

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

#### DESCRIPTION

The 2SK3664 is a switching device, which can be driven directly by a 2.5 V power source.

The device features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power switch of portable machine and so on.

#### FEATURES

- 2.5 V drive available
- Low on-state resistance
  - $R_{DS(on)1} = 0.57 \Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 0.30 \text{ A)}$
  - $R_{DS(on)2} = 0.60 \Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 0.30 \text{ A)}$
  - $R_{DS(on)3} = 0.88 \Omega \text{ MAX. (} V_{GS} = 2.5 \text{ V, } I_D = 0.15 \text{ A)}$

#### ORDERING INFORMATION

| PART NUMBER | PACKAGE     |
|-------------|-------------|
| 2SK3664     | SC-75 (USM) |

Marking: G1

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

|  |                |             |                  |
|--|----------------|-------------|------------------|
| Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ ) | $V_{DSS}$      | 20          | V                |
| Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )  | $V_{GSS}$      | $\pm 12$    | V                |
| Drain Current (DC)                                 | $I_{D(DC)}$    | $\pm 0.5$   | A                |
| Drain Current (pulse) <sup>Note1</sup>             | $I_{D(pulse)}$ | $\pm 2.0$   | A                |
| Total Power Dissipation <sup>Note2</sup>           | $P_T$          | 0.2         | W                |
| Channel Temperature                                | $T_{ch}$       | 150         | $^\circ\text{C}$ |
| Storage Temperature                                | $T_{stg}$      | -55 to +150 | $^\circ\text{C}$ |

- Notes**
1.  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$
  2. Mounted on ceramic substrate of  $300 \text{ mm}^2 \times 0.64 \text{ mm}$

**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.

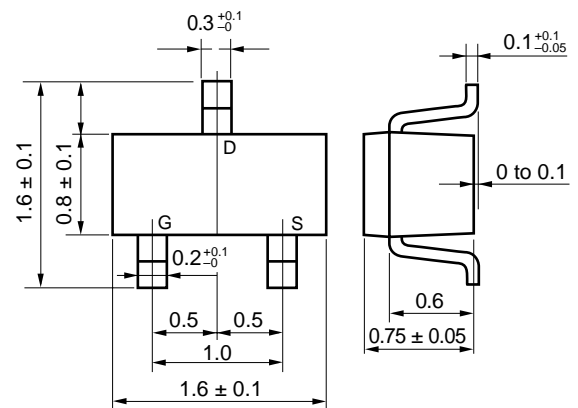
**Caution** This product is electrostatic-sensitive device due to low ESD capability and should be handled with caution for electrostatic discharge.

$V_{ESD} = \pm 200 \text{ V TYP. (} C = 200 \text{ pF, } R = 0 \Omega, \text{ Single pulse)}$

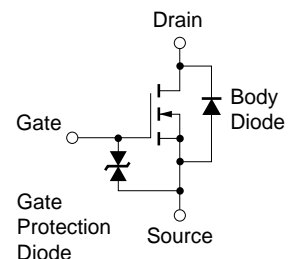
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#### PACKAGE DRAWING (Unit: mm)



#### EQUIVALENT CIRCUIT

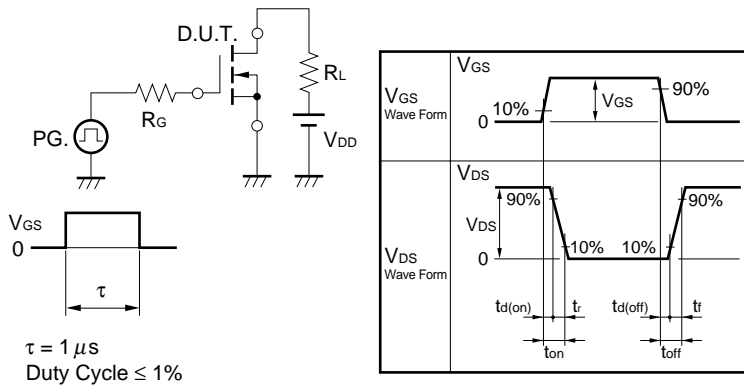


**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

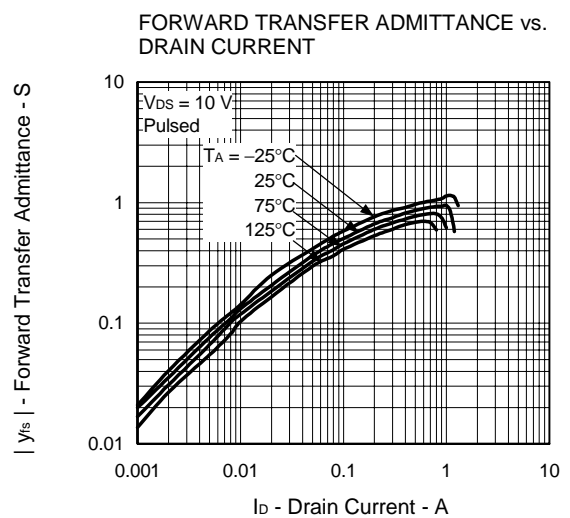
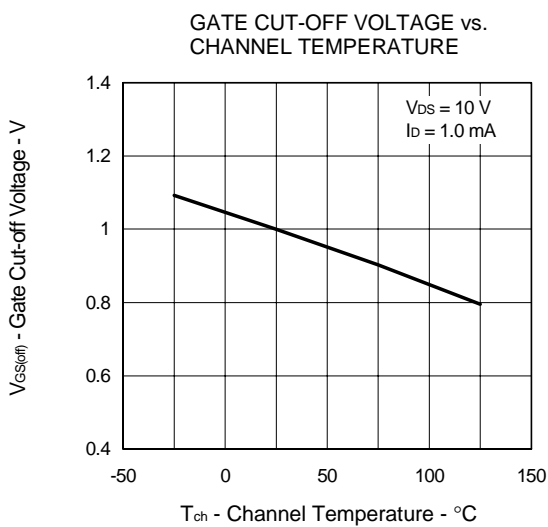
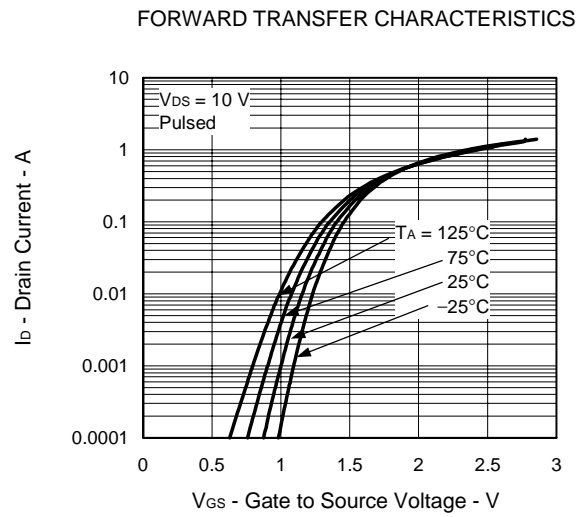
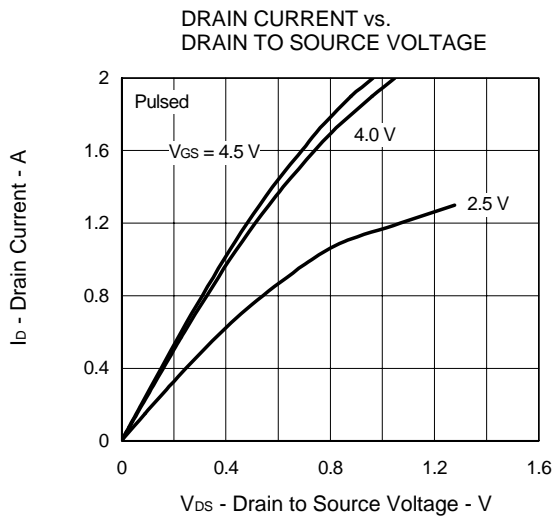
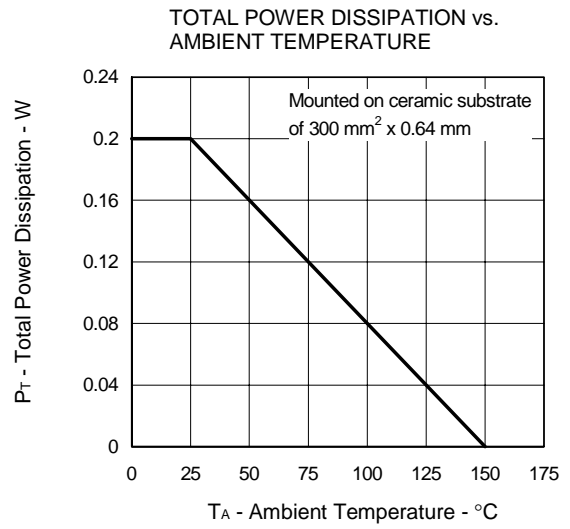
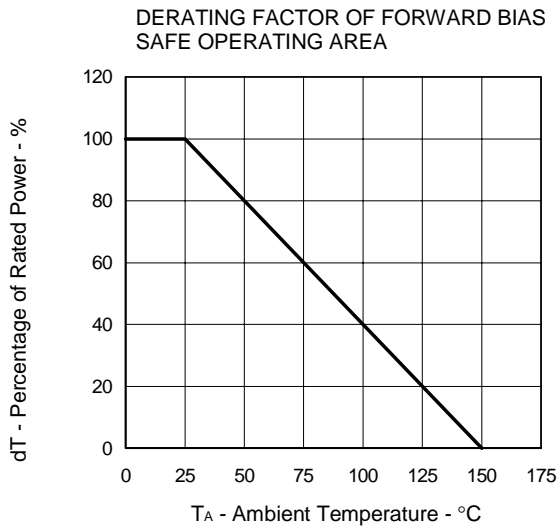
| CHARACTERISTICS                                     | SYMBOL               | TEST CONDITIONS                                  | MIN. | TYP. | MAX. | UNIT |
|---|----------------------|--|------|------|------|------|
| Zero Gate Voltage Drain Current                     | I <sub>DSS</sub>     | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V    |      |      | 1.0  | μA   |
| Gate Leakage Current                                | I <sub>GSS</sub>     | V <sub>GS</sub> = ±12 V, V <sub>DS</sub> = 0 V   |      |      | ±10  | μA   |
| Gate Cut-off Voltage                                | V <sub>GS(off)</sub> | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.0 mA  | 0.5  | 1.0  | 1.5  | V    |
| Forward Transfer Admittance <sup>Note</sup>         | y <sub>fs</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.30 A  | 0.25 | 0.75 |      | S    |
| Drain to Source On-state Resistance <sup>Note</sup> | R <sub>DS(on)1</sub> | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.30 A |      | 0.38 | 0.57 | Ω    |
|   | R <sub>DS(on)2</sub> | V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 0.30 A |      | 0.41 | 0.60 | Ω    |
|   | R <sub>DS(on)3</sub> | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 0.15 A |      | 0.60 | 0.88 | Ω    |
| Input Capacitance                                   | C <sub>iss</sub>     | V <sub>DS</sub> = 10 V                           |      | 28   |      | pF   |
| Output Capacitance                                  | C <sub>oss</sub>     | V <sub>GS</sub> = 0 V                            |      | 11   |      | pF   |
| Reverse Transfer Capacitance                        | C <sub>rss</sub>     | f = 1.0 MHz                                      |      | 7    |      | pF   |
| Turn-on Delay Time                                  | t <sub>d(on)</sub>   | V <sub>DD</sub> = 10 V, I <sub>D</sub> = 0.30 A  |      | 20   |      | ns   |
| Rise Time   | t <sub>r</sub>       | V <sub>GS</sub> = 4.0 V                          |      | 51   |      | ns   |
| Turn-off Delay Time                                 | t <sub>d(off)</sub>  | R <sub>G</sub> = 10 Ω                            |      | 94   |      | ns   |
| Fall Time   | t <sub>f</sub>       |  |      | 87   |      | ns   |
| Body Diode Forward Voltage <sup>Note</sup>          | V <sub>F(S-D)</sub>  | I <sub>F</sub> = 0.50 A, V <sub>GS</sub> = 0 V   |      | 0.87 |      | V    |

**Note** Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

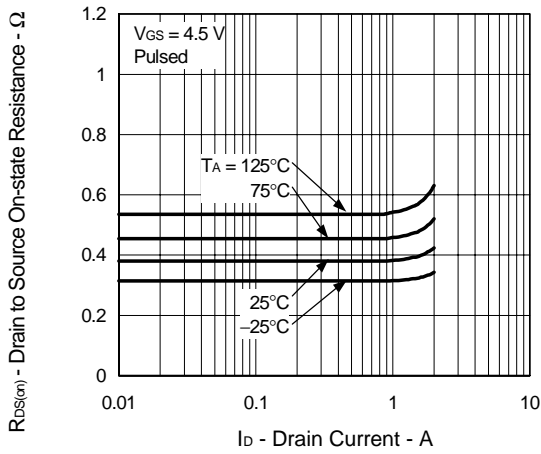
**TEST CIRCUIT SWITCHING TIME**



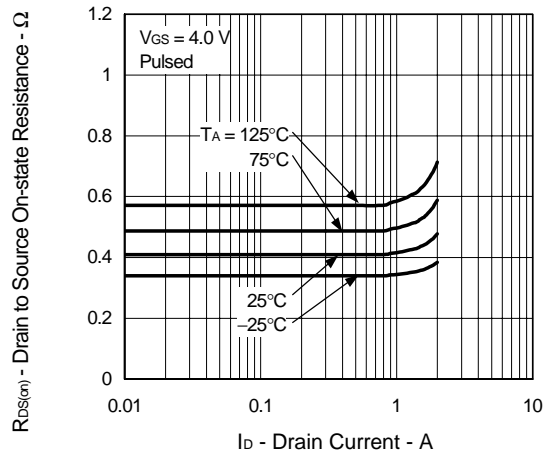
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



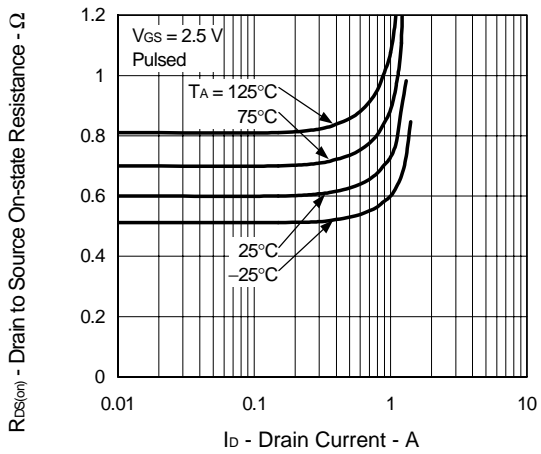
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



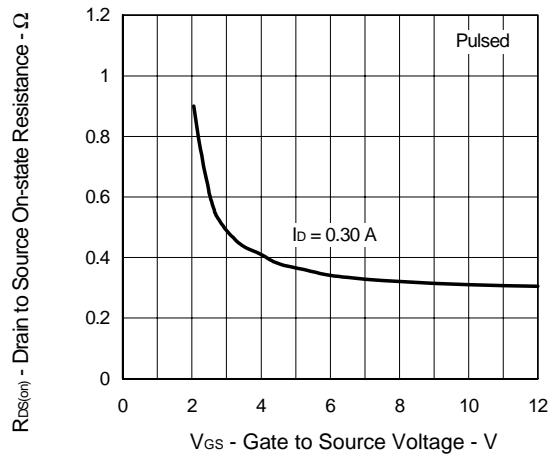
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



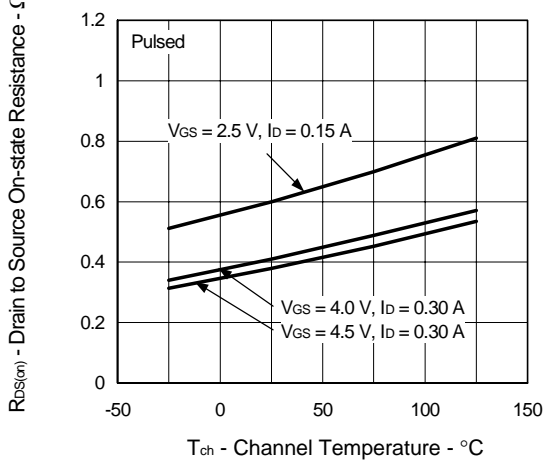
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



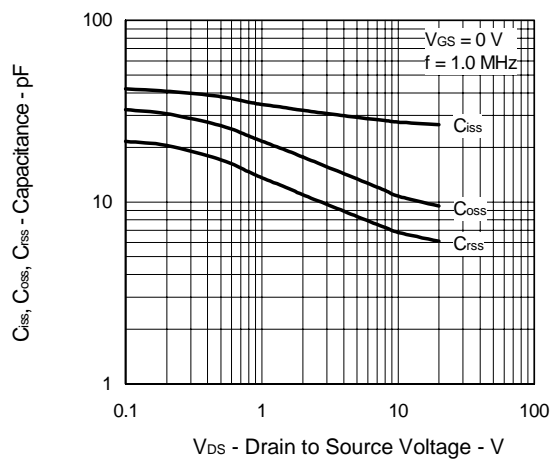
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



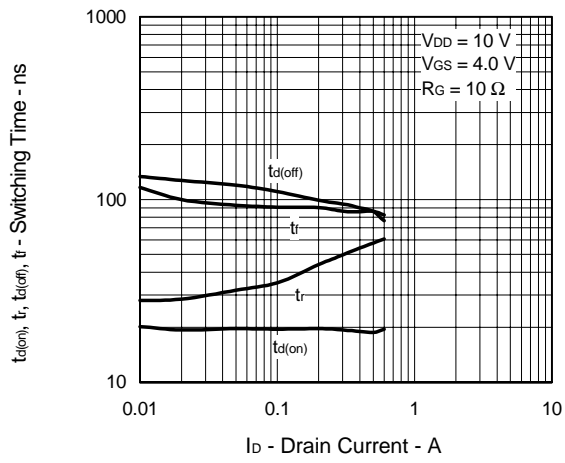
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



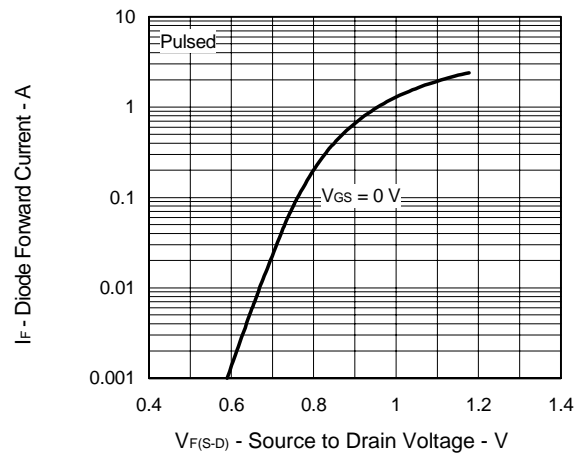
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



SWITCHING CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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