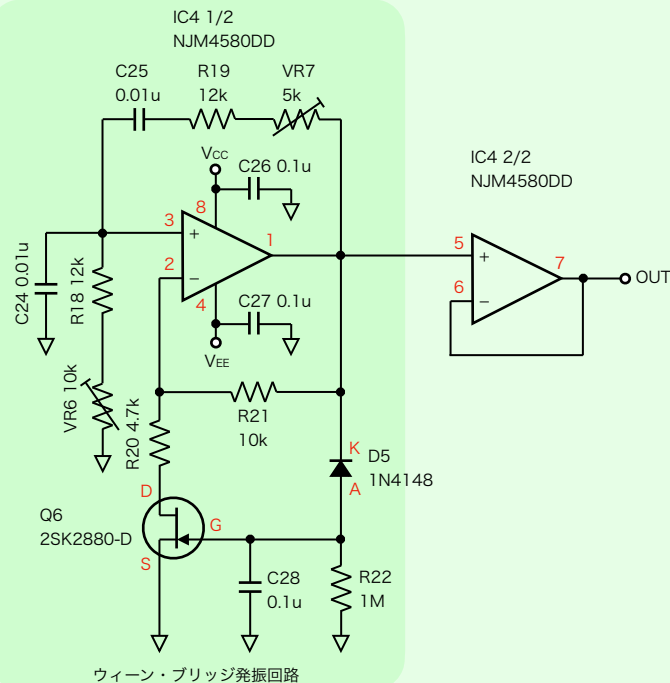


1W+1W AB級アンプ (その6.1 2/4)



正弦波発生回路

電圧利得 $A_v = 5$

$$A_v = 1 + R_7/R_6 = 1 + 9.1k/2.2k = 5.1 \text{ 倍}$$

$$= 20 \log 5.1 = 14 \text{ dB}$$

(C16の値)

$$\text{ローパスフィルタのカットオフ周波数 } f_c = 180 \text{ kHz とすると}$$

$$C16 = 1/(2\pi R_7 \cdot f_c)$$

$$= 1/(2\pi \times 9,100 \times 180,000) = 97 \text{ pF} \approx 100 \text{ pF}$$

(C17の値)

$$R10/R11 = 3,900/3,900 = 1,950 \Omega$$

$$\text{ハイパスフィルタのカットオフ周波数 } f_c = 10 \text{ Hz とすると}$$

$$C17 = 1/(2\pi (R10//R11) \cdot f_c)$$

$$= 1/(2\pi \times 1,950 \times 10) = 8.2 \mu\text{F} \approx 10 \mu\text{F}$$

電圧増幅回路

電源電圧 $V_{CC} = 9V \cdots \pm 9V$

出力電力 $P_o = 2W$ (タイトルの1W+1Wは負荷抵抗8Ωの場合)

負荷抵抗 $R_L = 4\Omega$

$Q4_{hFE} = 100$

$Q2_{hFE} = 100$

$$\text{出力電圧 } V_o = \sqrt{(P_o \cdot R_L)} = \sqrt{(2 \times 4)} = 2.83 V_{rms} \cdots 8 V_{PP} \cdots \pm 4 V_{peak}$$

$$Q4_{IC_{peak}} = V_{peak}/R_L = 4/4 = 1 A_{peak}$$

$$Q4_{IB_{peak}} = Q4_{IC_{peak}}/Q4_{hFE} = 1/100 = 10 \text{ mA}_{peak} = Q2_{IC_{peak}}$$

$$Q2_{IB_{peak}} = Q2_{IC_{peak}}/Q2_{hFE} = 0.01/100 = 0.1 \text{ mA}_{peak}$$

$$Q1_{IC} = Q2_{IB_{peak}} \text{ の } 10 \text{ 倍} = 1 \text{ mA} \rightarrow 2 \text{ mA}$$

$$Q1_{IB} = Q1_{IC} \text{ の } 1/10 \text{ 倍} \approx 0.2 \text{ mA}$$

$$R9 = 0.6/Q1_{IB} = 0.6/0.0002 = 3 \text{ k}\Omega$$

$$R10 = R11 = (18 - 2.4)/Q1_{IC}/2 = (18 - 2.4)/0.002/2 = 3,900 = 3.9 \text{ k}\Omega$$

(バイアス回路の電圧調整範囲)

$$V_{min} = (1 + R_8/R_9) \times 0.65 = (1 + 7.5/3) \times 0.65 = 2.28 \text{ V}$$

$$V_{max} = (1 + (VR5 + R_8)/R_9) \times 0.65 = (1 + (2 + 7.5)/3) \times 0.65 = 2.71 \text{ V}$$

(アイドリング電流)

$$Q4_{IC} = 50 \text{ mA}$$

$$Q4_{IB} = Q4_{IC}/Q4_{hFE} = 0.05/100 = 0.5 \text{ mA}$$

$$Q2_{IC} = Q4_{IB} \text{ の } 10 \text{ 倍} = 5 \text{ mA}$$

$$R12 = 1.2/0.005 = 240 \Omega$$

(コレクタ損失)

$$Q2_{PC} = V_{CC} \times Q2_{IC_{peak}} = 9 \times 0.01 = 0.09 \approx 0.1 \text{ W}$$

$$Q4_{PC} = V_{CC}^2/(2 \times R_L)/5 = 9^2/(2 \times 4)/5 = 2.0 \text{ W}$$

$$\text{熱抵抗 } \theta_{SA} = (T_j - T_a)/Q4_{PC} - (\theta_{jc} + \theta_{cs}) = (135 - 25)/2.0 - (1.5 + 0.5)$$

$$= 53^\circ\text{C/W} \cdots \theta_{SA} \text{ 以下のヒートシンクが必要}$$

(C23の値)

$$\text{ハイパスフィルタのカットオフ周波数 } f_c = 20 \text{ Hz とすると}$$

$$C23 = 1/(2\pi R_L \cdot f_c) = 1/(2\pi \times 4 \times 20) = 1,989 \mu\text{F} \approx 2,200 \mu\text{F}$$

電流増幅回路

(その6から6.1への変更点) $V_{CC} \cdot V_{EE} \pm 8V \rightarrow \pm 9V$, $R10 \cdot R11 \ 3.3k \rightarrow 3.9k$, $R12 \ 220 \rightarrow 240$