# RQ3E180AJ

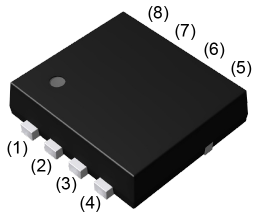
Nch 30V 18A Middle Power MOSFET

Datasheet

| | |
|---|---|
| $V_{DSS}$ | 30V |
| $R_{DS(on)}$(Max.) | 4.5mΩ |
| $I_D$ | ±30A |
| $P_D$ | 2W |

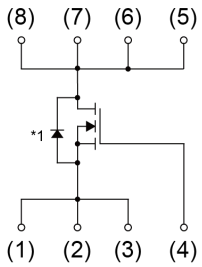
## ●Outline

HSMT8




## ●Inner circuit

(1) Source
(2) Source
(3) Source
(4) Gate
(5) Drain
(6) Drain
(7) Drain
(8) Drain
*1 Body Diode




## ●Features

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

## ●Application

Switching

## ●Packaging specifications

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

## ●Absolute maximum ratings ($T_a$ = 25°C)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain - Source voltage | | $V_{DSS}$ | 30 | V |
| Continuous drain current | $T_c$ = 25°C | $I_D$ *4 | ±30 | A |
| | $T_a$ = 25°C | $I_D$ | ±18 | A |
| Pulsed drain current | | $I_{D,pulse}$ *1 | ±72 | A |
| Gate - Source voltage | | $V_{GSS}$ | ±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 | ℃ |
| Range of storage temperature | | $T_{stg}$ | -55 to +150 | ℃ |

## ●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - ambient | $R_{thJA}$ *3 | - | 62.5 | - | ℃/W |
| Thermal resistance, junction - case | $R_{thJC}$ *4 | - | 4.17 | - | ℃/W |

## ●Electrical characteristics ($T_a$ = 25°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℃ | - | 18 | - | mV/℃ |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ = 24V, $V_{GS}$ = 0V | - | - | 1 | μA |
| Gate - Source leakage current | $I_{GSS}$ | $V_{GS}$ = ±12V, $V_{DS}$ = 0V | - | - | ±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 referenced to 25℃ | - | -2.0 | - | mV/℃ |
| Static drain - source on - state resistance | $R_{DS(on)}$ *5 | $V_{GS}$ = 4.5V, $I_D$ = 18A | - | 3.5 | 4.5 | mΩ |
| | | $V_{GS}$ = 2.5V, $I_D$ = 18A | - | 4.5 | 5.8 | |
| Forward Transfer Admittance | $\|Y_{fs}\|$ *5 | $V_{DS}$ = 5V, $I_D$ = 18A | 24 | - | - | S |

*1 Pw ≤ 10μs, Duty cycle ≤ 1%

*2 L ≃ 100uH, $V_{DD}$ = 15V, $R_G$ = 25Ω, STARTING $T_{ch}$ = 25℃ Fig.3-1,3-2

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

*4 Tc=25℃

*5 Pulsed

## ●Electrical characteristics ($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0V | - | 4290 | - | pF |
| Output capacitance | $C_{oss}$ | $V_{DS}$ = 15V | - | 490 | - | |
| Reverse transfer capacitance | $C_{rss}$ | f = 1MHz | - | 320 | - | |
| Turn - on delay time | $t_{d(on)}$ *5 | $V_{DD}$ ≃ 15V, $V_{GS}$ = 4.5V | - | 28 | - | ns |
| Rise time | $t_r$ *5 | $I_D$ = 9A | - | 22 | - | |
| Turn - off delay time | $t_{d(off)}$ *5 | $R_L$ ≃ 1.67Ω | - | 150 | - | |
| Fall time | $t_f$ *5 | $R_G$ = 10Ω | - | 160 | - | |

## ●Gate charge characteristics ($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Total gate charge | $Q_g$ *5 | $V_{DD}$ ≃ 15V, $I_D$ = 18A, $V_{GS}$ = 4.5V | - | 39 | - | nC |
| Gate - Source charge | $Q_{gs}$ *5 | | - | 10 | - | |
| Gate - Drain charge | $Q_{gd}$ *5 | | - | 10 | - | |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Body diode continuous forward current | $I_S$ *1 | $T_a$ = 25°C | - | - | 1.67 | A |
| Body diode pulse current | $I_{SP}$ *2 | | - | - | 72 | A |
| Forward voltage | $V_{SD}$ *5 | $V_{GS}$ = 0V, $I_S$ = 1.67A | - | - | 1.2 | V |

## ●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

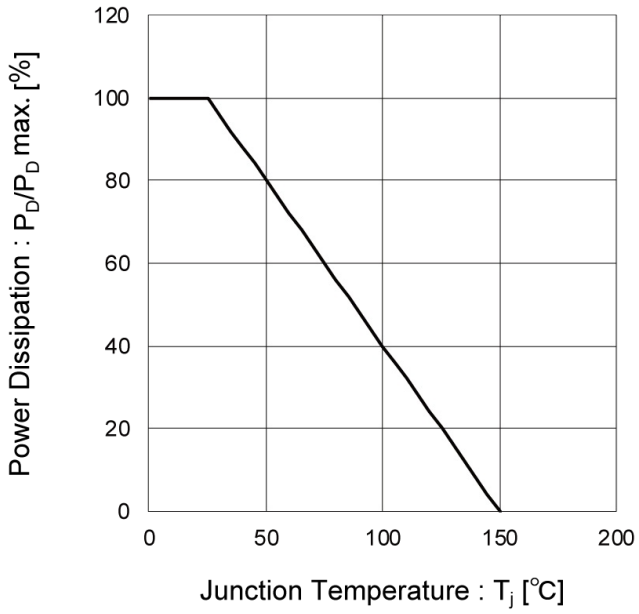



Fig.2 Maximum Safe Operating Area

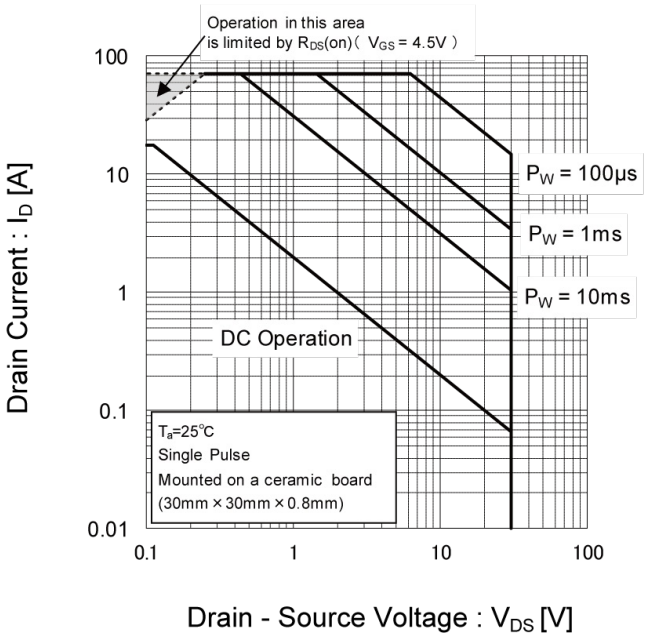



Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

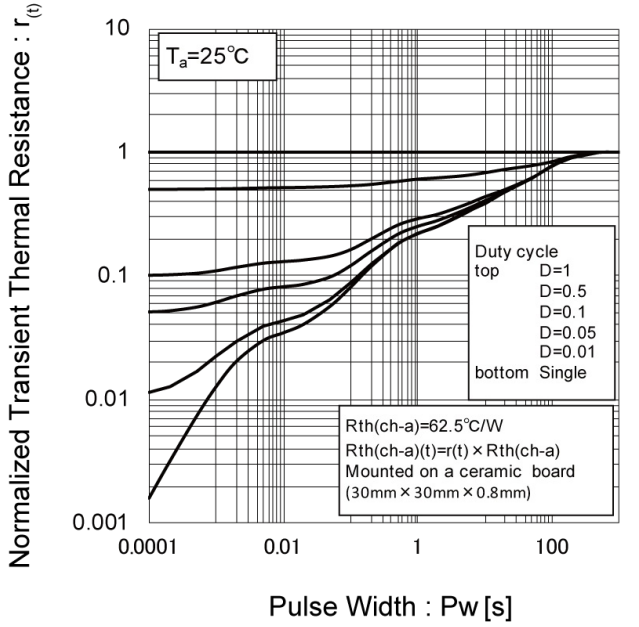
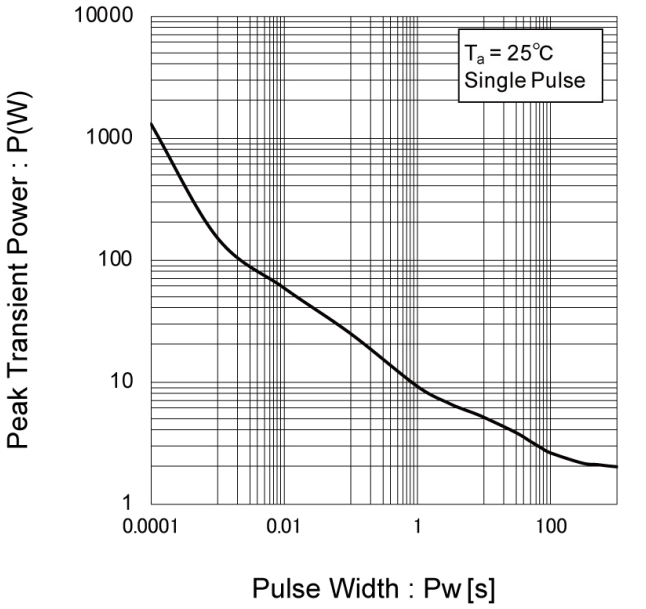



Fig.4 Single Pulse Maximum Power dissipation



## ●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

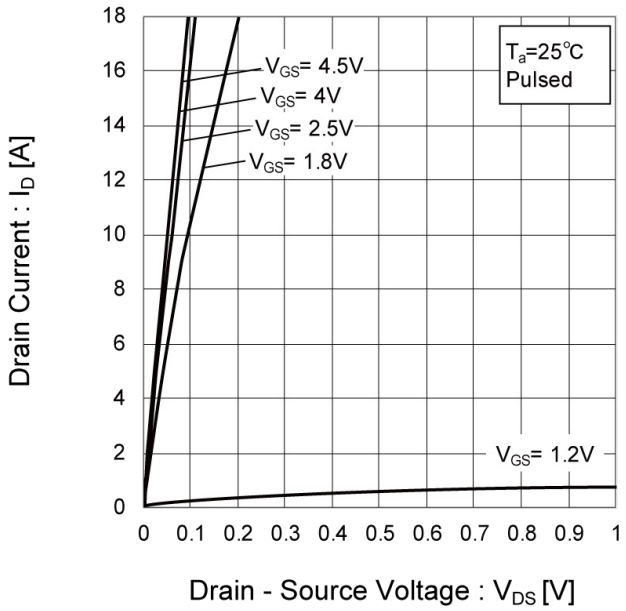



Fig.6 Typical Output Characteristics(II)

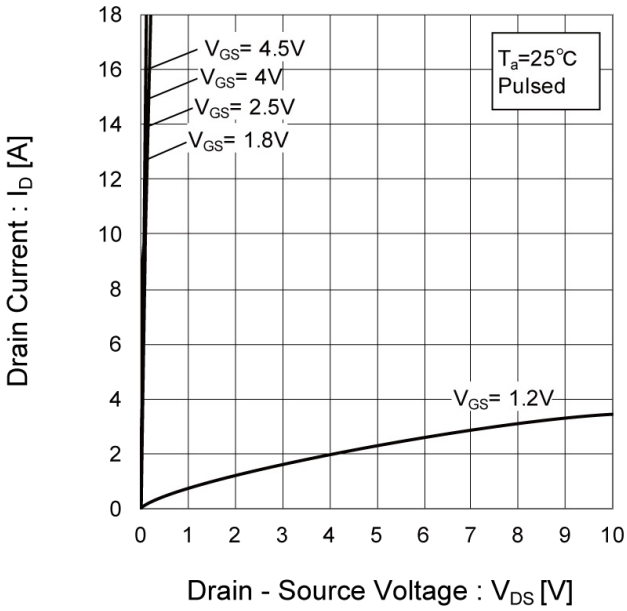
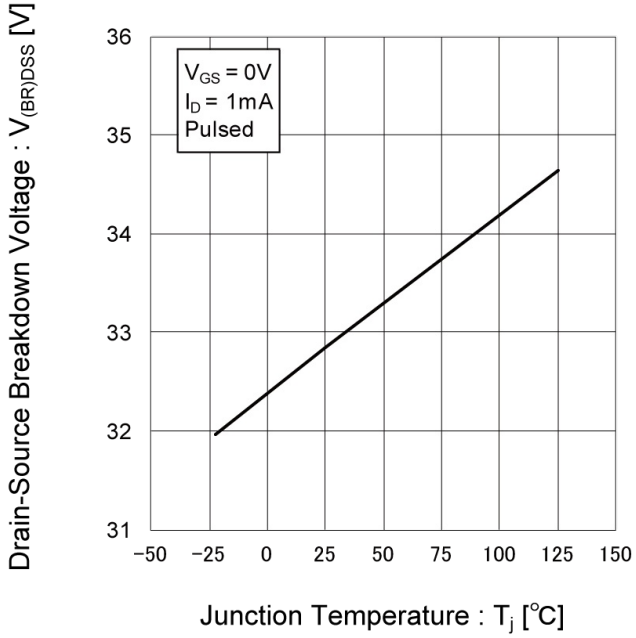



Fig.7 Breakdown Voltage vs. Junction Temperature



## ●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

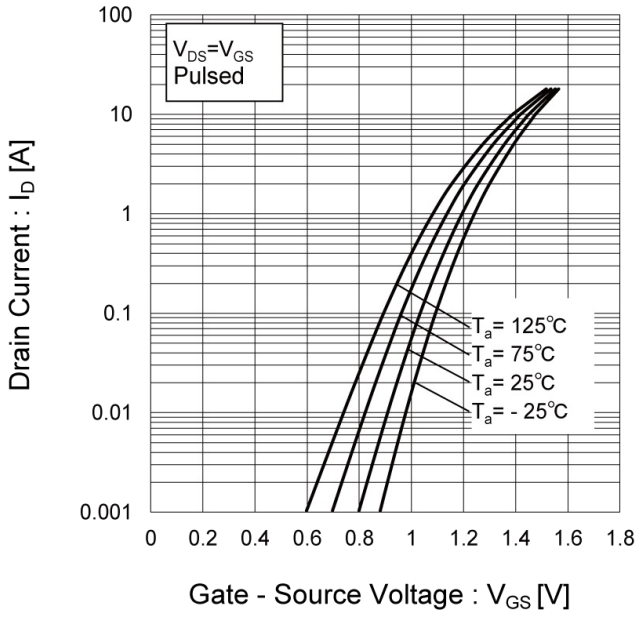



Fig.9 Gate Threshold Voltage vs. Junction Temperature

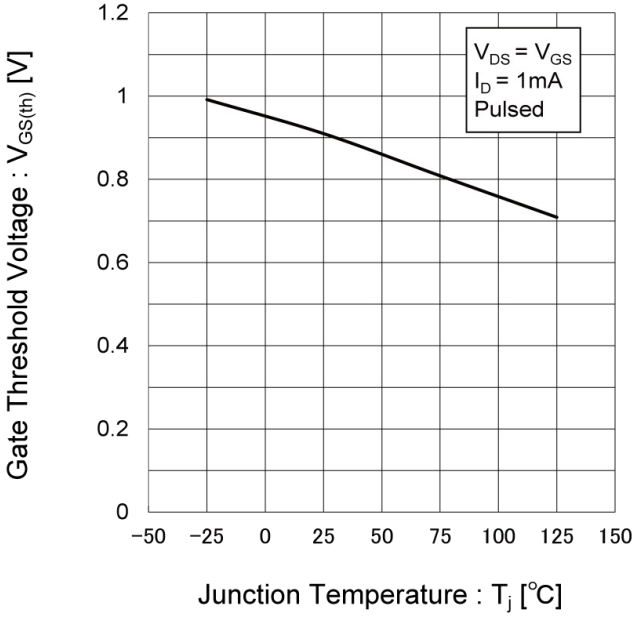
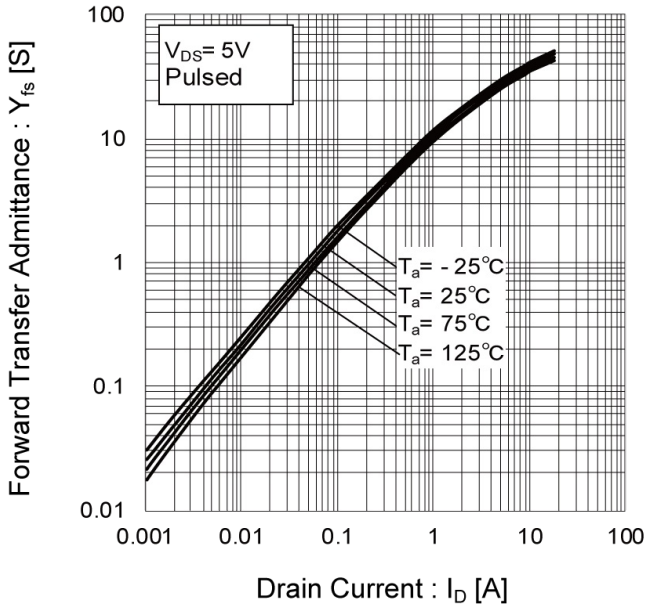



Fig.10 Transconductance vs. Drain Current



## ●Electrical characteristic curves

Fig.11 Drain Current Derating Curve

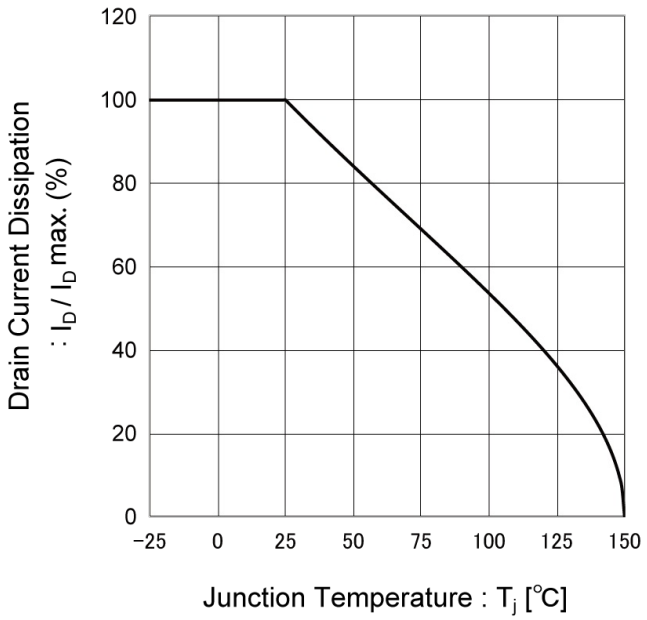



Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

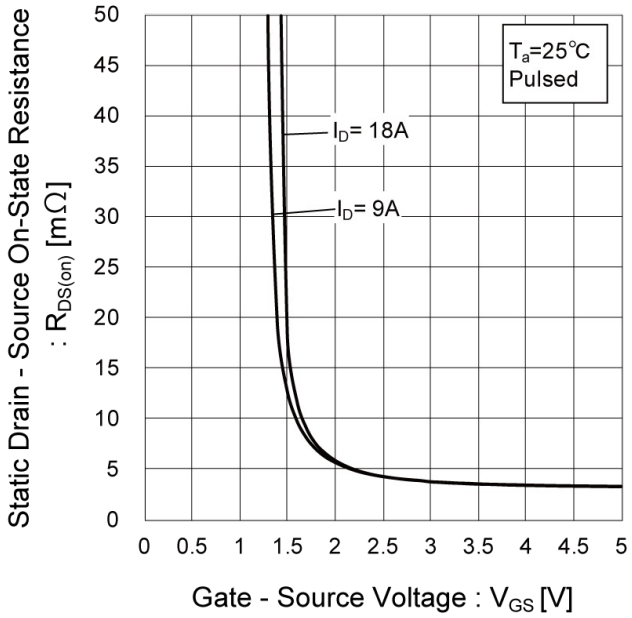
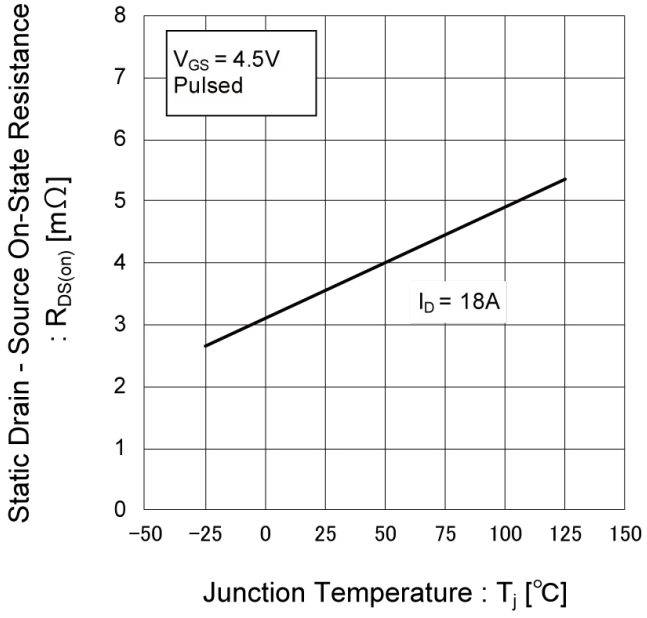



Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature



## ●Electrical characteristic curves

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

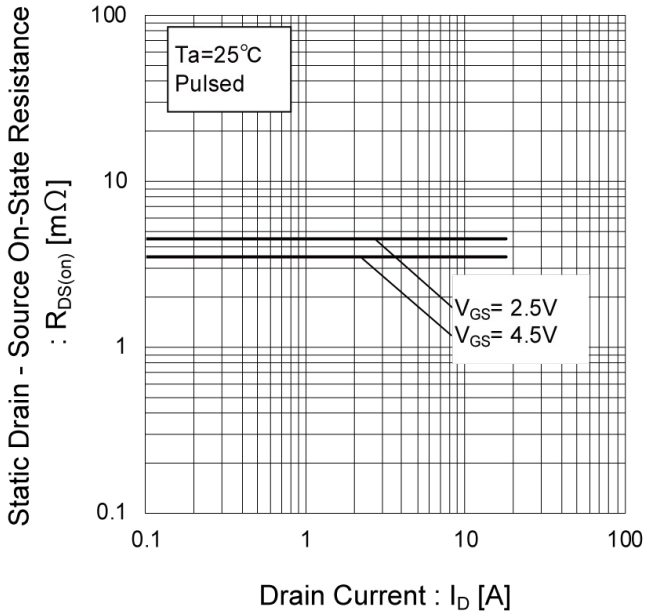



Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

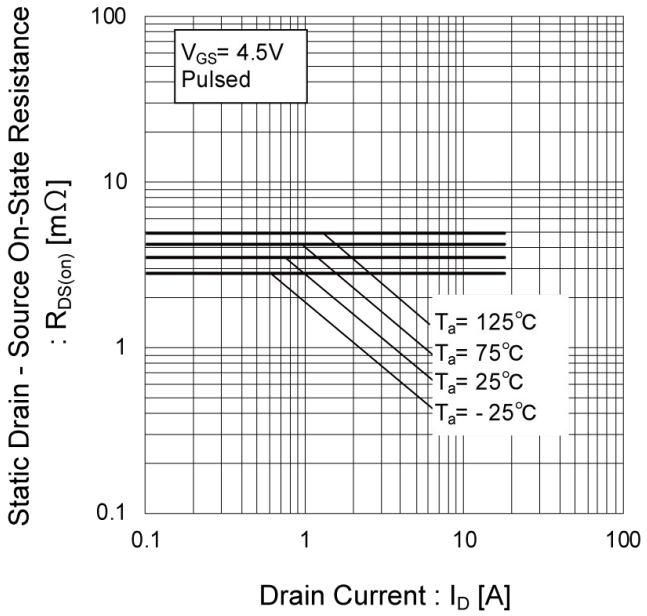
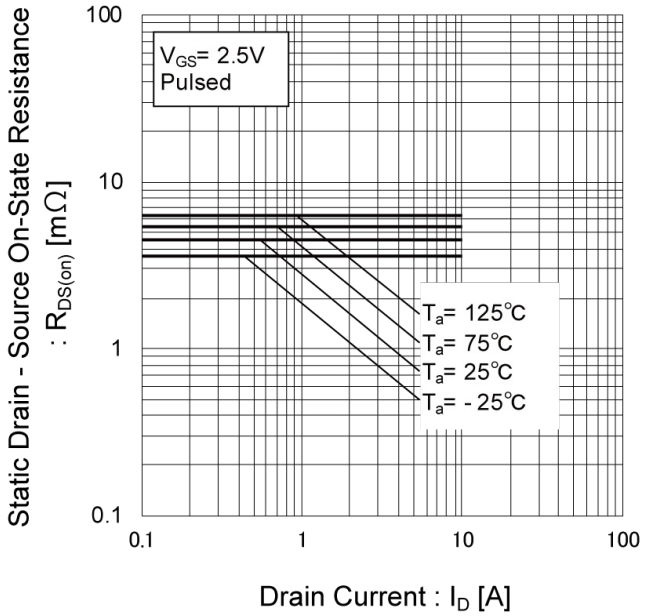



Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)



## ●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

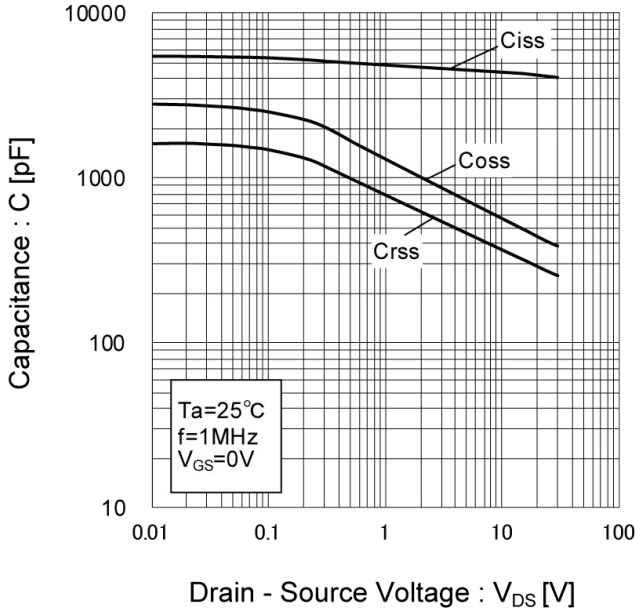



Fig.18 Switching Characteristics

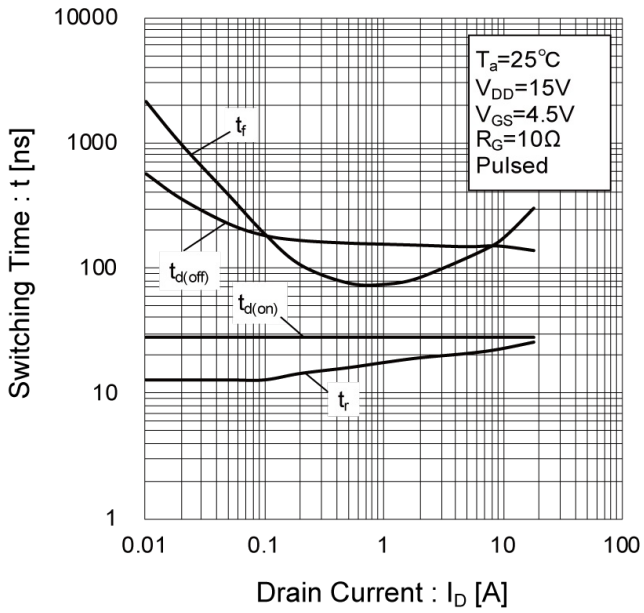



Fig.19 Dynamic Input Characteristics

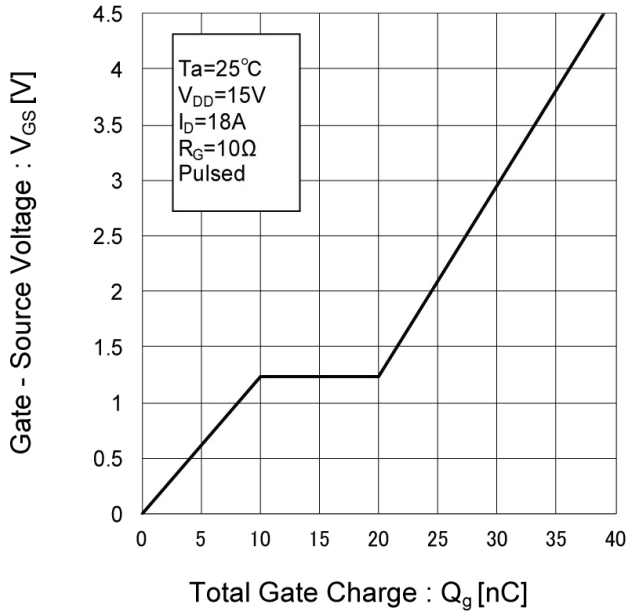
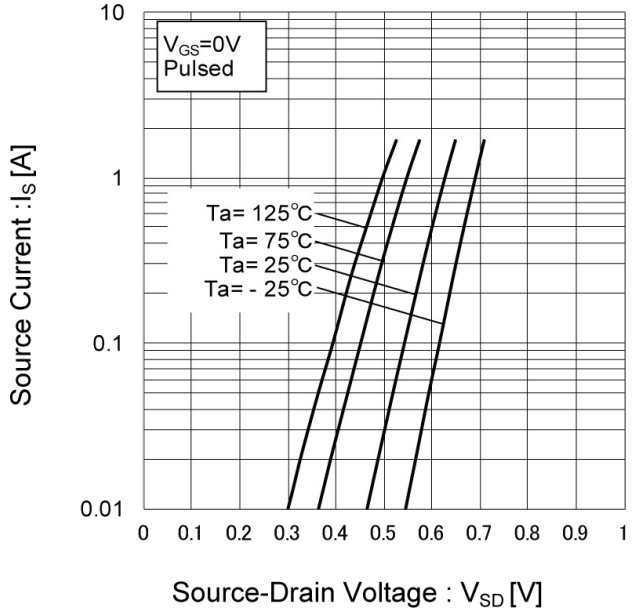



Fig.20 Source Current vs. Source Drain Voltage



## ●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

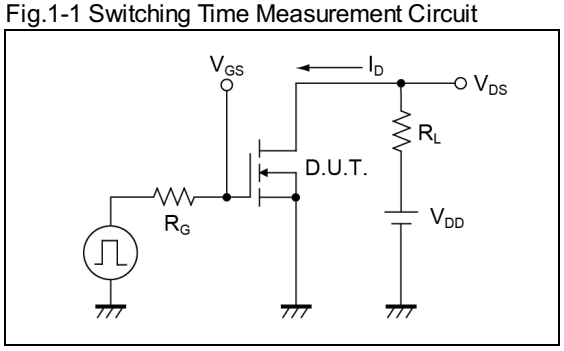



Fig.1-2 Switching Waveforms

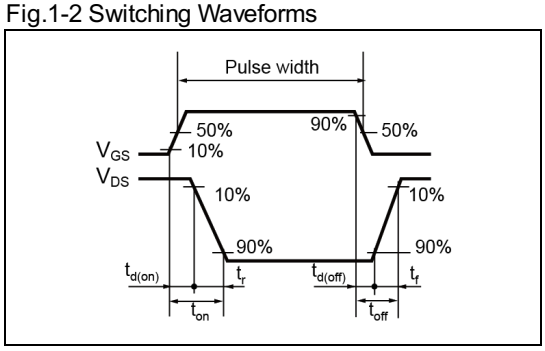



Fig.2-1 Gate Charge Measurement Circuit

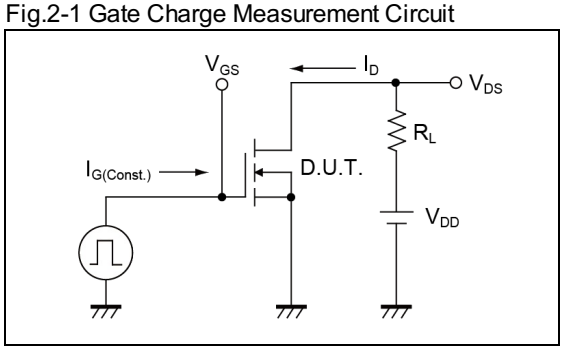



Fig.2-2 Gate Charge Waveform

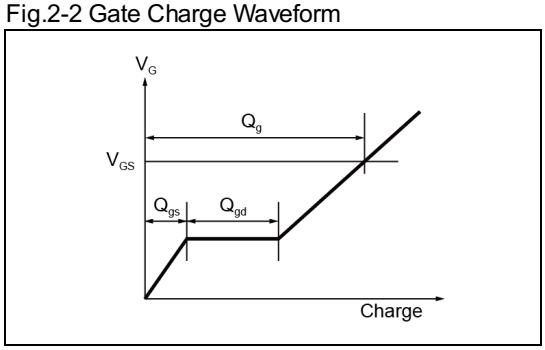



Fig.3-1 AVALANCHE MEASUREMENT CIRCUIT

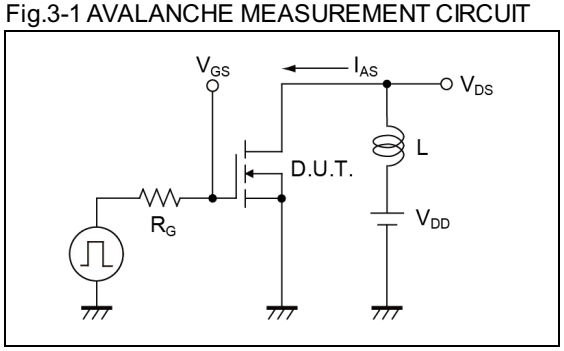
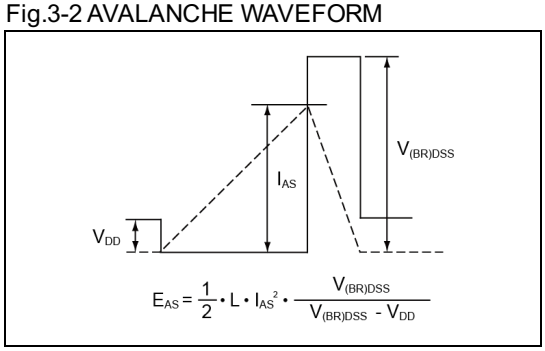



Fig.3-2 AVALANCHE WAVEFORM



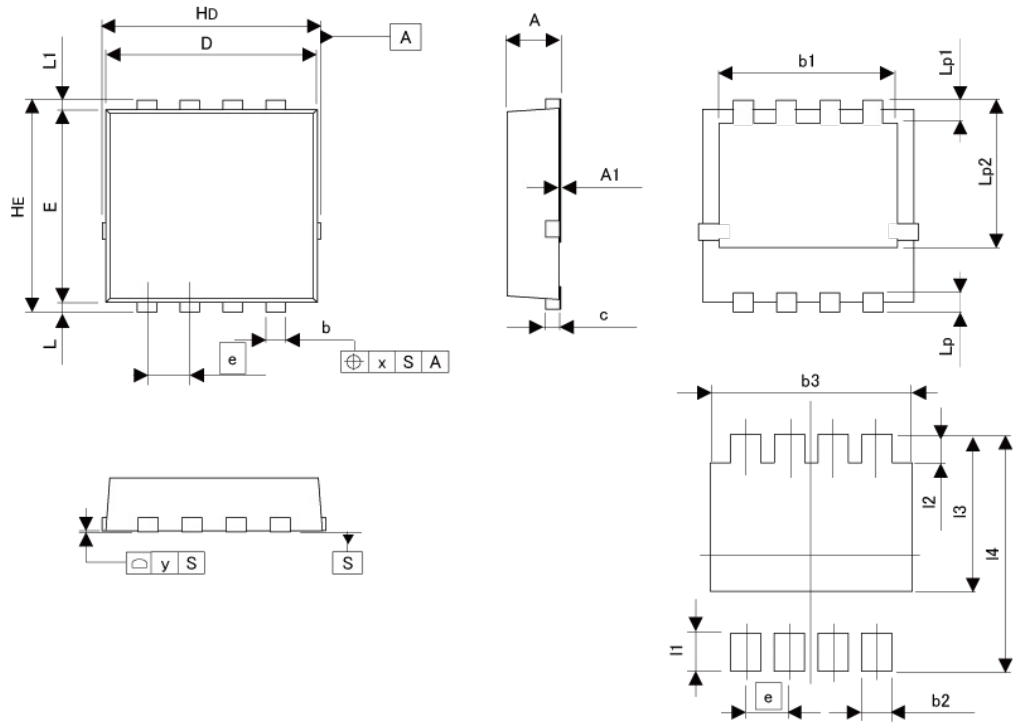

## ●Notice

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

## ●Dimensions

HSMT8

( 3.3x3.3 )




Pattern of terminal position areas
[Not a 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 |
| l1 | - | 0.50 | - | 0.020 |
| l2 | - | 0.55 | - | 0.022 |
| l3 | - | 2.40 | - | 0.094 |
| l4 | - | 3.40 | - | 0.134 |

Dimension in mm/inches

## Notes

1) The information contained herein is subject to change without notice.

2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
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