AN3794N

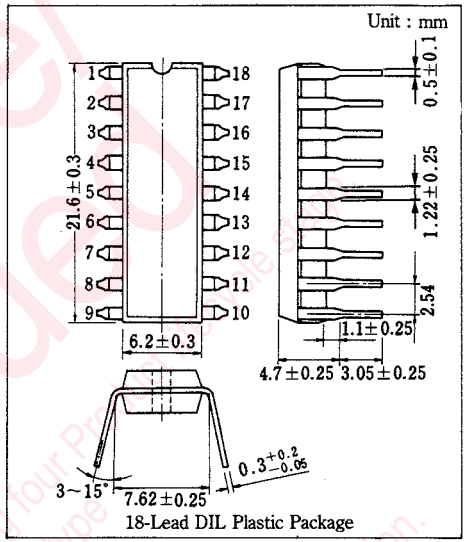
VTR Capstan Servo Interface Circuit

■ Outline

The AN3794N is an integrated circuit designed for VTR capstan servo interface. It forms the VTR servo circuit by combining the AN3792 with the MN6178.

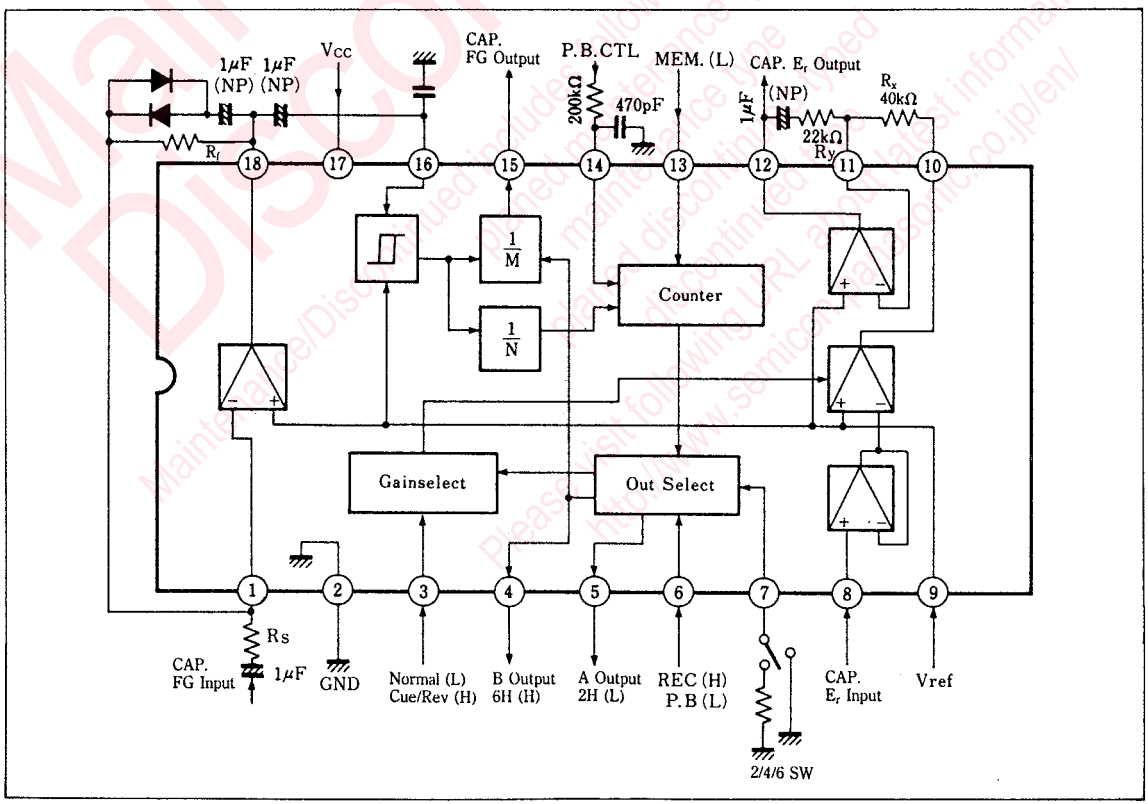
■ Features

- Supply voltage : V_{CC}=5V
- Built−in detector circuit for 2/4/6 hours
- Built−in automatic gain control circuit for 2/4/6 hours



18-Lead DIL Plastic Package

■ Block Diagram



■ Pin

Pin No.	Pin Name	Pin No.	Pin Name
1	Op. Amp. Inverting Input	10	Op. Amp. 2 Output
2	GND	11	Op. Amp. 3 Inverting Input
3	Normal/Cue. Rev Changeover	12	Cap. Error Output
4	B Output	13	Memory
5	A Output	14	P.B. CTL Input
6	REC/P.B. Changeover	15	Cap. FG Output
7	2H/4H/6H Changeover(REC)	16	Cap. FG Input
8	Cap. Error Input	17	V_{CC}
9	Vref. Input	18	Op. Amp. Output

■ Absolute Maximum Ratings (Ta=25℃)

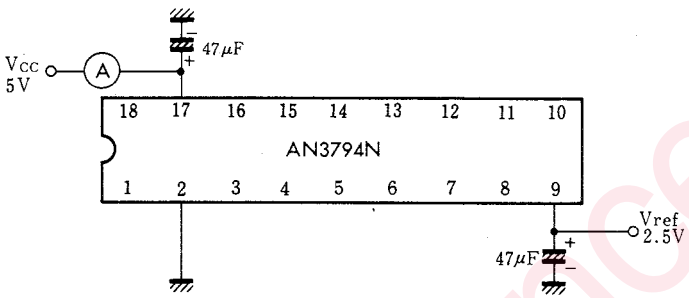
Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	6	V
Power Dissipation(Ta=70℃)	P_D	100	mW
Operating Ambient Temperature	T_{opr}	−20~+70	℃
Storage Temperature	T_{stg}	−55~+150	℃

■ Electrical Characteristics (Ta=25℃)

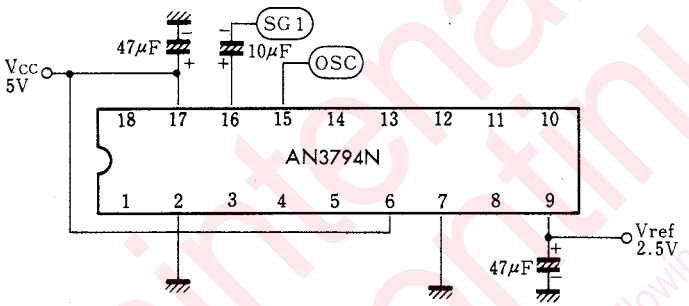
Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Circuit Current	I_{17}	1	V_{CC}=5V, V_{ref}=2.5V	5		15	mA
FG Amp. Input Sensitivity	S_{16}	2	V_{CC}=5V, V_{ref}=2.5V	30			mV_{P-P}
FG Divider Output High Level	V_{OH15}	3	V_{CC}=5V, V_{ref}=2.5V No load	4.6			V
FG Divider Low Level	V_{OL15}	3	V_{CC}=5V, V_{ref}=2.5V No load			0.4	V
A. B Output High Level	$V_{OHA,B}$	4	V_{CC}=5V, I=−1.5mA, V_{ref}=2.5V	3.6			V
A. B Output Low Level	$V_{OLA,B}$	4	V_{CC}=5V, I=1.0mA, V_{ref}=2.5V			0.5	V
P. B CTL Input Sensitivity	S_{14}	5	V_{CC}=5V, V_{ref}=2.5V	3.0			V
Rec./P.B Changeover Sensitivity(Rec. Mode)	$S_{6(Rec)}$	6	V_{CC}=5V, V_{ref}=2.5V	3.0			V
Rec./P.B Changeover Sensitivity(P.B Mode)	$S_{6(PB)}$	6	V_{CC}=5V, V_{ref}=2.5V			1.0	V
Normal/Cue. Rev Changeover Sensitivity(Nomal Mode)	$S_{3(NO)}$	6	V_{CC}=5V, V_{ref}=2.5V			1.0	V
Normal/Cue. Rev Changeover Sensitivity(Cue. Rev Mode)	$S_{3(C/R)}$	6	V_{CC}=5V, V_{ref}=2.5V	3.0			V
2/4/6 Changeover Sensitivity(2H Mode)	$S_{7(2H)}$	6	V_{CC}=5V, V_{ref}=2.5V	4.5			V
2/4/6 Changeover Sensitivity(4H Mode)	$S_{7(4H)}$	6	V_{CC}=5V, V_{ref}=2.5V	2.0		3.5	V
2/4/6 Changeover Sensitivity(6H Mode)	$S_{7(6H)}$	6	V_{CC}=5V, V_{ref}=2.5V			1.0	V
OP. Amp.3 Output High Level	V_{OH12}	7	V_{CC}=5V, V_{ref}=2.5V No load	3.8			V
OP. Amp.3 Output Low Level	V_{OL12}	7	V_{CC}=5V, V_{ref}=2.5V No load			1.1	V
Total offset Voltage (2H×1 Mode)	$V_{O(offset)}$	8	V_{CC}=5V, V_{ref}=2.5V	−50		50	mV
OP. Amp.2 Gain(2H×1 Mode)	$G_{V(2H)}$	9	V_{CC}=5V, V_{ref}=2.5V	−2.5		2.0	dB
OP. Amp.2 Gain(4H×1 Mode)	$G_{V(4H)}$	9	V_{CC}=5V, V_{ref}=2.5V	−8.5		−4.0	dB
OP. Amp.2 Gain(6H×1 Mode)	$G_{V(6H)}$	9	V_{CC}=5V, V_{ref}=2.5V	−7.0		−2.5	dB
OP. Amp. Output High Level	V_{OH18}	10	V_{CC}=5V, V_{ref}=2.5V	3.8			V
OP. Amp. Output Low Level	V_{OL18}	10	V_{CC}=5V, V_{ref}=2.5V			1.1	V
OP. Amp. Gain	G_{VF}	11	V_{CC}=5V, V_{ref}=2.5V	50			dB

Note : Operating Supply Voltage Range: V_{CC}=4.5~5.5V

Test Circuit 1 (I_{17})

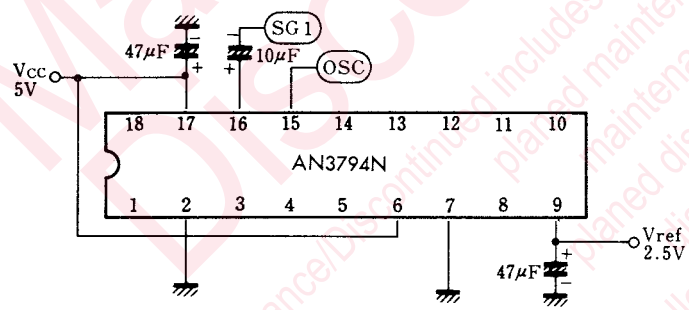


Test Circuit 2 (S_{16})



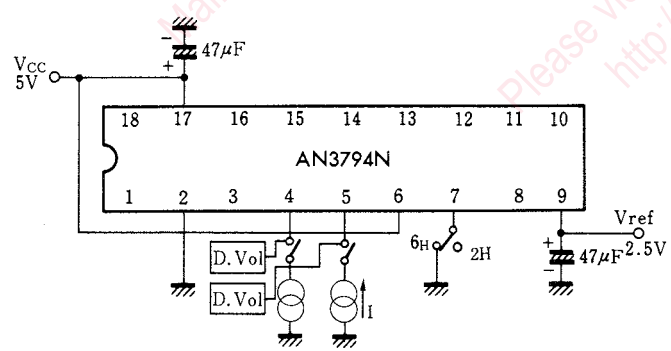
- SG1 input signal triangular wave f= 1kHz
- Rec. 6H mode

Test Circuit 3 (V_{OH15}, V_{OL15})



- SG1 input signal rectangular wave f= 1kHz, 100mV_{P-P}
- Rec. 6H mode

Test Circuit 4 (V_{OHA}, V_{OHB}, V_{OLA}, V_{OLB})

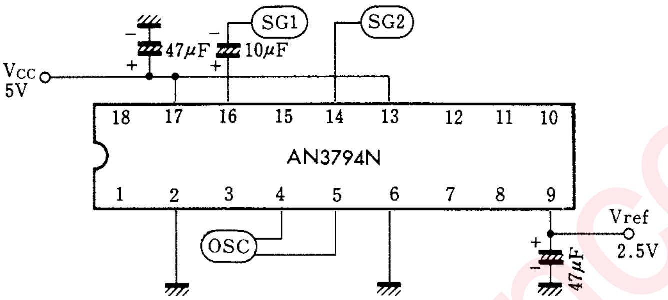


- V_{OHA}, V_{OLA} Pin ⑤ output
- V_{OHB}, V_{OLB} Pin ④ output

※In Rec. 6H mode (Pin ⑦ GND), take out 1.5mA current from Pins ④ and ⑤ to measure the high level voltage ($V_{OHA,B}$)with a voltmeter.

※In Rec. 2H mode (Pin ⑦ open), take out 1mA current from Pins ④ and ⑤ to measure the high level voltage ($V_{OLA,B}$)with a voltmeter.

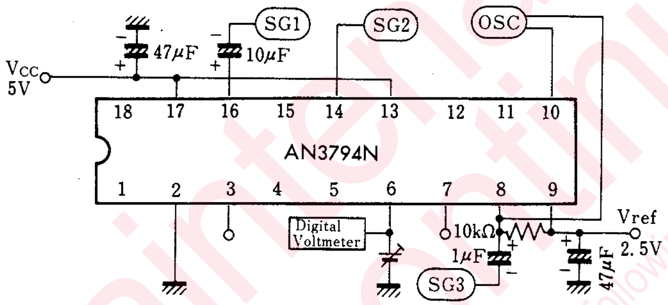
Test Circuit 5 (S_{14})



- SG1. Input signal rectangular wave f= 3.6kHz, 100mV_{P-P}
- SG2. input signal rectangular wave f= 300Hz

※When the sufficient large CTL signal is input, 6H mod (Pins ④ and ⑤ H) is set. However, when the CTL signal is less than input sensitivity, 2H mode (Pins ④ and ⑤ L_0) is forcibly set.

Test Circuit 6 ($S_{6(Rec)}$, $S_{6(PB)}$, $S_{3(NO)}$, $S_{3(C/R)}$, $S_{7(2H)}$, $S_{7(4H)}$, $S_{7(6H)}$)

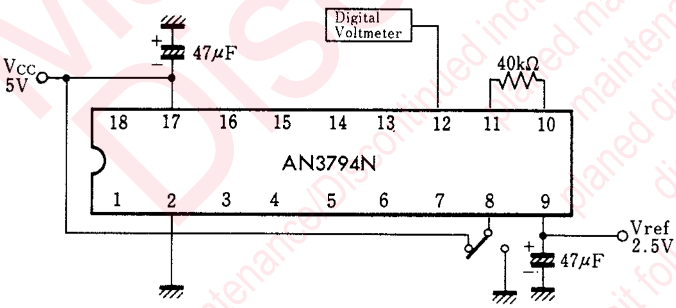


- SG1. Input signal rectangular wave f= 360Hz, 100mV_{P-P}
- SG2. input signal rectangular wave f= 30Hz, 5V_{O-P}
- SG3. input signal sine wave f=500Hz, 3V_{O-P}
- OSC is used in X−Y mode.

※The figure left shows the changeover of Rec./P.B. As in the same manner for Pin ③, measure the voltage of gain changeover.

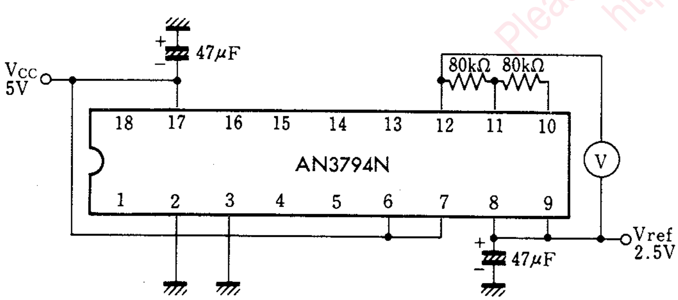
※For Pin ⑦ measurement, Pin ⑥ is regarded as V_{cc} to measure the voltage of gain changeover.

Test Circuit 7 (V_{OH12}, V_{OL12})



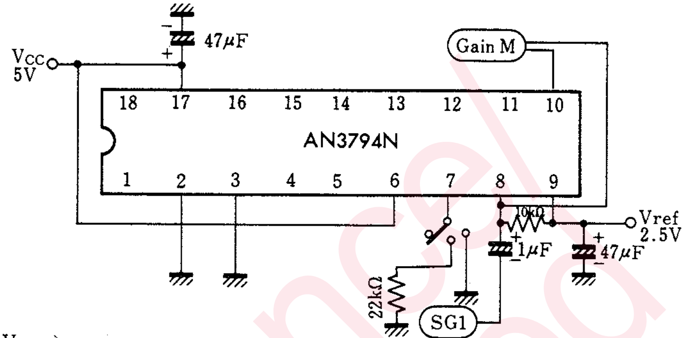
- V_{OH12} Pin⑧ V_{cc}
- V_{OH12} Pin⑧ GND

Test Circuit 8 ($V_{O(offset)}$)



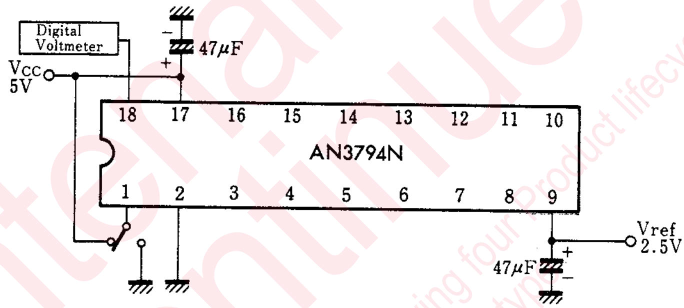
- REC 2H× 1 modee

Test Circuit 9 ($G_{V(2H)}$, $G_{V(4H)}$, $G_{V(6H)}$)



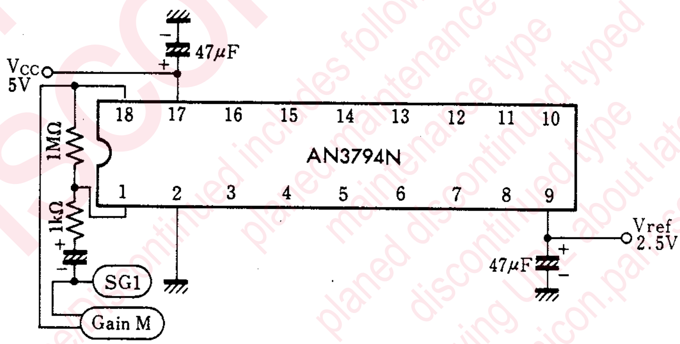
- SG1. input signal sine wave f= 500Hz, $1V_{P-P}$

Test Circuit 10 (V_{OH18}, V_{OL18})



- V_{OH18} Pin① GND
- V_{OL18} Pin① V_{CC}

Test Circuit 11 (G_{VF})



- SG1. input signal sine wave f= 1kHz, $2mV_{P-P}$

■ Functional Explanation

1. Capstan FG Divider Function

Mode	2H	4H	6H
FGin (Hz)	1080	540	360
FGout (Internal) (Hz)	360 (1/3)	180 (1/3)	120 (1/3)
FGout (Main) (Hz)	540 (1/2)	270 (1/2)	360 (1/1)

2. Recording Mode Auto Detection Function

<table>
<tr><th>Mode</th><th colspan="2">2H</th><th colspan="2">4H</th><th colspan="2">6H</th></tr>
<tr><td>FG Frequency (Hz)</td><td colspan="2">1080</td><td colspan="2">540</td><td colspan="2">360</td></tr>
<tr><td>Threshold (Hz)</td><td></td><td colspan="2">735</td><td colspan="2">465</td><td></td></tr>
<tr><td>Aout</td><td colspan="2">L</td><td colspan="2">H</td><td colspan="2">H</td></tr>
<tr><td>Bout</td><td colspan="2">L</td><td colspan="2">L</td><td colspan="2">H</td></tr>
</table>

3. Memory Function

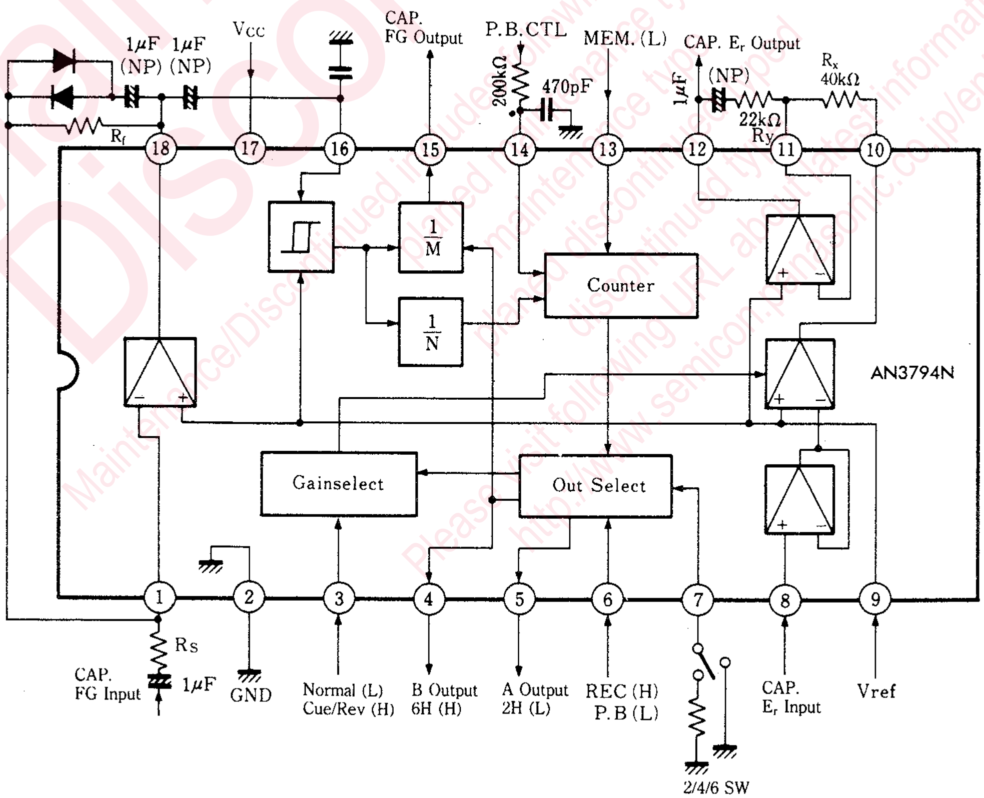
Setting Pin ⑬ to L during playback enables the recording of playback mode at the time of setting Pin ⑬. This function is available during special playback such as still , slow, etc.

4. Capstan Loop Gain Compensating Function

This function incorporates the loop gain compensating circuit for capstan speed cotrol and carries out recording or automatically gain compensation according to the playback time mode.

C/R	L		H			
	Normal		2		4	
Mode	Double	dB	Double	dB	Double	dB
2H	1.0	0	2.0	6.02		
4H	0.5	-6.02			2.0	6.02
6H	0.6	-4.44			2.4	7.60

■ Application Circuit



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