

KA9270

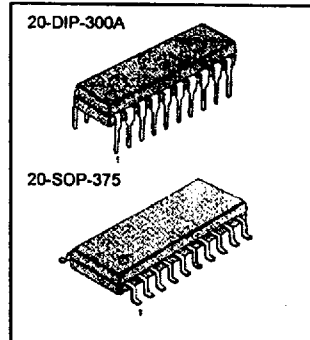
AUDIO FILTER

INTRODUCTION

The KA9270 is a monolithic integrated circuit designed for audio filter. It is used in compact disc player, digital audio tape recorder, etc.

FEATURES

- Functions:
 - * Buffer for impedance matching
 - * Low pass filter
 - * De - emphasis control
 - * Mute control
 - * Reference voltage circuit ($1/2 V_{CC}$ AMP)
- Gain adjustable of audio output
- Minimum number of external parts required
- Recommend operation supply voltage range : 5.0 ~ 12.0V



| Device | Package | Operating Temperature |
|---------|-------------|-----------------------|
| KA9270 | 20-DIP-300A | 20°C ~ +75°C |
| KA9270D | 20-SOP-375 | |

BLOCK DIAGRAM

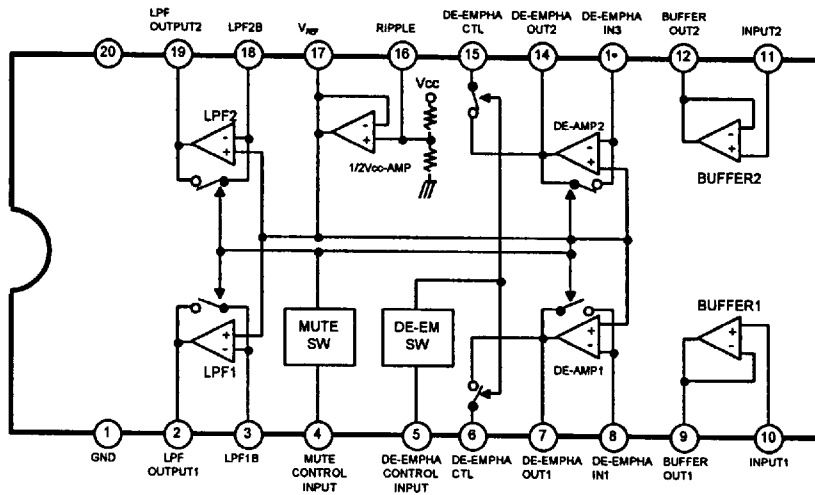


Fig. 1



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

| Characteristic | Symbol | Value | Unit |
|-----------------------|-----------|------------|------------------|
| Supply Voltage | V_{CC} | 16 | V |
| Power Dissipation | P_D | 550 | μW |
| Operating Temperature | T_{OPR} | -20 ~ +75 | $^\circ\text{C}$ |
| Storage Temperature | T_{STG} | -45 ~ +150 | $^\circ\text{C}$ |

ELECTRICAL CHARACTERISTICS(Ta = 25°C, V_{CC} = 8V, f = 1KHz, R_L = 10KΩ, De-emphasis: off, Mute: off, S1 & S2: off, unless otherwise specified)

| Characteristic | Symbol | Test Conditions | Min | Typ | Max | Unit | |
|---------------------------|---------------------|--|-----------|--------|-------|-------|----|
| Quiescent Circuit Current | I_{CC} | $V_i = 0$ | 1 | 4 | 6 | mA | |
| Maximum Output Voltage | V_{OM} | THD = 1% | 1.8 | 2.1 | | Vrms | |
| Total Harmonic Distortion | THD | $V_o = 0\text{dBm}$ | f = 100Hz | | 0.01 | 0.05 | % |
| | | | f = 1KHz | | 0.01 | 0.05 | |
| | | | f = 10KHz | | 0.05 | 0.1 | |
| | | | f = 16KHz | | 0.1 | 0.2 | |
| | | | f = 20KHz | | 0.1 | 0.2 | |
| Frequency Characteristics | fv | $V_o = 6\text{dBm}$ | f = 100Hz | -0.1 | 0 | 0.1 | dB |
| | | | f = 1KHz | 0 | 0 | 0 | |
| | | | f = 10KHz | -0.5 | 0 | 0.5 | |
| | | | f = 16KHz | -1.0 | 0 | 1.0 | |
| | | | f = 20KHz | -1.5 | 0 | 1.5 | |
| Cross Talk | CT | $V_o = 0\text{dBm}$ | f = 100Hz | 70 | 80 | dB | |
| | | | f = 1KHz | 65 | 75 | | |
| | | | f = 10KHz | 60 | 65 | | |
| Signal to Noise Ratio | S/N | $V_o = 0\text{dBm}$, $R_o = 600\Omega$ 20KHz LPF | 73 | 80 | | dB | |
| Channel Balance | CB | $V_o = 0\text{dBm}$ | -1.0 | 0 | 1.0 | dB | |
| Open Loop Gain | G_{VO} | $V_i = 900\text{mVrms}$ | -2.6 | -0.6 | 1.0 | dB | |
| Gain Adjusting Range | G_{VR} | $V_i = 900\text{mV}$, S1, S2: ON | 4.5 | 6 | | dB | |
| Mute Attenuation Ratio | ATT _{MUTE} | $V_i = 900\text{mV}$, Mute SW: ON | 40 | 50 | | dB | |
| De-emphasis | DE _{EMPH} | De-emphasis: ON | f = 1KHz | -0.87 | -0.37 | 0.13 | dB |
| | | | f = 5KHz | -6.03 | -4.53 | -3.03 | |
| | | | f = 16KHz | -10.53 | -9.03 | -7.53 | |

* Note: De-emphasis input conditions: $V_o = 0\text{dBm}$
De-emphasis off position

TEST CIRCUIT

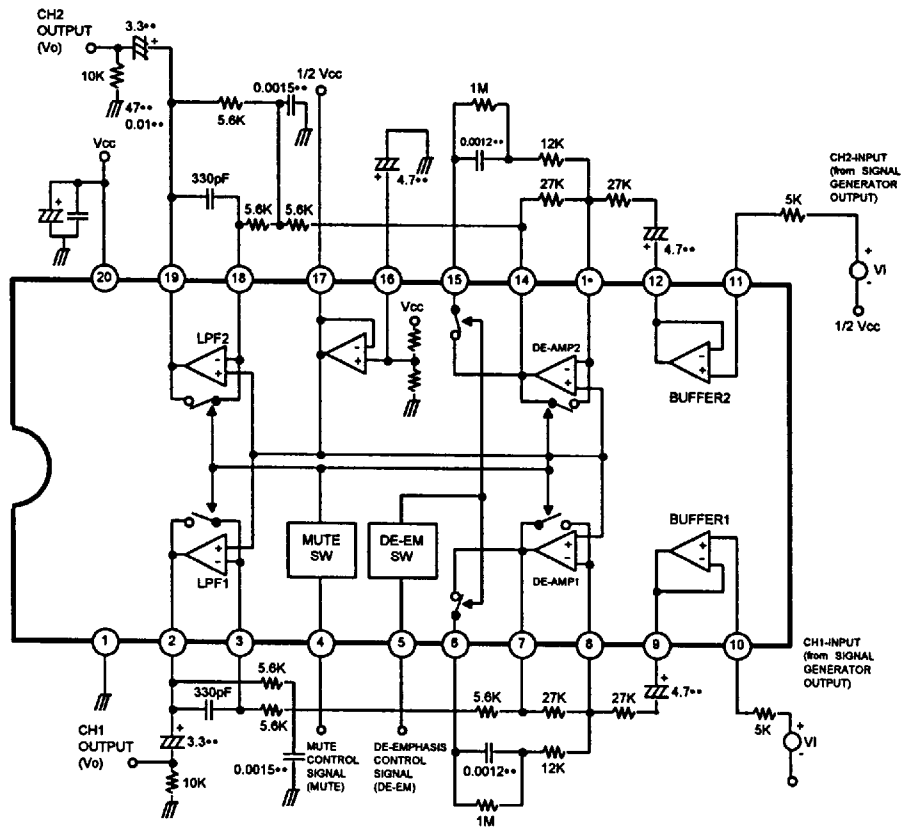


Fig. 2



APPLICATION INFORMATION

1. BUFFER

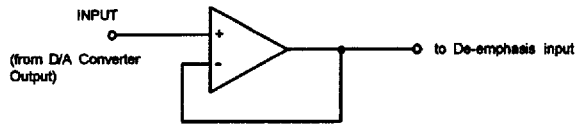


Fig. 3

It is used for impedance matching, between D/A converter output and de-emphasis input.

2. DE-EMPHASIS

a) De-emphasis operation condition

| Control Input | De-emphasis Operation |
|---------------|-----------------------|
| High | ON |
| Low | OFF |

b) De-emphasis characteristic at the de-emphasis ON

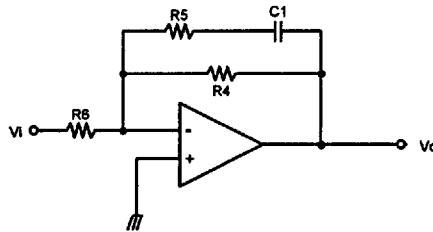


Fig. 4 Equivalent Circuit of De-emphasis ON Mode

$$A_v \approx R_4 / R_6$$

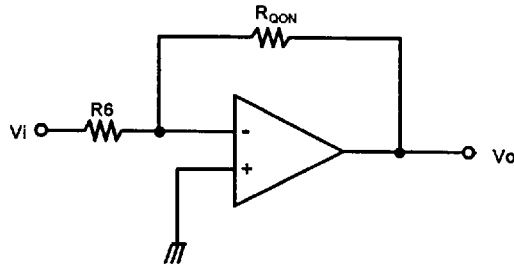
$$T_1 = C_1 (R_4 + R_6)$$

$$T_2 = C_1 \times R_6$$

The de-emphasis characteristics is dependent on the external parts value.



3. MUTE



* Where:
 R_{oon} = Internal TR
 ON resistance

Fig. 5 Equivalent Circuit of Mute Switch ON Mode

Mute attenuation [M (att)] ratio is as follow;

$$M (att) = 20 \log \frac{V_o}{V_i}$$

$$= 20 \log \frac{R_{oon}}{R_6} \text{ (dB)}$$

4. LOW PASS FILTER

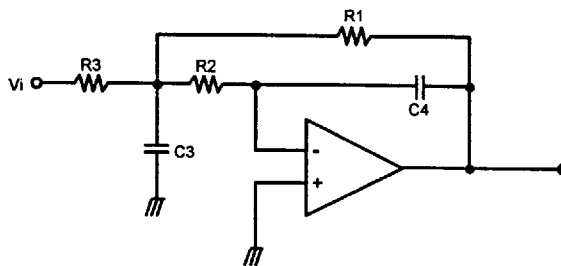


Fig. 6 Equivalent Circuit of LPF

Cut off frequency (F_c) is as follow:

$$f_c = \frac{1}{2\pi\sqrt{R_2 R_1 C_3 C_4}} \text{ (Hz)}$$



APPLICATION CIRCUIT

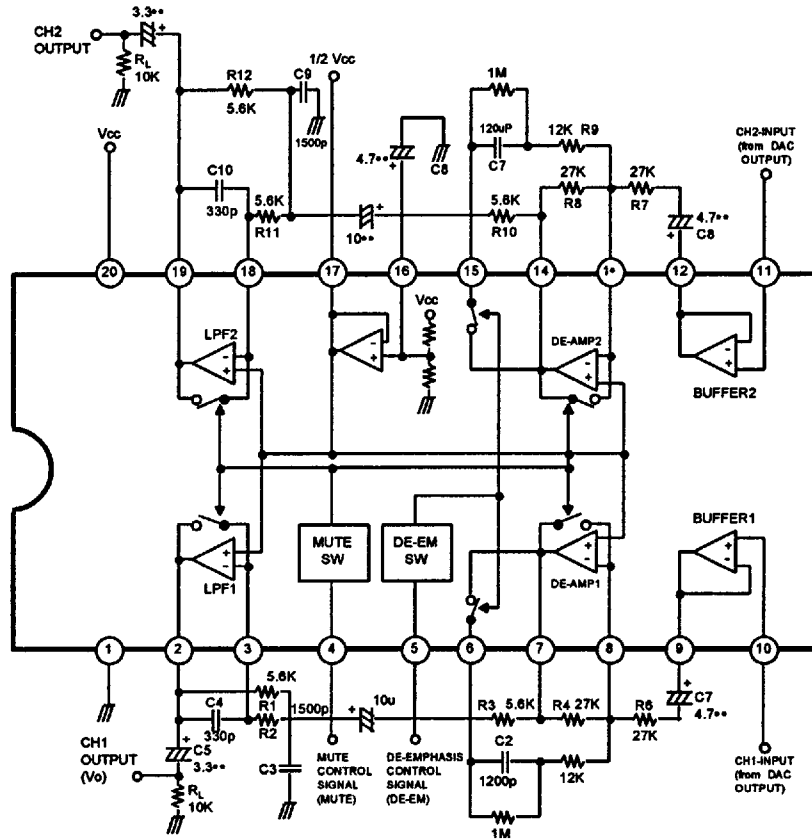
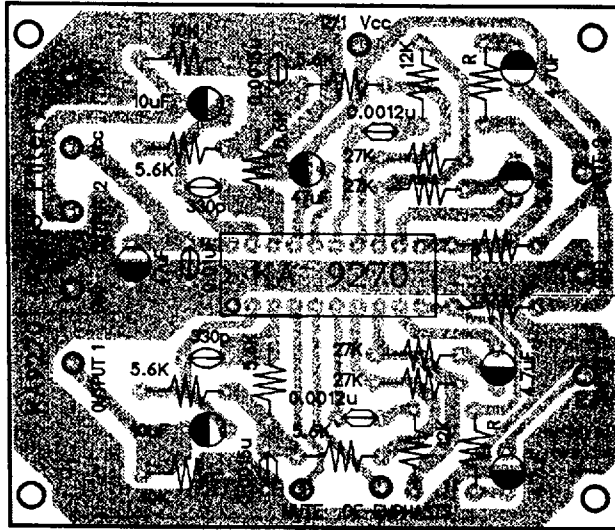


Fig. 7

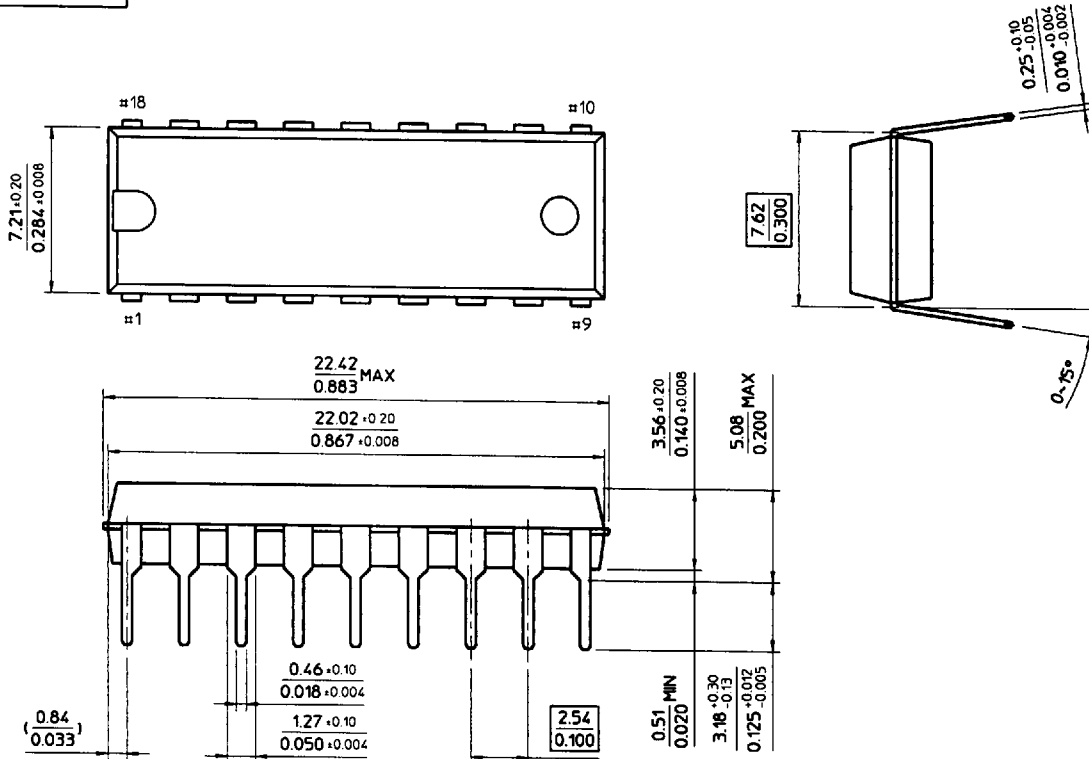




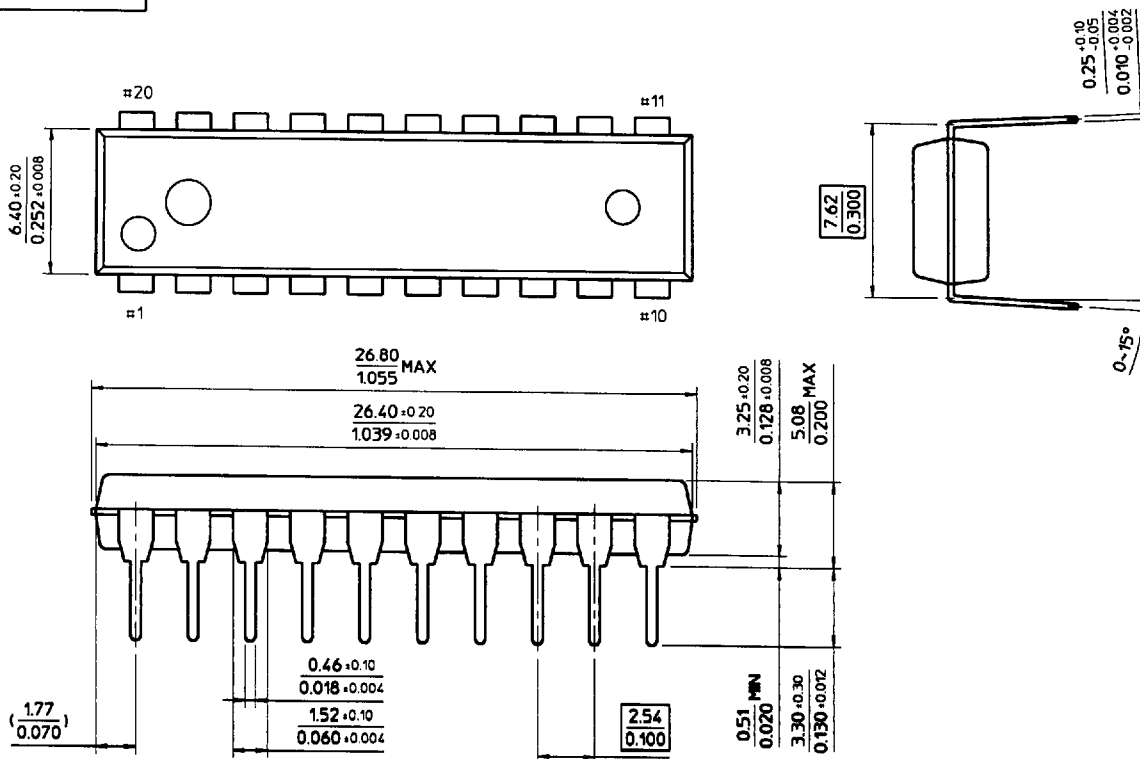
(PCB PATTERN)



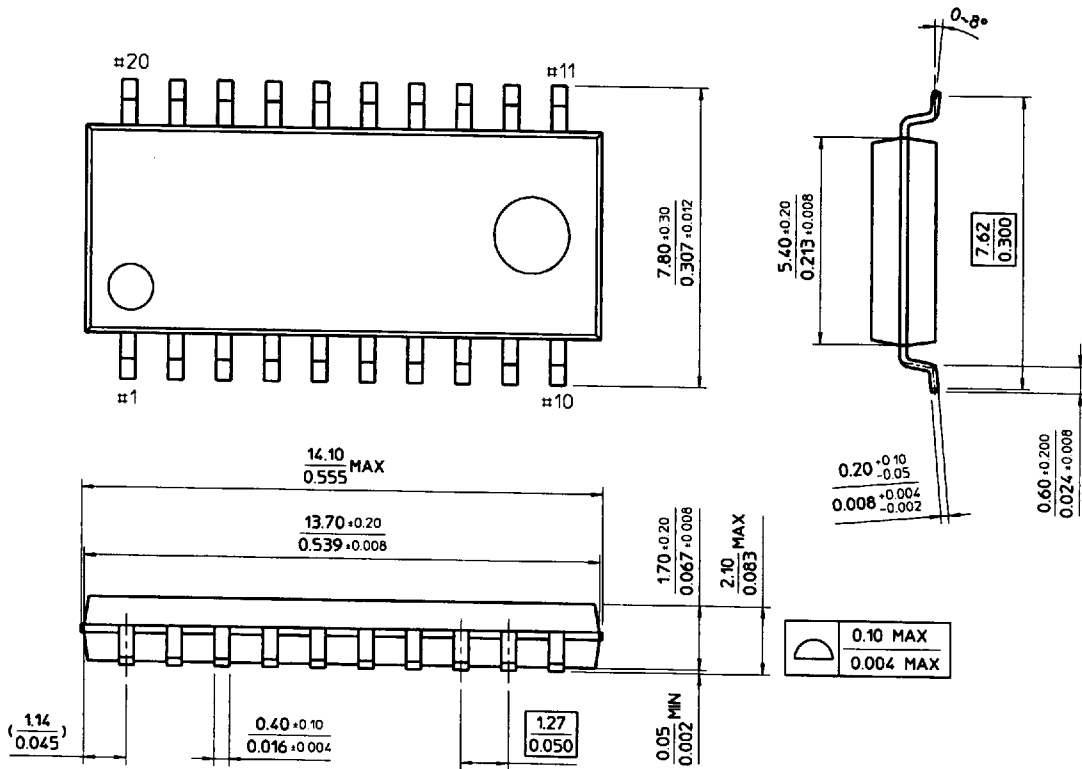
18-DIP-300B



20-DIP-300A



20-SOP-300



20-SOP-375

