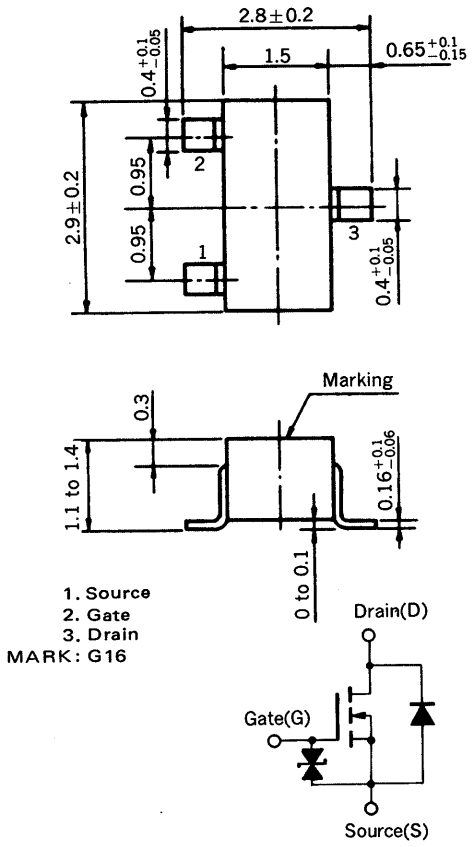
# MOS FIELD EFFECT TRANSISTOR

# 2SK1590

## N-CHANNEL MOS FET FOR SWITCHING

### PACKAGE DIMENSIONS (Unit : mm)




(Diode in the figure is the parasitic diode.)

The 2SK1590, N-channel vertical type MOS FET, is a switching device which can be driven directly by the output of ICs having a 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

- Directly driven by ICs having a 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.

### QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

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

| PARAMETER | SYMBOL | RATINGS | UNIT | TEST CONDITIONS |
|---|---|---|---|---|
| Drain to Source Voltage | $V_{DSS}$ | 60 | V | $V_{GS}$ = 0 |
| Gate to Source Voltage | $V_{GSS}$ | ±20 | V | $V_{DS}$ = 0 |
| Drain Current | $I_{D(DC)}$ | ±200 | mA | |
| Drain Current | $I_{D(pulse)}$ | ±400 | mA | PW ≦ 10 ms, Duty Cycle ≦ 50 % |
| Total Power Dissipation | $P_T$ | 200 | mW | |
| Channel Temperature | $T_{ch}$ | 150 | °C | |
| Storage Temperature | $T_{stg}$ | −55 to +150 | °C | |

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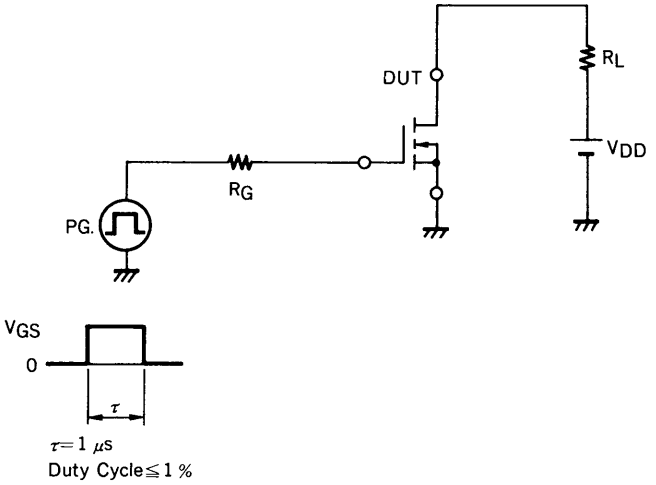
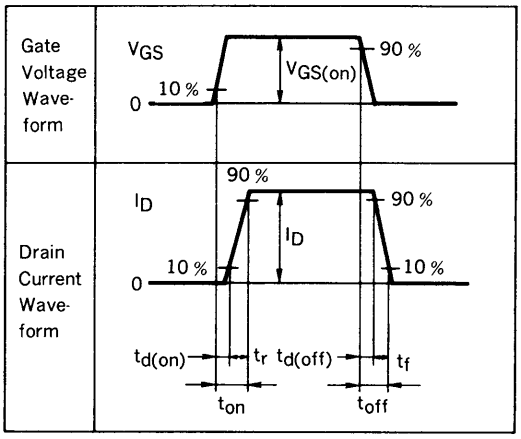
## ELECTRICAL CHARACTERISTICS ($T_a$ = 25 °C)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Drain Cut-off Current | $I_{DSS}$ | | | 1.0 | μA | $V_{DS}$ = 60 V, $V_{GS}$ = 0 |
| Gate Leakage Current | $I_{GSS}$ | | | ±1.0 | μA | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 |
| Gate Cut-off Voltage | $V_{GS(off)}$ | 0.8 | 1.2 | 1.8 | V | $V_{DS}$ = 5.0 V, $I_D$ = 1.0 μA |
| Forward Transfer Admittance | $\|y_{fs}\|$ | 20 | 65 | | mS | $V_{DS}$ = 5.0 V, $I_D$ = 10 mA |
| Drain to Source On-State Resistance | $R_{DS(on)1}$ | | 3.2 | 6.0 | Ω | $V_{GS}$ = 4.0 V, $I_D$ = 10 mA |
| Drain to Source On-State Resistance | $R_{DS(on)2}$ | | 2.4 | 3.0 | Ω | $V_{GS}$ = 10 V, $I_D$ = 10 mA |
| Input Capacitance | $C_{iss}$ | | 26 | | pF | $V_{DS}$ = 5.0 V, $V_{GS}$ = 0, f = 1 MHz |
| Output Capacitance | $C_{oss}$ | | 20 | | pF | |
| Feedback Capacitance | $C_{iss}$ | | 4 | | pF | |
| Turn-On Delay Time | $t_{d(on)}$ | | 50 | | ns | $V_{DD}$ = 5.0 V, $I_D$ = 10 mA<br>$V_{GS(on)}$ = 5.0 V, $R_G$ = 10 Ω<br>$R_L$ = 500 Ω |
| Rise Time | $t_r$ | | 140 | | ns | |
| Turn-Off Delay Time | $t_{d(off)}$ | | 200 | | ns | |
| Fall Time | $t_f$ | | 190 | | ns | |

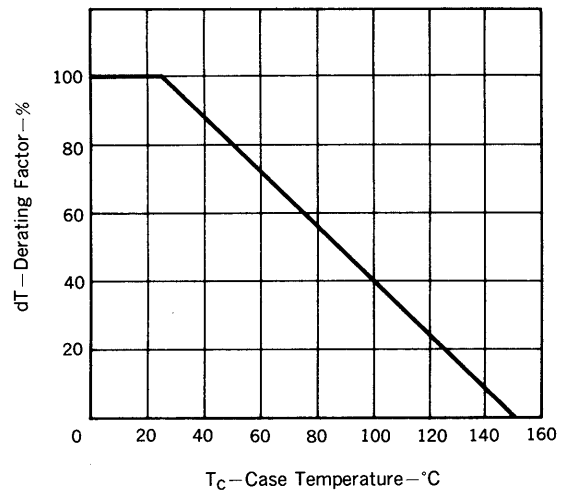
## SWITCHING TIME MEASUREMENT CIRCUIT AND CONDITIONS



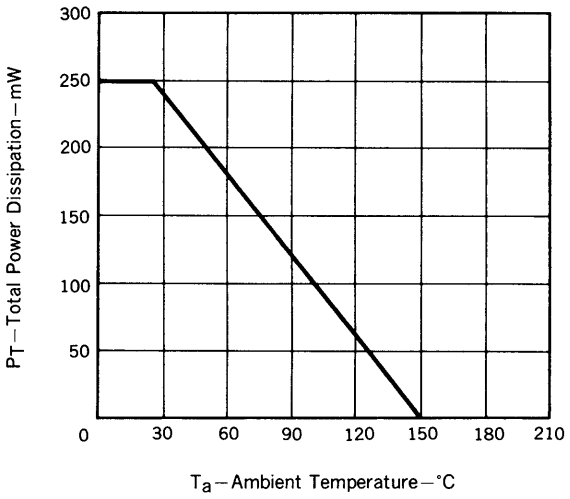



## TYPICAL CHARACTERISTICS ($T_a$ = 25 °C)

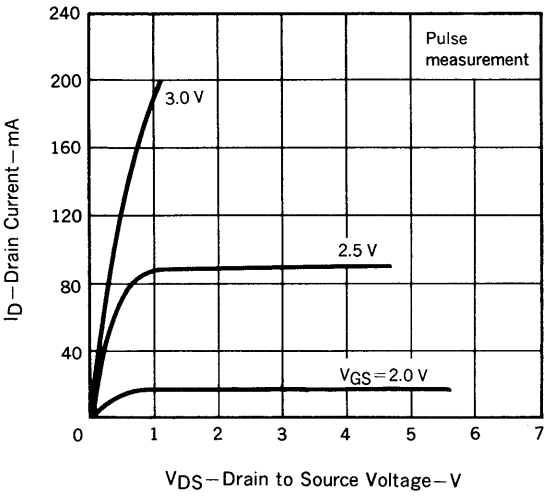
DERATING FACTOR OF FORWARD BIAS SAFE OPERATION AREA



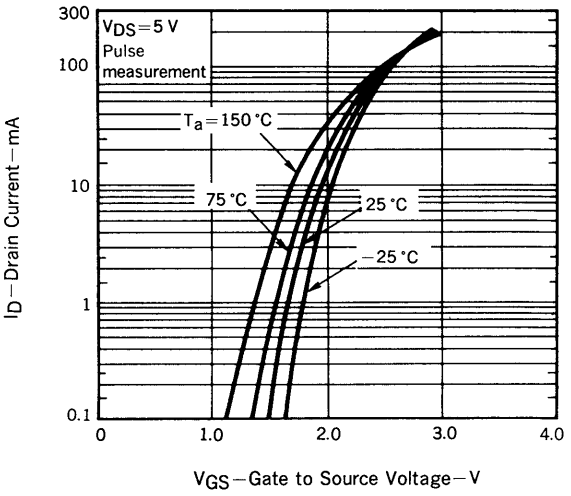

TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



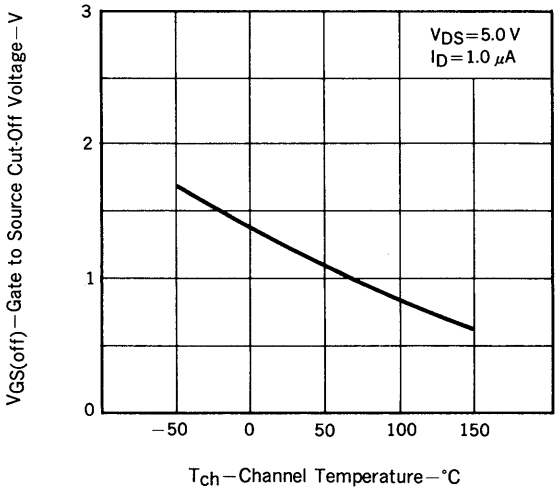

DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



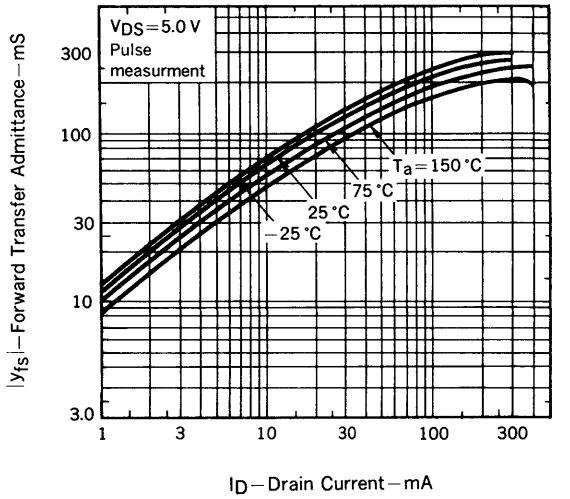

TRANSFER CHARACTERISTICS



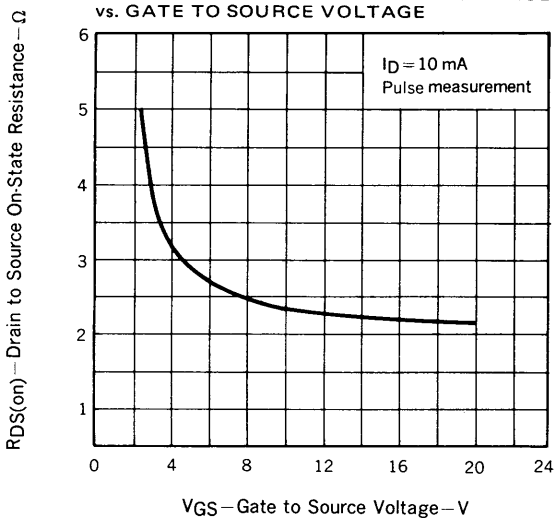

GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



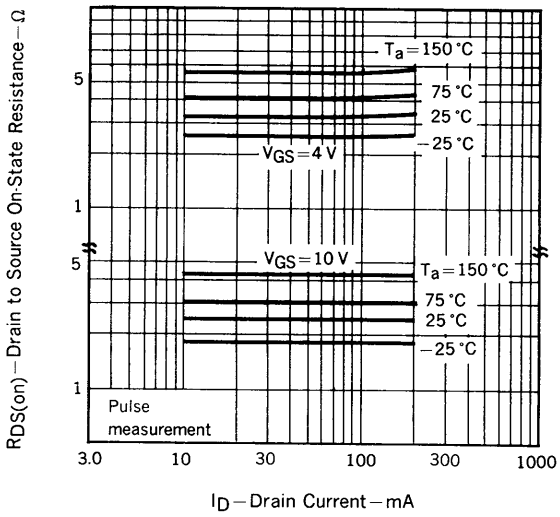

FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



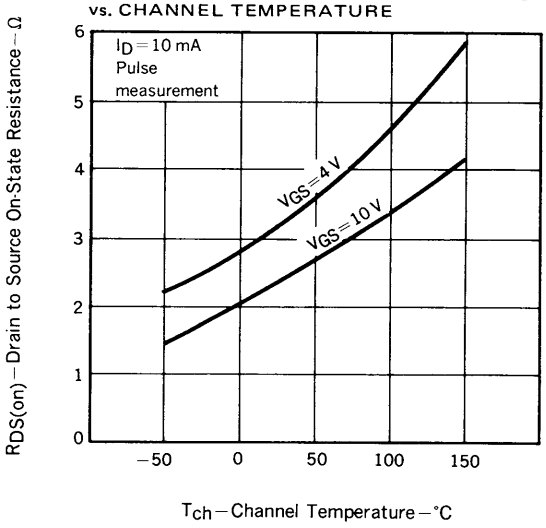
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



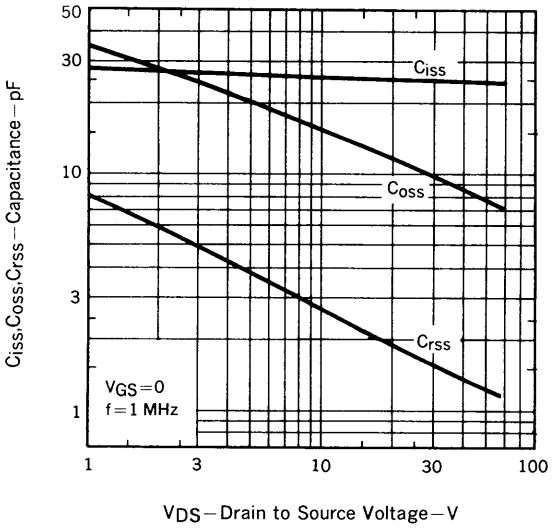

DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



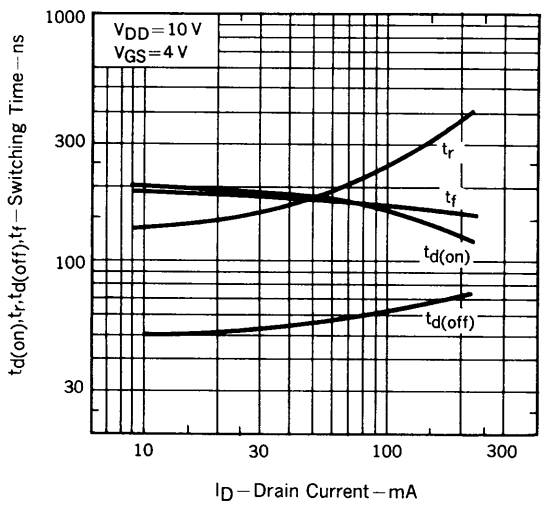

DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



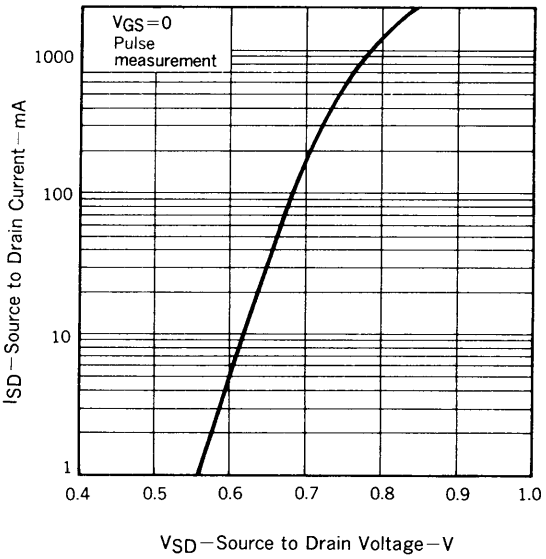

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE




SWITCHING CHARACTERISTICS




SOURCE TO DRAIN DIODE FORWARD VOLTAGE



## RECOMMENDED SOLDERING CONDITIONS

Mounting of this product by soldering should be done under the following conditions.

Please consult our representatives about soldering methods and conditions other than these.

### SURFACE MOUNT TYPE

For details of the recommended soldering conditions, see the information document "SMT MANUAL" (IEI-1207).

| Soldering Method | Soldering Conditions | Symbol for Recommended Conditions |
|---|---|---|
| Infrared Reflow | Package peak temp.: 230 °C<br>Soldering time: within 30 sec (above 210 °C)<br>Soldering times: 1, Days limitation: none* | IR30-00 |
| Vapor Phase Soldering | Package peak temp.: 215 °C<br>Soldering time: within 40 sec (above 200 °C)<br>Soldering times: 1, Days limitation: none* | VP15-00 |
| Wave Soldering | Soldering bath temp.: below 260 °C<br>Soldering time: within 10 sec<br>Soldering times: 1, Days limitation: none* | WS60-00 |

*: Stored days under storage conditions at 25 °C and below 65 % R.H. after the dry-pack has been opened.

**Note 1** Combination of soldering methods should be avoided.

[MEMO]