

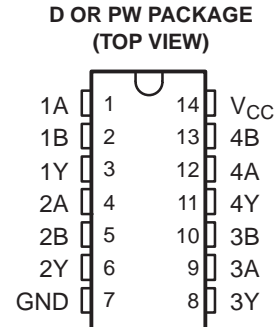
## FEATURES

- **Controlled Baseline**
  - One Assembly
  - One Test Site
  - One Fabrication Site
- **Extended Temperature Performance of –40°C to 125°C and –55°C to 125°C**
- **Enhanced Diminishing Manufacturing Sources (DMS) Support**
- **Enhanced Product-Change Notification**
- **Qualification Pedigree**

Component qualification in accordance with JEDEC and industry standards to ensure reliable operation over an extended temperature range. This includes, but is not limited to, Highly Accelerated Stress Test (HAST) or biased 85/85, temperature cycle, autoclave or unbiased HAST, electromigration, bond intermetallic life, and mold compound life. Such qualification testing should not be viewed as justifying use of this component beyond specified performance and environmental limits.

- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Operates From 1.65 V to 3.6 V**
- **Inputs Accept Voltages to 5.5 V**
- **Max  $t_{pd}$  of 4.1 ns at 3.3 V**

- **Typical  $V_{OLP}$  (Output Ground Bounce) <0.8 V at  $V_{CC} = 3.3 V, T_A = 25^\circ C$**
- **Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot) >2 V at  $V_{CC} = 3.3 V, T_A = 25^\circ C$**



## DESCRIPTION/ORDERING INFORMATION

The SN74LVC08A quadruple 2-input positive-AND gate is designed for 2.7-V to 3.6-V  $V_{CC}$  operation.

The device performs the Boolean function in  $Y = A \bullet B$  or  $Y = \overline{A} + \overline{B}$  positive logic.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device as a translator in a mixed 3.3 V/5 V system environment.

### ORDERING INFORMATION<sup>(1)</sup>

$T_A$	PACKAGE <sup>(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 125°C	SOIC – D	Reel of 2500	SN74LVC08AQDREP	LVC08AE
	TSSOP – PW	Reel of 2000	SN74LVC08AQPWREP	LVC08AE
–55°C to 125°C	SOIC – D	Reel of 2500	SN74LVC08AMDREP	LVC08AM
	TSSOP – PW	Reel of 2000	SN74LVC08AMPWREP	LVC08AM

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at [www.ti.com](http://www.ti.com).

(2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).



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# SN74LVC08A-EP QUADRUPLE 2-INPUT POSITIVE-AND GATE

SCAS731D—NOVEMBER 2003—REVISED SEPTEMBER 2007

**FUNCTION TABLE  
(EACH GATE)**

INPUTS		OUTPUT Y
A	B	
H	H	H
L	X	L
X	L	L

**LOGIC DIAGRAM, EACH GATE (POSITIVE LOGIC)**



## Absolute Maximum Ratings<sup>(1)</sup>

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

		MIN	MAX	UNIT	
$V_{CC}$	Supply voltage range	-0.5	6.5	V	
$V_I$	Input voltage range <sup>(2)</sup>	-0.5	6.5	V	
$V_O$	Output voltage range <sup>(2)(3)</sup>	-0.5	$V_{CC} + 0.5$	V	
$I_{IK}$	Input clamp current	$V_I < 0$ V		-50	mA
$I_{OK}$	Output clamp current	$V_O < 0$ V		-50	mA
$I_O$	Continuous output current			±50	mA
	Continuous current through $V_{CC}$ or GND			±100	mA
$\theta_{JA}$	Package thermal impedance <sup>(4)</sup>	D package		86	°C/W
		PW package		113	
$T_{stg}$	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 negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) The value of  $V_{CC}$  is provided in the recommended operating conditions table.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

## Recommended Operating Conditions<sup>(1)</sup>

			MIN	MAX	UNIT	
$V_{CC}$	Supply voltage	Operating	2	3.6	V	
		Data retention only	1.5			
$V_{IH}$	High-level input voltage	$V_{CC} = 2.7$ V to 3.6 V	2		V	
$V_{IL}$	Low-level input voltage	$V_{CC} = 2.7$ V to 3.6 V		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	$V_{CC} = 2.7$ V			-12	mA
		$V_{CC} = 3$ V			-24	
$I_{OL}$	Low-level output current	$V_{CC} = 2.7$ V			12	mA
		$V_{CC} = 3$ V			24	
$\Delta t/\Delta v$	Input transition rise or fall rate		0	8	ns/V	

- (1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. See the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

**Recommended Operating Conditions (continued)**

		MIN	MAX	UNIT	
T <sub>A</sub>	Operating free-air temperature	M suffix	-55	125	°C
		Q suffix	-40	125	

# SN74LVC08A-EP

## QUADRUPLE 2-INPUT POSITIVE-AND GATE

SCAS731D–NOVEMBER 2003–REVISED SEPTEMBER 2007

### Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	MIN	TYP <sup>(1)</sup>	MAX	UNIT
V <sub>OH</sub>	I <sub>OH</sub> = -100 μA	2.7 V to 3.6 V	V <sub>CC</sub> - 0.2			V
	I <sub>OH</sub> = -12 mA	2.7 V	2.2			
		3 V	2.4			
	I <sub>OH</sub> = -24 mA	3 V	2.2			
V <sub>OL</sub>	I <sub>OL</sub> = 100 μA	2.7 V to 3.6 V			0.2	V
	I <sub>OL</sub> = 12 mA	2.7 V			0.4	
	I <sub>OL</sub> = 24 mA	3 V			0.55	
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	3.6 V			±5	μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	3.6 V			10	μA
ΔI <sub>CC</sub>	One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND	2.7 V to 3.6 V			500	μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V		5		pF

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

### Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 1](#))

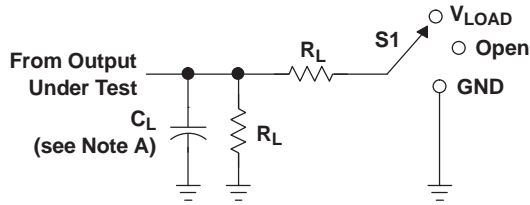
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		UNIT
			MIN	MAX	MIN	MAX	
t <sub>pd</sub>	A or B	Y		4.8	1	4.1	ns

### Operating Characteristics

T<sub>A</sub> = 25°C

PARAMETER	TEST CONDITIONS	V <sub>CC</sub> = 2.5 V	V <sub>CC</sub> = 3.3 V	UNIT
		TYP	TYP	
C <sub>pd</sub> Power dissipation capacitance per gate	f = 10 MHz	9.8	10	pF

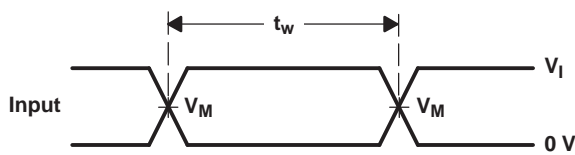
PARAMETER MEASUREMENT INFORMATION



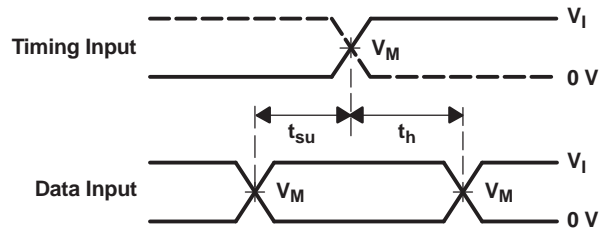
LOAD CIRCUIT

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

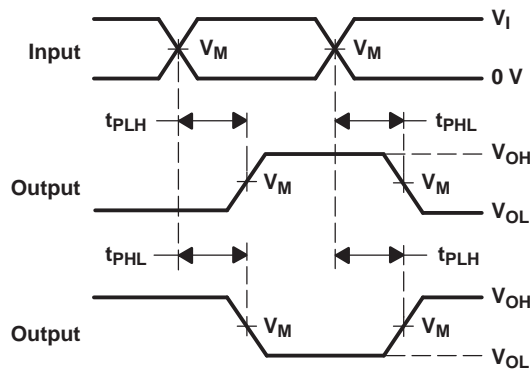
$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
2.7 V	2.7 V	$\leq 2.5$ ns	1.5 V	6 V	50 pF	500 $\Omega$	0.3 V
$3.3 \text{ V} \pm 0.3 \text{ V}$	2.7 V	$\leq 2.5$ ns	1.5 V	6 V	50 pF	500 $\Omega$	0.3 V



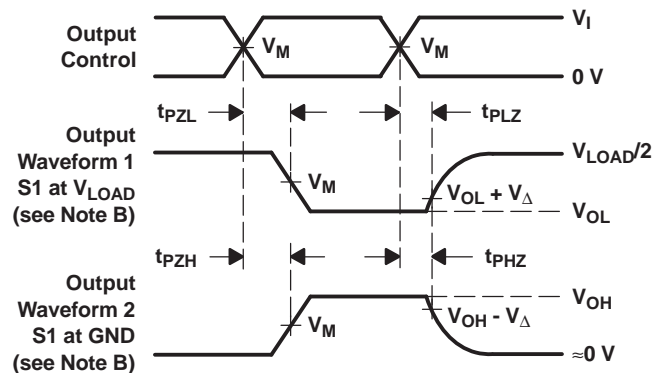
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- 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:  $PRR \leq 10$  MHz,  $Z_O = 50 \Omega$ .  
 D. The outputs are measured one at a time, with one 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.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .  
 H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

## 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
SN74LVC08AMDREP	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	LVC08AM	<a href="#">Samples</a>
SN74LVC08AMPWREP	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	LVC08AM	<a href="#">Samples</a>
SN74LVC08AQDREP	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08AE	<a href="#">Samples</a>
SN74LVC08AQPWREP	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08AE	<a href="#">Samples</a>
V62/04655-01XE	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08AE	<a href="#">Samples</a>
V62/04655-01YE	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LVC08AE	<a href="#">Samples</a>
V62/04655-02XE	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	LVC08AM	<a href="#">Samples</a>
V62/04655-02YE	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 125	LVC08AM	<a href="#">Samples</a>

(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.

<sup>(6)</sup> 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 SN74LVC08A-EP :**

- Catalog : [SN74LVC08A](#)
- Automotive : [SN74LVC08A-Q1](#)
- Military : [SN54LVC08A](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- 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
SN74LVC08AMDREP	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVC08AMPWREP	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74LVC08AQDREP	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LVC08AQPWREP	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	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)
SN74LVC08AMDREP	SOIC	D	14	2500	340.5	336.1	32.0
SN74LVC08AMPWREP	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74LVC08AQDREP	SOIC	D	14	2500	340.5	336.1	32.0
SN74LVC08AQPWREP	TSSOP	PW	14	2000	356.0	356.0	35.0

D (R-PDSO-G14)

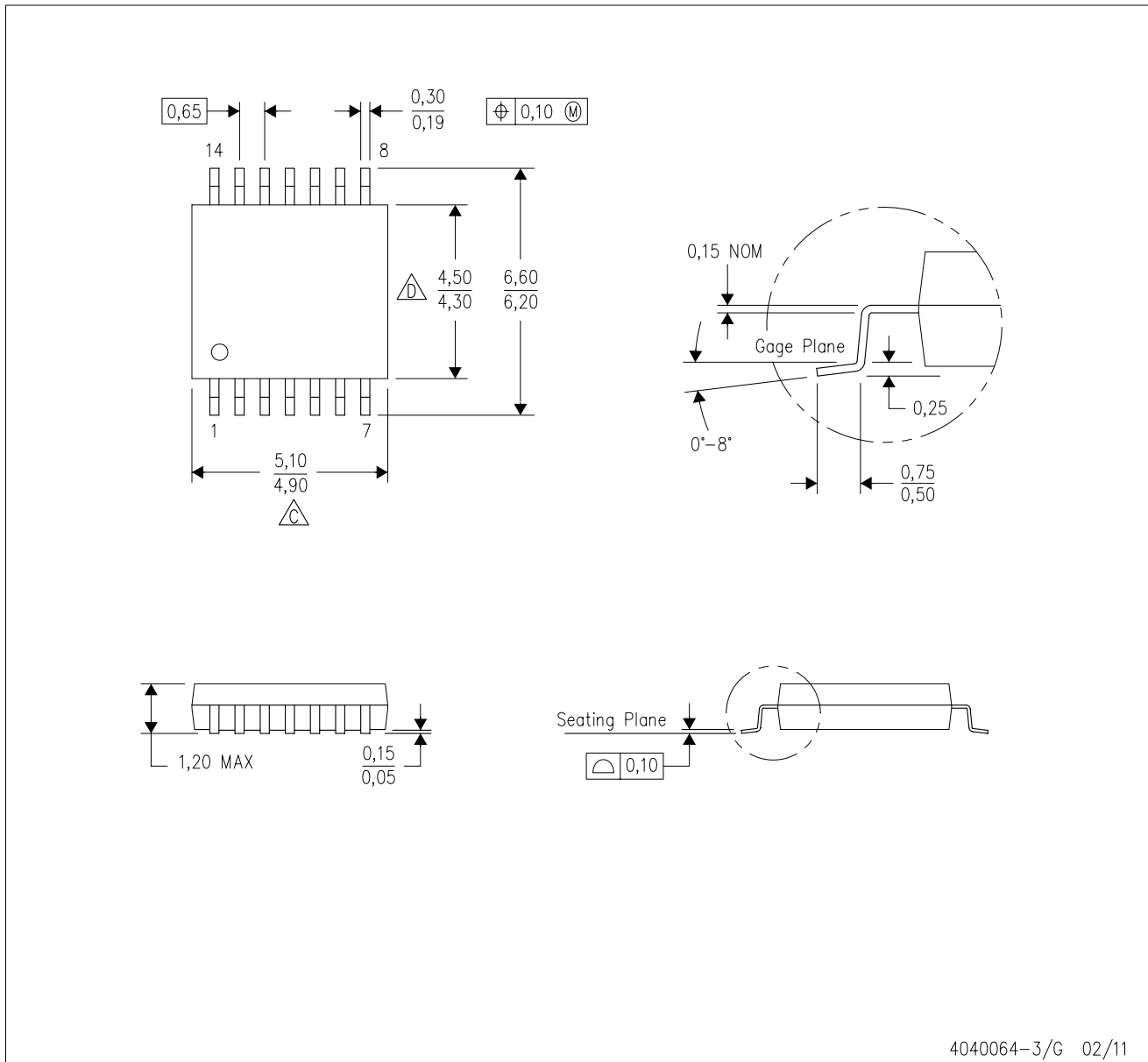
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  -  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.
  -  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.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

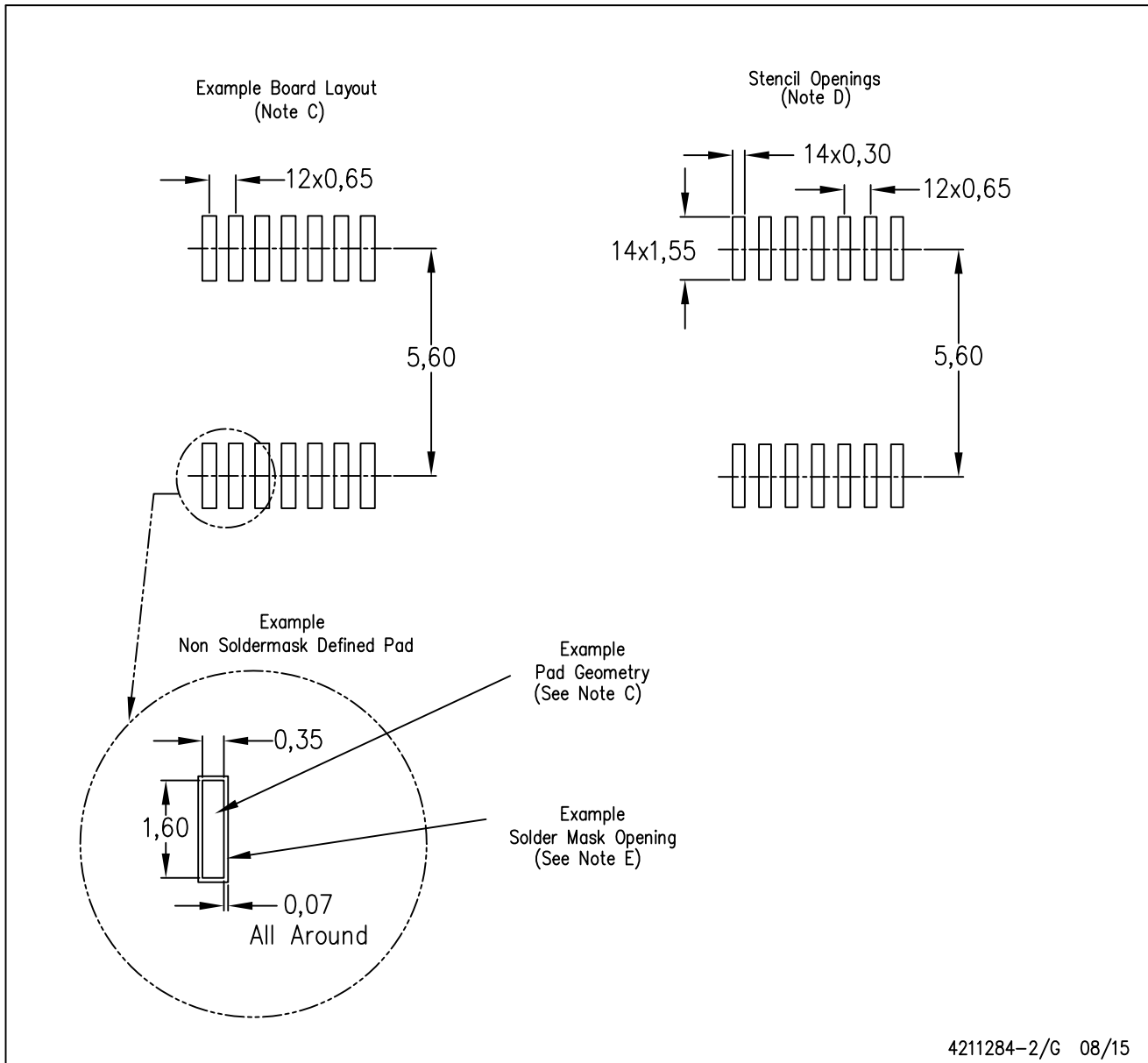


4040064-3/G 02/11

- 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

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211284-2/G 08/15

- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - 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.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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