

# 4V Drive Nch MOSFET

## RSH090N03

### ●Structure

Silicon N-channel MOSFET

### ●Features

- 1) Low on-resistance.
- 2) Built-in G-S Protection Diode.
- 3) Small Surface Mount Package (SOP8).

### ●Application

Power switching, DC / DC converter.

### ●Packaging specifications

|           |                              |        |
|-----------|------------------------------|--------|
| Type      | Package                      | Taping |
|           | Code                         | TB     |
|           | Basic ordering unit (pieces) | 2500   |
| RSH090N03 |                              | ○      |

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

| Parameter                   | Symbol            | Limits             | Unit |   |
|-----------------------------|-------------------|--------------------|------|---|
| Drain-Source Voltage        | V <sub>bss</sub>  | 30                 | V    |   |
| Gate-Source Voltage         | V <sub>GSS</sub>  | 20                 | V    |   |
| Drain Current               | Continuous        | I <sub>D</sub>     | ±9.0 | A |
|                             | Pulsed            | I <sub>DP</sub> *1 | ±36  | A |
| Source Current (Body Diode) | Continuous        | I <sub>S</sub>     | 1.6  | A |
|                             | Pulsed            | I <sub>SP</sub> *1 | 18   | A |
| Total Power Dissipation     | P <sub>D</sub> *2 | 2                  | W    |   |
| Channel Temperature         | T <sub>ch</sub>   | 150                | °C   |   |
| Storage Temperature         | T <sub>stg</sub>  | -55 to +150        | °C   |   |

\*1 P<sub>w</sub>≤10μs, Duty cycle≤1%

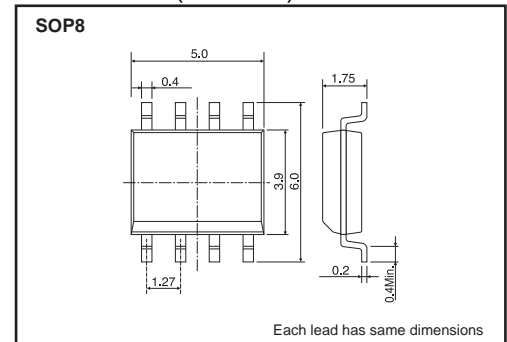
\*2 Mounted on a ceramic board.

### ●Thermal resistance

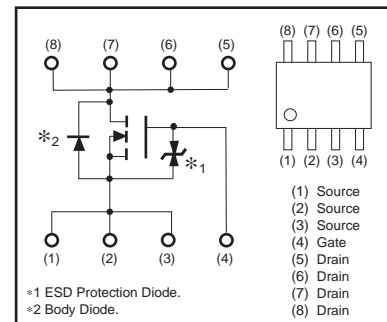
| Parameter          | Symbol                   | Limits | Unit   |
|--------------------|--------------------------|--------|--------|
| Channel to Ambient | R <sub>th (ch-a)</sub> * | 62.5   | °C / W |

\* Mounted on a ceramic board.

### ●Dimensions (Unit : mm)



### ●Inner circuit



\* A protection diode is included between the gate and the source terminals to protect the diode against static electricity when the product is in use. Use a protection circuit when the fixed voltage are exceeded.

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

| Parameter                               | Symbol                | Min. | Typ. | Max. | Unit | Test 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>  | 30   | –    | –    | 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> =30V, V <sub>GS</sub> =0V  |
| Gate Threshold Voltage                  | V <sub>GS(th)</sub>   | 1.0  | –    | 2.5  | 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> =9A, V <sub>GS</sub> =10V   |
|                                         |                       | –    | 15   | 22   |      | I <sub>D</sub> =9A, V <sub>GS</sub> =4.5V  |
|                                         |                       | –    | 17   | 24   |      | I <sub>D</sub> =9A, V <sub>GS</sub> =4V    |
| Forward Transfer Admittance             | Y <sub>fs</sub>  *    | 6.0  | –    | –    | S    | I <sub>D</sub> =9A, V <sub>DS</sub> =10V   |
| Input Capacitance                       | C <sub>iss</sub>      | –    | 810  | –    | pF   | V <sub>DS</sub> =10V                       |
| Output Capacitance                      | C <sub>oss</sub>      | –    | 225  | –    | pF   | V <sub>GS</sub> =0V                        |
| Reverse Transfer Capacitance            | C <sub>rss</sub>      | –    | 160  | –    | pF   | f=1MHz                                     |
| Turn-On Delay Time                      | t <sub>d(on)</sub> *  | –    | 10   | –    | ns   | I <sub>D</sub> =4.5A, V <sub>DD</sub> =15V |
| Rise Time                               | t <sub>r</sub> *      | –    | 13   | –    | ns   | V <sub>GS</sub> =10V                       |
| Turn-Off Delay Time                     | t <sub>d(off)</sub> * | –    | 46   | –    | ns   | R <sub>L</sub> =3.33Ω                      |
| Fall Time                               | t <sub>f</sub> *      | –    | 15   | –    | ns   | R <sub>G</sub> =10Ω                        |
| Total Gate Charge                       | Q <sub>g</sub> *      | –    | 11   | 15   | nC   | V <sub>DD</sub> =15V                       |
| Gate-Source Charge                      | Q <sub>gs</sub> *     | –    | 2.5  | –    | nC   | V <sub>GS</sub> =5V                        |
| Gate-Drain Charge                       | Q <sub>gd</sub> *     | –    | 4.5  | –    | nC   | I <sub>D</sub> =9A                         |

\*Pulsed

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

| Parameter       | Symbol            | Min. | Typ. | Max. | Unit | Test Conditions                           |
|-----------------|-------------------|------|------|------|------|-------------------------------------------|
| Forward Voltage | V <sub>SD</sub> * | –    | –    | 1.2  | V    | I <sub>S</sub> =6.4A, V <sub>GS</sub> =0V |

\*Pulsed

●Electrical characteristic curves

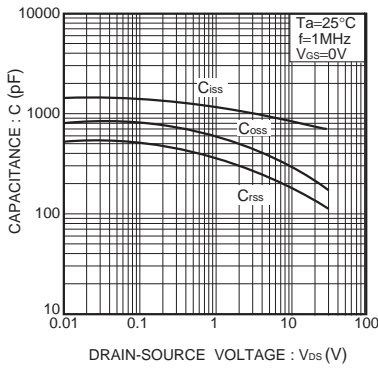


Fig.1 Typical Capacitance vs. Drain-Source Voltage

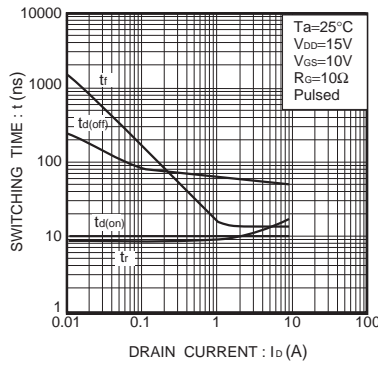


Fig.2 Switching Characteristics

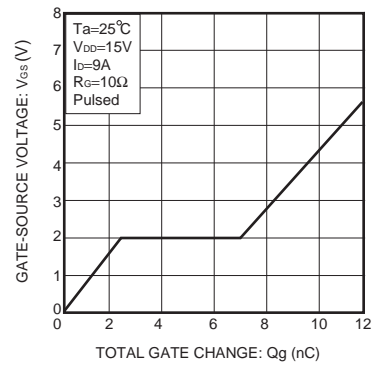


Fig.3 Dynamic Input Characteristics

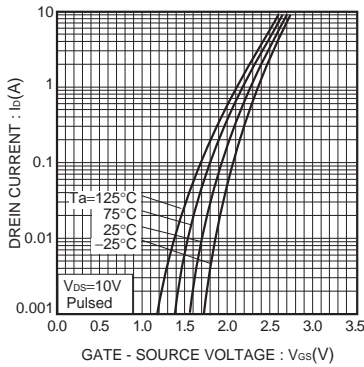


Fig.4 Typical Transfer Characteristics

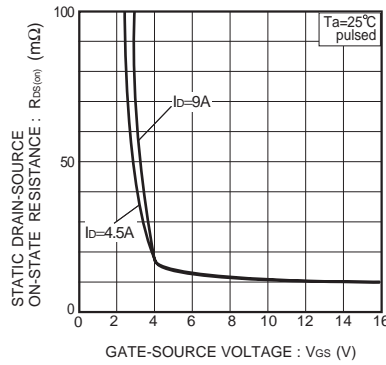


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

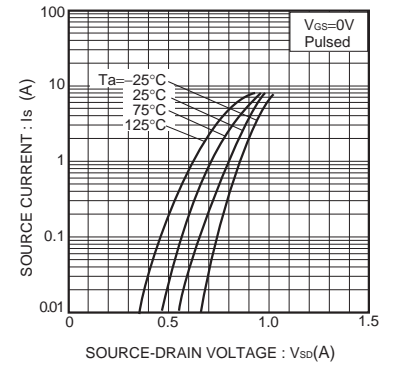


Fig.6 Source-Current vs. Source-Drain Voltage

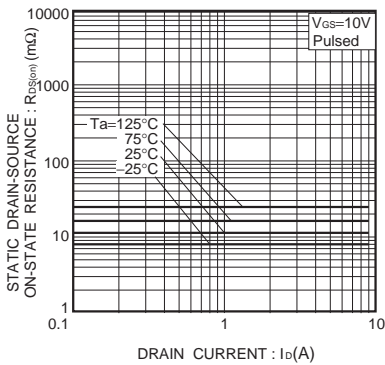


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (1)

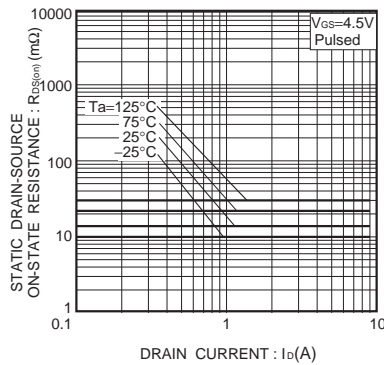


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (2)

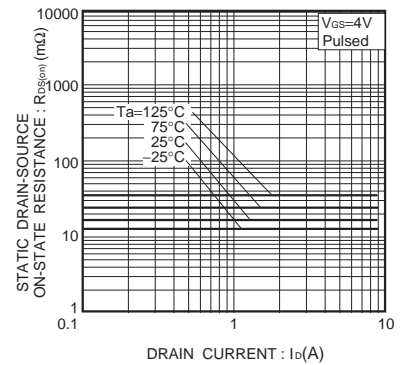


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (3)

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