



## STK405-030

### 2ch AF Power Amplifier (Split Power Supply) (20W + 20W min, THD = 10%)

#### Overview

The STK405-030, a member of the STK405-000 series, is a low-cost, 2-channel audio power amplifier hybrid IC that is ideal for a wide range of stereo sets. It has dedicated  $6\Omega$  output drive, in contrast with the STK401-000 series which supports  $6\Omega/3\Omega$  output drive.

#### Features

- Class B amplifiers
- Output load impedance  $R_L=6\Omega$  support
- EIAJ-output compatible ( $f=1\text{kHz}$ ,  $\text{THD}=10\%$ )
- Low supply switching shock noise
- Pin assignment grouped into individual blocks of inputs, outputs and supply lines to minimize the adverse effects of pattern layout on operating characteristics
- External bootstrap circuit not necessary
- Standby operation possible using external circuit
- Voltage gain  $V_G=26\text{dB}$  for easy gain distribution within the set
- Member of 10W/ch to 80W/ch pin-compatible series

#### Series Organization

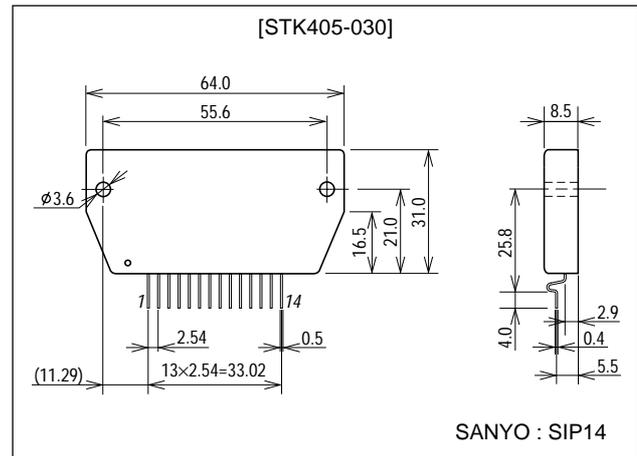
The following devices form a series with differing output capacity. Some of the following devices are under development. Contact your Sanyo sales representative if you require more detailed information.

Type No.	Output power	Supply voltage [V]	
		$V_{CC}$ max	$V_{CC}$
STK405-010	10W + 10W	$\pm 26.0$	$\pm 14.0$
STK405-030	20W + 20W	$\pm 30.5$	$\pm 18.5$
STK405-050	30W + 30W	$\pm 34.5$	$\pm 22.0$
STK405-070	40W + 40W	$\pm 39.0$	$\pm 25.0$
STK405-090	50W + 50W	$\pm 42.0$	$\pm 26.5$
STK405-100	60W + 60W	$\pm 45.0$	$\pm 29.0$
STK405-110	70W + 70W	$\pm 50.0$	$\pm 31.0$
STK405-120	80W + 80W	$\pm 52.5$	$\pm 33.0$

#### Package Dimensions

unit:mm

4158



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## Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\text{ max}}$		$\pm 30.5$	V
Thermal resistance	$\theta_{j-c}$	Per power transistor	3.4	$^\circ\text{C/W}$
Junction temperature	$T_j$		150	$^\circ\text{C}$
Operating temperature	$T_c$		125	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-30 to +125	$^\circ\text{C}$
Available time for load short-circuit	$t_s$	$V_{CC}=\pm 18.5\text{V}$ , $R_L=6\Omega$ , $f=50\text{Hz}$ , $P_O=20\text{W}$	1	s

### Operating Characteristics at $T_a = 25^\circ\text{C}$ , $R_L=6\Omega$ (noninductive load), $R_g=600\Omega$ , $V_G=26\text{dB}$

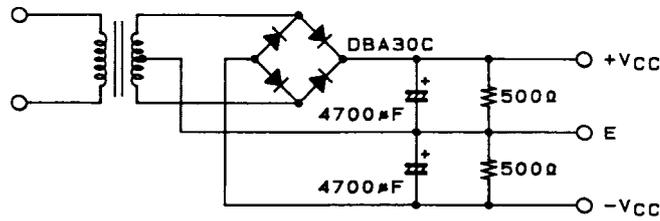
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent current	$I_{CCO}$	$V_{CC}=\pm 24.0\text{V}$ , no load		12	20	mA
Output power	$P_O$	$V_{CC}=\pm 18.5\text{V}$ , $f=1\text{kHz}$ , $\text{THD}=10.0\%$	20			W
Total harmonic distortion	THD	$V_{CC}=\pm 18.5\text{V}$ , $f=1\text{kHz}$ , $P_O=5.0\text{W}$		0.04	0.1	%
Frequency response	$f_L, f_H$	$V_{CC}=\pm 18.5\text{V}$ , $P_O=1.0\text{W}$ , $+0_{-3}\text{ dB}$		20 to 50k		Hz
Input impedance	$r_i$	$V_{CC}=\pm 18.5\text{V}$ , $f=1\text{kHz}$ , $P_O=1.0\text{W}$		55		$\text{k}\Omega$
Output noise voltage	$V_{NO}$	$V_{CC}=\pm 24.0\text{V}$ , $R_g=10\text{k}\Omega$			1.2	mVrms
Neutral voltage	$V_N$	$V_{CC}=\pm 24.0\text{V}$	-100	0	+100	mV

Note.

All tests are measured using a constant-voltage supply unless otherwise specified.

Available time for load short-circuit and output noise voltage are measured using the transformer supply specified below. The output noise voltage is the peak value of an average-reading meter with an rms value scale (VTVM). A regulated AC supply (50Hz) should be used to eliminate the effects of AC primary line flicker noise.

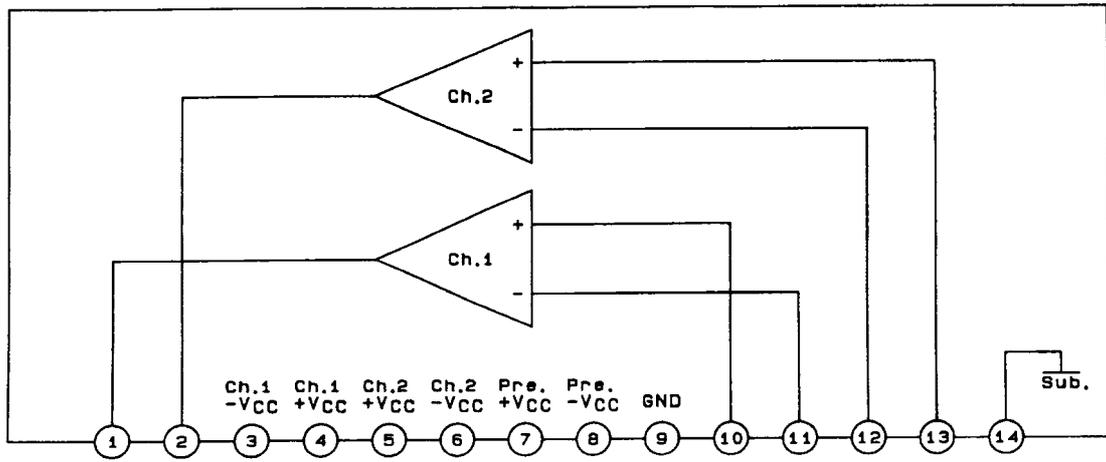
### Specified Transformer Supply (RP-22 or Equivalent)



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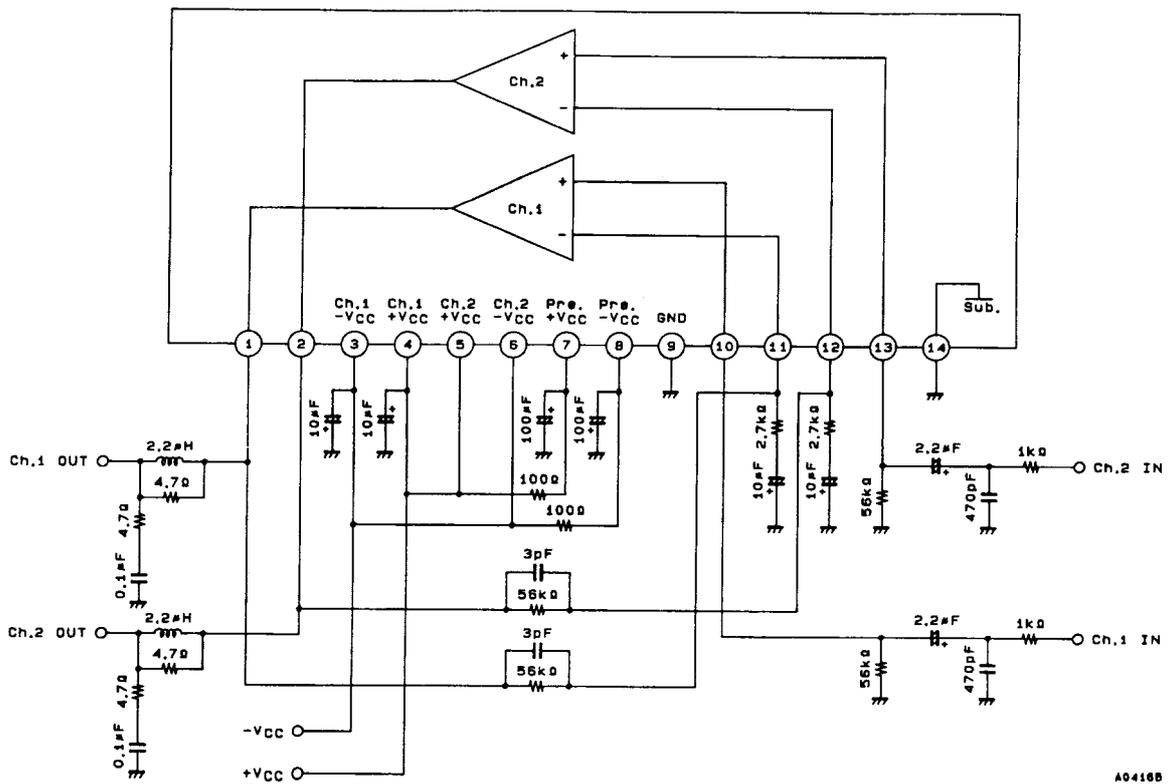
# STK405-030

## Block Diagram



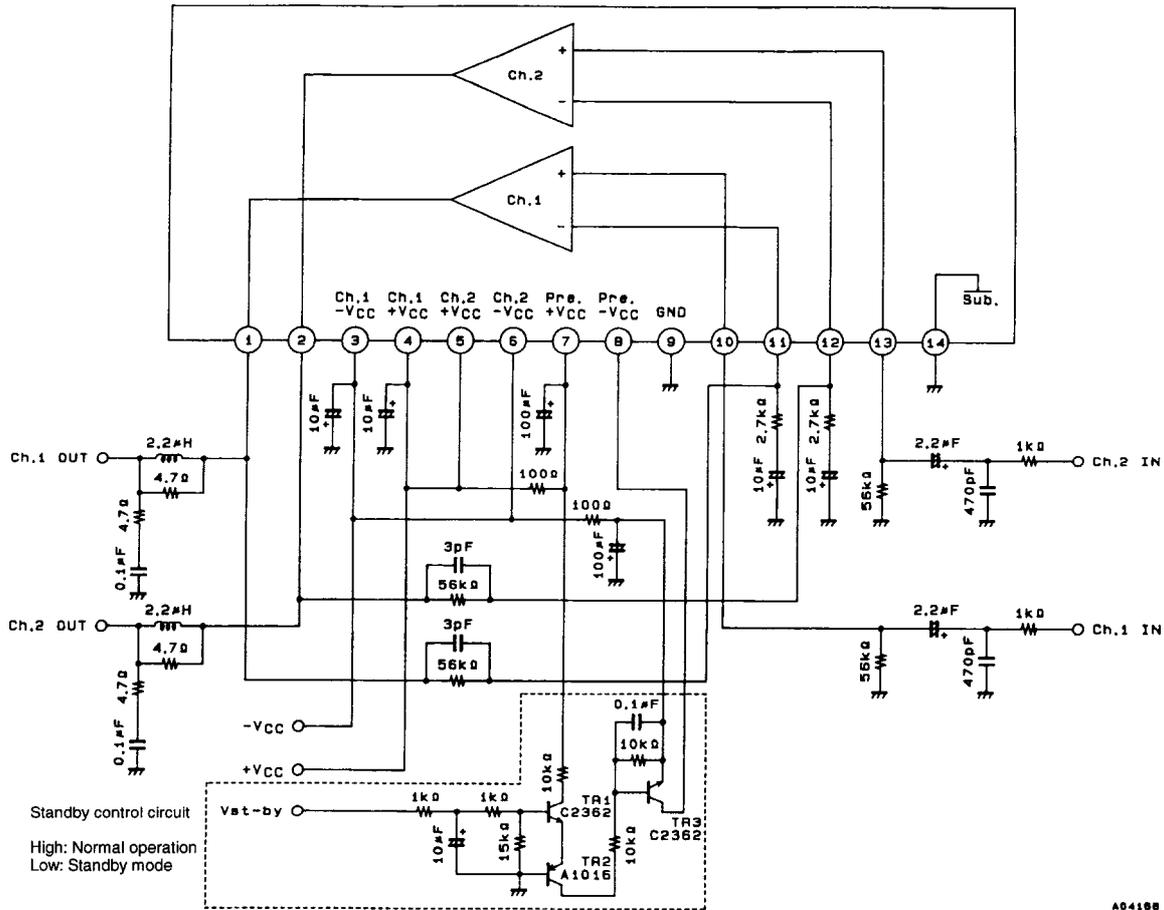
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## Test Circuit



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Sample Application Circuit (Standby Mode Supported)



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Heatsink Design Considerations

The heatsink thermal resistance,  $\theta_{c-a}$ , required to dissipate the STK405-030 device total power dissipation,  $P_d$ , is determined as follows :

Condition 1: IC substrate temperature not to exceed 125°C  
 $P_d \times \theta_{c-a} + T_a < 125^\circ\text{C}$  ..... (1)

Where  $T_a$  is the guaranteed maximum ambient temperature.

Condition 2: Power transistor junction temperature,  $T_j$ , not to exceed 150°C  
 $P_d \times \theta_{c-a} + P_d / N \times \theta_{j-c} + T_a < 150^\circ\text{C}$  ..... (2)

where  $N$  is the number of power transistors and  $\theta_{j-c}$  is the power transistor thermal resistance per transistor. Note that the power dissipated per transistor is the total,  $P_d$ , divided evenly among the  $N$  power transistors.

Expressions (1) and (2) can be rewritten making  $\theta_{c-a}$  the subject.

$\theta_{c-a} < (125 - T_a) / P_d$  ..... (1)  
 $\theta_{c-a} < (150 - T_a) / P_d - \theta_{j-c} / N$  ..... (2)

The heatsink required must have a thermal resistance that simultaneously satisfied both expressions.

The heatsink thermal resistance can be determined from (1)' and (2)' once the following parameters have been defined.

- Supply voltage :  $V_{CC}$
- Load resistance :  $R_L$
- Guaranteed maximum ambient temperature :  $T_a$

The total device power dissipation when STK405-030  $V_{CC} = \pm 18.5\text{V}$  and  $R_L = 6\Omega$ , for a continuous sine wave signal, is a maximum of 23.5W, as shown in the  $P_d - P_O$  characteristics graph.

When estimating the power dissipation for an actual audio signal input, the rule of thumb is to select  $P_d$  corresponding to 1/10  $P_O$  max (within safe limits) for a continuous sine wave input. For example,

$P_d = 16\text{W}$  [for 1/10  $P_O$  max = 2W]

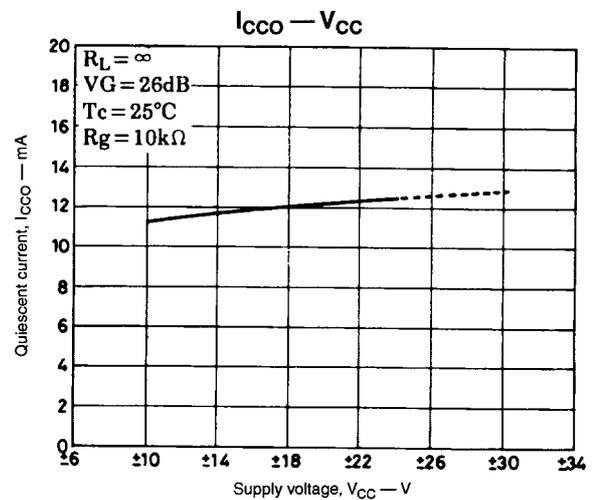
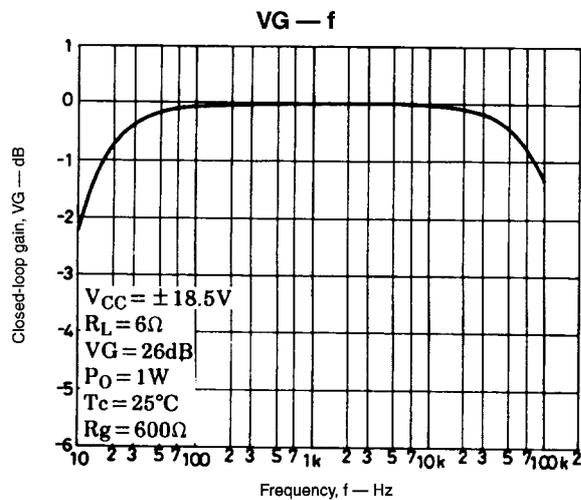
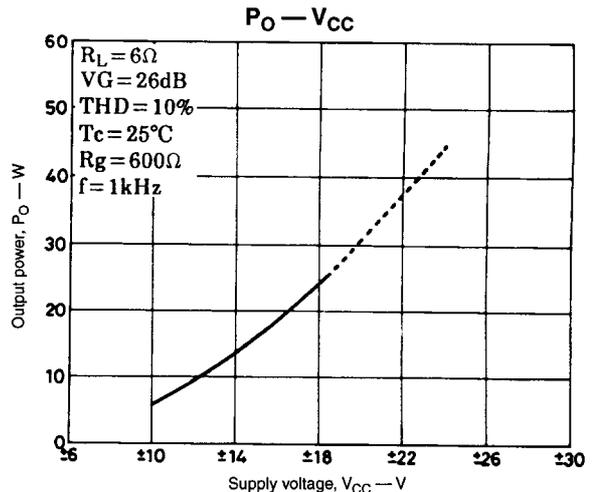
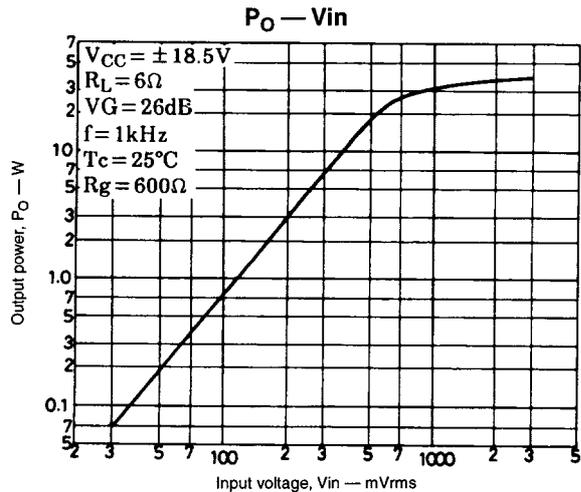
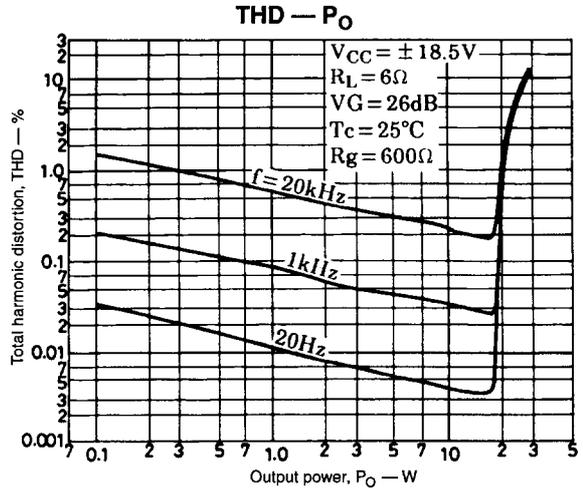
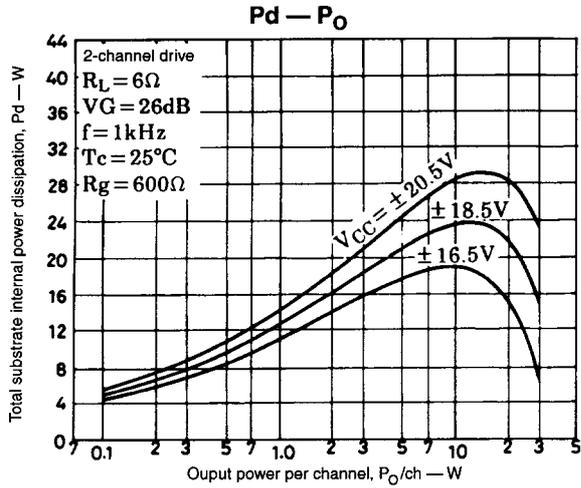
The STK405-030 has 4 power transistors, and the thermal resistance per transistor,  $\theta_{j-c}$ , is 3.4°C/W. If the guaranteed maximum ambient temperature,  $T_a$ , is 50°C, then the required heatsink thermal resistance,  $\theta_{c-a}$ , is :

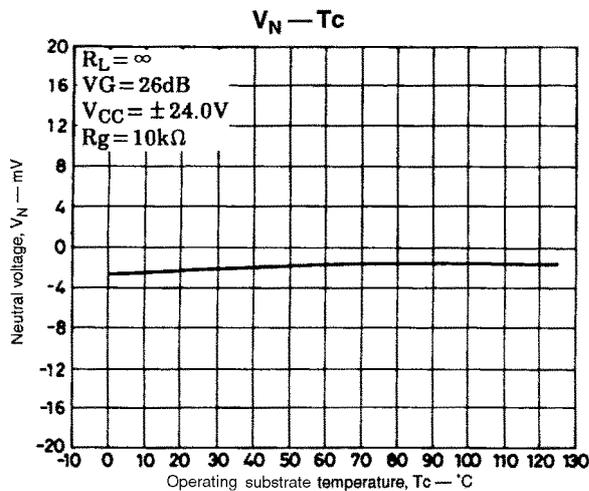
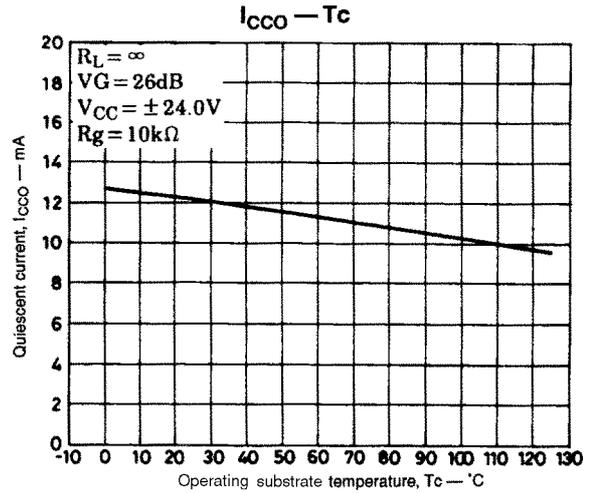
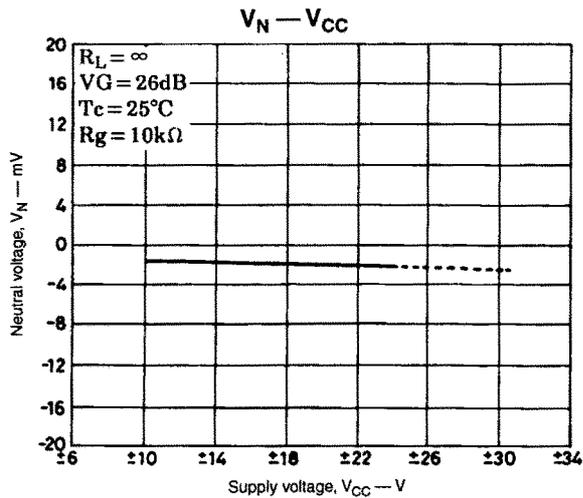
From expression (1) :  $\theta_{c-a} < (125-50)/16 < 4.68$

From expression (2) :  $\theta_{c-a} < (150-50)/16-3.4/4 < 5.40$

Therefore, to satisfy both expressions, the required heatsink must have a thermal resistance less than 4.68°C/W.

The heatsink design example is based on a constant-voltage supply, and should be verified within your specific set environment.





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