

# 4V Drive Pch MOSFET

## RSD140P06FRA

### ● Structure

Silicon P-channel MOSFET

### ● Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Drive circuits can be simple.
- 4) Parallel use is easy.

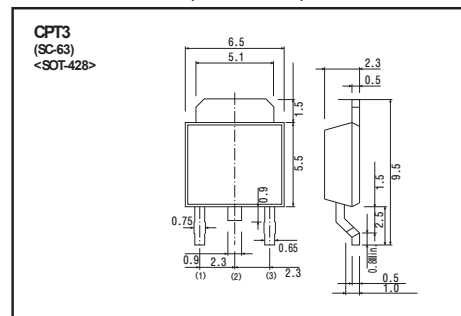
### ● Application

Switching

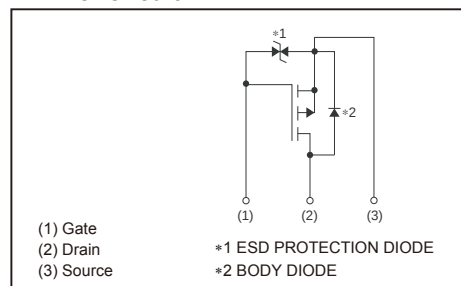
### ● Packaging specifications

| Type         | Package                      | Taping |
|--------------|------------------------------|--------|
|              | Code                         | TL     |
|              | Basic ordering unit (pieces) | 2500   |
| RSD140P06FRA |                              | ○      |

### ● Dimensions (Unit : mm)



### ● Inner circuit



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

| Parameter                      |            | Symbol      | Limits      | Unit             |
|--------------------------------|------------|-------------|-------------|------------------|
| Drain-source voltage           |            | $V_{DSS}$   | -60         | V                |
| Gate-source voltage            |            | $V_{GSS}$   | $\pm 20$    | V                |
| Drain current                  | Continuous | $I_D$       | $\pm 14$    | A                |
|                                | Pulsed     | $I_{DP}$ *1 | $\pm 28$    | A                |
| Source current<br>(Body Diode) | Continuous | $I_S$       | -14         | A                |
|                                | Pulsed     | $I_{SP}$ *1 | -28         | A                |
| Power dissipation              |            | $P_D$ *2    | 20          | W                |
| Channel temperature            |            | $T_{ch}$    | 150         | $^\circ\text{C}$ |
| Range of storage temperature   |            | $T_{stg}$   | -55 to +150 | $^\circ\text{C}$ |

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

 \*2  $T_c = 25^\circ\text{C}$ 

### ● Thermal resistance

| Parameter       | Symbol           | Limits | Unit                        |
|-----------------|------------------|--------|-----------------------------|
| Channel to Case | $R_{th(ch-c)}$ * | 6.25   | $^\circ\text{C} / \text{W}$ |

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

●Electrical characteristics ( $T_a = 25^\circ\text{C}$ )

| Parameter                               | Symbol         | Min. | Typ. | Max.     | Unit             | Conditions                                       |
|-----------------------------------------|----------------|------|------|----------|------------------|--------------------------------------------------|
| Gate-source leakage                     | $I_{GSS}$      | -    | -    | $\pm 10$ | $\mu\text{A}$    | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$ |
| Drain-source breakdown voltage          | $V_{(BR)DSS}$  | -60  | -    | -        | V                | $I_D = -1\text{mA}$ , $V_{GS} = 0\text{V}$       |
| Zero gate voltage drain current         | $I_{DSS}$      | -    | -    | -1       | $\mu\text{A}$    | $V_{DS} = -60\text{V}$ , $V_{GS} = 0\text{V}$    |
| Gate threshold voltage                  | $V_{GS(th)}$   | -1.0 | -    | -3.0     | V                | $V_{DS} = -10\text{V}$ , $I_D = -1\text{mA}$     |
| Static drain-source on-state resistance | $R_{DS(on)}^*$ | -    | 60   | 84       | $\text{m}\Omega$ | $I_D = -14\text{A}$ , $V_{GS} = -10\text{V}$     |
|                                         |                | -    | 73   | 103      |                  | $I_D = -14\text{A}$ , $V_{GS} = -4.5\text{V}$    |
|                                         |                | -    | 77   | 108      |                  | $I_D = -14\text{A}$ , $V_{GS} = -4.0\text{V}$    |
| Forward transfer admittance             | $ Y_{fs} ^*$   | 10   | -    | -        | S                | $I_D = -14\text{A}$ , $V_{DS} = -10\text{V}$     |
| Input capacitance                       | $C_{iss}$      | -    | 1900 | -        | pF               | $V_{DS} = -10\text{V}$                           |
| Output capacitance                      | $C_{oss}$      | -    | 200  | -        | pF               | $V_{GS} = 0\text{V}$                             |
| Reverse transfer capacitance            | $C_{rss}$      | -    | 100  | -        | pF               | $f = 1\text{MHz}$                                |
| Turn-on delay time                      | $t_{d(on)}^*$  | -    | 20   | -        | ns               | $I_D = -7.0\text{A}$ , $V_{DD} = -30\text{V}$    |
| Rise time                               | $t_r^*$        | -    | 45   | -        | ns               | $V_{GS} = -10\text{V}$                           |
| Turn-off delay time                     | $t_{d(off)}^*$ | -    | 240  | -        | ns               | $R_L = 4.3\Omega$                                |
| Fall time                               | $t_f^*$        | -    | 110  | -        | ns               | $R_G = 10\Omega$                                 |
| Total gate charge                       | $Q_g^*$        | -    | 27   | -        | nC               | $V_{DD} = -30\text{V}$                           |
| Gate-source charge                      | $Q_{gs}^*$     | -    | 4.5  | -        | nC               | $I_D = -14\text{A}$ ,                            |
| Gate-drain charge                       | $Q_{gd}^*$     | -    | 5.0  | -        | nC               | $V_{GS} = -10\text{V}$                           |

\*Pulsed

●Body diode characteristics (Source-Drain) ( $T_a = 25^\circ\text{C}$ )

| Parameter       | Symbol     | Min. | Typ. | Max. | Unit | Conditions                                 |
|-----------------|------------|------|------|------|------|--------------------------------------------|
| Forward Voltage | $V_{SD}^*$ | -    | -    | -1.2 | V    | $I_S = -14\text{A}$ , $V_{GS} = 0\text{V}$ |

\*Pulsed

●Electrical characteristic curves (Ta=25°C)

Fig.1 Typical Output Characteristics ( I )

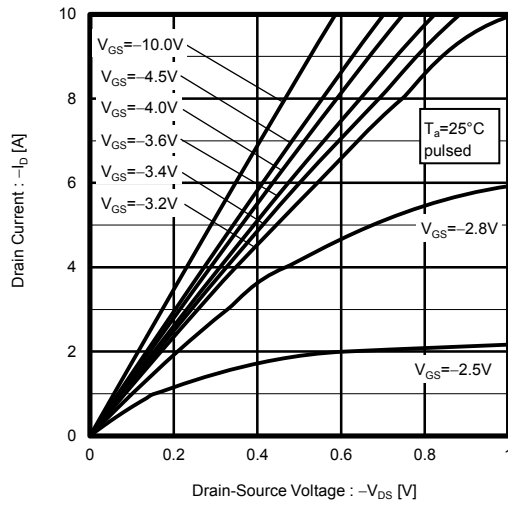


Fig.2 Typical Output Characteristics ( II )

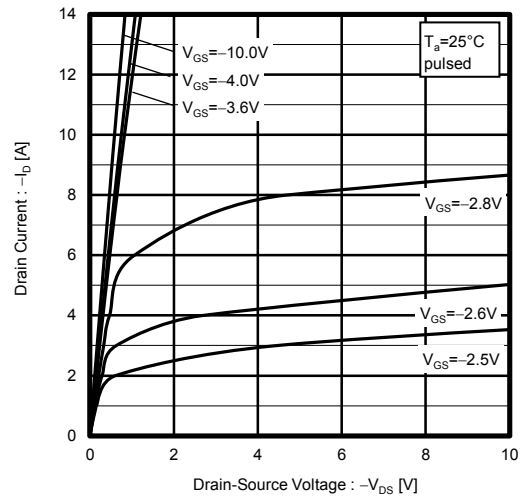


Fig.3 Static Drain-Source On-State Resistance vs. Drain Current

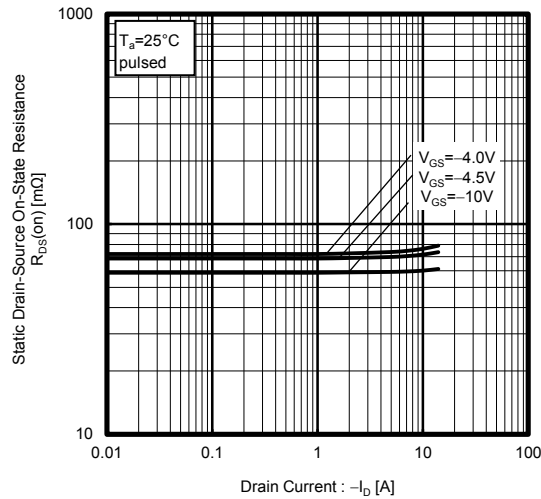


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

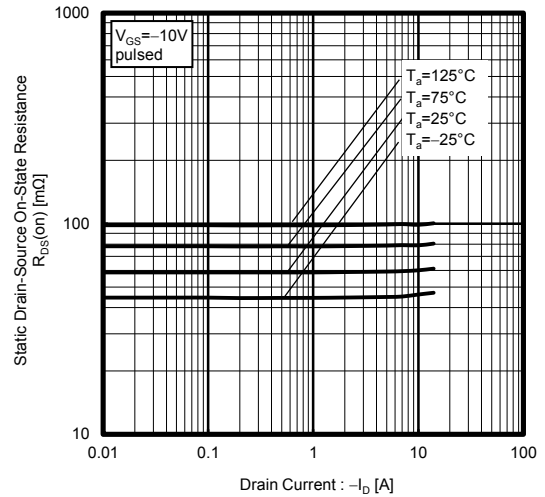


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

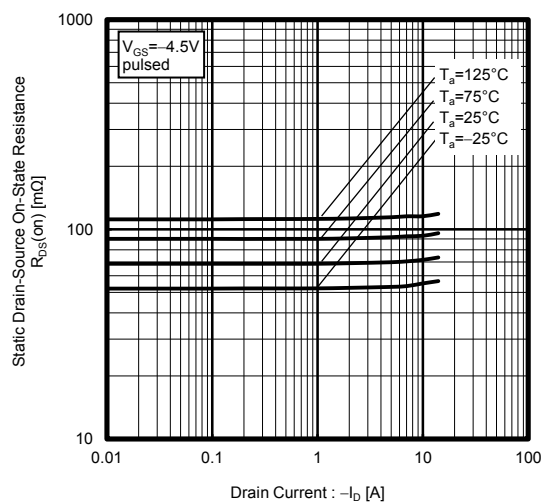


Fig.6 Static Drain-Source On-State Resistance vs. Drain Current

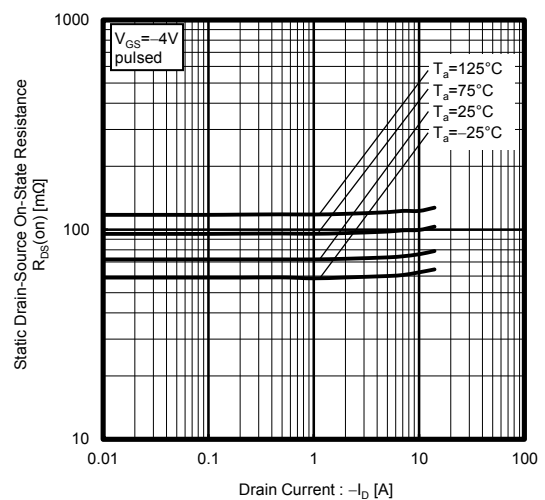


Fig.7 Forward Transfer Admittance vs. Drain Current

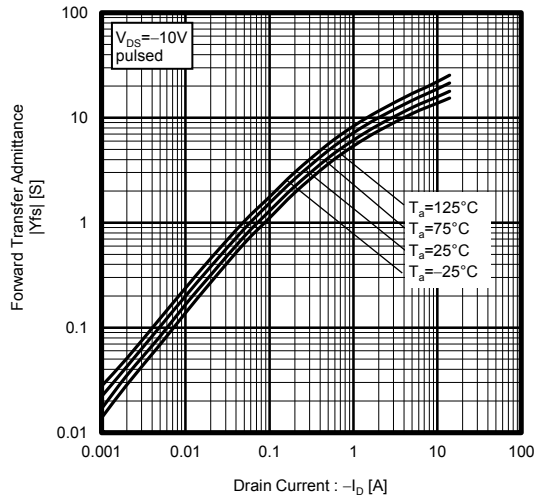


Fig.8 Typical Transfer Characteristics

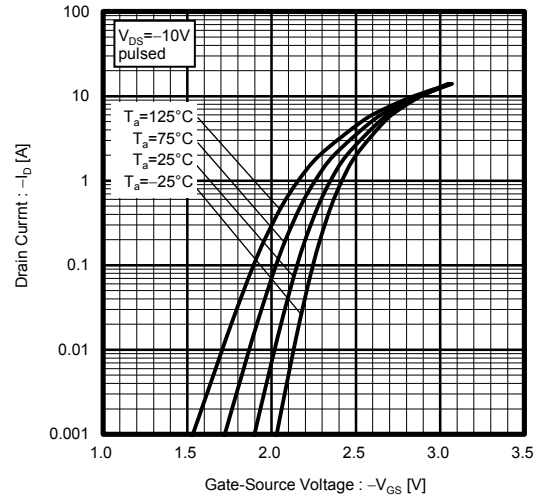


Fig.9 Source Current vs. Source-Drain Voltage

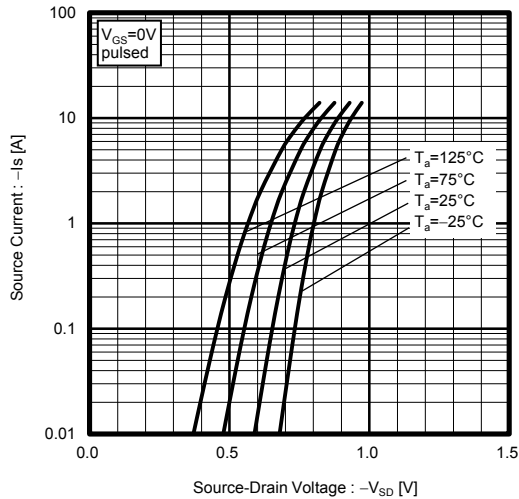


Fig.10 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

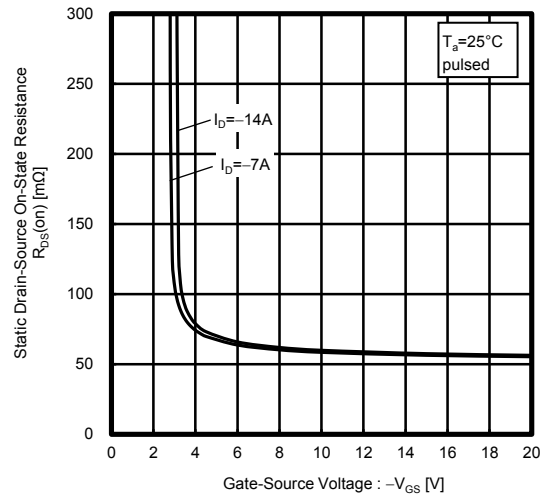


Fig.11 Switching Characteristics

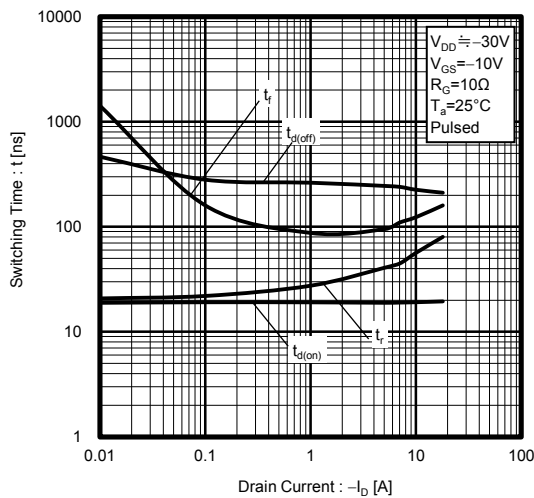


Fig.12 Dynamic Input Characteristics

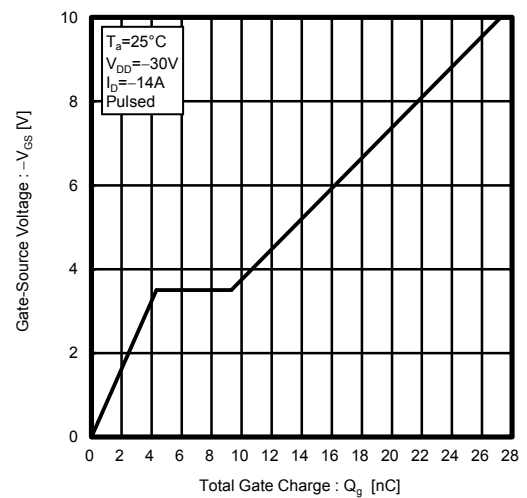


Fig.13 Typical Capacitance vs. Drain-Source Voltage

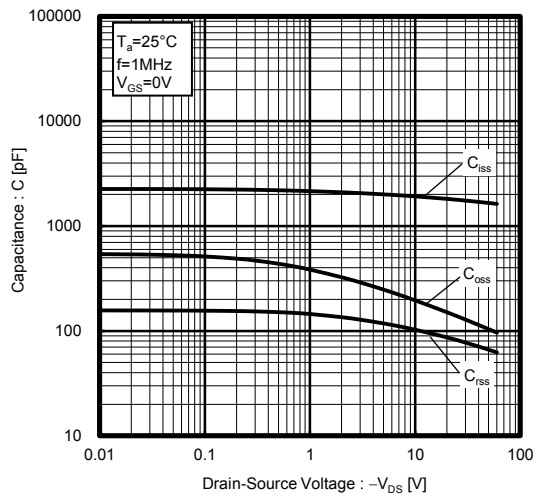


Fig.14 Maximum Safe Operating Area

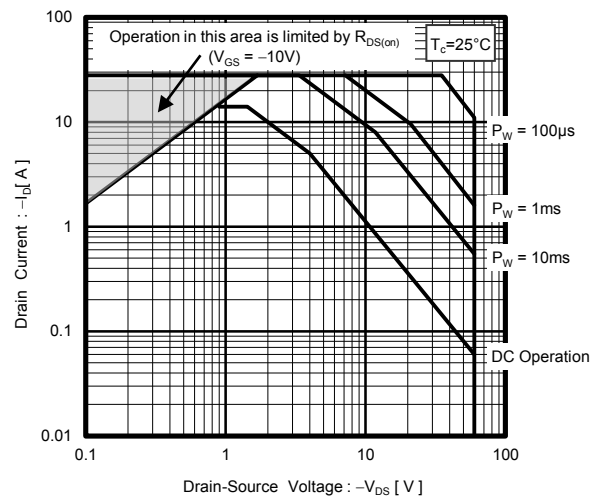
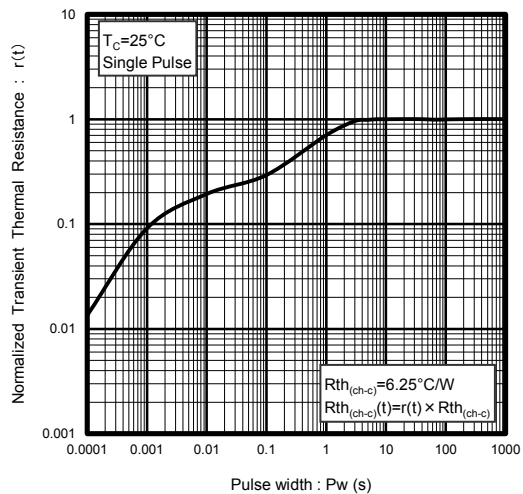


Fig.15 Normalized Transient Thermal Resistance v.s. Pulse Width



## ● Measurement circuits

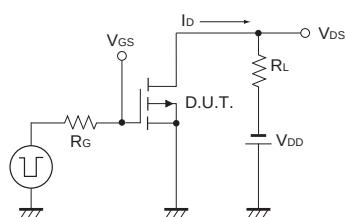


Fig.1-1 Switching Time Measurement Circuit

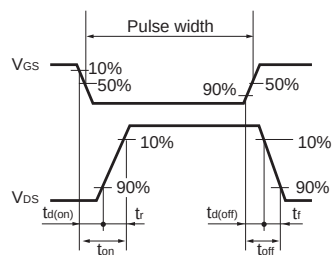


Fig.1-2 Switching Waveforms

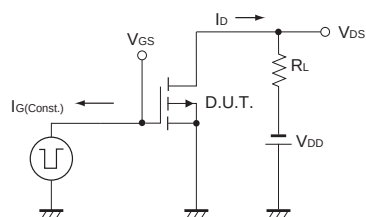


Fig.2-1 Gate Charge Measurement Circuit

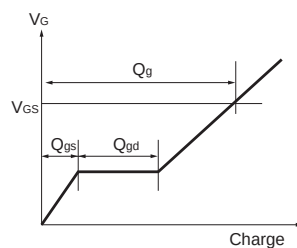


Fig.2-2 Gate Charge Waveform

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|-----------|-----------|------------|-----------|
| CLASS III | CLASS III | CLASS II b | CLASS III |
| CLASS IV  |           | CLASS III  |           |

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  - [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
  - [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.
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8. Confirm that operation temperature is within the specified range described in the product specification.
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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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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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RSD140P06FRA - Web Page

|                             |              |
|-----------------------------|--------------|
| Part Number                 | RSD140P06FRA |
| Package                     | CPT3         |
| Unit Quantity               | 2500         |
| Minimum Package Quantity    | 2500         |
| Packing Type                | Taping       |
| Constitution Materials List | inquiry      |
| RoHS                        | Yes          |