

V_{DSS}	650V
$R_{DS(on)}$ (Typ.)	120mΩ
I_D	29A
P_D	165W

●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

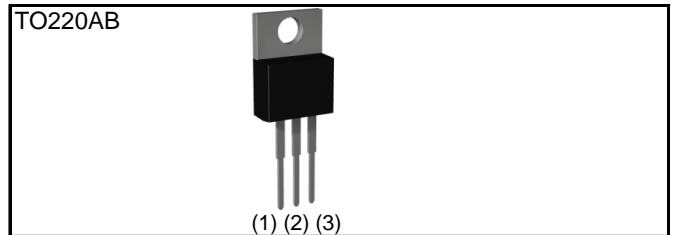
●Application

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

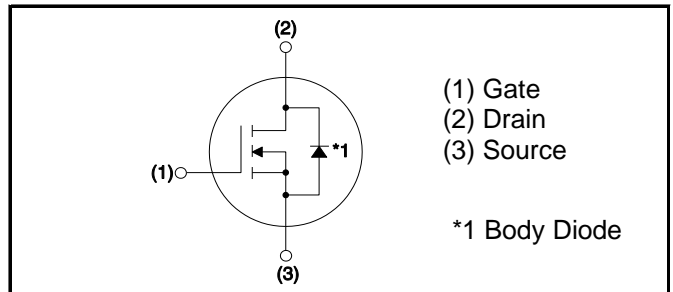
●Absolute maximum ratings ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Value	Unit	
Drain - Source voltage	V_{DSS}	650	V	
Continuous drain current	$T_c = 25^\circ\text{C}$	I_D^{*1}	29	A
	$T_c = 100^\circ\text{C}$	I_D^{*1}	20	A
Pulsed drain current	$I_{D,pulse}^{*2}$	72	A	
Gate - Source voltage (DC)	V_{GSS}	-6 to 22	V	
Gate - Source surge voltage ($t_{surge} < 300\text{nsec}$)	$V_{GSS-surge}^{*3}$	-10 to 26	V	
Power dissipation ($T_c = 25^\circ\text{C}$)	P_D	165	W	
Junction temperature	T_j	175	$^\circ\text{C}$	
Range of storage temperature	T_{stg}	-55 to +175	$^\circ\text{C}$	

●Outline



●Inner circuit



●Packaging specifications

Type	Packing	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	50
	Packing code	C
	Marking	SCT2120AF

●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	650	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} = 650V, V _{GS} = 0V T _j = 25°C	-	1	10	μA
			-	2	-	
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 = 3.3mA	1.6	2.8	4.0	V

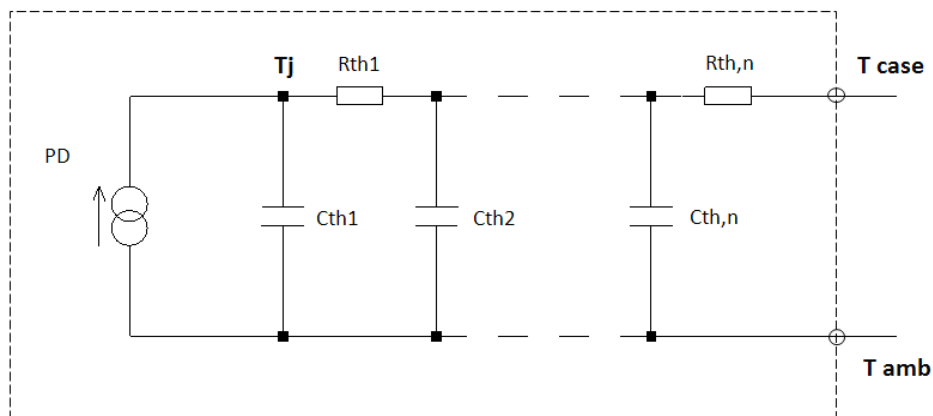
●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R _{thJC}	-	0.70	0.91	°C/W
Soldering temperature, wavesoldering for 10s	T _{sold}	-	-	265	°C

●Typical Transient Thermal Characteristics

Symbol	Value	Unit
R _{th1}	9.61E-02	K/W
R _{th2}	4.04E-01	
R _{th3}	1.96E-01	

Symbol	Value	Unit
C _{th1}	1.55E-03	Ws/K
C _{th2}	5.23E-03	
C _{th3}	8.33E-02	



●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Static drain - source on - state resistance	R _{DS(on)} ^{*4}	V _{GS} = 18V, I _D = 10A	-	120	156	mΩ
		T _j = 25°C	-	149	-	
Gate input resistance	R _G	f = 1MHz, open drain	-	13.8	-	Ω
Transconductance	g _{fs} ^{*4}	V _{DS} = 10V, I _D = 10A	-	2.7	-	S
Input capacitance	C _{iss}	V _{GS} = 0V	-	1200	-	pF
Output capacitance	C _{oss}	V _{DS} = 500V	-	90	-	
Reverse transfer capacitance	C _{rss}	f = 1MHz	-	13	-	
Effective output capacitance, energy related	C _{o(er)}	V _{GS} = 0V V _{DS} = 0V to 300V	-	115	-	pF
Turn - on delay time	t _{d(on)} ^{*4}	V _{DD} = 300V, I _D = 10A	-	22	-	ns
Rise time	t _r ^{*4}	V _{GS} = 18V/0V	-	31	-	
Turn - off delay time	t _{d(off)} ^{*4}	R _L = 30Ω	-	60	-	
Fall time	t _f ^{*4}	R _G = 0Ω	-	19	-	
Turn - on switching loss	E _{on} ^{*4}	V _{DD} = 300V, I _D = 10A V _{GS} = 18V/0V	-	61	-	μJ
Turn - off switching loss	E _{off} ^{*4}	R _G = 0Ω, L = 500μH *E _{on} includes diode reverse recovery	-	41	-	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q _g ^{*4}	V _{DD} = 300V	-	61	-	nC
Gate - Source charge	Q _{gs} ^{*4}	I _D = 10A	-	14	-	
Gate - Drain charge	Q _{gd} ^{*4}	V _{GS} = 18V	-	21	-	
Gate plateau voltage	V _(plateau)	V _{DD} = 300V, I _D = 10A	-	10.4	-	V

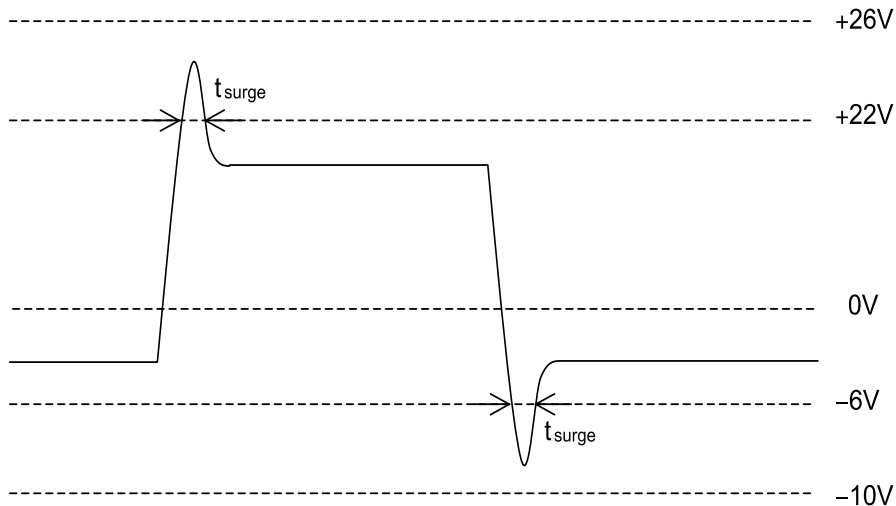
●Body diode electrical characteristics (Source-Drain) ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S^{*1}	$T_c = 25^\circ\text{C}$	-	-	29	A
Inverse diode direct current, pulsed	I_{SM}^{*2}		-	-	72	A
Forward voltage	V_{SD}^{*4}	$V_{GS} = 0\text{V}, I_S = 10\text{A}$	-	4.3	-	V
Reverse recovery time	t_{rr}^{*4}	$I_F = 10\text{A}, V_R = 400\text{V}$ $di/dt = 160\text{A}/\mu\text{s}$	-	33	-	ns
Reverse recovery charge	Q_{rr}^{*4}		-	53	-	nC
Peak reverse recovery current	I_{rrm}^{*4}		-	3.0	-	A

*1 Limited only by maximum temperature allowed.

*2 $PW \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$

*3 Example of acceptable Vgs waveform



*4 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

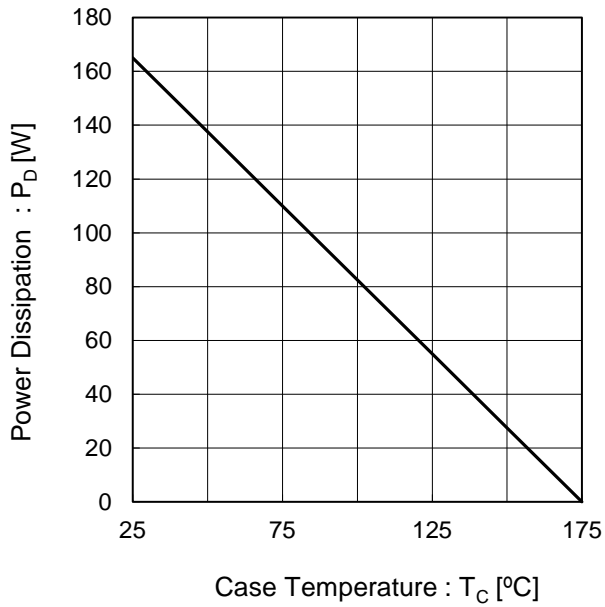


Fig.2 Maximum Safe Operating Area

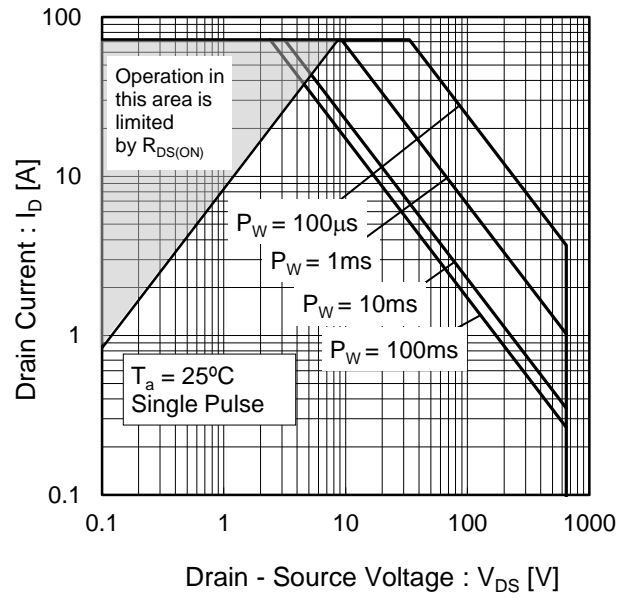
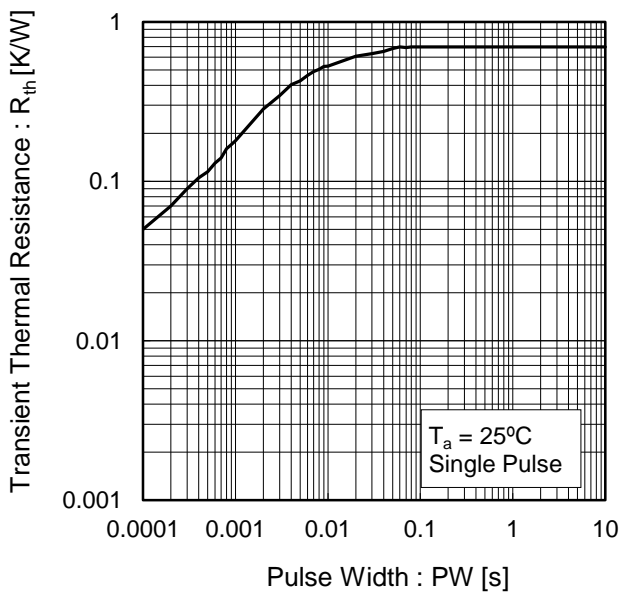


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

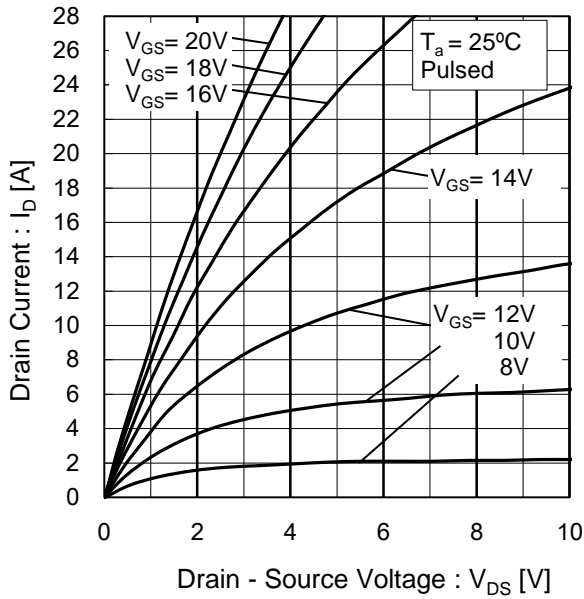


Fig.5 Typical Output Characteristics(II)

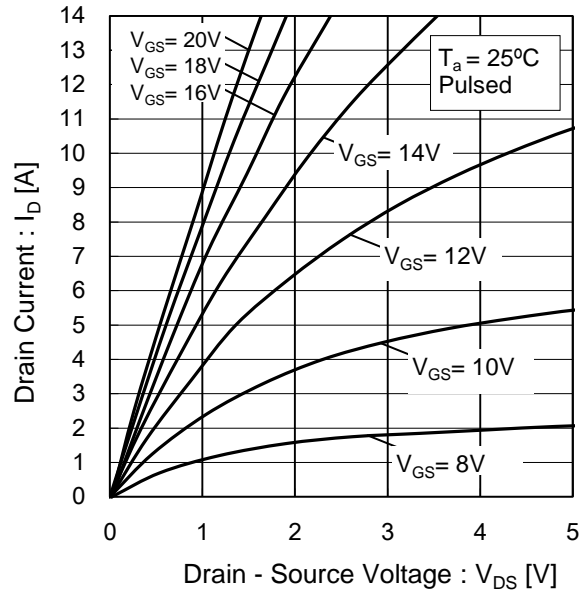


Fig.6 $T_j = 150^\circ\text{C}$ Typical Output Characteristics(I)

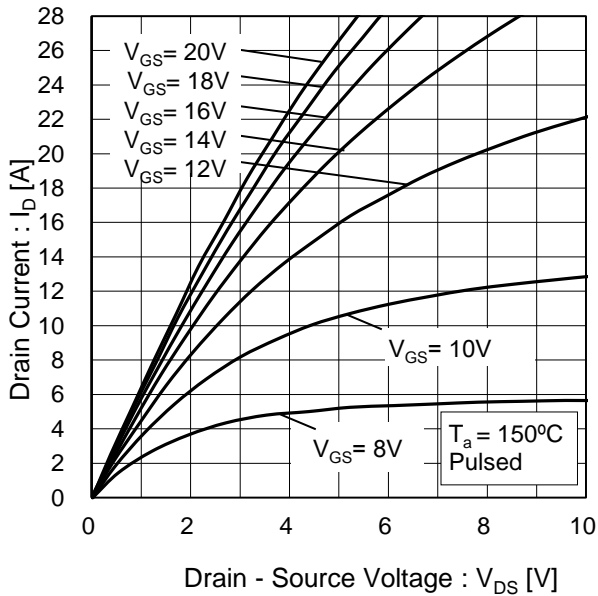
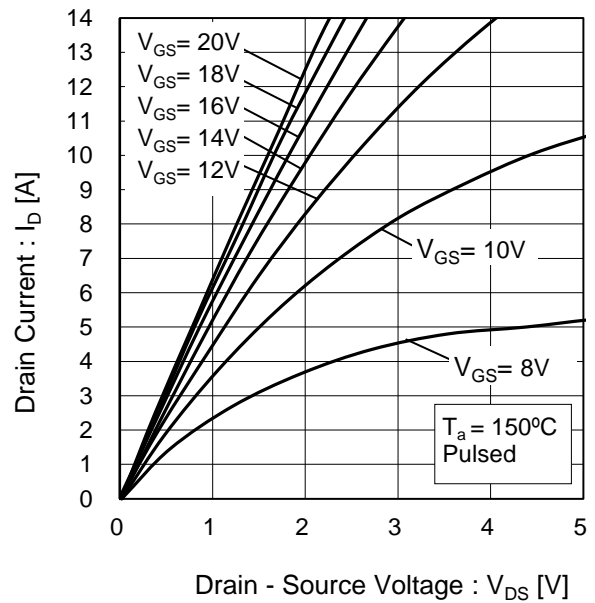


Fig.7 $T_j = 150^\circ\text{C}$ Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics (I)

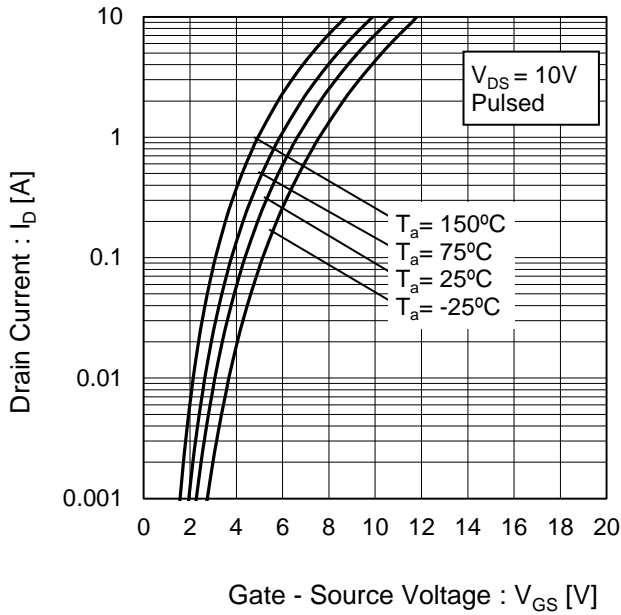


Fig.9 Typical Transfer Characteristics (II)

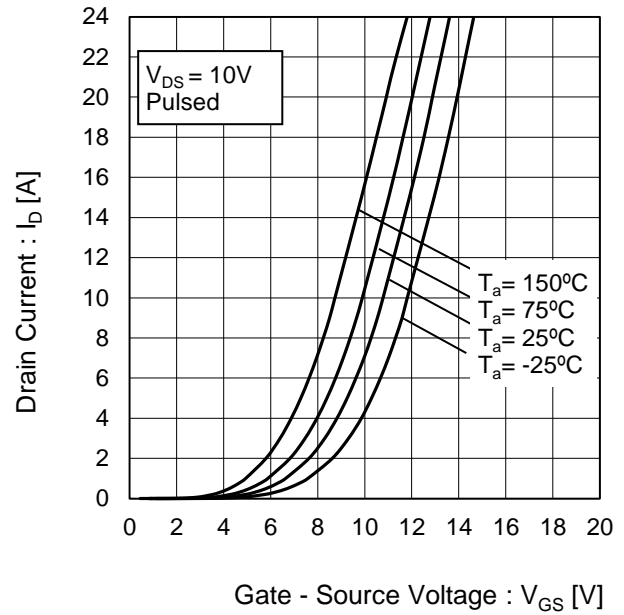


Fig.10 Gate Threshold Voltage vs. Junction Temperature

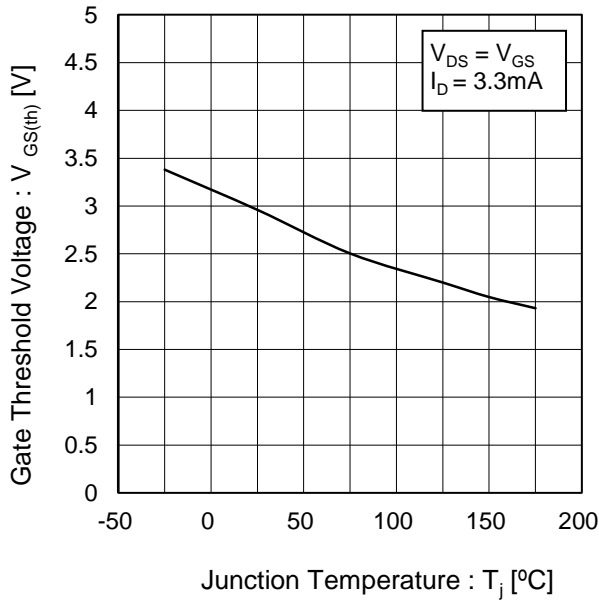
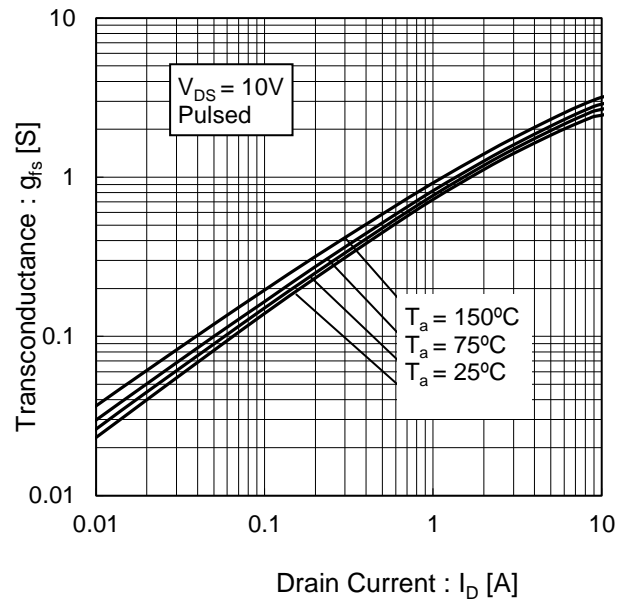


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

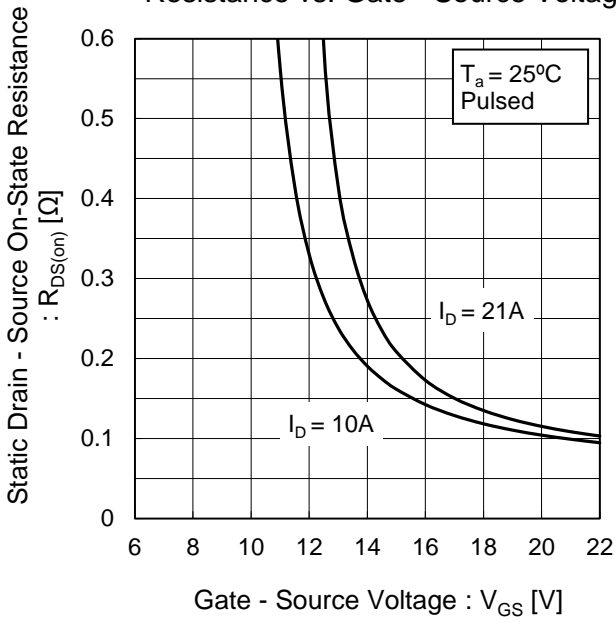


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

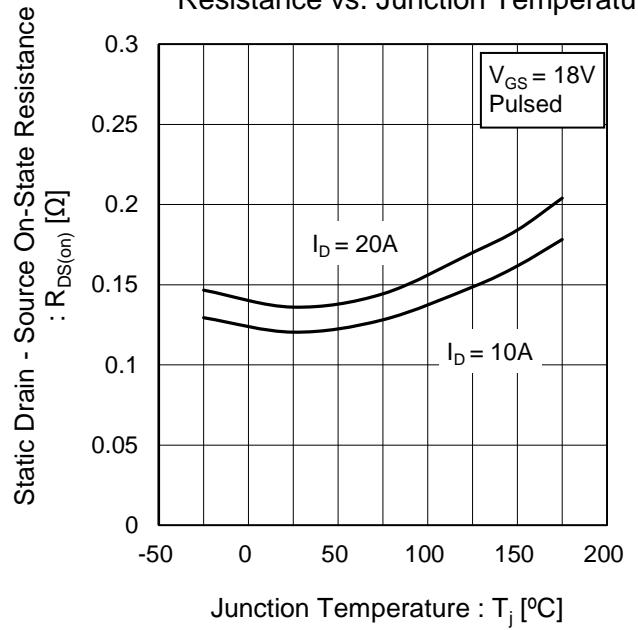
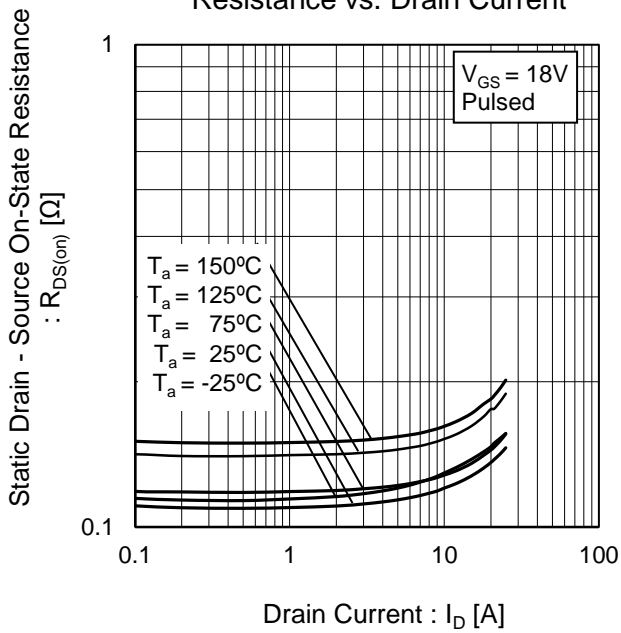


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

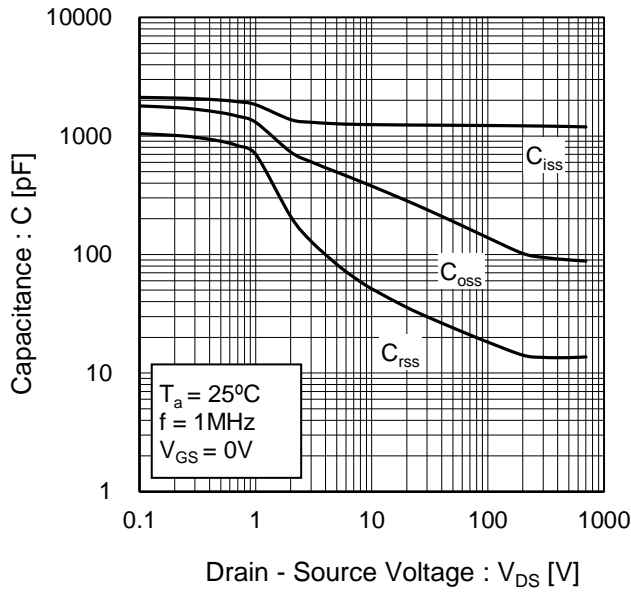


Fig.16 Coss Stored Energy

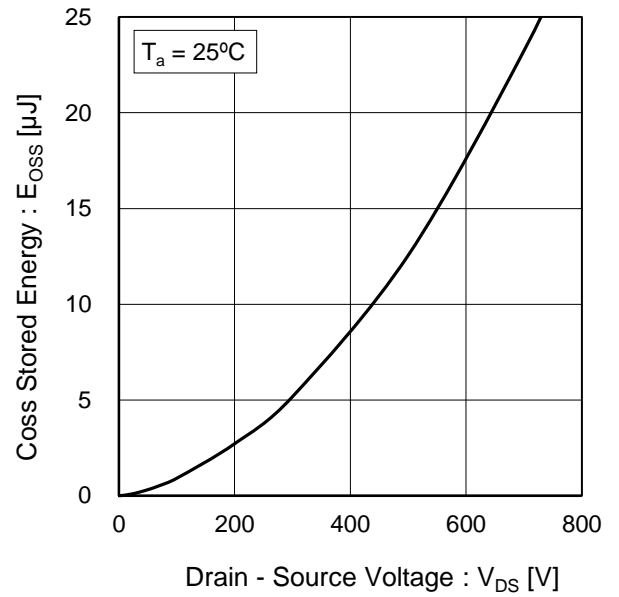


Fig.17 Switching Characteristics

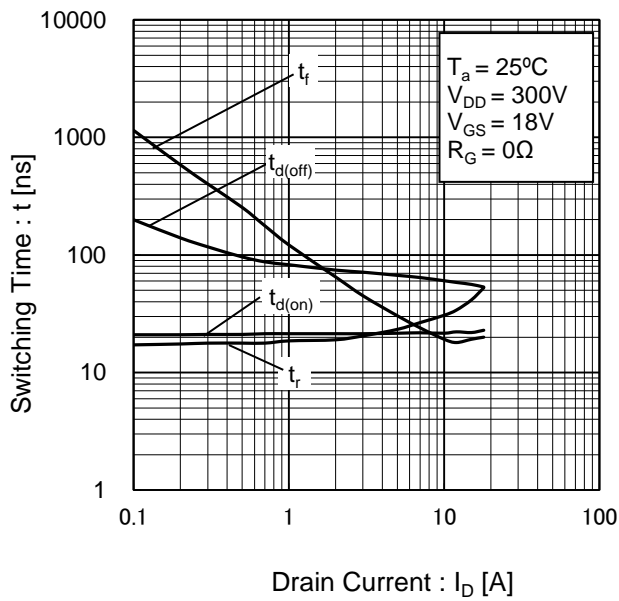
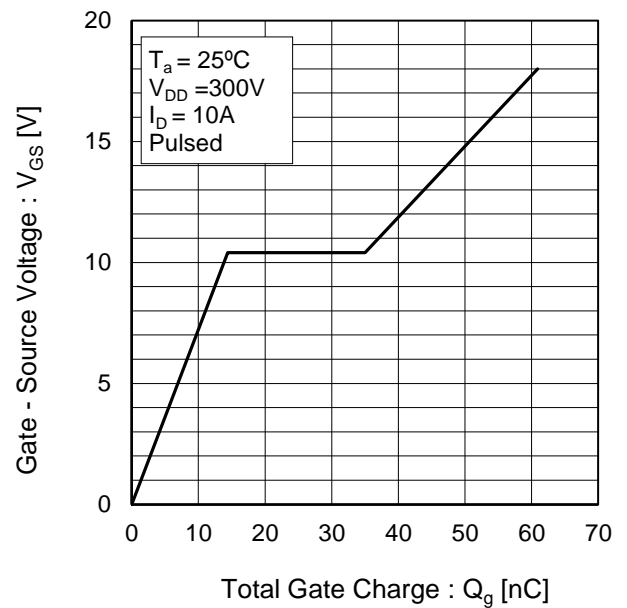


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

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

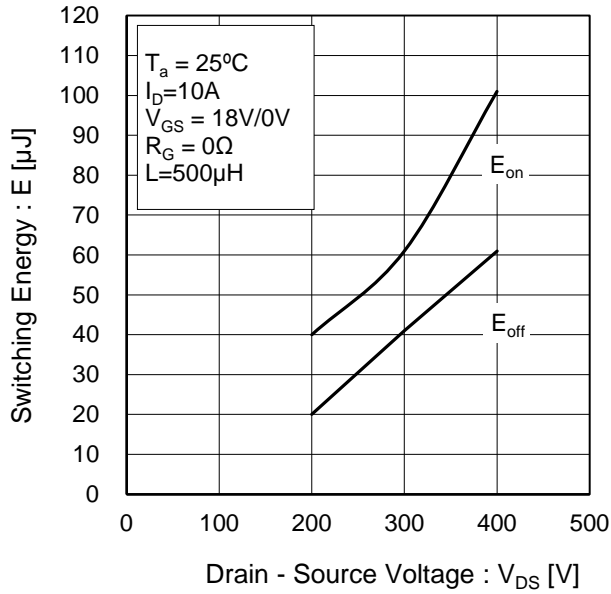


Fig.20 Typical Switching Loss vs. Drain Current

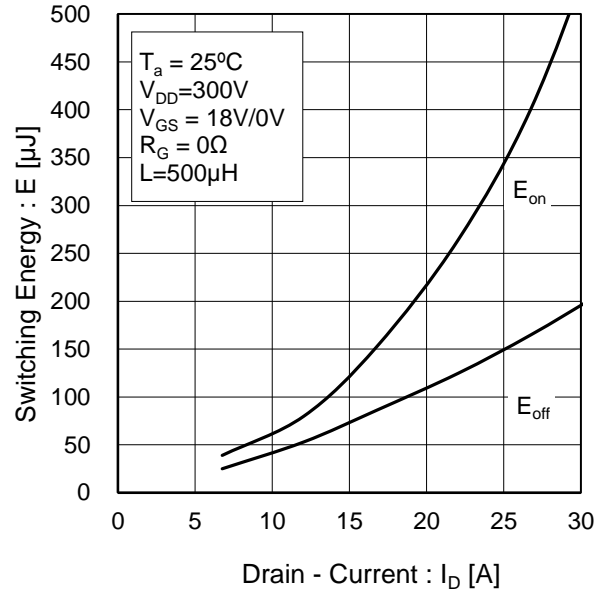
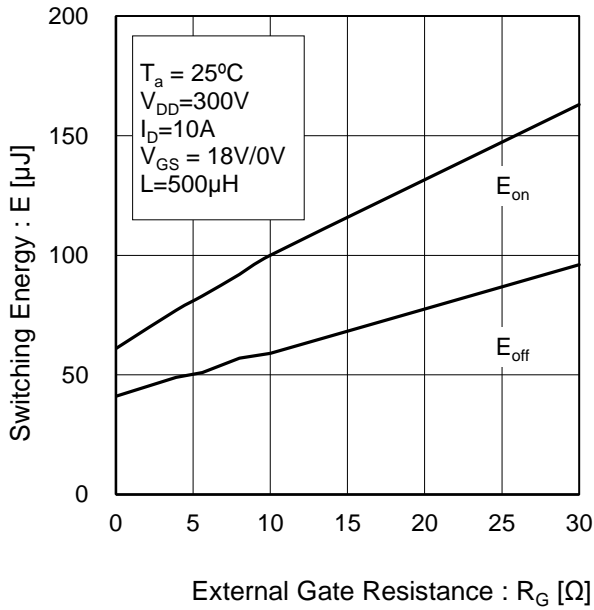


Fig.21 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

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

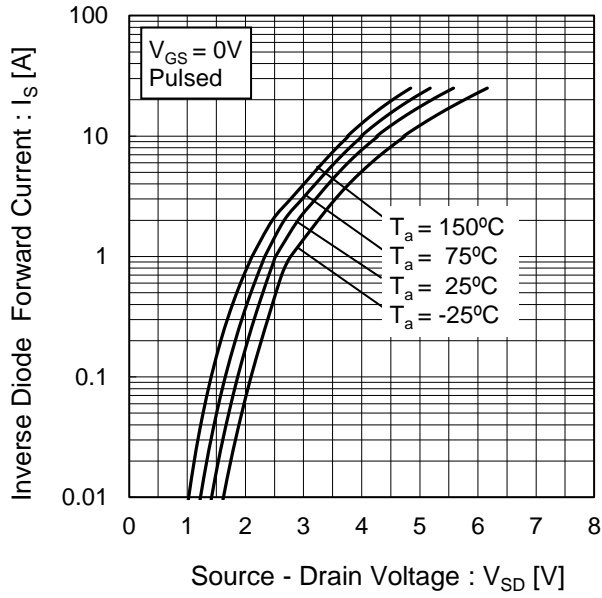
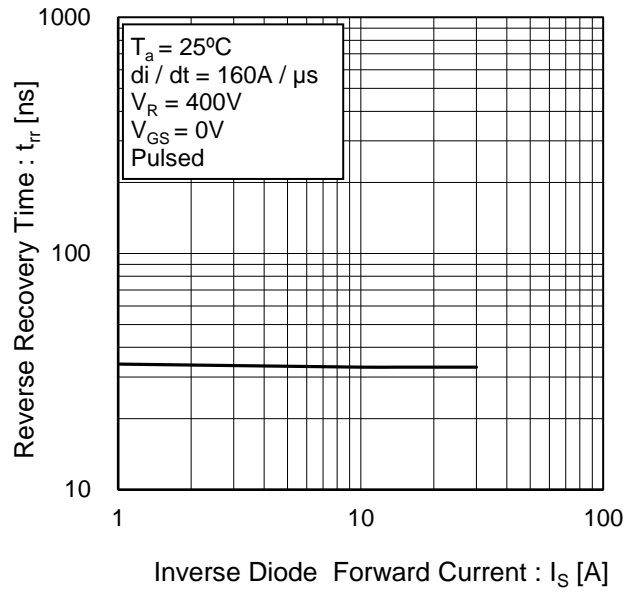


Fig.23 Reverse Recovery Time vs. Inverse Diode Forward Current



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

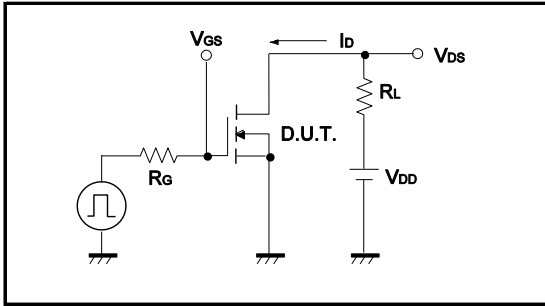


Fig.1-2 Switching Waveforms

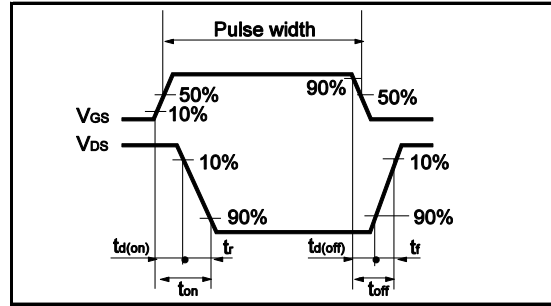


Fig.2-1 Gate Charge Measurement Circuit

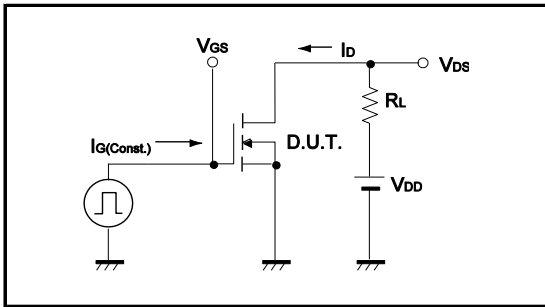


Fig.2-2 Gate Charge Waveform

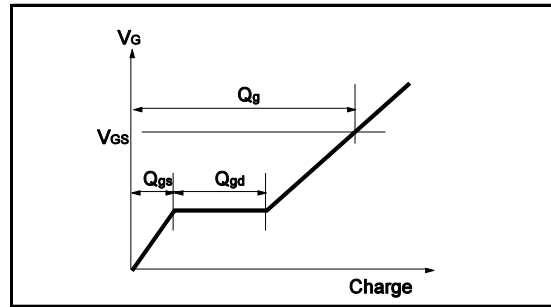


Fig.3-1 Switching Energy Measurement Circuit

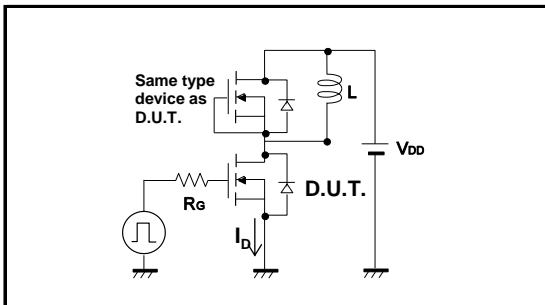


Fig.3-2 Switching Waveforms

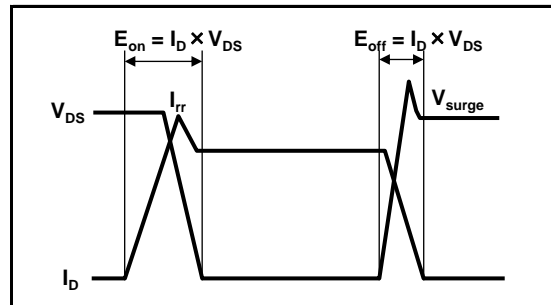


Fig.4-1 Reverse Recovery Time Measurement Circuit

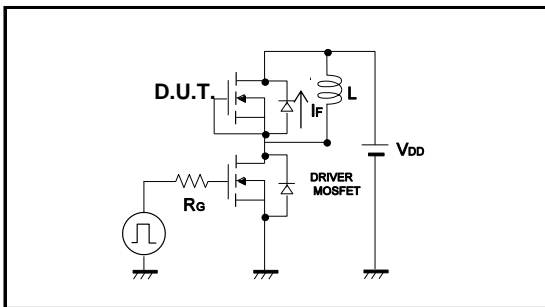
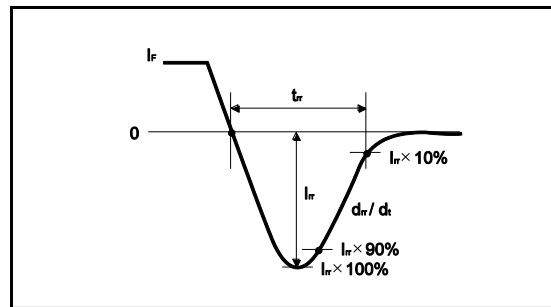


Fig.4-2 Reverse Recovery Waveform



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