

10V Drive Nch MOSFET

R5013ANX

●Structure

Silicon N-channel MOSFET

●Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Wide SOA (safe operating area).
- 4) Gate-source voltage (V_{GS}) guaranteed to be $\pm 30V$.
- 5) Drive circuits can be simple.
- 6) Parallel use is easy.

●Applications

Switching

●Packaging specifications

	Package	Bulk
	Code	—
Type	Basic ordering unit (pieces)	500
R5013ANX		○

●Absolute maximum ratings ($T_a=25^\circ C$)

Parameter	Symbol	Limits	Unit	
Drain-source voltage	V_{DS}	500	V	
Gate-source voltage	V_{GS}	± 30	V	
Drain current	Continuous	I_D *3	± 13	A
	Pulsed	I_{DP} *1	± 52	A
Source current (Body Diode)	Continuous	I_S *3	13	A
	Pulsed	I_{SP} *1	52	A
Avalanche Current	I_{AS} *2	13	A	
Avalanche Energy	E_{AS} *2	46	mJ	
Total power dissipation ($T_c=25^\circ C$)	P_D	50	W	
Channel temperature	T_{ch}	150	$^\circ C$	
Range of storage temperature	T_{stg}	-55 to +150	$^\circ C$	

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

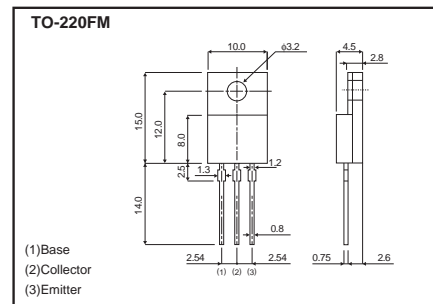
*2 $L = 500 \mu H$, $V_{DS} = 50V$, $R_G = 25 \Omega$, Starting, $T_{ch} = 25^\circ C$

*3 Limited only by maximum temperature allowed

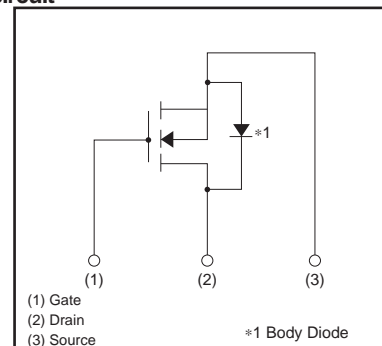
●Thermal resistance

Parameter	Symbol	Limits	Unit
Channel to case	$R_{th(ch-c)}$	2.5	$^\circ C/W$

●Dimensions (Unit : mm)



●Inner circuit



Transistors

●Electrical characteristics (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Gate-source leakage	I _{GSS}	–	–	±100	nA	V _{GS} =±30V, V _{DS} =0V
Drain-source breakdown voltage	V _{(BR)DSS}	500	–	–	V	I _D =1mA, V _{GS} =0V
Zero gate voltage drain current	I _{DSS}	–	–	100	μA	V _{DS} =500V, V _{GS} =0V
Gate threshold voltage	V _{GS(th)}	2.5	–	4.5	V	V _{DS} =10V, I _D =1mA
Static drain-source on-state resistance	R _{DS(on)} *	–	0.29	0.38	Ω	I _D =6.5A, V _{GS} =10V
Forward transfer admittance	Y _{fs} *	4.0	–	–	S	I _D =6.5A, V _{DS} =10V
Input capacitance	C _{iss}	–	1300	–	pF	V _{DS} =25V
Output capacitance	C _{oss}	–	500	–	pF	V _{GS} =0V
Reverse transfer capacitance	C _{rss}	–	40	–	pF	f=1MHz
Turn-on delay time	t _{d(on)} *	–	30	–	ns	I _D =6.5A, V _{DD} ≒250V
Rise time	t _r *	–	32	–	ns	V _{GS} =10V
Turn-off delay time	t _{d(off)} *	–	90	–	ns	R _L =38.5Ω
Fall time	t _f *	–	30	–	ns	R _G =10Ω
Total gate charge	Q _g *	–	35	–	nC	V _{DD} ≒250V
Gate-source charge	Q _{gs} *	–	8	–	nC	I _D =13A
Gate-drain charge	Q _{gd} *	–	15	–	nC	V _{GS} =10V R _L =19.2Ω / R _G =10Ω

* 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 = 13A, V _{GS} =0V

* Pulsed

Transistors

●Electrical characteristic curves

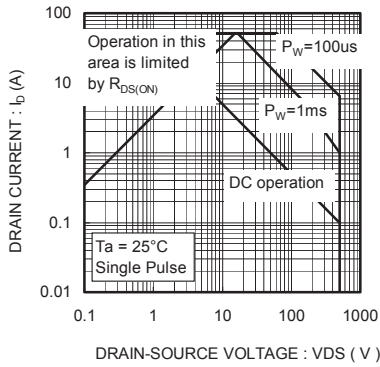


Fig.1 Maximum Safe Operating Area

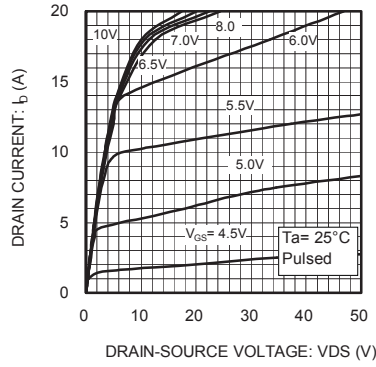


Fig.2: Typical Output Characteristics (I)

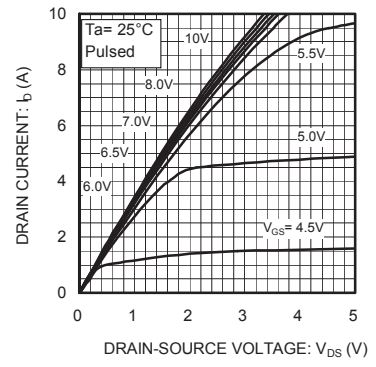


Fig.3: Typical Output Characteristics (II)

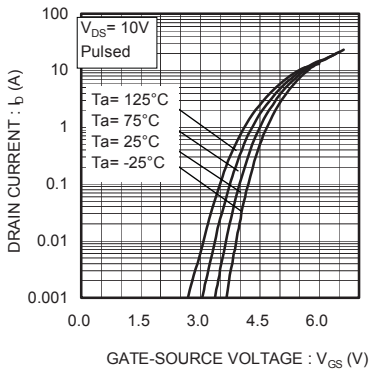


Fig.4 Typical Transfer Characteristics

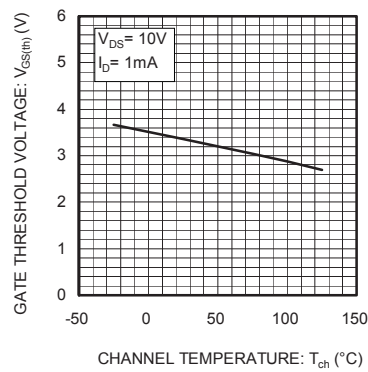


Fig.5 Gate Threshold Voltage vs. Channel

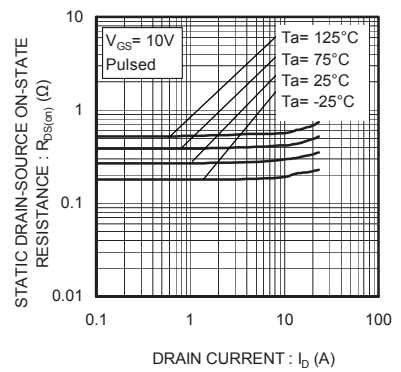


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

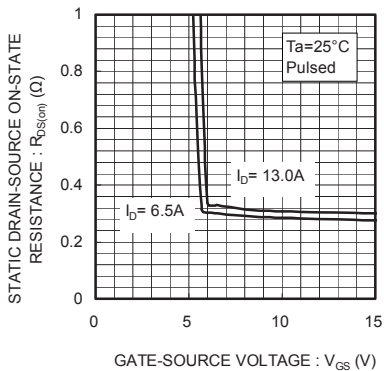


Fig.7 Static Drain-Source On-State Resistance vs. Gate Source

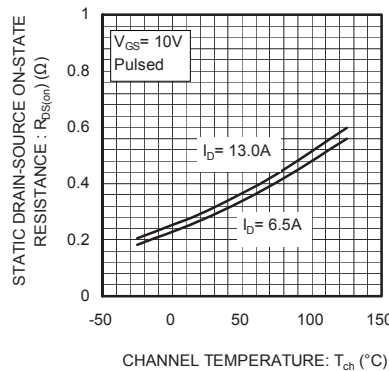


Fig.8 Static Drain-Source On-State Resistance vs. Channel

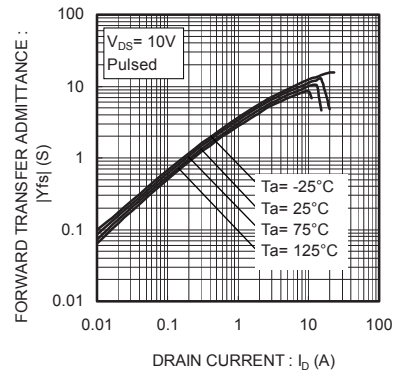


Fig.9 Forward Transfer Admittance vs. Drain Current

Transistors

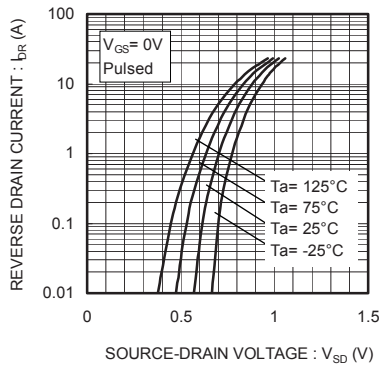


Fig.10 Reverse Drain Current vs. Source-Drain Voltage

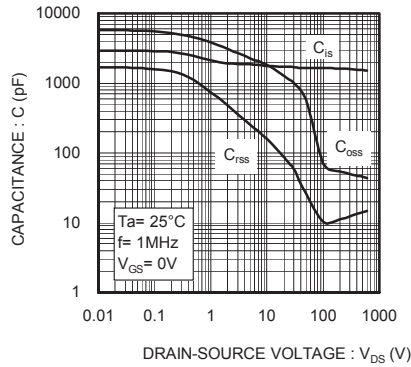


Fig.11 Typical Capacitance vs. Drain-Source Voltage

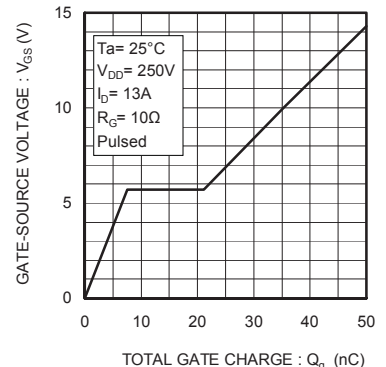


Fig.12 Dynamic Input Characteristics

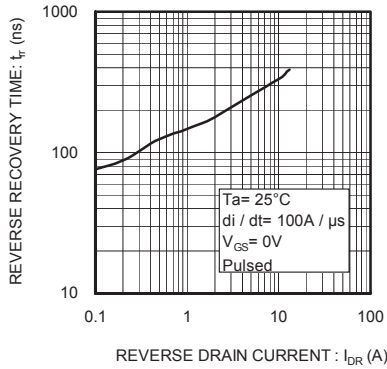


Fig.13 Reverse Recovery Time vs. Reverse Drain Current

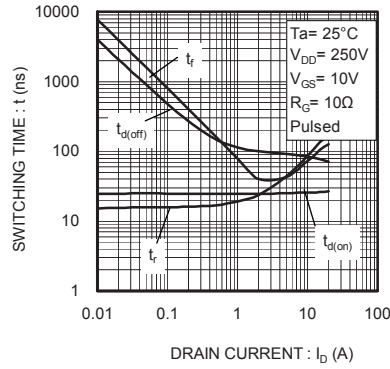


Fig.14 Switching Characteristics

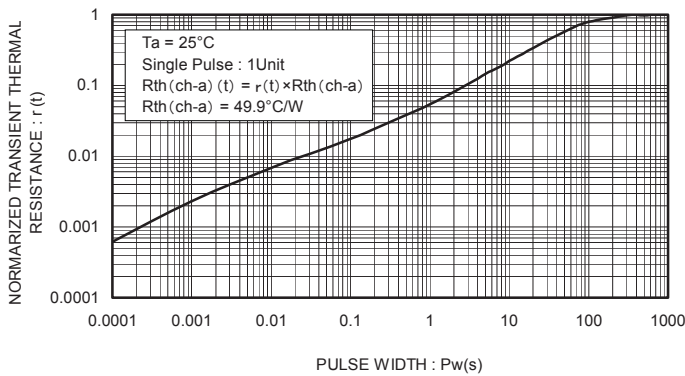


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

Transistors

●Switching characteristics measurement circuit

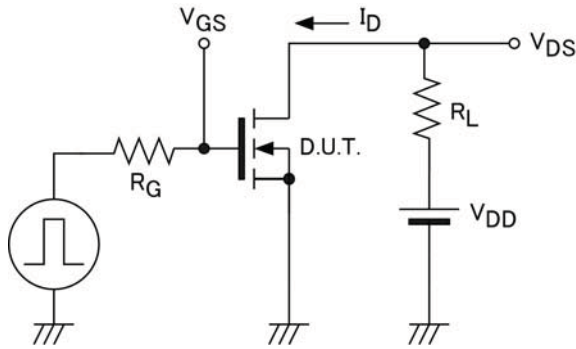


Fig.1 Switching time measurement circuit

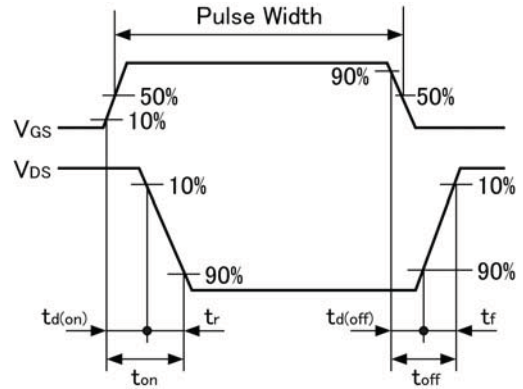


Fig.2 Switching waveforms

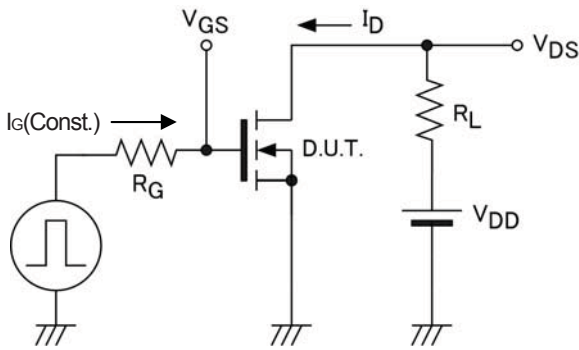


Fig.3 Gate charge measurement circuit

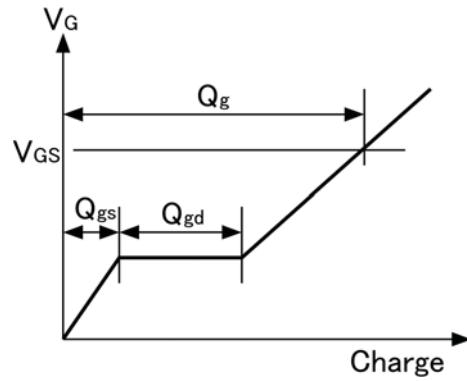


Fig.4 Gate charge waveform

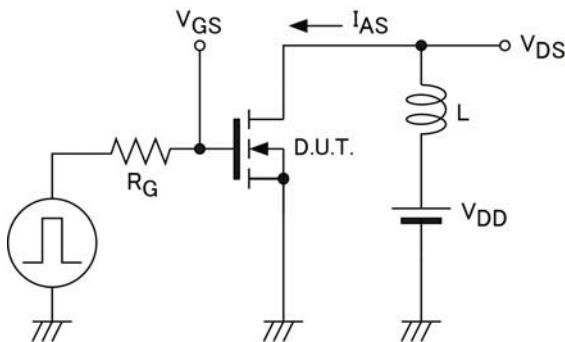


Fig.5 Avalanche measurement circuit

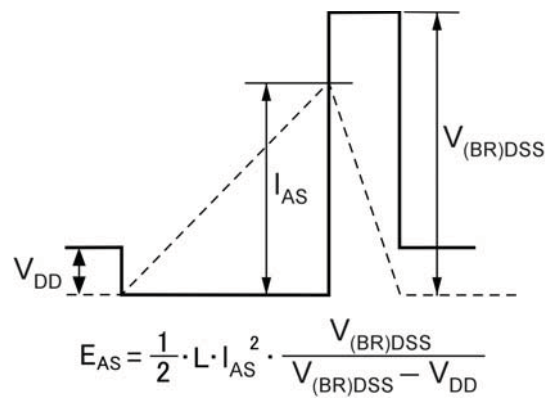


Fig.6 Avalanche waveform

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