USB Keyboard Controller MSE9750

Introduction

MSE9750 is a low-cost, highly integrated USB keyboard controller based on the most widely used 8051 microcontroller core. The USB portion of MSE9750 is implemented all in hardware and is fully compliant with *The Device Class Definition for Human Device Interface Device, Version 1.0*. Because the USB logic in the chip is implemented in hardware, the firmware programmer needs to write a very little code for USB functionality in the firmware.

The 8051 core in the chip shares the same instruction set as the standard 8051 microcontroller and provides the same internal registers and I/O interface, 4K mask ROM, multiple timers, 128 byte RAM and an additional watch dog timer. The four internal I/O ports are mapped to pre-assigned 18 scan-out pins and 10 scan-in pins. MSE9750 is the only USB keyboard controller in the industry that supports 18x10 scan matrix. MSE9750 provides two extra LED pins in addition to the standard three LED pins - Num Lock, Caps Lock and Scroll Lock. MSE9750 is again the only low-cost USB keyboard that provides up to eight LED pins.

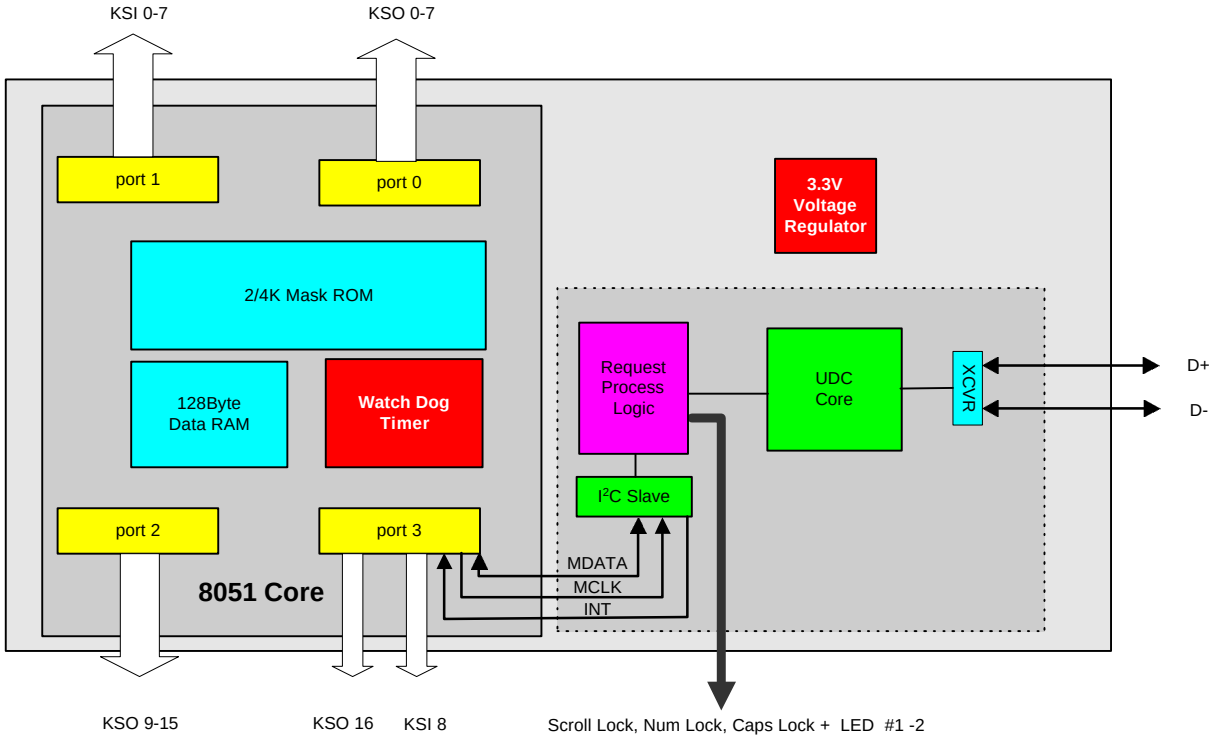
One major advantage of the MSE9750 USB keyboard controller is the fact that the USB descriptors which includes the standard descriptors and class-specific descriptors are not hard-coded in the chip. All descriptors are stored in the 8051 side and the 8051 gives descriptor contents to the USB logic when requested. This feature enables the firmware programmer to have a complete control over the makeup of the contents of all descriptors while developing a firmware. This flexibility is specially useful during the development of a report descriptor since finalizing a report descriptor usually requires an iterative process.

The MSE9750 device is a slow speed HID device which uses a single low-cost 6Mhz resonator and has a built-in 3.3 voltage regulator which eliminates the need for an external voltage regulator. It also includes a built-in USB transceiver for the upstream port.

MSE9750 Features

- Compliant with USB Protocol Revision 1.0
- 8051 Core with 4K Mask ROM and 128 byte RAM
- Built-in Watch Dog Timer
- Bus-powered Low Speed USB HID device
- Supports 17 scan-out lines and 9 scan-in Lines
- Up to 5 Direct Drive LED's
- Internal Key Scan Pull-up/Pull-down resistors
- Downstream device connect/disconnect detection
- Remote Wakeup Support
- Get/Set Protocol Support
- Get/Set Idle Rate Support
- Descriptors stored in the 8051 ROM
- Power management by supporting USB suspend/resume protocol
- Clock and data recovery from USB
- CRC5 checking, CRC16 generation and checking for the packets addressed to the Hub
- Maintenance of the data toggle bits for the supported endpoints
- Built-in transceiver for the upstream port
- Built-in 3.3v voltage regulator
- Space-saving 52-pin SDIP Package

MSE9750 Block Diagram



Pin Information

52-Pin SDIP Package Pinout

Pin No	Pin Name	Description
1	PVDD	Analog Power for PLL ONLY.
2	XOUT	Oscillator Output.
3	XIN	Oscillator Input.
4	AVDD	Analog Power for Voltage Regulator.
5	AGND	Analog Ground.
6	TESTn	For Test
7	EXT_MCn	External M80C51 Mode. To use the external Micro Controller this pin should be tied to “low”.
8	KSO_0	Key Scan Out_0. 200K Pull-down. *P0[0]*
9	KSO_1	Key Scan Out_1. 200K Pull-down. *P0[1]*
10	KSO_2	Key Scan Out_2. 200K Pull-down. *P0[2]*
11	KSO_3	Key Scan Out_3. 200K Pull-down. *P0[3]*
12	KSO_4	Key Scan Out_4. 200K Pull-down. *P0[4]*

13	KSO_5	Key Scan Out_5. 200K Pull-down. *P0[5]*
14	KSO_6	Key Scan Out_6. 200K Pull-down. *P0[6]*
15	KSO_7	Key Scan Out_7. 200K Pull-down. *P0[7]*
16	KSO_8	Key Scan Out_8. 200K Pull-down. *P2[0]*
17	KSO_9	Key Scan Out_9. 200K Pull-down. *P2[1]*
18	KSO_10	Key Scan Out_10. 200K Pull-down. *P2[2]*
19	KSO_11	Key Scan Out_11. 200K Pull-down. *P2[3]*
20	KSO_12	Key Scan Out_12. 200K Pull-down. *P2[4]*
21	VDD1	5V Power Supply for Core. 5V Power Supply for I/O PAD.
22	KSO_13	Key Scan Out_13. 200K Pull-down. *P2[5]*
23	KSO_14	Key Scan Out_14. 200K Pull-down. *P2[6]*
24	KSO_15	Key Scan Out_15. 200K Pull-down. *P2[7]*
25	KSO_16	Key Scan Out_16. 200K Pull-down. *P3[6]*
26	RXD	Serial In/Out to the M80C51. *P3[0]*
27	GND1	Ground for Core. Ground for I/O PAD.
28	KSI_0	Key Scan In_0. 8K Pull-up. *P1[0]*
29	KSI_1	Key Scan In_1. 8K Pull-up. *P1[1]*
30	KSI_2	Key Scan In_2. 8K Pull-up. *P1[2]*
31	KSI_3	Key Scan In_3. 8K Pull-up. *P1[3]*
32	KSI_4	Key Scan In_4. 8K Pull-up. *P1[4]*
33	KSI_5	Key Scan In_5. 8K Pull-up. *P1[5]*
34	KSI_6	Key Scan In_6. 8K Pull-up. *P1[6]*
35	KSI_7	Key Scan In_7. 8K Pull-up. *P1[7]*
36	KSI_8	Key Scan In_8. 8K Pull-up. *P3[7]*
37	TXD	Serial In/Out to the M80C51. *P3[1]*
38	VDD2	5V Power Supply for Core. 5V Power Supply for I/O PAD.
39	GND2	Ground for Core. Ground for I/O PAD.
40	CAPSLn	Caps Lock LED.
41	SCROLn	Scroll Lock LED. When TESTn is low, this pin will be used for “EA” input of the M80C51.
42	NUMLn	Num Lock LED.

		When TESTn is low, this pin will be used for P3[3] input of the M80C51.
43	LED1n	LED1. When TESTn is low, this pin will be used for P3[4] input of the M80C51.
44	LED2n	LED2. When TESTn is low, this pin will be used for P3[5] input of the M80C51.
45	SDA	Serial Data In/Out to/from the external M80C51.
46	SCL	Serial Clock to/from the external M80C51. *P3[5]*
47	MC_INTn	Interrupt Signal to the external M80C51. *P3[3]*
48	EXT_INTn	External Interrupt Signal. *P3[2]*
49	V3P3	3.3 V Voltage Regulator Output.
50	RP_DP	USB Upstream Port D+.
51	RP_DM	USB Upstream Port D-.
52	PSENn	PSENn input for the M80C51 test.