

| | |
|---------------------|--------------|
| V_{DSS} | -12V |
| $R_{DS(on)}$ (Max.) | 14m Ω |
| I_D | -7A |
| P_D | 1.5W |

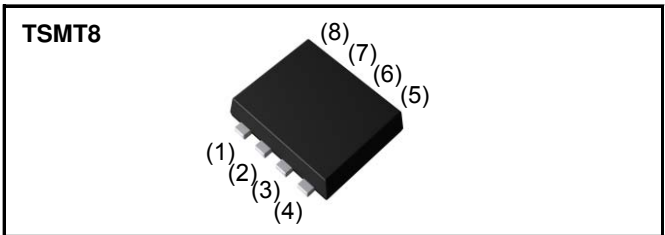
●Features

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

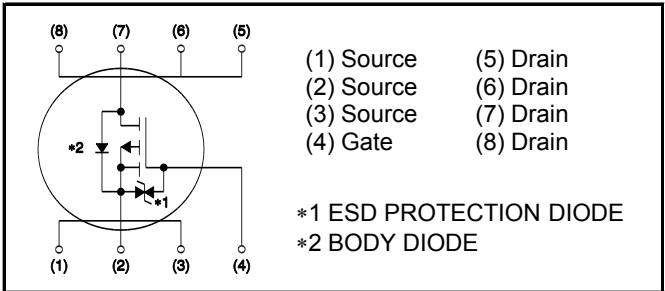
●Application

Road SW

●Outline



●Inner circuit



●Packaging specifications

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

●Absolute maximum ratings($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Value | Unit |
|------------------------------|--------------------|-------------|------------------|
| Drain - Source voltage | V_{DSS} | -12 | V |
| Continuous drain current | I_D^{*1} | ± 7 | A |
| Pulsed drain current | $I_{D,pulse}^{*2}$ | ± 28 | A |
| Gate - Source voltage | V_{GSS} | 0 to -8 | V |
| Power dissipation | P_D^{*3} | 1.5 | W |
| | P_D^{*4} | 0.55 | W |
| Junction temperature | T_j | 150 | $^\circ\text{C}$ |
| Range of storage temperature | T_{stg} | -55 to +150 | $^\circ\text{C}$ |

● Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|--|-----------------|--------|------|------|------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - ambient | R_{thJA}^{*3} | - | - | 83.3 | °C/W |
| Thermal resistance, junction - ambient | R_{thJA}^{*4} | - | - | 227 | °C/W |

● Electrical characteristics ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|--|---|---|--------|------|------|-------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{V}, I_D = -1\text{mA}$ | -12 | - | - | V |
| Breakdown voltage temperature coefficient | $\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$ | $I_D = -1\text{mA}$ referenced to 25°C | - | 12 | - | mV/°C |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = -12\text{V}, V_{GS} = 0\text{V}$ | - | - | -10 | μA |
| Gate - Source leakage current | I_{GSS} | $V_{GS} = -8\text{V}, V_{DS} = 0\text{V}$ | - | - | -10 | μA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = -6\text{V}, I_D = -1\text{mA}$ | -0.3 | - | -1 | V |
| Gate threshold voltage temperature coefficient | $\frac{\Delta V_{(GS)th}}{\Delta T_j}$ | $I_D = -1\text{mA}$ referenced to 25°C | - | 2.6 | - | mV/°C |
| Static drain - source on - state resistance | $R_{DS(on)}^{*5}$ | $V_{GS} = -4.5\text{V}, I_D = -7.0\text{A}$ | - | 10 | 14 | mΩ |
| | | $V_{GS} = -2.5\text{V}, I_D = -3.5\text{A}$ | - | 13 | 19 | |
| | | $V_{GS} = -1.8\text{V}, I_D = -3.5\text{A}$ | - | 18 | 27 | |
| | | $V_{GS} = -1.5\text{V}, I_D = -1.4\text{A}$ | - | 24 | 48 | |
| | | $V_{GS} = -10\text{V}, I_D = -7\text{A}, T_j = 125^\circ\text{C}$ | - | 22 | 31 | |
| Gate input resistance | R_G | $f = 1\text{MHz}, \text{open drain}$ | - | 8.0 | - | Ω |
| Transconductance | g_{fs}^{*5} | $V_{DS} = 10\text{V}, I_D = -7.0\text{A}$ | 11 | 22 | - | S |

*1 Limited only by maximum temperature allowed.

*2 $P_w \leq 10\mu\text{s}$, Duty cycle $\leq 1\%$

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

*4 Mounted on a FR4 (20×20×0.8mm)

●Electrical characteristics($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|------------------------------|-------------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Input capacitance | C_{iss} | $V_{GS} = 0\text{V}$ | - | 7800 | - | pF |
| Output capacitance | C_{oss} | $V_{DS} = -6\text{V}$ | - | 900 | - | |
| Reverse transfer capacitance | C_{rss} | $f = 1\text{MHz}$ | - | 850 | - | |
| Turn - on delay time | $t_{d(on)}^{*5}$ | $V_{DD} \approx -6\text{V}, V_{GS} = -4.5\text{V}$ | - | 25 | - | ns |
| Rise time | t_r^{*5} | $I_D = -3.5\text{A}$ | - | 135 | - | |
| Turn - off delay time | $t_{d(off)}^{*5}$ | $R_L = 1.7\Omega$ | - | 550 | - | |
| Fall time | t_f^{*5} | $R_G = 10\Omega$ | - | 260 | - | |

●Gate Charge characteristics($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|----------------------|---------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Total gate charge | Q_g^{*5} | $V_{DD} \approx -6\text{V}, I_D = -7\text{A}$ $V_{GS} = -4.5\text{V}$ | - | 80 | - | nC |
| Gate - Source charge | Q_{gs}^{*5} | $V_{DD} \approx -6\text{V}, I_D = -7\text{A}$ | - | 12 | - | |
| Gate - Drain charge | Q_{gd}^{*5} | $V_{GS} = -4.5\text{V}$ | - | 13 | - | |

●Body diode electrical characteristics (Source-Drain)($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---------------|--|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Inverse diode continuous, forward current | I_s^{*1} | $T_a = 25^\circ\text{C}$ | - | - | -1 | A |
| Forward voltage | V_{SD}^{*5} | $V_{GS} = 0\text{V}, I_s = -7\text{A}$ | - | - | -1.2 | V |

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

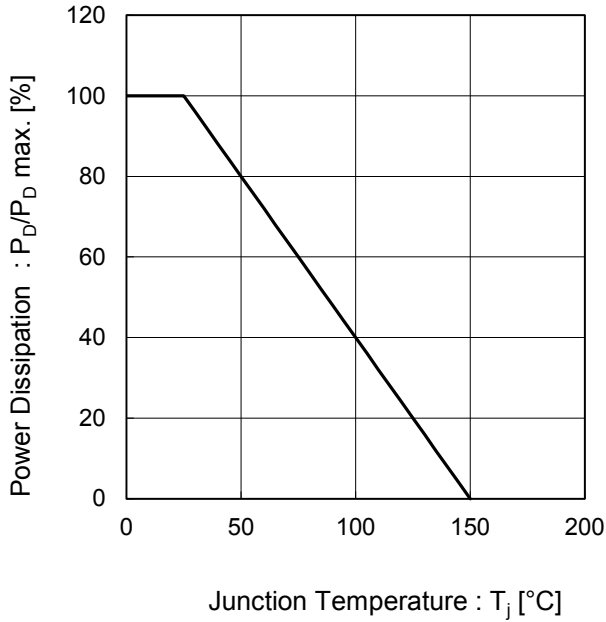


Fig.2 Maximum Safe Operating Area

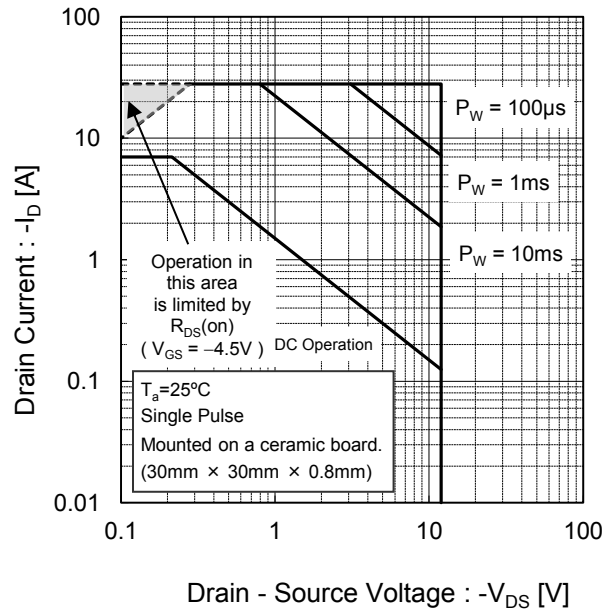


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

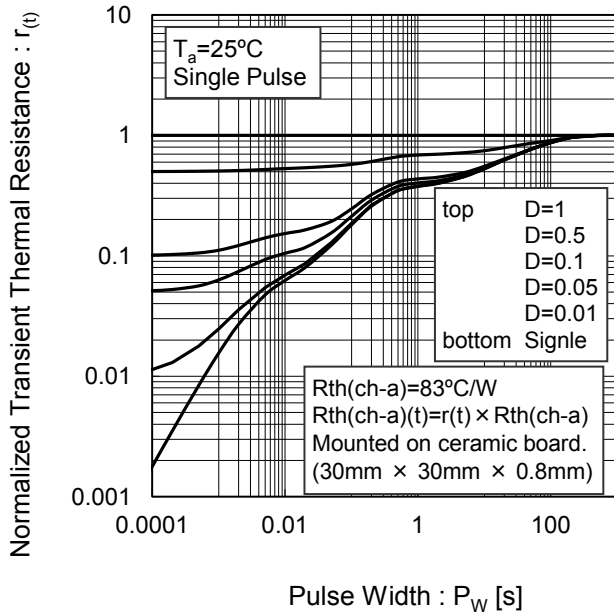
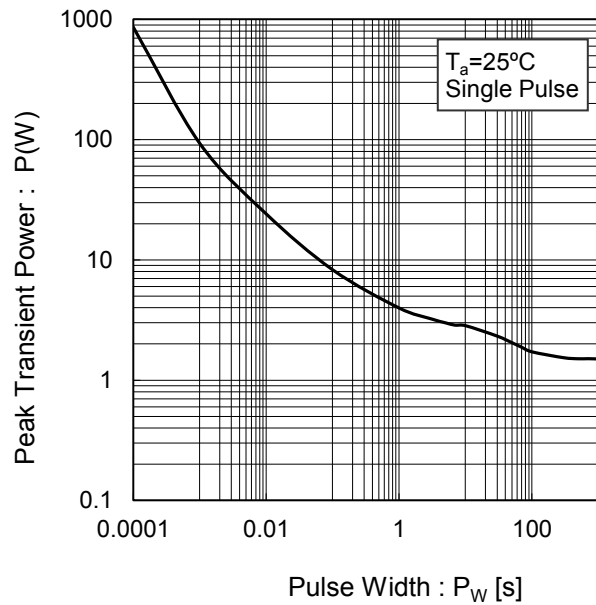


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

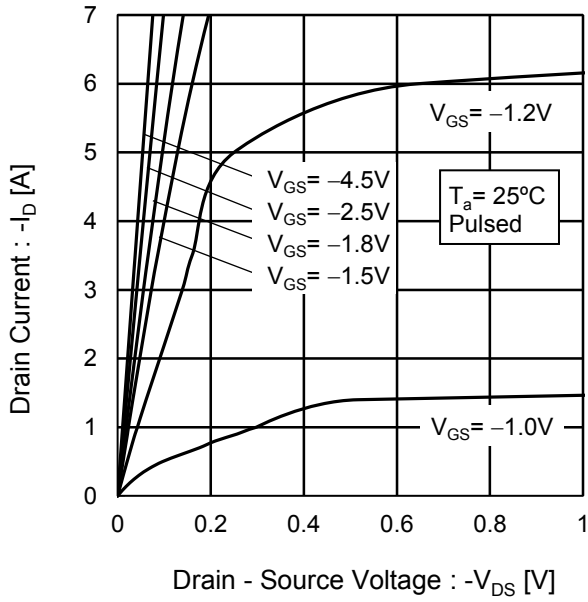
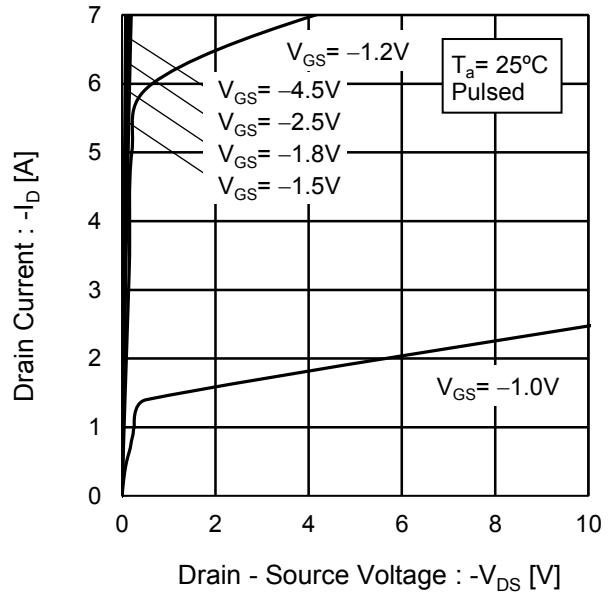


Fig.6 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.7 Breakdown Voltage vs. Junction Temperature

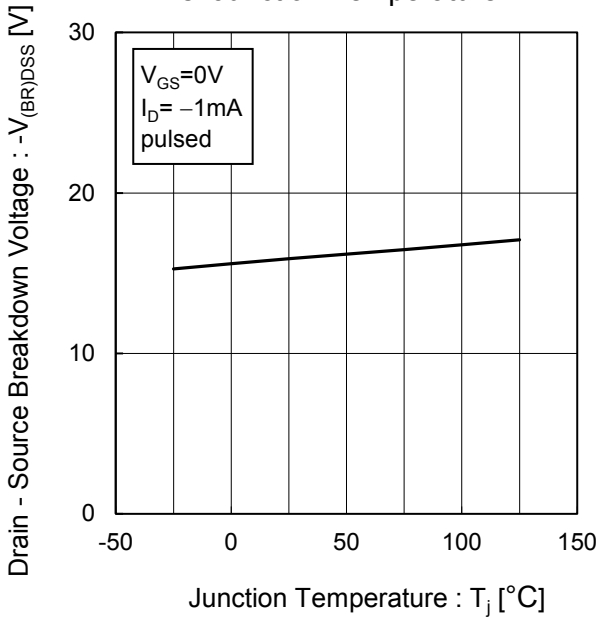


Fig.8 Typical Transfer Characteristics

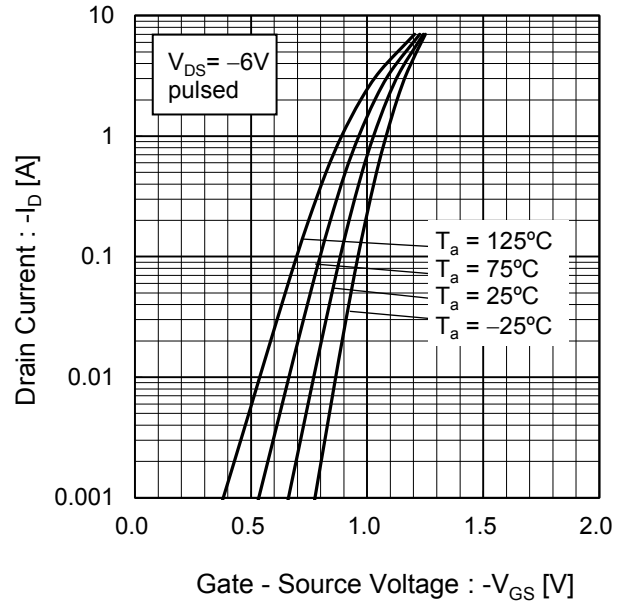


Fig.9 Gate Threshold Voltage vs. Junction Temperature

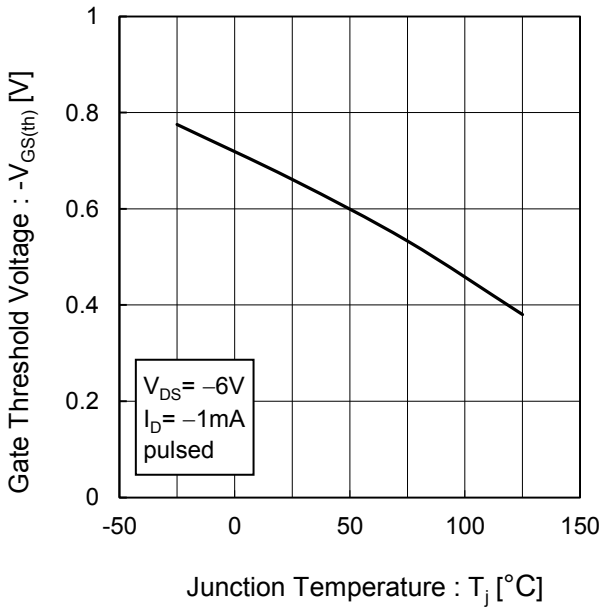
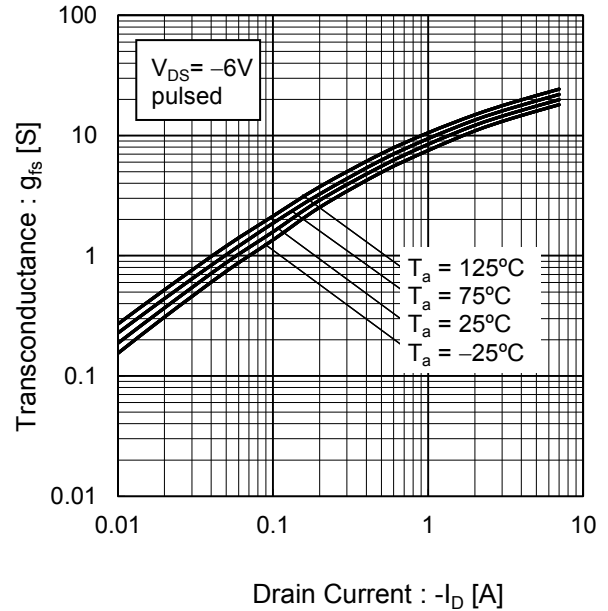


Fig.10 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.11 Drain Current Derating Curve

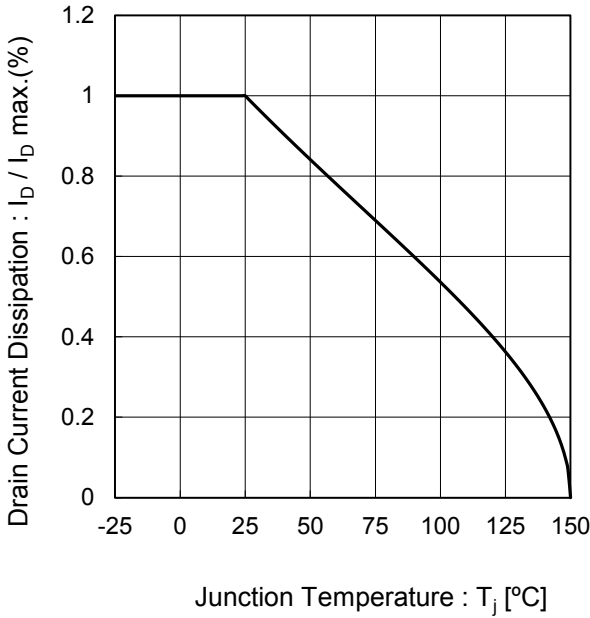


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

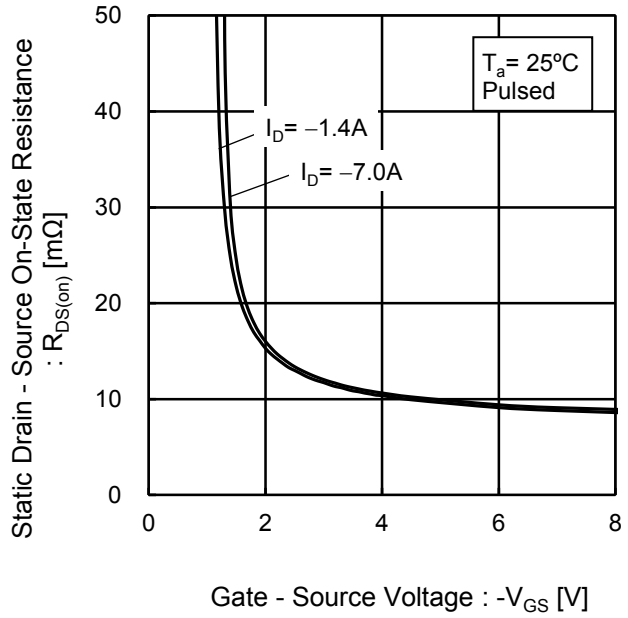


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current (I)

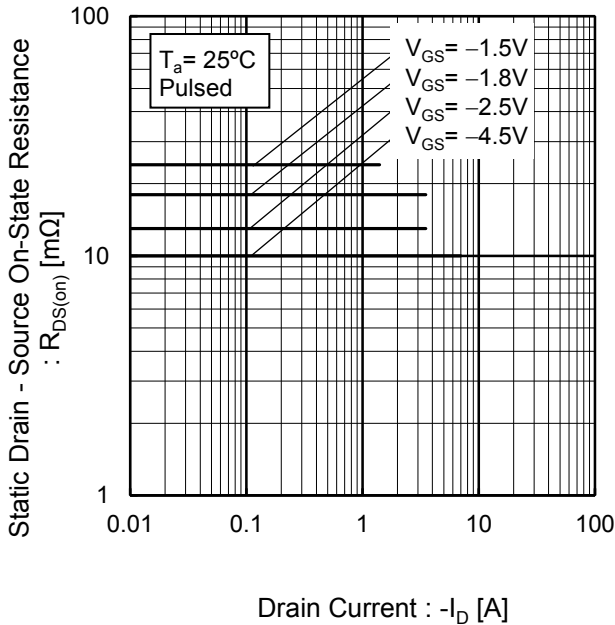
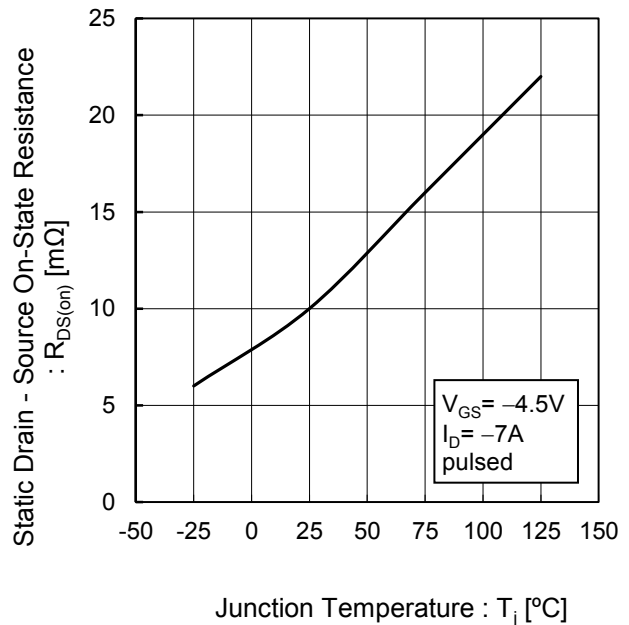


Fig.14 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

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

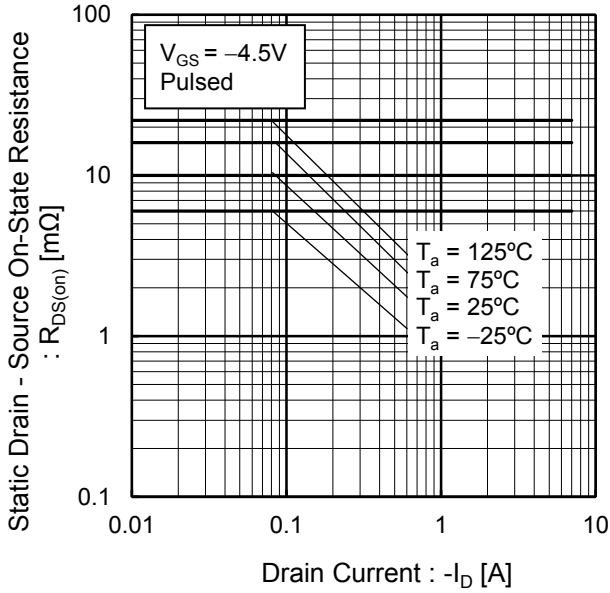


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)

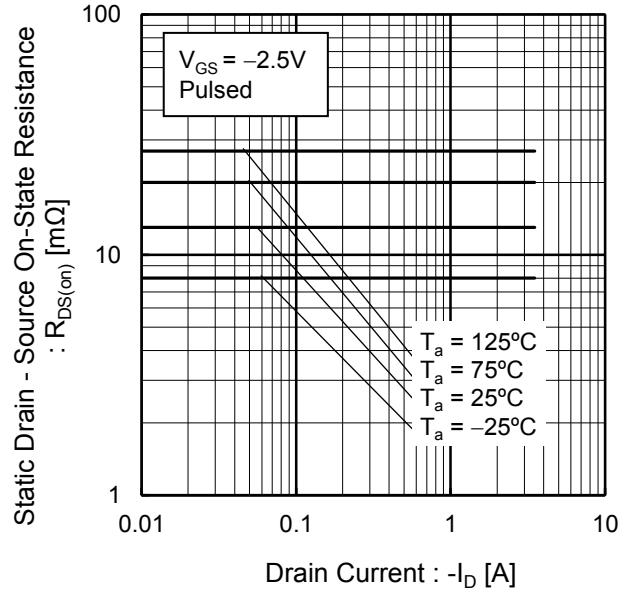


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current(IV)

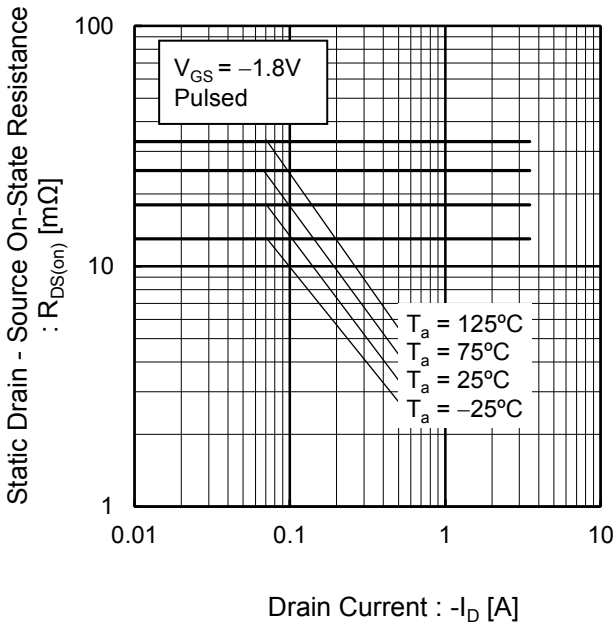
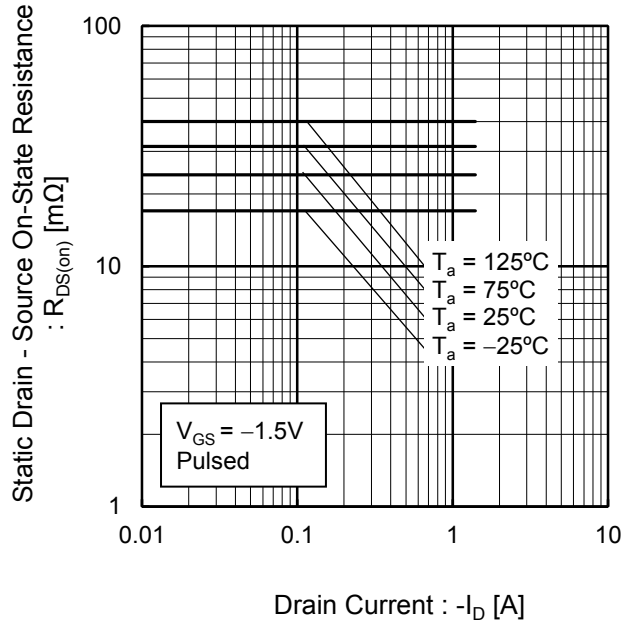


Fig.18 Static Drain - Source On - State Resistance vs. Drain Current(V)



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

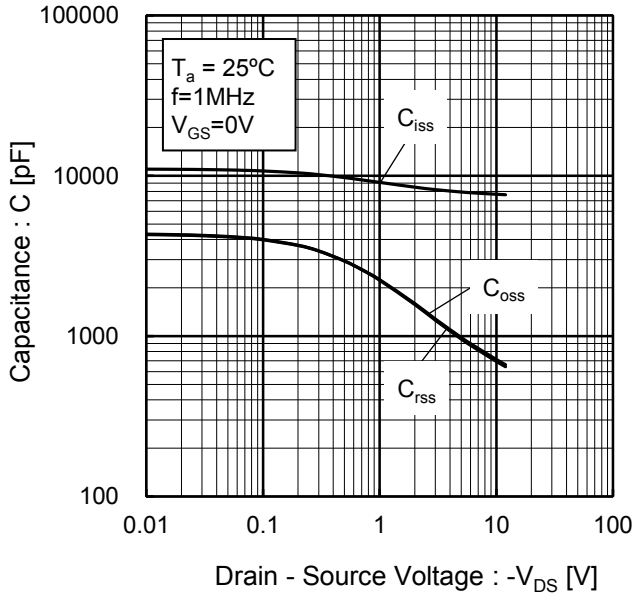


Fig.20 Switching Characteristics

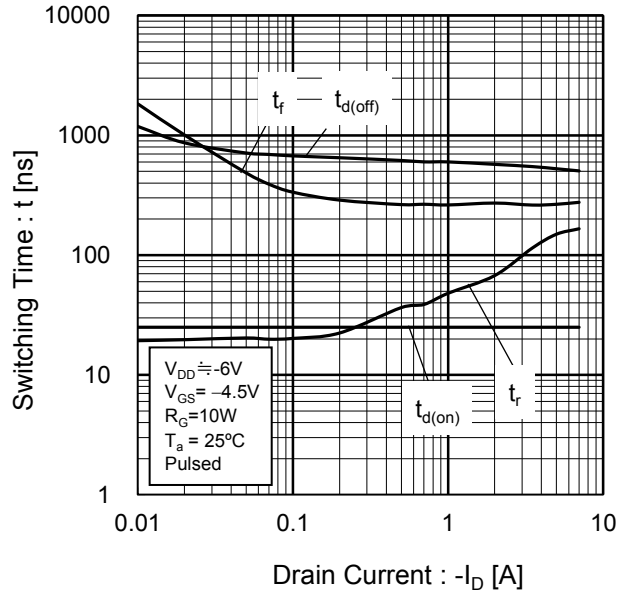


Fig.21 Dynamic Input Characteristics

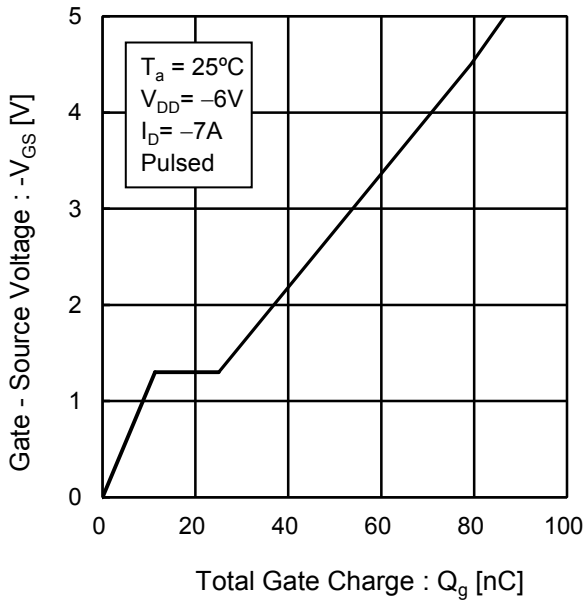
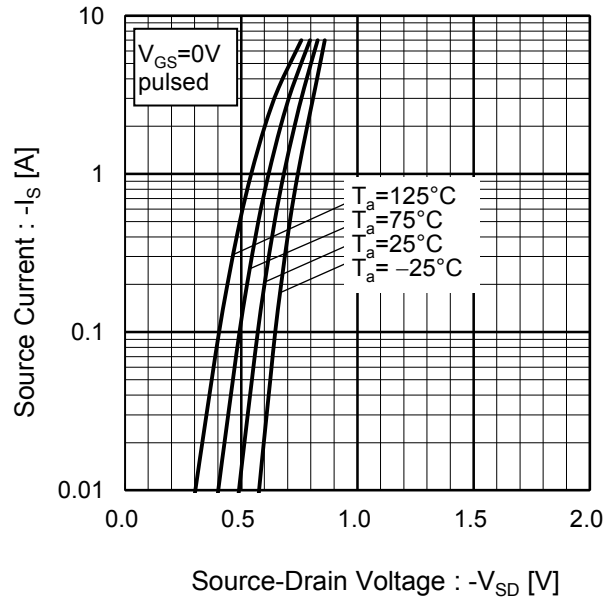


Fig.22 Source Current vs. Source Drain Voltage



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

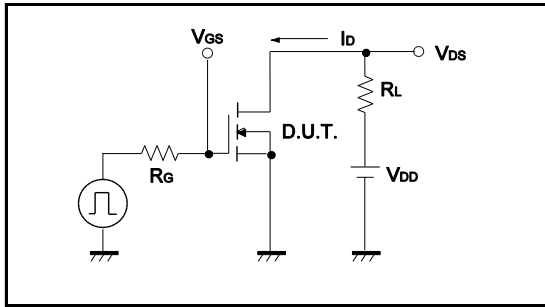


Fig.1-2 Switching Waveforms

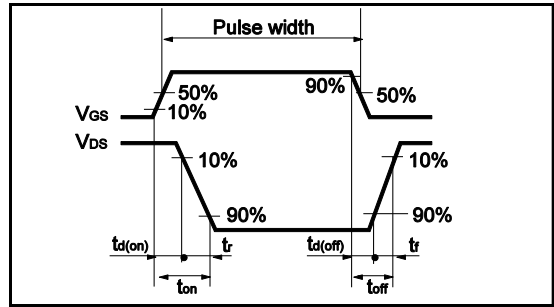


Fig.2-1 Gate Charge Measurement Circuit

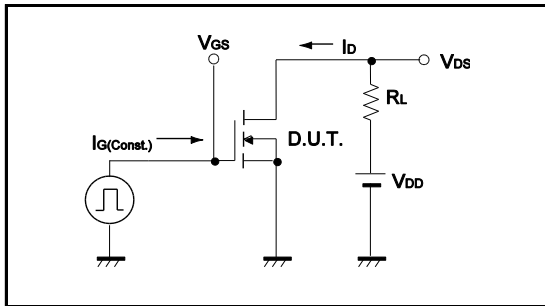
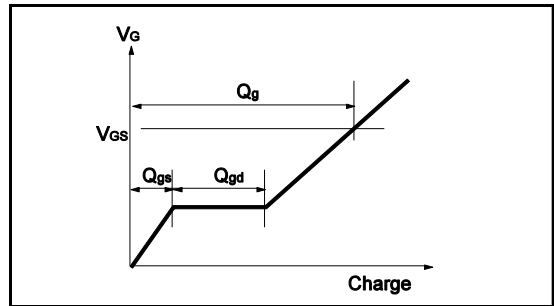
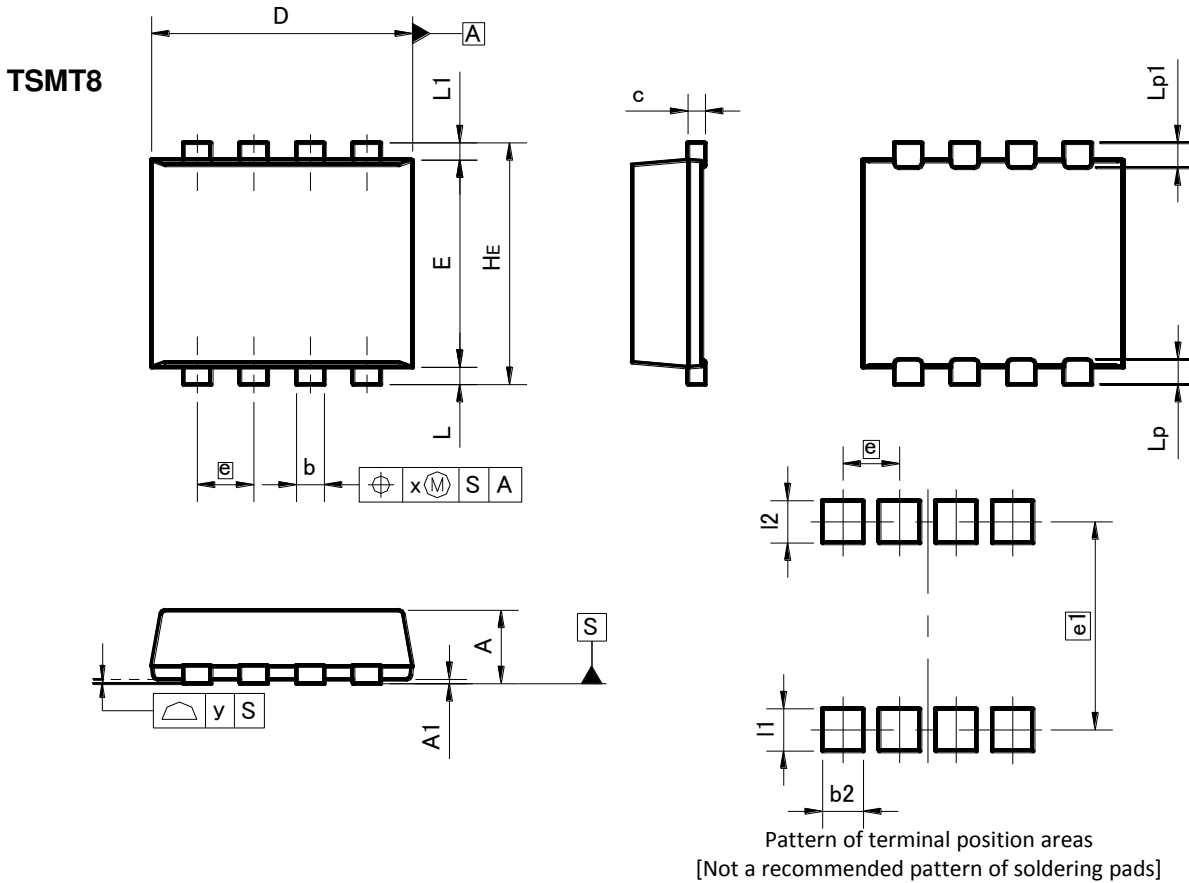


Fig.2-2 Gate Charge Waveform



●Dimensions (Unit : mm)



| 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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