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<u>Texas Instruments</u> <u>SN74ALVC00DGVR</u>

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Datasheet of SN74ALVC00DGVR - IC GATE NAND 4CH 2-INP 14-TVSOP

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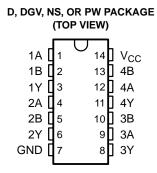
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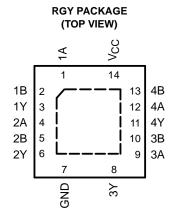
SN74ALVC00 QUADRUPLE 2-INPUT POSITIVE-NAND GATE

SCES115G-JULY 1997-REVISED AUGUST 2004

FEATURES

- Operates From 1.65 V to 3.6 V
- Max t_{pd} of 3 ns at 3.3 V
- ±24-mA Output Drive at 3.3 V
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)





DESCRIPTION/ORDERING INFORMATION

This quadruple 2-input positive-NAND gate is designed for 1.65-V to 3.6-V V_{CC} operation.

The SN74ALVC00 performs the Boolean function $Y = \overline{A \cdot B}$ or $Y = \overline{A} + \overline{B}$ in positive logic.

ORDERING INFORMATION

T _A	PAG	CKAGE ⁽¹⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING		
	QFN - RGY	Tape and reel	SN74ALVC00RGYR	VA00		
	SOIC - D	Tube	SN74ALVC00D	ALVC00		
-40°C to 85°C	SOIC - D	Tape and reel	SN74ALVC00DR	ALVC00		
-40 C to 65 C	SOP - NS	Tape and reel	SN74ALVC00NSR	ALVC00		
	TSSOP - PW	Tape and reel	SN74ALVC00PWR	VA00		
	TVSOP - DGV	Tape and reel	SN74ALVC00DGVR	VA00		

⁽¹⁾ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE (each gate)

INP	UTS	OUTPUT
Α	В	Y
Н	Н	L
L	Χ	н
X	L	н

LOGIC DIAGRAM, EACH GATE (POSITIVE LOGIC)





Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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SN74ALVC00 QUADRUPLE 2-INPUT POSITIVE-NAND GATE



SCES115G-JULY 1997-REVISED AUGUST 2004

ABSOLUTE MAXIMUM RATINGS(1)

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

			MIN	MAX	UNIT
V _{CC}	Supply voltage range		-0.5	4.6	V
V _I	Input voltage range ⁽²⁾		-0.5	4.6	V
Vo	Output voltage range ⁽²⁾⁽³⁾	-0.5	V _{CC} + 0.5	V	
I _{IK}	Input clamp current	V ₁ < 0		-50	mA
I _{OK}	Output clamp current	V _O < 0		-50	mA
Io	Continuous output current		±50	mA	
	Continuous current through V _{CC} or GND			±100	mA
		D package ⁽⁴⁾		86	
		DGV package ⁽⁴⁾		127	
θ_{JA}	Package thermal impedance	NS package (4)		76	°C/W
		PW package ⁽⁴⁾		113	
		RGY package ⁽⁵⁾		47	
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.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

			MIN	MAX	UNIT	
V _{CC}	Supply voltage		1.65	3.6	V	
		V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}			
V _{IH}	High-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7		V	
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2			
		V _{CC} = 1.65 V to 1.95 V		$0.35 \times V_{CC}$		
V_{IL}	Low-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.7	V	
		V _{CC} = 2.7 V to 3.6 V		0.8		
VI	Input voltage		0	3.6	V	
Vo	Output voltage		0	V_{CC}	V	
		V _{CC} = 1.65 V		-4		
	High level and an extend	V _{CC} = 2.3 V		-12	mΛ	
I _{OH}	High-level output current	V _{CC} = 2.7 V		-12	mA	
		V _{CC} = 3 V		-24		
		V _{CC} = 1.65 V		4		
	Low level output ourrent	V _{CC} = 2.3 V		12		
I _{OL}	Low-level output current	V _{CC} = 2.7 V		12	mA	
		V _{CC} = 3 V		24		
Δt/Δν	Input transition rise or fall rate			5	ns/V	
T _A	Operating free-air temperature		-40	85	°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, literature number SCBA004.

²⁾ The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

³⁾ This value is limited to 4.6 V maximum.

⁽⁴⁾ The package thermal impedance is calculated in accordance with JESD 51-7.

⁽⁵⁾ The package thermal impedance is calculated in accordance with JESD 51-5.

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SN74ALVC00 **QUADRUPLE 2-INPUT POSITIVE-NAND GATE**

SCES115G-JULY 1997-REVISED AUGUST 2004

ELECTRICAL CHARACTERISTICS

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

PARAMETER	TEST CONDITIONS	V _{cc}	MIN	TYP ⁽¹⁾	MAX	UNIT
	I _{OH} = -100 μA	1.65 V to 3.6 V	V _{CC} - 0.2			
	I _{OH} = -4 mA	1.65 V	1.2			
	$I_{OH} = -6 \text{ mA}$	2.3 V	2			
V _{OH}		2.3 V	1.7			V
	I _{OH} = -12 mA	2.7 V	2.2			
		3 V	2.4			
	I _{OH} = -24 mA	3 V	2			
	I _{OL} = 100 μA	1.65 V to 3.6 V			0.2	
	I _{OL} = 4 mA	1.65 V			0.45	
	I _{OL} = 6 mA	2.3 V			0.4	V
V _{OL}	10.77	2.3 V			0.7	V
	I _{OL} = 12 mA	2.7 V			0.4	
	I _{OL} = 24 mA	3 V			0.55	
I _I	$V_I = V_{CC}$ or GND	3.6 V			±5	μΑ
I _{CC}	$V_I = V_{CC}$ or GND, $I_{O} = 0$	3.6 V			10	μΑ
Δl _{CC}	One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND	3 V to 3.6 V			750	μΑ
C _i	$V_I = V_{CC}$ or GND	3.3 V		4.5		pF

⁽¹⁾ All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

SWITCHING CHARACTERISTICS

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 1.8 V ± 0.15 V		V _{CC} = 2.5 V ± 0.2 V		V _{CC} = 2.7 V		V _{CC} = 3.3 V ± 0.3 V		UNIT
	(INPUT)		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{pd}	A or B	Y	1	4.4	1	2.8		3.2	1	3	ns

OPERATING CHARACTERISTICS

 $T_A = 25^{\circ}C$

PARAMETER		TEST CONDITIONS	V _{CC} = 1.8 V	V _{CC} = 2.5 V	$V_{CC} = 3.3 \text{ V}$	UNIT	
	PARAMETER	TEST CONDITIONS	TYP	TYP	TYP	UNII	
C	Power dissipation capacitance per gate	C _L = 0 pF, f = 10 MHz	20	21	23	pF	

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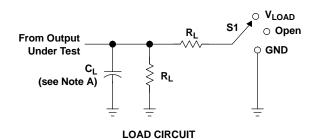
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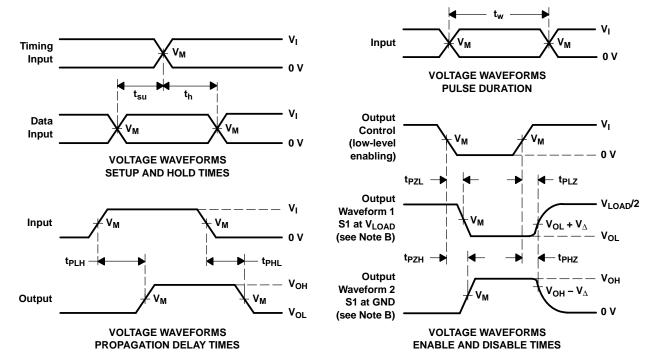
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PARAMETER MEASUREMENT INFORMATION



TEST	S1
t _{pd}	Open
t _{PLZ} /t _{PZL}	V _{LOAD}
t _{PHZ} /t _{PZH}	GND

V	IN	PUT	V	V		В	V	
V _{CC}	VI	t _r /t _f	V _M	V _{LOAD}	CL	R_L	V_{Δ}	
1.8 V ± 0.15 V	V _{CC}	≤2 ns	V _{CC} /2	2×V _{CC}	30 pF	1 k Ω	0.15 V	
2.5 V \pm 0.2 V	V _{CC}	≤2 ns	V _{CC} /2	2×V _{CC}	30 pF	500 Ω	0.15 V	
2.7 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V	
3.3 V \pm 0.3 V	2.7 V	≤2.5 ns	1.5 V	6 V	50 pF	500 Ω	0.3 V	



NOTES: A. C₁ 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 Ω .
- D. The outputs are measured one at a time, with one transition per measurement.
- 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



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PACKAGE OPTION ADDENDUM

10-Jun-2014

PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package	Pins	Package	Eco Plan	Lead/Ball Finish	Lead/Ball Finish MSL Peak Temp C		Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
SN74ALVC00D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVC00	Samples
SN74ALVC00DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVC00	Samples
SN74ALVC00DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVC00	Samples
SN74ALVC00DGVR	ACTIVE	TVSOP	DGV	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	VA00	Samples
SN74ALVC00DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVC00	Samples
SN74ALVC00DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVC00	Samples
SN74ALVC00NSR	ACTIVE	so	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	ALVC00	Samples
SN74ALVC00PWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	VA00	Samples
SN74ALVC00PWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	VA00	Samples
SN74ALVC00PWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	VA00	Samples

(1) The marketing status values are defined as follows:

* The flatfetting 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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): This terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flieber between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS Compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight



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- (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/Ball Finish Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF SN74ALVC00:

- Automotive: SN74ALVC00-Q1
- Enhanced Product: SN74ALVC00-EP

NOTE: Qualified Version Definitions:

- Automotive Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product Supports Defense, Aerospace and Medical Applications

Addendum-Page 2

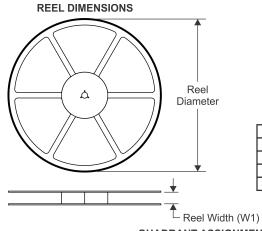
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PACKAGE MATERIALS INFORMATION

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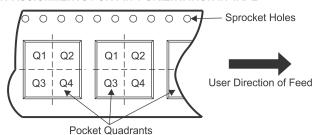
TAPE AND REEL INFORMATION



TAPE DIMENSIONS + K0 + P1 + B0 W Cavity - A0 +

	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device		Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74ALVC00DGVR	TVSOP	DGV	14	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74ALVC00DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74ALVC00NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74ALVC00PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

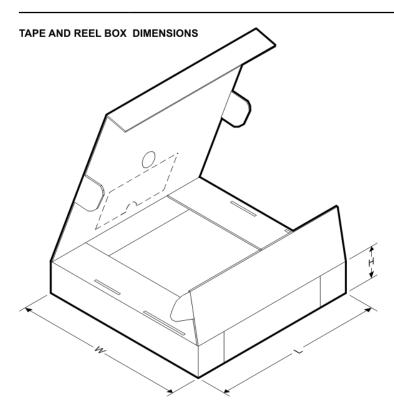
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PACKAGE MATERIALS INFORMATION

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*All dimensions are nominal

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Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ALVC00DGVR	TVSOP	DGV	14	2000	367.0	367.0	35.0
SN74ALVC00DR	SOIC	D	14	2500	367.0	367.0	38.0
SN74ALVC00NSR	SO	NS	14	2000	367.0	367.0	38.0
SN74ALVC00PWR	TSSOP	PW	14	2000	367.0	367.0	35.0



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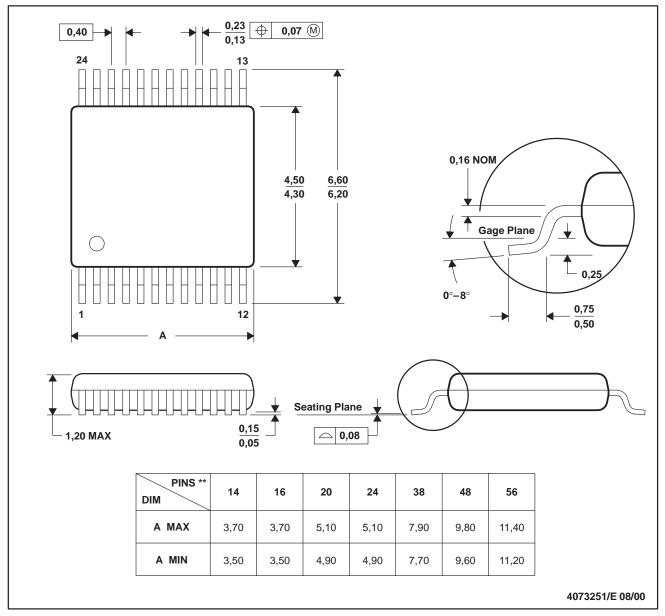
MECHANICAL DATA

MPDS006C - FEBRUARY 1996 - REVISED AUGUST 2000

DGV (R-PDSO-G**)

24 PINS SHOWN

PLASTIC SMALL-OUTLINE



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 per side.

D. Falls within JEDEC: 24/48 Pins – MO-153

14/16/20/56 Pins - MO-194

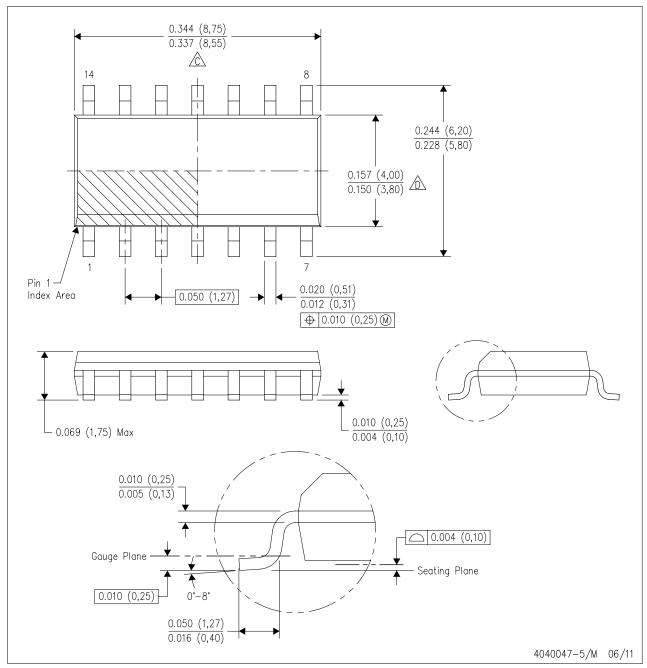




MECHANICAL DATA

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- 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.

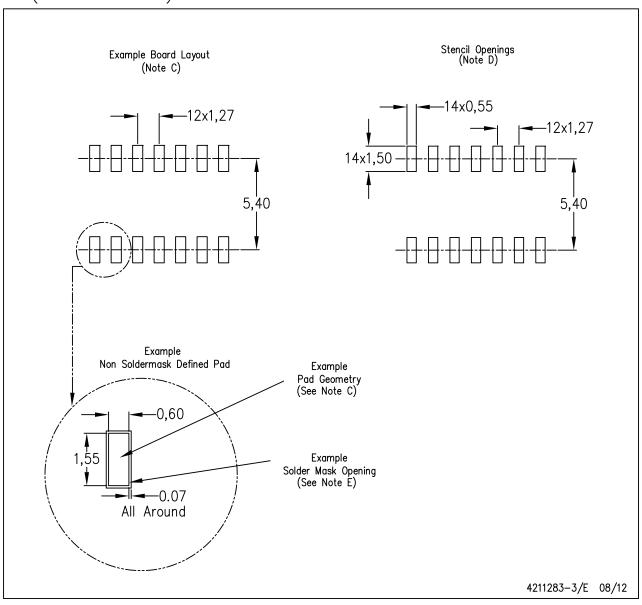




LAND PATTERN DATA

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- 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.

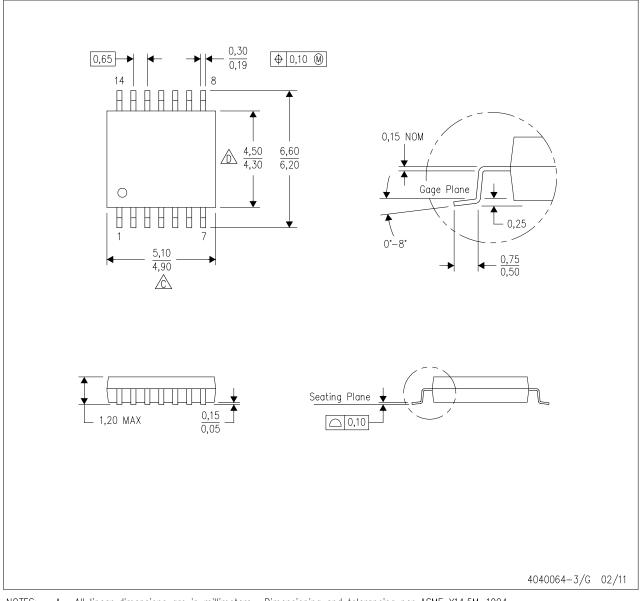




MECHANICAL DATA

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
- E. Falls within JEDEC MO-153

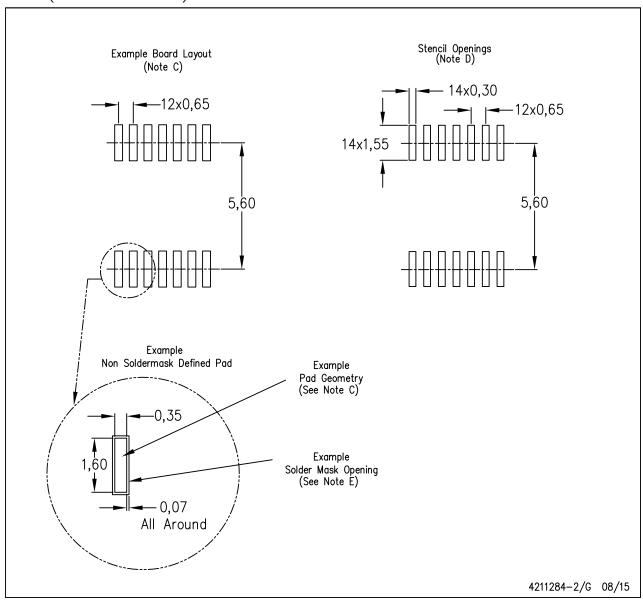




LAND PATTERN DATA

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- 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.





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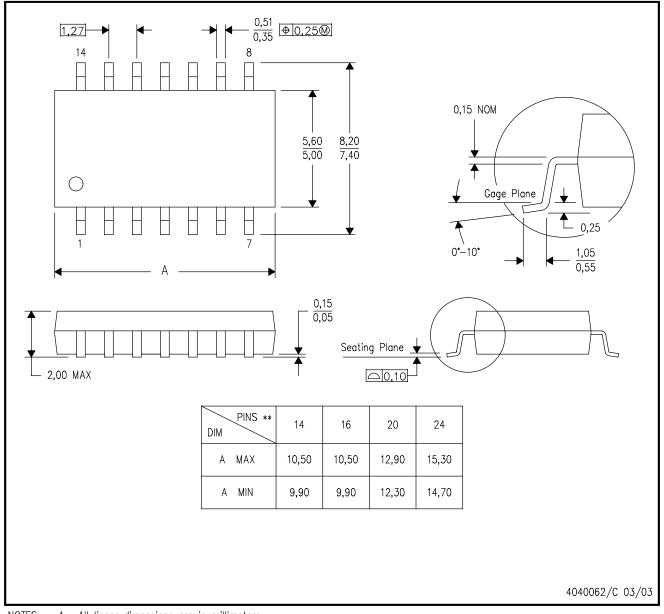
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MECHANICAL DATA

NS (R-PDSO-G**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



- 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.





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