

SN74AHCT1G125-Q1 車載対応、シングル・バス・バッファ・ゲート、3 ステート出力搭載

1 特長

- 車載アプリケーション向け認定済み
- 動作範囲: 3V~5.5V
- 最大 t_{pd} 6ns (5V 時)
- 低消費電力、最大 I_{CC} 10 μ A
- 5V で ± 8 mA の出力駆動能力
- 入力は TTL 電圧互換

2 アプリケーション

- デジタル信号のイネーブルまたはディセーブル
- インジケータ LED の制御
- 通信モジュールとシステム・コントローラの間の変換

3 概要

SN74AHCT1G125-Q1 は、3 ステート出力を搭載したシングル・バス・バッファ・ゲート / ライン・ドライバです。出力イネーブル (\overline{OE}) 入力が High になると、出力はディセーブルされます。 \overline{OE} が Low の場合、真のデータが A 入力から Y 出力に渡されます。

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⁾	本体サイズ ⁽³⁾
SN74AHCT1G125-Q1	DBV (SOT-23, 5)	2.8mm × 2.8mm	2.9mm × 1.6mm
	DCK (SC70, 5)	2.0mm × 2.1mm	2mm × 1.25mm
	DTX (X2SON, 5)	1.1mm × 0.85	0.85mm × 1.1mm

- (1) 利用可能なパッケージについては、この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。
- (3) 本体サイズ (長さ×幅) は公称値であり、ピンは含まれません。

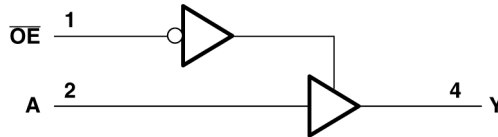


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4 Revision History

Changes from Revision C (July 2023) to Revision D (October 2023)	Page
• 「アプリケーション」セクションを追加	1
• 「パッケージ情報」表に DBV および DTX パッケージを追加	1
• Added DBV and DTX packages to <i>Pin Configuration and Functions</i> section.....	3
• Updated R θ JA values: DBV = 278.0, DTX = 184.7, all values in °C/W	5
• Added <i>Application and Implementation</i> section.....	9
Changes from Revision B (January 2008) to Revision C (July 2023)	Page
• 「パッケージ情報」表、「ピンの機能」表、「ESD 定格」表、「熱に関する情報」表、「デバイスの機能モード」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
• Updated thermal values for DCK package from R θ JA = 252 to 293.4, all values in °C/W	5

5 Pin Configuration and Functions

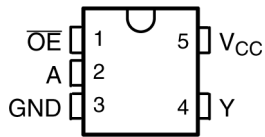


図 5-1. DBV Package, 5-Pin SOT-23; DCK Package (Top View)

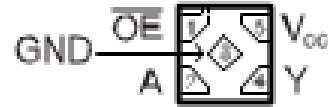


図 5-2. DTX Package, 5-Pin X2SON (Top View)

表 5-1. Pin Functions

PIN		TYPE ⁽¹⁾	DESCRIPTION
NO.	NAME		
1	\overline{OE}	I	Output Enable
2	A	I	Input A
3	GND	—	Ground Pin
4	Y	O	Output Y
5	V_{CC}	—	Power Pin

(1) Signal Types: I = Input, O = Output, I/O = Input or Output

6 Specifications

6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	7	V
V _I ⁽²⁾	Input voltage range	-0.5	7	V
V _O ⁽²⁾	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 range	-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 “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output 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 AEC Q100-002 ⁽¹⁾	±2000 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	3	5.5	V
V _{IH}	High-level input voltage	V _{CC} = 3.0 V	1.4	V
		V _{CC} = 4.5 V to 5.5 V	2	
V _{IL}	Low-level input voltage	V _{CC} = 3.0 V	0.53	V
		V _{CC} = 4.5 V to 5.5 V	0.8	
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
Δt/Δv	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 for specified device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

6.4 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74AHCT1G125-Q1			UNIT
		DBV (SOT-23)	DCK (SC-70)	DTX (X2SON)	
		5	5	5	
R _{θJA}	Junction-to-ambient thermal resistance	278.0	293.4	184.7	°C/W

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report (SPRA953).

6.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V _{OH}	I _{OH} = -50 μA	3 V	2.9	3		2.9	V	
		4.5 V	4.4	4.5		4.4		
	I _{OH} = -4 mA	3 V	2.58			2.34		
		4.5 V	3.94			3.66		
V _{OL}	I _{OL} = 50 μA	3 V and 4.5 V	0.1			0.1	V	
	I _{OL} = 4 mA	3 V	0.36			0.52		
	I _{OL} = 8 mA	4.5 V	0.36			0.52		
I _I	V _I = 5.5 V or GND	0 V to 5.5 V	±0.1			±1	μA	
I _{OZ}	V _O = V _{CC} or GND	5.5 V	±0.25			±2.5	μA	
I _{CC}	V _I = V _{CC} or GND, I _O = 0, OE high or low	3 V and 5.5 V	1			10	μA	
ΔI _{CC} ⁽¹⁾	One input at 3.4 V, Other input 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	
C _o	V _O = V _{CC} or GND	5 V	10					pF

(1) This is the increase in supply current for each input at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

6.6 Switching Characteristics, $V_{CC} = 3\text{ V} \pm 0.3\text{ V}$

over recommended operating free-air temperature range, $V_{CC} = 3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
				MIN	TYP	MAX			
t_{PLH}	A	Y	$C_L = 15\text{ pF}$		5.6	8		12	ns
t_{PHL}					5.6	8		12	
t_{PZH}	$\overline{\text{OE}}$	Y	$C_L = 15\text{ pF}$		5.4	8		11.5	ns
t_{PZL}					5.4	8		11.5	
t_{PHZ}	$\overline{\text{OE}}$	Y	$C_L = 15\text{ pF}$		6.5	9.7		14.5	ns
t_{PLZ}					6.5	9.7		14.5	
t_{PLH}	A	Y	$C_L = 50\text{ pF}$		8.1	11.5		16	ns
t_{PHL}					8.1	11.5		16	
t_{PZH}	$\overline{\text{OE}}$	Y	$C_L = 50\text{ pF}$		7.9	11.5		15	ns
t_{PZL}					7.9	11.5		15	
t_{PHZ}	$\overline{\text{OE}}$	Y	$C_L = 50\text{ pF}$		8	13.2		18	ns
t_{PLZ}					8	13.2		18	

6.7 Switching Characteristics, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

over recommended operating free-air temperature range, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

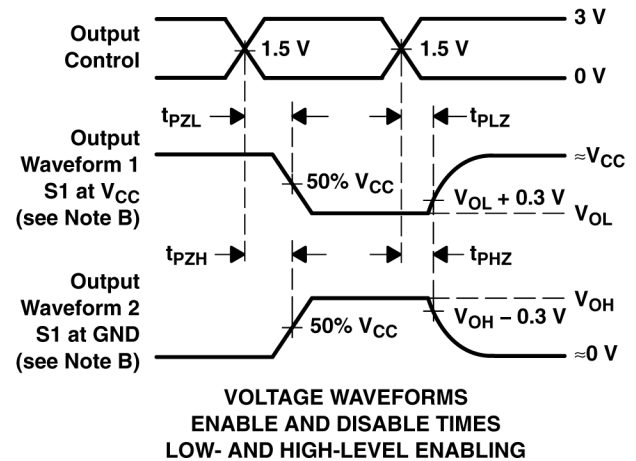
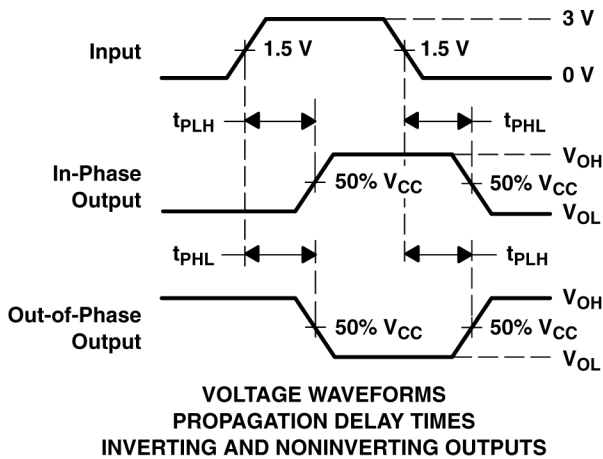
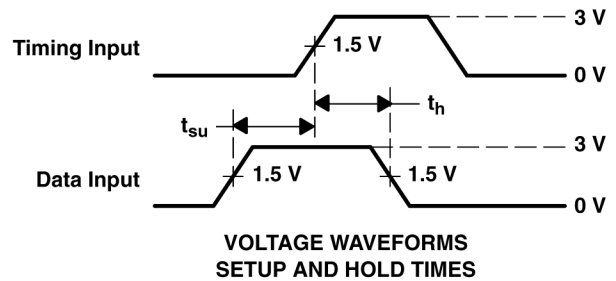
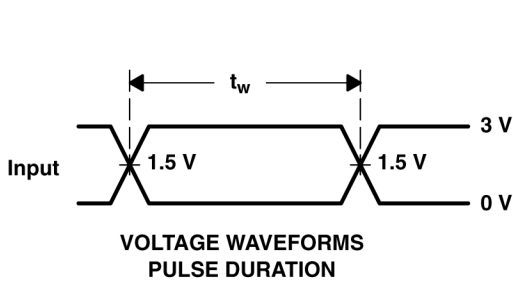
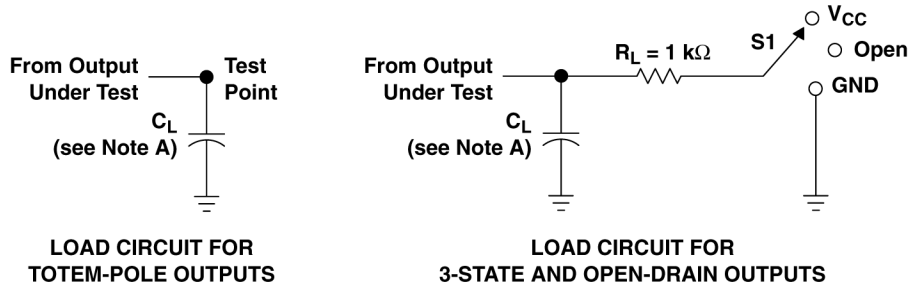
PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
				MIN	TYP	MAX			
t_{PLH}	A	Y	$C_L = 15\text{ pF}$		3.8	5.5		8.5	ns
t_{PHL}					3.8	5.5		8.5	
t_{PZH}	$\overline{\text{OE}}$	Y	$C_L = 15\text{ pF}$		3.6	5.1		7.5	ns
t_{PZL}					3.6	5.1		7.5	
t_{PHZ}	$\overline{\text{OE}}$	Y	$C_L = 15\text{ pF}$		4.8	6.8		10	ns
t_{PLZ}					4.8	6.8		10	
t_{PLH}	A	Y	$C_L = 50\text{ pF}$		5.3	7.5		10.5	ns
t_{PHL}					5.3	7.5		10.5	
t_{PZH}	$\overline{\text{OE}}$	Y	$C_L = 50\text{ pF}$		5.1	7.1		9.5	ns
t_{PZL}					5.1	7.1		9.5	
t_{PHZ}	$\overline{\text{OE}}$	Y	$C_L = 50\text{ pF}$		7	8.8		12	ns
t_{PLZ}					7	8.8		12	

6.8 Operating Characteristics

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

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

7 Parameter Measurement Information



- C_L includes probe and jig capacitance.
- 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.
- All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 3 \text{ ns}$, $t_f \leq 3 \text{ ns}$.
- The outputs are measured one at a time with one input transition per measurement.
- All parameters and waveforms are not applicable to all devices.

图 7-1. Load Circuit and Voltage Waveforms

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

8 Detailed Description

8.1 Overview

For specified high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

8.2 Functional Block Diagram

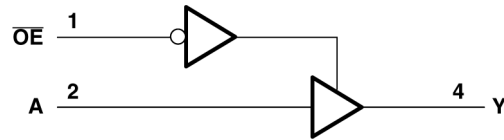


図 8-1. Logic Diagram (Positive Logic)

8.3 Device Functional Modes

表 8-1. Function Table

INPUTS		OUTPUT
\overline{OE}	A	Y
L	H	H
L	L	L
H	X	Z

9 Application and Implementation

注

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9.1 Application Information

In this application, three 2-input AND gates are combined to produce a 4-input AND gate function as shown in [Figure 9-1](#). The fourth gate can be used for another application in the system, or the inputs can be grounded and the channel left unused.

The SN74AHCT1G125-Q1 is used to directly control the $\overline{\text{RESET}}$ pin of a motor controller. The controller requires four input signals to all be HIGH before being enabled, and should be disabled in the event that any one signal goes LOW. The 4-input AND gate function combines the four individual reset signals into a single active-low reset signal.

9.2 Typical Application

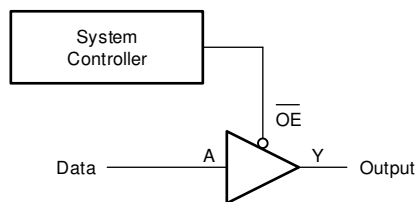


図 9-1. Typical Application Block Diagram

9.3 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- μF capacitor is recommended for this device. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. The 0.1- μF and 1- μF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results, as shown in the following layout example.

9.4 Layout

9.4.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices, inputs must never be left floating. In many cases, functions or parts of functions of digital logic devices are unused (for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used). Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or V_{CC} , whichever makes more sense for the logic function or is more convenient.

9.4.2 Layout Example

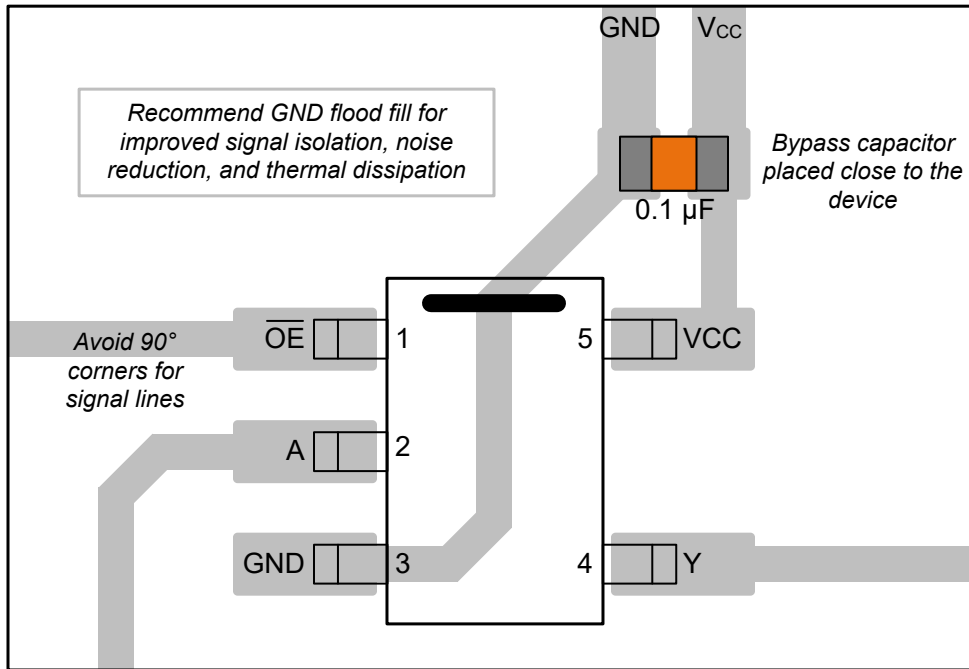


図 9-2. Example Layout for the SN74AHCT1G125-Q1

10 Device and Documentation Support

10.1 Documentation Support (Analog)

10.1.1 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 10-1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN74AHCT1G125-Q1	Click here	Click here	Click here	Click here	Click here

10.2 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、www.tij.co.jp のデバイス製品フォルダを開いてください。[通知] 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ることができます。変更の詳細については、改訂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。

10.3 サポート・リソース

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10.4 Trademarks

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10.5 静電気放電に関する注意事項



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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。

10.6 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。

11 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
CAHCT1G125QDBVRQ1	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	SN	Level-1-260C-UNLIM	-40 to 125	37PH	Samples
CAHCT1G125QDCKRG4Q	ACTIVE	SC70	DCK	5	3000	RoHS & Green	Call TI NIPDAU	Level-1-260C-UNLIM	-40 to 125	BMS	Samples
CAHCT1G125QDCKRQ1	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	BMS	Samples
PCAHCT1G125QDTRQ1	ACTIVE	X2SON	DTX	5	3000	TBD	Call TI	Call TI	-40 to 125		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.

OBSELETE: 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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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN74AHCT1G125-Q1 :

- Catalog : [SN74AHCT1G125](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

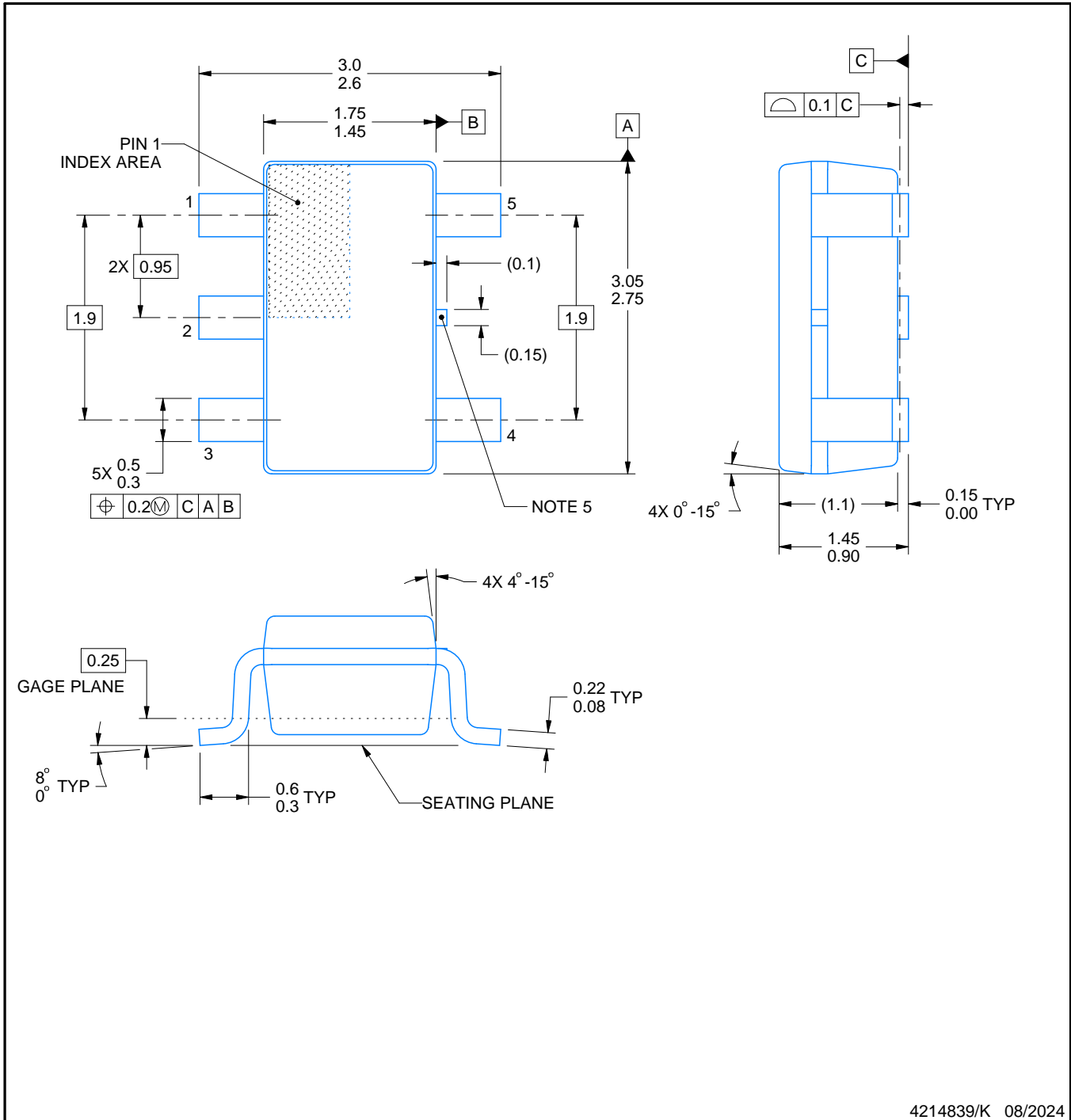

*All dimensions are nominal

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
CAHCT1G125QDBVRQ1	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CAHCT1G125QDBVRQ1	SOT-23	DBV	5	3000	210.0	185.0	35.0



4214839/K 08/2024

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. Reference JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
5. Support pin may differ or may not be present.

EXAMPLE BOARD LAYOUT

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



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.

EXAMPLE STENCIL DESIGN

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

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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.

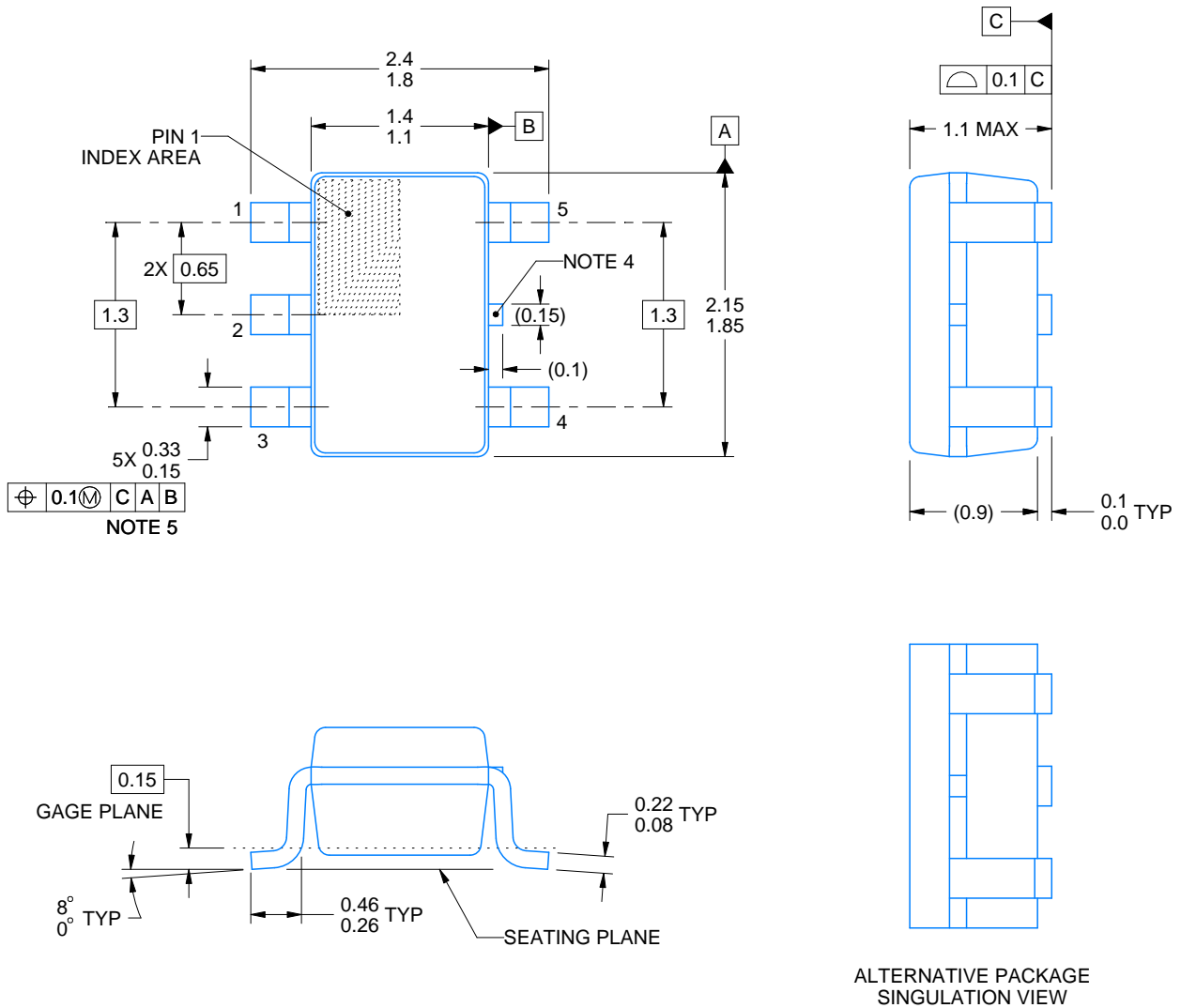
DCK0005A



PACKAGE OUTLINE

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



4214834/E 06/2024

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. Reference JEDEC MO-203.
4. Support pin may differ or may not be present.
5. Lead width does not comply with JEDEC.
6. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side

EXAMPLE BOARD LAYOUT

DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:18X



SOLDER MASK DETAILS

4214834/E 06/2024

NOTES: (continued)

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

EXAMPLE STENCIL DESIGN

DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



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

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NOTES: (continued)

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

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