RJK0856DPB

80V, 35A, 8.9mΩ max.
Silicon N Channel Power MOS FET
Power Switching

Features

- High speed switching
- Low drive current
- Low on-resistance
  \[ R_{DS(on)} = 6.9 \text{ mΩ typ. (at } V_{GS} = 10 \text{ V) } \]
- 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>80</td>
<td>V</td>
</tr>
<tr>
<td>Gate to source voltage</td>
<td>( V_{GSS} )</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>Drain current</td>
<td>( I_D )</td>
<td>35</td>
<td>A</td>
</tr>
<tr>
<td>Drain peak current</td>
<td>( I_{D(pulse)} )^Note1</td>
<td>140</td>
<td>A</td>
</tr>
<tr>
<td>Body-drain diode reverse drain current</td>
<td>( I_{DR} )</td>
<td>35</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche current</td>
<td>( I_{AP} )^Note2</td>
<td>35</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche energy</td>
<td>( E_{AS} )^Note2</td>
<td>16</td>
<td>mJ</td>
</tr>
<tr>
<td>Channel dissipation</td>
<td>( P_{ch} )^Note3</td>
<td>65</td>
<td>W</td>
</tr>
<tr>
<td>Channel to Case Thermal Resistance</td>
<td>( \theta_{ch-C} )</td>
<td>1.92</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. \( PW \leq 10 \mu s \), duty cycle \( \leq 1\% \)
2. Value at \( L=10\mu H, T_{ch} = 25°C \), \( R_g \geq 50 \Omega \)
3. \( T_c = 25°C \)
## Electrical Characteristics


table

<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>80</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>$I_{GS}$</td>
<td>—</td>
<td>—</td>
<td>$\pm 0.1$</td>
<td>$\mu$A</td>
<td>$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$</td>
</tr>
<tr>
<td>Zero gate voltage drain current</td>
<td>$I_{DSS}$</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>$\mu$A</td>
<td>$V_{DS} = 80 \text{ V}, V_{GS} = 0 \text{ V}$</td>
</tr>
<tr>
<td>Gate to source cutoff voltage</td>
<td>$V_{GS(\text{off})}$</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>6.9</td>
<td>8.9</td>
<td>m$\Omega$</td>
<td>$I_D = 17.5 \text{ A}, V_{GS} = 10 \text{ V}$</td>
</tr>
<tr>
<td>Forward transfer admittance</td>
<td>$</td>
<td>Y_{th}</td>
<td>$</td>
<td>—</td>
<td>53</td>
<td>—</td>
</tr>
<tr>
<td>Input capacitance</td>
<td>$C_{iss}$</td>
<td>—</td>
<td>3000</td>
<td>—</td>
<td>pF</td>
<td>$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, V_{DD} = 10 \text{ V}$</td>
</tr>
<tr>
<td>Output capacitance</td>
<td>$C_{oss}$</td>
<td>—</td>
<td>585</td>
<td>—</td>
<td>pF</td>
<td>$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, \nu = 1 \text{ MHz}$</td>
</tr>
<tr>
<td>Reverse transfer capacitance</td>
<td>$C_{rss}$</td>
<td>—</td>
<td>155</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>40</td>
<td>—</td>
<td>nC</td>
<td>$V_{DD} = 25 \text{ V}, V_{GS} = 10 \text{ V}$</td>
</tr>
<tr>
<td>Gate to source charge</td>
<td>$Q_{gs}$</td>
<td>—</td>
<td>13</td>
<td>—</td>
<td>nC</td>
<td>$I_D = 35 \text{ A}$</td>
</tr>
<tr>
<td>Gate to drain charge</td>
<td>$Q_{gd}$</td>
<td>—</td>
<td>7.0</td>
<td>—</td>
<td>nC</td>
<td></td>
</tr>
<tr>
<td>Turn-on delay time</td>
<td>$t_{(on)}$</td>
<td>—</td>
<td>16</td>
<td>—</td>
<td>ns</td>
<td>$V_{GS} = 10 \text{ V}, I_D = 17.5 \text{ A}$</td>
</tr>
<tr>
<td>Rise time</td>
<td>$t_r$</td>
<td>—</td>
<td>7.2</td>
<td>—</td>
<td>ns</td>
<td>$V_{DD} = 30 \text{ V}, R_L = 1.7 \Omega, V_{GS} = 0 \text{ V}$</td>
</tr>
<tr>
<td>Turn-off delay time</td>
<td>$t_{(off)}$</td>
<td>—</td>
<td>36</td>
<td>—</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Fall time</td>
<td>$t_f$</td>
<td>—</td>
<td>8.6</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>$I_F = 35 \text{ A}, V_{GS} = 0 \text{ V}$</td>
</tr>
<tr>
<td>Body–drain diode reverse recovery time</td>
<td>$t_{rr}$</td>
<td>—</td>
<td>46</td>
<td>—</td>
<td>ns</td>
<td>$I_F = 35 \text{ A}, V_{GS} = 0 \text{ V}$</td>
</tr>
</tbody>
</table>

Notes: 4. Pulse test
Main Characteristics

![Graphs and diagrams showing various characteristics of a semiconductor device, including power vs. temperature derating, maximum safe operation area, typical output characteristics, typical transfer characteristics, drain to source saturation voltage vs. gate to source voltage, and static drain to source on state resistance vs. drain current.]
Avalanche Test Circuit

\[ E_{AS} = \frac{1}{2} L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}} \]

Switching Time Test Circuit

Normalized Transient Thermal Impedance vs. Pulse Width

\[ \gamma(t) = \frac{1}{\rho c_v (t)} \cdot \theta(t) \cdot \theta(t) \cdot \theta(t) \]

Avalanche Waveform

Switching Time Waveform

Vdd Monitor

ID

0

1 m

10 m

100 m

10

0.1

0.01

0.001

0.0001

Vin Monitor

Vout Monitor

Vin Monitor

Vout Monitor
### 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>LFPACK</td>
<td>SC-100</td>
<td>PTZK0005DA-A</td>
<td>LFPACK</td>
<td>0.080g</td>
</tr>
</tbody>
</table>

Unit: mm

(Ni/Pd/Au plating)

### Ordering Information

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Quantity</th>
<th>Shipping Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>RJK0856DPB-00-J5</td>
<td>2500 pcs</td>
<td>Taping</td>
</tr>
</tbody>
</table>
Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in this design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.

2. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors or omissions from the information included herein.

3. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.

4. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics product.

5. Renesas Electronics products are classified according to the following two quality grades: “Standard” and “High Quality”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.

   - “Standard”: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment, and industrial robots etc.
   - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crisis systems; and safety equipment etc.

Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implants etc.) or may cause serious property damages (nuclear reactor control systems, military equipment etc.). You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application for which it is not intended. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.

6. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damage arising out of the use of Renesas Electronics products beyond such specified ranges.

7. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain-use conditions. Further, Renesas Electronics products are not subject to radiation-resistance design. Please be sure to implement safety measures to guard against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or systems manufactured by you.

8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHs Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.

9. Renesas Electronics products and technology may not be used for or incorporated into any products or systems where manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You should not use Renesas Electronics products or technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. When exporting the Renesas Electronics products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations.

10. It is the responsibility of the buyer or distributor of Renesas Electronics products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the product’s quality grade, as indicated below.

   - “Standard”: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment, and industrial robots etc.
   - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crisis systems; and safety equipment etc.

11. You should refer to the latest and detailed information at “http://www.renesas.com/” for the latest and detailed information.

12. This document may not be reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.

Renesas Electronics Corporation

http://www.renesas.com

SALES OFFICES

Renesas Electronics Corporation

Referto “http://www.renesas.com/” for the latest and detailed information.

Renesas Electronics America Inc.
2880 Scott Boulevard, Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1710 Nathaniel Road, Ottawa, Ontario, L3Y 9C3, Canada
Tel: +1-613-844-0141, Fax: +1-613-998-3220

Renesas Electronics Europe Limited

Dukes Meadow, Milkford Road, Bistance End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

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

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.57 ZhongHuan JiaDian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1153, Fax: +86-10-8235-7679

Renesas Electronics Hong Kong Limited
Unit 204, 205, 24/F. AIA Centre, No.1202 Lo Us Collection Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6877-7698

Renesas Electronics Taiwan Co., Ltd.
1391, No.3, Lotus Rd, Fuxing North Road, Taipei, Taiwan
Tel: +886-2-8157-9000, Fax: +886-2-8157-9670

Renesas Electronics Singapore Pte. Ltd.
80 Benthamore Road, Unit 05-02 H Rufus Innovation Centre Singapore 339949
Tel: +65-6213-9000, Fax: +65-6213-9300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 908, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-795-8590, Fax: +60-3-795-8550

Renesas Electronics Korea Co., Ltd.
11F, Rebar Landmark Bldg - 752-2 Yekyam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

© 2013 Renesas Electronics Corporation. All rights reserved.
Colophon 2.2