S2305

N-channel SiC power MOSFET bare die

Data Sheet

V_{DSS}	1200V
$R_{DS(on)}$ (Typ.)	450mΩ
I_D	10A*1

●Features

1) Low on-resistance

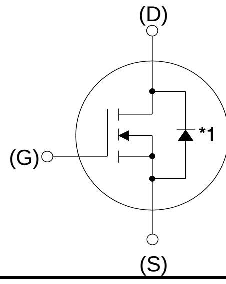
2) Fast switching speed

3) Fast reverse recovery

4) Easy to parallel

5) Simple to drive

●Inner circuit



(G) Gate
(D) Drain
(S) Source

*1 Body Diode

●Application

- Solar inverters
- DC/DC converters
- Switch mode power supplies
- Induction heating
- Motor drives

●Absolute maximum ratings (T_a = 25°C)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	1200	V
Continuous drain current	T_c = 25°C	I_D *1	10	A
Pulsed drain current		$I_{D,pulse}$ *2	25	A
Gate - Source voltage (DC)		V_{GSS}	–6 to 22	V
Gate - Source surge voltage (T_{surge} < 300nsec)		$V_{GSS\text{-}surge}$ *3	–10 to 26	V
Junction temperature		T_j	175	°C
Range of storage temperature		T_{stg}	–55 to +175	°C

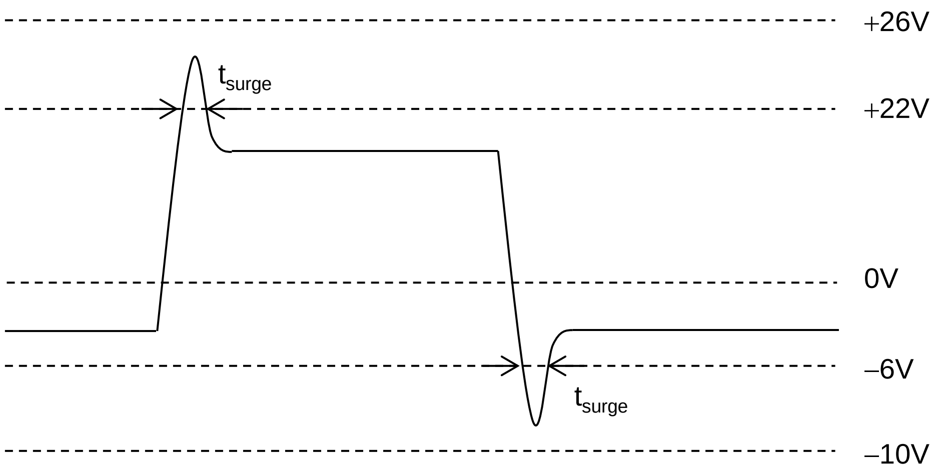
●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 1mA	1200	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 1200V, V_{GS} = 0V T_j = 25°C T_j = 150°C	 - -	 1 2	 10 -	μA
Gate - Source leakage current	I_{GSS+}	V_{GS} = +22V, V_{DS} = 0V	-	-	100	nA
Gate - Source leakage current	I_{GSS-}	V_{GS} = –6V, V_{DS} = 0V	-	-	–100	nA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = V_{GS}, I_D = 0.9mA	1.6	2.8	4.0	V
Static drain - source on - state resistance	$R_{DS(on)}$ *4	V_{GS} = 18V, I_D = 3A T_j = 25°C T_j = 125°C	 - -	 450 610	 556 -	mΩ
Gate input resistance	R_G	f = 1MHz, open drain	-	25	-	Ω

*1 Limited only by maximum temperature allowed.

*2 PW ≤ 10μs, Duty cycle ≤ 1%

*3 Example of acceptable Vgs waveform



*4 Pulsed

●**Electrical characteristics** (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs} *4	V_{DS} = 10V, I_D = 3A	-	1.0	-	S
Input capacitance	C_{iss}	V_{GS} = 0V	-	463	-	pF
Output capacitance	C_{oss}	V_{DS} = 800V	-	21	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	4	-	
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V V_{DS} = 0V to 500V	-	31	-	pF
Turn - on delay time	$t_{d(on)}$ *4	V_{DD} = 400V, V_{GS} = 18V	-	19	-	ns
Rise time	t_r *4	I_D = 3A	-	17	-	
Turn - off delay time	$t_{d(off)}$ *4	R_L = 133Ω	-	38	-	
Fall time	t_f *4	R_G = 0Ω	-	34	-	
Turn - on switching loss	E_{on} *4	V_{DD} = 600V, I_D=3A V_{GS} = 18V/0V R_G = 0Ω, L=500μH *E_{on} includes diode reverse recovery	-	47	-	μJ
Turn - off switching loss	E_{off} *4		-	17	-	

●**Gate Charge characteristics** (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *4	V_{DD} = 400V	-	27	-	nC
Gate - Source charge	Q_{gs} *4	I_D = 3A	-	7	-	
Gate - Drain charge	Q_{gd} *4	V_{GS} = 18V	-	9	-	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} = 400V, I_D = 3A	-	10.5	-	V

●**Body diode electrical characteristics** (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_c = 25°C	-	-	10	A
Inverse diode direct current, pulsed	I_{SM} *2		-	-	25	A
Forward voltage	V_{SD} *4	V_{GS} = 0V, I_S = 3A	-	4.3	-	V
Reverse recovery time	t_{rr} *4	I_F = 3A, V_R = 400V di/dt = 110A/μs	-	19	-	ns
Reverse recovery charge	Q_{rr} *4		-	13	-	nC
Peak reverse recovery current	I_{rrm} *4		-	1.4	-	A

● **Electrical characteristic curves**

Fig.1 Typical Output Characteristics(I)

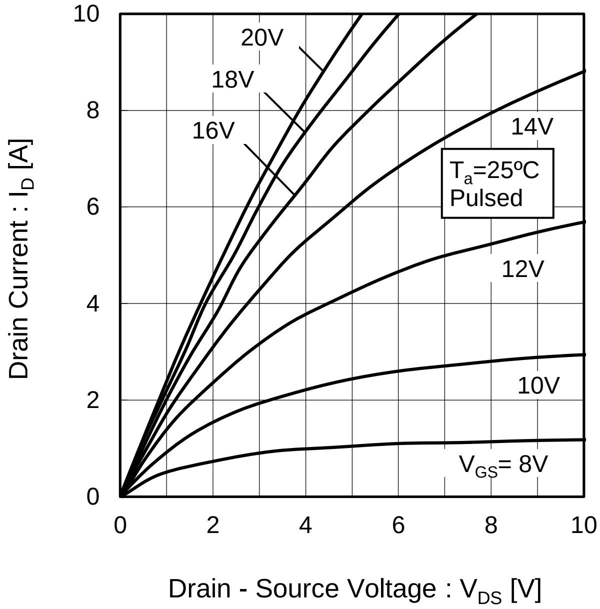


Fig.2 Typical Output Characteristics(II)

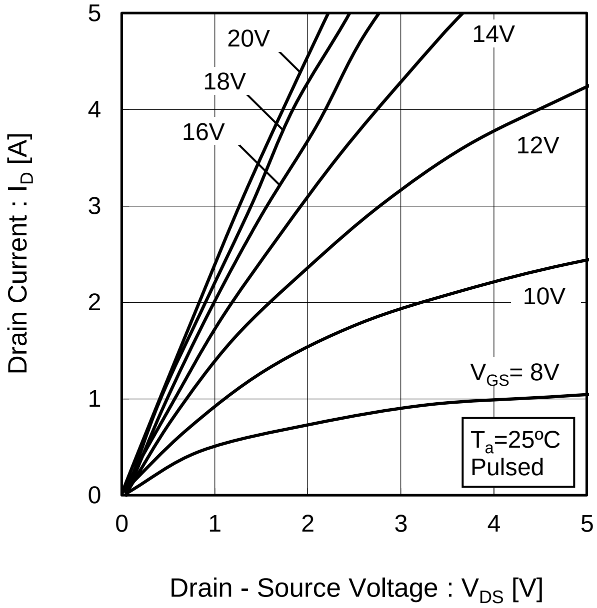


Fig.3 T_j = 150°C Typical Output Characteristics(I)

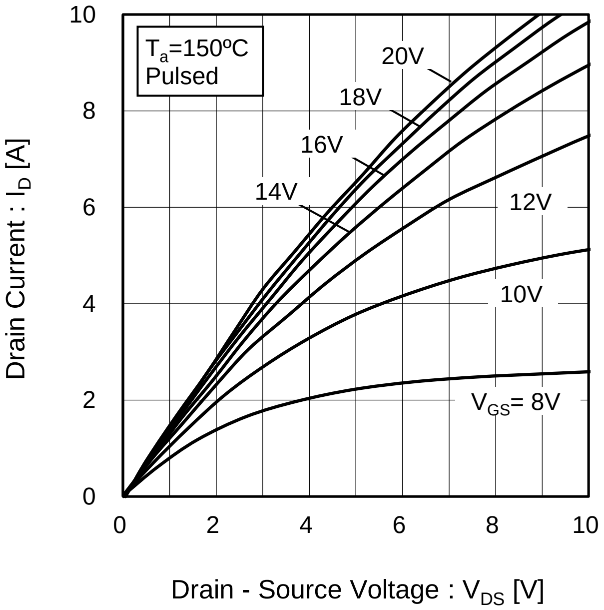
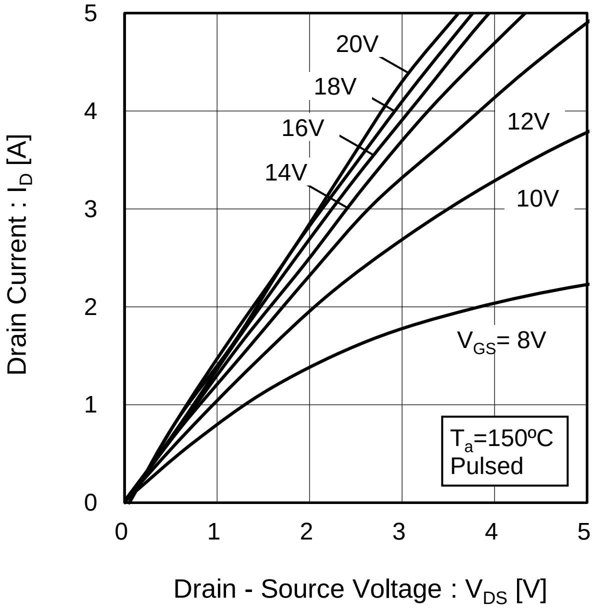


Fig.4 T_j = 150°C Typical Output Characteristics(II)



● **Electrical characteristic curves**

Fig.5 Typical Transfer Characteristics (I)

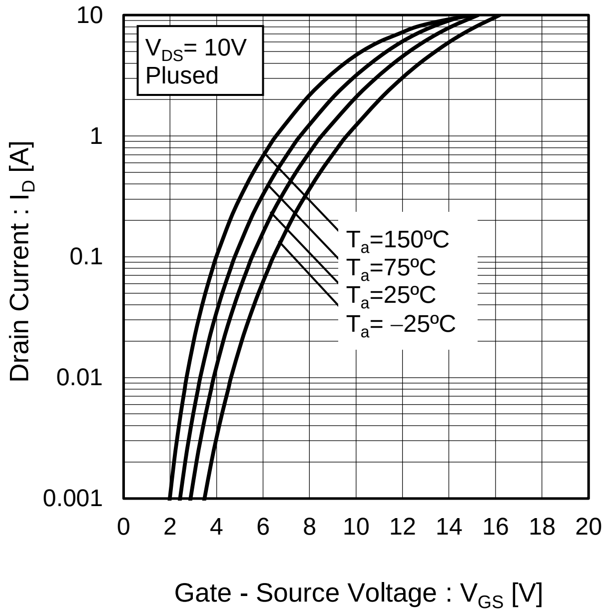


Fig.6 Typical Transfer Characteristics (II)

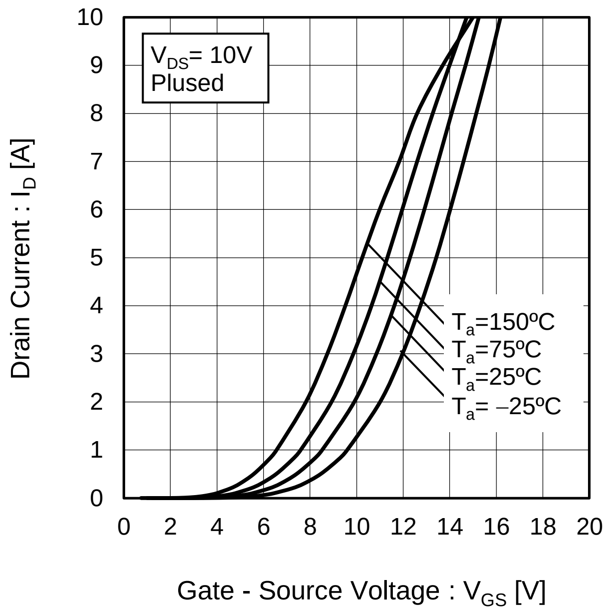


Fig.7 Gate Threshold Voltage vs. Junction Temperature

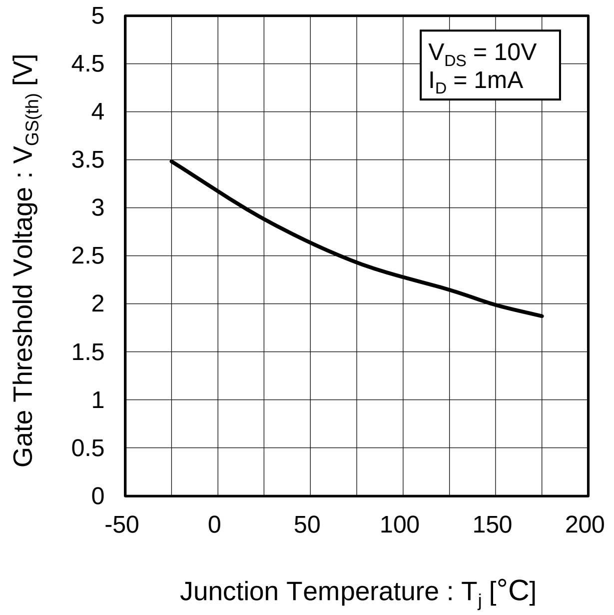
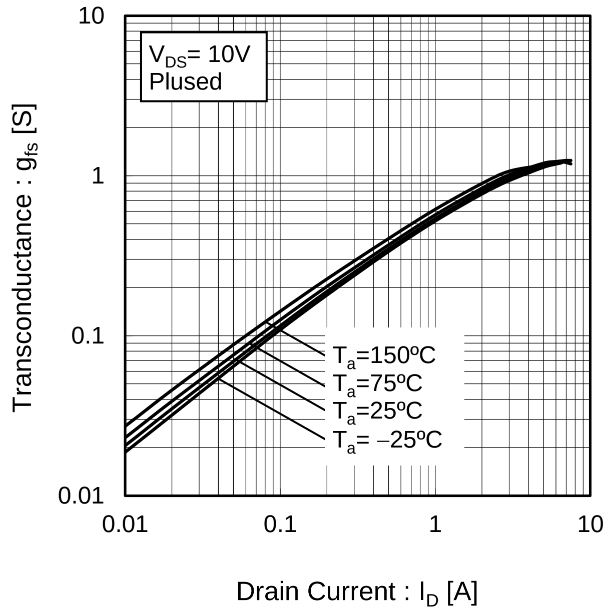


Fig.8 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.9 Static Drain - Source On - State Resistance vs. Gate Source Voltage

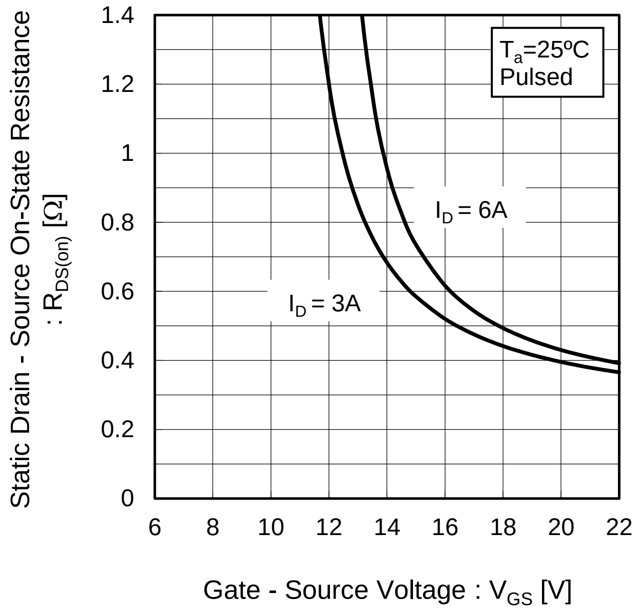


Fig.10 Static Drain - Source On - State Resistance vs. Junction Temperature

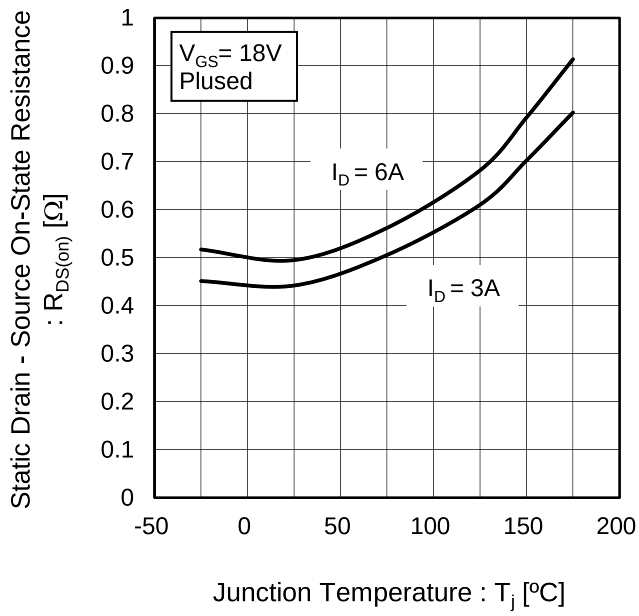
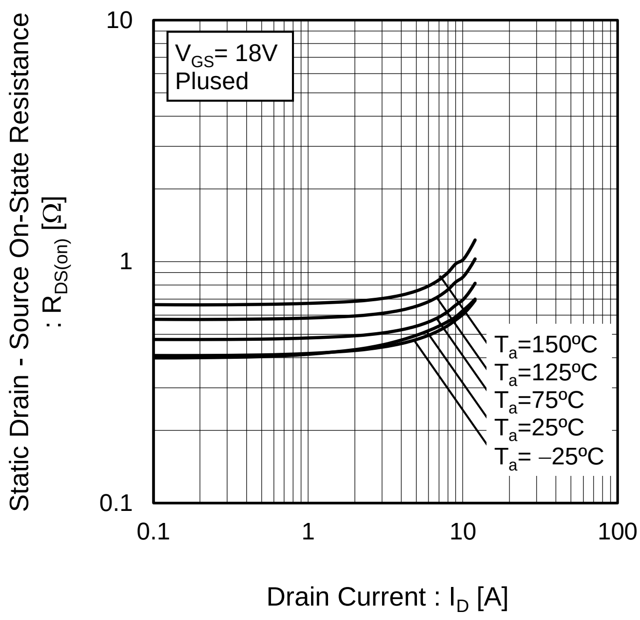


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

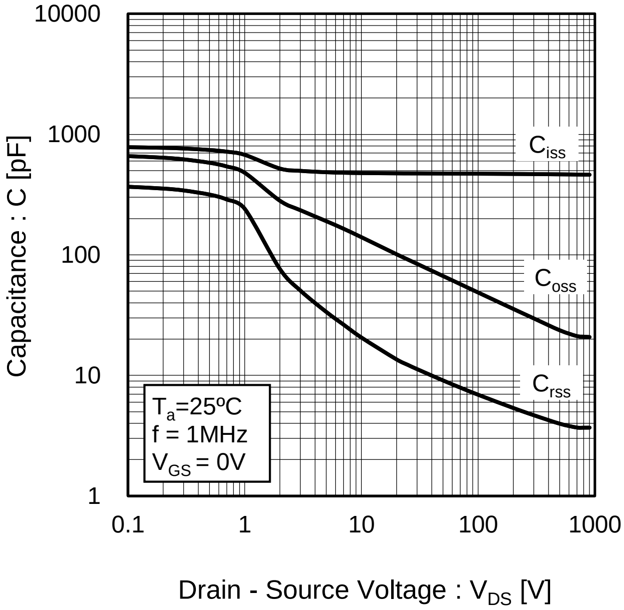


Fig.12 Typical Capacitance vs. Drain - Source Voltage

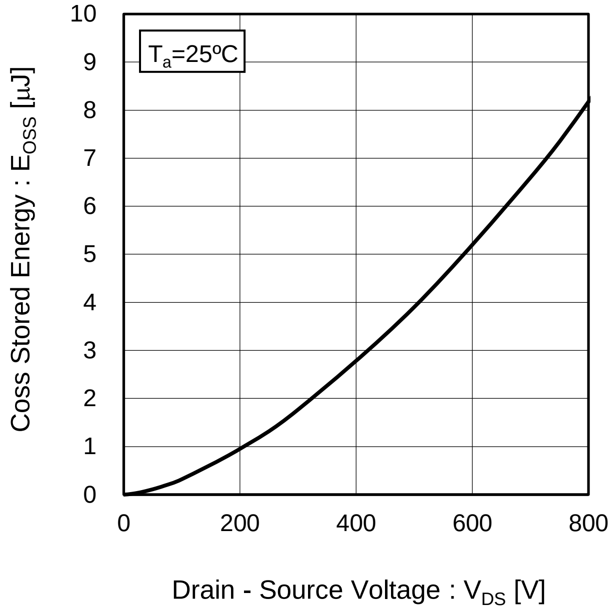


Fig.13 Coss Stored Energy

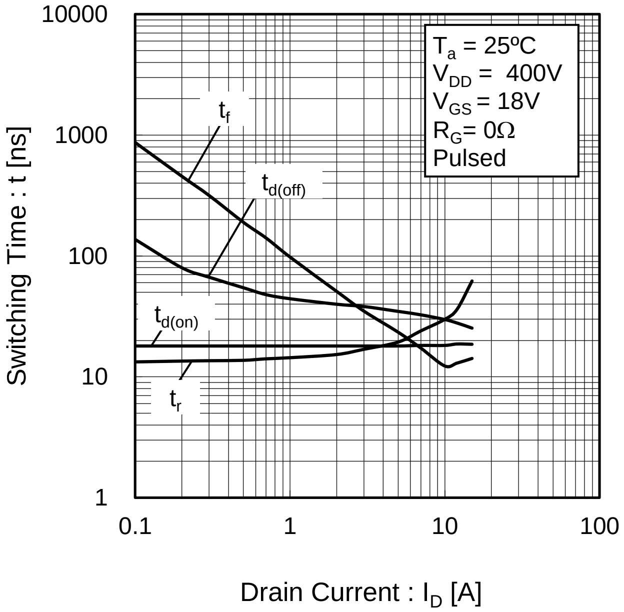


Fig.14 Switching Characteristics

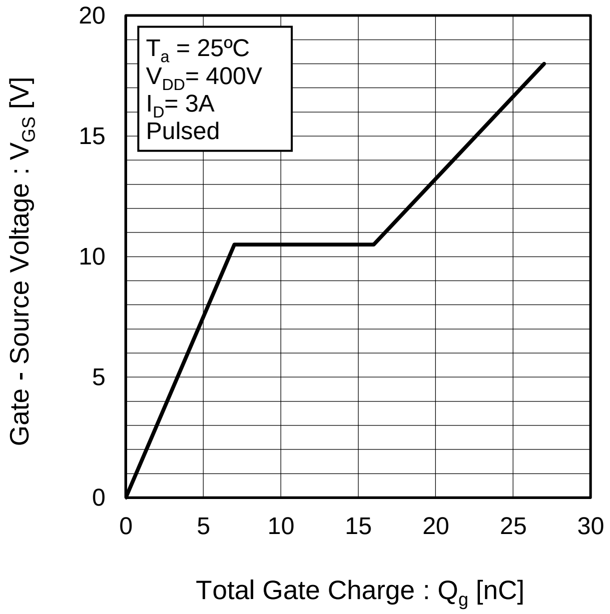


Fig.15 Dynamic Input Characteristics

●Electrical characteristic curves

Fig.16 Typical Switching Loss vs. Drain - Source Voltage

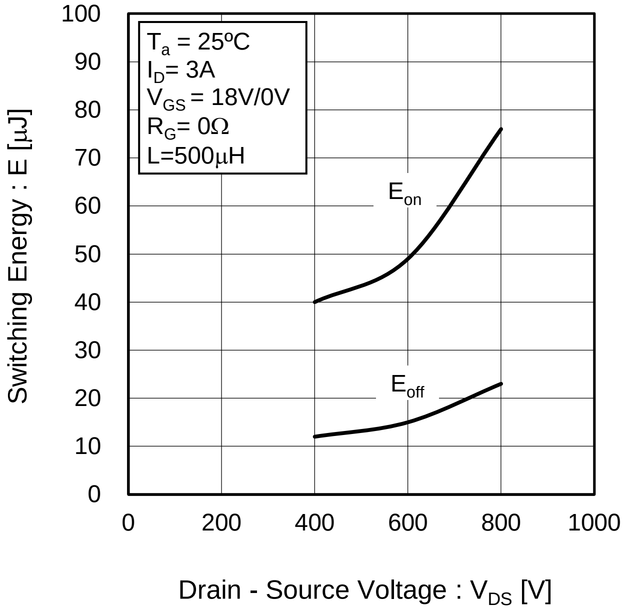


Fig.17 Typical Switching Loss vs. Drain Current

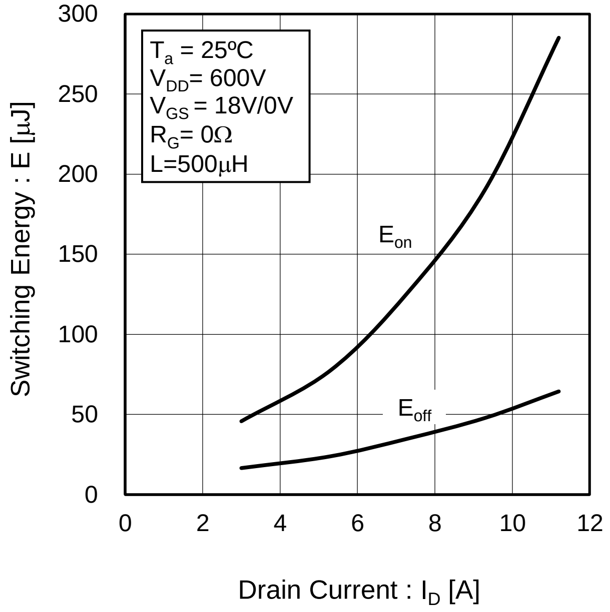
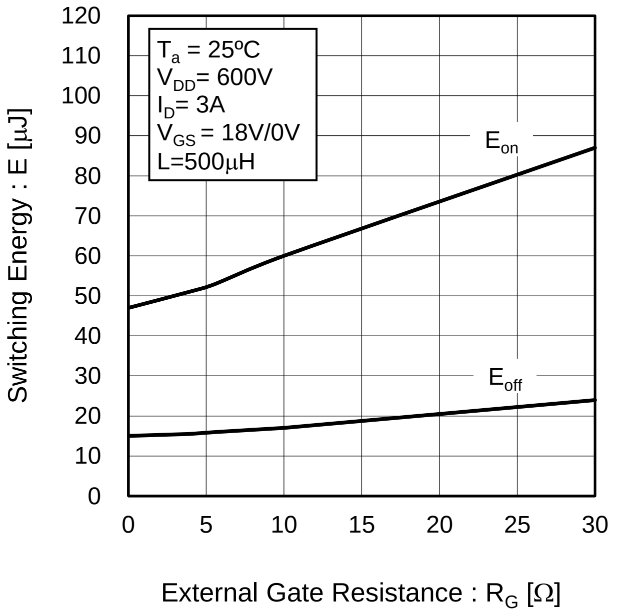


Fig.18 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

Fig.19 Inverse Diode Forward Current vs. Source - Drain Voltage

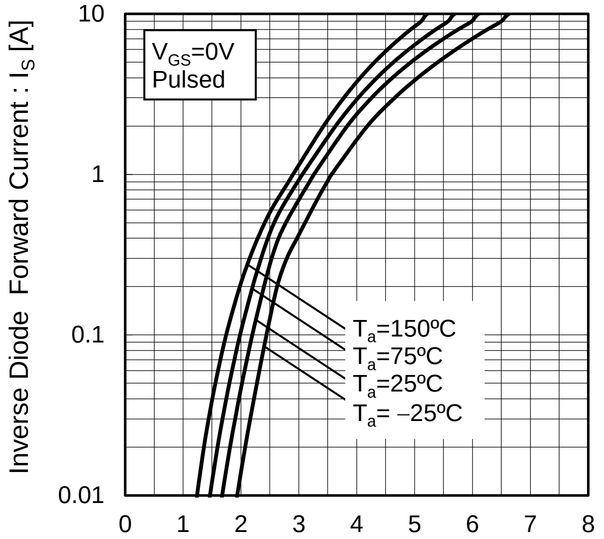
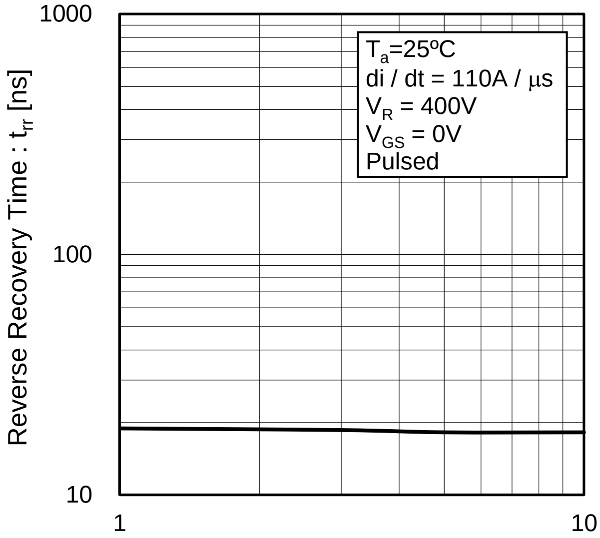


Fig.20 Reverse Recovery Time vs.Inverse Diode Forward Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

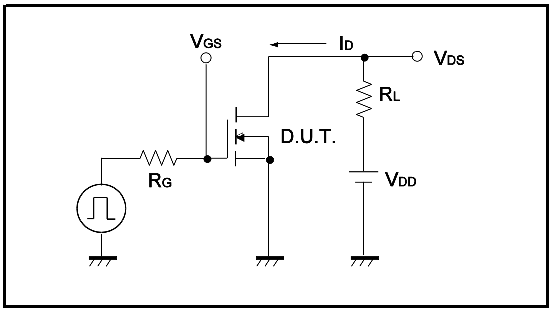


Fig.1-2 Switching Waveforms

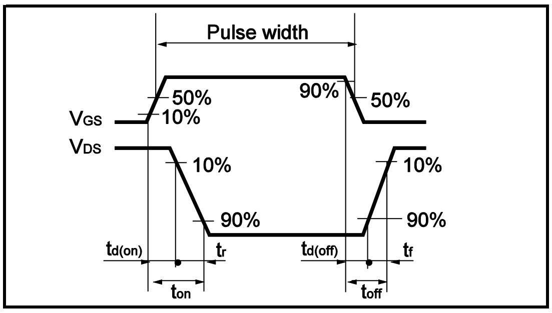


Fig.2-1 Gate Charge Measurement Circuit

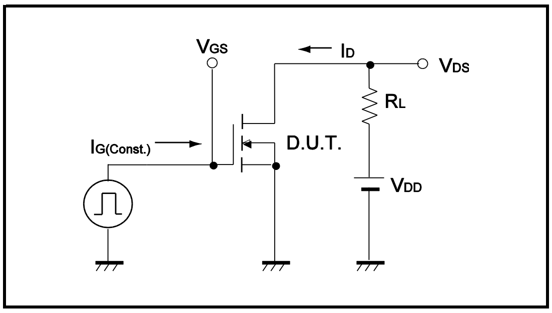


Fig.2-2 Gate Charge Waveform

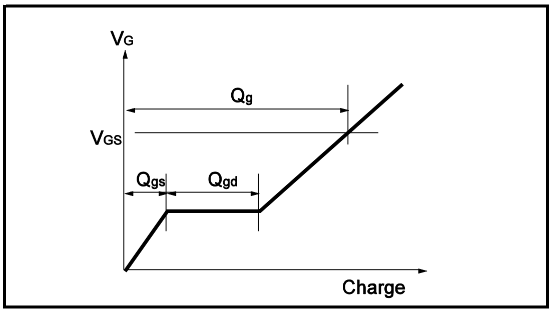


Fig.3-1 Switching Energy Measurement Circuit

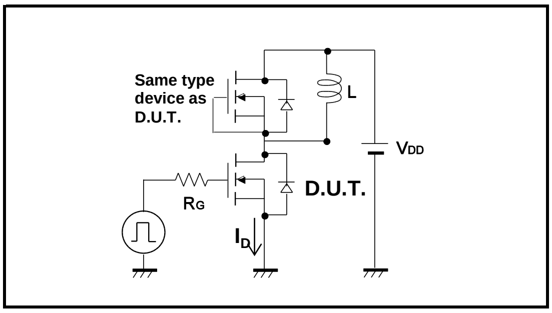


Fig.3-2 Switching Waveforms

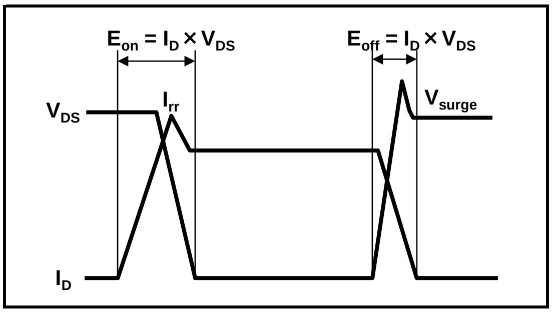


Fig.4-1 Reverse Recovery Time Measurement Circuit

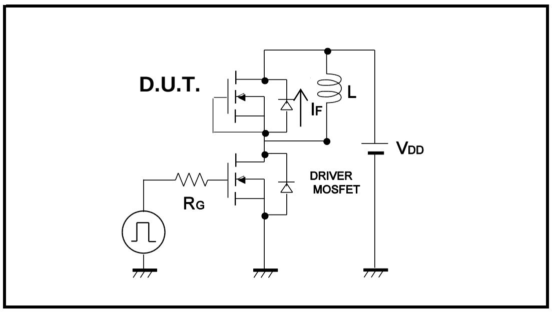
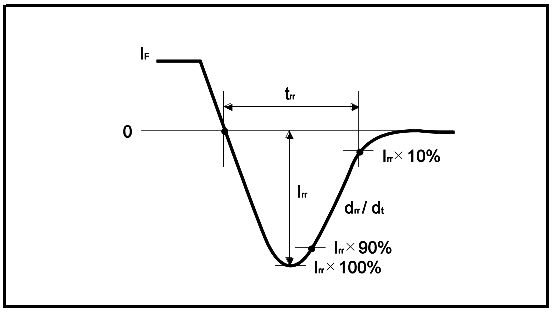


Fig.4-2 Reverse Recovery Waveform



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Package	
Unit Quantity	
Minimum Package Quantity	
Packing Type	
Constitution Materials List	inquiry
RoHS	Yes