

HA12016

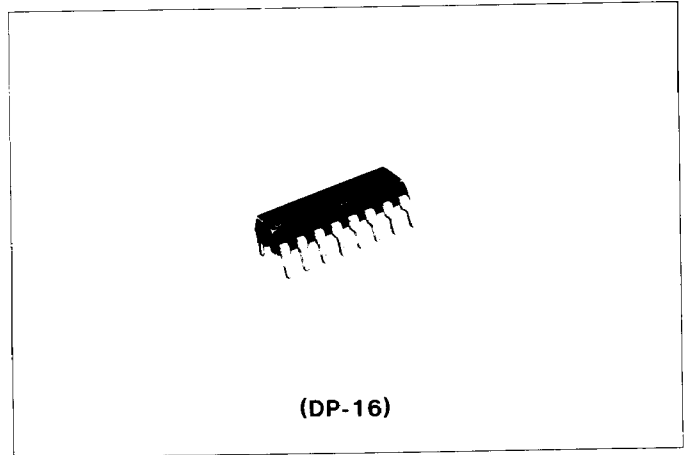
FM Stereo Multiplex Decoder

FUNCTIONS

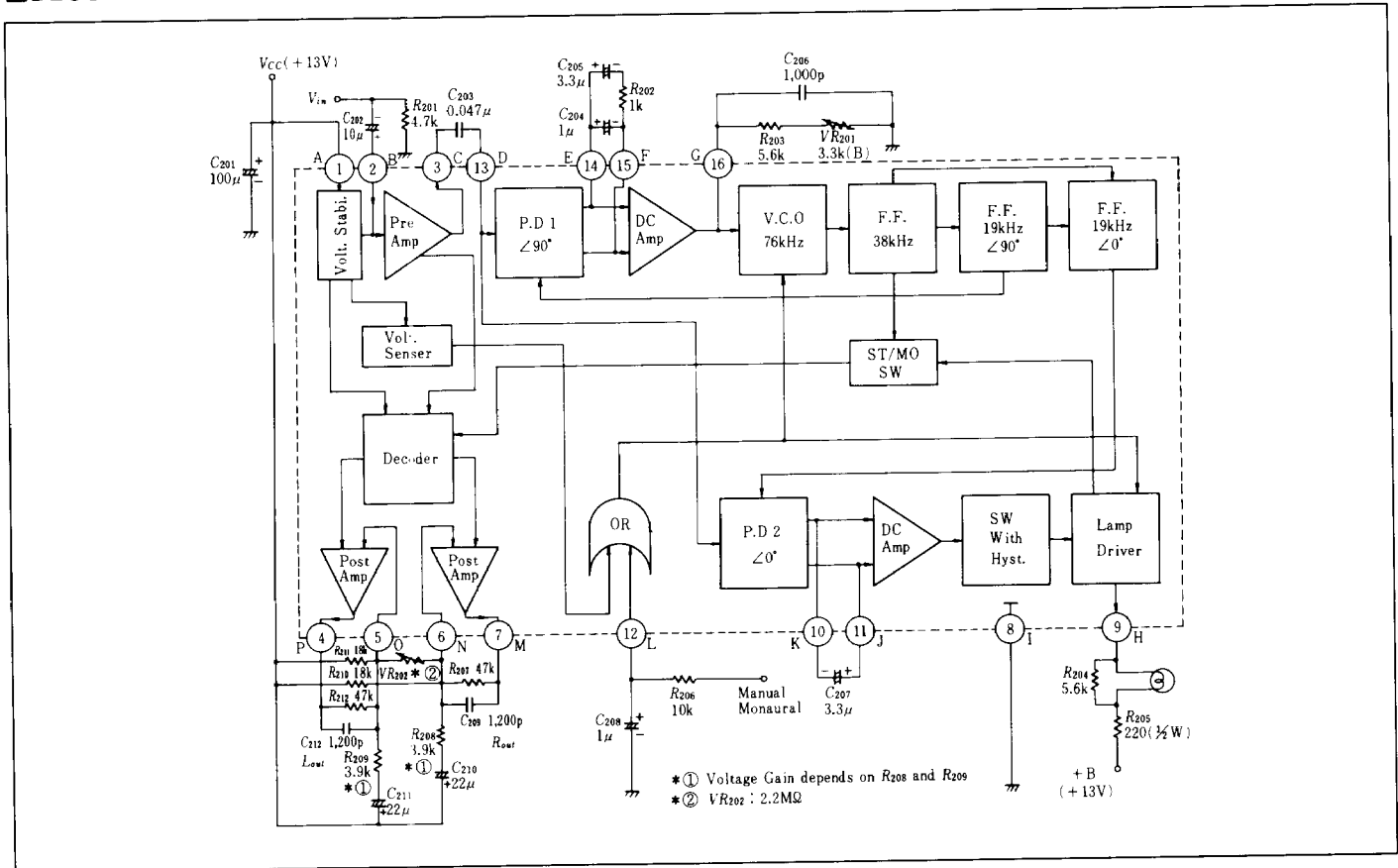
- PLL FM Demodulator
- Post Amplifier
- Lamp Lighting Error Prevention Circuit
- Manual Monaural and VCO Killing Circuit

FEATURES

- High Signal-to-Noise Ratio: 88dB typ.
- Low Distortion: 0.01% typ.
- High Channel Separation: 55dB typ.
- Wide Dynamic Range: 850mV (THD \leq 1.0%) typ.
- High Voltage Gain: 12.5dB typ.
- Channel Separation Control Available



BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Rating | Unit |
|-----------------------------|--------------|---------------|--------------------|
| Supply Voltage | V_{CC} max | 15 | V |
| Power Dissipation | P_T | 550* | mW |
| Operating Temperature Range | T_{opr} | -20 to +70 | $^{\circ}\text{C}$ |
| Storage Temperature Range | T_{sig} | -55 to +125 | $^{\circ}\text{C}$ |
| Lamp Driving Current | Stationary | I_L | 75 mA |
| | Transient | $I_{L\ peak}$ | 100 mA |

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

■ ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{CC} = 13\text{V}$, $f = 1\text{kHz}$, unless otherwise specified)

| Item | Symbol | Test Conditions | min. | typ. | max. | Unit | |
|------------------------------------|----------------------|--|--------------------|---------|-------|------------------|----|
| Input Impedance | Z_{in} | | 30 | 75 | — | $\text{k}\Omega$ | |
| Channel Separation | S_{ep} | $P = 30\text{mV}$, $L + R = 270\text{mV}$ | $f = 100\text{Hz}$ | — | 50 | — | dB |
| | | | $f = 1\text{kHz}$ | 45 | 55 | — | |
| | | | $f = 10\text{kHz}$ | — | 45 | — | |
| Stereo Total Harmonic Distortion | $ST \cdot THD$ | $P = 30\text{mV}$, $L + R = 270\text{mV}$ | $f = 100\text{Hz}$ | — | 0.03 | — | % |
| | | | $f = 1\text{kHz}$ | — | 0.025 | 0.08 | |
| | | | $f = 10\text{kHz}$ | — | 0.1 | — | |
| R-channel Output Voltage | $V_{out R}$ | $V_{in} = 300\text{mV}$ | 1.05 | 1.26 | 1.48 | V | |
| Channel Balance | CB | $V_{in} = 300\text{mV}$ | — | 0 | — | dB | |
| Monaural Total Harmonic Distortion | $MO \cdot THD$ | $V_{in} = 300\text{mV}$ | — | 0.01 | 0.08 | % | |
| Lamp-on Level | L_{on} | | 8 | 11.5 | 15 | mV | |
| Lamp-on/off Hysteresis | L_{hys} | | — | 5.5 | — | dB | |
| Total Carrier Leak | $T \cdot CL$ | $P = 30\text{mV}$, $L + R = 270\text{mV}$ | — | 30 | — | dB | |
| SCA Rejection | $SCAR$ | $P = 30\text{mV} = \text{SCA}$, $f_{SCA} = 67\text{kHz}$, $L + R = 270\text{mV}$ | — | 80 | — | dB | |
| Signal-to-Noise Ratio | S/N | $V_{in} = 300\text{mV}$, $R_s = 4.7\text{k}\Omega$ | 80 | 88 | — | dB | |
| Capture Range | CR | $P = 30\text{mV}$ | — | ± 3 | — | % | |
| Monaural Maximum Input Voltage | $V_{in \text{ max}}$ | $THD \leq 1.0\%$ | — | 850 | — | mV | |
| Stereo/Monaural Switching Voltage | V_{MO} | $P = 30\text{mV}$ | — | 1.26 | — | V | |
| VCO Stopping Voltage | V_{VCO} | | — | 7.04 | — | V | |
| Quiescent Current | I_Q | $V_{in} = 0$ | — | 17.8 | — | mA | |

● Adjustment

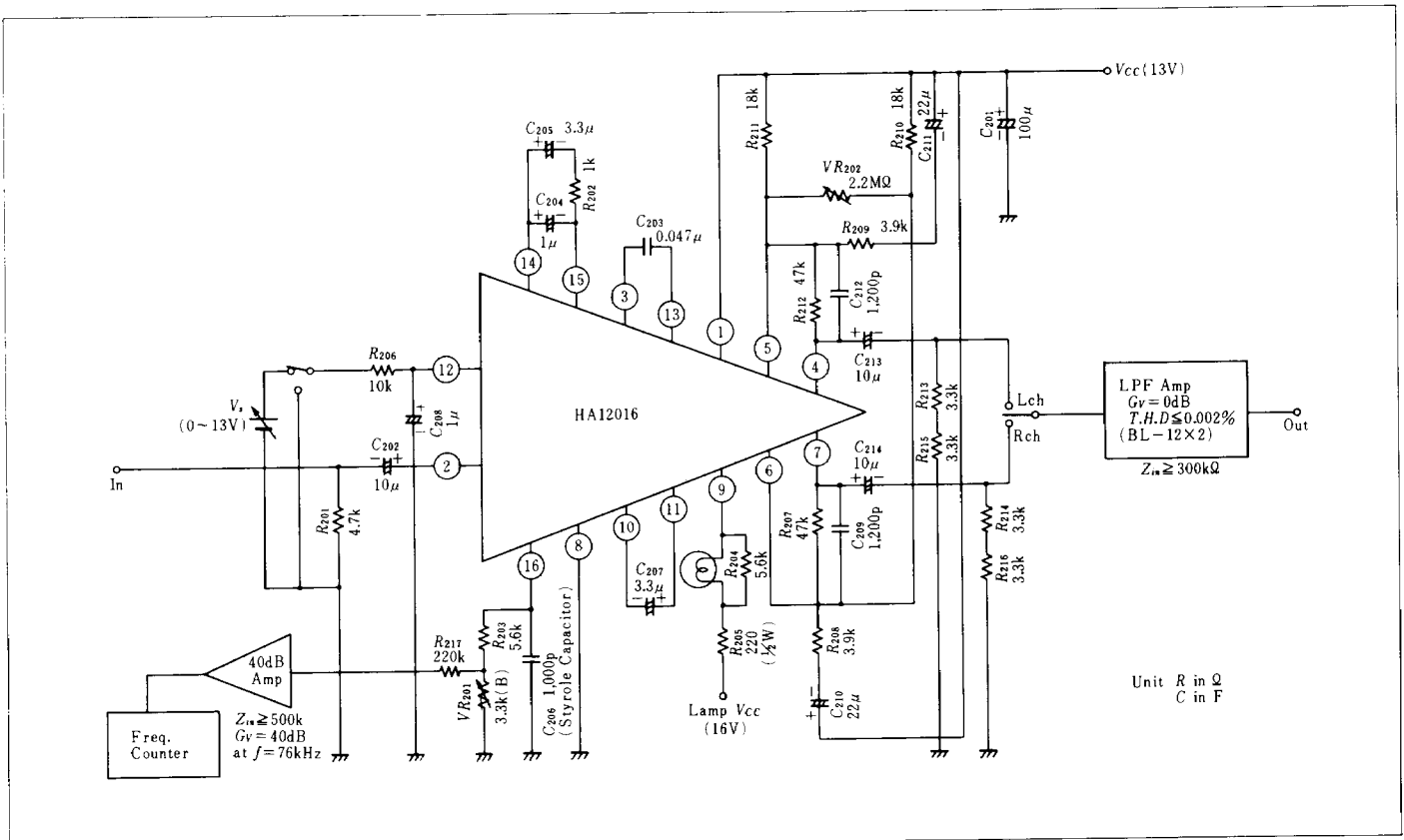
1 VCO Free Running Frequency

Adjusting VR_{201} so that the VCO free running frequency is $76\text{kHz} \pm 50\text{Hz}$ with no input to the pins 2 and 12.

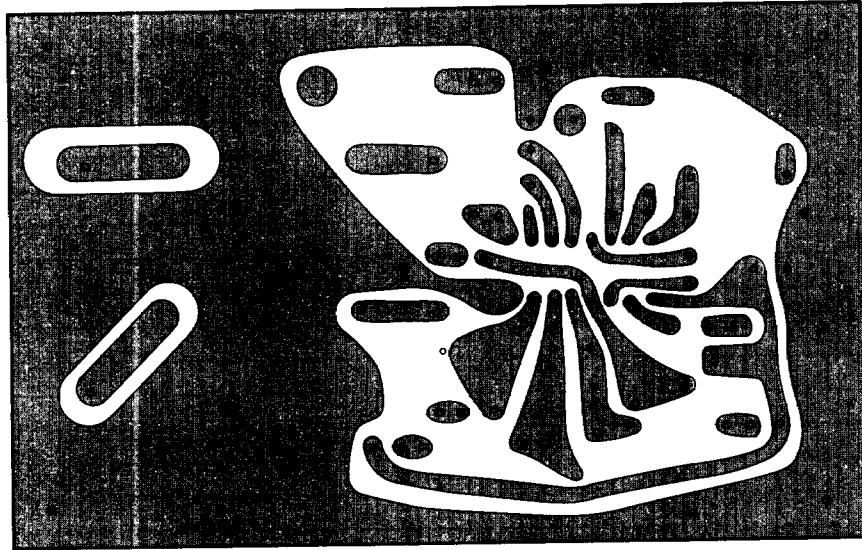
2. Channel Separation

Adjusting VR_{202} so that the separation of L-to-R is the same as that of R-to-L.

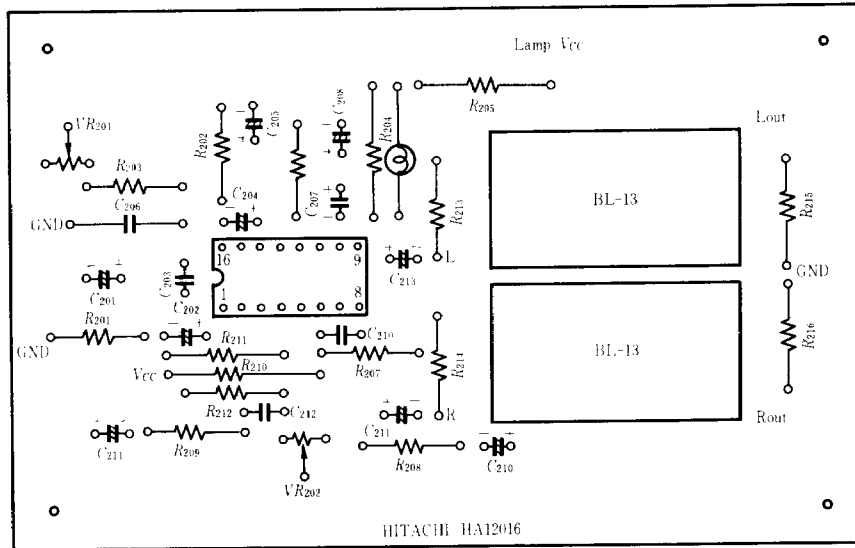
■ TEST CIRCUIT



■ PRINTED CIRCUIT BOARD PATTERN



(Bottom View)

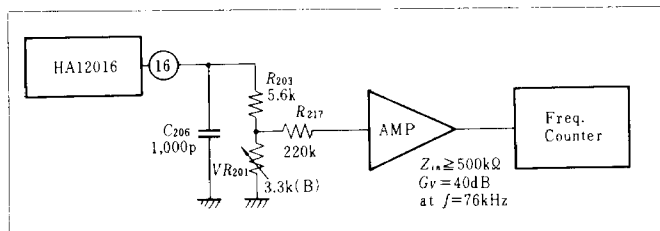


(Top View)

■ NOTES FOR APPLICATION

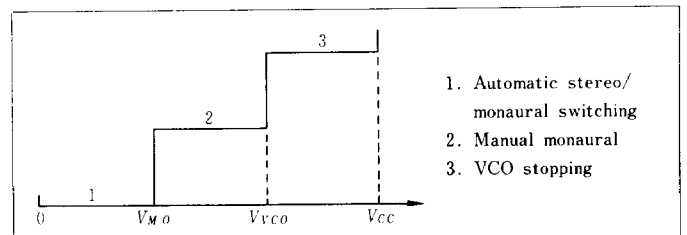
● VCO Free Running Freq. Adjustment

As there is no terminal for monitoring the VCO free running frequency, the frequency counter should be connected as showed in Fig. 5. The frequency should be adjusted $76\text{kHz} \pm 50\text{Hz}$ by rotating VR_{201} with no input to the pin 2. No voltage should be applied to the pin 12.



● Manual Monaural and VCO Stopping

There are two threshold levels, V_{MO} and V_{VCO} , for the pin 12. The operation mode is changed with the voltage applied to

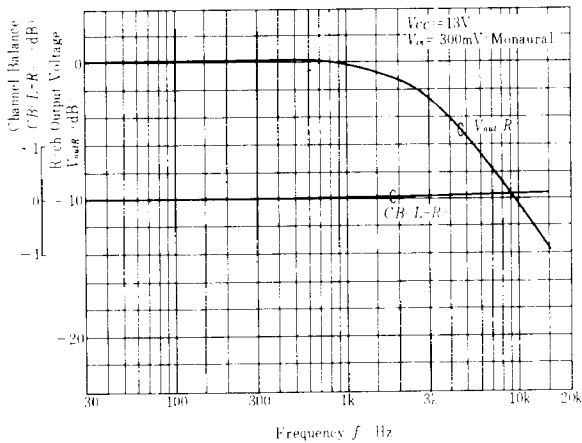


this pin.

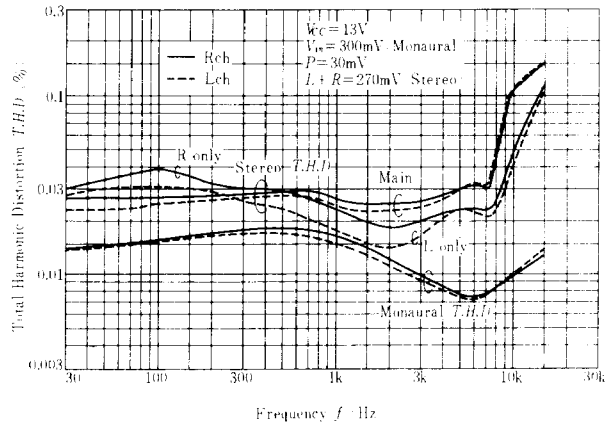
● Channel Separation

The Channel separation is controllable with VR_{202} inserted between the feedback terminals of the post amplifiers.

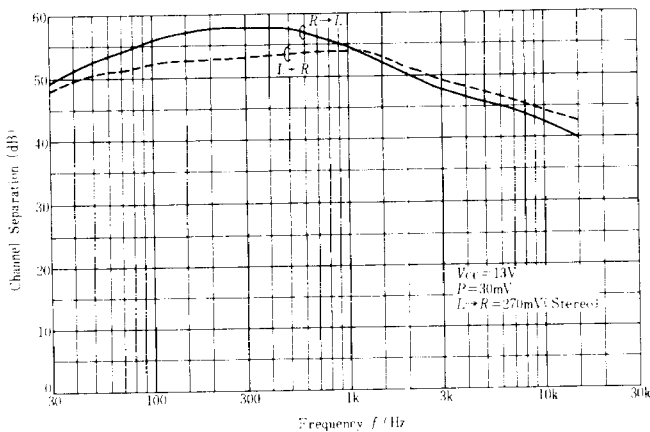
CHANNEL BALANCE AND R-CHANNEL OUTPUT VOLTAGE VS. FREQUENCY



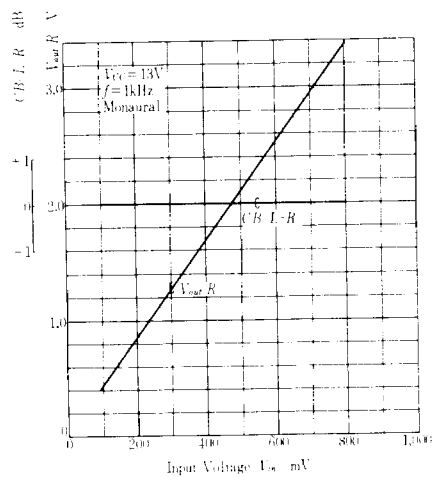
TOTAL HARMONIC DISTORTION VS. FREQUENCY



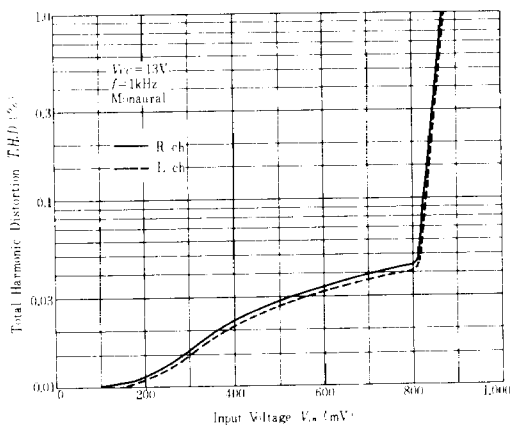
CHANNEL SEPARATION VS. FREQUENCY



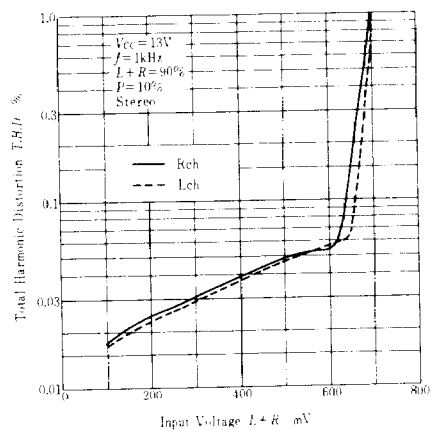
CHANNEL BALANCE AND R-CHANNEL OUTPUT VOLTAGE VS. INPUT VOLTAGE



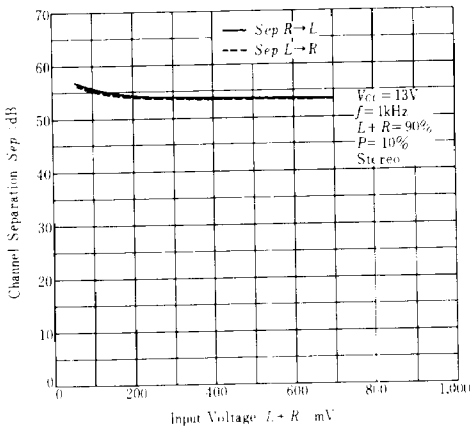
TOTAL HARMONIC DISTORTION VS. INPUT VOLTAGE (MONAURAL)



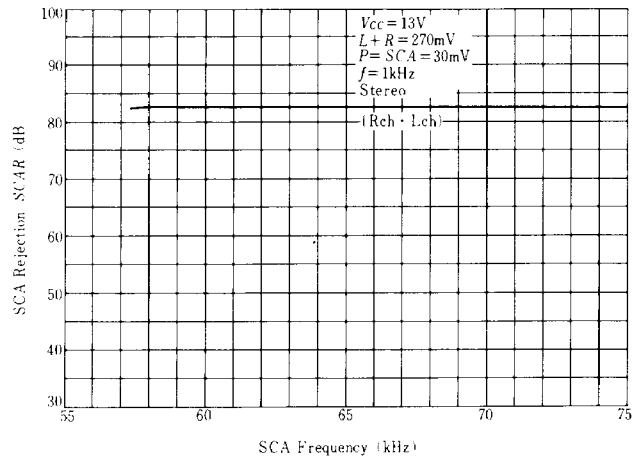
TOTAL HARMONIC DISTORTION VS. INPUT VOLTAGE (STEREO)



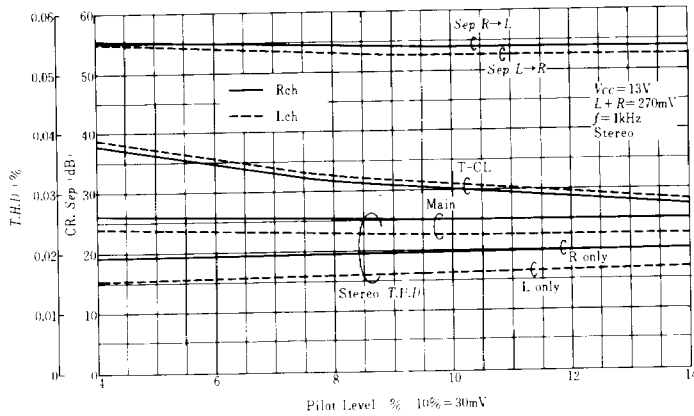
CHANNEL SEPARATION VS. INPUT VOLTAGE



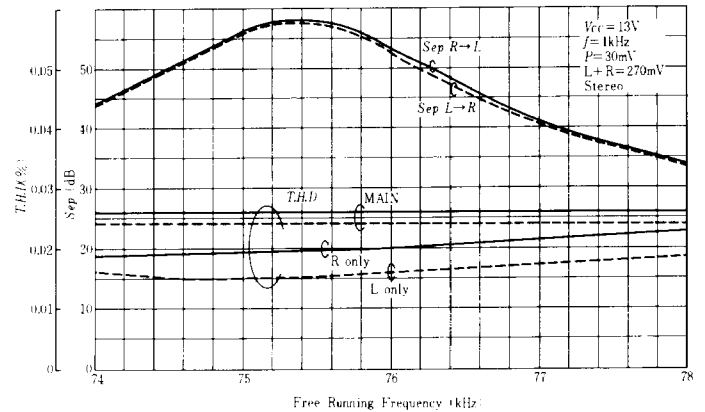
SCA REJECTION VS. SCA FREQUENCY



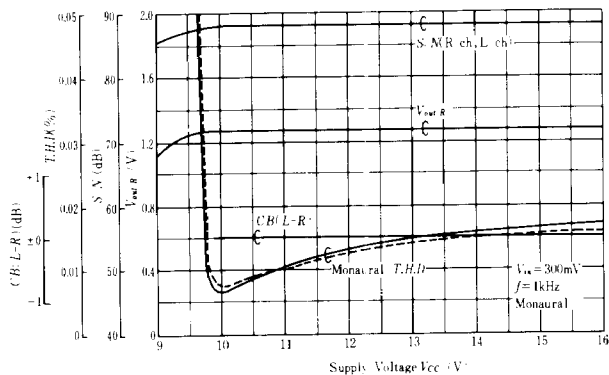
TOTAL HARMONIC DISTORTION, CARRIER LEAK, AND CHANNEL SEPARATION VS. PILOT LEVEL



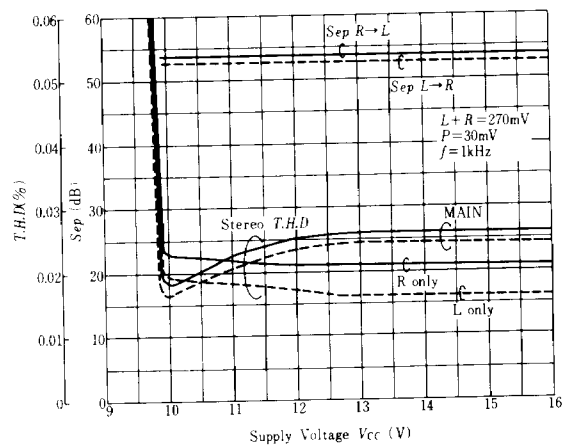
TOTAL HARMONIC DISTORTION AND CHANNEL SEPARATION VS. FREE RUNNING FREQUENCY



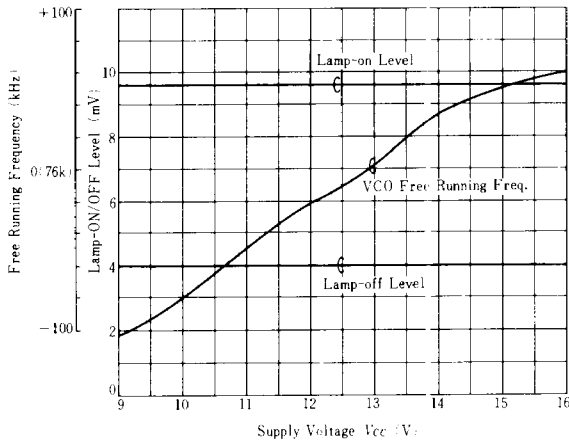
CHANNEL BALANCE, TOTAL HARMONIC DISTORTION, SIGNAL-TO-NOISE RATIO, AND R-CHANNEL OUTPUT VOLTAGE VS. SUPPLY VOLTAGE



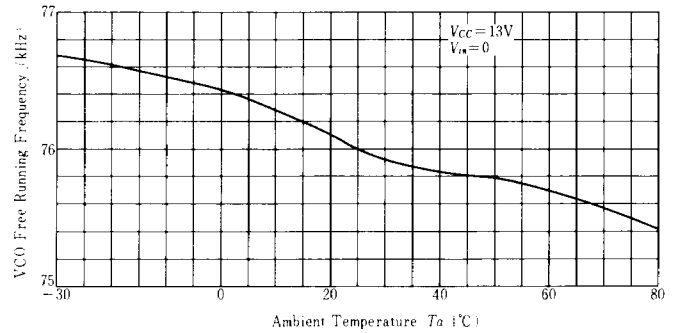
TOTAL HARMONIC DISTORTION AND CHANNEL SEPARATION VS. SUPPLY VOLTAGE



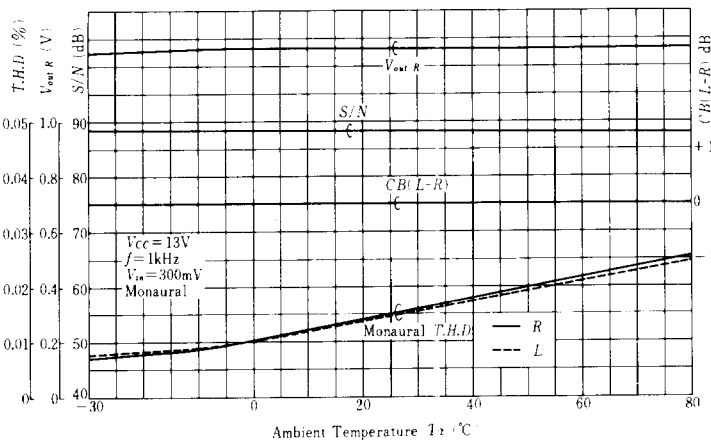
FREE RUNNING FREQUENCY AND LAMP-ON/OFF LEVEL VS. SUPPLY VOLTAGE



VCO FREE RUNNING FREQUENCY VS. AMBIENT TEMPERATURE (The IC and the external parts are in the same temperature.)



TOTAL HARMONIC DISTORTION, R-CHANNEL OUTPUT VOLTAGE, AND SIGNAL-TO-NOISE RATIO VS. AMBIENT TEMPERATURE (The IC and the external parts are in the same temperature.)



TOTAL HARMONIC DISTORTION AND CHANNEL SEPARATION VS. AMBIENT TEMPERATURE (The IC and the external parts are in the same temperature.)

