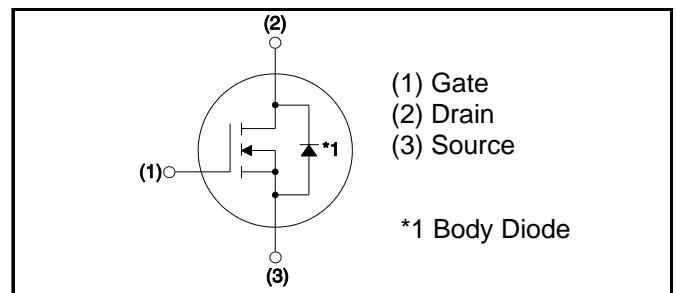


$V_{DSS}$	650V
$R_{DS(on)}$ (Typ.)	17m $\Omega$
$I_D$	118A <sup>*1</sup>

### ●Features

- 1) Low on-resistance
- 2) Fast switching speed
- 3) Fast reverse recovery
- 4) Easy to parallel
- 5) Simple to drive

### ●Inner circuit



### ●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	$I_D$ <sup>*1</sup>	118	A
Pulsed drain current	$I_{D,pulse}$ <sup>*2</sup>	295	A
Gate - Source voltage (DC)	$V_{GSS}$	-4 to +22	V
Gate-Source Surge Voltage ( $t_{surge} < 300\text{nsec}$ )	$V_{GSS,surge}$ <sup>*3</sup>	-4 to +26	V
Recommended Drive Voltage	$V_{GS,op}$ <sup>*4</sup>	0 / +18	V
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	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	650	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 650V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	-	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	$I_{GSS-}$	$V_{GS} = -4V, V_{DS} = 0V$	-	-	-100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 23.5mA$	2.7	-	5.6	V
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 18V, I_D = 47A$ $T_j = 25^\circ\text{C}$	-	17	21.3	$m\Omega$
		$T_j = 125^\circ\text{C}$	-	22.4	-	
Gate input resistance	$R_G$	$f = 1MHz, \text{open drain}$	-	4	-	$\Omega$

**●Electrical characteristics (T<sub>a</sub> = 25°C)**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	$g_{fs}^{*5}$	$V_{DS} = 10V, I_D = 47A$	-	16	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0V$	-	2884	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = 500V$	-	148	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1MHz$	-	65	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0V$ $V_{DS} = 0V \text{ to } 300V$	-	397	-	pF
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} = 300V, I_D = 18A$	-	30	-	ns
Rise time	$t_r^{*5}$	$V_{GS} = 18V/0V$	-	44	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 17\Omega$	-	64	-	
Fall time	$t_f^{*5}$	$R_G = 0\Omega$	-	31	-	
Turn - on switching loss	$E_{on}^{*5}$	$V_{DD} = 300V, I_D = 47A$ $V_{GS} = 18V/0V$ $R_G = 0\Omega, L = 250\mu H$	-	369	-	$\mu J$
Turn - off switching loss	$E_{off}^{*5}$	* $E_{on}$ includes diode reverse recovery	-	156	-	

**●Gate Charge characteristics (T<sub>a</sub> = 25°C)**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_g^{*5}$	$V_{DD} = 300V$	-	172	-	nC
Gate - Source charge	$Q_{gs}^{*5}$	$I_D = 47A$	-	40	-	
Gate - Drain charge	$Q_{gd}^{*5}$	$V_{GS} = 18V$	-	70	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 300V, I_D = 47A$	-	9.6	-	V

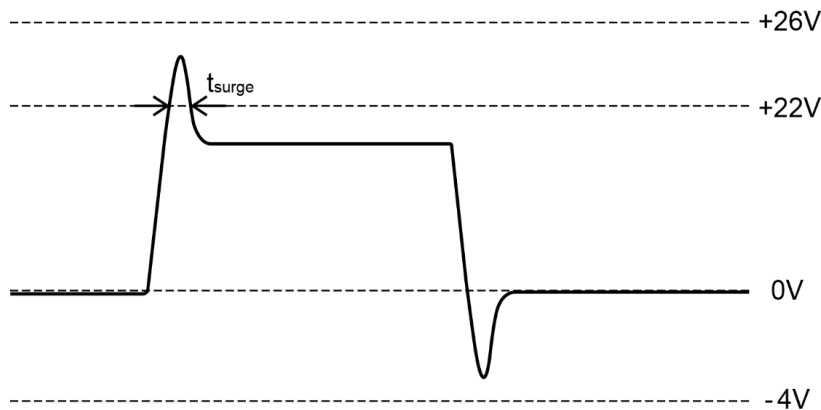
**●Body diode electrical characteristics (Source-Drain) ( $T_a = 25^\circ\text{C}$ )**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	$I_S^{*1}$	$T_c = 25^\circ\text{C}$	-	-	118	A
Inverse diode direct current, pulsed	$I_{SM}^{*2}$		-	-	295	A
Forward voltage	$V_{SD}^{*5}$	$V_{GS} = 0\text{V}, I_S = 47\text{A}$	-	3.2	-	V
Reverse recovery time	$t_{rr}^{*5}$	$I_F = 47\text{A}, V_R = 300\text{V}$ $di/dt = 1100\text{A}/\mu\text{s}$	-	31	-	ns
Reverse recovery charge	$Q_{rr}^{*5}$		-	206	-	nC
Peak reverse recovery current	$I_{rrm}^{*5}$		-	13	-	A

\*1 For  $T_j=175^\circ\text{C}$  and thermal dissipation to ambience of 427W or more.  
Limited only by maximum temperature allowed.

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

\*3 Example of acceptable  $V_{gs}$  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 Typical Output Characteristics(I)

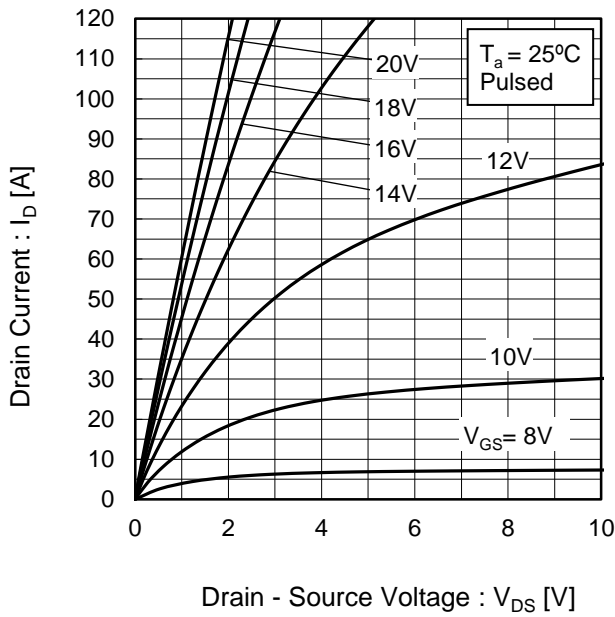


Fig.2 Typical Output Characteristics(II)

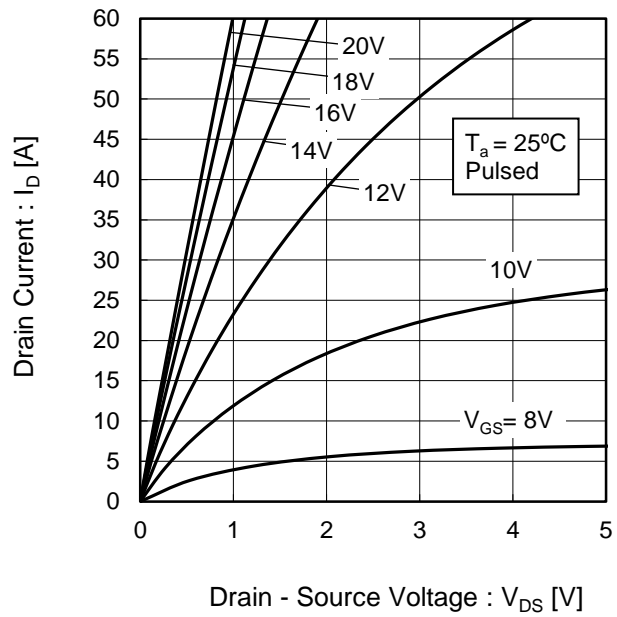


Fig.3  $T_j = 150^\circ\text{C}$  Typical Output Characteristics(I)

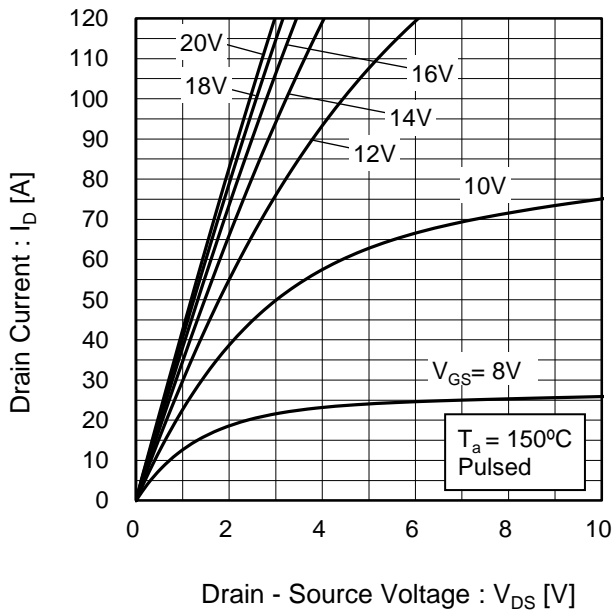
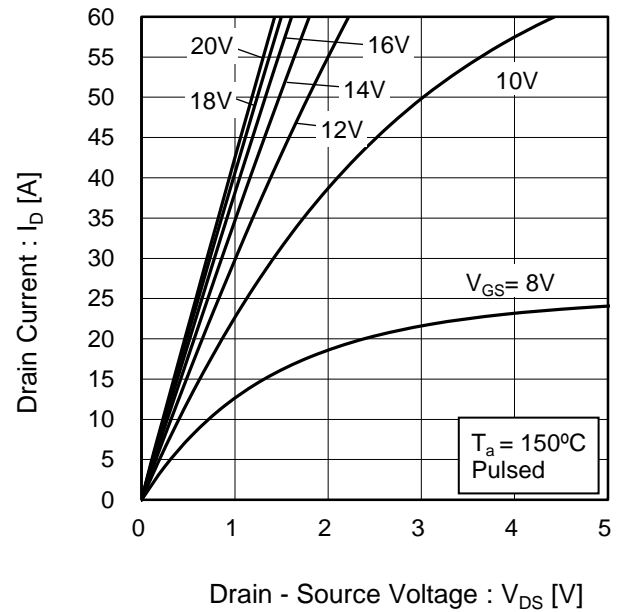


Fig.4  $T_j = 150^\circ\text{C}$  Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.5 Typical Transfer Characteristics (I)

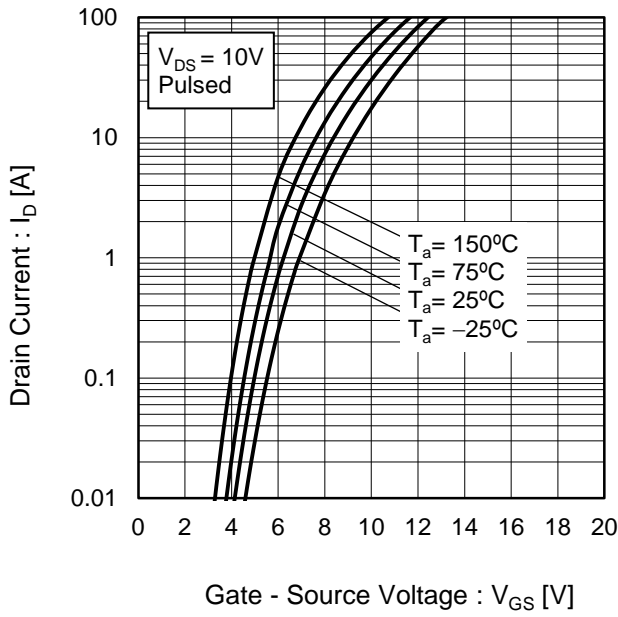


Fig.6 Typical Transfer Characteristics (II)

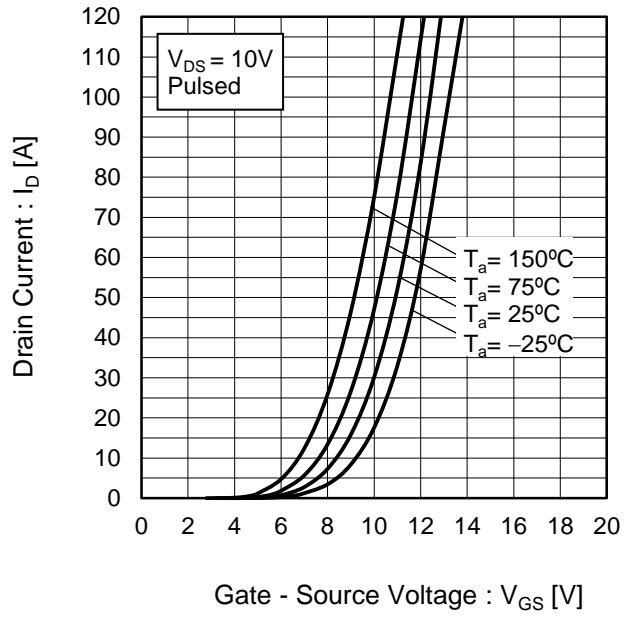


Fig.7 Gate Threshold Voltage vs. Junction Temperature

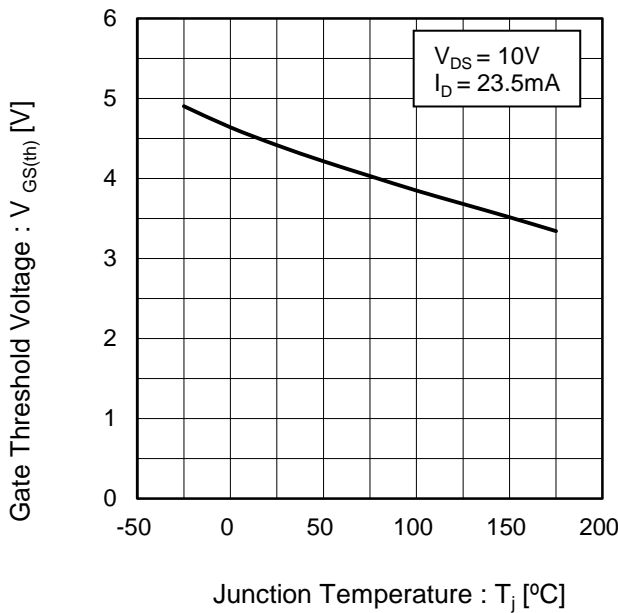
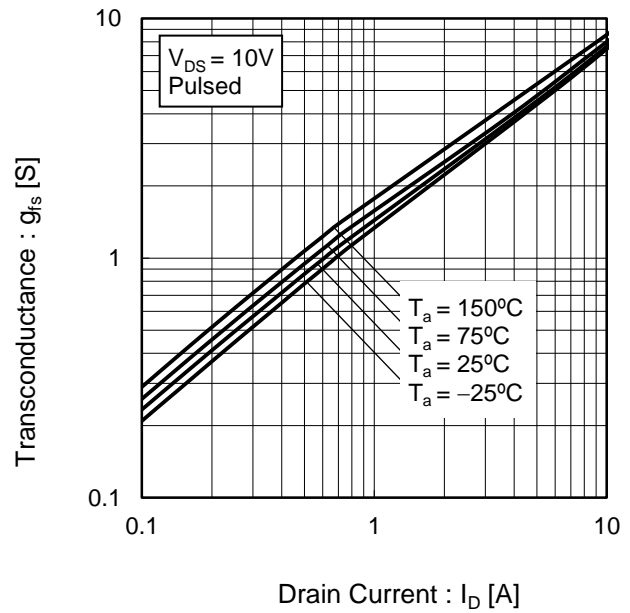


Fig.8 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.9 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

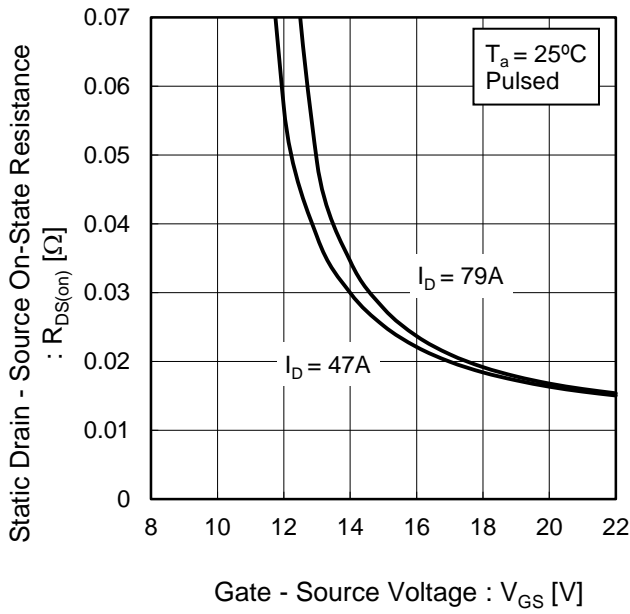


Fig.10 Static Drain - Source On - State Resistance vs. Junction Temperature

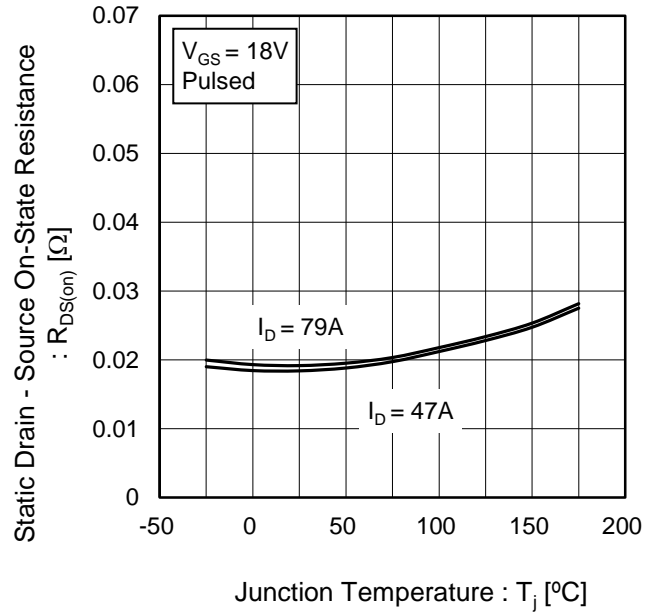
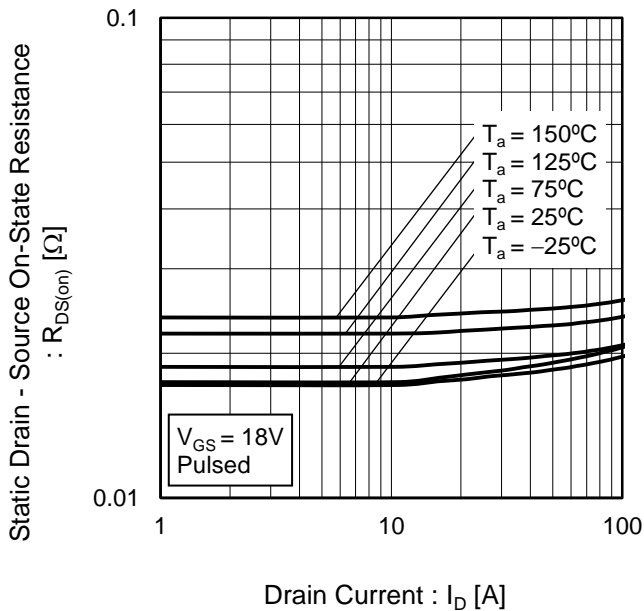


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.12 Typical Capacitance vs. Drain - Source Voltage

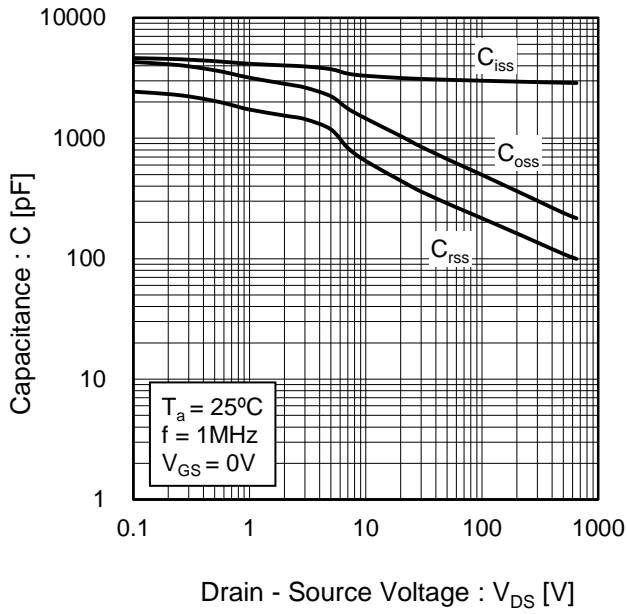


Fig.13 Coss Stored Energy

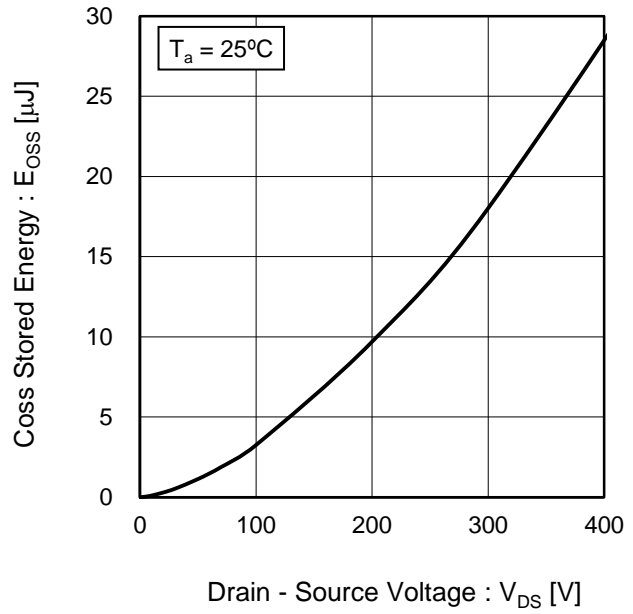


Fig.14 Switching Characteristics

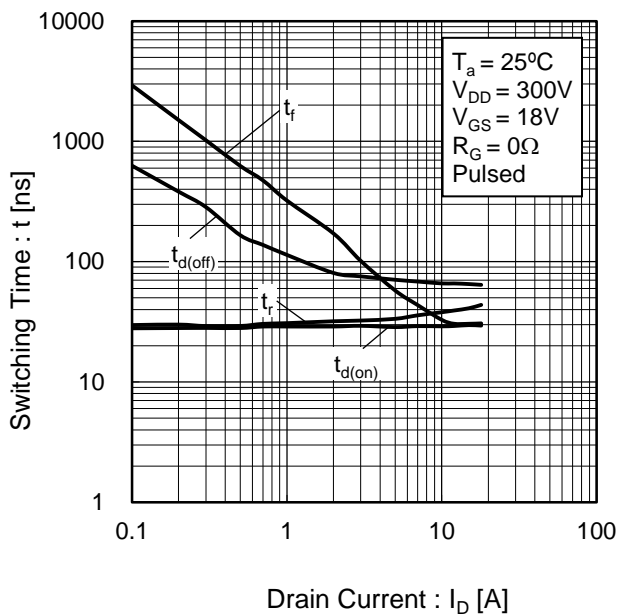
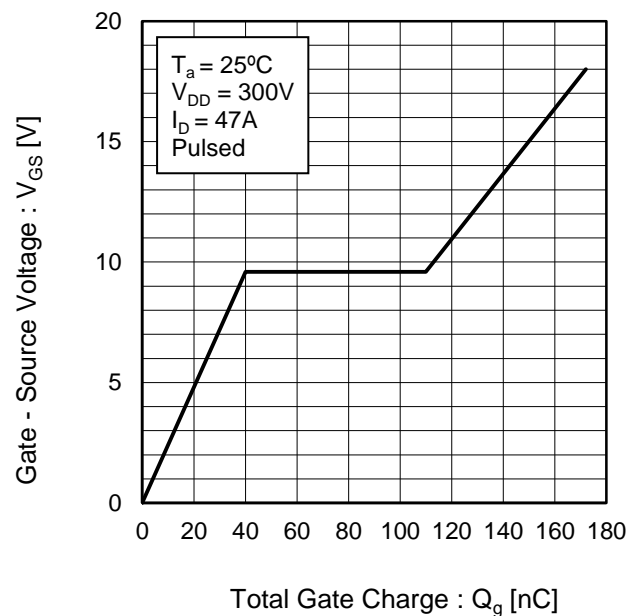


Fig.15 Dynamic Input Characteristics





● Electrical characteristic curves

Fig.16 Typical Switching Loss vs. Drain - Source Voltage

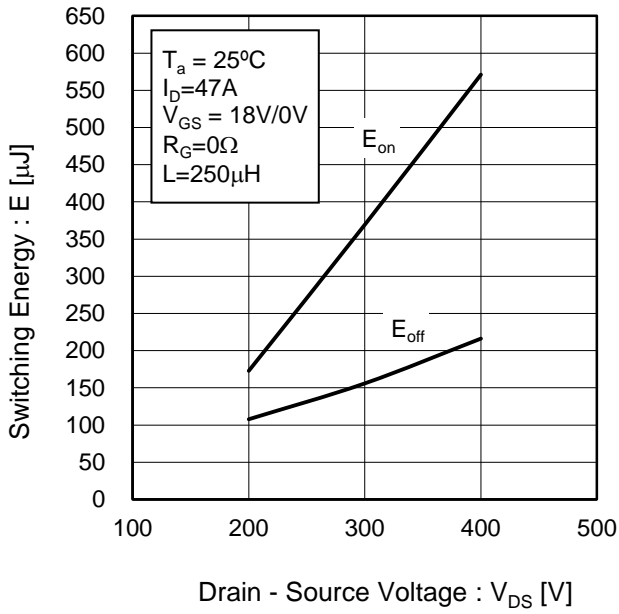


Fig.17 Typical Switching Loss vs. Drain Current

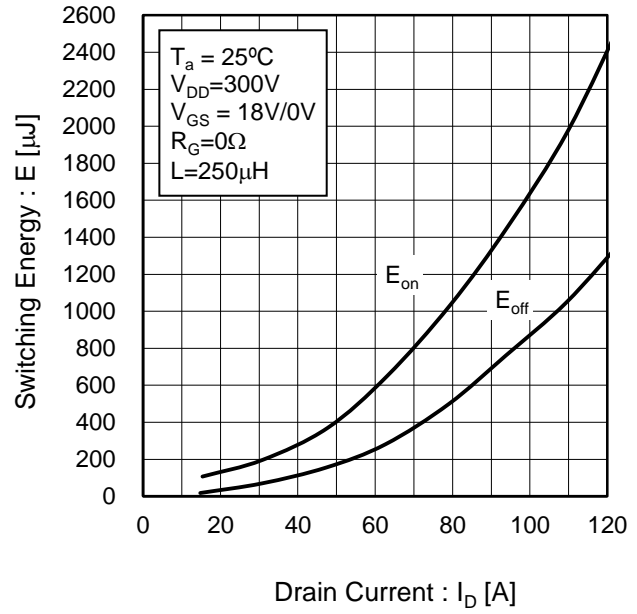
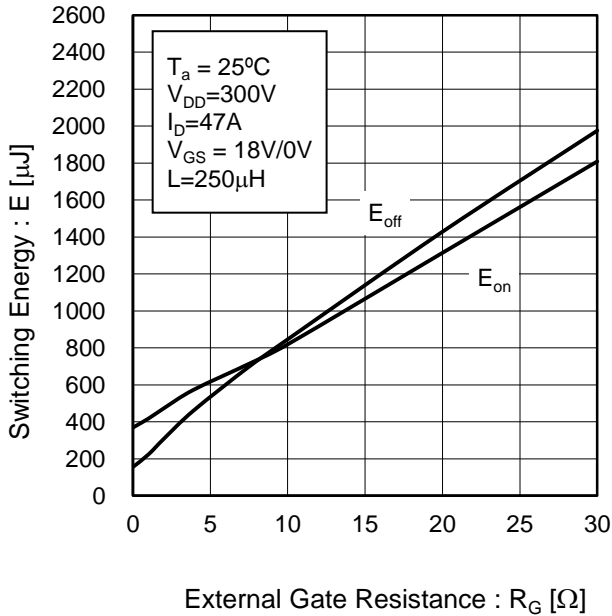


Fig.18 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

Fig.19 Inverse Diode Forward Current vs. Source - Drain Voltage

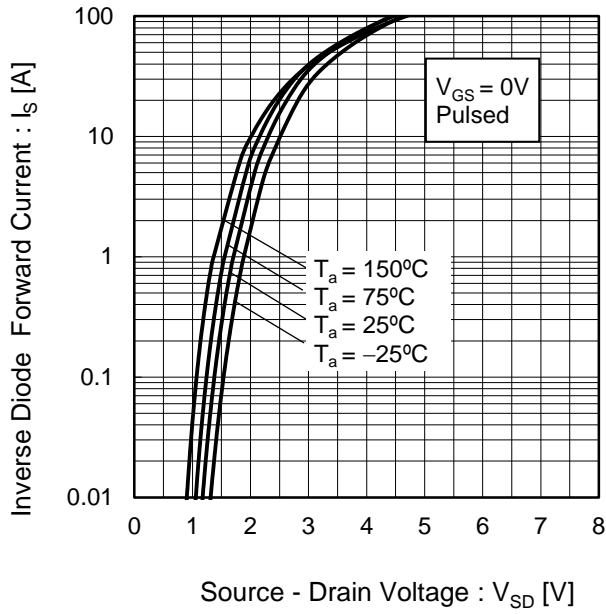
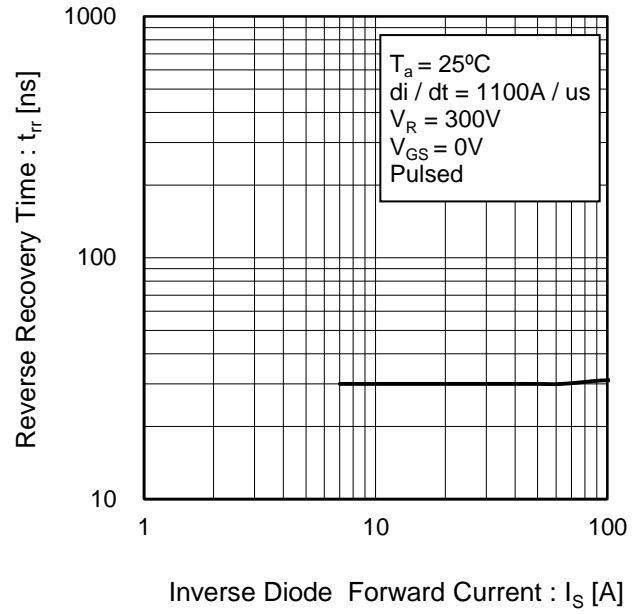


Fig.20 Reverse Recovery Time vs. Inverse Diode Forward Current



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

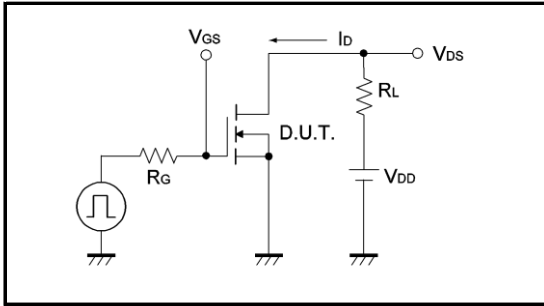


Fig.1-2 Switching Waveforms

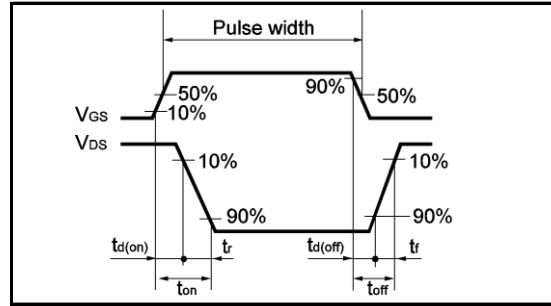


Fig.2-1 Gate Charge Measurement Circuit

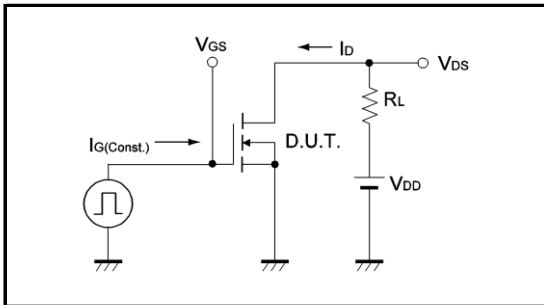


Fig.2-2 Gate Charge Waveform

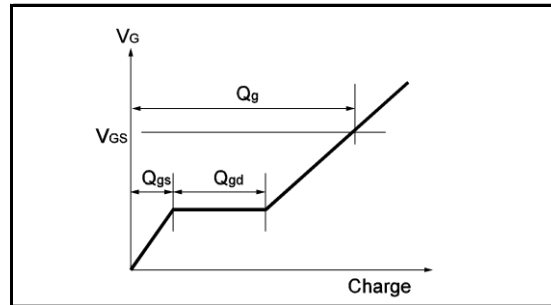


Fig.3-1 Switching Energy Measurement Circuit

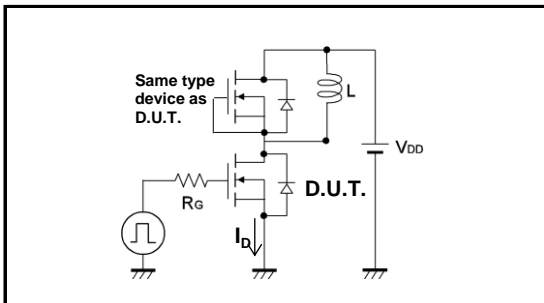


Fig.3-2 Switching Waveforms

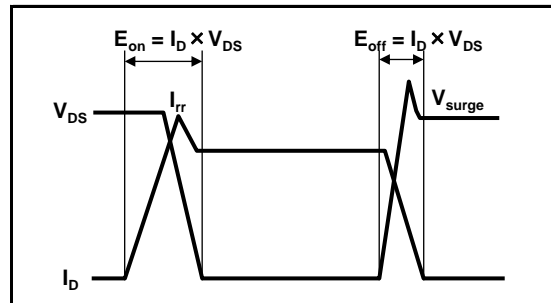


Fig.4-1 Reverse Recovery Time Measurement Circuit

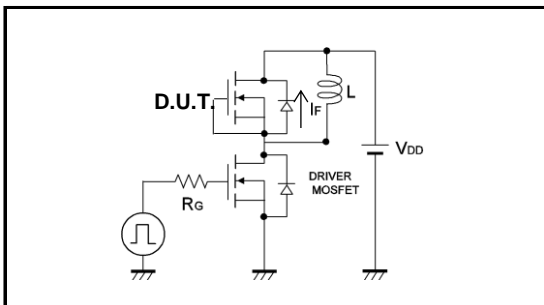
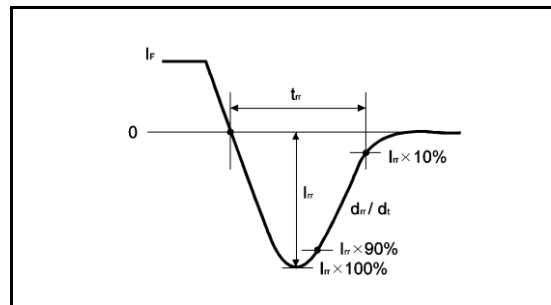


Fig.4-2 Reverse Recovery Waveform



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