

# Switching (450V, 7A)

## 2SK2299N

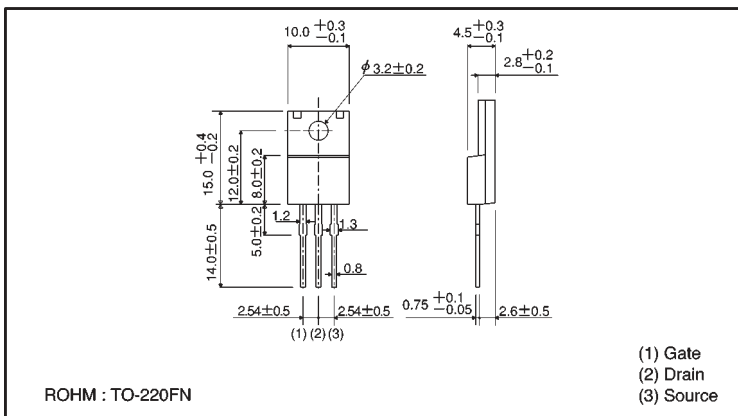
### ●Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Wide SOA (safe operating area).
- 4) Gate-source voltage ( $V_{GSS}$ ) guaranteed to be  $\pm 30V$ .
- 5) Easily designed drive circuits.
- 6) Easy to parallel.

### ●Structure

Silicon N-channel  
MOSFET

### ●External dimensions (Units: mm)



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

Parameter	Symbol	Limits	Unit	
Drain-source voltage	$V_{DSS}$	450	V	
Gate-source voltage	$V_{GSS}$	$\pm 30$	V	
Drain current	Continuous	$I_D$	7	A
	Pulsed	$I_{DP}^*$	28	A
Reverse drain current	Continuous	$I_{DR}$	7	A
	Pulsed	$I_{DRP}^*$	28	A
Total power dissipation ( $T_c=25^\circ\text{C}$ )	$P_D$	30	W	
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$	
Storage temperature	$T_{stg}$	$-55 \sim +150$	$^\circ\text{C}$	

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

### ●Packaging specifications

Type	Package	Bulk
	Code	—
	Basic ordering unit (pieces)	500
2SK2299N		○

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Gate-source leakage	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V
Drain-source breakdown voltage	V <sub>(BR)DSS</sub>	450	—	—	V	I <sub>D</sub> =1mA, V <sub>GS</sub> =0V
Zero gate voltage drain current	I <sub>DSS</sub>	—	—	100	μA	V <sub>DS</sub> =450V, V <sub>GS</sub> =0V
Gate threshold voltage	V <sub>GS(th)</sub>	2.0	—	4.0	V	V <sub>DS</sub> =10V, I <sub>D</sub> =1mA
Static drain-source on-state resistance	R <sub>DS(on)</sub>	—	0.85	1.1	Ω	I <sub>D</sub> =4.0A, V <sub>GS</sub> =10V
Forward transfer admittance	Y <sub>fs</sub>  *	3.0	5.5	—	S	I <sub>D</sub> =4.0A, V <sub>DS</sub> =10V
Input capacitance	C <sub>iss</sub>	—	870	—	pF	V <sub>DS</sub> =10V
Output capacitance	C <sub>oss</sub>	—	180	—	pF	V <sub>GS</sub> =0V
Reverse transfer capacitance	C <sub>rss</sub>	—	40	—	pF	f=1MHz
Turn-on delay time	t <sub>d(on)</sub>	—	15	—	ns	I <sub>D</sub> =4A, V <sub>DD</sub> ≐150V
Rise time	t <sub>r</sub>	—	18	—	ns	V <sub>GS</sub> =10V
Turn-off delay time	t <sub>d(off)</sub>	—	60	—	ns	R <sub>L</sub> =37.5Ω
Fall time	t <sub>f</sub>	—	35	—	ns	R <sub>G</sub> =10Ω
Reverse recovery time	t <sub>rr</sub>	—	400	—	ns	I <sub>DR</sub> =7A, V <sub>GS</sub> =0V
Reverse recovery charge	Q <sub>rr</sub>	—	2.5	—	μC	di/dt=100A/μs

\* Pw≦300 μs, Duty cycle≦1%

●Electrical characteristic curves

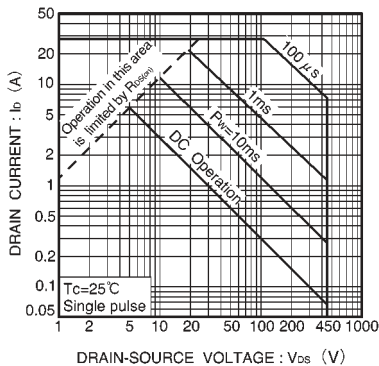


Fig.1 Maximum safe operating area

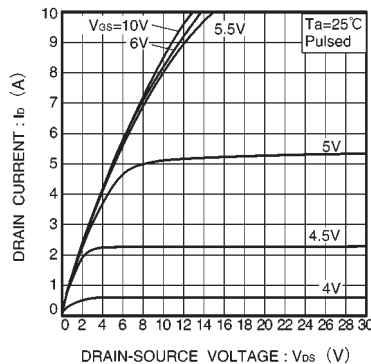


Fig.2 Typical output characteristics

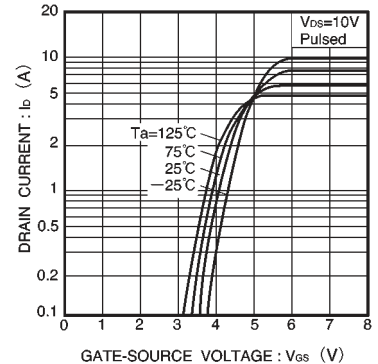


Fig.3 Typical transfer characteristics

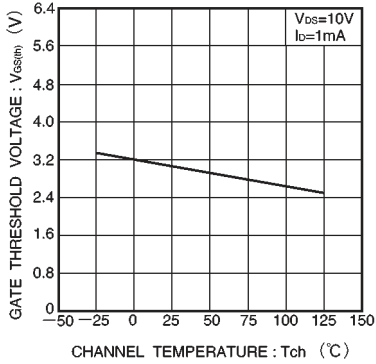


Fig.4 Gate threshold voltage vs. channel temperature

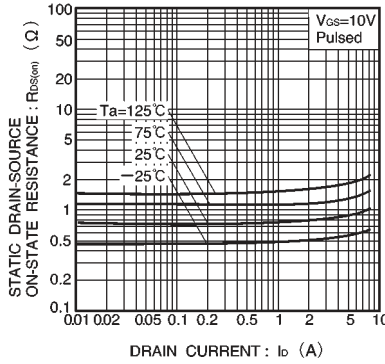


Fig.5 Static drain-source on-state resistance vs. drain current

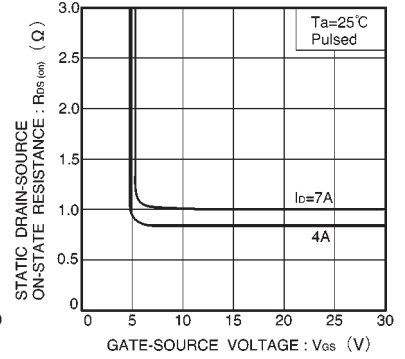


Fig.6 Static drain-source on-state resistance vs. gate-source voltage

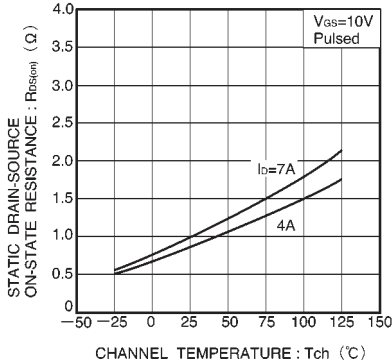


Fig.7 Static drain-source on-state resistance vs. channel temperature

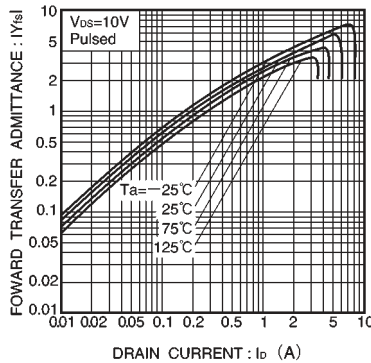


Fig.8 Forward transfer admittance vs. drain current

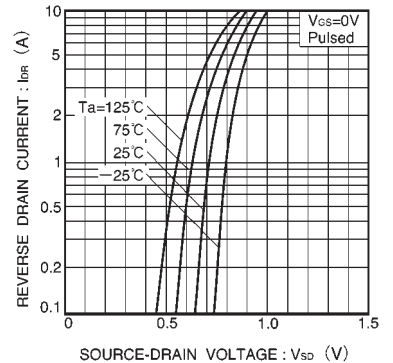


Fig.9 Reverse drain current vs. source-drain voltage (I)

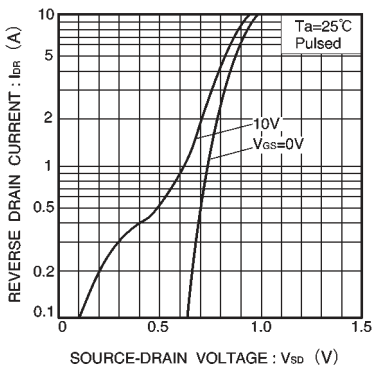


Fig.10 Reverse drain current vs. source-drain voltage (II)

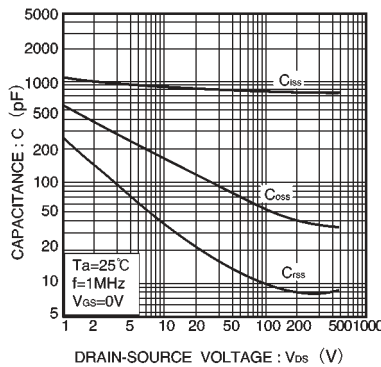


Fig.11 Typical capacitance vs. drain-source voltage

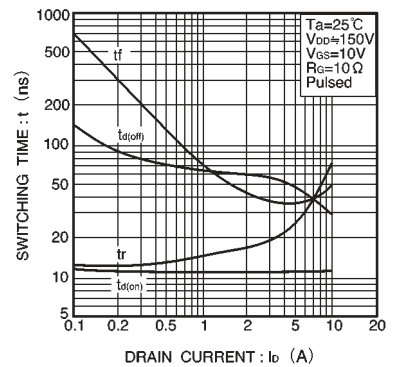


Fig.12 Switching characteristics (See Figures 16 and 17 for the measurement circuit and resultant waveforms)

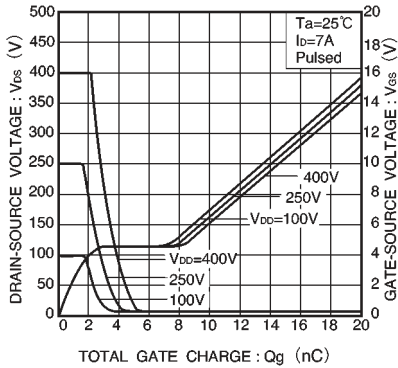


Fig.13 Dynamic input characteristics (See Figure 18 for measurement circuit)

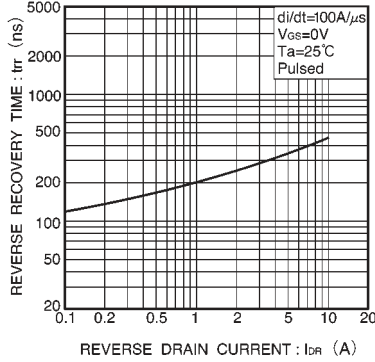


Fig.14 Reverse recovery time vs. reverse drain current

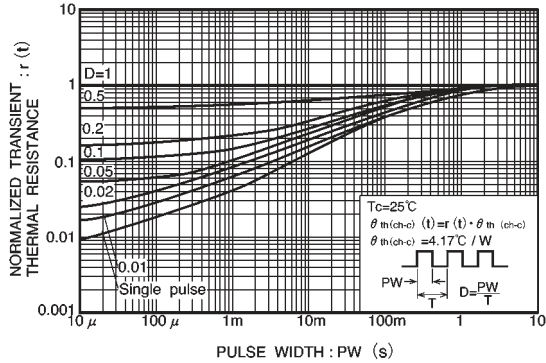


Fig.15 Normalized transient thermal resistance vs. pulse width

● Switching characteristics measurement circuit

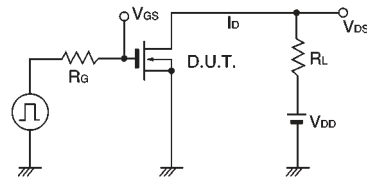


Fig.16 Switching time measurement circuit

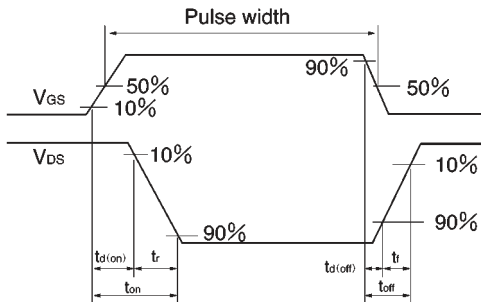


Fig.17 Switching time waveforms

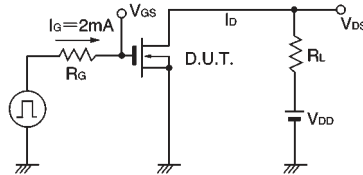


Fig.18 Gate charge measurement circuit

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