

HA1156W

FM STEREO DEMODULATOR

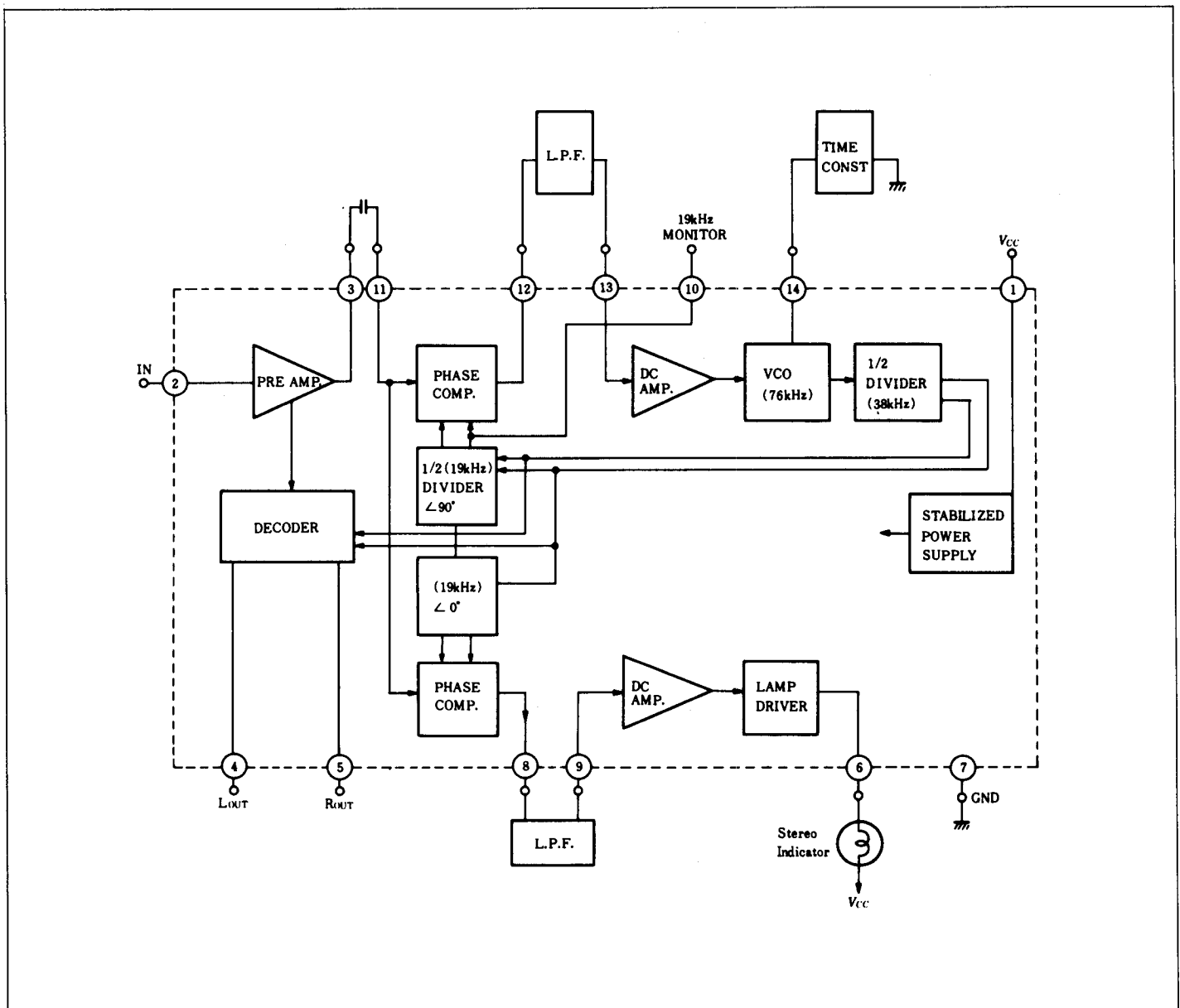
FEATURES

- 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

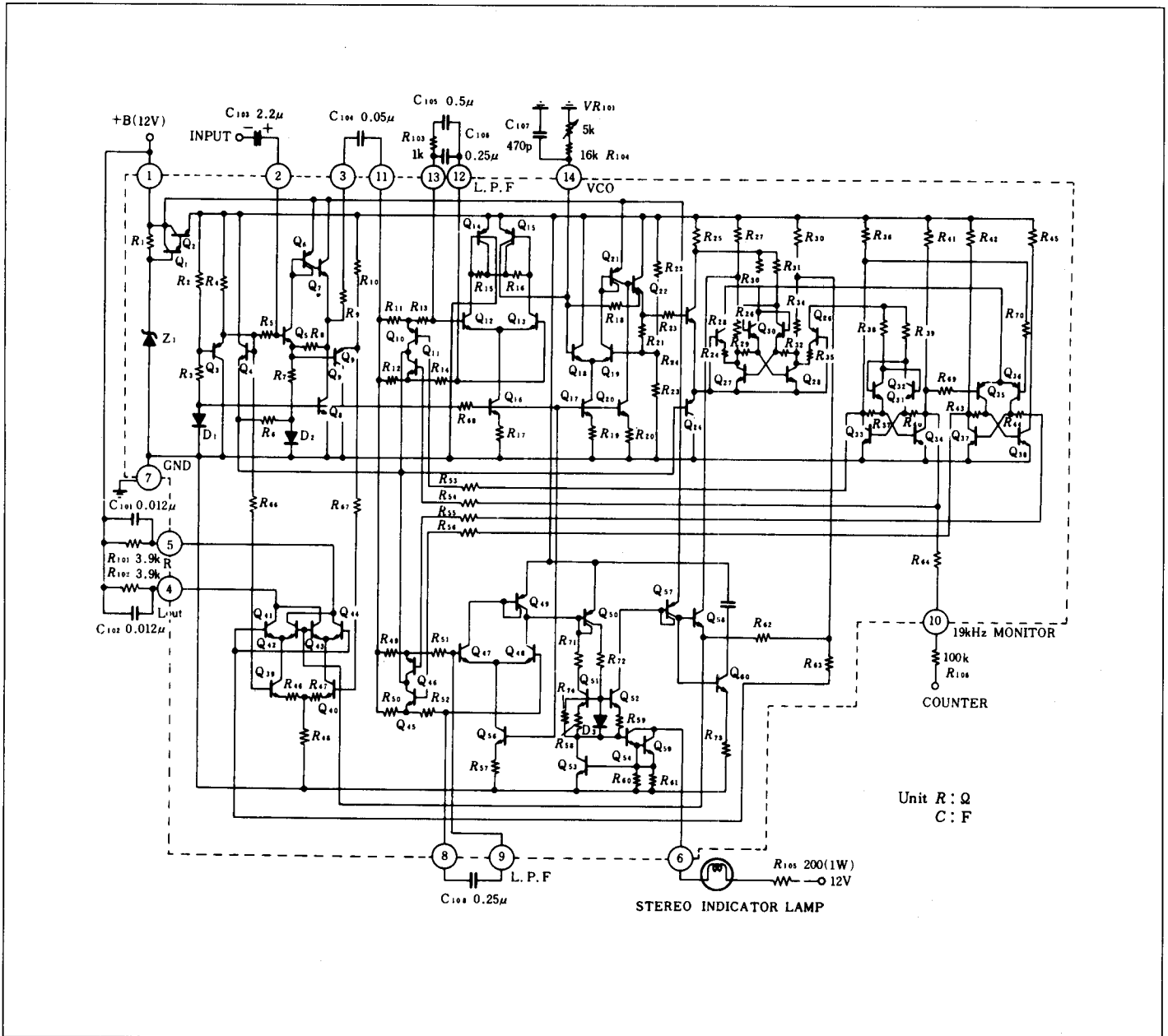


(DP-14)

FUNCTIONAL BLOCK DIAGRAM



■ **CIRCUIT SCHEMATIC AND TYPICAL EXTERNAL PARTS**



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

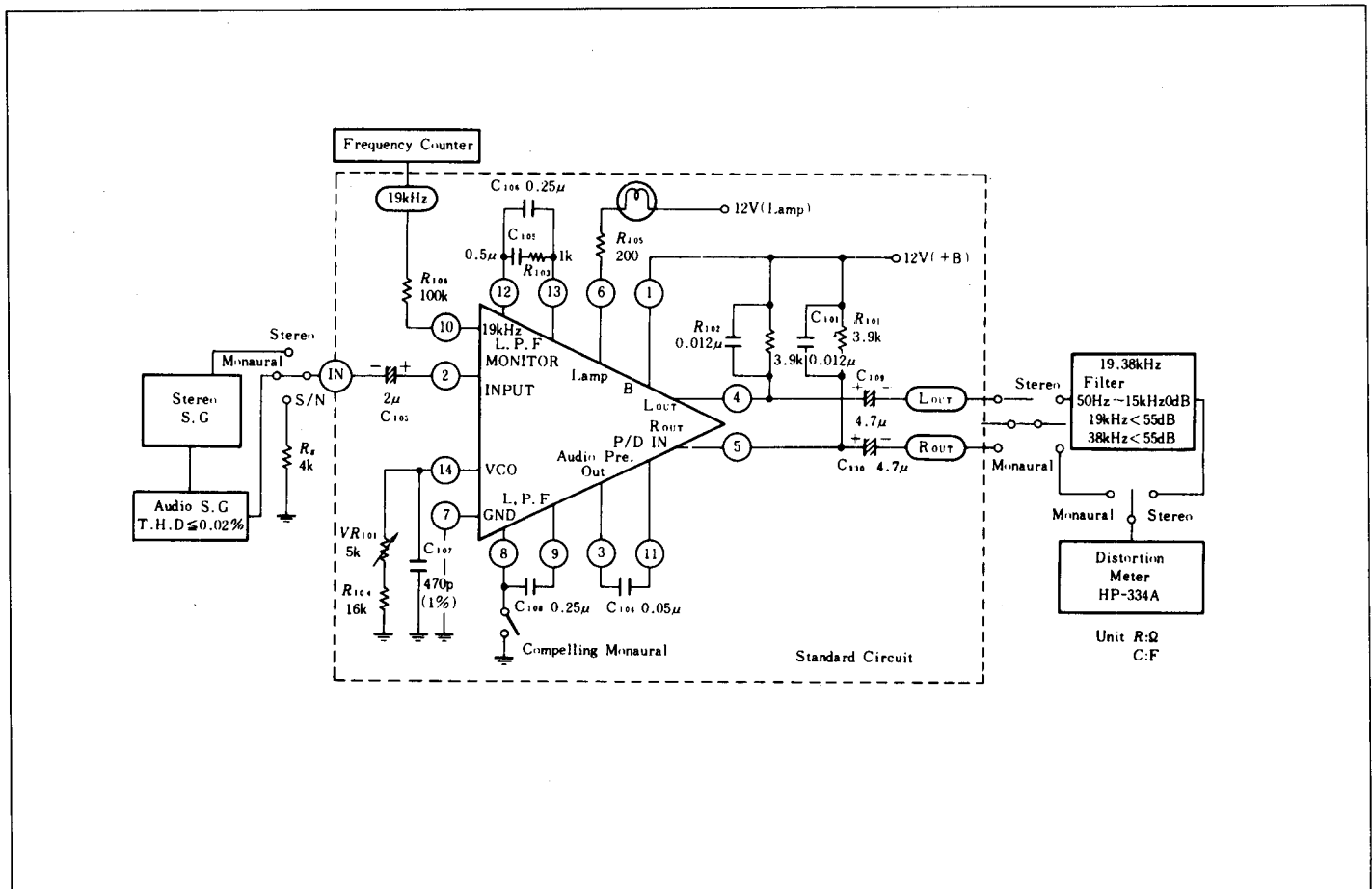
Item	Symbol	Rating	Unit
Supply Voltage	V_{cc}	16	V
Lamp Current	I_L	75	mA
Power Dissipation*	P_T	400	mW
Operating Temperature	T_{opr}	-20 to +85	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +125	$^\circ\text{C}$

* 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	ST.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	$P=56mV$	—	± 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.

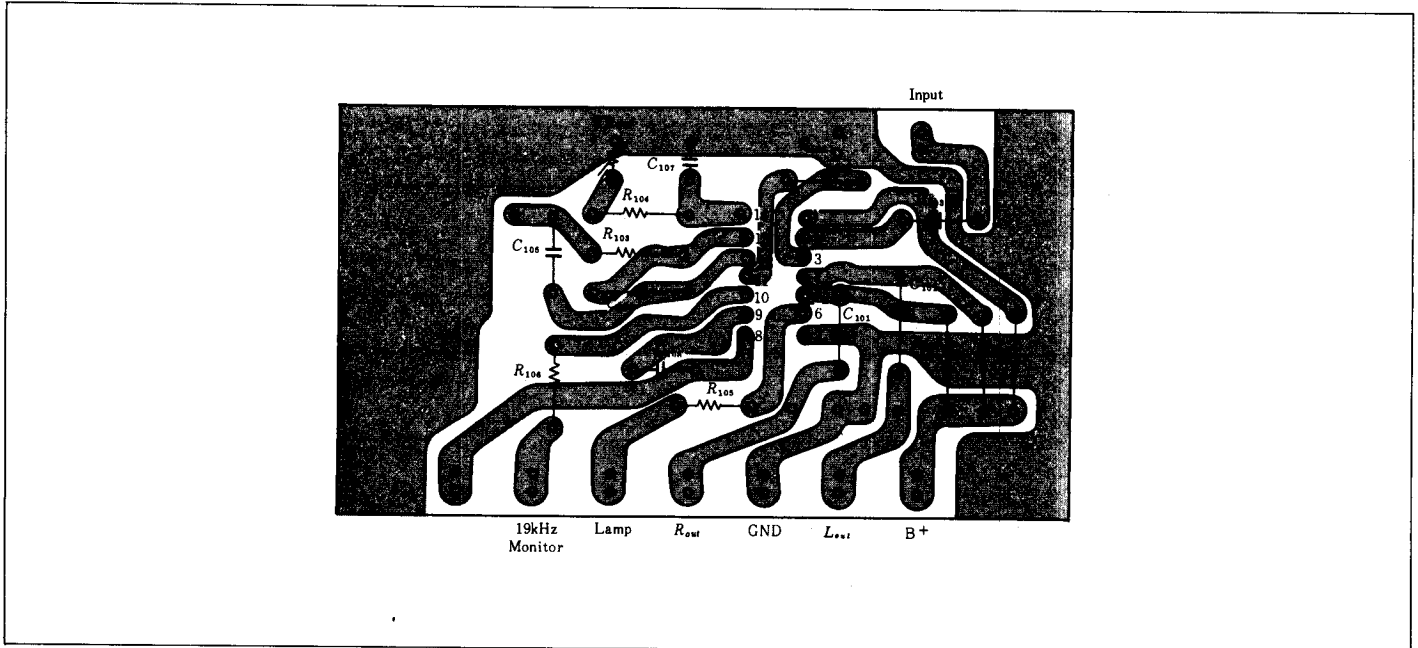
C_{108} :

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

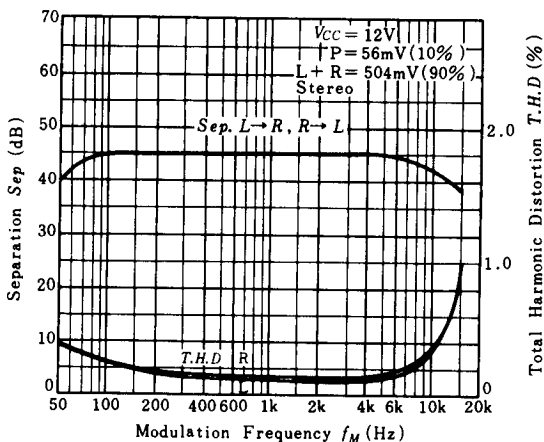
R_{105} :

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

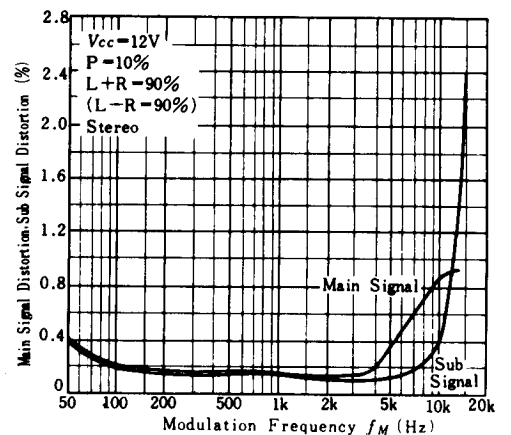
■ STANDARD PRINTED CIRCUIT BOARD (Bottom View)



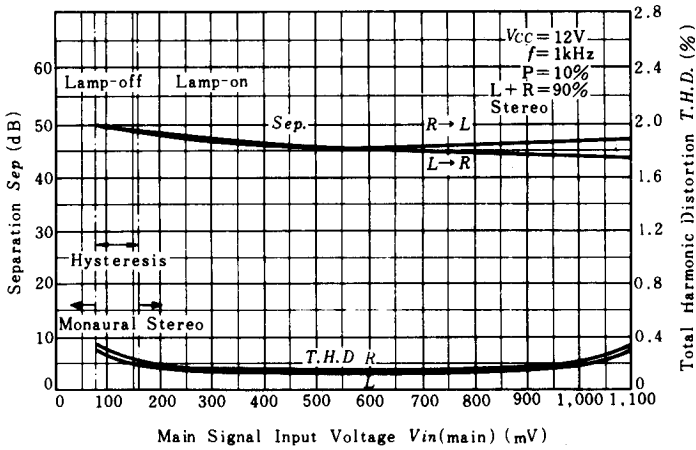
TOTAL HARMONIC DISTORTION AND SEPARATION VS. MODULATION FREQUENCY



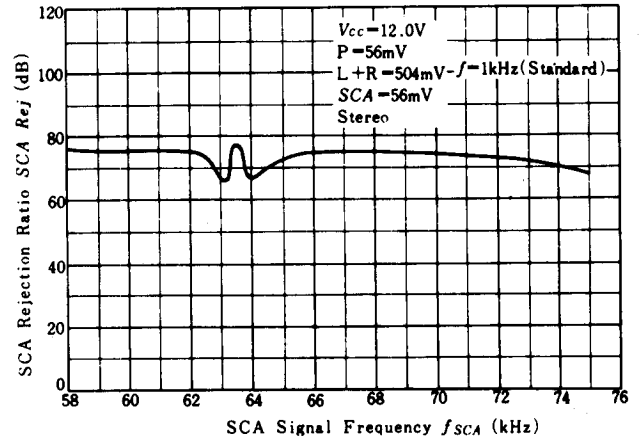
MAIN SIGNAL DISTORTION AND SUBSIGNAL DISTORTION VS. MODULATION FREQUENCY



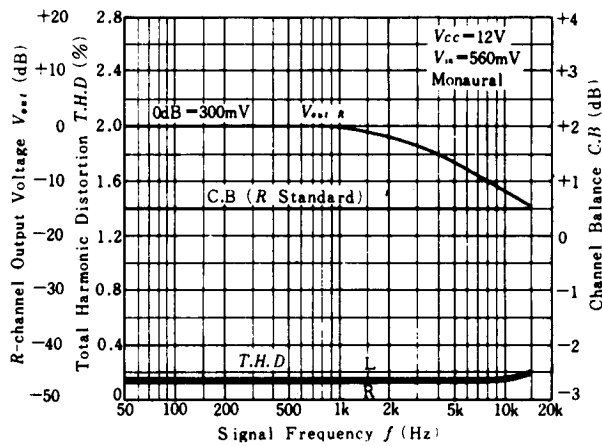
TOTAL HARMONIC DISTORTION AND SEPARATION VS. MAIN SIGNAL INPUT VOLTAGE



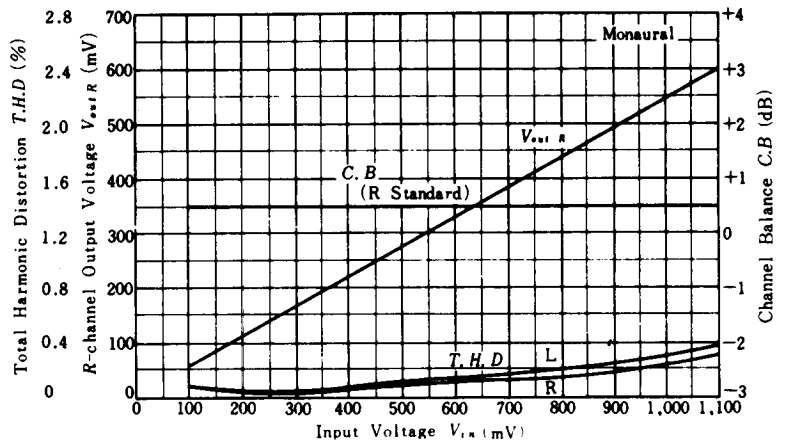
SCA REJECTION RATIO VS. SCA SIGNAL FREQUENCY



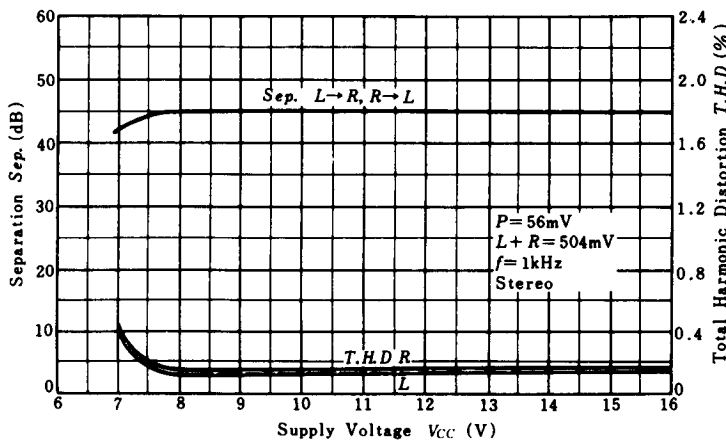
CHANNEL BALANCE, R-CHANNEL OUTPUT VOLTAGE AND TOTAL HARMONIC DISTORTION VS. SIGNAL FREQUENCY



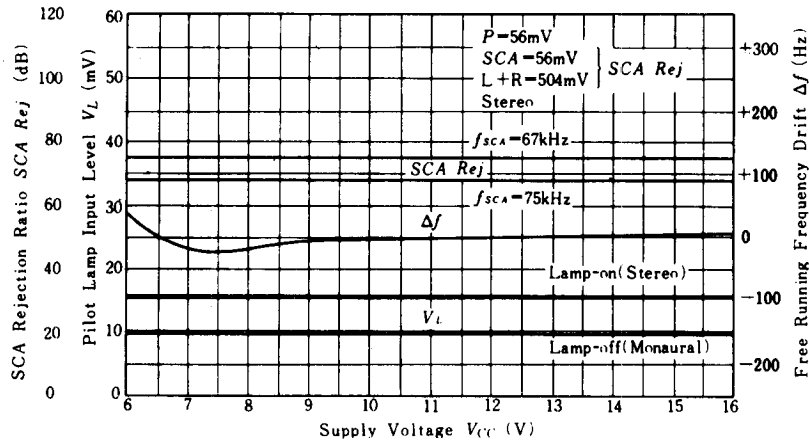
CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. INPUT VOLTAGE



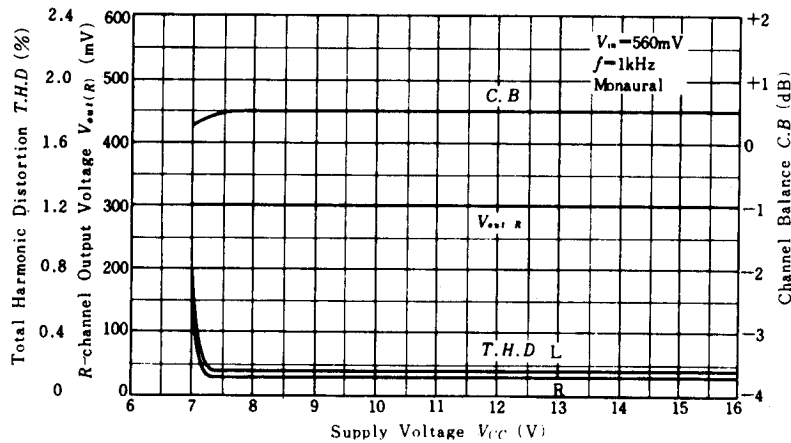
TOTAL HARMONIC DISTORTION AND SEPARATION VS. SUPPLY VOLTAGE



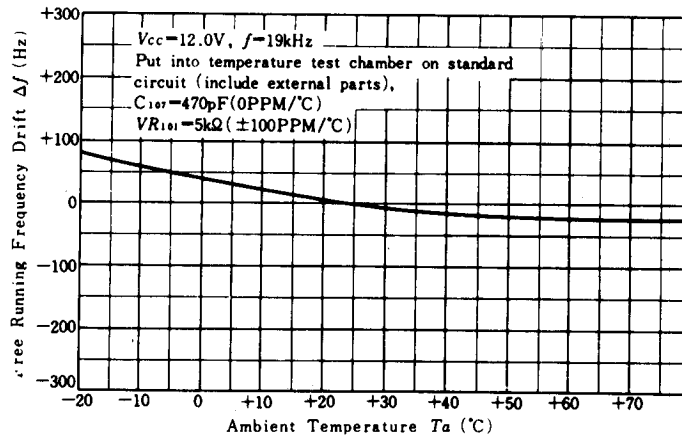
FREE-RUNNING FREQUENCY DRIFT, SCA REJECTION RATIO AND PILOT LAMP INPUT LEVEL FOR LAMP ON/OFF VS. SUPPLY VOLTAGE



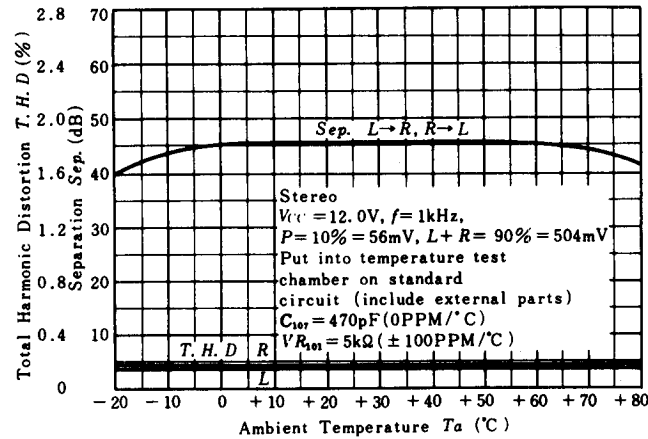
CHANNEL BALANCE, TOTAL HARMONIC DISTORTION AND R-CHANNEL OUTPUT VOLTAGE VS. SUPPLY VOLTAGE



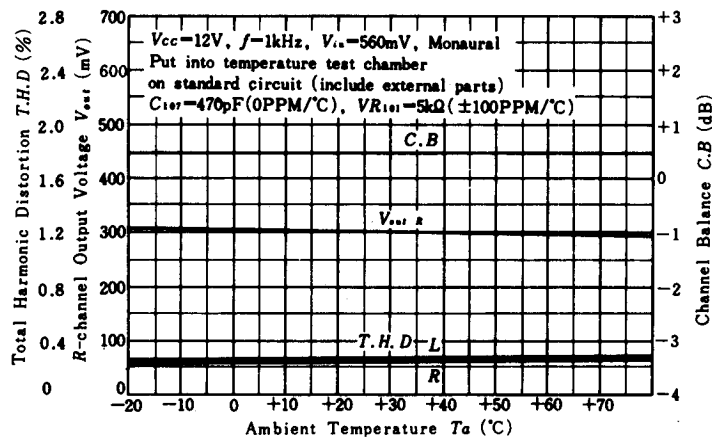
FREE-RUNNING FREQUENCY DRIFT VS. AMBIENT TEMPERATURE



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 ₁₀₁ R ₁₀₂	3.9k Ω 3.9k Ω	Load resistor of decoder	Decrease in output dynamic range. Output is clipped	Decrease in G _v	
R ₁₀₄	16k Ω	Determination of free-run frequency of V.C.O	Difficulty of frequency adjustment	Degradation of df/dT _{amb} .	
R ₁₀₅	200 Ω	Rush current limiter of stereo indicating lamp	Decrease in lamp current	Increase in rush current damage to IC	
VR ₁₀₁	5k Ω (B-type)	Adjustment of free-run frequency of V.C.O	Adjustment becomes critical	Adjustment impossible	Use palladium volume
R ₁₀₃ C ₁₀₅ C ₁₀₆	1k Ω 0.25 μF 0.5 μF	Composition of LPF in PLL	Increase in lock-up time of PLL.	Increase in T.H.D	
C ₁₀₃	2.2 μF	Input Coupling Capacitor	Large pop noise	Poor low-frequency characteristics	
C ₁₀₇	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 ₁₀₈	0.25 μF	Loop filter of lamp driver	Delay in lamp on	Lamp miss-on	