**Silan**
Microelectronics

CD DIGITAL SERVO SIGNAL PROCESSOR WITH MCU
(2/4 DIGITS LCD DISPLAY AND REMOTE CONTROL)

DESCRIPTION

SC9637B is a CD BOOMBOX project with low cost. It has agile functions and good performance with few external components.

FEATURES

* Compatible with CD/CD-R/CD-RW
* Support CD play /pause
* Support CD previous track/next track
* Support CD skip forward/skip backward
* Support CD single music, and whole disk repeat play display.
* Support CD random play display
* Support program play for 20 music at most
* Support LED and LCD two display modes(Free selecting by jumper, and LED has only 2 digits)
* Support 2digit and 4digit two display modes in LCD mode.(Free selecting by jumper)
* Support browse play(only LCD 4digit)
* Support current play time display(only LCD 4digit)
* Support compatible manual and auto control CD tray..
* Support 10 keys at most, and can select the key according to needed functions.
* Support clock CD options(Select power on auto play)
* Support full function remote control (SC6122)
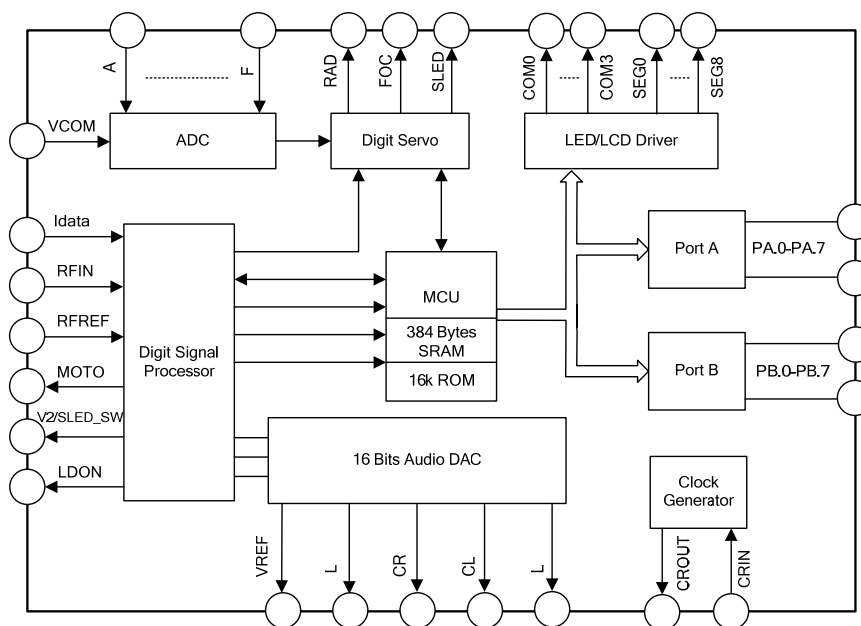* Compatible with various chips(Free selecting by jumper)
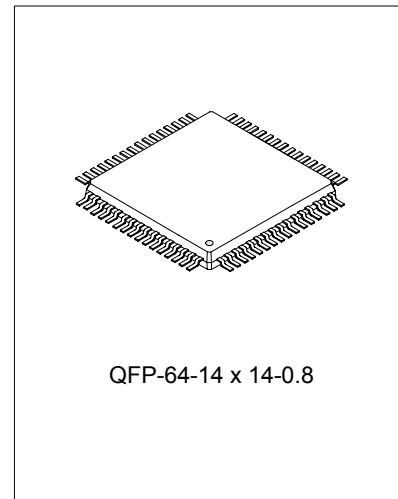
QFP-64-14 x 14-0.8

ORDERING INFORMATION

Device	Package
SC9637B	QFP-64-14X14-0.8

APPLICATIONS

* Desktop CD audio

BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS (Tamb=25°C)

Characteristics	Symbol	Ratings	Unit
Supply Voltage	V_{DD}	-0.5 ~ +5.5	V
Input Voltage On Pins	V_{IN}	-0.5 ~V_{DD} + 0.5	V
Operating Temperature	T_{opr}	-20 ~ +75	°C

ELECTRICAL CHARACTERISTICS(V_{DD}=4.5~5.5V;V_{SS}=0V;T_{amb}=-10~+50°C)

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}		4.5	5.0	5.5	V
Supply Current	I_{DD}	5V(When CD is working)	—	50	—	mA
RFIN Input Signal	V_{RFIN}		—	1	—	V
Reference Voltage	V_{lr}		—	0.5V_{DD}	—	
Common Mode DC	V_{com}		—	2.5	—	V
Input Current Of Central Diode B	I_{DB}		0	—	9	μA
Input Current Of Central Diode A	I_{DA}		0	—	9	μA
Input Current Of Central Diode C	I_{DC}		0	—	9	μA
Input Current Of Central Diode D	I_{DD}		0	—	9	μA
Input Current Of Satellite Diode F	I_{RF}		0	—	4.5	μA
Input Current Of Satellite Diode E	I_{RE}		0	—	4.5	μA
Low-level Input Current at PA Port.	$I_{IL(A)}$		—	10	—	mA
High-level Output Current at PA Port.	$I_{OH(A)}$		—	5	—	mA
Low-level Input Current at PB Port.	$I_{IL(B)}$		—	10	—	mA
High-level Output Current at PB Port.	$I_{OH(B)}$		—	5	—	mA
LDON Low-level Input Current	I_{LDON}		0	—	2	mA
Load Resistance DAC	R_L	Left channel is the same as the right.	5	—	—	KΩ
Full-Scale DAC Output Voltage	V_{FS}	Left channel is the same as the right.	0.9	1.1	1.2	V
RAD Output Current	I_{RAD}	High level is the same as the low level.	0	1	—	mA
FOC Output Current	I_{FOC}	High level is the same as the low level.	0	1	—	mA
SLED Current	I_{SLED}	High level is the same as the low level.	0	1	—	mA
MOTO Output Current	I_{MOTO}	High level is the same as the low level.	0	5	10	mA
Low Level Output Driving Voltage	$V_{OLDRIVE1}$	RAD,FOC,SELD	0	—	0.4	V
High Level Output Driving Voltage	$V_{OHDRIVE1}$	RAD,FOC,SELD	V_{DD}-0.4	—	V_{DD}	V
Moto Low Level Output Voltage	V_{OLmoto}		0	—	1.0	V
Moto High Level Output Voltage	V_{OHmoto}		V_{DD}-1	—	V_{DD}	V

(To be continued)

(Continued)

Characteristics	Symbol	Condition	Min.	Typ.	Max.	Unit
RAD, FOC, SLED, MOTO Output 3-State Leakage Current	IZODRIVE	RAD,FOC,SELD,MOTO	-10	0	+10	μA
DAC Total Harmonic Distortion Plus Noise	(THD+N)/S		60	65	70	dB
DA Filter Attenuation	Filter_DA	0 to 19 kHz	-	-	0.001	dB
		19 to 20 kHz	1	-	2	dB
		24KHz	25	-	-	dB
		25 to 35 KHz	40	-	-	dB
		35 to 64 KHz	50	-	-	dB
		64 to 68 KHz	31	-	-	dB
		68KHz	35	-	-	dB
		69 to 88KHz	40	-	-	dB
OSC Frequency	Fsystem		—	8.4672	—	MHz

PIN CONFIGURATIONS
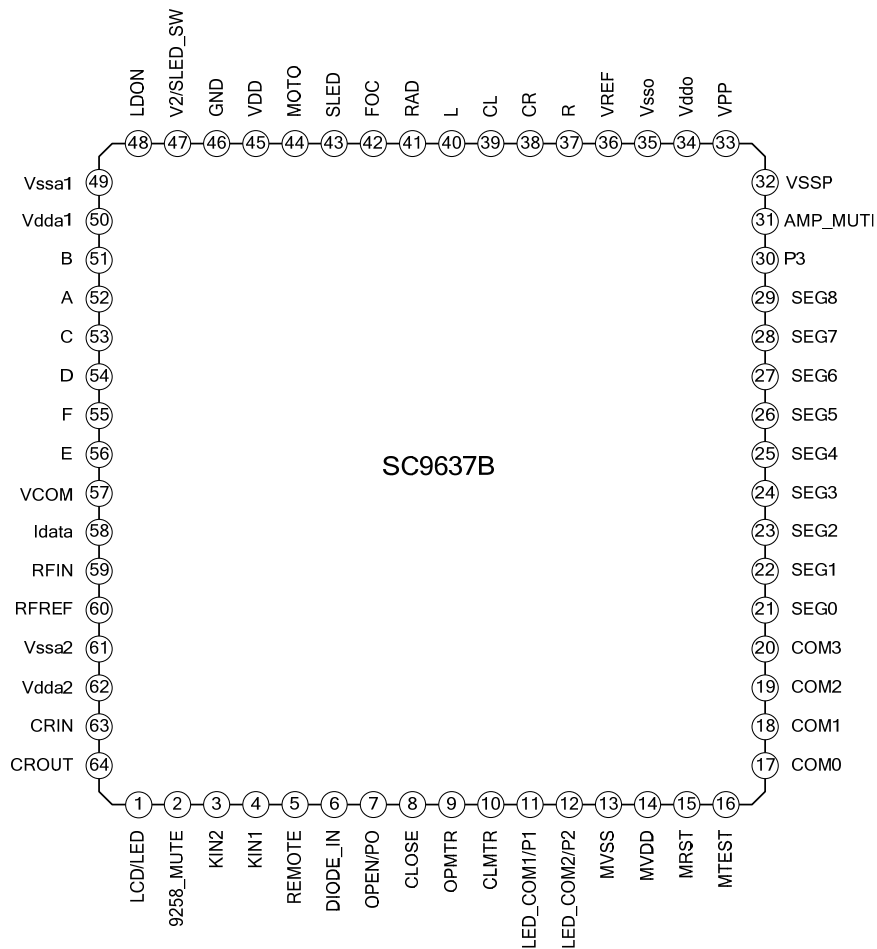
PIN DESCRIPTION

| Pin No.	Symbol	I/O	Description
1	LCD/LED	I	Display mode selecting jumper input When connects to ground, it is LED display. When connects to high level, it is LCD display.
2	9258_MUTE	O	9258 mute output. Close 9285 driver when CD stops.
3	KIN2	I	Key input
4	KIN1	I	Key input
5	REMOTE	I	Remote control decoding input
6	DIODE_IN	I	Jumper selecting input
7	OPEN/P0	I	The CD tray opens input pin which is low active. This pin is used as the jumper selecting output at the same time.
8	CLOSE	I	The CD tray closes input pin which is low active.
9	OPMTR	O	CD tray driver output.
10	CLMTR	O	CD tray driver output.
11	LED_COM1/P1	O	LED display driver COM1 This pin is used as the pick up head selecting output at the same time.
12	LED_COM2/P2	O	LED display driver COM1 This pin is used as the pick up head selecting output at the same time.
13	MVSS	--	MCU GND
14	MVDD	--	MCU power supply.
15	MRST	--	MCU reset pin.
16	MTEST	--	MCU test pin which is connected to the ground.
17	COM0	O	LCD COM0 port
18	COM1	O	LCD COM1 port
19	COM2	O	LCD COM2 port
20	COM3	O	LCD COM3 port
21	SEG0	O	LCD SEG0 port /LED SEG0 port
22	SEG1	O	LCD SEG1 port /LED SEG0 port
23	SEG2	O	LCD SEG2 port /LED SEG0 port
24	SEG3	O	LCD SEG3 port /LED SEG0 port
25	SEG4	O	LCD SEG4 port /LED SEG0 port
26	SEG5	O	LCD SEG5 port /LED SEG0 port
27	SEG6	O	LCD SEG6 port /LED SEG0 port
28	SEG7	O	LCD SEG7 port /LED SEG0 port
29	SEG8	O	LCD SEG8 port/LED SEG0 port
30	P3	O	CD clock selection jumper output. If connect with the diode, auto play when power on.
31	AMP_MUTE	O	Amplifier mute output which is high active.
32	VSSP	--	MCU GND

(To be continued)

(Continued)

Pin No.	Symbol	I/O	Description
33	VPP	--	OTP download power supply.
34	Vddo	--	DAC Power Supply
35	Vsso	--	DAC GND
36	VREF	O	Internal reference voltage output
37	R	O	DAC right channel output
38	CR	--	DAC right channel filter capacitor.
39	CL	--	DAC left channel filter capacitor.
40	L	--	DAC left channel filter capacitor.
41	RAD	O	Tracking drive output
42	FOC	O	Focus drive output
43	SLED	O	Sled drive output
44	MOTO	O	Spindle drive output
45	VDD	--	Servo Supply Voltage
46	GND	--	Servo Ground, I/O ground
47	V2/SLED_SW	I	Sledge motor position monitor signal input
48	LDON	O	Laser control signal output
49	Vssal	--	Analog Ground of Servo Module ADC.
50	Vdda1	--	Analog Supply Voltage of Servo Module ADC.
51	B	I	Central diode current signal input B
52	A	I	Central diode current signal input A
53	C	I	Central diode current signal input C
54	D	I	Central diode current signal input D
55	F	I	Satellite diode current signal input F
56	E	I	Satellite diode current signal input E
57	VCOM	I	DC Voltage Input
58	Idata	O	Data Slice feed-back current output
59	RFIN	I	EFM signal input
60	RFREF	I	Reference Signal.
61	Vssa2	--	Servo module HF and the analog ground of PLL.
62	Vdda2	--	Servo module HF and the analog power supply of PLL.
63	CRIN	I	8.4672MHz input
64	CROUT	O	8.4672MHz output

FUNCTION DESCRIPTION

1. LED illustration
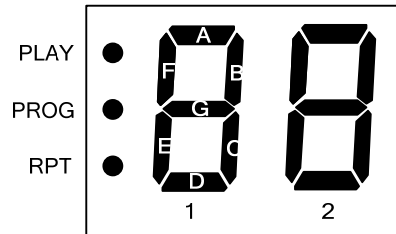
The connection in details is as follows:
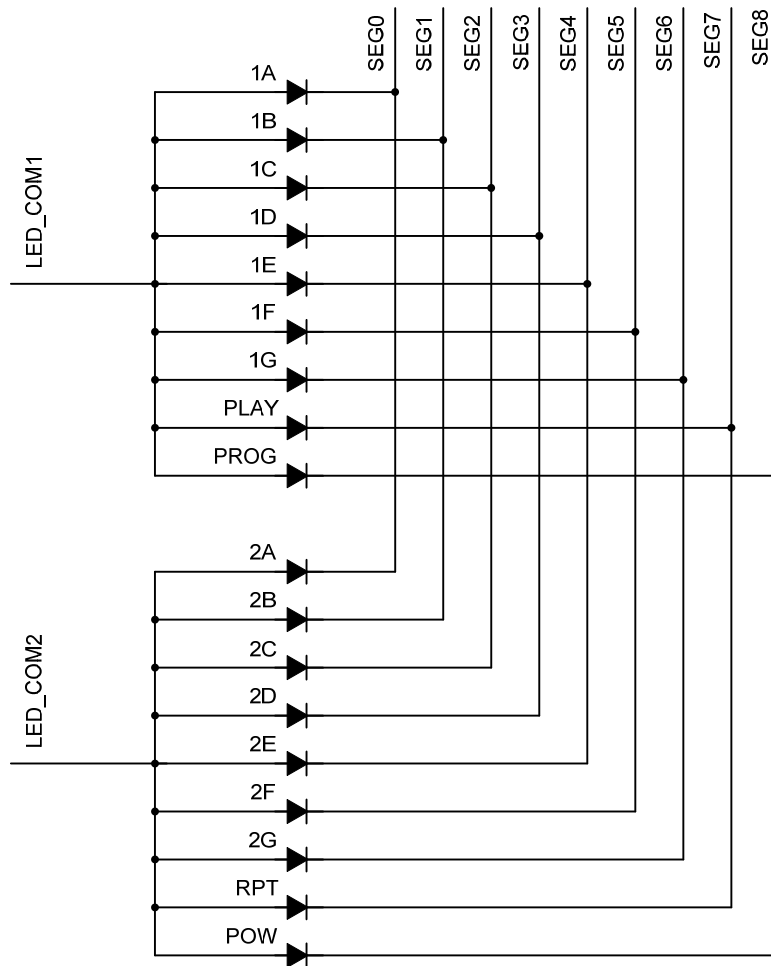
2. LCD illustration

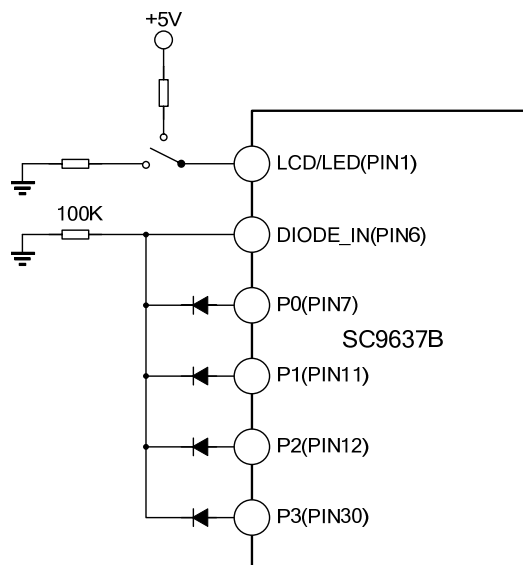The circuit adopts LCD of 4×10, 5V, 1/4duty, and 1/3bias, and the panel is as follows:

4 DIGIT:

2 DIGIT:
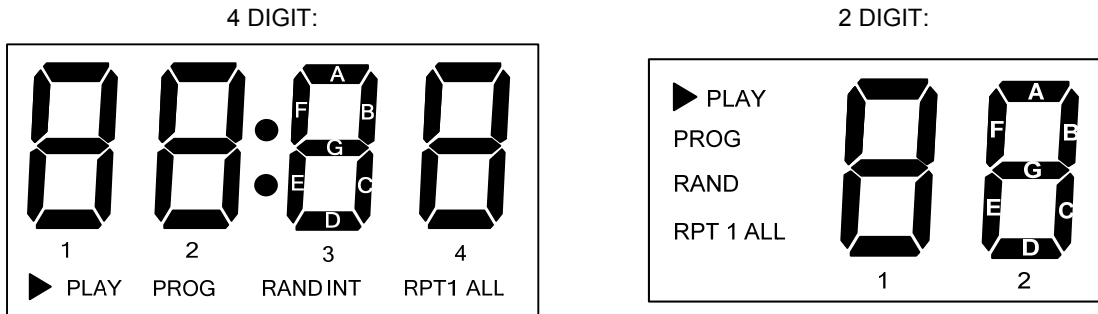
Corresponding truth table:

	COM0	COM1	COM2	COM3
SEG0	1	RAND	RPT	PROG
SEG1	ALL	1F	1G	1E
SEG2	1A	1B	1C	1D
SEG3	▶ PLAY	2F	2G	2E
SEG4	2A	2B	2C	2D
SEG5	⦂	3F	3G	3E
SEG6	3A	3B	3C	3D
SEG7	INT	4F	4G	4E
SEG8	4A	4B	4C	4D

3. Jumper

Jumper Description

Function Description in details (note: if it is 1, the jumper diode is connected)

Flag	Function Description		
LCD/LED(PIN1)	Select LED or LCD display mode		
	LCD/LED	**Function**	
	0	LED mode(connect to GND)	
	1	LCD mode(connect to high level)	
P0(PIN7)	This jumper is used to determine whether to play at once after complete reading the TOC in LED mode.		
	P0	**Function**	
	0	Stop after complete reading TOC.	
	1	Play the first track after complete reading TOC.	
P0(PIN7)	This jumper is used to select 2digit mode or 4digit mode in LCD mode.		
	P0	**Function**	
	0	2digit display	
	1	4digit display	
P1(PIN11)/P2(PIN12)	Select pick up head		
	P1	**P2**	**Function**
	0	0	SANYO DA11
	0	1	SONY KSS213C, SUMSUNG B31
	1	0	THOMSON TCP11
	1	1	JIANGHAIGM9350
P3(PIN30)	CD clock option		
	P3	**Function**	
	0	Stop after complete reading TOC when power on.	
	1	Play the first track after complete reading TOC when power on.	
	STOP_CLOCK	Function	

4. Keyboard

1. Keyboard Arrangement:

KIN1	KIN2	
PLAY/PAUSE	OPEN/CLOSE	(0.00V) ~
STOP	DISPLAY	(0.54V) ~
NEXT/FF	INTRO	(1.09V) ~
PREV/REW		(1.56V) ~
RPT		(2.18V) ~
PROG		(2.73V) ~
RAND		(3.35V) ~
PROG/RPT		(3.98V) ~ (4.68V)

2. The keyboard Arrangement of the remote controller:

	KI0	KI1	KI2
KO0	PLAY(00 H)	STOP(01 H)	NEXT(02 H)
KO1	PREV(04 H)	RPT(05 H)	PROG(06 H)
KO2	PROG/RPT (08 H)	RAND(09 H)	OPEN/CLOSE (0A H)
KO3	DISP(0C H)	INTRO(0D H)	

5. CD mode

5.1 CD Key Functions

1) STOP

   ✧ Press this key when the CD plays will stop the CD play, but do not clear the repeat and programming state.

   ✧ Press this key when the CD stops, it will clear the repeat and programming state.

2) PLAY/PAUSE

   ✧ When CD stops, it will play if press this key, and display the CD track;

   ✧ When CD plays, it will pause if press this key, and the display flashes.

3) NEXT/FF

   ✧ Next track in selecting mode.

   ✧ Press this key less than 1 second; skip to next track in playing mode.

   ✧ Press this key less than 1 second, skip forward.

4) PREV/FW

   ✧ Last track in selecting mode.

   ✧ In playing mode, press this key less than 1 second; skip to last track and if the play time is over 3 seconds, than skip to the first track.

   ✧ In playing mode, press this key more than 1 second, skip backforward.

5) RAND

   ✧ Switch to random play state.

   ✧ Display rotative light in LED mode.

   ✧ Display RDM flag in LCD mode.

6) RPT

   ✧ Switch to single track or repeat the whole disk state.

   ✧ Press the key RPT to repeat the current track, and "RPT" flashes.

   ✧ Press the key RPT again; repeat the whole disk, and "RPT" display.

7) PROG

   ✧ Enter the programming state (active in STOP sate), and "PROG" flashes.

   ✧ Press REW/FF to select the music, and PROG is to store the music; Programming number increases by 1, and it can store 20 tracks at most. If there is no operation in 30 seconds, exit the programming state, while the tracks are reserved.

   ✧ After complete programming, press the key PLAY to enter the programming play state, and "PROG" lights.

8) OPEN/CLOSE

   ✧ When the CD tray is closed, if press this key, CD stops and is out of the tray.

   ✧ When the CD tray is open, if press this key, close the tray.

9) INTRO

   ✧ Press this key to enter the audition mode. Each music plays for 10 seconds (only in LCD 4digit mode).

5.2 LED display

1）When the CD tray is open, display.
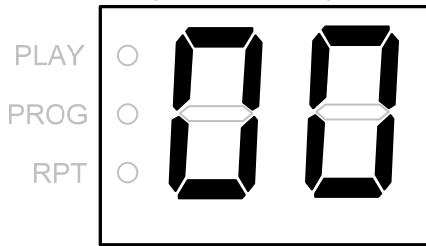
PLAY ○
PROG ○
RPT ○
00

2）When reading TOC, flashes.

PLAY
PROG
RPT
--

3）After complete reading TOC, display the max. Music number.

PLAY ○
PROG ○
RPT ○
16

4）When play, the PLAY lights.

PLAY ●
PROG ○
RPT ○
5

5）When pause, the PLAY flashes.

PLAY ●
PROG ○
RPT ○
5

6）When programming play, the PROG lights

PLAY ●
PROG ●
RPT ○
8

7）When random play, light and the music number display by turns.
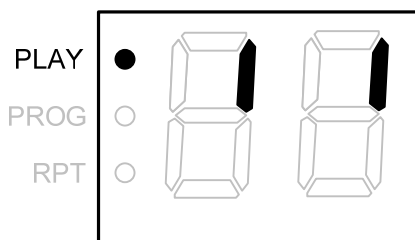
PLAY ●
PROG ○
RPT ○
11

8）When repeat the single music, the RPT flashes.
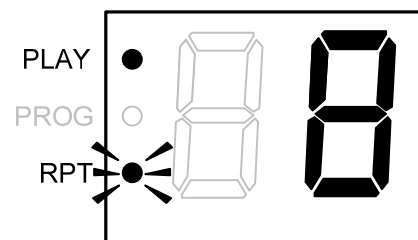
PLAY ●
PROG ○
RPT ●
8

9）When repeat the whole disk, the RPT lights.

PLAY ●
PROG ○
RPT ●
8
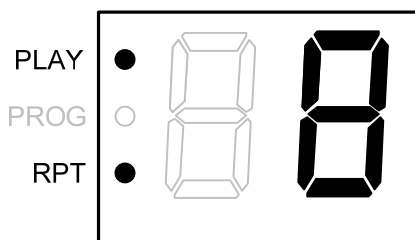
10）When select the music, the music number flashes
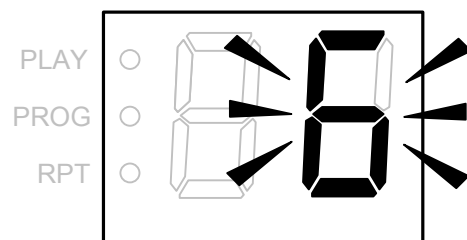
PLAY ○
PROG ○
RPT ○
6

5.3 LCD display（2 DIGIT）

1）When the CD tray opens, display.
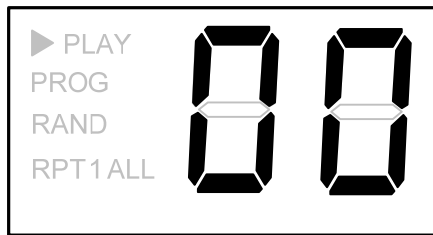
2）When read TOC, flashes.
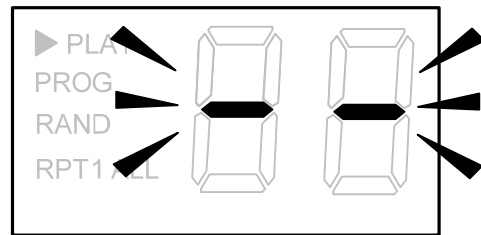
3）After complete reading TOC, display the max. music number.
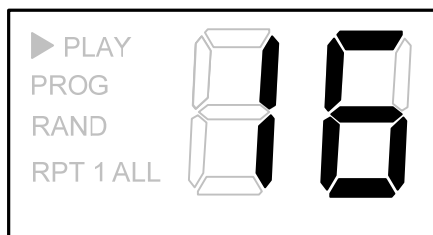
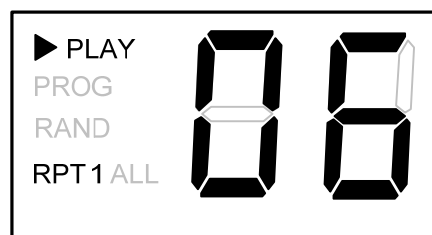4）When play, the PLAY lights.
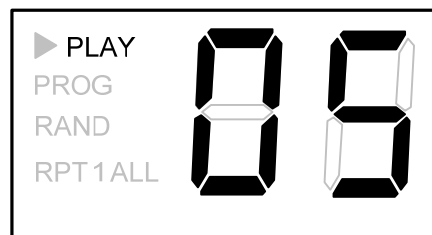
5）When pause, the PLAY flashes.
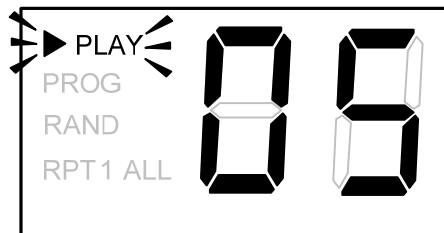
6）When programming play, the PROG lights.
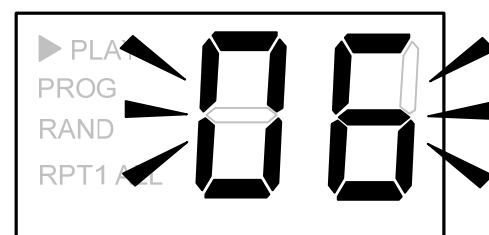
7）When random play, the RAND lights.
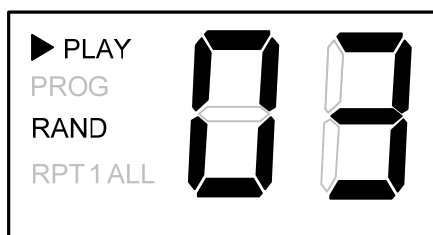
8）When repeat the single music:

9）When repeat the whole disk:
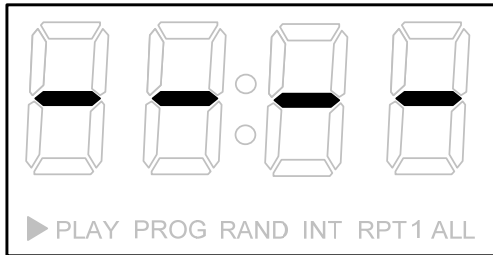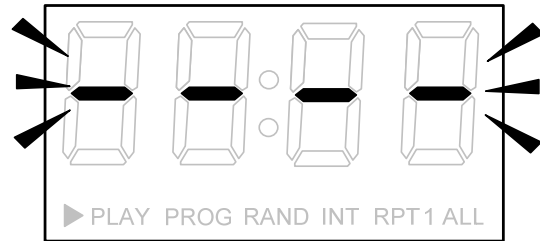
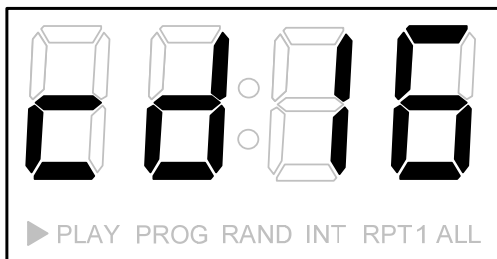10）When select the music, the music number flashes.

5.4 LCD display（4 DIGIT）

1）When the CD tray is open, display.

▶ PLAY PROG RAND INT RPT1 ALL

2）When read TOC, flashes.

▶ PLAY PROG RAND INT RPT1 ALL

3）Display the max track number after complete reading the TOC:

`cd 16`

▶ PLAY PROG RAND INT RPT1 ALL

4）Display the current time when playing：

`02:15`

▶ PLAY PROG RAND INT RPT1 ALL

5）Pause:

`02:15`

▶ PLAY PROG RAND INT RPT1 ALL

6）Random play:

`02:15`

▶ PLAY PROG RAND INT RPT1 ALL
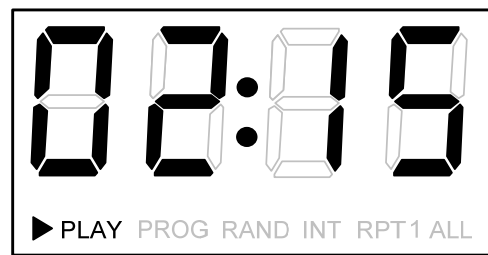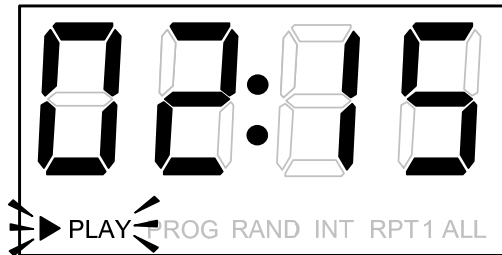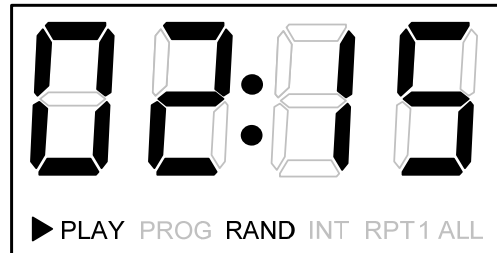
7）Repeat the single track:

`02:15`

▶ PLAY PROG RAND INT RPT1 ALL

8）Repeat the whole disk:

`02:15`

▶ PLAY PROG RAND INT RPT1 ALL
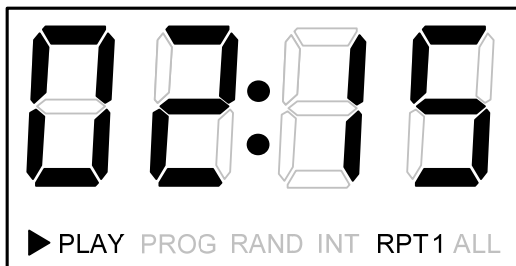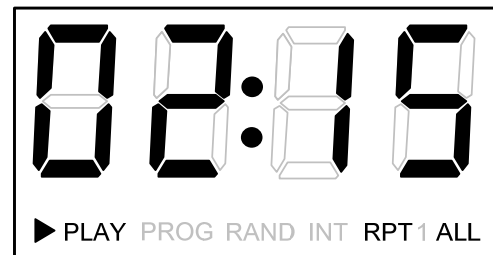
9）The number of track flashes when programming:

`0307`

▶ PLAY PROG RAND INT RPT1 ALL
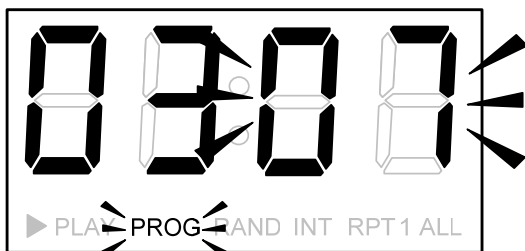
APPLICATION CIRCUIT

1. **LED display mode**
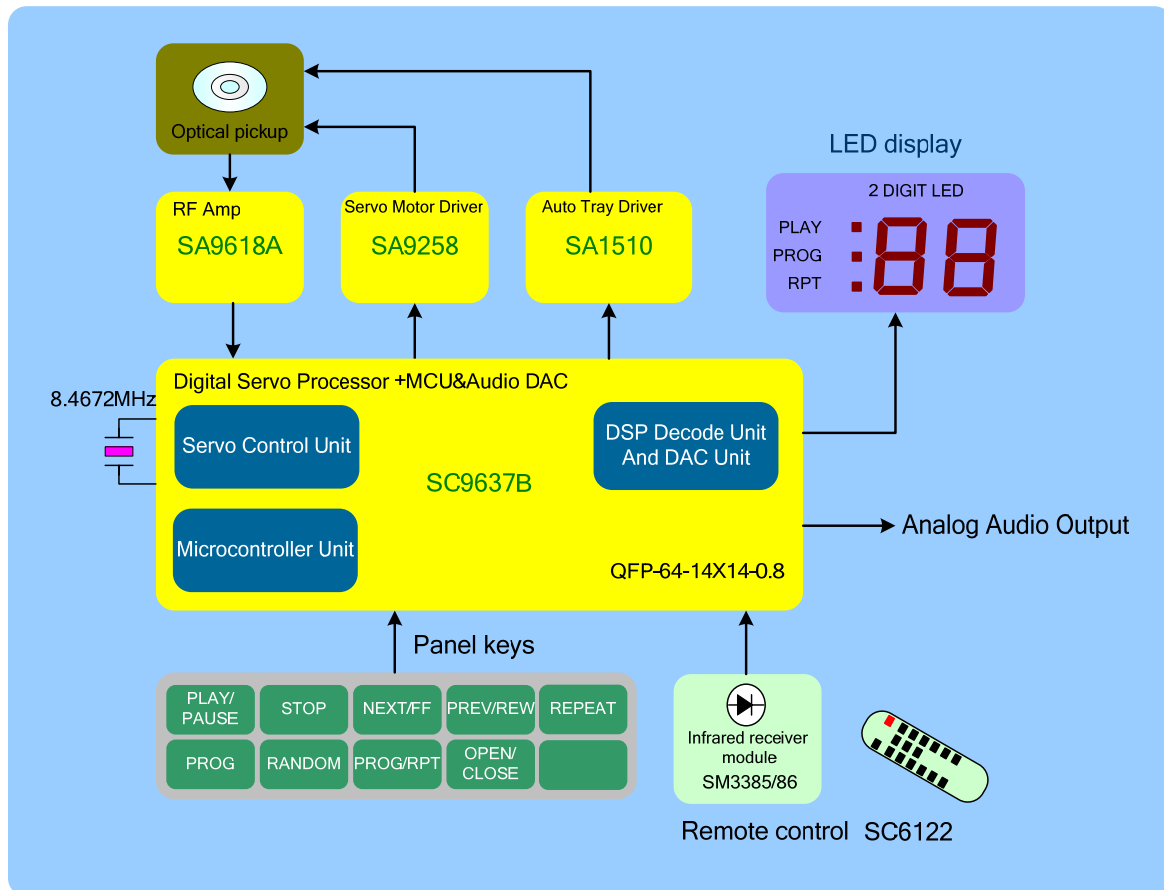
Optical pickup

RF Amp
SA9618A

Servo Motor Driver
SA9258

Auto Tray Driver
SA1510

LED display
2 DIGIT LED
PLAY
PROG
RPT

8.4672MHz

Digital Servo Processor +MCU&Audio DAC
Servo Control Unit
SC9637B
Microcontroller Unit
DSP Decode Unit
And DAC Unit
QFP-64-14X14-0.8

Analog Audio Output

Panel keys

| PLAY/PAUSE | STOP | NEXT/FF | PREV/REW | REPEAT |
| PROG | RANDOM | PROG/RPT | OPEN/CLOSE | |

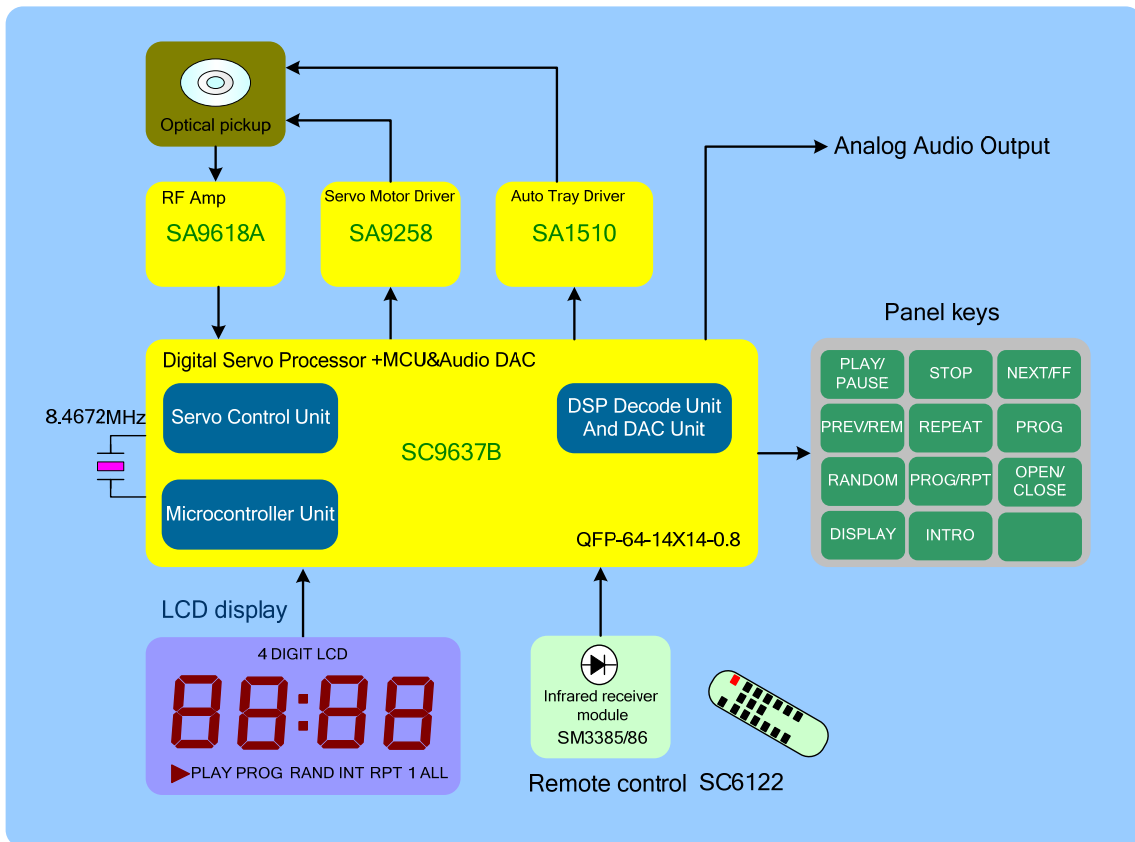Infrared receiver module
SM3385/86

Remote control SC6122

FEATURES:

* Pickup matching: THOMSON TCP11;

SONY KSS2132C;

SAMSUNG B31/33/B35;

SANYO DA11;

GM9350;

* CD/RW COMPATIBLE

2. LCD display mode

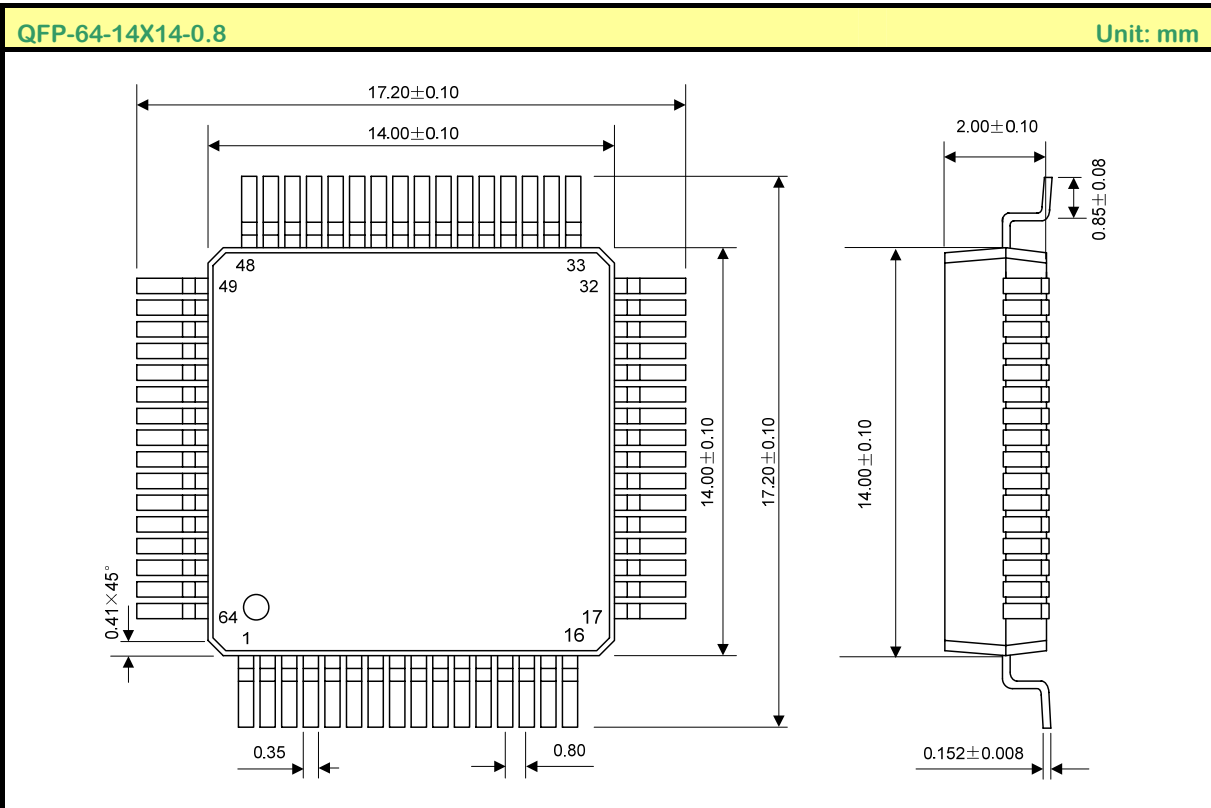

FEATURES:

* Pickup matching: THOMSON TCP11;

SONY KSS2132C;

SAMSUNG B31/33/B35;

SANYO DA11;

GM9350;

* CD/RW COMPATIBLE

PACKAGE OUTLINE

QFP-64-14X14-0.8   Unit: mm

MOS DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

Disclaimer:

- Silan reserves the right to make changes to the information herein for the improvement of the design and performance without further notice!
- All semiconductor products malfunction or fail with some probability under special conditions. When using Silan products in system design or complete machine manufacturing, it is the responsibility of the buyer to comply with the safety standards strictly and take essential measures to avoid situations in which a malfunction or failure of such Silan products could cause loss of body injury or damage to property.
- Silan will supply the best possible product for customers!