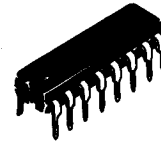


# HA1196

## PLL FM STEREO DEMODULATOR

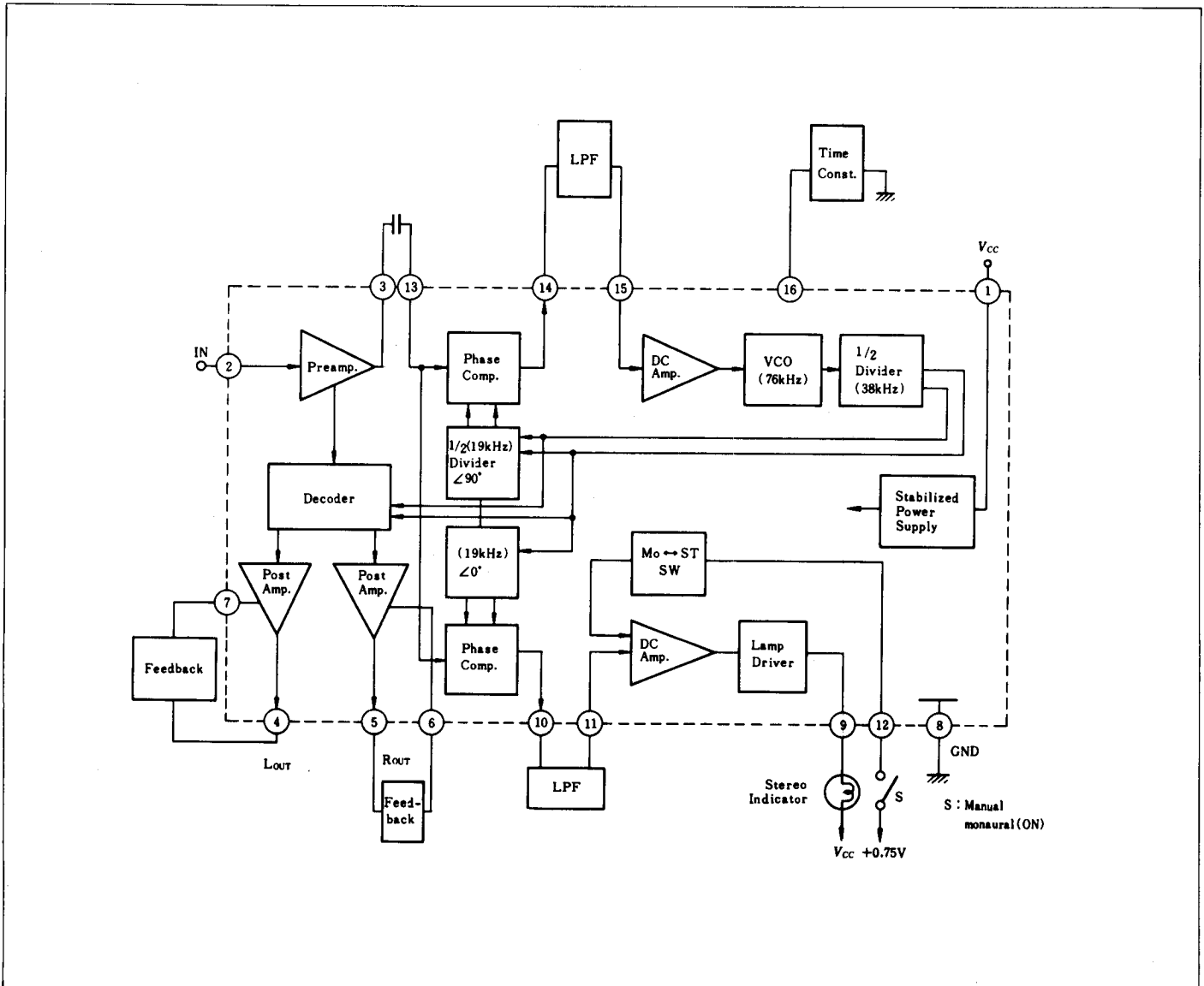
### ■ FEATURES

- 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

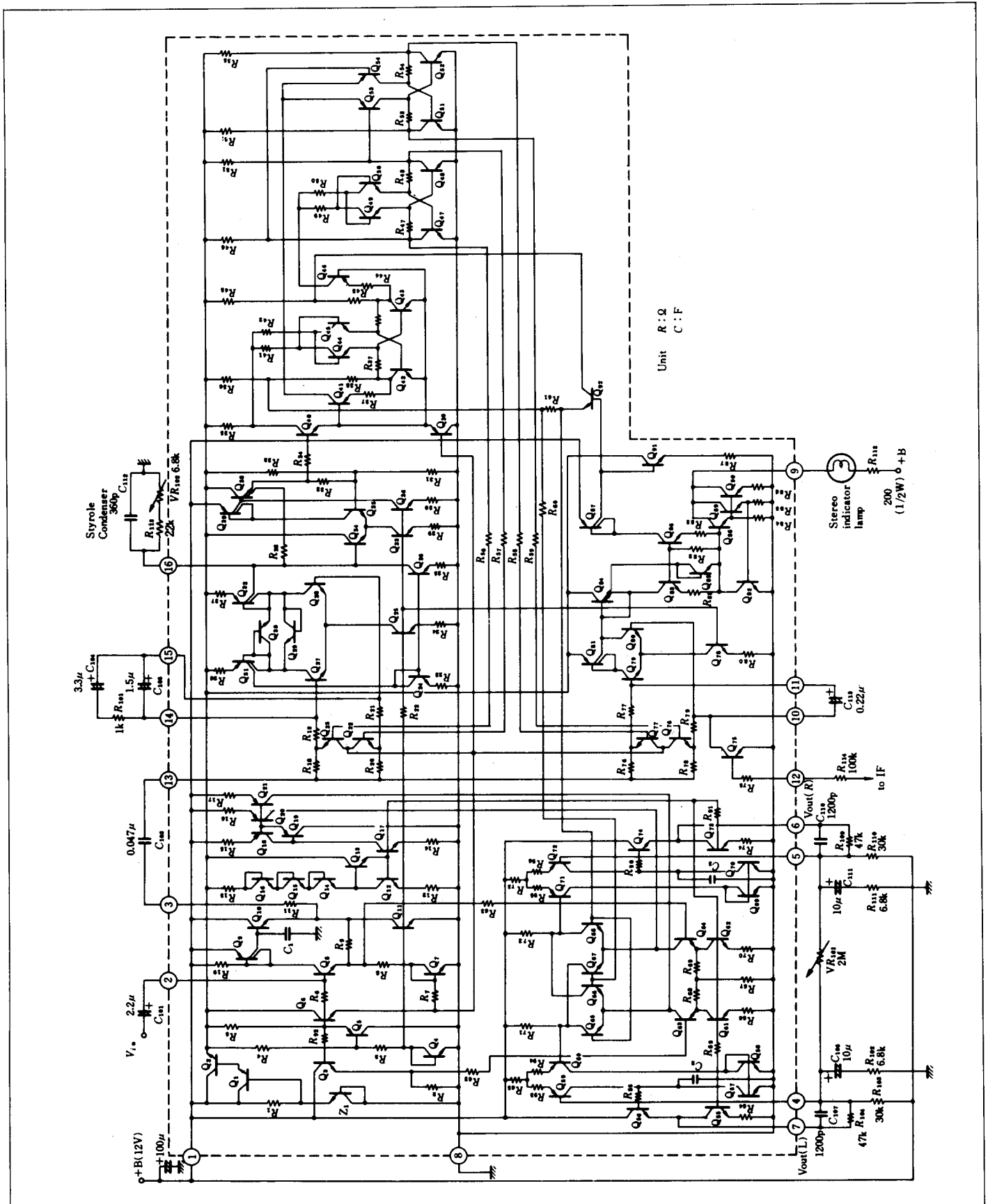


(DP-16)

### ■ 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

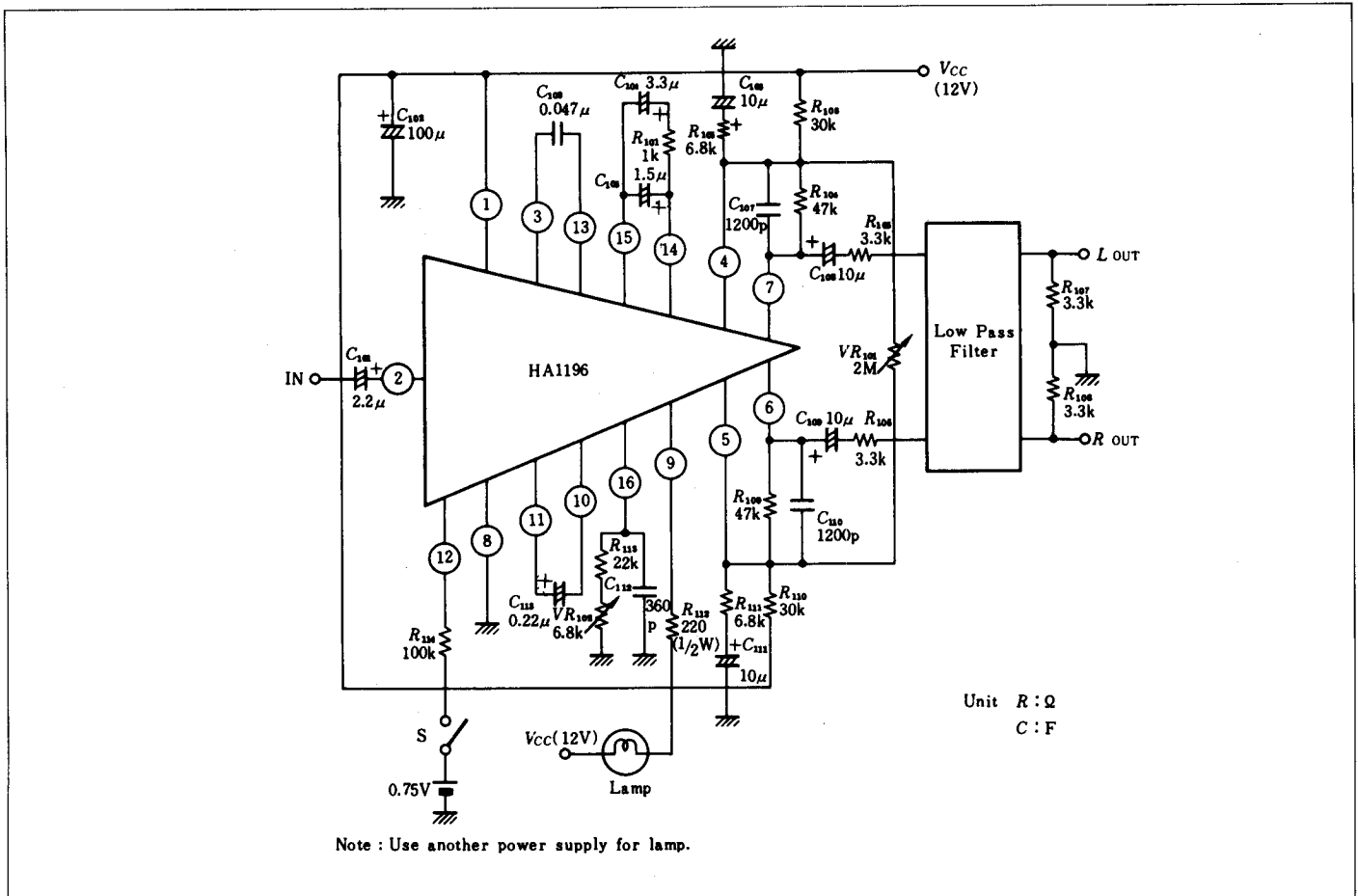
\* Value at  $T_a=70^\circ\text{C}$

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

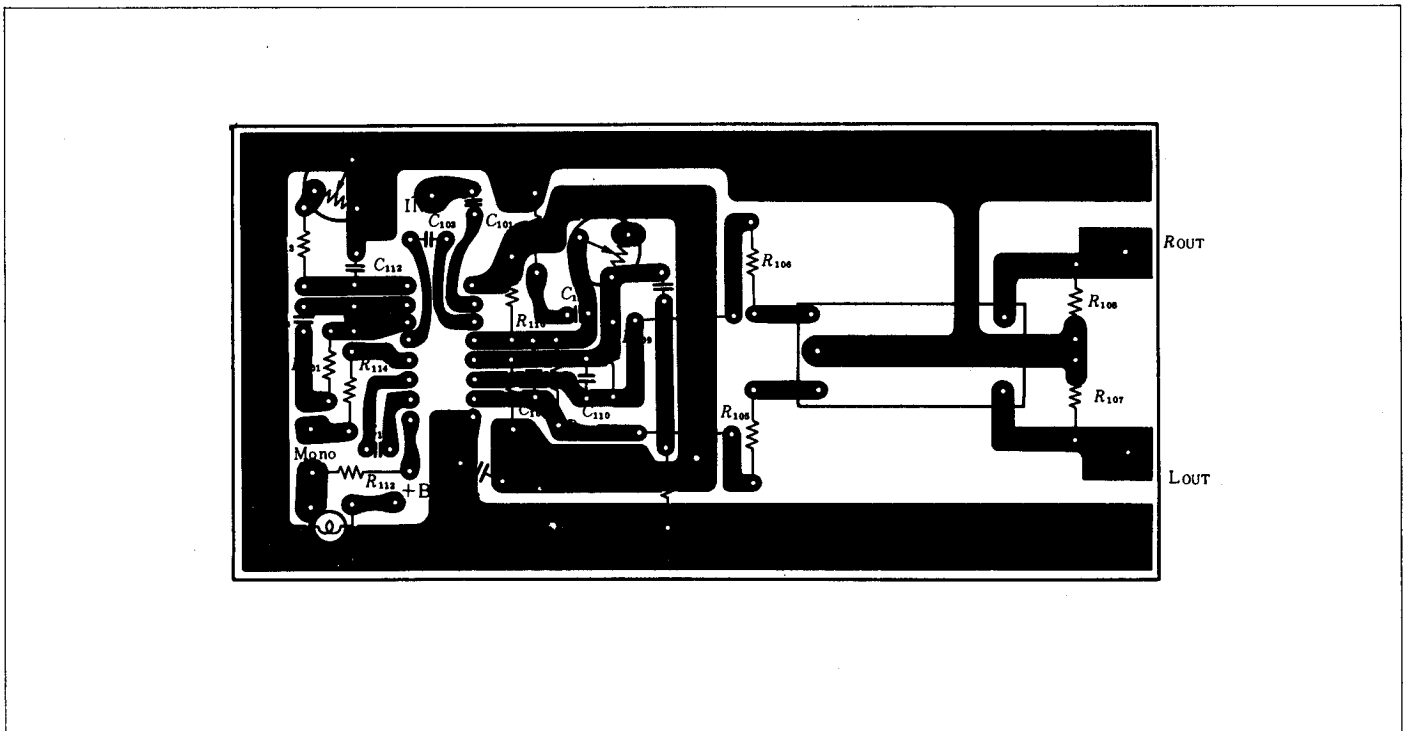
Item	Symbol	Test Condition	min	typ	max	Unit	
Input Impedance	$Z_{in}$		—	75	—	$\text{k}\Omega$	
Channel Separation	$S_{sp}$	$P=20\text{mV}$ , $L+R=180\text{mV}$ , $V.C.O.f_{req}=76\text{kHz}$	$f=100\text{Hz}$	—	42	—	dB
			$f=1\text{kHz}$	40	55	—	
			$f=10\text{kHz}$	—	42	—	
Stereo Total Harmonic Distortion	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	$P=14\text{mV}$	—	$\pm 3$	—	%	
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

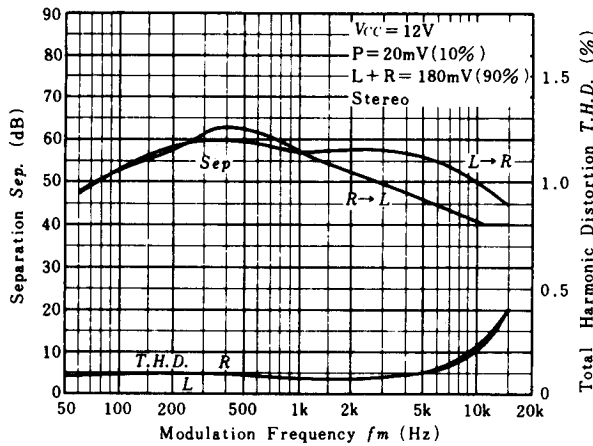
■ TEST CIRCUIT



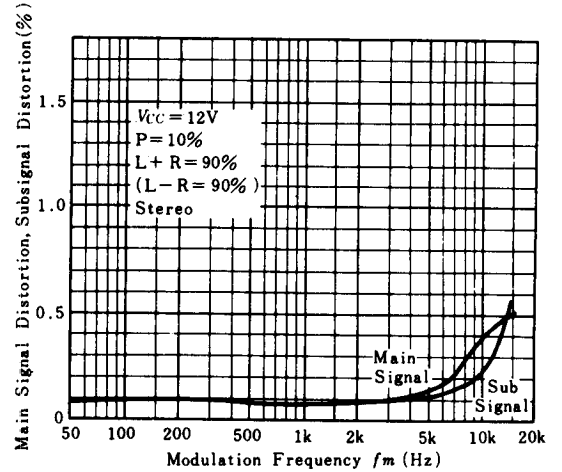
■ STANDARD PRINTED CIRCUIT BOARD (Bottom View)



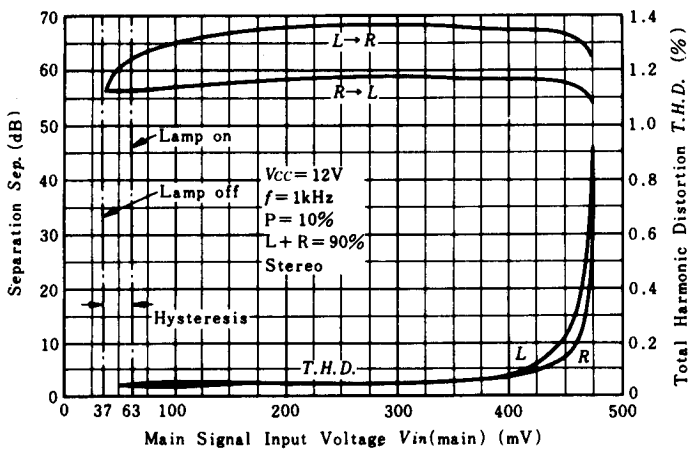
**TOTAL HARMONIC DISTORTION AND SEPARATION VS. MODULATION FREQUENCY**



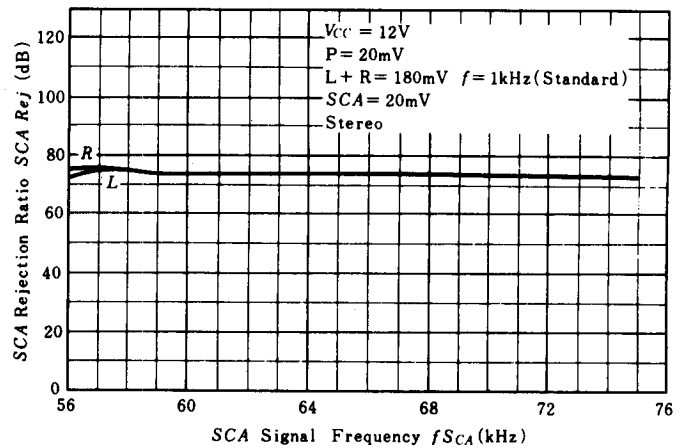
**MAIN SIGNAL DISTORTION AND SUBSIGNAL DISTORTION VS. MODULATION FREQUENCY**



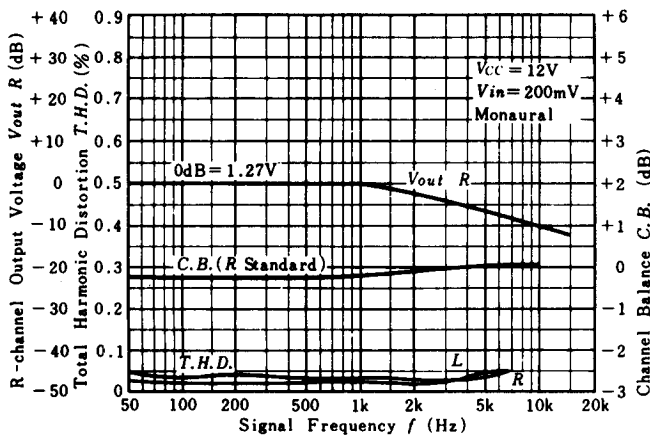
**TOTAL HARMONIC DISTORTION AND SEPARATION VS. MAIN SIGNAL INPUT VOLTAGE**



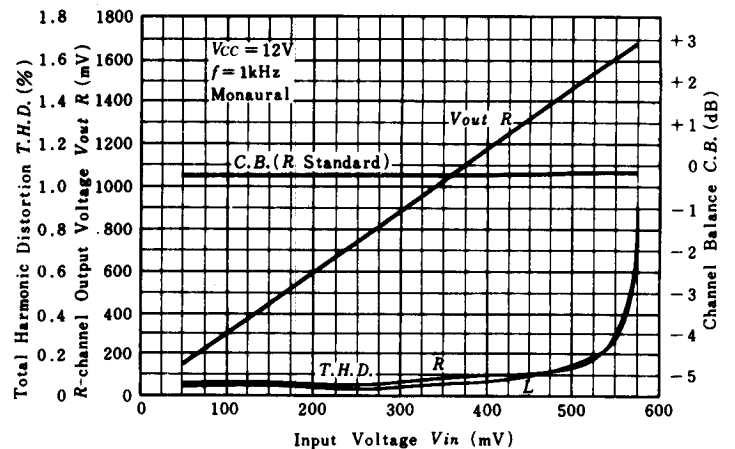
**SCA REJECTION RATIO VS. SCA SIGNAL FREQUENCY**



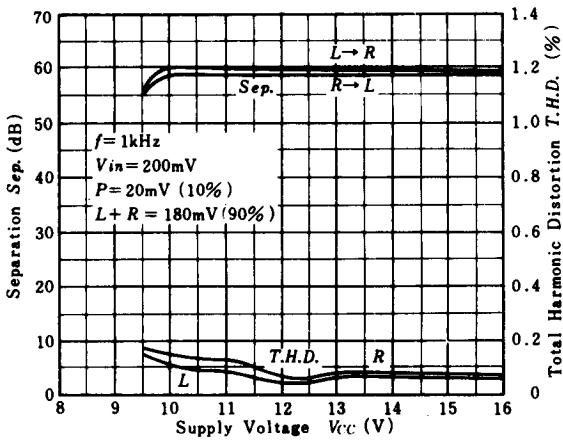
**CHANNEL BALANCE, R-CHANNEL OUTPUT VOLTAGE AND TOTAL HARMONIC DISTORTION VS. SIGNAL FREQUENCY**



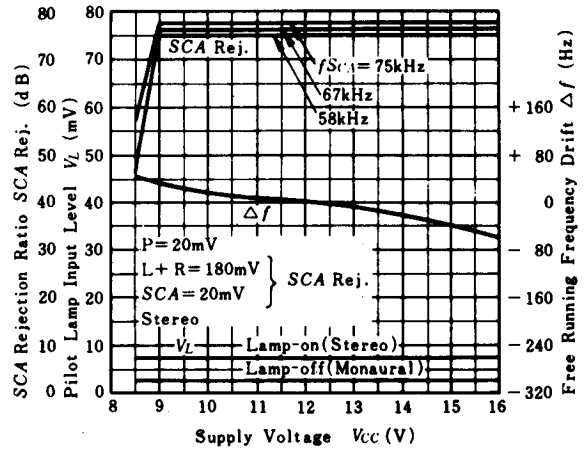
**CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. INPUT VOLTAGE**



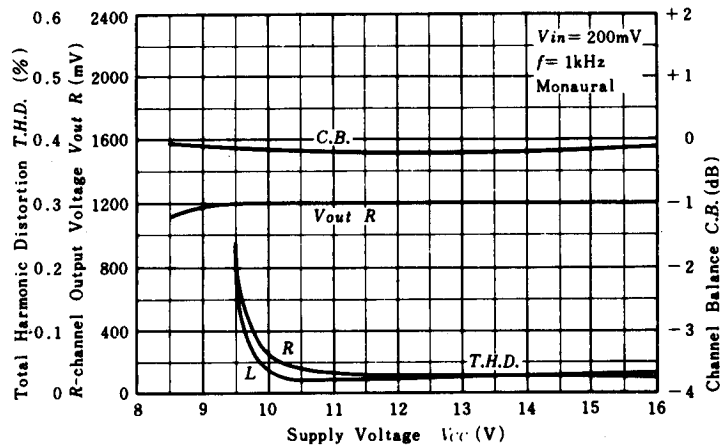
**TOTAL HARMONIC DISTORTION AND SEPARATION VS. SUPPLY VOLTAGE**



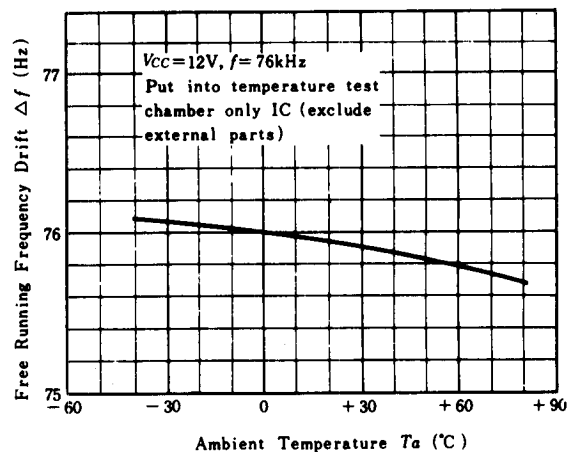
**FREE RUNNING FREQUENCY DRIFT, SCA REJECTION RATIO AND PILOT LAMP INPUT LEVEL FOR LAMP ON/OFF VS. SUPPLY VOLTAGE**



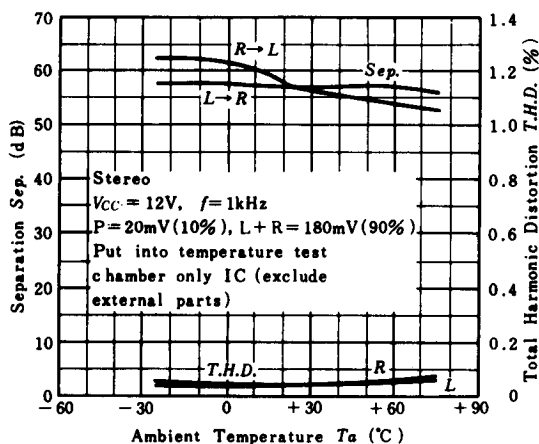
**CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. SUPPLY VOLTAGE**



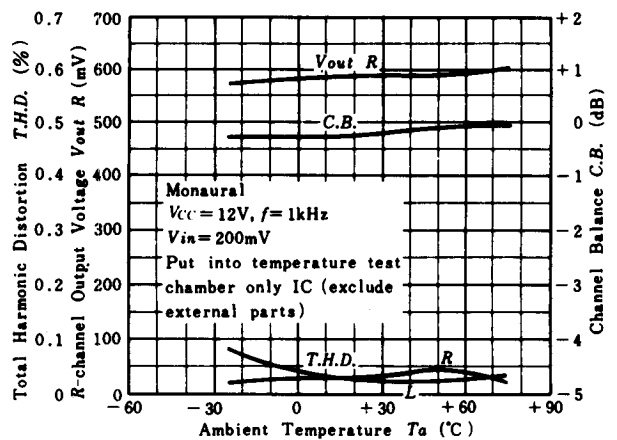
**FREE-RUNNING FREQUENCY DRIFT VS. AMBIENT TEMPERATURE**



**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 <sub>101</sub> C <sub>104</sub> C <sub>105</sub>	1k $\Omega$ 3.3 $\mu$ F 1.5 $\mu$ F	Composition of PLL loop filter	Decrease in capture range Increase in low-frequency distortion	—	—
R <sub>102</sub> R <sub>111</sub>	6.8k $\Omega$ 6.8k $\Omega$	Determination of post amplifier gain	Decrease*in post amplifier gain	Decrease in post amplifier gain	—
R <sub>103</sub> R <sub>110</sub> R <sub>104</sub> R <sub>109</sub>	30k $\Omega$ 30k $\Omega$ 47k $\Omega$ 47k $\Omega$	Determination of center voltage of post amplifier	Decrease in dynamic range	Decrease in dynamic range	—
R <sub>105</sub> R <sub>106</sub>	3.3k $\Omega$ 3.3k $\Omega$	Impedance matching with LPF	Increase in signal power loss	Poor rejection of 19kHz component	—
R <sub>107</sub> R <sub>108</sub>	3.3k $\Omega$ 3.3k $\Omega$	Impedance matching with LPF	Poor high-frequency response	Poor high-frequency characteristics	—
R <sub>112</sub>	200 $\Omega$	Rush current limiter of indicator lamp	Decrease in lamp current	Increase in rush current Damage to IC	—
R <sub>113</sub>	22k $\Omega$	Determination of free-run frequency of VCO	Difficulty in frequency adjustment	Poor df/dTa	—
C <sub>101</sub>	2.2 $\mu$ F	Input DC cutting capacitor	Large pop noise	Poor frequency characteristics	—
C <sub>107</sub> C <sub>110</sub>	1200pF 1200pF	Determination of de-emphasis time Constant with R <sub>104</sub> , R <sub>109</sub>	—	—	—
C <sub>108</sub> C <sub>109</sub>	10 $\mu$ F 10 $\mu$ F	Output DC cutting capacitor	Large pop noise	Poor low-frequency characteristics	—
C <sub>112</sub>	360pF	Determination of free-run frequency of VCO	Decrease in capture range	Increase in VCO jitter	Styrole Capacitor