

## Nch 20V 200mA Small Signall MOSFET

|                    |             |
|--------------------|-------------|
| $V_{DSS}$          | 20V         |
| $R_{DS(on)}(Max.)$ | $1.2\Omega$ |
| $I_D$              | $\pm 200mA$ |
| $P_D$              | 150mW       |

### ●Features

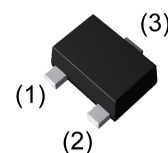
- 1) Small Package (SOT723).
- 2) Ultra Low voltage drive (1.2V drive).
- 3) Pb-free lead plating ; RoHS compliant.
- 4) Halogen Free.

### ●Application

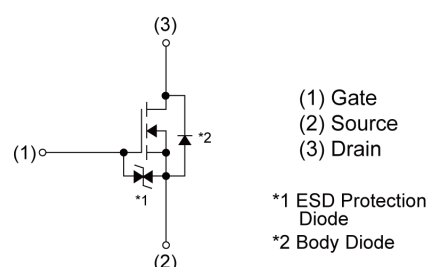
Switching

### ●Outline

SOT-723



### ●Inner circuit



### ●Absolute maximum ratings ( $T_a = 25^\circ C$ ,unless otherwise specified)

| Parameter                                        | Symbol        | Value       | Unit       |
|--------------------------------------------------|---------------|-------------|------------|
| Drain - Source voltage                           | $V_{DSS}$     | 20          | V          |
| Continuous drain current                         | $I_D$         | $\pm 200$   | mA         |
| Pulsed drain current                             | $I_{DP}^{*1}$ | $\pm 400$   | mA         |
| Gate - Source voltage                            | $V_{GSS}$     | $\pm 8$     | V          |
| Power dissipation                                | $P_D^{*2}$    | 150         | mW         |
| Junction temperature                             | $T_j$         | 150         | $^\circ C$ |
| Operating junction and storage temperature range | $T_{stg}$     | -55 to +150 | $^\circ C$ |

**● Thermal resistance**

| Parameter                              | Symbol          | Values |      |      | Unit |
|----------------------------------------|-----------------|--------|------|------|------|
|                                        |                 | Min.   | Typ. | Max. |      |
| Thermal resistance, junction - ambient | $R_{thJA}^{*2}$ | -      | -    | 833  | °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     |
| Breakdown voltage temperature coefficient      | $\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$ | $I_D = 1mA$<br>referenced to $25^\circ\text{C}$ | -      | 29.0 | -    | mV/°C |
| Zero gate voltage drain current                | $I_{DSS}$                               | $V_{DS} = 20V, V_{GS} = 0V$                     | -      | -    | 1    | μA    |
| Gate - Source leakage current                  | $I_{GSS}$                               | $V_{GS} = \pm 8V, V_{DS} = 0V$                  | -      | -    | ±10  | μA    |
| Gate threshold voltage                         | $V_{GS(th)}$                            | $V_{DS} = 10V, I_D = 1mA$                       | 0.3    | -    | 1.0  | V     |
| Gate threshold voltage temperature coefficient | $\frac{\Delta V_{GS(th)}}{\Delta T_j}$  | $I_D = 1mA$<br>referenced to $25^\circ\text{C}$ | -      | -1.6 | -    | mV/°C |
| Static drain - source on - state resistance    | $R_{DS(on)}^{*3}$                       | $V_{GS} = 2.5V, I_D = 200mA$                    | -      | 0.8  | 1.2  | Ω     |
|                                                |                                         | $V_{GS} = 1.8V, I_D = 200mA$                    | -      | 1.0  | 1.4  |       |
|                                                |                                         | $V_{GS} = 1.5V, I_D = 40mA$                     | -      | 1.2  | 2.4  |       |
|                                                |                                         | $V_{GS} = 1.2V, I_D = 20mA$                     | -      | 1.6  | 4.8  |       |
| Forward Transfer Admittance                    | $ Y_{fs} ^{*3}$                         | $V_{DS} = 10V, I_D = 200mA$                     | 200    | -    | -    | mS    |

\*1  $P_w \leq 10\mu s$ , Duty cycle  $\leq 1\%$

\*2 Each terminal mounted on a reference land.

\*3 Pulsed

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

| Parameter                    | Symbol            | Conditions                          | Values |      |      | Unit |
|------------------------------|-------------------|-------------------------------------|--------|------|------|------|
|                              |                   |                                     | Min.   | Typ. | Max. |      |
| Input capacitance            | $C_{iss}$         | $V_{GS} = 0V$                       | -      | 25   | -    | pF   |
| Output capacitance           | $C_{oss}$         | $V_{DS} = 10V$                      | -      | 10   | -    |      |
| Reverse transfer capacitance | $C_{rss}$         | $f = 1\text{MHz}$                   | -      | 10   | -    |      |
| Turn - on delay time         | $t_{d(on)}^{*3}$  | $V_{DD} \approx 10V, V_{GS} = 4.0V$ | -      | 5    | -    | ns   |
| Rise time                    | $t_r^{*3}$        | $I_D = 150\text{mA}$                | -      | 10   | -    |      |
| Turn - off delay time        | $t_{d(off)}^{*3}$ | $R_L \approx 67\Omega$              | -      | 15   | -    |      |
| Fall time                    | $t_f^{*3}$        | $R_G = 10\Omega$                    | -      | 10   | -    |      |

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

| Parameter                  | Symbol        | Conditions                        | Values |      |      | Unit |
|----------------------------|---------------|-----------------------------------|--------|------|------|------|
|                            |               |                                   | Min.   | Typ. | Max. |      |
| Continuous forward current | $I_S$         | $T_a = 25^{\circ}\text{C}$        | -      | -    | 100  | mA   |
| Pulse forward current      | $I_{SP}^{*1}$ |                                   | -      | -    | 400  | mA   |
| Forward voltage            | $V_{SD}^{*3}$ | $V_{GS} = 0V, I_S = 100\text{mA}$ | -      | -    | 1.2  | V    |

## ●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

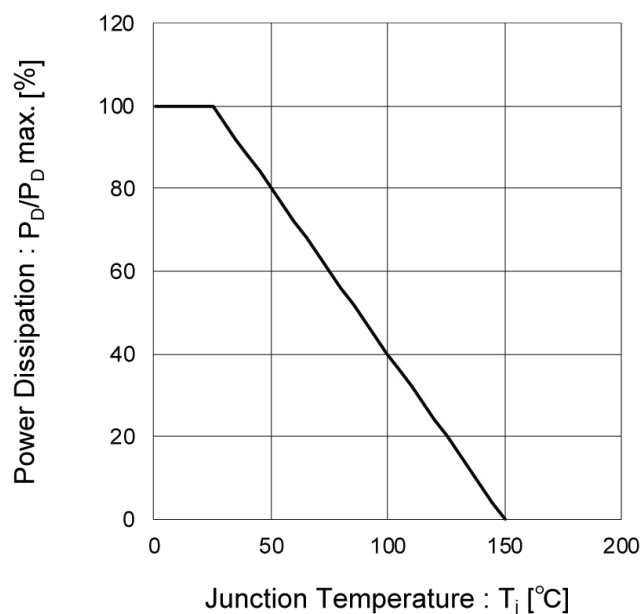


Fig.2 Drain Current Derating Curve

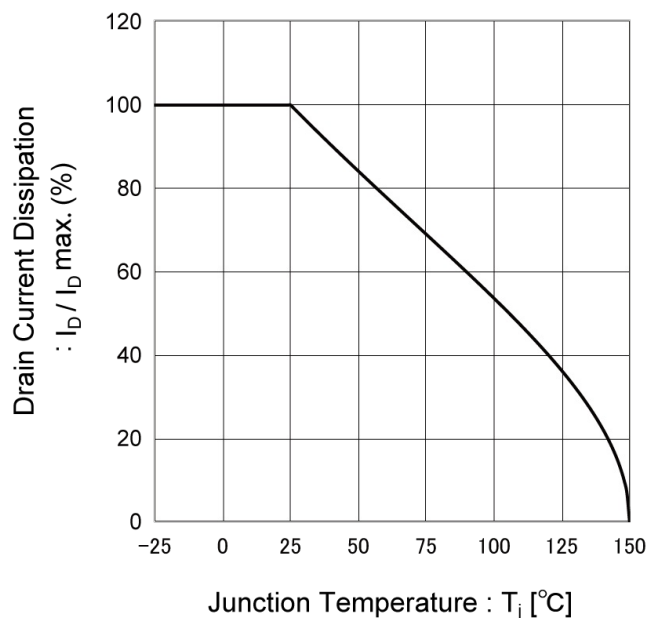


Fig.3 Typical Output Characteristics(I)

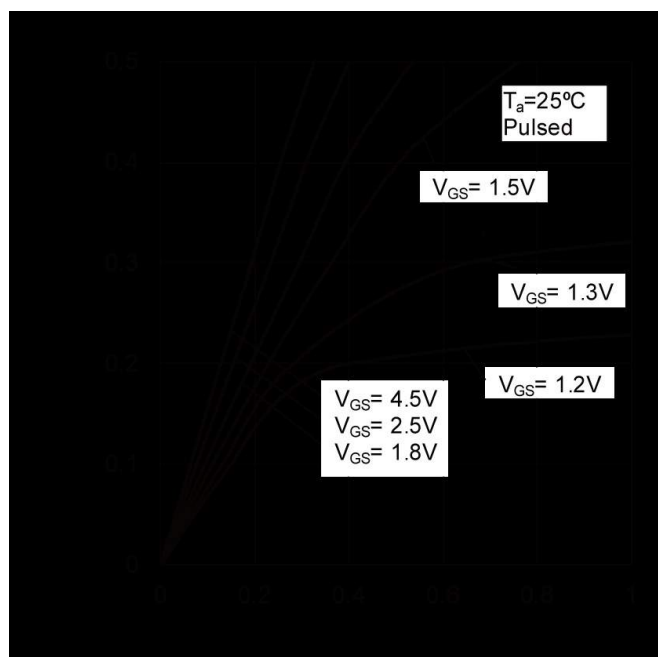
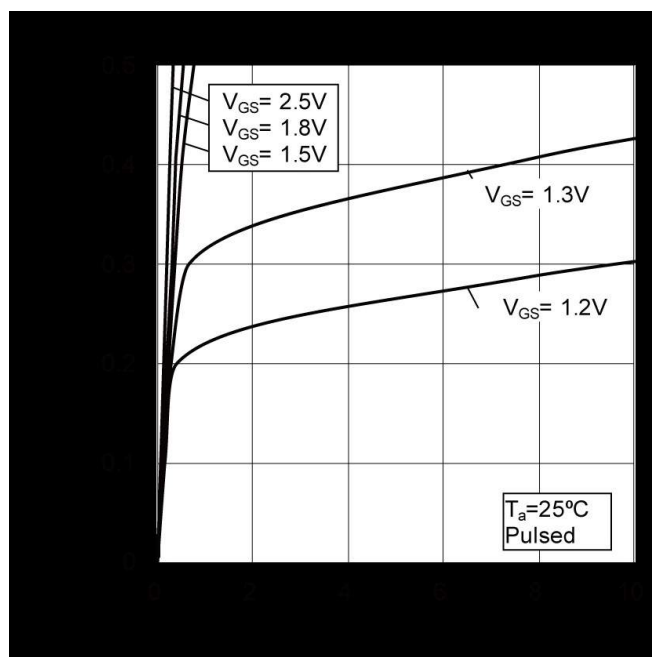


Fig.4 Typical Output Characteristics(II)



## ●Electrical characteristic curves

Fig.5 Breakdown Voltage vs. Junction Temperature

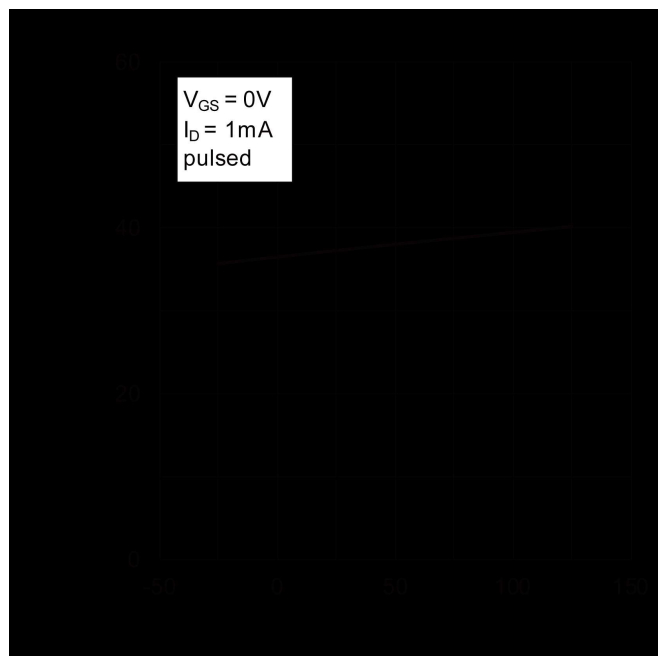


Fig.6 Typical Transfer Characteristics

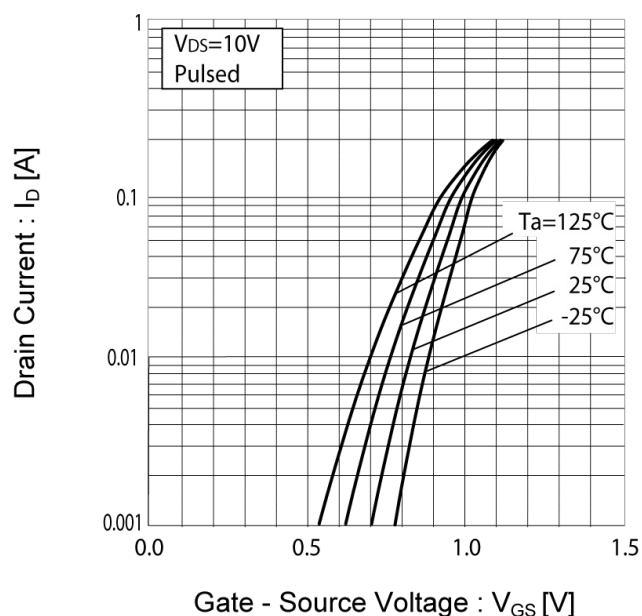


Fig.7 Gate Threshold Voltage vs. Junction Temperature

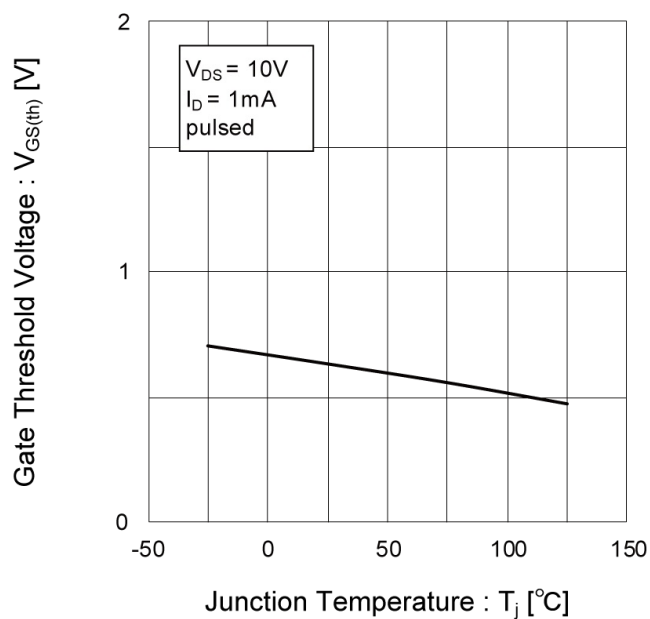
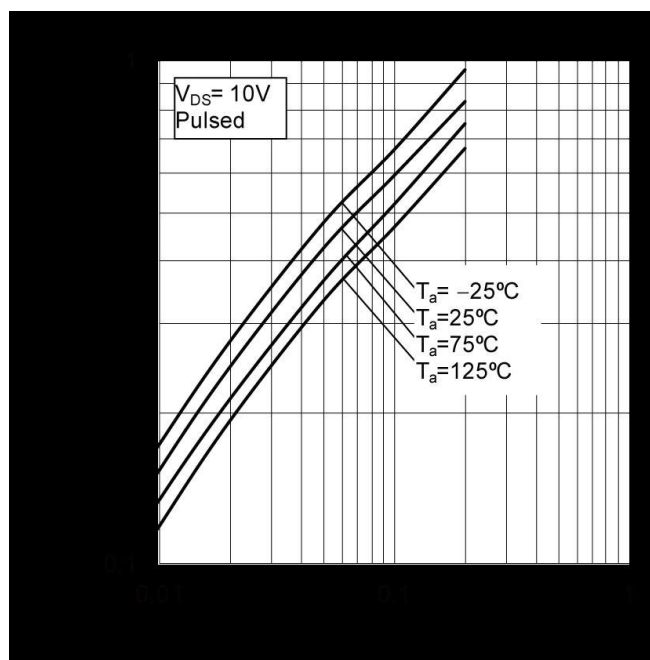


Fig.8 Forward Transfer Admittance vs. Drain Current



## ●Electrical characteristic curves

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

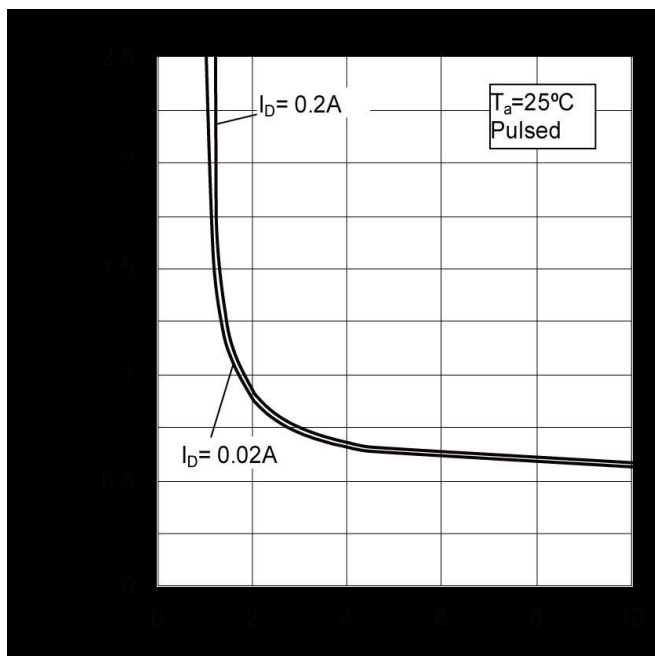


Fig.10 Static Drain - Source On - State  
Resistance vs. Junction Temperature

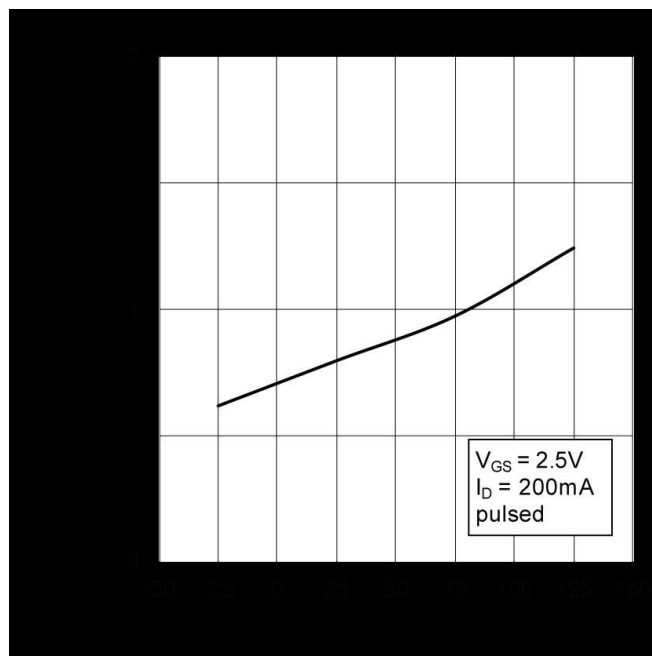
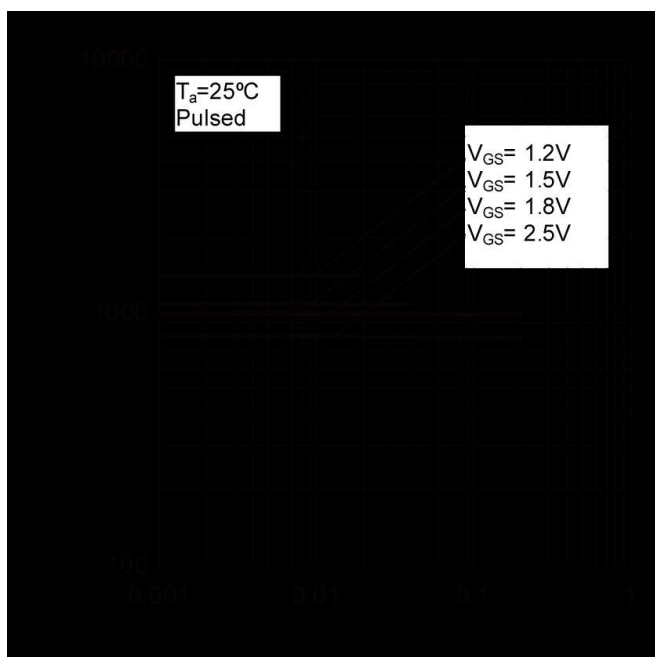


Fig.11 Static Drain - Source On - State  
Resistance vs. Drain Current (I)



## ●Electrical characteristic curves

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

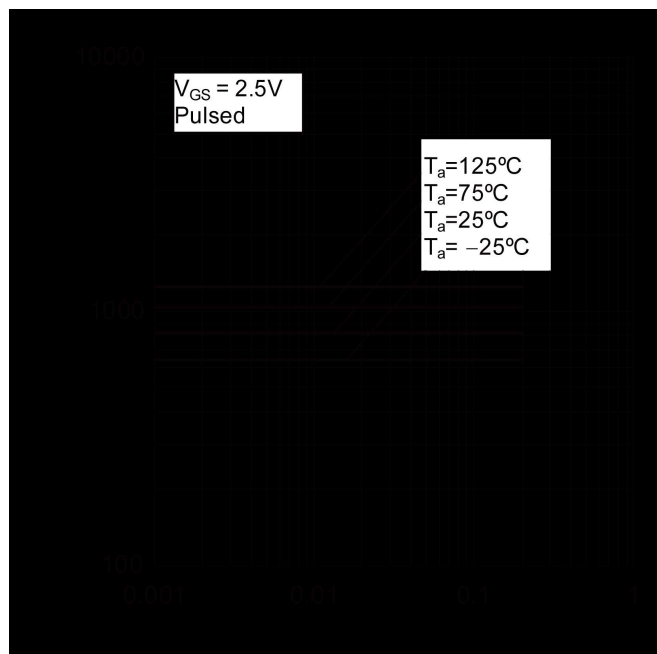


Fig.13 Static Drain - Source On - State  
Resistance vs. Drain Current (III)

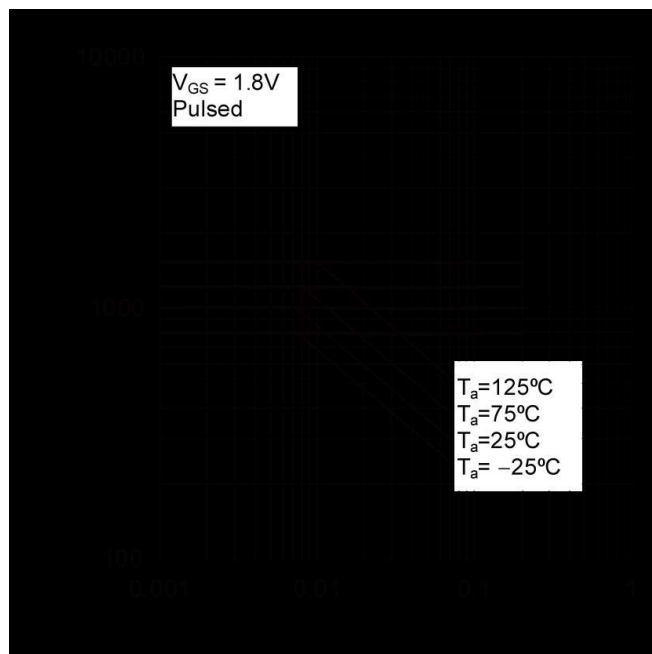


Fig.14 Static Drain - Source On - State  
Resistance vs. Drain Current (IV)

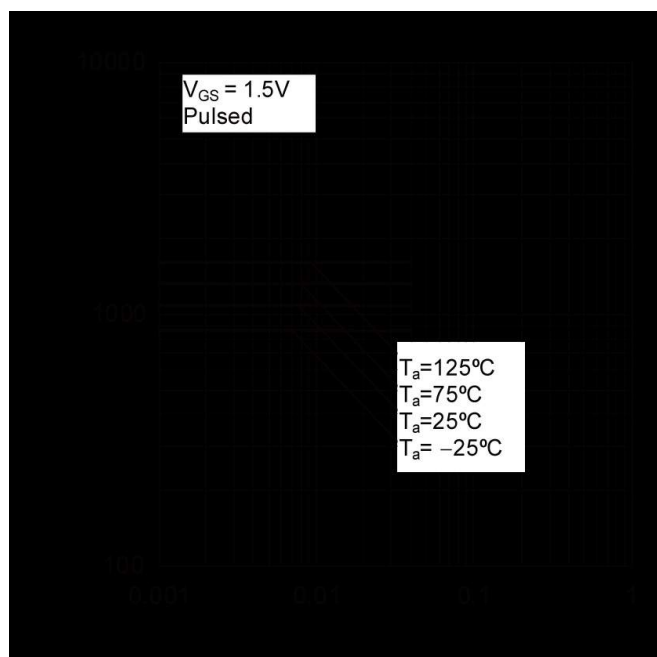
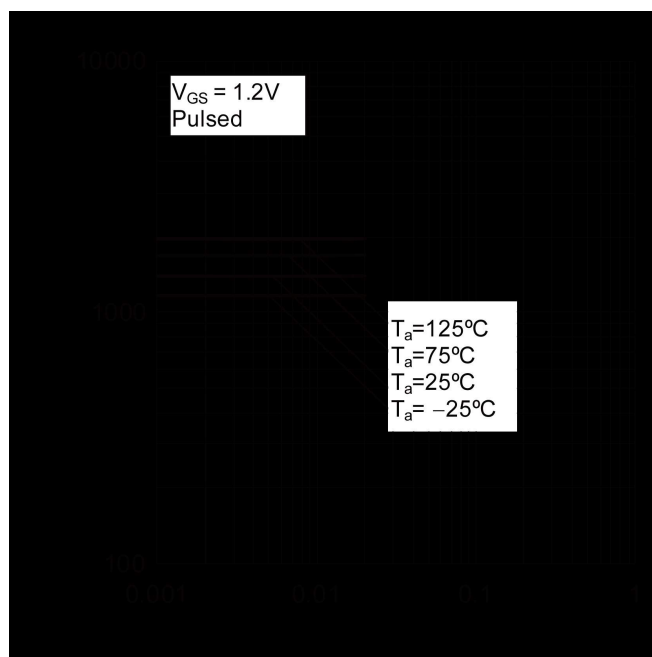


Fig.15 Static Drain - Source On - State  
Resistance vs. Drain Current (V)



## ●Electrical characteristic curves

Fig.16 Typical Capacitance vs.  
Drain - Source Voltage

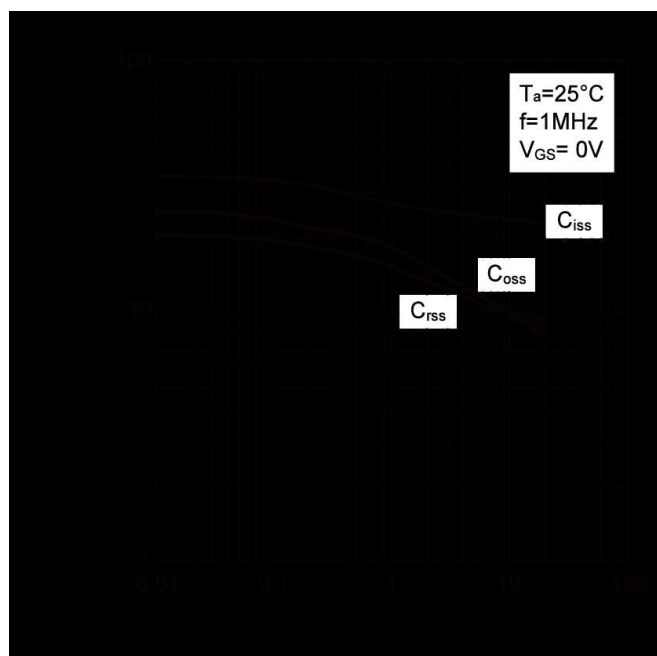


Fig.17 Switching Characteristics

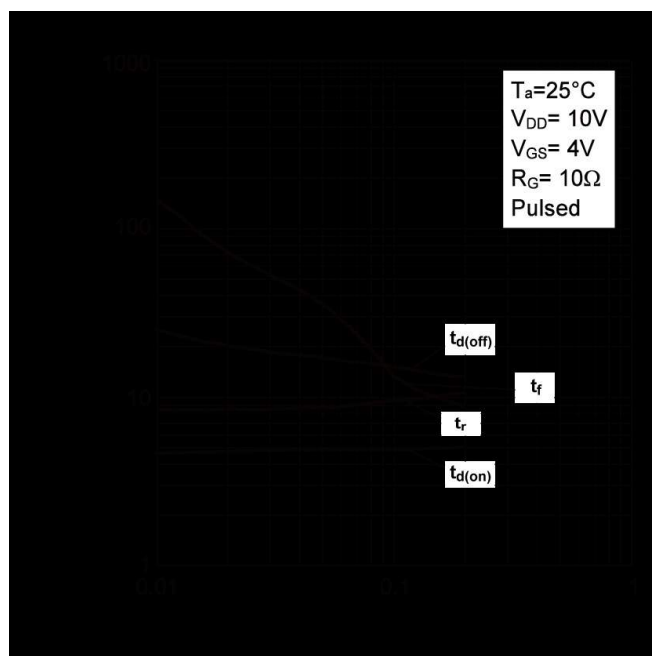
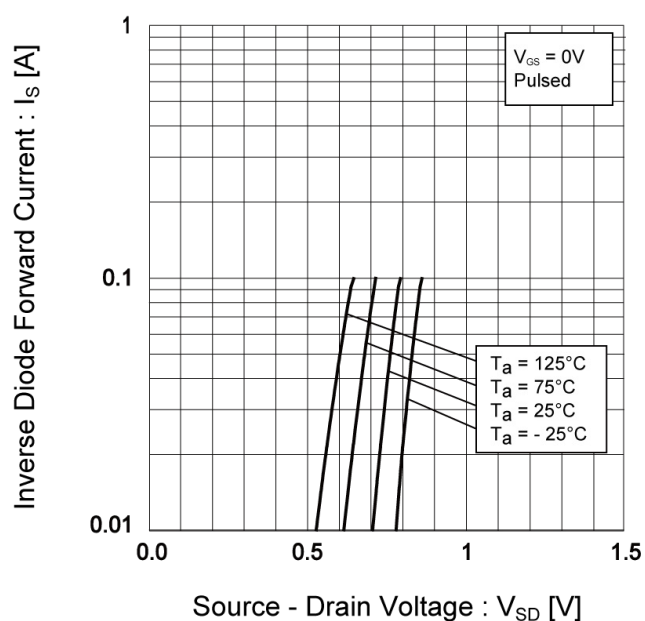


Fig.18 Source Current vs.  
Source Drain Voltage



## ● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

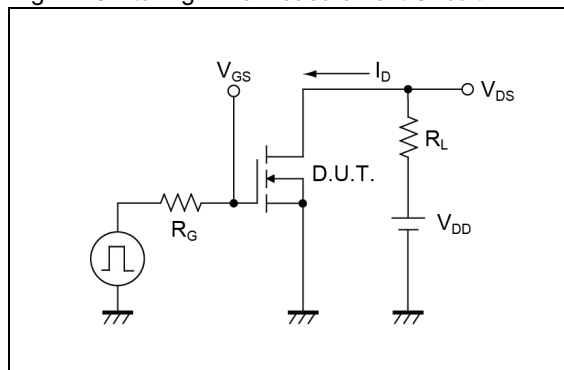
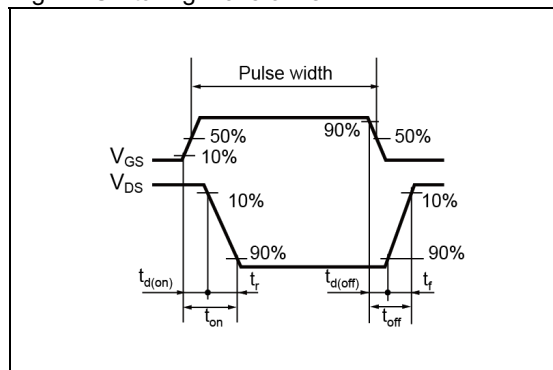
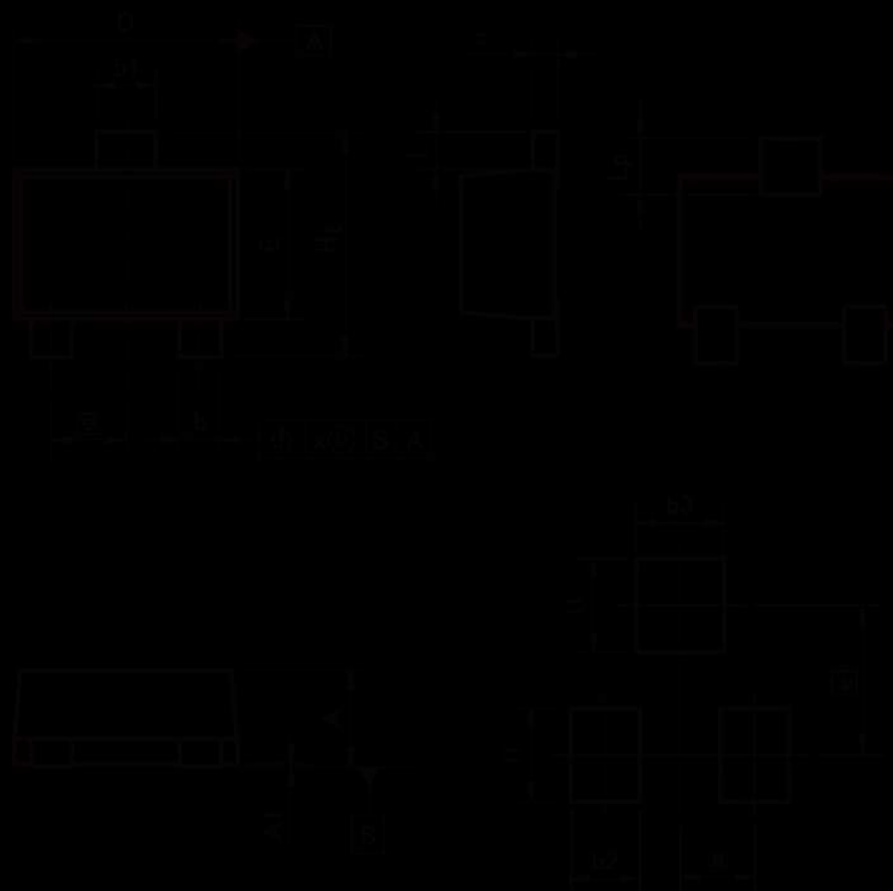


Fig.1-2 Switching Waveforms



# ●Dimensions



| DIM | MILIMETERS |      | INCHES |       |
|-----|------------|------|--------|-------|
|     | MIN        | MAX  | MIN    | MAX   |
| A   | 0.45       | 0.55 | 0.018  | 0.022 |
| A1  | 0.00       | 0.10 | 0.000  | 0.004 |
| b   | 0.17       | 0.27 | 0.007  | 0.011 |
| b1  | 0.27       | 0.37 | 0.011  | 0.015 |
| c   | 0.08       | 0.18 | 0.003  | 0.007 |
| D   | 1.10       | 1.30 | 0.043  | 0.051 |
| E   | 0.70       | 0.90 | 0.028  | 0.035 |
| e   | 0.40       |      | 0.02   |       |
| HE  | 1.10       | 1.30 | 0.043  | 0.051 |
| L   | 0.10       | 0.30 | 0.004  | 0.012 |
| Lp  | 0.20       | 0.40 | 0.008  | 0.016 |
| x   | –          | 0.10 | –      | 0.004 |

| DIM | MILIMETERS |      | INCHES |       |
|-----|------------|------|--------|-------|
|     | MIN        | MAX  | MIN    | MAX   |
| b2  | –          | 0.37 | –      | 0.015 |
| b3  | –          | 0.47 | –      | 0.019 |
| e1  | 0.80       |      | 0.031  |       |
| l1  | –          | 0.50 | –      | 0.020 |