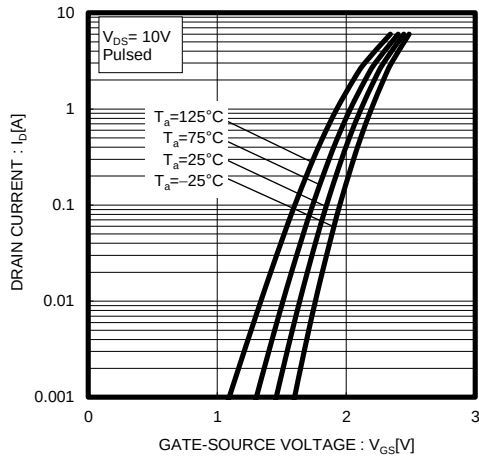


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current(I)

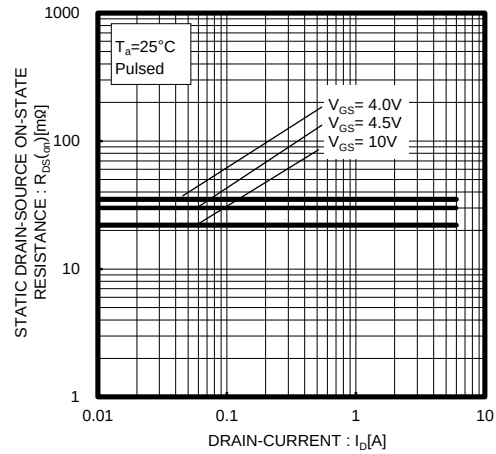


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current(II)

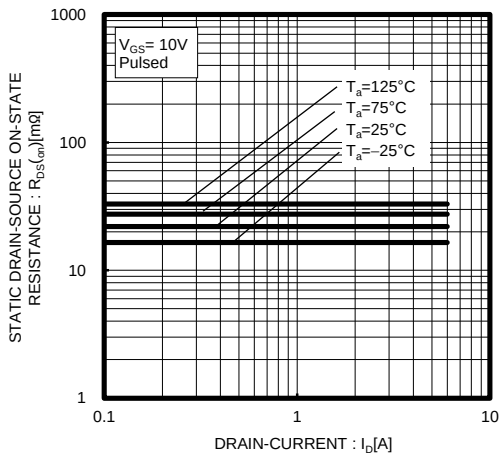


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current(III)

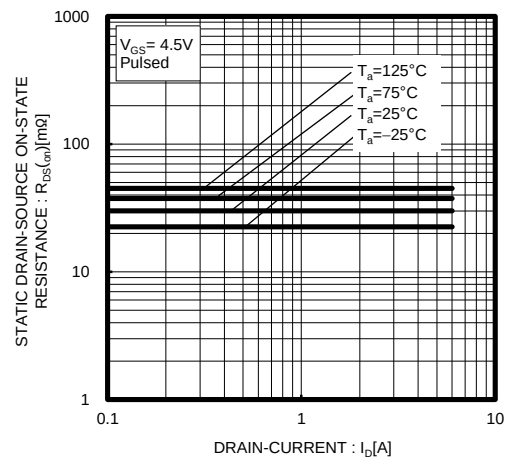


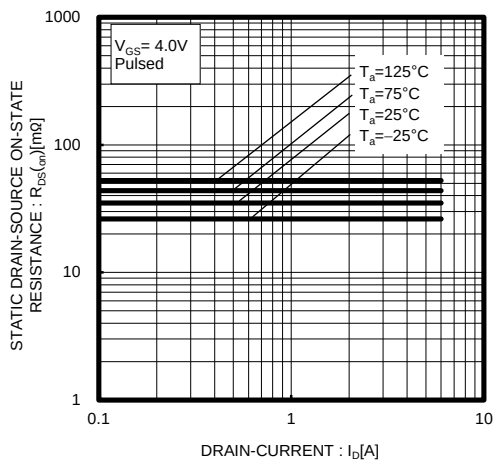
Fig.7 Static Drain-Source On-State Resistance vs. Drain Current(I_D)

Fig.8 Forward Transfer Admittance vs. Drain Current

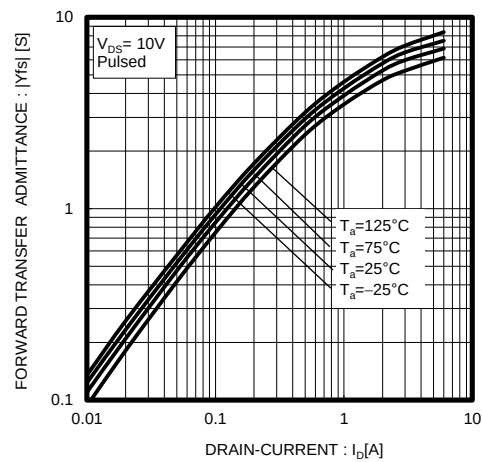


Fig.9 Reverse Drain Current vs. Source-Drain Voltage

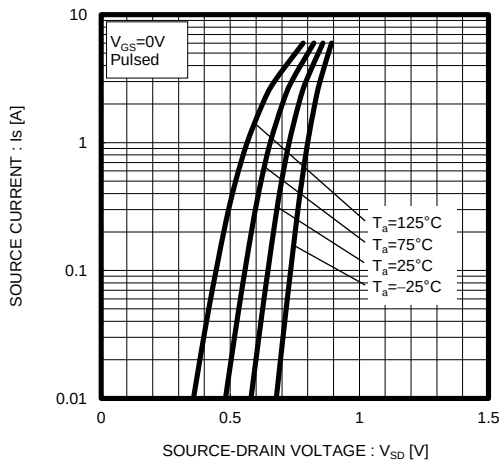


Fig.10 Static Drain-Source On-State Resistance vs. Gate Source Voltage

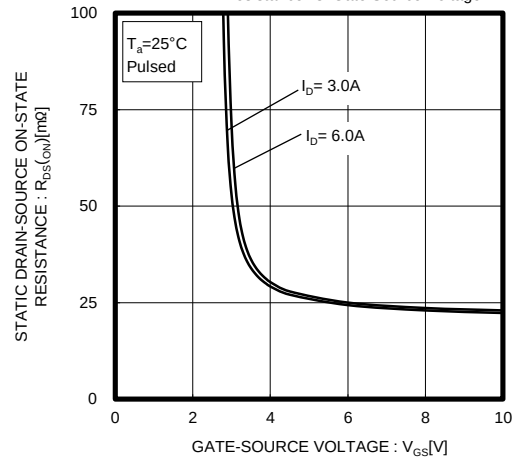


Fig.11 Switching Characteristics

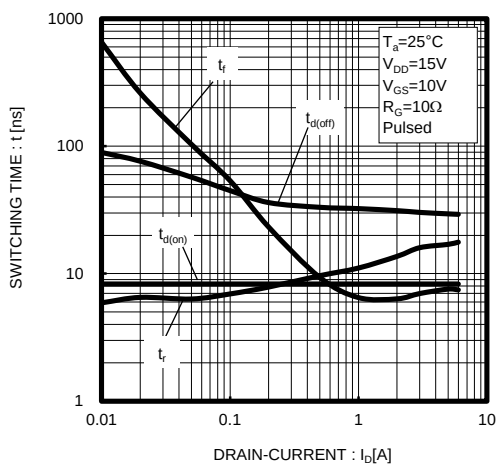


Fig.12 Dynamic Input Characteristics

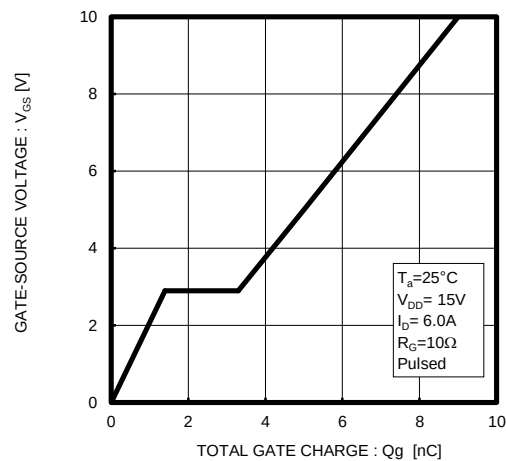


Fig.13 Typical Capacitance vs. Drain-Source Voltage

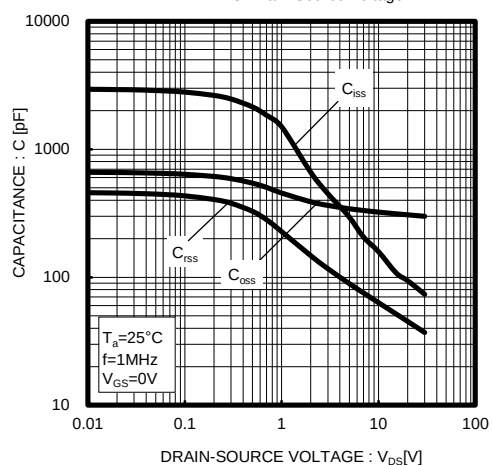


Fig.14 Maximum Safe Operating Area

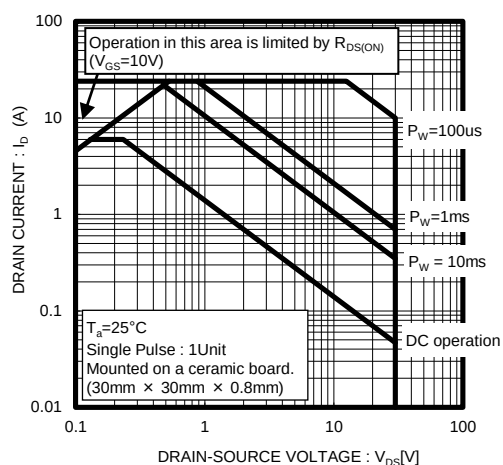
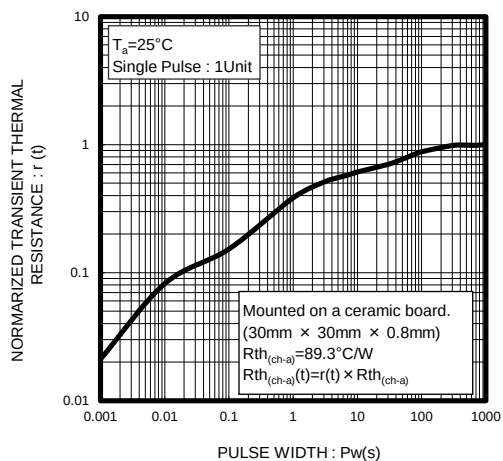


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width



<Tr.2(Pch)>

Fig.1 Typical Output Characteristics(I)

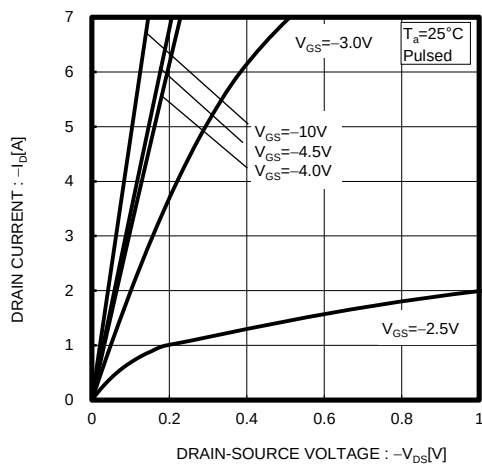


Fig.2 Typical Output Characteristics(II)

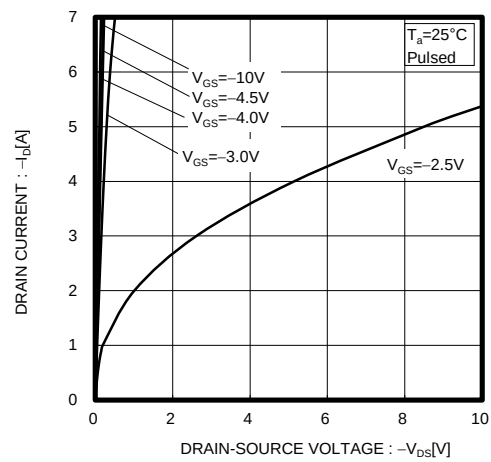


Fig.3 Typical Transfer Characteristics

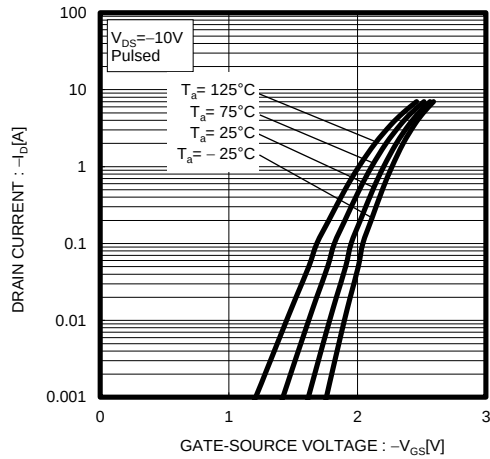


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current(I)

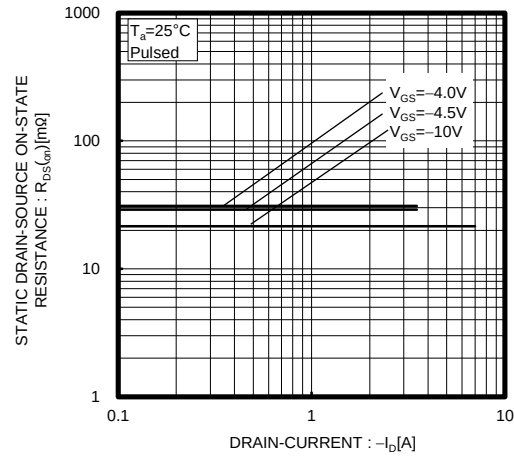


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current(II)

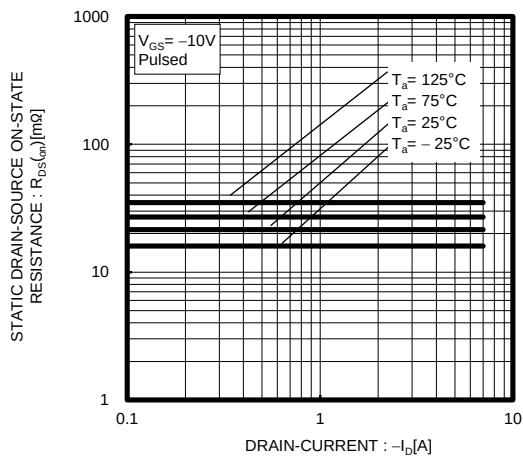


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current(III)

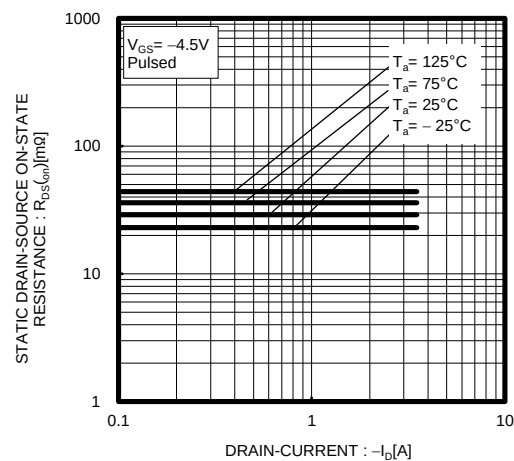


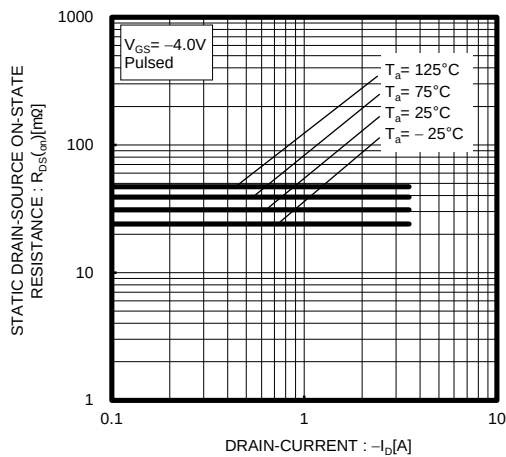
Fig.7 Static Drain-Source On-State Resistance vs. Drain Current(I_D)

Fig.8 Forward Transfer Admittance vs. Drain Current

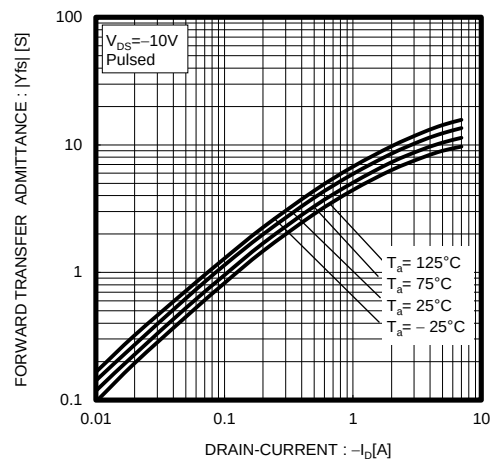


Fig.9 Reverse Drain Current vs. Source-Drain Voltage

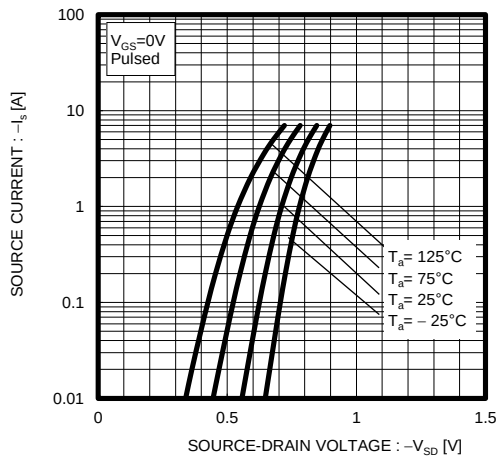


Fig.10 Static Drain-Source On-State Resistance vs. Gate Source Voltage

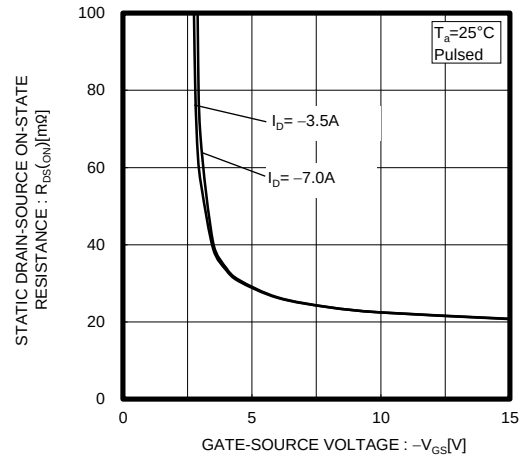


Fig.11 Switching Characteristics

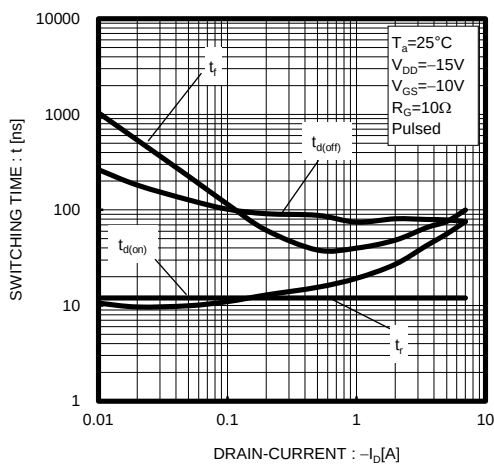


Fig.12 Dynamic Input Characteristics

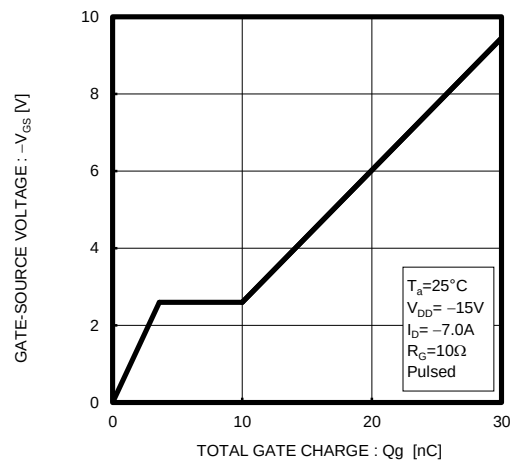


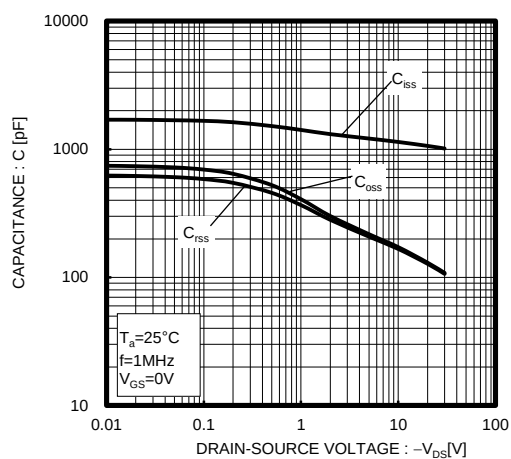
Fig.13 Typical Capacitance
vs. Drain-Source Voltage

Fig.14 Maximum Safe Operating Area

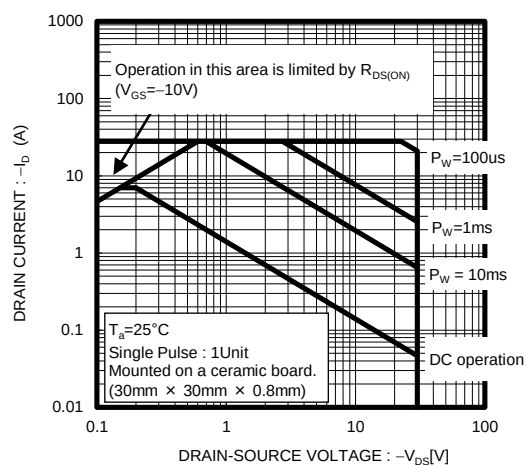
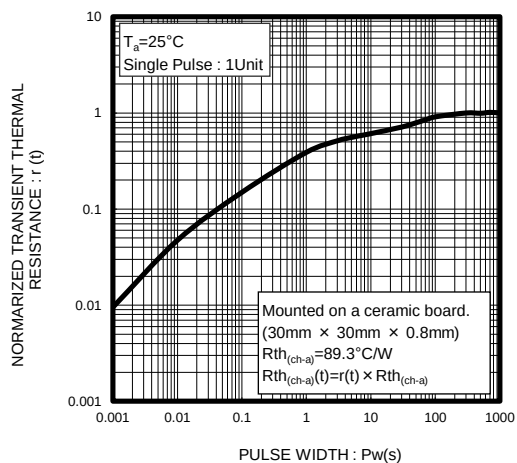


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width



● Measurement circuits

<Tr1(Nch)>

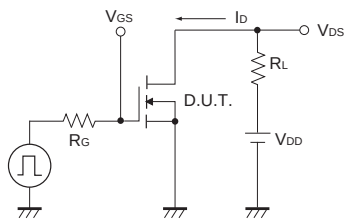


Fig.1-1 Switching Time Measurement Circuit

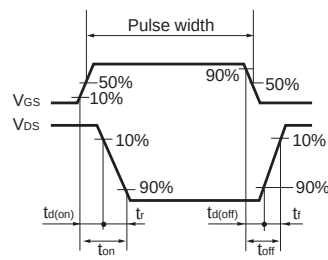


Fig.1-2 Switching Waveforms

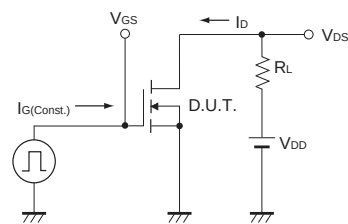


Fig.2-1 Gate Charge Measurement Circuit

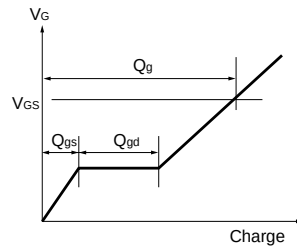


Fig.2-2 Gate Charge Waveform

<Tr2(Pch)>

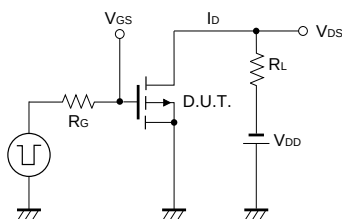


Fig.3-1 Switching Time Measurement Circuit

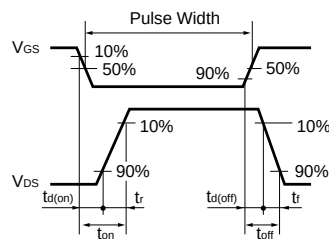


Fig.3-2 Switching Waveforms

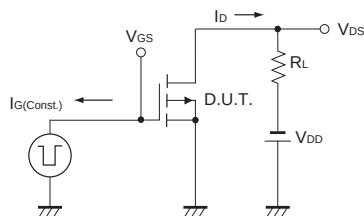


Fig.4-1 Gate Charge Measurement Circuit

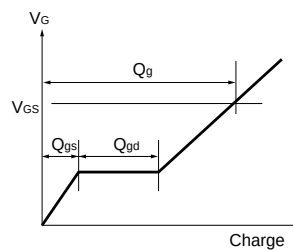


Fig.4-2 Gate Charge Waveform

● Notice

This product might cause chip aging and breakdown under the large electrified environment. Please consider to design ESD protection circuit.

Notes

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