

2.5V Drive Nch+Pch MOSFET

QS6M3

●Structure

Silicon N-channel / P-channel MOSFET

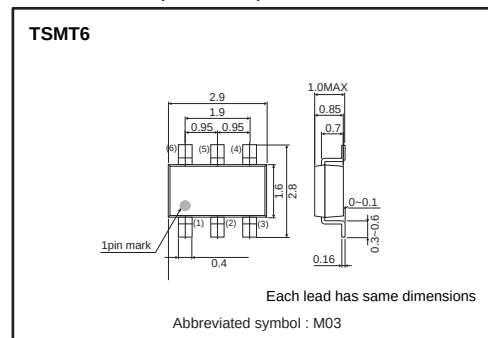
●Features

- 1) Low on-resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small Surface Mount Package (TSMT6).

●Application

Power switching, DC / DC converter.

●Dimensions (Unit : mm)



●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
QS6M3		○

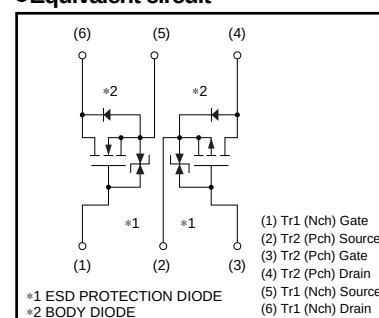
●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits		Unit
		Tr1 : Nch	Tr2 : Pch	
Drain-source voltage	V_{DS}	30	-20	V
Gate-source voltage	V_{GS}	±12	±12	V
Drain current	Continuous	I_D	±1.5	A
	Pulsed	I_{DP} *1	±6.0	A
Source current (Body diode)	Continuous	I_S	0.8	A
	Pulsed	I_{SP} *1	6.0	A
Total power dissipation	P_D *2	1.25		W / TOTAL
		0.9		W / ELEMENT
Channel temperature	T_{ch}	150		°C
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

●Equivalent circuit



●Thermal resistance

Parameter	Symbol	Limits	Unit
Channel to ambient	$R_{th}(ch-a)$ *	100	°C / W / TOTAL
		139	°C / W / ELEMENT

* Mounted on a ceramic board

Transistors

N-ch

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	—	—	±10	μA	$V_{GS}=±12V$, $V_{DS}=0V$
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	$V_{GS(th)}$	0.5	—	1.5	V	$V_{DS}=10V$, $I_D=1mA$
Static drain-source on-state resistance	$R_{DS(on)}$	—	170	230	mΩ	$I_D=1.5A$, $V_{GS}=4.5V$
		—	180	245		$I_D=1.5A$, $V_{GS}=4.0V$
		—	260	360		$I_D=1.0A$, $V_{GS}=2.5V$
Forward transfer admittance	$ Y_{fs} $	1.0	—	—	S	$I_D=1.0A$, $V_{DS}=10V$
Input capacitance	C_{iss}	—	80	—	pF	$V_{DS}=10V$
Output capacitance	C_{oss}	—	25	—	pF	$V_{GS}=0V$
Reverse transfer capacitance	C_{rss}	—	15	—	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}$	—	7	—	ns	$I_D=1A$, $V_{DD}=15V$
Rise time	t_r	—	18	—	ns	$V_{GS}=4.5V$
Turn-off delay time	$t_{d(off)}$	—	15	—	ns	$R_L=15Ω$
Fall time	t_f	—	15	—	ns	$R_G=10Ω$
Total gate charge	Q_g	—	1.6	—	nC	$V_{DD}=15V$ $R_L=10Ω$
Gate-source charge	Q_{gs}	—	0.5	—	nC	$V_{GS}=4.5V$ $R_G=10Ω$
Gate-drain charge	Q_{gd}	—	0.9	—	nC	$I_D=1.5A$

*Pulsed

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_{SD}	—	—	1.2	V	$I_S=3.2A$, $V_{GS}=0V$

*Pulsed

Transistors

P-ch

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	—	—	±10	μA	$V_{GS} = \pm 12V, V_{DS} = 0V$
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	$V_{GS(th)}$	−0.7	—	−2.0	V	$V_{DS} = -10V, I_D = 1mA$
Static drain-source on-state resistance	$R_{DS(on)}$	—	155	215	mΩ	$I_D = -1.5A, V_{GS} = -4.5V$
		—	170	235		$I_D = -1.5A, V_{GS} = -4.0V$
		—	310	430		$I_D = -0.75A, V_{GS} = -2.5V$
Forward transfer admittance	$ Y_{fs} $	1.0	—	—	S	$I_D = -0.75A, V_{DS} = -10V$
Input capacitance	C_{iss}	—	270	—	pF	$V_{DS} = -10V$
Output capacitance	C_{oss}	—	40	—	pF	$V_{GS} = 0V$
Reverse transfer capacitance	C_{rss}	—	35	—	pF	$f = 1MHz$
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	$I_D = -0.75A, V_{DD} = -15V$
Rise time	t_r	—	12	—	ns	$V_{GS} = -4.5V$
Turn-off delay time	$t_{d(off)}$	—	45	—	ns	$R_L = 20\Omega$
Fall time	t_f	—	20	—	ns	$R_G = 10\Omega$
Total gate charge	Q_g	—	3.0	—	nC	$V_{DD} = -15V, R_L = 10\Omega$
Gate-source charge	Q_{gs}	—	0.8	—	nC	$V_{GS} = -4.5V, R_G = 10\Omega$
Gate-drain charge	Q_{gd}	—	0.85	—	nC	$I_D = -1.5A$

*Pulsed

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_{SD}	—	—	−1.2	V	$I_S = -0.75A, V_{GS} = 0V$

Transistors

N-ch

●Electrical characteristic curves

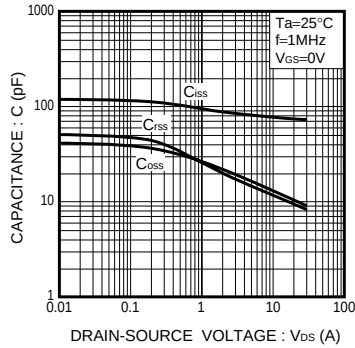


Fig.1 Typical Capacitance vs. Drain-Source Voltage

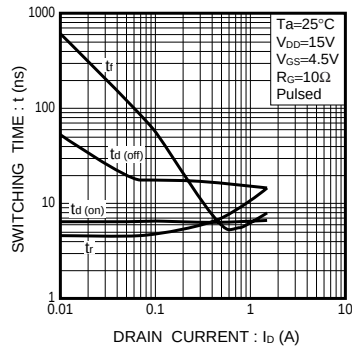


Fig.2 Switching Characteristics

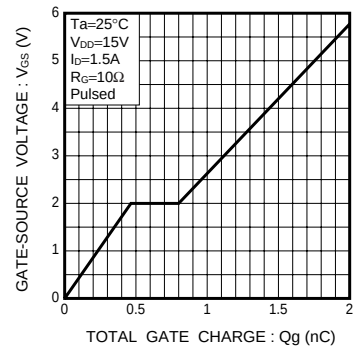


Fig.3 Dynamic Input Characteristics

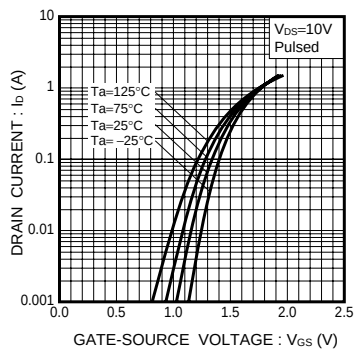


Fig.4 Typical Transfer Characteristics

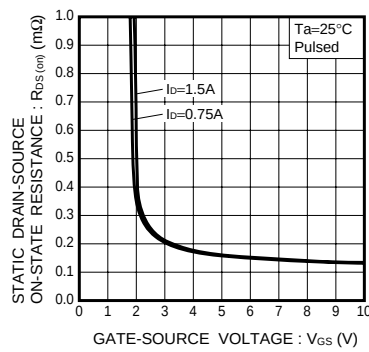


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

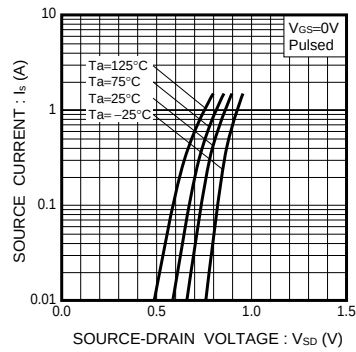


Fig.6 Source Current vs. Source-Drain Voltage

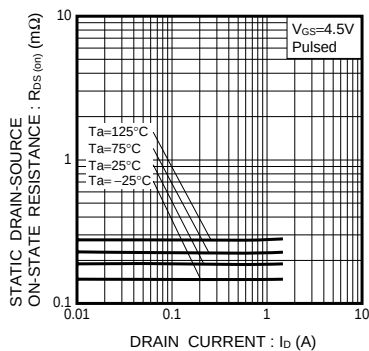


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

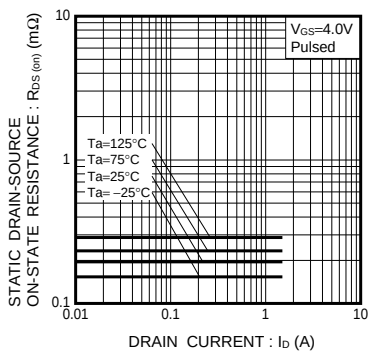


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

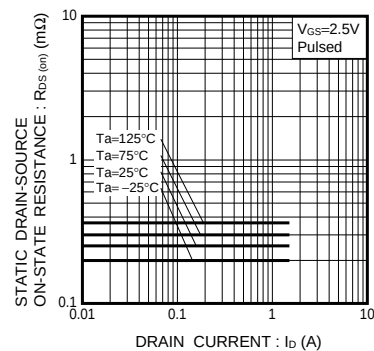


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

Transistors

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●Electrical characteristic curves

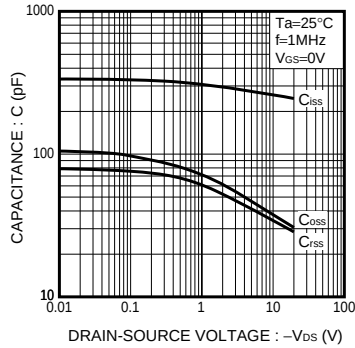


Fig.1 Typical Capacitance vs. Drain-Source Voltage

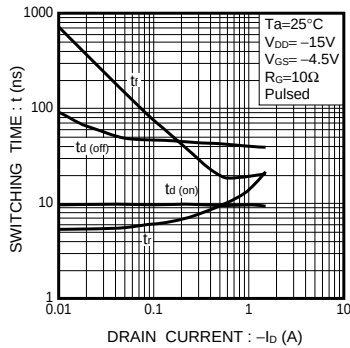


Fig.2 Switching Characteristics

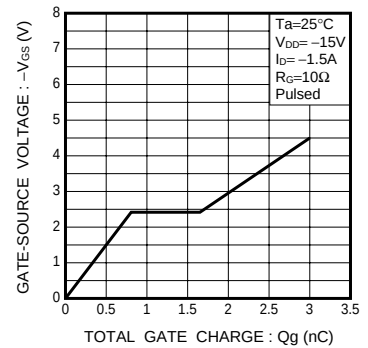


Fig.3 Dynamic Input Characteristics

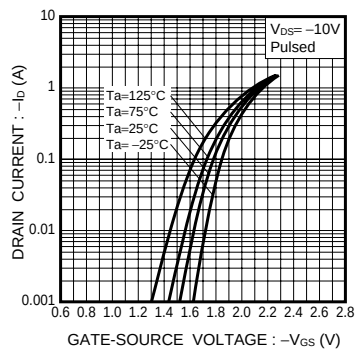


Fig.4 Typical Transfer Characteristics

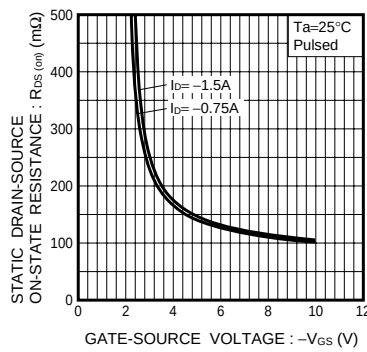


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

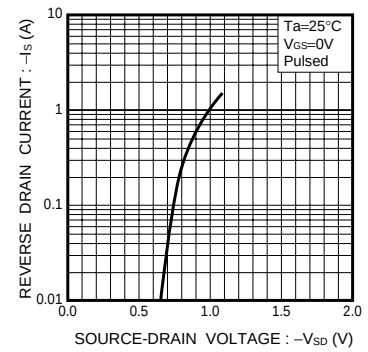


Fig.6 Source Current vs. Source-Drain Voltage

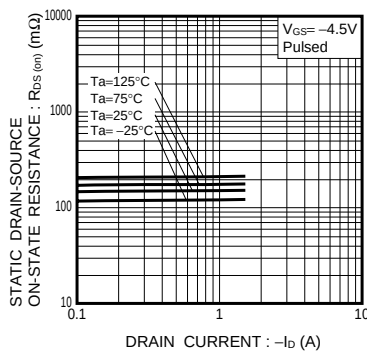


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

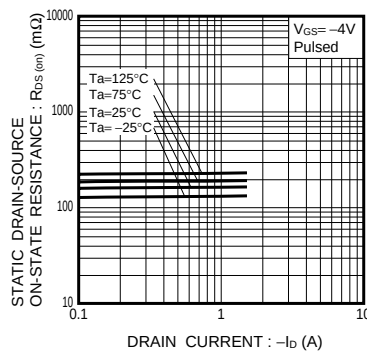


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

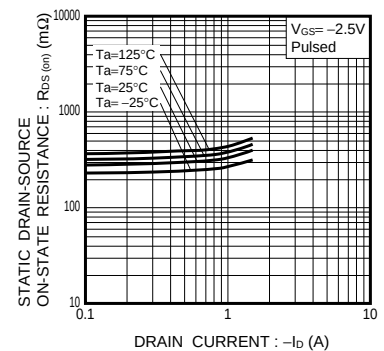


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

Transistors

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●Measurement circuit

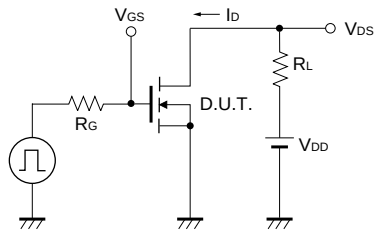


Fig.1-1 Switching Time Measurement Circuit

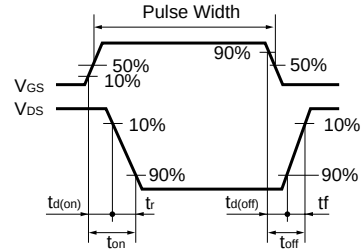


Fig.1-2 Switching Waveforms

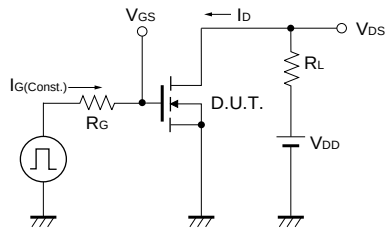


Fig.2-1 Gate Charge Measurement Circuit

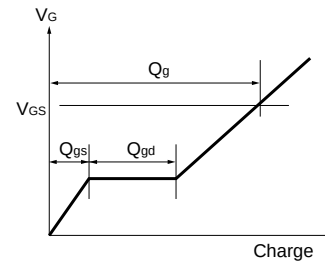


Fig.2-2 Gate Charge Waveform

Transistors

P-ch

●Measurement circuit

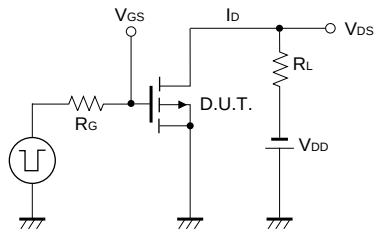


Fig.3-1 Switching Time Measurement Circuit

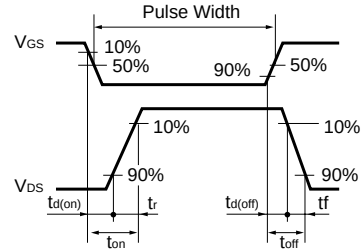


Fig.3-2 Switching Waveforms

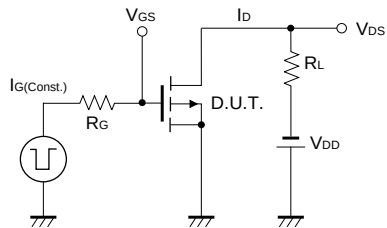


Fig.4-1 Gate Charge Measurement Circuit

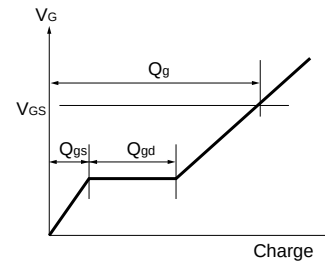


Fig.4-2 Gate Charge Waveform

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