Panasonic

FK330309EL
Silicon N-channel MOSFET
For switching circuits

Features
- Low drive voltage: 1.5 V drive
- Halogen-free / RoHS compliant
  (EU RoHS / UL-94 V-0 / MSL : Level 1 compliant)

Marking Symbol: X9

Packaging
Embosed type (Thermo-compression sealing): 10,000 pcs / reel (standard)

Absolute Maximum Ratings Ta = 25 °C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain to Source Voltage</td>
<td>VDS</td>
<td>30</td>
<td>V</td>
</tr>
<tr>
<td>Gate to Source Voltage</td>
<td>VGS</td>
<td>±6</td>
<td>V</td>
</tr>
<tr>
<td>Drain Current</td>
<td>ID</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Drain Current (Pulsed)*1</td>
<td>IDp</td>
<td>200</td>
<td>mA</td>
</tr>
<tr>
<td>Total Power Dissipation</td>
<td>PD</td>
<td>100</td>
<td>mW</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>Tch</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>Tstg</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Note *1 Pulse test: Ensure that the channel temperature does not exceed 150 °C
### Electrical Characteristics Ta = 25 °C ± 3 °C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-source Breakdown Voltage</td>
<td>VDSS</td>
<td>ID = 1 mA, VGS = 0 V</td>
<td>30</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>IDSS</td>
<td>VDS = 30 V, VGS = 0 V</td>
<td>10</td>
<td></td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>Gate-source Leakage Current</td>
<td>IGSS</td>
<td>VGS = ±6 V, VDS = 0 V</td>
<td>±10</td>
<td></td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>Gate-source Threshold Voltage</td>
<td>Vth</td>
<td>ID = 1 mA, VDS = 10 V</td>
<td>0.3</td>
<td>1.3</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Drain-source On-state Resistance</td>
<td>RDS(on)1</td>
<td>ID = 10 mA, VGS = 2.5 V</td>
<td>1</td>
<td>4</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td></td>
<td>RDS(on)2</td>
<td>ID = 10 mA, VGS = 1.5 V</td>
<td>4</td>
<td>12</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>Ciss</td>
<td>VDS = 10 V, VGS = 0 V</td>
<td>13</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Output Capacitance</td>
<td>Coss</td>
<td>f = 1 MHz</td>
<td>7</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Reverse Transfer Capacitance</td>
<td>Crss</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn-on Delay Time,¹¹</td>
<td>ton</td>
<td>VDD = 3 V, VGS = 0 to 3 V ID = 10 mA, RL = 300 Ω</td>
<td>20</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Turn-off Delay Time,¹¹</td>
<td>toff</td>
<td>VDD = 3 V, VGS = 3 to 0 V ID = 10 mA, RL = 300 Ω</td>
<td>100</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
</tbody>
</table>

**Note:**
1. Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 Measuring methods for transistors.
2. ¹¹ Measurement circuit for Turn-on Delay Time / Turn-off Delay Time
*1 Measurement circuit for Turn-on Delay Time / Turn-off Delay Time

**Diagram:**
- **Vin** input with levels 3 V and 0 V.
- **VDD** = 3 V with a pulse width (PW) of 10 μs and D.C. ≤ 1%.
- **ID** = 10 mA and **RL** = 300 Ω.
- **VGS** with levels 10% and 90%.
- **Vout** with levels 10% and 90%.
- **G** and **S** connections.
- **D** and **Vout** connections.

**Waveforms:**
- **VGS** and **Vout** waveform showing on-time (ton) and off-time (toff) durations.
Technical Data (reference)

**Capacitance - VDS**

- Ciss
- Coss
- Crss

**Dynamic Input/Output Characteristics**

- VDD = 3 V

**Gate-source Voltage VGS (V)**

**Drain Current ID (A)**

- ID = 10 mA
- VGS = 1.5 V
- 2.5 V

**Drain-source Voltage VDS (V)**

**Body Diode Forward Voltage VSD (V)**

**Forward Drain Current ISD (A)**

- Ta = 85 °C
- 25 °C
- -30 °C

**Drain-source On-state Resistance RDS(on) (Ω)**

- ID = 10 mA
- VGS = 1.5 V

**Gate-source Voltage VGS (V)**

**Forward Drain Current ISD (A)**

- Ta = 85 °C
- 25 °C
- -30 °C

**Drain Current ID (A)**

- Ta = 85 °C
- 25 °C
- -30 °C

**Gate-source Voltage VGS (V)**

**Dynamic Input/Output Characteristics**
Technical Data (reference)

- **Vth - Ta**
  - Gate-source Threshold Voltage Vth (V)
  - Temperature Ta (°C)

- **RDS(on) - Ta**
  - Drain-source On-state Resistance RDS(on) (Ω)
  - Temperature Ta (°C)

- **PD - Ta**
  - Total Power Dissipation PD (W)
  - Temperature Ta (°C)

- **Rth - tsw**
  - Thermal Resistance Rth (°C/W)
  - Pulse Width tsw (s)

- **Safe Operating Area**
  - Drain-source Voltage VDS (V)
  - Drain Current ID (A)
  - Operation in this area is limited by RDS(on)
  - Ta = 25 °C, Glass epoxy board (25.4 × 25.4 × 0.8 mm) coated with copper foil, which has more than 300 mm².
Land Pattern (Reference) (Unit : mm)
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