

1.5V Drive Nch+SBD MOSFET

ES6U2

●Structure

Silicon N-channel MOSFET /
Schottky barrier diode

●Features

- 1) Nch MOSFET and schottky barrier diode are put in WEMT6 package.
- 2) High-speed switching, Low On-resistance.
- 3) Low voltage drive (1.5V drive).
- 4) Built-in Low V_F schottky barrier diode.

●Applications

Switching

●Package specifications

Type	Package	Taping
	Code	T2R
	Basic ordering unit (pieces)	8000
ES6U2		○

●Absolute maximum ratings ($T_a=25^\circ\text{C}$)

<MOSFET>

Parameter	Symbol	Limits	Unit
Drain-source voltage	V_{DS}	20	V
Gate-source voltage	V_{GS}	± 10	V
Drain current	Continuous	I_D	± 1.5 A
	Pulsed	I_{DP} *1	± 3.0 A
Source current (Body diode)	Continuous	I_S	0.5 A
	Pulsed	I_{SP} *1	3.0 A
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Power dissipation	P_D *2	0.7	W / ELEMENT

*1 $P_w \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$
 *2 Mounted on a ceramic board

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Parameter	Symbol	Limits	Unit
Repetitive peak reverse voltage	V_{RM}	25	V
Reverse voltage	V_R	20	V
Forward current	I_F	0.5	A
Forward current surge peak	I_{FSM} *1	2.0	A
Junction temperature	T_j	150	$^\circ\text{C}$
Power dissipation	P_D *2	0.5	W / ELEMENT

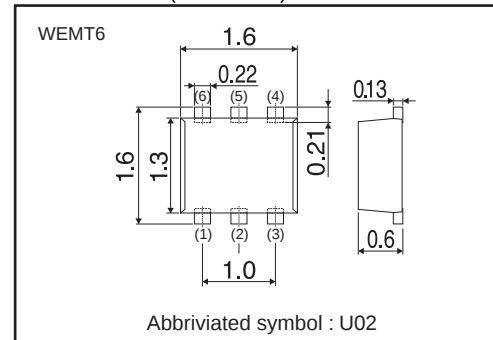
*1 60Hz · 1cyc.
 *2 Mounted on ceramic board

<MOSFET and Di>

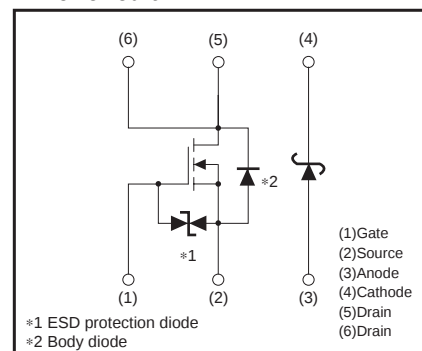
Parameter	Symbol	Limits	Unit
Power dissipation	P_D *	0.8	W / TOTAL
Range of storage temperature	T_{stg}	-55 to $+150$	$^\circ\text{C}$

* Mounted on a ceramic board

●Dimensions (Unit : mm)



●Inner circuit



●Electrical characteristics (Ta=25°C)

<MOSFET>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	–	–	± 10	μA	$V_{GS}=\pm 10V$, $V_{DS}=0V$
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	–	1.0	V	$V_{DS}=10V$, $I_D=1mA$
Static drain-source on-state resistance	$R_{DS(on)}^*$	–	130	180	m Ω	$I_D=1.5A$, $V_{GS}=4.5V$
		–	170	240	m Ω	$I_D=1.5A$, $V_{GS}=2.5V$
		–	220	310	m Ω	$I_D=0.8A$, $V_{GS}=1.8V$
		–	300	600	m Ω	$I_D=0.3A$, $V_{GS}=1.5V$
Forward transfer admittance	$ Y_{fs} ^*$	1.6	–	–	S	$V_{DS}=10V$, $I_D=1.5A$
Input capacitance	C_{iss}	–	110	–	pF	$V_{DS}=10V$
Output capacitance	C_{oss}	–	18	–	pF	$V_{GS}=0V$
Reverse transfer capacitance	C_{rss}	–	15	–	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}^*$	–	5	–	ns	$V_{DD}=10V$
Rise time	t_r^*	–	5	–	ns	$I_D=1A$
Turn-off delay time	$t_{d(off)}^*$	–	20	–	ns	$V_{GS}=4.5V$
Fall time	t_f^*	–	3	–	ns	$R_L=10\Omega$
Total gate charge	Q_g^*	–	1.8	–	nC	$V_{DD}=10V$, $V_{GS}=4.5V$
Gate-source charge	Q_{gs}^*	–	0.3	–	nC	$I_D=1.5A$, $R_L=6.7\Omega$
Gate-drain charge	Q_{gd}^*	–	0.3	–	nC	$R_G=10\Omega$

*Pulsed

<Body diode characteristics (Source-drain)>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_{SD}^*	–	–	1.2	V	$I_S=1.5A$, $V_{GS}=0V$

*Pulsed

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Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_F	–	–	0.36	V	$I_F=0.1A$
		–	–	0.52	V	$I_F=0.5A$
Reverse current	I_R	–	–	100	μA	$V_R=20V$

●Electrical characteristics curves

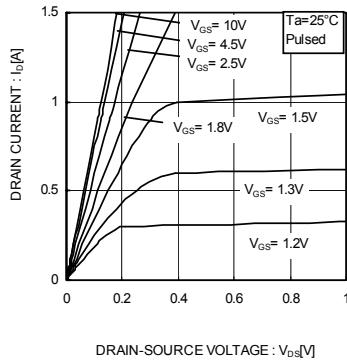


Fig.1 Typical Output Characteristics(I)

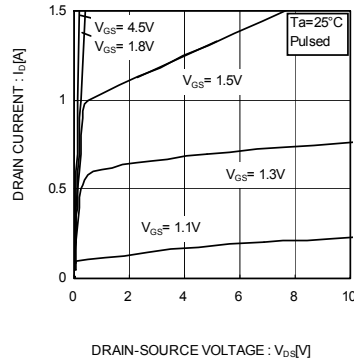


Fig.2 Typical Output Characteristics(II)

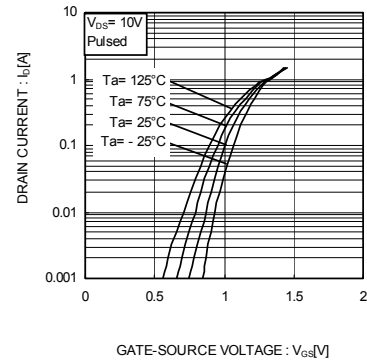


Fig.3 Typical Transfer Characteristics

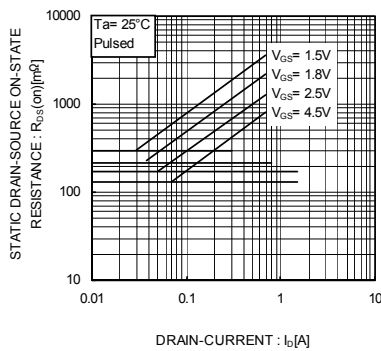


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current(I)

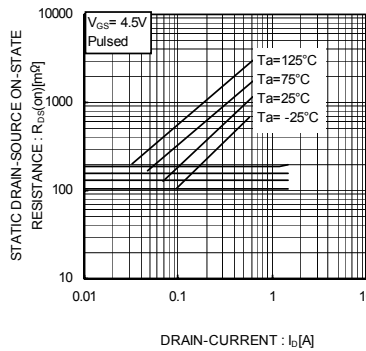


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current(II)

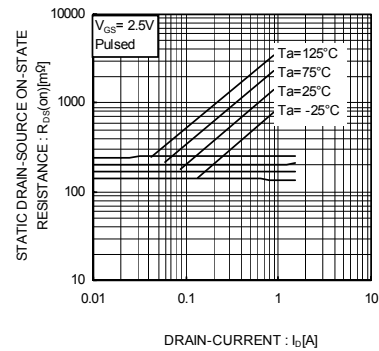


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current(III)

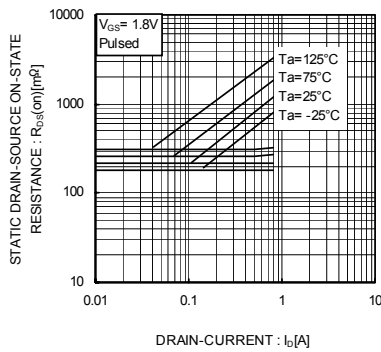


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current(IV)

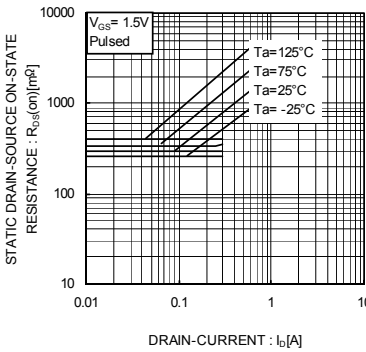


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current(V)

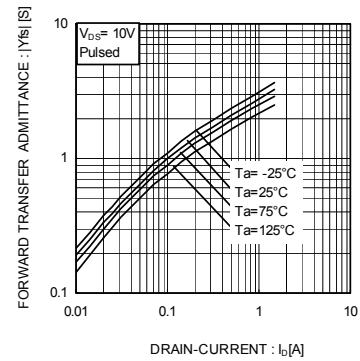


Fig.9 Forward Transfer Admittance vs. Drain Current

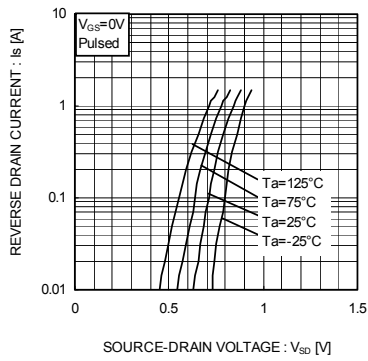


Fig. 10 Reverse Drain Current
vs. Source-Drain Voltage

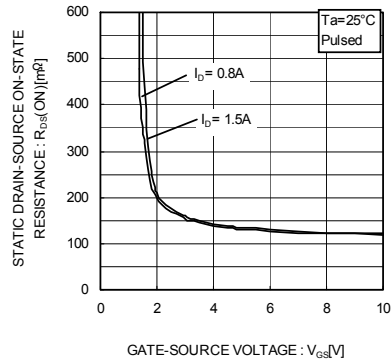


Fig. 11 Static Drain-Source On-State
Resistance vs. Gate Source Voltage

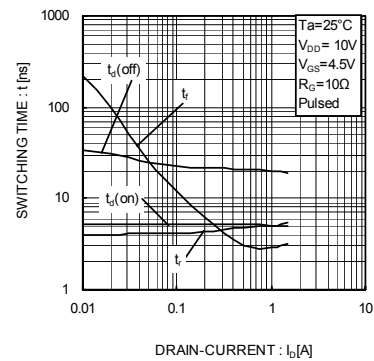


Fig. 12 Switching Characteristics

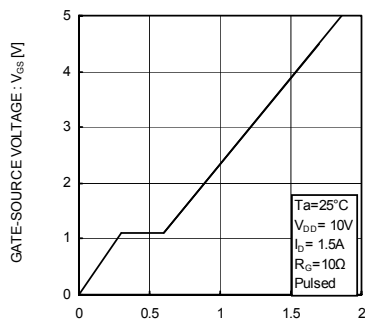


Fig. 13 Dynamic Input Characteristics

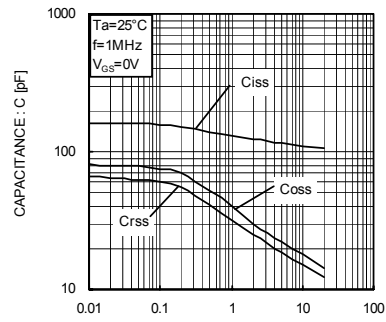


Fig. 14 Typical Capacitance
vs. Drain-Source Voltage

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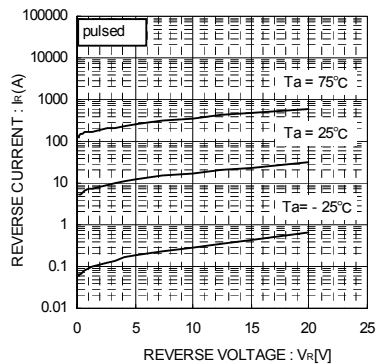


Fig. 1 Reverse Current vs. Reverse Voltage

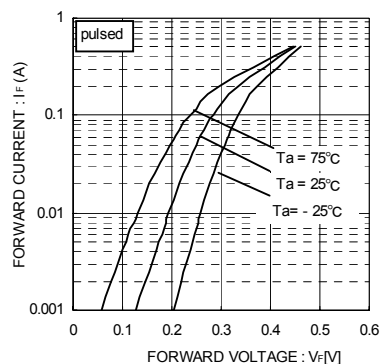


Fig. 2 Forward Current vs. Forward Voltage

●Measurement circuit

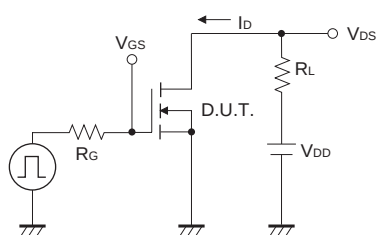


Fig.1-1 Switching Time Measurement Circuit

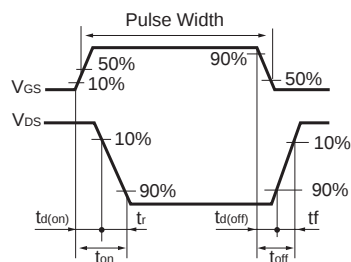


Fig.1-2 Switching Waveforms

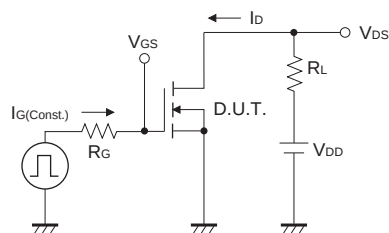


Fig.2-1 Gate Charge Measurement Circuit

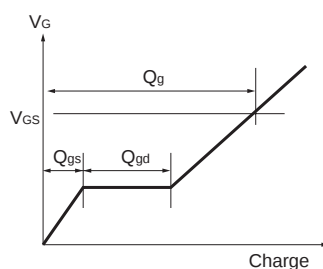


Fig.2-2 Gate Charge Waveform

●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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