TAS6584-Q1 - 45-V, 10-A Digital Input 4-Channel Automotive Class-D Audio Amplifier with Current Sense and Real-time Load Diagnostics

1 Features

- AEC-Q100 qualified for automotive applications
  - Temperature grade 1: –40°C to +125°C, T_A
- General operation
  - 4.5-V to 45-V supply voltage, 50-V load dump
  - Support for 1.8-V and 3.3-V I/O's
  - I^2C control with 8 address options
  - <2-W idle power loss at 14.4 V, <8-uA max VBAT+PVDD shutdown loss
- Integrated DSP processing
  - Class-H supply voltage control
  - Thermal monitoring and foldback
  - Clip detection, PVDD monitoring and foldback
- Output current sensing by channel via I^2S/TDM
  - No need for external circuitry
- Real-time load diagnostics
  - Monitor output conditions while playing audio
  - Open load, Shorted load, Short-to-power, Short-to-ground detection
- DC and AC Standby load diagnostics
- Audio inputs
  - 2-4 channel I^2S or 4-16 channel TDM input
  - Input sample rates: 44.1, 48, 96, 192 kHz
  - Secondary low latency path, >70% reduced signal delay at 48 kHz
- Audio outputs
  - 4-channel bridge-tied load (BTL), configurable 2-channel parallel BTL (PBTL)
  - 384-kHz to 2.1-MHz configurable output switching frequency
  - Up to 10-A channel output current
  - 400-VA peak BTL output power
  - 118 W (45 V, 8 Ω, 1% THD, BTL)
  - 215 W (45 V, 4 Ω, 1% THD, BTL)
- Audio Performance
  - THD+N 0.03% (8 Ω, 1 W, 1 kHz)
  - 111 dB SNR
  - 37 µV (14.4 V), 80 µV (45 V) output noise
- Protection
  - Output short protection
  - DC offset, undervoltage and overvoltage
  - Configurable overtemperature warning and individual channel shutdown
  - I^2C temperature and supply voltage readout
- Easily meet CISPR25-L5 EMC specification
  - Advanced spread-spectrum

2 Applications

- Automotive external amplifier
- Automotive head unit

3 Description

The TAS6584-Q1 is a four-channel, digital-input, high-voltage, Class-D audio amplifier that supports up to 45-V supply voltage. In combination with up to 10-A output current, this device delivers maximum output power and high fidelity audio in high and low impedance loads. The device provides four channels at 118 W (45 V, 8 Ω, 1% THD, BTL) and 215 W (45 V, 4 Ω, 1% THD, BTL).

The TAS6584-Q1 integrates DC and AC load diagnostics to determine the status of the connected loads before enabling the output stage. During audio playback, the status can be monitored through output current sense which is available for each channel and reports the measurement to a host processor through TDM with minimal delay. The device monitors the output load condition while playing audio using real-time load diagnostics which operate independent from host and audio input.

To optimize system efficiency, the integrated DSP of the TAS6584-Q1 enables Class-H envelope tracking control, eliminating the need for development of complex tracking software and making local boost voltage control possible without the need for an external microcontroller.

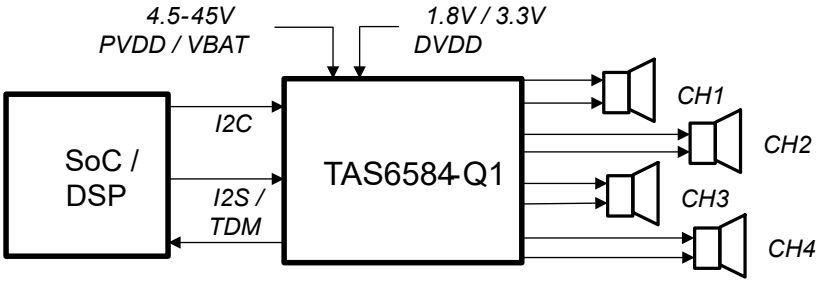
The TAS6584-Q1 device features an additional low-latency signal path for each channel, providing up to 70% faster signal processing at 48 kHz which enables time-sensitive Active Noise Cancellation (ANC), Road Noise Cancellation (RNC) applications.

The device is offered in a 64-pin QFP package with the exposed thermal pad up.

Device Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
TAS6584-Q1	HTQFP (64)	14.00 mm x 14.00 mm

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



Simplified Diagram

Table of Contents

4 Revision History

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

Changes from Revision * (January 2022) to Revision A (March 2022)	Page
• Changed device status from *Advanced Information* to *Production Data*	1

5 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.

5.1 Device Support

5.2 Documentation Support

5.2.1 Related Documentation

5.3 Receiving Notification of Documentation Updates

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

5.4 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.

5.5 Trademarks

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5.6 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.

5.7 Glossary

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

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TAS6584QPHDRQ1	Active	Production	HTQFP (PHD) | 64	1000 | LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 125	TAS6584
TAS6584QPHDRQ1.A	Active	Production	HTQFP (PHD) | 64	1000 | LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 125	TAS6584

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

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

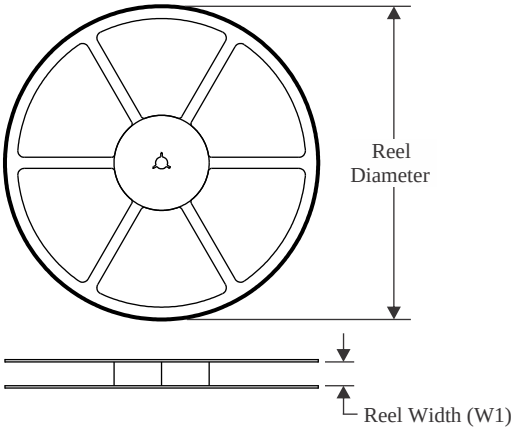
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

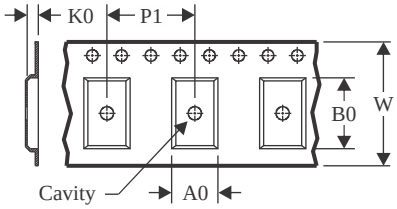
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

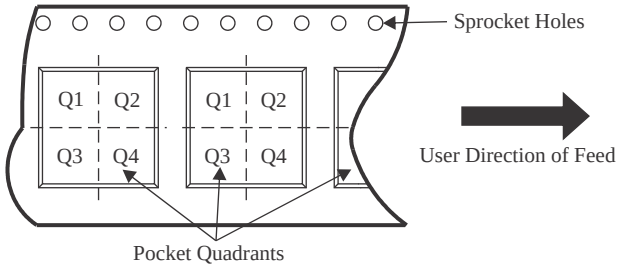


TAPE DIMENSIONS



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

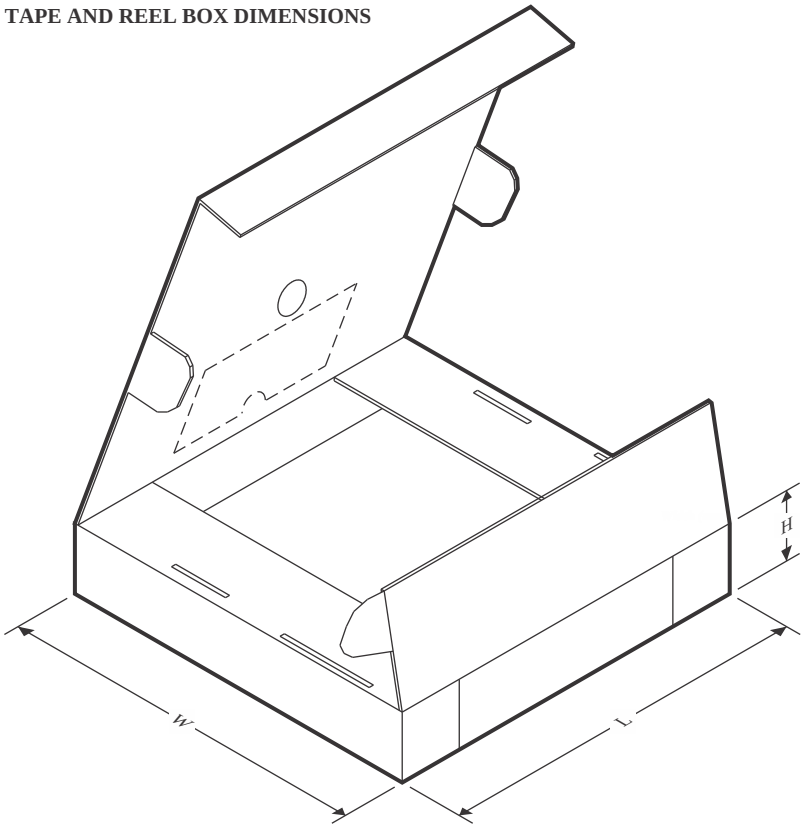
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

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
TAS6584QPHDRQ1	HTQFP	PHD	64	1000	330.0	24.4	17.0	17.0	1.5	20.0	24.0	Q2

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TAS6584QPHDRQ1	HTQFP	PHD	64	1000	367.0	367.0	55.0

GENERIC PACKAGE VIEW

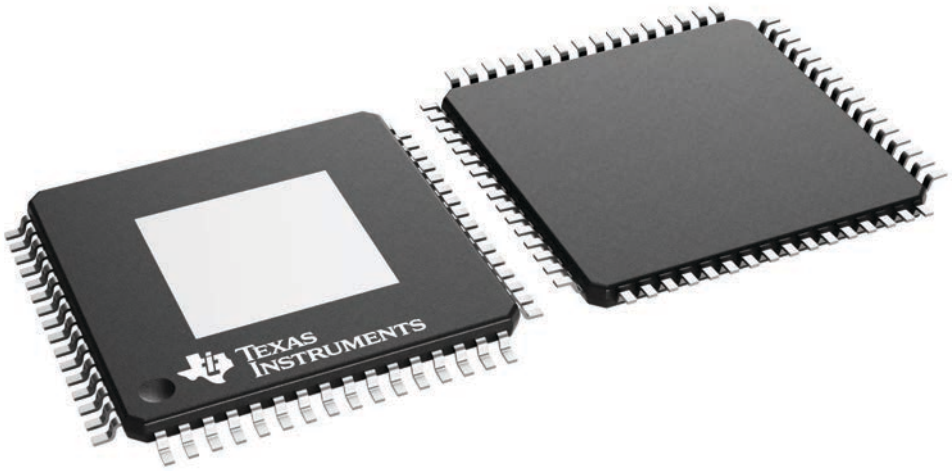
PHD 64

HTQFP - 1.2 mm max height

14 x 14, 0.8 mm pitch

PLASTIC QUAD FLATPACK

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



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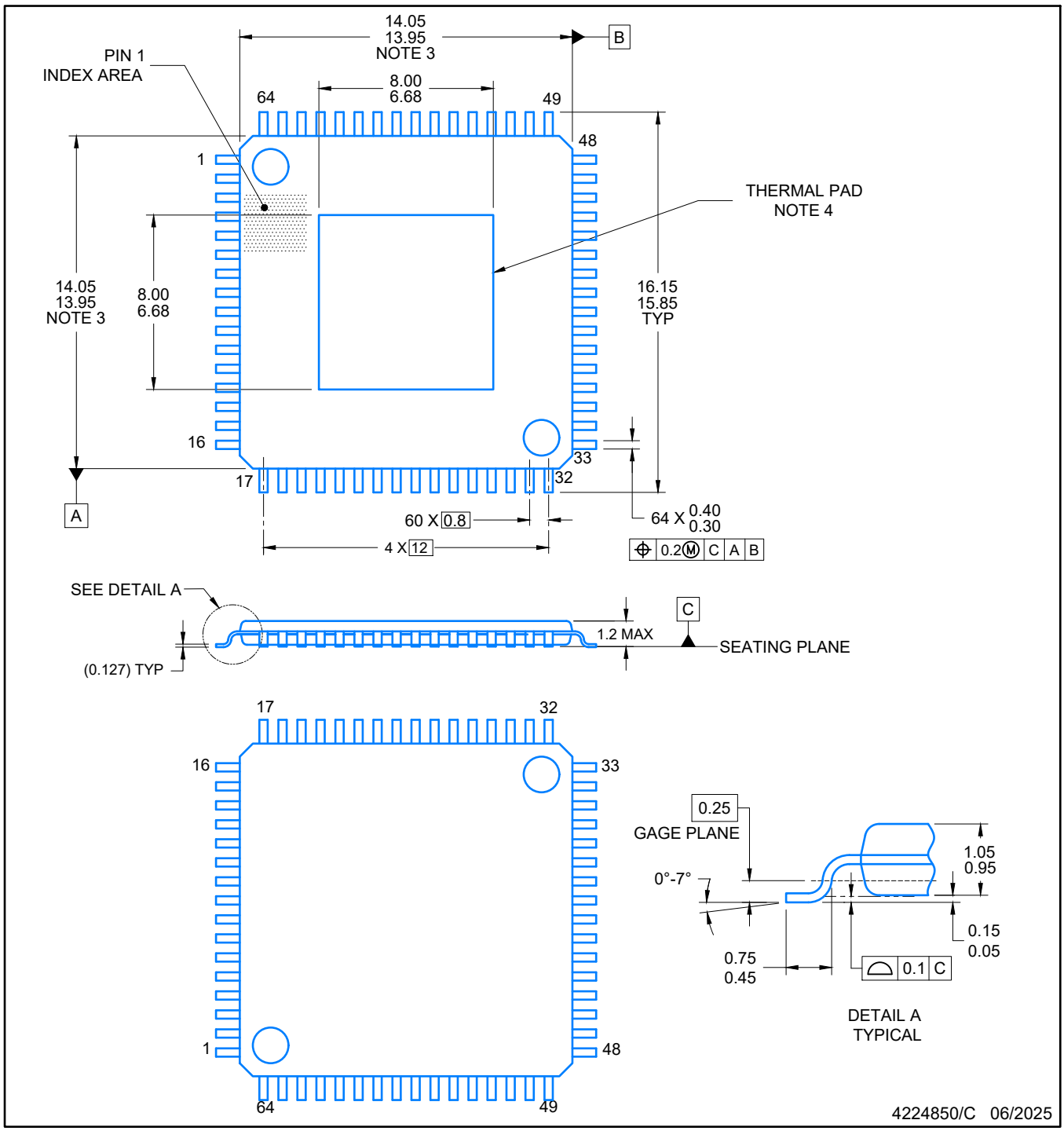
PACKAGE OUTLINE

PHD0064B

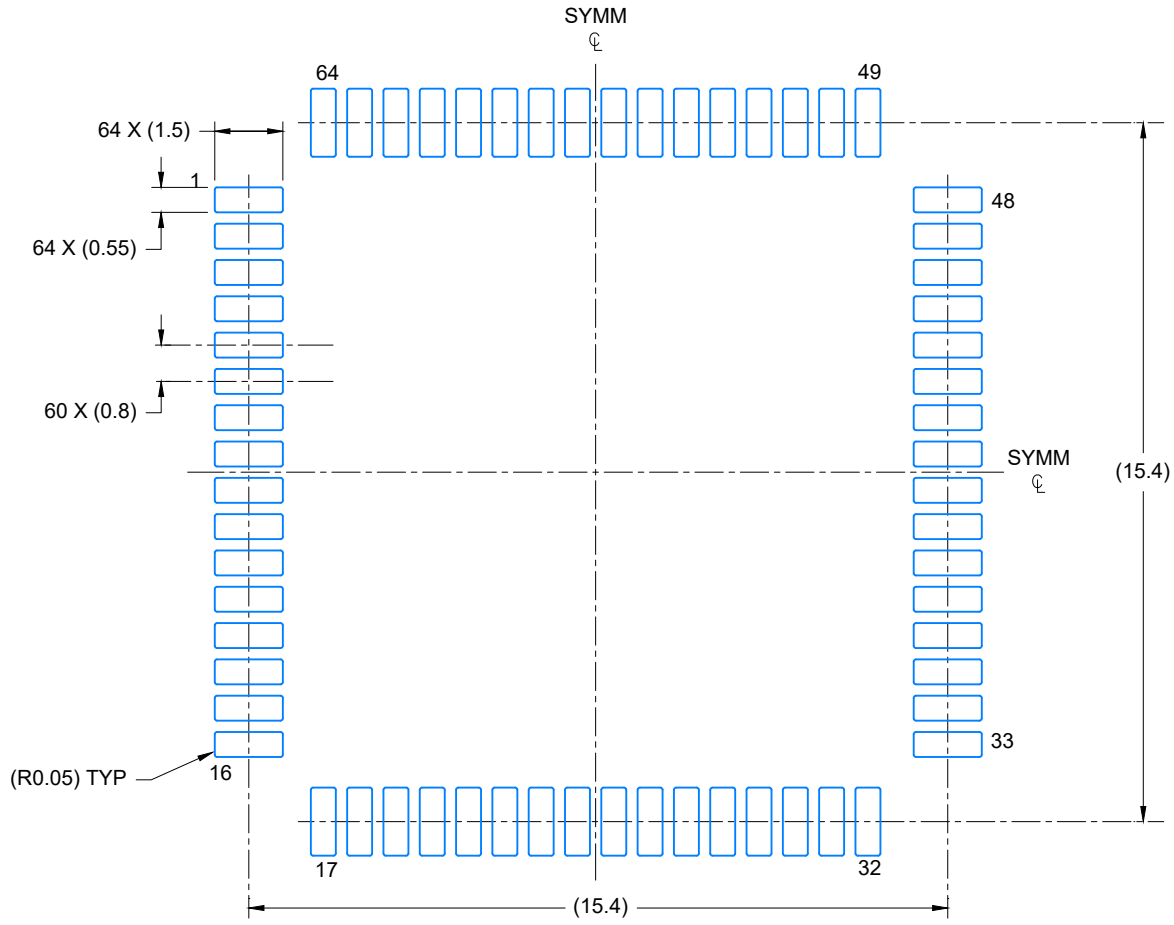
HTQFP - 1.2 mm max height

PLASTIC QUAD FLATPACK

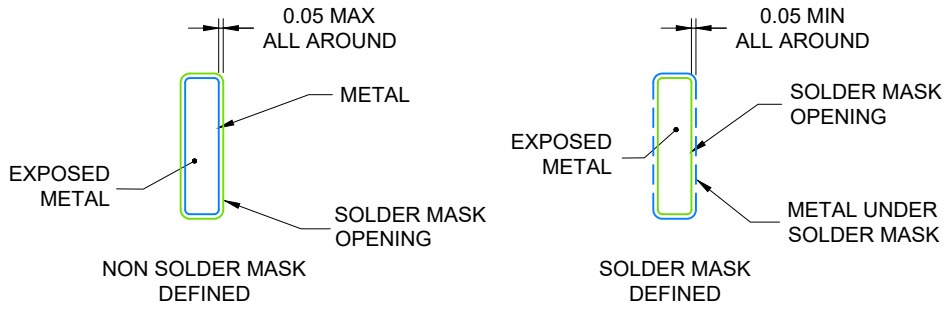


NOTES:

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 per side.
4. See technical brief. PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 (www.ti.com/lit/slma002) and SLMA004 (www.ti.com/lit/slma004) for information regarding recommended board layout.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 6X



SOLDER MASK DETAILS

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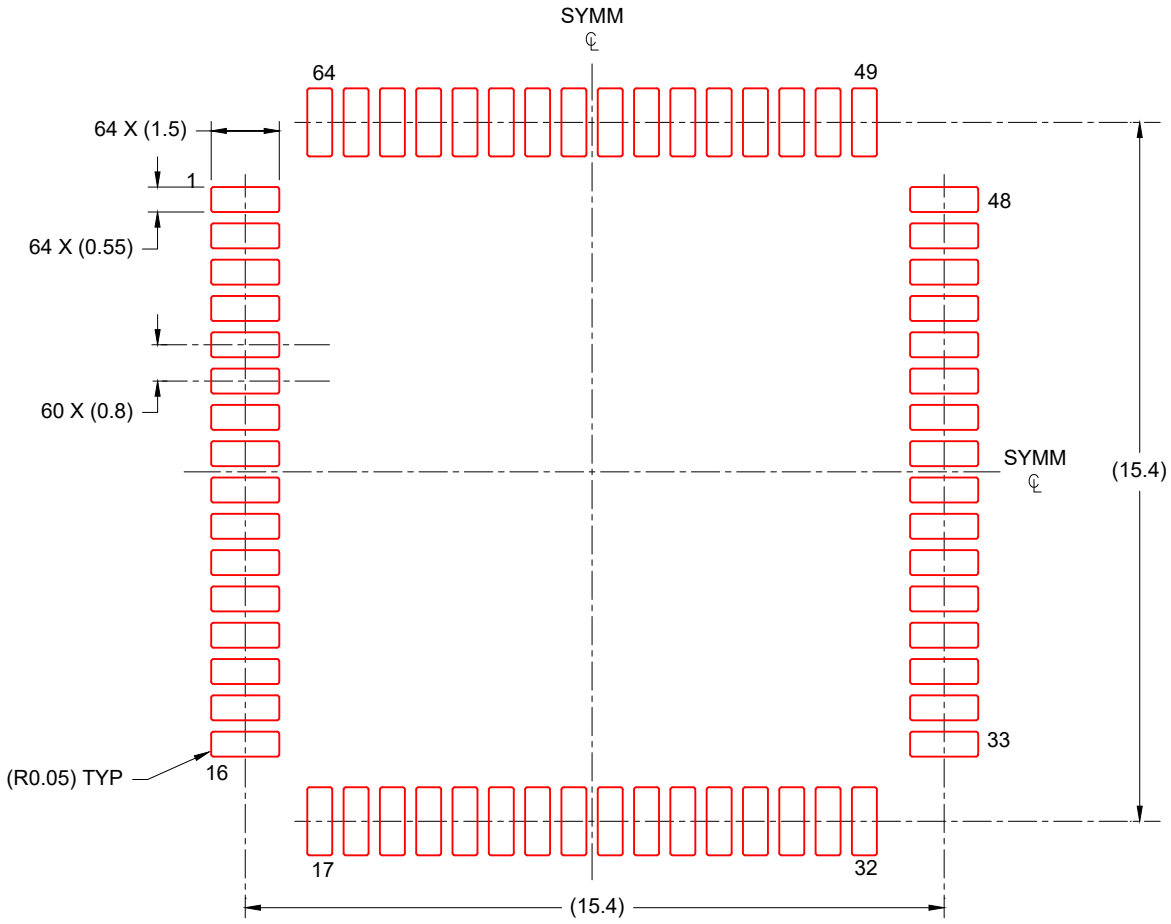
NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.
7. Vias are optional depending on application, refer to device data sheet. It is recommended that vias under paste be filled, plugged or tented.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 6X

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NOTES: (continued)

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

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