HT1300
Analog Alarm Clock

Features

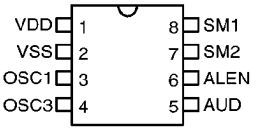
- Operating voltage: 1.2V ~ 1.8V
- Low operating current
- Alarm sound output
- Minimal external components
- Stepper motor driving duty, 46.875ms for HT1300 and 31.25ms for HT1300A
- Direct output for driving stepper motor.
- 32768Hz crystal as system clock.
- Oscillator capacitance adjustable by bonding option.
- 8 pin dual-in-line package.

General Description

The HT1300/HT1300A is a CMOS LSI specially designed for general analog clock motor drivers.

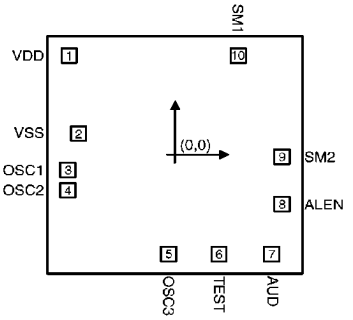
The HT1300/HT1300A directly drives the stepper motor and provides the alarm function.

Pin Assignment



HT1300
HT1300A

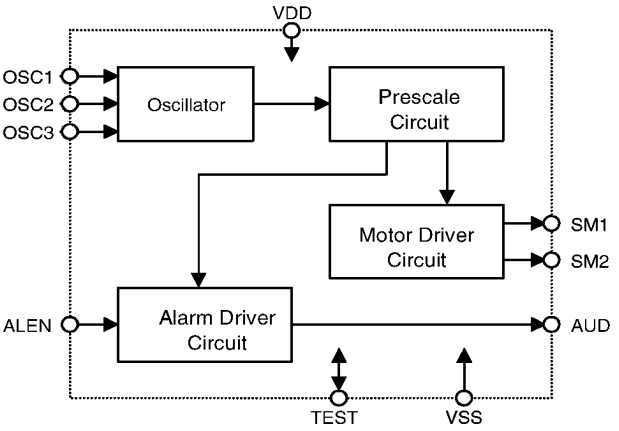
Pad Assignment



Chip Size: 72×70 (mil)^2

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

Block Diagram



Pad Coordinates

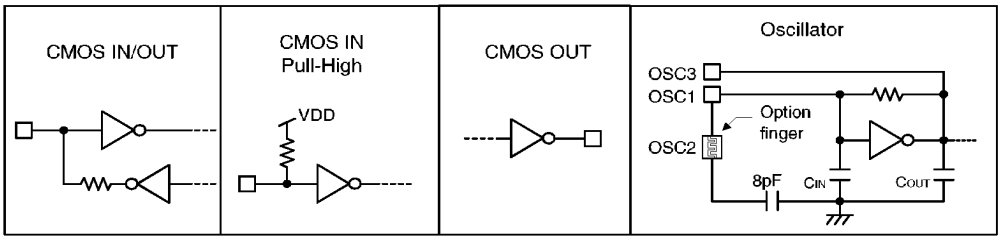
Unit: mil

Pad No.	X	Y	Pad No.	X	Y
1	–29.81	29.35	6	12.47	–29.35
2	–27.18	6.31	7	27.35	–29.35
3	–30.24	–4.53	8	30.24	–14.60
4	–30.24	–10.48	9	30.24	–0.62
5	–1.81	–29.35	10	17.87	29.35

Pad Description

Pad No.	Pad Name	I/O	Internal Connection	Decsription
1	VDD	I	—	Power supply (positive).
2	VSS	I	—	Power supply (ground).
3,4	OSC1, OSC2	I	CMOS	Oscillator input. The OSC2 is an option finger. If the option finger is short-circuited by bonding, the internal capacitor (8 pF) will be added to the oscillator input. For details refer to the functional description.
5	OSC3	O	CMOS	Oscillator output.
6	TEST	I/O	CMOS	For IC test only.
7	AUD	O	CMOS	The alarm sound output. Controlled by ALEN. For waveforms refer to the functional description.
8	ALEN	I	CMOS Pull-High	Alarm sound output control pad. When the ALEN is connected to a low voltage (VSS) the AUD will sound the alarms.
9, 10	SM2, SM1	O	CMOS	Stepper motor drive output. SM1 and SM2 are alternate to generate the high driving pulses (or low pulse by mask option). The duration of driving pulse is 46.875ms (HT1300) or 31.25ms (HT1300A). For timing diagrams refer to the functional description.

Approximate internal circuits



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 ..... –20°C to 75°C

Electrical Characteristics

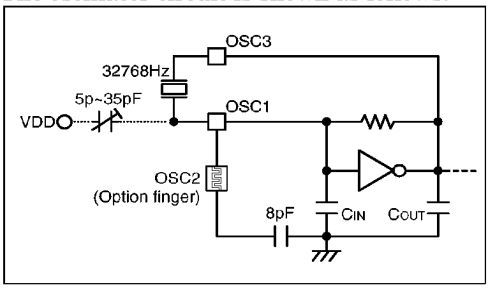
(Ta=25°C)

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V_{DD}	Condition				
V_{DD}	Supply Voltage	—	—	1.2	1.5	1.8	V
I_{DD}	Operation Current	1.5V	F_{OSC}=32768Hz No Load.	—	1.5	4.0	μA
I_{OH1}	SM1, SM2 Output Source Current	1.5V	V_{OH}=1.35V	–4.0	–8	—	mA
I_{OH2}	AUD Output Source Current	1.5V	V_{OH}=1.35V	–200	–400	—	μA
I_{OL1}	SM1, SM2 Output Sink Current	1.5V	V_{OL}=0.15V	4.0	6	—	mA
I_{OL2}	AUD Output Sink Current	1.5V	V_{OL}=0.15V	80	120	—	μA
V_{IL}	"L" Input Voltage	—	—	—	—	$0.2V_{DD}$	V
V_{IH}	"H" Input Voltage	—	—	$0.8V_{DD}$	—	—	V
R_P	Oscillator Polarization Resistance	1.5V	—	20	40	80	MΩ
T_S	Oscillator Start-up Time	1.5V	—	—	20	500	ms
T_W	Driving Pulse Width	1.5V	HT1300, F_{OSC}=32768Hz	—	46.875	—	ms
			HT1300A, F_{OSC}=32768Hz	—	31.25	—	ms
C_{IN}	Oscillator Input Capacitance	1.5V	—	—	22	—	pF
C_{OUT}	Oscillator Output Capacitance	1.5V	—	—	30	—	pF
F_{OSC}	System Frequency	1.5V	32768Hz Crystal	—	32768	—	Hz

Functional Description

Oscillator

The oscillator circuit is shown as follows:

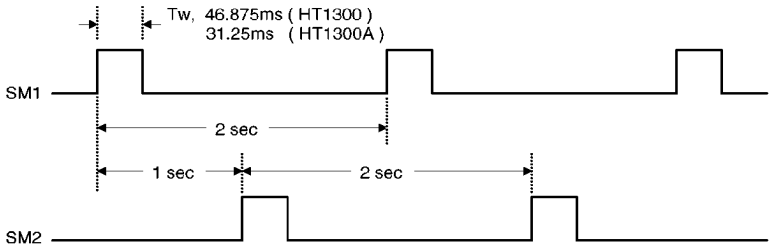


The option finger can be short-circuited by bonding to add an 8 pF capacitor to oscillator input. That is to say, if the user bonds OSC2 to pin for oscillator input, the capacitor of total input are C_{IN} and 8pF (see figure). A trimmer capaciator (5pF ~ 35pF) can also be connected to VDD to trim the oscillator frequency.

The capacitance of C_{IN} and C_{OUT} are selective by mask option (refers to mask option).

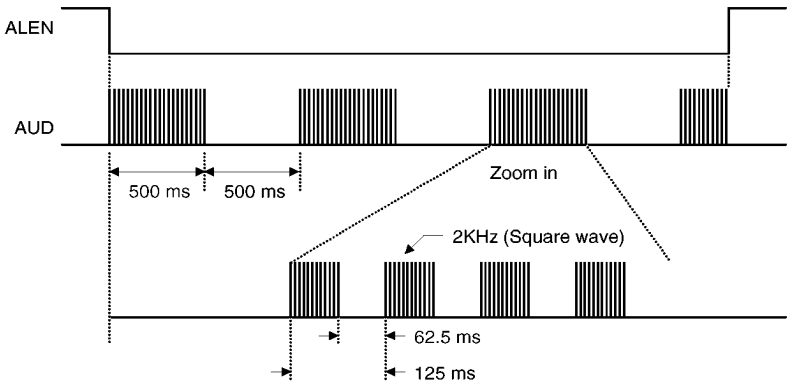
Motor driving waveform

The driving signals are high pulse, they can be inverted by mask option (low pulse). The waveforms of the motor driving signal are shown as follows:



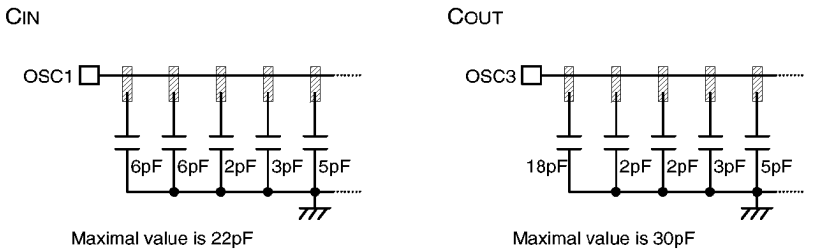
Alarm driving signal

When the ALEN is connected to a low voltage (VSS), the AUD generates an alarm signal immediately. Its output signal waveform is shown as follows.



Mask option

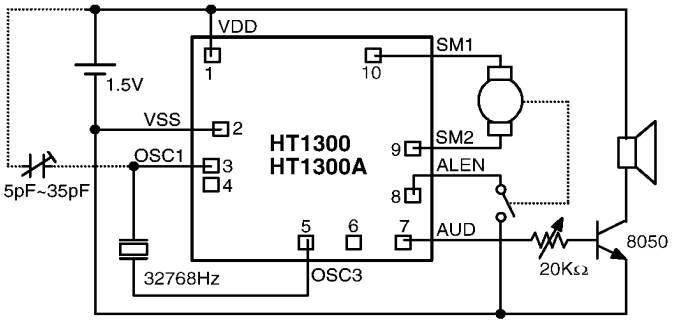
- The user can select a proper capacitance (C_{IN} and C_{OUT}) by changing one mask layer. Their configurations are shown as follows:



- The output driving signals of SM1 and SM2 can also be low pulse by changing one mask layer.

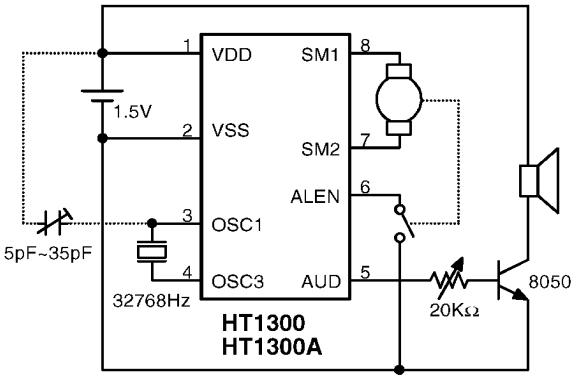
Application Circuit

Chip form



*Note: 1. The IC substrate should be connected to VDD in the PCB layout artwork.
2. The trimmer capacitor (5pF~35pF) is used to trim the oscillator frequency.

Package form



*Note: The trimmer capacitor (5pF~35pF) is used to trim the oscillator frequency.