

General Description

This single 2-input positive-OR gate is designed for 1.65-V to 5.5-V V_{CC} operation.

The NC7SZ32 performs the Boolean function $Y = A + B$ or $Y = \overline{A} \cdot \overline{B}$ in positive logic.

The CMOS device has high output drive while maintaining low static power dissipation over a broad V_{CC} operating range.

Features

- Low Power Consumption, 10- μ A Max ICC
- Supports 5-V VCC Operation
- Inputs Accept Voltages to 5.5 V
- Provides Down Translation to VCC
- Max tpd of 3.6 ns at 3.3 V
- ± 24 -mA Output Drive at 3.3 V

The NC7SZ32 device is available in a variety of packages.

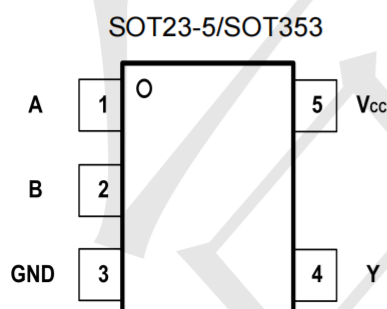
Applications

- Personal Navigation Device (GPS)
- AV Receiver
- High-Speed Data Acquisition and Generation
- SSD: Internal and External
- Digital Picture Frame (DPF)
- TV: LCD/Digital and High-Definition (HDTV)

Ordering Information

ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION
NC7SZ32M5X-TP	SOT23-5	Tape and Reel,3000
NC7SZ32P5X-TP	SOT353	Tape and Reel,3000

Pin Configuration



Marking

NC7SZ32M5X-TP Marking:7Z32D

NC7SZ32P5X-TP Marking:Z32C

Logic Diagram

Simplified Schematic



Function Table

INPUT(A)	INPUT(B)	OUTPUT(Y)
H	X	H
X	H	H
L	L	L

Note: H: HIGH voltage level; L: LOW voltage level; X: Don't care.

Absolute Maximum Ratings

Parameters	Min.	Max.	Unit
Supply Voltage, $V_{CC}=(V+)-(V-)$, Single-supply		6.5	V
Supply Voltage, $V_{CC}=(V+)-(V-)$, Dual-supply		± 3.25	V
Select Input Voltage	$V-$	$V+$	V
Maximum Junction Temperature	-55	150	$^{\circ}\text{C}$
Storage Temperature Range	-55	150	$^{\circ}\text{C}$
Continuous Output Current		± 50	mA
Continuous Current through V_{CC} or GND		± 100	mA

ESD Ratings

ESD		VALUE	UNIT
V(ESD)	Electrostatic discharge	Human-body model (HBM)	4K V
		Charge device model (CDM)	2K V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

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

Symbol	Parameters	Min	Max	Unit
VCC	Supply Voltage	1.65	5.5	V
TA	Operating Temperature	-40	125	°C

Electrical Characteristics

VCC=1.65V to 5.5V, FULL=-40°C to +125°C, Typical values are at TA = +25°C. (unless otherwise noted)

Parameter	Symbol	Test conditions	Vcc	TA	Min	Typ	Max	Units
OUTPUT								
Output High Voltage	VOH	I _{OH} = -100 μA	1.65V to 5.5V	FULL	V _{CC} -0.1			V
		I _{OH} = -4 mA	1.65V	FULL	1.2			V
		I _{OH} = -8 mA	2.3V	FULL	1.9			V
		I _{OH} = -16 mA	3V	FULL	2.4			V
		I _{OH} = -24 mA		FULL	2.3			V
		I _{OH} = -32 mA	4.5V	FULL	3.8			V
Output Low Voltage	VOL	I _{OL} = 100 μA	1.65V to 5.5V	FULL			0.1	V
		I _{OL} = 4 mA	1.65V	FULL			0.45	V
		I _{OL} = 8 mA	2.3V	FULL			0.3	V
		I _{OL} = 16 mA	3V	FULL			0.4	V
		I _{OL} = 24 mA		FULL			0.65	V
		I _{OL} = 32 mA	4.5V	FULL			0.65	V
Off-State Current	I _{off}	V _I or V _O = 5.5 V	0V	FULL			±25	μA
INPUT								
Input Leakage Current	I _I	V _I = 5.5 V or GND	0V to 5.5V	FULL			±5	μA
Input capacitance	C _I	V _I = V _{CC} or GND	3.3V	FULL		4		pF

Electrical specifications(continued)

V_{CC}=1.65V or 3.3V, FULL=−40°C to +125°C, Typical values are at T_A = +25°C. (unless otherwise noted)

Parameter	Symbol	Test conditions	V _{cc}	T _A	Min	Typ	Max	Units
DYNAMIC CHARACTERISTICS								
Propagation Delay	t _{pd}	R _L = 1 MΩ, C _L = 15 pF, t _r /t _f = 2 ns	1.65V to 1.95V	FULL	1.9		8	ns
		R _L = 1 MΩ, C _L = 15 pF, t _r /t _f = 2 ns	2.3V to 2.7V	FULL	0.8		4.4	ns
		R _L = 1 MΩ, C _L = 15 pF, t _r /t _f = 2.5 ns	3V to 3.6V	FULL	0.8		3.6	ns
		R _L = 1 MΩ, C _L = 15 pF, t _r /t _f = 2.5 ns	4.5V to 5.5V	FULL	0.8		3.4	ns
		R _L = 1 kΩ, C _L = 30 pF, t _r /t _f = 2 ns	1.65V to 1.95V	FULL	2.8		9	ns
		R _L = 1 kΩ, C _L = 30 pF, t _r /t _f = 2 ns	2.3V to 2.7V	FULL	1.2		6	ns
		R _L = 500 Ω, C _L = 50 pF, t _r /t _f = 2.5 ns	3V to 3.6V	FULL	1		5	ns
		R _L = 500 Ω, C _L = 50 pF, t _r /t _f = 2.5 ns	4.5V to 5.5V	FULL	1		4.5	ns
POWER								
Power Supply Range	V _{CC}		1.65V to 5.5V	FULL	1.65		5.5	V
Power Supply Current	I _{CC}	V _I = 5.5 V or GND, I _O = 0	5.5V	FULL			10	μA
Delta Power Current	ΔI _{CC}	One input at V _{CC} – 0.6 V, Other inputs at V _{CC} or GND	3V to 5.5V	FULL			500	μA
Power dissipation capacitance	C _{pd}	f = 10 MHz	1.8V	+25°C		23		pF
		f = 10 MHz	2.5V	+25°C		23		pF
		f = 10 MHz	3.3V	+25°C		23		pF
		f = 10 MHz	5V	+25°C		25		pF

Typical Characteristics

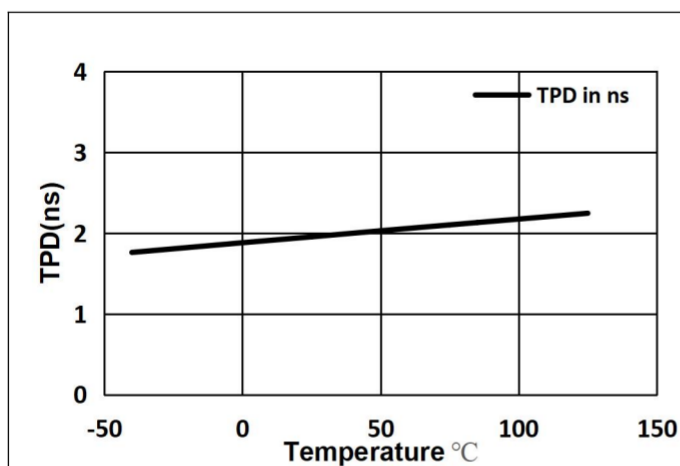


Fig. 8-1. TPD Across Temperature AT 3.3 V V_{CC}

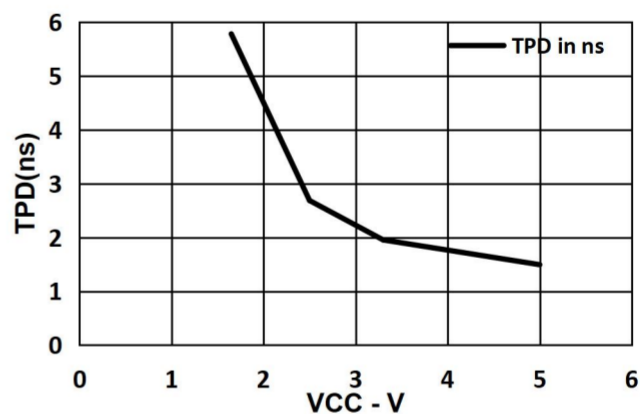


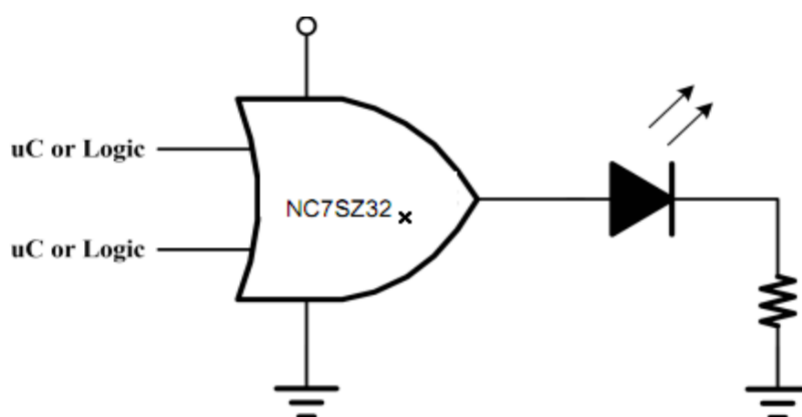
Fig. 8-2. TPD Across V_{CC} at 25°C

Detailed Description

The NC7SZ32 device contains one 2-input positive OR gate devices and performs the Boolean function $Y = A + B$ or $Y = \overline{\overline{A} \cdot \overline{B}}$. 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 I_{off} feature allows voltages on the inputs and outputs, when V_{CC} is 0 V.

Application Note

The NC7SZ32 is a high drive CMOS device that can be used for implement OR logic with a high output drive, such as an LED application. It can produce 24-mA of drive current at 3.3 V making it Ideal for driving multiple outputs and good for high speed applications up to 100 Mhz. The inputs are 5.5-V tolerant allowing translation down to V_{CC} .

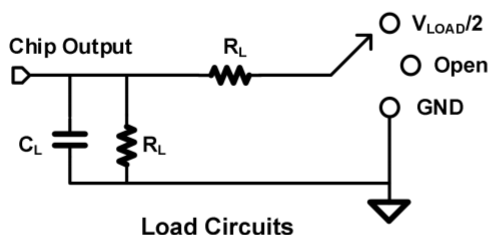


Basic LED Driver

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive will also create fast edges into light loads, so routing and load conditions should be considered to prevent ringing.

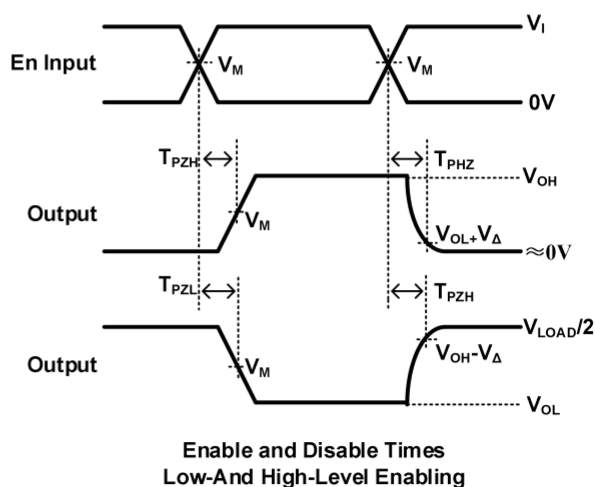
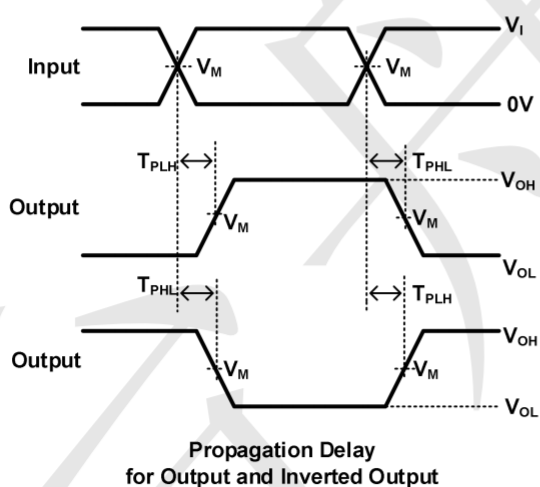
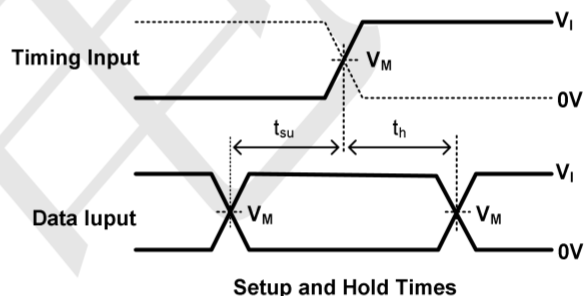
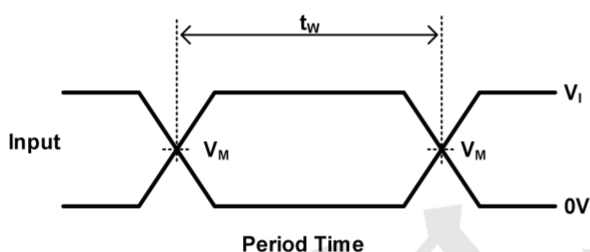
Each VCC pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1-μF capacitor is recommended. If there are multiple VCC pins, then a 0.01-μF or 0.022-μF capacitor is recommended for each power pin. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise. A 0.1-μF and 1-μF capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

Measurement Information



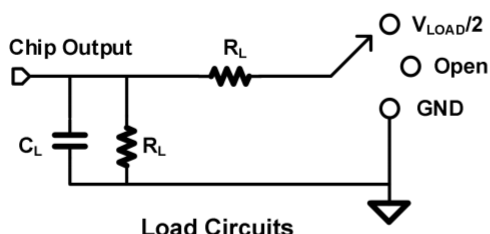
TEST	S1
T_{PHL}/T_{PLH}	OPEN
T_{PLZ}/T_{PZL}	V_{LOAD}
T_{PHZ}/T_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LAOD}	C_L	R_L	V_{Δ}
	V_I	T_r/T_f					
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M Ω	0.15V
$2.5V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M Ω	0.15V
$3.3V \pm 0.15V$	3V	$\leq 2.5ns$	1.5V	6V	15pF	1M Ω	0.3V
$5V \pm 0.15V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M Ω	0.3V



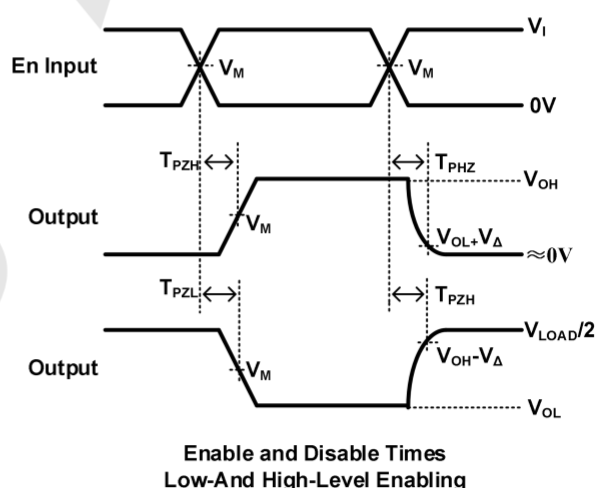
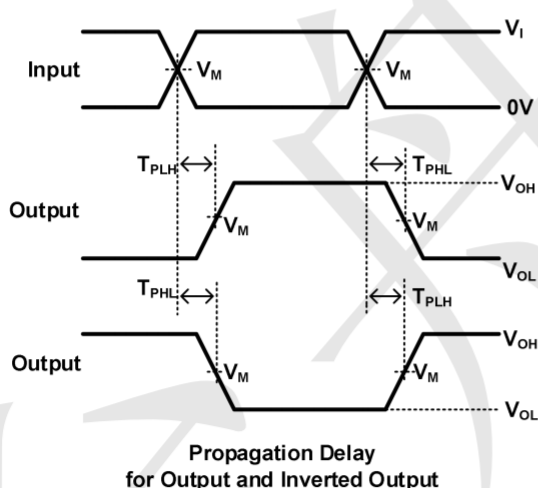
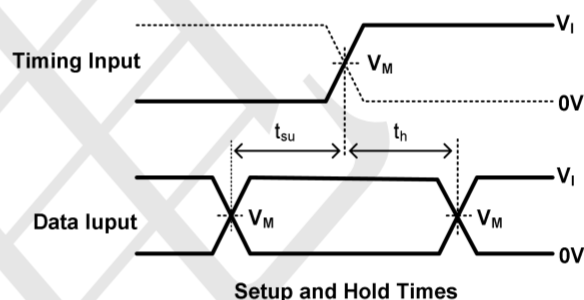
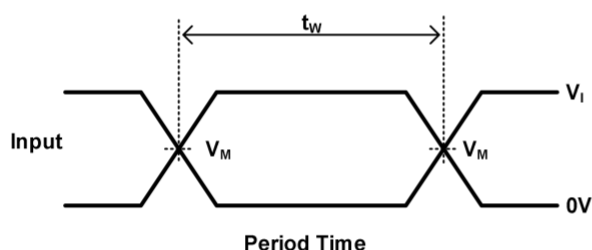
- Notes: A. C includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR 10 MHz, Z = 50 .
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. All parameters and waveforms are not applicable to all device.

Measurement Information (continued)



TEST	S1
T_{PHL}/T_{PLH}	OPEN
T_{PLZ}/T_{PZL}	V_{LOAD}
T_{PHZ}/T_{PZH}	GND

V_{CC}	INPUTS		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	T_r/T_f					
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1k Ω	0.15V
$2.5V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 Ω	0.15V
$3.3V \pm 0.15V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500 Ω	0.3V
$5V \pm 0.15V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500 Ω	0.3V



Notes: A. C 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, Z = 50 .

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} .

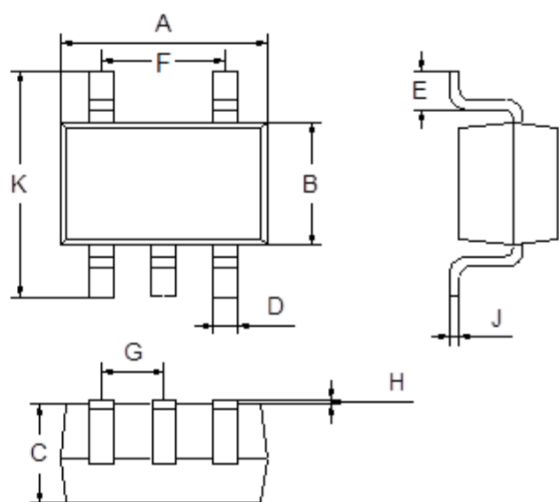
F. t_{PZL} and t_{PZH} are the same as t_{en} .

G. t_{PLH} and t_{PHL} are the same as t_{pd} .

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

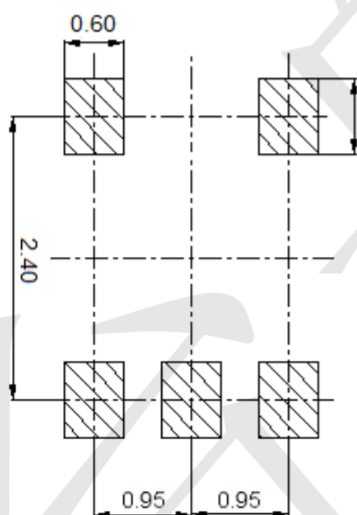
Package Outline Dimensions (Unit: mm)

SOT23-5



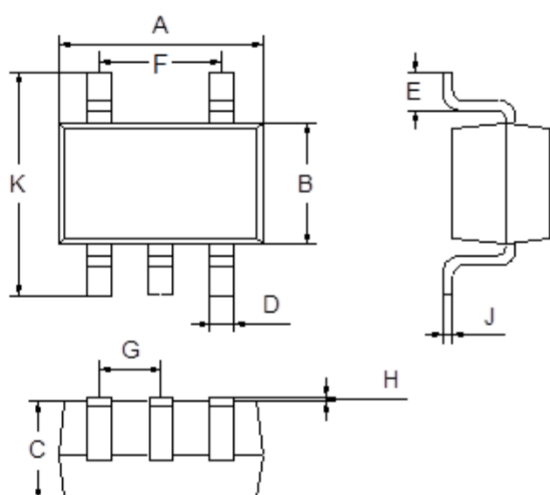
Dimension	Min.	Max.
A	2.80	3.00
B	1.50	1.70
C	1.00	1.20
D	0.35	0.45
E	0.35	0.55
F	1.80	2.00
G	0.90	1.00
H	0.02	0.10
J	0.10	0.20
K	2.60	3.00

Mounting Pad Layout (Unit: mm)



Package Outline Dimensions (Unit: mm)

SOT353



Dimension	Min.	Max.
A	2.00	2.20
B	1.15	1.35
C	0.85	1.05
D	0.15	0.35
E	0.25	0.40
F	1.20	1.40
G	0.60	0.70
H	0.02	0.10
J	0.05	0.15
K	2.20	2.40

Mounting Pad Layout (Unit: mm)

