

1.5V Drive Nch+SBD MOSFET

QS5U36

●Structure

Silicon N-channel MOSFET
Schottky Barrier DIODE

●Features

- 1) The QS5U36 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 (1.5V).
- 4) The Independently connected Schottky barrier diode has low forward voltage.

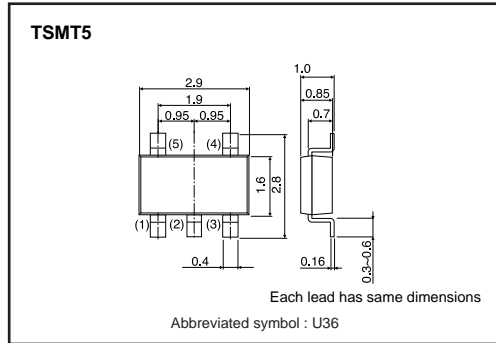
●Applications

Switching

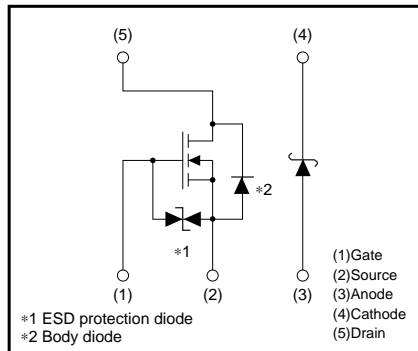
●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
QS5U36		○

●Dimensions (Unit : mm)



●Equivalent circuit



Transistors

●Absolute maximum ratings (Ta=25°C)

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Parameter	Symbol	Limits	Unit	
Drain-source voltage	V _{DSS}	20	V	
Gate-source voltage	V _{GSS}	±10	V	
Drain current	Continuous	I _D	±2.5	A
	Pulsed	I _{DP} *1	±5.0	A
Source current (Body diode)	Continuous	I _S	0.7	A
	Pulsed	I _{SP} *1	5.0	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}	25	V
Reverse voltage	V _R	20	V
Forward current	I _F	0.7	A
Forward current surge peak	I _{FSM} *2	3.0	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 Pw≤10μs, Duty cycles≤1% *2 60Hz·1cyc. *3 Mounted on a ceramic board

●Electrical characteristics (Ta=25°C)

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Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I _{GSS}	–	–	±10	μA	V _{GS} =±10V / 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)}	0.3	–	1.3	V	V _{DS} =10V / I _D =1mA
Static drain-source on-state resistance	R _{DS(on)} *	–	58	81	mΩ	I _D =2.5A, V _{GS} =4.5V
		–	74	104	mΩ	I _D =2.5A, V _{GS} =2.5V
		–	95	133	mΩ	I _D =1.3A, V _{GS} =1.8V
		–	120	240	mΩ	I _D =0.5A, V _{GS} =1.5V
Forward transfer admittance	Y _{fs} *	2.7	–	–	S	V _{DS} =10V, I _D =2.5A
Input capacitance	C _{iss}	–	280	–	pF	V _{DS} =10V
Output capacitance	C _{oss}	–	65	–	pF	V _{GS} =0V
Reverse transfer capacitance	C _{rss}	–	35	–	pF	f=1MHz
Turn-on delay time	t _{d(on)} *	–	6	–	ns	I _D =1.3A V _{DD} ≐10V
Rise time	t _r *	–	15	–	ns	V _{GS} =4.5V
Turn-off delay time	t _{d(off)} *	–	30	–	ns	R _L ≐7.7Ω
Fall time	t _f *	–	15	–	ns	R _G =10Ω
Total gate charge	Q _g *	–	3.5	–	nC	I _D =2.5A, V _{DD} ≐10V
Gate-source charge	Q _{gs} *	–	0.8	–	nC	V _{GS} =4.5V
Gate-drain charge	Q _{gd} *	–	0.7	–	nC	R _L ≐4Ω, R _G =10Ω

*Pulsed

<MOSFET>Body diode (source-drain)

Forward voltage	V _{SD} *	–	–	1.2	V	I _S =0.7A / V _{GS} =0V
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*Pulsed

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Forward voltage	V _F	–	–	0.49	V	I _F =0.7A
Reverse current	I _R	–	–	200	μA	V _R =20V

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●Electrical characteristic curves

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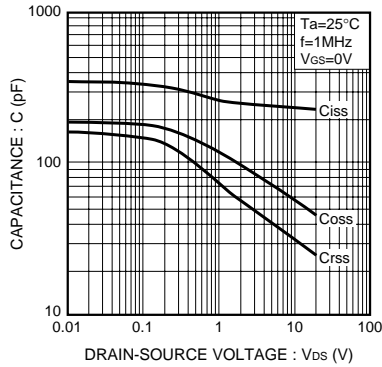


Fig.1 Typical Capacitance vs. Drain-Source Voltage

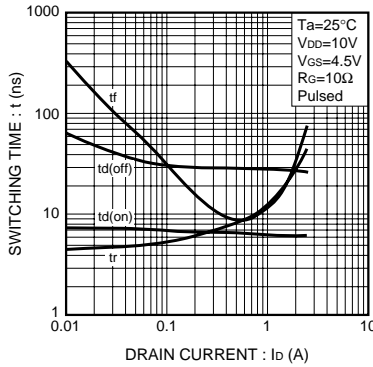


Fig.2 Switching Characteristics

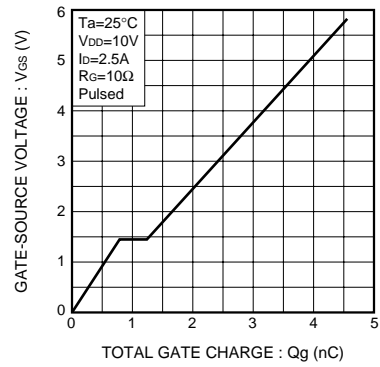


Fig.3 Dynamic Input Characteristics

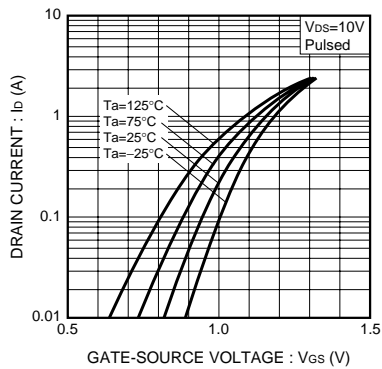


Fig.4 Typical Transfer Characteristics

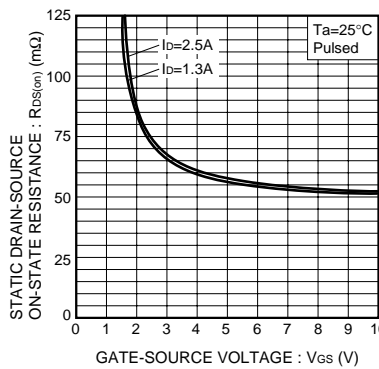


Fig.5 Static Drain-Source On-State Resistance vs. Gate-source Voltage

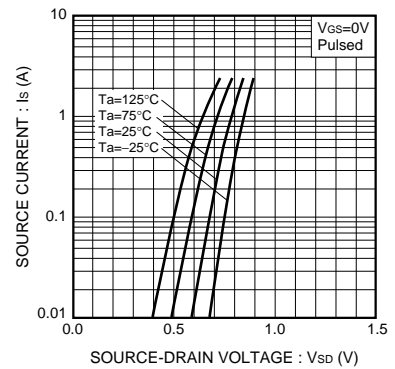


Fig.6 Source Current vs. Source-Drain Voltage

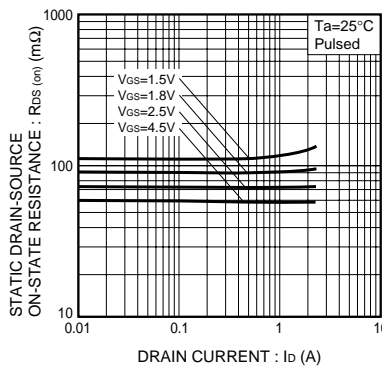


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

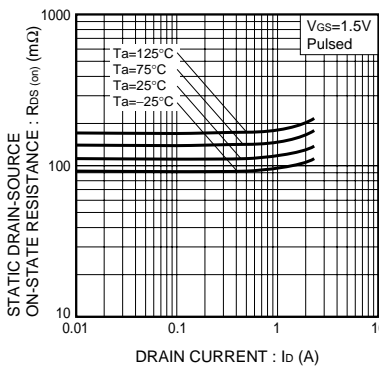


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

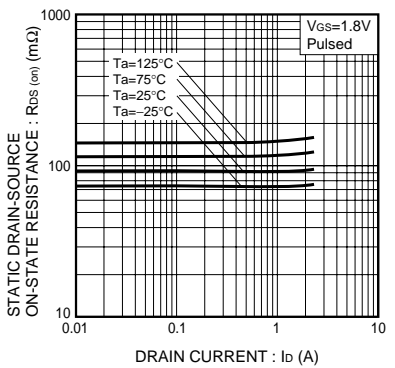


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

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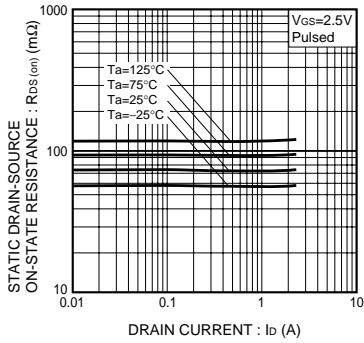


Fig.10 Static Drain-Source On-State Resistance vs. Drain Current (IV)

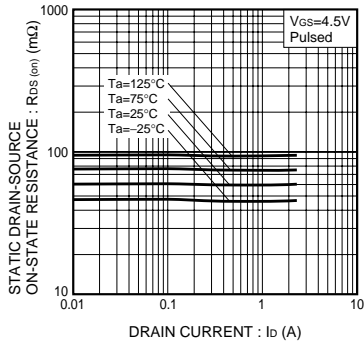


Fig.11 Static Drain-Source On-State Resistance vs. Drain Current (V)

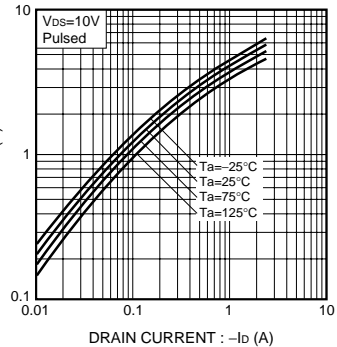


Fig.12 Forward Transfer Admittance vs. Drain Current

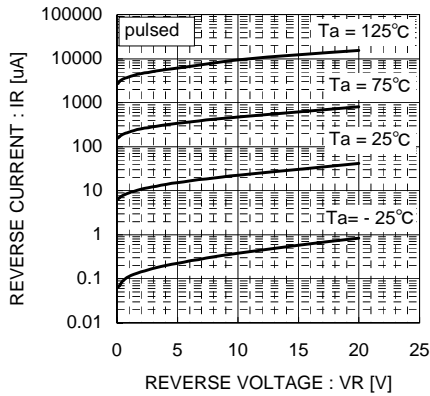


Fig.13 Reverse Current vs. Reverse Voltage

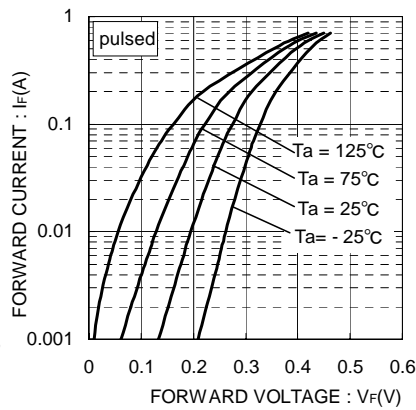


Fig.14 Forward Current vs. Forward Voltage

●Notice

1. SBD has a large reverse leak current compared to other type of diode. Therefore; it would raise a junction temperature, and increase a reverse power loss. Further rise of inside temperature would cause a thermal runaway. This built-in SBD has low V_F characteristics and therefore, higher leak current. Please consider enough the surrounding temperature, generating heat of MOSFET and the reverse current.
2. This product might cause chip aging and breakdown under the large electrified environment. Please consider to design ESD protection circuit.

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● Measurement circuit

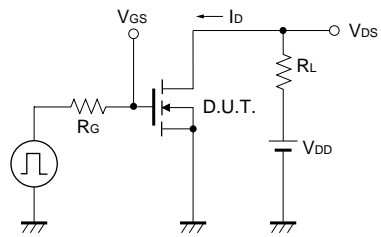


Fig.15 Switching Time Measurement Circuit

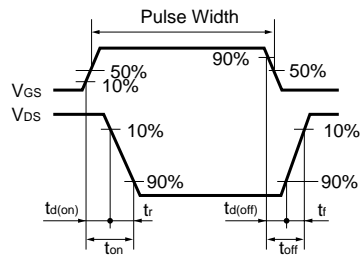


Fig.16 Switching Waveforms

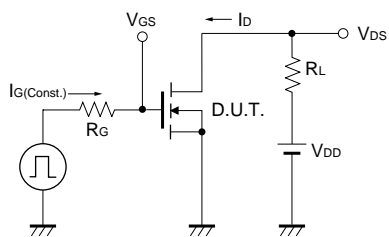


Fig.17 Gate Charge Measurement Circuit

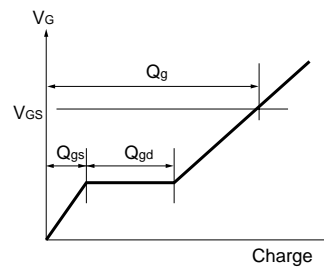


Fig.18 Gate Charge Waveform

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