

TCAN1046A-Q1 Automotive Dual CAN FD Transceiver with Standby Mode

1 Features

- AEC-Q100 (Grade 1): Qualified for automotive applications
- Two independent high-speed CAN FD transceivers with mode control
- Meets the requirements of ISO 11898-2:2016 physical layer standard
- [Functional Safety-Capable](#)
 - [Documentation available to aid in functional safety system design](#)
- Support of classical CAN and optimized CAN FD performance at 2, 5, and 8 Mbps
 - Short and symmetrical propagation delays for enhanced timing margin
- Support for 12-V and 24-V battery applications
- Receiver common-mode input voltage: ± 12 V
- Protection features:
 - Bus fault protection: ± 58 V
 - Undervoltage protection
 - TXD-dominant time-out (DTO)
 - Data rates down to 9.2 kbps
 - Thermal-shutdown protection (TSD)
- Operating modes:
 - Normal mode
 - Low power standby mode supporting remote wake-up request
- Optimized behavior when unpowered
 - Bus and logic pins are high impedance (no load to operating bus or application)
 - Hot-plug capable: power up and down glitch-free operation on bus and RXD output
- Junction temperatures from: -40°C to 150°C
- Available in SOIC (14) and leadless VSON (14) packages (4.5 mm x 3.0 mm) with improved automated optical inspection (AOI) capability

2 Applications

- Automotive and transportation
 - [Body control modules](#)
 - [Automotive gateway](#)
 - [Advanced driver assistance system \(ADAS\)](#)
 - [Infotainment](#)

3 Description

The TCAN1046A-Q1 is a dual high-speed controller area network (CAN) transceiver that meets the physical layer requirements of the ISO 11898-2:2016 high-speed CAN specification.

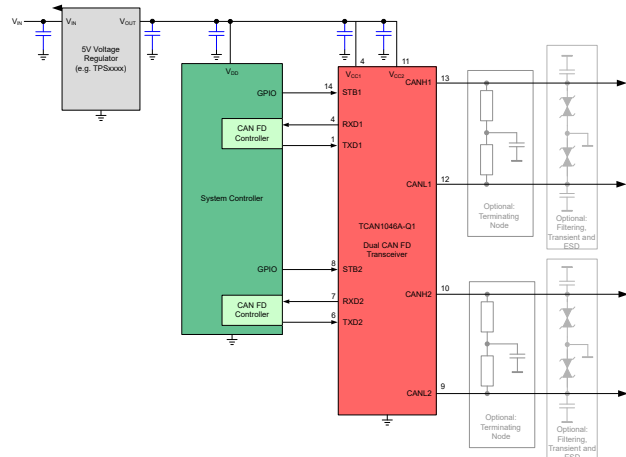
The device supports both classical CAN and CAN FD networks up to 8 megabits per second (Mbps). The device has two CAN FD channels with independent supply, V_{CC1} and V_{CC2} , and mode control, STB1 and STB2 pins, allowing for true independent operation of each CAN channel. The ability to operate each channel independent of one another is important in applications that require redundancy or additional CAN FD channels to act as a back-up in the event of a system failure.

The device includes many protection and diagnostic features including thermal-shutdown (TSD), TXD-dominant time-out (DTO), and bus fault protection up to ± 58 V. The device has defined failsafe behavior in supply under-voltage or floating pin scenarios.

Device Information

PART NUMBER	PACKAGE ⁽¹⁾	BODY SIZE (NOM)
TCAN1046A-Q1	VSON (DMT) (14)	4.50 mm x 3.00 mm
	SOIC (D) (14)	8.95 mm x 3.91 mm

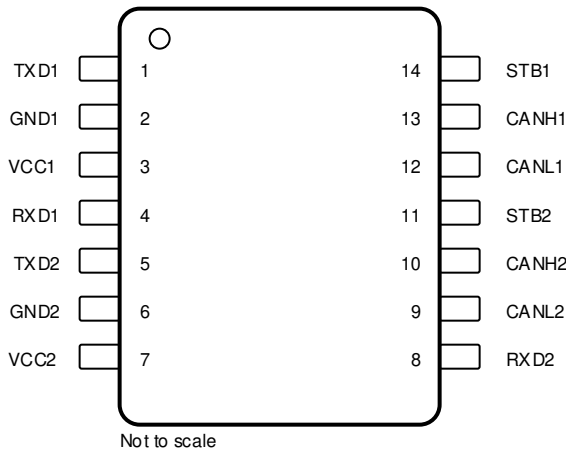
- (1) For all available packages, see the orderable addendum at the end of the data sheet.



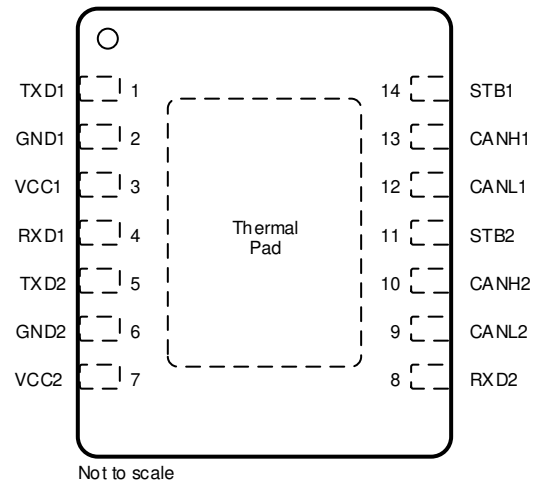
Simplified Schematic



4 Pin Configuration and Functions



Not to scale
Figure 4-1. D Package, 14 Pin SOIC, Top View



Not to scale
Figure 4-2. DMT Package, 14 Pin VSON, Top View

Table 4-1. Pin Functions

Pins		Type	Description
Name	No.		
TXD1	1	Digital Input	CAN transmit data input 1, integrated pull-up
GND1	2	GND1	Ground connection, transceiver 1
V _{CC1}	3	Supply	5-V supply voltage, transceiver 1
RXD1	4	Digital Output	CAN receive data output 1, tri-state when $V_{CC} < UV_{VCC}$
TXD2	5	Digital Input	CAN transmit data input 2, integrated pull-up
GND2	6	GND2	Ground connection, transceiver 2
V _{CC2}	7	Supply	5-V supply voltage, transceiver 2
RXD2	8	Digital Output	CAN receive data output 2, tri-state when $V_{CC} < UV_{VCC}$
CANL2	9	Bus IO	Low-level CAN bus 2 input/output line
CANH2	10	Bus IO	High-level CAN bus 2 input/output line
STB2	11	Digital Input	Standby input 2 for mode control, integrated pull-up
CANL1	12	Bus IO	Low-level CAN bus 1 input/output line
CANH1	13	Bus IO	High-level CAN bus 1 input/output line
STB1	14	Digital Input	Standby input 1 for mode control, integrated pull-up
Thermal Pad (VSON only)		—	Electrically connected to GND, connect the thermal pad to the printed circuit board (PCB) ground plane for thermal relief

5 Device and Documentation Support

5.1 Device Support

This device conforms to the following CAN standards. The core of what is needed is covered within this system specification; however, reference should be made to these standards and any discrepancies pointed out and discussed. This document should provide all the basics of what is needed. However, for a full understanding of CAN including the protocol these additional sources are helpful as the scope of CAN protocol in detail is outside the scope of this physical layer (transceiver) specification.

5.1.1 Device Nomenclature

CAN Transceiver Physical Layer Standards:

- ISO 11898-2:2016 High speed medium access unit (original High Speed CAN transceiver standard)
- ISO 11898-5 High speed medium access unit with low power mode (super sets -2 standard electrically in several specs and adds the original wake up capability via the bus in low power mode).
- ISO 11898-6 High speed medium access unit with selective wake.
- ISO 8802-3: CSMA/CD – referenced for collision detection from ISO11898-2
- CAN FD 1.0 Spec and Papers
- Bosch "Configuration of CAN Bit Timing", Paper from 6th International CAN Conference (ICC), 1999. This is repeated a lot in the DCAN IP CAN Controller spec copied into this system spec.
- GMW3122: GM requirements for HS CAN
- SAE J2284-2: High Speed CAN (HSC) for Vehicle Applications at 250 kbps
- SAE J2284-3: High Speed CAN (HSC) for Vehicle Applications at 500 kbps

EMC requirements:

- HW Requirements for CAN, LIN, FR V1.3: German OEM requirements for HS CAN

Conformance Test requirements:

- HS_TRX_Test_Spec_V_1_0: GIFT / ICT CAN test requirements for High Speed Physical Layer

5.2 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.

5.3 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.

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5.4 Trademarks

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5.5 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.

5.6 Glossary

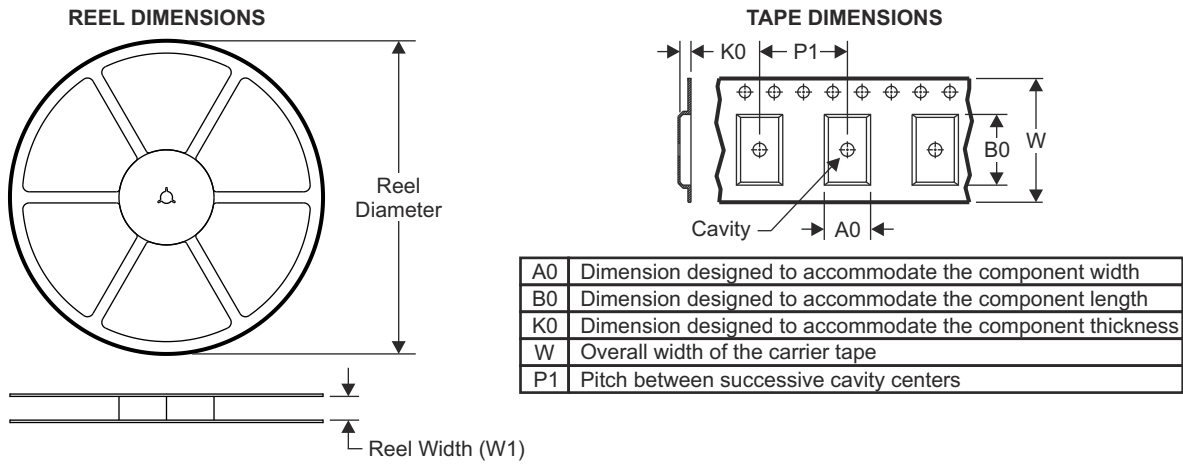
[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

Mechanical, Packaging, and Orderable Information

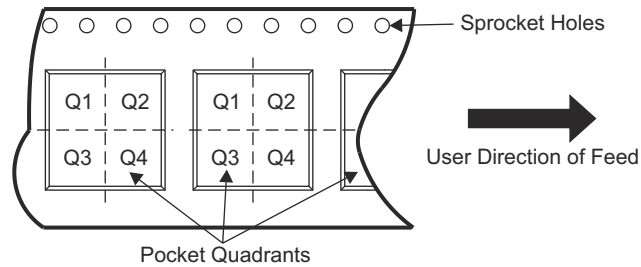
The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

ADVANCE INFORMATION

6.1 Tape and Reel Information



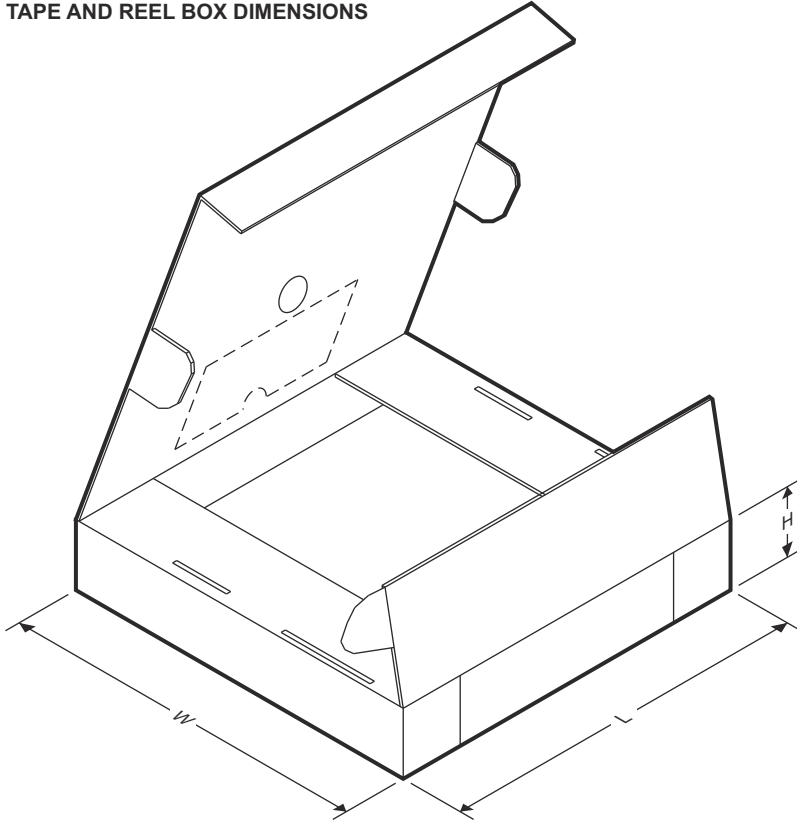
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



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
TCAN1046ADMTRQ1	VSON	DMT	14	3000	330.0	12.4	3.2	4.7	1.15	8.0	12.0	Q1
TCAN1046ADRQ1	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1

ADVANCE INFORMATION

TAPE AND REEL BOX DIMENSIONS



ADVANCE INFORMATION

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TCAN1046ADMTRQ1	VSON	DMT	14	3000	370.0	355.0	55.0
TCAN1046ADRQ1	SOIC	D	14	2500	853.0	449.0	35.0

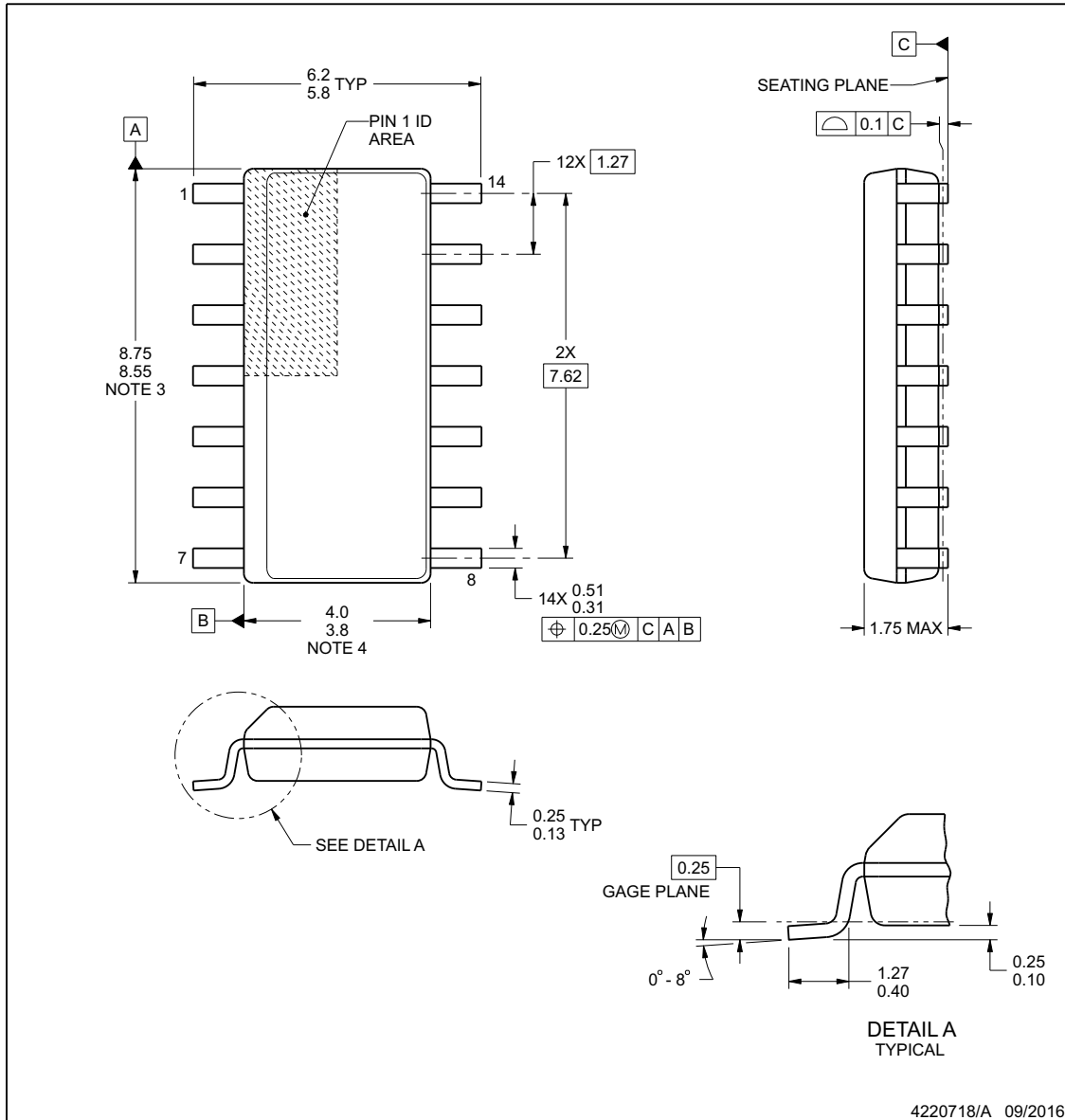


PACKAGE OUTLINE

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



NOTES:

1. All linear dimensions are in millimeters. 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. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm, per side.
5. Reference JEDEC registration MS-012, variation AB.

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ADVANCE INFORMATION

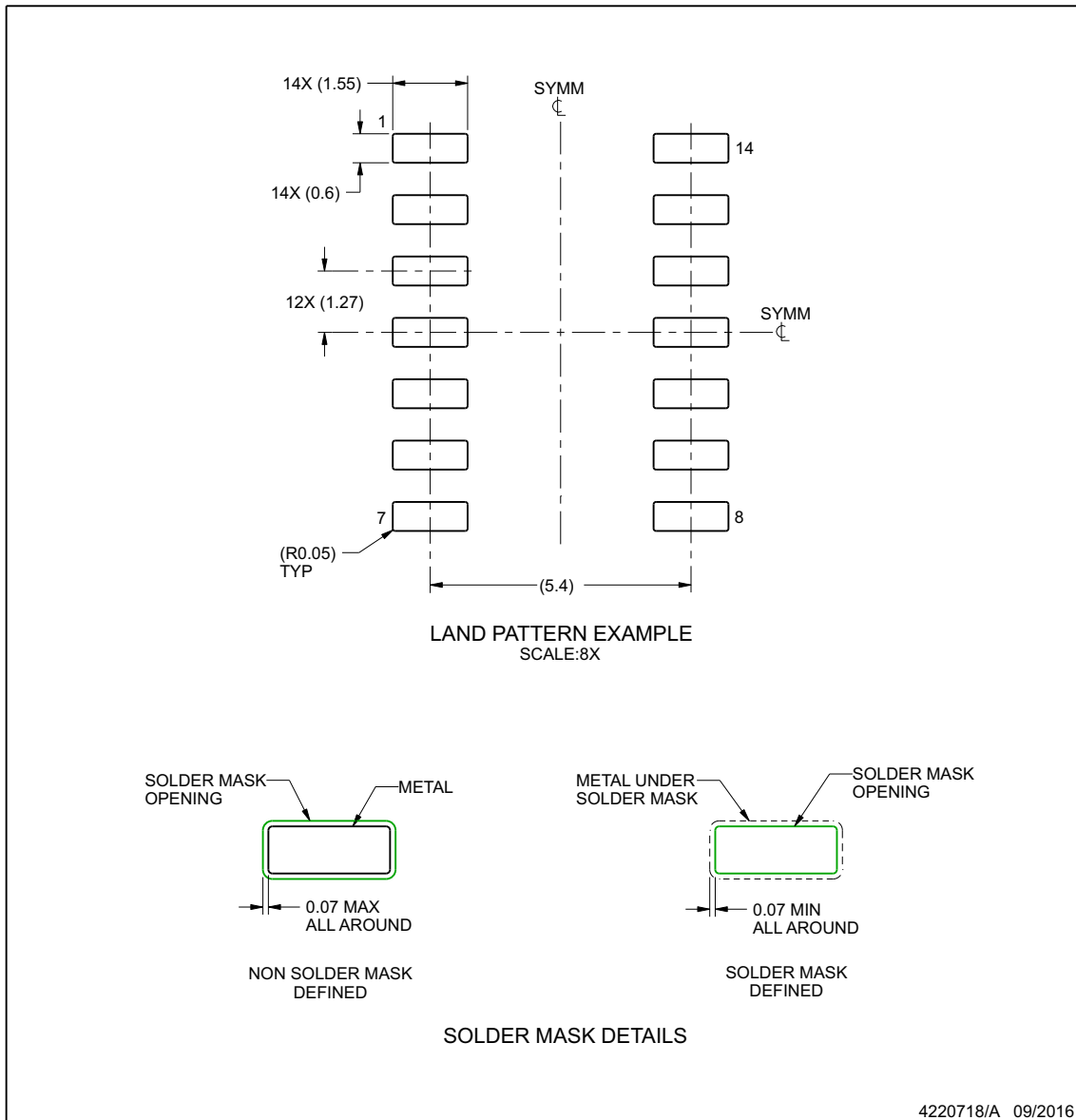
EXAMPLE BOARD LAYOUT

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

ADVANCE INFORMATION



4220718/A 09/2016

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.

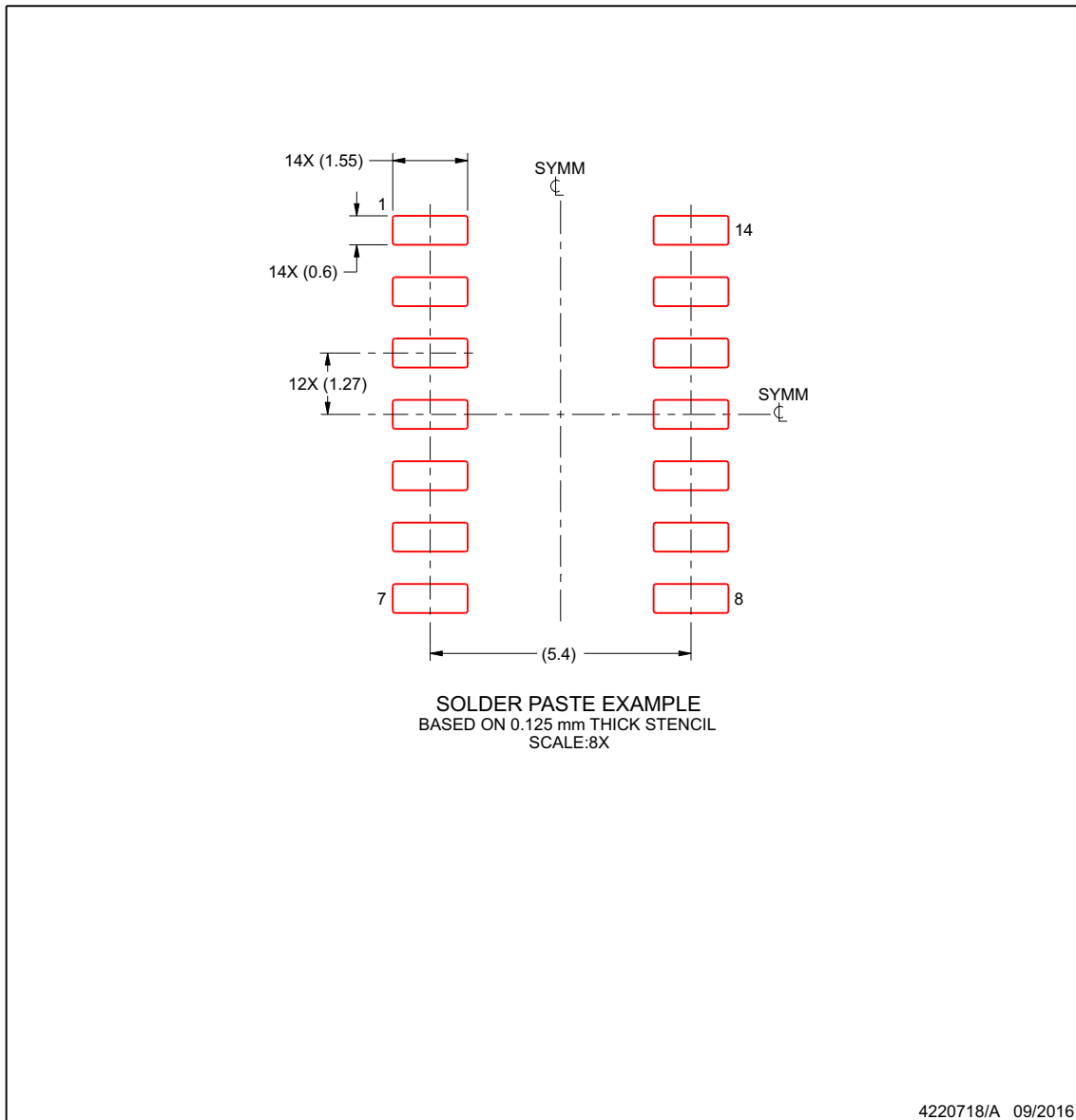
www.ti.com

EXAMPLE STENCIL DESIGN

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



NOTES: (continued)

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

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ADVANCE INFORMATION

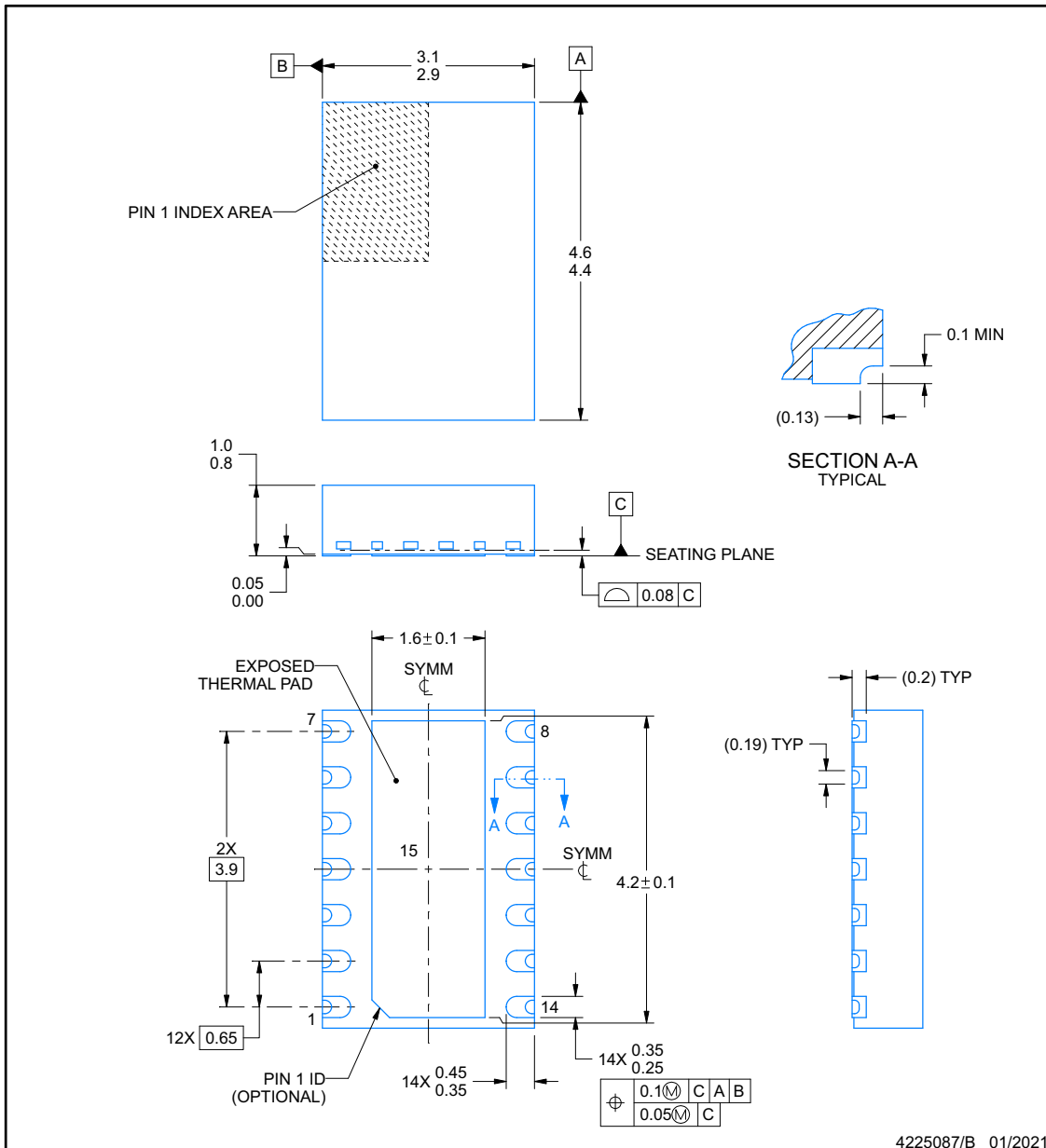


DMT0014B

PACKAGE OUTLINE
VSON - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD

ADVANCE INFORMATION



NOTES:

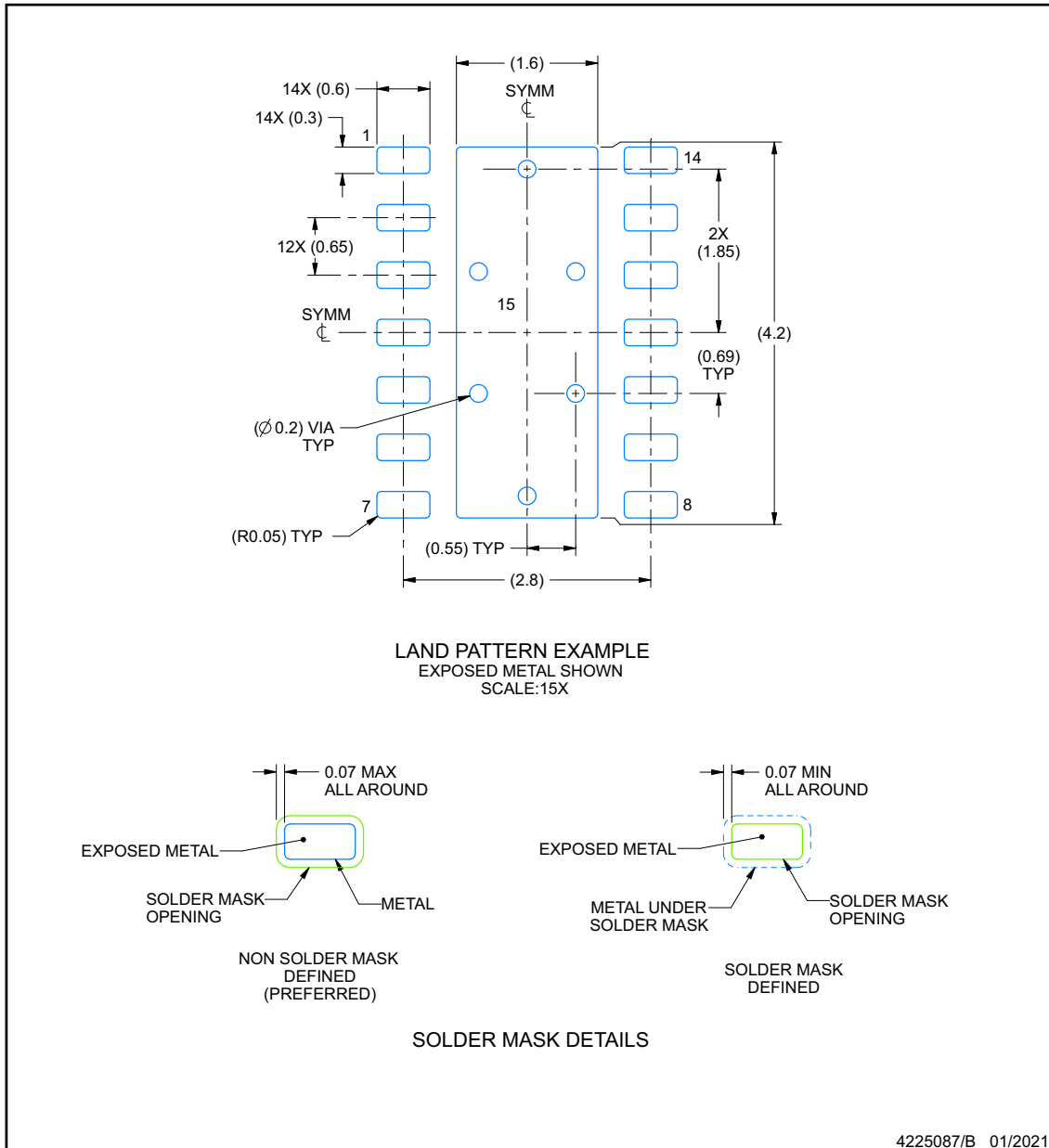
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

DMT0014B

VSON - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



NOTES: (continued)

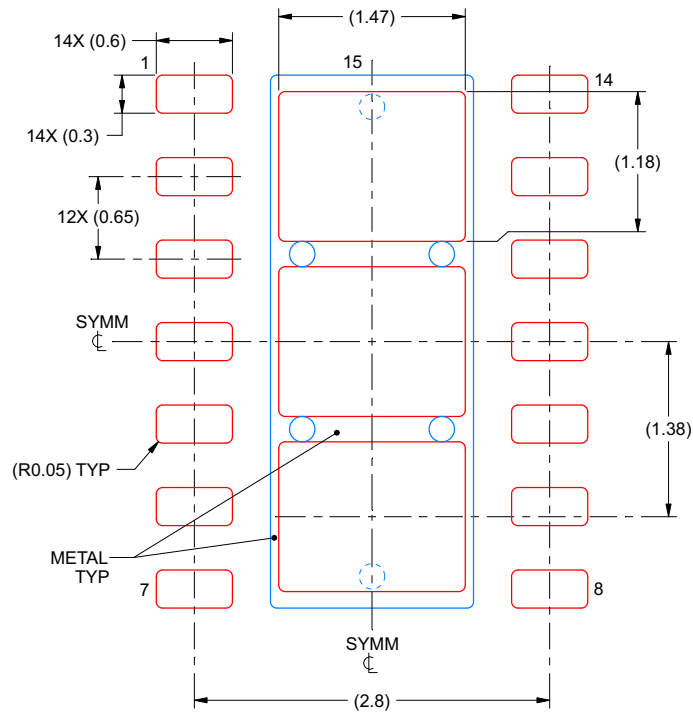
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sl原因271).
- Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

DMT0014B

VSON - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
EXPOSED PAD 15
77.4% PRINTED SOLDER COVERAGE BY AREA
SCALE:20X

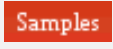
4225087/B 01/2021

NOTES: (continued)

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

ADVANCE INFORMATION

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
PTCAN1046ADMTRQ1	ACTIVE	VSON	DMT	14	3000	Non-RoHS & Non-Green	Call TI	Call TI	-40 to 150		

(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.

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) **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.

(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 finish/Ball material - Orderable Devices 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.

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