M5246P,FP

SINGLE POWER SOURCE PREAMPLIFIER WITH SWITCHING CIRCUITS

DESCRIPTION

M5246 is a semiconductor integrated circuit designed as a single power source preamplifier containing analog switching circuits. Two channels of preamplifiers and analog switches are contained in the 16-pin DIP or mini-flat standard package. Each of them can be used separately or can be combined.

The switch control can be operated using CONT pins in four modes.

The (+) input can be operated from the GND level and can be used for the single preamplifier or the switching function plus preamplifier.

Since this device uses the single power supply, it is best suitable for portable audio equipments such as cassette tape recorders with radio, mini-component audio sets, tape recorders, etc.

FEATURES

•	Low noise $V_{NI} = 0.8 \mu Vrms$ (typ.)
	$@R_S = 2.2k\Omega$
•	High open loop voltage gain $G_{VO} = 80dB$ (typ.)
	@f = 400Hz
•	Low distortion THD = 0.025% (typ.)
	@f = $1kHz$, $V_0 = 0.3Vrms$
•	Can be used as the switching function plus preamplifier or

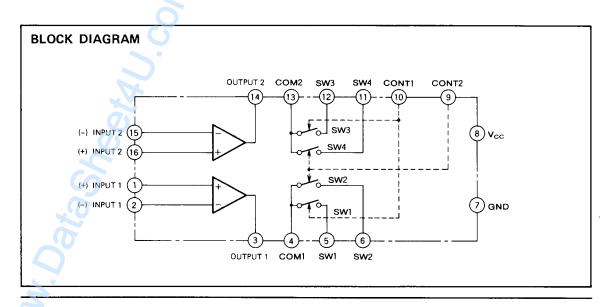
- as a preamplifier.The switch section can use 4 modes.
- The input level can be operated from the GND level so that no coupling capacitor is required.
- Can use the single power supply for operation.
- Contains the output-rise speed-up circuit when power is applied.

APPLICATION

Cassette tape recorders with radio, tape recorders, preamplifiers for audio sets

PIN CONFIG	JRATION	(TOP VIEW)		
(+) INPUT 1 (-) INPUT 1 OUTPUT 1 COM1 SW1 SW2 GND POWER SUPPLY	M5246P, FP	16 (+) INPUT 2 15 (-) INPUT 2 14 OUTPUT 2 13 COM2 12 SW3 11 SW4 10 CONT1 9 CONT2		
Outline 16P4(M5246P) 16P2S(M5246FP)				

RECOMMENDED OPERATING CONDITIONS Supply voltage range $4 \sim 16 \text{V}$ Rated supply voltage 9V



ABSOLUTE MAXIMUM RATINGS (Ta=25℃, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit	
Vcc	Supply voltage		20	V	
VCONT	Control voltage		-0.3-20	V	
Pd	Power dissipation		700(DIP)		
- u			550(FP)	m∨	
K_{θ}	Thermal derating	hermal derating Ta≥25℃	7(DIP)	mw/℃	
Nθ			5.5(FP)		
Topr	Operating temperature		-20~+75	°C	
Tstg	Storage temperature		-55-+125	υ	

ELECTRICAL CHARACTERISTICS $(Ta=25\%, V_{CC}=9V)$

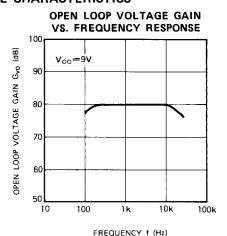
Symbol	Parameter	Took and distance		Limits			
Symbol		f (Hz)	f (Hz) Test conditions		Тур	Max	Unit
Icc	Circuit current		$R_S = 2.2 k \Omega$, $R_R = 390 k \Omega$, $CONT = GND$		3.9	8.0	mA
+ I _B	Positive input bias current		R _S =10kΩ		0.5	5	μΑ
- IB	Negative input bias current	_	Rg = 390k Ω		50	500	nA
Gvo	Open loop voltage gain	400	$V_0 = -10 dB$	65	80		dB
THD	Total harmonic distortion	1k	V _O = 300mVrms, BW: 400Hz ~ 30kHz		0.025	1	%
Vом	Maximum output voltage	1k	THD=1%	0.5	0.7		Vrms
VNI	Input-referred noise voltage		R _S =2.2kΩ,30kHz		0.8	2.5	μVrms
CC	Channel separation	1k	V _O = 0dBm, 30kHz	55	75		dB
Ron	ON resistance	1k	V _O = 10mVrms		20	50	Ω
СТ	Cross talk	1k	V _O =0dBm, 30kHz	55	75		dB
Son	Switch ON voltage		$I_0 = 5 \text{mA}$, COM = GND, $V_{OL} \le 400 \text{mV}$	2.0		20	V
Soff	Switch OFF voltage		lleak ≤ 10μA, COM = GND	-0.3		0.6	V
VoL	Low output voltage	_	1 _O = 5mA		100	400	mV
lleak	Leak current		$V_0 = 20V$, $C_{ONT} = GND$		2	10	μΑ
Isink	Sink current		V _O =1V, C _{ONT} =OPEN	5	25		mA

SWITCH ACTION (COM = GND)

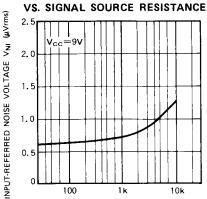


CONTROL (CONT) VOLTAGE

TYPICAL CHARACTERISTICS

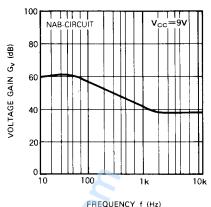


INPUT-REFERRED NOISE VOLTAGE VS. SIGNAL SOURCE RESISTANCE

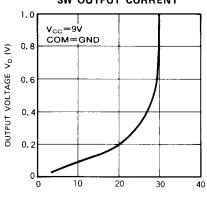


SIGNAL SOURCE RESISTANCE $R_g\ (\Omega)$

VOLTAGE GAIN VS. FREQUENCY RESPONSE



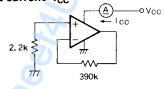
SW OUTPUT VOLTAGE VS. SW OUTPUT CURRENT



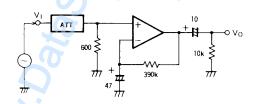
SW OUTPUT CURRENT IO (mA)

TEST CIRCUIT

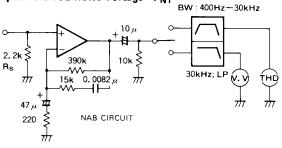
Circuit current Icc



Open loop voltage gain G_{VO}



Total Harmonic distortion THD, Maximum output voltage $\,V_{OM}\,$, Input-referred noise voltage $\,V_{N\,I}\,$



Unit Resistance: Ω

Capacitance: F

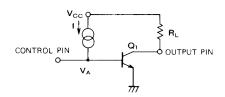
DESCRIPTION OF THE SWITCHING CIRCUIT OPERATIONS AND ITS USAGE

When constant current I is sent to the NPN transistor shown below, Q_1 becomes the bias status, V_A potential becomes the V_{BE} of Q_1 , and the potential of the output pin becomes the $V_{CE(sat)}$ of Q_1 .

At the point if the control pin is grounded, V_{BE} of Q_1 becomes off state and all the current flow to the GND. The output potential becomes V_{CC} .

In case of this circuit, the switching operation can be initiated by turning ON/OFF the V_{BF} of Q_1 .

1. BASIC CIRCUIT



In case that COM = GND and the $\rm R_{L}$ in inserted between SW OUT-V $_{\rm CC}$:

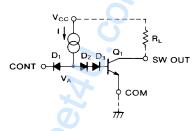
If constant current is supplied, D_2 , D_3 , and Q_1 become ON, the potential of V_A becomes $2V_F + V_{BE}$, and all the current I becomes the drive current for Q_1 .

The SW OUT potential becomes the $V_{CE(sat)}$ of Q_1 .

At this point if the CONT pin is grounded, V_A becomes the V_F of D_1 and D_2 , D_3 , and Q_1 can not be set to ON so that I will flow through D_1 to the GND.

By controlling the potential of V_A , M5246 switches Ω_1 . Note: Each inserted diode is used for pressure compensation centering at the point V_A .

2. ACTUAL CIRCUIT



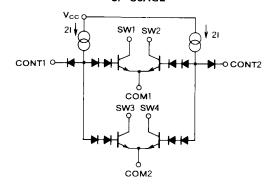
- COM pin arbitrary sets the DC potential. (The above potential V_A is not determined if it is not DS biased.)
- Because of the above, Q₁ ON/OFF will be set arbitrary. (The standard values for electrical characteristics is limited only to COM = GND.)
- It is desirable that the switch control to be OPEN/GND as a standard.
- AC input is available for both the COM and SW OUT sides.

- Two circuits of emitters are shared (COM) so that it is best suitable for the selection, branch, and synthesis of 2-input/output.
- Since SW1, 3/SW2, and 4 are common to the CONT, they cannot operate separately.

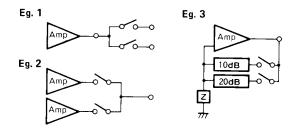
CONTI	OPEN	OPEN	GND	GND
CONT2	OPEN	GND	OPEN	GND
SW1	L	L	н	н
SW2	L	Н	L	Н
SW3	L	L	Н	н
SW4	L	н	L	н

 When a R_L is inserted between each SW output pin and V_{CC} and cach COM pin is grounded.

3. USAGE



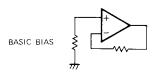
4. SAMPLE USAGES



NOTE ON THE USAGE:

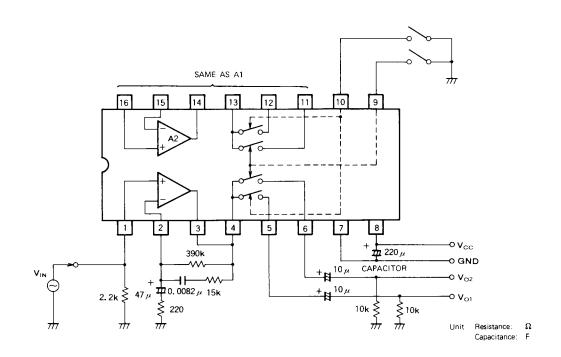
- 1. DC bias voltage must be applied to the Amp. section.
- Note that the reverse insertion of elements or supplying the source voltage under pin shifted status may degrade the performance or destroy the IC.

Moreover, the SW section can be used separately as a driver of LEDs.



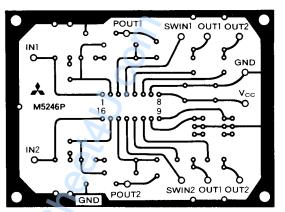


APPLICATION EXAMPLES



PCB FOR CIRCUIT TESTING (Typical application example)

PCB DIAGRAM (COPPER FOIL SIDE)



(PARTS INSERTION SIDE)

