

Small switching (–20V, –1.5A)

QS5U21

●Features

- 1) The QS5U21 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 voltate.

●Applications

Load switch, DC/DC conversion

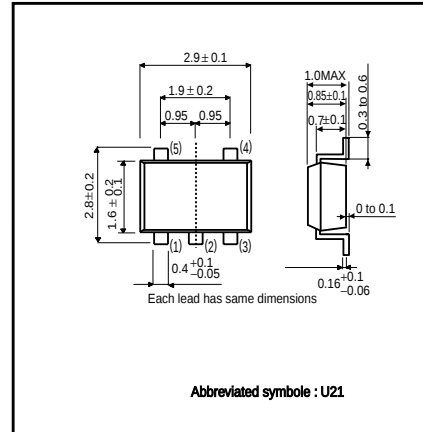
●Structure

Silicon P-channel MOSFET
Schottky Barrier DIODE

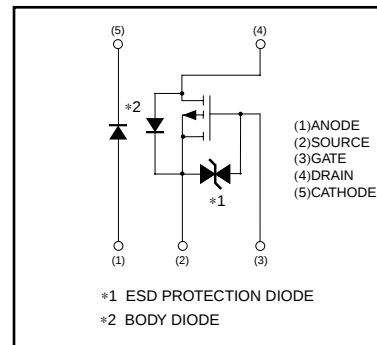
●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
QS5U21		○

●External dimensions (Units : mm)



●Equivalent circuit



●Absolute maximum ratings (Ta=25°C)

< MOSFET >

Parameter	Symbol	Limits	Unit
DRAIN-SOURCE VOLTAGE	VDSS	–20	V
GATE-SOURCE VOLTAGE	VGSS	±12	V
DRAIN CURRENT	CONTINUOUS	ID	±1.5 A
	PULSED	IDP	±6.0 A PW≤10μs DUTY CYCLE ≤1%
SOURCE CURRENT (BODY DIODE)	CONTINUOUS	IS	–0.75 A
	PULSED	ISP	–0.3 A PW≤10μs DUTY CYCLE ≤1%
CHANNEL TEMPERATURE	Tch	150	°C

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REPETITIVE PEAK REVERSE VOLTAGE	VRM	25	V
REVERSE VOLTAGE	VR	20	V
FORWARD CURRENT	IF	1.0	A
FORWARD CURRENT SURGE PEAK	IFSM	3.0	A 60HZ / 1CYC.
JUNCTION TEMPERATURE	TJ	125	°C

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TOTAL POWER DISSIPATION	PD	1.0	W/TOTAL/MOUNTED ON A CERAMIC BOARD
RANGE OF STRAGE TEMPERATURE	Tstg	–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	$V_{DD} \doteq -15$
Turn off delay time	$t_{d(off)}$ *Pulsed	—	35	—	ns	$V_{GS}=-4.5V$
Fall time	t_f *Pulsed	—	10	—	ns	$R_L=20\Omega$ $R_{GS}=10\Omega$
Total gate charge	Q_g	—	4.2	—	nC	$V_{DD} \doteq -15V$
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	VSD	—	—	-1.2	V	$I_S=-0.75A$ / $V_{GS}=0V$
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Forward voltage drop	V_F	—	—	0.45	V	$I_F=1.0A$
Reverse leakage	I_R	—	—	200	μA	$V_R=20V$

Transistor

●Electrical characteristic curves

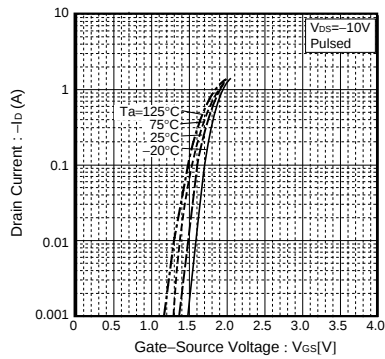


Fig.1 Typical Transfer Characteristics

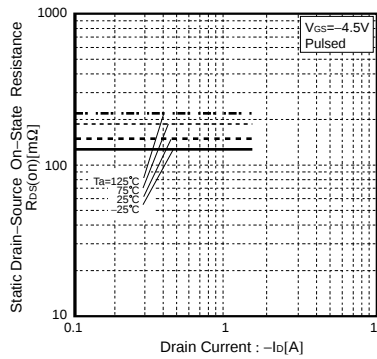


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

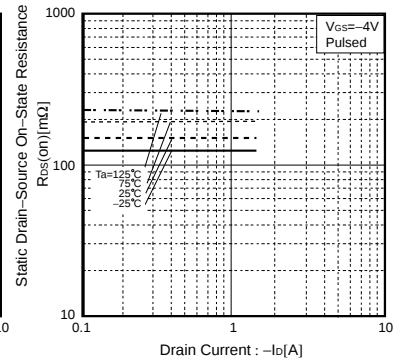


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

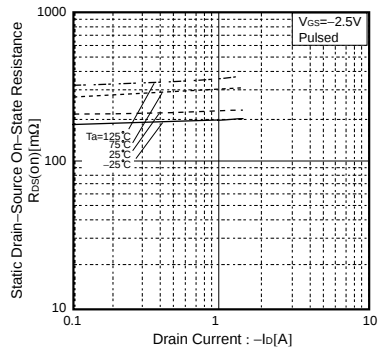


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

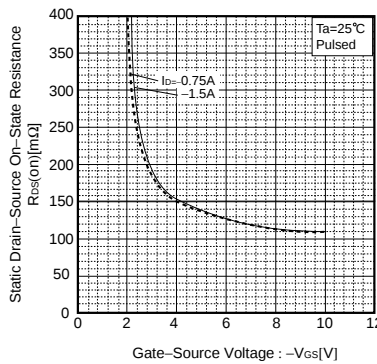


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

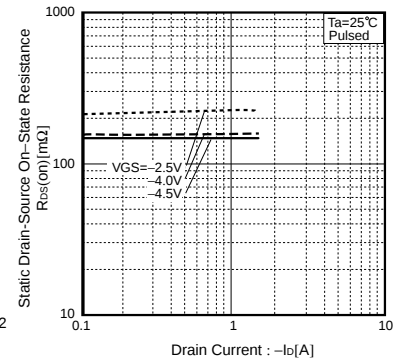


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

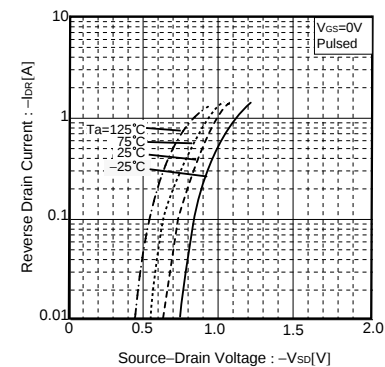


Fig.7 Reverse Drain Current vs. Source-Drain Current

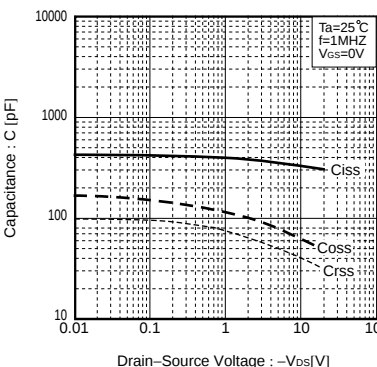


Fig.8 Typical Capacitance vs. Drain-Source Voltage

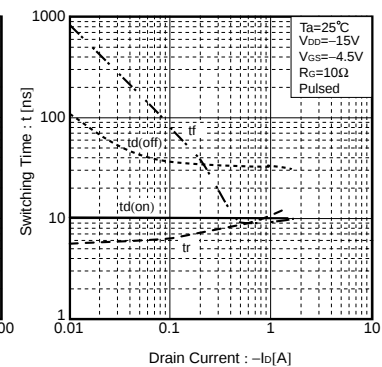


Fig.9 Switching Characteristics

Transistor

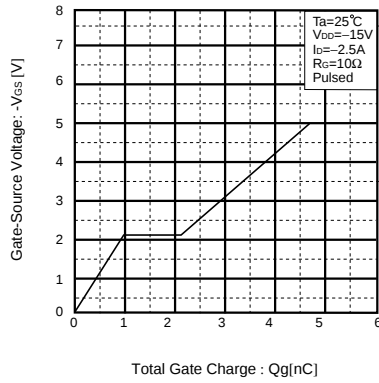


Fig.10 Dynamic Input Characteristics

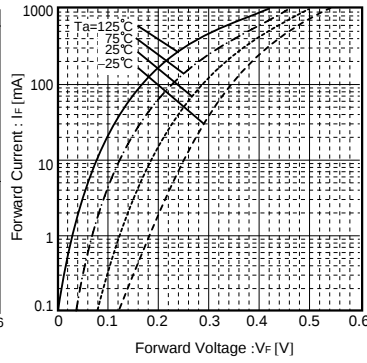


Fig.11 Forward Temperature Characteristics

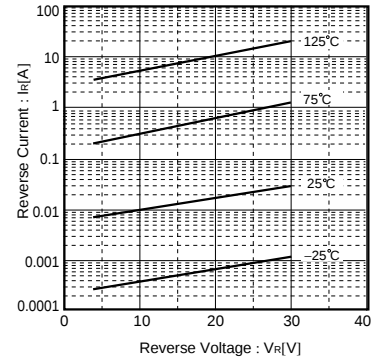


Fig.12 Reverse Temperature Characteristics

●Measurement circuits

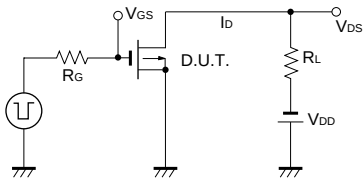


Fig.13 Switching Time Measurement Circuit

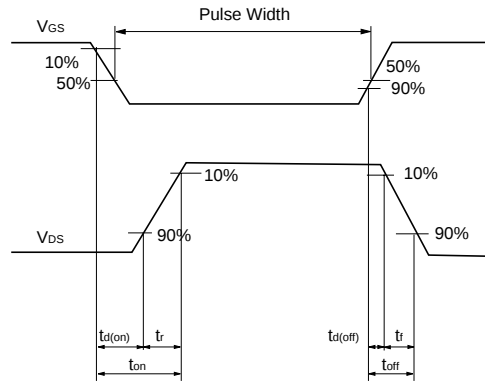


Fig.14 Switching Waveforms

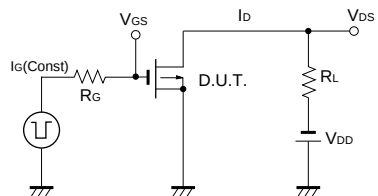


Fig.15 Gate Charge Measurement Circuit

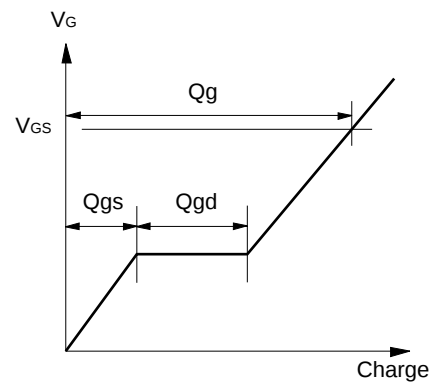


Fig.16 Gate Charge Waveforms