32 KHz Watch Circuit with Programmable Adaptive Motor Pulse

PCA2000_PCA2001

Last Updated: Jan 31, 2024

The PCA2000 and PCA2001 are CMOS integrated circuits for battery operated wrist watches with a 32 kHz quartz crystal as timing element and a bipolar 1 Hz stepping motor. The quartz crystal oscillator and the frequency divider are optimized for minimum power consumption. A timing accuracy of 1 ppm is achieved with a programmable, digital frequency adjustment.

To obtain the minimum overall power consumption for the watch, an automatic motor pulse adaptation function is provided. The circuit supplies only the minimum drive current, which is necessary to ensure a correct motor step. Changing the drive current of the motor is achieved by chopping the motor pulse with a variable duty cycle. The pulse width and the range of the variable duty cycle can be programmed to suit different types of motors. The automatic pulse adaptation scheme is based on a safe dynamic detection of successful motor steps.

A pad RESET is provided (used for stopping the motor) for accurate time setting and for accelerated testing of the watch.

The PCA2000 has a battery End Of Life (EOL) warning function. If the battery voltage drops below the EOL threshold voltage (which can be programmed for silver oxide or lithium batteries), the motor steps change from one pulse per second to a burst of four pulses every 4 seconds.

The PCA2001 uses the same circuit as the PCA2000, but without the EOL function.

PCA2000/2001 Block Diagram Block Diagram
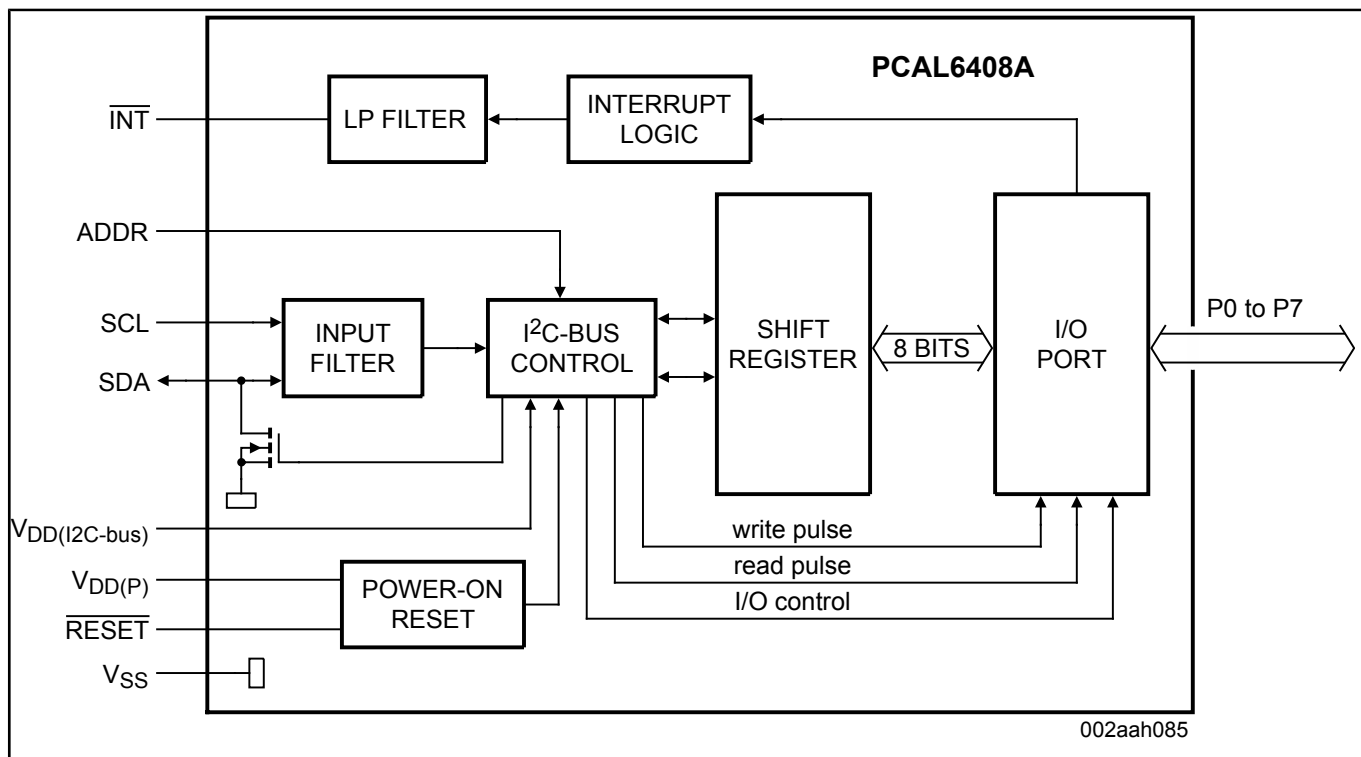
Block diagram: PCA2000CX8, PCA2000U, PCA2001CX8, PCA2001U Block Diagram
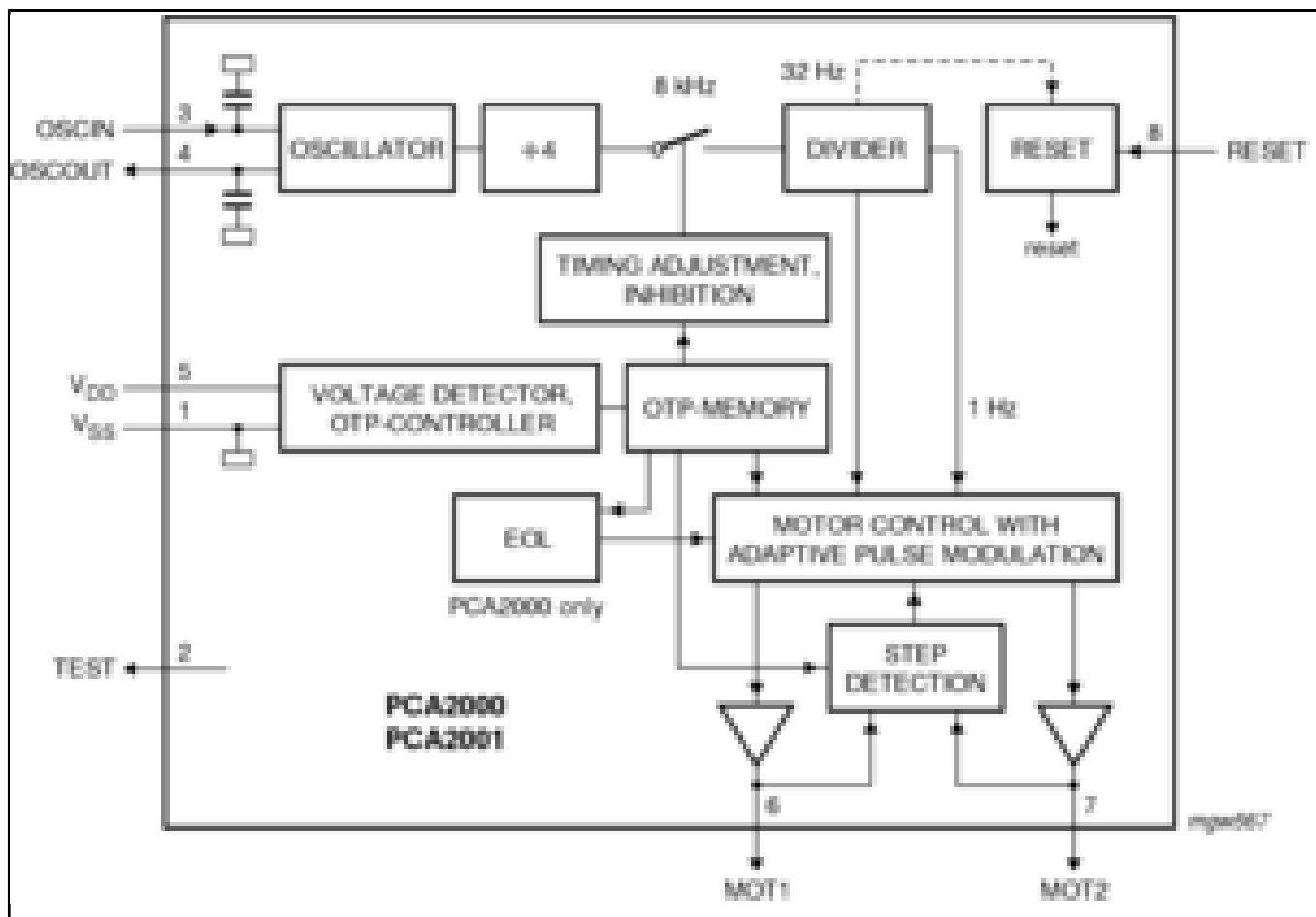
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