

# SN74AVC4T774-Q1 Automotive 4-Bit Dual-Supply Bus Transceiver With Configurable Voltage-Level Shifting and 3-State Outputs With Independent Direction Control Inputs

## 1 Features

- Qualified for automotive applications
- AEC-Q100 qualified with the following results:
  - Device temperature: –40°C to 125°C ambient operating temperature range
  - Device HBM ESD classification level H3B (JES-001)
  - Device CDM ESD classification level C5 (JESD 22 C101)
- [Function safety capable](#)
- Control input  $V_{IH}$  and  $V_{IL}$  levels are referenced to  $V_{CCA}$  voltage
- Fully configurable dual-rail design allows each port to operate over the full 1.08V to 3.6V power-supply range
- I/Os are 4.6V tolerant
- $I_{off}$  supports partial power-down-mode operation
- Maximum data rates:
  - 500Mbps (1.08V to 3.6V translation)
- Latch-up performance exceeds 100mA per JESD 78, Class II

## 2 Applications

- [Telematics](#)
- [Cluster](#)
- [Head unit](#)
- [Navigation systems](#)

## 3 Description

This 4-bit non-inverting 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 1.08V to 3.6V. The B port is designed to track  $V_{CCB}$ .  $V_{CCB}$  accepts any supply voltage from 1.08V to 3.6V. This allows for universal low-voltage bidirectional translation between any of the 1.2V, 1.5V, 1.8V, 2.5V, and 3.3V voltage nodes.

The SN74AVC4T774-Q1 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  $I_{CCZ}$ .

The SN74AVC4T774-Q1 is designed so that the control pins (DIR1, DIR2, DIR3, DIR4 and  $\overline{OE}$ ) 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 design of the  $V_{CC}$  isolation feature places both ports in the high-impedance state if either  $V_{CC}$  input is at GND.

To place the device in the high-impedance state during power up or power down, tie  $\overline{OE}$  to  $V_{CC}$  through a pullup resistor; the current-sinking capability of the driver determines the minimum value of the resistor.

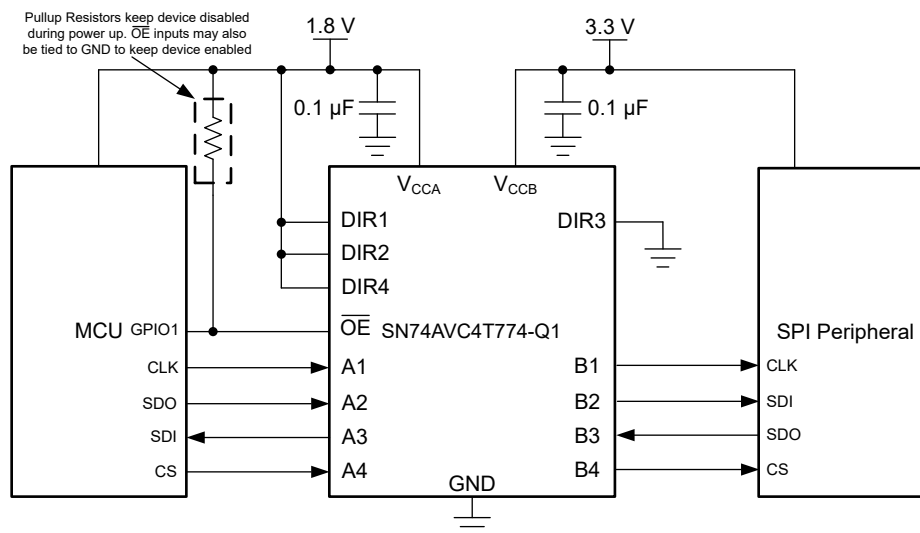
### Package Information

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE SIZE <sup>(2)</sup>
SN74AVC4T774-Q1	PW (TSSOP, 16)	5mm × 6.4mm
	BQB (WQFN, 16)	3.5mm × 2.5mm
	DYY (SOT, 16)	4.2mm × 2mm

(1) For more information, see [Section 11](#).

(2) The package size (length × width) is a nominal value and includes pins, where applicable.



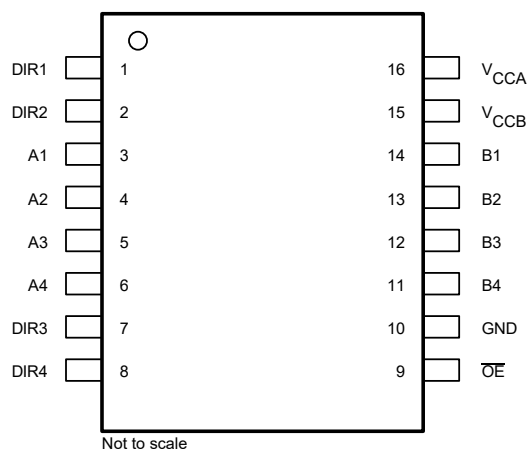


**Typical Application Schematic SN74AVC4T774-Q1**

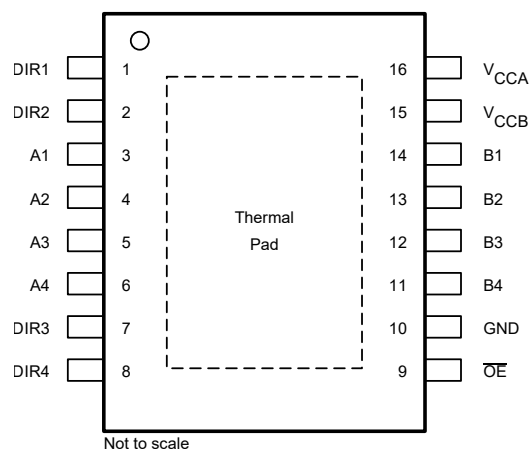
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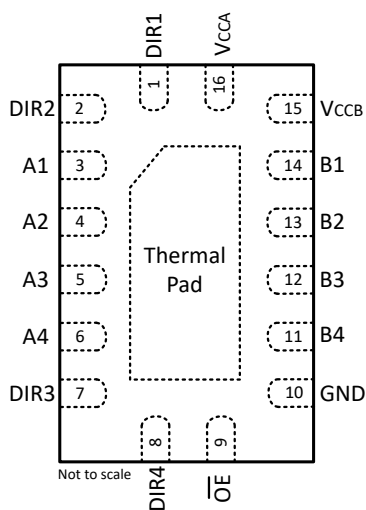
## 4 Pin Configuration and Functions



**Figure 4-1. PW Package, 16-Pin TSSOP  
(Top View)**



**Figure 4-2. DYY Package, 16-Pin SOT  
(Top View)**



**Figure 4-3. BQB Package, 16-Pin WQFN  
(Top View)**

**Table 4-1. Pin Functions**

PIN		TYPE <sup>(1)</sup>	DESCRIPTION
NAME	NO.		
DIR1	1	I	Controls signal flow for the first (A1/B1) I/O channels. Direction-control input referenced to V <sub>CCA</sub>
DIR2	2	I	Controls signal flow for the second (A2/B2) I/O channels. Direction-control input referenced to V <sub>CCA</sub>
A1	3	I/O	Input/output A1. Referenced to V <sub>CCA</sub>
A2	4	I/O	Input/output A2. Referenced to V <sub>CCA</sub>
A3	5	I/O	Input/output A3. Referenced to V <sub>CCA</sub>
A4	6	I/O	Input/output A4. Referenced to V <sub>CCA</sub>
DIR3	7	I	Controls signal flow for the third (A3/B3) I/O channels. Direction-control input referenced to V <sub>CCA</sub>
DIR4	8	I	Controls signal flow for the fourth (A4/B4) I/O channels. Direction-control input referenced to V <sub>CCA</sub>
$\overline{OE}$	9	I	3-state output-mode enables. Pull $\overline{OE}$ high to place all outputs in 3-state mode. Referenced to V <sub>CCA</sub>
GND	10	G	Ground
B4	11	I/O	Input/output B4. Referenced to V <sub>CCB</sub>
B3	12	I/O	Input/output B3. Referenced to V <sub>CCB</sub>
B2	13	I/O	Input/output B2. Referenced to V <sub>CCB</sub>
B1	14	I/O	Input/output B1. Referenced to V <sub>CCB</sub>
V <sub>CCB</sub>	15	P	B-port supply voltage. $1.08V \leq V_{CCB} \leq 3.6V$
V <sub>CCA</sub>	16	P	A-port supply voltage. $1.08V \leq V_{CCA} \leq 3.6V$
Thermal pad		—	The exposed thermal pad must be connected as a secondary GND or be left electrically open.

(1) I = input, O = output, P = Power, G = Ground

## 5 Specifications

### 5.1 Absolute Maximum Ratings

over operating ambient temperature range (unless otherwise noted) <sup>(1)</sup>

			MIN	MAX	UNIT
$V_{CCA}$ $V_{CCB}$	Supply voltage		–0.5	4.6	V
$V_I$	Input voltage <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 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 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
$T_{stg}$	Storage temperature		–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 do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. 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 4.6V maximum if the output current rating is observed.

### 5.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>	±8000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins	±1000	
		Machine model (C101)	±150	

(1) AEC Q100-002 indicates HBM stressing is done in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

### 5.3 Recommended Operating Conditions

			V <sub>CCI</sub>	V <sub>CCO</sub>	MIN	MAX	UNIT
V <sub>CCA</sub>	Supply voltage				1.08	3.6	V
V <sub>CCB</sub>	Supply voltage				1.08	3.6	V
V <sub>IH</sub>	High-level input voltage	Data inputs <sup>(1)</sup>	1.08V		V <sub>CCI</sub> × 0.7		V
			1.2V to 1.95V		V <sub>CCI</sub> × 0.65		
			2V to 2.7V		1		
			2.8V to 3.6V		1.4		
V <sub>IL</sub>	Low-level input voltage	Data inputs <sup>(1)</sup>	1.08V		V <sub>CCI</sub> × 0.3		V
			1.1V to 1.95V		V <sub>CCI</sub> × 0.35		
			2V to 2.7V		1.5		
			3V to 3.6V		1.9		
V <sub>IH</sub>	High-level input voltage	DIR (referenced to V <sub>CCA</sub> ) <sup>(2)</sup>	1.08V to 1.95V		V <sub>CCA</sub> × 0.65		V
			2V to 2.7V		1		
			3V to 3.6V		1.3		

### 5.3 Recommended Operating Conditions (continued)

			V <sub>CCI</sub>	V <sub>CCO</sub>	MIN	MAX	UNIT
V <sub>IL</sub>	Low-level input voltage	DIR (referenced to V <sub>CCA</sub> ) <sup>(2)</sup>	1.08V to 1.95V		V <sub>CCA</sub> × 0.35		V
			2V to 2.7V		1.3		
			3V to 3.6V		1.7		
V <sub>I</sub>	Input voltage				0	3.6	V
V <sub>O</sub>	Output voltage	Active state			0	V <sub>CCO</sub>	V
		3-state			0	3.6	
I <sub>OH</sub>	High-level output current			1.08V to 1.32V	−3		mA
				1.4V to 1.6V	−6		
				1.65V to 1.95V	−8		
				2.3V to 2.7V	−9		
				3V to 3.6V	−12		
I <sub>OL</sub>	Low-level output current			1.08V to 1.32V	3		mA
				1.4V to 1.6V	6		
				1.65V to 1.95V	8		
				2.3V to 2.7V	9		
				3V to 3.6V	12		
Δt/Δv	Input transition rise or fall rate				5		ns/V
T <sub>A</sub>	Operating ambient temperature				−40	125	°C

(1) For V<sub>CCI</sub> values not specified in the data sheet, V<sub>IH</sub> min = V<sub>CCI</sub> × 0.7V, V<sub>IL</sub> max = V<sub>CCI</sub> × 0.3V

(2) For V<sub>CCI</sub> values not specified in the data sheet, V<sub>IH</sub> min = V<sub>CCA</sub> × 0.7V, V<sub>IL</sub> max = V<sub>CCA</sub> × 0.3V

### 5.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74AVC4T774-Q1			UNIT
		PW (TSSOP)	BQB (WQFN)	DYY (SOT)	
		16 PINS	16 PINS	16 PINS	
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	123.8	79.9	163.4	°C/W
R <sub>θJC(top)</sub>	Junction-to-case (top) thermal resistance	58.3	77.5	90.0	°C/W
R <sub>θJB</sub>	Junction-to-board thermal resistance	81.7	49.0	93.1	°C/W
ψ <sub>JT</sub>	Junction-to-top characterization parameter	6.7	7.3	10.9	°C/W
ψ <sub>JB</sub>	Junction-to-board characterization parameter	80.9	49.0	92.1	°C/W
R <sub>θJC(bot)</sub>	Junction-to-case (bottom) thermal resistance	N/A	26.4	N/A	°C/W

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

### 5.5 Electrical Characteristics

All typical limits apply over T<sub>A</sub> = 25°C, and all maximum and minimum limits apply over T<sub>A</sub> = –40°C to 125°C (unless otherwise noted).<sup>(1) (2)</sup>

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V <sub>OH</sub>	I <sub>OH</sub> = −100μA; V <sub>CCA</sub> = 1.08V to 3.6V; V <sub>CCB</sub> = 1.08V to 3.6V; V <sub>I</sub> = V <sub>IH</sub>	V <sub>CCO</sub> − 0.2			V
	I <sub>OH</sub> = −3mA; V <sub>CCA</sub> = 1.1V; V <sub>CCB</sub> = 1.1V; V <sub>I</sub> = V <sub>IH</sub>	0.8			
	I <sub>OH</sub> = −6mA; V <sub>CCA</sub> = 1.4V; V <sub>CCB</sub> = 1.4V; V <sub>I</sub> = V <sub>IH</sub>	1			
	I <sub>OH</sub> = −8mA; V <sub>CCA</sub> = 1.65V; V <sub>CCB</sub> = 1.65V; V <sub>I</sub> = V <sub>IH</sub>	1.2			
	I <sub>OH</sub> = −9mA; V <sub>CCA</sub> = 2.3V; V <sub>CCB</sub> = 2.3V; V <sub>I</sub> = V <sub>IH</sub>	1.8			
	I <sub>OH</sub> = −12mA; V <sub>CCA</sub> = 3V; V <sub>CCB</sub> = 3V; V <sub>I</sub> = V <sub>IH</sub>	2.3			

## 5.5 Electrical Characteristics (continued)

All typical limits apply over  $T_A = 25^\circ\text{C}$ , and all maximum and minimum limits apply over  $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$  (unless otherwise noted).<sup>(1) (2)</sup>

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{OL}$		$I_{OL} = 100\mu\text{A}$ ; $V_{CCA} = 1.08\text{V}$ to $3.6\text{V}$ ; $V_{CCB} = 1.08\text{V}$ to $3.6\text{V}$ ; $V_I = V_{IL}$			0.2	V
		$I_{OL} = 3\text{mA}$ ; $V_{CCA} = 1.1\text{V}$ ; $V_{CCB} = 1.1\text{V}$ ; $V_I = V_{IL}$			0.2	
		$I_{OL} = 6\text{mA}$ ; $V_{CCA} = 1.4\text{V}$ ; $V_{CCB} = 1.4\text{V}$ ; $V_I = V_{IL}$			0.31	
		$I_{OL} = 8\text{mA}$ ; $V_{CCA} = 1.65\text{V}$ ; $V_{CCB} = 1.65\text{V}$ ; $V_I = V_{IL}$			0.35	
		$I_{OL} = 9\text{mA}$ ; $V_{CCA} = 2.3\text{V}$ ; $V_{CCB} = 2.3\text{V}$ ; $V_I = V_{IL}$			0.33	
		$I_{OL} = 12\text{mA}$ ; $V_{CCA} = 3\text{V}$ ; $V_{CCB} = 3\text{V}$ ; $V_I = V_{IL}$			0.40	
$I_I$	DIR input	$V_I = V_{CCA}$ or GND; $V_{CCA} = 1.08\text{V}$ to $3.6\text{V}$ ; $V_{CCB} = 1.08\text{V}$ to $3.6\text{V}$	$T_A = 25^\circ\text{C}$	-0.25	0.25	$\mu\text{A}$
			$T_A = -40^\circ\text{C}$ to $125^\circ\text{C}$	-1	1.5	
$I_{off}$	A port	$V_I$ or $V_O = 0$ to $3.6\text{V}$ ; $V_{CCA} = 0\text{V}$ ; $V_{CCB} = 0\text{V}$ to $3.6\text{V}$	$T_A = 25^\circ\text{C}$	$\pm 0.1$	$\pm 1$	$\mu\text{A}$
			$T_A = -40^\circ\text{C}$ to $125^\circ\text{C}$		$\pm 5$	
	B port	$V_I$ or $V_O = 0$ to $3.6\text{V}$ ; $V_{CCA} = 0\text{V}$ to $3.6\text{V}$ ; $V_{CCB} = 0\text{V}$	$T_A = 25^\circ\text{C}$	$\pm 0.1$	$\pm 1$	
			$T_A = -40^\circ\text{C}$ to $125^\circ\text{C}$		$\pm 5$	
$I_{OZ}$ <sup>(3)</sup>	A or B port	$V_O = V_{CCO}$ or GND; $V_I = V_{CCI}$ or GND; $\overline{OE} = V_{IH}$ ; $V_{CCA} = 3.6\text{V}$ ; $V_{CCB} = 3.6\text{V}$	$T_A = 25^\circ\text{C}$	$\pm 0.5$	$\pm 2.5$	$\mu\text{A}$
			$T_A = -40^\circ\text{C}$ to $125^\circ\text{C}$		$\pm 5$	
	B port	$V_O = V_{CCO}$ or GND; $V_I = V_{CCI}$ or GND; $\overline{OE} = \text{don't care}$ ; $V_{CCA} = 0\text{V}$ ; $V_{CCB} = 3.6\text{V}$			$\pm 5$	
	A port	$V_O = V_{CCO}$ or GND; $V_I = V_{CCI}$ or GND; $\overline{OE} = \text{don't care}$ ; $V_{CCA} = 3.6\text{V}$ ; $V_{CCB} = 0\text{V}$			$\pm 5$	
$I_{CCA}$		$V_I = V_{CCI}$ or GND, $I_O = 0$	$V_{CCA} = 1.08\text{V}$ to $3.6\text{V}$ $V_{CCB} = 1.08\text{V}$ to $3.6\text{V}$		9	$\mu\text{A}$
			$V_{CCA} = 0\text{V}$ ; $V_{CCB} = 3.6\text{V}$		-2	
			$V_{CCA} = 3.6\text{V}$ ; $V_{CCB} = 0\text{V}$		5	
$I_{CCB}$		$V_I = V_{CCI}$ or GND, $I_O = 0$	$V_{CCA} = 1.08\text{V}$ to $3.6\text{V}$ $V_{CCB} = 1.08\text{V}$ to $3.6\text{V}$		7	$\mu\text{A}$
			$V_{CCA} = 0\text{V}$ ; $V_{CCB} = 3.6\text{V}$		4.5	
			$V_{CCA} = 3.6\text{V}$ ; $V_{CCB} = 0\text{V}$		-2	
$I_{CCA} + I_{CCB}$		$V_I = V_{CCI}$ or GND, $I_O = 0$ ; $V_{CCA} = 1.08\text{V}$ to $3.6\text{V}$ ; $V_{CCB} = 1.08\text{V}$ to $3.6\text{V}$			16	$\mu\text{A}$
$C_i$	Control inputs	$V_I = 3.3\text{V}$ or GND; $V_{CCA} = 3.3\text{V}$ ; $V_{CCB} = 3.3\text{V}$			4.5	pF
$C_{io}$	A or B port	$V_O = 3.3\text{V}$ or GND; $V_{CCA} = 3.3\text{V}$ ; $V_{CCB} = 3.3\text{V}$			5.1	pF

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

## 5.6 Switching Characteristics: $V_{CCA} = 1.2V \pm 0.12V$

over recommended operating free-air temperature range (for parameter descriptions, see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}$	TYP	UNIT
$t_{PLH}$ , $t_{PHL}$	A	B	$V_{CCB} = 1.2V \pm 0.12V$	3.1	ns
			$V_{CCB} = 1.5V \pm 0.1V$	2.6	
			$V_{CCB} = 1.8V \pm 0.15V$	2.5	
			$V_{CCB} = 2.5V \pm 0.2V3$	3	
			$V_{CCB} = 3.3V \pm 0.3V$	3.5	
$t_{PLH}$ , $t_{PHL}$	B	A	$V_{CCB} = 1.2V \pm 0.12V$	3.1	ns
			$V_{CCB} = 1.5V \pm 0.1V$	2.7	
			$V_{CCB} = 1.8V \pm 0.15V$	2.5	
			$V_{CCB} = 2.5V \pm 0.2V$	2.4	
			$V_{CCB} = 3.3V \pm 0.3V$	2.3	
$t_{PZH}$ , $t_{PZL}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$	5.3	ns
			$V_{CCB} = 1.5V \pm 0.1V$	5.3	
			$V_{CCB} = 1.8V \pm 0.15V$	5.3	
			$V_{CCB} = 2.5V \pm 0.2V$	5.3	
			$V_{CCB} = 3.3V \pm 0.3V$	5.3	
$t_{PZH}$ , $t_{PZL}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$	5.1	ns
			$V_{CCB} = 1.5V \pm 0.1V$	4	
			$V_{CCB} = 1.8V \pm 0.15V$	3.5	
			$V_{CCB} = 2.5V \pm 0.2V$	3.2	
			$V_{CCB} = 3.3V \pm 0.3V$	3.1	
$t_{PHZ}$ , $t_{PLZ}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$	4.8	ns
			$V_{CCB} = 1.5V \pm 0.1V$	4.8	
			$V_{CCB} = 1.8V \pm 0.15V$	4.8	
			$V_{CCB} = 2.5V \pm 0.2V$	4.8	
			$V_{CCB} = 3.3V \pm 0.3V$	4.8	
$t_{PHZ}$ , $t_{PLZ}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$	4.7	ns
			$V_{CCB} = 1.5V \pm 0.1V$	4	
			$V_{CCB} = 1.8V \pm 0.15V$	4.1	
			$V_{CCB} = 2.5V \pm 0.2V$	4.3	
			$V_{CCB} = 3.3V \pm 0.3V$	5.1	

## 5.7 Switching Characteristics, $V_{CCA} = 1.5V \pm 0.1V$

over temperature range  $-40^{\circ}C$  to  $+125^{\circ}C$  (for parameter descriptions, see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}$	MIN	TYP	MAX	UNIT
$t_{PHL}$ , $t_{PLH}$	A	B	$V_{CCB} = 1.2V \pm 0.12V$		4.2		ns
			$V_{CCB} = 1.5V \pm 0.1V$	2.2		5.7	
			$V_{CCB} = 1.8V \pm 0.15V$	2.0		4.7	
			$V_{CCB} = 2.5V \pm 0.2V$	1.7		3.8	
			$V_{CCB} = 3.3V \pm 0.3V$	1.5		3.4	
$t_{PLH}$ , $t_{PHL}$	B	A	$V_{CCB} = 1.2V \pm 0.12V$		4.6		ns
			$V_{CCB} = 1.5V \pm 0.1V$	2.1		5.7	
			$V_{CCB} = 1.8V \pm 0.15V$	1.9		5.1	
			$V_{CCB} = 2.5V \pm 0.2V$	1.7		4.2	
			$V_{CCB} = 3.3V \pm 0.3V$	1.6		3.8	
$t_{PZH}$ , $t_{PZL}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$		5.8		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.8		10.6	
			$V_{CCB} = 1.8V \pm 0.15V$	3.8		10.7	
			$V_{CCB} = 2.5V \pm 0.2V$	3.7		10.6	
			$V_{CCB} = 3.3V \pm 0.3V$	3.7		10.5	
$t_{PZH}$ , $t_{PZL}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		8.7		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.9		10.8	
			$V_{CCB} = 1.8V \pm 0.15V$	3.5		9.5	
			$V_{CCB} = 2.5V \pm 0.2V$	3.2		8.3	
			$V_{CCB} = 3.3V \pm 0.3V$	3.1		8.0	
$t_{PHZ}$ , $t_{PLZ}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$		5.6		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.9		9.4	
			$V_{CCB} = 1.8V \pm 0.15V$	3.9		9.4	
			$V_{CCB} = 2.5V \pm 0.2V$	3.9		9.4	
			$V_{CCB} = 3.3V \pm 0.3V$	3.9		9.4	
$t_{PHZ}$ , $t_{PLZ}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		8.6		ns
			$V_{CCB} = 1.5V \pm 0.1V$	4.6		11.0	
			$V_{CCB} = 1.8V \pm 0.15V$	4.6		10.6	
			$V_{CCB} = 2.5V \pm 0.2V$	3.7		8.9	
			$V_{CCB} = 3.3V \pm 0.3V$	4.2		9.4	

## 5.8 Switching Characteristics: $V_{CCA} = 1.8V \pm 0.15V$

over temperature range  $-40^{\circ}C$  to  $+125^{\circ}C$  (for parameter descriptions, see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}$	MIN	TYP	MAX	UNIT
$t_{PLH}$ , $t_{PHL}$	A	B	$V_{CCB} = 1.2V \pm 0.12V$		3.8		ns
			$V_{CCB} = 1.5V \pm 0.1V$	2.1		5.1	
			$V_{CCB} = 1.8V \pm 0.15V$	2.0		4.2	
			$V_{CCB} = 2.5V \pm 0.2V$	1.6		3.1	
			$V_{CCB} = 3.3V \pm 0.3V$	1.4		2.9	
$t_{PLH}$ , $t_{PHL}$	B	A	$V_{CCB} = 1.2V \pm 0.12V$		4.2		ns
			$V_{CCB} = 1.5V \pm 0.1V$	2.2		4.7	
			$V_{CCB} = 1.8V \pm 0.15V$	2.0		4.2	
			$V_{CCB} = 2.5V \pm 0.2V$	1.8		3.7	
			$V_{CCB} = 3.3V \pm 0.3V$	1.7		3.3	
$t_{PZH}$ , $t_{PZL}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$		4.5		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.4		7.7	
			$V_{CCB} = 1.8V \pm 0.15V$	3.4		7.7	
			$V_{CCB} = 2.5V \pm 0.2V$	3.3		7.7	
			$V_{CCB} = 3.3V \pm 0.3V$	3.4		7.6	
$t_{PZH}$ , $t_{PZL}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		8.0		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.9		9.1	
			$V_{CCB} = 1.8V \pm 0.15V$	3.4		7.9	
			$V_{CCB} = 2.5V \pm 0.2V$	3.0		6.6	
			$V_{CCB} = 3.3V \pm 0.3V$	2.9		6.2	
$t_{PHZ}$ , $t_{PLZ}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$		5.3		ns
			$V_{CCB} = 1.5V \pm 0.1V$	4.1		7.9	
			$V_{CCB} = 1.8V \pm 0.15V$	4.1		8.0	
			$V_{CCB} = 2.5V \pm 0.2V$	4.1		8.0	
			$V_{CCB} = 3.3V \pm 0.3V$	4.1		8.0	
$t_{PHZ}$ , $t_{PLZ}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		7.7		ns
			$V_{CCB} = 1.5V \pm 0.1V$	4.5		9.4	
			$V_{CCB} = 1.8V \pm 0.15V$	4.6		9.1	
			$V_{CCB} = 2.5V \pm 0.2V$	3.9		7.6	
			$V_{CCB} = 3.3V \pm 0.3V$	4.3		8.1	

Switching Characteristics,  $V_{CCA} = 2.5V \pm 0.2V$ **5.9 Switching Characteristics:  $V_{CCA} = 2.5V \pm 0.2V$** over temperature range  $-40^{\circ}C$  to  $+125^{\circ}C$  (for parameter descriptions, see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}$	MIN	TYP	MAX	UNIT
$t_{PLH}, t_{PHL}$	A	B	$V_{CCB} = 1.2V \pm 0.12V$		3.3		ns
			$V_{CCB} = 1.5V \pm 0.1V$	1.9		4.2	
			$V_{CCB} = 1.8V \pm 0.15V$	1.8		3.7	
			$V_{CCB} = 2.5V \pm 0.2V$	1.5		2.6	
			$V_{CCB} = 3.3V \pm 0.3V$	1.3		2.3	
$t_{PLH}, t_{PHL}$	B	A	$V_{CCB} = 1.2V \pm 0.12V$		3.6		ns
			$V_{CCB} = 1.5V \pm 0.1V$	1.8		3.8	
			$V_{CCB} = 1.8V \pm 0.15V$	1.6		3.1	
			$V_{CCB} = 2.5V \pm 0.2V$	1.5		2.6	
			$V_{CCB} = 3.3V \pm 0.3V$	1.5		2.5	
$t_{PZH}, t_{PZL}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$		3.0		ns
			$V_{CCB} = 1.5V \pm 0.1V$	2.5		4.8	
			$V_{CCB} = 1.8V \pm 0.15V$	2.5		4.8	
			$V_{CCB} = 2.5V \pm 0.2V$	2.5		4.8	
			$V_{CCB} = 3.3V \pm 0.3V$	2.5		4.8	
$t_{PZH}, t_{PZL}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		7.0		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.5		7.4	
			$V_{CCB} = 1.8V \pm 0.15V$	3.1		6.1	
			$V_{CCB} = 2.5V \pm 0.2V$	2.6		4.9	
			$V_{CCB} = 3.3V \pm 0.3V$	2.4		4.4	
$t_{PHZ}, t_{PLZ}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$		3.7		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.1		5.3	
			$V_{CCB} = 1.8V \pm 0.15V$	3.2		5.4	
			$V_{CCB} = 2.5V \pm 0.2V$	3.1		5.4	
			$V_{CCB} = 3.3V \pm 0.3V$	3.1		5.4	
$t_{PHZ}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		4.5		ns
			$V_{CCB} = 1.5V \pm 0.1V$	1.5		9.4	
			$V_{CCB} = 1.8V \pm 0.15V$	1.3		8.2	
			$V_{CCB} = 2.5V \pm 0.2V$	1.1		6.2	
			$V_{CCB} = 3.3V \pm 0.3V$	0.9		5.2	
$t_{PLZ}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		6.6		ns
			$V_{CCB} = 1.5V \pm 0.1V$	4.1		7.4	
			$V_{CCB} = 1.8V \pm 0.15V$	4.2		7.3	
			$V_{CCB} = 2.5V \pm 0.2V$	3.5		6.0	
			$V_{CCB} = 3.3V \pm 0.3V$	4.0		6.6	

## 5.10 Switching Characteristics: $V_{CCA} = 3.3V \pm 0.3V$

over temperature range -40 °C to +125 °C (for parameter descriptions, see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}$	MIN	TYP	MAX	UNIT
$t_{PLH}$ , $t_{PHL}$	A	B	$V_{CCB} = 1.2V \pm 0.12V$		3.2		ns
			$V_{CCB} = 1.5V \pm 0.1V$	1.8		3.8	
			$V_{CCB} = 1.8V \pm 0.15V$	1.7		3.3	
			$V_{CCB} = 2.5V \pm 0.2V$	1.5		2.5	
			$V_{CCB} = 3.3V \pm 0.3V$	1.2		2.0	
$t_{PLH}$ , $t_{PHL}$	B	A	$V_{CCB} = 1.2V \pm 0.12V$		3.4		ns
			$V_{CCB} = 1.5V \pm 0.1V$	1.7		3.4	
			$V_{CCB} = 1.8V \pm 0.15V$	1.5		2.9	
			$V_{CCB} = 2.5V \pm 0.2V$	1.3		2.9	
			$V_{CCB} = 3.3V \pm 0.3V$	1.2		2.0	
$t_{PZH}$ , $t_{PZL}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$		2.4		ns
			$V_{CCB} = 1.5V \pm 0.1V$	2.2		3.6	
			$V_{CCB} = 1.8V \pm 0.15V$	2.2		3.6	
			$V_{CCB} = 2.5V \pm 0.2V$	2.2		3.6	
			$V_{CCB} = 3.3V \pm 0.3V$	2.2		3.6	
$t_{PZH}$ , $t_{PZL}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		6.7		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.2		6.7	
			$V_{CCB} = 1.8V \pm 0.15V$	2.8		5.4	
			$V_{CCB} = 2.5V \pm 0.2V$	2.4		4.2	
			$V_{CCB} = 3.3V \pm 0.3V$	2.2		3.7	
$t_{PHZ}$ , $t_{PLZ}$	$\overline{OE}$	A	$V_{CCB} = 1.2V \pm 0.12V$		4.0		ns
			$V_{CCB} = 1.5V \pm 0.1V$	3.5		5.5	
			$V_{CCB} = 1.8V \pm 0.15V$	3.5		5.5	
			$V_{CCB} = 2.5V \pm 0.2V$	3.4		5.4	
			$V_{CCB} = 3.3V \pm 0.3V$	3.5		5.4	
$t_{PHZ}$ , $t_{PLZ}$	$\overline{OE}$	B	$V_{CCB} = 1.2V \pm 0.12V$		6.3		ns
			$V_{CCB} = 1.5V \pm 0.1V$	4.0		6.6	
			$V_{CCB} = 1.8V \pm 0.15V$	4.0		6.5	
			$V_{CCB} = 2.5V \pm 0.2V$	3.3		5.3	
			$V_{CCB} = 3.3V \pm 0.3V$	3.7		5.9	

## 5.11 Operating Characteristics

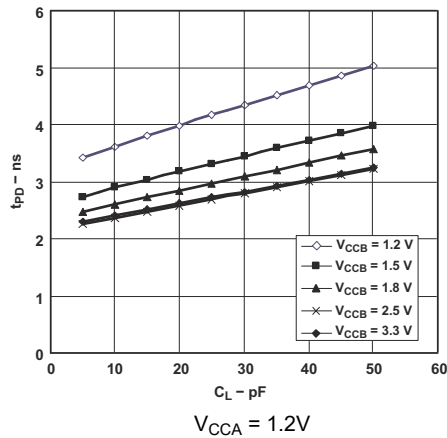
 $T_A = 25^\circ\text{C}$ 

PARAMETER			TEST CONDITIONS	V <sub>CCA</sub>	TYP	UNIT
C <sub>pdA</sub> <sup>(1)</sup>	A to B	Outputs enabled	C <sub>L</sub> = 0, f = 10MHz, t <sub>r</sub> = t <sub>f</sub> = 1ns	V <sub>CCA</sub> = V <sub>CCB</sub> = 1.2V	1	pF
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.5V	1	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.8V	1	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 2.5V	1.5	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3V	2	
		Outputs disabled	C <sub>L</sub> = 0, f = 10MHz, t <sub>r</sub> = t <sub>f</sub> = 1ns	V <sub>CCA</sub> = V <sub>CCB</sub> = 1.2V	1	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.5V		
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.8V		
				V <sub>CCA</sub> = V <sub>CCB</sub> = 2.5V		
				V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3V		
	B to A	Outputs enabled	C <sub>L</sub> = 0, f = 10MHz, t <sub>r</sub> = t <sub>f</sub> = 1ns	V <sub>CCA</sub> = V <sub>CCB</sub> = 1.2V	12	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.5V	12.5	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.8V	13	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 2.5V	14	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3V	15	
		Outputs disabled	C <sub>L</sub> = 0, f = 10MHz, t <sub>r</sub> = t <sub>f</sub> = 1ns	V <sub>CCA</sub> = V <sub>CCB</sub> = 1.2V	1	
V <sub>CCA</sub> = V <sub>CCB</sub> = 1.5V						
V <sub>CCA</sub> = V <sub>CCB</sub> = 1.8V						
V <sub>CCA</sub> = V <sub>CCB</sub> = 2.5V						
V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3V						
C <sub>pdB</sub> <sup>(1)</sup>	A to B	Outputs enabled	C <sub>L</sub> = 0, f = 10MHz, t <sub>r</sub> = t <sub>f</sub> = 1ns	V <sub>CCA</sub> = V <sub>CCB</sub> = 1.2V	12	pF
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.5V	12.5	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.8V	13	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 2.5V	14	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3V	15	
		Outputs disabled	C <sub>L</sub> = 0, f = 10MHz, t <sub>r</sub> = t <sub>f</sub> = 1ns	V <sub>CCA</sub> = V <sub>CCB</sub> = 1.2V	1	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.5V		
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.8V		
				V <sub>CCA</sub> = V <sub>CCB</sub> = 2.5V		
				V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3V		
	B to A	Outputs enabled	C <sub>L</sub> = 0, f = 10MHz, t <sub>r</sub> = t <sub>f</sub> = 1ns	V <sub>CCA</sub> = V <sub>CCB</sub> = 1.2V	1	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.5V	1	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 1.8V	1	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 2.5V	1	
				V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3V	2	
		Outputs disabled	C <sub>L</sub> = 0, f = 10MHz, t <sub>r</sub> = t <sub>f</sub> = 1ns	V <sub>CCA</sub> = V <sub>CCB</sub> = 1.2V	1	
V <sub>CCA</sub> = V <sub>CCB</sub> = 1.5V						
V <sub>CCA</sub> = V <sub>CCB</sub> = 1.8V						
V <sub>CCA</sub> = V <sub>CCB</sub> = 2.5V						
V <sub>CCA</sub> = V <sub>CCB</sub> = 3.3V						

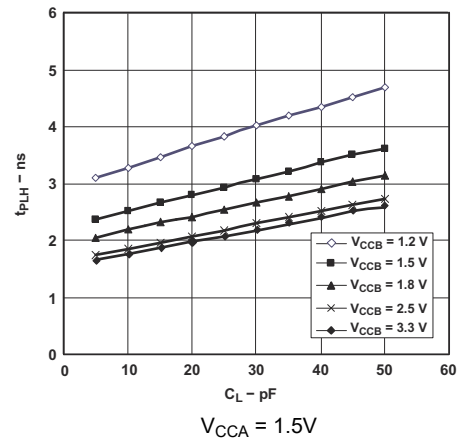
(1) Power dissipation capacitance per transceiver

## 5.12 Typical Characteristics

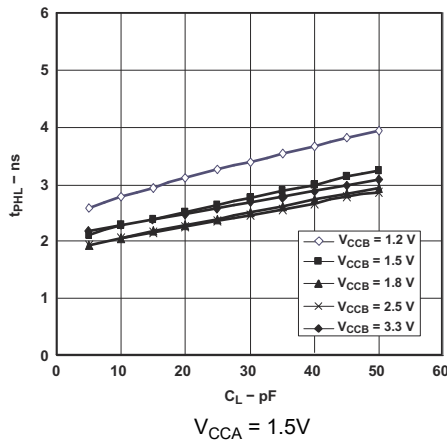
$T_A = 25^\circ\text{C}$



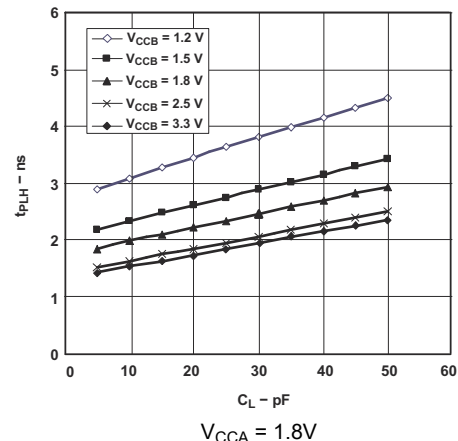
**Figure 5-1. Typical Propagation Delay (A to B) vs Load Capacitance**



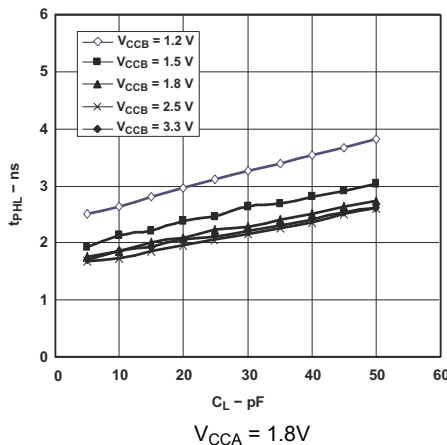
**Figure 5-2. Typical Propagation Delay (A to B) vs Load Capacitance**



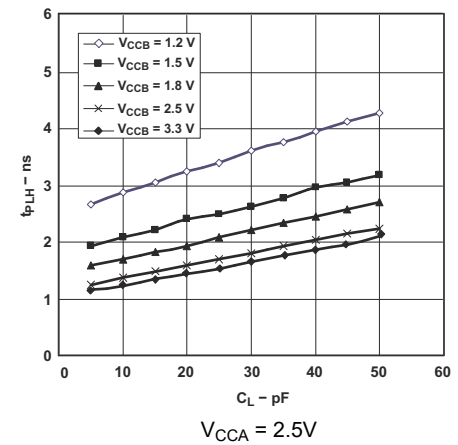
**Figure 5-3. Typical Propagation Delay (A to B) vs Load Capacitance**



**Figure 5-4. Typical Propagation Delay (A to B) vs Load Capacitance**



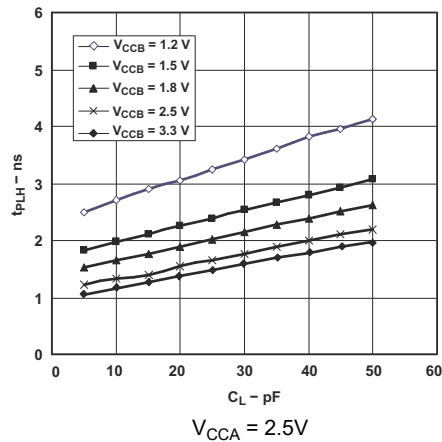
**Figure 5-5. Typical Propagation Delay (A to B) vs Load Capacitance**



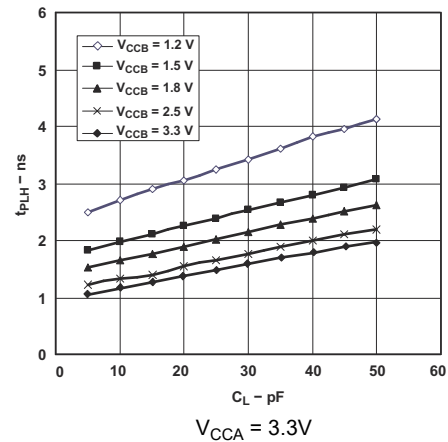
**Figure 5-6. Typical Propagation Delay (A to B) vs Load Capacitance**

## 5.12 Typical Characteristics (continued)

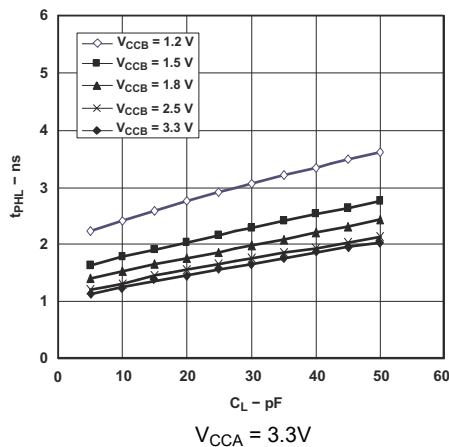
$T_A = 25^\circ\text{C}$



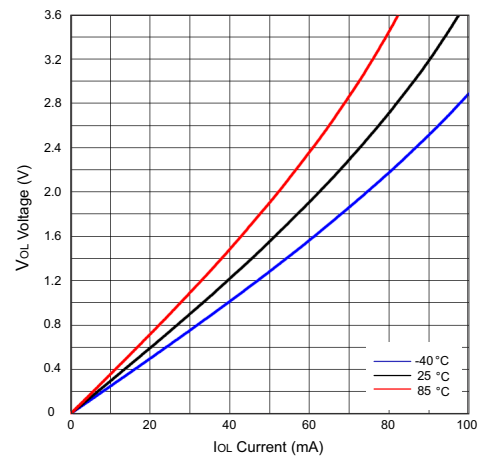
**Figure 5-7. Typical Propagation Delay (A to B) vs Load Capacitance**



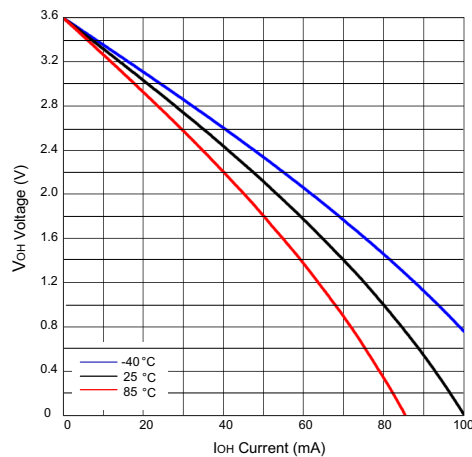
**Figure 5-8. Typical Propagation Delay (A to B) vs Load Capacitance**



**Figure 5-9. Typical Propagation Delay (A to B) vs Load Capacitance**

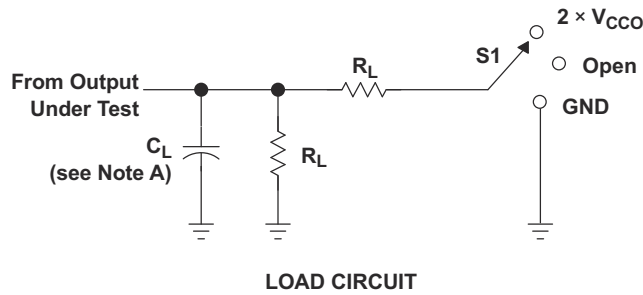


**Figure 5-10. Low-Level Output Voltage ( $V_{OL}$ ) vs Low-Level Current ( $I_{OL}$ )**



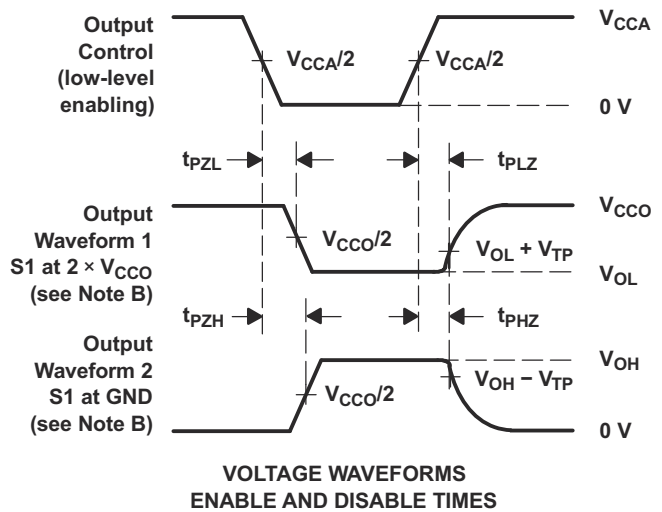
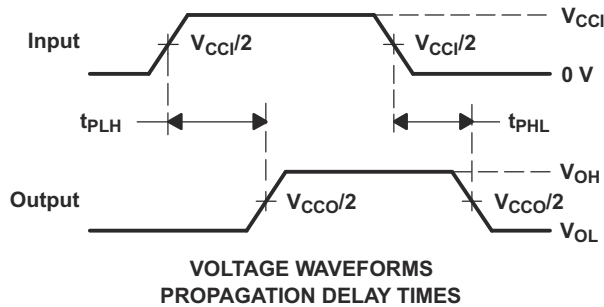
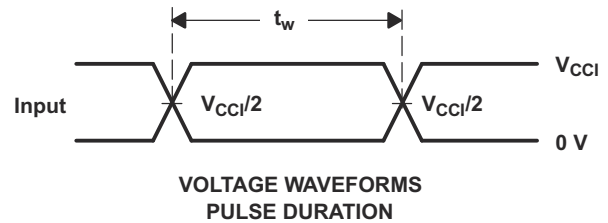
**Figure 5-11. High-Level Output Voltage ( $V_{OH}$ ) vs High-Level Current ( $I_{OH}$ )**

## 6 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.

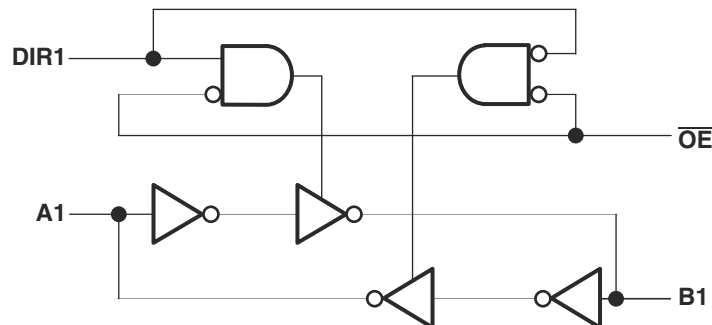
**Figure 6-1. Load and Circuit and Voltage Waveforms**

## 7 Detailed Description

## 7.1 Overview

The SN74AVC4T774-Q1 is a 4-bit, dual-supply noninverting bidirectional voltage level translation device. Ax pins and control pins (DIR1, DIR2, DIR3, DIR4 and  $\overline{\text{OE}}$ ) are supported by  $V_{\text{CCA}}$ , and Bx pins are supported by  $V_{\text{CCB}}$ . The A port is able to accept I/O voltages ranging from 1.08V to 3.6V, while the B port can accept I/O voltages from 1.08V to 3.6V. A high on DIR allows data transmission from Ax to Bx and a low on DIR allows data transmission from Bx to Ax when  $\overline{\text{OE}}$  is set to low. When  $\overline{\text{OE}}$  is set to high, both Ax and Bx pins are in the high-impedance state.

## 7.2 Functional Block Diagram



**Figure 7-1. Logic Diagram (Positive Logic) of SN74AVC4T774-Q1**

### 7.3 Feature Description

### 7.3.1 Fully Configurable Dual-Rail Design

Both  $V_{CCA}$  and  $V_{CCB}$  can be supplied at any voltage between 1.08V and 3.6V; thus, making the device suitable for translating between any of the low voltage nodes (1.2V, 1.8V, 2.5V, and 3.3V).

### 7.3.2 Supports High Speed Translation

The SN74AVC4T774-Q1 device can support high data rate applications. The translated signal data rate can be up to 500Mbps when the signal is translated from 1.8V to 3.3V.

### 7.3.3 $I_{off}$ Supports Partial-Power-Down Mode Operation

$I_{off}$  prevents backflow current by disabling I/O output circuits when the device is in partial-power-down mode.

## 7.4 Device Functional Modes

Table 7-1 lists the functional modes of the SN74AVC4T774-Q1 device.

### Table 7-1. Function Table (Each Bit)

CONTROL INPUTS		OUTPUT CIRCUITS <sup>(1)</sup>		OPERATION
$\overline{OE}$	DIR	A PORT	B PORT	
L	L	Enabled	Hi-Z	B data to A bus
L	H	Hi-Z	Enabled	A data to B bus
H	X	Hi-Z	Hi-Z	Isolation

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

## 8 Application and Implementation

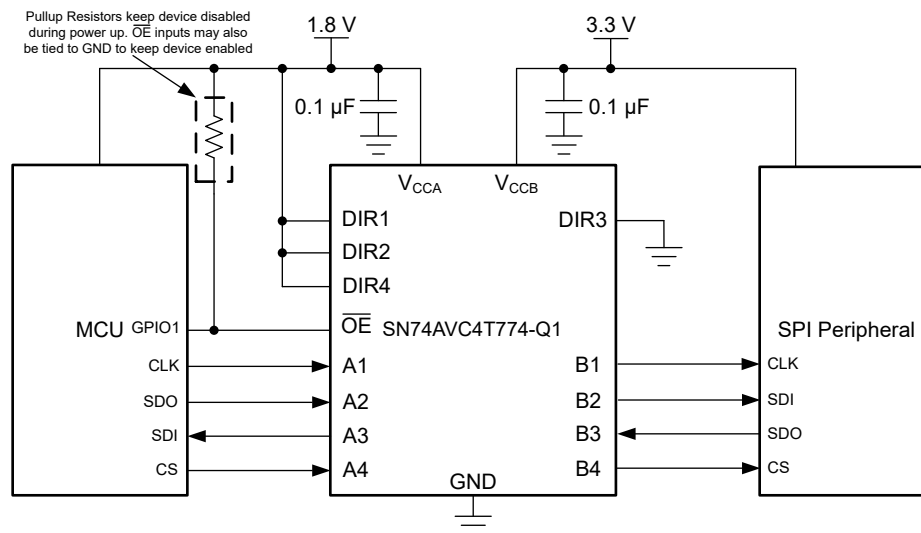
### Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

### 8.1 Application Information

The SN74AVC4T774-Q1 device can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another. The SN74AVC4T774-Q1 device is ideal for use in applications where a push-pull driver is connected to the data I/Os. The maximum data rate can be up to 500Mbps when the device translates a signal from 1.8V to 3.3V.

### 8.2 Typical Application



**Figure 8-1. Typical Application Diagram**

### 8.2.1 Design Requirements

Table 8-1 lists the parameters for this design example.

**Table 8-1. Design Parameters**

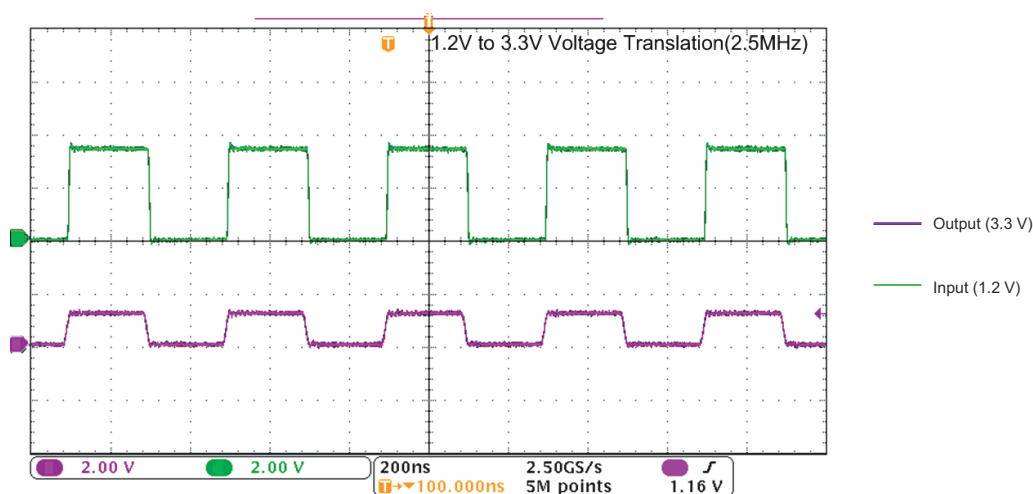
DESIGN PARAMETER	EXAMPLE VALUE
Input voltage range	1.2V
Output voltage range	3.3V

### 8.2.2 Detailed Design Procedure

To begin the design process, determine the following:

- Input voltage range
  - Use the supply voltage of the device that is driving the SN74AVC4T774-Q1 device to determine the input voltage range. For a valid logic high, the value must exceed the  $V_{IH}$  of the input port. For a valid logic low, the value must be less than the  $V_{IL}$  of the input port. For this example, the input voltage is 1.2V.
- Output voltage range
  - Use the supply voltage of the device that the SN74AVC4T774-Q1 device is driving to determine the output voltage range. For this example, the output voltage is 3.3V.

### 8.2.3 Application Curve



**Figure 8-2. Translation Up (1.2V to 3.3V) at 2.5MHz**

## 8.3 Power Supply Recommendations

The SN74AVC4T774-Q1 device uses two separate configurable power-supply rails:  $V_{CCA}$  and  $V_{CCB}$ .  $V_{CCA}$  accepts any supply voltage from 1.08V to 3.6V, and  $V_{CCB}$  accepts any supply voltage from 1.08V to 3.6V. The A port and B port are designed to track  $V_{CCA}$  and  $V_{CCB}$  respectively, allowing for low-voltage bidirectional translation between any of the 1.2V, 1.5V, 1.8V, 2.5V, and 3.3V voltage nodes.

The output-enable ( $\overline{OE}$ ) input circuit is designed so that it is supplied by  $V_{CCA}$ ; when the  $\overline{OE}$  input is high, all outputs are placed in the high-impedance state. To place the outputs in the high-impedance state during power up or power down, tie the  $\overline{OE}$  input pin to  $V_{CCA}$  through a pullup resistor and do not enable it until  $V_{CCA}$  and  $V_{CCB}$  are fully ramped and stable. The minimum value of the pullup resistor to  $V_{CCA}$  is determined by the current-sinking capability of the driver.

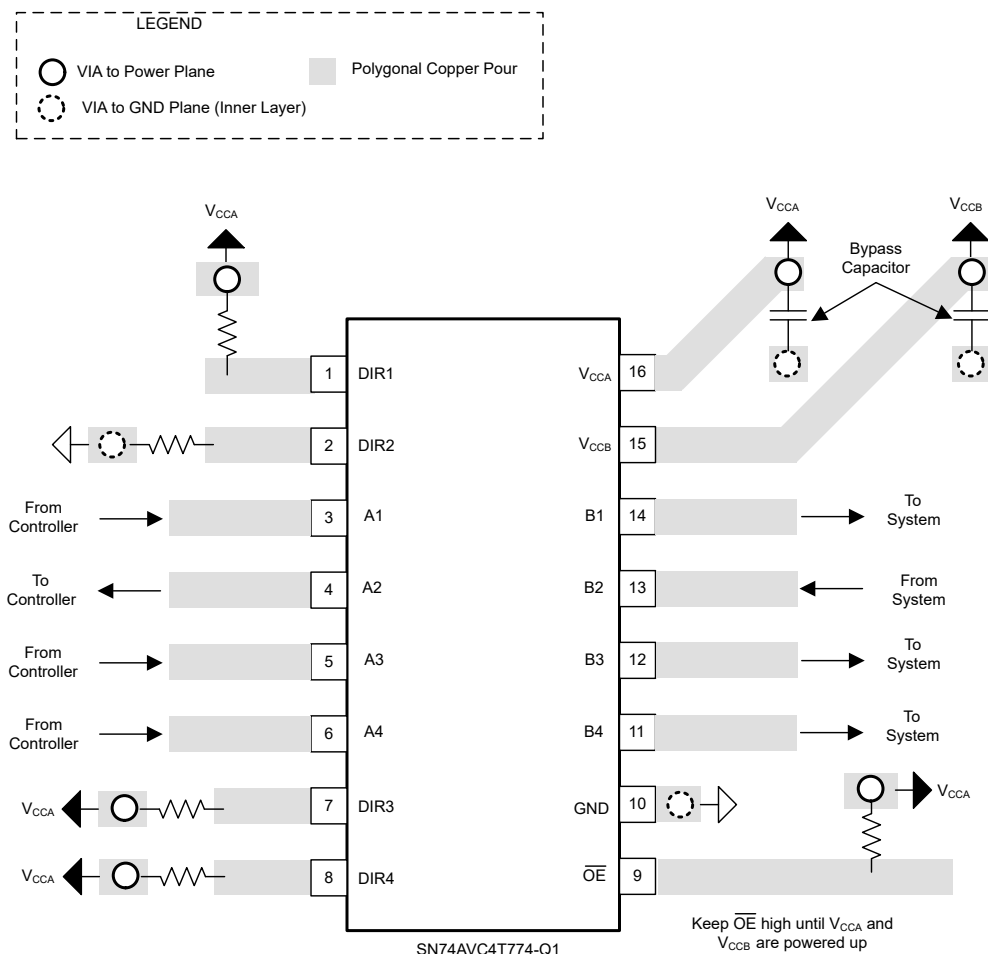
## 8.4 Layout

### 8.4.1 Layout Guidelines

For device reliability, the recommendation is to follow common printed-circuit board layout guidelines such as:

- Use bypass capacitors on power supplies.
- Use short trace lengths to avoid excessive loading.
- Place pads on the signal paths for loading capacitors or pullup resistors to help adjust rise and fall times of signals, depending on the system requirements.

### 8.4.2 Layout Example



**Figure 8-3. SN74AVC4T774-Q1 PW Package Layout Diagram**

## 9 Device and Documentation Support

### 9.1 Documentation Support

#### 9.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [IC Package Thermal Metrics](#)
- Texas Instruments, [Implications of Slow or Floating CMOS Inputs](#)

### 9.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](#). Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 9.3 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

### 9.4 Trademarks

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### 9.5 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 9.6 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 10 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision A (September 2024) to Revision B (December 2024)	Page
• Updated Description.....	1
• Updated Pinout Diagrams.....	4
• Updated Pin Description.....	4
• Updated Overview.....	18
• Updated <a href="#">Figure 7-1</a> .....	18
• Updated <a href="#">Figure 8-1</a> .....	19
• Updated <a href="#">Figure 8-3</a> .....	21

Changes from Revision * (March 2024) to Revision A (September 2024)	Page
• Changed status from Advanced Information to Production Data.....	1

## 11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most-current data available for the designated device. This data is subject to change without notice and without revision of this document. For browser-based versions of this data sheet, see the left-hand navigation pane.

## PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">74AVC4T774QDYRQ1</a>	Active	Production	SOT-23-THIN (DYY)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	WT774Q
74AVC4T774QDYRQ1.A	Active	Production	SOT-23-THIN (DYY)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	WT774Q
<a href="#">74AVC4T774QPWRQ1</a>	Active	Production	TSSOP (PW)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	WT774Q
74AVC4T774QPWRQ1.A	Active	Production	TSSOP (PW)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	WT774Q
<a href="#">74AVC4T774QWBQBRQ1</a>	Active	Production	WQFN (BQB)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	WT774Q
74AVC4T774QWBQBRQ1.A	Active	Production	WQFN (BQB)   16	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	WT774Q

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part 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 SN74AVC4T774-Q1 :**

- Catalog : [SN74AVC4T774](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

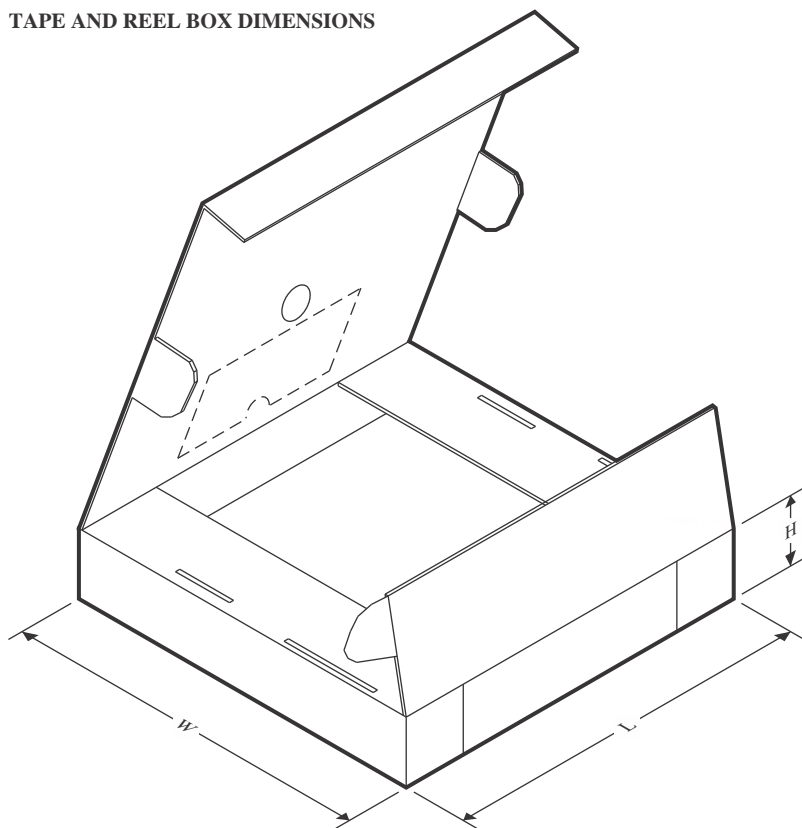
## TAPE AND REEL INFORMATION



\*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
74AVC4T774QDYRQ1	SOT-23-THIN	DYY	16	3000	330.0	12.4	4.8	3.6	1.6	8.0	12.0	Q3
74AVC4T774QPWRQ1	TSSOP	PW	16	3000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
74AVC4T774QWBQRQ1	WQFN	BQB	16	3000	180.0	12.4	2.8	3.8	1.2	4.0	12.0	Q1

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
74AVC4T774QDYRQ1	SOT-23-THIN	DYY	16	3000	336.6	336.6	31.8
74AVC4T774QPWRQ1	TSSOP	PW	16	3000	353.0	353.0	32.0
74AVC4T774QWBQRQ1	WQFN	BQB	16	3000	210.0	185.0	35.0

## GENERIC PACKAGE VIEW

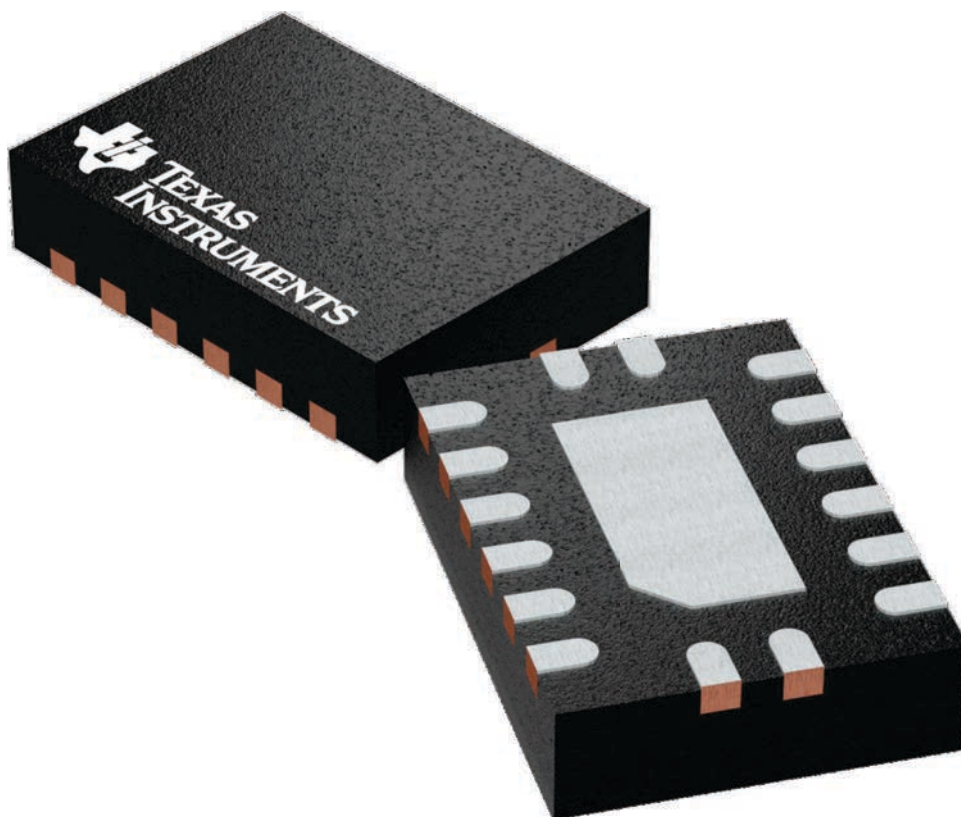
**BQB 16**

**WQFN - 0.8 mm max height**

2.5 x 3.5, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4226161/A

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for optimal thermal and mechanical performance.

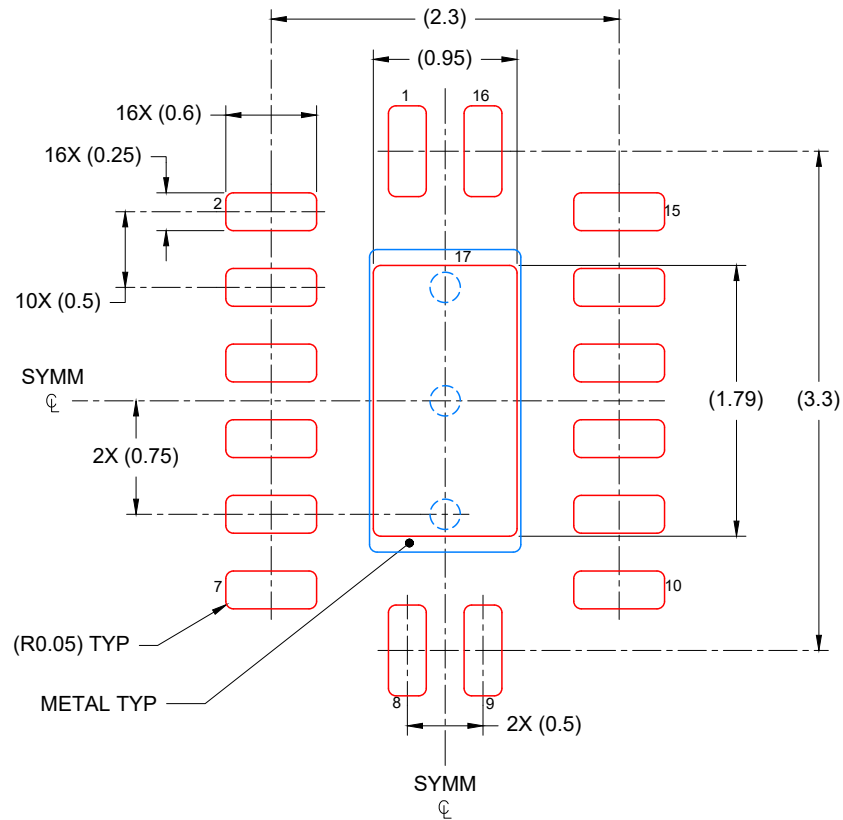
**WQFN - 0.8 mm max height**

The drawing shows a symmetrical PCB layout with the following dimensions and features:
 

- Overall Dimensions:**
  - Width: 2.3
  - Height: 3.3
- Internal Dimensions and Spacing:**
  - Top spacing: 16X (0.6)
  - Left spacing: 16X (0.25)
  - Bottom spacing: 10X (0.5)
  - Central vertical spacing: 2X (0.75)
  - Right spacing: 2X (0.5)
- Features and Callouts:**
  - SYMM** (Symmetrical) callouts at the top and bottom center.
  - (R0.05) TYP** (Typical) callout pointing to a fillet on the left side.
  - (Ø 0.2) VIA TYP** (Typical) callout pointing to a circular via in the center.
  - Feature Numbers:** 1, 2, 7, 8, 9, 10, 15, 16, 17.

4226135/A 08/2020

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.



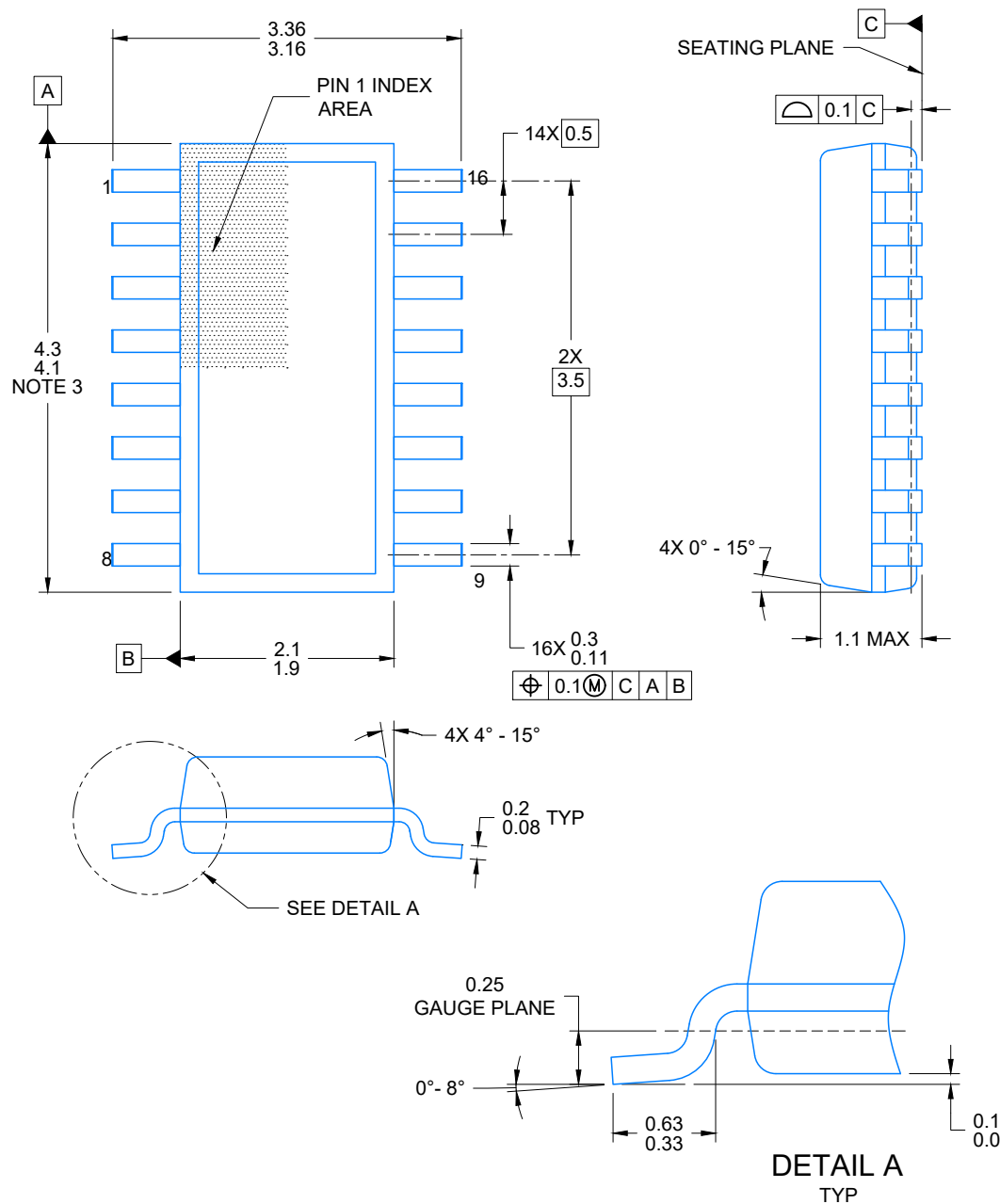
**SOLDER PASTE EXAMPLE**  
 BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
 85% PRINTED COVERAGE BY AREA  
 SCALE: 20X

4226135/A 08/2020

NOTES: (continued)

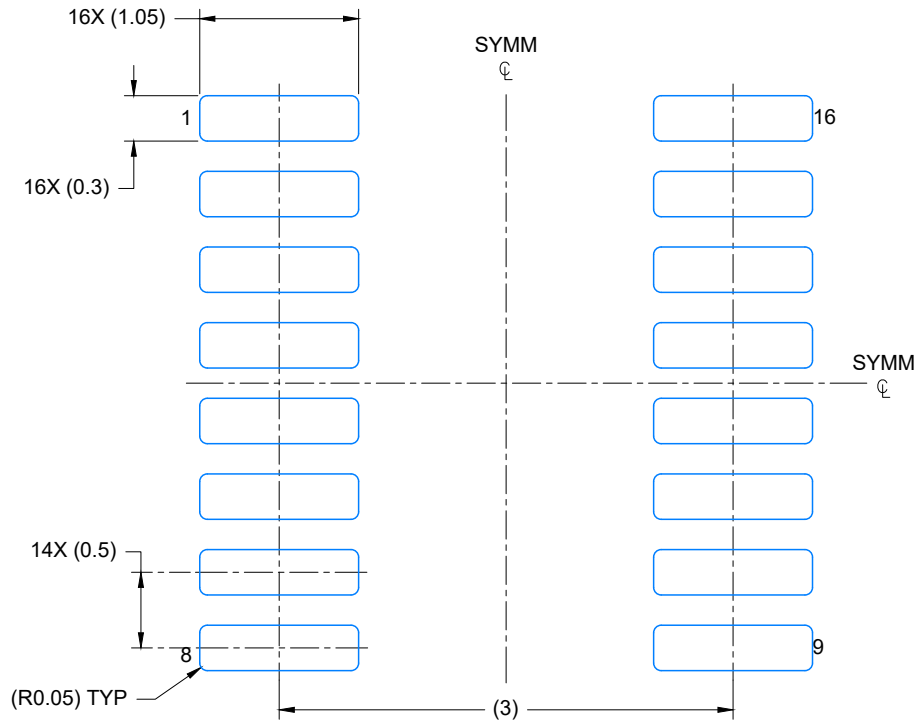
6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.



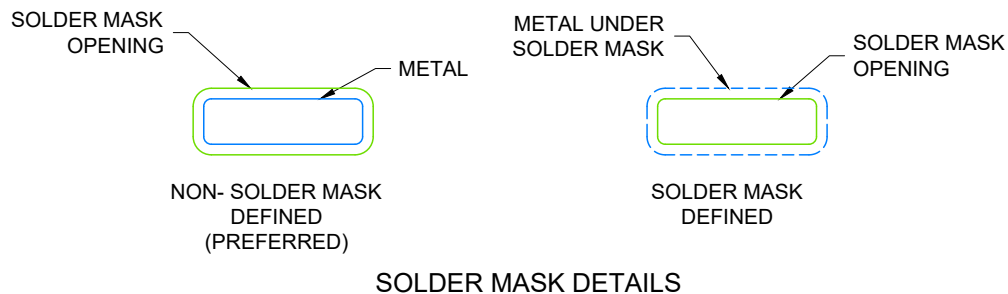
4224642/D 07/2024

## NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
5. Reference JEDEC Registration MO-345, Variation AA



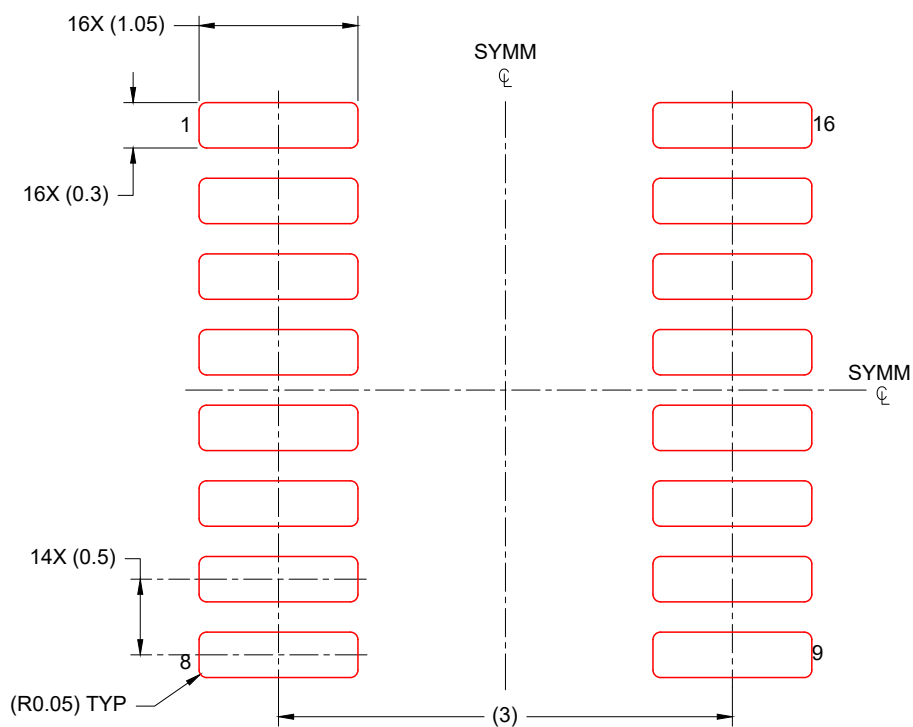
LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 20X



4224642/D 07/2024

## NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 20X

4224642/D 07/2024

## NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.



## PACKAGE OUTLINE

## TSSOP - 1.2 mm max height

## SMALL OUTLINE PACKAGE



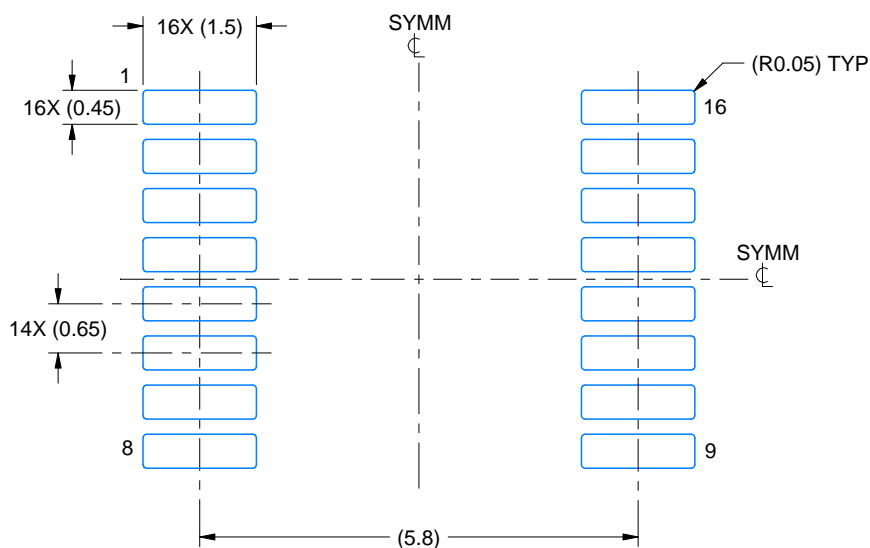
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

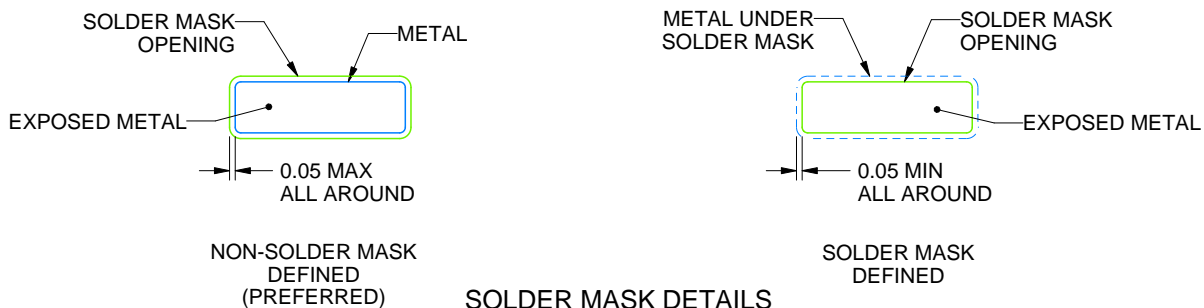
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220204/B 12/2023

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

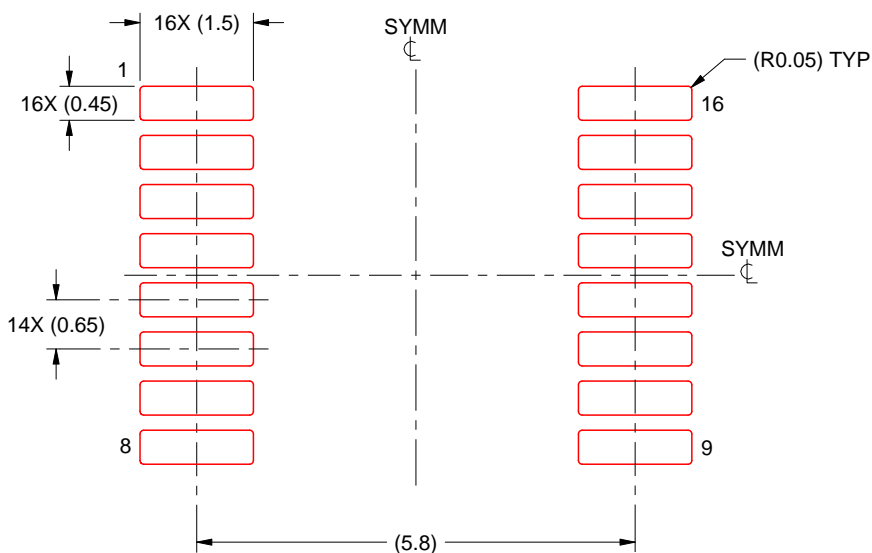
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220204/B 12/2023

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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