

bq79606-Q1 SafeTI™ Precision Monitor With Integrated Hardware Protector for Automotive Battery Pack Applications

1 Features

- Qualified for Automotive Applications
- AEC-Q100 Qualified With the Following Results:
 - Device Temperature Grade 2: –40°C to +105°C Ambient Operating Temperature Range
 - Device HBM ESD Classification Level 2
 - Device CDM ESD Classification Level C4B
- Monitor and Communication Functions: SafeTI™-26262 ASIL-D Compliant
- Hardware Protector Function: SafeTI™-26262 ASIL-B Compliant
- Highly Accurate Cell Voltage Measurements
- Integrated High-Voltage AFE Filter Components
- Designed for Robust Hot-Plug Performance
- Monitors 3 to 6 Cell Connections and up to 6 NTC/Auxillary Channels
 - Integrated 16-bit, 1-MS/s, Analog-to-Digital Converters (ADC)
- Stackable Configuration up to 51 Devices (1 Base + 50 Stack, 300-Series Cells)
- Isolated Differential UART Daisy Chain communication
 - Ring Architecture to Ensure Stack Communication Even With Communication Cable breaks
 - Supports Transformer or Capacitor based Isolation
- Supports Simultaneous Cell Voltage Measurements
 - Full-Accuracy Stack Measurements in Less Than 1 ms (for 96 cells)
- Configurable SINC³ Digital Filter
- Configurable Digital RC Filter for Accuracy Cell Measurements
- Integrated Hardware Protector
 - Secondary Protection for Cell Overtemperature and Undertemperature
 - Secondary Protection for Cell Overvoltage and Undervoltage
- Integrated Cell-Balancing MOSFET's up to 150 mA
- Designed to Pass BCI/DPI Testing
- UART Host Interface

2 Applications

- Full Electric, Plug-In Hybrid, and Hybrid Vehicles
- Automotive 12-V and 48-V Li-Ion Battery Systems
- Grid Storage Battery Systems
- Uninterruptible Power Supplies (UPS)
- E-Bikes, E-Scooters

3 Description

The bq79606-Q1 device provides simultaneous, high accuracy, channel measurements for three to six battery cells. With the inclusion of a daisy chain communication port, the bq79606-Q1 device is stackable (up to 51 devices) to support the large stack configurations found in battery packs for electrified automotive drive trains. Providing a Delta Sigma converter per cell input, the bq79606-Q1 allows simultaneous measurement of the battery voltages, providing a true snapshot of the voltage of the cells.

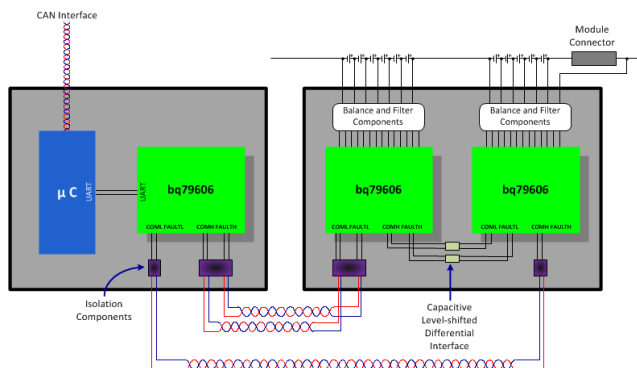
The bq79606-Q1 includes an auxiliary ADC that supports cell temperature measurements for up to six NTCs as well as internal rails to enable safety checks for the device. A die temperature measurement ADC is also included to provide temperature correction to enable high accuracy results over an extended temperature range.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
bq79606-Q1	PQFP (48 pin)	7.00 mm x 7.00 mm

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

Simplified System Diagram



4 Revision History

DATE	REVISION	NOTES
March 2018	*	Initial release

5 Description (Continued)

Host communication to the bq79606-Q1 device is done via dedicated UART interface. Additionally, an isolated, differential UART daisy-chain communication interface that supports either capacitor and transformer isolation allows the host to communicate with the entire battery stack over a single interface. The daisy-chain communication interface is configured in a ring architecture that allows the host to talk to devices at either end of the stack in cases of communication line breaks.

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.

ADVANCE INFORMATION

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
BQ79606PHPRQ1	PREVIEW	HTQFP	PHP	48	1000	TBD	Call TI	Call TI	-40 to 105		
BQ79606PHPTQ1	PREVIEW	HTQFP	PHP	48	250	TBD	Call TI	Call TI	-40 to 105		
PBQ79606PHPTQ1	ACTIVE	HTQFP	PHP	48	250	TBD	Call TI	Call TI	-40 to 105		Samples

(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.

OBSELETE: 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.

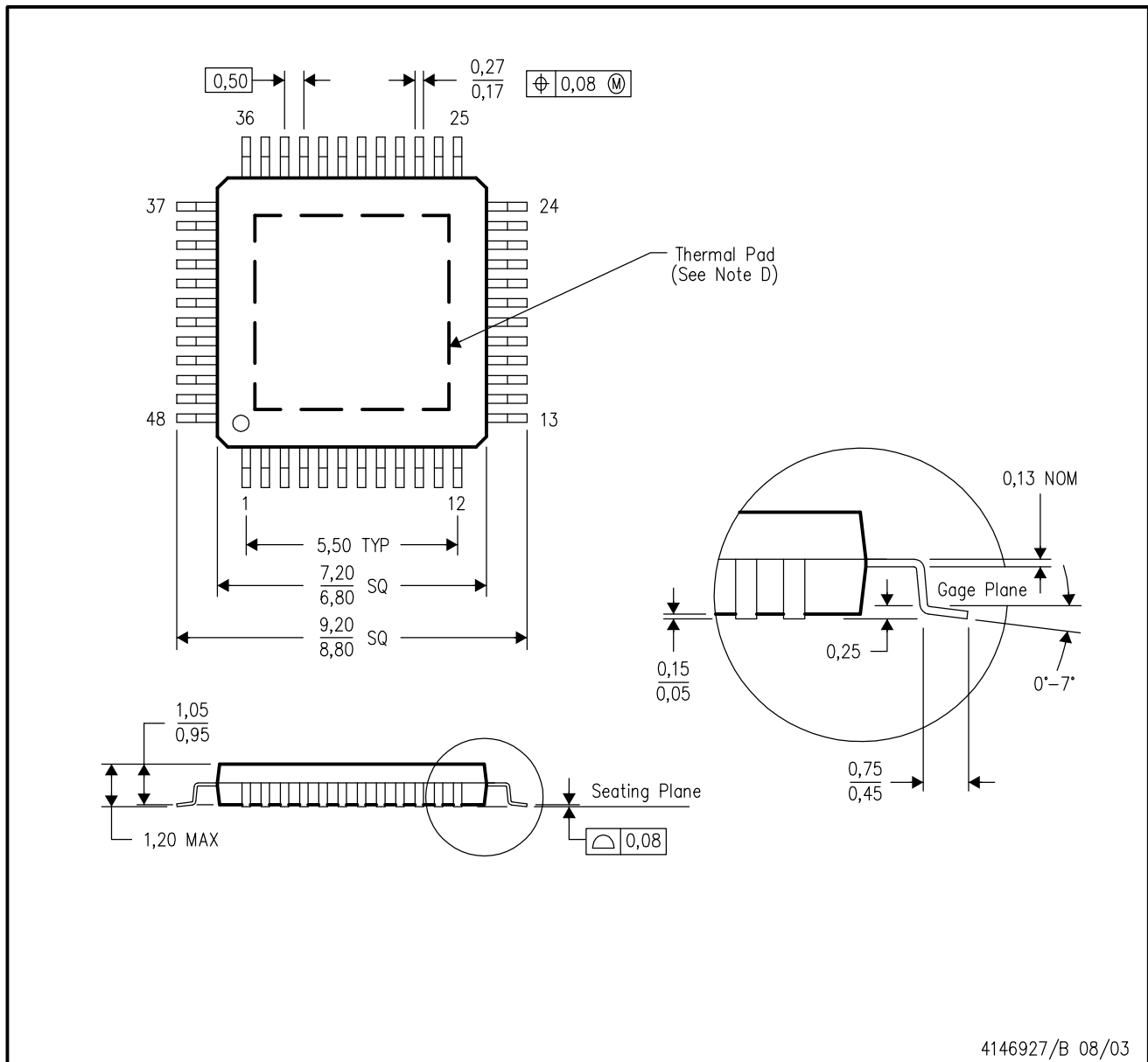
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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PHP (S-PQFP-G48)

PowerPAD™ PLASTIC QUAD FLATPACK



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion
 - D. This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 for information regarding recommended board layout. This document is available at www.ti.com <<http://www.ti.com>>.
 - E. Falls within JEDEC MS-026

PowerPAD is a trademark of Texas Instruments.

THERMAL PAD MECHANICAL DATA

PHP (S-PQFP-G48)

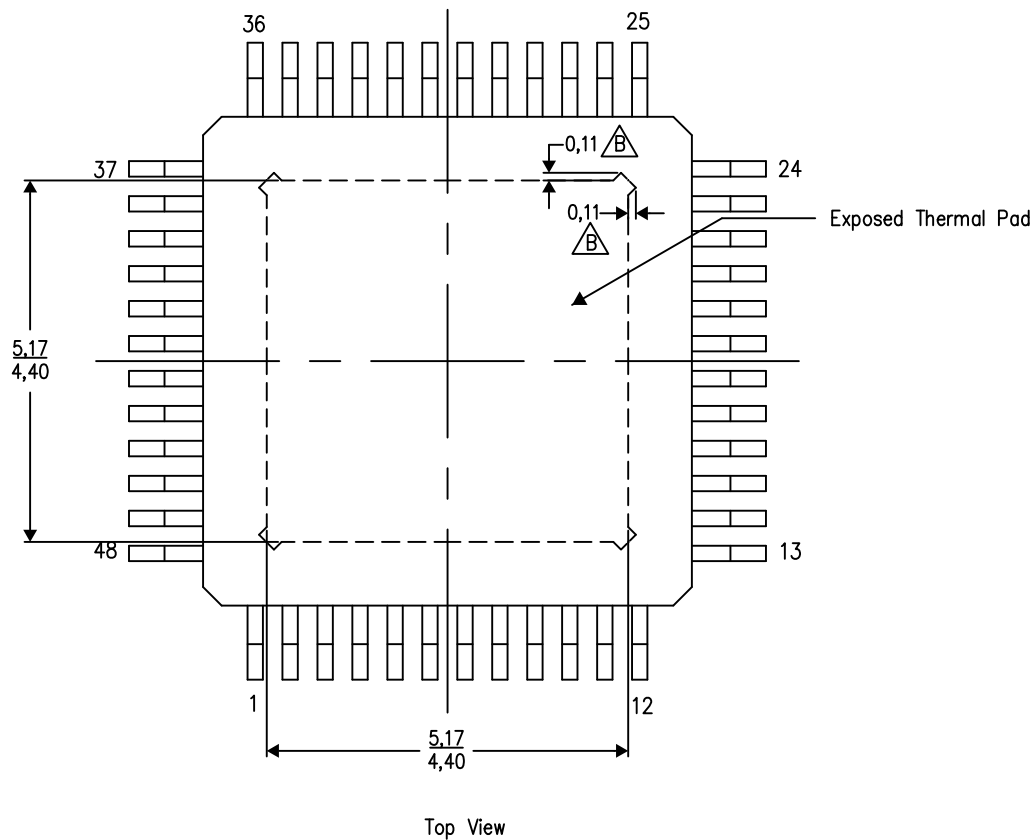
PowerPAD™ PLASTIC QUAD FLATPACK

THERMAL INFORMATION

This PowerPAD™ package incorporates an exposed thermal pad that is designed to be attached to a printed circuit board (PCB). The thermal pad must be soldered directly to the PCB. After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For additional information on the PowerPAD package and how to take advantage of its heat dissipating abilities, refer to Technical Brief, PowerPAD Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 and Application Brief, PowerPAD Made Easy, Texas Instruments Literature No. SLMA004. Both documents are available at www.ti.com.


The exposed thermal pad dimensions for this package are shown in the following illustration.



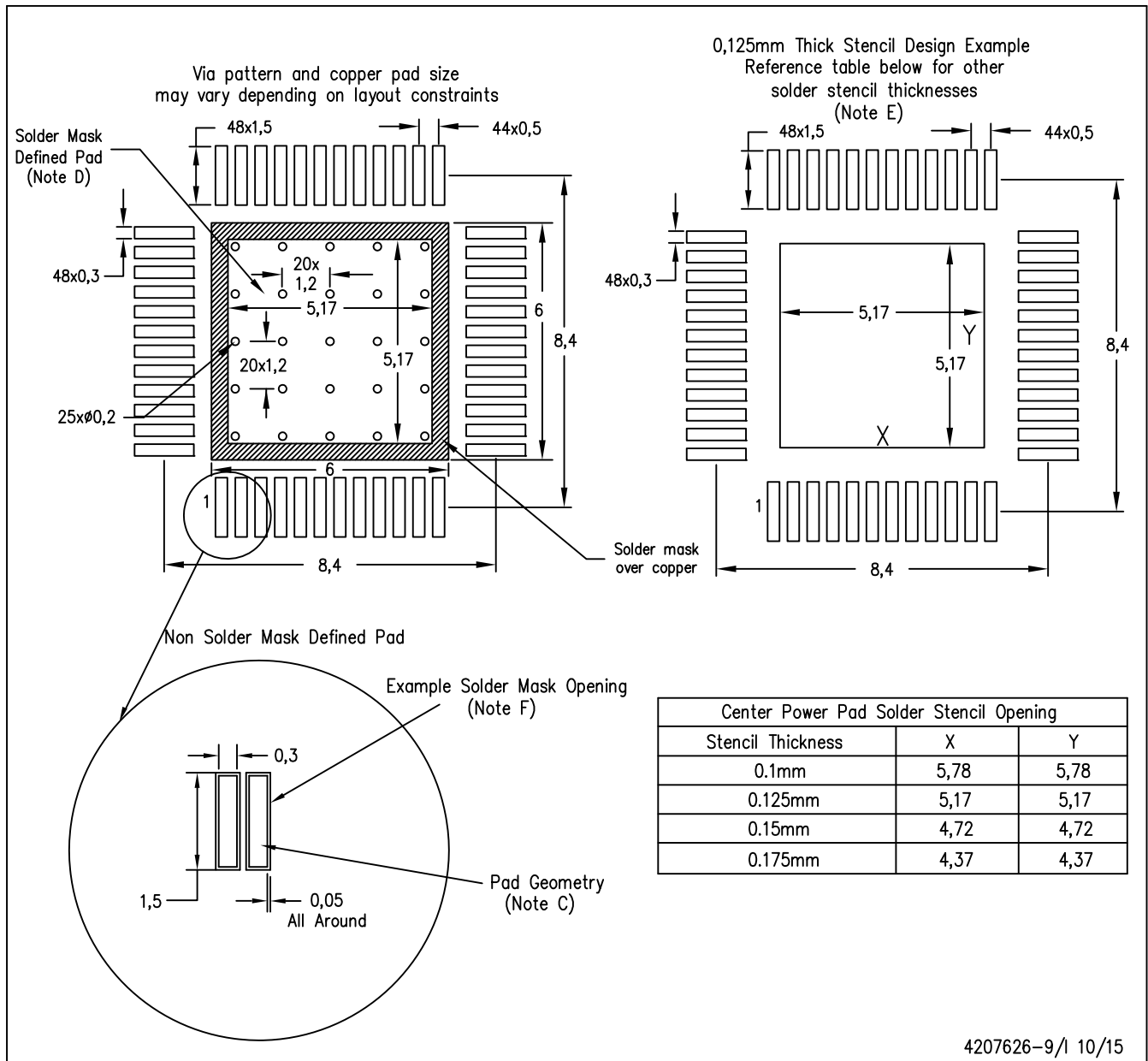
Exposed Thermal Pad Dimensions

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NOTE: A. All linear dimensions are in millimeters

 Tie strap features may not be present.

PowerPAD is a trademark of Texas Instruments



4207626-9/1 10/15

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPAD Thermally Enhanced Package, Texas Instruments Literature No. SLMA002, SLMA004, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <<http://www.ti.com>>.
 - E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - F. Customers should contact their board fabrication site for recommended solder mask tolerances and via tenting options for vias placed in the thermal pad.

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