

Small switching (−20V, −1.5A)

QS6J1

●Features

- 1) The QS6J1 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

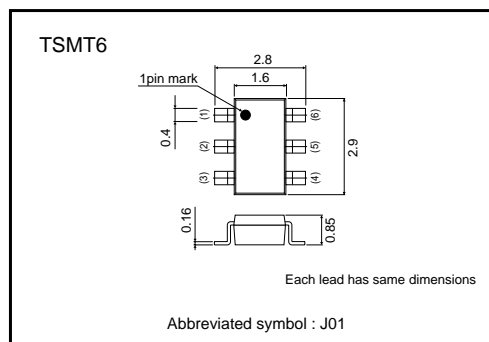
Silicon P-channel MOSFET

Schottky Barrier DIODE

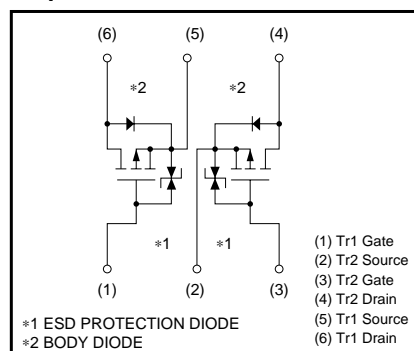
●Packaging specifications

| Type | Package | Taping |
|-------|------------------------------|--------|
| | Code | TR |
| | Basic ordering unit (pieces) | 3000 |
| QS6J1 | | ○ |

●External dimensions (Unit : mm)



●Equivalent circuit



●Absolute maximum ratings (Ta=25°C)

⟨MOSFET⟩

| Parameter | Symbol | Limits | Unit |
|------------------------------|------------|-------------|--------------|
| Drain-source voltage | V_{DSS} | −20 | V |
| Gate-source voltage | V_{GSS} | ±12 | V |
| Drain current | Continuous | I_D | ±1.5 A |
| | Pulsed | I_{DP} | ±6 A *1 |
| Source current (Body diode) | Continuous | I_S | −0.75 A *1 |
| | Pulsed | I_{SP} | −6 A |
| Total power dissipation | P_D | 1.25 | W / Total *2 |
| Channel temperature | T_{ch} | 150 | °C |
| Range of Storage temperature | T_{stg} | −55 to +150 | °C |

*1 $P_w \leq 10\mu s$, Duty cycle $\leq 1\%$ *2 Mounted on a ceramic board

●Thermal resistance

| Parameter | Symbol | Limits | Unit |
|--------------------|----------------|--------|----------------|
| Channel to ambient | $R_{th}(ch-a)$ | 100 | °C / W / Total |

Transistors

●Electrical characteristics (Ta=25°C)

(MOSFET)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---------------|------|------|------|------|------------------------------|
| Gate-source leakage | I_{GSS} | - | - | ±10 | μA | $V_{GS}=\pm 12V, V_{DS}=0V$ |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | -20 | - | - | V | $I_D=-1mA, V_{GS}=0V$ |
| Zero gate voltage drain current | I_{DSS} | - | - | -1 | μA | $V_{DS}=-20V, V_{GS}=0V$ |
| 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 | mΩ | $I_D=-1.5A, V_{GS}=-4.5V$ |
| | | - | 170 | 235 | mΩ | $I_D=-1.5A, V_{GS}=-4V$ * |
| | | - | 310 | 430 | mΩ | $I_D=-0.75A, V_{GS}=-2.5V$ |
| 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 | $V_{DD}=-15V, R_L=10\Omega$ |
| Gate-source charge | Q_{gs} | - | 0.8 | - | nC | $V_{GS}=-4.5V, R_G=10\Omega$ |
| Gate-drain charge | Q_{gd} | - | 0.85 | - | nC | $I_D=-1.5A$ |

*Pulsed

●Body diode (Source-drain)

(MOSFET)

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

●Electrical characteristic curves

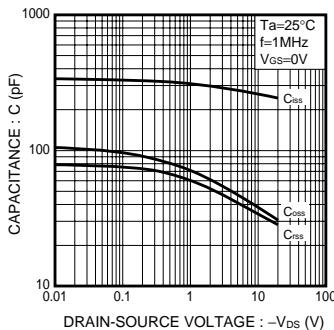


Fig.1 Typical Capacitance vs. Drain-Source Voltage

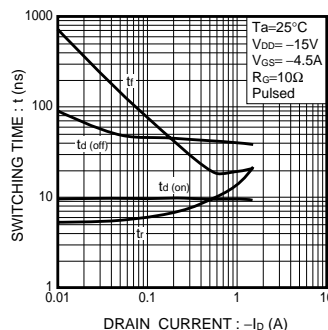


Fig.2 Switching Characteristics

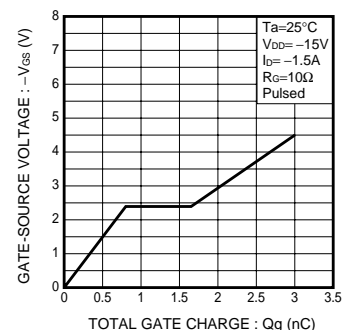


Fig.3 Dynamic Input Characteristics

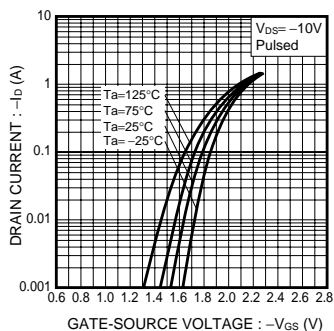


Fig.4 Typical Transfer Characteristics

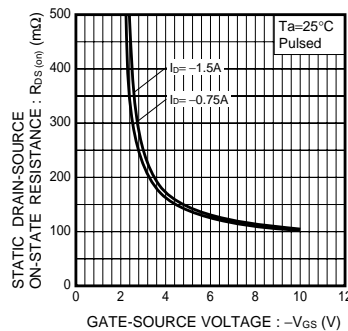


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

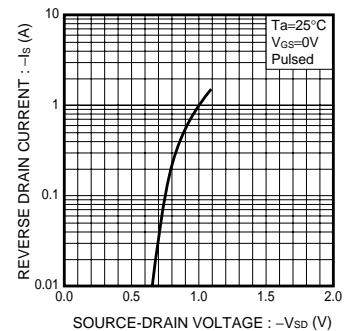


Fig.6 Reverse Drain Current vs. Source-Drain Voltage

Transistors

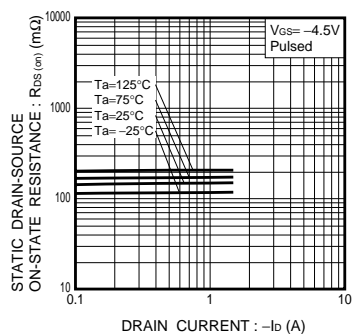


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

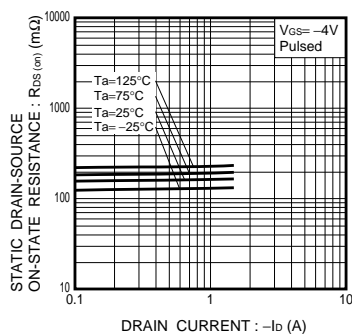


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

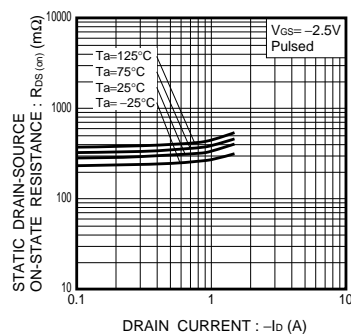


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

●Measurement circuits

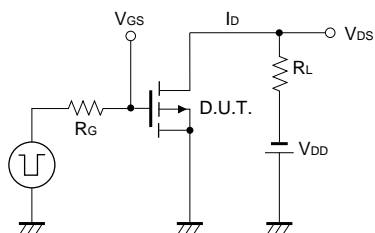


Fig.10 Switching Time Measurement Circuit

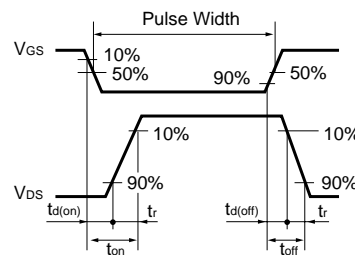


Fig.11 Switching Waveforms

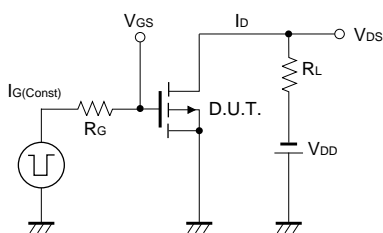


Fig.12 Gate Charge Measurement Circuit

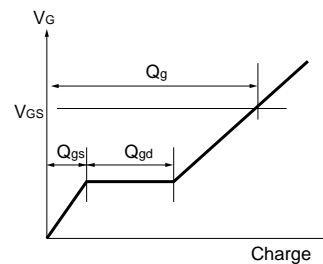


Fig.13 Gate Charge Waveform