

Small switching (30V, 2.0A)

QS5U13

●Features

- 1) The QS5U13 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

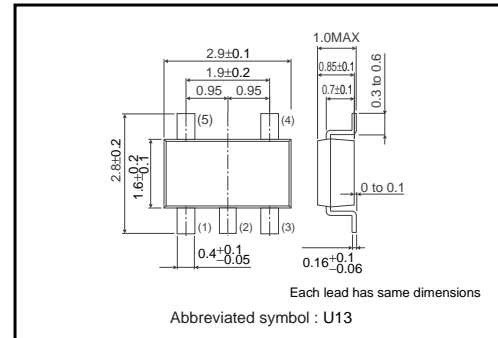
●Structure

Silicon N-channel MOSFET
Schottky Barrier DIODE

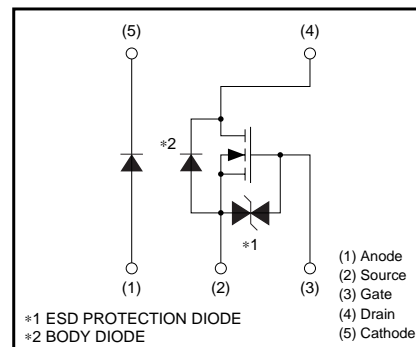
●Packaging specifications

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

●External dimensions (Unit : mm)



●Equivalent circuit



Transistors

●Absolute maximum ratings (Ta=25°C)

<MOSFET>

Parameter	Symbol	Limits	Unit
Drain-source voltage	V _{DSS}	30	V
Gate-source voltage	V _{GSS}	12	V
Drain current	Continuous	I _D	±2.0 A
	Pulsed	I _{DP}	±8.0 A Pw≤10μs, Duty cycle≤1%
Source current (Body diode)	Continuous	I _S	0.8 A
	Pulsed	I _{SP}	3.2 A Pw≤10μs, Duty cycle≤1%
Channel temperature	T _{ch}	150	°C

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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}	2.0	A 60Hz · 1cyc.
Junction temperature	T _J	125	°C

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Total power dissipation	P _D	1.0	W / Total / Mounted on a ceramic board
Range of Storage temperature	T _{stg}	-50 to 150	°C

●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	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 _{riss}	-	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} ≐15V
Turn-off delay time	t _{d(off)} *	-	21	-	ns	V _{GS} =4.5V
Fall time	t _f *	-	8	-	ns	R _L =15Ω
Total gate charge	Q _g	-	2.8	3.9	nC	R _{GS} =10Ω
Gate-source charge	Q _{gs}	-	0.6	-	nC	V _{DD} ≐15V
Gate-drain charge	Q _{gd}	-	0.8	-	nC	V _{GS} =4.5V
						I _D =2.0A

*Pulsed

<MOSFET>Body diode (source-drain)

Forward voltage	V _{SD}	-	-	1.2	V	I _S =3.2A / V _{GS} =0V
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Forward voltage	V _F	-	-	0.47	V	I _F =0.5A
Reverse leakage	I _R	-	-	100	μA	V _R =20V

Transistors

●Electrical characteristic curves

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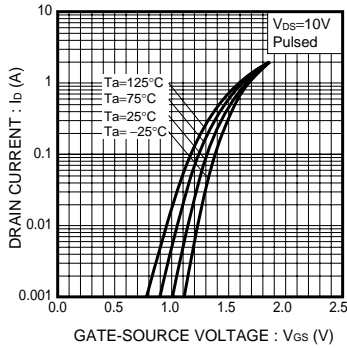


Fig.1 Typical Transfer Characteristics

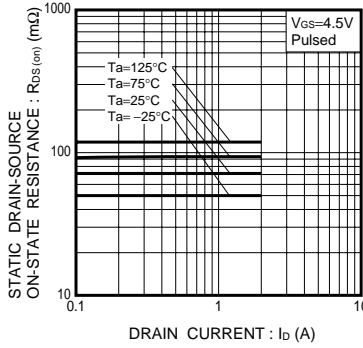


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

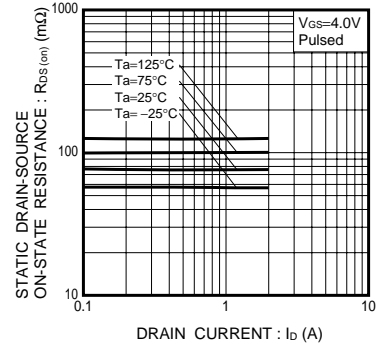


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

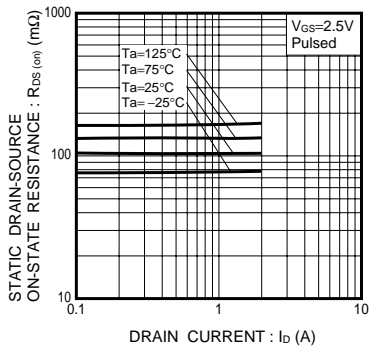


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

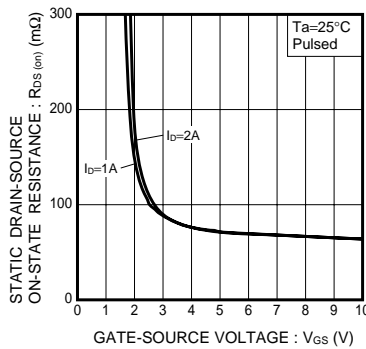


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

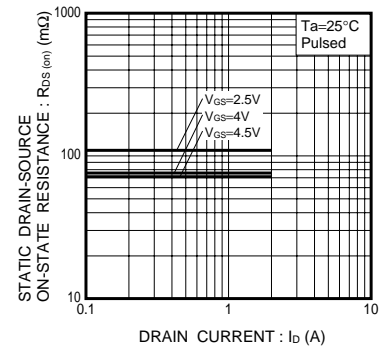


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

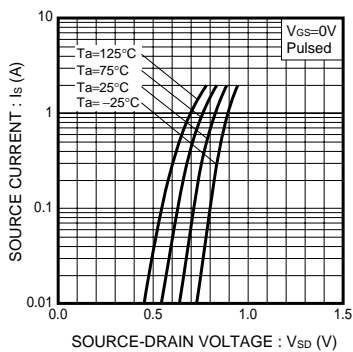


Fig.7 Reverse Drain Current vs. Source-Drain Current

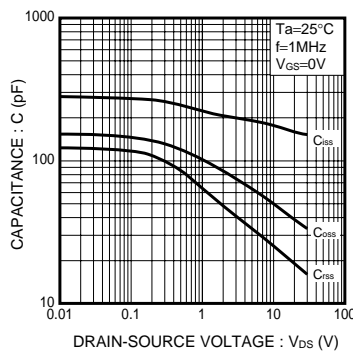


Fig.8 Typical Capacitance vs. Drain-Source Voltage

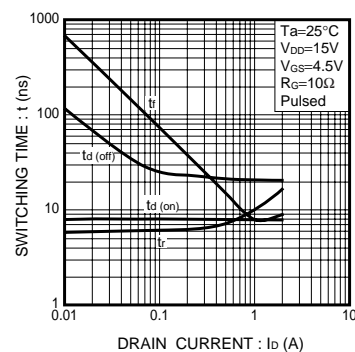


Fig.9 Switching Characteristics

Transistors

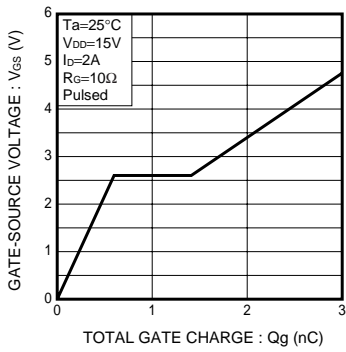


Fig.10 Dynamic Input Characteristics

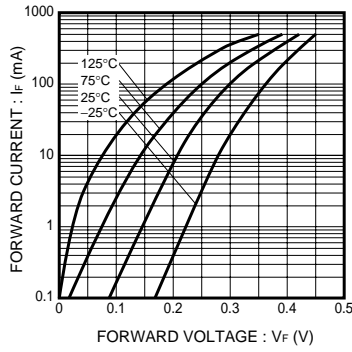


Fig.11 Forward Current vs. Forward Voltage

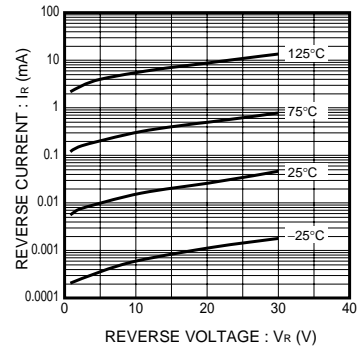


Fig.12 Reverse Current vs. Reverse Voltage

● Measurement circuits

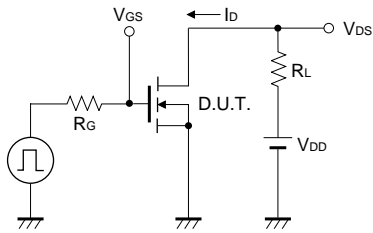


Fig.13 Switching Time Measurement Circuit

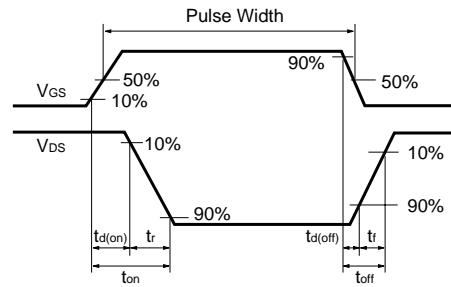


Fig.14 Switching Waveforms

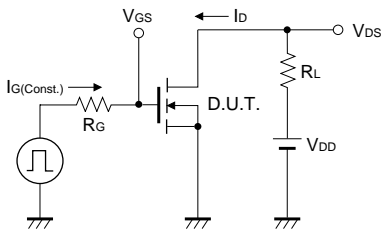


Fig.15 Gate Charge Measurement Circuit

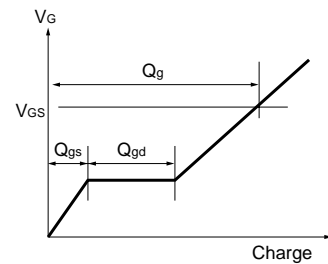


Fig.16 Gate Charge Waveform

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