## DATA SHEET

## SWITCHING <br> N-CHANNEL POWER MOS FET INDUSTRIAL USE

## DESCRIPTION

The 2SK2478 is N-Channel MOS Field Effect Transistor designed for high voltage switching applications.

## FEATURES

- Low On-Resistance

Rds (on) $=7.5 \Omega(\mathrm{VGS}=10 \mathrm{~V}, \mathrm{Id}=1.0 \mathrm{~A})$

- Low Ciss Ciss = 485 pF TYP.
- High Avalanche Capability Ratings
- Isolated TO-220 Package

| ABSOLUTE MAXIMUM R | (TA = $25{ }^{\circ} \mathrm{C}$ ) |  |  |
| :---: | :---: | :---: | :---: |
| Drain to Source Voltage | Voss | 900 | V |
| Gate to Source Voltage | Vgss | $\pm 30$ | V |
| Drain Current (DC) | Id (DC) | $\pm 2.0$ | A |
| Drain Current (pulse)* | ID(pulse) | ) $\pm 8.0$ | A |
| Total Power Dissipation ( $\mathrm{T}_{\mathrm{c}}=25^{\circ} \mathrm{C}$ ) | PT1 | 30 | W |
| Total Power Dissipation ( $\mathrm{T}_{\mathrm{A}}=25{ }^{\circ} \mathrm{C}$ ) | Pt2 | 2.0 | W |
| Channel Temperature | Tch | 150 | ${ }^{\circ} \mathrm{C}$ |
| Storage Temperature | Tstg | -55 to +150 | ${ }^{\circ} \mathrm{C}$ |
| Single Avalanche Current** | IAs | 2.0 | A |
| Single Avalanche Energy** | Eas | 16.5 | mJ |

* PW $\leq 10 \mu \mathrm{~s}$, Duty Cycle $\leq 1$ \%
** Starting $\mathrm{T}_{\mathrm{ch}}=25^{\circ} \mathrm{C}, \mathrm{Rg}=25 \Omega, \mathrm{Vgs}_{\mathrm{g}}=20 \mathrm{~V} \rightarrow 0$


ELECTRICAL CHARACTERISTICS (TA = $25{ }^{\circ} \mathrm{C}$ )

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Drain to Source On-Resistance | Rds (on) |  | 5.0 | 7.5 | $\Omega$ | V GS $=10 \mathrm{~V}, \mathrm{ID}=1.0 \mathrm{~A}$ |
| Gate to Source Cutoff Voltage | VGS (off) | 2.5 |  | 3.5 | V | $\mathrm{V}_{\mathrm{DS}}=10 \mathrm{~V}, \mathrm{ID}=1 \mathrm{~mA}$ |
| Forward Transfer Admittance | $\mid \mathrm{yfs}_{\mathrm{f}}$ \| | 0.6 |  |  | S | $\mathrm{V} \mathrm{DS}=20 \mathrm{~V}, \mathrm{ID}=1.0 \mathrm{~A}$ |
| Drain Leakage Current | Idss |  |  | 100 | $\mu \mathrm{A}$ | $V_{\text {ds }}=\mathrm{V}_{\text {dss, }} \mathrm{V}_{\mathrm{GS}}=0$ |
| Gate to Source Leakage Current | Igss |  |  | $\pm 100$ | nA | $\mathrm{V}_{\mathrm{Gs}}= \pm 30 \mathrm{~V}, \mathrm{~V}$ ds $=0$ |
| Input Capacitance | Ciss |  | 485 |  | pF | $\mathrm{V}_{\mathrm{Ds}}=10 \mathrm{~V}$ |
| Output Capacitance | Coss |  | 75 |  | pF | $V_{G S}=0$ |
| Reverse Transfer Capacitance | Crss |  | 10 |  | pF | $\mathrm{f}=1 \mathrm{MHz}$ |
| Turn-On Delay Time | td (on) |  | 11 |  | ns | $\mathrm{ld}=1.0 \mathrm{~A}$ |
| Rise Time | $\mathrm{tr}^{\text {r }}$ |  | 3 |  | ns | $\mathrm{V}_{\mathrm{GS}}=10 \mathrm{~V}$ |
| Turn-Off Delay Time | td (off) |  | 35 |  | ns | $V_{\text {dD }}=150 \mathrm{~V}$ |
| Fall Time | tf |  | 8 |  | ns | $\mathrm{R}_{\mathrm{G}}=150 \Omega$ |
| Total Gate Charge | Qg |  | 17 |  | $n \mathrm{C}$ | $\mathrm{ld}=2.0 \mathrm{~A}$ |
| Gate to Source Charge | Qgs |  | 3 |  | $n \mathrm{C}$ | $V_{D D}=450 \mathrm{~V}$ |
| Gate to Drain Charge | QGd |  | 8 |  | $n \mathrm{C}$ | $\mathrm{V}_{\mathrm{GS}}=10 \mathrm{~V}$ |
| Body Diode Forward Voltage | $\mathrm{V}_{\mathrm{F}}$ (S-D) |  | 1.0 |  | V | $\mathrm{If}_{F}=2.0 \mathrm{~A}, \mathrm{~V}_{\mathrm{Gs}}=0$ |
| Reverse Recovery Time | trr |  | 580 |  | ns | $\mathrm{If}_{\mathrm{F}}=2.0 \mathrm{~A}, \mathrm{~V}_{\mathrm{GS}}=0$ |
| Reverse Recovery Charge | Qrr |  | 2.3 |  | $\mu \mathrm{C}$ |  |

Test Circuit 1 Avalanche Capability



Test Circuit 2 Switching Time


Duty Cycle $\leq 1$ \%

## Test Circuit 3 Gate Charge



The application circuits and their parameters are for references only and are not intended for use in actual design-in's.

TYPICAL CHARACTERISTICS (TA = $25^{\circ} \mathrm{C}$ )

DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



VDS - Drain to Source Voltage - V


TOTAL POWER DISSIPATION vs. CASE TEMPERATURE


DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE


Vos - Drain to Source Voltage - V

TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH





GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE





## 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 |
| Semiconductor device package manual. | IEI-1213 |
| Guide to quality assurance for semiconductor devices. | MEI-1202 |
| Semiconductor selection guide. | MF-1134 |
| Power MOS FET features and application switching power supply. | TEA-1034 |
| Application circuits using Power MOS FET. | TEA-1035 |
| Safe operating area of Power MOS FET. | TEA-1037 |

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