

Small switching (30V, 2.0A)

QS5U12

●Features

- 1) The QS5U12 combines Nch MOSFET with a Schottky barrier diode in a single TSMT5 package.
- 2) Nch MOSFET have a low on-state resistance with a fast switching.
- 3) Nch MOSFET is reacted a low voltage drive (2.5V).
- 4) The Independently connected Schottky barrier diode have a low forward voltage.

●Applications

Load switch, DC / DC conversion

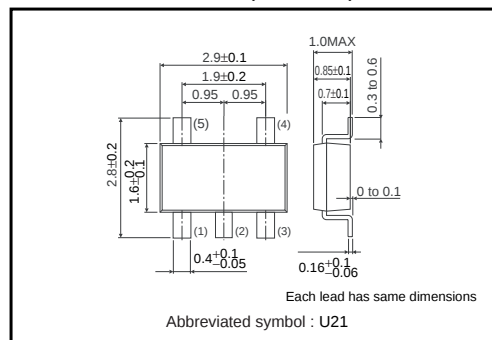
●Structure

Silicon N-channel MOSFET
Schottky Barrier DIODE

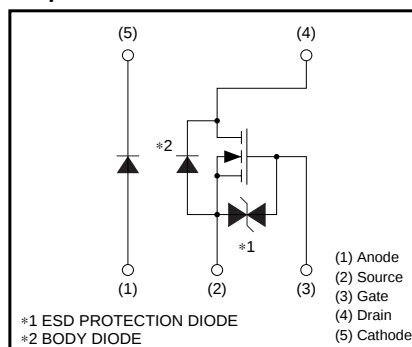
●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
QS5U12		○

●External dimensions (Unit : mm)



●Equivalent circuit



Transistors

●Absolute maximum ratings (Ta=25°C)

<MOSFET>

Parameter	Symbol	Limits	Unit
Drain-source voltage	V_{DS}	30	V
Gate-source voltage	V_{GS}	12	V
Drain current	Continuous	I_D	±2.0 A
	Pulsed	I_{DP}	±8.0 A $P_w \leq 10\mu s$, Duty cycle $\leq 1\%$
Source current (Body diode)	Continuous	I_S	0.8 A
	Pulsed	I_{SP}	3.2 A $P_w \leq 10\mu s$, Duty cycle $\leq 1\%$
Channel temperature	T_{ch}	150	°C

<Di>

Repetitive peak reverse voltage	V_{RM}	25	V
Reverse voltage	V_R	20	V
Forward current	I_F	1.0	A
Forward current surge peak	I_{FSM}	3.0	A 60Hz · 1cyc.
Junction temperature	T_J	150	°C

<MOSFET AND Di>

Total power dissipation	P_D	1.0	W / Total / Mounted on a ceramic board
Range of Storage temperature	T_{stg}	-40 to 125	°C

●Electrical characteristics (Ta=25°C)

<MOSFET>

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	$V_{(BR)DSS}$	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	$R_{DS(on)}^*$	—	71	100	mΩ	$I_D = 2.0A$, $V_{GS} = 4.5V$
		—	76	107	mΩ	$I_D = 2.0A$, $V_{GS} = 4V$
		—	110	154	mΩ	$I_D = 2.0A$, $V_{GS} = 2.5V$
Forward transfer admittance	$ Y_{fs} ^*$	1.5	—	—	S	$V_{DS} = 10V$, $I_D = 2.0A$
Input capacitance	C_{iss}	—	175	—	pF	$V_{DS} = 10V$
Output capacitance	C_{oss}	—	50	—	pF	$V_{GS} = 0V$
Reverse transfer capacitance	C_{rss}	—	25	—	pF	$f = 1MHz$
Turn-on delay time	$t_{d(on)}^*$	—	8	—	ns	$I_D = 1.0A$
Rise time	t_r^*	—	10	—	ns	$V_{DD} \doteq 15V$
Turn-off delay time	$t_{d(off)}^*$	—	21	—	ns	$V_{GS} = 4.5V$
Fall time	t_f^*	—	8	—	ns	$R_L = 15\Omega$
Total gate charge	Q_g	—	2.8	3.9	nC	$R_{GS} = 10\Omega$
Gate-source charge	Q_{gs}	—	0.6	—	nC	$V_{DD} \doteq 15V$
Gate-drain charge	Q_{gd}	—	0.8	—	nC	$V_{GS} = 4.5V$

*Pulsed

<MOSFET>Body diode (source-drain)

Forward voltage	V_{SD}	—	—	1.2	V	$I_S = 3.2A$ / $V_{GS} = 0V$
<Di>						
Forward voltage	V_F	—	—	0.45	V	$I_F = 1.0A$
Reverse leakage	I_R	—	—	200	μA	$V_R = 20V$

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●Electrical characteristic curves

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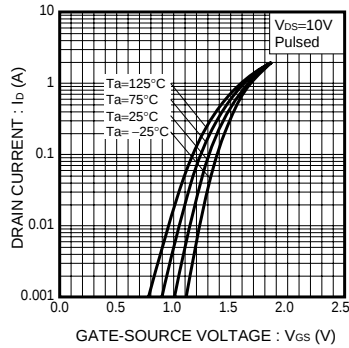


Fig.1 Typical Transfer Characteristics

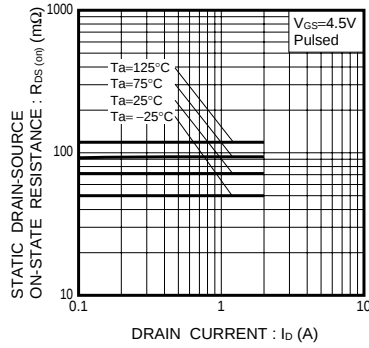


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

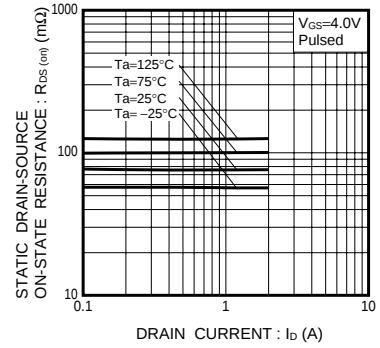


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

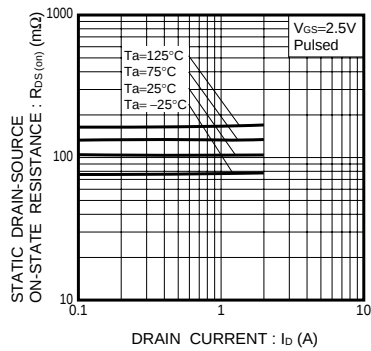


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

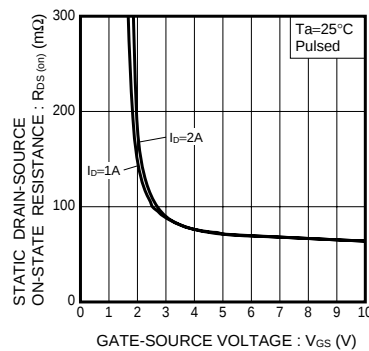


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

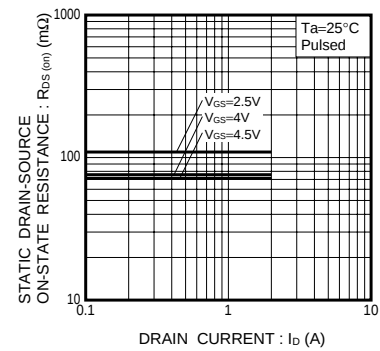


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

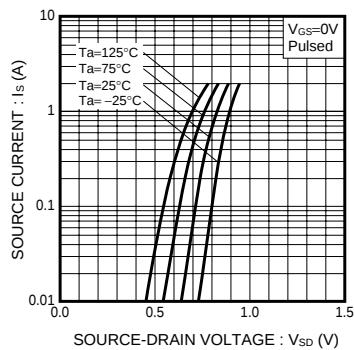


Fig.7 Reverse Drain Current vs. Source-Drain Current

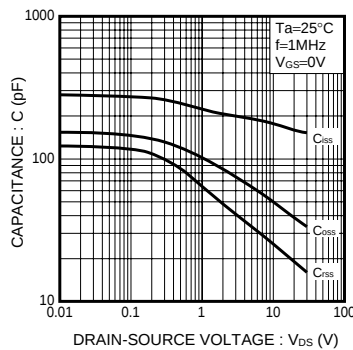


Fig.8 Typical Capacitance vs. Drain-Source Voltage

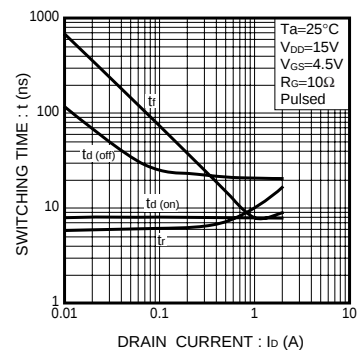


Fig.9 Switching Characteristics

Transistors

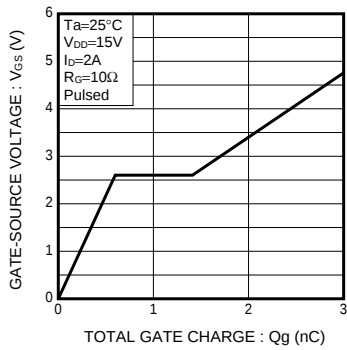


Fig.10 Dynamic Input Characteristics

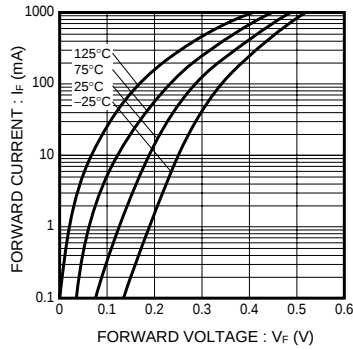


Fig.11 Forward Current vs. Forward Voltage

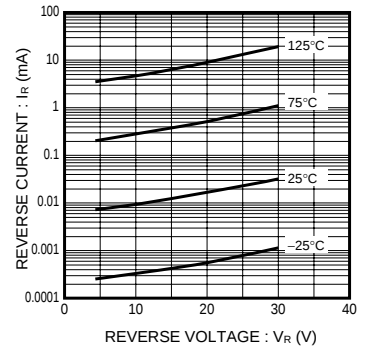


Fig.12 Reverse Current vs. Reverse Voltage

●Measurement circuits

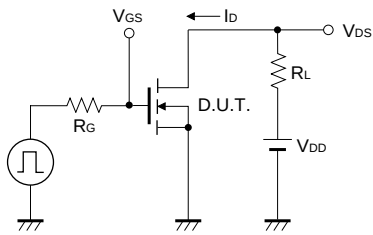


Fig.13 Switching Time Measurement Circuit

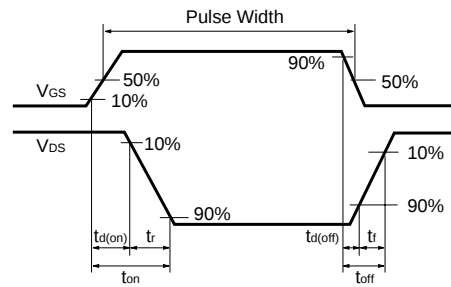


Fig.14 Switching Waveforms

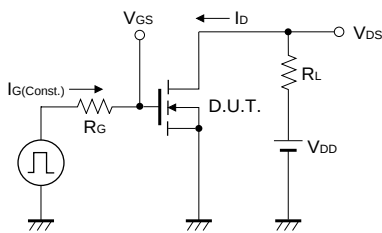


Fig.15 Gate Charge Measurement Circuit

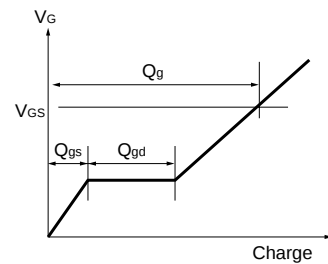


Fig.16 Gate Charge Waveform

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