

## 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, Both Ports 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 1.2-V to 3.6-V Power-Supply Range
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- I/Os Are 4.6-V Tolerant
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 8000-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 SN74AVC16T245 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. 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. 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 SN74AVC16T245 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 effectively are isolated.

The SN74AVC16T245 is designed so that the control pins (1DIR, 2DIR, 1 $\overline{OE}$ , and 2 $\overline{OE}$ ) are supplied by  $V_{CCA}$ .

## ORDERING INFORMATION

$T_A$	PACKAGE <sup>(1)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	TSSOP – DGG	Tape and reel	SN74AVC16T245DGGR	AVC16T245
	TVSOP – DGV	Tape and reel	SN74AVC16T245DGVR	WF245
	VFBGA – GQL	Tape and reel	SN74AVC16T245GQLR	WF245
	VFBGA – ZQL (Pb-free)		SN74AVC16T245ZQLR	

(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).



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## DESCRIPTION/ORDERING INFORMATION (CONTINUED)

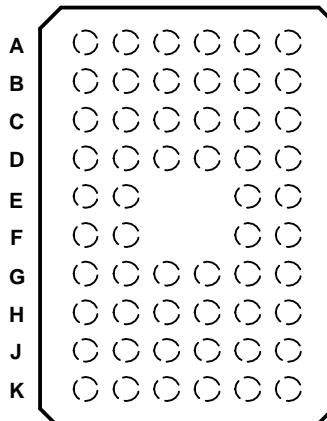
This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

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

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)**

1 2 3 4 5 6



## TERMINAL ASSIGNMENTS<sup>(2)</sup>

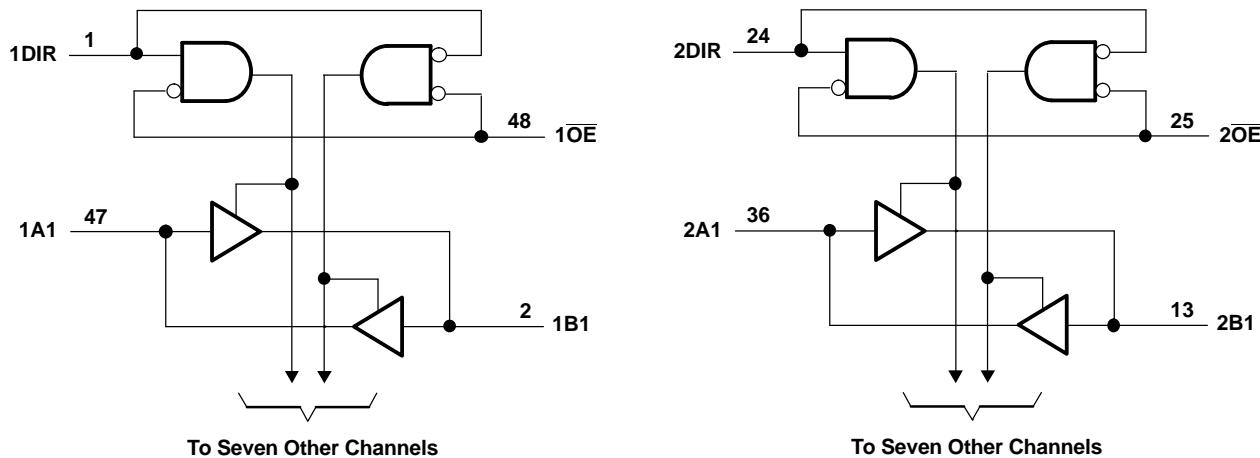
	1	2	3	4	5	6
<b>A</b>	1DIR	NC	NC	NC	NC	$1\overline{OE}$
<b>B</b>	1B2	1B1	GND	GND	1A1	1A2
<b>C</b>	1B4	1B3	$V_{CCB}$	$V_{CCA}$	1A3	1A4
<b>D</b>	1B6	1B5	GND	GND	1A5	1A6
<b>E</b>	1B8	1B7			1A7	1A8
<b>F</b>	2B1	2B2			2A2	2A1
<b>G</b>	2B3	2B4	GND	GND	2A4	2A3
<b>H</b>	2B5	2B6	$V_{CCB}$	$V_{CCA}$	2A6	2A5
<b>J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

(2) NC – No internal connection

**FUNCTION TABLE  
(EACH 8-BIT SECTION)**

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

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	4.6	V
$V_I$	I/O ports (A port)	-0.5	4.6	V
	I/O ports (B port)	-0.5	4.6	
	Control inputs	-0.5	4.6	
$V_O$	A port	-0.5	4.6	V
	B port	-0.5	4.6	
$V_O$	A port	-0.5	$V_{CCA} + 0.5$	V
	B port	-0.5	$V_{CCB} + 0.5$	
$I_{IK}$	$V_I < 0$		-50	mA
$I_{OK}$	$V_O < 0$		-50	mA
$I_O$	Continuous output current		$\pm 50$	mA
Continuous current through each $V_{CCA}$ , $V_{CCB}$ , and GND			$\pm 100$	mA
$\theta_{JA}$	DGG package	70		°C/W
	DGV package	58		
	GQL/ZQL package	42		
$T_{stg}$	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 voltage 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 4.6 V maximum if the output current rating is observed.

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

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

		$V_{CCI}$	$V_{CCO}$	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 <sup>(4)</sup>	1.2 V to 1.95 V	$V_{CCI} \times 0.65$	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 <sup>(4)</sup>	1.2 V to 1.95 V	$V_{CCI} \times 0.35$	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 $V_{CCA}$ ) <sup>(5)</sup>	1.2 V to 1.95 V	$V_{CCA} \times 0.65$	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 $V_{CCA}$ ) <sup>(5)</sup>	1.2 V to 1.95 V	$V_{CCA} \times 0.35$	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		1.2 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		1.2 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	
$\Delta t/\Delta V$	Input transition rise or fall rate				5	ns/V
$T_A$	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 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.(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>	T <sub>A</sub> = 25°C			-40°C to 85°C		UNIT
				MIN	TYP	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -100 µA	V <sub>I</sub> = V <sub>IH</sub>	1.2 V to 3.6 V	1.2 V to 3.6 V			V <sub>CCO</sub> - 0.2		V
	I <sub>OH</sub> = -3 mA		1.2 V	1.2 V		0.95			
	I <sub>OH</sub> = -6 mA		1.4 V	1.4 V			1.05		
	I <sub>OH</sub> = -8 mA		1.65 V	1.65 V			1.2		
	I <sub>OH</sub> = -9 mA		2.3 V	2.3 V			1.75		
	I <sub>OH</sub> = -12 mA		3 V	3 V			2.3		
V <sub>OL</sub>	I <sub>OL</sub> = 100 µA	V <sub>I</sub> = V <sub>IL</sub>	1.2 V to 3.6 V	1.2 V to 3.6 V			0.2		V
	I <sub>OL</sub> = 3 mA		1.2 V	1.2 V		0.15			
	I <sub>OL</sub> = 6 mA		1.4 V	1.4 V			0.35		
	I <sub>OL</sub> = 8 mA		1.65 V	1.65 V			0.45		
	I <sub>OL</sub> = 9 mA		2.3 V	2.3 V			0.55		
	I <sub>OL</sub> = 12 mA		3 V	3 V			0.7		
I <sub>I</sub>	Control inputs	V <sub>I</sub> = V <sub>CCA</sub> or GND	1.2 V to 3.6 V	1.2 V to 3.6 V	±0.025	±0.25		±1	µA
I <sub>off</sub>	A or B port	V <sub>I</sub> or V <sub>O</sub> = 0 to 3.6 V	0 V	0 to 3.6 V	±0.1	±2.5		±5	µA
	A or B port		0 to 3.6 V	0 V	±0.5	±2.5		±5	
I <sub>OZ</sub> <sup>(3)</sup>	A or B port	V <sub>O</sub> = V <sub>CCO</sub> or GND, V <sub>I</sub> = V <sub>CCI</sub> or GND, OE = V <sub>IH</sub>	3.6 V	3.6 V	±0.5	±2.5		±5	µA
I <sub>CCA</sub>	V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0	1.2 V to 3.6 V	1.2 V to 3.6 V				25		µA
		0 V	3.6 V				-5		
		3.6 V	0 V				25		
I <sub>CCB</sub>	V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0	1.2 V to 3.6 V	1.2 V to 3.6 V				25		µA
		0 V	3.6 V				25		
		3.6 V	0 V				-5		
I <sub>CCA</sub> + I <sub>CCB</sub>	V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0	1.2 V to 3.6 V	1.2 V to 3.6 V				45		µA
C <sub>i</sub>	Control inputs	V <sub>I</sub> = 3.3 V or GND	3.3 V	3.3 V	3.5				pF
C <sub>io</sub>	A or B port	V <sub>O</sub> = 3.3 V or GND	3.3 V	3.3 V	7				pF

 (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) For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

## Switching Characteristics

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.2\text{ V}$	$V_{CCB} = 1.5\text{ V}$	$V_{CCB} = 1.8\text{ V}$	$V_{CCB} = 2.5\text{ V}$	$V_{CCB} = 3.3\text{ V}$	UNIT
			TYP	TYP	TYP	TYP	TYP	
$t_{PLH}$	A	B	4.1	3.3	3	2.8	3.2	ns
$t_{PHL}$			4.1	3.3	3	2.8	3.2	
$t_{PLH}$	B	A	4.4	4	3.8	3.6	3.5	ns
$t_{PHL}$			4.4	4	3.8	3.6	3.5	
$t_{PZH}$	$\overline{OE}$	A	6.4	6.4	6.4	6.4	6.4	ns
$t_{PZL}$			6.4	6.4	6.4	6.4	6.4	
$t_{PZH}$	$\overline{OE}$	B	6	4.6	4	3.4	3.2	ns
$t_{PZL}$			6	4.6	4	3.4	3.2	
$t_{PHZ}$	$\overline{OE}$	A	6.6	6.6	6.6	6.6	6.8	ns
$t_{PLZ}$			6.6	6.6	6.6	6.6	6.8	
$t_{PHZ}$	$\overline{OE}$	B	6	4.9	4.9	4.2	5.3	ns
$t_{PLZ}$			6	4.9	4.9	4.2	5.3	

## 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	3.6	0.5	6.2	0.5	5.2	0.5	4.1	0.5	3.7	ns
$t_{PHL}$			3.6	0.5	6.2	0.5	5.2	0.5	4.1	0.5	3.7	
$t_{PLH}$	B	A	3.3	0.5	6.2	0.5	5.9	0.5	5.6	0.5	5.5	ns
$t_{PHL}$			3.3	0.5	6.2	0.5	5.9	0.5	5.6	0.5	5.5	
$t_{PZH}$	$\overline{OE}$	A	4.3	1	10.1	1	10.1	1	10.1	1	10.1	ns
$t_{PZL}$			4.3	1	10.1	1	10.1	1	10.1	1	10.1	
$t_{PZH}$	$\overline{OE}$	B	5.6	1	10.1	0.5	8.1	0.5	5.9	0.5	5.2	ns
$t_{PZL}$			5.6	1	10.1	0.5	8.1	0.5	5.9	0.5	5.2	
$t_{PHZ}$	$\overline{OE}$	A	4.5	1.5	9.1	1.5	9.1	1.5	9.1	1.5	9.1	ns
$t_{PLZ}$			4.5	1.5	9.1	1.5	9.1	1.5	9.1	1.5	9.1	
$t_{PHZ}$	$\overline{OE}$	B	5.5	1.5	8.7	1.5	7.5	1	6.5	1	6.3	ns
$t_{PLZ}$			5.5	1.5	8.7	1.5	7.5	1	6.5	1	6.3	

## 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	3.4	0.5	5.9	0.5	4.8	0.5	3.7	0.5	3.3	ns
$t_{PHL}$			3.4	0.5	5.9	0.5	4.8	0.5	3.7	0.5	3.3	
$t_{PLH}$	B	A	3	0.5	5.2	0.5	4.8	0.5	4.5	0.5	4.4	ns
$t_{PHL}$			3	0.5	5.2	0.5	4.8	0.5	4.5	0.5	4.4	
$t_{PZH}$	$\overline{OE}$	A	3.4	1	7.8	1	7.8	1	7.8	1	7.8	ns
$t_{PZL}$			3.4	1	7.8	1	7.8	1	7.8	1	7.8	
$t_{PZH}$	$\overline{OE}$	B	5.4	1	9.2	0.5	7.4	0.5	5.3	0.5	4.5	ns
$t_{PZL}$			5.4	1	9.2	0.5	7.4	0.5	5.3	0.5	4.5	
$t_{PHZ}$	$\overline{OE}$	A	4.2	1.5	7.7	1.5	7.7	1.5	7.7	1.5	7.7	ns
$t_{PLZ}$			4.2	1.5	7.7	1.5	7.7	1.5	7.7	1.5	7.7	
$t_{PHZ}$	$\overline{OE}$	B	5.2	1.5	8.4	1.5	7.1	1	5.9	1	5.7	ns
$t_{PLZ}$			5.2	1.5	8.4	1.5	7.1	1	5.9	1	5.7	

## 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	3.2	0.5	5.6	0.5	4.5	0.5	3.3	0.5	2.8	ns
$t_{PHL}$			3.2	0.5	5.6	0.5	4.5	0.5	3.3	0.5	2.8	
$t_{PLH}$	B	A	2.6	0.5	4.1	0.5	3.7	0.5	3.3	0.5	3.2	ns
$t_{PHL}$			2.6	0.5	4.1	0.5	3.7	0.5	3.3	0.5	3.2	
$t_{PZH}$	$\overline{OE}$	A	2.5	0.5	5.3	0.5	5.3	0.5	5.3	0.5	5.3	ns
$t_{PZL}$			2.5	0.5	5.3	0.5	5.3	0.5	5.3	0.5	5.3	
$t_{PZH}$	$\overline{OE}$	B	5.2	0.5	9.4	0.5	7.3	0.5	5.1	0.5	4.5	ns
$t_{PZL}$			5.2	0.5	9.4	0.5	7.3	0.5	5.1	0.5	4.5	
$t_{PHZ}$	$\overline{OE}$	A	3	1	6.1	1	6.1	1	6.1	1	6.1	ns
$t_{PLZ}$			3	1	6.1	1	6.1	1	6.1	1	6.1	
$t_{PHZ}$	$\overline{OE}$	B	5	1	7.9	1	6.6	1	6.1	1	5.2	ns
$t_{PLZ}$			5	1	7.9	1	6.6	1	6.1	1	5.2	

**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	3.2	0.5	5.5	0.5	4.4	0.5	3.2	0.5	2.7	ns
$t_{PHL}$			3.2	0.5	5.5	0.5	4.4	0.5	3.2	0.5	2.7	
$t_{PLH}$	B	A	2.8	0.5	3.7	0.5	3.3	0.5	2.8	0.5	2.7	ns
$t_{PHL}$			2.8	0.5	3.7	0.5	3.3	0.5	2.8	0.5	2.7	
$t_{PZH}$	$\overline{OE}$	A	2.2	0.5	4.3	0.5	4.2	0.5	4.1	0.5	4	ns
$t_{PZL}$			2.2	0.5	4.3	0.5	4.2	0.5	4.1	0.5	4	
$t_{PZH}$	$\overline{OE}$	B	5.1	0.5	9.3	0.5	7.2	0.5	4.9	0.5	4	ns
$t_{PZL}$			5.1	0.5	9.3	0.5	7.2	0.5	4.9	0.5	4	
$t_{PHZ}$	$\overline{OE}$	A	3.4	0.5	5	0.5	5	0.5	5	0.5	5	ns
$t_{PLZ}$			3.4	0.5	5	0.5	5	0.5	5	0.5	5	
$t_{PHZ}$	$\overline{OE}$	B	4.9	1	7.7	1	6.5	1	5.2	0.5	5	ns
$t_{PLZ}$			4.9	1	7.7	1	6.5	1	5.2	0.5	5	

**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	
$C_{pdA}^{(1)}$	A to B	Outputs enabled	$C_L = 0$ , $f = 10\text{ MHz}$ , $t_r = t_f = 1\text{ ns}$	1	1	1	1	2	pF
		Outputs disabled		1	1	1	1	1	
	B to A	Outputs enabled		13	13	14	15	16	
		Outputs disabled		1	1	1	1	1	
$C_{pdB}^{(1)}$	A to B	Outputs enabled	$C_L = 0$ , $f = 10\text{ MHz}$ , $t_r = t_f = 1\text{ ns}$	13	13	14	15	16	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	

(1) Power dissipation capacitance per transceiver

Table 1. Typical Total Static Power Consumption ( $I_{CCA} + I_{CCB}$ )

$V_{CCB}$	$V_{CCA}$						UNIT
	0 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
0 V	0	<0.5	<0.5	<0.5	<0.5	<0.5	$\mu A$
1.2 V	<0.5	<1	<1	<1	<1	1	
1.5 V	<0.5	<1	<1	<1	<1	1	
1.8 V	<0.5	<1	<1	<1	<1	<1	
2.5 V	<0.5	1	<1	<1	<1	<1	
3.3 V	<0.5	1	<1	<1	<1	<1	

## TYPICAL CHARACTERISTICS

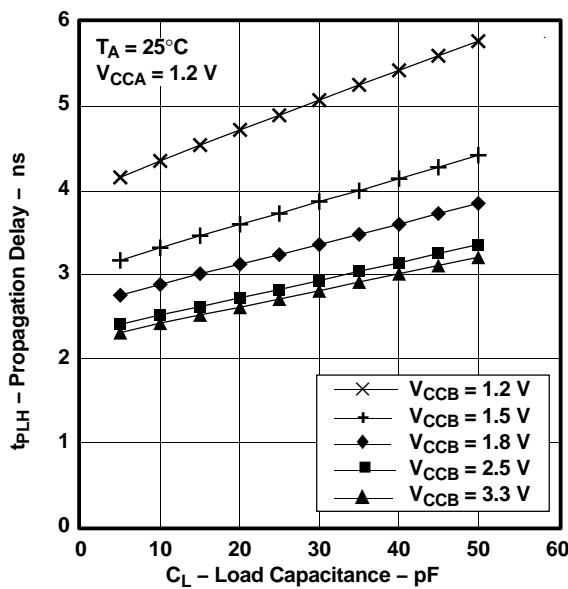


Figure 1.

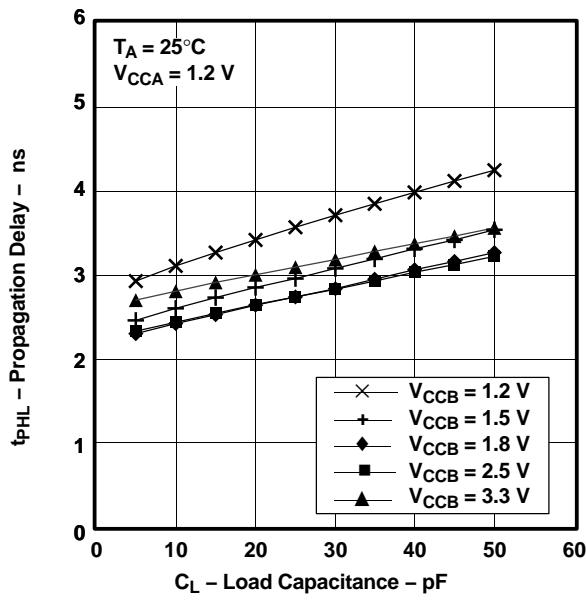


Figure 2.

TYPICAL CHARACTERISTICS

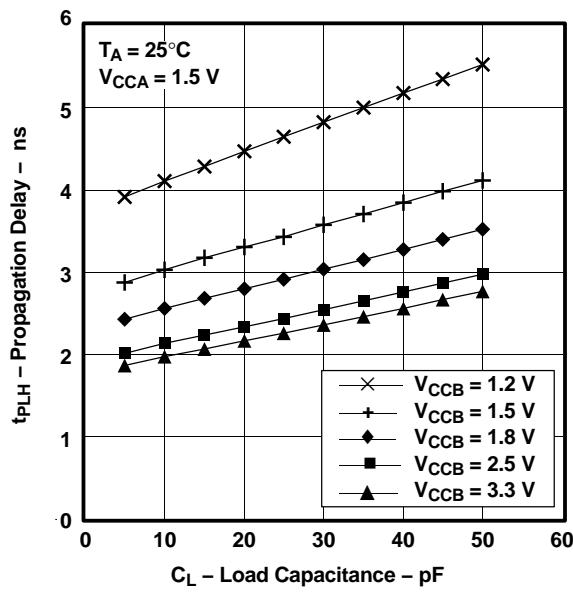


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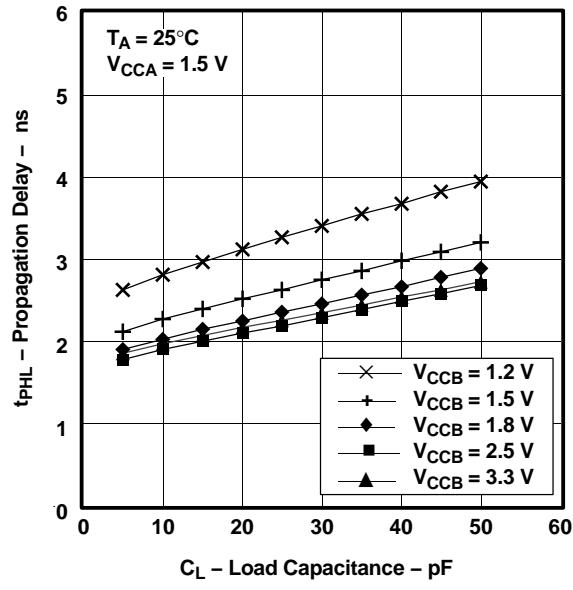


Figure 4.

## TYPICAL CHARACTERISTICS

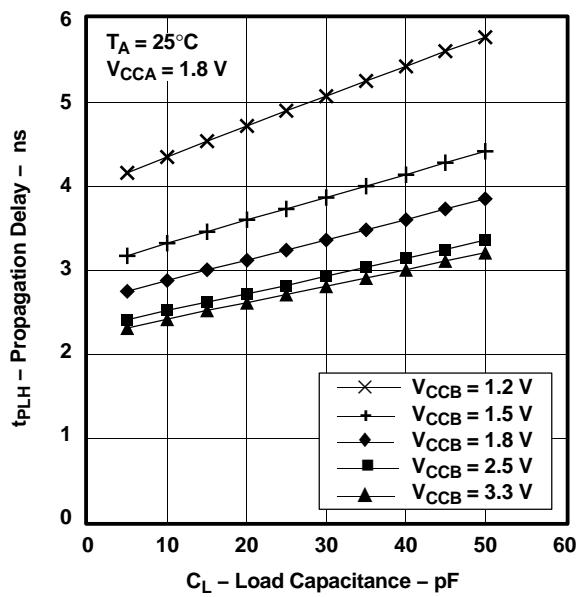


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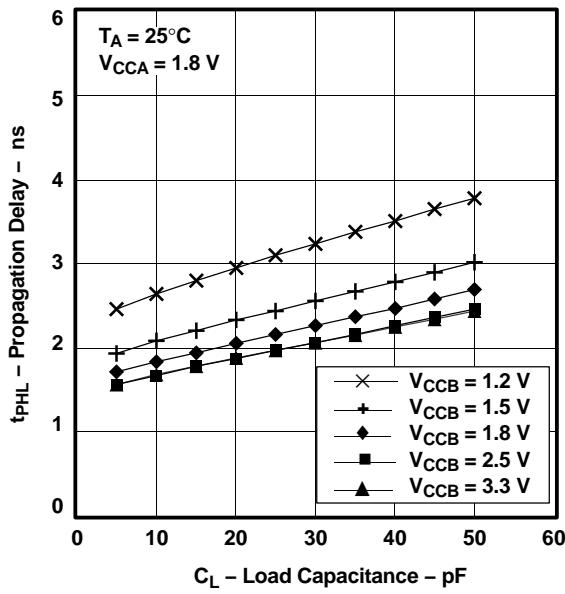


Figure 6.

TYPICAL CHARACTERISTICS

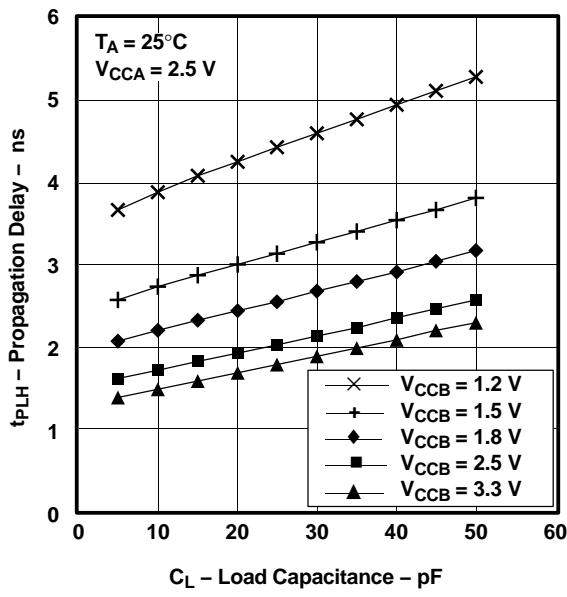


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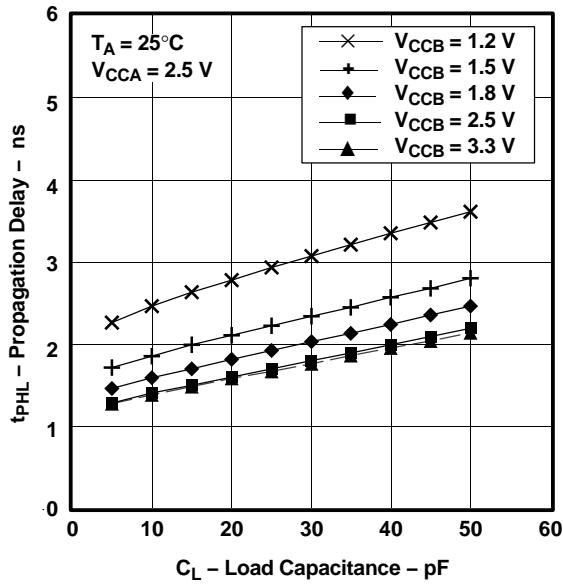


Figure 8.

## TYPICAL CHARACTERISTICS

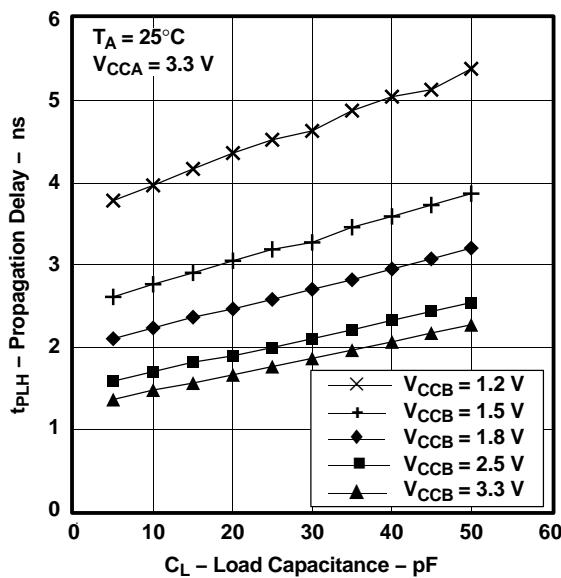


Figure 9.

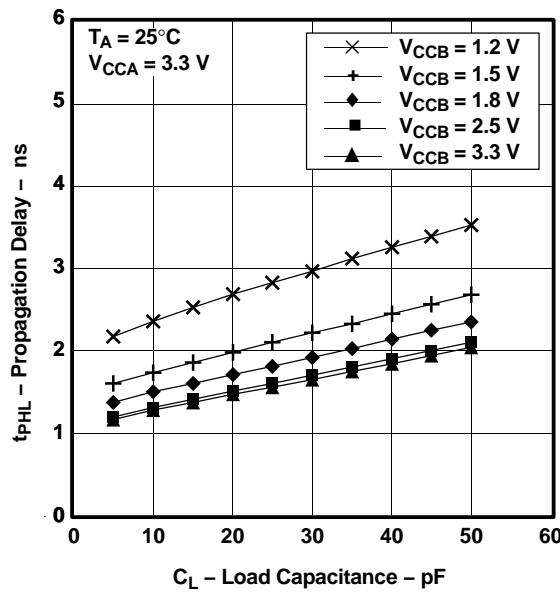
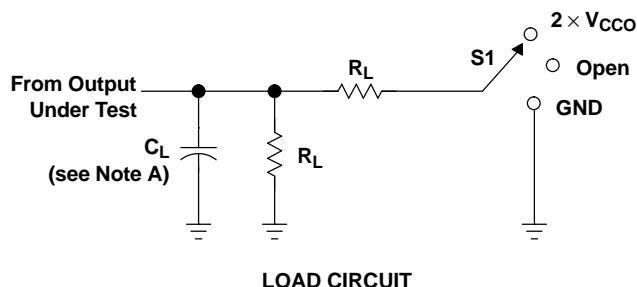


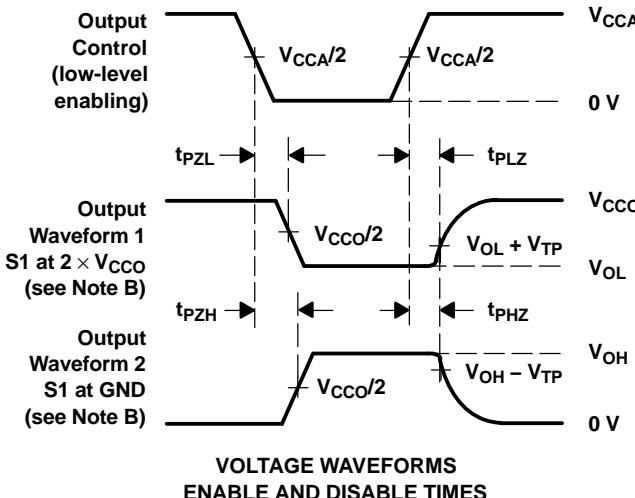
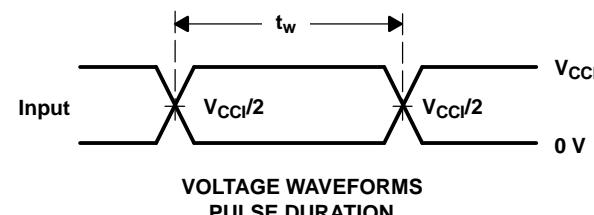
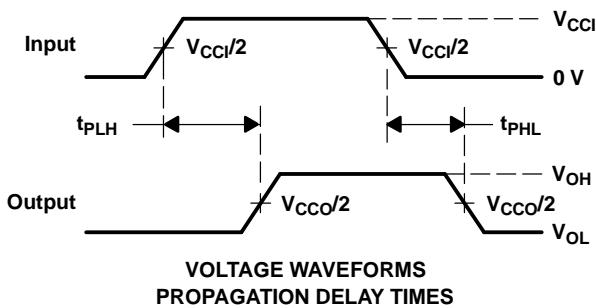
Figure 10.

PARAMETER MEASUREMENT INFORMATION



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

$V_{CCO}$	$C_L$	$R_L$	$V_{TP}$
1.2 V	15 pF	2 k $\Omega$	0.1 V
$1.5 V \pm 0.1 V$	15 pF	2 k $\Omega$	0.1 V
$1.8 V \pm 0.15 V$	15 pF	2 k $\Omega$	0.15 V
$2.5 V \pm 0.2 V$	15 pF	2 k $\Omega$	0.15 V
$3.3 V \pm 0.3 V$	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 MHz,  $Z_O = 50 \Omega$ ,  $dv/dt \geq 1$  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.

Figure 11. Load Circuit and Voltage Waveforms

## 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
74AVC16T245DGGRE4	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AVC16T245	Samples
74AVC16T245DGGRG4	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AVC16T245	Samples
74AVC16T245DGVR4	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	WF245	Samples
74AVC16T245DGVRG4	ACTIVE	TVSOP	DGV	48		TBD	Call TI	Call TI	-40 to 85		Samples
AVC16T245DGGR-D	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AVC16T245	Samples
SN74AVC16T245DGGR	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AVC16T245	Samples
SN74AVC16T245DGVR	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	WF245	Samples
SN74AVC16T245GQLR	OBsolete	BGA MICROSTAR JUNIOR	GQL	56		TBD	Call TI	Call TI	-40 to 85	WF245	
SN74AVC16T245ZQLR	ACTIVE	BGA MICROSTAR JUNIOR	ZQL	56	1000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	WF245	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.

**OBsolete:** TI has discontinued the production of the device.

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

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

**Pb-Free (RoHS):** 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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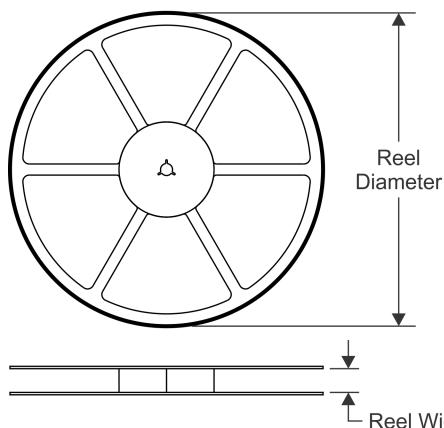
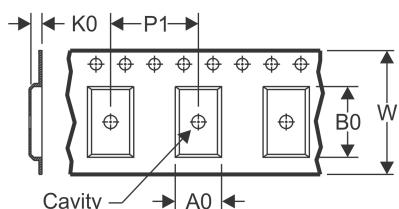
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**OTHER QUALIFIED VERSIONS OF SN74AVC16T245 :**

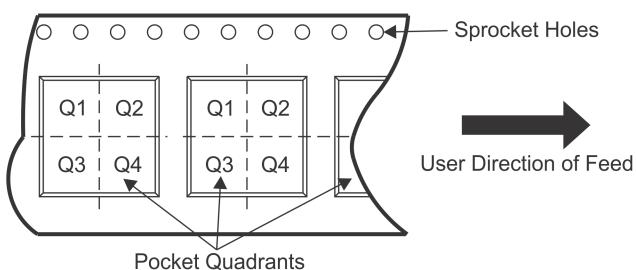
- Automotive: [SN74AVC16T245-Q1](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

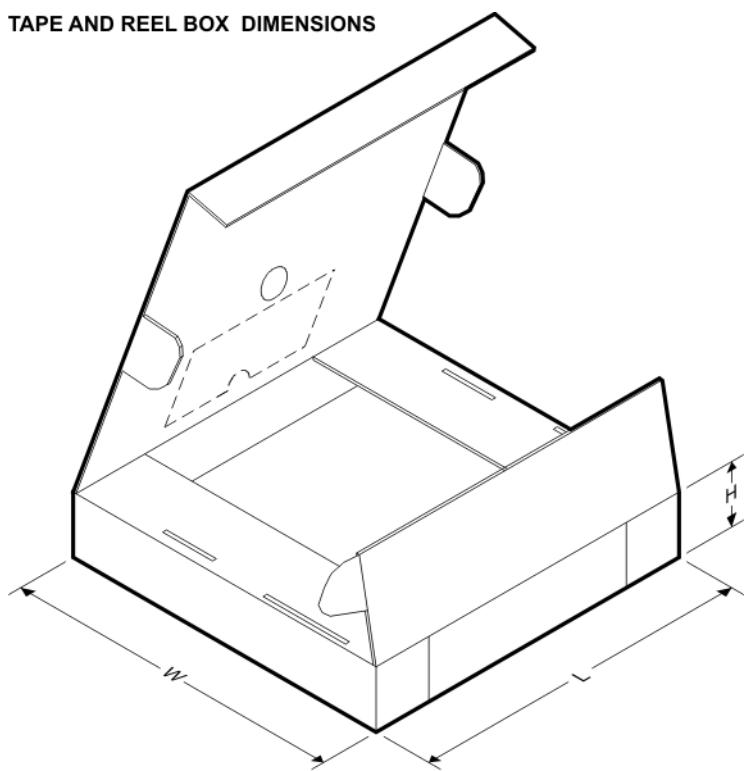
**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**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

**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
SN74AVC16T245DGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	15.8	1.8	12.0	24.0	Q1
SN74AVC16T245DGVR	TVSOP	DGV	48	2000	330.0	16.4	7.1	10.2	1.6	12.0	16.0	Q1
SN74AVC16T245ZQLR	BGA MI CROSTA R JUNI OR	ZQL	56	1000	330.0	16.4	4.8	7.3	1.5	8.0	16.0	Q1

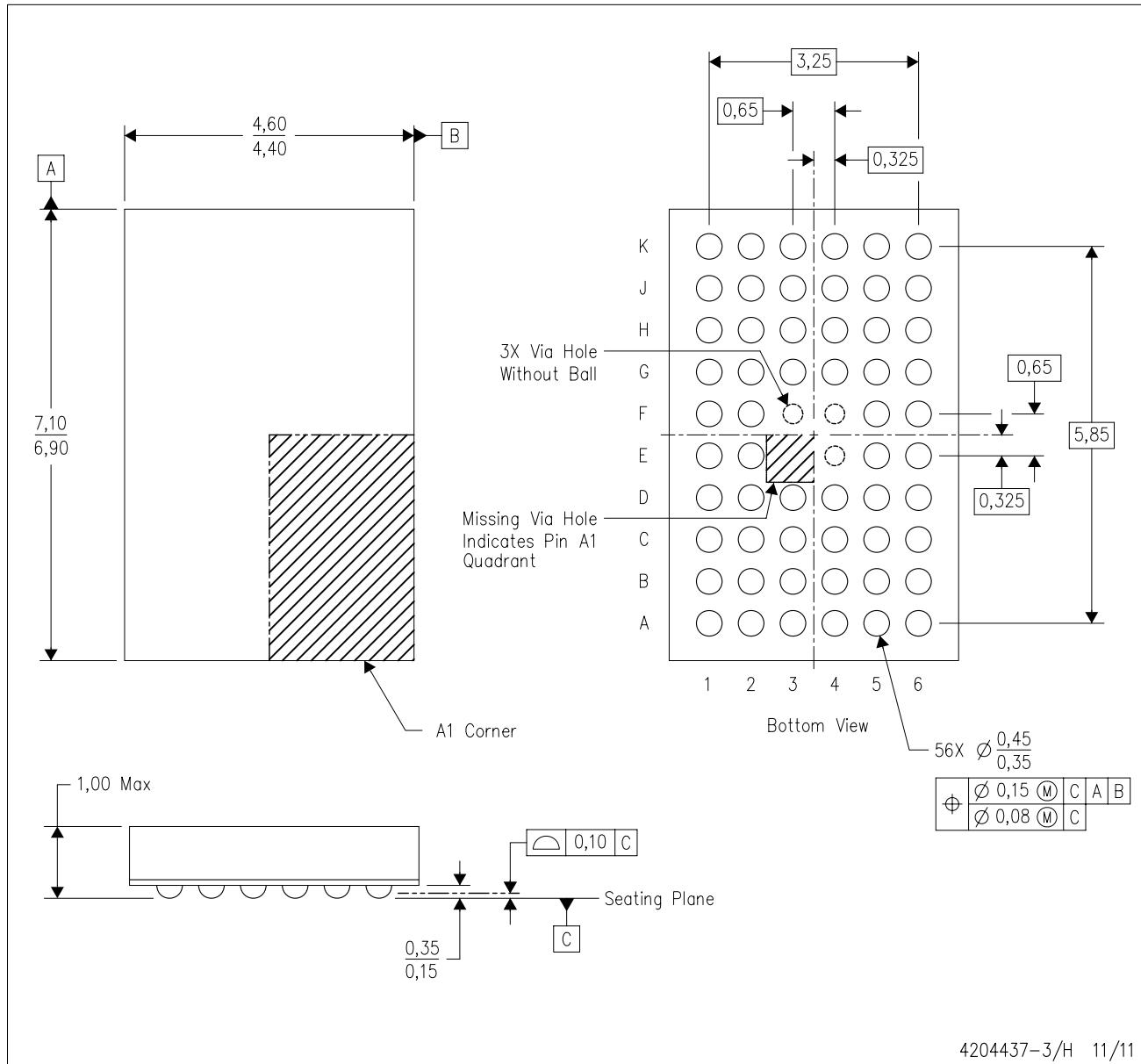
**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AVC16T245DGGR	TSSOP	DGG	48	2000	367.0	367.0	45.0
SN74AVC16T245DGVR	TVSOP	DGV	48	2000	367.0	367.0	38.0
SN74AVC16T245ZQLR	BGA MICROSTAR JUNIOR	ZQL	56	1000	336.6	336.6	28.6

ZQL (R-PBGA-N56)

PLASTIC BALL GRID ARRAY



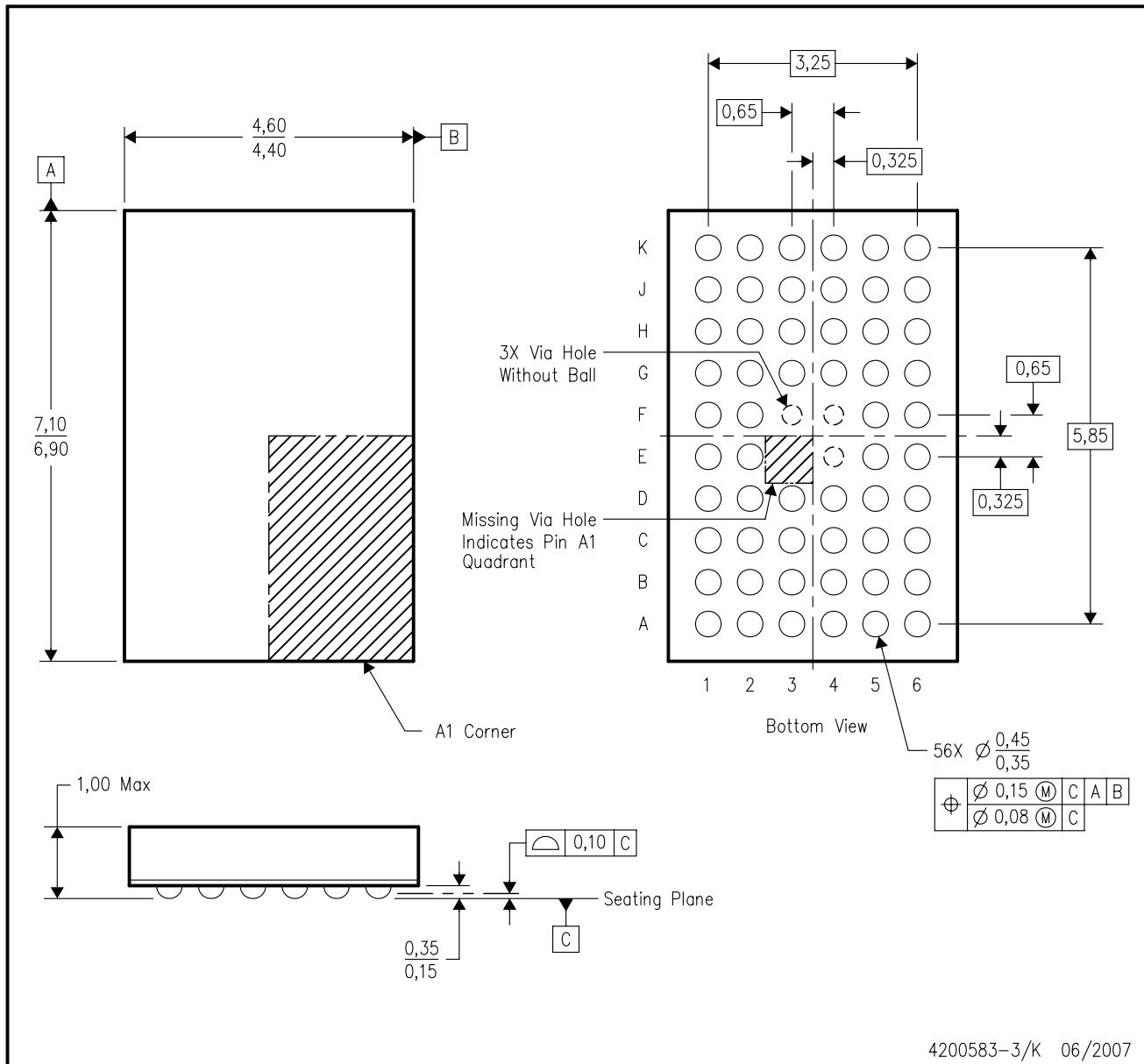
4204437-3/H 11/11

NOTES:

- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
- This drawing is subject to change without notice.
- Falls within JEDEC MO-285 variation BA-2.
- This package is Pb-free. Refer to the 56 QGL package (drawing 4200583) for tin-lead (SnPb).

## GQL (R-PBGA-N56)

## PLASTIC BALL GRID ARRAY



4200583-3/K 06/2007

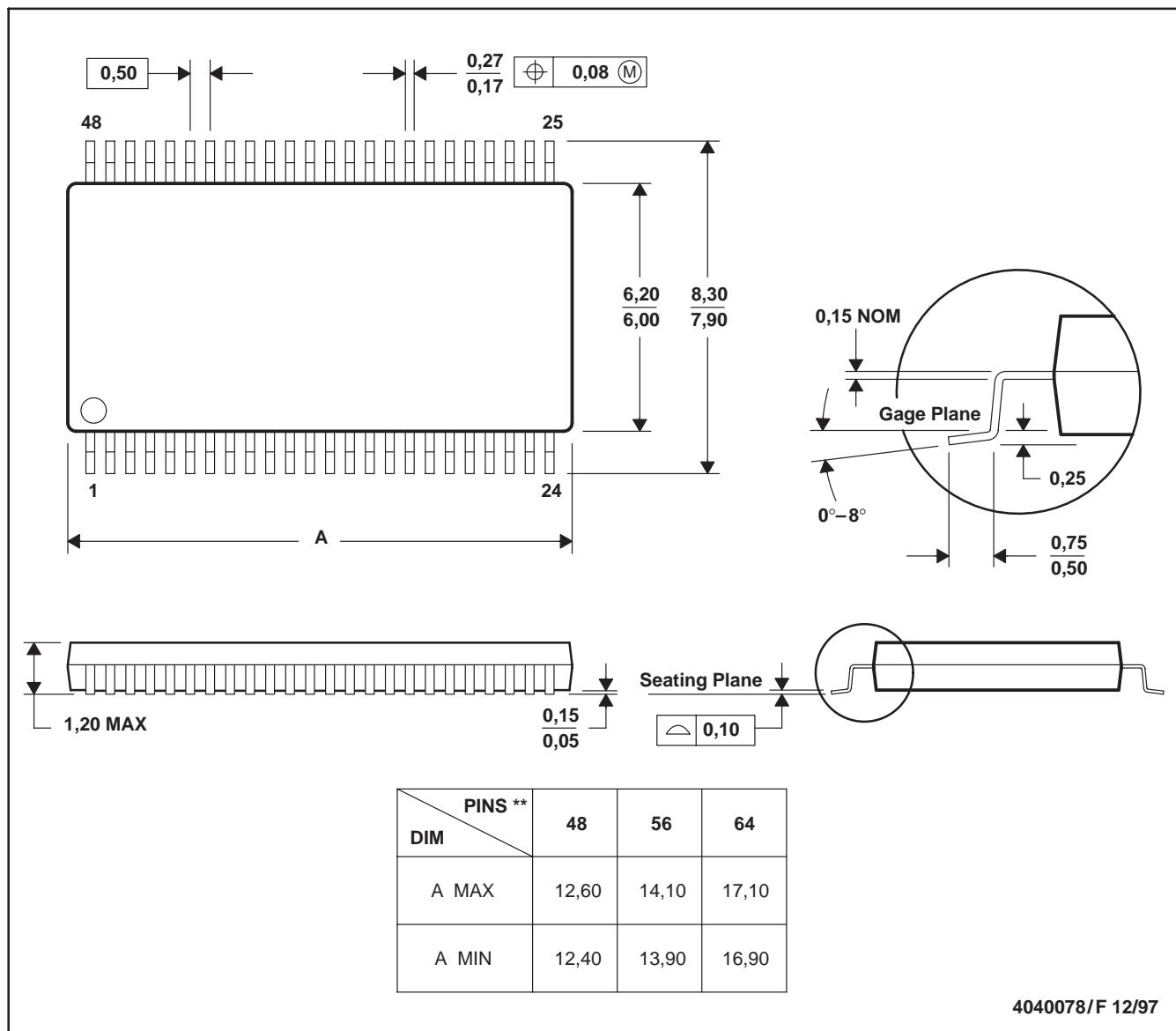
NOTES:

- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
- This drawing is subject to change without notice.
- Falls within JEDEC MO-285 variation BA-2.
- This package is tin-lead (SnPb). Refer to the 56 ZQL package (drawing 4204437) for lead-free.

## 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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