DESCRIPTION

This 4-bit noninverting bus transceiver uses two separate configurable power-supply rails. The A port is designed to track VCCA. VCCA accepts any supply voltage from 0.9 V to 3.6 V. The B port is designed to track VCCB. VCCB accepts any supply voltage from 0.9 to 3.6 V. This allows for universal low-voltage bi-directional translation between any of the 0.9V, 1.2V, 1.5V, 1.8V, 2.5V, and 3.3V voltage nodes.

The AL4T774 is designed for asynchronous community-cation 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 ICC and ICCZ.

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

AL4T774 is available in TSSOP16, VQFN16 (2.5x3.5) and TQFN16(2.6x1.8) packages.

ORDERING INFORMATION

Package Type	Part Number	
TSSOP16 SPQ: 4,000pcs/Reel	TMX16	AL4T774TMX16R
		AL4T774TMX16VR
VQFN16(2.5x3.5) SPQ: 5,000pcs/Reel	VQ16	AL4T774VQ16R
		AL4T774VQ16VR
TQFN16(2.6x1.8) SPQ: 3,000pcs/Reel	TQ16	AL4T774TQ16R
		AL4T774TQ16VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

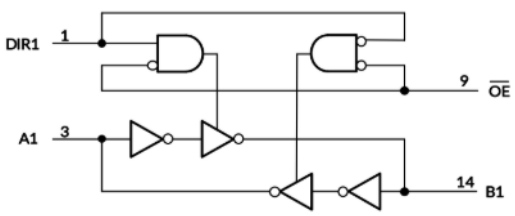
FEATURES

- Each Channel Has an Independent DIR
- Control Input
- Control Inputs VIH/VIL Levels are Referenced to V_{CCA} Voltage
- Power-Supply Range:
  V_{CCA} and V_{CCB}: 0.9V to 3.6V
- V_{CC} Isolation Feature:
  If Either V_{CC} Input is Below 100 mV, all I/Os Outputs are Disabled and Become High Impedance
- I_{OFF}: Supports Partial-Power-Down Mode Operation
- Extended Temperature: -40°C ~ +125°C

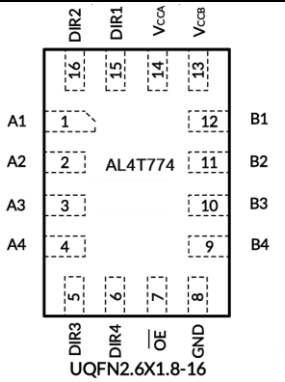
APPLICATION

- Desktop PC
- Personal electronics
- Industrial
- Enterprise

LOGIC SYMBOL

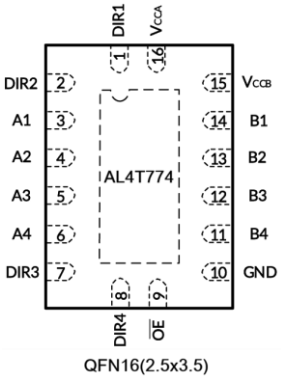


PIN DESCRIPTION



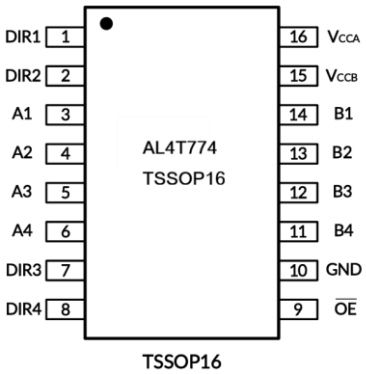
TQFN16(2.6x1.8), UQ16

Top View



VQFN16(2.5x3.5), Q16

Top View



TSSOP16, TMX16

Top View

PIN#		Symbol	I/O Type	Function
TSSOP16/ VQFN16 (2.5x3.5)	TQFN16 (2.6x1.8)			
1	15	DIR1	I	Direction-control input referenced to VCCA, controls signal flow for the first (A1/B1) I/O channels.
2	16	DIR2	I	Direction-control input referenced to VCCA, controls signal flow for the second (A2/B2) I/O channels.
3	1	A1	I/O	Input/output A1. Reference to V_{CCA}.
4	2	A2	I/O	Input/output A2. Reference to V_{CCA}.
5	3	A3	I/O	Input/output A3. Reference to V_{CCA}.
6	4	A4	I/O	Input/output A4. Reference to V_{CCA}.
7	5	DIR3	I	Direction-control input referenced to VCCA, controls signal flow for the second (A3/B3) I/O channels.
8	6	DIR4	I	Direction-control input referenced to VCCA, controls signal flow for the second (A4/B4) I/O channels.
9	7	$\overline{OE}$	I	3-state output-mode enables. Pull OE high to place all outputs in 3-state mode. Referenced to VCCA.
10	8	GND	G	Ground
11	9	B4	I/O	Input/output B4. Reference to V_{CCB}.
12	10	B3	I/O	Input/output B3. Reference to V_{CCB}.
13	11	B2	I/O	Input/output B2. Reference to V_{CCB}.
14	12	B1	I/O	Input/output B1. Reference to V_{CCB}.
15	13	V_{CCB}	P	B-port supply voltage. $0.9V \le V_{CCB} \le 3.6V$
16	14	V_{CCA}	P	A-port supply voltage. $0.9V \le V_{CCB} \le 3.6V$

FUNCTION TABLE

CONTROL INPUT		OUTPUT CIRCUITS		OPERATION
$\overline{OE}$	DIR	A Port	B PORT	
L	L	Enabled	Hi-Z	B data to A data
L	H	Hi-Z	Enabled	A data to B data
H	X	Hi-Z	Hi-Z	Isolation

ABSOLUTE MAXIMUM RATINGS

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

V_{CCA}, Supply Voltage Range		-0.5V ~ +4.6V
V_{CCB}, Supply Voltage Range		-0.5V ~ +4.6V
V_I, Input Voltage Range (1)	A Port	-0.5V ~ +4.6V
	B Port	-0.5V ~ +4.6V
	Control Inputs	-0.5V ~ +4.6V
V_O, Voltage range applied to any output in the high impedance or power-off state (1)	A Port	-0.5V ~ +4.6V
	B Port	-0.5V ~ +4.6V
V_O, Voltage range applied to any output in the high or low state (1) (2)	A Port	-0.5V ~ V_{CCA} +0.5V
	B Port	-0.5V ~ V_{CCB} +0.5V
I_{IK}, Input Clamp Current	V_I < 0	-50mA
I_{OK}, Output Clamp Current	V_O < 0	-50mA
I_O, Continuous Output Current		±50mA
I_O, Continuous Current through V_{CC} or GND		±100mA
θ_{JA}, Package Thermal Impedance (2)	TSSOP16	45°C/W
T_J, Junction Temperature (3)		-40℃ ~ +150℃
T_{STG}, Storage Temperature		-65℃ ~ +150℃
$V_{(ESD)}$, Electrostatic Discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001	±4000V
	Charged-device model (CDM), per ANSI/ESDA/JEDEC JS-002 (1)	±1500V
	Machine Model (MM)	±300V

Stresses above 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 in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(1) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

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

(3) The maximum power dissipation is a function of TJ(MAX), $R_{\theta JA}$, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(MAX)} - T_A) / R_{\theta JA}$. All numbers apply for packages soldered directly onto a PCB.

RECOMMENDED OPERATING CONFITIONS

T_A=25°C, Full=-40°C to 125°C,unless otherwise noted. (1) (2) (3)

Parameter		Symbol	Conditions	Min	Typ.	Max	Unit
Supply Voltage (1)		V_{CCA}	-	0.90	-	3.60	V
		V_{CCB}	-	0.90		3.60	
High-Level Input Voltage	Data inputs (4)	V_{IH}	V_{CCI} = 0.9V ~ 1.95V	V_{CCI} x0.75	-	-	
			V_{CCI} = 1.95V ~ 2.7V	V_{CCI} x0.75	-	-	
			V_{CCI} = 2.7V ~ 3.6V	V_{CCI} x0.75	-	-	
Low-Level Input Voltage	Data inputs (4)	V_{IL}	V_{CCI} = 0.9V ~ 1.95V	-	-	V_{CCI} x0.35	V
			V_{CCI} = 1.95V ~ 2.7V	-	-	V_{CCI} x0.35	
			V_{CCI} = 2.7V ~ 3.6V	-	-	V_{CCI} x0.35	
High-Level Input Voltage	Control inputs (referenced to V_{CCA}) (5)	V_{IH}	V_{CCI} = 0.9V ~ 1.95V	V_{CCI} x0.75	-	-	V
			V_{CCI} = 1.95V ~ 2.7V	V_{CCI} x0.75	-	-	
			V_{CCI} = 2.7V ~ 3.6V	V_{CCI} x0.75	-	-	
Low-Level Input Voltage	Control inputs (referenced to V_{CCA}) (5)	V_{IL}	V_{CCI} = 0.9V ~ 1.95V	-	-	V_{CCI} x0.35	V
			V_{CCI} = 1.95V ~ 2.7V	-	-	V_{CCI} x0.35	
			V_{CCI} = 2.7V ~ 3.6V	-	-	V_{CCI} x0.35	
Input Voltage		V_I	-	0	-	3.60	V
Output Voltage	Active state	V_O	-	0	-	V_{CCO}	V
	3-state		-	0	-	3.60	
High-Level Output Current		I_{OH}	V_{CCO} = 0.9V ~ 1.3V	-	-	-3	mA
			V_{CCO} = 1.4V ~ 1.6V	-	-	-6	
			V_{CCO} = 1.65V ~ 1.95V	-	-	-8	
			V_{CCO} = 2.3V ~ 2.7V	-	-	-9	
			V_{CCO} = 3V ~ 3.6V	-	-	-12	
Low-Level Output Current		I_{OL}	V_{CCO} = 0.9V ~ 1.3V	-	-	3	mA
			V_{CCO} = 1.4V ~ 1.6V	-	-	6	
			V_{CCO} = 1.65V ~ 1.95V	-	-	8	
			V_{CCO} = 2.3V ~ 2.7V	-	-	9	
			V_{CCO} = 3V ~ 3.6V	-	-	12	
Input Transition Rise or Fall		Δt/Δv	-	-	-	5	ns/V
Operating Free-air Temperature		T_A	-	-40	-	+125	°C

(1) VCCI is the VCC associated with the data input port.
(2) VCCO is the VCC associated with the output port.
(3) All unused data inputs of the device must be held at VCCI or GND to ensure proper device operation.
(4) For VCCI values not specified in the data sheet, VIH min = VCCI × 0.75 V, VIL max = VCCI × 0.35 V.
(5) For VCCA values not specified in the data sheet, VIH min = VCCA × 0.75 V, VIL max = VCCA × 0.35 V..

ELECTRICAL CHARACTERISTICS

Parameter		Conditions		Min	Typ.	Max	Unit
V_{OH}		I_{OH} = -100μA, V_I=V_{IH}, V_{CCA}=0.9V ~ 3.6V V_{CCB}=0.9V ~ 3.6V	-40℃ ~ +125℃	V_{CCO}-0.2	-	-	V
		I_{OH} = -3mA, V_I=V_{IH}, V_{CCA}=1.2V, V_{CCB}=1.2V		0.95	-	-	
		I_{OH} = -6mA, V_I=V_{IH}, V_{CCA}=1.4V, V_{CCB}=1.4V		1.05	-	-	
		I_{OH} = -8mA, V_I=V_{IH}, V_{CCA}=1.65V, V_{CCB}=1.65V		1.20	-	-	
		I_{OH} = -9mA, V_I=V_{IH}, V_{CCA}=2.3V, V_{CCB}=2.3V		1.75	-	-	
		I_{OH} = -12mA, V_I=V_{IH}, V_{CCA}=3V, V_{CCB}=3V		2.30	-	-	
V_{OL}		I_{OH} = -100μA, V_I=V_{IH}, V_{CCA}=0.9V ~ 3.6V V_{CCB}=0.9V ~ 3.6V	-40℃ ~ +125℃	-	-	0.20	V
		I_{OH} = -3mA, V_I=V_{IH}, V_{CCA}=1.2V, V_{CCB}=1.2V		-	-	0.25	
		I_{OH} = -6mA, V_I=V_{IH}, V_{CCA}=1.4V, V_{CCB}=1.4V		-	-	0.35	
		I_{OH} = -8mA, V_I=V_{IH}, V_{CCA}=1.65V, V_{CCB}=1.65V		-	-	0.45	
		I_{OH} = -9mA, V_I=V_{IH}, V_{CCA}=2.3V, V_{CCB}=2.3V		-	-	0.55	
		I_{OH} = -12mA, V_I=V_{IH}, V_{CCA}=3V, V_{CCB}=3V		-	-	0.70	
I_I	DIR	V_I = V_{CCA} or GND, V_{CCA}=0.9V ~ 3.6V V_{CCB}=0.9V ~ 3.6V	+25℃	-	-	±1	μA
			-40℃ ~ +125℃	-	-	±5	
I_{off}	A or B Port	V_I or V_O=0V ~ 3.6V V_{CCA}=0V, V_{CCB}=0V ~ 3.6V	+25℃	-	-	±1	μA
		V_I or V_O=0V ~ 3.6V	-40℃ ~ +125℃	-	-	±5	

		V_{CCB}=0V, V_{CCA}=0V ~ 3.6V					
I_{OZ}	A or B Port	V_O=V_{CCO} or GND V_{IH}=V_{CCI} or GND OE=V_{IH}, V_{CCB}=3.6V, V_{CCA}= 3.6V	+25℃	-	-	±1	μA
		V_O=V_{CCO} or GND V_{IH}=V_{CCI} or GND OE=V_{IH}, V_{CCB}=3.6V, V_{CCA}= 3.6V	-40℃ ~ +125℃	-	-	±2	
I_{CCA}	V_{CCA} supply current	V_I = V_{CCI} or GND, IO=0, V_{CCA}=0.9V ~ 3.6V V_{CCB}=0.9V ~ 3.6V	-40℃ ~ +125℃	-	-	15	μA
		V_I = V_{CCI} or GND, IO=0, V_{CCA}=0V, V_{CCB}=0V ~ 3.6V		-2	-	-	
		V_I = V_{CCI} or GND, IO=0, V_{CCB}=0V, V_{CCA}=0V ~ 3.6V		-	-	15	
I_{CCB}	V_{CCB} supply current	V_I = V_{CCI} or GND, IO=0, V_{CCA}=0.9V ~ 3.6V V_{CCB}=0.9V ~ 3.6V	+25℃	-	-	15	μA
		V_I = V_{CCI} or GND, IO=0, V_{CCA}=0V, V_{CCB}=0V ~ 3.6V	-40℃ ~ +125℃	-	-	15	
		V_I = V_{CCI} or GND, IO=0, V_{CCB}=0V, V_{CCA}=0V ~ 3.6V		-2	-	-	
I_{CCA}+ I_{CCB}	Combined supply current	V_I = V_{CCI} or GND, IO=0, V_{CCB}=0.9V ~ 3.6V V_{CCA}=0.9V ~ 3.6V	-40℃ ~ +125℃	-	-	30	μA
C_I	Input Capacitance	V_I = V_{CCA} or GND, V_{CCB}=3.3V, V_{CCA}=3.3V	+25℃	-	2.50	-	pF
C_{IO}	A or B Port	V_O = V_{CCI} or GND, V_{CCB}=3.3V, V_{CCA}=3.3V	+25℃	-	5	-	pF

SWITCHING CHARACTERISTICS

VCCA=0.9V±0.1 V

over recommended operating free-air temperature range, CL = 50 pF (unless otherwise noted) (1)

Parameter	From (Input)	To (Output)	V_{CCB}=0.9V± 0.1V (1)		V_{CCB}=1.2V± 0.1V (1)		V_{CCB}=1.5V± 0.1V (1)		V_{CCB}=1.8V± 0.15V (1)		V_{CCB}=2.5V± 0.2V (1)		V_{CCB}=3.3 ±0.3V (1)		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
tPLH	An	Bn	6.6	23.9	5.9	18.6	5.5	17.0	5.2	16.5	5.0	15.9	5.0	15.9	ns
tPHL			5.9	18.9	4.9	16.1	4.8	15.5	4.6	15.3	4.8	15.2	4.8	15.0	
tPLH	Bn	An	7.7	24.5	6.8	21.3	6.2	21.2	6.3	19.5	6.1	19.1	6.4	20.1	ns
tPHL			5.9	19.2	5.2	16.5	4.9	16.1	4.7	16.1	4.5	14.9	4.4	14.3	
tPZH	$\overline{OE}$	An	10.2	60.0	7.6	39.3	6.4	42.8	6.0	32.6	5.6	28.1	7.4	27.8	ns
tPZL			9.1	30.2	8.2	27.8	7.8	26.3	7.8	25.4	7.7	25.2	7.5	24.0	
tPZH	$\overline{OE}$	Bn	10.1	44.3	10.7	44.7	10.7	48.9	10.1	56.3	10.7	47.4	12.6	52.4	ns
tPZL			7.3	30.2	6.6	30.9	6.5	30.2	5.8	29.3	6.4	27.5	6.9	30.8	
tPHZ	$\overline{OE}$	An	6.4	31.2	5.8	25.2	5.2	24.5	5.6	22.1	5.4	19.2	7.1	24.3	ns
tPLZ			7.2	29.1	5.7	24.6	4.9	22.2	4.9	23.3	4.8	20.4	6.4	23.6	
tPHZ	$\overline{OE}$	Bn	6.0	28.5	5.5	26.1	5.6	30.2	5.7	28.8	5.6	28.4	5.5	27.9	ns
tPLZ			9.2	31.5	9.4	31.8	9.4	31.4	9.2	31.4	9.6	32.4	9.8	32.4	

VCCA=1.2V±0.1 V

over recommended operating free-air temperature range, CL = 50 pF (unless otherwise noted) (1)

Parameter	From (Input)	To (Output)	V_{CCB}=0.9V± 0.1V (1)		V_{CCB}=1.2V± 0.1V (1)		V_{CCB}=1.5V± 0.1V (1)		V_{CCB}=1.8V± 0.15V (1)		V_{CCB}=2.5V± 0.2V (1)		V_{CCB}=3.3 ±0.3V (1)		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
tPLH	An	Bn	6.8	21.5	5.1	16.7	4.5	14.1	4.1	13.7	4.1	12.6	4.0	12.6	ns
tPHL			5.0	17.0	4.1	14.3	3.9	12.9	3.8	12.5	3.8	11.7	3.6	12	
tPLH	Bn	An	6.1	18.9	5.0	17.0	4.7	16.2	4.5	15.5	4.0	15.2	4.0	15	ns
tPHL			5.1	16.2	4.2	14.4	4.0	14.3	3.7	13.1	3.6	12.3	3.6	11.6	
tPZH	$\overline{OE}$	An	10.2	42.0	7.4	29.1	6.2	31.2	5.6	23.9	5.4	21.5	5.1	20.0	ns
tPZL			7.1	25.5	6.0	22.4	5.7	21.0	5.3	19.7	5.2	18.6	5.1	17.9	
tPZH	$\overline{OE}$	Bn	7.3	29.3	7.2	29.0	7.3	29.7	7.1	29.3	7.1	27.8	7.5	27.5	ns
tPZL			5.1	23.3	5.0	22.1	4.9	21.2	4.5	23.1	5.0	20.6	5.0	20.6	
tPHZ	$\overline{OE}$	An	5.4	27.6	5.4	24.5	4.2	22.7	5.3	21.2	4.7	17.4	5.7	22.8	ns
tPLZ			5.9	25.8	4.8	22.5	4.2	17.7	4.9	20.1	4.3	17.1	5.4	20.4	
tPHZ	$\overline{OE}$	Bn	4.8	23.3	4.6	20.0	5.1	21.0	5.1	21.3	4.6	22.5	4.8	22.8	ns
tPLZ			6.1	21.9	5.9	21.8	6.0	22.8	6.0	21.9	5.9	22.8	5.8	22.5	

VCCA=1.5V±0.1 V

over recommended operating free-air temperature range, CL = 50 pF (unless otherwise noted) (1)

Parameter	From (Input)	To (Output)	V_{CCB}=0.9V±0.1V (1)		V_{CCB}=1.2V±0.1V (1)		V_{CCB}=1.5V±0.1V (1)		V_{CCB}=1.8V±0.15V (1)		V_{CCB}=2.5V±0.2V (1)		V_{CCB}=3.3±0.3V (1)		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
tPLH	An	Bn	6.5	21.0	4.6	16.1	4.0	13.7	3.9	12.8	3.6	11.9	3.5	11.1	ns
tPHL			4.9	15.9	4.0	13.1	3.5	11.9	3.5	11.7	3.2	11.1	3.3	11.1	
tPLH	Bn	An	5.1	17.0	4.4	14.4	4.0	13.7	3.7	13.5	3.5	12.5	3.5	12.5	ns
tPHL			4.9	15.8	4.1	13.2	3.8	12.6	3.4	12.2	3.4	11.3	3.3	11.0	
tPZH	$\overline{OE}$	An	8.7	49.4	6.2	26.3	5.6	22.7	5.0	18.5	4.8	17.7	4.4	16.5	ns
tPZL			6.4	24.3	5.0	18.9	4.8	18.3	4.4	17.4	4.5	16.8	4.1	15.5	
tPZH	$\overline{OE}$	Bn	5.6	22.4	5.6	21.8	5.7	21.5	5.7	21.9	5.5	22.5	5.6	21.8	ns
tPZL			4.0	19.1	4.3	19.8	4.6	19.2	4.0	17.1	3.9	20.1	4.2	21.2	
tPHZ	$\overline{OE}$	An	6.2	25.8	5.1	24.2	4.1	24.0	5.2	20.1	4.0	16.7	5.1	20.7	ns
tPLZ			5.2	26.7	4.8	19.8	4.1	18.9	4.3	20.1	3.9	16.7	5.3	19.7	
tPHZ	$\overline{OE}$	Bn	3.3	18.0	3.5	17.4	3.4	18.6	3.7	20.1	4.0	17.9	3.9	19.5	ns
tPLZ			5.1	18.9	4.8	18.5	4.9	19.2	4.7	18.2	4.9	18.3	4.8	18.6	

VCCA=1.8V±0.1 V

over recommended operating free-air temperature range, CL = 50 pF (unless otherwise noted) (1)

Parameter	From (Input)	To (Output)	V_{CCB}=0.9V±0.1V (1)		V_{CCB}=1.2V±0.1V (1)		V_{CCB}=1.5V±0.1V (1)		V_{CCB}=1.8V±0.15V (1)		V_{CCB}=2.5V±0.2V (1)		V_{CCB}=3.3±0.3V (1)		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
tPLH	An	Bn	6.6	20.6	4.6	15.5	4.0	14.0	3.7	12.9	3.5	11.7	3.5	11.3	ns
tPHL			4.5	15.3	3.5	12.5	3.2	11.1	3.1	10.5	3.0	10.2	3.0	9.9	
tPLH	Bn	An	5.3	16.4	4.0	13.2	3.8	12.6	3.7	12.3	3.4	11.7	3.3	11.6	ns
tPHL			4.7	15.3	3.9	12.8	3.7	12.0	3.3	11.3	3.2	10.7	3.2	10.4	
tPZH	$\overline{OE}$	An	9.5	40.4	6.0	26.6	5.2	29.0	4.5	22.8	4.4	15.8	4.0	15	ns
tPZL			5.7	21.5	4.5	17.7	4.1	15.9	4.0	15	3.9	14.1	3.5	13.4	
tPZH	$\overline{OE}$	Bn	5.1	17.6	4.8	17.4	5.0	17.3	4.9	18.2	5.0	17.1	4.8	17.1	ns
tPZL			4.6	20.0	4.6	19.1	5.2	20.9	4.9	20.1	5.1	19.7	4.5	19.1	
tPHZ	$\overline{OE}$	An	5.8	27.2	5.6	24.8	4.2	21.5	4.9	23.3	4.4	16.7	5.3	21.6	ns
tPLZ			6.3	27.0	4.5	20.9	4.1	19.1	4.8	20.7	4.0	16.7	5.1	18.9	
tPHZ	$\overline{OE}$	Bn	4.7	21.3	4.7	20.7	5.0	19.8	4.7	21.6	4.4	20.4	4.8	21.6	ns
tPLZ			4.0	15.2	4.1	15.0	3.8	15.2	4.0	14.7	3.7	15.2	3.7	15.0	

VCCA=2.5V±0.1 V

over recommended operating free-air temperature range, CL = 50 pF (unless otherwise noted) (1)

Parameter	From (Input)	To (Output)	V_{CCB}=0.9V±0.1V (1)		V_{CCB}=1.2V±0.1V (1)		V_{CCB}=1.5V±0.1V (1)		V_{CCB}=1.8V±0.15V (1)		V_{CCB}=2.5V±0.2V (1)		V_{CCB}=3.3±0.3V (1)		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
tPLH	An	Bn	6.3	19.8	4.3	15.5	3.8	13.1	3.4	12.2	3.3	11.1	3.2	11.0	ns
tPHL			4.6	14.9	3.5	11.6	3.3	10.8	3.1	10.2	3.0	9.8	2.8	9.5	
tPLH	Bn	An	4.6	15.0	3.8	12.6	3.5	11.6	3.3	11.3	3.2	10.5	2.9	10.8	ns
tPHL			4.8	15.0	3.8	12.6	3.6	11.7	3.2	10.8	3.1	10.5	3.1	10.1	
tPZH	$\overline{OE}$	An	8.0	37.7	5.1	23.9	4.4	21.0	4.0	15.0	3.8	13.5	3.4	12.3	ns
tPZL			5.4	19.8	3.8	15.5	3.5	14.6	3.2	12.6	3.1	12.2	2.8	10.8	
tPZH	$\overline{OE}$	Bn	4.0	14.3	3.9	14.1	3.9	14.3	3.8	14.3	3.9	14.4	3.9	14.0	ns
tPZL			4.1	15.3	4.1	15.2	4.1	16.5	4.0	16.7	4.3	16.1	4.1	17.9	
tPHZ	$\overline{OE}$	An	6.6	27.5	5.3	25.7	5.0	20.9	5.4	21.5	4.8	18.2	5.8	22.5	ns
tPLZ			5.3	25.5	4.4	22.7	4.0	19.1	4.7	19.7	4.2	16.8	4.8	20.4	
tPHZ	$\overline{OE}$	Bn	3.7	17.3	3.4	17.3	3.6	17.3	4.0	17.0	4.3	17.6	3.6	16.1	ns
tPLZ			3.3	12.5	3.3	12.5	3.1	12.3	3.1	12.5	3.2	12.3	2.5	11.7	

VCCA=3.3V±0.1 V

over recommended operating free-air temperature range, CL = 50 pF (unless otherwise noted) (1)

Parameter	From (Input)	To (Output)	V_{CCB}=0.9V±0.1V (1)		V_{CCB}=1.2V±0.1V (1)		V_{CCB}=1.5V±0.1V (1)		V_{CCB}=1.8V±0.15V (1)		V_{CCB}=2.5V±0.2V (1)		V_{CCB}=3.3±0.3V (1)		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
tPLH	An	Bn	6.3	19.8	4.1	15.2	3.7	13.1	3.4	11.9	3.1	11.0	3.1	10.2	ns
tPHL			4.3	14.0	3.5	11.3	3.2	10.5	3.1	9.8	2.9	9.3	2.9	9.2	
tPLH	Bn	An	4.9	15.6	3.8	12.2	3.5	11.1	3.3	10.7	3.1	10.1	2.9	9.9	ns
tPHL			4.8	15.8	3.8	12.5	3.5	11.7	3.3	10.8	3.0	10.2	3.0	9.6	
tPZH	$\overline{OE}$	An	7.1	31.8	4.7	20.6	3.6	17.9	3.2	13.2	2.9	11.9	2.7	10.7	ns
tPZL			4.4	18.6	3.0	13.5	2.6	11.1	2.5	10.1	2.3	9.15	1.9	8.4	
tPZH	$\overline{OE}$	Bn	2.6	10.2	2.6	10.1	2.7	10.4	2.8	11.0	2.8	10.8	2.8	10.8	ns
tPZL			5.1	20.9	5.8	20.6	5.3	20.3	5.7	20.3	5.8	20.4	5.8	20.4	
tPHZ	$\overline{OE}$	An	6.9	29.9	5.9	27.2	5.2	22.8	5.4	23.1	4.7	18.5	5.9	21.5	ns
tPLZ			5.1	28.8	4.5	20.6	4.3	18.2	4.8	21	4.2	17.9	5.0	20.1	
tPHZ	$\overline{OE}$	Bn	5.6	21.5	5.5	19.7	5.7	20.4	5.1	20.1	5.0	19.7	5.3	20.6	ns
tPLZ			2.1	8.55	2.0	8.6	2.0	8.6	1.8	8.7	2.0	8.4	2.0	8.6	

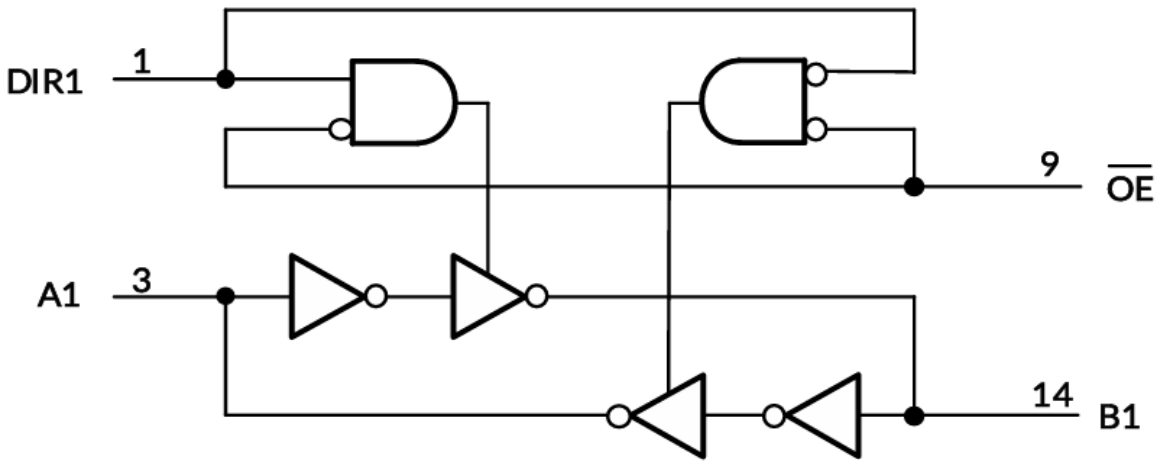
OPERATING CHARACTERISTICS

T_A=25°C

Parameter		Test Conditions	V_{CCA}= V_{CCB}=0.9V	V_{CCA}= V_{CCB}=1.2V	V_{CCA}= V_{CCB}=1.5V	V_{CCA}= V_{CCB}=1.8V	V_{CCA}= V_{CCB}=2.5V	V_{CCA}= V_{CCB}=3.3V	UNIT
			TYP	TYP	TYP	TYP	TYP	TYP	
C_{pdA}(1)	A-port input, B-port output	C_L=0, f=10MHz, t_r=t_f=1ns	2	2	2	3	3	5	pF
	B-port input, A-port output		15	18	22	25	28	32	
C_{pdB}(1)	A-port input, B-port output		15	18	22	25	28	32	
	B-port input, A-port output		2	2	2	3	3	5	

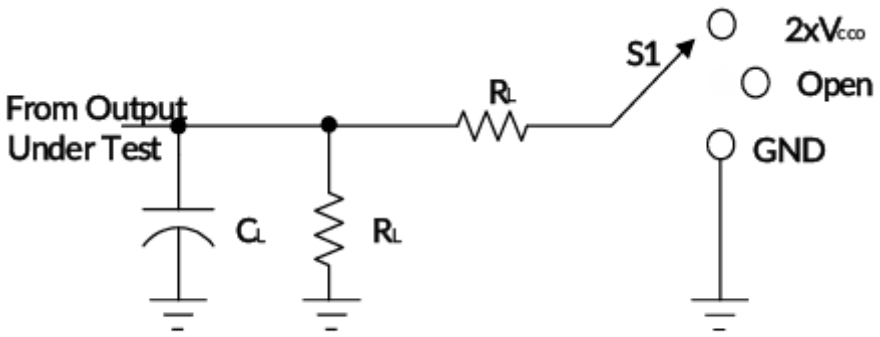
(1) Power dissipation capacitance per transceiver.

BLOCK DIAGRAM



PARAMETER MEASUREMENT INFORMATION

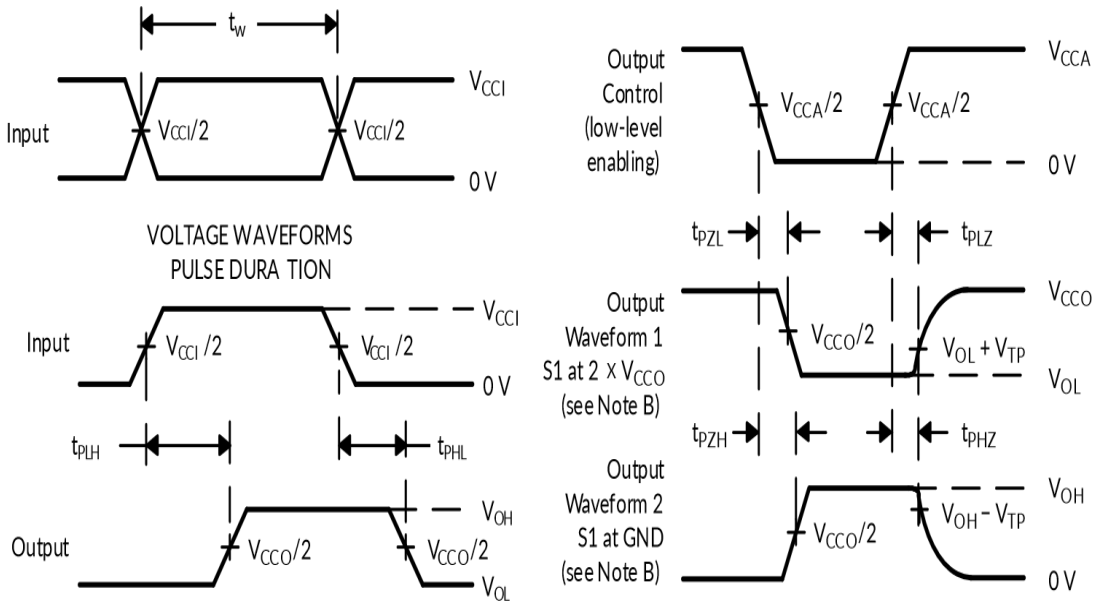
Fig 1. Load Circuit



LOAD CIRCUIT

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

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



NOTES: A. CL 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, ZO = 50Ω, dv/dt≥1V/ns.

D. The outputs are measured one at a time, with one transition per measurement.

E. tPLZ and tPHZ are the same as tdis.

F. tPZL and tPZH are the same as ten.

G. tPLH and tPHL are the same as tpd.

H. All parameters and waveforms are not applicable to all devices.

Fig1. Load Circuit and Voltage Waveforms

APPLICATION INFORMATION

The AL4T774 device can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another. The maximum output current can be up to 12 mA when device is powered by 3.3 V.

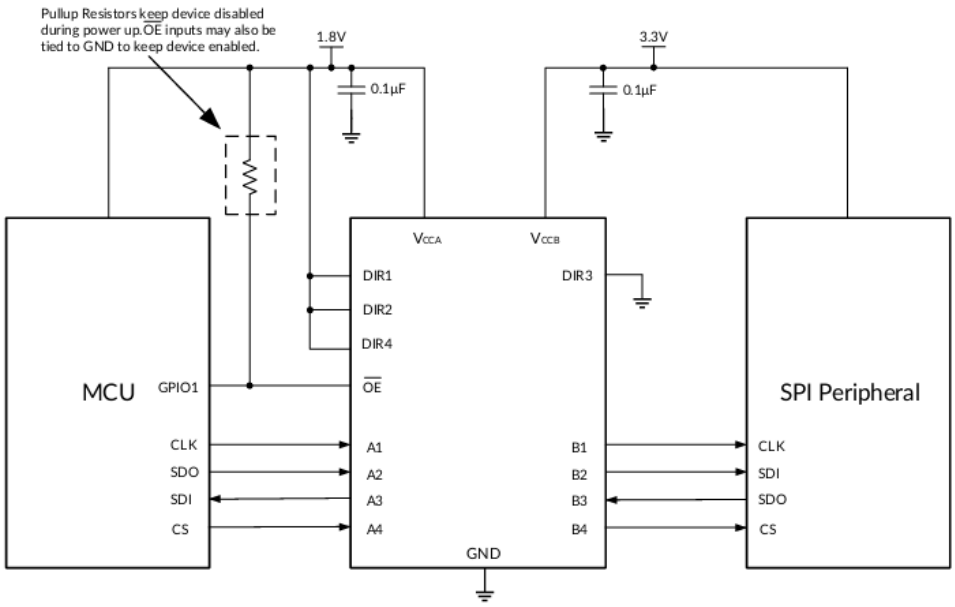


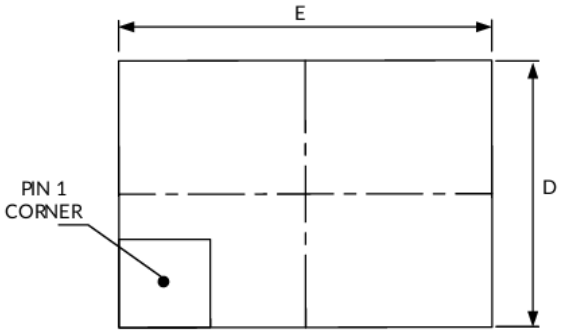
Fig 2. Typical Application Circuit

POWER SUPPLY RECOMMENDATIONS

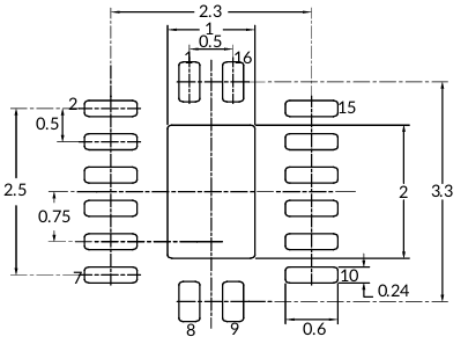
The output-enable OE SPI Peripheral CLK SDI SDO CS input circuit is designed so that it is supplied by VCCA and when the OE input is high, all outputs are placed in the high-impedance state. To ensure the high-impedance state of the outputs during power-up or power-down, the OE input pin must be tied to VCCA through a pullup resistor and must not be enabled until VCCA and VCCB are fully ramped and stable. The minimum value of the pullup resistor to VCCA is determined by the current-sinking capability of the driver.

PACKAGE INFORMATION

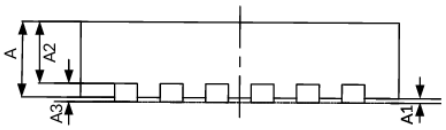
Dimension in VQFN16(2.5x3.5) (Unit: mm)



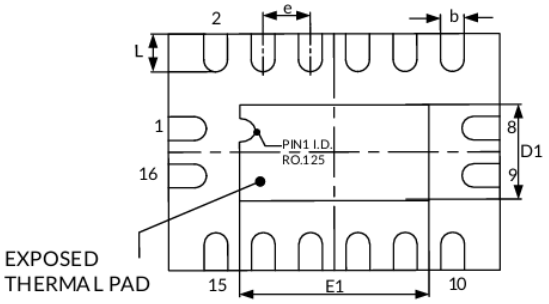
TOP VIEW



RECOMMENDED LAND PATTERN



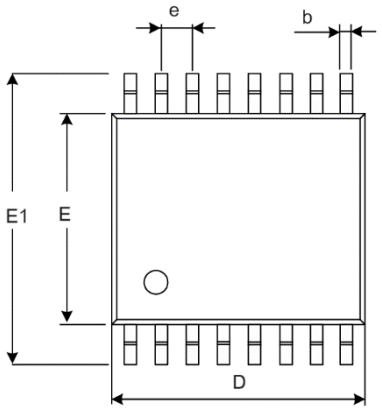
SIDE VIEW

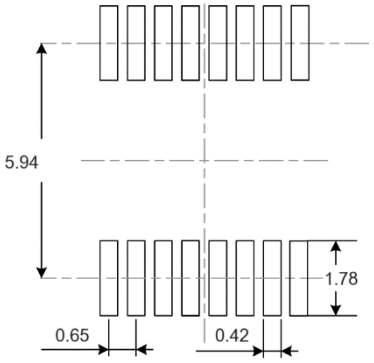


BOTTOM VIEW

Symbol	Millimeters	
	Min	Max
A	0.700	0.800
A1	0.000	0.050
A2	0.600	0.700
A3	0.203 REF.	
b	0.200	0.300
D	2.400	2.600
D1	0.850	1.150
E	3.400	3.600
E1	1.850	2.150
e	0.500 BSC.	
L	0.300	0.500

Dimension in TSSOP16 (Unit: mm)





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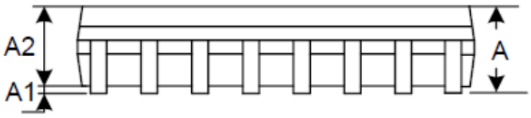
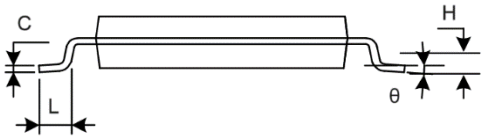
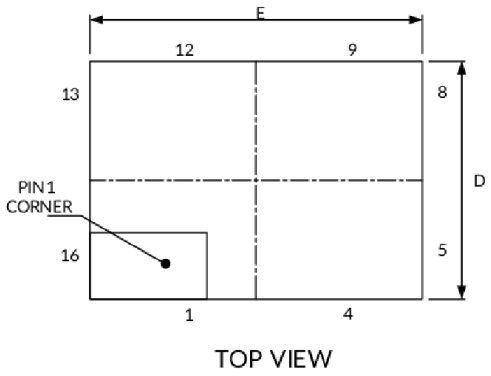


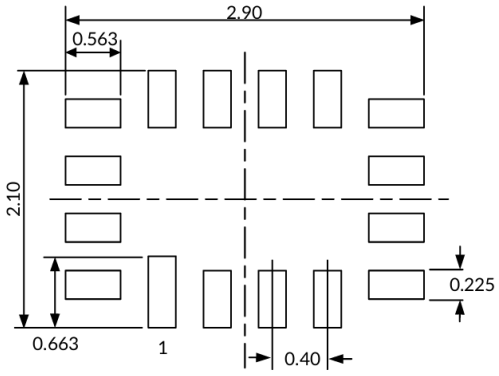


Symbol	Millimeters	
	Min	Max
A	-	1.200
A1	0.050	0.150
A2	0.900	1.050
b	0.200	0.280
c	0.130	0.170
D	4.900	5.100
E	4.300	4.500
E1	6.200	6.600
e	0.650 BSC.	
L	0.450	0.750
H	0.250 TYP.	
θ	0°	8°

Dimension in VQFN16(2.6x1.8) (Unit: mm)



TOP VIEW



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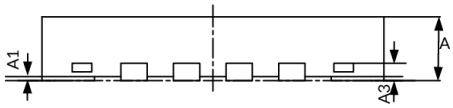
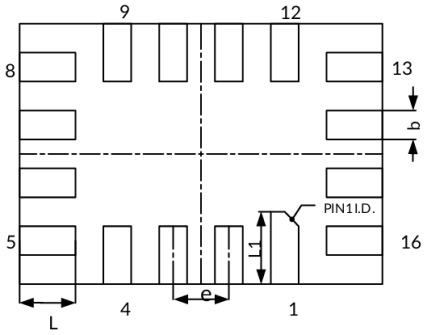


SIDE VIEW



BOTTOM VIEW

Symbol	Millimeters	
	Min	Max
A	0.450	0.550
A1	0.000	0.046
A3	0.110 REF.	
b	0.150	0.250
D	1.750	1.850
E	2.550	2.650
e	0.400 TYP.	
L	0.350	0.450
L1	0.450	0.550

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