

2.5V Drive Nch+Pch MOSFET

QS6M3

●Structure

Silicon N-channel / P-channel MOSFET

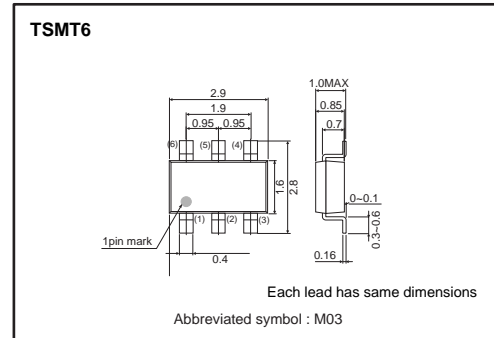
●Features

- 1) Low on-resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small Surface Mount Package (TSM T6).

●Application

Power switching, DC / DC converter.

●Dimensions (Unit : mm)



●Packaging specifications

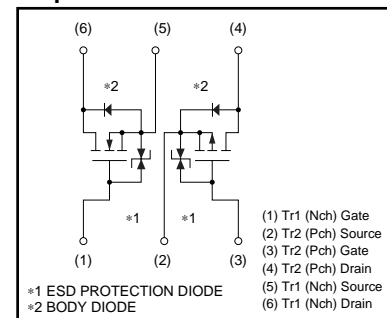
Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
QS6M3		○

●Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits		Unit
		Tr1 : Nch	Tr2 : Pch	
Drain-source voltage	V _{DSS}	30	-20	V
Gate-source voltage	V _{GSS}	±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≤10μs, Duty cycle≤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

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●Electrical characteristic curves

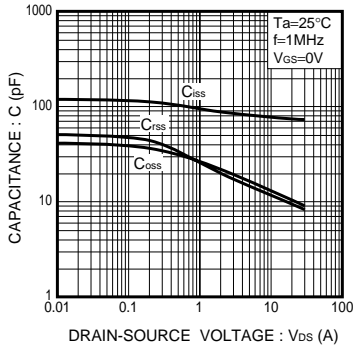


Fig.1 Typical Capacitance vs. Drain-Source Voltage

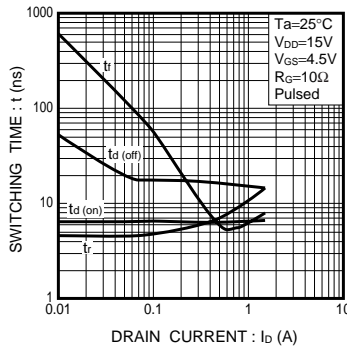


Fig.2 Switching Characteristics

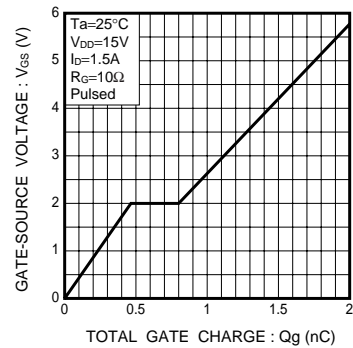


Fig.3 Dynamic Input Characteristics

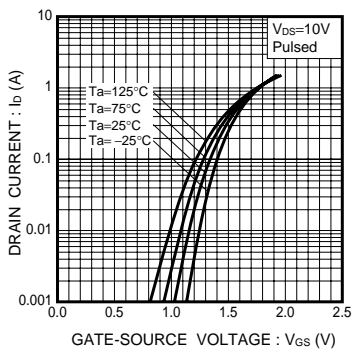


Fig.4 Typical Transfer Characteristics

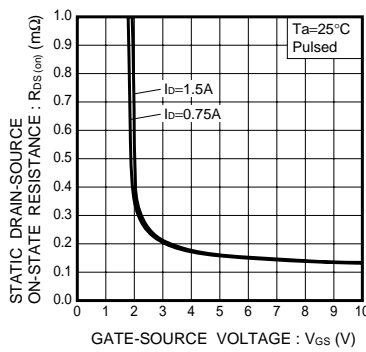


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

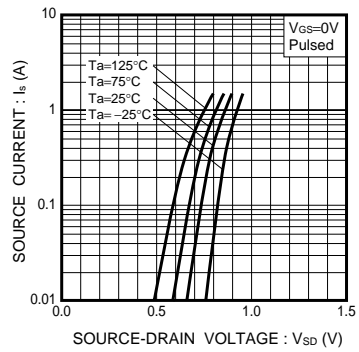


Fig.6 Source Current vs. Source-Drain Voltage

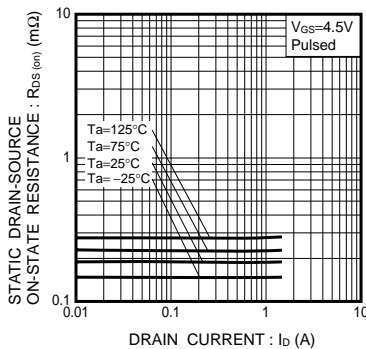


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

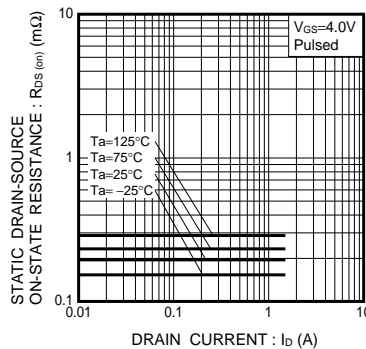


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

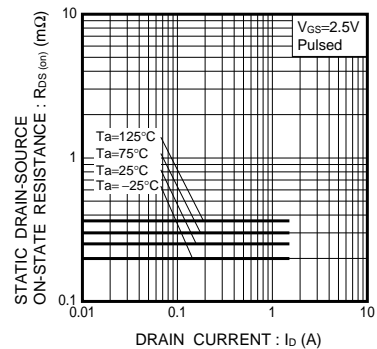


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

Transistors

P-ch

●Electrical characteristic curves

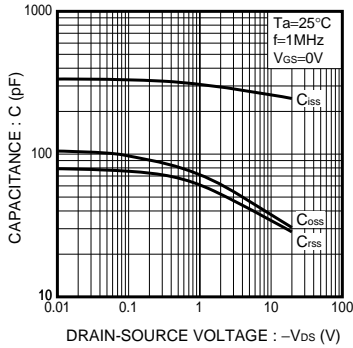


Fig.1 Typical Capacitance vs. Drain-Source Voltage

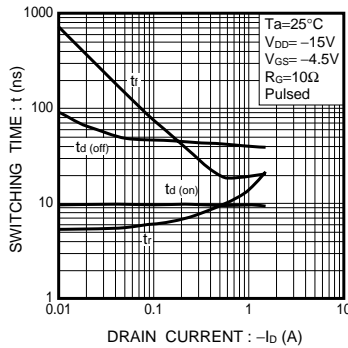


Fig.2 Switching Characteristics

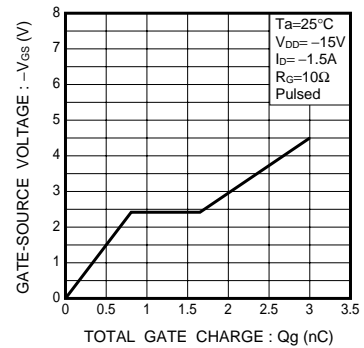


Fig.3 Dynamic Input Characteristics

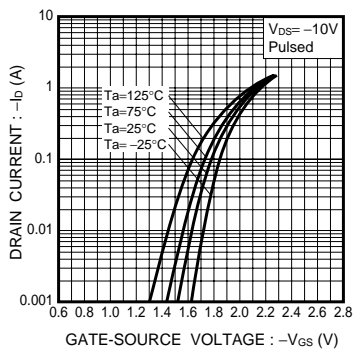


Fig.4 Typical Transfer Characteristics

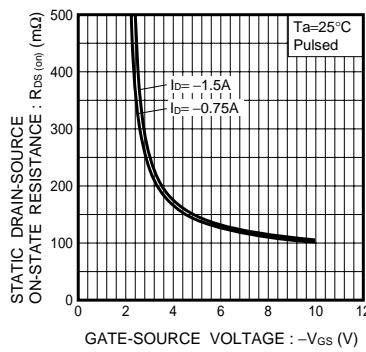


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

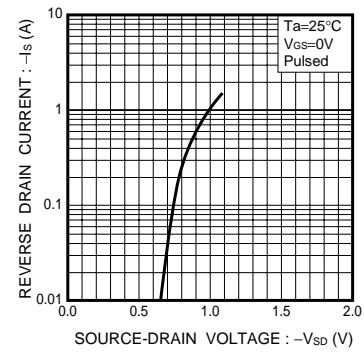


Fig.6 Source Current vs. Source-Drain Voltage

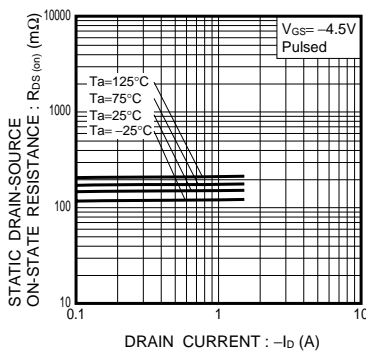


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

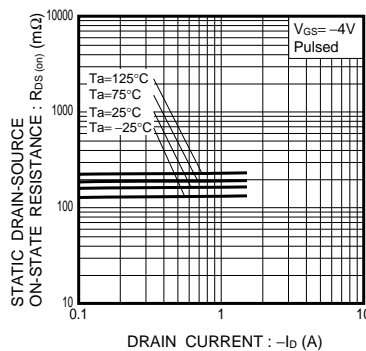


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

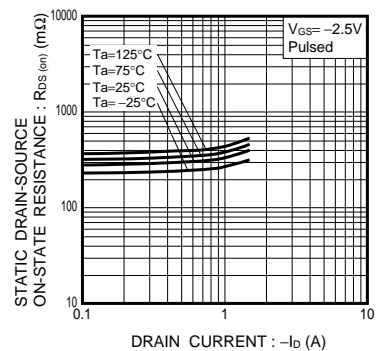


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

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● Measurement circuit

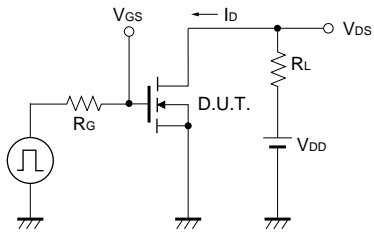


Fig.1-1 Switching Time Measurement Circuit

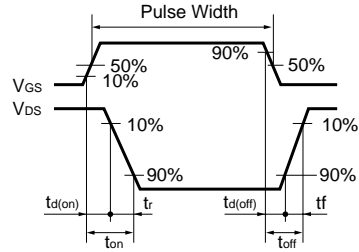


Fig.1-2 Switching Waveforms

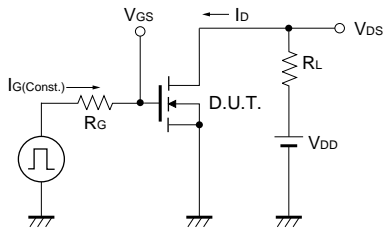


Fig.2-1 Gate Charge Measurement Circuit

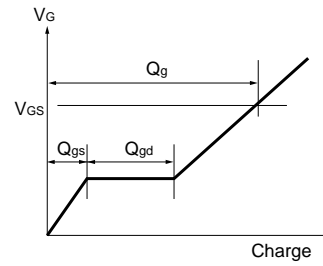


Fig.2-2 Gate Charge Waveform

Transistors

P-ch

●Measurement circuit

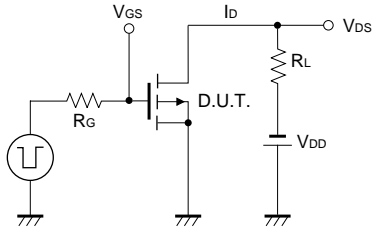


Fig.3-1 Switching Time Measurement Circuit

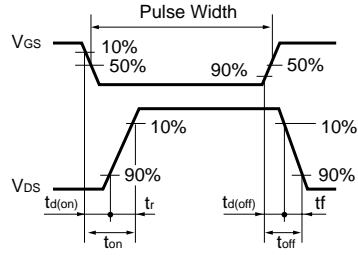


Fig.3-2 Switching Waveforms

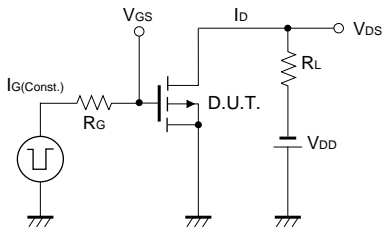


Fig.4-1 Gate Charge Measurement Circuit

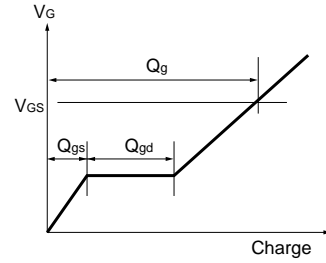


Fig.4-2 Gate Charge Waveform

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