
MGC3140 3D Tracking and Gesture Controller Product Brief

Introduction

Microchip's MGC3140 is a 3D gesture and motion tracking controller based on Microchip's patented GestIC[®] technology – suitable for consumer, industrial and automotive applications. It enables robust user interfaces with natural hand and finger movements utilizing the principles of electrical near-field sensing.

Implemented as a low-power mixed-signal configurable controller, the MGC3140 provides a compelling set of smart functional features such as gesture recognition while using adaptive working frequencies for robust performance in noisy environments. Microchip's on-chip Colibri gesture suite removes the need for host post-processing and reduces system power consumption, resulting in low software development efforts for short time-to-market success.

The MGC3140 represents a unique and high-performance single-chip gesture solution focusing on automotive applications. MGC3140 provides proximity, gesture detection and driver recognition, thus enabling modern and compelling user interfaces to be created.

MGC3140 Applications

- Automotive Applications
- IoT
- Audio Products
- Notebooks/Keyboards/PC Peripherals
- Home Automation
- White Goods
- Switches
- Medical Products
- Game Controllers

Power Operation Modes

Several Power Operation Modes Including:

- Processing Mode: 29 mA, typical
- Deep Sleep: 84 μ A, typical

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1. Key Features

- Automotive Qualification AEC Q100 Grade 1
- Recognition of 3D Hand Gestures and x, y, z Positional Data
- Proximity and Touch Sensing
- Built-in Colibri Gesture Suite (running on-chip)
- Advanced 3D Signal Processing Unit
- Detection Range: 0 to 10 cm, typical
- Receiver Sensitivity: <1 fF
- Position Rate: 200 positions/sec.
- Spatial Resolution: up to 150 dpi
- Carrier Frequency: 42, 43, 44, 45, 100 kHz
- Channels Supported:
 - Five receive (Rx) channels
 - One transmit (Tx) channel
- On-chip Auto-Calibration
- Low-Noise Radiation due to Low-Transmit Voltage and Slew Rate Control
- Noise Susceptibility Reduction:
 - On-chip analog filtering
 - On-chip digital filtering
 - Automatic frequency hopping
- Enables the use of Low-Cost Electrode Material including:
 - Printed circuit board
 - Conductive paint
 - Conductive foil
 - Laser Direct Structuring (LDS)
 - Touch panel ITO structures
- Field Upgrade Capability
- Operating Voltage: $V_{DD} = 3.3V \pm 5\%$
- Operating Temperature Range: $-40^{\circ}C$ to $+125^{\circ}C$

1.1 Peripheral Features

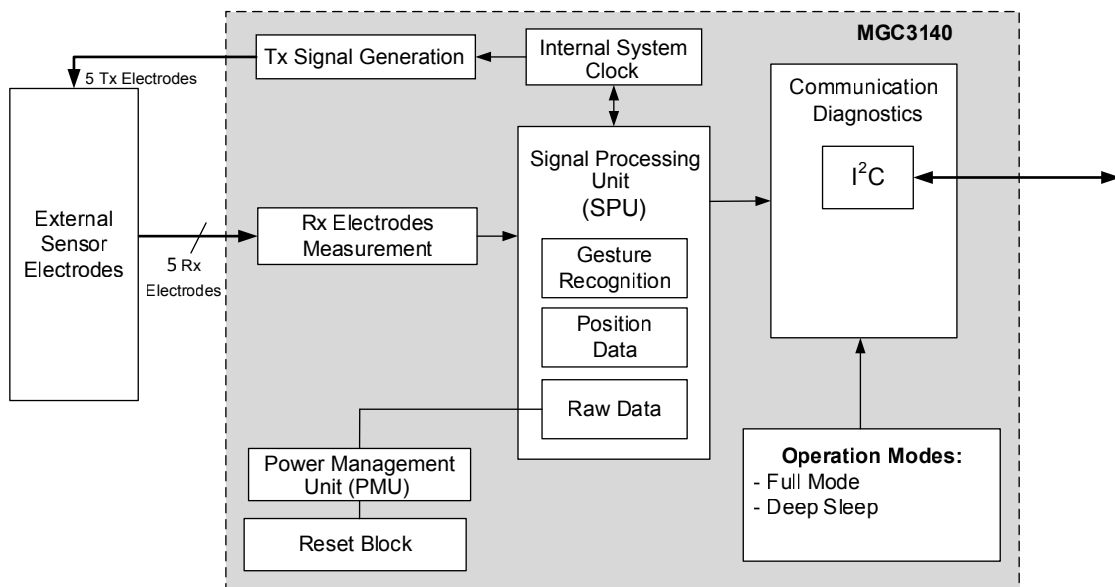
- I²C for Configuration and Sensor Output Streaming I²C, speed up to 400 kHz

2. Functional Description

Microchip Technology's GestIC technology utilizes electrical near-field (E-field) sensing. The chip is connected to electrodes that are sensing the E-field variance. The GestIC device then calculates the user's hand motion relatively to the sensing area in x, y, z position data, and classifies the movement pattern into gestures in real time. In addition, by utilizing the principles of E-field sensing, the GestIC system is immune to ambient influences such as light or sound, which have a negative impact on the majority of other 3D technologies. Also, it allows full-surface coverage of the electrode area with no detection blind spots of a user's action.

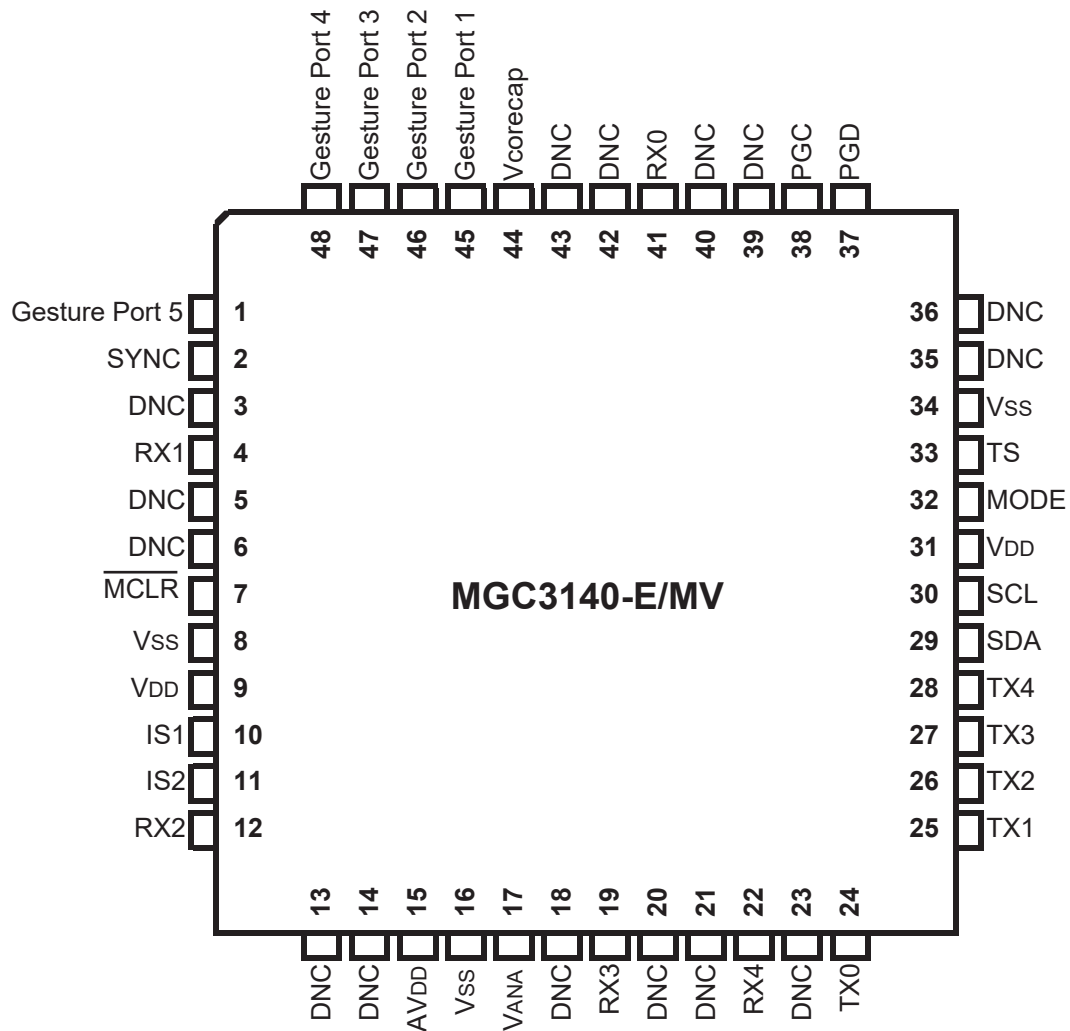
Microchip Technology's MGC3140 is a configurable controller. Featuring a Signal Processing Unit (SPU), a wide range of 3D gesture applications are being processed on the MGC3140, which allows short development cycles. Always-on 3D sensing is enabled, even for battery-driven devices, by the chip's low-power design and the variety of programmable power modes. GestIC sensing electrodes are driven by a low-voltage signal with frequencies of 42, 43, 44, 45, and 100 kHz, allowing their electrical conductive structure to be made of any low-cost material. Figure 2-1 provides an overview of the main building blocks of MGC3140.

Figure 2-1. MGC3140 Block Diagram



3. Pin Diagram

Figure 3-1. MGC3140 48L Diagram UQFN



Related Links

- [4. 48-Pin Allocation and Pinout Description Table](#)

4. 48-Pin Allocation and Pinout Description Table

| Pin Name | Pin Number | Pin Type | Buffer Type | Description |
|--------------------------|------------|----------|-------------|--|
| GP5 | 1 | O | — | Gesture Port 5. |
| SYNC | 2 | O | — | Gesture device synchronization pulse (every 1 ms). |
| DNC | 3 | — | — | not connected |
| RX1 | 4 | I | Analog | Analog GestIC [®] input channel 1: Receive electrode connection. |
| DNC | 5 | — | — | not connected |
| DNC | 6 | — | — | not connected |
| $\overline{\text{MCLR}}$ | 7 | I | — | Master Clear (Reset) input. This pin is an active-low Reset to the device. |
| V _{SS} | 8 | P | — | Ground reference for logic and I/O pins. This pin must be connected at all times. |
| V _{DD} | 9 | P | — | Positive supply for peripheral logic and I/O pins. |
| IS1 | 10 | I | ST | Interface Selection Pin 1 |
| IS2 | 11 | I | ST | Interface Selection Pin 2 |
| RX2 | 12 | I | Analog | Analog GestIC [®] input channel 2: Receive electrode connection. |
| DNC | 13 | — | — | not connected |
| DNC | 14 | — | — | not connected |
| AV _{DD} | 15 | P | — | Positive supply for analog modules. This pin must be connected at all times. |
| V _{SS} | 16 | P | — | Ground reference for analog modules. |
| V _{ANA} | 17 | P | — | Positive supply for analog front end. |
| DNC | 18 | — | — | not connected |
| RX3 | 19 | I | Analog | Analog GestIC [®] input channel 3: Receive electrode connection. |
| DNC | 20 | — | — | not connected |
| DNC | 21 | — | — | not connected |
| RX4 | 22 | I | Analog | Analog GestIC [®] input channel 4: Receive electrode connection. |
| DNC | 23 | — | — | not connected |
| TX0 | 24 | O | — | GestIC [®] Transmit electrode connection 0. |
| TX1 | 25 | O | — | GestIC [®] Transmit electrode connection 1. |
| TX2 | 26 | O | — | GestIC [®] Transmit electrode connection 2. |
| TX3 | 27 | O | — | GestIC [®] Transmit electrode connection 3. |
| TX4 | 28 | O | — | GestIC [®] Transmit electrode connection 4. |
| SDA | 29 | I/O | ST | Synchronous serial data input/output for I ² C. |
| SCL | 30 | I/O | ST | Synchronous serial clock input/output for I ² C. |

48-Pin Allocation and Pinout Description Table

| Pin Name | Pin Number | Pin Type | Buffer Type | Description |
|---|------------|----------|-------------|---|
| V _{DD} | 31 | P | — | Positive supply for peripheral logic and I/O pins. |
| MODE | 32 | I | ST | Gesture Devices Scan mode: High: 2D touch device measuring; Low: gesture device measuring |
| \overline{TS} | 33 | O | — | Transfer Status. GestIC [®] message ready interrupt. |
| V _{SS} | 34 | P | — | Ground reference for analog modules. This pin must be connected at all times. |
| DNC | 35 | — | — | not connected |
| DNC | 36 | — | — | not connected |
| PGD | 37 | I/O | ST | Programming Data line, connect to test pin in application. |
| PGC | 38 | I/O | ST | Programming Clock line, connect to test pin in application. |
| DNC | 39 | — | — | not connected |
| DNC | 40 | — | — | not connected |
| RX0 | 41 | I | Analog | Analog GestIC [®] input channel 0: Receive electrode connection. |
| DNC | 42 | — | — | not connected |
| DNC | 43 | — | — | not connected |
| V _{CORECAP} | 44 | P | — | Capacitor for Internal Voltage Regulator. |
| GP1 | 45 | O | — | Gesture Port 1. |
| GP2 | 46 | O | — | Gesture Port 2. |
| GP3 | 47 | O | — | Gesture Port 3. |
| GP4 | 48 | O | — | Gesture Port 4. |
| Legend: | | | | |
| Analog = Analog input | | | | |
| P = Power | | | | |
| ST = Schmitt Trigger input with CMOS levels | | | | |
| I = Input | | | | |
| O = Output | | | | |
| I/O = Input/Output | | | | |
| — = N/A | | | | |



Important: Exposed pad must be connected to V_{SS}.

Related Links

[3. Pin Diagram](#)

6. Packaging Information

Package Marking Information

Rev. 30-009000A
5/17/2017

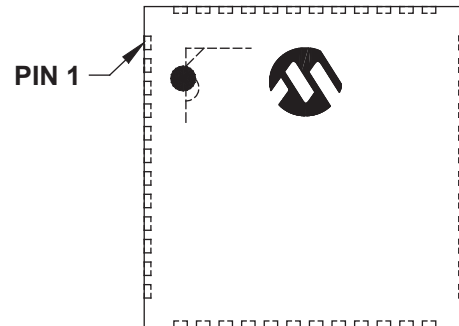
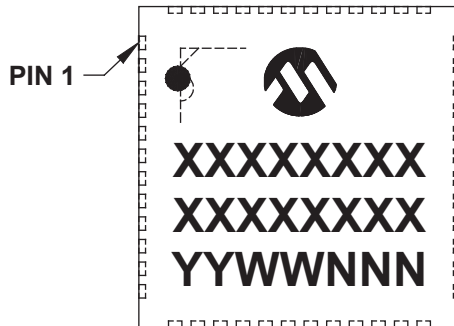
| | | |
|----------------|--------|--|
| Legend: | XX...X | Customer-specific information or Microchip part number |
| | Y | Year code (last digit of calendar year) |
| | YY | Year code (last 2 digits of calendar year) |
| | WW | Week code (week of January 1 is week '01') |
| | NNN | Alphanumeric traceability code |
| | (e3) | b-free JEDEC [®] designator for Matte Tin (Sn) |
| | * | This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package. |

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

Rev. 30-009048A
3/04/2017

48-Lead UQFN (6x6x0.5 mm)

Example

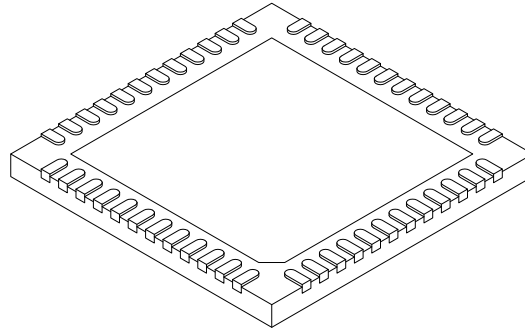


6.1 Package Details

The following sections give the technical details of the packages.

48-Lead Plastic Ultra Thin Quad Flat, No Lead Package (MV) – 6x6x0.5 mm Body [UQFN]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



| Dimension Limits | Units | MILLIMETERS | | |
|------------------------|-------|-------------|------|------|
| | | MIN | NOM | MAX |
| Number of Pins | N | 48 | | |
| Pitch | e | 0.40 BSC | | |
| Overall Height | A | 0.45 | 0.50 | 0.55 |
| Standoff | A1 | 0.00 | 0.02 | 0.05 |
| Contact Thickness | A3 | 0.127 REF | | |
| Overall Width | E | 6.00 BSC | | |
| Exposed Pad Width | E2 | 4.45 | 4.60 | 4.75 |
| Overall Length | D | 6.00 BSC | | |
| Exposed Pad Length | D2 | 4.45 | 4.60 | 4.75 |
| Contact Width | b | 0.15 | 0.20 | 0.25 |
| Contact Length | L | 0.30 | 0.40 | 0.50 |
| Contact-to-Exposed Pad | K | 0.20 | - | - |

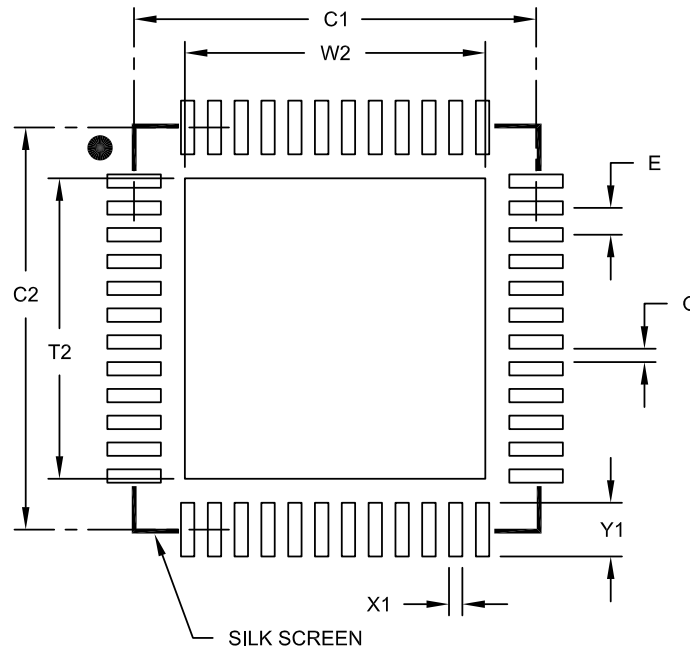
Notes:

- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Package is saw singulated.
- Dimensioning and tolerancing per ASME Y14.5M.
 BSC: Basic Dimension. Theoretically exact value shown without tolerances.
 REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-153A Sheet 2 of 2

48-Lead Ultra Thin Plastic Quad Flat, No Lead Package (MV) - 6x6 mm Body [UQFN] With 0.40 mm Contact Length

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

| Dimension Limits | Units | MILLIMETERS | | |
|----------------------------|-------|-------------|------|------|
| | | MIN | NOM | MAX |
| Contact Pitch | E | 0.40 BSC | | |
| Optional Center Pad Width | W2 | | | 4.45 |
| Optional Center Pad Length | T2 | | | 4.45 |
| Contact Pad Spacing | C1 | | 6.00 | |
| Contact Pad Spacing | C2 | | 6.00 | |
| Contact Pad Width (X28) | X1 | | | 0.20 |
| Contact Pad Length (X28) | Y1 | | | 0.80 |
| Distance Between Pads | G | 0.20 | | |

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2153A

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ISBN: 978-1-5224-2925-8

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