

V_{DSS}	650V
$R_{DS(on)}$ (Typ.)	60m Ω
I_D^{*1}	38A
P_D	159W

●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

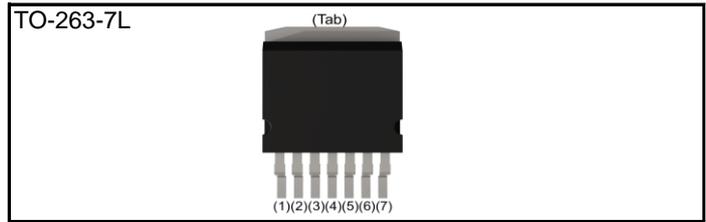
●Application

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

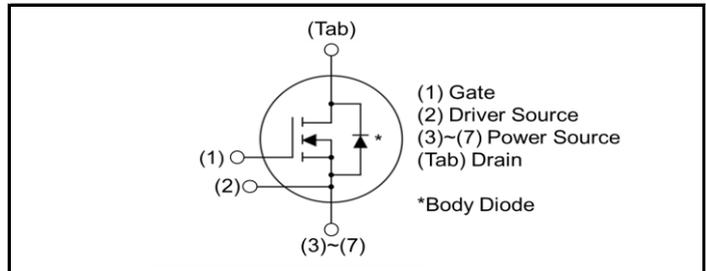
●Absolute maximum ratings ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Value	Unit
Drain - Source Voltage	V_{DSS}	650	V
Continuous Drain current	$T_c = 25^\circ\text{C}$	I_D^{*1}	38
	$T_c = 100^\circ\text{C}$	I_D^{*1}	27
Pulsed Drain current	$I_{D,pulse}^{*2}$	95	A
Gate - Source voltage (DC)	V_{GSS}	-4 to +22	V
Gate - Source surge voltage ($t_{surge} < 300\text{ns}$)	$V_{GSS,surge}^{*3}$	-4 to +26	V
Recommended drive voltage	$V_{GS,op}^{*4}$	0 / +18	V
Junction temperature	T_j	175	$^\circ\text{C}$
Range of storage temperature	T_{stg}	-55 to +175	$^\circ\text{C}$

●Outline



●Inner circuit



Please note Driver Source and Power Source are not exchangeable. Their exchange might lead to malfunction.

●Packaging specifications

Type	Packing	Embossed tape
	Reel size (mm)	330
	Tape width (mm)	24
	Basic ordering unit (pcs)	1000
	Taping code	TL
	Marking	SCT3060AW7

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

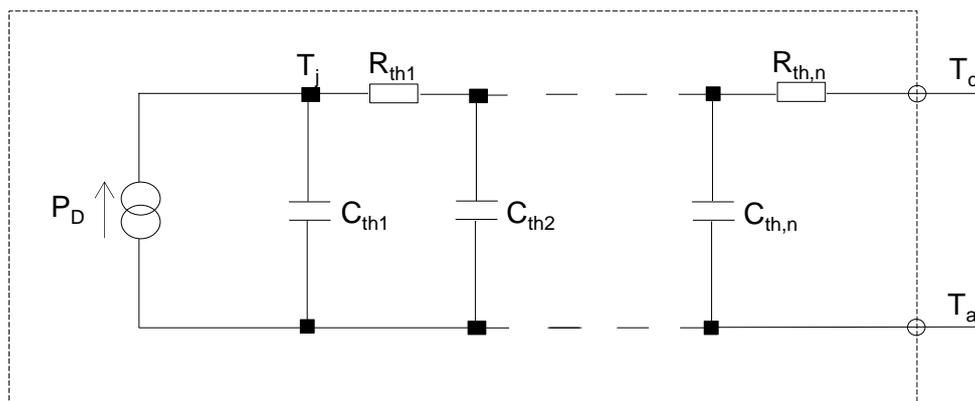
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{V}$, $I_D = 1\text{mA}$ $T_j = 25^\circ\text{C}$ $T_j = -55^\circ\text{C}$	650 650	- -	- -	V
Zero Gate voltage Drain current	I_{DSS}	$V_{GS} = 0\text{V}$, $V_{DS} = 650\text{V}$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	- -	1 2	10 -	μA
Gate - Source leakage current	I_{GSS+}	$V_{GS} = +22\text{V}$, $V_{DS} = 0\text{V}$	-	-	100	nA
Gate - Source leakage current	I_{GSS-}	$V_{GS} = -4\text{V}$, $V_{DS} = 0\text{V}$	-	-	-100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10\text{V}$, $I_D = 6.67\text{mA}$	2.7	-	5.6	V
Static Drain - Source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 18\text{V}$, $I_D = 13\text{A}$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	- -	60 86	78 -	m Ω
Gate input resistance	R_G	$f = 1\text{MHz}$, open drain	-	12	-	Ω

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case ^{*6}	R_{thJC}	-	0.73	0.94	$^\circ\text{C/W}$

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	1.14×10^{-1}	K/W	C_{th1}	2.18×10^{-3}	Ws/K
R_{th2}	1.31×10^{-1}		C_{th2}	3.70×10^{-2}	
R_{th3}	4.56×10^{-1}		C_{th3}	1.09×10^{-2}	



●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs}^{*5}	V _{DS} = 10V, I _D = 13A	-	4.9	-	S
Input capacitance	C _{iss}	V _{GS} = 0V	-	852	-	pF
Output capacitance	C _{oss}	V _{DS} = 500V	-	55	-	
Reverse transfer capacitance	C _{riss}	f = 1MHz	-	24	-	
Effective output capacitance, energy related	C _{o(er)}	V _{GS} = 0V V _{DS} = 0V to 300V	-	126	-	pF
Total Gate charge	Q _g ^{*5}	V _{DS} = 300V I _D = 13A	-	58	-	nC
Gate - Source charge	Q _{gs} ^{*5}	V _{GS} = 18V	-	11	-	
Gate - Drain charge	Q _{gd} ^{*5}	See Fig. 1-1.	-	31	-	
Turn - on delay time	t _{d(on)} ^{*5}	V _{DS} = 400V I _D = 13A	-	5	-	ns
Rise time	t _r ^{*5}	V _{GS} = 0V/+18V	-	14	-	
Turn - off delay time	t _{d(off)} ^{*5}	R _G = 0Ω, L = 750μH L _σ = 50nH, C _σ = 10pF	-	17	-	
Fall time	t _f ^{*5}	See Fig. 2-1, 2-2, 2-3.	-	13	-	
Turn - on switching loss	E _{on} ^{*5}	E _{on} includes diode reverse recovery.	-	79	-	μJ
Turn - off switching loss	E _{off} ^{*5}		-	18	-	

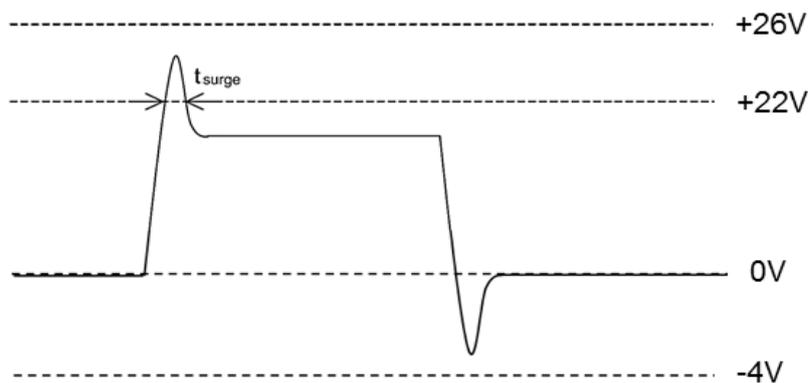
●Body diode electrical characteristics (Source-Drain) ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous, forward current	I_S *1	$T_c = 25^\circ\text{C}$	-	-	38	A
Body diode direct current, pulsed	I_{SM} *2		-	-	95	A
Forward voltage	V_{SD} *5	$V_{GS} = 0\text{V}, I_D = 13\text{A}$	-	3.2	-	V
Reverse recovery time	t_{rr} *5	$I_F = 13\text{A}$ $V_R = 400\text{V}$ $di/dt = 2500\text{A}/\mu\text{s}$	-	18	-	ns
Reverse recovery charge	Q_{rr} *5		-	294	-	nC
Peak reverse recovery current	I_{rrm} *5	$L_\sigma = 50\text{nH}, C_\sigma = 10\text{pF}$ See Fig. 3-1, 3-2.	-	27	-	A

*1 Limited by maximum temperature allowed.

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

*3 Example of acceptable V_{GS} waveform



Please note especially when using driver source that V_{GSS_surge} must be in the range of absolute maximum rating.

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

*5 Pulsed

*6 The case is bottom of leadframe underneath the chip. Practical value of $R_{th(j-c)}$ is influenced by design of the user. Discribed value is only valid at the specific conditions such as JESD51-14.

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

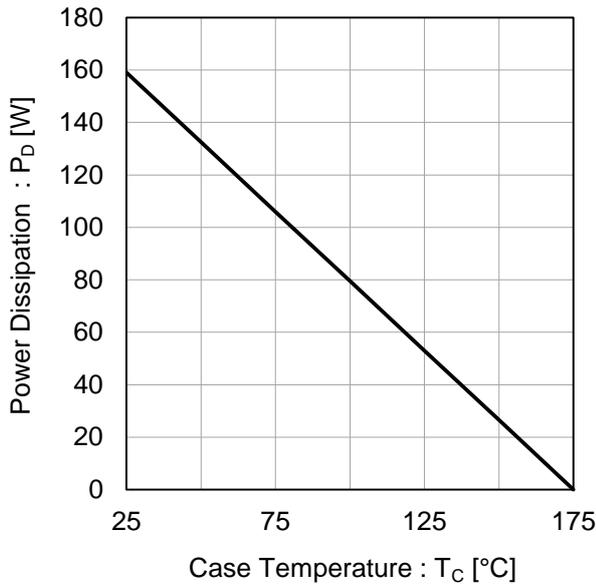


Fig.2 Maximum Safe Operating Area

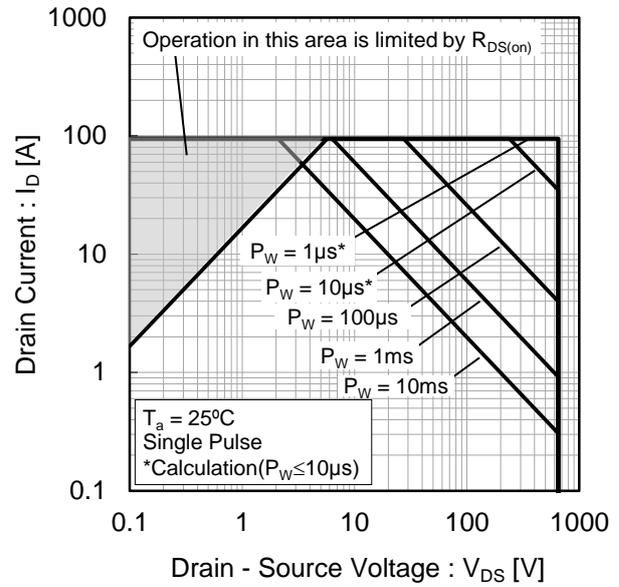
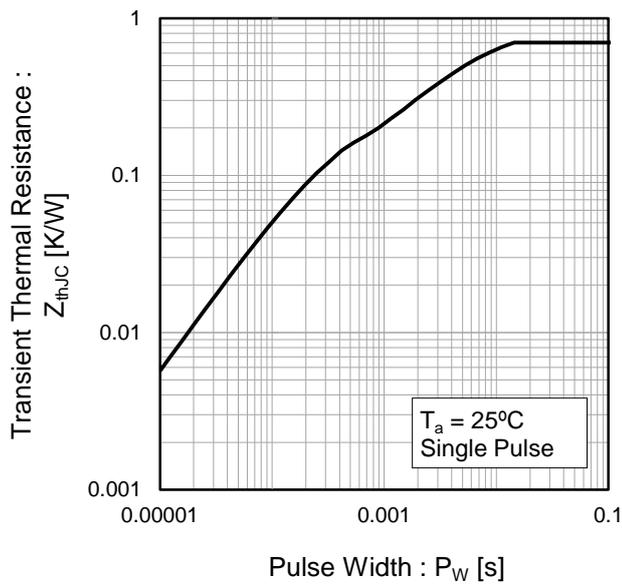


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

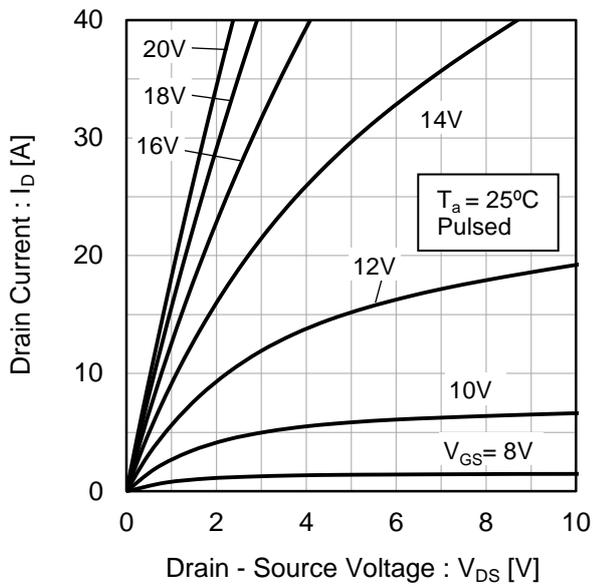


Fig.5 Typical Output Characteristics(II)

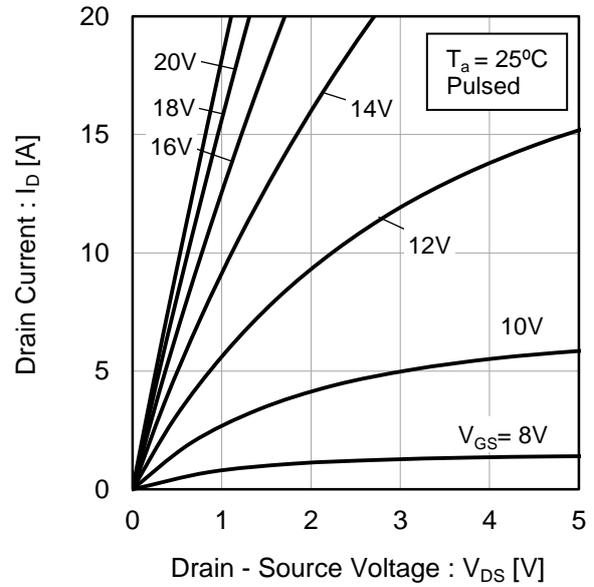
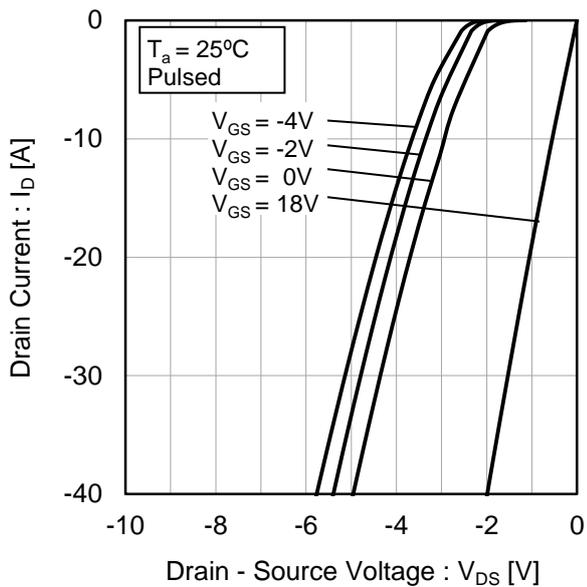


Fig.6 $T_j = 25^\circ C$ 3rd Quadrant Characteristics



●Electrical characteristic curves

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

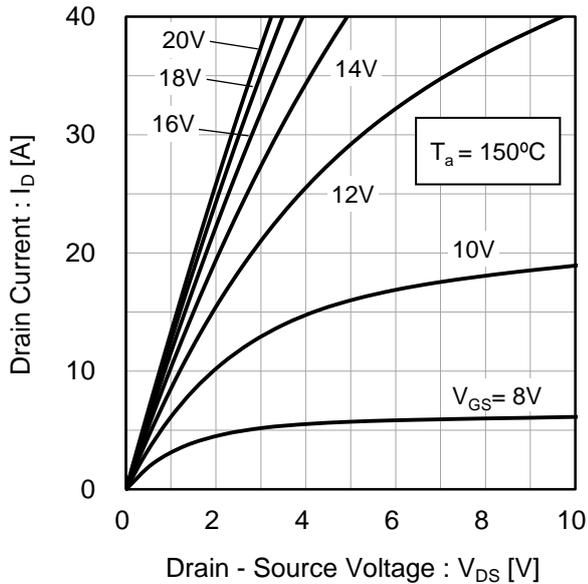


Fig.8 $T_j = 150^\circ\text{C}$ Typical Output Characteristics(II)

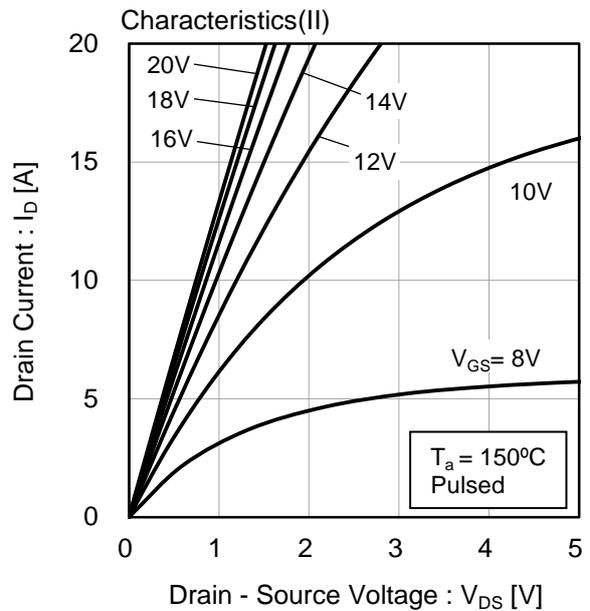


Fig.9 $T_j = 150^\circ\text{C}$ 3rd Quadrant Characteristics

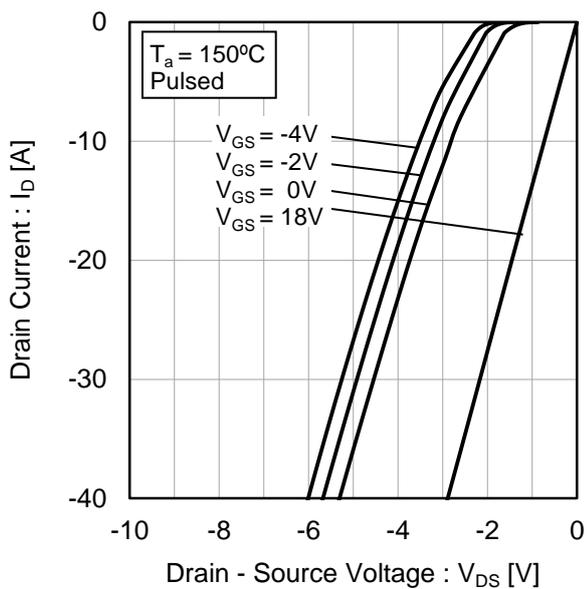
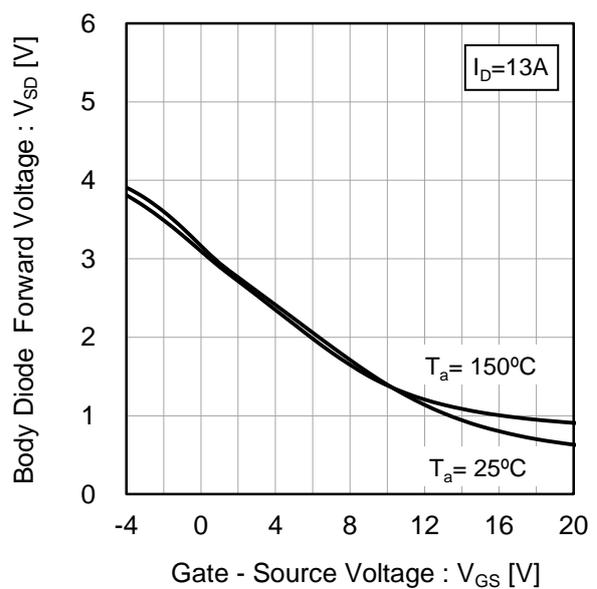


Fig.10 Body Diode Forward Voltage vs. Gate - Source Voltage



●Electrical characteristic curves

Fig.11 Typical Transfer Characteristics (I)

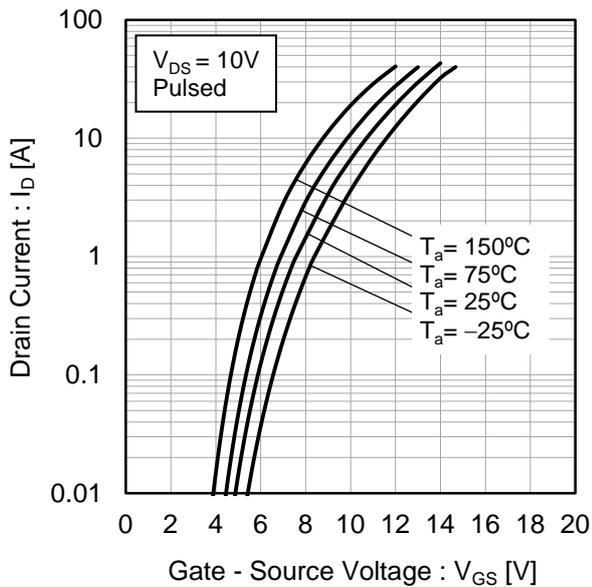


Fig.12 Typical Transfer Characteristics (II)

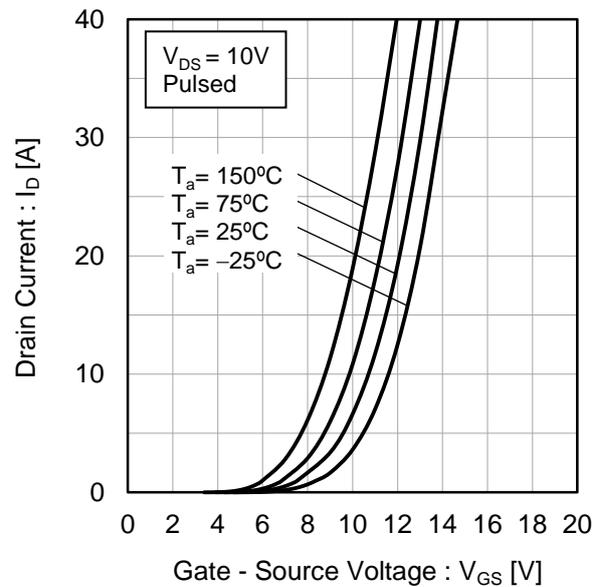


Fig.13 Gate Threshold Voltage vs. Junction Temperature

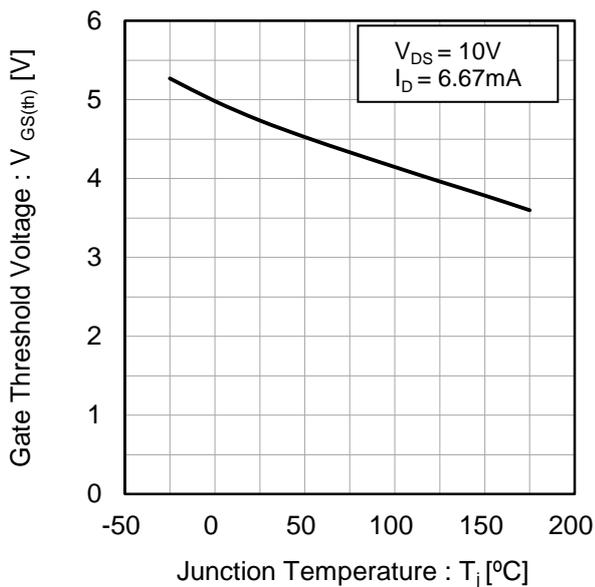
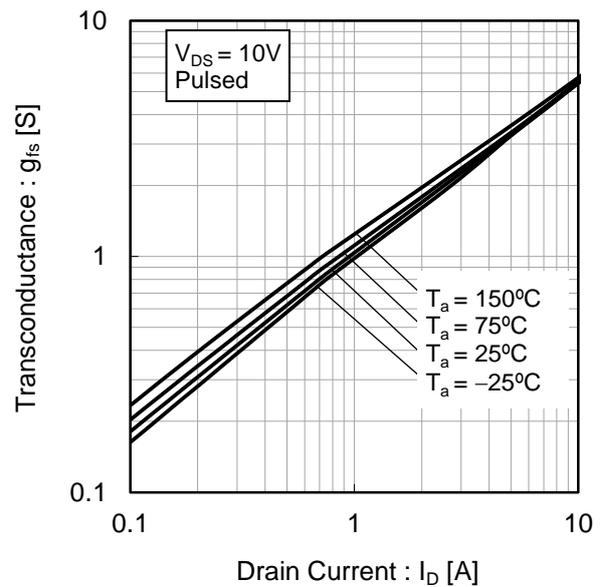


Fig.14 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

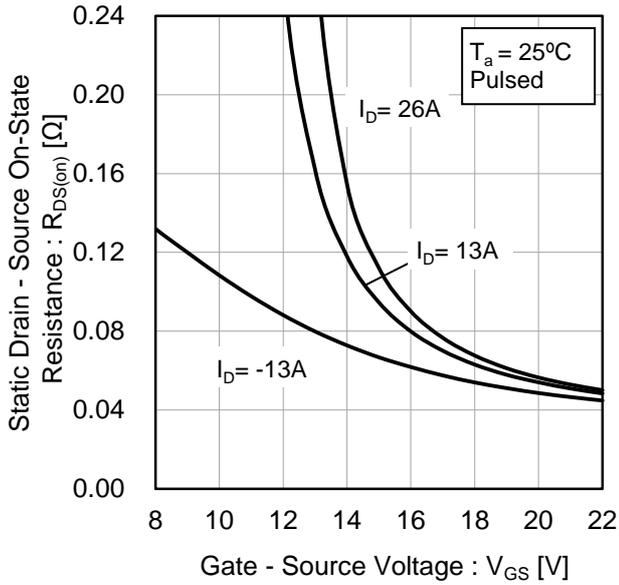


Fig.16 Static Drain - Source On - State Resistance vs. Junction Temperature

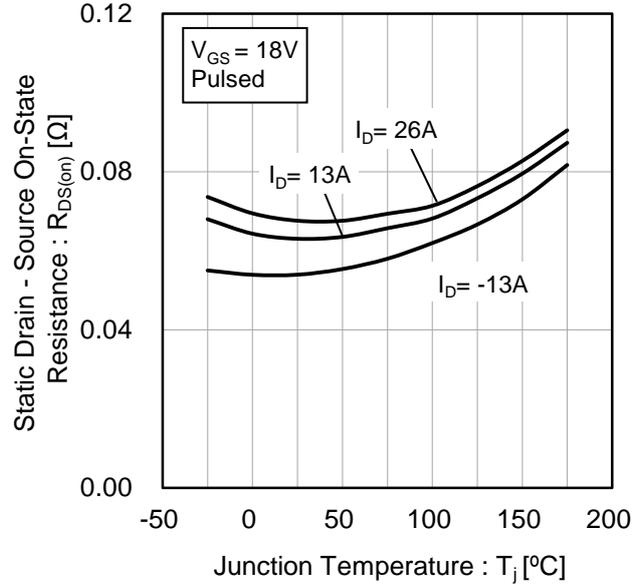


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current

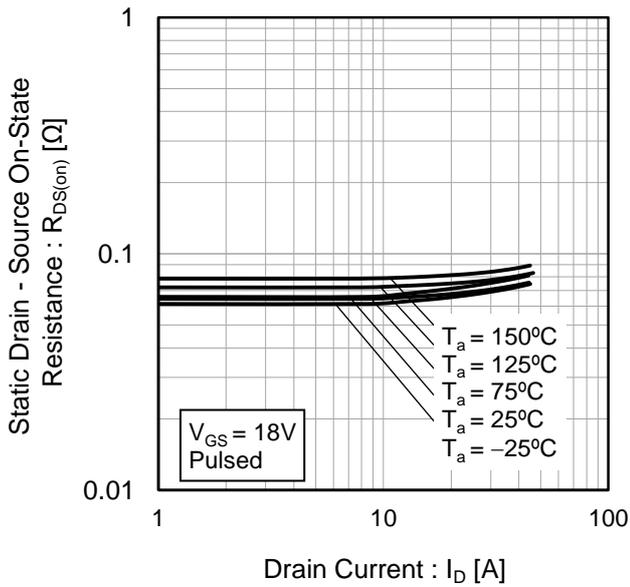
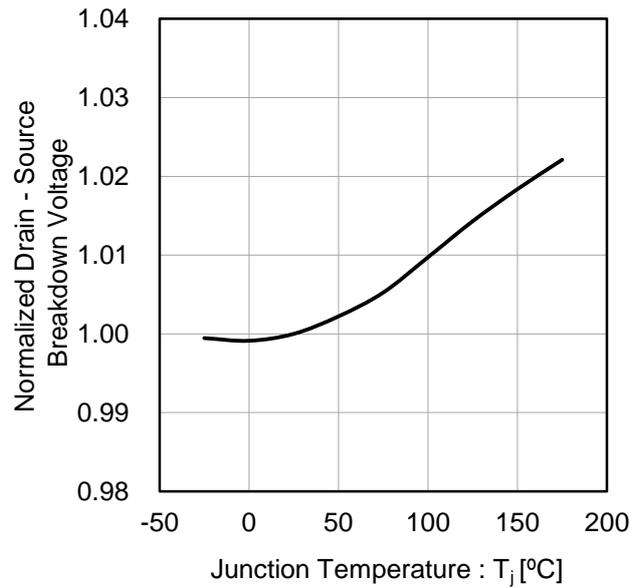


Fig.18 Normalized Drain - Source Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

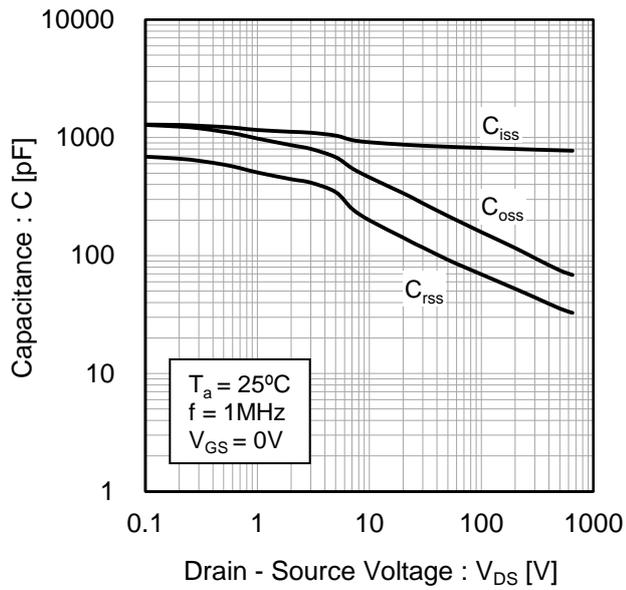


Fig.20 C_{oss} Stored Energy

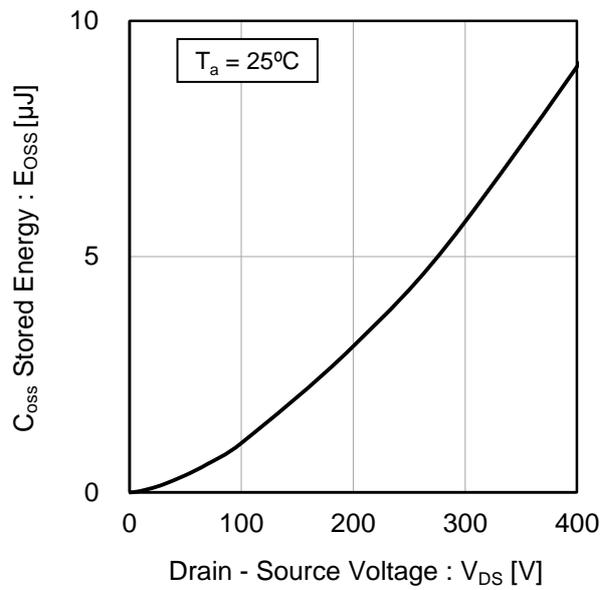
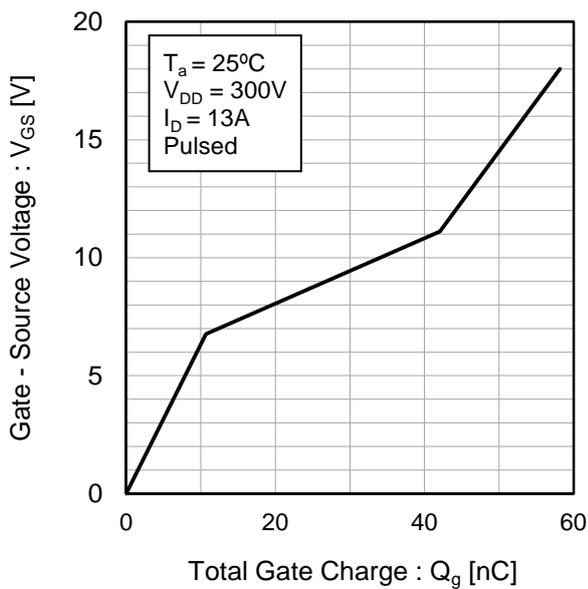
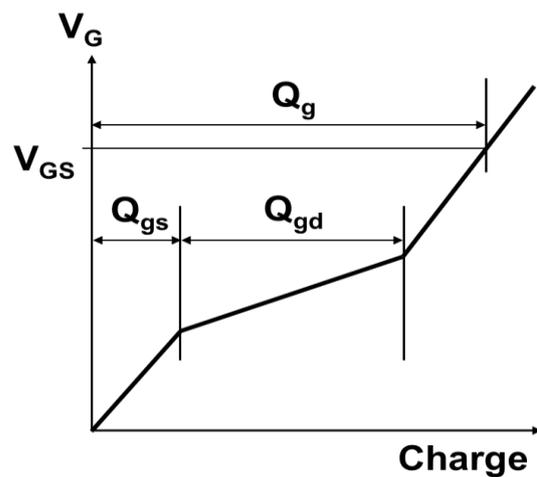


Fig.21 Dynamic Input Characteristics



*Gate Charge Waveform



●Electrical characteristic curves

Fig.22 Typical Switching Time vs. External Gate Resistance

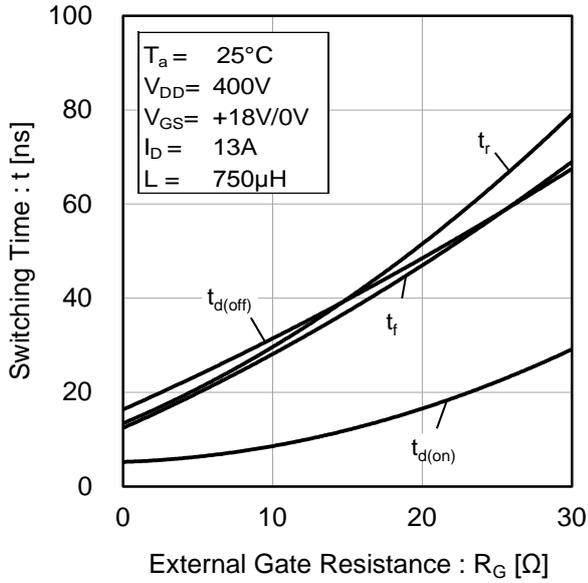


Fig.23 Typical Switching Loss vs. Drain - Source Voltage

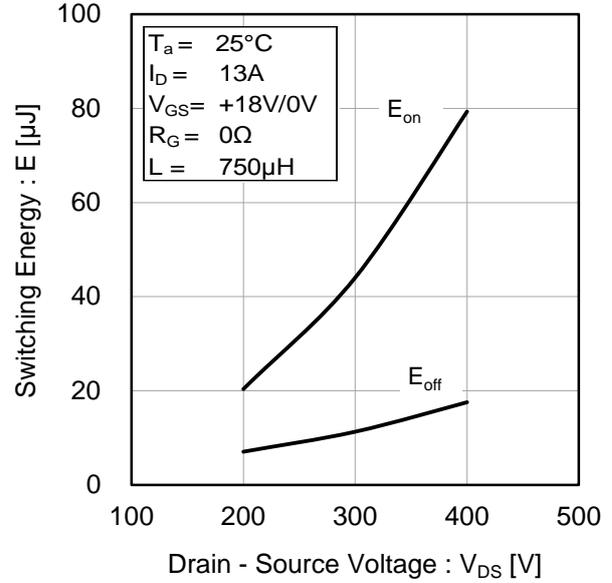


Fig.24 Typical Switching Loss vs. Drain Current

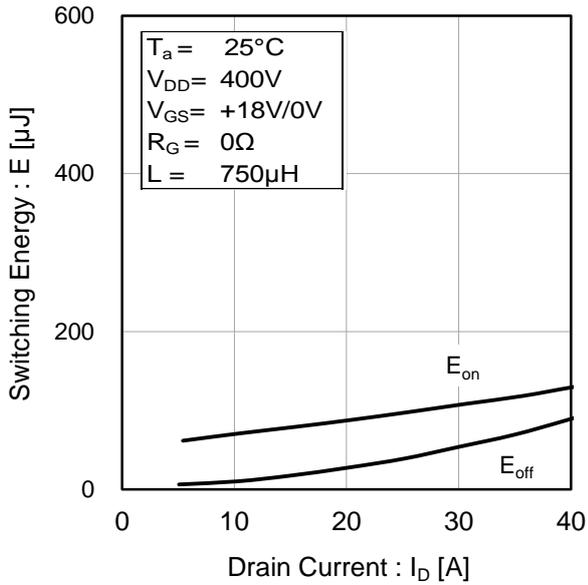
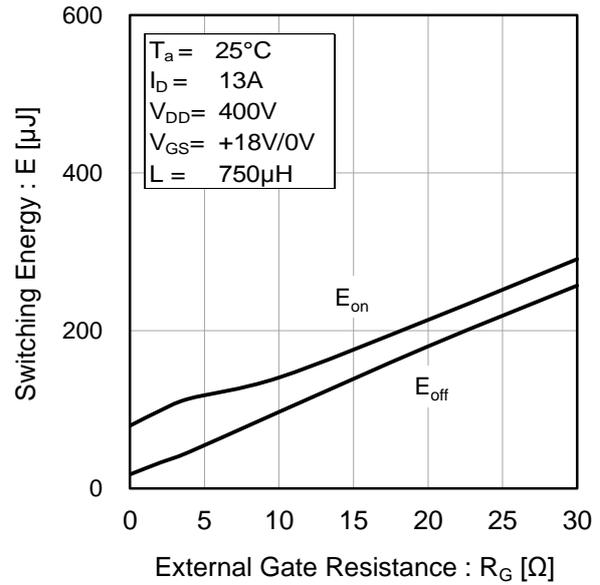


Fig.25 Typical Switching Loss vs. External Gate Resistance



● Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

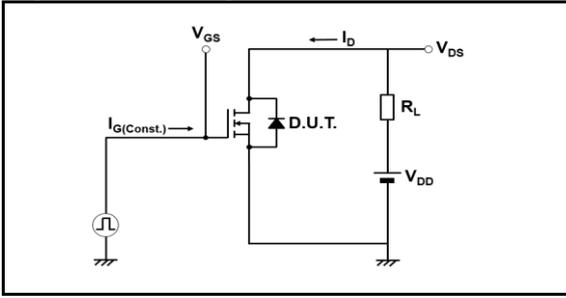


Fig.2-1 Switching Characteristics Measurement Circuit

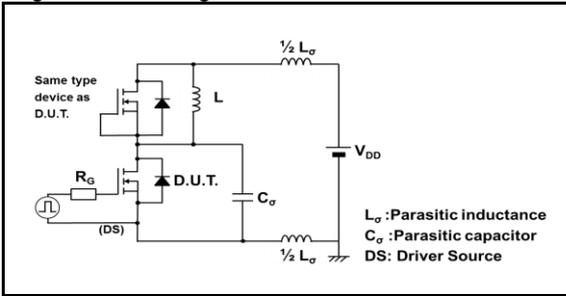


Fig.2-2 Waveforms for Switching Time

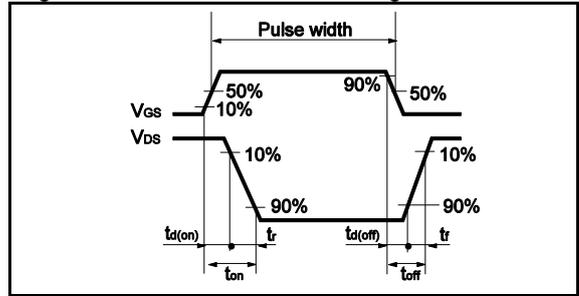


Fig.2-3 Waveforms for Switching Energy Loss

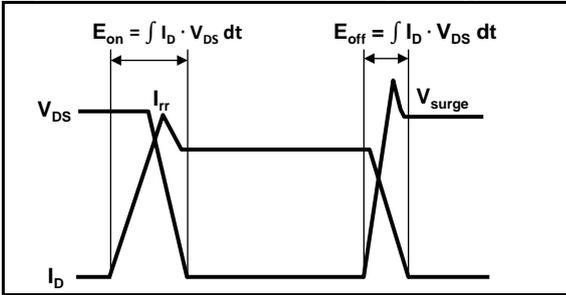


Fig.3-1 Reverse Recovery Time Measurement Circuit

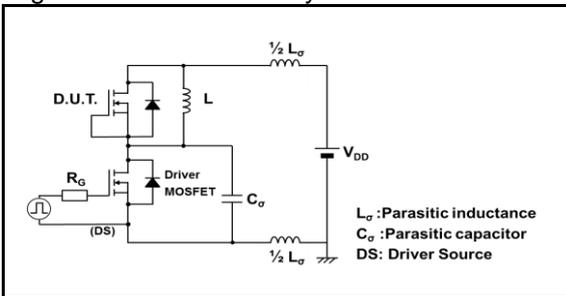
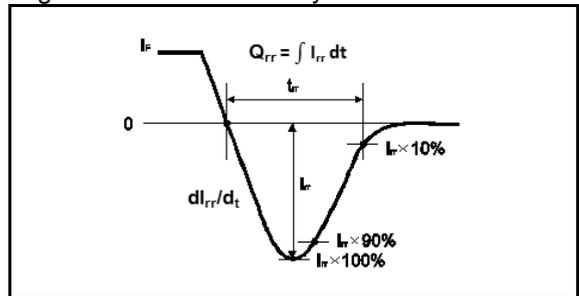


Fig.3-2 Reverse Recovery Waveform



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