HT3670C
Electronic Drum

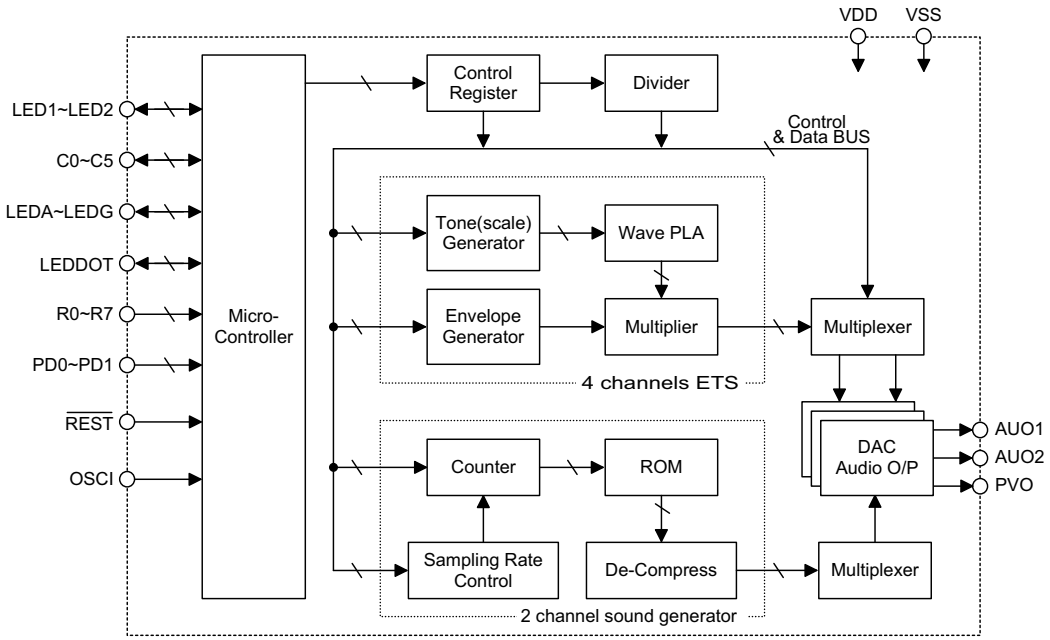
Features

- Operating voltage: 3.3V~5.2V
- System frequency: 3.58MHz
- RC type oscillator
- Low standby current
- Three 8-bit D/A audio outputs
- Embedded Holtek 8-bit microcontroller
- Four channel melody processing
- Two channel sound processing
- Eight level main volume control
- Power on/off indication music
- 2 min. auto power off alert sound
- 36 rhythm/fill-in effects
- 13 percussion pads provided for selection of 18 effects
- Two 7-segment LED drive capability
- Adjustable tempo
- 40-pin DIP or die form package

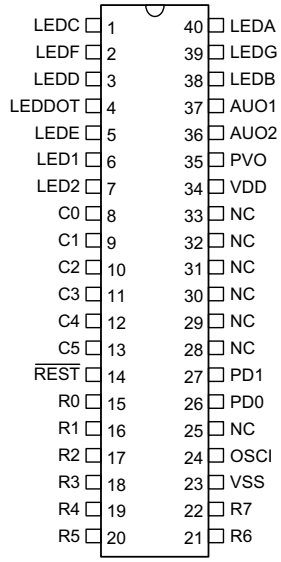
General Description

The HT3670C is a CMOS VLSI designed specifically for Electronic Drum sound applications. With a comprehensive range of 18 instruments and 36 rhythm/fill-in effects, the device provides an exceptional amount of sound flexibility for a multitude of drum sound applications. Other important sound functions are provided in the way of adjustable tempo and volume keys in addition to replay and demo key functions. With the ability to control an external keypad and with full control over the internal sound processing circuits, Holtek's embedded fully functional 8-bit microcontroller provides the programmable ability to create many varied and multi functional applications. Sound output is provided through a four-channel ETS (Electronic Tone Synthesizer) in addition to a two-channel sound processing circuit.

Block Diagram

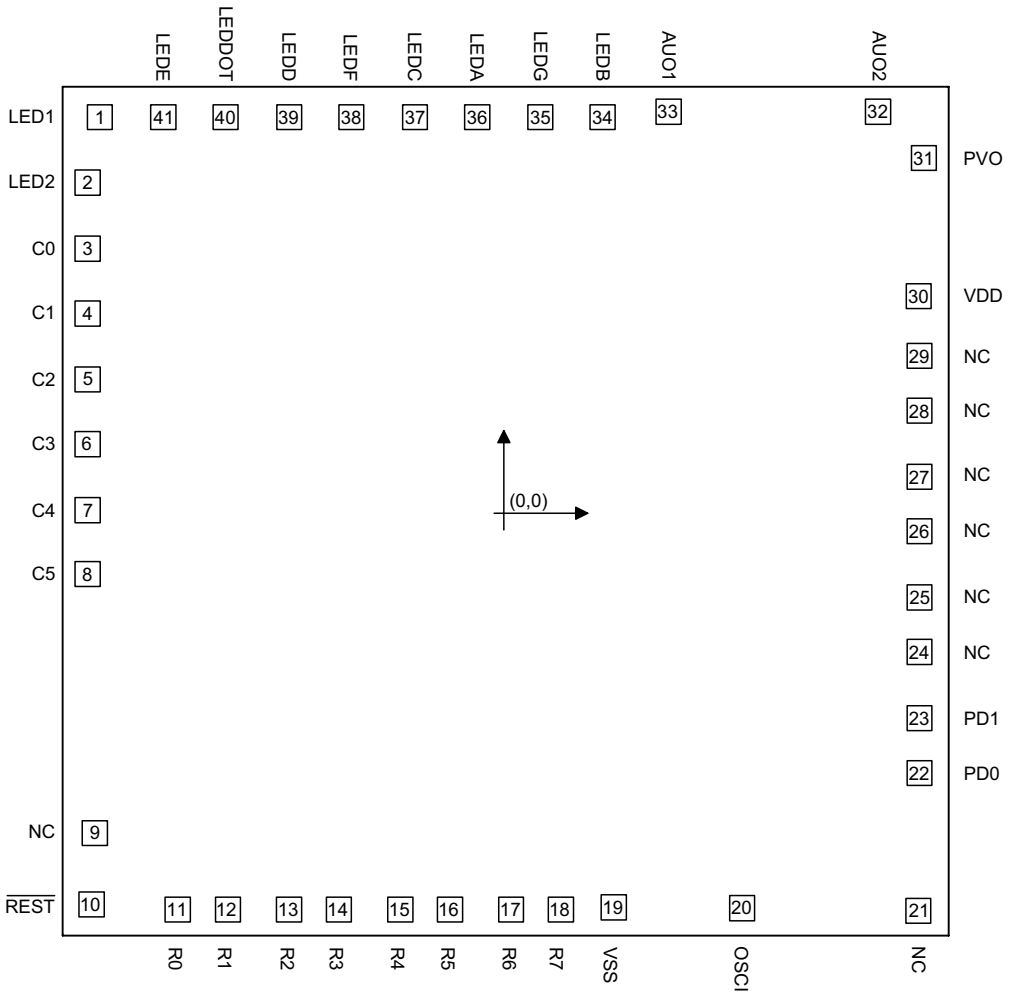


Pin Assignment



HT3670C
– 40 DIP

Pad Assignment



Chip size: 3770 × 3700 $(\mu m)^2$

* The IC substrate should be connected to VSS in the PCB layout artwork.

Pad Coordinates

Unit: μm

Pad No.	X	Y	Pad No.	X	Y
1	–1655.80	1623.00	22	1704.80	–1066.50
2	–1706.70	1354.30	23	1704.80	–841.70
3	–1706.70	1083.50	24	1704.80	–570.90
4	–1706.70	818.90	25	1704.80	–346.10
5	–1706.70	548.10	26	1704.80	–75.30
6	–1706.70	283.50	27	1704.80	149.50
7	1706.70	12.70	28	1704.80	420.30
8	1706.70	251.90	29	1704.80	645.10
9	1676.90	1312.20	30	1701.30	890.30
10	1689.90	1604.00	31	1722.40	1455.40
11	1336.10	1625.90	32	1535.90	1645.50
12	1131.30	1625.90	33	676.10	1645.50
13	880.50	1625.90	34	405.80	1623.00
14	675.70	1625.90	35	151.20	1623.00
15	424.90	1625.90	36	109.60	1623.00
16	220.10	1625.90	37	364.20	1623.00
17	30.70	1625.90	38	625.00	1623.00
18	235.50	1625.90	39	879.60	1623.00
19	452.60	1617.00	40	140.40	1623.00
20	977.70	1620.60	41	1395.00	1623.00
21	1699.40	1630.10			

Pad Description

Pad No.	Pad Name	I/O	Internal Connection	Description
1 2 34 35 36 37 38 39 40 41	LED1 LED2 LEDB LEDG LEDA LEDC LEDF LEDD LEDDOT LEDE	O	CMOS	CMOS output for LED driving
3~6	C0~C3	O	CMOS	Keyboard scanning outputs
7	C4	O	CMOS	2 min. Auto power off control switch.
8	C5	O	CMOS	Power on/off
9, 21 24~29	NC	—	—	No connection

Pad No.	Pad Name	I/O	Internal Connection	Description
10	$\overline{\text{REST}}$	I	CMOS	System reset input pad for the μC, active low
11~18	R0~R7	I	CMOS Pull-high	Keyboard scanning inputs
19	VSS	—	—	Power supply, ground
20	OSCI	O	—	OSCI connect to an RC network for an internal system clock.
22~23	PD0~PD1	I	Input without Pull-high	Bonding option for auto power off & auto bass chord
30	VDD	—	—	Positive power supply
31	PVO	O	PMOS	Percussion signal output The output of PVO is of a current type D/A.
32 33	AUO2 AUO1	O	PMOS	Audio signal outputs The outputs of AUO1~AUO2 are of a current type D/A. The outputs of melody channels 0~1 are from AUO1 whereas the outputs of channels 2~3 from AUO2.

Absolute Maximum Ratings

Supply Voltage .....–0.3V to 5.5V

Input Voltage ..... V_{SS}–0.3V to V_{DD}+0.3V

Storage Temperature .....–50°C to 125°C

Operating Temperature .....0°C to 70°C

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Electrical Characteristics

Ta=25°C

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V_{DD}	Conditions				
V_{DD}	Operating Voltage		—	3.3	4.5	5.2	V
I_{DD}	Operating Current	4.5V	No load f_{OSC}=3.58MHz	—	3.5	7.0	mA
I_{STB}	Standby Current	4.5V	No load system halt	—	2	10	μA
I_{AUD}	max. Output Current (for AUO1, AUO2)	4.5V	V_{OH}=0.6V	–1.4	–2.2	–3.08	mA
I_{PVO}	max. Output Current (for PVO)	4.5V	V_{OH}=0.6V	–1.4	–2.2	–3.08	mA
I_{OL}	Sink Current (for Ports A, B)	4.5V	V_{OL}=0.45V	5.4	9	—	mA
I_{OH}	Source Current (for Ports A, B)	4.5V	V_{OH}=4.05V	–1.8	–3	—	mA
I_{IL}	Input Current (for Ports A, B, C, D with Pull-high Resistor)	4.5V	V_{IL}=0V	80	130	260	μA
V_{IH}	Input High Voltage for Input Port		—	$0.8V_{DD}$	—	V_{DD}	V
V_{IL}	Input Low Voltage for Input Port		—	V_{SS}	—	$0.2V_{DD}$	V
f_{OSC}	System Frequency	4.5V	3.58MHz crystal or R_{OSC}	—	3.58	—	MHz
t_{WDTOSC}	Watchdog Oscillator	—	—	31	78	140	μs
t_{WDT1}	Watchdog Time-out Period (RC)	—	Without WDT prescaler	8	20	36	ms
t_{WDT2}	Watchdog Time-out Period (system clock)	—	Without WDT prescaler	—	1024	—	t_{SYS}
$t_{\overline{RES}}$	External Reset Low Pulse Width	—	—	1	—	—	μs
$t_{\overline{INT}}$	Interrupt Pulse Width	—	—	1	—	—	μs

Note: $t_{SYS}=1/f_{SYS}$

Functional Description

The HT3670C is a VLSI CMOS device specifically designed to offer maximum drum and rhythm sound flexibility for many drum instrument applications. The device provides 13 percussion pads each of which can select from a range of 18 percussion instruments. The additional choice of 36 rhythm/fill-in sounds, from which one can be chosen using 6 selection keys, supplies the additional backing sounds. Other important sound functions are provided in the way of adjustable tempo and volume keys in addition to replay and demo key functions. By utilizing a fully functional embedded Holtek 8-bit microcontroller, the device has the means to fully control a multi-key input keypad as well as having the ability to control the internal ETS (Electronic Tone Synthesizer). After receiving the required action from the keypad, the microcontroller will generate and send the correct control code to the ETS to produce the required drum sound signals. The sound outputs appear on two melody outputs and a single sound output, all driven by current type D/A converters. Internal hardware circuitry is also provided to drive two seven-segment LED displays which together with connection to an appropriate external sound amplifier, a complete and fully programmable drum sound system can be created.

Rhythm listing

The following table lists the range of 36 rhythms available. The rhythm to be played chosen can be selected using the 6 selection keys, the corresponding number will be displayed on the LED display.

No.	Rhythm	No.	Rhythm
00	Dance Pop	30	Reggae
01	Folk Rock	31	Rock & Roll
02	Casa	32	Samba
03	Funk	33	Soul
04	Rap	34	Tango
05	Pop Rock	35	Twist
10	Hard Rock	40	Waltz
11	Disco Party	41	Mambo
12	Rave	42	Pop Bossa
13	Dance	43	Polka
14	8 Beat	44	Disco Soul
15	Beguine	45	R&B
20	Bigband	50	Blues
21	Boogie	51	Merengue
22	Chacha	52	16 Beat Pop
23	Disco Pop	53	8 Beat Light
24	Latin Rock	54	Fusion
25	March	55	Pop Shuffle

Instrument Listing

The following table lists the range of percussion instruments that can be chosen. By using the Pad Left/Right Keys and the corresponding Pad Key, each one of the 13 drum pads can select an individual instrument from the following list.

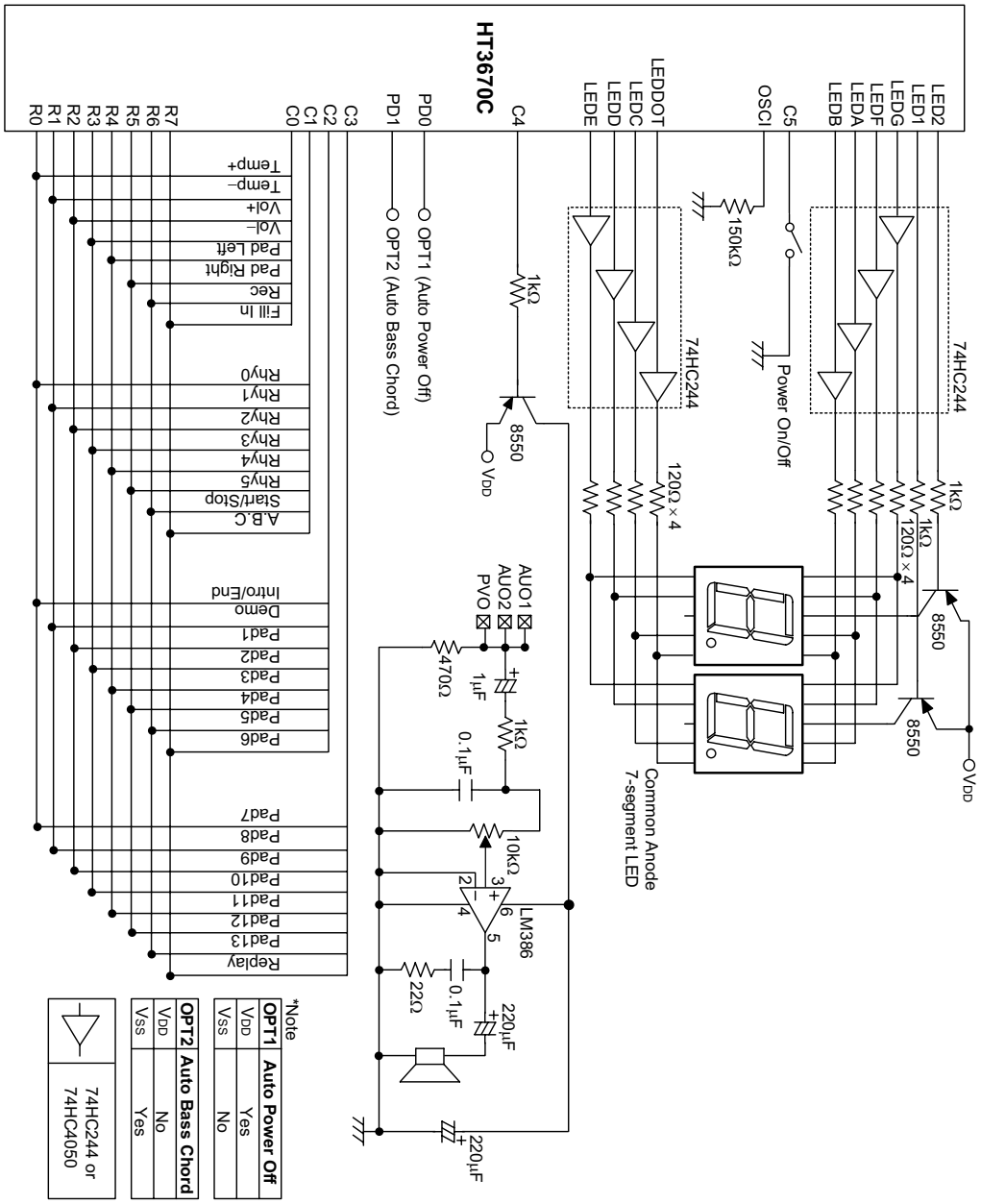
No.	Instrument	No.	Instrument
1	Bass Drum	10	Cowbell
2	E-Snare	11	Bongo
3	Hand Clap	12	Scratch
4	Snare Drum	13	Conga
5	Hi-Hat Close	14	Timbale
6	Hi-Hat Open	15	Guiro Long
7	Crash Cymbal	16	Mid Tom
8	Ha	17	E-Tom
9	Ya	18	Whistle

Key listing

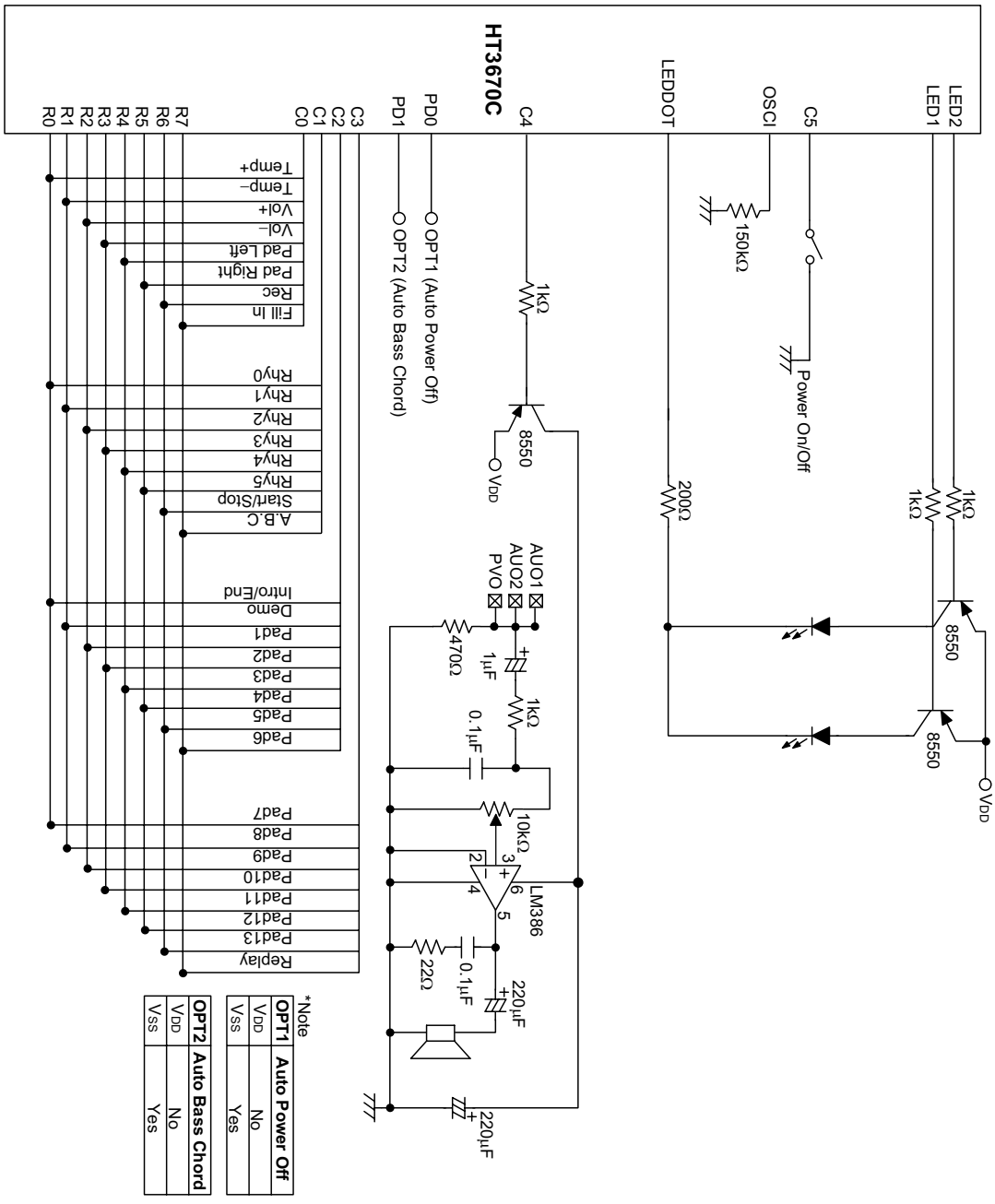
The following table shows the function assigned to each of the keypad switches. To understand how the keypad switches correspond to the IC pins please refer to the application circuits.

Key	Content
Pad1~13	Total of 13 input drum percussion pads
Rhy0~5	These 6 selection keys select the required rhythm from a total choice of 36
T+ & T–	Tempo control Up/Down, when pressed a Beep sound will be heard unless the upper or lower limit is reached
V+ & V–	Volume control Up/Down, when this key is pressed a Beep sound will be heard unless the upper or lower limit is reached, the default volume is set to be the largest volume setting
Pad Left & Pad Right	Assigns one of the 18 percussion sounds to each of the 13 keys; pressing either the Pad Left/Right key and then pressing the corresponding drum pad key will change the presently assigned sound of that key one position to the left or to the right
Start/Stop	Toggle function key to start or stop the rhythm
Fill In	Total of 36 kinds
Rec	The internal memory can record up to 8 drum beats
A.B.C	Auto Bass Chord On/Off
Intro/Ending	Before playing the Rhythm, the key′s function is Intro; after playing the keys′ function is Ending
Demo	Pressing the Demo key will sequentially play all the Rhythms starting from 00, pressing again or pressing the Start/Stop key will stop Play
Replay	Repeat play of the recorded content

Application Circuits



*Note: 74HC244 buffer chip is used to increase the lightness of the 7-segment LED display.
It can be omitted under cost effective considerations.


HT3670C
LED2
LED1
LEDDOT
OSCI
C5
C4
PD0
PD1
C3
C2
C1
C0
R0
R1
R2
R3
R4
R5
R6
R7
1kΩ
1kΩ
200Ω
150kΩ
Power On/Off
8550
8550
VDD
1kΩ
8550
VDD
OPT1 (Auto Power Off)
OPT2 (Auto Bass Chord)
AUO1
AUO2
PVO
470Ω
1μF
1kΩ
0.1μF
10kΩ
LM386
22Ω
0.1μF
220μF
220μF
Temp+
Temp−
Vol+
Vol−
Pad Left
Pad Right
Rec
Fill In
Rhy0
Rhy1
Rhy2
Rhy3
Rhy4
Rhy5
Start/Stop
A.B.C
Intro/End
Demo
Pad1
Pad2
Pad3
Pad4
Pad5
Pad6
Pad7
Pad8
Pad9
Pad10
Pad11
Pad12
Pad13
Replay
*Note
OPT1 Auto Power Off
VDD No
VSS Yes
OPT2 Auto Bass Chord
VDD No
VSS Yes

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