# RQ1A070ZP

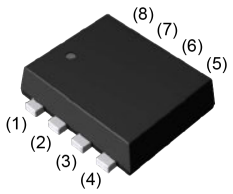
Pch -12V -7A Middle Power MOSFET

Datasheet

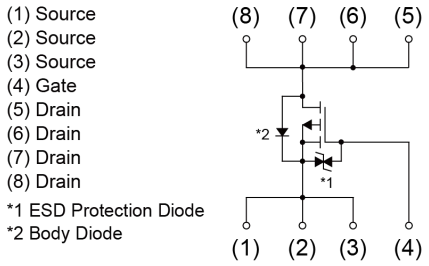
| | |
|---|---|
| $V_{DSS}$ | -12V |
| $R_{DS(on)}$(Max.) | 12mΩ |
| $I_D$ | ±7A |
| $P_D$ | 1.5W |

## ●Outline

TSMT8




## ●Inner circuit




## ●Features

1) Low on - resistance.
2) Low voltage drive(1.5V).
3) High power package.

## ●Application

Switching

## ●Packaging specifications

| | | |
|---|---|---|
| Type | Packing | Embossed Tape |
| | Reel size (mm) | 180 |
| | Tape width (mm) | 8 |
| | Basic ordering unit (pcs) | 3000 |
| | Taping code | TR |
| | Marking | YJ |

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

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain - Source voltage | $V_{DSS}$ | -12 | V |
| Continuous drain current | $I_D$ | ±7 | A |
| Pulsed drain current | $I_{D,pulse}$ *1 | ±28 | A |
| Gate - Source voltage | $V_{GSS}$ | ±10 | V |
| Power dissipation | $P_D$ *2 | 1.5 | W |
| | $P_D$ *3 | 0.7 | W |
| Junction temperature | $T_j$ | 150 | ℃ |
| Range of storage temperature | $T_{stg}$ | -55 to +150 | ℃ |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## ●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - ambient | $R_{thJA}$ *2 | - | - | 83.3 | ℃/W |
| | $R_{thJA}$ *3 | - | - | 178 | ℃/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 | -12 | - | - | V |
| Breakdown voltage temperature coefficient | $\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$ | $I_D$ = -1mA referenced to 25℃ | - | -21.9 | - | mV/℃ |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ = -12V, $V_{GS}$ = 0V | - | - | -1 | μA |
| Gate - Source leakage current | $I_{GSS}$ | $V_{GS}$ = ±10V, $V_{DS}$ = 0V | - | - | ±10 | μA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ = -6V, $I_D$ = -1mA | -0.3 | - | -1.0 | V |
| Gate threshold voltage temperature coefficient | $\frac{\Delta V_{GS(th)}}{\Delta T_j}$ | $I_D$ = -1mA referenced to 25℃ | - | 2.4 | - | mV/℃ |
| Static drain - source on - state resistance | $R_{DS(on)}$ *4 | $V_{GS}$ = -4.5V, $I_D$ = -7A | - | 8 | 12 | mΩ |
| | | $V_{GS}$ = -2.5V, $I_D$ = -3.5A | - | 11 | 16 | |
| | | $V_{GS}$ = -1.8V, $I_D$ = -3.5A | - | 15 | 23 | |
| | | $V_{GS}$ = -1.5V, $I_D$ = -1.4A | - | 19 | 38 | |
| Forward Transfer Admittance | $\|Y_{fs}\|$ *4 | $V_{DS}$ = -6V, $I_D$ = -7A | 12 | - | - | S |

*1 Pw≦10μs, Duty cycle≦1%

*2 Mounted on a ceramic board (30×30×0.8mm)

*3 Mounted on a FR4(20×20×0.8mm)

*4 Pulsed


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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0V | - | 7400 | - | pF |
| Output capacitance | $C_{oss}$ | $V_{DS}$ = -6V | - | 800 | - | |
| Reverse transfer capacitance | $C_{rss}$ | f = 1MHz | - | 750 | - | |
| Turn - on delay time | $t_{d(on)}$ *4 | $V_{DD}$ ≃ -6V, $V_{GS}$ = -4.5V | - | 35 | - | ns |
| Rise time | $t_r$ *4 | $I_D$ = -3.5A | - | 95 | - | |
| Turn - off delay time | $t_{d(off)}$ *4 | $R_L$ ≃ 1.7Ω | - | 310 | - | |
| Fall time | $t_f$ *4 | $R_G$ = 10Ω | - | 190 | - | |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Total gate charge | $Q_g$ *4 | $V_{DD}$ ≃ -6V, $I_D$ = -7A, $V_{GS}$ = -4.5V | - | 58 | - | nC |
| Gate - Source charge | $Q_{gs}$ *4 | | - | 11 | - | |
| Gate - Drain charge | $Q_{gd}$ *4 | | - | 10 | - | |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Body diode continuous forward current | $I_S$ | $T_a$ = 25°C | - | - | -1 | A |
| Body diode pulse current | $I_{SP}$ *1 | | - | - | -28 | A |
| Forward voltage | $V_{SD}$ *4 | $V_{GS}$ = 0V, $I_S$ = -7A | - | - | -1.2 | V |


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## ●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

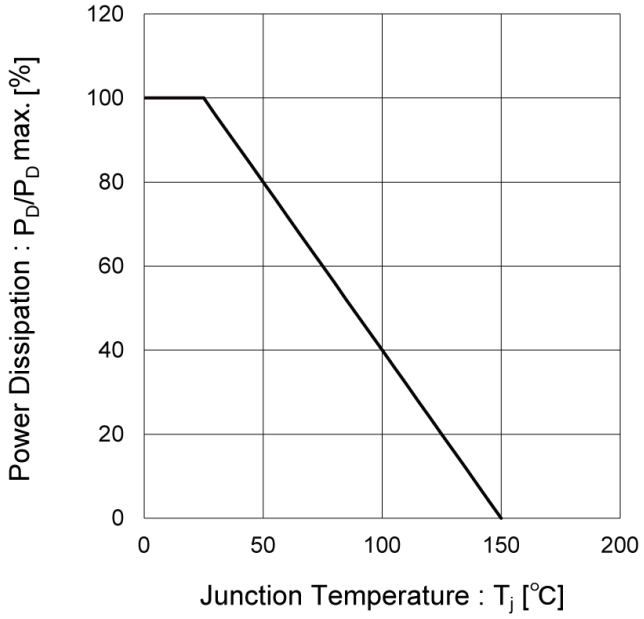



Fig.2 Maximum Safe Operating Area

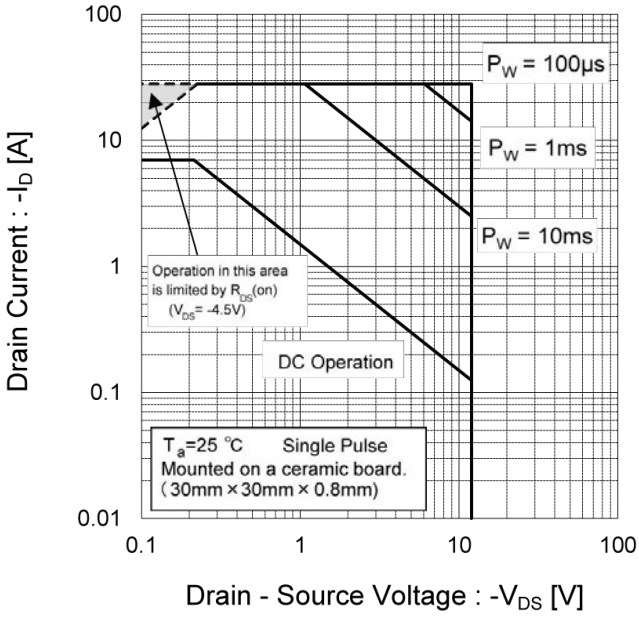



Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

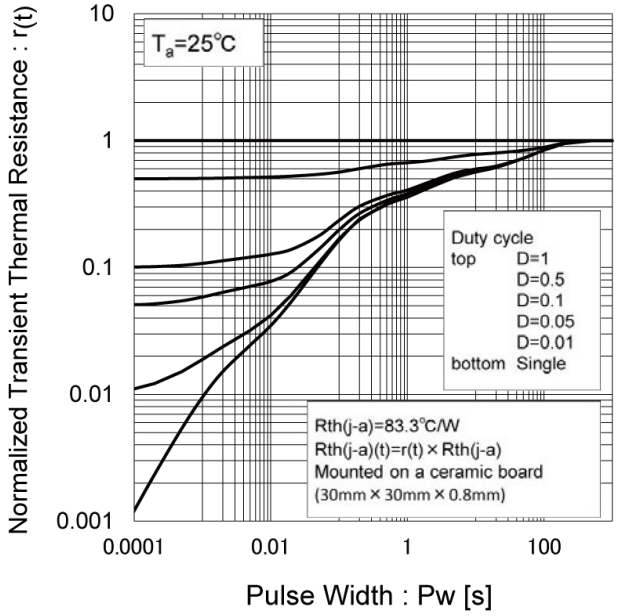
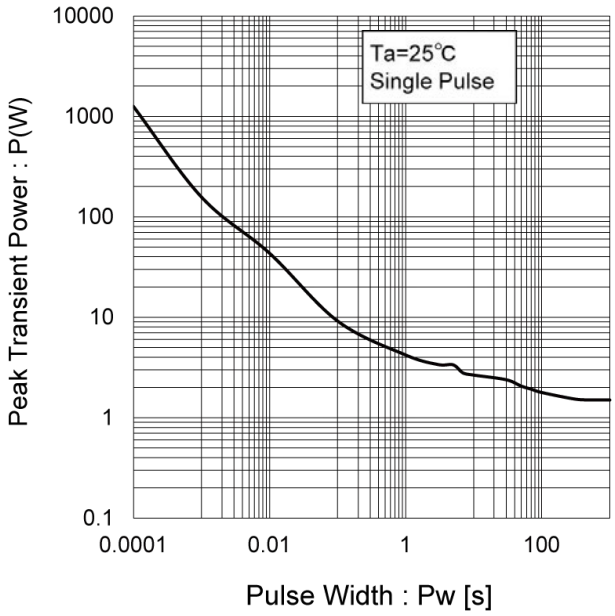



Fig.4 Single Pulse Maximum Power dissipation





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## ●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

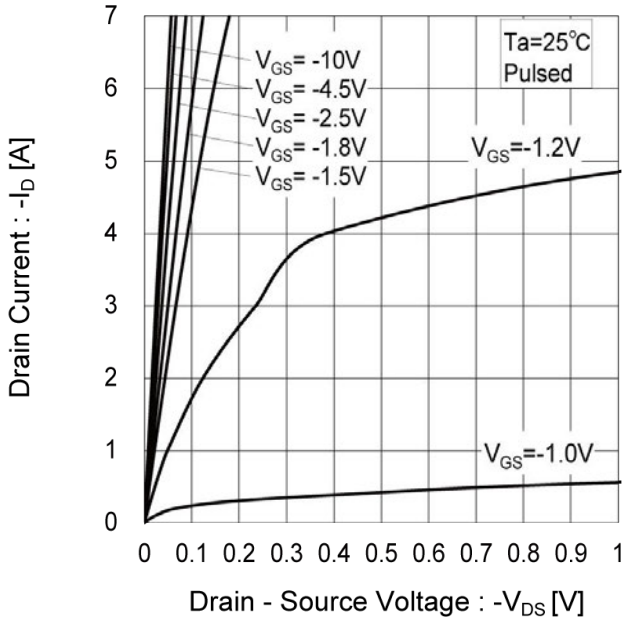



Fig.6 Typical Output Characteristics(II)

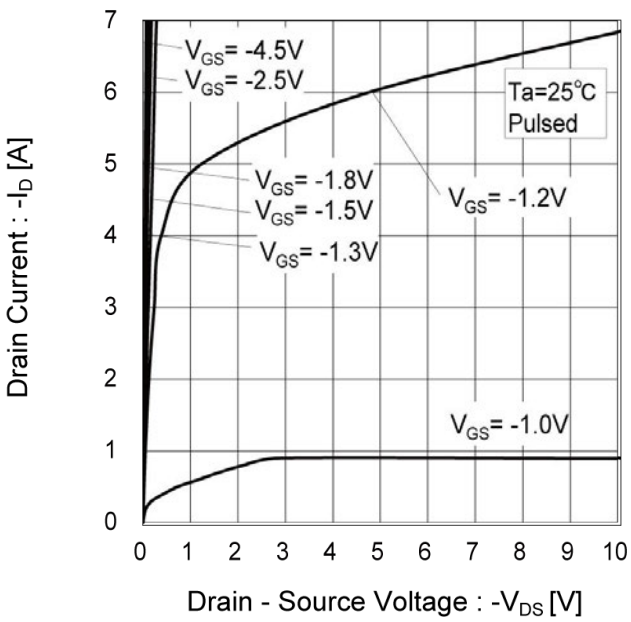



Fig.7 Breakdown Voltage vs. Junction Temperature

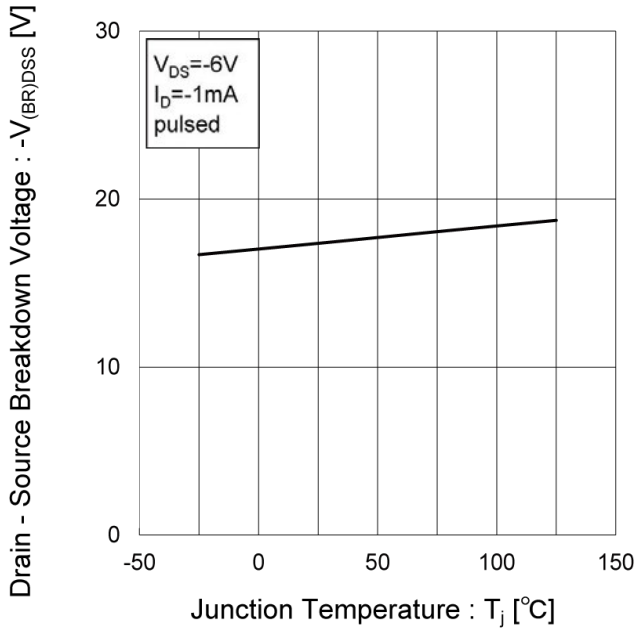
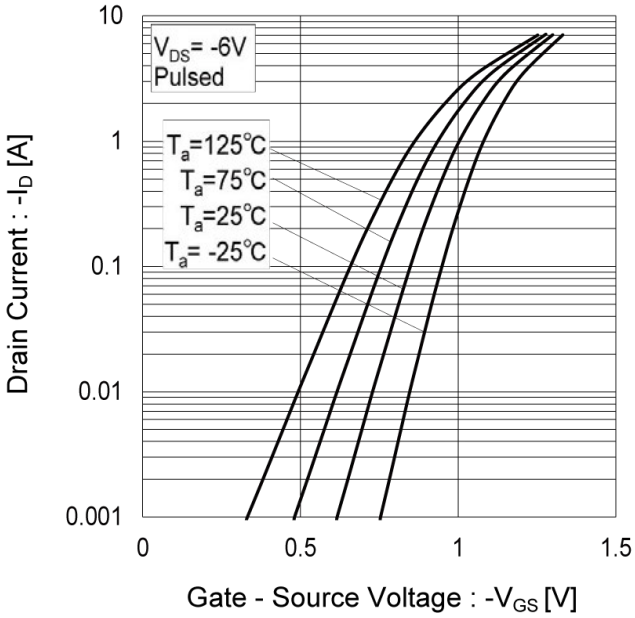



Fig.8 Typical Transfer Characteristics





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## ●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

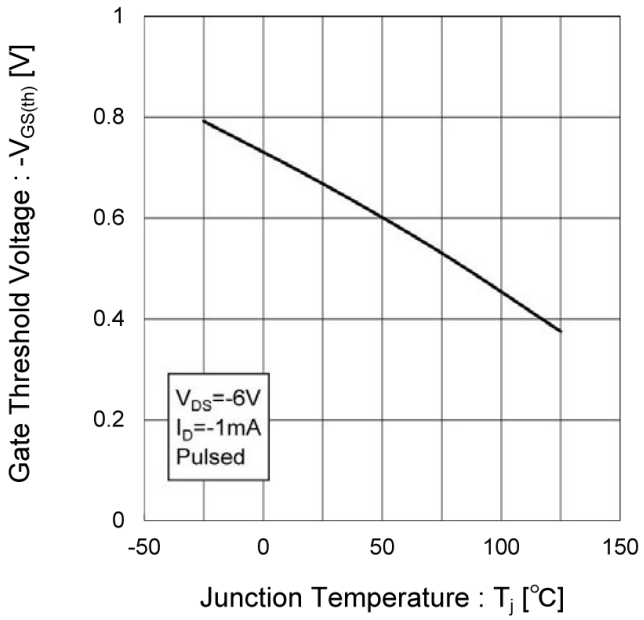



Fig.10 Forward Transfer Admittance vs. Drain Current

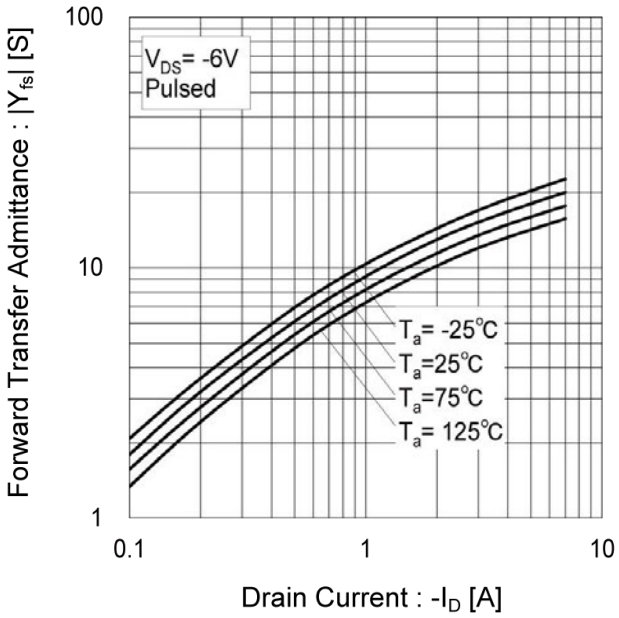



Fig.11 Drain Current Derating Curve

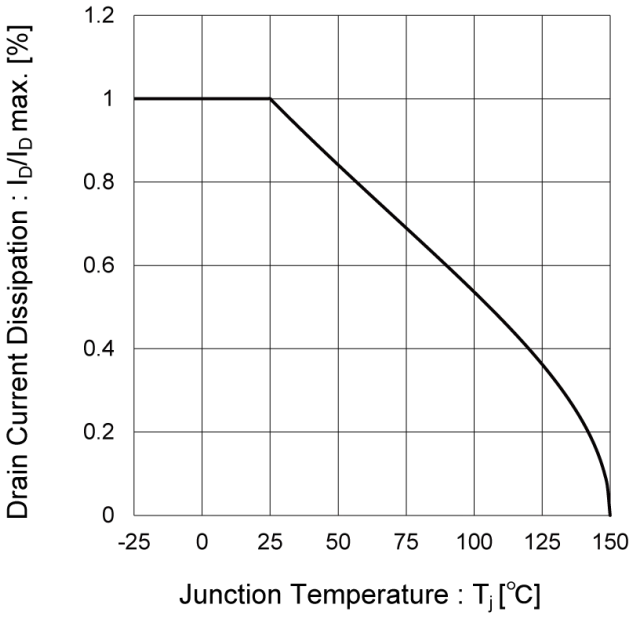
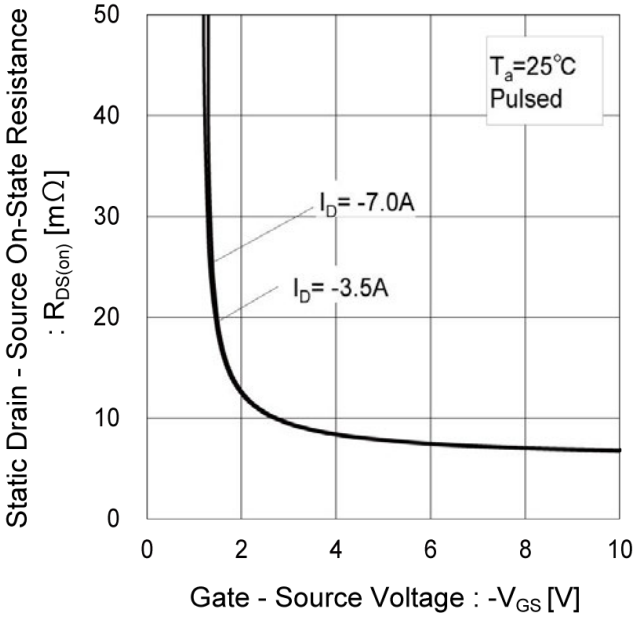



Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage





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## ●Electrical characteristic curves

Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

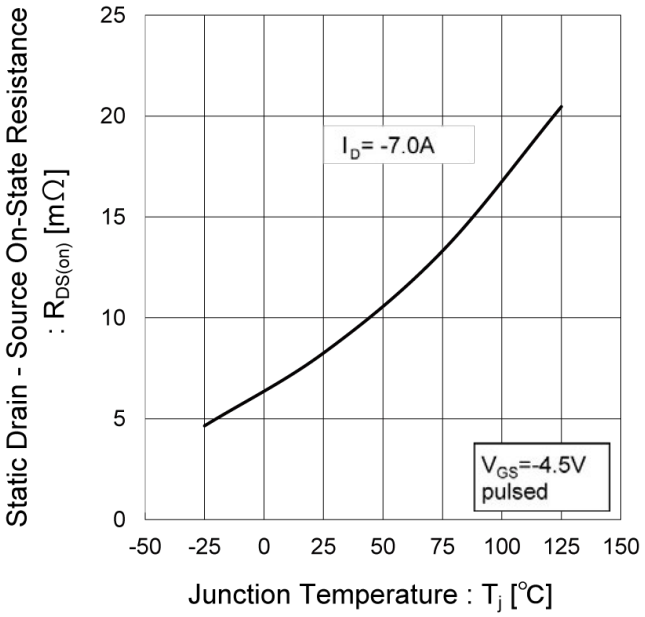
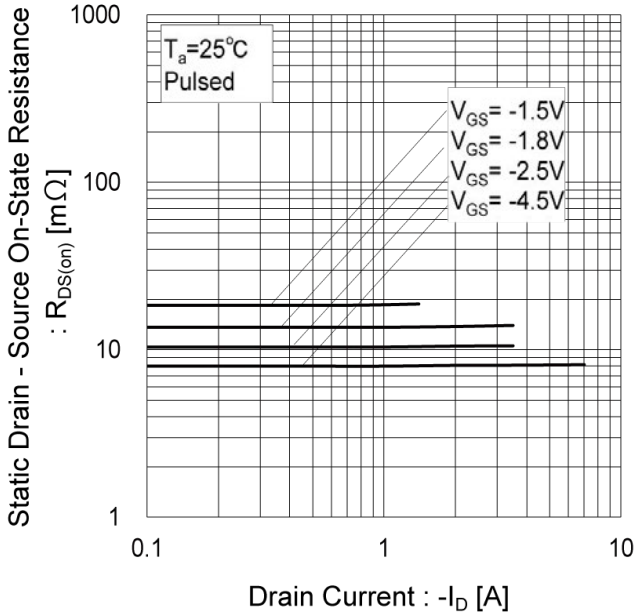



Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (I)





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## ●Electrical characteristic curves

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

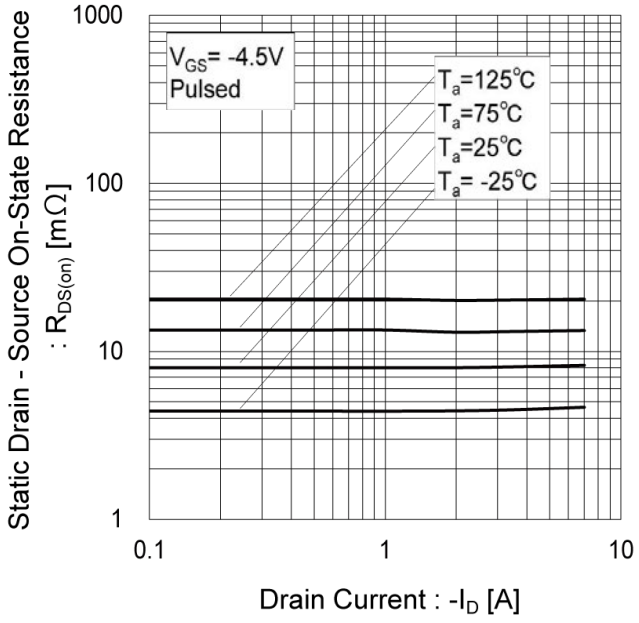



Fig.16 Static Drain - Source On - State Resistance vs. Drain Current (III)

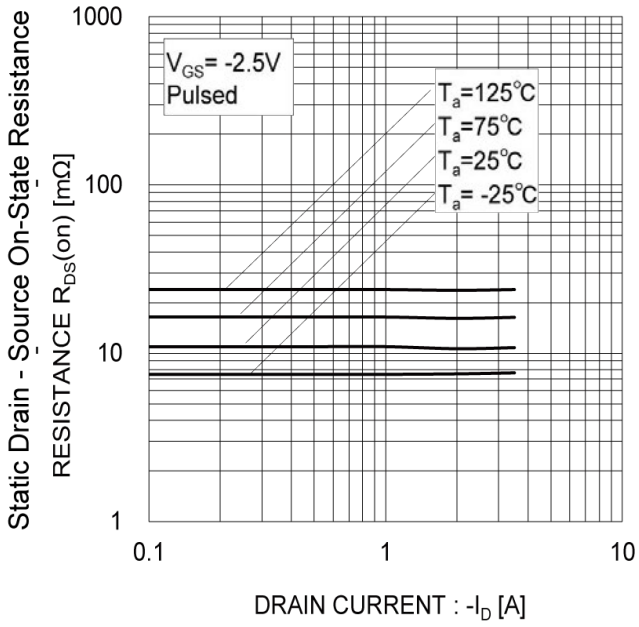



Fig.17 Static Drain - Source On - State Resistance vs. Drain Current (IV)

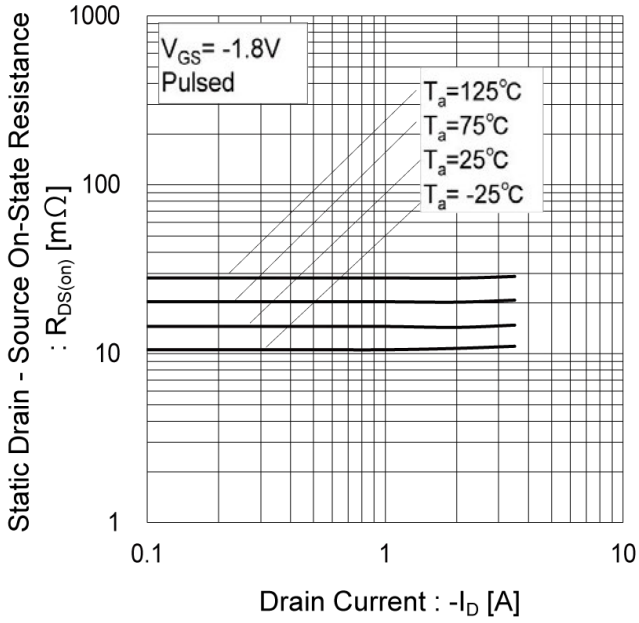
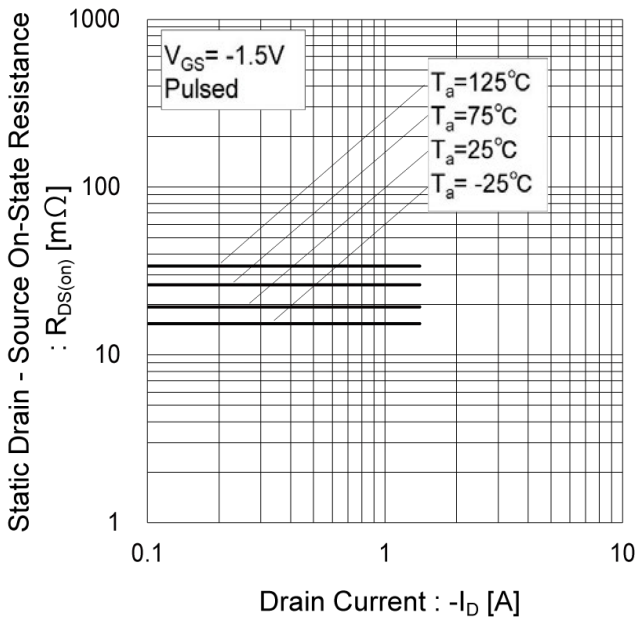



Fig.18 Static Drain - Source On - State Resistance vs. Drain Current(V)





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## ●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

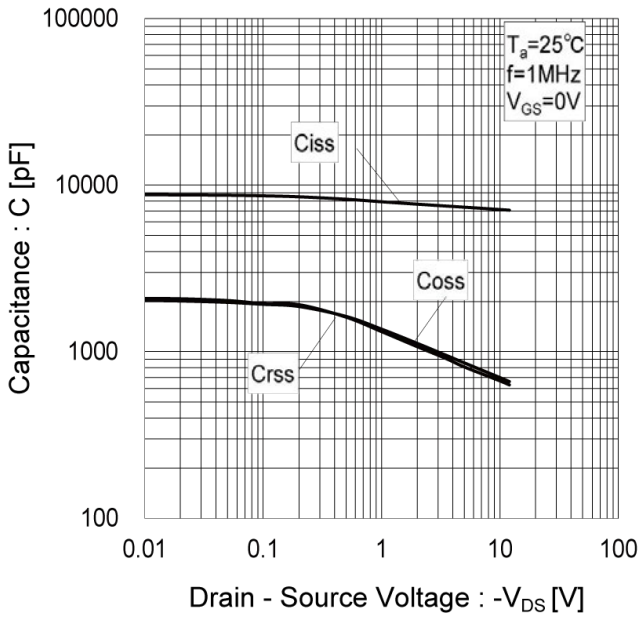



Fig.20 Switching Characteristics

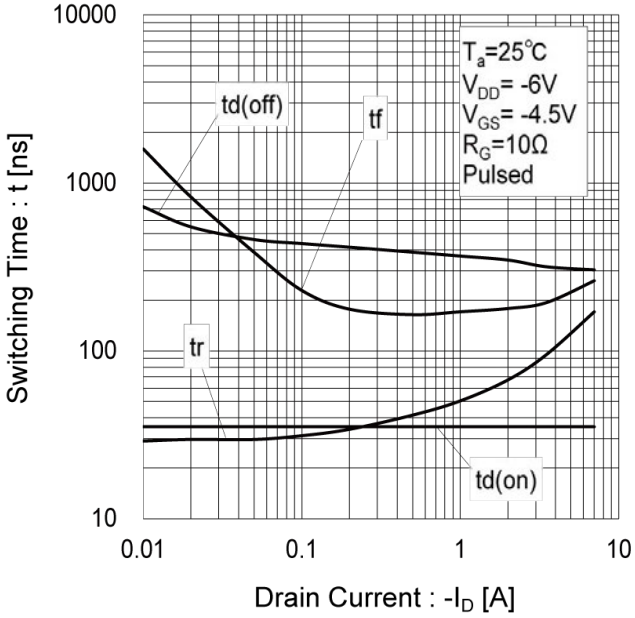



Fig.21 Dynamic Input Characteristics

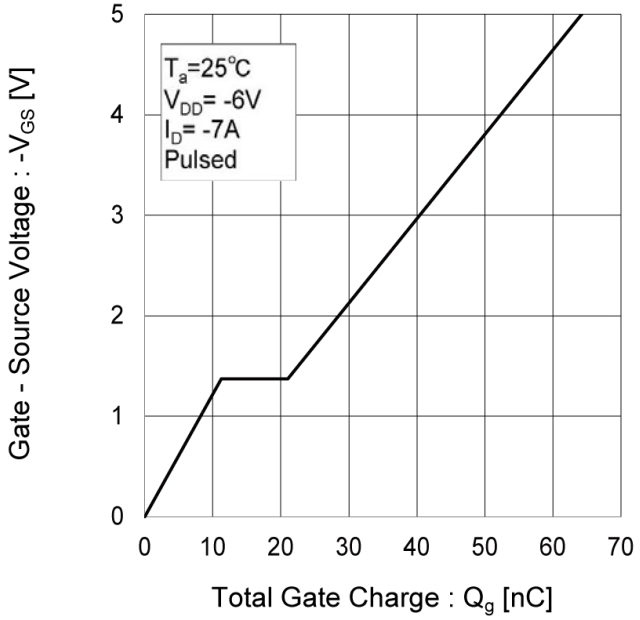
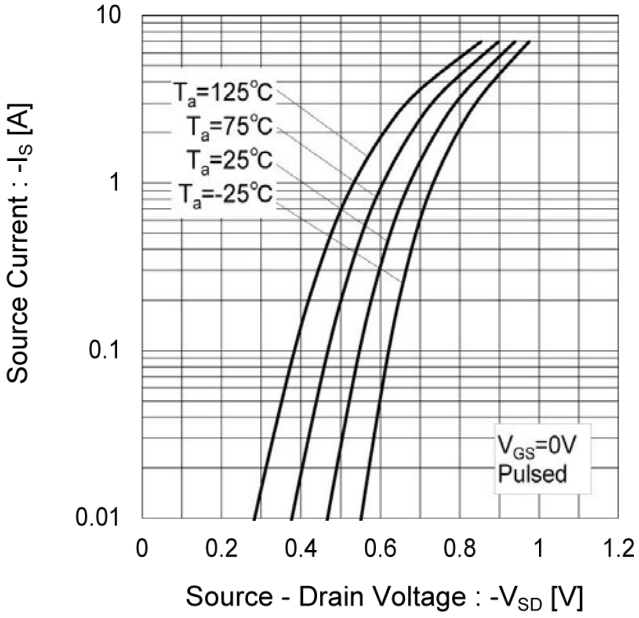



Fig.22 Source Current vs. Source Drain Voltage





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## ●Measurement circuits

Fig. 1-1 SWITCHING TIME MEASUREMENT CIRCUIT

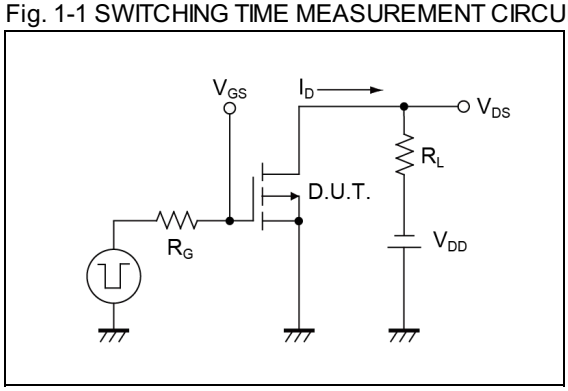



Fig. 1-2 SWITCHING WAVEFORMS

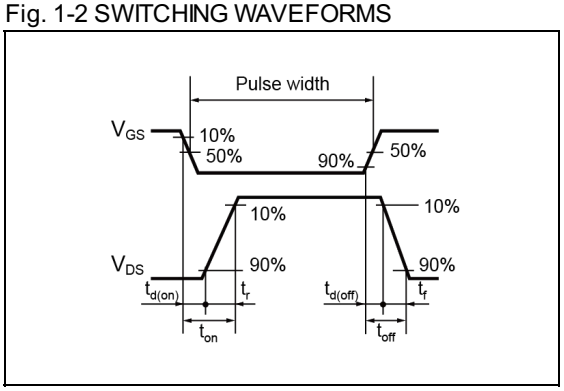



Fig. 2-1 GATE CHARGE MEASUREMENT CIRCUIT

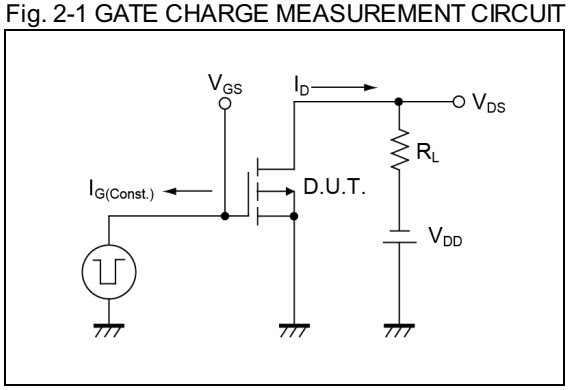
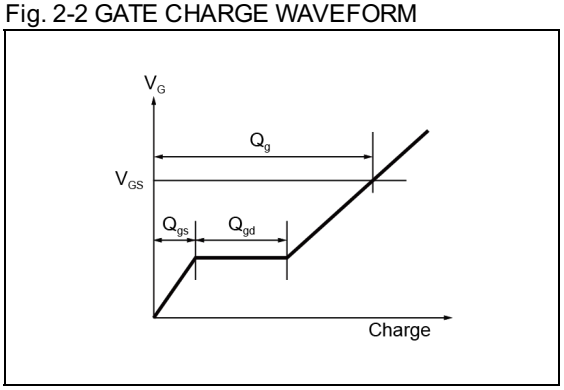



Fig. 2-2 GATE CHARGE WAVEFORM




## ●Notice

This product might cause chip aging and breakdown under the large electrified environment.
Please consider to design ESD protection circuit.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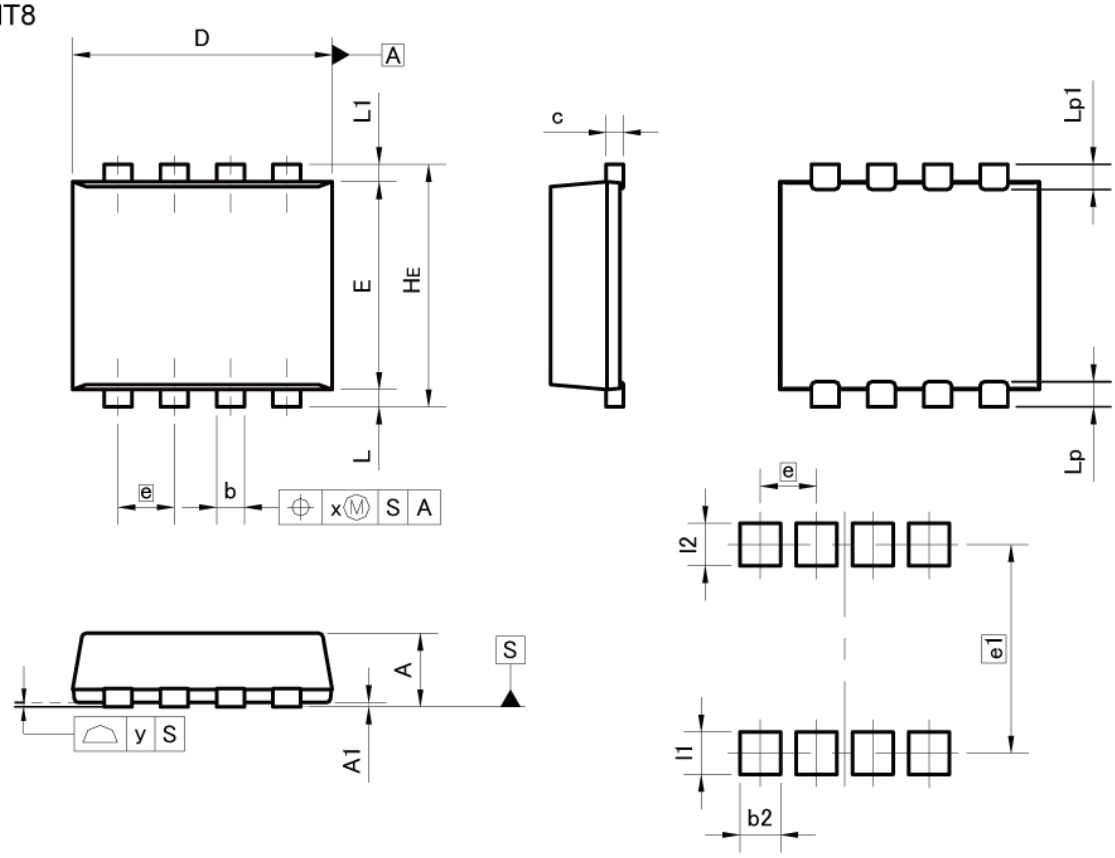
## ●Dimensions

TSMT8




Pattern of terminal position areas
[Not a pattern of soldering pads]

| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.75 | 0.85 | 0.030 | 0.033 |
| A1 | 0.00 | 0.05 | 0.000 | 0.002 |
| b | 0.27 | 0.37 | 0.011 | 0.015 |
| c | 0.12 | 0.22 | 0.005 | 0.009 |
| D | 2.90 | 3.10 | 0.114 | 0.122 |
| E | 2.30 | 2.50 | 0.091 | 0.098 |
| e | 0.65 | | 0.026 | |
| HE | 2.70 | 2.90 | 0.106 | 0.114 |
| L | 0.10 | 0.30 | 0.004 | 0.012 |
| L1 | 0.10 | 0.30 | 0.004 | 0.012 |
| Lp | 0.19 | 0.39 | 0.007 | 0.015 |
| Lp1 | 0.19 | 0.39 | 0.007 | 0.015 |
| x | – | 0.10 | – | 0.004 |
| y | – | 0.10 | – | 0.004 |

| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| b2 | – | 0.47 | – | 0.019 |
| e1 | 2.41 | | 0.095 | |
| l1 | – | 0.49 | – | 0.019 |
| l2 | – | 0.49 | – | 0.019 |

Dimension in mm/inches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## Notes

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2) Before you use our Products, please contact our sales representative and verify the latest specifications :

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7) The Products specified in this document are not designed to be radiation tolerant.

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9) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

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