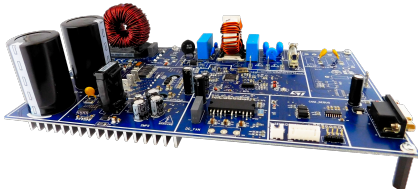


# 1.5 kW dual motor drive with digital PFC based on SLLIMM™ IPMs and STM32F3



## Features

### Features

- Input voltage: 230 V<sub>AC</sub> 50 Hz / 60 Hz
- Max. power: up to 2 kW
- PFC topology: digital control, boost single stage
- PFC protections: overcurrent, overvoltage, and undervoltage lockout
- Inrush current limiter based on overvoltage protected AC switch
- Motor 1 stage:
  - STGIB10CH60TS-L, SLLIMM series IPM 15 A, 600 V, 3-phase IGBT inverter bridge
  - Max. current: up to 10 A, 0-to-peak (current sensing network threshold)
  - 1-, 2-, and 3-shunt resistors for current sensing
  - Protections: overcurrent, overtemperature, undervoltage lockout
- Motor 2 stage:
  - STGIPQ3H60T-HZ SLLIMM nano series IPM, 3 A, 600 V, 3-phase IGBT inverter bridge
  - Max. power: 60 W (no heatsink)
  - Max. current: up to 1 A, 0-to-peak (current sensor network threshold)
  - 1 shunt resistor for current sensing
  - Protections: overcurrent, overtemperature, undervoltage lockout
- Centralized driving (motor 1, motor 2, PFC) from single STM32F303RB MCU based on ARM Cortex-M4 core with DSP and FPU
- WEEE and RoHS compliant

## Description

The STEVAL-CTM010V1 board embeds two sensorless 3-phase motor drives, plus a single stage digital PFC boost topology, all controlled by the [STM32F303RB](#) ARM based microcontroller. The ST FOC MC SDK firmware library enables this complete hardware and software solution, featuring FOC dual motor sensorless and PFC CCM mode. The inverter stages are based on SLLIMM™ IPM series of intelligent power modules for compact, high-performance AC motor drives in a simple, rugged design. It combines new ST proprietary driver ICs with an improved short-circuit rugged trench gate field-stop (TFS) IGBT, making it ideal for motor drives operating up to 20 kHz in hard-switching circuits.

The PFC section is based on the [STTH30AC06C](#) ultra-fast high voltage rectifier and [STGWT20H65FB](#) trench gate field-stop IGBT.

The board embeds the 2nd generation SLLIMM [STGIB10CH60TS-L](#) and [STGIPQ3H60T-HZ](#) intelligent power modules, which are tailored to drive motors for compressors and fans in outdoor units. The [STEVAL-CTM010V1](#) is therefore ideal for evaluating room air conditioner solutions able to meet new efficiency standards requiring digital PFCs, and any single or dual motor application with power factor correction.

| Product summary  |                                 |
|--|---------------------------------|
| 1.5 kW dual motor drive with digital PFC based on SLLIMM™ IPMs and STM32F3 | <a href="#">STEVAL-CTM010V1</a> |
| Mainstream mixed signal MCUs ARM® Cortex®-M4 core with DSP and FPU         | <a href="#">STM32F303RB</a>     |
| 600 V, 30 A dual Interleave Boost Ultrafast Diode                          | <a href="#">STTH30AC06C</a>     |
| Trench gate field-stop IGBT, HB series 650 V, 20 A high speed              | <a href="#">STGWT20H65FB</a>    |
| STGIB10CH60TS-L SLLIMM™ 2nd series IPM                                     | <a href="#">STGIB10CH60TS-L</a> |
| SLLIMM nano 2nd series IPM, 3 A, 600 V, 3-phase IGBT inverter bridge       | <a href="#">STGIPQ3H60T-HZ</a>  |

Figure 1. STEVAL-CTM010V1 block diagram

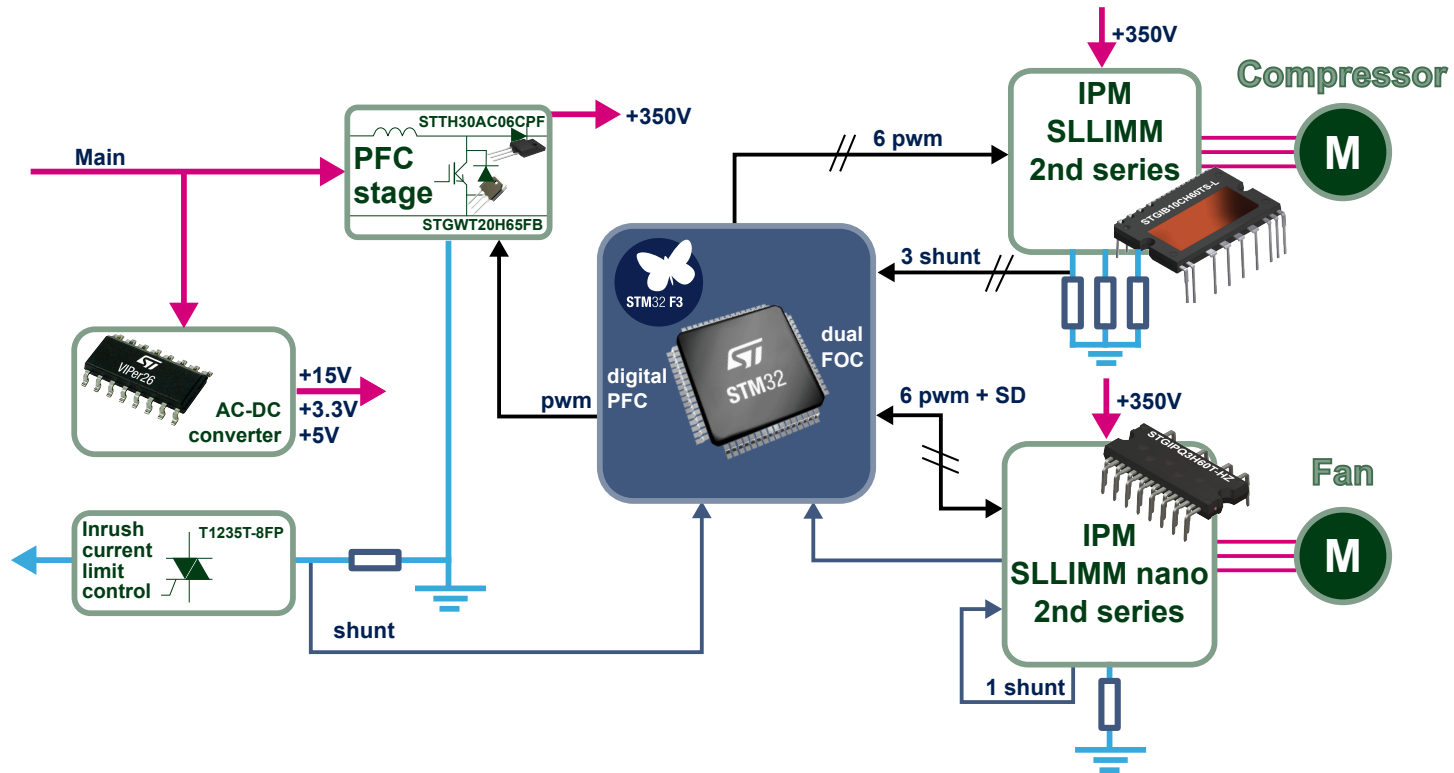


Figure 2. STEVAL-CTM010V1 schematic diagram - SMPS

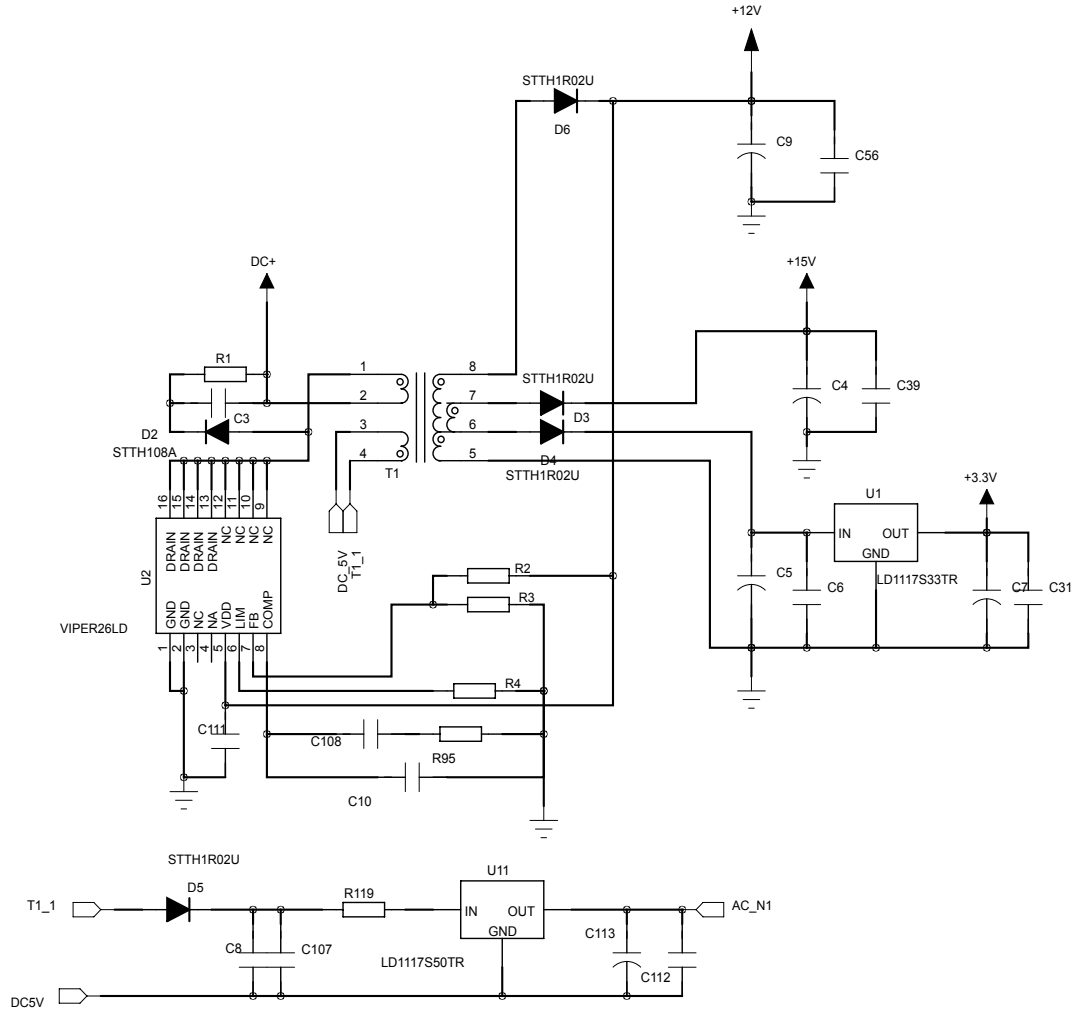


Figure 3. STEVAL-CTM010V1 schematic diagram - EMI and PFC

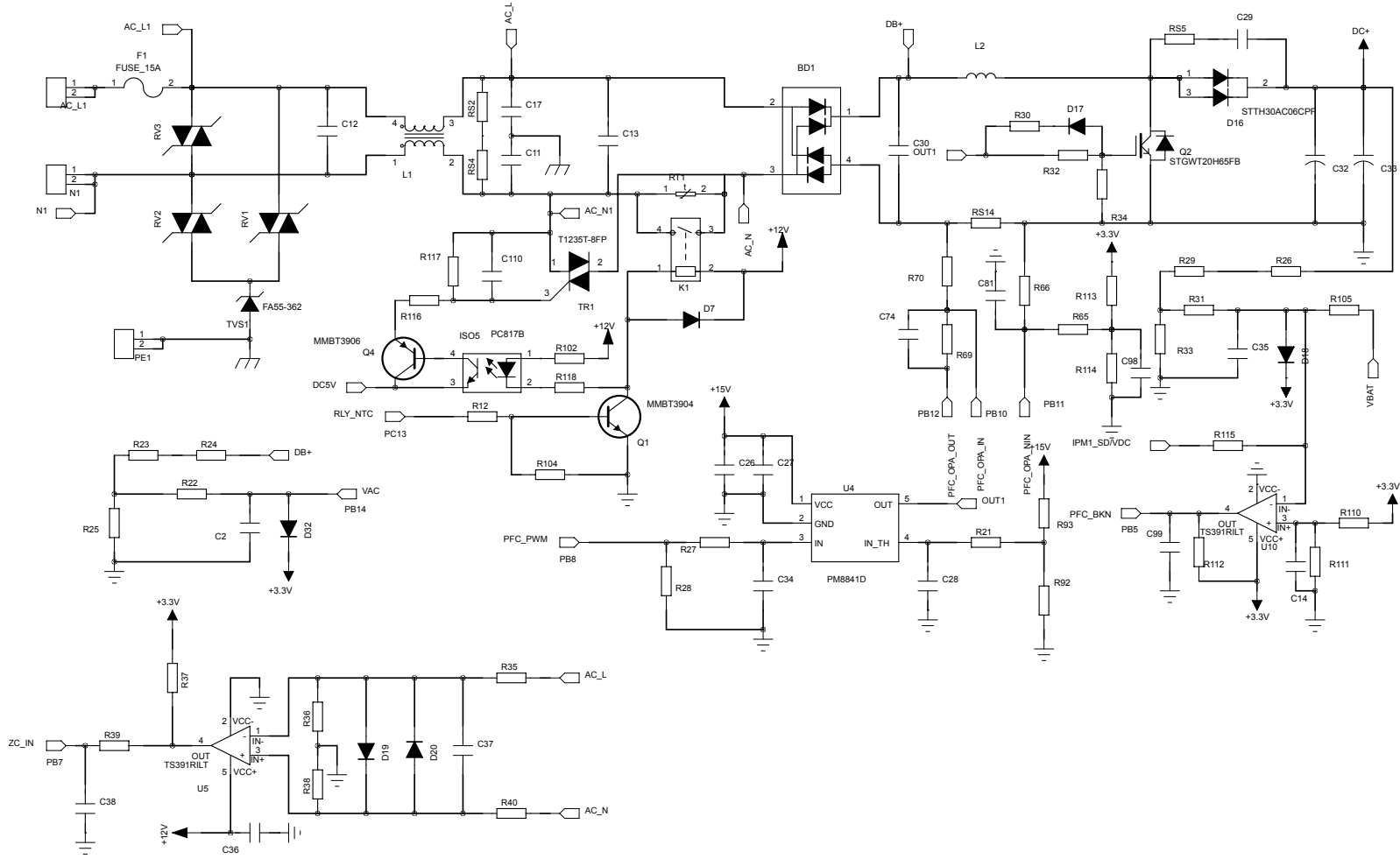


Figure 4. STEVAL-CTM010V1 schematic diagram - IPM1

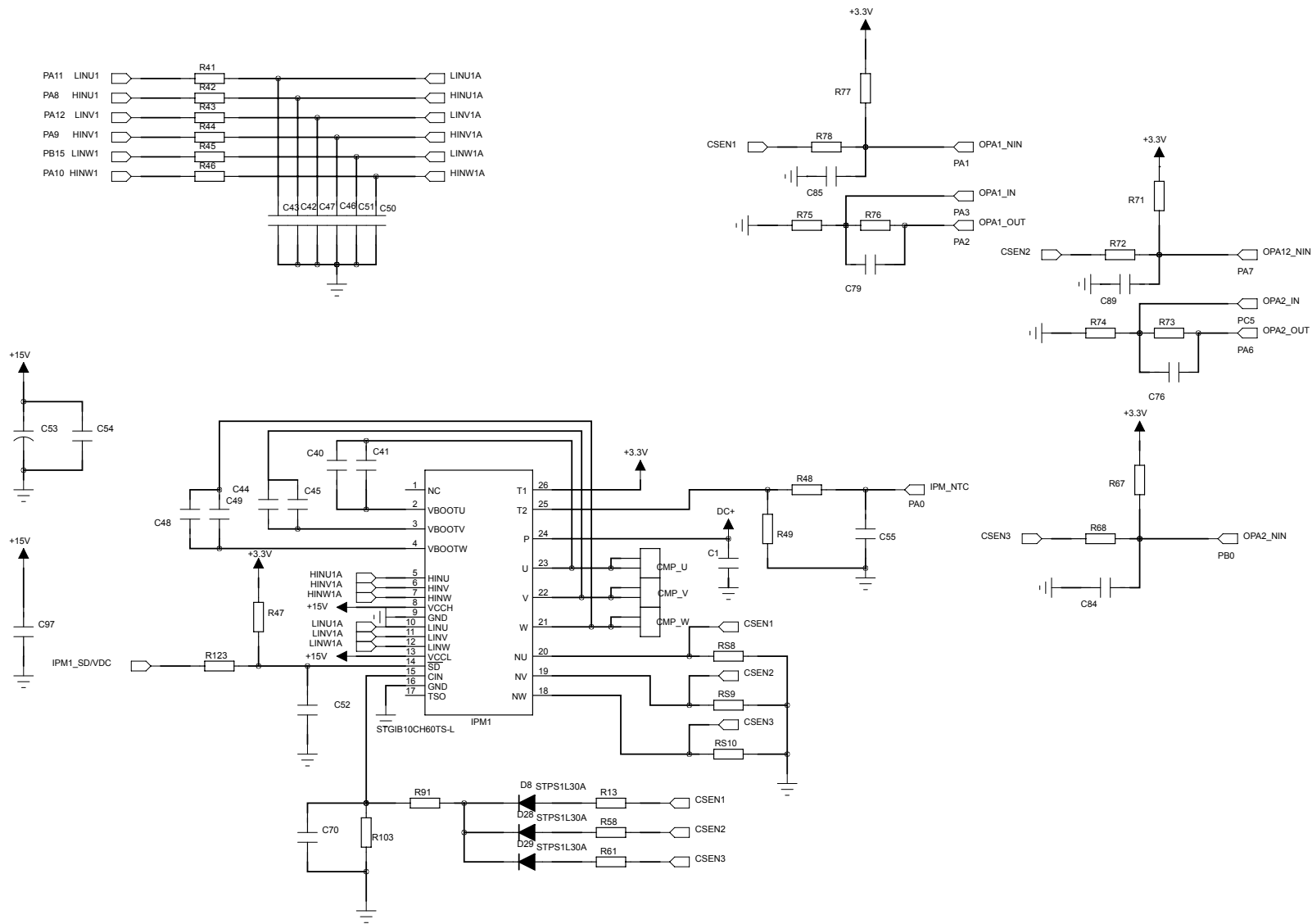


Figure 5. STEVAL-CTM010V1 schematic diagram - IPM2

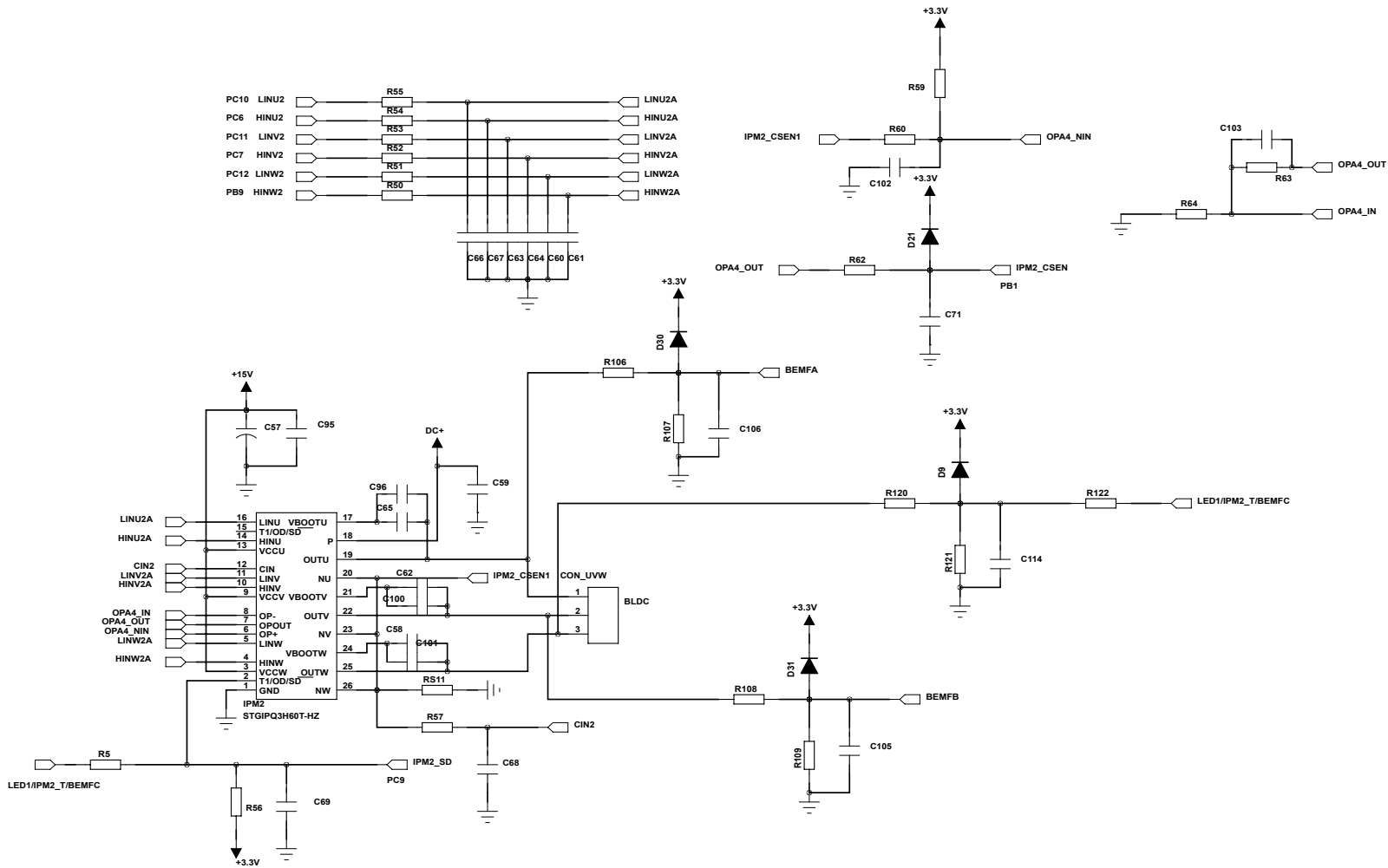


Figure 6. STEVAL-CTM010V1 schematic diagram - MCU

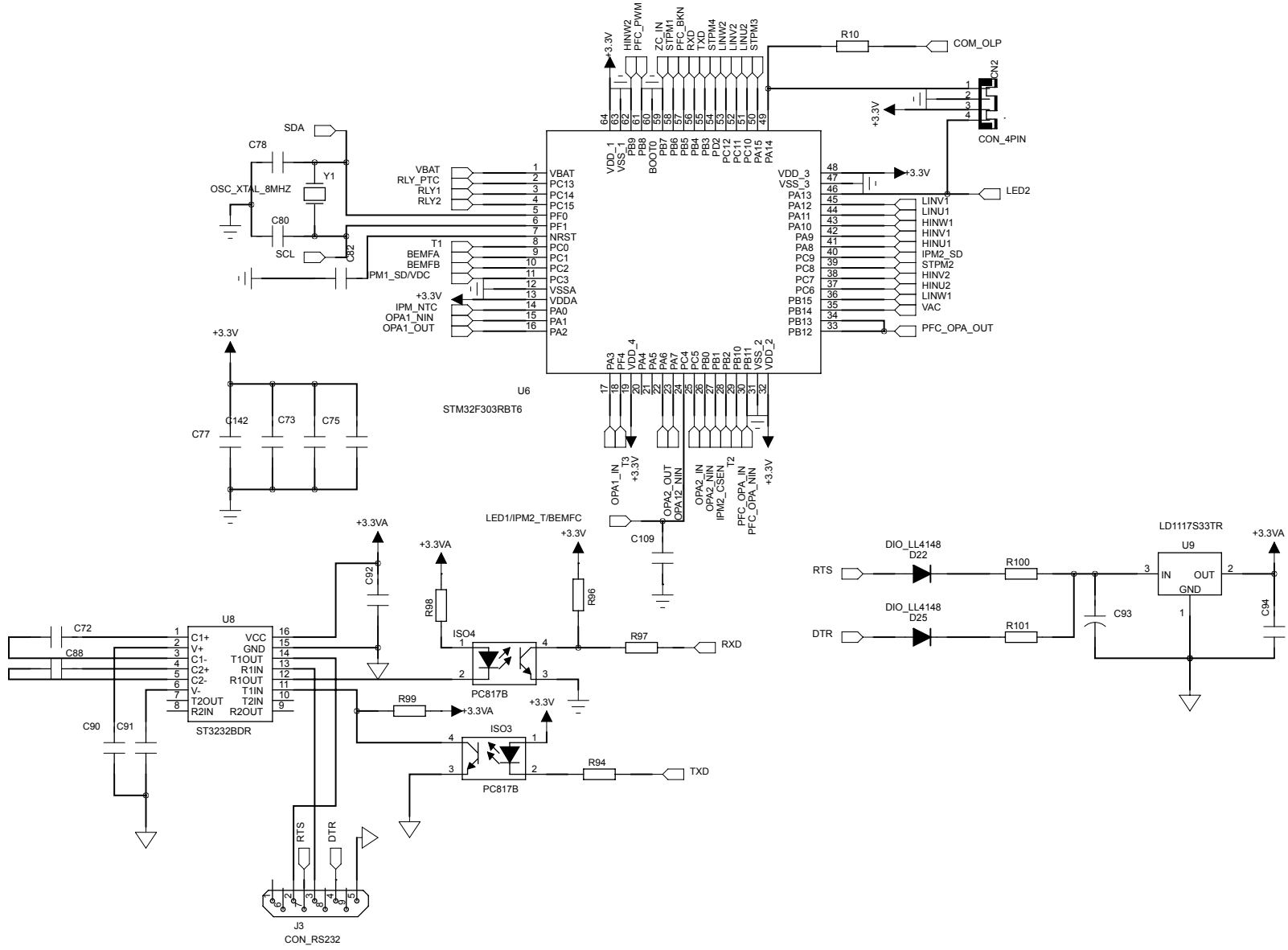
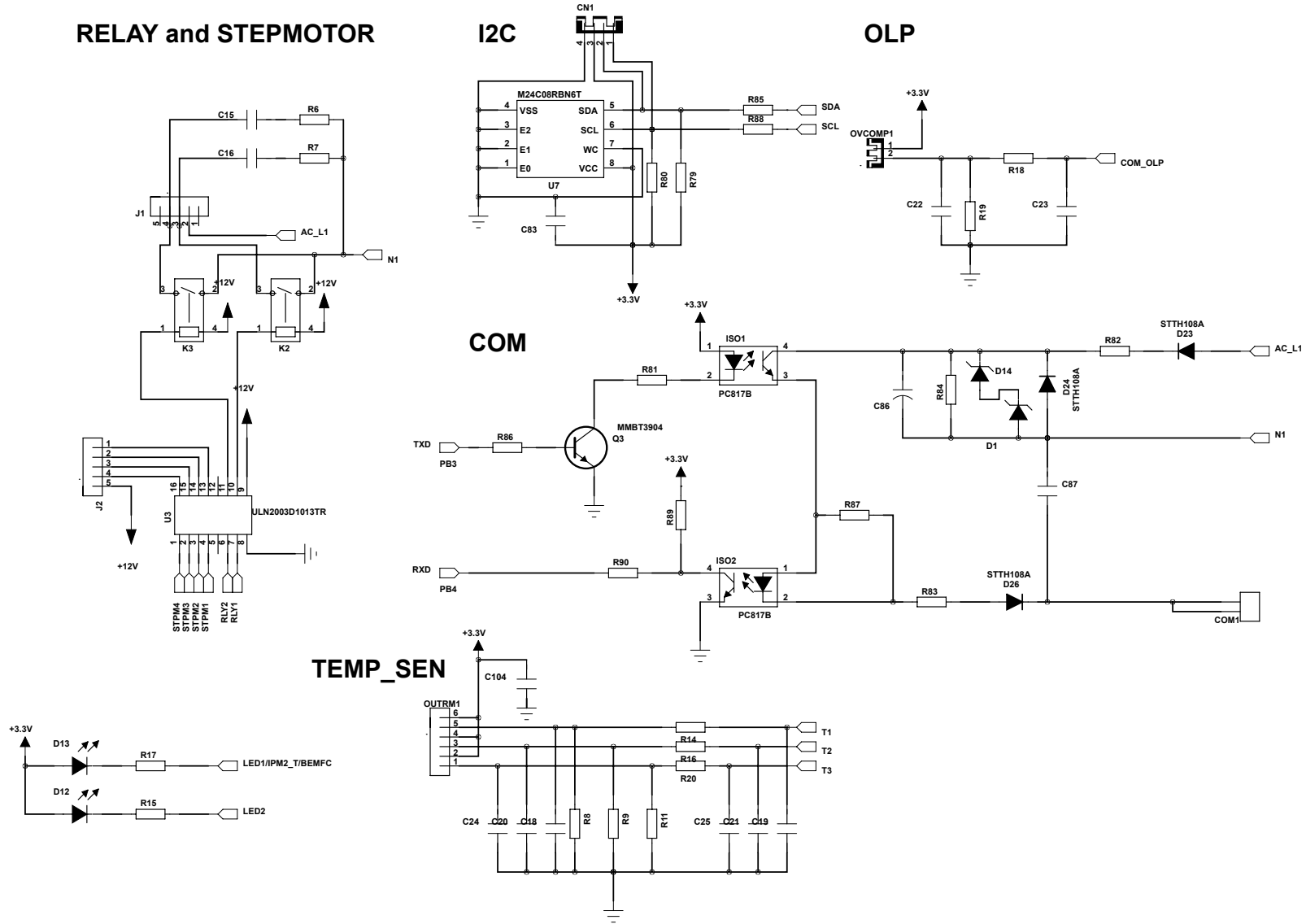


Figure 7. STEVAL-CTM010V1 schematic diagram - miscellaneous





## Revision history

**Table 1. Document revision history**

| Date        | Version | Changes          |
|-------------|---------|------------------|
| 12-Mar-2019 | 1       | Initial release. |

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