BQ79735-Q1 Pack Voltage and Isolation Resistance Monitor for HV Automotive BMS Applications

1 Features

- AEC-Q100 qualified –40°C to +125°C
- Functional safety compliant
  - Documentation to aid ISO 26262 system design
  - Systematic capability up to ASIL D
  - Hardware capability up to ASIL D
- 17 single-ended voltage channels
  - High voltage pack, link, charge measurement accuracy update to 0.2%
  - Pack and cell sync to 64uS
- 15 GPIO inputs as IO, I2C, SPI, ADC and temp sense
- Dedicated MOSFET switch drive pins
- Intelligent SPI contoller HUB
  - Support multiple SPI peripheral devices
  - HW pin to trigger contactor drivers and Pyro Fuse drivers
- Stackable and register map compatible with BQ7971x-Q1 cell monitors

2 Applications

- Full Electric, Plug-In Hybrid, Hybrid Vehicles

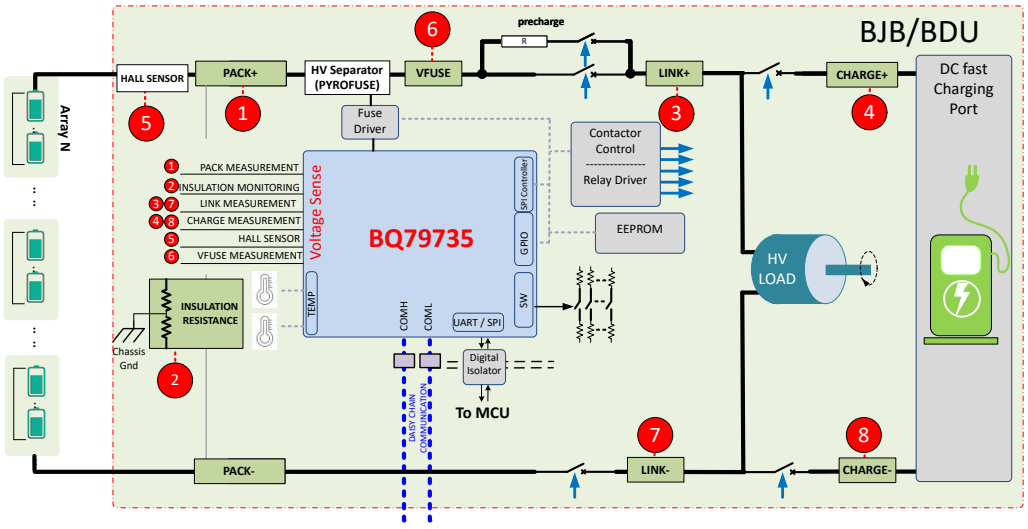
3 Description

The device can be used to measure divided down high voltage nodes in a battery system. It can measure voltage across Fuse, Contactors and check isolation voltage in battery junction box (BJB) system. There are 15 GPIOs/auxiliary inputs that can be used for HV measurements, thermistor measurements and driving relays. There are 4 SW outputs that can be used to drive MOSFET switches in the measurement path. The device can function as a SPI HUB and interface with up to 8 separate SPI devices/groups. The isolated bi-directional daisy chain ports support both capacitor and transformer based isolation. The device can also communicate with MCU over SPI and UART.

Device Information

PART NUMBER	PACKAGE (1)	BODY SIZE (NOM)
BQ79735-Q1	HTQFP (48-pin)	7mm × 7mm

(1) For all available packages, see Section 5.



Simplified System Diagram

4 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

4.1 Device Support

4.1.1 Third-Party Products Disclaimer

TI'S PUBLICATION OF INFORMATION REGARDING THIRD-PARTY PRODUCTS OR SERVICES DOES NOT CONSTITUTE AN ENDORSEMENT REGARDING THE SUITABILITY OF SUCH PRODUCTS OR SERVICES OR A WARRANTY, REPRESENTATION OR ENDORSEMENT OF SUCH PRODUCTS OR SERVICES, EITHER ALONE OR IN COMBINATION WITH ANY TI PRODUCT OR SERVICE.

4.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* 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.

4.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is 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.

4.4 Trademarks

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All trademarks are the property of their respective owners.

4.5 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.

4.6 Glossary

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

5 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.

5.1 Package Option Addendum

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)
BQ79735PHPRQ1	ACTIVE	HTQFP	PHP	48	1000	RoHS & Green	NiPdAu	MSL-3-260 C-168 HR	-40 to 125C	BQ79735Q

(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.
PRE_PROD Unannounced device, not in production, not available for mass market, nor on the web, samples not available.
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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material).

(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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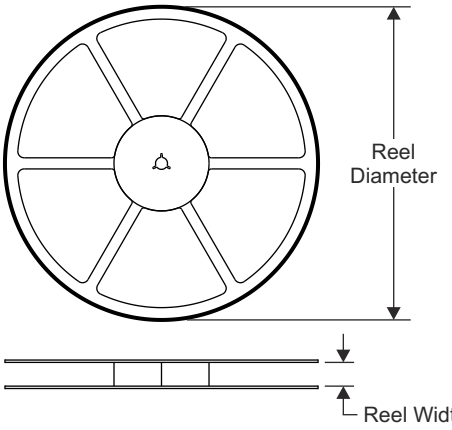
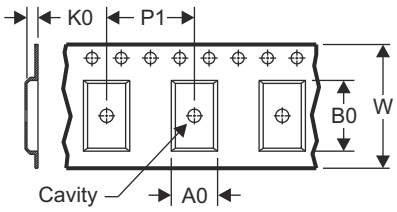
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

5.2 Tape and Reel Information

REEL DIMENSIONS

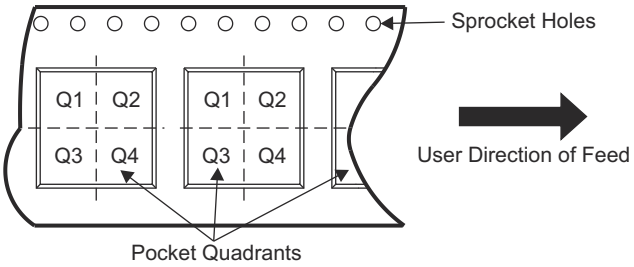


TAPE DIMENSIONS



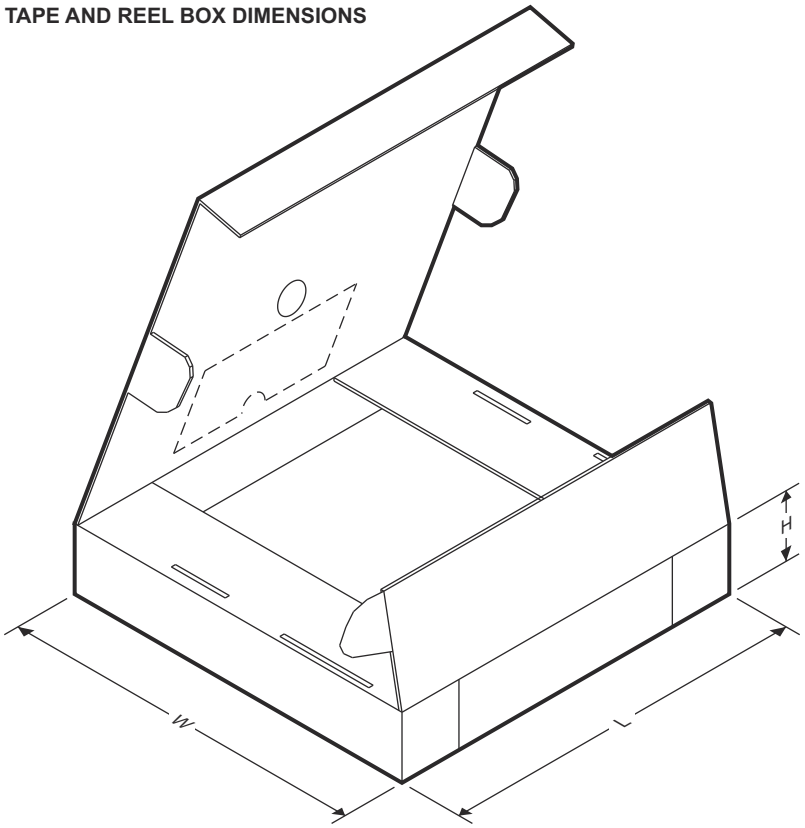
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
BQ79735PHPRQ1	HTQFP	PHP	48	1000	330.0	16.4	9.6	9.6	1.5	12.0	16.0	Q2

TAPE AND REEL BOX DIMENSIONS



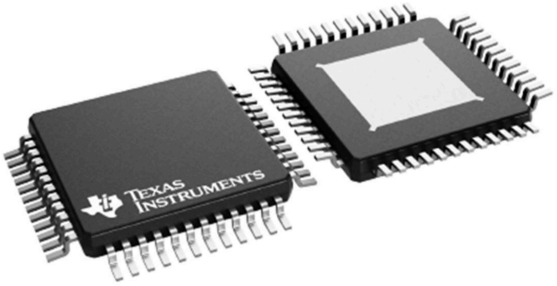
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
BQ79735PHPRQ1	HTQFP	PHP	48	1000	336.6	336.6	31.8

5.3 Mechanical Data

PHP 48 — **TQFP - 1.2 mm max height**

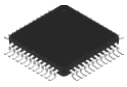
7 x 7, 0.5 mm pitch — QUAD FLATPACK

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

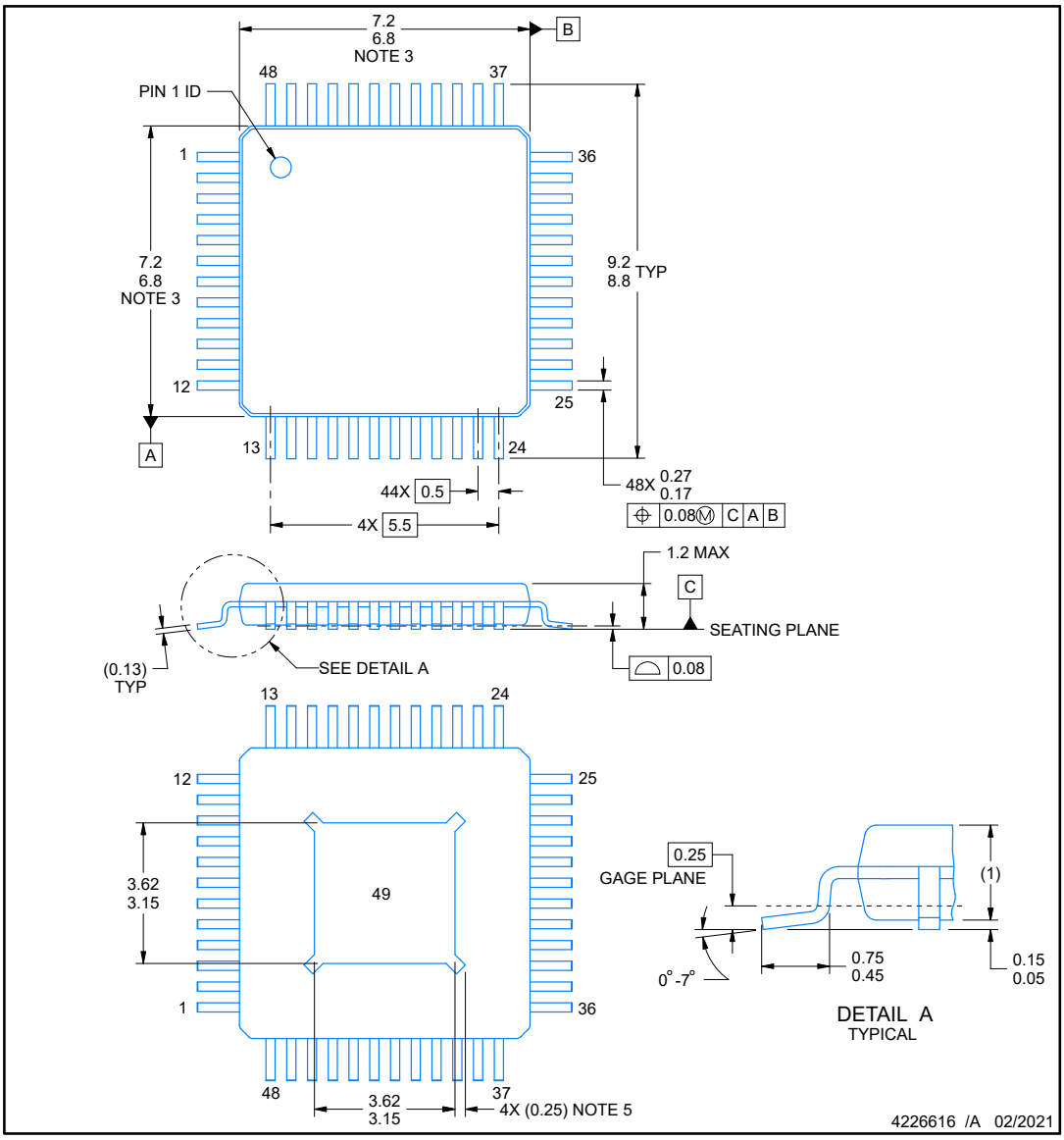


PACKAGE OUTLINE

PHP0048E



PowerPAD™ HTQFP - 1.2 mm max height



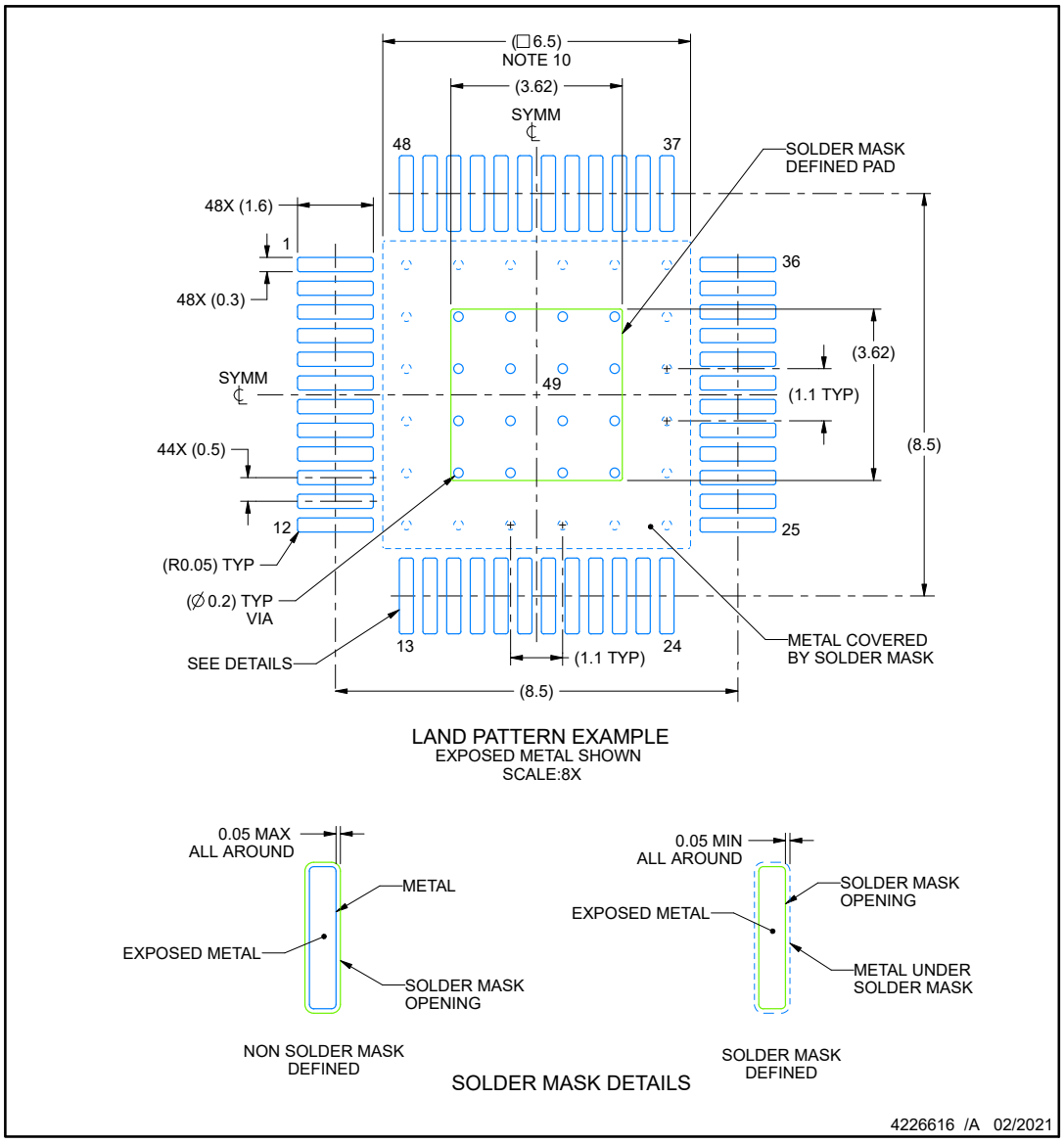
PowerPAD is a trademark of Texas Instruments.

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MS-026.
5. Feature may not be present.

EXAMPLE BOARD LAYOUT

PHP0048E — **PowerPAD™ HTQFP - 1.2 mm max height**

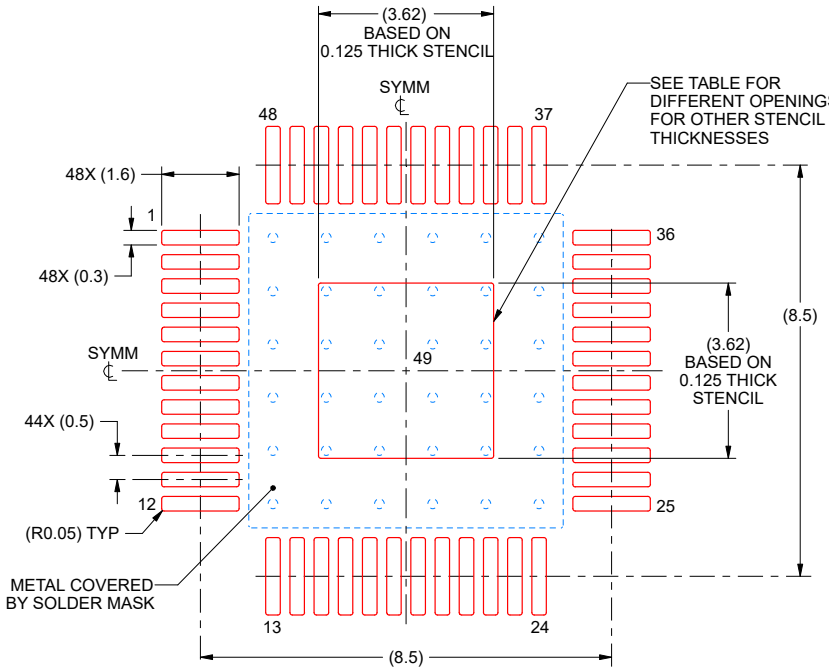


NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
8. This package is designed to be soldered to a thermal pad on the board. See technical brief, Powerpad thermally enhanced package, Texas Instruments Literature No. SLMA002 (www.ti.com/lit/slma002) and SLMA004 (www.ti.com/lit/slma004).
9. Vias are optional depending on application, refer to device data sheet. It is recommended that vias under paste be filled, plugged or tented.
10. Size of metal pad may vary due to creepage requirement.

EXAMPLE STENCIL DESIGN

PHP0048E — **PowerPAD™ HTQFP - 1.2 mm max height**



SOLDER PASTE EXAMPLE
EXPOSED PAD
100% PRINTED SOLDER COVERAGE BY AREA
SCALE:8X

STENCIL THICKNESS	SOLDER STENCIL OPENING
0.1	4.05 X 4.05
0.125	3.62 x 3.62 (SHOWN)
0.150	3.30 x 3.30
0.175	3.06 x 3.06

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NOTES: (continued)

11. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
12. Board assembly site may have different recommendations for stencil design.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
BQ79735PHPRQ1	ACTIVE	HTQFP	PHP	48	1000	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 125	BQ79735Q	Samples

(1) The marketing status values are defined as follows:
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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.
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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.

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GENERIC PACKAGE VIEW

PHP 48

TQFP - 1.2 mm max height

7 x 7, 0.5 mm pitch

QUAD FLATPACK

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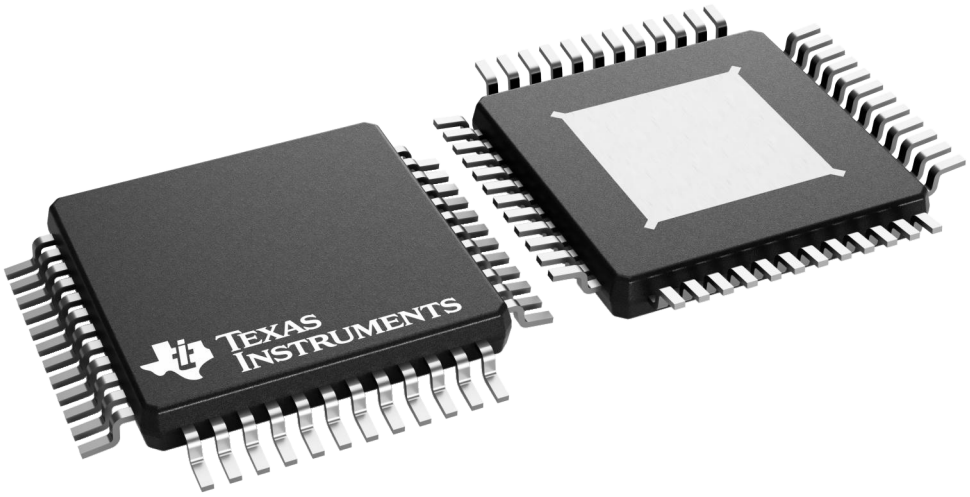

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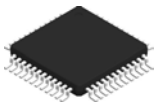
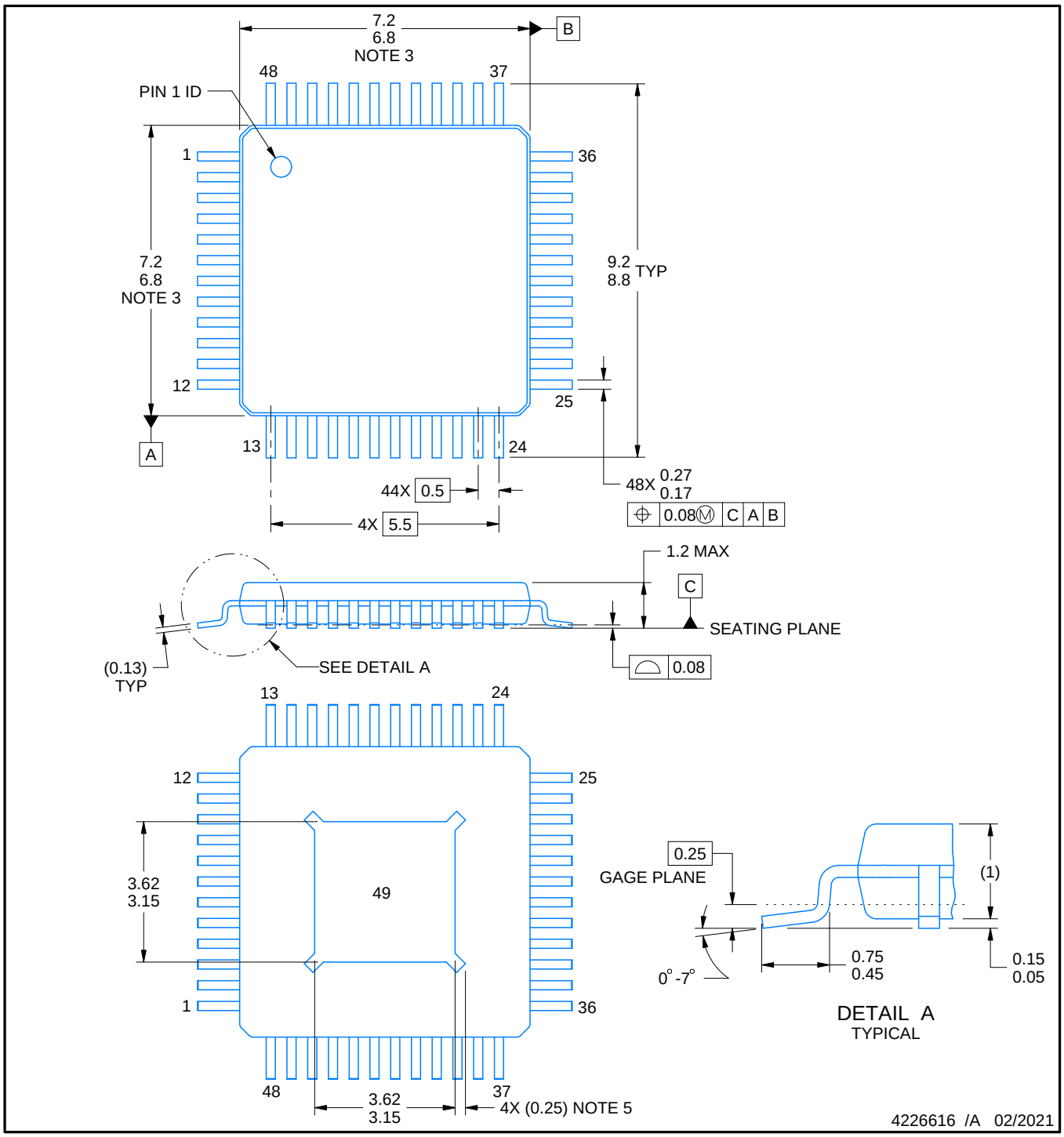


PACKAGE OUTLINE

PHP0048E

PowerPAD™ HTQFP - 1.2 mm max height



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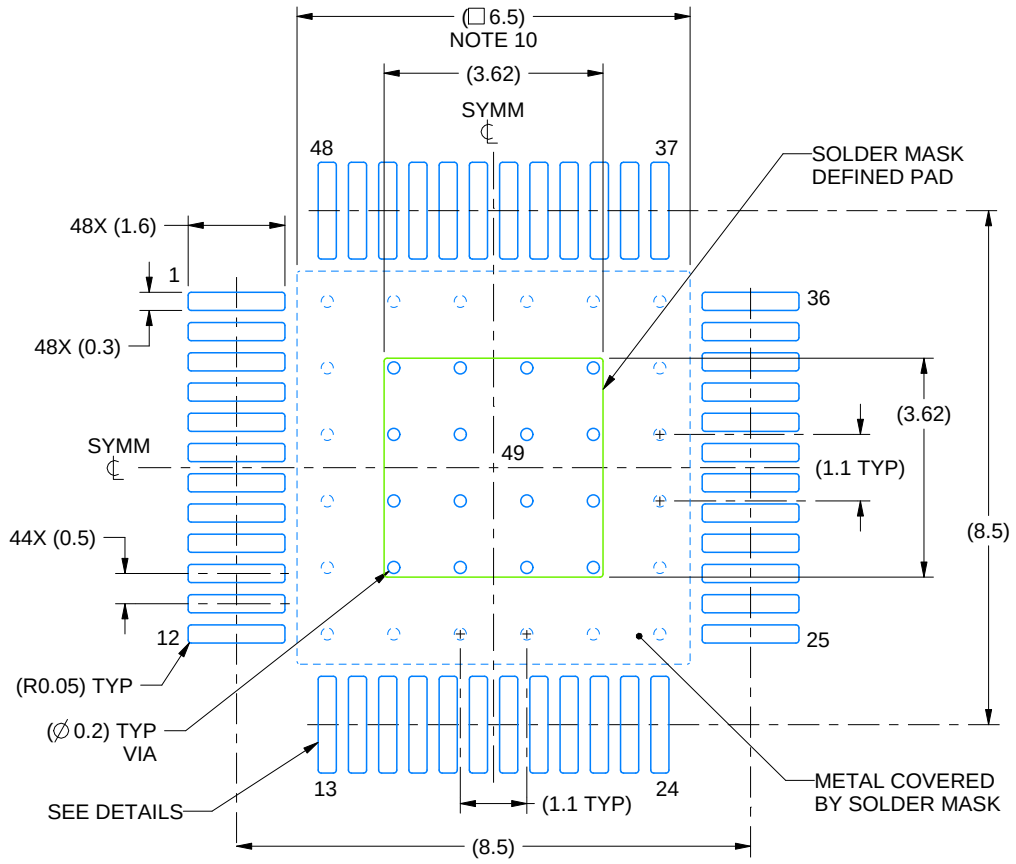
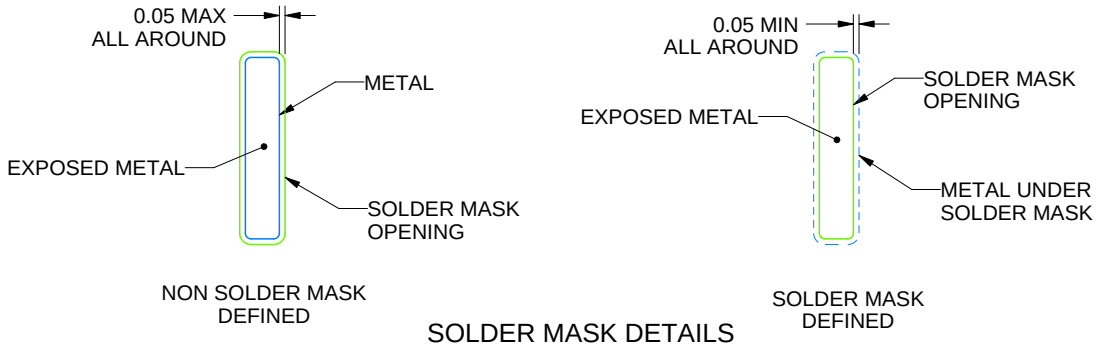


LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

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NOTES: (continued)

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9. Vias are optional depending on application, refer to device data sheet. It is recommended that vias under paste be filled, plugged or tented.
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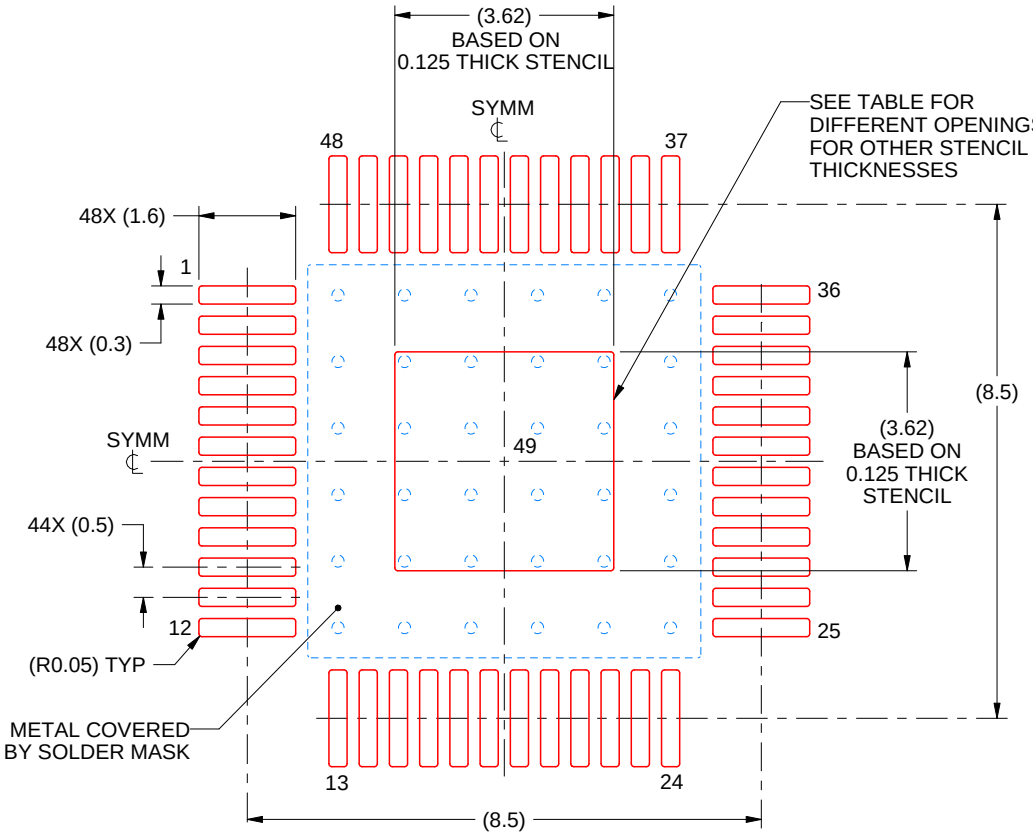

SOLDER PASTE EXAMPLE
EXPOSED PAD
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