SANYO

No. 5178

STK405-050

2ch AF Power Amplifier (Split Power Supply) 30W + 30W min, THD = 10%

Overview

The STK405-050, 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 6Ω 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 = 1kHz, 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 VG = 26dB for easy gain distribution within the set
- Member of 10W/ch to 80W/ch pin-compatible series

Series Organization

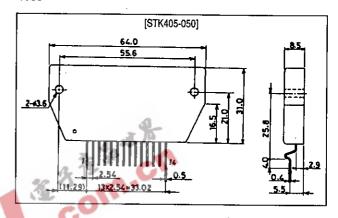
The following devices form a series with differing output capacity. Some of the following devices are under development. Contact your Sanyo sales representative if you require more detailed information.

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

Package Dimensions

unit: mm

4158



Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit	
Maximum supply voltage	V _{CC} max		±34.5		
Thermal resistance	θј-с	Per power transistor	3.4	°C/W	
Junction temperature	Tj		150	°C	
Operating substrate temperature	Tc		125		
Storage temperature	Tstg		-30 to +125	•c	
Available time for load short-circuit	t _s	$V_{CC} = \pm 22V$, $R_L = 6\Omega$, $f = 50Hz$, $P_O = 30W$	1	s	

Operating Characteristics at Ta = 25°C, $R_L = 6\Omega$ (noninductive load), $Rg = 600\Omega$, VG = 26dB

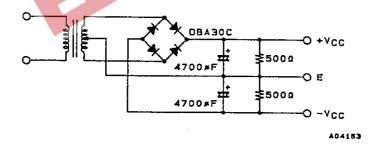
Parameter	Symbol	Conditions	min	typ	max	Unit
Quiescent current	Icco	V _{CC} = ±28.0V, no load	-	13	20	mA
Output power	Po	V _{CC} = ±22.0V, f = 1kHz, THD = 10.0%	30	_		W
Total harmonic distortion	THD	V _{CC} = ±22.0V, f = 1kHz, P _O = 5.0W		0.04	0.1	%
Frequency response	f _L , f _H	$V_{CC} = \pm 22.0V, P_O = 1.0W, ^{+0}_{-3} dB$	4	20 to 50k	-	Hz
Input impedance	r _i	V _{CC} = ±22.0V, f = 1kHz, P _O = 1.0W	44	55	-	kΩ
Output noise voltage	V _{NO}	$V_{CC} = \pm 28.0$ V, Rg = 10 k Ω	- (-	1.2	mVrms
Neutral voltage	V _N	V _{CC} = ±28.0V	-100	0	+100	m∨

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

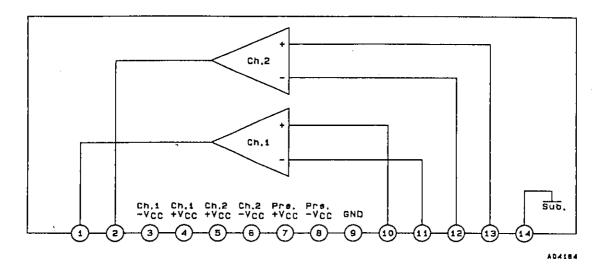
Available time for load short-circuit and output noise voltage are measured using the transformer supply specified below.

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.

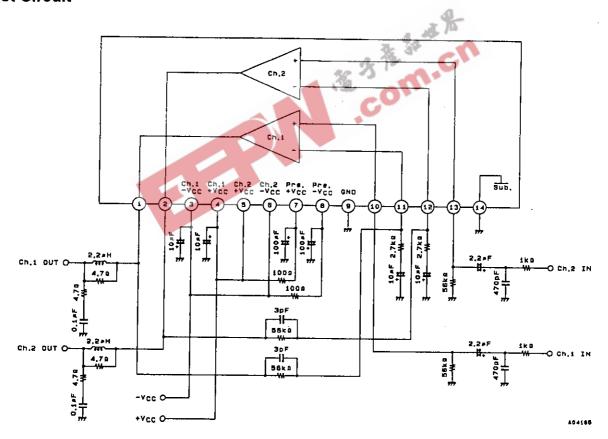
Specified Transformer Supply (RP-25 or Equivalent)



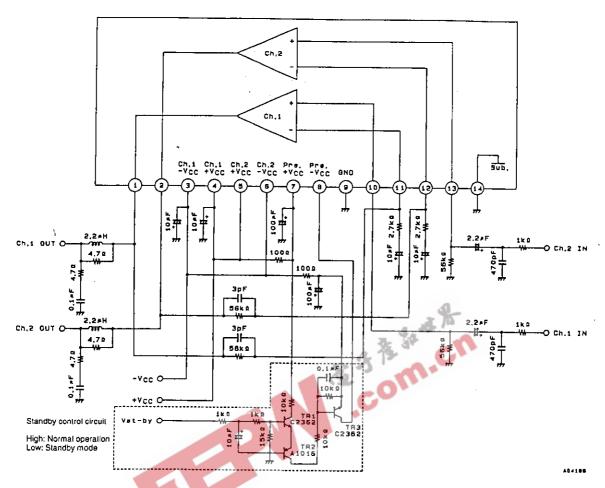
Block Diagram



Test Circuit



Sample Application Circuit (Standby Mode Supported)



Heatsink Design Considerations

The heatsink thermal resistance, θ_{c-a} , required to dissipate the STK405-050 device total power dissipation, Pd, is determined as follows:

Condition 1: IC substrate temperature not to exceed 125°C.

$$Pd \times \theta c - a + Ta < 125^{\circ}C$$
(1)

where Ta is the guaranteed maximum ambient temperature.

Condition 2: Power transistor junction temperature, Tj, not to exceed 150°C.

$$Pd \times \theta c-a + Pd/N \times \theta j-c + Ta < 150^{\circ}C$$
(2)

where N is the number of power transistors and θ j-c is the power transistor thermal resistance per transistor. Note that the power dissipated per transistor is the total, Pd, divided evenly among the N power transistors.

Expressions (1) and (2) can be rewritten making θ c-a the subject.

$$\theta c-a < (125 - Ta)/Pd$$
.....(1)

$$\theta c-a < (150 - Ta)/Pd - \theta j-c/N \dots (2)'$$

The heatsink required must have a thermal resistance that simultaneously satisfies 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: Ta

The total device power dissipation when STK405-050 $V_{CC} = \pm 22.0V$ and $R_L = 6\Omega$, for a continuous sine wave signal, is a maximum of 33.5W, as shown in the Pd— P_O characteristic graph.

When estimating the power dissipation for an actual audio signal input, the rule of thumb is to select Pd corresponding to $1/10 P_0$ max (within safe limits) for a continuous sine wave input. For example,

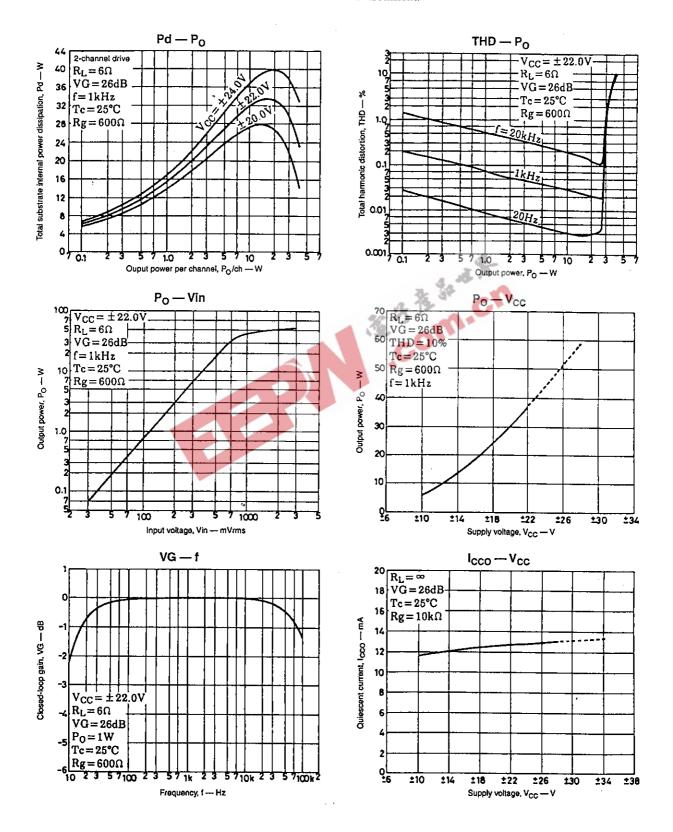
$$Pd = 23W \text{ (for 1/10 P}_{O} \text{ max} = 3W)$$

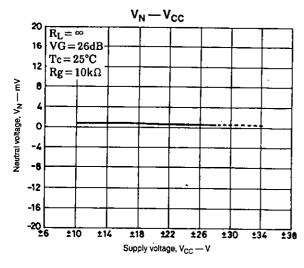
The STK405-050 has 4 power transistors, and the thermal resistance per transistor, 0j-c, is 3.4°C/W. If the guaranteed maximum ambient temperature, Ta, is 50°C, then the required heatsink thermal resistance, 0c-a, is:

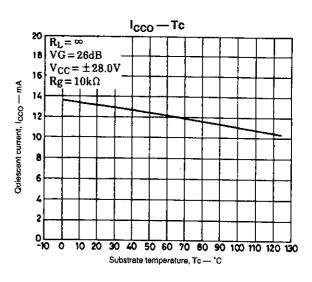
From expression (1)': θ c-a < (125 – 50)/23 < 3.26

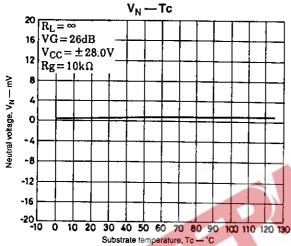
From expression (2)': $\theta c-a < (150 - 50)/23 - 3.4/4$ < 3.49 Therefore, to satisfy both expressions, the required heatsink must have a thermal resistance less than 3.26°C/W.

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











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