

# MOS FIELD EFFECT POWER TRANSISTOR

# 2SK1283

## SWITCHING

## N-CHANNEL POWER MOS FET

## INDUSTRIAL USE

### DESCRIPTION

The 2SK1283 is N-channel MOS Field Effect Transistor designed for solenoid, motor and lamp driver.

### FEATURES

- Low On-state Resistance  
 $R_{DS(on)} \leq 0.18 \Omega$  ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 2 \text{ A}$ )  
 $R_{DS(on)} \leq 0.24 \Omega$  ( $V_{GS} = 4 \text{ V}$ ,  $I_D = 2 \text{ A}$ )
- Low  $C_{iss}$   $C_{iss} = 500 \text{ pF TYP.}$
- Built-in G-S Gate Protection Diode

### 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.

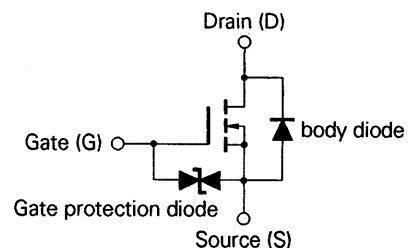
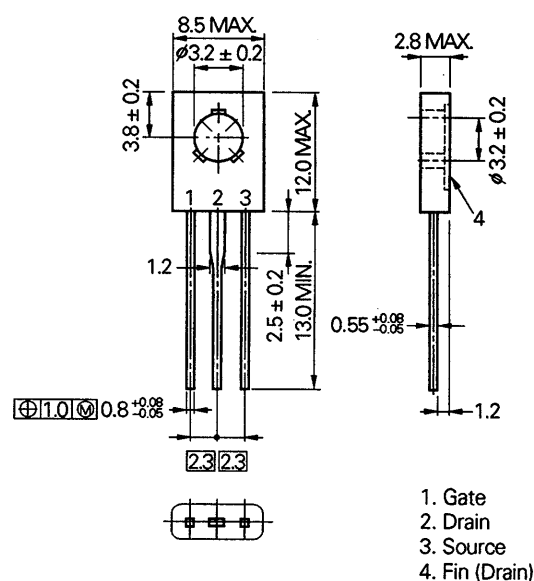
### ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

|                                                      |                  |             |                  |
|------------------------------------------------------|------------------|-------------|------------------|
| Drain to Source Voltage                              | $V_{DSS}$        | 60          | V                |
| Gate to Source Voltage                               | $V_{GSS(AC)}$    | $\pm 20$    | V                |
| Drain Current (DC)                                   | $I_{D(DC)}$      | $\pm 3.0$   | A                |
| Drain Current (pulse)                                | $I_{D(pulse)^*}$ | $\pm 12$    | A                |
| Total Power Dissipation ( $T_c = 25^\circ\text{C}$ ) | $P_{T1}$         | 20          | W                |
| Total Power Dissipation ( $T_a = 25^\circ\text{C}$ ) | $P_{T2}$         | 1.3         | W                |
| Channel Temperature                                  | $T_{ch}$         | 150         | $^\circ\text{C}$ |
| Storage Temperature                                  | $T_{stg}$        | -55 to +150 | $^\circ\text{C}$ |

\*  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

### PACKAGE DIMENSIONS

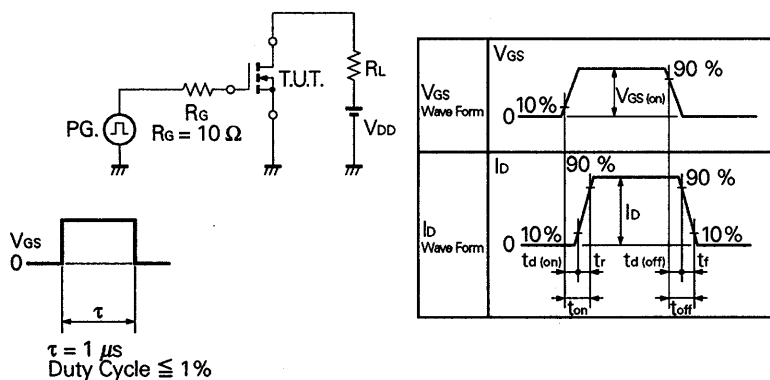
(in millimeters)



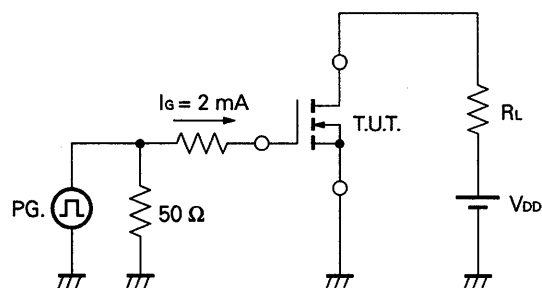
ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )

| CHARACTERISTIC                      | SYMBOL        | MIN. | TYP. | MAX.     | UNIT          | TEST CONDITIONS                                                                                                       |
|-------------------------------------|---------------|------|------|----------|---------------|-----------------------------------------------------------------------------------------------------------------------|
| Drain to Source On-state Resistance | $R_{DS(on)}$  |      | 0.15 | 0.18     | $\Omega$      | $V_{GS} = 10\text{ V}$ , $I_D = 2\text{ A}$                                                                           |
| Drain to Source On-state Resistance | $R_{DS(on)}$  |      | 0.18 | 0.24     | $\Omega$      | $V_{GS} = 4.0\text{ V}$ , $I_D = 2\text{ A}$                                                                          |
| Gate to Source Cutoff Voltage       | $V_{GS(off)}$ | 1.0  |      | 2.5      | V             | $V_{DS} = 10\text{ V}$ , $I_D = 1\text{ mA}$                                                                          |
| Forward Transfer Admittance         | $ y_{fs} $    | 2.4  |      |          | S             | $V_{DS} = 10\text{ V}$ , $I_D = 2\text{ A}$                                                                           |
| Drain Leakage Current               | $I_{DSS}$     |      |      | 10       | $\mu\text{A}$ | $V_{DS} = 60\text{ V}$ , $V_{GS} = 0$                                                                                 |
| Gate to Source Leakage Current      | $I_{GSS}$     |      |      | $\pm 10$ | $\mu\text{A}$ | $V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0$                                                                             |
| Input Capacitance                   | $C_{iss}$     |      | 500  |          | pF            | $V_{DS} = 10\text{ V}$<br>$V_{GS} = 0$<br>$f = 1\text{ MHz}$                                                          |
| Output Capacitance                  | $C_{oss}$     |      | 200  |          | pF            |                                                                                                                       |
| Reverse Transfer Capacitance        | $C_{rss}$     |      | 40   |          | pF            |                                                                                                                       |
| Turn-On Delay Time                  | $t_{d(on)}$   |      | 40   |          | ns            | $V_{GS(on)} = 10\text{ V}$<br>$V_{DD} = 30\text{ V}$<br>$I_D = 2\text{ A}$ , $R_G = 10\ \Omega$<br>$R_L = 15\ \Omega$ |
| Rise Time                           | $t_r$         |      | 100  |          | ns            |                                                                                                                       |
| Turn-Off Delay Time                 | $t_{d(off)}$  |      | 550  |          | ns            |                                                                                                                       |
| Fall Time                           | $t_f$         |      | 200  |          | ns            |                                                                                                                       |
| Total Gate Charge                   | $Q_G$         |      | 13   |          | nC            | $V_{GS} = 10\text{ V}$<br>$I_D = 3\text{ A}$<br>$V_{DD} = 48\text{ V}$                                                |
| Gate to Source Charge               | $Q_{GS}$      |      | 3    |          | nC            |                                                                                                                       |
| Gate to Drain Charge                | $Q_{GD}$      |      | 3    |          | nC            |                                                                                                                       |
| Diode Forward Voltage               | $V_{SD}$      |      | 0.9  |          | V             | $I_{SD} = 3\text{ A}$ , $V_{GS} = 0$                                                                                  |
| Reverse Recovery Time               | $t_{rr}$      |      | 140  |          | ns            | $I_F = 3\text{ A}$ , $V_{GS} = 0$<br>$di/dt = 50\text{ A}/\mu\text{s}$                                                |
| Reverse Recovery Charge             | $Q_{rr}$      |      | 700  |          | nC            |                                                                                                                       |

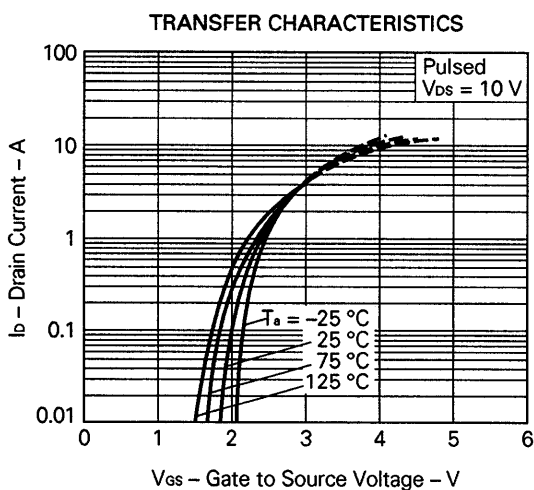
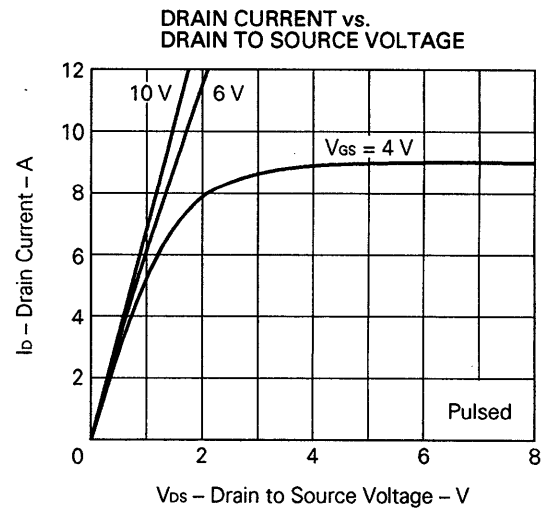
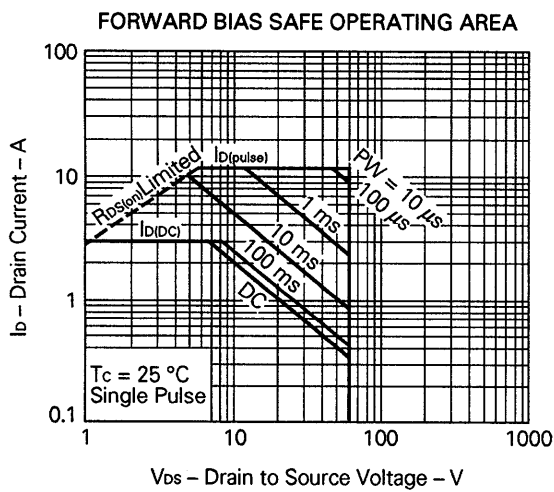
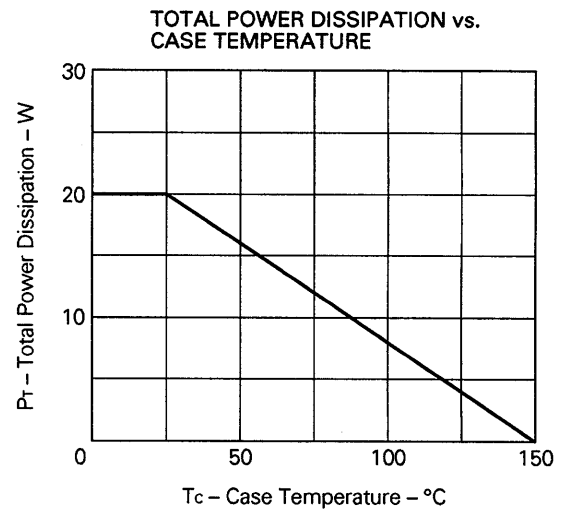
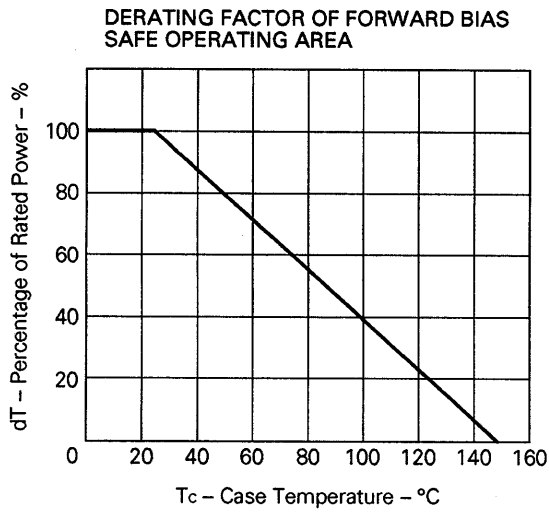
## Test Circuit 1: Switching Time



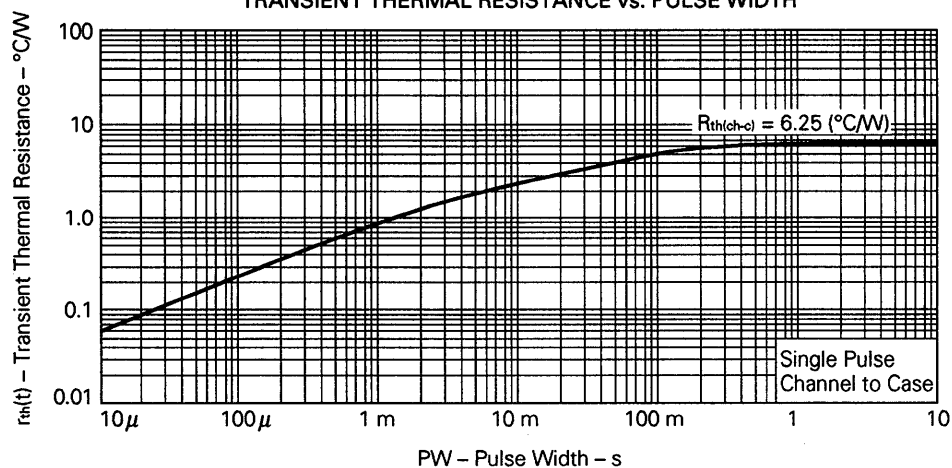
## Test Circuit 2: Gate Charge



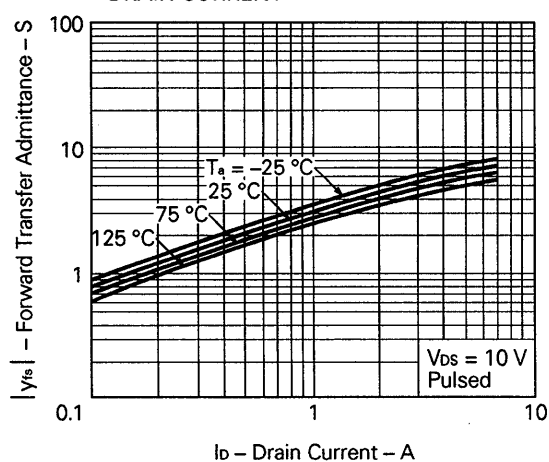
TYPICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )



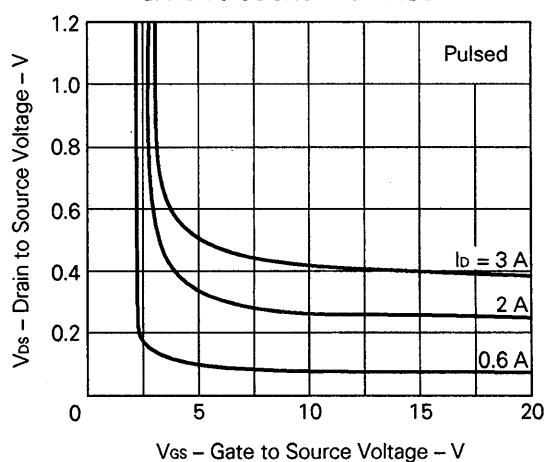
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



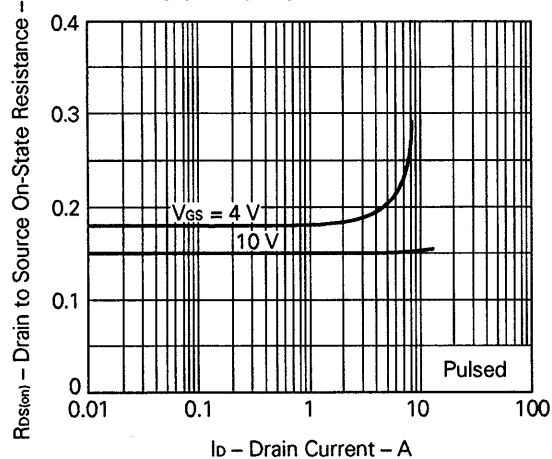
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



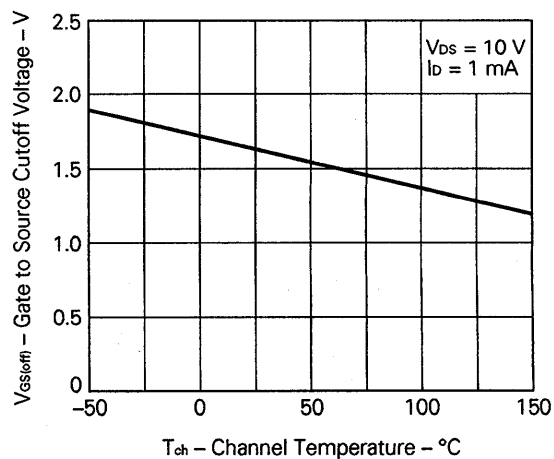
DRAIN TO SOURCE VOLTAGE vs. GATE TO SOURCE VOLTAGE

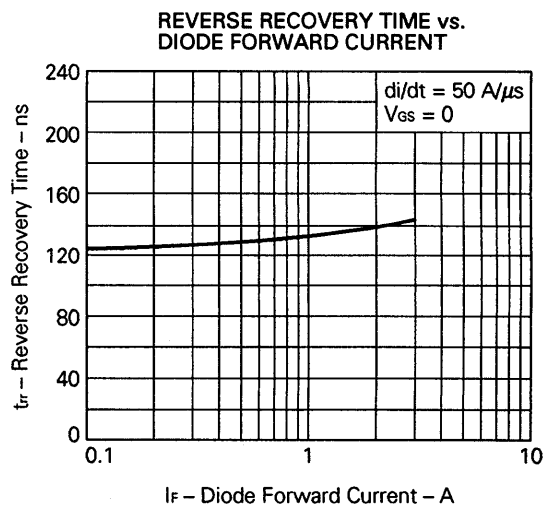
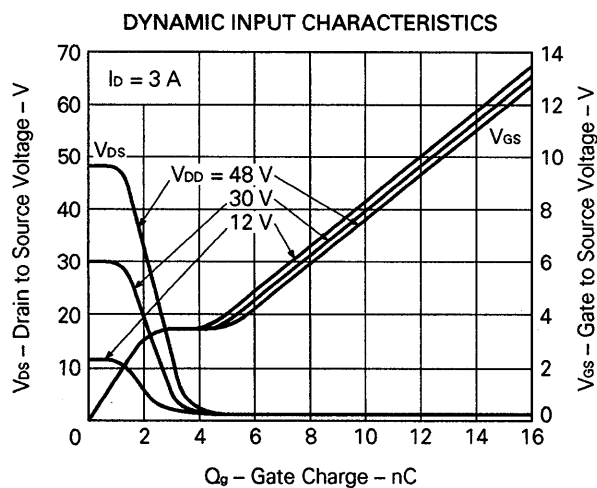
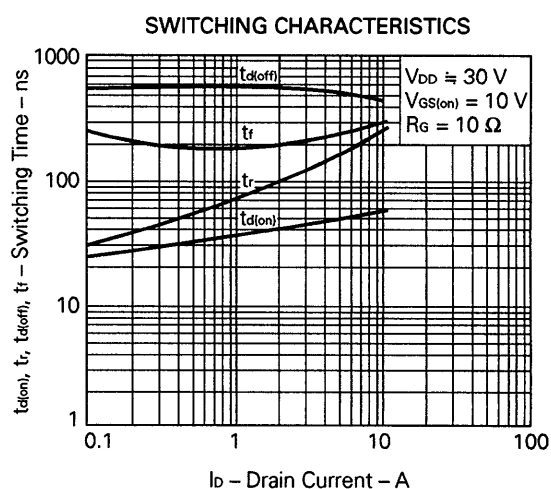
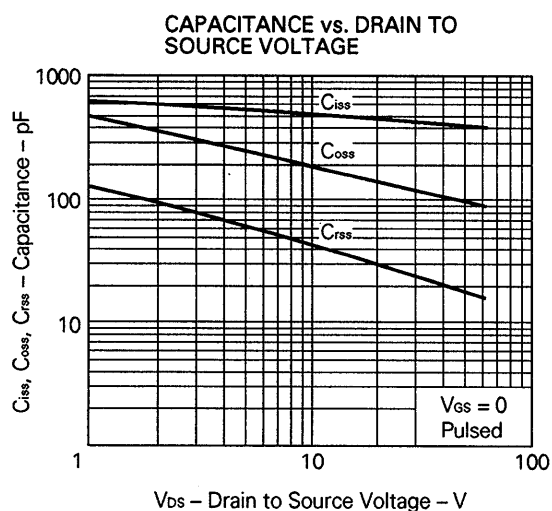
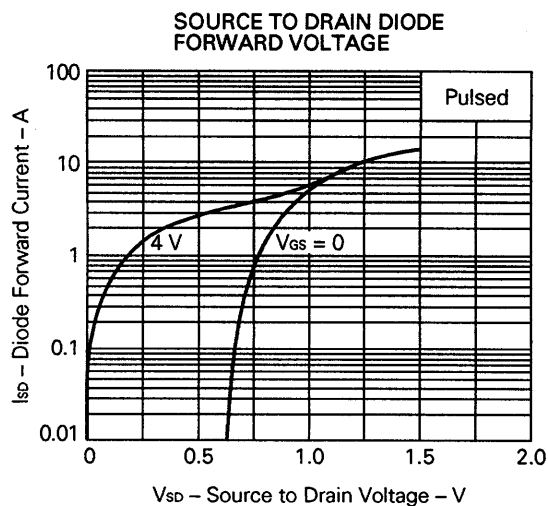
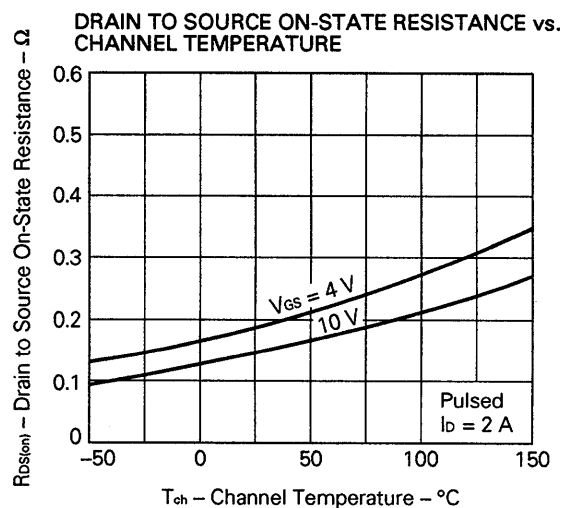


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE





**Reference**

| Application note name                            | No.      |
|--------------------------------------------------|----------|
| Safe operating area of Power MOS FET.            | TEA-1034 |
| Application circuit using Power MOS FET.         | TEA-1035 |
| Quality control of NEC semiconductors devices.   | TEI-1202 |
| Quality control guide of semiconductors devices. | MEI-1202 |
| Assembly manual of semiconductors devices.       | IEI-1207 |

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