4S/3HQ/4T+2Per Speech+Melody Processor (BandDirector™ Series)

GENERAL DESCRIPTION

The W566Cxxx is a powerful embedded microcontroller (uC) dedicated to speech and melody synthesis applications. This series IC is tailored for plush toys, educational toys, or musical instruments. In multi-tasking requirements, W566Cxxx series can make toy more funny than before. With the help of 16-bit microprocessor (uP) W566-16, W566Cxxx can synthesize multi-channel speech and melody. 3-track of synthesized speech can be in different kinds of format, for example ADPCM and MDPCM. Regarding synthesized melody, W566Cxxx can provide 4-track of Tone melody (T-melody), or 3-track of High-Quality melody (HQ-melody) that can emulate the characteristics of musical instruments. These signals can be mixed flexibly through 6-input Mixer to produce colorful effects. The result of Mixer is converted to analog signal to drive speaker output.

W566Cxxx has two kinds of power saving modes: one is HOLD mode and the other is STOP mode. In HOLD mode, the specific peripherals can be inactivated and IC can operate at the sub-clock. Consequently, the W566Cxxx can perform some special tasks periodically. In STOP mode, all the IC's peripherals are disable which is designated specially for try-me application. Besides, W566Cxxx can sink 8mA at most for high-current application.

The characteristics of W566Cxxx series are depicted in the following table.

Publication Release Date: October 2001

Part Number	W566C210	W566C260	W566C300	W566C340
ROM (byte)	650K	792K	922K	1020K
RAM (byte)	512	512	512	512
Duration1 (sec)*	212"	260"	304"	338"
Duration2 (sec)*	159"	195"	228"	253"
In : Bid[1]	8:16	8:16	8:16	8:16
Speaker Driver	DAC	DAC	DAC	DAC
Mixer Inputs	6	6	6	6
Speech Tracks[2]	4	4	4	4
Speech Algorithms	ADPCM MDPCM PCM	ADPCM MDPCM PCM	ADPCM MDPCM PCM	ADPCM MDPCM PCM
Melody Tracks	3	3	3	3
Instrument Types	HQ Tone Voice	HQ Tone Voice	HQ Tone Voice	HQ Tone Voice
IR-Carrier	✓	✓	✓	✓
Numbers of System Clock	2	2	2	2
Power Management	HOLD STOP	HOLD STOP	HOLD STOP	HOLD STOP

***The Duration1 is calculated based on 6000Hz*4-bits=24Kbps, 24Kbps on the assumption that all the ROM space is used to store speech data.**

***The Duration2 is calculated based on 8000Hz*4-bits=32Kbps, 32Kbps on the assumption that all the ROM space is used to store speech data.**

[1] "In" is the number of input pins; "Bid" is the number of I/O pins.

[2] Synthesized speech in ADPCM/MDPCM format.

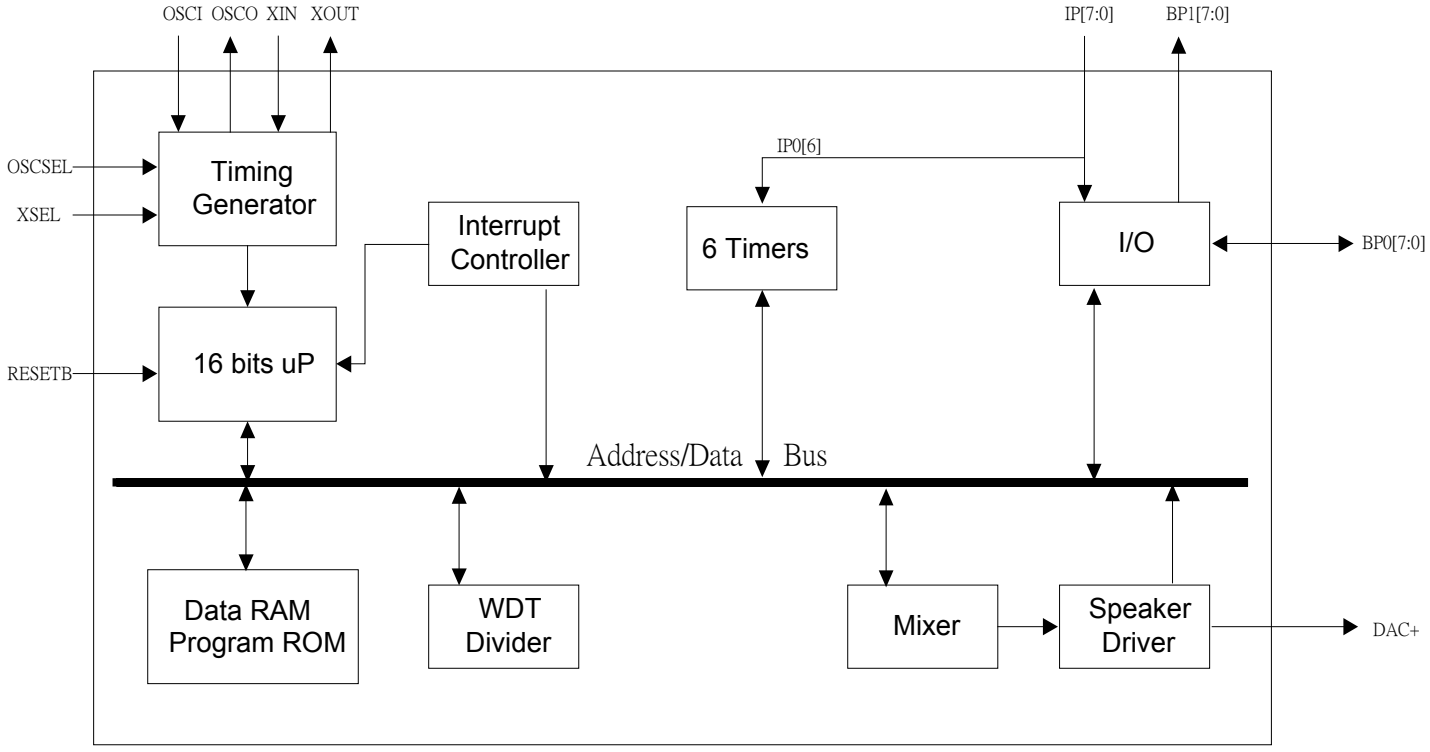
FEATURES

- Wide range of operating voltage: 4 M Hz @ 2.4 volt ~ 5.5 volt
  6 M Hz @ 3.6 volt ~ 5.5 volt
- Sophisticated power management:
  - dual system clocks, one in 6M Hz and the other in 32768 Hz
  - HOLD mode for dealing with interrupt events only
  - STOP mode for stopping all IC operations
- 8 input pins
- 16 I/O pins and 8 of them can sink 8mA in their output portion
- Versatile Digital-to-Analog Converter (DAC) to drive speaker output:
  - 10-bit Current type DAC (DAC) with programmable output current
- Multiple synthesized speech formats: ADPCM/MDPCM/PCM
- 3 tracks synthesized ADPCM/MDPCM speech at programmable playback rate
- 4 tracks Tone melody that can emulate envelope of musical instruments
- 3 tracks High-Quality melody that can emulate characteristic of musical instruments
- 6-input/10-bit-resolution Mixer can mix the speech and melody signals flexibly
- Built-in IR carrier generation circuit for simplification firmware IR application
- Built-in 6 timers for speech/melody synthesis and general purpose applications
- Built-in Watch-Dog Timer (WDT)
- Built-in Divider for real-time clock application
- Available package: COB

PIN DESCRIPTION

PIN NAME	I/O	FUNCTION
RESETB	In	IC reset input.
XIN	In	Sub-clock oscillation input.
XOUT	Out	Sub-clock oscillation output.
XSEL	In	Pin selection of sub-clock type. When XSEL is logic 1, RC type is used. When XSEL is logic 0, crystal type is used.
OSCI	In	Main-clock oscillation input.
OSCO	Out	Main-clock oscillation output.
OSCSEL	In	Pin selection of main-clock type. When OSCSEL is logic 1, Ring type is used. When OSCSEL is logic 0, crystal type is used.
IP0[7:0]	In	General input port with pull-high selection. Each input pin can be programmed to generate interrupt request and used to release IC from HOLD/STOP mode. IP0.6 can be used as the external clock source of the general timer TimerG.
BP0[7:0]	I/O	General input/output pins. When used as output pin, it can be open–drain or CMOS type and it can sink 8mA for high-current application. When used as input pin, there may have a pull-high option and generate interrupt request to release IC from HOLD/STOP mode. When BP0[7] is used as output pin, it can be the IR transmission carrier for firmware IR application.
BP1[7:0]	I/O	General input/output pins. When used as output pin, it can be open–drain or CMOS type. When used as input pin, there may have a pull-high option and generate interrupt request to release IC from HOLD/STOP mode.
DAC+	Out	Current type DAC
NC_DAC2	Out	Reserved, non connect
NC_SPK1	Out	Reserved, non connect
NC_SPK2	Out	Reserved, non connect
TEST	In	Test input. Do not connect during normal operation.
VDD	Power	Positive power supply for uP.
VSS	Power	Negative power supply for uP.
VDD1	Power	Positive power supply for peripherals.
VSS1	Power	Negative power supply for peripherals.
OVDD	Power	Positive power supply for oscillation.
OVSS	Power	Negative power supply for oscillation.
PVDD	Power	Positive power supply for speaker output.
PVSS	Power	Negative power supply for speaker output.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Supply Voltage to Ground Potential	-0.3 to +7.0	V
D.C. Voltage on Any Pin to Ground Potential	-0.3 to VDD+0.3	V
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.

D.C. ELECTRICAL CHARACTERISTICS

(V_{DD}-V_{SS}= 4.5 V, F_M=6 MHz, F_S=32768 Hz, Ta= 25°C; No Load unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	SPEC.			UNIT
			Min.	Typ.	Max.	
Operating Voltage	V_{DD}	F_{SYS}= 6 MHz	3.6	--	5.5	V
Operating Current	I_{OP}	F_{SYS}=F_M, F_S active, normal operation	--	--	12	mA
Hold Current	I_{HD}	F_{SYS}=F_S, F_M inactive, HOLD mode	--	--	25	uA
Standby Current	I_{SB}	STOP mode	--	--	1	uA
Input Low Voltage	V_{IL}	All input pins	V_{SS}	--	0.3V_{DD}	V
Input High Voltage	V_{IH}	All input pins	0.7V_{DD}	--	V_{DD}	V
Output Low Current	I_{OL}	Vout=0.4V, all output pins expect BP0	--	--	4	mA
		Vout=0.4V, BP0 only	--	--	8	mA
Output High Current	I_{OH}	Vout=2.4V, all output pins	-4	--	--	mA
DAC Full Scale Current	I_{DAC}	VDD=4.5V, RL=100Ω	-1.6 -2.4 -3.2 -4.0	-2.0 -3.0 -4.0 -5.0	-2.4 -3.6 -4.8 -6.0	mA
Pull High Resistance	R_{IN}	All input pins except RESETB	160	--	300	KΩ
		RESERB	100	--	--	KΩ

A.C. ELECTRICAL CHARACTERISTICS

(V_{DD}-V_{SS}= 4.5 V, F_M=6 MHz, F_S=32768 Hz, Ta= 25°C; No Load unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	SPEC.			UNIT
			Min.	Typ.	Max.	
Main-Clock	F_M	Ring type, R= 370 KΩ	5.7	6	6.3	MHz
		Crystal type	--	6	--	MHz
Sub-Clock	F_S	RC type, R= 1650 KΩ	26.214	32.768	39.322	KHz
		Crystal type	--	32.768	--	Hz
Cycle Time	T_{CYC}	F_{SYS} = 6 MHz	167	--	DC	ns
Main-Clock Wake-up Stable Time	T_{WSM}	Ring type, R= 370 KΩ	--	3	5	ms
		Crystal type, F_M = 6 MHz	--	3	5	ms
Sub-Clock Wake-up Stable Time	T_{WSS}	RC type, R= 1650 KΩ	--	1	2	s
		Crystal type, F_S=32768 Hz	--	1	2	s
Main-Clock Frequency Deviation, Ring type	$\frac{\Delta F}{F}$	[1] $\frac{F_{MAX} - F_{MIN}}{F_{MIN}}$	--	3	5	%
RESETB Active Width	T_{RES}	After F_{SYS} stable	4			T_{CYC}

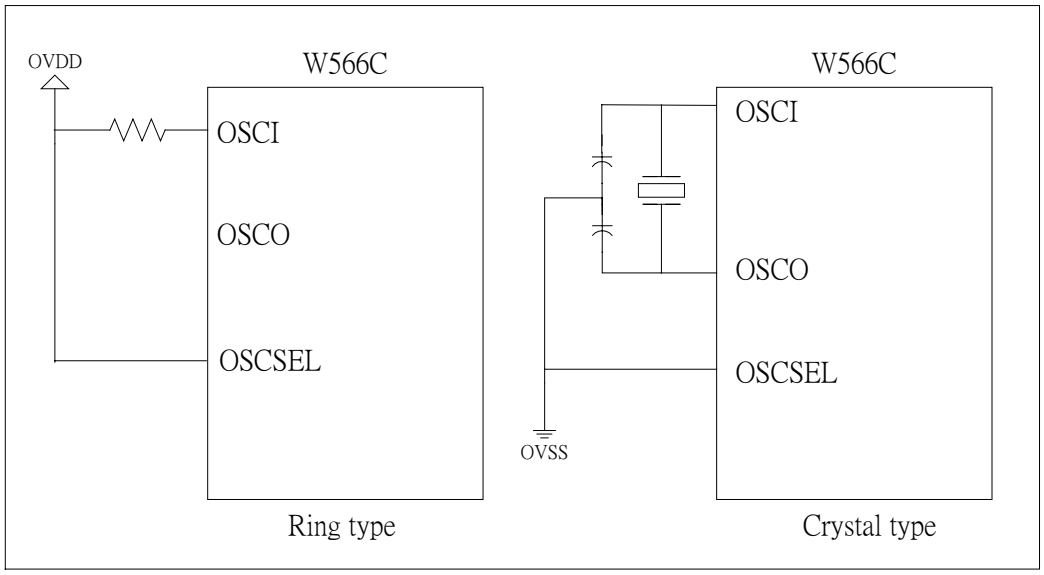
STABILITY DATA

- Resistance vs. Frequency for W566C340 at V_{DD} = 4.5V, main-clock in Ring Type
- Resistance vs. Frequency for W566C340 at V_{DD} = 4.5V, sub-clock in RC Type

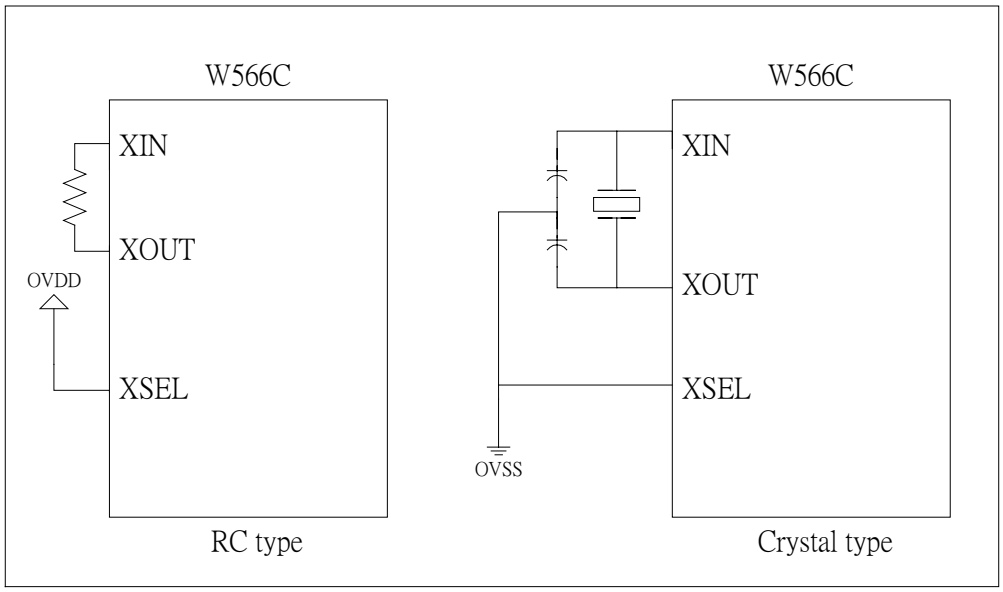
[1] "F_{MAX}" is max oscillation frequency for operating voltage V_{DD}, "F_{MIN}" is minimum oscillation frequency for operating voltage V_{DD}

APPLICATION CIRCUITS

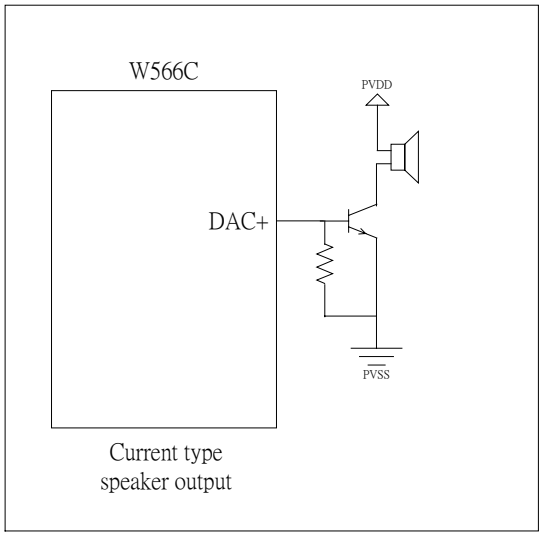
- F_M connection



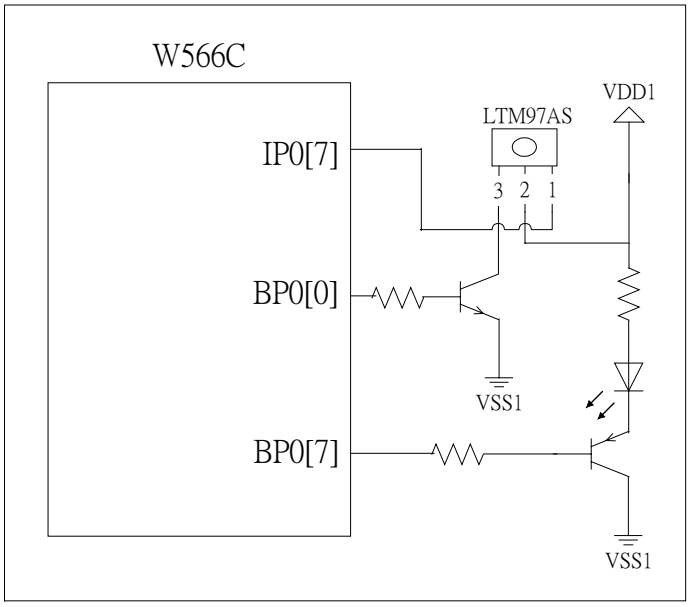
- F_S connection



- Speaker output connection



- IR Tx/Rx connection



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