

# Small switching (−20V, −1.5A)

## QS6U22

### ●Features

- 1) The QS6U22 combines Pch MOSFET with a Schottky barrier diode in a single TSMT6 package.
- 2) Pch Treueh MOSFET have a low on-state resistance with a fast switching.
- 3) Nch Treueh MOSFET is reacted a low voltage drive (4V).
- 4) The Independently connected Schottky barrier diode have a low forward voltage.

### ●Applications

Load switch, DC / DC conversion

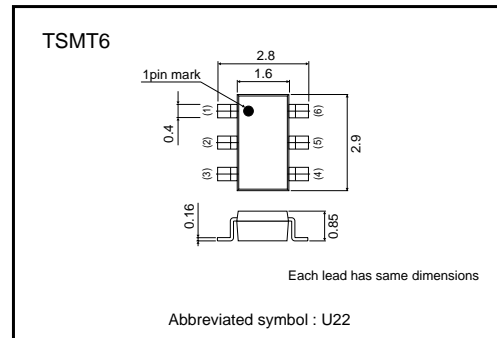
### ●Structure

Silicon P-channel MOSFET  
Schottky Barrier DIODE

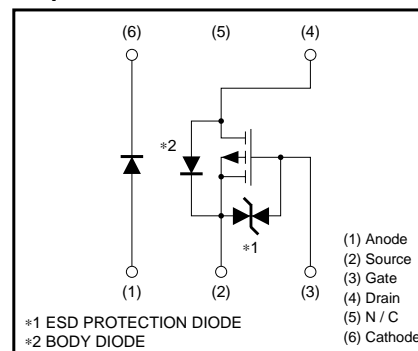
### ●Packaging specifications

| Type   | Package                      | Taping |
|--------|------------------------------|--------|
|        | Code                         | TR     |
|        | Basic ordering unit (pieces) | 3000   |
| QS6U22 |                              | ○      |

### ●External dimensions (Unit : mm)



### ●Equivalent circuit



\*A protection diode has been in between the gate and the source to protect against static electricity when the product is in use. Use the protection circuit when rated voltages are exceeded.

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

| 〈MOSFET〉                        |                  |                 |           |    |
|---------------------------------|------------------|-----------------|-----------|----|
| Parameter                       | Symbol           | Limits          | Unit      |    |
| Drain-source voltage            | V <sub>DSS</sub> | −20             | V         |    |
| Gate-source voltage             | V <sub>GSS</sub> | ±12             | V         |    |
| Drain current                   | Continuous       | I <sub>D</sub>  | ±1.5      | A  |
|                                 | Pulsed           | I <sub>DP</sub> | ±6.0      | A  |
| Source current (Body diode)     | Continuous       | I <sub>S</sub>  | −0.75     | A  |
|                                 | Pulsed           | I <sub>SP</sub> | −6.0      | A  |
| Channel temperature             | T <sub>ch</sub>  | 150             | °C        |    |
| 〈Di〉                            |                  |                 |           |    |
| Parameter                       | Symbol           | Limits          | Unit      |    |
| Repetitive peak reverse voltage | V <sub>RM</sub>  | 25              | V         |    |
| Reverse voltage                 | V <sub>R</sub>   | 20              | V         |    |
| Forward current                 | I <sub>F</sub>   | 0.7             | A         |    |
| Forward current surge peak      | I <sub>FSM</sub> | 3.0             | A         | *2 |
| Junction temperature            | T <sub>J</sub>   | 150             | °C        |    |
| 〈MOSFET AND Di〉                 |                  |                 |           |    |
| Parameter                       | Symbol           | Limits          | Unit      |    |
| Total power dissipation         | P <sub>D</sub>   | 1.25            | W / Total | *3 |
| Range of Storage temperature    | T <sub>stg</sub> | −55 to +150     | °C        |    |

\*1 Pw≤10μs, Duty cycles≤1% \*2 60Hz-1cyc. \*3 Total mounted on a ceramic board

Transistors

●Electrical characteristics (Ta=25°C)

<MOSFET>

| Parameter                               | Symbol        | Min. | Typ. | Max.     | Unit      | Conditions                      |
|---|---------------|------|------|----------|-----------|---------------------------------|
| Gate-source leakage                     | $I_{GSS}$     | -    | -    | $\pm 10$ | $\mu A$   | $V_{GS}=\pm 12V, V_{DS}=0V$     |
| Drain-source breakdown voltage          | $V_{(BR)DSS}$ | -20  | -    | -        | V         | $I_D=-1mA, V_{GS}=0V$           |
| Zero gate voltage drain current         | $I_{DSS}$     | -    | -    | -1       | $\mu A$   | $V_{DS}=-20V, V_{GS}=0V$        |
| Gate threshold voltage                  | $V_{GS(th)}$  | -0.7 | -    | -2.0     | V         | $V_{DS}=-10V, I_D=-1mA$         |
| Static drain-source on-state resistance | $R_{DS(on)}$  | -    | 155  | 215      | $m\Omega$ | $I_D=-1.5A, V_{GS}=-4.5V$       |
|   |               | -    | 170  | 235      | $m\Omega$ | $I_D=-1.5A, V_{GS}=-4V$ *       |
|   |               | -    | 310  | 430      | $m\Omega$ | $I_D=-0.75A, V_{GS}=-2.5V$      |
| Forward transfer admittance             | $ Y_{fs} $    | 1.0  | -    | -        | S         | $V_{DS}=-10V, I_D=-0.75A$ *     |
| Input capacitance                       | $C_{iss}$     | -    | 270  | -        | pF        | $V_{DS}=-10V$                   |
| Output capacitance                      | $C_{oss}$     | -    | 40   | -        | pF        | $V_{GS}=0V$                     |
| Reverse transfer capacitance            | $C_{rss}$     | -    | 35   | -        | pF        | $f=1MHz$                        |
| Turn-on delay time                      | $t_{d(on)}$   | -    | 10   | -        | ns        | $I_D=-0.75A$ *                  |
| Rise time                               | $t_r$         | -    | 12   | -        | ns        | $V_{DD}=-15V$ *                 |
| Turn-off delay time                     | $t_{d(off)}$  | -    | 45   | -        | ns        | $V_{GS}=-4.5V$ *                |
| Fall time                               | $t_f$         | -    | 20   | -        | ns        | $R_L=20\Omega$ *                |
| Total gate charge                       | $Q_g$         | -    | 3.0  | -        | nC        | $V_{DD}=-15V$ *                 |
| Gate-source charge                      | $Q_{gs}$      | -    | 0.8  | -        | nC        | $V_{GS}=-4.5V$ *                |
| Gate-drain charge                       | $Q_{gd}$      | -    | 0.85 | -        | nC        | $R_L=10\Omega / R_G=10\Omega$ * |

\*Pulsed

●Body diode (Source-drain)

<MOSFET>

| Parameter       | Symbol   | Min. | Typ. | Max. | Unit | Conditions              |
|-----------------|----------|------|------|------|------|-------------------------|
| Forward voltage | $V_{SD}$ | -    | -    | -1.2 | V    | $I_S=-0.75A, V_{GS}=0V$ |

<Di>

| Parameter            | Symbol | Min. | Typ. | Max. | Unit    | Conditions |
|----------------------|--------|------|------|------|---------|------------|
| Forward voltage drop | $V_F$  | -    | -    | 0.49 | V       | $I_F=0.7A$ |
| Reverse leakage      | $I_R$  | -    | -    | 200  | $\mu A$ | $V_R=20V$  |

●Electrical characteristic curves

<MOSFET>

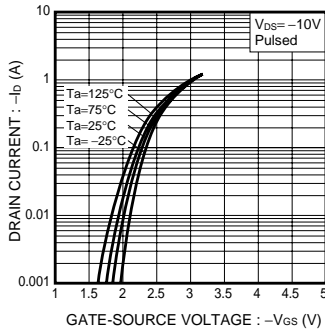


Fig.1 Typical Transfer Characteristics

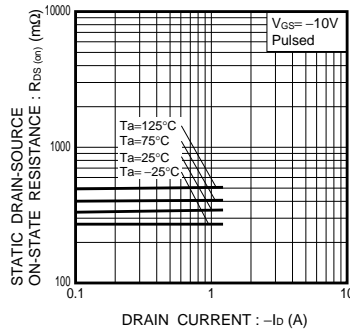


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current (I)

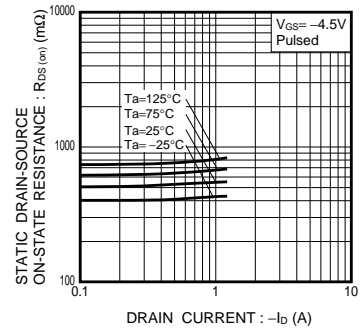


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current (II)

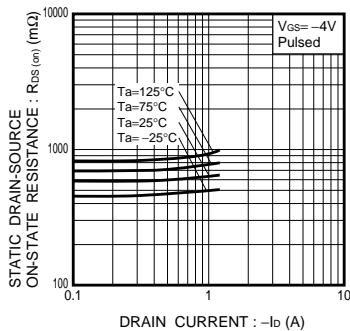


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current (III)

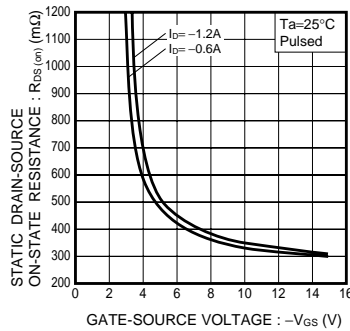


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

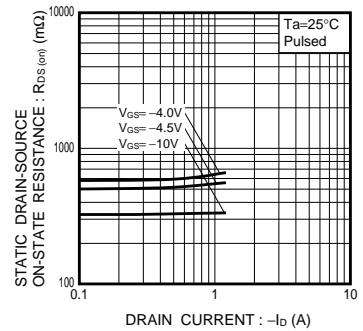


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current (IV)

Transistors

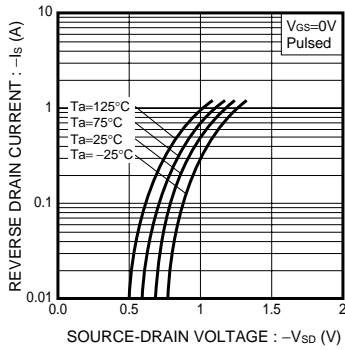


Fig.7 Reverse Drain Current vs. Source-Drain Voltage

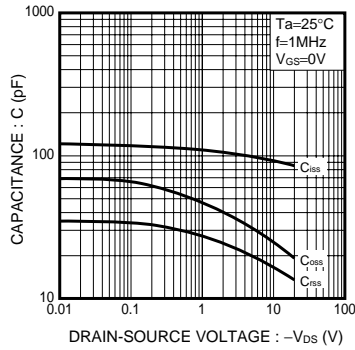


Fig.8 Typical Capacitance vs. Drain-Source Voltage

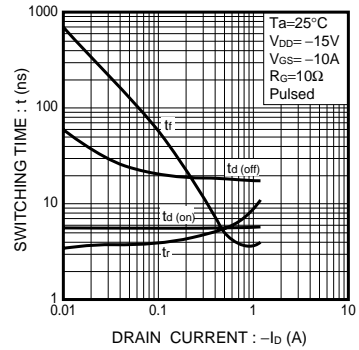


Fig.9 Switching Characteristics

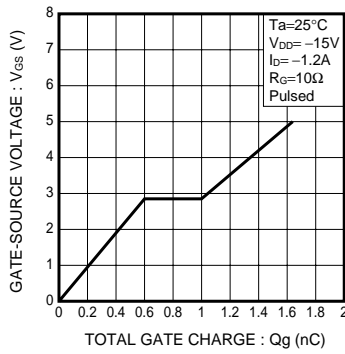


Fig.10 Dynamic Input Characteristics

●Measurement circuits

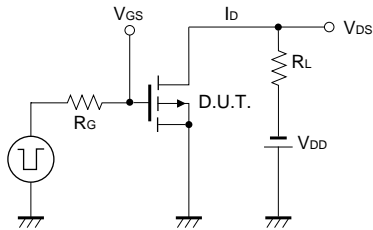


Fig.11 Switching Time Measurement Circuit

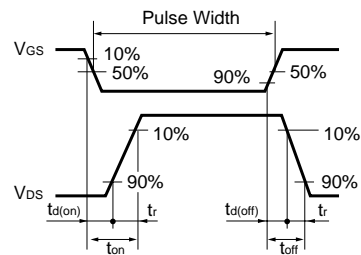


Fig.12 Switching Waveforms

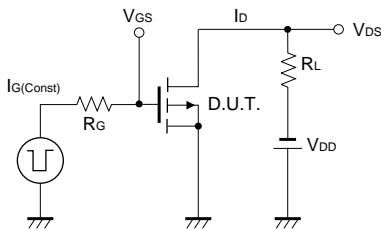


Fig.13 Gate Charge Measurement Circuit

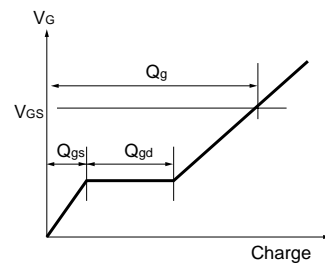


Fig.14 Gate Charge Waveform

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