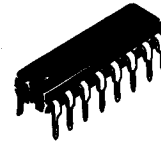


HA1196

PLL FM STEREO DEMODULATOR

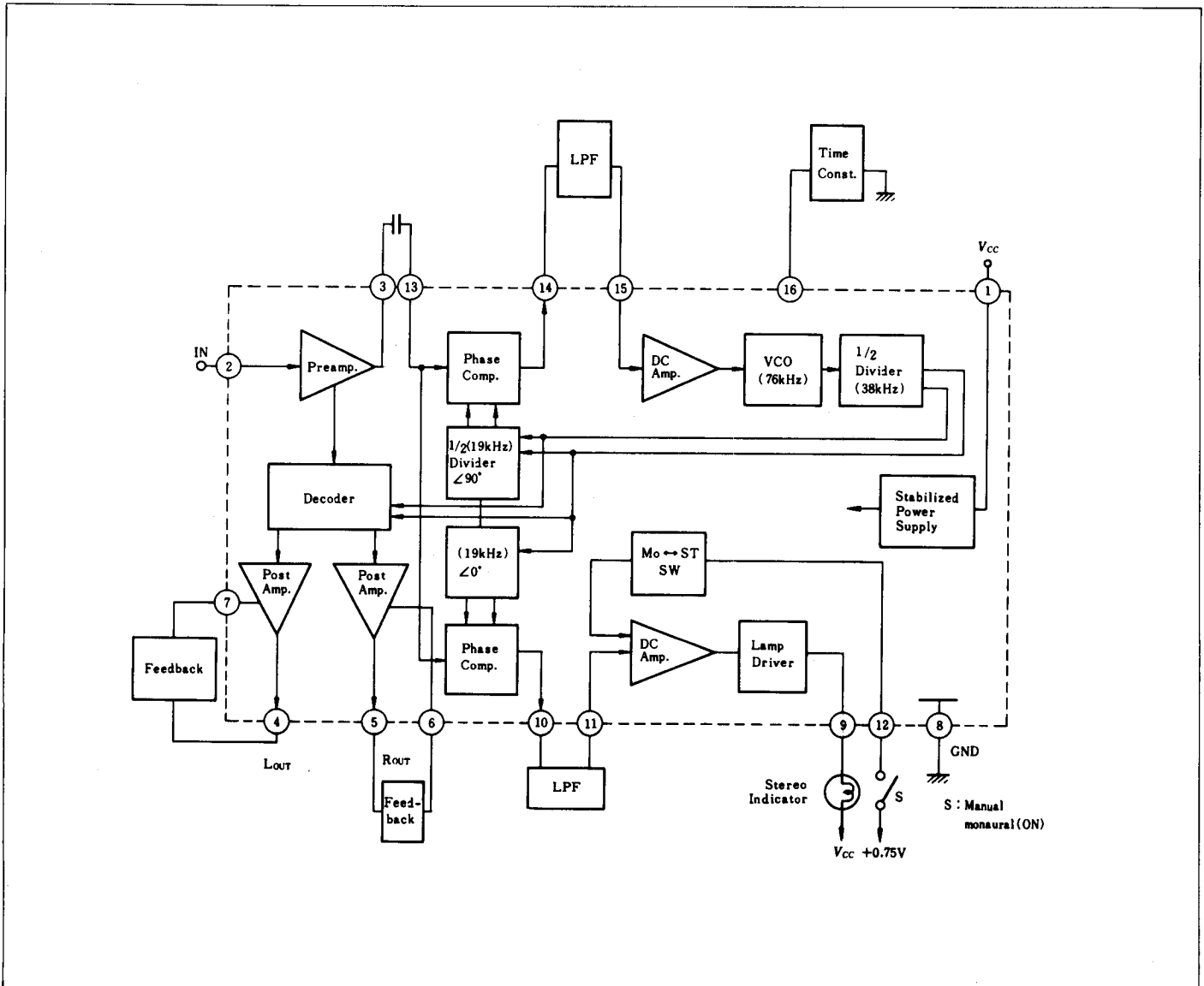
■ FEATURES

- High-quality FM Stereo Demodulator using PLL technic for separating L and R signals from composite signal
- Less peripheral components; no coils
- Total System—including stereo demodulator, automatic stereo-monoaural switching circuit, and stereo indicator lamp driver
- Separation controllable, plus very high separation (Sep; 55dB typ. at $f = 1$ kHz)
- Low total harmonic distortion during stereo and monoaural operation by using new circuit (Mono; 0.05%, St; 0.1% at $f = 1$ kHz, $V_{in} = 200$ mV)
- Fully synchronized stereo indicator lamp
- High-output voltage level ($V_{out} = 1.2V$ at $V_{in} = 200$ mV)
- Low total harmonic distortion at high frequency; (Main; 0.4%, L or R; 0.15%, Sub; 0.3% at $f = 10$ kHz)
- Low shock noise during stereo-monoaural switching

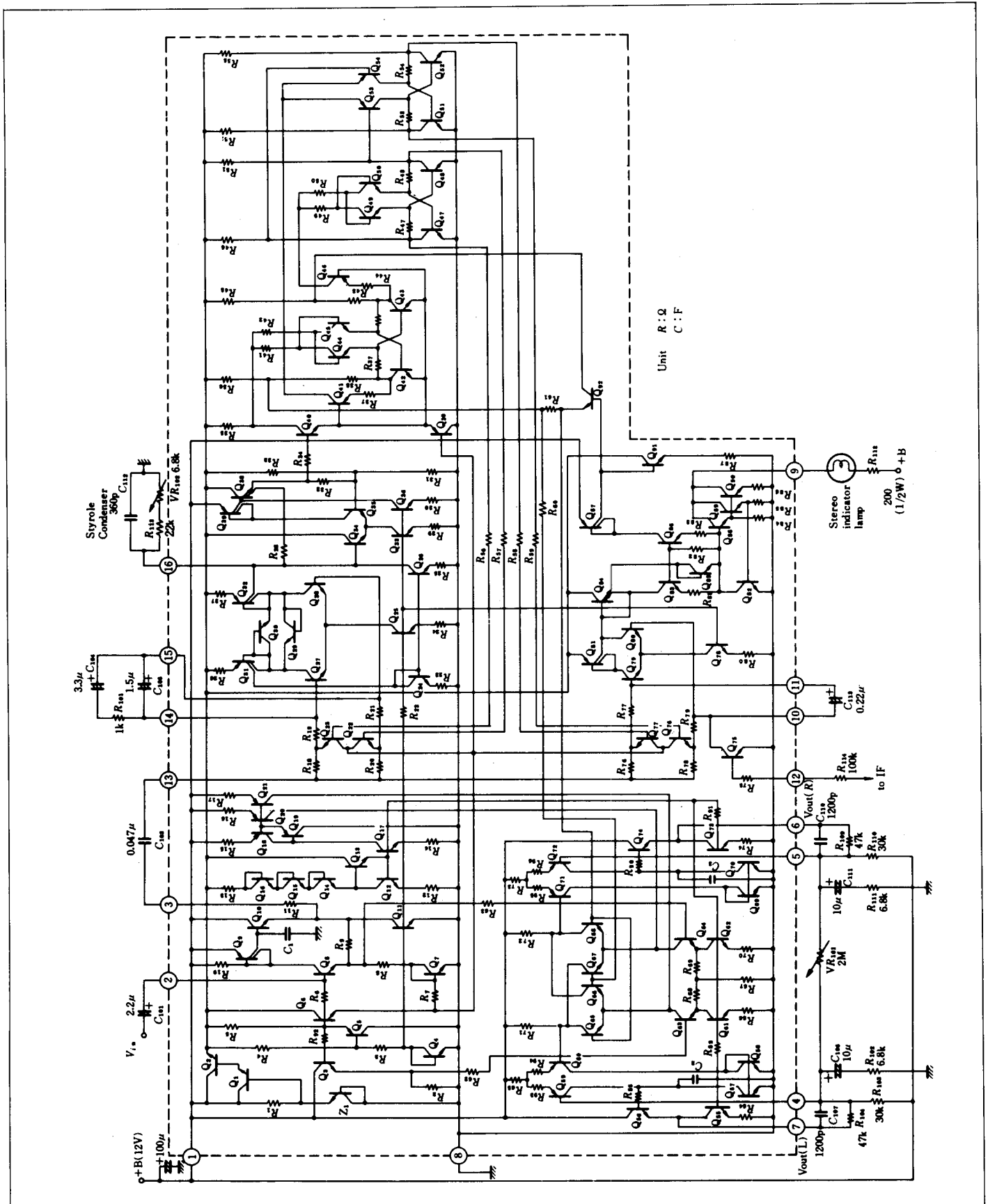


(DP-16)

■ FUNCTIONAL BLOCK DIAGRAM



■ CIRCUIT SCHEMATIC AND TYPICAL EXTERNAL COMPONENTS



■ ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$)

Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	15	V
Power Dissipation*	P_T	490	mW
Operating Temperature	T_{opr}	-20 to +70	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +125	$^\circ\text{C}$
Lamp Current	I_L	75	mA

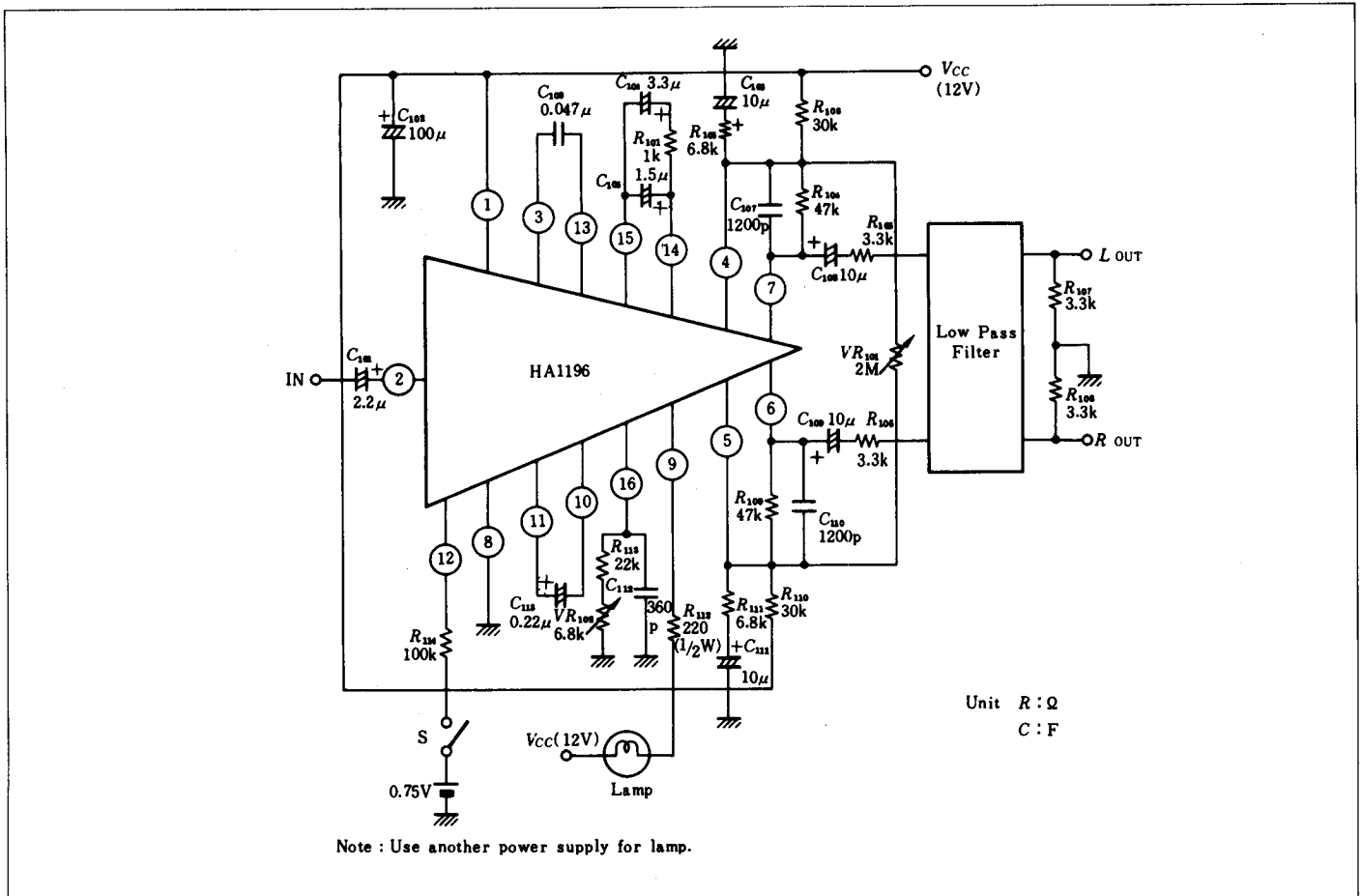
* Value at $T_a=70^\circ\text{C}$

■ ELECTRICAL CHARACTERISTICS ($V_{CC}=12\text{V}$, $f=1\text{kHz}$, $T_a=25^\circ\text{C}$ unless otherwise noted)

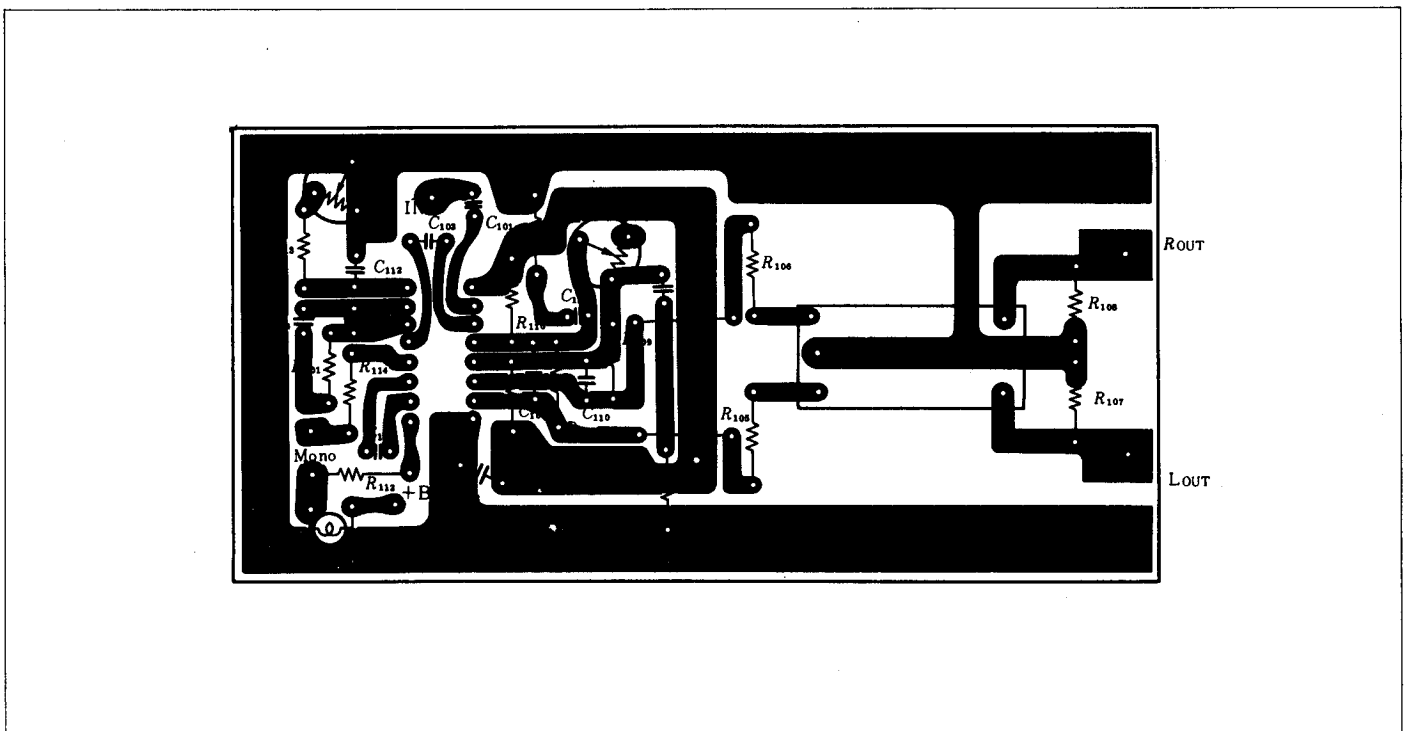
Item	Symbol	Test Condition	min	typ	max	Unit	
Input Impedance	Z_{in}		—	75	—	$\text{k}\Omega$	
Channel Separation	S_{sp}	$P=20\text{mV}$, $L+R=180\text{mV}$, $V.C.O.f_{req}=76\text{kHz}$	$f=100\text{Hz}$	—	42	—	dB
			$f=1\text{kHz}$	40	55	—	
			$f=10\text{kHz}$	—	42	—	
Stereo Total Harmonic Distortion	ST.T.H.D	$P=20\text{mV}$, $L+R=180\text{mV}$ ($L+R=45\%$, $L-R=45\%$ $P=10\%$)	$f=100\text{Hz}$	—	0.1	—	%
			$f=10\text{kHz}$	—	0.1	0.3	
			$f=10\text{kHz}$	—	0.15	—	
Output Voltage	V_{out}	$V_{in}=200\text{mV}$	—	1.2	—	V	
Channel Balance	C.B	$V_{in}=200\text{mV}$	-1.5	0	1.5	dB	
Monaural Total Harmonic Distortion	MONO. T.H.D	$V_{in}=200\text{mV}$	—	0.05	0.25	%	
Carrier Leak	C.L	$P=20\text{mV}$, $L+R=180\text{mV}$ (See Note)	$f=19\text{kHz}$	—	30	—	dB
			$f=38\text{kHz}$	—	30	—	
SCA Rejection Ratio	SCA R_{ej}	$P=20\text{mV}$, $L+R=180\text{mV}$, $SCA=20\text{mV}$, $f_{SCA}=67\text{kHz}$	—	75	—	dB	
Pilot Level for Lamp ON	$L_{(ON)}$		4	7	13	mV	
Stereo Lamp Hysteresis			—	6	—	dB	
Capture Range	C.R	$P=14\text{mV}$	—	± 3	—	%	
Signal-to-noise Ratio	S/N	$V_{in}=200\text{mV}$, $R_g=4.7\text{k}\Omega$	—	80	—	dB	
Total Current Drain	I_T	Lamp OFF	—	17.5	—	mA	
Max. Input Signal	V_{in}	Monaural T.H.D=1%	—	400	—	mV	
Threshold Voltage Stereo-Monaural Switching		Pin ② voltage for Lamp OFF	—	0.55	—	V	

Note : Output terminal of IC

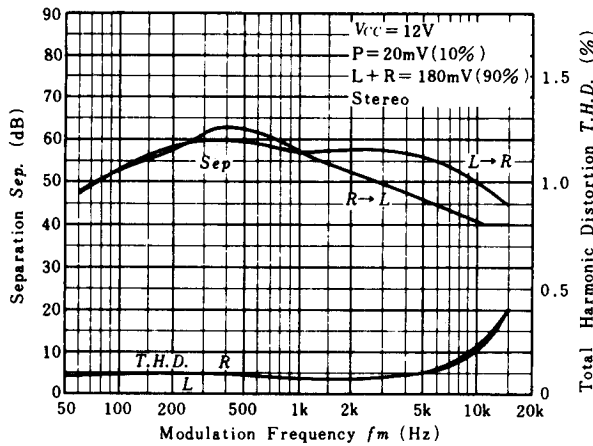
■ TEST CIRCUIT



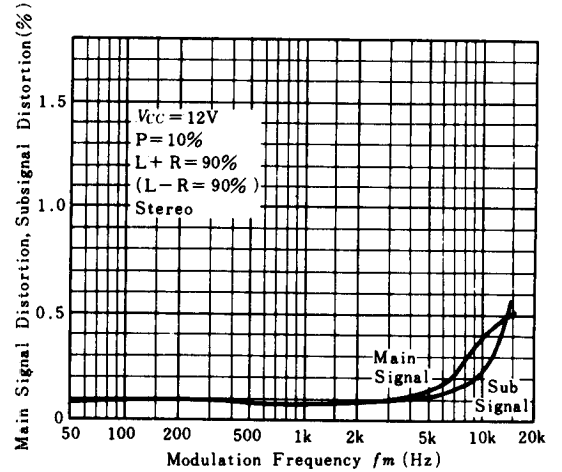
■ STANDARD PRINTED CIRCUIT BOARD (Bottom View)



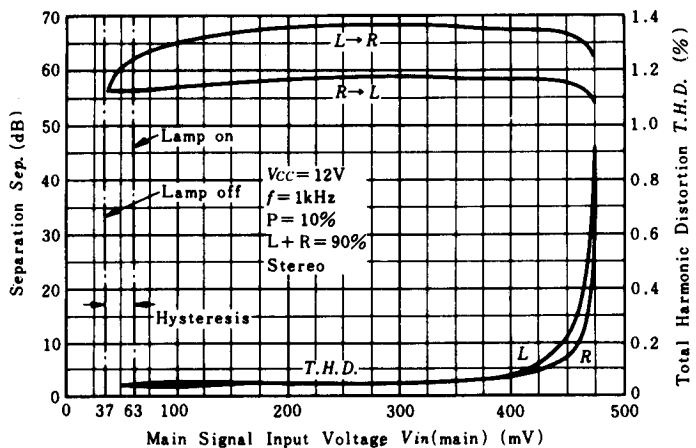
TOTAL HARMONIC DISTORTION AND SEPARATION VS. MODULATION FREQUENCY



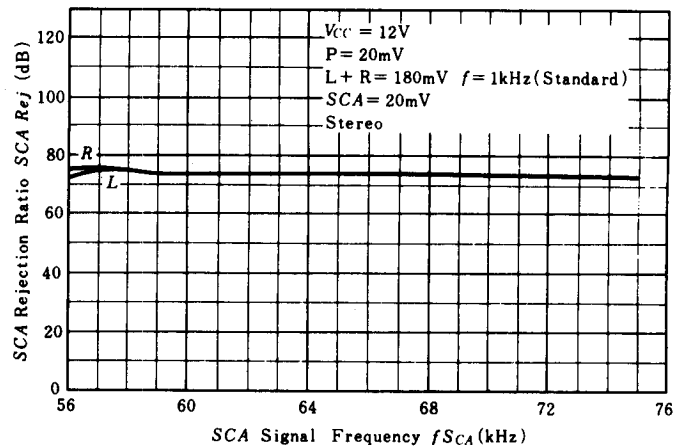
MAIN SIGNAL DISTORTION AND SUBSIGNAL DISTORTION VS. MODULATION FREQUENCY



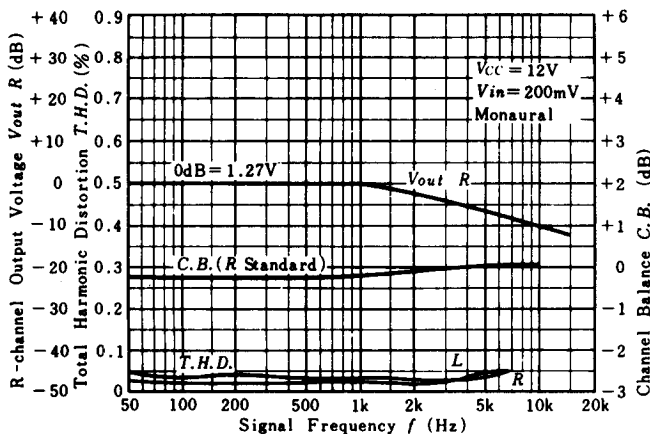
TOTAL HARMONIC DISTORTION AND SEPARATION VS. MAIN SIGNAL INPUT VOLTAGE



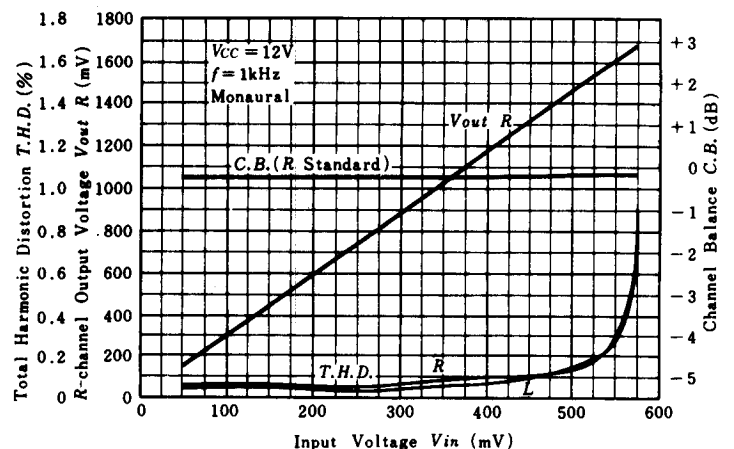
SCA REJECTION RATIO VS. SCA SIGNAL FREQUENCY



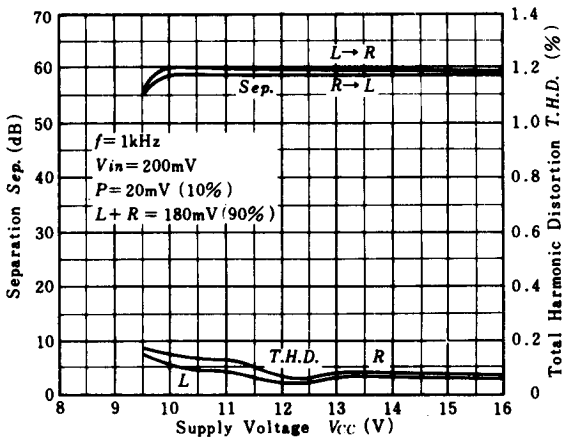
CHANNEL BALANCE, R-CHANNEL OUTPUT VOLTAGE AND TOTAL HARMONIC DISTORTION VS. SIGNAL FREQUENCY



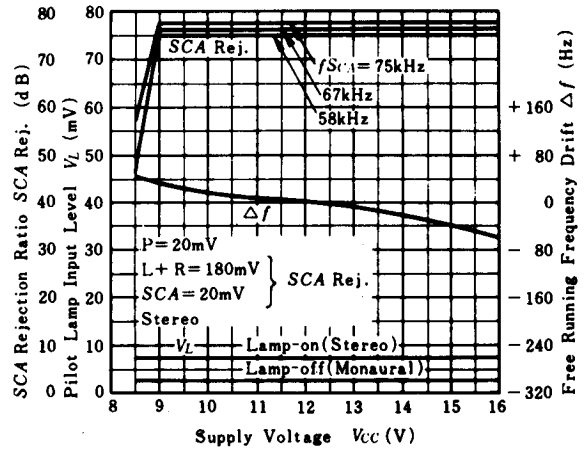
CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. INPUT VOLTAGE



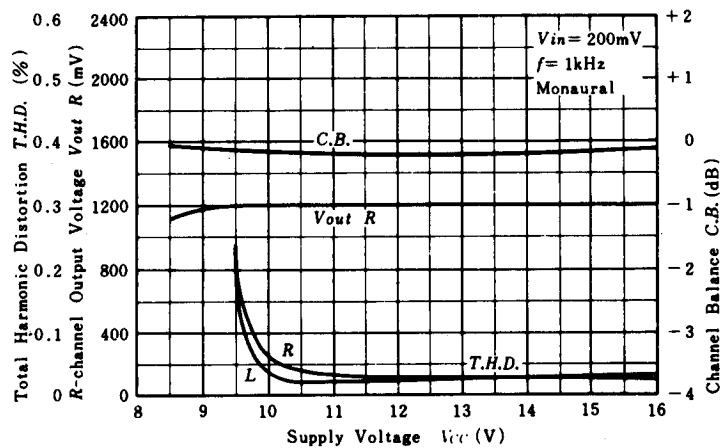
TOTAL HARMONIC DISTORTION AND SEPARATION VS. SUPPLY VOLTAGE



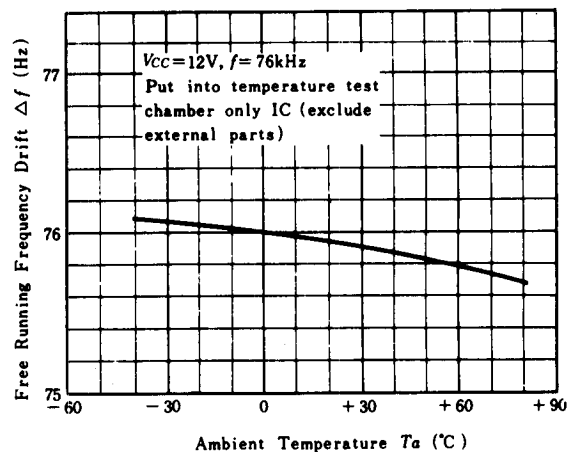
FREE RUNNING FREQUENCY DRIFT, SCA REJECTION RATIO AND PILOT LAMP INPUT LEVEL FOR LAMP ON/OFF VS. SUPPLY VOLTAGE



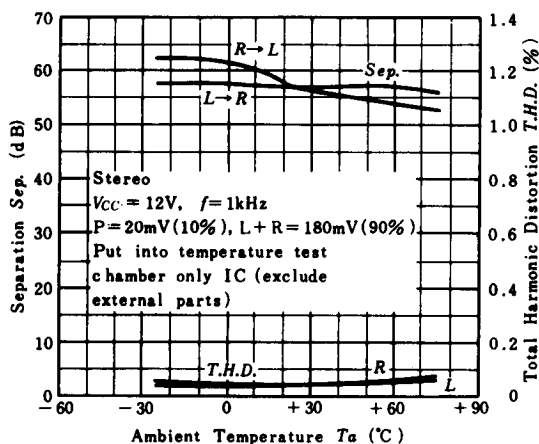
CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. SUPPLY VOLTAGE



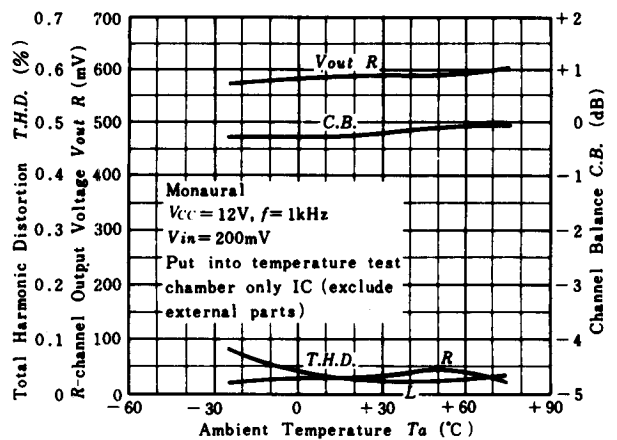
FREE-RUNNING FREQUENCY DRIFT VS. AMBIENT TEMPERATURE



TOTAL HARMONIC DISTORTION AND SEPARATION VS. AMBIENT TEMPERATURE



CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. AMBIENT TEMPERATURE



■ EXTERNAL COMPONENTS

Parts No.	Recommended Value	Purpose	Influence		Remarks
			Larger than Recommended Value	Smaller than Recommended Value	
R ₁₀₁ C ₁₀₄ C ₁₀₅	1k Ω 3.3 μ F 1.5 μ F	Composition of PLL loop filter	Decrease in capture range Increase in low-frequency distortion	—	—
R ₁₀₂ R ₁₁₁	6.8k Ω 6.8k Ω	Determination of post amplifier gain	Decrease*in post amplifier gain	Decrease in post amplifier gain	—
R ₁₀₃ R ₁₁₀ R ₁₀₄ R ₁₀₉	30k Ω 30k Ω 47k Ω 47k Ω	Determination of center voltage of post amplifier	Decrease in dynamic range	Decrease in dynamic range	—
R ₁₀₅ R ₁₀₆	3.3k Ω 3.3k Ω	Impedance matching with LPF	Increase in signal power loss	Poor rejection of 19kHz component	—
R ₁₀₇ R ₁₀₈	3.3k Ω 3.3k Ω	Impedance matching with LPF	Poor high-frequency response	Poor high-frequency characteristics	—
R ₁₁₂	200 Ω	Rush current limiter of indicator lamp	Decrease in lamp current	Increase in rush current Damage to IC	—
R ₁₁₃	22k Ω	Determination of free-run frequency of VCO	Difficulty in frequency adjustment	Poor df/dTa	—
C ₁₀₁	2.2 μ F	Input DC cutting capacitor	Large pop noise	Poor frequency characteristics	—
C ₁₀₇ C ₁₁₀	1200pF 1200pF	Determination of de-emphasis time Constant with R ₁₀₄ , R ₁₀₉	—	—	—
C ₁₀₈ C ₁₀₉	10 μ F 10 μ F	Output DC cutting capacitor	Large pop noise	Poor low-frequency characteristics	—
C ₁₁₂	360pF	Determination of free-run frequency of VCO	Decrease in capture range	Increase in VCO jitter	Styrole Capacitor