bq25898C I²C Controlled Single Cell 3-A Charger for High Input Voltage in Compact DSBGA Package

1 Features

- Operation as Slave Charger to Provide Fast Charging in Dual Charger Operation
- Simple Configuration with Minimum BOM
- High Efficiency 3-A, 1.5-MHz Switch Mode Buck Charge
  - 92% Charge Efficiency at 3 A and 94% Charge Efficiency at 2 A Charge Current
  - Optimize for High Voltage Input (9 V / 12 V)
  - Low Power PFM mode for Light Load Operations
- Single Input to Support USB Input and Adjustable High Voltage Adapters
  - Support 3.9-V to 14-V Input Voltage Range
  - Input Current Limit (100 mA to 3.25 A with 50-mA resolution) to Support USB2.0, USB3.0 standard and High Voltage Adapters
  - Wide Input Dynamic Power Management (DPM) Range
- Highest Battery Discharge Efficiency with 5-mΩ
- Default Charge Disabled
- Integrated ADC for System Monitor (Voltage, Charge Current)
- Flexible Autonomous and I²C Mode for Optimal System Performance
- Remote Battery Sensing
- High Integration includes all MOSFETs, Current Sensing and Loop Compensation
- High Accuracy
  - ±0.5% Charge Voltage Regulation
  - ±5% Charge Current Regulation
  - ±7.5% Input Current Regulation
- Safety
  - Thermal Regulation and Thermal Shutdown
  - Input UVLO/Overvoltage Protection
  - Battery OVP
  - Safety Timer

2 Applications

- Smart Phone
- Tablet PC
- Portable Internet Devices

3 Description

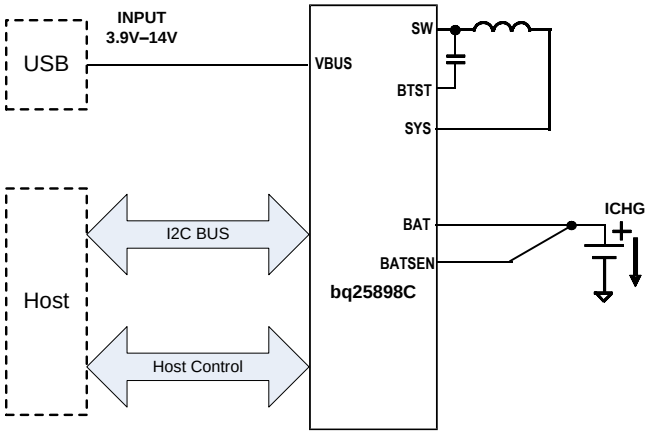
The bq25898C is a highly-integrated switch-mode battery charge management and system power path management device for single cell Li-Ion and Li-polymer battery. The device supports high input voltage for charging. The low impedance power path optimizes switch-mode operation efficiency, reduces battery charging time and extends battery life during discharging phase. The I2C serial interface with charging and system settings makes the device a truly flexible solution. The bq25898C is available in a 2.8mm x 2.5mm 42-ball DSBGA package.

Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
bq25898C	DSBGA (42)	2.80 mm x 2.50 mm

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

Simplified Schematic



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4 Revision History

Changes from Revision A (March 2016) to Revision B **Page**

- Updated product preview data sheet to production data 1

5 Description (Continued)

The bq25898C is a highly-integrated 3-A switch-mode battery charge management device for single cell Li-Ion and Li-polymer battery. As a tiny and cost-effective device, it can also be configured as slave charger to provide fast charging in dual charger applications.

It features fast charging with high input voltage support for a wide range of smartphone, tablet and portable devices. Its low impedance power path optimizes switch-mode operation efficiency, reduces battery charging time and extends battery life during discharging phase. The solution is highly integrated with input reverse-blocking FET (RBFET,Q1), high-side switching FET (HSFET, Q2), low-side switching FET (LSFET, Q3), and integrated charge current sensing. It also integrates the bootstrap diode for the high-side gate drive and battery monitor for simplified system design. The I2C serial interface with charging and system settings makes the device a truly flexible solution.

The device supports a wide range of input sources, including standard USB host port, USB charging port, and USB compliant adjustable high voltage adapter. To set the default input current limit, the device takes the result from detection circuit in the system, such as USB PHY device. The device is compliant with USB 2.0 and USB 3.0 power spec with input current and voltage regulation.

The default charge current is set to 0 mA (charge disabled). Once charge is enabled, the device may initiate and complete a charging cycle with software control.

The charger provides various safety features for battery charging and system operations, charging safety timer and overvoltage/overcurrent protections. The thermal regulation reduces charge current when the junction temperature exceeds 120°C (programmable). The STAT output reports the charging status and any fault conditions. The PG output indicates if a good power source is present. The INT immediately notifies host when fault occurs.

The device is available in a 2.80 mm x 2.50 mm 42-ball DSBGA package.

6 Device and Documentation Support

6.1 Device Support

6.1.1 Third-Party Products Disclaimer

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6.2 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.

6.3 Trademarks

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6.4 Electrostatic Discharge Caution

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

6.5 Glossary

SLYZ022 — *TI Glossary*.

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

7 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.

7.1 Package Option Addendum

7.1.1 Packaging Information

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4) (5)
BQ25898CYFFR	ACTIVE	DSBGA	YFF	42	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	BQ25898C
BQ25898CYFFT	ACTIVE	DSBGA	YFF	42	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	

(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.

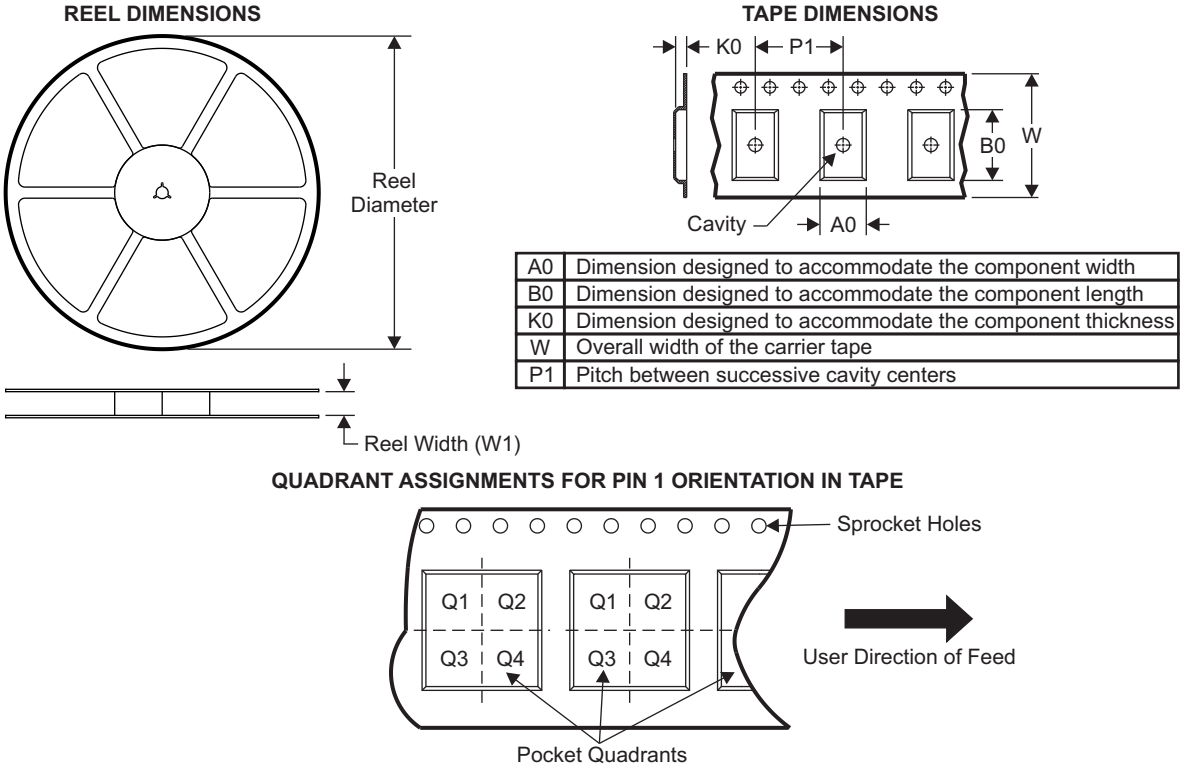
(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been 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 on 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.

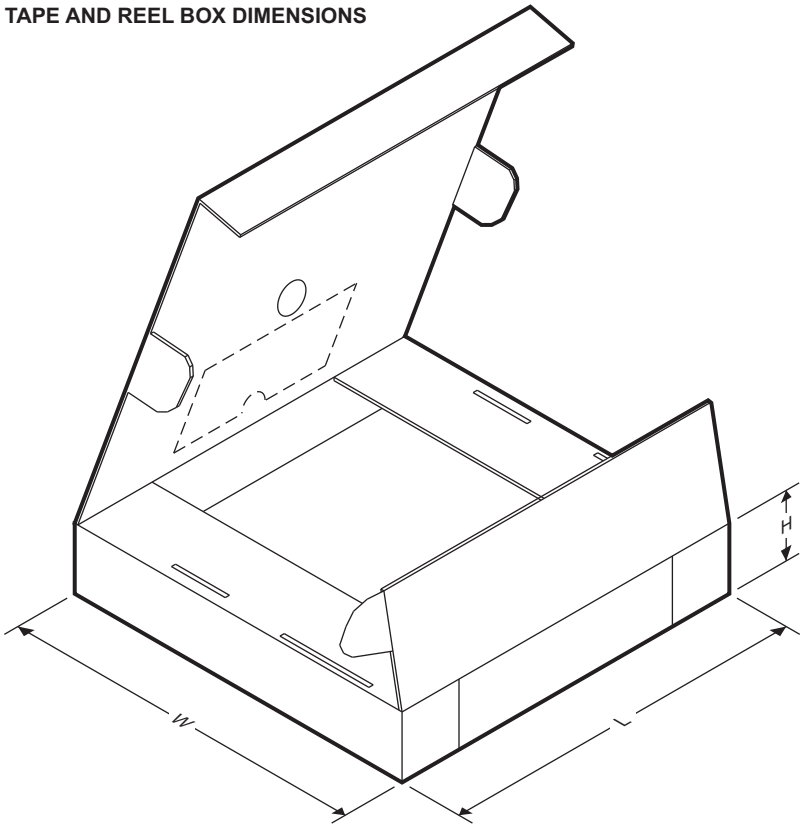
7.1.2 Tape and Reel Information



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

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
BQ25898CYFFR	DSBGA	YFF	42	3000	180	8.4	2.66	2.95	0.81	4.0	8.0	Q1
BQ25898CYFFT	DSBGA	YFF	42	250	180	8.4	2.66	2.95	0.81	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS



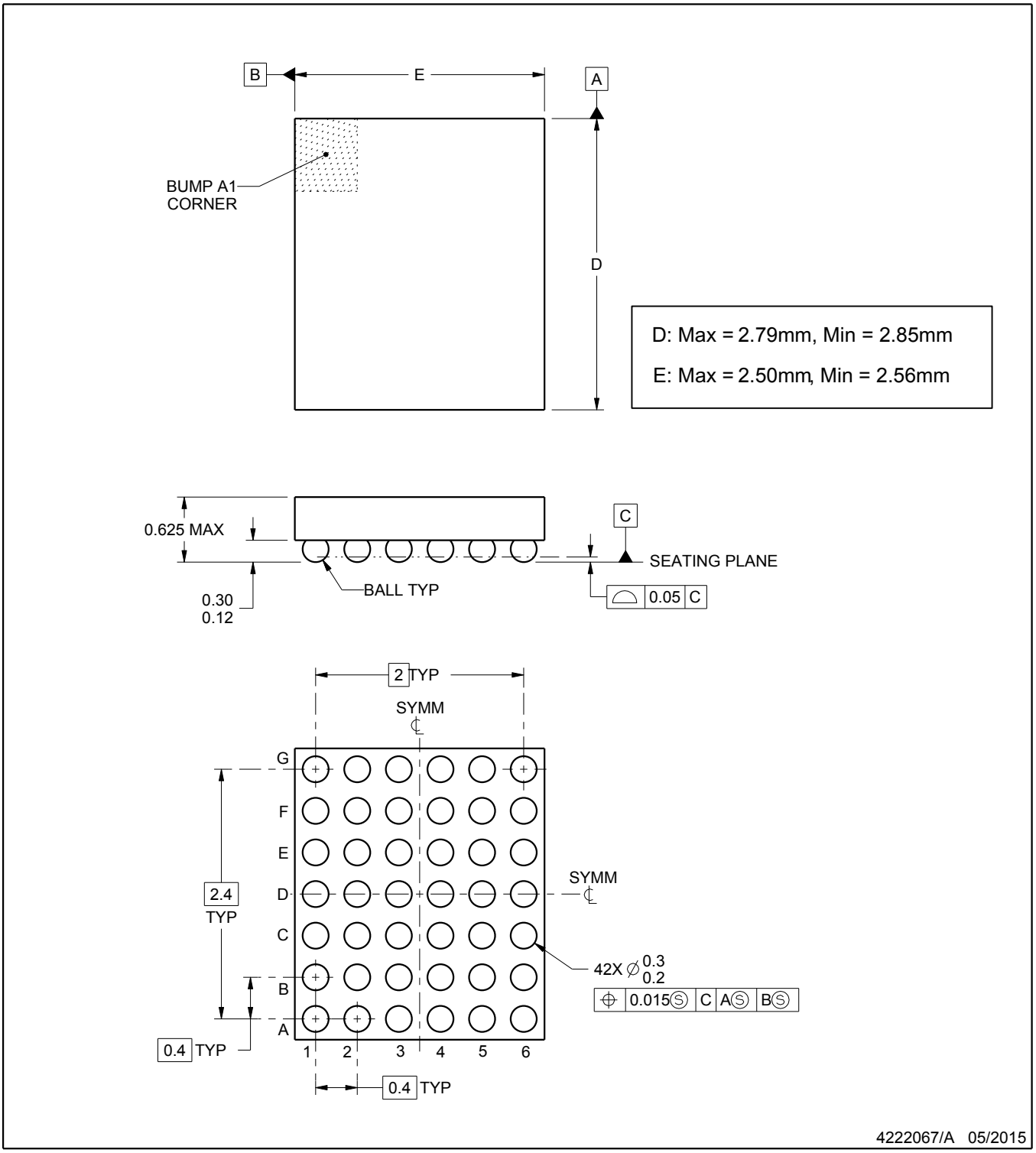
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
BQ25898CYFFR	DSBGA	YFF	42	3000	182	182	20
BQ25898CYFFT	DSBGA	YFF	42	250	182	182	20

PACKAGE OUTLINE

YFF0042

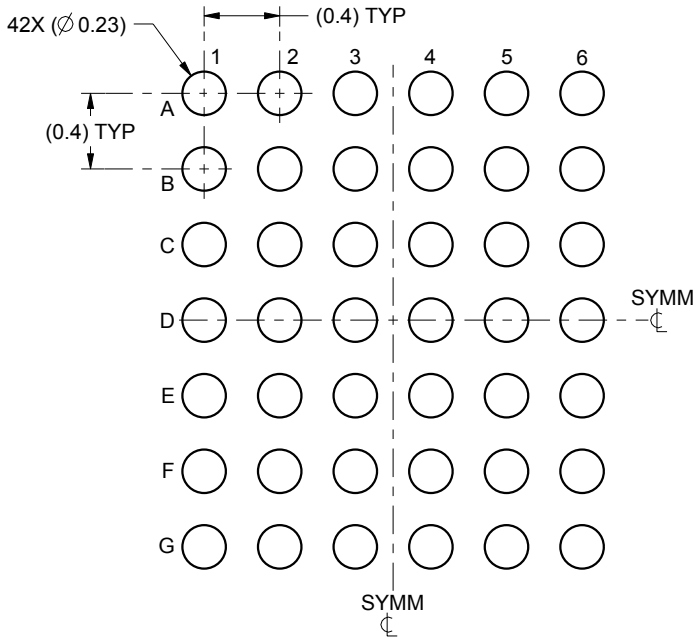
DSBGA - 0.625 mm max height

DIE SIZE BALL GRID ARRAY

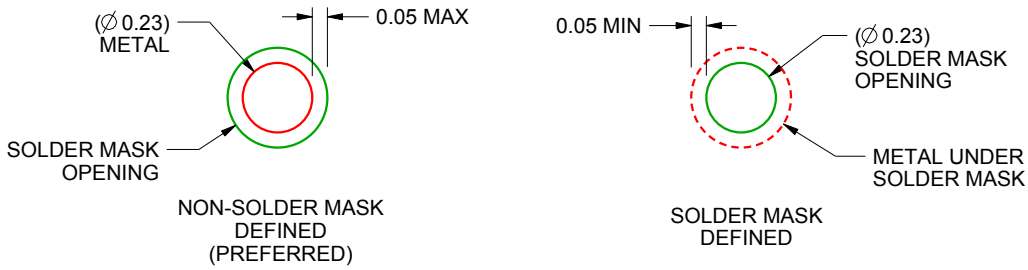


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:25X



SOLDER MASK DETAILS
NOT TO SCALE

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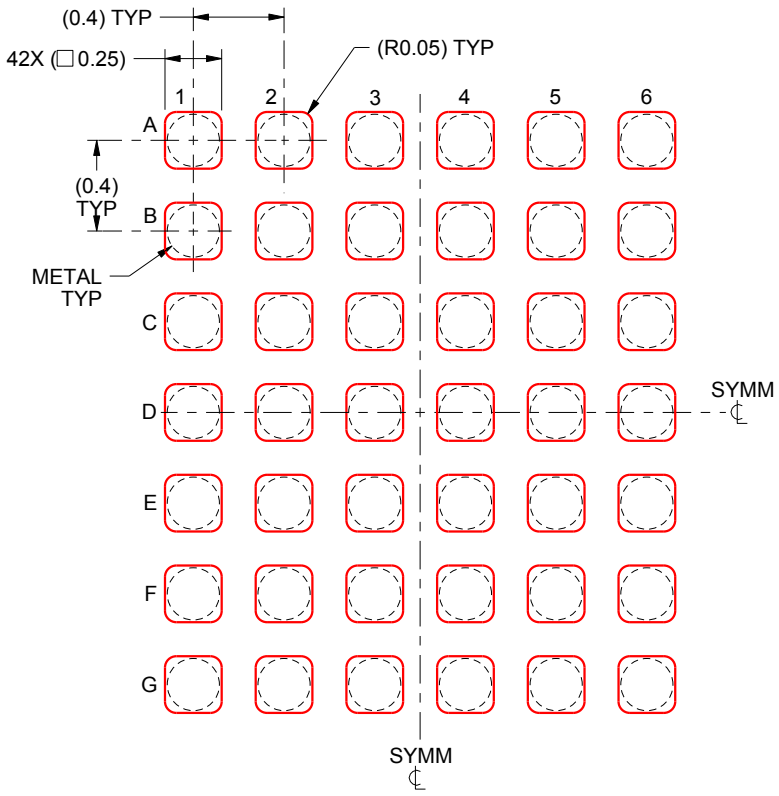
NOTES: (continued)

3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints.
For more information, see Texas Instruments literature number SNVA009 (www.ti.com/lit/snva009).



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL
SCALE:30X

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NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

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