

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

Check for Samples: [SN74AVCB164245-Q1](#)

### FEATURES

- Qualified for Automotive Applications
- Member of the Texas Instruments Widebus™ Family
- DOC™ Circuitry Dynamically Changes Output Impedance, Resulting in Noise Reduction Without Speed Degradation
- Dynamic Drive Capability Is Equivalent to Standard Outputs With  $I_{OH}$  and  $I_{OL}$  of  $\pm 24$  mA at 2.5-V  $V_{CC}$
- Control Inputs  $V_{IH}/V_{IL}$  Levels Are Referenced to  $V_{CCB}$  Voltage
- 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
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Fully Configurable Dual-Rail Design Allows Each Port to Operate Over Full 1.4-V to 3.6-V Power-Supply Range
- 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)
  - 750-V Charged-Device Model (C101)

### DESCRIPTION

This 16-bit (dual-octal) 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 1.4 V to 3.6 V. The B port is designed to track  $V_{CCB}$ .  $V_{CCB}$  accepts any supply voltage from 1.4 V to 3.6 V. This allows for universal low-voltage bidirectional translation between any of the 1.5-V, 1.8-V, 2.5-V, and 3.3-V voltage nodes.

The SN74AVCB164245 is designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the outputs so the buses are effectively isolated.

The SN74AVCB164245 is designed so that the control pins (1DIR, 2DIR,  $1\overline{OE}$ , and  $2\overline{OE}$ ) are supplied by  $V_{CCB}$ .

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

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. If either  $V_{CC}$  input is at GND, both ports are in the high-impedance state.

### ORDERING INFORMATION<sup>(1)</sup>

$T_A$	PACKAGE <sup>(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 125°C	TSSOP – DGG	Tape and reel	CAVCB164245QDGGRRQ1	AVCB164245Q

(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](http://www.ti.com).

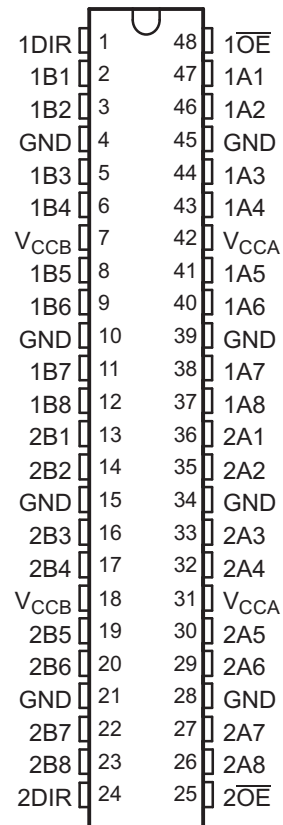
(2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).



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.

## TERMINAL ASSIGNMENTS

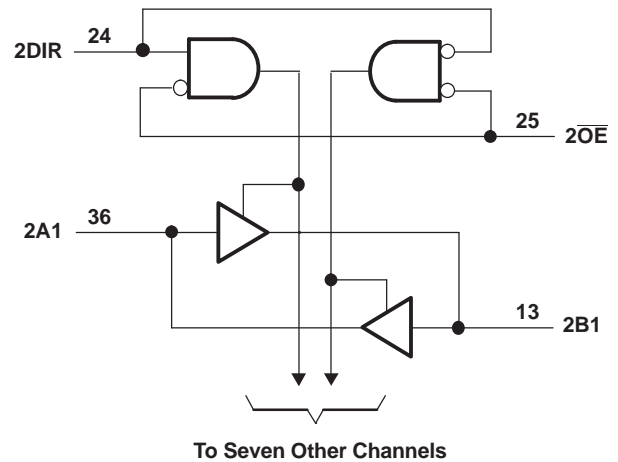
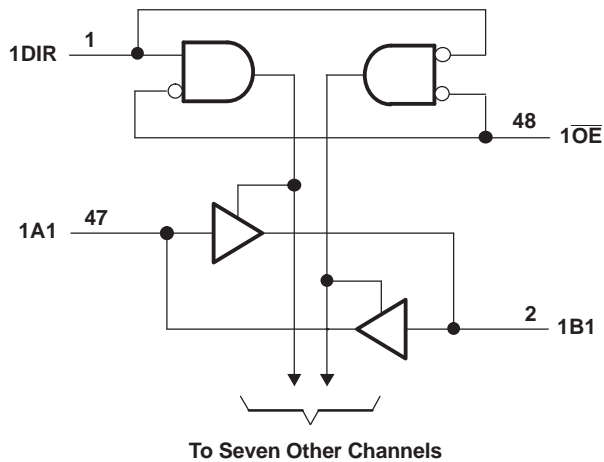
### DGG PACKAGE (TOP VIEW)



### 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)



Pin numbers shown are for the DGG and DGV packages.

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	
$V_I$	Input voltage range <sup>(2)</sup>	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	
$V_O$	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>	A port	-0.5	4.6	V
		B port	-0.5	4.6	
$V_O$	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 $V_{CCA}$ , $V_{CCB}$ , or GND		±100	mA	
$\theta_{JA}$	Package thermal impedance <sup>(4)</sup>	DGG package	70	°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 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>

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

		$V_{CCI}$	$V_{CCO}$	MIN	MAX	UNIT
$V_{CCA}$	Supply voltage			1.4	3.6	V
$V_{CCB}$	Supply voltage			1.4	3.6	V
$V_{IH}$	High-level input voltage	Data inputs	1.4 V to 1.95 V		$V_{CCI} \times 0.65$	V
			1.95 V to 2.7 V		1.7	
			2.7 V to 3.6 V		2	
$V_{IL}$	Low-level input voltage	Data inputs	1.4 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	Control inputs (referenced to $V_{CCB}$ )	1.4 V to 1.95 V		$V_{CCB} \times 0.65$	V
			1.95 V to 2.7 V		1.7	
			2.7 V to 3.6 V		2	
$V_{IL}$	Low-level input voltage	Control inputs (referenced to $V_{CCB}$ )	1.4 V to 1.95 V		$V_{CCB} \times 0.35$	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		1.4 V to 1.6 V		-2	mA
			1.65 V to 1.95 V		-4	
			2.3 V to 2.7 V		-8	
			3 V to 3.6 V		-12	
$I_{OL}$	Low-level output current		1.4 V to 1.6 V		2	mA
			1.65 V to 1.95 V		4	
			2.3 V to 2.7 V		8	
			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	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 data 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.

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

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

PARAMETER	TEST CONDITIONS	V <sub>CCA</sub>	V <sub>CCB</sub>	T <sub>A</sub> = -40°C to 85°C			T <sub>A</sub> = -40°C to 125°C			UNIT
				MIN	TYP <sup>(3)</sup>	MAX	MIN	TYP <sup>(3)</sup>	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -100 μA      V <sub>I</sub> = V <sub>IH</sub>	1.4 V to 3.6 V	1.4 V to 3.6 V	V <sub>CCO</sub> - 0.2			V <sub>CCO</sub> - 0.2			V
	I <sub>OH</sub> = -2 mA      V <sub>I</sub> = V <sub>IH</sub>	1.4 V	1.4 V	1.05			1.05			
	I <sub>OH</sub> = -4 mA      V <sub>I</sub> = V <sub>IH</sub>	1.65 V	1.65 V	1.2			1.2			
	I <sub>OH</sub> = -8 mA      V <sub>I</sub> = V <sub>IH</sub>	2.3 V	2.3 V	1.75			1.75			
	I <sub>OH</sub> = -12 mA      V <sub>I</sub> = V <sub>IH</sub>	3 V	3 V	2.3			2.3			
V <sub>OL</sub>	I <sub>OH</sub> = 100 μA      V <sub>I</sub> = V <sub>IL</sub>	1.4 V to 3.6 V	1.4 V to 3.6 V						0.2	V
	I <sub>OH</sub> = 2 mA      V <sub>I</sub> = V <sub>IL</sub>	1.4 V	1.4 V						0.35	
	I <sub>OH</sub> = 4 mA      V <sub>I</sub> = V <sub>IL</sub>	1.65 V	1.65 V						0.45	
	I <sub>OH</sub> = 8 mA      V <sub>I</sub> = V <sub>IL</sub>	2.3 V	2.3 V						0.55	
	I <sub>OH</sub> = 12 mA      V <sub>I</sub> = V <sub>IL</sub>	3 V	3 V						0.7	
I <sub>I</sub>	Control inputs V <sub>I</sub> = V <sub>CCB</sub> or GND	1.4 V to 3.6 V	3.6 V			±2.5			±2.5	μA
I <sub>off</sub>	A port V <sub>I</sub> or V <sub>O</sub> = 0 to 3.6 V	0 V	0 to 3.6 V			±10			±10	μA
	B port	0 to 3.6 V	0 V			±10			±10	
I <sub>OZ</sub> <sup>(4)</sup>	A or B ports V <sub>O</sub> = V <sub>CCO</sub> or GND, V <sub>I</sub> = V <sub>CCI</sub> or GND	V <sub>I</sub> = V <sub>IH</sub>	3.6 V	3.6 V			±12.5		±12.5	μA
	B port		0 V	3.6 V			±12.5		±12.5	
	A port		3.6 V	0 V			±12.5		±12.5	
I <sub>CCA</sub>	V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0	1.6 V	1.6 V			20		35	μA	
		1.95 V	1.95 V			20		35		
		2.7 V	2.7 V			30		45		
		0 V	3.6 V			-40		-50		
		3.6 V	0 V			40		50		
		3.6 V	3.6 V			40		50		
I <sub>CCB</sub>	V <sub>I</sub> = V <sub>CCI</sub> or GND, I <sub>O</sub> = 0	1.6 V	1.6 V			20		35	μA	
		1.95 V	1.95 V			20		35		
		2.7 V	2.7 V			30		45		
		0 V	3.6 V			40		50		
		3.6 V	0 V			-40		-50		
		3.6 V	3.6 V			40		50		
C <sub>i</sub>	Control inputs V <sub>I</sub> = 3.3 V or GND	3.3 V	3.3 V			4		4	pF	
C <sub>io</sub>	A or B ports V <sub>O</sub> = 3.3 V or GND	3.3 V	3.3 V			5		5	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) All typical values are at T<sub>A</sub> = 25°C.

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

### Switching Characteristics

 $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ ,  $V_{CCA} = 1.5\text{ V} \pm 0.1\text{ V}$  (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.7	6.7	1.9	6.3	1.8	5.5	1.7	5.8	ns
	B	A	1.8	6.8	2.2	7.4	2.1	7.6	2.1	7.3	
$t_{en}$	$\overline{OE}$	A	2.5	8.4	2.4	7.4	2.1	5.2	1.9	4.2	ns
		B	2.1	9	2.9	9.8	3.2	10	3	9.8	
$t_{dis}$	$\overline{OE}$	A	2.2	6.9	2.3	6.1	1.3	3.6	1.3	3	ns
		B	2.1	7.1	2.3	6.4	1.7	5.1	1.6	4.8	

### Switching Characteristics

 $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CCA} = 1.5\text{ V} \pm 0.1\text{ V}$  (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.7	12.7	1.9	12.3	1.8	11.5	1.7	11.8	ns
	B	A	1.8	12.8	2.2	13.4	2.1	13.6	2.1	13.3	
$t_{en}$	$\overline{OE}$	A	2.5	14.4	2.4	13.4	2.1	11.2	1.9	10.2	ns
		B	2.1	15	2.9	15.8	3.2	16	3	15.8	
$t_{dis}$	$\overline{OE}$	A	2.2	12.9	2.3	12.1	1.3	9.6	1.3	9	ns
		B	2.1	13.1	2.3	12.4	1.7	11.1	1.6	10.8	

### Switching Characteristics

 $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ ,  $V_{CCA} = 1.8\text{ V} \pm 0.15\text{ V}$  (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.7	6.7	1.8	6	1.7	4.7	1.6	4.3	ns
	B	A	1.4	5.5	1.8	6	1.8	5.8	1.8	5.5	
$t_{en}$	$\overline{OE}$	A	2.6	8.5	2.5	7.5	2.2	5.3	1.9	4.2	ns
		B	1.8	7.6	2.6	7.7	2.6	7.6	2.6	7.4	
$t_{dis}$	$\overline{OE}$	A	2.3	7	2.3	6.1	1.3	3.6	1.3	3	ns
		B	1.8	7	2.5	6.3	1.8	4.7	1.7	4.4	

### Switching Characteristics

 $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CCA} = 1.8\text{ V} \pm 0.15\text{ V}$  (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.7	12.7	1.8	12	1.7	10.7	1.6	10.3	ns
	B	A	1.4	11.5	1.8	12	1.8	11.8	1.8	11.5	
$t_{en}$	$\overline{OE}$	A	2.6	14.5	2.5	13.5	2.2	11.3	1.9	10.2	ns
		B	1.8	13.6	2.6	13.7	2.6	13.6	2.6	13.4	
$t_{dis}$	$\overline{OE}$	A	2.3	13	2.3	12.1	1.3	9.6	1.3	9	ns
		B	1.8	13	2.5	12.3	1.8	10.7	1.7	10.4	

### Switching Characteristics

 $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ ,  $V_{CCA} = 2.5\text{ V} \pm 0.2\text{ V}$  (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.6	6	1.8	5.6	1.5	4	1.4	3.4	ns
	B	A	1.3	4.6	1.7	4.4	1.5	4	1.4	3.7	
$t_{en}$	$\overline{OE}$	A	3.1	8.5	2.5	7.5	2.2	5.3	1.9	4.2	ns
		B	1.7	5.7	2.2	5.5	2.2	5.3	2.2	5.1	
$t_{dis}$	$\overline{OE}$	A	2.4	7	3	6.1	1.4	3.6	1.2	3	ns
		B	1.2	5.8	1.9	5	1.4	3.6	1.3	3.3	

### Switching Characteristics

 $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CCA} = 2.5\text{ V} \pm 0.2\text{ V}$  (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.6	12	1.8	11.6	1.5	10	1.4	9.4	ns
	B	A	1.3	10.6	1.7	10.4	1.5	10	1.4	9.7	
$t_{en}$	$\overline{OE}$	A	3.1	14.5	2.5	13.5	2.2	11.3	1.9	10.2	ns
		B	1.7	11.7	2.2	11.5	2.2	11.3	2.2	11.1	
$t_{dis}$	$\overline{OE}$	A	2.4	13	3	12.1	1.4	9.6	1.2	9	ns
		B	1.2	11.8	1.9	11	1.4	9.6	1.3	9.3	

### Switching Characteristics

 $T_A = -40^\circ\text{C}$  to  $85^\circ\text{C}$ ,  $V_{CCA} = 3.3\text{ V} \pm 0.3\text{ V}$  (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.5	5.9	1.7	5.4	1.5	3.7	1.4	3.1	ns
	B	A	1.3	4.5	1.6	3.8	1.5	3.3	1.4	3.1	
$t_{en}$	$\overline{OE}$	A	2.6	8.3	2.5	7.4	2.2	5.2	1.9	4.1	ns
		B	1.6	4.9	2	4.5	2	4.3	1.9	4.1	
$t_{dis}$	$\overline{OE}$	A	2.3	7	3	6	1.3	3.5	1.2	3.5	ns
		B	1.3	6.9	2.1	5.5	1.6	3.8	1.5	3.5	

### Switching Characteristics

 $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CCA} = 3.3\text{ V} \pm 0.3\text{ V}$  (see [Figure 2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB} = 1.5\text{ V} \pm 0.1\text{ V}$		$V_{CCB} = 1.8\text{ V} \pm 0.15\text{ V}$		$V_{CCB} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CCB} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A	B	1.5	11.9	1.7	11.4	1.5	9.7	1.4	9.1	ns
	B	A	1.3	10.5	1.6	9.8	1.5	9.3	1.4	9.1	
$t_{en}$	$\overline{OE}$	A	2.6	14.3	2.5	13.4	2.2	11.2	1.9	10.1	ns
		B	1.6	10.9	2	10.5	2	10.3	1.9	10.1	
$t_{dis}$	$\overline{OE}$	A	2.3	13	3	12	1.3	9.5	1.2	9.5	ns
		B	1.3	12.9	2.1	11.5	1.6	9.8	1.5	9.5	

### Operating Characteristics

$V_{CCA}$  and  $V_{CCB} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
$C_{pdA}$ ( $V_{CCA}$ )	Power dissipation capacitance per transceiver, A-port input, B-port output	Outputs enabled	14	pF
		Outputs disabled	7	
	Power dissipation capacitance per transceiver, B-port input, A-port output	Outputs enabled	20	
		Outputs disabled	7	
$C_{pdB}$ ( $V_{CCB}$ )	Power dissipation capacitance per transceiver, A-port input, B-port output	Outputs enabled	20	pF
		Outputs disabled	7	
	Power dissipation capacitance per transceiver, B-port input, A-port output	Outputs enabled	14	
		Outputs disabled	7	

### Output Description

The DOC™ circuitry is implemented, which, during the transition, initially lowers the output impedance to effectively drive the load and, subsequently, raises the impedance to reduce noise. Figure 1 shows typical  $V_{OL}$  vs  $I_{OL}$  and  $V_{OH}$  vs  $I_{OH}$  curves to illustrate the output impedance and drive capability of the circuit. At the beginning of the signal transition, the DOC circuit provides a maximum dynamic drive that is equivalent to a high-drive standard-output device. For more information, refer to the TI application reports, *AVC Logic Family Technology and Applications*, literature number SCEA006, and *Dynamic Output Control (DOC™) Circuitry Technology and Applications*, literature number SCEA009.

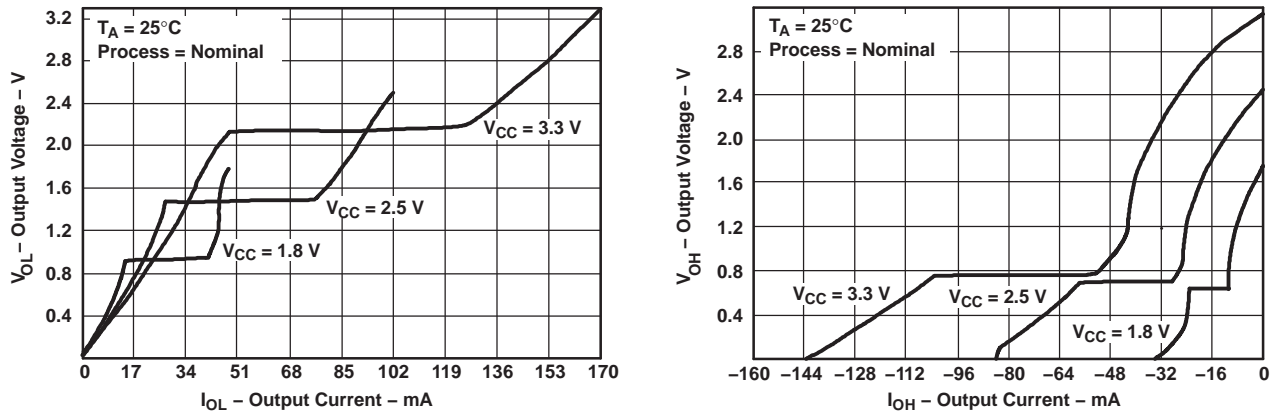
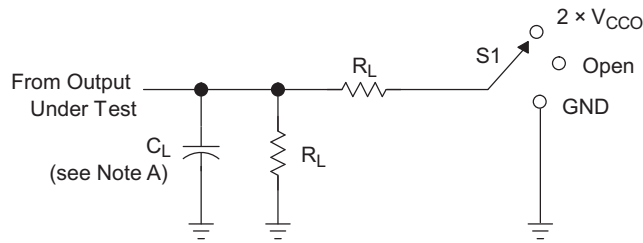


Figure 1. Typical Output Voltage vs Output Current



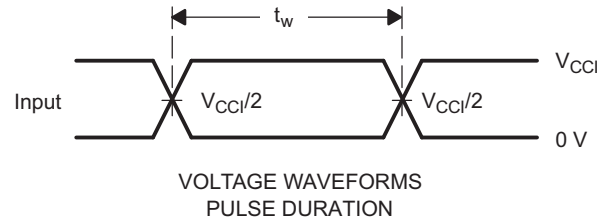
PARAMETER MEASUREMENT INFORMATION



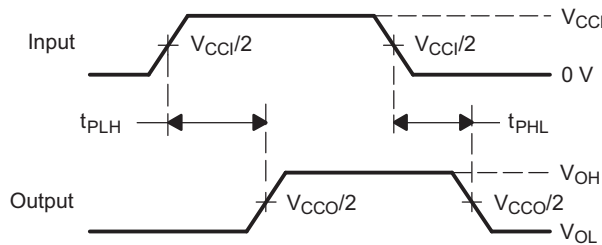
LOAD CIRCUIT

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

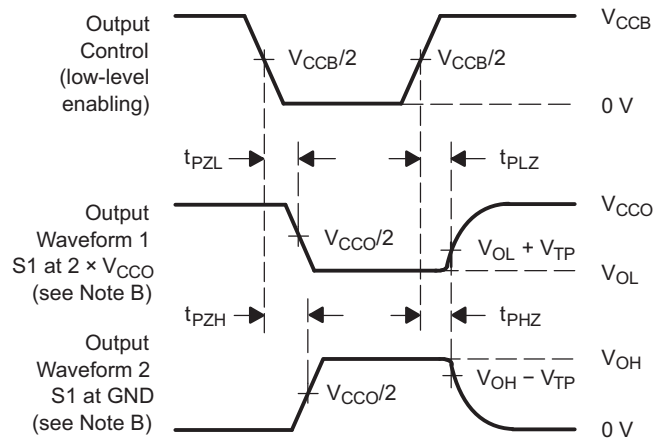
$V_{CCO}$	$C_L$	$R_L$	$V_{TP}$
$1.5\text{ V} \pm 0.1\text{ V}$	15 pF	500 $\Omega$	0.1 V
$1.8\text{ V} \pm 0.15\text{ V}$	30 pF	500 $\Omega$	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	30 pF	500 $\Omega$	0.15 V
$3.3\text{ V} \pm 0.3\text{ V}$	30 pF	500 $\Omega$	0.3 V



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,  $Z_O = 50\ \Omega$ ,  $dv/dt \geq 1\text{ V/ns}$ .
  - 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.

Figure 2. 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)	Op Temp (°C)	Top-Side Markings (4)	Samples
CAVCB164245QDGGRRQ1	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-3-260C-168 HR	-40 to 125	AVCB164245Q	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) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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**OTHER QUALIFIED VERSIONS OF SN74AVCB164245-Q1 :**

- Catalog: [SN74AVCB164245](#)

- Enhanced Product: [SN74AVCB164245-EP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

## TAPE AND REEL INFORMATION



### 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
CAVCB164245QDGGQRQ1	TSSOP	DGG	48	2000	330.0	24.4	8.6	15.8	1.8	12.0	24.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CAVCB164245QDGGRRQ1	TSSOP	DGG	48	2000	367.0	367.0	45.0

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