

| | |
|---------------------|--------|
| V_{DSS} | -20V |
| $R_{DS(on)}$ (Max.) | 3.8Ω |
| I_D | -100mA |
| P_D | 100mW |

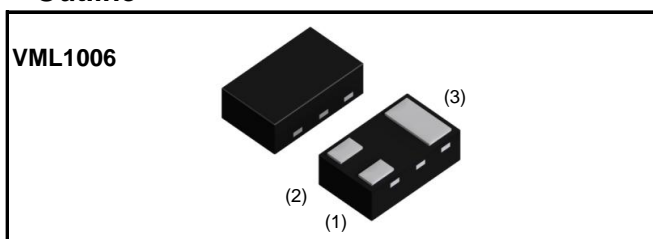
●Features

- 1) Low voltage drive(-1.2V) makes this device ideal for portable equipment.
- 2) Drive circuits can be simple.
- 3) Built-in ESD Protection Diode.

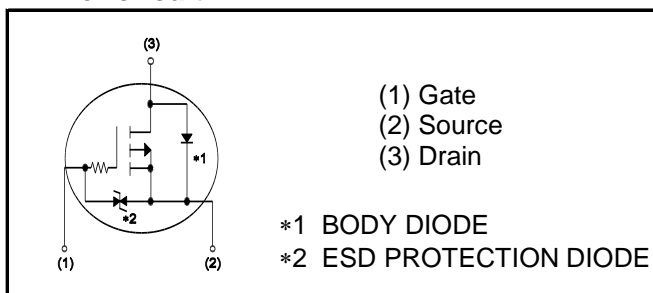
●Application

Switching

●Outline



●Inner circuit



●Packaging specifications

| Type | Packaging | Taping |
|------|---------------------------|--------|
| | Reel size (mm) | 180 |
| | Tape width (mm) | 8 |
| | Basic ordering unit (pcs) | 8,000 |
| | Taping code | T2L |
| | Marking | RX |

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

| Parameter | Symbol | Value | Unit |
|------------------------------|--------------------|-------------|------|
| Drain - Source voltage | V_{DSS} | -20 | V |
| Continuous drain current | I_D^{*1} | ±100 | mA |
| Pulsed drain current | $I_{D,pulse}^{*2}$ | ±400 | mA |
| Gate - Source voltage | V_{GSS} | ±10 | V |
| Power dissipation | P_D^{*3} | 100 | mW |
| Junction temperature | T_j | 150 | °C |
| Range of storage temperature | T_{stg} | -55 to +150 | °C |

●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|--|-----------------|--------|------|------|------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - ambient | R_{thJA}^{*3} | - | - | 1250 | °C/W |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|-----------------|---|--------|------|----------|---------------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = -1mA$ | -20 | - | - | V |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = -20V, V_{GS} = 0V$ | - | - | -1 | μA |
| Gate - Source leakage current | I_{GSS} | $V_{GS} = \pm 10V, V_{DS} = 0V$ | - | - | ± 10 | μA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = -10V, I_D = -100\mu\text{A}$ | -0.3 | - | -1 | V |
| Static drain - source on - state resistance | $R_{DS(on)}$ *4 | $V_{GS} = -4.5V, I_D = -100mA$ | - | 2.5 | 3.8 | Ω |
| | | $V_{GS} = -2.5V, I_D = -50mA$ | - | 3.4 | 5.1 | |
| | | $V_{GS} = -1.8V, I_D = -20mA$ | - | 4.8 | 8.2 | |
| | | $V_{GS} = -1.5V, I_D = -10mA$ | - | 6.0 | 13.2 | |
| | | $V_{GS} = -1.2V, I_D = -1mA$ | - | 10.0 | 40.0 | |
| | | $V_{GS} = -4.5V, I_D = -100mA, T_j = 125^\circ\text{C}$ | - | 3.3 | 6.6 | |
| Transconductance | g_{fs} *4 | $V_{DS} = -10V, I_D = -100mA$ | 120 | - | - | mS |

*1 Limited only by maximum temperature allowed.

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

*3 Each terminal mounted on a recommended land

*4 Pulsed

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|------------------------------|-------------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Input capacitance | C_{iss} | $V_{GS} = 0\text{V}$ | - | 15.0 | - | pF |
| Output capacitance | C_{oss} | $V_{DS} = -10\text{V}$ | - | 4.0 | - | |
| Reverse transfer capacitance | C_{rss} | $f = 1\text{MHz}$ | - | 1.5 | - | |
| Turn - on delay time | $t_{d(on)}^{*4}$ | $V_{DD} \approx -10\text{V}, V_{GS} = -4.5\text{V}$ | - | 46 | - | ns |
| Rise time | t_r^{*4} | $I_D = -50\text{mA}$ | - | 62 | - | |
| Turn - off delay time | $t_{d(off)}^{*4}$ | $R_L = 200\Omega$ | - | 325 | - | |
| Fall time | t_f^{*4} | $R_G = 10\Omega$ | - | 137 | - | |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---------------------------|---------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Continuous source current | I_s^{*1} | $T_a = 25^\circ\text{C}$ | - | - | -80 | mA |
| Pulsed source current | I_{SM}^{*2} | | - | - | -400 | mA |
| Forward voltage | V_{SD}^{*4} | $V_{GS} = 0\text{V}, I_s = -100\text{mA}$ | - | - | -1.2 | V |

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

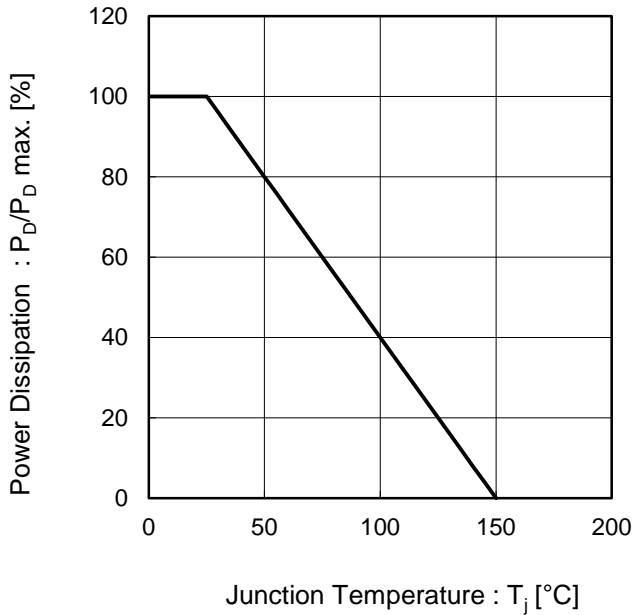


Fig.2 Drain Current Derating Curve

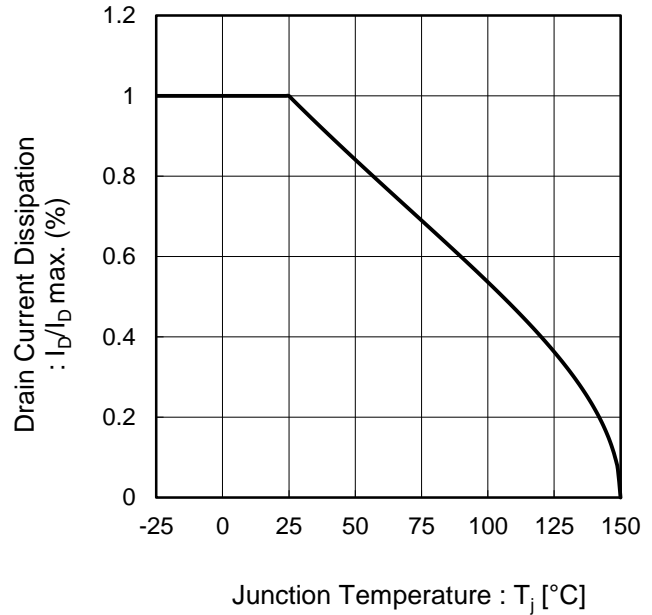


Fig.3 Typical Output Characteristics(I)

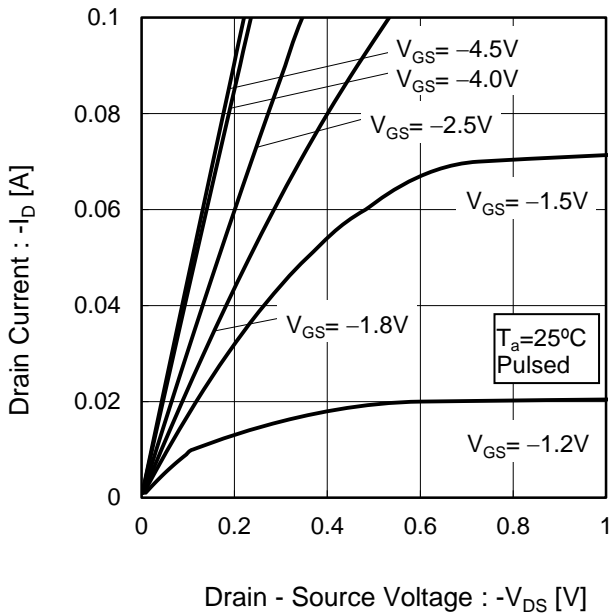
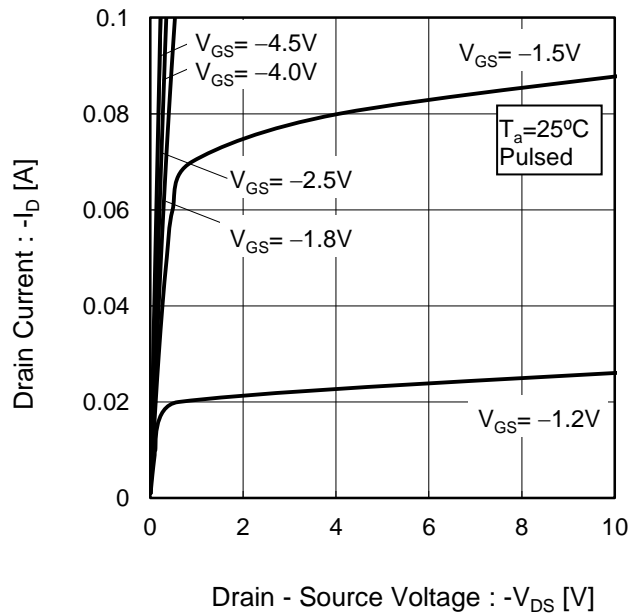


Fig.4 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.5 Breakdown Voltage vs. Junction Temperature

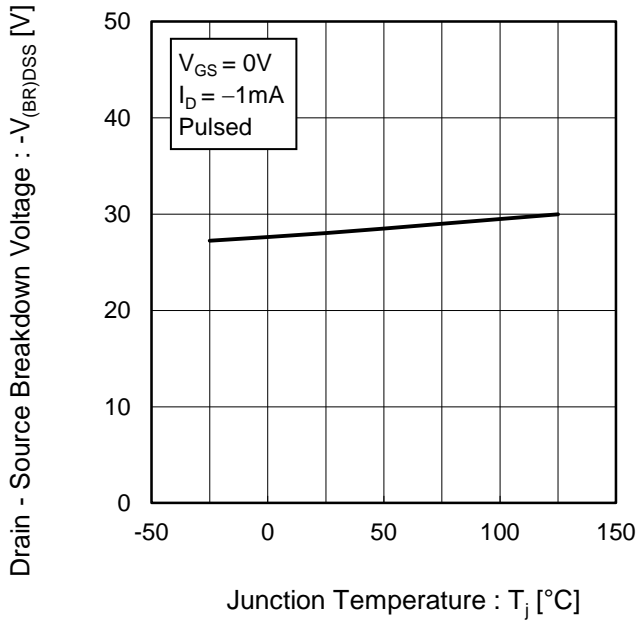


Fig.6 Typical Transfer Characteristics

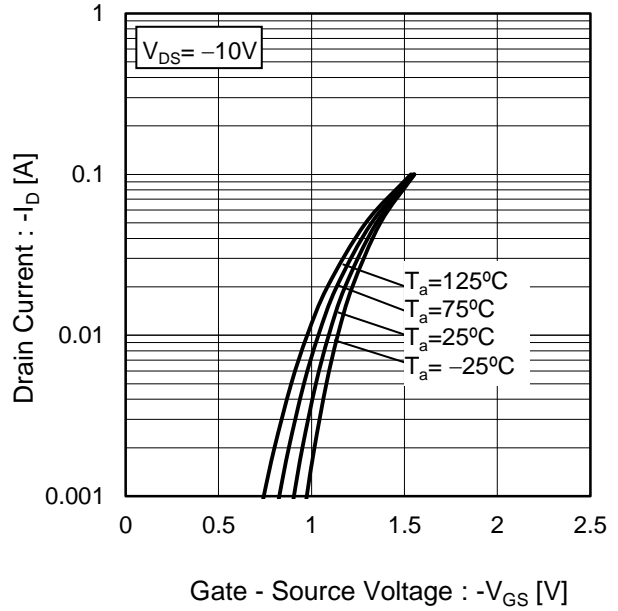


Fig.7 Gate Threshold Voltage vs. Junction Temperature

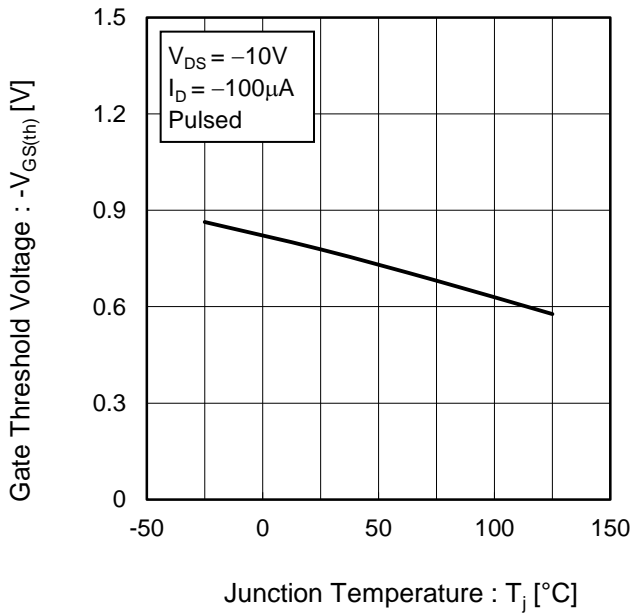
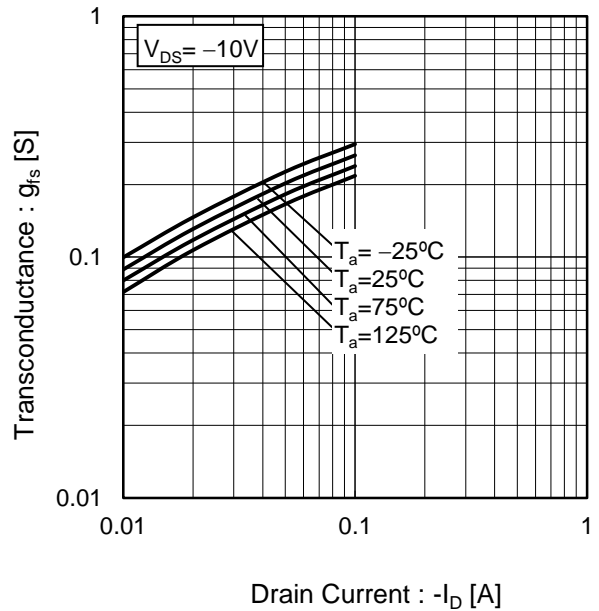


Fig.8 Transconductance vs. Drain Current



●Electrical characteristic curves

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

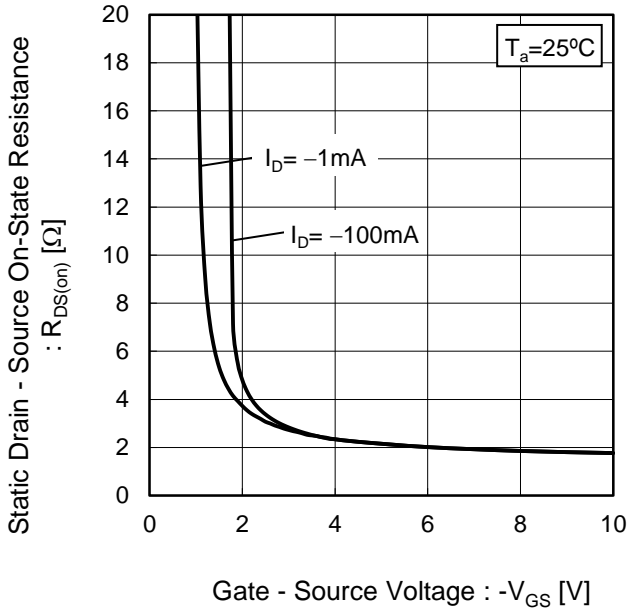


Fig.10 Static Drain - Source On - State Resistance vs. Drain Current(I)

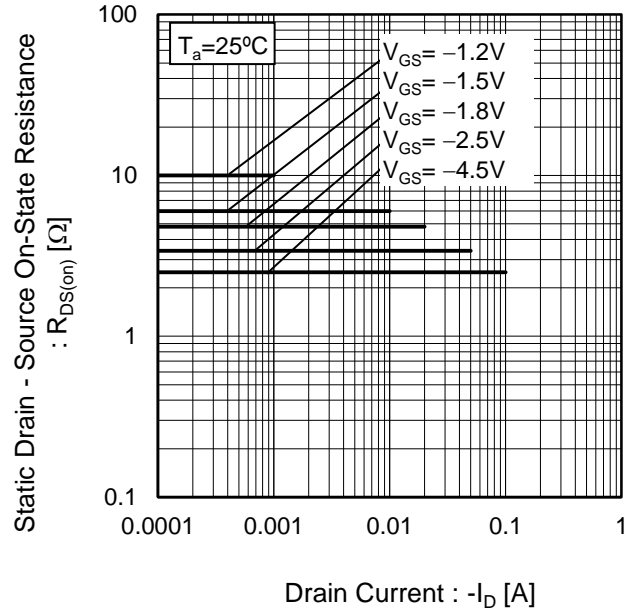


Fig.11 Static Drain - Source On - State Resistance vs. Junction Temperature

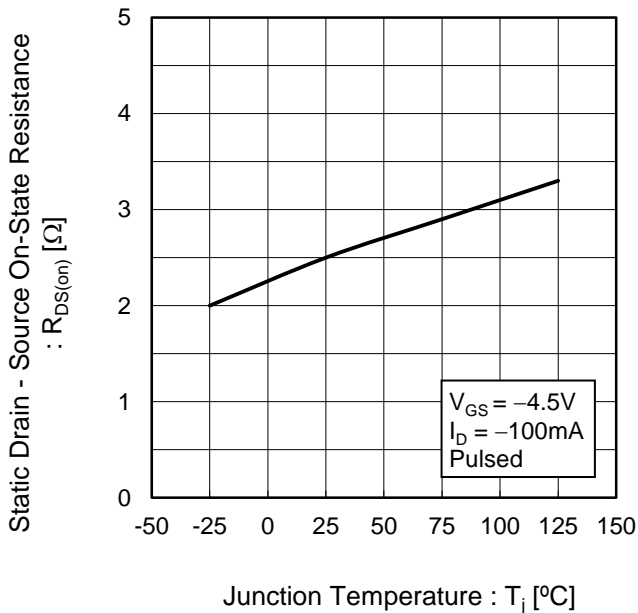
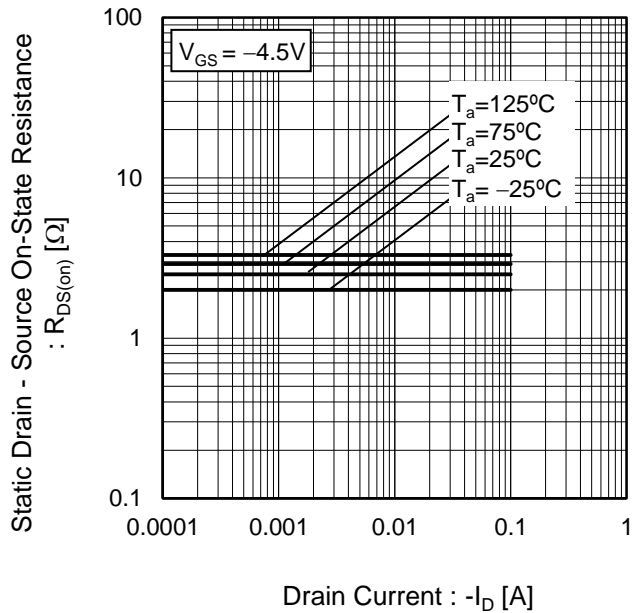


Fig.12 Static Drain - Source On - State Resistance vs. Drain Current(II)



●Electrical characteristic curves

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

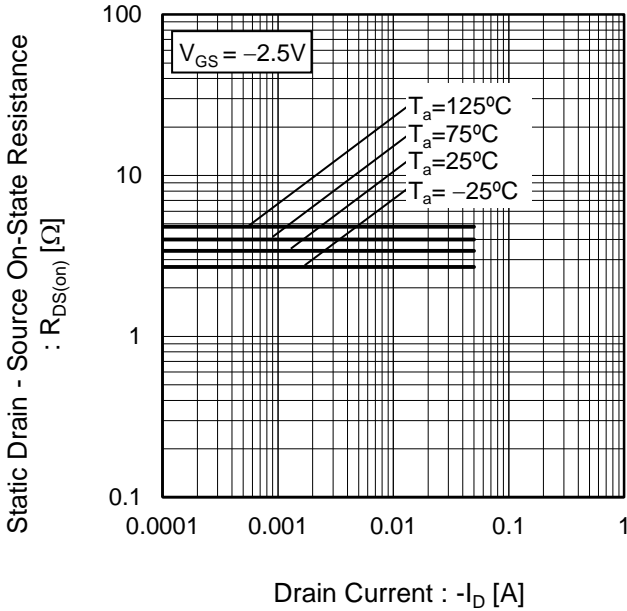


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current(IV)

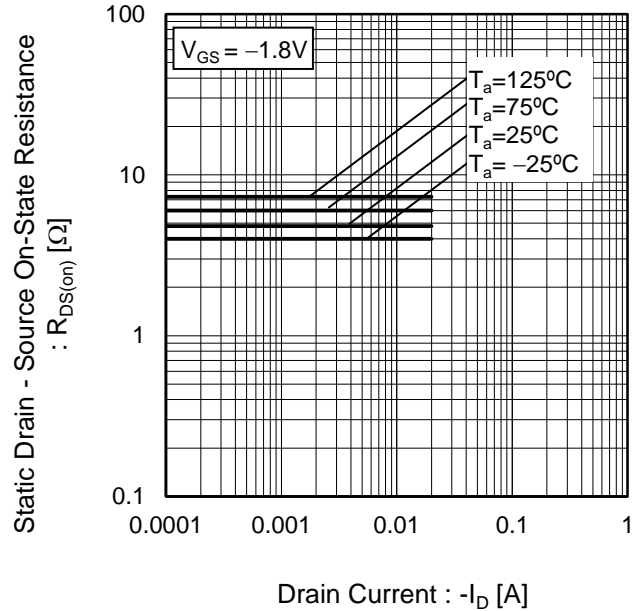


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(V)

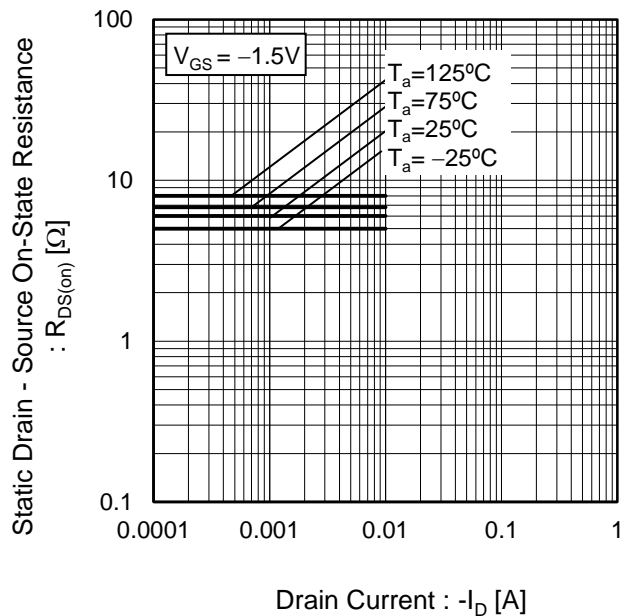
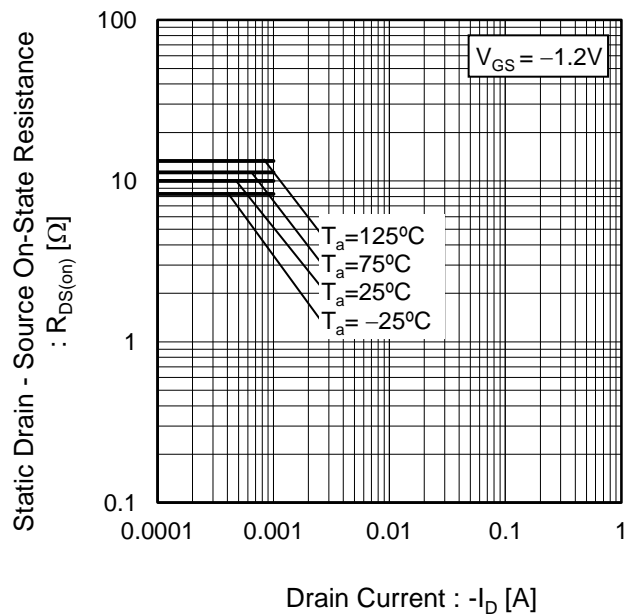


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(VI)



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

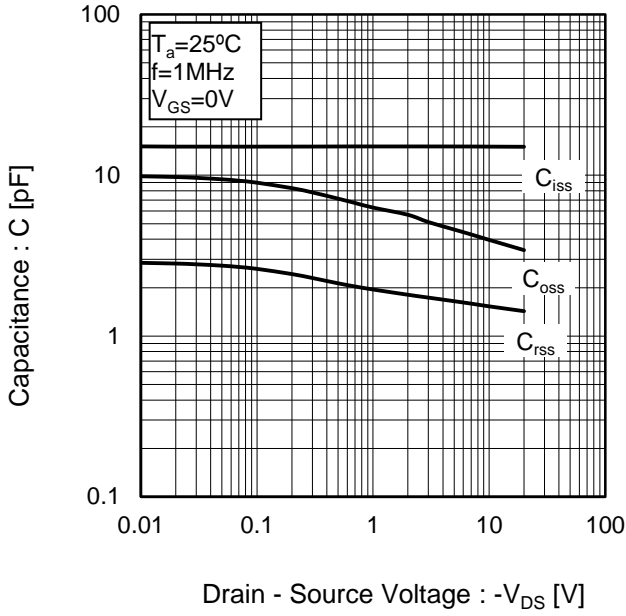


Fig.18 Switching Characteristics

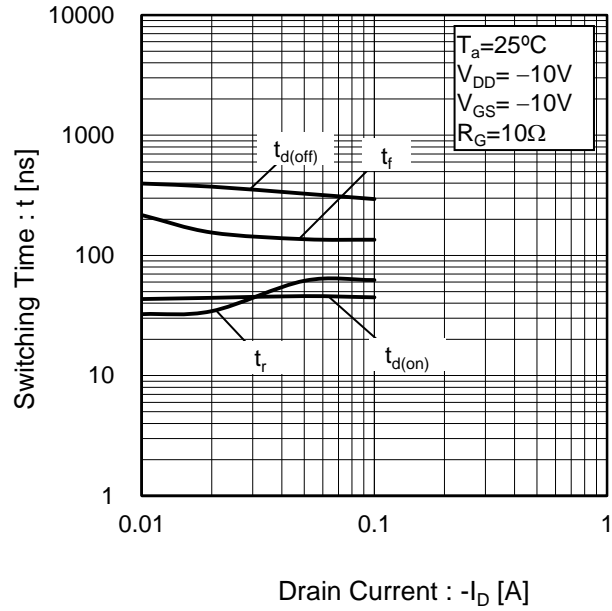
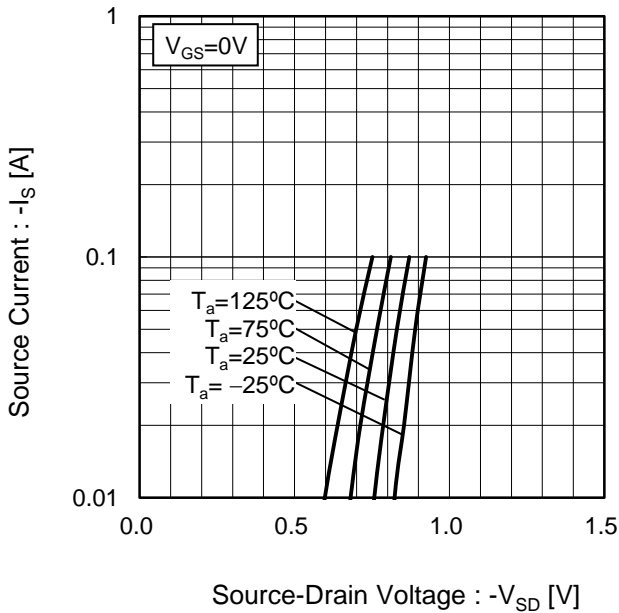


Fig.19 Source Current vs. Source Drain Voltage



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

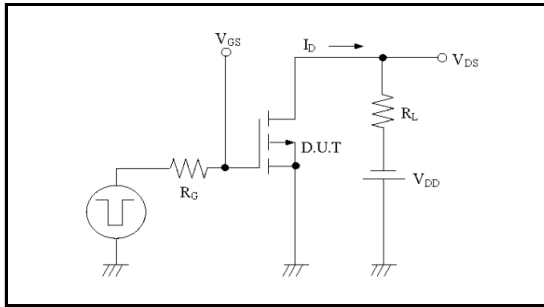
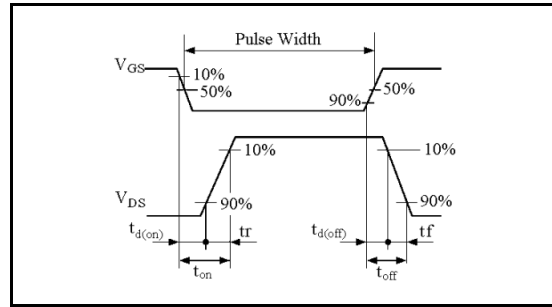


Fig.1-2 Switching Waveforms



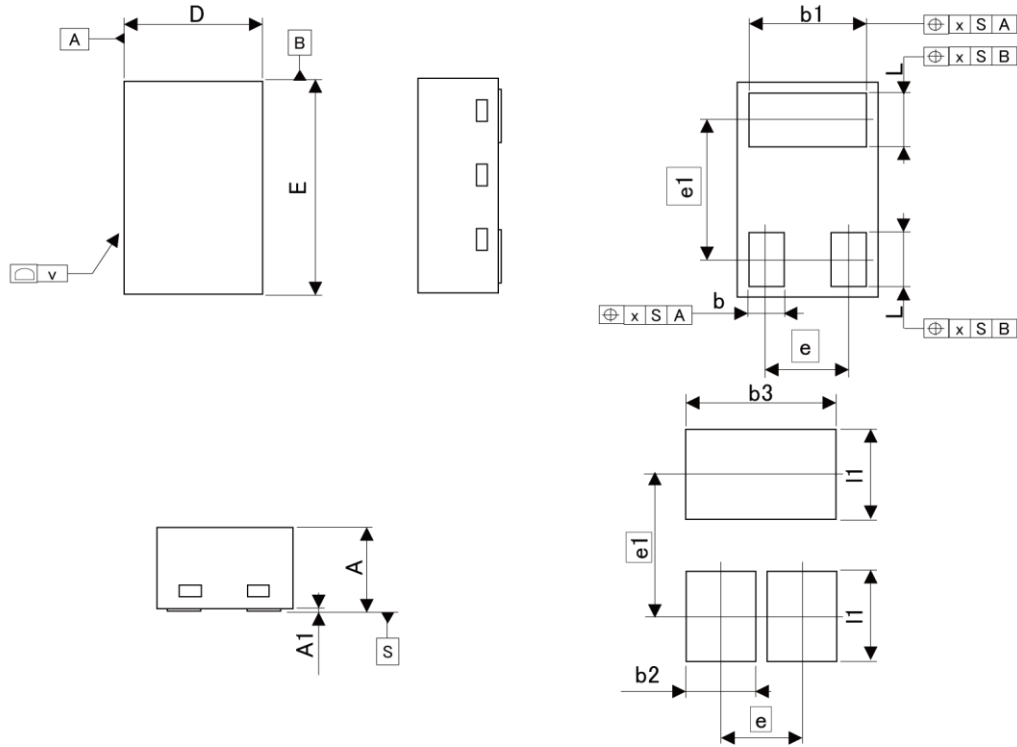
●Notice

This product might cause chip aging and breakdown under the large electrified environment.

Please consider to design ESD protection circuit.

●Dimensions (Unit : mm)

VML1006



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

| DIM | MILIMETERS | | INCHES | |
|-----|------------|------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.34 | 0.40 | 0.013 | 0.016 |
| A1 | 0.00 | 0.05 | 0.000 | 0.002 |
| b | 0.10 | 0.20 | 0.004 | 0.008 |
| b1 | 0.45 | 0.55 | 0.018 | 0.022 |
| D | 0.55 | 0.65 | 0.022 | 0.026 |
| E | 0.95 | 1.05 | 0.037 | 0.041 |
| e | 0.35 | | 0.014 | |
| e1 | 0.65 | | 0.026 | |
| L | 0.20 | 0.30 | 0.008 | 0.012 |
| x | - | 0.10 | - | 0.004 |
| v | - | 0.05 | - | 0.002 |

| DIM | MILIMETERS | | INCHES | |
|-----|------------|------|--------|-------|
| | MIN | MAX | MIN | MAX |
| b2 | - | 0.3 | - | 0.012 |
| b3 | - | 0.65 | - | 0.026 |
| l1 | - | 0.40 | - | 0.016 |

Dimension in mm/inches

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