4-bit dual supply translating transceiver with configurable voltage translation; 3-state

General Description

The ETQ74AVC4T774 is a 4-bit, dual supply transceiver that enables bidirectional level translation. It features two 8-bit input-output ports (An and Bn), a direction control input (DIR), an output enable input ($\overline{OE}$) and dual supply pins ($V_{CC(A)}$ and $V_{CC(B)}$). Both $V_{CC(A)}$ and $V_{CC(B)}$ can be supplied at any voltage between 0.8 V and 3.6 V making the device suitable for translating between any of the low voltage nodes (0.8V, 1.2 V, 1.5 V, 1.8 V, 2.5 V and 3.3 V). Pins An, OE and DIR are referenced to $V_{CC(A)}$ and pins Bn are referenced to $V_{CC(B)}$. A HIGH on DIR allows transmission from An to Bn and a LOW on DIR allows transmission from Bn to An. The output enable input ($\overline{OE}$) can be used to disable the outputs so the buses are effectively isolated.

The device is fully specified for partial power-down applications using I_{OFF}. The I_{OFF} circuitry disables the output, preventing any damaging backflow current through the device when it is powered down. In suspend mode when either $V_{CC(A)}$ or $V_{CC(B)}$ are at GND level, both An and Bn outputs are in the high-impedance OFF-state.

Features

- Wide Supply Voltage Range:
  VCC(A): 0.8 V to 3.6 V
  VCC(B): 0.8 V to 3.6 V
- Suspend mode
- Maximum Data Rates:
  380 Mbit/s (≥ 1.8 V to 3.3 V translation)
  200 Mbit/s (≥ 1.1 V to 3.3 V translation)
  200 Mbit/s (≥ 1.1 V to 2.5 V translation)
  200 Mbit/s (≥ 1.1 V to 1.8 V translation)
  150 Mbit/s (≥ 1.1 V to 1.5 V translation)
  100 Mbit/s (≥ 1.1 V to 1.2 V translation)
- I_{OFF} Circuitry Provides Partial Power-down Mode Operation
- Multiple Package Options Automotive AEC-Q100 Grade 1 Qualified
  -- Ambient temperature range of -40°C to +125°C
  -- ESD HBM 4KV PASS
  -- ESD CDM 1.5KV PASS
  -- Latch Up Current to 100mA PASS

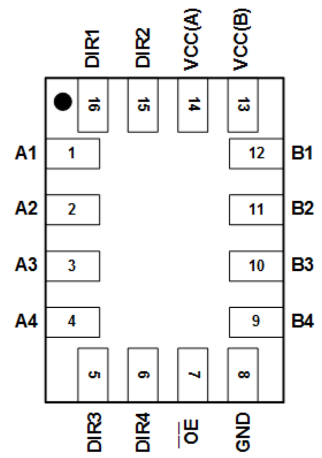
Applications

- Constant-Voltage Power Supply for Battery-Powered Device
- Constant-Voltage Power Supply for Smartphones, Tablets
- Constant-Voltage Power Supply for Cameras, DVRs, STB and Camcorders

Ordering Information

Part No.	Package	MSL
ETQ74AVC4T774	QFN16L（2.6x1.8mm）	Level 1

Pin Configuration



QFN16L

Fig 1. Top View

Pin Function

Pin		I/O	Description
Pin Name	XQFN16		
V_{CCA}	14	–	A port supply voltage.
V_{CCB}	13	–	B port supply voltage.
DIR1~DIR4	15,16,5,6	I	Direction-control signal. Referenced to V_{CCA}.
$\overline{OE}$	7	I	3-state output-mode enables. Pull OE high to place all outputs in 3-state mode. Referenced to V_{CCA}.
A1~A4	1~4	I/O	Input/output A1~A8.Referenced to V_{CCA}
B1~B4	9~12	I/O	Input/output B1~B8.Referenced to V_{CCB}
GND	8	–	Ground

Functional Diagram

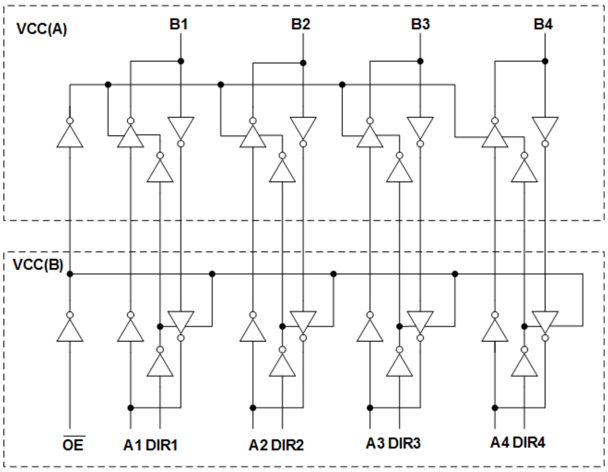


Fig 2. Logic Symbol

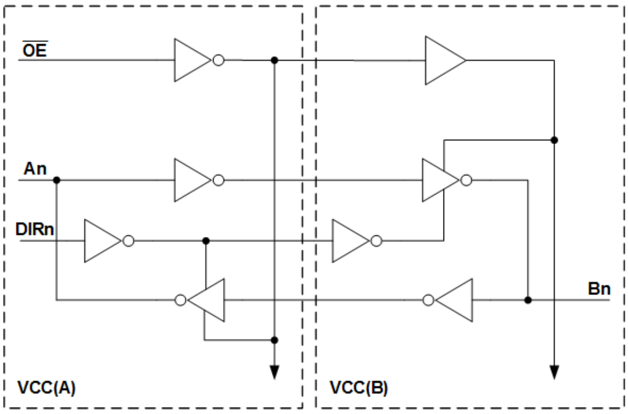


Fig 3. Logic Diagram

Functional Description

Table 1. Function table[1]

Supply voltage	Input		Input/Output	
$V_{CC(A)}$, $V_{CC(B)}$	$\overline{OE}$ [2]	DIR[2]	An[2]	Bn[2]
0.8V to 3.6V	L	L	An = Bn	input
0.8V to 3.6V	L	H	input	Bn = An
0.8V to 3.6V	H	X	Hi-Z	Hi-Z
GND[3]	X	X	Hi-Z	Hi-Z

Note1: H = High Voltage Level; L = Low Voltage Level; X = Don't Care; Z = High-impedance OFF-state.

Note2: The An, DIR and $\overline{OE}$ input circuit is referenced to $V_{CC(A)}$; The Bn input circuit is referenced to $V_{CC(B)}$.

Note3: If at least one of $V_{CC(A)}$ or $V_{CC(B)}$ is at GND level, the device goes into suspend mode.

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Rating	Unit
$V_{CC(A)}$	Supply Voltage A		-0.5~+4.6	V
$V_{CC(B)}$	Supply Voltage B		-0.5~+4.6	V
I_{IK}	Input Clamping Current	V_I < 0 V	-50	mA
V_I	Input Voltage[4]		-0.5~+4.6	V
I_{OK}	Output Clamping Current	V_O < 0 V	-50	mA
V_O	Output Voltage	Active Mode[5]	-0.5~V_{CCO}+0.5	V
		Suspend or 3-state Mode	-0.5~+4.6	V
I_O	Output Current	V_O = 0 V to V_{CC}	±50	mA
I_{CC}	Supply Current	Per $V_{CC(A)}$ or $V_{CC(B)}$ pin	+100	mA
I_{GND}	Ground Current	Per GND pin	-100	mA
T_{STG}	Storage Temperature		-65 to +150	°C
T_{LEAD}	Lead Temperature (Soldering, 10 sec)		260	°C
P_D	Power Dissipation	T_A = 25°C	500	mW
T_J	Operating Junction Range		-40 to +150	°C
V_{ESD}	Human Body Mode[6]		±8000	V
	Charged Device Mode[7]		±1500	V
I_{LU}	Latch-up Current[8]		±100	mA

Note4: I/O absolute maximum rating must be observed.

Note5: V_{CCO} is the supply voltage associated with the output port.

Note6: HBM tested per AEC-Q100-002(EIA/JESD22-A114);

Note7: CDM tested per AEC-Q100-011(EIA/JESD22-C101);

Note8: Latch up Current Maximum Rating tested per AEC-Q100-004(EIA/JESD78E);

Recommended Operating Conditions

Symbol	Parameter	Conditions	Rating	Unit
$V_{CC(A)}$	Supply Voltage A		0.8~3.6	V
$V_{CC(B)}$	Supply Voltage B		0.8~3.6	V
V_I	Input Voltage		0~3.6	V
V_O	Output Voltage	Active Mode	0~V_{CCO}	V
		Suspend or 3-state Mode	0~3.6	V
T_A	Operating Ambient Temperature		-40 to +125	°C
t_r,t_f	Input Rise and Fall Time	V_{CCI} = 0.8 V to 3.6 V [9]	10	ns/V

Note9: V_{CCI} is the supply voltage associated with the input port.

Electrical Characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

V_{CCI} is the supply voltage associated with the data input port; V_{CCO} is the supply voltage associated with the output port.

Symbol	Parameter	Conditions	T_A = +25°C			Unit
			Min	Typ	Max	
V_{OH}	High-Level Output Voltage	V_I = V_{IH} or V_{IL}; I_O = -1.5 mA; $V_{CC(A)}$ = $V_{CC(B)}$ = 0.8 V		0.69		V
V_{OL}	Low-Level Output Voltage	V_I = V_{IH} or V_{IL}; I_O = 1.5 mA; $V_{CC(A)}$ = $V_{CC(B)}$ = 0.8 V		0.07		V
I_I	Input Leakage Current	DIR, $\overline{OE}$ Input; V_I = 0 V or 3.6 V; $V_{CC(A)}$ = $V_{CC(B)}$ = 0.8 V to 3.6 V		±0.025	±0.25	μA
I_{OZ}	Off-State Output Current	A or B port; V_O = 0 V or V_{CCO}; $V_{CC(A)}$ = $V_{CC(B)}$ = 3.6 V		±0.5	±2.5	μA
		Suspend Mode A port; V_O = 0 V or V_{CCO}; $V_{CC(A)}$ = 3.6 V; $V_{CC(B)}$ = 0 V		±0.5	±2.5	μA
		Suspend Mode B port; V_O = 0 V or V_{CCO}; $V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 3.6 V		±0.5	±2.5	μA
I_{OFF}	Power-Off Leakage Current	A port; V_I or V_O = 0 V to 3.6 V; $V_{CC(A)}$ =0 V; $V_{CC(B)}$ = 0.8V to 3.6V		±0.1	±1	μA
		B port; V_I or V_O = 0 V to 3.6 V; $V_{CC(B)}$ =0 V; $V_{CC(A)}$ = 0.8 V to 3.6 V		±0.1	±1	μA
C_I	Input Capacitance	DIR, $\overline{OE}$ Input; V_I = 0 V or 3.3 V; $V_{CC(A)}$ = $V_{CC(B)}$ = 3.3 V		2		pF
$C_{I/O}$	Input/Output Capacitance	A and B port; V_O = 3.3 V or 0 V; $V_{CC(A)}$ = $V_{CC(B)}$ = 3.3 V		4		pF

DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	−40°C ≤ T_A ≤ +85°C		−40°C ≤ T_A ≤ +125°C		Unit
			Min	Max	Min	Max	
V_{IH}	High−Level Input Voltage	Data Input					
		V_{CCI} = 0.8V	0.70V_{CCI}		0.70V_{CCI}		V
		V_{CCI} = 1.1V to 1.95V	0.65V_{CCI}		0.65V_{CCI}		V
		V_{CCI} = 2.3V to 2.70V	1.6		1.6		V
		V_{CCI} = 3.0V to 3.60V	2.0		2.0		V
		DIR, $\overline{OE}$ Input					
		$V_{CC(A)}$ = 0.8V	0.70$V_{CC(A)}$		0.70$V_{CC(A)}$		V
		$V_{CC(A)}$ = 1.1V to 1.95V	0.65$V_{CC(A)}$		0.65$V_{CC(A)}$		V
		$V_{CC(A)}$ = 2.3V to 2.70V	1.6		1.6		V
		$V_{CC(A)}$ = 3.0V to 3.60V	2.0		2.0		V
V_{IL}	Low−Level Input Voltage	Data Input					
		V_{CCI} = 0.8V		0.30V_{CCI}		0.30V_{CCI}	V
		V_{CCI} = 1.1V to 1.95V		0.35V_{CCI}		0.35V_{CCI}	V
		V_{CCI} = 2.3V to 2.70V		0.7		0.7	V
		V_{CCI} = 3.0V to 3.60V		0.8		0.8	V
		DIR, $\overline{OE}$ Input					
		$V_{CC(A)}$ = 0.8V		0.30$V_{CC(A)}$		0.30$V_{CC(A)}$	V
		$V_{CC(A)}$ = 1.1V to 1.95V		0.35$V_{CC(A)}$		0.35$V_{CC(A)}$	V
		$V_{CC(A)}$ = 2.3V to 2.70V		0.7		0.7	V
		$V_{CC(A)}$ = 3.0V to 3.60V		0.8		0.8	V
V_{OH}	High-Level Output Voltage	$V_I = V_{IH}$ or V_{IL}					
		I_O = -100µA; $V_{CC(A)} = V_{CC(B)}$ = 0.8V to 3.6 V	V_{CCO} - 0.1		V_{CCO} - 0.1		V
		I_O = -3mA; $V_{CC(A)} = V_{CC(B)}$ = 1.1V	0.85		0.85		V
		I_O = -6mA; $V_{CC(A)} = V_{CC(B)}$ = 1.4V	1.05		1.05		V
		I_O = -8mA; $V_{CC(A)} = V_{CC(B)}$ = 1.65V	1.2		1.2		V
		I_O = -9mA; $V_{CC(A)} = V_{CC(B)}$ = 2.3V	1.75		1.75		V
		I_O = -12mA; $V_{CC(A)} = V_{CC(B)}$ = 3.0V	2.3		2.3		V
V_{OL}	Low-Level Output Voltage	$V_I = V_{IH}$ or V_{IL}					
		I_O = 100µA; $V_{CC(A)} = V_{CC(B)}$ = 0.8V to 3.6 V		0.10		0.10	V
		I_O = 3mA; $V_{CC(A)} = V_{CC(B)}$ = 1.1 V		0.25		0.25	V
		I_O = 6mA; $V_{CC(A)} = V_{CC(B)}$ = 1.4 V		0.35		0.35	V
		I_O = 8mA; $V_{CC(A)} = V_{CC(B)}$ = 1.65 V		0.45		0.45	V
		I_O = 9mA; $V_{CC(A)} = V_{CC(B)}$ = 2.3 V		0.55		0.55	V
		I_O = 12mA; $V_{CC(A)} = V_{CC(B)}$ = 3.0 V		0.70		0.70	V

DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	−40°C ≤ T_A ≤+85°C		−40°C≤ T_A≤+125°C		Unit
			Min	Max	Min	Max	
I_I	Input Leakage Current	DIR, $\overline{OE}$ Input; V_I = 0 V or 3.6 V; $V_{CC(A)}$ = $V_{CC(B)}$ = 0.8 V to 3.6 V		±1		±5	µA
I_{OZ}	Off-State Output Current	A or B port; V_O = 0 V or V_{CCO}; $V_{CC(A)}$ = $V_{CC(B)}$ = 3.6 V		±5		±30	µA
		Suspend Mode A port; V_O = 0 V or V_{CCO}; $V_{CC(A)}$ = 3.6 V; $V_{CC(B)}$ = 0 V		±5		±30	µA
		Suspend Mode B port; V_O = 0 V or V_{CCO}; $V_{CC(A)}$ = 0 V; $V_{CC(B)}$ = 3.6 V		±5		±30	µA
I_{OFF}	Power-Off Leakage Current	A port; V_I or V_O = 0 V to 3.6 V; $V_{CC(A)}$ =0 V; $V_{CC(B)}$ = 0.8 V to 3.6V		±5		±30	µA
		B port; V_I or V_O = 0 V to 3.6 V; $V_{CC(B)}$ =0 V; $V_{CC(A)}$ = 0.8 V to 3.6 V		±5		±30	µA
I_{CC}	Supply Current	A port; V_I = 0 V or V_{CCI}; I_O = 0 A					
		$V_{CC(A)}$ = 0.8 to 3.6 V; $V_{CC(B)}$ = 0.8 to 3.6 V		10		55	µA
		$V_{CC(A)}$ = 1.1 to 3.6 V; $V_{CC(B)}$ = 1.1 to 3.6 V		8		50	µA
		$V_{CC(A)}$ = 3.6 V; $V_{CC(B)}$ = 0.0 V		8		50	µA
		$V_{CC(A)}$ = 0.0 V; $V_{CC(B)}$ = 3.6 V	-2		-12		µA
		B port; V_I = 0 V or V_{CCI}; I_O = 0 A					
		$V_{CC(A)}$ = 0.8 to 3.6 V; $V_{CC(B)}$ = 0.8 to 3.6 V		10		55	µA
		$V_{CC(A)}$ = 1.1 to 3.6 V; $V_{CC(B)}$ = 1.1 to 3.6 V		8		50	µA
		$V_{CC(A)}$ = 3.6 V; $V_{CC(B)}$ = 0.0 V		8		50	µA
		$V_{CC(A)}$ = 0.0 V; $V_{CC(B)}$ = 3.6 V	-2		-12		µA
		A plus B port ($I_{CC(A)}$ + $I_{CC(B)}$); I_O = 0 A; V_I = 0 V or V_{CCI};		16		65	µA

DC Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	−40°C ≤ T_A ≤+85°C		−40°C≤ T_A≤+125°C		Unit
			Min	Max	Min	Max	
ΔI_{CC}	Additional supply current	V_I=3.0 V; $V_{CC(A)} = V_{CC(B)}$ = 3.6 V		500		650	μA

Table 2. Typical Total Supply Current, T_A = 25 °C ($I_{CC(A)} + I_{CC(B)}$)

$V_{CC(A)}$	$V_{CC(B)}$							Unit
	0 V	0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
0 V	0	0.1	0.1	0.1	0.1	0.1	0.1	μA
0.8 V	0.1	0.1	0.1	0.1	0.1	0.3	1.6	μA
1.2 V	0.1	0.1	0.1	0.1	0.1	0.1	0.8	μA
1.5 V	0.1	0.1	0.1	0.1	0.1	0.1	0.4	μA
1.8 V	0.1	0.1	0.1	0.1	0.1	0.1	0.2	μA
2.5 V	0.1	0.3	0.1	0.1	0.1	0.1	0.1	μA
3.3 V	0.1	1.6	0.8	0.4	0.2	0.1	0.1	μA

Dynamic Characteristics

Typical switching characteristics at $V_{CC(A)}$ = 0.8V and T_A = 25°C (unless otherwise noted)

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig 6.; for wave forms see Fig 4. and Fig5.

t_{pd} is the same as t_{PLH} and t_{PHL}; t_{dis} is the same as t_{PLZ} and t_{PHZ}; t_{en} is the same as t_{PZL} and t_{PZH}.

Symbol	Parameter	Conditions	$V_{CC(B)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
t_{pd}	Propagation Delay	An to Bn	14.5	7.3	6.5	6.2	5.9	6.0	ns
		Bn to An	14.5	12.7	12.4	12.3	12.1	12.0	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	14.3	14.3	14.3	14.3	14.3	14.3	ns
		$\overline{OE}$ to Bn	17.0	9.9	9.0	9.4	9.0	9.7	ns
t_{en}	Enable Time	$\overline{OE}$ to An	18.2	18.2	18.2	18.2	18.2	18.2	ns
		$\overline{OE}$ to Bn	19.2	10.7	9.8	9.6	9.7	10.2	ns

Typical switching characteristics at $V_{CC(B)}$ = 0.8V and T_A = 25°C (unless otherwise noted)

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig 6.; for wave forms see Fig 4. and Fig 5.
t_{pd} is the same as t_{PLH} and t_{PHL}; t_{dis} is the same as t_{PLZ} and t_{PHZ}; t_{en} is the same as t_{PZL} and t_{PZH}.

Symbol	Parameter	Conditions	$V_{CC(A)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
t_{pd}	Propagation Delay	An to Bn	14.5	12.7	12.4	12.3	12.1	12.0	ns
		Bn to An	14.5	7.3	6.5	6.2	5.9	6.0	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	14.3	5.5	4.1	4.0	3.0	3.5	ns
		$\overline{OE}$ to Bn	17.0	13.8	13.4	13.1	12.9	12.7	ns
t_{en}	Enable Time	$\overline{OE}$ to An	18.2	5.6	4.1	3.2	2.4	2.2	ns
		$\overline{OE}$ to Bn	19.2	14.6	14.1	13.9	13.7	13.6	ns

Dynamic Characteristics(Continued)

Voltages are referenced to GND (ground = 0 V),TA = 25°C.

Symbol	Parameter	Conditions	$V_{CC(A)} = V_{CC(B)}$						Unit
			0.8 V	1.2 V	1.5 V	1.8 V	2.5 V	3.3 V	
C_{PD} (12) (13)	Power Dissipation Capacitance	A port: (direction An to Bn); output enabled	0.2	0.2	0.2	0.2	0.3	0.4	pF
		A port: (direction An to Bn); output disabled	0.2	0.2	0.2	0.2	0.3	0.4	pF
		A port: (direction Bn to An); output enabled	9.5	9.7	9.8	9.9	10.7	11.9	pF
		A port: (direction Bn to An); output disabled	0.6	0.6	0.6	0.6	0.7	0.7	pF
		B port: (direction An to Bn); output enabled	9.5	9.7	9.8	9.9	10.7	11.9	pF
		B port: (direction An to Bn); output disabled	0.6	0.6	0.6	0.6	0.7	0.7	pF
		B port: (direction Bn to An); output enabled	0.2	0.2	0.2	0.2	0.3	0.4	pF
		B port: (direction Bn to An); output disabled	0.2	0.2	0.2	0.2	0.3	0.4	pF

Note12: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$P_D = C_{PD} \times V_{CC}{}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}{}^2 \times f_o)$ where:

f_i = Input Frequency in MHz;

f_o = Output Frequency in MHz;

C_L = Output Load capacitance in pF;

V_{CC} = Supply Voltage in V;

N = Number of Inputs Switching;

$\Sigma(C_L \times V_{CC}{}^2 \times f_o)$ = Sum of Outputs.

Note13: f_i = 10 MHz; V_I = GND to V_{CC}; $t_r = t_f$ = 1 ns; C_L = 0 pF; $R_L = \infty\ \Omega$.

Dynamic Characteristics(Continued)

Voltages are referenced to GND (ground = 0 V), T_A = -40°C ~ +85°C.

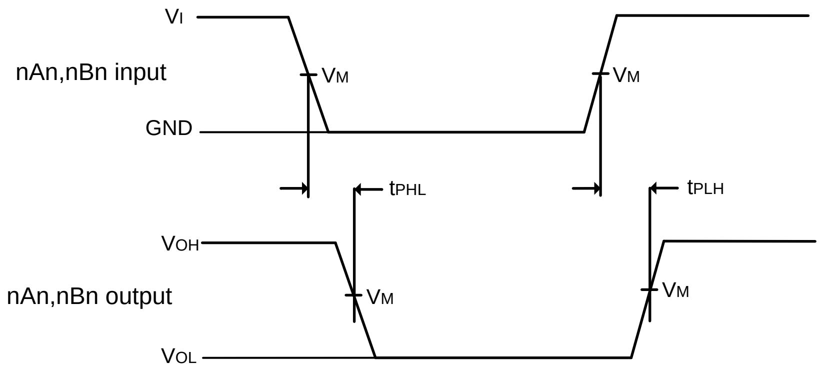
Symbol	Parameter	Conditions	$V_{CC(B)}$										Unit
			1.2V±0.1V		1.5V±0.1V		1.8V±0.15V		2.5V±0.2V		3.3V±0.3V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
$V_{CC(A)}$= 1.1V to 1.3V													
t_{pd}	Propagation Delay	An to Bn	2.0	10.5	1.3	7.8	1.2	6.9	1.0	5.9	0.8	5.7	ns
		Bn to An	2.0	10.5	1.5	9.9	1.5	9.7	1.4	9.4	1.4	9.3	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	2.0	10.0	ns
		$\overline{OE}$ to Bn	2.0	11.1	2.0	8.6	1.0	8.0	0.2	7.0	1.0	8.0	ns
t_{en}	Enable Time	$\overline{OE}$ to An	2.0	13.5	2.0	13.5	2.0	13.5	2.0	13.5	2.0	13.5	ns
		$\overline{OE}$ to Bn	2.0	15.0	2.0	11.0	2.0	9.4	1.0	7.8	1.0	7.4	ns
$V_{CC(A)}$= 1.4V to 1.6V													
t_{pd}	Propagation Delay	An to Bn	1.5	9.9	1.0	7.1	1.0	6.0	0.5	4.8	0.5	4.3	ns
		Bn to An	1.3	7.8	1.0	7.1	0.9	6.9	0.8	6.6	0.6	6.5	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	ns
		$\overline{OE}$ to Bn	2.0	10.2	1.5	7.5	0.9	7.2	0.4	6.2	0.4	6.1	ns
t_{en}	Enable Time	$\overline{OE}$ to An	1.0	7.5	1.0	7.5	1.0	7.5	1.0	7.5	1.0	7.5	ns
		$\overline{OE}$ to Bn	2.0	14.4	1.4	7.9	1.3	7.7	1.1	6.4	1.1	5.6	ns
$V_{CC(A)}$= 1.65V to 1.95V													
t_{pd}	Propagation Delay	An to Bn	1.5	9.7	0.9	6.9	0.8	5.7	0.5	4.5	0.3	4.0	ns
		Bn to An	1.2	6.9	1.0	6.0	0.8	5.7	0.5	5.5	0.5	5.3	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	0.5	5.7	0.5	5.7	0.5	5.7	0.5	5.7	0.5	5.7	ns
		$\overline{OE}$ to Bn	2.0	9.9	1.5	7.0	0.8	6.9	0.2	5.8	0.2	5.9	ns
t_{en}	Enable Time	$\overline{OE}$ to An	1.0	6.7	1.0	6.7	1.0	6.7	1.0	6.7	1.0	6.7	ns
		$\overline{OE}$ to Bn	1.5	13.9	1.2	7.2	1.2	6.9	0.8	5.4	0.6	5.0	ns
$V_{CC(A)}$= 2.3V to 2.7V													
t_{pd}	Propagation Delay	An to Bn	1.4	9.4	0.8	6.6	0.5	5.5	0.4	4.2	0.2	3.7	ns
		Bn to An	1.0	5.9	0.5	4.8	0.5	4.5	0.4	4.2	0.3	3.9	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	0.2	4.0	0.2	4.0	0.2	4.0	0.2	4.0	0.2	4.0	ns
		$\overline{OE}$ to Bn	2.0	9.3	1.5	6.7	0.7	6.3	0.5	5.0	0.2	5.7	ns
t_{en}	Enable Time	$\overline{OE}$ to An	0.6	4.5	0.6	4.5	0.6	4.5	0.6	4.5	0.6	4.5	ns
		$\overline{OE}$ to Bn	1.5	13.6	1.0	6.8	1.0	6.0	0.8	4.6	0.6	4.2	ns
$V_{CC(A)}$= 3.0V to 3.6V													
t_{pd}	Propagation Delay	An to Bn	1.4	9.3	0.6	9.5	0.5	5.3	0.3	3.9	0.2	3.5	ns
		Bn to An	0.8	5.7	0.5	4.3	0.3	4.0	0.2	3.7	0.2	3.5	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	0.2	4.5	0.2	4.5	0.2	4.5	0.2	4.5	0.2	4.5	ns
		$\overline{OE}$ to Bn	2.0	9.0	1.5	6.4	0.7	6.1	0.2	4.8	0.2	5.6	ns
t_{en}	Enable Time	$\overline{OE}$ to An	0.5	4.0	0.5	4.0	0.5	4.0	0.5	4.0	0.5	4.0	ns
		$\overline{OE}$ to Bn	1.5	13.4	1.0	6.7	1.0	5.9	0.7	4.4	0.5	4.0	ns

Dynamic Characteristics(Continued)

Voltages are referenced to GND (ground = 0 V), T_A = -40°C ~ +125°C.

Symbol	Parameter	Conditions	$V_{CC(B)}$										Unit
			1.2V±0.1V		1.5V±0.1V		1.8V±0.15V		2.5V±0.2V		3.3V±0.3V		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
$V_{CC(A)}$= 1.1V to 1.3V													
t_{pd}	Propagation Delay	An to Bn	2.0	12.1	1.3	9.0	1.2	8.0	1.0	6.8	0.8	6.6	ns
		Bn to An	2.0	12.1	1.5	11.4	1.5	11.2	1.4	10.9	1.4	10.7	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	2.0	11.5	2.0	11.5	2.0	11.5	2.0	11.5	2.0	11.5	ns
		$\overline{OE}$ to Bn	2.0	12.8	2.0	9.9	1.0	9.2	0.7	8.1	1.0	9.2	ns
t_{en}	Enable Time	$\overline{OE}$ to An	2.0	15.6	2.0	15.6	2.0	15.6	2.0	15.6	2.0	15.6	ns
		$\overline{OE}$ to Bn	2.0	17.3	2.0	12.7	2.0	10.9	1.0	9.0	1.0	8.6	ns
$V_{CC(A)}$= 1.4V to 1.6V													
t_{pd}	Propagation Delay	An to Bn	1.5	11.4	1.0	8.2	1.0	6.9	0.5	5.6	0.5	5.0	ns
		Bn to An	1.3	9.0	1.0	8.2	0.9	8.0	0.8	7.6	0.6	7.5	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	1.0	6.9	1.0	6.9	1.0	6.9	1.0	6.9	1.0	6.9	ns
		$\overline{OE}$ to Bn	2.0	11.8	1.5	8.7	0.9	8.3	0.4	7.2	0.4	7.1	ns
t_{en}	Enable Time	$\overline{OE}$ to An	1.0	8.7	1.0	8.7	1.0	8.7	1.0	8.7	1.0	8.7	ns
		$\overline{OE}$ to Bn	2.0	16.6	1.4	9.1	1.3	8.9	1.1	7.4	1.1	6.5	ns
$V_{CC(A)}$= 1.65V to 1.95V													
t_{pd}	Propagation Delay	An to Bn	1.5	11.2	0.9	8.0	0.8	6.6	0.5	5.2	0.3	4.6	ns
		Bn to An	1.2	8.0	1.0	6.9	0.8	6.6	0.5	6.4	0.5	6.1	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	0.5	6.6	0.5	6.6	0.5	6.6	0.5	6.6	0.5	6.6	ns
		$\overline{OE}$ to Bn	2.0	11.4	1.5	8.1	0.8	8.0	0.2	6.7	0.2	6.8	ns
t_{en}	Enable Time	$\overline{OE}$ to An	1.0	7.8	1.0	7.8	1.0	7.8	1.0	7.8	1.0	7.8	ns
		$\overline{OE}$ to Bn	1.5	16.0	1.2	8.3	1.2	8.0	0.8	6.3	0.6	5.8	ns
$V_{CC(A)}$= 2.3V to 2.7V													
t_{pd}	Propagation Delay	An to Bn	1.4	10.9	0.8	7.6	0.5	6.4	0.4	4.9	0.2	4.3	ns
		Bn to An	1.0	6.8	0.5	5.6	0.5	5.2	0.4	4.9	0.3	4.5	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	0.2	4.6	0.2	4.6	0.2	4.6	0.2	4.6	0.2	4.6	ns
		$\overline{OE}$ to Bn	2.0	10.7	1.5	7.8	0.7	7.3	0.2	5.8	0.2	6.6	ns
t_{en}	Enable Time	$\overline{OE}$ to An	0.6	5.2	0.6	5.2	0.6	5.2	0.6	5.2	0.6	5.2	ns
		$\overline{OE}$ to Bn	1.5	15.7	1.0	7.9	1.0	6.9	0.8	5.3	0.6	4.9	ns
$V_{CC(A)}$= 3.0V to 3.6V													
t_{pd}	Propagation Delay	An to Bn	1.4	10.7	0.6	7.5	0.5	6.1	0.3	4.5	0.2	4.1	ns
		Bn to An	0.8	6.6	0.5	5.0	0.3	4.6	0.2	4.3	0.2	4.1	ns
t_{dis}	Disable Time	$\overline{OE}$ to An	0.2	5.2	0.2	5.2	0.2	5.2	0.2	5.2	0.2	5.2	ns
		$\overline{OE}$ to Bn	2.0	10.4	1.5	7.4	0.7	7.1	0.2	5.6	0.2	6.5	ns
t_{en}	Enable Time	$\overline{OE}$ to An	0.5	4.6	0.5	4.6	0.5	4.6	0.5	4.6	0.5	4.6	ns
		$\overline{OE}$ to Bn	1.5	15.5	1.0	7.8	1.0	6.8	0.7	5.1	0.5	4.6	ns

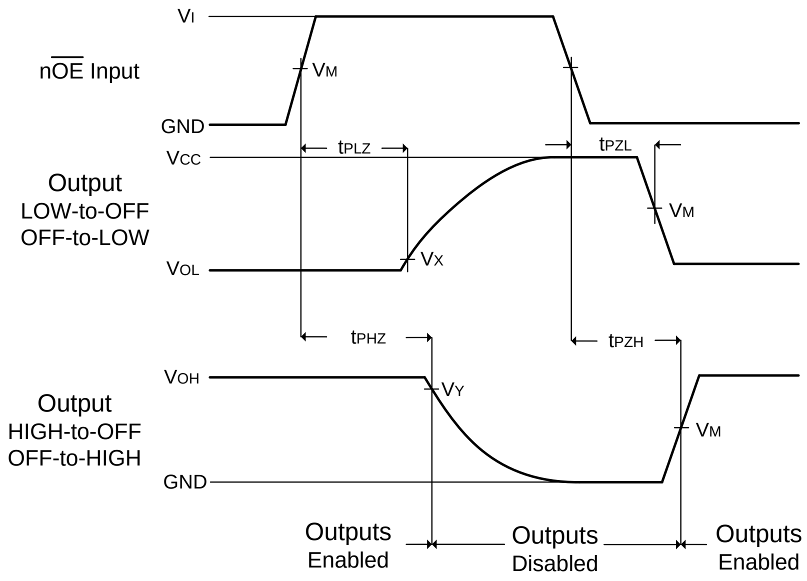
Test Circuit



Measurement points are given in Table 2.

V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 4. The data input (nAn, nBn) to output (nBn, nAn) propagation delay times



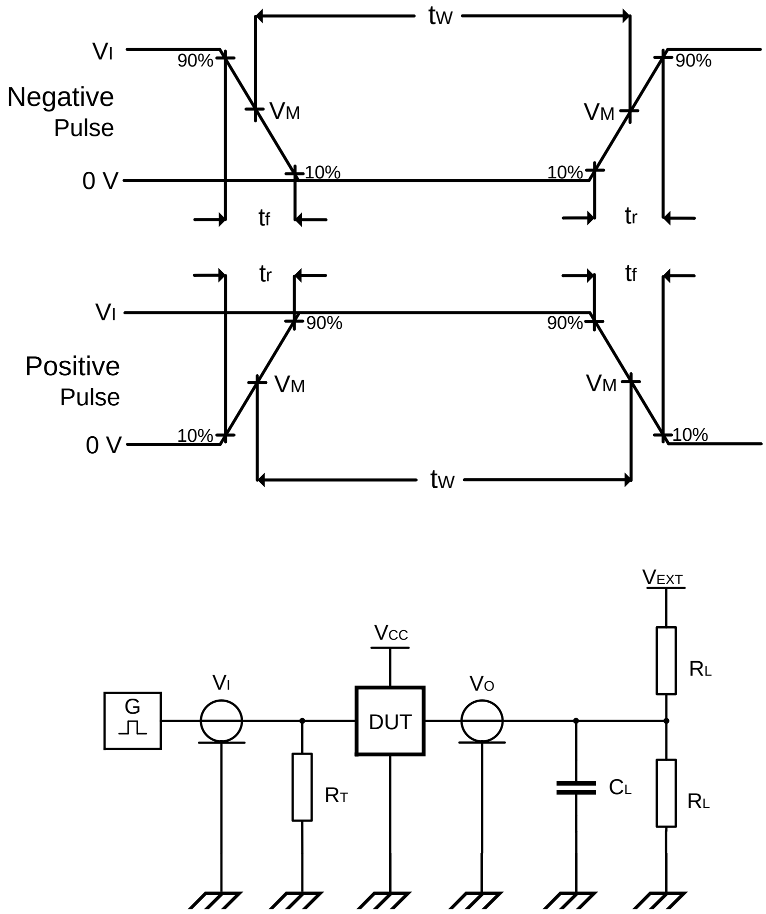
Measurement points are given in Table 2.

V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 5. Enable and disable times

Table 2. Measurement Points

Supply Voltage	**Input**	**Output**		
$V_{CC(A)}$, $V_{CC(B)}$	**V_M**	**V_M**	**V_X**	**V_Y**
0.8V to 1.6V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.1V	V_{OH} - 0.1V
1.65V to 2.7V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.15V	V_{OH} - 0.15V
3.0V to 3.6V	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.3V	V_{OH} - 0.3V



Measurement points are given in Table 3.

Definitions test circuit:

R_L = Load resistance;

C_L = Load capacitance including jig and probe capacitance;

R_T = Termination resistance should be equal to output impedance Z_O of the pulse generator;

V_{EXT} = External voltage for measuring switching times.

Fig 6. Test circuit for measuring switching times

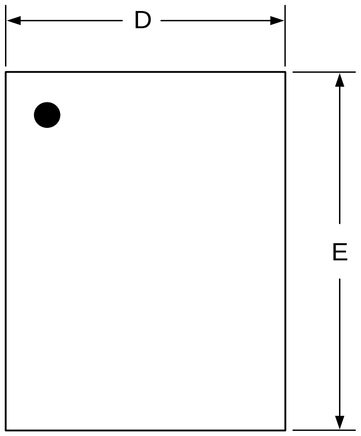
Table 3. Test Data

Supply Voltage	**Input**		**Load**		**V_{EXT}**		
$V_{CC(A)}$, $V_{CC(B)}$	**V_I**	**Δt/ΔV[14]**	**C_L**	**R_L**	**t_{PLH} , t_{PHL}**	**t_{PZH} , t_{PHZ}**	**t_{PZL} , t_{PLZ}**
0.8V to 1.6V	V_{CCI}	≤ 1.0 ns/V	15 pF	2 kΩ	Open	GND	2 × V_{CCO}
1.65V to 2.7V	V_{CCI}	≤ 1.0 ns/V	15 pF	2 kΩ	Open	GND	2 × V_{CCO}
3.0V to 3.6V	V_{CCI}	≤ 1.0 ns/V	15 pF	2 kΩ	Open	GND	2 × V_{CCO}

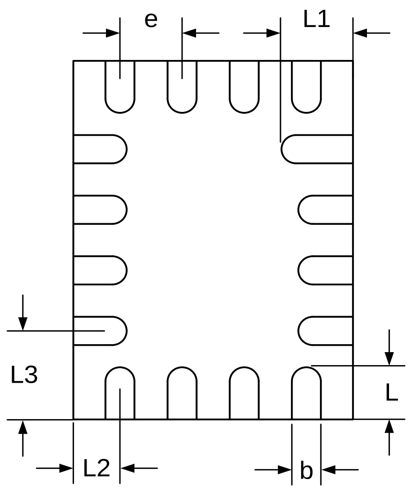
Note14: dV/dt ≥ 1.0 V/ns

Package Dimension

QFN16L



TOP VIEW



BOTTOM VIEW

SIDE VIEW

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0.00	—	0.05
A2	0.15 TYP		
b	0.15	0.20	0.25
D	1.75	1.80	1.85
E	2.55	2.60	2.65
e	0.40 TYP		
L	0.30	0.40	0.50
L1	0.50 TYP		
L2	0.30 TYP		
L3	0.70 TYP		

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2024-10-21	Preliminary Version	Wujunyan	Lichenxuan	Liujy
1.0	2025-03-20	Official Version	Marj	Yangxx	Liujy