

# Switching (30V, 6A)

## RK4936

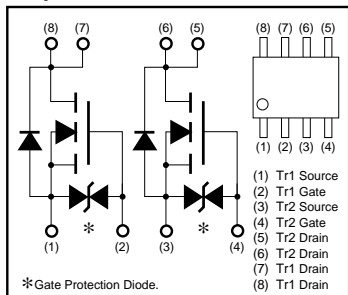
● **Features**

- 1) Low Qg.
- 2) Low on-resistance.
- 3) Excellent resistance to damage from static electricity.

● **Structure**

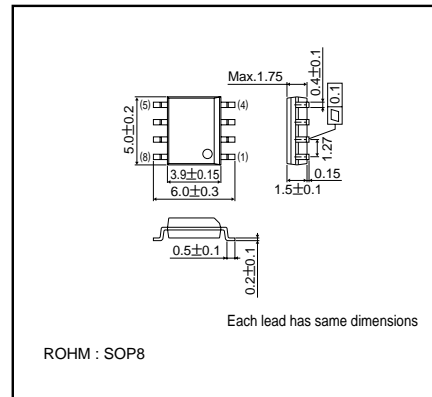
Silicon N-channel  
MOS FET

● **Equivalent circuit**



\* A protection diode is included between the gate and the source terminals to protect the diode against static electricity when the product is in use. Use a protection circuit when the fixed voltage are exceeded.

● **External dimensions (Units : mm)**



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

| Parameter                        | Symbol           | Limits             | Unit  |
|----------------------------------|------------------|--------------------|-------|
| Drain-Source Voltage             | V <sub>DSS</sub> | 30                 | V     |
| Gate-Source Voltage              | V <sub>GSS</sub> | ±20                | V     |
| Drain Current                    | Continuous       | I <sub>D</sub>     | 6 A   |
|                                  | Pulsed           | I <sub>DP</sub> *  | 24 A  |
| Reverse Drain Current            | Continuous       | I <sub>DR</sub>    | 6 A   |
|                                  | Pulsed           | I <sub>DRP</sub> * | 24 A  |
| Source Current (Body Diode)      | Continuous       | I <sub>S</sub>     | 1.3 A |
|                                  | Pulsed           | I <sub>SP</sub> *  | 5.2 A |
| Total Power Dissipation(Tc=25°C) | P <sub>D</sub>   | 2                  | W     |
| Channel Temperature              | T <sub>ch</sub>  | 150                | °C    |
| Storage Temperature              | T <sub>stg</sub> | -55~+150           | °C    |

\*Pw≤10μs, Duty cycle≤1%

## Transistors

## ● Thermal resistance (Ta = 25°C)

| Parameter          | Symbol    | Limits | Unit |
|--------------------|-----------|--------|------|
| Channel to Ambient | Rth(ch-A) | 62.5   | °C/W |

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

| Parameter                               | Symbol               | Min. | Typ. | Max. | Unit | Test Conditions                            |
|-----------------------------------------|----------------------|------|------|------|------|--------------------------------------------|
| Gate-Source Leakage                     | I <sub>GSS</sub>     | –    | –    | ±10  | μA   | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V |
| Drain-Source Breakdown Voltage          | V <sub>(BR)DSS</sub> | 30   | –    | –    | V    | I <sub>D</sub> =1mA, V <sub>GS</sub> =0V   |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>     | –    | –    | 10   | μA   | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V  |
| Gate Threshold Voltage                  | V <sub>GS(th)</sub>  | 1.0  | –    | 2.5  | V    | V <sub>DS</sub> =10V, I <sub>D</sub> =1mA  |
| Static Drain-Source On-State Resistance | R <sub>DS(on)*</sub> | –    | 22   | 28   | mΩ   | I <sub>D</sub> =6A, V <sub>GS</sub> =10V   |
|                                         |                      | –    | 32   | 42   |      | I <sub>D</sub> =6A, V <sub>GS</sub> =4.5V  |
|                                         |                      | –    | 40   | 52   |      | I <sub>D</sub> =6A, V <sub>GS</sub> =4V    |
| Forward Transfer Admittance             | Y <sub>fs</sub>  *   | 5    | –    | –    | S    | I <sub>D</sub> =6A, V <sub>DS</sub> =10V   |
| Input Capacitance                       | C <sub>iss</sub>     | –    | 740  | –    | pF   | V <sub>DS</sub> =10V                       |
| Output Capacitance                      | C <sub>oss</sub>     | –    | 420  | –    | pF   | V <sub>GS</sub> =0V                        |
| Reverse Transfer Capacitance            | C <sub>rss</sub>     | –    | 180  | –    | pF   | f=1MHz                                     |
| Turn-On Delay Time                      | t <sub>d(on)*</sub>  | –    | 14   | –    | ns   | I <sub>D</sub> =3A, V <sub>DD</sub> =15V   |
| Rise Time                               | t <sub>r</sub> *     | –    | 30   | –    | ns   | V <sub>GS</sub> =10V                       |
| Turn-Off Delay Time                     | t <sub>d(off)*</sub> | –    | 55   | –    | ns   | R <sub>L</sub> =5Ω                         |
| Fall Time                               | t <sub>f</sub> *     | –    | 25   | –    | ns   | R <sub>GS</sub> =10Ω                       |
| Total Gate Charge                       | Q <sub>g</sub> *     | –    | 21   | 42   | nC   | V <sub>DD</sub> =15V                       |
| Gate-Source Charge                      | Q <sub>gs</sub> *    | –    | 2.7  | –    | nC   | V <sub>GS</sub> =10V                       |
| Gate-Drain Charge                       | Q <sub>gd</sub> *    | –    | 5.6  | –    | nC   | I <sub>D</sub> =6A                         |

\*Pulsed

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

| Parameter               | Symbol            | Min. | Typ. | Max. | Unit | Test Conditions                            |
|-------------------------|-------------------|------|------|------|------|--------------------------------------------|
| Forward Voltage         | V <sub>SD</sub> * | –    | –    | 1.5  | V    | I <sub>S</sub> =5.2A, V <sub>GS</sub> =0V  |
| Reverse Recovery Time   | t <sub>rr</sub> * | –    | 140  | –    | ns   | I <sub>DR</sub> =5.2A, V <sub>GS</sub> =0V |
| Reverse Recovery Charge | Q <sub>rr</sub> * | –    | 140  | –    | nC   | di/dt=100A/μs                              |

\*Pulsed

Transistors

● Electrical characteristic curves

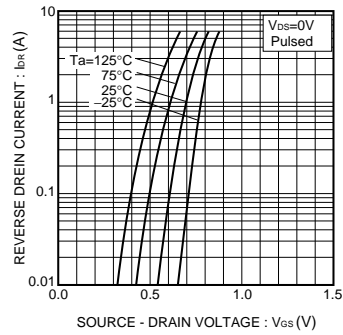


Fig.1 Reverse Drain Current vs. Source-Drain Voltage

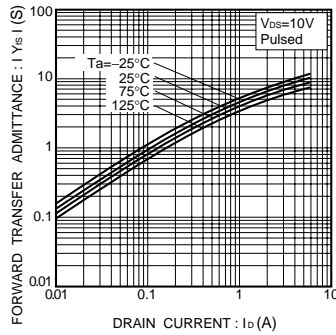


Fig.2 Forward Transfer Admittance vs. Drain Current

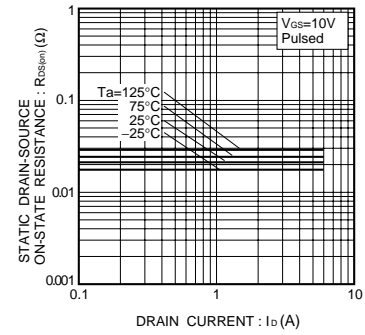


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current ( I )

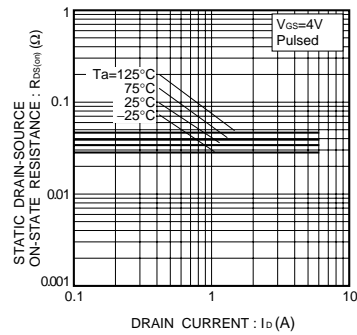


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current ( II )

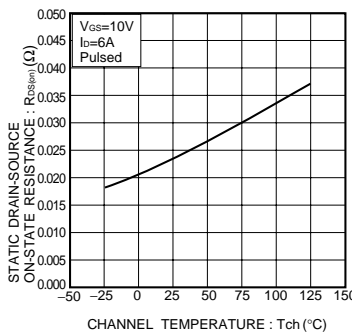


Fig.5 Static Drain-Source On-State Resistance vs. Channel Temperature

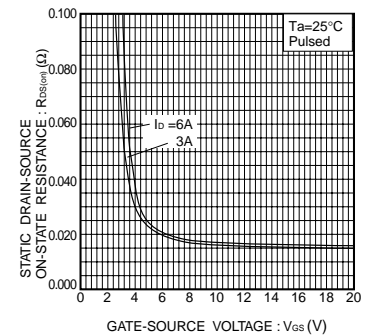


Fig.6 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

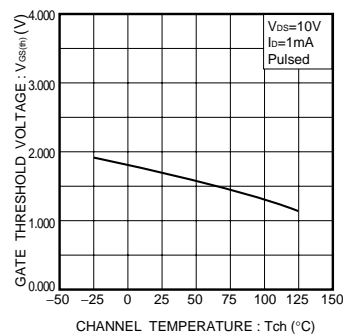


Fig.7 Gate Threshold Voltage vs. Channel Temperature

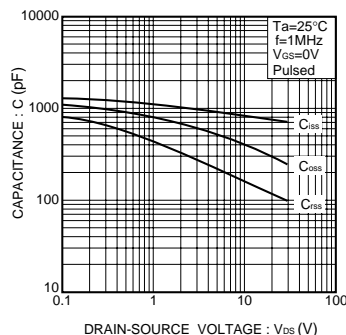


Fig.8 Typical Capacitance vs. Drain-Source Voltage

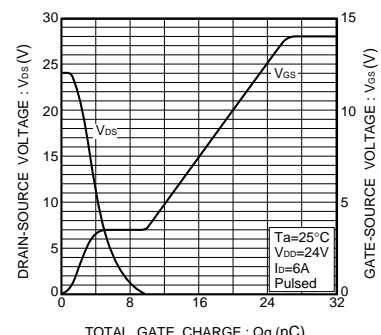


Fig.9 Dynamic Input Characteristics



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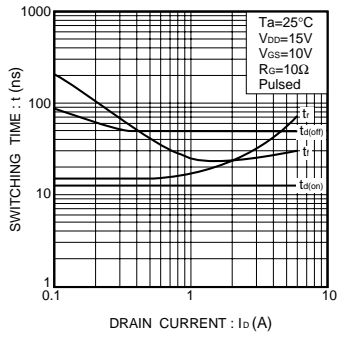


Fig.10 Switching Characteristics

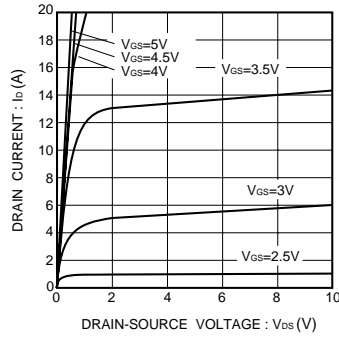


Fig.11 Typical Output Characteristics

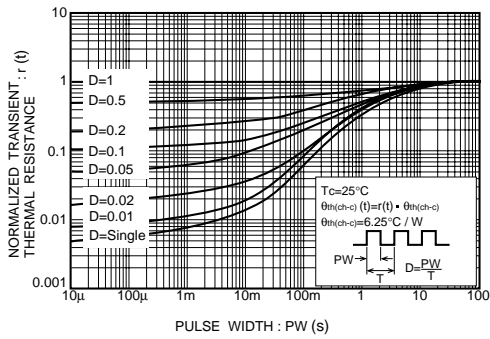


Fig.12 Normalized Transient Thermal Resistance vs. Pulse Width