

DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTORS

2SK2941

SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

DESCRIPTION

This product is n-Channel MOS Field Effect Transistor designed high current switching application.

FEATURE

- Low On-Resistance
 $R_{DS(on)1} = 14 \text{ m}\Omega$ Typ. ($V_{GS} = 10 \text{ V}$, $I_D = 18 \text{ A}$)
 $R_{DS(on)2} = 22 \text{ m}\Omega$ Typ. ($V_{GS} = 4 \text{ V}$, $I_D = 18 \text{ A}$)
- Low C_{iss} $C_{iss} = 1250 \text{ pF}$ Typ.
- Built-in G-S Protection Diode

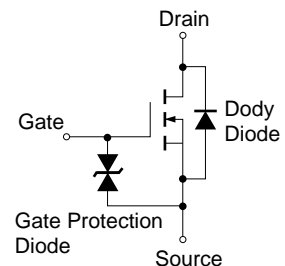
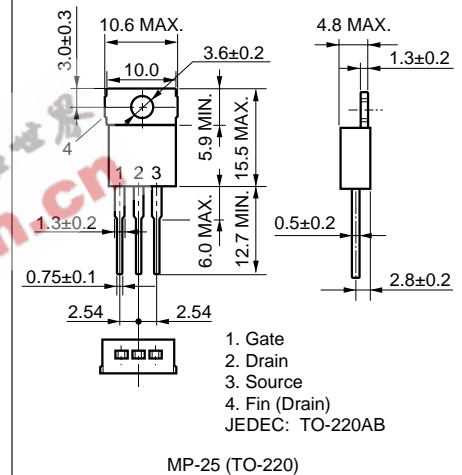
ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Maximum Voltages and Currents

| | | | |
|--|----------------|--------------|------------------|
| Drain to Source Voltage | V_{DSS} | 30 | V |
| Gate to Source Voltage | V_{GSS} | ± 20 | V |
| Drain Current (DC) | $I_{D(DC)}$ | ± 35 | A |
| Drain Current (Pulse)* | $I_{D(Pulse)}$ | ± 140 | A |
| Maximum Power Dissipation | | | |
| Total Power Dissipation ($T_A = 25^\circ\text{C}$) | P_T | 1.5 | W |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$) | P_T | 60 | W |
| Maximum Temperature | | | |
| Channel Temperature | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | -55 to + 125 | $^\circ\text{C}$ |

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

PACKAGE DIMENSIONS in millimeters



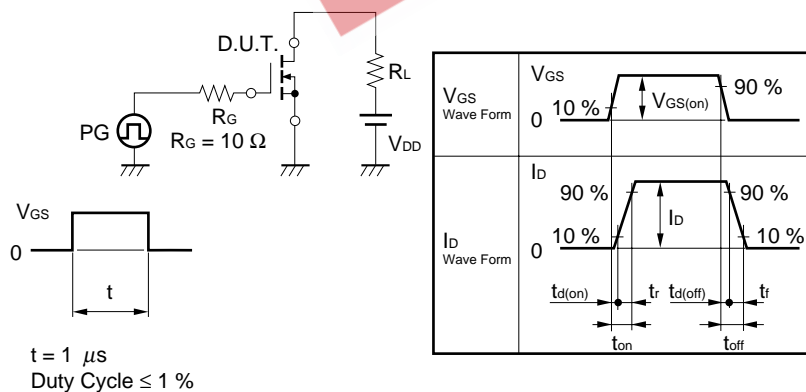
The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device acutally used, an additional protection circuit is externally required if voltage exeeding the rated voltage may be applied to this device.

The information in this document is subject to change without notice.

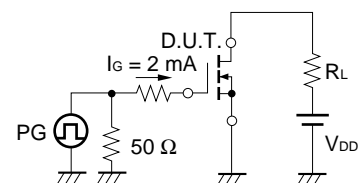
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITION |
|-------------------------------------|----------------------|------|------|------|------|--|
| Drain to Source On-State Resistance | R _{DS(on)1} | | 14 | 20 | mΩ | V _{GS} = 10 V, I _D = 18 A |
| | R _{DS(on)2} | | 22 | 33 | mΩ | V _{GS} = 4 V, I _D = 18 A |
| Gate to Source Cutoff Voltage | V _{GS(off)} | 1.0 | 1.5 | 2.0 | V | V _{DS} = 10 V, I _D = 1 mA |
| Forward Transfer Admittance | y _{fs} | 8.0 | 25 | | S | V _{DS} = 10 V, I _D = 18 A |
| Drain Leakage Current | I _{DSS} | | | 10 | μA | V _{DS} = 30 V, V _{GS} = 0 |
| Gate to Source Leakage Current | I _{GSS} | | | ±10 | μA | V _{GS} = ±20 V, V _{DS} = 0 |
| Input Capacitance | C _{iss} | | 1250 | | pF | V _{DS} = 10 V, V _{GS} = 0, f = 1 MHz |
| Output Capacitance | C _{oss} | | 900 | | pF | |
| Reverse Transfer Capacitance | C _{rss} | | 460 | | pF | |
| Turn-on Delay Time | t _{d(on)} | | 40 | | ns | I _D = 18 A, V _{GS(on)} = 10 V V _{DD} = 15 V, R _G = 10 Ω |
| Rise Time | t _r | | 430 | | ns | |
| Turn-off Delay Time | t _{d(off)} | | 160 | | ns | |
| Fall Time | t _f | | 220 | | ns | |
| Total Gate Charge | Q _G | | 50 | | nC | I _D = 35 A, V _{DD} = 24 V, V _{GS} = 10 V |
| Gate to Source Charge | Q _{GS} | | 4.5 | | nC | |
| Gate to Drain Charge | Q _{GD} | | 21 | | nC | |
| Body Diode Forward Voltage | V _{F(S-D)} | | 1.0 | | V | I _F = 35 A, V _{GS} = 0 |
| Reverse Recovery Time | t _{rr} | | 65 | | ns | I _F = 35 A, V _{GS} = 0, di/dt = 100 A/μs |
| Reverse Recovery Charge | Q _{rr} | | 90 | | nC | |

Test Circuit 1 Switching Time

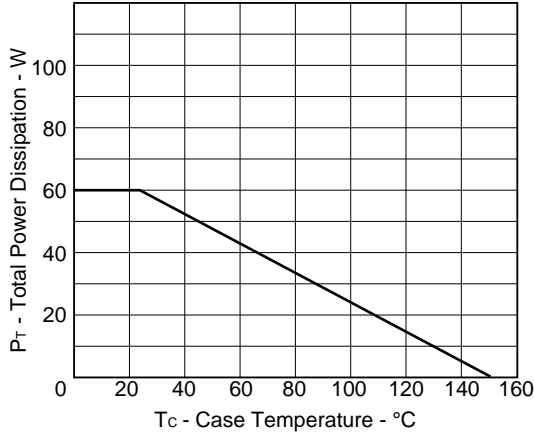


Test Circuit 2 Gate Charge

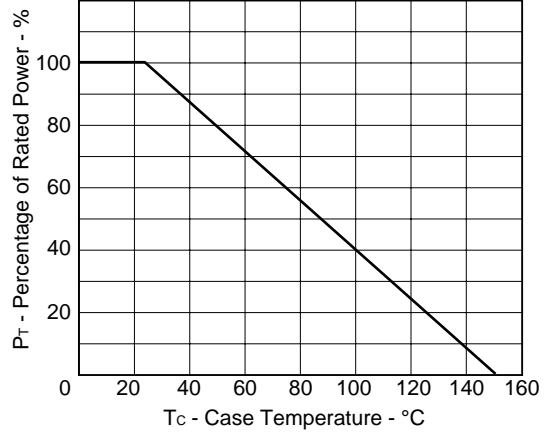


ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

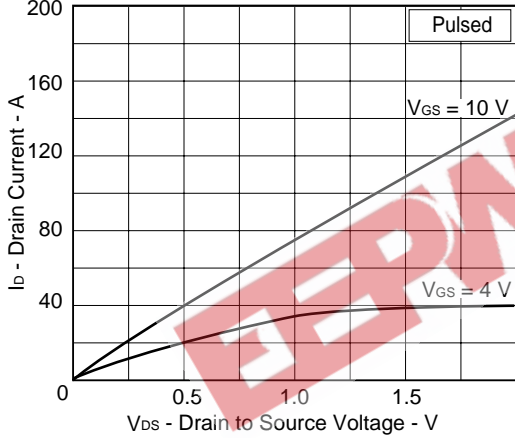
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



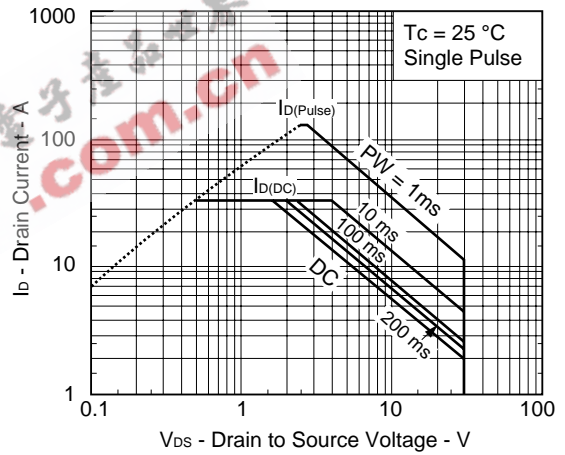
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



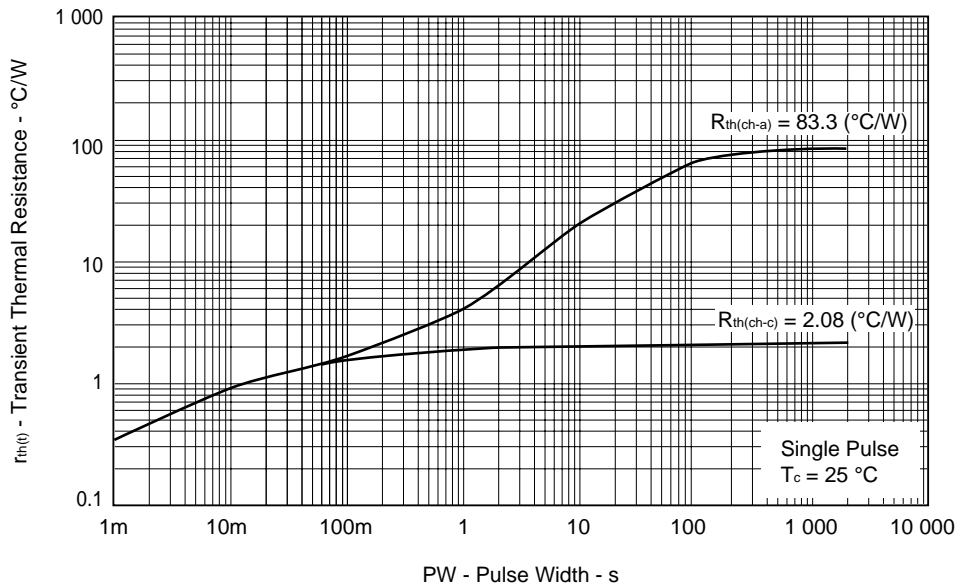
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

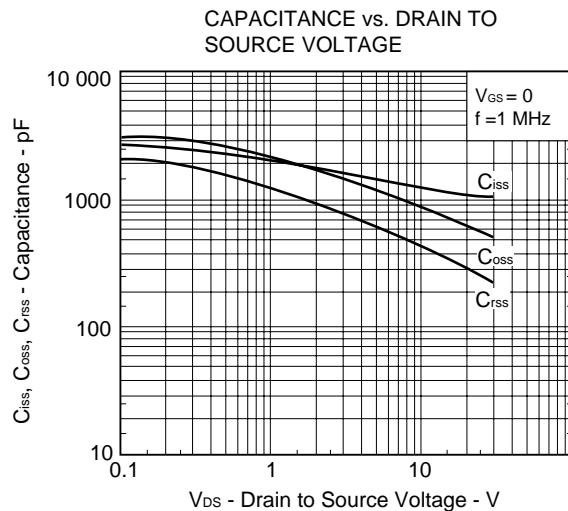
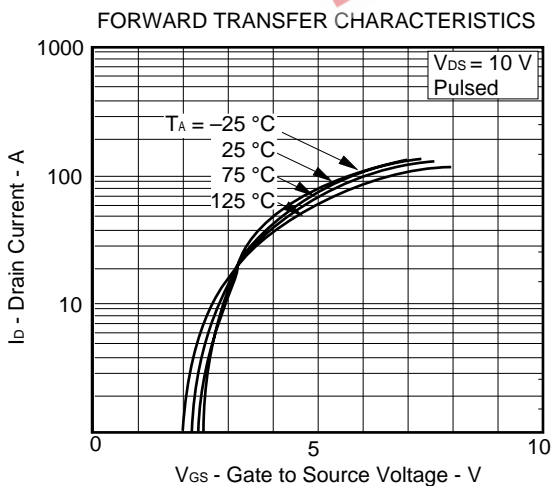
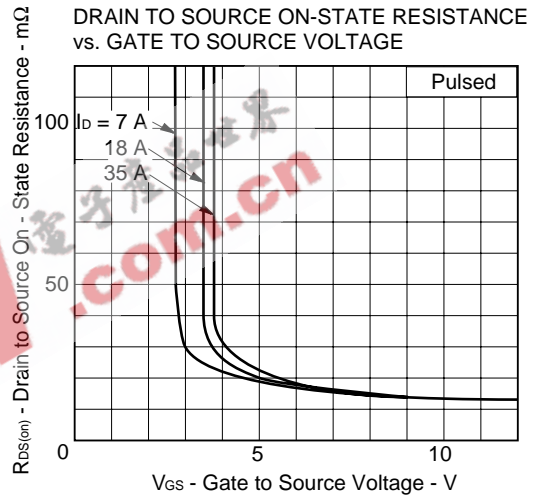
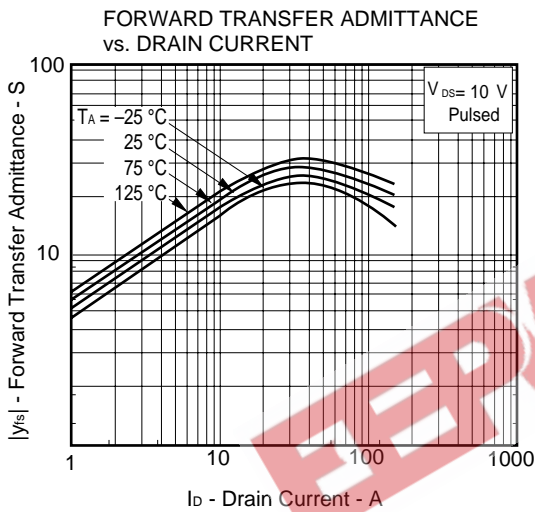
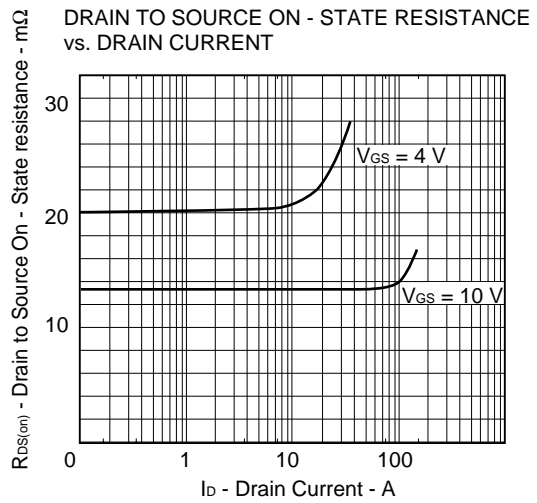
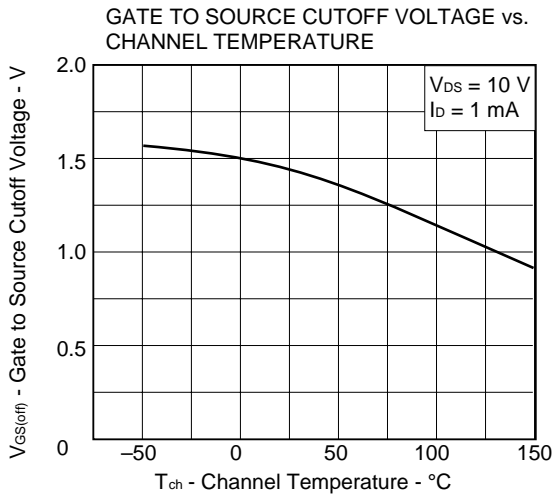


FORWARD BIAS SAFE OPERATING AREA

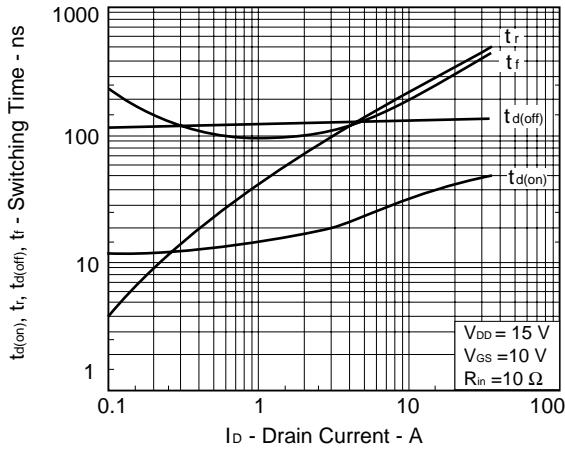


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

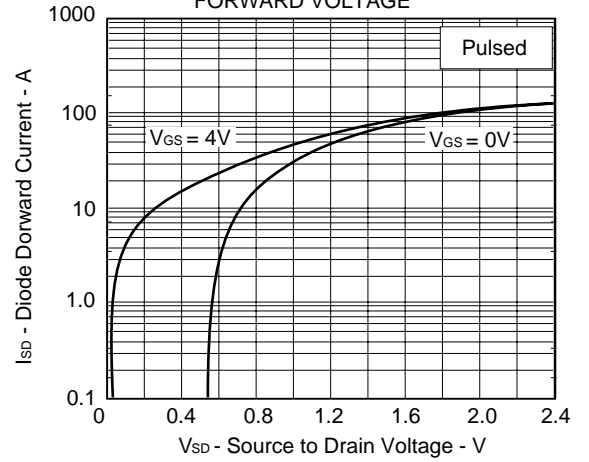




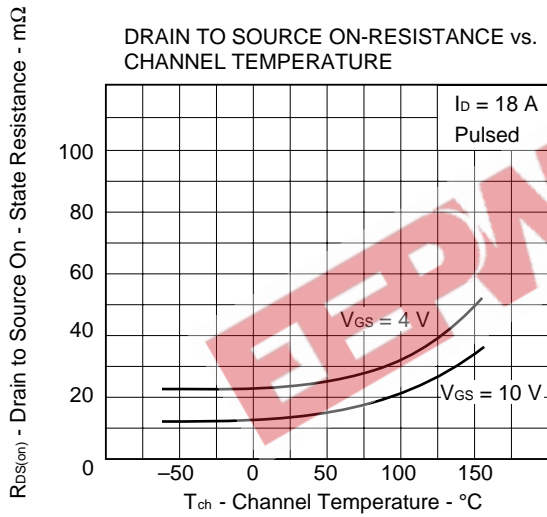
SWITCHING CHARACTERISTICS



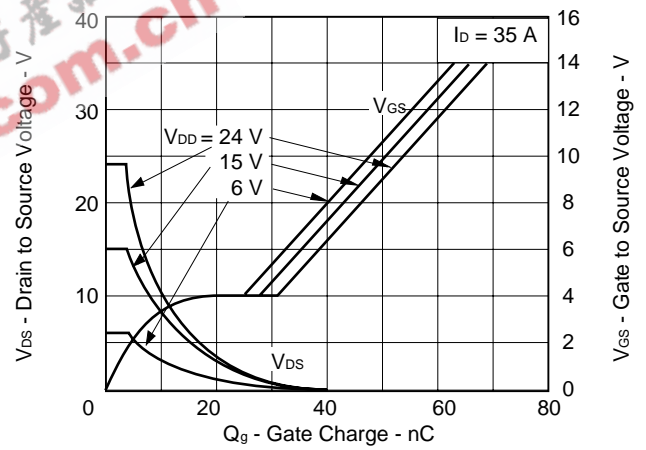
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



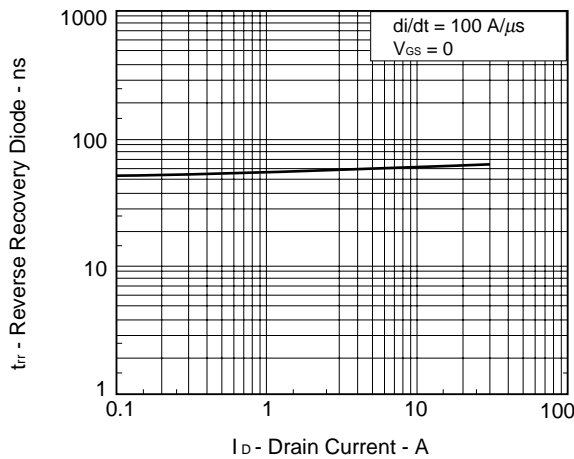
DRAIN TO SOURCE ON-RESISTANCE vs. CHANNEL TEMPERATURE



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT



ELECTRICAL REFERENCE (T_A = 25 °C)

| Document Name | Document No. |
|---|--------------|
| NEC semiconductor device reliability/quality control system | C11745E |
| Quality grade on NEC semiconductor devices | C11531E |
| Semiconductor device mounting technology manual | C10535E |
| Semiconductor device package manual | C10943X |
| Guide to quality assurance for semiconductor devices | MEI-1202 |
| Application circuits using Power MOS FET | TEA-1035 |
| Safe operating area of Power MOS FET | TEA-1037 |



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Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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Anti-radioactive design is not implemented in this product.