

$V_{DSS}$	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

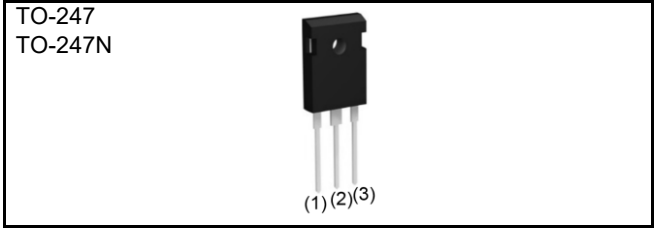
### ●Application

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

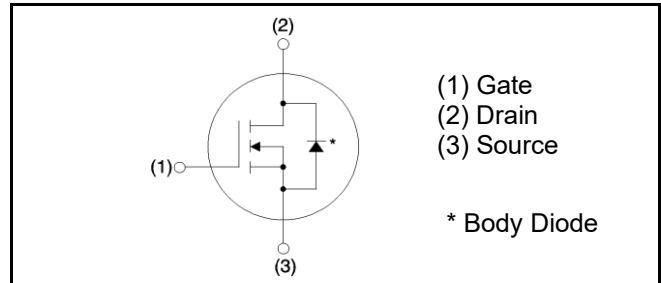
### ●Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )

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	$P_D$	$T_c=25^\circ\text{C}$ , See Fig.1	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	$^\circ\text{C}$

### ●Outline



### ●Inner circuit



### ●Packaging specifications<sup>\*1</sup>

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

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

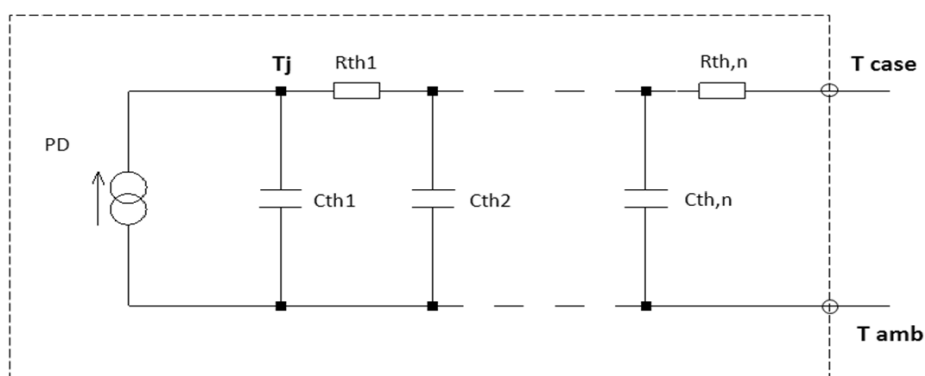
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	1200	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 1200V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	1	10	$\mu\text{A}$
			$T_j = 150^\circ\text{C}$	-	2	-
Gate - 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	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 4.4mA$	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	$R_{DS(on)}^{*5}$	$V_{GS} = 18\text{V}, I_D = 10\text{A}$	-	80	117	m $\Omega$
		$T_j = 25^\circ\text{C}$	-	125	-	
Gate input resistance	$R_G$	$f = 1\text{MHz}, \text{open drain}$	-	6.3	-	$\Omega$
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	$C_{riss}$	$f = 1\text{MHz}$	-	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	$t_{d(on)}^{*5}$	$V_{DD} = 400\text{V}, V_{GS} = 18\text{V}$	-	35	-	ns
Rise time	$t_r^{*5}$	$I_D = 10\text{A}$	-	36	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 40\Omega$	-	76	-	
Fall time	$t_f^{*5}$	$R_G = 0\Omega$	-	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	-	$\mu\text{J}$
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) ( $T_a = 25^\circ\text{C}$ )**

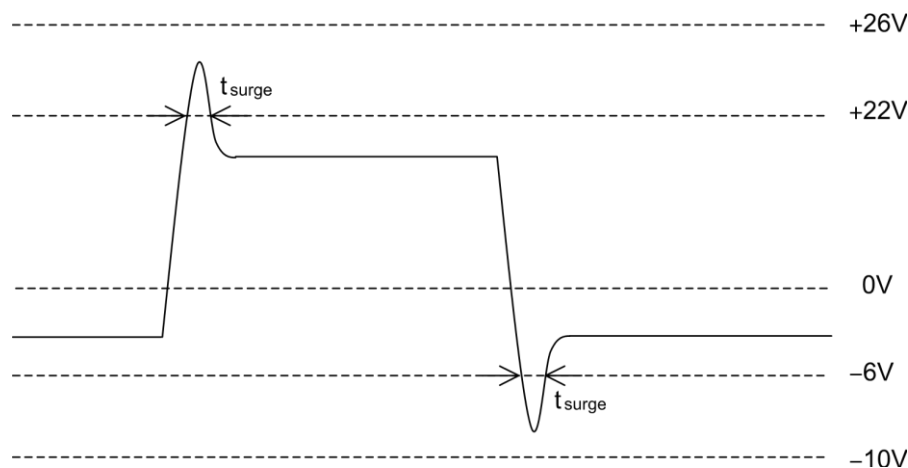
Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous, forward current	$I_S^{*2}$	$T_c = 25^\circ\text{C}$	-	-	40	A
Body diode direct current, pulsed	$I_{SM}^{*3}$		-	-	80	A
Forward voltage	$V_{SD}^{*5}$	$V_{GS} = 0\text{V}, I_S = 10\text{A}$	-	4.6	-	V
Reverse recovery time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

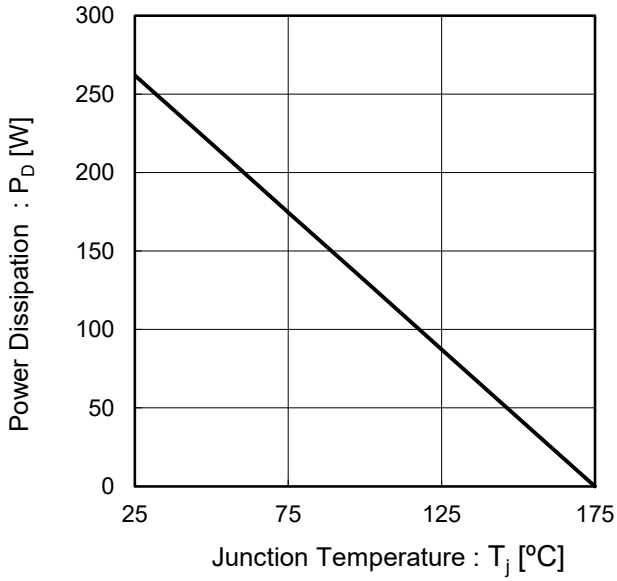


Fig.2 Maximum Safe Operating Area

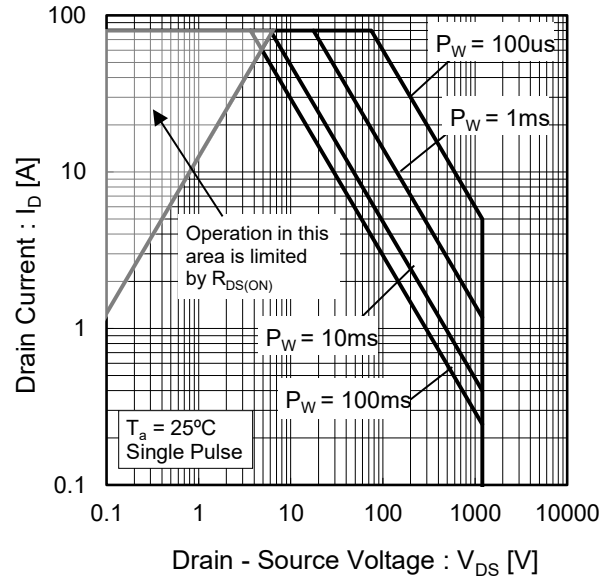
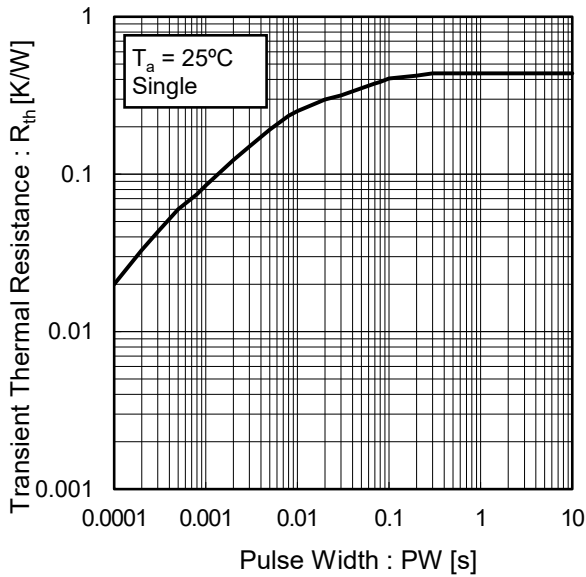


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

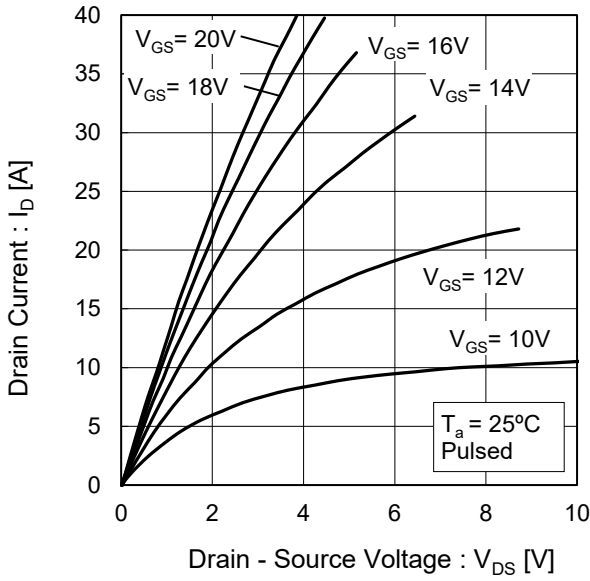


Fig.5 Typical Output Characteristics(II)

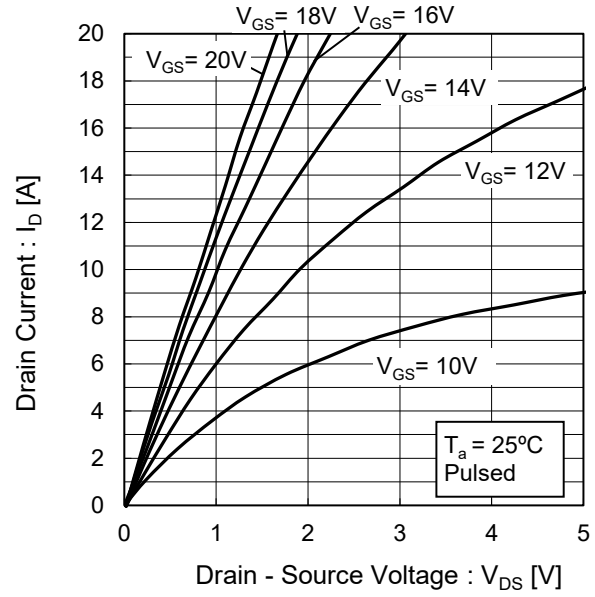


Fig.6 Typical Output Characteristics(I)

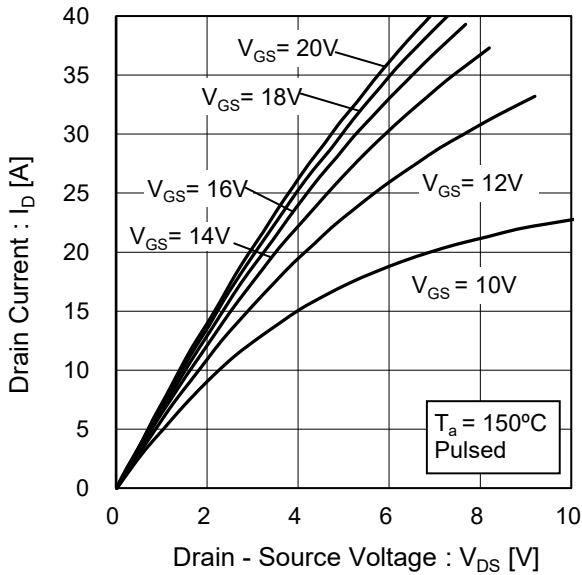
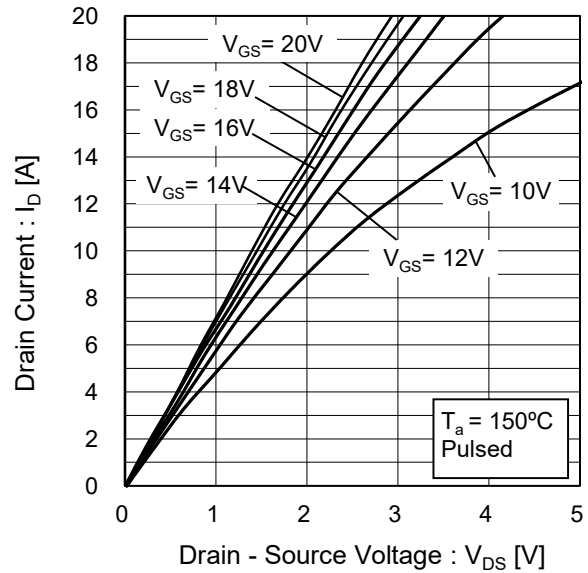


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

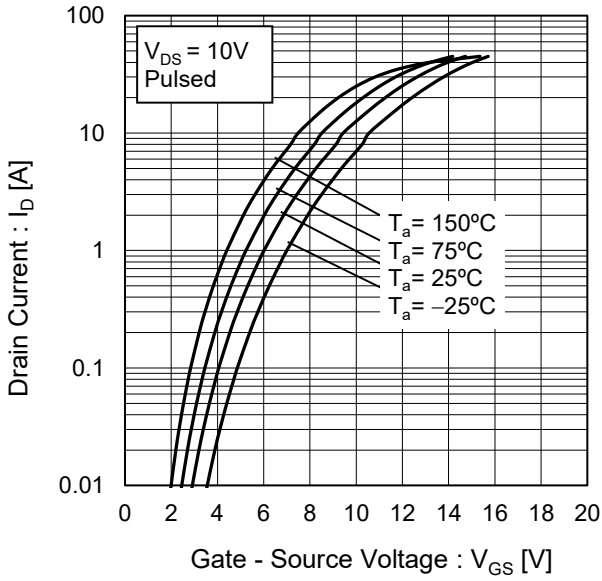


Fig.9 Typical Transfer Characteristics (II)

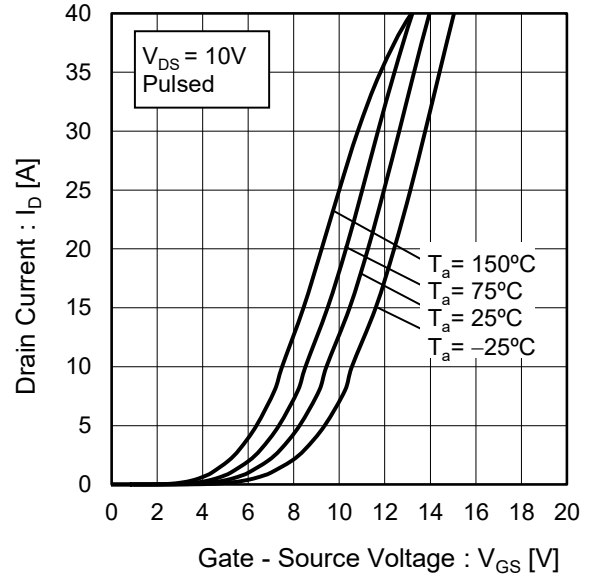


Fig.10 Gate Threshold Voltage vs. Junction Temperature

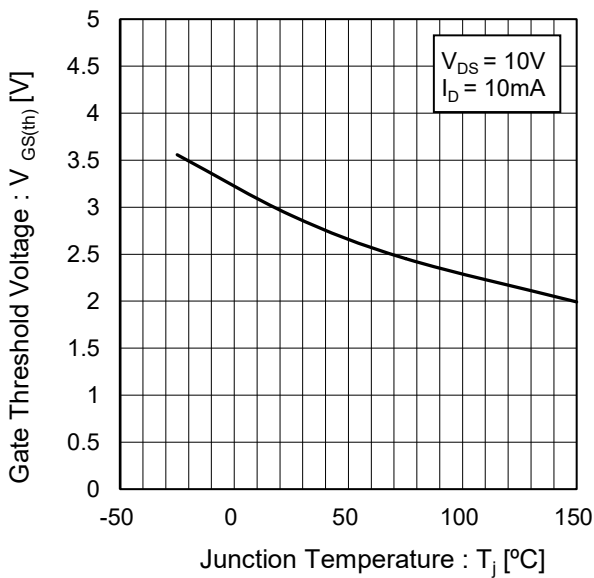
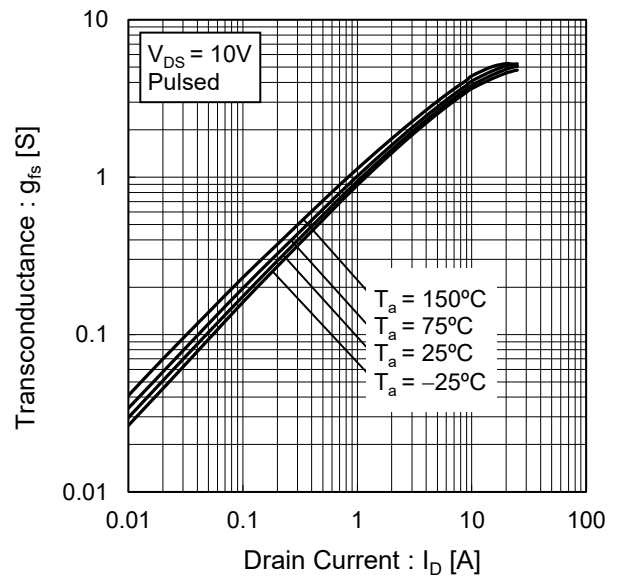


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

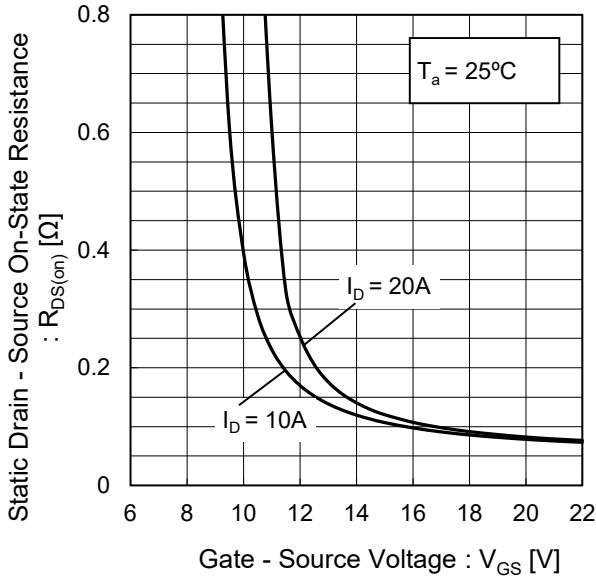


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

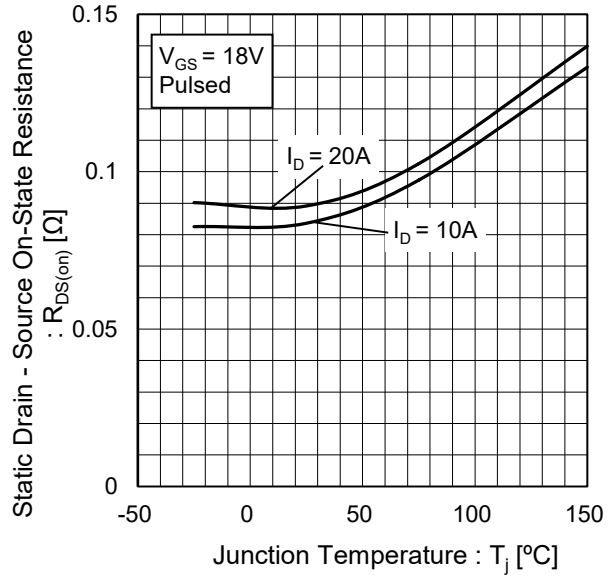
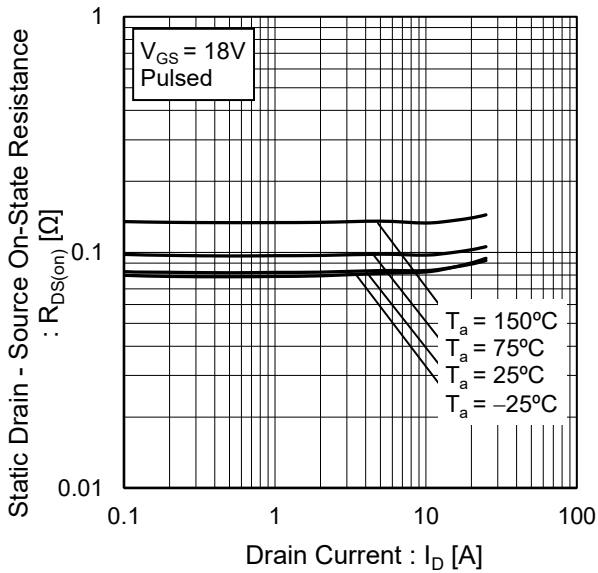


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current





●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

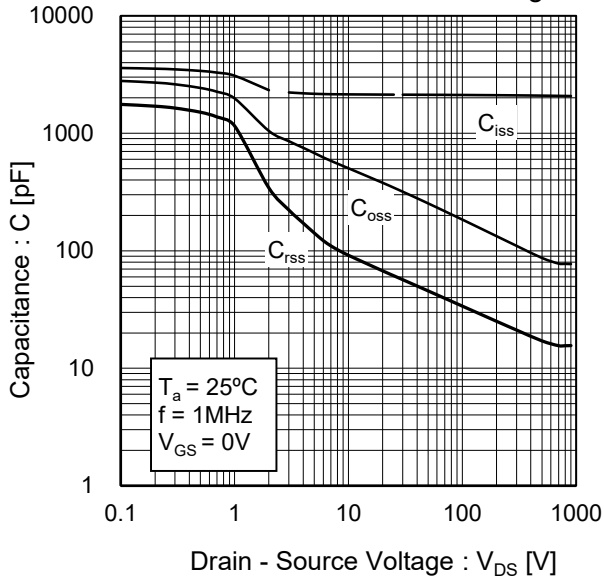


Fig.16 C<sub>oss</sub> Stored Energy

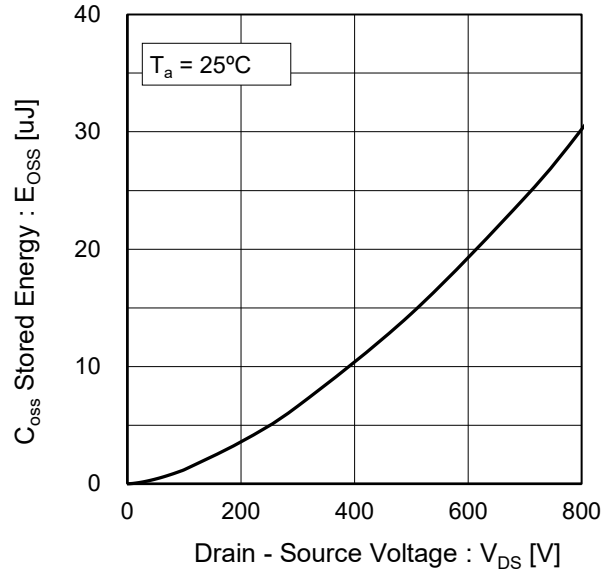


Fig.17 Switching Characteristics

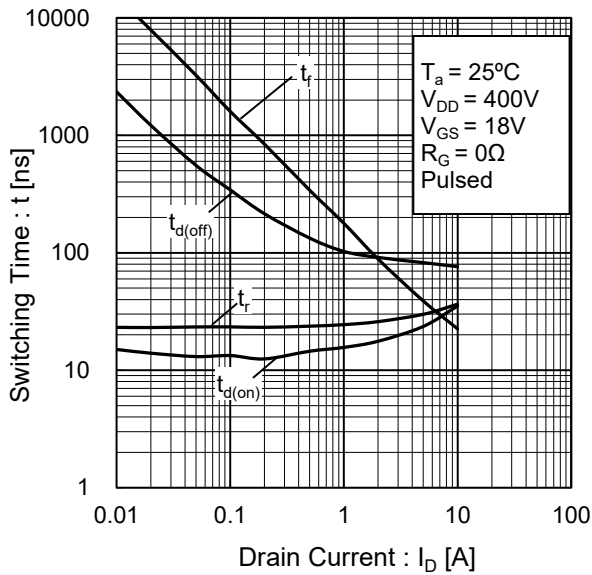
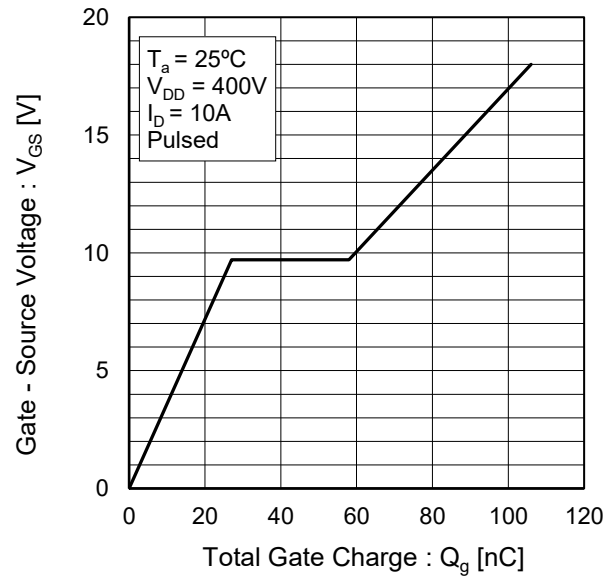


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

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

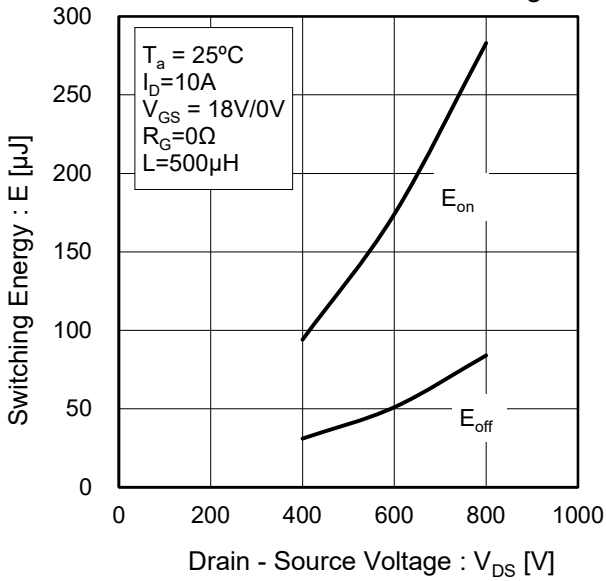


Fig.20 Typical Switching Loss vs. Drain Current

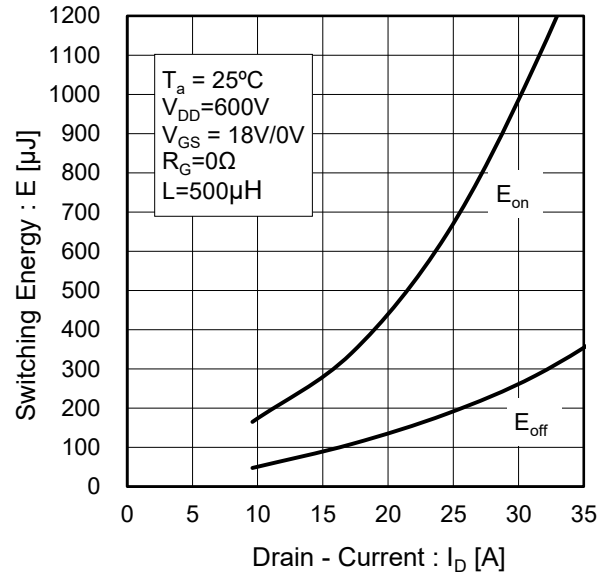
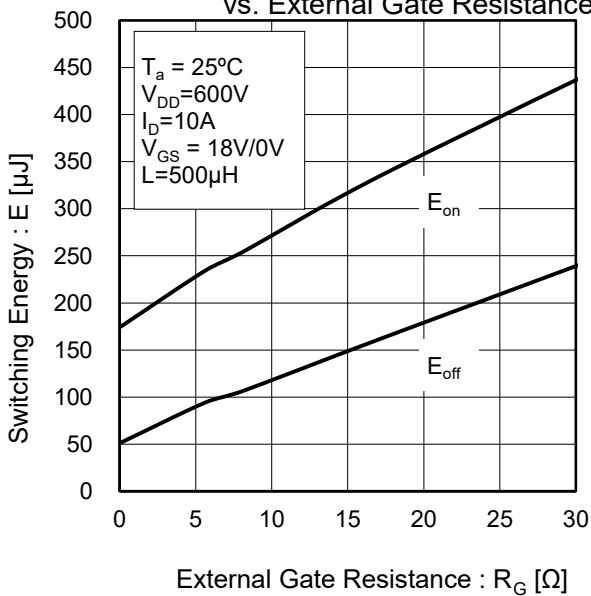


Fig.21 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

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

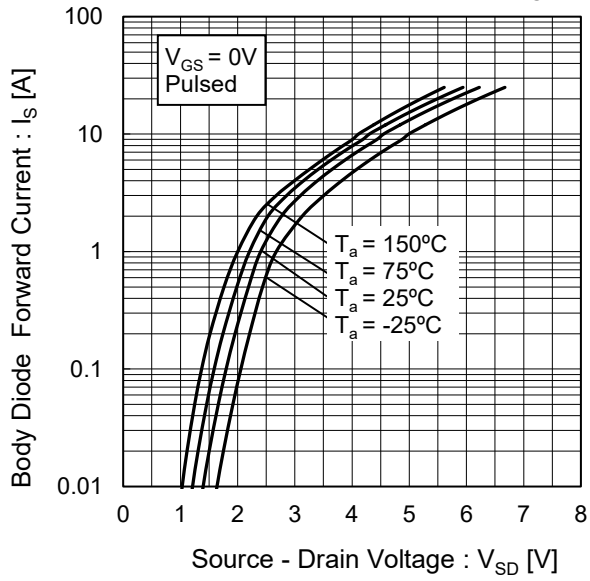
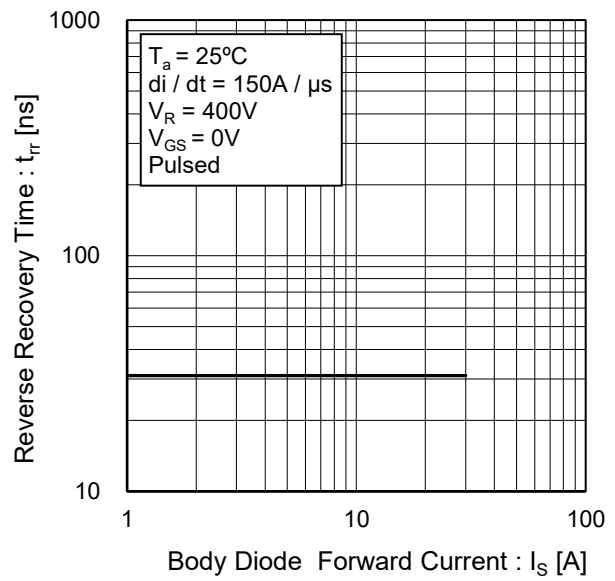


Fig.23 Reverse Recovery Time vs. Body Diode Forward Current



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

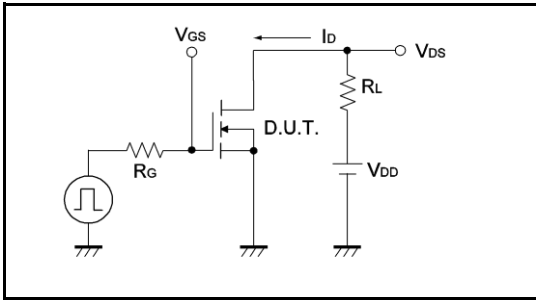


Fig.1-2 Switching Waveforms

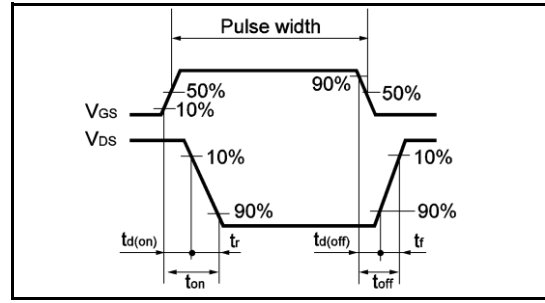


Fig.2-1 Gate Charge Measurement Circuit

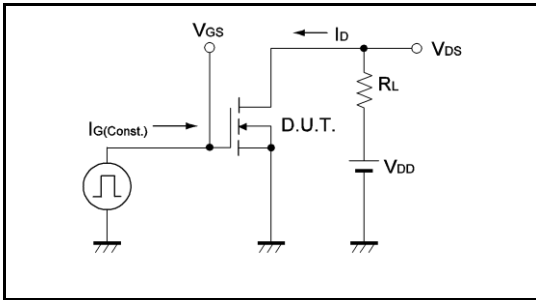


Fig.2-2 Gate Charge Waveform

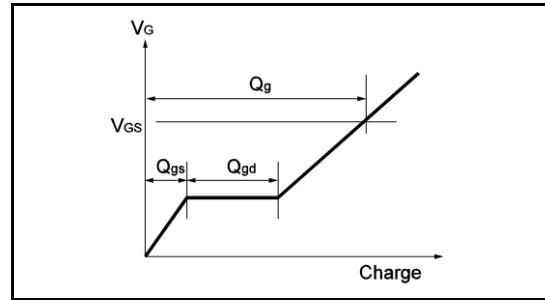


Fig.3-1 Switching Energy Measurement Circuit

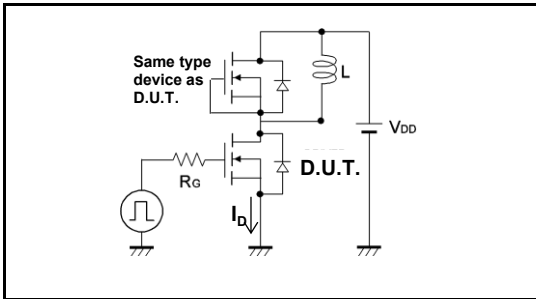


Fig.3-2 Switching Waveforms

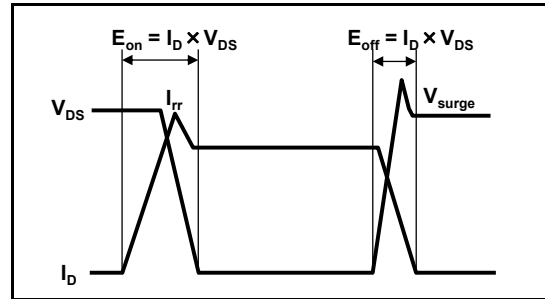


Fig.4-1 Reverse Recovery Time Measurement Circuit

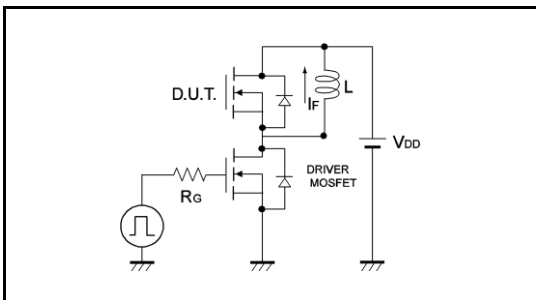
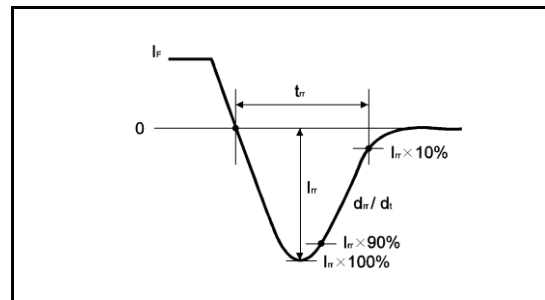


Fig.4-2 Reverse Recovery Waveform



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