

BQ25630 I²C Controlled Single Cell 5A Buck Charger with USB-C Detection

1 Features

- High-efficiency 5A, 1.5MHz, synchronous switch mode buck charger for single cell battery
 - >90% efficiency down to 10mA output current from 5V input
 - Charge current up to 5A in 20mA steps
 - Charge termination from 30 to 1000mA in 10mA steps
 - Flexible JEITA profile for safe charging over temperature
- Fully Integrated CC Controller with Dual Role Power (DRP), Try.SNK and Try.SRC
- BATFET control to support shutdown, ship mode and full system reset
 - 1.5µA quiescent current in battery only mode
 - 0.15µA battery leakage current in ship mode
 - 0.1µA battery leakage current in shutdown
- Supports USB On-The-Go (OTG) and SRC mode
 - Reverse mode operation with 3.84V to 9.6V output
 - Programmable current limit up to 3.2A
- Supports a wide range of input sources
 - 3.9V to 18V input operating voltage range with 26V absolute max input voltage
 - Supports USB Type-C inputs, USB BC1.2, and Non-Standard Adapters
 - Supports IINDPM Range from 10mA to 3.2A
 - VINDPM automatically tracks battery voltage
 - Input Current Optimizer (ICO) to maximize input power without overloading adapters
- Efficient battery operation with 7mΩ BATFET
- Narrow VDC (NVDC) power path management
 - System instant-on with depleted or no battery
 - Battery supplement when adapter is fully loaded
- Flexible autonomous or I²C-controlled modes
- Integrated 12-bit ADC for voltage, current, and temperature monitoring
- Safety
 - Thermal regulation and thermal shutdown
 - Input/system/battery overvoltage and overcurrent protection
 - Charging safety timer

2 Applications

- Gaming and computer accessories
- Smart phone, tablet
- IP camera, EPOS
- Portable medical equipment

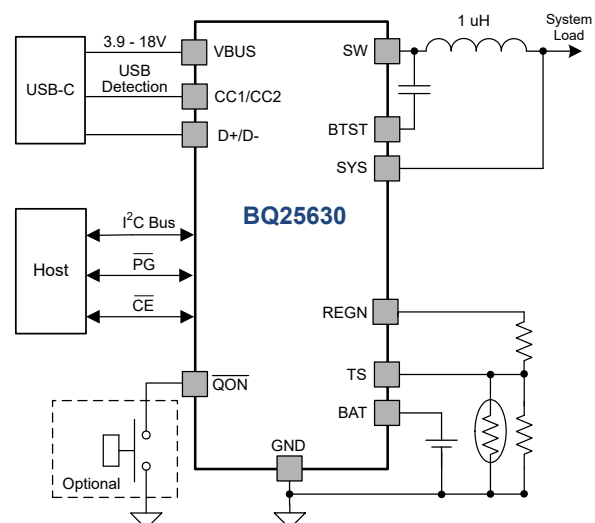
3 Description

The BQ25630 is a highly-integrated 5A switch-mode battery charge management and system power path management device for single cell Li-Ion and Li-polymer batteries. The solution is highly integrated with built-in current sensing, loop compensation, input reverse-blocking FET (RBFET, Q1), switching FETs (HSFET - Q2 and LSFET - Q3), and battery FET (BATFET, Q4) between system and battery. It integrates a USB Type-C controller with Dual-Role Power with Try.SNK and Try.SRC support. It uses NVDC power path management, regulating the system slightly above the battery voltage without dropping below a configurable minimum system voltage. The low impedance power path optimizes efficiency, reduces battery charging time and extends battery life during discharging phase, and the ultra-low 0.15µA ship mode current extends battery shelf life. The I²C serial interface with charging and system settings makes the BQ25630 a truly flexible solution.

Package Information

PART NUMBER	PACKAGE ⁽¹⁾	PACKAGE SIZE ⁽²⁾
BQ25630	YBG (DSBGA 30)	2.3mm × 2.4mm

- For all available packages, see the orderable addendum at the end of the data sheet.
- The package size (length × width) is a nominal value and includes pins, where applicable.



BQ25630 Simplified Application

4 Description (continued)

The BQ25630 supports a wide range of input sources, including standard USB host port, USB charging port, USB-C adapters, and USB compliant high voltage adapter. It integrates a USB Type-C controller (CC1/CC2) with USB-C Detection up to 15W and sets the current limit according to the detection result. The BQ25630 supports Dual-Role Power with Try.SNK and Try.SRC. It also includes BC1.2 detection using the built-in D+/D-USB adapter detection interface. It is compliant with USB 2.0 and USB 3.0 power specifications for input current and voltage regulation. In addition, the Input Current Optimizer (ICO) supports the detection of maximum power point of the input source without overload. The device also meets USB On-the-Go (OTG) operation power rating specification with constant current limit up to 3.2A.

The power path management regulates the system slightly above battery voltage but does not drop below the programmable minimum system voltage. With this feature, the system maintains operation even when the battery is completely depleted or removed. When the input current limit or input voltage limit is reached, the power path management automatically reduces the charge current. If the system load continues to increase, the power path discharges the battery until the system power requirement is met. This supplement mode prevents overloading the input source.

The device initiates and completes a charging cycle without host control. By sensing the battery voltage, it charges the battery in four different phases: trickle charge, pre-charge, constant current (CC) charge and constant voltage (CV) charge. At the end of the charging cycle, the charger automatically terminates when the charge current is below a preset threshold and the battery voltage is higher than the recharge threshold. Termination is supported for TS pin COOL, PRECOOL, NORMAL, WARM and PREWARM temperature zones. When the full battery voltage falls below the programmable recharge threshold, the charger automatically starts a new charging cycle.

The charger provides various safety features for battery charging and system operations, including battery negative temperature coefficient (NTC) thermistor monitoring, charging safety timer and overvoltage and overcurrent protections. The thermal regulation reduces charge current when the junction temperature exceeds the programmable threshold. Other safety features include battery temperature sensing for charge mode and OTG boost mode, thermal shutdown and input UVLO and over-voltage protection. The PG output indicates if a good power source is present and above the programmable PG_TH value. The INT output immediately notifies the host when a fault occurs or status changes.

The device also provides a 12-bit analog-to-digital converter (ADC) for monitoring charge current and input/battery/system (VBUS, BAT, SYS, TS) voltages. The QON pin provides BATFET enable and reset control to exit ultra-low power mode or initiate a full system reset.

BQ25630 is available in a 30-ball, 2.3mm × 2.4mm DSBGA package.

5 Device and Documentation Support

5.1 Device Support

5.1.1 Third-Party Products Disclaimer

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5.2 Documentation Support

5.2.1 Related Documentation

For related documentation see the following:

- [BQ25601 and BQ25601D \(PWR877\) Evaluation Module User's Guide](#)

5.3 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.

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.

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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 Revision History

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

DATE	REVISION	NOTES
April 2025	*	Advance Information Initial Release

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.

ADVANCE INFORMATION

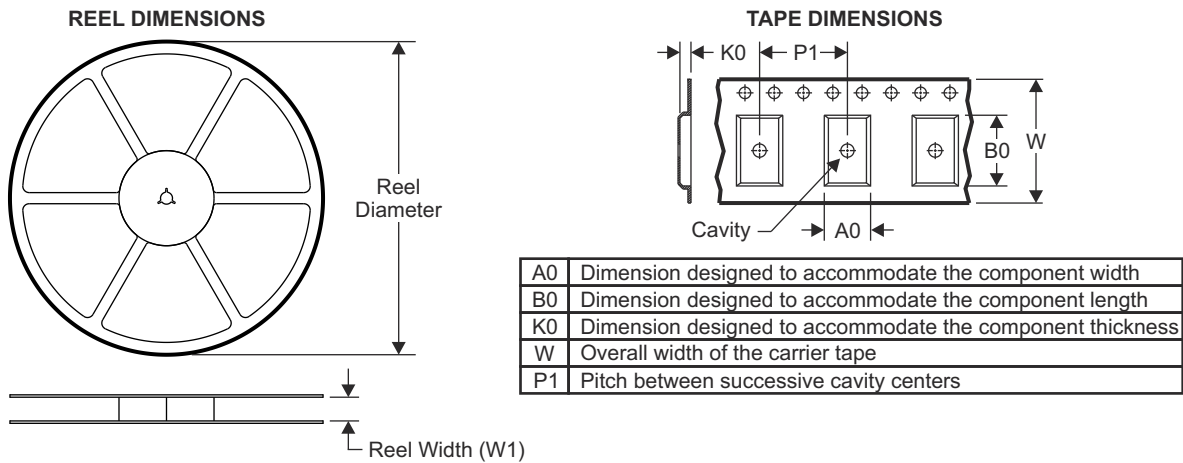
7.1 Package Option Addendum

7.1.1 Packaging Information

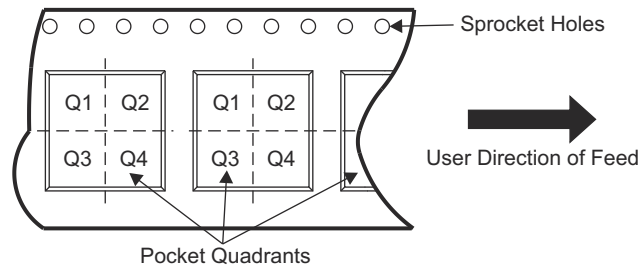
Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish ⁽⁴⁾	MSL Peak Temp ⁽³⁾	Op Temp (°C)	Device Marking ^{(5) (6)}
BQ25630YBGR	PREVIEW	DSBGA	YBG	30	3000		SNAGCU	Level-1-260C-UNLIM	-40 to 85	BQ25630

- (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) 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.
- (5) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device
- (6) 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.
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7.1.2 Tape and Reel Information



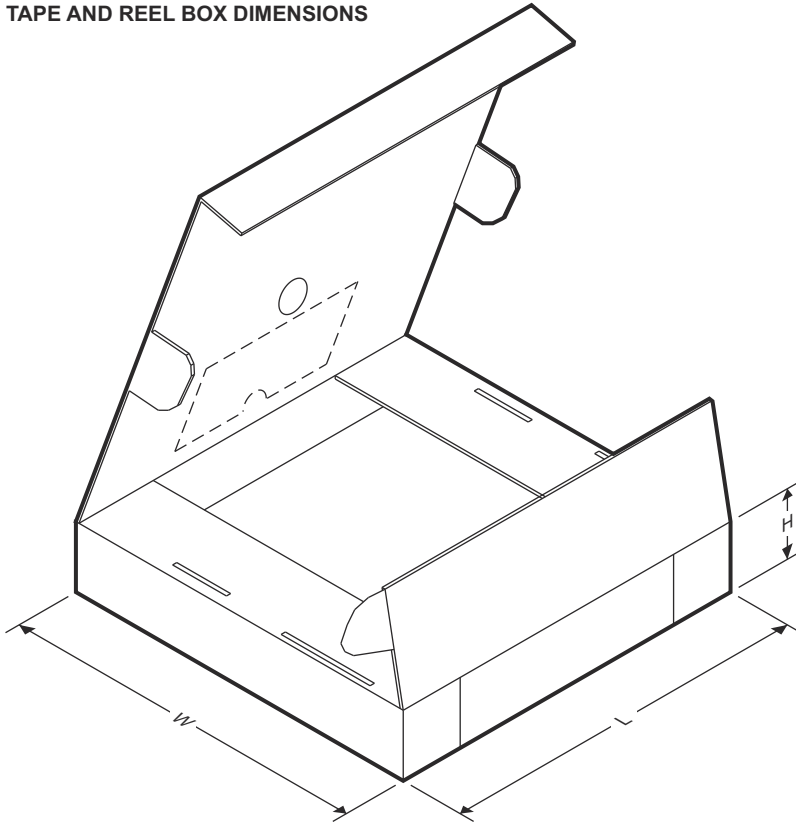
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



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
BQ25630YBGR	DSBGA	YBG	30	3000	330.0	12.4	2.30	2.68	0.65	8.0	12.0	Q2

ADVANCE INFORMATION

TAPE AND REEL BOX DIMENSIONS

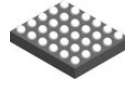


Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
BQ25630YBGR	DSBGA	YBG	30	3000	360.0	360.0	36.0

ADVANCE INFORMATION

7.2 Mechanical Data

YBG0030

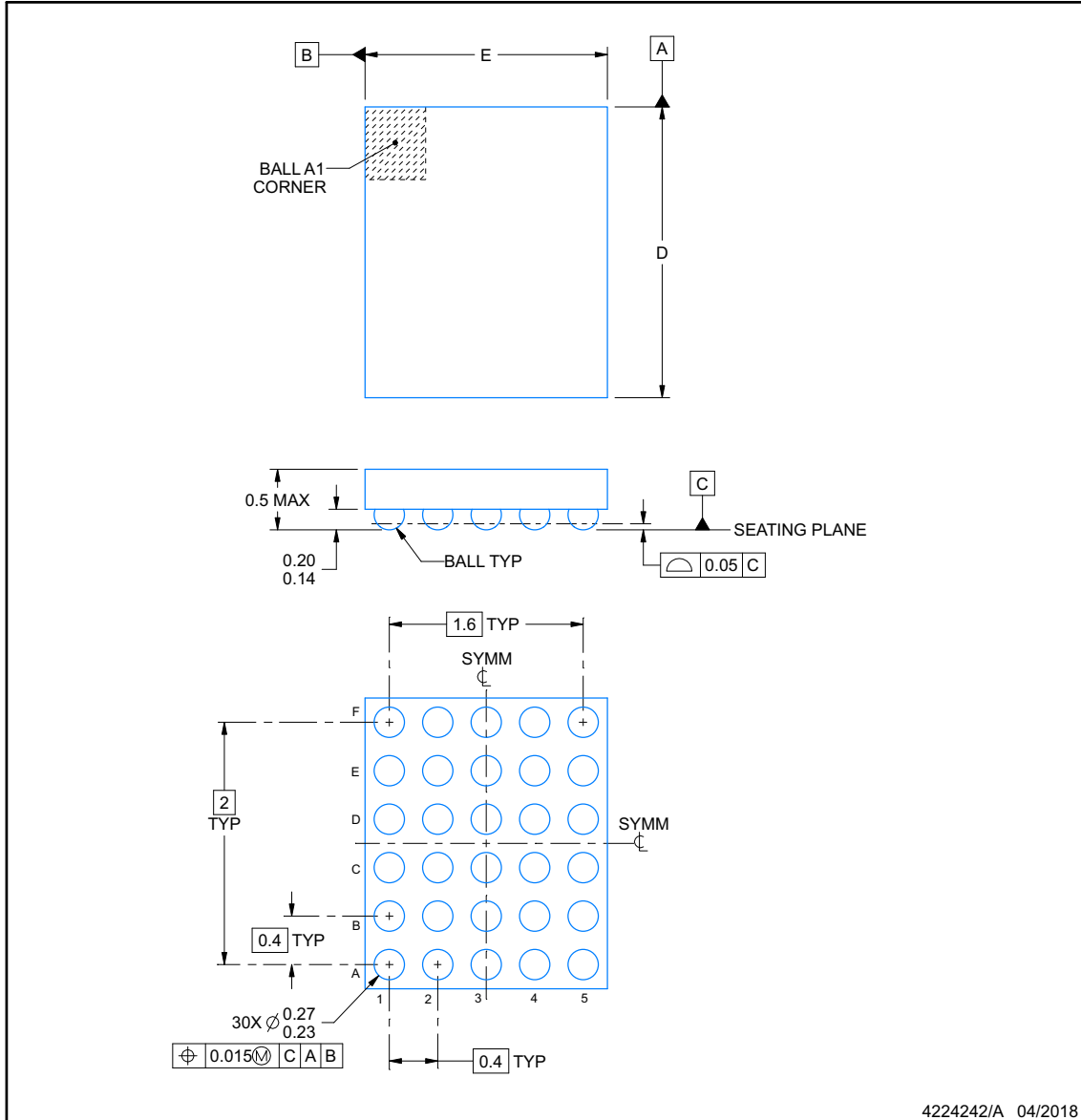


PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY

ADVANCE INFORMATION



NOTES:

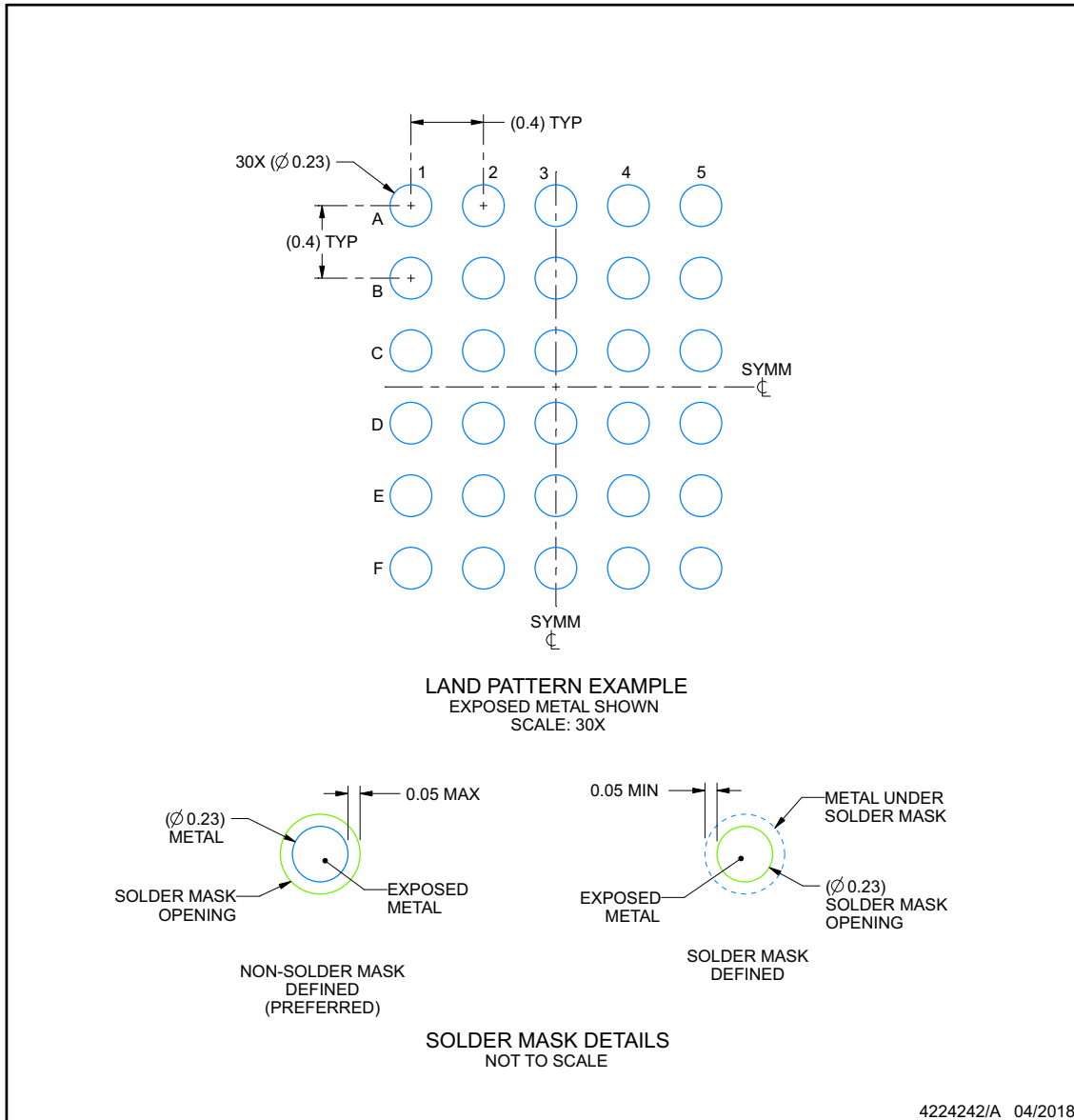
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

YBG0030

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



ADVANCE INFORMATION

NOTES: (continued)

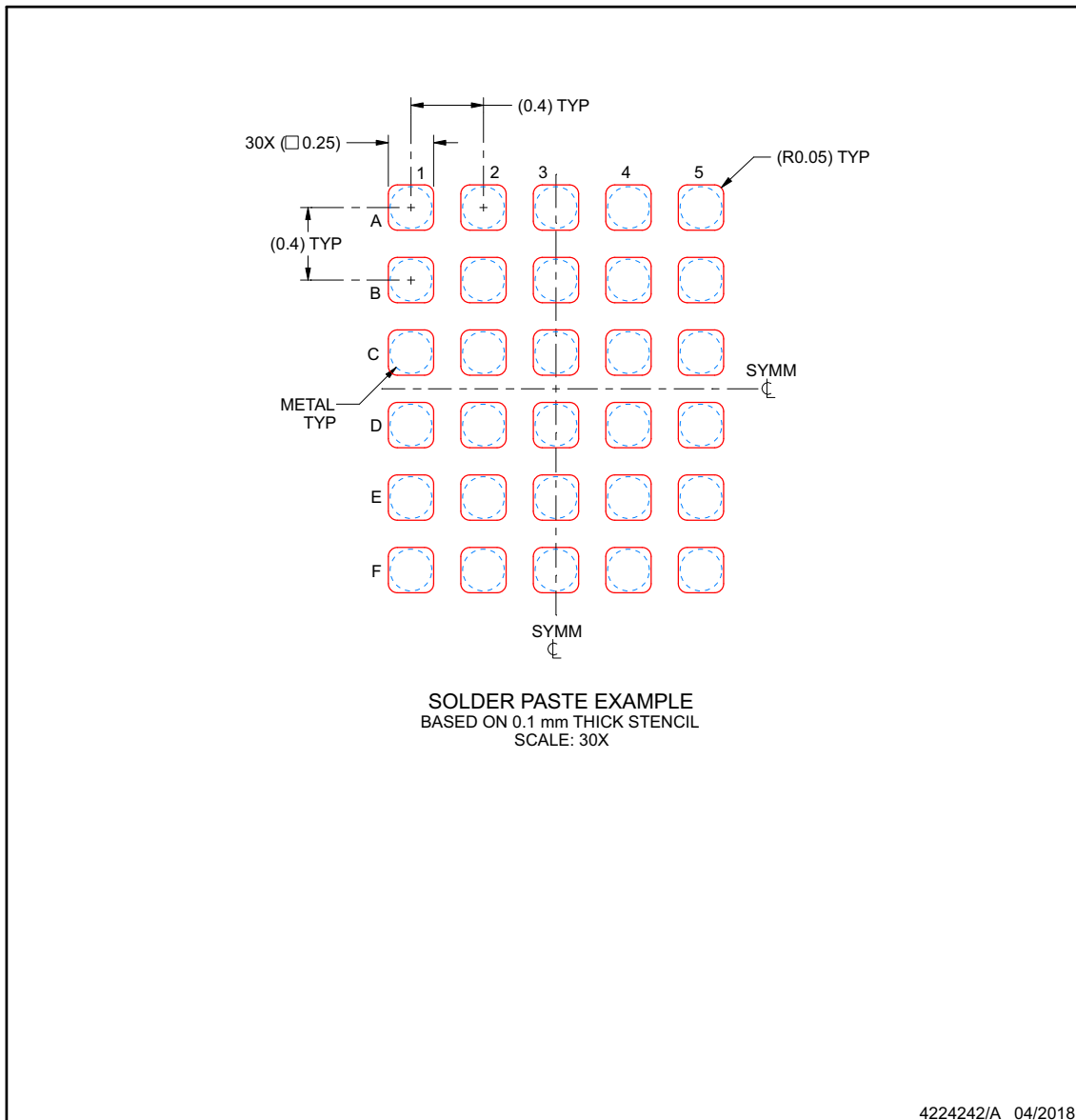
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. See Texas Instruments Literature No. SNVA009 (www.ti.com/lit/snva009).

EXAMPLE STENCIL DESIGN

YBG0030

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



ADVANCE INFORMATION

NOTES: (continued)

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

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