

Transistor

# 2.5V Drive Pch+SBD MOS FET

## QS5U23

### ●Structure

Silicon P-channel MOS FET  
 Schottky Barrier DIODE

### ●Features

- 1) The QS5U23 combines Pch MOS FET with a Schottky barrier diode in a TSMT5 package.
- 2) Low on-state resistance with fast switching.
- 3) Low voltage drive(2.5V)
- 4) Built-in schottky barrier diode has low forward voltage.

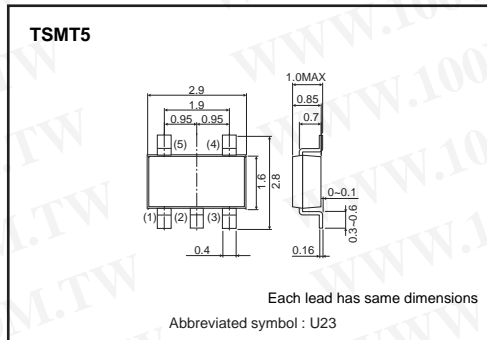
### ●Applications

Load switch , DC/DC conversion

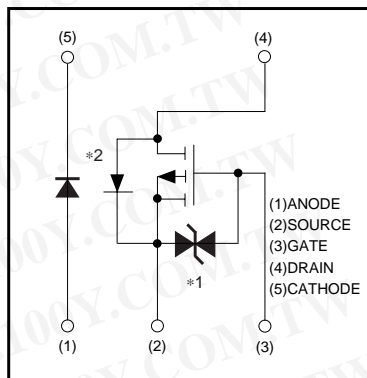
### ●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
QS5U23		○

### ●External dimensions (Unit : mm)



### ●Equivalent circuit



\*1 ESD PROTECTION DIODE  
 \*2 BODY DIODE

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### ●Absolute maximum ratings (Ta=25°C)

<MOSFET>

Parameter	Symbol	Limits	Unit	
Drain-source voltage	V <sub>DSS</sub>	-20	V	
Gate-source voltage	V <sub>GSS</sub>	±12	V	
Drain current	Continuous	I <sub>D</sub>	±1.5	A
	Pulsed	I <sub>DP</sub> *1	±6.0	A
Source current (Body diode)	Continuous	I <sub>S</sub>	-0.75	A
	Pulsed	I <sub>SP</sub> *1	-3.0	A
Channel temperature	T <sub>ch</sub>	150	°C	
Power dissipation	P <sub>D</sub> *3	0.9	W / ELEMENT	

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Repetitive peak reverse voltage	V <sub>RM</sub>	30	V
Reverse voltage	V <sub>R</sub>	20	V
Forward current	I <sub>F</sub>	0.5	A
Forward current surge peak	I <sub>FSM</sub> *2	2.0	A
Junction temperature	T <sub>j</sub>	150	°C
Power dissipation	P <sub>D</sub> *3	0.7	W / ELEMENT

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Total power dissipation	P <sub>D</sub> *3	1.25	W / TOTAL
Range of Storage temperature	T <sub>stg</sub>	-55 to +150	°C

\*1 Pw≤10μs, Duty cycles≤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 <sub>GSS</sub>	-	-	±10	μA	V <sub>GS</sub> =±12V/ V <sub>DS</sub> =0V
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	-20	-	-	V	I <sub>D</sub> =-1mA/ V <sub>GS</sub> =0V
Zero gate voltage drain current	I <sub>DSS</sub>	-	-	-1	μA	V <sub>DS</sub> =-20V/ V <sub>GS</sub> =0V
Gate threshold voltage	V <sub>GS(th)</sub>	-0.7	-	-2.0	V	V <sub>DS</sub> =-10V/ I <sub>D</sub> =-1mA
Static drain-source on-state resistance	R <sub>DS(on)</sub> *	-	160	200	mΩ	I <sub>D</sub> =-1.5A, V <sub>GS</sub> =-4.5V
		-	180	240	mΩ	I <sub>D</sub> =-1.5A, V <sub>GS</sub> =-4V
		-	260	340	mΩ	I <sub>D</sub> =-0.75A, V <sub>GS</sub> =-2.5V
Forward transfer admittance	Y <sub>fs</sub>   *	1.0	-	-	S	V <sub>DS</sub> =-10V, I <sub>D</sub> =-0.75A
Input capacitance	C <sub>iss</sub>	-	325	-	pF	V <sub>DS</sub> =-10V
Output capacitance	C <sub>oss</sub>	-	60	-	pF	V <sub>GS</sub> =0V
Reverse transfer capacitance	C <sub>rss</sub>	-	40	-	pF	f=1MHz
Turn-on delay time	t <sub>d(on)</sub> *	-	10	-	ns	I <sub>D</sub> =-0.75A
Rise Time	t <sub>r</sub> *	-	10	-	ns	V <sub>DD</sub> ≒ -15
Turn off delay time	t <sub>d(off)</sub> *	-	35	-	ns	V <sub>GS</sub> =-4.5V R <sub>L</sub> =20Ω
Fall time	t <sub>f</sub> *	-	10	-	ns	R <sub>G</sub> =10Ω
Total gate charge	Q <sub>g</sub>	-	4.2	-	nC	V <sub>DD</sub> ≒ -15V
Gate-source charge	Q <sub>gs</sub>	-	1.0	-	nC	V <sub>GS</sub> =-4.5V
Gate-drain charge	Q <sub>gd</sub>	-	1.1	-	nC	I <sub>D</sub> =-1.5A

\*Pulsed

<Body diode (source-drain)>

Forward voltage	V <sub>SD</sub>	-	-	-1.2	V	I <sub>S</sub> =-0.75A/ V <sub>GS</sub> =0V
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Forward voltage drop	V <sub>F</sub>	-	-	0.36	V	I <sub>F</sub> =0.1A
		-	-	0.47	V	I <sub>F</sub> =0.5A
Reverse current	I <sub>R</sub>	-	-	100	μA	V <sub>R</sub> =20V

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●Electrical characteristic curves

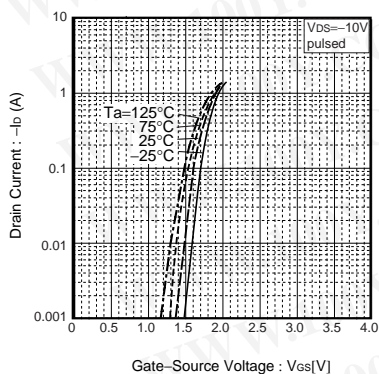


Fig.1 Typical Transfer Characteristics

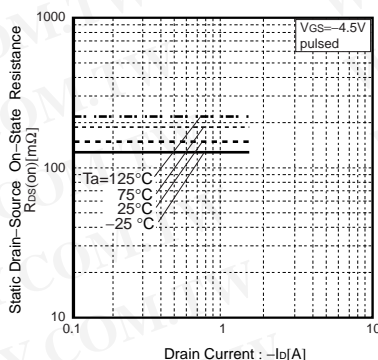


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

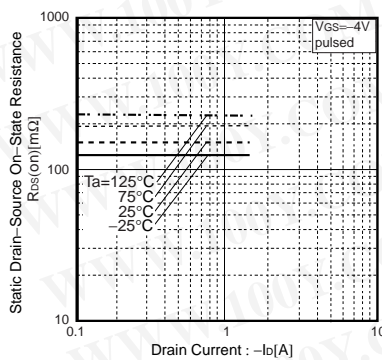


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

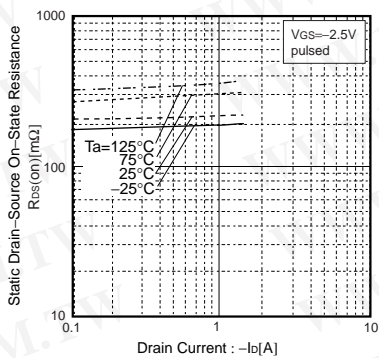


Fig.4 Static Drain-Source On-State Resistance vs. Drain-Current

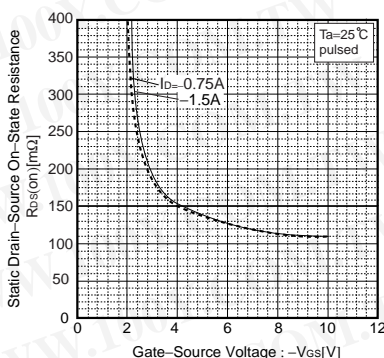


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

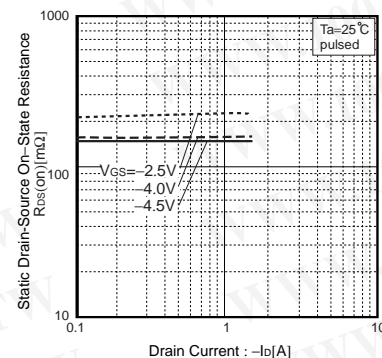


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

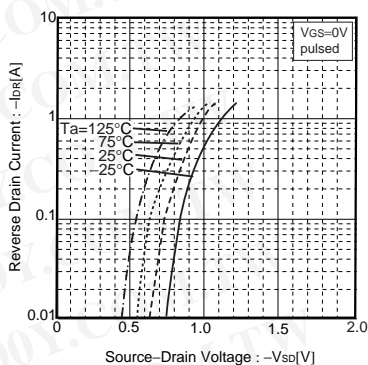


Fig.7 Reverse Drain Current VS. Source-Drain Current

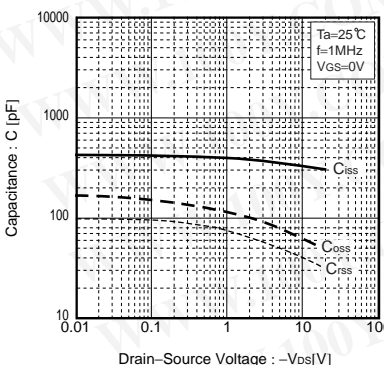


Fig.8 Typical Capacitance vs. Drain-Source Voltage

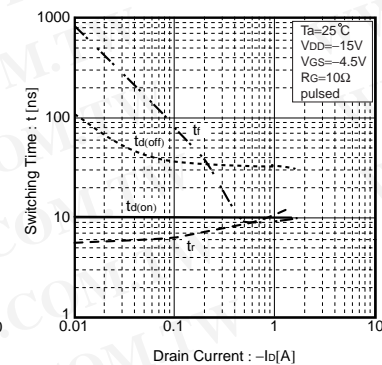


Fig.9 Switching Characteristics

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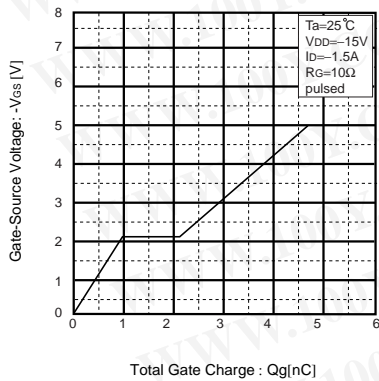


Fig.10 Dynamic Input Characteristics

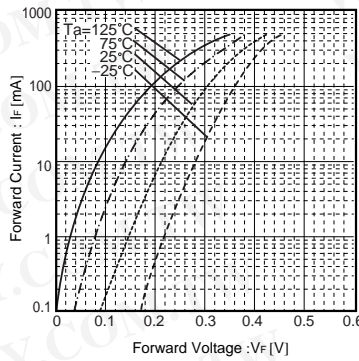


Fig.11 Forward Temperature Characteristics

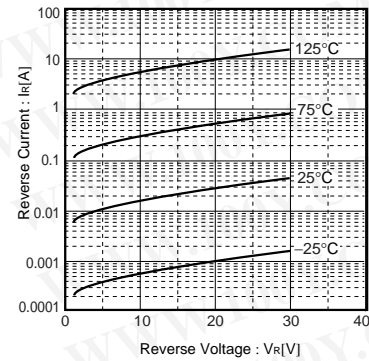


Fig.12 Reverse Temperature Characteristics

●Measurement circuits

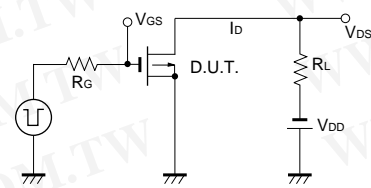


Fig.13 Switching Time Measurement Circuit

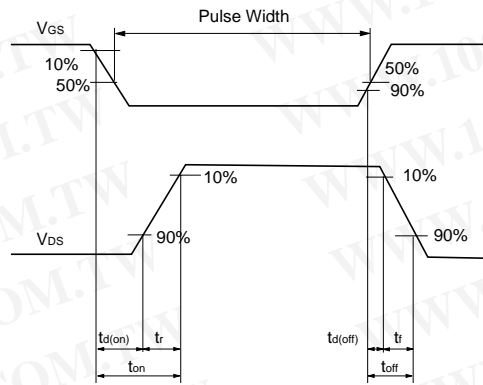


Fig.14 Switching Waveforms

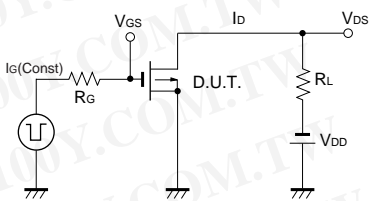


Fig.15 Gate Charge Measurement Circuit

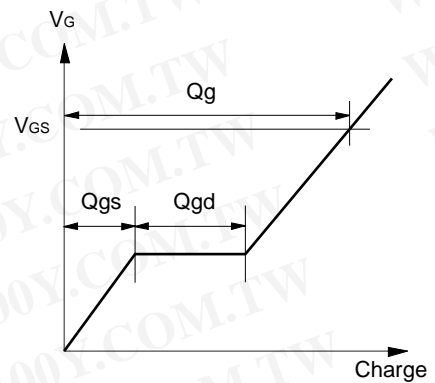


Fig.16 Gate Charge Waveforms

## Appendix

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