



# STK4024V

## AF Power Amplifier (Split Power Supply) (20 W min, THD = 0.08%)

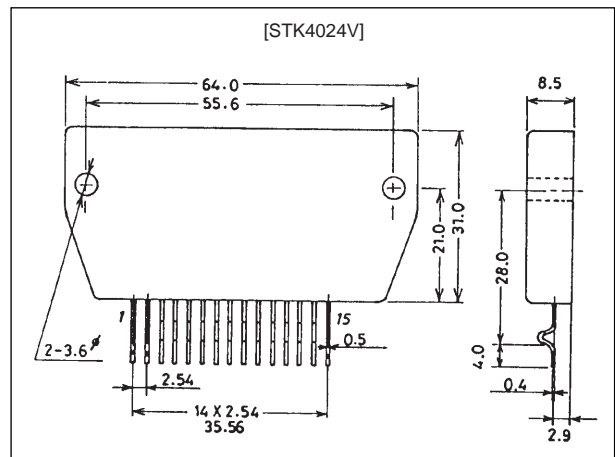
### Features

- Compact packaging supports slimmer set designs (up to 70 W)
- Series designed from 20 up to 100 W (200 W) and pin-compatibility (120 to 200 W have 18 pins)
- Simpler heat sink design facilitates thermal design of slim stereo sets
- Current mirror circuit application reduces distortion to 0.08%
- 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

4062



### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$		$\pm 37$	V
Thermal resistance	$\theta_{j-c}$		2.6	$^\circ\text{C}/\text{W}$
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	$t_{s^*1}$	$V_{CC} = \pm 24.5 \text{ V}, R_L = 8 \Omega, f = 50 \text{ Hz}, P_O = 20 \text{ W}$	2	s

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

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		$\pm 24.5$	V
Load resistance	$R_L$		8	$\Omega$

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## Operating Characteristics

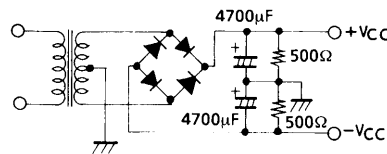
at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = \pm 24.5\text{ V}$ ,  $R_L = 8\ \Omega$ ,  $V_G = 40\text{ dB}$ ,  $R_g = 600\ \Omega$ , 100 k LPF ON,  $R_L$  (non-inductive)

Parameter	Symbol	Conditions	min	typ	max	Unit
Quiescent current	$I_{CCO}$	$V_{CC} = \pm 29.5\text{ V}$	15		120	mA
Output power	$P_O$ (1)	THD = 0.08%, $f = 20\text{ Hz to } 20\text{ kHz}$	20			W
	$P_O$ (2)	$V_{CC} = \pm 21.5\text{ V}$ , THD = 0.2%, $R_L = 4\ \Omega$ , $f = 1\text{ kHz}$	20			W
Total harmonic distortion	THD	$P_O = 1.0\text{ W}$ , $f = 1\text{ kHz}$			0.08	%
Frequency response	$f_L, f_H$	$P_O = 1.0\text{ W}$ , $+0$ $-3\text{ dB}$		20 to 50k		Hz
Input resistance	$r_i$	$P_O = 1.0\text{ W}$ , $f = 1\text{ kHz}$		55		k $\Omega$
Output noise voltage	$V_{NO} *2$	$V_{CC} = \pm 29.5\text{ V}$ , $R_g = 10\text{ k}\Omega$			1.2	mVrms
Neutral voltage	$V_N$	$V_{CC} = \pm 29.5\text{ V}$	-70	0	+70	mV

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

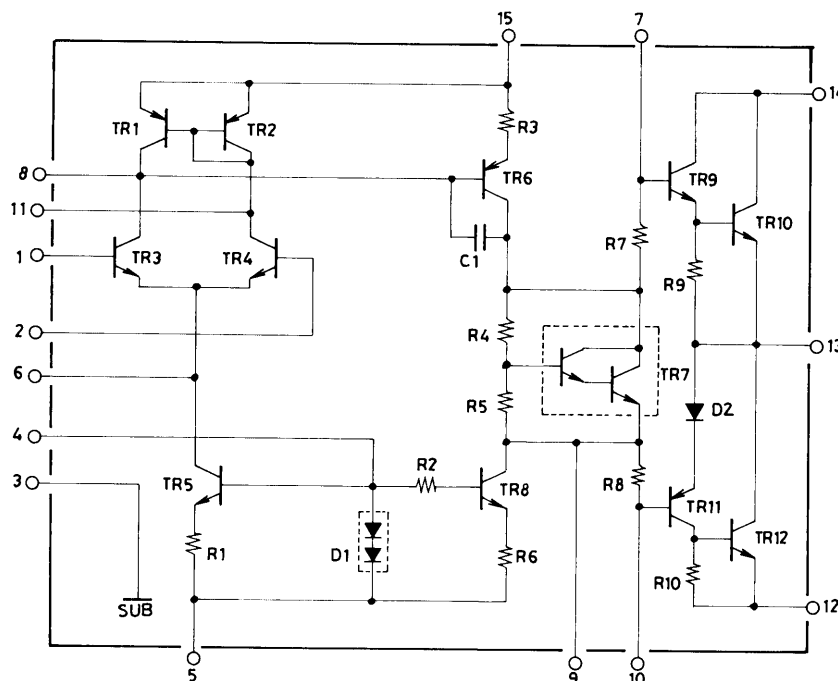
\*1 When measuring permissible load short time and output noise voltage use transformer power supply indicated below.

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



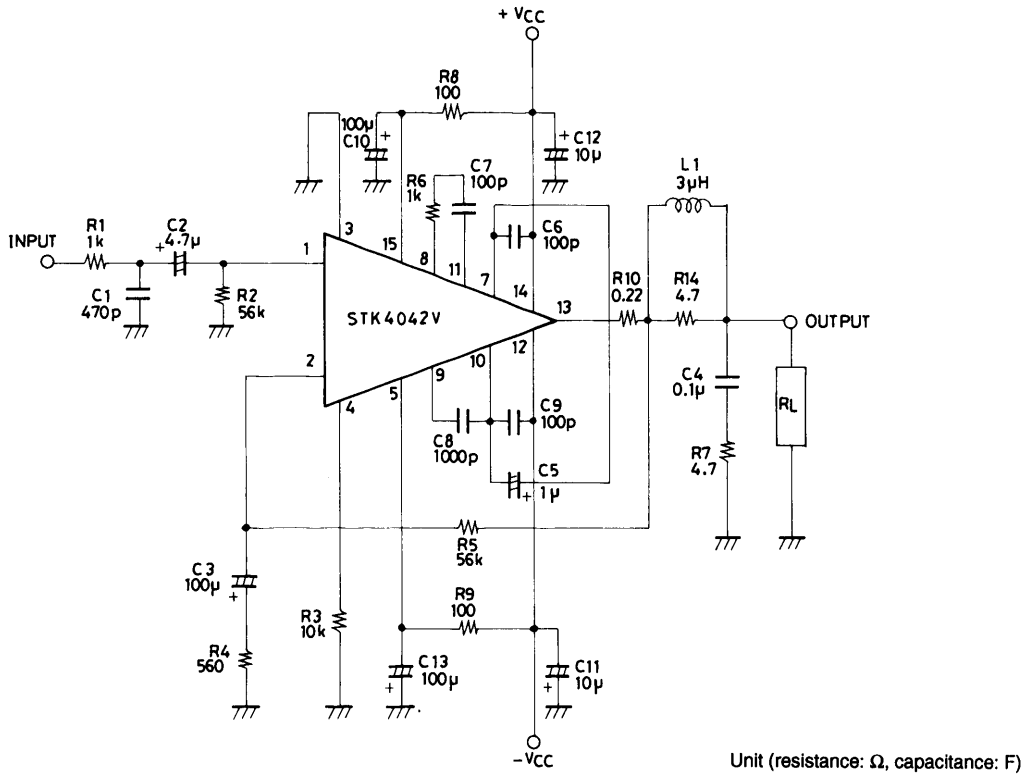
**Specified Transformer Power Supply  
(RP-25 Equivalent)**

## Equivalent Circuit

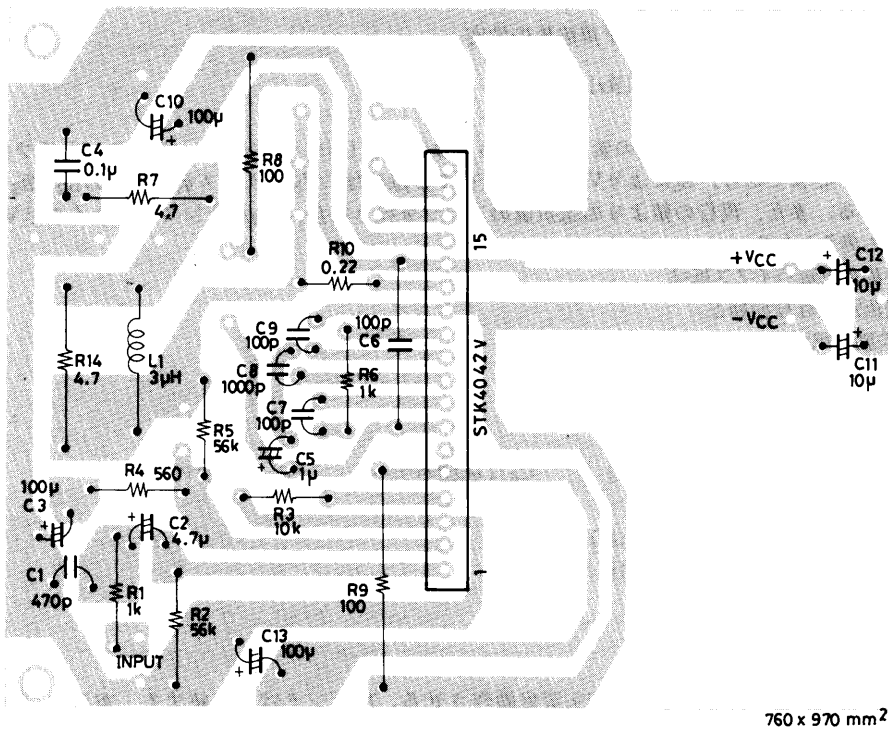


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## Application Circuit: 20W min Single Channel AF Power Amplifier



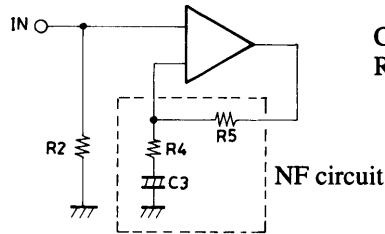
## Sample Printed Circuit Pattern for Application Circuit (Copper-foiled side)



Unit (resistance:  $\Omega$ , 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.

