General Description

QX5252 is an ASIC for solar LED lawn lights.

Only a peripheral inductor is required to realize the step-up power supply, and the maximum drive efficiency can exceed 84%.

QX5252 has automatical charge characteristic.

QX5252 uses CMOS technology, therefore the power consumption is very small.

QX5252 uses patented technique to realize the LED lights shutdown without flicker when the battery voltage is low.

The operating voltage of QX5252 is 0.9V to 1.5V, suitable for a single AA battery or a single Ni-H battery.

Features

- Operating Voltage: 0.9V~1.5V
- 3mA~300mA Output current
- Patented over-discharge protection: shutdown without flicker
- Integrated light control switch
- Integrated Schottky Diode
- Only an external inductor is required
- High Efficiency
- Low quiescent current: 17uA

Applications

- Solar lawn
- Solar landscape

Typical Application

(a) Uses solar panel to achieve light control

(b) Uses photo-resistor to achieve light control

Figure 1: Typical Application Circuit Diagrams of QX5252
Ordering Information

Type Number

QX5252

Package Marking

5252F
XXX

Lot Number
Date

Pin Assignments

TO-94

SOT23-5
Pin Description

<table>
<thead>
<tr>
<th>Pin Name</th>
<th>Package Type and Pin Number</th>
<th>Pin Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LX</td>
<td>SOT23-5 3</td>
<td>TO-94 4</td>
<td>Output</td>
</tr>
<tr>
<td>SBAT</td>
<td>SOT23-5 1</td>
<td>TO-94 1</td>
<td>Input</td>
</tr>
<tr>
<td>VSS</td>
<td>SOT23-5 4</td>
<td>TO-94 3</td>
<td>Ground</td>
</tr>
<tr>
<td>BAT</td>
<td>SOT23-5 5</td>
<td>TO-94 2</td>
<td>Output</td>
</tr>
<tr>
<td>LS</td>
<td>SOT23-5 2</td>
<td>TO-94 -</td>
<td>Input</td>
</tr>
</tbody>
</table>

Functional Block Diagram

![Functional Block Diagram of QX5252](image)

Figure 2: Functional Block Diagram of QX5252
### Absolute Maximum Ratings (Note 1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Description</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>V_{MAX}</td>
<td>Maximum Voltage On SBAT,BAT and LX Pins</td>
<td>7</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>I_{LX,MAX}</td>
<td>Maximum Current On LX Pin</td>
<td>800</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>P_{TO-94}</td>
<td>Maximum Power Dissipation for P_{TO-94} Package</td>
<td>0.75</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P_{SOT23-5}</td>
<td>Maximum Power Dissipation for P_{SOT23-5} Package</td>
<td>0.25</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>Thermal</td>
<td>T_A</td>
<td>Operating Temperature Range</td>
<td>-20</td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td>T_{STG}</td>
<td>Storage Temperature Range</td>
<td>-40</td>
<td>120</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td>T_{SD1}</td>
<td>Soldering Temperature Range for TO-94 Package (less than 5 sec)</td>
<td>250</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td>T_{SD2}</td>
<td>Soldering Temperature Range for SOT23-5 Package (less than 30 sec)</td>
<td>230</td>
<td>240</td>
<td>°C</td>
</tr>
<tr>
<td>ESD</td>
<td>V_{ESD}</td>
<td>ESD Voltage for Human Body Mode</td>
<td>2000</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

### Electronic Characteristics

T_A = 25 °C, L_1 = 47uH, unless otherwise specified

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>V_{BAT}</td>
<td>Operating Voltage</td>
<td>0.9</td>
<td>1.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Supply Current</td>
<td>I_{BAT0}</td>
<td>Quiescent Current</td>
<td>17</td>
<td></td>
<td>uA</td>
<td></td>
</tr>
<tr>
<td><strong>T_{ON} Time</strong></td>
<td></td>
<td><strong>T_{ON}</strong></td>
<td>5</td>
<td></td>
<td>us</td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td>\eta</td>
<td>L_1 = 180uH, C_1 = 22uF</td>
<td>84</td>
<td></td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>
Typical Electrical Curves

$V_{BAT}=1.2\,\text{V},\ T_A=25\,^\circ\text{C}$, unless otherwise specified
Applications Information

Detailed Description

QX5252 is an ASIC for solar LED lawn lights.

Only a peripheral inductor is required to realize the step-up power supply, and the maximum drive efficiency can exceed 84%.

QX5252 has automatically charge characteristics.

The operating voltage of QX5252 is 0.9V to 1.5V, suitable for a single AA battery or a single Ni-H battery.

QX5252 uses CMOS technology, therefore the power consumption is very small.

QX5252 uses patented technique to realize the LED lights shutdown without flicker when the battery voltage is low.

The internal circuits of QX5252 include switching driver, light control switching circuit, over-discharge protection, and the internal integrated Schottky diode.

Light Control Switch Setting

TO-94 Package Uses solar panels to achieve light control.

SOT23-5 Package Uses an external photo-resistor and an ordinary resistor to achieve light control, LS terminal voltage is set by the following equation:

\[ V_{LS} = \frac{R_2}{R_1 + R_2} \times V_{BAT} \]

When \( V_{LS} \) higher than 0.3 \( V_{BAT} \), the light control switch makes the LED light control switches off, when \( V_{LS} \) lower than 0.22 \( V_{BAT} \), the light control switch makes the LED lights turn on.

Power Setting

The LED power is set to:

\[ P_{LED} = \frac{2.5 \cdot \eta \cdot V_{BAT}^2}{L_1} \times 10^{-6} \]
Package Information

Physical Dimensions for TO-94 Package:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Dimensions in Millimeters</th>
<th>Dimensions in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>A</td>
<td>1.400</td>
<td>1.800</td>
</tr>
<tr>
<td>A1</td>
<td>0.700</td>
<td>0.900</td>
</tr>
<tr>
<td>A2</td>
<td>0.500</td>
<td>0.700</td>
</tr>
<tr>
<td>b</td>
<td>0.360</td>
<td>0.500</td>
</tr>
<tr>
<td>b1</td>
<td>0.380</td>
<td>0.550</td>
</tr>
<tr>
<td>c</td>
<td>0.360</td>
<td>0.510</td>
</tr>
<tr>
<td>D</td>
<td>4.980</td>
<td>5.280</td>
</tr>
<tr>
<td>D1</td>
<td>3.780</td>
<td>4.080</td>
</tr>
<tr>
<td>E</td>
<td>3.450</td>
<td>3.750</td>
</tr>
<tr>
<td>e</td>
<td>1.270</td>
<td>0.050</td>
</tr>
<tr>
<td>e1</td>
<td>3.710</td>
<td>3.910</td>
</tr>
<tr>
<td>L</td>
<td>14.900</td>
<td>15.300</td>
</tr>
<tr>
<td>θ</td>
<td>45°</td>
<td>45°</td>
</tr>
</tbody>
</table>

www.qxmd.com.cn
Physical Dimensions for SOT23-5 Package:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Dimensions In Millimeters</th>
<th>Dimensions In Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>A</td>
<td>1.050</td>
<td>1.250</td>
</tr>
<tr>
<td>A1</td>
<td>0.000</td>
<td>0.100</td>
</tr>
<tr>
<td>A2</td>
<td>1.050</td>
<td>1.150</td>
</tr>
<tr>
<td>b</td>
<td>0.300</td>
<td>0.500</td>
</tr>
<tr>
<td>c</td>
<td>0.100</td>
<td>0.200</td>
</tr>
<tr>
<td>D</td>
<td>2.820</td>
<td>3.020</td>
</tr>
<tr>
<td>E</td>
<td>1.500</td>
<td>1.700</td>
</tr>
<tr>
<td>E1</td>
<td>2.650</td>
<td>2.950</td>
</tr>
<tr>
<td>e</td>
<td>0.950(BSC)</td>
<td>0.037(BSC)</td>
</tr>
<tr>
<td>e1</td>
<td>1.800</td>
<td>2.000</td>
</tr>
<tr>
<td>L</td>
<td>0.300</td>
<td>0.600</td>
</tr>
<tr>
<td>θ</td>
<td>0°</td>
<td>8°</td>
</tr>
</tbody>
</table>
Declaration

- QXMD reserves the right to make changes to improve technical design and semiconductor products, and may do so without further notice. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

- QXMD is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyers, when utilizing QXMD products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such QXMD products could cause loss of human life, bodily injury or damage to property.

In developing your designs, please ensure that QXMD products are used within specified operating ranges as set forth in the most recent QXMD products specifications.

- The QXMD products listed in this document are intended for usage in consumer electronics applications. These QXMD products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of QXMD products listed in this document shall be made at the customer’s own risk.

- The information contained herein is presented only as a guide for the applications of our products. QXMD cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a QXMD product. No circuit patent licenses are implied.

Customer Service Center

QX Micro Devices Co., Ltd.
Add: 4th Floor, Building 22, Zhiheng Hi-Tech Park, Nantou Guangkou 2nd Road, Nanshan, Shenzhen, Guangdong, China
ZIP Code: 518052
Tel: +86-0755-88852177
Fax: +86-0755-86350858
Web Site: www.qxmd.com.cn