SCT3160KL

N-channel SiC power MOSFET

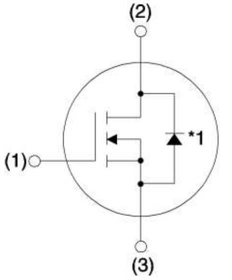
Datasheet

V_{DSS}	1200V
$R_{DS(on)}$ (Typ.)	160mΩ
I_D	17A
P_D	103W

●Outline

TO-247N

●Inner circuit



(1) Gate
(2) Drain
(3) Source

*1 Body Diode

●Packaging specifications

Type	Packing	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	30
	Taping code	C11
	Marking	SCT3160KL

●Features

1) Low on-resistance

2) Fast switching speed

3) Fast reverse recovery

4) Easy to parallel

5) Simple to drive

6) Pb-free lead plating ; RoHS compliant

●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]	17	A
	T_c = 100°C	I_D [*1]	12	A
Pulsed drain current		$I_{D,pulse}$ [*2]	42	A
Gate - Source voltage (DC)		V_{GSS}	–4 to +22	V
Gate-Source Surge Voltage (t_{surge} < 300nsec)		V_{GSS_surge} [*3]	–4 to +26	V
Recommended Drive Voltage		V_{GS_op} [*4]	0 / +18	V
Junction temperature		T_j	175	°C
Range of storage temperature		T_{stg}	–55 to +175	°C

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	1.12	1.46	°C/W

●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} = –4V, V_{DS} = 0V	-	-	–100	nA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = 10V, I_D = 2.5mA	2.7	-	5.6	V
Static drain - source on - state resistance	$R_{DS(on)}$ [*5]	V_{GS} = 18V, I_D = 5A T_j = 25°C T_j = 125°C	- -	160 240	208 -	mΩ
Gate input resistance	R_G	f = 1MHz, open drain	-	18	-	Ω

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs} *5	V_{DS} = 10V, I_D = 5A	-	2.5	-	S
Input capacitance	C_{iss}	V_{GS} = 0V V_{DS} = 800V f = 1MHz	-	398	-	pF
Output capacitance	C_{oss}		-	41	-	
Reverse transfer capacitance	C_{rss}		-	18	-	
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V V_{DS} = 0V to 600V	-	45	-	pF
Turn - on delay time	$t_{d(on)}$ *5	V_{DD} = 400V, I_D =5A V_{GS} = 18V/0V R_L =80Ω R_G = 0Ω	-	14	-	ns
Rise time	t_r *5		-	18	-	
Turn - off delay time	$t_{d(off)}$ *5		-	24	-	
Fall time	t_f *5		-	25	-	
Turn - on switching loss	E_{on} *5	V_{DD} = 600V, I_D=5A V_{GS} = 18V/0V R_G = 0Ω L=750μH *E_{on} includes diode reverse recovery	-	62	-	μJ
Turn - off switching loss	E_{off} *5		-	12	-	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *5	V_{DD} = 600V I_D = 5A V_{GS} = 18V	-	42	-	nC
Gate - Source charge	Q_{gs} *5		-	11	-	
Gate - Drain charge	Q_{gd} *5		-	18	-	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} = 600V, I_D = 5A	-	9.6	-	V

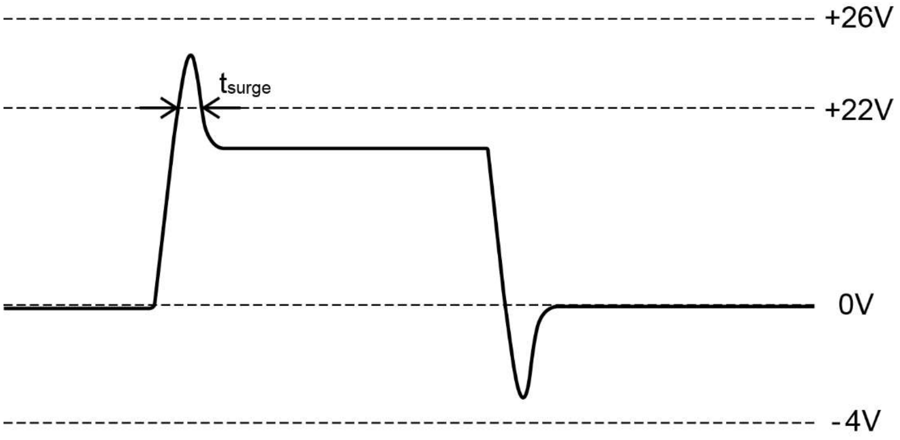
●**Body diode electrical characteristics** (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S [*1]	T_c = 25°C	-	-	17	A
Inverse diode direct current, pulsed	I_{SM} [*2]		-	-	42	A
Forward voltage	V_{SD} [*5]	V_{GS} = 0V, I_S = 5A	-	3.2	-	V
Reverse recovery time	t_{rr} [*5]	I_F =5A, V_R = 600V di/dt = 1100A/µs	-	13	-	ns
Reverse recovery charge	Q_{rr} [*5]		-	26	-	nC
Peak reverse recovery current	I_{rrm} [*5]		-	4	-	A

*1 Limited only by maximum temperature allowed.

*2 PW ≤ 10µs, Duty cycle ≤ 1%

*3 Example of acceptable Vgs waveform



*4 Please be advised not to use SiC-MOSFETs with V_{gs} below 13V as doing so may cause thermal runaway.

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

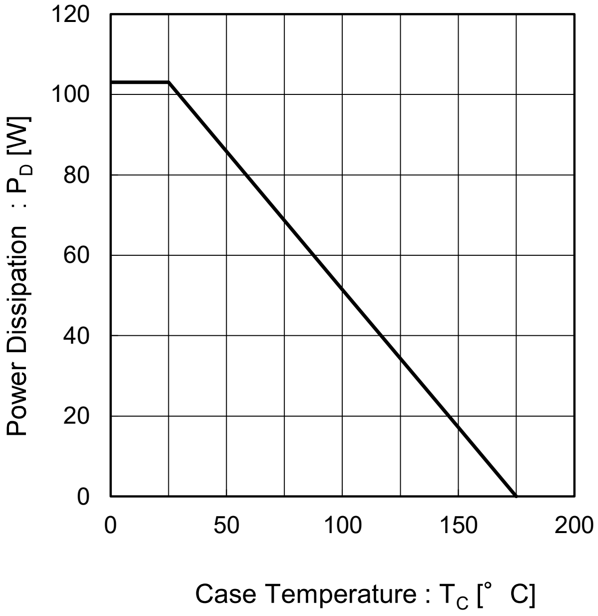


Fig.2 Maximum Safe Operating Area

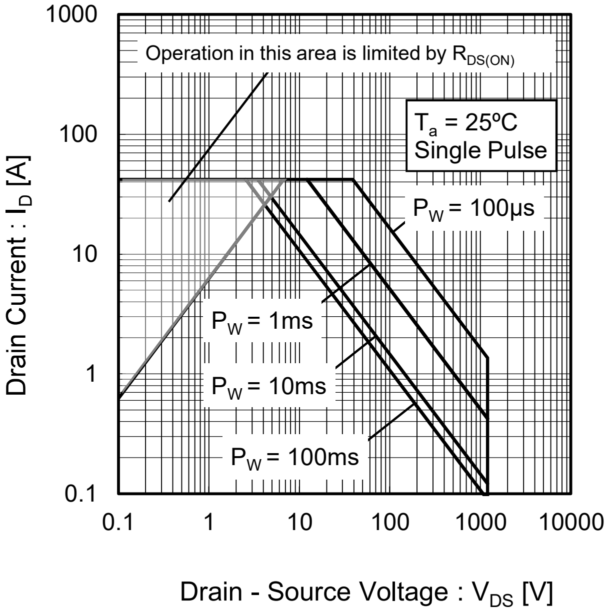
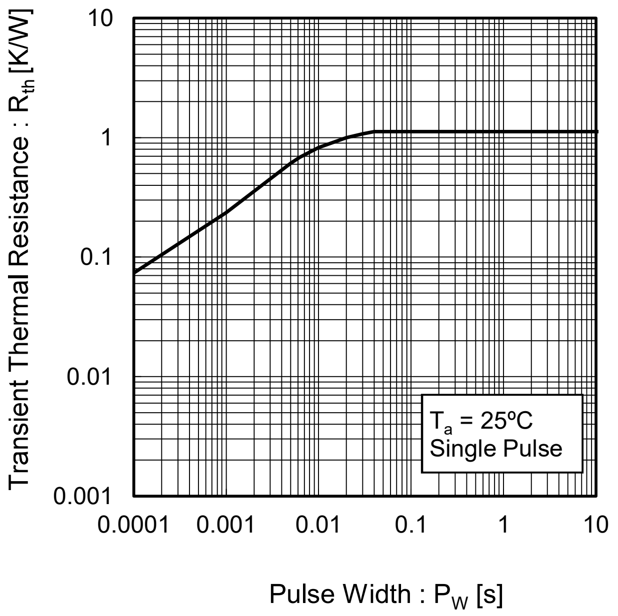


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

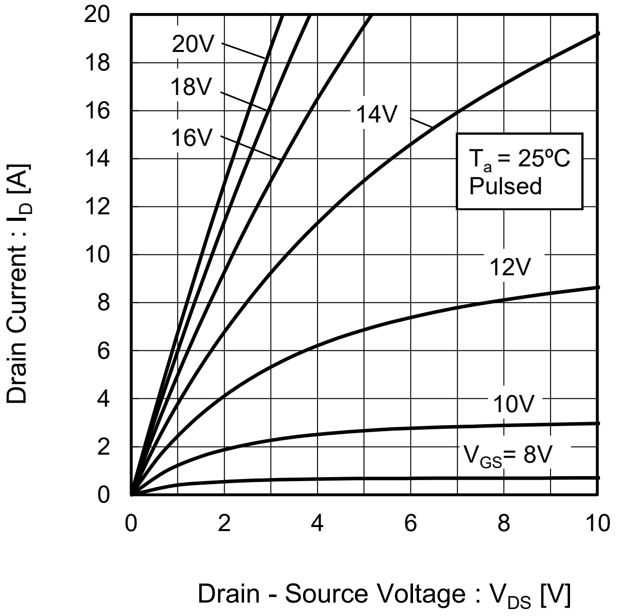


Fig.5 Typical Output Characteristics(II)

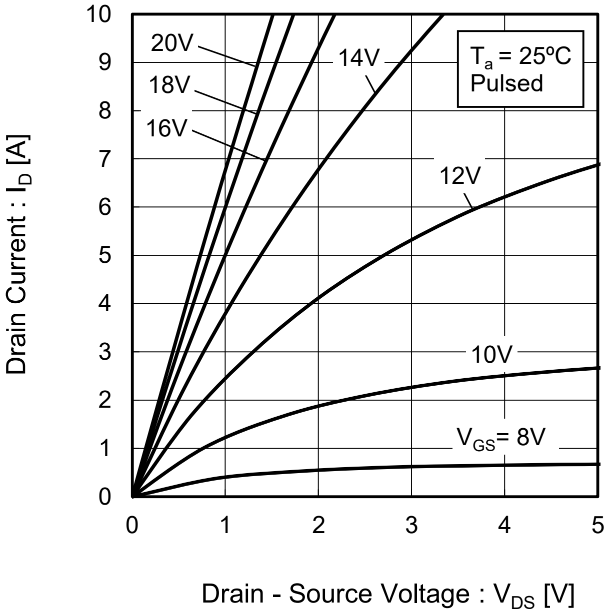


Fig.6 T_j = 150ºC Typical Output Characteristics(I)

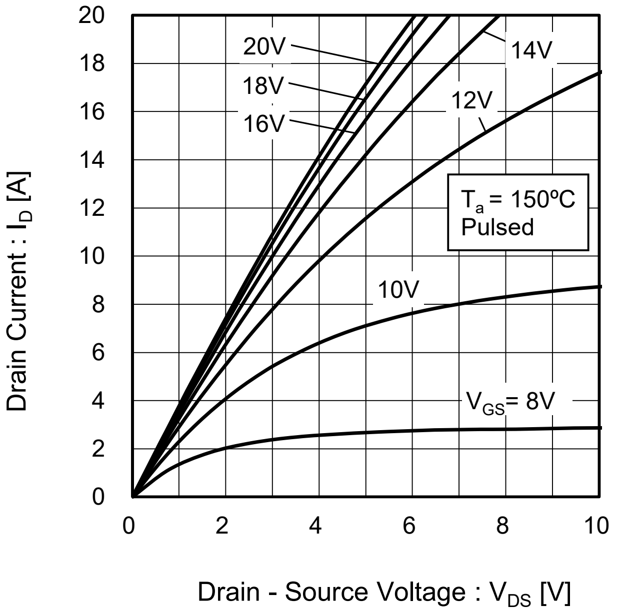
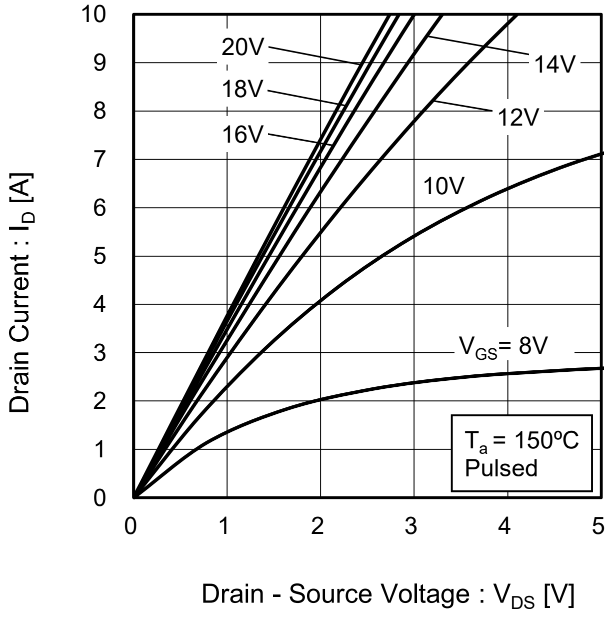


Fig.7 T_j = 150ºC Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics (I)

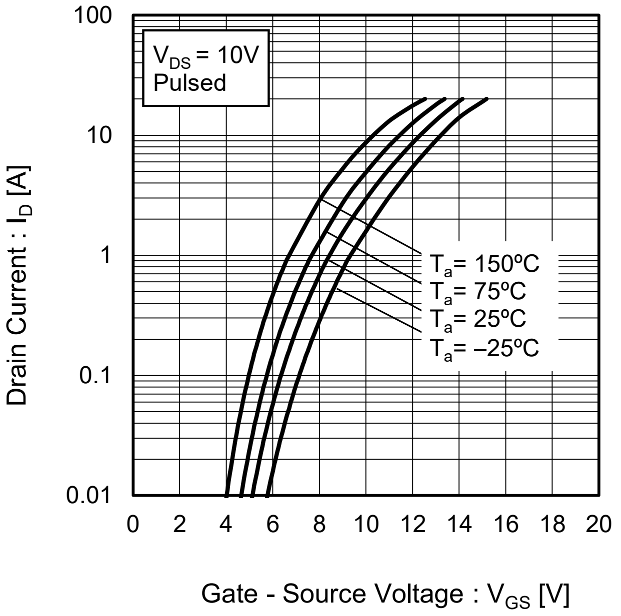


Fig.9 Typical Transfer Characteristics (II)

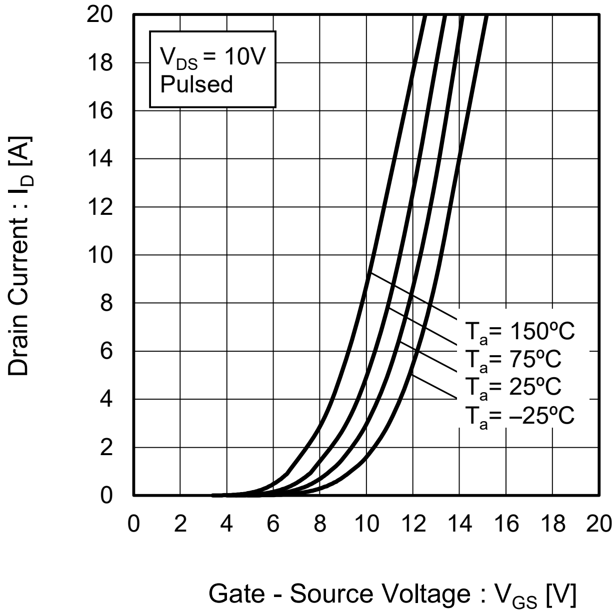


Fig.10 Gate Threshold Voltage vs. Junction Temperature

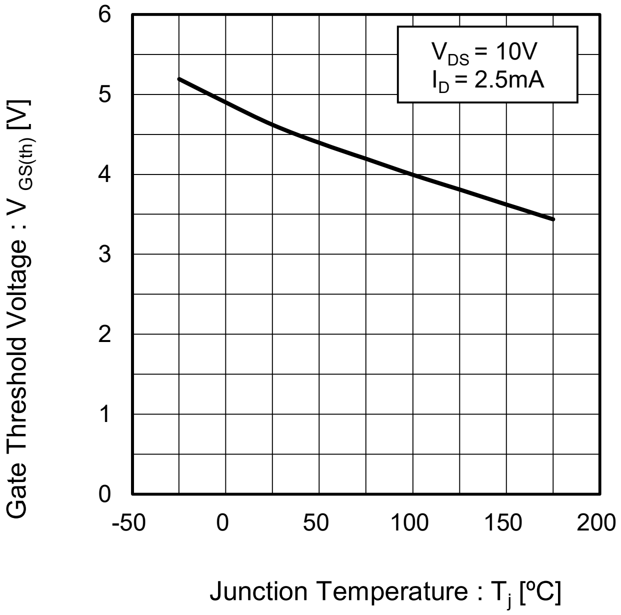
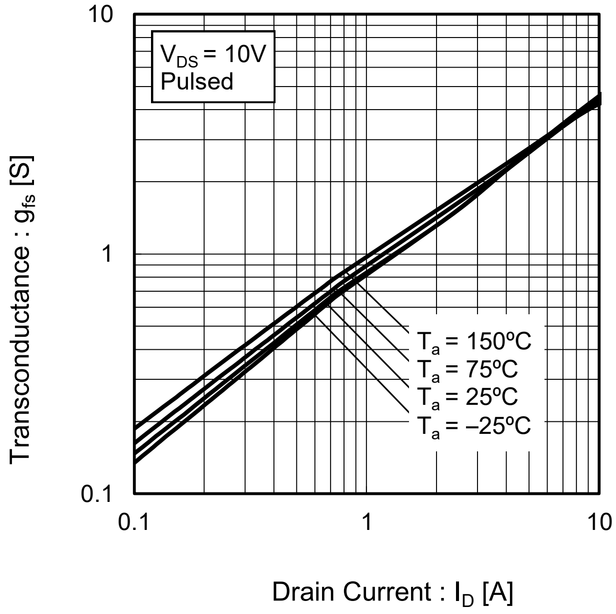


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.12 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

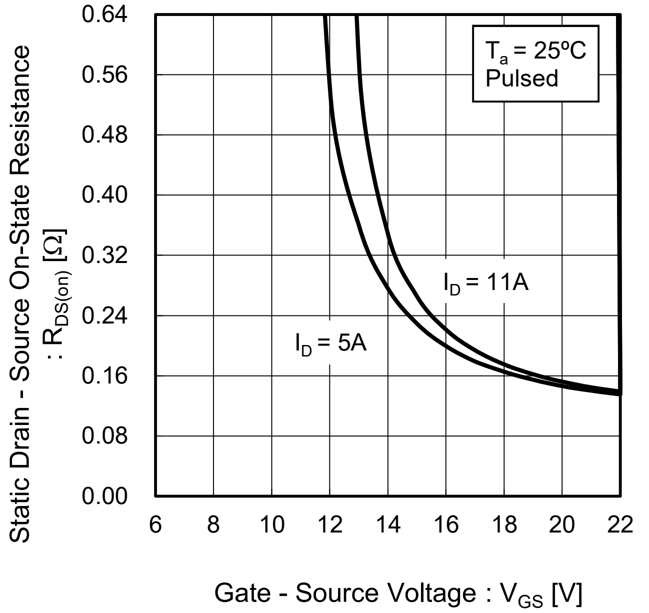


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

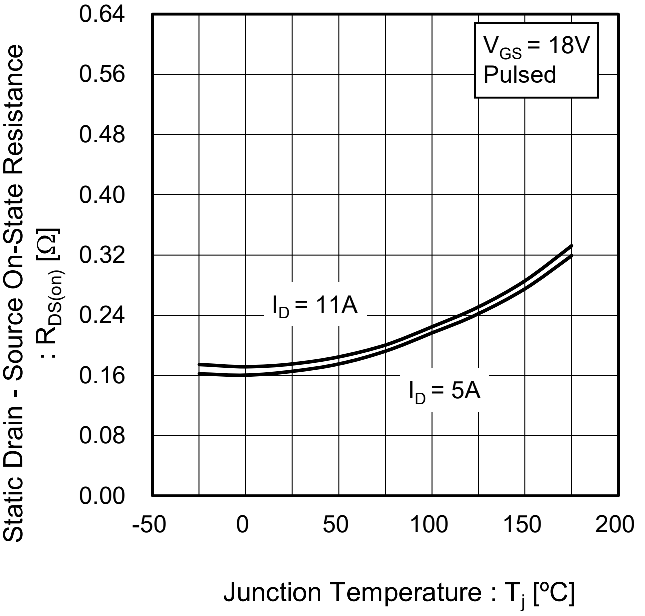
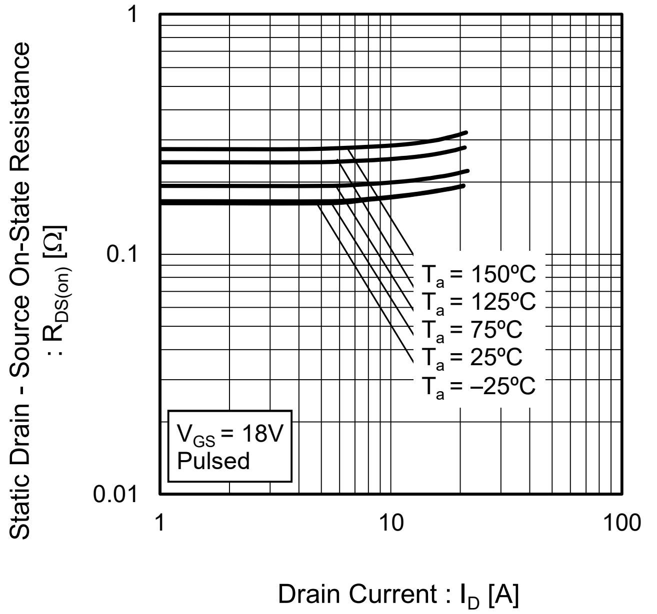


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

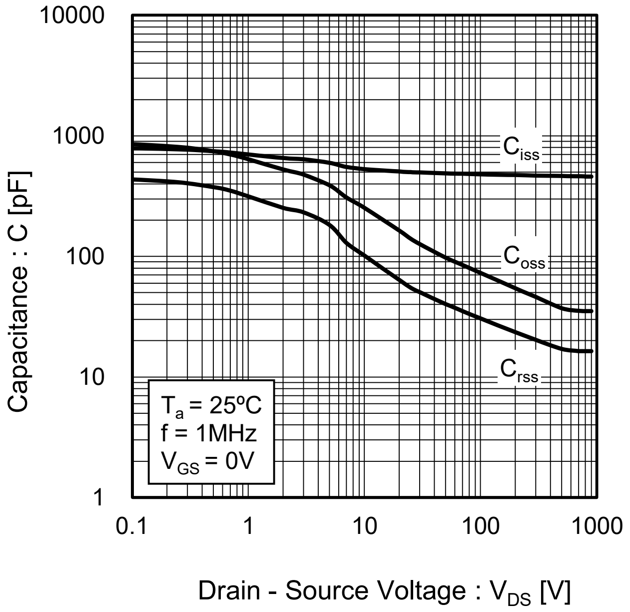


Fig.16 Coss Stored Energy

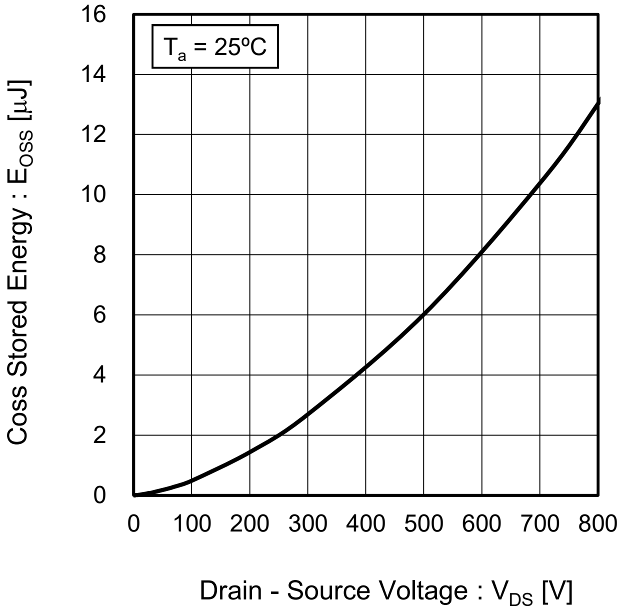


Fig.17 Switching Characteristics

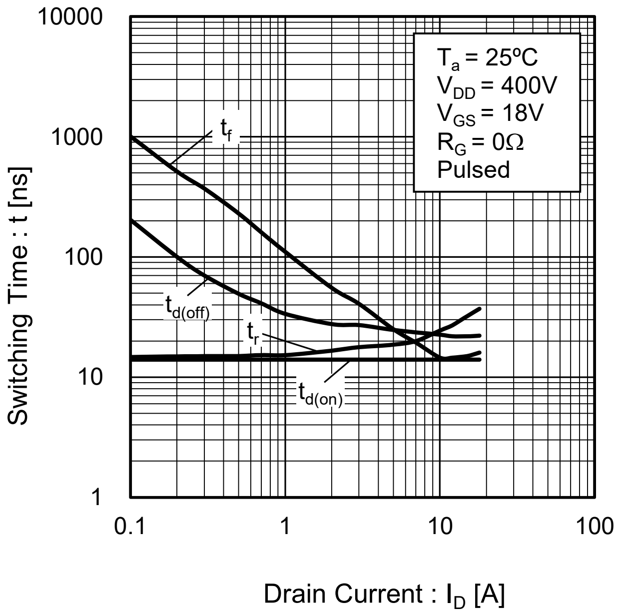
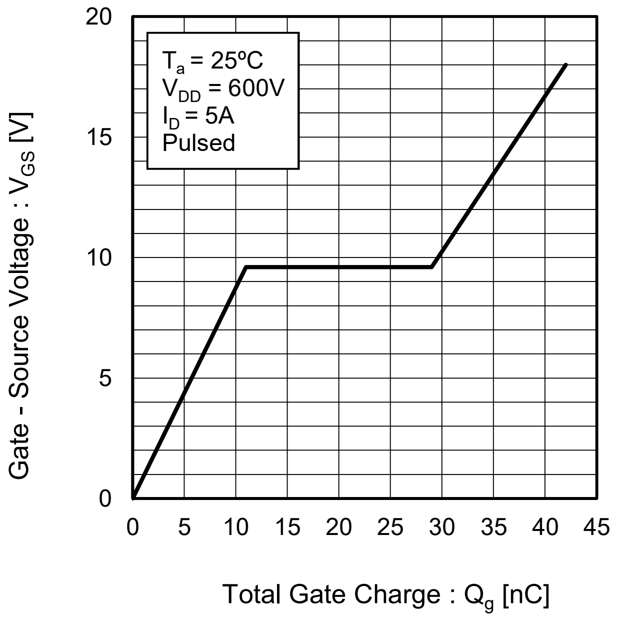


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.19 Typical Switching Loss vs. Drain - Source Voltage

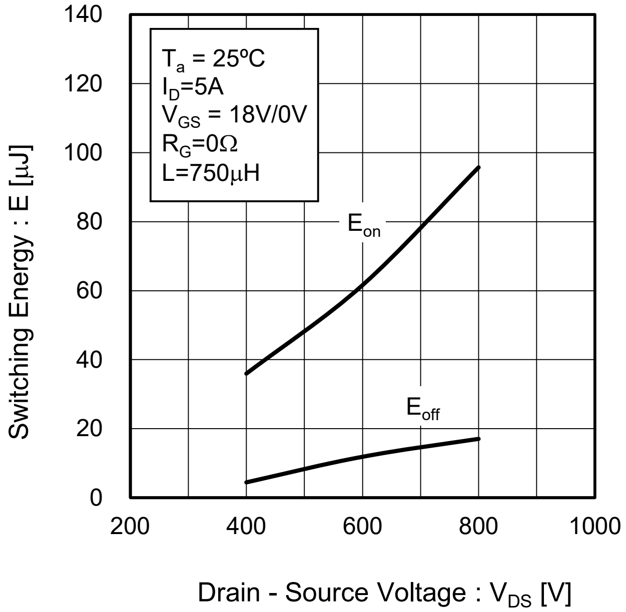


Fig.20 Typical Switching Loss vs. Drain Current

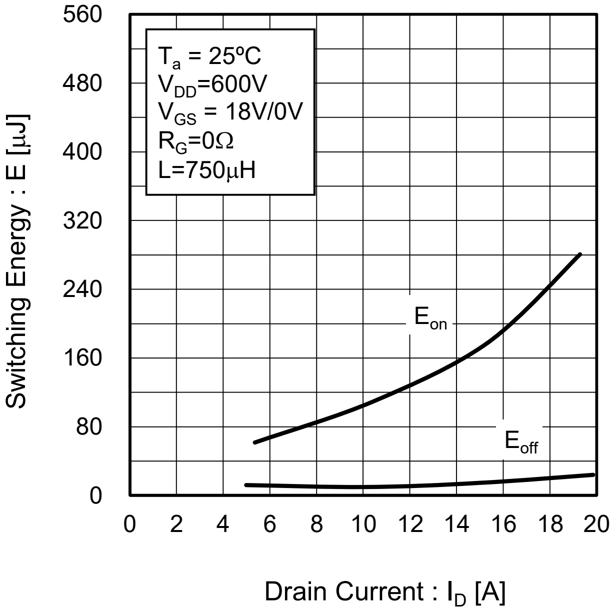
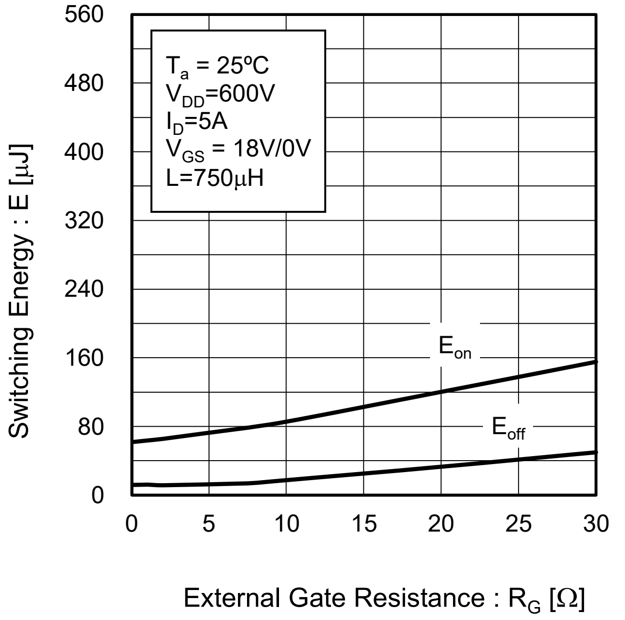


Fig.21 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

Fig.22 Inverse Diode Forward Current vs. Source - Drain Voltage

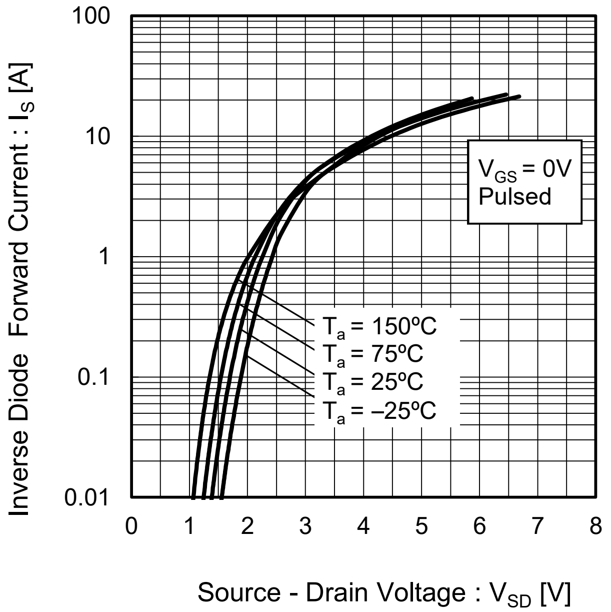
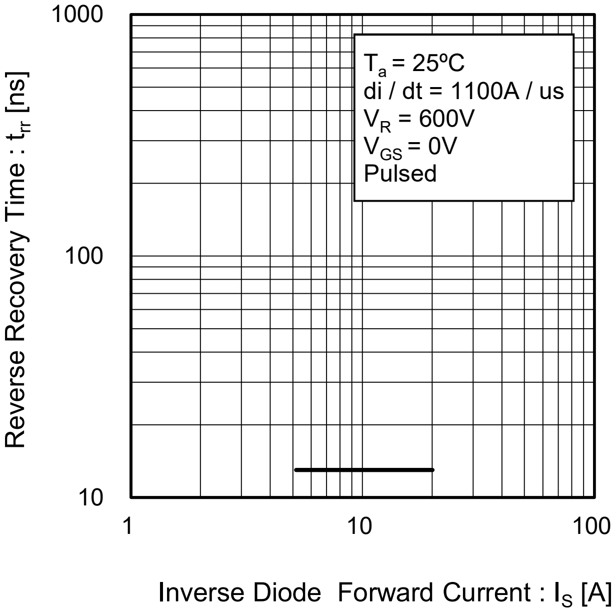


Fig.23 Reverse Recovery Time vs.Inverse Diode Forward Current



●Measurement circuits

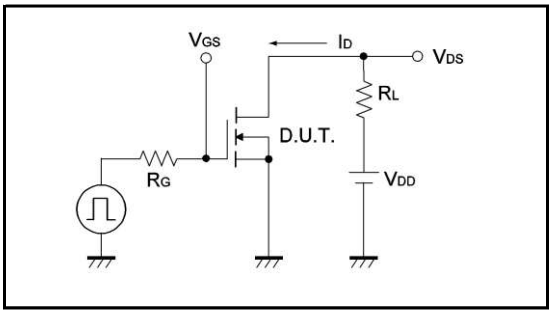


Fig.1-1 Switching Time Measurement Circuit

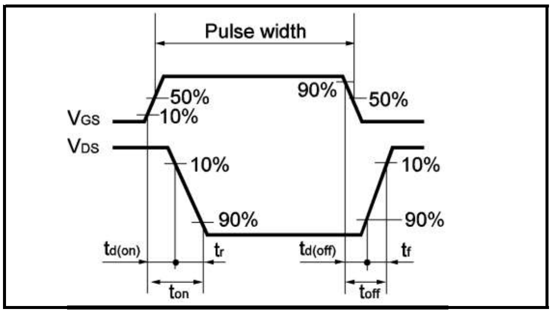


Fig.1-2 Switching Waveforms

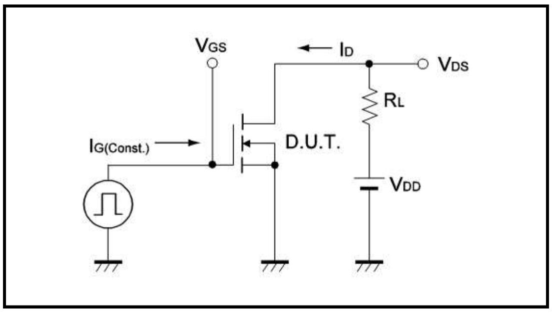


Fig.2-1 Gate Charge Measurement Circuit

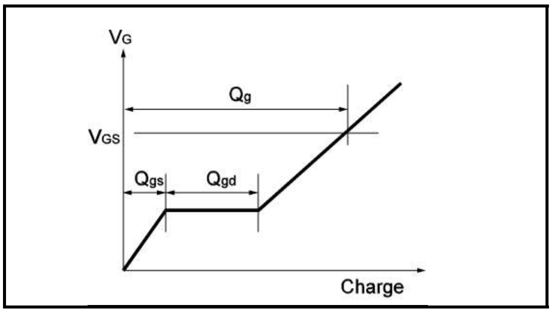


Fig.2-2 Gate Charge Waveform

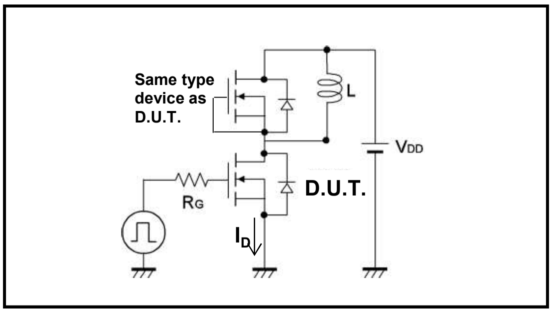


Fig.3-1 Switching Energy Measurement Circuit

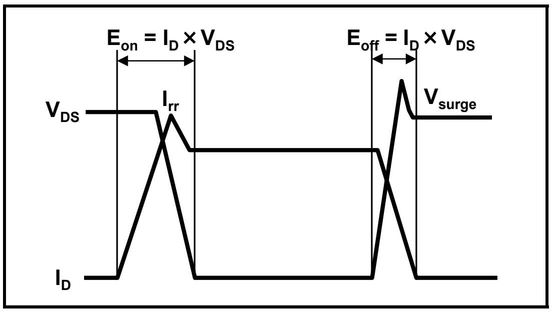


Fig.3-2 Switching Waveforms

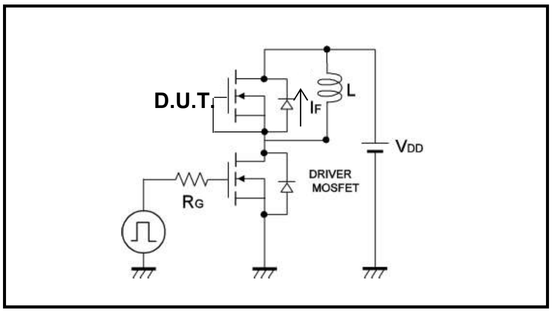


Fig.4-1 Reverse Recovery Time Measurement Circuit

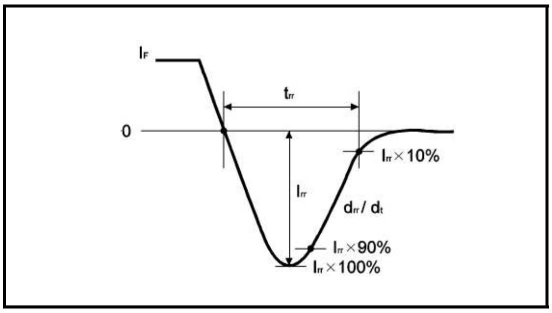


Fig.4-2 Reverse Recovery Waveform