

QS1500

Data Sheet

48 Poly Sound Synthesizer With Effects

Version 1.0

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Chapter 1 General Description

QS1500 is a high quality PCM synthesizer LSI for General MIDI Sound Module as like Roland's SC-xx series That is capable of playing music by utilizing MIDI handler which is built in this device.

QS1500 is equipped with HWASS's QPCM synthesizer, which is capable of generating up to 48 polyphonic with effects and various sampling rate.

QS1500 is support to two kinds of special effect to improve sound quality.

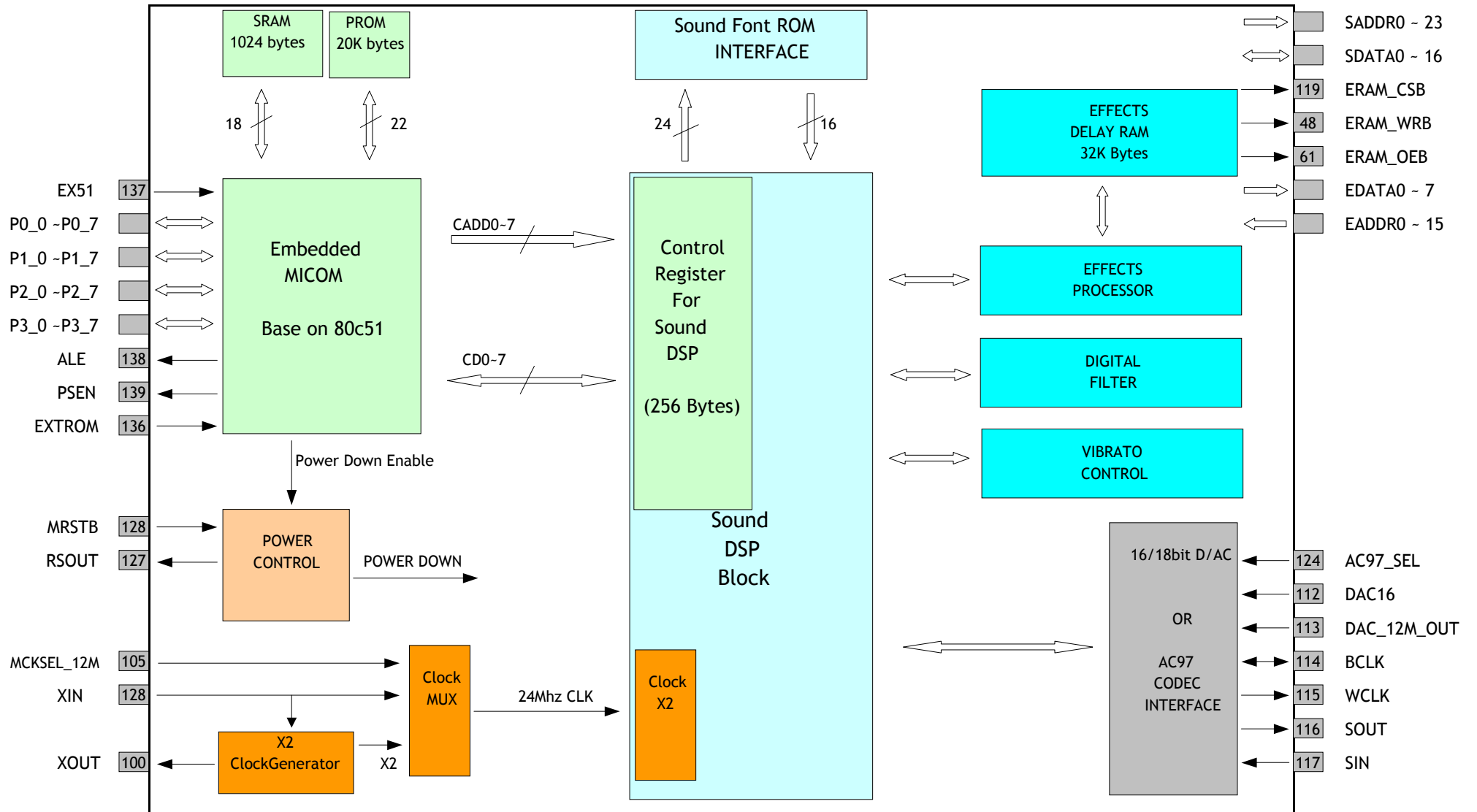
It's called Reverb and Chorus in General MIDI specification.

Since receive the MIDI data from host via MIDI_IN QS1500 are interpreted at anytime Through the MIDI handler. Also most of control parameter can be changed during the creation of music According to the GM specification. QS1500 can be supported application as like "GM SOUND MODULE". Therefore QS1500 is ideal device to design musical instrument, Digital Piano, Karaoke System, Keyboard.

Chapter 2 Features

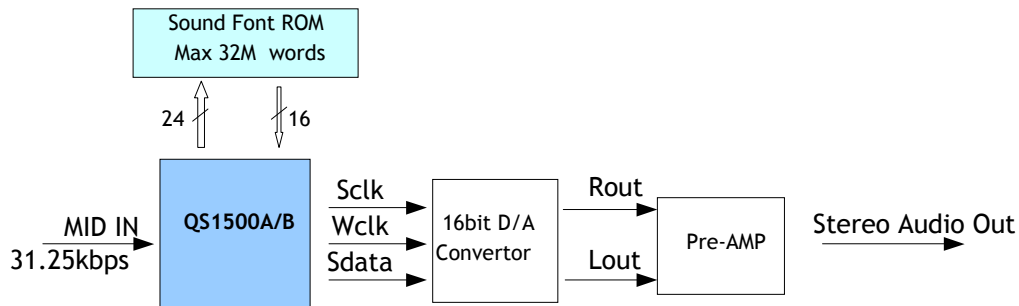
- ▶ Up to 48 voices generated at Max 44.1Khz.
- ▶ Built-in MIDI handler(interpreter)
- ▶ Built-in 4 bit or 8 bit ADPCM and 16bit PCM tone generator.
- ▶ Full Supports GENERAL MIDI specification.
- ▶ Various sampling rate : 8 ~ 44.1Khz
- ▶ Up to 32M x 16bit sound font ROM available.
- ▶ 1 Wire MIDI interfacing at 31.25kbps.
- ▶ 16bit/18bit DAC interfacing available
- ▶ Built-in 32kbytes SRAM for the effect function.
- ▶ Support the AC97 CODEC interface.
- ▶ Operating voltage 2.7 ~ 3.3V
- ▶ Package : - QS1500A : 100 Low Profile QFP100(LQFP)
- QS1500B : 144 Pin Low Profile QFP144(LQFP)
- ▶ Two channel Microphone ECHO function available(when using AC97 CODEC)
- ▶ Support 8 types of Reverb and Chorus.
- ▶ Operating Colck : 12Mhz or 24Mhz Selection Available.
- ▶ Application
 - High quality Karaoke Machine(DVD or VCD)
 - Digital Piano or Keyboard
 - Arcade Game Machine
 - Sound Card..ect.

Chapter 3 Block Diagram



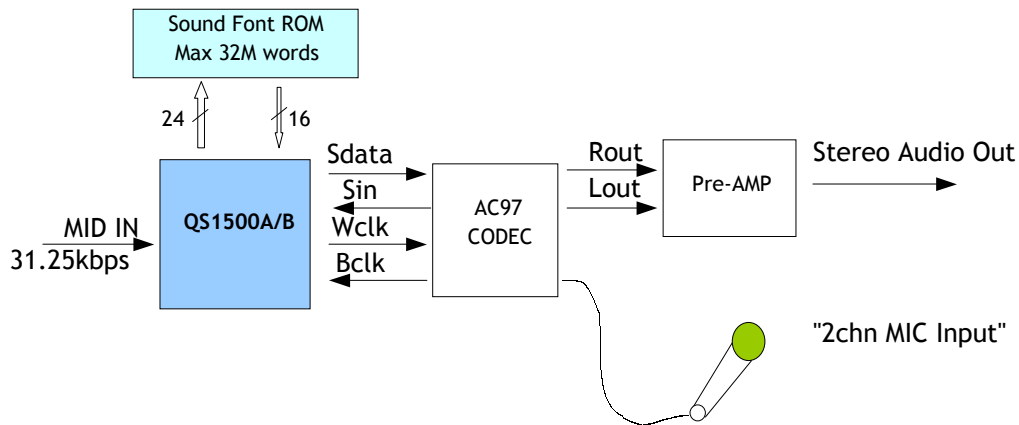
Chapter 4 Typical Hardware Configuration

1) Using the D/A convertor



- General MIDI compliant Wavetable Synthesis
- Serial Interface
- 8 types Reverb
- 8 Types Chorus
- 32Mbit Sound Font ROM(Wavetable)

2) Using the AC97 Codec for the karaoke system



- General MIDI compliant Wavetable Synthesis
- Serial Interface
- 8 types Reverb
- 8 Types Chorus
- 32Mbit Sound Font ROM(Wavetable)
- 2 Channel MIC Echo

Chapter 5 Pin Description

5-1.Pins By Function

1.144LQFP

PIN NAME	PIN NO	TYPE	DESCRIPTION
I/O_VDD	18,53,54,76,77,125,126	P	Power Supply 3.3V All pin should be connected to a VDD plane.
CORE_VDD	4,5,90	P	Core Power Supply. All pin should be connected to nominal 2.5V If 2.5V is not available, then CORE_VDD can be driven from 3.3V by a 1N4148 diode in series.
VSS	19,32,33,55,56,91,104,129,130	P	Digital Ground All pin should be connected GND plane.
P0_0 - P0_7	3 - 1,144 -140	I/O	Internal 80C52 General Port 0.0 - 0.7
P1_0 - P1_7	31 - 24	I/O	Internal 80C52 General Port 1.0 - 1.7
P2_0 - P2_7	13 - 6	I/O	Internal 80C52 General Port 2.0 - 2.7
P3_0 - P3_7	41 - 34	I/O	Internal 80C52 General Port 3.0 - 3.7
CA0 - CA7	23 - 20,17 - 14	O	80C52's low address latch output when EX51=high and EXTROM=low.
ALE	138	O	The Address Latch enable for External Program ROM
PSEN	139	O	Read strobe for Program ROM. When EXTROM is "low" level Program ROM can be select for external.
EXTROM	136	I	Program ROM select input When this pin holds "low" or "high" level, Program ROM Select for External or Internal.
EXTRAM_CSB	135	O	Chip Enable for External SRAM.
EXT51	137	I	Internal 80C52 disable input. If this input hold "high" level. 80c52 that embedded in QS1500 is disable. In this mode should be need External Micom.
SADDR0 - 23	110-106,103-96,85-78,75-73	O	External Sound ROM address for up to 16M words of Memory. ROM memory holds firmware parameter and the Sound Sample data.
SDATA0 - 15	72 - 62,47 - 43	I	External ROM data bus. It read data from ROM when SROM_CSB is low.
SROM_CSB	42	O	Chip select for Sound ROM. When this ouput hold "low" level, Sound ROM can be selected.
EADDR0 - 15	134-131,123-120,95-92,89-86	O	External Effect RAM address for up to 64k bytes. RAM memory holds effect delay data.
EDATA0 - 7	60 - 57,52 - 49	I/O	Effect RAM data bus. It read data from RAM when ERAM_CSB is low.
ERAM_WRB	48	O	Write strobe for Effect RAM. Active low
ERAM_OEB	61	O	Output Enable for Effect RAM. Active low
ERAM_CSB	119	O	Chip Enable for Effect RAM. Active low
MRSTB	111	I	Master reset input. Active low
RSOUT	118	O	Master reset(#111) inverting output.
DAC16	112	I	16bit/18bit DAC select. "Low"= 18bit "High"=16bit
MCKSEL_12M	105	I	Master clock select pin. "Low"= 24Mhz "High"=12Mhz
DAC_12M_OUT	113	O	12Mhz Bit Clock Out for D/AC
SIN	117	I	Serial Data Input from the external AC97 CODEC.
SOUT	116	O	Serial Data Output for D/AC.
BCLK	114	O	Bit Clock Output for D/AC.
WCLK	115	O	R/L Synch Clock Output for D/AC.
AC97_SEL	124	I	AC 97 CODEC select for Audio Out."Low"= D/AC "High"= AC97 CODEC.
XIN	128	I	12Mhz or 24Mhz Master Clock Input.
XOUT	127	O	Inverting output of XIN.

5-2 Pinout By Pin Number

144P* = 144P LQFP , 100P** = 100P LQFP

PIN NO		PIN NAME	PIN NO		PIN NAME	PIN NO		PIN NAME
144P*	100P**		144P*	100P**		144P*	100P**	
1	1	P0_2	49	-	EDATA7	97	65	SADDR11
2	2	P0_1	50	-	EDATA6	98	66	SADDR10
3	3	P0_0	51	-	EDATA5	99	67	SADDR9
4	4	CORE_VDD	52	-	EDATA4	100	68	SADDR8
5		CORE_VDD	53	37	VDD	101	69	SADDR7
6	5	P2_7	54		VDD	102	70	SADDR6
7	6	P2_6	55	38	VSS	103	71	SADDR5
8	7	P2_5	56		VSS	104	72	VSS
9	8	P2_4	57	-	EDATA3	105	73	MCKSEL_12M
10	9	P2_3	58	-	EDATA2	106	74	SADDR4
11	10	P2_2	59	-	EDATA1	107	75	SADDR3
12	11	P2_1	60	-	EDATA0	108	76	SADDR2
13	12	P2_0	61	-	ERAM_OEB	109	77	SADDR1
14	-	CA7	62	39	SDATA10	110	78	SADDR0
15	-	CA6	63	40	SDATA9	111	79	MRSTB
16	-	CA5	64	41	SDATA8	112	80	DAC16
17	-	CA4	65	42	SDATA7	113	81	DAC_12M_OUT
18	13	VDD	66	43	SDATA6	114	82	BCLK
19	14	VSS	67	44	SDATA5	115	83	WCLK
20	-	CA3	68	45	SDATA4	116	84	SOUT
21	-	CA2	69	46	SDATA3	117	85	SIN
22	-	CA1	70	47	SDATA2	118	-	RSOUT
23	-	CA0	71	48	SDATA1	119	-	ERAM_CSB
24	15	P1_7	72	49	SDATA0	120	-	EADDR7
25	16	P1_6	73	50	SADDR23	121	-	EADDR6
26	17	P1_5	74	51	SADDR22	122	-	EADDR5
27	18	P1_4	75	52	SADDR21	123	-	EADDR4
28	19	P1_3	76	53	VDD	124	86	AC97_SEL
29	20	P1_2	77		VDD	125	87	VDD
30	21	P1_1	78	54	SADDR20	126		VDD
31	22	P1_0	79	55	SADDR19	127	88	XOUT
32	23	VSS	80	56	SADDR18	128	89	XIN
33		VSS	81	57	SADDR17	129	90	VSS
34	24	P3_7	82	58	SADDR16	130		VSS
35	25	P3_6	83	59	SADDR15	131	-	EADDR3
36	26	P3_5	84	60	SADDR14	132	-	EADDR2
37	27	P3_4	85	61	SADDR13	133	-	EADDR1
38	28	P3_3	86	-	EADDR15	134	-	EADDR0
39	29	P3_2	87	-	EADDR14	135	91	EXTRAM_CSB
40	30	P3_1	88	-	EADDR13	136	92	EXTROM
41	31	P3_0	89	-	EADDR12	137	93	EX51
42	-	SRAM_CSB	90	62	CORE_VDD	138	94	ALE
43	32	SDATA15	91	63	VSS	139	95	PSEN
44	33	SDATA14	92	-	EADDR11	140	96	P0_7
45	34	SDATA13	93	-	EADDR10	141	97	P0_6
46	35	SDATA12	94	-	EADDR9	142	98	P0_5
47	36	SDATA11	95	-	EADDR8	143	99	P0_4
48	-	ERAM_WRB	96	64	SADDR12	144	100	P0_3

Chapter 6 Eletrical Charateristics

Absolute maximum range

Note : VDD = 3.0V , VSS = 0V

Item	Symbol	Min	Max	Unit
I/O_VDD terminal power supply voltage	VDDio	VDD-0.3	3.6	V
CORE_VDD terminal power supply voltage	VDDco	2	2.7	V
Operating ambient temperature	TOP	-20	80	°C
Carrier temperature	TCA	-50	125	°C

Recommended operating condition

Item	Symbol	Min	Typ	Max	Unit
I/O_VDD operating voltage	VDDio	2.7	3	3.3	V
CORE_VDD operating voltage	VDDco	-	2.5	-	
Operating ambient temperature	TOP	0	-	70	°C

DC characteristics

Note : VDD = 3.3V , VSS = 0V , TA = 25°C

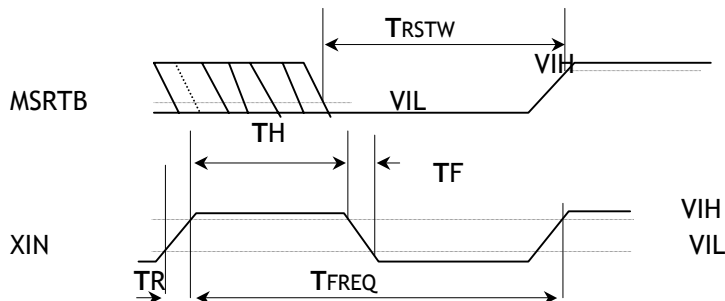
Item	Symbol	Min	Typ	Max	Unit
Input voltage "H" level	VIH	2.7	3.3	VCC+0.5	V
Input voltage "L" level	VIL	-0.5	-	1	V
Output voltage "H" level	VOH	3	-	-	V
Output voltage "L" level	VOL	-	-	0.1	V
Power Supply Current (Crystal Frequency = 24Mhz)	ICCCORE	-	60	80	mA
	ICCI/O	-	20	30	mA
Power Down Current		-	-	10	uA

AC characteristics

MRSTB,XIN

Note : VDD = 3V±0.3 , Copacitor load = 20pF

Item	Symbol	Min	Typ	Max	Unit
MRTSB active "L" pulse width	TRSTW	10			ms
XIN frequency	1/TFREQ	-		24	Mhz
XIN rising / falling time	TR/TF			5	ns
XIN duty	TH/TFREQ	40	50	60	%

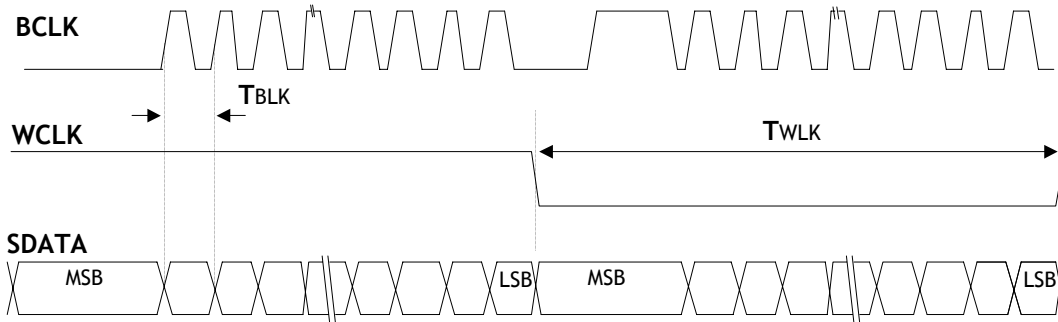


BCLK, WCLK, SOUT, SIN

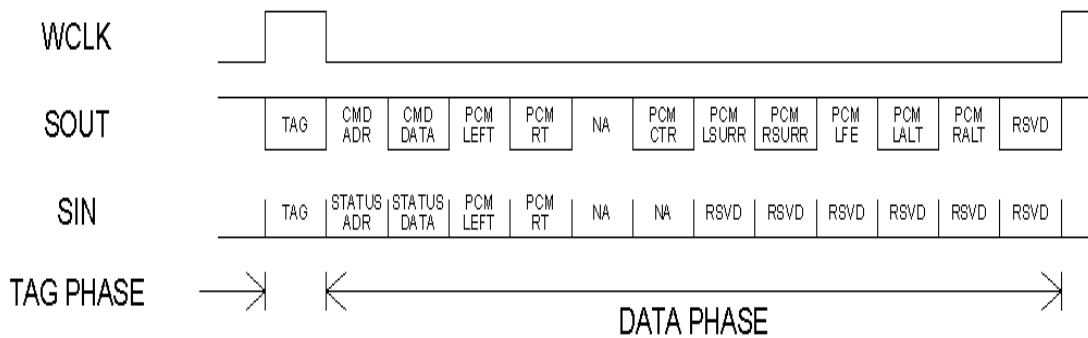
When XIN = 24Mhz

Item	Symbol	Min	Typ	Max	Unit
BCLK 1/Freq time	TBLK	-	300	-	ns
WCLK 1/Freq time	TWCLK	-	20	-	μs

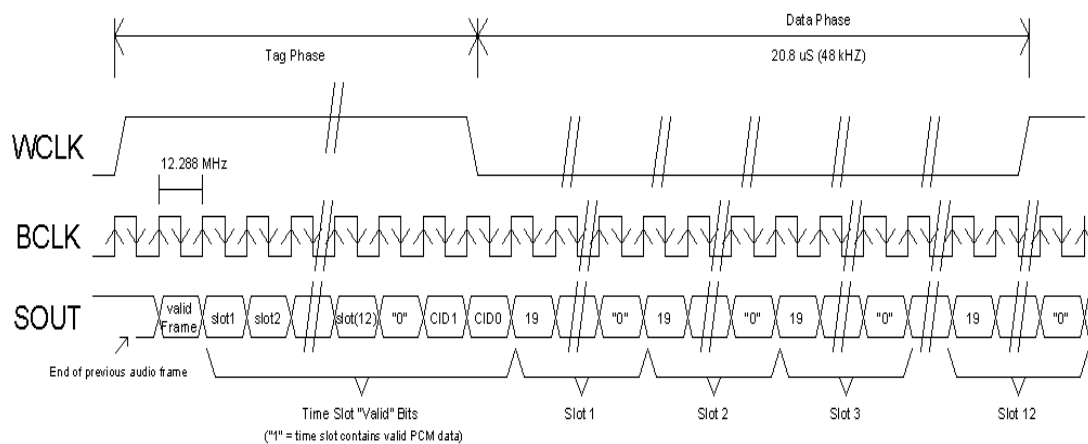
< 16bit D/AC interface Audio Frame Format >



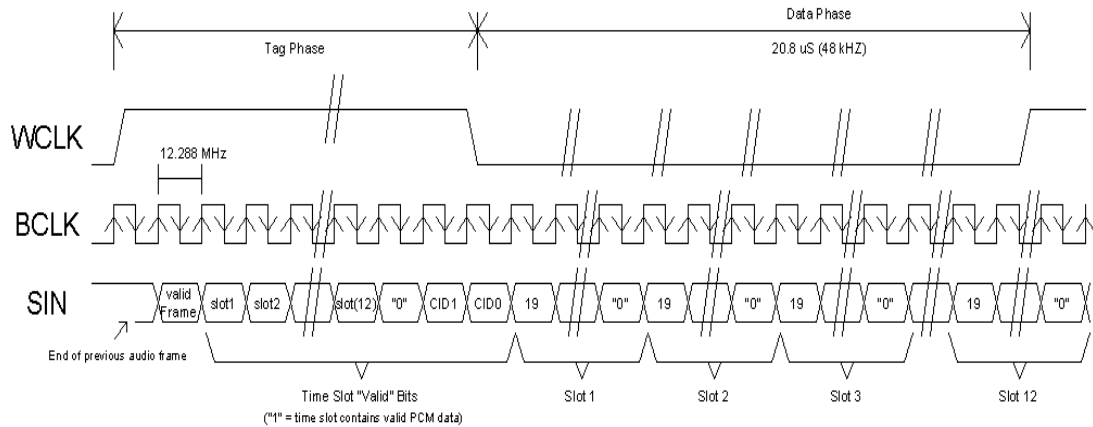
< AC97 CODEC interface Audio Frame Format >



AC97 Standard Bidirectional Frame Format



AC-Link Audio Output Timing



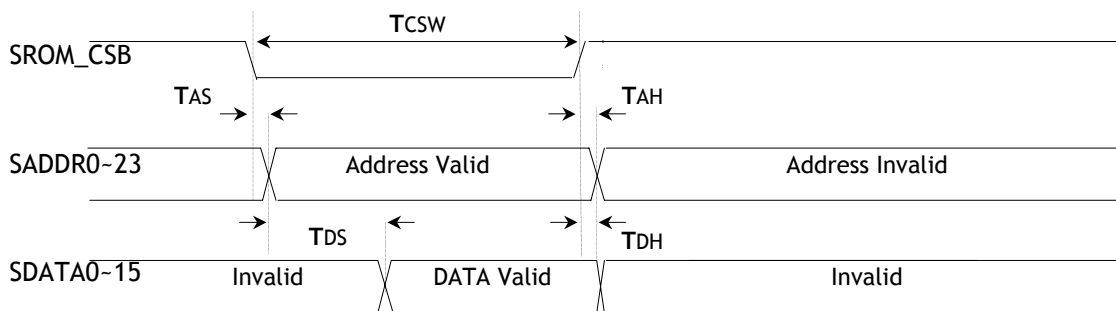
AC-Link Audio Input Timing

< Sound Memory Read Cycle >

SROM_CS, SADDR, SDATA

When XIN = 20Mhz

Item	Symbol	Min	Typ	Max	Unit
CSB active "L" pulse width	TCSW	150	-	-	ns
Address setup time after SROM_CS to low	TAS	0	-	-	ns
Address hold time after SROM_CS to high	TAH	0	-	-	ns
Data setup time after address changed	TDS	-	-	100	ns
Data hold time after address changed	TDH	0	-	-	ns



Chapter 7 Sound Map

7-1 GM 128 SOUND TABLE

	PC#	CCO	Tone name
Piano	1	0	Acoustic Grand Piano
	2	0	Brigh Acoustic Piano
	3	0	Electric Grand Piano
	4	0	Honkey tonk Piano
	5	0	Electric Piano 1
	6	0	Electric Piano 2
	7	0	Harpichord
	8	0	Clavi
Ch-Percussion	9	0	Celesta
	10	0	Glockenspiel
	11	0	Music Box
	12	0	Vibraphone
	13	0	Marinba
	14	0	Xylophone
	15	0	Tubular Bells
	16	0	Dulcimer
Organ	17	0	Drawbar Organ
	18	0	Percussive Organ
	19	0	Rock Organ
	20	0	Church Organ
	21	0	Reed Organ
	22	0	Accordion
	23	0	Harmonica
	24	0	Tango Accordion
Guitar	25	0	Acoustic Guitar (nylon)
	26	0	Acoustic Guitar (steel)
	27	0	Electric Guitar (jazz)
	28	0	Electric Guitar (clean)
	29	0	Electric Guitar (muted)
	30	0	Overdriven Guitar
	31	0	Distortion Guitar
	32	0	Guitar harmonics
Bass	33	0	Acoustic Bass
	34	0	Electric Bass (finger)
	35	0	Electric Bass (pick)
	36	0	Fretless Bass
	37	0	Slap Bass 1
	38	0	Slap Bass 2
	39	0	Synth Bass 1
	40	0	Synth Bass 2

	PC#	CCO	Tone name
String/Orchestra	41	0	Violin
	42	0	Viola
	43	0	Cello
	44	0	Contrabass
	45	0	Tremolo Stings
	46	0	Pizzicato Strings
	47	0	Orchestral Harp
	48	0	Timpani
Ensemble	49	0	String Ensemble 1
	50	0	String Ensemble 2
	51	0	SynthStrings 1
	52	0	SynthStrings 2
	53	0	Choir Aashes
	54	0	Voice Oohs
	55	0	Synth Voice
	56	0	Orchestra Hit
Brass	57	0	Trumpet
	58	0	Trombone
	59	0	Tuba
	60	0	Muted Trumpet
	61	0	French Horn
	62	0	Brass Section
	63	0	SynthBrass 1
	64	0	SynthBrass 2
Reed	65	0	Soprano Sax
	66	0	Alto Sax
	67	0	Tenor Sax
	68	0	Baritone Sax
	69	0	Oboe
	70	0	English Horn
	71	0	Bassoon
	72	0	Clarinet
Pipe	73	0	Piccolo
	74	0	Flute
	75	0	Recorder
	76	0	Pan Flute
	77	0	Blown Bottle
	78	0	Shakuhachi
	79	0	Whistle
	80	0	Ocarina

continue next page

	PC#	CCO	Tone name
Synth lead	81	0	Lead 1 (square)
	82	0	Lead 2 (sawtooth)
	83	0	Lead 3 (calliope)
	84	0	Lead 4 (chiff)
	85	0	Lead 5 (charang)
	86	0	Lead 6 (voice)
	87	0	Lead 7(fifths)
	88	0	Lead 8(bass + lead)
Synth pad	89	0	Pad 1 (new age)
	90	0	Pad 2 (warm)
	91	0	Pad 3 (polysynth)
	92	0	Pad 4 (choir)
	93	0	Pad 5 (bowed)
	94	0	Pad 6 (metallic)
	95	0	Pad 7 (halo)
	96	0	Pad 8 (sweep)
Synth SFX	97	0	FX 1 (rain)
	98	0	FX 2 (soundtrack)
	99	0	FX3 (crystal)
	100	0	FX 4 (atmosphere)
	101	0	FX 5 (brightness)
	102	0	FX 6 (goblins)
	103	0	FX7 (echoes)
	104	0	FX 8 (sci-fi)
Ethnic	105	0	Sitar
	106	0	Banjo
	107	0	Shamisen
	108	0	Koto
	109	0	Kalimba
	110	0	Bag pipe
	111	0	Fiddle
	112	0	Shanai
Percussive	113	0	Tinkle Bell
	114	0	Agogo
	115	0	Steel Drums
	116	0	Woodblock
	117	0	Taiko Drum
	118	0	Melodic Tom
	119	0	Synth Drum
	120	0	Reverse Cymbal

	PC#	CCO	Tone name
SFX	121	0	Guitar Fret Noise
	122	0	Breath Noise
	123	0	Seashore
	124	0	Bird Tweet
	125	0	Telephone Ring
	126	0	Helicopter
	127	0	Applause
	128	0	Gunshot

PC# : Program Number

CCO : Value of control "0"(Variation

7-2 Percussion Map (Channel 10)

Note	Key	Standard	Room	Power	Electronic	TR-808
D#0	27	High Q	High Q	High Q	High Q	High Q
E0	28	Slap	Slap	Slap	Slap	Slap
F0	29	Scratch Push	Scratch Push	Scratch Push	Scratch Push	Scratch Push
F#0	30	Scratch Pull	Scratch Pull	Scratch Pull	Scratch Pull	Scratch Pull
G0	31	Sticks	Sticks	Sticks	Sticks	Sticks
G#0	32	Square Click	Square Click	Square Click	Square Click	Square Click
A0	33	Metronome Click	Metronome Click	Metronome Click	Metronome Click	Metronome Click
A#0	34	Metronome Bell	Metronome Bell	Metronome Bell	Metronome Bell	Metronome Bell
B0	35	Kick Drum 2	Kick Drum 2	Kick Drum 2	Kick Drum 2	Kick Drum 2
C1	36	Kick Drum 1	Kick Drum 1	Mondo Kick	Elec BD	808 Bass Drum
C#1	37	Side Stick	Side Stick	Side Stick	Side Stick	808 Rim Shot
D1	38	Snare Drum 1	Snare Drum 1	Gated SD	Elec SD	808 Snare Drum
D#1	39	Hand Clap	Hand Clap	Hand Clap	Hand Clap	Hand Clap
E1	40	Snare Drum 2	Snare Drum 2	Snare Drum 2	Gated SD	Snare Drum 2
F1	41	Low Tom 2	Room Lo Tom 2	Room Lo Tom 2	Elec Lo Tom 2	808 Low Tom 2
F#1	42	Closed Hi-Hat	Closed Hi-Hat	Closed Hi-Hat	Closed Hi-Hat	808 Closed Hi-Hat
G1	43	Low Tom 1	Room Lo Tom 1	Room Lo Tom 1	Elec Lo Tom 1	808 Low Tom 1
G#1	44	Pedal Hi-Hat	Pedal Hi-Hat	Pedal Hi-Hat	Pedal Hi-Hat	808 Closed Hi-Hat
A1	45	Mid Tom 2	Room Mid Tom 2	Room Mid Tom 2	Elec Mid Tom 2	808 Mid Tom 2
A#1	46	Open Hi-Hat	Open Hi-Hat	Open Hi-Hat	Open Hi-Hat	808 Closed Hi-Hat
B1	47	Mid Tom 1	Room Mid Tom 1	Room Mid Tom 1	Elec Mid Tom 1	808 Mid Tom 1
C2	48	High Tom 2	Room Hi Tom 2	Room Hi Tom 2	Elec Hi Tom 2	808 High Tom 2
C#2	49	Crash Cymbal	Crash Cymbal	Crash Cymbal	Crash Cymbal	808 Cymbal
D2	50	High Tom 1	Room Hi Tom 1	Room Hi Tom 1	Elec Hi Tom 1	808 High Tom 1
D#2	51	Ride Cymbal	Ride Cymbal	Ride Cymbal	Ride Cymbal	Ride Cymbal
E2	52	Chinese Cymbal	Chinese Cymbal	Chinese Cymbal	Reverse Cymbal	Reverse Cymbal
F2	53	Ride Bell	Ride Bell	Ride Bell	Ride Bell	Ride Bell
F#2	54	Tambourine	Tambourine	Tambourine	Tambourine	Tambourine
G2	55	Splash Cymbal	Splash Cymbal	Splash Cymbal	Splash Cymbal	Splash Cymbal
G#2	56	Cowbell	Cowbell	Cowbell	Cowbell	808 Cowbell
A2	57	Crash Cymbal 2	Crash Cymbal 2	Crash Cymbal 2	Crash Cymbal 2	Crash Cymbal 2
A#2	58	Vibra-Slap	Vibra-Slap	Vibra-Slap	Vibra-Slap	Vibra-Slap
B2	59	Ride Cymbal 2	Ride Cymbal 2	Ride Cymbal 2	Ride Cymbal 2	Ride Cymbal 2
C3	60	High Bongo	High Bongo	High Bongo	High Bongo	High Bongo
C#3	61	Low Bongo	Low Bongo	Low Bongo	Low Bongo	Low Bongo
D3	62	Mute Hi Conga	Mute Hi Conga	Mute Hi Conga	Mute Hi Conga	808 High Conga
D#3	63	Open Hi Conga	Open Hi Conga	Open Hi Conga	Open Hi Conga	808 Mid Conga
E3	64	Low Conga	Low Conga	Low Conga	Low Conga	808 Low Conga
F3	65	High Timbale	High Timbale	High Timbale	High Timbale	High Timbale
F#3	66	Low Timbale	Low Timbale	Low Timbale	Low Timbale	Low Timbale
G3	67	High Agogo	High Agogo	High Agogo	High Agogo	High Agogo
G#3	68	Low Agogo	Low Agogo	Low Agogo	Low Agogo	Low Agogo
A3	69	Cabasa	Cabasa	Cabasa	Cabasa	Cabasa
A#3	70	Maracas	Maracas	Maracas	Maracas	808 Maracas
B3	71	Short Hi Whistle	Short Hi Whistle	Short Hi Whistle	Short Hi Whistle	Short Hi Whistle
C4	72	Long Lo Whistle	Long Lo Whistle	Long Lo Whistle	Long Lo Whistle	Long Lo Whistle
C#4	73	Short Guiro	Short Guiro	Short Guiro	Short Guiro	Short Guiro
D4	74	Long Guiro	Long Guiro	Long Guiro	Long Guiro	Long Guiro
D#4	75	Claves	Claves	Claves	Claves	808 Claves
E4	76	High Woodblock	High Woodblock	High Woodblock	High Woodblock	High Woodblock
F4	77	Low Woodblock	Low Woodblock	Low Woodblock	Low Woodblock	Low Woodblock
F#4	78	Mute Cuica	Mute Cuica	Mute Cuica	Mute Cuica	Mute Cuica
G4	79	Open Cuica	Open Cuica	Open Cuica	Open Cuica	Open Cuica
G#4	80	Mute Triangle	Mute Triangle	Mute Triangle	Mute Triangle	Mute Triangle
A4	81	Open Triangle	Open Triangle	Open Triangle	Open Triangle	Open Triangle
A#4	82	Shaker	Shaker	Shaker	Shaker	Shaker
B4	83	Jingle Bell	Jingle Bell	Jingle Bell	Jingle Bell	Jingle Bell
C5	84	Belltrees	Belltrees	Belltrees	Belltrees	Belltrees
C#5	85	Castanets	Castanets	Castanets	Castanets	Castanets
D5	86	Mute Surdo	Mute Surdo	Mute Surdo	Mute Surdo	Mute Surdo
D#5	87	Open Surdo	Open Surdo	Open Surdo	Open Surdo	Open Surdo

Note	key	Jazz	Brush	Orchestra	Sound FX
D#0	27	High Q	High Q	Closed Hi-Hat	-
E0	28	Slap	Slap	Pedal Hi-Hat	-
F0	29	Scratch Push	Scratch Push	Open Hi-Hat	-
F#0	30	Scratch Pull	Scratch Pull	Ride Cymbal	-
G0	31	Sticks	Sticks	Sticks	-
G#0	32	Square Click	Square Click	Square Click	-
A0	33	Metronome Click	Metronome Click	Metronome Click	-
A#0	34	Metronome Bell	Metronome Bell	Metronome Bell	-
B0	35	Jazz BD 2	Jazz BD 2	Concert BD 2	-
C1	36	Jazz BD 1	Jazz BD 1	Concert BD 1	-
C#1	37	Side Stick	Side Stick	Side Stick	-
D1	38	Snare Drum 1	Brush Tap	Concert SD	-
D#1	39	Hand Clap	Brush Slap	Castanets	High Q
E1	40	Snare Drum 2	Brush Swirl	Concert SD	Slap
F1	41	Low Tom 2	Low Tom 2	Tympani F	Scratch Push
F#1	42	Closed Hi-Hat	Closed Hi-Hat	Tympani F#	Scratch Pull
G1	43	Low Tom 1	Low Tom 1	Tympani G	Sticks
G#1	44	Pedal Hi-Hat	Pedal Hi-Hat	Tympani G#	Square Click
A1	45	Mid Tom 2	Mid Tom 2	Tympani A	Metronome Click
A#1	46	Open Hi-Hat	Open Hi-Hat	Tympani A#	Metronome Bell
B1	47	Mid Tom 1	Mid Tom 1	Tympani B	Guitar Fret Noise
C2	48	High Tom 2	High Tom 2	Tympani C	Guitar Cut Noise Up
C#2	49	Crash Cymbal	Crash Cymbal	Tympani C#	Guitar Cut Noise Down
D2	50	High Tom 1	High Tom 1	Tympani D	Double Bass String Slap
D#2	51	Ride Cymbal	Ride Cymbal	Tympani D#	Flute Key Click
E2	52	Chinese Cymbal	Chinese Cymbal	Tympani E	Laughing
F2	53	Ride Bell	Ride Bell	Tympani F	Screaming
F#2	54	Tambourine	Tambourine	Tambourine	Punch
G2	55	Splash Cymbal	Splash Cymbal	Splash Cymbal	Heartbeat
G#2	56	Cowbell	Cowbell	Cowbell	Footsteps 1
A2	57	Crash Cymbal 2	Crash Cymbal 2	Concert Cymbal 2	Footsteps 2
A#2	58	Vibra-Slap	Vibra-Slap	Vibra-Slap	Applause
B2	59	Ride Cymbal 2	Ride Cymbal 2	Concert Cymbal 1	Door Creaking
C3	60	High Bongo	High Bongo	High Bongo	Door Closing
C#3	61	Low Bongo	Low Bongo	Low Bongo	Scratch
D3	62	Mute Hi Conga	Mute Hi Conga	Mute Hi Conga	Wind Chimes
D#3	63	Open Hi Conga	Open Hi Conga	Open Hi Conga	Car Engine
E3	64	Low Conga	Low Conga	Low Conga	Car Brakes
F3	65	High Timbale	High Timbale	High Timbale	Car Passing
F#3	66	Low Timbale	Low Timbale	Low Timbale	Car Crash
G3	67	High Agogo	High Agogo	High Agogo	Siren
G#3	68	Low Agogo	Low Agogo	Low Agogo	Train
A3	69	Cabasa	Cabasa	Cabasa	Jet Plane
A#3	70	Maracas	Maracas	Maracas	Helicopter
B3	71	Short Hi Whistle	Short Hi Whistle	Short Hi Whistle	Starship
C4	72	Long Lo Whistle	Long Lo Whistle	Long Lo Whistle	Gun Shot
C#4	73	Short Guiro	Short Guiro	Short Guiro	Machine Gun
D4	74	Long Guiro	Long Guiro	Long Guiro	Laser Gun
D#4	75	Claves	Claves	Claves	Explosion
E4	76	High Woodblock	High Woodblock	High Woodblock	Dog Bark
F4	77	Low Woodblock	Low Woodblock	Low Woodblock	Horse Gallop
F#4	78	Mute Cuica	Mute Cuica	Mute Cuica	Birds Tweet
G4	79	Open Cuica	Open Cuica	Open Cuica	Rain
G#4	80	Mute Triangle	Mute Triangle	Mute Triangle	Thunder
A4	81	Open Triangle	Open Triangle	Open Triangle	Wind
A#4	82	Shaker	Shaker	Shaker	Seashore
B4	83	Jingle Bell	Jingle Bell	Jingle Bell	Stream
C5	84	Belltree	Belltree	Belltree	Bubble
C#5	85	Castanets	Castanets	Castanets	-
D5	86	Mute Surdo	Mute Surdo	Mute Surdo	-
D#5	87	Open Surdo	Open Surdo	Open Surdo	-

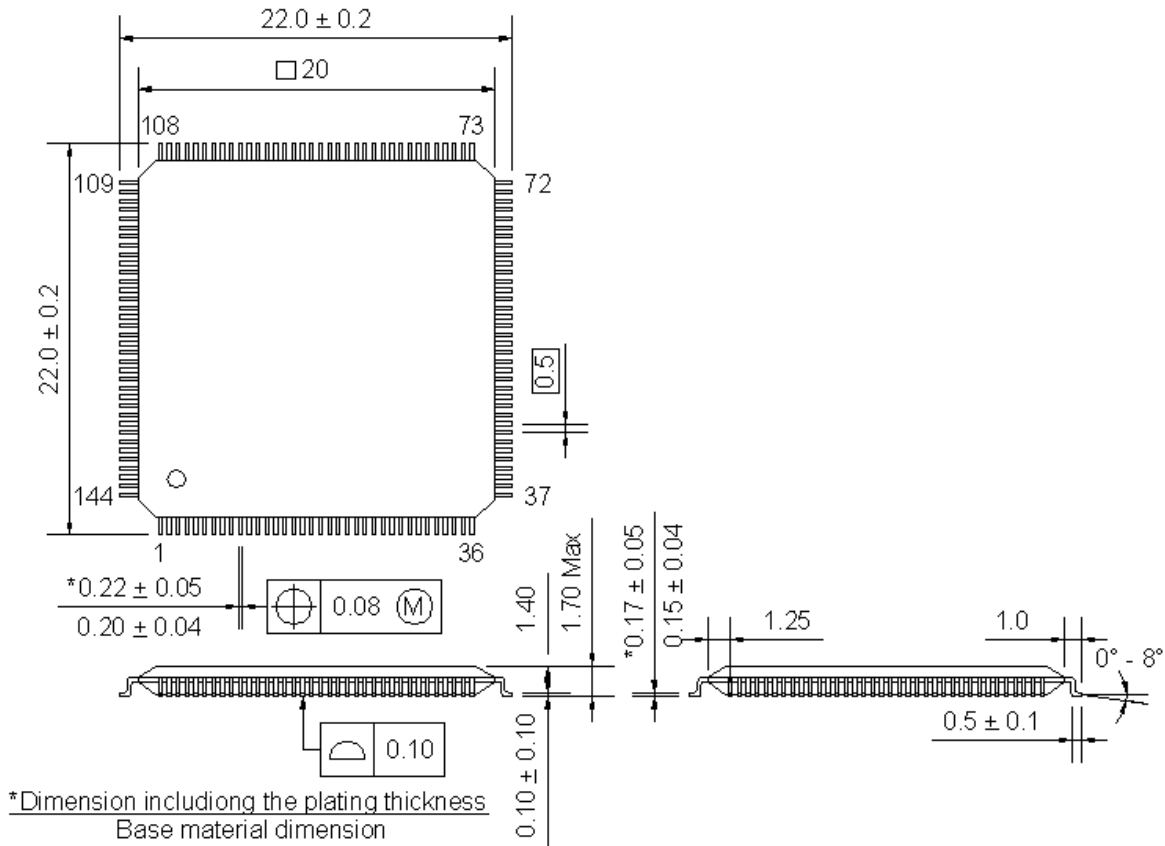
7-3 MIDI Implementation Chart

Function		Transmitted	Recognized	Remarks
Basic	default	X	1~16	
Channel	Changed	X	1~16 Each	
Mode	Default	X	Mode 1*	
Note number		X	0 ~ 127	
Velocity	ON	X	0	
Velocity	OFF	X	0	
After Touch	Key's	X	X	
After Touch	Chn's	X	X	
Pitch Bender		X	0	
Control Change	0,32	X	X	Bank Selection
	1	X	0	Modulation
	6,38	X	0	Data entry
	7	X	0	Volume
	10	X	0	Panpot
	11	X	0	Expression
	64	X	0	Sustain
	66	X	X	Sustanuto
	67	X	X	Soft
	91	X	X	Reverb Depth
	93	X	X	Chorus Depth
	98,99	X	0	NRPN LSB MSB
	100,101	X	0	RPN LSB MSB(00,00 Only)
	120	X	0	All sound off
	121	X	0	Reset all controller
123	X	0	All note off	
Program	Change	X	0-127	Prog.Number 1 - 128
System	Exclusive	X	X	
Common	Song position	X	X	
	Song selection	X	X	
	Tune	X	X	

Mode 1* : Omni ON / Poly ON

Chapter 8 Package Dimension

144p LQFP



100p LQFP

