TLC69633-Q1 Automotive 100mA, 8-Channel LED Driver with Integrated Oscillator, Advance Diagnostics and Cascaded Serial Interface

1 Features

- AEC-Q100 qualified for automotive applications
  - Grade 1: –40°C to 125°C ambient operating temperature
  - Device HBM classification level H1C
  - Device CDM classification level C4B
- Functional Safety-Compliant
  - Developed for functional safety applications
  - Documentation available to aid ISO 26262 system design up to ASIL B
- 8 integrated current sinks
  - Programmable 16-bit PWM / Hybrid dimming
  - Programmable 7-bit analog dot correction (DC)
  - Maximum output current / voltage: 100mA / 16V
- Integrated 33MHz oscillator
  - 16-bit PWM output in 500Hz
  - >20KHz refresh rate with enhanced spectrum (ES) PWM
- High speed communication
  - Cascaded serial interface (CSI)
  - Data rates up to 17Mbps
- Power efficiency optimization
  - Adaptive headroom voltage control (AHVC)
  - Device power save mode (PSM)
- EMI mitigation
  - Interface: programmable buffer driving capability
  - Current sinks: phase shifting / spread spectrum
- Protection and Diagnostic
  - LED: open / short detection / health check
  - Current sink: adjacent-pin short / health check
  - Interface: CRC / command error / time-out error / communication watchdog
  - Device: under voltage / ISET out of range / thermal shutdown / memory CRC / OTP CRC / OSC watchdog

2 Applications

- Automotive Central information Display
- Automotive Cluster Display
- Automotive Head-up Display

3 Description

The TLC69633-Q1 is a LED driver with 8 constant current sink channels which could provide up to 16-bit individual pixel-level LED PWM control. The additional 7-bit dot correction (DC) is also implemented to each channel to control peak current. Each device shares data stream by cascaded serial interface (CSI) which supports up to 511 devices connection. The interface is software compatible with LED drivers in the same group which can be applied to different application scenarios based on LED current and total LED number.

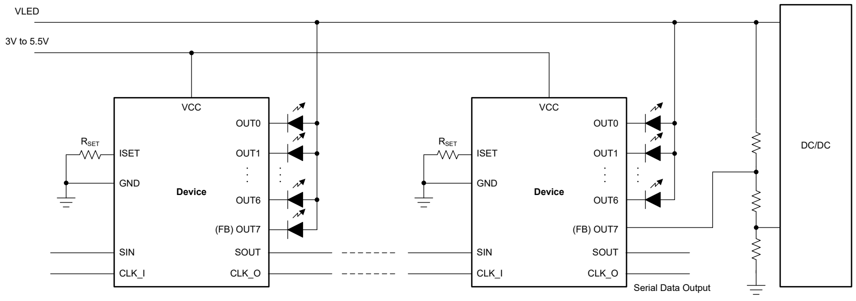
To optimize overall systematic power efficiency, the device is equipped with adaptive headroom voltage control (AHVC) scheme to optimize headroom voltage across each channel and device. Only the OUT7 pin from the last device of daisy chain is required to be programmed as FB pin to optimize LED supply voltage from DC/DC.

The TLC69633-Q1 is equipped diagnostics for LED, current sink, communication and device.

Packaging Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
TLC69633-Q1	X2QFN (16) Wettable flank	2.5mm × 2.5mm
	SOT-23-THIN (16)	4.2mm × 2mm

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



Simplified Schematic

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4 Device Comparison

PART NUMBER	CHANNEL NUMBER	MAX. CHANNEL CURRENT	FUNCTIONAL SAFETY CLASSIFICATION	INTERFACE	SOFTWARE COMPATIBLE
TLC69621-Q1	8	60mA	Functional Safety-Capable	SPI	Group 1
TLC69624-Q1	24				
TLC69627-Q1	48				
TLC69631-Q1	8	100mA			
TLC69634-Q1	24				
TLC69637-Q1	48				
TLC69622-Q1	8	60mA	Functional Safety-Compliant	SPI	Group 2
TLC69625-Q1	24				
TLC69628-Q1	48				
TLC69632-Q1	8	100mA			
TLC69635-Q1	24				
TLC69638-Q1	48				
TLC69623-Q1	8	60mA	Functional Safety-Compliant	CSI	Group 3
TLC69626-Q1	24				
TLC69629-Q1	48				
TLC69633-Q1	8	100mA			
TLC69636-Q1	24				
TLC69639-Q1	48				

5 Revision History

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

DATE	REVISION	NOTES
March 2026	*	Initial Release

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.

PACKAGE OPTION ADDENDUM

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)
TLC69633QDYYRQ1	Active	Production	SOT-23-THIN (DYY) | 16	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	69622Q1
TLC69633QRUJRQ1	Active	Production	X2QFN (RUJ) | 16	5000 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	22Q

(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.

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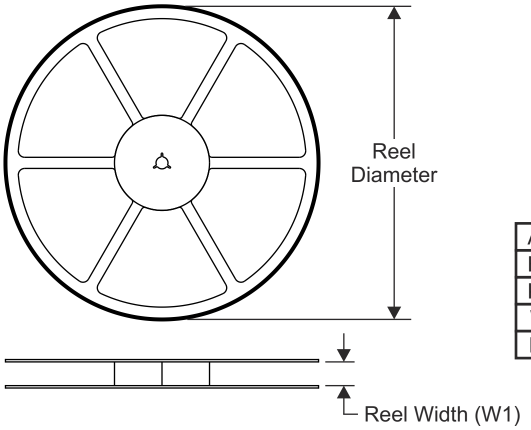
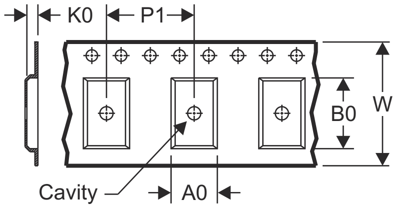
6.1 Tape and Reel Information

REEL DIMENSIONS

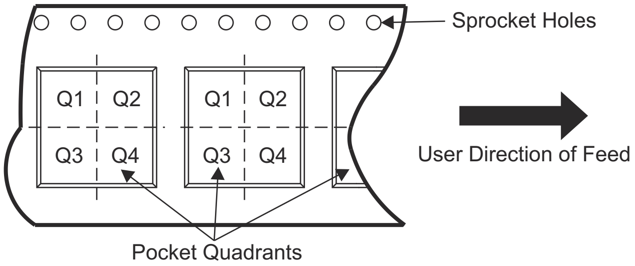


TAPE DIMENSIONS



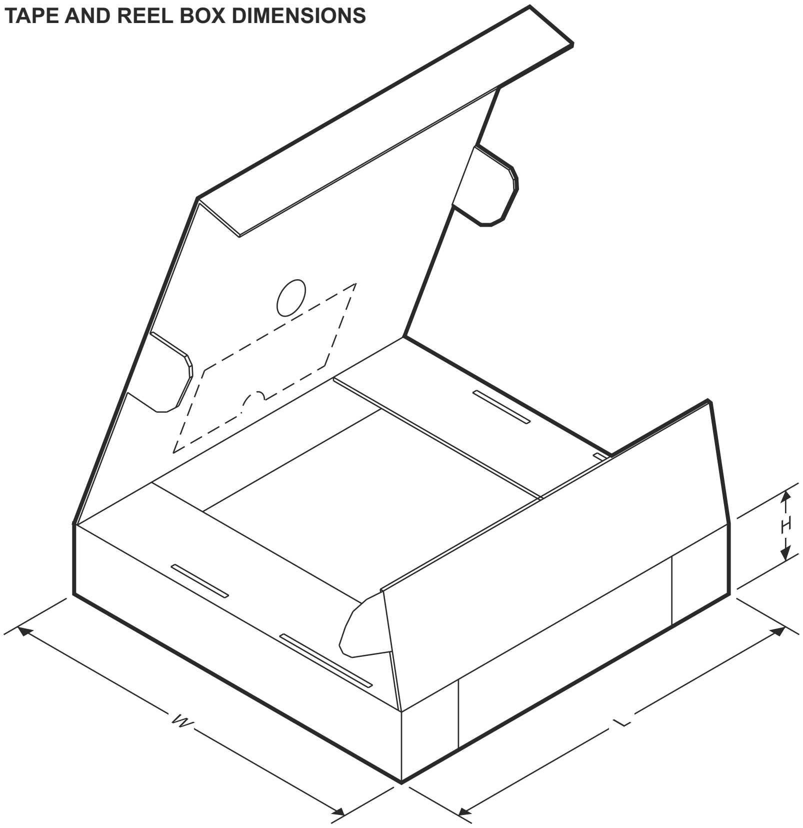
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



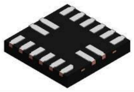
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLC69633QDYYRQ1	SOT-23-THIN	DYY	16	3000	300	12.4	4.8	3.6	1.6	8	12	Q3
TLC69633QRUJRQ1	X2QFN	RUJ	16	5000	180	8.4	1.8	1.8	0.48	4	8	Q1

TAPE AND REEL BOX DIMENSIONS



Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLC69633QDYYRQ1	SOT-23-THIN	DYY	16	3000	336.6	336.6	31.8
TLC69633QRUJRQ1	X2QFN	RUJ	16	5000	210	185	35

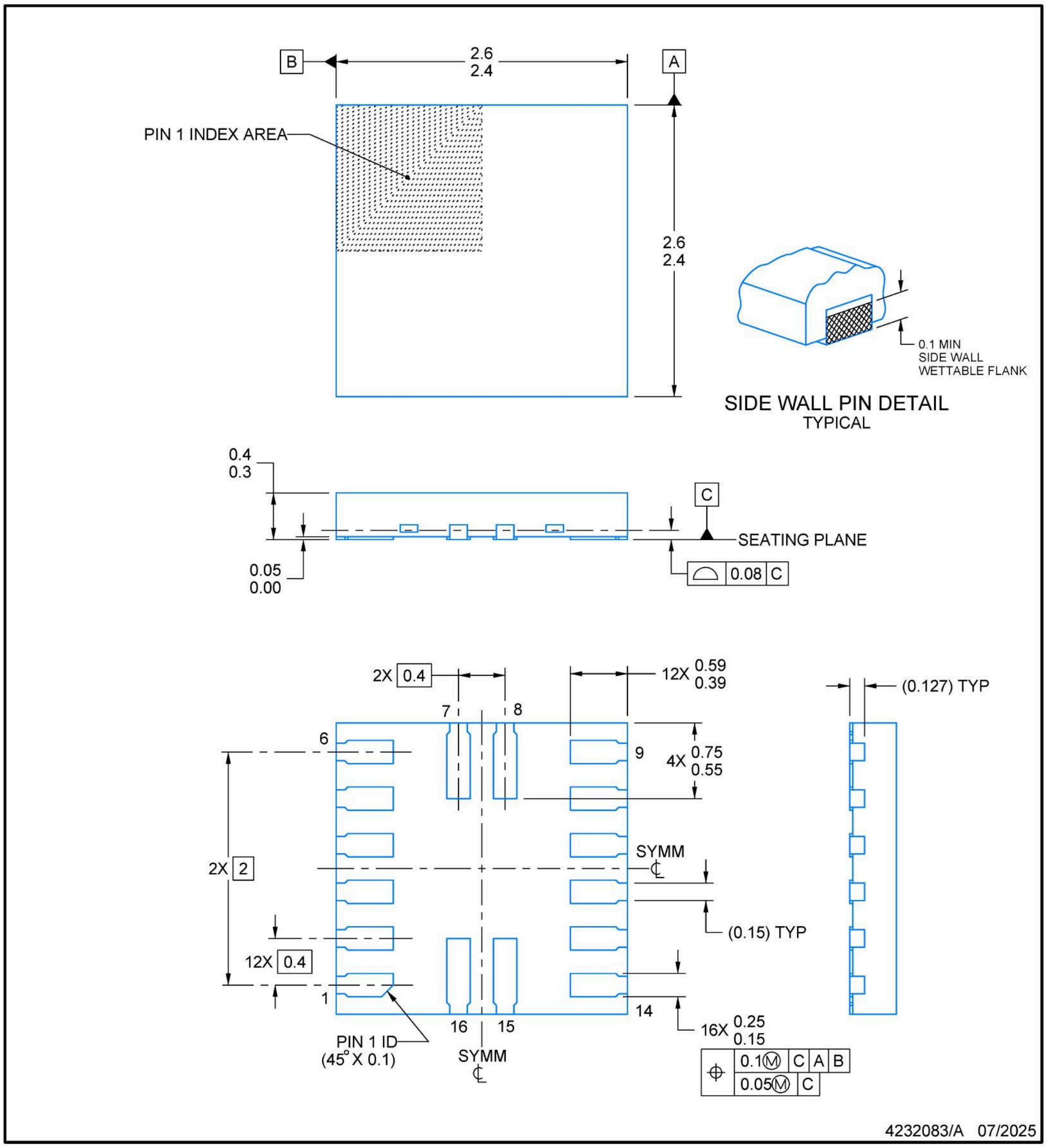
PACKAGE OUTLINE



RUJ0016B

X2QFN - 0.4 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



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.

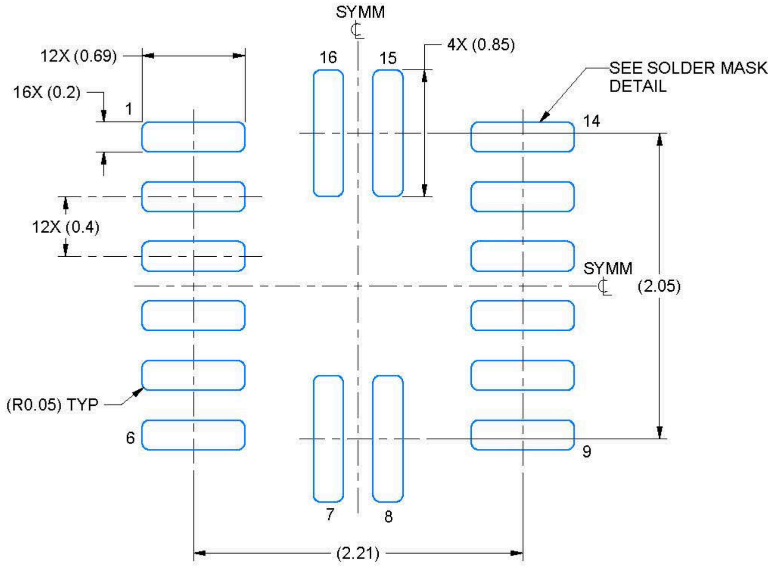
www.ti.com

EXAMPLE BOARD LAYOUT

RUJ0016B

X2QFN - 0.4 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 25X

NON SOLDER MASK
DEFINED
(PREFERRED)

SOLDER MASK DEFINED

SOLDER MASK DETAILS

4232083/A 07/2025

NOTES: (continued)

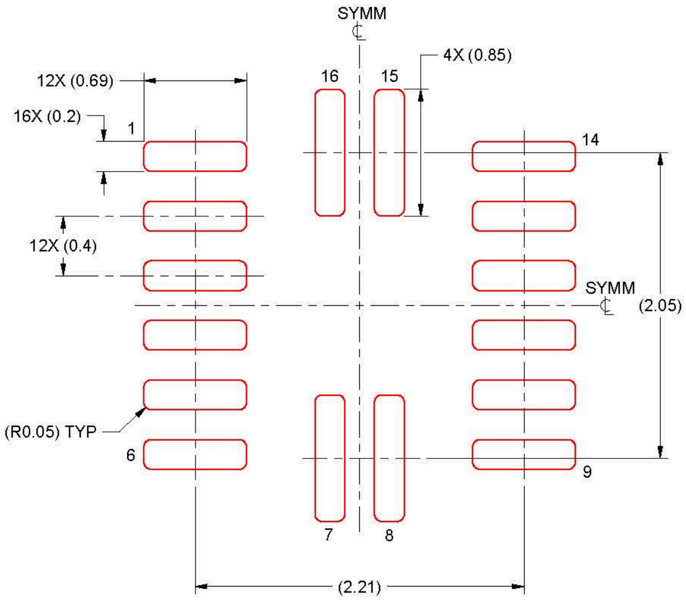
3. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).

EXAMPLE STENCIL DESIGN

RUJ0016B

X2QFN - 0.4 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 MM THICK STENCIL
SCALE: 25X

4232083/A 07/2025

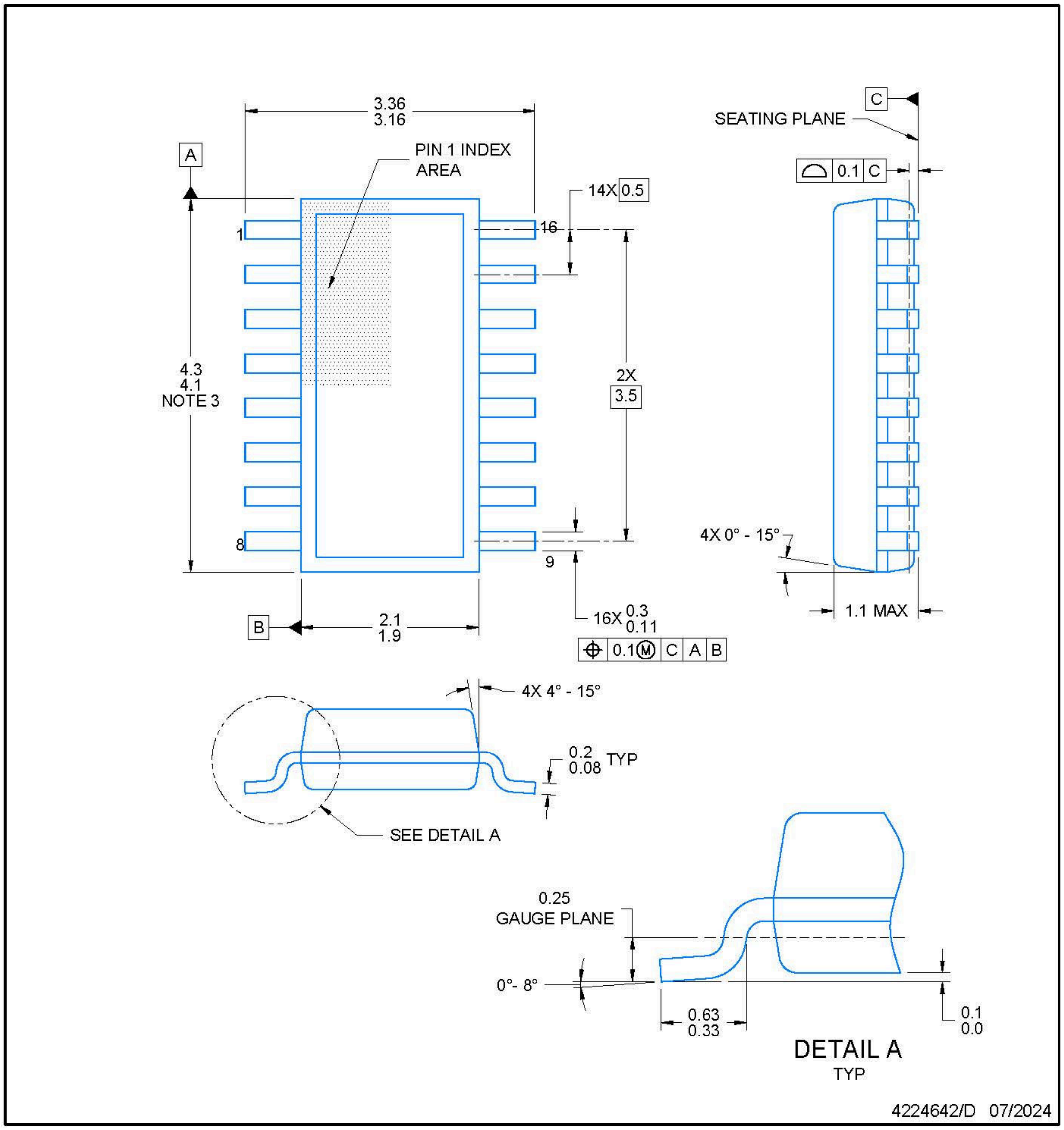
NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

PACKAGE OUTLINE

DYY0016A **SOT-23-THIN - 1.1 mm max height**

PLASTIC SMALL OUTLINE



4224642/D 07/2024

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. This dimension does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
5. Reference JEDEC Registration MO-345, Variation AA

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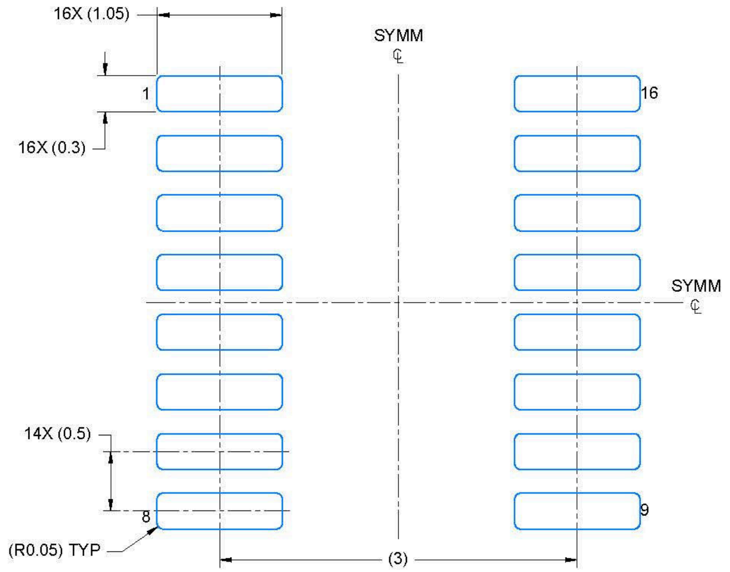
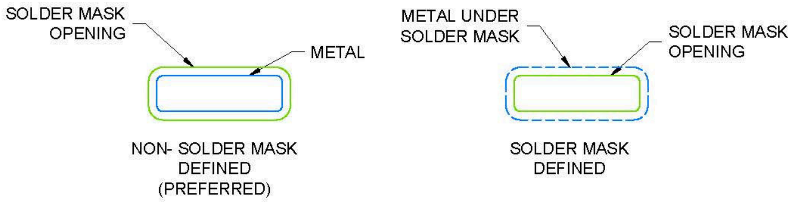
EXAMPLE BOARD LAYOUT

DYY0016A **SOT-23-THIN - 1.1 mm max height**

PLASTIC SMALL OUTLINE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 20X



SOLDER MASK DETAILS

4224642/D 07/2024

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.

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DYY0016A

SOT-23-THIN - 1.1 mm max height

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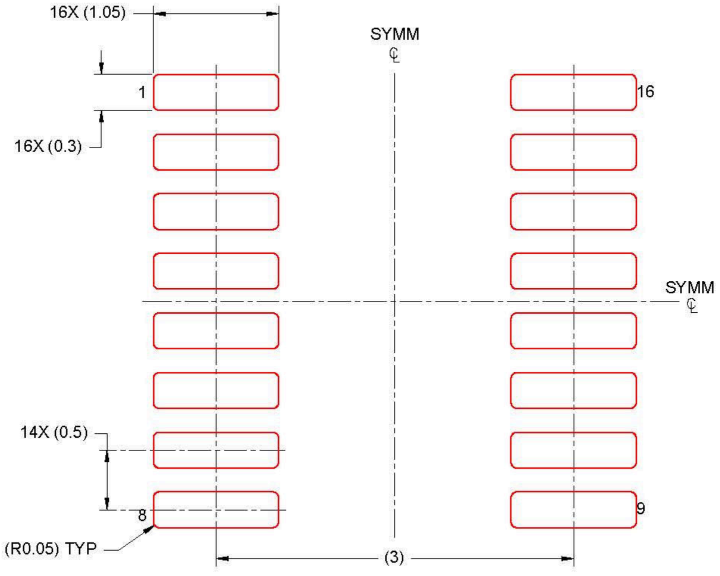

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BASED ON 0.125 mm THICK STENCIL
SCALE: 20X

4224642/D 07/2024

NOTES: (continued)

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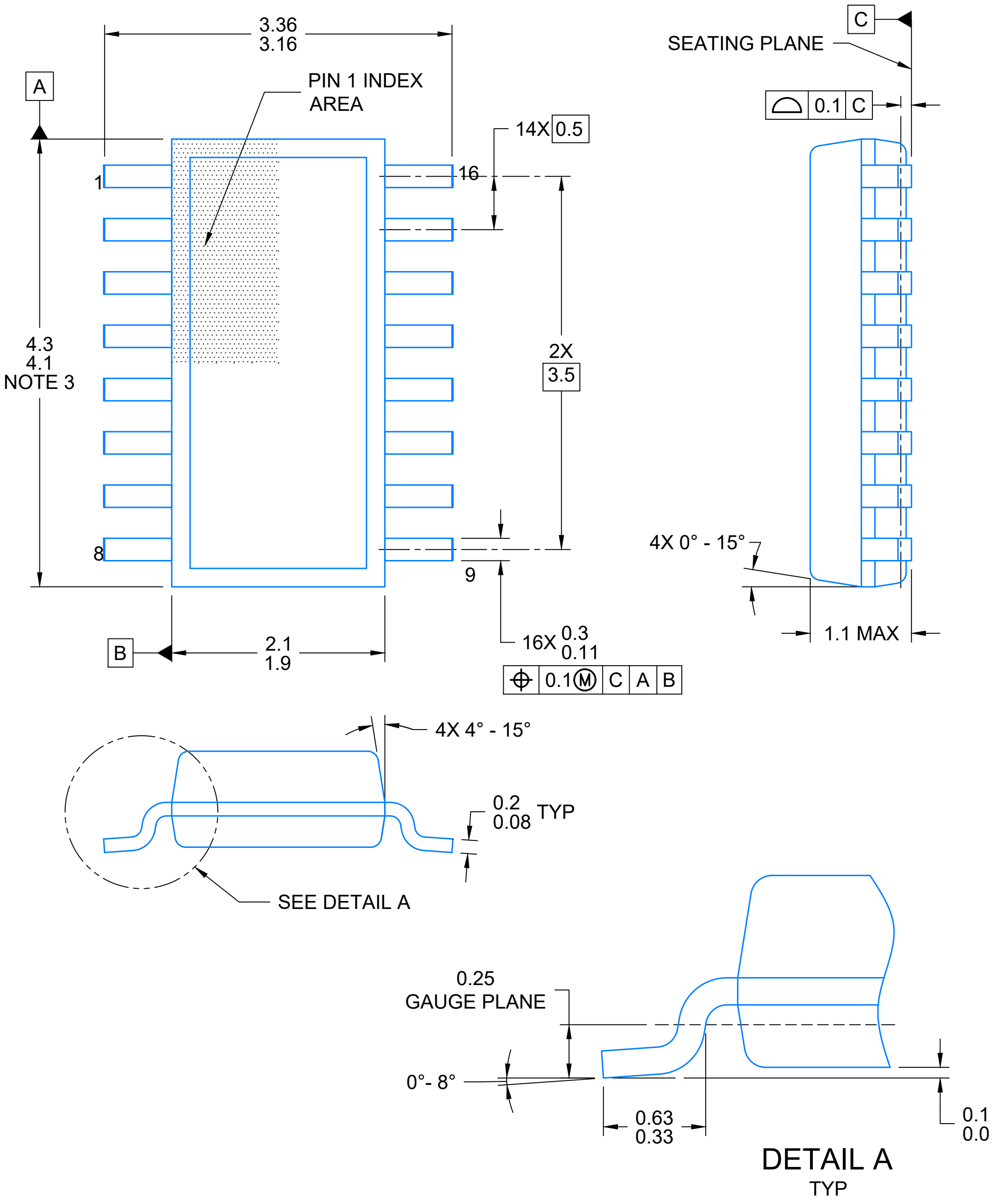
PACKAGE OUTLINE

SOT-23-THIN - 1.1 mm max height

PLASTIC SMALL OUTLINE



4224642/D 07/2024

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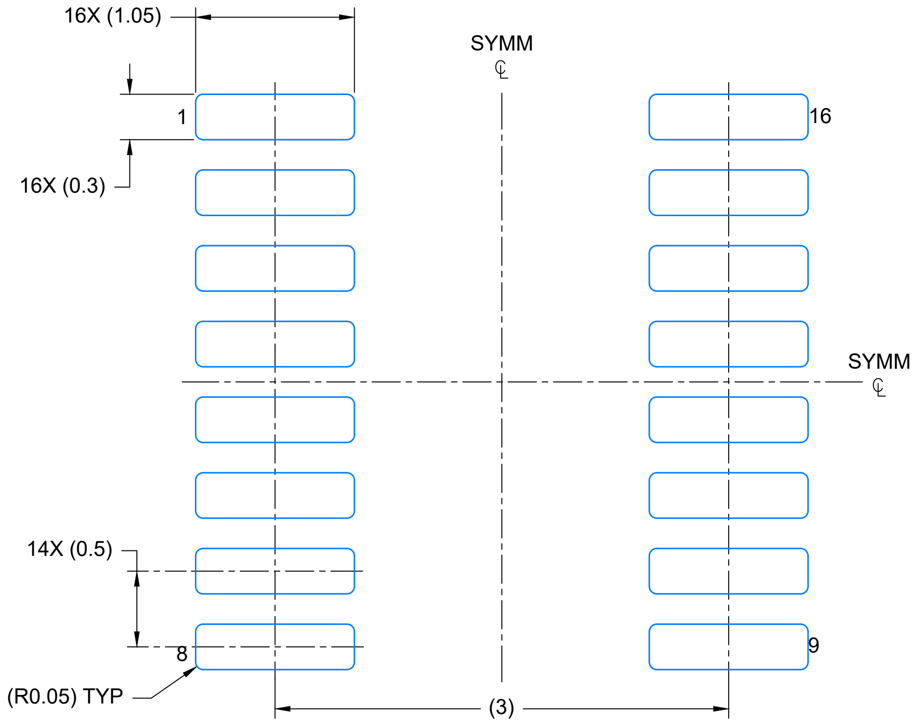
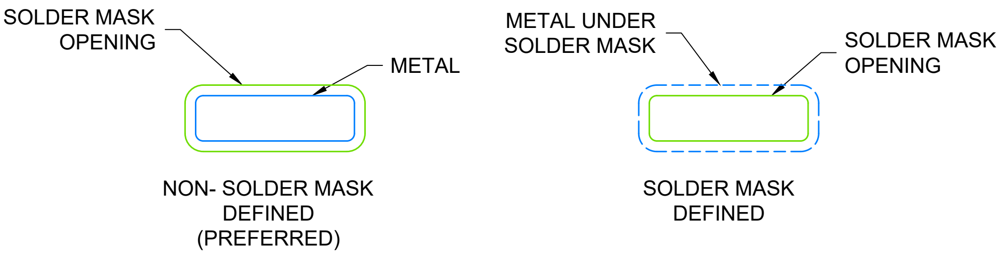


LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 20X



SOLDER MASK DETAILS

4224642/D 07/2024

NOTES: (continued)

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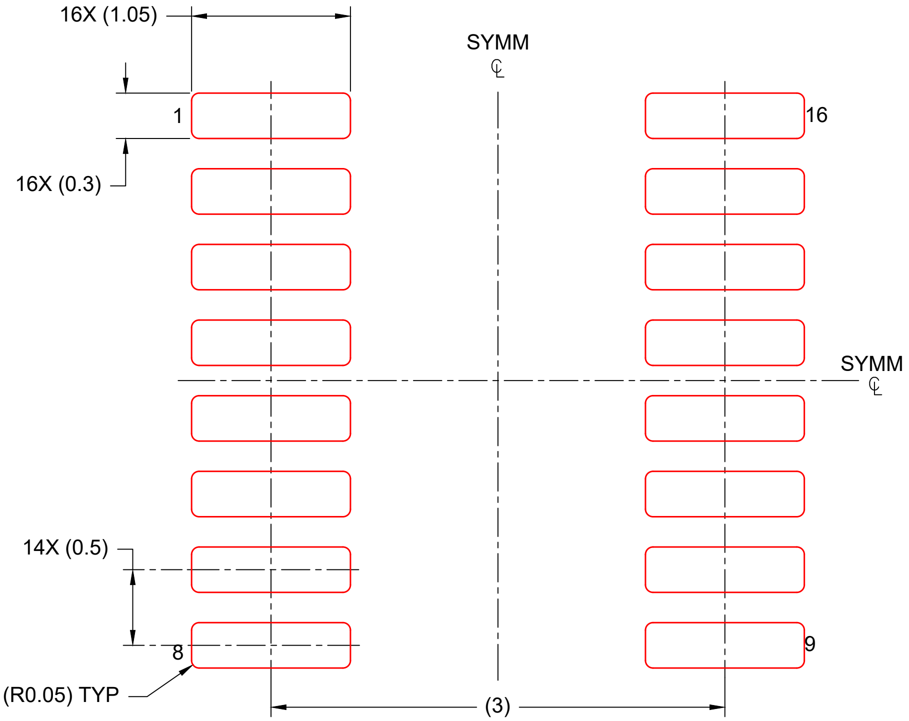
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 20X

NOTES: (continued)

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9. Board assembly site may have different recommendations for stencil design.

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