

Features

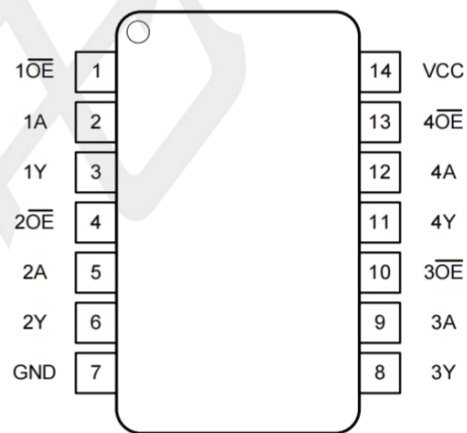
- Wide supply voltage range from 1.65 V to 3.6 V
- CMOS low power dissipation
- Overvoltage tolerant inputs to 5.5 V
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- ESD protection:
HBM ANSI/ESDA/JEDEC JS-00
Class 3A exceeds 6000 V
CDM ANSI/ESDA/JEDEC JS-002
Class C3 exceeds 2000 V
- I_{OFF} circuitry provides partial Power-down mode operation
- Complies with JEDEC standard:
JESD8-7 (1.65 V to 1.95 V)
JESD8-5 (2.3 V to 2.7 V)
JESD8C (2.7 V to 3.6 V)
- Packaging: TSSOP-14

General Description

The is a quad buffer/line driver with 3-state outputs controlled by the output enable inputs (nOE). A HIGH on nOE causes the outputs to assume a high impedance OFF-state. Inputs can be driven from either 2.7 V or 3.3 V devices. This feature allows the use of these devices as translators in mixed 2.7 V and 3.3 V environments.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times. This device is fully specified for partial power down applications using IOFF.

PIN CONFIGURATIONS (Top view)



TSSOP-14

PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION	PIN NO.	PIN NAME	DESCRIPTION
1	1OE	Data enable input(active LOW)	8	3Y	Data output
2	1A	Data input	9	3A	Data input
3	2Y	Data output	10	3OE	Data enable input(active LOW)
4	2OE	Data enable input(active LOW)	11	4Y	Data output
5	2A	Data input	12	4A	Data input
6	2Y	Data output	13	4OE	Data enable input(active LOW)
7	GND	ground (0 V)	14	V _{CC}	supply voltage

Functional diagram

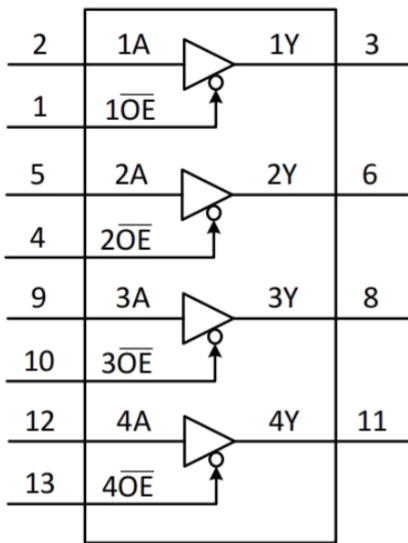


Fig. 1. Logic symbol

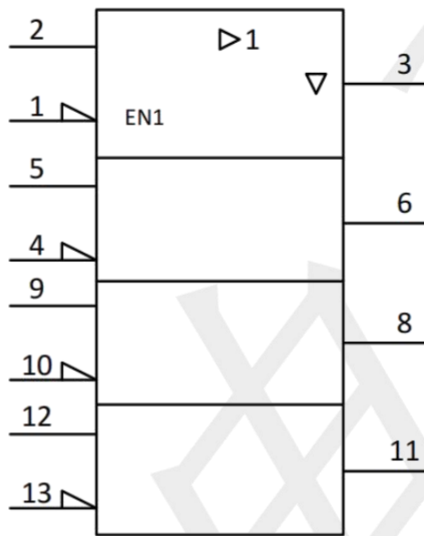


Fig. 2. IEC logic symbol

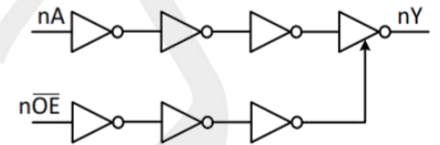


Fig. 3. Logic diagram(one gate)

Functional Description

Function table

Input		Output
\overline{nOE}	nA	nY
L	L	L
L	H	H
H	X	Z

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

ABSOLUTE MAXIMUM RATINGS

In accordance with the Absolute Maximum Rating System. Voltages are referenced to GND.

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	6.5	V
I _{IK}	input clamping current	V _I < 0 V	-50	--	mA
V _I	input voltage	(1)	-0.5	6.5	V
I _{OK}	output clamping current	V _O > V _{CC} or V _O < 0 V	--	±50	mA
V _O	output voltage	Active mode (1)	0	V _{CC} + 0.5	V
		Power-down mode; V _{CC} = 0 V (1)	0	6.5	V
I _O	output current	V _O = 0 V to V _{CC}	--	±50	mA
I _{CC}	supply current		--	100	mA
I _{GND}	ground current		-100	--	mA
P _{tot}	total power dissipation	T _{amb} = -40 °C to + 125 °C	--	500	mW
T _{stg}	storage temperature		-65	150	°C

Note:1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		1.65	3.6	V
		functional	1.2	--	V
V _I	input voltage		0	3.6	V
V _O	output voltage	Active mode	0	V _{CC}	V
		Power-down mode; V _{CC} = 0 V	0	3.6	V
T _{amb}	ambient temperature		-40	125	°C
Δt/ΔV	Input transition rise and fall rate	V _{CC} = 1.65 V to 2.7 V	0	20	ns/V
		V _{CC} = 2.7 V to 5.5 V	0	10	ns/V

Static characteristics

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
V _{IH}	HIGH-level input voltage	V _{CC} = 1.2 V	1.08	--	--	1.08	--	V
		V _{CC} = 1.65 V to 1.95 V	0.65V _{CC}	--	--	0.65V _{CC}	--	V
		V _{CC} = 2.3 V to 2.7 V	1.7	--	--	1.7	--	V
		V _{CC} = 2.7 V to 3.6 V	2.0	--	--	2.0	--	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.2 V	--	--	0.12	--	0.12	V
		V _{CC} = 1.65 V to 1.95 V	--	--	0.35V _{CC}	--	0.35V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	--	--	0.7	--	0.7	V
		V _{CC} = 2.7 V to 3.6 V	--	--	0.8	--	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = -100μA; V _{CC} = 1.65 V to 3.6 V	V _{CC} - 0.1	--	--	V _{CC} - 0.1	--	V
		I _O = -4 mA; V _{CC} = 1.65 V	1.2	--	--	1.05	--	V
		I _O = -8 mA; V _{CC} = 2.3 V	1.9	--	--	1.7	--	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	--	--	2.05	--	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.4	--	--	2.25	--	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = 100μA; V _{CC} = 1.65 V to 3.6 V	--	--	0.10	--	0.10	V
		I _O = 4 mA; V _{CC} = 1.65 V	--	--	0.45	--	0.65	V
		I _O = 8 mA; V _{CC} = 2.3 V	--	--	0.30	--	0.45	V
		I _O = 12 mA; V _{CC} = 2.7 V	--	--	0.40	--	0.60	V
		I _O = 24 mA; V _{CC} = 3.0 V	--	--	0.55	--	0.80	V
I _I	Input leakage current	V _I = 3.6 V or GND ; V _{CC} = 0 V to 3.6 V	--	±0.1	±5	--	±20	μA

Static characteristics

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
I_{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 3.6V$; $V_O = 5.5V$ or GND	--	± 0.1	± 5	--	± 20	μA
I_{OFF}	power-off leakage current	$V_{CC} = 0V$; V_I or $V_O = 3.6 V$	--	± 0.1	± 10	--	± 20	μA
I_{CC}	supply current	$V_I = 3.6V$ or GND ; $I_O = 0A$; $V_{CC} = 1.65V$ to $3.6V$	--	0.01	10	--	40	μA
ΔI_{CC}	additional supply current	per input pin ; $V_{CC} = 2.3V$ to $3.6V$; $V_I = V_{CC} - 0.6V$; $I_O = 0A$	--	0.2	500	--	5000	μA
C_I	input capacitance	$V_{CC} = 3.3V$; $V_I = GND$ to V_{CC}	--	4	--	--	--	pF

Note:All typical values are measured at $V_{CC} = 3.3V$ and $T_{amb} = 25\text{ }^\circ C$.

Dynamic Characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
t_{pd}	propagation delay	nA to nY;						
		$V_{CC} = 1.2 V$	--	25	--	--	--	ns
		$V_{CC} = 1.65 V$ to $1.95 V$	3.0	7.9	16.2	3.0	16.5	ns
		$V_{CC} = 2.3 V$ to $2.7 V$	2.2	4.4	8.0	2.2	8.6	ns
		$V_{CC} = 3.0 V$ to $3.6 V$	1.5	3.4	5.8	1.5	6.0	ns

Dynamic Characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
t_{en}	enable time	$\overline{\text{nOE}}$ to nY						
		$V_{CC} = 1.2 \text{ V}$	--	25	--	--	--	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	3.0	8.0	15.5	3.0	15.7	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.2	4.8	8.0	2.2	8.2	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.5	3.4	5.8	1.5	6.0	ns
t_{dis}	disable time	$\overline{\text{nOE}}$ to nY						
		$V_{CC} = 1.2 \text{ V}$	--	25	--	--	--	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.0	7.2	15.5	2.0	15.7	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.6	5.7	8.6	1.6	8.8	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.3	4.5	6.5	1.3	7.0	ns
C_{PD}	power dissipation capacitance	per buffer ; $V_I = \text{GND to } V_{CC}$						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	--	12	--	--	--	pF
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	--	13	--	--	--	pF
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	--	14	--	--	--	pF
$t_{sk(o)}$	output skew time	$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	--	--	1.0	--	1.5	ns

Note:

Typical values are measured at $T_{amb} = 25 \text{ °C}$ and $V_{CC} = 1.65 \text{ V}, 1.8 \text{ V}, 2.5 \text{ V}, 3.3 \text{ V}$ and 3.6 V respectively.

t_{pd} is the same as t_{PLH} and t_{PHL} .

Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

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

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

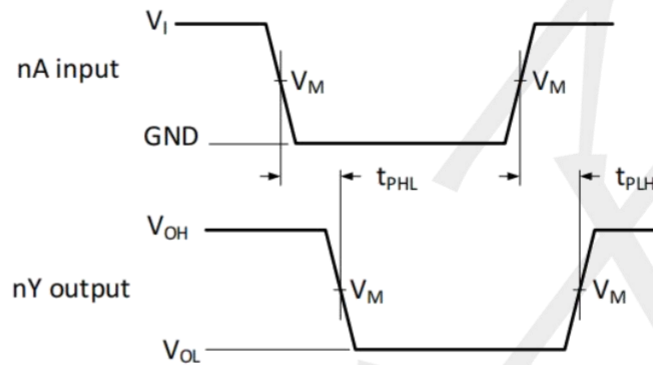
C_L = output load capacitance in

pF; V_{CC} = supply voltage in V;

N = number of inputs switching;

$\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

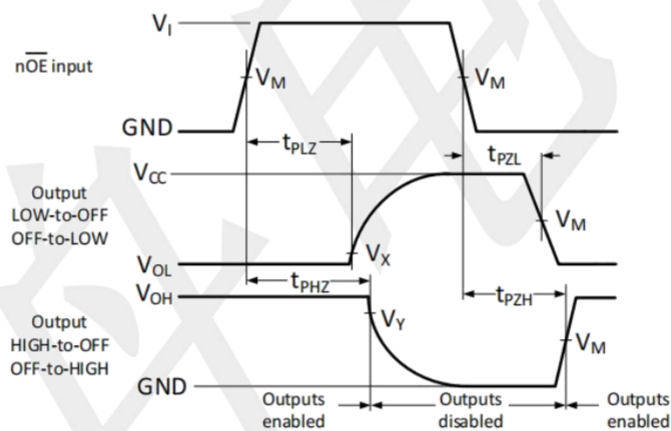
Waveforms and test circuit



Measurement points are given in Table 8.

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

Fig. 5. The input nA to output nY propagation delays



Measurement points are given in Table 8.

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

Fig. 6. 3-state enable and disable times

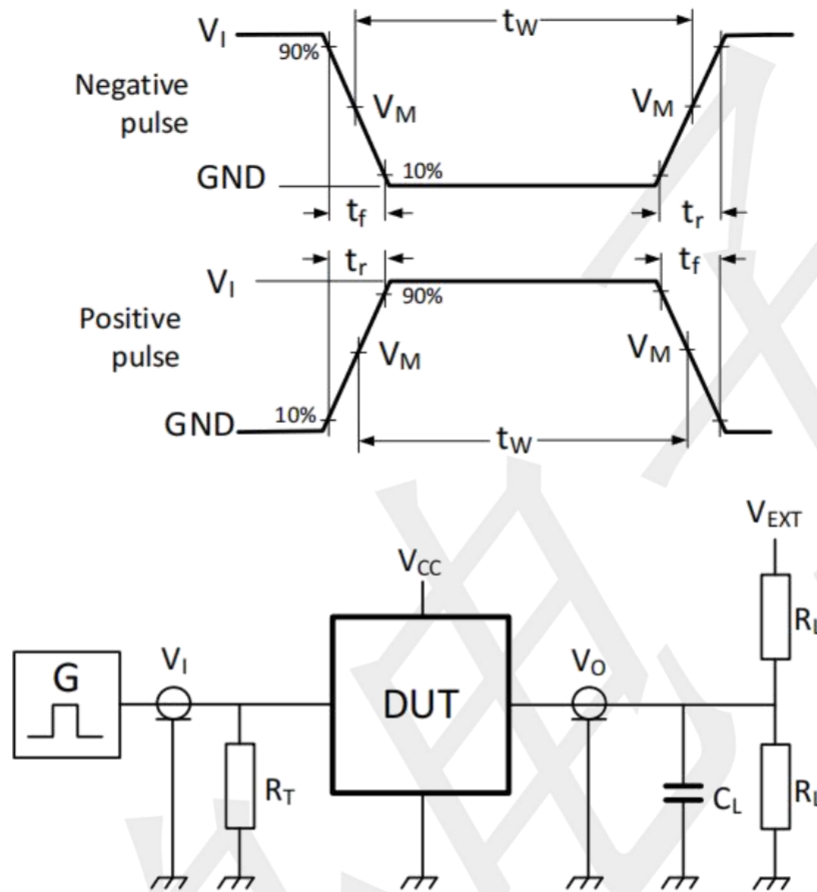
Measurement points

Supply voltage	Input	Output		
V_{CC}	V_M	V_M	V_X	V_Y
1.65 V to 1.95 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.15V$	$V_{OH} - 0.15V$
2.3 V to 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$	$V_{OL} + 0.15V$	$V_{OH} - 0.15V$
3.0 V to 3.6 V	1.5 V	1.5 V	$V_{OL} + 0.3V$	$V_{OH} - 0.3V$

74LVC125APW-TP

Quad Bus Buffer with 3-State Control Inputs

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Test data is given in Table 9.

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

R_T = Termination resistance should be equal to the output impedance Z_o of the pulse generator.

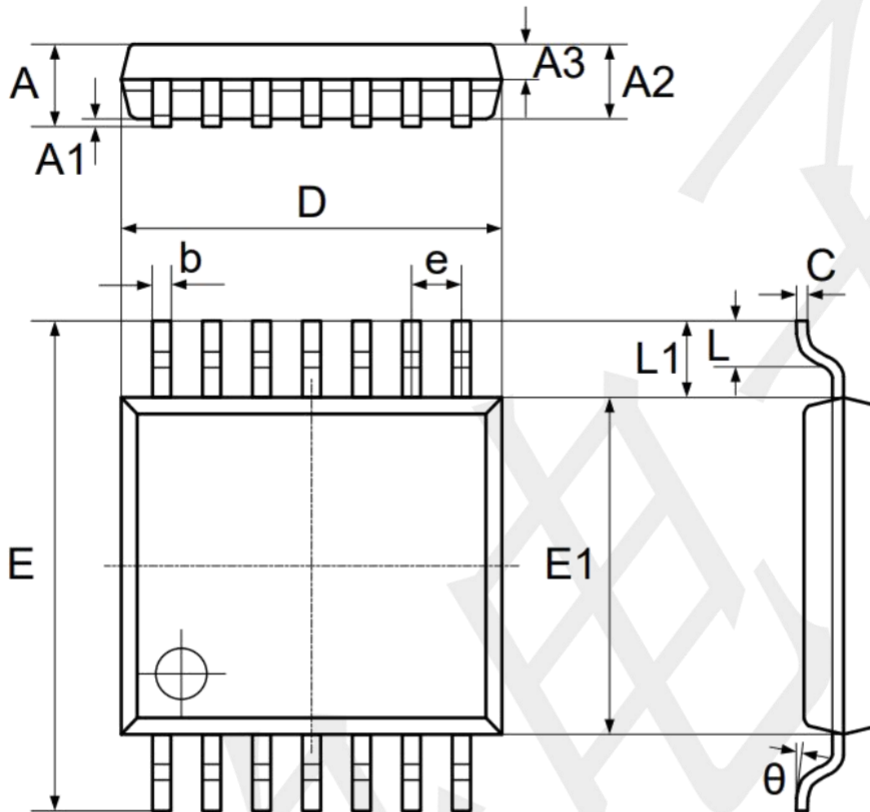
V_{EXT} = External voltage for measuring switching times.

Fig. 7. Test circuit for measuring switching times

Test data

Supply voltage	Input		Load		V_{EXT}		
	V_I	$t_r = t_f$	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
1.65 V to 1.95 V	V_{CC}	≤ 2.0 ns	15 pF	500 Ω	open	GND	$2 \times V_{CC}$
2.3 V to 2.7 V	V_{CC}	≤ 2.0 ns	15 pF	500 Ω	open	GND	$2 \times V_{CC}$
3.0 V to 3.6 V	3 V	≤ 2.0 ns	15 pF	500 Ω	open	GND	6V

Package information TSSOP-14



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	-	1.200	-	0.047
A1	0.050	0.150	0.002	0.006
A2	0.900	1.050	0.035	0.041
A3	0.390	0.490	0.015	0.019
b	0.200	0.290	0.008	0.011
C	0.130	0.180	0.005	0.007
D	4.860	5.060	0.191	0.199
E	6.200	6.600	0.244	0.260
E1	4.300	4.500	0.169	0.177
e	0.650 TYP.		0.026 TYP.	
L1	1.000 REF.		0.039 REF.	
L	0.450	0.750	0.018	0.030
θ	0°	8°	0°	8°