

# DC-DC Converter (−20V, −3.5A)

## RTQ035P02

### ●Features

- 1) Low On-resistance.(80mΩ at 2.5V)
- 2) High Power Package.
- 3) High speed switching.
- 4) Low voltage drive.(2.5V)

### ●Applications

DC-DC converter

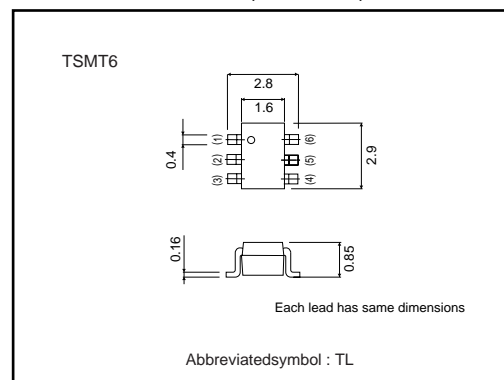
### ●Structure

Silicon P-channel  
MOSFET

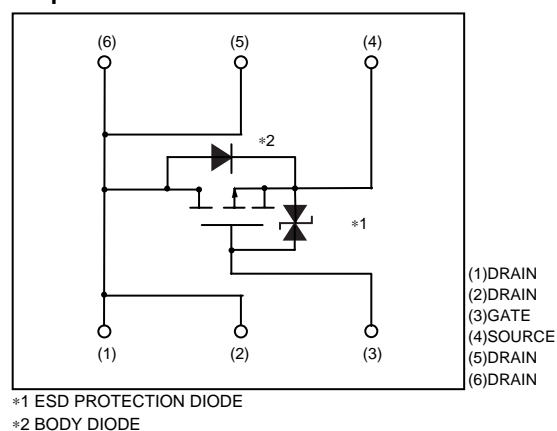
### ●Packaging specifications

| Type      | Package                      | Taping |
|-----------|------------------------------|--------|
|           | Code                         | TR     |
|           | Basic ordering unit (pieces) | 3000   |
| RTQ035P02 |                              | ○      |

### ●External dimensions (Units : mm)



### ●Equivalent circuit



## Transistor

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

| 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>   | ±3.5     | A    |
|                                | Pulsed     | I <sub>DP</sub>  | ±17.5    | A *1 |
| Source current<br>(Body diode) | Continuous | I <sub>S</sub>   | -1       | A    |
|                                | Pulsed     | I <sub>SP</sub>  | -4       | A *1 |
| Total power dissipation        |            | P <sub>D</sub>   | 1.25     | W*2  |
| Channel temperature            |            | T <sub>ch</sub>  | 150      | °C   |
| Range of Storage temperature   |            | T <sub>stg</sub> | -55~+150 | °C   |

\*1 Pw≤10μs, Duty cycle≤1%

\*2 Mounted on a ceramic board

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

| Parameter                               | Symbol                | Min. | Typ. | Max. | Unit | Conditions   |
|---|-----------------------|------|------|------|------|--|
| Gate-source leakage                     | I <sub>GSS</sub>      | -    | -    | ±10  | μA   | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V   |
| Drain-source breakdown voltage          | V <sub>(BR)DSS</sub>  | -20  | -    | -    | V    | I <sub>D</sub> =-1mA, V <sub>GS</sub> =0V  |
| Zero gate voltage drain current         | I <sub>DSS</sub>      | -    | -    | -1   | μA   | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V   |
| Gate threshold voltage                  | V <sub>GS(th)</sub>   | -0.7 | -    | -2.0 | V    | V <sub>DS</sub> =-10V, I <sub>D</sub> =-1mA  |
| Static drain-source on-state resistance | R <sub>DS(on)</sub> * | -    | 50   | 65   | mΩ   | I <sub>D</sub> =-3.5A, V <sub>GS</sub> =-4.5V  |
|   |                       | -    | 55   | 70   | mΩ   | I <sub>D</sub> =-3.5A, V <sub>GS</sub> =-4V  |
|   |                       | -    | 80   | 100  | mΩ   | I <sub>D</sub> =-1.75A, V <sub>GS</sub> =-2.5V   |
| Forward transfer admittance             | Y <sub>fs</sub>   *   | 3.5  | -    | -    | S    | V <sub>DS</sub> =-10V, I <sub>D</sub> =-3.5A   |
| Input capacitance                       | C <sub>iss</sub>      | -    | 1200 | -    | pF   | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V<br>f=1MHz   |
| Output capacitance                      | C <sub>oss</sub>      | -    | 200  | -    | pF   |  |
| Reverse transfer capacitance            | C <sub>rss</sub>      | -    | 130  | -    | pF   |  |
| Turn-on delay time                      | t <sub>d(on)</sub> *  | -    | 16   | -    | ns   | I <sub>D</sub> =-2A<br>V <sub>DD</sub> =-15V<br>V <sub>GS</sub> =-4.5V<br>R <sub>L</sub> =7.5Ω<br>R <sub>GS</sub> =10Ω |
| Rise time                               | t <sub>r</sub> *      | -    | 40   | -    | ns   |  |
| Turn-off delay time                     | t <sub>d(off)</sub> * | -    | 55   | -    | ns   |  |
| Fall time                               | t <sub>f</sub> *      | -    | 30   | -    | ns   |  |
| Total gate charge                       | Q <sub>g</sub>        | -    | 10.5 | -    | nC   | V <sub>DD</sub> =-15V<br>V <sub>GS</sub> =-4.5V<br>I <sub>D</sub> =-3.5A   |
| Gate-source charge                      | Q <sub>gs</sub>       | -    | 2.0  | -    | nC   |  |
| Gate-drain charge                       | Q <sub>gd</sub>       | -    | 3.5  | -    | nC   |  |

\*PULSED

Body diode characteristics (source-drain characteristics)

|                 |                 |   |   |      |   |  |
|-----------------|-----------------|---|---|------|---|--|
| Forward voltage | V <sub>SD</sub> | - | - | -1.2 | V | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V |
|-----------------|-----------------|---|---|------|---|--|

## Transistor

## ●Electrical characteristic curves

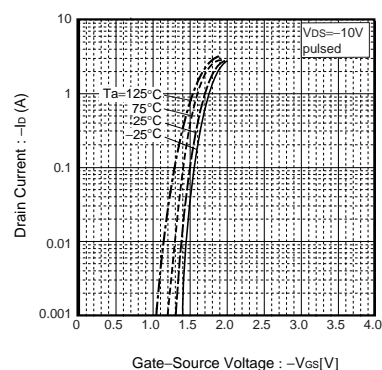


Fig.1 Typical Transfer Characteristics

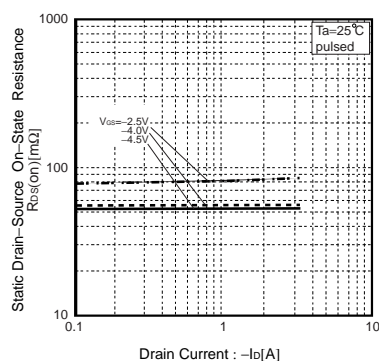


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

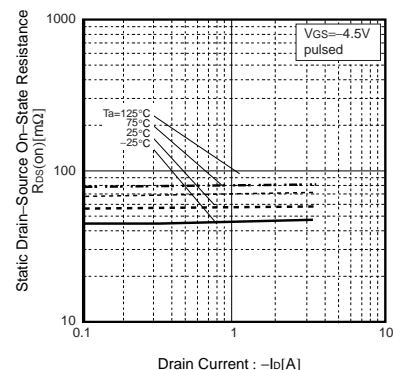


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

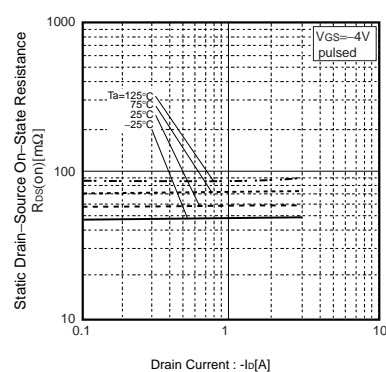


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

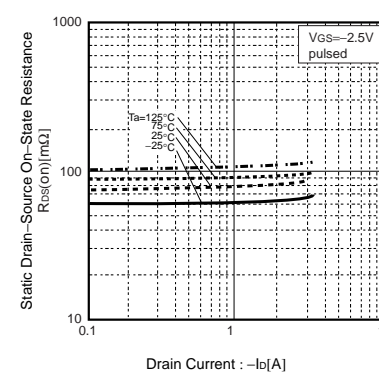


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

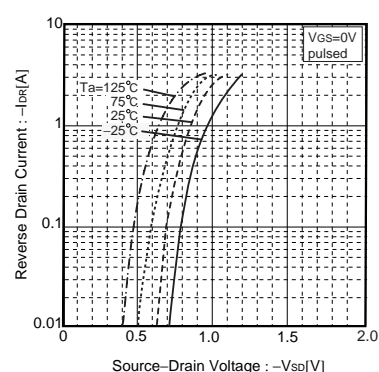


Fig.6 Reverse Drain Current vs. Source-Drain Voltage

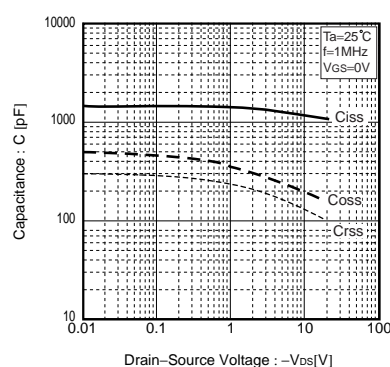


Fig.7 Typical Capacitance vs. Drain-Source Voltage

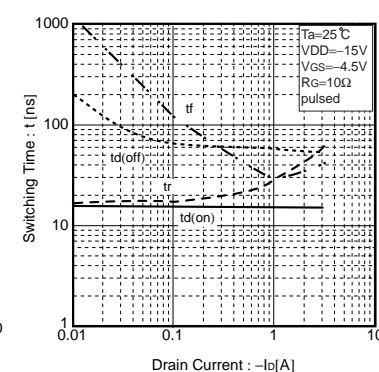


Fig.8 Switching Characteristics

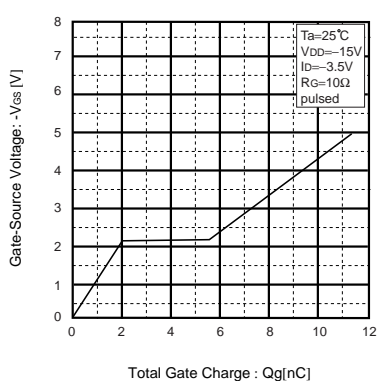


Fig.9 Dynamic Input Characteristics

Transistor

●Measurement circuits

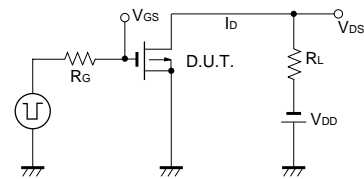


Fig.10 Switching Time Measurement Circuit

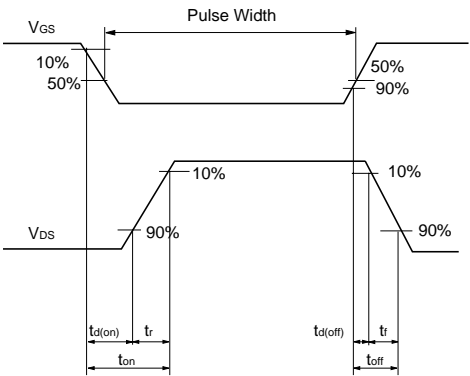


Fig.11 Switching Waveforms

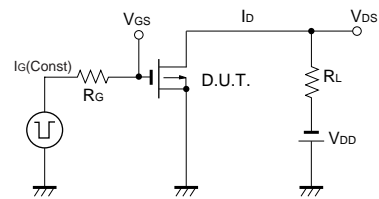


Fig.12 Gate Charge Measurement Circuit

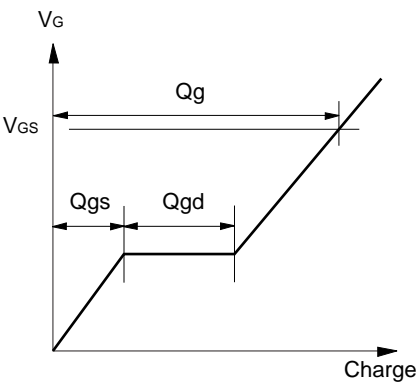


Fig.13 Gate Charge Waveforms

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