NEC

# MOS FIELD EFFECT TRANSISTOR
# 2SJ647

## P-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

### DESCRIPTION

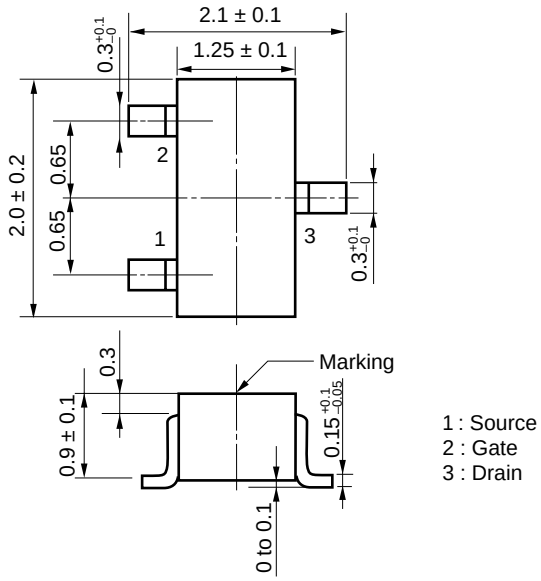
The 2SJ647 is a switching device which can be driven directly by a 2.5 V power source.

The 2SJ647 features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power switch of portable machine and so on.

### FEATURES

- 2.5 V drive available
- Low on-state resistance
  $R_{DS(on)1}$ = 1.45 Ω MAX. ($V_{GS}$ = –4.5 V, $I_D$ = –0.2 A)
  $R_{DS(on)2}$ = 1.55 Ω MAX. ($V_{GS}$ = –4.0 V, $I_D$ = –0.2 A)
  $R_{DS(on)3}$ = 2.98 Ω MAX. ($V_{GS}$ = –2.5 V, $I_D$ = –0.15 A)

### PACKAGE DRAWING (Unit: mm)

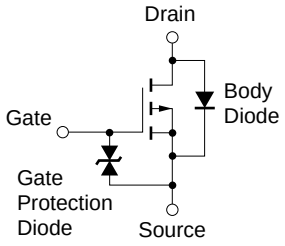



### ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|---|---|
| 2SJ647 | SC-70 (SSP) |

**Remark** Marking: H22

### EQUIVALENT CIRCUIT




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

| | | | |
|---|---|---|---|
| Drain to Source Voltage ($V_{GS}$ = 0 V) | $V_{DSS}$ | –20 | V |
| Gate to Source Voltage ($V_{DS}$ = 0 V) | $V_{GSS}$ | ∓12 | V |
| Drain Current (DC) ($T_A$ = 25°C) | $I_{D(DC)}$ | ∓0.4 | A |
| Drain Current (pulse) **Note1** | $I_{D(pulse)}$ | ∓1.6 | A |
| Total Power Dissipation **Note2** | $P_T$ | 0.2 | W |
| Channel Temperature | $T_{ch}$ | 150 | °C |
| Storage Temperature | $T_{stg}$ | –55 to +150 | °C |

**Notes 1.** PW ≤ 10 μs, Duty Cycle ≤ 1%
**2.** Mounted on FR-4 board of 2500 mm$^2$ x 1.1 mm.

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

**Caution This product is electrostatic-sensitive device due to low ESD capability and should be handled with caution for electrostatic discharge.**
**$V_{ESD}$ ±100 V TYP. at C = 200 pF, R = 0, Single Pulse.**



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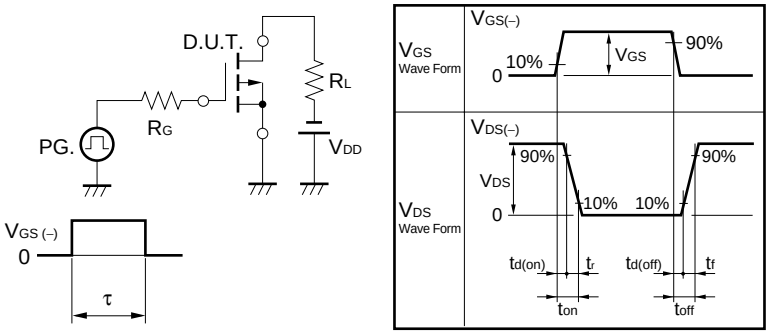
## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C)

| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = –20 V, $V_{GS}$ = 0 V | | | –1.0 | μA |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$ = ∓12 V, $V_{DS}$ = 0 V | | | ∓10 | μA |
| Gate Cut-off Voltage | $V_{GS(off)}$ | $V_{DS}$ = –10 V, $I_D$ = –1.0 mA | –0.8 | –1.3 | –1.8 | V |
| Forward Transfer Admittance | $\|y_{fs}\|$ | $V_{DS}$ = –10 V, $I_D$ = –0.2 A | 0.2 | 0.6 | | S |
| Drain to Source On-state Resistance | $R_{DS(on)1}$ | $V_{GS}$ = –4.5 V, $I_D$ = –0.2 A | | 1.17 | 1.45 | Ω |
| | $R_{DS(on)2}$ | $V_{GS}$ = –4.0 V, $I_D$ = –0.2 A | | 1.25 | 1.55 | Ω |
| | $R_{DS(on)3}$ | $V_{GS}$ = –2.5 V, $I_D$ = –0.15 A | | 2.25 | 2.98 | Ω |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = –10 V | | 29 | | pF |
| Output Capacitance | $C_{oss}$ | $V_{GS}$ = 0 V | | 15 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | f = 1.0 MHz | | 3 | | pF |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = –10 V, $I_D$ = –0.2 A | | 23 | | ns |
| Rise Time | $t_r$ | $V_{GS}$ = –4.0 V | | 39 | | ns |
| Turn-off Delay Time | $t_{d(off)}$ | $R_G$ = 10 Ω | | 50 | | ns |
| Fall Time | $t_f$ | | | 33 | | ns |
| Body Diode Forward Voltage | $V_{F(S-D)}$ | $I_F$ = 0.4 A, $V_{GS}$ = 0 V | | 0.93 | | V |

### TEST CIRCUIT SWITCHING TIME

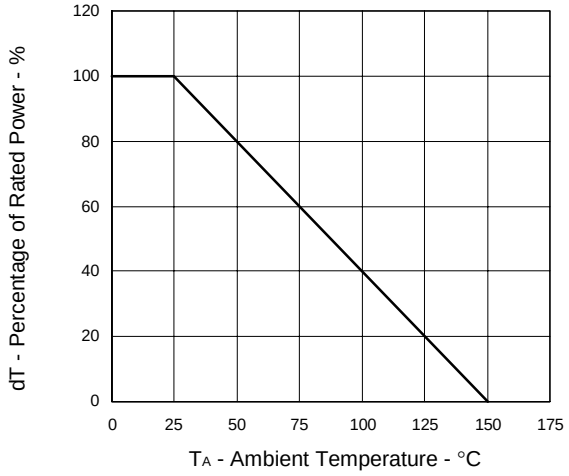




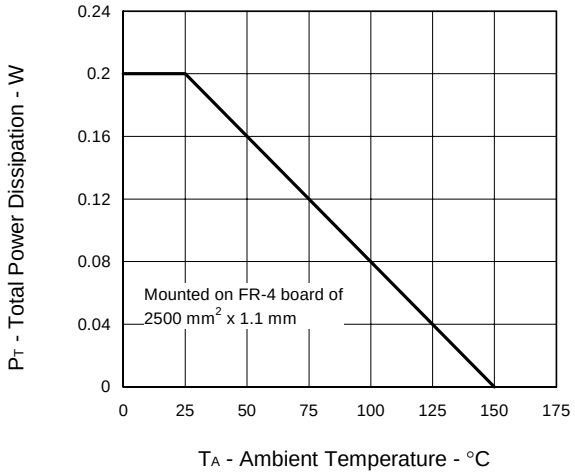

τ = 1 μs
Duty Cycle ≤ 1%

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

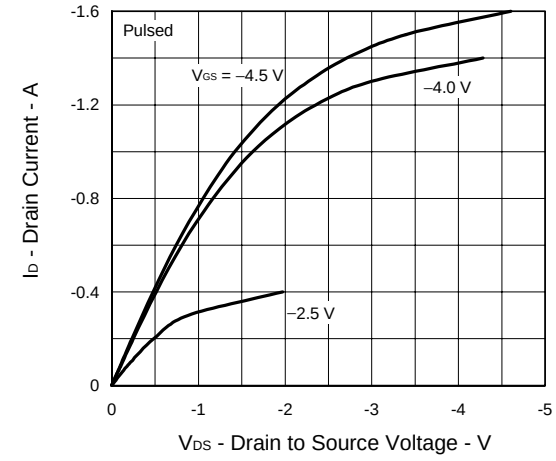
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



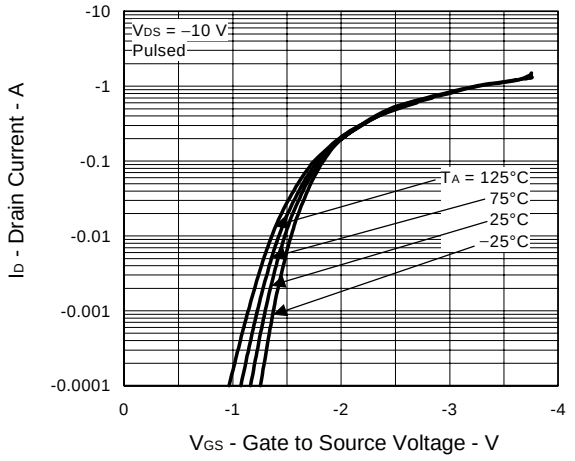

TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



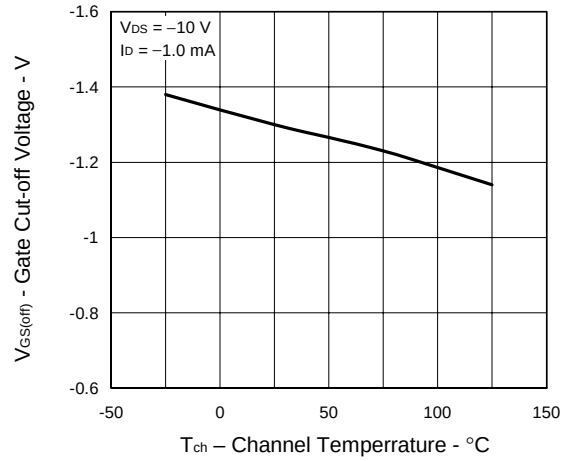

DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



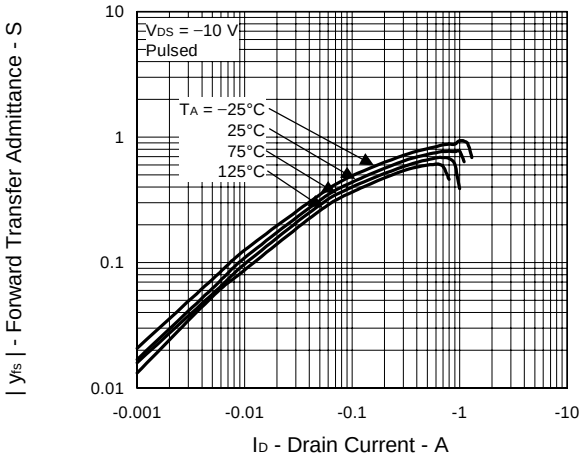

FORWARD TRANSFER CHARACTERISTICS



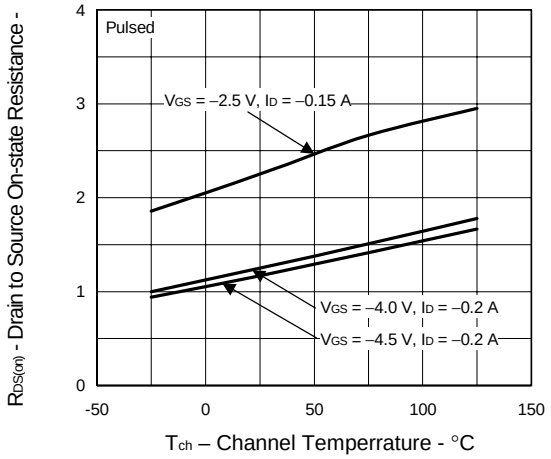

GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



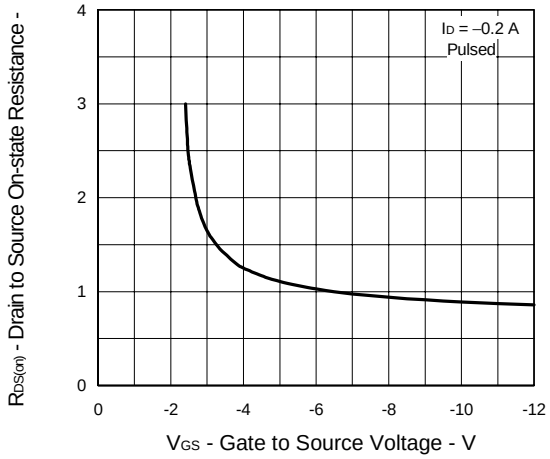

FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



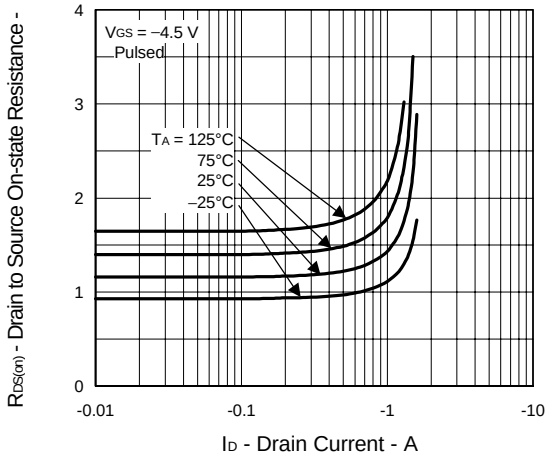
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE



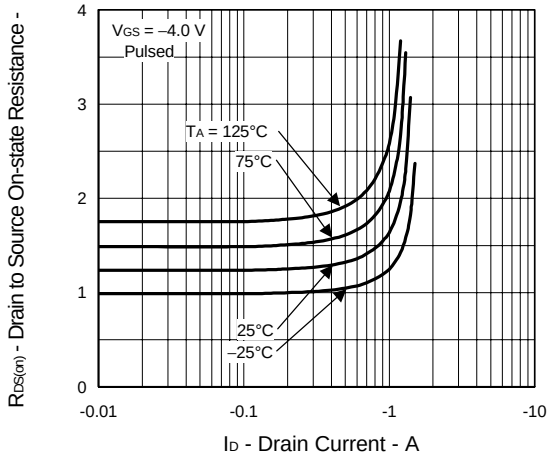

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



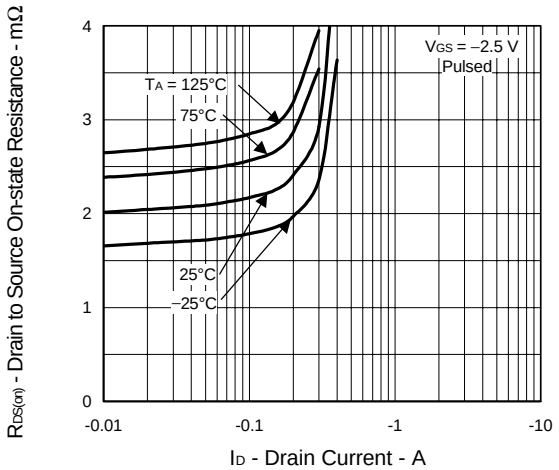

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



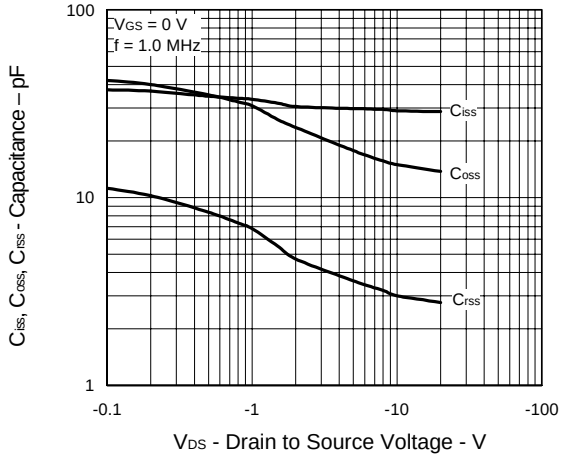

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



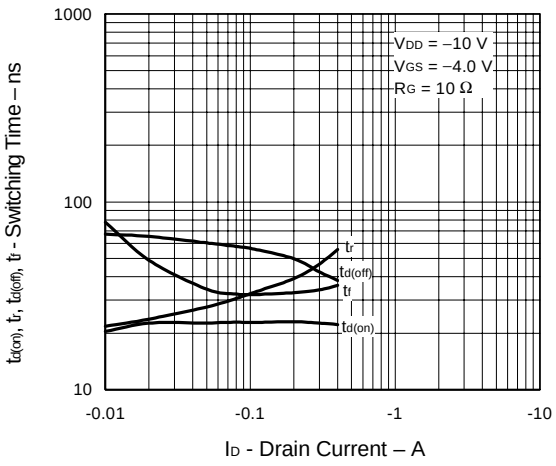

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



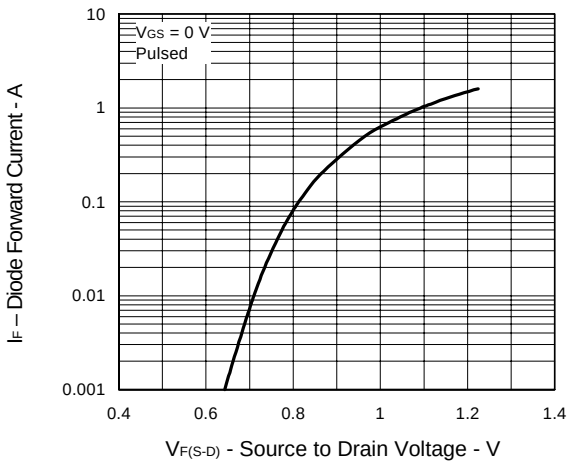

CAPACITANCE vs.
DRAIN TO SOURCE VOLTAGE



SWITCHING CHARACTERISTICS




SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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