

Dual Channel Proximity Touch Controller Product Brief

FEATURES

- Capacitive Proximity Detection System:
 - High Signal to Noise Ratio (SNR)
 - Adjustable sensitivity
 - Noise Rejection Filters
 - Scanning method actively optimized to attenuate strongest noise frequencies
 - Automatic calibration with optional user presets
 - Dynamic threshold management adjusts sensitivity of sensor based on the level of environmental noise
 - Constant press calibration tracks the expected offset when the sensor is pressed and adjusts the threshold to automatically achieve the best press/release behavior
 - User-defined "minimum shift" values specify the lowest amount of signal change to activate a state transition. Automatic thresholds never decrease below these settings.
 - Automatic Environmental Compensation
- No Required External Components
- Low-Power mode: Highly Configurable Low-Power mode
 - 1ms to 4s Sleep interval between sensor samples
- Response Time as Low as 10 mS
- Hardware Error Detection notifies if either sensors is shorted to VDD, VSS, or the other sensor
- Operating Voltage Range: 1.8V to 3.6V
- Operating Temperature: -40°C to +85°C

GENERAL DESCRIPTION

The Microchip mTouch™ MTCH112 Dual Channel Proximity/Touch Controller provides an easy way to add proximity and/or touch sensor detection to any application. The device implements either two capacitive sensors or one sensor and one active guard driver. The optional device configuration through I²C™ allow presets to be loaded in a production environment. Automatic calibration routines are used by default to choose the best options, so user configuration is not required.

The MTCH112 uses a sophisticated optimization algorithm to actively eliminate noise from the signal. While the noise level is being measured, the requirements for a proximity or touch detection are updated to reflect the degree of uncertainty in the readings. When a press is detected for the first time, the threshold is automatically calibrated to choose a smart threshold for the 'release' and next press. This creates a system that dynamically optimizes the signal-to-noise ratio for its environment.

PACKAGE TYPE

The device is available in 8-lead SOIC and DFN.

FIGURE 1: 8-PIN SOIC, DFN DIAGRAM FOR MTCH112

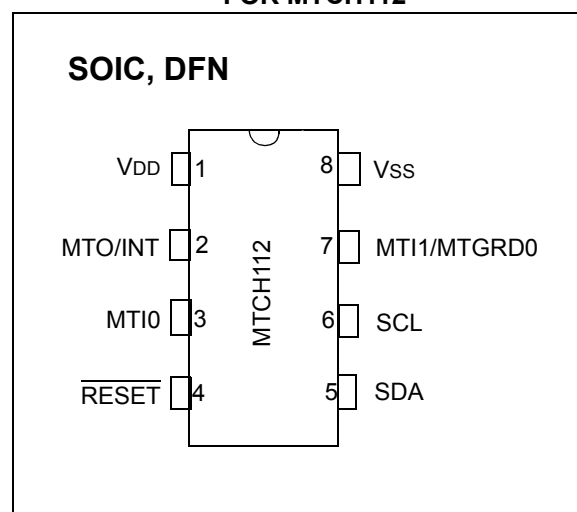


TABLE 1: 8-PIN DESCRIPTION

Name	8-Pin SOIC and DFN	Description
VDD	1	Power Supply Input
MTO/INT	2	Detect Output (Active-Low) Notification Interrupt Pin
MTIO	3	Proximity/Touch Sensor Input
RESET	4	Device Reset (Active-Low)
SDA	5	I ² C™ Data
SCL	6	I ² C™ Clock
MTI1/MTGRD0	7	Proximity/Touch Sensor Input and Active Guard Shield for MTIO
VSS	8	Ground Reference

MTCH112

TABLE 2: POWER CONSUMPTION

		1.8V	3.0V			3.0V	3.6V
CLKSEL	SLEEP (S)	Typ (μA)	Typ (μA)	CLKSEL	SLEEP (S)	Typ (μA)	Typ (μA)
16 MHz	0	640	990	32 MHz	0	1952	2350
	0.001	580	900		0.001	1780	2140
	0.002	540	830		0.002	1630	1970
	0.004	460	710		0.004	1400	1690
	0.008	360	560		0.008	1090	1320
	0.016	250	390		0.016	760	915
	0.032	160	240		0.032	470	570
	0.064	89	140		0.064	270	320
	0.128	48	74		0.128	150	170
	0.256	25	38		0.256	75	91
	0.512	13	20		0.512	39	46
	1	6.8	11		1	20	24
	2	3.6	5.5		2	10	12
	4	1.9	3.0		4	5	6
	8	1.1	1.8		8	3	3
	16	0.7	1.1		16	1.7	2
	32	0.5	0.8		32	1	1
	64	0.4	0.7		64	0.8	0.9
	128	0.3	0.6		128	0.7	0.7
	256	0.3	0.5		256	0.6	0.6

PIN DESCRIPTION

MTI

Connect the sensor to this input. An additional resistor of at least 4.7kΩ is recommended for best noise immunity. Sensors up to 40 pF in capacitance are supported. Sensors work best when the base capacitance is minimized. This will maximize the percentage change in capacitance when a finger is added to the circuit.

MTGRD0

The waveform on MTGRD0 will shield or guard MTI0's sensor from the effect of nearby noise sources or power planes if MTGRD0's trace surrounds MTI0's trace and sensor. The pin will be driven in phase with MTI0 to minimize the voltage differential between the two pins. This does not interfere with measuring capacitive changes on the MTI1 sensor.

MTO

The mTouch™ output pin is always driven to either VDD or VSS by the device. The MTCH112 OUTCON register determines the behavior of the MTO/INT pin. The pin is always active-low, but the states in which this output occurs can be adjusted in the device's OUTCON register. If no options are selected for output states, the MTO pin acts as an interrupt to a master device. The MTCH112 will pulse low for at least 1ms if any state changes occur. Further information must be determined by communicating through I²C with the device.

SDA/SCL

These pins are the serial data (SDA) and clock (SCL) connections of the I²C interface. They should be connected to the I²C master SDA and SCL signals with a 1.5k pull-up resistor to VDD.

REVISION HISTORY

Revision A (October 2012)

Initial release of this Product Brief.

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, FlashFlex, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, PIC³² logo, rPIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MTP, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

Analog-for-the-Digital Age, Application Maestro, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniclient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICTail, REAL ICE, rLAB, Select Mode, SQL, Serial Quad I/O, Total Endurance, TSHARC, UniWinDriver, WiperLock, ZENA and Z-Scale are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

GestIC and ULPP are registered trademarks of Microchip Technology Germany II GmbH & Co. & KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2012, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.



Printed on recycled paper.

ISBN: 9781620766361

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949 ==

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

Santa Clara
Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto
Mississauga, Ontario,
Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hangzhou
Tel: 86-571-2819-3187
Fax: 86-571-2819-3189

China - Hong Kong SAR
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Osaka
Tel: 81-66-152-7160
Fax: 81-66-152-9310

Japan - Yokohama
Tel: 81-45-471-6166
Fax: 81-45-471-6122

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-213-7828
Fax: 886-7-330-9305

Taiwan - Taipei
Tel: 886-2-2508-8600
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

UK - Wokingham
Tel: 44-118-921-5869
Fax: 44-118-921-5820