SN74AHCT1G04-Q1 車載用シングル 4.5V～5.5V インバータ、TTL 互換 CMOS 入力付き

1 特長

- 車載アプリケーション用に認定済み
- MIL-STD-883、手法 3015 に従い 1500 V を超える ESD 保護、マシン・モデルで 200V 超 (C = 200pF、R = 0)
- 動作範囲:4.5 V～5.5V
- 最大 tpd 7.5ns (5V 時)
- 低消費電力、最大 10μA の ICC
- 5V で 8mA の出力駆動
- 入力は TTL 電圧互換

2 アプリケーション

- ハイブリッド車、電気自動車、パワートレイン・システム
- 先進運転支援システム (ADAS)
- ボディ・エレクトロニクスおよびライティング
- インフォテインメントおよびクラスタ

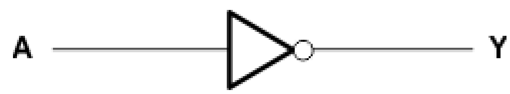
3 概要

SN74AHCT1G04-Q1 には 1 つのゲートが搭載されています。デバイスはブール関数 Y = A を実行します。

パッケージ情報

部品番号	パッケージ [1]	パッケージ・サイズ [2]
SN74AHCT1G04-Q1	DCK (SOT-SC70、5)	2.00mm × 1.25mm

1. 利用可能なすべてのパッケージについては、データシートの末尾にある注文情報を参照してください。
2. パッケージ・サイズ (長さ×幅) は公称値であり、該当する場合はピンも含まれます。



概略回路図

Table of Contents

4 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

Changes from Revision B (January 2023) to Revision C (July 2023)	Page
• Updated thermal values for DCK package from RθJA = 252 to 293.4, all values in °C/W	4

Changes from Revision A (June 2003) to Revision B (January 2023)	Page
• 「アプリケーション」セクション、「製品情報」表、「端子機能」表、「ESD 定格」表、「熱に関する情報」表、「代表的特性」セクション、「機能説明」セクション、「デバイスの機能モード」セクション、「アプリケーションと実装」セクション、「電源に関する推奨事項」セクション、「レイアウト」セクション、「デバイスおよびドキュメントのサポート」セクション、「メカニカル、パッケージ、および注文情報」セクションを追加。	1

5 Pin Configuration and Functions

図 5-1. DCK Package Top View

NC − No internal connection

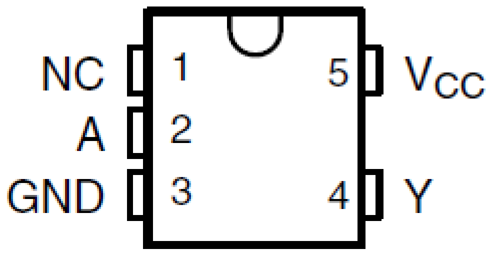


図 5-2.

表 5-1. Pin Functions

PIN		TYPE	DESCRIPTION
NO.	NAME		
1	NC	—	No Connection
2	A	I	Input A
3	GND	—	Ground Pin
4	Y	O	Output Y
5	V_{CC}	—	Power Pin

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)[(1)]

			MIN	MAX	UNIT
V_{CC}	Supply voltage		–0.5	7	V
V_I	Input voltage range[(2)]		–0.5	7	V
V_O	Output voltage range		–0.5	V_{CC} + 0.5	V
I_{IK}	Input clamp current	$V_I < 0$		–20	mA
I_{OK}	Output clamp current	$V_O < 0$ or $V_O > V_{CC}$		. ±20	mA
I_O	Continuous output current	$V_O = 0$ to V_{CC}		±25	mA
	Continuous current through V_{CC} or GND			±50	mA
T_{stg}	Storage temperature		–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *セクション 6.3* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins[(1)]	±1500	V

(1) AEC Q100-002 indicates that HBM stressing must be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)[(1)]

		MIN	MAX	UNIT
V_{CC}	Supply voltage	4.5	5.5	V
V_{IH}	High-level input voltage	2		V
V_{IL}	Low-level Input voltage		0.8	V
V_I	Input voltage	0	5.5	V
V_O	Output voltage	0	V_{CC}	V
I_{OH}	High-level output current		–8	mA
I_{OL}	Low-level output current		8	mA
$\Delta t/\Delta v$	Input Transition rise or fall rate		20	ns/V
T_A	Operating free-air temperature	–40	125	°C

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, Implications of Slow or Floating CMOS Inputs.

6.4 Thermal Information

THERMAL METRIC[(1)]		DCK (SC-70)	UNIT
		5 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	293.4	°C/W

(1) For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report.

6.5 Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	V_{CC}	T_A = 25°C			–40°C to +125°C		UNIT
			MIN	TYP	MAX	MIN	MAX	
V_{OH}	I_{OH} = –50 µA	4.5 V	4.4	4.5		4.4		V
	I_{OH} = −8 mA	4.5 V	3.94			3.8		
V_{OL}	I_{OL} = 50 µA	4.5 V			0.1		0.1	V
	I_{OL} = 8 mA	4.5 V			0.36		0.44	
I_I	V_I = 5.5 V or GND	0 V to 5.5 V			± 0.1		±1	µA
I_{CC}	V_I = V_{CC} or GND, I_O = 0	5.5 V			1		10	µA
ΔI_{CC} [1]	One input at 3.4 V, Other inputs at V_{CC} or GND	5.5 V			1.35		1.5	mA
C_i	V_I = V_{CC} or GND	5 V		4	10		10	pF

6.6 Switching Characteristics

over recommended operating free-air temperature rangee, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see load circuit and voltage wave forms)

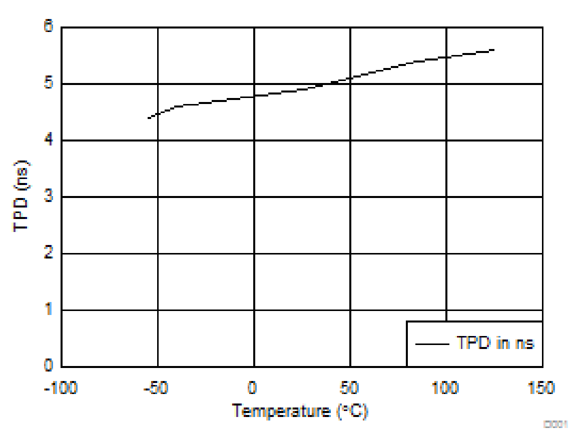
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	T_A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t_{PLH}	A	Y	C_L = 15 pF		4.7	6.7	1	7.5	ns
t_{PHL}	A	Y	C_L = 15 pF		4.7	6.7	1	7.5	
t_{PLH}	A	Y	C_L = 50 pF		5.5	7.7	1	8.5	ns
t_{PHL}	A	Y	C_L = 50 pF		5.5	7.7	1	8.5	

6.7 Operating Characteristics

V_{CC} = 5 V, T_A = 25°C

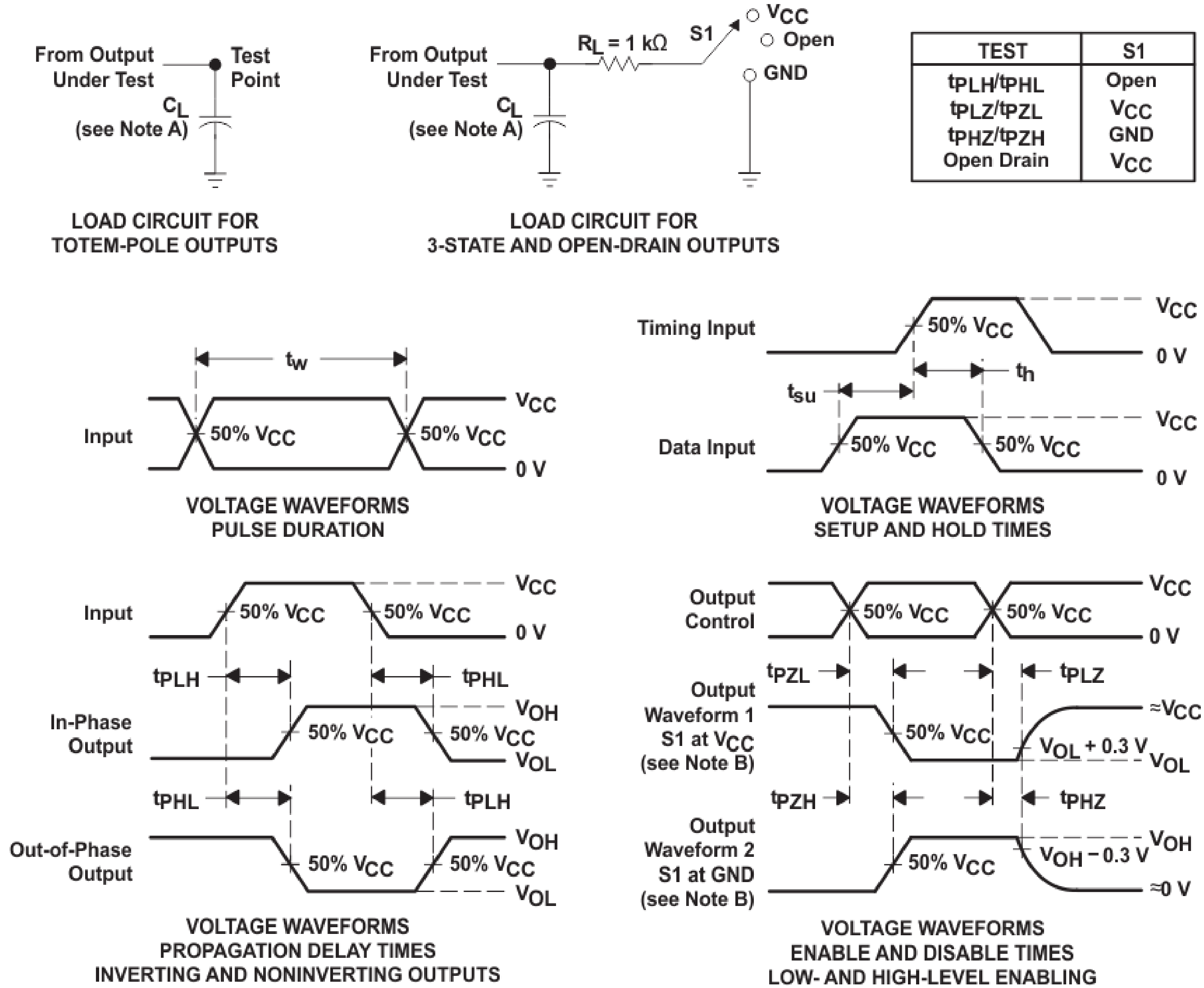
PARAMETER		TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance	No load,	f = 1 MHz	14	pF

6.8 Typical Characteristics



7 Parameter Measurement Information

7.1



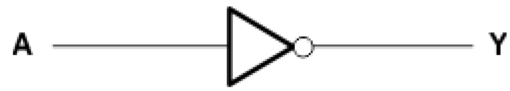
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{CC}
t_{PHZ}/t_{PZH}	GND
Open Drain	V_{CC}

NOTES:
- A. C_L includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 3 ns, t_f ≤ 3 ns.
- D. The outputs are measured one at a time, with one input transition per measurement.
- E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
- F. t_{PZL} and t_{PZH} are the same as t_{en}.
- G. t_{PHL} and t_{PLH} are the same as t_{pd}.
- H. All parameters and waveforms are not applicable to all devices.

図 7-1. Load Circuit and Voltage Waveforms

8 Detailed Description

8.1 Functional Block Diagram



8.2 Device Functional Modes

表 8-1. Function Table

INPUT	OUTPUT
A	**Y**
H	L
L	H

9 Device and Documentation Support

9.1 Documentation Support

9.1.1 Related Documentation

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

表 9-1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN74AHCT1G04-Q1	Click here	Click here	Click here	Click here	Click here

9.2 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、ti.com のデバイス製品フォルダを開いてください。「更新の通知を受け取る」をクリックして登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取れます。変更の詳細については、修正されたドキュメントに含まれている改訂履歴をご覧ください。

9.3 サポート・リソース

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ESD による破損は、わずかな性能低下からデバイスの完全な故障まで多岐にわたります。精密な IC の場合、パラメータがわずかに変化するだけで公表されている仕様から外れる可能性があるため、破損が発生しやすくなっています。

9.6 用語集

テキサス・インスツルメンツ用語集	この用語集には、用語や略語の一覧および定義が記載されています。

10 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 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
CAHCT1G04QDCKRG4Q1	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	BCS	Samples
CAHCT1G04QDCKRQ1	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	BCS	Samples

(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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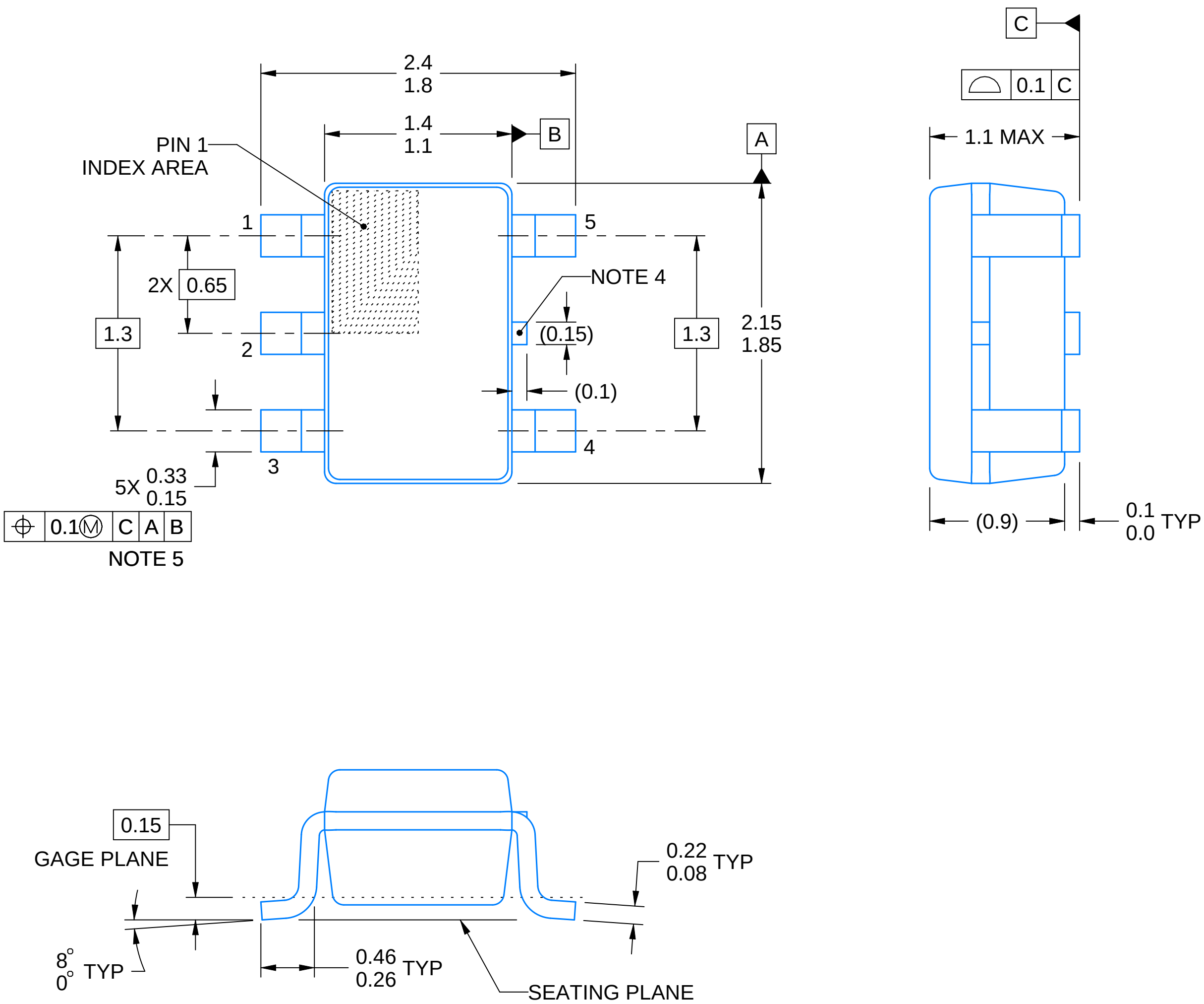
OTHER QUALIFIED VERSIONS OF SN74AHCT1G04-Q1 :

- Catalog : SN74AHCT1G04

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product



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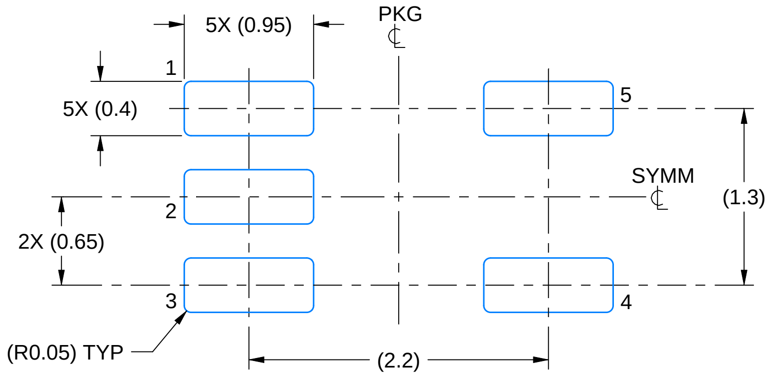
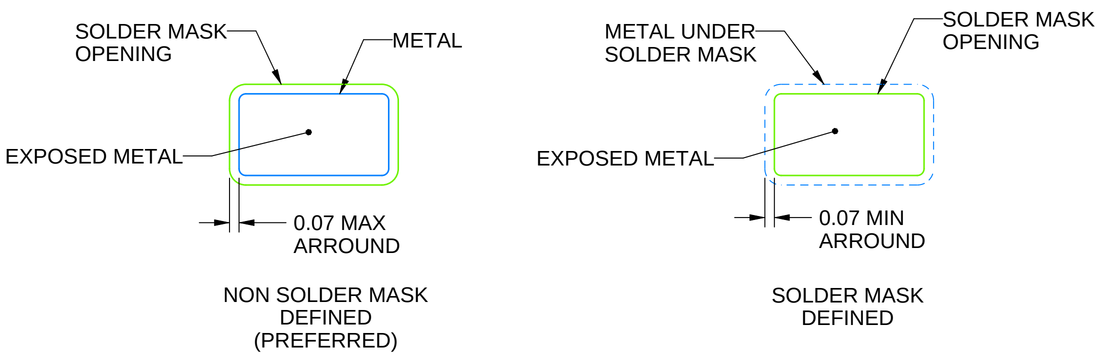
NOTES:

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. Refernce JEDEC MO-203.
4. Support pin may differ or may not be present.
5. Lead width does not comply with JEDEC.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:18X



SOLDER MASK DETAILS

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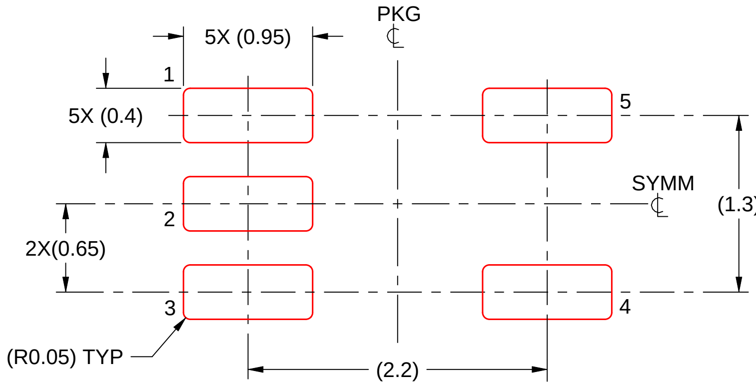
NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 THICK STENCIL
SCALE:18X

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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.

重要なお知らせと免責事項