



# **Winbond @i-toys Controller**

## **W55FC200**

## **Data Sheet**



# Contents

|   |          |
|---|----------|
| <b>General Description</b>                  | <b>2</b> |
| 1.1 W55FC200 Functional Description.....    | 3        |
| 1.2 W55FC200 Features.....                  | 4        |
| 1.3 W55FC200 Pin Description .....          | 4        |
| <b>System Description</b>                   | <b>5</b> |
| 2.1 W55FC200 System Block Diagram .....     | 5        |
| 2.2 W55FC200 Absolute Maximum Ratings ..... | 6        |
| 2.3 W55FC200 DC Characteristics .....       | 6        |
| 2.4 W55FC200 AC Characteristics .....       | 7        |
| 2.5 W55FC200 Bonding Diagram .....          | 8        |





## General Description

Using Internet technologies to connect to web sites that offer more & more contents and play options is one of the most important function of Winbond Internet toy controller W55FC200 which is capable of downloading toy's sound files or motion data from toy company web site as well as allows toy's contents can be uploaded to PC.

Similarly, the PC enhanced interactive toy is one of the most important application of Winbond Internet toy controller W55FC200 which can be allowed to download additional commands or motion data into the body of toys for extended play.

At this moment, Winbond supports a total solution to combine toys and Internet related applications which we call Winbond @i-toys solution. We support the total solutions for toy's contents updateable, personalized, and interactive applications. Therefore, designer can quickly design Internet toys & download sound files data or motion program from web site or local PC's HD/CD to change the toy's contents or scenarios.



## 1.1 W55FC200 Functional Description

- ❑ W55FC200 provides optional data download from PC's parallel-port or serial-port interface.
- ❑ There is no any PC's system compatibility problem.
- ❑ Automatically detect PC's download interface which toy is already connected.
- ❑ Bi-directional upload & download speech, melody, and program between PC and toys.
- ❑ Provides 30 ~ 33 Kbps data download transmission rate (@  $10^{-3}$  BER).
- ❑ Automatically data error detection & recovery once data downloading or uploading.
- ❑ Download data re-send request while transmission data error is occurring.
- ❑ Allowing up to 16Mbits external flash memory cascading function for longer speech duration download applications (around 8.5 minutes speech duration @ 30Kbps).



## 1.2 W55FC200 Features

- ❑ Operating Voltage: 2.4V ~ 5.5V
- ❑ Crystal Oscillation Circuit:
  - Crystal/Ceramic oscillator: up to 4 MHz
- ❑ Power-down Mode
  - Hold Mode: no operation (except for oscillator)
  - Stop Mode: no operation (including oscillator)
- ❑ Package:
  - PDIP-28
  - SOP-28
  - DICE-29

## 1.3 W55FC200 Pin Description

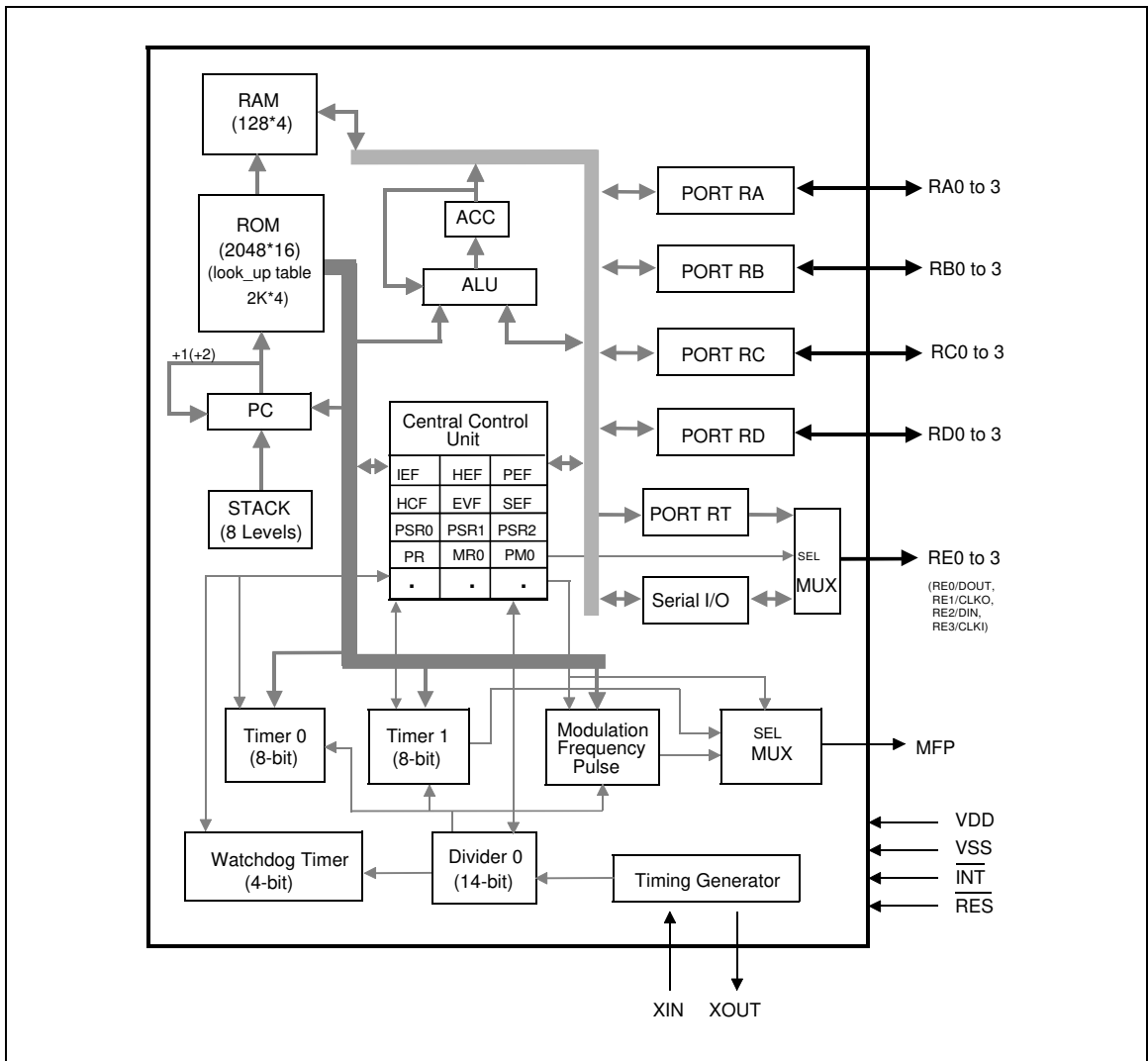
| Symbol   | I/O | Function  |
|--|-----|---|
| XIN  | I   | Input pin for oscillator.<br>Connected to crystal to generate system clock.   |
| XOUT   | O   | Output pin for oscillator.<br>Connected to crystal to generate system clock.  |
| RA0–RA3  | I/O | Input/Output port. Input/output mode specified by port mode 1 register (PM1).<br>When used as output port, can provide high sink current for driving LED.   |
| RB0–RB3  | I/O | Input/Output port. Input/output mode specified by port mode 2 register (PM2).<br>When used as output port, can provide high sink current for driving LED.   |
| RC0–RC3  | I/O | Input/Output port. Input/output mode specified by port mode 4 register (PM4).<br>Each pin has an independent interrupt capability in input mode.  |
| RD0–RD3  | I/O | Input/Output port. Input/output mode specified by port mode 5 register (PM5).   |
| RE0/DOUT,<br>RE1/CLKO,<br>RE2/DIN,<br>RE3/CLKI | I/O | Special input/output port.<br>This port can be configured by software to act as the output of internal port RT or the serial I/O port. When used as output port, can provide high sink current for driving LED. |
| MFP  | O   | Output pin only.<br>This pin can output modulating or nonmodulating frequency, or Timer 1 clock output specified by mode register 1 (MR1).  |
| $\overline{\text{INT}}$                        | I   | External interrupt pin with pull-high resistor.   |
| $\overline{\text{RES}}$                        | I   | System reset pin with pull-high resistor.   |
| VDD  | I   | Positive power supply (+).  |
| VSS  | I   | Negative power supply (-).  |





# System Description

## 2.1 W55FC200 System Block Diagram



## 2.2 W55FC200 Absolute Maximum Ratings

| Parameter                          | Rating       | Unit |
|------------------------------------|--------------|------|
| Supply Voltage to Ground Potential | -0.3 to +7.0 | V    |
| Applied Input/Output Voltage       | -0.3 to +7.0 | V    |
| Power Dissipation                  | 120          | mW   |
| Ambient Operating Temperature      | 0 to +70     | °C   |
| Storage Temperature                | -55 to +150  | °C   |

**Note:** Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

## 2.3 W55FC200 DC Characteristics

(VDD-VSS = 3.0 V, Fosc. = 32.768 KHz, Ta = 25° C; unless otherwise specified)

| Parameter                       | Sym. | Conditions                   | Min.       | Typ. | Max.       | Unit |
|---------------------------------|------|------------------------------|------------|------|------------|------|
| Op. Voltage                     | VDD  | -                            | 2.2        | -    | 5.5        | V    |
| Op. Current (Crystal type)      | IOP1 | No load (Ext-V)              | -          | 8    | 20         | μA   |
| Op. Current (RC type)           | IOP2 | No load (Ext-V)              | -          | 35   | 65         | μA   |
| Hold Current (Crystal type)     | IHM1 | Hold mode No load (Ext-V)    | -          | 4    | 6          | μA   |
| Hold Current (RC type)          | IHM2 | Hold mode No load (Ext-V)    | -          | 16   | 40         | μA   |
| Stop Current (Crystal type)     | ISM1 | Stop mode No load (Ext-V)    | -          | 0.1  | 2          | μA   |
| Stop Current (RC type)          | ISM2 | Stop mode<br>No load (Ext-V) | -          | 0.1  | 2          | μA   |
| Input Low Voltage               | VIL  | -                            | VSS        | -    | 0.3<br>VDD | V    |
| Input High Voltage              | VIH  | -                            | 0.7<br>VDD | -    | VDD        | V    |
| MFP Output Low Voltage          | VML  | IOL = 3.5mA                  | -          | -    | 0.4        | V    |
| MFP Output High Voltage         | VMH  | IOH = -3.5mA                 | 2.4        | -    | -          | V    |
| Port RA, RB Sink Current        | IABL | VOL = 0.9V                   | 9          | -    | -          | mA   |
| Port RA, RB Source Current      | IABH | VOH = 2.4V                   | 0.4        | 1.2  | -          | mA   |
| Port RC, RD Output Low Voltage  | VCDL | IOL = 2.0 mA                 | -          | -    | 0.4        | V    |
| Port RC, RD Output High Voltage | VCDH | IOH = -2.0 mA                | 2.4        | -    | -          | V    |
| Port RE Sink Current            | IEL  | VOL = 0.9V                   | 9          | -    | -          | mA   |
| Port RE Source Current          | IEH  | VOH = 2.4V                   | 0.4        | 1.2  | -          | mA   |



*DC Characteristics, continued*

| Parameter                                | Sym. | Conditions                    | Min. | Typ. | Max. | Unit       |
|--|------|-------------------------------|------|------|------|------------|
| $\overline{\text{INT}}$ Pull-up Resistor | RINT | -                             | 50   | 250  | 1000 | K $\Omega$ |
| DIN Pin Pull-up Resistor                 | RDIN | RE.2 used as serial input pin | 50   | 250  | 1000 | K $\Omega$ |
| $\overline{\text{RES}}$ Pull-up Resistor | RRES | -                             | 20   | 100  | 500  | K $\Omega$ |

## 2.4 W55FC200 AC Characteristics

*(VDD-VSS = 3.0 V, Ta = 25° C; unless otherwise specified)*

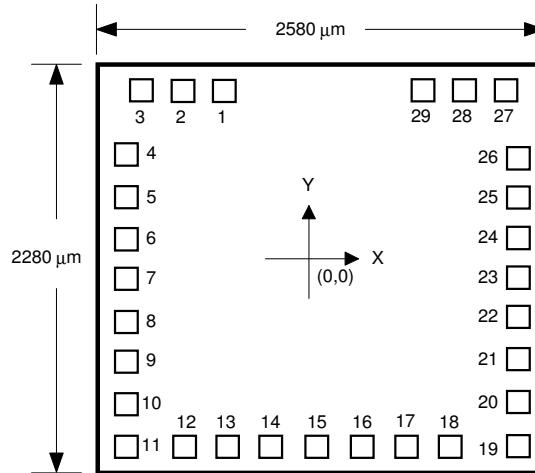
| Parameter   | Sym.                 | Conditions                              | Min. | Typ.   | Max. | Unit    |
|---|----------------------|---|------|--------|------|---------|
| Op. Frequency   | Fosc                 | RC type                                 | -    | -      | 4000 | KHz     |
|   |                      | Crystal type 1 (Option low speed type)  | -    | 32.768 | -    |         |
|   |                      | Crystal type 2 (Option high speed type) | 400  | -      | 4190 |         |
| Frequency Deviation by Voltage drop for RC Oscillator | $\frac{\Delta f}{f}$ | $\frac{f(3V) - f(2.4V)}{f(3V)}$         | -    | -      | 10   | %       |
| Instruction Cycle Time                                | TI                   | One machine cycle                       | -    | 4/Fosc | -    | S       |
| Serial Port Data Ready Time                           | TDR                  | -                                       | 200  | -      | -    | nS      |
| Serial Port Data Hold Time                            | TDH                  | -                                       | 200  | -      | -    | nS      |
| Reset Active Width                                    | TRAW                 | Fosc=32.768 KHz                         | 1    | -      | -    | $\mu$ S |
| Interrupt Active Width                                | TIAW                 | Fosc=32.768 KHz                         | 1    | -      | -    | $\mu$ S |







## 2.5 W55FC200 Bonding Diagram



*Note: The chip substrate must be connected to system ground (VSS).*

| Pad No. | Pad Name                | X        | Y       | Pad No. | Pad Name | X       | Y       |
|---------|-------------------------|----------|---------|---------|----------|---------|---------|
| 1       | RA2                     | -576.30  | 943.70  | 16      | RC0      | 215.10  | -965.00 |
| 2       | RA3                     | -819.50  | 943.70  | 17      | RC1      | 476.30  | -965.00 |
| 3       | $\overline{\text{INT}}$ | -1063.00 | 943.70  | 18      | RC2      | 722.30  | -965.00 |
| 4       | $\overline{\text{RES}}$ | -1115.00 | 671.70  | 19      | RC3      | 1113.90 | -959.30 |
| 5       | VSS                     | -1115.00 | 464.20  | 20      | VDD      | 1113.90 | -749.30 |
| 6       | RE0                     | -1115.00 | 207.00  | 21      | RD0      | 1113.90 | -492.10 |
| 7       | RE1                     | -1115.00 | -21.00  | 22      | RD1      | 1113.90 | -264.10 |
| 8       | RE2                     | -1115.00 | -264.20 | 23      | RD2      | 1113.90 | -20.90  |
| 9       | RE3                     | -1115.00 | -492.20 | 24      | RD3      | 1113.90 | 207.10  |
| 10      | VSS                     | -1115.00 | -749.40 | 25      | VDD      | 1113.90 | 464.30  |
| 11      | RB0                     | -1115.00 | -965.00 | 26      | XOUT     | 1113.90 | 738.00  |
| 12      | RB1                     | -813.30  | -965.00 | 27      | XIN      | 1061.30 | 943.70  |
| 13      | RB2                     | -552.10  | -965.00 | 28      | RA0      | 752.20  | 943.70  |
| 14      | RB3                     | -302.10  | -965.00 | 29      | RA1      | 509.00  | 943.70  |
| 15      | MFP                     | -40.90   | -965.00 |         |          |         |         |





#### Headquarters

No. 4, Creation Rd. III,  
Science-Based Industrial Park,  
Hsinchu, Taiwan  
TEL: 886-3-5770066  
FAX: 886-3-5792697  
<http://www.winbond.com.tw/>  
Voice & Fax-on-demand: 886-2-27197006

#### Taipei Office

11F, No. 115, Sec. 3, Min-Sheng East Rd.,  
Taipei, Taiwan  
TEL: 886-2-27190505  
FAX: 886-2-27197502

#### Winbond Electronics (H.K.) Ltd.

Rm. 803, World Trade Square, Tower II,  
123 Hoi Bun Rd., Kwun Tong,  
Kowloon, Hong Kong  
TEL: 852-27513100  
FAX: 852-27552064

#### Winbond Electronics North America Corp.

**Winbond Memory Lab.**  
**Winbond Microelectronics Corp.**  
**Winbond Systems Lab.**

2727 N. First Street, San Jose,  
CA 95134, U.S.A.  
TEL: 408-9436666  
FAX: 408-5441798

---

Note: All data and specifications are subject to change without notice.

