

# 4V Drive Nch + Pch MOSFET

## SH8M14

### ● Structure

Silicon N-channel MOSFET/  
Silicon P-channel MOSFET

### ● Features

- 1) Low on-resistance.
- 2) High power package(SOP8).
- 3) Low voltage drive(4V drive).

### ● Application

Switching

### ● Packaging specifications

|        |                              |        |
|--------|------------------------------|--------|
| Type   | Package                      | Taping |
|        | Code                         | TB     |
|        | Basic ordering unit (pieces) | 2500   |
| SH8M14 |                              | ○      |

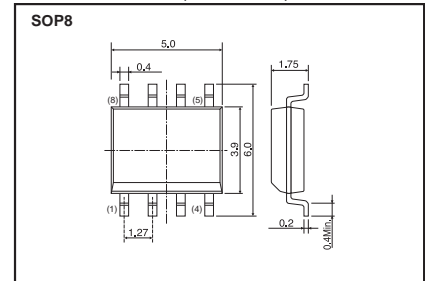
### ● Absolute maximum ratings (Ta = 25°C)

| Parameter                      | Symbol     | Limits        |            | Unit        |   |
|--------------------------------|------------|---------------|------------|-------------|---|
|                                |            | Tr1 : N-ch    | Tr2 : P-ch |             |   |
| Drain-source voltage           | $V_{DSS}$  | 30            | -30        | V           |   |
| Gate-source voltage            | $V_{GSS}$  | ±20           | ±20        | V           |   |
| Drain current                  | Continuous | $I_D$         | ±9         | ±7          | A |
|                                | Pulsed     | $I_{DP}^{*1}$ | ±36        | ±28         | A |
| Source current<br>(Body Diode) | Continuous | $I_s$         | 1.6        | -1.6        | A |
|                                | Pulsed     | $I_{sp}^{*1}$ | 36         | -28         | A |
| Power dissipation              | $P_D^{*2}$ | 2.0           |            | W / TOTAL   |   |
|                                |            | 1.4           |            | W / ELEMENT |   |
| Channel temperature            | Tch        | 150           |            | °C          |   |
| Range of storage temperature   | Tstg       | -55 to +150   |            | °C          |   |

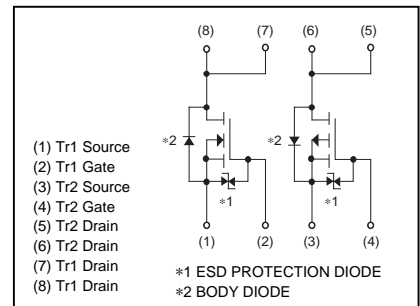
\*1  $P_w \leq 10\mu s$ , Duty cycle  $\leq 1\%$

\*2 Mounted on a ceramic board.

### ● Dimensions (Unit : mm)



### ● Inner circuit



● **Electrical characteristics** (Ta = 25°C)

<Tr1(Nch)>

| Parameter                               | Symbol         | Min. | Typ. | Max. | Unit | Conditions                  |
|---|----------------|------|------|------|------|-----------------------------|
| Gate-source leakage                     | $I_{GSS}$      | -    | -    | ±10  | μA   | $V_{GS}=\pm 20V, V_{DS}=0V$ |
| Drain-source breakdown voltage          | $V_{(BR)DSS}$  | 30   | -    | -    | V    | $I_D=1mA, V_{GS}=0V$        |
| Zero gate voltage drain current         | $I_{DSS}$      | -    | -    | 1    | μA   | $V_{DS}=30V, V_{GS}=0V$     |
| Gate threshold voltage                  | $V_{GS(th)}$   | 1.0  | -    | 2.5  | V    | $V_{DS}=10V, I_D=1mA$       |
| Static drain-source on-state resistance | $R_{DS(on)}^*$ | -    | 15   | 21   | mΩ   | $I_D=9A, V_{GS}=10V$        |
|   |                | -    | 18   | 25   |      | $I_D=9A, V_{GS}=4.5V$       |
|   |                | -    | 20   | 28   |      | $I_D=9A, V_{GS}=4V$         |
| Forward transfer admittance             | $ Y_{fs} ^*$   | 5.0  | -    | -    | S    | $V_{DS}=10V, I_D=9A$        |
| Input capacitance                       | $C_{iss}$      | -    | 630  | -    | pF   | $V_{DS}=10V$                |
| Output capacitance                      | $C_{oss}$      | -    | 230  | -    | pF   | $V_{GS}=0V$                 |
| Reverse transfer capacitance            | $C_{rss}$      | -    | 110  | -    | pF   | $f=1MHz$                    |
| Turn-on delay time                      | $t_{d(on)}^*$  | -    | 10   | -    | ns   | $I_D=4.5A, V_{DD}=15V$      |
| Rise time                               | $t_r^*$        | -    | 33   | -    | ns   | $V_{GS}=10V$                |
| Turn-off delay time                     | $t_{d(off)}^*$ | -    | 42   | -    | ns   | $R_L=3.3\Omega$             |
| Fall time                               | $t_f^*$        | -    | 10   | -    | ns   | $R_G=10\Omega$              |
| Total gate charge                       | $Q_g^*$        | -    | 8.5  | -    | nC   | $I_D=9A, V_{DD}=15V$        |
| Gate-source charge                      | $Q_{gs}^*$     | -    | 2.3  | -    | nC   | $V_{GS}=5V$                 |
| Gate-drain charge                       | $Q_{gd}^*$     | -    | 4.0  | -    | nC   |                             |

\*Pulsed

● **Body diode characteristics** (Source-Drain) (Ta = 25°C)

| Parameter       | Symbol     | Min. | Typ. | Max. | Unit | Conditions          |
|-----------------|------------|------|------|------|------|---------------------|
| Forward Voltage | $V_{SD}^*$ | -    | -    | 1.2  | V    | $I_S=9A, V_{GS}=0V$ |

\*Pulsed

● **Electrical characteristics** (Ta = 25°C)

<Tr2(Pch)>

| Parameter                               | Symbol         | Min. | Typ. | Max. | Unit | Conditions                  |
|---|----------------|------|------|------|------|-----------------------------|
| Gate-source leakage                     | $I_{GSS}$      | -    | -    | ±10  | μA   | $V_{GS}=\pm 20V, V_{DS}=0V$ |
| Drain-source breakdown voltage          | $V_{(BR)DSS}$  | -30  | -    | -    | V    | $I_D=-1mA, V_{GS}=0V$       |
| Zero gate voltage drain current         | $I_{DSS}$      |      | -    | -1   | μA   | $V_{DS}=-30V, V_{GS}=0V$    |
| Gate threshold voltage                  | $V_{GS(th)}$   | -1.0 | -    | -2.5 | V    | $V_{DS}=-10V, I_D=-1mA$     |
| Static drain-source on-state resistance | $R_{DS(on)}$ * | -    | 21.5 | 29.0 | mΩ   | $I_D=-7A, V_{GS}=-10V$      |
|   |                | -    | 29.0 | 39.0 |      | $I_D=-3.5A, V_{GS}=-4.5V$   |
|   |                | -    | 31.0 | 40.8 |      | $I_D=-3.5A, V_{GS}=-4.0V$   |
| Forward transfer admittance             | $ Y_{fs} $ *   | 6.0  | -    | -    | S    | $V_{DS}=-10V, I_D=-7A$      |
| Input capacitance                       | $C_{iss}$      | -    | 1200 | -    | pF   | $V_{DS}=-10V$               |
| Output capacitance                      | $C_{oss}$      | -    | 170  | -    | pF   | $V_{GS}=0V$                 |
| Reverse transfer capacitance            | $C_{rss}$      | -    | 170  | -    | pF   | $f=1MHz$                    |
| Turn-on delay time                      | $t_{d(on)}$ *  | -    | 12   | -    | ns   | $I_D=-3.5A, V_{DD}=-15V$    |
| Rise time                               | $t_r$ *        | -    | 40   | -    | ns   | $V_{GS}=-10V$               |
| Turn-off delay time                     | $t_{d(off)}$ * | -    | 80   | -    | ns   | $R_L=4.27\Omega$            |
| Fall time                               | $t_f$ *        | -    | 65   | -    | ns   | $R_G=10\Omega$              |
| Total gate charge                       | $Q_g$ *        | -    | 18   | -    | nC   | $I_D=-7A, V_{DD}=-15V$      |
| Gate-source charge                      | $Q_{gs}$ *     | -    | 3.5  | -    | nC   | $V_{GS}=-5V$                |
| Gate-drain charge                       | $Q_{gd}$ *     | -    | 6.5  | -    | nC   |                             |

\*Pulsed

● **Body diode characteristics** (Source-Drain) (Ta = 25°C)

| Parameter       | Symbol     | Min. | Typ. | Max. | Unit | Conditions           |
|-----------------|------------|------|------|------|------|----------------------|
| Forward Voltage | $V_{SD}$ * | -    | -    | -1.2 | V    | $I_S=-7A, V_{GS}=0V$ |

\*Pulsed

●Electrical characteristic curves (Ta=25°C)

<Tr.1(Nch)>

Fig.1 Typical Output Characteristics ( I )

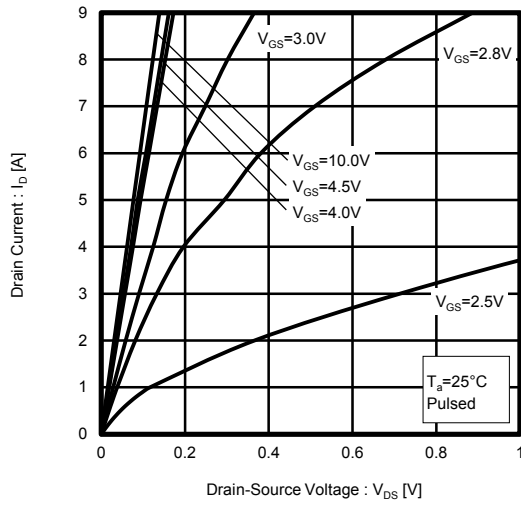


Fig.2 Typical Output Characteristics ( II )

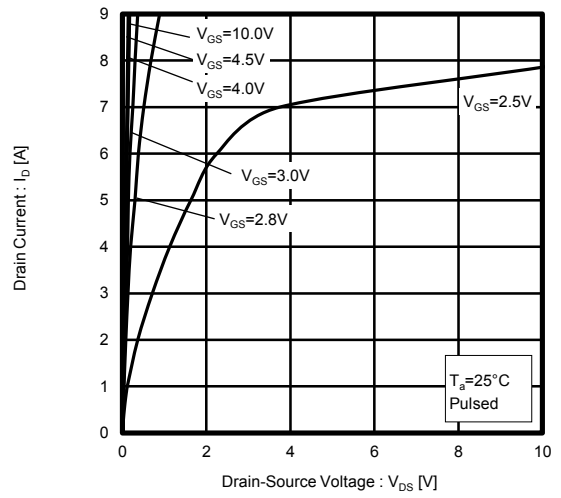


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

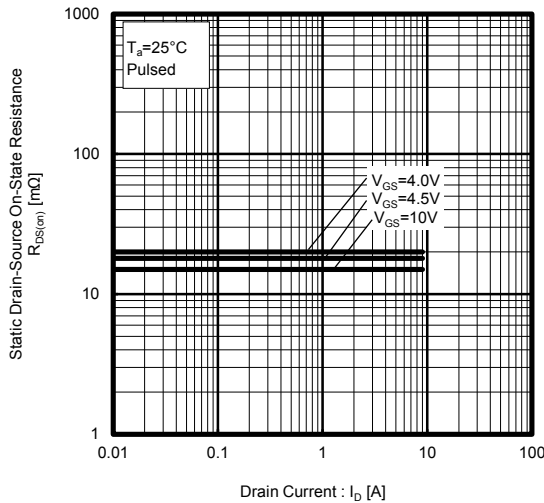


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

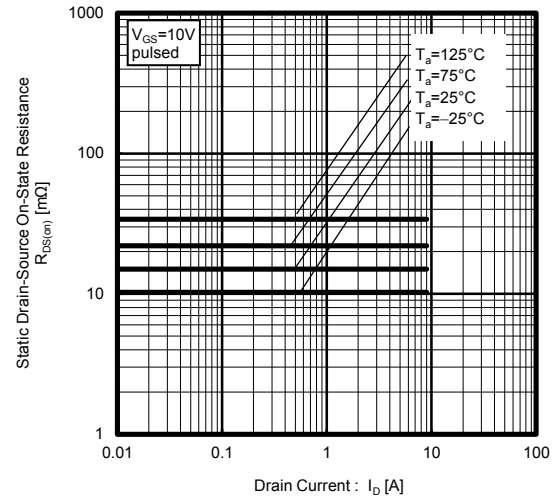


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

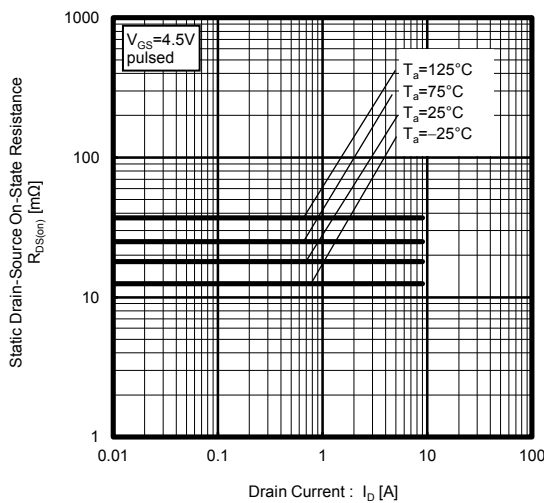


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

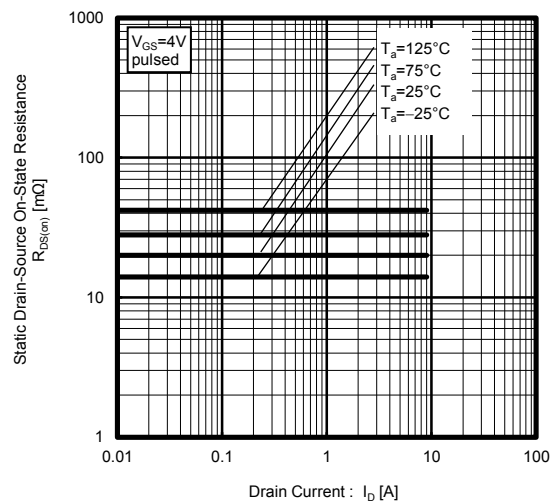


Fig.7 Forward Transfer Admittance vs. Drain Current

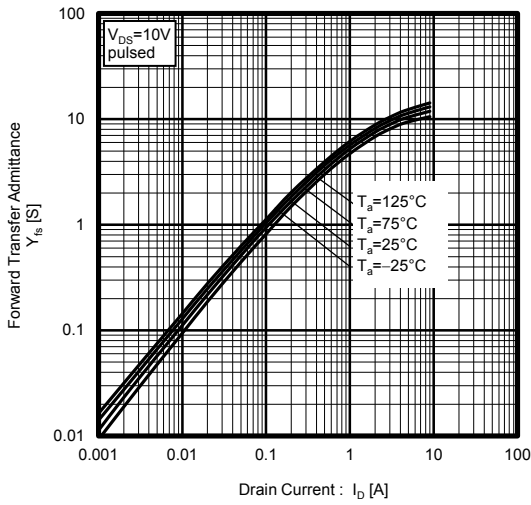


Fig.8 Typical Transfer Characteristics

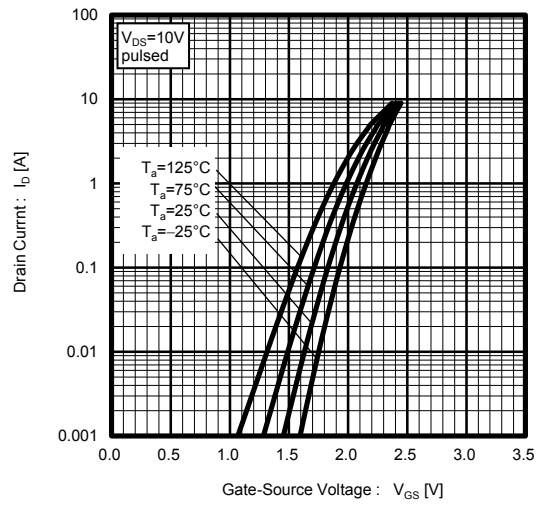


Fig.9 Source Current vs. Source-Drain Voltage

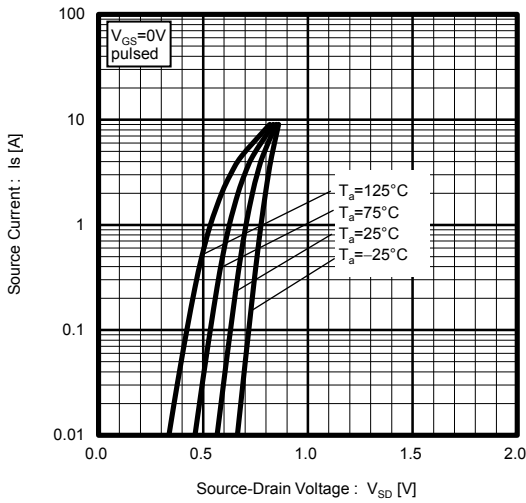


Fig.10 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

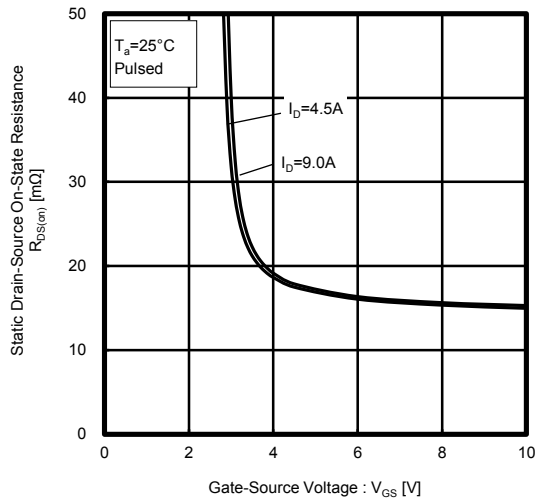


Fig.11 Switching Characteristics

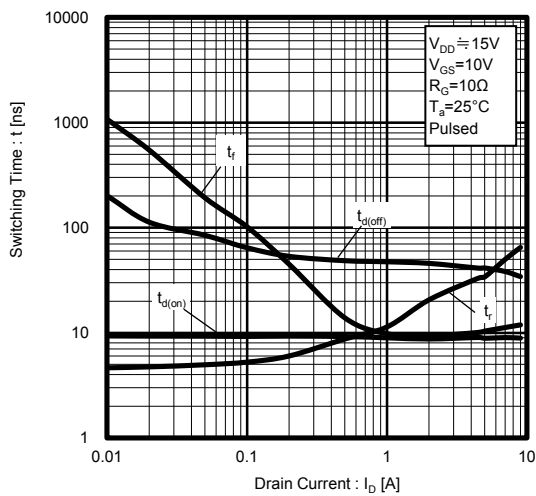


Fig.12 Dynamic Input Characteristics

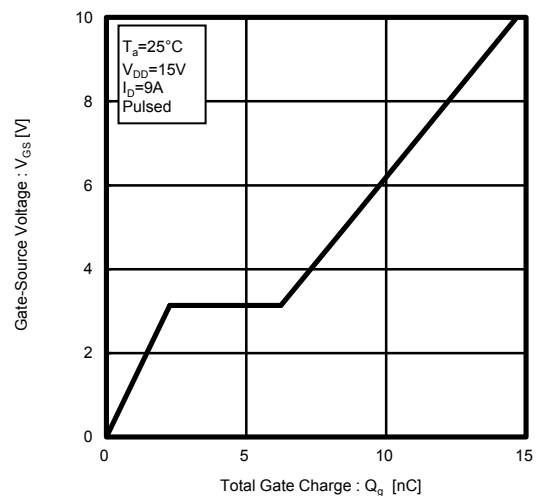


Fig.13 Typical Capacitance vs. Drain-Source Voltage

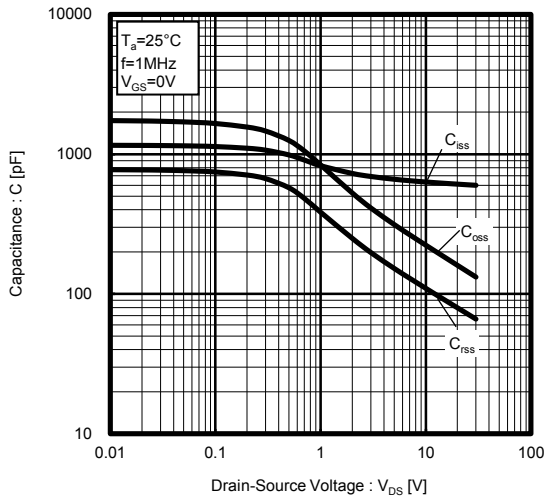


Fig.14 Maximum Safe Operating Area

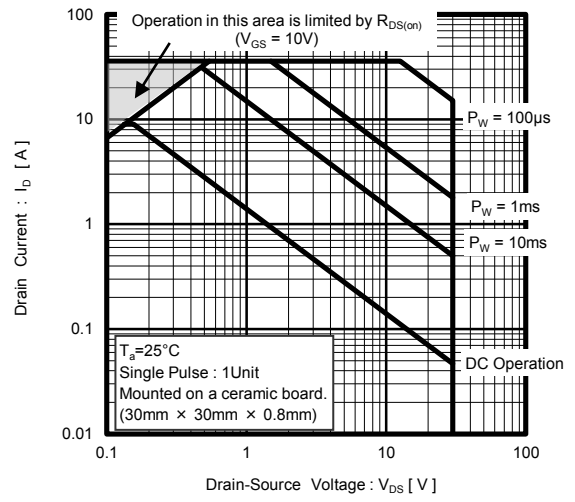
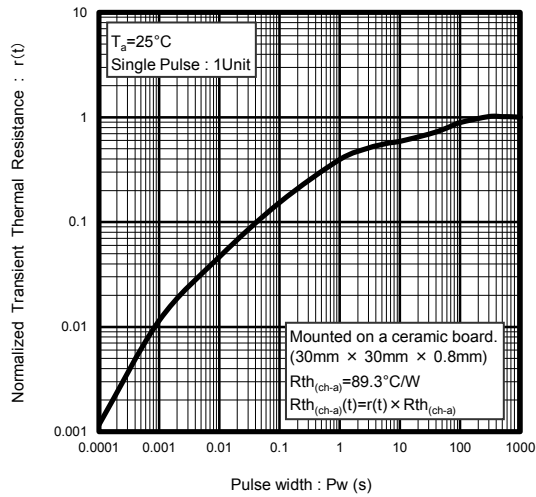


Fig.15 Normalized Transient Thermal Resistance v.s. Pulse Width



<Tr.2(Pch)>

Fig.1 Typical Output Characteristics ( I )

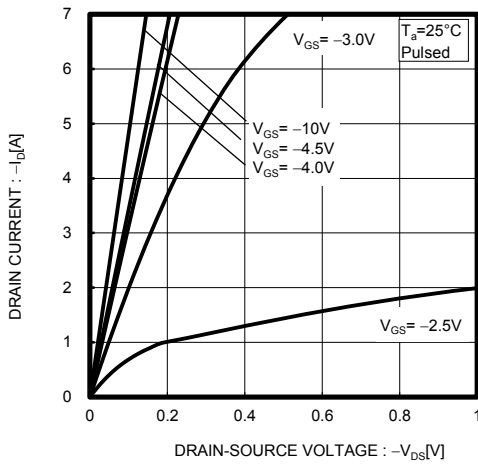


Fig.2 Typical Output Characteristics ( II )

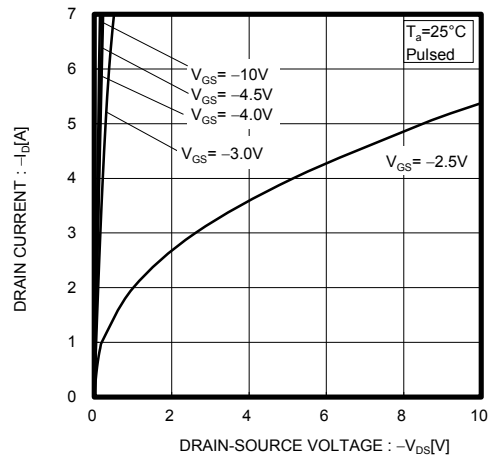


Fig.3 Typical Transfer Characteristics

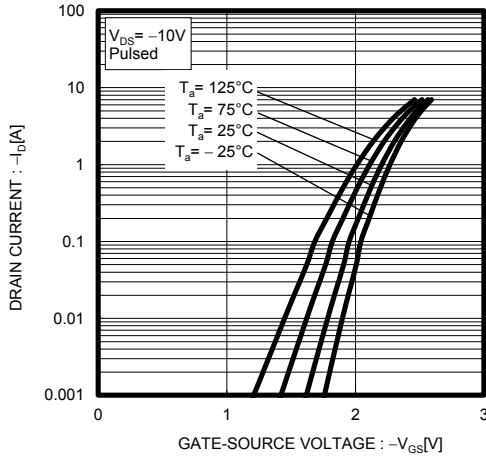


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current ( I )

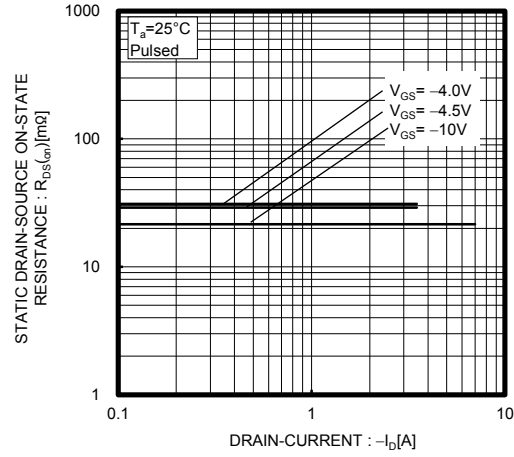


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current ( II )

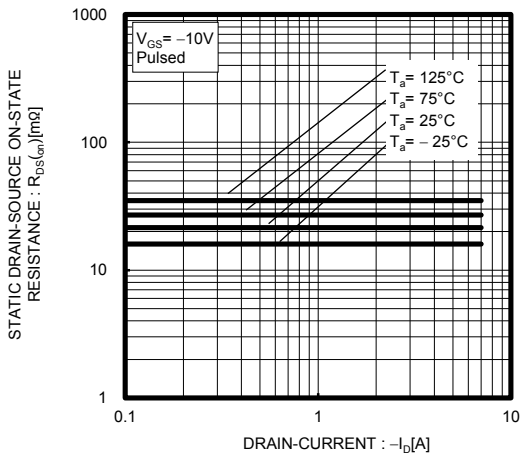


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current ( III )

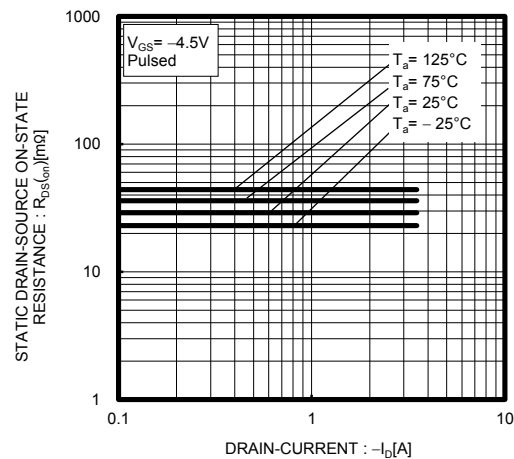


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current(I<sub>D</sub>)

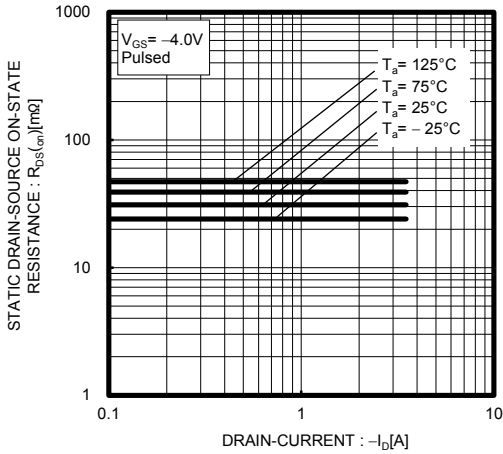


Fig.8 Forward Transfer Admittance vs. Drain Current

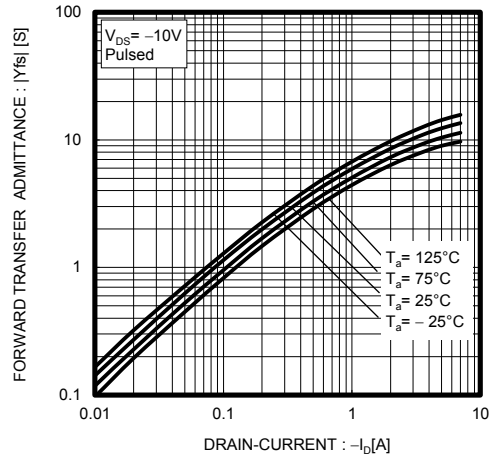


Fig.9 Reverse Drain Current vs. Source-Drain Voltage

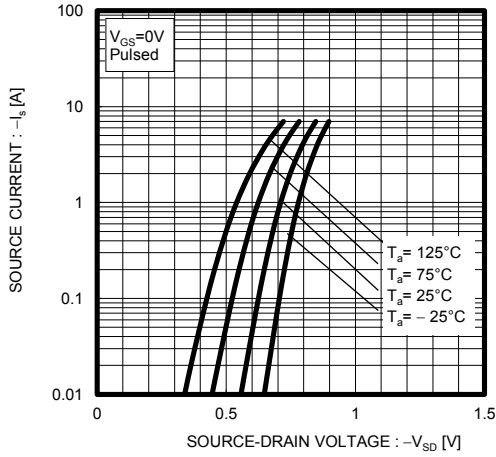


Fig.10 Static Drain-Source On-State Resistance vs. Gate Source Voltage

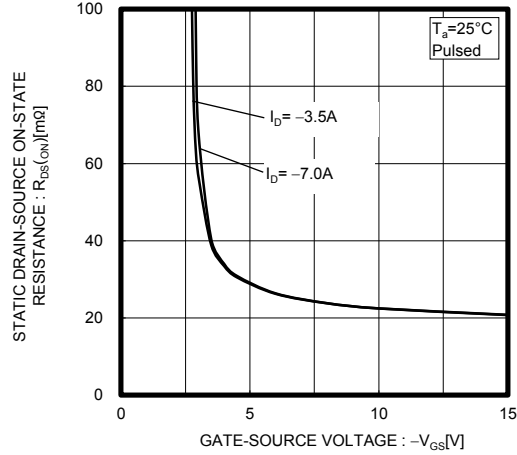


Fig.11 Switching Characteristics

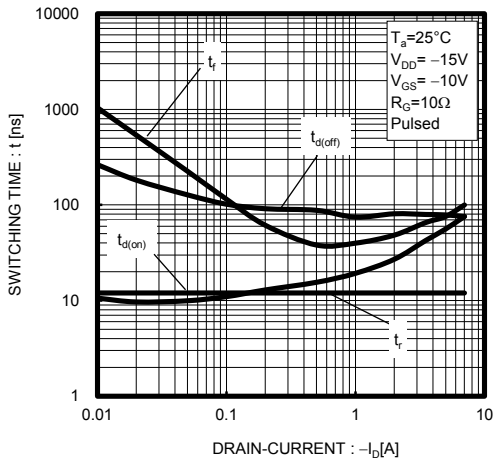


Fig.12 Dynamic Input Characteristics

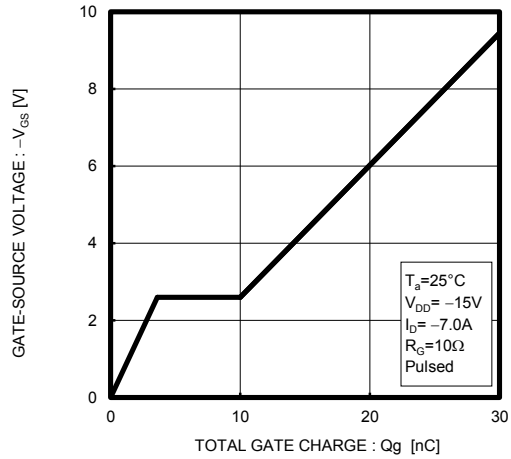




Fig.13 Typical Capacitance vs. Drain-Source Voltage

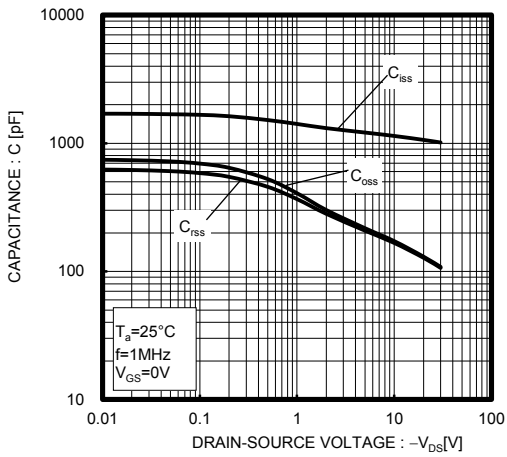


Fig.14 Maximum Safe Operating Area

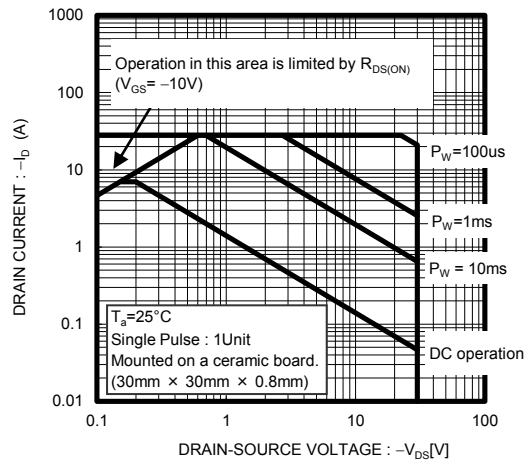
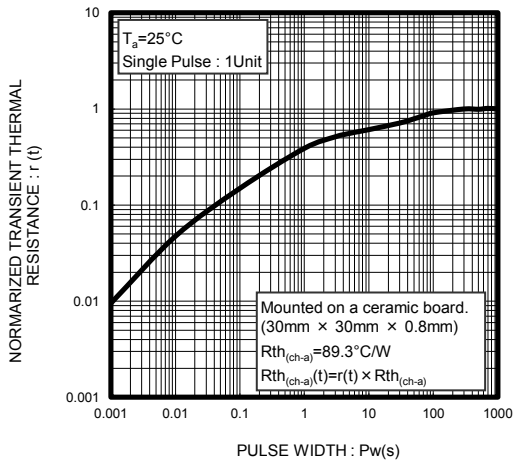


Fig.15 Normalized Transient Thermal Resistance vs. Pulse Width



● Measurement circuits

<Tr1(Nch)>

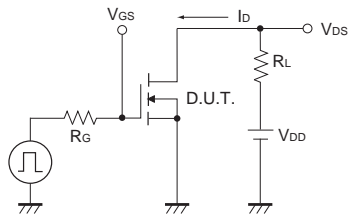


Fig.1-1 Switching Time Measurement Circuit

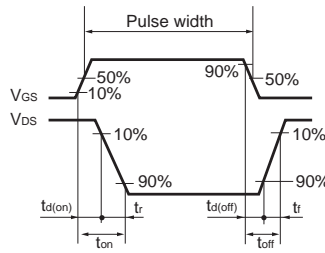


Fig.1-2 Switching Waveforms

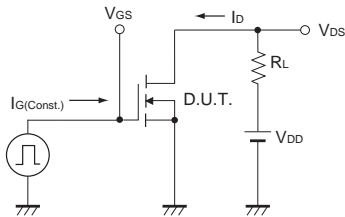


Fig.2-1 Gate Charge Measurement Circuit

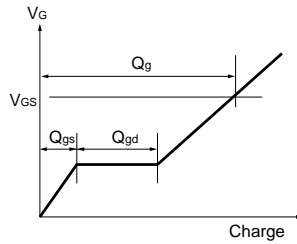


Fig.2-2 Gate Charge Waveform

<Tr2(Pch)>

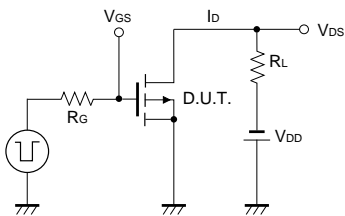


Fig.3-1 Switching Time Measurement Circuit

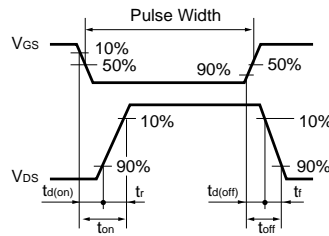


Fig.3-2 Switching Waveforms

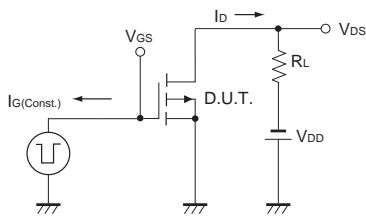


Fig.4-1 Gate Charge Measurement Circuit

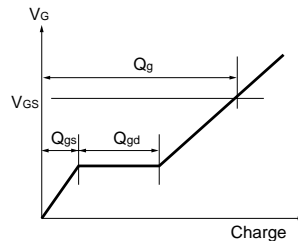


Fig.4-2 Gate Charge Waveform

● Notice

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

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