PQ1CG2032FZ/PQ1CG2032RZ

TO-220 Type Chopper Regulators

■ Features
- Maximum switching current: 3.5A
- Built-in ON/OFF control function
- Built-in soft start function to suppress overshoot of output voltage in power on sequence or ON/OFF control sequence
- Built-in oscillation circuit (Oscillation frequency: TYP. 70kHz)
- Built-in overheat, overcurrent protection function
- TO-220 package
- Variable output voltage (Output variable range: Vref to 35V/-Vref to -30V)
  [Possible to select step-down output/inversing output according to external connection circuit]
- PQ1CG2032FZ: Zigzag forming
- PQ1CG2032RZ: Self-stand forming

■ Applications
- Switching power supplies
- Facsimiles, printers and other OA equipment
- Battery chargers
- Personal computers and amusement equipment

■ Outline Dimensions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>V IN</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>Error input voltage</td>
<td>V ADJ</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>Input-output voltage</td>
<td>V LO</td>
<td>41</td>
<td>V</td>
</tr>
<tr>
<td>Output – COM voltage</td>
<td>V OUT</td>
<td>−1</td>
<td>V</td>
</tr>
<tr>
<td>ON/OFF control voltage</td>
<td>V C</td>
<td>−0.3 to +40</td>
<td>V</td>
</tr>
<tr>
<td>Switching current</td>
<td>I SW</td>
<td>3.5</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>P D1</td>
<td>1.4</td>
<td>W</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>T SAD</td>
<td>260 (10s)</td>
<td>°C</td>
</tr>
</tbody>
</table>

Notice: In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

Internet: Internet address for Electronic Components Group http://sharp-world.com/ecg/

■ Absolute Maximum Ratings (Ta=25°C)

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</table>

*1 Voltage between V IN terminal and COM terminal
*2 Voltage between V OUT terminal and COM terminal
*3 Voltage between ON/OFF control and COM terminal
*4 P D1: With infinite heat sink
*5 Overheat protection may operate at T J=125°C to 150°C

Please refer to the chapter “Handling Precautions”. 
### Electrical Characteristics

(Unless otherwise specified, condition shall be $V_{IN}=12V$, $I_O=0.2A$, $V_O=5V$, ON-OFF terminals is open, $T_a=25^\circ C$)

<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>Output saturation voltage</td>
<td>$V_{SAT}$</td>
<td>$I_{SW}=3A$</td>
<td>−</td>
<td>1.4</td>
<td>1.8</td>
<td>V</td>
</tr>
<tr>
<td>Reference voltage</td>
<td>$V_{ref}$</td>
<td>−</td>
<td>1.235</td>
<td>1.26</td>
<td>1.285</td>
<td>V</td>
</tr>
<tr>
<td>Reference voltage temperature fluctuation</td>
<td>$\Delta V_{ref}$</td>
<td>$T_j=0$ to $125^\circ C$</td>
<td>−</td>
<td>±0.5</td>
<td>−</td>
<td>%</td>
</tr>
<tr>
<td>Load regulation</td>
<td>$</td>
<td>R_{egL}</td>
<td>$</td>
<td>$I_O=0.5$ to $3A$</td>
<td>−</td>
<td>0.2</td>
</tr>
<tr>
<td>Line regulation</td>
<td>$</td>
<td>R_{egI}</td>
<td>$</td>
<td>$V_{IN}=8$ to $35V$</td>
<td>−</td>
<td>0.5</td>
</tr>
<tr>
<td>Efficiency</td>
<td>$\eta$</td>
<td>$I_O=3A$</td>
<td>−</td>
<td>80</td>
<td>−</td>
<td>%</td>
</tr>
<tr>
<td>Oscillation frequency</td>
<td>$f_0$</td>
<td>−</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>kHz</td>
</tr>
<tr>
<td>Oscillation frequency temperature fluctuation</td>
<td>$\Delta f_0$</td>
<td>$T_j=0$ to $125^\circ C$</td>
<td>−</td>
<td>±2</td>
<td>−</td>
<td>%</td>
</tr>
<tr>
<td>Overcurrent detecting level</td>
<td>$I_{CHG}$</td>
<td>−</td>
<td>3.6</td>
<td>4.2</td>
<td>5.8</td>
<td>A</td>
</tr>
<tr>
<td>Charge current</td>
<td>$I_{CHG}$</td>
<td>②,③terminals is open,⑤terminal</td>
<td>−</td>
<td>−10</td>
<td>−</td>
<td>μA</td>
</tr>
<tr>
<td>Input threshold voltage</td>
<td>$V_{THL}$</td>
<td>Duty ratio=0,④terminal=0V,⑤terminal</td>
<td>−</td>
<td>1.3</td>
<td>−</td>
<td>V</td>
</tr>
<tr>
<td>ON threshold voltage</td>
<td>$V_{THON}$</td>
<td>④terminal=0V,⑤terminal</td>
<td>0.7</td>
<td>0.8</td>
<td>0.9</td>
<td>V</td>
</tr>
<tr>
<td>Stand-by current</td>
<td>$I_{SD}$</td>
<td>$V_{IN}=40V$,⑤terminal=0V</td>
<td>−</td>
<td>140</td>
<td>400</td>
<td>μA</td>
</tr>
<tr>
<td>Output OFF-state dissipation current</td>
<td>$I_{QS}$</td>
<td>$V_{IN}=40V$,⑤terminal=0.9V</td>
<td>−</td>
<td>8</td>
<td>16</td>
<td>mA</td>
</tr>
</tbody>
</table>

**Fig.1 Test Circuit**

**Fig.2 Power Dissipation vs. Ambient Temperature**

**Fig.3 Overcurrent Protection Characteristics (Typical Value)**

Note: Oblique line portion: Overheat protection may operate in this area
Fig. 4 Efficiency vs. Input Voltage

Fig. 5 Output Saturation Voltage vs. Switching Current

Fig. 6 Stand-by Current vs. Input Voltage

Fig. 7 Reference Voltage Fluctuation vs. Junction Temperature

Fig. 8 Load Regulation vs. Output Current

Fig. 9 Line Regulation vs. Input Voltage
Fig. 10 Oscillation Frequency Fluctuation vs. Junction Temperature

- Oscillation frequency fluctuation (%)
- Junction temperature $T_j$ (°C)
- $V_{IN}=12V$, $V_O=5V$

Fig. 11 Overcurrent Detecting Level Fluctuation vs. Junction Temperature

- Overcurrent detecting level fluctuation (%)
- Junction temperature $T_j$ (°C)
- $V_{IN}=12V$, $V_O=5V$

Fig. 12 Threshold Voltage vs. Junction Temperature

- Threshold voltage $V_{TH(ON)}$, $V_{TH(L)}$, $V_{TH(H)}$ (V)
- Junction temperature $T_j$ (°C)
- $V_{IN}=12V$

Fig. 13 Operating Dissipation Current vs. Input Voltage

- Operating dissipation current $I_Q'$ (mA)
- Input voltage $V_{IN}$ (V)
- $T_j=25°C$, $V_O=5V$

Fig. 14 Block Diagram

- Voltage regulator
- ON/OFF circuit
- PWM COMP.
- OADJ
- COM
- $V_{IN}$
- $V_{OUT}$
- $V_{ref}$
Fig. 15 Step Down Type Circuit Diagram

Fig. 16 Polarity Inversion Type Circuit Diagram
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