

SN74AVC4T245

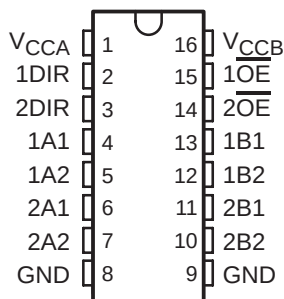
4-BIT DUAL-SUPPLY BUS TRANSCEIVER

WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS

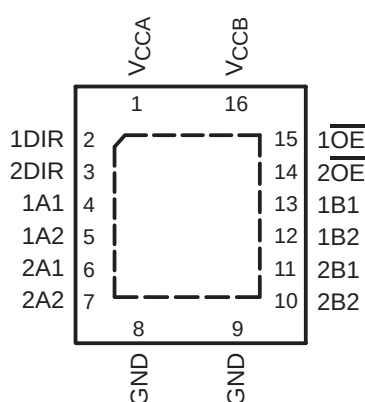
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- Control Inputs V_{IH}/V_{IL} Levels are Referenced to V_{CCA} Voltage
- Fully Configurable Dual-Rail Design Allows Each Port to Operate Over the Full 1.2-V to 3.6-V Power-Supply Range
- I/Os Are 4.6-V Tolerant
- I_{off} Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
 - 8000-V Human-Body Model (A114-A)
 - 150-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

D, DGV, OR PW PACKAGE
(TOP VIEW)



RGY PACKAGE
(TOP VIEW)



description/ordering information

This 4-bit noninverting bus transceiver uses two separate configurable power-supply rails. The A port is designed to track V_{CCA} . V_{CCA} accepts any supply voltage from 1.2 V to 3.6 V. The B port is designed to track V_{CCB} . V_{CCB} accepts any supply voltage from 1.2 V to 3.6 V. The SN74AVC4T245 is optimized to operate with V_{CCA}/V_{CCB} set at 1.4 V to 3.6 V. It is operational with V_{CCA}/V_{CCB} as low as 1.2 V. This allows for universal low-voltage bidirectional translation between any of the 1.2-V, 1.5-V, 1.8-V, 2.5-V, and 3.3-V voltage nodes.

The SN74AVC4T245 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 outputs so the buses are effectively isolated.

The SN74AVC4T245 is designed so that the control pins (1DIR, 2DIR, $\overline{1OE}$, and $\overline{2OE}$) are supplied by V_{CCA} .

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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ORDERING INFORMATION

T _A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QFN – RGY	Tape and reel	SN74AVC4T245RGYR	WT245
	SOIC – D	Tube	SN74AVC4T245D	AVC4T245
		Tape and reel	SN74AVC4T245DR	
	TSSOP – PW	Tube	SN74AVC4T245PW	WT245
		Tape and reel	SN74AVC4T245PWR	
	TVSOP – DGV	Tape and reel	SN74AVC4T245DGVR	WT245

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



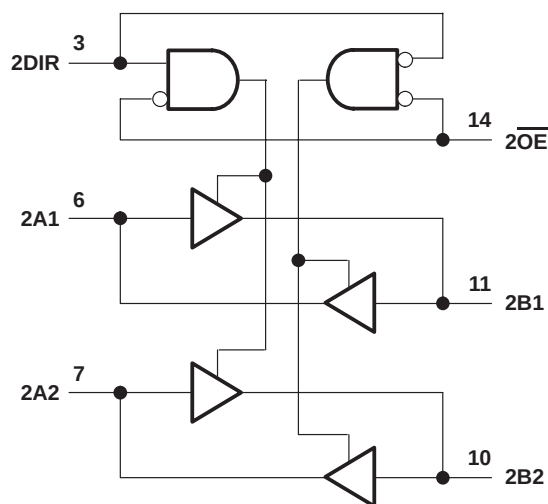
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The V_{CC} isolation feature ensures that if either V_{CC} input is at GND, then both ports are in the high-impedance state.

FUNCTION TABLE
(each 4-bit section)

INPUTS		OPERATION
$\overline{\text{OE}}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	All output Hi-Z

The logic diagram shows a 3-to-8 decoder implemented with NAND and NOR gates. The inputs are 1DIR (pin 2), 1A1 (pin 4), and 1A2 (pin 5). The outputs are 10OE (pin 15), 1B1 (pin 13), and 1B2 (pin 12). The circuit uses two NAND gates and four NOR gates. The first NAND gate has inputs 1DIR and 1A1, with its output connected to 10OE. The second NAND gate has inputs 1DIR and 1A2, with its output connected to 1B1. The output of the first NAND gate is also connected to the input of the first NOR gate. The output of the second NAND gate is also connected to the input of the first NOR gate. The output of the first NOR gate is connected to 1B2. The output of the second NOR gate is connected to 1B1. The output of the third NOR gate is connected to 1B2. The output of the fourth NOR gate is connected to 1B1.



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

Supply voltage range, V_{CCA} and V_{CCB}	–0.5 V to 4.6 V
Input voltage range, V_I (see Note 1): I/O ports (A port)	–0.5 V to 4.6 V
I/O ports (B port)	–0.5 V to 4.6 V
Control inputs	–0.5 V to 4.6 V
Voltage range applied to any output in the high-impedance or power-off state, V_O	
(see Note 1): (A port)	–0.5 V to 4.6 V
(B port)	–0.5 V to 4.6 V
Voltage range applied to any output in the high or low state, V_O	
(see Notes 1 and 2): (A port)	–0.5 V to $V_{CCA} + 0.5$ V
(B port)	–0.5 V to $V_{CCB} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–50 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Continuous output current, I_O	±50 mA
Continuous current through V_{CCA} , V_{CCB} , or GND	±100 mA
Package thermal impedance, θ_{JA} (see Note 3): D package	73°C/W
(see Note 3): DB package	82°C/W
(see Note 3): DGV package	120°C/W
(see Note 3): PW package	108°C/W
(see Note 4): RGY package	39°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. The input voltage and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The output positive-voltage rating may be exceeded up to 4.6 V maximum if the output current rating is observed.
 3. The package thermal impedance is calculated in accordance with JESD 51-7.
 4. The package thermal impedance is calculated in accordance with JESD 51-5.

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recommended operating conditions (see Notes 5 through 7)

			V _{CCI}	V _{CCO}	MIN	MAX	UNIT
V _{CCA}	Supply voltage				1.2	3.6	V
V _{CCB}	Supply voltage				1.2	3.6	V
V _{IH}	High-level input voltage	Data inputs (see Note 8)	1.2 V to 1.95 V		V _{CCI} × 0.65		V
			1.95 V to 2.7 V		1.6		
			2.7 V to 3.6 V		2		
V _{IL}	Low-level input voltage	Data inputs (see Note 8)	1.2 V to 1.95 V		V _{CCI} × 0.35		V
			1.95 V to 2.7 V		0.7		
			2.7 V to 3.6 V		0.8		
V _{IH}	High-level input voltage	DIR (referenced to V _{CCA}) (see Note 9)	1.2 V to 1.95 V		V _{CCA} × 0.65		V
			1.95 V to 2.7 V		1.6		
			2.7 V to 3.6 V		2		
V _{IL}	Low-level input voltage	DIR (referenced to V _{CCA}) (see Note 9)	1.2 V to 1.95 V		V _{CCA} × 0.35		V
			1.95 V to 2.7 V		0.7		
			2.7 V to 3.6 V		0.8		
V _I	Input voltage				0	3.6	V
V _O	Output voltage	Active state			0	V _{CCO}	V
		3-state			0	3.6	
I _{OH}	High-level output current			1.1 V to 1.2 V	−3		mA
				1.4 V to 1.6 V	−6		
				1.65 V to 1.95 V	−8		
				2.3 V to 2.7 V	−9		
				3 V to 3.6 V	−12		
I _{OL}	Low-level output current			1.1 V to 1.2 V	3		mA
				1.4 V to 1.6 V	6		
				1.65 V to 1.95 V	8		
				2.3 V to 2.7 V	9		
				3 V to 3.6 V	12		
Δt/Δv	Input transition rise or fall rate				5		ns/V
T _A	Operating free-air temperature				−40	85	°C

- NOTES: 5. V_{CCI} is the V_{CC} associated with the data input port.
6. V_{CCO} is the V_{CC} associated with the output port.
7. All unused data inputs of the device must be held at V_{CCI} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.
8. For V_{CCI} values not specified in the data sheet, V_{IH(min)} = V_{CCI} × 0.7 V, V_{IL(max)} = V_{CCI} × 0.3 V.
9. For V_{CCI} values not specified in the data sheet, V_{IH(min)} = V_{CCA} × 0.7 V, V_{IL(max)} = V_{CCA} × 0.3 V.



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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Notes 10 and 11)

PARAMETER		TEST CONDITIONS		V _{CCA}	V _{CCB}	T _A = 25°C			–40°C to 85°C		UNIT
						MIN	TYP	MAX	MIN	MAX	
V _{OH}		I _{OH} = –100 μA	V _I = V _{IH}	1.2 V to 3.6 V	1.2 V to 3.6 V				V _{CCO} – 0.2 V		V
		I _{OH} = –3 mA		1.2 V	1.2 V	0.95					
		I _{OH} = –6 mA		1.4 V	1.4 V				1.05		
		I _{OH} = –8 mA		1.65 V	1.65 V				1.2		
		I _{OH} = –9 mA		2.3 V	2.3 V				1.75		
		I _{OH} = –12 mA		3 V	3 V				2.3		
V _{OL}		I _{OL} = 100 μA	V _I = V _{IL}	1.2 V to 3.6 V	1.2 V to 3.6 V				0.2		V
		I _{OL} = 3 mA		1.2 V	1.2 V	0.25					
		I _{OL} = 6 mA		1.4 V	1.4 V				0.35		
		I _{OL} = 8 mA		1.65 V	1.65 V				0.45		
		I _{OL} = 9 mA		2.3 V	2.3 V				0.55		
		I _{OL} = 12 mA		3 V	3 V				0.7		
I _I	Control inputs	V _I = V _{CCA} or GND		1.2 V to 3.6 V	1.2 V to 3.6 V	±0.025		±0.25	±1		μA
I _{off}	A or B port	V _I or V _O = 0 to 3.6 V		0 V	0 to 3.6 V	±0.1		±1	±5		μA
				0 to 3.6 V	0 V	±0.1		±1	±5		
I _{OZ} [†]	A or B port	V _O = V _{CCO} or GND, V _I = V _{CCI} or GND	$\overline{\text{OE}}$ = V _{IH}	3.6 V	3.6 V	±0.5		±2.5	±5		μA
I _{CCA}		V _I = V _{CCI} or GND	I _O = 0	1.2 V to 3.6 V	1.2 V to 3.6 V				8		μA
				0 V	3.6 V				–2		
				3.6 V	0 V				8		
I _{CCB}		V _I = V _{CCI} or GND	I _O = 0	1.2 V to 3.6 V	1.2 V to 3.6 V				8		μA
				0 V	3.6 V				8		
				3.6 V	0 V				–2		
I _{CCA} + I _{CCB}		V _I = V _{CCI} or GND	I _O = 0	1.2 V to 3.6 V	1.2 V to 3.6 V				16		μA
C _i	Control inputs	V _I = 3.3 V or GND		3.3 V	3.3 V	3.5			4.5		pF
C _{io}	A or B ports	V _O = 3.3 V or GND		3.3 V	3.3 V	6			7		pF

NOTES: 10. V_{CCO} is the V_{CC} associated with the output port.

11. V_{CCI} is the V_{CC} associated with the input port.



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switching characteristics over recommended operating free-air temperature range,
 $V_{CCA} = 1.2 \text{ V}$ (see Figure 11)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.2 \text{ V}$	$V_{CCB} = 1.5 \text{ V} \pm 0.1 \text{ V}$	$V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$	$V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$	$V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$	UNIT
			TYP	TYP	TYP	TYP	TYP	
t_{PLH}	A	B	3.4	2.9	2.7	2.6	2.8	ns
t_{PHL}			3.4	2.9	2.7	2.6	2.8	
t_{PLH}	B	A	3.6	3.1	2.8	2.6	2.6	ns
t_{PHL}			3.6	3.1	2.8	2.6	2.6	
t_{PZH}	$\overline{OE}$	A	5.6	4.7	4.3	3.9	3.7	ns
t_{PZL}			5.6	4.7	4.3	3.9	3.7	
t_{PZH}	$\overline{OE}$	B	5	4.3	3.9	3.6	3.6	ns
t_{PZL}			5	4.3	3.9	3.6	3.6	
t_{PHZ}	$\overline{OE}$	A	6.2	5.2	5.2	4.3	4.8	ns
t_{PLZ}			6.2	5.2	5.2	4.3	4.8	
t_{PHZ}	$\overline{OE}$	B	5.9	5.1	5	4.7	5.5	ns
t_{PLZ}			5.9	5.1	5	4.7	5.5	

switching characteristics over recommended operating free-air temperature range,
 $V_{CCA} = 1.5 \text{ V} \pm 0.1 \text{ V}$ (see Figure 11)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.2 \text{ V}$	$V_{CCB} = 1.5 \text{ V} \pm 0.1 \text{ V}$		$V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$		$V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	3.2	0.3	6.3	0.3	5.2	0.4	4.2	0.4	4.2	ns
t_{PHL}			3.2	0.3	6.3	0.3	5.2	0.4	4.2	0.4	4.2	
t_{PLH}	B	A	3.3	0.7	6.3	0.5	6	0.4	5.7	0.3	5.6	ns
t_{PHL}			3.3	0.7	6.3	0.5	6	0.4	5.7	0.3	5.6	
t_{PZH}	$\overline{OE}$	A	4.9	1.4	9.6	1.1	9.5	0.7	9.4	0.4	9.4	ns
t_{PZL}			4.9	1.4	9.6	1.1	9.5	0.7	9.4	0.4	9.4	
t_{PZH}	$\overline{OE}$	B	4.5	1.4	9.6	1.1	7.7	0.9	5.8	0.9	5.6	ns
t_{PZL}			4.5	1.4	9.6	1.1	7.7	0.9	5.8	0.9	5.6	
t_{PHZ}	$\overline{OE}$	A	5.6	1.8	10.2	1.5	10.2	1.3	10.2	1.6	10.2	ns
t_{PLZ}			5.6	1.8	10.2	1.5	10.2	1.3	10.2	1.6	10.2	
t_{PHZ}	$\overline{OE}$	B	5.2	1.9	10.3	1.9	9.1	1.4	7.4	1.2	7.6	ns
t_{PLZ}			5.2	1.9	10.3	1.9	9.1	1.4	7.4	1.2	7.6	

switching characteristics over recommended operating free-air temperature range,
 $V_{CCA} = 1.8 \text{ V} \pm 0.15 \text{ V}$ (see Figure 11)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.2 \text{ V}$	$V_{CCB} = 1.5 \text{ V} \pm 0.1 \text{ V}$		$V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$		$V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	2.9	0.1	6	0.1	4.9	0.1	3.9	0.3	3.9	ns
t_{PHL}			2.9	0.1	6	0.1	4.9	0.1	3.9	0.3	3.9	
t_{PLH}	B	A	3	0.6	5.3	0.5	4.9	0.3	4.6	0.3	4.5	ns
t_{PHL}			3	0.6	5.3	0.5	4.9	0.3	4.6	0.3	4.5	
t_{PZH}	$\overline{OE}$	A	4.4	1	7.4	1	7.3	0.6	7.3	0.4	7.2	ns
t_{PZL}			4.4	1	7.4	1	7.3	0.6	7.3	0.4	7.2	
t_{PZH}	$\overline{OE}$	B	4.1	1.2	9.2	1	7.4	0.8	5.3	0.8	4.6	ns
t_{PZL}			4.1	1.2	9.2	1	7.4	0.8	5.3	0.8	4.6	
t_{PHZ}	$\overline{OE}$	A	5.4	1.6	8.6	1.8	8.7	1.3	8.7	1.6	8.7	ns
t_{PLZ}			5.4	1.6	8.6	1.8	8.7	1.3	8.7	1.6	8.7	
t_{PHZ}	$\overline{OE}$	B	5	1.7	9.9	1.6	8.7	1.2	6.9	1	6.9	ns
t_{PLZ}			5	1.7	9.9	1.6	8.7	1.2	6.9	1	6.9	

switching characteristics over recommended operating free-air temperature range,
 $V_{CCA} = 2.5 \text{ V} \pm 0.2 \text{ V}$ (see Figure 11)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.2 \text{ V}$	$V_{CCB} = 1.5 \text{ V} \pm 0.1 \text{ V}$		$V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$		$V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	2.8	0.1	5.7	0.1	4.6	0.2	3.5	0.1	3.6	ns
t_{PHL}			2.8	0.1	5.7	0.1	4.6	0.2	3.5	0.1	3.6	
t_{PLH}	B	A	2.7	0.6	4.2	0.4	3.9	0.2	3.4	0.2	3.3	ns
t_{PHL}			2.7	0.6	4.2	0.4	3.9	0.2	3.4	0.2	3.3	
t_{PZH}	$\overline{OE}$	A	4	0.7	6.5	0.7	5.2	0.6	4.8	0.4	4.8	ns
t_{PZL}			4	0.7	6.5	0.7	5.2	0.6	4.8	0.4	4.8	
t_{PZH}	$\overline{OE}$	B	3.8	0.9	8.8	0.8	7	0.6	4.8	0.6	4	ns
t_{PZL}			3.8	0.9	8.8	0.8	7	0.6	4.8	0.6	4	
t_{PHZ}	$\overline{OE}$	A	4.7	1	8.4	1	8.4	1	6.2	1	6.6	ns
t_{PLZ}			4.7	1	8.4	1	8.4	1	6.2	1	6.6	
t_{PHZ}	$\overline{OE}$	B	4.5	1.5	9.4	1.3	8.2	1.1	6.2	0.9	5.2	ns
t_{PLZ}			4.5	1.5	9.4	1.3	8.2	1.1	6.2	0.9	5.2	

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switching characteristics over recommended operating free-air temperature range,
 $V_{CCA} = 3.3 \text{ V} \pm 0.3 \text{ V}$ (see Figure 11)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.2 \text{ V}$	$V_{CCB} = 1.5 \text{ V} \pm 0.1 \text{ V}$		$V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$		$V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	2.9	0.1	5.6	0.1	4.5	0.1	3.3	0.1	2.9	ns
t_{PHL}			2.9	0.1	5.6	0.1	4.5	0.1	3.3	0.1	2.9	
t_{PLH}	B	A	2.6	0.6	4.2	0.4	3.4	0.2	3	0.1	2.8	ns
t_{PHL}			2.6	0.6	4.2	0.4	3.4	0.2	3	0.1	2.8	
t_{PZH}	$\overline{OE}$	A	3.8	0.6	8.7	0.6	5.2	0.6	3.8	0.4	3.8	ns
t_{PZL}			3.8	0.6	8.7	0.6	5.2	0.6	3.8	0.4	3.8	
t_{PZH}	$\overline{OE}$	B	3.7	0.8	8.7	0.6	6.8	0.5	4.7	0.5	3.8	ns
t_{PZL}			3.7	0.8	8.7	0.6	6.8	0.5	4.7	0.5	3.8	
t_{PHZ}	$\overline{OE}$	A	4.8	0.7	9.3	0.7	8.3	0.7	5.6	0.7	6.6	ns
t_{PLZ}			4.8	0.7	9.3	0.7	8.3	0.7	5.6	0.7	6.6	
t_{PHZ}	$\overline{OE}$	B	5.3	1.4	9.3	1.2	8.1	1	6.4	0.8	6.2	ns
t_{PLZ}			5.3	1.4	9.3	1.2	8.1	1	6.4	0.8	6.2	

operating characteristics, $T_A = 25^\circ\text{C}$

PARAMETER			TEST CONDITIONS	$V_{CCA} =$ $V_{CCB} = 1.2 \text{ V}$	$V_{CCA} =$ $V_{CCB} = 1.5 \text{ V}$	$V_{CCA} =$ $V_{CCB} = 1.8 \text{ V}$	$V_{CCA} =$ $V_{CCB} = 2.5 \text{ V}$	$V_{CCA} =$ $V_{CCB} = 3.3 \text{ V}$	UNIT
				TYP	TYP	TYP	TYP	TYP	
$C_{pdA}^\dagger$	A to B	Outputs Enabled	$C_L = 0$, $f = 10 \text{ MHz}$, $t_r = t_f = 1 \text{ ns}$	1	1	1	1.5	2	pF
		Outputs Disabled		1	1	1	1	1	
	B to A	Outputs Enabled		12	12.5	13	14	15	
		Outputs Disabled		1	1	1	1	1	
$C_{pdB}^\dagger$	A to B	Outputs Enabled	$C_L = 0$, $f = 10 \text{ MHz}$, $t_r = t_f = 1 \text{ ns}$	12	12.5	13	14	15	pF
		Outputs Disabled		1	1	1	1	1	
	B to A	Outputs Enabled		1	1	1	1	2	
		Outputs Disabled		1	1	1	1	1	

† Power dissipation capacitance per transceiver

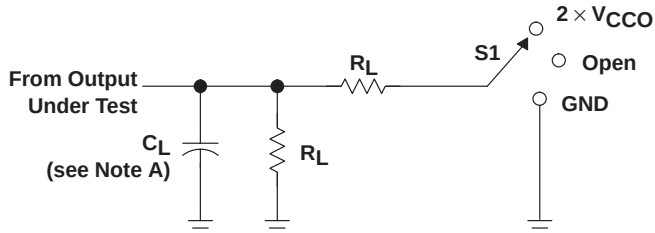
SN74AVC4T245

4-BIT DUAL-SUPPLY BUS TRANSCEIVER

WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS

SCES576A – JUNE 2004 – REVISED APRIL 2005

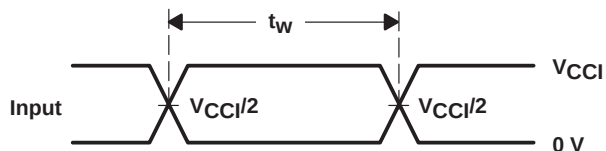
PARAMETER MEASUREMENT INFORMATION



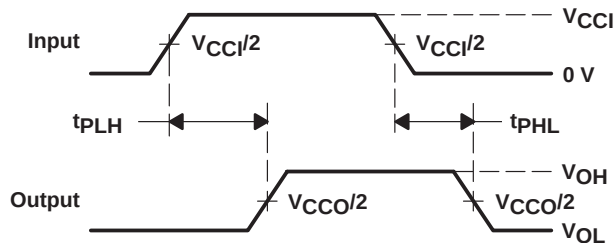
LOAD CIRCUIT

V_{CCO}	C_L	R_L	V_{TP}
1.2 V	15 pF	2 k Ω	0.1 V
1.5 V $\pm$ 0.1 V	15 pF	2 k Ω	0.1 V
1.8 V $\pm$ 0.15 V	15 pF	2 k Ω	0.15 V
2.5 V $\pm$ 0.2 V	15 pF	2 k Ω	0.15 V
3.3 V $\pm$ 0.3 V	15 pF	2 k Ω	0.3 V

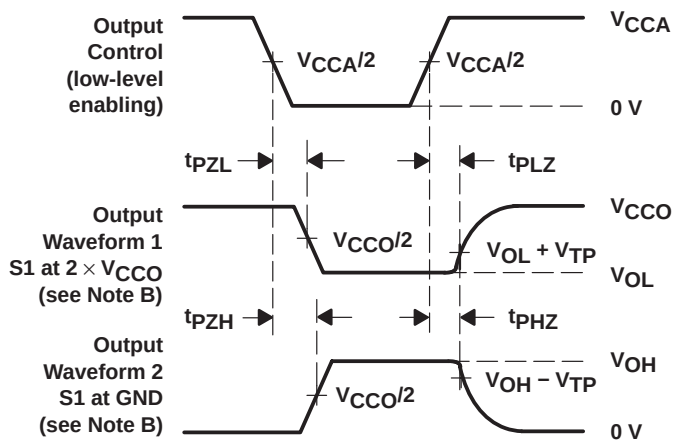
TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CCO}$
t_{PHZ}/t_{PZH}	GND



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $dv/dt \geq 1$ V/ns, $dv/dt \geq 1$ V/ns.
 - The outputs are measured one at a time, with one transition per measurement.
 - t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - t_{PZL} and t_{PZH} are the same as t_{en} .
 - t_{PLH} and t_{PHL} are the same as t_{pd} .
 - V_{CCI} is the V_{CC} associated with the input port.
 - V_{CCO} is the V_{CC} associated with the output port.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
74AVC4T245DGVRE4	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74AVC4T245RGYRG4	ACTIVE	QFN	RGY	16	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
SN74AVC4T245D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245DBR	PREVIEW	SSOP	DB	16	2000	TBD	Call TI	Call TI
SN74AVC4T245DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245DGVR	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245DT	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245DTE4	ACTIVE	SOIC	D	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245PW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245PWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245PWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245PWT	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245PWTE4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AVC4T245RGYR	ACTIVE	QFN	RGY	16	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR

⁽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⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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.

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.

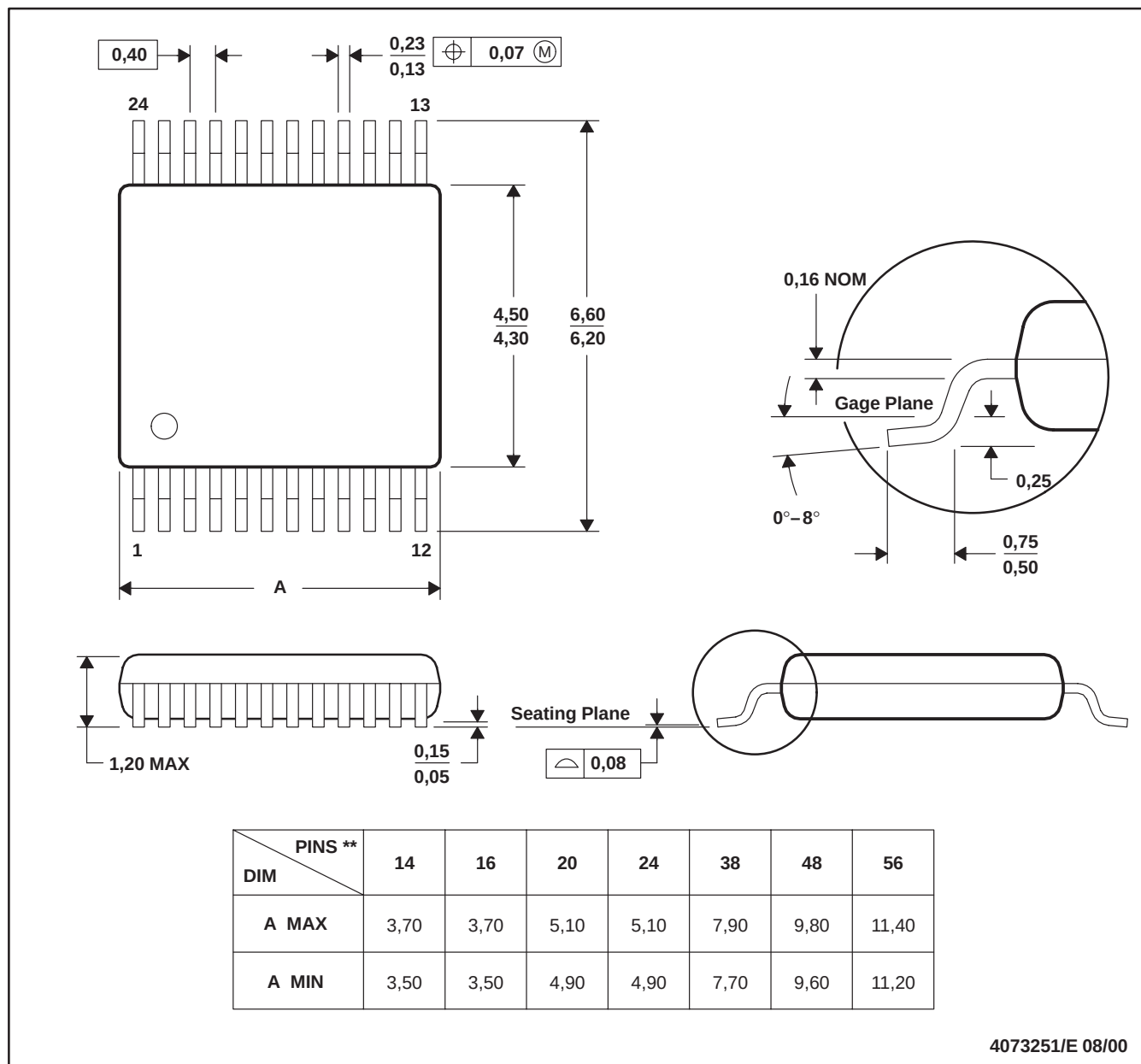
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DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

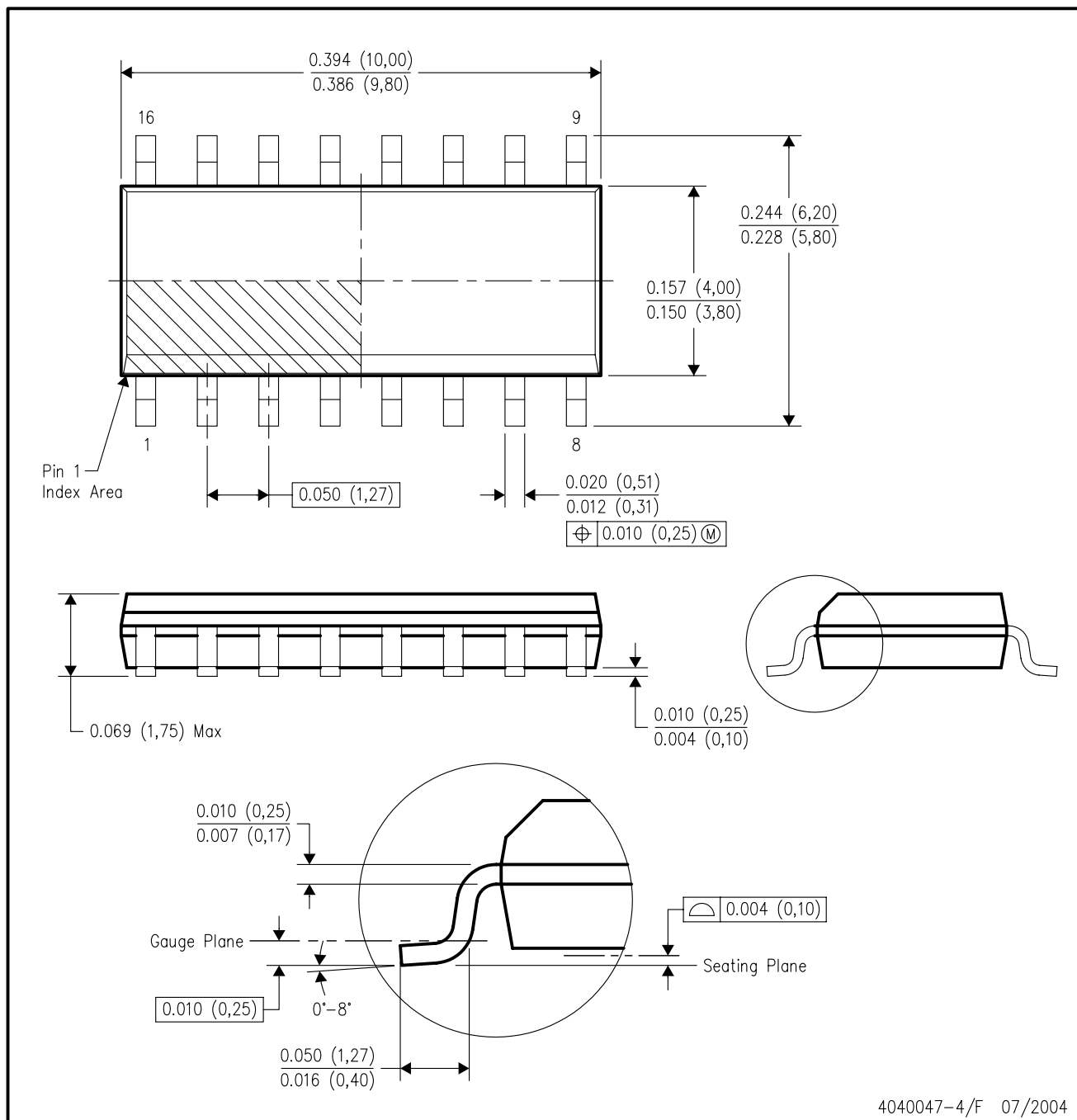
24 PINS SHOWN



- 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 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

D (R-PDSO-G16)

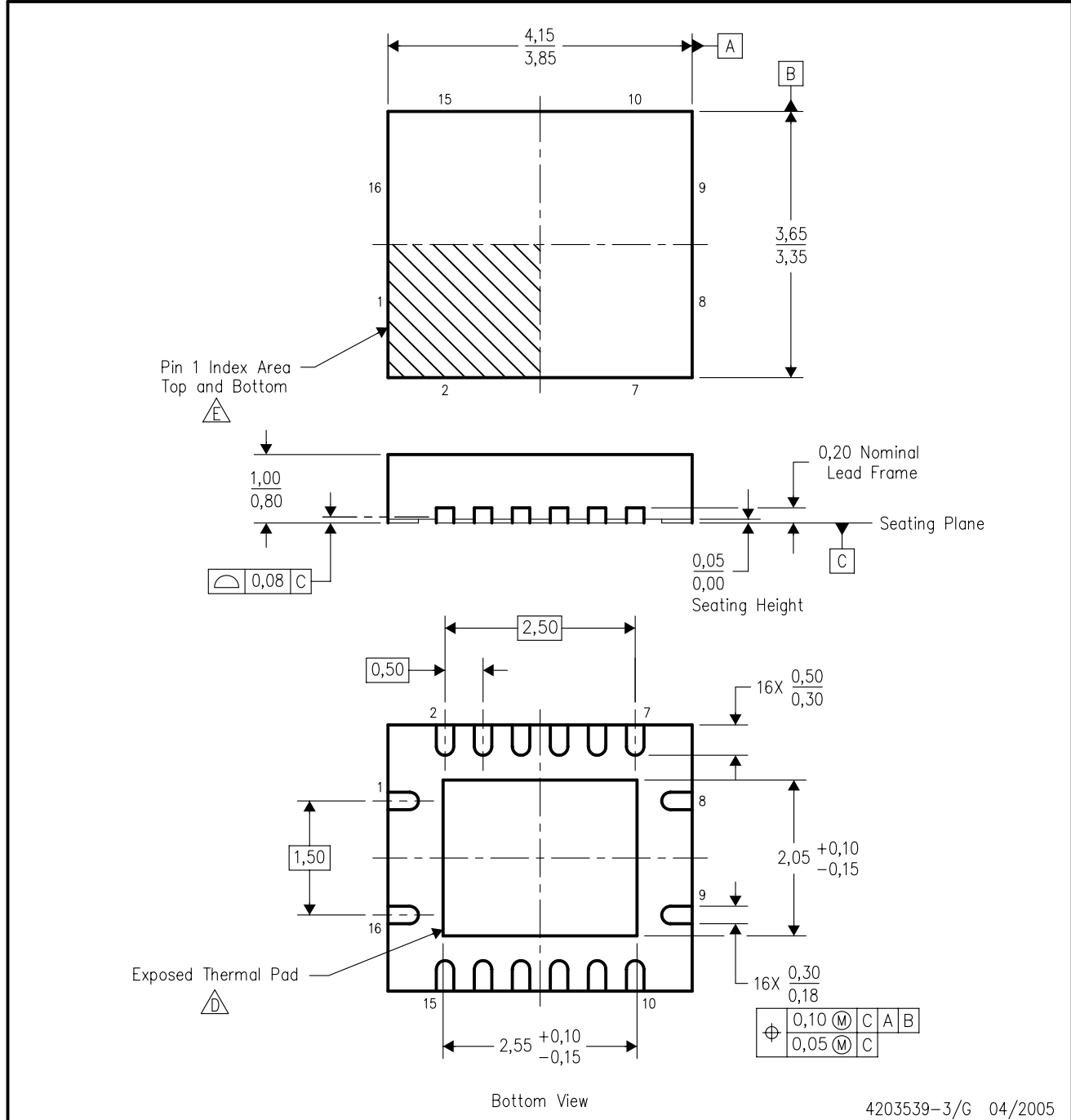
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MS-012 variation AC.

RGY (R-PQFP-N16)

PLASTIC QUAD FLATPACK

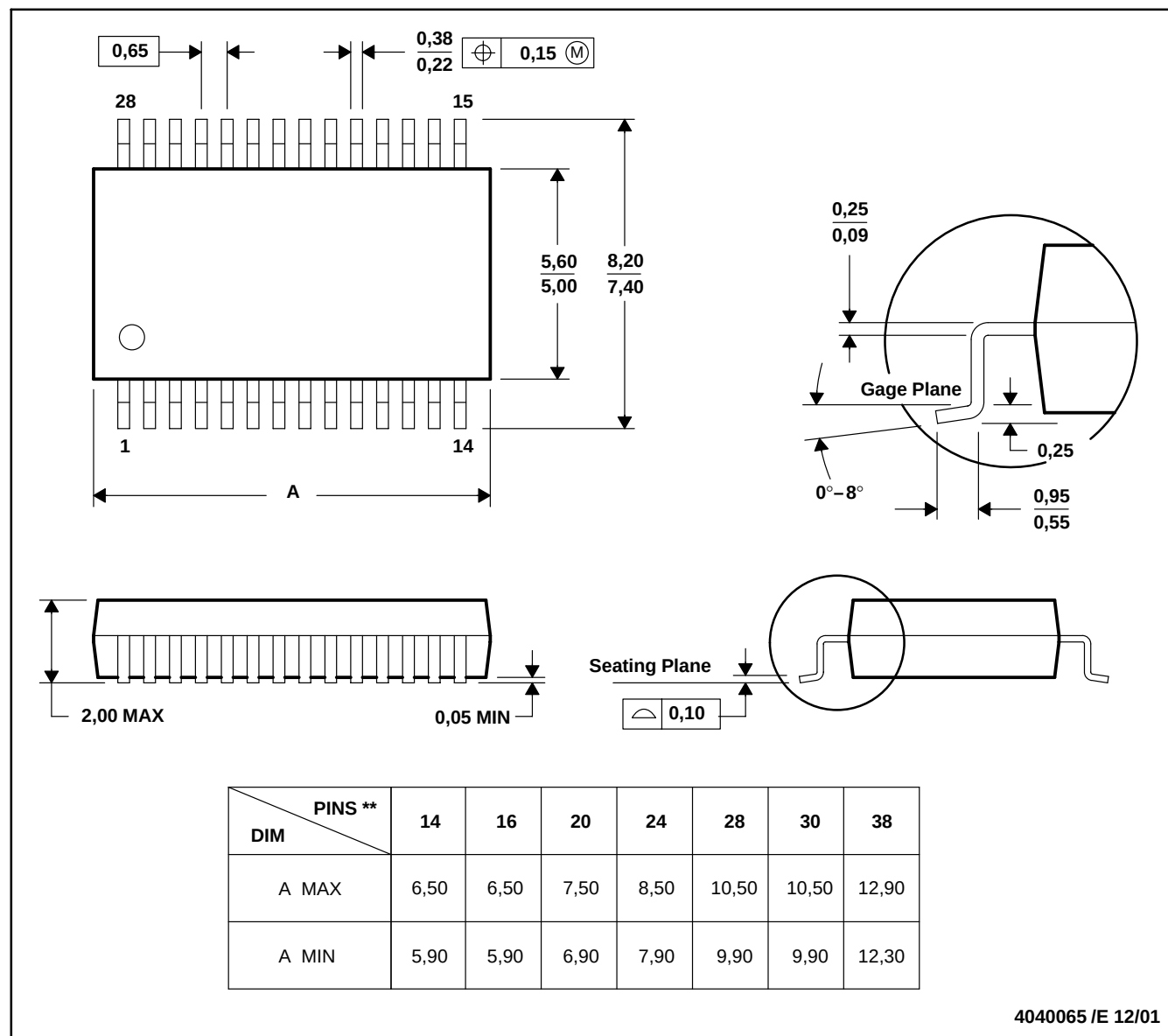


- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 - The package thermal pad must be soldered to the board for thermal and mechanical performance.
 - 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.
 - F. Package complies to JEDEC MO-241 variation BB.

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN

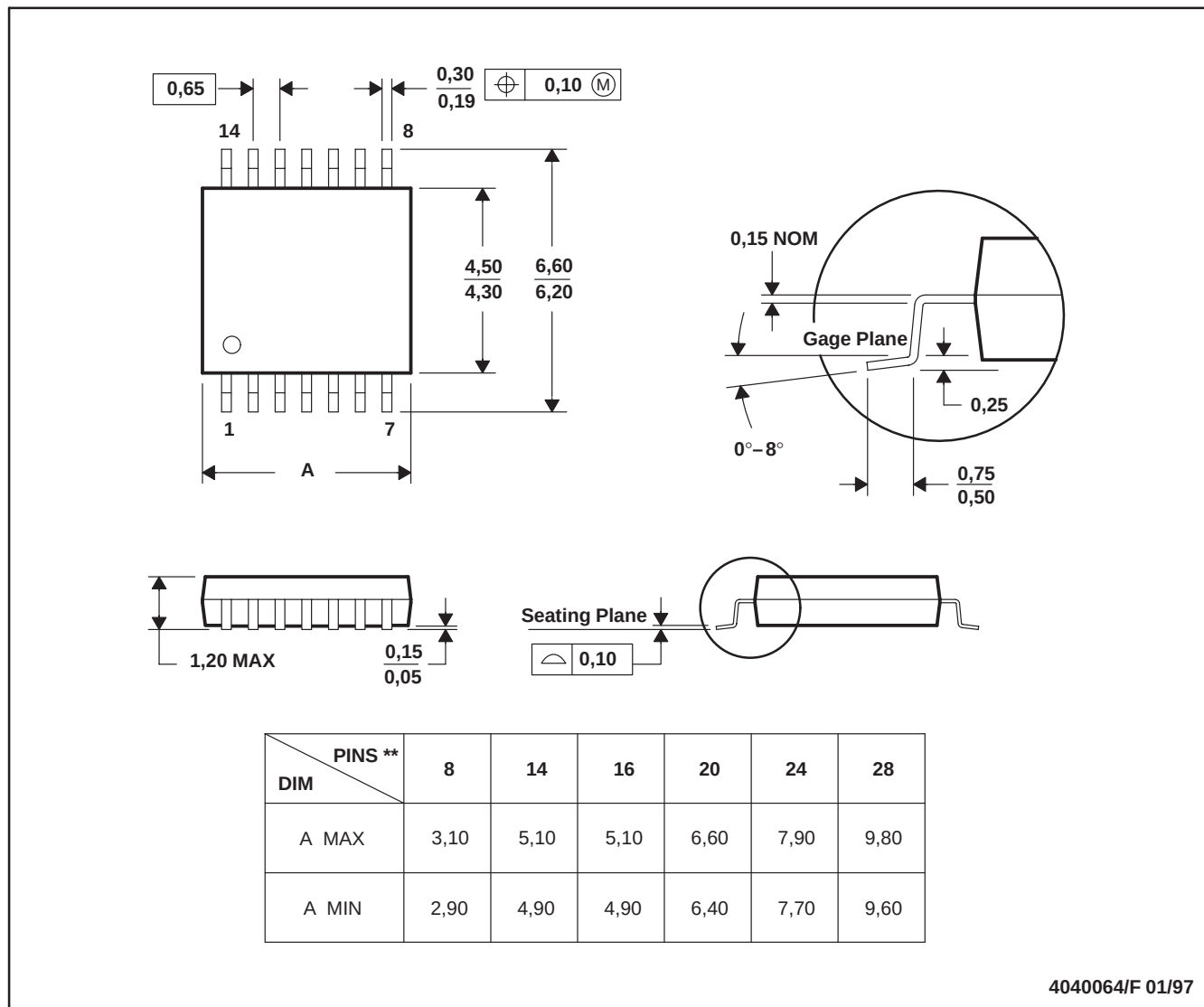


- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-150

PW (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.
 D. Falls within JEDEC MO-153

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