

# HA1156W

## FM STEREO DEMODULATOR

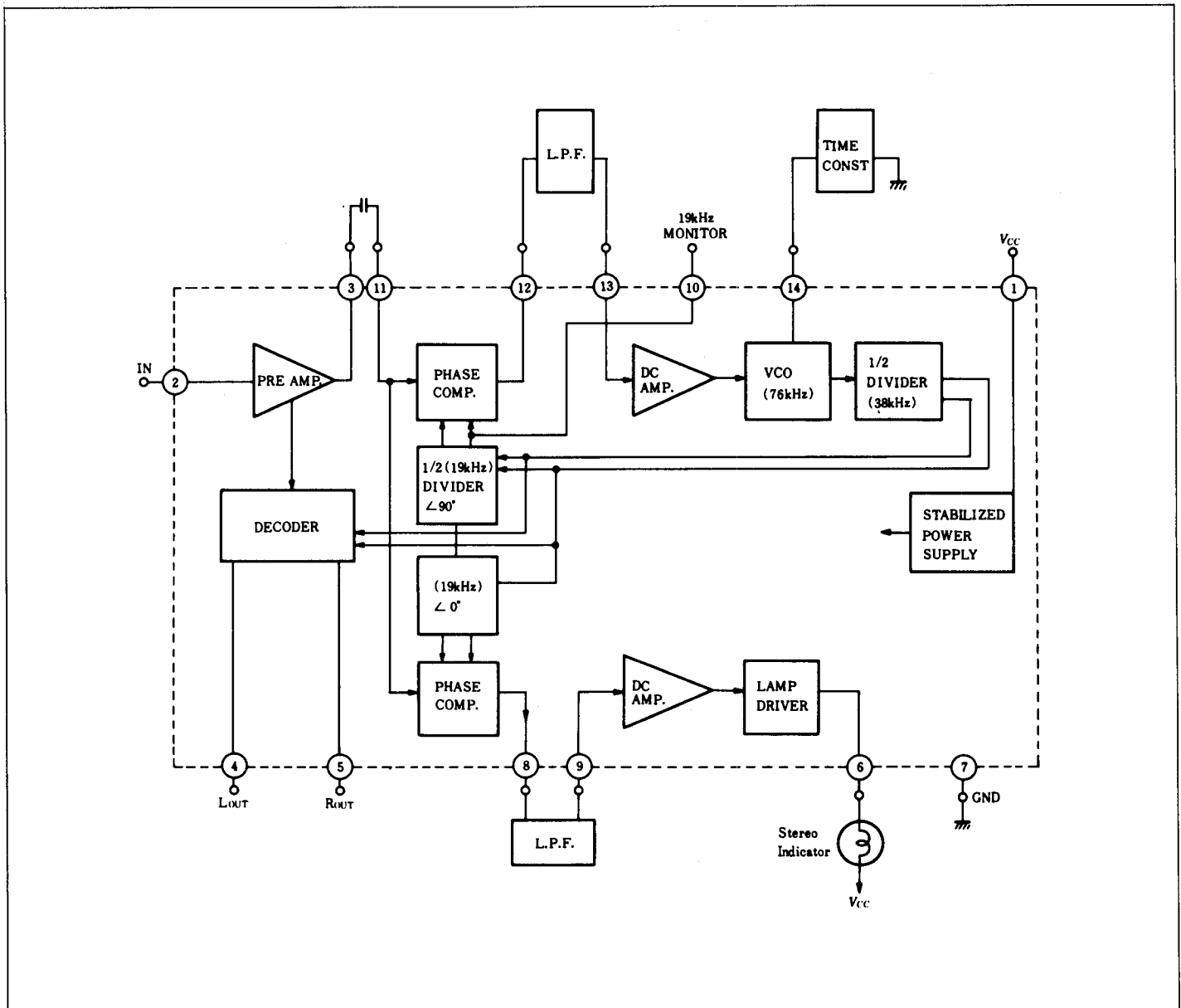
### FEATURES

- Low External Part – No Coils
- Only One Adjustment of Semifixed Volume for Oscillation Frequency
- High Operating Stability Against Environmental Condition Change
- Total System Including Stereo Demodulator, Automatic Stereo-Monaural Switching Circuit, and Stereo Indicator Lamp Driver
- Low Total Harmonic Distortion During Monaural Operation (0.15% typ. at  $f = 400\text{ Hz}$ ,  $V_{in} = 560\text{ mV}$ )
- Perfect Synchronous Stereo Indicator Lamp Operation to Stereo-Monaural Switching

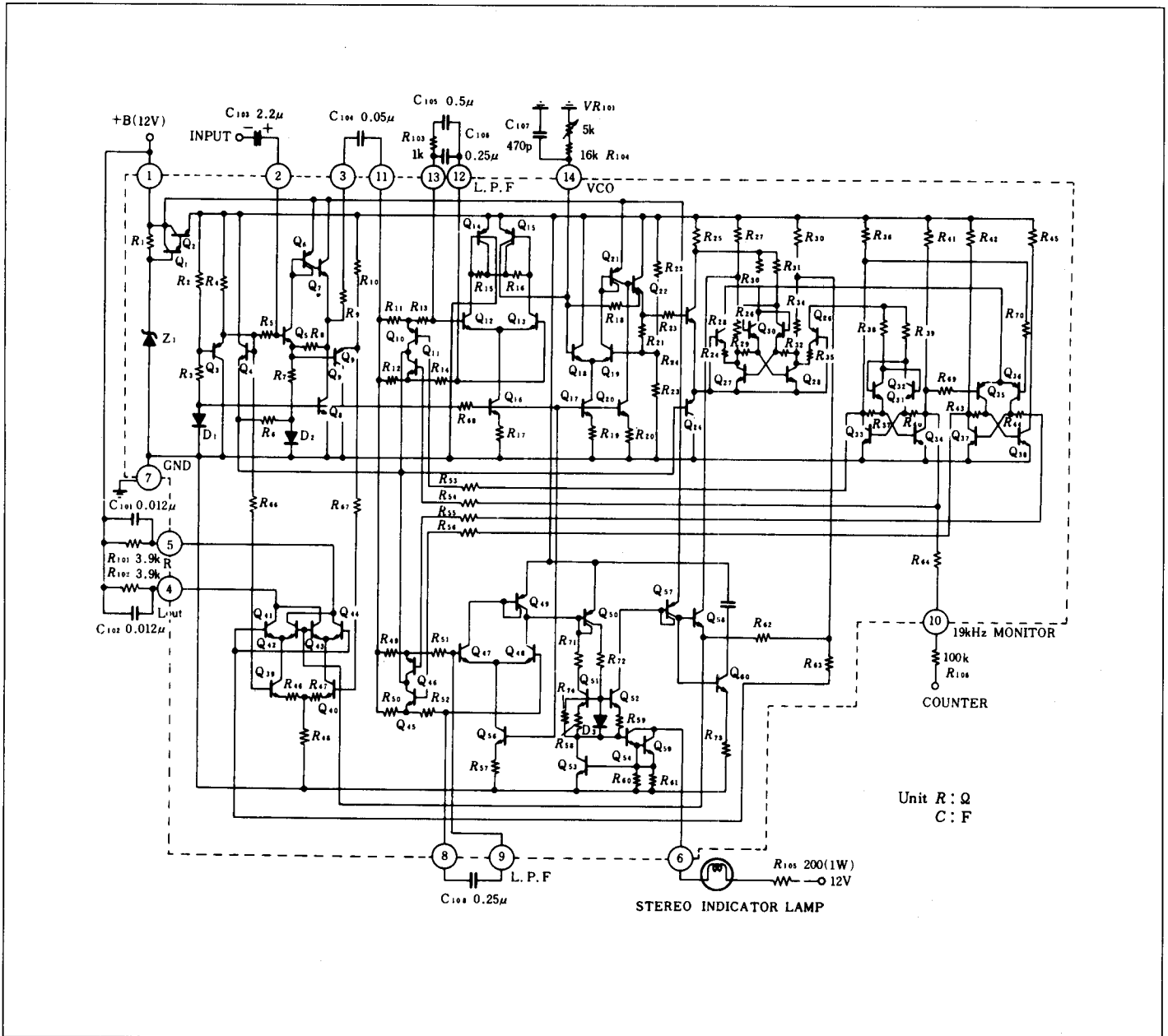


(DP-14)

### FUNCTIONAL BLOCK DIAGRAM



■ **CIRCUIT SCHEMATIC AND TYPICAL EXTERNAL PARTS**



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

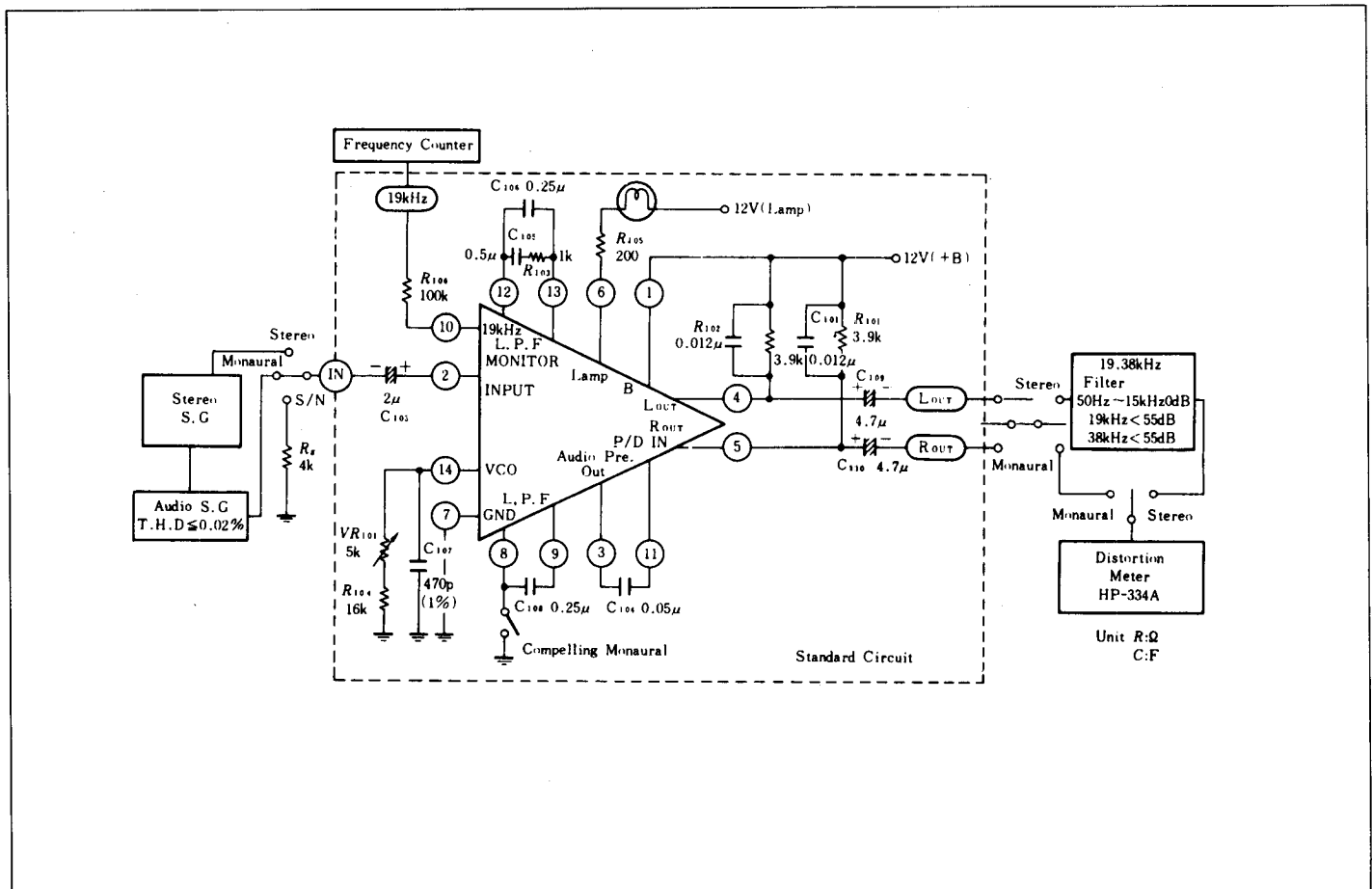
Item	Symbol	Rating	Unit
Supply Voltage	$V_{cc}$	16	V
Lamp Current	$I_L$	75	mA
Power Dissipation*	$P_T$	400	mW
Operating Temperature	$T_{opr}$	-20 to +85	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +125	$^\circ\text{C}$

\* Value at  $T_a=85^\circ\text{C}$

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

Item	Symbol	Test Condition	min	typ	max	Unit	
Input Impedance	$Z_{in}$		—	50	—	$k\Omega$	
Channel Separation	$S_{ep}$	$P=56mV$ , $L+R=504mV$	$f=100Hz$	—	45	—	dB
			$f=1kHz$	30	45	—	
			$f=10kHz$	—	40	—	
Stereo Total Harmonic Distortion	S.T.H.D	$P=56mV$ , $L+R=504mV$	$f=100Hz$	—	0.25	—	%
			$f=1kHz$	—	0.15	0.5	
			$f=10kHz$	—	0.30	—	
Output Voltage	$V_{out}$	$V_{in}=560mV$	—	300	—	mV	
Channel Balance	C.B	$V_{in}=560mV$	—	0.5	1.5	dB	
Monaural Total Harmonic Distortion	$M_{ono} T.H.D$	$V_{in}=560mV$	—	0.15	0.7	%	
Carrier Leak	CL	$P=56mV$ , $L+R=504mV$	$f=19kHz$	—	35	—	dB
			$f=38kHz$	—	45	—	
SCA Rejection Ratio	SCA $R_{ej}$	$P=56mV$ , $L+R=504mV$ , SCA=56mV, $f_{SCA}=67kHz$	—	75	—	dB	
Pilot Level for Lamp ON	$L_{(ON)}$		12	16	20	mV	
Stereo Lamp Hysteresis			—	6	—	dB	
Capture Range	CR	$P=56mV$	—	$\pm 3$	—	%	
Signal-to-noise Ratio	S/N	$V_{in}=560mV$ (standard), $R_g=4k\Omega$	—	76	—	dB	
Total Current Drain	$I_T$	Lamp OFF	—	13	—	mA	
Maximum Input Signal	$V_{in}$	Stereo : T.H.D=0.5%, $P=10\%$ $L+R=90\%$ , Monaural : T.H.D=1.0%	—	1.3	—	Vrms	

■ TEST CIRCUIT



■ EXTERNAL COMPONENTS FUNCTION

$R_{101}, R_{102}, C_{101}, C_{102}$  :

Load resistors and de-emphasis capacitors

$C_{103}$  :

Input coupling capacitor to demodulator

$C_{104}$  :

Internal coupling capacitor

$R_{103}, C_{105}, C_{106}$  :

Phase loop filter components

$R_{104}, VR_{101}, C_{107}$  :

Oscillator timing network which determines free running

frequency of HA1156W. Adjust the semifixed volume  $VR_{101}$  so that Pin 10 output frequency becomes exactly 19 kHz at no pilot input.

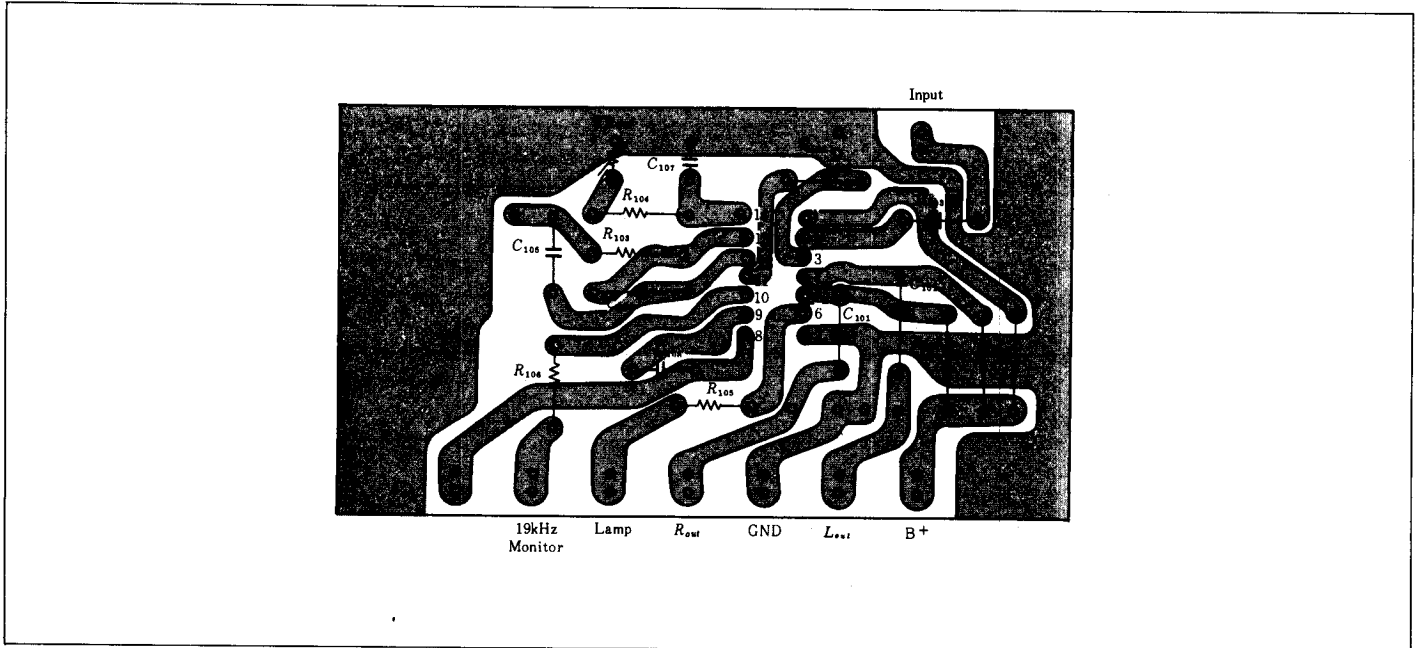
$C_{108}$  :

Filter capacitor for stereo switch level detector. If Pin 8 is grounded directly, HA1156W operates in monaural mode independent of the pilot input level.

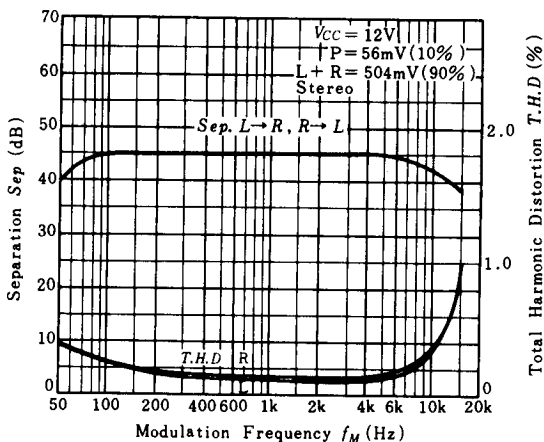
$R_{105}$  :

Resistor which limits the lamp current (especially at lamp ON)

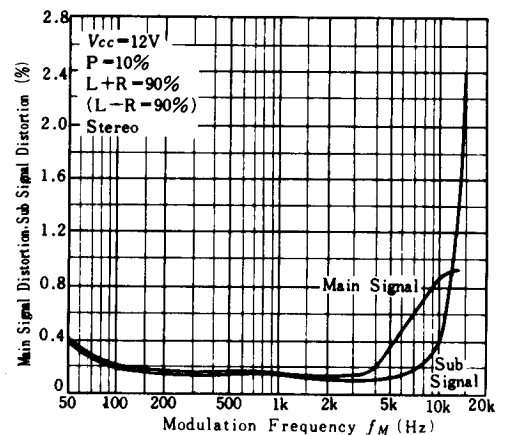
■ STANDARD PRINTED CIRCUIT BOARD (Bottom View)



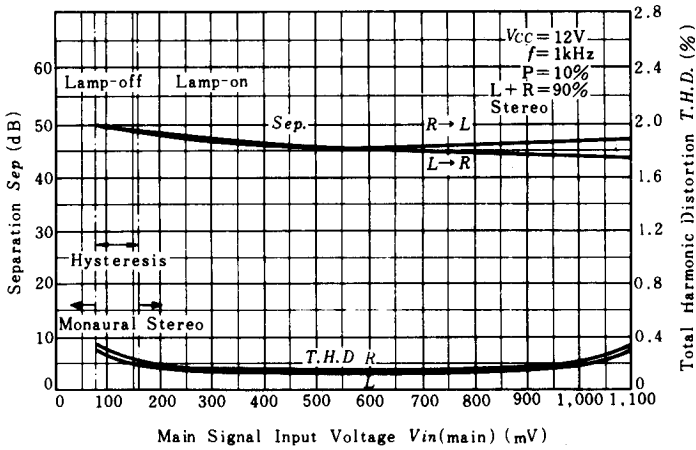
TOTAL HARMONIC DISTORTION AND SEPARATION VS. MODULATION FREQUENCY



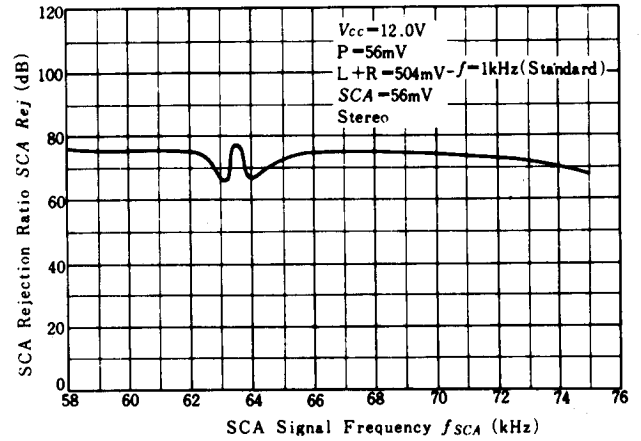
MAIN SIGNAL DISTORTION AND SUBSIGNAL DISTORTION VS. MODULATION FREQUENCY



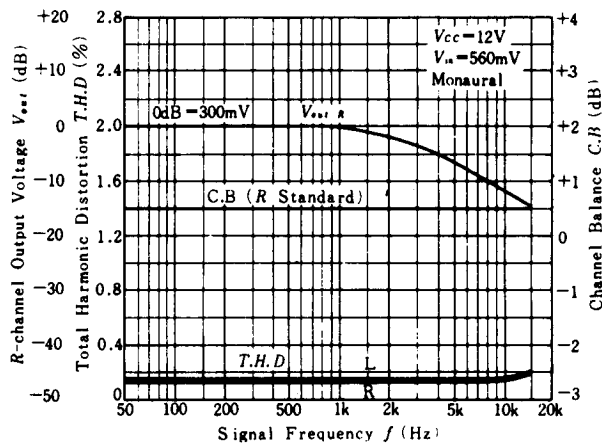
**TOTAL HARMONIC DISTORTION AND SEPARATION VS. MAIN SIGNAL INPUT VOLTAGE**



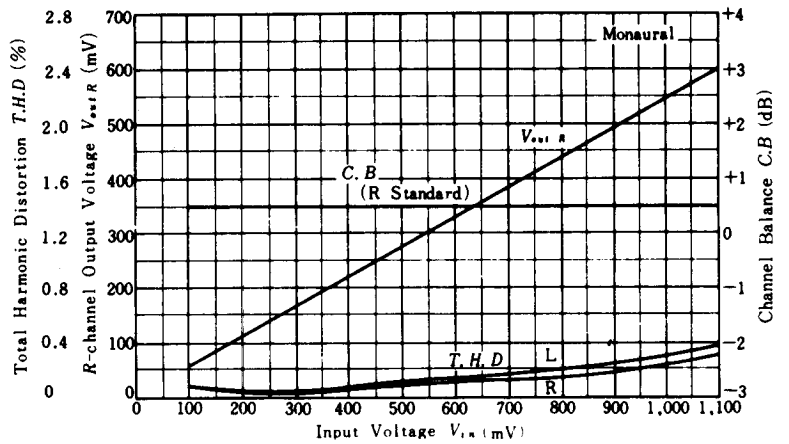
**SCA REJECTION RATIO VS. SCA SIGNAL FREQUENCY**



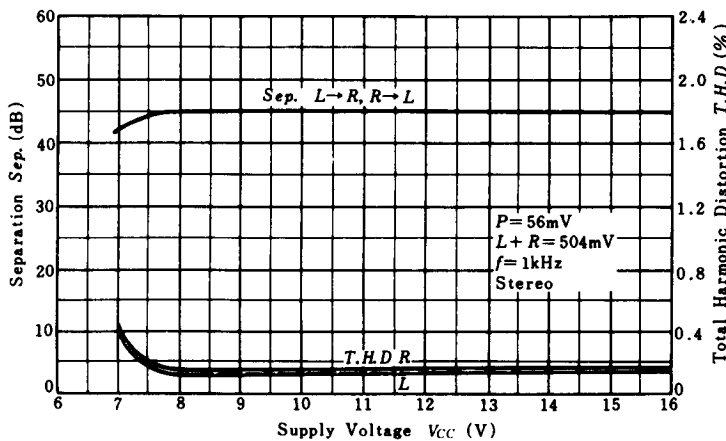
**CHANNEL BALANCE, R-CHANNEL OUTPUT VOLTAGE AND TOTAL HARMONIC DISTORTION VS. SIGNAL FREQUENCY**



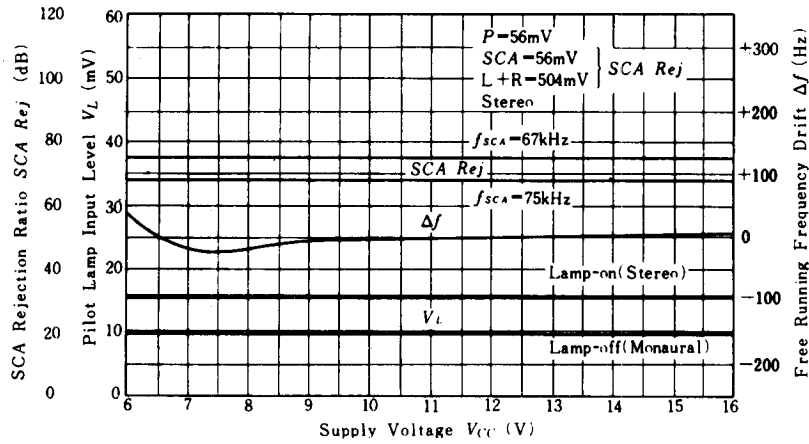
**CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. INPUT VOLTAGE**



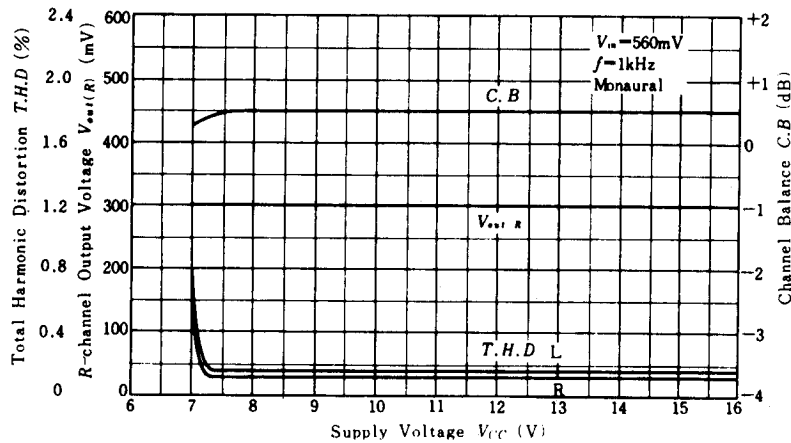
**TOTAL HARMONIC DISTORTION AND SEPARATION VS. SUPPLY VOLTAGE**



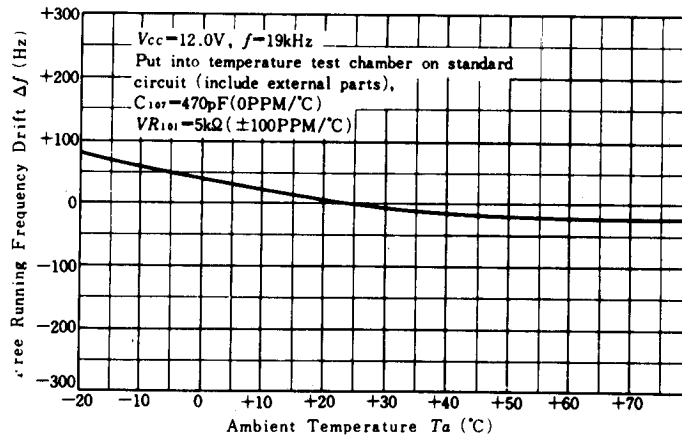
**FREE-RUNNING FREQUENCY DRIFT, SCA REJECTION RATIO AND PILOT LAMP INPUT LEVEL FOR LAMP ON/OFF VS. SUPPLY VOLTAGE**



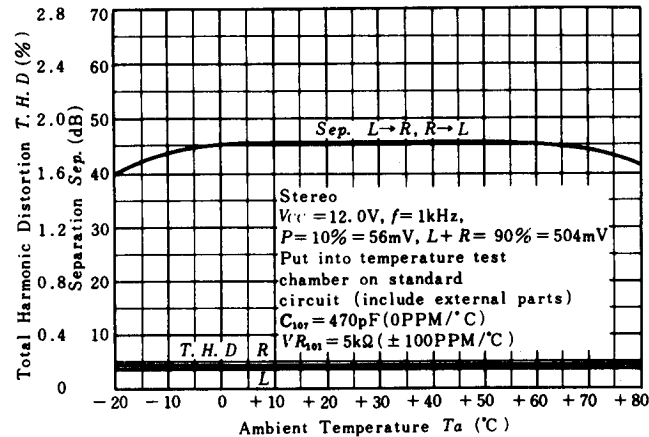
**CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. SUPPLY VOLTAGE**



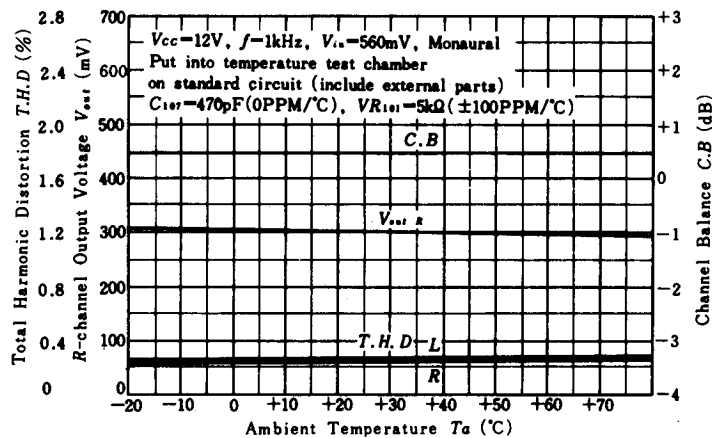
**FREE-RUNNING FREQUENCY DRIFT VS. AMBIENT TEMPERATURE**



### 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> R <sub>102</sub>	3.9k $\Omega$ 3.9k $\Omega$	Load resistor of decoder	Decrease in output dynamic range. Output is clipped	Decrease in Gv	
R <sub>104</sub>	16k $\Omega$	Determination of free-run frequency of V.C.O	Difficulty of frequency adjustment	Degradation of df/d Tamb.	
R <sub>105</sub>	200 $\Omega$	Rush current limiter of stereo indicating lamp	Decrease in lamp current	Increase in rush current damage to IC	
VR <sub>101</sub>	5k $\Omega$ (B-type)	Adjustment of free-run frequency of V.C.O	Adjustment becomes critical	Adjustment impossible	Use palladium volume
R <sub>103</sub> C <sub>105</sub> C <sub>106</sub>	1k $\Omega$ 0.25 $\mu F$ 0.5 $\mu F$	Composition of LPF in PLL	Increase in lock-up time of PLL.	Increase in T.H.D	
C <sub>103</sub>	2.2 $\mu F$	Input Coupling Capacitor	Large pop noise	Poor low-frequency characteristics	
C <sub>107</sub>	470pF	Determination of free-run frequency of V.C.O	Decrease in PLL loop gain	Increase in PLL loop gain	Use a styrolex Capacitor
C <sub>108</sub>	0.25 $\mu F$	Loop filter of lamp driver	Delay in lamp on	Lamp miss-on	