

# Switching (450V, 7A)

## 2SK2299N

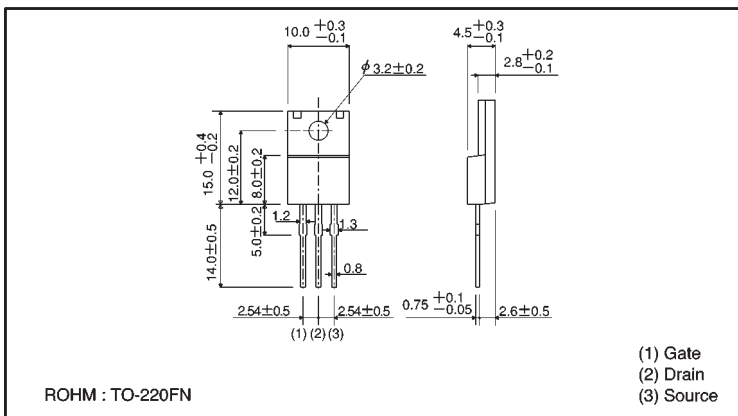
### ●Features

- 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) 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                               |            | $V_{DS}$    | 450             | V                |
| Gate-source voltage                                |            | $V_{GS}$    | $\pm 30$        | 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<br>V <sub>GS</sub> =0V<br>f=1MHz             |
| Output capacitance                      | C <sub>oss</sub>     | —    | 180  | —    | pF   |                                                                   |
| Reverse transfer capacitance            | C <sub>rss</sub>     | —    | 40   | —    | pF   |                                                                   |
| Turn-on delay time                      | t <sub>d(on)</sub>   | —    | 15   | —    | ns   | I <sub>D</sub> =4A, V <sub>DD</sub> ≒150V<br>V <sub>GS</sub> =10V |
| Rise time                               | t <sub>r</sub>       | —    | 18   | —    | ns   |                                                                   |
| Turn-off delay time                     | t <sub>d(off)</sub>  | —    | 60   | —    | ns   | R <sub>L</sub> =37.5Ω<br>R <sub>G</sub> =10Ω                      |
| Fall time                               | t <sub>f</sub>       | —    | 35   | —    | ns   |                                                                   |
| 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

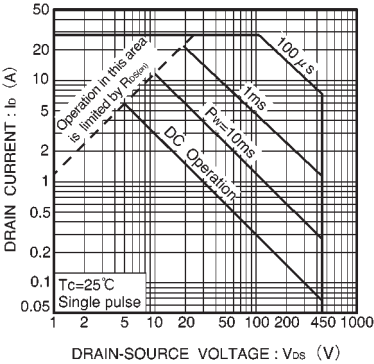


Fig.1 Maximum safe operating area

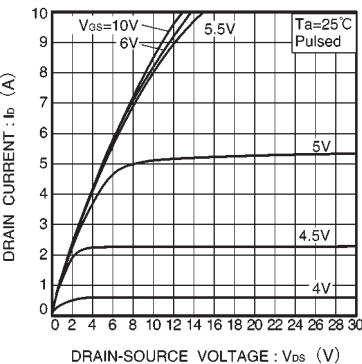


Fig.2 Typical output characteristics

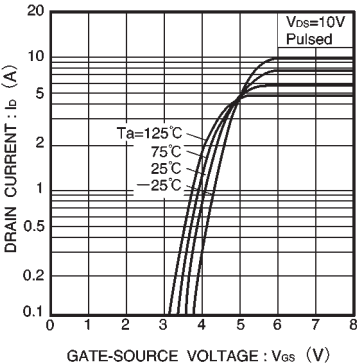


Fig.3 Typical transfer characteristics

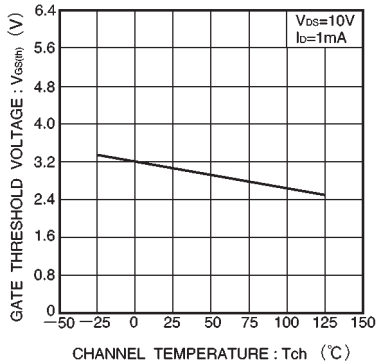


Fig.4 Gate threshold voltage vs. channel temperature

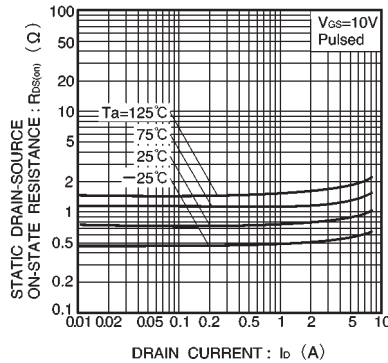


Fig.5 Static drain-source on-state resistance vs. drain current

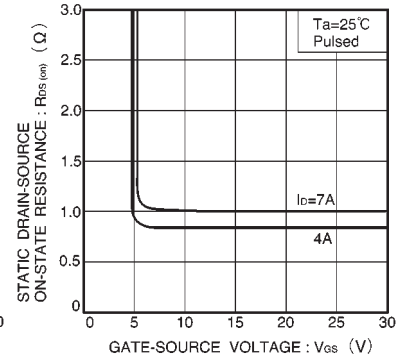


Fig.6 Static drain-source on-state resistance vs. gate-source voltage

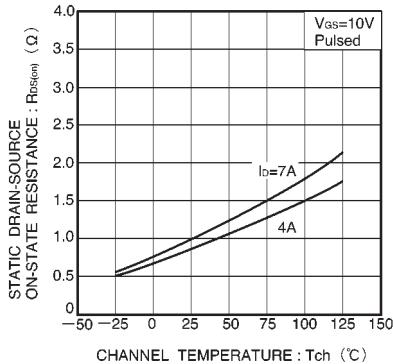


Fig.7 Static drain-source on-state resistance vs. channel temperature

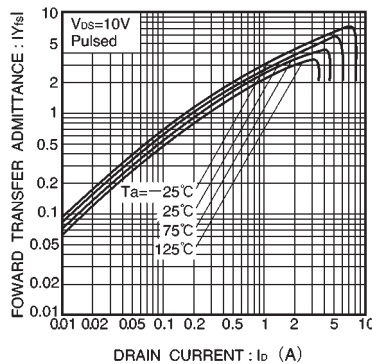


Fig.8 Forward transfer admittance vs. drain current

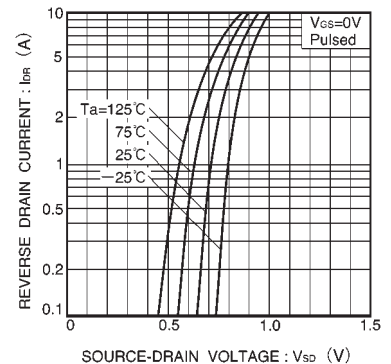


Fig.9 Reverse drain current vs. source-drain voltage (I)

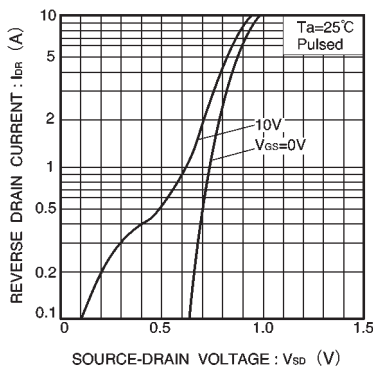


Fig.10 Reverse drain current vs. source-drain voltage (II)

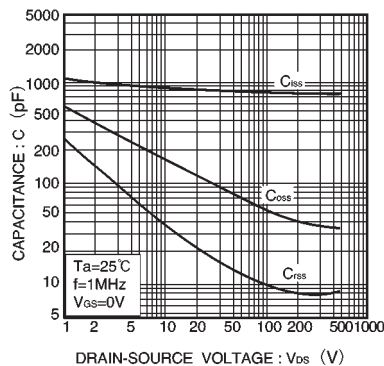


Fig.11 Typical capacitance vs. drain-source voltage

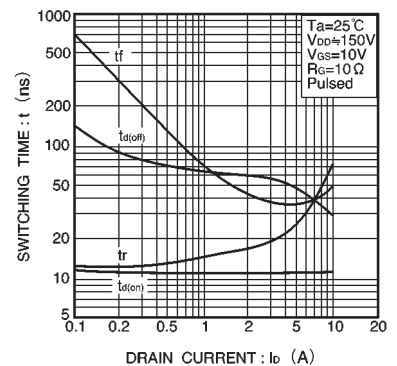


Fig.12 Switching characteristics (See Figures 16 and 17 for the measurement circuit and resultant waveforms)

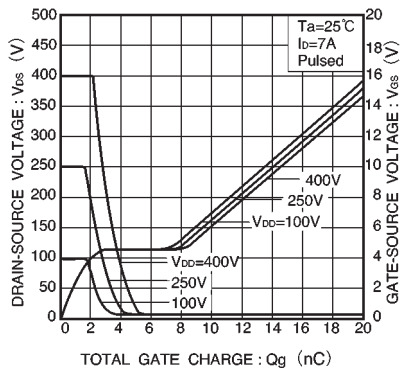


Fig.13 Dynamic input characteristics  
(See Figure 18 for measurement circuit)

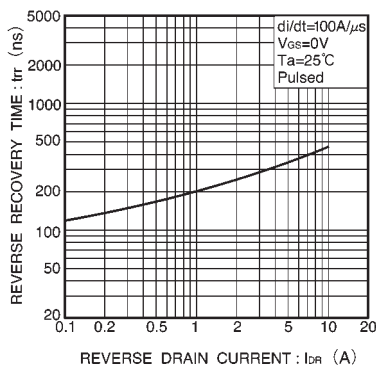


Fig.14 Reverse recovery time  
vs. reverse drain current

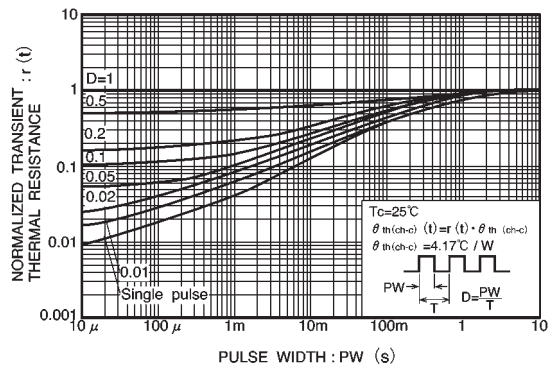


Fig.15 Normalized transient thermal  
resistance vs. pulse width

#### ● Switching characteristics measurement circuit

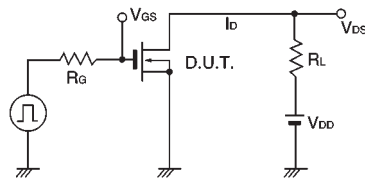


Fig.16 Switching time measurement circuit

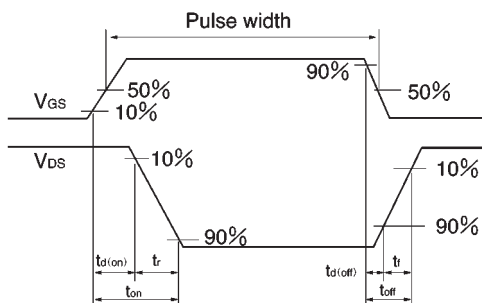


Fig.17 Switching time waveforms

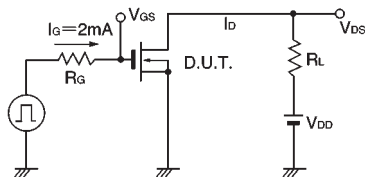


Fig.18 Gate charge measurement circuit