

# 10V Drive Nch MOSFET

## R5009ANJ

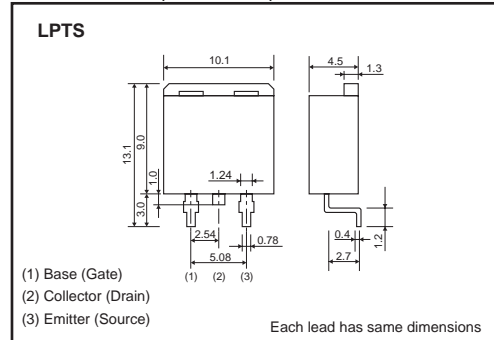
### ●Structure

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.

### ●Dimensions (Unit : mm)



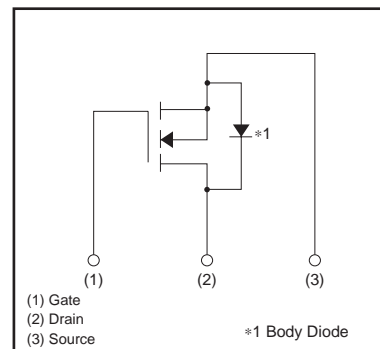
### ●Applications

Switching

### ●Packaging specifications

Type	Package	Taping
		Code
	Basic ordering unit (pieces)	1000
R5009ANJ		○

### ●Inner circuit



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

Parameter	Symbol	Limits	Unit	
Drain-source voltage	$V_{DSS}$	500	V	
Gate-source voltage	$V_{GSS}$	30	V	
Drain current	Continuous	$I_D$ *3	$\pm 9$	A
	Pulsed	$I_{DP}$ *1	$\pm 36$	A
Source current (Body Diode)	Continuous	$I_S$	9	A
	Pulsed	$I_{SP}$ *1	36	A
Avalanche Current	$I_{AS}$ *2	4.5	A	
Avalanche Energy	$E_{AS}$ *2	5.4	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  $L = 500 \mu H$ ,  $V_{DD} = 50V$ ,  $R_G = 25 \Omega$ , 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	$^\circ C/W$

**●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	$V_{(BR)DSS}$	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	$R_{DS(on)}^*$	–	0.55	0.72	Ω	$I_D=4.5A, V_{GS}=10V$
Forward transfer admittance	$ Y_{fs} ^*$	2.5	–	–	S	$I_D=4.5A, V_{DS}=10V$
Input capacitance	$C_{iss}$	–	650	–	pF	$V_{DS}=25V$
Output capacitance	$C_{oss}$	–	400	–	pF	$V_{GS}=0V$
Reverse transfer capacitance	$C_{rss}$	–	30	–	pF	$f=1MHz$
Turn-on delay time	$t_{d(on)}^*$	–	30	–	ns	$I_D=4.5A, V_{DD}=250V$
Rise time	$t_r^*$	–	20	–	ns	$V_{GS}=10V$
Turn-off delay time	$t_{d(off)}^*$	–	62	–	ns	$R_L=55.6\Omega$
Fall time	$t_f^*$	–	28	–	ns	$R_G=10\Omega$
Total gate charge	$Q_g^*$	–	21	–	nC	$V_{DD}=250V$
Gate-source charge	$Q_{gs}^*$	–	5	–	nC	$I_D=9A$ $V_{GS}=10V$
Gate-drain charge	$Q_{gd}^*$	–	9	–	nC	$R_L=27.8\Omega / R_G=10\Omega$

\* Pulsed

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward voltage	$V_{SD}^*$	–	–	1.5	V	$I_S=9A, V_{GS}=0V$

\* Pulsed

●Electrical characteristics curves

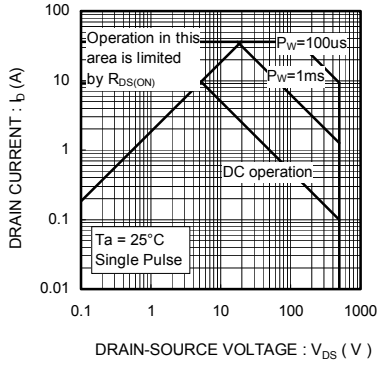


Fig.1 Maximum Safe Operating Area

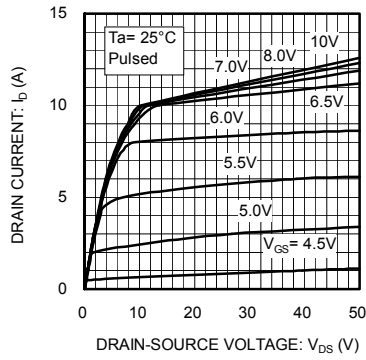


Fig.2 Typical Output Characteristics(I)

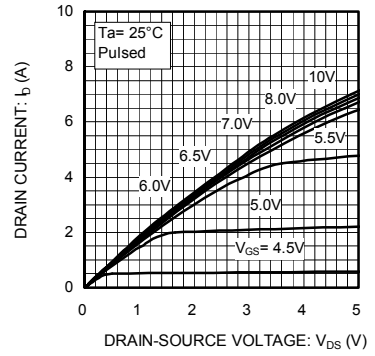


Fig.3 Typical Output Characteristics(II)

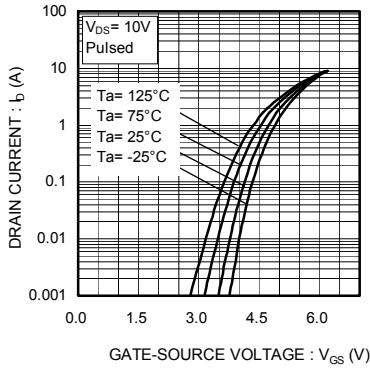


Fig.4 Typical Transfer Characteristics

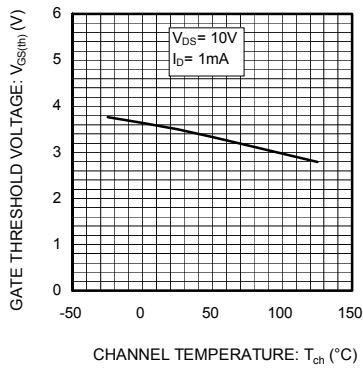


Fig.5 Gate Threshold Voltage vs. Channel Temperature

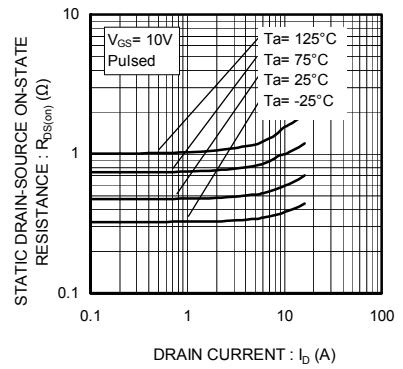


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

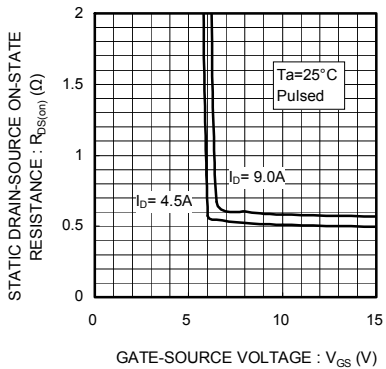


Fig.7 Static Drain-Source On-State Resistance vs. Gate Source Voltage

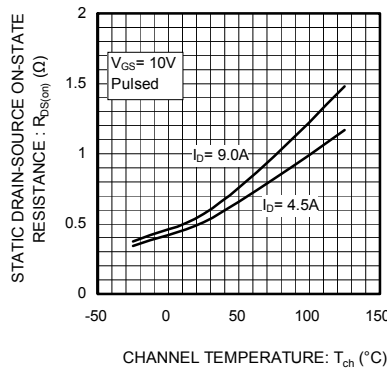


Fig.8 Static Drain-Source On-State Resistance vs. Channel Temperature

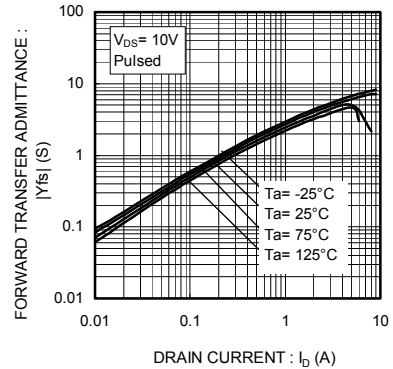


Fig.9 Forward Transfer Admittance vs. Drain Current

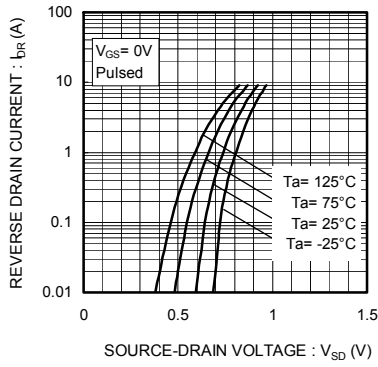


Fig.10 Reverse Drain Current vs. Source-Drain Voltage

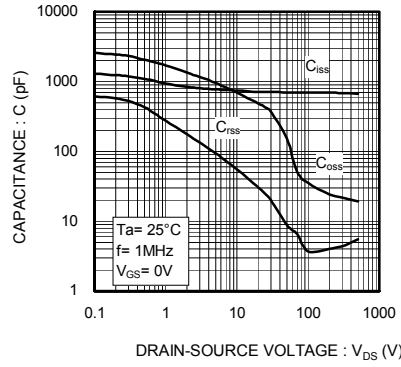


Fig.11 Typical Capacitance vs. Drain-Source Voltage

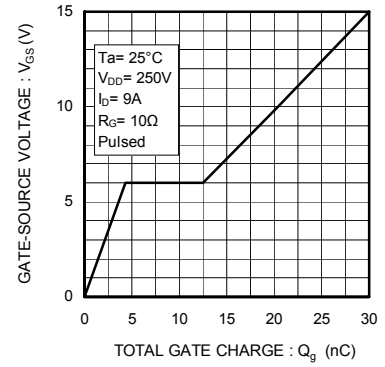


Fig.12 Dynamic Input Characteristics

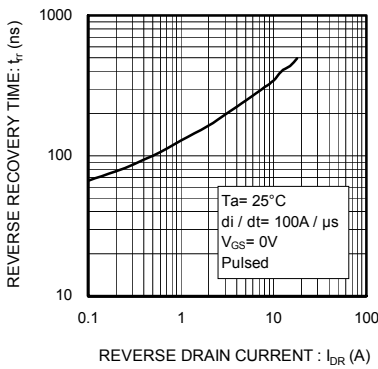


Fig.13 Reverse Recovery Time vs. Reverse Drain Current

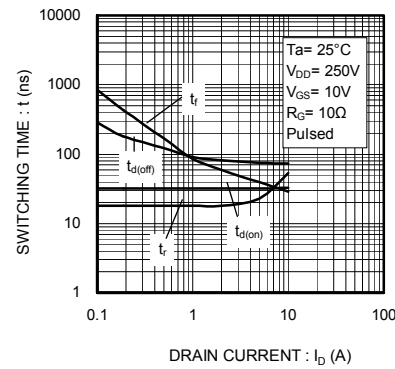


Fig.14 Switching Characteristics

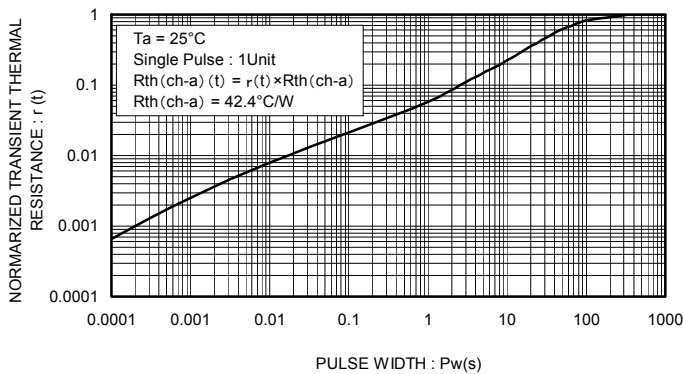


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width

●Switching characteristics measurement circuit

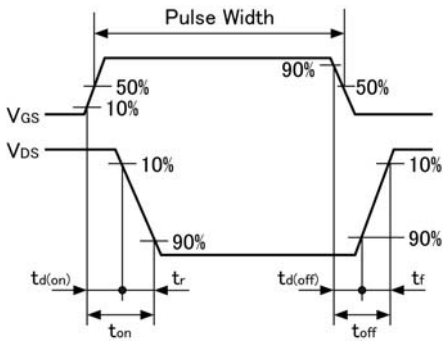


Fig.1-1 Switching time measurement circuit

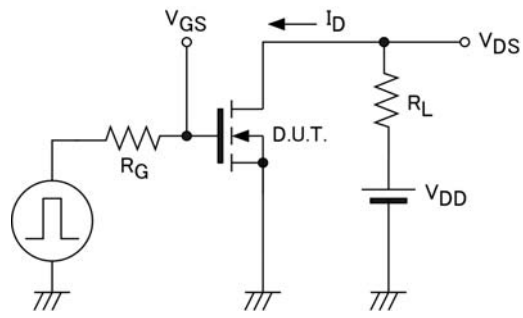


Fig.1-2 Switching waveforms

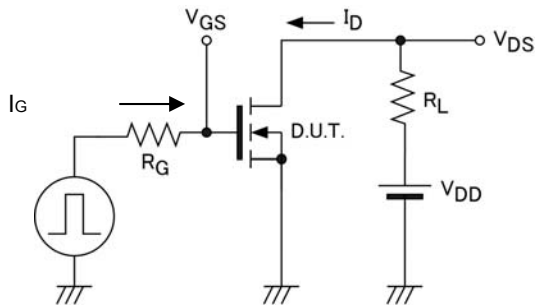


Fig.2-1 Gate charge measurement circuit

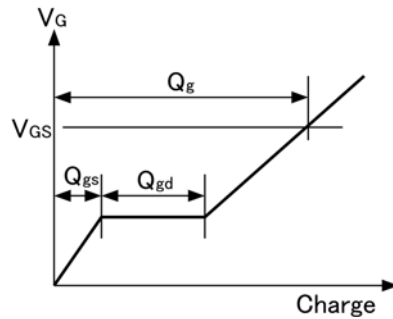


Fig.2-2 Gate charge waveform

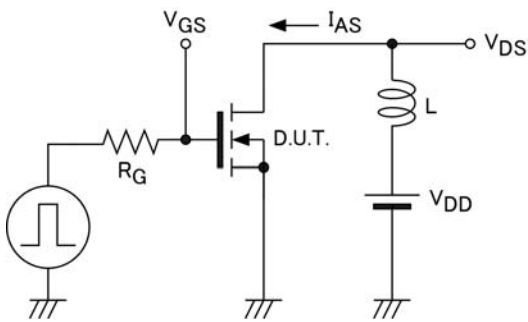


Fig.3-1 Avalanche measurement circuit

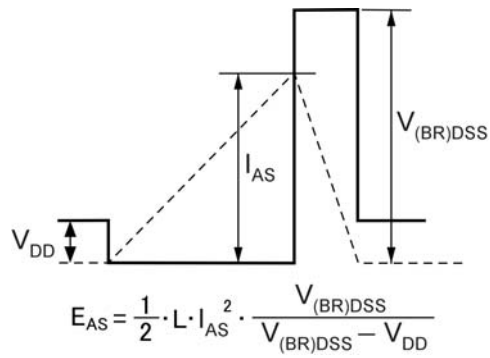


Fig.3-2 Avalanche waveform

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