**RJK0454DPB**

40V, 40A, 4.9mΩ max.
Silicon N Channel Power MOS FET
Power Switching

**Features**
- High speed switching
- Low drive current
- Low on-resistance
  \[ R_{DS(\text{on})} = 3.9 \text{ mΩ typ. (at } V_{GS} = 10 \text{ V)} \]
- Pb-free
- Halogen-free
- High density mounting

**Outline**

RENESAS Package code: PTZZ0005DA-A
(Package name: LFPAK)

**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>40</td>
<td>V</td>
</tr>
<tr>
<td>Gate to source voltage</td>
<td>( V_{GS} )</td>
<td>( \pm 20 )</td>
<td>V</td>
</tr>
<tr>
<td>Drain current</td>
<td>( I_D )</td>
<td>40</td>
<td>A</td>
</tr>
<tr>
<td>Drain peak current</td>
<td>( I_{D\text{,(pulse)}} )</td>
<td>160</td>
<td>A</td>
</tr>
<tr>
<td>Body-drain diode reverse drain current</td>
<td>( I_{DR} )</td>
<td>40</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche current</td>
<td>( I_{AP} )</td>
<td>40</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche energy</td>
<td>( E_{AS} )</td>
<td>13</td>
<td>mJ</td>
</tr>
<tr>
<td>Channel dissipation</td>
<td>( P_{ch} )</td>
<td>55</td>
<td>W</td>
</tr>
<tr>
<td>Channel to Case Thermal Resistance</td>
<td>( \theta_{ch-C} )</td>
<td>2.27</td>
<td>°C/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. \( PW \leq 10 \mu s, \text{ duty cycle} \leq 1% \)
2. Value at \( L=10\mu H, T_{ch} = 25^\circ C, R_{g} \geq 50 \Omega \)
3. \( T_{c} = 25^\circ C \)
# Electrical Characteristics

\( \text{(Ta} = 25^\circ\text{C}) \)

<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>40</td>
<td>—</td>
<td>—</td>
<td>V</td>
<td>( I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V} )</td>
</tr>
<tr>
<td>Gate to source leak current</td>
<td>( \text{IGSS} )</td>
<td>—</td>
<td>—</td>
<td>±0.1</td>
<td>( \mu A )</td>
<td>( V_{GS} = \pm20 \text{ V}, V_{DS} = 0 \text{ V} )</td>
</tr>
<tr>
<td>Zero gate voltage drain current</td>
<td>( \text{IDSS} )</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>( \mu A )</td>
<td>( V_{DS} = 40 \text{ V}, V_{GS} = 0 \text{ V} )</td>
</tr>
<tr>
<td>Gate to source cutoff voltage</td>
<td>( V_{GS(off)} )</td>
<td>2.0</td>
<td>—</td>
<td>4.0</td>
<td>V</td>
<td>( V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA} )</td>
</tr>
<tr>
<td>Static drain to source on state resistance</td>
<td>( R_{DS(on)} )</td>
<td>—</td>
<td>3.9</td>
<td>4.9</td>
<td>m( \Omega )</td>
<td>( I_D = 20 \text{ A}, V_{GS} = 10 \text{ V} )^Note4</td>
</tr>
<tr>
<td>Forward transfer admittance</td>
<td>(</td>
<td>Y_{hs}</td>
<td>)</td>
<td>—</td>
<td>40</td>
<td>—</td>
</tr>
<tr>
<td>Input capacitance</td>
<td>Ciss</td>
<td>—</td>
<td>2000</td>
<td>—</td>
<td>pF</td>
<td>( V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz} )</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>Coss</td>
<td>—</td>
<td>620</td>
<td>—</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>Crss</td>
<td>—</td>
<td>150</td>
<td>—</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Gate Resistance</td>
<td>( R_g )</td>
<td>—</td>
<td>0.5</td>
<td>—</td>
<td>( \Omega )</td>
<td></td>
</tr>
<tr>
<td>Total gate charge</td>
<td>( Q_g )</td>
<td>—</td>
<td>25</td>
<td>—</td>
<td>nC</td>
<td>( V_{DD} = 10 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 40 \text{ A} )</td>
</tr>
<tr>
<td>Gate to source charge</td>
<td>( Qgs )</td>
<td>—</td>
<td>9.0</td>
<td>—</td>
<td>nC</td>
<td></td>
</tr>
<tr>
<td>Gate to drain charge</td>
<td>( Qgd )</td>
<td>—</td>
<td>3.0</td>
<td>—</td>
<td>nC</td>
<td></td>
</tr>
<tr>
<td>Turn-on delay time</td>
<td>( t_{(on)} )</td>
<td>—</td>
<td>10</td>
<td>—</td>
<td>ns</td>
<td>( V_{GS} = 10 \text{ V}, I_D = 20 \text{ A}, V_{DD} \approx 10 \text{ V}, R_L = 0.5 \text{ ( \Omega )}, R_g = 4.7 \text{ ( \Omega )} )</td>
</tr>
<tr>
<td>Rise time</td>
<td>( t_r )</td>
<td>—</td>
<td>5.2</td>
<td>—</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Turn-off delay time</td>
<td>( t_{(off)} )</td>
<td>—</td>
<td>30</td>
<td>—</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>( t_f )</td>
<td>—</td>
<td>6.5</td>
<td>—</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Body–drain diode forward voltage</td>
<td>( V_{DF} )</td>
<td>—</td>
<td>0.8</td>
<td>1.1</td>
<td>V</td>
<td>( I_F = 40 \text{ A}, V_{GS} = 0 \text{ V} )^Note4</td>
</tr>
<tr>
<td>Body–drain diode reverse recovery time</td>
<td>( t_r )</td>
<td>—</td>
<td>37</td>
<td>—</td>
<td>ns</td>
<td>( I_F = 40 \text{ A}, V_{GS} = 0 \text{ V} ), ( \text{di}I/\text{dt} = 100 \text{ A}/\mu\text{s} )</td>
</tr>
</tbody>
</table>

Notes: 4. Pulse test
Main Characteristics

- **Power vs. Temperature Derating**
  - Channel Dissipation, $P_{ch}$ (W) vs. Case Temperature, $T_c$ (°C)

- **Maximum Safe Operation Area**
  - Drain to Source Voltage, $V_{DS}$ (V)
  - Drain Current, $I_D$ (A)

- **Typical Output Characteristics**
  - Drain Current, $I_D$ (A) vs. Drain to Source Voltage, $V_{DS}$ (V)
  - Drain to Source Saturation Voltage vs. Gate to Source Voltage

- **Typical Transfer Characteristics**
  - Drain Current, $I_D$ (A) vs. Gate to Source Voltage, $V_{GS}$ (V)
  - Static Drain to Source on State Resistance vs. Drain Current

- **Static Drain to Source on State Resistance**
  - Drain to Source Saturation Voltage, $V_{DS(on)}$ (mV) vs. Gate to Source Voltage, $V_{GS}$ (V)

- **Operation in this area is limited by $R_{DS(on)}$**
  - Operation at $V_{DS} = 10$ V
  - Pulse Test: $V_{GS} = 3.6$ V, $I_D = 20$ A
  - DC Operation
  - $T_c = 25$ °C, 1 shot Pulse
  - Operation at $V_{DS} = 4.8$ V
  - Pulse Test: $V_{GS} = 4.4$ V, $I_D = 5$ A

- **Static Drain to Source on State Resistance**
  - Drain to Source Saturation Voltage, $V_{DS(on)}$ (mΩ) vs. Drain Current, $I_D$ (A)
  - Pulse Test: $V_{GS} = 10$ V
  - $V_{DS} = 4.4$ V
  - $V_{GS} = 4.2$ V

- **Operation in this area is limited by $R_{DS(on)}$**
  - Operation at $V_{DS} = 10$ V
  - Pulse Test: $V_{GS} = 3.6$ V, $I_D = 5$ A
  - DC Operation
  - $T_c = 25$ °C, 1 shot Pulse
  - Operation at $V_{DS} = 4.8$ V
  - Pulse Test: $V_{GS} = 4.4$ V, $I_D = 5$ A

- **Power vs. Temperature Derating**
  - Channel Dissipation, $P_{ch}$ (W) vs. Case Temperature, $T_c$ (°C)

- **Maximum Safe Operation Area**
  - Drain to Source Voltage, $V_{DS}$ (V)
  - Drain Current, $I_D$ (A)

- **Typical Output Characteristics**
  - Drain Current, $I_D$ (A) vs. Drain to Source Voltage, $V_{DS}$ (V)
  - Drain to Source Saturation Voltage vs. Gate to Source Voltage

- **Typical Transfer Characteristics**
  - Drain Current, $I_D$ (A) vs. Gate to Source Voltage, $V_{GS}$ (V)
  - Static Drain to Source on State Resistance vs. Drain Current

- **Static Drain to Source on State Resistance**
  - Drain to Source Saturation Voltage, $V_{DS(on)}$ (mV) vs. Gate to Source Voltage, $V_{GS}$ (V)

- **Operation in this area is limited by $R_{DS(on)}$**
  - Operation at $V_{DS} = 10$ V
  - Pulse Test: $V_{GS} = 3.6$ V, $I_D = 20$ A
  - DC Operation
  - $T_c = 25$ °C, 1 shot Pulse
  - Operation at $V_{DS} = 4.8$ V
  - Pulse Test: $V_{GS} = 4.4$ V, $I_D = 5$ A

- **Static Drain to Source on State Resistance**
  - Drain to Source Saturation Voltage, $V_{DS(on)}$ (mΩ) vs. Drain Current, $I_D$ (A)
  - Pulse Test: $V_{GS} = 10$ V
  - $V_{DS} = 4.4$ V
  - $V_{GS} = 4.2$ V

- **Operation in this area is limited by $R_{DS(on)}$**
  - Operation at $V_{DS} = 10$ V
  - Pulse Test: $V_{GS} = 3.6$ V, $I_D = 5$ A
  - DC Operation
  - $T_c = 25$ °C, 1 shot Pulse
  - Operation at $V_{DS} = 4.8$ V
  - Pulse Test: $V_{GS} = 4.4$ V, $I_D = 5$ A
Normalized Transient Thermal Impedance vs. Pulse Width

Avalanche Test Circuit

Avalanche Waveform

Switching Time Test Circuit

Switching Time Waveform
Package Dimensions

<table>
<thead>
<tr>
<th>Package Name</th>
<th>JETTA Package Code</th>
<th>RENESAS Code</th>
<th>Previous Code</th>
<th>Mass [Typ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFPARK</td>
<td>SC-100</td>
<td>PTZ2002SDA-A</td>
<td>LFPARV</td>
<td>0.080g</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>RJK0454DPB-00-J5</td>
<td>2500 pcs</td>
<td>Taping</td>
</tr>
</tbody>
</table>
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Renesas Electronics Americas Inc.
2990 Scott Boulevard, Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1701 Northpark Road, Waterloo, Ontario L7V 9C3, Canada
Tel: +1-519-748-8841, Fax: +1-519-748-3220

Renesas Electronics Europe Limited
Dulles Meadow, Milton Road, Basingstoke, Hampshire, RG24 8DF, UK
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Amradibüelstrasse 15, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.37 Zhanchun Li Hadian District, Beijing 100083, P.R.China
Tel: +86-10-8226-1153, Fax: +86-10-8226-7679

Renesas Electronics Hong Kong Limited
Unit 204, 205, A24 Center, No.1220 Lojaqiu Rong Rd, Puding District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7965 / 7898

Renesas Electronics Taiwan Co., Ltd.
13F., No. 363, Fu Shing North Road, Taipei, Taiwan
Tel: +886-2-875-3900, Fax: +886-2-875-0900

Renesas Electronics Malaysia Sdn.Bhd.
Unit 905, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46500 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-795-0590, Fax: +60-3-795-9510

Renesas Electronics Korea Co., Ltd.
11F., Korea International Trade Center, 2-52 Teikya-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3707, Fax: +82-2-558-5141

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