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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation



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RENESAS

# MOS FIELD EFFECT TRANSISTOR
# 2SK1399

## N-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR HIGH SPEED SWITCHING

### DESCRIPTION

The 2SK1399 is an N-channel vertical type MOS FET can be driven by 2.5 V power supply.

The 2SK1399 is driven by low voltage and does not require consideration of driving current, it is suitable for appliances including VCR cameras and headphone stereos which need power saving.

### FEATURES

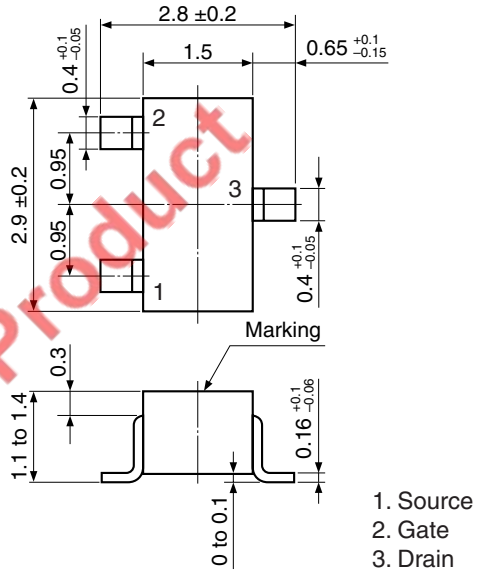
- Can be driven by a 3.0 V power source
- Not necessary to consider driving current because of its high input impedance
- Possible to reduce the number of parts by omitting the bias resistor
- Can be used complementary with the 2SJ185

### ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|---|---|
| 2SK1399 | SC-59 (Mini Mold) |

**Marking: G12**

### PACKAGE DRAWING (Unit: mm)



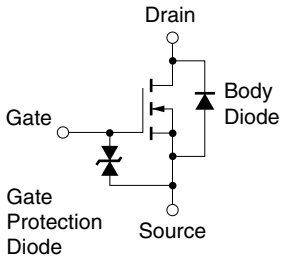

1. Source
2. Gate
3. Drain

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C)

| | | | |
|---|---|---|---|
| Drain to Source Voltage ($V_{GS}$ = 0 V) | $V_{DSS}$ | 50 | V |
| Gate to Source Voltage ($V_{DS}$ = 0 V) | $V_{GSS}$ | ±7.0 | V |
| Drain Current (DC) | $I_{D(DC)}$ | ±100 | mA |
| Drain Current (pulse) Note | $I_{D(pulse)}$ | ±200 | mA |
| Total Power Dissipation ($T_C$ = 25°C) | $P_T$ | 200 | mW |
| Channel Temperature | $T_{ch}$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | –55 to +150 | °C |

**Note** PW ≤ 10 ms, Duty Cycle ≤ 50%

### EQUIVALENT CIRCUIT




★ **Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.





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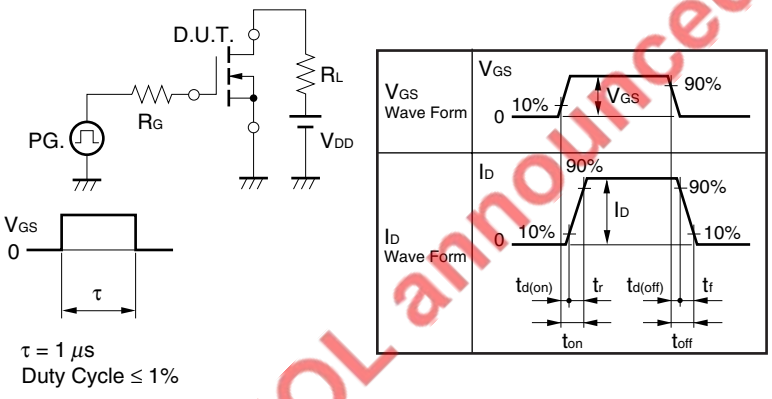
**The mark ★ shows major revised points.**

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C)

| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 50 V, $V_{GS}$ = 0 V | | | 10 | μA |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±7.0 V, $V_{DS}$ = 0 V | | | ±5.0 | μA |
| Gate Cut-off Voltage | $V_{GS(off)}$ | $V_{DS}$ = 3.0 V, $I_D$ = 1.0 μA | 0.9 | 1.2 | 1.5 | V |
| Forward Transfer Admittance **Note** | $\|y_{fs}\|$ | $V_{DS}$ = 3.0 V, $I_D$ = 10 mA | 20 | 38 | | mS |
| Drain to Source On-state Resistance **Note** | $R_{DS(on)1}$ | $V_{GS}$ = 2.5 V, $I_D$ = 10 mA | | 22 | 40 | Ω |
| | $R_{DS(on)2}$ | $V_{GS}$ = 4.0 V, $I_D$ = 10 mA | | 14 | 20 | Ω |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 3.0 V | | 8.0 | | pF |
| Output Capacitance | $C_{oss}$ | $V_{GS}$ = 0 V | | 7.0 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | f = 1 MHz | | 3.0 | | pF |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 3.0 V, $I_D$ = 20 mA | | 15 | | ns |
| Rise Time | $t_r$ | $V_{GS}$ = 3.0 V | | 100 | | ns |
| Turn-off Delay Time | $t_{d(off)}$ | $R_G$ = 10 Ω | | 30 | | ns |
| Fall Time | $t_f$ | | | 35 | | ns |

**Note** Pulsed

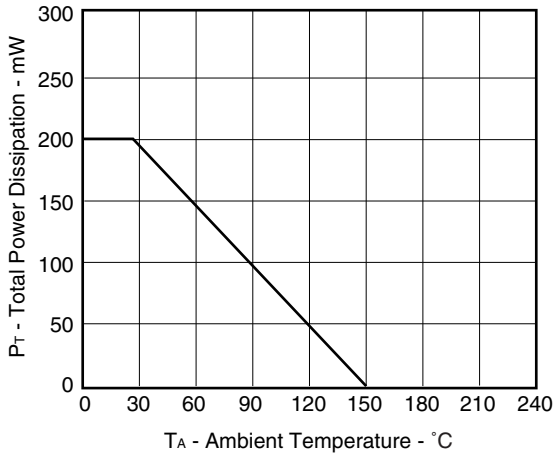
### TEST CIRCUIT SWITCHING TIME



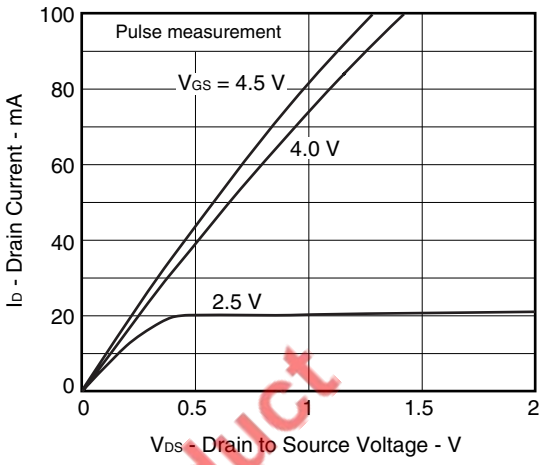

τ = 1 μs
Duty Cycle ≤ 1%

## ★ TYPICAL CHARACTERISTICS ($T_A$ = 25°C)

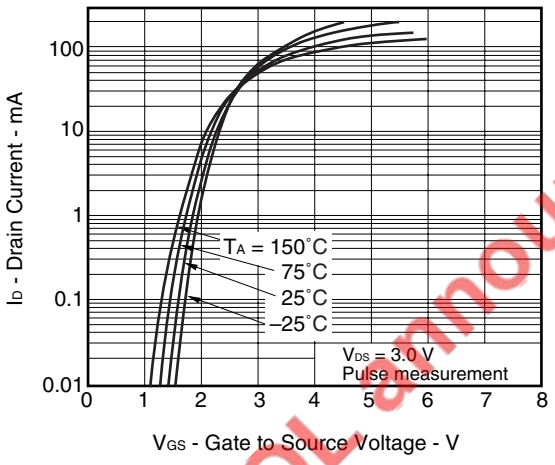
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



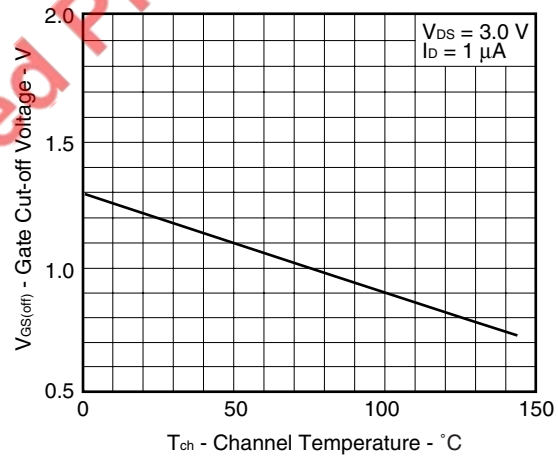

DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



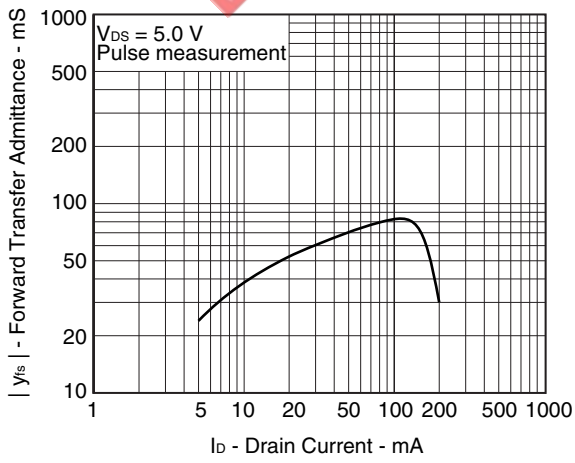

TRANSFER CHARACTERISTICS



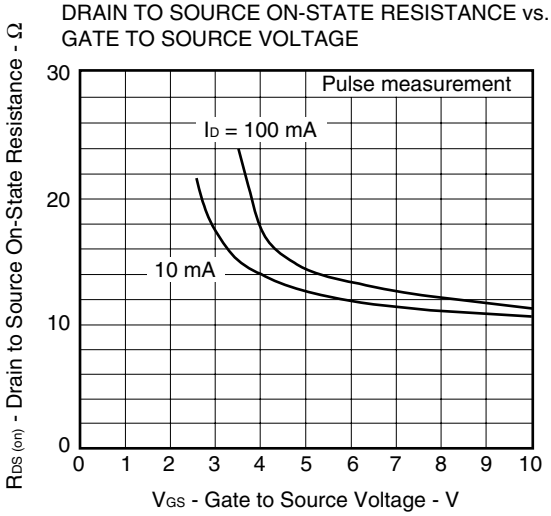

GATE CUT-OFF VOLTAGE
vs. CHANNEL TEMPERATURE



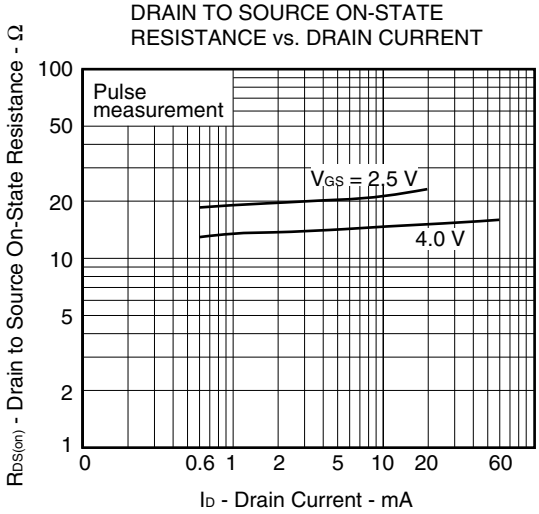

FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT




DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



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