

# 2.5V Drive Nch+SBD MOS FET

## QS5U16

### ●Structure

Silicon N-channel MOSFET  
Schottky Barrier DIODE

### ●Features

- 1) The QS5U16 combines Nch MOSFET with a Schottky barrier diode in a single TSMT5 package.
- 2) Low on-state resistance with fast switching.
- 3) Low voltage drive (2.5V).
- 4) The Independently connected Schottky barrier diode has low forward voltage.

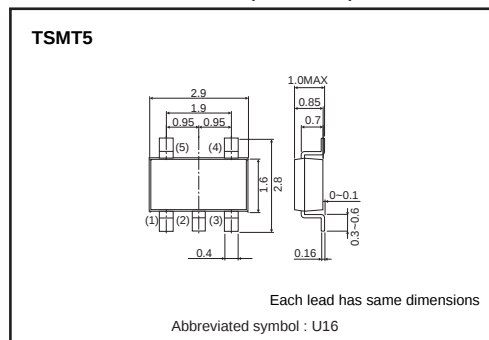
### ●Applications

Load switch, DC / DC conversion

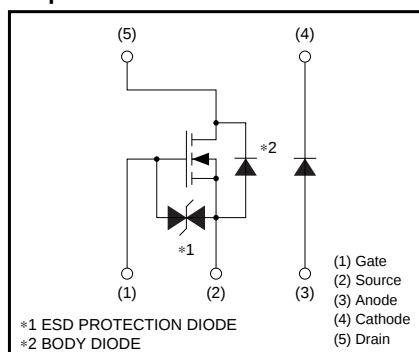
### ●Packaging specifications

| Type   | Package                      | Taping |
|--------|------------------------------|--------|
|        | Code                         | TR     |
|        | Basic ordering unit (pieces) | 3000   |
| QS5U16 |                              | ○      |

### ●External dimensions (Unit : mm)



### ●Equivalent circuit



## Transistors

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

## &lt;MOSFET&gt;

| Parameter                      |            | Symbol      | Limits | Unit      |
|--------------------------------|------------|-------------|--------|-----------|
| Drain-source voltage           |            | $V_{DS}$    | 30     | V         |
| Gate-source voltage            |            | $V_{GS}$    | 12     | V         |
| Drain current                  | Continuous | $I_D$       | ±2.0   | A         |
|                                | Pulsed     | $I_{DP}$ *1 | ±8.0   | A         |
| Source current<br>(Body diode) | Continuous | $I_S$       | 0.8    | A         |
|                                | Pulsed     | $I_{SP}$ *1 | 3.2    | A         |
| Channel temperature            |            | $T_{ch}$    | 150    | °C        |
| Power dissipation              |            | $P_D$ *3    | 0.9    | W/ELEMENT |

## &lt;Di&gt;

|                                 |              |     |           |
|---------------------------------|--------------|-----|-----------|
| Repetitive peak reverse voltage | $V_{RM}$     | 30  | V         |
| Reverse voltage                 | $V_R$        | 20  | V         |
| Forward current                 | $I_F$        | 0.5 | A         |
| Forward current surge peak      | $I_{FSM}$ *2 | 2.0 | A         |
| Junction temperature            | $T_j$        | 150 | °C        |
| Power dissipation               | $P_D$ *3     | 0.7 | W/ELEMENT |

## &lt;MOSFET AND Di&gt;

|                              |           |             |           |
|------------------------------|-----------|-------------|-----------|
| Total power dissipation      | $P_D$ *3  | 1.25        | W / TOTAL |
| Range of Storage temperature | $T_{stg}$ | -55 to +150 | °C        |

\*1  $P_w \leq 10 \mu s$ , Duty cycle  $\leq 1\%$  \*2 60Hz-1cyc. \*3 Mounted on a ceramic board

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

## &lt;MOSFET&gt;

| Parameter                               | Symbol         | Min. | Typ. | Max. | Unit       | Conditions                       |
|-----------------------------------------|----------------|------|------|------|------------|----------------------------------|
| Gate-source leakage                     | $I_{GSS}$      | —    | —    | 10   | $\mu A$    | $V_{GS}=12V / V_{DS}=0V$         |
| Drain-source breakdown voltage          | $V_{(BR)DSS}$  | 30   | —    | —    | V          | $I_D=1mA, / V_{GS}=0V$           |
| Zero gate voltage drain current         | $I_{DSS}$      | —    | —    | 1    | $\mu A$    | $V_{DS}=30V / V_{GS}=0V$         |
| Gate threshold voltage                  | $V_{GS(th)}$   | 0.5  | —    | 1.5  | V          | $V_{DS}=10V / I_D=1mA$           |
| Static drain-source on-state resistance | $R_{DS(on)}$ * | —    | 71   | 100  | m $\Omega$ | $I_D=2.0A, V_{GS}=4.5V$          |
|                                         |                | —    | 76   | 107  | m $\Omega$ | $I_D=2.0A, V_{GS}=4V$            |
|                                         |                | —    | 110  | 154  | m $\Omega$ | $I_D=2.0A, V_{GS}=2.5V$          |
| Forward transfer admittance             | $ Y_{fs} $ *   | 1.5  | —    | —    | S          | $V_{DS}=10V, I_D=2.0A$           |
| Input capacitance                       | $C_{iss}$      | —    | 175  | —    | pF         | $V_{DS}=10V$                     |
| Output capacitance                      | $C_{oss}$      | —    | 50   | —    | pF         | $V_{GS}=0V$                      |
| Reverse transfer capacitance            | $C_{rss}$      | —    | 25   | —    | pF         | $f=1MHz$                         |
| Turn-on delay time                      | $t_{d(on)}$ *  | —    | 8    | —    | ns         | $I_D=1.0A$                       |
| Rise time                               | $t_r$ *        | —    | 10   | —    | ns         | $V_{DD}=15V$                     |
| Turn-off delay time                     | $t_{d(off)}$ * | —    | 21   | —    | ns         | $V_{GS}=4.5V$                    |
| Fall time                               | $t_f$ *        | —    | 8    | —    | ns         | $R_L=15\Omega$<br>$R_G=10\Omega$ |
| Total gate charge                       | $Q_g$ *        | —    | 2.8  | 3.9  | nC         | $V_{DD}=15V$                     |
| Gate-source charge                      | $Q_{gs}$ *     | —    | 0.6  | —    | nC         | $V_{GS}=4.5V$                    |
| Gate-drain charge                       | $Q_{gd}$ *     | —    | 0.8  | —    | nC         | $I_D=2.0A$                       |

\*Pulsed

## &lt;Body diode (source-drain)&gt;

|                 |            |   |   |     |   |                        |
|-----------------|------------|---|---|-----|---|------------------------|
| Forward voltage | $V_{SD}$ * | — | — | 1.2 | V | $I_S=3.2A / V_{GS}=0V$ |
|-----------------|------------|---|---|-----|---|------------------------|

\* Pulsed

## &lt;Di&gt;

|                 |       |   |   |      |         |            |
|-----------------|-------|---|---|------|---------|------------|
| Forward voltage | $V_F$ | — | — | 0.36 | V       | $I_F=0.1A$ |
|                 |       | — | — | 0.47 | V       | $I_F=0.5A$ |
| Reverse current | $I_R$ | — | — | 100  | $\mu A$ | $V_R=20V$  |

# Transistors

## ●Electrical characteristic curves

<MOSFET>

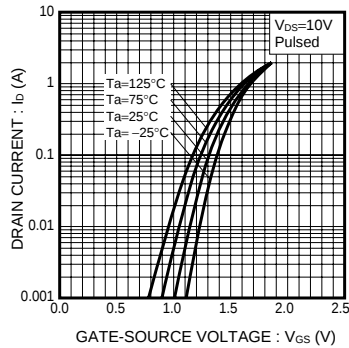


Fig.1 Typical Transfer Characteristics

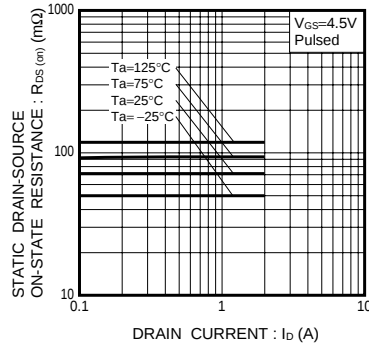


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

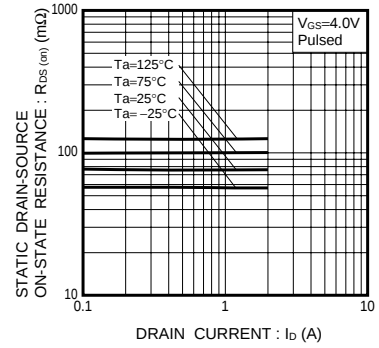


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

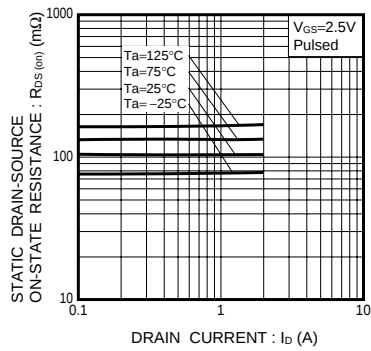


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

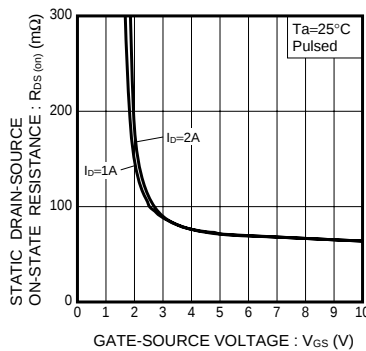


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

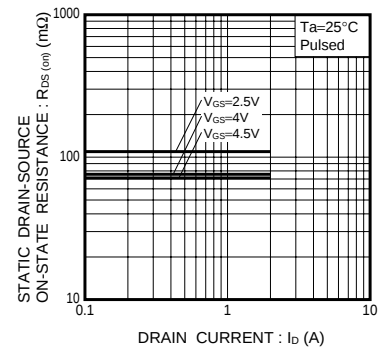


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

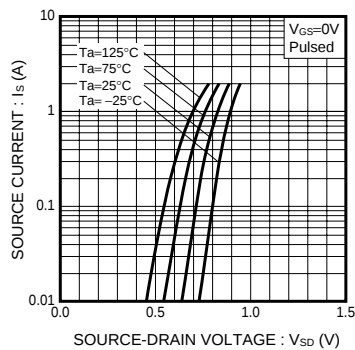


Fig.7 Reverse Drain Current vs. Source-Drain Current

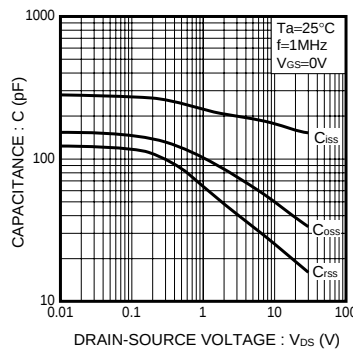


Fig.8 Typical Capacitance vs. Drain-Source Voltage

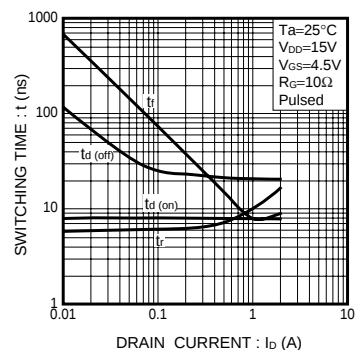


Fig.9 Switching Characteristics

# Transistors

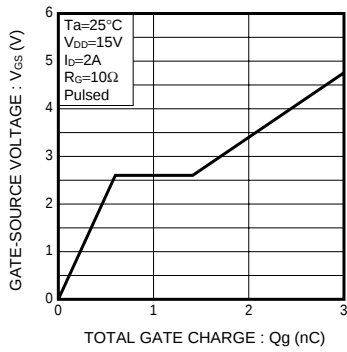


Fig.10 Dynamic Input Characteristics

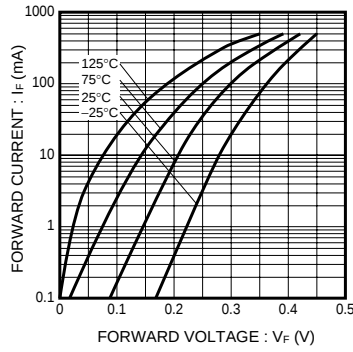


Fig.11 Forward Current vs. Forward Voltage

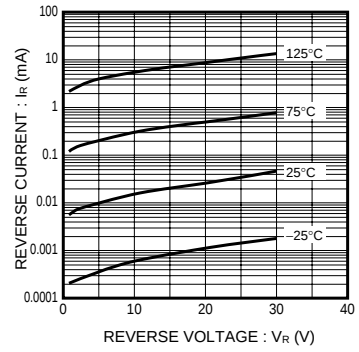


Fig.12 Reverse Current vs. Reverse Voltage

## ●Measurement circuits

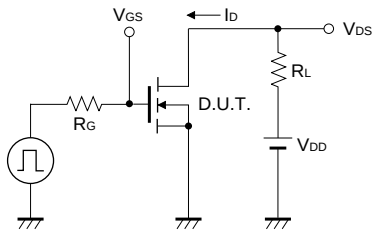


Fig.13 Switching Time Measurement Circuit

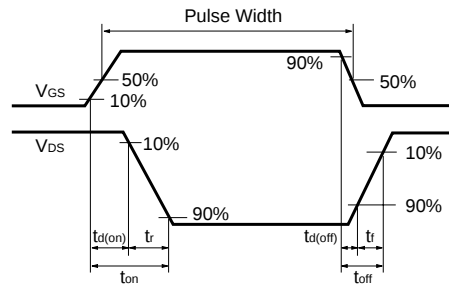


Fig.14 Switching Waveforms

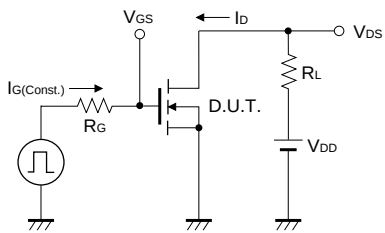


Fig.15 Gate Charge Measurement Circuit

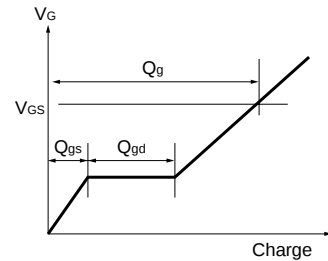


Fig.16 Gate Charge Waveform

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