DATA SHEET

NEC

# MOS FIELD EFFECT TRANSISTOR

# 2SJ411

## P-CHANNEL SIGNAL MOS FET FOR SWITCHING

The 2SJ411 is a P-channel MOS FET of a vertical type and is a switching element that can be directly driven by the output of an IC operating at 5 V.

This product has a low ON resistance and superb switching characteristics and is ideal for power control switches and DC/DC converters.

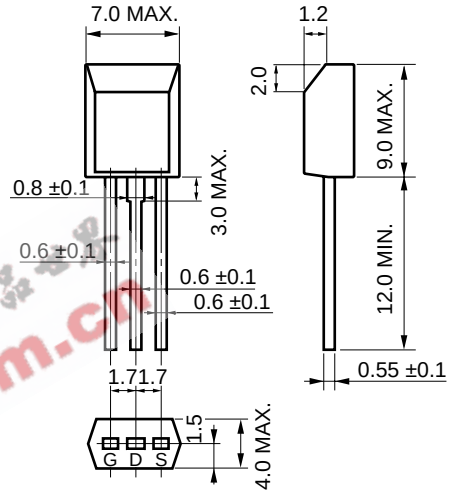
### FEATURES

- Radial taping supported
- Can be directly driven by 5-V IC
- Low ON resistance

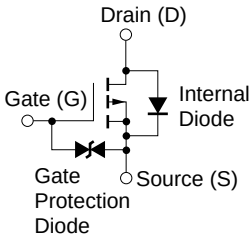
  $R_{DS(on)}$ = 0.24 Ω MAX. @$V_{GS}$ = –4 V, $I_D$ = –2.5 A

  $R_{DS(on)}$ = 0.11 Ω MAX. @$V_{GS}$ = –10 V, $I_D$ = –2.5 A

### PACKAGE DIMENSIONS (in mm)




### EQUIVALENT CIRCUIT




**PIN CONNECTIONS**
G: Gate
D: Drain
S: Source

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 ˚C)

| PARAMETER | SYMBOL | TEST CONDITIONS | RATING | UNIT |
|---|---|---|---|---|
| Drain to Source Voltage | $V_{DSS}$ | $V_{GS}$ = 0 | –30 | V |
| Gate to Source Voltage | $V_{GSS}$ | $V_{DS}$ = 0 | –20/+10 | V |
| Drain Current (DC) | $I_{D(DC)}$ | | ±5.0 | A |
| Drain Current (Pulse) | $I_{D(pulse)}$ | PW ≤ 10 μs<br>Duty cycle ≤ 1 % | ±20.0 | A |
| Total Power Dissipation | $P_{T1}$ | $T_A$ = 25 ˚C | 1.0 | W |
| Total Power Dissipation | $P_{T2}$ | $T_C$ = 25 ˚C | 6.0 | W |
| Channel Temperature | $T_{ch}$ | | 150 | ˚C |
| Storage Temperature | $T_{stg}$ | | –55 to +150 | ˚C |

**The internal diode connected between the gate and source of this product is to protect the product from static electricity. If the product is used in a circuit where the rated voltage of the product may be exceeded, connect a protection circuit.**



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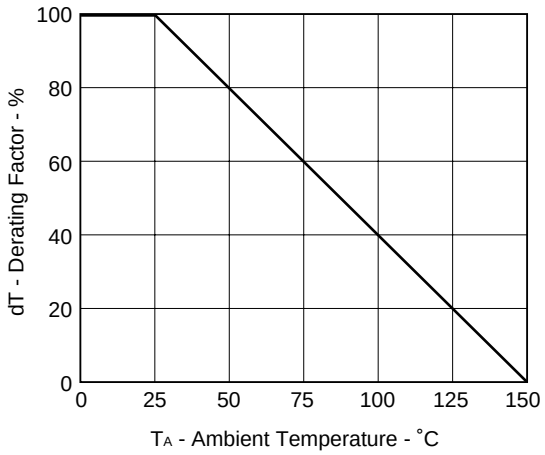
## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C)

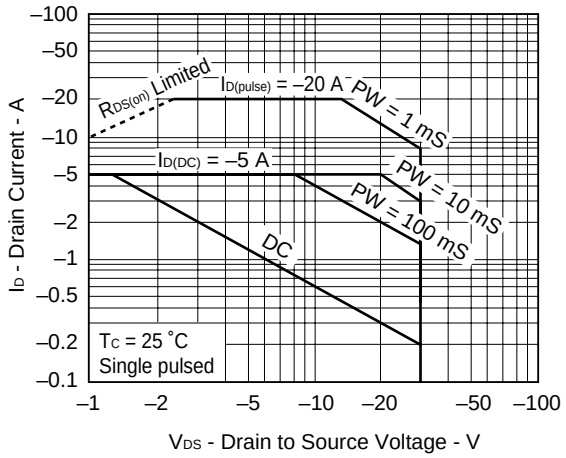
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Drain Cut-Off Current | $I_{DSS}$ | $V_{DS}$ = –30 V, $V_{GS}$ = 0 | | | –10 | μA |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$ = –16/+10 V, $V_{DS}$ = 0 | | | ±10 | μA |
| Gate Cut-Off Voltage | $V_{GS(off)}$ | $V_{DS}$ = –10 V, $I_D$ = –1 mA | –1.0 | –1.4 | –2.0 | V |
| Forward Transfer Admittance | $\|y_{fs}\|$ | $V_{DS}$ = –10 V, $I_D$ = –2.5 A | 3.0 | | | S |
| Drain to Source On-State Resistance | $R_{DS(on)1}$ | $V_{GS}$ = –4 V, $I_D$ = –2.5 A | | 0.175 | 0.24 | Ω |
| Drain to Source On-State Resistance | $R_{DS(on)2}$ | $V_{GS}$ = –10 V, $I_D$ = –2.5 A | | 0.096 | 0.11 | Ω |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = –10 V, $V_{GS}$ = 0 | | 790 | | pF |
| Output Capacitance | $C_{oss}$ | f = 1.0 MHz | | 580 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 280 | | pF |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = –15 V, $I_D$ = –2.5 A | | 10 | | ns |
| Rise Time | $t_r$ | $V_{GS(on)}$ = –10 V | | 110 | | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | $R_G$ = 10 Ω, $R_L$ = 6 Ω | | 195 | | ns |
| Fall Time | $t_f$ | | | 185 | | ns |
| Gate Input Charge | $Q_G$ | $V_{DS}$ = –24 V | | 29.8 | | nC |
| Gate to Source Charge | $Q_{GS}$ | $V_{GS}$ = –10 V | | 2.7 | | nC |
| Gate to Drain Charge | $Q_{GD}$ | $I_D$ = –5.0 A, $I_G$ = –2 mA | | 11.5 | | nC |
| Internal Diode Forward Voltage | $V_{F(S-D)}$ | $I_F$ = 5.0 A, $V_{GS}$ = 0 | | 1.0 | | V |
| Internal Diode Reverse Recovery Time | $t_{rr}$ | $I_F$ = 5.0 A, $V_{GS}$ = 0 | | 140 | | ns |
| Internal Diode Reverse Recovery Charge | $Q_{rr}$ | di/dt = 50 A/μs | | 160 | | nC |

## TYPICAL CHARACTERISTICS ($T_A$ = 25 °C)

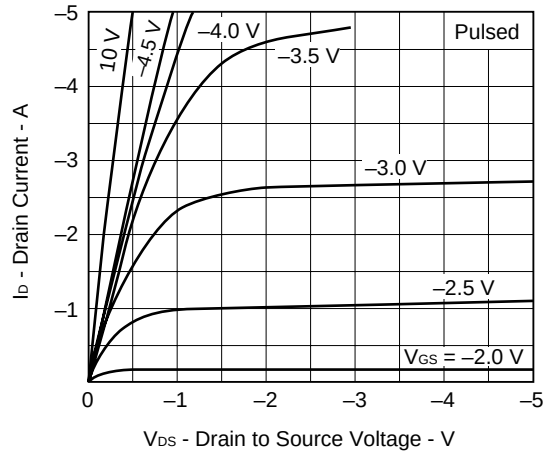
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



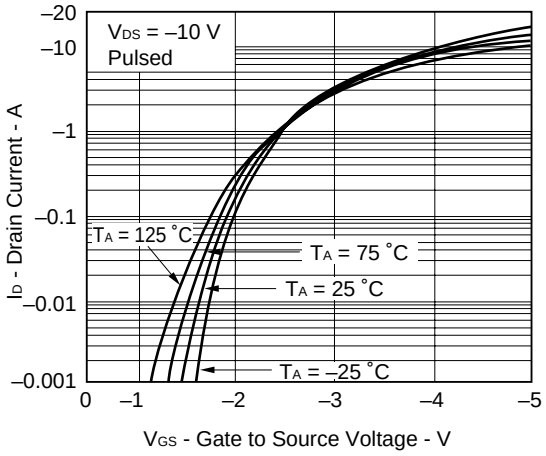

FORWARD BIAS SAFE OPERATING AREA



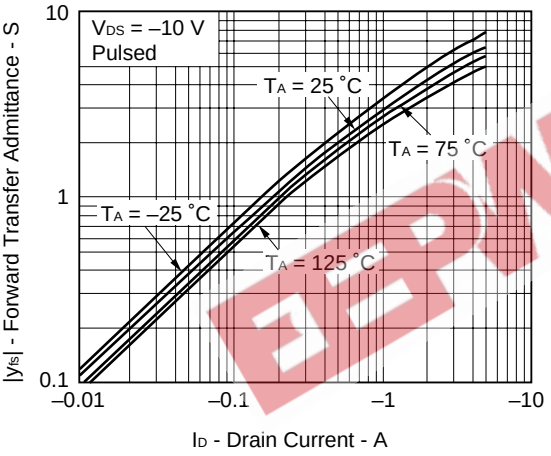
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



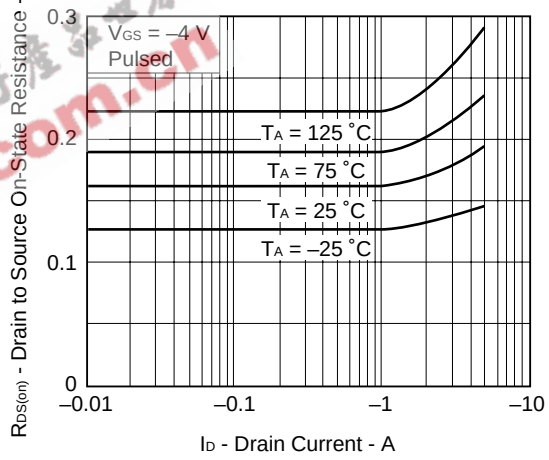

TRANSFER CHARACTERISTICS



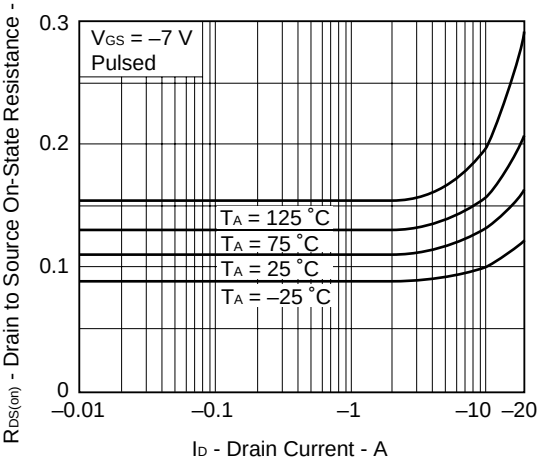

FORWARD TRANSFER ADMITTANCE
vs. DRAIN CURRENT



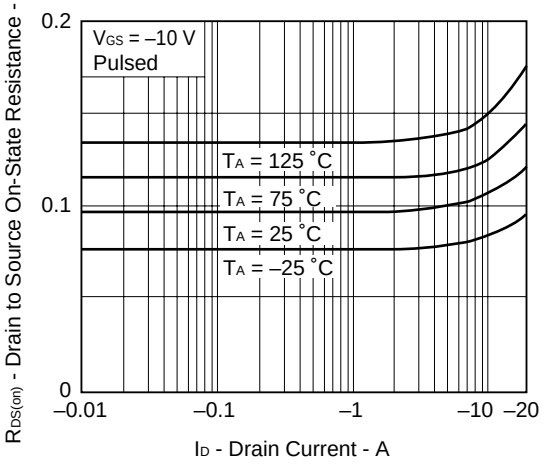

DRAIN TO SOURCE ON-STATE RESISTANCE
vs. DRAIN CURRENT



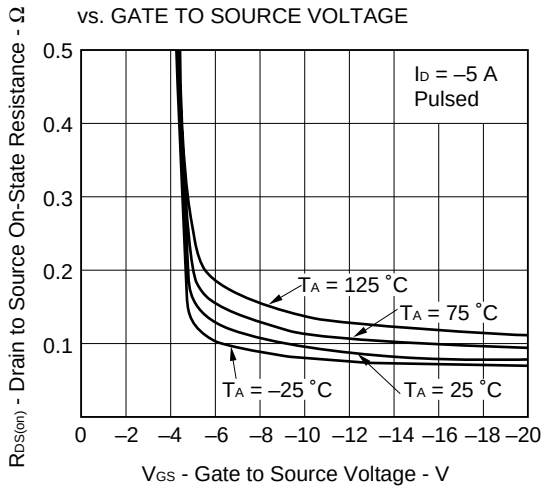

DRAIN TO SOURCE ON-STATE RESISTANCE
vs. DRAIN CURRENT



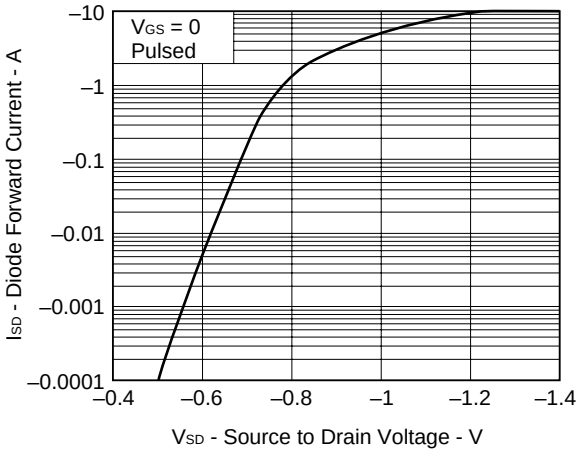

DRAIN TO SOURCE ON-STATE RESISTANCE
vs. DRAIN CURRENT



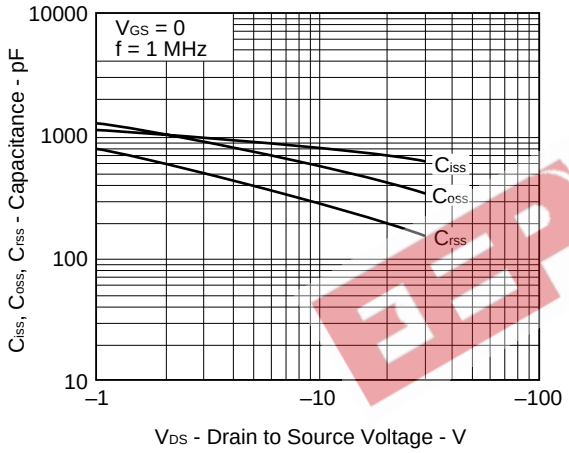
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



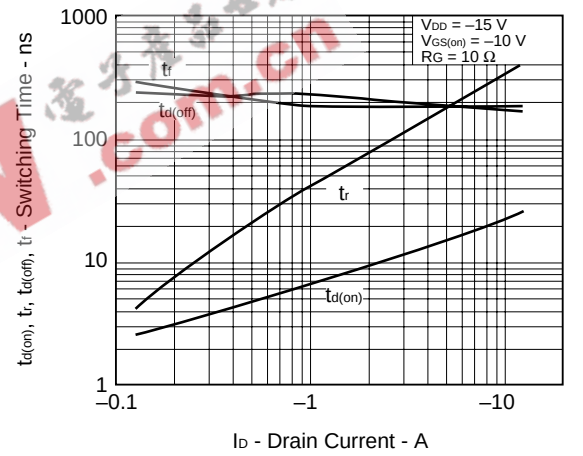

SOURCE TO DRAIN DIODE FORWARD VOLTAGE



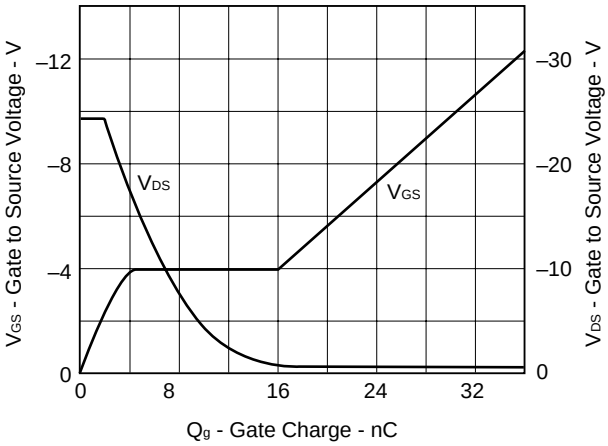

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

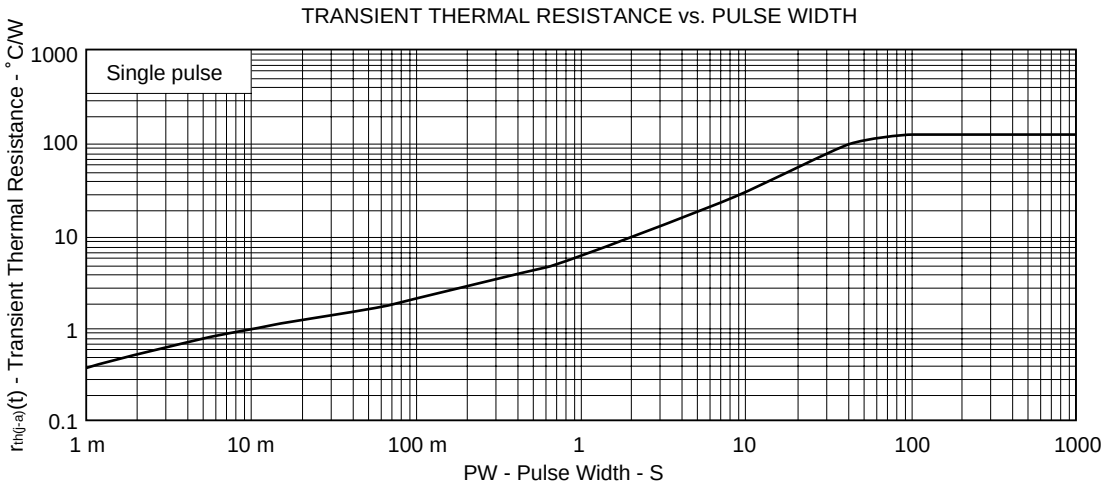



SWITCHING CHARACTERISTICS




DYNAMIC INPUT/OUTPUT CHARACTERISTICS






## 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 | C10535E |
| Guide to quality assurance for semiconductor devices | MEI-1202 |
| Semiconductor selection guide | X10679E |

**[MEMO]**