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1. General Description

MG84FL54B is an enhanced single-chip 8-bit microcontroller manufactured in an advanced Embedded-Flash process. The instruction set is fully compatible with that of the 8051. With the enhanced CPU core, the device needs only 1 to 7 clock cycles to complete an instruction, and thus provides much higher performance than the standard 8051, which needs 12 to 48 clock cycles to complete an instruction. So, at the same performance as the standard 8051, the device can operate at a much lower speed and thereby greatly reduce the power consumption.

The device has on-chip 16KB Flash memory that is parallel programmable (via a universal programmer), In-System Programmable (via USB DFU). ISP allows the device to alter its own program memory without being removed from the actual end product under software control. This opens up a range of applications that need the ability to field update the application firmware. The other important and useful feature, In-Application-Programming (IAP), provides the device with the ability to save non-volatile data in its Flash memory.

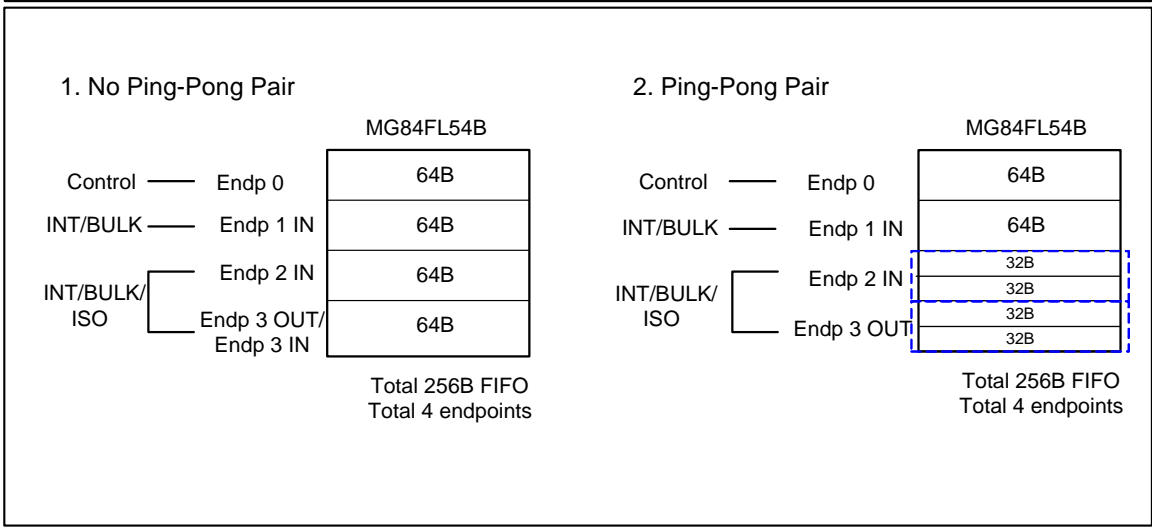
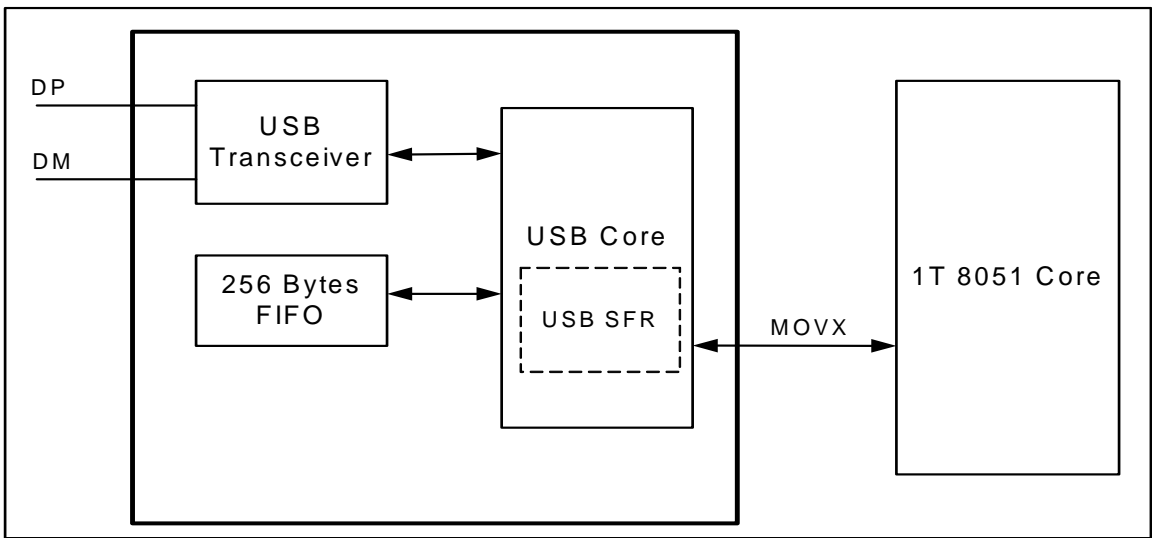
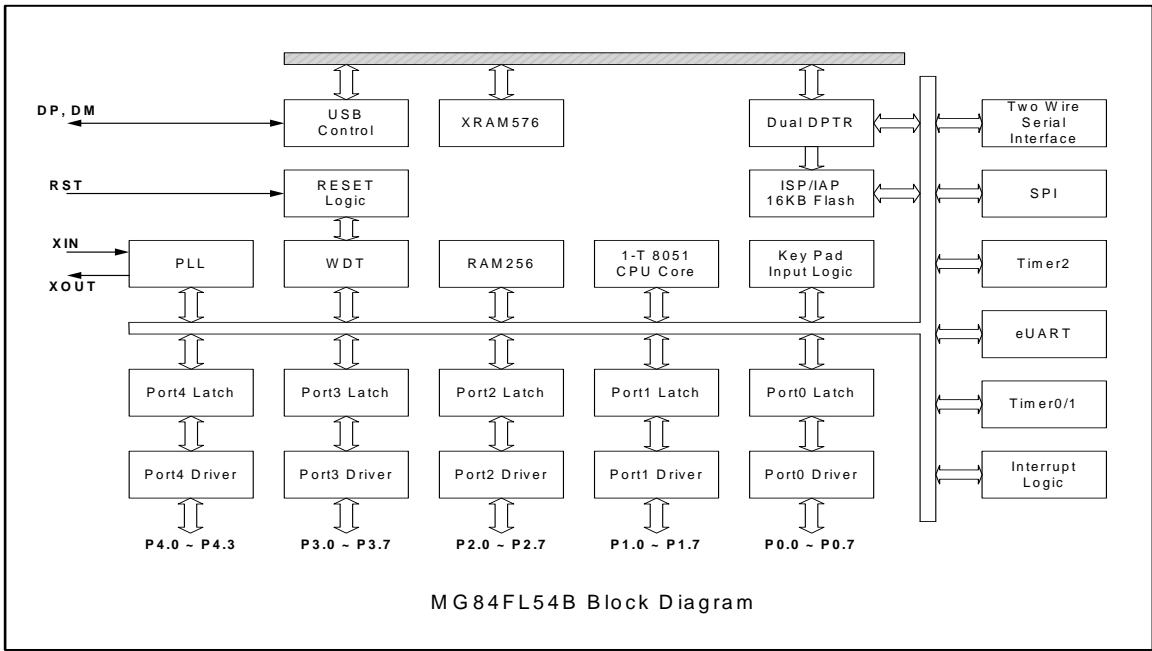
And in addition to the 256 bytes of internal scratch-pad RAM, the device has 576 bytes of on-chip expanded RAM (XRAM) for the applications that require extra memory. The device has also four 8-bit I/O ports and one 4-bit I/O ports, three 16-bit timers/counters, a multi-source/two-priority-level/nested interrupt structure, an enhanced UART input. More important, the added features such as KBI, SPI, TWSI bus and USB1.1 make it a powerful microcontroller and suitable for wide field applications.

2. Features

- 1-T 8051 CPU Core
- 16K bytes of on-chip Flash program memory with ISP/IAP function
- 256 bytes internal scratch-pad RAM and 576 bytes on-chip expanded RAM (XRAM)
- Dual DPTR (Data Pointer register)
- Four and half configurable I/O ports
- Three 16-bits Timers
- Enhanced UART
- Two-priority-level interrupt structure
- Additional external interrupts, INT2 and INT3
- Keypad interrupt (P0)
- Wake-up from power-down mode
- Serial Peripheral Interface (SPI)
- 2-wire Serial Interface (TWSI)
- One-time-enabled Watch-dog Timer (WDT)
- Programmable system clock
- USB specification 2.0 and 1.1 compliant
 - Built in full speed (12Mbps) USB transceiver
 - Intel 8X931 like USB control flow
 - One 256 bytes FIFO for USB endpoint-shared buffer
 - Maximum 64 bytes data for EP0 control-in/out buffer
 - Maximum 64 bytes data for EP1 bulk/interrupt-in buffer
 - Maximum 64 bytes data for EP2 bulk/interrupt/isochronous-in buffer, it could be configured to two 32 bytes dual-buffer-mode in bulk and isochronous operating.
 - Maximum 64 bytes data for EP3 bulk/interrupt/isochronous-out buffer, it could be configured to two 32 bytes dual-buffer-mode in bulk and isochronous operating. Additionally, it also can be configured to an interrupt-in buffer on EP3 function.
 - Supports USB suspend/resume and remote wake-up
 - Software-controlled USB connection/disconnection mechanism
 - Support USB DFU (Device Firmware Update)
- Power saving modes
 - Idle mode
 - Power-down mode
- Operating voltage
 - 2.4 ~ 5.5V on VDD_IO, 2.7V ~ 3.6V on VDD_CORE and VDD_PLL, 3.0V~3.6V on VDDA.
 - Built-in Low-Voltage Reset circuit.
- Operating temperature
 - Industrial (-40°C to +85°C)*
- Maximum operating frequency
 - Up to 24MHz, Industrial range
- Flash Quality criterion:
 - Flash data endurance: 20K erase/write cycles
 - Flash data retention: 100 years under room temperature
- 2-level code protection: SB (code scrambled) & LOCK (code locked)
- Package: **LQFP-48**

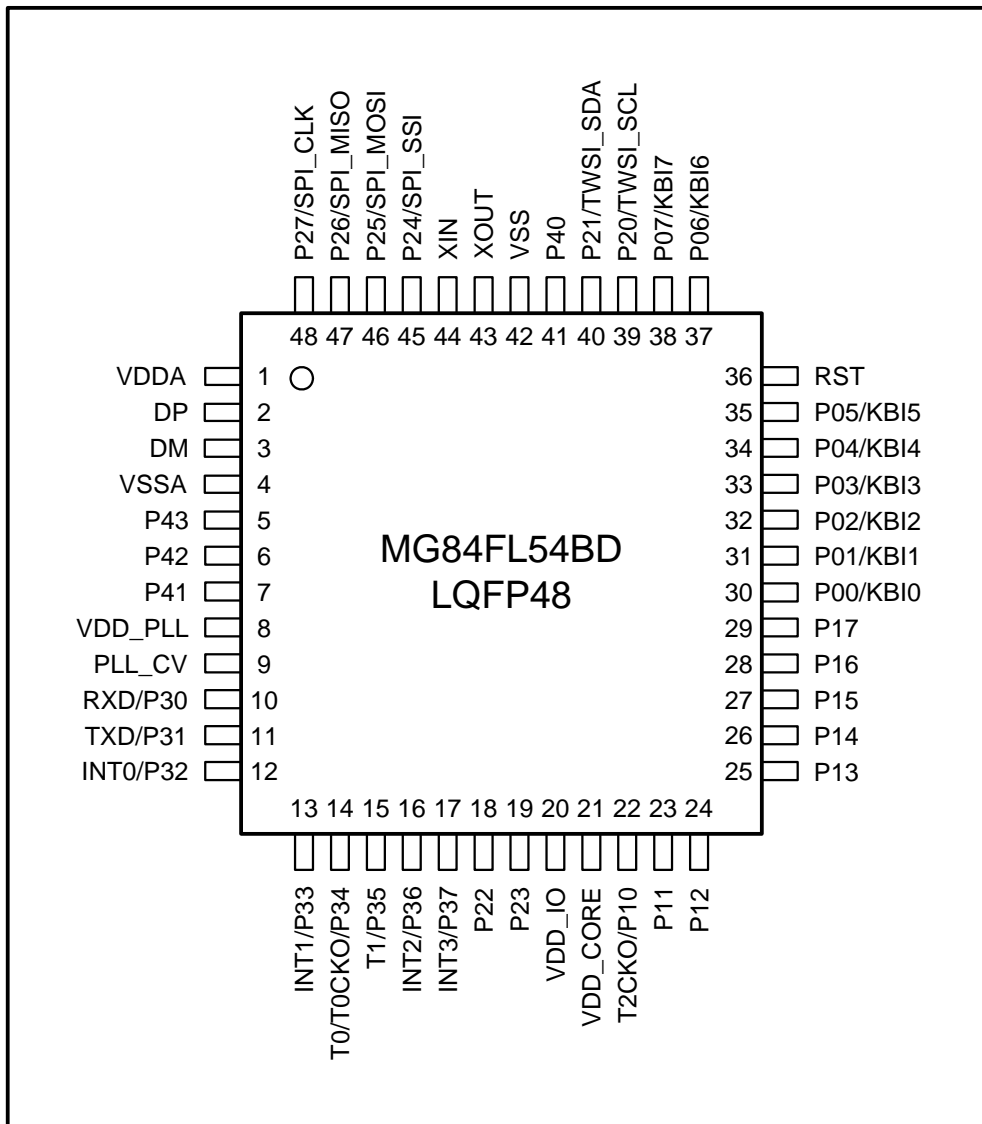
*: Tested by sampling.

3. Block Diagram



4. Pin Configurations

4.1. Pin-out for 48-pin Package

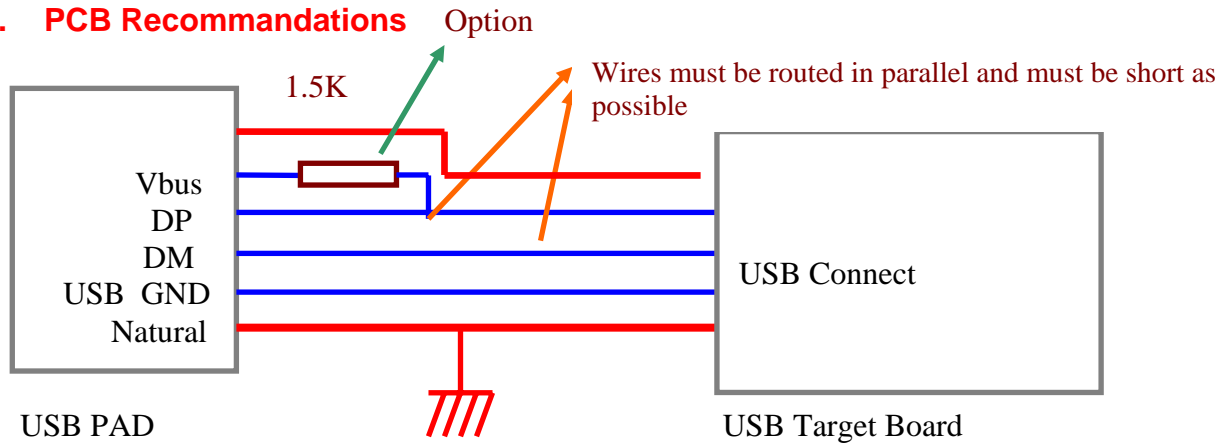


4.2. Pin Description

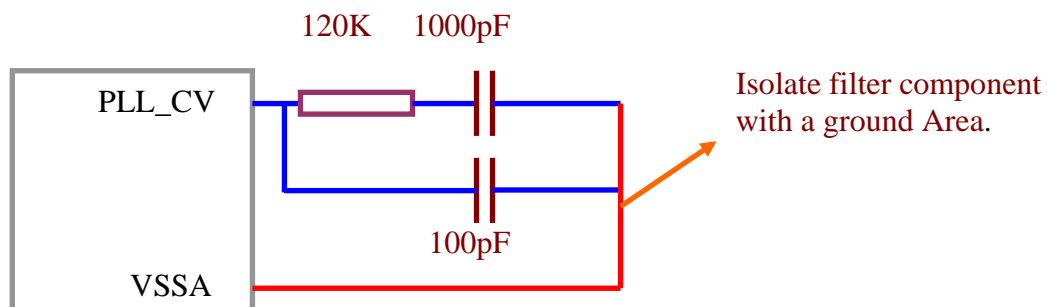
Pin No.	Name	Type	Description
1	VDDA	P	3.3V Analog Power
2	DP	I/O	USB DP I/O.
3	DM	I/O	USB DM I/O.
4	VSSA	P	Analog Ground.
5	P4.3	I/O	P4.3
6	P4.2	I/O	P4.2
7	P4.1	I/O	P4.1
8	VDD_PLL	P	Power input of PLL.
9	PLL_CV	I/O	Reference for internal PLL.
10	P3.0 /RXD	I/O	P3.0 & Serial port RXD.
11	P3.1 /TXD	I/O	P3.1 & Serial port TXD.
12	P3.2 /INT0	I/O	P3.2 & External interrupt 0.
13	P3.3 /INT1	I/O	P3.3 & External interrupt 1.
14	P3.4 /T0 /T0CKO	I/O	P3.4, Timer 0 external input & Timer 0 clock output.
15	P3.5 /T1	I/O	P3.5 & Timer 1 external input.
16	P3.6 /INT2	I/O	P3.6 & External interrupt 2.
17	P3.7 /INT3	I/O	P3.7 & External interrupt 3.
18	P2.2	I/O	P2.2.
19	P2.3	I/O	P2.3.
20	VDD_IO	P	Digital power for I/O pads.
21	VDD_CORE	P	Digital power for I/O internal core logic.
22	P1.0 /T2CKO	I/O	P1.0 & Timer 2 clock output.
23	P1.1	I/O	P1.1
24	P1.2	I/O	P1.2.
25	P1.3	I/O	P1.3.
26	P1.4	I/O	P1.4.
27	P1.5	I/O	P1.5.
28	P1.6	I/O	P1.6.
29	P1.7	I/O	P1.7.
30	P0.0	I/O	P0.0 & Keypad input 0.
31	P0.1	I/O	P0.1 & Keypad input 1.
32	P0.2	I/O	P0.2 & Keypad input 2.
33	P0.3	I/O	P0.3 & Keypad input 3.
34	P0.4	I/O	P0.4 & Keypad input 4.

35	P0.5	I/O	P0.5 & Keypad input 5.
36	RST	I	System reset input, high active.
37	P0.6	I/O	P0.6 & Keypad input 6.
38	P0.7	I/O	P0.7 & Keypad input 7.
39	P2.0 /TWSI_SCL	I/O	P2.0 & TWSI_SCL.
40	P2.1 /TWSI_SDA	I/O	P2.1 & TWSI_SDA.
41	P4.0	I/O	P4.0
42	VSS	P	Digital ground.
43	XOUT	O	Crystal output pad.
44	XIN	I	Crystal input pad.
45	P2.4 /SPI_SSI	I/O	P2.4 & SPI_SSI.
46	P2.5 /SPI_MOSI	I/O	P2.5 & SPI_MOSI.
47	P2.6 /SPI_MISO	I/O	P2.6 & SPI_MISO.
48	P2.7 /SPI_CLK	I/O	P2.7 & SPI_CLK.

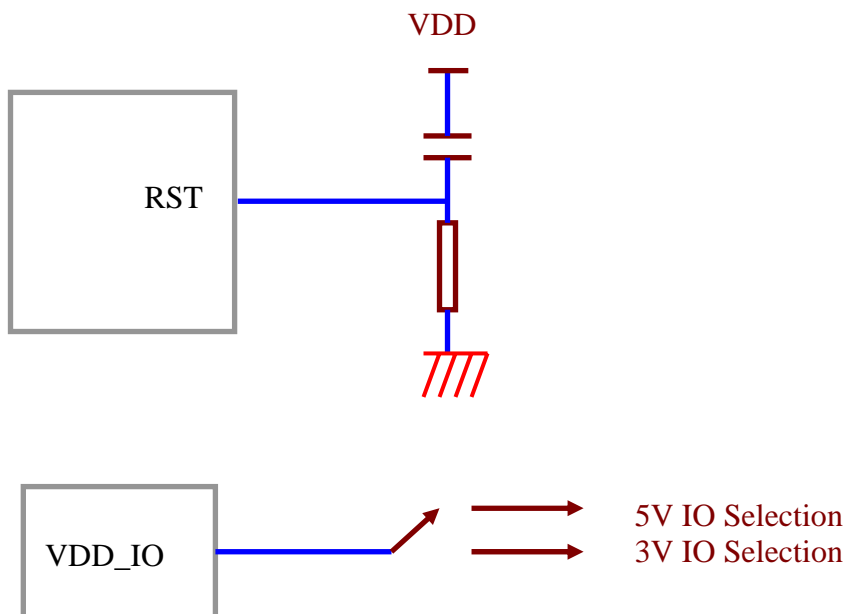
5. PCB Recommendations



PLL Circuit



Reset Circuit



Note:

All of USB wires must be impedance control.

6. Field Applications

- Home Appliance
- Healthcare
- POS Control
- Wireless Dongle
- Joy Stick
- Wireless Keyboard/Mouse
- USB to Serial Application.
- USB to Parallel Application

7. Absolute Maximum Rating

Parameter	Rating	Unit
Ambient temperature under bias	-55 ~ +125	°C
Storage temperature	-65 ~ + 150	°C
Voltage on any Port I/O Pin or RST with respect to Ground	-0.3 ~ VCC + 0.3	V
Voltage on VCC with respect to Ground	-0.3 ~ +4.2	V
Maximum total current through VCC and Ground	400	mA
Maximum output current sunk by any Port pin	40	mA

*Note: stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the devices at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

8. Order Information

Part Number	Temperature Range	Package	Packing	Operation Voltage
MG84FL54BD	-40°C~85°C	LQFP-48	Tray	3.3V

9. Package Dimension

MG84FL54BD (LQFP-48)

