



proximity



Touch & Proximity Sensing Solutions

Smart Sensing Selector Guide

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Innovative Human Sensing for Smarter Touch Applications

Semtech's advanced sensing solutions provide best-in-class sensitivity with robust noise immunity to enhance touch & near range proximity detection. These ultra-low power, feature-rich touch controllers are optimized for a wide range of battery-powered, portable applications such as smartphones, tablets, wearables, notebooks, GPS, handheld gaming devices, and other consumer electronics.





Ultra-Small, Low Power, Smart Proximity Sensor for SAR/Human Sensing

The SX9306 is an ultra-low power capacitive Specific Absorption Rate (SAR) controller that accurately discriminates between an inanimate object and human body proximity. The resulting detection is used in portable electronic devices to reduce and control radio frequency (RF) emission power in the presence of a human body, enabling significant performance advantages for manufacturers of electronic devices with electro-magnetic radiation sources to meet stringent emission regulations criteria and Specific Absorption Rate (SAR) standards.

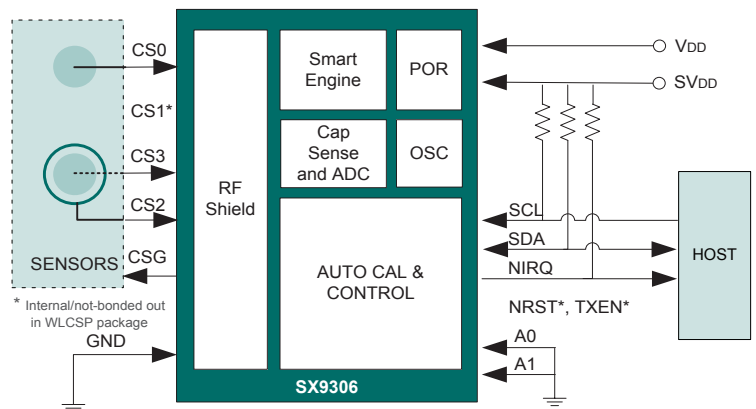
FEATURES

- Patented on-chip smart engine for human detection and advanced SAR control
- Up to 4 programmable capacitive sensor inputs
 - High resolution capacitive sensing down to 0.08fF
 - Capacitance offset compensation up to 30pF
 - Stable proximity sensing with temperature
 - >30mm detection distance
 - Configurable proximity detection (single/combined)
 - Integrated high performance RF shield for enhanced noise immunity
 - Extremely low temperature drift for stable measurement
 - Reduced V_{DD} ripple susceptibility
- Input supply voltage: 2.7V-5.5V
- Active sensor guarding
- Ultra-low power
 - Doze mode: 18 μ A
 - Sleep mode: 2.5 μ A
- Automatic calibration
 - Eliminates false triggers due to environmental factors
- Dedicated TX_EN pin
 - For synchronized proximity measurement to RF transmission
- 400kHz I²C serial interface
 - Input level compatible w/ 1.8V host processor

- Compact size:
 - 3mm x 3mm thin QFN-20
 - 1.6mm x 1.2mm WLCSP-12

APPLICATIONS

- Smartphones
- Tablets
- Wearable Devices
- Notebooks
- Mobile hotspot



SMART PROXIMITY SOLUTIONS						
Part Number	Sensor inputs	Interface	Proximity	Smart Engine	Auto Compensation	Package (mm)
SX9306	Up to 4	I ² C	✓	✓	✓	QFN (3x3) WLCSP (1.6x1.2)



Smart Proximity Sensors for SAR

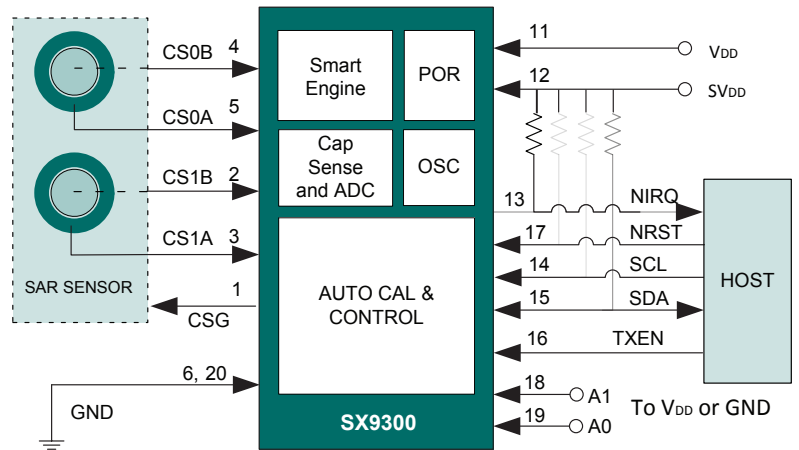
The SX9300 is the world's first dual channel capacitive Specific Absorption Rate (SAR) controller that accurately discriminates between an inanimate object and human body proximity.

FEATURES

- Dual SAR smart sensor inputs
 - On-chip engine for inanimate object vs. human body detection
 - Stable proximity sensing with temperature
 - >30mm detection distance
 - Capacitance offset compensation to 30pf
- Input supply voltage: 2.7V-5.5V
- Active sensor guarding
- Ultra-low power
 - Doze mode: 18µA
 - Sleep mode: 2.5µA
- Automatic calibration
 - Eliminates false triggers due to environmental factors
- Dedicated TX_EN pin
 - For synchronize proximity measurement to RF transmission
- 400kHz I²C serial interface
 - Input level compatible with 1.8V host processor
- Compact size: 3mm x 3mm thin QFN-20 package

APPLICATIONS

- Smartphones
- Tablets
- Wearable Devices
- Notebooks
- Mobile hotspot



SMART PROXIMITY SOLUTIONS						
Part Number	Sensor inputs	Interface	Proximity	Smart Engine	Auto Compensation	Package (mm)
SX9300	2	I ² C	✓	✓	✓	QFN (3x3)



Low Power Proximity Sensor for SAR

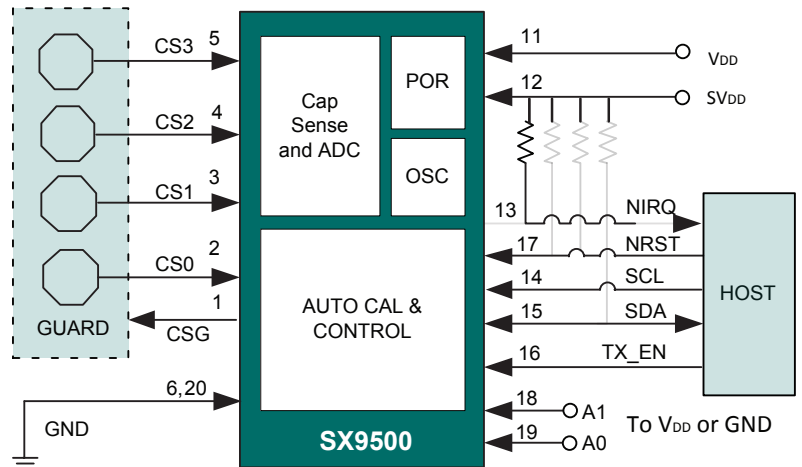
The SX9500 is a low-cost, very low power 4-channel capacitive controller that can operate either as a proximity or button sensor. The SX9500 includes sophisticated onchip auto-calibration circuitry to regularly perform sensitivity adjustments, maintaining peak performance over a wide variation of temperature, humidity and noise environments, providing simplified product development and enhanced performance.

FEATURES

- 4 Channel sensor inputs
 - Stable proximity sensing with temperature
 - >30mm detection distance
 - Capacitance offset compensation to 30pf
- Input supply voltage: 2.7V-5.5V
- Active sensor guarding
- Ultra-low power
 - Doze mode: 18µA
 - Sleep mode: 2.5µA
- Automatic calibration
 - Eliminates false triggers due to environmental factors
- Dedicated TX_EN pin
 - For synchronize proximity measurement to RF transmission
- 400kHz I²C serial interface
 - Input level compatible with 1.8V host processor
- Compact size: 3mm x 3mm thin QFN-20 package

APPLICATIONS

- Smartphones
- Tablets
- Wearable Devices
- Notebooks
- Mobile hotspot



SMART PROXIMITY SOLUTIONS					
Part Number	Sensor inputs	Interface	Proximity	Auto Compensation	Package (mm)
SX9500	4	I ² C	✓	✓	QFN (3x3)

High Performance Touch Button Controllers with Proximity Sensing

SX9510, SX9511, SX9512, SX9513 — A family of feature-rich capacitive touch button solutions enhances the ECO mode present in many green home electronics by integrating an IR decoder for automatic system wake up, thus minimizing the power consumption while in standby. The family also features a unique patent pending circuitry which combines the capacitive sensor with the LED driver to reduce the overall footprint.

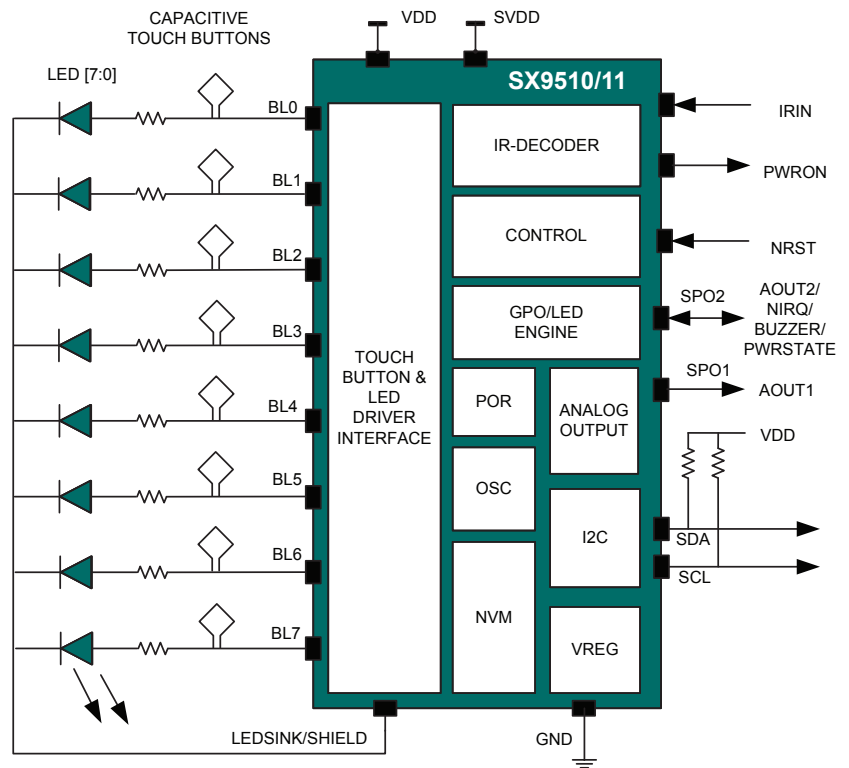
FEATURES

- Fully integrated 8 channel touch button controller and 8 LED driver solution
 - Separate core and I/O supplies
 - 2.7V-5.5V core supply voltage
 - 1.65V-5.5V I/O supply voltage
 - Support for metal sensing user interface design
 - Smart auto-offset compensation
 - Eliminate false triggers due to environmental factors
 - Compensate up to 40pf
 - Extreme sensitivity:
 - Works with thick overlay materials (>5mm)
 - Enhanced proximity sensing
 - >10cm detection
 - Dedicated proximity sensor or combined mode
 - Integrated IR decoder for smart energy management
 - Reduces overall system power consumption in standby mode
- Individual 256-step intensity/Fade-in/Fade-out control
 - Programmable address w/ 8 commands
 - Compatible with a wide range of protocols (i.e. NEC, RCA, Toshiba)
 - Advanced LED driver for visual feedback
 - High current, 15mA LED outputs
 - 256-step intensity control with blink/ breathing mode
 - Buzzer control for audible feedback
 - 2 channel analog output for direct mechanical button replacement
 - 6-bit DAC programmable control
 - 100Ω output impedance
 - 400kHz I²C serial interface
 - Ultra-small footprint
 - 4.0mm x 4.0mm QFN-20
 - 4.4mm x 6.5mm TSSOP-24



APPLICATIONS

- Notebooks
- Tablets
- Mobile applications
- LCD TVs, monitors
- White goods
- Metal sensing applications
- Consumer products, instrumentation, automotive
- Mechanical button replacement



TOUCH BUTTONS & PROXIMITY SOLUTIONS									
Part Number	Sensor Inputs & LED Driver	Interface	Prox.	IR Decoder	Metal Sensing	Auto Comp.	Intensity (256-step)	Field Prog. Memory	Package (mm)
SX9510	8	I ² C/ Analog	✓	✓	✓	✓	Lin./Log.	✓	QFN (4x4) TSSOP (4.4x6.5)
SX9511	8	I ² C/ Analog	-	✓	-	✓	Lin./Log.	✓	QFN (4x4) TSSOP (4.4x6.5)
SX9512	8	I ² C/ Analog	✓	-	✓	✓	Lin./Log.	✓	QFN (4x4) TSSOP (4.4x6.5)
SX9513	8	I ² C/ Analog	-	-	-	✓	Lin./Log.	✓	QFN (4x4) TSSOP (4.4x6.5)



Touch Button Controllers with Proximity Sensing & Analog Output

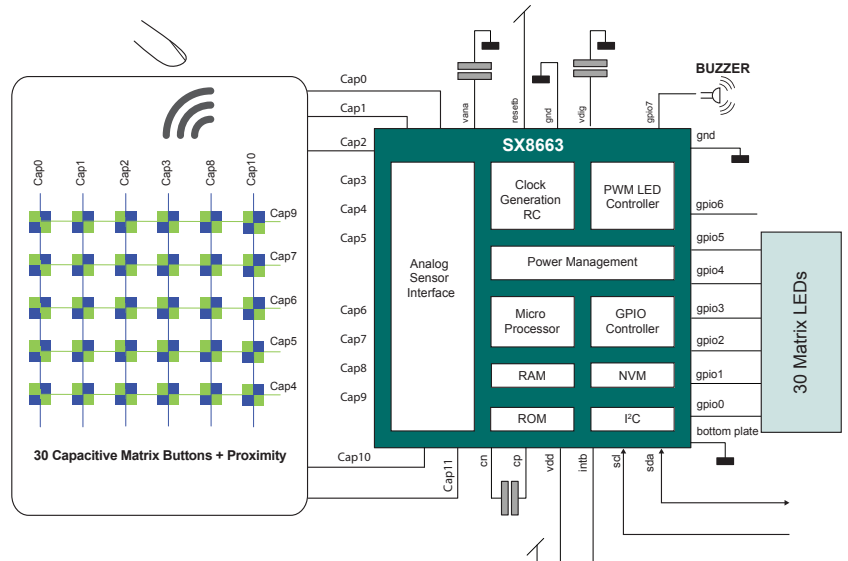
The versatile, ultra-low power SX866x platform provides a cost effective solution to support various touch user interface designs (up to 36 buttons) in a space saving 5x5mm footprint. It also comes with individual LED drivers for visual feedback as well as buzzer control for audible feedback.

FEATURES

- High resolution capacitive sensing solution
 - Proximity detection up to 10cm
 - Support up to 36 matrix buttons
- Up to 2 analog output interfaces (SX8661)
 - Enable button reporting through host's ADC
- Versatile button reporting configuration (SX8661)
 - Advanced channel filtering responds to the strongest touch
- Extreme sensitivity
 - Works with thick overlay materials (>5mm)
- Ultra-low power with programmable scan time
 - 100µA (typ) @ 195ms
- Smart auto-offset compensation
 - Eliminates false triggers due to environmental factors
- Support of buzzer for audible feedback
- Enhanced LED operation
 - 256-step intensity/fade-in/fade-out control
 - Auto-lightening without host interaction
- No external components per input
- Small footprint
 - 5.0mm x 5.0mm QFN-32
 - 4.0mm x 4.0mm QFN-28

APPLICATIONS

- Home automation
- White goods
- Printers
- Notebook/netbook/portable/handheld computers
- Consumer products, instrumentation, automotive
- Mechanical button replacement



TOUCH BUTTON & PROXIMITY SOLUTIONS

Part Number	Button #	LED Driver	Interface	Proximity	Button	Overlay	Auto Comp.	Intensity (256-step)	Fade-in/out	Auto Lightening	Field Prog. Memory	Package (mm)
SX8661	8	8	I²C	✓	✓	>5mm	✓	Lin./Log.	✓	✓	✓	QFN (4x4)
SX8662	36	36	I²C	–	✓	>5mm	✓	Lin./Log.	✓	✓	✓	QFN (5x5)
SX8663	36	36	I²C	✓	✓	>5mm	✓	Lin./Log.	✓	✓	✓	QFN (5x5)



Low Power, Touch Sensors with Proximity Sensing and LED Drivers

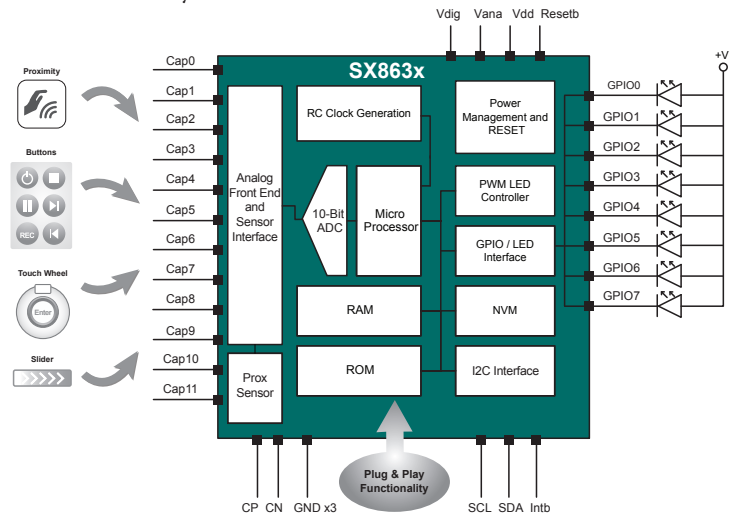
The superior sensitivity of the SX863x touch sensor platform enables sensing through a thick overlay material as well as proximity detection with an extended range all in a tiny footprint with zero components per input. The low power consumption and advanced, built-in LED drivers make it the ideal solution for a wide range of sensing applications in mobile phone, media players, notebooks and white goods.

FEATURES

- High resolution capacitive sensing solution
 - Proximity detection
 - Supports button, slider and wheel design
- Extreme sensitivity:
 - Works with thick overlay materials (>5mm)
 - Extremely low power with programmable scan time
 - 70µA (typ) @ 195ms
- Smart auto-offset compensation
- Eliminates false triggers due to environmental factors
- Enhanced LED operation
- Individual 256-step intensity (Lin. /Log.)
- Fade-in/Fade-out control
- Auto-lightening without host interaction
- No external components per input
- Ultra-small footprint
 - 4.0mm x 4.0mm QFN-28
 - 5.0mm x 5.0mm QFN-32

APPLICATIONS

- LCD monitors
- Appliances
- Printers
- Automotive radio console
- Personal media players
- Set Top Box (STBs)
- Game consoles
- Industrial systems



TOUCH BUTTON & PROXIMITY SOLUTIONS

Part Number	Sensor Inputs	LED Driver (12 mA)	Interface	Prox.	Button	Slider	Wheel	Min. Scan Time	Power @ 195ms	Auto Comp.	Field Prog. Memory	Package (mm)
SX8633	12	8	I ² C	✓	✓	–	–	15ms	80µA	✓	✓	QFN (5x5)
SX8634	12	8	I ² C	✓	✓	✓	–	15ms	80µA	✓	✓	QFN (5x5)
SX8635	12	8	I ² C	✓	✓	–	✓	15ms	80µA	✓	✓	QFN (5x5)
SX8636	8	8	I ² C	✓	✓	–	–	15ms	70µA	✓	✓	QFN (4x4)
SX8638	8	8	I ² C	✓	✓	✓	–	15ms	70µA	✓	✓	QFN (4x4)
SX8639	8	8	I ² C	✓	✓	–	✓	15ms	70µA	✓	✓	QFN (4x4)



Touchscreen Controller with Integrated Proximity Sensing and Haptics

These fully integrated, haptics enabled resistive touchscreen controllers feature unique built-in proximity sensing circuitry, which enables proximity detection in applications where automatic system wake up or backlight LED dimming adjustments are required without the need for any additional components. The SX867x family can directly connect to an ERM or LRA Motor to create haptic feedback, thus eliminating the need for a dedicated μ C interface. The SX867x family also supports various multi-touch gestures such as pinch, stretch and rotation on a regular 4-wire analog resistive touchscreen.

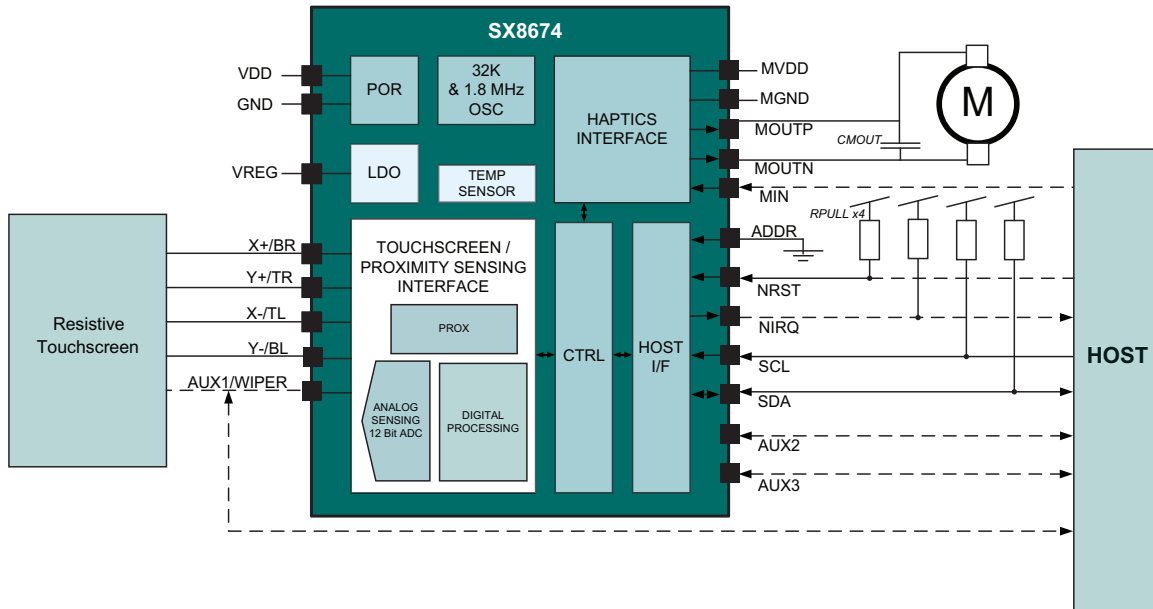
FEATURES

- Extremely low power consumption optimized for battery-powered devices
 - 0.4 μ A @ 2.3V (Standby), 30 μ A @ 2.3V (8ksps)
- 12-bit Resolution with I²C Interface
- Best-in-Class on-chip ESD protection:
Eliminates the needs for external components
 - \pm 25kV Air Gap Discharge
 - \pm 15kV Contact Discharge
 - \pm 15kV HBM
 - \pm 2kV CDM
 - \pm 300V MM
- Built-in proximity sensing with any resistive panel (>5cm)
 - Automatic system/display wake up
 - 4/5 wire touch panel control (IR replacement)
- Integrated haptics motor control (LRA & ERM)
- Programmable setting time
- Enable multi-touch with low cost 4-wire touch panel
- Fully compatible with most 4-wire/5-wire resistive touchscreen
- Ultra-small footprint
 - 2.07mm x 2.07mm WLCSP-19
 - 4.0mm x 4.0mm QFN-20

APPLICATIONS

- Portable navigation device
- Automotive center console
- Digital photo frame
- DSC
- Digital video camera
- Handheld games
- Mobile
- POS terminals





LOW POWER TOUCHSCREEN SOLUTIONS

Part Number	Power Consumption	On-chip ESD Protection	Digital Filter	Multi-touch	Proximity Sensing	Haptics	Package (mm)
SX8674	0.4µA	±25kV Air	✓	✓	✓	Generic	WLCSP (2.07x2.07)
		±15kV Contact					QFN (4x4)
SX8675	0.4µA	±25kV Air	✓	✓	-	Generic	WLCSP (2.07x2.07)
		±15kV Contact					QFN (4x4)
SX8676	0.4µA	±25kV Air	✓	✓	✓	-	WLCSP (2.07x2.07)
		±15kV Contact					QFN (4x4)
SX8677	0.4µA	±25kV Air	✓	✓	✓	Immersion	WLCSP (2.07x2.07)
		±15kV Contact					QFN (4x4)
SX8678	0.4µA	±25kV Air	✓	✓	-	Immersion	WLCSP (2.07x2.07)
		±15kV Contact					QFN (4x4)



Touchscreen Controller with +/-15kV ESD Protection & Multi-touch

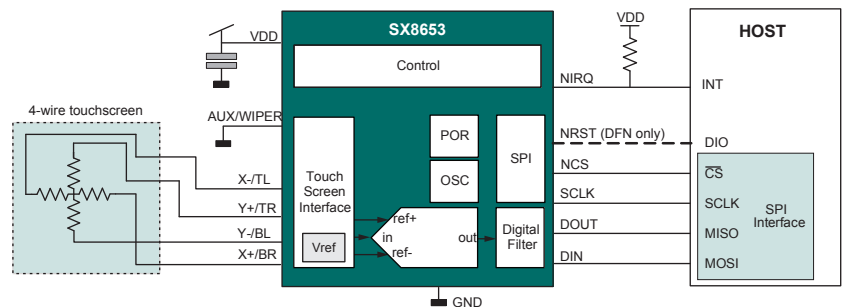
Semtech's ultra-low power, resistive touchscreen controller family provides the best-in-class on-chip ESD protection as well as multi-touch capability on a resistive panel. An extremely small footprint makes these controllers ideal for portable applications where power consumption and board-space are at a premium. The SX8651/53 also enables various multi-touch gestures such as pinch, stretch and rotation on a regular 4-wire analog resistive touchscreen.

FEATURES

- Extremely low power consumption optimized for battery-powered devices
 - 0.4µA @ 2.3V (Standby), 30µA @ 2.3V (8ksps)
- 12-bit Resolutions with I²C Interface
- Best-in-Class on-chip ESD protection: Eliminates the need for external components
 - ±25kV air gap discharge / ±15kV contact discharge
 - ±15kV HBM / ±2kV CDM / ±300V MM
- Equivalent throughput up to 50ksps
- Enable multi-touch gestures with low cost 4-wire analog resistive touch panel
- Built-in programmable settling time and digital filter reduces host processing overhead and bus loading
- Ultra-small footprint
 - 1.46mm x 1.96mm WLCSP-12
 - 3.0mm x 3.0mm DFN-12
 - 4.0mm x 3.0mm DFN-14

APPLICATIONS

- Portable navigation device
- Automotive center console
- Digital photo frame
- Digital video camera and DSC
- Handheld games
- Mobile
- POS terminals



LOW POWER TOUCHSCREEN SOLUTIONS							
Part Number	Touch Panel	Power Consumption	On-chip ESD Protection	Digital Filter	Programmable Settling Time	Multi-touch	Package (mm)
SX8650	4-wire	0.4µA	±25kV Air	✓	✓	-	WLCSP (1.46x1.96)
			±15kV Contact				DFN (3x3)
SX8651	4-wire	0.4µA	±25kV Air	✓	✓	✓	WLCSP (1.46x1.96)
			±15kV Contact				DFN (3x3)
SX8652	4/5-wire	0.4µA	±25kV Air	✓	✓	-	WLCSP (1.46x1.96)
			±15kV Contact				DFN (4x3)
SX8653	4/5-wire	0.4µA	±25kV Air	✓	✓	✓	WLCSP (1.46x1.96)
			±15kV Contact				DFN (4x3)



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