NEC

# MOS FIELD EFFECT TRANSISTOR
# 2SK2541

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

### DESCRIPTION

The 2SK2541 is a switching device which can be driven directly by a 1.5 V power source.

The MOS FET has excellent switching characteristics and is suitable for use as a high-speed switching device in digital circuits.

### FEATURES

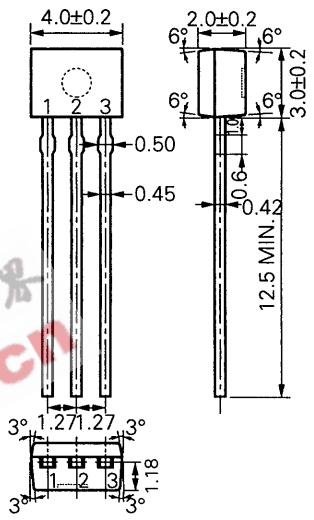
- Can be driven by a 1.5 V power source.
- Not necessary to consider driving current because of its high input impedance.
- Possible to reduce the number of parts by omitting the bias resistor.

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

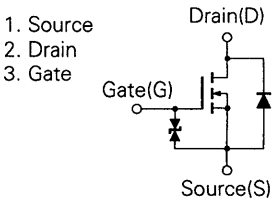
| | | | |
|---|---|---|---|
| Drain to Source Voltage | $V_{DSS}$ | 50 | V |
| Gate to Source Voltage | $V_{GSS}$ | ±7.0 | V |
| Drain Current (DC) | $I_{D(DC)}$ | ±0.1 | A |
| Drain Current (pulse) | $I_{D(pulse)}$ | ±0.2 * | A |
| Total Power Dissipation | $P_T$ | 250 | mW |
| Channel Temperature | $T_{CH}$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | −55 to +150 | °C |

*PW ≦10 ms, Duty cycle ≦ 1 %

### PACKAGE DRAWINGS (in millimeter)




### EQUIVALENT CIRCUIT




(Diode in the figure is the parasitic diode.)

The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device is 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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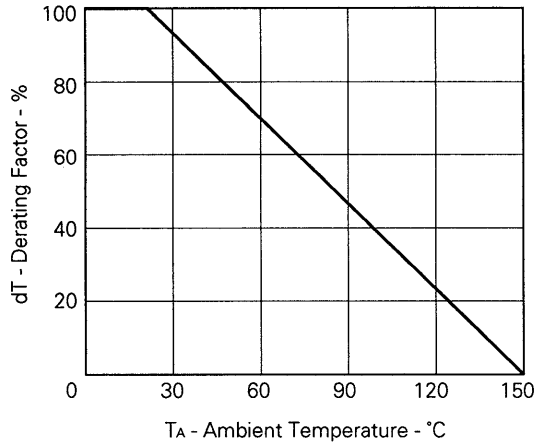
## ELECTRICAL CHARACTERISTICS ($T_A$ = +25 °C)

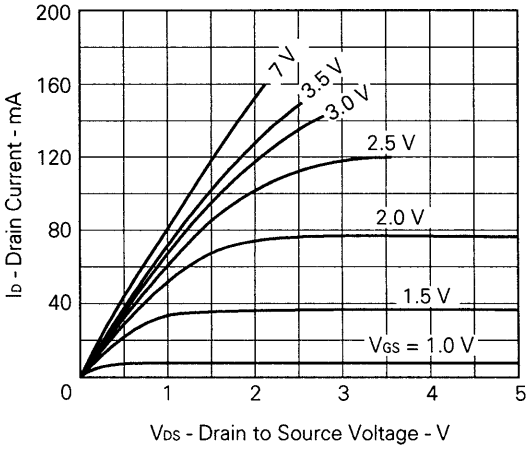
| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Drain Cut-off Current | $I_{DSS}$ | | | 1.0 | μA | $V_{DS}$ = 50 V, $V_{GS}$ = 0 |
| Gate Leakage Current | $I_{GSS}$ | | | ±3.0 | μA | $V_{GS}$ = ±7.0 V, $V_{DS}$ = 0 |
| Gate Cut-off Voltage | $V_{GS(off)}$ | 0.5 | 0.7 | 1.1 | V | $V_{DS}$ = 3.0 V, $I_D$ = 1.0 μA |
| Forward Transfer Admittance | $\|y_{fs}\|$ | 20 | | | mS | $V_{DS}$ = 3.0 V, $I_D$ = 10 mA |
| Drain to Source On-State Resistance | $R_{DS(on)1}$ | | 32 | 50 | Ω | $V_{GS}$ = 1.5 V, $I_D$ = 1 mA |
| Drain to Source On-State Resistance | $R_{DS(on)2}$ | | 16 | 20 | Ω | $V_{GS}$ = 2.5 V, $I_D$ = 10 mA |
| Drain to Source On-State Resistance | $R_{DS(on)3}$ | | 12 | 15 | Ω | $V_{GS}$ = 4.0 V, $I_D$ = 10 mA |
| Input Capacitance | $C_{iss}$ | | 6 | | pF | $V_{DS}$ = 3.0 V, $V_{GS}$ = 0<br>f = 1.0 MHz |
| Output Capacitance | $C_{oss}$ | | 8 | | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | | 1 | | pF | |
| Turn-On Delay Time | $t_{d(on)}$ | | 9 | | ns | $V_{DD}$ = 3.0 V, $I_D$ = 20 mA<br>$V_{GS(on)}$ = 3.0 V, $R_G$ = 10 Ω<br>$R_L$ = 150 Ω |
| Rise Time | $t_r$ | | 48 | | ns | |
| Turn-Off Delay Time | $t_{d(off)}$ | | 21 | | ns | |
| Fall Time | $t_f$ | | 31 | | ns | |

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

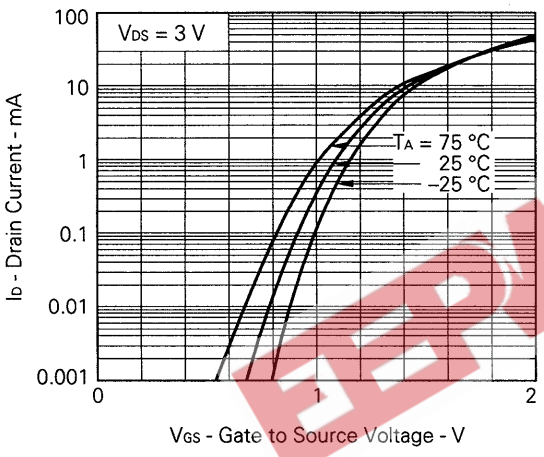
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



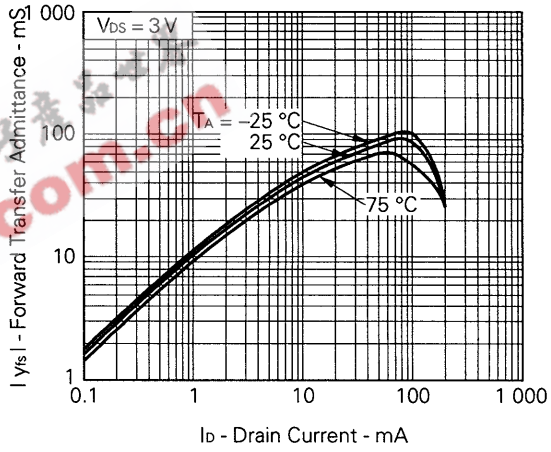

DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



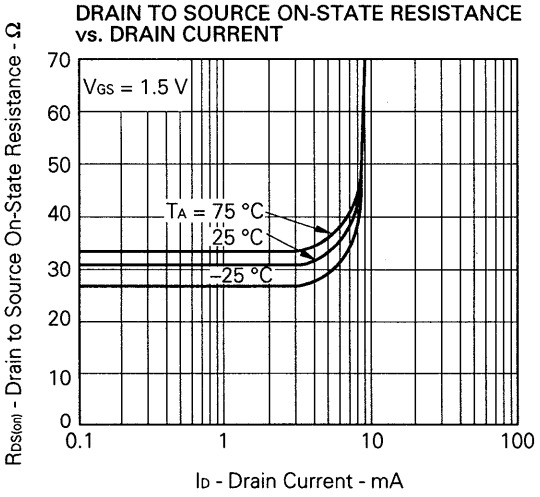

TRANSFER CHARACTERISTICS



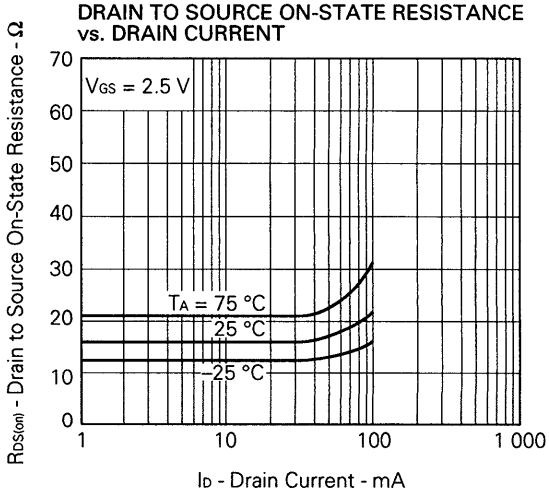

FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



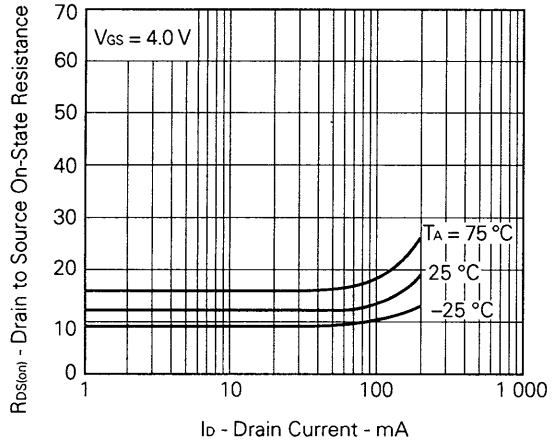

DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



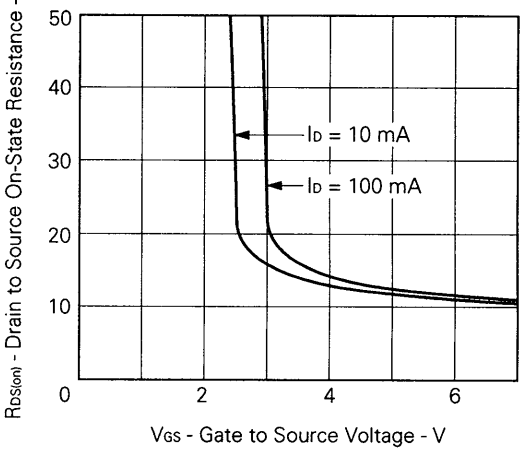

DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



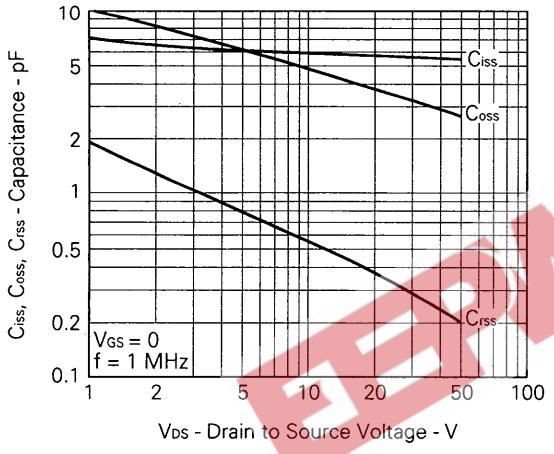
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



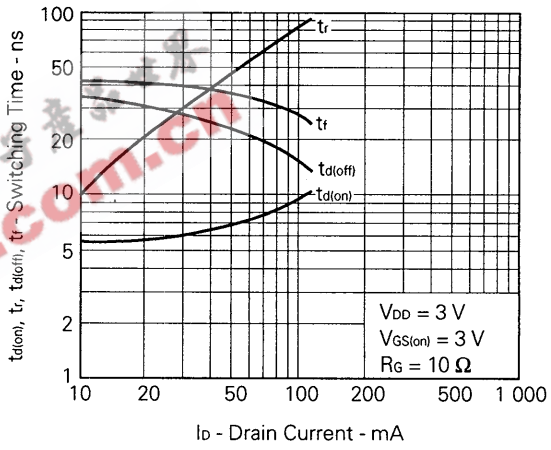

DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



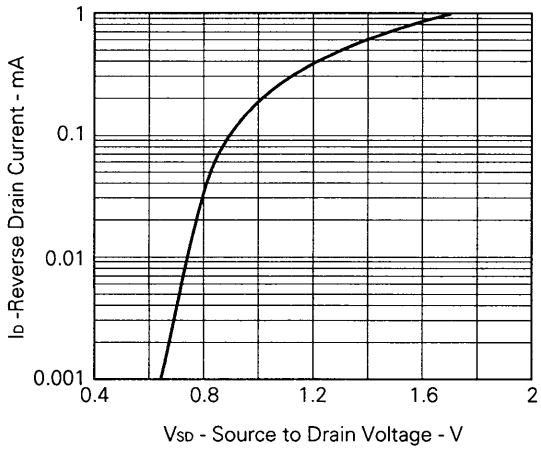

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE




SWITCHING CHARACTERISTICS




SOURCE TO DRAIN DIODE FORWARD VOLTAGE



## 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 | IEI-1207 |
| Guide to quality assurance for semiconductor devices | MEI-1202 |
| Semiconductor selection guide | MF-1134 |

[MEMO]



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