

2.5V Drive Nch+SBD MOS FET

QS5U13

●Structure

Silicon N-channel MOSFET
Schottky Barrier DiODE

●Features

- 1) The QS5U13 combines Nch MOSFET with a Schottky barrier diode in a single TSMT5 package.
- 2) Low on-state resistance with fast switching.
- 3) Low voltage drive (2.5V).
- 4) The Independently connected Schottky barrier diode has low forward voltage.

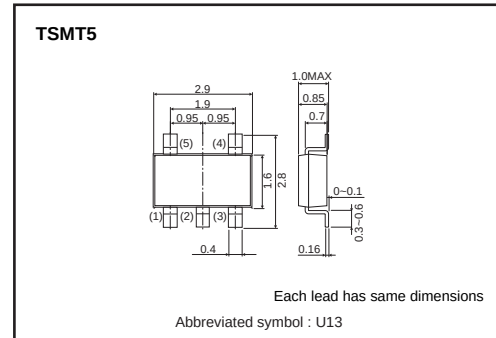
●Applications

Load switch, DC / DC conversion

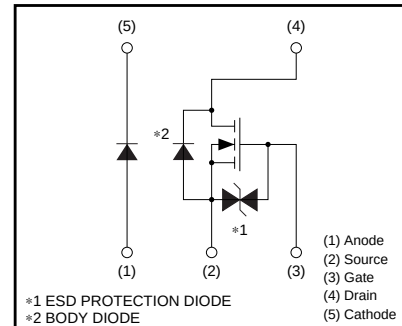
●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
QS5U13		○

●External dimensions (Unit : mm)



●Equivalent circuit



Transistors

●Absolute maximum ratings (Ta=25°C)

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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} *1	± 8.0 A
Source current (Body diode)	Continuous	I_S	0.8 A
	Pulsed	I_{SP} *1	3.2 A
Channel temperature	T_{ch}	150	°C
Power dissipation	P_D *3	0.9	W/ELEMENT

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Repetitive peak reverse voltage	V_{RM}	30	V
Reverse voltage	V_R	20	V
Forward current	I_F	0.5	A
Forward current surge peak	I_{FSM} *2	2.0	A
Junction temperature	T_j	150	°C
Power dissipation	P_D *3	0.7	W/ELEMENT

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Total power dissipation	P_D *3	1.25	W / TOTAL
Range of Storage temperature	T_{stg}	-55 to +150	°C

*1 $P_w \leq 10 \mu s$, Duty cycle $\leq 1\%$ *2 60Hz-1cyc. *3 Mounted on a ceramic board

●Electrical characteristics (Ta=25°C)

<MOSFET>

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	$R_{DS(on)}$ *	—	71	100	m Ω	$I_D=2.0A$, $V_{GS}=4.5V$
		—	76	107	m Ω	$I_D=2.0A$, $V_{GS}=4V$
		—	110	154	m Ω	$I_D=2.0A$, $V_{GS}=2.5V$
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	$V_{DD} \div 15V$ $V_{GS}=4.5V$
Turn-off delay time	$t_{d(off)}$ *	—	21	—	ns	$R_L=15\Omega$
Fall time	t_f *	—	8	—	ns	$R_G=10\Omega$
Total gate charge	Q_g *	—	2.8	3.9	nC	$V_{DD} \div 15V$
Gate-source charge	Q_{gs} *	—	0.6	—	nC	$V_{GS}=4.5V$
Gate-drain charge	Q_{gd} *	—	0.8	—	nC	$I_D=2.0A$

*Pulsed

<Body diode (source-drain)>

Forward voltage	V_{SD} *	—	—	1.2	V	$I_S=3.2A$ / $V_{GS}=0V$
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* Pulsed

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Forward voltage	V_F	—	—	0.36	V	$I_F=0.1A$
		—	—	0.47	V	$I_F=0.5A$
Reverse current	I_R	—	—	100	μA	$V_R=20V$

Transistors

●Electrical characteristic curves

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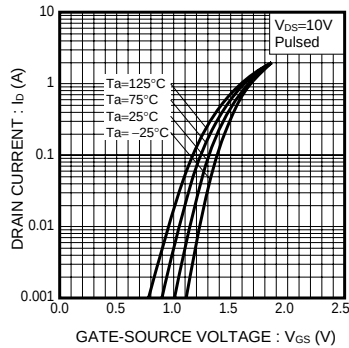


Fig.1 Typical Transfer Characteristics

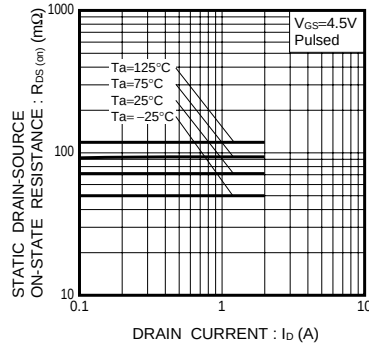


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

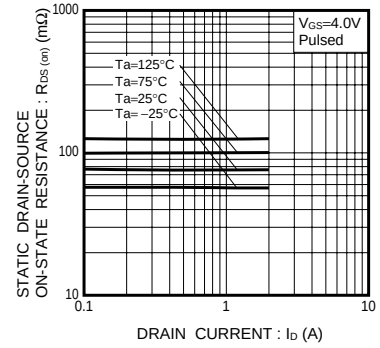


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

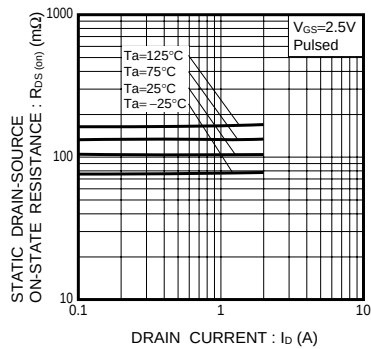


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

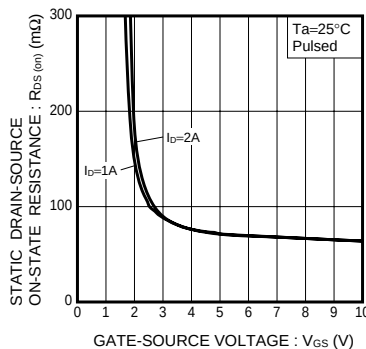


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

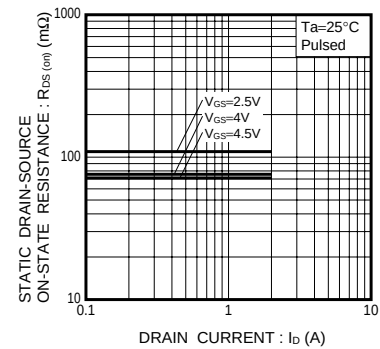


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

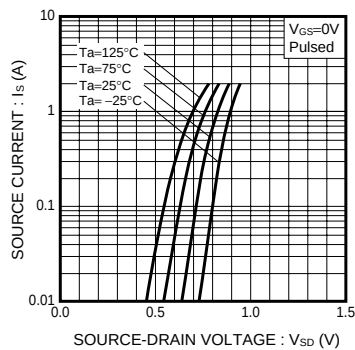


Fig.7 Reverse Drain Current vs. Source-Drain Current

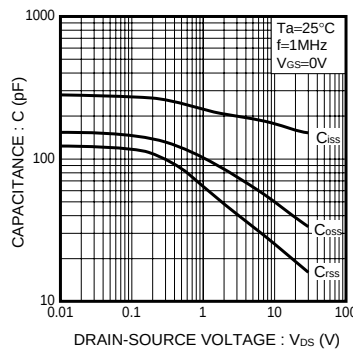


Fig.8 Typical Capacitance vs. Drain-Source Voltage

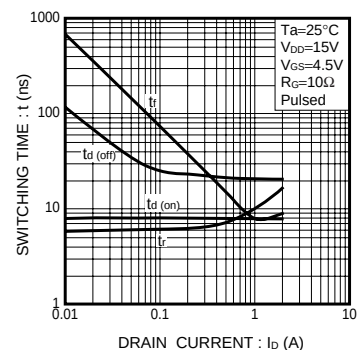


Fig.9 Switching Characteristics

Transistors

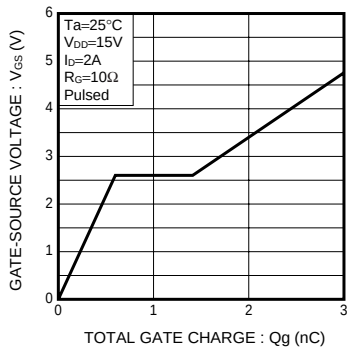


Fig.10 Dynamic Input Characteristics

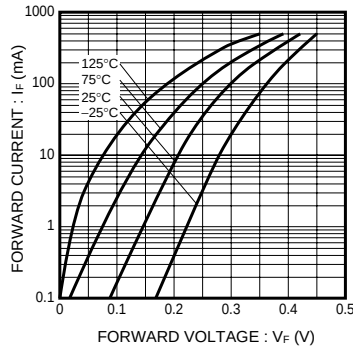


Fig.11 Forward Current vs. Forward Voltage

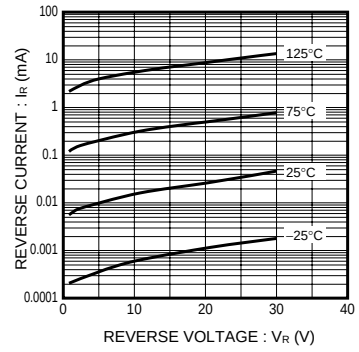


Fig.12 Reverse Current vs. Reverse Voltage

●Measurement circuits

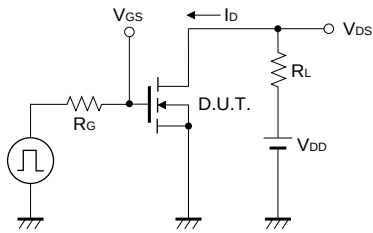


Fig.13 Switching Time Measurement Circuit

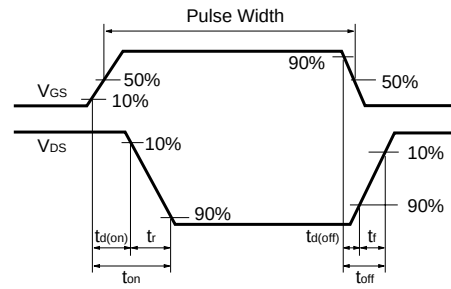


Fig.14 Switching Waveforms

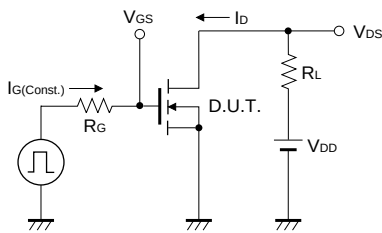


Fig.15 Gate Charge Measurement Circuit

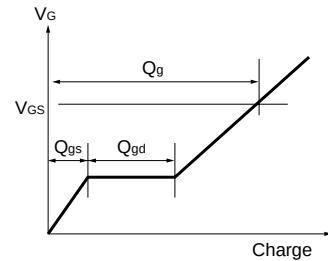


Fig.16 Gate Charge Waveform

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