

V_{DSS}	-20V
$R_{DS(on)}(Max.)$	105m Ω
I_D	$\pm 2.4A$
P_D	1.25W

●Features

- 1) Pch MOSFET and shottky barrier diode are put in TSST8 package.
- 2) High-speed switching and Low on-resistance.
- 3) Low voltage drive(1.5V)
- 4) Built in Low I_R shottky barrier diode.

●Application

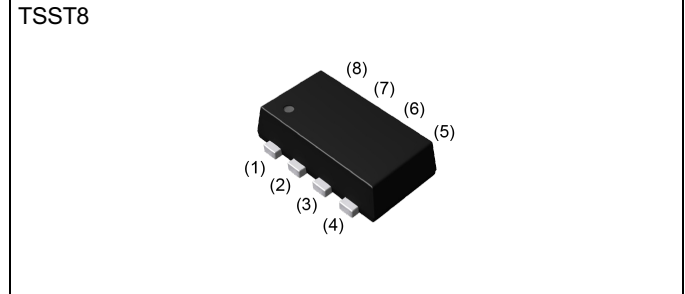
Switching

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

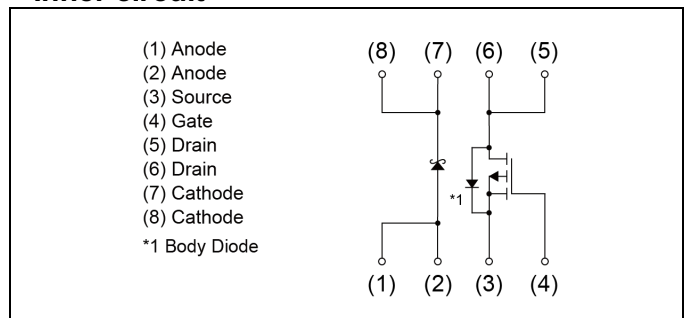
< MOSFET >

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	-20	V
Gate - Source voltage	V_{GSS}	± 10	V
Continuous drain current	I_D	± 2.4	A
Pulsed drain current	$I_{D,pulse}^{*1}$	± 9.6	A
Continuous source current (body diode)	I_S	-0.8	A
Pulsed source current (body diode)	$I_{S,pulse}^{*1}$	-9.6	A
Power dissipation	P_D^{*2}	1.0	W/element
Junction temperature	T_j	150	$^\circ C$

●Outline



●Inner circuit



●Packaging specifications

Type	Packing	Embossed Tape
	Reel size (mm)	180
	Tape width (mm)	8
	Basic ordering unit (pcs)	3000
	Taping code	TR
	Marking	U02

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

< Diode >

Parameter	Symbol	Value	Unit
Repetitive peak reverse voltage	V_{RM}	30	V
Reverse voltage	V_R	20	V
Forward current	I_F	1.0	A
Forward current surge peak	I_{FSM}^{*3}	3.0	A
Power dissipation	P_D^{*2}	1.0	W/element
Junction temperature	T_j	150	$^\circ\text{C}$

< MOSFET + Diode >

Parameter	Symbol	Value	Unit
Power dissipation	P_D^{*2}	1.25	W/total
Range of storage temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

● **Electrical characteristics** ($T_a = 25^\circ\text{C}$)

< MOSFET >

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Gate - Source leakage current	I_{GSS}	$V_{GS} = \pm 10\text{V}, V_{DS} = 0\text{V}$	-	-	± 100	nA
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{V}, I_D = -1\text{mA}$	-20	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = -20\text{V}, V_{GS} = 0\text{V}$	-	-	-1	μA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = -10\text{V}, I_D = -1\text{mA}$	-0.3	-	-1.0	V
Static drain - source on - state resistance	$R_{DS(on)}^{*4}$	$V_{GS} = -4.5\text{V}, I_D = -2.4\text{A}$	-	80	105	m Ω
		$V_{GS} = -2.5\text{V}, I_D = -1.2\text{A}$	-	105	140	
		$V_{GS} = -1.8\text{V}, I_D = -1.2\text{A}$	-	150	225	
		$V_{GS} = -1.5\text{V}, I_D = -0.5\text{A}$	-	180	360	
Forward Transfer Admittance	$ Y_{fs} ^{*4}$	$V_{DS} = -10\text{V}, I_D = -2.4\text{A}$	2.4	-	-	S

● **Electrical characteristics** ($T_a = 25^\circ\text{C}$)

< MOSFET >

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	$V_{GS} = 0V$	-	850	-	pF
Output capacitance	C_{oss}	$V_{DS} = -10V$	-	60	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	50	-	
Turn - on delay time	$t_{d(on)}^{*4}$	$V_{DD} \approx -10V, V_{GS} = -4.5V$	-	9	-	ns
Rise time	t_r^{*4}	$I_D = -1.2A$	-	25	-	
Turn - off delay time	$t_{d(off)}^{*4}$	$R_L = 8.3\Omega$	-	55	-	
Fall time	t_f^{*4}	$R_G = 10\Omega$	-	45	-	

● **Gate charge characteristics** ($T_a = 25^\circ\text{C}$)

< MOSFET >

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*4}	$V_{DD} \approx -10V, I_D = -2.4A$ $V_{GS} = -4.5V$	-	6.7	-	nC
Gate - Source charge	Q_{gs}^{*4}		-	1.7	-	
Gate - Drain charge	Q_{gd}^{*4}		-	0.6	-	

● **Body diode electrical characteristics** (Source-Drain) ($T_a = 25^\circ\text{C}$)

< MOSFET >

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_{SD}^{*4}	$V_{GS} = 0V, I_S = -2.4A$	-	-	-1.2	V

● **Electrical characteristics** ($T_a = 25^\circ\text{C}$)

< Diode >

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	V_F	$I_F = 1.0\text{A}$	-	0.48	0.52	V
Reverse current	I_R	$V_R = 10\text{V}$	-	-	10	μA

*1 $P_w \leq 0\mu\text{s}$, Duty cycle $\leq 1\%$

*2 MOUNTED ON A CERAMIC BOARD (30×30×0.8mm)

*3 60Hz·1cycle

*4 Pulsed

● Electrical characteristic curves <MOSFET>

Fig.1 Typical Output Characteristics(I)

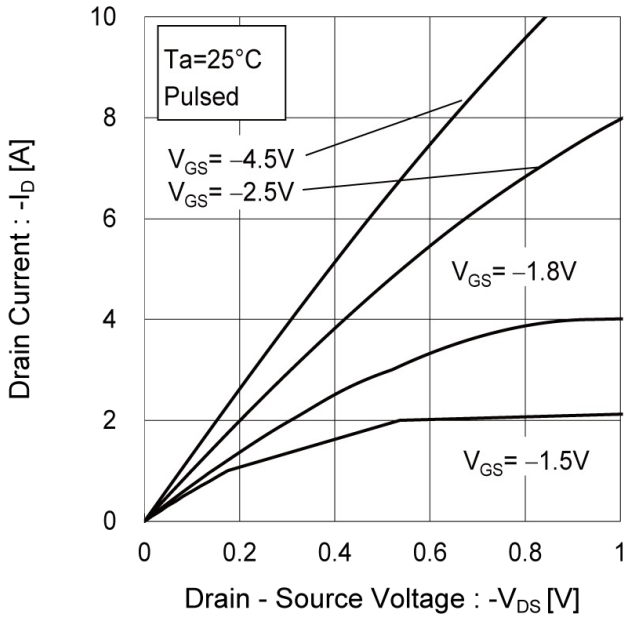


Fig.2 Typical Output Characteristics(II)

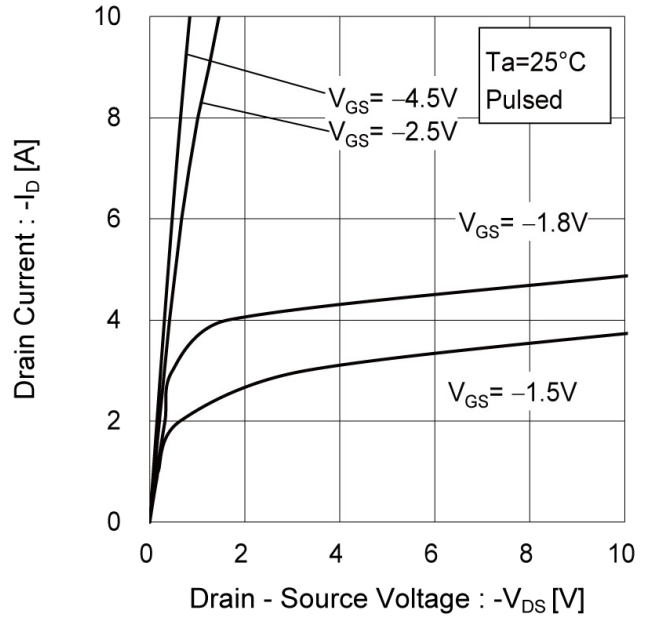


Fig.3 Breakdown Voltage vs. Junction Temperature

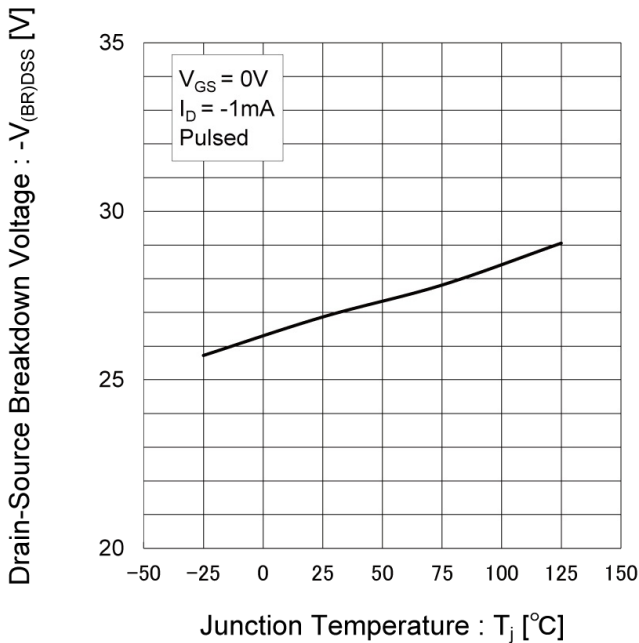
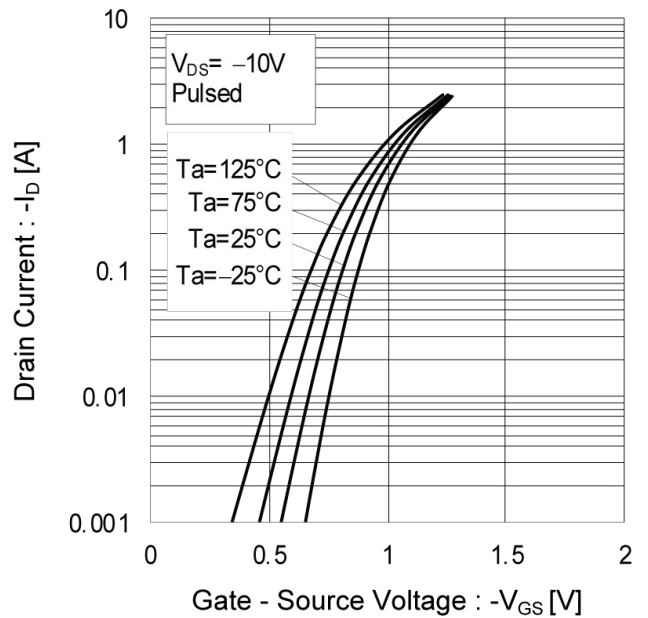


Fig.4 Typical Transfer Characteristics



●Electrical characteristic curves <MOSFET>

Fig.5 Gate Threshold Voltage vs. Junction Temperature

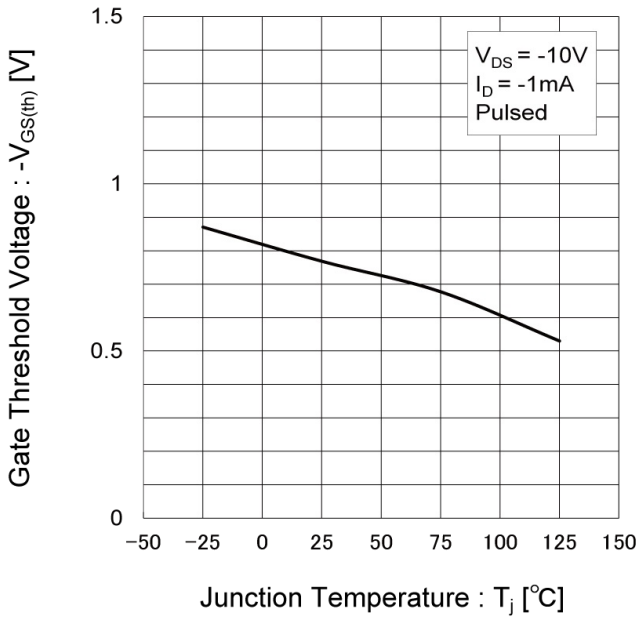


Fig.6 Forward Transfer Admittance vs. Drain Current

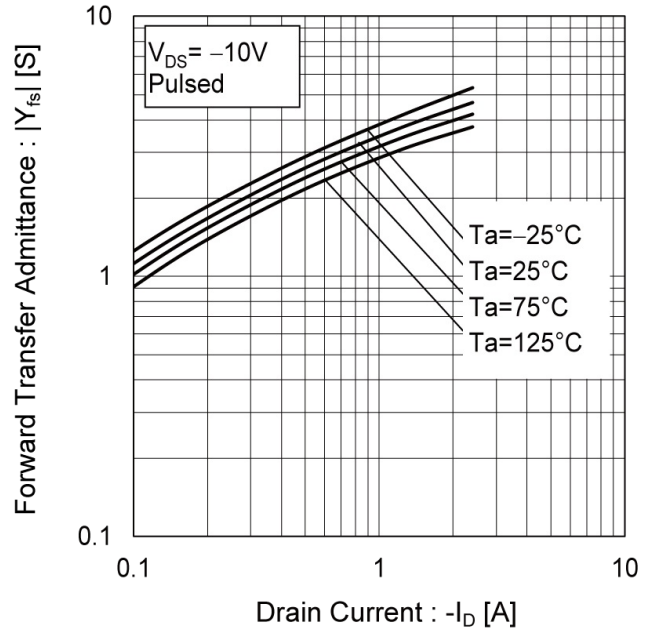


Fig.7 Drain Current Derating Curve

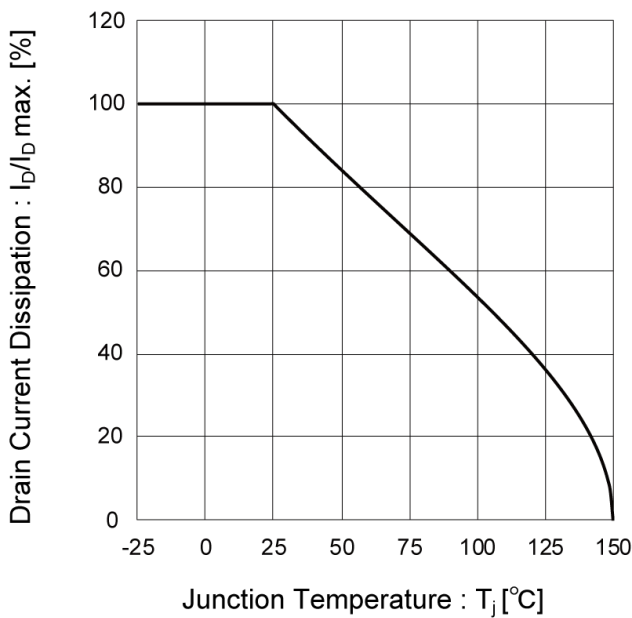
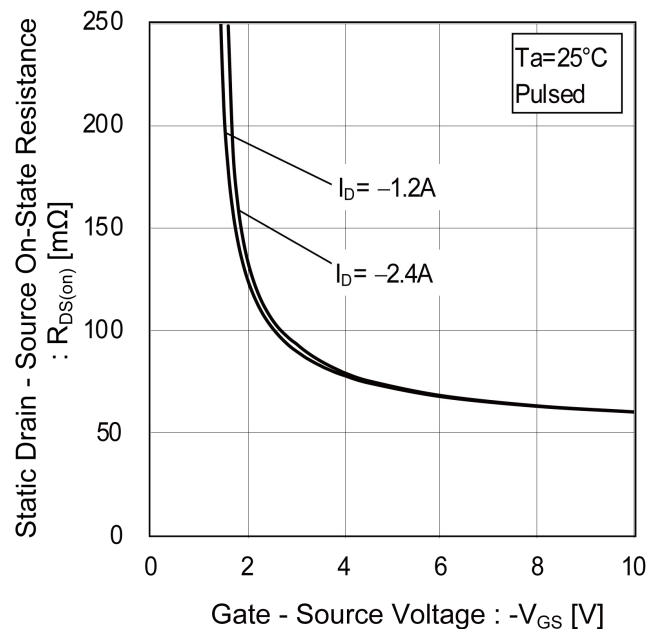


Fig.8 Static Drain - Source On - State Resistance vs. Gate Source Voltage



● Electrical characteristic curves <MOSFET>

Fig.9 Static Drain - Source On - State Resistance vs. Junction Temperature

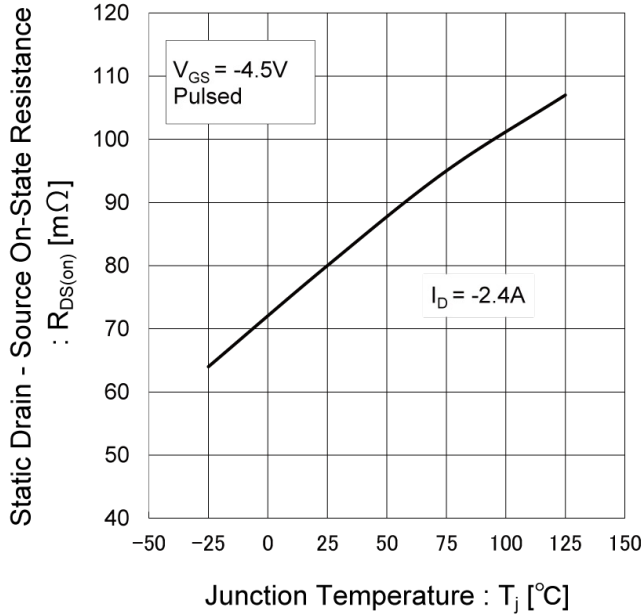
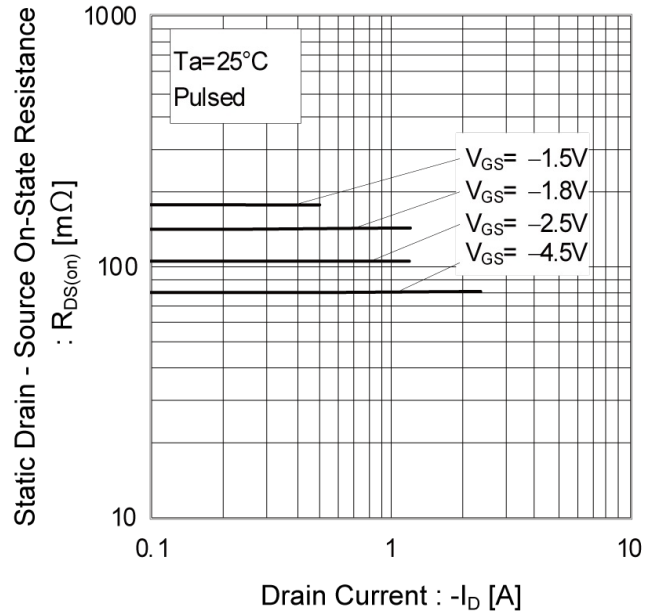


Fig.10 Static Drain - Source On - State Resistance vs. Drain Current (I)



● Electrical characteristic curves <MOSFET>

Fig.11 Static Drain - Source On - State Resistance vs. Drain Current (II)

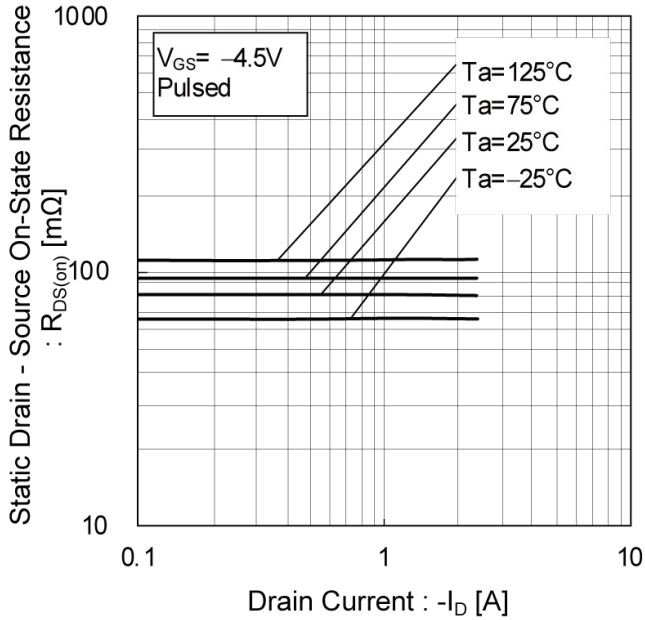


Fig.12 Static Drain - Source On - State Resistance vs. Drain Current (III)

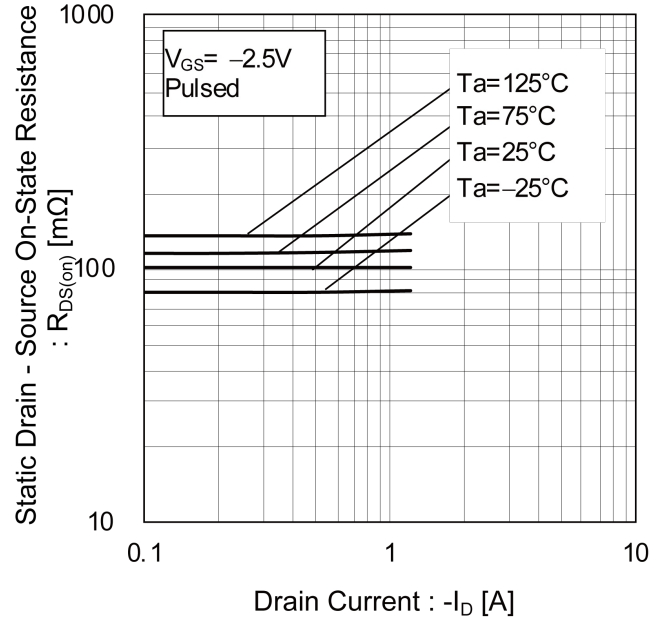


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current (IV)

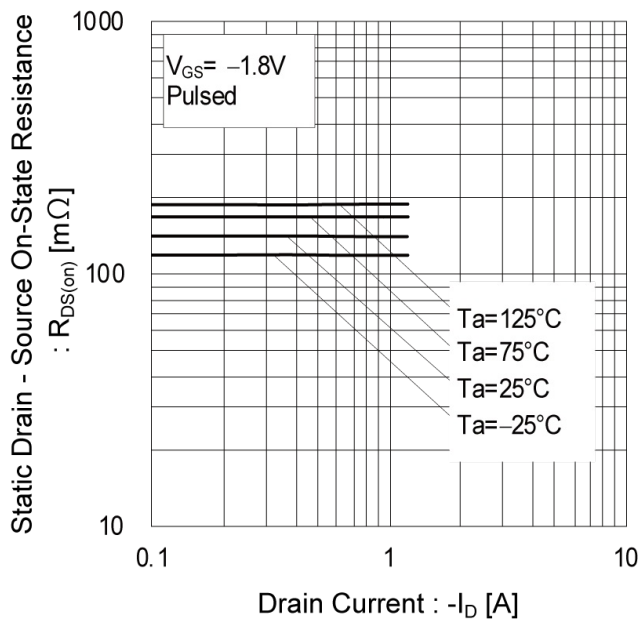
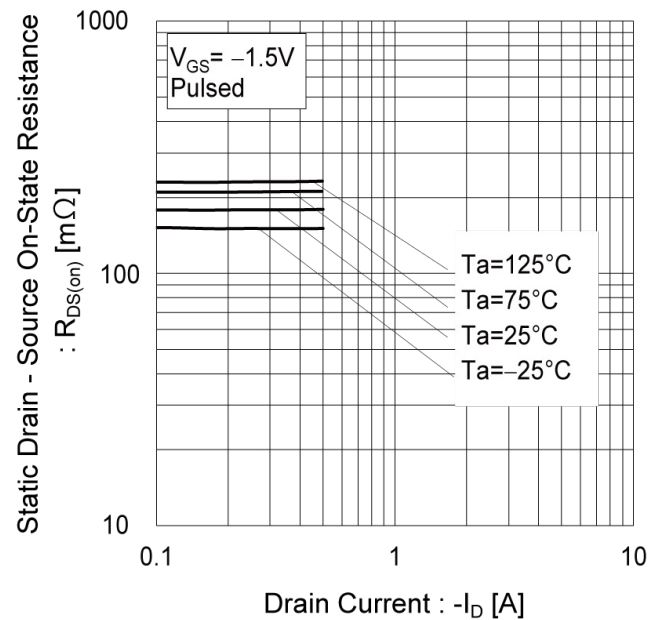


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (V)



● Electrical characteristic curves <MOSFET>

Fig.15 Typical Capacitance vs. Drain - Source Voltage

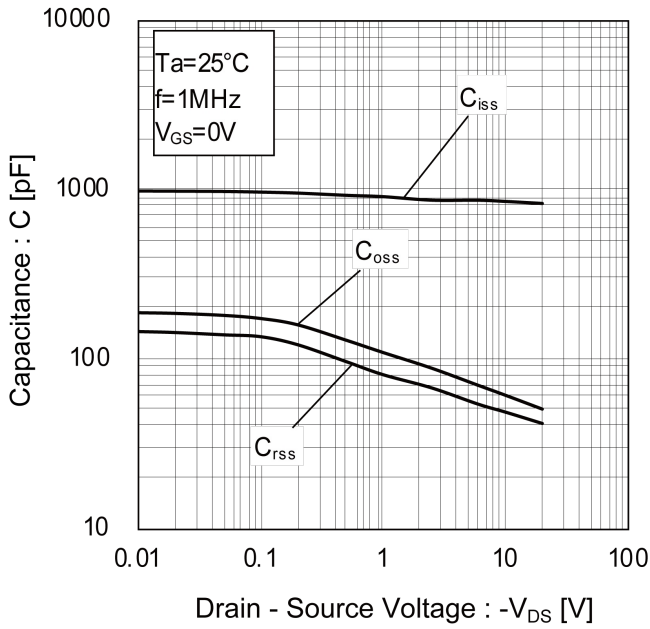


Fig.16 Switching Characteristics

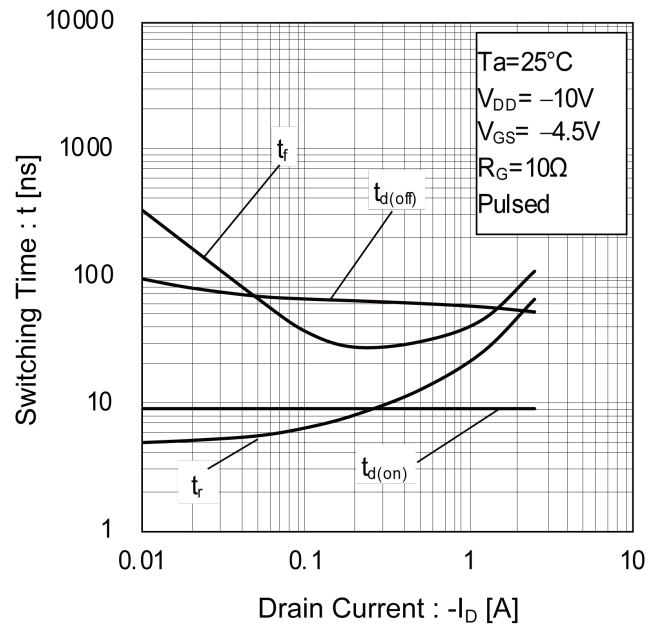


Fig.17 Dynamic Input Characteristics

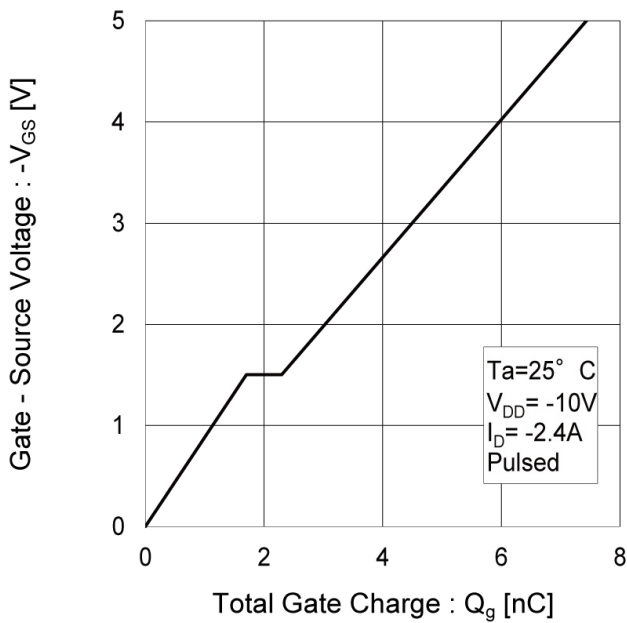
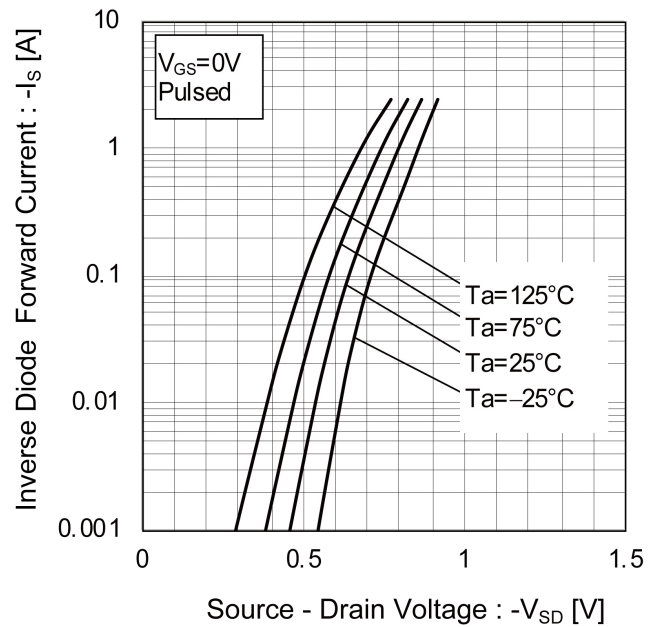


Fig.18 Source Current vs. Source Drain Voltage



● Electrical characteristic curves <Di>

Fig.19 Reverse Current vs. Reverse Voltage

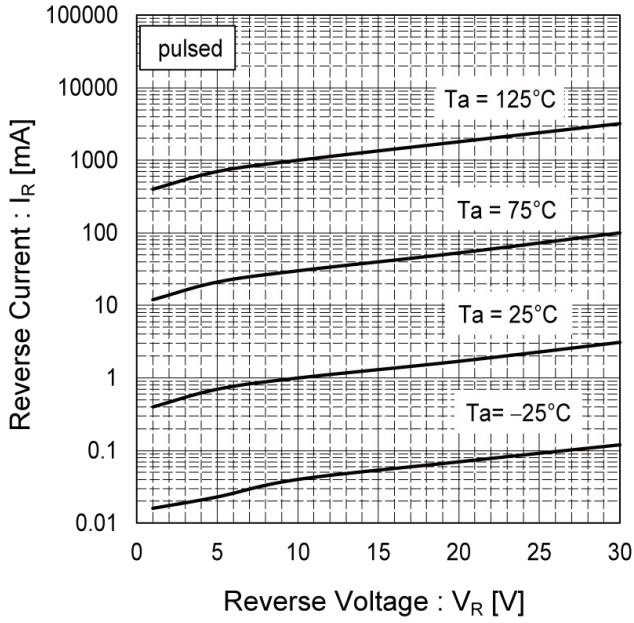
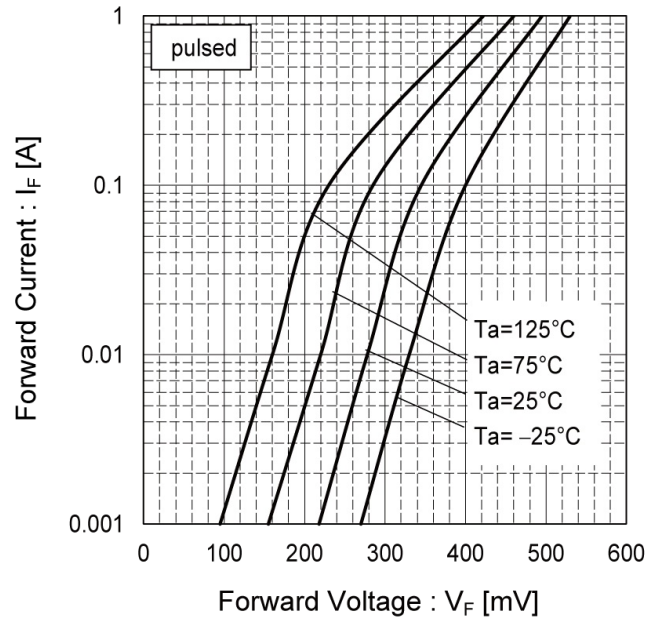


Fig.20 Forward Current vs. Forward Voltage



● Measurement circuits

Fig. 1-1 SWITCHING TIME MEASUREMENT CIRCUIT

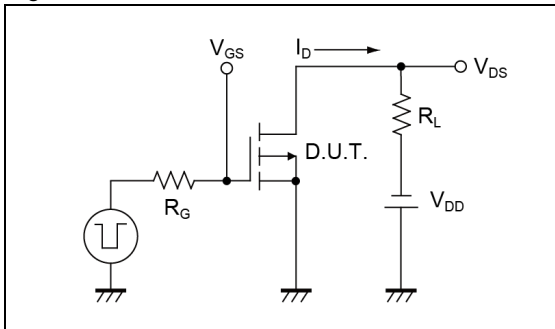


Fig. 1-2 SWITCHING WAVEFORMS

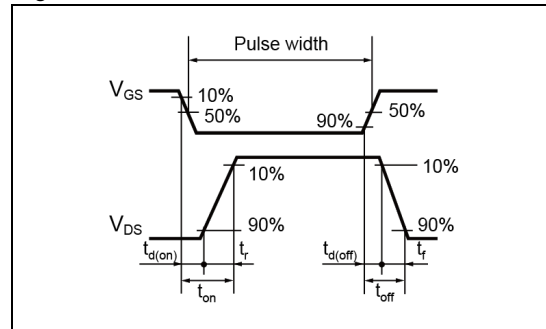


Fig. 2-1 GATE CHARGE MEASUREMENT CIRCUIT

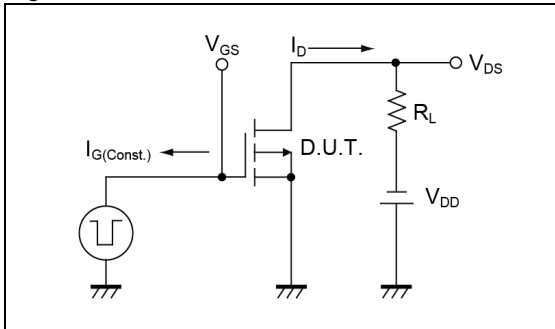
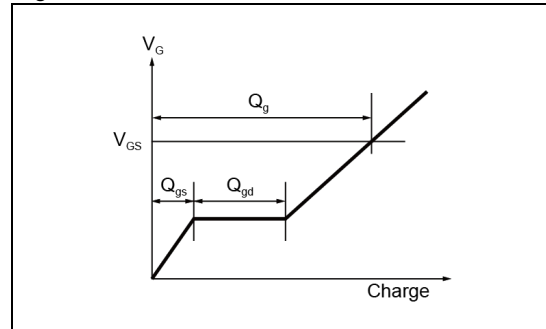


Fig. 2-2 GATE CHARGE WAVEFORM



● 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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