NIPPON PRECISION CIRCUITS INC.

CF5741 series
Analog Clock CMOS IC

OVERVIEW

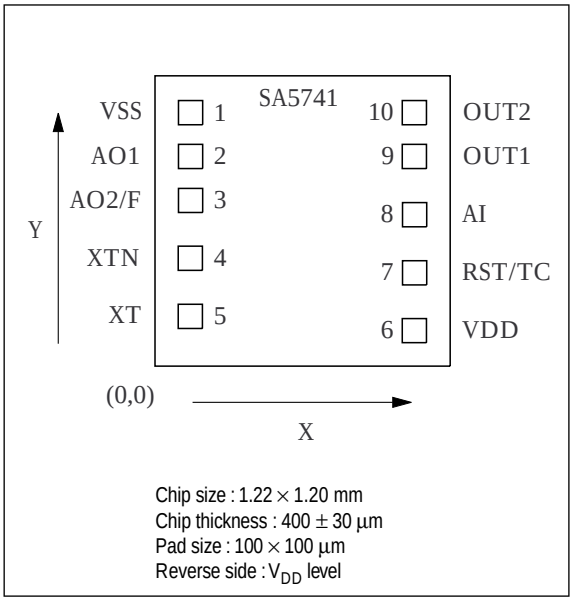
The CF5741 series are analog clock driver ICs using 32.768kHz reference frequency of crystal oscillator. Some versions in accordance with the combinations of each motor drive and alarm output characteristics can provide a wide range of applications for various clock specifications.

FEATURES

- Operating voltage 1.2 to 2.0V
- Low current 1.2µA (typ) / 1.5V
- Built-in oscillator circuits (32.768 kHz)
- Built-in crystal oscillator capacitors (C_G, C_D)
- Motor output
  Various motor output
- Alarm output
  Various alarm output
- Reset function
- Input debounce function (AI, RST/TC)
- Chip form (CF5741××)

PINOUT

(Top View)



Chip size : 1.22 × 1.20 mm
Chip thickness : 400 ± 30 µm
Pad size : 100 × 100 µm
Reverse side : V_{DD} level

SERIES LINEUP

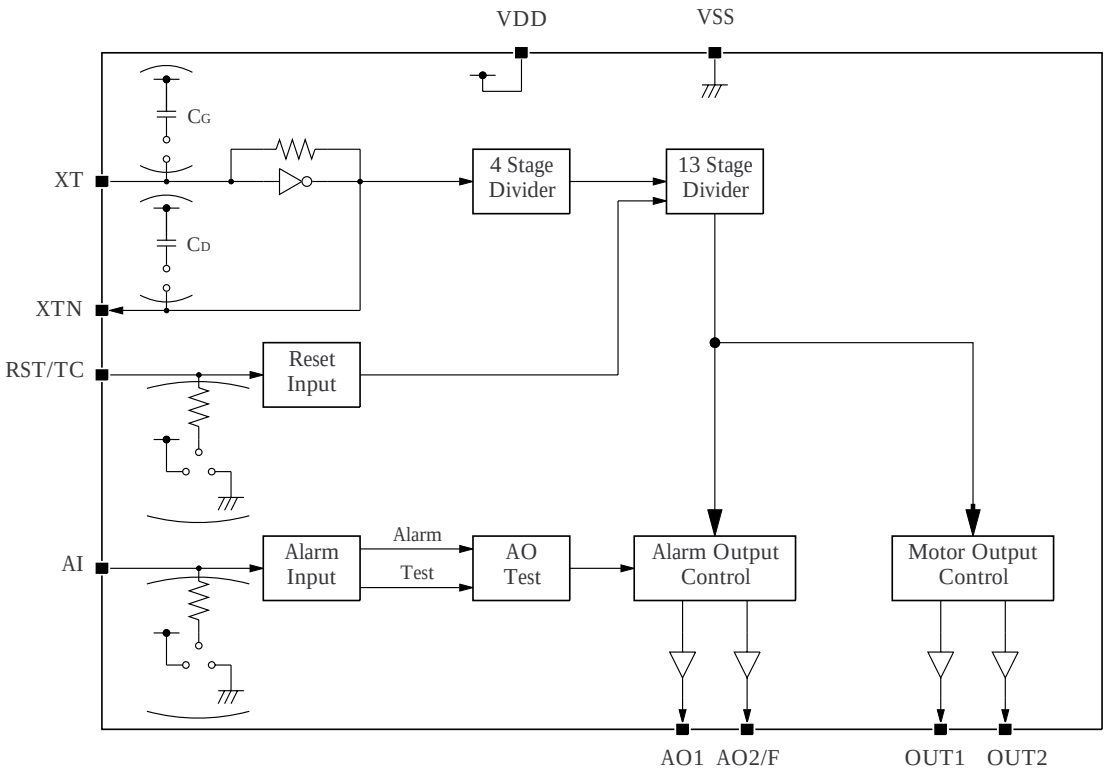
		CF5741AA		CF5741AB		CF5741BA		CF5741BB	
Built-in capacitor	XT terminal C_G (pF)	0		25		0		27	
	XTN terminal C_D (pF)	25		25		25		25	
Reset input	Active level	Low (Pull-up resistor)		Low (Pull-up resistor)		Low (Pull-up resistor)		Low (Pull-up resistor)	
Motor output	Active level	High		High		High		High	
	Hand drive cycle t_{CY} (sec)	1		1		1		1	
	Pulse width t_{PW} (msec)	31.25		31.25		46.875		46.875	
Alarm input	Active level	Low (Pull-up resistor)		Low (Pull-up resistor)		Low (Pull-up resistor)		Low (Pull-up resistor)	
	Test function (1/2V_{DD})	Yes		Yes		Yes		Yes	
Alarm output	Terminal	AO1	AO2/F	AO1	AO2/F	AO1	AO2/F[1]	AO1	AO2/F[1]
	Active level	High	High	High	High	High	Low	High	Low
	Fundamental frequency f_{PW} (Hz)	2048	32	2048	32	2048	2048	2048	2048
	Modulation frequency f_{CY} (Hz)	8 + 1	–	8 + 1	–	8 + 1	8 + 1	8 + 1	8 + 1

1. AO is complete reverse phase of AO. (even output is inactive.)

ORDERING INFORMATION

Device	Package
CF5741××	Chip form

BLOCK DIAGRAM



PIN DESCRIPTION

Number	Name	Description	Dimensions (μm)	
			X	Y
1	VSS	Ground	147	1048
2	AO1	Alarm signal output1	147	867
3	AO2 / F	Alarm signal output2/Frequency output	147	685
4	XTN	Crystal oscillator connection	146	446
5	XT	Crystal oscillator connection	146	206
6	VDD	Power supply pin	1072	147
7	RST / TC	Reset/Test clock input	1073	386
8	AI	Alarm input	1073	626
9	OUT1	Motor drive output 1	1072	867
10	OUT2	Motor drive output 2	1072	1048

SPECIFICATIONS

Absolute Maximum Ratings

Parameter	Symbol	Condition	Rating	Unit
Supply voltage	$V_{DD} - V_{SS}$		– 0.3 to 5.0	V
Input voltage	V_{IN}		$V_{SS} \leq V_{IN} \leq V_{DD}$	V
Operating temperature	T_{OPR}		– 30 to 80	°C
Storage temperature	T_{STG}		– 65 to 150	°C

Electrical Characteristics

Ta = 25°C, V_{DD} = 1.5V, V_{SS} = 0V, X′tal (fo = 32.768kHz, $C_I \leq 35k\Omega$), unless otherwise noted.

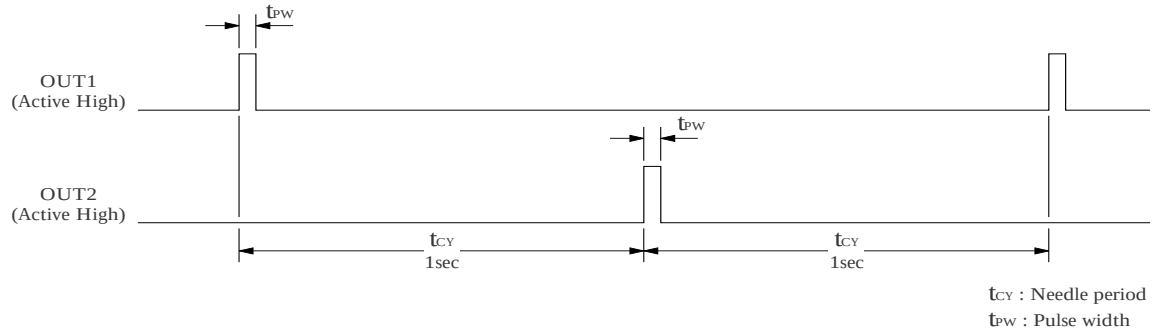
Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Supply voltage	V_{DD}		1.2	1.5	2.0	V
Current consumption	I_{DD}	OUT1, OUT2 = Open		1.2	4.0	µA
Oscillator start-up time	t_{STA}	V_{DD} = 1.2V			5.0	sec
		V_{DD} = 1.5V			2.0	sec
Motor output current	I_{MOT}	V_{DD} = 1.2V, $R_L = 200\Omega$[1]	4.0			mA
Input resistance[2](AI, RST/TC)	R_{IN}		200		1200	kΩ
Oscillator stability	$\Delta f/f$	V_{DD} = 1.2V to 2.0V		0.5	1.0	ppm / 0.1V
Alarm output current (AO1, AO2/F)	I_{OL1}	V_{OL} = 0.75V	900			µA
	I_{OL2}	V_{OL} = 0.75V	10			µA
	I_{OH1}	V_{OH} = 0.75V	900			µA
	I_{OH2}	V_{OH} = 0.75V	10			µA
Frequency output voltage	V_F	V_{DD} = 1.2V, C_L = 50pF	0.4			V
Internal capacitance[3]	C_G					pF
	C_D					pF

1. R_L is resistor of motor coil, that connect OUT1 between OUT2.
2. $R_{IN} = V_{DD}/I_{IS}$. I_{IS} is current that flow into VSS from AI, RST/TC, when AI, RST/TC short VSS. (AI,RST/TC build-in pull-up resistor.)
3. C_G is internal capacitor between VDD and XT. C_D is internal capacitor between VDD and XTN.

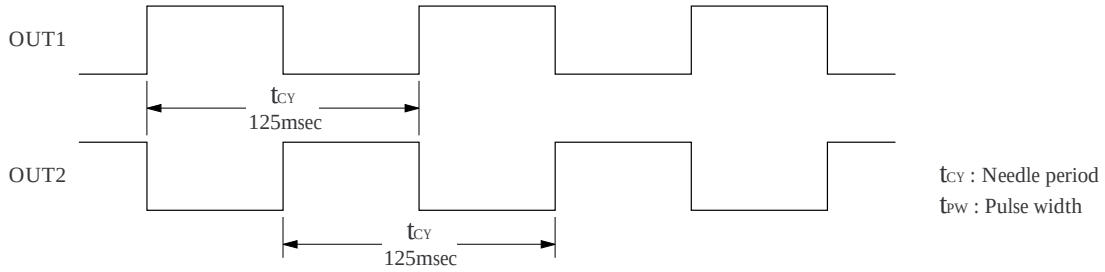
FUNCTIONAL DESCRIPTION

Motor Output

Stepping motor drive type



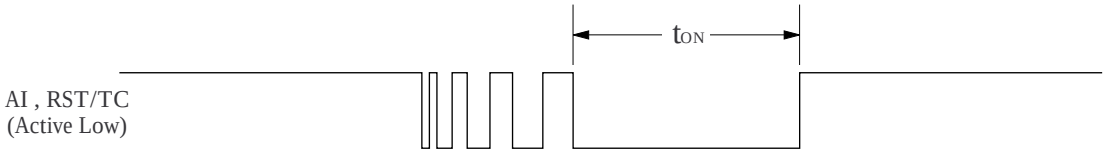
Sweeping motor drive type



Input Debounce Function (AI ,RST/TC)

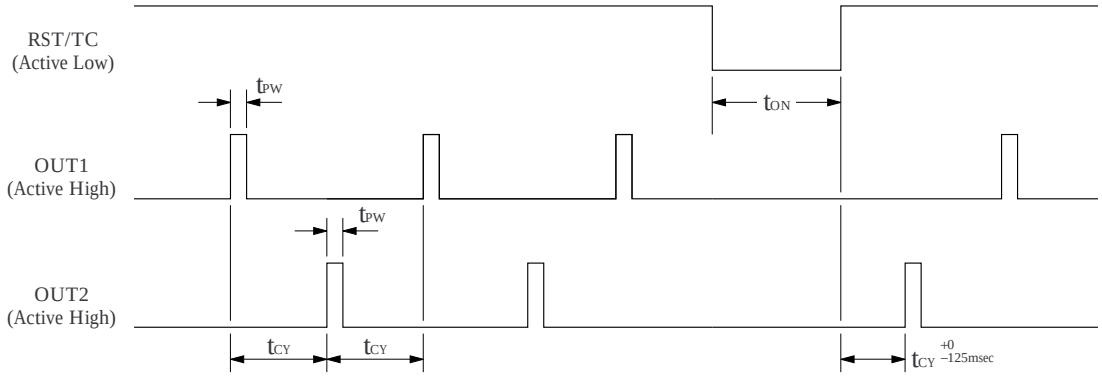
Setting bouncing delay time prevents the circuit from the erroneous operation by AI and RST/TC input bouncing.

t_{ON} < 62.5 msec : Alarm and reset input is ignored.
62.5 ≤ t_{ON} ≤ 125 msec : Alarm and reset input is ignored or accepted.
t_{ON} > 125 msec : Alarm and reset input is accepted.



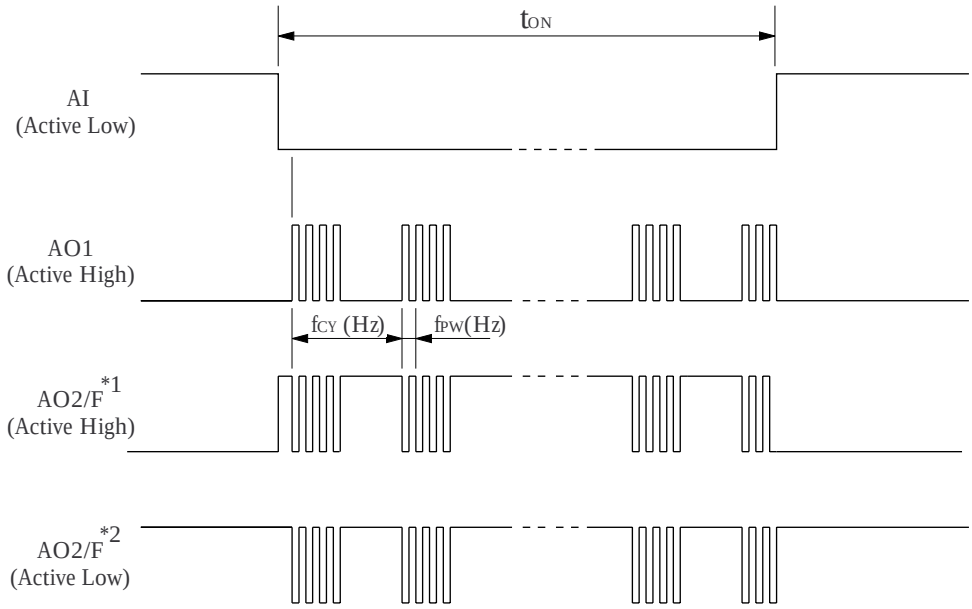
Reset Function

RST/TC goes to active level when motor output can be stopped. Motor output(AO1,AO2) restart of another stopped output after reset off.



Alarm Output

Alarm input/output

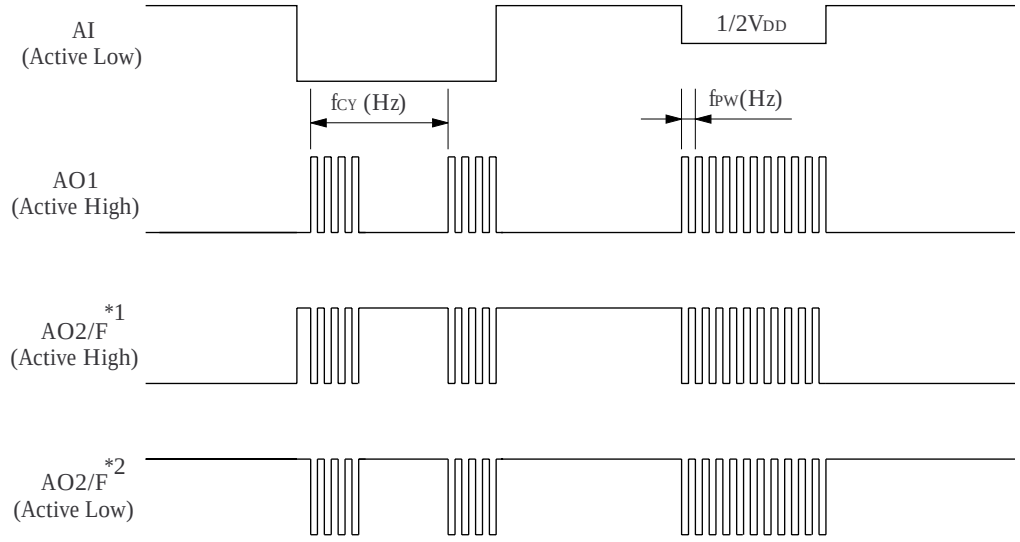


*1 : AO2 / F is the reverse phase of AO1, when output is active.
*2 : AO2 / F is complete reverse phase of AO1.
f_{PW} : Alarm fundamental frequency
f_{CY} : Alarm modulation frequency

Test Function

Fundamental frequency alarm output function

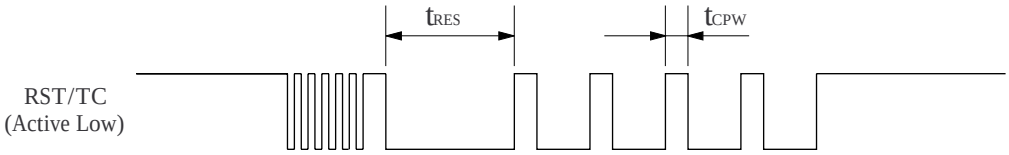
AI goes to $1/2V_{DD}$ when AO1 and AO2 output alarm fundamental frequency. This frequency can used to adjust frequency.



*1 : AO2 / F is the reverse phase of AO1, when output is active.
*2 : AO2 / F is complete reverse phase of AO1.
f_{PW} : Alarm fundamental frequency
f_{CY} : Alarm modulation frequency

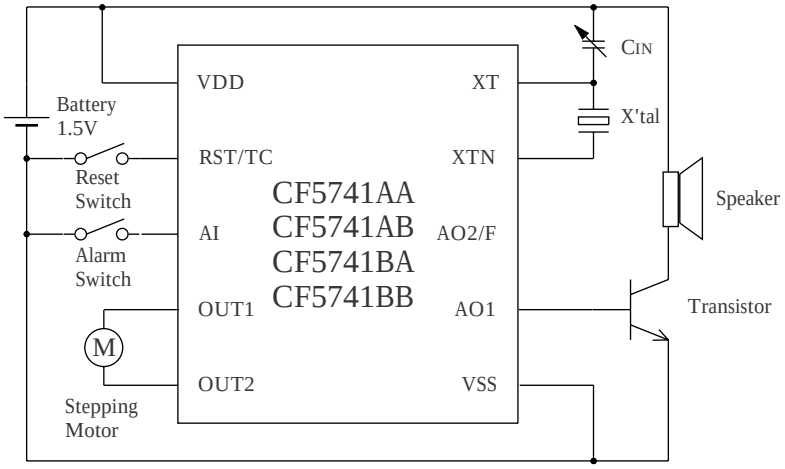
Gain fast function

RST/TC is active level more than 125 msec. And RST/TC input outside clock when motor output gain fast. t_{CPW} is more less than 0.9765625 msec.



$t_{RES} \geq 125$msec
$t_{CPW} \leq 0.9765625$msec

APPLICATION CIRCUITS



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NC9613DE 1998.08