

## MOS FIELD EFFECT TRANSISTOR

2SK4082

# SWITCHING N-CHANNEL POWER MOS FET

### **DESCRIPTION**

The 2SK4082 is N-channel MOS FET device that features a low gate charge and excellent switching characteristics, and designed for high voltage applications such as switching power supply, AC adapter.

FEATURES (Isolated TO-220)

• Low on-state resistance

 $R_{DS(on)} = 2.2 \Omega MAX. (V_{GS} = 10 V, I_D = 1.8 A)$ 

· Low gate charge

 $Q_G = 13 \text{ nC TYP.}$  ( $V_{DD} = 450 \text{ V}$ ,  $V_{GS} = 10 \text{ V}$ ,  $I_D = 3.5 \text{ A}$ )

- Gate voltage rating: ±30 V
- Avalanche capability ratings



### **ORDERING INFORMATION**

| PART NUMBER         | LEAD PLATING  | PACKING        | PACKAGE                             |
|---------------------|---------------|----------------|-------------------------------------|
| 2SK4082-S17-AY Note | Pure Sn (Tin) | Tube 50 p/tube | Isolated TO-220 (MP-45F) typ. 2.2 g |

Note Pb-free (This product does not contain Pb in external electrode.)

### ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

| Drain to Source Voltage (Ves = 0 V)             | Voss               | 600         | V  |
|---|--------------------|-------------|----|
| Gate to Source Voltage (V <sub>DS</sub> = 0 V)  | Vgss               | ±30         | V  |
| Drain Current (DC) (Tc = 25°C)                  | I <sub>D(DC)</sub> | ±3.5        | Α  |
| Drain Current (pulse) Note1                     | D(pulse)           | ±14         | Α  |
| Total Power Dissipation (Tc = 25°C)             | P <sub>T1</sub>    | 35          | W  |
| Total Power Dissipation (T <sub>A</sub> = 25°C) | P <sub>T2</sub>    | 2.0         | W  |
| Channel Temperature                             | Tch                | 150         | °C |
| Storage Temperature                             | T <sub>stg</sub>   | -55 to +150 | °C |
| Single Avalanche Current Note2                  | las                | 2           | Α  |
| Single Avalanche Energy Note2                   | Eas                | 240         | mJ |

**Notes 1.** PW  $\leq$  10  $\mu$ s, Duty Cycle  $\leq$  1%

2. Starting T<sub>ch</sub> = 25°C, V<sub>DD</sub> = 150 V, R<sub>G</sub> = 25  $\Omega$ , V<sub>GS</sub> = 20  $\rightarrow$  0 V

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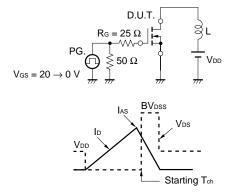
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### **ELECTRICAL CHARACTERISTICS (TA = 25°C)**

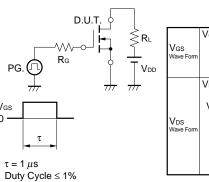
| CHARACTERISTICS                          | SYMBOL               | TEST CONDITIONS                                  | MIN. | TYP. | MAX. | UNIT |
|--|----------------------|--|------|------|------|------|
| Zero Gate Voltage Drain Current          | IDSS                 | V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V   |      |      | 10   | μΑ   |
| Gate Leakage Current                     | Igss                 | V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V   |      |      | ±100 | nA   |
| Gate to Source Cut-off Voltage           | V <sub>GS(off)</sub> | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA    | 2.5  | 3.0  | 3.5  | V    |
| Forward Transfer Admittance Note         | y <sub>fs</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.8 A   | 0.8  |      |      | S    |
| Drain to Source On-state Resistance Note | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 1.8 A   |      | 1.7  | 2.2  | Ω    |
| Input Capacitance                        | Ciss                 | V <sub>DS</sub> = 10 V,                          |      | 550  |      | pF   |
| Output Capacitance                       | Coss                 | V <sub>GS</sub> = 0 V,                           |      | 250  |      | pF   |
| Reverse Transfer Capacitance             | Crss                 | f = 1 MHz  |      | 49   |      | pF   |
| Turn-on Delay Time                       | t <sub>d(on)</sub>   | V <sub>DD</sub> = 150 V, I <sub>D</sub> = 1.8 A, |      | 13   |      | ns   |
| Rise Time                                | tr                   | V <sub>GS</sub> = 10 V,                          |      | 10   |      | ns   |
| Turn-off Delay Time                      | t <sub>d(off)</sub>  | R <sub>G</sub> = 10 Ω                            |      | 26   |      | ns   |
| Fall Time                                | t <sub>f</sub>       |  |      | 21   |      | ns   |
| Total Gate Charge                        | Q <sub>G</sub>       | V <sub>DD</sub> = 450 V,                         |      | 13   |      | nC   |
| Gate to Source Charge                    | Q <sub>G</sub> s     | V <sub>GS</sub> = 10 V,                          |      | 4.3  |      | nC   |
| Gate to Drain Charge                     | Q <sub>GD</sub>      | I <sub>D</sub> = 3.5 A                           |      | 5.2  |      | nC   |
| Body Diode Forward Voltage Note          | V <sub>F(S-D)</sub>  | I <sub>F</sub> = 3.5 A, V <sub>GS</sub> = 0 V    |      | 0.87 | 1.5  | V    |
| Reverse Recovery Time                    | trr                  | I <sub>F</sub> = 3.5 A, V <sub>GS</sub> = 0 V,   |      | 220  |      | ns   |
| Reverse Recovery Charge                  | Qrr                  | di/dt = 100 A/μs                                 |      | 840  |      | nC   |

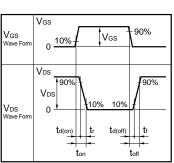
Note Pulsed

### TEST CIRCUIT 1 AVALANCHE CAPABILITY



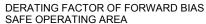
### TEST CIRCUIT 2 SWITCHING TIME

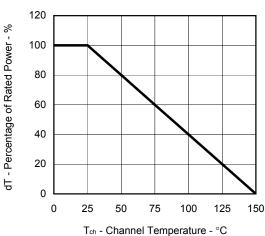




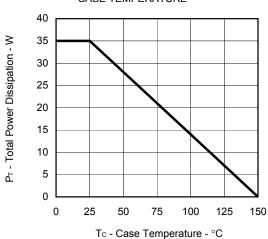
### **TEST CIRCUIT 3 GATE CHARGE**

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

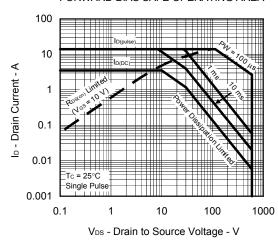




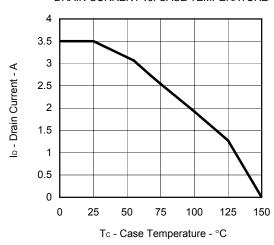
# TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



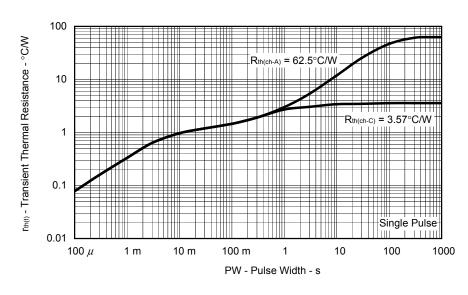
### FORWARD BIAS SAFE OPERATING AREA



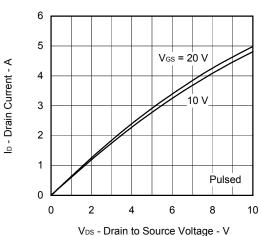
### DRAIN CURRENT vs. CASE TEMPERATURE



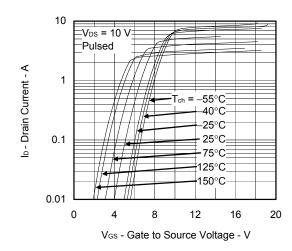
### TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



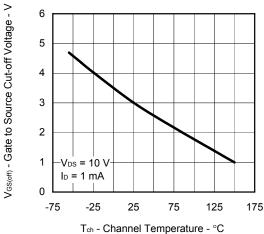
### DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

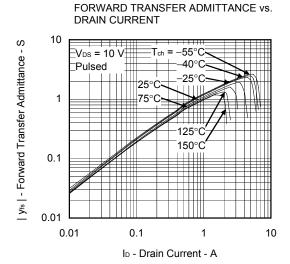


### FORWARD TRANSFER CHARACTERISTICS

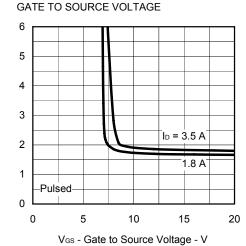


GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE

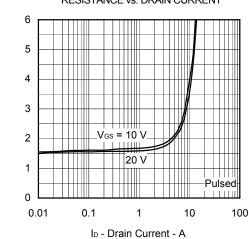




DRAIN TO SOURCE ON-STATE RESISTANCE vs.



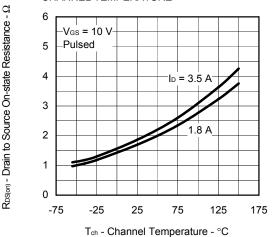
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



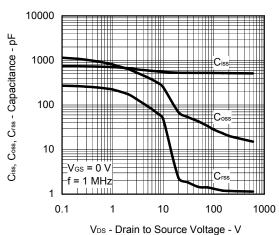
 $\mathsf{R}_{\mathsf{DS}(\varpi)}$  - Drain to Source On-state Resistance -  $\Omega$ 

 $\mathsf{R}_{\mathsf{DS}(\varpi)}$  - Drain to Source On-state Resistance -  $\Omega$ 

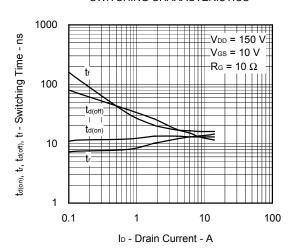
# DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



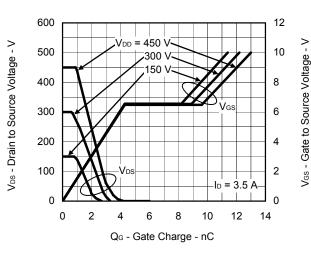
# CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



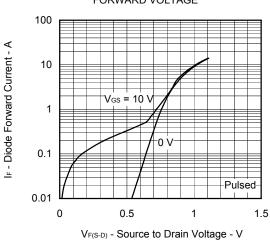
### SWITCHING CHARACTERISTICS



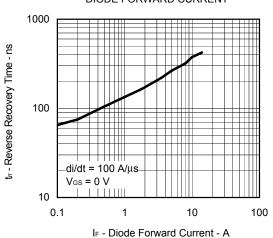
### DYNAMIC INPUT/OUTPUT CHARACTERISTICS



# SOURCE TO DRAIN DIODE FORWARD VOLTAGE



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



**NEC** 2SK4082

# INDUCTIVE LOAD 10 V-tuenno equation of the property of the

10

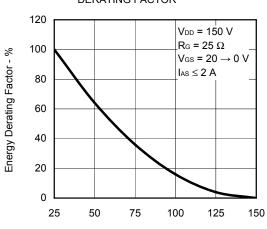
L - Inductive Load - H

100

1000

SINGLE AVALANCHE CURRENT vs.

# SINGLE AVALANCHE ENERGY DERATING FACTOR



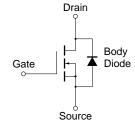
Starting Tch - Starting Channel Temperature - °C

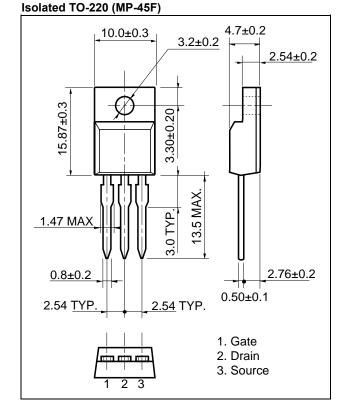
### **PACKAGE DRAWING (Unit: mm)**

0.1

0.01

**EQUIVALENT CIRCUIT** 





**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

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