

# MOS FIELD EFFECT TRANSISTOR

## 2SK2109

# N-CHANNEL MOS FET FOR HIGH-SPEED SWITCHING

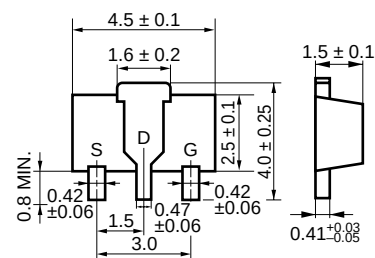
The 2SK2109 is a N-channel MOS FET of a vertical type and is a switching element that can be directly driven by the output of an IC operating at 5 V.

This product has a low ON resistance and superb switching characteristics and is ideal for driving the actuator, such as motors and DC/DC converters.

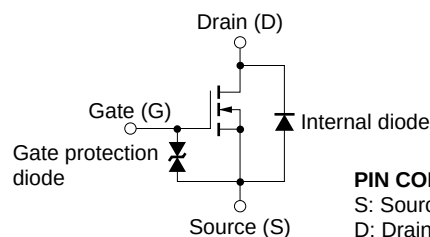
## FEATURES

- Low ON resistance  
 $R_{DS(on)} = 1.0 \, \Omega$  MAX. @  $V_{GS} = 4.0 \, V$ ,  $I_D = 0.3 \, A$
- High switching speed  
 $t_{on} + t_{off} < 100 \, ns$
- Low parasitic capacitance

### PACKAGE DIMENSIONS (in mm)



### EQUIVALENT CIRCUIT



Marking: NS

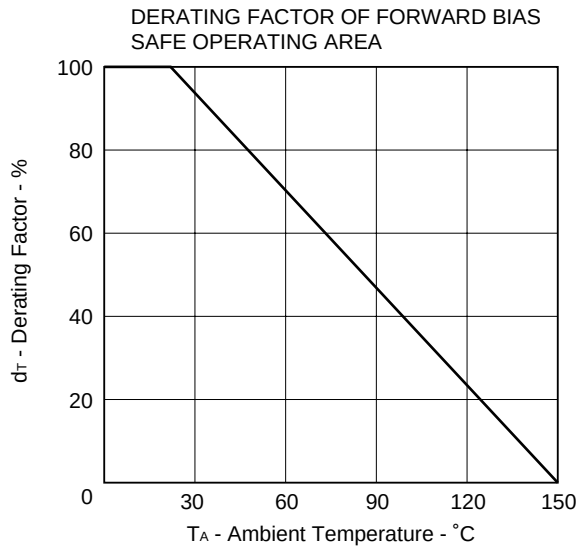
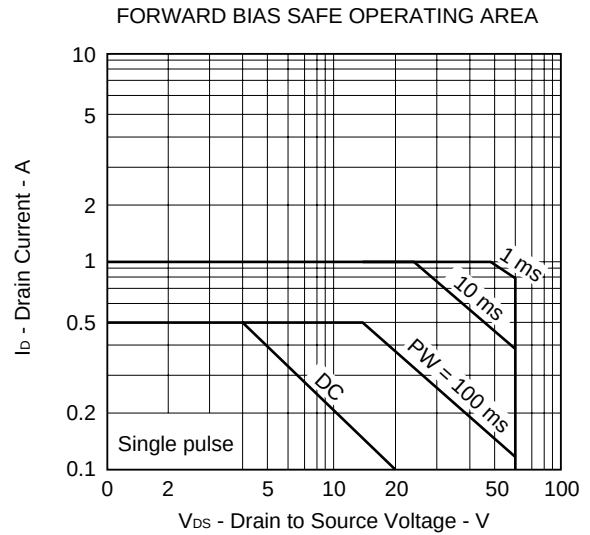
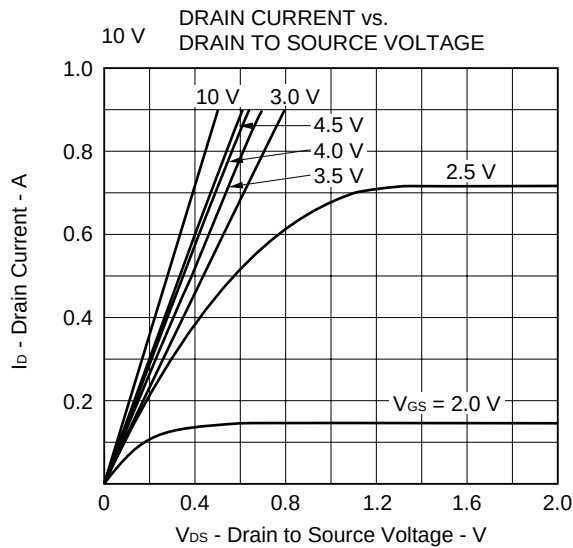
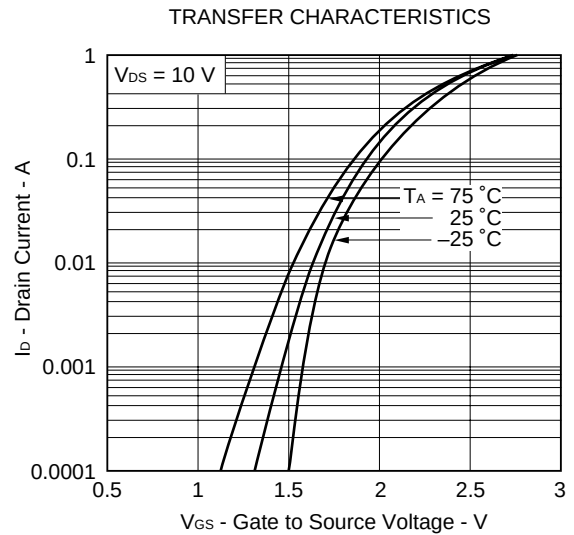
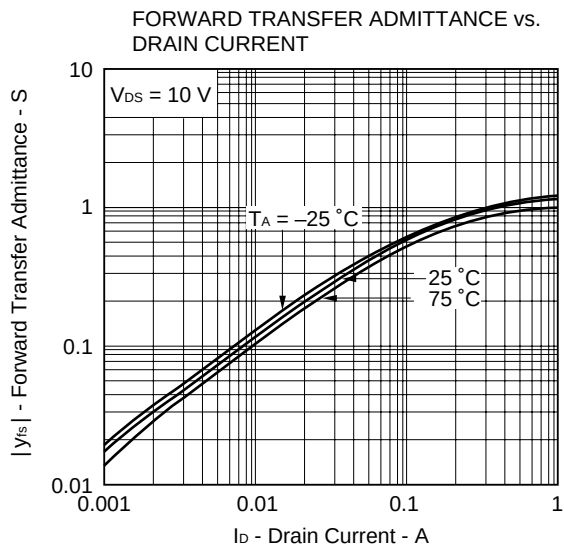
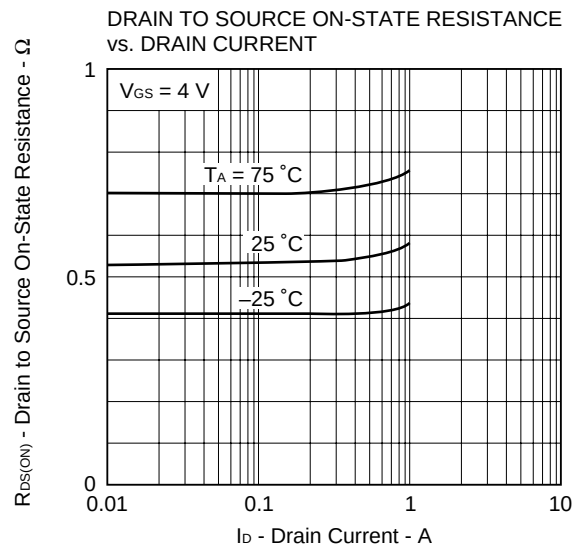
### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)

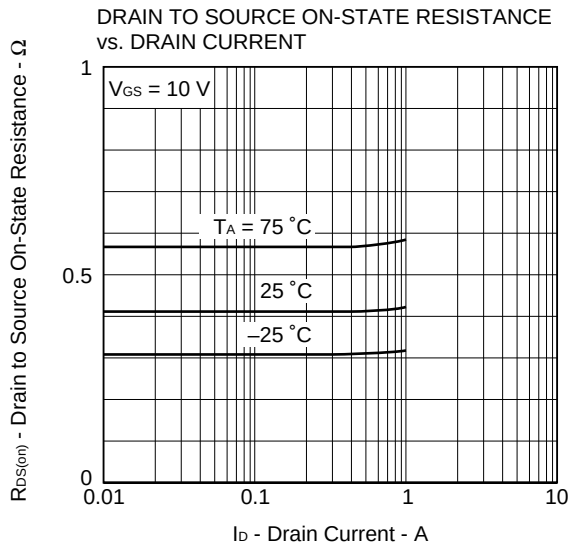
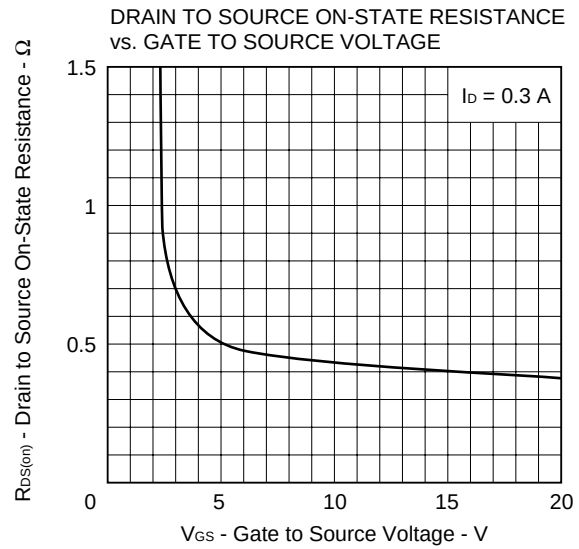
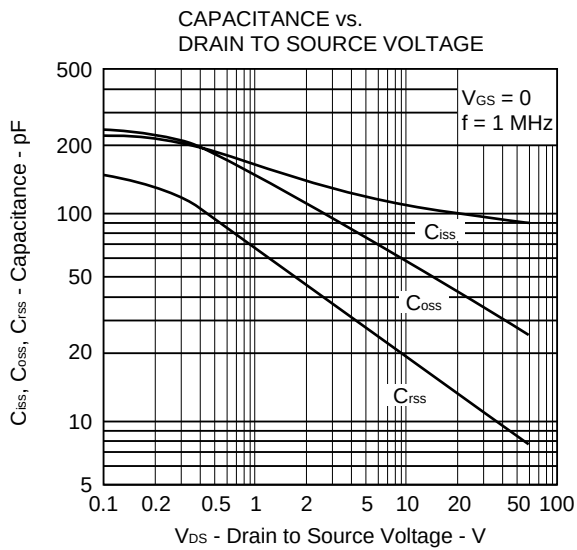
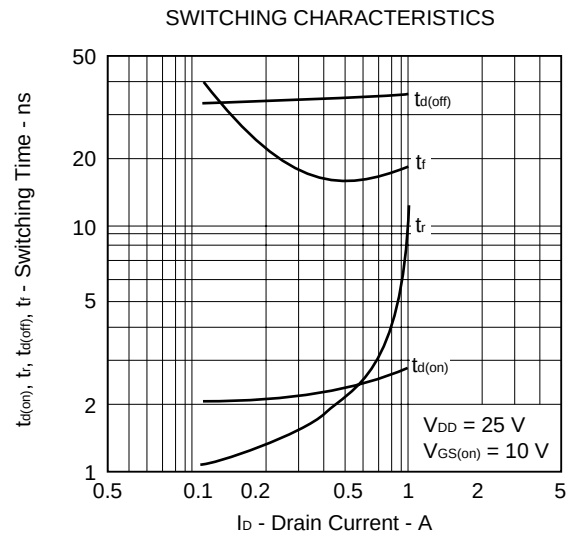
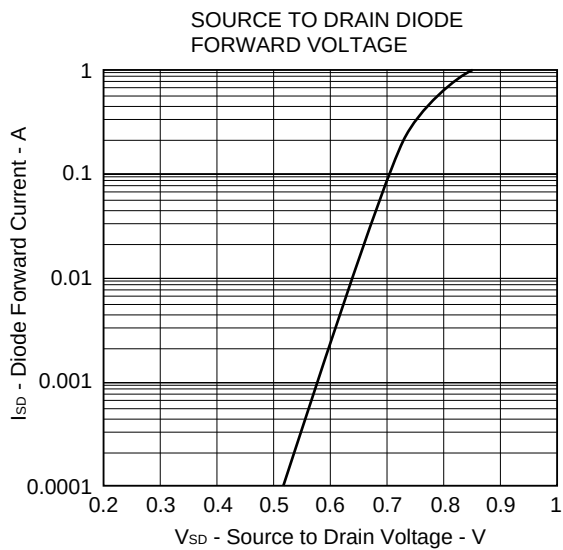
| PARAMETER               | SYMBOL                | TEST CONDITIONS                                     | RATING      | UNIT |
|-------------------------|-----------------------|-----------------------------------------------------|-------------|------|
| Drain to Source Voltage | V <sub>DSS</sub>      | V <sub>GS</sub> = 0                                 | 60          | V    |
| Gate to Source Voltage  | V <sub>GSS</sub>      | V <sub>DS</sub> = 0                                 | ±20         | V    |
| Drain Current (DC)      | I <sub>D(DC)</sub>    |                                                     | ±0.5        | A    |
| Drain Current (Pulse)   | I <sub>D(pulse)</sub> | PW ≤ 10 ms,<br>Duty cycle ≤ 50 %                    | ±1.0        | A    |
| Total Power Dissipation | P <sub>T</sub>        | 16 cm <sup>2</sup> × 0.7 mm, ceramic substrate used | 2.0         | W    |
| Channel Temperature     | T <sub>ch</sub>       |                                                     | 150         | °C   |
| Storage Temperature     | T <sub>stg</sub>      |                                                     | −55 to +150 | °C   |

ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ }^{\circ}\text{C}$ )

| PARAMETER                           | SYMBOL        | TEST CONDITIONS                                                                                                                    | MIN. | TYP. | MAX.     | UNIT          |
|-------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------|------|------|----------|---------------|
| Drain Cut-Off Current               | $I_{DSS}$     | $V_{DS} = 60\text{ V}$ , $V_{GS} = 0$                                                                                              |      |      | 1.0      | $\mu\text{A}$ |
| Gate Leakage Current                | $I_{GSS}$     | $V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0$                                                                                          |      |      | $\pm 10$ | $\mu\text{A}$ |
| Gate Cut-Off Voltage                | $V_{GS(off)}$ | $V_{DS} = 10\text{ V}$ , $I_D = 1\text{ mA}$                                                                                       | 0.8  | 1.5  | 2.0      | V             |
| Forward Transfer Admittance         | $ y_{fs} $    | $V_{DS} = 10\text{ V}$ , $I_D = 0.3\text{ A}$                                                                                      | 0.4  |      |          | S             |
| Drain to Source On-State Resistance | $R_{DS(on)1}$ | $V_{GS} = 4.0\text{ V}$ , $I_D = 0.3\text{ A}$                                                                                     |      | 0.55 | 1.0      | $\Omega$      |
| Drain to Source On-State Resistance | $R_{DS(on)2}$ | $V_{GS} = 10\text{ V}$ , $I_D = 0.3\text{ A}$                                                                                      |      | 0.41 | 0.8      | $\Omega$      |
| Input Capacitance                   | $C_{iss}$     | $V_{DS} = 10\text{ V}$ , $V_{GS} = 0$ ,<br>$f = 1.0\text{ MHz}$                                                                    |      | 111  |          | pF            |
| Output Capacitance                  | $C_{oss}$     |                                                                                                                                    |      | 55   |          | pF            |
| Reverse Transfer Capacitance        | $C_{rss}$     |                                                                                                                                    |      | 19   |          | pF            |
| Turn-On Delay Time                  | $t_{d(on)}$   | $V_{DD} = 25\text{ V}$ , $I_D = 0.3\text{ A}$<br>$V_{GS(on)} = 10\text{ V}$ , $R_G = 10\text{ }\Omega$<br>$R_L = 83\text{ }\Omega$ |      | 2.2  |          | ns            |
| Rise Time                           | $t_r$         |                                                                                                                                    |      | 1.5  |          | ns            |
| Turn-Off Delay Time                 | $t_{d(off)}$  |                                                                                                                                    |      | 35   |          | ns            |
| Fall Time                           | $t_f$         |                                                                                                                                    |      | 19   |          | ns            |

TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )





## REFERENCE

| Document Name                                               | Document No. |
|-------------------------------------------------------------|--------------|
| NEC semiconductor device reliability/quality control system | TEI-1202     |
| Quality grade on NEC semiconductor devices                  | IEI-1209     |
| Semiconductor device mounting technology manual             | C10535E      |
| Guide to quality assurance for semiconductor devices        | MEI-1202     |
| Semiconductor selection guide                               | X10679E      |

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Anti-radioactive design is not implemented in this product.