

## SNx4AHCT04 六路反相器

### 1 特性

- 输入兼容 TTL 电压
- 闩锁性能超过 250mA，符合 JESD 17 规范
- 对于符合 MIL-PRF-38535 标准的产品，所有参数均经过测试，除非另有说明。对于所有其他产品，生产流程不一定包含对所有参数的测试。

### 2 应用

- 服务器
- 网络交换机
- 电信基础设施
- 测试和测量

### 3 说明

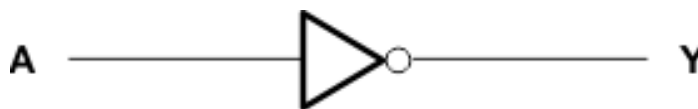
SNx4AHCT04 器件包含六个独立的反相器。这些器件执行布尔函数  $Y = \bar{A}$ 。

#### 封装信息

器件型号	封装 <sup>(1)</sup>	封装尺寸 (标称值) <sup>(2)</sup>
SN54AHCT04	J (CDIP, 14)	19.56mm x 6.67mm
	W (CFP, 14)	13.09mm x 6.92mm
	FK (LCCC, 20)	8.89mm x 8.89mm
SN74AHCT04	N (PDIP, 14)	19.3mm x 6.35mm
	D (SOIC, 14)	8.65mm x 3.91mm
	NS (SOP, 14)	10.30mm x 5.30mm
	DB (SSOP, 14)	6.20mm x 5.30mm
	PW (TSSOP, 14)	5.00mm x 4.40mm
	DGV (TVSOP, 14)	3.60mm x 4.40mm
	RGY (VQFN, 14)	3.50mm x 3.50mm
BQA (WQFN, 14)	3.00mm x 2.50mm	

(1) 更多相关信息，请参阅第 11 节。

(2) 封装尺寸 (长 × 宽) 为标称值，不包括引脚。



简化版原理图



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## 4 Pin Configuration and Functions

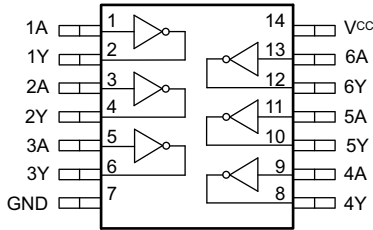


图 4-1. SN54AHCT04 J 或 W 封装, 14 引脚 (顶视图)  
SN74AHCT04 D, DB, DGV, N, NS, 或 PW 封装, 14 引脚 (顶视图)

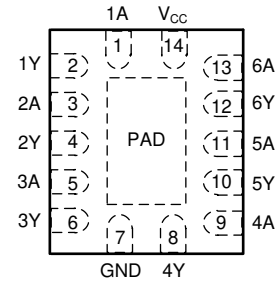


图 4-2. SN74AHCT04 RGY 或 BQA 封装, 14 引脚 (顶视图)

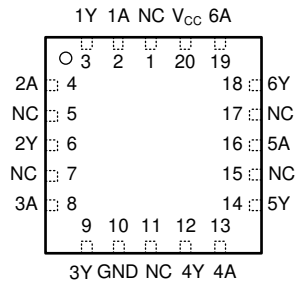


图 4-3. SN54AHCT04 FK 封装, 20 引脚 (顶视图)

表 4-1. Pin Functions

NAME	PIN				TYPE <sup>(1)</sup>	DESCRIPTION
	SN74AHCT04		SN54AHCT04			
	D, DB, DGV, N, NS, PW	RGY, BQA	J, W	FK		
1A	1	1	1	2	I	1A Input
1Y	2	2	2	3	O	1Y Output
2A	3	3	3	4	I	2A Input
2Y	4	4	4	6	O	2Y Output
3A	5	5	5	8	I	3A Input
3Y	6	6	6	9	O	3Y Output
4A	9	9	9	13	I	4A Input
4Y	8	8	8	12	O	4Y Output
5A	11	11	11	16	I	5A Input
5Y	10	10	10	14	I	5Y Output
6A	13	13	13	19	I	6A Input
6Y	12	12	12	18	O	6Y Output
GND	7	7	7	10	—	Ground Pin
NC	—	—	—	1, 5, 7, 11, 15, 17	—	No Connection
V <sub>CC</sub>	14	14	14	20	—	Power Pin
Thermal Pad	—	PAD	—	—	—	Thermal Pad

(1) I = input, O = output

## 5 Specifications

### 5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range	- 0.5	7	V
V <sub>I</sub>	Input voltage range <sup>(2)</sup>	- 0.5	7	V
V <sub>O</sub>	Output voltage range <sup>(2)</sup>	- 0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0	- 20	mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub>	±20	mA
I <sub>O</sub>	Continuous output current	V <sub>O</sub> = 0 to V <sub>CC</sub>	±25	mA
	Continuous current through V <sub>CC</sub> or GND		±50	mA
T <sub>stg</sub>	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, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. 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.

### 5.2 ESD Ratings

		Value	UNIT
V <sub>(ESD)</sub>	Electrostatic discharge		
	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>	±2000	V
	Charged device model (CDM), per ANSI/ESDA/JEDEC JS-002, all pins <sup>(2)</sup>	±1000	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

### 5.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

		SN54AHCT04		SN74AHCT04		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.5	4.5	5.5	V
V <sub>IH</sub>	High-level input voltage	2		2		V
V <sub>IL</sub>	Low-level input voltage		0.8	0	0.8	V
V <sub>I</sub>	Input voltage	0	5.5	0	5.5	V
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current		- 8		- 8	mA
I <sub>OL</sub>	Low-level output current		8		8	mA
Δt/Δv	Input transition rise or fall rate		20		20	ns/V
T <sub>A</sub>	Operating free-air temperature	- 55	125	- 40	125	°C

(1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI Application Report, *Implications of Slow or Floating CMOS Inputs*, (SCBA004).

## 5.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74AHCT04								UNIT
		D	DB	DGV	N	NS	PW	RGY	BQA	
		14 PINS								
$R_{\theta JA}$	Junction-to-ambient thermal resistance	124.5	113.1	138.7	61.1	120.9	147.7	63.7	88.3	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	78.8	65.6	60.6	48.0	78.2	77.4	77.6	90.9	
$R_{\theta JB}$	Junction-to-board thermal resistance	81	60.4	71.8	41.0	81.6	90.9	39.7	56.8	
$\psi_{JT}$	Junction-to-top characterization parameter	37	25.5	10.6	32.4	42.8	27.2	5.7	9.9	
$\psi_{JB}$	Junction-to-board characterization parameter	80.6	59.9	71.1	40.9	81.1	90.2	39.9	56.7	
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	N/A	N/A	N/A	19.9	33.4	

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

## 5.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54AHCT04		SN74AHCT04		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$V_{OH}$	$I_{OH} = -50 \mu\text{A}$	4.5 V	4.4	4.5		4.4		4.4	V	
	$I_{OH} = -8 \text{mA}$		3.94			3.8		3.8		
$V_{OL}$	$I_{OL} = 50 \mu\text{A}$	4.5 V			0.1		0.1	0.1	V	
	$I_{OL} = 8 \text{mA}$				0.36		0.44	0.44		
$I_I$	$V_I = 5.5 \text{V}$ or GND	0 V to 5.5 V			$\pm 0.1$		$\pm 1^{(1)}$	$\pm 1$	$\mu\text{A}$	
$I_{CC}$	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			2		20	20	$\mu\text{A}$	
$\Delta I_{CC}^{(2)}$	One input at 3.4 V, Other inputs at $V_{CC}$ or GND	5.5 V			1.35		1.5	1.5	mA	
$C_i$	$V_I = V_{CC}$ or GND	5 V			4	10		10	pF	

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested at  $V_{CC} = 0 \text{V}$ .

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

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

over recommended operating free-air temperature range (unless otherwise noted) (see 图 6-1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	$T_A = 25^\circ\text{C}$			SN54AHCT04		SN74AHCT04		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	Y	$C_L = 15 \text{pF}$	4.7 <sup>(1)</sup>	6.7 <sup>(1)</sup>		1 <sup>(1)</sup>	7.5 <sup>(1)</sup>	1	7.5	ns
$t_{PHL}$				4.7 <sup>(1)</sup>	6.7 <sup>(1)</sup>		1 <sup>(1)</sup>	7.5 <sup>(1)</sup>	1	7.5	
$t_{PLH}$	A	Y	$C_L = 50 \text{pF}$	5.5	7.7		1	8.5	1	8.5	ns
$t_{PHL}$				5.5	7.7		1	8.5	1	8.5	

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### 5.7 Noise Characteristics

$V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$ <sup>(1)</sup>

PARAMETER		SN74AHCT04			UNIT
		MIN	TYP	MAX	
$V_{OL(P)}$	Quiet output, maximum dynamic $V_{OL}$		0.8		V
$V_{OL(V)}$	Quiet output, minimum dynamic $V_{OL}$		-0.8		V
$V_{OH(V)}$	Quiet output, minimum dynamic $V_{OH}$		4.7		V
$V_{IH(D)}$	High-level dynamic input voltage	2			V
$V_{IL(D)}$	Low-level dynamic input voltage			0.8	V

(1) Characteristics are for surface-mount packages only.

### 5.8 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

### 5.9 Typical Characteristics

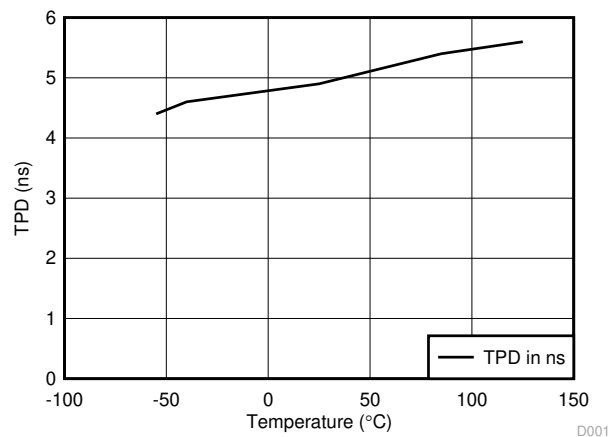
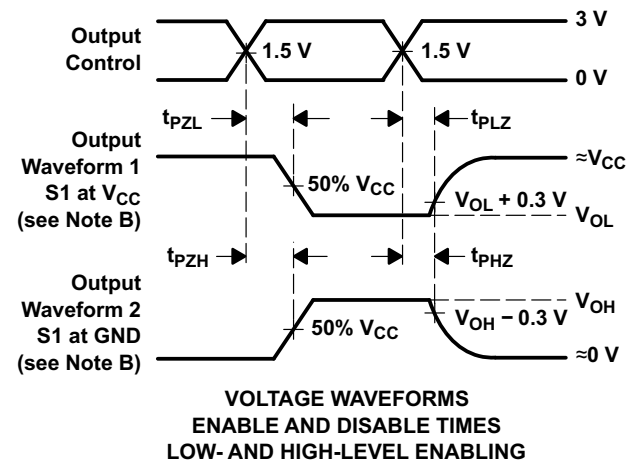
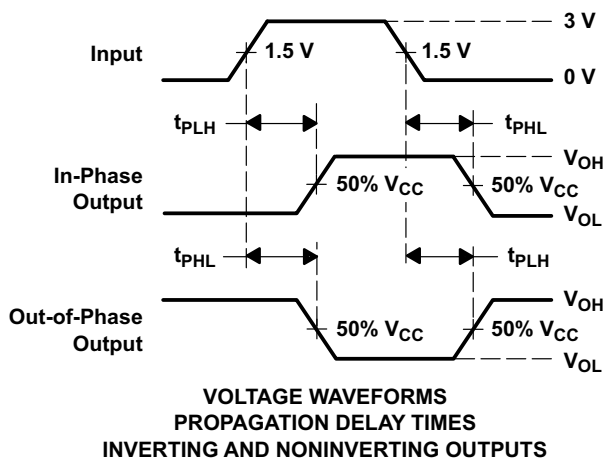
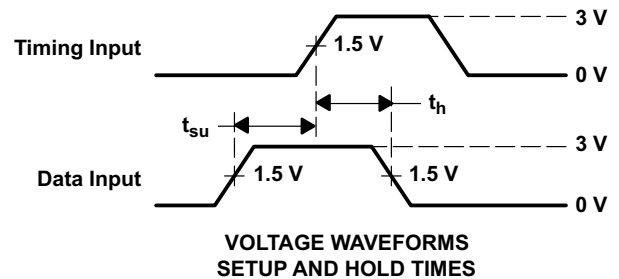
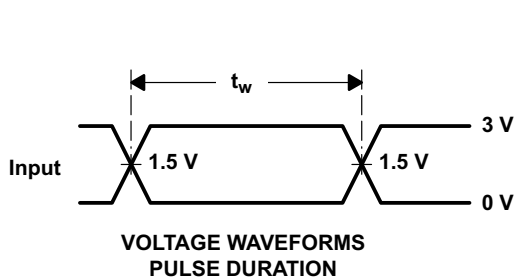
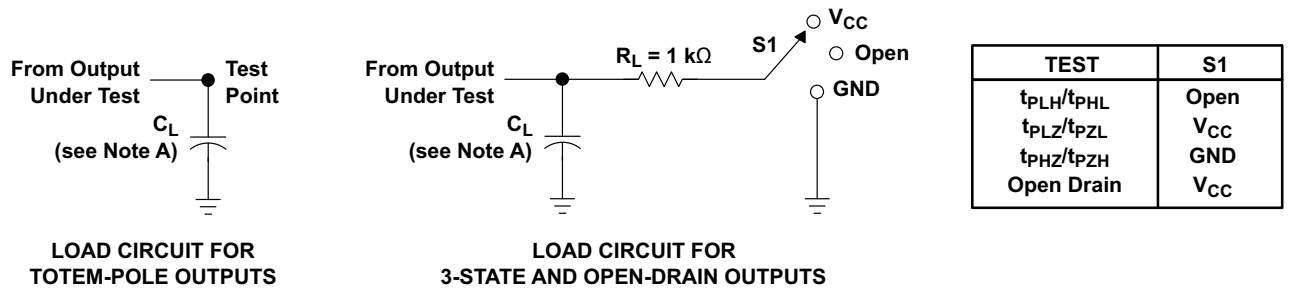


图 5-1. TPD vs Temperature

## 6 Parameter Measurement Information



- 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:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r \leq 3$  ns,  $t_f \leq 3$  ns.  
 D. The outputs are measured one at a time with one input transition per measurement.  
 E. All parameters and waveforms are not applicable to all devices.

图 6-1. Load Circuit and Voltage Waveforms

## 7 Detailed Description

### 7.1 Overview

The SNx4AHCT04 devices contain six independent inverters. These devices have TTL input levels that allow up translation from 3.3 V to 5 V.

### 7.2 Functional Block Diagram



### 7.3 Feature Description

- $V_{CC}$  is optimized at 5 V
- Allows up voltage translation from 3.3 V to 5 V
  - Inputs Accept  $V_{IH}$  levels of 2 V
- Slow edge rates minimize output ringing
- Inputs are TTL-voltage compatible

### 7.4 Device Functional Modes

表 7-1. Function Table  
(Each Inverter)

INPUT A	OUTPUT Y
H	L
L	H



## 8 Application and Implementation

### 备注

以下应用部分中的信息不属于 TI 器件规格的范围，TI 不担保其准确性和完整性。TI 的客户应负责确定器件是否适用于其应用。客户应验证并测试其设计，以确保系统功能。

### 8.1 Application Information

The SNx4AHCT04 is a low-drive CMOS device that can be used for a multitude of inverting type applications where output ringing is a concern. The low drive and slow edge rates will minimize overshoot and undershoot on the outputs. The input switching levels have been lowered to accommodate TTL inputs of  $0.8\text{-V } V_{IL}$  and  $2\text{-V } V_{IH}$ . This feature makes it ideal for translating up from 3.3 V to 5 V. 图 8-1 和 图 8-2 显示这种类型的翻译。

### 8.2 Typical Application

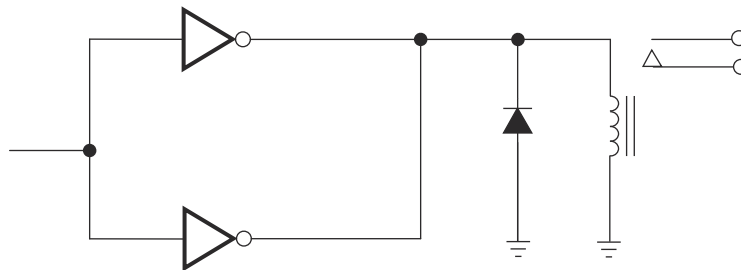


图 8-1. Driving Relays

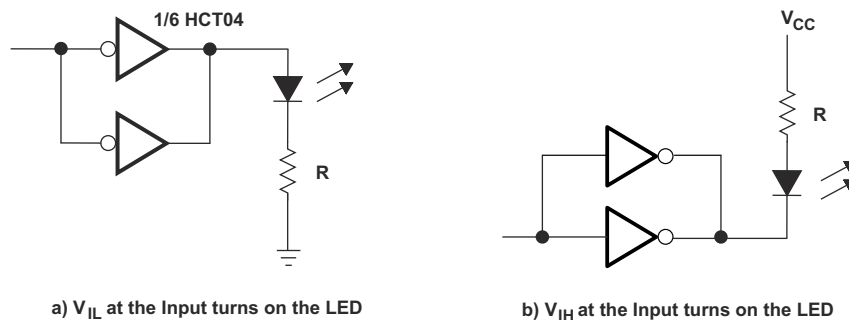


图 8-2. Driving LEDs

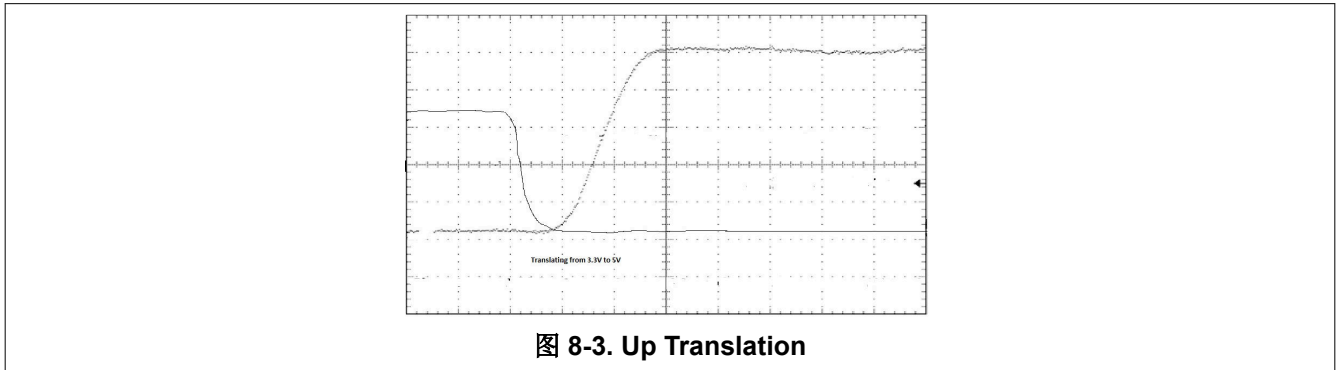
#### 8.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads, so routing and load conditions should be considered to prevent ringing.

#### 8.2.2 Detailed Design Procedure

- Recommended input conditions
  - Rise time and fall time specs: See  $(\Delta t / \Delta V)$  in the [Recommended Operating Conditions](#) table.
  - Specified High and low levels: See  $(V_{IH}$  and  $V_{IL})$  in the [Recommended Operating Conditions](#) table.
- Recommend output conditions
  - Load currents should not exceed 25 mA per output and 50 mA total for the part
  - Outputs should not be pulled above  $V_{CC}$

### 8.2.3 Application Curves



### 8.3 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the [Recommended Operating Conditions](#) table.

Each  $V_{CC}$  pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply,  $0.1 \mu\text{F}$  is recommended. If there are multiple  $V_{CC}$  pins,  $0.01 \mu\text{F}$  or  $0.022 \mu\text{F}$  is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A  $0.1 \mu\text{F}$  and  $1 \mu\text{F}$  are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

### 8.4 Layout

#### 8.4.1 Layout Guidelines

When using multiple bit logic devices inputs should not ever float.

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 input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. [#none#](#) shows the rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or  $V_{CC}$ ; whichever makes more sense or is more convenient. It is generally acceptable to float outputs unless the part is a transceiver. If the transceiver has an output enable pin, it will disable the outputs section of the part when asserted. This will not disable the input section of the IOs, so they cannot float when disabled.

### 8.4.2 Layout Example

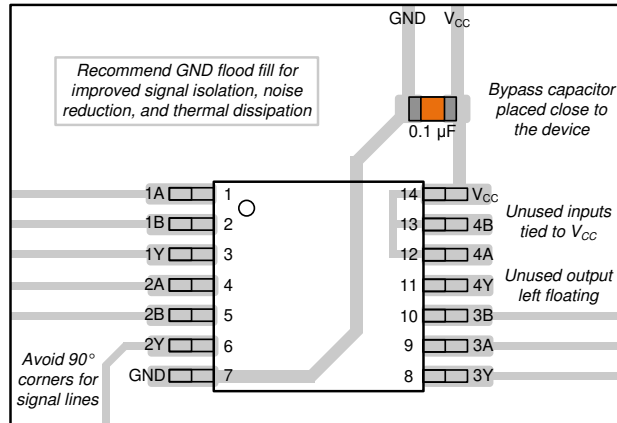


图 8-4. Example Layout for the SN74AHCT04

## 9 Device and Documentation Support

### 9.1 Documentation Support (Analog)

#### 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
SN54AHCT04	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>
SN74AHCT04	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>	<a href="#">Click here</a>

#### 9.2 接收文档更新通知

要接收文档更新通知，请导航至 [ti.com](https://www.ti.com) 上的器件产品文件夹。点击 [通知](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

#### 9.3 支持资源

TI E2E™ [中文支持论坛](#) 是工程师的重要参考资料，可直接从专家处获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题，获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的 [使用条款](#)。

#### 9.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

#### 9.5 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

#### 9.6 术语表

[TI 术语表](#) 本术语表列出并解释了术语、首字母缩略词和定义。

## 10 Revision History

注：以前版本的页码可能与当前版本的页码不同

### Changes from Revision Q (October 2023) to Revision R (February 2024) Page

- Updated thermal values for NS package from R<sup>θ</sup> JA = 98.6 to 120.9, R<sup>θ</sup> JC(top) = 54.1 to 78.2, R<sup>θ</sup> JB = 57.4 to 81.6, ΨJT = 19.6 to 42.8, ΨJB = 57.0 to 81.1, R<sup>θ</sup> JC(bot) = N/A, all values in °C/W ..... **5**

### Changes from Revision P (May 2023) to Revision Q (October 2023) Page

- Updated R<sup>θ</sup> JA values: D = 101.2 to 124.5, PW = 129.9 to 147.7; Updated D and PW packages for R<sup>θ</sup> JC(top), R<sup>θ</sup> JB, ΨJT, ΨJB, and R<sup>θ</sup> JC(bot), all values in °C/W..... **5**

## 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
5962-9680401Q2A	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9680401Q2A SNJ54AHCT 04FK	<a href="#">Samples</a>
5962-9680401QCA	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9680401QC A SNJ54AHCT04J	<a href="#">Samples</a>
5962-9680401QDA	ACTIVE	CFP	W	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9680401QD A SNJ54AHCT04W	<a href="#">Samples</a>
SN74AHCT04BQAR	ACTIVE	WQFN	BQA	14	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT04	<a href="#">Samples</a>
SN74AHCT04D	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI	-40 to 125	AHCT04	
SN74AHCT04DBR	ACTIVE	SSOP	DB	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB04	<a href="#">Samples</a>
SN74AHCT04DGVR	ACTIVE	TVSOP	DGV	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	HB04	<a href="#">Samples</a>
SN74AHCT04DR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT04	<a href="#">Samples</a>
SN74AHCT04N	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 125	SN74AHCT04N	<a href="#">Samples</a>
SN74AHCT04NSR	ACTIVE	SO	NS	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AHCT04	<a href="#">Samples</a>
SN74AHCT04PW	OBSOLETE	TSSOP	PW	14		TBD	Call TI	Call TI	-40 to 125	HB04	
SN74AHCT04PWR	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	HB04	<a href="#">Samples</a>
SN74AHCT04RGYR	ACTIVE	VQFN	RGY	14	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	HB04	<a href="#">Samples</a>
SN74AHCT04RGYRG4	ACTIVE	VQFN	RGY	14	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	HB04	<a href="#">Samples</a>
SNJ54AHCT04FK	ACTIVE	LCCC	FK	20	55	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962- 9680401Q2A SNJ54AHCT 04FK	<a href="#">Samples</a>
SNJ54AHCT04J	ACTIVE	CDIP	J	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9680401QC A SNJ54AHCT04J	<a href="#">Samples</a>

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
SNJ54AHCT04W	ACTIVE	CFP	W	14	25	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	5962-9680401QD A SNJ54AHCT04W	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 <=100ppm 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 SN54AHCT04, SN74AHCT04 :**

- Catalog : [SN74AHCT04](#)
- Military : [SN54AHCT04](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications



**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
SN74AHCT04BQAR	WQFN	BQA	14	3000	180.0	12.4	2.8	3.3	1.1	4.0	12.0	Q1
SN74AHCT04DBR	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74AHCT04DGVR	TVSOP	DGV	14	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74AHCT04NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74AHCT04PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AHCT04RGYR	VQFN	RGY	14	3000	330.0	12.4	3.75	3.75	1.15	8.0	12.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AHCT04BQAR	WQFN	BQA	14	3000	210.0	185.0	35.0
SN74AHCT04DBR	SSOP	DB	14	2000	356.0	356.0	35.0
SN74AHCT04DGVR	TVSOP	DGV	14	2000	356.0	356.0	35.0
SN74AHCT04NSR	SO	NS	14	2000	367.0	367.0	38.0
SN74AHCT04PWR	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74AHCT04RGYR	VQFN	RGY	14	3000	356.0	356.0	35.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
5962-9680401Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-9680401QDA	W	CFP	14	25	506.98	26.16	6220	NA
SN74AHCT04N	N	PDIP	14	25	506	13.97	11230	4.32
SN74AHCT04N	N	PDIP	14	25	506	13.97	11230	4.32
SNJ54AHCT04FK	FK	LCCC	20	55	506.98	12.06	2030	NA
SNJ54AHCT04W	W	CFP	14	25	506.98	26.16	6220	NA

RGY (S-PVQFN-N14)

PLASTIC QUAD FLATPACK NO-LEAD



4203539-2/1 06/2011

- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - QFN (Quad Flatpack No-Lead) package configuration.
  - The package thermal pad must be soldered to the board for thermal and mechanical performance.
  - See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
  - △ Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
  - Package complies to JEDEC MO-241 variation BA.

RGY (S-PVQFN-N14)

PLASTIC QUAD FLATPACK NO-LEAD

**THERMAL INFORMATION**

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at [www.ti.com](http://www.ti.com).

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

Exposed Thermal Pad Dimensions

4206353-2/P 03/14

NOTE: All linear dimensions are in millimeters

RGY (S-PVQFN-N14)

PLASTIC QUAD FLATPACK NO-LEAD



4208122-2/P 03/14

- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at [www.ti.com](http://www.ti.com) <<http://www.ti.com>>.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
  - Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

## GENERIC PACKAGE VIEW

**BQA 14**

**WQFN - 0.8 mm max height**

2.5 x 3, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4227145/A



**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 optimal thermal and mechanical performance.



# EXAMPLE BOARD LAYOUT

WQFN - 0.8 mm max height

BQA0014A

PLASTIC QUAD FLAT PACK-NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 20X



4224636/A 11/2018

NOTES: (continued)

4. 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/slua271](http://www.ti.com/lit/slua271)).
5. 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

BQA0014A

WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD



SOLDER PASTE EXAMPLE  
 BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
 88% PRINTED COVERAGE BY AREA  
 SCALE: 20X

4224636/A 11/2018

NOTES: (continued)

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

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL STD 1835 GDFP1-F14

# DB0014A



# PACKAGE OUTLINE

## SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



### 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 mm per side.
4. Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220762/A 05/2024

NOTES: (continued)

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

# EXAMPLE STENCIL DESIGN

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220762/A 05/2024

NOTES: (continued)

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

## GENERIC PACKAGE VIEW

**FK 20**

**LCCC - 2.03 mm max height**

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4229370VA\



J 14

**GENERIC PACKAGE VIEW**  
**CDIP - 5.08 mm max height**  
CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

4040083-5/G

J0014A



# PACKAGE OUTLINE

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

# EXAMPLE BOARD LAYOUT

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



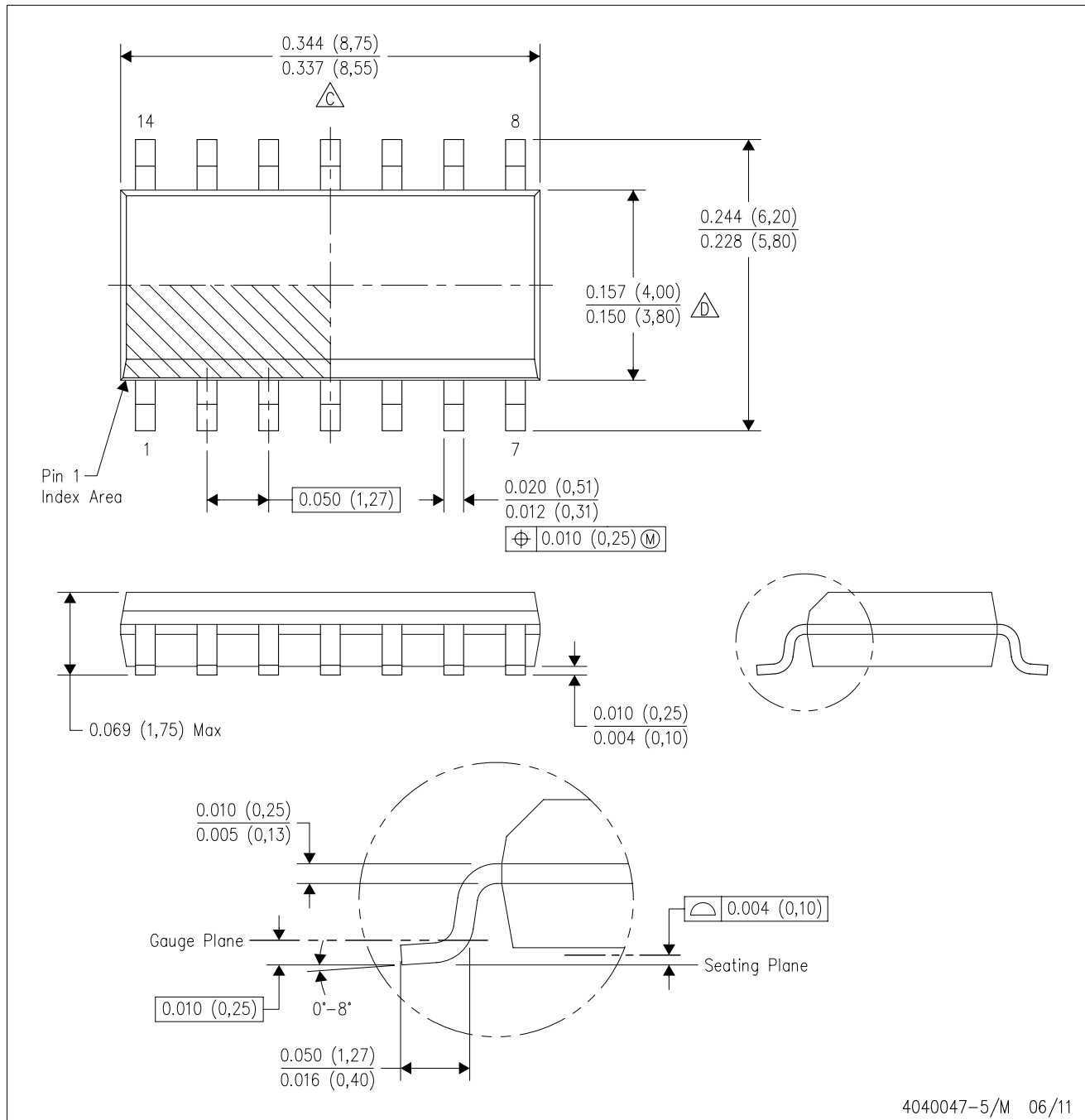
LAND PATTERN EXAMPLE  
NON-SOLDER MASK DEFINED  
SCALE: 5X



4214771/A 05/2017

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  - $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

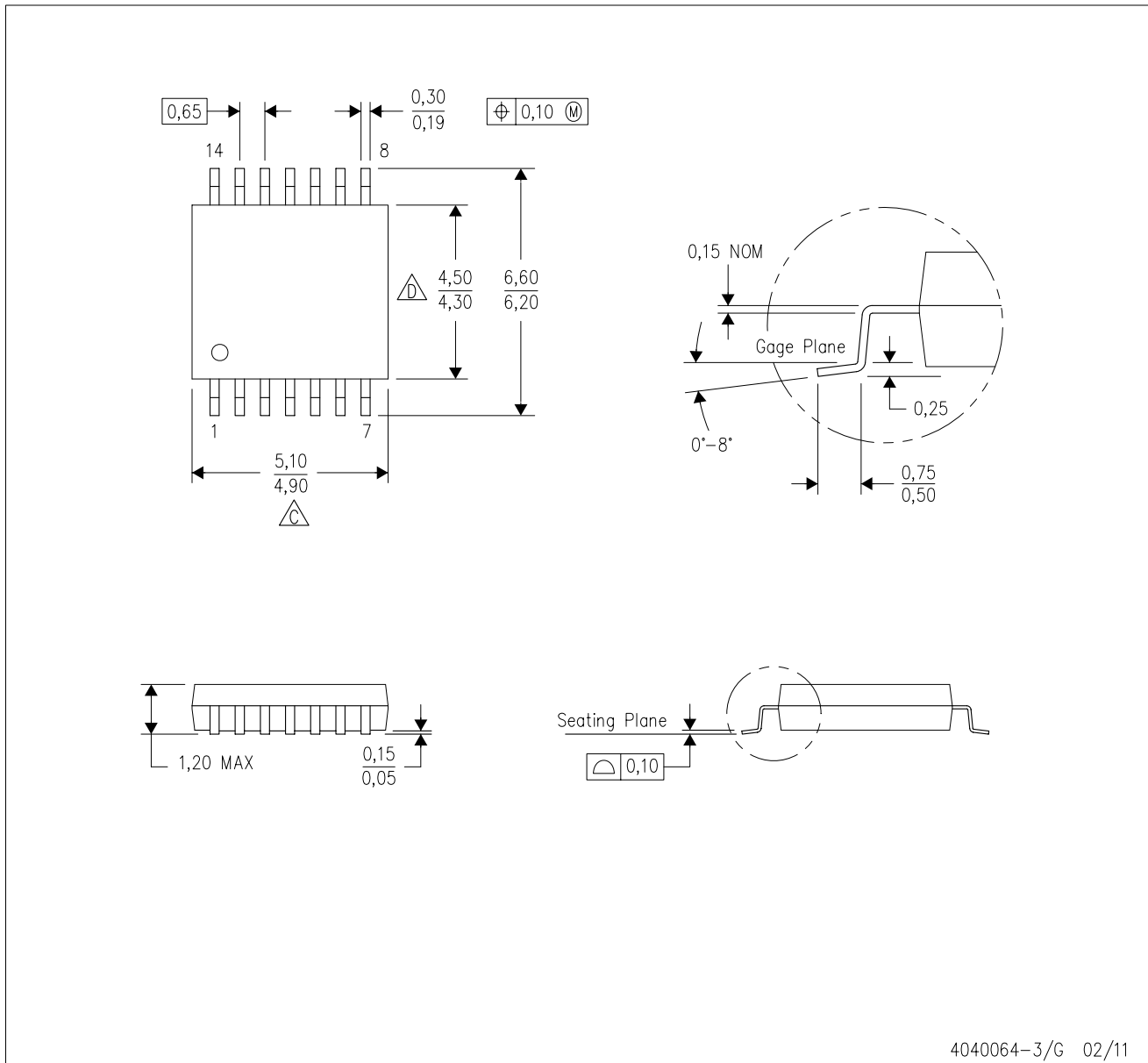
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040064-3/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

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