

## 2, 5 and 8-Channel Proximity/Touch Controller Product Brief

### Description

The Microchip mTouch<sup>®</sup> MTCH102/105/108 Proximity/Touch Controller with simple digital output provides an easy way to add proximity and/or touch detection to any application. This device family implements capacitive sensors with active guarding capability. The sensitivity and power mode can be configured through the MTSA and MTPM pins. The MTCH102/105/108 devices also use an advanced optimization algorithm to actively suppress noise from the signal to achieve reliable proximity/touch detection.

### Features

- Capacitive Proximity and Touch Detection System:
  - High Signal to Noise Ratio (SNR)
  - Adjustable sensitivity with compensation for different sensor sizes
  - Multi-stage Active noise suppression filters
  - Automatic environmental compensation
  - Support for wide range of sensor shape and size
- Simple I/O Interface with existing System
- Smart Scan Scheduling
- Threshold Hysteresis
- Flexible Low-Power mode
- Brown-Out Protection
- Operating Voltage Range: 2.05V to 3.6V
- Operating Temperature: -40°C to +85°C

### Application

- Light Switch
- Portable Device Enabler
- White Goods and Appliance
- Office Equipment and Toys
- Display and Keypad Back-Lighting Activation

**TABLE 1: MTCH10X FAMILY TYPES**

| Device  | Data Sheet Index | Sensor Input     | Active Guard     | Digital Output |
|---------|------------------|------------------|------------------|----------------|
| MTCH101 | (A)              | 1                | N                | 1              |
| MTCH102 | (B)              | 2 <sup>(1)</sup> | Y <sup>(1)</sup> | 2              |
| MTCH105 | (B)              | 5 <sup>(1)</sup> | Y <sup>(1)</sup> | 5              |
| MTCH108 | (B)              | 8 <sup>(1)</sup> | Y <sup>(1)</sup> | 8              |

**Note 1:** One of the sensor inputs can be configured as active guard output.

**Data Sheet Index:** (Unshaded devices are described in this document.)

**A:** DS-40001664 [MTCH101 Single-Channel Proximity Detector](#)

**B:** Future Release [MTCH102/105/108 Dual-Channel Proximity/Touch Controller](#)

**Note:** For other small form-factor package availability and marking information, please visit <http://www.microchip.com/packaging> or contact your local sales office.

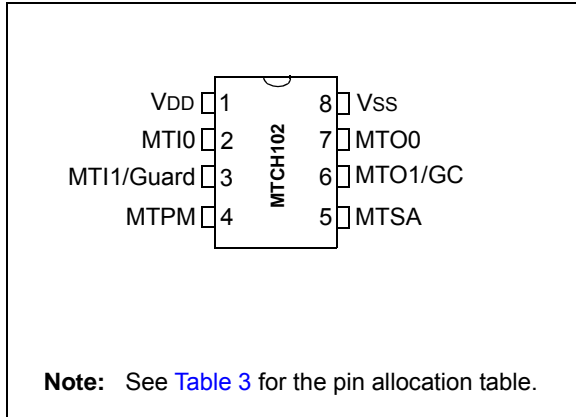
**TABLE 2: PACKAGES**

| Packages | MSOP | TSSOP | SSOP | UDFN | QFN |
|----------|------|-------|------|------|-----|
| MTCH102  | X    |       |      | X    |     |
| MTCH105  |      | X     |      |      | X   |
| MTCH108  |      |       | X    |      | X   |

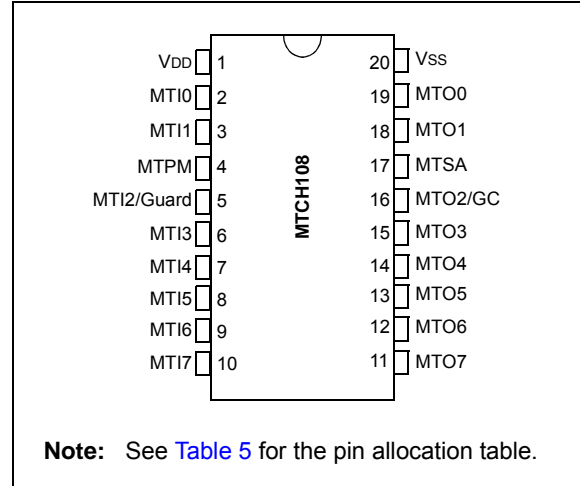
# MTCH102/105/108

## PIN DIAGRAMS

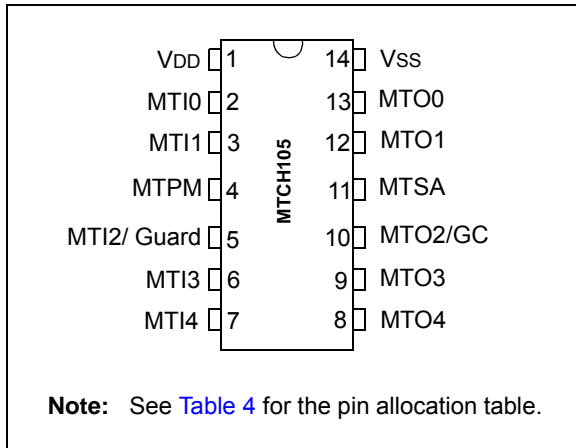
**FIGURE 1: 8-LEAD SOIC, DFN**



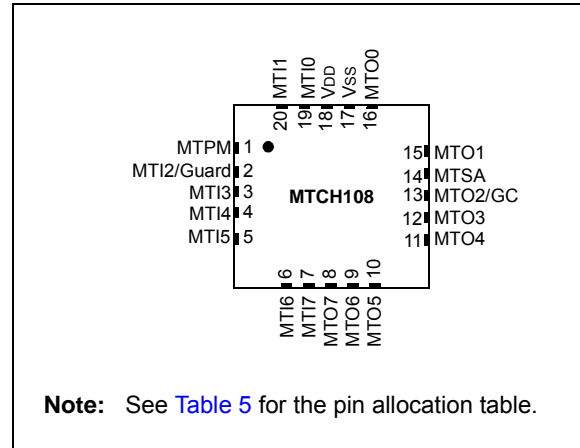
**FIGURE 4: 20-LEAD TSSOP**



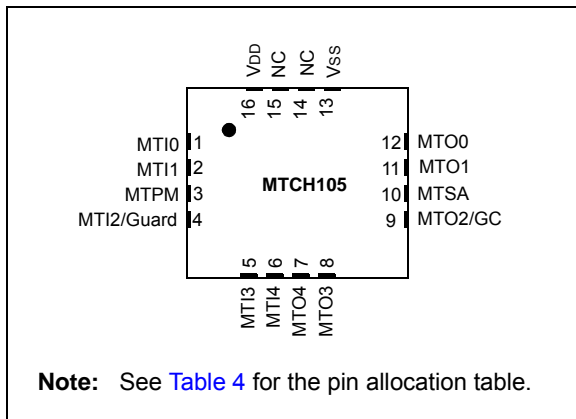
**FIGURE 2: 14-LEAD SOIC**



**FIGURE 5: 20-LEAD QFN**



**FIGURE 3: 16-LEAD QFN**



## PIN ALLOCATION TABLES

**TABLE 3: 8-PIN DESCRIPTION (MTCH102)**

| Name       | 8-Lead SOIC and DFN | Description                                   |
|------------|---------------------|---|
| VDD        | 1                   | Power Supply Input                            |
| MTI0       | 2                   | Proximity/Touch Sensor 0 Input                |
| MTI1/Guard | 3                   | Proximity/Touch Sensor 1 Input/Active Guard   |
| MTPM       | 4                   | Low-Power Mode Select                         |
| MTSA       | 5                   | Sensitivity Adjust Input                      |
| MTO1/GC    | 6                   | MTI1 Detect Output (Active-Low)/Guard Control |
| MTO0       | 7                   | MTI0 Detect Output (Active-Low)               |
| Vss        | 8                   | Ground  |

**TABLE 4: 14-,16-PIN DESCRIPTION (MTCH105)**

| Name       | 14-Lead SOIC | 16-Lead QFN | Description                                    |
|------------|--------------|-------------|--|
| VDD        | 1            | 16          | Power Supply Input                             |
| MTI0       | 2            | 1           | Proximity/Touch Sensor 0 Input                 |
| MTI1       | 3            | 2           | Proximity/Touch Sensor 1 Input                 |
| MTPM       | 4            | 3           | Low-Power Mode Select                          |
| MTI2/Guard | 5            | 4           | Proximity/Touch Sensor 2 Input/Active Guard    |
| MTI3       | 6            | 5           | Proximity/Touch Sensor 3 Input                 |
| MTI4       | 7            | 6           | Proximity/Touch Sensor 4 Input                 |
| MTO4       | 8            | 7           | MTI4 Detect Output (Active-Low)                |
| MTO3       | 9            | 8           | MTI3 Detect Output (Active-Low)                |
| MTO2/GC    | 10           | 9           | MTI2 Detect Output (Active-Low) /Guard Control |
| MTSA       | 11           | 10          | Sensitivity Adjust Input                       |
| MTO1       | 12           | 11          | MTI1 Detect Output (Active-Low)                |
| MTO0       | 13           | 12          | MTI0 Detect Output (Active-Low)                |
| Vss        | 14           | 13          | Ground   |

# MTCH102/105/108

**TABLE 5: 20-PIN DESCRIPTION (MTCH108)**

| Name       | 20-Lead TSSOP | 20-Lead QFN | Description                                   |
|------------|---------------|-------------|---|
| VDD        | 1             | 18          | Power Supply Input                            |
| MTI0       | 2             | 19          | Proximity/Touch Sensor 0 Input                |
| MTI1       | 3             | 20          | Proximity/Touch Sensor 1 Input                |
| MTPM       | 4             | 1           | Low-Power Mode Select                         |
| MTI2/Guard | 5             | 2           | Proximity/Touch Sensor 2 Input/Active Guard   |
| MTI3       | 6             | 3           | Proximity/Touch Sensor 3 Input                |
| MTI4       | 7             | 4           | Proximity/Touch Sensor 4 Input                |
| MTI5       | 8             | 5           | Proximity/Touch Sensor 5 Input                |
| MTI6       | 9             | 6           | Proximity/Touch Sensor 6 Input                |
| MTI7       | 10            | 7           | Proximity/Touch Sensor 7 Input                |
| MTO7       | 11            | 8           | MTI7 Detect Output (Active-Low)               |
| MTO6       | 12            | 9           | MTI6 Detect Output (Active-Low)               |
| MTO5       | 13            | 10          | MTI5 Detect Output (Active-Low)               |
| MTO4       | 14            | 11          | MTI4 Detect Output (Active-Low)               |
| MTO3       | 15            | 12          | MTI3 Detect Output (Active-Low)               |
| MTO2/GC    | 16            | 13          | MTI2 Detect Output (Active-Low)/Guard Control |
| MTSA       | 17            | 14          | Sensitivity Adjust Input                      |
| MTO1       | 18            | 15          | MTI1 Detect Output (Active-Low)               |
| MTO0       | 19            | 16          | MTI0 Detect Output (Active-Low)               |
| Vss        | 20            | 17          | Ground  |

## PIN DESCRIPTION

### MTIx

Connect the sensor to this input. An additional resistor of at least 4.7 k $\Omega$  is recommended for high-frequency noise immunity.

### GUARD

The waveform on the Guard pin will shield or guard MTIx's sensor from the effect of nearby noise sources or power planes if the guard trace surrounds MTIx's trace and sensor. The Guard pin will be driven in phase with MTIx to minimize the voltage difference between the two pins.

### MTOx

The MTOx pin is an open-drain output, which reports the proximity/touch state of MTIx. A pull-up resistor is required, and it will pull the line low when proximity/touch is detected, and release the line when proximity/touch is released.

### GC

By grounding the GC pin, the active guard signal will be enabled on the Guard pin.

### MTSA

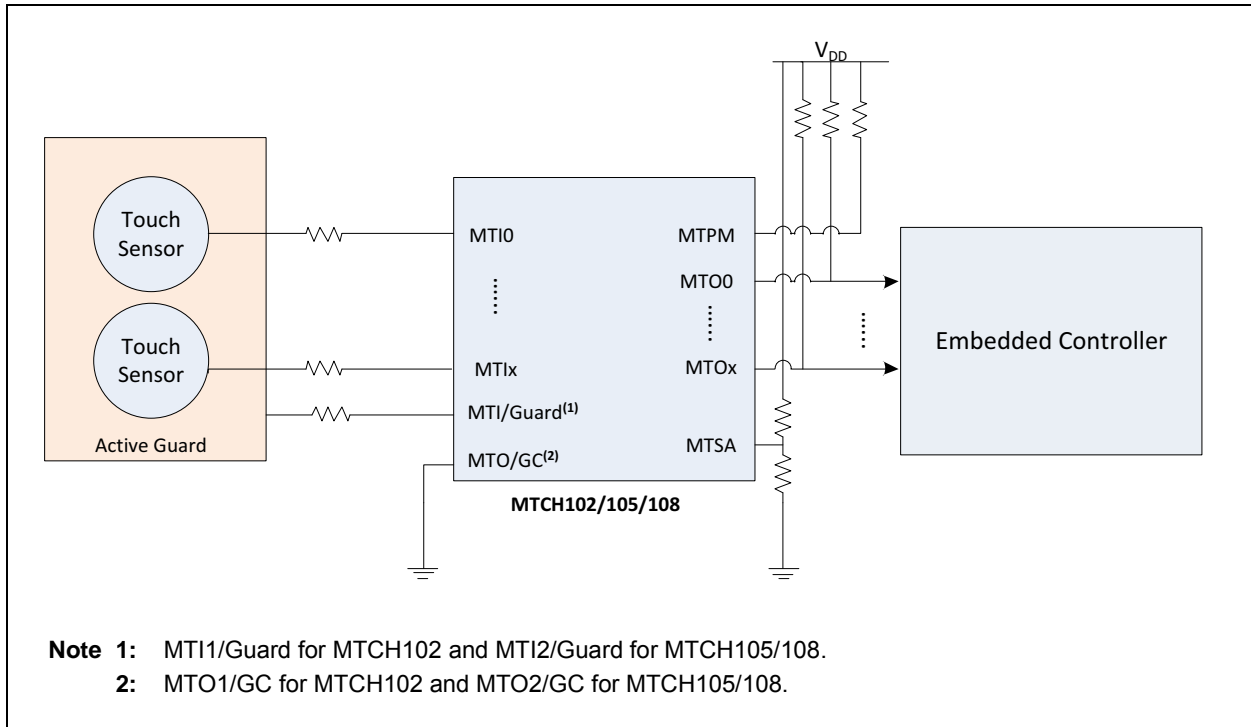
The voltage will determine the sensitivity. VDD voltage will give the lowest sensitivity while GND voltage will give the highest. A linear voltage sensitivity is implemented between VDD and GND. A resistor ladder is used to adjust the sensitivity.

### MTPM

By grounding the MTPM pin, the MTCH102/105/108 will be in Low-Power mode, thus having a slower response time. When the MTPM pin is at VDD, the power consumption will be higher with a faster response time.

## TYPICAL CIRCUIT

FIGURE 6: SYSTEM DIAGRAM FOR MTCH10X



---

---

**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, flexPWR, JukeBlox, KEELOQ, KEELOQ logo, Klear, LANCheck, MediaLB, MOST, MOST logo, MPLAB, OptoLyzer, PIC, PICSTART, PIC<sup>32</sup> logo, RightTouch, SpyNIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

The Embedded Control Solutions Company and mTouch are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, ECAN, In-Circuit Serial Programming, ICSP, Inter-Chip Connectivity, KlearNet, KlearNet logo, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, RightTouch logo, REAL ICE, SQI, Serial Quad I/O, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA 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.

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

GestIC is a 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.

© 2015, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-63277-013-4

**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.*



# MICROCHIP

## 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](http://www.microchip.com)

#### Atlanta

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

#### Austin, TX

Tel: 512-257-3370

#### 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

Novi, MI  
Tel: 248-848-4000

#### Houston, TX

Tel: 281-894-5983  
Indianapolis

#### Noblesville, IN

Tel: 317-773-8323  
Fax: 317-773-5453

#### Los Angeles

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

#### New York, NY

Tel: 631-435-6000

#### San Jose, CA

Tel: 408-735-9110

#### Canada - Toronto

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: 852-2943-5100  
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 - Dongguan

Tel: 86-769-8702-9880

#### China - Hangzhou

Tel: 86-571-8792-8115  
Fax: 86-571-8792-8116

#### China - Hong Kong SAR

Tel: 852-2943-5100  
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: 86-755-8864-2200  
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

### ASIA/PACIFIC

#### China - Xiamen

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

#### China - Zhuhai

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

#### 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: 91-20-3019-1500

#### Japan - Osaka

Tel: 81-6-6152-7160  
Fax: 81-6-6152-9310

#### Japan - Tokyo

Tel: 81-3-6880-3770  
Fax: 81-3-6880-3771

#### 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

#### 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 - Dusseldorf

Tel: 49-2129-3766400

#### Germany - Munich

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

#### Germany - Pforzheim

Tel: 49-7231-424750

#### Italy - Milan

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

#### Italy - Venice

Tel: 39-049-7625286

#### Netherlands - Drunen

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

#### Poland - Warsaw

Tel: 48-22-3325737

#### Spain - Madrid

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

#### Sweden - Stockholm

Tel: 46-8-5090-4654



#### UK - Wokingham

Tel: 44-118-921-5800  
Fax: 44-118-921-5820

01/27/15

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  [View MTCH108-I/SS on WIN SOURCE](#)
-  [Microchip Technology](#) Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management