User Guide

MV300/MVQ300 Test Board (TBMV300-Q-LT-I2C and TBMV300-Q-LT-SPI)

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Overview

Introduction

MPS's MV300/MVQ300 is a MagVector™ 3D magnetic sensor. The MV300/MVQ300 has two available test boards using either an I²C communication interface or a serial peripheral interface (SPI) communication interface. The MV300/MVQ300 test board with I²C communication is called the TBMV300-Q-LT-I2C. The MV300/MVQ300 test board with SPI communication is called the TBMV300-Q-LT-SPI. These test boards are designed to work with the EVKT-MV-RP-PICO evaluation kit and the MagVector Evaluation App Software. It is also possible to use these test boards directly with any microcontroller (MCU) that has a 3.3V I²C or SPI interface.

The IC mounted on both TBMV300 boards is the MV300. Since the MV300 and MVQ300 are functionally equivalent, the TBMV300 can also be used for evaluation of MVQ300.

Board Types

The test board is available in two versions for different communication interfaces. The first test board (TBMV300-Q-LT-I2C-xxx) uses an I²C communication interface, while the second test board (TBMV300-Q-LT-SPI-xxx) uses an SPI communication interface. Figure 1 shows the TBMV300-Q-LT-I2C-xxx.

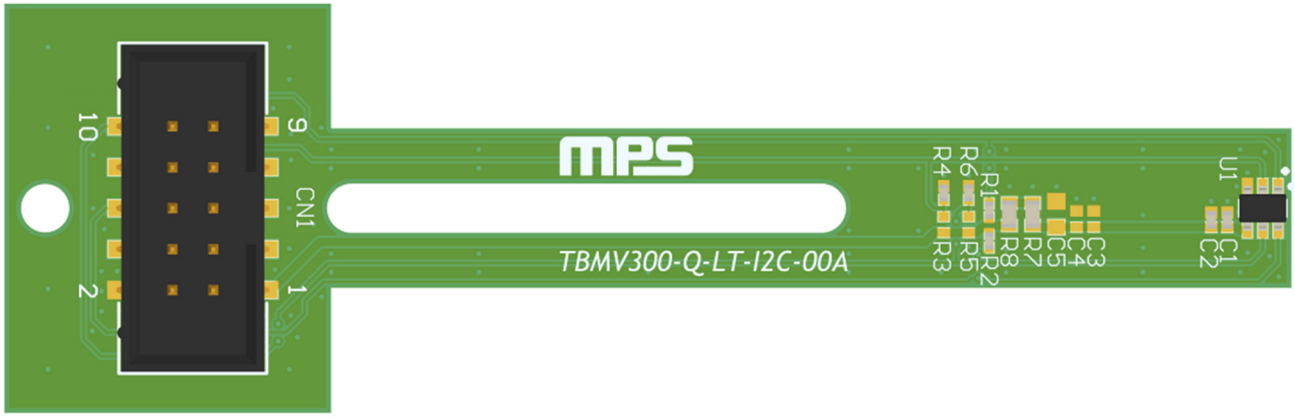

Figure 1: TBMV300-Q-LT-I2C-00A (3D Top View)

Figure 2 shows the TBMV300-Q-LT-SPI-xxx.

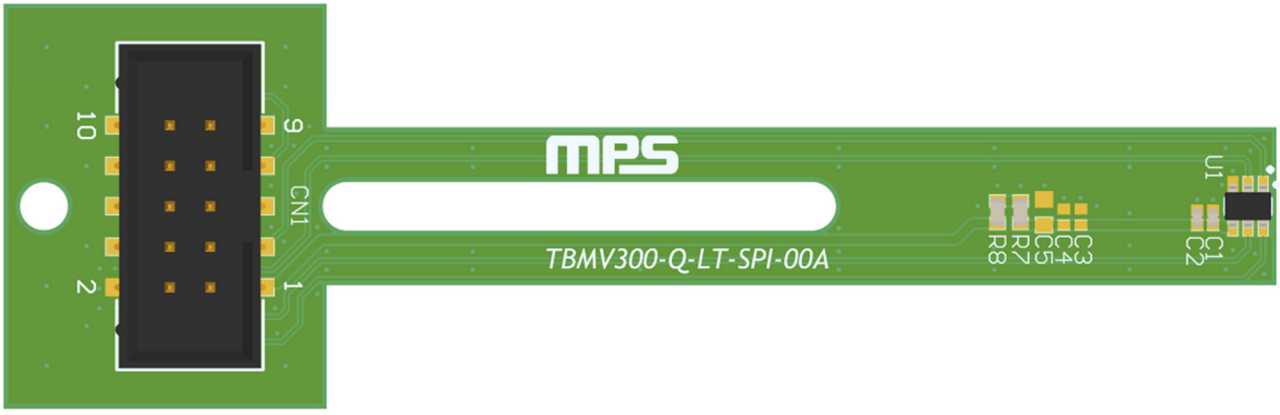

Figure 2: TBMV300-Q-LT-SPI-00A (3D Top View)

Items Compatible with the Test Board

The table below lists all items that are compatible with the MV300/MVQ300 test board (items below must be ordered separately):

#	Part Number	Item
1	EVKT-MV-RP-PICO	Includes one USB cable, one ribbon cable (not included with the TBMV300-Q-LT; must be ordered separately)
2	MagVector Evaluation App	Software that communicates with the EVKT-MV-RP-PICO. Can be downloaded from the MPS website

Figure 3 shows the evaluation kit set-up.

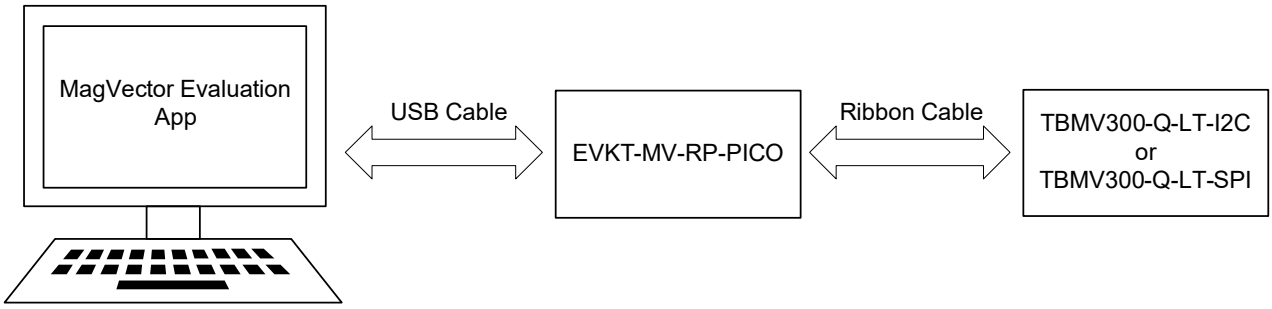

Figure 3: MV300/MVQ300 Test Board and Evaluation Kit Set-Up

Operating Conditions

Features	Specification
Supply Voltage (V_{DD})	3V to 3.6V
Operating Temperature	-40°C to +125°C

Section 1. Test Board with I²C Communication

1.1 Schematic

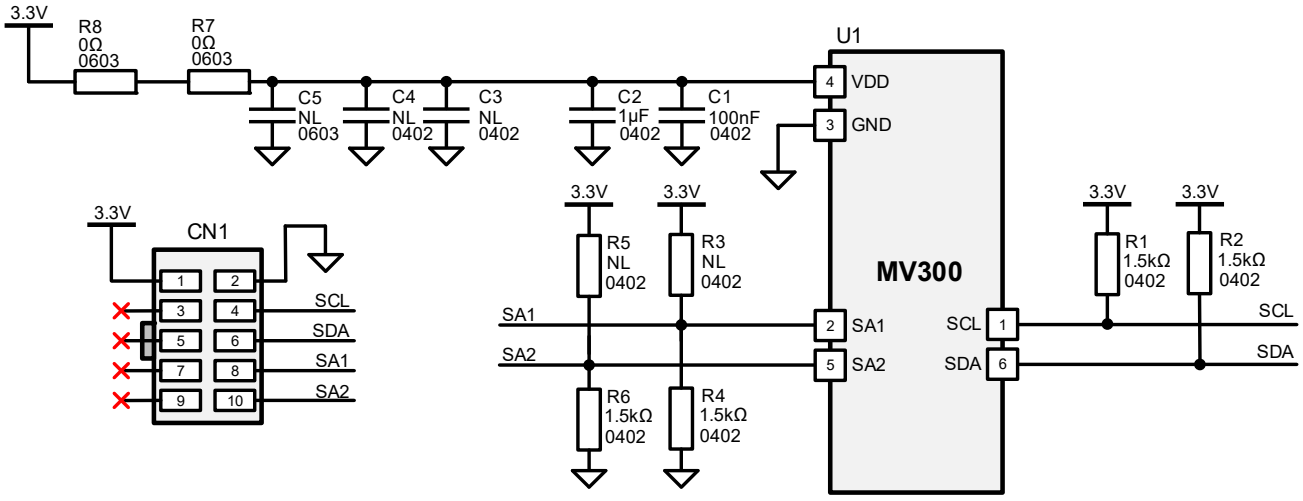

Figure 4: TBMV300-Q-LT-I2C Schematic

The I²C device address can be changed by modifying the voltage level on the SA1 pin (pin 2) and the SA2 pin (pin 5) using certain resistors (R3, R4, R5, and R6). By default, the I²C device address is set to 0x14, which means both SA1 and SA2 are set to 0 (see Table 1).

Table 1: I²C Addresses

SA2	SA1	I²C Address	Resistor Values
0	0	0x14 (default)	R3 and R5 = NL, R4 and R6 = 1.5kΩ
0	1	0x15	R4 and R5 = NL, R3 and R6 = 1.5kΩ
1	0	0x16	R3 and R6 = NL, R4 and R5 = 1.5kΩ
1	1	0x17	R3 and R5 = 1.5kΩ, R4 and R6 = NL

If the power supply is noisy, R7 and C5 can be used to add a low-pass filter on the 3.3V VDD pin. It is also possible to implement the R8 footprint and add a ferrite bead that filters the high-frequency noise on the power supply.

If necessary, move the C1 and C2 capacitors further away from the MV300. C1 and C2 can be soldered to the C3 and C4 footprint.

1.2 Bill of Materials

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	CN1	2 x 5 pins	Male header, 10 pins	Dual-row, 2.54mm pitch SMD header	CNC Tech or Wurth	3020-10-0300-00 or 61231020621
1	C1	100nF	Ceramic capacitor, 16V, X7R	0402	Murata	GRM155R71C104KA88J
1	C2	1μF	Ceramic capacitor, 16V, X6S	0402	Murata	GRM155C81A105KA12D
2	C3, C4	NS	NL capacitor	0402		
4	R1, R2, R4, R6	1.5kΩ	Resistor	0402	Yageo	RC0402FR-071K5L
2	R3, R5	NS	NL resistor	0402		
2	R7, R8	0Ω Jumper	Resistor	0603	Yageo	RC0603JR-070RL
1	C5	NS	NL capacitor	0603		
1	U1	MV300	Magnetic sensor with I²C interface	TSOT23-6	MPS	MV300GJ-C

1.3 Connector Pin Functions

CN1 Pin #	Name	Description
1	+3.3V_VDD	3.3V supply
2	GND	Supply ground
3	N/C	No connection
4	I2C_SCL	I²C serial clock (open drain) and interrupt (indicating data ready status)
5	N/C	No connection
6	I2C_SDA	I²C serial data (open drain)
7	N/C	No connection
8	I2C_SA1	I²C serial address definition
9	N/C	No connection
10	I2C_SA2	I²C serial address definition

1.4 Layout

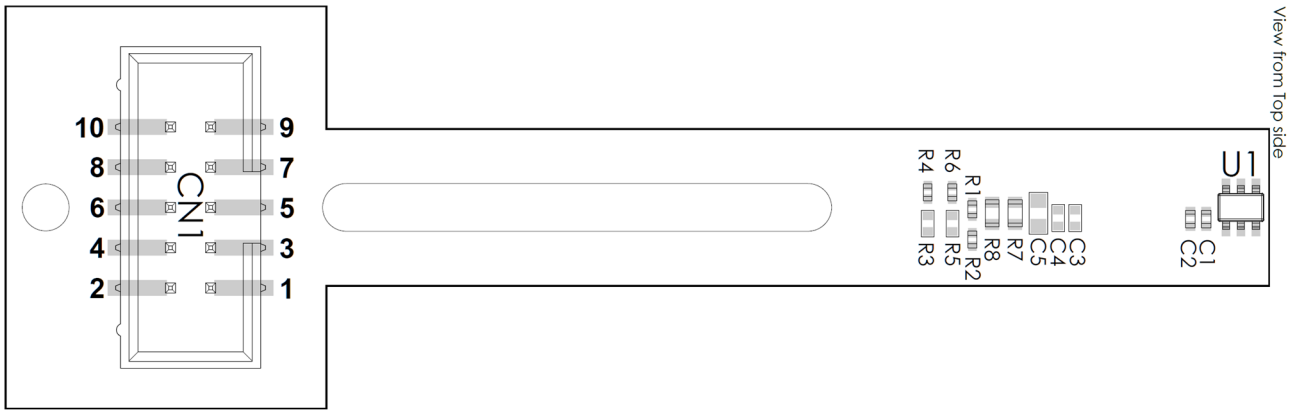

Figure 5: TBMV300-Q-LT (I²C Version, Top Assembly View with Pin Numbers)

Section 2. Test Board with SPI Communication

2.1 Schematic

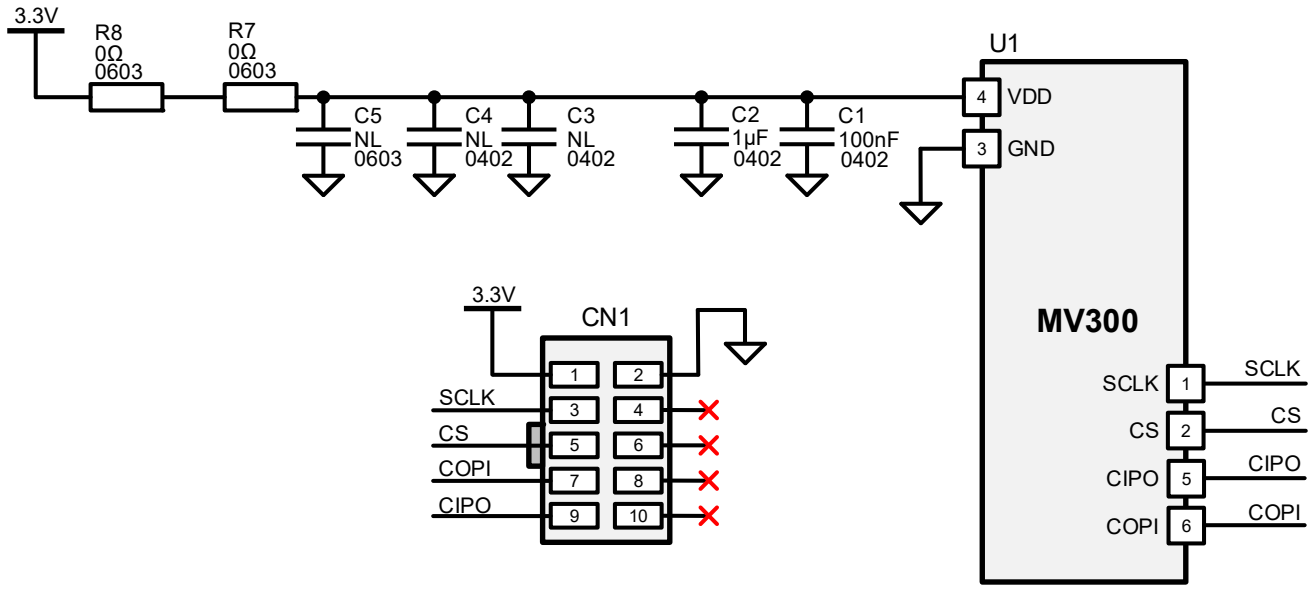

Figure 6: TBMV300-Q-LT-SPI Schematic

If the power supply is noisy, R7 and C5 can be used to add a low-pass filter on the 3.3V VDD pin. It is also possible to implement the R8 footprint and add a ferrite bead that filters the high-frequency noise on the power supply.

If necessary, move the C1 and C2 capacitors further away from the MV300. C1 and C2 can be soldered to the C3 and C4 footprint.

2.2 Bill of Materials

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	CN1	2 x 5 pins	Male header, 10 pins	Dual-row, 2.54mm pitch SMD header	CNC Tech or Wurth	3020-10-0300-00 or 61231020621
1	C1	100nF	Ceramic capacitor, 16V, X7R	0402	Murata	GRM155R71C104KA88J
1	C2	1μF	Ceramic capacitor, 16V, X6S	0402	Murata	GRM155C81A105KA12D
2	C3, C4	NS	NL capacitor	0402		
2	R7, R8	0Ω Jumper	Resistor	0603	Yageo	RC0603JR-070RL
1	C5	NS	NL capacitor	0603		
1	U1	MV300	Magnetic sensor with SPI interface	TSOT23-6	MPS	MV300GJ-S

2.3 Connector Pin Functions

CN1 Pin #	Name	Description
1	+3.3V_VDD	3.3V supply
2	GND	Supply ground
3	SPI_SCLK	SPI serial clock
4	N/C	No connection
5	SPI_CS	SPI chip selection
6	N/C	No connection
7	SPI_COPI	SPI controller’s output peripheral input
8	N/C	No connection
9	SPI_CIPO	SPI controller’s input peripheral output
10	N/C	No connection

2.4 Layout

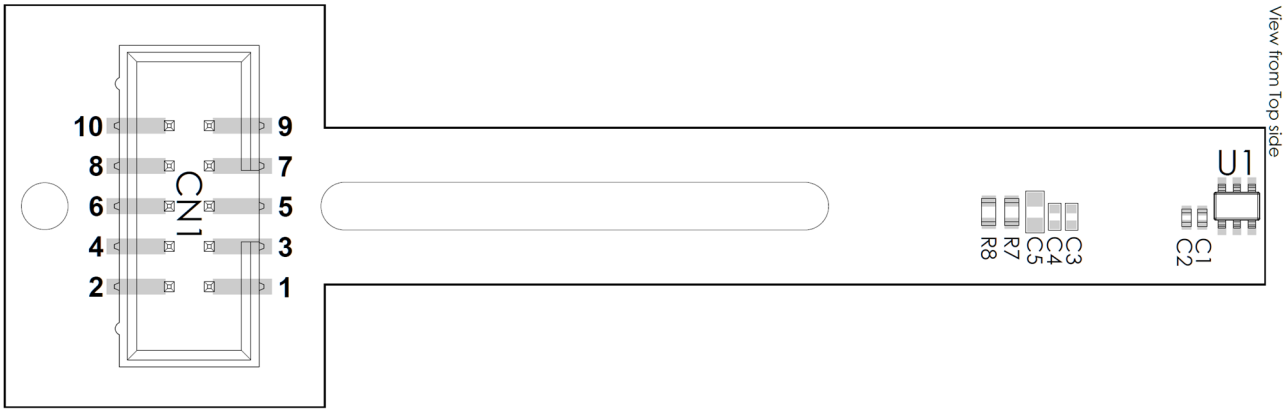

Figure 7: TBMV300-Q-LT (SPI Version, Top Assembly View)

Section 3. Mechanical Dimensions

Figure 8 shows the top-side mechanical drawing of the TBMV300 I²C and SPI boards. Note that both test boards share the same mechanical dimensions.

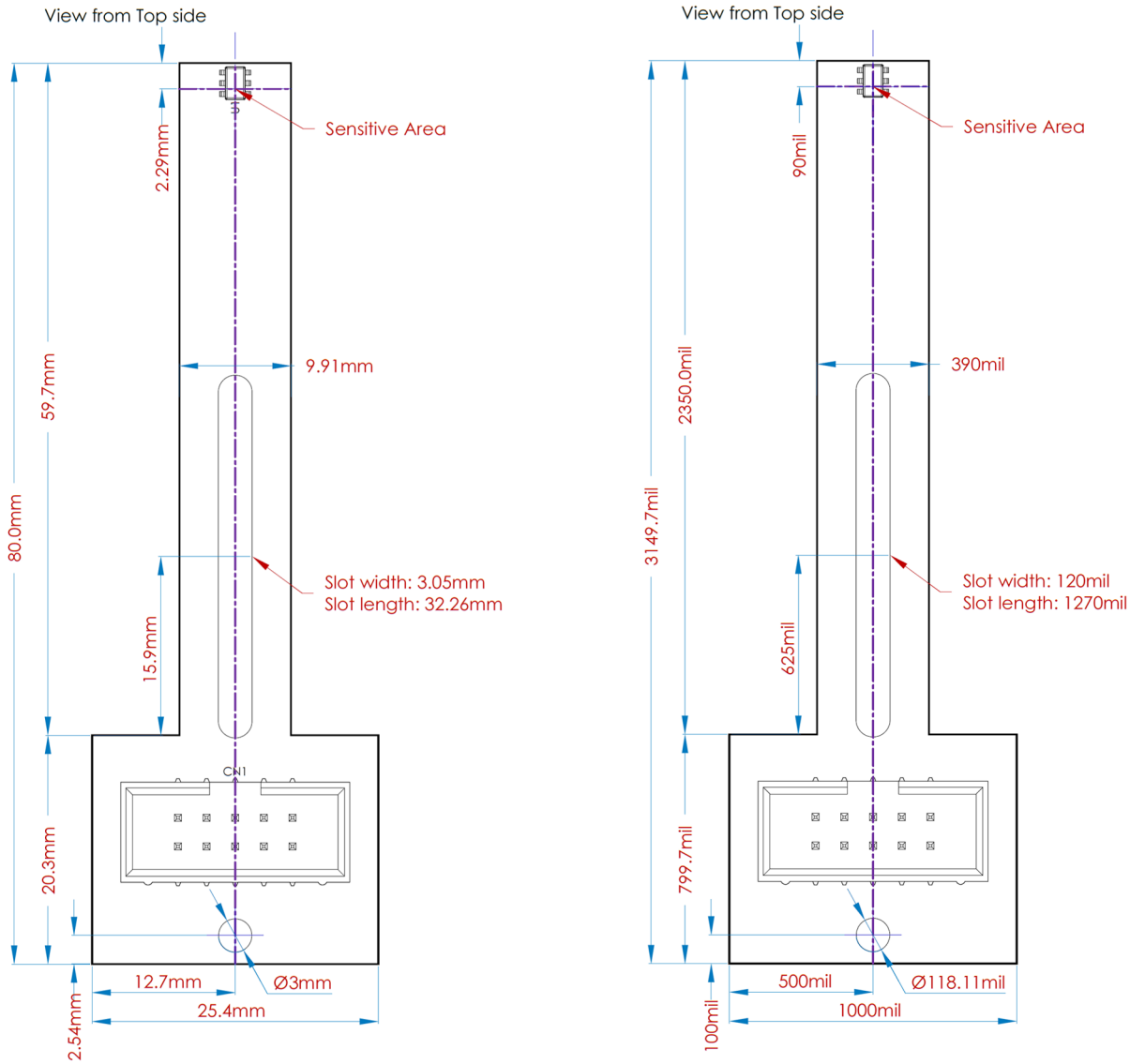

Figure 8: TBMV300-Q-LT I²C and SPI Mechanical Dimensions (In mm and mils)

Section 4. Set-Up

4.1 Hardware Set-Up

The hardware must be properly configured prior to use. Follow the instructions below to set up the test board:

1. Connect the test board to the EVKT-MV-RP-PICO board using the ribbon cable
2. Connect the EVKT-MV-RP-PICO to the computer using the USB cable.

4.2 Powering Up the Test Board

The TBMV300-Q-LT board must be powered by a 3.3V supply. This can be achieved by connecting the test board to the EVKT-MV-RP-PICO.

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	10/6/2022	Initial Release	-
1.1	1/10/2025	Replaced “MV300” with “MV300/MVQ300” in the title, headers, and footers.	All
		Minor formatting updates.	2, 10
		Added following sentence to the Introduction section “The IC mounted on both TBMV300 boards is the MV300. Since the MV300 and MVQ300 are functionally equivalent, the TBMV300 can also be used for evaluation of MVQ300.”	3
		Replaced “MV300” with “MV300/MVQ300” in text and Figure 3 title.	3, 4