

SN74LVC4245A Octal Bus Transceiver and 3.3-V to 5-V Shifter With 3-State Outputs

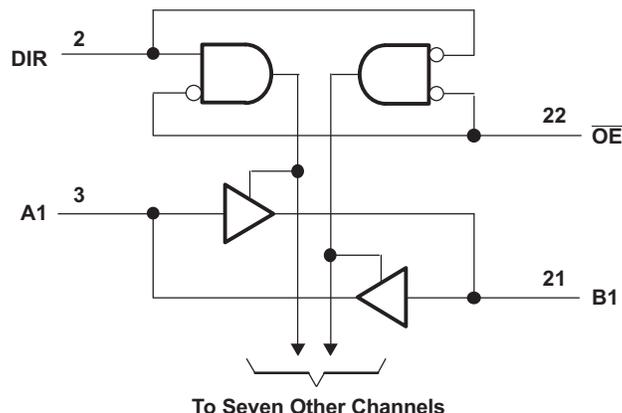
1 Features

- Bidirectional Voltage Translator
- 5.5 V on A Port and 2.7 V to 3.6 V on B Port
- Control Inputs V_{IH}/V_{IL} Levels Are Referenced to V_{CCA} Voltage
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model
 - 200-V Machine Model
 - 1000-V Charged-Device Model

2 Applications

- ATCA Solutions
- CPAP Machines
- Cameras: Surveillance Analog
- Chemical or Gas Sensors
- CT Scanners
- DLP 3D Machine Vision and Optical Networking
- Digital Signage
- ECGs: Electrocardiograms
- Field Transmitters: Pressure Sensors and Temperature Sensors
- High-Speed Data Acquisition and Generation
- HMI (Human Machine Interface)
- RF4CE Remote Controls
- Server Motherboards
- Software Defined Radios (SDR)
- Wireless LAN Cards and Data Access Cards
- X-ray: Medical, Dental, and Baggage Scanners

4 Simplified Schematic



3 Description

This 8-bit (octal) noninverting bus transceiver contains two separate supply rails; B port has V_{CCB} , which is set at 3.3 V, and A port has V_{CCA} , which is set at 5 V. This allows for translation from a 3.3-V to a 5-V environment, and vice versa.

The SN74LVC4245A device is designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable (\overline{OE}) input can be used to disable the device so the buses are effectively isolated. The control circuitry (DIR, \overline{OE}) is powered by V_{CCA} .

The SN74LVC4245A device terminal out allows the designer to switch to a normal all-3.3-V or all-5-V 20-terminal SN74LVC4245 device without board re-layout. The designer uses the data paths for pins 2–11 and 14–23 of the SN74LVC4245A device to align with the conventional '245 terminal out.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74LVC4245A	SSOP (24)	8.20 mm × 5.30 mm
	SOIC (24)	15.40 mm × 7.50 mm
	TSSOP (24)	7.80 mm × 4.40 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Table of Contents

1 Features	1	8 Parameter Measurement Information	8
2 Applications	1	8.1 A Port	8
3 Description	1	8.2 B Port	9
4 Simplified Schematic	1	9 Detailed Description	10
5 Revision History	2	9.1 Overview	10
6 Pin Configuration and Functions	3	9.2 Functional Block Diagram	10
7 Specifications	4	9.3 Feature Description	10
7.1 Absolute Maximum Ratings, (please advise specific title)	4	9.4 Device Functional Modes	10
7.2 Absolute Maximum Ratings, (please advise specific title)	4	10 Application and Implementation	11
7.3 ESD Ratings	4	10.1 Application Information	11
7.4 Recommended Operating Conditions, (please advise specific title)	5	10.2 Typical Application	11
7.5 Recommended Operating Conditions, (please advise specific title)	5	11 Power Supply Recommendations	13
7.6 Thermal Information	5	11.1 Power-Up Consideration	13
7.7 Electrical Characteristics, (please advise specific title)	6	12 Layout	13
7.8 Electrical Characteristics, (please advise specific title)	6	12.1 Layout Guidelines	13
7.9 Switching Characteristics	7	12.2 Layout Example	13
7.10 Operating Characteristics	7	13 Device and Documentation Support	14
7.11 Typical Characteristics	7	13.1 Trademarks	14
		13.2 Electrostatic Discharge Caution	14
		13.3 Glossary	14
		14 Mechanical, Packaging, and Orderable Information	14

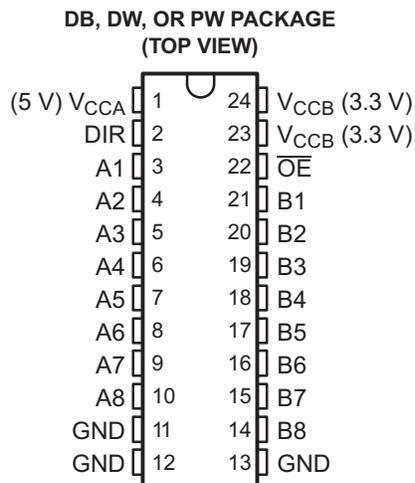
5 Revision History

Changes from Revision H (March 2005) to Revision I

Page

<ul style="list-style-type: none"> Added <i>Applications</i>, <i>Device Information</i> table, <i>Pin Functions</i> table, <i>ESD Ratings</i> table, <i>Thermal Information</i> table, <i>Typical Characteristics</i>, <i>Feature Description</i> section, <i>Device Functional Modes</i>, <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section. Deleted <i>Ordering Information</i> table. 	1 1
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6 Pin Configuration and Functions



Pin Functions

PIN		TYPE	DESCRIPTION
NO.	NAME		
1	V_{CCA}	—	Power supply for side A
2	DIR	I	Direction control
3	A1	I/O	Transceiver I/O pin
4	A2	I/O	Transceiver I/O pin
5	A3	I/O	Transceiver I/O pin
6	A4	I/O	Transceiver I/O pin
7	A5	I/O	Transceiver I/O pin
8	A6	I/O	Transceiver I/O pin
9	A7	I/O	Transceiver I/O pin
10	A8	I/O	Transceiver I/O pin
11	GND	—	Ground
12	GND	—	Ground
13	GND	—	Ground
14	B8	I/O	Transceiver I/O pin
15	B7	I/O	Transceiver I/O pin
16	B6	I/O	Transceiver I/O pin
17	B5	I/O	Transceiver I/O pin
18	B4	I/O	Transceiver I/O pin
19	B3	I/O	Transceiver I/O pin
20	B2	I/O	Transceiver I/O pin
21	B1	I/O	Transceiver I/O pin
22	\overline{OE}	I	Output Enable
23	V_{CCB}	—	Power supply for side B
24	V_{CCB}	—	Power supply for side B

7 Specifications

7.1 Absolute Maximum Ratings, (please advise specific title)

 over operating free-air temperature range for $V_{CCA} = 4.5\text{ V}$ to 5.5 V (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V_{CCA}	Supply voltage range	-0.5	6.5	V
V_I	Input voltage range	A port ⁽²⁾	$V_{CCA} + 0.5$	V
		Control inputs	6	
V_O	Output voltage range	A port ⁽²⁾	$V_{CCA} + 0.5$	V
I_{IK}	Input clamp current	$V_I < 0$	-50	mA
I_{OK}	Output clamp current	$V_O < 0$	-50	mA
I_O	Continuous output current		±50	mA
	Continuous current through each V_{CCA} or GND		±100	
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*, (please advise specific title) is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) This value is limited to 6 V maximum.

7.2 Absolute Maximum Ratings, (please advise specific title)

 over operating free-air temperature range for $V_{CCB} = 2.7\text{ V}$ to 3.6 V (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V_{CCB}	Supply voltage range	-0.5	4.6	V
V_I	Input voltage range	B port ⁽²⁾	$V_{CCB} + 0.5$	V
V_O	Output voltage range	B port ⁽²⁾	$V_{CCB} + 0.5$	V
I_{IK}	Input clamp current	$V_I < 0$	-50	mA
I_{OK}	Output clamp current	$V_O < 0$	-50	mA
I_O	Continuous output current		±50	mA
	Continuous current through V_{CCB} or GND		±100	
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*, (please advise specific title) is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) This value is limited to 4.6 V maximum.

7.3 ESD Ratings

PARAMETER	DEFINITION	VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾	2000
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾	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.

7.4 Recommended Operating Conditions, (please advise specific title)

 for $V_{CCA} = 4.5\text{ V to }5.5\text{ V}^{(1)}$

		MIN	MAX	UNIT
V_{CCA}	Supply voltage	4.5	5.5	V
V_{IH}	High-level input voltage	2		V
V_{IL}	Low-level input voltage		0.8	V
V_{IA}	Input voltage	0	V_{CCA}	V
V_{OA}	Output voltage	0	V_{CCA}	V
I_{OH}	High-level output current		-24	mA
I_{OL}	Low-level output current		24	mA
T_A	Operating free-air temperature	-40	85	°C

(1) All unused inputs of the device must be held at the associated 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](#).

7.5 Recommended Operating Conditions, (please advise specific title)

 for $V_{CCB} = 2.7\text{ V to }3.6\text{ V}^{(1)}$

		MIN	MAX	UNIT
V_{CCB}	Supply voltage	2.7	3.6	V
V_{IH}	High-level input voltage	$V_{CCB} = 2.7\text{ V to }3.6\text{ V}$	2	V
V_{IL}	Low-level input voltage	$V_{CCB} = 2.7\text{ V to }3.6\text{ V}$	0.8	V
V_{IB}	Input voltage	0	V_{CCB}	V
V_{OB}	Output voltage	0	V_{CCB}	V
I_{OH}	High-level output current	$V_{CCB} = 2.7\text{ V}$	-12	mA
		$V_{CCB} = 3\text{ V}$	-24	
I_{OL}	Low-level output current	$V_{CCB} = 2.7\text{ V}$	12	mA
		$V_{CCB} = 3\text{ V}$	24	
T_A	Operating free-air temperature	-40	85	°C

(1) All unused inputs of the device must be held at the associated 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](#).

7.6 Thermal Information

THERMAL METRIC ⁽¹⁾	SN74LVC4245A			UNIT	
	DB	DW	PW		
	24 PINS				
$R_{\theta JA}$	Junction-to-ambient thermal resistance	63	46	88	°C/W

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

7.7 Electrical Characteristics, (please advise specific title)

 over recommended operating free-air temperature range for $V_{CCA} = 4.5\text{ V}$ to 5.5 V (unless otherwise noted)⁽¹⁾

PARAMETER		TEST CONDITIONS	V_{CCA}	MIN	TYP ⁽²⁾	MAX	UNIT
V_{OH}		$I_{OH} = -100\ \mu\text{A}$	4.5 V	4.3		V	
			5.5 V	5.3			
		$I_{OH} = -24\ \text{mA}$	4.5 V	3.7			
			5.5 V	4.7			
V_{OL}		$I_{OL} = 100\ \mu\text{A}$	4.5 V	0.2		V	
			5.5 V	0.2			
		$I_{OL} = 24\ \text{mA}$	4.5 V	0.55			
			5.5 V	0.55			
I_i	Control inputs	$V_i = V_{CCA}$ or GND	5.5 V	± 1		μA	
I_{OZ} ⁽³⁾	A port	$V_O = V_{CCA}$ or GND	5.5 V	± 5		μA	
I_{CCA}		$V_i = V_{CCA}$ or GND, $I_O = 0$	5.5 V	80		μA	
ΔI_{CCA} ⁽⁴⁾		One input at 3.4 V, Other inputs at V_{CCA} or GND	5.5 V	1.5		mA	
C_i	Control inputs	$V_i = V_{CCA}$ or GND	Open	5		pF	
C_{io}	A port	$V_O = V_{CCA}$ or GND	5 V	11		pF	

 (1) $V_{CCB} = 2.7\text{ V}$ to 3.6 V .

 (2) All typical values are measured at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

 (3) For I/O ports, the parameter I_{OZ} includes the input leakage current.

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

7.8 Electrical Characteristics, (please advise specific title)

 over recommended operating free-air temperature range for $V_{CCB} = 2.7\text{ V}$ to 3.6 V (unless otherwise noted)⁽¹⁾

PARAMETER		TEST CONDITIONS	V_{CCB}	MIN	TYP ⁽²⁾	MAX	UNIT
V_{OH}		$I_{OH} = -100\ \mu\text{A}$	2.7 V to 3.6 V	$V_{CC} - 0.2$		V	
			2.7 V	2.2			
		$I_{OH} = -24\ \text{mA}$	3 V	2.4			
			3 V	2			
V_{OL}		$I_{OL} = 100\ \mu\text{A}$	2.7 V to 3.6 V	0.2		V	
			2.7 V	0.4			
			3 V	0.55			
I_{OZ} ⁽³⁾	B port	$V_O = V_{CCB}$ or GND	3.6 V	± 5		μA	
I_{CCB}		$V_i = V_{CCB}$ or GND, $I_O = 0$	3.6 V	50		μA	
ΔI_{CCB} ⁽⁴⁾		One input at $V_{CCB} - 0.6\text{ V}$, Other inputs at V_{CCB} or GND	2.7 V to 3.6 V	0.5		mA	
C_{io}	B port	$V_O = V_{CCB}$ or GND	3.3 V	11		pF	

 (1) $V_{CCA} = 5\text{ V} \pm 0.5\text{ V}$.

 (2) All typical values are measured at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

 (3) For I/O ports, the parameter I_{OZ} includes the input leakage current.

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

7.9 Switching Characteristics

over recommended operating free-air temperature range, $C_L = 50$ pF (unless otherwise noted) (see Figure 3 and Figure 4)

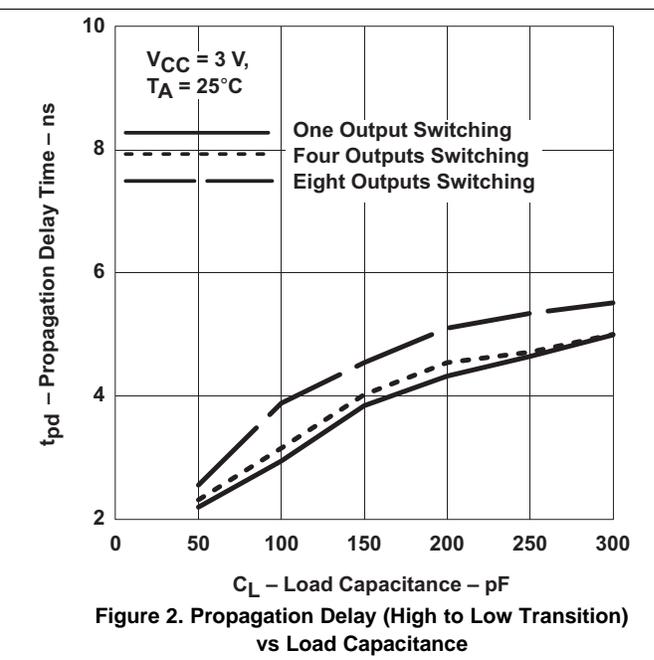
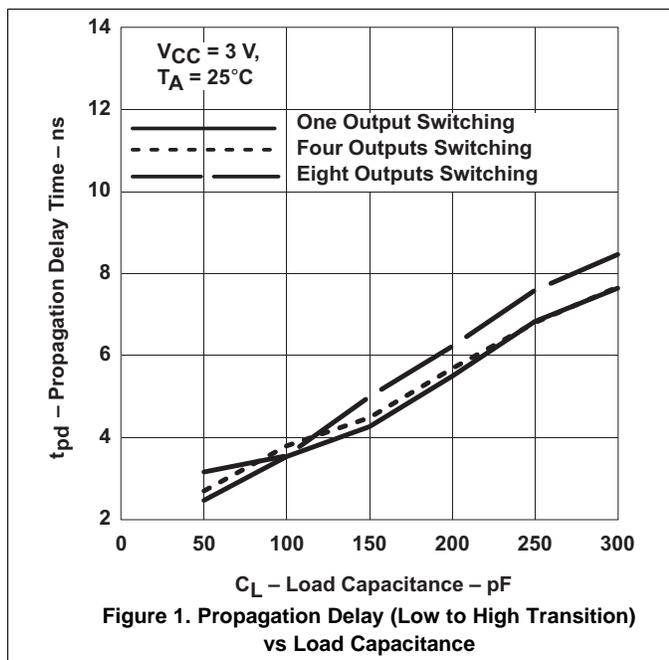
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCA} = 5 V \pm 0.5 V$, $V_{CCB} = 2.7 V$ to $3.6 V$		UNIT
			MIN	MAX	
t_{PHL}	A	B	1	6.3	ns
t_{PLH}			1	6.7	
t_{PHL}	B	A	1	6.1	ns
t_{PLH}			1	5	
t_{PZL}	\overline{OE}	A	1	9	ns
t_{PZH}			1	8.1	
t_{PZL}	\overline{OE}	B	1	8.8	ns
t_{PZH}			1	9.8	
t_{PLZ}	\overline{OE}	A	1	7	ns
t_{PHZ}			1	5.8	
t_{PLZ}	\overline{OE}	B	1	7.7	ns
t_{PHZ}			1	7.8	

7.10 Operating Characteristics

$V_{CCA} = 4.5 V$ to $5.5 V$, $V_{CCB} = 2.7 V$ to $3.6 V$, $T_A = 25^\circ C$

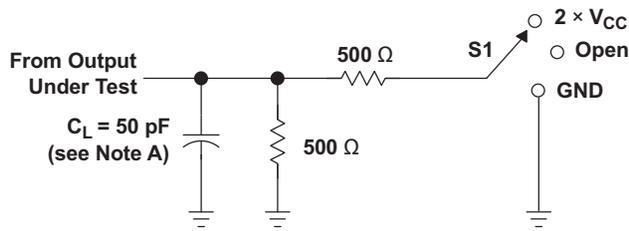
PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance per transceiver	Outputs enabled	39.5	pF
		Outputs disabled	5	

7.11 Typical Characteristics



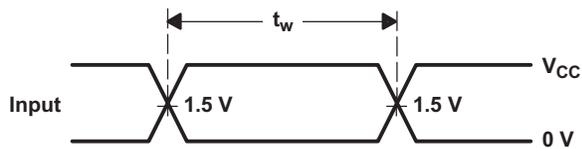
8 Parameter Measurement Information

8.1 A Port

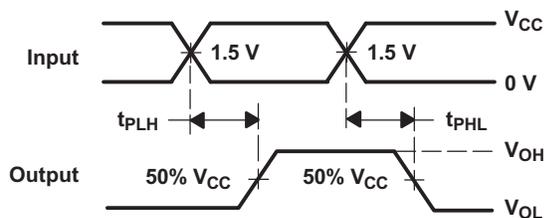


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CC}$
t_{PHZ}/t_{PZH}	GND

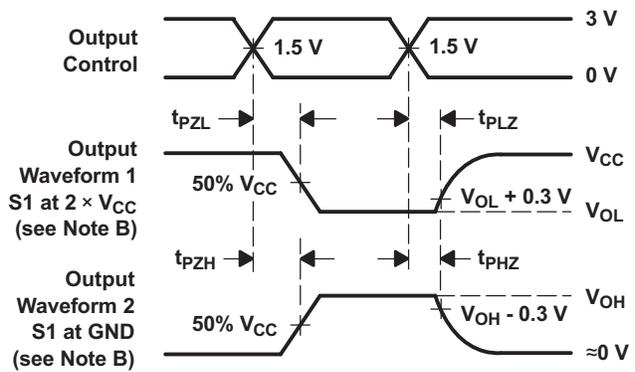
LOAD CIRCUIT



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
NONINVERTING OUTPUTS

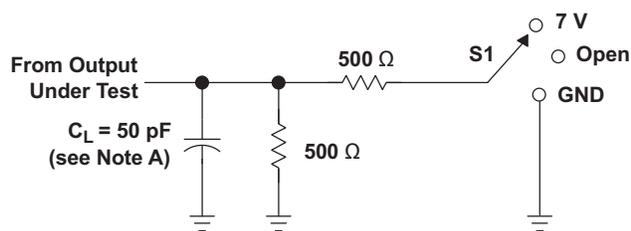


VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- 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, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.
 D. The outputs are measured one at a time, with one transition per measurement.
 E. All parameters and waveforms are not applicable to all devices.

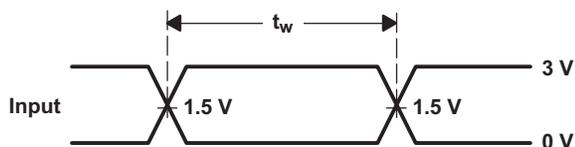
Figure 3. Load Circuit and Voltage Waveforms

8.2 B Port

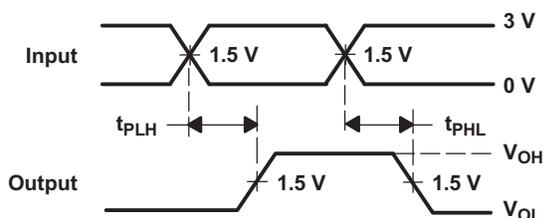


LOAD CIRCUIT

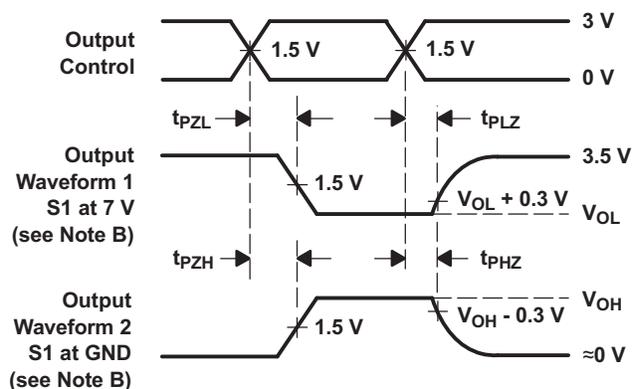
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	GND



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
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: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
- D. The outputs are measured one at a time, with one transition per measurement.
- E. All parameters and waveforms are not applicable to all devices.

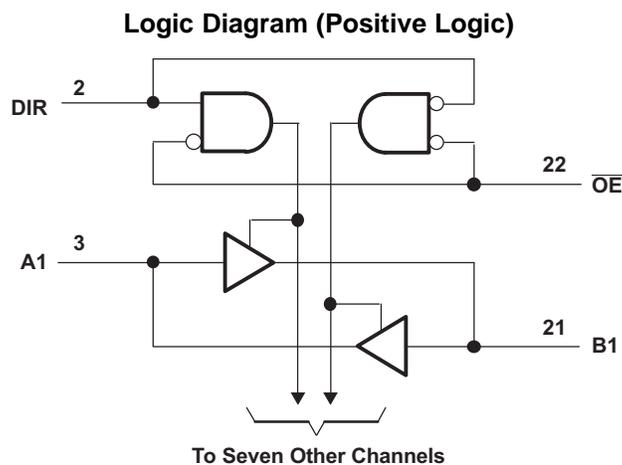
Figure 4. Load Circuit and Voltage Waveforms

9 Detailed Description

9.1 Overview

SN74LVC4245A is an 8-bit (octal) noninverting bus transceiver contains two separate supply rails; B port has V_{CCB} , which is set at 3.3 V, and A port has V_{CCA} , which is set at 5 V. This allows for translation from a 3.3-V to a 5-V environment, and vice versa, designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable (\overline{OE}) input can be used to disable the device so the buses are effectively isolated. The control circuitry (DIR, \overline{OE}) is powered by V_{CCA} .

9.2 Functional Block Diagram



9.3 Feature Description

- 24 mA drive at 3-V supply
 - Good for heavier loads and longer traces
- Low V_{IH}
 - Allows 3.3-V to 5-V translation

9.4 Device Functional Modes

Function Table

INPUTS		OPERATION
\overline{OE}	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

10 Application and Implementation

10.1 Application Information

The SN74LVC4245A device pinout allows the designer to switch to a normal all-3.3-V or all-5-V 20-pin '245 device without board re-layout. The designer uses the data paths for pins 2–11 and 14–23 of the SN74LVC4245A to align with the conventional SN74LVC4245 device's pinout. SN74LVC4245A is a high drive CMOS device that can be used for a multitude of bus interface type applications where output drive or PCB trace length is a concern.

10.2 Typical Application

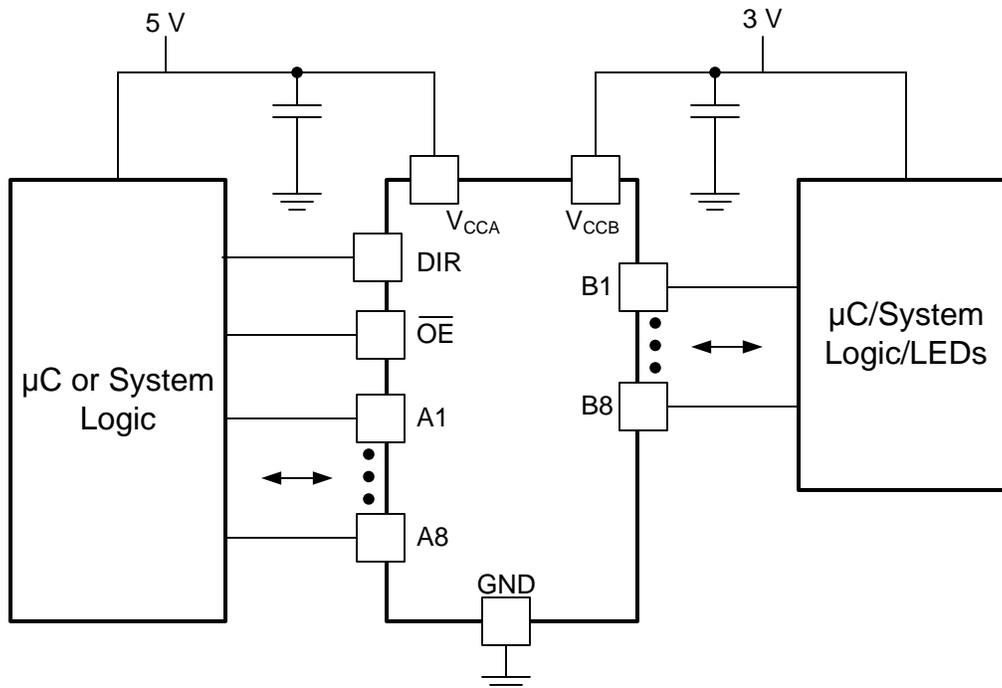


Figure 5. Typical Application Schematic

10.2.1 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.

10.2.2 Detailed Design Procedure

1. Recommended Input Conditions:

- For rise time and fall time specifications, see $(\Delta t/\Delta V)$ in the [Recommended Operating Conditions, \(please advise specific title\)](#) table.
- For specified high and low levels, see $(V_{IH}$ and $V_{IL})$ in the [Recommended Operating Conditions, \(please advise specific title\)](#) table.

2. Recommend Output Conditions:

- Load currents should not exceed $(I_O \text{ max})$ per output and should not exceed (Continuous current through V_{CC} or GND) total current for the part. These limits are located in the [Absolute Maximum Ratings, \(please advise specific title\)](#) table.
- Outputs should not be pulled above V_{CC} .
- Series resistors on the output may be used if the user desires to slow the output edge signal or limit the output current.

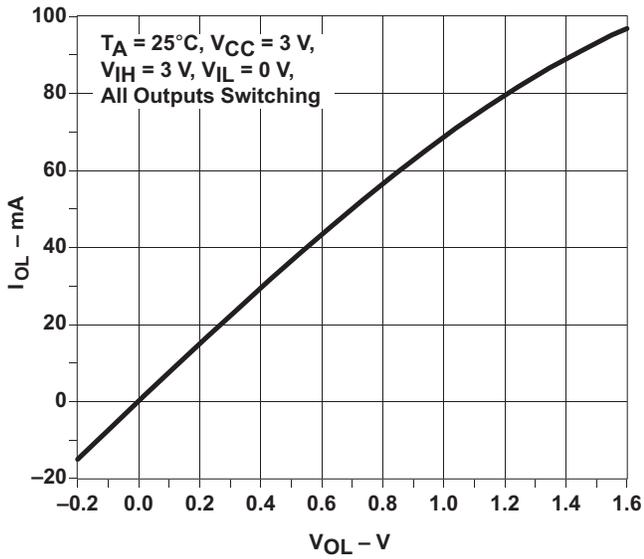
Typical Application (continued)
10.2.3 Application Curves


Figure 6. Output Drive Current (I_{OL}) vs LOW-level Output Voltage (V_{OL})

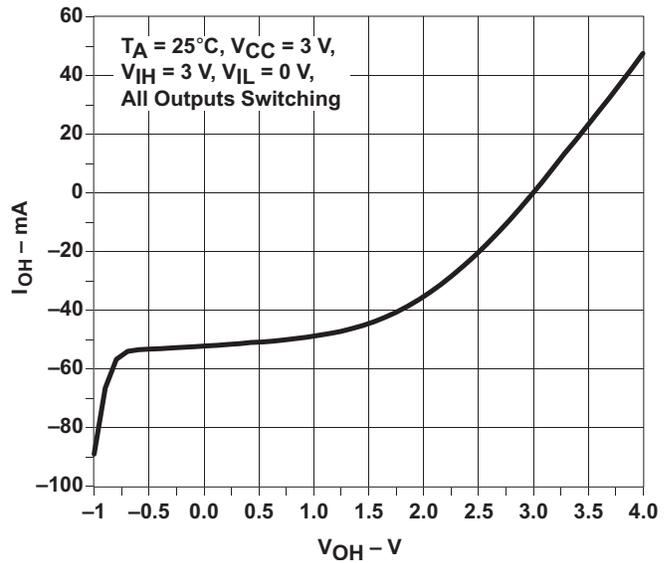


Figure 7. Output Drive Current (I_{OH}) vs HIGH-level Output Voltage (V_{OH})

11 Power Supply Recommendations

11.1 Power-Up Consideration

⁽¹⁾TI level-translation devices offer an opportunity for successful mixed-voltage signal design. A proper power-up sequence always should be followed to avoid excessive supply current, bus contention, oscillations, or other anomalies caused by improperly biased device terminals. Take these precautions to guard against such power-up problems:

1. Connect ground before any supply voltage is applied.
2. Power up the control side of the device (V_{CCA} for all four of these devices).
3. Tie \overline{OE} to V_{CCA} with a pullup resistor so that it ramps with V_{CCA} .
4. Depending on the direction of the data path, DIR can be high or low. If DIR high is needed (A data to B bus), ramp it with V_{CCA} . Otherwise, keep DIR low.

(1) Refer to the TI application report, *Texas Instruments Voltage-Level-Translation Devices*, literature number [SCEA021](#).

12 Layout

12.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when 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.

Specified in [Figure 8](#) are 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.

12.2 Layout Example

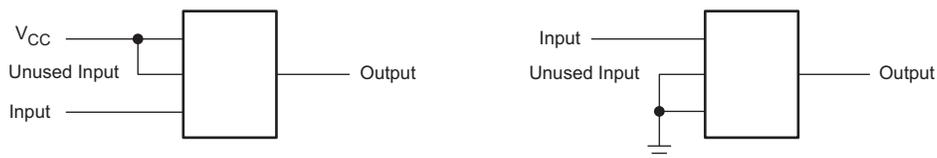


Figure 8. Layout Diagram

13 Device and Documentation Support

13.1 Trademarks

All trademarks are the property of their respective owners.

13.2 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

13.3 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

14 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/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LVC4245ADBR	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245ADBRE4	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245ADBRG4	ACTIVE	SSOP	DB	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245ADW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVC4245A	Samples
SN74LVC4245ADWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVC4245A	Samples
SN74LVC4245ADWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVC4245A	Samples
SN74LVC4245ADWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU CU SN	Level-1-260C-UNLIM	-40 to 85	LVC4245A	Samples
SN74LVC4245ADWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVC4245A	Samples
SN74LVC4245ADWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LVC4245A	Samples
SN74LVC4245APW	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245APWG4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245APWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245APWRE4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245APWRG4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245APWT	ACTIVE	TSSOP	PW	24	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	Samples
SN74LVC4245APWTG4	ACTIVE	TSSOP	PW	24	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	LJ245A	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⁾ 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)

⁽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 SN74LVC4245A :

- Enhanced Product: [SN74LVC4245A-EP](#)

NOTE: Qualified Version Definitions:

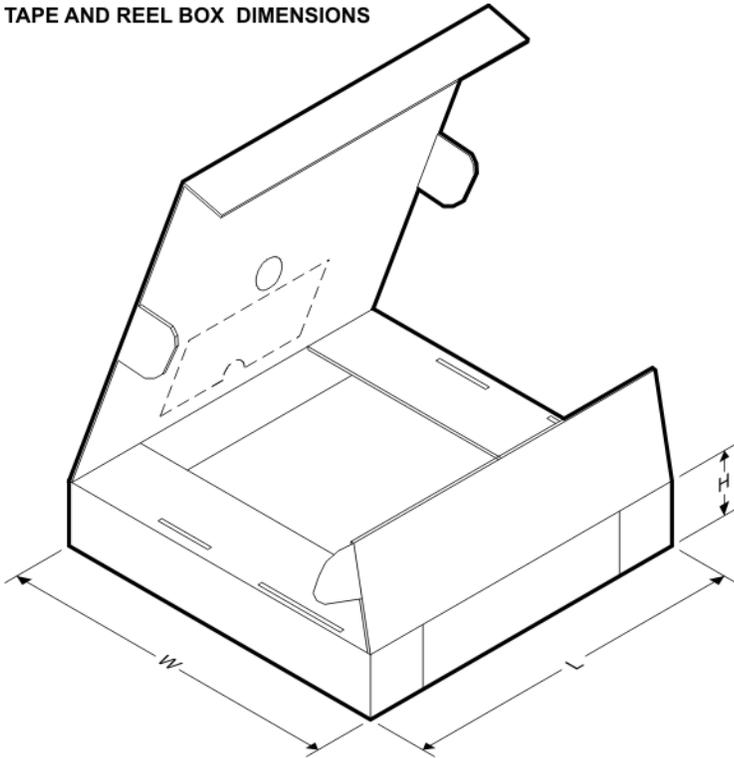
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

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
SN74LVC4245ADBR	SSOP	DB	24	2000	330.0	16.4	8.2	8.8	2.5	12.0	16.0	Q1
SN74LVC4245ADWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74LVC4245ADWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74LVC4245ADWRG4	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74LVC4245APWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1
SN74LVC4245APWT	TSSOP	PW	24	250	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

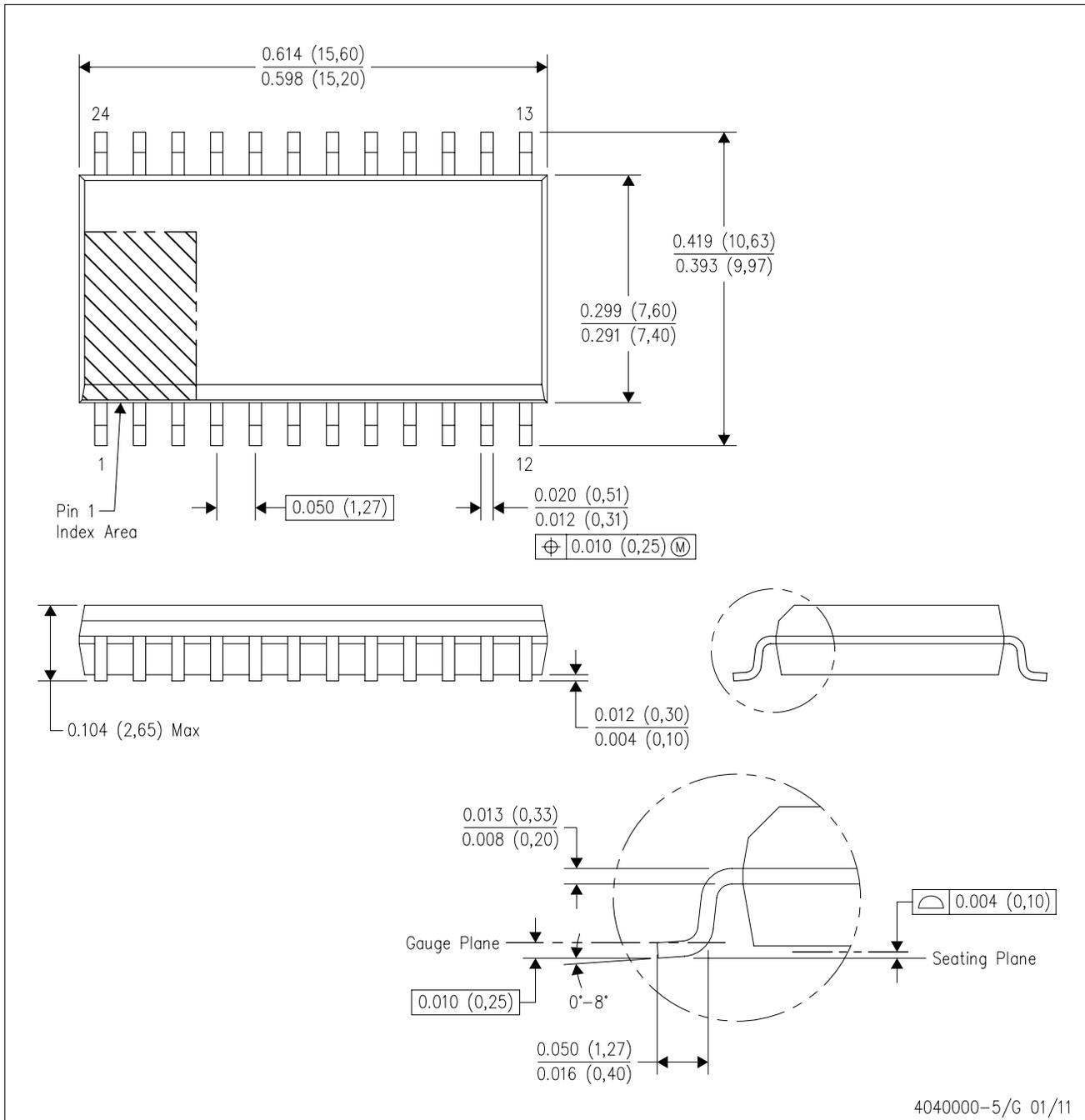
TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC4245ADBR	SSOP	DB	24	2000	367.0	367.0	38.0
SN74LVC4245ADWR	SOIC	DW	24	2000	366.0	364.0	50.0
SN74LVC4245ADWR	SOIC	DW	24	2000	367.0	367.0	45.0
SN74LVC4245ADWRG4	SOIC	DW	24	2000	367.0	367.0	45.0
SN74LVC4245APWR	TSSOP	PW	24	2000	367.0	367.0	38.0
SN74LVC4245APWT	TSSOP	PW	24	250	367.0	367.0	38.0

DW (R-PDSO-G24)

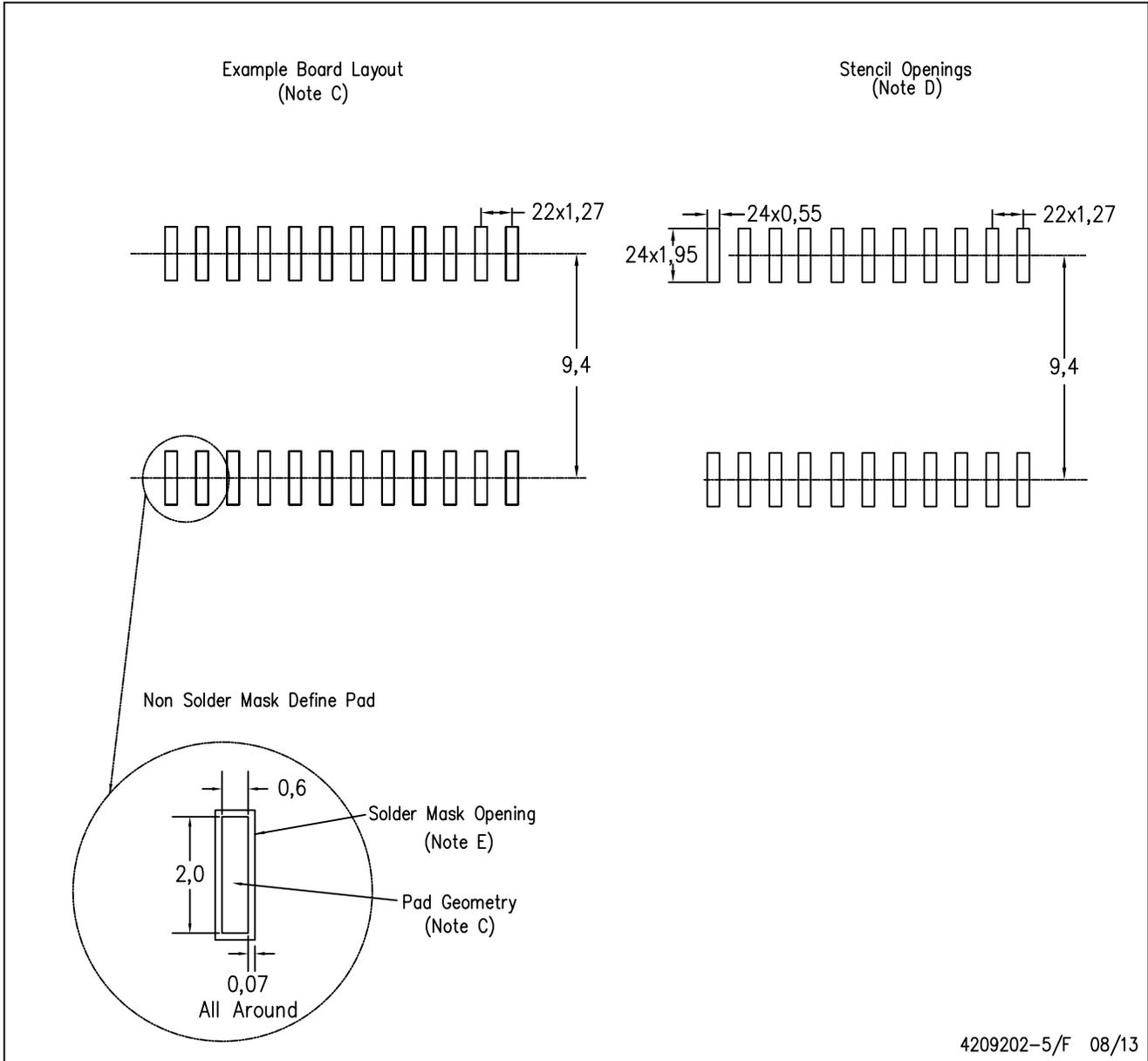
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-013 variation AD.

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE

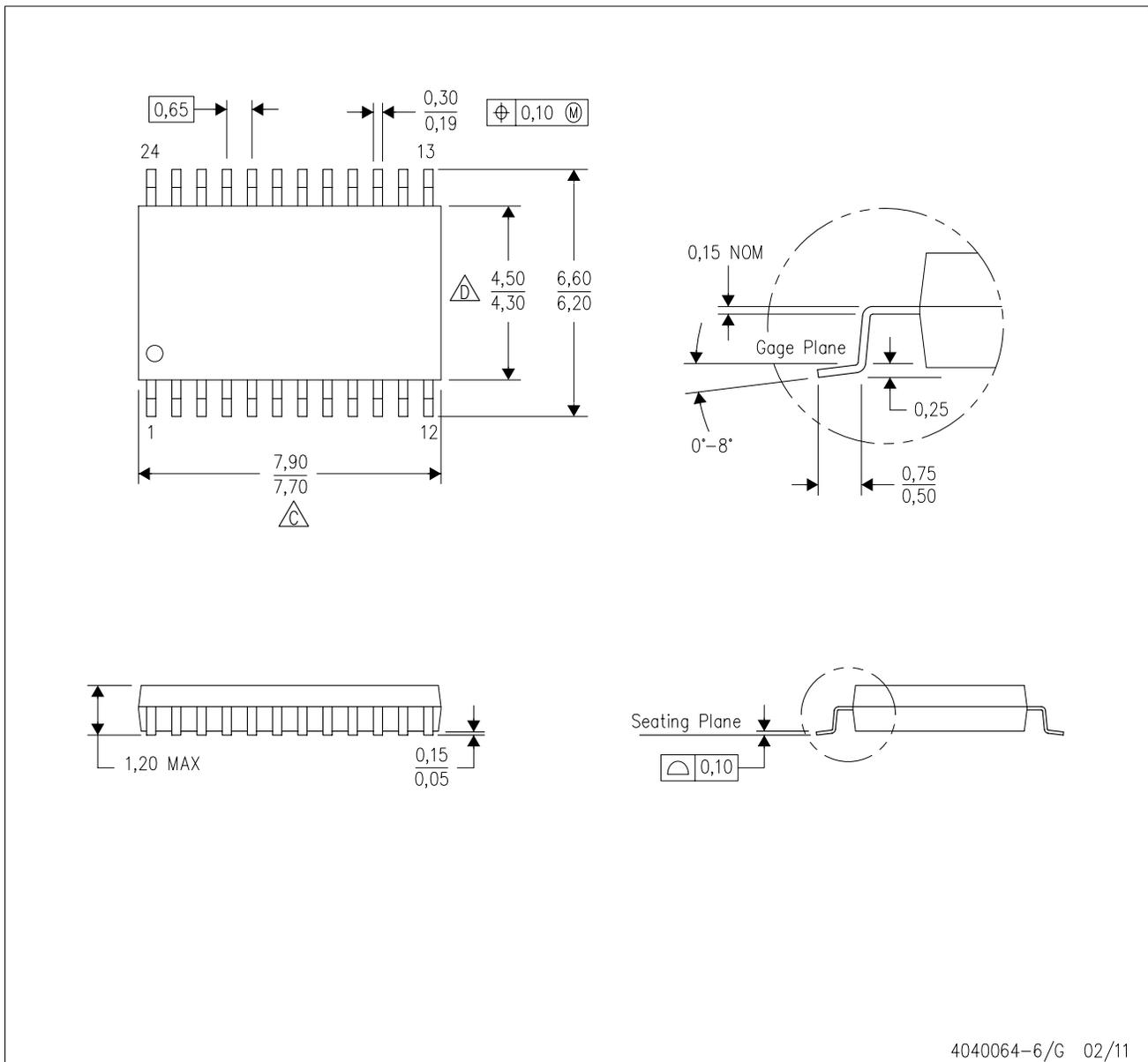


4209202-5/F 08/13

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Refer to IPC7351 for alternate board design.
 - 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
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G24)

PLASTIC SMALL OUTLINE

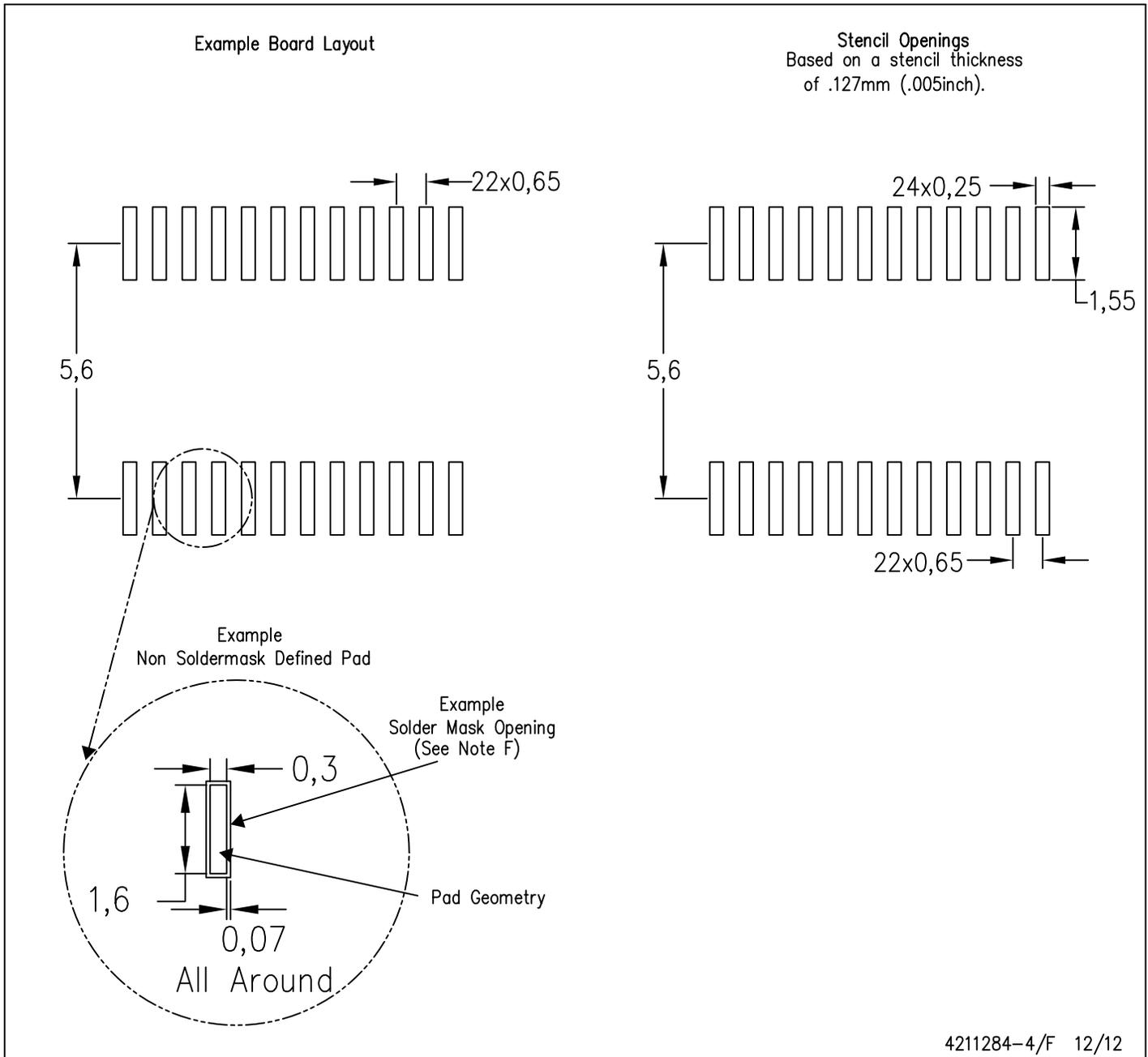


4040064-6/G 02/11

- 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-G24)

PLASTIC SMALL OUTLINE

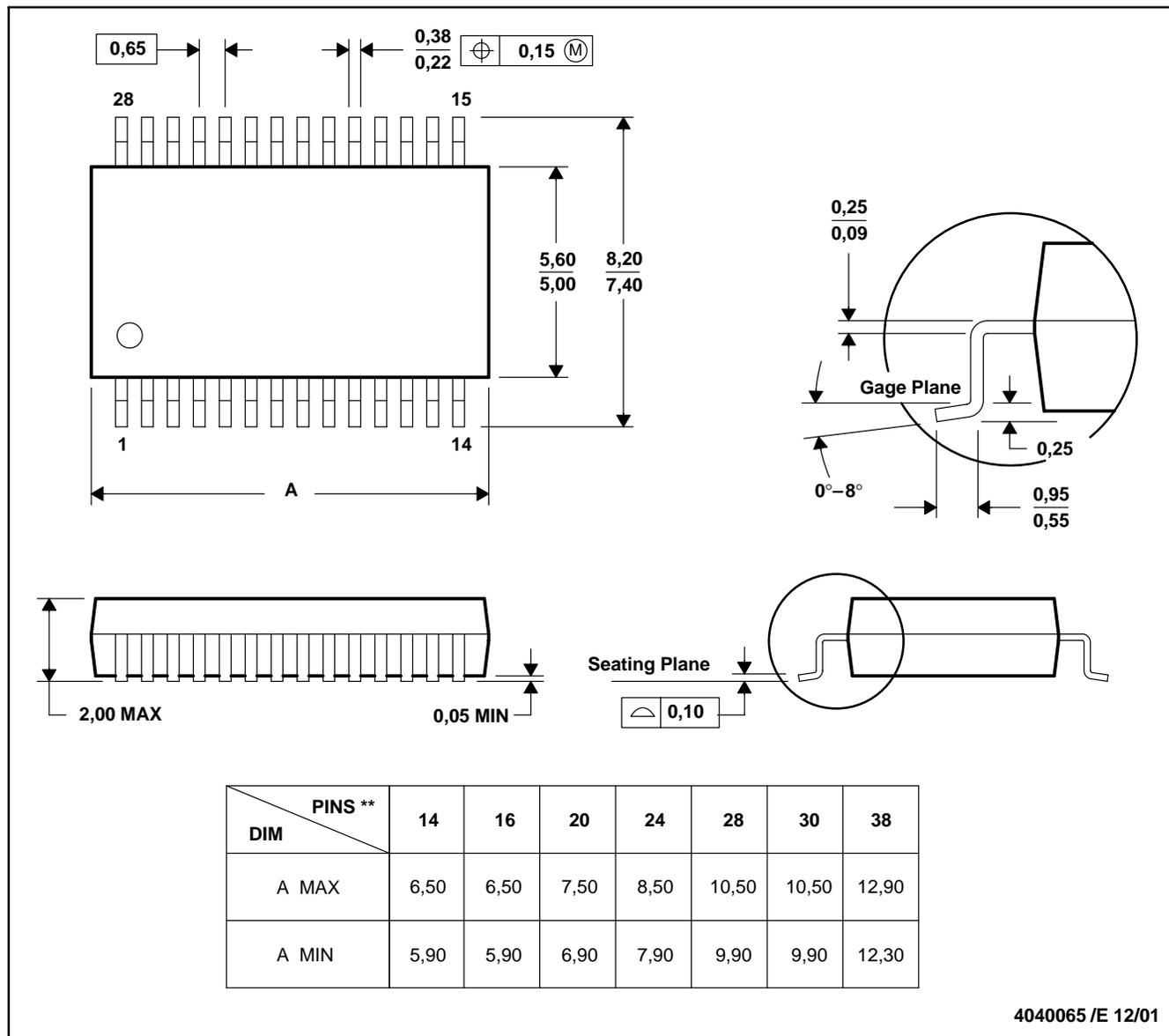


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should 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.

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 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.
 D. Falls within JEDEC MO-150

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