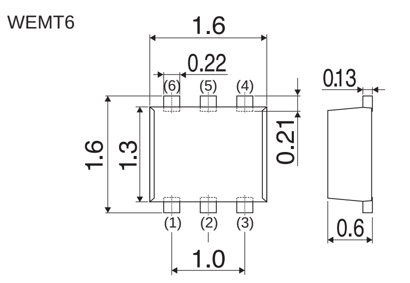
4V Drive Nch+SBD MOSFET

ES6U3

●Structure
Silicon N-channel MOSFET /
Schottky barrier diode

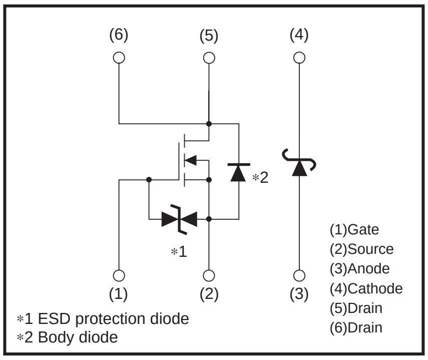
●Dimensions (Unit : mm)



●Features
1) Nch MOSFET and schottky barrier diode are put in WEMT6 package.
2) High-speed switching, Low On-resistance.
3) Built-in Low V_F schottky barrier diode.

●Applications
Switching

●Inner circuit



●Package specifications

Type		Taping
	Package	Taping
	Code	T2R
	Basic ordering unit (pieces)	8000
ES6U3		○

●Absolute maximum ratings (Ta=25°C)

<MOSFET>

Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	30	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	Continuous	I_D	±1.4	A
	Pulsed	I_{DP} *1	±2.8	A
Source current (Body diode)	Continuous	I_S	0.5	A
	Pulsed	I_{SP} *1	2.8	A
Channel temperature		Tch	150	°C
Power dissipation		P_D *2	0.7	W / ELEMENT

*1 Pw≤10µs, Duty cycle≤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	Tj	150	°C
Power dissipation	P_D *2	0.5	W / ELEMENT

*1 60Hz • 1cyc.
*2 Mounted on a ceramic board

<MOSFET and Di>

Parameter	Symbol	Limits	Unit
Power dissipation	P_D *	0.8	W / TOTAL
Range of storage temperature	Tstg	−55 to +150	°C

* Mounted on a ceramic board

●Electrical characteristics (Ta=25°C)

<MOSFET>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I_{GSS}	–	–	±10	μA	V_{GS}=±20V, V_{DS}=0V
Drain-source breakdown voltage	$V_{(BR)\,DSS}$	30	–	–	V	I_D= 1mA, V_{GS}=0V
Zero gate voltage drain current	I_{DSS}	–	–	1	μA	V_{DS}= 30V, V_{GS}=0V
Gate threshold voltage	$V_{GS\,(th)}$	1.0	–	2.5	V	V_{DS}= 10V, I_D= 1mA
Static drain-source on-state resistance	$R_{DS\,(on)}$*	–	170	240	mΩ	I_D= 1.4A, V_{GS}= 10V
		–	250	350	mΩ	I_D= 1.4A, V_{GS}= 4.5V
		–	270	380	mΩ	I_D= 1.4A, V_{GS}= 4V
Forward transfer admittance	$\|Y_{fs}\|$ *	1	–	–	S	V_{DS}= 10V, I_D= 1.4A
Input capacitance	C_{iss}	–	70	–	pF	V_{DS}= 10V
Output capacitance	C_{oss}	–	15	–	pF	V_{GS}=0V
Reverse transfer capacitance	C_{rss}	–	12	–	pF	f=1MHz
Turn-on delay time	$t_{d\,(on)}$ *	–	6	–	ns	V_{DD}≒ 15V
Rise time	t_r *	–	6	–	ns	I_D= 0.7A
Turn-off delay time	$t_{d\,(off)}$ *	–	13	–	ns	V_{GS}= 10V R_L≒21Ω
Fall time	t_f *	–	8	–	ns	R_G= 10Ω
Total gate charge	Q_g *	–	1.4	–	nC	V_{DD}≒15V, V_{GS}= 5V
Gate-source charge	Q_{gs} *	–	0.6	–	nC	I_D= 1.4A, R_L≒11Ω
Gate-drain charge	Q_{gd} *	–	0.3	–	nC	R_G= 10Ω

*Pulsed

<Body diode characteristics (Source-drain)>

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	V_{SD}*	–	–	1.2	V	I_S= 1.4A, 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

< MOSFET >

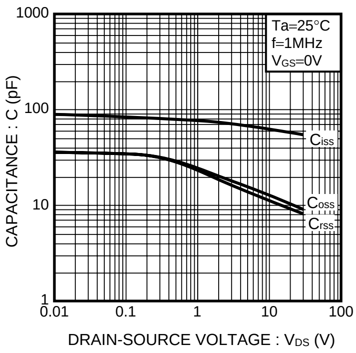

Fig.1 Typical Capacitance vs. Drain-Source Voltage

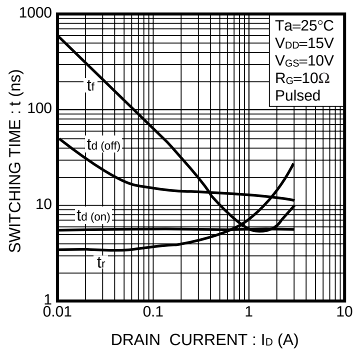

Fig.2 Switching Characteristics

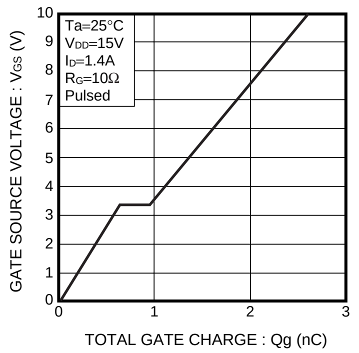

Fig.3 Dynamic Input Characteristics

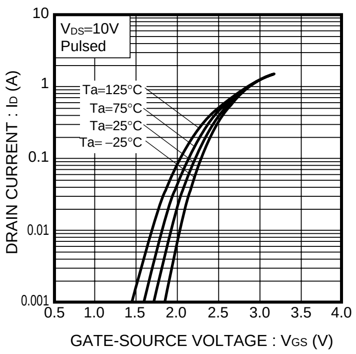

Fig.4 Typical Transfer Characteristics

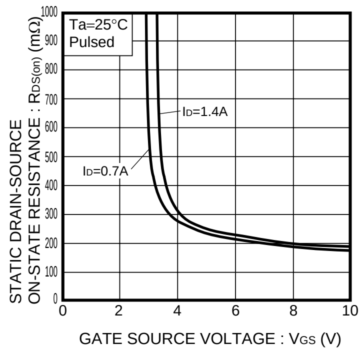

Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

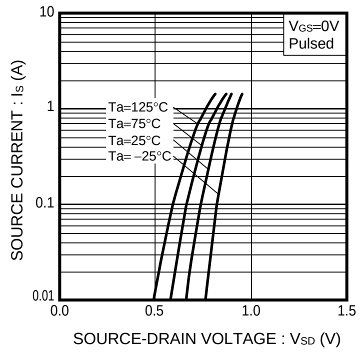

Fig.6 Source Current vs. Source-Drain Voltage

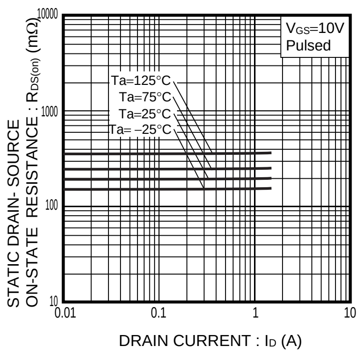

Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

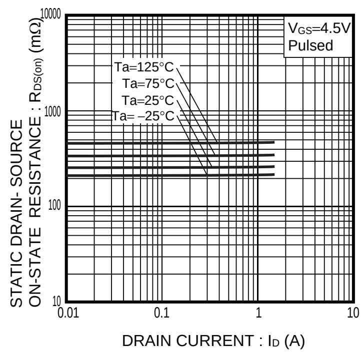

Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

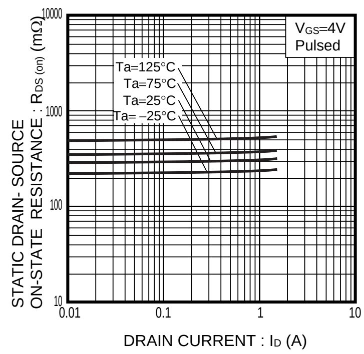

Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

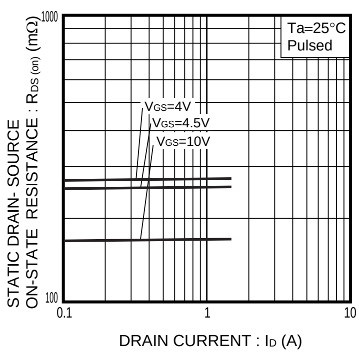

Fig.10 Static Drain-Source On-State Resistance vs. Drain Current (IV)

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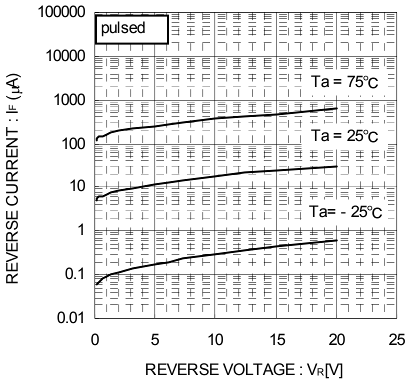

Fig.1 Reverse Current vs. Reverse Voltage

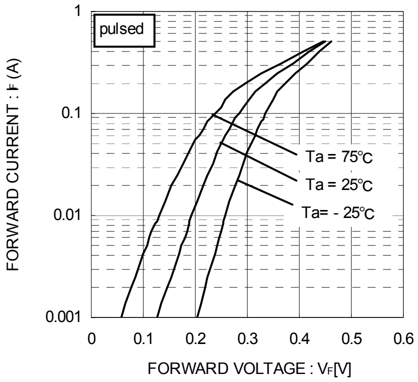

Fig.2 Forward Current vs. Forward Voltage

●Measurement circuit

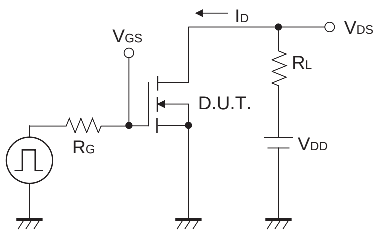

Fig.1-1 Switching Time Measurement Circuit

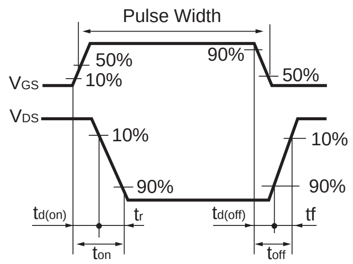

Fig.1-2 Switching Waveforms

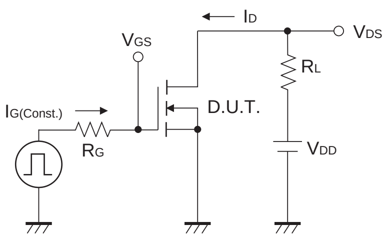

Fig.2-1 Gate Charge Measurement Circuit

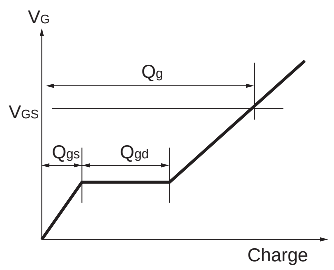

FIg.2-2 Gate Charge Waveform

●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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