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April 1st, 2010
Renesas Electronics Corporation

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RQK0608BQDQS
Silicon N Channel MOS FET
Power Switching

Features

- Low on-resistance
  \( R_{DS(on)} = 120 \, \text{m}\Omega \, \text{typ.} \) (at \( V_{GS} = 4.5 \, \text{V}, \, I_D = 1.6 \, \text{A} \))
- Low drive current
- High speed switching
- \( V_{DSS} : 60 \, \text{V} \) and capable of 2.5 V gate drive

Outline

RENESAS package code: PLZZ0004CA-A
(Package name: UPAK®)

Note: Marking is “BQ”.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Ratings</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain to source voltage</td>
<td>( V_{DSS} )</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>Gate to source voltage</td>
<td>( V_{GSS} )</td>
<td>±12</td>
<td>V</td>
</tr>
<tr>
<td>Drain current</td>
<td>( I_D )</td>
<td>3.2</td>
<td>A</td>
</tr>
<tr>
<td>Drain peak current ( \text{Note1} )</td>
<td>( I_{D(pulse)} )</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>Body - drain diode reverse drain current</td>
<td>( I_{BR} )</td>
<td>3.2</td>
<td>A</td>
</tr>
<tr>
<td>Channel dissipation</td>
<td>( P_{ch} )</td>
<td>1.5</td>
<td>W</td>
</tr>
<tr>
<td>Channel temperature</td>
<td>( T_{ch} )</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>( T_{stg} )</td>
<td>–55 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Notes:
1. \( PW \leq 10 \, \mu\text{s}, \, \text{Duty cycle} \leq 1\% \)
2. When using the glass epoxy board (FR-4 40 × 40 × 1 mm)
## Electrical Characteristics

*(Ta = 25°C)*

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
<th>Test conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain to source breakdown voltage</td>
<td>$V_{BRDSS}$</td>
<td>60</td>
<td></td>
<td></td>
<td>V</td>
<td>$I_D = 10$ mA, $V_{GS} = 0$</td>
</tr>
<tr>
<td>Gate to source breakdown voltage</td>
<td>$V_{BRGSS}$</td>
<td>+12</td>
<td></td>
<td></td>
<td>V</td>
<td>$I_G = +100$ µA, $V_{DS} = 0$</td>
</tr>
<tr>
<td>Gate to source breakdown voltage</td>
<td>$V_{BRGSS}$</td>
<td>−12</td>
<td></td>
<td></td>
<td>V</td>
<td>$I_G = −100$ µA, $V_{DS} = 0$</td>
</tr>
<tr>
<td>Gate to source leak current</td>
<td>$I_{GSS}$</td>
<td></td>
<td></td>
<td></td>
<td>µA</td>
<td>$V_{GS} = +10$ V, $V_{DS} = 0$</td>
</tr>
<tr>
<td>Gate to source leak current</td>
<td>$I_{GSS}$</td>
<td></td>
<td></td>
<td></td>
<td>µA</td>
<td>$V_{GS} = −10$ V, $V_{DS} = 0$</td>
</tr>
<tr>
<td>Zero gate voltage drain current</td>
<td>$I_{GSS}$</td>
<td></td>
<td></td>
<td></td>
<td>µA</td>
<td>$V_{DS} = 60$ V, $V_{GS} = 0$</td>
</tr>
<tr>
<td>Gate to source cutoff voltage</td>
<td>$V_{GS(off)}$</td>
<td>0.4</td>
<td></td>
<td>1.4</td>
<td>V</td>
<td>$V_{DS} = 10$ V, $I_D = 1$ mA</td>
</tr>
<tr>
<td>Drain to source on state resistance</td>
<td>$R_{DSS(on)}$</td>
<td></td>
<td>120</td>
<td>155</td>
<td>mΩ</td>
<td>$I_D = 1.6$ A, $V_{GS} = 4.5$ V&lt;sup&gt;Note3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Drain to source on state resistance</td>
<td>$R_{DSS(on)}$</td>
<td></td>
<td>140</td>
<td>195</td>
<td>mΩ</td>
<td>$I_D = 1.6$ A, $V_{GS} = 2.5$ V&lt;sup&gt;Note3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Forward transfer admittance</td>
<td>$</td>
<td>y_{fs}</td>
<td>$</td>
<td>5</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Input capacitance</td>
<td>$C_{iss}$</td>
<td></td>
<td>300</td>
<td></td>
<td>pF</td>
<td>$V_{DS} = 10$ V</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>$C_{oss}$</td>
<td></td>
<td>36</td>
<td></td>
<td>pF</td>
<td>$V_{GS} = 0$</td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>$C_{rss}$</td>
<td></td>
<td>20</td>
<td></td>
<td>pF</td>
<td>$f = 1$ MHz</td>
</tr>
<tr>
<td>Turn - on delay time</td>
<td>$t_{d(on)}$</td>
<td></td>
<td>12</td>
<td></td>
<td>ns</td>
<td>$I_D = 1.6$ A</td>
</tr>
<tr>
<td>Rise time</td>
<td>$t_r$</td>
<td></td>
<td>64</td>
<td></td>
<td>ns</td>
<td>$V_{GS} = 4.5$ V</td>
</tr>
<tr>
<td>Turn - off delay time</td>
<td>$t_{d(off)}$</td>
<td></td>
<td>32</td>
<td></td>
<td>ns</td>
<td>$R_L = 6.2$ Ω</td>
</tr>
<tr>
<td>Fall time</td>
<td>$t_f$</td>
<td></td>
<td>4</td>
<td></td>
<td>ns</td>
<td>$R_g = 4.7$ Ω</td>
</tr>
<tr>
<td>Total gate charge</td>
<td>$Q_g$</td>
<td></td>
<td>3</td>
<td></td>
<td>nC</td>
<td>$V_{DD} = 10$ V</td>
</tr>
<tr>
<td>Gate to Source charge</td>
<td>$Q_{gs}$</td>
<td></td>
<td>0.6</td>
<td></td>
<td>nC</td>
<td>$V_{GS} = 4.5$ V</td>
</tr>
<tr>
<td>Gate to drain charge</td>
<td>$Q_{gd}$</td>
<td></td>
<td>1</td>
<td></td>
<td>nC</td>
<td>$I_D = 3.2$ A</td>
</tr>
<tr>
<td>Body - drain diode forward voltage</td>
<td>$V_{DF}$</td>
<td></td>
<td>0.8</td>
<td></td>
<td>V</td>
<td>$I_F = 3.2$ A, $V_{GS} = 0$&lt;sup&gt;Note3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Notes: 3. Pulse test
Main Characteristics

- **Ambient Temperature** $T_a$ (°C)
- **Channel Dissipation** $P_{ch}$ (W)
- **Drain to Source Voltage** $V_{DS}$ (V)
- **Drain Current** $I_D$ (A)
- **Gate to Source Voltage** $V_{GS}$ (V)
- **Gate to Source Cutoff Voltage vs. Case Temperature** $V_{GS(off)}$ (V)
- **Gate to Source Cutoff Voltage** $V_{GS}$ (V)

*When using the glass epoxy board (FR-4 40 x 40 x 1 mm)
Drain to Source Saturation Voltage vs. Gate to Source Voltage

Static Drain to Source on State Resistance vs. Case Temperature (1)

Forward Transfer Admittance vs. Drain Current

Zero Gate Voltage Drain current vs. Case Temperature
Switching Time Test Circuit

Vin Monitor

D.U.T.

Rg

Vin
4.5 V

Vin

Vout

Monitor

VDD = 10 V

Switching Time Waveform

Vout

VDD

Vin

10% 10%

90% 90%

90%

90%

td(on)

tr

td(off)

tf
Package Dimensions

<table>
<thead>
<tr>
<th>Package Name</th>
<th>JEITA Package Code</th>
<th>RENESAS Code</th>
<th>Previous Code</th>
<th>MASS (Typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPAK</td>
<td>SC-E2</td>
<td>PL2Z0000CA-A</td>
<td>UPAK / UPAKV</td>
<td>0.050g</td>
</tr>
</tbody>
</table>

Unit: mm

Ordering Information

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Quantity</th>
<th>Shipping Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQK0608BQDQSTL-E</td>
<td>1000 pcs.</td>
<td>φ178 mm reel, 12 mm Emboss taping</td>
</tr>
</tbody>
</table>
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