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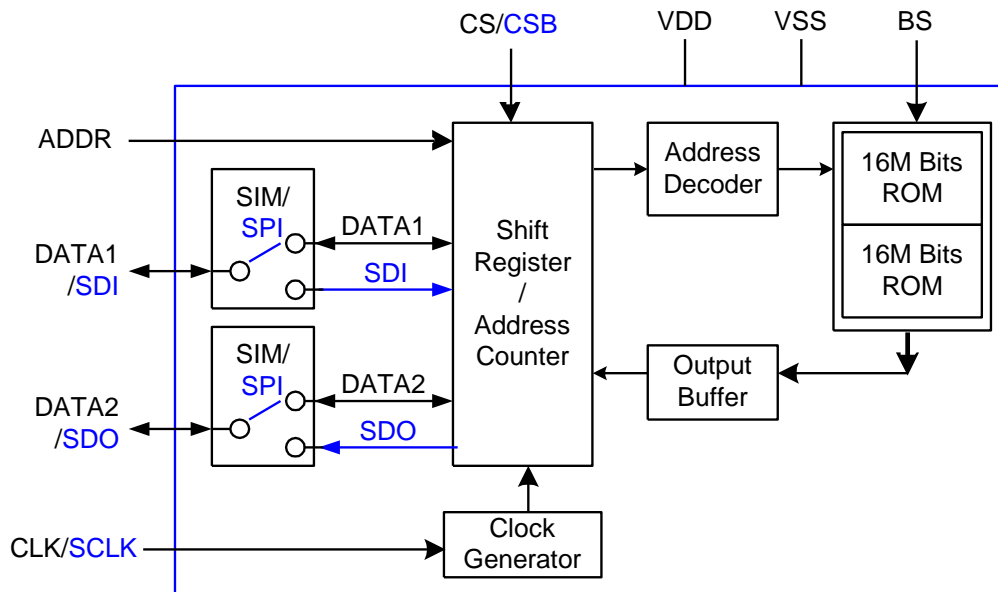
## 1. GENERAL DESCRIPTION

The N551C321 is an 32Mbit Mask ROM with interface with Nuvoton PowerSpeech, BandDirector and ViewTalk series products to extend the memory size for long duration applications.

## 2. FEATURES

- Wide range of operation voltage: 2.4 ~ 5.5V @ normal read mode
- ROM size: 32Mbit
- Interface: W551C interface or SPI ROM interface by mask option
- Normal read access time: 500 nS
- Low power consumption
  - Operating current:
    - ◆ 2.5mA (max.) for SPI mode
    - ◆ 1.0mA (max.) for W551C mode
- Available package form:
  - COB is essential

### 3. BLOCK DIAGRAM



### 4. PIN DESCRIPTION

#### 4.1.1 W551C interface pad

SYMBOL	I/O	FUNCTION
BS	I	Memory Bank selection "0": Lower 16Mbit; "1": Higher 16Mbit
ADDR	I	Clock input for shift-in the start address; The first rising edge signals will reset the address counter.
CLK	I	Clock input for Data read/write
DATA1	I/O	Bi-directional data pin with internal pull-high
DATA2	I/O	Bi-directional data pin with internal pull-high for cascade data through
CS	I	Chip select pin, active-low chip enable.
VSS	I	Microcontroller Negative power supply (-).
VDD	I	Microcontroller Positive power supply (+).

#### 4.1.2 SPI interface pad

SYMBOL	I/O	FUNCTION
SDI	I	Command/address input
SDO	O	Data output
SCLK	I	Clock input

SYMBOL	I/O	FUNCTION
CSB	I	Chip select input, low active. When CSB is High, chip is in standby mode and SDO pin is at high impedance
VSS	I	Microcontroller Negative power supply (-).
VDD	I	Microcontroller Positive power supply (+).

## 5. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	RATED VALUE	UNIT
Power Supply	VDD – VSS	-	-0.3 ~ +7.0	V
Input Voltage	V <sub>IN</sub>	All Inputs	VSS-0.3 ~ VDD+0.3	V
Storage Temp.	TSTG	-	-55 ~ +150	°C
Operating Temp.	TOPR	-	0 ~ +70	°C

NOTE: Operating the device under conditions beyond those indicated above may cause permanent damage or affect device reliability

## 6. ELECTRICAL CHARACTERISTICS

### DC Parameters

(VDD–VSS = 4.5V±10%, TA = 25° C; unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating voltage	VDD		2.4		5.5	V
Operation current	I <sub>op1</sub>	W551C interface mode, data output rate 1MHz			1	mA
Operation current	I <sub>op2</sub>	SPI interface mode, data output rate 2MHz			2.5	mA
Standby current	I <sub>sb</sub>	VDD=5.5V			4	μA
Output high current	I <sub>oh</sub>	V <sub>out</sub> =4.0V		-5		mA
Output low current	I <sub>ol</sub>	V <sub>out</sub> =0.5V		5		mA
Input Low Voltage	V <sub>IL</sub>	All input pins	-0.3	-	0.8	V
Input High Voltage	V <sub>IH</sub>	All input pins	2.0	-	VDD	V
Pull-high resistor	R <sub>ph2</sub>	DATA1, DATA2		750		KΩ

### AC Parameters

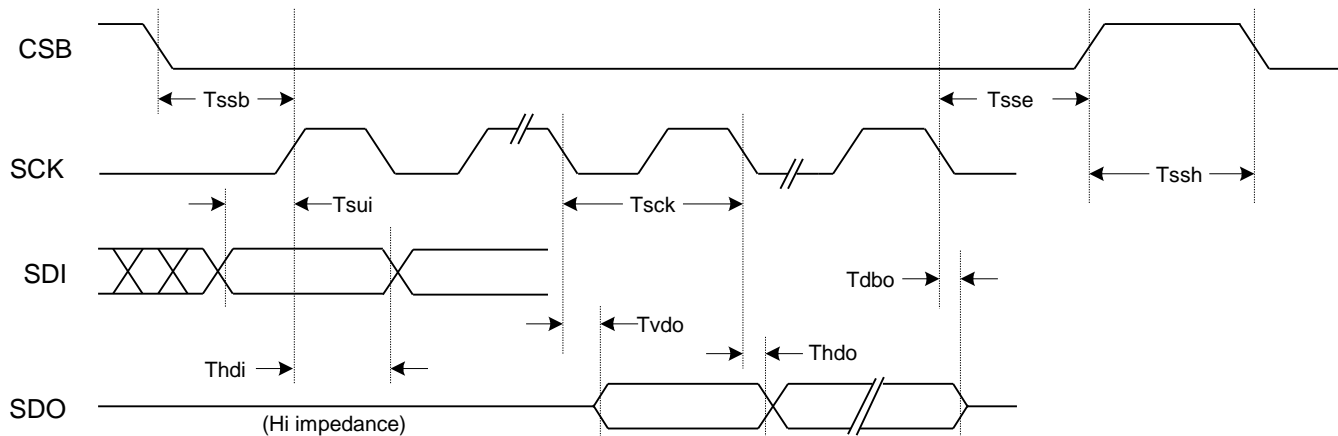
#### SPI mode interface

(VDD–VSS = 4.5V±10%, TA = 25° C; unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Serial clock period	T <sub>sck</sub>	Data Read	500			nS
		Fast Data Read	250			nS

Select lead time	Tssb	100			nS
Data input setup time	Tsui	20			nS
Data input hold time	Thdi	20			nS
Data output valid time	Tvdo			85	nS

SPI Mode Interface

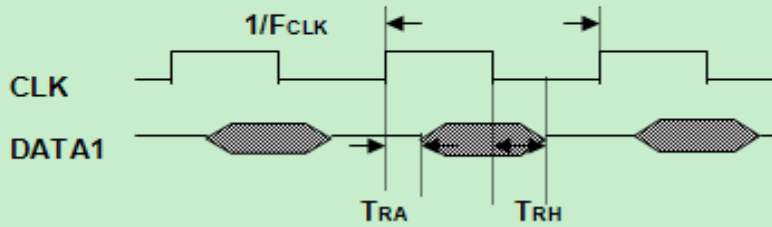


W551C Mode Interface

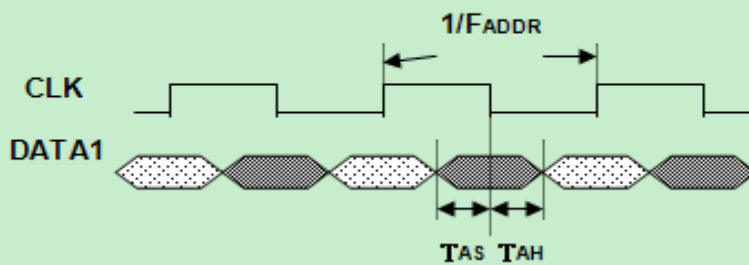
(VDD-VSS = 4.5V, TA = 25° C; unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Clock frequency of ADDR	FADDR	VDD = 3.0V	-	-	6	MHz
Clock frequency of CLK	FCLK	VDD < 3.0V	-	-	1	MHz
		VDD ≥ 3.0V	-	-	1.5	
Interval time between ADDR and CLK	Ti	Read mode	1	-	-	uS
Interval between DATA to another pin active	TCFA	-	10	-	-	uS
Data access time	TRA	Read mode	-	-	500	nS
Data setup time	TAS	Address shift-in	40	-	-	nS
Data hold time	TRH	Read mode	0	-	-	nS
	TAH	Address shift-in	10	-	-	nS
Transmission time between DATA1 and DATA2	TD12	Cascade Mode, VDD=2.4V	35	-	-	nS
	TD21		20			
PS switch time	TPS1	Read mode	500	-	-	nS
	TPS2		500			
CS switch time	Tcs1	Read mode	500	-	-	nS
	Tcs2		500			

**Read Mode**

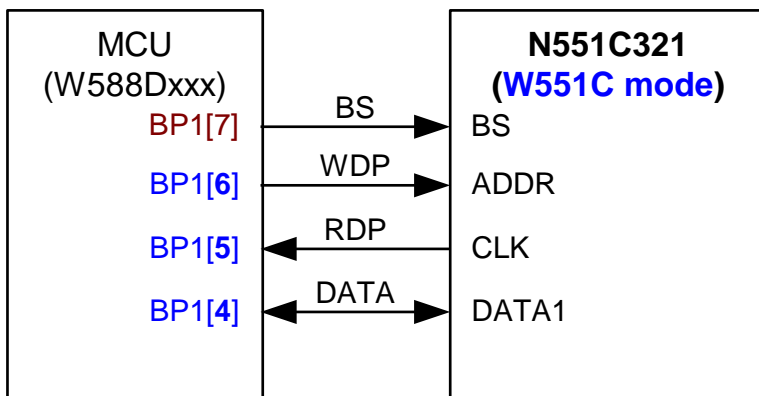


**Address Shift-in Cycle**

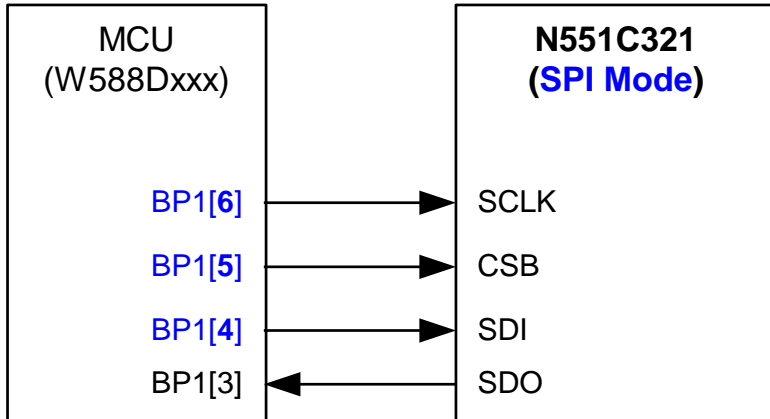


**7. APPLICATION CIRCUIT**

**7.1 W551C Mode**



7.2 SPI Mode



8. REVISION HISTORY

Version	Date	Reasons For Change
A1.0	Nov, 2010	First establishment
A2.0	Sep-2011	Revise ADDR, CLK spec in page 5

### Important Notice

**Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, “Insecure Usage”.**

**Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.**

**All Insecure Usage shall be made at customer’s risk, and in the event that third parties lay claims to Nuvoton as a result of customer’s Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.**

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