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# QS8J12

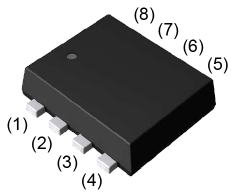
-12V Pch+Pch Middle Power MOSFET

Datasheet

| | |
|---|---|
| $V_{DSS}$ | -12V |
| $R_{DS(on)}$(Max.) | 29mΩ |
| $I_D$ | ±4.5A |
| $P_D$ | 1.5W |

## ●Outline

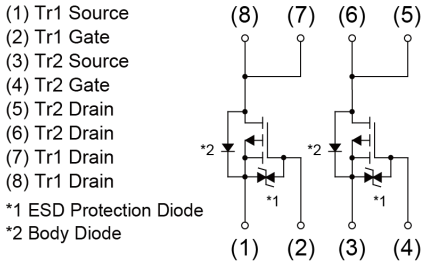
TSMT8




## ●Features

1) Low on - resistance.
2) -1.5V Drive.
3) Built-in G-S Protection Diode.
4) Small Surface Mount Package (TSMT8).
5) Pb-free lead plating ; RoHS compliant

## ●Inner circuit




## ●Packaging specifications

| | | |
|---|---|---|
| Type | Packing | Embossed Tape |
| | Reel size (mm) | 180 |
| | Tape width (mm) | 8 |
| | Basic ordering unit (pcs) | 3000 |
| | Taping code | TR |
| | Marking | J12 |

## ●Application

Switching

## ●Absolute maximum ratings ($T_a$ = 25°C) <It is the same ratings for the Tr1 and Tr2>

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain - Source voltage | | $V_{DSS}$ | -12 | V |
| Continuous drain current | | $I_D$ | ±4.5 | A |
| Pulsed drain current | | $I_{D,pulse}$*1 | ±18 | A |
| Gate - Source voltage | | $V_{GSS}$ | 0～-8 | V |
| Power dissipation | total | $P_D$*2 | 1.5 | W |
| | element | | 1.25 | |
| | total | $P_D$*3 | 0.7 | |
| Junction temperature | | $T_j$ | 150 | ℃ |
| Range of storage temperature | | $T_{stg}$ | -55 to +150 | ℃ |

## ●Thermal resistance

| Parameter | | Symbol | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Thermal resistance, junction - ambient | total | $R_{thJA}$*2 | - | - | 83.3 | ℃/W |
| | element | | - | - | 100 | |
| | total | $R_{thJA}$*3 | - | - | 178 | |

## ●Electrical characteristics ($T_a$ = 25°C) <It is the same characteristics for the Tr1 and Tr2>

| 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℃ | - | -5.0 | - | mV/℃ |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ = -12V, $V_{GS}$ = 0V | - | - | -10 | μA |
| Gate - Source leakage current | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = -8V | - | - | -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℃ | - | 2.7 | - | mV/℃ |
| Static drain - source on - state resistance | $R_{DS(on)}$*4 | $V_{GS}$ = -4.5V, $I_D$ = -4.5A | - | 21 | 29 | mΩ |
| | | $V_{GS}$ = -2.5V, $I_D$ = -2.2A | - | 27 | 38 | |
| | | $V_{GS}$ = -1.8V, $I_D$ = -2.2A | - | 37 | 55 | |
| | | $V_{GS}$ = -1.5V, $I_D$ = -0.9A | - | 49 | 98 | |
| Gate input resistance | $R_G$ | f = 1MHz, open drain | - | 20 | - | Ω |
| Forward Transfer Admittance | $\|Y_{fs}\|$*4 | $V_{DS}$ = -6V, $I_D$ = -4.5A | 5.5 | - | - | S |

●**Electrical characteristics** ($T_a$ = 25°C) <It is the same characteristics for the Tr1 and Tr2>

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0V | - | 4200 | - | pF |
| Output capacitance | $C_{oss}$ | $V_{DS}$ = -6V | - | 350 | - | |
| Reverse transfer capacitance | $C_{rss}$ | f = 1MHz | - | 330 | - | |
| Turn - on delay time | $t_{d(on)}$ *4 | $V_{DD}$ ≃ -6V,$V_{GS}$ = -4.5V | - | 16 | - | ns |
| Rise time | $t_r$ *4 | $I_D$ = -2.2A | - | 60 | - | |
| Turn - off delay time | $t_{d(off)}$ *4 | $R_L$ = 2.7Ω | - | 400 | - | |
| Fall time | $t_f$ *4 | $R_G$ = 10Ω | - | 150 | - | |

●**Gate charge characteristics** ($T_a$ = 25°C) <It is the same characteristics for the Tr1 and Tr2>

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Total gate charge | $Q_g$ *4 | $V_{DD}$ ≃ -6V | - | 40 | - | nC |
| Gate - Source charge | $Q_{gs}$ *4 | $I_D$ = -4.5A | - | 6.5 | - | |
| Gate - Drain charge | $Q_{gd}$ *4 | $V_{GS}$ = -4.5V | - | 6.0 | - | |

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

<It is the same characteristics for the Tr1 and Tr2>

| 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 | | - | - | -18 | |
| Forward voltage | $V_{SD}$ *4 | $V_{GS}$ = 0V, $I_S$ = -4.5A | - | - | -1.2 | V |

*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

## ●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

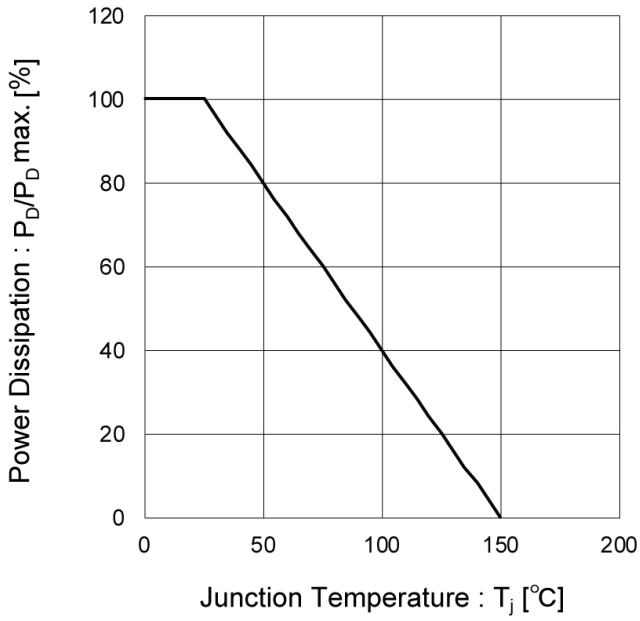



Fig.2 Maximum Safe Operating Area

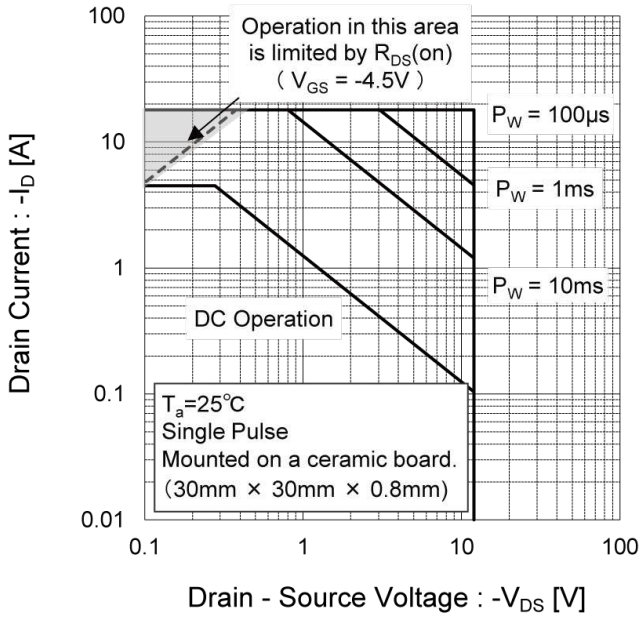



Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

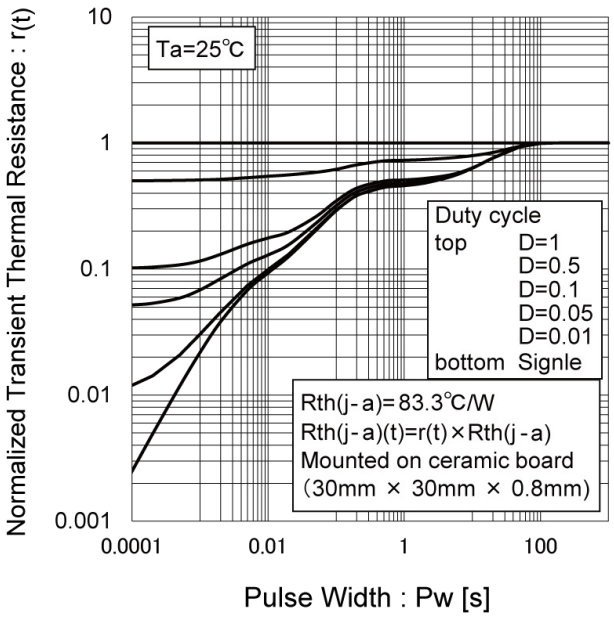
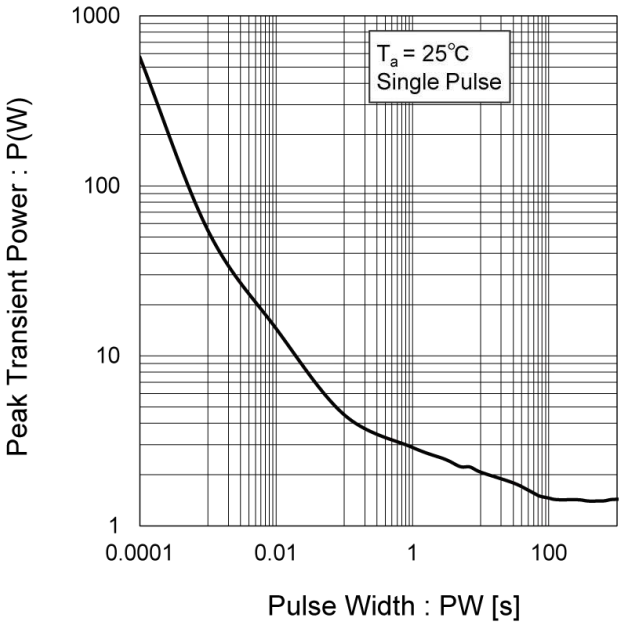



Fig.4 Single Pulse Maximum Power dissipation



## ●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

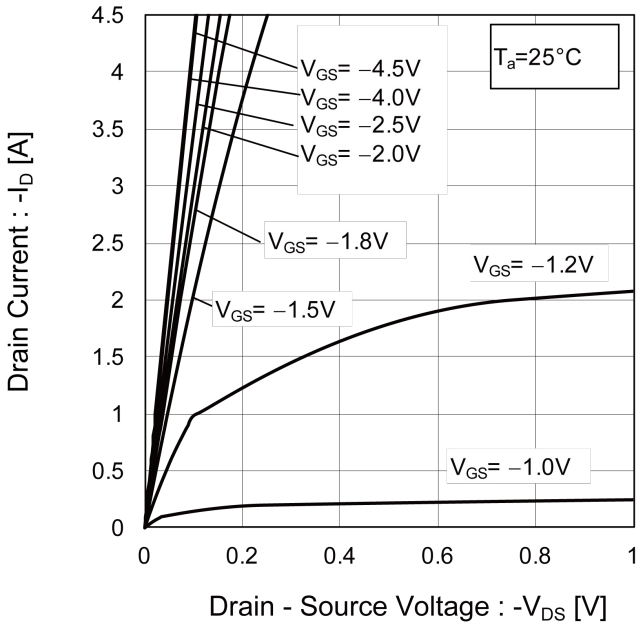



Fig.6 Typical Output Characteristics(II)

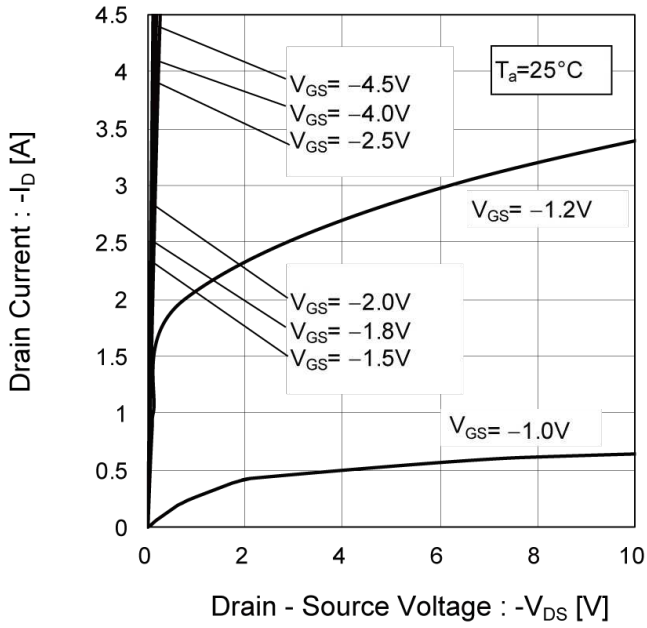



Fig.7 Breakdown Voltage vs. Junction Temperature

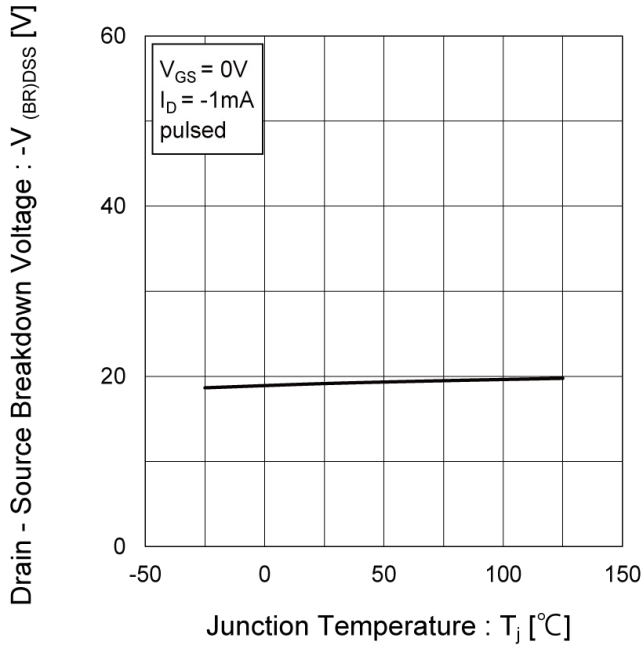
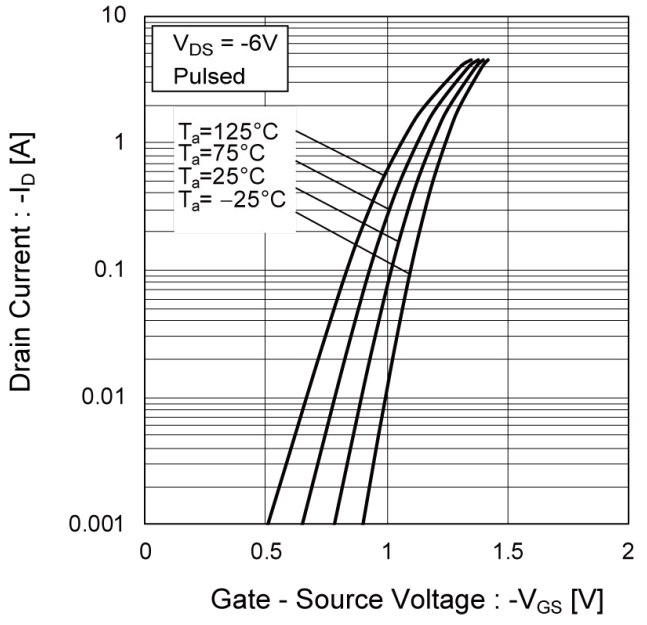



Fig.8 Typical Transfer Characteristics



## ●Electrical characteristic curves

Fig.9 Gate Threshold Voltage vs. Junction Temperature

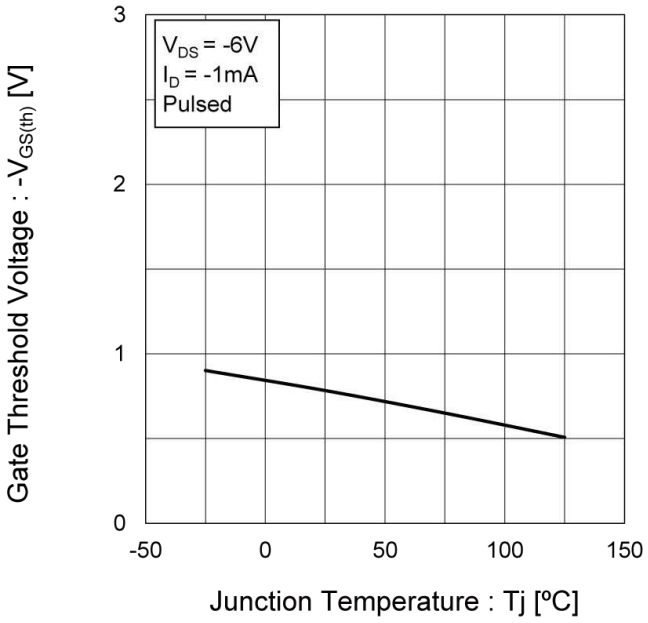



Fig.10 Forward Transfer Admittance vs. Drain Current

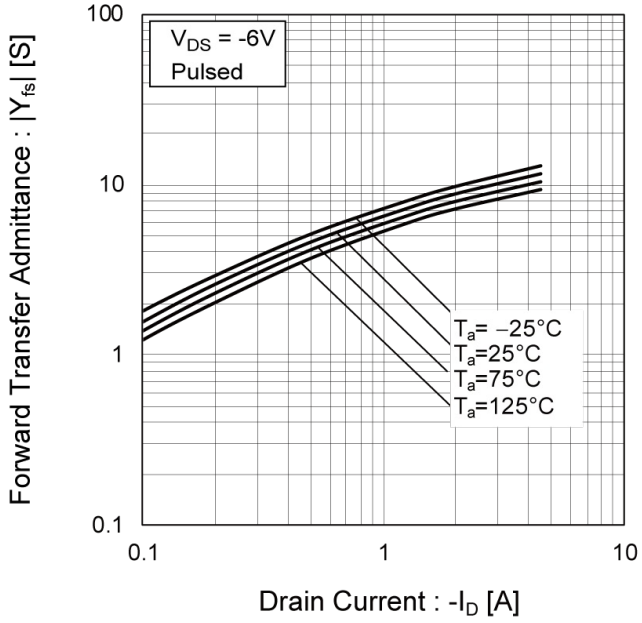



Fig.11 Drain Current Derating Curve

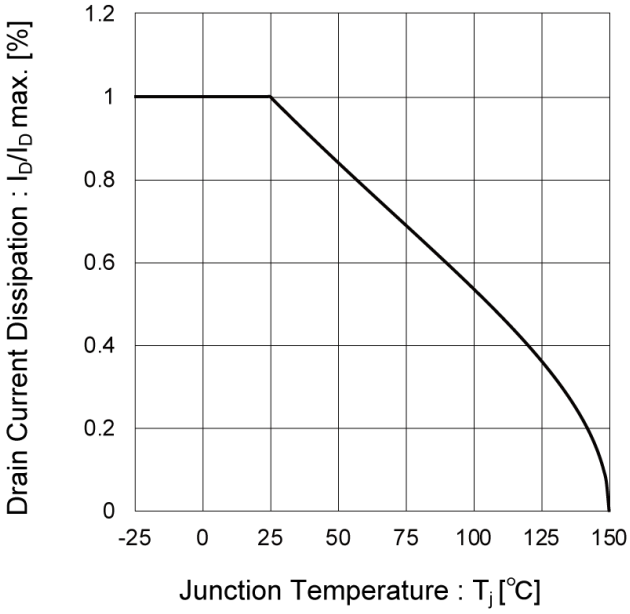
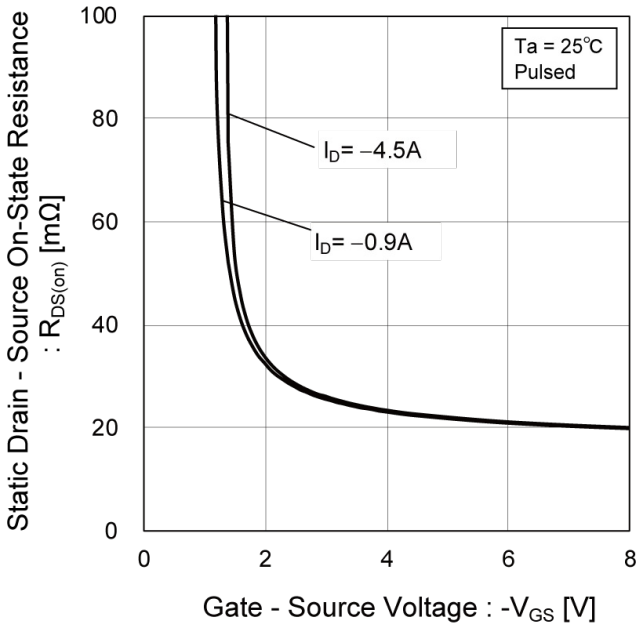



Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage



## ●Electrical characteristic curves

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

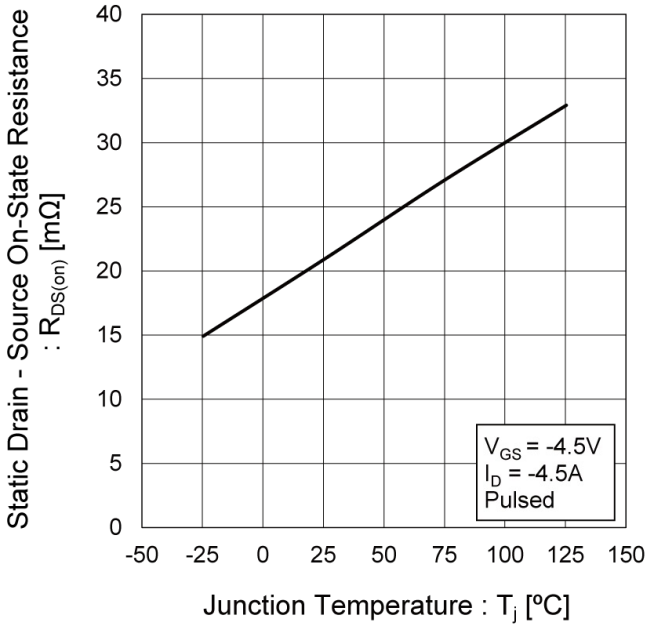
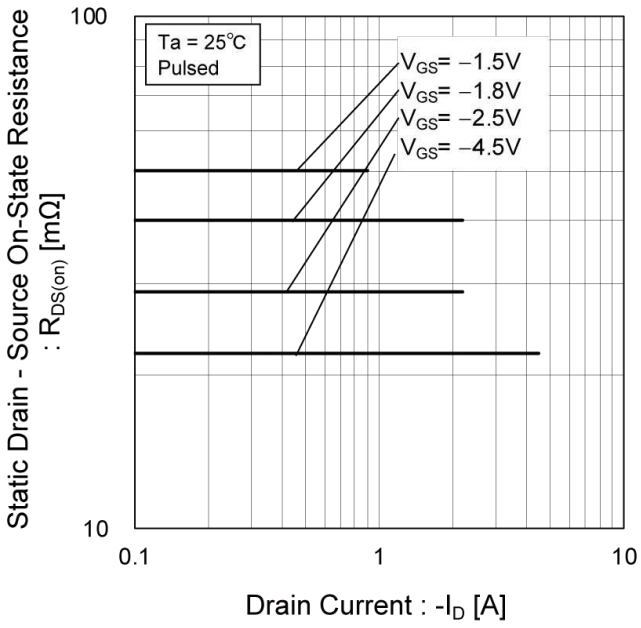



Fig.14 Static Drain - Source On - State Resistance vs. Drain Current (I)



## ●Electrical characteristic curves

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

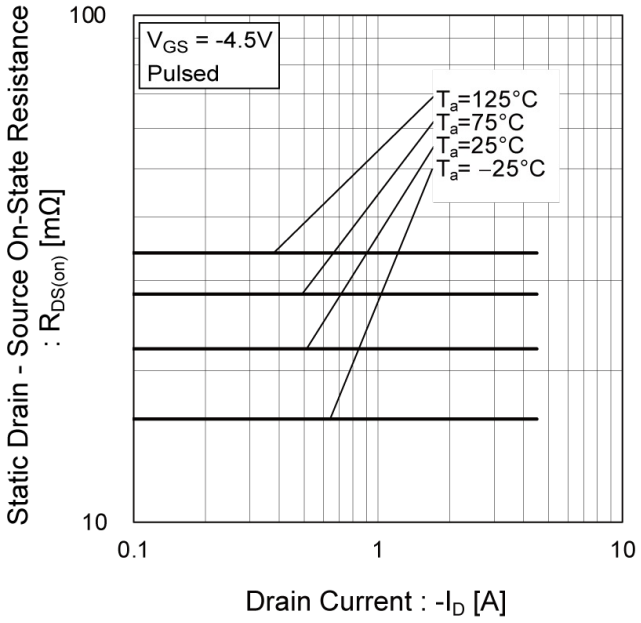



Fig.16 Static Drain - Source On - State Resistance vs. Drain Current (III)

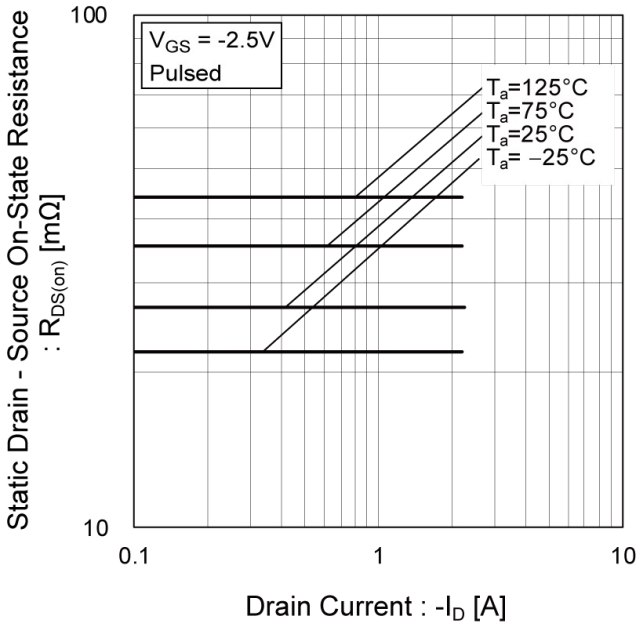



Fig.17 Static Drain - Source On - State Resistance vs. Drain Current (IV)

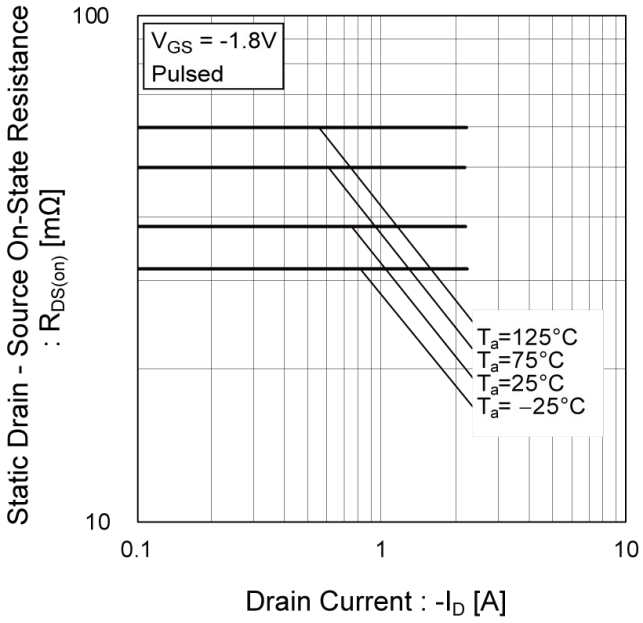
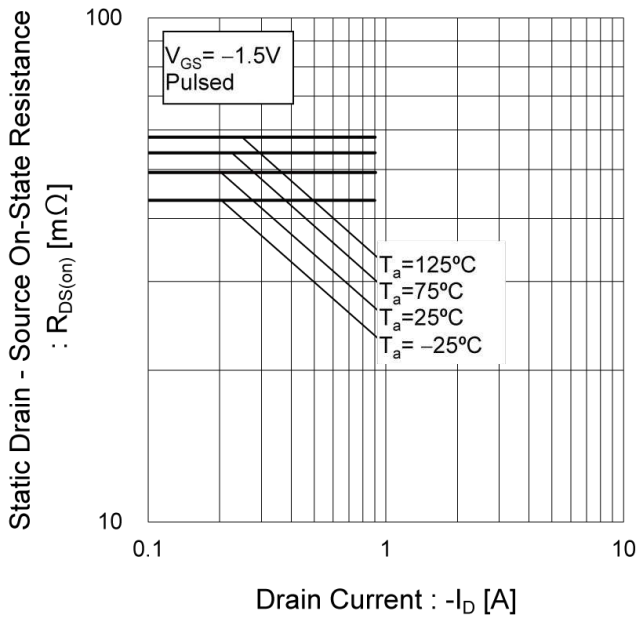



Fig.18 Static Drain - Source On - State Resistance vs. Drain Current (V)



## ●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

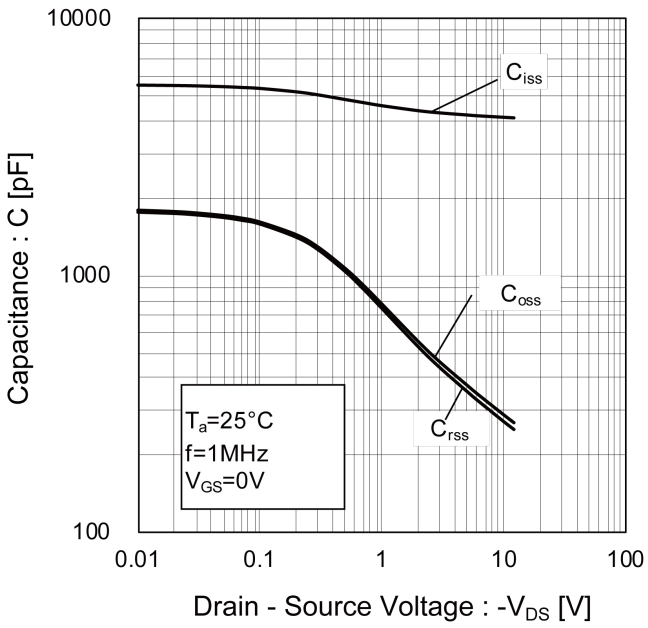



Fig.20 Switching Characteristics

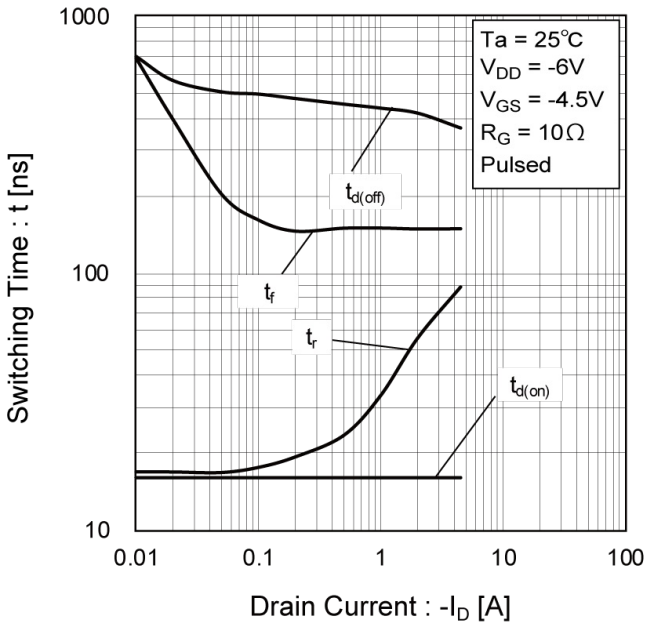



Fig.21 Dynamic Input Characteristics

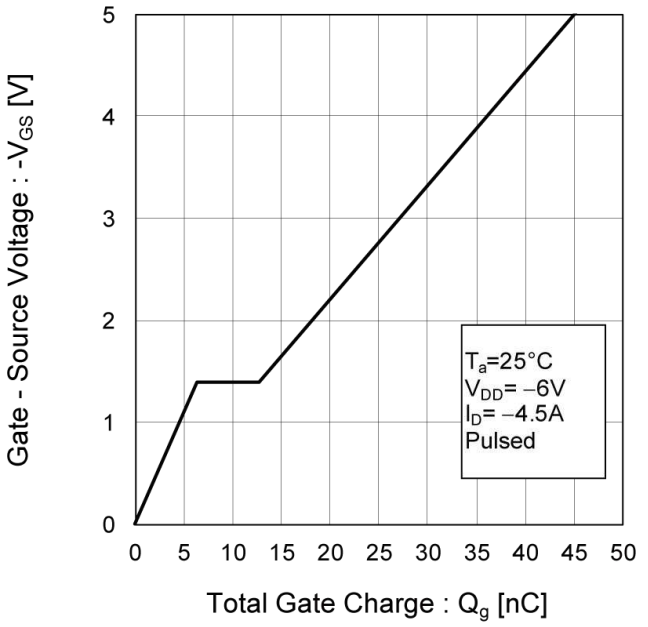
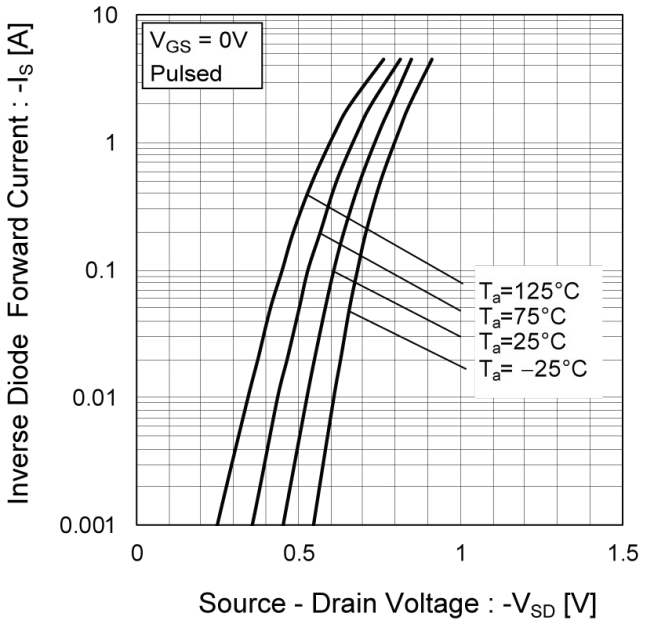



Fig.22 Source Current vs. Source Drain Voltage



## ●Measurement circuits <It is the same for the Tr1 and Tr2>

Fig. 1-1 SWITCHING TIME MEASUREMENT CIRCUIT

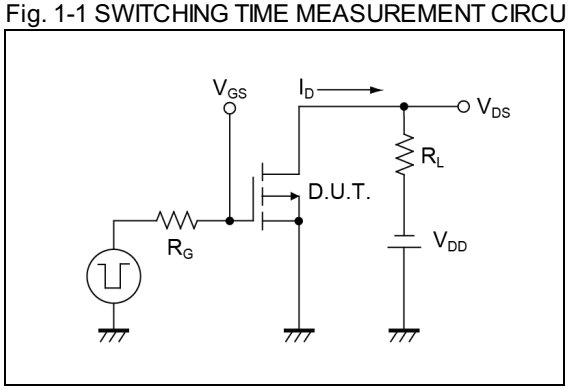



Fig. 1-2 SWITCHING WAVEFORMS

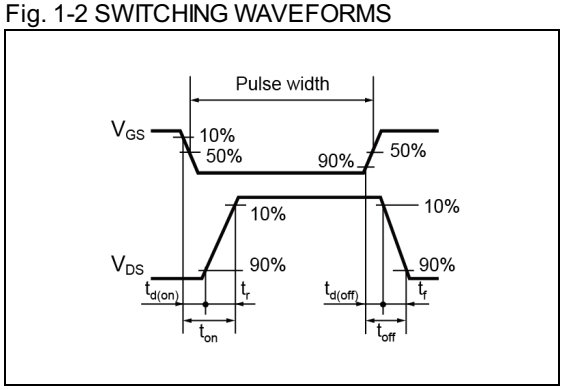



Fig. 2-1 GATE CHARGE MEASUREMENT CIRCUIT

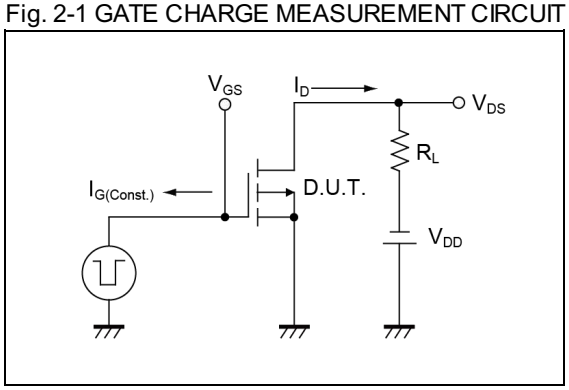
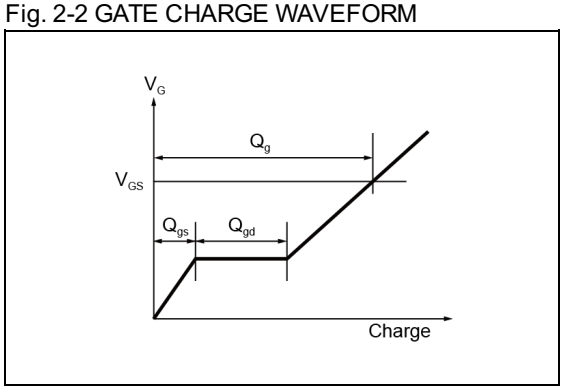



Fig. 2-2 GATE CHARGE WAVEFORM

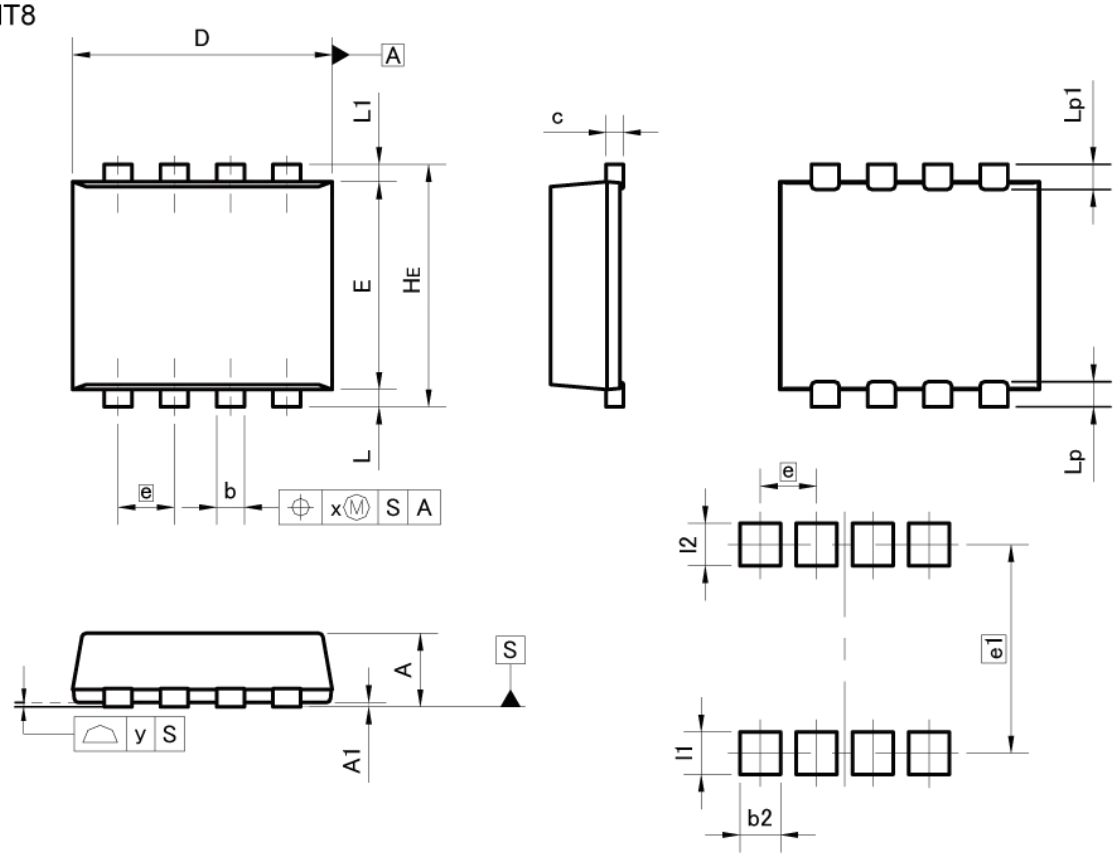



## ●Notice

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

## ●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

## Notes

1) The information contained herein is subject to change without notice.

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

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
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5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

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

8) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.

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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ROHM SEMICONDUCTOR

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