

# DB3672B Demo Board User Guide

**MEMSIC** Semiconductor (Tianjin) Co., Ltd.

### INTRODUCTION

The DB3672B Demo Board is a standalone accelerometer demonstration platform that enables firsthand user experience of the IoMT (Internet of Moving Things) functionality for the latest MEMSIC motion sensors. It highlights either the MC3672 (1.1 x 1.3 mm CSP) and MC3635 (1.6 x 1.6 mm LGA) ultra-low power, 3-axis accelerometers by providing g-force data to 32-bit ARM Cortex-M4. Motion sensing algorithms are performed in firmware on the MCU to demonstrate popular accelerometer use cases. These include a variety activity tracking, user interface and power management functions. Results and status are displayed live on the on-board OLED display. The board is also equipped with an USB/UART interface for easy firmware upgrades and external power.



Figure 1: Top View



Figure 2: Bottom View

## TABLE OF CONTENTS

Introduction	2
Features	
Component Layout	
Demo Applications	
Application Flow	6
Firmware Update Tool	
Current Measurement	
Schematics	
EV3672/EV3635 EVAL boards install	
Order a board from www.mouser.com/	
GET quick start guide from MEMSIC	
Plug ev36xxa into a breadboard	
Connect to processor(arduino) via spi or i2c	
GET drivers from MEMSIC	
Load and run mc36xx demo	
Revision History	

### FEATURES

The DB3672B (demo) board offers the following features:

- 1. MEMSIC 3-axis Accelerometer MC3635 (U9) in 1.6 x 1.6mm LGA package
- 2. MEMSIC 3-axis Accelerometer MC3672 (U10) in 1.3 x 1.1 mm WLCSP package
- 3. Ambig 32-bit ARM Cortex-M4F Apollo2 MCU (U7) with 48 MHz clock frequency, 1 MB flash storage and 256 KB SRAM
- 4. 0.96" 128x64 monochrome OLED (U11) using ssd1306 controller
- 5. CP210x USB-to-UART interface(J1) chip for connection to PC
- 6. Four LEDs:
  - 1. Application controllable Red(D3), Green(D4), Yellow(D5)
  - 2. Power(D2)
- 7. Push-button (SW3)

COMPONENT LAYOUT

- 8. Power-on slide switch (SW4)
- 9. Pre-programmed bootloader
- 10. Coin-cell battery CR2032 (BT1) powered for standalone use
- 11. Demo application with various motion algorithms





#### SW4 (power slide switch)

MEMSIC DB3672B APS-045-0031 v1.1 Page 4 of 22



## DEMO APPLICATIONS

DB3672B illustrates with a few common IoT gestures of accelerometer. All results are shown on screen with LEDs to assist demonstration, which consists of following features:

Feature	KPI	Memory (KB)	DMIPS	Version	Comments
Data Readout	N/A	N/A	N/A	v1.0.0	Raw data
	90%				Single Tap
Тар	95%	2.7	0.32	v1.0.0	Double Tap
	90%				Triple Tap
Shake	95%	1.3	0.23	v1.0.0	2 (or more) back-and-forth shakes
Freefall	99%	0.6	0.16	v1.0.0	> 2 cm drop
Tilt Angle	N/A	3.6	6.73	v1.0.0	Pitch/Roll
Face Side	N/A	N/A	N/A	v1.0.0	Dominant side
Jump Rope	90%	1.7	0.03	v1.0.0	Jump rope
Activity	95%	3.5	1.64	v1.0.0	Steps/State
Sniff	N/A	N/A	N/A	v1.0.0	Power switch

#### APPLICATION FLOW

The board can be turned-on by sliding the power slide switch (SW4) to the right. When powered ON, it will show a splash screen containing logo with FW version.



Figure 5 splash screen

Splash screen is followed by 1<sup>st</sup> feature on sensor data output. Long press (SW3) to toggle sensor MC3672 and MC3635. Default accelerometer is MC3672 (U10). See Image below for



Figure 6 Data mode

**Tap Mode:** On pressing button (SW3), subsequent feature is shown. This button is used to toggle between different demo modes. First feature is Tap mode.



Figure 7 Tap Mode

#### Shake Mode:

Shake mode window: waiting for shake event	Hode · Shake
When device is shaken two to-and-fro movement, Shaken is shown and <b>Red</b> LED (D3) is ON for 2 seconds.	HALASZA DHALASZA MODE:Shake Shaken Case of the state

Figure 8 Shake Mode

#### Freefall Mode:

Freefall mode window: waiting for freefall event	Node: Freefall Company of the second
When device dropped over 10 cm height, freefall event is shown on screen and Green LED (D5) is ON for 2 seconds.	HANATAR HANATAR Hode:Freefall Freefall Hode:Fre

Figure 9 Freefall Mode

#### Tilt Mode:

Tilt mode: Shows Roll and Pitch angle when board is rotated along X and Y axis. Pitch >  $abs(30^\circ)$ , Green LED is ON Roll >  $abs((30^\circ)$ , Yellow LED is ON Both Green and Yellow are ON when Pitch and Roll >  $abs(30^\circ)$ .



Figure 10 Tilt Mode

#### Face Side Mode:

Dominant side displayed on screen, +Z when board is parallel to the plane of the horizon.



Figure 11 Face Side Mode

#### Jump Rope Mode:

Jump mode: waiting for Jump	
Jump Rope mode: track number of Jumps	Node: Junp Rope Junps : 2 Constant Brid Constant Brid Cons

#### Figure 12 Jump Rope Mode

**Activity Mode:** In this mode DB3672B acts like a pedometer, which measures number of steps taken and current state: still, walking or running. At least 10 steps required to transit from Still to "Walking" or "Running" for every single trial.

Node:Activity CB Production Steps:0 State:Still
mCube"

Activity mode: Walking Steps: number of step count State: Walking	Hode:Activity Steps: 22 State: Walking Works Kistrz
Activity mode: Running Steps: number of step count State: Running	Hode 22 Hode 22 Hode 24 Hode 24 Hode 25 Hode 25 Hod

Figure 13 Activity Mode

**Sniff Mode:** Sniff mode is a unique feature in MC3672/MC3635 to have sensor enter an ultralow power state (0.4uA) and can be activated when significant motion is detected.

Sniff mode: waiting for motion detection	
Sniff mode: motion detected event displayed on screen for 2 seconds	Data 28 Det to 28 De

Figure 14 Activity Mode

After Sniff page, subsequent screen shows QR code followed by Data page again in loop.

QR Code	
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#### Figure 15 QR code Mode



Figure 16 Demo application flow

## FIRMWARE UPDATE TOOL

#### Get the tools from MEMSIC

#### STEPS to update firmware:

 Install CP2102 driver on your PC/laptop from link below: <u>https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers</u>

U Driver Software Installation	× (	1
Installing device driver software		
CP2102N USB to UART Bridge Controller OSearching Windows Update		
Obtaining device driver software from Windows Update might take a while. <u>Skip obtaining driver software from Windows Update</u>		
	Close	

Figure 17 Installing USB-to-UART Driver

- 2. While pressing button (SW3) on sensor board, connect board to computer by micro USB cable
- 3. Now, on connecting sensor board to Windows PC will automatically install driver. Will show up in Device Manager as COM Port. See Image below.



- 4. Unzip "MEMSIC\_DB3672B\_tools v1.0.0.zip file
- 5. Click to open "DB3672\_flash\_tool.exe" application from package. (Do NOT copy it outside of the folder).
- 6. Press "Load" button and choose firmware binary file "MEMSIC\_DB3672B\_v1.0.0.bin"
- 7. Select your COM port from "SerialPort" drop-down list menu. Should match to the one found in device manager. Press "Reload" button in case this does not work
- 8. Now press "Program" button to flash firmware.
- 9. If you don't see the Serial Port on the flash tool, which indicates that you may haven't installed the USB-to-UART device driver successfully. Try to reinstall it again, then you will see the com port on the flash tool when USB plug-in.

🎄 DB3672 flash tool	_		×
<u>H</u> elp			
Reload			Load
Serial Port : 🛛 🗸	Program		
		09	%

#### Figure 18 Serial Port Not Detected

🔝 DB3672 flash tool		
Help		
Reload vollo2_evb/projs/DB3672B/keil/bin/DB3672B.bin	Load	
Serial Port COM171   Program		
	100%	
	<b>100%</b>	

#### Figure 19 DB3672 FW flash tool

### CURRENT MEASUREMENT

DB3672B board has a pair of jumpers for measuring current consumption on MEMSIC accelerometers (U9 & U10).

J4 (MC3635) and J5(MC3672) jumper can be used to measure current on sensor, depicted ultra-low power at 0.4uA in Sniff mode.



Figure 20 Current measurement by jumper J4, J5



#### Figure 21 Sniff current at 6Hz

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Figure 22 Wake supply current @ ultra-low power, 25Hz

Sensor Category	Sniff Current @ 6Hz	Wake Current @ ULP, 25Hz
MC3672	0.4 uA	0.9 uA
MC3635	0.4 uA	0.9 uA

## SCHEMATICS









## EV3672/EV3635 EVAL BOARDS INSTALL

#### ORDER A BOARD FROM WWW.MOUSER.COM



#### GET QUICK START GUIDE FROM MEMSIC

#### PLUG EV36XXA INTO A BREADBOARD



#### CONNECT TO PROCESSOR(ARDUINO) VIA SPI OR I2C



GET DRIVERS FROM MEMSIC

#### LOAD AND RUN MC36XX DEMO

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## **REVISION HISTORY**

Date	Revision	Description
2019-06-18	APS-045-0031v1.0	First release.
2020-08-17	APS-045-0031v1.1	Change to MEMSIC format based on the License Agreement with mCube.