

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type

SSM5N16FU

High Speed Switching Applications

Analog Switching Applications

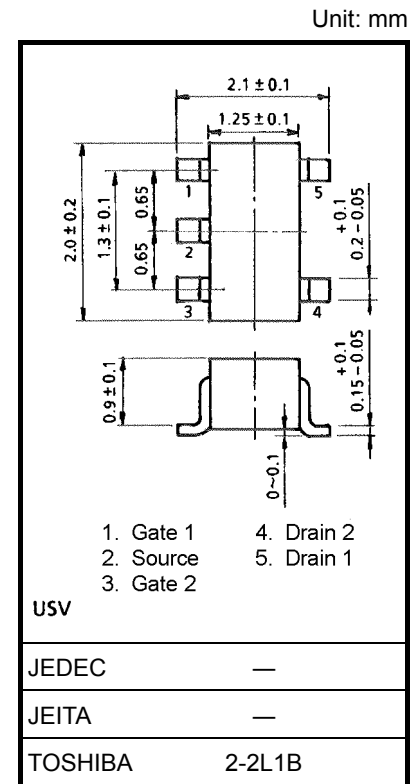
- Suitable for high-density mounting due to compact package
- Low on resistance: $R_{on} = 3.0 \Omega$ (max) (@ $V_{GS} = 4 V$)
 : $R_{on} = 4.0 \Omega$ (max) (@ $V_{GS} = 2.5 V$)
 : $R_{on} = 15 \Omega$ (max) (@ $V_{GS} = 1.5 V$)

Absolute Maximum Ratings ($T_a = 25^\circ C$) (Q1, Q2 Common)

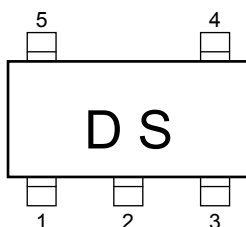
| Characteristics | | Symbol | Rating | Unit |
|--|-------|----------------|------------|------------|
| Drain-Source voltage | | V_{DS} | 20 | V |
| Gate-Source voltage | | V_{GSS} | ± 10 | V |
| Drain current | DC | I_D | 100 | mA |
| | Pulse | I_{DP} | 200 | |
| Drain power dissipation ($T_a = 25^\circ C$) | | P_D (Note 1) | 200 | mW |
| Channel temperature | | T_{ch} | 150 | $^\circ C$ |
| Storage temperature range | | T_{stg} | -55 to 150 | $^\circ C$ |

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).

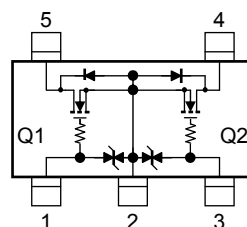
Note 1: Total rating



Marking



Equivalent Circuit



Handling Precaution

When handling individual devices (which are not yet mounting on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

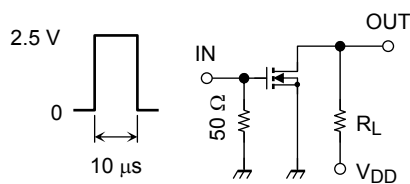
Start of commercial production
2001-03

Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------|---------------|---|-----|------|---------|---------------|
| Gate leakage current | I_{GSS} | $V_{GS} = \pm 10\text{ V}, V_{DS} = 0$ | — | — | ± 1 | μA |
| Drain-Source breakdown voltage | $V_{(BR)DSS}$ | $I_D = 0.1\text{ mA}, V_{GS} = 0$ | 20 | — | — | V |
| Drain cut-off current | I_{DSS} | $V_{DS} = 20\text{ V}, V_{GS} = 0$ | — | — | 1 | μA |
| Gate threshold voltage | V_{th} | $V_{DS} = 3\text{ V}, I_D = 0.1\text{ mA}$ | 0.6 | — | 1.1 | V |
| Forward transfer admittance | $ Y_{fs} $ | $V_{DS} = 3\text{ V}, I_D = 10\text{ mA}$ | 40 | — | — | mS |
| Drain-Source ON resistance | $R_{DS(ON)}$ | $I_D = 10\text{ mA}, V_{GS} = 4\text{ V}$ | — | 1.5 | 3.0 | Ω |
| | | $I_D = 10\text{ mA}, V_{GS} = 2.5\text{ V}$ | — | 2.2 | 4.0 | |
| | | $I_D = 1\text{ mA}, V_{GS} = 1.5\text{ V}$ | — | 5.2 | 15 | |
| Input capacitance | C_{iss} | $V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$ | — | 9.3 | — | pF |
| Reverse transfer capacitance | C_{rss} | $V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$ | — | 4.5 | — | pF |
| Output capacitance | C_{oss} | $V_{DS} = 3\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$ | — | 9.8 | — | pF |
| Switching time | Turn-on time | t_{on} | — | 70 | — | ns |
| | Turn-off time | t_{off} | | 125 | | |

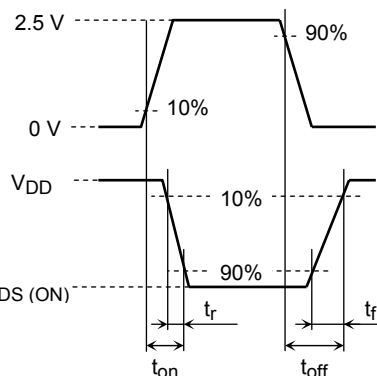
Switching Time Test Circuit

(a) Test circuit

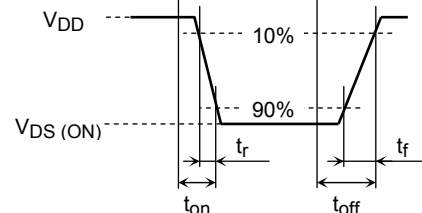


$V_{DD} = 3\text{ V}$
 Duty $\leq 1\%$
 V_{IN} : $t_r, t_f < 5\text{ ns}$
 $(Z_{out} = 50\ \Omega)$
 Common Source
 $T_a = 25^\circ\text{C}$

(b) V_{IN}



(c) V_{OUT}

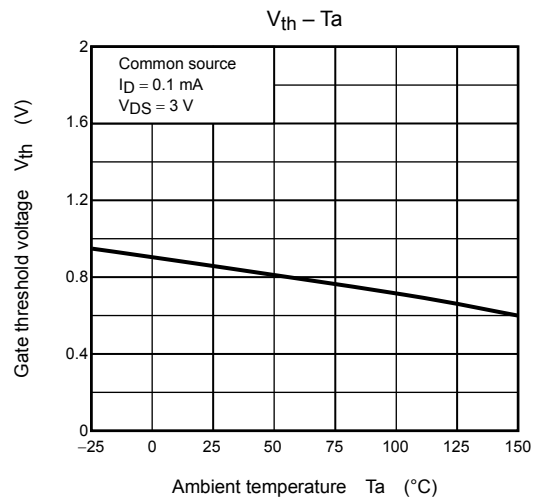
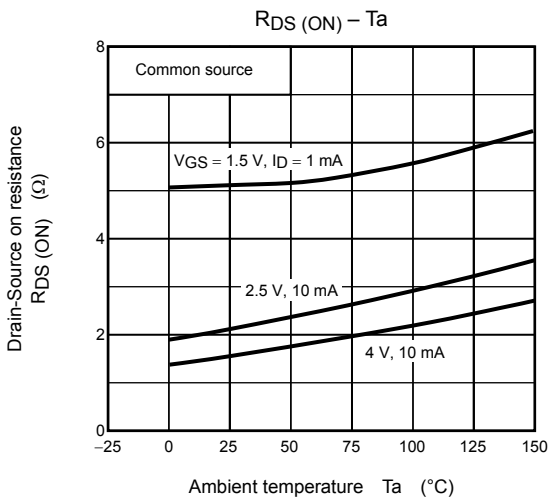
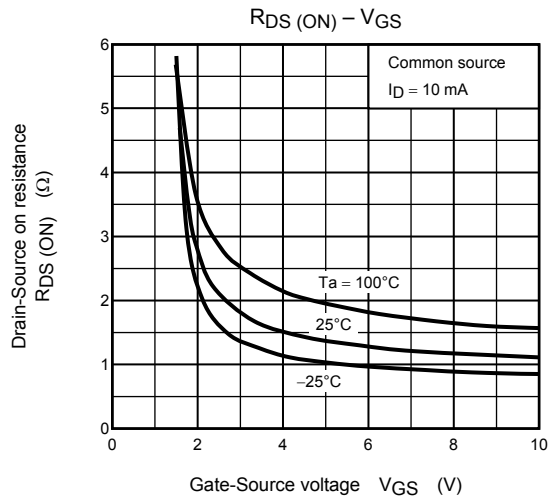
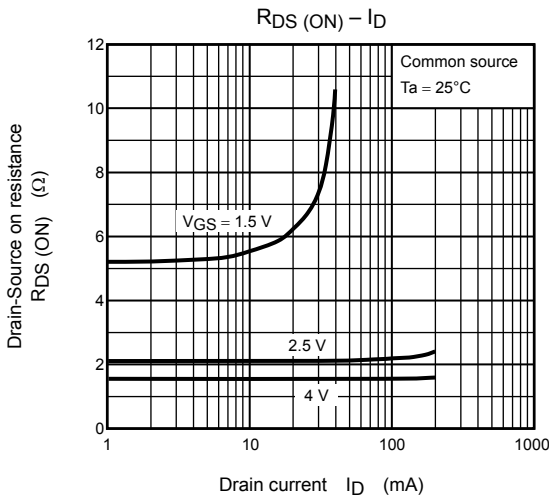
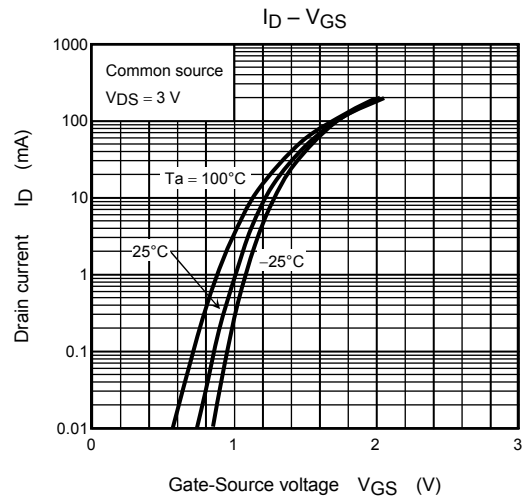
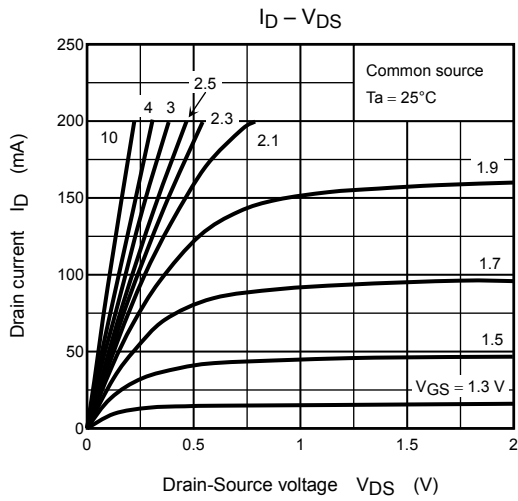


Precaution

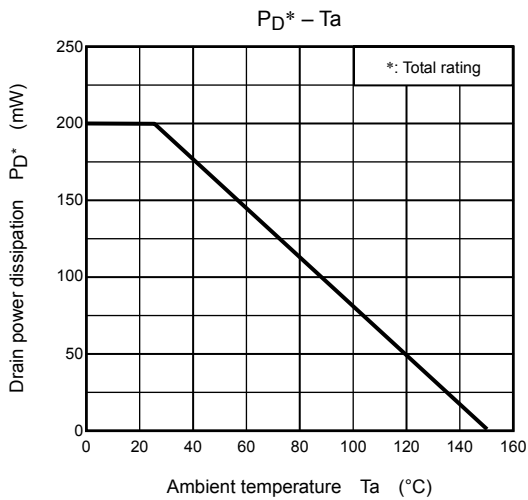
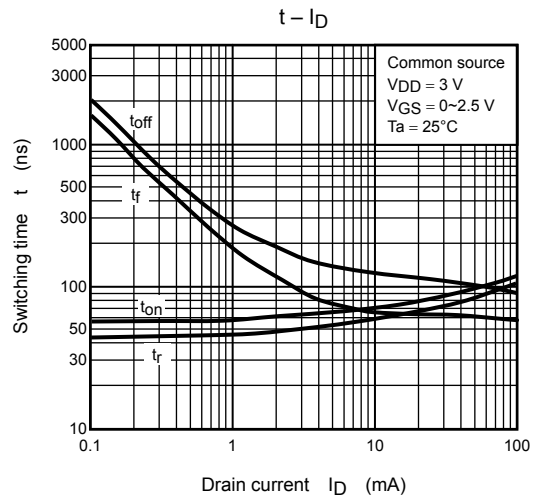
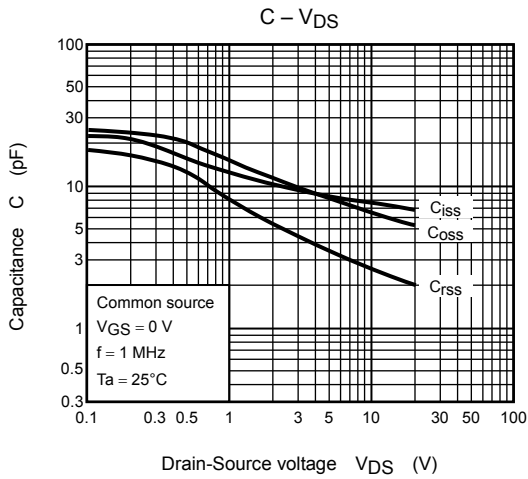
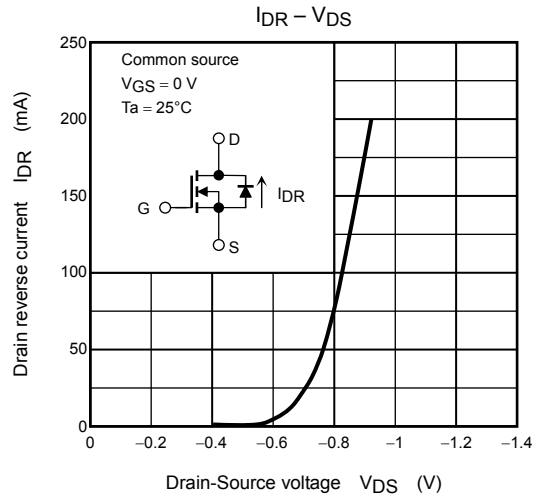
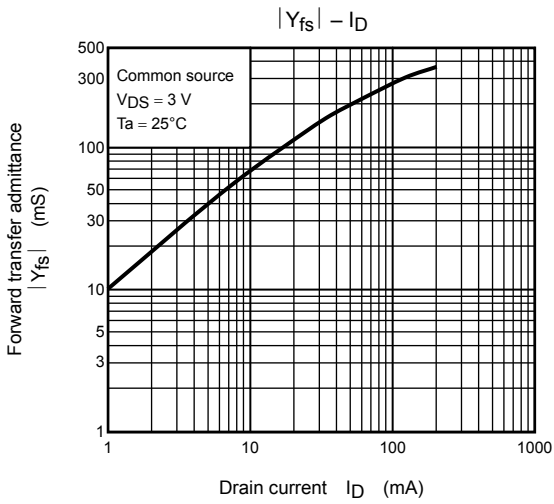
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 100\ \mu\text{A}$ for this product. For normal switching operation, $V_{GS(on)}$ requires higher voltage than V_{th} and $V_{GS(off)}$ requires lower voltage than V_{th} . (Relationship can be established as follows: $V_{GS(off)} < V_{th} < V_{GS(on)}$)

Please take this into consideration for using the device.

(Q1, Q2 common)



(Q1, Q2 common)



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