

# 10V Drive Nch MOSFET

## R6004CND

### ● Structure

Silicon N-channel MOSFET

### ● Features

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

### ● Application

Switching

### ● Packaging specifications

| Type     | Package                      | Taping |
|----------|------------------------------|--------|
|          | Code                         | TL     |
|          | Basic ordering unit (pieces) | 2500   |
| R6004CND |                              | ○      |

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

| Parameter                      |            | Symbol      | Limits      | Unit |
|--------------------------------|------------|-------------|-------------|------|
| Drain-source voltage           |            | $V_{DSS}$   | 600         | V    |
| Gate-source voltage            |            | $V_{GSS}$   | ±25         | V    |
| Drain current                  | Continuous | $I_D$ *3    | ±4          | A    |
|                                | Pulsed     | $I_{DP}$ *1 | ±16         | A    |
| Source current<br>(Body Diode) | Continuous | $I_S$       | 4           | A    |
|                                | Pulsed     | $I_{SP}$ *1 | 16          | A    |
| Avalanche current              |            | $I_{AS}$ *2 | 2           | A    |
| Avalanche energy               |            | $E_{AS}$ *2 | 1.1         | mJ   |
| Power dissipation              |            | $P_D$ *4    | 40          | W    |
| Channel temperature            |            | $T_{ch}$    | 150         | °C   |
| Range of storage temperature   |            | $T_{stg}$   | -55 to +150 | °C   |

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

\*2  $L = 500 \mu H$ ,  $V_{DD} = 50V$ ,  $R_G = 25 \Omega$ ,  $T_{ch} = 25^\circ C$

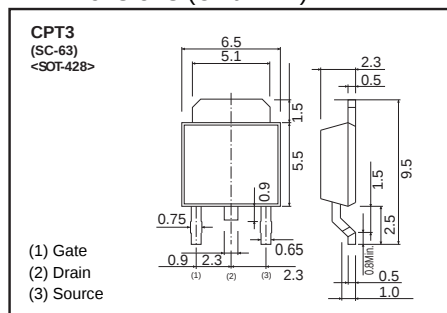
\*3 Limited only by maximum temperature allowed.

\*4  $T_C = 25^\circ C$

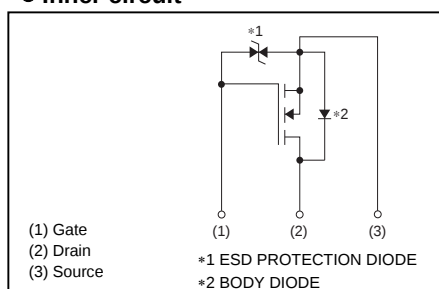
### ● Thermal resistance

| Parameter       | Symbol         | Limits | Unit   |
|-----------------|----------------|--------|--------|
| Channel to Case | $R_{th(ch-c)}$ | 3.13   | °C / W |

### ● Dimensions (Unit : mm)



### ● Inner circuit



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

| Parameter                               | Symbol         | Min. | Typ. | Max.     | Unit     | Conditions                      |
|-----------------------------------------|----------------|------|------|----------|----------|---------------------------------|
| Gate-source leakage                     | $I_{GSS}$      | -    | -    | $\pm 10$ | $\mu A$  | $V_{GS} = \pm 25V, V_{DS} = 0V$ |
| Drain-source breakdown voltage          | $V_{(BR)DSS}$  | 600  | -    | -        | V        | $I_D = 1mA, V_{GS} = 0V$        |
| Zero gate voltage drain current         | $I_{DSS}$      | -    | -    | 100      | $\mu A$  | $V_{DS} = 600V, V_{GS} = 0V$    |
| Gate threshold voltage                  | $V_{GS(th)}$   | 2.5  | -    | 4.5      | V        | $V_{DS} = 10V, I_D = 1mA$       |
| Static drain-source on-state resistance | $R_{DS(on)}^*$ | -    | 1.4  | 1.8      | $\Omega$ | $I_D = 2A, V_{GS} = 10V$        |
| Forward transfer admittance             | $ Y_{fs} ^*$   | 1.2  | -    | -        | S        | $V_{DS} = 10V, I_D = 2A$        |
| Input capacitance                       | $C_{iss}$      | -    | 280  | -        | pF       | $V_{DS} = 25V$                  |
| Output capacitance                      | $C_{oss}$      | -    | 222  | -        | pF       | $V_{GS} = 0V$                   |
| Reverse transfer capacitance            | $C_{rss}$      | -    | 15   | -        | pF       | $f = 1MHz$                      |
| Turn-on delay time                      | $t_{d(on)}^*$  | -    | 23   | -        | ns       | $V_{DD} \approx 300V, I_D = 2A$ |
| Rise time                               | $t_r^*$        | -    | 28   | -        | ns       | $V_{GS} = 10V$                  |
| Turn-off delay time                     | $t_{d(off)}^*$ | -    | 44   | -        | ns       | $R_L = 150\Omega$               |
| Fall time                               | $t_f^*$        | -    | 39   | -        | ns       | $R_G = 10\Omega$                |
| Total gate charge                       | $Q_g^*$        | -    | 11   | -        | nC       | $V_{DD} \approx 300V$           |
| Gate-source charge                      | $Q_{gs}^*$     | -    | 3    | -        | nC       | $I_D = 4A$                      |
| Gate-drain charge                       | $Q_{gd}^*$     | -    | 5    | -        | nC       | $V_{GS} = 10V$                  |

\*Pulsed

## ● Body diode characteristics (Source-Drain)

| Parameter       | Symbol     | Min. | Typ. | Max. | Unit | Conditions              |
|-----------------|------------|------|------|------|------|-------------------------|
| Forward Voltage | $V_{SD}^*$ | -    | -    | 1.5  | V    | $I_S = 4A, V_{GS} = 0V$ |

\*Pulsed

# ●Electrical characteristic curves

Fig.1 Typical Output Characteristics ( I )

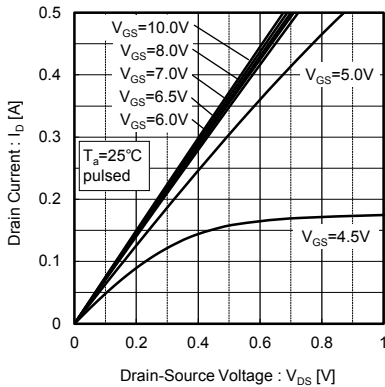


Fig.2 Typical Output Characteristics ( II )

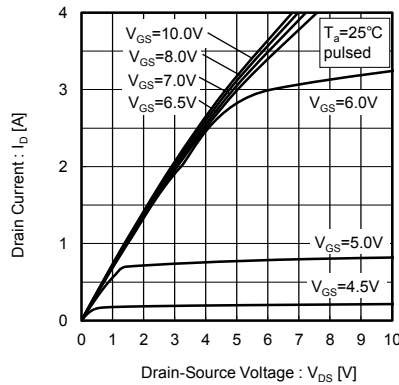


Fig.3 Typical Transfer Characteristics

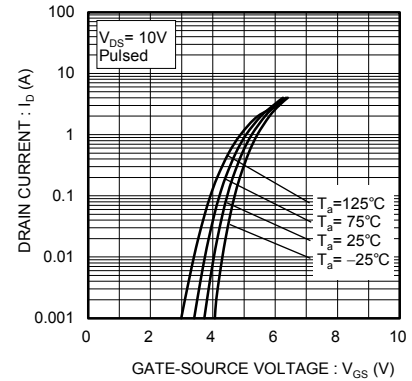


Fig.4 Gate Threshold Voltage vs. Channel Temperature

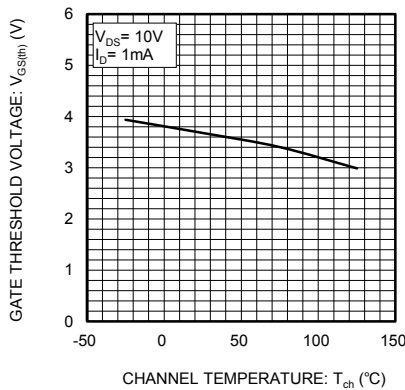


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

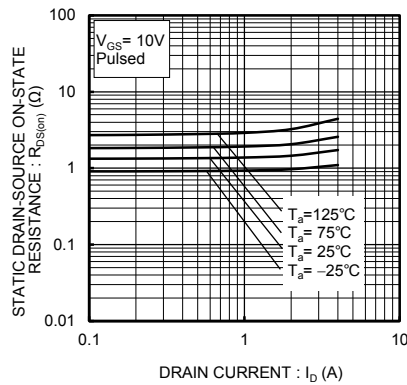


Fig.6 Static Drain-Source On-State Resistance vs. Gate Source

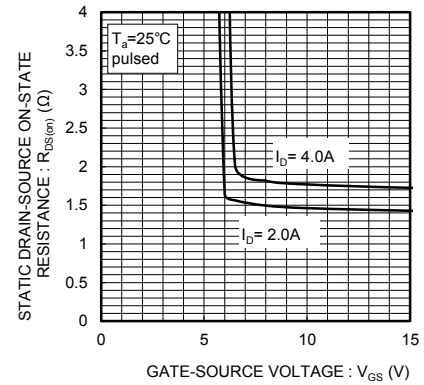


Fig.7 Static Drain-Source On-State Resistance vs. Channel Temperature

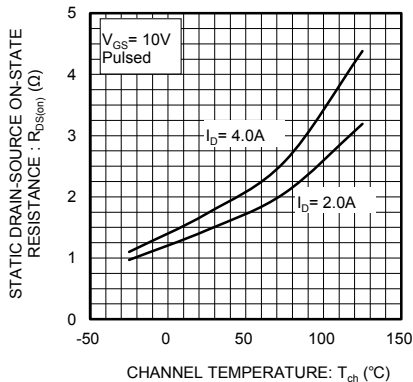


Fig.8 Forward Transfer Admittance vs. Drain Current

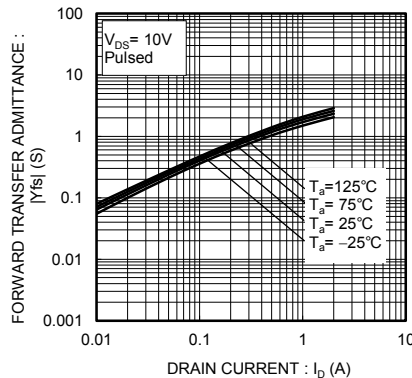


Fig.9 Source Current vs. Source-Drain Voltage

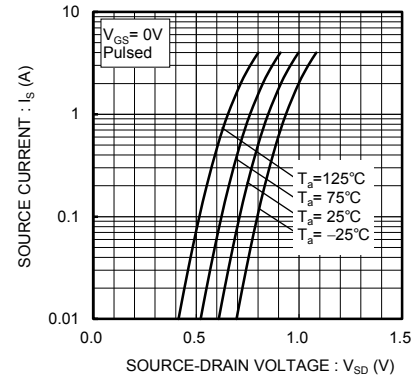


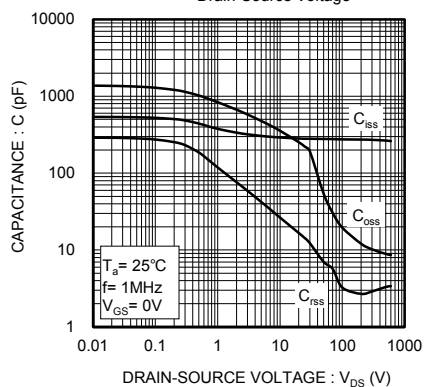
Fig.10 Typical Capacitance vs.  
Drain-Source Voltage

Fig.11 Dynamic Input Characteristics

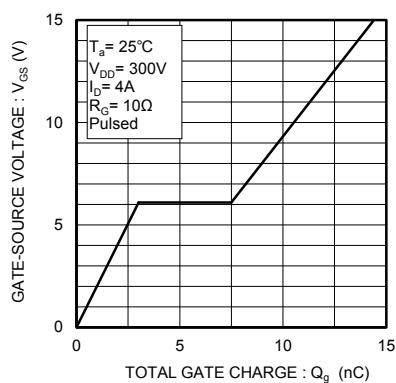
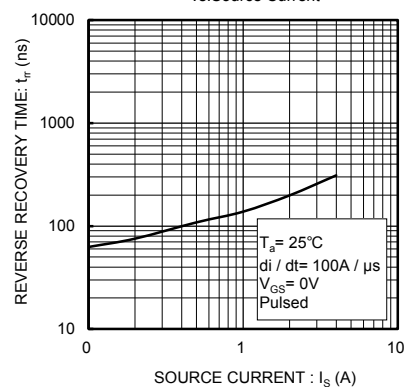
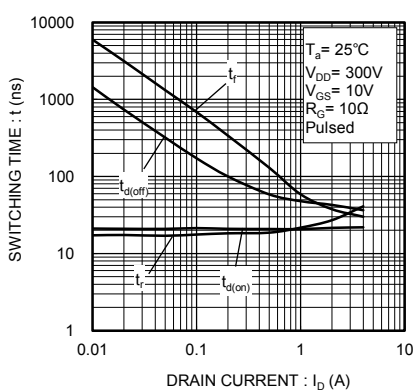
Fig.12 Reverse Recovery Time  
vs. Source Current

Fig.13 Switching Characteristics



## ● Measurement circuits

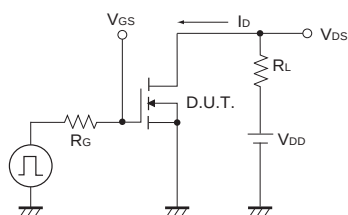


Fig.1-1 Switching Time Measurement Circuit

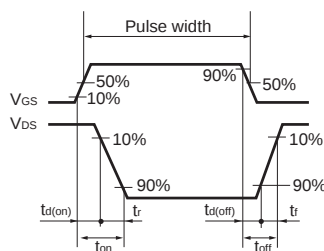


Fig.1-2 Switching Waveforms

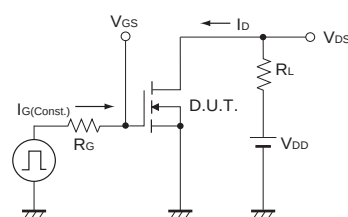


Fig.2-1 Gate Charge Measurement Circuit

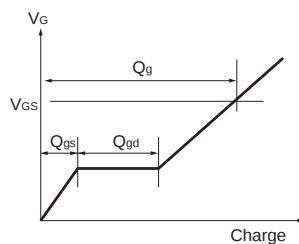


Fig.2-2 Gate Charge Waveform

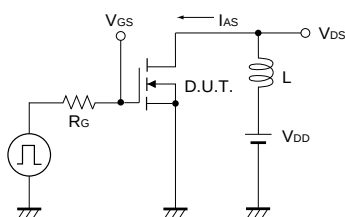


Fig.3-1 Avalanche Measurement Circuit

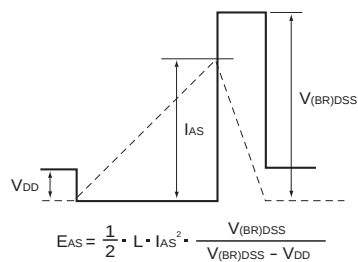


Fig.3-2 Avalanche Waveform

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