

MOSFETs Silicon P-Channel MOS

SSM3J355R

1. Applications

· Power Management Switches

2. Features

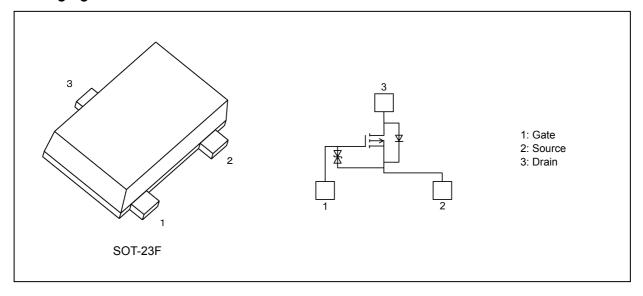
- (1) 1.8 V drive
- (2) Low drain-source on-resistance

: $R_{DS(ON)} = 36.0 \text{ m}\Omega \text{ (typ.) } (V_{GS} = -1.8 \text{ V})$

 $R_{\mathrm{DS(ON)}} = 28.0 \ \mathrm{m}\Omega \ \mathrm{(typ.)} \ \mathrm{(V_{\mathrm{GS}} = -2.5 \ V)}$

 $R_{DS(ON)}$ = 23.0 m Ω (typ.) (V_{GS} = -4.5 V)

3. Packaging and Internal Circuit





4. Absolute Maximum Ratings (Note) (Unless otherwise specified, Ta = 25 °C)

| | Characteristics | | | Symbol | Rating | Unit |
|------------------------|-----------------|---------|--------------------|------------------|------------|------|
| Drain-source voltage | | | | V_{DSS} | -20 | V |
| Gate-source voltage | , | | | V_{GSS} | ±10 | |
| Drain current (DC) | | | (Note 1) | Ι _D | -6 | Α |
| Drain current (pulsed) | , | | (Note 1), (Note 2) | I_{DP} | -24 | |
| Power dissipation | , | | (Note 3) | P_{D} | 1 | W |
| Power dissipation | (t | = 10 s) | (Note 3) | | 2 | |
| Channel temperature | | | | T _{ch} | 150 | °C |
| Storage temperature | | | | T _{stg} | -55 to 150 | |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

- Note 1: Ensure that the channel temperature does not exceed 150 °C.
- Note 2: Pulse width (PW) \leq 1 ms, duty \leq 1 %
- Note 3: Device mounted on a 25.4 mm × 25.4 mm × 1.6 mm FR4 glass epoxy board (Cu pad: 645 mm²)

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

Note: The MOSFETs in this device are sensitive to electrostatic discharge. When handling this device, the worktables, operators, soldering irons and other objects should be protected against anti-static discharge.

Note: The channel-to-ambient thermal resistance, R_{th(ch-a)}, and the drain power dissipation, P_D, vary according to the board material, board area, board thickness and pad area. When using this device, be sure to take heat dissipation fully into account.

5. Thermal Characteristics

| Characteristics | | Symbol | Max | Unit |
|---------------------------------------|----------|-----------------------|-----|------|
| Channel-to-ambient thermal resistance | (Note 1) | R _{th(ch-a)} | 125 | °C/W |

Note 1: Device mounted on an 25.4 mm × 25.4 mm × 1.6 mm FR4 glass epoxy board (Cu pad: 645 mm²)



6. Electrical Characteristics

6.1. Static Characteristics (Unless otherwise specified, Ta = 25 °C)

| Characteristics | | Symbol | Test Condition | Min | Тур. | Max | Unit |
|--------------------------------|----------|----------------------|---|------|------|------|------|
| Gate leakage current | | I _{GSS} | $V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$ | _ | _ | ±1 | μА |
| Drain cut-off current | | I _{DSS} | V _{DS} = -20 V, V _{GS} = 0 V | _ | _ | -1 | |
| Drain-source breakdown voltage | | V _{(BR)DSS} | I _D = -1 mA, V _{GS} = 0 V | -20 | _ | _ | V |
| Drain-source breakdown voltage | (Note 1) | V _{(BR)DSX} | I _D = -1 mA, V _{GS} = 5 V | -15 | _ | _ | |
| Gate threshold voltage | (Note 2) | V _{th} | $V_{DS} = -3 \text{ V}, I_{D} = -1 \text{ mA}$ | -0.3 | _ | -1.0 | |
| Drain-source on-resistance | (Note 3) | R _{DS(ON)} | I _D = -2.0 A, V _{GS} = -1.8 V | _ | 36.0 | 52.3 | mΩ |
| | | | I _D = -4.0 A, V _{GS} = -2.5 V | _ | 28.0 | 38.8 | |
| | | | I _D = -4.0 A, V _{GS} = -4.5 V | _ | 23.0 | 30.1 | |
| Forward transfer admittance | (Note 3) | Y _{fs} | V _{DS} = -3 V, I _D = -1 A | _ | 12.8 | _ | S |

Note 1: If a reverse bias is applied between gate and source, this device enters $V_{(BR)DSX}$ mode. Note that the drain-source breakdown voltage is lowered in this mode.

Note 2: Let V_{th} be the voltage applied between gate and source that causes the drain current (I_D) to below (-1 mA for this device). Then, for normal switching operation, $V_{GS(ON)}$ must be higher than V_{th} , and $V_{GS(OFF)}$ must be lower than V_{th} . This relationship can be expressed as: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$.

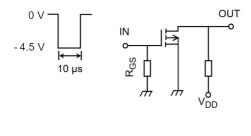
Take this into consideration when using the device.

Note 3: Pulse measurement.

6.2. Dynamic Characteristics (Unless otherwise specified, Ta = 25 °C)

| Characteristics | Symbol | Test Condition | Min | Тур. | Max | Unit |
|--------------------------------|------------------|---|-----|------|-----|------|
| Input capacitance | C _{iss} | V _{DS} = -10 V, V _{GS} = 0 V, | _ | 1030 | | pF |
| Reverse transfer capacitance | C _{rss} | f = 1 MHz | | 94 | | |
| Output capacitance | C _{oss} | | | 113 | | |
| Switching time (turn-on time) | t _{on} | V_{DD} = -10 V, I_{D} = -1 A, V_{GS} = 0 to -4.5 V, R_{GS} = 10 Ω | _ | 30 | | ns |
| Switching time (turn-off time) | t _{off} | Duty \leq 1 %,Input: t_r , t_f < 5 ns, Common source | _ | 320 | _ | |

6.3. Switching Time Test Circuit



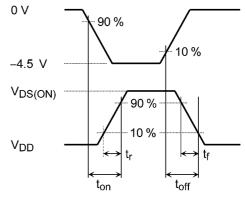


Fig. 6.3.1 Switching Time Test Circuit

Fig. 6.3.2 Input Waveform/Output Waveform

6.4. Gate Charge Characteristics (Unless otherwise specified, T_a = 25 °C)

| Characteristics | Symbol | Test Condition | Min | Тур. | Max | Unit |
|---|------------------|---|-----|------|-----|------|
| Total gate charge (gate-source plus gate-drain) | Qg | $V_{DD} = -10 \text{ V}, I_{D} = -6.0 \text{ A},$ | _ | 16.6 | | nC |
| Gate-source charge 1 | Q _{gs1} | $V_{GS} = -4.5 \text{ V}$ | _ | 3.0 | | |
| Gate-drain charge | Q _{gd} | | _ | 3.5 | | |

Rev.4.0

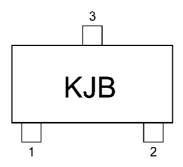


6.5. Source-Drain Characteristics (Unless otherwise specified, Ta = 25 °C)

| Characteristics | Symbol | Test Condition | Min | Тур. | Max | Unit |
|----------------------------|-----------------------|--|-----|------|-----|------|
| Diode forward voltage (Not | e 1) V _{DSF} | I _{DR} = 6 A, V _{GS} = 0 V | _ | 0.83 | 1.2 | V |

Note 1: Pulse measurement.

7. Marking





8. Characteristics Curves (Note)

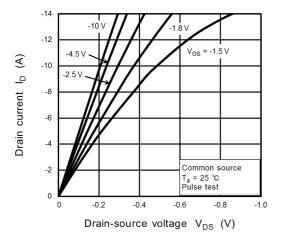


Fig. 8.1 I_D - V_{DS}

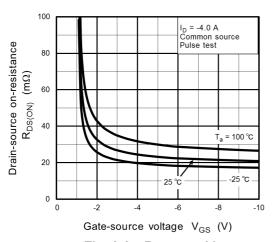


Fig. 8.3 R_{DS(ON)} - V_{GS}

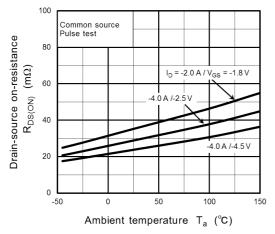


Fig. 8.5 R_{DS(ON)} - T_a

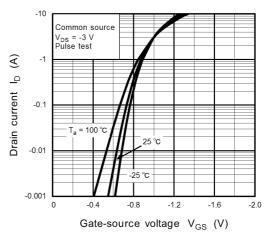


Fig. 8.2 I_D - V_{GS}

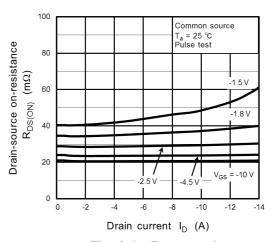


Fig. 8.4 R_{DS(ON)} - I_D

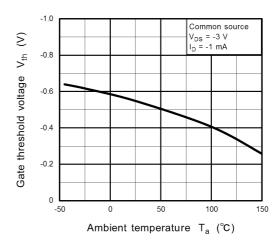
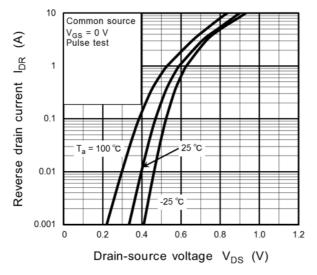


Fig. 8.6 V_{th} - T_a





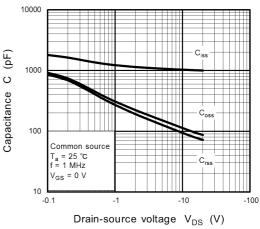
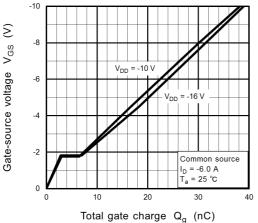
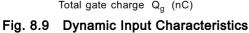


Fig. 8.7 IDR - VDS

Fig. 8.8 C - V_{DS}





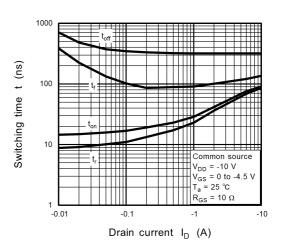


Fig. 8.10 t - I_D

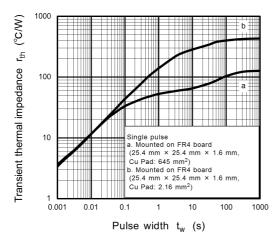


Fig. 8.11 rth - tw

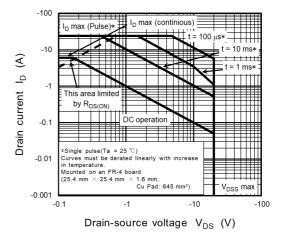


Fig. 8.12 Safe Operating Area



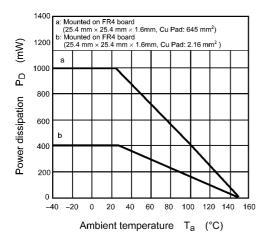


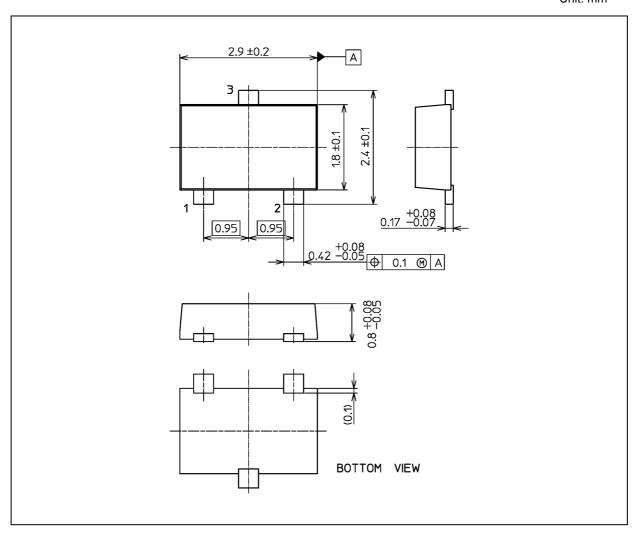
Fig. 8.13 P_D - T_a

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



Package Dimensions

Unit: mm



Weight: 0.011 g (typ.)

| | Package Name(s) |
|-------------------|-----------------|
| Nickname: SOT-23F | |



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