



# STK4040XI

## AF Power Amplifier (Split Power Supply) (70 W min, THD = 0.008%)

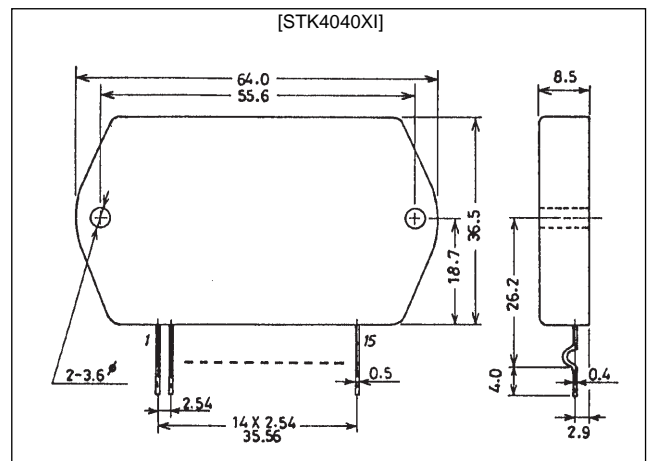
### Features

- Compact packaging supports slimmer set designs
- Series designed from 50 up to 150 W and pin-compatibility
- Simpler heat sink design facilitates thermal design of slim stereo sets
- Current mirror circuit, cascade circuit and pure-complimentary circuit application reduce distortion to 0.008 %
- Supports addition of electronic circuits for thermal shutdown and load-short protection circuit as well as pop noise muting which occurs when the power supply switch is turned on and off.

### Package Dimensions

unit: mm

4075



### Specifications

#### Maximum Ratings at $T_a = 25^\circ\text{C}$

| Parameter                       | Symbol               | Condition  | Rating      | Unit               |
|---------------------------------|----------------------|--|-------------|--------------------|
| Maximum supply voltage          | $V_{CC \text{ max}}$ |  | $\pm 63$    | V                  |
| Thermal resistance              | $\theta_{j-c}$       |  | 1.4         | $^\circ\text{C/W}$ |
| Junction temperature            | $T_j$                |  | 150         | $^\circ\text{C}$   |
| Operating substrate temperature | $T_c$                |  | 125         | $^\circ\text{C}$   |
| Storage temperature             | $T_{stg}$            |  | -30 to +125 | $^\circ\text{C}$   |
| Available time for load shorted | $t_s^{*1}$           | $V_{CC} = \pm 43.5 \text{ V}, R_L = 8 \Omega, f = 50 \text{ Hz}, P_O = 70 \text{ W}$ | 1           | s                  |

#### Recommended Operational Conditions at $T_a = 25^\circ\text{C}$

| Parameter                  | Symbol   | Condition | Rating     | Unit     |
|----------------------------|----------|-----------|------------|----------|
| Recommended supply voltage | $V_{CC}$ |           | $\pm 43.5$ | V        |
| Load resistance            | $R_L$    |           | 8          | $\Omega$ |

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### Operating Characteristics

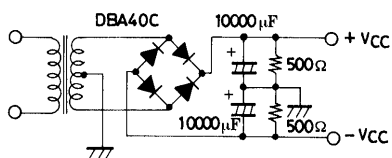
at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = \pm 43.5\text{ V}$ ,  $R_L = 8\ \Omega$ ,  $V_G = 40\text{ dB}$ ,  $R_g = 600\ \Omega$ , 100 k LPF ON,  $R_L$  (non-inductive)

| Parameter                 | Symbol        | Condition  | Rating |           |       | Unit       |
|---------------------------|---------------|--|--------|-----------|-------|------------|
|                           |               |  | min    | typ       | max   |            |
| Quiescent current         | $I_{CCO}$     | $V_{CC} = \pm 52.5\text{ V}$                             | 15     |           | 120   | mA         |
| Output power              | $P_O$         | THD = 0.008 %, $f = 20\text{ Hz to } 20\text{ kHz}$      | 70     |           |       | W          |
| Total harmonic distortion | THD           | $P_O = 1.0\text{ W}$ , $f = 1\text{ kHz}$                |        |           | 0.008 | %          |
| Frequency response        | $f_L, f_H$    | $P_O = 1.0\text{ W}$ , $+0$<br>$-3\text{ dB}$            |        | 20 to 50k |       | Hz         |
| Input resistance          | $r_i$         | $P_O = 1.0\text{ W}$ , $f = 1\text{ kHz}$                |        | 55        |       | k $\Omega$ |
| Output noise voltage      | $V_{NO}^{*2}$ | $V_{CC} = \pm 52.5\text{ V}$ , $R_g = 10\text{ k}\Omega$ |        |           | 1.2   | mVrms      |
| Neutral voltage           | $V_N$         | $V_{CC} = \pm 52.5\text{ V}$                             | -70    | 0         | +70   | mV         |

Note: Use rated power supply for test unless otherwise specified.

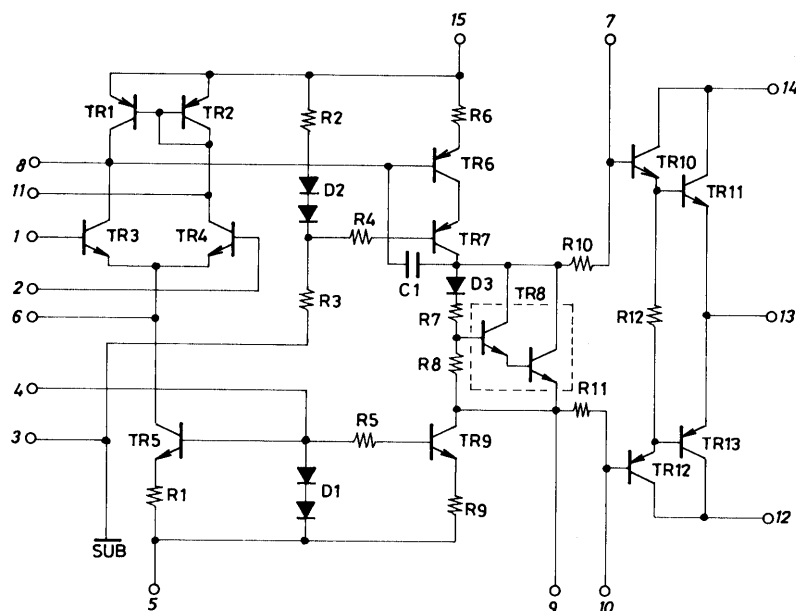
\*1 When measuring permissible load short time and output noise voltage use transformer power supply indicated below.

\*2 Output noise voltage represents the peak value on the rms scale (VTVM). The noise voltage waveform does not include the pulse noise.



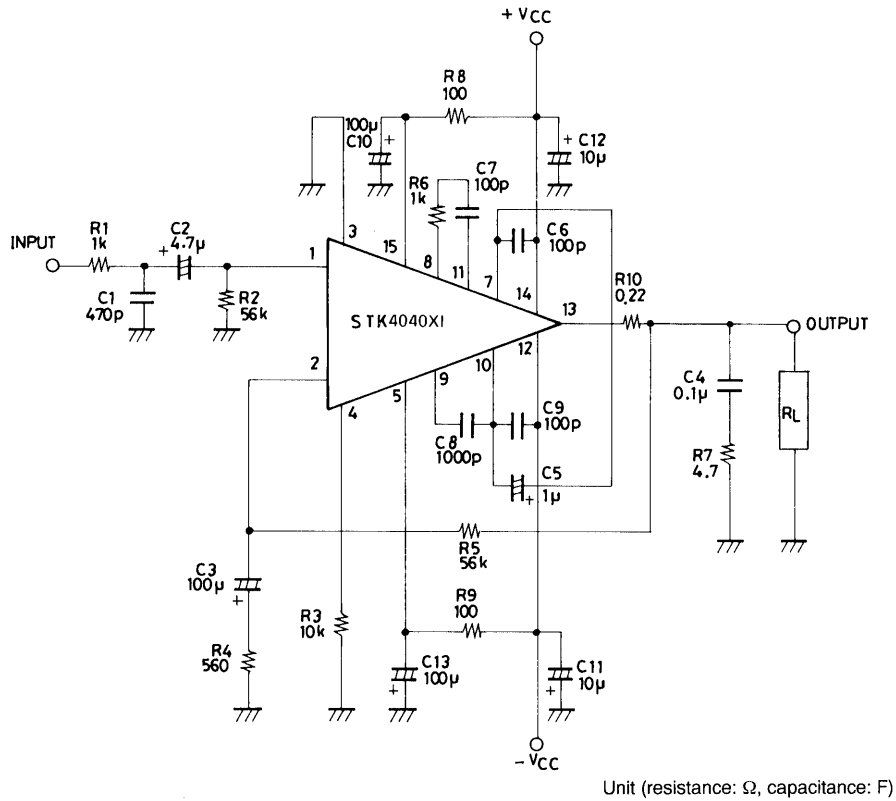
**Specified Transformer Power Supply  
(MG-200 Equivalent)**

### Equivalent Circuit



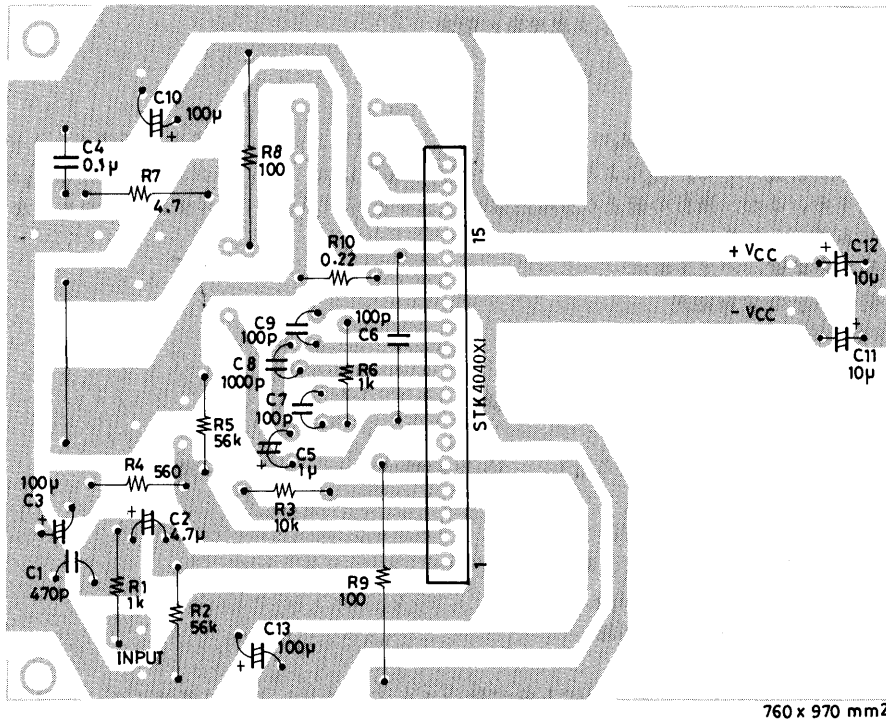
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## Application Circuit: 70W min Single Channel AF Power Amplifier



Unit (resistance: Ω, capacitance: F)

## Sample Printed Circuit Pattern for Application Circuit (Copper-foiled side)

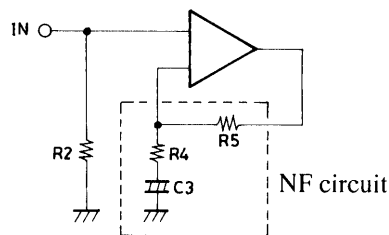


760 x 970 mm<sup>2</sup>

Unit (resistance: Ω, capacitance: F)

**Description of External Parts**

- R<sub>1</sub>, C<sub>1</sub> : Input filter circuit
  - Reduces high-frequency noise.
- C<sub>2</sub> : Input coupling capacitor
  - DC current suppression. A reduction in reactance is effective because of increases in capacitor reactance at low frequencies and 1/f noise dependence on signal source resistance which result in output noise worsening.
- R<sub>2</sub> : Input bias resistor
  - Biases the input pin to zero.
  - Effects V<sub>N</sub> stability (refer to NF circuit).
  - Due to differential input, input resistance is more or less determined by this resistance value.
- R<sub>4</sub>, R<sub>5</sub> : NFB circuit (AC NF circuit). Use of resistor with 1% error is suggested.
- C<sub>3</sub> (R<sub>2</sub>)



- C<sub>3</sub> : AC NF capacitor
- R<sub>4</sub>, R<sub>5</sub> : Used for VG setting.

- VG settings are obtained using R<sub>4</sub> and R<sub>5</sub> according to the following equation:

$$\log_{20} \frac{R_5}{R_4} \quad 40 \text{ dB is recommended.}$$

- Low-frequency cutoff frequency settings are obtained using R<sub>4</sub> and C<sub>3</sub> according to the following equation:

$$f_L = \frac{1}{2\pi \cdot R_4 \cdot C_3} \quad [\text{Hz}]$$

When changing the VG setting, you should change R<sub>4</sub> which requires a recheck of the low cutoff frequency setting. When the VG setting is changed using R<sub>5</sub>, the setting should ensure R<sub>2</sub> equals R<sub>5</sub> so that V<sub>N</sub> balance stability is maintained. If the resistor value is increased more than the existing value, V<sub>N</sub> balance may be disturbed and result in deterioration of V<sub>N</sub> temperature characteristics.

- R<sub>3</sub> : Differential constant-current bias resistor
- R<sub>6</sub>, R<sub>7</sub> : For oscillation suppression and phase compensation applications  
(For use with differential stage applications)
- R<sub>7</sub>, C<sub>4</sub> : For oscillation suppression and phase compensation applications  
(A Mylar capacitor is recommended for C<sub>4</sub> for use with output stage applications)
- C<sub>6</sub>, C<sub>9</sub> : For oscillation suppression and phase compensation applications  
Power stage (Must be connected near the pin)    C<sub>6</sub>: Positive (+) power    C<sub>9</sub>: Negative (-) power
- C<sub>8</sub> : For oscillation suppression and phase compensation applications  
(Oscillation suppression before power step clip)
- C<sub>5</sub> : For oscillation suppression and distortion improvement applications
- R<sub>8</sub>, C<sub>10</sub> : Ripple filter circuit on positive (+) side.
- R<sub>9</sub>, C<sub>13</sub> : Ripple filter circuit on negative (-) side.
- C<sub>11</sub>, C<sub>12</sub> : For oscillation suppression applications
  - Used for reducing power supply impedance to stable IC operation and should be connected near the IC pin. We recommend that you use an electrolytic capacitor.
- R<sub>10</sub> : Output resistor  
Increases load shorting endurance capacity during times of high output.

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