M30240EC/M5/M6 16-Bit MCU 12Mbps USB

This slide presentation includes:

- *Attractive Features for USB System design*
- *Distinctive Features*
- *Pin Configuration*
- *Block Diagram*
- *Enabling Quick System Development*

MITSUBISHI 16-Bit Single-chip Microcomputer
M16C Family / M16C/24 Group

M30240 Attractive Features for USB System Design

- A high speed 5 endpoints USB function controller supports all USB transfer types: Isochronous, Bulk, Control and Interrupt.
- Operates in both self-powered and bus-powered applications; also, remains powered during USB suspend mode using <200uA.
- Bulk Data Rate (via EP1): can support the theoretical maximum transfer rate of 19 64-byte packets/frame.
- The built-in DC-to-DC converter eliminates the need of an external 3.3V power supply (converts from 4.15V~5.25V to 3.3V).
- The built-in analog transceiver (USB V1.1 Spec.) eliminates the need for an external device.
- Two independent DMA channels provide an efficient means of transferring USB data between the USB FIFOs and other peripherals.

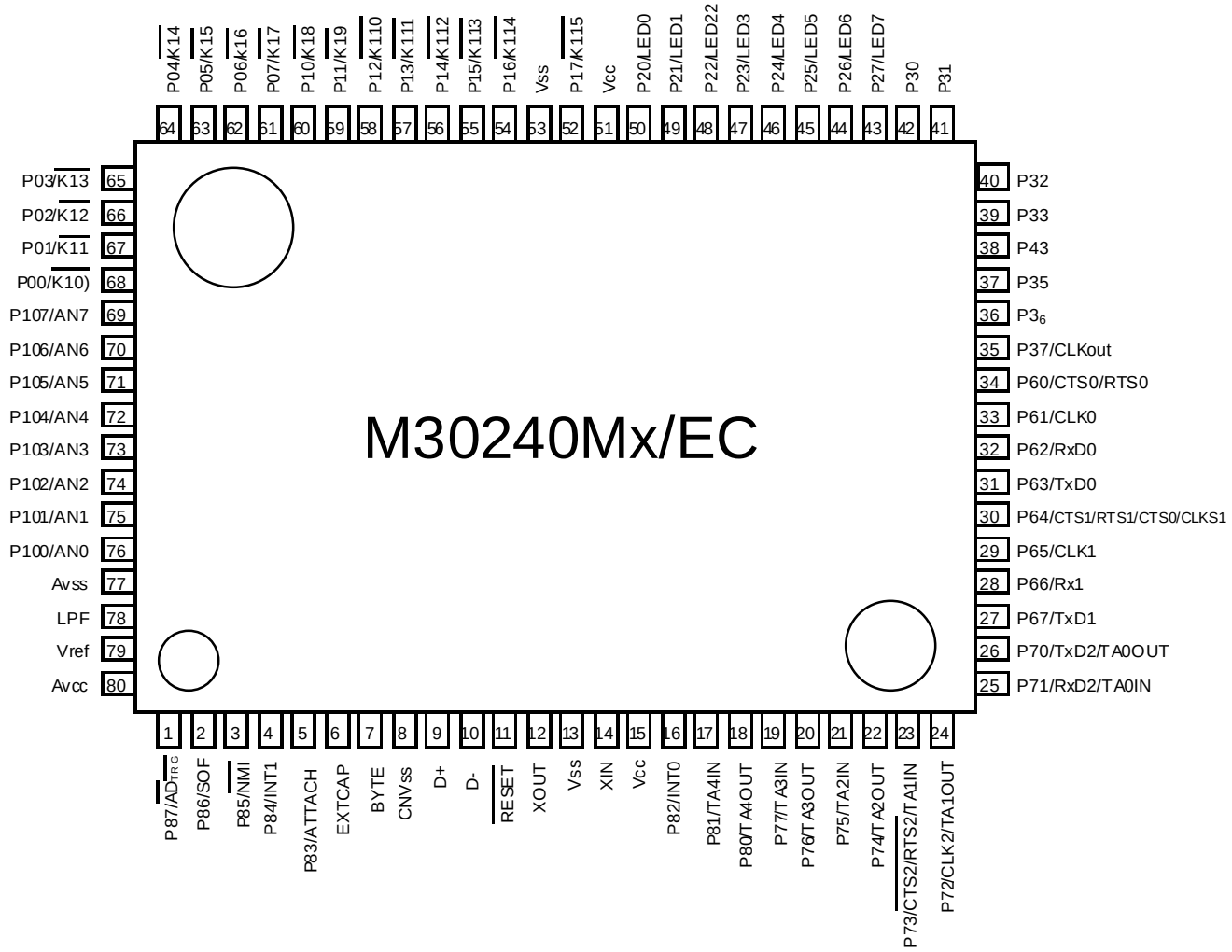
M30240 Attractive Features for USB System Design (con't)

- 8 Key-on Wake-up pins provide a way of returning from a STOP or WAIT mode by the touch of a key pad.
- An internal frequency multiplier provides the 48 MHz clock for the USB block. This eliminates the need for an external 48mhz clock source and helps reduce overall system EMI.
- 4 LED Drivers and 5 Current Drivers (<20mA) ease board design.
- 10-bit A/D Converter, Timers, UARTs, Cyclic Redundancy Check CRC calculation circuit make this a peripheral rich USB MCU (CRC_CCITT X16+X12+X5+1).
- The 16-bit M16C core is designed to have advantages of both accumulator and register-based architectures to provide high-speed processing with RISC-like performance.

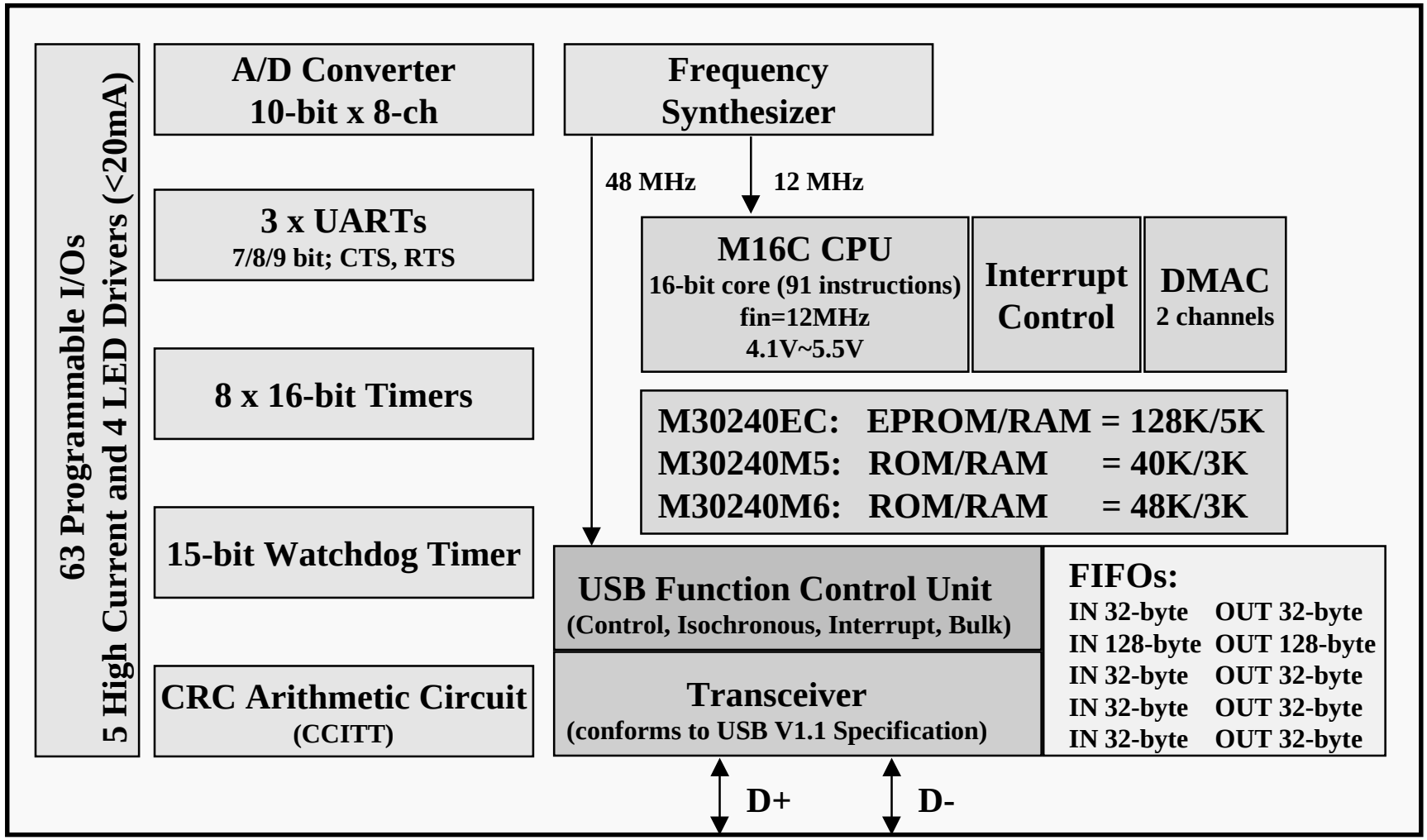
M30240 Distinctive Features

CPU	16 bit (including a hardware multiplier)
Number of instructions	91
Shortest instruction execution time	83ns(f(Xin)=12MHz
USB Features:	Five endpoint pairs (IN/OUT) FIFO Sizes (endpoints 0-4):32,128, 32, 32, 32 Conforms to USB V1.1 Specification
USB Transceiver	Conforms to USB V1.1 Specification-Internal Vref
Frequency Multiplier	PLL for 48MHz clock
Memory capacity (mask device M5/M6):	ROM (40K/48K) / RAM (3.0 K)
Memory capacity (OTP device):	EPROM (128K) / RAM (5K)
Supply Voltage	4.1 to 5.5V (f(Xin)=12MHz)
Interrupts	21 internal and 4 external interrupt sources, 4 software interrupt sources; 7 levels (including key input interrupt X 16)
Multifunction timer	5 X 16-bit, w/integrated 20mA PWM outputs
General purpose timer	3 X 16-bit, internal interrupt only
UART	3 X 7/8/9 bits; Configurable for synchronous or asynchronous mode
DMAC	2 channels (trigger: 16 sources)
A-D Converter	10 bits X 8 channels
CRC calculation circuit	Industry standard polynomial
Watchdog timer	15-bit
Programmable I/O	63 lines
High current and LED Drivers	5 high current and 8 LED drivers
Clock-generating circuit	1 built-in circuit including feedback resistor
Package:	80P6N (0.8 mm pitch)

M30240 Pin Configuration

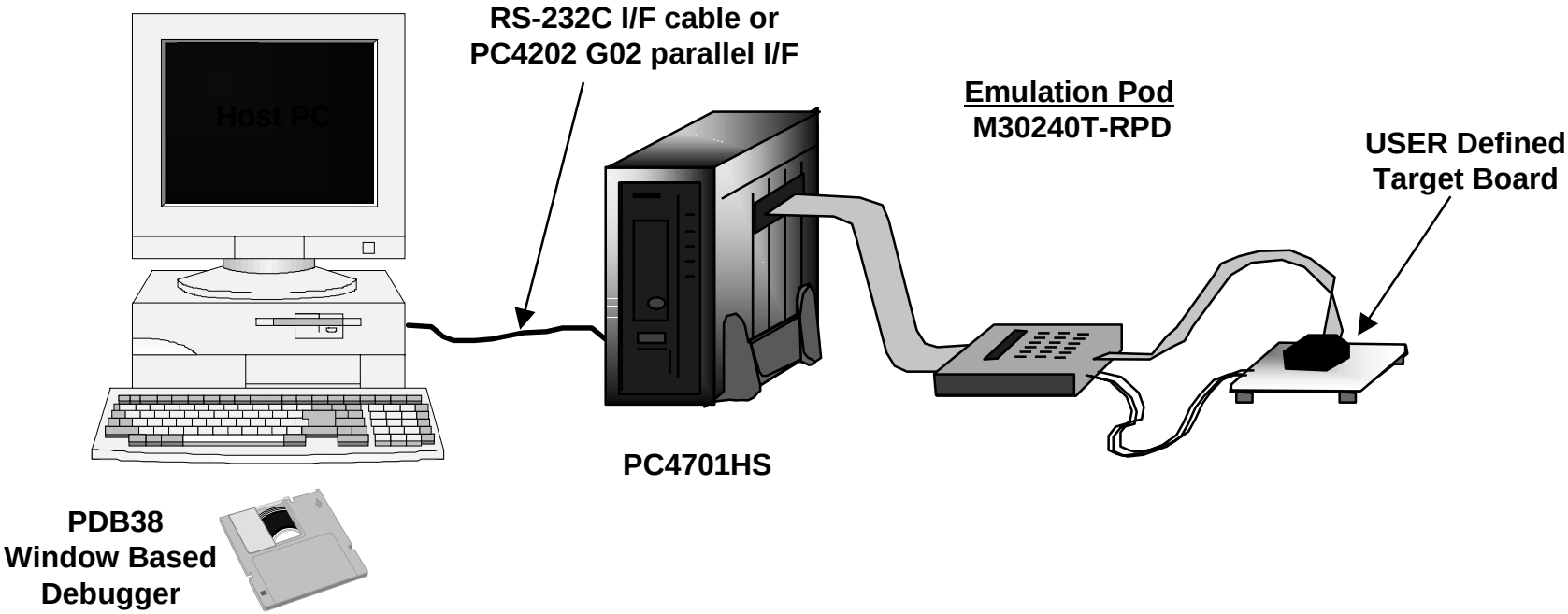


M30240 USB MCU Block Diagram

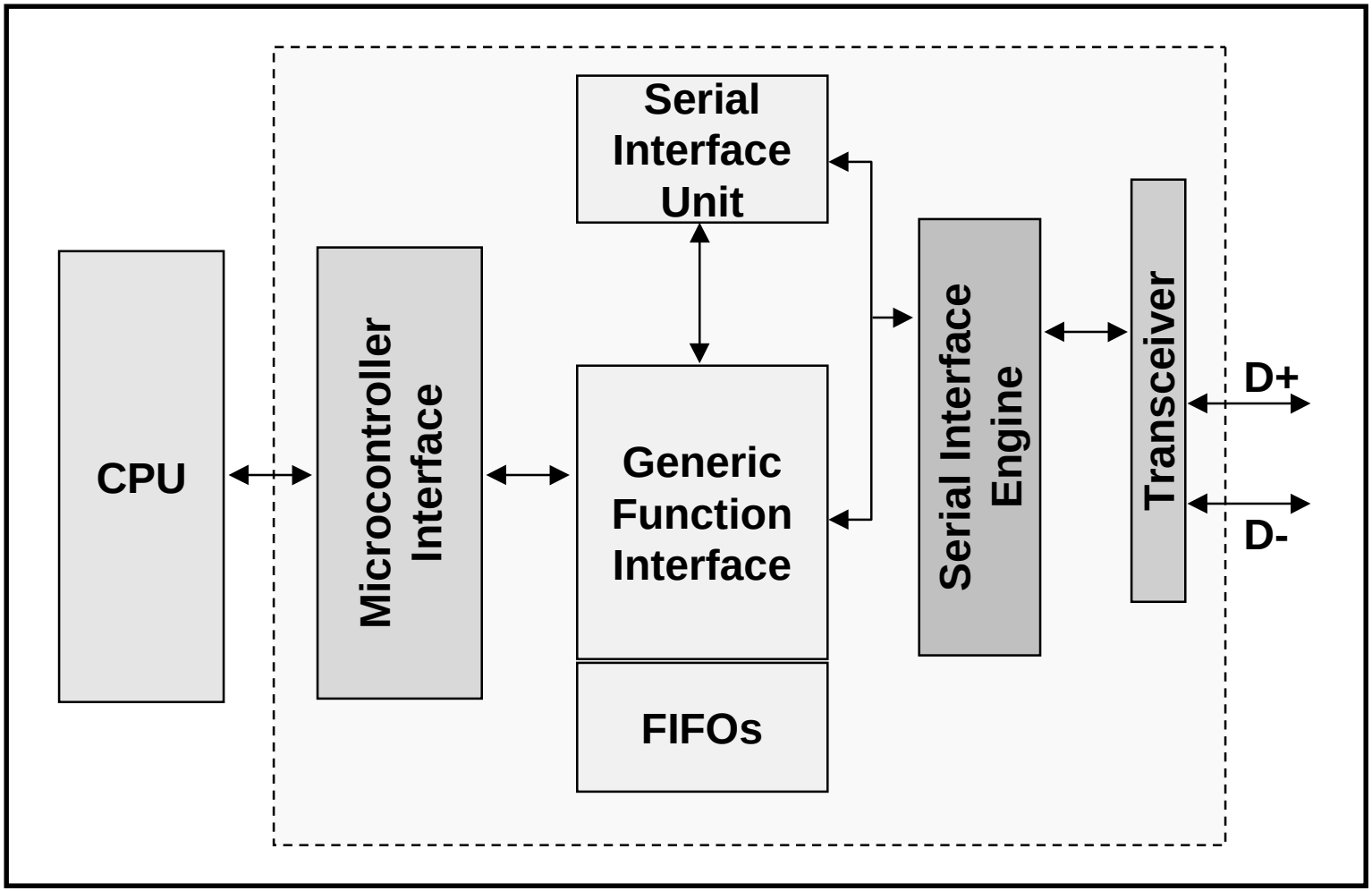


Enabling Quick System Development

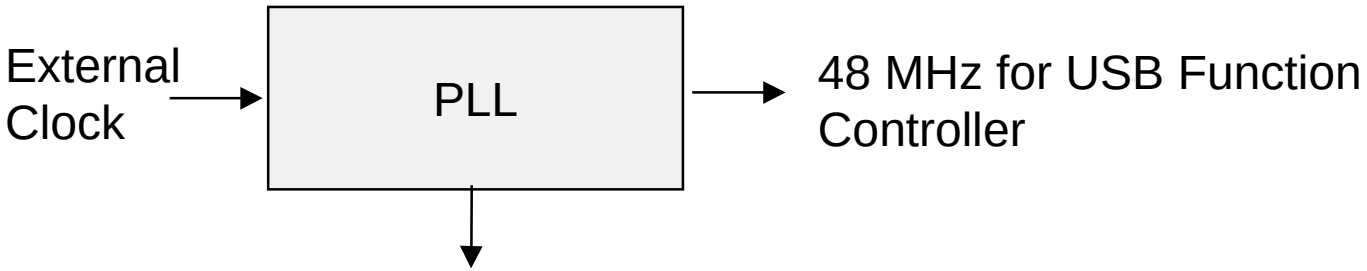
- Various Sample Programs:
  - USB Enumeration Code
  - Peripheral Initialization S/W Routines
- Various Application Notes/Diagrams
- Erasable EPROM and OTP Devices
- Programming adapter
- In Circuit Emulator



USB Function Controller Block Diagram



Frequency Multiplier



- 48MHz clock for USB eliminates need for external clock oscillators
- On-chip clock generator minimizes EMI
- Generates MCU internal clock