4V Drive Nch MOSFET
RSD050N10

●Structure
Silicon N-channel MOSFET

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

●Applications
Switching

●Packaging specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Package</th>
<th>Code</th>
<th>Basic ordering unit (pieces)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CPT3</td>
<td>TL</td>
<td>2500</td>
</tr>
</tbody>
</table>

●Absolute maximum ratings (Ta=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-source voltage</td>
<td>VGS</td>
<td>100</td>
<td>V</td>
</tr>
<tr>
<td>Gate-source voltage</td>
<td>VGS</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>Drain current</td>
<td>ID</td>
<td>±5.0</td>
<td>A</td>
</tr>
<tr>
<td>Continuous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulsed</td>
<td>IDP</td>
<td>±20</td>
<td>A</td>
</tr>
<tr>
<td>Source current</td>
<td>IS</td>
<td>±5.0</td>
<td>A</td>
</tr>
<tr>
<td>Continuous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulsed</td>
<td>ISP</td>
<td>±20</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>PD</td>
<td>15</td>
<td>W</td>
</tr>
<tr>
<td>Channel temperature</td>
<td>TC</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Range of storage temperature</td>
<td>Tstb</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

*1 PW≤10μs, Duty cycle≤1%
*2 Ta=25°C

●Thermal resistance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Limits</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel to Case</td>
<td>Rθh (ch-c)</td>
<td>8.33</td>
<td>°C / W</td>
</tr>
</tbody>
</table>

* Ta=25°C
### Electrical characteristics \((T_a=25^\circ C)\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate-source leakage</td>
<td>(I_{GS})</td>
<td>-</td>
<td>-</td>
<td>±10</td>
<td>(\mu A)</td>
<td>(V_{GS}=\pm 20 V, V_{DS}=0 V)</td>
</tr>
<tr>
<td>Drain-source breakdown voltage ((V_{BRSS}))</td>
<td>V_{BRSS}</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>V</td>
<td>(I_{D}=1 mA, V_{GS}=0 V)</td>
</tr>
<tr>
<td>Zero gate voltage drain current ((I_{DSS}))</td>
<td>V_{DS}</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>(\mu A)</td>
<td>(V_{DS}=100 V, V_{GS}=0 V)</td>
</tr>
<tr>
<td>Gate threshold voltage</td>
<td>(V_{GS(th)})</td>
<td>1.0</td>
<td>-</td>
<td>2.5</td>
<td>V</td>
<td>(V_{DS}=10 V, I_{D}=1 mA)</td>
</tr>
<tr>
<td>Static drain-source on-state resistance ((R_{DS(on)}))</td>
<td>-</td>
<td>-</td>
<td>135</td>
<td>190</td>
<td>m(\Omega)</td>
<td>(I_{D}=5.0 A, V_{GS}=10 V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>142</td>
<td>200</td>
<td>m(\Omega)</td>
<td>(I_{D}=5.0 A, V_{GS}=4.5 V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>145</td>
<td>205</td>
<td>m(\Omega)</td>
<td>(I_{D}=5.0 A, V_{GS}=4.0 V)</td>
</tr>
<tr>
<td>Forward transfer admittance ((I_{Yfs}))</td>
<td>-</td>
<td>2.5</td>
<td>-</td>
<td>-</td>
<td>S</td>
<td>(I_{D}=5.0 A, V_{DS}=10 V)</td>
</tr>
<tr>
<td>Input capacitance ((C_{iss}))</td>
<td>-</td>
<td>530</td>
<td>-</td>
<td>-</td>
<td>p(F)</td>
<td>(V_{DS}=25 V)</td>
</tr>
<tr>
<td>Output capacitance ((C_{oss}))</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>p(F)</td>
<td>(V_{GS}=0 V)</td>
</tr>
<tr>
<td>Reverse transfer capacitance ((C_{iss}))</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>p(F)</td>
<td>(f=1 MHz)</td>
</tr>
<tr>
<td>Turn-on delay time ((t_{d(on)}))</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>ns</td>
<td>(I_{D}=2.5 A, V_{DD}=50 V)</td>
</tr>
<tr>
<td>Rise time ((t_{r}))</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>ns</td>
<td>(V_{GS}=10 V)</td>
</tr>
<tr>
<td>Turn-off delay time ((t_{d(off)}))</td>
<td>-</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>ns</td>
<td>(R_L=200 \Omega)</td>
</tr>
<tr>
<td>Fall time ((t_{f}))</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>ns</td>
<td>(R_G=10 \Omega)</td>
</tr>
<tr>
<td>Total gate charge ((Q_g))</td>
<td>-</td>
<td>14</td>
<td>-</td>
<td>-</td>
<td>n(C)</td>
<td>(V_{DD}=50 V)</td>
</tr>
<tr>
<td>Gate-source charge ((Q_{gs}))</td>
<td>-</td>
<td>1.7</td>
<td>-</td>
<td>-</td>
<td>n(C)</td>
<td>(I_{D}=5.0 A,)</td>
</tr>
<tr>
<td>Gate-drain charge ((Q_{gd}))</td>
<td>-</td>
<td>3.0</td>
<td>-</td>
<td>-</td>
<td>n(C)</td>
<td>(V_{GS}=10 V)</td>
</tr>
</tbody>
</table>

*Pulsed

### Body diode characteristics \((Source-Drain) \ (T_a=25^\circ C)\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Voltage</td>
<td>V_{SD}</td>
<td>1.2</td>
<td>-</td>
<td>-</td>
<td>V</td>
<td>(I_{D}=5.0 A, V_{DS}=0 V)</td>
</tr>
</tbody>
</table>

*Pulsed
Electrical characteristic curves ($T_a = 25^\circ C$)

- **Fig. 1 Typical Output Characteristics (I)**
  - $V_{GS} = 2.5V$
  - $V_{GS} = 10.0V$
  - $V_{GS} = 4.0V$
  - $V_{GS} = 3.0V$
  - $V_{GS} = 2.5V$

- **Fig. 2 Typical Output Characteristics (II)**
  - $V_{GS} = 2.5V$
  - $V_{GS} = 10.0V$
  - $V_{GS} = 4.0V$
  - $V_{GS} = 3.0V$

- **Fig. 3 Static Drain-Source On-State Resistance vs. Drain Current**
  - $V_{GS} = 4.0V$
  - $V_{GS} = 4.5V$
  - $V_{GS} = 10V$

- **Fig. 4 Static Drain-Source On-State Resistance vs. Drain Current**
  - $V_{GS} = 4V$

- **Fig. 5 Static Drain-Source On-State Resistance vs. Drain Current**
  - $T_a = 125^\circ C$
  - $T_a = 75^\circ C$
  - $T_a = 25^\circ C$
  - $T_a = -25^\circ C$

- **Fig. 6 Static Drain-Source On-State Resistance vs. Drain Current**
  - $V_{GS} = 4V$

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**Fig. 7** Forward Transfer Admittance vs. Drain Current

- Forward Transfer Admittance: $Y_{FS}$ [S]
- Drain Current: $I_D$ [A]
- Gate-Source Voltage: $V_{GS}$ [V]
- Source-Drain Voltage: $V_{DS}$ [V]
- Static Drain-Source On-State Resistance: $R_{DS(on)}$ [mΩ]

**Fig. 8** Typical Transfer Characteristics

- Drain Current: $I_D$ [A]
- Gate-Source Voltage: $V_{GS}$ [V]

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

- Source Current: $I_S$ [A]
- Source-Drain Voltage: $V_{SD}$ [V]

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

- Gate-Source Voltage: $V_{GS}$ [V]
- Static Drain-Source On-State Resistance: $R_{DS(on)}$ [mΩ]

**Fig. 11** Switching Characteristics

- Switching Time: $t_{on}$, $t_{off}$ [ns]
- Drain Current: $I_D$ [A]

**Fig. 12** Dynamic Input Characteristics

- Gate-Source Voltage: $V_{GS}$ [V]
- Total Gate Charge: $Q_g$ [nC]

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Fig.13 Typical Capacitance vs. Drain-Source Voltage

Capacitance : C [pF]
Drain-Source Voltage : VDS [V]

Fig.14 Maximum Safe Operating Area

Operation in this area is limited by RDS(on) (VGS = 10V)

PW = 100 μs
PW = 1ms
PW = 10ms
DC Operation

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

Normalized Transient Thermal Resistance : r (t)
Pulse width : Pw (s)
**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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