

|                    |               |
|--------------------|---------------|
| $V_{DSS}$          | 30V           |
| $R_{DS(on)}(Max.)$ | 4.5m $\Omega$ |
| $I_D$              | $\pm 18A$     |
| $P_D$              | 2W            |

### ●Features

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

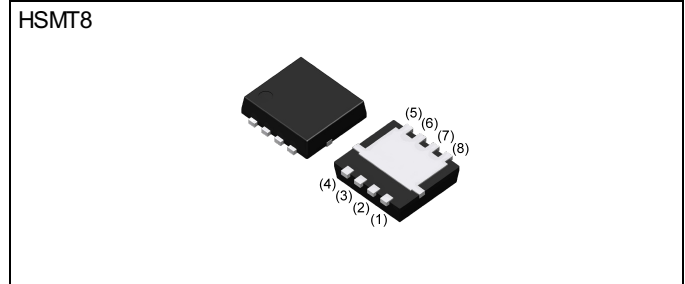
### ●Application

Switching

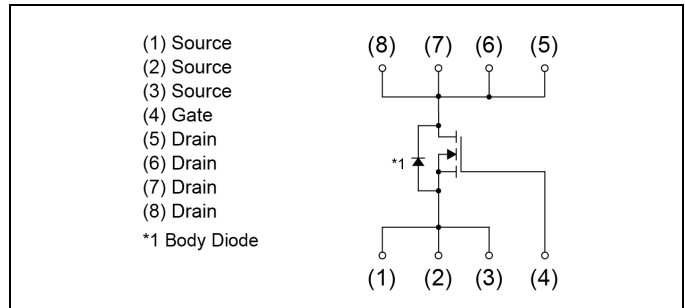
### ●Absolute maximum ratings ( $T_a = 25^\circ C$ )

| Parameter                      | Symbol             | Value       | Unit       |   |
|--------------------------------|--------------------|-------------|------------|---|
| Drain - Source voltage         | $V_{DSS}$          | 30          | V          |   |
| Continuous drain current       | $T_a = 25^\circ C$ | $I_D$       | $\pm 18$   | A |
|                                | $T_c = 25^\circ C$ | $I_D^{*4}$  | $\pm 30$   | A |
| Pulsed drain current           | $I_{D,pulse}^{*1}$ | $\pm 72$    | A          |   |
| Gate - Source voltage          | $V_{GSS}$          | $\pm 12$    | V          |   |
| Avalanche energy, single pulse | $E_{AS}^{*2}$      | 24.6        | mJ         |   |
| Avalanche current              | $I_{AS}^{*2}$      | 18          | A          |   |
| Power dissipation              | $P_D^{*3}$         | 2           | W          |   |
|                                | $P_D^{*4}$         | 30          | W          |   |
| Junction temperature           | $T_j$              | 150         | $^\circ C$ |   |
| Range of storage temperature   | $T_{stg}$          | -55 to +150 | $^\circ C$ |   |

### ●Outline



### ●Inner circuit



### ●Packaging specifications

| Type | Packing                   | Embossed Tape |
|------|---------------------------|---------------|
|      | Reel size (mm)            | 330           |
|      | Tape width (mm)           | 12            |
|      | Basic ordering unit (pcs) | 3000          |
|      | Taping code               | TB            |
|      | Marking                   | E180AJ        |

### ● Thermal resistance

| Parameter                              | Symbol          | Values |      |      | Unit |
|----------------------------------------|-----------------|--------|------|------|------|
|                                        |                 | Min.   | Typ. | Max. |      |
| Thermal resistance, junction - ambient | $R_{thJA}^{*3}$ | -      | 62.5 | -    | °C/W |
| Thermal resistance, junction - case    | $R_{thJC}^{*4}$ | -      | 4.17 | -    | °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      | $\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$ | $I_D = 1mA$<br>referenced to $25^\circ\text{C}$ | -      | 18   | -         | mV/°C         |
| Zero gate voltage drain current                | $I_{DSS}$                               | $V_{DS} = 24V, V_{GS} = 0V$                     | -      | -    | 1         | $\mu\text{A}$ |
| Gate - Source leakage current                  | $I_{GSS}$                               | $V_{GS} = \pm 12V, V_{DS} = 0V$                 | -      | -    | $\pm 100$ | nA            |
| Gate threshold voltage                         | $V_{GS(th)}$                            | $V_{DS} = V_{GS}, I_D = 11mA$                   | 0.5    | -    | 1.5       | V             |
| Gate threshold voltage temperature coefficient | $\frac{\Delta V_{GS(th)}}{\Delta T_j}$  | $I_D = 1mA$<br>referenced to $25^\circ\text{C}$ | -      | -2.0 | -         | mV/°C         |
| Static drain - source on - state resistance    | $R_{DS(on)}^{*5}$                       | $V_{GS} = 4.5V, I_D = 18A$                      | -      | 3.5  | 4.5       | m $\Omega$    |
|                                                |                                         | $V_{GS} = 2.5V, I_D = 18A$                      | -      | 4.5  | 5.8       |               |
| Transconductance                               | $g_{fs}^{*5}$                           | $V_{DS} = 5V, I_D = 18A$                        | 24     | -    | -         | S             |

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

\*2  $L \approx 100\mu\text{H}$ ,  $V_{DD} = 15V$ ,  $R_G = 25\Omega$ , STARTING  $T_{ch} = 25^\circ\text{C}$  Fig.3-1,3-2

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

\*4  $T_c = 25^\circ\text{C}$

\*5 Pulsed

**●Electrical characteristics (T<sub>a</sub> = 25°C)**

| Parameter                    | Symbol                            | Conditions                                    | Values |      |      | Unit |
|------------------------------|-----------------------------------|-----------------------------------------------|--------|------|------|------|
|                              |                                   |                                               | Min.   | Typ. | Max. |      |
| Input capacitance            | C <sub>iss</sub>                  | V <sub>GS</sub> = 0V                          | -      | 4290 | -    | pF   |
| Output capacitance           | C <sub>oss</sub>                  | V <sub>DS</sub> = 15V                         | -      | 490  | -    |      |
| Reverse transfer capacitance | C <sub>rss</sub>                  | f = 1MHz                                      | -      | 320  | -    |      |
| Turn - on delay time         | t <sub>d(on)</sub> <sup>*5</sup>  | V <sub>DD</sub> ≈ 15V, V <sub>GS</sub> = 4.5V | -      | 28   | -    | ns   |
| Rise time                    | t <sub>r</sub> <sup>*5</sup>      | I <sub>D</sub> = 9A                           | -      | 22   | -    |      |
| Turn - off delay time        | t <sub>d(off)</sub> <sup>*5</sup> | R <sub>L</sub> = 1.67Ω                        | -      | 150  | -    |      |
| Fall time                    | t <sub>f</sub> <sup>*5</sup>      | R <sub>G</sub> = 10Ω                          | -      | 160  | -    |      |

**●Gate charge characteristics (T<sub>a</sub> = 25°C)**

| Parameter            | Symbol                        | Conditions                                                            | Values |      |      | Unit |
|----------------------|-------------------------------|-----------------------------------------------------------------------|--------|------|------|------|
|                      |                               |                                                                       | Min.   | Typ. | Max. |      |
| Total gate charge    | Q <sub>g</sub> <sup>*5</sup>  | V <sub>DD</sub> ≈ 15V, I <sub>D</sub> = 18A<br>V <sub>GS</sub> = 4.5V | -      | 39   | -    | nC   |
| Gate - Source charge | Q <sub>gs</sub> <sup>*5</sup> |                                                                       | -      | 10   | -    |      |
| Gate - Drain charge  | Q <sub>gd</sub> <sup>*5</sup> |                                                                       | -      | 10   | -    |      |

**●Body diode electrical characteristics (Source-Drain) (T<sub>a</sub> = 25°C)**

| Parameter                             | Symbol                        | Conditions                                   | Values |      |      | Unit |
|---------------------------------------|-------------------------------|----------------------------------------------|--------|------|------|------|
|                                       |                               |                                              | Min.   | Typ. | Max. |      |
| Body diode continuous forward current | I <sub>S</sub> <sup>*1</sup>  | T <sub>a</sub> = 25°C                        | -      | -    | 1.67 | A    |
| Body diode pulse current              | I <sub>SP</sub> <sup>*2</sup> |                                              | -      | -    | 72   |      |
| Forward voltage                       | V <sub>SD</sub> <sup>*5</sup> | V <sub>GS</sub> = 0V, I <sub>S</sub> = 1.67A | -      | -    | 1.2  | V    |

● Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve



Fig.2 Maximum Safe Operating Area

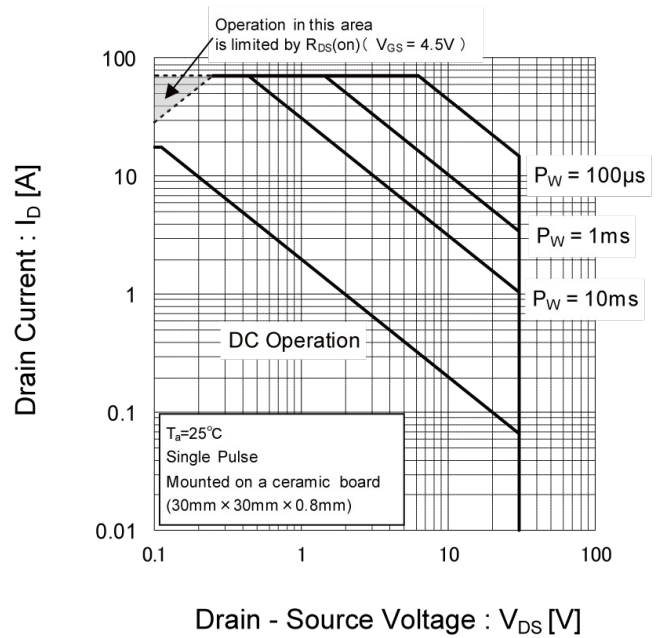


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

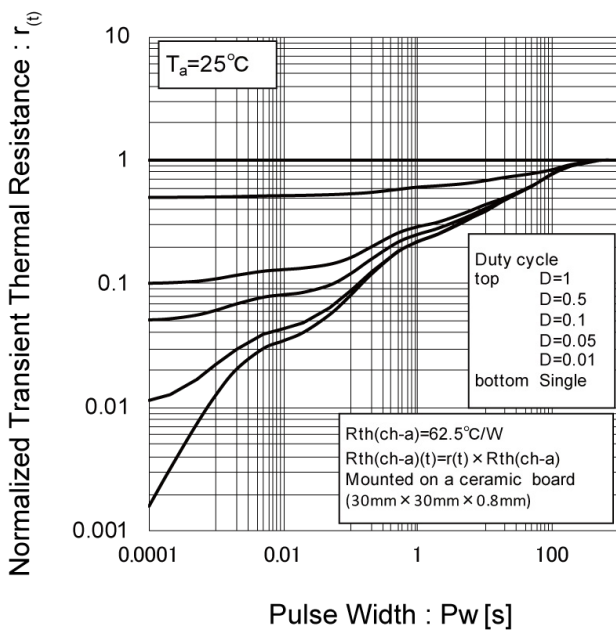
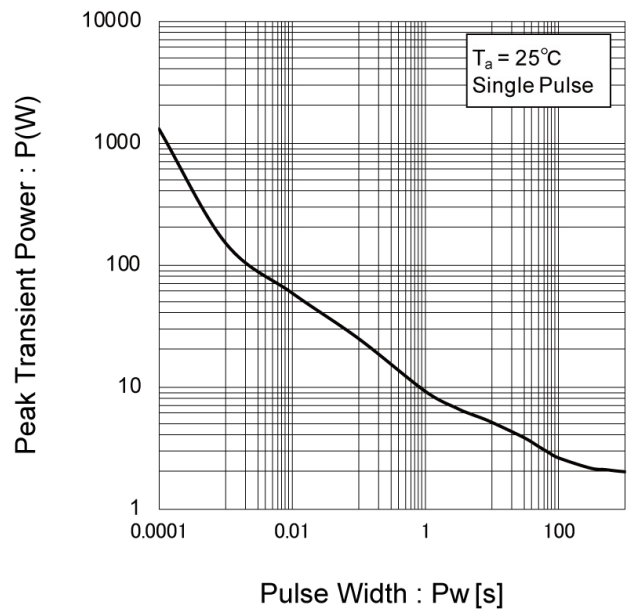


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

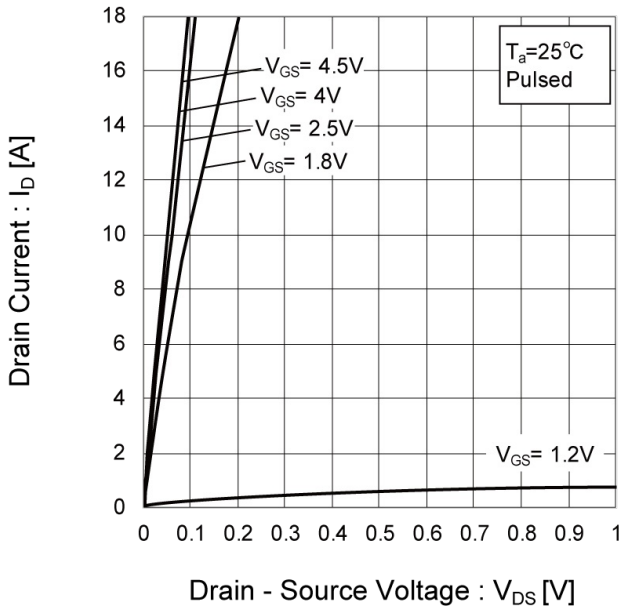


Fig.6 Typical Output Characteristics(II)

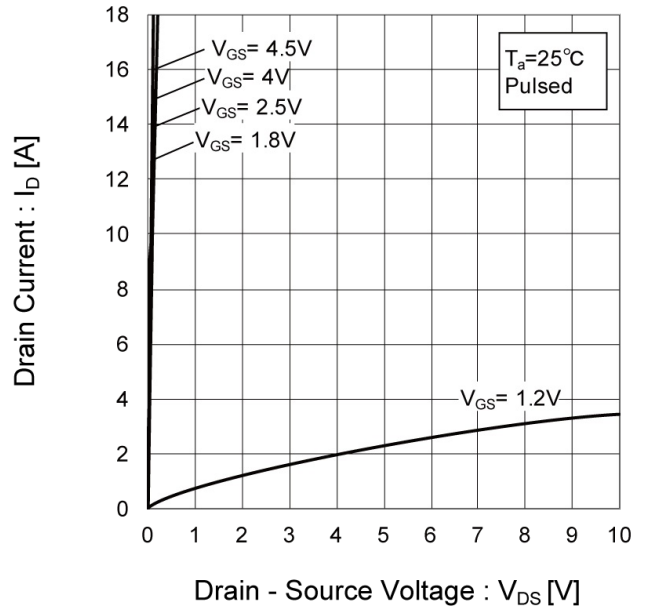
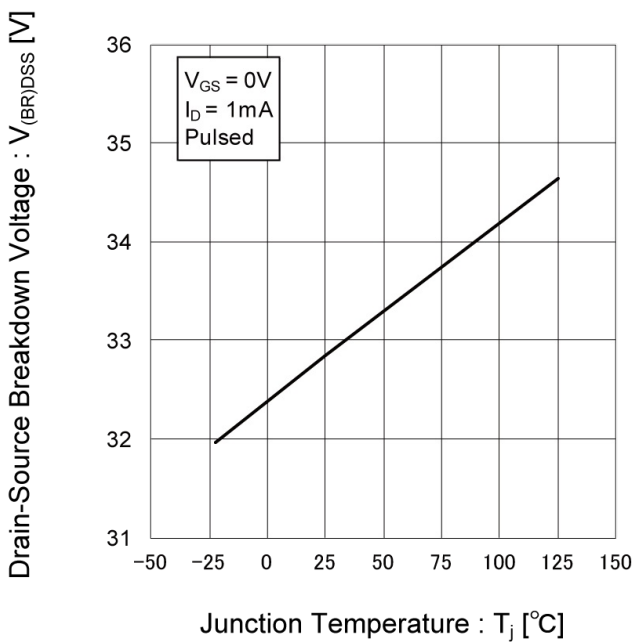


Fig.7 Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

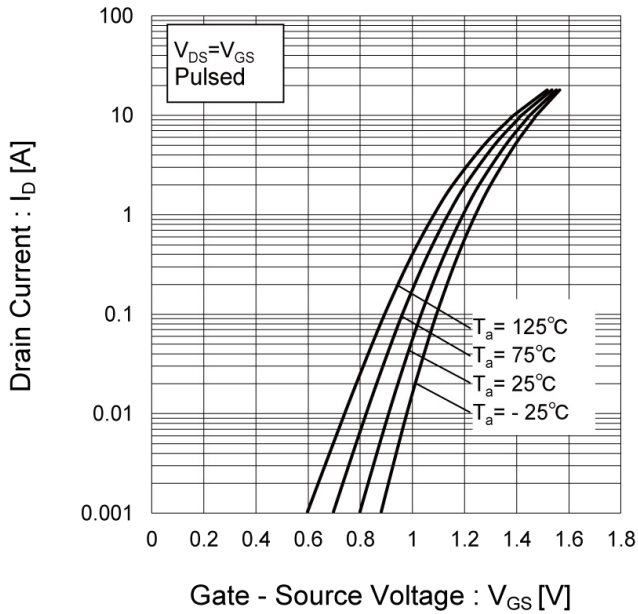


Fig.9 Gate Threshold Voltage vs. Junction Temperature

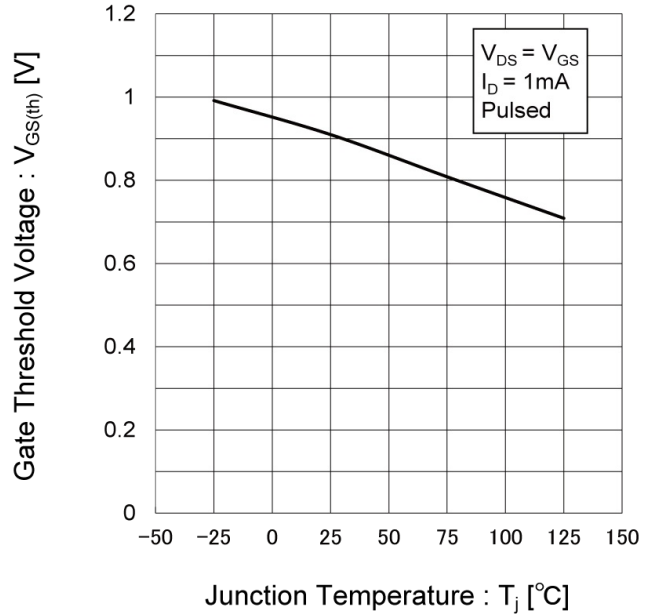
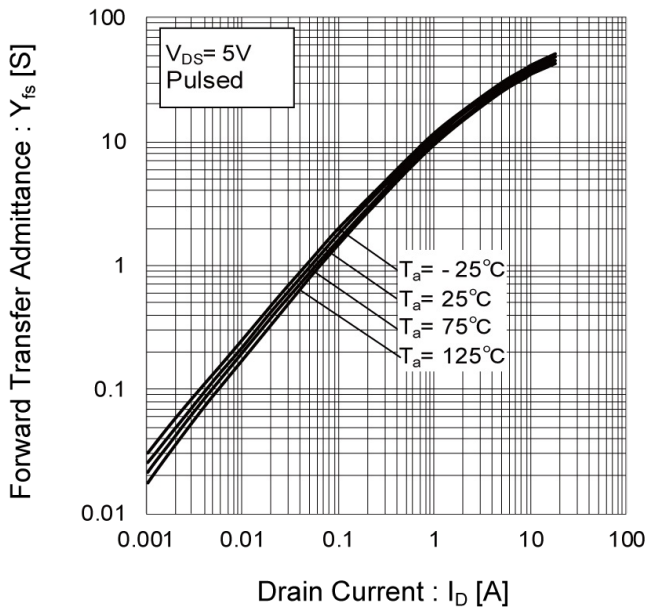


Fig.10 Transconductance vs. Drain Current



● Electrical characteristic curves

Fig.11 Drain Current Derating Curve



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

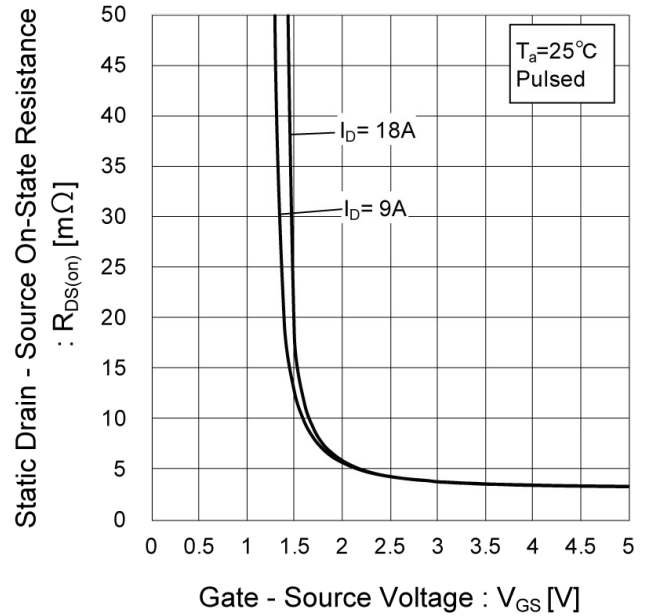
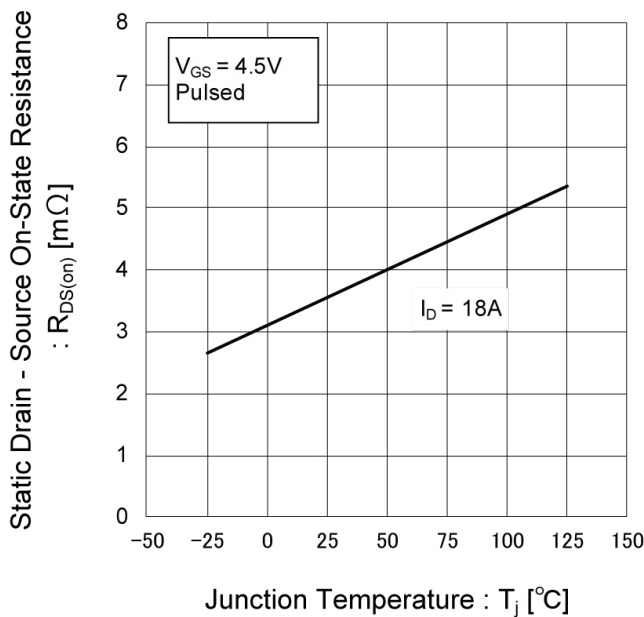


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature



● Electrical characteristic curves

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

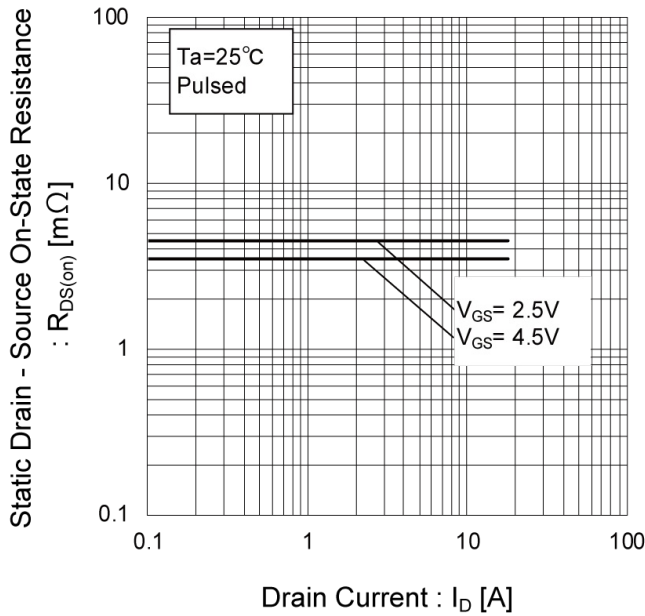


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

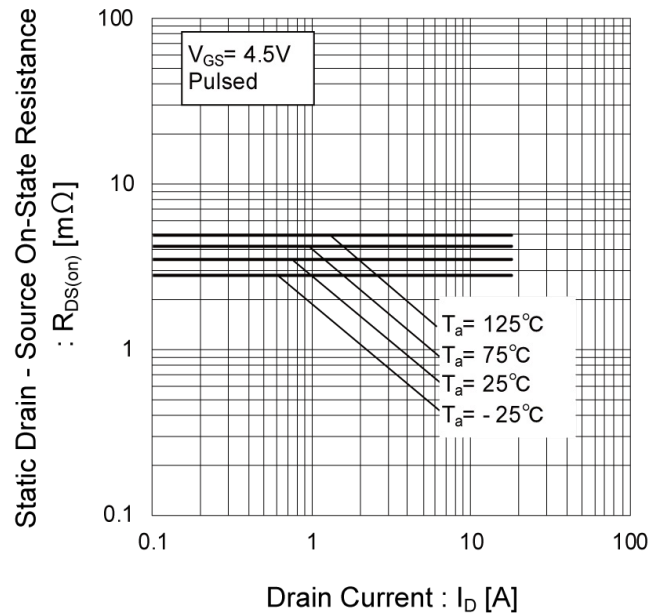
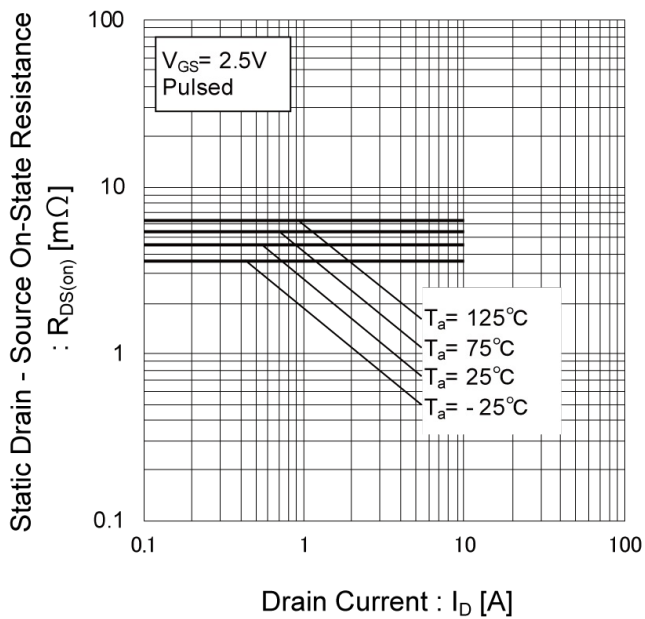


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)





● Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

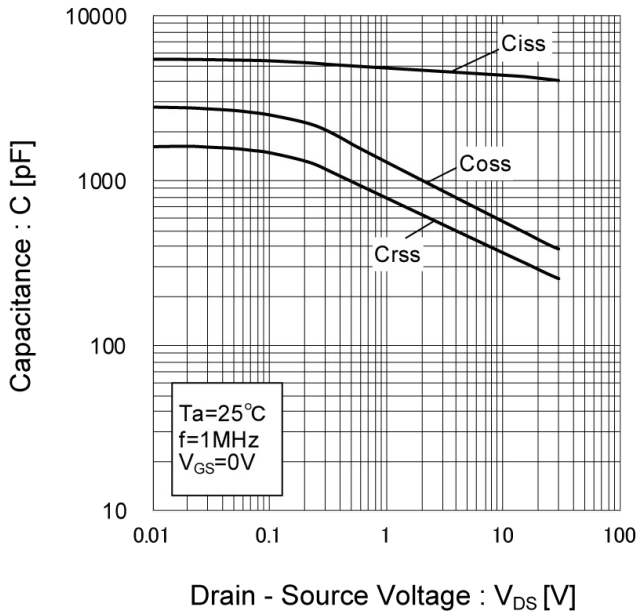


Fig.18 Switching Characteristics

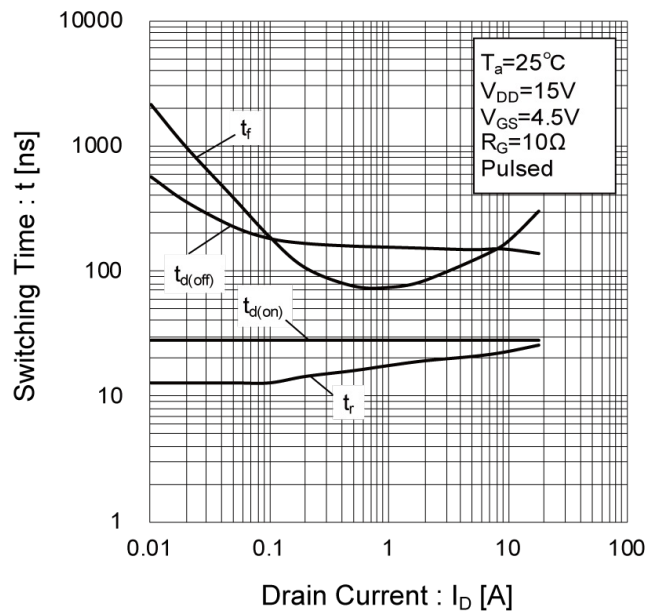


Fig.19 Dynamic Input Characteristics

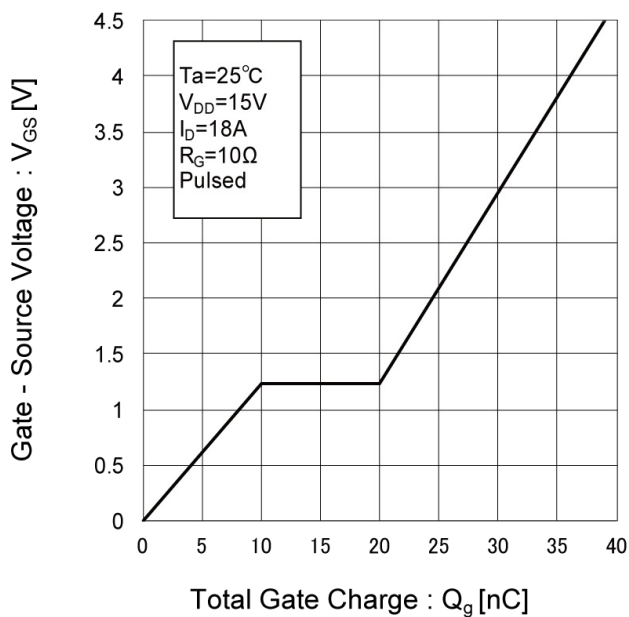
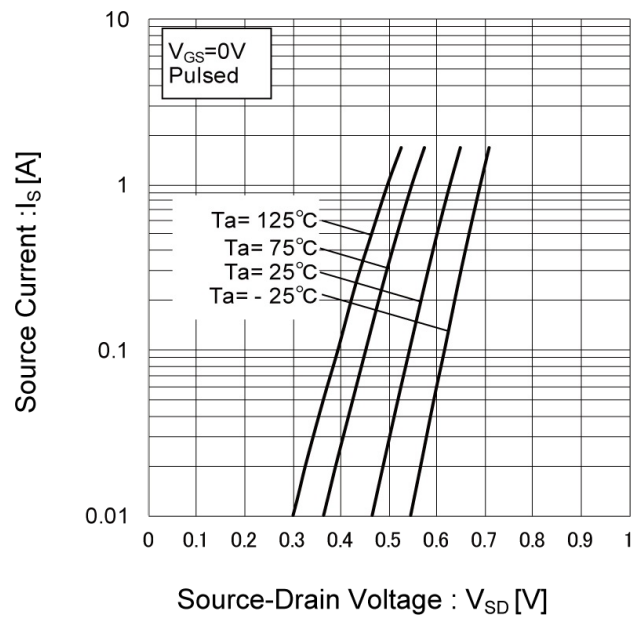


Fig.20 Source Current vs. Source Drain Voltage



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

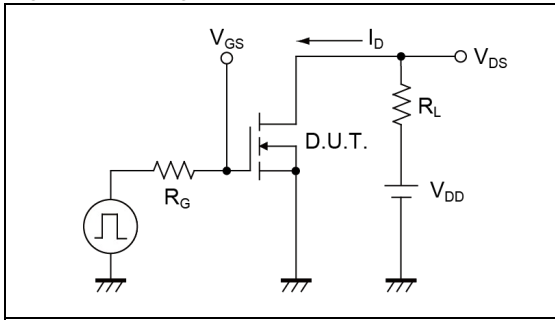


Fig.1-2 Switching Waveforms

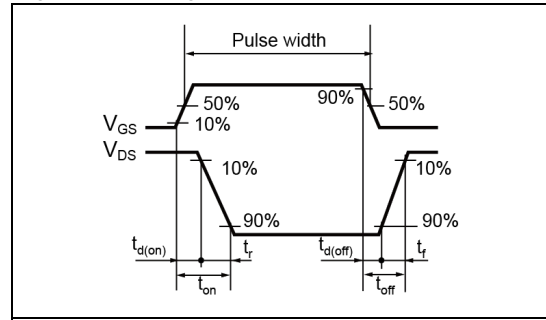


Fig.2-1 Gate Charge Measurement Circuit

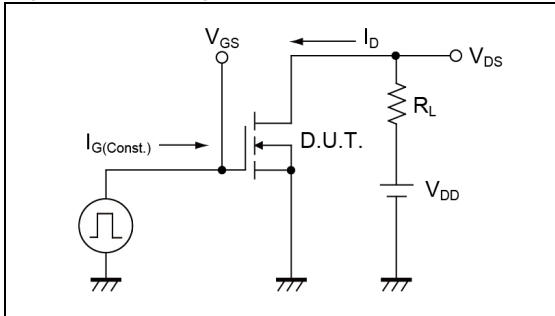


Fig.2-2 Gate Charge Waveform

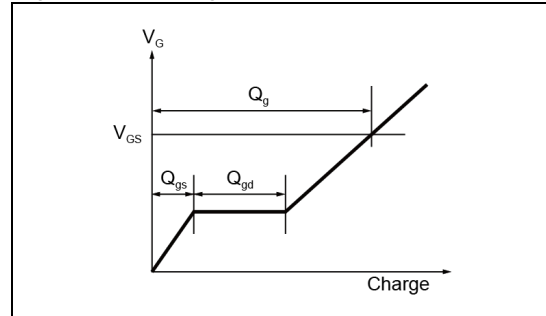


Fig.3-1 AVALANCHE MEASUREMENT CIRCUIT

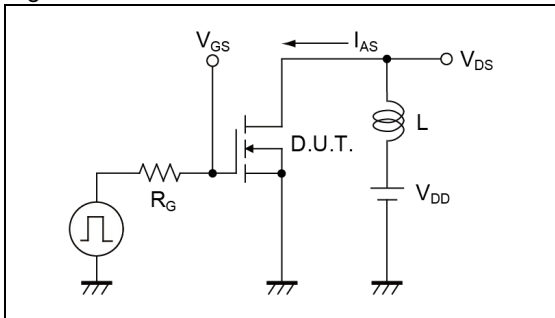
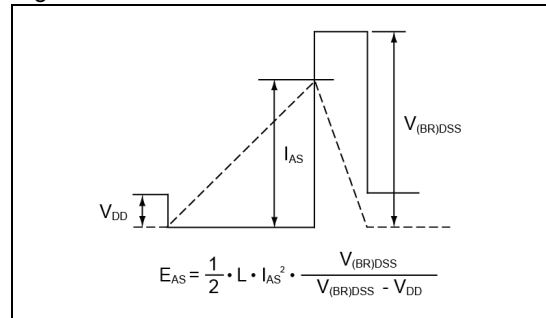


Fig.3-2 AVALANCHE WAVEFORM

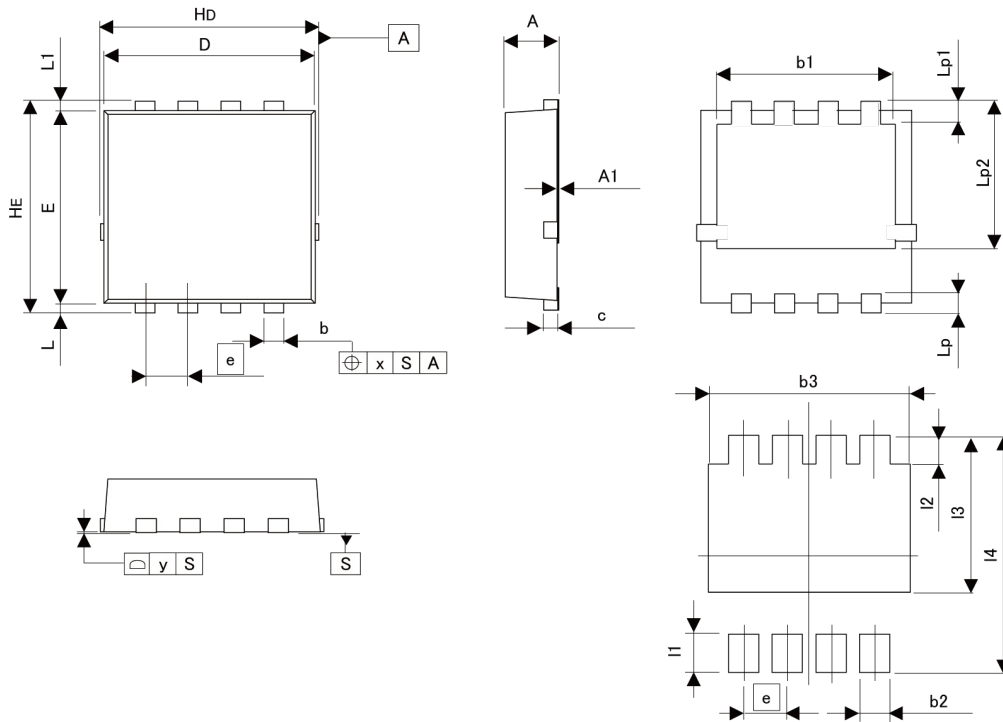


● Notice

This product might cause chip aging and breakdown under the large electrified environment. Please consider to design ESD protection circuit.

●Dimensions

HSMT8



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

| DIM | MILIMETERS |      | INCHES |       |
|-----|------------|------|--------|-------|
|     | MIN        | MAX  | MIN    | MAX   |
| A   | 0.70       | 0.90 | 0.028  | 0.035 |
| A1  | 0.00       | 0.05 | 0.000  | 0.002 |
| b   | 0.27       | 0.37 | 0.011  | 0.015 |
| b1  | 2.50       | 2.70 | 0.098  | 0.106 |
| c   | 0.10       | 0.30 | 0.004  | 0.012 |
| D   | 3.10       | 3.30 | 0.122  | 0.130 |
| E   | 2.90       | 3.10 | 0.114  | 0.122 |
| e   | 0.65       |      | 0.026  |       |
| Hd  | 3.20       | 3.40 | 0.126  | 0.134 |
| HE  | 3.20       | 3.40 | 0.126  | 0.134 |
| L   | 0.07       | 0.25 | 0.003  | 0.010 |
| L1  | 0.07       | 0.25 | 0.003  | 0.010 |
| Lp  | 0.20       | 0.40 | 0.008  | 0.016 |
| Lp1 | 0.25       | 0.45 | 0.010  | 0.018 |
| Lp2 | 2.20       | 2.40 | 0.087  | 0.094 |
| x   | -          | 0.10 | -      | 0.004 |
| y   | -          | 0.10 | -      | 0.004 |

| DIM | MILIMETERS |      | INCHES |       |
|-----|------------|------|--------|-------|
|     | MIN        | MAX  | MIN    | MAX   |
| b2  | -          | 0.47 | -      | 0.019 |
| b3  | -          | 2.70 | -      | 0.106 |
| I1  | -          | 0.50 | -      | 0.020 |
| I2  | -          | 0.55 | -      | 0.022 |
| I3  | -          | 2.40 | -      | 0.094 |
| I4  | -          | 3.40 | -      | 0.134 |

Dimension in mm/inches

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