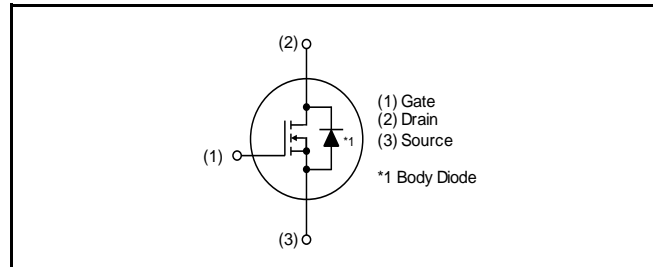


$V_{DSS}$	750V
$R_{DS(on)}$ (Typ.)	45mΩ
$I_D^{*1}$	34A

### ● 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 ( $T_{vj} = 25^\circ\text{C}$ unless otherwise specified)

Parameter			Symbol	Value	Unit
Drain - source voltage			$V_{DSS}$	750	V
Continuous drain and source current	$V_{GS} = V_{GS\_on}$	$T_c = 25^{\circ}C$	$I_D, I_S^{*1}$	34	A
		$T_c = 100^{\circ}C$		24	A
Pulsed drain current	$V_{GS} = V_{GS\_on}$	$T_c = 25^{\circ}C$	$I_{D,pulse}^{*2}$	61	A
Body diode pulsed forward current		$V_{GS} = 0\text{ V}$ $T_c = 25^{\circ}C$	$I_{S,pulse}^{*1,*3}$	34	A
Body diode surge forward current			$I_{S,pulse}^{*1,*4}$	61	A
Gate - source voltage (DC)			$V_{GSS}$	-4 to +21	V
Gate - source surge voltage ( $t_{surge} < 300ns$ )			$V_{GSS\_surge}^{*5}$	-4 to +23	V
Recommended turn-on gate - source drive voltage			$V_{GS\_on}^{*6}$	+15 to +18	V
Recommended turn-off gate - source drive voltage			$V_{GS\_off}$	0	V
Virtual junction temperature			$T_{vj}$	175	$^{\circ}C$
Range of storage temperature			$T_{stg}$	-40 to +175	$^{\circ}C$

●Electrical characteristics ( $T_{vj} = 25^{\circ}\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$ , $I_D = 5.3\text{mA}$ $T_{vj} = 25^{\circ}\text{C}$	750	-	-	V
Zero Gate voltage Drain current	$I_{DSS}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 750\text{V}$ $T_{vj} = 25^{\circ}\text{C}$	-	1	80	$\mu\text{A}$
		$T_{vj} = 150^{\circ}\text{C}$	-	10	-	
Gate - Source leakage current	$I_{GSS+}$	$V_{GS} = +21\text{V}$ , $V_{DS} = 0\text{V}$	-	-	100	nA
Gate - Source leakage current	$I_{GSS-}$	$V_{GS} = -4\text{V}$ , $V_{DS} = 0\text{V}$	-	-	-100	nA
Gate threshold voltage	$V_{GS(th)}^{*7}$	$V_{DS} = 10\text{V}$ , $I_D = 8.89\text{mA}$	2.8	-	4.8	V
Static Drain - Source on - state resistance	$R_{DS(on)}^{*8}$	$V_{GS} = 18\text{V}$ , $I_D = 17\text{A}$ $T_{vj} = 25^{\circ}\text{C}$	-	45	57	$\text{m}\Omega$
		$T_{vj} = 150^{\circ}\text{C}$	-	77	-	
Gate input resistance	$R_G$	$f = 1\text{MHz}$ , open drain	-	4	-	$\Omega$

●Electrical characteristics ( $T_{vj} = 25^{\circ}\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	$g_{fs}^{*8}$	$V_{DS} = 10\text{V}, I_D = 17\text{A}$	-	9.4	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0\text{V}$	-	1460	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = 500\text{V}$	-	69	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1\text{MHz}$	-	5	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}$ $V_{DS} = 0\text{V to } 500\text{V}$	-	90	-	pF
Total Gate charge	$Q_g^{*8}$	$V_{DS} = 500\text{V}$ $I_D = 17\text{A}$	-	63	-	nC
Gate - Source charge	$Q_{gs}^{*8}$	$V_{GS} = 18\text{V}$	-	14	-	
Gate - Drain charge	$Q_{gd}^{*8}$	See Fig. 1-1, 1-2.	-	19	-	
Turn - on delay time	$t_{d(on)}^{*8}$	$V_{DS} = 500\text{V}$ $I_D = 17\text{A}$	-	5.1	-	ns
Rise time	$t_r^{*8}$	$V_{GS} = +18\text{V} / 0\text{V}$	-	16	-	
Turn - off delay time	$t_{d(off)}^{*8}$	$R_G = 3.3\Omega, L = 250\mu\text{H}$ $E_{on}$ includes diode reverse recovery	-	27	-	
Fall time	$t_f^{*8}$	$L_\sigma = 50\text{nH}, C_\sigma = 10\text{pF}$ See Fig. 2-1, 2-2, 2-3.	-	10	-	
Turn - on switching loss	$E_{on}^{*8}$		-	112	-	$\mu\text{J}$
Turn - off switching loss	$E_{off}^{*8}$		-	17	-	

**●Body diode electrical characteristics (Source-Drain) ( $T_{vj} = 25^{\circ}\text{C}$  unless otherwise specified)**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Forward voltage	$V_{SD}^{*8}$	$V_{GS} = 0\text{V}, I_D = 17\text{A}$	-	3.3	-	V
Reverse recovery time	$t_{rr}^{*8}$	$I_F = 17\text{A}$ $V_R = 500\text{V}$	-	9.3	-	ns
Reverse recovery charge	$Q_{rr}^{*8}$	$di/dt = 2900\text{A}/\mu\text{s}$	-	89	-	nC
Peak reverse recovery current	$I_{rrm}^{*8}$	$L_{\sigma} = 50\text{nH}, C_{\sigma} = 10\text{pF}$ See Fig. 3-1, 3-2.	-	19	-	A

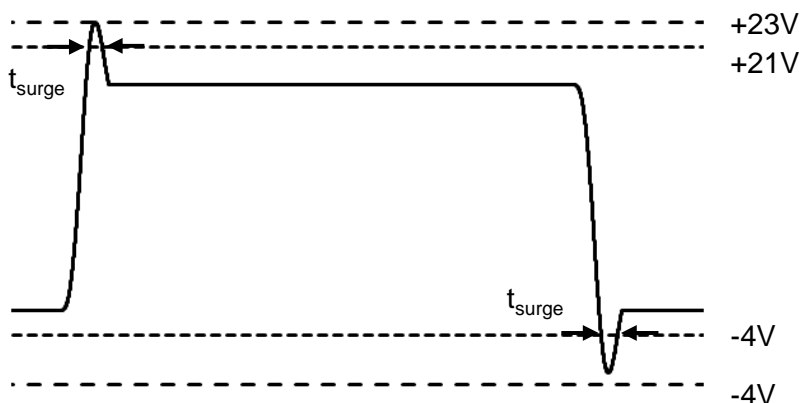
\*1 Limited by maximum  $T_{vj}$  and assumes  $R_{thJC} < 1.3\text{K/W}$ . The value is based on TO-247 package.

\*2 Pulse width and duty cycle are limited by  $T_{vj,max}$ . The value is based on TO-247 package.

\*3 Only for body-diode, Repetitive pulse,  $PW \leq 1.5\mu\text{s}$ , Duty cycle  $\leq 5\%$

\*4 When used as a protective function,  $PW \leq 10\mu\text{s}$

\*5 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.

\*6 Please be advised not to use SiC-MOSFETs with  $V_{GS}$  below 10V as doing so may cause thermal runaway.

\*7 Tested after applying  $V_{GS} = 21\text{V}$  for 100ms.

\*8 Pulsed

# ●Electrical characteristic curves

Fig.1  $T_{vj} = 25^{\circ}\text{C}$  Typical Output Characteristics(I)

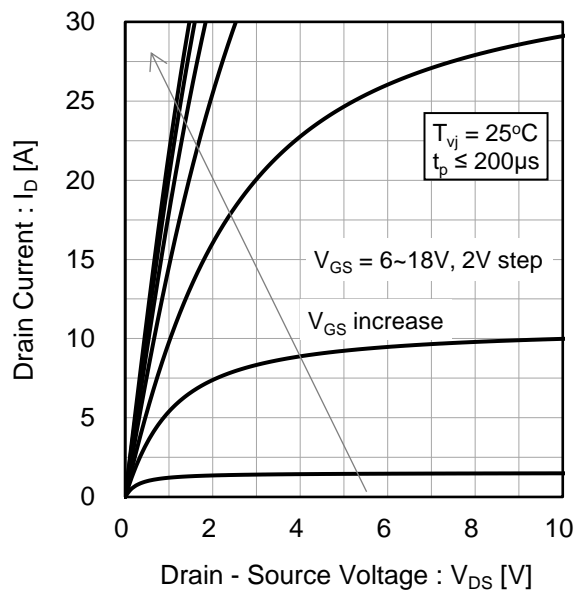


Fig.2  $T_{vj} = 25^{\circ}\text{C}$  Typical Output Characteristics(II)

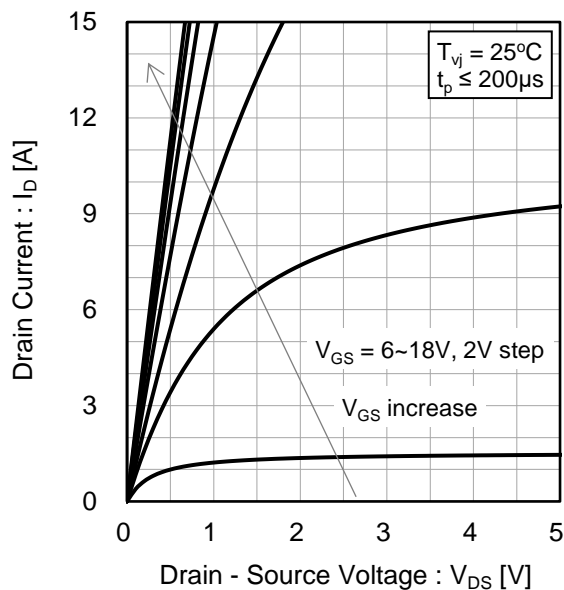
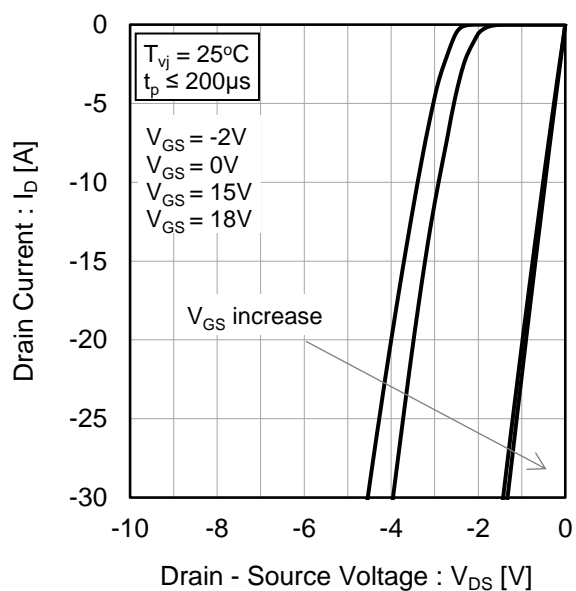


Fig.3  $T_{vj} = 25^{\circ}\text{C}$  3rd Quadrant Characteristics



# ●Electrical characteristic curves

Fig.4  $T_{vj} = 150^{\circ}\text{C}$  Typical Output Characteristics(I)

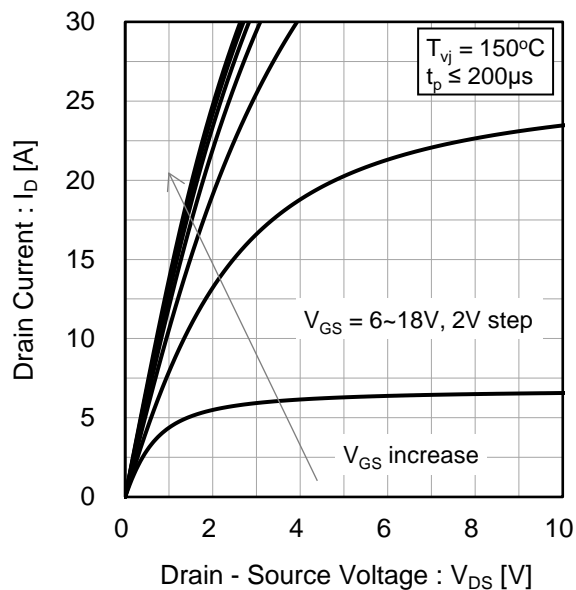


Fig.5  $T_{vj} = 150^{\circ}\text{C}$  Typical Output Characteristics(II)

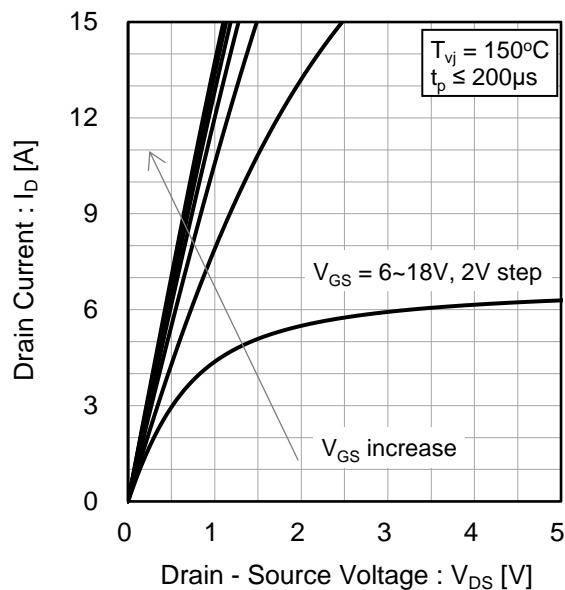


Fig.6  $T_{vj} = 150^{\circ}\text{C}$  3rd Quadrant Characteristics

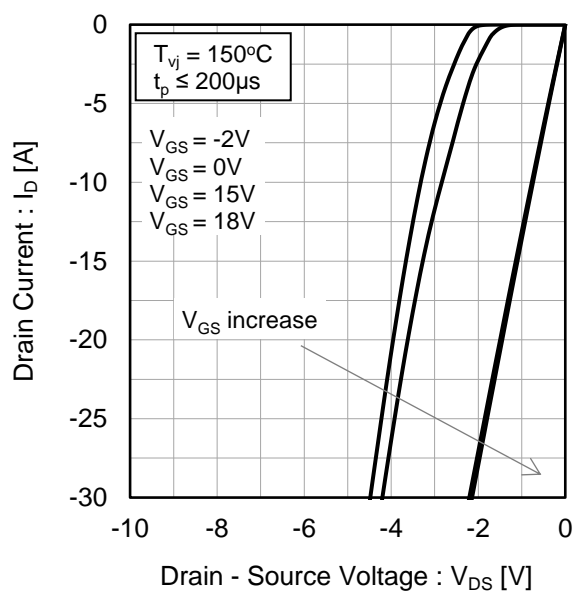
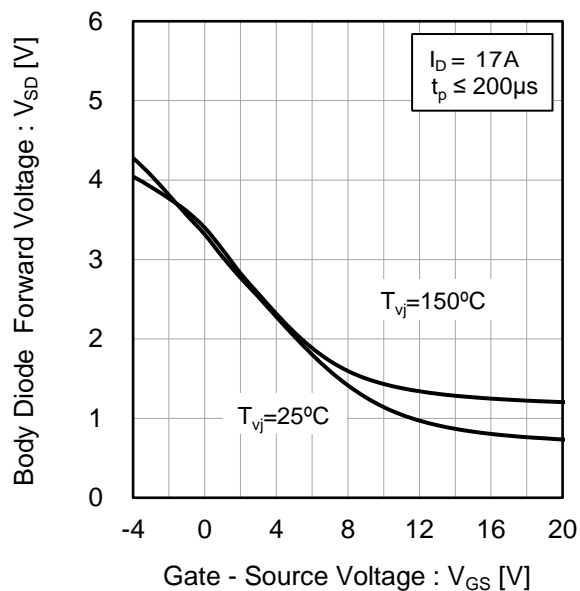


Fig.7 Body Diode Forward Voltage vs. Gate - Source Voltage



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics (I)

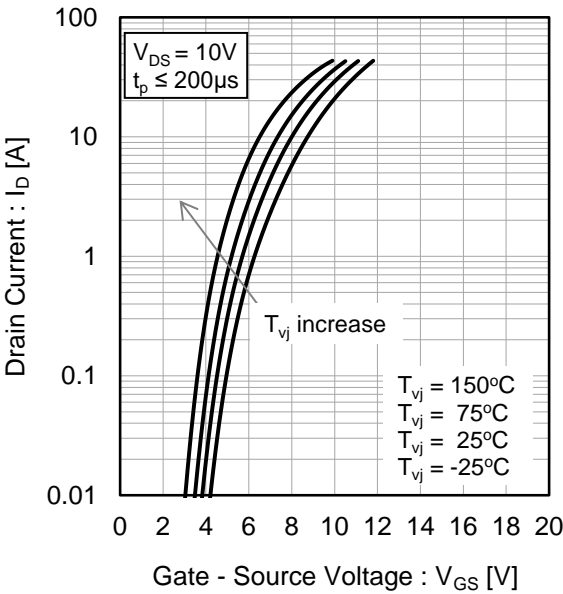


Fig.9 Typical Transfer Characteristics (II)

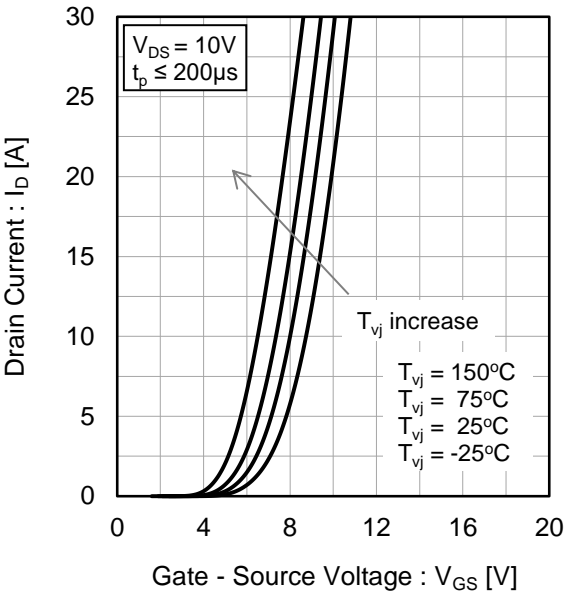


Fig.10 Gate Threshold Voltage vs. Junction Temperature

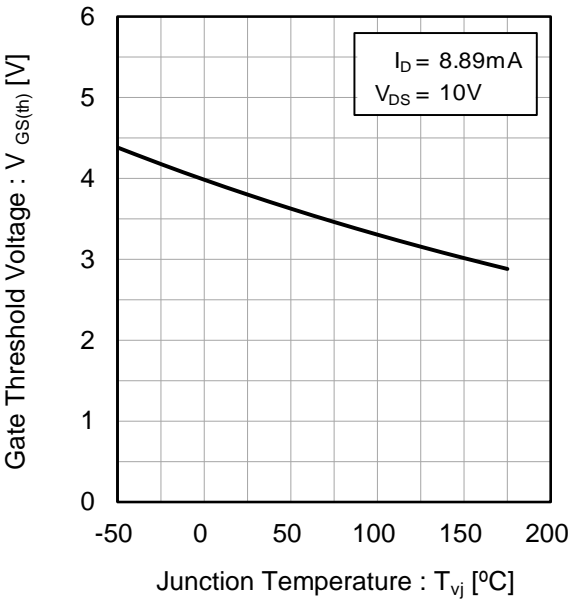
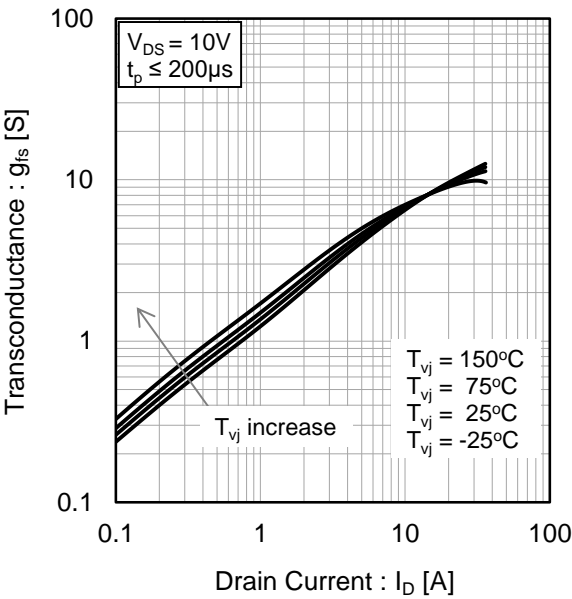


Fig.11 Transconductance vs. Drain Current



# ●Electrical characteristic curves

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

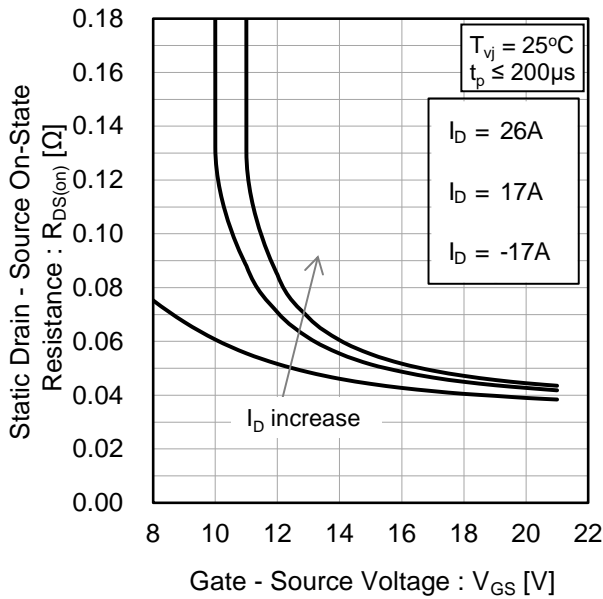


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

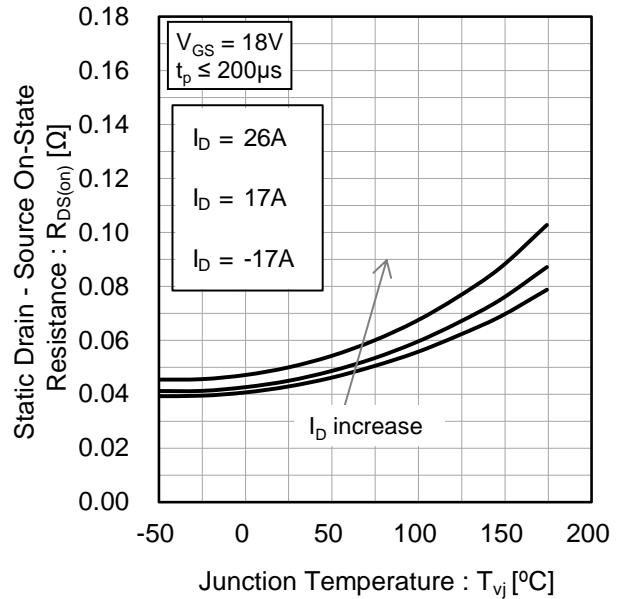


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current

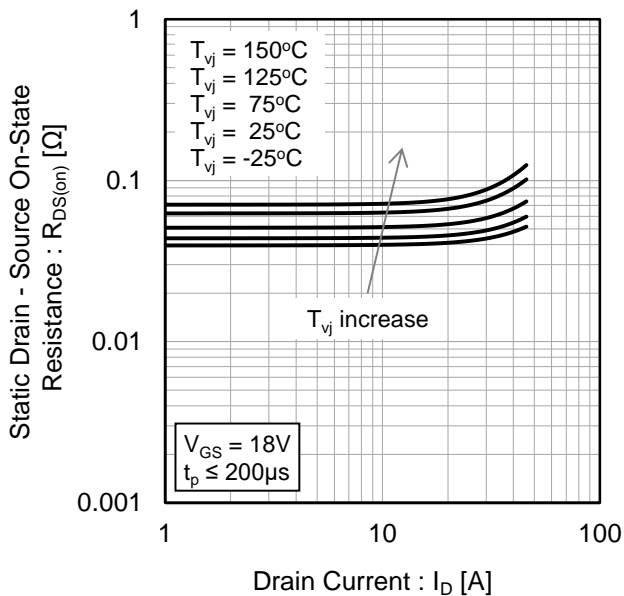
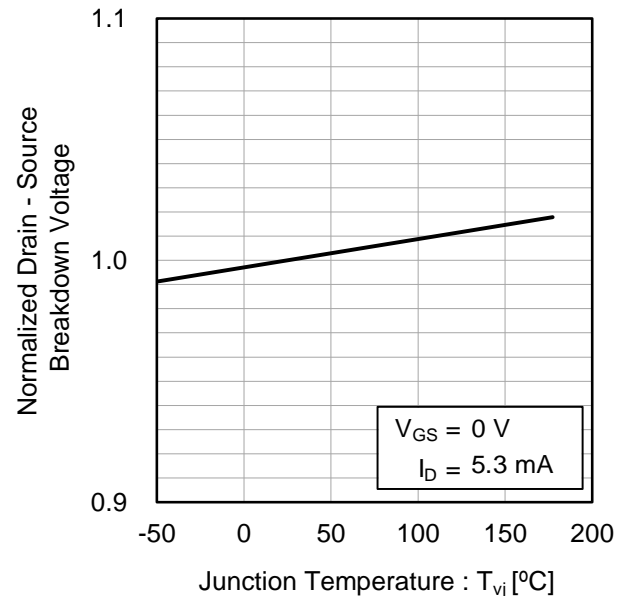


Fig.15 Normalized Drain - Source Breakdown Voltage vs. Junction Temperature





●Electrical characteristic curves

Fig.16 Typical Capacitance vs. Drain - Source Voltage

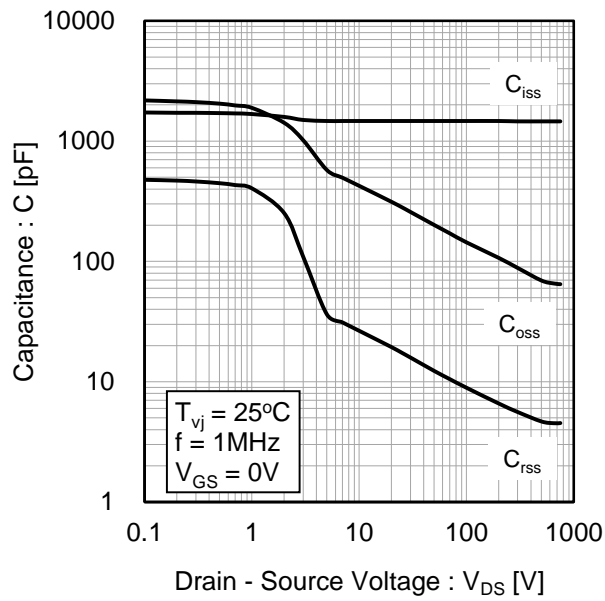


Fig.17  $C_{oss}$  Stored Energy

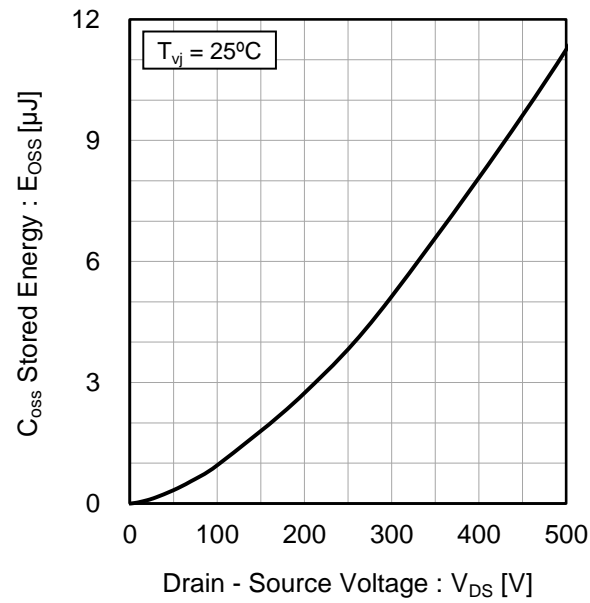
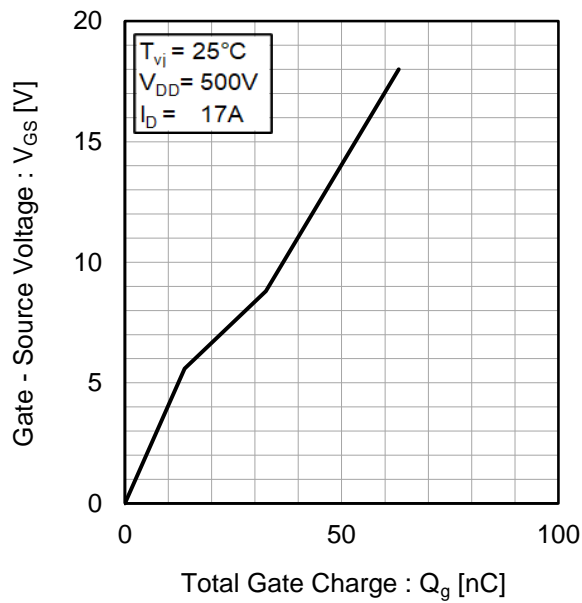


Fig.18 Dynamic Input Characteristics



# ●Electrical characteristic curves

Fig.19 Typical Switching Time  
vs. External Gate Resistance

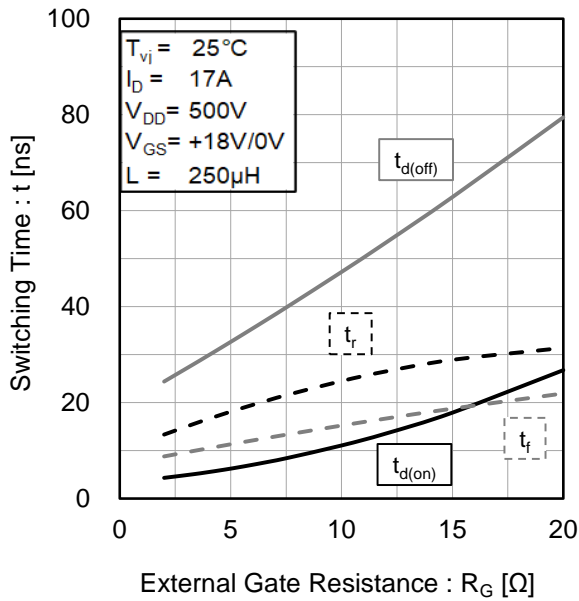


Fig.20 Typical Switching Loss  
vs. Drain - Source Voltage

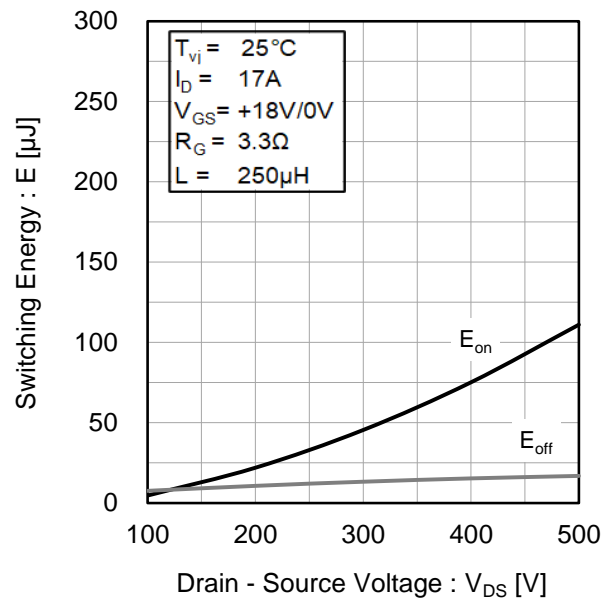


Fig.21 Typical Switching Loss  
vs. Drain Current

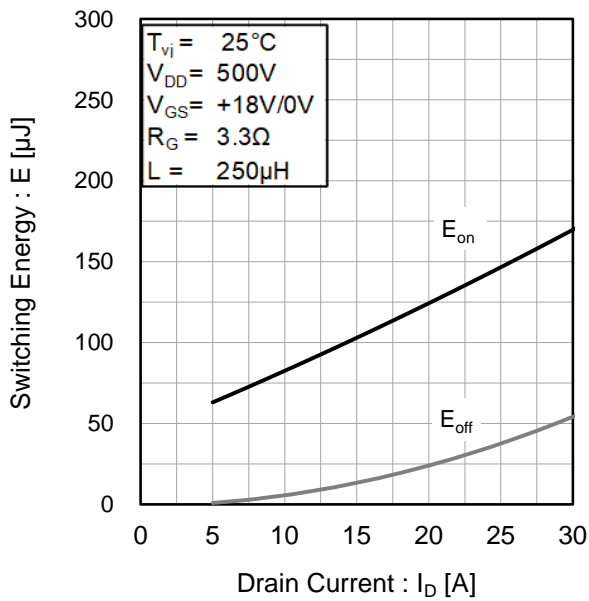
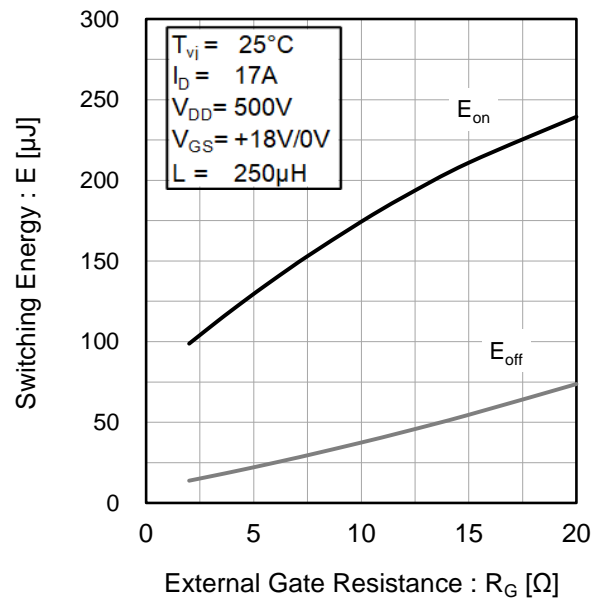


Fig.22 Typical Switching Loss  
vs. External Gate Resistance



## ●Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

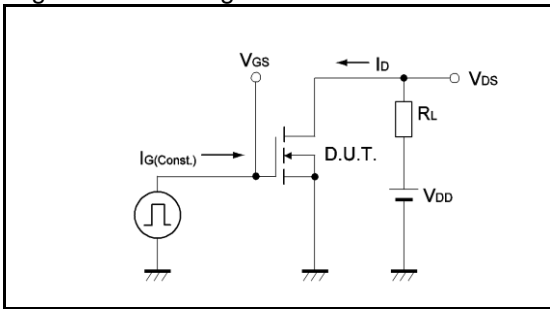


Fig.1-2 Gate Charge Waveform

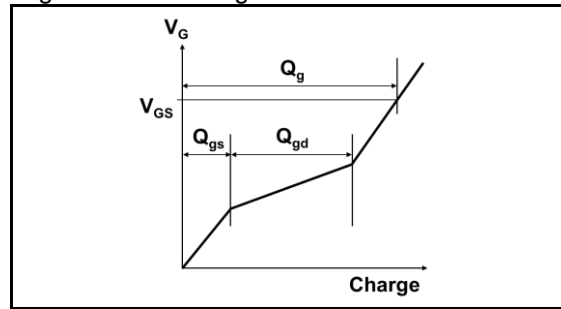


Fig.2-1 Switching Characteristics Measurement Circuit

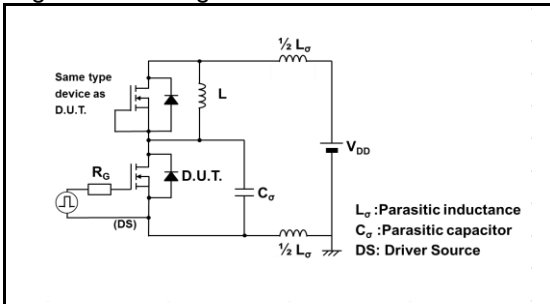


Fig.2-2 Waveforms for Switching Time

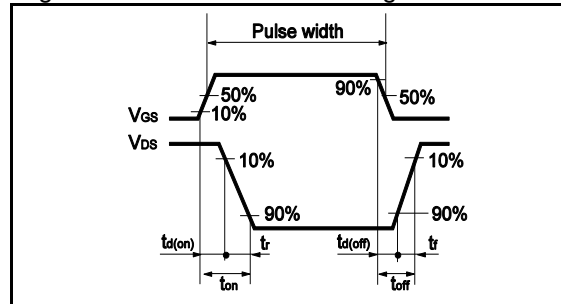


Fig.2-3 Waveforms for Switching Energy Loss

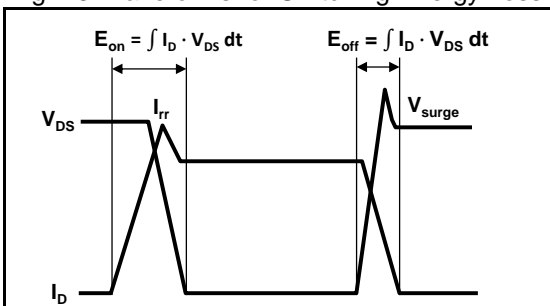


Fig.3-1 Reverse Recovery Time Measurement Circuit

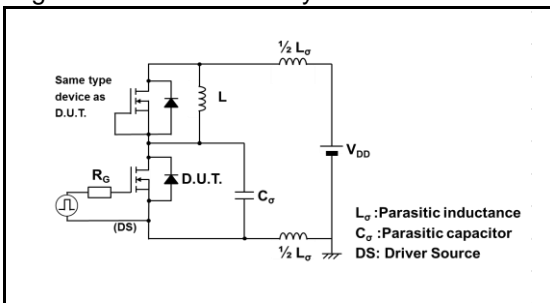
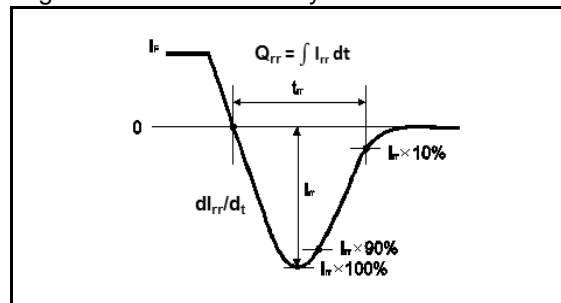


Fig.3-2 Reverse Recovery Waveform

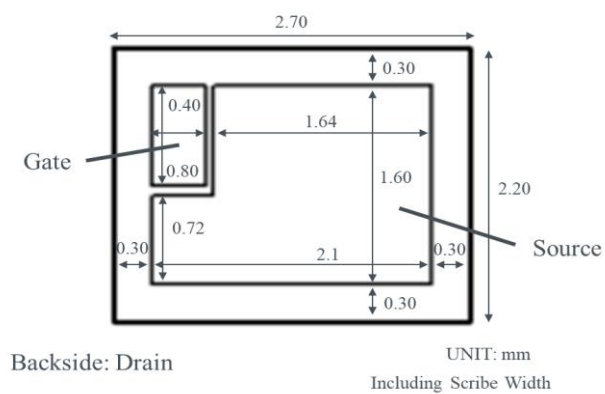


### ●Mechanical Parameters

Die Size	2.70 mm x 2.20 mm (Including Scribe Width)
Thickness	150 ± 15 μm
Source Pad Size	See Pad Layout.
Gate Pad Size	0.40 mm x 0.80 mm

Wafer Size	150 mm
Topside Metallization	AlCu
Backside Metallization	Ti-Ni(1.2μm)-Au(0.07μm)
Passivation	Polyimide

### ●Pad Layout



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