NXP LPC1857-based design for 8-bit camera interface

Flexible camera interface

Use this complete design example to add image-based features to your application. The unique camera-to-MCU connection eliminates the need for a dedicated camera interface and supports any clocked parallel camera module.

KEY FEATURES

▶ Full design based on Keil MCB1800 evaluation board
▶ 180 MHz ARM® Cortex™-M3 LPC1857 microcontroller
  - 1 MB Flash, 136 kB SRAM, 16 kB EEPROM
  - SCTimer/PWM subsystem
  - Quad SPIFI interface
  - Two 12 Mbps USB controllers
  - Two CAN 2.0B controllers
  - 10/100 Ethernet
  - Graphic LCD controller
  - External memory controller
  - Two 8 ch/10 b ADCs, one 10-bit DAC
▶ 8-bit OmniVision OV7670 QVGA camera module
▶ Includes source code
▶ Compatible with Keil µVision 4.70 IDE

TARGET APPLICATIONS

▶ Toys
▶ Face detection
▶ Doorbell cameras
▶ Biometrics authentication
▶ Automated inspection
▶ Quality assurance (detection of defects, flaws, missing parts)
▶ Part sorting and identification
▶ Barcode reading & verification
▶ Camera-based fire or smoke detection

This camera-in-a-box design example, built around a powerful NXP LPC1857 MCU, provides everything needed to add entry-level camera functionality to an application.

Developers can use the design example to create a wide range of imaging-related features. In the consumer segment, they can use it to capture images and devices that support face detection. In the security segment, they can add imaging for use in biometric authentication, doorbell cameras, or camera-based detection of fire or smoke. And in industrial and manufacturing environments, developers can use the camera function to enable automated inspection, part sorting and identification, barcode reading and verification, and quality-assurance functions such as detecting flaws, defects, or missing parts.

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The image-capture function uses only 8% of the full CPU capacity, so the LPC1857 MCU has plenty of bandwidth left over for image processing and connectivity. The LPC1857 also supports a number of formats for outputting image data and/or image analysis.

The design example eliminates the need for a dedicated camera interface by using a highly flexible, patent-pending peripheral, called the state-configurable timer and PWM module (SCTimer/PWM). The SCTimer/PWM is available on several NXP MCU families, so developers can use the design example to explore features and then select a different MCU for production. This gives developers the option to choose from a range of supported features and functionality, and lets developers create designs that are smaller, more compact, and less expensive to produce.

The design example is equipped with an OmniVision OV7670 camera module that uses an 8-bit parallel output in RGB565 format with support for QVGA mode. The design example works with any camera module that supports a clocked parallel interface, so developers can easily swap out the provided OmniVision module and use the best camera for their application.

SCTIMER/PWM SUBSYSTEM
The SCTimer/PWM on the MCU works with the SCCB bus on the camera module to provide all the control, data, and timing functions for a full camera interface. The camera's 8-bit data signals are connected to the MCU's GPIO, and the Vsync, Hsync, and PixClk signals connect to the SCTimer/PWM subsystem.

In the design example, the SCTimer/PWM samples the video data and then transfers it, using general-purpose DMA and the external memory controller (EMC), to the onboard SDRAM. Next, the graphic LCD controller on the LPC1857 uses its dedicated DMA controller and the EMC to pull the frame buffer data from the SDRAM for display on an LCD panel.

COMPLETE DESIGN
The design example is shipped with all the necessary components for an image-capture application running on the LPC1857 MCU. That includes source code, developed using the Keil MDK-ARM environment and µVision version 4.70, the OmniVision camera module, an adapter board and USB cable, and a Quick Start guide.

Additional material, including an application note describing the camera interface, is available on the design example's dedicated LPCware.com project page: www.lpcware.com/content/nxpfile/an11365-sct-camera-interface-design-lpc1800-and-lpc4300

ABOUT THE LPC1857 MCU
The LPC1857 is a highly integrated MCU based on a 180 MHz ARM Cortex-M3 CPU. It offers low power consumption, enhanced debug features, and extensive connectivity options.
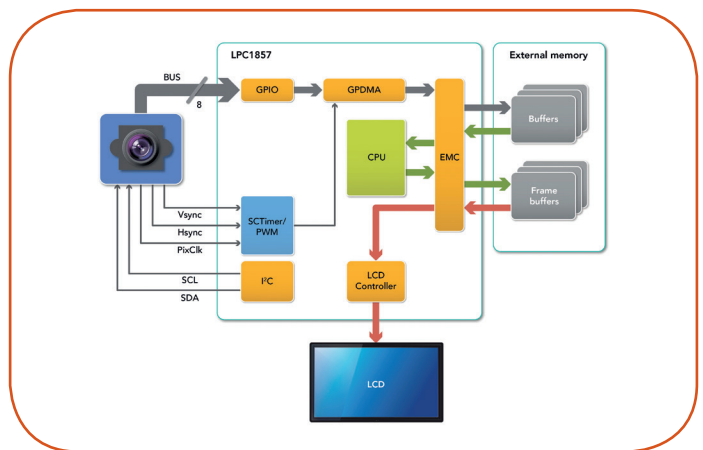
The LPC1857 camera interface

Project page on LPCware.com (includes app note and source code)
www.lpcware.com/content/nxpfile/an11365-sct-camera-interface-design-lpc1800-and-lpc4300

LPC1857 product page
www.nxp.com/products/microcontrollers/cortex_m3/LPC1857FET256.html