

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

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)

SUPPORTS DEFENSE, AEROSPACE, AND MEDICAL APPLICATIONS

- Controlled Baseline
- One Assembly/Test Site
- One Fabrication Site
- Available in Military ($-55^{\circ}\text{C}/125^{\circ}\text{C}$) Temperature Ranges⁽¹⁾
- Extended Product Life Cycle
- Extended Product-Change Notification
- Product Traceability

(1) Additional temperature ranges are available – contact factory

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, $1\overline{\text{OE}}$, and $2\overline{\text{OE}}$) are supplied by V_{CCA} .

DGG OR DGV PACKAGE
(TOP VIEW)

1DIR	1	48	$1\overline{\text{OE}}$
1B1	2	47	1A1
1B2	3	46	1A2
GND	4	45	GND
1B3	5	44	1A3
1B4	6	43	1A4
V_{CCB}	7	42	V_{CCA}
1B5	8	41	1A5
1B6	9	40	1A6
GND	10	39	GND
1B7	11	38	1A7
1B8	12	37	1A8
2B1	13	36	2A1
2B2	14	35	2A2
GND	15	34	GND
2B3	16	33	2A3
2B4	17	32	2A4
V_{CCB}	18	31	V_{CCA}
2B5	19	30	2A5
2B6	20	29	2A6
GND	21	28	GND
2B7	22	27	2A7
2B8	23	26	2A8
2DIR	24	25	$2\overline{\text{OE}}$



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.

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} .

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.

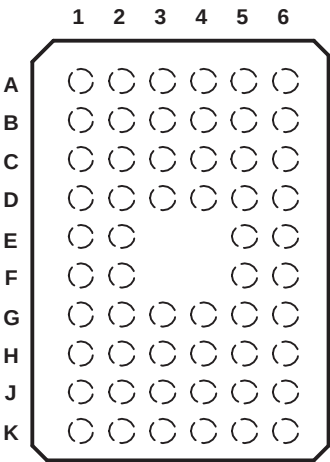
To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

ORDERING INFORMATION⁽¹⁾

T_A	PACKAGE ⁽²⁾		ORDERABLE PART NUMBER	Top-Side Marking
–55°C to 125°C	TSSOP – DGG	Tape and reel	CLVCH16T245MDGGREP	8UT245MEP
	TVSOP – DGV	Tape and reel	CLVCH16T245MDGVREP	LDHT245MEP

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

GQL OR ZQL PACKAGE
(TOP VIEW)



TERMINAL ASSIGNMENTS⁽¹⁾

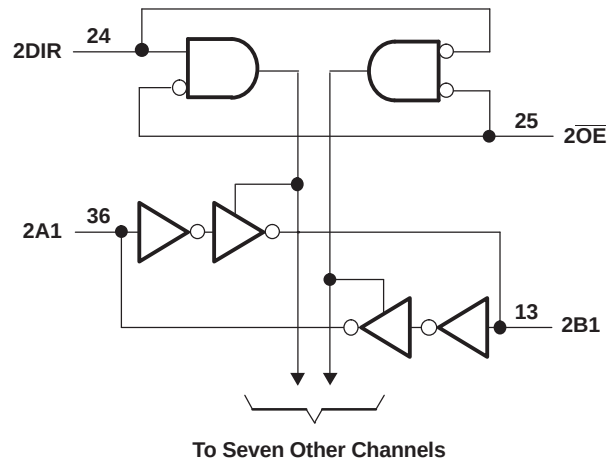
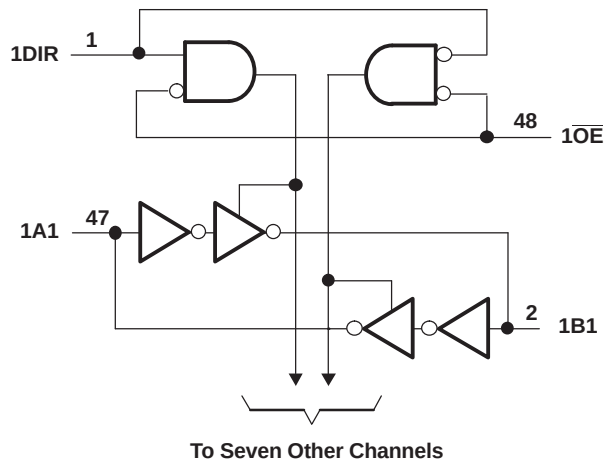
	1	2	3	4	5	6
A	1DIR	NC	NC	NC	NC	1 $\overline{\text{OE}}$
B	1B2	1B1	GND	GND	1A1	1A2
C	1B4	1B3	V _{CCB}	V _{CCA}	1A3	1A4
D	1B6	1B5	GND	GND	1A5	1A6
E	1B8	1B7			1A7	1A8
F	2B1	2B2			2A2	2A1
G	2B3	2B4	GND	GND	2A4	2A3
H	2B5	2B6	V _{CCB}	V _{CCA}	2A6	2A5
J	2B7	2B8	GND	GND	2A8	2A7
K	2DIR	NC	NC	NC	NC	2 $\overline{\text{OE}}$

(1) NC – No internal connection

**FUNCTION TABLE⁽¹⁾
(EACH 16-BIT SECTION)**

CONTROL INPUTS		OUTPUT CIRCUITS		OPERATION
$\overline{\text{OE}}$	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⁽¹⁾

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 ⁽²⁾	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 ⁽²⁾	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 ⁽²⁾⁽³⁾	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
θ_{JA}	Package thermal impedance ⁽⁴⁾	DGV package		58	°C/W
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.

Recommended Operating Conditions⁽¹⁾⁽²⁾⁽³⁾

			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 ⁽⁴⁾	1.65 V to 1.95 V		V _{CCI} × 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} × 0.7		
V _{IL}	Low-level input voltage	Data inputs ⁽⁴⁾	1.65 V to 1.95 V		V _{CCI} × 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} × 0.3		
V _{IH}	High-level input voltage	Control inputs (referenced to V _{CCA}) ⁽⁵⁾	1.65 V to 1.95 V		V _{CCA} × 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} × 0.7		
V _{IL}	Low-level input voltage	Control inputs (referenced to V _{CCA}) ⁽⁵⁾	1.65 V to 1.95 V		V _{CCA} × 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} × 0.3		
V _I	Input voltage	Control inputs			0	5.5	V
V _{I/O}	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		
Δt/ Δv	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				–55	125	°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} × 0.7 V, V_{IL} max = V_{CCI} × 0.3 V.

(5) For V_{CCA} values not specified in the data sheet, V_{IH} min = V_{CCA} × 0.7 V, V_{IL} max = V_{CCA} × 0.3 V.

Electrical Characteristics⁽¹⁾⁽²⁾

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

PARAMETER		TEST CONDITIONS		V _{CCA}	V _{CCB}	MIN	TYP	MAX	MIN	MAX	UNIT
V _{OH}	I _{OH} = −100 μA, V _I = V _{IH}		1.65 V to 4.5 V	1.65 V to 4.5 V					V _{CCO} − 0.1		V
	I _{OH} = −4 mA, V _I = V _{IH}		1.65 V	1.65 V					1.2		
	I _{OH} = −8 mA, V _I = V _{IH}		2.3 V	2.3 V					1.9		
	I _{OH} = −24 mA, V _I = V _{IH}		3 V	3 V					2.4		
	I _{OH} = −32 mA, V _I = V _{IH}		4.5 V	4.5 V					3.8		
V _{OL}	I _{OL} = 100 μA, V _I = V _{IL}		1.65 V to 4.5 V	1.65 V to 4.5 V						0.1	V
	I _{OL} = 4 mA, V _I = V _{IL}		1.65 V	1.65 V						0.45	
	I _{OL} = 8 mA, V _I = V _{IL}		2.3 V	2.3 V						0.3	
	I _{OL} = 24 mA, V _I = V _{IL}		3 V	3 V						0.55	
	I _{OL} = 32 mA, V _I = V _{IL}		4.5 V	4.5 V						0.55	
I _I	Control inputs	V _I = V _{CCA} or GND		1.65 V to 5.5 V	1.65 V to 5.5 V		±0.5	±1		±3	μA
I _{BHL} ⁽³⁾	V _I = 0.58 V		1.65 V	1.65 V					15		μA
	V _I = 0.7 V		2.3 V	2.3 V					45		
	V _I = 0.8 V		3 V	3 V					75		
	V _I = 0.1.35 V		4.5 V	4.5 V					100		
I _{BHH} ⁽⁴⁾	V _I = 1.07 V		1.65 V	1.65 V					−15		μA
	V _I = 1.7 V		2.3 V	2.3 V					−45		
	V _I = 2 V		3 V	3 V					−75		
	V _I = 3.15 V		4.5 V	4.5 V					−100		
I _{BHLO} ⁽⁵⁾	V _I = 0 to V _{CC}		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 _{BHHO} ⁽⁶⁾	V _I = 0 to V _{CC}		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 _{off}	A port	V _I or V _O = 0 to 5.5 V		0 V	0 to 5.5 V		±0.5	±1.5		±20	μA
	B port			0 to 5.5 V	0 V		±0.5	±1.5		±20	
I _{OZ}	A or B port	V _O = V _{CCO} or GND, V _I = V _{CCI} or GND	$\overline{\text{OE}}$ = V _{IH}	1.65 V to 5.5 V	1.65 V to 5.5 V			±1		±4	μA
	B port		$\overline{\text{OE}}$ = don't care	0 V	5.5 V			±1		±4	
	A port			5.5 V	0 V			±1		±4	
I _{CCA}	V _I = V _{CCI} or GND, I _O = 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					−4		
I _{CCB}	V _I = V _{CCI} or GND, I _O = 0		1.65 V to 5.5 V	1.65 V to 5.5 V					20		μA
			5 V	0 V					−4		
			0 V	5 V					20		
I _{CCA} + I _{CCB}		V _I = V _{CCI} or GND, I _O = 0		1.65 V to 5.5 V	1.65 V to 5.5 V				30	μA	

(1) V_{CCO} is the V_{CC} associated with the output port.(2) V_{CCI} is the V_{CC} associated with the input port.(3) The bus-hold circuit can sink at least the minimum low sustaining current at V_{IL} max. I_{BHL} should be measured after lowering V_{IN} to GND and then raising it to V_{IL} max.(4) The bus-hold circuit can source at least the minimum high sustaining current at V_{IH} min. I_{BHH} should be measured after raising V_{IN} to V_{CC} and then lowering it to V_{IH} min.(5) An external driver must source at least I_{BHLO} to switch this node from low to high.(6) An external driver must sink at least I_{BHHO} to switch this node from high to low.

Electrical Characteristics (continued)

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

PARAMETER		TEST CONDITIONS	V _{CCA}	V _{CCB}	MIN	TYP	MAX	MIN	MAX	UNIT
ΔI _{CCA}	DIR	DIR at V _{CCA} – 0.6 V, B port = open, A port at V _{CCA} or GND	3 V to 5.5 V	3 V to 5.5 V					50	μA
C _i	Control inputs	V _I = V _{CCA} or GND	3.3 V	3.3 V		4			5	pF
C _{io}	A or B port	V _O = V _{CCA/B} or GND	3.3 V	3.3 V		8.5			10	pF

Switching Characteristics

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CCB} = 1.8 V ± 0.15 V		V _{CCB} = 2.5 V ± 0.2 V		V _{CCB} = 3.3 V ± 0.3 V		V _{CCB} = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A	B	1.7	25.9	1.3	13.2	1	11.4	0.4	11.1	ns
t _{PHL}											
t _{PLH}	B	A	0.9	27.8	0.8	27.8	0.7	27.4	0.7	27.4	ns
t _{PHL}											
t _{PHZ}	$\overline{OE}$	A	1.5	33.6	1.5	33.4	1.5	33.3	1.4	33.2	ns
t _{PLZ}											
t _{PHZ}	$\overline{OE}$	B	2.4	36.2	1.9	17.1	1.7	16	1.3	14.3	ns
t _{PLZ}											
t _{PZH}	$\overline{OE}$	A	0.4	28	0.4	27.8	0.4	27.7	0.4	27.7	ns
t _{PZL}											
t _{PZH}	$\overline{OE}$	B	1.8	36	1.5	22	1.2	16.6	0.9	14.8	ns
t _{PZL}											

Switching Characteristics

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CCB} = 1.8 V ± 0.15 V		V _{CCB} = 2.5 V ± 0.2 V		V _{CCB} = 3.3 V ± 0.3 V		V _{CCB} = 5 V ± 0.5 V		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A	B	1.5	25.4	1.2	13	0.8	10.2	0.6	8.8	ns
t _{PHL}											
t _{PLH}	B	A	1.2	13.3	1	13.1	1	12.9	0.9	12.8	ns
t _{PHL}											
t _{PHZ}	$\overline{OE}$	A	1.4	13	1.4	13	1.4	13	1.4	13	ns
t _{PLZ}											
t _{PHZ}	$\overline{OE}$	B	2.3	33.6	1.8	14	1.7	14.3	0.9	10.9	ns
t _{PLZ}											
t _{PZH}	$\overline{OE}$	A	1	14.9	1	14.9	1	14.9	1	14.9	ns
t _{PZL}											
t _{PZH}	$\overline{OE}$	B	1.7	32.2	1.5	16.9	1.2	13.4	1	10.9	ns
t _{PZL}											

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	25.2	1.1	12.8	0.8	10.2	0.6	8.4	ns
t_{PHL}											
t_{PLH}	B	A	0.8	11.2	0.8	10.2	0.7	10.1	0.6	10	ns
t_{PHL}											
t_{PHZ}	$\overline{OE}$	A	1.6	12.2	1.6	12.2	1.6	12.2	1.6	12.2	ns
t_{PLZ}											
t_{PHZ}	$\overline{OE}$	B	2.1	33	1.7	14.3	1.5	12.8	0.8	10.3	ns
t_{PLZ}											
t_{PZH}	$\overline{OE}$	A	0.8	11.8	0.8	12.1	0.8	12.1	0.8	12.1	ns
t_{PZL}											
t_{PZH}	$\overline{OE}$	B	1.8	3.7	1.4	16.4	1.1	12.5	0.8	10.4	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	25.4	1	12.8	0.7	10	0.4	8.2	ns
t_{PHL}											
t_{PLH}	B	A	0.7	11	0.4	8.8	0.3	8.5	0.3	8.3	ns
t_{PHL}											
t_{PHZ}	$\overline{OE}$	A	0.3	9.4	0.3	9.4	0.3	9.4	0.3	9.4	ns
t_{PLZ}											
t_{PHZ}	$\overline{OE}$	B	2	32.7	1.8	13.7	1.4	12	0.7	9.7	ns
t_{PLZ}											
t_{PZH}	$\overline{OE}$	A	0.7	10.4	0.7	10.4	0.7	10.4	0.7	10.4	ns
t_{PZL}											
t_{PZH}	$\overline{OE}$	B	1.5	31.6	1.3	15.4	1	12.1	0.9	10	ns
t_{PZL}											

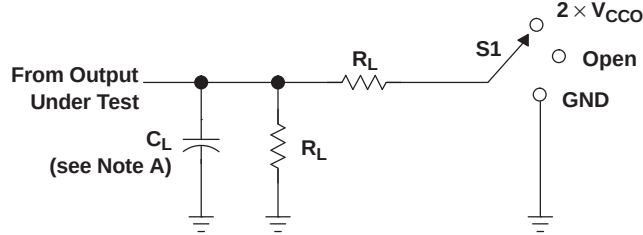
Operating Characteristics

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

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

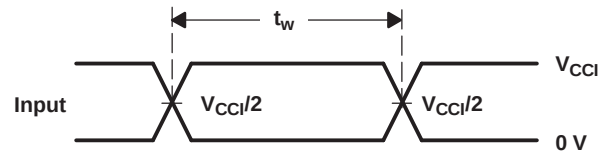
PARAMETER MEASUREMENT INFORMATION



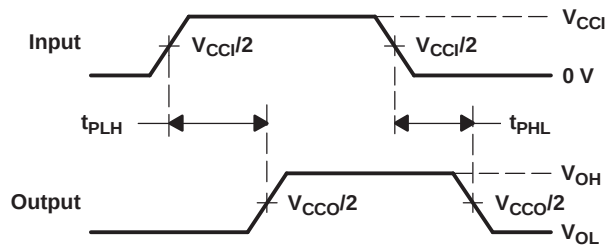
LOAD CIRCUIT

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

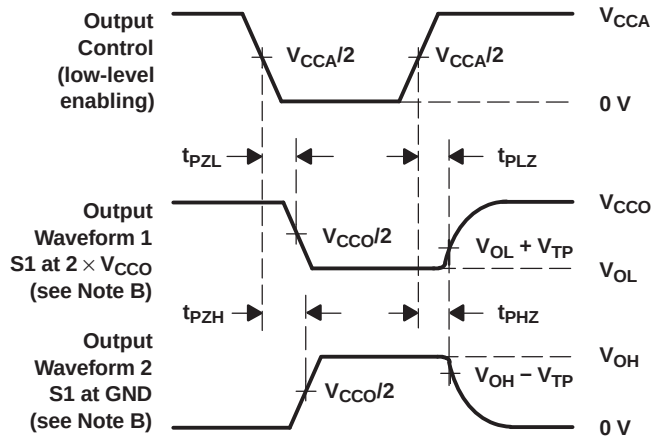
TEST	S1
t_{pd}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CCO}$
t_{PHZ}/t_{PZH}	GND



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: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $dv/dt \geq 1\text{ V/ns}$, $dv/dt \geq 1\text{ V/ns}$.
 - 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.
 - All parameters and waveforms are not applicable to all devices.

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⁾
CLVCH16T245MDGGREP	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CLVCH16T245MDGVREP	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/09605-01XE	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
V62/09605-01YE	ACTIVE	TVSOP	DGV	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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.

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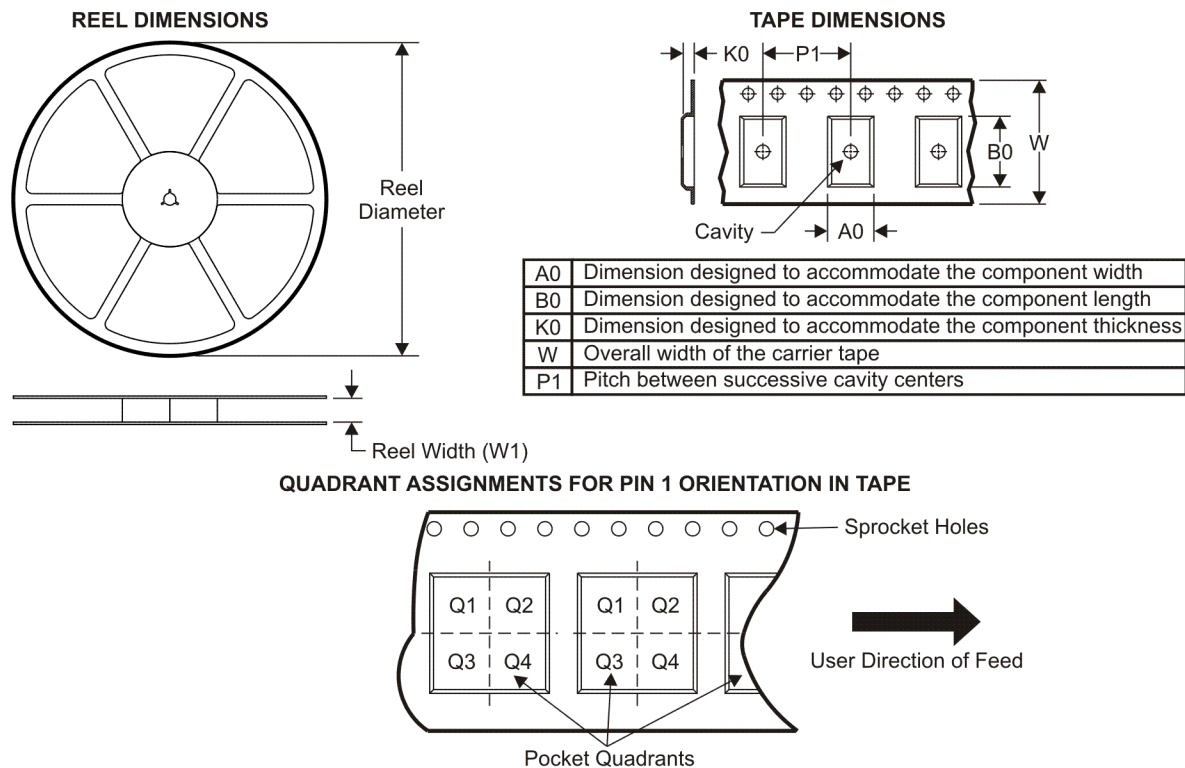
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OTHER QUALIFIED VERSIONS OF SN74LVCH16T245-EP :

- Catalog: [SN74LVCH16T245](#)

NOTE: Qualified Version Definitions:

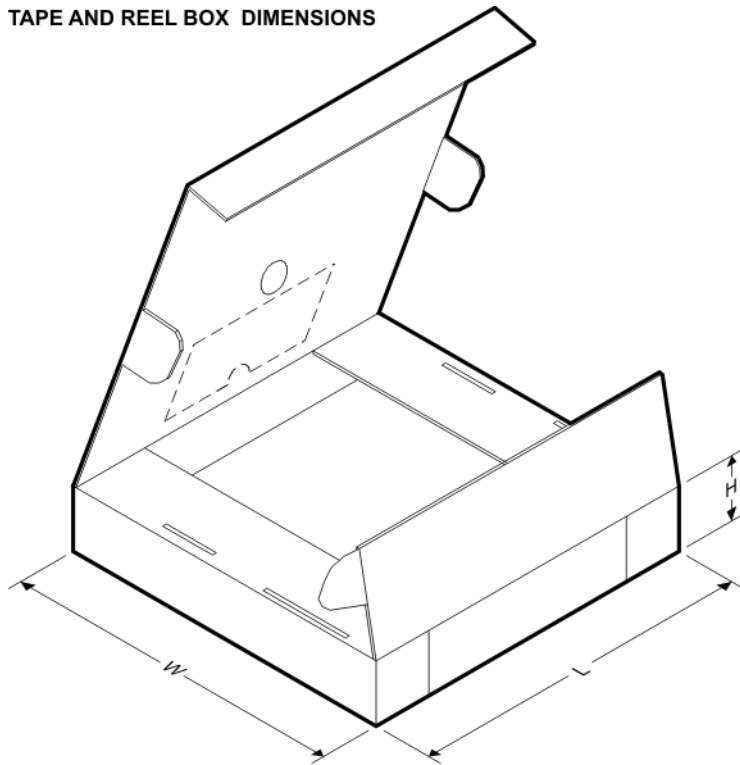
- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION


*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
CLVCH16T245MDGGRE P	TSSOP	DGG	48	2000	330.0	24.4	8.6	15.8	1.8	12.0	24.0	Q1
CLVCH16T245MDGVREP	TVSOP	DGV	48	2000	330.0	16.4	7.1	10.2	1.6	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



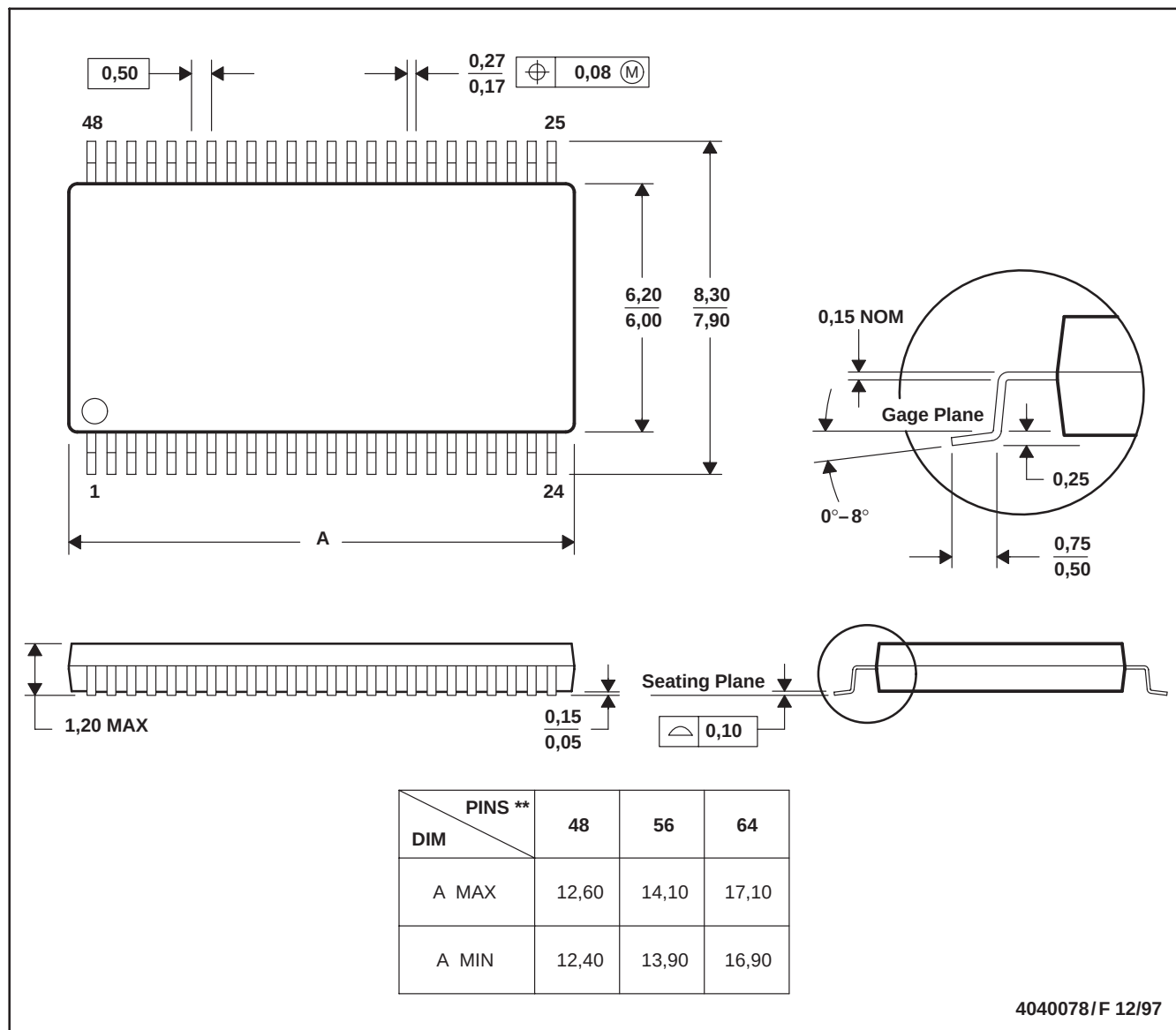
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CLVCH16T245MDGGREP	TSSOP	DGG	48	2000	346.0	346.0	41.0
CLVCH16T245MDGVREP	TVSOP	DGV	48	2000	346.0	346.0	33.0

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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