EM78612

Universal Serial Bus Microcontroller

Product Specification

DOC. VERSION 1.4

ELAN MICROELECTRONICS CORP.

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Specification Revision History

Doc. Version	Revision Description	Date
1.0	Initial Version	2003/03/05
1.1	1. Modified some text on the General Description. 2. Modified the Pin Description of EM78612. 3. Updated the Special Purpose Register. 4. Modified the R4 Example of Selecting Bank.	2006/03/17
1.2	Modified the resonator Cap. of the application circuit	2007/03/30
1.3	1. Modified the package type. 2. Added Appendix D.	2008/10/01
1.4	1. Remove Pin Configuration. 2. Remove Package Outline Dimension	2011/11/23

1 General Description

The EM78612 is a series of 8-bit Universal Serial Bus (USB), RISC architecture microcontroller. It is specifically designed for USB low speed device application and to support legacy device such as PS/2 mouse. The EM78612 also support one device address and two endpoints.

The EM78612 has 5-level stacks and 6 interrupt sources. It has a maximum of 12 General Input/Output pins. Each device has 80 bytes SRAM. The ROM capacity of the EM78612 is 2K.

These series of ICs have Dual Clock mode which allows the device to run on low power saving frequency.

2 Features

- Low-cost solution for low-speed USB devices, such as mouse, joystick, and gamepad.
- USB Specification Compliance
  - Universal Serial Bus Specification Version 1.1
  - USB Device Class Definition for Human Interface Device (HID), Firmware Specification Version 1.1
  - Supports 1 device address and 2 endpoints (EP0 and EP1)
- USB Application
  - USB protocol handling
  - USB device state handling
  - Identifies and decodes Standard USB commands to EndPoint Zero
- PS/2 Application Support
  - Built-in PS/2 port interface
- Built-in 8-bit RISC MCU
  - 5-level stacks for subroutine and interrupt
  - 6 available interrupts
  - 8-bit real time clock/counter (TCC) with overflow interrupt
  - Built-in RC oscillator free running for Watchdog Timer and Dual clock mode
  - Two independent programmable prescalers for WDT and TCC
  - Two power saving methods:
    1. Power-down mode (Sleep mode)
    2. Low frequency mode
  - Two clocks per instruction cycle
- I/O Ports

- Up to 12 general purposes I/O pins grouped into two ports (Port 6 and 7).
- Up to two LED sink pins
- Each GPIO pin of Ports 6 and Port 7 has an internal programmable pull-high resistor.
- Each GPIO pin of Port 6 has an internal programmable pull-low resistor.
- Each GPIO pin wakes up the MCU from sleep mode by input state change.

■ Internal Memory

- Built-in 2048×13 bits Mask ROM
- Built-in 80 bytes general purpose registers (SRAM)
- Built-in USB Application FIFOs

■ Operation Frequency

- Normal Mode: MCU runs on the external oscillator frequency
- Dual Clock Mode: MCU runs at the frequency of 256kHz (or 32kHz, 4kHz, 500Hz), emitted by the internal oscillator with the external ceramic resonator turned off to save power.

■ Built-in 3.3V Voltage Regulator

- For MCU power supply
- Pull-up source for the external USB resistor on D-pin.

3 Application

This microcontroller is designed for USB low speed device application or non-USB embedded devices. It is also suitable for PS/2 mouse application.

4 Pin Description

Table 4-1

Pin Name	I/O	Function
P60 ~ P67	I/O	Port 6 has up to 8 GIOP pins. The pull-high resistors (**132K**Ω) and pull-low resistors (**10K**Ω) are selected through pin programming.
P70 ~ P73	I/O	Port 7 has up to 4 GIOP pins. The sink current of P70 and P71 are programmable for driving an LED. Each pin has pull-high resistors (**132K**Ω) that can be selected through pin programming.
D+ / P50	I/O	USB Plus data line interface or PS/2 line interface are user-defined through firmware setting. When the EM78612 is running under PS/2 mode, this pin will have an internal pull-high resistor (2.2KΩ), with V_{DD}=5.0V. When this pin is used as a PS/2 line interface, it will generate an interrupt when its state changes (Port 5 state change interrupt enable).
D- / P51	I/O	USB Minus data line interface or PS/2 line interface are user-defined through firmware setting. When the EM78612 is running under PS/2 mode, this pin will have an internal pulled-high resistor (2.2KΩ), with V_{DD}=5.0V. When this pin is used as a PS/2 line interface, it will generate an interrupt when its state changes (Port 5 state change interrupt enable). When the EM78612 is running under USB mode, this pin will have an internal pull-high resistor, 1.5KΩ, with $V_{3.3}$=3.3V.
OSCI	I	6MHz/12 MHz ceramic resonator input.
OSCO	I/O	Return path for 6MHz/12MHz ceramic resonator.
$V_{3.3V}$	O	3.3V DC voltage output from internal regulator. **This pin should be tied to a 4.7μF decoupling capacitor to GND.**
V_{DD}	-	Connect to the USB power source or to a nominal 5V-power supply. Actual V_{DD} range can vary between 4.4V and 5.2V.
V_{SS}	-	Connect to ground.