

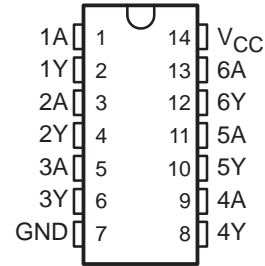
The SN54LS07 and SN74LS17 are obsolete and are no longer supplied.

# SN54LS07, SN74LS07, SN74LS17 HEX BUFFERS/DRIVERS WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

SDLS021C – MAY 1990 – REVISED FEBRUARY 2004

- Convert TTL Voltage Levels to MOS Levels
- High Sink-Current Capability
- Input Clamping Diodes Simplify System Design
- Open-Collector Driver for Indicator Lamps and Relays

SN54LS07 . . . J PACKAGE  
SN74LS07, SN74LS17 . . . D, DB, N, OR NS PACKAGE  
(TOP VIEW)



## description/ordering information

These hex buffers/drivers feature high-voltage open-collector outputs to interface with high-level circuits or for driving high-current loads. They are also characterized for use as buffers for driving TTL inputs. The 'LS07 devices have a rated output voltage of 30 V, and the SN74LS17 has a rated output voltage of 15 V. The maximum sink current is 30 mA for the SN54LS07 and 40 mA for the SN74LS07 and SN74LS17.

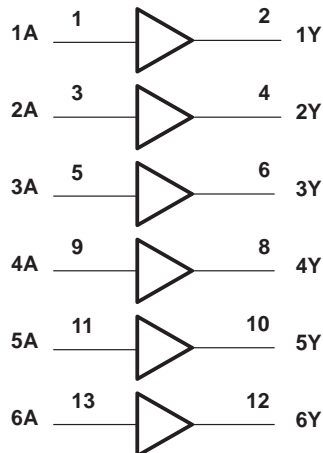
These circuits are compatible with most TTL families. Inputs are diode-clamped to minimize transmission-line effects, which simplifies design. Typical power dissipation is 140 mW, and average propagation delay time is 12 ns.

## ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74LS07N	SN74LS07N
	SOIC – D	Tube	SN74LS07D	LS07
		Tape and reel	SN74LS07DR	
	SOP – NS	Tape and reel	SN74LS07NSR	74LS07
	SSOP – DB	Tape and reel	SN74LS07DBR	LS07

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

## logic diagram (positive logic)



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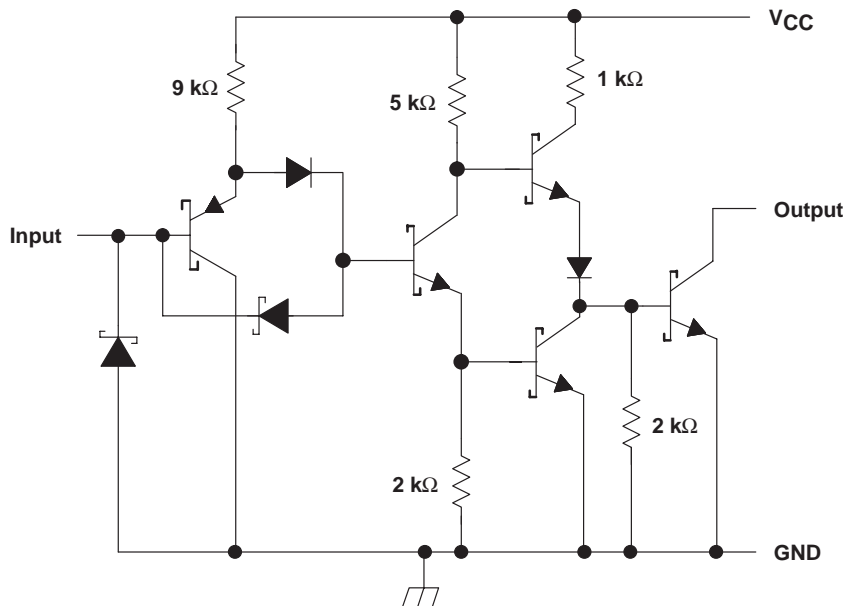
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# SN54LS07, SN74LS07, SN74LS17 HEX BUFFERS/DRIVERS WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

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## schematic (each gate)



Resistor values shown are nominal.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, $V_{CC}$ .....	7 V
Input voltage, $V_I$ (see Note 1) .....	7 V
Output voltage, $V_O$ (see Notes 1 and 2): SN54LS07, SN74LS07 .....	30 V
SN74LS17 .....	15 V
Package thermal impedance, $\theta_{JA}$ (see Note 3): D package .....	86°C/W
DB package .....	96°C/W
N package .....	80°C/W
NS package .....	76°C/W
Storage temperature range, $T_{stg}$ .....	-65°C to 150°C

† 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.

- NOTES: 1. All voltage values are with respect to GND.  
 2. This is the maximum voltage that should be applied to any output when it is in the off state.  
 3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 4)

		SN54LS07			SN74LS07 SN74LS17			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High-level input voltage	2			2			V
V <sub>IL</sub>	Low-level input voltage			0.8			0.8	V
V <sub>OH</sub>	High-level output voltage	'LS07			30			V
		SN74LS17			15			
I <sub>OL</sub>	Low-level output current			30			40	mA
T <sub>A</sub>	Operating free-air temperature	-55		125	0		70	°C

NOTE 4: 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*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS†		SN54LS07		SN74LS07 SN74LS17		UNIT
			MIN	MAX	MIN	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = MIN,	I <sub>I</sub> = -12 mA	-1.5		-1.5		V
I <sub>OH</sub>	V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V	'LS07, V <sub>OH</sub> = 30 V		0.25		mA
			SN74LS17, V <sub>OH</sub> = 15 V		0.25		
V <sub>OL</sub>	V <sub>CC</sub> = MIN,	V <sub>IL</sub> = 0.8 V	I <sub>OL</sub> = 16 mA		0.4		V
			I <sub>OL</sub> = MAX‡		0.7		
I <sub>I</sub>	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 7 V	1		1		mA
I <sub>IH</sub>	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 2.4 V	20		20		µA
I <sub>IL</sub>	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0.4 V	-0.2		-0.2		mA
I <sub>CCH</sub>	V <sub>CC</sub> = MAX		14		14		mA
I <sub>CCL</sub>	V <sub>CC</sub> = MAX		45		45		mA

† For conditions shown as MIN or MAX, use the appropriate value specified under *recommended operating conditions*.

‡ I<sub>OL</sub> = 30 mA for SN54 series parts and 40 mA for SN74 series parts.

switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see Figure 1)

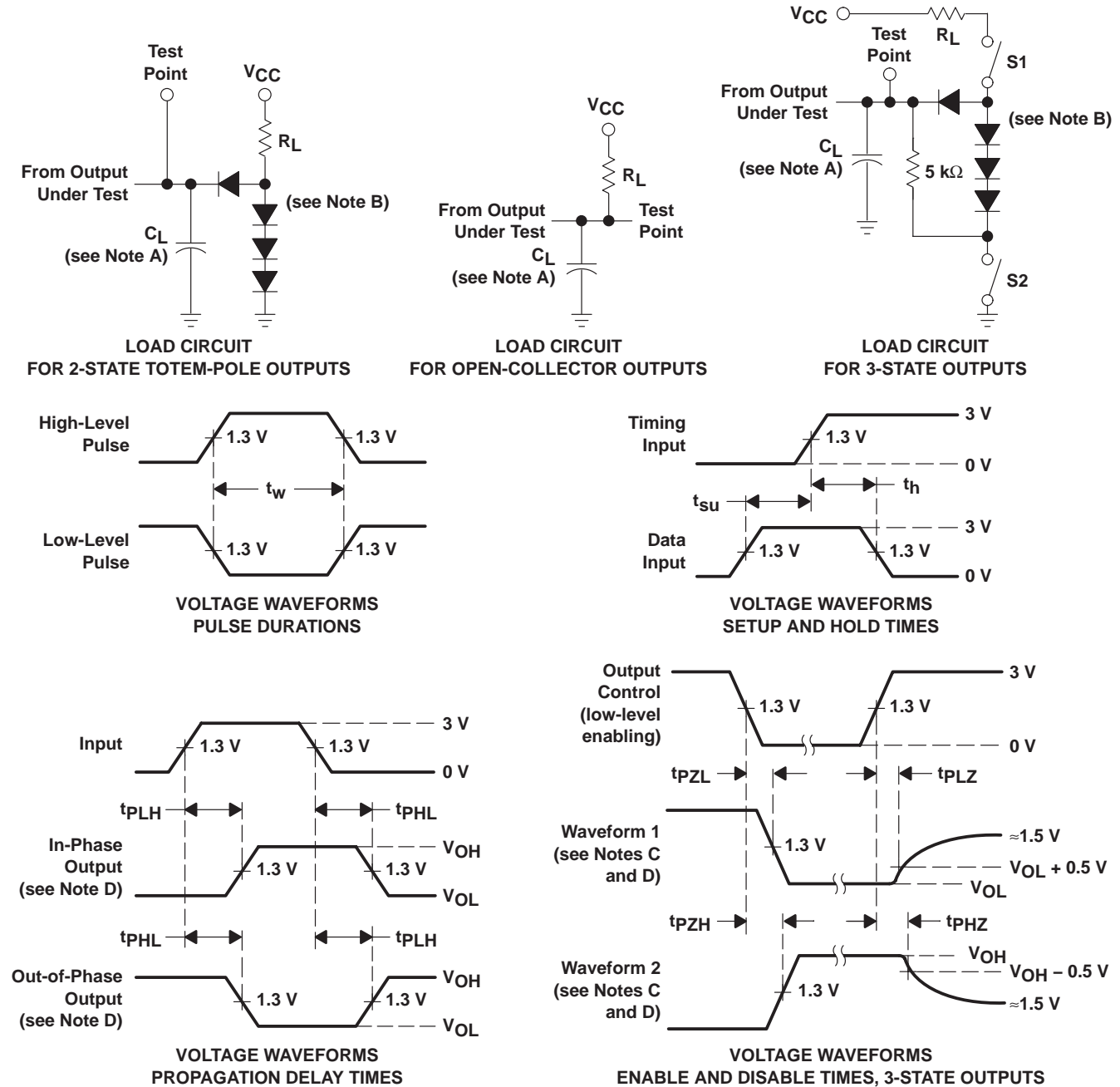
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	A	Y	R <sub>L</sub> = 110 Ω,	C <sub>L</sub> = 15 pF	6	10	ns	
t <sub>PHL</sub>					19	30		

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## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All diodes are 1N3064 or equivalent.  
 C. 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.  
 D. S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PZL}$ ; S1 is open and S2 is closed for  $t_{PZH}$ ; S1 is closed and S2 is open for  $t_{PZL}$ .  
 E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.  
 F. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O \approx 50 \Omega$ ,  $t_r \leq 1.5$  ns,  $t_f \leq 2.6$  ns.  
 G. The outputs are measured one at a time, with one input transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
SN74LS07D	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07DBLE	OBSOLETE	SSOP	DB	14		TBD	Call TI	Call TI
SN74LS07DBR	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07DBRE4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07DBRG4	ACTIVE	SSOP	DB	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07DE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07DG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07DR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07DRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07DRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07N	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS07NE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74LS07NSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07NSRE4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS07NSRG4	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LS17D	OBSOLETE	SOIC	D	14		TBD	Call TI	Call TI
SN74LS17N	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI

<sup>(1)</sup> 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.

<sup>(2)</sup> 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):** TI's 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.

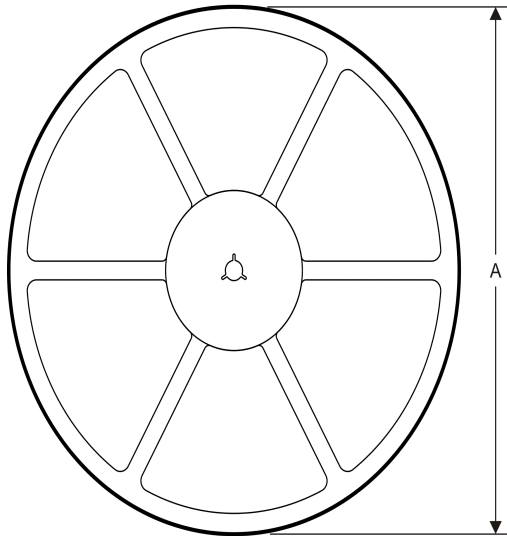
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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 in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**TAPE AND REEL INFORMATION**

\*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
SN74LS07DBR	SSOP	DB	14	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
SN74LS07DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LS07NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS07DBR	SSOP	DB	14	2000	367.0	367.0	38.0
SN74LS07DR	SOIC	D	14	2500	367.0	367.0	38.0
SN74LS07NSR	SO	NS	14	2000	367.0	367.0	38.0



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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

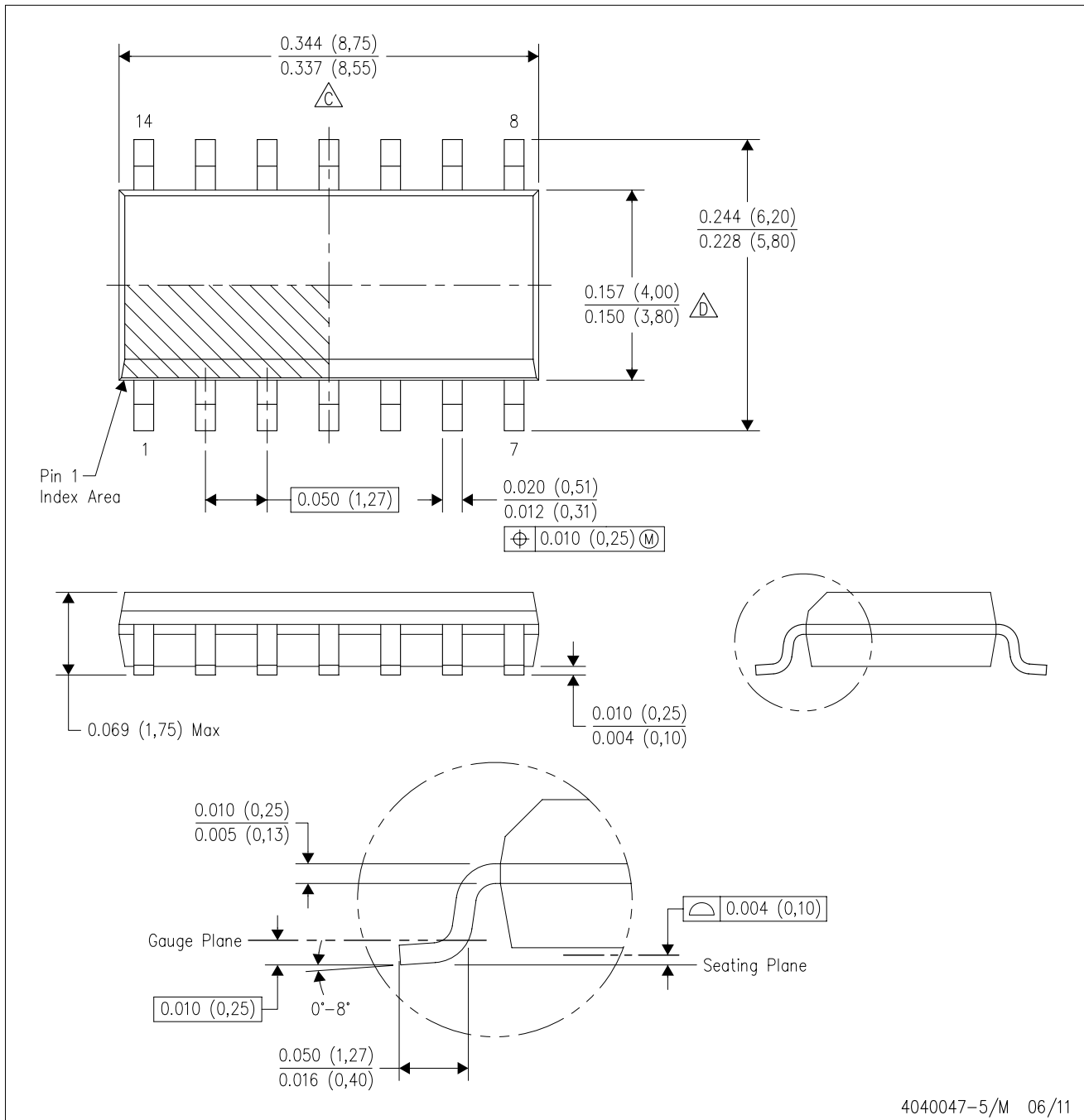


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- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - (C) Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - (D) The 20 pin end lead shoulder width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

D (R-PDSO-G14)

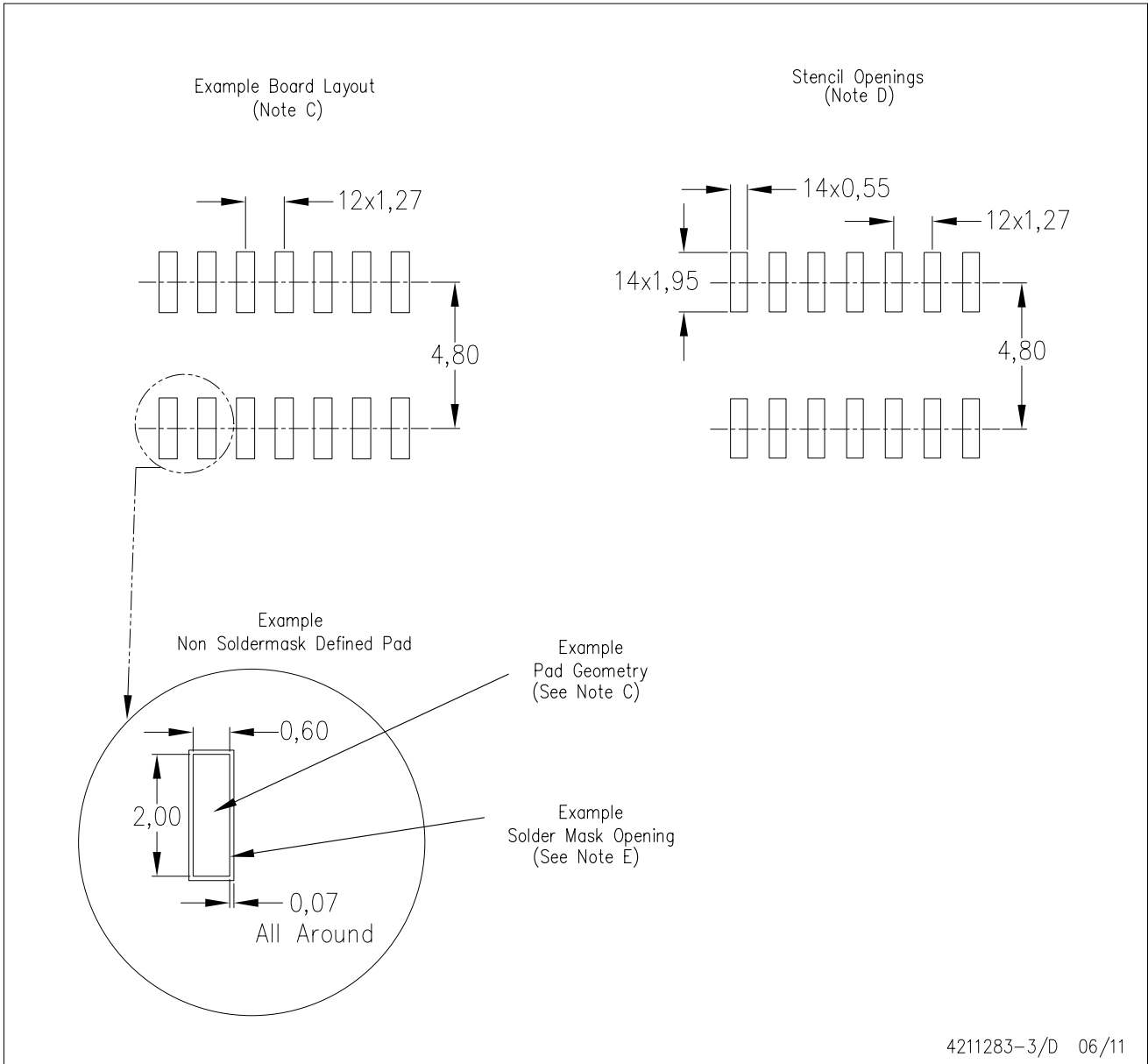
PLASTIC SMALL OUTLINE



- 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.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- 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.

# 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.



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