

## FEATURES

- Control Inputs  $V_{IH}/V_{IL}$  Levels Are Referenced to  $V_{CCA}$  Voltage
- $V_{CC}$  Isolation Feature – If Either  $V_{CC}$  Input Is at GND, All Outputs Are in the High-Impedance State
- Overvoltage-Tolerant Inputs/Outputs Allow Mixed-Voltage-Mode Data Communications
- Fully Configurable Dual-Rail Design Allows Each Port to Operate Over the Full 1.65-V to 5.5-V Power-Supply Range
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

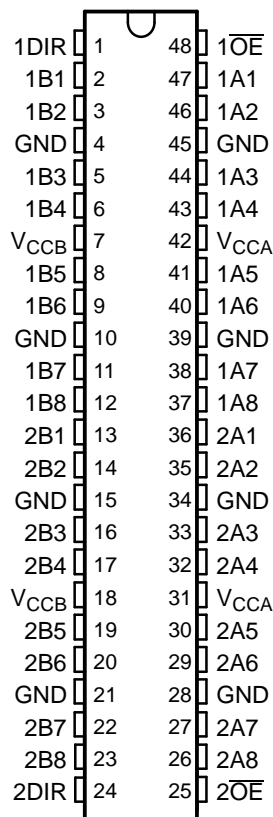
## DESCRIPTION/ORDERING INFORMATION

This 16-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 1.65 V to 5.5 V. The B port is designed to track  $V_{CCB}$ .  $V_{CCB}$  accepts any supply voltage from 1.65 V to 5.5 V. This allows for universal low-voltage bidirectional translation between any of the 1.8-V, 2.5-V, 3.3-V, and 5-V voltage nodes.

The SN74LVCH16T245 is designed so that the control pins (1DIR, 2DIR,  $1\overline{OE}$ , and  $2\overline{OE}$ ) are supplied by  $V_{CCA}$ .

The SN74LVCH16T245 is designed for asynchronous communication between two data buses. The logic levels of the direction-control (DIR) input and the output-enable ( $\overline{OE}$ ) input activate either the B-port outputs or the A-port outputs or place both output ports into the high-impedance mode. The device transmits data from the A bus to the B bus when the B-port outputs are activated, and from the B bus to the A bus when the A-port outputs are activated. The input circuitry on both A and B ports is always active and must have a logic HIGH or LOW level applied to prevent excess  $I_{CC}$  and  $I_{CCZ}$ .

DGG OR DGV PACKAGE  
(TOP VIEW)



## ORDERING INFORMATION

$T_A$	PACKAGE <sup>(1)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	TSSOP – DGG	Tape and reel	SN74LVCH16T245DGGR	LVCH16T245
	TVSOP – DGV	Tape and reel	SN74LVCH16T245DGVR	LDHT245
	VFBGA – GQL	Tape and reel	SN74LVCH16T245GQLR	LDHT245
	VFBGA – ZQL (Pb-free)	Tape and reel	SN74LVCH16T245ZQLR	

(1) 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).



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.

**SN74LVCH16T245**  
**16-BIT DUAL-SUPPLY BUS TRANSCEIVER**  
**WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS**

SCES635A—JULY 2005—REVISED AUGUST 2005

**DESCRIPTION/ORDERING INFORMATION (CONTINUED)**

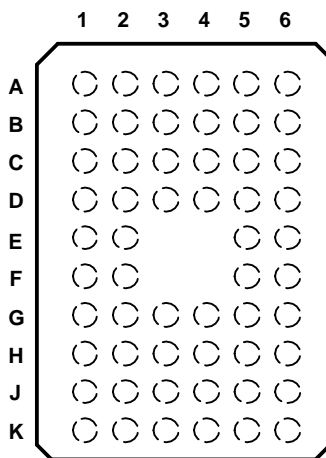
Active bus-hold circuitry holds unused or undriven data inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

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.

The  $V_{CC}$  isolation feature ensures that if either  $V_{CC}$  input is at GND, then all outputs are in the high-impedance state. The bus-hold circuitry on the powered-up side always stays active.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

**GQL OR ZQL PACKAGE**  
**(TOP VIEW)**



**TERMINAL ASSIGNMENTS<sup>(1)</sup>**

	1	2	3	4	5	6
<b>A</b>	1DIR	NC	NC	NC	NC	1 $\overline{OE}$
<b>B</b>	1B2	1B1	GND	GND	1A1	1A2
<b>C</b>	1B4	1B3	$V_{CCB}$	$V_{CCA}$	1A3	1A4
<b>D</b>	1B6	1B5	GND	GND	1A5	1A6
<b>E</b>	1B8	1B7			1A7	1A8
<b>F</b>	2B1	2B2			2A2	2A1
<b>G</b>	2B3	2B4	GND	GND	2A4	2A3
<b>H</b>	2B5	2B6	$V_{CCB}$	$V_{CCA}$	2A6	2A5
<b>J</b>	2B7	2B8	GND	GND	2A8	2A7
<b>K</b>	2DIR	NC	NC	NC	NC	2 $\overline{OE}$

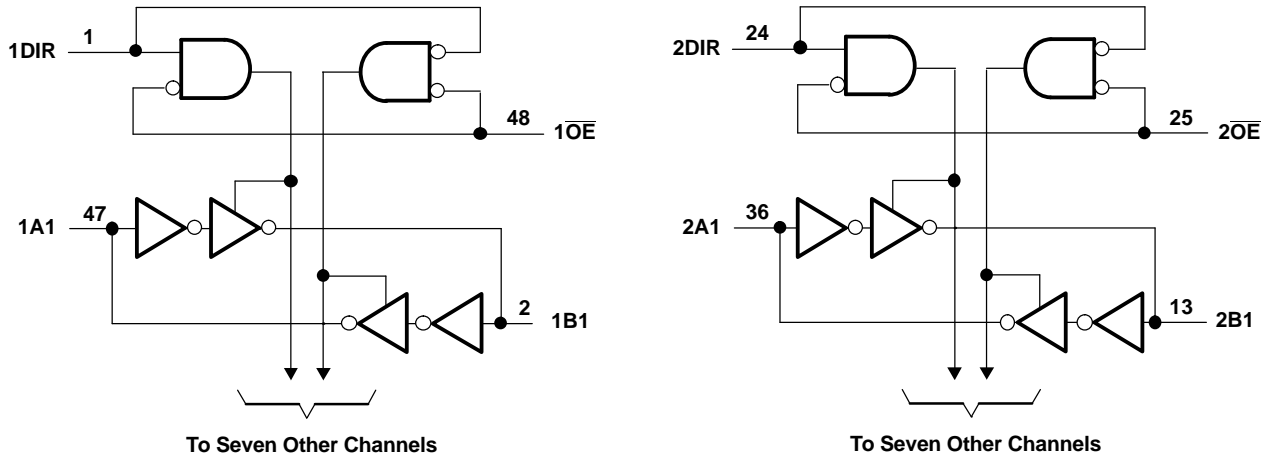
(1) NC – No internal connection

**FUNCTION TABLE<sup>(1)</sup>**  
**(EACH 16-BIT SECTION)**

CONTROL INPUTS		OUTPUT CIRCUITS		OPERATION
$\overline{OE}$	DIR	A PORT	B PORT	
L	L	Enabled	Hi-Z	B data to A bus
L	H	Hi-Z	Enabled	A data to B bus
H	X	Hi-Z	Hi-Z	Isolation

(1) Input circuits of the data I/Os are always active.

**LOGIC DIAGRAM (POSITIVE LOGIC)**



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

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

		MIN	MAX	UNIT	
$V_{CCA}$ $V_{CCB}$	Supply voltage range	-0.5	6.5	V	
$V_I$	Input voltage range <sup>(2)</sup>	I/O ports (A port)	-0.5	6.5	V
		I/O ports (B port)	-0.5	6.5	
		Control inputs	-0.5	6.5	
$V_O$	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	A port	-0.5	6.5	V
		B port	-0.5	6.5	
$V_O$	Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>	A port	-0.5	$V_{CCA} + 0.5$	V
		B port	-0.5	$V_{CCB} + 0.5$	
$I_{IK}$	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 $V_{CCA}$ , $V_{CCB}$ , and GND		±100	mA	
$\theta_{JA}$	Package thermal impedance <sup>(4)</sup>	DGG package	70	°C/W	
		DGV package	58		
		GQL/ZQL package	28		
$T_{stg}$	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 output positive-voltage rating may be exceeded up to 6.5 V maximum if the output current rating is observed.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

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**Recommended Operating Conditions**<sup>(1)(2)(3)</sup>

			$V_{CCI}$	$V_{CCO}$	MIN	MAX	UNIT
$V_{CCA}$	Supply voltage				1.65	5.5	V
$V_{CCB}$					1.65	5.5	
$V_{IH}$	High-level input voltage	Data inputs <sup>(4)</sup>	1.65 V to 1.95 V		$V_{CCI} \times 0.65$		V
			2.3 V to 2.7 V		1.7		
			3 V to 3.6 V		2		
			4.5 V to 5.5 V		$V_{CCI} \times 0.7$		
$V_{IL}$	Low-level input voltage	Data inputs <sup>(4)</sup>	1.65 V to 1.95 V			$V_{CCI} \times 0.35$	V
			2.3 V to 2.7 V			0.7	
			3 V to 3.6 V			0.8	
			4.5 V to 5.5 V			$V_{CCI} \times 0.3$	
$V_{IH}$	High-level input voltage	Control inputs (referenced to $V_{CCA}$ ) <sup>(5)</sup>	1.65 V to 1.95 V		$V_{CCA} \times 0.65$		V
			2.3 V to 2.7 V		1.7		
			3 V to 3.6 V		2		
			4.5 V to 5.5 V		$V_{CCA} \times 0.7$		
$V_{IL}$	Low-level input voltage	Control inputs (referenced to $V_{CCA}$ ) <sup>(5)</sup>	1.65 V to 1.95 V			$V_{CCA} \times 0.35$	V
			2.3 V to 2.7 V			0.7	
			3 V to 3.6 V			0.8	
			4.5 V to 5.5 V			$V_{CCA} \times 0.3$	
$V_I$	Input voltage	Control inputs			0	5.5	V
$V_{IO}$	Input/output voltage	Active state			0	$V_{CCO}$	V
		3-State			0	5.5	
$I_{OH}$	High-level output current		1.65 V to 1.95 V			–4	mA
			2.3 V to 2.7 V			–8	
			3 V to 3.6 V			–24	
			4.5 V to 5.5 V			–32	
$I_{OL}$	Low-level output current		1.65 V to 1.95 V			4	mA
			2.3 V to 2.7 V			8	
			3 V to 3.6 V			24	
			4.5 V to 5.5 V			32	
$\Delta t/\Delta v$	Input transition rise or fall rate	Data inputs	1.65 V to 1.95 V			20	ns/V
			2.3 V to 2.7 V			20	
			3 V to 3.6 V			10	
			4.5 V to 5.5 V			5	
$T_A$	Operating free-air temperature				–40	85	°C

- (1)  $V_{CCI}$  is the  $V_{CC}$  associated with the data input port.
- (2)  $V_{CCO}$  is the  $V_{CC}$  associated with the output port.
- (3) All unused control inputs of the device must be held at  $V_{CCA}$  GND to ensure proper device operation and minimize power consumption. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.
- (4) For  $V_{CCI}$  values not specified in the data sheet,  $V_{IH}$  min =  $V_{CCI} \times 0.7$  V,  $V_{IL}$  max =  $V_{CCI} \times 0.3$  V.
- (5) For  $V_{CCA}$  values not specified in the data sheet,  $V_{IH}$  min =  $V_{CCA} \times 0.7$  V,  $V_{IL}$  max =  $V_{CCA} \times 0.3$  V.

**Electrical Characteristics<sup>(1)(2)</sup>**

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

PARAMETER		TEST CONDITIONS		V <sub>CCA</sub>	V <sub>CCB</sub>	MIN	TYP	MAX	MIN	MAX	UNIT	
V <sub>OH</sub>	I <sub>OH</sub> = -100 μA, V <sub>I</sub> = V <sub>IH</sub>		1.65 V to 4.5 V	1.65 V to 4.5 V					V <sub>CCO</sub> - 0.1		V	
	I <sub>OH</sub> = -4 mA, V <sub>I</sub> = V <sub>IH</sub>		1.65 V	1.65 V					1.2			
	I <sub>OH</sub> = -8 mA, V <sub>I</sub> = V <sub>IH</sub>		2.3 V	2.3 V					1.9			
	I <sub>OH</sub> = -24 mA, V <sub>I</sub> = V <sub>IH</sub>		3 V	3 V					2.4			
	I <sub>OH</sub> = -32 mA, V <sub>I</sub> = V <sub>IH</sub>		4.5 V	4.5 V					3.8			
V <sub>OL</sub>	I <sub>OL</sub> = 100 μA, V <sub>I</sub> = V <sub>IL</sub>		1.65 V to 4.5 V	1.65 V to 4.5 V					0.1		V	
	I <sub>OL</sub> = 4 mA, V <sub>I</sub> = V <sub>IL</sub>		1.65 V	1.65 V					0.45			
	I <sub>OL</sub> = 8 mA, V <sub>I</sub> = V <sub>IL</sub>		2.3 V	2.3 V					0.3			
	I <sub>OL</sub> = 24 mA, V <sub>I</sub> = V <sub>IL</sub>		3 V	3 V					0.55			
	I <sub>OL</sub> = 32 mA, V <sub>I</sub> = V <sub>IL</sub>		4.5 V	4.5 V					0.55			
I <sub>I</sub>	Control inputs	V <sub>I</sub> = V <sub>CCA</sub> or GND		1.65 V to 5.5 V	1.65 V to 5.5 V		±0.5	±1		±2	μA	
I <sub>BHL</sub> <sup>(3)</sup>	V <sub>I</sub> = 0.58 V		1.65 V	1.65 V					15		μA	
	V <sub>I</sub> = 0.7 V		2.3 V	2.3 V					45			
	V <sub>I</sub> = 0.8 V		3 V	3 V					75			
	V <sub>I</sub> = 0.1.35 V		4.5 V	4.5 V					100			
I <sub>BHH</sub> <sup>(4)</sup>	V <sub>I</sub> = 1.07 V		1.65 V	1.65 V					-15		μA	
	V <sub>I</sub> = 1.7 V		2.3 V	2.3 V					-45			
	V <sub>I</sub> = 2 V		3 V	3 V					-75			
	V <sub>I</sub> = 3.15 V		4.5 V	4.5 V					-100			
I <sub>BHLO</sub> <sup>(5)</sup>	V <sub>I</sub> = 0 to V <sub>CC</sub>		1.95 V	1.95 V					200		μA	
			2.7 V	2.7 V					300			
			3.6 V	3.6 V					500			
			5.5 V	5.5 V					900			
I <sub>BHHO</sub> <sup>(6)</sup>	V <sub>I</sub> = 0 to V <sub>CC</sub>		1.95 V	1.95 V					-200		μA	
			2.7 V	2.7 V					-300			
			3.6 V	3.6 V					-500			
			5.5 V	5.5 V					-900			
I <sub>off</sub>	A port	V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V		0 V	0 to 5.5 V		±0.5	±1		±2	μA	
	B port			0 to 5.5 V	0 V		±0.5	±1		±2		
I <sub>OZ</sub>	A or B port	V <sub>O</sub> = V <sub>CCO</sub> or GND, V <sub>I</sub> = V <sub>CCI</sub> or GND	$\overline{OE} = V_{IH}$	1.65 V to 5.5 V	1.65 V to 5.5 V			±1		±2	μA	
	B port			$\overline{OE} = \text{don't care}$	0 V	5.5 V			±1			±2
	A port			5.5 V	0 V			±1		±2		
I <sub>CCA</sub>	V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0		1.65 V to 5.5 V	1.65 V to 5.5 V					20		μA	
			5 V	0 V					20			
			0 V	5 V					-2			
I <sub>CCB</sub>	V <sub>I</sub> = V <sub>CCB</sub> or GND, I <sub>O</sub> = 0		1.65 V to 5.5 V	1.65 V to 5.5 V					20		μA	
			5 V	0 V					-2			
			0 V	5 V					20			
I <sub>CCA</sub> + I <sub>CCB</sub>		V <sub>I</sub> = V <sub>CCB</sub> or GND, I <sub>O</sub> = 0		1.65 V to 5.5 V	1.65 V to 5.5 V				30		μA	

 (1) V<sub>CCO</sub> is the V<sub>CC</sub> associated with the output port.

 (2) V<sub>CCI</sub> is the V<sub>CC</sub> associated with the input port.

 (3) The bus-hold circuit can sink at least the minimum low sustaining current at V<sub>IL</sub> max. I<sub>BHL</sub> should be measured after lowering V<sub>IN</sub> to GND and then raising it to V<sub>IL</sub> max.

 (4) The bus-hold circuit can source at least the minimum high sustaining current at V<sub>IH</sub> min. I<sub>BHH</sub> should be measured after raising V<sub>IN</sub> to V<sub>CC</sub> and then lowering it to V<sub>IH</sub> min.

 (5) An external driver must source at least I<sub>BHLO</sub> to switch this node from low to high.

 (6) An external driver must sink at least I<sub>BHHO</sub> to switch this node from high to low.

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**Electrical Characteristics (continued)**

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

PARAMETER		TEST CONDITIONS	V <sub>CCA</sub>	V <sub>CCB</sub>	MIN	TYP	MAX	MIN	MAX	UNIT
ΔI <sub>CCA</sub>	DIR	DIR at V <sub>CCA</sub> – 0.6 V, B port = open, A port at V <sub>CCA</sub> or GND	3 V to 5.5 V	3 V to 5.5 V					50	μA
C <sub>i</sub>	Control inputs	V <sub>i</sub> = V <sub>CCA</sub> or GND	3.3 V	3.3 V		4			5	pF
C <sub>io</sub>	A or B port	V <sub>O</sub> = V <sub>CCA/B</sub> or GND	3.3 V	3.3 V		8.5			10	pF

**Switching Characteristics**

over recommended operating free-air temperature range, V<sub>CCA</sub> = 1.8 V ± 0.15 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CCB</sub> = 1.8 V ± 0.15 V		V <sub>CCB</sub> = 2.5 V ± 0.2 V		V <sub>CCB</sub> = 3.3 V ± 0.3 V		V <sub>CCB</sub> = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	B	1.7	21.9	1.3	9.2	1	7.4	0.4	7.1	ns
t <sub>PHL</sub>											
t <sub>PLH</sub>	B	A	0.9	23.8	0.8	23.8	0.7	23.4	0.7	23.4	ns
t <sub>PHL</sub>											
t <sub>PHZ</sub>	OE	A	1.5	29.6	1.5	29.4	1.5	29.3	1.4	29.2	ns
t <sub>PLZ</sub>											
t <sub>PHZ</sub>	OE	B	2.4	32.2	1.9	13.1	1.7	12	1.3	10.3	ns
t <sub>PLZ</sub>											
t <sub>PZH</sub>	OE	A	0.4	24	0.4	23.8	0.4	23.7	0.4	23.7	ns
t <sub>PZL</sub>											
t <sub>PZH</sub>	OE	B	1.8	32	1.5	18	1.2	12.6	0.9	10.8	ns
t <sub>PZL</sub>											

**Switching Characteristics**

over recommended operating free-air temperature range, V<sub>CCA</sub> = 2.5 V ± 0.2 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CCB</sub> = 1.8 V ± 0.15 V		V <sub>CCB</sub> = 2.5 V ± 0.2 V		V <sub>CCB</sub> = 3.3 V ± 0.3 V		V <sub>CCB</sub> = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	B	1.5	21.4	1.2	9	0.8	6.2	0.6	4.8	ns
t <sub>PHL</sub>											
t <sub>PLH</sub>	B	A	1.2	9.3	1	9.1	1	8.9	0.9	8.8	ns
t <sub>PHL</sub>											
t <sub>PHZ</sub>	OE	A	1.4	9	1.4	9	1.4	9	1.4	9	ns
t <sub>PLZ</sub>											
t <sub>PHZ</sub>	OE	B	2.3	29.6	1.8	11	1.7	9.3	0.9	6.9	ns
t <sub>PLZ</sub>											
t <sub>PZH</sub>	OE	A	1	10.9	1	10.9	1	10.9	1	10.9	ns
t <sub>PZL</sub>											
t <sub>PZH</sub>	OE	B	1.7	28.2	1.5	12.9	1.2	9.4	1	6.9	ns
t <sub>PZL</sub>											

### Switching Characteristics

over recommended operating free-air temperature range,  $V_{CCA} = 3.3 \text{ V} \pm 0.3 \text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.8 \text{ V} \pm 0.15 \text{ V}$		$V_{CCB} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CCB} = 3.3 \text{ V} \pm 0.3 \text{ V}$		$V_{CCB} = 5 \text{ V} \pm 0.5 \text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	B	1.6	21.2	1.1	8.8	0.8	6.2	0.6	4.4	ns
$t_{PHL}$											
$t_{PLH}$	B	A	0.8	7.2	0.8	6.2	0.7	6.1	0.6	6	ns
$t_{PHL}$											
$t_{PHZ}$	$\overline{OE}$	A	1.6	8.2	1.6	8.2	1.6	8.2	1.6	8.2	ns
$t_{PLZ}$											
$t_{PHZ}$	$\overline{OE}$	B	2.1	29	1.7	10.3	1.5	8.8	0.8	6.3	ns
$t_{PLZ}$											
$t_{PZH}$	$\overline{OE}$	A	0.8	7.8	0.8	8.1	0.8	8.1	0.8	8.1	ns
$t_{PZL}$											
$t_{PZH}$	$\overline{OE}$	B	1.8	27.7	1.4	12.4	1.1	8.5	0.8	6.4	ns
$t_{PZL}$											

### Switching Characteristics

over recommended operating free-air temperature range,  $V_{CCA} = 5 \text{ V} \pm 0.5 \text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$		$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$		$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}$	A	B	1.5	21.4	1	8.8	0.7	6	0.4	4.2	ns
$t_{PHL}$											
$t_{PLH}$	B	A	0.7	7	0.4	4.8	0.3	4.5	0.3	4.3	ns
$t_{PHL}$											
$t_{PHZ}$	$\overline{OE}$	A	0.3	5.4	0.3	5.4	0.3	5.4	0.3	5.4	ns
$t_{PLZ}$											
$t_{PHZ}$	$\overline{OE}$	B	2	28.7	1.8	9.7	1.4	8	0.7	5.7	ns
$t_{PLZ}$											
$t_{PZH}$	$\overline{OE}$	A	0.7	6.4	0.7	6.4	0.7	6.4	0.7	6.4	ns
$t_{PZL}$											
$t_{PZH}$	$\overline{OE}$	B	1.5	27.6	1.3	11.4	1	8.1	0.9	6	ns
$t_{PZL}$											

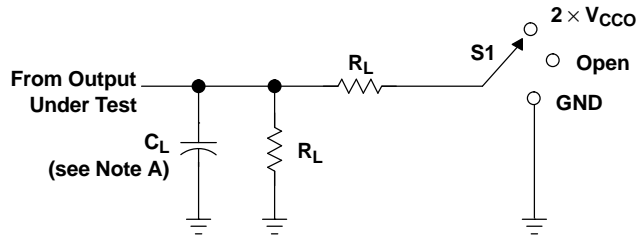
### Operating Characteristics

$T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	$V_{CCA} =$ $V_{CCB} = 1.8 \text{ V}$	$V_{CCA} =$ $V_{CCB} = 2.5 \text{ V}$	$V_{CCA} =$ $V_{CCB} = 3.3 \text{ V}$	$V_{CCA} =$ $V_{CCB} = 5 \text{ V}$	UNIT
			TYP	TYP	TYP	TYP	
$C_{pdA}^{(1)}$	A-port input, B-port output	$C_L = 0,$ $f = 10 \text{ MHz},$ $t_r = t_f = 1 \text{ ns}$	2	2	2	3	pF
	B-port input, A-port output		18	19	19	22	
$C_{pdB}^{(1)}$	A-port input, B-port output		18	19	20	22	
	B-port input, A-port output		2	2	2	2	

(1) Power dissipation capacitance per transceiver

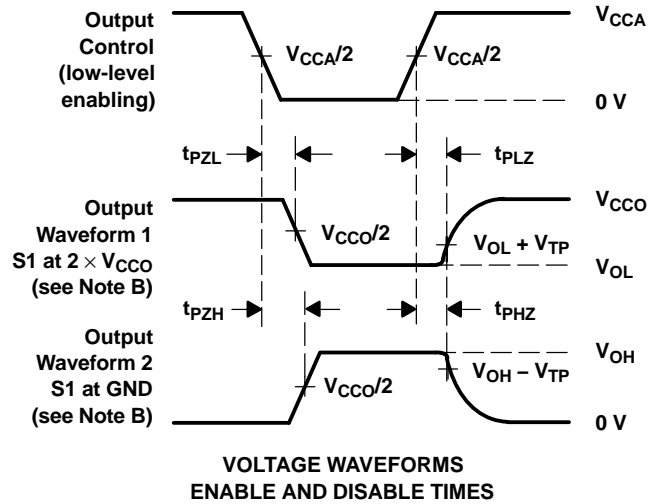
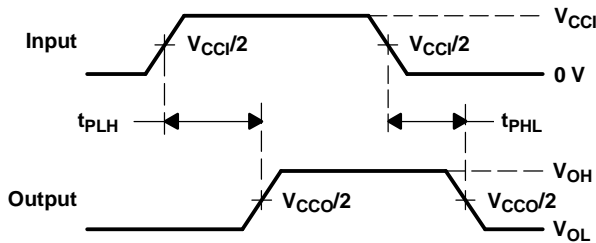
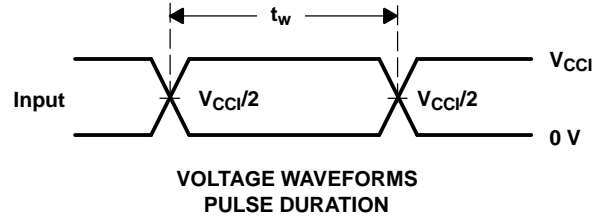
PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

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

$V_{CCO}$	$C_L$	$R_L$	$V_{TP}$
$1.8\text{ V} \pm 0.15\text{ V}$	15 pF	2 k $\Omega$	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	15 pF	2 k $\Omega$	0.15 V
$3.3\text{ V} \pm 0.3\text{ V}$	15 pF	2 k $\Omega$	0.3 V
$5\text{ V} \pm 0.5\text{ V}$	15 pF	2 k $\Omega$	0.3 V



- 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:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $dv/dt \geq 1\text{ V/ns}$ ,  $dv/dt \geq 1\text{ V/ns}$ .  
 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.  $V_{CCi}$  is the  $V_{CC}$  associated with the input port.  
 I.  $V_{CCO}$  is the  $V_{CC}$  associated with the output port.  
 J. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit 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>
74LVCH16T245DGGRE4	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74LVCH16T245DLG4	ACTIVE	SSOP	DL	48	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74LVCH16T245DLRG4	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74LVCH16T245ZQLR	ACTIVE	BGA MI CROSTA R JUNI OR	ZQL	56	1000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM
SN74LVCH16T245DGGR	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVCH16T245DGVR	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVCH16T245DL	ACTIVE	SSOP	DL	48	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVCH16T245DLR	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVCH16T245KR	ACTIVE	BGA MI CROSTA R JUNI OR	GQL	56	1000	TBD	SNPB	Level-1-240C-UNLIM

<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)

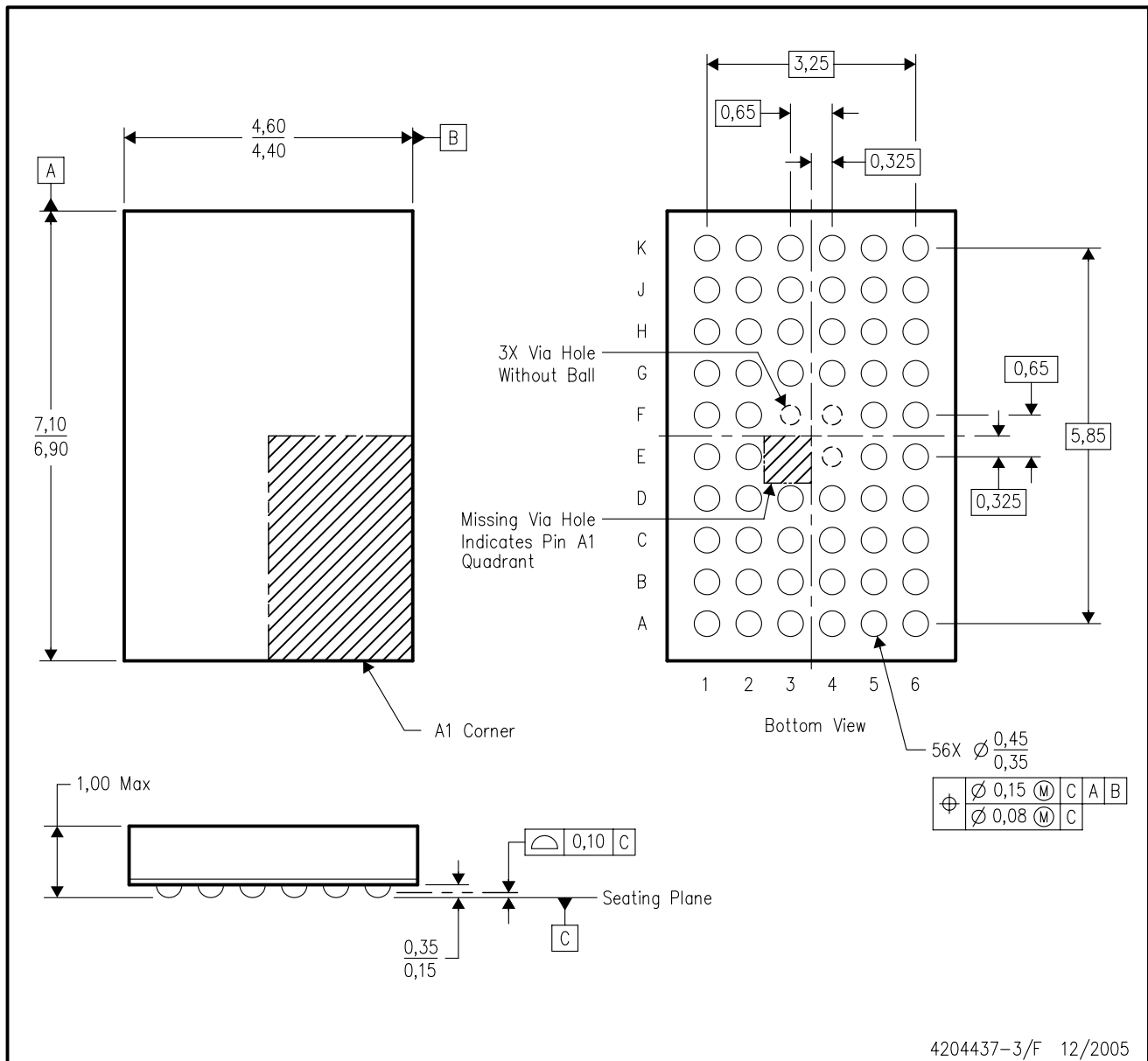
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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ZQL (R-PBGA-N56)

PLASTIC BALL GRID ARRAY



- 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. Falls within JEDEC MO-225 variation BA.
  - D. This package is lead-free. Refer to the 56 GQL package (drawing 4200583) for tin-lead (SnPb).

DGV (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

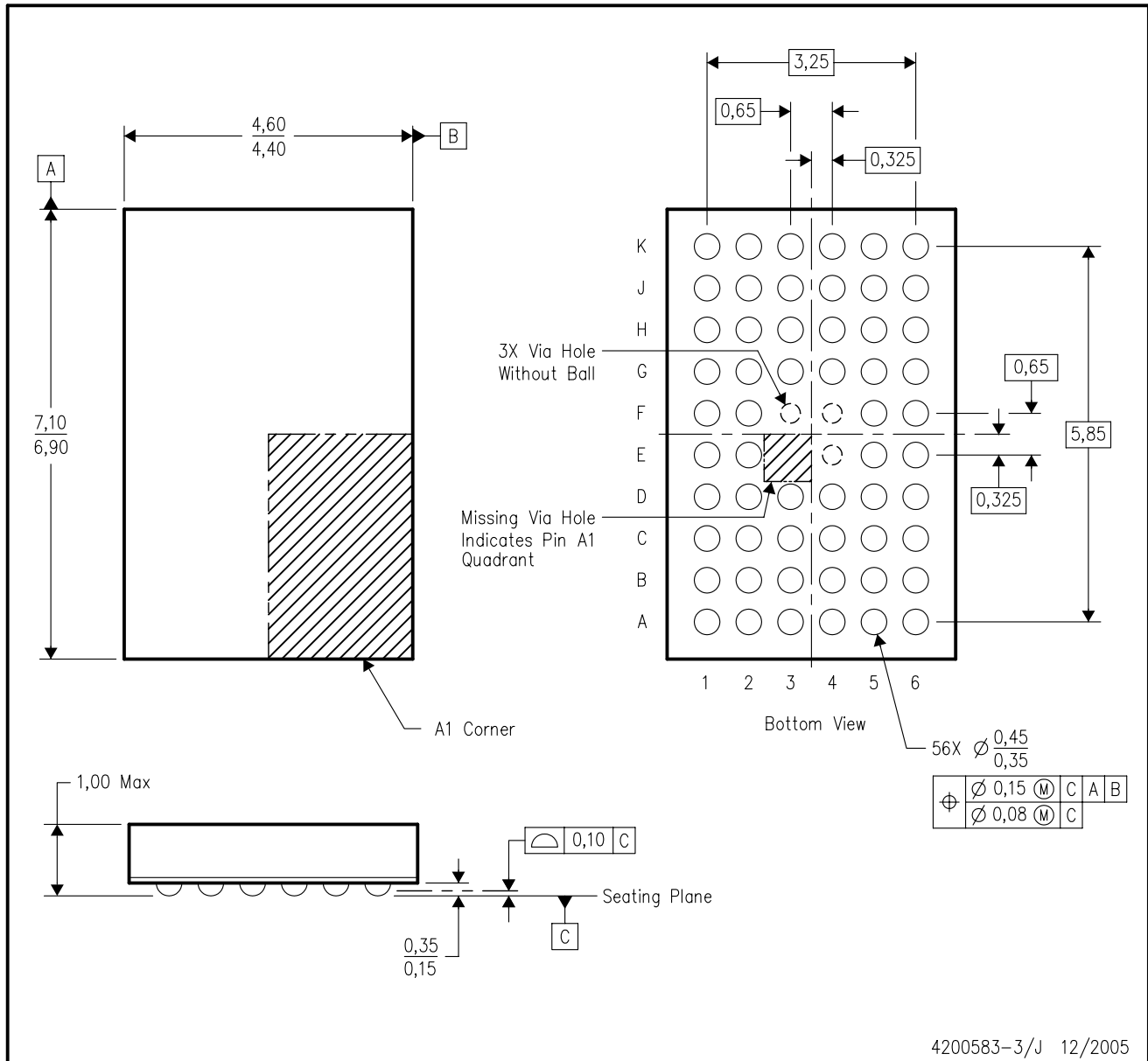
24 PINS SHOWN



- 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

GQL (R-PBGA-N56)

PLASTIC BALL GRID ARRAY

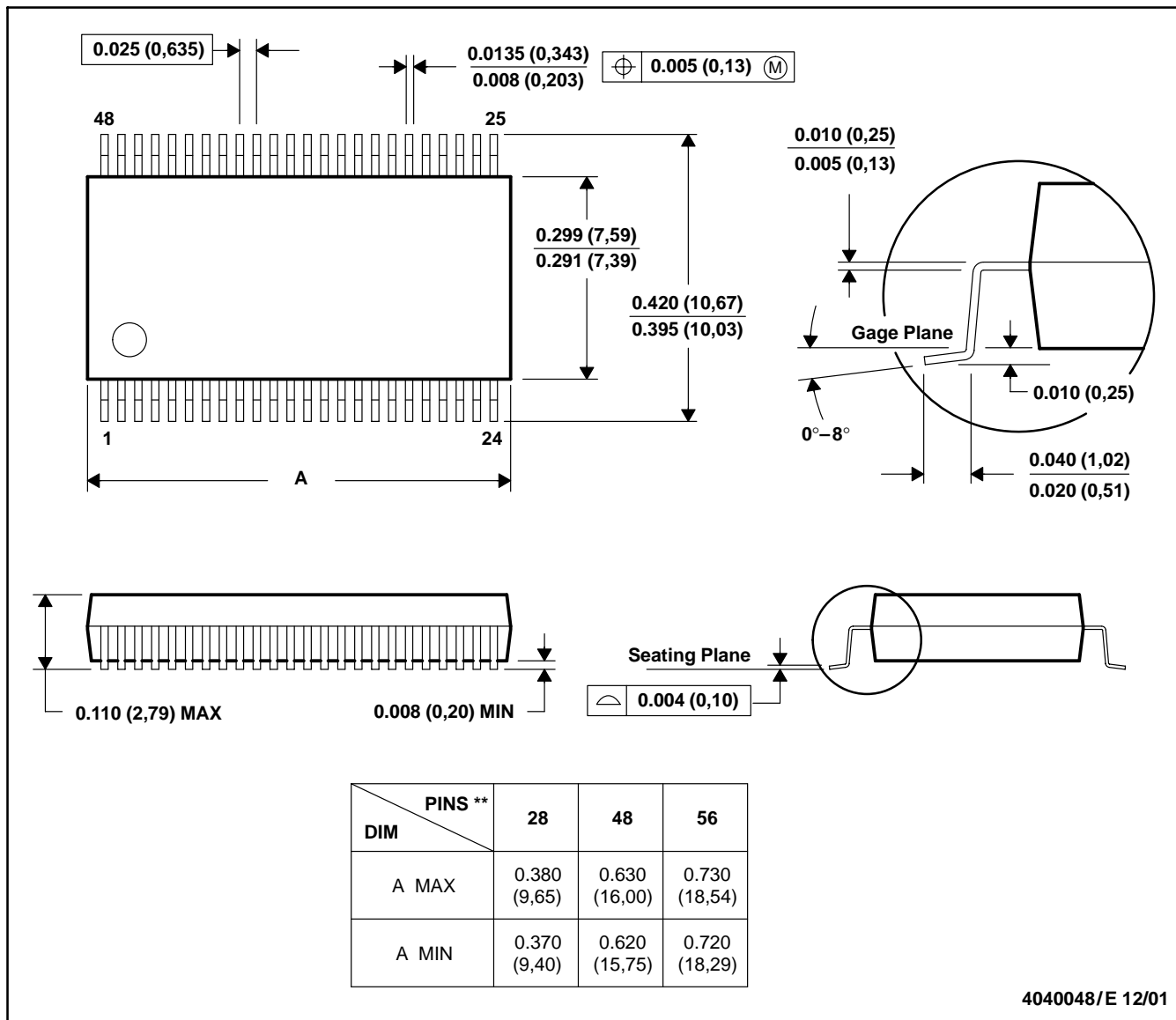


- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MO-225 variation BA.
  - D. This package is tin-lead (SnPb). Refer to the 56 ZQL package (drawing 4204437) for lead-free.

DL (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 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 MO-118

DGG (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

48 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 protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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