

V_{DSS}	1200V
$R_{DS(on)}$ (Typ.)	80mΩ
I_D	40A

●Features

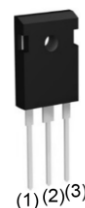
- 1) Low on-resistance
- 2) Fast switching speed
- 3) Fast reverse recovery
- 4) Easy to parallel
- 5) Simple to drive
- 6) Pb-free lead plating ; RoHS compliant

●Application

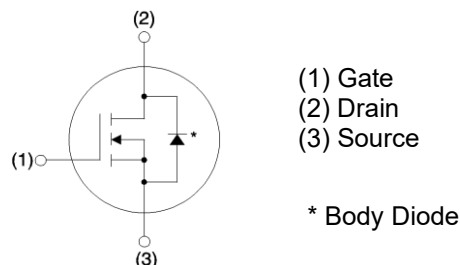
- Solar inverters
- DC/DC converters
- Induction heating
- Motor drives

●Outline

TO-247
TO-247N



●Inner circuit



●Packaging specifications^{*1}

Package		TO-247	TO-247N
Type	Packing	Tube	
	Reel size (mm)	-	
	Tape width (mm)	-	
	Basic ordering unit (pcs)	30	
	Packing code	C	C11
	Marking	SCT2080KE	

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

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	1200	V
Continuous drain current	$T_c = 25^\circ\text{C}$	I_D^{*2}	40	A
	$T_c = 100^\circ\text{C}$	I_D^{*2}	28	A
Pulsed drain current		$I_{D,pulse}^{*3}$	80	A
Gate - Source voltage (DC)		V_{GSS}	-6 to +22	V
Gate - Source surge voltage ($t_{surge} < 300\text{nsec}$)		$V_{GSS_surge}^{*4}$	-10 to +26	V
Total power dissipation	$T_c=25^\circ\text{C}$, See Fig.1	P_D	262	W
	$T_c=100^\circ\text{C}$, See Fig.1		130	W
Junction temperature		T_j	175	$^\circ\text{C}$
Range of storage temperature		T_{stg}	-55 to +175	$^\circ\text{C}$

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

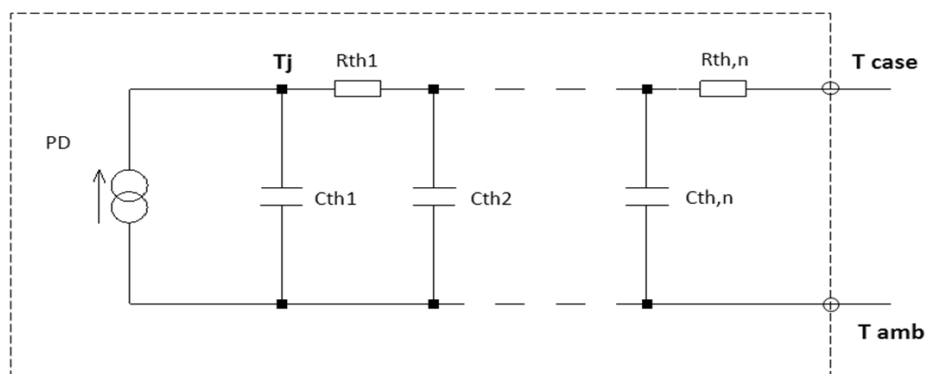
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{V}, I_D = 1\text{mA}$	1200	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 1200\text{V}, V_{GS} = 0\text{V}$ $T_j = 25^\circ\text{C}$	-	1	10	μA
		$T_j = 150^\circ\text{C}$	-	2	-	
Gate - Source leakage current	I_{GSS+}	$V_{GS} = +22\text{V}, V_{DS} = 0\text{V}$	-	-	100	nA
Gate - Source leakage current	I_{GSS-}	$V_{GS} = -6\text{V}, V_{DS} = 0\text{V}$	-	-	-100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 4.4\text{mA}$	1.6	2.8	4.0	V

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	0.44	0.57	$^\circ\text{C/W}$

●Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
R_{th1}	7.80E-02	K/W	C_{th1}	5.00E-03	Ws/K
R_{th2}	1.97E-01		C_{th2}	1.80E-02	
R_{th3}	1.62E-01		C_{th3}	2.49E-01	



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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 18\text{V}, I_D = 10\text{A}$ $T_j = 25^\circ\text{C}$	-	80	117	mΩ
		$T_j = 125^\circ\text{C}$	-	125	-	
Gate input resistance	R_G	$f = 1\text{MHz}$, open drain	-	6.3	-	Ω
Transconductance	g_{fs}^{*5}	$V_{DS} = 10\text{V}, I_D = 10\text{A}$	-	3.7	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$	-	2080	-	pF
Output capacitance	C_{oss}	$V_{DS} = 800\text{V}$	-	77	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	16	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}$ $V_{DS} = 0\text{V to } 500\text{V}$	-	116	-	pF
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} = 400\text{V}, V_{GS} = 18\text{V}$ $I_D = 10\text{A}$ $R_L = 40\Omega$ $R_G = 0\Omega$	-	35	-	ns
Rise time	t_r^{*5}		-	36	-	
Turn - off delay time	$t_{d(off)}^{*5}$		-	76	-	
Fall time	t_f^{*5}		-	22	-	
Turn - on switching loss	E_{on}^{*5}	$V_{DD} = 600\text{V}, I_D = 10\text{A}$ $V_{GS} = 18\text{V}/0\text{V}$ $R_G = 0\Omega, L = 500\mu\text{H}$	-	174	-	μJ
Turn - off switching loss	E_{off}^{*5}	* E_{on} includes diode reverse recovery	-	51	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*5}	$V_{DD} = 400\text{V}$	-	106	-	nC
Gate - Source charge	Q_{gs}^{*5}	$I_D = 10\text{A}$	-	27	-	
Gate - Drain charge	Q_{gd}^{*5}	$V_{GS} = 18\text{V}$	-	31	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 400\text{V}, I_D = 10\text{A}$	-	9.7	-	V

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

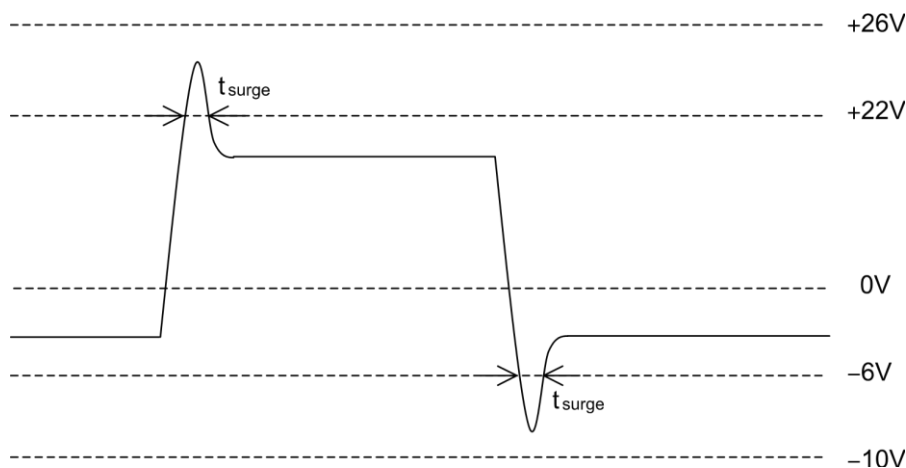
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous, forward current	I_S^{*2}	$T_c = 25^\circ\text{C}$	-	-	40	A
Body diode direct current, pulsed	I_{SM}^{*3}		-	-	80	A
Forward voltage	V_{SD}^{*5}	$V_{GS} = 0\text{V}, I_S = 10\text{A}$	-	4.6	-	V
Reverse recovery time	t_{rr}^{*5}	$I_F = 10\text{A}, V_R = 400\text{V}$ $di/dt = 150\text{A}/\mu\text{s}$	-	31	-	ns
Reverse recovery charge	Q_{rr}^{*5}		-	44	-	nC
Peak reverse recovery current	I_{rrm}^{*5}		-	2.3	-	A

*1 Tolerances of dimensions and packing specifications slightly differ between TO-247 and TO-247N, which is unlikely to influence compatibility for mounting. Please refer to corresponding specifications of dimensions for more details.

*2 Limited only by maximum temperature allowed.

*3 $PW \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$

*4 Example of acceptable V_{GS} waveform



*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

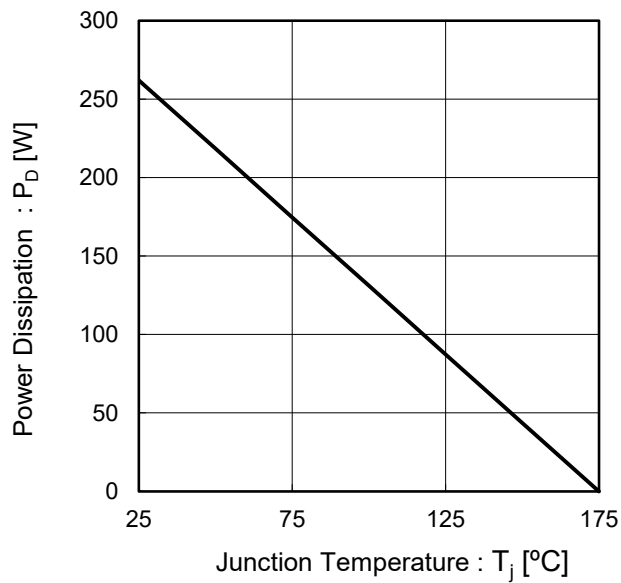


Fig.2 Maximum Safe Operating Area

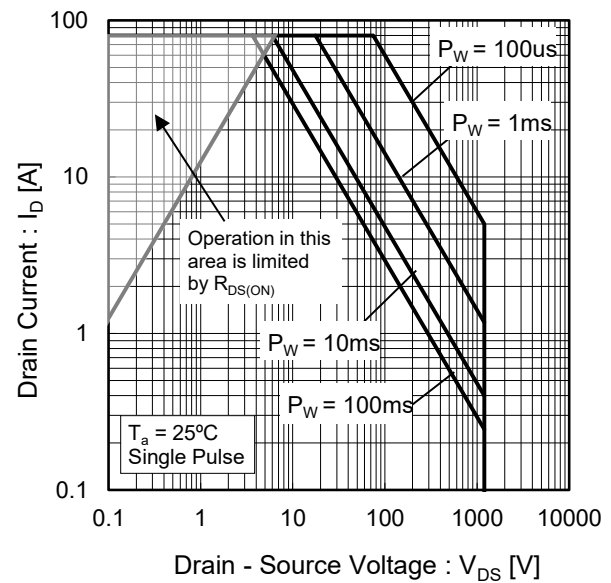
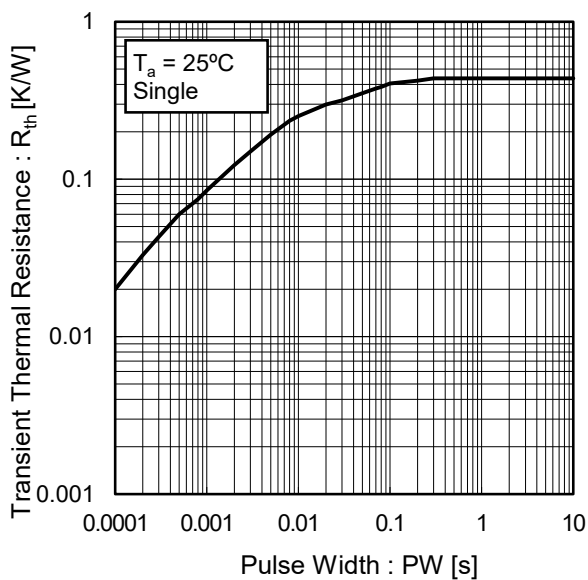


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

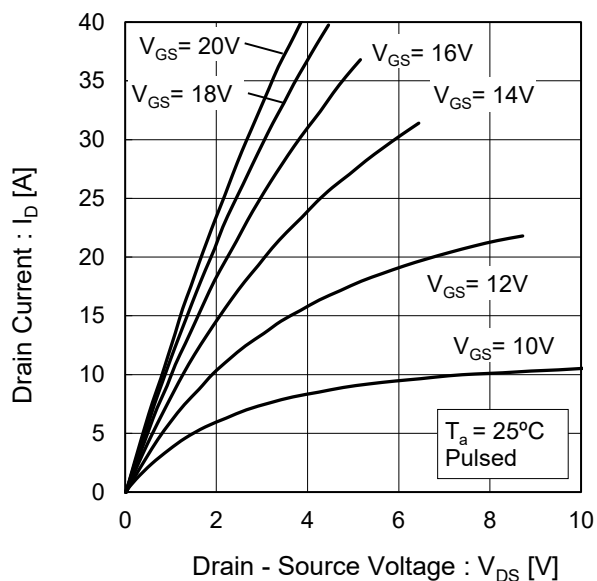


Fig.5 Typical Output Characteristics(II)

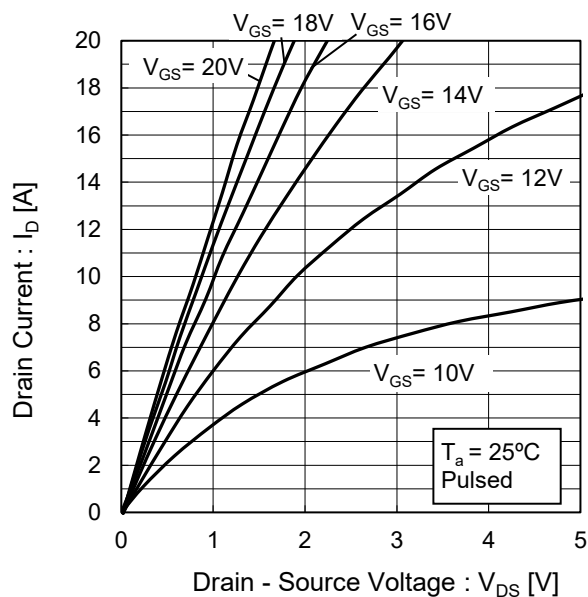


Fig.6 Typical Output Characteristics(I)

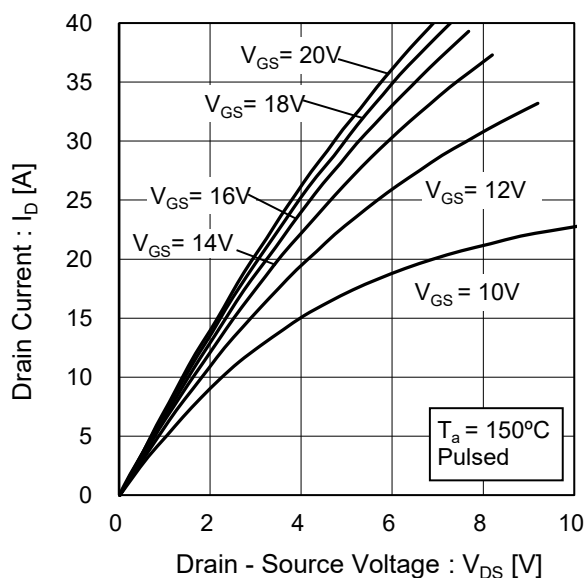
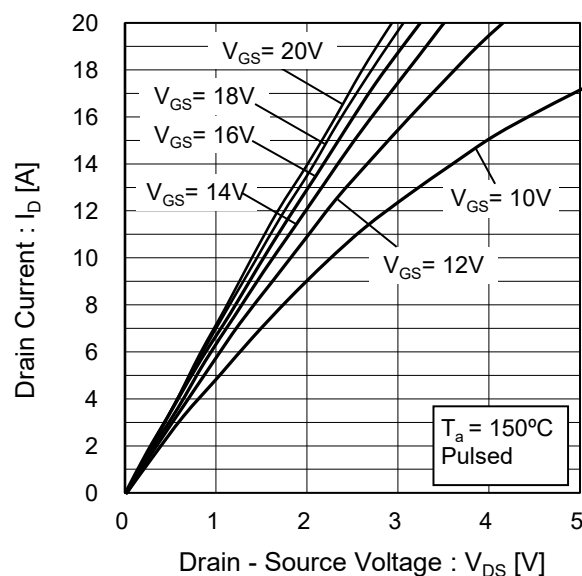


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

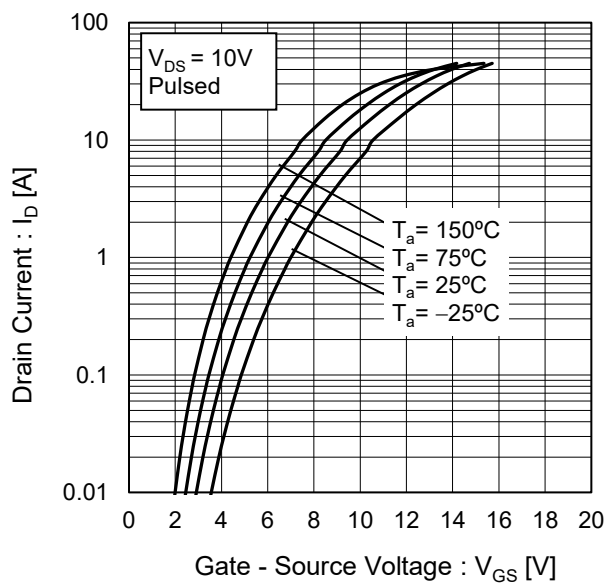


Fig.9 Typical Transfer Characteristics (II)

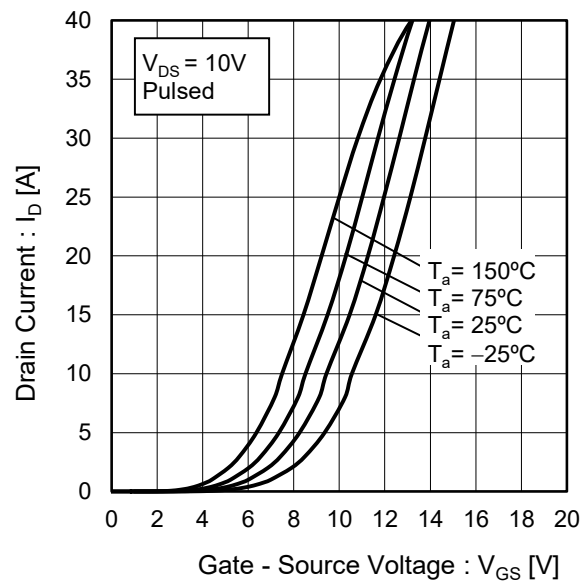


Fig.10 Gate Threshold Voltage vs. Junction Temperature

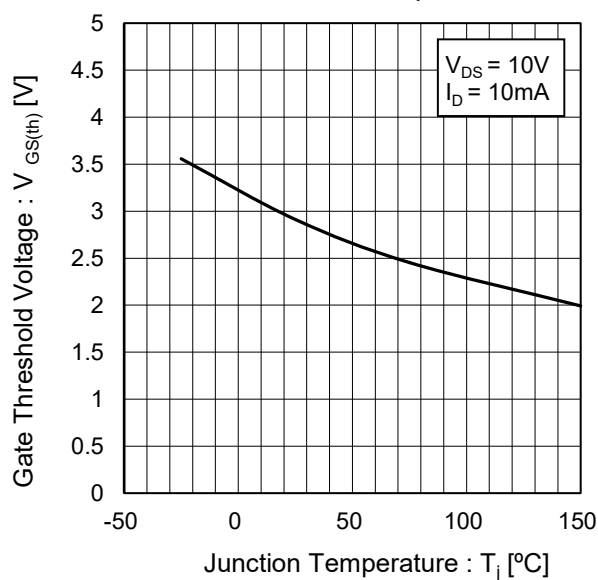
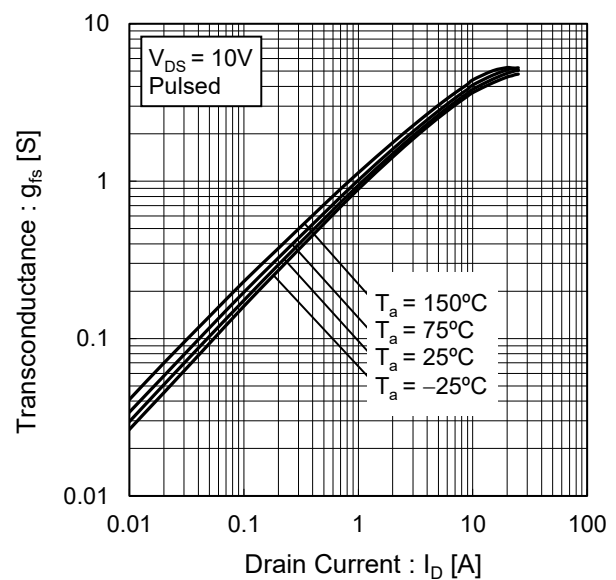


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

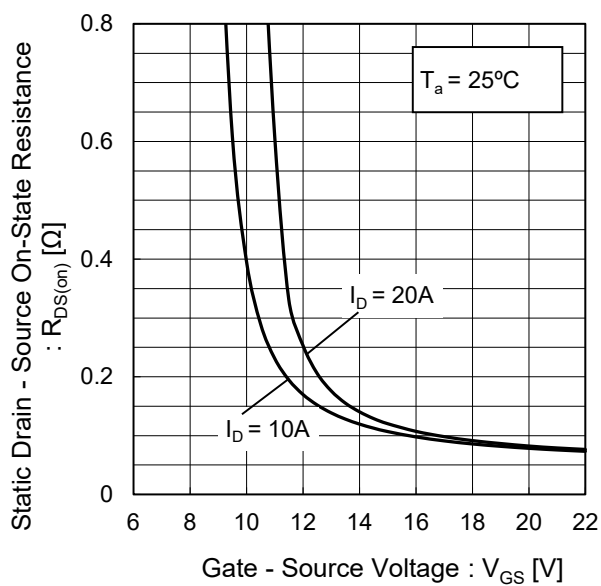


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

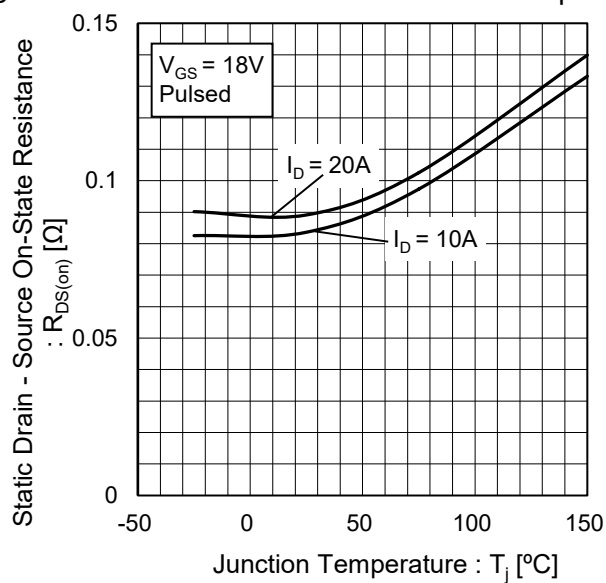
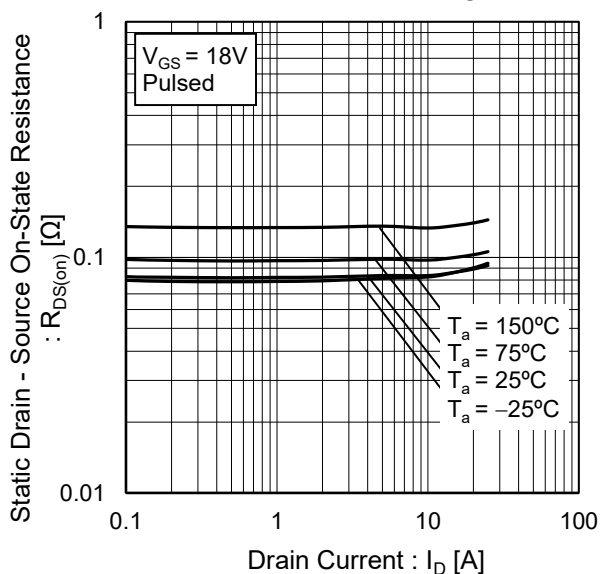


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.15 Typical Capacitance
vs. Drain - Source Voltage

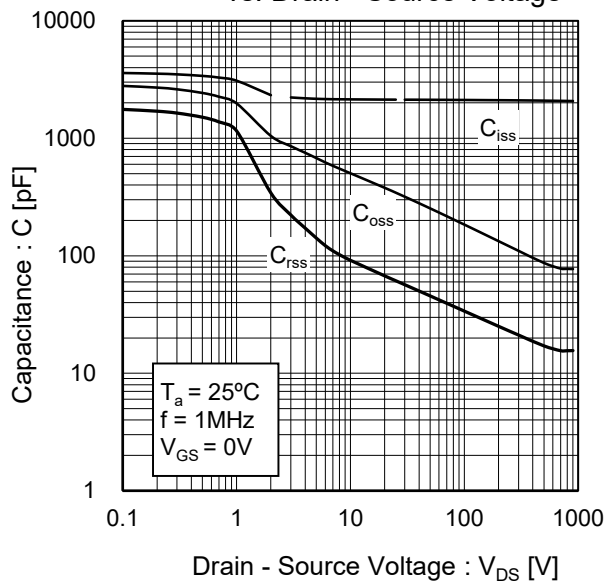


Fig.16 C_{oss} Stored Energy

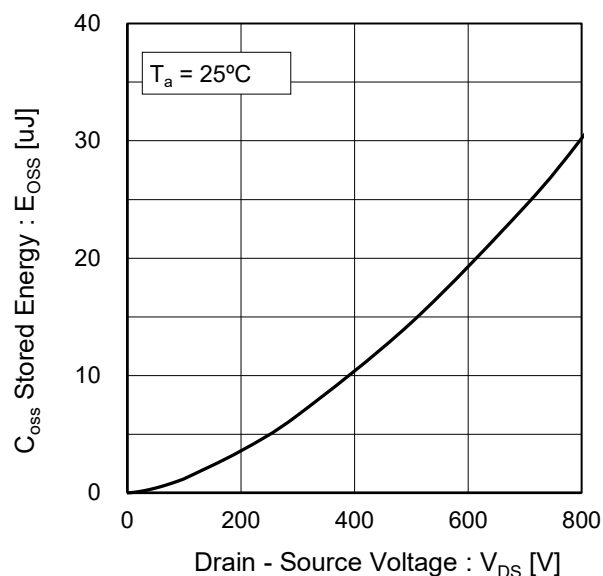


Fig.17 Switching Characteristics

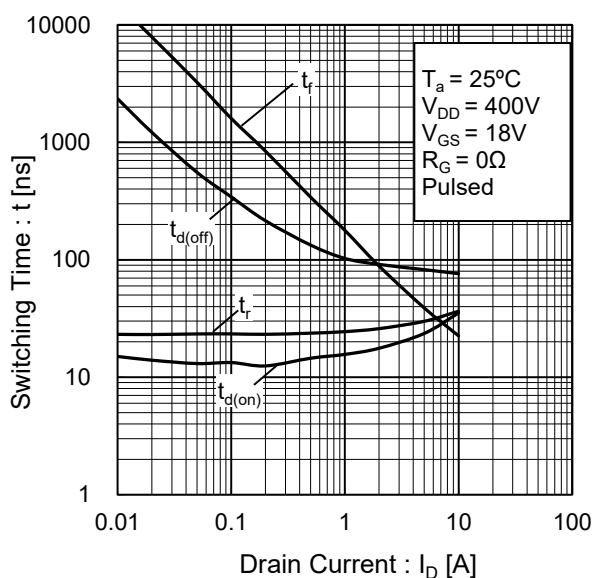
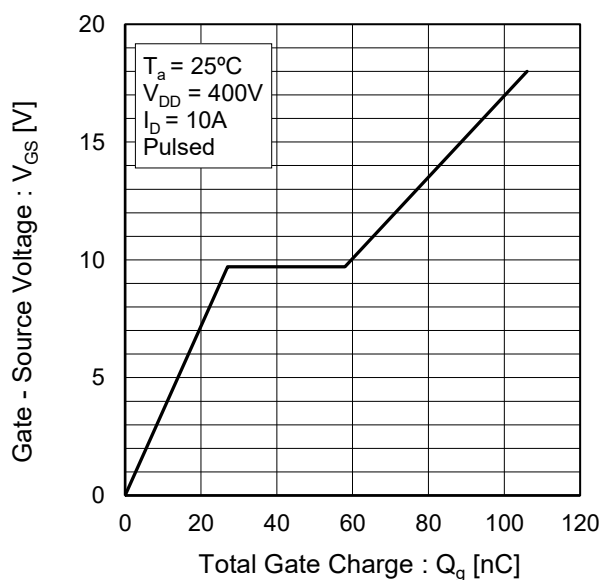


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

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

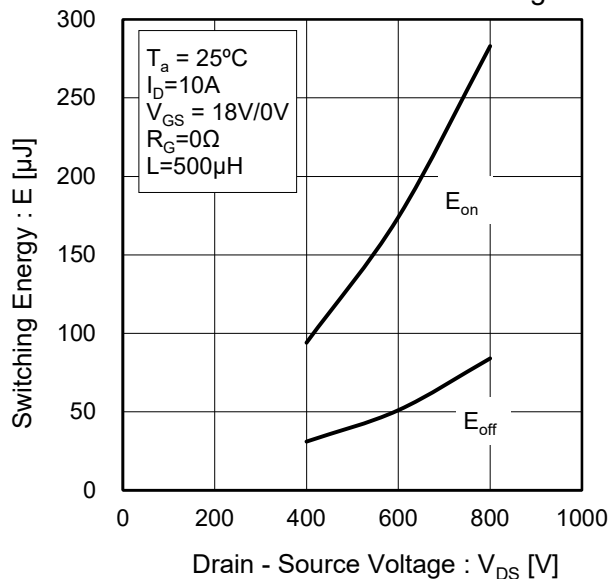


Fig.20 Typical Switching Loss
vs. Drain Current

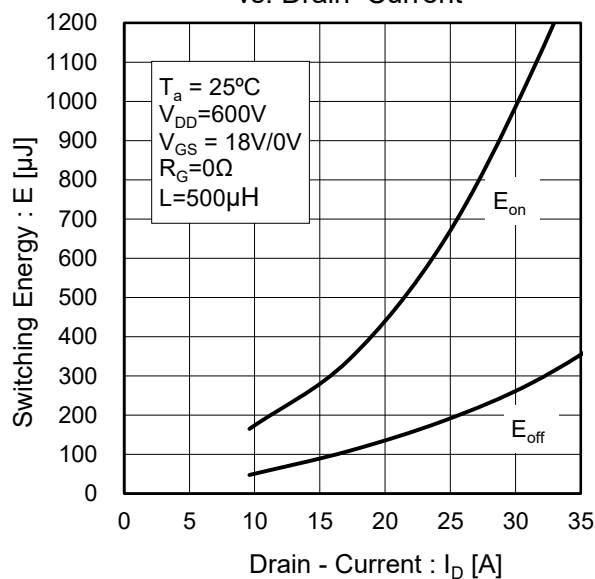
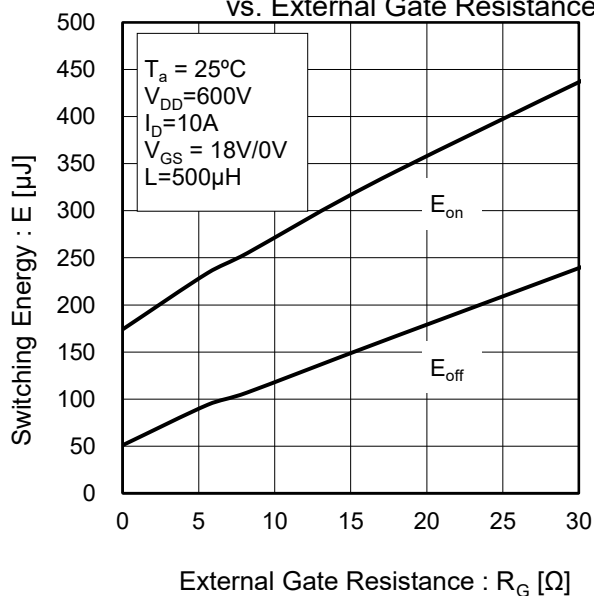


Fig.21 Typical Switching Loss
vs. External Gate Resistance



●Electrical characteristic curves

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

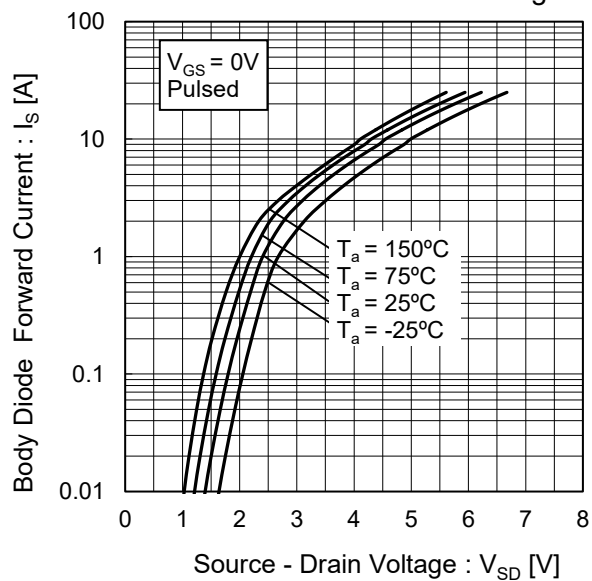
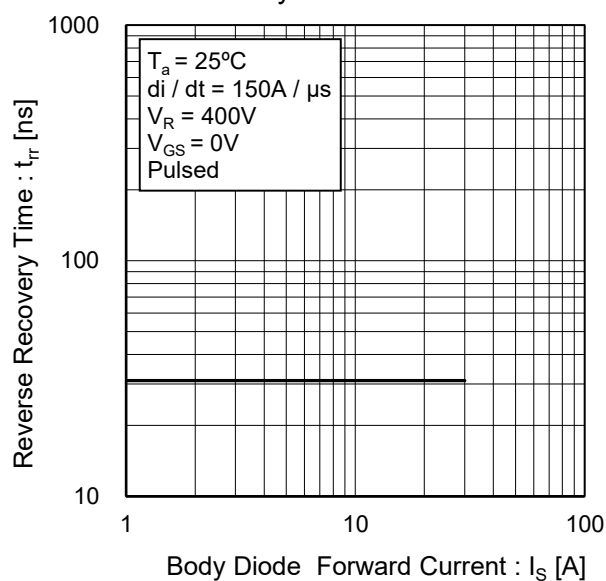


Fig.23 Reverse Recovery Time
vs. Body Diode Forward Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

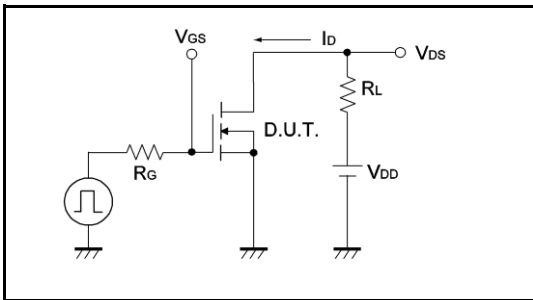


Fig.1-2 Switching Waveforms

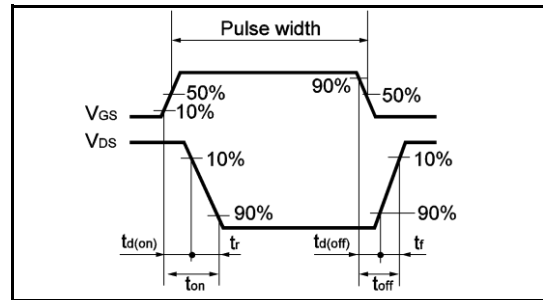


Fig.2-1 Gate Charge Measurement Circuit

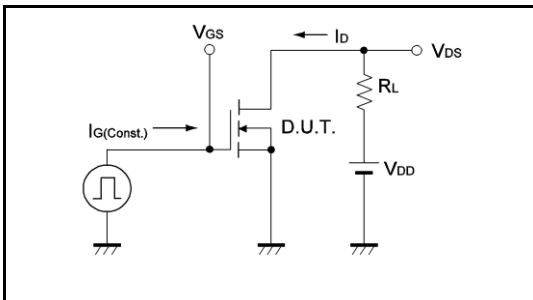


Fig.2-2 Gate Charge Waveform

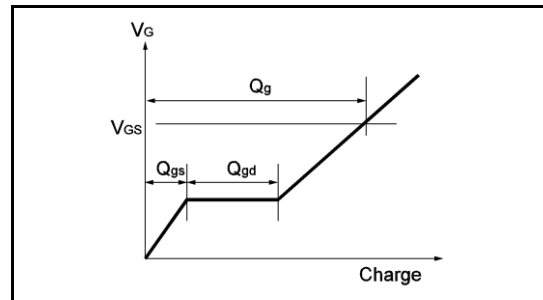


Fig.3-1 Switching Energy Measurement Circuit

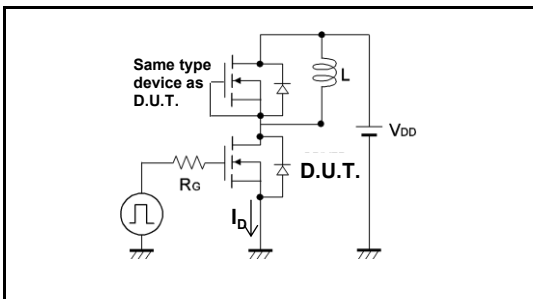


Fig.3-2 Switching Waveforms

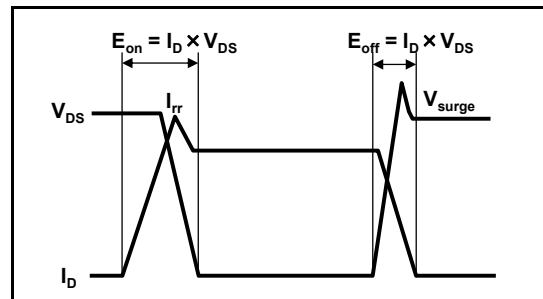


Fig.4-1 Reverse Recovery Time Measurement Circuit

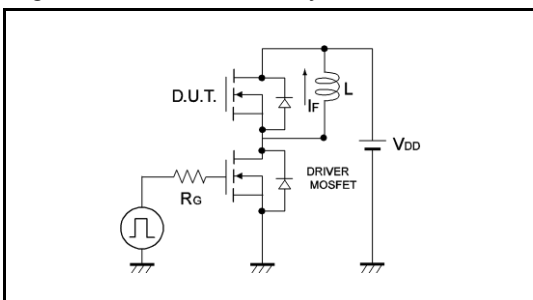
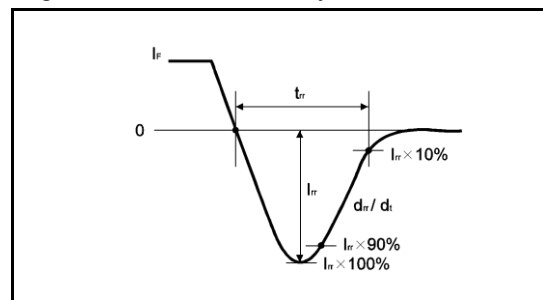


Fig.4-2 Reverse Recovery Waveform



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