

## OVERVIEW

The SM5307A is a 3-channel video buffer for the HD output equipment that corresponds to the 480i to 1080p video signal standards. It can change the 5th-order lowpass filter (LPF) which is mounted on this IC, to four modes of SD1, SD2, HD and filter-bypass mode, which corresponds to video signal. In addition, improvement of S/N characteristic with HD band is actualized.

## FEATURES

- Supply voltages: 4.75 to 5.25V
- Current consumption
  - Normal operation: 65mA (typ,  $V_{CC} = 5.0V$ )
  - Disable mode: 1.4mA (typ,  $V_{CC} = 5.0V$ )
- Output gain: 6.0dB  $\pm$  0.5dB
- LPF passband
  - SD1 mode
    - CH1 = 6.75MHz
    - CH2, CH3 = 3.375MHz
  - SD2 mode
    - CH1 = 13.5MHz
    - CH2, CH3 = 6.75MHz
  - HD mode
    - CH1 = 30MHz
    - CH2, CH3 = 15MHz
- Filter-bypass mode corresponding to 1080p: 80MHz (typ)
- Maximum input amplitude: 1.4Vp-p
- S/N ratio: 70dB (typ)
- Input multiplexer: 2-system input, 1-system output
- Input type
  - CH1: Sync tip clamp
  - CH2, CH3: Bias
- Disable mode function (power-down mode)
- Operating ambient temperature range:  $-40$  to  $85^{\circ}C$
- Package: 24-pin VSOP (Pb free)

## APPLICATIONS

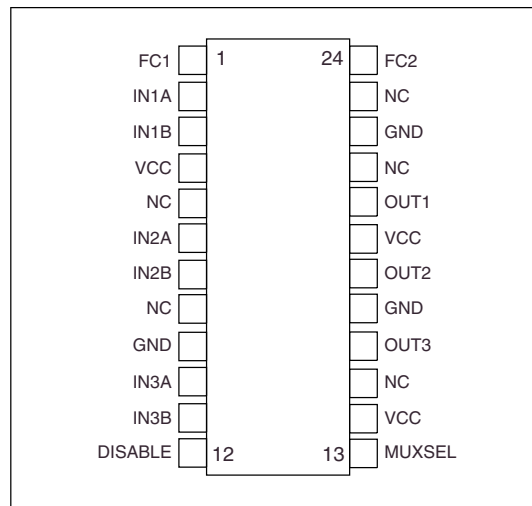
- DVD player
- DVD recorder
- Set Top Box

## ORDERING INFORMATION

Device	Package
SM5307AV	24-pin VSOP

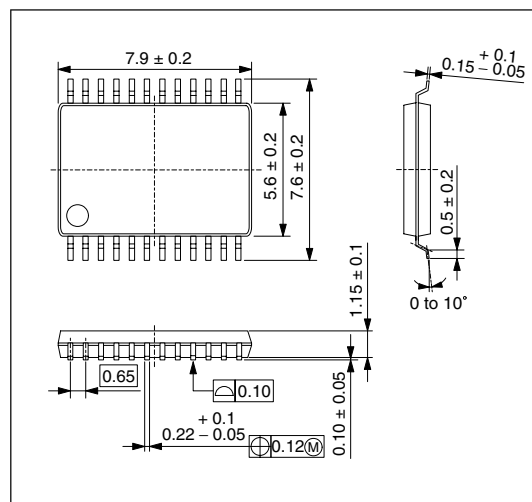
## PINOUT

(Top view)

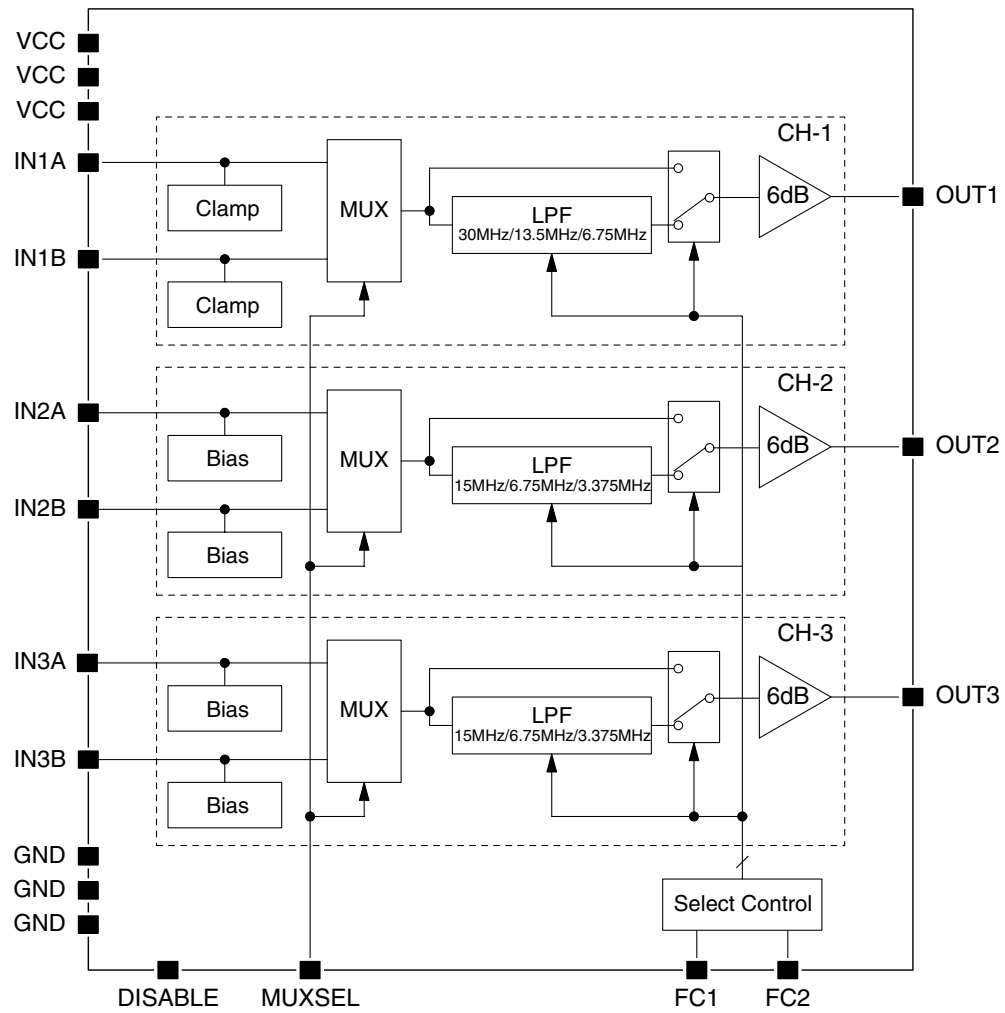


## PACKAGE DIMENSIONS

(Unit: mm)



## BLOCK DIAGRAM



## PIN DESCRIPTION

Number	Name	I/O *1	A/D*2	Description
1	FC1	I	D	Filter select pin 1
2	IN1A	I	A	Video signal input pin (CH-1, input A)
3	IN1B	I	A	Video signal input pin (CH-1, input B)
4	VCC	—	—	Supply pin
5	NC	—	—	No connection
6	IN2A	I	A	Video signal input pin (CH-2, input A)
7	IN2B	I	A	Video signal input pin (CH-2, input B)
8	NC	—	—	No connection
9	GND	—	—	Ground pin
10	IN3A	I	A	Video signal input pin (CH-3, input A)
11	IN3B	I	A	Video signal input pin (CH-3, input B)
12	DISABLE	I	D	Disable function control pin
13	MUXSEL	I	D	Input multiplexer switch control pin
14	VCC	—	—	Supply pin
15	NC	—	—	No connection
16	OUT3	O	A	Video signal output pin (CH-3)
17	GND	—	—	Ground pin
18	OUT2	O	A	Video signal output pin (CH-2)
19	VCC	—	—	Supply pin
20	OUT1	O	A	Video signal output pin (CH-1)
21	NC	—	—	No connection
22	GND	—	—	Ground pin
23	NC	—	—	No connection
24	FC2	I	D	Filter select pin 2

\*1. I: input, O: output

\*2. A: analog, D: digital

**PIN EQUIVALENT CIRCUITS**

Number	Name	I/O *1	Equivalent circuit
2 3	IN1A IN1B	I	
6 7 10 11	IN2A IN2B IN3A IN3B	I	
20 18 16	OUT1 OUT2 OUT3	O	
12 13 24 1	DISABLE MUXSEL FC2 FC1	I	

\*1. I: input, O: output

## SPECIFICATIONS

### Absolute Maximum Ratings

GND = 0V

Parameter	Symbol	Condition	Rating	Unit
Supply voltage	$V_{CC}$	VCC	-0.3 to 6.5	V
Input voltage	$V_{IN}$	MUXSEL, DISABLE, FC1, FC2, IN1A, IN1B, IN2A, IN2B, IN3A, IN3B	GND - 0.3 to $V_{CC} + 0.3$	V
Storage temperature range	$T_{STG}$		-55 to +125	°C
Junction temperature	$T_J$		125	°C
Power dissipation	$P_D$	$\theta_{ja} = 33^\circ\text{C/W}$	1.0	W

### Recommended Operating Conditions

Parameter	Symbol	Condition	Rating	Unit
Supply voltage	$V_{CC}$		4.75 to 5.25	V
Operating ambient temperature range	$T_a$		-40 to +85	°C

### Electrical Characteristics

#### DC Characteristics

$V_{CC} = 5.0\text{V}$ ,  $T_a = 25^\circ\text{C}$ ,  $f_{in} = 100\text{kHz}$ ,  $V_{IN} = 1.0\text{Vp-p}$ ,  $R_L = 75\Omega$ , unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit	Test level
			min	typ	max		
Current consumption 1 <sup>*1</sup>	$I_{CC1}$	DISABLE = "L"	-	65	100	mA	I
Current consumption 2 <sup>*1</sup>	$I_{CC2}$	DISABLE = "H" (on disable mode)	-	1.4	2.0	mA	I
HIGH-level Input voltage	$V_{IH}$	MUXSEL, DISABLE, FC1, FC2, $V_{CC} = 4.75\text{ to }5.25\text{V}$ , $T_a = -40\text{ to }+85^\circ\text{C}$	2.0	-	-	V	I
LOW-level Input voltage	$V_{IL}$		-	-	0.8	V	I
HIGH-level input leakage current	$I_{LH}$	MUXSEL, DISABLE, FC1, FC2	-	-	1.0	$\mu\text{A}$	I
LOW-level input leakage current	$I_{LL}$		-	-	1.0	$\mu\text{A}$	I

\*1. Total of current consumption of VCC when no input signals.

## Analog Characteristics

### Analog input characteristics

$V_{CC} = 5.0V$ ,  $T_a = 25^\circ C$ ,  $f_{in} = 100kHz$ ,  $V_{IN} = 1.0V_{p-p}$ ,  $R_L = 75\Omega$ , DISABLE = "L", unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit	Test level
			min	typ	max		
Clamp voltage	$V_{CLMP}$	IN1A, IN1B, $V_{IN} = 0V_{p-p}$	1.36	1.56	1.76	V	I
Bias voltage	$V_{BIAS}$	IN2A, IN2B, IN3A, IN3B, $V_{IN} = 0V_{p-p}$	2.1	2.4	2.7	V	I
Input resistance	$R_{BIAS}$	IN2A, IN2B, IN3A, IN3B	–	20	–	k $\Omega$	II
Input amplitude	$V_{AI}$	Output THD up to 1.0%	–	–	1.4	V $_{p-p}$	I

### Filter frequency characteristics

$V_{CC} = 5.0V$ ,  $T_a = 25^\circ C$ ,  $V_{IN} = 1.0V_{p-p}$ ,  $R_L = 75\Omega$ , DISABLE = "L", unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit	Test level
			min	typ	max		
CH-1 passband attenuation (30MHz)	$A_{PB30}$	HD mode, $f_{in} = 30MHz/100kHz$	-2.0	–	+1.0	dB	I
CH-2, CH-3 passband attenuation (15MHz)	$A_{PB30H}$	HD mode, $f_{in} = 15MHz/100kHz$	-2.0	–	+1.0	dB	I
CH-1 passband attenuation (13.5MHz)	$A_{PB14}$	SD2 mode, $f_{in} = 13.5MHz/100kHz$	-1.5	–	+1.0	dB	I
CH-2, CH-3 passband attenuation (6.75MHz)	$A_{PB14H}$	SD2 mode, $f_{in} = 6.75MHz/100kHz$	-1.5	–	+1.0	dB	I
CH-1 passband attenuation (6.75MHz)	$A_{PB7}$	SD1 mode, $f_{in} = 6.75MHz/100kHz$	-1.5	–	+1.0	dB	I
CH-2, CH-3 passband attenuation (3.375MHz)	$A_{PB7H}$	SD1 mode, $f_{in} = 3.375MHz/100kHz$	-1.5	–	+1.0	dB	I
CH-1 stopband attenuation (30MHz)	$A_{SB30}$	HD mode, $f_{in} = 148MHz/100kHz$	–	-30	–	dB	II
CH-2, CH-3 stopband attenuation (15MHz)	$A_{SB30H}$	HD mode, $f_{in} = 76MHz/100kHz$	–	-30	–	dB	II
CH-1 stopband attenuation (13.5MHz)	$A_{SB14}$	SD2 mode, $f_{in} = 54MHz/100kHz$	–	-30	–	dB	II
CH-2, CH-3 stopband attenuation (6.75MHz)	$A_{SB14H}$	SD2 mode, $f_{in} = 27MHz/100kHz$	–	-30	-15	dB	I
CH-1 stopband attenuation (6.75MHz)	$A_{SB7}$	SD1 mode, $f_{in} = 27MHz/100kHz$	–	-30	-20	dB	I
CH-2, CH-3 stopband attenuation (3.375MHz)	$A_{SB7H}$	SD1 mode, $f_{in} = 13.5MHz/100kHz$	–	-25	-15	dB	I
Filter-bypass mode band width	$f_{BP}$	$V_{IN} = 0.7 V_{p-p}$ , at -1dB falling from the gain of $f_{in} = 100kHz$	–	80	–	MHz	II



## FUNCTIONAL DESCRIPTION

### Filter Select and Filter-bypass Mode

The SM5307A is mounted the 5th-order lowpass filter (LPF), and is possible to use changing four modes of SD1, SD2, HD and filter-bypass mode for corresponding to input video signal. The filter mode changes with the FC1 and FC2 pins.

Control pins		Filter mode	Filter passband (typ)		
FC1	FC2		CH-1	CH-2	CH-3
L	L	SD1 mode	6.75MHz	3.375MHz	3.375MHz
H	L	SD2 mode	13.5MHz	6.75MHz	6.75MHz
L	H	HD mode	30MHz	15MHz	15MHz
H	H	Filter-bypass mode	80MHz	80MHz	80MHz

### Input Multiplexer

The SM5307A is mounted the two input multiplexer for each channels. The MUXSEL pin selects the input signals.

Control pin	Selected input		
	CH-1	CH-2	CH-3
MUXSEL			
L	IN1A	IN2A	IN3A
H	IN1B	IN2B	IN3B

### Disable Mode Function

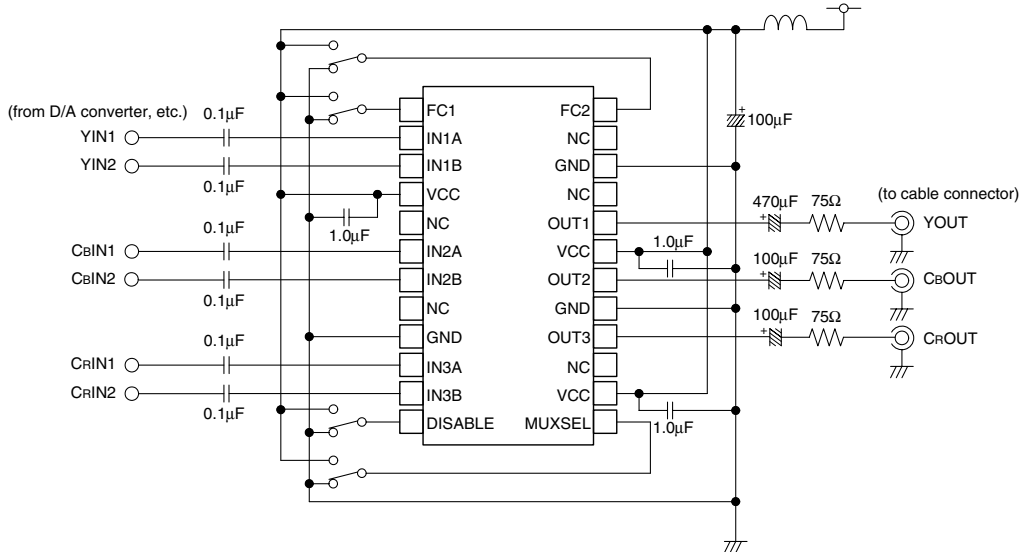
The SM5307A has the disable mode function. When DISABLE pin set to “H”, The SM5307A operation becomes disable mode. In disable mode operation, current consumption becomes up to 2mA and video signal input and output pins are setting high-impedance.

Control pin	SM5307A operation
DISABLE	
L	Normal operation
H	Disable mode

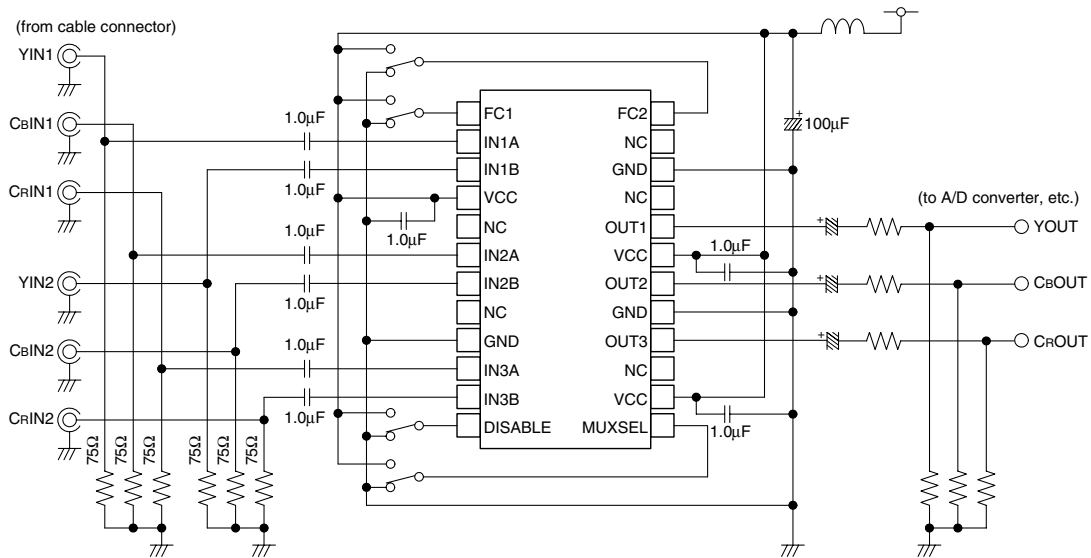


## RECOMMENDED APPLICATION CIRCUIT

- When using on the output side of equipment



- When using on the input side of equipment



**TYPICAL CHARACTERISTICS**

$V_{CC} = 5.0V$ ,  $T_a = 25^\circ C$ ,  $V_{IN} = 1.0V_{p-p}$ ,  $R_L = 75\Omega$ , unless otherwise noted.

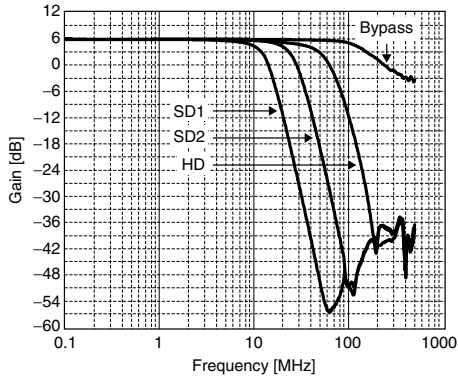


Figure 1. Gain vs. Frequency characteristics (CH-1)

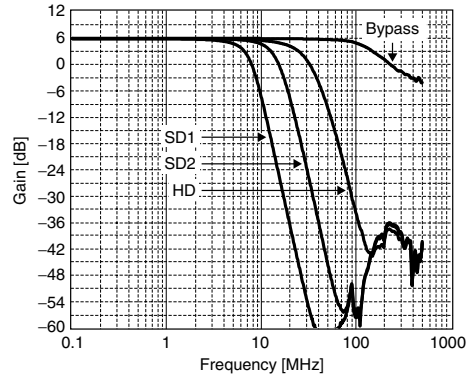


Figure 2. Gain vs. Frequency characteristics (CH-2, CH-3)

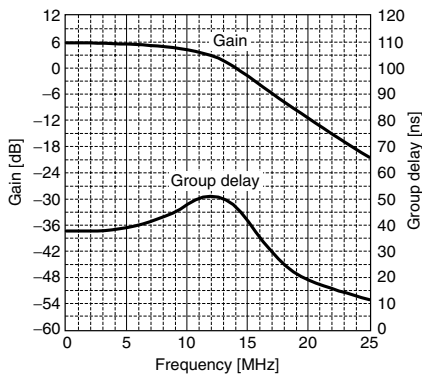


Figure 3. Gain and Group delay vs. Frequency characteristics (CH-1, SD1 mode)

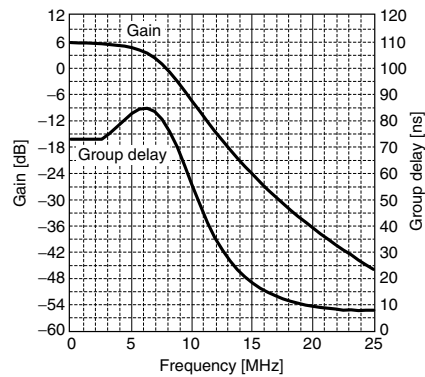


Figure 4. Gain and Group delay vs. Frequency characteristics (CH-2, CH-3, SD1 mode)

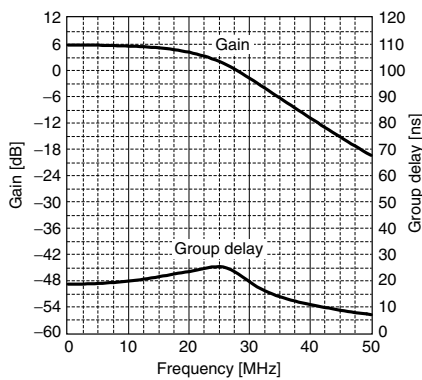


Figure 5. Gain and Group delay vs. Frequency characteristics (CH-1, SD2 mode)

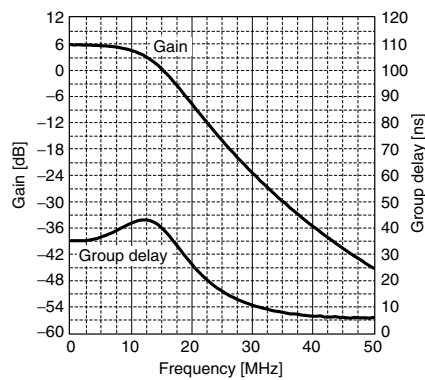


Figure 6. Gain and Group delay vs. Frequency characteristics (CH-2, CH-3, SD2 mode)

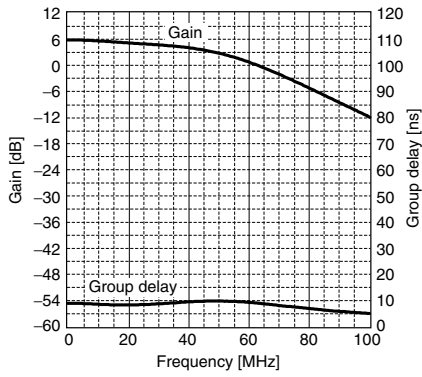


Figure 7. Gain and Group delay vs. Frequency characteristics (CH-1, HD mode)

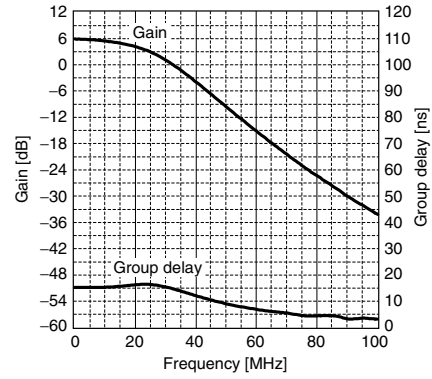


Figure 8. Gain and Group delay vs. Frequency characteristics (CH-2, CH-3, HD mode)

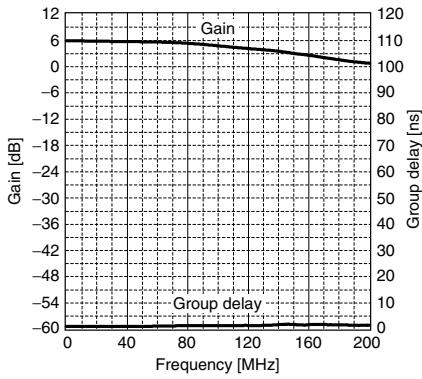


Figure 9. Gain and Group delay vs. Frequency characteristics (CH-1, CH-2, CH-3, Filter-bypass mode)

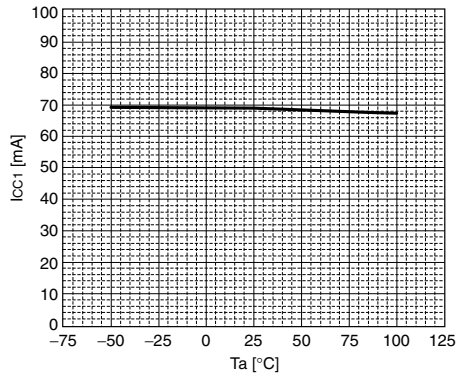


Figure 10.  $I_{CC1}$  vs. Ta  
(no signal input)

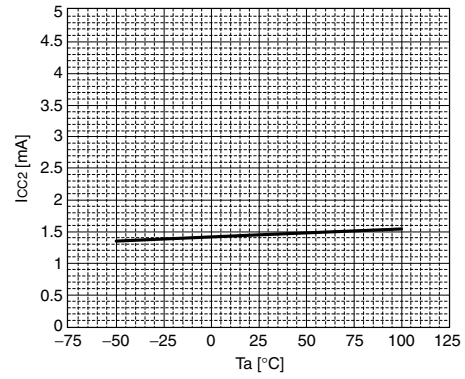


Figure 11.  $I_{CC2}$  vs. Ta  
(no signal input)

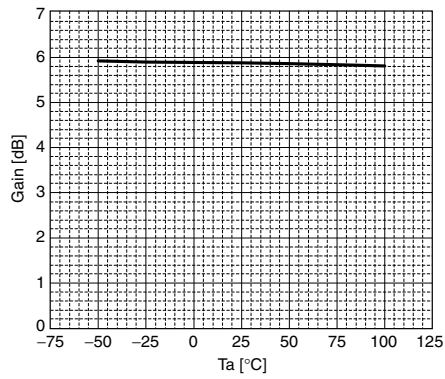


Figure 12. Gain vs. Ta  
( $f_{in} = 100\text{kHz}$ )

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SEIKO NPC CORPORATION

15-6, Nihombashi-kabutocho, Chuo-ku,  
Tokyo 103-0026, Japan  
Telephone: +81-3-6667-6601  
Facsimile: +81-3-6667-6611  
<http://www.npc.co.jp/>  
Email: [sales@npc.co.jp](mailto:sales@npc.co.jp)

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