

Highly Integrated PMIC Powers MPU Power Rails And System Peripherals

[STMicroelectronics'](#) STPMIC25 is a power-management IC (PMIC) for the company's STM32MP2 microprocessors, featuring 16 channels to supply all the MPU power rails as well as system peripherals in one convenient package (Figs. 1 and 2). Completing the hardware design requires only a small number of external components to provide filtering and stabilization and an evaluation board (the STEVAL-PMIC25V1) is available to help designers start development (Fig. 3).

The IC contains seven buck converters and eight low-dropout regulators (LDOs), with an additional LDO to provide the reference voltage (Vref) for system DDR3 and DDR4 DRAMs. Among the eight LDOs is a dedicated 3.3-V channel to supply USB high-speed and type-C PHY ICs. There are also general-purpose LDOs that can be assigned to power circuitry such as memory card interfaces and Ethernet ports.

The buck converters are optimized to power the MPU's CPU, core circuitry, GPU, I/O and analog domains, with additional channels for DDR RAM supply and a general-purpose auxiliary output. The converters are designed with fast transient response and low ripple across a wide range of operating conditions, to meet specific demands of the MPU's power domains.

All converters use adaptive constant on-time control for high efficiency, with spread-spectrum frequency modulation and phase-shifted switching with an advanced synchronization technique to minimize EMI. In addition, each converter can operate in high-power or low-power mode, controlled by the application software, allowing the host system to enhance energy savings by minimizing converter quiescent currents. All bucks and LDOs can be enabled and disabled independently.

With non-volatile memory (NVM) on-chip and an I²C interface, the STPMIC25 allows flexibility to support a wide range of uses. Settings such as output voltages and power-up and power-down sequencing can be programmed or configured dynamically through software. Safety features including thermal protection and overcurrent protection for each output are built in.

The STPMIC25 is in production now, packaged in a 6.5-mm x 6.5-mm 56-lead WFQFN just 0.9-mm high, with unit pricing from \$3.38 for orders of 1000 pieces. For more information see the STPMIC25APQR product [page](#) or STPMIC25 [datasheet](#) and the STEVAL-PMIC25V1 product [page](#).

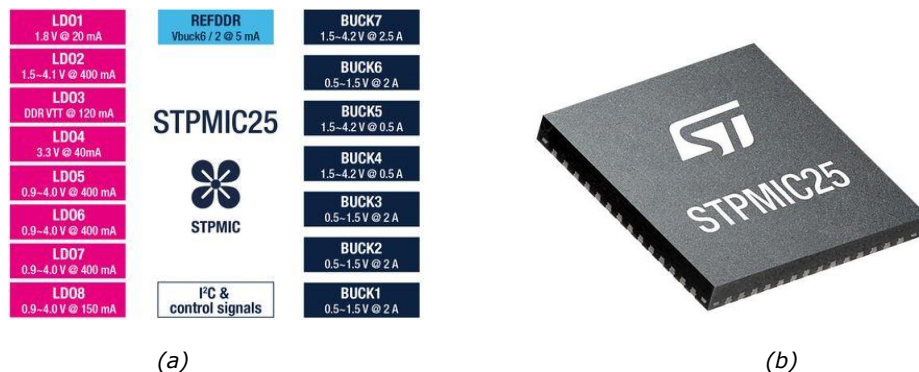


Fig. 1. The STPMIC25 is a fully integrated power management IC designed to manage the power requirements of the core, memory and interfaces of the STM32MP2x series MPU and other application microprocessors. A high-level block diagram depicting the chip's regulators and other functions (a) and an image of its WFQFN package (b) are shown here.

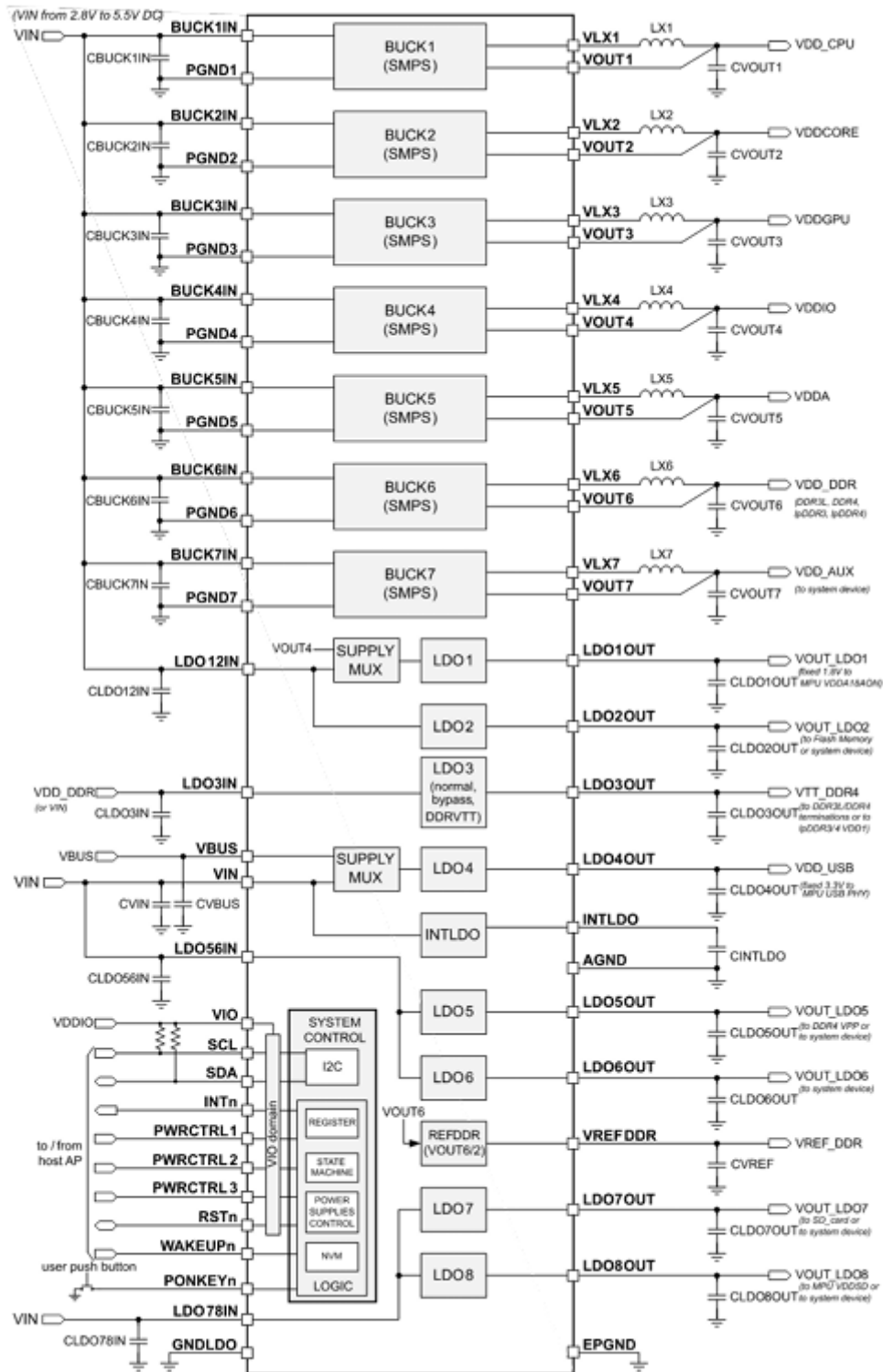


Fig. 2. Typical application circuit for the STPMIC25. The device integrates advanced low power features controlled by a host processor via I²C and IO interfaces. The PMIC's regulators are designed to supply power to the application processor as well as to the external system peripherals such as DDR, flash memories, and other system devices.



Fig. 3. The STEVAL-PMIC25V1 is an evaluation board for the highly integrated STPMIC25 PMIC. The associated eval kit includes a USB dongle, which provides I²C access to the configuration registers of the STPMIC25 device, where voltage settings, power sequences, protection thresholds and other parameters can be set. The board also contains header connectors for external access to the embedded regulators and switches in the device, as well as internal routing via jumpers to satisfy any physical configuration requirements. The passive components on the board are chosen for optimal performance across most use conditions, and three push buttons and digital I/Os allow triggering of the digital controls of the device.