

# 10V Drive Nch MOSFET

## R6012FNX

### ● Structure

Silicon N-channel MOSFET

### ● Features

- 1) Fast reverse recovery time ( $t_{rr}$ )
- 2) Low on-resistance.
- 3) Fast switching speed.
- 4) Gate-source voltage  
 $V_{GSS}$  guaranteed to be  $\pm 30V$ .
- 5) Drive circuits can be simple.
- 6) Parallel use is easy.

### ● Application

Switching

### ● Packaging specifications

Type	Package	Bulk
	Code	-
	Basic ordering unit (pieces)	500
R6012FNX		○

### ● Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	Unit	
Drain-source voltage	$V_{DSS}$	600	V	
Gate-source voltage	$V_{GSS}$	$\pm 30$	V	
Drain current	Continuous	$I_D$ *3	$\pm 12$	A
	Pulsed	$I_{DP}$ *1	$\pm 48$	A
Source current (Body Diode)	Continuous	$I_S$ *3	12	A
	Pulsed	$I_{SP}$ *1	48	A
Avalanche Current	$I_{AS}$ *2	6	A	
Avalanche Energy	$E_{AS}$ *2	9.6	mJ	
Power dissipation (Tc=25°C)	$P_D$	50	W	
Channel temperature	Tch	150	°C	
Range of storage temperature	Tstg	-55 to +150	°C	

\*1  $P_w \leq 10\mu s$ , Duty cycle  $\leq 1\%$

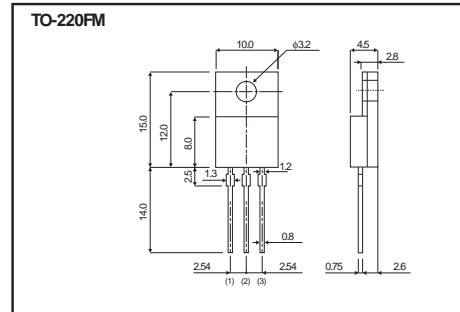
\*2  $L = 500\mu H$ ,  $V_{DD} = 50V$ ,  $R_g = 25\Omega$ , starting Tch=25°C

\*3 Limited only by maximum temperature allowed.

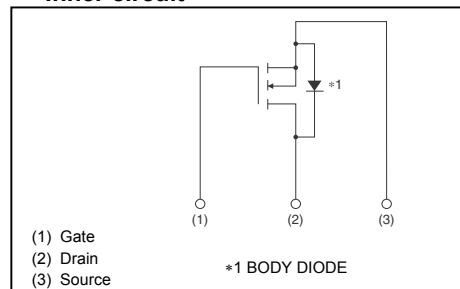
### ● Thermal resistance

Parameter	Symbol	Limits	Unit
Channel to Case	Rth (ch-c)	2.5	°C / W

### ● Dimensions (Unit : mm)



### ● Inner circuit



**●Electrical characteristics (Ta = 25°C)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	$I_{GSS}$	-	-	±100	nA	$V_{GS}=\pm 30V, V_{DS}=0V$
Drain-source breakdown voltage	$V_{(BR)DSS}$	600	-	-	V	$I_D=1mA, V_{GS}=0V$
Zero gate voltage drain current	$I_{DSS}$	-	-	100	μA	$V_{DS}=600V, V_{GS}=0V$
Gate threshold voltage	$V_{GS(th)}$	3	-	5	V	$V_{DS}=10V, I_D=1mA$
Static drain-source on-state resistance	$R_{DS(on)}$ *	-	0.39	0.51	Ω	$I_D=6A, V_{GS}=10V$
Forward transfer admittance	$ Y_{fs} $ *	3.5	-	-	S	$I_D=6A, V_{DS}=10V$
Input capacitance	$C_{iss}$	-	1300	-	pF	$V_{DS}=25V$
Output capacitance	$C_{oss}$	-	890	-	pF	$V_{GS}=0V$
Reverse transfer capacitance	$C_{rss}$	-	45	-	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}$ *	-	30	-	ns	$I_D=6A, V_{DD}\approx 300V$
Rise time	$t_r$ *	-	37	-	ns	$V_{GS}=10V$
Turn-off delay time	$t_{d(off)}$ *	-	77	-	ns	$R_L=50\Omega$
Fall time	$t_f$ *	-	20	-	ns	$R_G=10\Omega$
Total gate charge	$Q_g$ *	-	35	-	nC	$I_D=12A,$
Gate-source charge	$Q_{gs}$ *	-	10	-	nC	$V_{DD}\approx 300V$
Gate-drain charge	$Q_{gd}$ *	-	15	-	nC	$V_{GS}=10V$

\*Pulsed

**●Body diode characteristics (Source-Drain) (Ta = 25°C)**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	$V_{SD}$ *	-	-	1.5	V	$I_S=12A, V_{GS}=0V$
Reverse Recovery Time	$t_{rr}$ *	45	75	105	ns	$I_S=12A, di/dt=100A/\mu s$

\*Pulsed

●Electrical characteristic curves (Ta=25°C)

Fig.1 Typical Output Characteristics ( I )

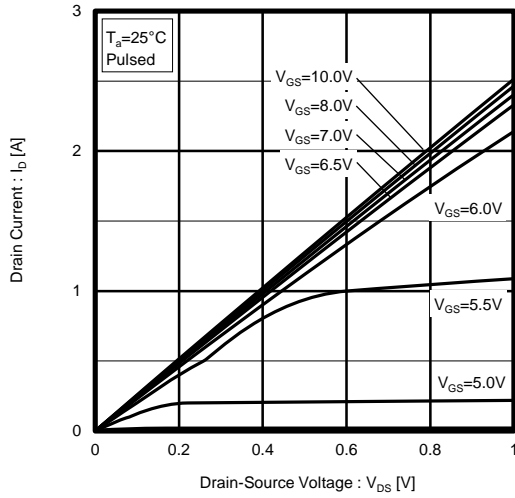


Fig.2 Typical Output Characteristics ( II )

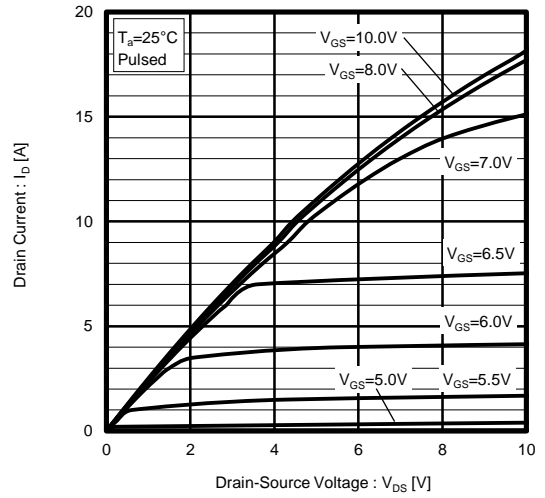


Fig.3 Typical Transfer Characteristics

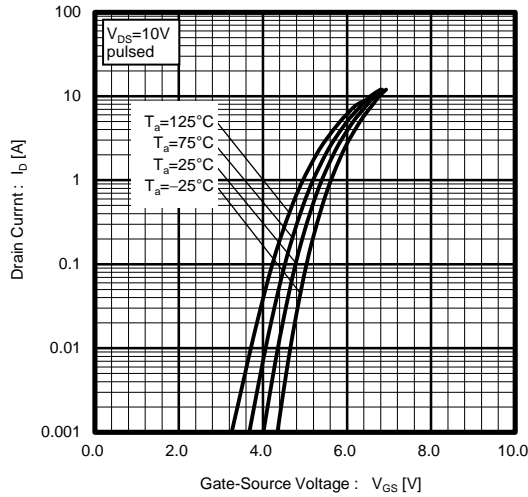


Fig.4 Gate Threshold Voltage vs. Channel Temperature

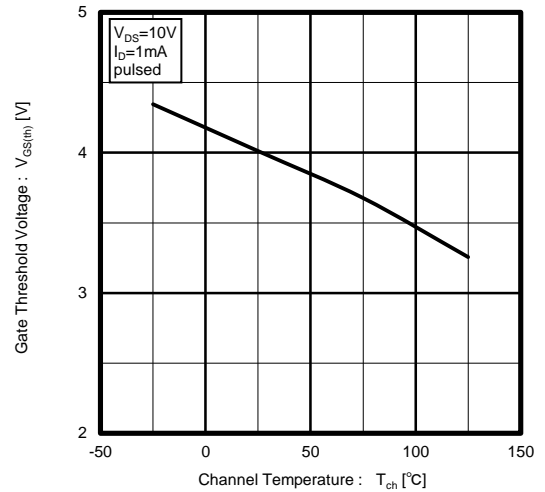


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

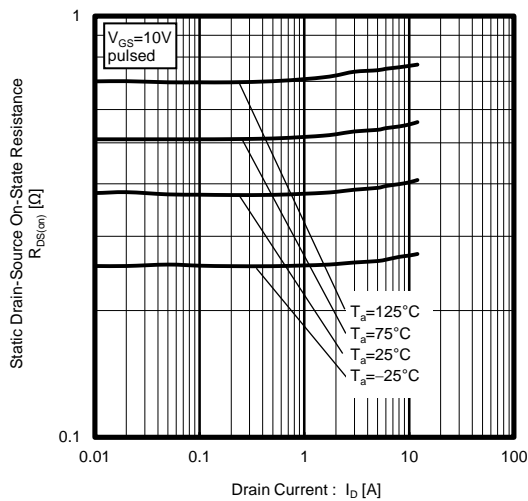


Fig.6 Static Drain-Source On-State Resistance vs. Channel Temperature

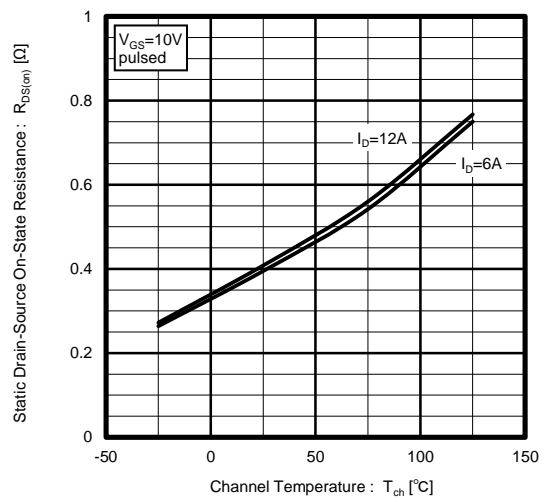


Fig.7 Forward Transfer Admittance vs. Drain Current

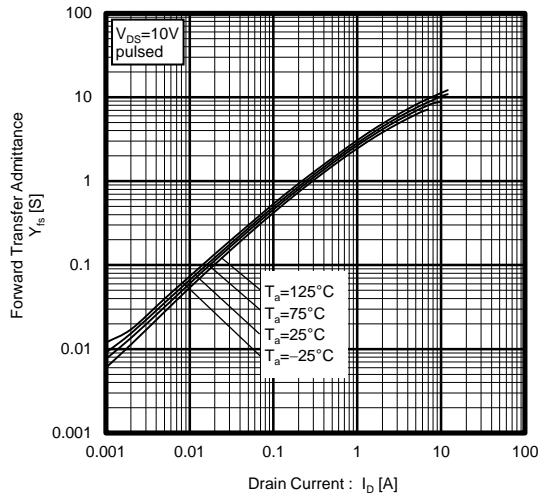


Fig.8 Source Current vs. Source-Drain Voltage

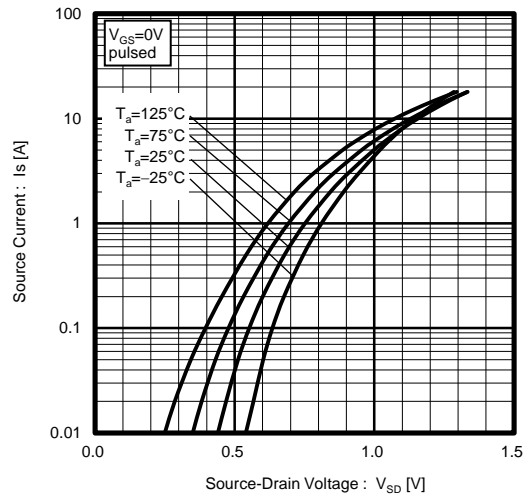


Fig.9 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

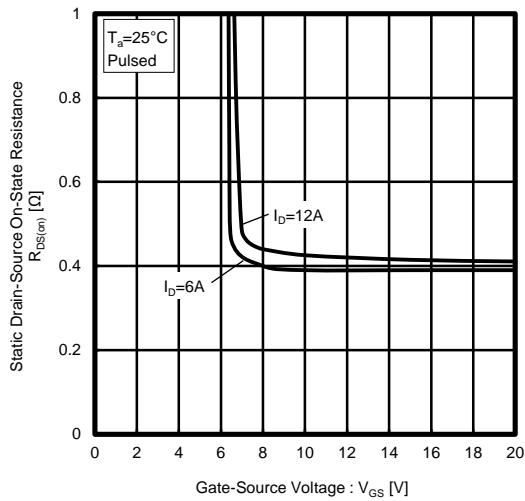


Fig.10 Switching Characteristics

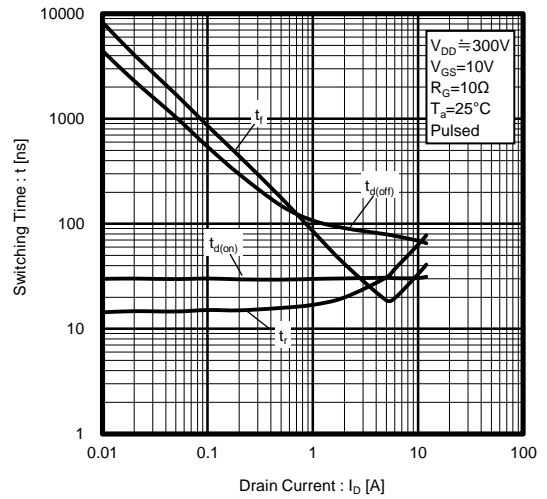


Fig.11 Dynamic Input Characteristics

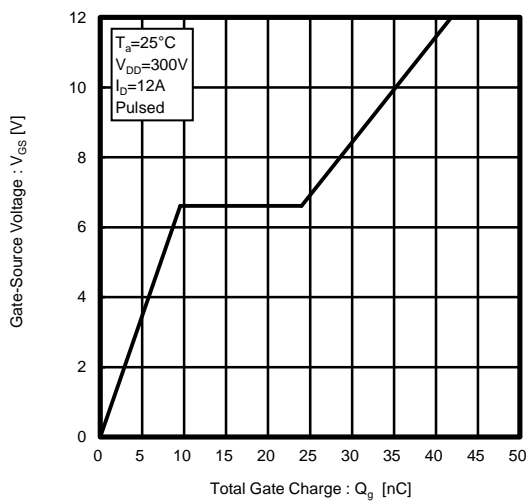


Fig.12 Typical Capacitance vs. Drain-Source Voltage

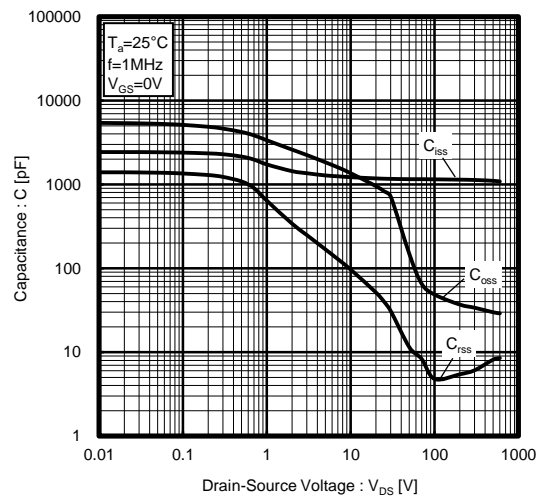


Fig.13 Reverse Recovery Time vs. Source Current

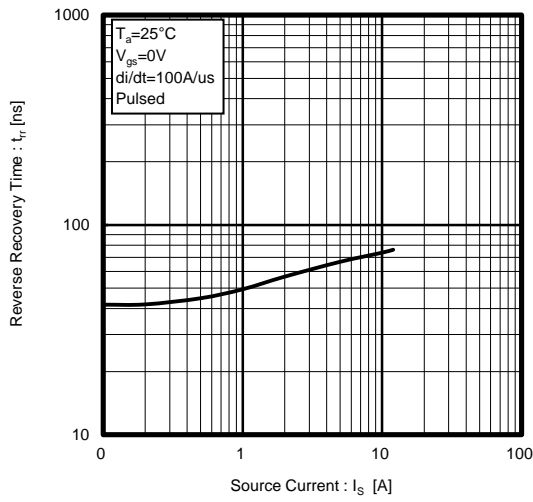


Fig.14 Maximum Safe Operating Area

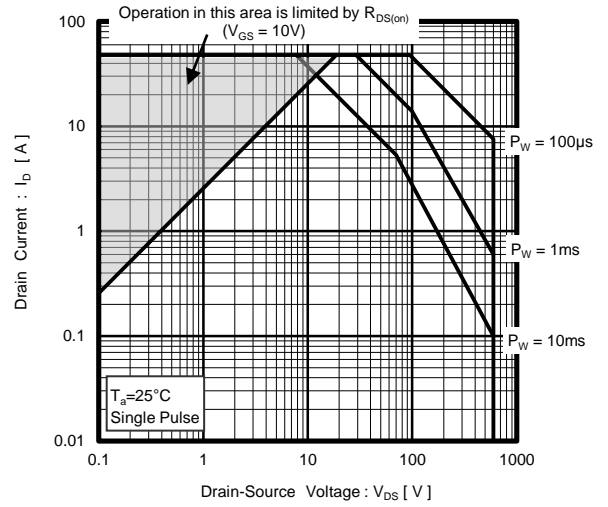
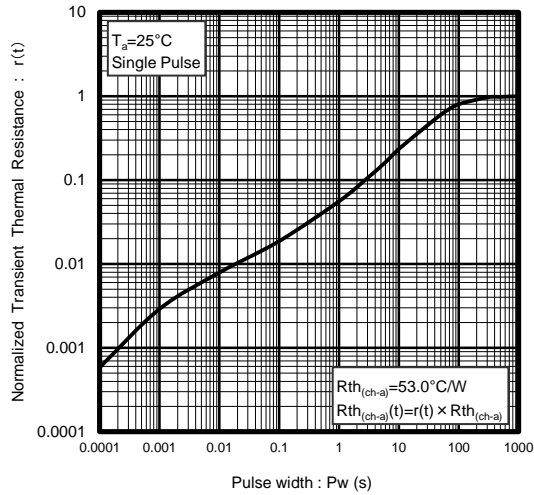


Fig.15 Normalized Transient Thermal Resistance v.s. Pulse Width



● Measurement circuits

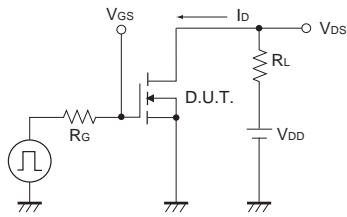


Fig.1-1 Switching Time Measurement Circuit

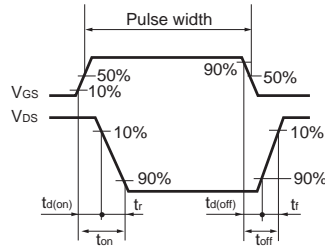


Fig.1-2 Switching Waveforms

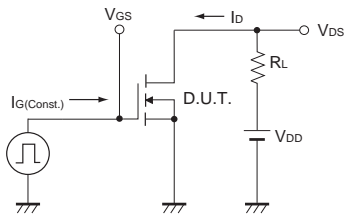


Fig.2-1 Gate Charge Measurement Circuit

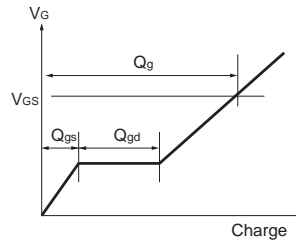


Fig.2-2 Gate Charge Waveform

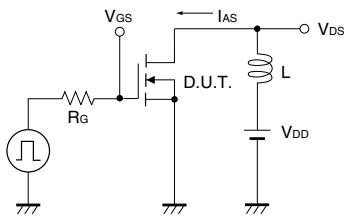


Fig.3-1 Avalanche Measurement Circuit

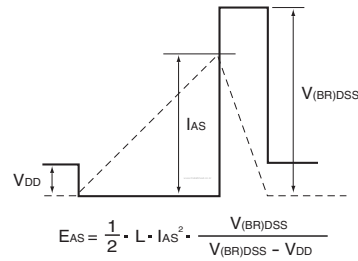


Fig.3-2 Avalanche Waveform

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