

1. GENERAL DESCRIPTION

The N55T10 is a general purpose capacitive touch sensor to co-work with other general micro-processors through serial interface. One N55T10 can support up to 10 sensor pads. Each pad equips with environment adaptive calibration function to prevent false trigger. The N55T10 features serial interface to communicate with master microprocessor to receive command /configuration from master and deliver touch sensor pad status to master chip. The N55T10 provides stand-by mode to minimize the power consumption and all touch sensor pads can be waked up under low stand-by current.

Part number	Sensor pads	Wake up	Serial Interface	Auto Calibration
N55T10	10	V	V	V

2. FEATURES

- Wide range of operating voltage:
 - 2.1~5.5V
- Built-in oscillator
- Built-in regulator
- Operating modes: Normal mode and Stand-by mode
- Max 10 touch sensor pads
 - Any sensor pad can be configured to wake up
 - Configurable less number of sensor pads to speed up response time
- Key lock release feature
- Reset management
 - Power-on reset
 - Reset command from Master Chip
- ¹Standby current : 10uA@3V, 10 sensor pads
- Operating current : 500uA@3V, 10 sensor pads
- The sensor function still can work while one speaker connecting to the same power supply is playing.
- Support development system
 - Configuration emulator with USB port
 - Configuration tool for developing parameters easily

¹ The Standby current depends on the number of active sensor pads.

3. BLOCK DIAGRAM

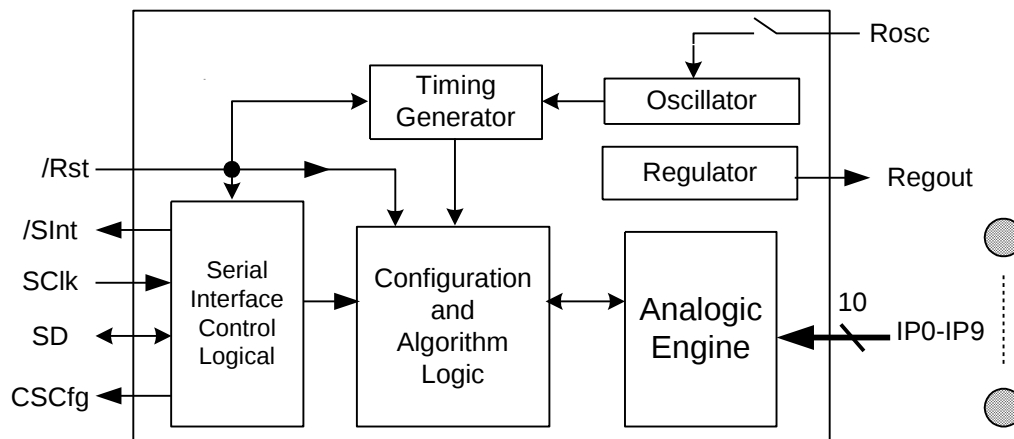


Figure 1 N55T10 Block Diagram

3.1 Pin description

PIN NAME	TYPE	FUNCTION
R _{osc}	I	Ring oscillator resistor pin
V _{dd}	Power	Power
V _{ss}	Ground	Ground
RegOut	O	Regulator output
IP0~IP9	I	Cap sensor input pins.
SClk	I	Serial clock
SD	I/O	Serial data
/SInt	O	Serial interrupt to master MCU
/RST	I	Reset pin
CSCfg	I	Chip select configuration pin

4. FUNCTIONAL DESCRIPTION

The N55T10 provides up to 10 touch sensor pads. Each touch sensor pad can be configured to be able to wake up or not.

There are normal mode and stand-by mode for the chip. In the stand-by mode, chip consumes less current to save power and any sensor pad can be waked up.

This chip equips calibration function to adapt to new circumstances to prevent false trigger.

4.1 Serial interface

There are three pins for the serial interface.

This chip always acts as a slave chip. There are SClk, SD and /SIInt pins. Another MCU will be needed and act as master chip. Master MCU control/configure and gets sensor pad status through the serial interface.

1. SClk always generate from master MCU.
2. SD can be command or parameters from master MCU or sensor pad status from this chip.
3. /SIInt pin act as interrupt pin and will be active whenever any of monitored sensor pads status was changed. And /SIInt will release once the sensor pads status was read by MCU from serial port.

5. ELECTRICAL CHARACTERISTICS

5.1 Absolute maximum ratings

PARAMETER	SYMBOL	CONDITIONS	RATED VALUE	UNIT
Power Supply	$V_{DD}-V_{SS}$	-	-0.3 to +7.0	V
Input Voltage	V_{IN}	All Inputs	$V_{SS}-0.3$ to $V_{DD}+0.3$	V
Operating Temp.	T_{OPR}	-	0 to +70	°C

Note: Exposure to conditions beyond those listed under the Absolute Maximum Ratings table may adversely affect the life and reliability of the device.

5.2 DC Characteristics

($V_{DD}-V_{SS}=3.0V$, $T_A=25^{\circ}C$, No Load unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating voltage	V_{DD}		2.1	-	5.5	V
Input low voltage	V_{IL}	All Input Pins	V_{SS}	-	0.3 V_{DD}	V
Input high voltage	V_{IH}	All Input Pins	0.7 V_{DD}	-	V_{DD}	V
Operating current	I_{OP}	10 sensor pads	-	500	-	uA
Standby current	I_{SB}	1 sensor pad	-	3	-	uA
		5 sensor pads	-	6	-	uA
		10 sensor pads	-	10	-	uA
		1 sensor pad ($V_{DD}=4.5V$)	-	5	-	uA
		5 sensor pads ($V_{DD}=4.5V$)	-	10	-	uA
		10 sensor pads ($V_{DD}=4.5V$)	-	15	-	uA
Power down current	I_{PD}		-	-	1	uA
Pull-high resistor	R_{PH}		50	100	200	K Ω

5.3 AC Characteristics

($V_{DD} - V_{SS} = 3.0V$, $T_A = 25^\circ C$; unless otherwise specified)

PARAMETER	SYM.	CONDITIONS	MIN.	TYP.	MAX.	UNIT
External Main Oscillator Frequency	F_{ext}	$R_{osc}=220Kohm$		10	-	MHz
Frequency Deviation by Voltage Drop External Main Oscillator		$\frac{F(Max) - F(Min)}{F(Min)}$ ($R_{osc}=220K$, $V_{Reg}=2.0V\sim 2.4V$)			10	%
Sensor pad response time (10 active pads)	T_{RT}	Standby mode	-	310	-	ms
Sensor pad response time (10 active pads)	T_{RT}	Normal mode	-	100	-	ms
SCLK	F_{SCLK}		-	-	4	MHz
Sync CLK	T_{sync}		1	-	-	SCLK

6. TYPICAL APPLICATION CIRCUIT

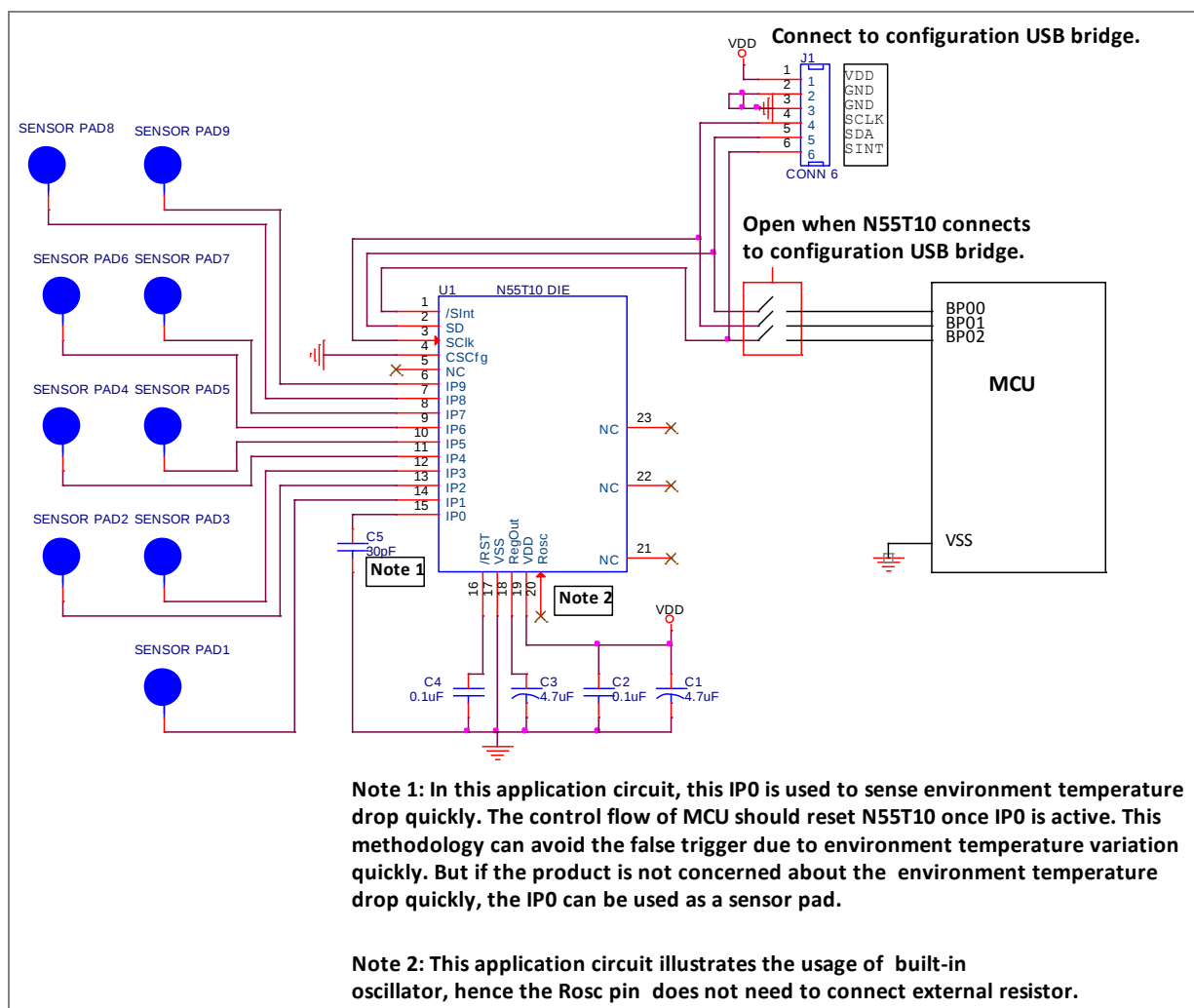


Figure 2 Application circuit of N55T10

7. REVISION HISTORY

REVISION	DATE	MODIFICATIONS
A1.0	October 2009	➤ Preliminary release.
A2.0	December 2009	➤ Add touch modes description
A3.0	January 2010	➤ Modify the spec for 3 batteries application
A4.0	February 2010	➤ Add some features
A5.0	March 2010	➤ Confidential release
A5.1	May 2010	➤ Add the serial interface AC spec
A5.2	May,28 2010	➤ Modify the block diagram
		➤ Modify the standby current data with different conditions
		➤ Typ application circuit modify for Regout and CSCfg pin
A5.3	Aug, 12 2010	➤ Remove some useless data
		➤ Modify the standby current data in typical conditions
		➤ Update the typical application circuit for USB bridge
A6.0	Sep, 27, 2013	➤ Update the TYPICAL APPLICATION CIRCUIT.
		➤ To uniform the terminology to use sensor pads instead of key.

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.

*Please note that all data and specifications are subject to change without notice.
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.*