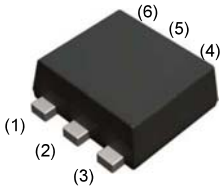
# RRL025P03

**Pch -30V -2.5A Power MOSFET** Datasheet

| | |
|---|---|
| $V_{DSS}$ | –30V |
| $R_{DS(on)}$ (Max.) | 75mΩ |
| $I_D$ | –2.5A |
| $P_D$ | 1.0W |

## ●Outline

TUMT6




## ●Features

1) Low on - resistance.

2) Built-in G-S Protection Diode.

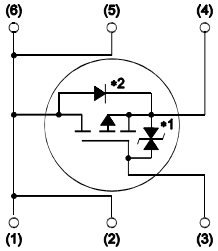
3) Small Surface Mount Package (TUMT6).

4) Pb-free lead plating ; RoHS compliant

## ●Inner circuit

(1) Drain
(2) Drain
(3) Gate
(4) Source
(5) Drain
(6) Drain

∗1 ESD PROTECTION DIODE
∗2 BODY DIODE




## ●Application

DC/DC converters

## ●Packaging specifications

| | | |
|---|---|---|
| Type | Packaging | Taping |
| | Reel size (mm) | 180 |
| | Tape width (mm) | 8 |
| | Basic ordering unit (pcs) | 3,000 |
| | Taping code | TR |
| | Marking | UA |

## ●Absolute maximum ratings($T_a$ = 25°C)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain - Source voltage | $V_{DSS}$ | –30 | V |
| Continuous drain current | $I_D$ *1 | ±2.5 | A |
| Pulsed drain current | $I_{D,pulse}$ *2 | ±10 | A |
| Gate - Source voltage | $V_{GSS}$ | ±20 | V |
| Power dissipation | $P_D$ *3 | 1.0 | W |
| | $P_D$ *4 | 0.32 | W |
| Junction temperature | $T_j$ | 150 | °C |
| Range of storage temperature | $T_{stg}$ | –55 to +150 | °C |

## ●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - ambient | $R_{thJA}$ *3 | - | - | 125 | °C/W |
| | $R_{thJA}$ *4 | - | - | 391 | °C/W |

## ●Electrical characteristics($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = –1mA | –30 | - | - | V |
| Breakdown voltage temperature coefficient | $\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$ | $I_D$= –1mA referenced to 25°C | - | –25 | - | mV/°C |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ = –30V, $V_{GS}$ = 0V | - | - | –1 | μA |
| Gate - Source leakage current | $I_{GSS}$ | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | - | - | ±10 | μA |
| Gate threshold voltage | $V_{GS\ (th)}$ | $V_{DS}$ = –10V, $I_D$ = –1mA | –1 | - | –2.5 | V |
| Gate threshold voltage temperature coefficient | $\frac{\Delta V_{(GS)th}}{\Delta T_j}$ | $I_D$= –1mA referenced to 25°C | - | 3.9 | - | mV/°C |
| Static drain - source on - state resistance | $R_{DS(on)}$ *5 | $V_{GS}$= –10V, $I_D$= –2.5A | - | 55 | 75 | mΩ |
| | | $V_{GS}$= –4.5V, $I_D$= –1.2A | - | 85 | 115 | |
| | | $V_{GS}$= –4.0V, $I_D$= –1.2A | - | 95 | 125 | |
| | | $V_{GS}$= –10V, $I_D$= –2.5A, $T_j$=125°C | - | 95 | 135 | |
| Gate input resistannce | $R_G$ | f = 1MHz, open drain | - | 24 | - | Ω |
| Transconductance | $g_{fs}$ *5 | $V_{DS}$= –10V, $I_D$= –2.5A | 2.0 | 4.4 | - | S |

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 Mounted on a seramic board (30×30×0.8mm)

*4 Mounted on a FR4 (15×20×0.8mm)

*5 Pulsed

## ●Electrical characteristics($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0V | - | 480 | - | pF |
| Output capacitance | $C_{oss}$ | $V_{DS}$ = –10V | - | 70 | - | |
| Reverse transfer capacitance | $C_{rss}$ | f = 1MHz | - | 70 | - | |
| Turn - on delay time | $t_{d(on)}$ *5 | $V_{DD} \simeq$ –15V, $V_{GS}$ = –10V | - | 7 | - | ns |
| Rise time | $t_r$ *5 | $I_D$ = –1.2A | - | 16 | - | |
| Turn - off delay time | $t_{d(off)}$ *5 | $R_L$ = 12.5Ω | - | 50 | - | |
| Fall time | $t_f$ *5 | $R_G$ = 10Ω | - | 33 | - | |

## ●Gate Charge characteristics($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Total gate charge | $Q_g$ *5 | $V_{DD} \simeq$ –15V, $I_D$= –2.5A<br>$V_{GS}$ = –5V | - | 5.2 | - | nC |
| | | $V_{DD} \simeq$ –15V, $I_D$= –2.5A<br>$V_{GS}$ = –10V | - | 12 | - | |
| Gate - Source charge | $Q_{gs}$ *5 | $V_{DD} \simeq$ –15V, $I_D$= –2.5A<br>$V_{GS}$ = –5V | - | 1.6 | - | |
| Gate - Drain charge | $Q_{gd}$ *5 | | - | 1.6 | - | |

## ●Body diode electrical characteristics (Source-Drain)($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Inverse diode continuous, forward current | $I_S$ *1 | $T_a$ = 25°C | - | - | –0.8 | A |
| Forward voltage | $V_{SD}$ *5 | $V_{GS}$ = 0V, $I_s$ = –2.5A | - | - | –1.2 | V |

## ●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

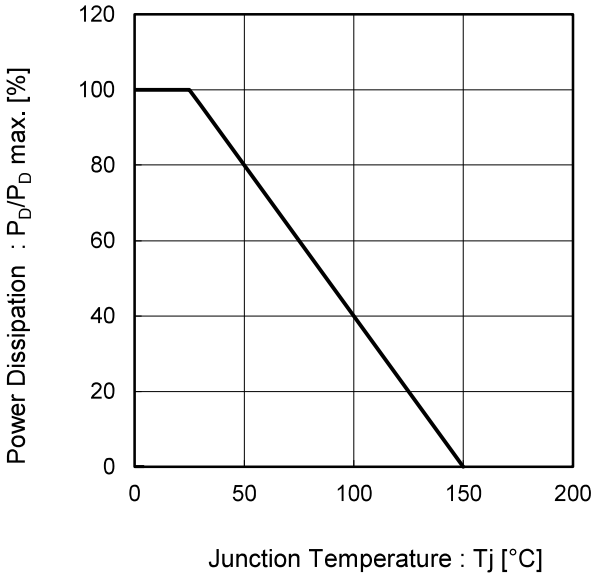



Fig.2 Maximum Safe Operating Area

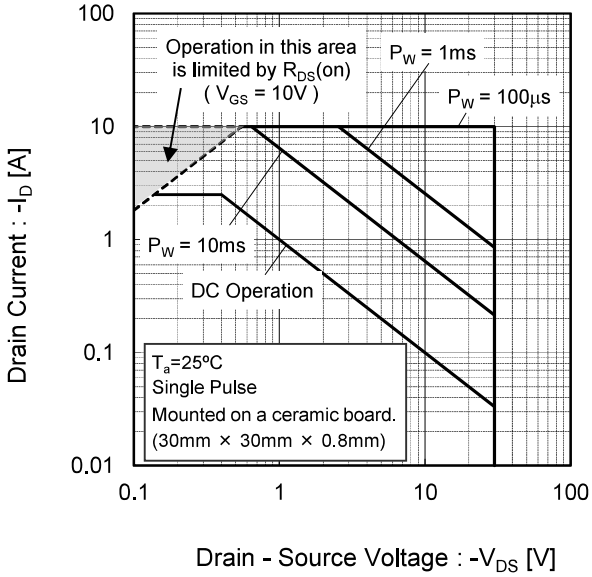



Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

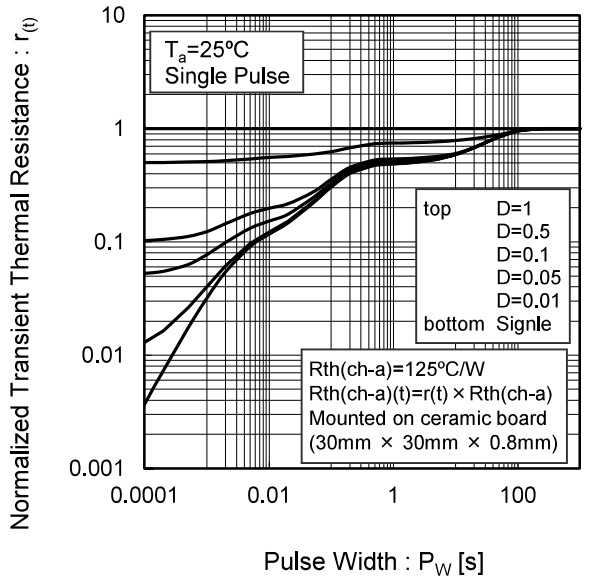
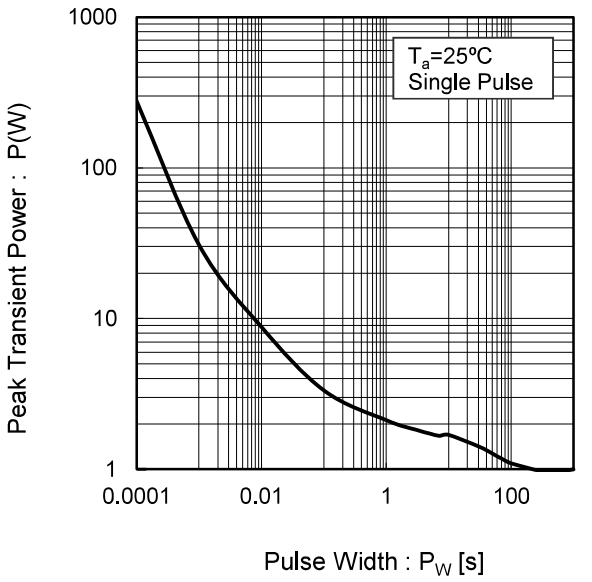



Fig.4 Single Pulse Maxmum Power dissipation



## ●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

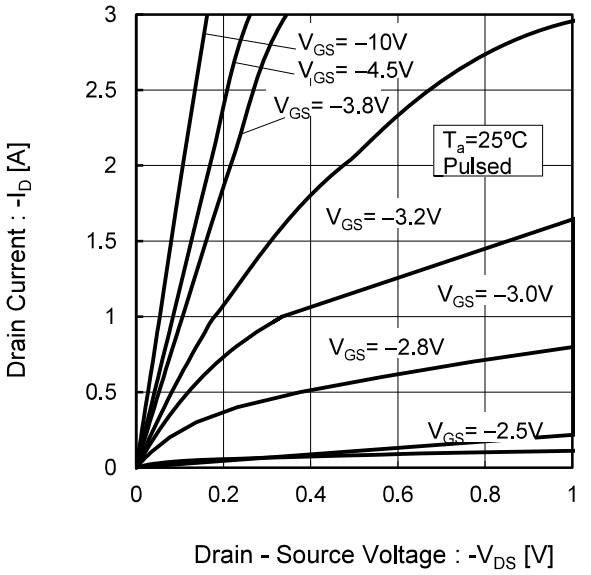



Fig.6 Typical Output Characteristics(II)

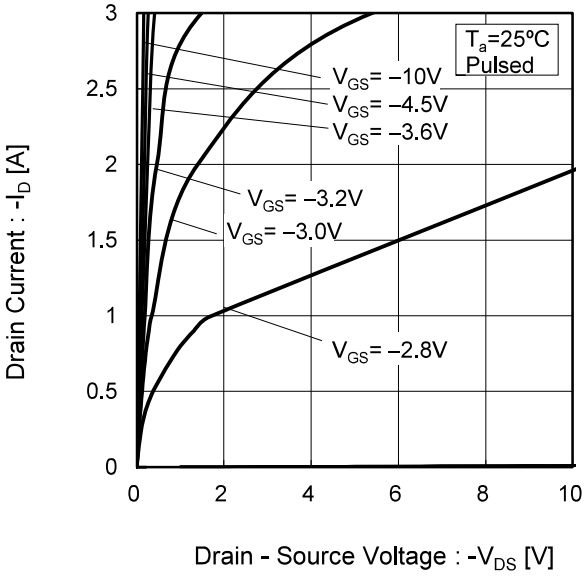



Fig.7 Breakdown Voltage vs. Junction Temperature

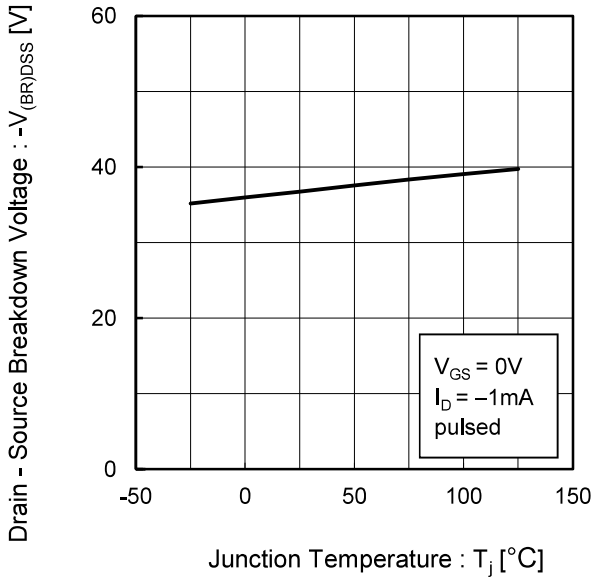
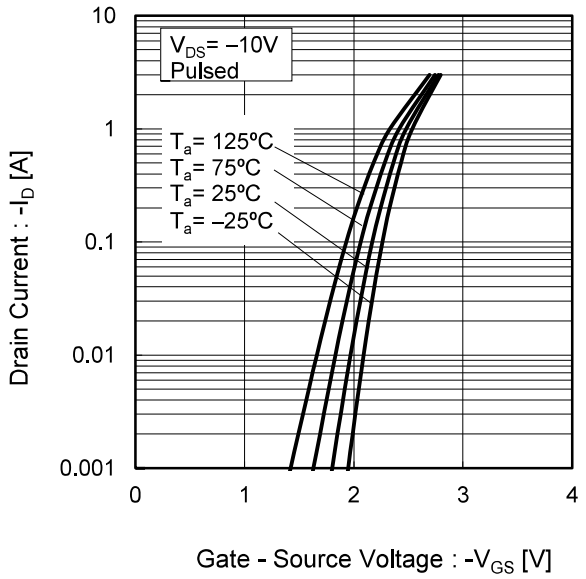



Fig.8 Typical Transfer Characteristics



## ●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

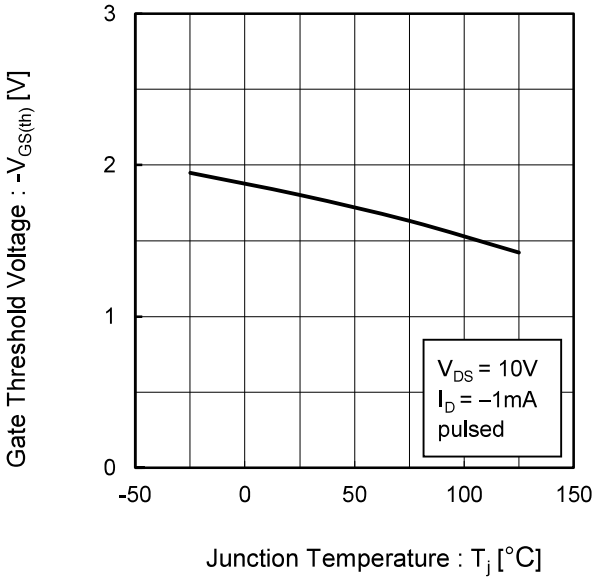



Fig.10 Transconductance vs. Drain Current

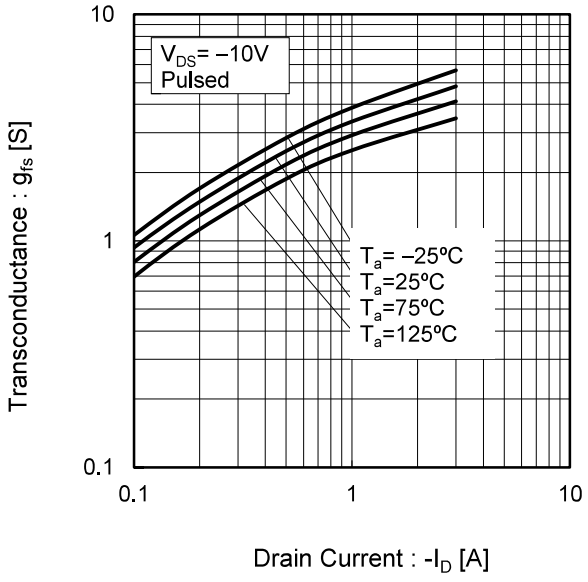



Fig.11 Drain CurrentDerating Curve

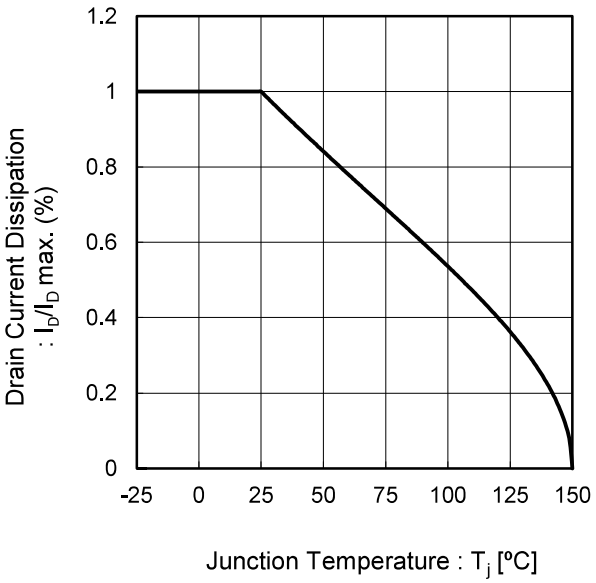
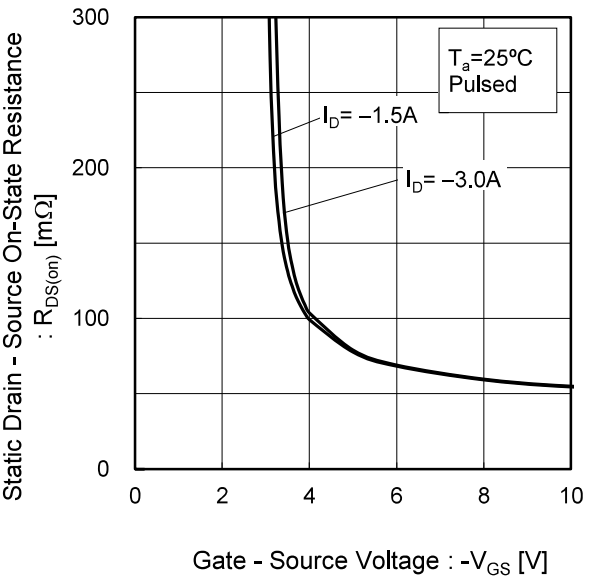



Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



## ●Electrical characteristic curves

Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(I)

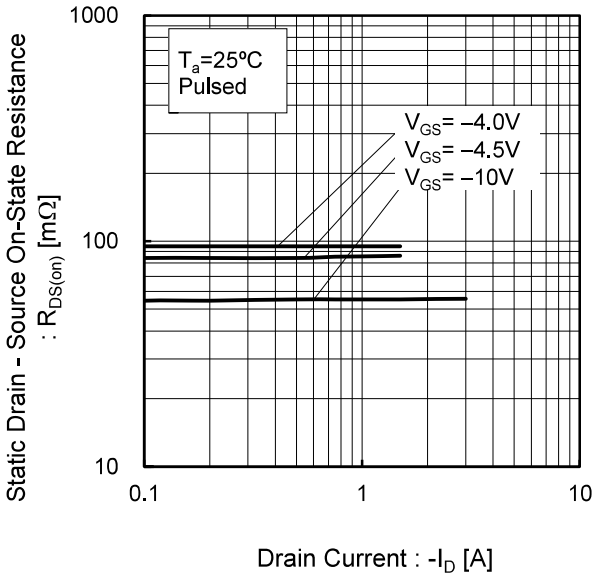



Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature

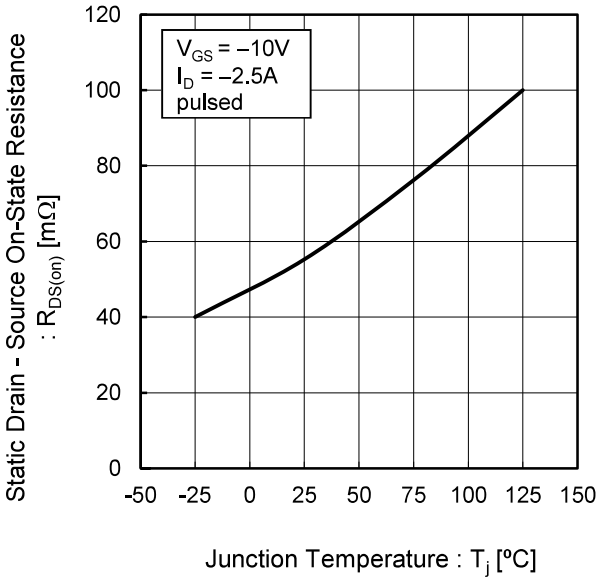



Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

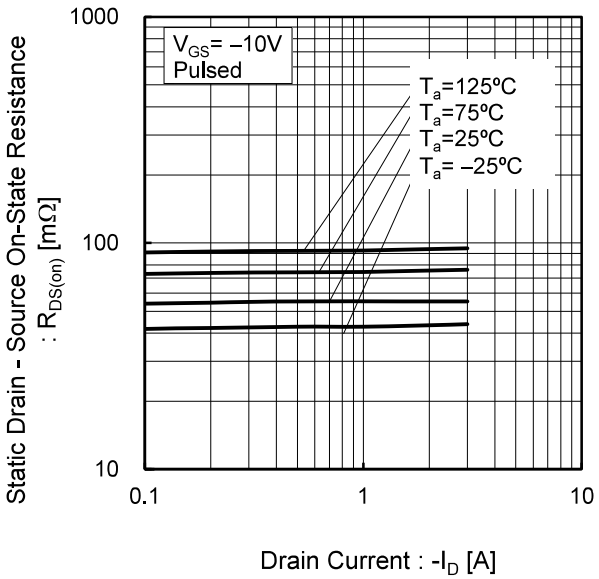
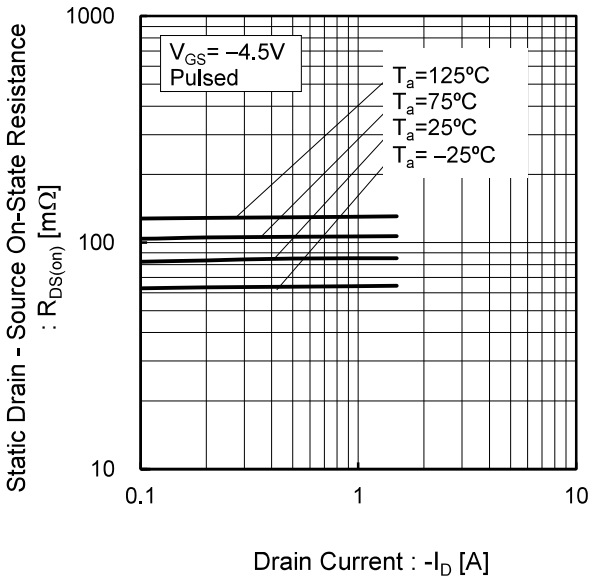



Fig.16 Static Drain-Source On-State Resistance vs. Drain Current(III)



## ●Electrical characteristic curves

Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)

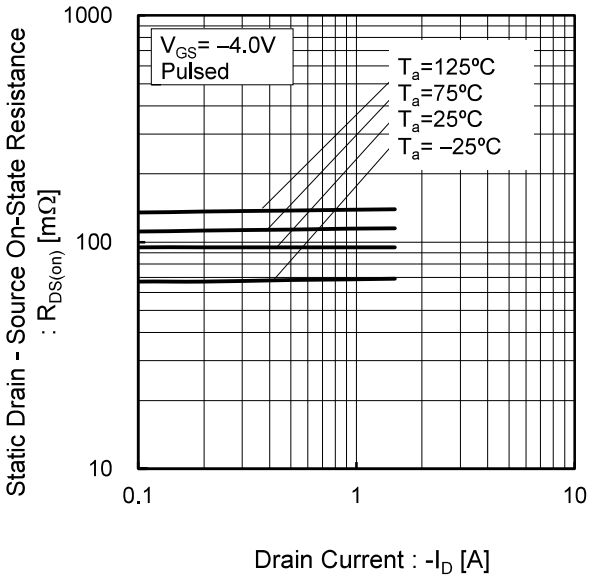



Fig.18 Typical Capacitance vs. Drain - Source Voltage

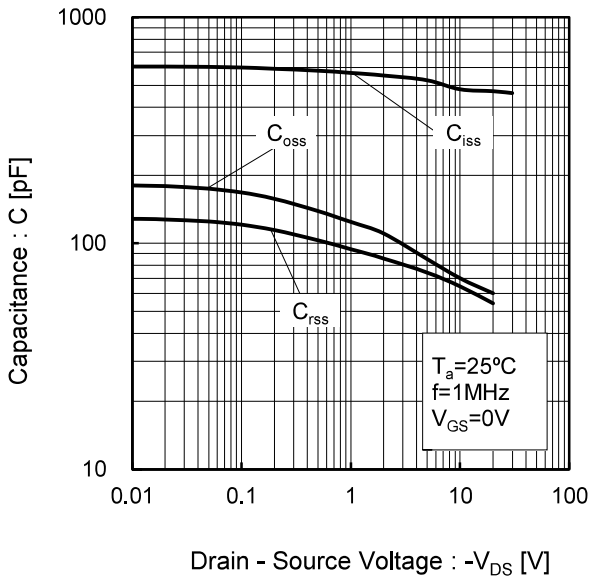



Fig.19 Switching Characteristics

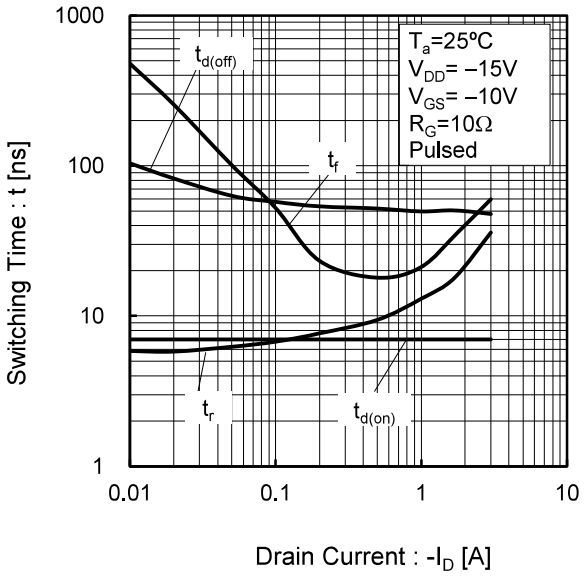
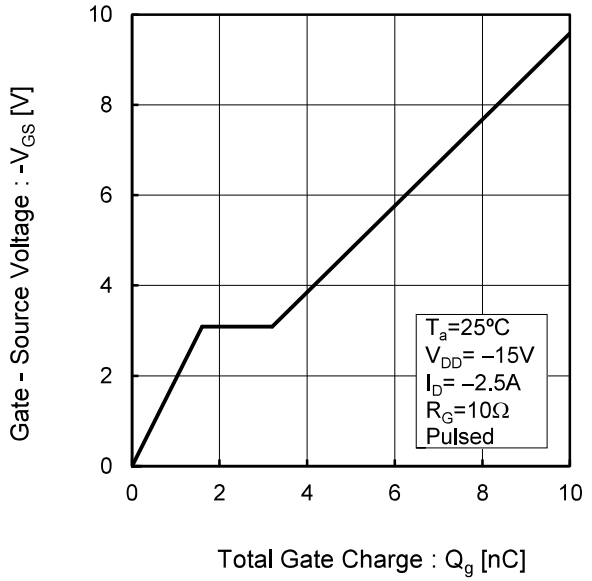
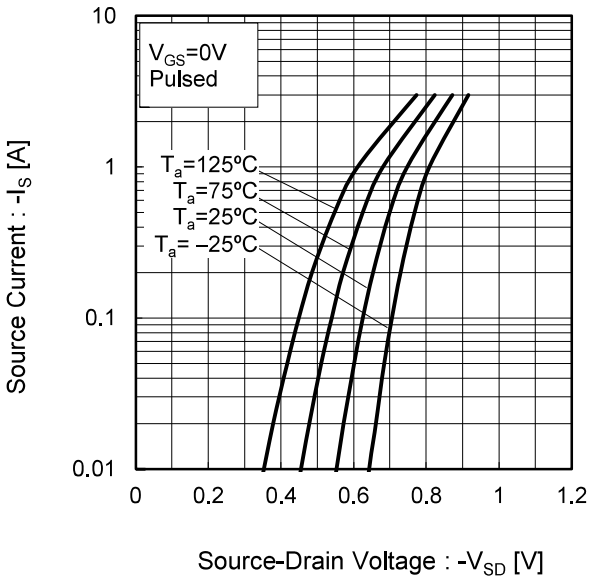



Fig.20 Dynamic Input Characteristics



## ●Electrical characteristic curves

Fig.21 Source Current
vs. Source Drain Voltage



## ●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

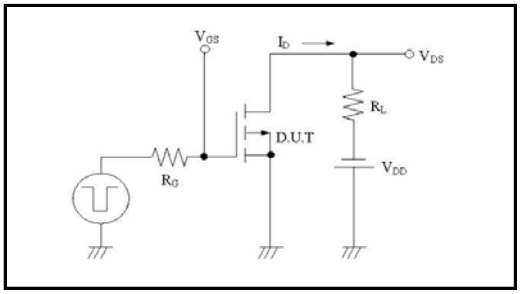



Fig.1-2 Switching Waveforms

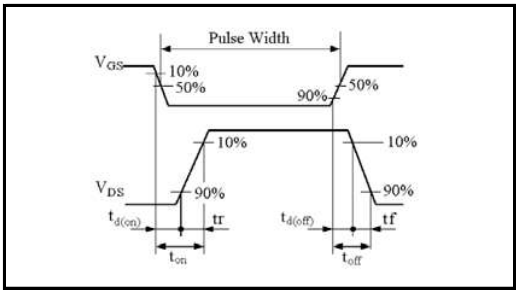



Fig.2-1 Gate Charge Measurement Circuit

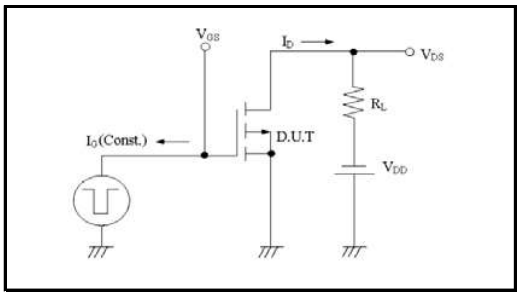
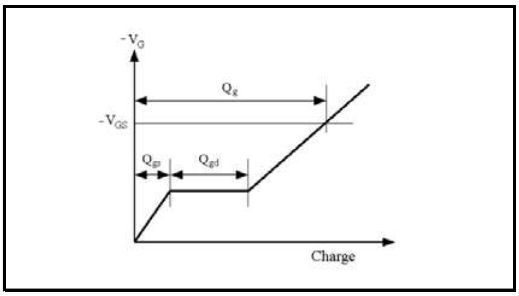
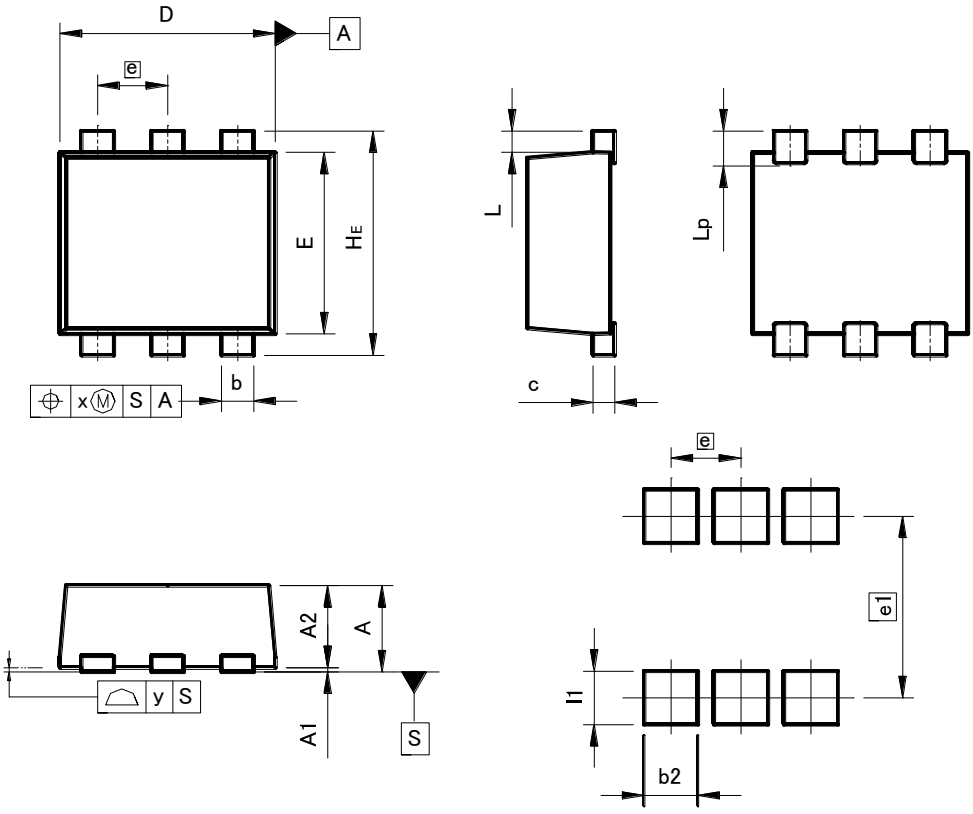



Fig.2-2 Gate Charge Waveform



●**Dimensions** (Unit : mm)

**TUMT6**




**Patterm of terminal position areas**

| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | – | 0.85 | – | 0.033 |
| A1 | 0.00 | 0.10 | 0 | 0.004 |
| A2 | 0.72 | 0.82 | 0.028 | 0.032 |
| b | 0.25 | 0.40 | 0.01 | 0.016 |
| c | 0.12 | 0.22 | 0.005 | 0.009 |
| D | 1.90 | 2.10 | 0.075 | 0.083 |
| E | 1.60 | 1.80 | 0.063 | 0.071 |
| e | 0.65 | | 0.03 | |
| HE | 2.00 | 2.20 | 0.079 | 0.087 |
| L | 0.20 | | 0.01 | |
| Lp | – | 0.40 | – | 0.016 |
| x | – | 0.10 | – | 0.004 |
| y | – | 0.10 | – | 0.004 |

| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| e1 | 1.70 | | 0.067 | |
| b2 | – | 0.50 | – | 0.02 |
| l1 | – | 0.50 | – | 0.02 |

Dimension in mm/inches

## Notes

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