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# 1.5V Drive Nch + Pch MOSFET

## TT8M1

### ● Structure

Silicon N-channel MOSFET/  
Silicon P-channel MOSFET

### ● Features

- 1) Low on-resistance.
- 2) High power package (TSST8).
- 3) Low voltage drive (1.5V drive).

### ● Application

Switching

### ● Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
TT8M1		○

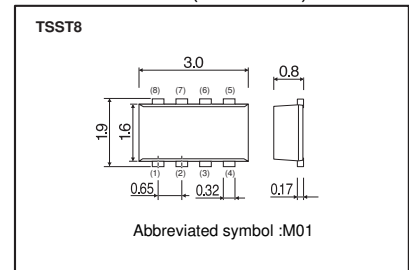
### ● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits		Unit
		Tr1 : N-ch	Tr2 : P-ch	
Drain-source voltage	$V_{DSS}$	20	-20	V
Gate-source voltage	$V_{GSS}$	$\pm 10$	$\pm 10$	V
Drain current	Continuous	$I_D$	$\pm 2.5$	A
	Pulsed	$I_{DP}^{*1}$	$\pm 10$	A
Source current (Body Diode)	Continuous	$I_S$	0.8	A
	Pulsed	$I_{sp}^{*1}$	10	A
Power dissipation	$P_D^{*2}$	1.25		W / TOTAL
		1		W / ELEMENT
Channel temperature	Tch	150		°C
Range of storage temperature	Tstg	-55 to +150		°C

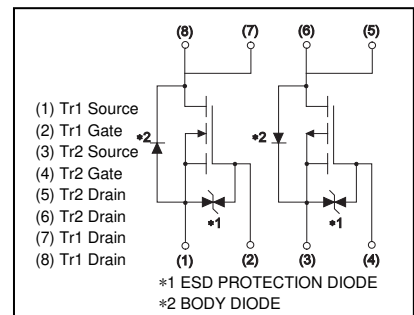
\*1  $P_w \leq 10\mu s$ , Duty cycle  $\leq 1\%$

\*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	$V_{GS}=\pm 10V, V_{DS}=0V$
Drain-source breakdown voltage	$V_{(BR)DSS}$	20	-	-	V	$I_D=1mA, V_{GS}=0V$
Zero gate voltage drain current	$I_{DSS}$	-	-	1	μA	$V_{DS}=20V, V_{GS}=0V$
Gate threshold voltage	$V_{GS(th)}$	0.3	-	1.0	V	$V_{DS}=10V, I_D=1mA$
Static drain-source on-state resistance	$R_{DS(on)}$ *	-	52	72	mΩ	$I_D=2.5A, V_{GS}=4.5V$
		-	65	90		$I_D=2.5A, V_{GS}=2.5V$
		-	85	120		$I_D=1.2A, V_{GS}=1.8V$
		-	100	140		$I_D=0.5A, V_{GS}=1.5V$
Forward transfer admittance	$ Y_{fs} ^*$	2.7	-	-	S	$V_{DS}=10V, I_D=2.5A$
Input capacitance	$C_{iss}$	-	260	-	pF	$V_{DS}=10V$
Output capacitance	$C_{oss}$	-	65	-	pF	$V_{GS}=0V$
Reverse transfer capacitance	$C_{rss}$	-	35	-	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}$ *	-	9	-	ns	$I_D=1.2A, V_{DD}=10V$
Rise time	$t_r$ *	-	17	-	ns	$V_{GS}=4.5V$
Turn-off delay time	$t_{d(off)}$ *	-	28	-	ns	$R_L=8.3\Omega$
Fall time	$t_f$ *	-	17	-	ns	$R_G=10\Omega$
Total gate charge	$Q_g$ *	-	3.6	-	nC	$I_D=2.5A, V_{DD}=10V$
Gate-source charge	$Q_{gs}$ *	-	0.7	-	nC	$V_{GS}=4.5V, R_L=4\Omega$
Gate-drain charge	$Q_{gd}$ *	-	0.6	-	nC	$R_G=10\Omega$

\*Pulsed

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	$V_{SD}$ *	-	-	1.2	V	$I_s=2.5A, V_{GS}=0V$

\*Pulsed

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

<Tr2(Pch)>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	$I_{GSS}$	-	-	$\pm 10$	$\mu A$	$V_{GS}=\pm 10V, V_{DS}=0V$
Drain-source breakdown voltage	$V_{(BR)DSS}$	-20	-	-	V	$I_D=-1mA, V_{GS}=0V$
Zero gate voltage drain current	$I_{DSS}$		-	-1	$\mu A$	$V_{DS}=-20V, V_{GS}=0V$
Gate threshold voltage	$V_{GS(th)}$	-0.3	-	-1.0	V	$V_{DS}=-10V, I_D=-1mA$
Static drain-source on-state resistance	$R_{DS(on)}$ *	-	49	68	m $\Omega$	$I_D=-2.5A, V_{GS}=-4.5V$
		-	68	95		$I_D=-1.2A, V_{GS}=-2.5V$
			100	150		$I_D=-1.2A, V_{GS}=-1.8V$
		-	140	280		$I_D=-0.5A, V_{GS}=-1.5V$
Forward transfer admittance	$ Y_{fs} ^*$	2.5	-	-	S	$V_{DS}=-10V, I_D=-2.5A$
Input capacitance	$C_{iss}$	-	1270	-	pF	$V_{DS}=-10V$
Output capacitance	$C_{oss}$	-	100	-	pF	$V_{GS}=0V$
Reverse transfer capacitance	$C_{rss}$	-	90	-	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}$ *	-	9	-	ns	$I_D=-1.2A, V_{DD}=-10V$
Rise time	$t_r$ *	-	30	-	ns	$V_{GS}=-4.5V$
Turn-off delay time	$t_{d(off)}$ *	-	120	-	ns	$R_L=8.3\Omega$
Fall time	$t_f$ *	-	85	-	ns	$R_G=10\Omega$
Total gate charge	$Q_g$ *	-	12	-	nC	$I_D=-2.5A, V_{DD}=-10V$
Gate-source charge	$Q_{gs}$ *	-	2.5	-	nC	$V_{GS}=-4.5V, R_L=4\Omega$
Gate-drain charge	$Q_{gd}$ *	-	2	-	nC	$R_G=10\Omega$

\*Pulsed

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	$V_{SD}$ *	-	-	-1.2	V	$I_s=-2.5A, V_{GS}=0V$

\*Pulsed



● Electrical characteristic curves (Ta = 25°C)

<Tr1(Nch)>

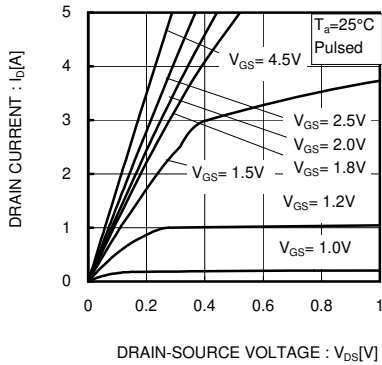


Fig.1 Typical Output Characteristics( I )

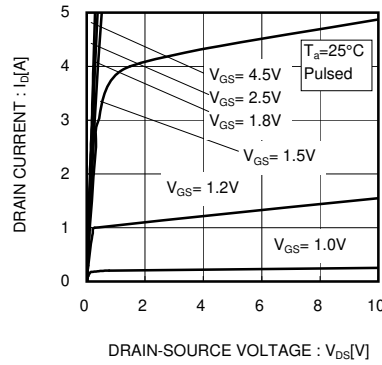


Fig.2 Typical Output Characteristics( II )

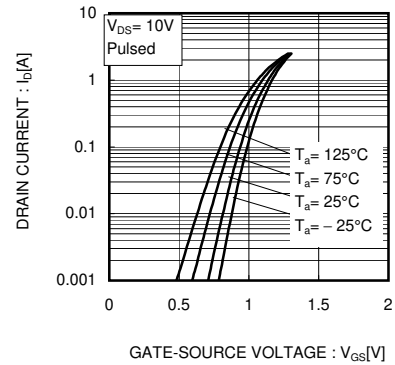


Fig.3 Typical Transfer Characteristics

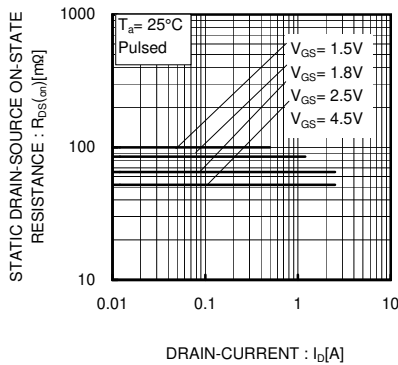


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current( I )

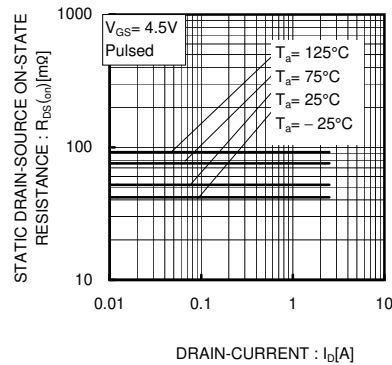


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current( II )

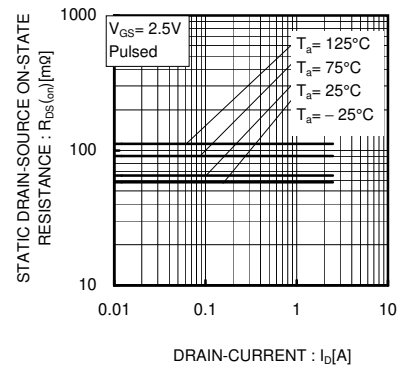


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current( III )

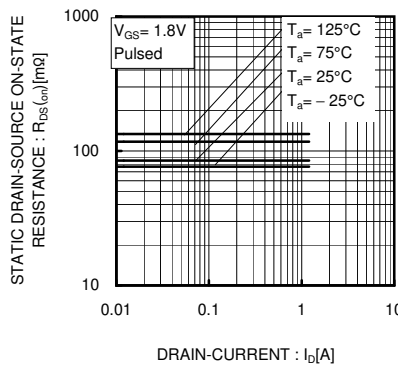


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current( IV )

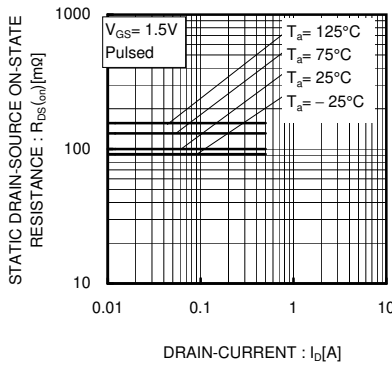


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current( V )

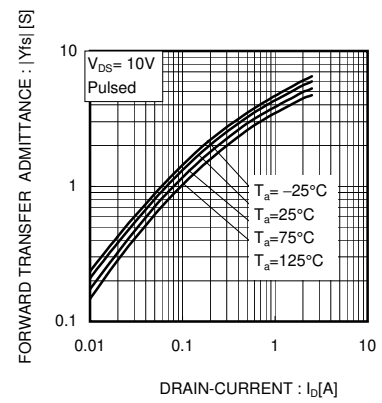


Fig.9 Forward Transfer Admittance vs. Drain Current

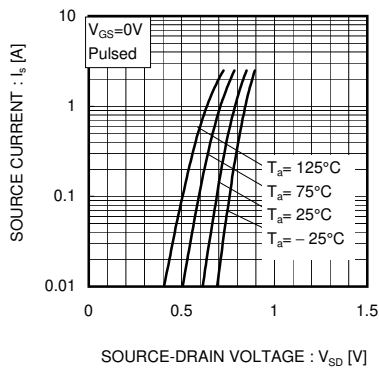


Fig.10 Reverse Drain Current vs. Source-Drain Voltage

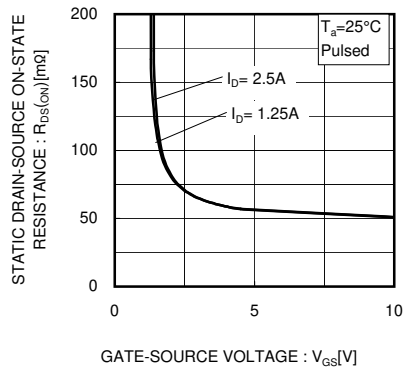


Fig.11 Static Drain-Source On-State Resistance vs. Gate Source Voltage

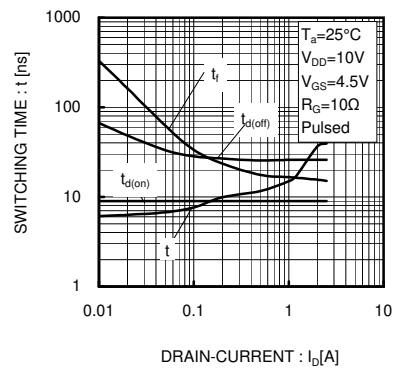


Fig.12 Switching Characteristics

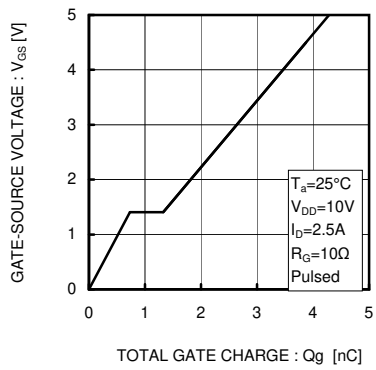


Fig.13 Dynamic Input Characteristics

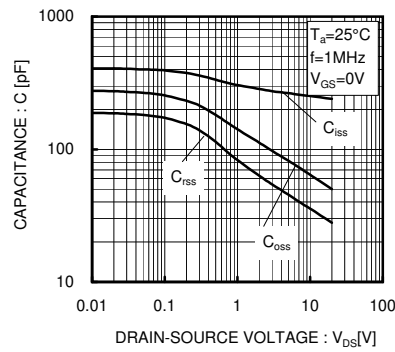


Fig.14 Typical Capacitance vs. Drain-Source Voltage

<Tr2(Pch)>

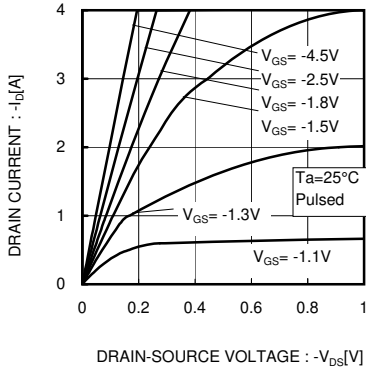


Fig.1 Typical Output Characteristics( I )

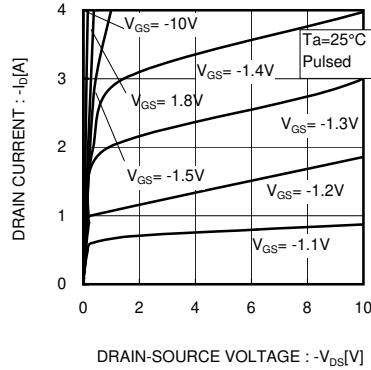


Fig.2 Typical Output Characteristics( II )

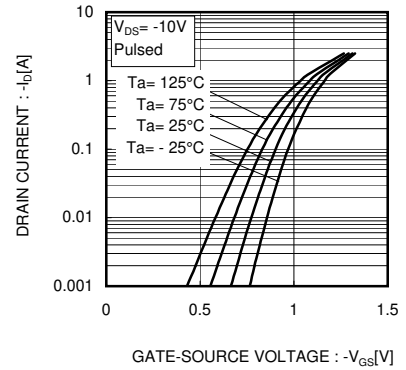


Fig.3 Typical Transfer Characteristics

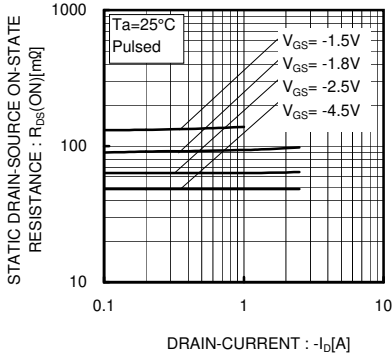


Fig.4 Static Drain-Source On-State Resistance vs. Drain

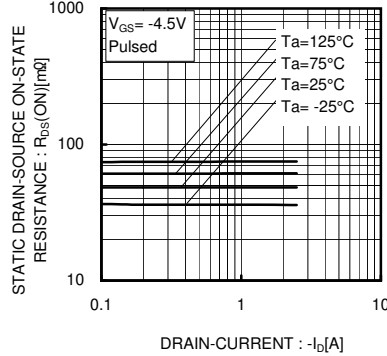


Fig.5 Static Drain-Source On-State Resistance vs. Drain

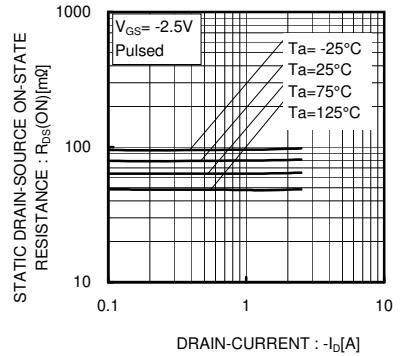


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current(III)

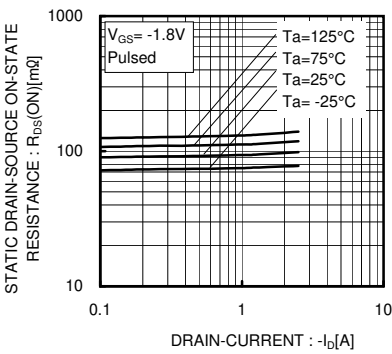


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current(IV)

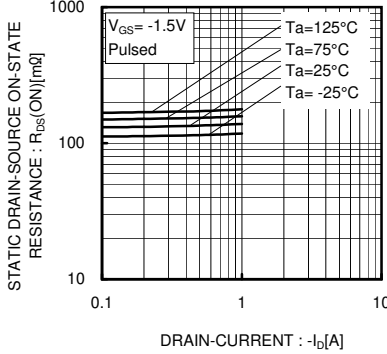


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current(V)

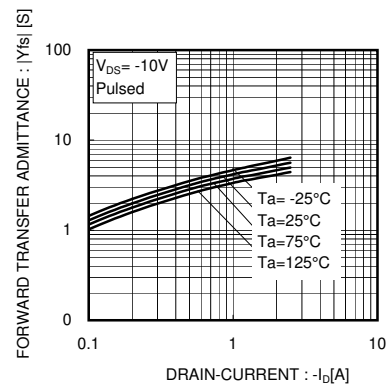
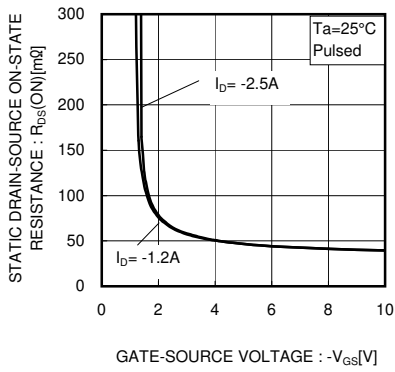
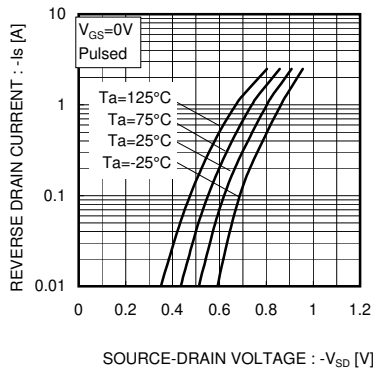


Fig.9 Forward Transfer Admittance vs. Drain Current



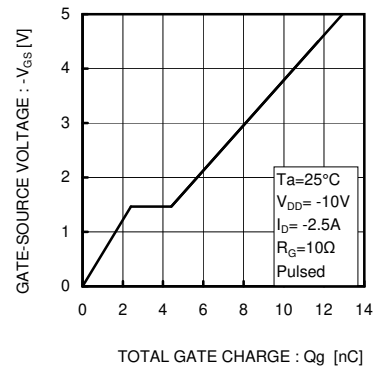
GATE-SOURCE VOLTAGE :  $-V_{GS}$ [V]

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



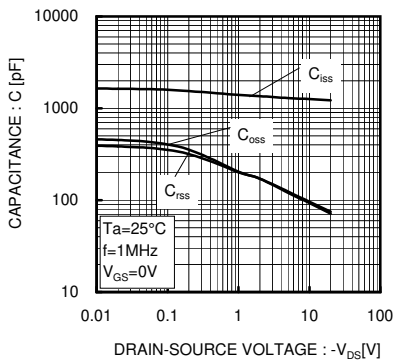
SOURCE-DRAIN VOLTAGE :  $-V_{SD}$  [V]

Fig.11 Reverse Drain Current vs. Source-Drain Voltage



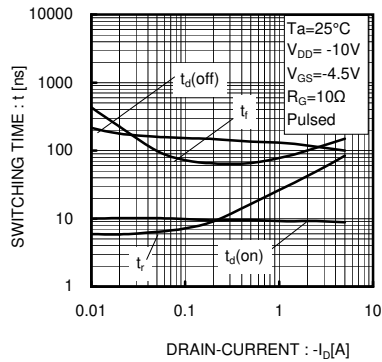
TOTAL GATE CHARGE :  $Q_g$  [nC]

Fig.12 Dynamic Input Characteristics



DRAIN-SOURCE VOLTAGE :  $-V_{DS}$ [V]

Fig.13 Typical Capacitance vs. Drain-Source



DRAIN-CURRENT :  $-I_D$ [A]

Fig.14 Switching Characteristics



● Measurement circuits

<Tr1(Nch)>

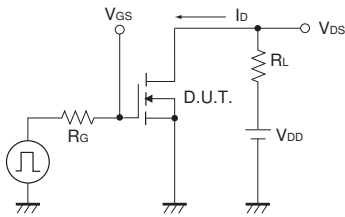


Fig.1-1 Switching time measurement circuit

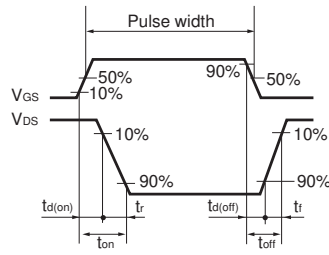


Fig.1-2 Switching waveforms

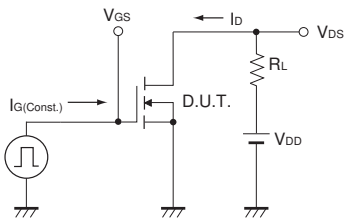


Fig.2-1 Gate charge measurement circuit

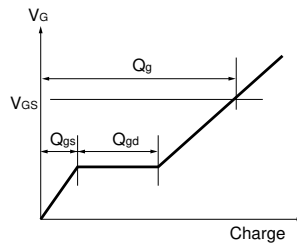


Fig.2-2 Gate Charge Waveform

<Tr2(Pch)>

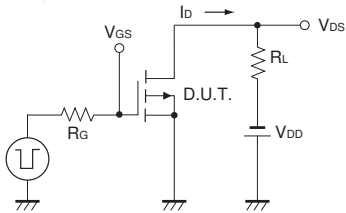


Fig.3-1 Switching time measurement circuit

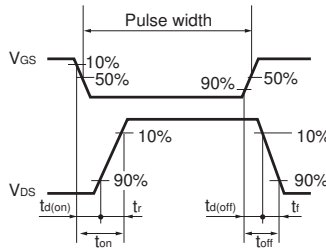


Fig.3-2 Switching waveforms

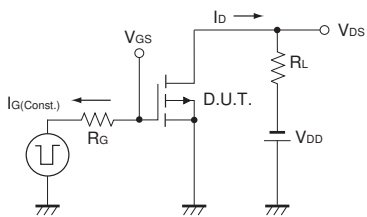


Fig.4-1 Gate charge measurement circuit

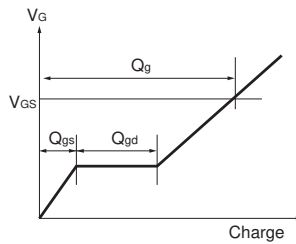


Fig.4-2 Gate charge waveform

● Notice

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

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