

# 1.5V Drive Nch + Pch MOSFET

## TT8M3

### ●Structure

Silicon N-channel MOSFET/  
Silicon P-channel MOSFET

### ●Features

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

### ●Application

Switching

### ●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
TT8M3		○

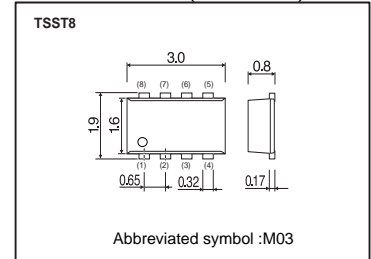
### ●Absolute maximum ratings (Ta = 25°C)

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
		1.0		W / ELEMENT
Channel temperature	Tch	150		°C
Range of storage temperature	Tstg	-55 to +150		°C

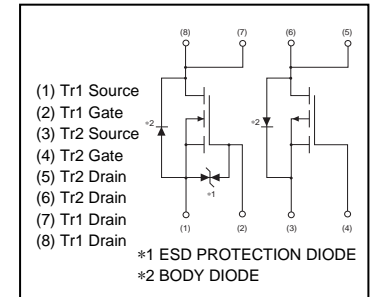
\*1  $P_w \leq 10\mu s$ , Duty cycle  $\leq 1\%$

\*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	$I_{GSS}$	-	-	$\pm 100$	$\mu A$	$V_{GS}=\pm 10V, V_{DS}=0V$
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	$R_{DS(on)}$ *	-	80	105	m $\Omega$	$I_D=-2.4A, V_{GS}=-4.5V$
		-	105	140		$I_D=-1.2A, V_{GS}=-2.5V$
		-	150	225		$I_D=-1.2A, V_{GS}=-1.8V$
		-	180	360		$I_D=-0.5A, V_{GS}=-1.5V$
Forward transfer admittance	$ Y_{fs} ^*$	2.4	-	-	S	$I_D=-2.4A, V_{DS}=-10V$
Input capacitance	$C_{iss}$	-	850	-	pF	$V_{DS}=-10V$
Output capacitance	$C_{oss}$	-	60	-	pF	$V_{GS}=0V$
Reverse transfer capacitance	$C_{rfs}$	-	50	-	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}$ *	-	9	-	ns	$I_D=-1.2A, V_{DD} \approx -10V$
Rise time	$t_r$ *	-	25	-	ns	$V_{GS}=-4.5V$
Turn-off delay time	$t_{d(off)}$ *	-	55	-	ns	$R_L=8.3\Omega$
Fall time	$t_f$ *	-	45	-	ns	$R_G=10\Omega$
Total gate charge	$Q_g$ *	-	6.7	-	nC	$I_D=-2.4A$
Gate-source charge	$Q_{gs}$ *	-	1.7	-	nC	$V_{DD} \approx -10V$
Gate-drain charge	$Q_{gd}$ *	-	0.6	-	nC	$V_{GS}=-4.5V$

\*Pulsed

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	$V_{SD}$ *	-	-	-1.2	V	$I_s=-2.4A, V_{GS}=0V$

\*Pulsed

●Electrical characteristic curves<Tr1(Nch)>

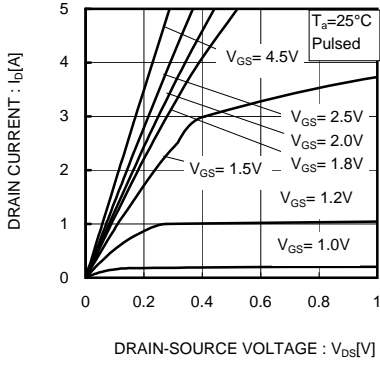


Fig.1 Typical Output Characteristics( I )

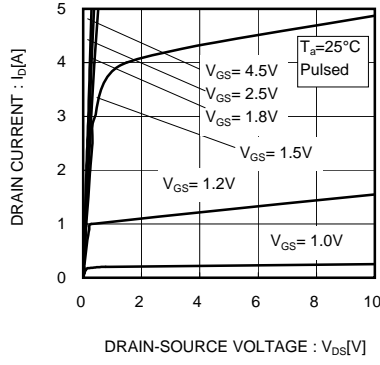


Fig.2 Typical Output Characteristics( II )

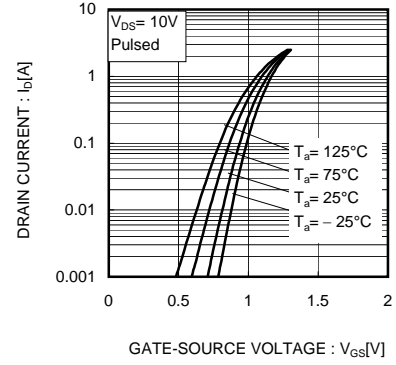


Fig.3 Typical Transfer Characteristics

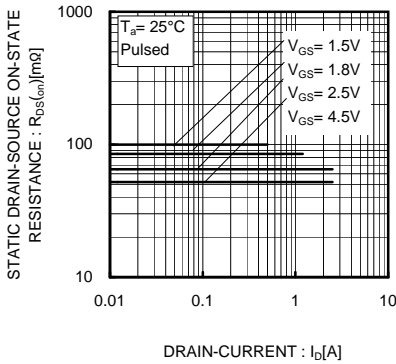


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current( I )

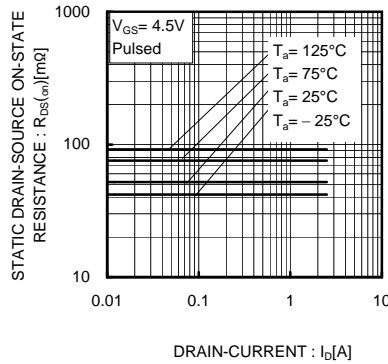


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current( II )

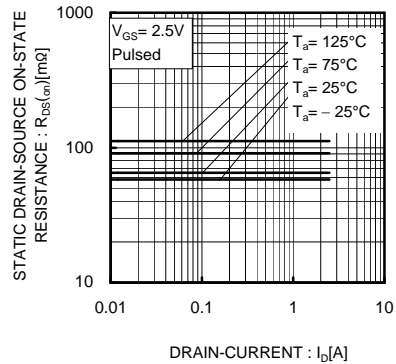


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current( III )

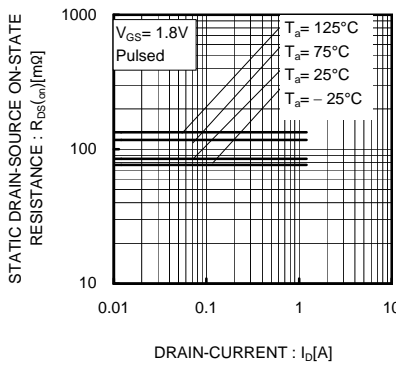


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current( IV )

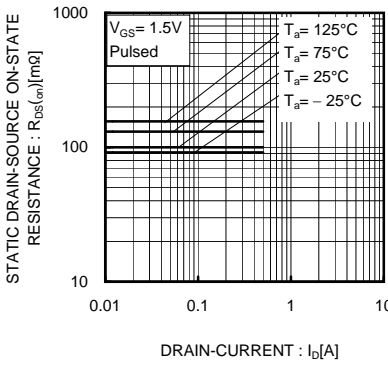


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current( V )

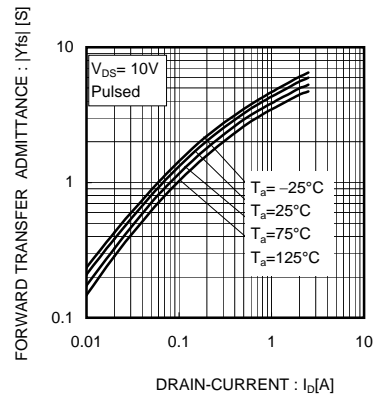


Fig.9 Forward Transfer Admittance vs. Drain Current

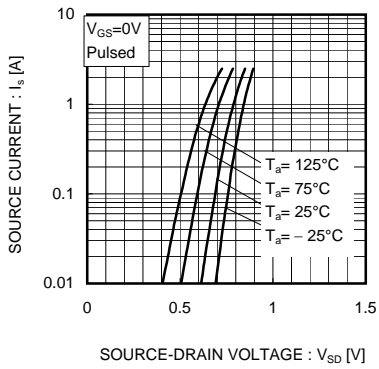


Fig.10 Reverse Drain Current vs. Source-Drain Voltage

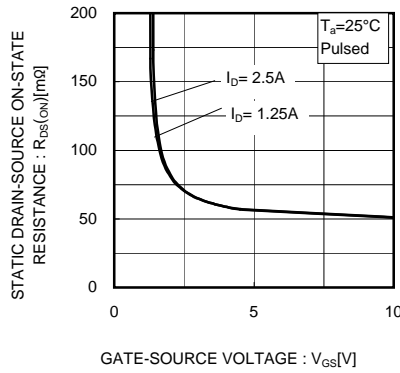


Fig.11 Static Drain-Source On-State Resistance vs. Gate Source Voltage

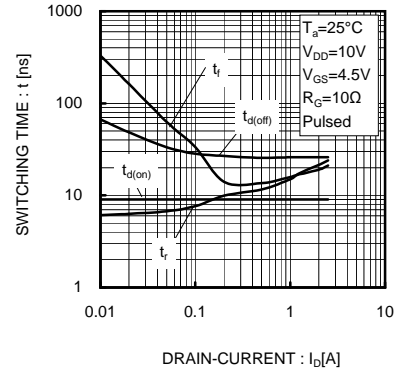


Fig.12 Switching Characteristics

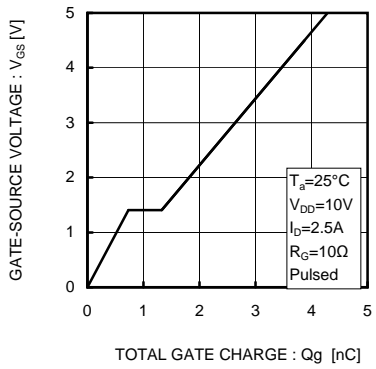


Fig.13 Dynamic Input Characteristics

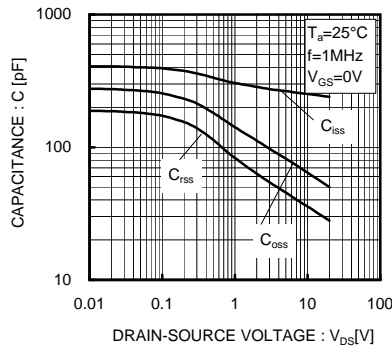
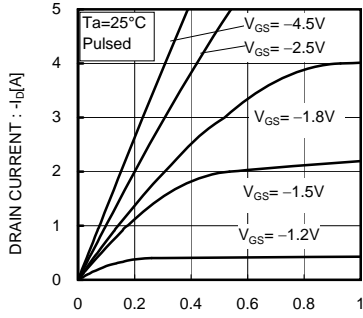
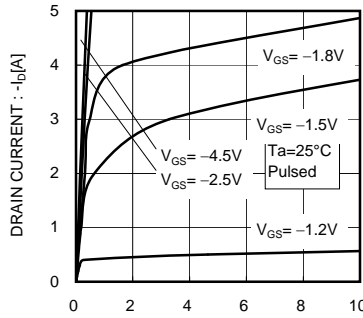


Fig.14 Typical Capacitance vs. Drain-Source Voltage

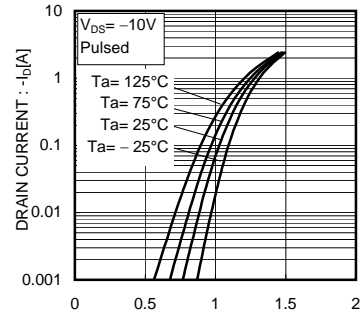
●Electrical characteristic curves<Tr2(Pch)>



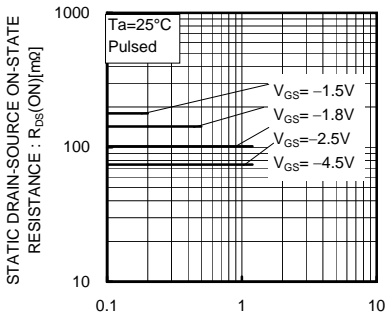
DRAIN-SOURCE VOLTAGE :  $-V_{DS}$ [V]  
Fig.1 Typical output characteristics( I )



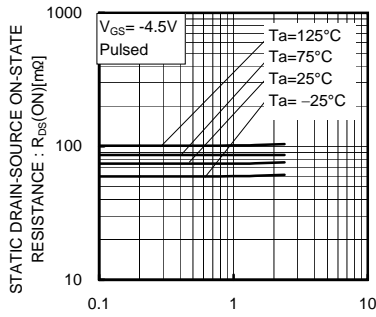
DRAIN-SOURCE VOLTAGE :  $-V_{DS}$ [V]  
Fig.2 Typical output characteristics( II )



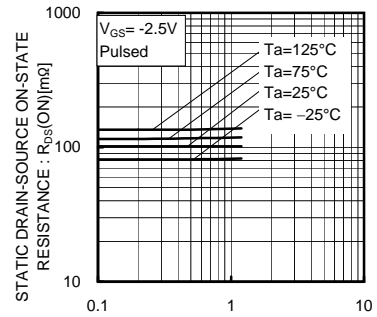
GATE-SOURCE VOLTAGE :  $-V_{GS}$ [V]  
Fig.3 Typical Transfer Characteristics



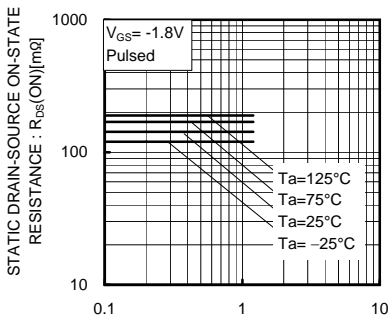
DRAIN-CURRENT :  $-I_D$ [A]  
Fig.4 Static Drain-Source On-State Resistance vs. Drain Current( I )



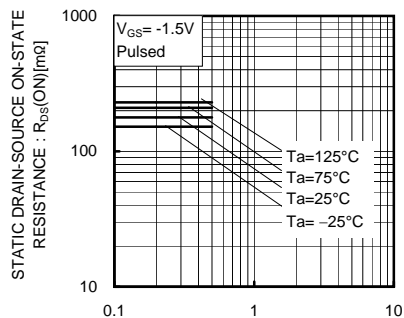
DRAIN-CURRENT :  $-I_D$ [A]  
Fig.5 Static Drain-Source On-State Resistance vs. Drain Current( II )



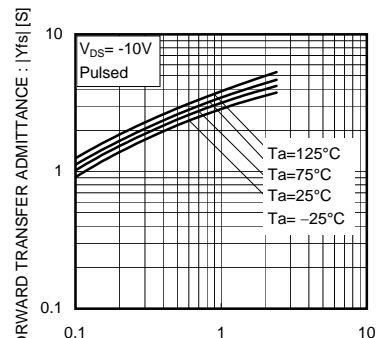
DRAIN-CURRENT :  $-I_D$ [A]  
Fig.6 Static Drain-Source On-State Resistance vs. Drain Current( III )



DRAIN-CURRENT :  $-I_D$ [A]  
Fig.7 Static Drain-Source On-State Resistance vs. Drain Current( IV )



DRAIN-CURRENT :  $-I_D$ [A]  
Fig.8 Static Drain-Source On-State Resistance vs. Drain Current( V )



DRAIN-CURRENT :  $-I_D$ [A]  
Fig.9 Forward Transfer Admittance vs. Drain Current

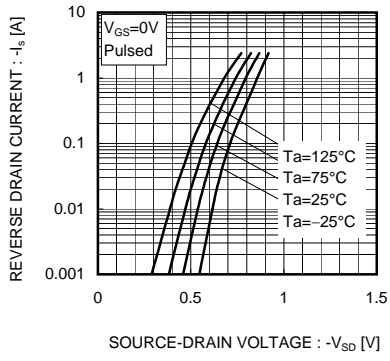


Fig.10 Reverse Drain Current vs. Source-Drain Voltage

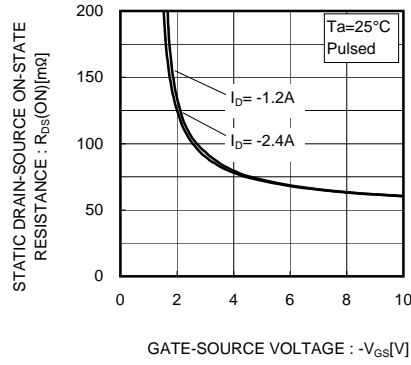


Fig.11 Static Drain-Source On-State Resistance vs. Gate Source Voltage

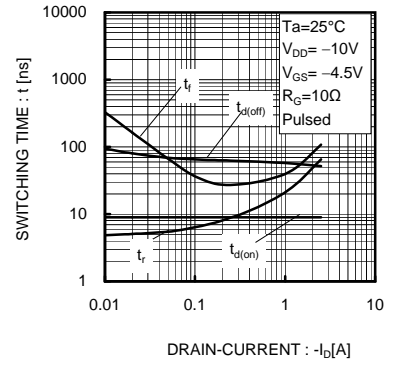


Fig.12 Switching Characteristics

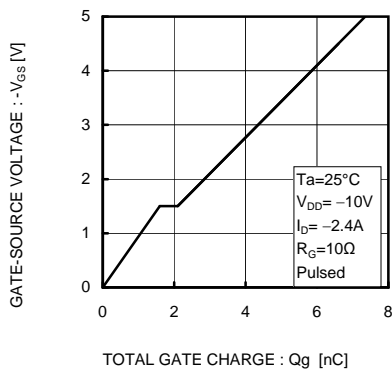


Fig.12 Dynamic Input Characteristics

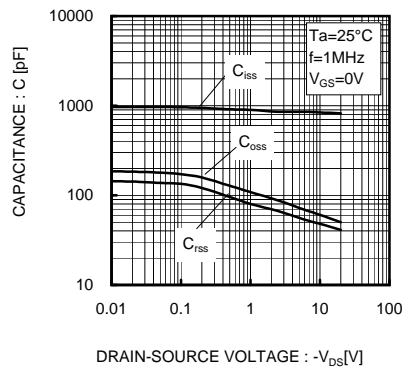


Fig.13 Typical Capacitance vs. Drain-Source Voltage

●Measurement circuits

<Tr1(Nch)>

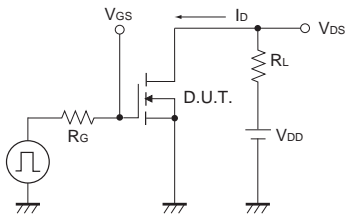


Fig.1-1 Switching time measurement circuit

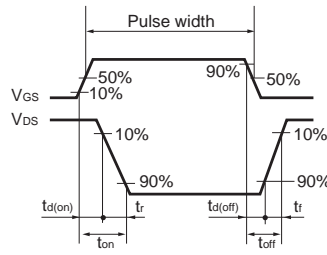


Fig.1-2 Switching waveforms

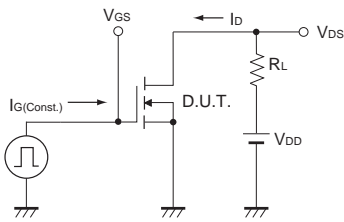


Fig.2-1 Gate charge measurement circuit

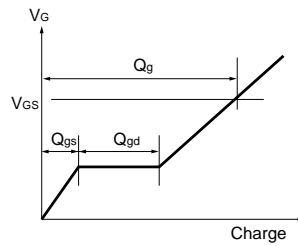


Fig.2-2 Gate Charge Waveform

<Tr2(Pch)>

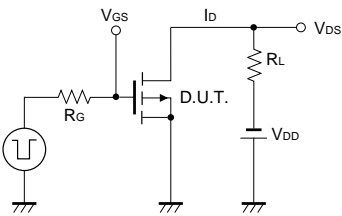


Fig 3-1 Switching Time Measurement Circuit

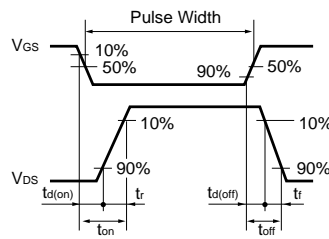


Fig 3-2 Switching Waveforms

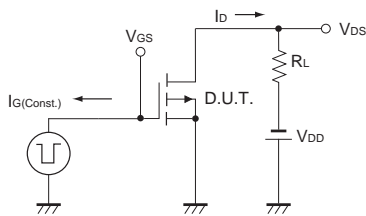


Fig 4-1 Gate charge measurement circuit

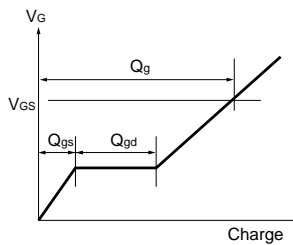


Fig 4-2 Gate Charge Waveform

●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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