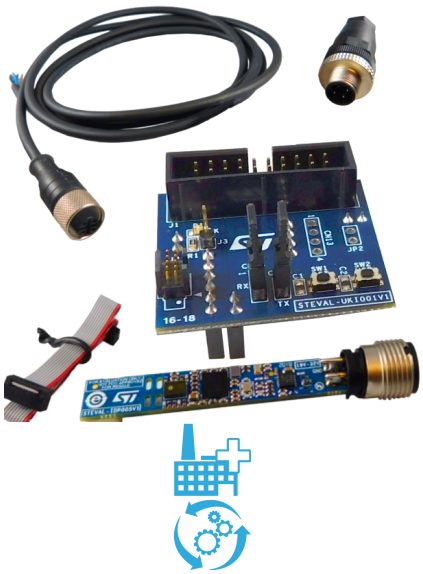
STEVAL-BFA001V1B

Data brief

Predictive maintenance kit with sensors and IO-Link capability



Product summary
Capacitive digital sensor for relative humidity and temperature HTS221
iNEMO 6DoF inertial module for Industrial Applications. Ultra-low power and high accuracy ISM330DLC
Ultra-compact piezoresistive absolute pressure sensor, 260-1260 hPa, digital output barometer, full-mold, holed LGA package (HLGA) LPS22HB
1-Mbit SPI bus EEPROM with high-speed clock M95M01-DF
MEMS audio sensor omnidirectional digital microphone, 64 dB SNR, -26 dBFS sensitivity, top-port, 122.5 dBSPL AOP MP34DT05-A
High-performance advanced line, ARM Cortex-M4 core with DSP and FPU, 2 Mbytes Flash, 384+4 kB of RAM, DMA controller, up to 17 timers STM32F469AI
IO-Link communication transceiver device L6362A

Features

- Compact solution for condition monitoring and predictive maintenance based on 3D digital accelerometer, environmental and acoustic MEMS sensors
- Main supply voltage: 18 V - 32 V
- Main components:
  - 32-bit ARM® Cortex®-M4 core for signal processing and analysis (STM32F469AI)
  - iNEMO 6DoF (ISM330DLC)
  - Absolute digital pressure sensor (LPS22HB)
  - Relative humidity and temperature sensors (HTS221)
  - Digital microphone sensors (MP34DT05-A)
  - IO-Link PHY device (L6362A)
  - EEPROM (M95M01-DF) for data storage
  - Step-down switching regulator and LDO regulator (L6984 and LDK220)
- Complete set of firmware demo examples based on 3D accelerometer library with advanced frequency and time domain signal processing for predictive maintenance, including:
  - Programmable FFT size (512, 1024, 2048)
  - Programmable FFT averaging
  - Programmable overlapping
  - Programmable windowing (Flat Top, Hanning, Hamming)
  - Speed RMS moving average, acceleration max. peak
  - Programmable threshold for warning and alarm conditions in spectral band
- Microphone algorithms for:
  - PDM to PCM
  - Sound pressure
  - Audio FFT
- IO-Link PHY using the L6362A Device transceiver for data communication with host unit
- M12 industrial connector
- SWD connector for debugging and programming capability
- Reset button
- Expansion connector with GPIO, ADC, I2C bus
- Designed to meet IEC industrial standard requirements
- WEEE compliant
- RoHS compliant

Description

The STEVAL-BFA001V1B is an industrial reference design kit designed for condition monitoring (CM) and predictive maintenance (PdM).

The hardware development kit consists of an industrial sensor board (STEVAL-IDP005V1), an adapter for the ST-LINK/V2-1 programming and debugging tool

(STEVAL-UKI001V1), a 0.050” 10-pin flat cable, a 4-pole cable mount connector plug with male contacts and an M12 female connector with a 2 m cable.

The firmware package includes dedicated algorithms for advanced time and frequency domain signal processing and analysis of the 3D digital accelerometer with 3 kHz flat bandwidth. The package includes drivers for pressure, relative humidity and temperature sensor monitoring. Audio algorithms for acoustic emission (AE) are also part of the package.

The firmware runs on the high performance STM32F469AI, ARM® Cortex®-M4, 32-bit microcontroller and the sensor data analysis results are sent via wired connectivity based on IO-Link device transceiver (IO-Link stack protocol not included).

The STEVAL-BFA001V1B reference design is suitable for monitoring motors, pumps and fans, and can accelerate the development of predictive maintenance solutions.

The package also allows connection with the STEVAL-IDP004V1 IO-Link master capable, multi-port evaluation board; a PC GUI included in the package displays the algorithms output and sensor data. The data can also be displayed on a PC using a common terminal emulator by simply connecting the STEVAL-IDP005V1 to a PC through the STEVAL-UKI001V1 adapter and ST-LINK/V2-1 included on any STM32 Nucleo-64 development board.

The package includes an industrial M12 cable for power or connection with a master port. The connection is managed using a standard multipolar cable with one wire used for IO-Link data, one for the L+ line (positive supply voltage pole) and one for the L- line (negative supply voltage pole).

The layout is designed to meet IEC61000-4-2/4 and EN60947 requirements for industrial applications.

The STEVAL-IDP005V1 is specifically designed with dimensions (50mm x 9mm x 9mm) that reflect real industrial applications and needs.

The firmware is freely available on STSW-BFA001V1.

1 Schematic diagram

Figure 1. **Schematic - STEVAL-UKI001V1**

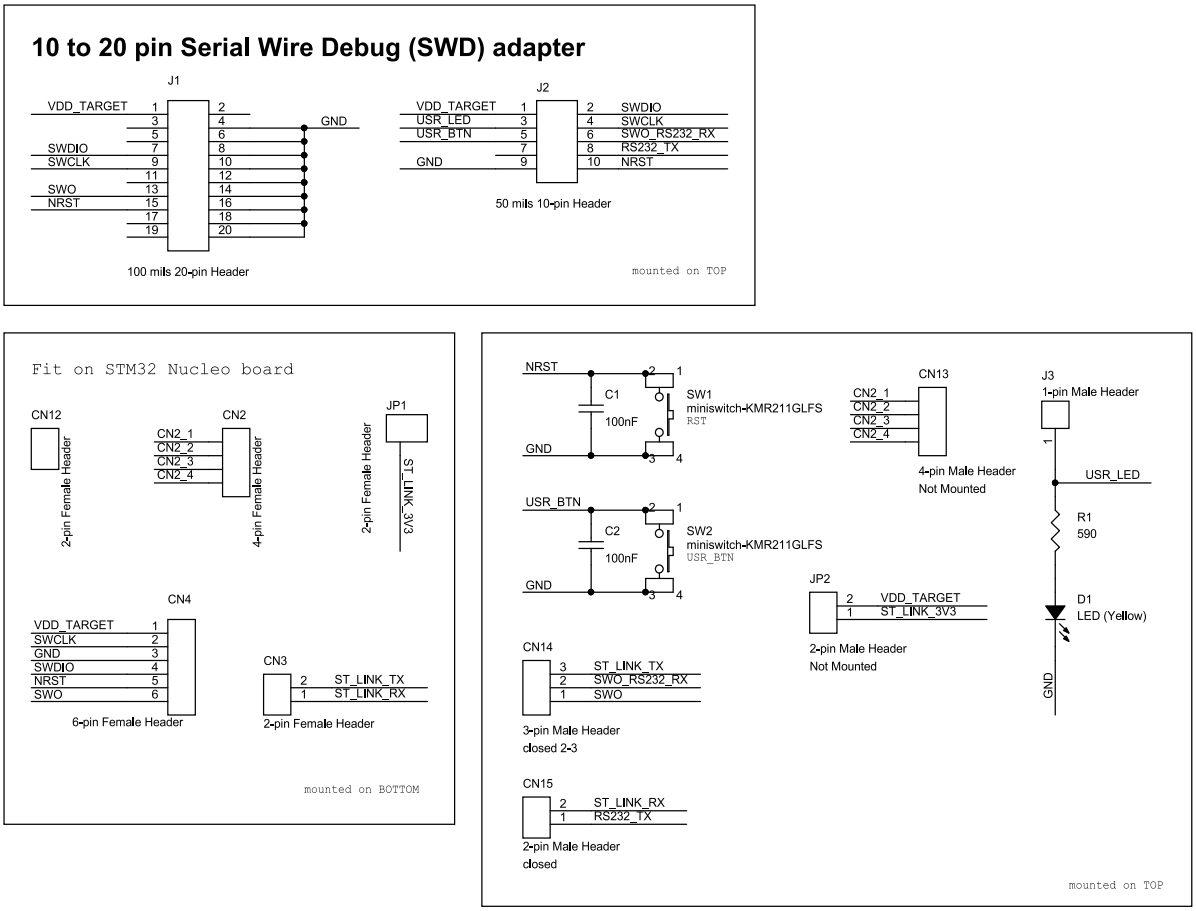


Figure 2. Schematic - STEVAL-IDP005V1 (1 of 7)

General Purpose Industrial Sensor

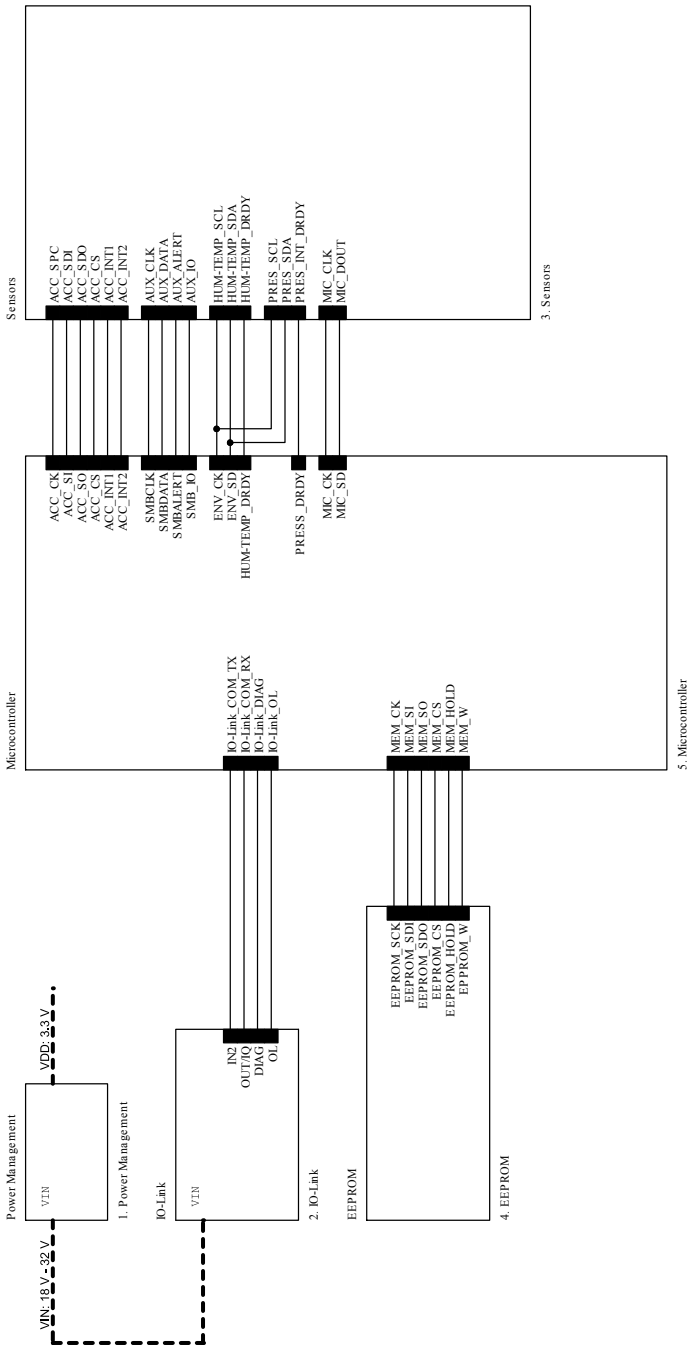


Figure 3. **Schematic - STEVAL-IDP005V1 (2 of 7)**

IO-Link

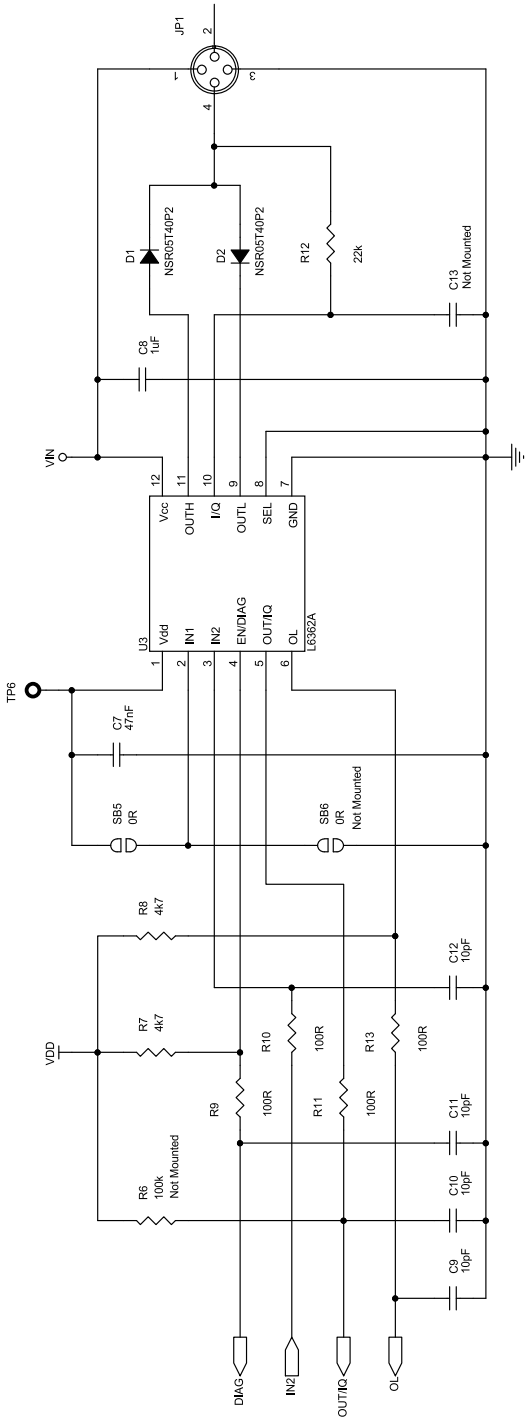


Figure 4. **Schematic - STEVAL-IDP005V1 (3 of 7)**

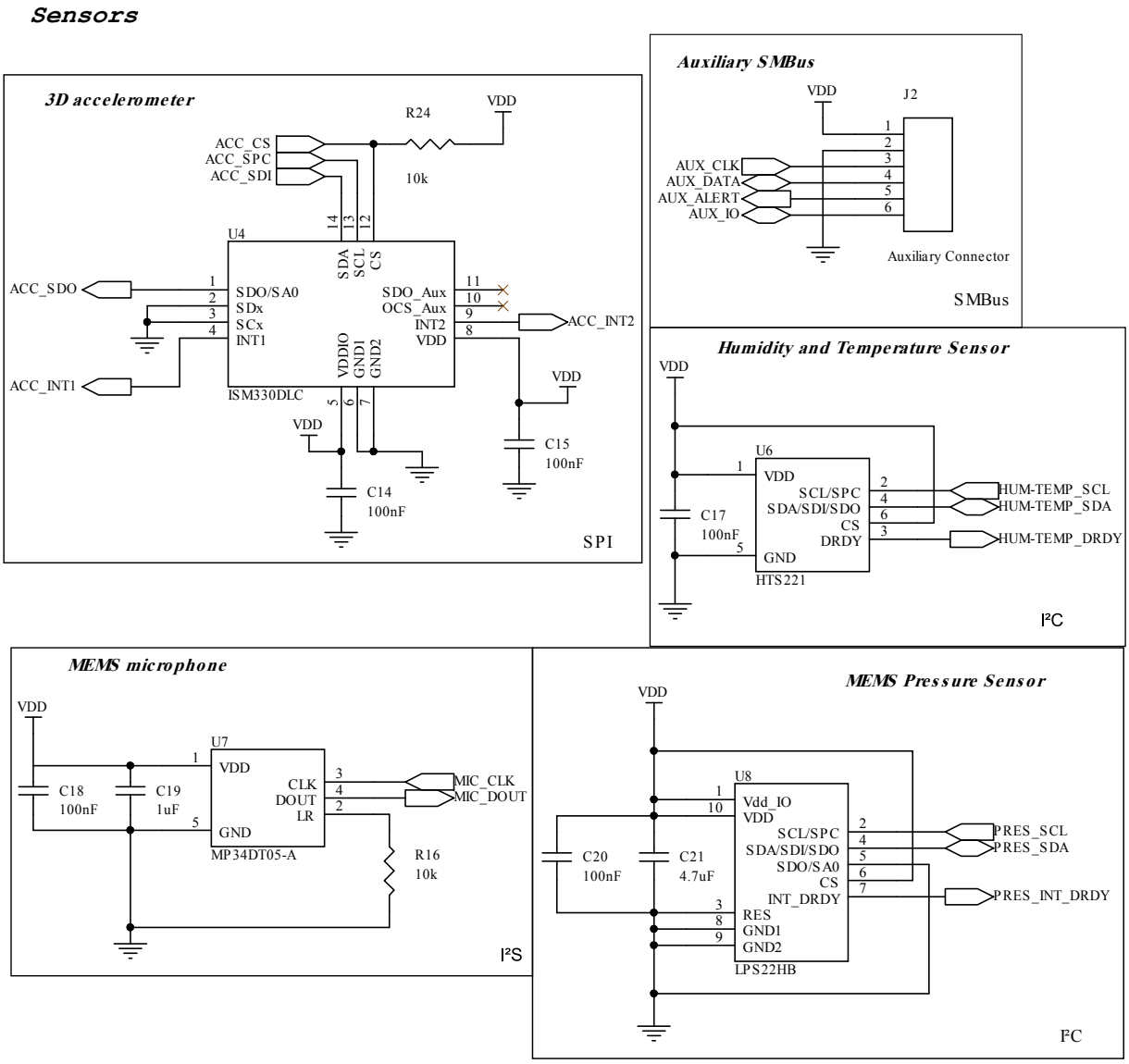


Figure 5. **Schematic - STEVAL-IDP005V1 (4 of 7)**

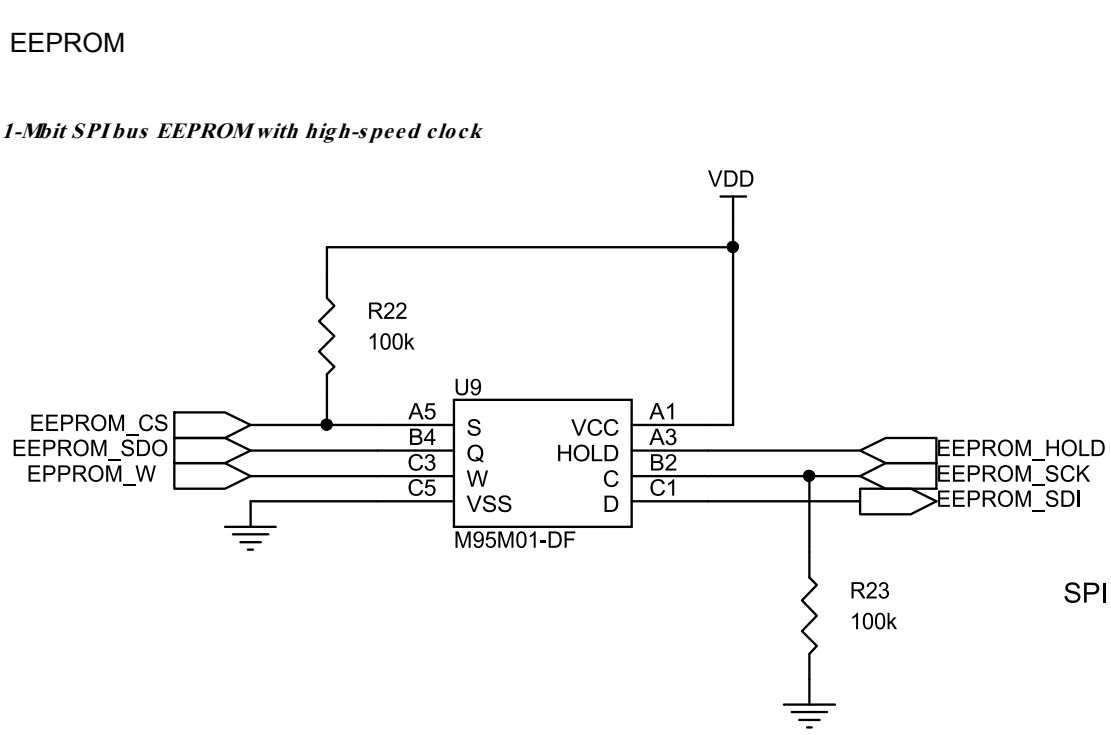


Figure 6. **Schematic - STEVAL-IDP005V1 (5 of 7)**

Power Management

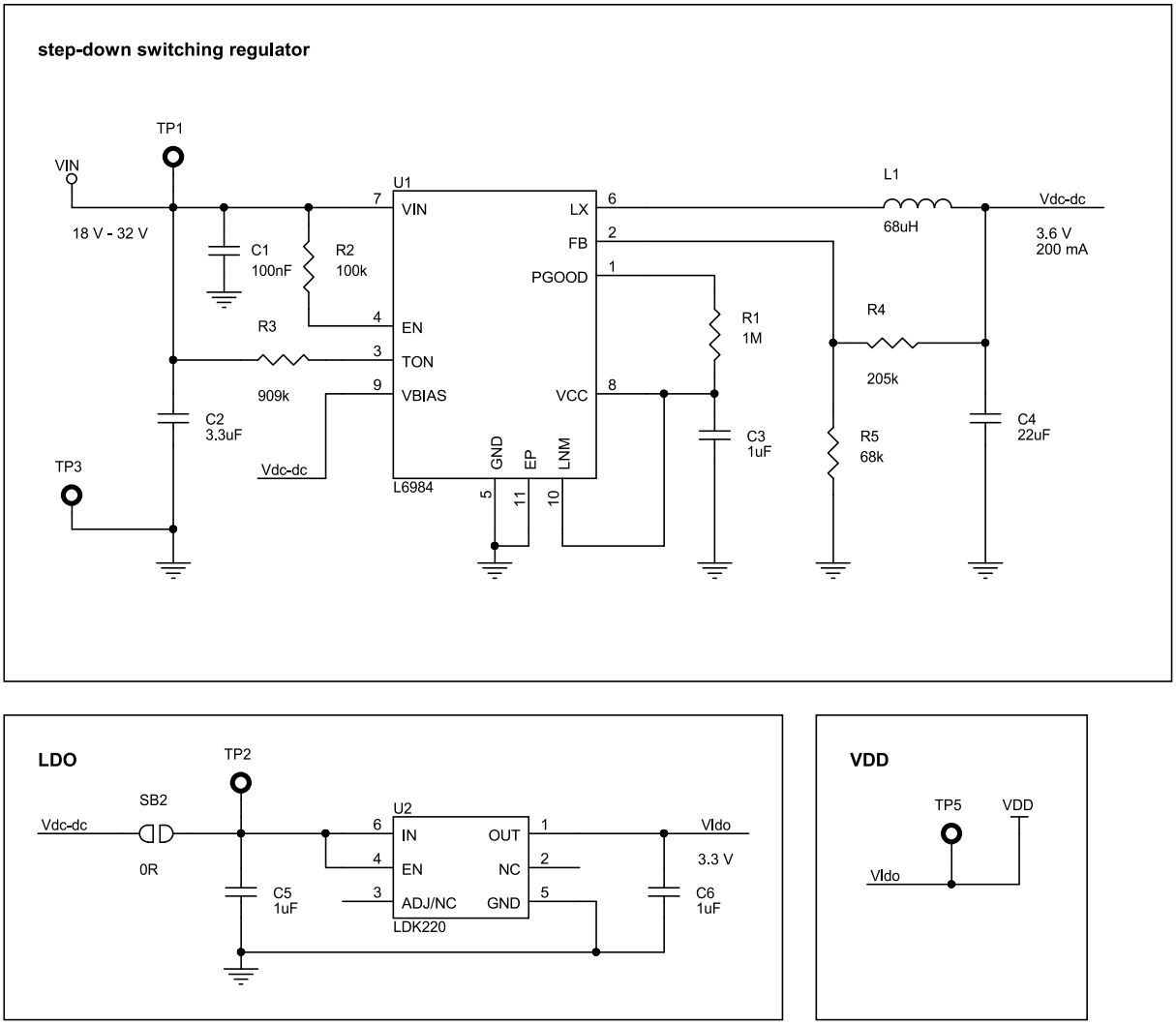


Figure 7. **Schematic - STEVAL-IDP005V1 (6 of 7)**

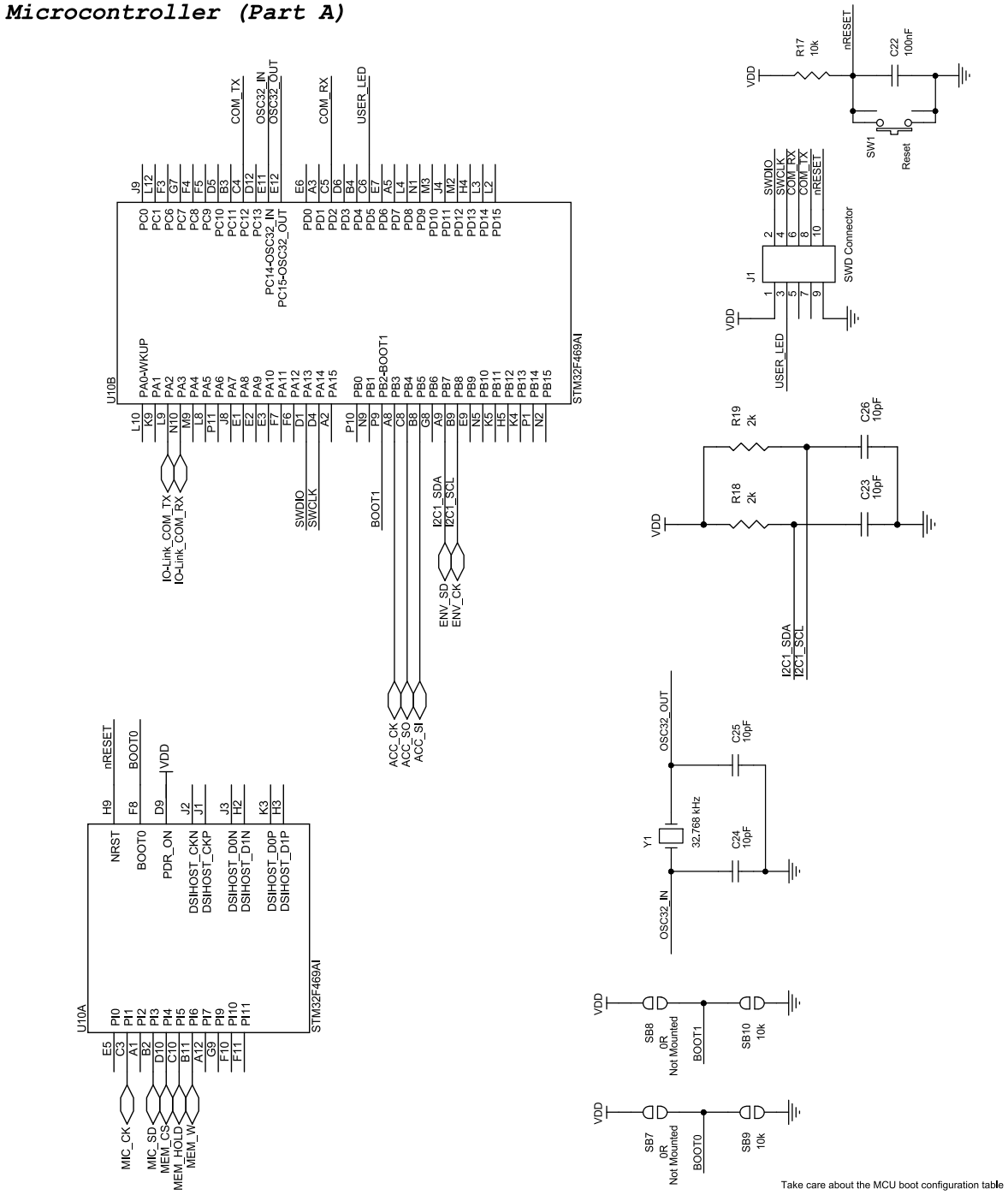
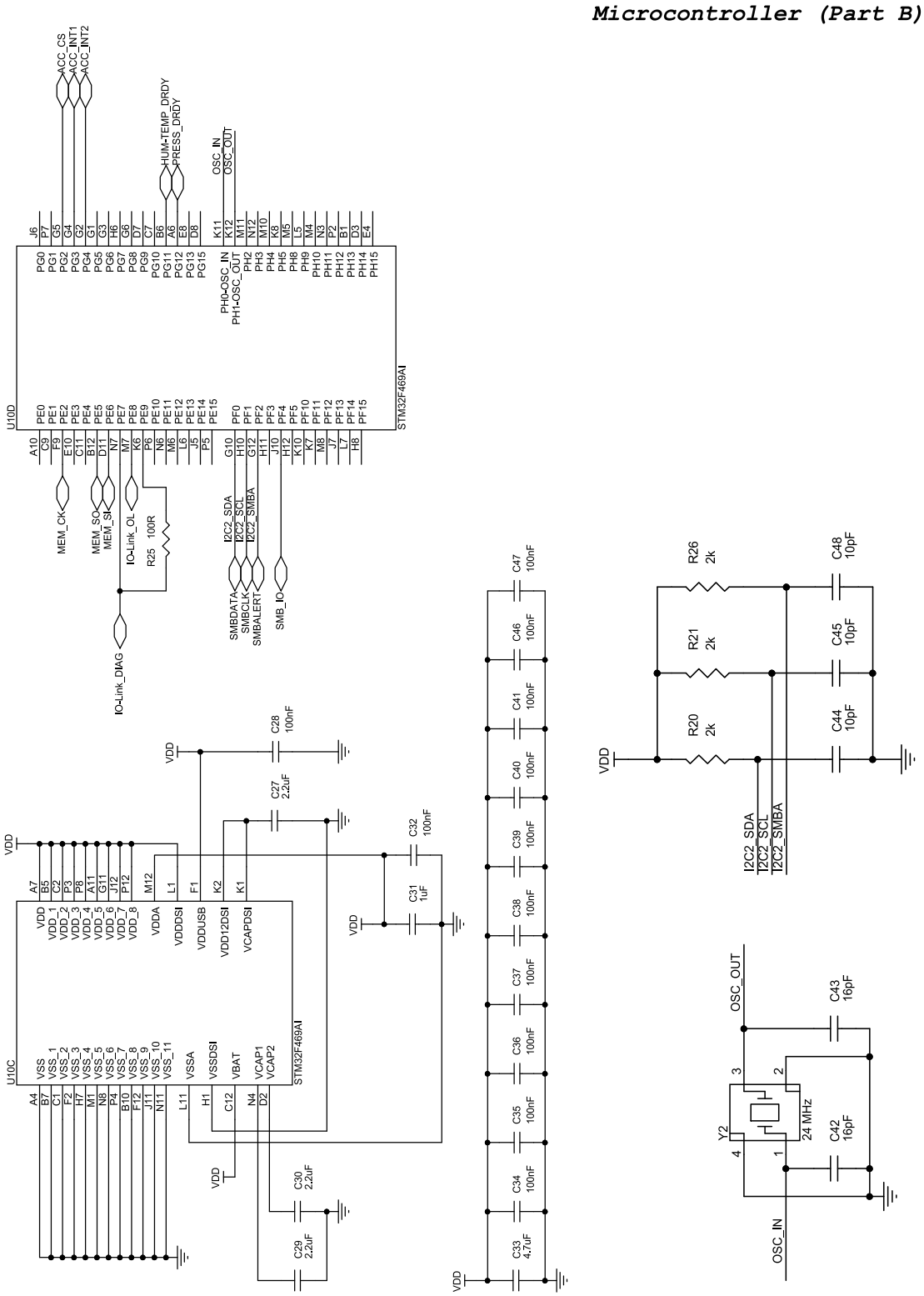


Figure 8. **Schematic - STEVAL-IDP005V1 (7 of 7)**



Revision history

Table 1. **Document revision history**

Date	Version	Changes
04-Jul-2018	1	Initial release.
25-Jan-2019	2	Updated cover page product summary table

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