

General Description

The NC7SZ02 single 2 -input positive-NOR gate is designed for 1.65V to 5.5V V_{CC} operation.

The NC7SZ02 device performs the Boolean function $Y = \overline{A + B}$ or $Y = \overline{A} \cdot \overline{B}$ in positive logic. The 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 NC7SZ02 is available in Green SOT23-5 and SOT353(SC70-5) packages. It operates over an ambient temperature range of -40°C to +125°C.

Features

- Operating Voltage Range: 1.65V to 5.5V
- Low Power Consumption: 1μA (Max)
- Operating Temperature Range: -40°C to +125°C
- Inputs Accept Voltage to 5.5V
- High Output Drive: ±24mA at $V_{CC}=3.0V$
- Micro SIZE PACKAGES: SOT23-5, SOT353(SC70-5)

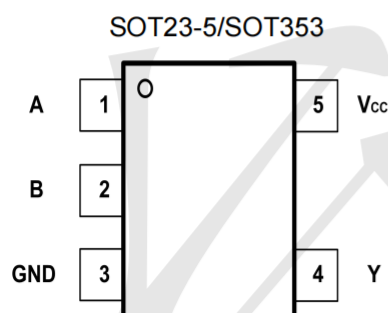
Applications

- Active Noise Elimination
- Bar Code Scanner
- Blood Pressure Monitor
- CPAP Machine
- Fingerprint identification
- Network attached storage (NAS)

Ordering Information

ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION
NC7SZ02M5X	SOT23-5	Tape and Reel,3000
NC7SZ02P5X	SOT353	Tape and Reel,3000

Pin Configuration

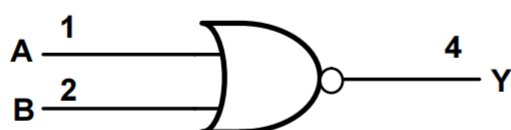


Marking

NC7SZ02M5X Marking:7Z02D

NC7SZ02P5X Marking:Z02C

Logic Diagram



Function Table

Inputs		Output
A	B	Y
H	X	L
X	H	L
L	L	H

Absolute Maximum Ratings

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	6.5	V
V _I	Input voltage range ⁽²⁾	-0.5	6.5	V
V _O	Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾	-0.5	6.5	V
V _O	Voltage range applied to any output in the high or low state ^{(2) (3)}	-0.5	V _{CC} +0.5	V
I _{IK}	Input clamp current		-50	mA
I _{OK}	Output clamp current		-50	mA
I _O	Continuous output current		±50	mA
	Continuous current through V _{CC} or GND		±100	mA
θ _{JA}	Package thermal impedance ⁽⁴⁾	SOT23-5	230	°C/W
		SOT353/(SC70-5)	380	
T _J	Junction temperature ⁽⁵⁾	-65	150	°C
T _{stg}	Storage temperature	-65	150	°C

ESD Ratings

The following ESD information is provided for handling of ESD-sensitive devices in an ESD protected area only.

		VALUE	UNIT
V _(ESD) Electrostatic discharge	Human-body model (HBM), MIL-STD-883K METHOD 3015.9	±2000	V
	Charged-device model (CDM), ANSI/ESDA/JEDEC JS-002-2018	±1000	V
	Machine model (MM), JESD22-A115C (2010)	±200	V

Electrical Characteristics

over recommended operating free-air temperature range (TYP values are at T_A = +25°C, Full=-40°C to 125°C, unless otherwise noted.)⁽¹⁾

Recommended Operating Conditions

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
Supply voltage	V _{CC}	Operating	1.65	5.5	V
		Data retention only	1.5		
High-level input voltage	V _{IH}	V _{CC} =1.65V to 1.95V	0.65 x V _{CC}		V
		V _{CC} =2.3V to 2.7V	1.7		
		V _{CC} =3V to 3.6V	2		
		V _{CC} =4.5V to 5.5V	0.7 x V _{CC}		
Low-level input voltage	V _{IL}	V _{CC} =1.65V to 1.95V		0.35 x V _{CC}	V
		V _{CC} =2.3V to 2.7V		0.7	
		V _{CC} =3V to 3.6V		0.8	
		V _{CC} =4.5V to 5.5V		0.3 x V _{CC}	
Input voltage	V _I		0	5.5	V
Output voltage	V _O		0	V _{CC}	V
Input transition rise or fall	Δt/Δv	V _{CC} =1.8V±0.15V, 2.5V±0.2V		20	ns/V
		V _{CC} =3.3V±0.3V		10	
		V _{CC} =5V±0.5V		5	
Operating temperature	T _A		-40	125	°C

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

DC Characteristics

PARAMETER		TEST CONDITIONS	V _{CC}	TEMP	MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
V _{OH}		I _{OH} = -100μA	1.65V to 5.5V	Full	V _{CC} -0.1			V
		I _{OH} = -4mA	1.65V		1.2			
		I _{OH} = -8mA	2.3V		1.9			
		I _{OH} = -16mA	3V		2.4			
		I _{OH} = -24mA			2.3			
		I _{OH} = -32mA	4.5V		3.8			
V _{OL}		I _{OL} = 100μA	1.65V to 5.5V	Full			0.1	V
		I _{OL} = 4mA	1.65V				0.45	
		I _{OL} = 8mA	2.3V				0.3	
		I _{OL} = 16mA	3V				0.4	
		I _{OL} = 24mA					0.55	
		I _{OL} = 32mA	4.5V				0.55	
I _I	A or B inputs	V _I =5.5V or GND	0V to 5.5V	+25°C		±0.1	±1	μA
				Full			±5	
I _{off}		V _I or V _O =5.5V	0	+25°C		±0.1	±1	μA
				Full			±10	
I _{CC}		V _I =5.5V or GND, I _O =0	1.65V to 5.5V	+25°C		0.1	1	μA
				Full			10	
ΔI _{CC}		One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND	3V to 5.5V	Full			500	μA
C _i (Input Capacitance)		V _I =V _{CC} or GND	3.3V	+25°C		4		pF

(1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

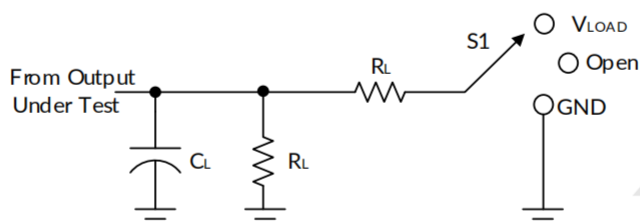
(2) Limits are 100% production tested at 25°C. Limits over the operating temperature range are ensured through correlations using statistical quality control (SQC) method.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and will also depend on the application and configuration.

AC Characteristics

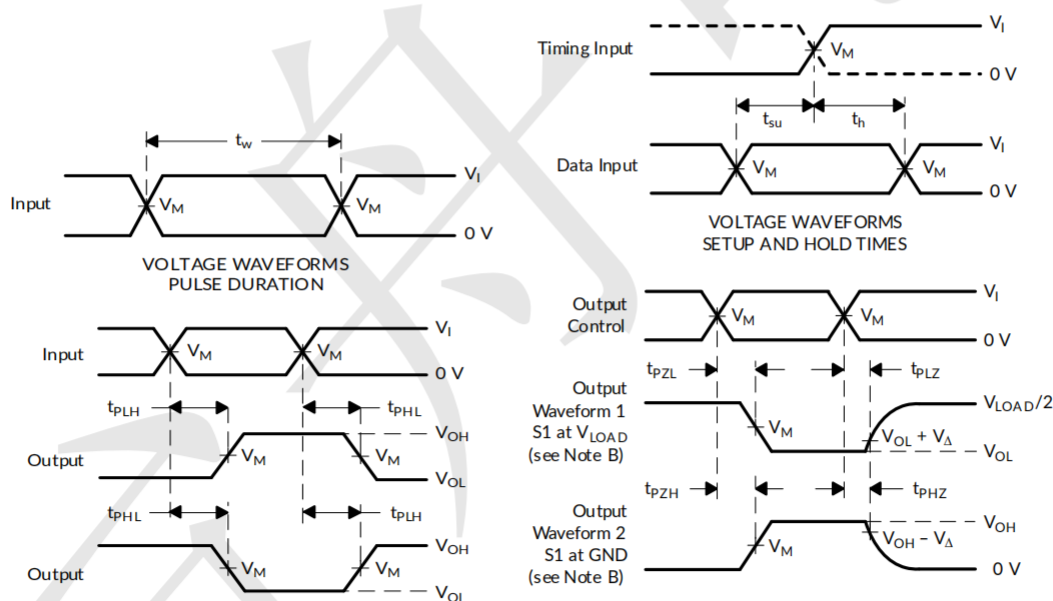
PARAMETER	SYMBOL	TEST CONDITIONS		MIN ⁽²⁾	TYP ⁽³⁾	MAX ⁽²⁾	UNIT
Propagation Delay	t _{pd}	V _{CC} =1.8V±0.15V	C _L =30pF, R _L =1kΩ		13.3		ns
		V _{CC} =2.5V±0.2V	C _L =30pF, R _L =500Ω		5.3		
		V _{CC} =3.3V±0.3V	C _L =50pF, R _L =500Ω		4.1		
		V _{CC} =5V±0.5 V	C _L =50pF, R _L =500Ω		3.6		
Power dissipation capacitance	C _{pd}	V _{CC} =1.8V	f=10MHz		16		pF
		V _{CC} =2.5V			18		
		V _{CC} =3.3V			18		
		V _{CC} =5V			20		

Parameter Measurement Information



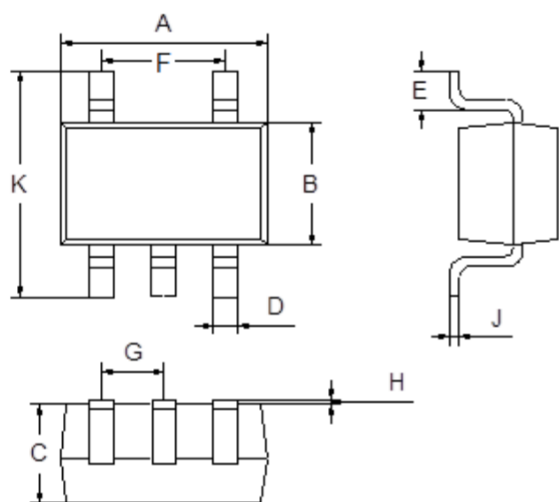
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{LOAD}
t_{PHZ}/t_{PZH}	GND

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
$2.5V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 Ω	0.15V
$3.3V \pm 0.3V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500 Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500 Ω	0.3V



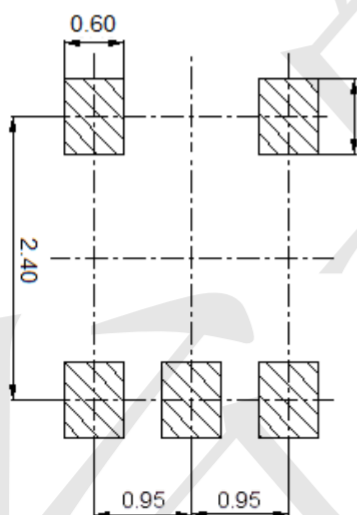
Package Outline Dimensions (Unit: mm)

SOT23-5



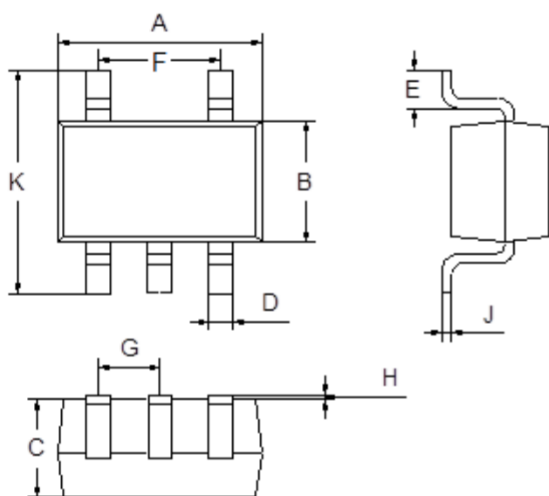
Dimension	Min.	Max.
A	2.80	3.00
B	1.50	1.70
C	1.00	1.20
D	0.35	0.45
E	0.35	0.55
F	1.80	2.00
G	0.90	1.00
H	0.02	0.10
J	0.10	0.20
K	2.60	3.00

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)

