

# Small switching (−20V, −1.5A)

## US5U29

### ●Features

- 1) The US5U29 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

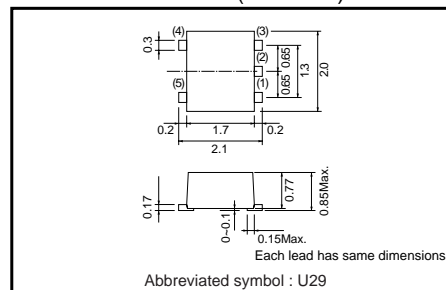
### ●Structure

Silicon P-channel MOSFET  
Schottky Barrier DIODE

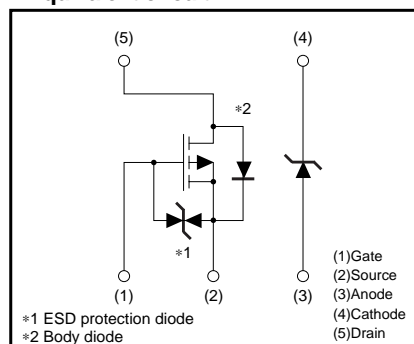
### ●Packaging specifications

Type	Package	Taping
	Code	TR
	Basic ordering unit (pieces)	3000
US5U29		○

### ●External dimensions (Unit : 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 A
	Pulsed	$I_{DP}$	±4 A PW≤10μs DUTY CYCLE ≤1%
Source current (Body diode)	Continuous	$I_S$	−0.4 A
	Pulsed	$I_{SP}$	−4 A PW≤10μs DUTY CYCLE ≤1%
Channel temperature	$T_{ch}$	150	°C

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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	$I_{FSM}$	3.0	A 60HZ / 1CYC.
Junction temperature	$T_j$	150	°C

< MOSFET AND Di >

Total power dissipation	$P_D$	1.0	W/TOTAL/MOUNTED ON A CERAMIC BOARD
Range of storage temperature	$T_{stg}$	−55 to 150	°C

## Transistor

## ●Electrical characteristics (Ta=25°C)

## &lt;MOSFET&gt;

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-starte resistance	R <sub>DS (on)</sub> *	—	280	390	mΩ	I <sub>D</sub> =−1A, V <sub>GS</sub> =−4.5V
		—	310	430	mΩ	I <sub>D</sub> =−1A, V <sub>GS</sub> =−4V
		—	570	800	mΩ	I <sub>D</sub> =−0.5A, V <sub>GS</sub> =−2.5V
Forward transfer admittance	Y <sub>fs</sub>   *	0.7	—	—	S	V <sub>DS</sub> =−10V, I <sub>D</sub> =−0.5A
Input capacitance	C <sub>iss</sub>	—	150	—	pF	V <sub>DS</sub> =−10V
Output capacitance	C <sub>oss</sub>	—	20	—	pF	V <sub>GS</sub> =0V
Reverse transfer capacitance	C <sub>rss</sub>	—	20	—	pF	f=1MHz
Turn-on delay time	t <sub>d (on)</sub> *	—	9	—	ns	I <sub>D</sub> =−0.5A
Rise time	t <sub>r</sub> *	—	8	—	ns	V <sub>DD</sub> =−15V
Turn-off delay time	t <sub>d (off)</sub> *	—	25	—	ns	V <sub>GS</sub> =−4.5V
Fall time	t <sub>f</sub> *	—	10	—	ns	R <sub>L</sub> =30Ω
Total gate charge	Q <sub>g</sub>	—	2.1	—	nC	V <sub>DD</sub> =−15V
Gate-source charge	Q <sub>gs</sub>	—	0.5	—	nC	V <sub>GS</sub> =−5V
Gate-drain charge	Q <sub>gd</sub>	—	0.5	—	nC	I <sub>D</sub> =−1A
						R <sub>L</sub> =15Ω
						R <sub>G</sub> =10Ω

\* Pulsed

## &lt;MOSFET&gt;

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V <sub>SD</sub>	—	—	−1.2	V	I <sub>S</sub> =−0.4A, V <sub>GS</sub> =0V

## &lt;Di&gt;

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage drop	V <sub>F</sub>	—	—	0.49	V	I <sub>F</sub> =0.7A
Reverse leakage	I <sub>R</sub>	—	—	200	μA	V <sub>R</sub> =20V

## Transistor

## ●Electrical characteristic curves

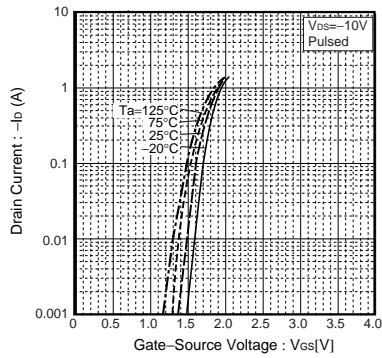


Fig.1 Typical Transfer Characteristics

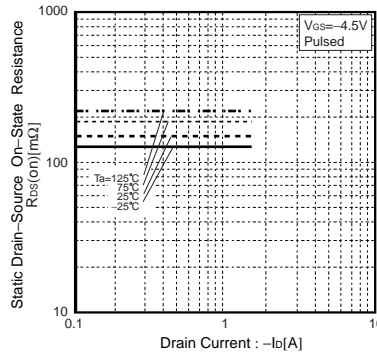


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

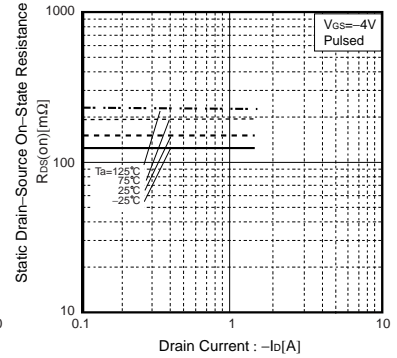


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

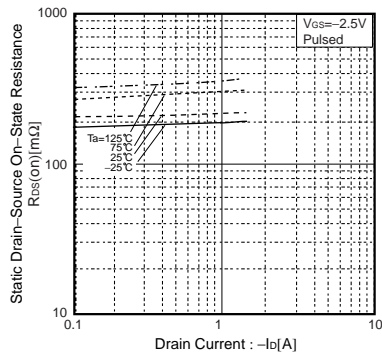


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

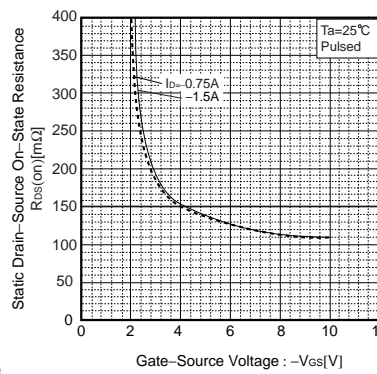


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

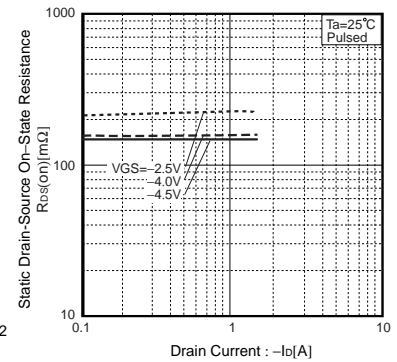


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

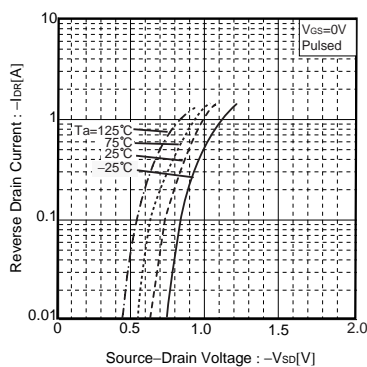


Fig.7 Reverse Drain Current vs. Source-Drain Current

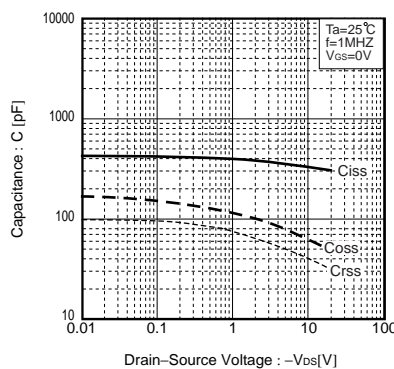


Fig.8 Typical Capacitance vs. Drain-Source Voltage

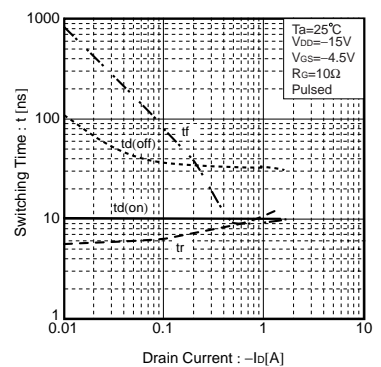


Fig.9 Switching Characteristics

# Transistor

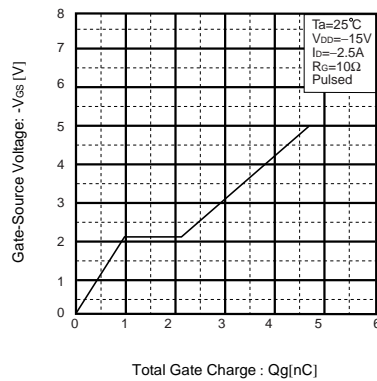


Fig.10 Dynamic Input Characteristics

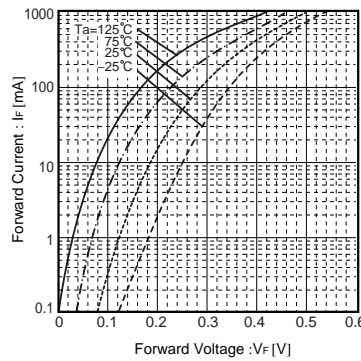


Fig.11 Forward Temperature Characteristics

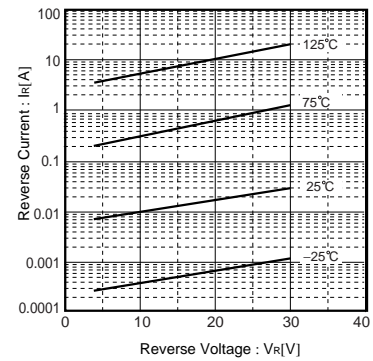


Fig.12 Reverse Temperature Characteristics

## Measurement circuits

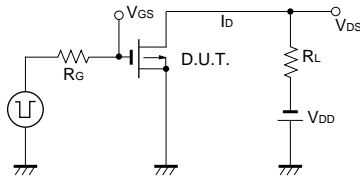


Fig.13 Switching Time Measurement Circuit

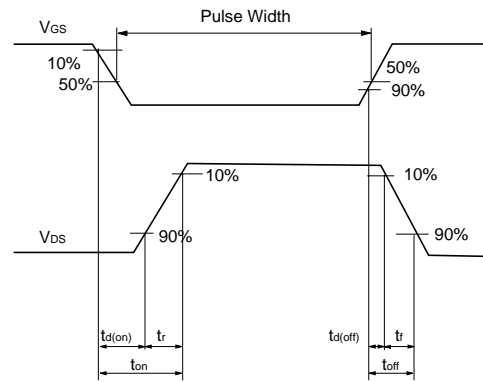


Fig.14 Switching Waveforms

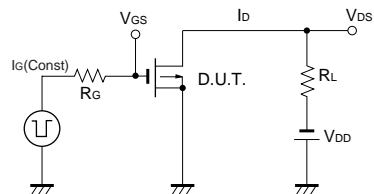


Fig.15 Gate Charge Measurement Circuit

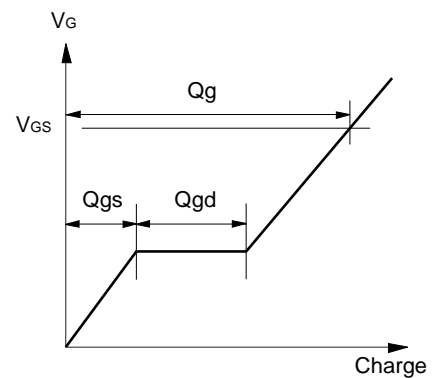


Fig.16 Gate Charge Waveforms

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