Product specification

MODEL: GS3000

NAME: One chip servo signal processor for 2-Digit & 4-Digit LED/LCD CD player

VERSION: 0.14

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Chapter 1 Product Overview

The GS3000 is a one-chip servo signal processor complete with built-in pre-servo amplifier for application to 2-Digit & 4-Digit LED/LCD compact disk players. It also can meet EuP requirement.

Features

Pre-sevo amplifier

- RF signal generator generates EFM signal from signals being sent from the pickup. RFAGC circuit is contained therein. Furthermore, this generator enables to set the equalizer to any optional value.
- FE and TE signal generator contains therein gain balance adjust circuits.
- Offset adjustment is individually available for each of AC, BD, E and F.
- This amplifier contains therein asymmetric correction circuit.
- This amplifier contains therein APC circuit intended for automatic control of laser power.
- This amplifier contains therein DISC defect detection circuit.
- Also, this amplifier contains therein bias voltage generation circuit.
- This pre-servo amplifier corresponds flexibly to playback of CD-RW.
- Simultaneous power-down is available for all of the pre-servo amplifier circuits. But the bias voltage generator only can be started independently in advance.

Digital Servo

- Digital servo can control focus, tracking and sled filter characteristics according to control command.
- Servo unit contains therein the function of automatically adjusting offset, balance and gain for focus and tracking.
- Broadly flexible digital spindle servo mounted in this processor selects automatically CLV mode by its sequencer.
- Track jump sequencer enables processing of jump-start and end by one command without applying any load to microcomputer. In addition, this sequencer enables jumping at any number of tracks.

Error corrector (ECC)

- Corrector contains therein de-interleave function, C12 and C24 major error code detection, correction and flag processing circuits.
- Corrector contains therein 16Kbit SRAM so as to enable absorbing of jitter equivalent to ±4 frames.
- Corrector corresponds to CD-DA and CD-ROM modes.

Audio output unit

- Audio output unit contains therein ×8 over-sampling digital filter and secondary ΔΣ 1bit DAC.
- Audio output data is output as analog data through secondary analog low-path filter.
- Digital filter provides the following functions.
  Digital attenuator; Digital soft mute; Infinity zero detection and mute; Digital bus boost filter; Digital de-emphasis filter.

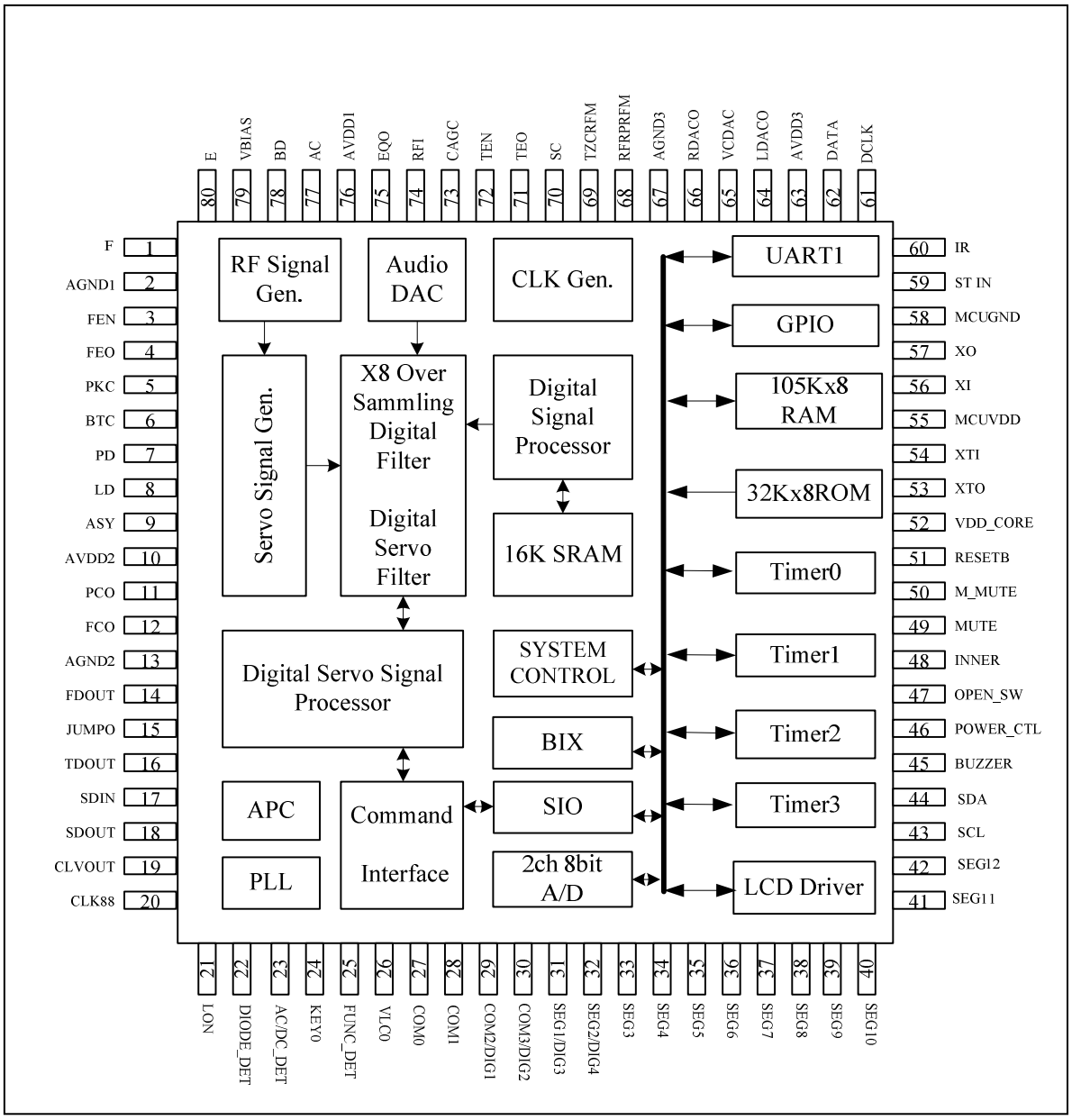
System Configuration

- CD processor and system controlling MCU: GS3000
- 5CH driver: SA5888
- CD mechanism match: Lian Zhong, Sanyo
- Display: 2-Digit LCD/LED or 4-Digit LCD/LED
- Tuner & Pre-scaler for Frequency Counter Tuning System: SA2111+CS9255

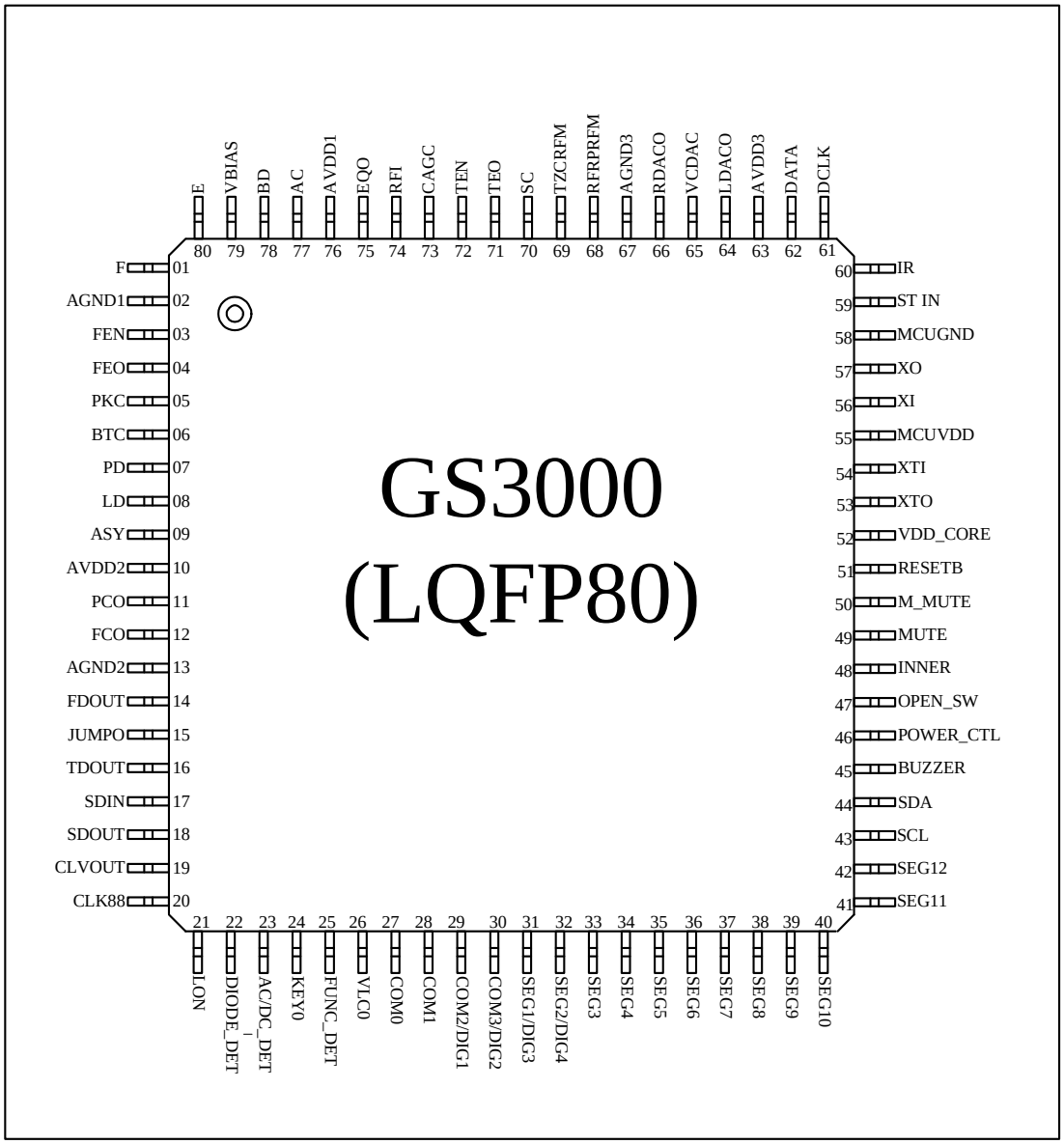
Playback Functions of Audio CD

- Compatible Disc: CD, CD-R, CD-RW
- Play/Pause
- Stop
- Next/FF and Previous/FR search
- Repeat 1/All Play
- Random Play
- Program Memories Up to 20 Tracks

Block Diagram



Pin Assignment



Pin Descriptions

Pin No.	Pin Names	I/O	Pin Description
1	F	I	F voltage input terminal from pichup
2	AGND1	-	GND teminal for RF system analog
3	FEN	I	Focus error to-amplifier feedback input teminal
4	FEO	O	Focus error output teminal
5	PKC	O	RF signal peak detector capacity connecting terminal
6	BTC	O	RF signal bottom detector capacity connecting terminal
7	PD	I	APC photo detector input terminal
8	LD	O	APC laser driver output terminal
9	ASY	I	C-fitted terminal for comparator slice for asymmetric correction
10	AVDD2	-	Analog power teminal for Servo system analog
11	PCO	O	PLL PCO output terminal
12	FCO	O	PLL FCO-DAC output terminal
13	AGND2	-	Servo system analog GND terminal
14	FDOUT	O	Focus drive output terminal
15	JUMPO	O	Tracking jump pulse output terminal
16	TDOUT	O	Tracking drive output terminal
17	SDIN	I	Sled signal input terminal
18	SDOUT	O	Sled drive output terminal
19	CLVOUT	O	CLV drive output terminal
20	CLK88	O	Clock output terminal for driver IC
21	LON	O	Laser ON control output terminal
22	DIODE_DET	I	Optional function select
23	AC/DC_DET	I	AC and DC mode operation detect. AC mode: H DC mode: L
24	KEY0	I	Key input terminal
25	FUNC_DET	I	Function mode detect pin
26	VLC0	-	LCD power supply pins.
27	COM0	O	LCD: COM0 output pin

Pin No.	Pin Names	I/O	Pin Description
28	COM1	O	LCD: COM1 output pin
29	COM2/DIG1	O	LCD: COM2 output pin / LED: DIG1 output pin
30	COM3/DIG2	O	LCD: COM3 output pin / LED: DIG2 output pin
31	SEG1/DIG3	O	LCD: SEG1 / LED: DIG3 output pin
32	SEG2/DIG4	O	LCD: SEG2 / LED: DIG4 output pin
33	SEG3	O	LCD / LED: SEG3
34	SEG4	O	LCD / LED: SEG4
35	SEG5	O	LCD / LED: SEG5 / Optional function select
36	SEG6	O	LCD / LED: SEG6 / Optional function select
37	SEG7	O	LCD / LED: SEG7 / Optional function select
38	SEG8	O	LCD / LED: SEG8 / Optional function select
39	SEG9	O	LCD / LED: SEG9 / Optional function select
40	SEG10	O	LCD / LED: SEG10 / Optional function select
41	SEG11	I/O	LCD / LED: SEG11 / Optional function select
42	SEG12	I/O	LCD / LED: SEG12
43	SCL	--	Not connect.
44	SDA	O	Connect to CS9255.
45	BUZZER	O	Buzzer output
46	POWER_CTL	O	Power supply control pin
47	OPEN_SW	I	CD door switch detect pin
48	INNER	I	CDM inner limit switch detection input terminal
49	MUTE	O	Audio mute control signal output
50	M_MUTE	O	Motor driver IC mute output terminal
51	RESETB	I	System reset terminal, L active
52	VDD_CORE	-	Internal digital power supply
53	XTO	O	Crystal oscillator pins for sub-clock
54	XTI	I	
55	MCUVDD	-	MCU power terminal

Pin No.	Pin Names	I/O	Pin Description
56	XI	I	X'tal 16.9344MHz connecting terminal
57	XO	O	
58	MCUGND	-	MCU GND terminal
59	ST_IN	I	ST indicator control input terminal
60	IR	I	Remote control input terminal
61	DCLK	O	Connect to CS9255 CLK
62	DATA	I/O	Connect to CS9255 DATA
63	AVDD3	-	Audio system analog power terminal
64	LDACO	O	Audio Lch output terminal
65	VCDAC	O	Audio system reference voltage output terminal
66	RDACO	O	Audio Rch output terminal
67	AGND3	-	Audio system analog GND terminal
68	RFRPRFM	O	C-fitted terminal for RFRP
69	TZCRFM	O	C-fitted terminal for TZC
70	SC	I	Scratch depth adjust resistor connecting terminal
71	TEO	O	Tracking error output terminal
72	TEN	O	Tracking error to-amplifier feedback input terminal
73	CAGC	I	C-fitted terminal for constant at RFAGC
74	RFI	I	RF output capacity combined data re-input terminal
75	EQO	O	After-RF-equalizer output terminal
76	AVDD1	-	Analog power teminal for RF system analog
77	AC	I	A+C voltage input terminal from pichup
78	BD	I	B+D voltage input terminal from pichup
79	VBIAS	O	Bias level (VDD/2) output terminal
80	E	I	E voltage input terminal from pichup

Option Table

1) CD Mechanism

CDM / Pin	Sanyo DA11	Sanyo DA23	QingYa	Lian Zhong
OPTION0 (Pin39_D12)	0	1	0	1
OPTION1 (Pin40_D6)	0	0	1	1

2) LCD/LED

LCD/LED / Pin	2-Dig LCD	2-Dig LED	4-Dig LCD	4-Dig LED
OPTION2 (Pin41_D28)	0	1	0	1
OPTION3 (Pin42_D29)	0	0	1	1

3) Autoplay

	Pin35_D7
Disable	0
Enable	1

4) 12/24-Hour Clock display

	Pin36_D8
24H	0
12H	1

5) REPEAT/RANDOM Combine key

	Pin37_D9
Combine key	0
Separate key	1

6) Frequency Counter Tuning System (For 4-Digit LCD version only)

	Pin38_D10
Enable	0
Disable	1

Electrical Data

Absolute maximum ratings (Ta=25°C)

Parameter	Rating	Unit
Operating temperature	-25 ~ 85	℃
Storage temperature	-55 ~ 125	℃
Power supply voltage(V_{DD})	4	V
Internal power supply voltage(V_{CORE})	2	V

Electrical characteristics (Digital System)

D.C Characteristics

(T_A=25°C , V_{DD}= 3.0V)

Parameter		Symbol	Conditions	Limit			Unit
				Min.	Typ.	Max.	
Input voltage	H-level voltage	V_{IH}		2.4	--	--	V
	L-level voltage	V_{IL}		--	--	0.6	V
Hysterics input voltage	H-level voltage	V_{IH}		2.1	--	--	V
	L-level voltage	V_{IL}		--	--	0.9	V
Input L current to Pull-up resistor		I_{IL}	V_{IN}=0V	-35	-80	-150	μA
Input current		I_I	V_{IN}=0~3.0V	--	--	±1	μA
Output voltage	H-level voltage	V_{OH}	I_O=-0.6mA	2.5	--	--	V
	L-level voltage	V_{OL}	I_O=0.6mA	--	--	0.4	V
Open-drain output	Output leak current	I_{ODH}	Hi-z output	--	--	1	μA
	L-level voltage	V_{ODL}	I_O=1.6mA	--	--	0.4	V

Electrical Characteristics (Analog system)

(V_{DD}=3.0V; unless otherwise specified T_A= 25°C, R_L=10KΩ, standard V_C)

Parameter	Symbol	Applicable pins, Conditions	Limit			Unit
			Min.	Typ.	Max.	
Total						
Circuit current	I_Q	AVDD1,AVDD2,AVDD3,MCUVD	--	22	29	mA
PLL (VCO)						
Max. Oscillation	f_{VCOH}	1/2 of PWC/W and VCO outputs	12.5	18	--	MHz
Min. Oscillation	f_{VCOL}	1/2 of PWC/W and VCO outputs	--	0.4	0.8	MHz
FC-DAC						
Offset voltage	V_{FCOF}	FCO	-50	--	50	mV
Max. output voltage	V_{FCH}	FCO	0.8	1.2	--	V
Min. output voltage	V_{FCL}	FCO	--	-1.2	-0.8	V
PCO						
L-level output	V_{PCH}	PCO	--	-1.0	-0.6	V
H-level output	V_{PCL}	PCO	0.6	1.0	--	V
CLV-DAC						
Offset voltge	V_{CLVOF}	CLVOUT	-50	--	50	mV
Max. output voltage	V_{CLVH}	CLVOUT	0.8	1.2	--	V
Min. output voltage	V_{CLVL}	CLVOUT	--	-1.2	-0.8	V
Audio-DAC						
Distortion rate	THD	LDACO,RDACO,0dB 1kHz sine	--	0.01	--	%
Dynamic range	DR	LDACO,RDACO,-60dB 1kHz sine	--	90	--	dB
S/N ratio	S/N	LDACO,RDACO	--	96	--	dB
Max. output level	V_{SMAX}	LDACO,RDACO, 0dB 1kHz sine	0.75	0.85	0.95	Vrms
EFM comparator						
Threshold level	V_{EFM}	RFI,TZCRFM,WFCK	-200	--	200	mV
TZC comparator						
Threshold level	V_{TZC}	TZCRFM,WFCK	-50	--	50	mV
Servo-ADC						
Offset voltage	V_{ADOF}	SDIN,RFRPRFM,TZCRFM	-140	--	140	mV
Max. conversion	V_{ADH}	SDIN,RFRPRFM,TZCRFM	1.0	1.2	1.4	V
Min. conversion	V_{ADL}	SDIN,RFRPRFM,TZCRFM	-1.4	-1.2	-1.0	V

Electrical Characteristics (Analog system) -- Con't

(V_{DD}=3.0V; unless otherwise specified T_A= 25°C, R_L=10KΩ, standard V_C)

Parameter	Symbol	Applicable pins, Conditions	Limit			Unit
			Min.	Typ.	Max.	
Servo-DAC						
Offset voltage	V_{DAOF}	FDOUT,JUMPO,TDOUT,SDOUT	-80	--	80	mV
Max. output voltage	V_{DAH}	FDOUT,JUMPO,TDOUT,SDOUT	0.8	1.2	--	V
Min. output voltage	V_{DAL}	FDOUT,JUMPO,TDOUT,SDOUT	--	-1.2	-0.8	V
Bias amplifier						
Max. output current	I_{BO}	VBIAS and BIAS fluctuation	--	±1.5	--	mA
RF amplifier						
Offset voltage	V_{RFOF}	AC,BD,EQO	--	-0.7	--	V
Max. output voltage	V_{RFH}	AC,BD,EQO	1.1	1.3	--	V
Min. output voltage	V_{RFL}	AC,BD,EQO	--	-1.3	-1.1	V
FE amplifier						
Offset voltage	V_{FEOF}	AC,BD,FEN,FEO	--	0	--	mV
Max. output voltage	V_{FEH}	AC,BD,FEN,FEO	1.0	1.4	--	V
Min. output voltage	V_{FEL}	AC,BD,FEN,FEO	--	-1.4	-1.0	V
TE amplifier						
Offset voltage	V_{TEOF}	E,F,TEN,TEO	--	0	--	mV
Max. output voltage	V_{TEH}	E,F,TEN,TEO	1.0	1.4	--	V
Min. output voltage	V_{TEL}	E,F,TEN,TEO	--	-1.4	-1.0	V
FOK comparator						
Threshold level	V_{FOK}	RFI,TZCRFM(FOK)	-0.5	-0.3	-0.1	V
Asymmetric amplifier						
Offset voltage	V_{ASYOF}	ASY=V_C,RFI,TZCRFM(EFM)	--	0	--	mV
Max. output voltage	V_{ASYH}	ASY,RFI,TZCRFM(EFM)	1.1	1.4	--	V
Min. output voltage	V_{ASYL}	ASY,RFI,TZCRFM(EFM)	--	-1.4	-1.1	V
APC						
Output voltage 1	V_{APC1}	PD="H",LD,TZCRFM(APCREF)	2.4	2.8	--	V
Output volatge 2	V_{APC2}	PD="L", LD,RZCRFM(APCREF)	--	0.1	0.5	V
Max. ref. voltage	V_{APCH}	PD,LD,TZCRFM(APCREF)	--	185	--	mV
Min. ref. voltage	V_{APCL}	PD,LD,TZCRFM(APCREF)	--	110	--	mV

Electrical Characteristics (Analog system) -- Con't

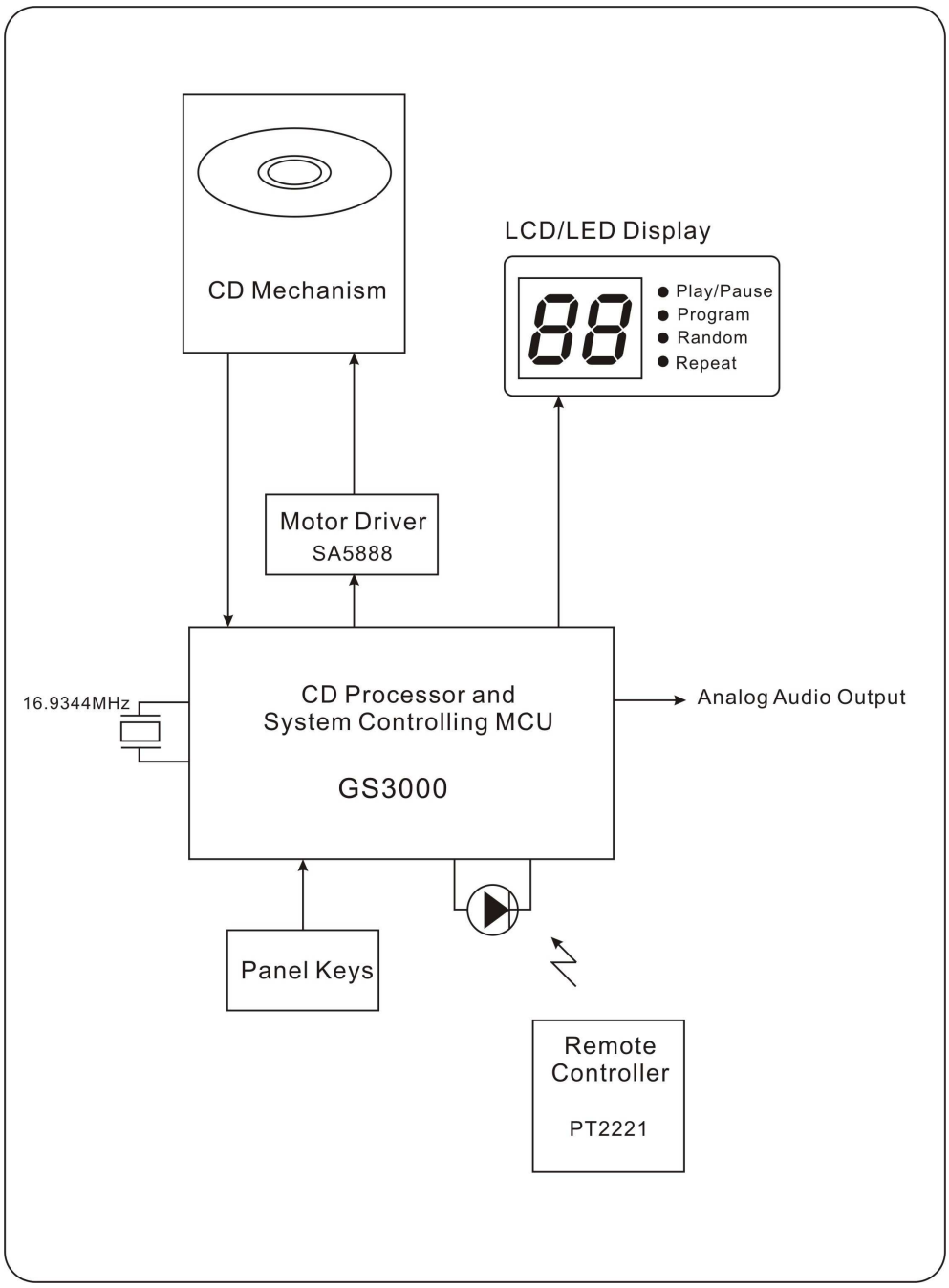
(V_{DD}=3.0V; unless otherwise specified T_A= 25°C, R_L=10KΩ, standard V_C)

Parameter	Symbol	Applicable pins, Conditions	Limit			Unit
			Min.	Typ.	Max.	
AGC						
Reference voltage	V_{AGC}	ASY,RFI,CAGC,(EFM),(RFDET)	0.1	0.3	0.5	V
Max. gain	G_{AGC}	ASY,RFI,CAGC,(EFM),(RFDET)	7.5	11.5	15.5	dB
Operating gain	G_{AGCOP}	ASY,RFI,CAGC,(EFM),(RFDET)	1	6	10	dB
Compression gain	G_{AGCCM}	ASY,RFI,CAGC,(EFM),(RFDET)	-6	0	4	dB
Mirror detector						
Max. output voltage	V_{MRH}	AC,BD,RFRPRFM(MIRR)	2.5	--	--	V
Min. output voltage	V_{MRL}	AC,BD,RFRPRFM(MIRR)	--	--	0.5	V
Defect detector						
Max. output voltage	V_{DFH}	AC,BD,RFRPRFM(DEFECT)	2.5	--	--	V
Min. output voltage	V_{DFL}	AC,BD,RFRPRFM(DEFECT)	--	--	0.5	V
RF ripple detector						
Output voltage	V_{RFRP}	AC,BD,RFRPRFM(RFRP)	0.55	0.75	0.95	V
Operating amplitude	V_{RPOP}	AC,BD,RFRPRFM(RFRP)	90	140	240	mV_{p-p}
A/D conversion						
Resolution	RES	ADC0,ADC1	--	8	--	Bits
Settling time	t_s	ADC0,ADC1	--	35.4	--	µsec
Linearity	E_L	ADC0,ADC1	--	--	±3	LSB
LCD driver						
2/3 level voltage	V_1	COM0~3,SEG0~6	--	2	--	V
1/3 level voltage	V_2	COM0~3,SEG0~6	--	1	--	V

Chapter 2 System Composition

1) 2-Digit LCD / LED CD Player

System Block Diagram



Key Functions

Panel Key Assigment

	[0.4V]	[0.6V]	[0.8V]	[1.1V]	[1.4V]	[1.6V]	[1.8V]
KEY0 (Pin24)	PLAY/ PAUSE	STOP	UP/FF	DN/FR	PROGRAM	REPEAT (REP/RND)	RANDOM

Remote Control Key Assignment

	KI/O0	KI/O1	KI/O2	KI/O3	KI/O4	KI/O5	KI/O6
KI3	PLAY/ PAUSE	STOP	UP/FF	DN/FR	PROGRAM	REPEAT	RANDOM

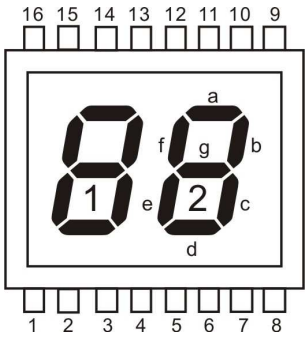
Key Function Description

Key	Description
PLAY/PAUSE	● Start playback from stop mode. ● Start pause during play and press this key again to resume play.
STOP	● During normal playback, press this key to stop playback. ● During repeat and random playback, press this key once to stop playback. Press this key again to cancel repeat and random play mode. ● During program playback, press this key once to stop playback. Press this key again to erase program. ● After entering the program, if STOP key is pressed before pressing the Play/Pause key, all the programmed tracks will be erased.
UP/FF	● To advance to the next track. ● During playback, press and hold to start fast forward search. Normal playback resume after this key is released. ● Press to select the track to be stored into the program.
DN/FR	● To return to the previous track. ● During playback, press and hold to start fast reverse search. Normal playback resume after this key is released. ● Press to select the track to be stored into the program.

Key	Description
DN/FR	● To return to the previous track. ● During playback, press and hold to start fast reverse search. Normal playback resume after this key is released. ● Press to select the track to be stored into the program.
PROGRAM	● Enter program registration mode. ● To store tracks into the memory.
REPEAT	● Press this key repeatedly to select Repeat Track, Repeat All and Normal play mode. ● During program play, press this key repeatedly to select Repeat one programmed track, Repeat all programmed tracks and program play mode.
RANDOM	● Press this key repeatedly to select Radom and normal play mode.

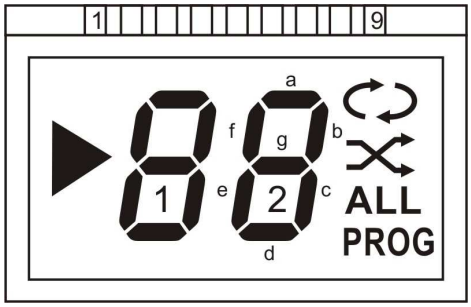
Display and Indicators

2-Digit LED Layout



Pin	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7
DIG1	1d	1e	1c	1g	1a	1f	1b
DIG2	2d	2e	2c	2g	2a	2f	2b

2-Digit LCD Layout



Pin	1	2	3	4	5	6	7	8	9
COM1	2a	▶	1a	ALL	--	--	--	--	COM1
COM2	2b	2f	1b	1f		--	--	COM2	--
COM3	2c	2g	1c	1g		--	COM3	--	--
COM4	2d	2e	1d	1e	PROG	COM4	--	--	--

Drive condition: 1/4 Duty, 1/3 Bias, 3.1V

System Operation

1 Play a Disc

1.1 Turn on the power.

1.2 Open the CD lid. "OP" will be shown.

1.3 Close the CD lid. The unit will spin a Disc, the focusing is done, and the Disc will be stopped after reading the TOC. (If AUTOPLAY jumper diode is selected, playback will be started automatically after reading the TOC). "--" will flash while reading and total number of tracks on the Disc will be shown after reading. Up to maximum 99 tracks can be shown in the display.

1.4 If a Disc is not found, "00" will be shown.

1.5 Press the PLAY/PAUSE key to start playback. Play will begin from Track 1. The PLAY/PAUSE LED (▸ icon) will light and the track number which is currently playing will be shown.

1.6 Press the PLAY/PAUSE key to temporarily stop the playback (Pause). The PLAY/PAUSE LED (▸ icon) and the current track number will flash. To resume playback, press the Play/Pause key again.

1.7 Press the Stop key to stop playback. The PLAY/PAUSE LED (▸ icon) will go off and the total track number on the Disc will be shown.

1.8 Playback will be stopped when the last track on the Disc has finished playing, or if the CD Lid is opened during play.

2 Track Search

2.1 During playback, press UP/FF key to advance to the next track. If UP/FF key is pressed in the last track, the first track will be advanced.

2.2 During playback, press DOWN/FR key to return to the beginning of the track which is playing currently. Press DOWN/FR key twice or more to return to the previous tracks. If the DOWN/FR key is pressed twice in the first track, the last track will be returned.

2.3 To start playback from the desired track in the Stop or Pause mode, select the track number with the UP/FF or Down/FR key, then press the Play/PAUSE key.

3 Forward or Reverse Fast Search

3.1 During playback, press and hold the UP/FF or Down/FR key to quickly scan in the forward or reverse direction. When the desired section of the Disc is found, release the key. Play will continue from that point.

3.2 Scanning can be activated in the Pause mode. Press the PLAY/PAUSE key to begin play from that point. The unit cannot scan in the Stop mode.

4 Random Play

All tracks on a disc are played in random order.

4.1 Press the RANDOM key to begin Random play during playback. All tracks on a Disc are played at random. The RANDOM LED (icon) will light.

4.2 To begin Random play in the Stop or Pause mode, press the RANDOM key, then press the PLAY/PAUSE key.

4.3 Press PLAY/PAUSE key to pause the Random playback. The PLAY/PAUSE LED (▸ icon) and the current track number will flash. Press PLAY/PAUSE key again to resume.

4.4 Press the STOP key to stop Random playback. The PLAY/PAUSE LED (▸ icon) goes off. Press the STOP key again to cancel the Random play mode. The RANDOM LED (icon) will go off .

4.5 To cancel the Random mode during Random play, press the RANDOM key.

4.6 The Random play mode will be canceled when the CD Lid is opened, or when the power is turned off.

4.7 The Random function cannot be used in the program mode.

5 Repeat Play

A single track or all tracks on the Disc can be played repeatedly.

5.1 Single Track Repeat

5.1.1 Press the REPEAT key once during play. The REPEAT LED will flash (icon) will light. The track which is currently playing will be played repeatedly until the STOP key is pressed.

5.1.2 If the REPEAT key is pressed once during programmed play, the programmed track which is currently playing will be played repeatedly.

5.1.3 To begin Repeat one play in Stop or Pause mode, press the REPEAT key once, then press the PLAY/PAUSE key.

5.1.4 Press PLAY/PAUSE key to pause the Repeat One playback. The PLAY/PAUSE LED (▸ icon) and the current track number will flash. Press PLAY/PAUSE key again to resume.

5.1.5 Press the STOP key to stop Repeat One playback. The PLAY/PAUSE LED (▸ icon) goes off. Press the STOP key again to cancel the Repeat One play mode. The REPEAT LED (icon) will go off.

5.1.6 To cancel the Repeat One play mode during Repeat One play, press the REPEAT key twice.

5.1.7 The Repeat One play mode will be canceled when the CD Lid is opened, or when the power is turned off.

5.2 All Tracks Repeat

5.2.1 Press the REPEAT key twice during play. The REPEAT LED (ALL icon) will light. All the tracks on a Disc will be played repeatedly until the STOP key is pressed.

5.2.2 If the REPEAT key is pressed twice during programmed play, all programmed tracks will be played repeatedly.

5.2.3 To begin Repeat All play in Stop or Pause mode, press the REPEAT key twice, then press the PLAY/PAUSE key.

5.2.4 Press PLAY/PAUSE key to pause the Repeat All playback. The PLAY/PAUSE LED (▸ icon) will flash. Press PLAY/PAUSE key again to resume.

5.2.5 Press the STOP key to stop Repeat All playback. The PLAY/PAUSE LED (▸ icon) goes off. Press the STOP key again to cancel the Repeat All play mode. The REPEAT LED (ALL icon) will go off.

5.2.6 To cancel the Repeat All play mode during Repeat All play, press the REPEAT key once.

5.2.7 The Repeat All play mode will be canceled when the CD Lid is opened, or when the power is turned off.

6 Programmed Play

Up to 20 tracks can be entered into the program.

6.1 Entering a Program

6.1.1 Press the PROGRAM key in the Stop mode. The PROGRAM LED (PROG icon) and the program number “01” will flash.

6.1.2 Press the UP/FF or DOWN/FR key to selct a track number. The selected track number will be shown.

6.1.3 Press the PROGRAM key. The first selected track is now programmed. The next program number “02” will flash.

6.1.4 Repeat step 6.1.2 and 6.1.3 to enter other tracks into the program.

6.1.5 After entering a program, press the PROGRAM key repeatedly to check the program content. The program number and the track number of the programmed tracks will be shown in order.

6.1.6 After entering a program, if the STOP key is pressed before the PLAY/PAUSE key, all of the

programmed tracks will be cleared.

6.2 Playing a Program

6.2.1 After entering a program, press the PLAY/PAUSE key. Programmed play starts from the beginning of the first programmed track. The PROGRAM LED (PROG icon) and PLAY LED (▸ icon) will light, and the track number which is currently playing will be shown.

6.2.2 Press the STOP key to stop programmed play. The PLAY/PAUSE LED (▸ icon) will go out, and the total number on the Disc will be shown.

6.2.3 When all of the programmed tracks have been played, the unit will stop.

6.3 Adding/Changing a Track into a Program

6.3.1 Press the STOP key to stop the Program play.

6.3.2 Press the PROGRAM key repeatedly to select the desired program number. The selected program number will flash.

6.3.3 Press the UP/FF or DOWN/FR key to select the track.

6.3.4 Press the PROGRAM key to store the selected track into the program.

6.4 Clearing the Program

6.4.1 Press the STOP key to stop programmed play.

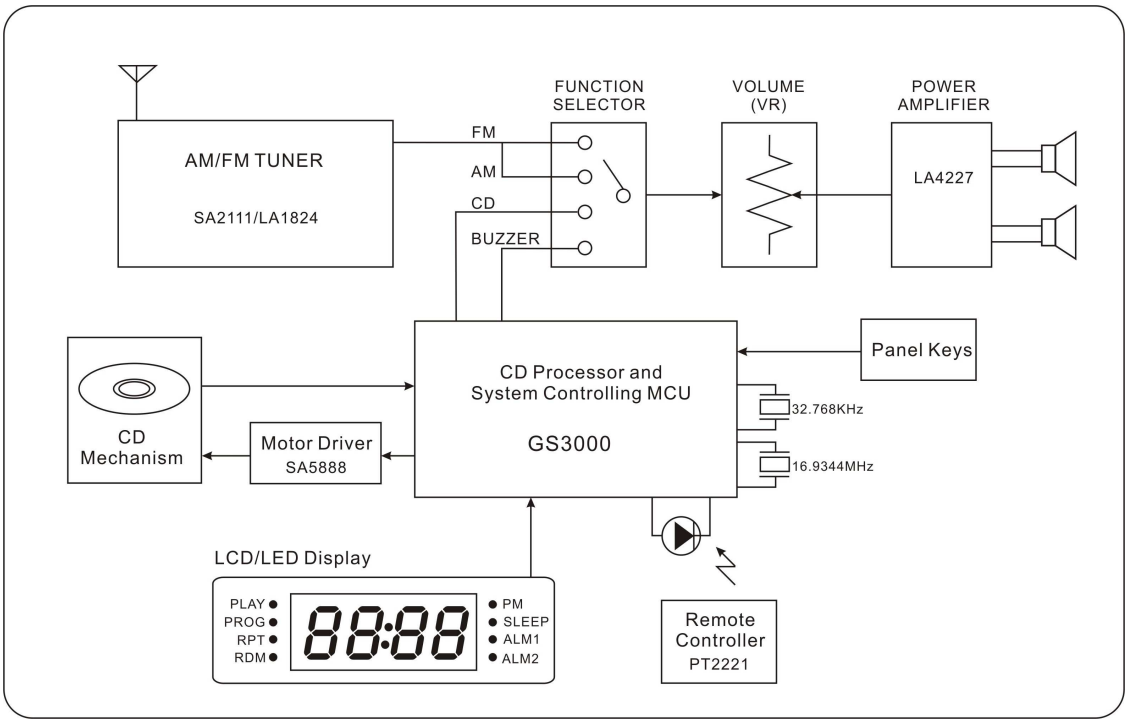
6.4.2 Press the STOP key again to clear the program. the PROGRAM LED goes off.

6.4.3 The program will also be cleared when the CD Lid is opened, or when the power is turned off

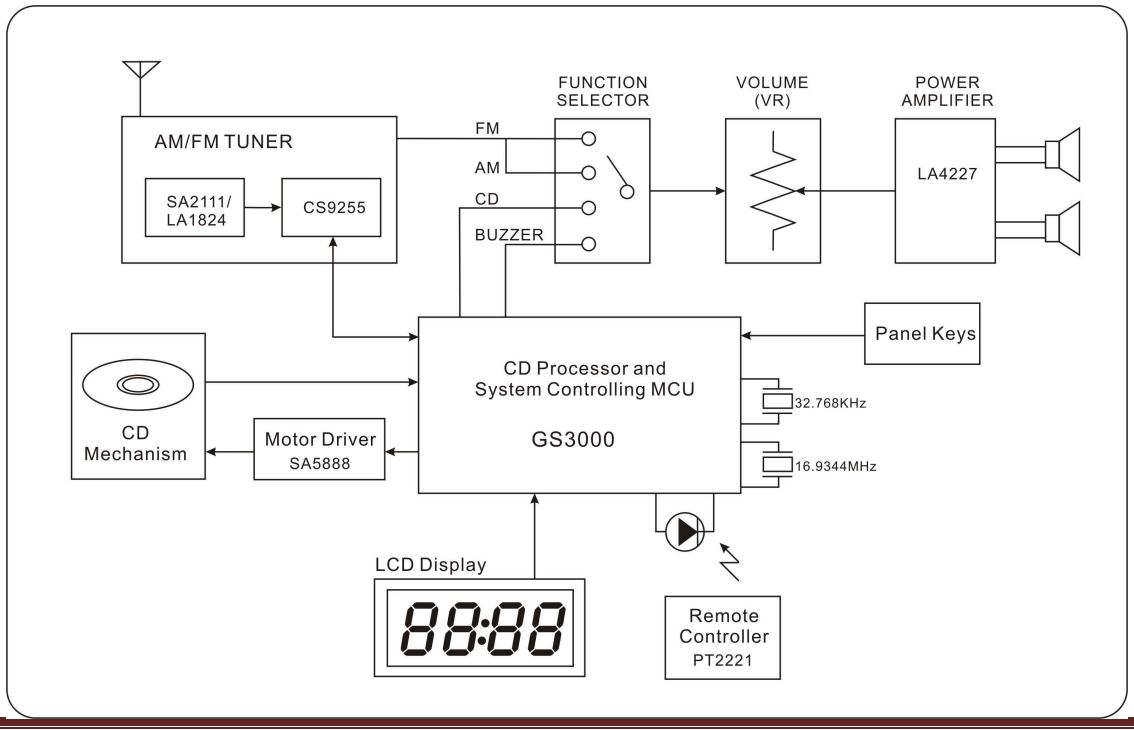
2) CD Clock Radio with 4-Digit LED/LCD

System Block Diagram

CD Clock Radio with 4-Digit LED/LCD and Manual Tuning System



CD Clock Radio with 4-Digit LCD and Frequency Counter Tuning System



Key Functions

Panel Key Assigment

	[0.2V]	[0.4V]	[0.6V]	[0.8V]	[1.1V]	[1.4V]
KEY0 (Pin24)	POWER	PLAY/ PAUSE	STOP	UP/FF	DN/FR	PROGRAM/ CLOCK
	[1.6V]	[1.8V]	[2.1V]	[2.4V]	[2.6V]	[2.8V]
KEY0 (Pin24)	REPEAT/ RANDOM (REPEAT)	DISPLAY (RANDOM)	SLEEP	ALARM1	ALARM2	SNOOZE

Remote Control Key Assignment

	KI/O0	KI/O1	KI/O2	KI/O3	KI/O4	KI/O5	KI/O6
KI3	PLAY/ PAUSE	STOP	UP/FF	DN/FR	PROGRAM	REPEAT	RANDOM
KI2	POWER	ALARM1	ALARM2	SLEEP	SNOOZE	--	--

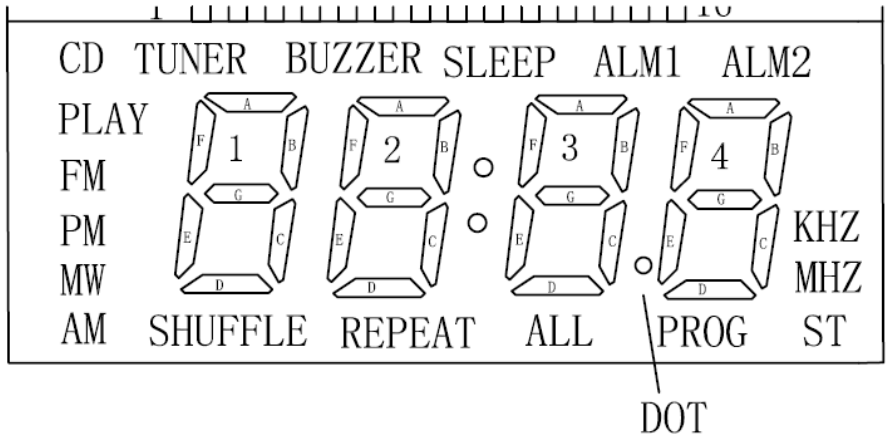
Key Function Description

Key	Description
POWER	● In Standby mode, press this key to switch the system on. ● In Power on mode, press this key to switch the system to Standby mode. ● During the alarm sound, press this key to reset the alarm. Alarm will be sound again at the set time on the next day.
PLAY/PAUSE	● Start playback from stop mode. ● Start pause during play and press this key again to resume play.
STOP	● During normal playback, press this key to stop playback. ● During repeat and random playback, press this key once to stop playback. Press this key again to cancel repeat and random play mode. ● During program playback, press this key once to stop playback. Press this key again to erase program. ● After entering the program, if STOP key is pressed before pressing the Play/Pause key, all the programmed tracks will be erased.

Key	Description
UP/FF	● To advance to the next track. ● During playback, press and hold to start fast forward search. Normal playback resume after this key is released. ● Press to select the track to be stored into the program.
DN/FR	● To return to the previous track. ● During playback, press and hold to start fast reverse search. Normal playback resume after this key is released. ● Press to select the track to be stored into the program.
PROGRAM/ CLOCK	In Standy mode: ● Enter clock setting mode. ● To store the set time. In CD mode: ● Enter program registration mode. ● To store tracks into the memory.
REPEAT/ RANDOM	● Press this key repeatedly to select Repeat Track, Repeat All, Random and Normal play mode. ● During program play, press this key repeatedly to select Repeat one programmed track, Repeat all programmed tracks and program play mode.
DISPLAY	● Press this key to toggle betweem Clock display and current mode display.
SNOOZE	● Press this key to stop the alarm temporarily. Alarm will sound again after 9 minutes.
ALARM 1	● Press and hold ALARM 1 key for more than 2 seconds to enter Alarm 1 time setting mode. ● Press ALARM 1 key to confirm the time set. ● Press ALARM 1 key to turn the ALARM 1 on/off.
ALARM 2	● Press and hold ALARM 2 key for more than 2 seconds to enter Alarm 2 time setting mode. ● Press ALARM 2 key to confirm the time set. ● Press ALARM 2 key to turn the ALARM 2 on/off.
SLEEP	● Press this key repeatedly to select the desired time before system shuts off.

Display

4-Digit LCD Layout

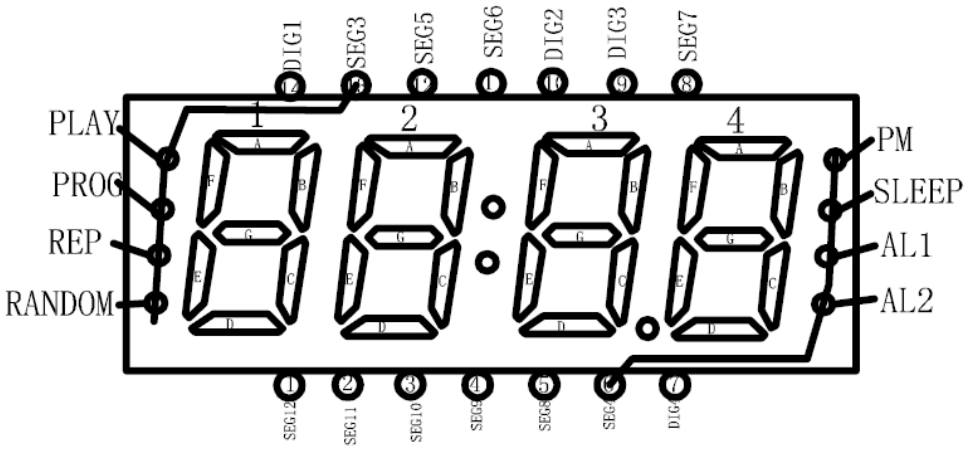


Pin	1	2	3	4	5	6	7	8
COM0	COM0				1a	PM	2a	Col
COM1		COM1			1f	1b	2f	2b
COM2			COM2		1e	1g	2e	2g
COM3				COM3	1d	1c	2d	2c

Pin	9	10	11	12	13	14	15	16
COM0	PLAY	3a	CD	BUZZER	4a	SHUFFLE	ALM1	SLEEP
COM1	ALL	3f	3b	TUNER	4f	4b	ALM2	KHz
COM2	REPEAT	3e	3g	ST	4e	4g	MW	MHz
COM3	AM	3d	3c	dot	4d	4c	FM	PROG

Drive condition: 1/4 Duty, 1/3 Bias, 3.1V

4-Digit LED Layout



LED Pin	1	2	3	4	5	6	8	11	12	13
DIG1	1e	1d	--	1c	1g	PM	1b	1f	1a	PLAY
DIG2	2e	2d	:	2c	2g	SLEEP	2b	2f	2a	PROG
DIG3	3e	3d	--	3c	3g	AL1	3b	3f	3a	REP
DIG4	4e	4d	.	4c	4g	AL2	4b	4f	4a	RANDOM

System Operation

1. Setting the Clock

The Clock can uses12-hour or 24-hour time format dependng on jumper diode setting.

1.1 In Standby mode, press and hold the PROG/CLOCK key until clock digit flashes.

1.2 Press repeatedly, or hold down the UP/FF key to adjust the hours.

1.3 Press repeatedly, or hold down the DOWN/FR to adjust the minutes.

1.4 Press the PROG/CLOCK key to confirm the setting.

2. Radio

2.1 Press the POWER key to switch on the unit.

2.2 Pushing the FM.AM.BUZZ.CD slide switch to select FM or AM waveband.

2.3 Turn the TUNING knob to find the station. For frequency counter tuning system, reception frequency will be shown on LCD for a while and return to the Clock display.

2.4 Ajust the sound with the VOLUME knob.

2.5 Press the POWER key to swithch off the unit.

3. CD Playback

3.1 Play a Disc

3.1.1 Press the POWER key to switch the unit from Standby.

3.1.2 Select CD source by pushing FM.AM.BUZ.CD slide switch to CD.

3.1.3 Open the CD lid. "OP" will be shown.

3.1.4 Close the CD lid. The unit will spin a Disc, the focusing is done, and the Disc will be stopped after reading the TOC. (If AUTOPLAY jumper diode is selected, playback will be started automatically after reading the TOC). "----" will flash while reading and total number of tracks on the Disc will be shown after reading. Up to maximum 99 tracks can be shown in the display.

3.1.5 If a Disc is not found, "00" will be shown.

3.1.6 Press the PLAY/PAUSE key to start playback. Play will begin from Track 1. The PLAY LED / icon will light and the track number which is currently playing will be shown for a while and then return to the Clock display.

3.1.7 To adjust the sound, turn VOLUME knob.

3.1.8 Press the PLAY/PAUSE key to temporarily stop the playback (Pause). The PLAY LED / icon and the current track number will flash. To resume playback, press the Play/Pause key again.

3.1.9 Press the Stop key to stop playback. The PLAY LED / icon will go off and the total track number on the Disc will be shown for a while then return to the Clock display.

3.1.10 Playback will be stopped when the last track on the Disc has finished playing, or if the CD Lid is opened during play.

3.1.11 To switch off CD and back to Standby, press the POWER key

3.2 Track Search

3.2.1 During playback, press the UP/FF key to advance to the next track. If the UP/FF key is pressed in the last track, the first track will be advanced.

3.2.2 During playback, press the DOWN/FR key to return to the beginning of the track which is playing currently. Press the DOWN/FR key twice or more to return to the previous tracks. If the DOWN/FR key is pressed twice in the first track, the last track will be returned.

3.2.3 To start playback from the desired track in the Stop or Pause mode, select the track number with the UP/FF or Down/FR key, then press the Play/PAUSE key.

3.3 Forward or Reverse Fast Search

3.3.1 During playback, press and hold the UP/FF or Down/FR key to quickly scan in the forward or reverse direction. When the desired section of the Disc is found, release the key. Play will continue from that point.

3.3.2 Scanning can be activated in the Pause mode. Press the PLAY/PAUSE key to begin play from that point. The unit cannot scan in the Stop mode.

3.4 Random Play

All tracks on a disc are played in random order.

3.4.1 Press the REPEAT/RANDOM key repeatedly until the SHUF LED / icon is on to begin Random play during playback. All tracks on a Disc are played at random.

3.4.2 To begin Random play in the Stop or Pause mode, press the REPEAT/RANDOM key repeatedly until the SHUF LED / icon is on, then press the PLAY/PAUSE key.

3.4.3 Press the PLAY/PAUSE key to pause the Random playback. The PLAY LED / icon and the current track number will flash. Press the PLAY/PAUSE key again to resume.

3.4.4 Press the STOP key to stop Random playback. The PLAY LED / icon goes off. Press the STOP key again to cancel the Random play mode. The SHUF LED / icon will go off.

3.4.5 To cancel the Random mode during Random play, press the REPEAT/RANDOM key repeatedly until SHUF LED / icon goes off..

3.4.6 The Random play mode will be canceled when the CD Lid is opened, or when the power is turned off.

3.4.7 The Random function cannot be used in the program mode.

3.5 Repeat Play

A single track or all tracks on the Disc can be played repeatedly.

3.5.1 Single Track Repeat

3.5.2 Press the REPEAT/RANDOM key once during play. The REP LED will flash / REPEAT icon will light. The track which is currently playing will be played repeatedly until the STOP key is pressed.

3.5.3 If the REPEAT/RANDOM key is pressed once during programmed play, the programmed track which is currently playing will be played repeatedly.

3.5.4 To begin Repeat one play in Stop or Pause mode, press the REPEAT/RANDOM key once, then press the PLAY/PAUSE key.

3.5.5 Press the PLAY/PAUSE key to pause the Repeat One playback. The PLAY LED / icon and

the current track number will flash. Press PLAY/PAUSE key again to resume.

3.5.6 Press the STOP key to stop Repeat One playback. The PLAY LED / icon goes off. Press the STOP key again to cancel the Repeat One play mode. The REP LED / icon will go off.

3.5.7 To cancel the Repeat One play mode during Repeat One play, press the REPEAT/RANDOM key until REP LED / icon goes off.

3.5.8 The Repeat One play mode will be canceled when the CD Lid is opened, or when the power is turned off.

3.6 All Tracks Repeat

3.6.1 Press the REPEAT/RANDOM key twice during play. The REP LED / REPEAT ALL icon will light on. All the tracks on a Disc will be played repeatedly until the STOP key is pressed.

3.6.2 If the REPEAT/RANDOM key is pressed twice during programmed play, all programmed tracks will be played repeatedly.

3.6.3 To begin Repeat All play in Stop or Pause mode, press the REPEAT/RANDOM key twice, then press the PLAY/PAUSE key.

3.6.4 Press PLAY/PAUSE key to pause the Repeat All playback. The PLAY LED / icon and the current track number will flash. Press PLAY/PAUSE key again to resume.

3.6.5 Press the STOP key to stop Repeat All playback. The PLAY LED / icon goes off. Press the STOP key again to cancel the Repeat All play mode. The REP LED / REPEAT ALL icon will go off.

3.6.6 To cancel the Repeat All play mode during Repeat All play, press the REPEAT/RANDOM key until the REP LED / REPEAT ALL icon goes off.

3.6.7 The Repeat All play mode will be canceled when the CD Lid is opened, or when the power is turned off.

3.7 Programmed Play

Up to 20 tracks can be entered into the program.

3.7.1 Entering a Program

3.7.1.1 Press the PROGRAM key in the Stop mode. The PROG LED / PROGRAM icon will flash. The program number “P01” shows on the display.

3.7.1.2 Press the UP/FF or DOWN/FR key to selct a track number. The selected track number will flash.

3.7.1.3 Press the PROGRAM key. The first selected track is now programmed. The next program number “P02” will be shown.

3.7.1.4 Repeat step 3.7.1.2 and 3.7.1.3 to enter other tracks into the program.

3.7.1.5 After entering a program, press the PROGRAM key repeatedly to check the program content. The program number and the track number of the programmed track will be shown in order.

3.7.1.6 After entering a program, if the STOP key is pressed before the PLAY/PAUSE key, all of the programmed tracks will be cleared.

3.7.2 Playing a Program

3.7.2.1 After entering a program, press the PLAY/PAUSE key. Programmed play starts from the beginning of the first programmed track. The PROGRAM LED/icon and PLAY LED/icon will light, and the track number which is currently playing will be shown for a while, then return to the Clock display.

3.7.2.2 Press the STOP key to stop programmed play. The PLAY LED/icon will go out.

3.7.2.3 When all of the programmed tracks have been played, the unit will stop.

3.8 Adding/Changing a Track into a Program

3.8.1 Press the STOP key to stop the Program play.

3.8.2 Press the PROGRAM key repeatedly to select the desired program number. The track number of the selected program track will flash.

3.8.3 Press the UP/FF or DOWN/FR key to select the new track.

3.8.4 Press the PROGRAM key to store the selected track into the program.

3.9 Clearing the Program

3.9.1.1 Press the STOP key to stop programmed play.

3.9.1.2 Press the STOP key again to clear the program. the PROGRAM LED/icon goes off.

3.9.1.3 The program will also be cleared when the CD Lid is opened, or when the power is turned off

4. Alarm

The clock time needs to be set before using alarm.

4.1 Setting alarm time

4.1.1 Press and hold the ALARM 1 or ALARM 2 key until clock digits flashes. "ALM1" or "ALM2" LED/icon flashes.

4.1.2 Press repeatedly, or hold down the UP/FF key to adjust the hours.

4.1.3 Press repeatedly, or hold down the DOWN/FR key to adjust the minutes.

4.1.4 Press the corresponding ALARM 1 or ALARM 2 key to confirm the setting.

4.1.5 To review the set alarm time, press the ALARM 1 or ALARM 2 key again.

4.2 Selecting the alarm sound mode

4.2.1 Press the POWER key to switch off the unit.

4.2.2 Select alarm sound mode by pushing FM.AM. BUZZER.CD slide switch.

4.2.3 At the set alarm time, the Tuner, Buzzer or CD will switch on and switch off automatically after about 60mins.

4.2.4 If CD is selected as the alarm sound mode, the Buzzer alarm will automatically replace the CD alarm if no disc is found.

4.3 Switching off the alarm

4.3.1 If you want to stop the alarm immediately but also wish to repeat the alarm at the same time for the following day, press the POWER key during alarm is sounding.

4.3.2 If you want to repeat the alarm at 9-minute intervals, press the SNOOZE key.

4.3.3 If you want to switch off the alarm completely, press the ALARM 1 or ALARM 2 key once or more until ALM1 or ALM2 LED/icon goes off.

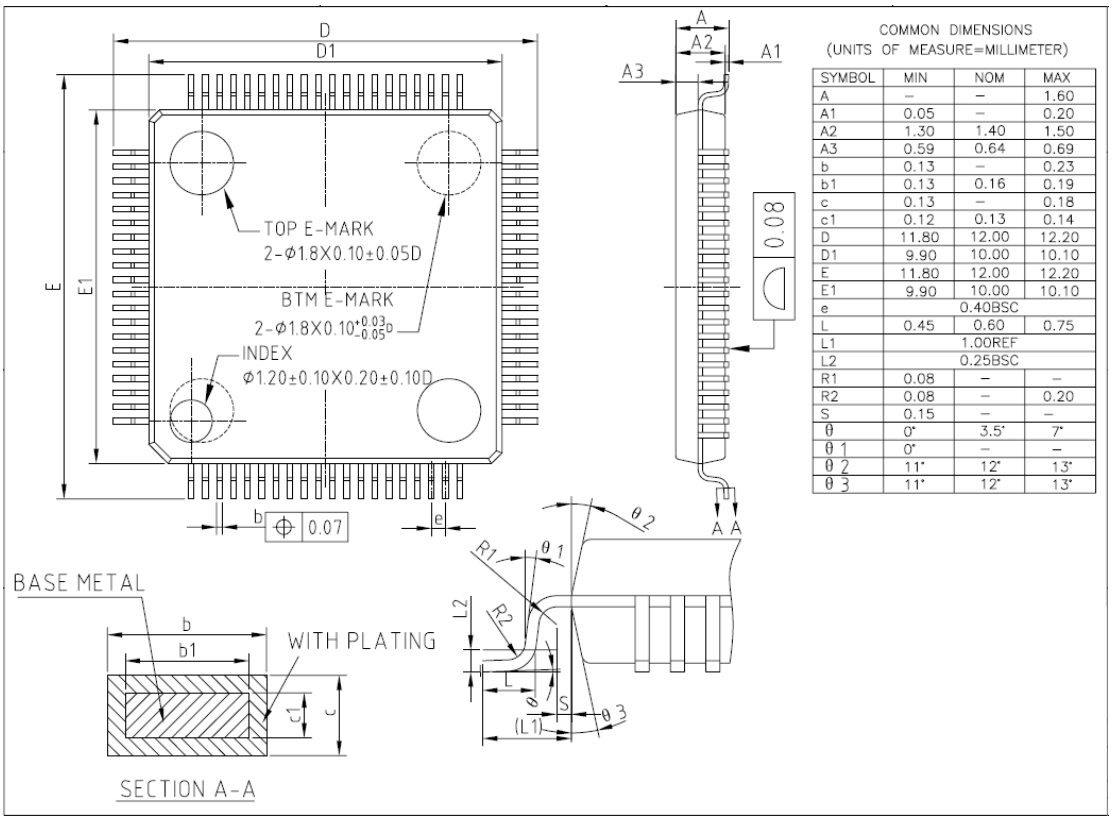
4.4 Sleep

4.4.1.1 Press the SLEEP key repeatedly to select the desired sleep timer in the sequence: 90 (minutes) --> 60 --> 30 --> 15 --> Off. SLEEP LED / icon will on.

4.4.1.2 To cancel the sleep, press the SLEEP key once or more until the SLEEP LED / icon turn off . You can also press the POWER key to turn off the sleep timer.

Chapter 3 Mechanical Data

The device is currently available in an 80-pin LQFP package.



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	–	–	1.60
A1	0.05	–	0.20
A2	1.30	1.40	1.50
A3	0.59	0.64	0.69
b	0.13	–	0.23
b1	0.13	0.16	0.19
c	0.13	–	0.18
c1	0.12	0.13	0.14
D	11.80	12.00	12.20
D1	9.90	10.00	10.10
E	11.80	12.00	12.20
E1	9.90	10.00	10.10
e		0.40BSC	
L	0.45	0.60	0.75
L1		1.00REF	
L2		0.25BSC	
R1	0.08	–	–
R2	0.08	–	0.20
S	0.15	–	–
θ	0°	3.5°	7°
θ1	0°	–	–
θ2	11°	12°	13°
θ3	11°	12°	13°