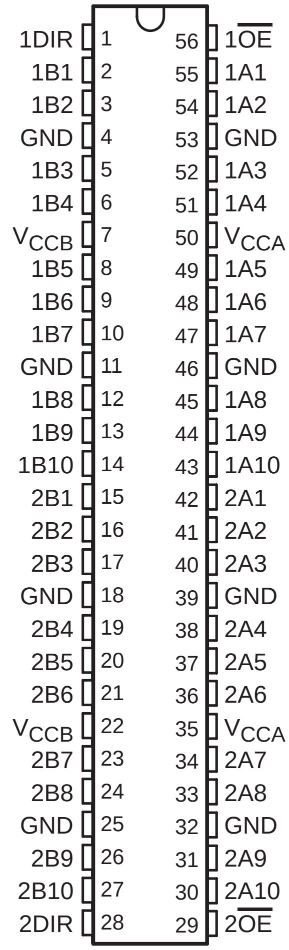
- **Control Inputs V_{IH}/V_{IL} Levels are Referenced to V_{CCA} Voltage**
- **V_{CC} Isolation Feature − If Either V_{CC} Input Is at GND, Both Ports Are in the High-Impedance State**
- **Overvoltage-Tolerant Inputs/Outputs Allow Mixed-Voltage-Mode Data Communications**
- **Fully Configurable Dual-Rail 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**
- **Max Data Rates**
  - **380 Mbps (1.8-V to 3.3-V Translation)**
  - **260 Mbps (< 1.8-V to 3.3-V Translation)**
  - **260 Mbps (Translate to 2.5 V)**
  - **210 Mbps (Translate to 1.8 V)**
  - **120 Mbps (Translate to 1.5 V)**
  - **100 Mbps (Translate to 1.2 V)**
- **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)**

DGG OR DGV PACKAGE
(TOP VIEW)



description/ordering information

This 20-bit noninverting bus transceiver uses two separate configurable power-supply rails.

The SN74AVC20T245 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.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
−40°C to 85°C	TSSOP − DGG	Tape and reel	SN74AVC20T245DGGR	AVC20T245
	TVSOP − DGV	Tape and reel	SN74AVC20T245DGVR	WG245
	VFBGA − GQL	Tape and reel	SN74AVC20T245GQLR	WG245
	VFBGA − ZQL (Pb-free)		SN74AVC20T245ZQLR	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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.

description/ordering information (continued)

The SN74AVC20T245 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 is used to disable the outputs so that the buses are isolated.

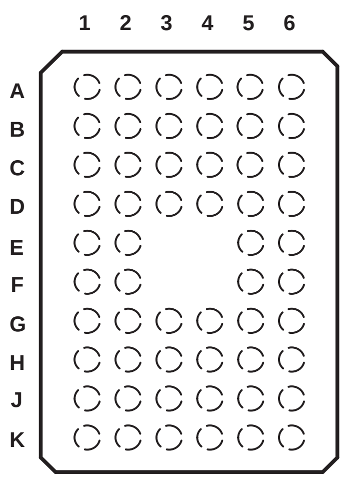
The SN74AVC20T245 is designed so that the control (1DIR, 2DIR, 1$\overline{OE}$, and 2$\overline{OE}$) inputs are supplied by V_{CCA}.

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.

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)



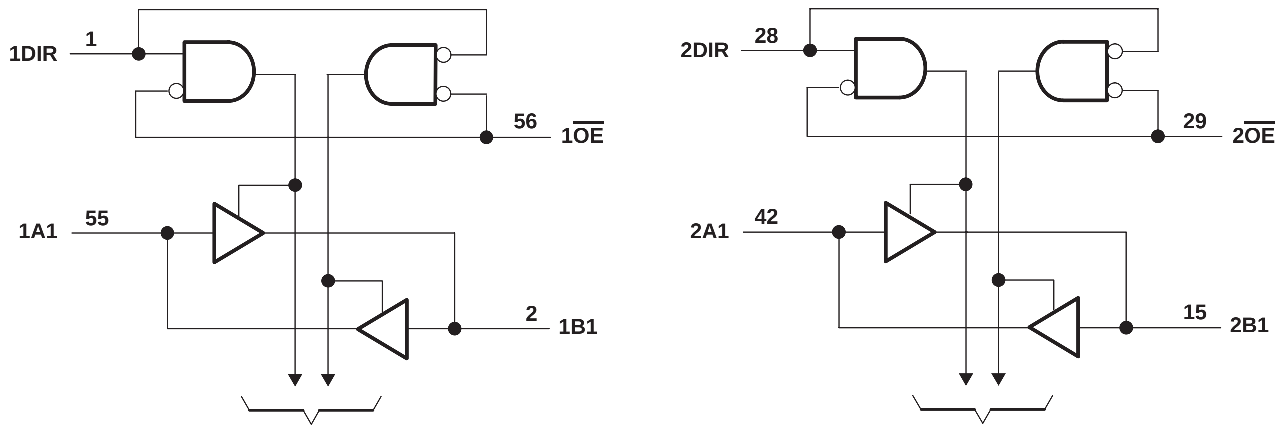
terminal assignments

	1	2	3	4	5	6
A	1B1	1B2	1DIR	1$\overline{OE}$	1A2	1A1
B	1B3	1B4	GND	GND	1A4	1A3
C	1B5	1B6	V_{CCB}	V_{CCA}	1A6	1A5
D	1B7	1B8	GND	GND	1A8	1A7
E	1B9	1B10			1A10	1A9
F	2B1	2B2			2A2	2A1
G	2B3	2B4	GND	GND	2A4	2A3
H	2B5	2B6	V_{CCB}	V_{CCA}	2A6	2A5
J	2B7	2B8	GND	GND	2A8	2A7
K	2B9	2B10	2DIR	2$\overline{OE}$	2A10	2A9

FUNCTION TABLE
(each 10-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)



Pin numbers shown are for the DGG and DGV packages.

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 each V_{CCA}, V_{CCB}, and GND . . . . ±100 mA
Package thermal impedance, θ_{JA} (see Note 3): DGG package . . . . 64°C/W
DGV package . . . . 48°C/W
GQL/ZQL package . . . . 42°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.

recommended operating conditions (see Notes 4 through 8)

			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 7)	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 (see Note 7)	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}) (see Note 8)	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}) (see Note 8)	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

NOTES:
4. V_{CCI} is the V_{CC} associated with the data input port.
5. V_{CCO} is the V_{CC} associated with the output port.
6. 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.
7. For V_{CCI} values not specified in the data sheet, $V_{IH(min)} = V_{CCI}$ x 0.7 V, $V_{IL(max)} = V_{CCI}$ x 0.3 V.
8. For V_{CCI} values not specified in the data sheet, $V_{IH(min)} = V_{CCA}$ x 0.7 V, $V_{IL(max)} = V_{CCA}$ x 0.3 V.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Notes 9 and 10)

PARAMETER		TEST CONDITIONS		V_{CCA}	V_{CCB}	T_A = 25°C MIN	T_A = 25°C TYP	T_A = 25°C MAX	−40°C to 85°C MIN	−40°C to 85°C MAX	UNIT
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		0.15				
		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
	A or B port			0 to 3.6 V	0 V		±0.1	±1		±5	
I_{OZ}†	A or B ports	$V_O = V_{CCO}$ or GND, $V_I = V_{CCI}$ or GND	$\overline{OE} = V_{IH}$	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					35	µA
				0 V	3.6 V					−5	
				3.6 V	0 V					35	
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					35	µA
				0 V	3.6 V					35	
				3.6 V	0 V					−5	
$I_{CCA} + I_{CCB}$		$V_I = V_{CCI}$ or GND, $I_O = 0$		1.2 V to 3.6 V	1.2 V to 3.6 V					65	µA
C_i	Control inputs	V_I = 3.3 V or GND		3.3 V	3.3 V		3.5				pF
C_{io}	A or B ports	V_O = 3.3 V or GND		3.3 V	3.3 V		7				pF

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

NOTES: 9. V_{CCO} is the V_{CC} associated with the output port.
10. V_{CCI} is the V_{CC} associated with the input port.

switching characteristics over recommended operating free-air temperature range, V_{CCA} = 1.2 V (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2 V	V_{CCB} = 1.5 V	V_{CCB} = 1.8 V	V_{CCB} = 2.5 V	V_{CCB} = 3.3 V	UNIT
			TYP	TYP	TYP	TYP	TYP	
t_{PLH}	A	B	3.8	3.1	2.8	2.7	3.3	ns
t_{PHL}			3.8	3.1	2.8	2.7	3.3	
t_{PLH}	B	A	4.1	3.8	3.6	3.5	3.4	ns
t_{PHL}			4.1	3.8	3.6	3.5	3.4	
t_{PZH}	$\overline{OE}$	A	6.5	6.5	6.5	6.5	6.5	ns
t_{PZL}			6.5	6.5	6.5	6.5	6.5	
t_{PZH}	$\overline{OE}$	B	5.6	4.4	3.8	3.3	3.2	ns
t_{PZL}			5.6	4.4	3.8	3.3	3.2	
t_{PHZ}	$\overline{OE}$	A	6.4	6.4	6.4	6.4	6.4	ns
t_{PLZ}			6.4	6.4	6.4	6.4	6.4	
t_{PHZ}	$\overline{OE}$	B	5.7	4.6	4.7	4.1	5.4	ns
t_{PLZ}			5.7	4.6	4.7	4.1	5.4	

switching characteristics over recommended operating free-air temperature range, V_{CCA} = 1.5 V ± 0.1 V (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2 V	V_{CCB} = 1.5 V ± 0.1 V		V_{CCB} = 1.8 V ± 0.15 V		V_{CCB} = 2.5 V ± 0.2 V		V_{CCB} = 3.3 V ± 0.3 V		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	3.8	0.5	6.4	0.5	5.4	0.5	4.3	0.5	3.9	ns
t_{PHL}			3.8	0.5	6.4	0.5	5.4	0.5	4.3	0.5	3.9	
t_{PLH}	B	A	3.1	0.5	6.4	0.5	6.1	0.5	5.8	0.5	5.7	ns
t_{PHL}			3.1	0.5	6.4	0.5	6.1	0.5	5.8	0.5	5.7	
t_{PZH}	$\overline{OE}$	A	4.3	1.5	10.3	1.5	10.3	1.5	10.2	1.5	10.2	ns
t_{PZL}			4.3	1.5	10.3	1.5	10.3	1.5	10.2	1.5	10.2	
t_{PZH}	$\overline{OE}$	B	5.2	1	10.3	1	8.4	0.5	6.1	0.5	5.3	ns
t_{PZL}			5.2	1	10.3	1	8.4	0.5	6.1	0.5	5.3	
t_{PHZ}	$\overline{OE}$	A	4.5	2	9	2	9	2	9	2	9	ns
t_{PLZ}			4.5	2	9	2	9	2	9	2	9	
t_{PHZ}	$\overline{OE}$	B	5.1	1.5	9	1.5	7.8	1	6.4	1	5.9	ns
t_{PLZ}			5.1	1.5	9	1.5	7.8	1	6.4	1	5.9	

switching characteristics over recommended operating free-air temperature range, V_{CCA} = 1.8 V ± 0.15 V (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2 V	V_{CCB} = 1.5 V ± 0.1 V		V_{CCB} = 1.8 V ± 0.15 V		V_{CCB} = 2.5 V ± 0.2 V		V_{CCB} = 3.3 V ± 0.3 V		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	3.6	0.5	6.1	0.5	5	0.5	3.9	0.5	3.5	ns
t_{PHL}			3.6	0.5	6.1	0.5	5	0.5	3.9	0.5	3.5	
t_{PLH}	B	A	2.8	0.5	5.4	0.5	5	0.5	4.7	0.5	4.6	ns
t_{PHL}			2.8	0.5	5.4	0.5	5	0.5	4.7	0.5	4.6	
t_{PZH}	$\overline{OE}$	A	3.4	1	8.1	1	7.9	1	7.9	1	7.9	ns
t_{PZL}			3.4	1	8.1	1	7.9	1	7.9	1	7.9	
t_{PZH}	$\overline{OE}$	B	5	0.5	10	0.5	7.9	0.5	5.7	0.5	4.8	ns
t_{PZL}			5	0.5	10	0.5	7.9	0.5	5.7	0.5	4.8	
t_{PHZ}	$\overline{OE}$	A	4.1	2	7.4	2	7.4	2	7.4	2	7.4	ns
t_{PLZ}			4.1	2	7.4	2	7.4	2	7.4	2	7.4	
t_{PHZ}	$\overline{OE}$	B	4.9	1.5	8.7	1.5	7.4	1	5.8	1	5.1	ns
t_{PLZ}			4.9	1.5	8.7	1.5	7.4	1	5.8	1	5.1	

switching characteristics over recommended operating free-air temperature range, V_{CCA} = 2.5 V ± 0.2 V (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2 V	V_{CCB} = 1.5 V ± 0.1 V		V_{CCB} = 1.8 V ± 0.15 V		V_{CCB} = 2.5 V ± 0.2 V		V_{CCB} = 3.3 V ± 0.3 V		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	3.5	0.5	5.8	0.5	4.7	0.5	3.5	0.5	3	ns
t_{PHL}			3.5	0.5	5.8	0.5	4.7	0.5	3.5	0.5	3	
t_{PLH}	B	A	2.7	0.5	4.3	0.5	3.9	0.5	3.5	0.5	3.4	ns
t_{PHL}			2.7	0.5	4.3	0.5	3.9	0.5	3.5	0.5	3.4	
t_{PZH}	$\overline{OE}$	A	2.5	0.5	5.4	0.5	5.3	0.5	5.2	0.5	5.2	ns
t_{PZL}			2.5	0.5	5.4	0.5	5.3	0.5	5.2	0.5	5.2	
t_{PZH}	$\overline{OE}$	B	4.8	0.5	9.6	0.5	7.6	0.5	5.3	0.5	4.3	ns
t_{PZL}			4.8	0.5	9.6	0.5	7.6	0.5	5.3	0.5	4.3	
t_{PHZ}	$\overline{OE}$	A	3	1.1	5.2	1.1	5.2	1.1	5.2	1.1	5.2	ns
t_{PLZ}			3	1.1	5.2	1.1	5.2	1.1	5.2	1.1	5.2	
t_{PHZ}	$\overline{OE}$	B	4.7	1.2	8.2	1.2	6.9	1	5.3	1	5	ns
t_{PLZ}			4.7	1.2	8.2	1.2	6.9	1	5.3	1	5	

switching characteristics over recommended operating free-air temperature range, V_{CCA} = 3.3 V ± 0.3 V (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CCB} = 1.2 V	V_{CCB} = 1.5 V ± 0.1 V		V_{CCB} = 1.8 V ± 0.15 V		V_{CCB} = 2.5 V ± 0.2 V		V_{CCB} = 3.3 V ± 0.3 V		UNIT
			TYP	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	3.4	0.5	5.7	0.5	4.6	0.5	3.4	0.5	2.9	ns
t_{PHL}			3.4	0.5	5.7	0.5	4.6	0.5	3.4	0.5	2.9	
t_{PLH}	B	A	3.3	0.5	3.9	0.5	3.5	0.5	3	0.5	2.9	ns
t_{PHL}			3.3	0.5	3.9	0.5	3.5	0.5	3	0.5	2.9	
t_{PZH}	$\overline{OE}$	A	2.2	0.5	4.4	0.5	4.3	0.5	4.2	0.5	4.1	ns
t_{PZL}			2.2	0.5	4.4	0.5	4.3	0.5	4.2	0.5	4.1	
t_{PZH}	$\overline{OE}$	B	4.7	1	9.6	0.5	7.5	0.5	5.1	0.5	4.1	ns
t_{PZL}			4.7	1	9.6	0.5	7.5	0.5	5.1	0.5	4.1	
t_{PHZ}	$\overline{OE}$	A	3.4	0.8	5	0.8	5	0.8	5	0.8	5	ns
t_{PLZ}			3.4	0.8	5	0.8	5	0.8	5	0.8	5	
t_{PHZ}	$\overline{OE}$	B	4.6	1.2	8.1	1.2	6.7	1	5.1	0.8	5	ns
t_{PLZ}			4.6	1.2	8.1	1.2	6.7	1	5.1	0.8	5	

operating characteristics, T_A = 25°C

PARAMETER			TEST CONDITIONS	V_{CCA} = V_{CCB} = 1.2 V	V_{CCA} = V_{CCB} = 1.5 V	V_{CCA} = V_{CCB} = 1.8 V	V_{CCA} = V_{CCB} = 2.5 V	V_{CCA} = V_{CCB} = 3.3 V	UNIT
				TYP	TYP	TYP	TYP	TYP	
C_{pdA}†	A to B	Outputs Enabled	C_L = 0, f = 10 MHz, t_r = t_f =1 ns	1	1	1	1	2	pF
		Outputs Disabled		1	1	1	1	1	
	B to A	Outputs Enabled		12	13	14	15	16	
		Outputs Disabled		1	1	1	1	1	
C_{pdB}†	A to B	Outputs Enabled	C_L = 0, f = 10 MHz, t_r = t_f =1 ns	13	13	14	15	16	pF
		Outputs Disabled		1	1	1	1	1	
	B to A	Outputs Enabled		1	1	1	2	2	
		Outputs Disabled		1	1	1	1	1	

† Power-dissipation capacitance per transceiver

typical total static power consumption ($I_{CCA} + I_{CCB}$)

TABLE 1

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	μA
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

TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE
T_A = 25°C, V_{CCA} = 1.2 V

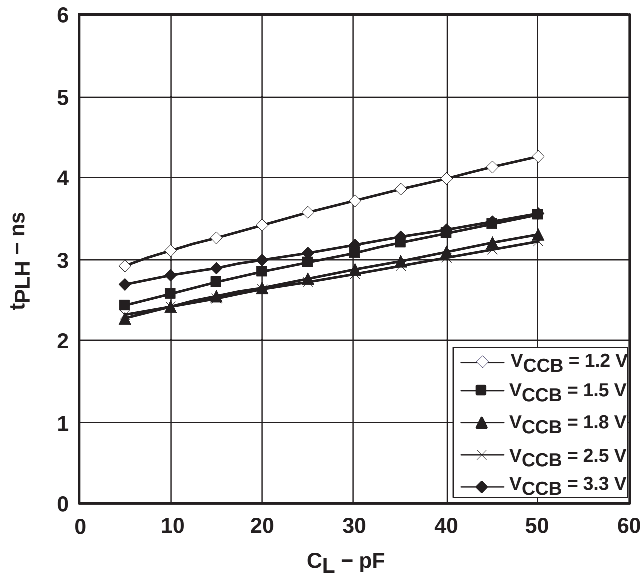


Figure 1

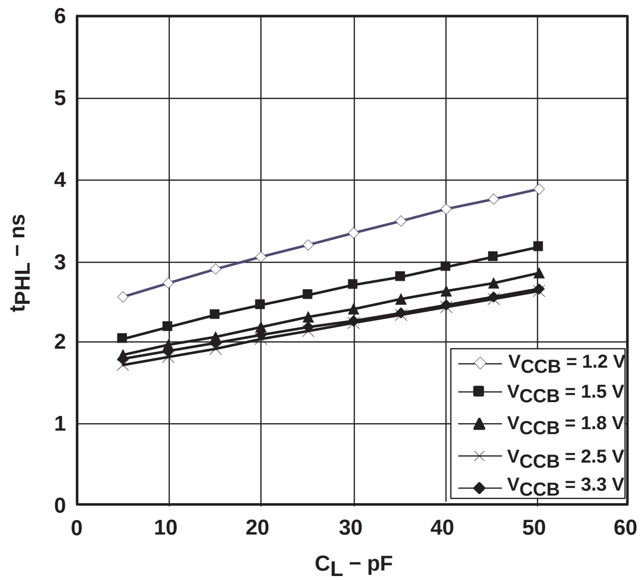


Figure 2

TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE
T_A = 25°C, V_{CCA} = 1.5 V

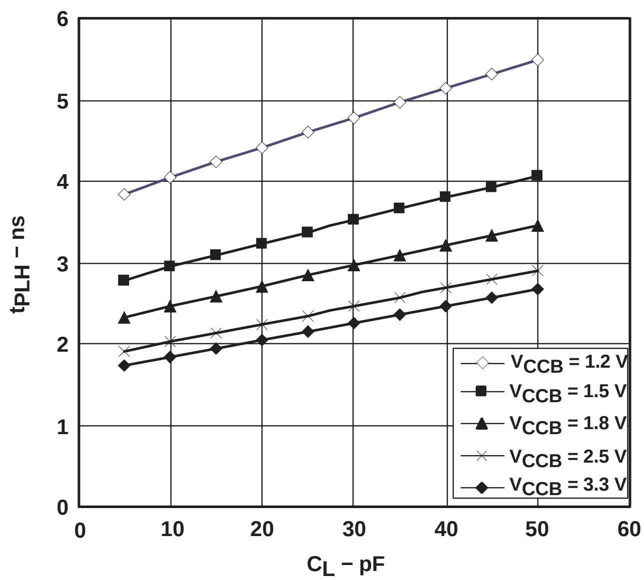


Figure 3

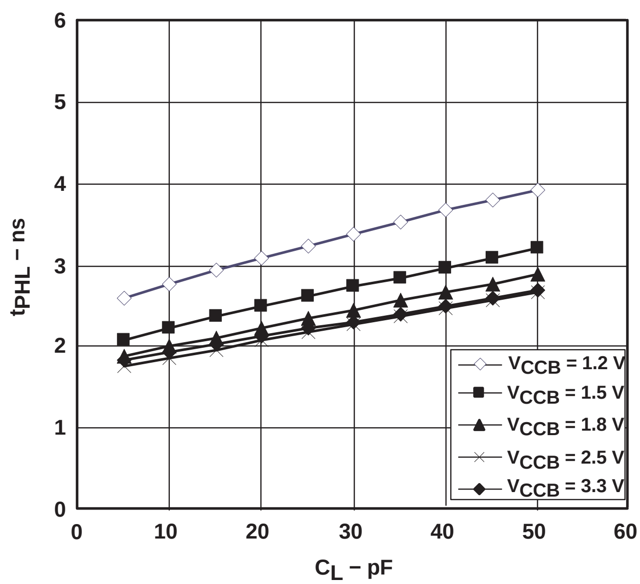


Figure 4

TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE
T_A = 25°C, V_{CCA} = 1.8 V

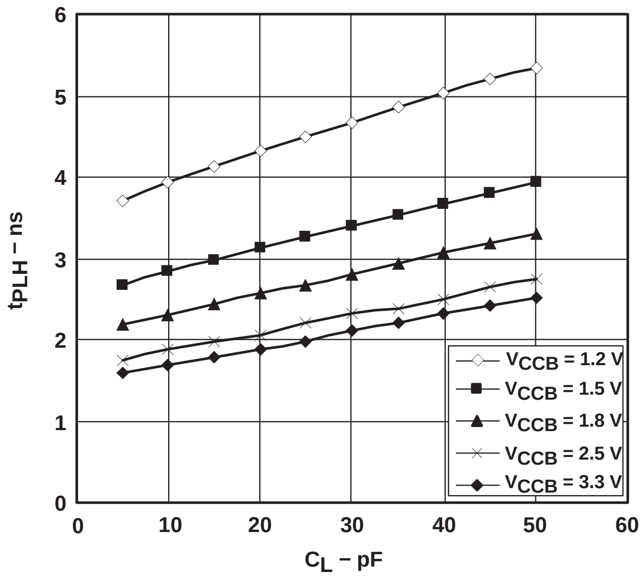


Figure 5

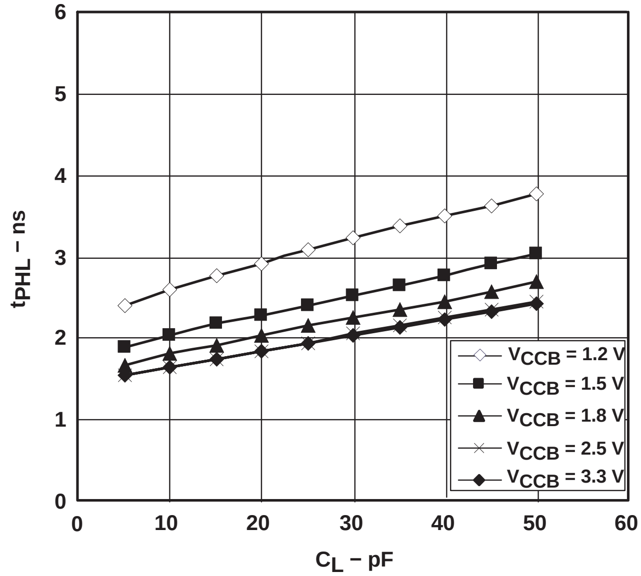


Figure 6

TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE
T_A = 25°C, V_{CCA} = 2.5 V

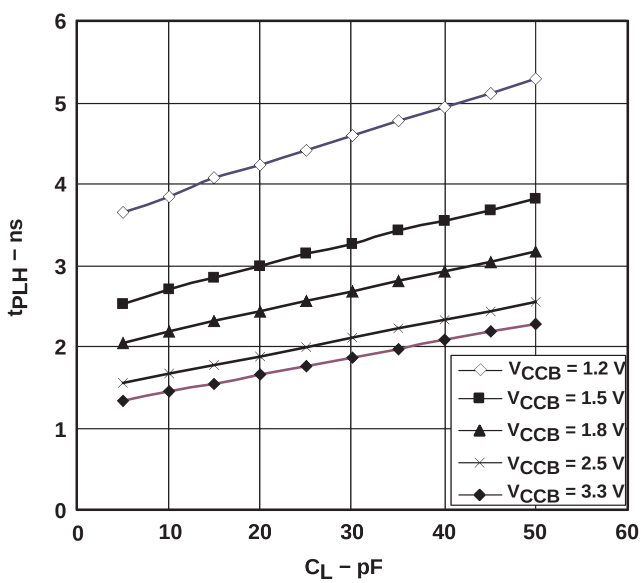


Figure 7

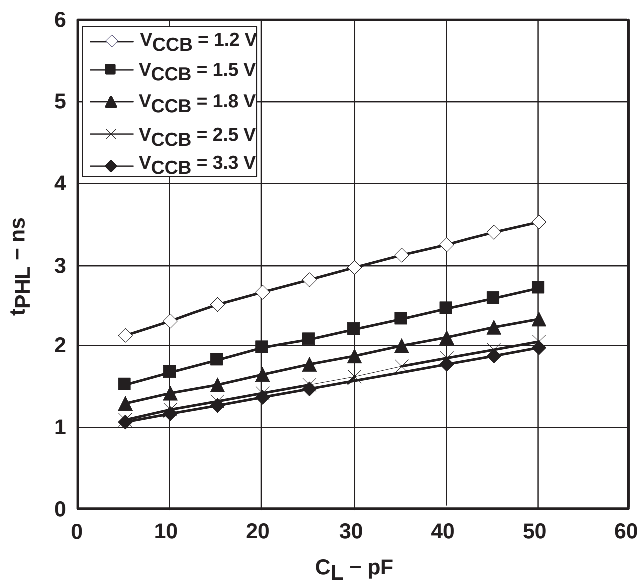


Figure 8

TYPICAL PROPAGATION DELAY (A to B) vs LOAD CAPACITANCE
T_A = 25°C, V_{CCA} = 3.3 V

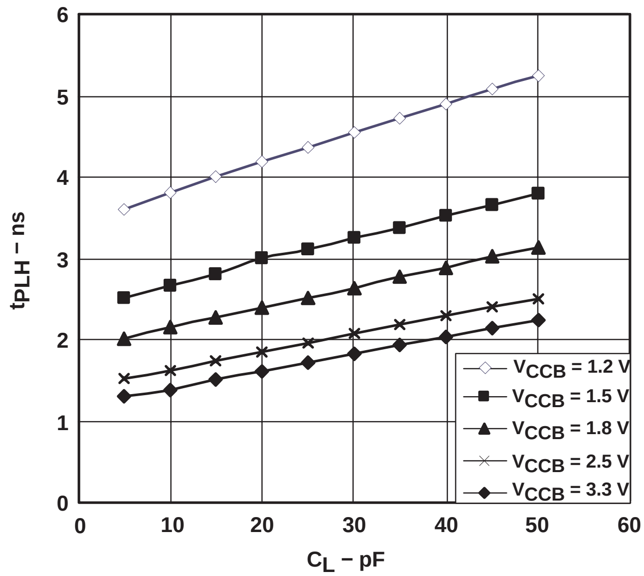


Figure 9

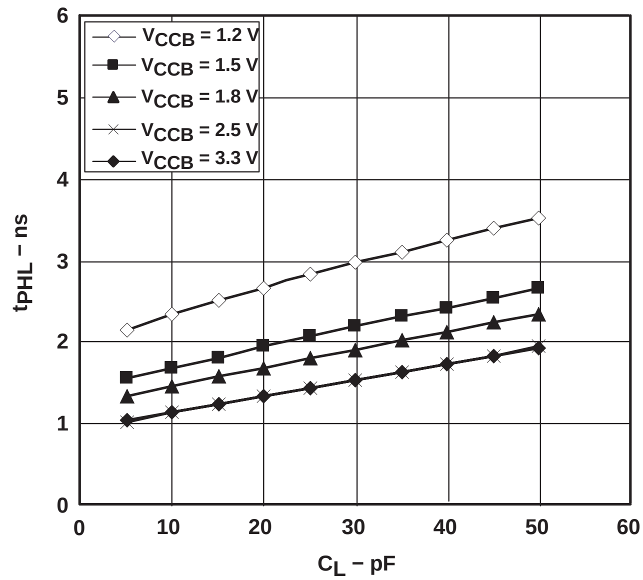
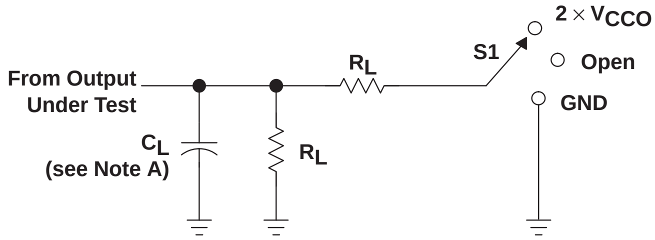


Figure 10

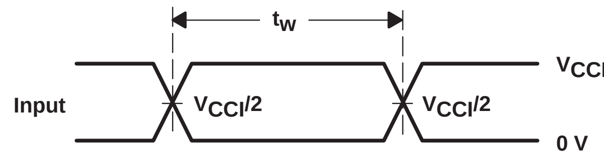
PARAMETER MEASUREMENT INFORMATION



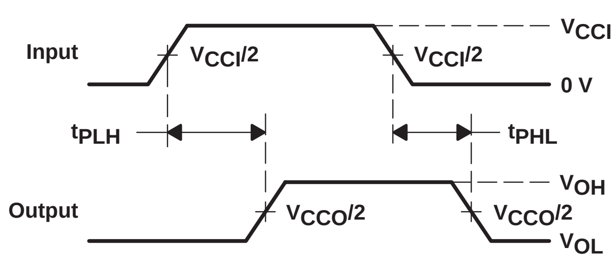
LOAD CIRCUIT

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

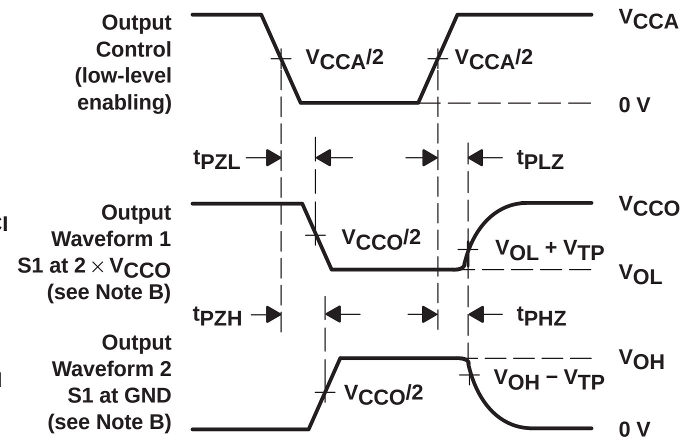
V_{CCO}	C_L	R_L	V_{TP}
1.2 V	15 pF	2 kΩ	0.1 V
1.5 V ± 0.1 V	15 pF	2 kΩ	0.1 V
1.8 V ± 0.15 V	15 pF	2 kΩ	0.15 V
2.5 V ± 0.2 V	15 pF	2 kΩ	0.15 V
3.3 V ± 0.3 V	15 pF	2 kΩ	0.3 V



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES

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 ≤ 10 MHz, Z_O = 50 Ω, dv/dt ≥ 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
74AVC20T245DGGG4	PREVIEW	TSSOP	DGG	56		TBD	Call TI	Call TI	-40 to 85		
74AVC20T245DGGRE4	ACTIVE	TSSOP	DGG	56		TBD	Call TI	Call TI	-40 to 85		Samples
74AVC20T245DGGRG4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AVC20T245	Samples
74AVC20T245DGVRE4	ACTIVE	TVSOP	DGV	56		TBD	Call TI	Call TI	-40 to 85		Samples
74AVC20T245DGVRG4	ACTIVE	TVSOP	DGV	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	WG245	Samples
SN74AVC20T245DGG	PREVIEW	TSSOP	DGG	56	35	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AVC20T245	
SN74AVC20T245DGGR	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	AVC20T245	Samples
SN74AVC20T245DGVR	ACTIVE	TVSOP	DGV	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	WG245	Samples
SN74AVC20T245ZQLR	ACTIVE	BGA MICROSTAR JUNIOR	ZQL	56	1000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	WG245	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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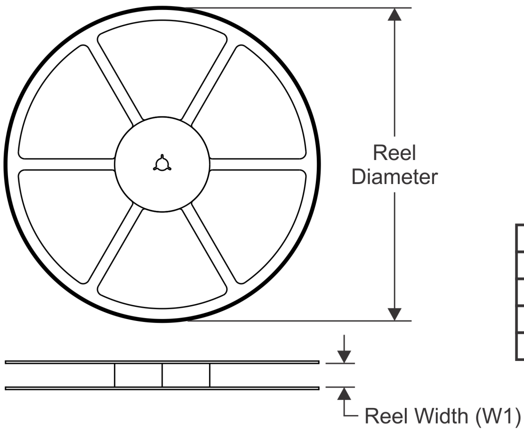
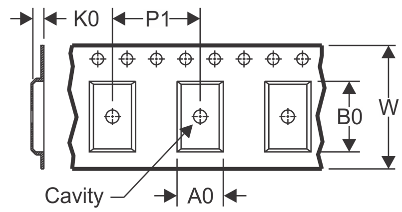
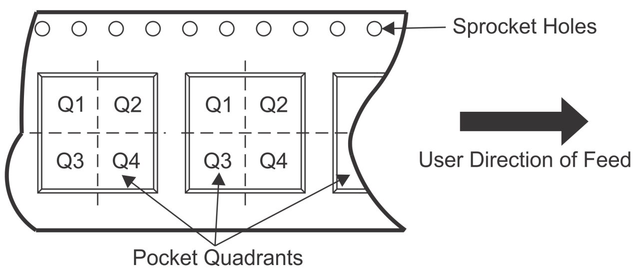
TAPE AND REEL INFORMATION





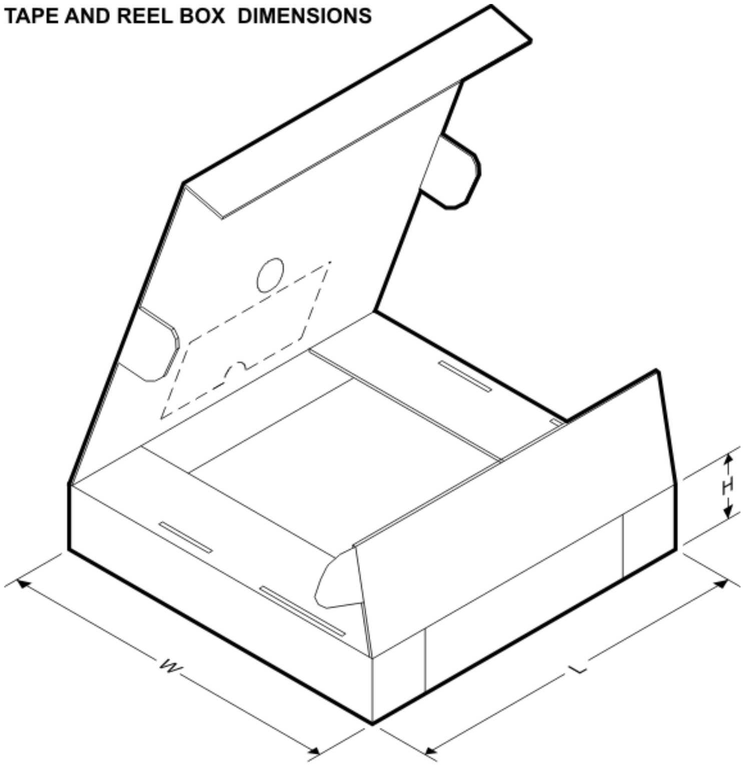
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers



*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
SN74AVC20T245DGGR	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
SN74AVC20T245ZQLR	BGA MI CROSTA R JUNI OR	ZQL	56	1000	330.0	16.4	4.8	7.3	1.5	8.0	16.0	Q1

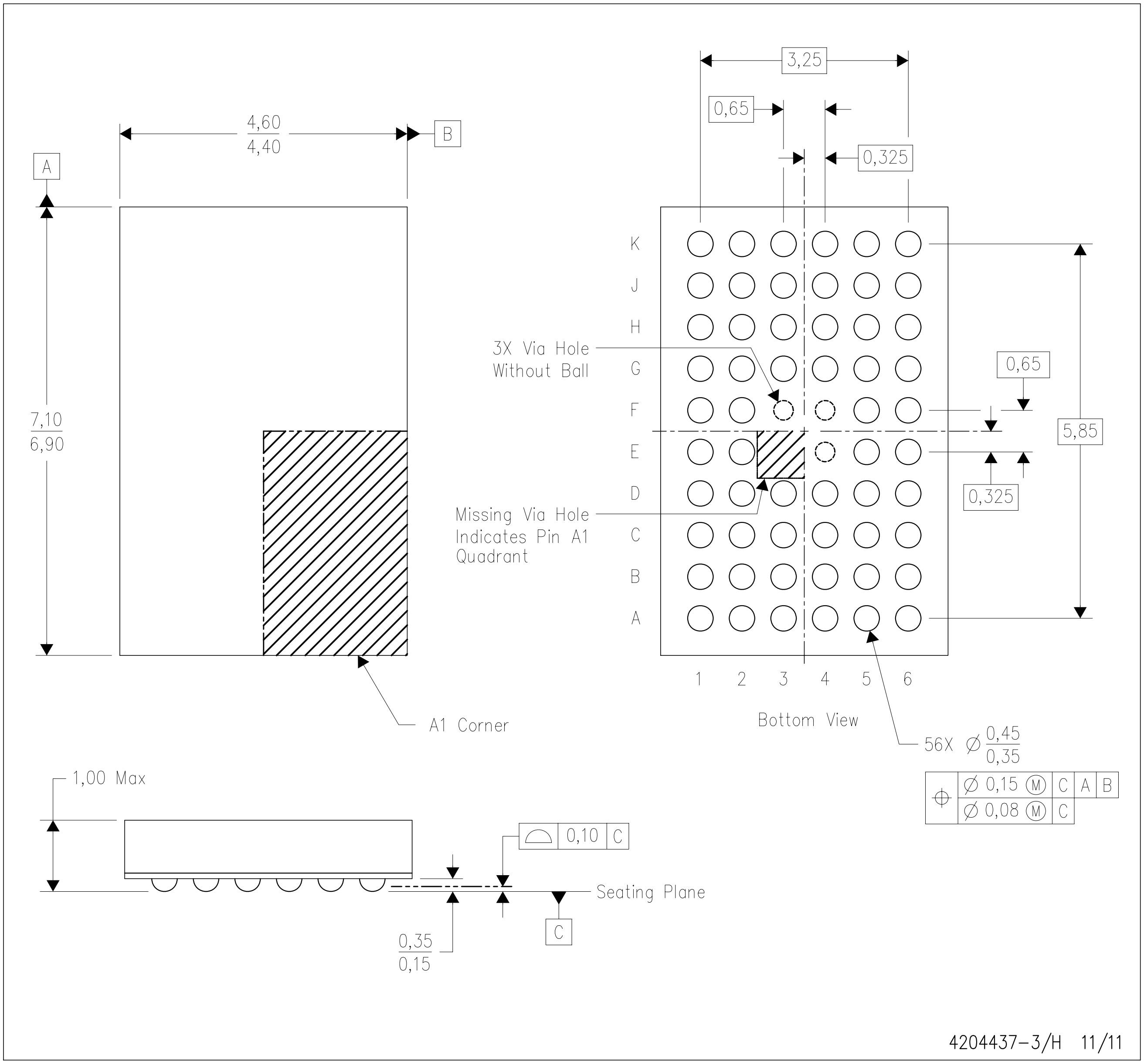
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AVC20T245DGGR	TSSOP	DGG	56	2000	367.0	367.0	45.0
SN74AVC20T245ZQLR	BGA MICROSTAR JUNIOR	ZQL	56	1000	336.6	336.6	28.6

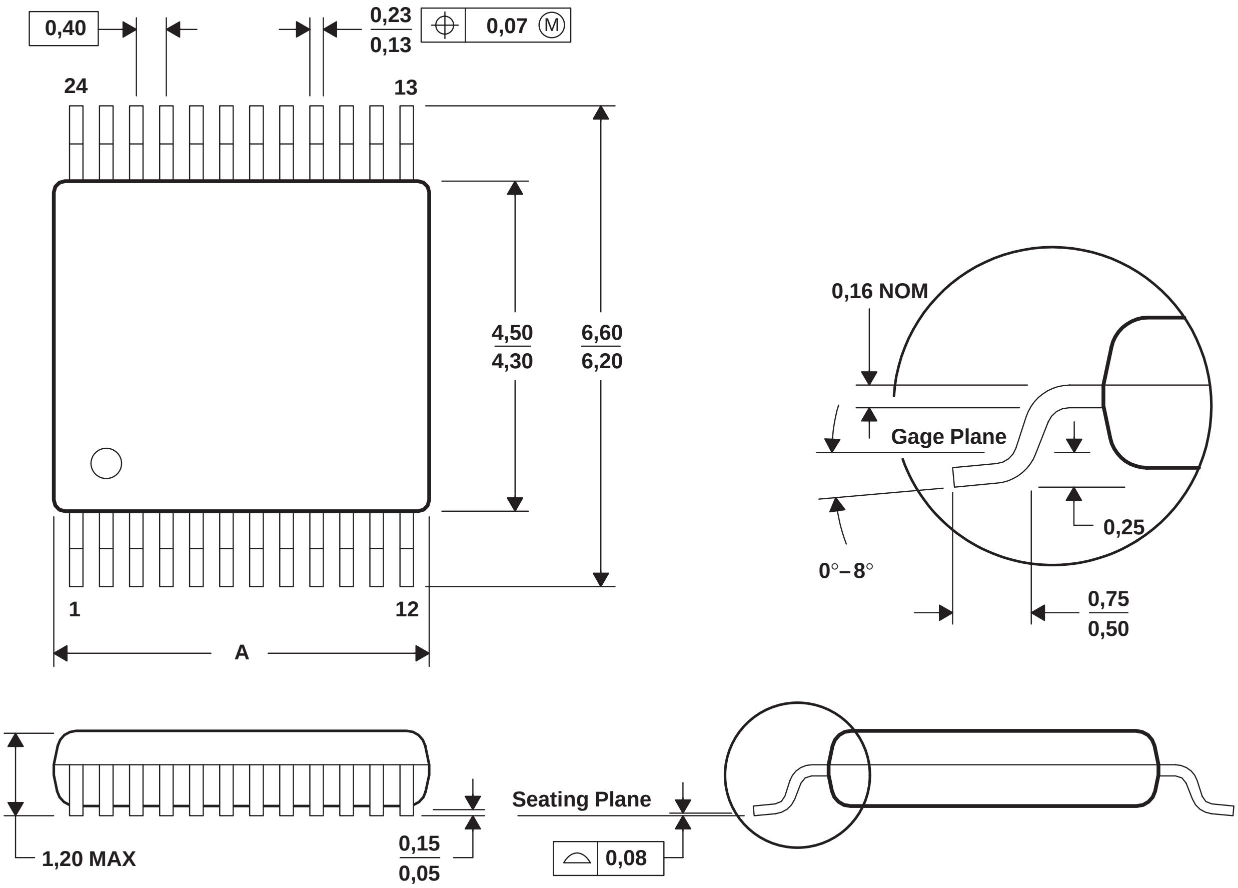
ZQL (R-PBGA-N56) PLASTIC BALL GRID ARRAY



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-285 variation BA-2.
D. This package is Pb-free. Refer to the 56 GQL package (drawing 4200583) for tin-lead (SnPb).

DGV (R-PDSO-G)** **PLASTIC SMALL-OUTLINE**

24 PINS SHOWN



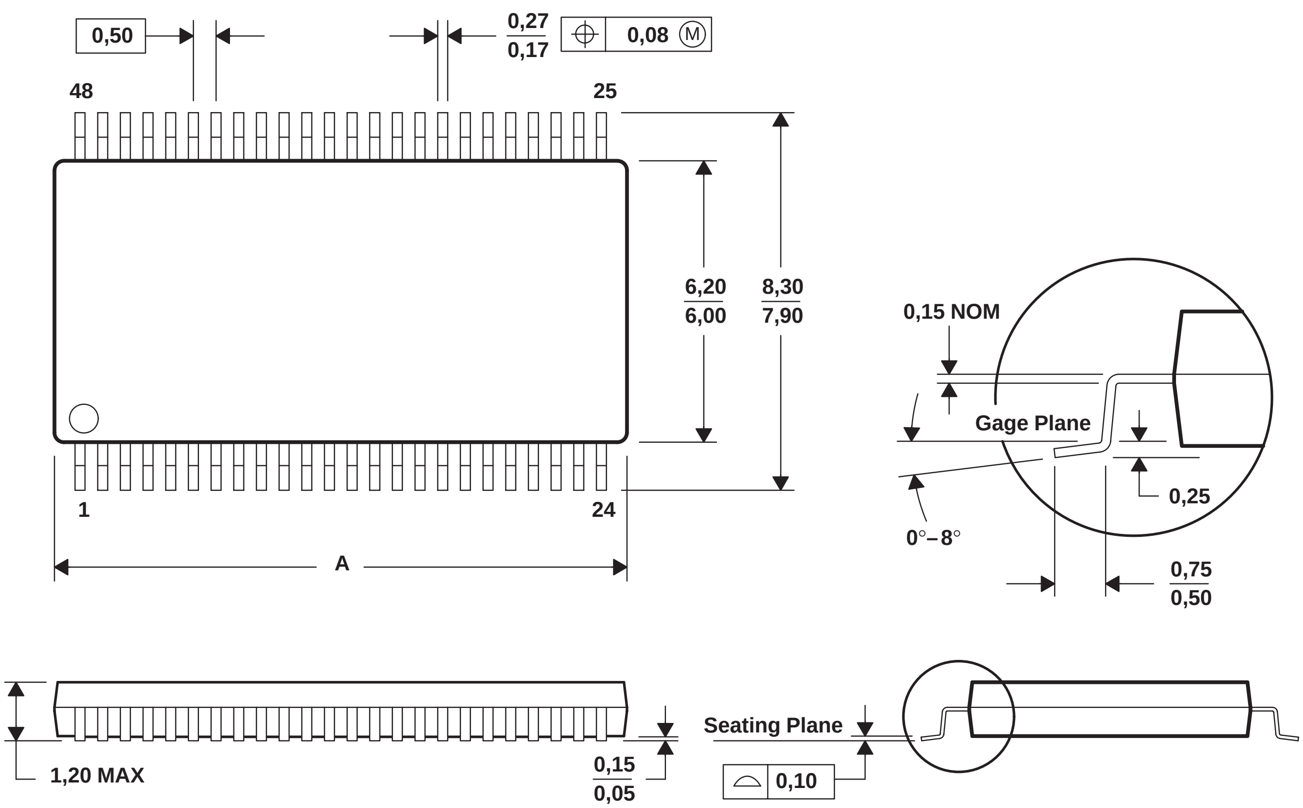
PINS ** / DIM	14	16	20	24	38	48	56
A MAX	3,70	3,70	5,10	5,10	7,90	9,80	11,40
A MIN	3,50	3,50	4,90	4,90	7,70	9,60	11,20

4073251/E 08/00

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

DGG (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

48 PINS SHOWN



DIM \ PINS **	48	56	64
A MAX	12,60	14,10	17,10
A MIN	12,40	13,90	16,90

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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