

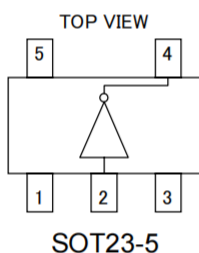
### Features

- Power voltage range : 2.0 ~ 6.0V
- Operation temp. range : -40 ~ +85°C
- | IOH | = IOL = 2mA (min)
- ESD Protection Exceeds ESD 22
- -2000-V Human-Body Model (A114-A)
- -1000-V Charged-Device Model (C101)
- SOT23-5 Package Available

### General Description

NC7S04M5X are CMOS inverter ICs. They realize a high speed operation similar to LS-TTL with a lower power consumption by CMOS features. An inner circuit structure of 3-stages logic gates obtains a wider noise immunity and a constant output.

### Pin Configuration



Marking : 7S04F

### Function Table

Pin No.	Pin Name
1	NC
2	INY
3	GND
4	OUTX
5	VCC

Input	Output
INA	OUTX
Low	High
High	Low

### Maximum Absolute Ratings

Parameter	Symbol	Value	Units
Power Voltage	VCC	-0.5~+7.0	V
Input Voltage	VIN	-0.5~VCC+0.5	V
Output Voltage	VOUT	-0.5~VCC+0.5	V
Input Protection Diode Current	I <sub>IK</sub>	±20	mA
Output Parasitic Diode Current	I <sub>OK</sub>	±20	mA
Output Current	I <sub>OUT</sub>	±25	mA
VCC/GND Current	I <sub>CC</sub> , I <sub>IGND</sub>	±25	mA
Power Dissipation	P <sub>d</sub>	200	mW
Storage Temp.	T <sub>stg</sub>	-65~+150	°C

### Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as:
  - PCs, Networking, Notebooks, Netbooks, PDAs
  - Tablet Computers, E-readers
  - Computer Peripherals, Hard Drives, CD/DVD ROM
  - TV, DVD, DVR, Set-Top Box
  - Cell Phones, Personal Navigation / GPS
  - MP3 Players, Cameras, Video Recorders

### Suggested Operating Condition

Parameter	Symbol	Value	Units
Power Voltage	VCC	2.0~6.0	V
Input Voltage	VIN	0~VCC	V
Output Voltage	VOUT	0~VCC	V
Operating Temp.	Top	-40~+85	°C
High-input, Down-time	tr,tf	0~1000 (VCC=2.0V)	ns
		0~500 (VCC=4.5V)	
		0~400 (VCC=6.0V)	

### DC Electrical Characteristics

Parameter	Sym.	VCC	Top = 25°C			Top = -40~+85°C		Units	Conditions	
			Min.	Typ.	Max.	Min.	Max.			
Input Voltage	VIH	2.0	1.5	-	-	1.5	-	V		
		4.5	3.15	-	-	3.15	-			
		6.0	4.2	-	-	4.2	-			
	VIL	2.0	-	-	0.5	-	0.5	V		
		4.5	-	-	1.35	-	1.35			
		6.0	-	-	1.8	-	1.8			
Output Voltage	VOH	2.0	1.9	2.0	-	1.9	-	V	VIN=VIL	IOH = -20 μA
		4.5	4.4	4.5	-	4.4	-			
		6.0	5.9	6.0	-	5.9	-			
		4.5	4.18	4.35	-	4.13	-		IOH = -2mA	
		6.0	5.68	5.83	-	5.63	-		IOH = -2.6mA	
		2.0	-	0.0	0.1	-	0.1		V	VIN=VIH
	4.5	-	0.0	0.1	-	0.1				
	6.0	-	0.0	0.1	-	0.1				
	4.5	-	0.12	0.26	-	0.33	IOL = 2mA			
	6.0	-	0.13	0.26	-	0.33	IOL = 2.6mA			
	2.0	-	0.0	0.1	-	0.1				
	Input Current	IIN	6.0	-0.1	-	0.1	-1.0	1.0	μA	VIN = VCC or GND
Static Current	ICC	6.0	-	-	1.0	-	10.0	μA	VIN = VCC or GND	

### AC Electrical Characteristics

(CL=15pF, tr=tf=6ns, VCC=5V)

Parameter	Sym.	Top = 25°C			Units	Conditions
		Min.	Typ.	Max.		
High Output Down-time	tTLH	-	4	10	ns	Refer to following test circuit
	tTHL	-	3	10		
Propagation Delay-time	tPLH	-	5	15	ns	Refer to following test circuit
	tPHL	-	5	15		



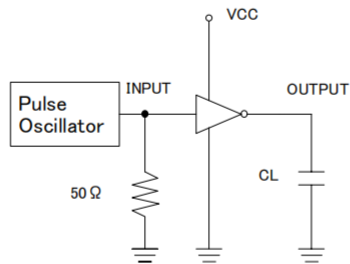
(CL=50pF, tr=tf=6ns)

Parameter	Sym.	VCC	Top = 25°C			Top = -40~+85°C		Units	Conditions
			Min.	Typ.	Max.	Min.	Max.		
High-Output Down-time	tTLH	2.0	-	22	125	-	155	ns	Refer to test circuit
		4.5	-	8	25	-	31		
		6.0	-	6	21	-	26		
	tTHL	2.0	-	16	125	-	155	ns	
		4.5	-	7	25	-	31		
		6.0	-	6	21	-	26		
Propagation Delay-time	tPLH	2.0	-	18	100	-	125	ns	Refer to test circuit
		4.5	-	8	20	-	25		
		6.0	-	7	17	-	21		
	tPHL	2.0	-	17	100	-	125	ns	
		4.5	-	7	20	-	25		
		6.0	-	6	17	-	21		
Input Capacity	CIN	-	-	5	10	-	10	pF	
Equivalent Inner Capacity	CPD	-	-	10	-	-	-	pF	

\* CPD is IC's inner equivalent capacity which is calculated from non-loaded operating current consumption referred to following test circuit. Averaged operating current consumption at non-load is calculated as following formula;

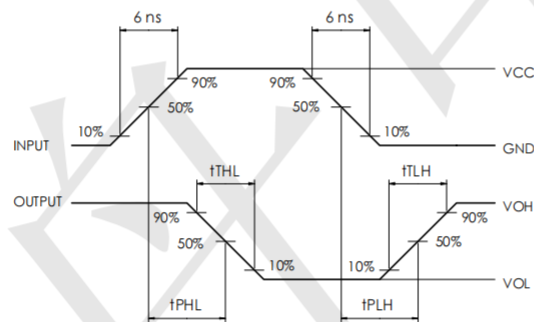
$$ICC(\text{opr}) = CPD \cdot VCC \cdot f_{IN} + ICC$$

## Test Circuit And Waveforms



\* Output should be opened when measuring current consumption.

## Measured Wave Pattern





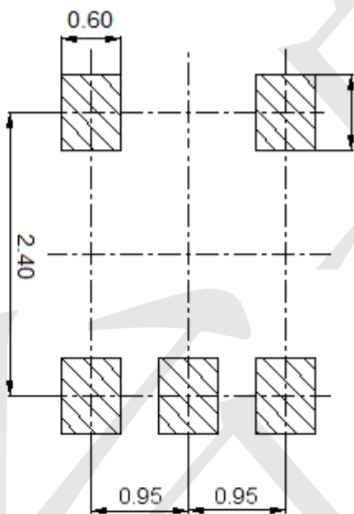
**Package Outline Dimensions** (Unit: mm)

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)



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