M37532 / M37536 8-bit MCU
1.5Mbps USB
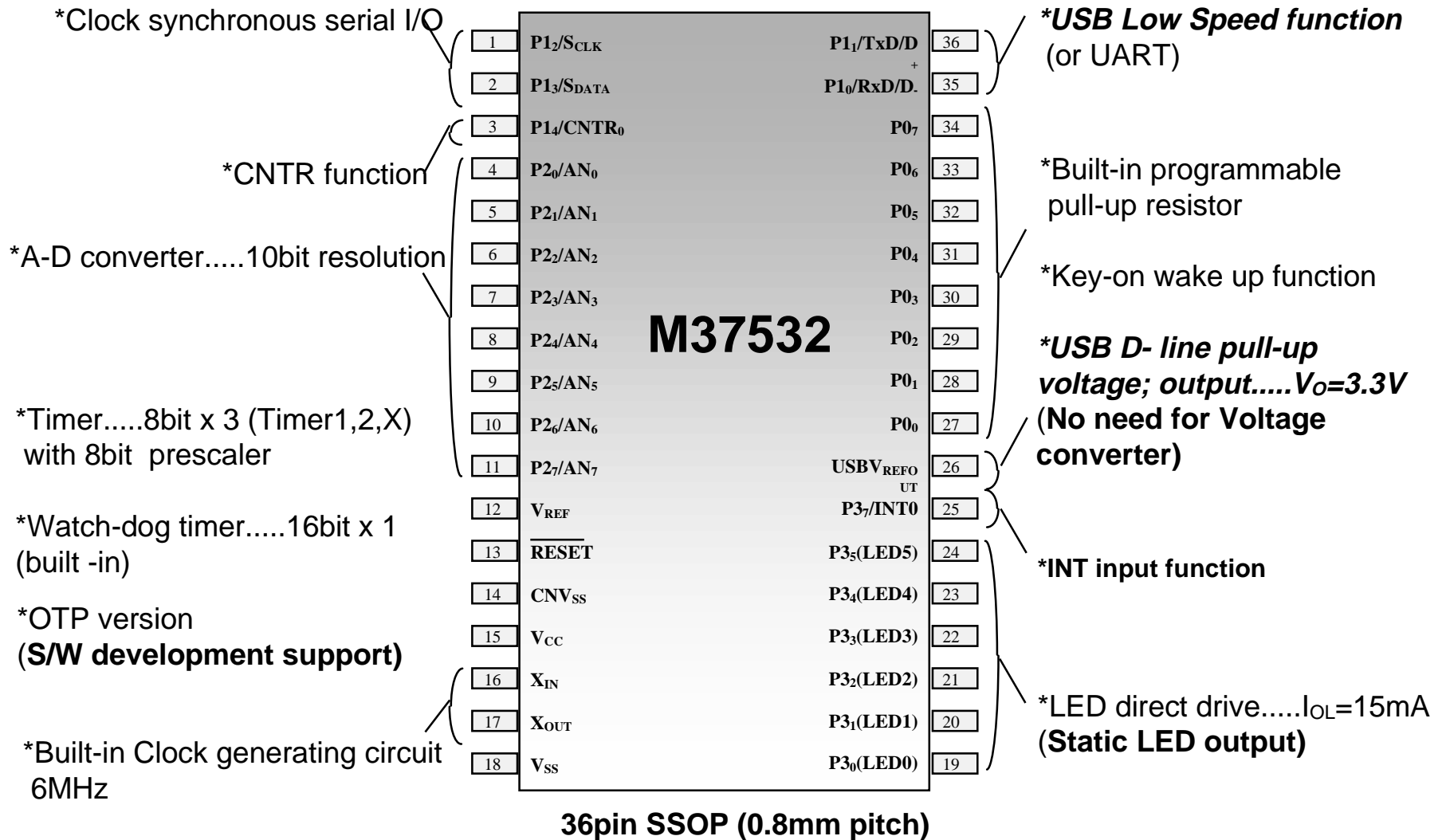## **USB Human Interface Device Controller**

This slide presentation includes:

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

MITSUBISHI 8-Bit Single-chip Microcomputer
740 Family / 7532/7536 Group

# M37532/M37536 Attractive Features For USB System Design

- A low speed (1.5Mpbs) HID USB controller and transceiver are built-in.
- The low pin count package reduces system cost.
- A 10-bit x 8-channels successive-approximation A/D opens up the application possibilities.
- The Watchdog timer enables chip recovery.
- 7 LED Drivers ease board design.
- 8 Key-on Wake-up pins provide a way of returning from a STOP or WAIT mode by the touch of a key pad.
- The built-in DC-to-DC converter eliminates the need of an external 3.3V power supply (converts from 4.4V~5.25V to 3.0~3.6V).

M37532 Highlights (SSOP Package)

*Clock synchronous serial I/O

*CNTR function

*A-D converter.....10bit resolution

*Timer.....8bit x 3 (Timer1,2,X) with 8bit prescaler

*Watch-dog timer.....16bit x 1 (built -in)

*OTP version (**S/W development support**)

*Built-in Clock generating circuit 6MHz

Pin	Left		Right	Pin
1	$P1_2/S_{CLK}$		$P1_1/TxD/D_+$	36
2	$P1_3/S_{DATA}$		$P1_0/RxD/D_-$	35
3	$P1_4/CNTR_0$		$P0_7$	34
4	$P2_0/AN_0$		$P0_6$	33
5	$P2_1/AN_1$		$P0_5$	32
6	$P2_2/AN_2$		$P0_4$	31
7	$P2_3/AN_3$		$P0_3$	30
8	$P2_4/AN_4$	**M37532**	$P0_2$	29
9	$P2_5/AN_5$		$P0_1$	28
10	$P2_6/AN_6$		$P0_0$	27
11	$P2_7/AN_7$		$USBV_{REFOUT}$	26
12	V_{REF}		$P3_7/INT0$	25
13	$\overline{RESET}$		$P3_5(LED5)$	24
14	CNV_{SS}		$P3_4(LED4)$	23
15	V_{CC}		$P3_3(LED3)$	22
16	X_{IN}		$P3_2(LED2)$	21
17	X_{OUT}		$P3_1(LED1)$	20
18	V_{SS}		$P3_0(LED0)$	19

36pin SSOP (0.8mm pitch)

*USB Low Speed function (or UART)

*Built-in programmable pull-up resistor

*Key-on wake up function

*USB D- line pull-up voltage; output.....V_O=3.3V (**No need for Voltage converter**)

*INT input function

*LED direct drive.....I_{OL}=15mA (**Static LED output**)

USB

M37532 SSOP vs. LQFP package: Feature comparisons

Both packages are fit for USB mouse or pointing device applications. LQFP has less functionality, but is desirable when the package type is a constraint.
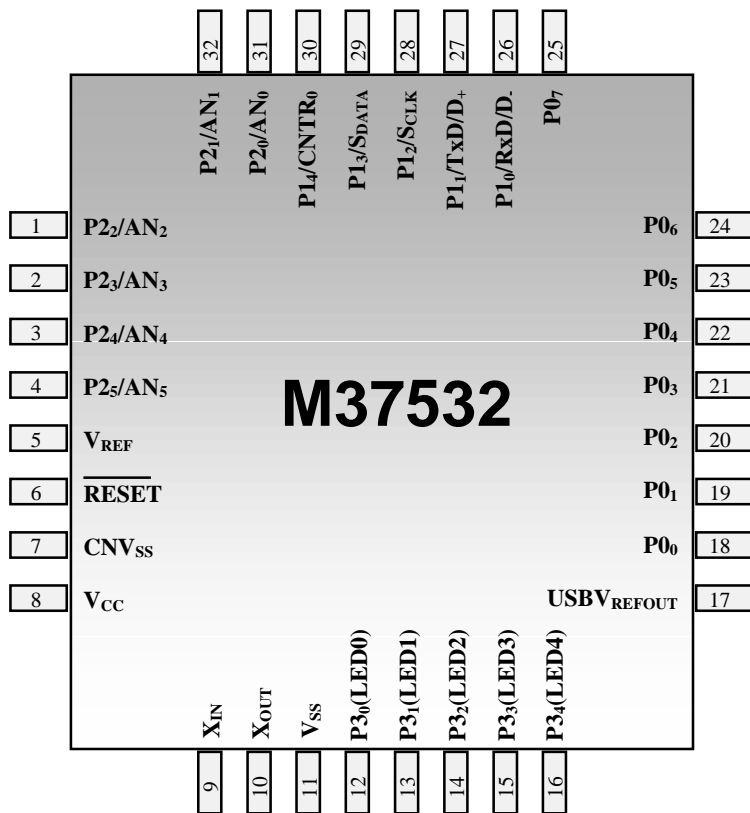
32pin LQFP(0.8mm pitch)

A-D converter
SSOP: 8Channel;   LQFP: 6Channel
(Mouse and Pointing device usually need only 4 Channel)

LED direct drive
SSOP: 6 I/O ports;   LQFP: 5 I/O ports
(Mouse and Pointing device usually need only 4)

INT input function
SSOP:1 input;   LQFP: Nothing
(LQFP can use CNTR function instead of INT input function)

M37532 (SSOP) vs. M37536 Feature comparison

	M37536	
1 — $P1_4/CNTR_0$		$P1_3/S_{DATA}$ — 42
2 — $P1_5$		$P1_2/S_{CLK}$ — 41
3 — $P1_6$		$P1_1/TxD/D$ — 40
4 — $P2_0/AN_0$		$P1_0/RxD/D_{.}^{+}$ — 39
5 — $P2_1/AN_1$		$P0_7$ — 38
6 — N.C.		$P0_6$ — 37
7 — $P2_2/AN_2$		$P0_5$ — 36
8 — $P2_3/AN_3$		$P0_4$ — 35
9 — $P2_4/AN_4$		$P0_3$ — 34
10 — $P2_5/AN_5$		$P0_2$ — 33
11 — $P2_6/AN_6$		$P0_1$ — 32
12 — $P2_7/AN_7$		$P0_0$ — 31
13 — $P4_0$		$USBV_{REFOUT}$ — 30
14 — $P4_1$		$P3_7/INT0$ — 29
15 — V_{REF}		$P3_6(LED6)/INT1$ — 28
16 — $\overline{RESET}$		$P3_5(LED5)$ — 27
17 — CNV_{SS}		$P3_4(LED4)$ — 26
18 — V_{CC}		$P3_3(LED3)$ — 25
19 — X_{IN}		$P3_2(LED2)$ — 24
20 — X_{OUT}		$P3_1(LED1)$ — 23
21 — V_{SS}		$P3_0(LED0)$ — 22

42pin SDIP (1.778mm pitch)

M37536 has added functionality and is well suited for (especially) keyboard applications..

I/O ports
M37532: 28 I/O ports;   M37536: 33 I/O ports
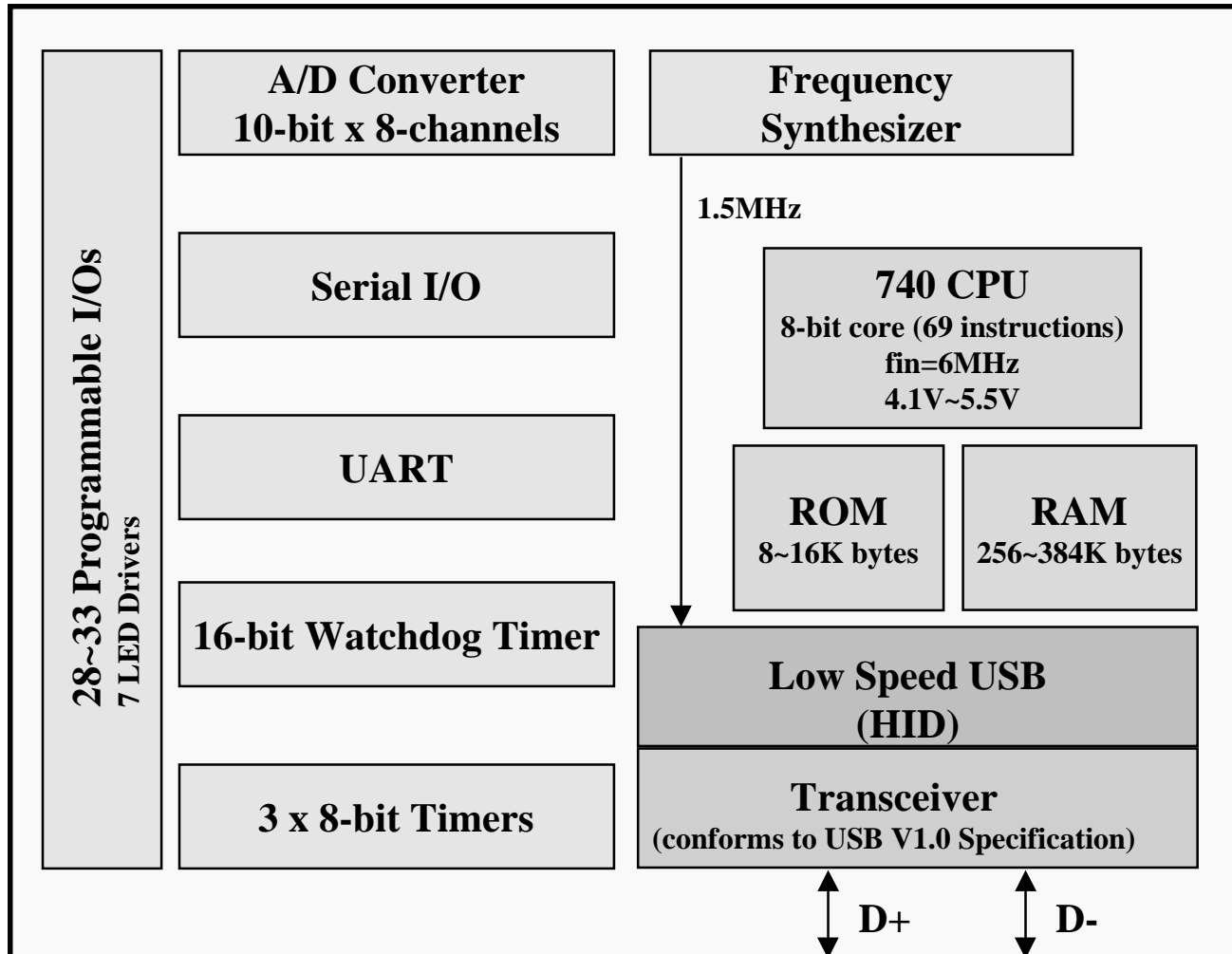(Keyboard usually needs 16+8 key scan ports the minimum.)

LED direct drive
M37532: 6 I/O ports;   M37536:7 I/O ports
(Keyboard need 5 LED ports the minimum.)

INT input function
M37532:1 input;   M37536:2 input

USB

M37532/M37536 USB MCU Block Diagram

28~33 Programmable I/Os / 7 LED Drivers	A/D Converter 10-bit x 8-channels	Frequency Synthesizer

A/D Converter
10-bit x 8-channels

Frequency
Synthesizer

1.5MHz

Serial I/O

740 CPU
8-bit core (69 instructions)
fin=6MHz
4.1V~5.5V

UART

ROM
8~16K bytes

RAM
256~384K bytes

16-bit Watchdog Timer

Low Speed USB
(HID)

3 x 8-bit Timers

Transceiver
(conforms to USB V1.0 Specification)

D+   D-

Enabling Quick System Development

- Peripheral Initialization S/W Routines
- Various Application Notes/Diagrams
- Erasable EPROM and OTP Devices
- Programming adapter
- In Circuit Emulator

**RS-232C I/F cable or
PC4202 G02 parallel I/F**

**Emulation Pod
M37530T2-RPD
M38002TL2-FPD** (for 3753x)

**USER Defined
Target Board**

Host PC

**PC4701L or
PC4701HS**

**PDB38
Window Based
Debugger**

USB