

# DC-DC Converter (–20V, –1.5A)

## RTF015P02

### ●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

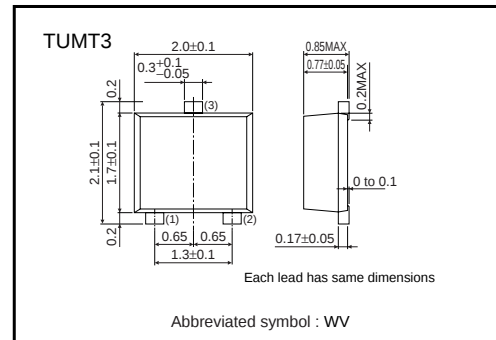
Silicon P-channel

MOS FET

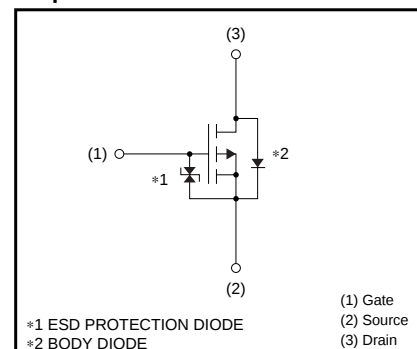
### ●Packaging specifications

| Type      | Package                      | Taping |
|-----------|------------------------------|--------|
|           | Code                         | TL     |
|           | Basic ordering unit (pieces) | 3000   |
| RTF015P02 |                              | ○      |

### ●External dimensions (Unit : mm)



### ●Equivalent circuit



## Transistors

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

| Parameter                      |            | Symbol      | Limits      | Unit |
|--------------------------------|------------|-------------|-------------|------|
| Drain-source voltage           |            | $V_{DS}$    | -20         | V    |
| Gate-source voltage            |            | $V_{GS}$    | ±12         | V    |
| Drain current                  | Continuous | $I_D$       | ±1.5        | A    |
|                                | Pulsed     | $I_{DP}$ *1 | ±6          | A    |
| Source current<br>(Body diode) | Continuous | $I_S$ *1    | -0.6        | A    |
|                                | Pulsed     | $I_{SP}$    | -6          | A    |
| Total power dissipation        |            | $P_D$ *2    | 0.8         | W    |
| 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

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

| 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 | $R_{DS(on)}$ * | -    | 100  | 135  | mΩ   | $I_D = -1.5A$ , $V_{GS} = -4.5V$           |
|                                         |                | -    | 110  | 150  | mΩ   | $I_D = -1.5A$ , $V_{GS} = -4V$             |
|                                         |                | -    | 180  | 250  | mΩ   | $I_D = -1.5A$ , $V_{GS} = -2.5V$           |
| Forward transfer admittance             | $ Y_{fs} $ *   | 1.5  | -    | -    | S    | $V_{DS} = -10V$ , $I_D = -0.8A$            |
| Input capacitance                       | $C_{iss}$      | -    | 560  | -    | pF   | $V_{DS} = -10V$                            |
| Output capacitance                      | $C_{oss}$      | -    | 90   | -    | pF   | $V_{GS} = 0V$                              |
| Reverse transfer capacitance            | $C_{rss}$      | -    | 55   | -    | pF   | $f = 1MHz$                                 |
| Turn-on delay time                      | $t_{d(on)}$ *  | -    | 12   | -    | ns   | $I_D = -0.8A$                              |
| Rise time                               | $t_r$ *        | -    | 12   | -    | ns   | $V_{DD} \doteq -15V$                       |
| Turn-off delay time                     | $t_{d(off)}$ * | -    | 38   | -    | ns   | $V_{GS} = -4.5V$                           |
| Fall time                               | $t_f$ *        | -    | 12   | -    | ns   | $R_L = 9\Omega$                            |
| Total gate charge                       | $Q_g$          | -    | 5.2  | -    | nC   | $V_{DD} \doteq -15V$ $R_L \doteq 10\Omega$ |
| Gate-source charge                      | $Q_{gs}$       | -    | 1.3  | -    | nC   | $V_{GS} = -4.5V$ $R_{GS} = 10\Omega$       |
| Gate-drain charge                       | $Q_{gd}$       | -    | 1.4  | -    | nC   | $I_D = -1.5A$                              |

\*Pulsed

## Body diode characteristics (source-drain characteristics)

|                 |          |   |   |      |   |                               |
|-----------------|----------|---|---|------|---|-------------------------------|
| Forward voltage | $V_{SD}$ | - | - | -1.2 | V | $I_S = -0.6A$ , $V_{GS} = 0V$ |
|-----------------|----------|---|---|------|---|-------------------------------|

## Transistors

## ●Electrical characteristic curves

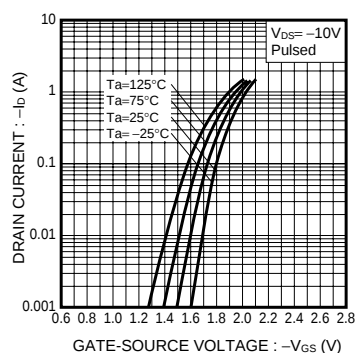


Fig.1 Typical Transfer Characteristics

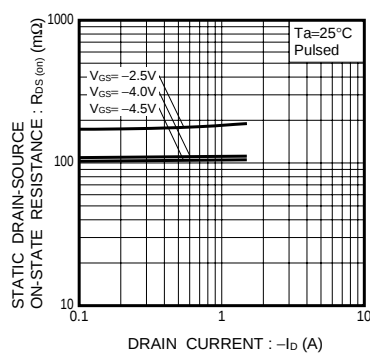


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

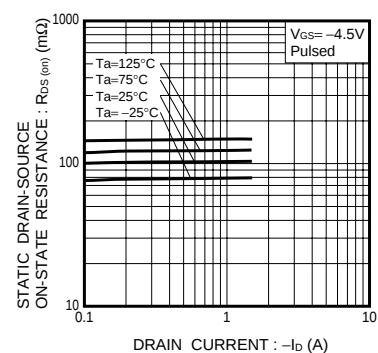


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

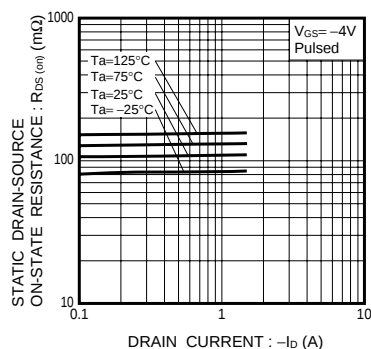


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

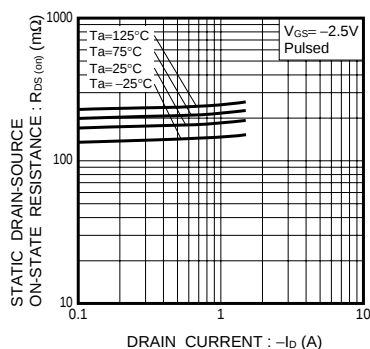


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

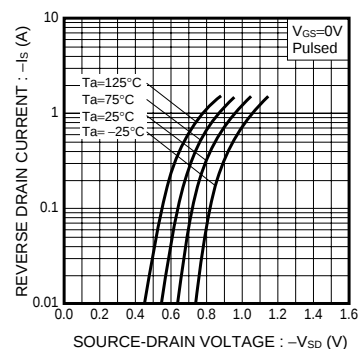


Fig.6 Reverse Drain Current vs. Source-Drain Voltage

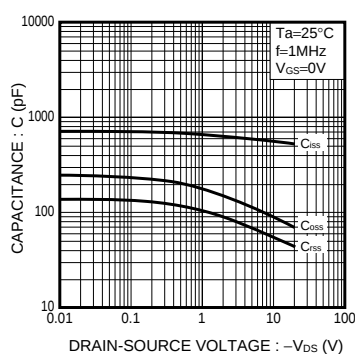


Fig.7 Typical Capacitance vs. Drain-Source Voltage

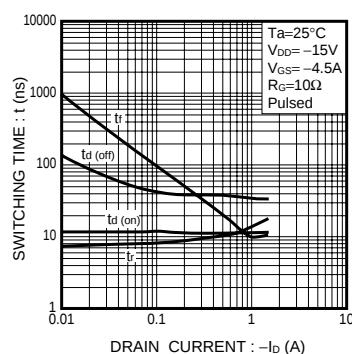


Fig.8 Switching Characteristics

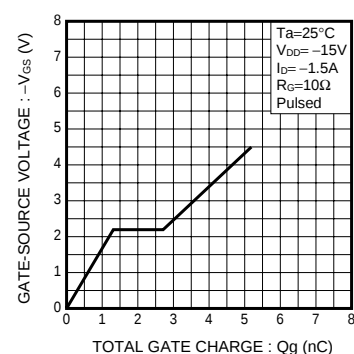


Fig.9 Dynamic Input Characteristics

## Transistors

### ●Measurement circuits

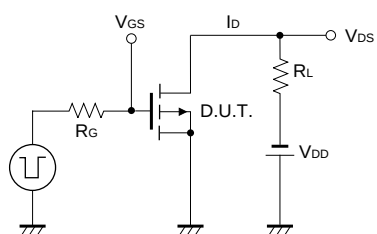


Fig.10 Switching Time Measurement Circuit

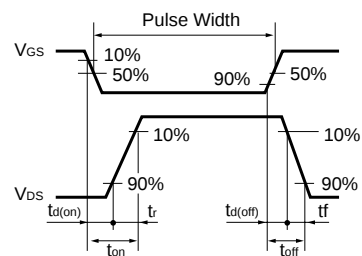


Fig.11 Switching Waveforms

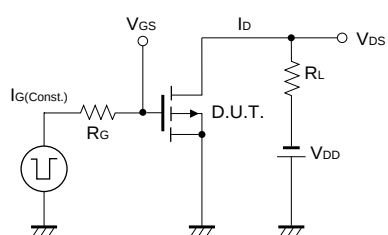


Fig.12 Gate Charge Measurement Circuit

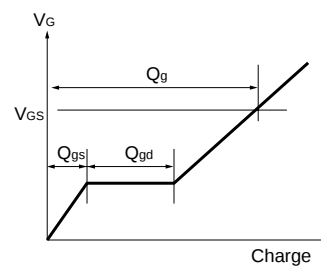


Fig.13 Gate Charge Waveforms

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