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# 10V Drive Nch MOSFET

**RSJ400N06FRA**

## ● Structure

Silicon N-channel MOSFET

## ● Features

- 1) Low on-resistance.
- 2) High current
- 3) High power Package

## ● Application

Switching

## ● Packaging specifications

| Type         | Package                      | Taping |
|--------------|------------------------------|--------|
|              | Code                         | TL     |
|              | Basic ordering unit (pieces) | 1000   |
| RSJ400N06FRA |                              | ○      |

## ● Absolute maximum ratings (T<sub>a</sub> = 25°C)

| Parameter                      |            | Symbol             | Limits      | Unit |
|--------------------------------|------------|--------------------|-------------|------|
| Drain-source voltage           |            | V <sub>DSS</sub>   | 60          | V    |
| Gate-source voltage            |            | V <sub>GSS</sub>   | ±20         | V    |
| Drain current                  | Continuous | I <sub>D</sub>     | ±40         | A    |
|                                | Pulsed     | I <sub>DP</sub> *1 | ±80         | A    |
| Source current<br>(Body Diode) | Continuous | I <sub>S</sub>     | 40          | A    |
|                                | Pulsed     | I <sub>SP</sub> *1 | 80          | A    |
| Power dissipation              |            | P <sub>D</sub> *2  | 50          | W    |
| Channel temperature            |            | T <sub>ch</sub>    | 150         | °C   |
| Range of storage temperature   |            | T <sub>stg</sub>   | -55 to +150 | °C   |

 \*1 P<sub>w</sub>≤10μs, Duty cycle≤1%

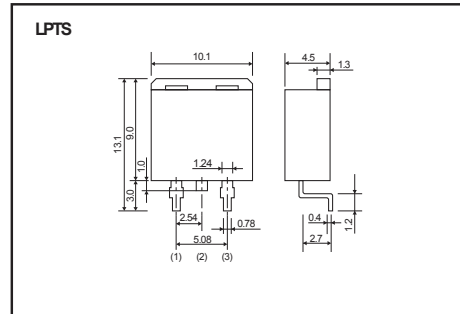
 \*2 T<sub>c</sub>=25°C

## ● Thermal resistance

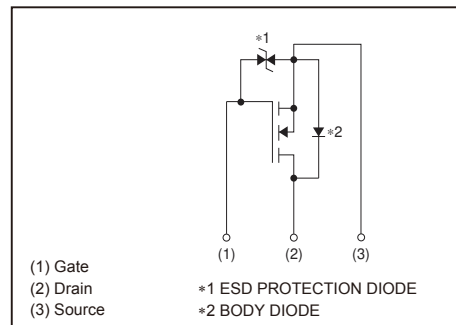
| Parameter       | Symbol                  | Limits | Unit   |
|-----------------|-------------------------|--------|--------|
| Channel to Case | R <sub>th(ch-c)</sub> * | 2.5    | °C / W |

 \* T<sub>c</sub>=25°C

## ● Dimensions (Unit : mm)



## ● Inner circuit



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

| Parameter                               | Symbol                | Min. | Typ. | Max. | Unit | Conditions                                 |
|-----------------------------------------|-----------------------|------|------|------|------|--------------------------------------------|
| Gate-source leakage                     | I <sub>GSS</sub>      | -    | -    | ±10  | μA   | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V |
| Drain-source breakdown voltage          | V <sub>(BR)DSS</sub>  | 60   | -    | -    | V    | I <sub>D</sub> =1mA, V <sub>GS</sub> =0V   |
| Zero gate voltage drain current         | I <sub>DSS</sub>      | -    | -    | 1    | μA   | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V  |
| Gate threshold voltage                  | V <sub>GS(th)</sub>   | 1.0  | -    | 3.0  | V    | V <sub>DS</sub> =10V, I <sub>D</sub> =1mA  |
| Static drain-source on-state resistance | R <sub>DS(on)</sub> * | -    | 11   | 16   | mΩ   | I <sub>D</sub> =40A, V <sub>GS</sub> =10V  |
| Forward transfer admittance             | Y <sub>fs</sub>   *   | 14   | -    | -    | S    | I <sub>D</sub> =20A, V <sub>DS</sub> =10V  |
| Input capacitance                       | C <sub>iss</sub>      | -    | 2400 | -    | pF   | V <sub>DS</sub> =10V                       |
| Output capacitance                      | C <sub>oss</sub>      | -    | 490  | -    | pF   | V <sub>GS</sub> =0V                        |
| Reverse transfer capacitance            | C <sub>rss</sub>      | -    | 250  | -    | pF   | f=1MHz                                     |
| Turn-on delay time                      | t <sub>d(on)</sub> *  | -    | 20   | -    | ns   | I <sub>D</sub> =20A, V <sub>DD</sub> ≒ 30V |
| Rise time                               | t <sub>r</sub> *      | -    | 60   | -    | ns   | V <sub>GS</sub> =10V                       |
| Turn-off delay time                     | t <sub>d(off)</sub> * | -    | 90   | -    | ns   | R <sub>L</sub> =1.5Ω                       |
| Fall time                               | t <sub>f</sub> *      | -    | 140  | -    | ns   | R <sub>G</sub> =10Ω                        |
| Total gate charge                       | Q <sub>g</sub> *      | -    | 52   | -    | nC   | V <sub>DD</sub> ≒ 30V                      |
| Gate-source charge                      | Q <sub>gs</sub> *     | -    | 8    | -    | nC   | I <sub>D</sub> =40A,                       |
| Gate-drain charge                       | Q <sub>gd</sub> *     | -    | 15   | -    | nC   | V <sub>GS</sub> =10V                       |

\*Pulsed

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

| Parameter       | Symbol            | Min. | Typ. | Max. | Unit | Conditions                               |
|-----------------|-------------------|------|------|------|------|------------------------------------------|
| Forward Voltage | V <sub>SD</sub> * | -    | -    | 1.2  | V    | I <sub>s</sub> =40A, V <sub>GS</sub> =0V |

\*Pulsed

●Electrical characteristic curves (Ta=25°C)

Fig.1 Static Drain-Source On-State Resistance vs. Drain Current

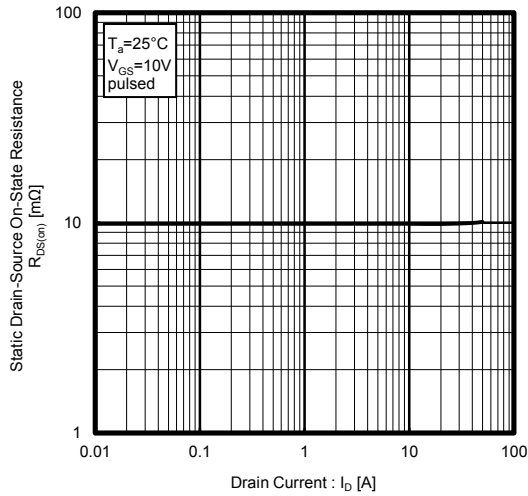


Fig.2 Static Drain-Source On-State Resistance vs. Drain Current

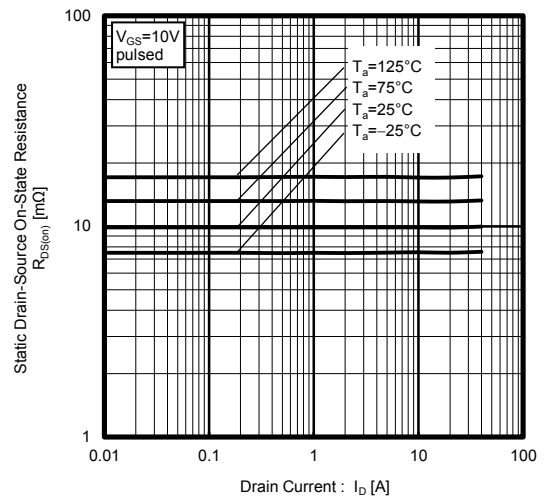


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

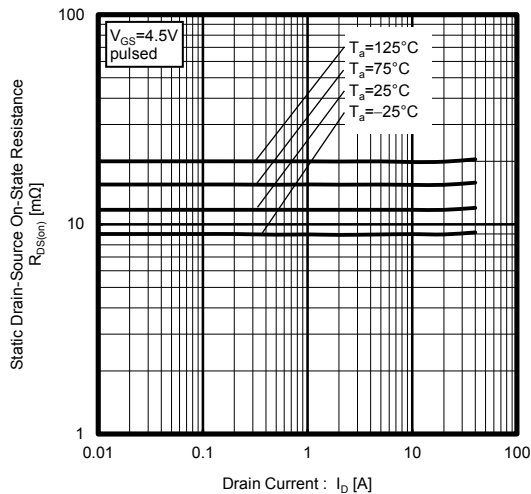


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

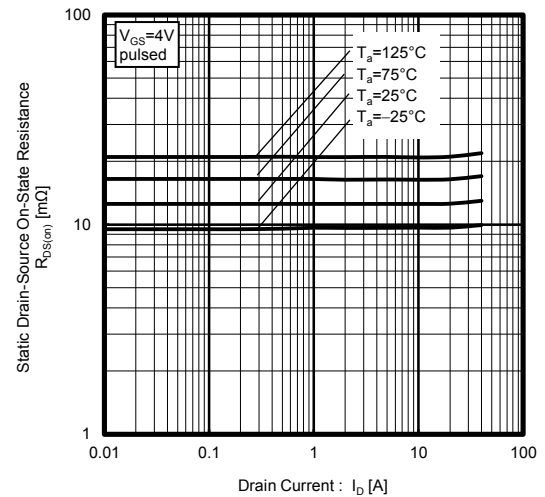


Fig.5 Forward Transfer Admittance vs. Drain Current

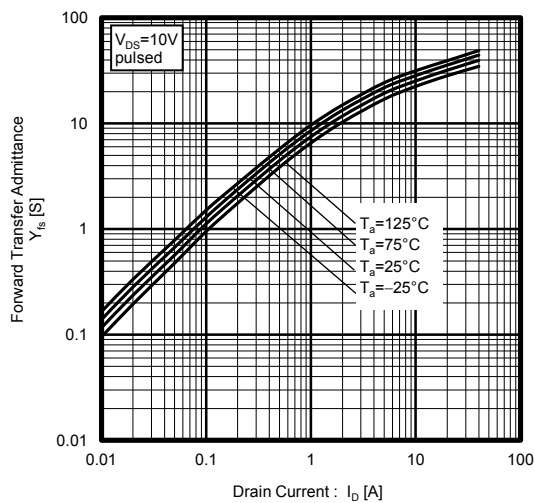


Fig.6 Typical Transfer Characteristics

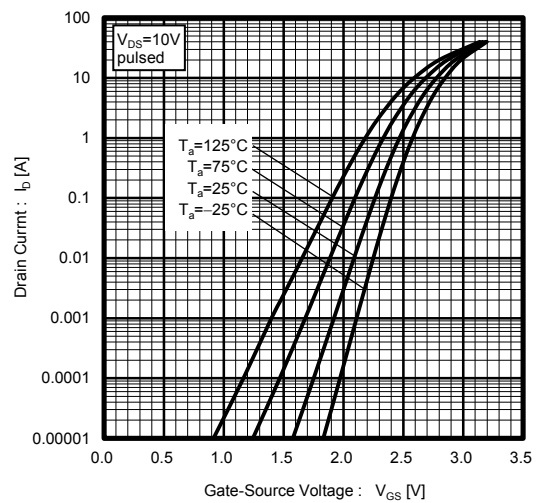




Fig.7 Source Current vs. Source-Drain Voltage

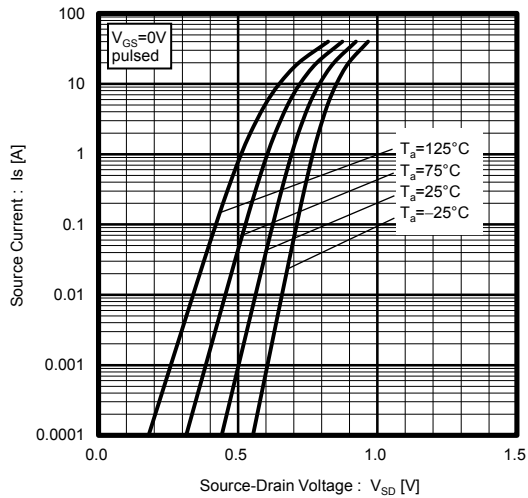


Fig.8 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

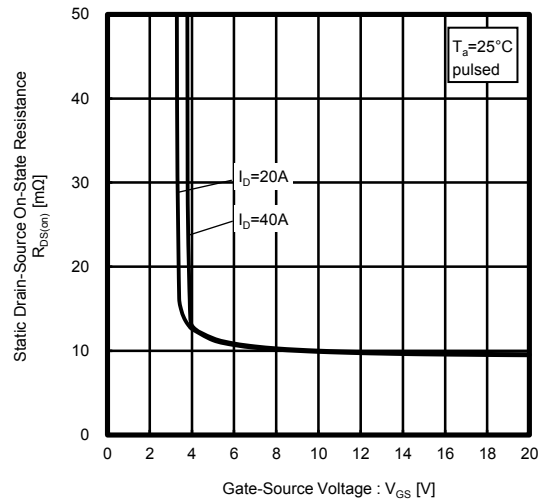


Fig.9 Switching Characteristics

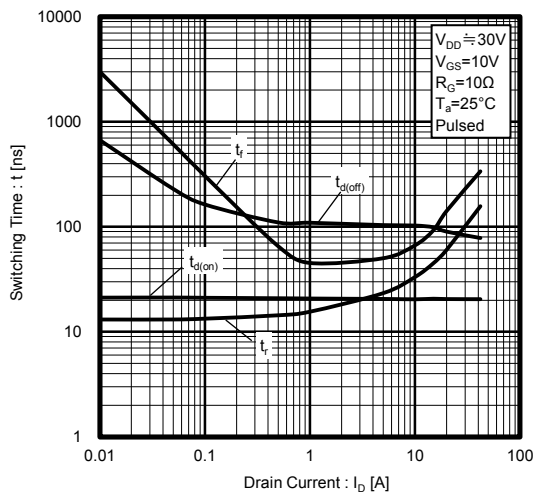


Fig.10 Dynamic Input Characteristics

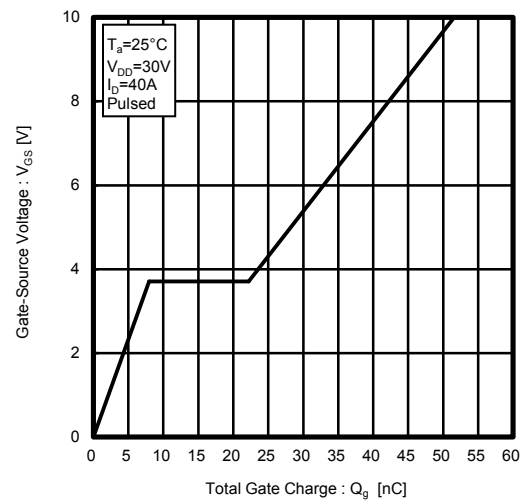


Fig.11 Typical Capacitance vs. Drain-Source Voltage

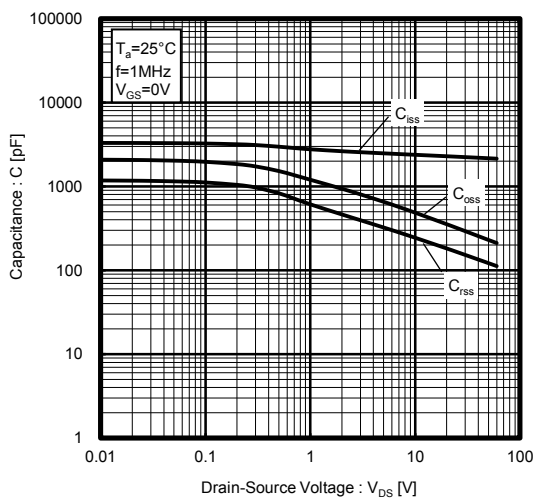
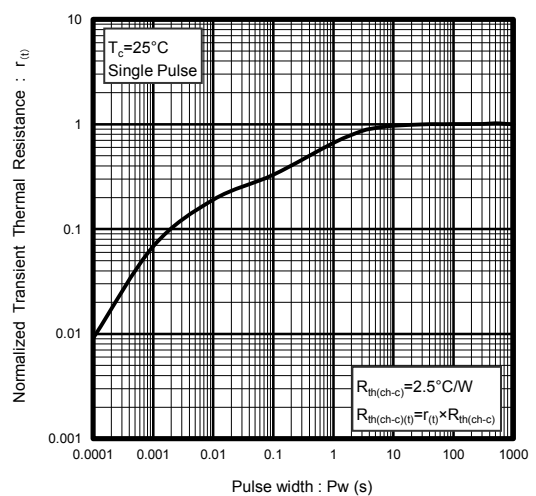


Fig.12 Normalized Transient Thermal Resistance v.s. Pulse Width



# ● Measurement circuits

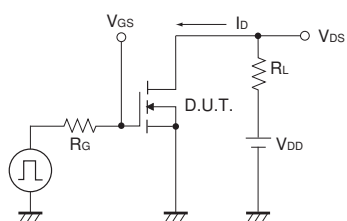


Fig.1-1 Switching Time Measurement Circuit

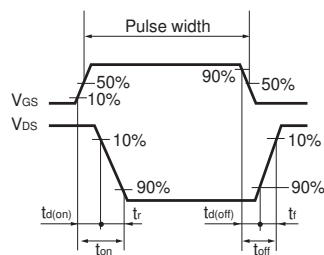


Fig.1-2 Switching Waveforms

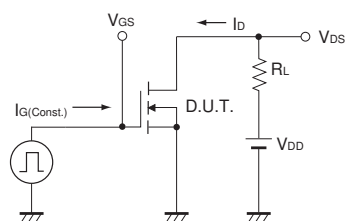


Fig.2-1 Gate Charge Measurement Circuit

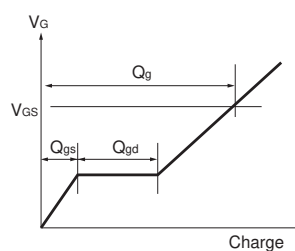


Fig.2-2 Gate Charge Waveform

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| JAPAN     | USA       | EU         | CHINA     |
|-----------|-----------|------------|-----------|
| CLASS III | CLASS III | CLASS II b | CLASS III |
| CLASS IV  |           | CLASS III  |           |

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  - [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
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  - [h] Use of the Products in places subject to dew condensation
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5. Please verify and confirm characteristics of the final or mounted products in using the Products.
6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse. is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
7. De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient temperature.
8. Confirm that operation temperature is within the specified range described in the product specification.
9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

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1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
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This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of ionizer, friction prevention and temperature / humidity control).

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1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
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  - [b] the temperature or humidity exceeds those recommended by ROHM
  - [c] the Products are exposed to direct sunshine or condensation
  - [d] the Products are exposed to high Electrostatic
2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

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