FAIRCHILD SEMICONDUCTOR™

December 1997

NC7SZ66
TinyLogic™ UHS 1-Bit Low Power Digital Switch

General Description

The NC7SZ66 is a single-bit, ultra high-speed CMOS compatible digital switch. The low on resistance of the switch allows inputs to be connected to outputs with minimal propagation delay and without generating additional ground bounce noise. The device is organized as a 1-bit switch with a switch enable (SE) signal. When SE is high, the switch is on and Port A is connected to Port B. When SE is low, the switch is open and a high-impedance state exists between the two ports.

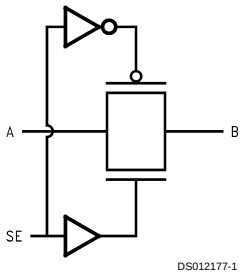
Features

- Space saving SOT23 or SC70 5-lead surface mount package
- Broad V_{CC} Operating Range 2.3V–5.5V
- 5Ω switch connection between two ports
- Minimal propagation delay through the switch
- Low I_{CC}
- Zero bounce in flow-through mode
- Control input compatible with CMOS input levels

Ordering Code:

Product Code	Package	Package Drawing	Package Top Mark	Supplied As
NC7SZ66M5	SOT23-5	MA05B	7Z66	250 Units on Tape and Reel
NC7SZ66M5X	SOT23-5	MA05B	7Z66	3k Units on Tape and Reel
NC7SZ66P5	SC70-5	MAA05A	Z66	250 Units on Tape and Reel
NC7SZ66P5X	SC70-5	MAA05A	Z66	3k Units on Tape and Reel

Logic Symbol



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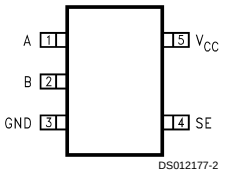
Connection Diagram

Pin Assignment for 5-lead Packages



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(Top View)

Pin Descriptions

Pin Names	Description
SE	Switch Enable Input
A	Bus A I/O
B	Bus B I/O

Function Table

SE	B_0	Function
L	HIGH-Z State	Disconnect
H	A_0	Connect

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Absolute Maximum Ratings (Note 1)

Supply Voltage (V_{CC})	0.5V to +7.0V
DC Switch Voltage (V_S)	−0.5V to V_{CC} +0.5V
DC Input Voltage (V_{IN}) (Note 2)	−0.5V to +7.0V
DC Input Diode Current (I_{IK}) V_{IN} < 0V	−50 mA
DC Output (I_{OUT}) Sink Current	128 mA
DC V_{CC}/GND Current (I_{CC}/I_{GND})	±100 mA
Storage Temperature Range (T_{STG})	−65˚C to +150˚C
Junction Lead Temperature under Bias (T_J)	+150˚C
Junction Lead Temperature (T_L) (Soldering, 10 Seconds)	+260˚C
Power Dissipation (P_D) @ +85˚C	
SOT23-5	200 mW
SC70-5	150 mW
ESD Tolerance (Human Body Model) MIL-STD-883D Method 17	2000V
DC Latchup Tolerance (JEDEC 3015.7)	
Negative Source Current (NIT)	−500mA
Positive Source Current (PIT)	500mA

Recommended Operating Conditions

Power Supply Operating (V_{CC})	2.3V to 5.5V
Control Input Voltage (V_{IN})	0V to 5.5V
Switch Input Voltage (V_{IN})	0V to V_{CC}
Switch Output Voltage (V_{OUT})	0V to V_{CC}
Input Rise and Fall Time (t_r, t_f)	
Control Input; V_{CC} = 2.3V–3.6V	0 ns/V to 10 ns
Control Input; V_{CC} = 4.5–5.5V	0 ns/V to 5 ns
Switch I/O	0 ns/V to DC
Operating Temperature (T_A)	−40˚C to +85˚C
Thermal Resistance (θ_{JA})	
SOT23-5	300˚C/Watt
SC70-5	425˚C/Watt

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 2: The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

DC Electrical Characteristics

Symbol	Parameter	V_{CC}(V)	NC7SZ66 T_A= −40˚C to +85˚C			Units	Conditions
			Min	Typ (Note 4)	Max		
V_{IH}	High Level Input Voltage	2.3–5.5	0.7 V_{CC}			V	
V_{IL}	Low Level Input Voltage	2.3–5.5			0.3 V_{CC}	V	
I_{IN}	Ctrl Input Leakage Current	0–5.5			±1.0	µA	0 ≤ V_{IN} ≤ 5.5V
I_{OFF}	OFF Leakage Current	2.3–5.5			±10.0	µA	0 ≤ A, B ≤ V_{CC}
R_{ON}	Switch On Resistance (Note 3)	4.5		3	7	Ω	V_{IN} = 0V, I_{IN} = 30 mA
				5	12	Ω	V_{IN} = 2.4V, I_{IN} = 15 mA
				7	15	Ω	V_{IN} = 4.5V, I_{IN} = 30 mA
		3.0		4	9	Ω	V_{IN} = 0V, I_{IN} = 24 mA
				10	20	Ω	V_{IN} = 3V, I_{IN} = 24 mA
		2.3		5	12	Ω	V_{IN} = 0V, I_{IN} = 8 mA
				13	30	Ω	V_{IN} = 2.3V, I_{IN} = 8 mA
I_{CC}	Quiescent Supply Current	5.5			10	µA	V_{IN} = V_{CC} or GND I_{OUT} = 0

Note 3: Measured by the voltage drop between A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the two (A or B) pins.

Note 4: All typical values are at the specified V_{CC}, and T_A = 25˚C.

AC Electrical Characteristics

Symbol	Parameter	VCC (V)	NC7SZ66 T_A = −40°C to +85°C, C_L = 50 pF, RU = RD = 500Ω			Units	Conditions	Figure No.
			Min	Typ (Note 5)	Max			
T_{PHL}, T_{PLH}	Prop Delay Bus to Bus (Note 6)	2.3–2.7			1.2	ns	V_{IN} = open	*Figures 1, 2*
		3.0–3.6			0.8	ns		
		4.5–5.5			0.3	ns		
T_{PZL}, T_{PZH}	Output Enable Time	2.3–2.7	1.5	3.3	7.0	ns	V_{IN} = 2 x V_{CC} for T_{PZL} V_{IN} = 0V for T_{PZH}	*Figures 1, 2*
		3.0–3.6	1.5	2.4	5.5	ns		
		4.5–5.5	1.5	2.0	4.5	ns		
T_{PLZ}, T_{PHZ}	Output Disable Time	2.3–2.7	1.5	5.3	9.0	ns	V_{IN}= 2 x V_{CC} for T_{PLZ} V_{IN} = 0V for T_{PHZ}	*Figures 1, 2*
		3.0–3.6	1.5	4.0	7.0	ns		
		4.5–5.5	1.5	2.7	5.0	ns		

Note 5: All typical values are at the specified V_{CC}, and T_A = 25°C.

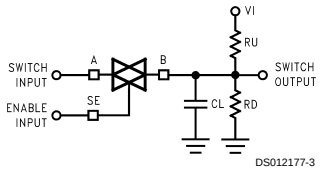
Note 6: This parameter is guaranteed by design but is not tested. The switch contributes no propagation delay other than the RC delay of the typical On resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).

Capacitance

(Note 7)

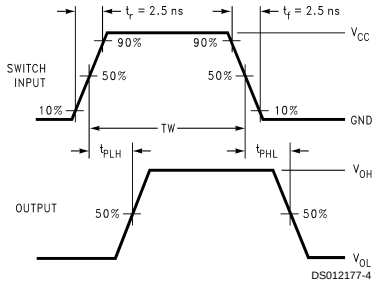
Symbol	Parameter	Typ	Max	Units	Conditions
C_{IN}	Control Pin Input Capacitance	2		pF	V_{CC} = 0V
$C_{I/O}$	Input/Output Capacitance	6		pF	V_{CC} = 5.0V

Note 7: Capacitance is characterized but not tested.



Input driven by 50Ω source terminated in 50Ω
C_L includes load and stray capacitance.
Input PRR = 1.0 MHz; t_W = 500 ns

FIGURE 1. AC Test Circuit



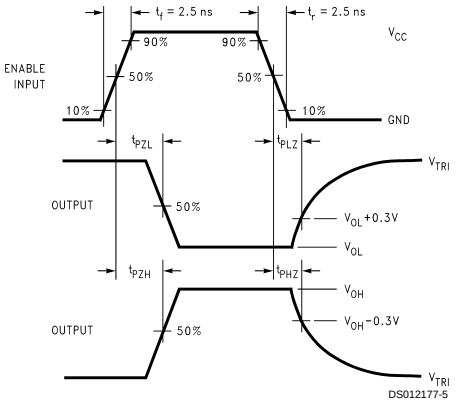
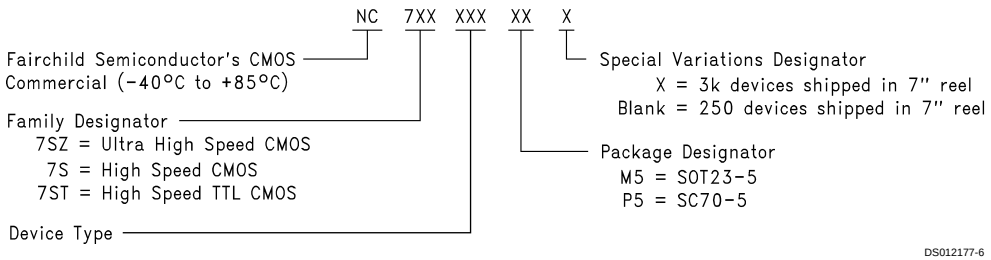


FIGURE 2. AC Waveforms

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



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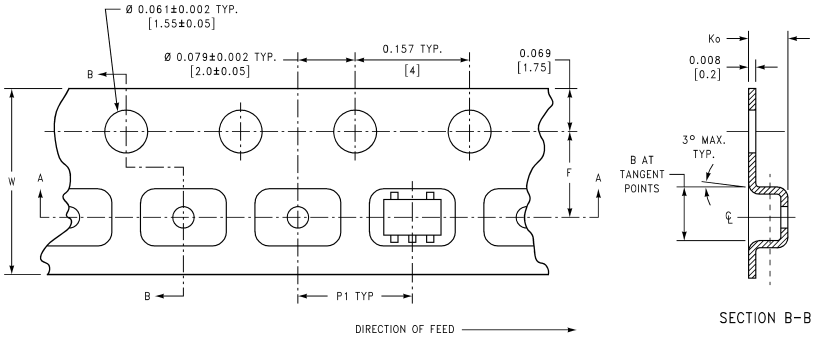
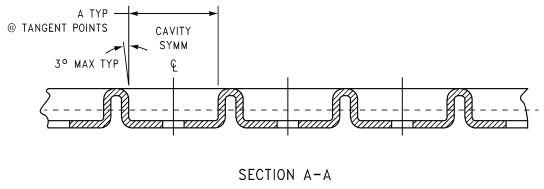
Tape and Reel Specification

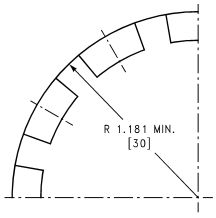
TAPE FORMAT

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
M5, P5	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	250	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed
M5X, P5X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

TAPE DIMENSIONS inches (millimeters)







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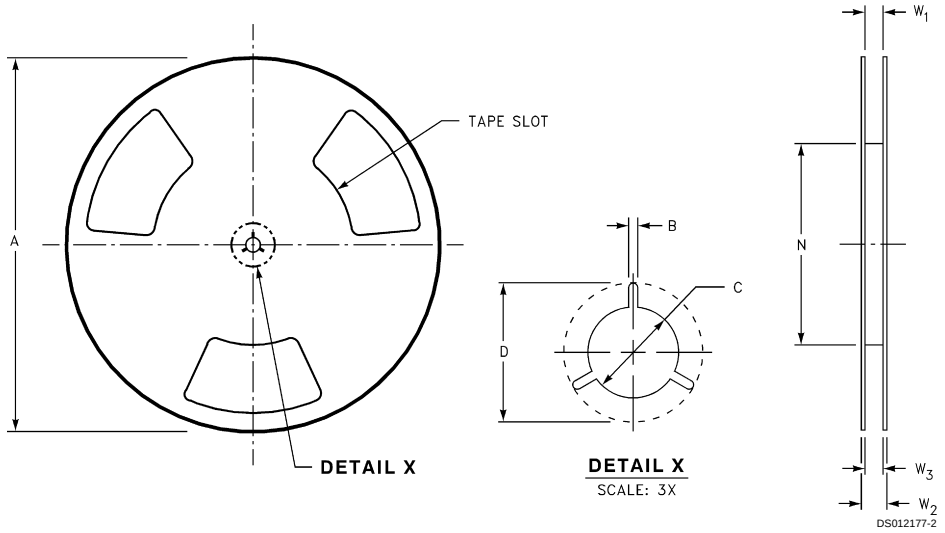
Pkg	Tape Size	DIM A	DIM B	DIM F	DIM K_o	DIM P1	DIM W
SC70-5	8 mm	0.093 (2.35)	0.096 (2.45)	0.138 ±0.004 (3.5 ±0.10)	0.053 ±0.004 (1.35 ±0.10)	0.157 (4)	0.315 ±0.004 (8 ±0.1)
SOT23-5	8 mm	0.130 (3.3)	0.130 (3.3)	0.138 ±0.002 (3.5 ±0.05)	0.055 ±0.004 (1.4 ±0.11)	0.157 (4)	0.315 ±0.012 (8 ±0.3)

Tape and Reel Specification

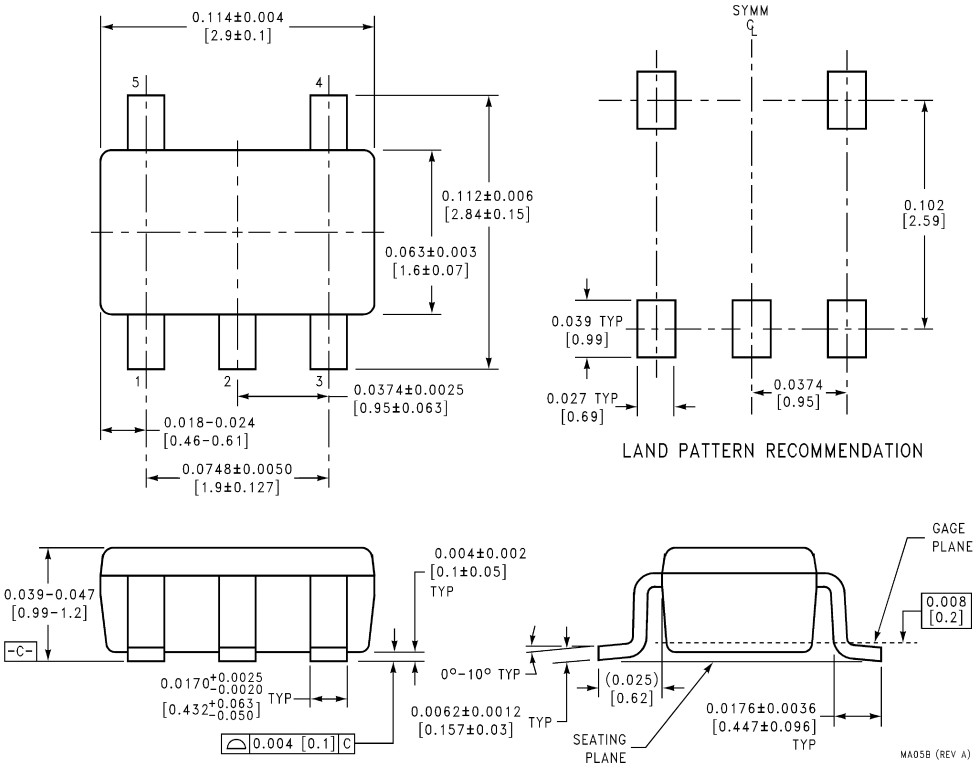
(Continued)

REEL DIMENSIONS inches (millimeters)



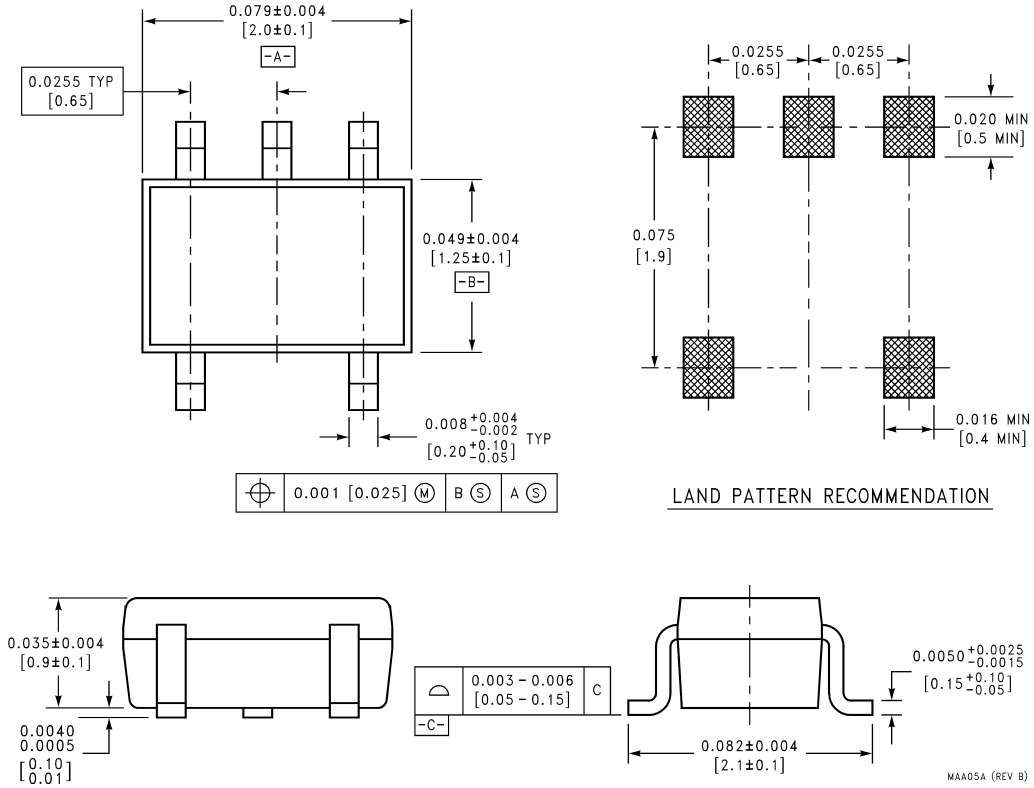
Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	0.331 +0.059/−0.000 (8.40 +1.50/−0.00)	0.567 (14.40)	W1 +0.078/−0.039 (W1 +2.00/−1.00)

Physical Dimensions inches (millimeters) unless otherwise noted



5-Lead Molded SOT23, Enhanced Thermal
Package Number MA05B

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



5-Lead Molded SC70, Enhanced Thermal
Package Number MAA05A

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