

| | |
|--------------------|-------|
| V_{DSS} | -30V |
| $R_{DS(on)}(Max.)$ | 50mΩ |
| I_D | ±3.5A |
| P_D | 1W |

●Features

- 1) Low on - resistance.
- 2) Small Surface Mount Package (TSMT3).
- 3) Pb-free lead plating ; RoHS compliant.

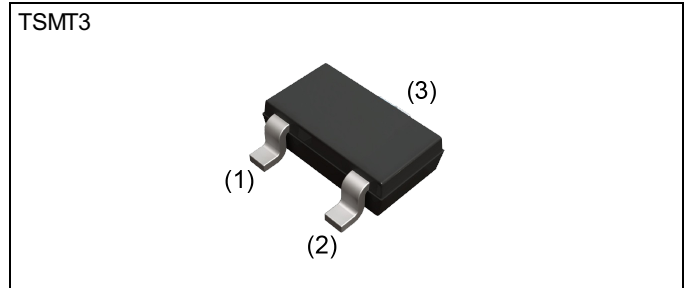
●Application

Switching

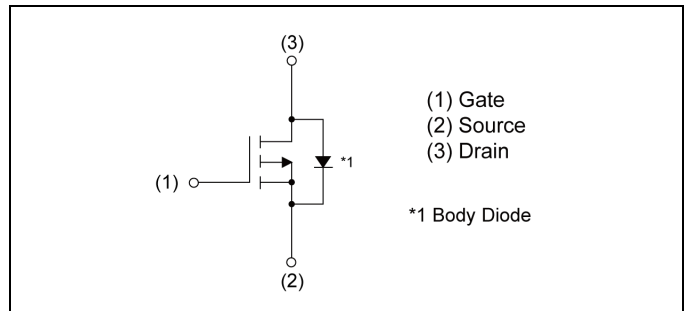
●Absolute maximum ratings ($T_a = 25^\circ C$)

| Parameter | Symbol | Value | Unit |
|--------------------------------|--------------------|-------------|------|
| Drain - Source voltage | V_{DSS} | -30 | V |
| Continuous drain current | I_D^{*1} | ±3.5 | A |
| Pulsed drain current | $I_{D,pulse}^{*2}$ | ±12 | A |
| Gate - Source voltage | V_{GSS} | ±20 | V |
| Avalanche energy, single pulse | E_{AS}^{*3} | 9.0 | mJ |
| Avalanche current | I_{AS}^{*3} | -3.5 | A |
| Power dissipation | P_D^{*4} | 1 | W |
| Junction temperature | T_j | 150 | °C |
| Range of storage temperature | T_{stg} | -55 to +150 | °C |

●Outline



●Inner circuit



●Packaging specifications

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

● Thermal resistance

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

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|--|---|--|--------|------|------|-------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = -1mA$ | -30 | - | - | V |
| Breakdown voltage temperature coefficient | $\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$ | $I_D = -1mA$ referenced to 25°C | - | -22 | - | mV/°C |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = -30V, V_{GS} = 0V$ | - | - | -1 | μA |
| Gate - Source leakage current | I_{GSS} | $V_{GS} = \pm 20V, V_{DS} = 0V$ | - | - | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = -1mA$ | -1.0 | - | -2.5 | V |
| Gate threshold voltage temperature coefficient | $\frac{\Delta V_{GS(th)}}{\Delta T_j}$ | $I_D = -1mA$ referenced to 25°C | - | 2.9 | - | mV/°C |
| Static drain - source on - state resistance | $R_{DS(on)}^{*5}$ | $V_{GS} = -10V, I_D = -3.5A$ | - | 38 | 50 | mΩ |
| | | $V_{GS} = -4.5V, I_D = -3.5A$ | - | 54 | 70 | |
| Transconductance | g_{fs}^{*5} | $V_{DS} = -5V, I_D = -3.5A$ | 3.2 | - | - | S |

*1 Limited only by maximum temperature allowed.

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

*3 $L \approx 1\text{mH}$, $V_{DD} = -15V$, $R_G = 25\Omega$, STARTING $T_{ch} = 25^\circ\text{C}$ Fig.3-1,3-2

*4 Mounted on a ceramic boad (30×30×0.8mm)

*5 Pulsed

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|------------------------------|-------------------|--------------------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Input capacitance | C_{iss} | $V_{GS} = 0V$ | - | 475 | - | pF |
| Output capacitance | C_{oss} | $V_{DS} = -15V$ | - | 85 | - | |
| Reverse transfer capacitance | C_{rss} | $f = 1\text{MHz}$ | - | 65 | - | |
| Turn - on delay time | $t_{d(on)}^{*5}$ | $V_{DD} \approx -15V, V_{GS} = -10V$ | - | 8 | - | ns |
| Rise time | t_r^{*5} | $I_D = -1.8A$ | - | 12 | - | |
| Turn - off delay time | $t_{d(off)}^{*5}$ | $R_L = 8.2\Omega$ | - | 40 | - | |
| Fall time | t_f^{*5} | $R_G = 10\Omega$ | - | 20 | - | |

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

| Parameter | Symbol | Conditions | | Values | | | Unit | |
|----------------------|---------------|-----------------------|---------------|------------------|------|------|------|----|
| | | | | Min. | Typ. | Max. | | |
| Total gate charge | Q_g^{*5} | $V_{DD} \approx -15V$ | $I_D = -3.5A$ | $V_{GS} = -10V$ | - | 10 | - | nC |
| Gate - Source charge | Q_{gs}^{*5} | | | $V_{GS} = -4.5V$ | - | 5.2 | - | |
| Gate - Drain charge | Q_{gd}^{*5} | | | $V_{GS} = -4.5V$ | - | 1.6 | - | |
| | | | | | - | 1.9 | - | |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---------------------------------------|---------------|----------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Body diode continuous forward current | I_S^{*1} | $T_a = 25^\circ\text{C}$ | - | - | -0.8 | A |
| Body diode pulse current | I_{SP}^{*2} | | - | - | -12 | |
| Forward voltage | V_{SD}^{*5} | $V_{GS} = 0V, I_S = -0.8A$ | - | - | -1.2 | V |

● Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve



Fig.2 Maximum Safe Operating Area

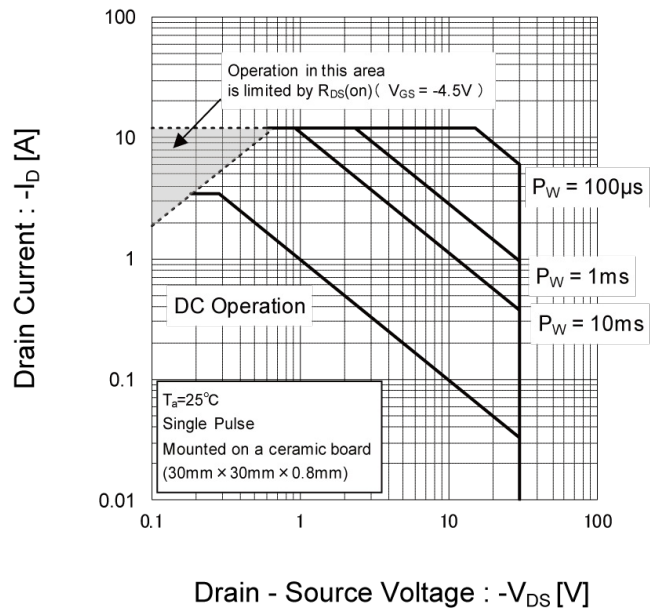


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

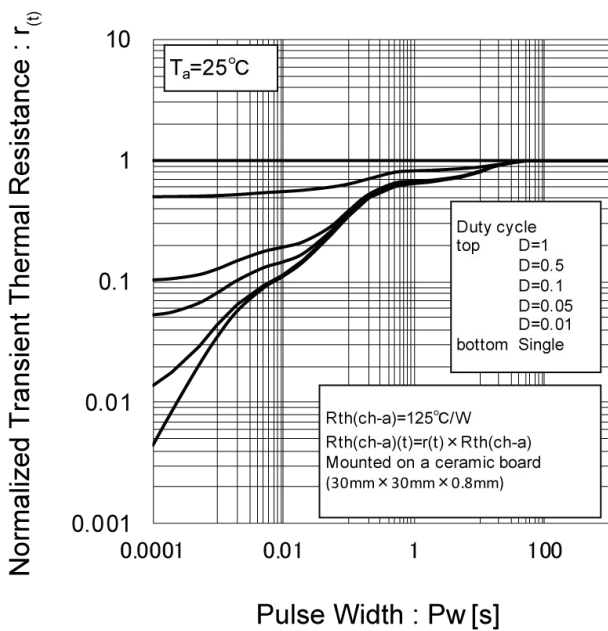
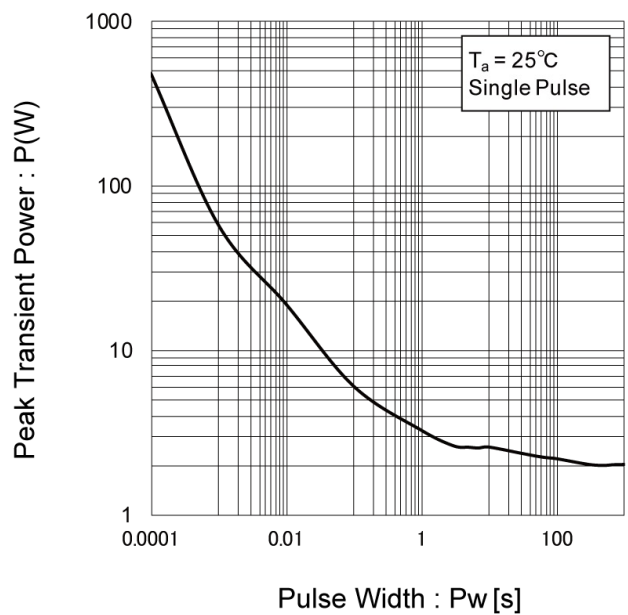


Fig.4 Single Pulse Maximum Power dissipation



● Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

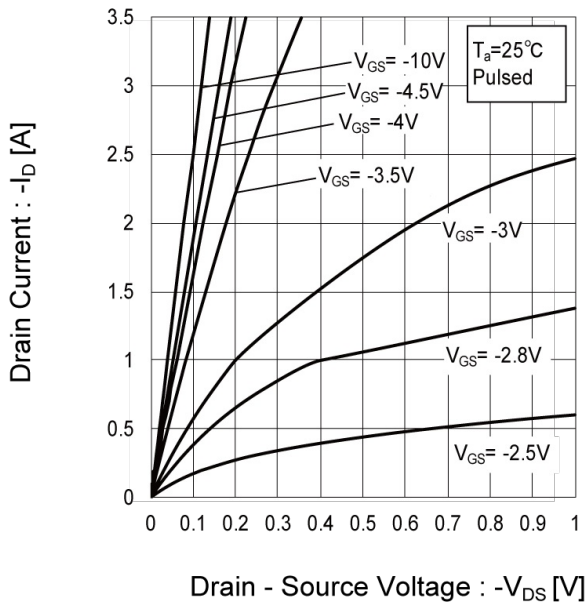


Fig.6 Typical Output Characteristics(II)

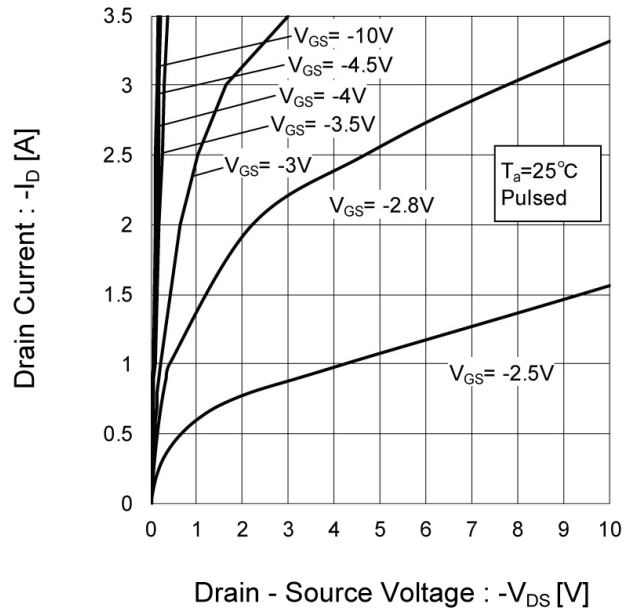
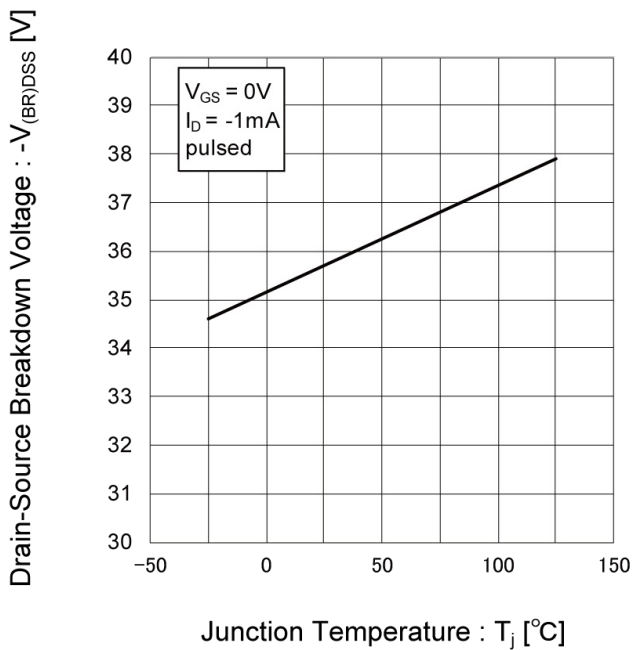


Fig.7 Breakdown Voltage vs. Junction Temperature



● Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

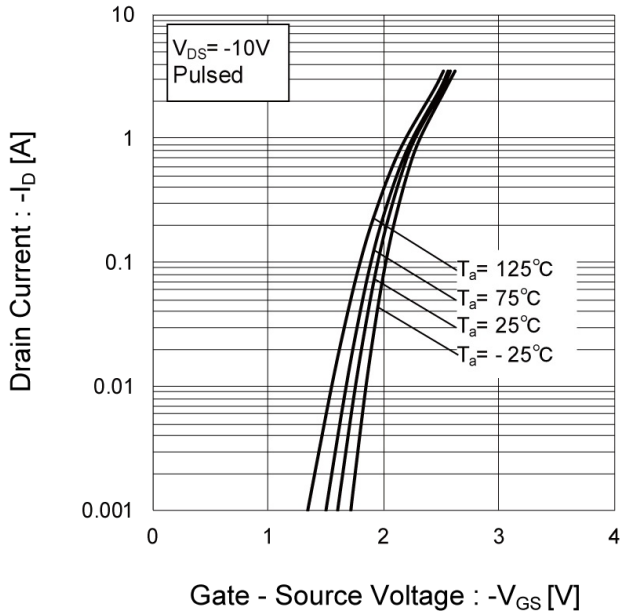


Fig.9 Gate Threshold Voltage vs. Junction Temperature

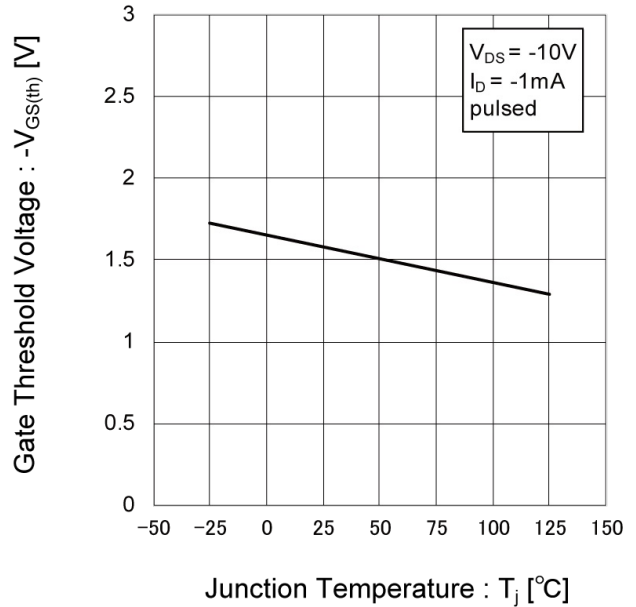
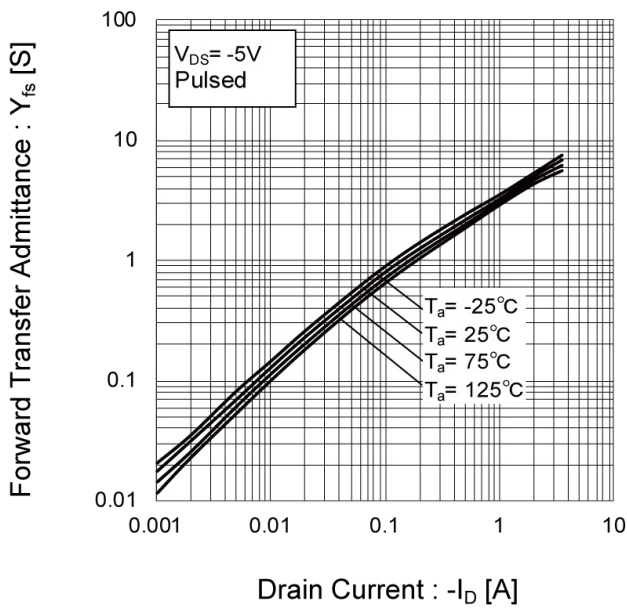


Fig.10 Transconductance vs. Drain Current



● Electrical characteristic curves

Fig.11 Drain Current Derating Curve

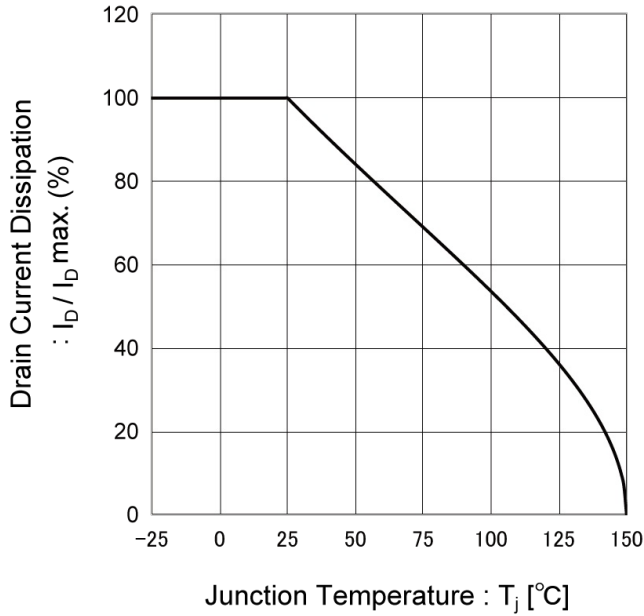


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

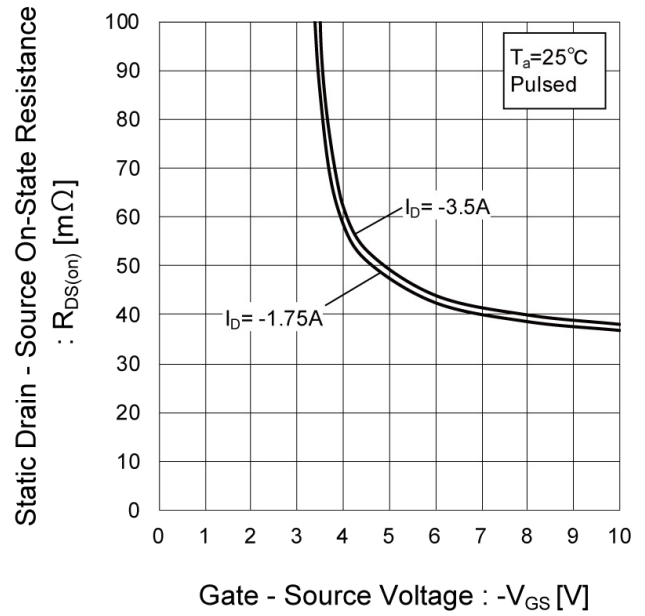
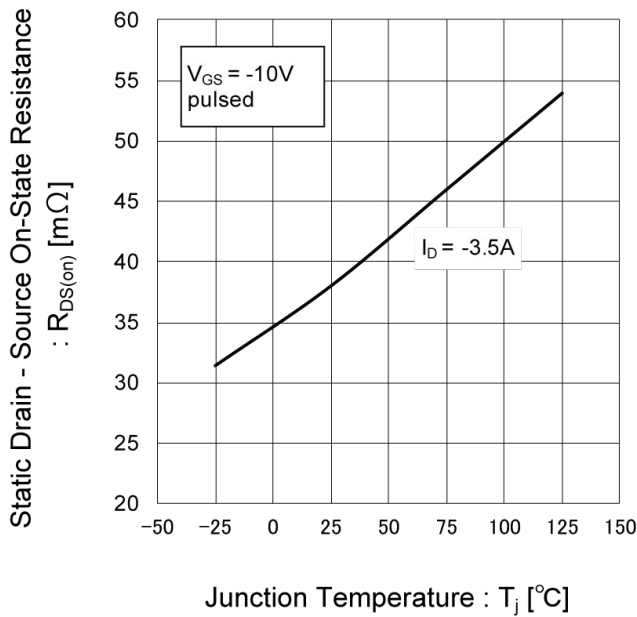


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature



● Electrical characteristic curves

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

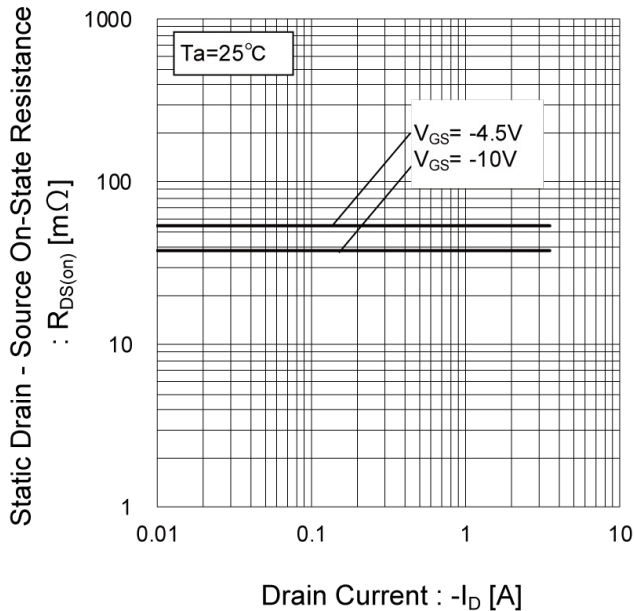


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

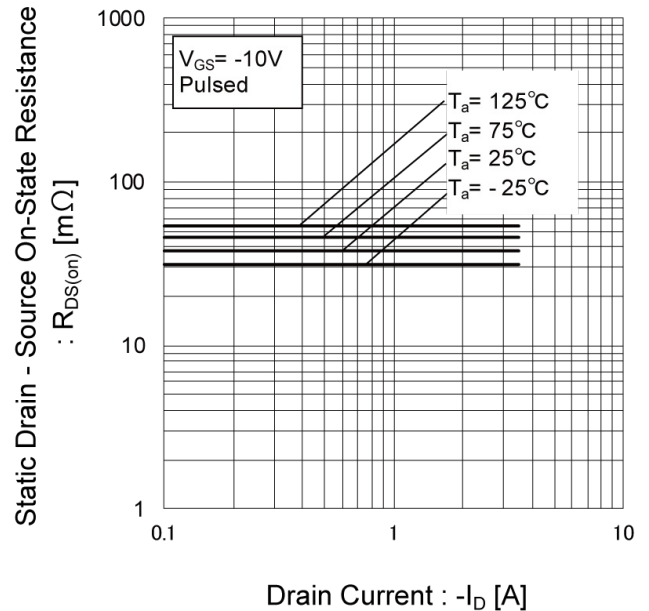
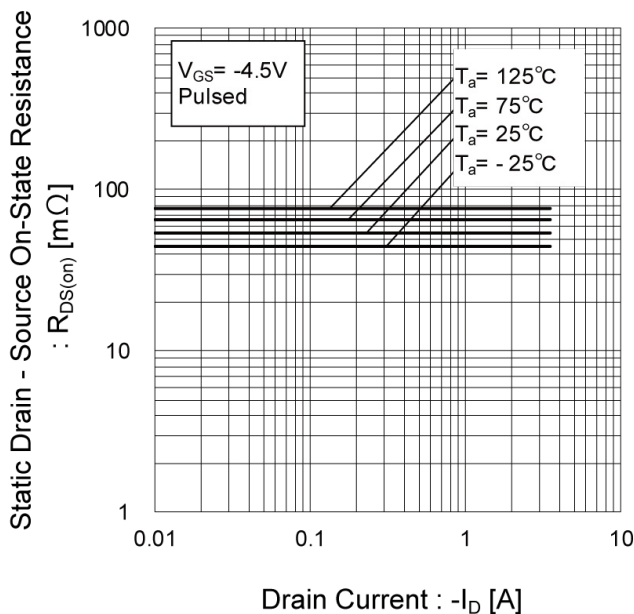


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

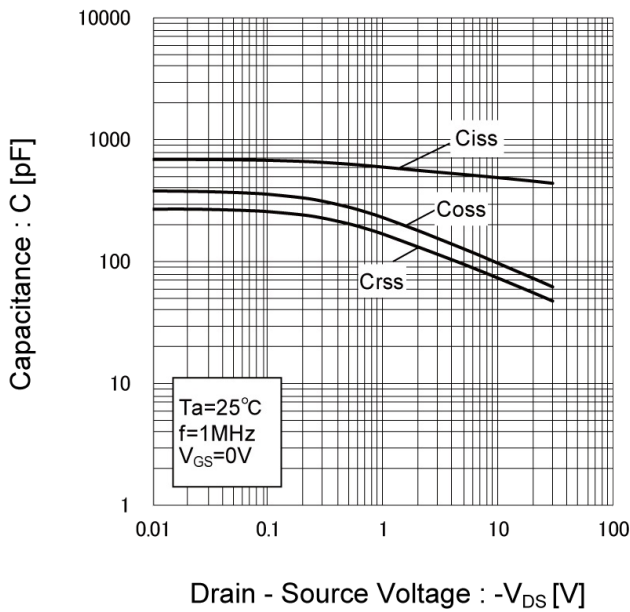


Fig.18 Switching Characteristics

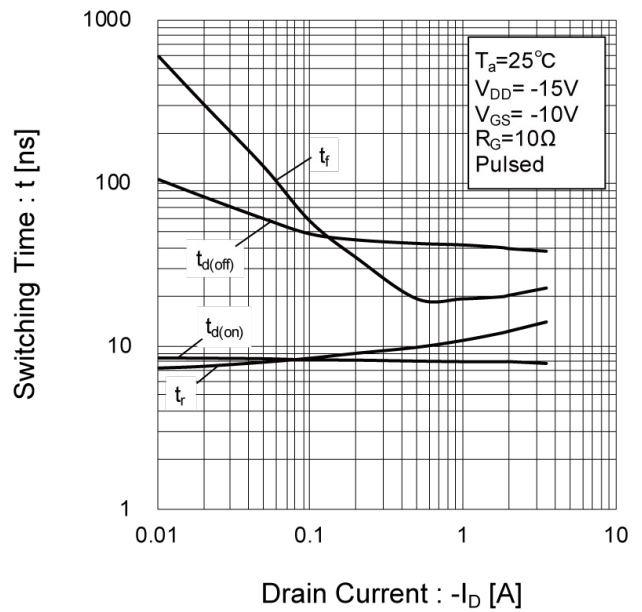


Fig.19 Dynamic Input Characteristics

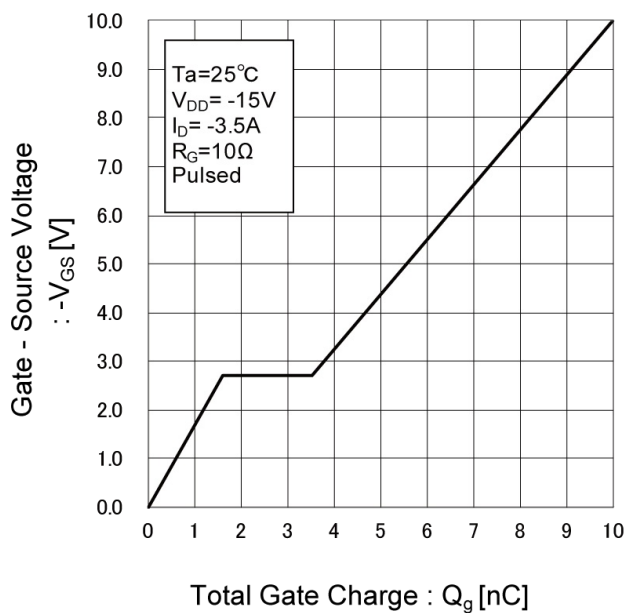
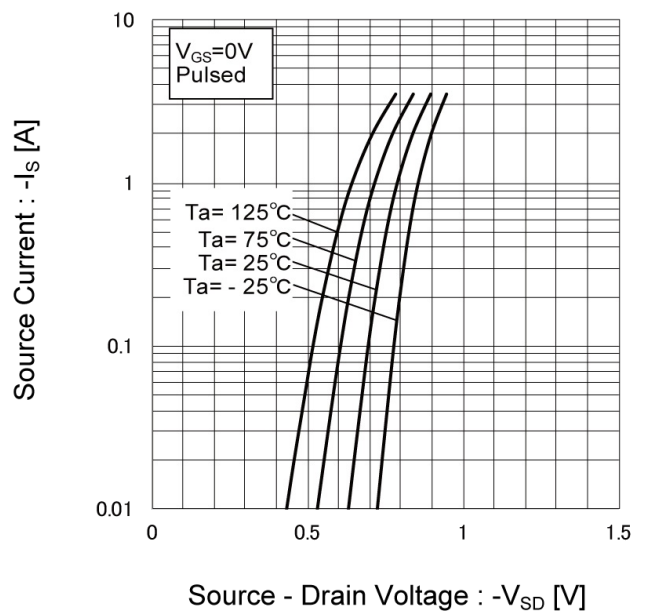


Fig.20 Source Current vs. Source Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

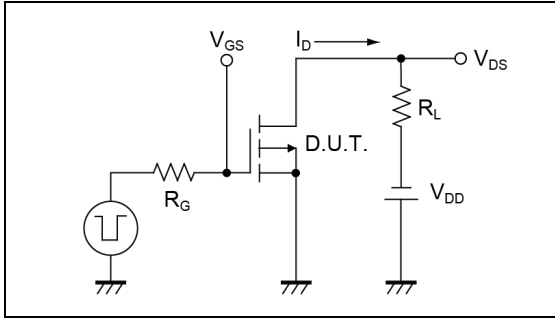


Fig.1-2 Switching Waveforms

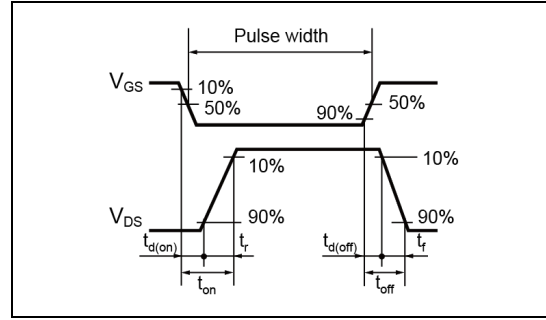


Fig.2-1 Gate Charge Measurement Circuit

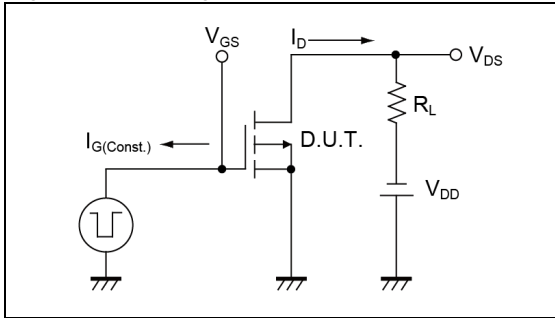


Fig.2-2 Gate Charge Waveform

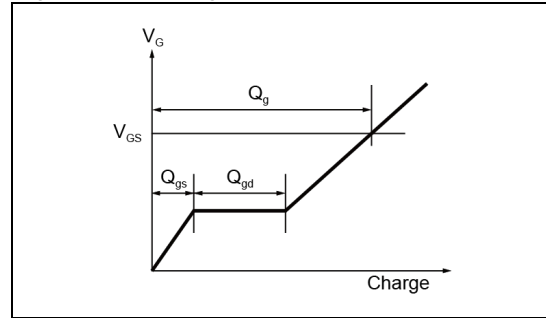


Fig.3-1 AVALANCHE MEASUREMENT CIRCUIT

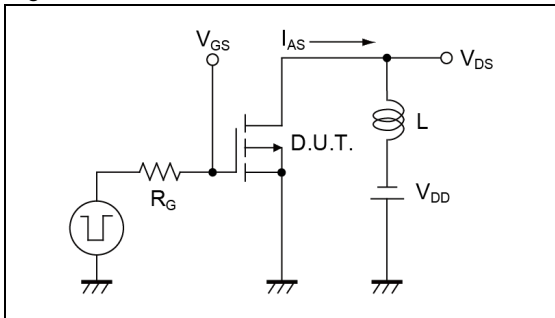
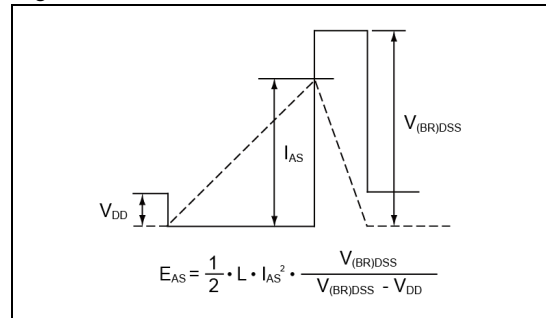
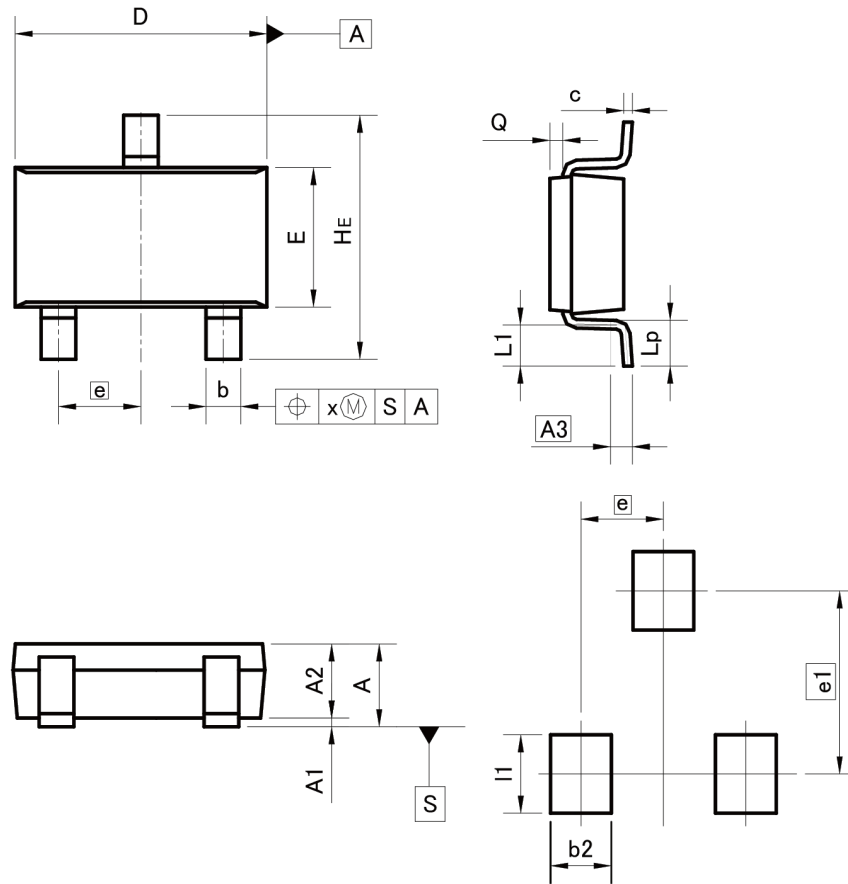


Fig.3-2 AVALANCHE WAVEFORM



●Dimensions

TSMT3



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

| 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 | |
| I1 | - | 0.90 | - | 0.035 |

Dimension in mm/inches

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