1 Features

- AEC-Q100 qualified for automotive applications
  - Device temperature grade 1, T_A range –40°C to +125°C, and T_J range –40°C to +150°C
- Low EMI
  - Adjustable SW node rise time
  - Spread spectrum to reduce peak emissions
  - Frequency adjust or synchronize over 200 kHz – 2.2 MHz range
  - FPWM when synchronized for constant frequency at light loads
  - 4 mm × 3.5 mm low-EMI VQFN-HR package (with wettable flanks) and pinout
- High efficiency power conversion at all loads
  - 8-µA standby current with V_IN = 13.5 V, V_OUT = 3.3 V, no load
  - Frequency foldback in light load for improved efficiency with Auto Mode
  - Low MOSFET ON Resistance
    - R_DS_ON_HS = 41 mΩ (typical)
    - R_DS_ON_LS = 21 mΩ (typical)
- Wide Conversion Range
  - Input voltage: 3 V to 36 V
  - Output voltage adjustable from 1 V to 95% of V_IN
  - DC load current: 0 A to 4 A
  - t_ON_MIN = 50 ns (typical)
  - t_OFF_MIN = 70 ns (typical)
- PGood output with filter and delayed release
- Built-in compensation, soft start, current limits, hiccup protection, thermal shutdown, and UVLO

2 Applications

- Automotive infotainment & cluster, head unit, media hub, USB charge, display
- Automotive ADAS and body applications
- Battery powered subsystems

3 Description

The LM61440-Q1 is an automotive-focused synchronous step-down buck converter providing adjustable output voltage and 0 to 4 A DC load current from a supply voltage ranging from 3.0 V to 36 V. The LM61440-Q1 is designed from the ground up for minimal EMI. The device incorporates pseudo-random spread spectrum, adjustable SW node rise time, and low-EMI VQFN-HR package featuring low ringing and optimal-layout-friendly pinout. Switching frequency can be set or synchronized between 200 kHz and 2.2 MHz to avoid noise sensitive frequency bands, and for improved efficiency at low operating frequency or smaller solution size at high frequency. Factory auto-mode enables frequency foldback when operating with light loads, allowing an unloaded current consumption of only 8 µA (typical) and high efficiency with light loads. Together with very low MOSFET ON resistances and optional external bias input, exceptional efficiency is achieved over entire load range. The device also provides an open-drain PGood output and comprehensive protection features. Electrical characteristics are specified over a junction temperature range of –40°C to +150°C.

Device Information

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PACKAGE</th>
<th>BODY SIZE (NOM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM61440-Q1</td>
<td>VQFN-HR (14)</td>
<td>4.00 mm × 3.50 mm</td>
</tr>
</tbody>
</table>

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Efficiency V_IN=13.5 V F_SW=400 kHz

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. ADVANCE INFORMATION for pre-production products; subject to change without notice.
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4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<table>
<thead>
<tr>
<th>DATE</th>
<th>REVISION</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2019</td>
<td>*</td>
<td>Initial release</td>
</tr>
</tbody>
</table>
5 Device and Documentation Support

5.1 Receiving Notification of Documentation Updates
To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on Alert me to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

5.2 Community Resources
The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI’s views; see TI’s Terms of Use.

TI E2E™ Online Community TI’s Engineer-to-Engineer (E2E) Community. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support TI’s Design Support Quickly find helpful E2E forums along with design support tools and contact information for technical support.

5.3 Trademarks
E2E is a trademark of Texas Instruments.
All other trademarks are the property of their respective owners.

5.4 Electrostatic Discharge Caution
This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

5.5 Glossary
SLYZ022 — TI Glossary.
This glossary lists and explains terms, acronyms, and definitions.

6 Mechanical, Packaging, and Orderable Information
The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.
## PACKAGING INFORMATION

<table>
<thead>
<tr>
<th>Orderable Device</th>
<th>Status</th>
<th>Package Type</th>
<th>Package Drawing</th>
<th>Pins</th>
<th>Package Qty</th>
<th>Eco Plan</th>
<th>Lead/Ball Finish</th>
<th>MSL Peak Temp</th>
<th>Op Temp (°C)</th>
<th>Device Marking</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM61440AASQRJRTQ1</td>
<td>PREVIEW</td>
<td>VQFN-HR</td>
<td>RJR</td>
<td>14</td>
<td>250</td>
<td>TBD</td>
<td>Call TI</td>
<td>Call TI</td>
<td>-40 to 150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

1. The marketing status values are defined as follows:
   - **ACTIVE**: Product device recommended for new designs.
   - **LIFEBUY**: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
   - **NRND**: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
   - **PREVIEW**: Device has been announced but is not in production. Samples may or may not be available.
   - **OBSOLETE**: TI has discontinued the production of the device.

2. **RoHS**: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
   - **RoHS Exempt**: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
   - **Green**: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

3. **MSL, Peak Temp.** - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

4. There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

5. Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

6. Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**OTHER QUALIFIED VERSIONS OF LM61440-Q1:**
Catalog: LM61440

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
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