

4V Drive Nch + Pch MOSFET

MP6M12

● 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 (MPT6).

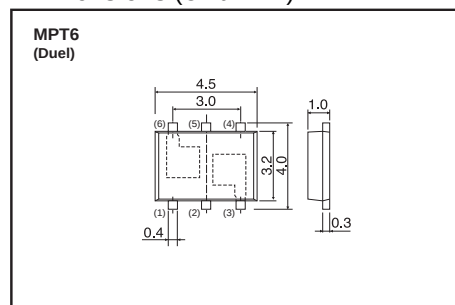
● Application

Switching

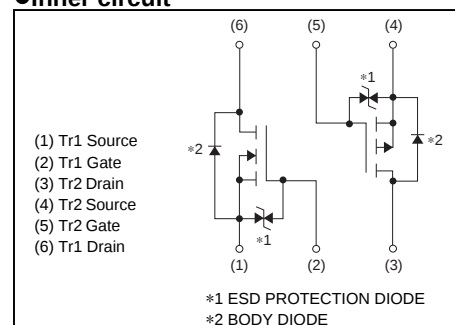
● Packaging specifications

Type	Package	Taping
	Code	TCR
	Basic ordering unit (pieces)	1000
MP6M12		○

● Dimensions (Unit : mm)



● Inner circuit



● 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	±5.0	±5.0	A
	Pulsed	I_{DP} *1	±12	±12	A
Source current (Body Diode)	Continuous	I_s	1.6	-1.6	A
	Pulsed	I_{sp} *1	12	-12	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.

● 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	$R_{DS(on)}^*$	-	30	42	m Ω	$I_D = 5.0A, V_{GS} = 10V$
		-	40	56		$I_D = 5.0A, V_{GS} = 4.5V$
		-	45	63		$I_D = 5.0A, V_{GS} = 4.0V$
Forward transfer admittance	$ Y_{fs} ^*$	2.5	-	-	S	$V_{DS} = 10V, I_D = 5.0A$
Input capacitance	C_{iss}	-	250	-	pF	$V_{DS} = 10V$
Output capacitance	C_{oss}	-	90	-	pF	$V_{GS} = 0V$
Reverse transfer capacitance	C_{rss}	-	45	-	pF	$f = 1MHz$
Turn-on delay time	$t_{d(on)}^*$	-	6	-	ns	$I_D = 2.5A, V_{DD} = 15V$
Rise time	t_r^*	-	27	-	ns	$V_{GS} = 10V$
Turn-off delay time	$t_{d(off)}^*$	-	26	-	ns	$R_L = 6\Omega$
Fall time	t_f^*	-	5	-	ns	$R_G = 10\Omega$
Total gate charge	Q_g^*	-	4.0	-	nC	$I_D = 5.0A$
Gate-source charge	Q_{gs}^*	-	1.2	-	nC	$V_{DD} = 15V$
Gate-drain charge	Q_{gd}^*	-	1.2	-	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	$I_s = 5.0A, V_{GS} = 0V$

*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	$R_{DS(on)}^*$	-	40	56	m Ω	$I_D = -4.5A, V_{GS} = -10V$
		-	55	77		$I_D = -2.5A, V_{GS} = -4.5V$
		-	60	84		$I_D = -2.5A, V_{GS} = -4.0V$
Forward transfer admittance	$ Y_{fs} ^*$	2.5	-	-	S	$I_D = -4.5A, V_{DS} = -10V$
Input capacitance	C_{iss}	-	800	-	pF	$V_{DS} = -10V$
Output capacitance	C_{oss}	-	120	-	pF	$V_{GS} = 0V$
Reverse transfer capacitance	C_{rss}	-	110	-	pF	$f = 1MHz$
Turn-on delay time	$t_{d(on)}^*$	-	10	-	ns	$I_D = -2.5A, V_{DD} = -15V$
Rise time	t_r^*	-	25	-	ns	$V_{GS} = -10V$
Turn-off delay time	$t_{d(off)}^*$	-	80	-	ns	$R_L = 6.0\Omega$
Fall time	t_f^*	-	65	-	ns	$R_G = 10\Omega$
Total gate charge	Q_g^*	-	8.4		nC	$I_D = -4.5A$
Gate-source charge	Q_{gs}^*	-	3.0	-	nC	$V_{DD} = -15V$
Gate-drain charge	Q_{gd}^*	-	3.5	-	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	$I_s = -4.5A, V_{GS} = 0V$

*Pulsed

●Electrical characteristic curves (Ta=25°C)

〈Tr.1(Nch)〉

Fig.1 Typical Output Characteristics (I)

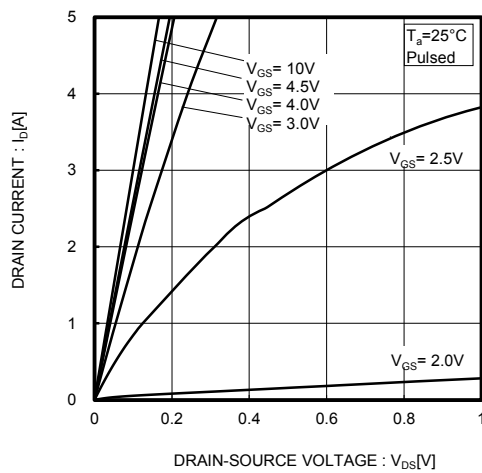


Fig.2 Typical Output Characteristics (II)

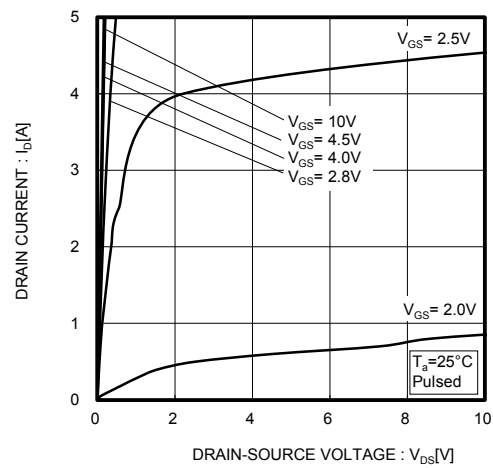


Fig.3 Typical Transfer Characteristics

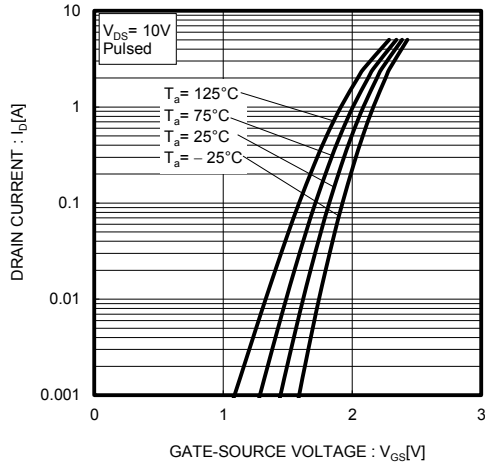


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current (I)

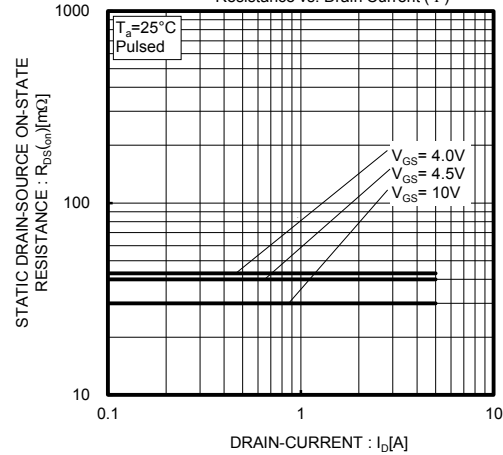


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current (II)

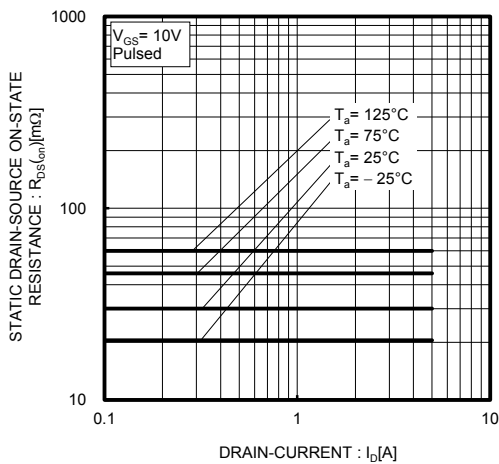


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (III)

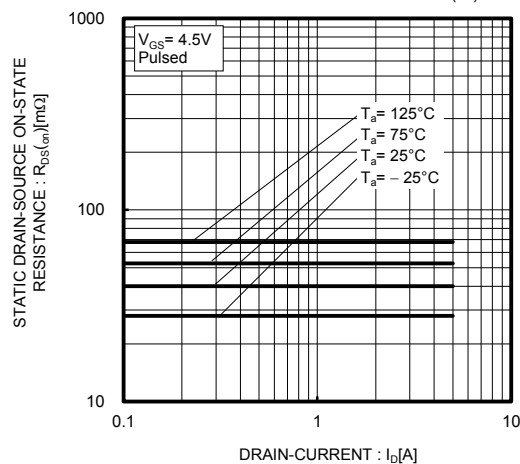


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (IV)

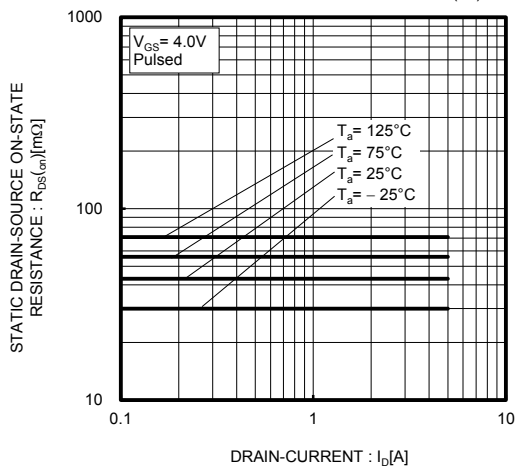


Fig.8 Forward Transfer Admittance vs. Drain Current

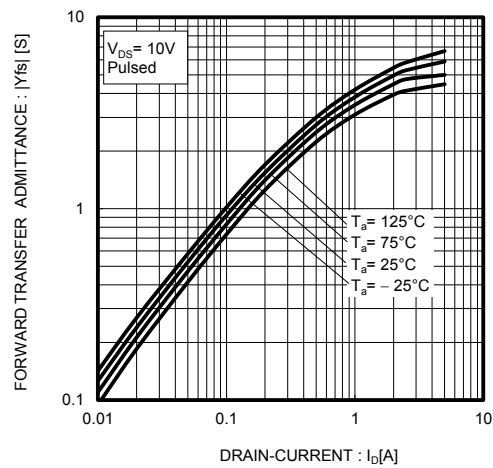


Fig.9 Reverse Drain Current vs. Source-Drain Voltage

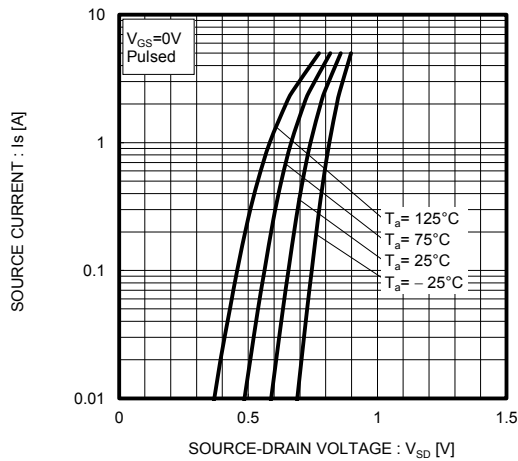


Fig.10 Static Drain-Source On-State Resistance vs. Gate Source Voltage

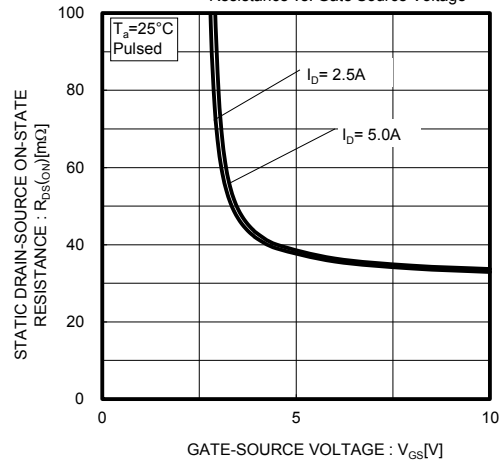


Fig.11 Switching Characteristics

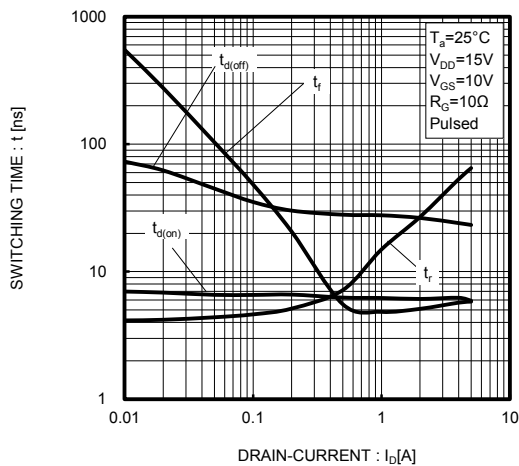


Fig.12 Dynamic Input Characteristics

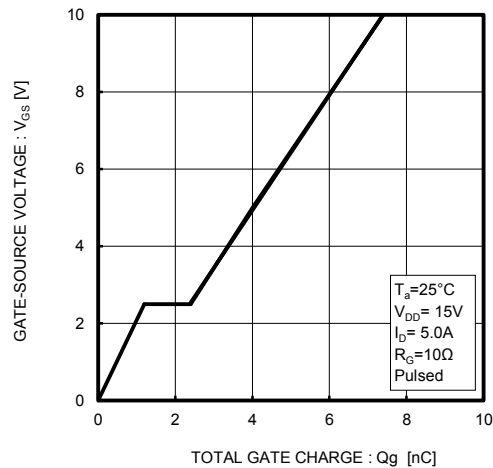


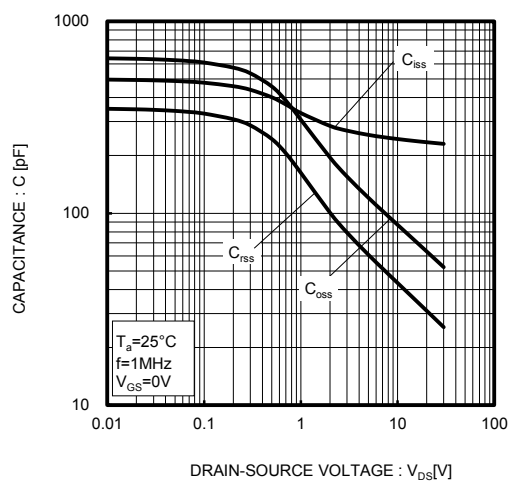
Fig.13 Typical Capacitance
vs. Drain-Source Voltage

Fig.14 Maximum Safe Operating Area

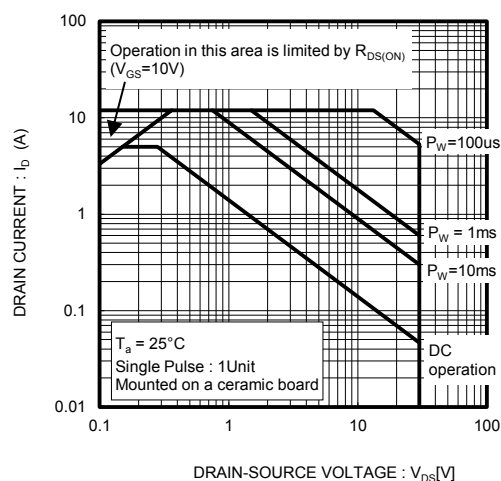
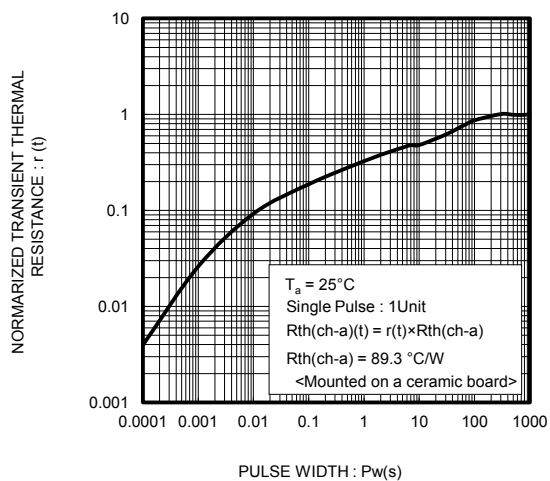


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width



〈Tr.2(Pch)〉

Fig.1 Typical Output Characteristics(I)

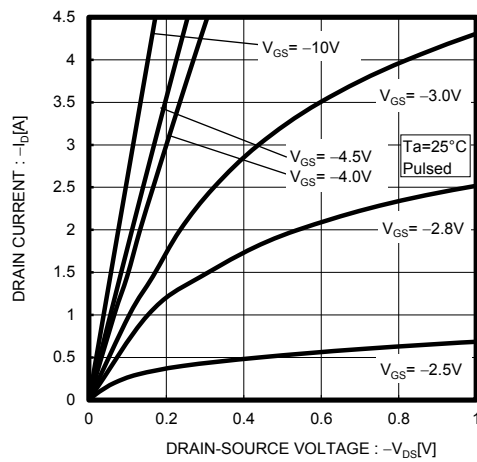


Fig.2 Typical Output Characteristics(II)

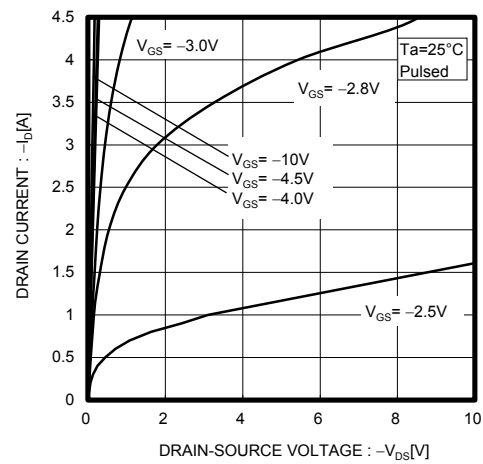


Fig.3 Typical Transfer Characteristics

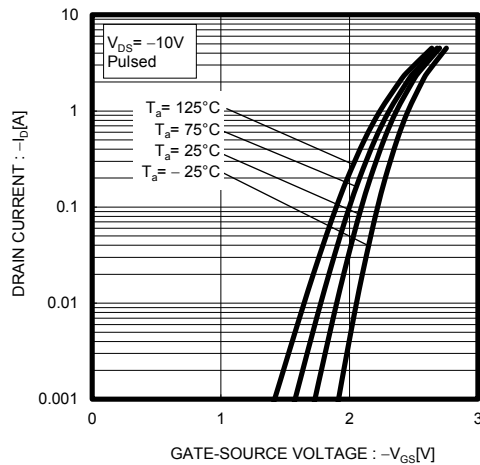


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current(I)

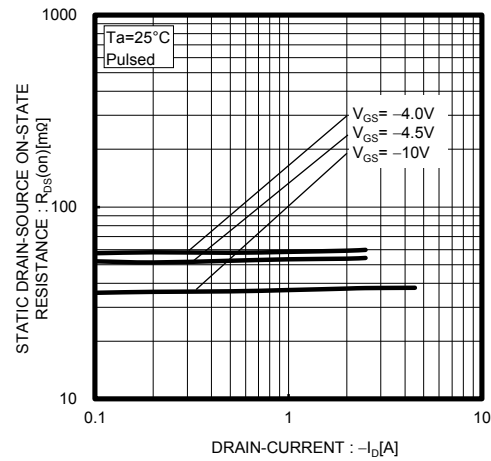


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current(II)

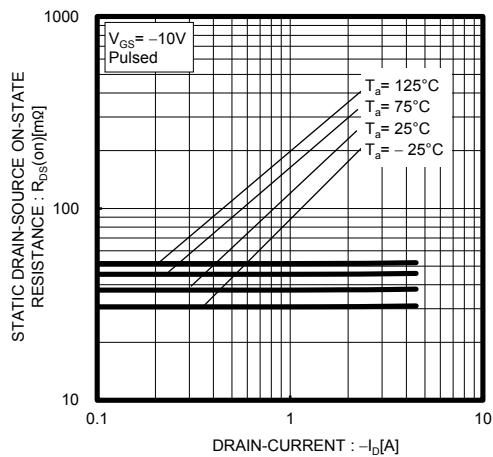


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current(III)

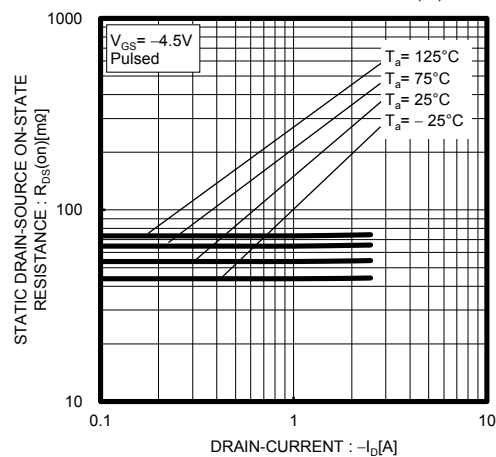


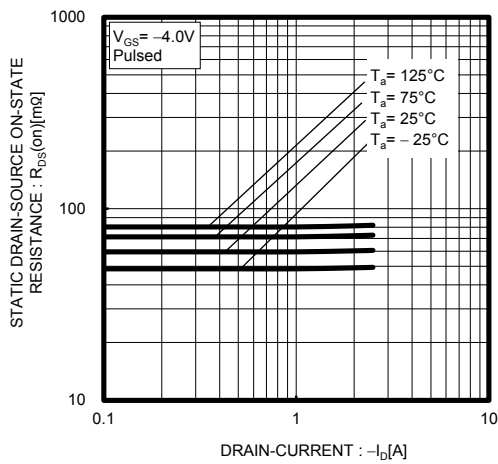
Fig.7 Static Drain-Source On-State Resistance vs. Drain Current(I_V)

Fig.8 Forward Transfer Admittance vs. Drain Current

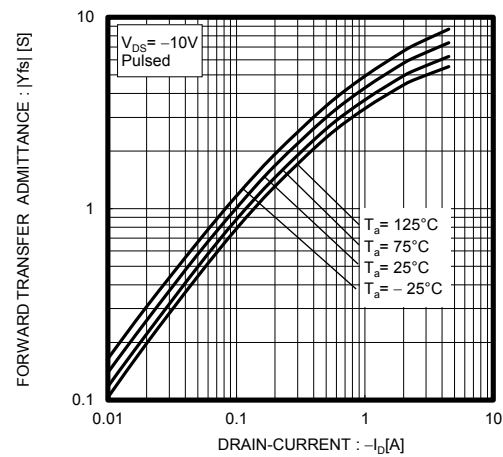


Fig.9 Reverse Drain Current vs. Source-Drain Voltage

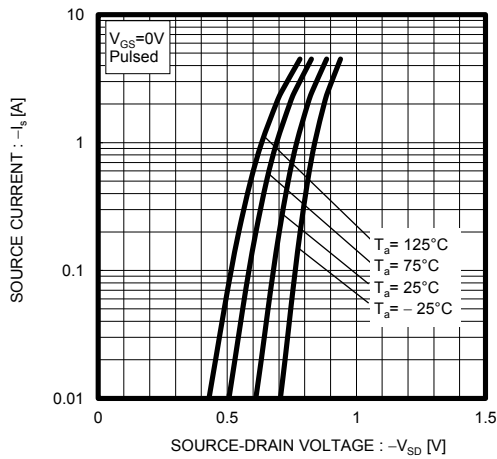


Fig.10 Static Drain-Source On-State Resistance vs. Gate Source Voltage

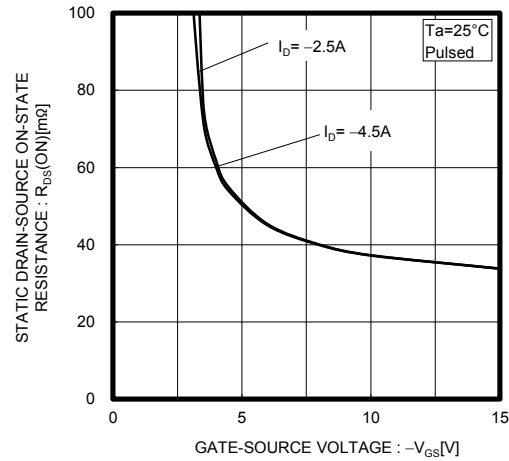


Fig.11 Switching Characteristics

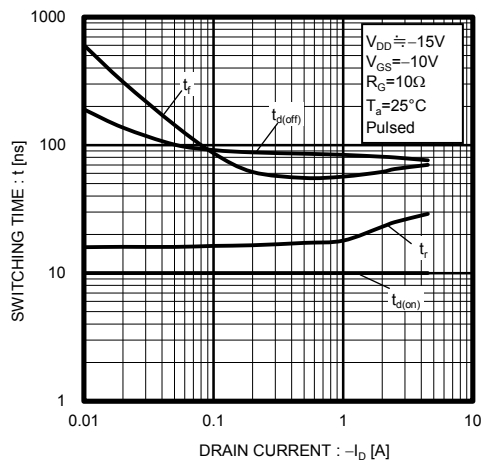


Fig.12 Dynamic Input Characteristics

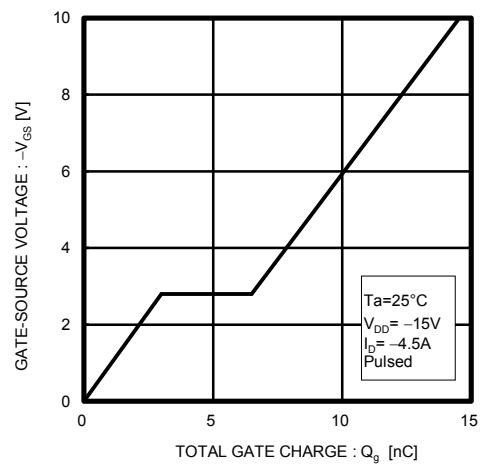


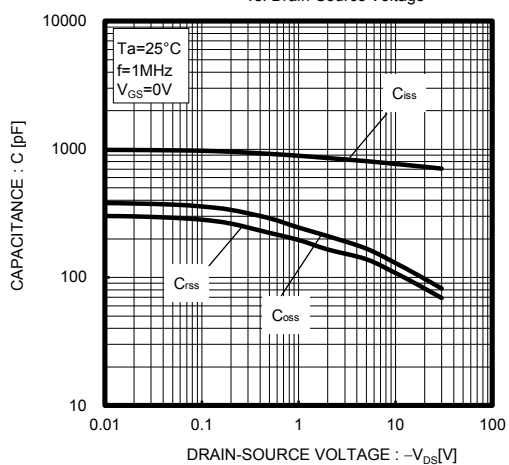
Fig.13 Typical Capacitance
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Fig.14 Maximum Safe Operating Area

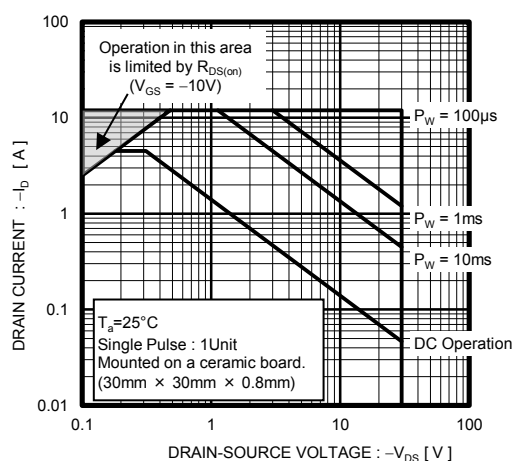
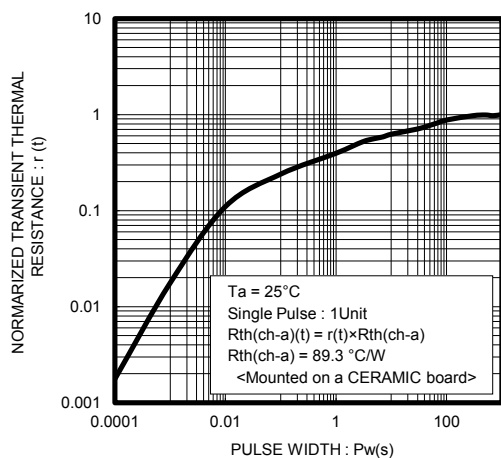


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width



● Measurement circuits

<Tr1(Nch)>

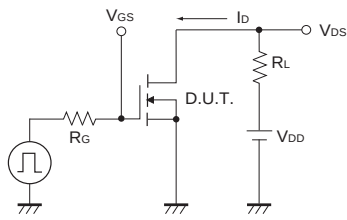


Fig.1-1 Switching Time Measurement Circuit

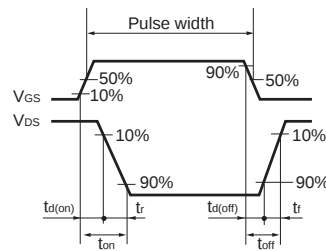


Fig.1-2 Switching Waveforms

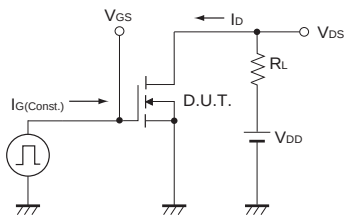


Fig.2-1 Gate Charge Measurement Circuit

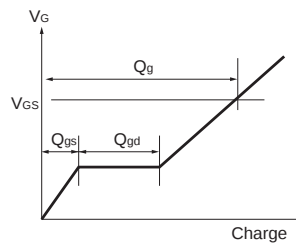


Fig.2-2 Gate Charge Waveform

<Tr2(Pch)>

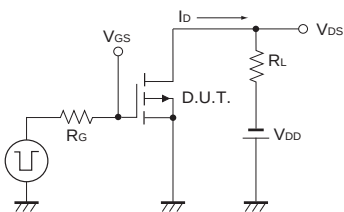


Fig.1-1 Switching Time Measurement Circuit

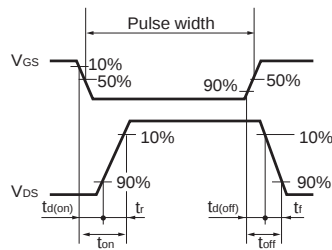


Fig.1-2 Switching Waveforms

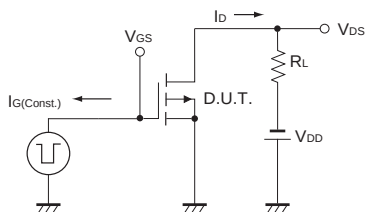


Fig.2-1 Gate Charge Measurement Circuit

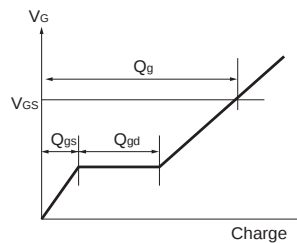


Fig.2-2 Gate Charge Waveform

● 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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