

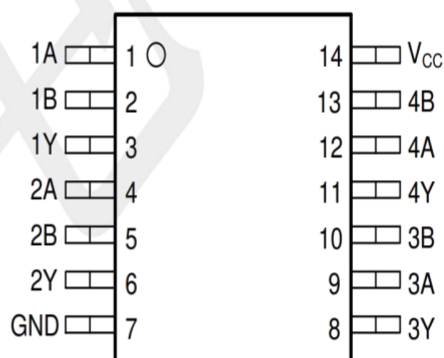
Features

- 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: SOP-14

General Description

The provides four independent 2-input exclusive OR gates. The device is designed for operation with a power supply range of 1.65V to 3.6V. The inputs are tolerant to 3.6V allowing this device to be used in a mixed-voltage environment. The device is fully specified for partial power down applications using I_{OFF}. The I_{OFF} circuitry disables the output preventing damaging current back flow when the device is powered down.

PIN CONFIGURATIONS (Top view)

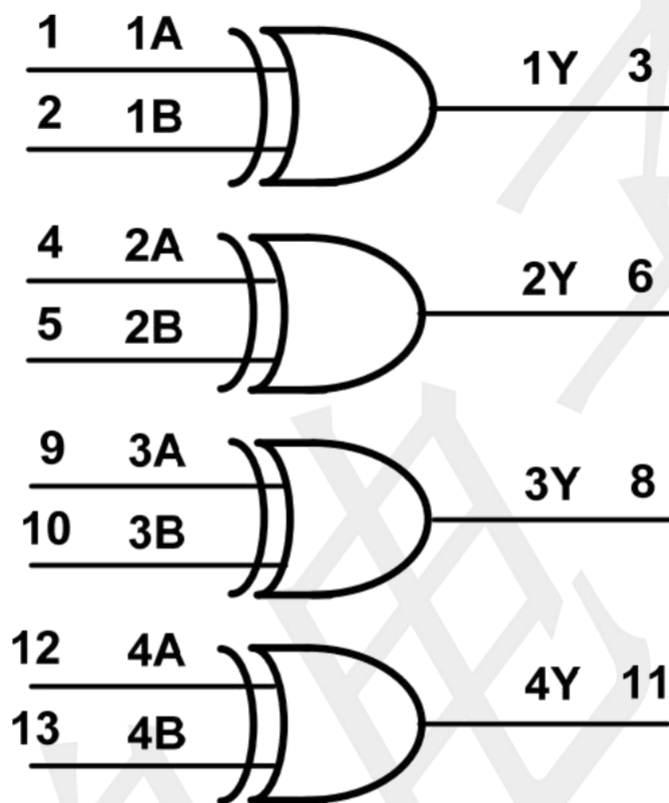


PIN DESCRIPTION

SOP-14

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

Functional diagram



Functional Description

Function table

Input nA	Input nB	Output nY
L	L	L
L	H	H
H	L	H
H	H	L

H = HIGH voltage level; L = LOW voltage level; X = don't care.

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	$V_I < 0\text{ V}$	-50	--	mA
V_I	input voltage	(1)	-0.5	6.5	V
I_{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0\text{ V}$	--	± 50	mA
V_O	output voltage	Active mode (1)	0	$V_{CC} + 0.5$	V
		Power-down mode; $V_{CC} = 0\text{ V}$ (1)	0	6.5	V
I_O	output current	$V_O = 0\text{ V}$ to V_{CC}	--	± 50	mA
I_{CC}	supply current		--	100	mA
I_{GND}	ground current		-100	--	mA
P_{tot}	total power dissipation	$T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	--	500	mW
T_{stg}	storage temperature		-65	150	$^{\circ}\text{C}$

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
V_I	input voltage		0	3.6	V
V_O	output voltage	Active mode	0	V_{CC}	V
		Power-down mode; $V_{CC} = 0\text{ V}$	0	5.5	V
T_{amb}	ambient temperature		-40	125	$^{\circ}\text{C}$
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65\text{ V}$ to 2.7 V	0	20	ns/V
		$V_{CC} = 2.7\text{ V}$ to 3.6 V	0	10	ns/V

Static characteristics

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

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	$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	$0.65V_{CC}$	--	--	$0.65V_{CC}$	--	V
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7	--	--	1.7	--	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2.0	--	--	2.0	--	V
V_{IL}	LOW-level input voltage	$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	--	--	$0.35V_{CC}$	--	$0.35V_{CC}$	V
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	--	--	0.7	--	0.7	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	--	--	0.8	--	0.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}$						
		$I_O = -100 \mu\text{A}; V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	$V_{CC} - 0.1$	--	--	$V_{CC} - 0.1$	--	V
		$I_O = -4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	1.2	--	--	1.05	--	V
		$I_O = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	1.9	--	--	1.7	--	V
		$I_O = -12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	2.2	--	--	2.05	--	V
		$I_O = -24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	2.4	--	--	2.25	--	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}$						
		$I_O = 100 \mu\text{A}; V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$	--	--	0.10	--	0.10	V
		$I_O = 4 \text{ mA}; V_{CC} = 1.65 \text{ V}$	--	--	0.45	--	0.65	V
		$I_O = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$	--	--	0.30	--	0.45	V
		$I_O = 12 \text{ mA}; V_{CC} = 2.7 \text{ V}$	--	--	0.40	--	0.60	V
		$I_O = 24 \text{ mA}; V_{CC} = 3.0 \text{ V}$	--	--	0.55	--	0.80	V
I_I	input leakage current	$V_I = 3.6 \text{ V or GND}; V_{CC} = 0 \text{ V to } 3.6 \text{ V}$	--	± 0.1	± 5	--	± 20	μA

Static characteristics

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

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

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

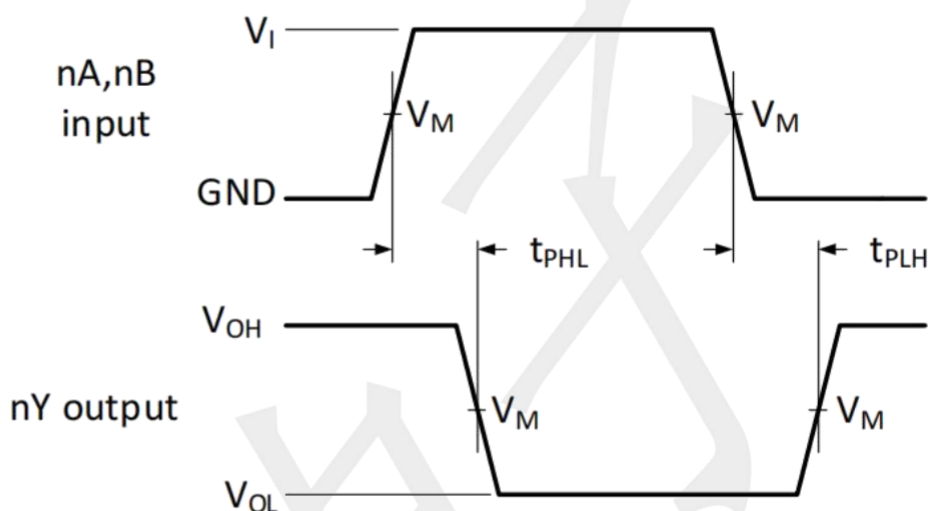
Dynamic Characteristics

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;						
		$V_{CC} = 1.65\text{ V to } 1.95\text{ V}$	3.4	11.4	22	3.4	22.5	ns
		$V_{CC} = 2.3\text{ V to } 2.7\text{ V}$	2.7	6.3	10.5	2.7	11	ns
		$V_{CC} = 3.0\text{ V to } 3.6\text{ V}$	2.0	4.6	7.5	2.0	8.0	ns
$t_{sk(o)}$	output skew time	$V_{CC} = 3.0\text{ V to } 3.6\text{ V}$	--	--	1.0	--	1.5	ns
C_{PD}	power dissipation capacitance	per gate ; $V_I = \text{GND to } V_{CC}$						
		$V_{CC} = 1.65\text{ V to } 1.95\text{ V}$	--	12.7	--	--	--	pF
		$V_{CC} = 2.3\text{ V to } 2.7\text{ V}$	--	13.4	--	--	--	pF
		$V_{CC} = 3.0\text{ V to } 3.6\text{ V}$	--	14.3	--	--	--	pF

Note: Typical values are measured at $T_{amb} = 25\text{ }^\circ\text{C}$ and 2.5 V, 3.3 V and 3.6 V respectively.

Waveforms and test circuit

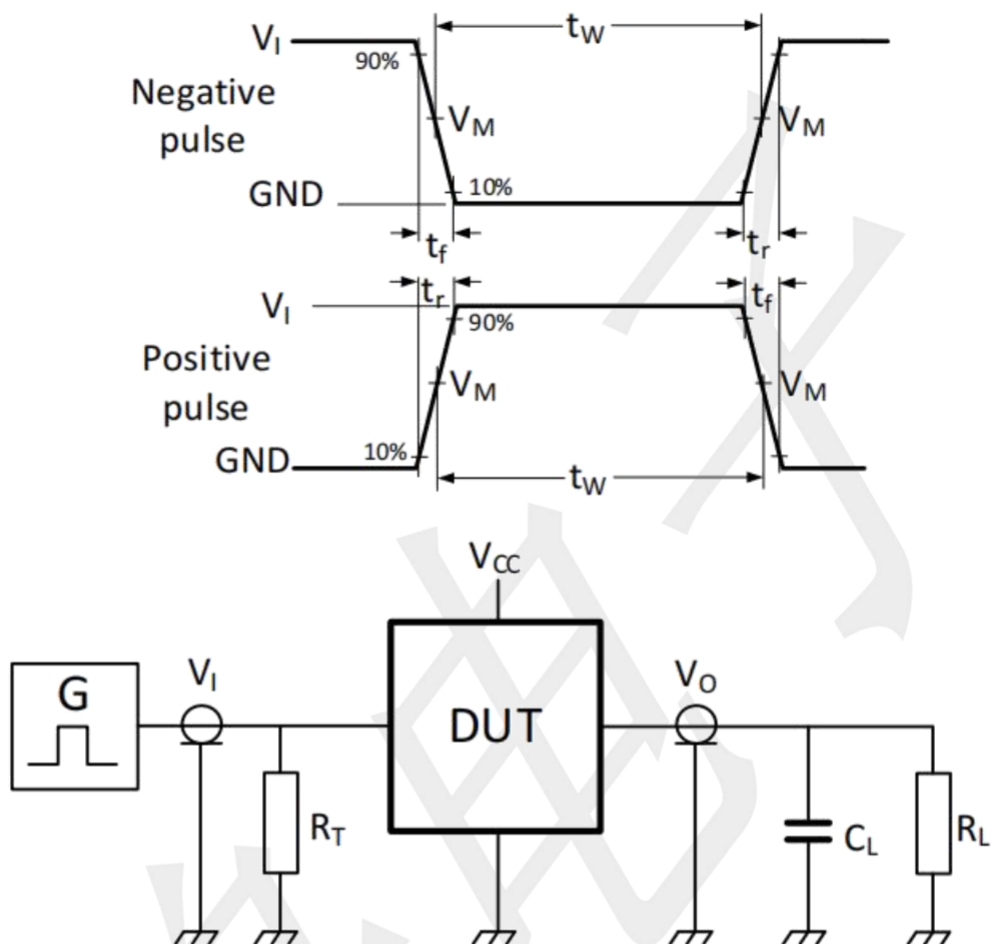


Measurement points are given in Table 8.

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

Measurement points

Supply voltage	Input	Output
V_{CC}	V_M	V_M
1.65 V to 1.95 V	$0.5V_{CC}$	$0.5V_{CC}$
2.3 V to 2.7 V	$0.5V_{CC}$	$0.5V_{CC}$
3.0 V to 3.6 V	1.5 V	1.5 V



Test data is given in Table 9.

Definitions for test circuit:

R_L = Load resistance.

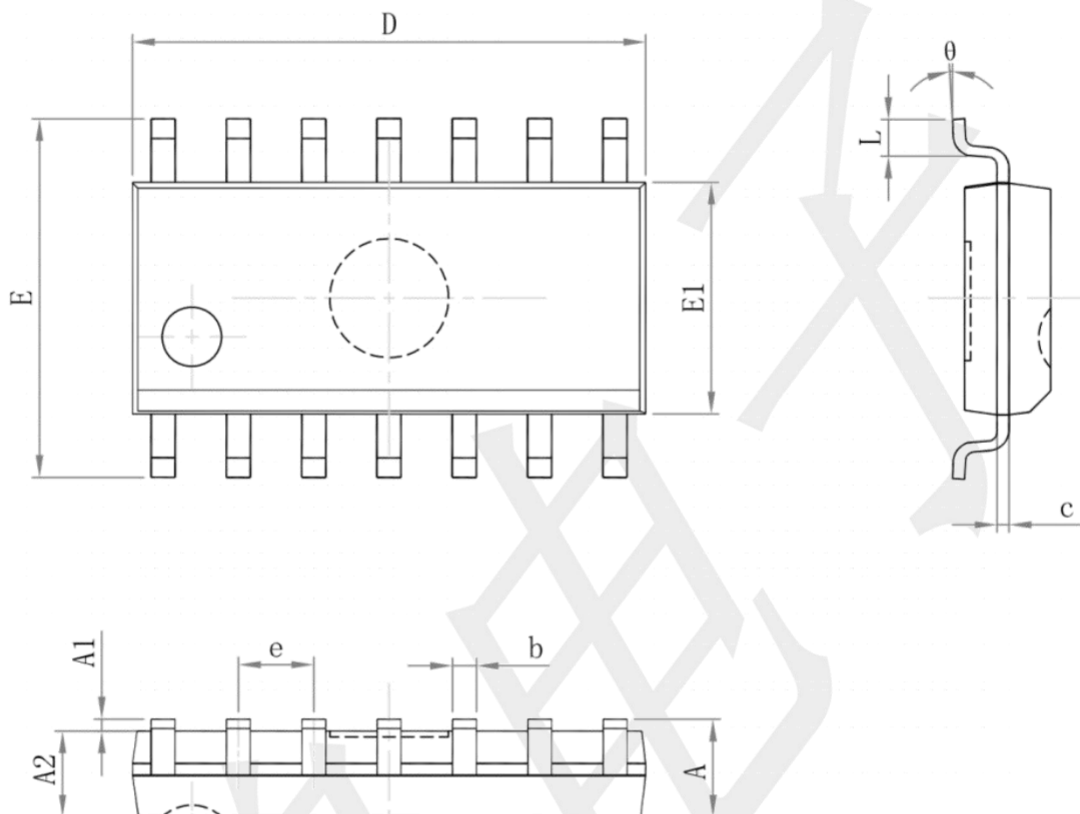
C_L = Load capacitance including jig and probe capacitance.

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

Test data

Supply voltage	Input		Load	
V_{CC}	V_I	$t_r = t_f$	C_L	R_L
1.65 V to 1.95 V	V_{CC}	≤ 2.0 ns	15 pF	500 Ω
2.3 V to 2.7 V	V_{CC}	≤ 2.0 ns	15 pF	500 Ω
3.0 V to 3.6 V	3 V	≤ 2.0 ns	15 pF	500 Ω

Package information SOP-14



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	—	1.750	—	0.069
A1	0.100	0.250	0.004	0.010
A2	1.250	—	0.049	—
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	8.450	8.850	0.333	0.348
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
theta	0°	8°	0°	8°