

| | |
|---------------------|------|
| V_{DSS} | 250V |
| $R_{DS(on)}$ (Max.) | 8.8Ω |
| I_D | 0.5A |
| P_D | 1.0W |

●Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Drive circuits can be simple.
- 4) Parallel use is easy.
- 5) Pb-free lead plating ; RoHS compliant

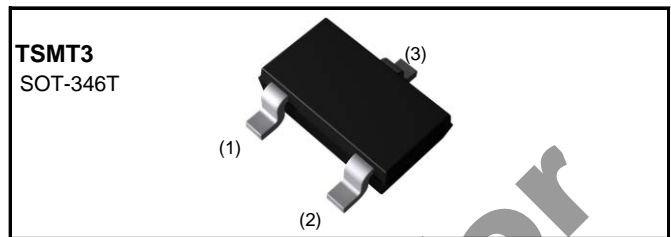
●Application

Switching Power Supply
 Automotive Motor Drive
 Automotive Solenoid Drive

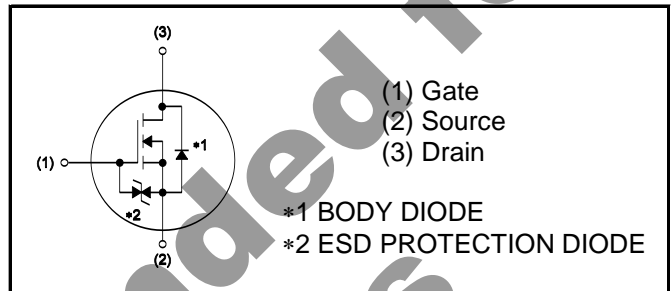
●Absolute maximum ratings ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Value | Unit | |
|------------------------------|---------------------------|-------------|-------|---|
| Drain - Source voltage | V_{DSS} | 250 | V | |
| Continuous drain current | $T_c = 25^\circ\text{C}$ | I_D^{*1} | ±0.5 | A |
| | $T_c = 100^\circ\text{C}$ | I_D^{*1} | ±0.27 | A |
| Pulsed drain current | $I_{D,pulse}^{*2}$ | ±2.0 | A | |
| Gate - Source voltage | V_{GSS} | ±20 | V | |
| Power dissipation | P_D^{*3} | 1.0 | W | |
| | P_D^{*4} | 0.54 | W | |
| Junction temperature | T_j | 150 | °C | |
| Range of storage temperature | T_{stg} | -55 to +150 | °C | |

●Outline



●Inner circuit



●Packaging specifications

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

● Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|--|-----------------|--------|------|------|------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - ambient | R_{thJA}^{*3} | - | - | 125 | °C/W |
| | R_{thJA}^{*4} | - | - | 232 | °C/W |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|-------------------|---|--------|------|----------|---------------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 1mA$ | 250 | - | - | V |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 250V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$ | - | - | 25 | μA |
| | | $V_{DS} = 250V, V_{GS} = 0V$ $T_j = 125^\circ\text{C}$ | - | - | 100 | |
| Gate - Source leakage current | I_{GSS} | $V_{GS} = \pm 20V, V_{DS} = 0V$ | - | - | ± 10 | μA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = 10V, I_D = 1mA$ | 1.0 | - | 3.0 | V |
| Static drain - source on - state resistance | $R_{DS(on)}^{*5}$ | $V_{GS} = 10V, I_D = 0.25A$ | - | 6.8 | 8.8 | Ω |
| | | $V_{GS} = 4.5V, I_D = 0.25A$ | - | 7.2 | 9.4 | |
| | | $V_{GS} = 4V, I_D = 0.25A$ | - | 7.4 | 9.6 | |
| | | $V_{GS} = 10V, I_D = 0.25A$ $T_j = 125^\circ\text{C}$ | - | 12.8 | 18.0 | |
| Forward transfer admittance | g_{fs} | $V_{DS} = 10V, I_D = 0.25A$ | 0.21 | 0.42 | - | S |

●Electrical characteristics (T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|------------------------------|-----------------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Input capacitance | C _{iss} | V _{GS} = 0V | - | 70 | - | pF |
| Output capacitance | C _{oss} | V _{DS} = 25V | - | 10 | - | |
| Reverse transfer capacitance | C _{rss} | f = 1MHz | - | 3 | - | |
| Turn - on delay time | t _{d(on)} ^{*5} | V _{DD} ≈ 125V, V _{GS} = 10V | - | 6 | - | ns |
| Rise time | t _r ^{*5} | I _D = 0.25A | - | 10 | - | |
| Turn - off delay time | t _{d(off)} ^{*5} | R _L = 500Ω | - | 21 | - | |
| Fall time | t _f ^{*5} | R _G = 10Ω | - | 90 | - | |

●Gate Charge characteristics (T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|----------------------|-------------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Total gate charge | Q _g ^{*5} | V _{DD} ≈ 125V | - | 3.5 | - | nC |
| Gate - Source charge | Q _{gs} ^{*5} | I _D = 0.5A | - | 0.55 | - | |
| Gate - Drain charge | Q _{gd} ^{*5} | V _{GS} = 10V | - | 1.0 | - | |
| Gate plateau voltage | V _(plateau) | V _{DD} ≈ 125V, I _D = 0.5A | - | 3.0 | - | V |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---------------------------|-------------------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Continuous source current | I _s ^{*1} | T _c = 25°C | - | - | 0.5 | A |
| Pulsed source current | I _{SM} ^{*2} | | - | - | 2.0 | A |
| Forward voltage | V _{SD} ^{*5} | V _{GS} = 0V, I _S = 0.5A | - | - | 1.2 | V |
| Reverse recovery time | t _{rr} ^{*5} | I _S = 0.25A | - | 60 | - | ns |
| Reverse recovery charge | Q _{rr} ^{*5} | di/dt = 100A/μs | - | 60 | - | nC |

*1 Limited only by maximum temperature allowed.

*2 P_w ≤ 10μs, Duty cycle ≤ 1%

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

*4 Mounted on a FR4 (12×20×0.8mm)

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

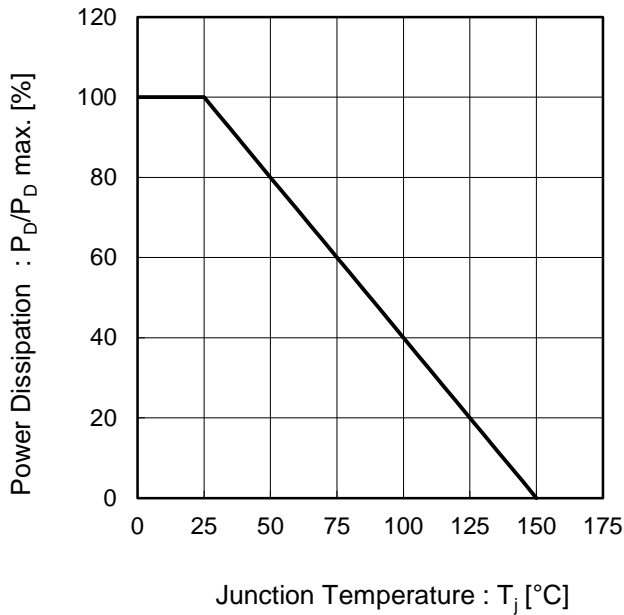
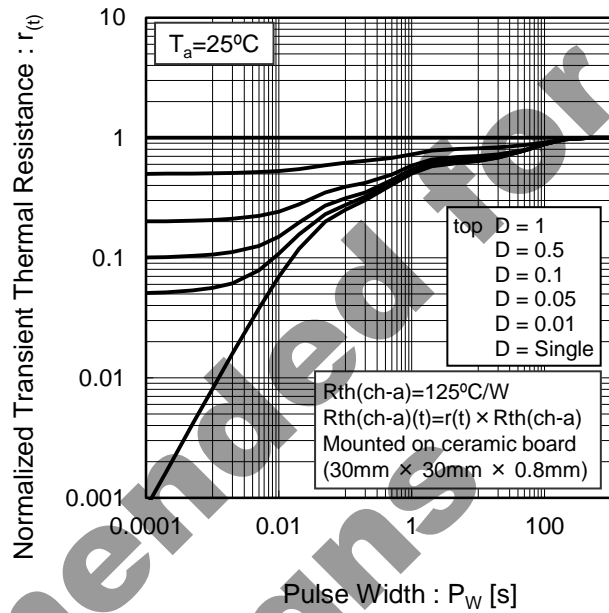


Fig.2 Normalized Transient Thermal Resistance vs. Pulse Width



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●Electrical characteristic curves

Fig.3 Typical Output Characteristics(I)

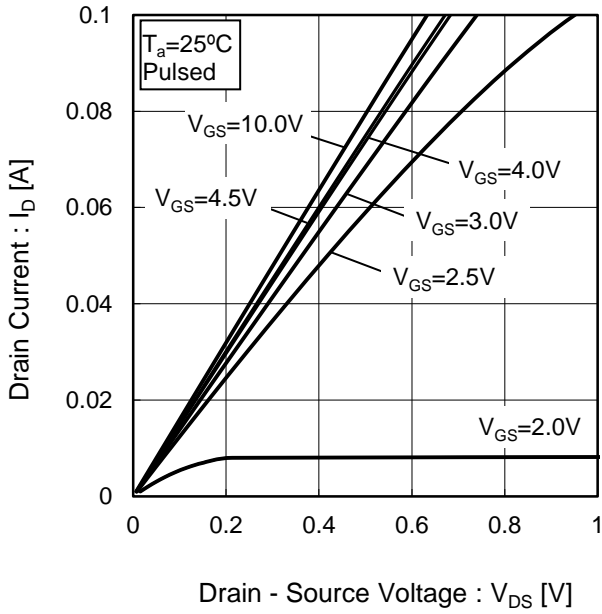
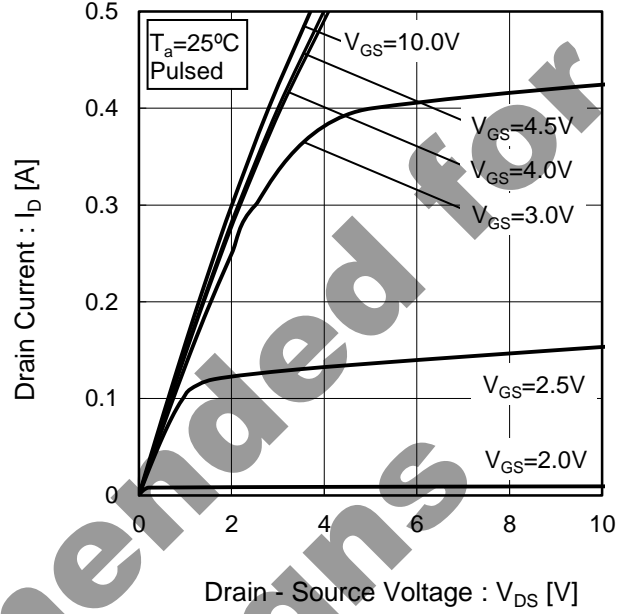


Fig.4 Typical Output Characteristics(II)



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●Electrical characteristic curves

Fig.5 Breakdown Voltage vs. Junction Temperature

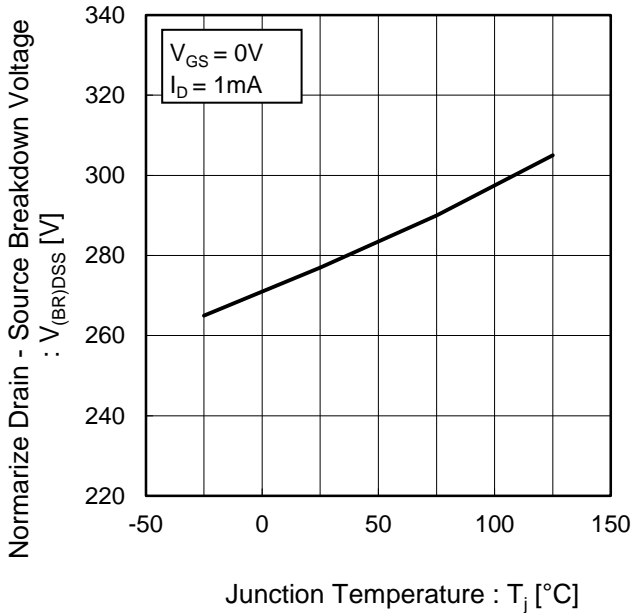


Fig.6 Typical Transfer Characteristics

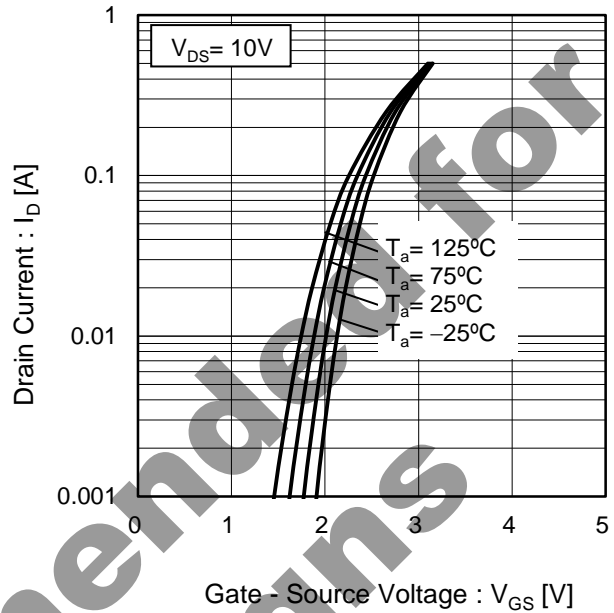


Fig.7 Gate Threshold Voltage vs. Junction Temperature

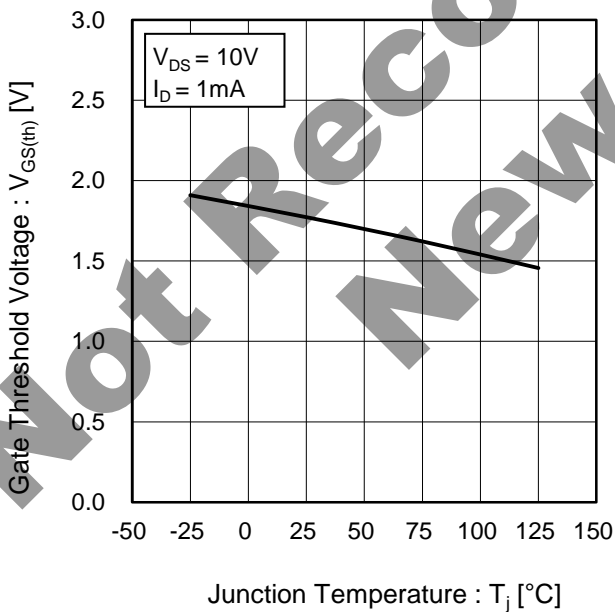
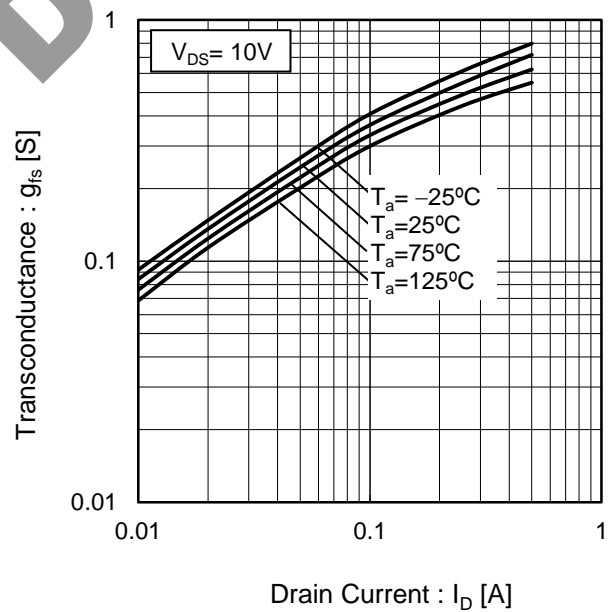


Fig.8 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.9 Static Drain - Source On - State Resistance vs. Gate Source Voltage

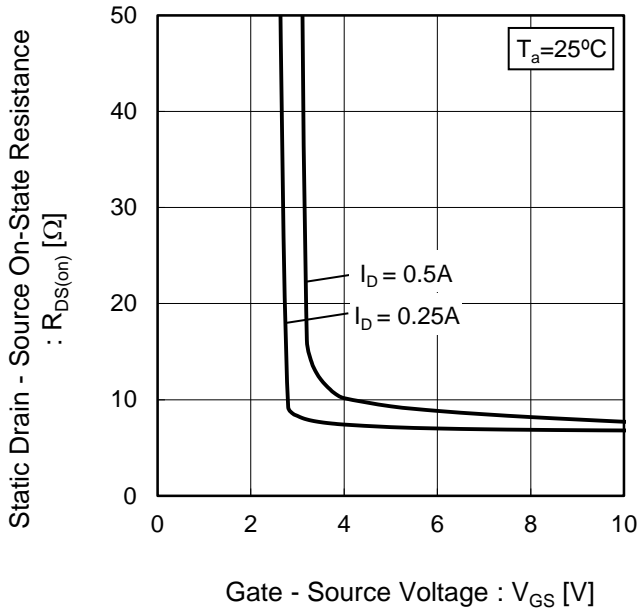


Fig.10 Static Drain - Source On - State Resistance vs. Drain Current(I)

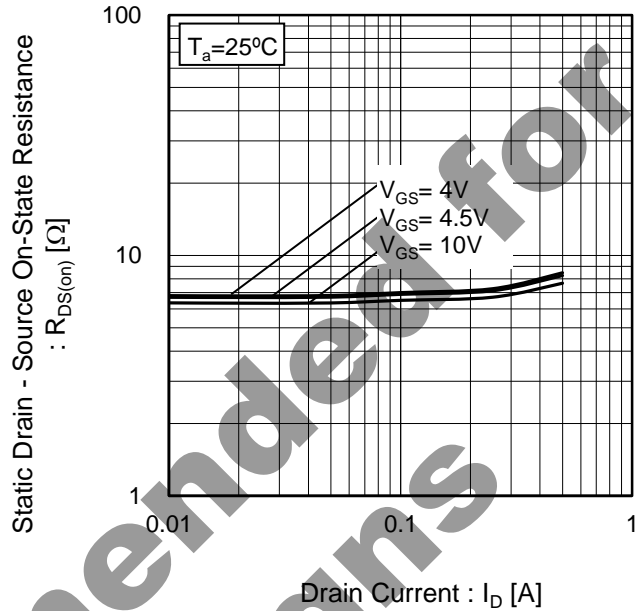
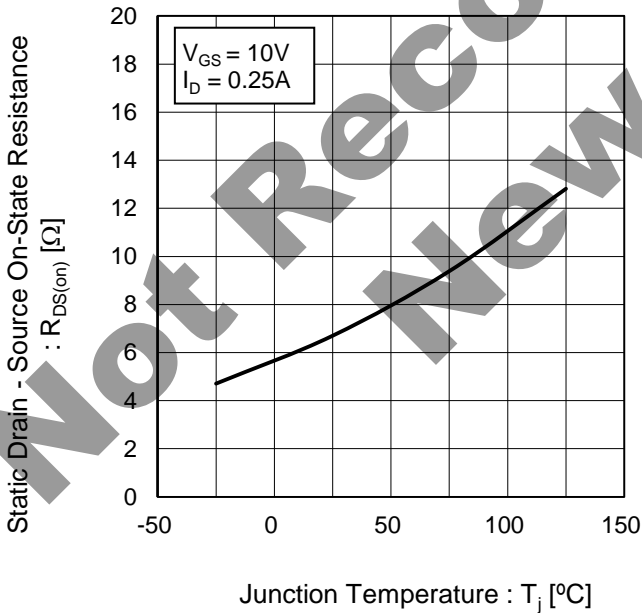


Fig.11 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

Fig.12 Static Drain - Source On - State Resistance vs. Drain Current(I)

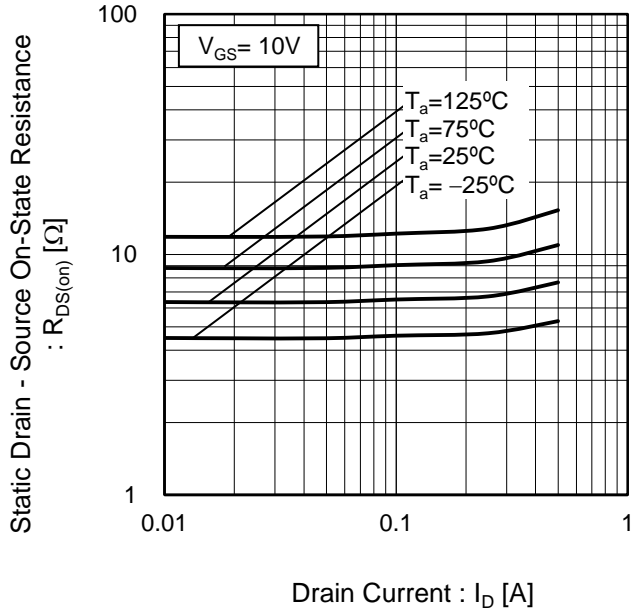


Fig.13 Static Drain - Source On - State Resistance vs. Drain Current(II)

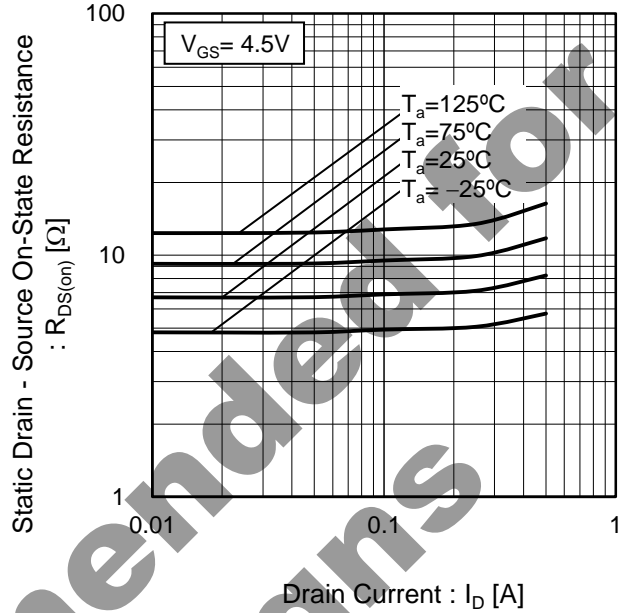


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current(III)

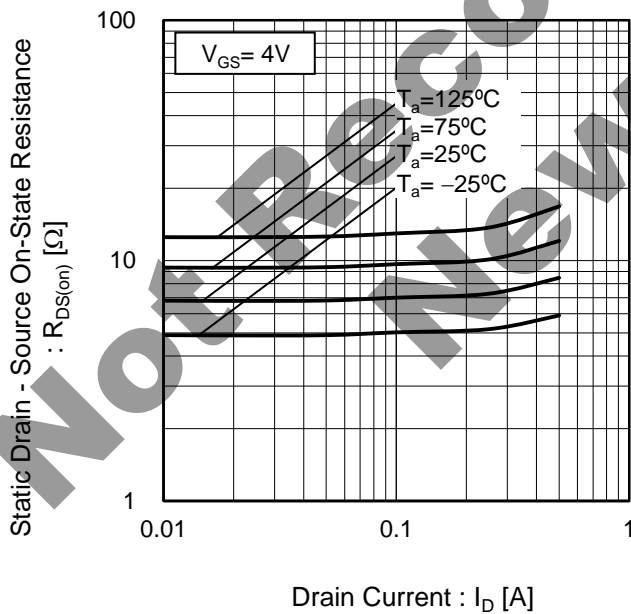
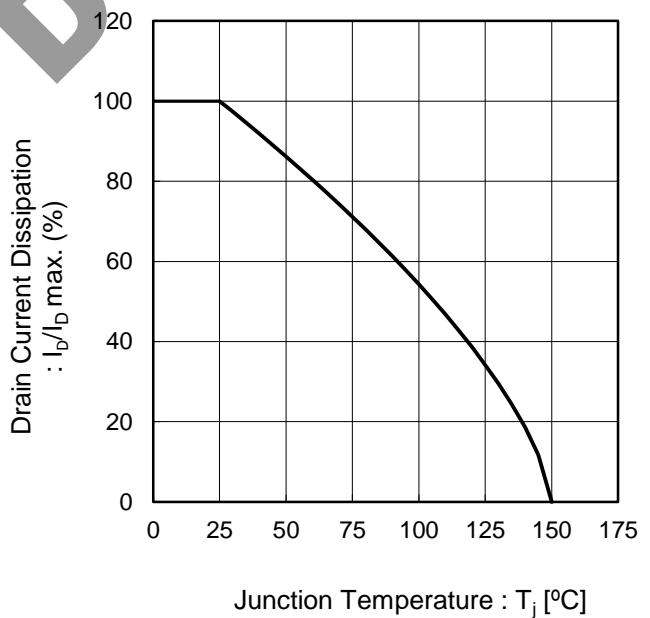


Fig.15 Drain Current Derating Curve



●Electrical characteristic curves

Fig.16 Typical Capacitance vs. Drain - Source Voltage

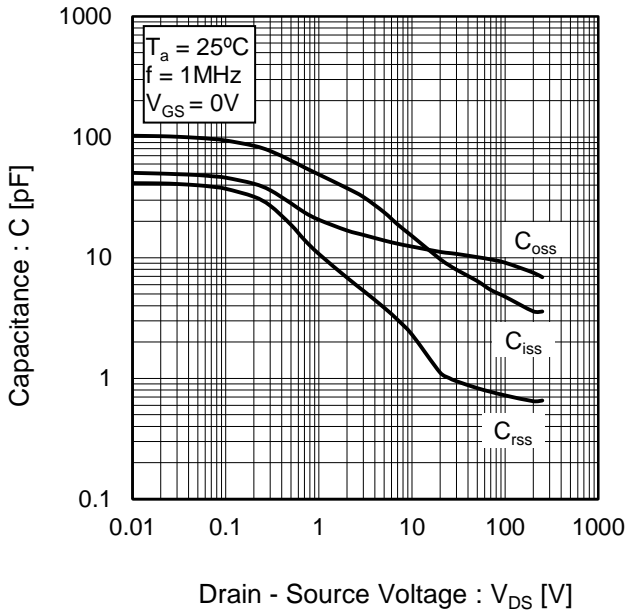


Fig.17 Switching Characteristics

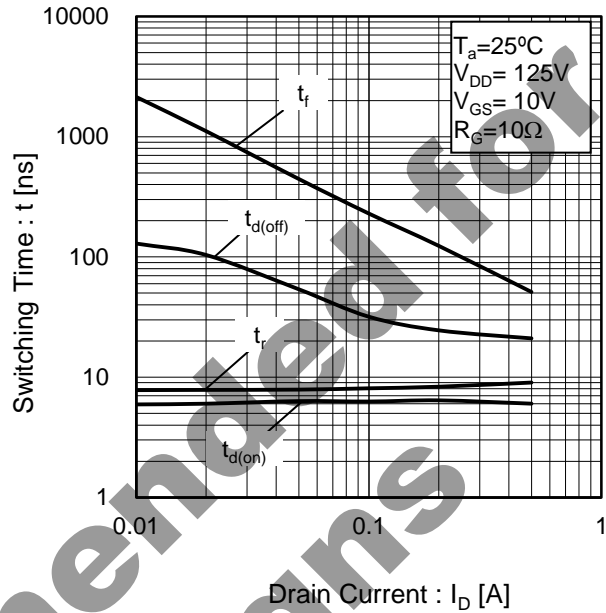
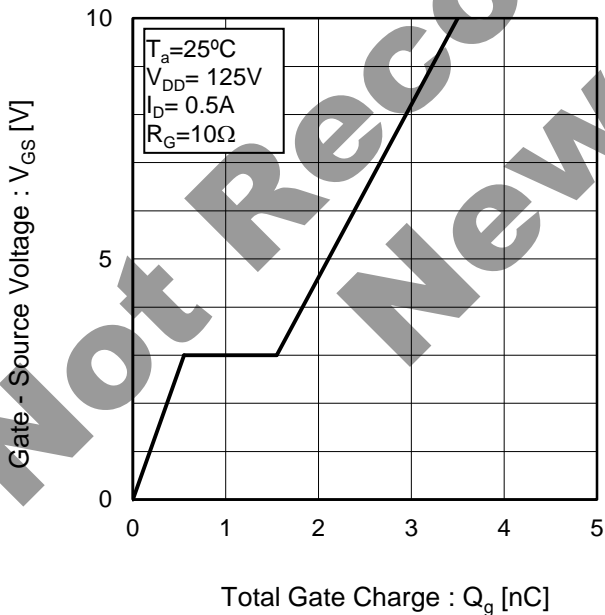


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.19 Source Current vs. Source - Drain Voltage

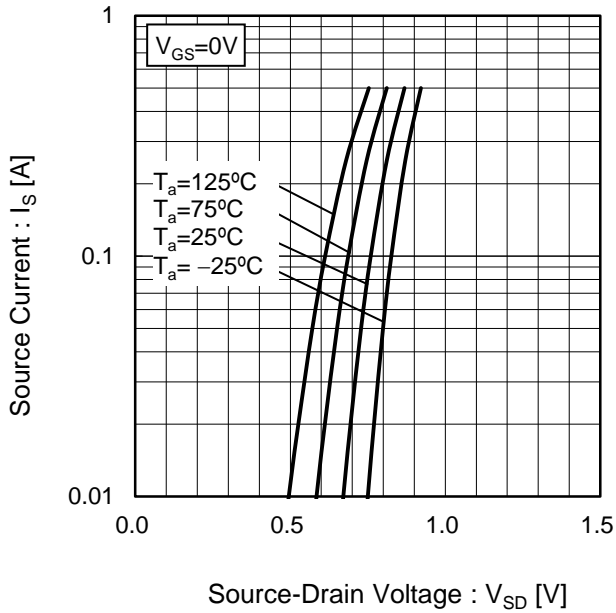
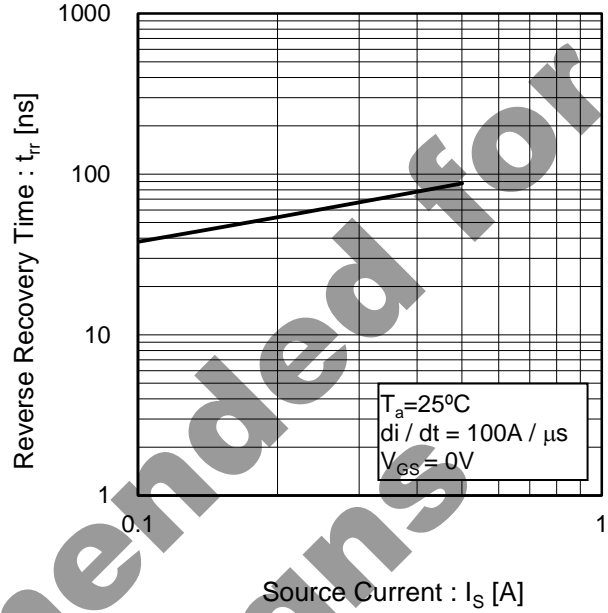


Fig20 Reverse Recovery Time vs. Source Current



Not Recommended for New Designs

●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

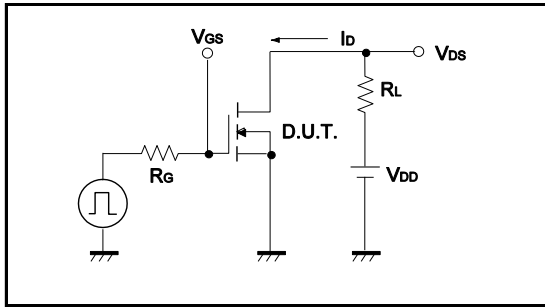


Fig.1-2 Switching Waveforms

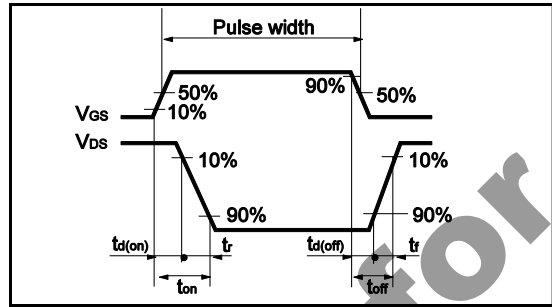


Fig.2-1 Gate Charge Measurement Circuit

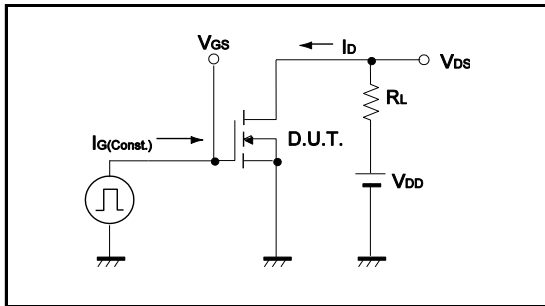
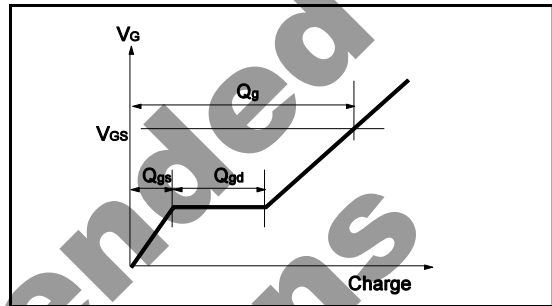


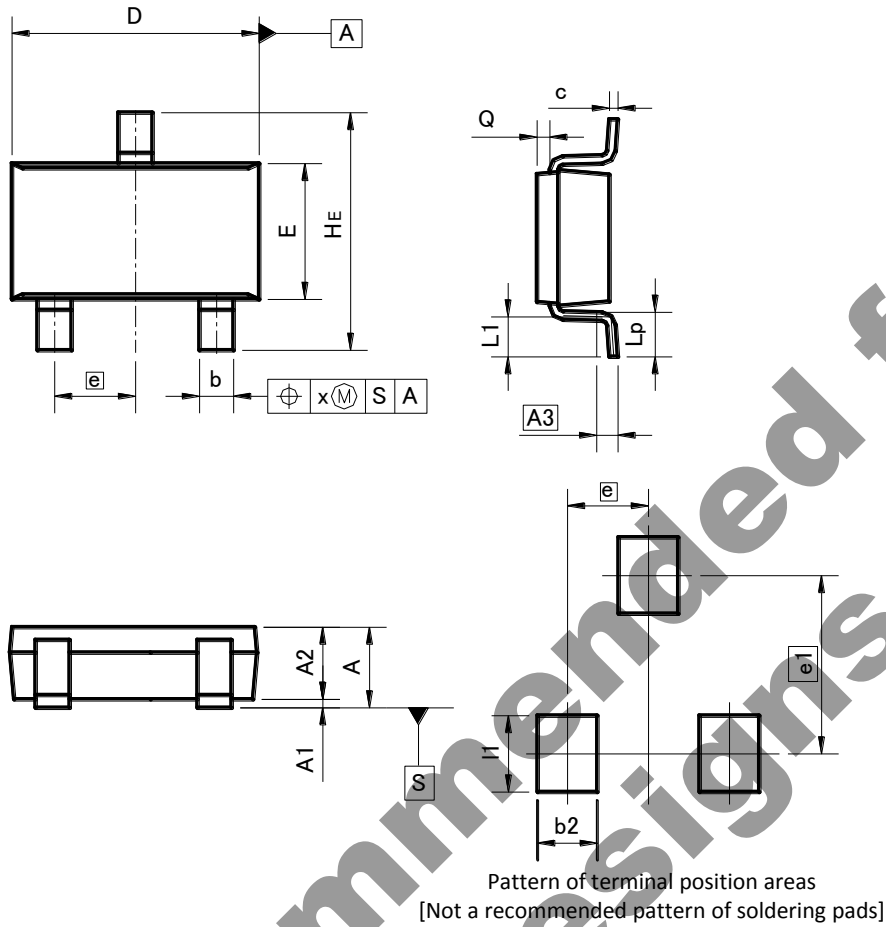
Fig.2-2 Gate Charge Waveform



Not Recommended for New Designs

●Dimensions (Unit : mm)

TSMT3



| DIM | MILIMETERS | | INCHES | |
|-----|------------|------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | - | 1.00 | - | 0.039 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| A2 | 0.75 | 0.95 | 0.030 | 0.037 |
| A3 | 0.25 | | 0.010 | |
| b | 0.35 | 0.50 | 0.014 | 0.020 |
| c | 0.10 | 0.26 | 0.004 | 0.010 |
| D | 2.80 | 3.00 | 0.110 | 0.118 |
| E | 1.50 | 1.80 | 0.059 | 0.071 |
| e | 0.95 | | 0.037 | |
| HE | 2.60 | 3.00 | 0.102 | 0.118 |
| L1 | 0.30 | 0.60 | 0.012 | 0.024 |
| Lp | 0.40 | 0.70 | 0.016 | 0.028 |
| Q | 0.05 | 0.25 | 0.002 | 0.010 |
| x | - | 0.20 | - | 0.008 |

| DIM | MILIMETERS | | INCHES | |
|-----|------------|------|--------|-------|
| | MIN | MAX | MIN | MAX |
| b2 | - | 0.70 | - | 0.028 |
| e1 | 2.10 | | 0.083 | |
| l1 | - | 0.90 | - | 0.035 |

Dimension in mm / inches

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