# 1.5V Drive Pch +SBD MOSFET

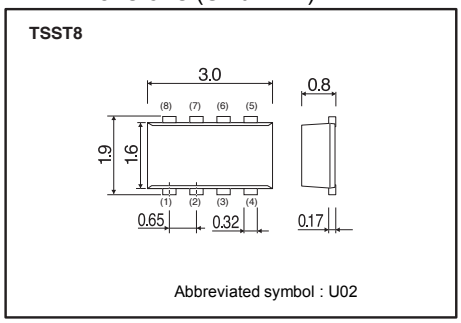
## TT8U2

### ●Structure
Silicon P-channel MOSFET / schottky barrier diode

### ●Features
1) Pch MOSFET and shottky barrier diode are put in TSST8 package.
2) High-speed switching and Low on-resistance.
3) Low voltage drive(1.5V).
4) Built in Low $I_R$ shottky barierr daiode.

### ●Applications
Switching

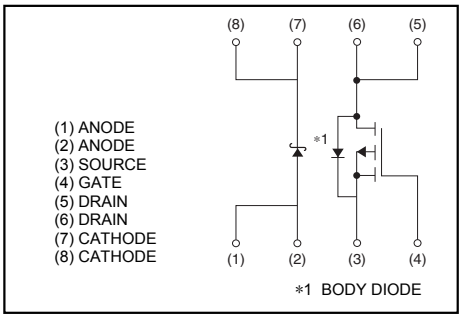
### ●Dimensions (Unit : mm)




### ●Packaging specifications

| | | |
|---|---|---|
| Type | Package | Taping |
| | Code | TR |
| | Basic ordering unit (pieces) | 3000 |
| TT8U2 | | O |

### ●Inner circuit




### ●Absolute maximum ratings (Ta = 25°C)

<MOSFET>

| Parameter | | Symbol | Limits | Unit |
|---|---|---|---|---|
| Drain-source voltage | | $V_{DSS}$ | −20 | V |
| Gate-source voltage | | $V_{GSS}$ | ±10 | V |
| Drain current | Continuous | $I_D$ | ±2.4 | A |
| | Pulsed | $I_{DP}$ | ±9.6 | A |
| Source current (Body Diode) | Continuous | $I_S$ | −0.8 | A |
| | Pulsed | $I_{SP}$*1 | −9.6 | A |
| Channel temperature | | Tch | 150 | °C |
| Power dissipation | | $P_D$*2 | 1.0 | W / ELEMENT |

*1 Pw≤10μs, Duty cycle≤1%

*2 Mounted on a ceramic board.

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| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Repetitive peak reverse voltage | $V_{RM}$ | 30 | V |
| Reverse voltage | $V_R$ | 20 | V |
| Forward current | $I_F$ | 1.0 | A |
| Forward current surge peak | $I_{FSM}$*1 | 3.0 | A |
| Junction temperature | $T_j$ | 150 | °C |
| Power dissipation | $P_D$*2 | 1.0 | W / ELEMENT |

*1 60Hz / 1Cycle

*2 Mounted on a ceramic board

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| Parameter | Symbol | Limits | Unit |
|---|---|---|---|
| Total power dissipation | $P_D$* | 1.25 | W / TOTAL |
| Range of Storage temperature | Tstg | −55 to +150 | °C |

* Mounted on a ceramic board

●**Electrical characteristics** (Ta=25°C)

<MOSFET>

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Gate-source leakage | $I_{GSS}$ | - | - | ±100 | nA | $V_{GS}$=±10V, $V_{DS}$=0V |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | −20 | - | - | V | $I_D$=−1mA, $V_{GS}$=0V |
| Zero gate voltage drain current | $I_{DSS}$ | - | - | −1 | μA | $V_{DS}$=−20V, $V_{GS}$=0V |
| Gate threshold voltage | $V_{GS\ (th)}$ | −0.3 | - | −1.0 | V | $V_{DS}$=−10V, $I_D$=−1mA |
| Static drain-source on-state resistance | $R_{DS\ (on)}$ * | - | 80 | 105 | mΩ | $I_D$=−2.4A, $V_{GS}$=−4.5V |
| | | - | 105 | 140 | mΩ | $I_D$=−1.2A, $V_{GS}$=−2.5V |
| | | - | 150 | 225 | mΩ | $I_D$=−1.2A, $V_{GS}$=−1.8V |
| | | - | 180 | 360 | mΩ | $I_D$=−0.5A, $V_{GS}$=−1.5V |
| Forward transfer admittance | $\|Y_{fs}\|$* | 2.4 | - | - | S | $V_{DS}$=−10A, $I_D$=−2.4V |
| Input capacitance | $C_{iss}$ | - | 850 | - | pF | $V_{DS}$=−10V |
| Output capacitance | $C_{oss}$ | - | 60 | - | pF | $V_{GS}$=0V |
| Reverse transfer capacitance | $C_{rss}$ | - | 50 | - | pF | f=1MHz |
| Turn-on delay time | $t_{d(on)}$* | - | 9 | - | ns | $V_{DD}$≒−10V,$V_{GS}$=−4.5V |
| Rise time | $t_r$ * | - | 25 | - | ns | $I_D$=−1.2A, |
| Turn-off delay time | $t_{d(off)}$* | - | 55 | - | ns | $R_L$≒8.3Ω |
| Fall time | $t_f$ * | - | 45 | - | ns | $R_G$=10Ω |
| Total gate charge | $Q_g$ * | - | 6.7 | - | nC | $V_{DD}$≒−10V,$V_{GS}$=−4.5V |
| Gate-source charge | $Q_{gs}$ * | - | 1.7 | - | nC | $I_D$=−2.4A, |
| Gate-drain charge | $Q_{gd}$ * | - | 0.6 | - | nC | $R_L$≒ 4.2Ω ,$R_G$=10Ω |

*Pulsed

●**Body diode(source-drain)** (Ta=25°C)

<MOSFET>

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_{SD}$ | - | - | −1.2 | V | $I_s$=−2.4A, $V_{GS}$=0V |

*Pulsed

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| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Forward Voltage drop | $V_F$ | - | 0.48 | 0.52 | V | $I_F$=1.0A |
| Reverse leakage | $I_R$ | - | - | 10 | μA | $V_R$=10V |

●**Electrical characteristic curves** (Ta=25°C)

<MOSFET>

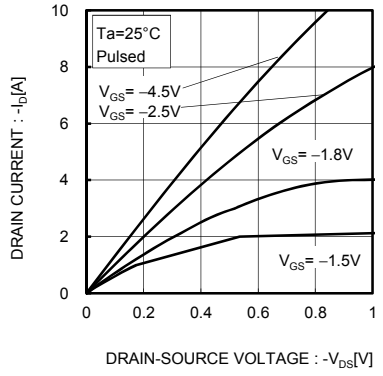


Fig.1 Typical output characteristics(Ⅰ)

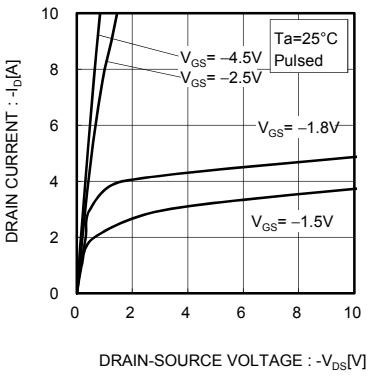


Fig.2 Typical output characteristics(Ⅱ)

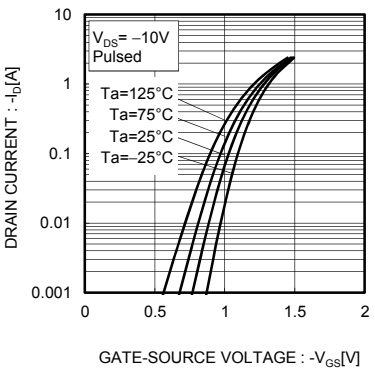


Fig.3 Typical Transfer Characteristics

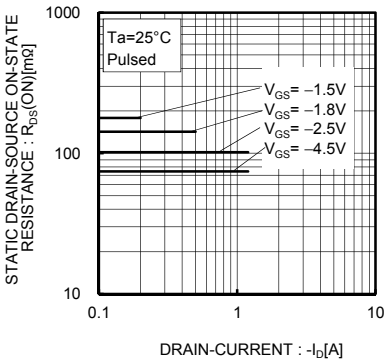


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current(Ⅰ)

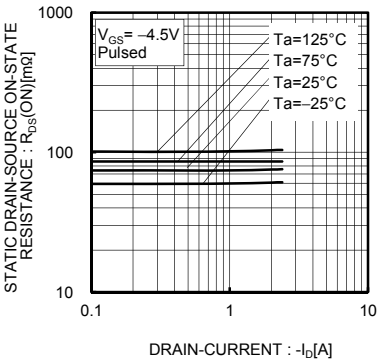


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current(Ⅱ)

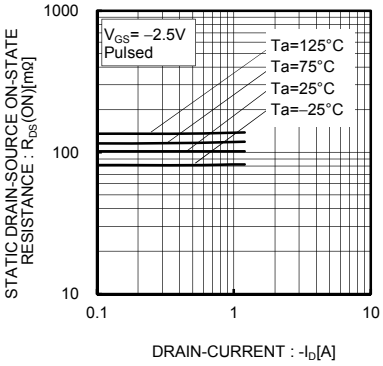


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current(Ⅲ)

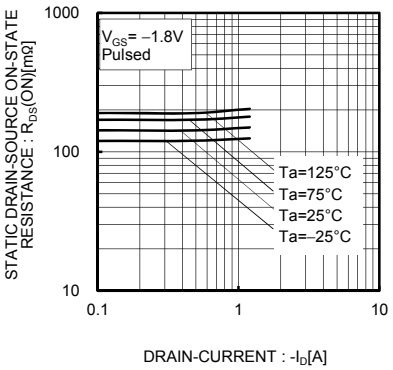


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current(Ⅳ)

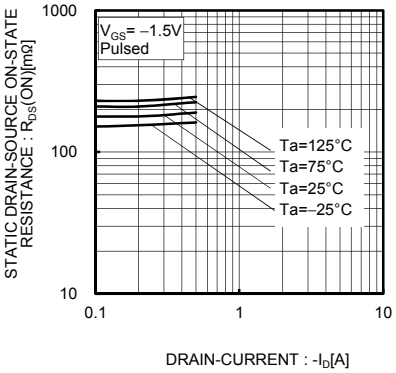


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current(Ⅴ)

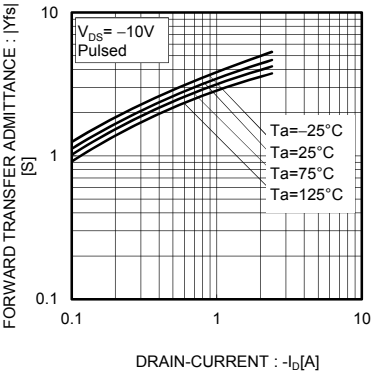


Fig.9 Forward Transfer Admittance vs. Drain Current

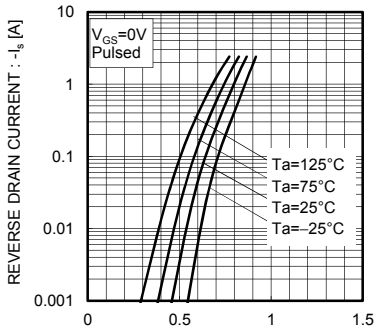


Fig.10 Reverse Drain Current vs. Sourse-Drain Voltage

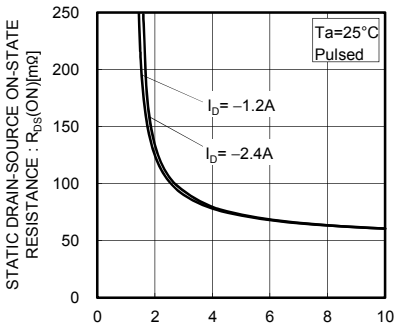


Fig.11 Static Drain-Source On-State Resistance vs. Gate Source Voltage

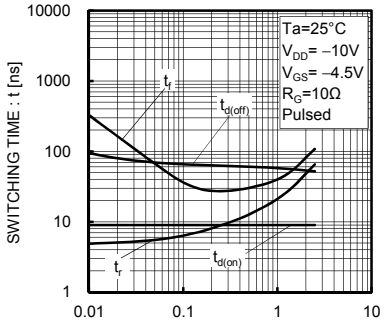


Fig.12 Switching Characteristics

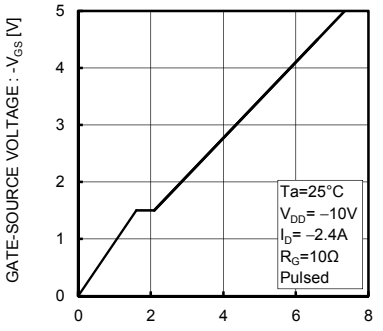


Fig.13 Dynamic Input Characteristics

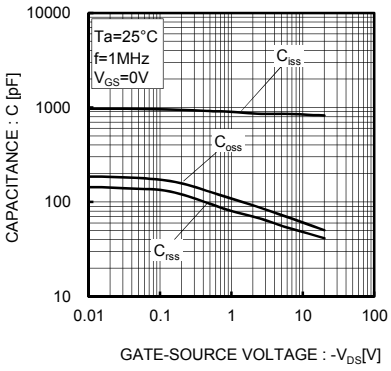


Fig.14 Typical Capacitance vs. Drain-Source Voltage

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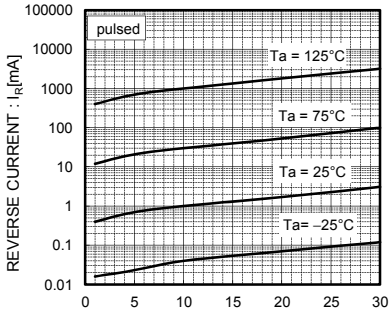


Fig.1 Reverse Current vs. Reverse Voltage

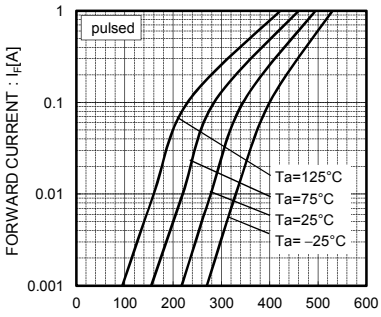


Fig.2 Forward Current vs. Forward Voltage

## ●Measurement circuits

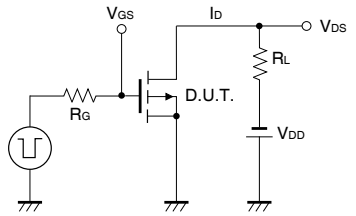


Fig.1-1 Switching Time Measurement Circuit

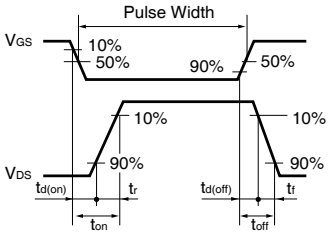


Fig.1-2 Switching Waveforms

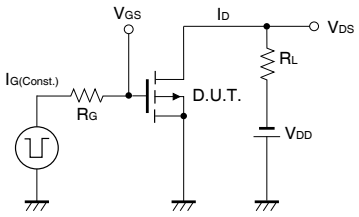


Fig.2-1 Gate Charge Measurement Circuit

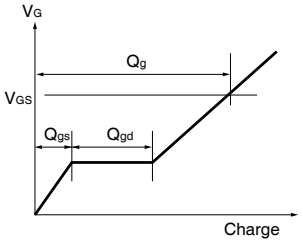


Fig.2-2 Gate Charge Waveform

## ●Notice

1. SBD has a large reverse leak current compared to other type of diode. Therefore ; it would raise a junction temperature, and increase a reverse power loss. Further rise of inside temperature would cause a thermal runaway.
This built-in SBD has low $V_F$ characteristics and therefore, higher leak current. Please consider enough the surrounding temperature, generating heat of MOSFET and the reverse current.

2. This product might cause chip aging and breakdown under the large electrified environment. Please consider to design ESD protection circuit.

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