

Small switching (–20V, –1.5A)

QS5U23

●Features

- 1) The QS5U23 combines Pch MOSFET with a Schottky barrier diode in a single TSMT5 package.
- 2) Pch MOSFET have a low on-state resistance with a fast switching.
- 3) Pch 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

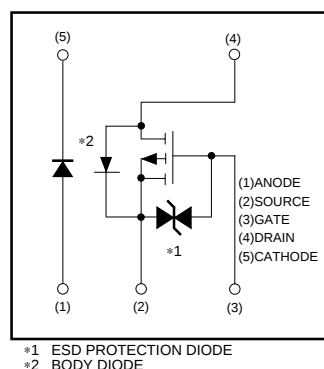
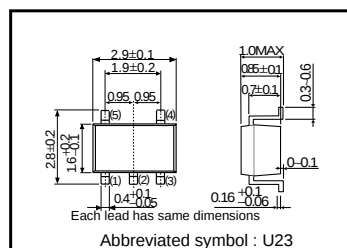
●Structure

- Silicon P-channel MOSFET
- Schottky Barrier DIODE

●Packaging specifications

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

●External dimensions (Units : mm)



●Equivalent circuit

●Absolute maximum ratings (Ta=25°C)

< MOSFET >

Parameter	Symbol	Limits	Unit
Drain-source voltage	V_{DS}	–20	V
Gate-source voltage	V_{GS}	±12	V
Drain current	Continuous	I_D	±1.5 A
	Pulsed	I_{DP}	±6.0 A $P_w \leq 10\mu s$, Duty cycle $\leq 1\%$
Source current (Body diode)	Continuous	I_S	–0.75 A
	Pulsed	I_{SP}	–3.0 A $P_w \leq 10\mu s$, Duty cycle $\leq 1\%$
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}	–40–125	°C

Transistor

●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	$V_{(BR)DSS}$	–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	$V_{GS(th)}$	–0.7	–	–2.0	V	$V_{DS}=-10V$ / $I_D=-1mA$
Static drain-source on-state resistance	$R_{DS(on)}$ *Pulsed	–	160	200	m Ω	$I_D=-1.5A$, $V_{GS}=-4.5V$
		–	180	240	m Ω	$I_D=-1.5A$, $V_{GS}=-4V$
		–	260	340	m Ω	$I_D=-0.75A$, $V_{GS}=-2.5V$
Forward transfer admittance	$ Y_{fs} $ *Pulsed	1.0	–	–	S	$V_{DS}=-10V$, $I_D=-0.75A$
Input capacitance	C_{iss}	–	325	–	pF	$V_{DS}=-10V$
Output capacitance	C_{oss}	–	60	–	pF	$V_{GS}=0V$
Reverse transfer capacitance	C_{rss}	–	40	–	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}$ *Pulsed	–	10	–	ns	$I_D=-0.75A$
Rise Time	t_r *Pulsed	–	10	–	ns	$V_{DD} \rightleftharpoons -15$
Turn off delay time	$t_{d(off)}$ *Pulsed	–	35	–	ns	$V_{GS}=-4.5V$ $R_L=20\Omega$
Fall time	t_f *Pulsed	–	10	–	ns	$R_{GS}=10\Omega$
Total gate charge	Q_g	–	4.2	–	nC	$V_{DD} \rightleftharpoons -15V$
Gate-source charge	Q_{gs}	–	1.0	–	nC	$V_{GS}=-4.5V$
Gate-drain charge	Q_{gd}	–	1.1	–	nC	$I_D=-1.5A$

< MOSFET >Body diode(source-drain)

Forward voltage	V_{SD}	–	–	–1.2	V	$I_S=-0.75A$ / $V_{GS}=0V$
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Foward voltage drop	V_F	–	–	0.36	V	$I_F=0.1A$
		–	–	0.47	V	$I_F=0.5A$
Reverse leakage	I_R	–	–	100	μA	$V_R=20V$

Transistor

●Electrical characteristic curves

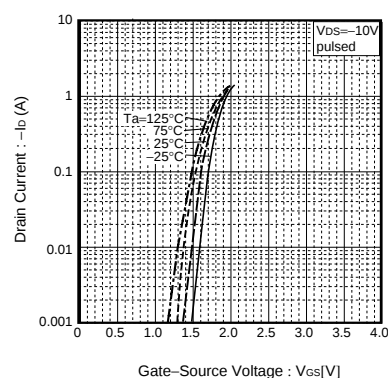


Fig.1 Typical Transfer Characteristics

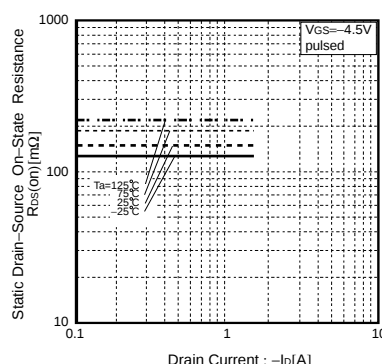


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

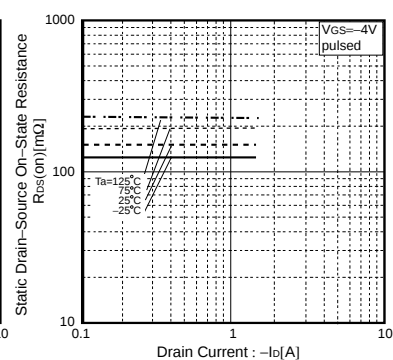


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

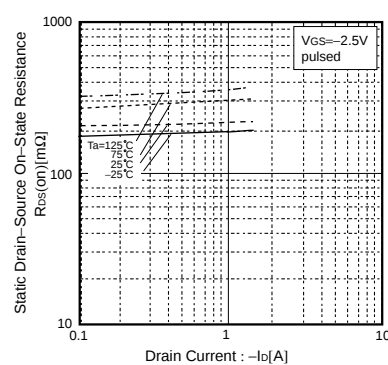


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

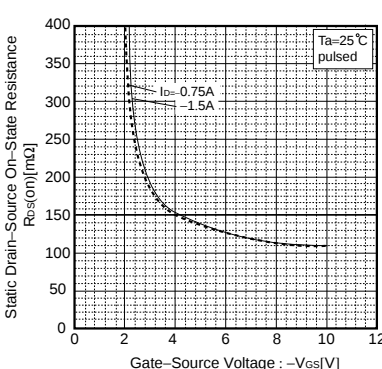


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

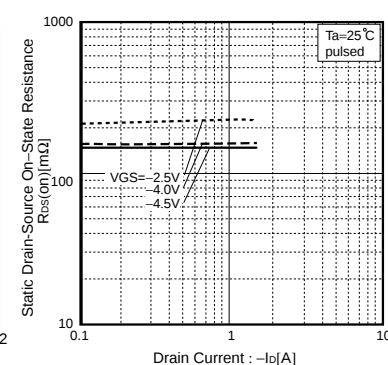


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

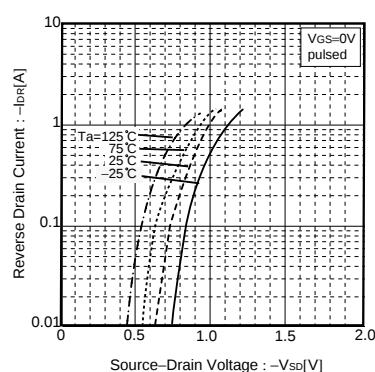


Fig.7 Reverse Drain Current vs. Source-Drain Voltage

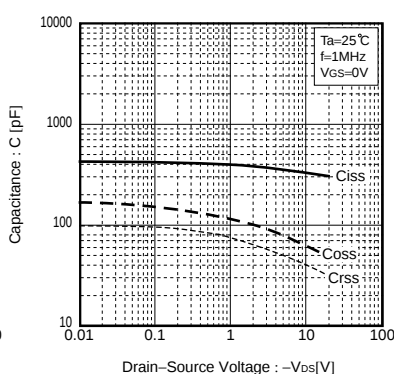


Fig.8 Typical Capacitance vs. Drain-Source Voltage

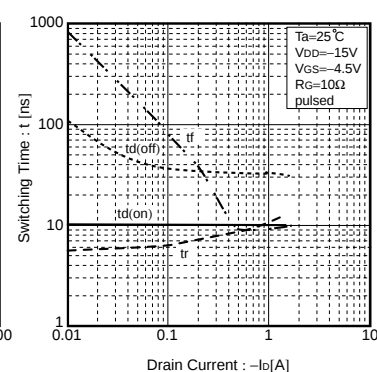


Fig.9 Switching Characteristics

Transistor

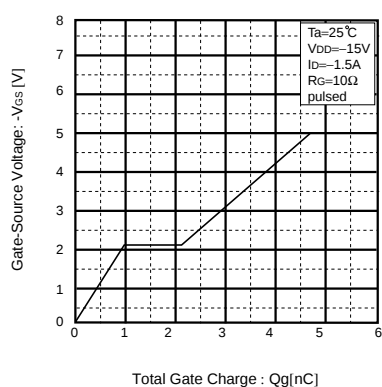


Fig.10 Dynamic Input Characteristics

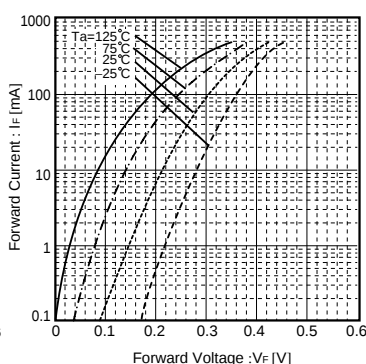


Fig.11 Forward Temperature Characteristics

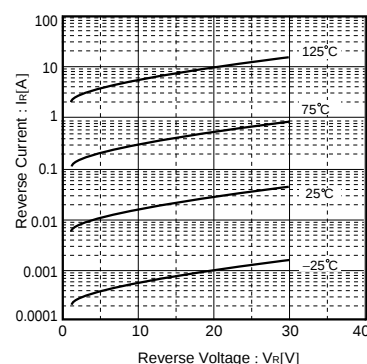


Fig.12 Reverse Temperature Characteristics

●Measurement circuits

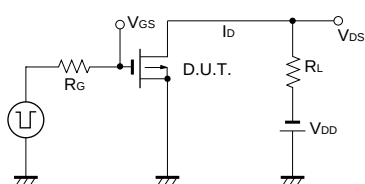


Fig.13 Switching Time Measurement Circuit

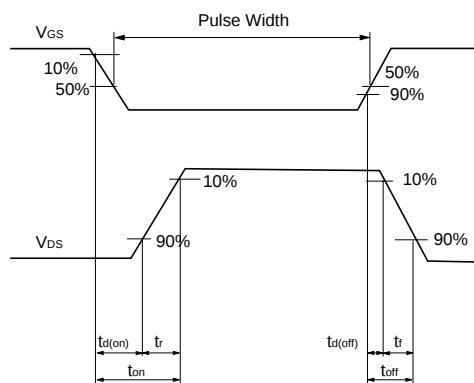


Fig.14 Switching Waveforms

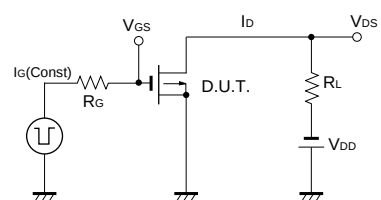


Fig.15 Gate Charge Measurement Circuit

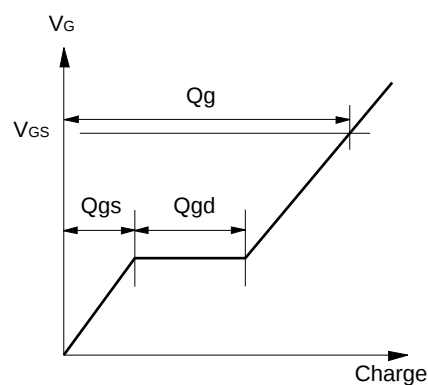


Fig.16 Gate Charge Waveforms

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