

$V_{DSS}$	650V
$R_{DS(on)}$ (Typ.)	60m $\Omega$
$I_D$	39A
$P_D$	165W

#### ●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

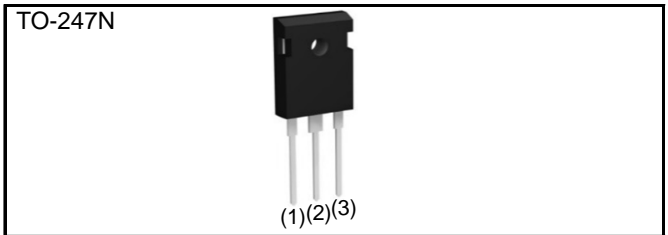
#### ●Application

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

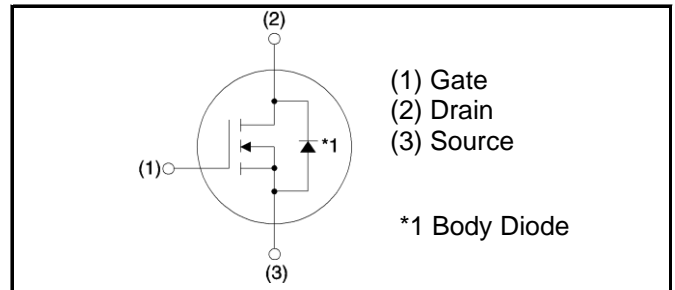
#### ●Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Value	Unit
Drain - Source voltage	$V_{DSS}$	650	V
Continuous drain current	$T_c = 25^\circ\text{C}$	$I_D^{*1}$ 39	A
	$T_c = 100^\circ\text{C}$	$I_D^{*1}$ 27	A
Pulsed drain current	$I_{D,pulse}^{*2}$	97	A
Gate - Source voltage (DC)	$V_{GSS}$	-4 to +22	V
Gate-Source Surge Voltage ( $t_{surge} < 300\text{nsec}$ )	$V_{GSS,surge}^{*3}$	-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



#### ●Packaging specifications

Type	Packing	Tube
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	30
	Taping code	C11
	Marking	SCT3060AL

### ● Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	$R_{thJC}$	-	0.70	0.91	°C/W

### ● 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	$V_{GS(th)}$	$V_{DS} = 10V, I_D = 6.67mA$	2.7	-	5.6	V
Static drain - source on - state resistance	$R_{DS(on)}^{*5}$	$V_{GS} = 18V, I_D = 13A$ $T_j = 25^\circ\text{C}$	-	60	78	$m\Omega$
		$T_j = 125^\circ\text{C}$	-	79.2	-	
Gate input resistance	$R_G$	$f = 1MHz, \text{open drain}$	-	12	-	$\Omega$

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	$g_{fs}^{*5}$	$V_{DS} = 10V, I_D = 13A$	-	4.9	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0V$	-	852	-	pF
Output capacitance	$C_{oss}$	$V_{DS} = 500V$	-	55	-	
Reverse transfer capacitance	$C_{rss}$	$f = 1MHz$	-	24	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0V$ $V_{DS} = 0V \text{ to } 300V$	-	126	-	pF
Turn - on delay time	$t_{d(on)}^{*5}$	$V_{DD} = 300V, I_D = 13A$	-	19	-	ns
Rise time	$t_r^{*5}$	$V_{GS} = 18V/0V$	-	37	-	
Turn - off delay time	$t_{d(off)}^{*5}$	$R_L = 23\Omega$	-	34	-	
Fall time	$t_f^{*5}$	$R_G = 0\Omega$	-	21	-	
Turn - on switching loss	$E_{on}^{*5}$	$V_{DD} = 300V, I_D = 13A$ $V_{GS} = 18V/0V$ $R_G = 0\Omega, L = 500\mu H$	-	70	-	$\mu J$
Turn - off switching loss	$E_{off}^{*5}$	* $E_{on}$ includes diode reverse recovery	-	10	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	$Q_g^{*5}$	$V_{DD} = 300V$	-	58	-	nC
Gate - Source charge	$Q_{gs}^{*5}$	$I_D = 13A$	-	15	-	
Gate - Drain charge	$Q_{gd}^{*5}$	$V_{GS} = 18V$	-	23	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 300V, I_D = 13A$	-	9.6	-	V

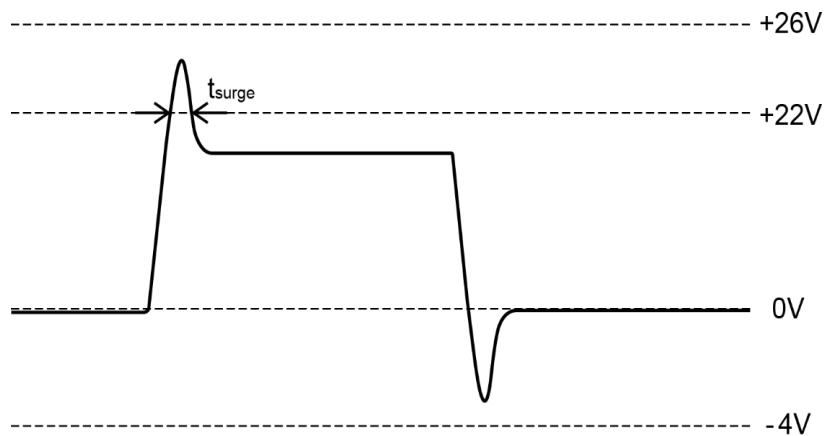
**●Body diode electrical characteristics (Source-Drain) ( $T_a = 25^\circ\text{C}$ )**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	$I_S^{*1}$	$T_c = 25^\circ\text{C}$	-	-	39	A
Inverse diode direct current, pulsed	$I_{SM}^{*2}$		-	-	97	A
Forward voltage	$V_{SD}^{*5}$	$V_{GS} = 0\text{V}, I_S = 13\text{A}$	-	3.2	-	V
Reverse recovery time	$t_{rr}^{*5}$	$I_F = 13\text{A}, V_R = 300\text{V}$ $di/dt = 1100\text{A}/\mu\text{s}$	-	15	-	ns
Reverse recovery charge	$Q_{rr}^{*5}$		-	55	-	nC
Peak reverse recovery current	$I_{rrm}^{*5}$		-	8	-	A

\*1 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 Power Dissipation Derating Curve

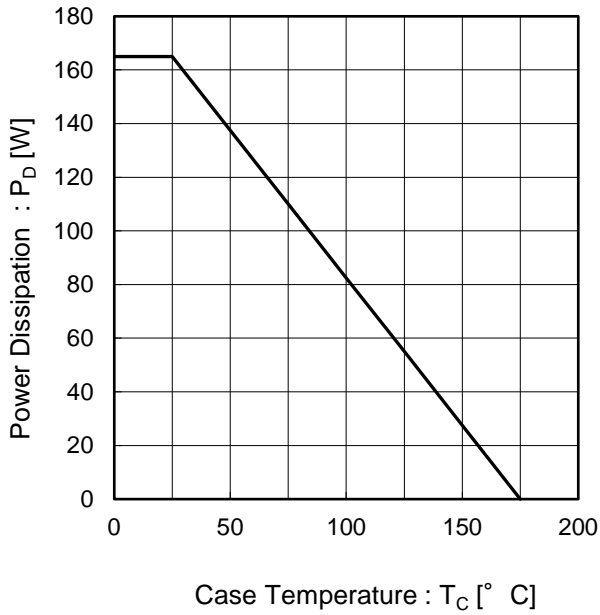


Fig.2 Maximum Safe Operating Area

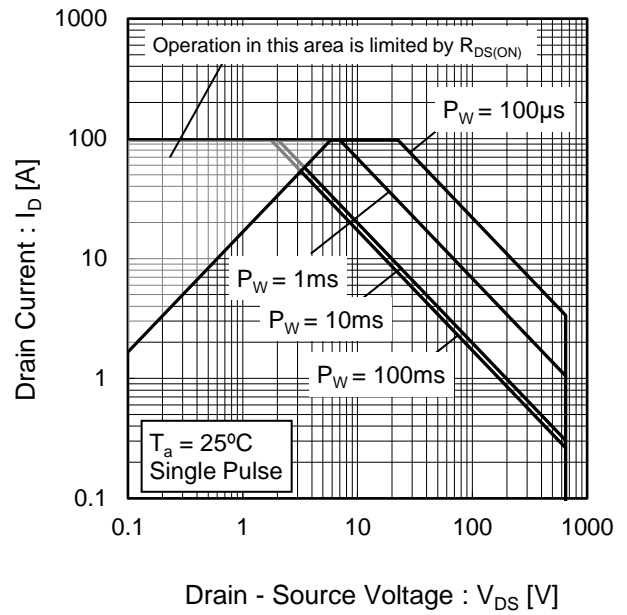
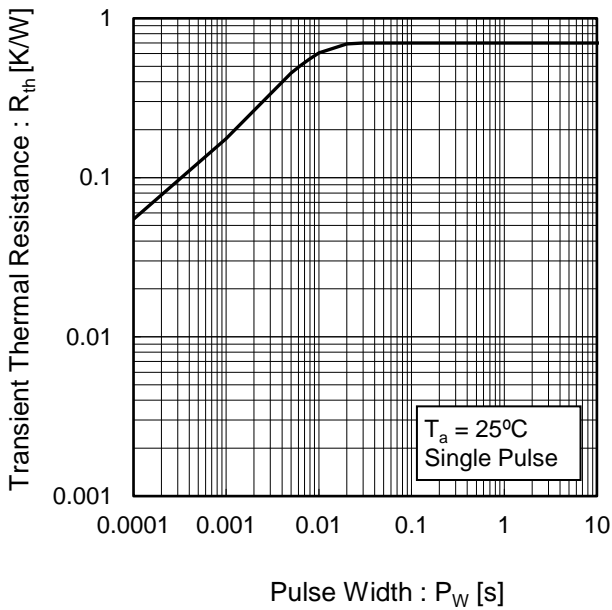


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

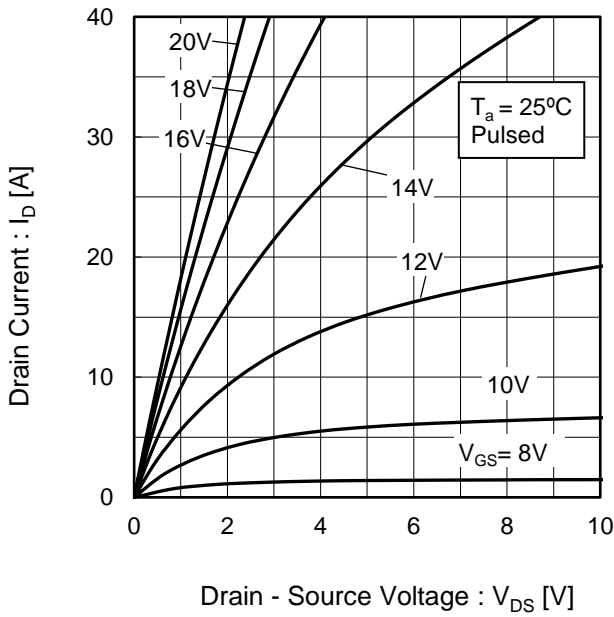


Fig.5 Typical Output Characteristics(II)

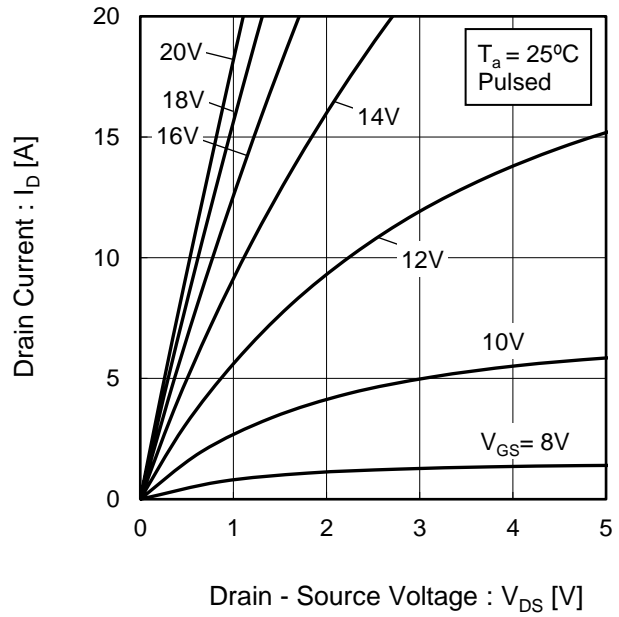


Fig.6  $T_j = 150^\circ\text{C}$  Typical Output Characteristics(I)

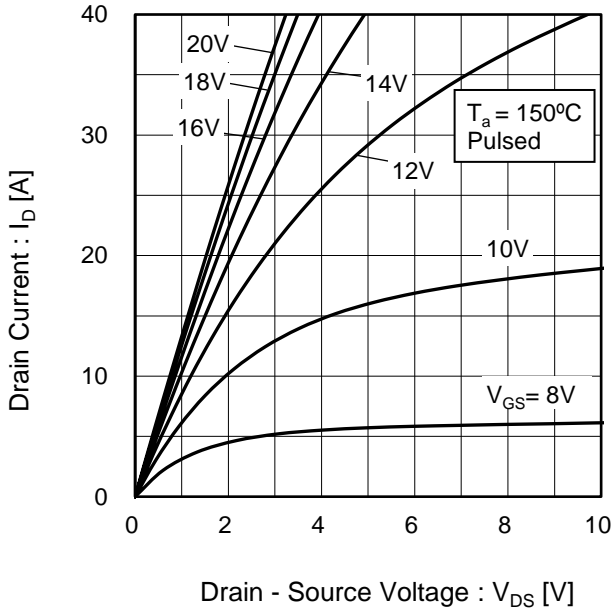
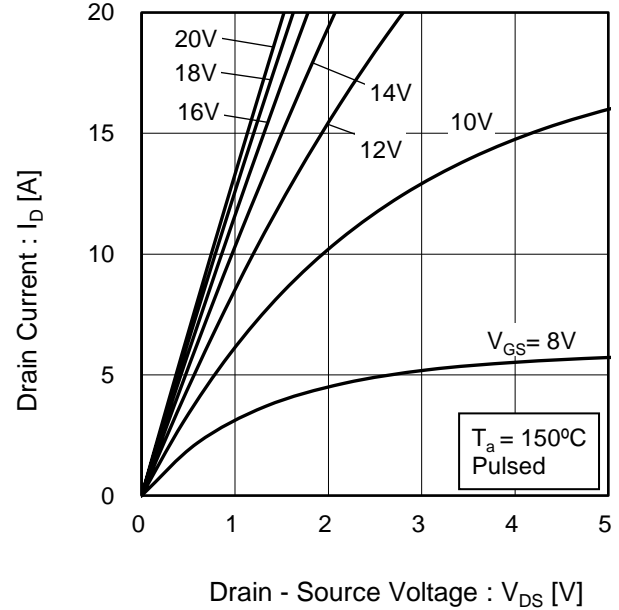


Fig.7  $T_j = 150^\circ\text{C}$  Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics (I)

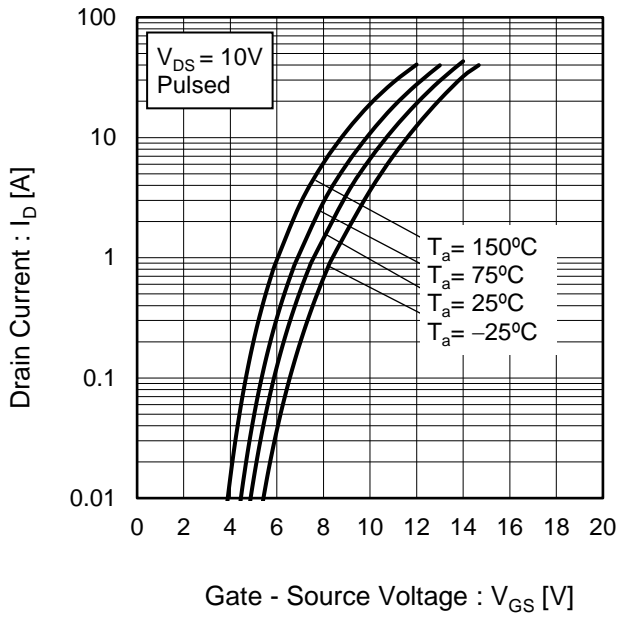


Fig.9 Typical Transfer Characteristics (II)

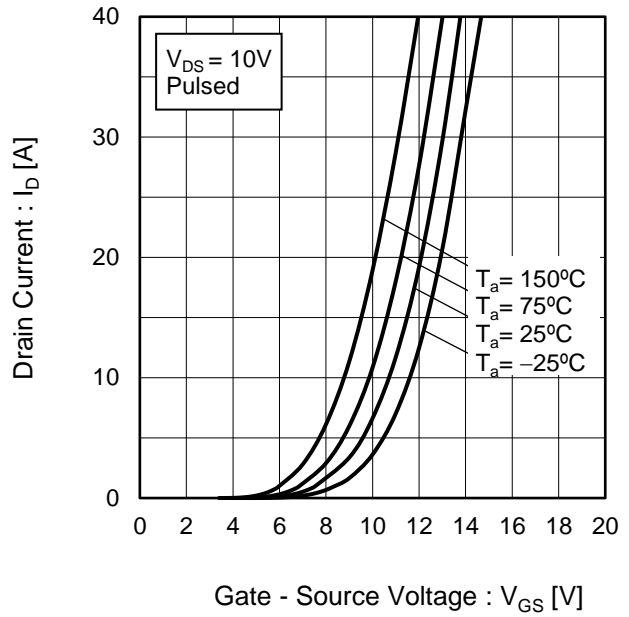


Fig.10 Gate Threshold Voltage vs. Junction Temperature

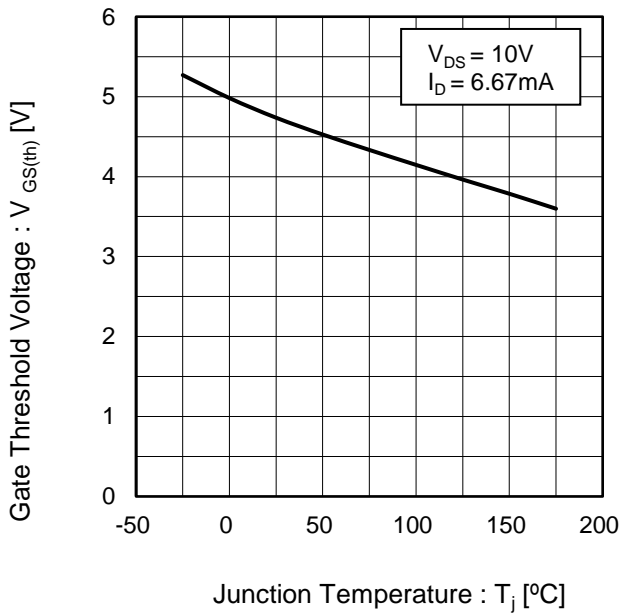
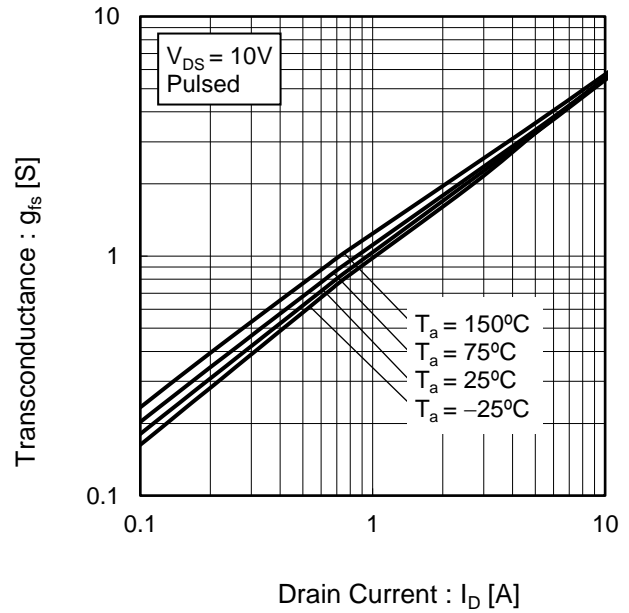


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

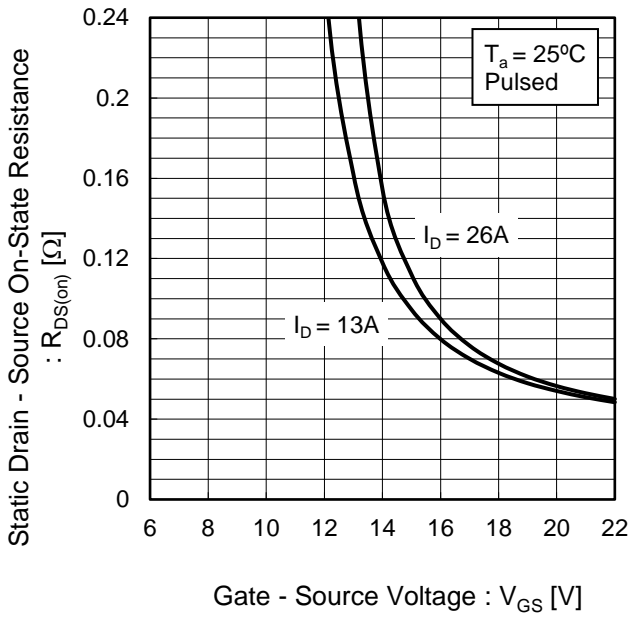


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

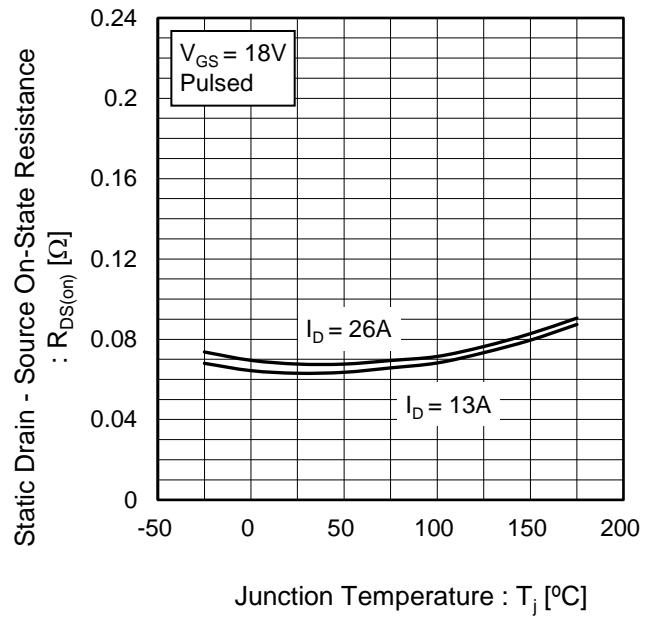
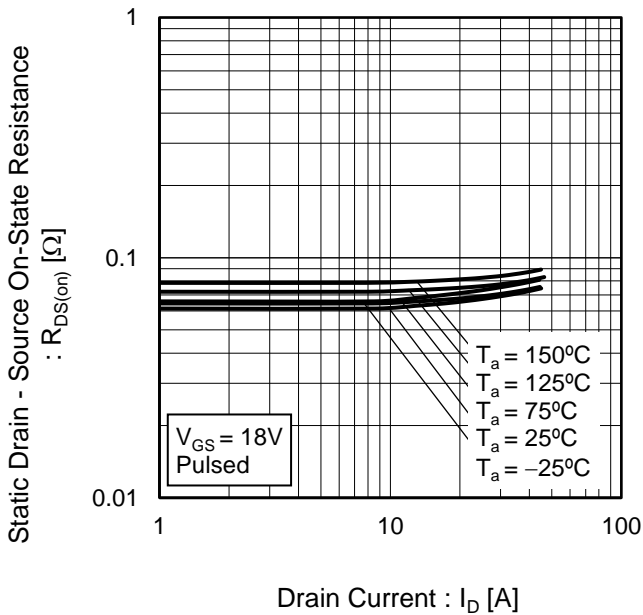


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current





●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

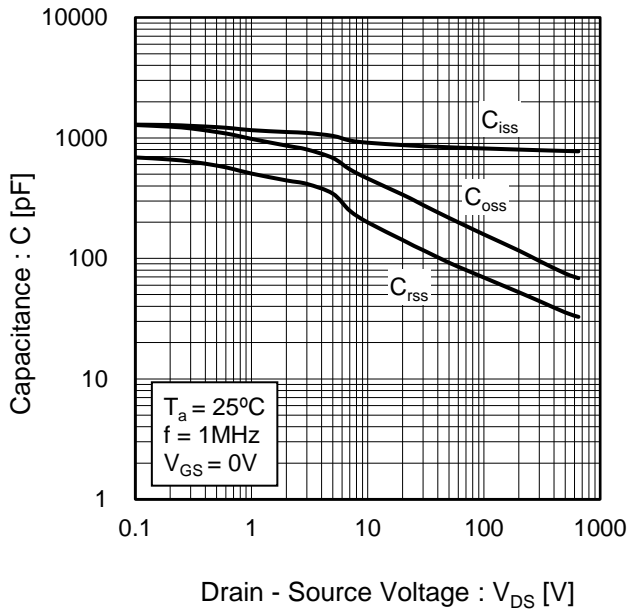


Fig.16 Coss Stored Energy

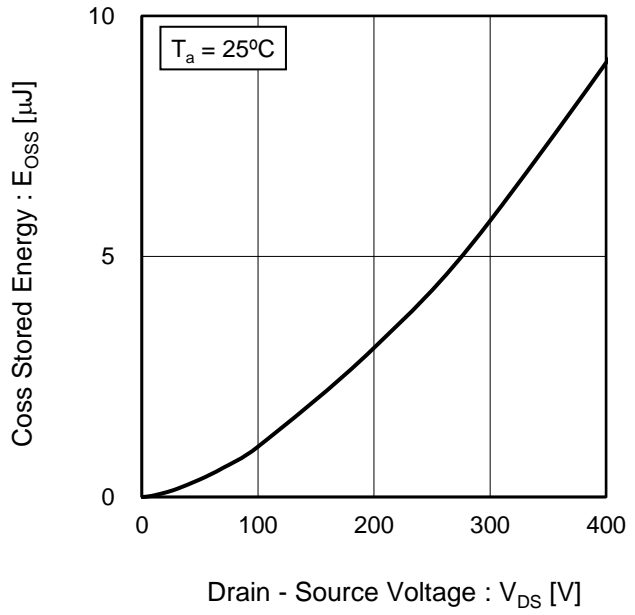


Fig.17 Switching Characteristics

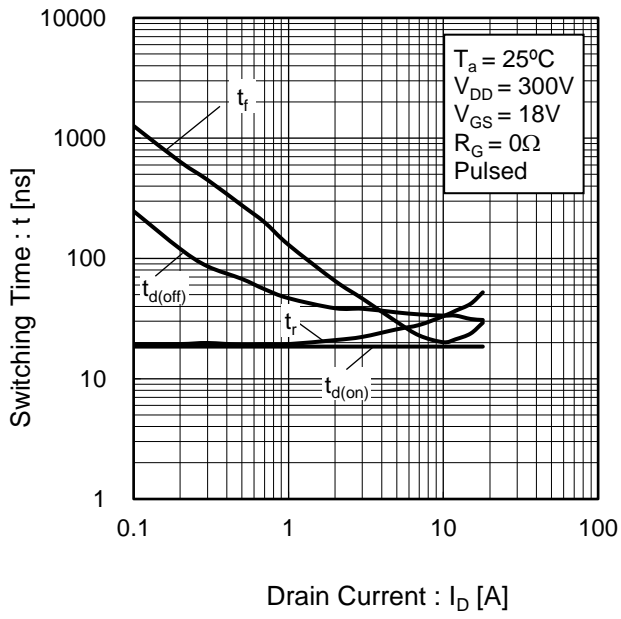
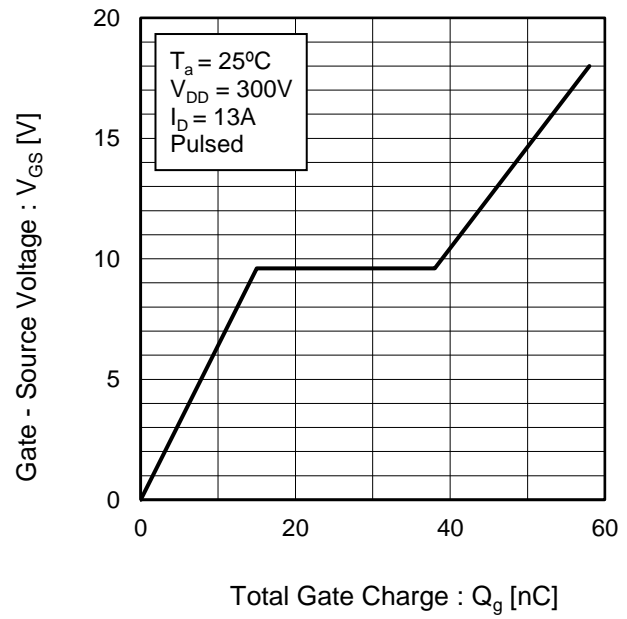


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

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

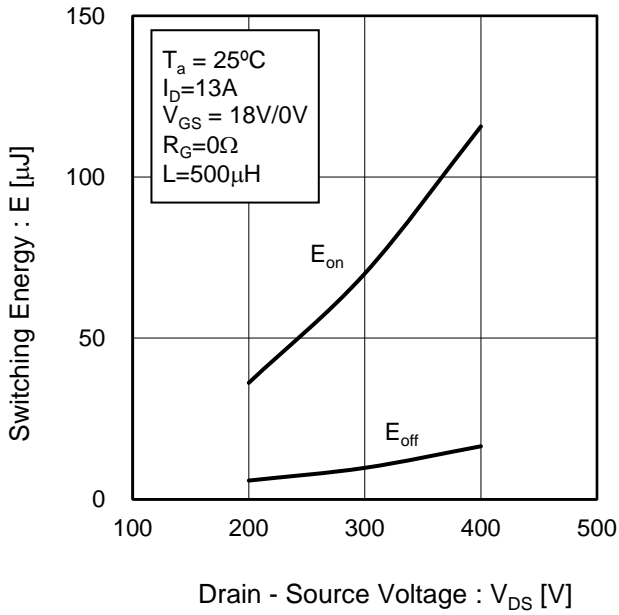


Fig.20 Typical Switching Loss vs. Drain Current

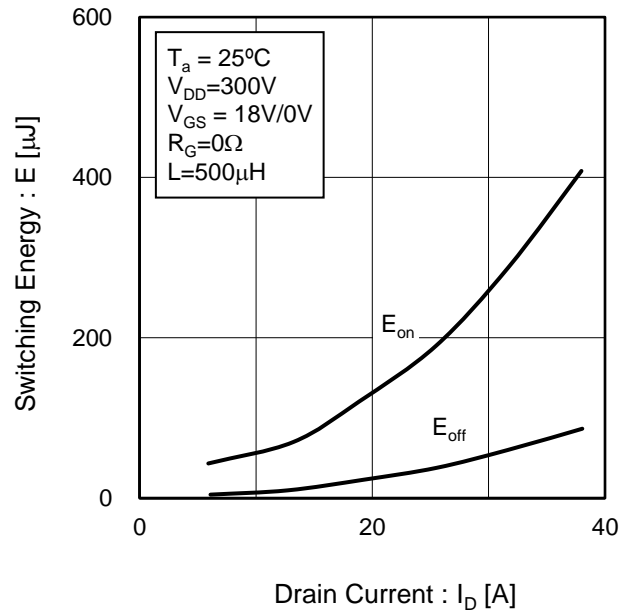
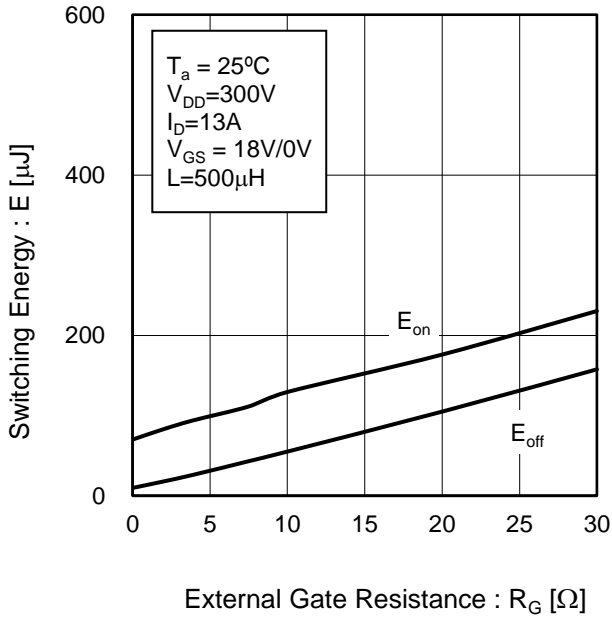


Fig.21 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

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

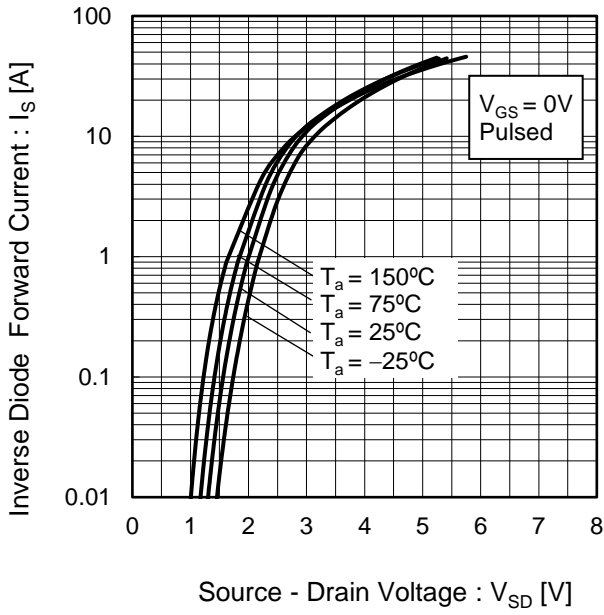
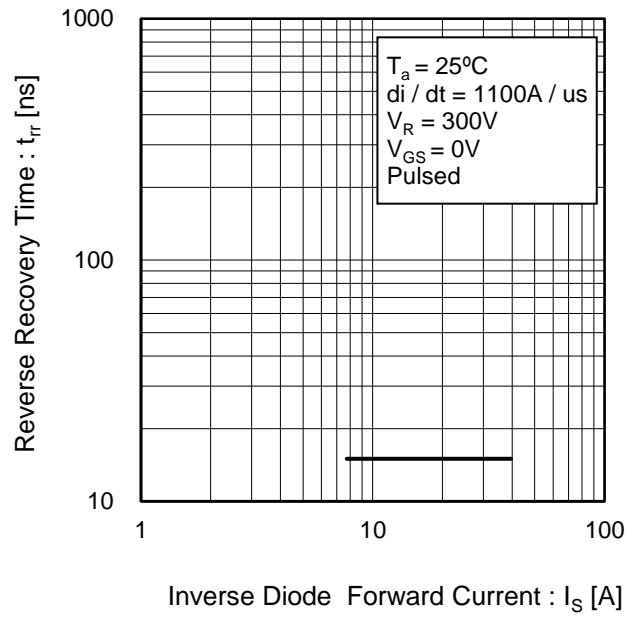


Fig.23 Reverse Recovery Time vs. Inverse Diode Forward Current



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

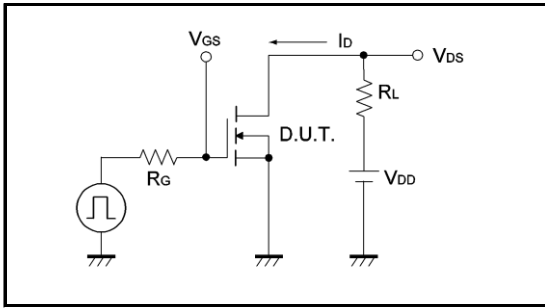


Fig.1-2 Switching Waveforms

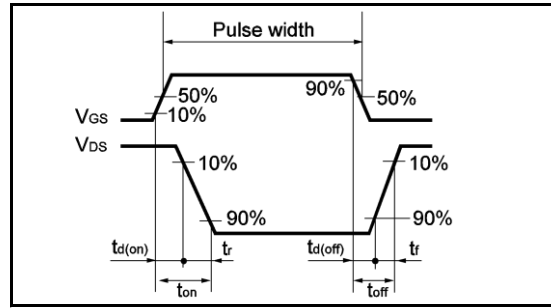


Fig.2-1 Gate Charge Measurement Circuit

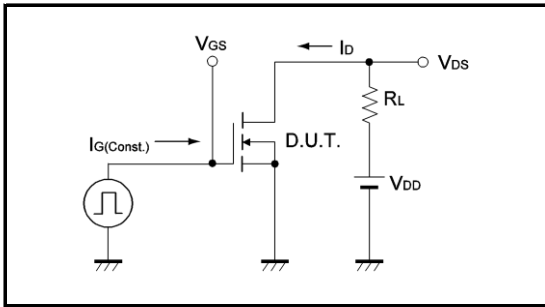


Fig.2-2 Gate Charge Waveform

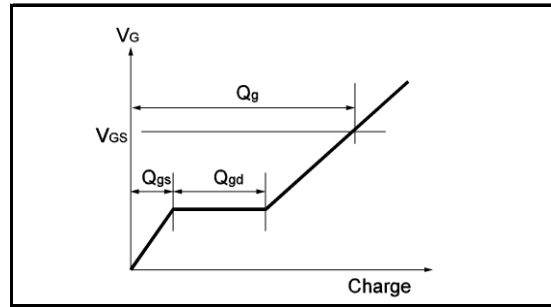


Fig.3-1 Switching Energy Measurement Circuit

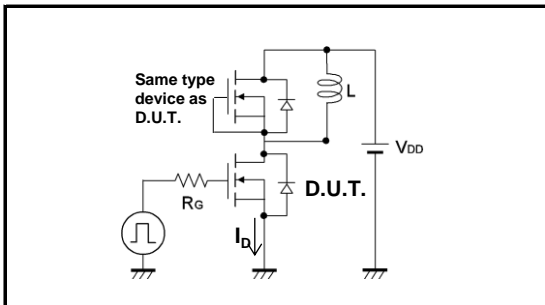


Fig.3-2 Switching Waveforms

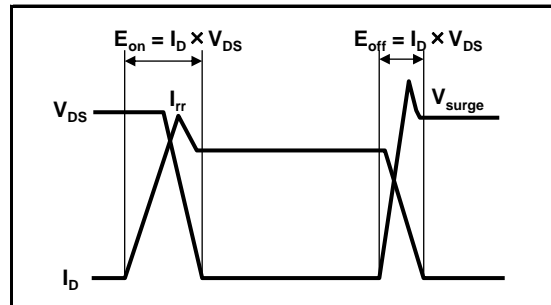


Fig.4-1 Reverse Recovery Time Measurement Circuit

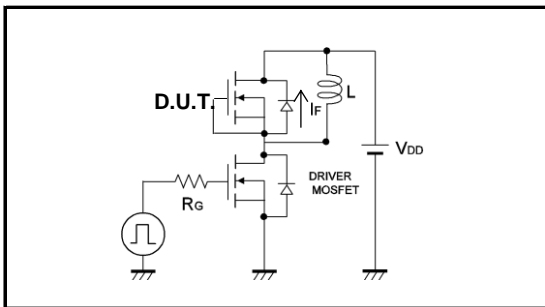
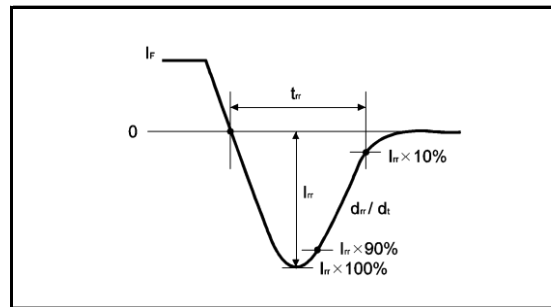


Fig.4-2 Reverse Recovery Waveform



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