SM5307C

3-channel Video Buffer

OVERVIEW

The SM5307C 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: 1.8mA (typ, V_{CC} = 5.0V)
- Output gain: 6.0dB ± 0.5dB
- LPF passband
  - SD1 mode
    CH1, CH2, CH3 = 6.75MHz
  - SD2 mode
    CH1, CH2, CH3 = 13.5MHz
  - HD mode
    CH1, CH2, CH3 = 30MHz
- 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: Bias (CH1, CH2, CH3)
- Disable mode function (power-down mode)
- Operating ambient temperature range: –40 to 85°C
- Package: 24-pin VSOP (Pb free)

APPLICATIONS

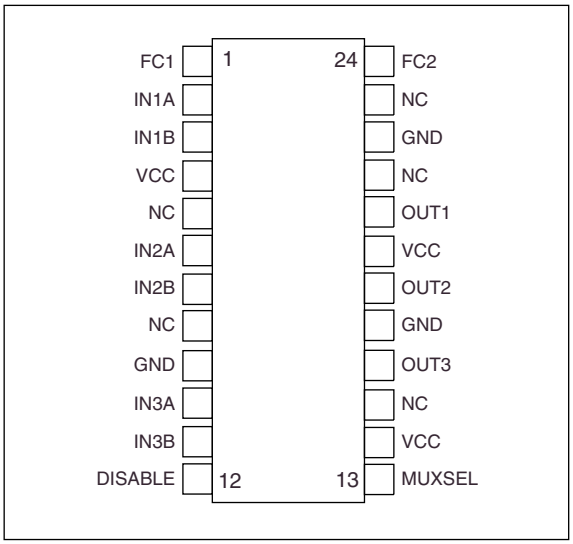
- DVD player
- DVD recorder
- Set Top Box

ORDERING INFORMATION

Device	Package
SM5307CV	24-pin VSOP

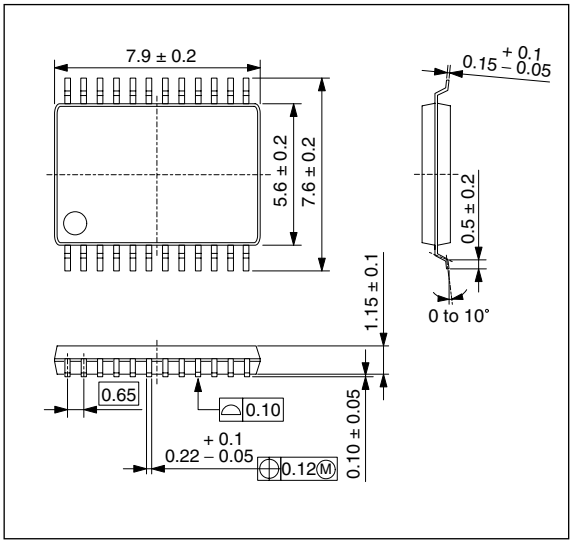
PINOUT

(Top view)

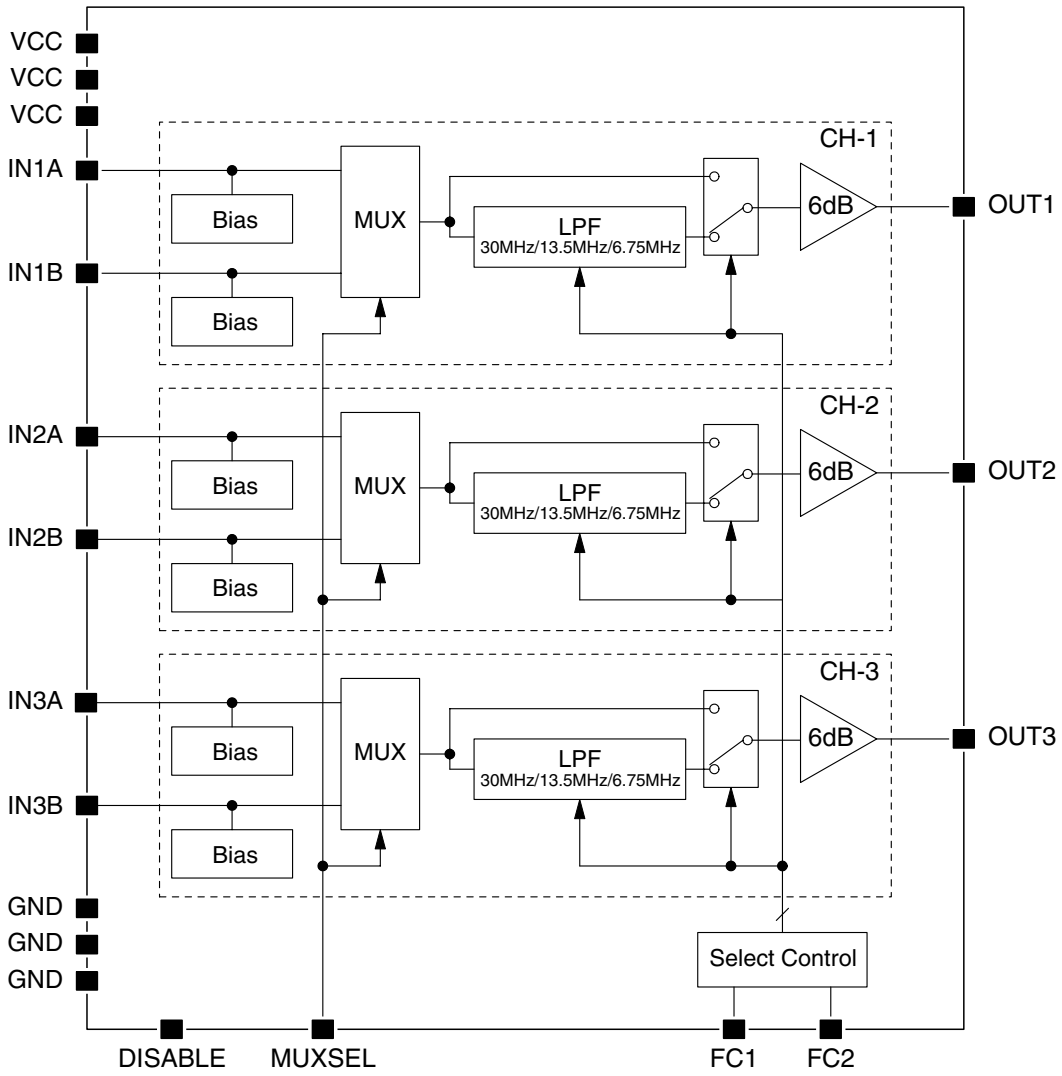


PACKAGE DIMENSIONS

(Unit: mm)



BLOCK DIAGRAM

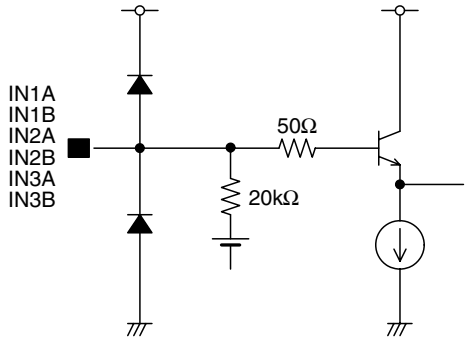
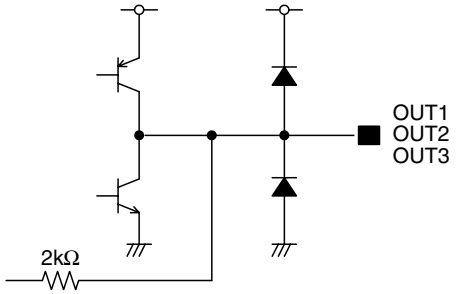
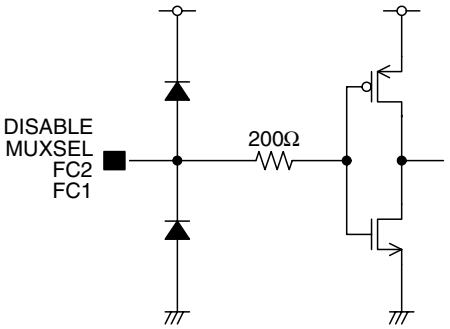


PIN DESCRIPTION

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 6 7 10 11	IN1A IN1B 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	θ_{ja} = 33°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	Ta		–40 to +85	°C

Electrical Characteristics

DC Characteristics

V_{CC} = 5.0V, Ta = 25°C, fin = 100 kHz, V_{IN} = 1.0Vp-p, R_L = 75Ω, unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit	Test level
			min	typ	max		
Current consumption 1*1	I_{CC1}	DISABLE = "L"	–	65	100	mA	I
Current consumption 2*1	I_{CC2}	DISABLE = "H" (on disable mode)	–	1.8	2.5	mA	I
HIGH-level Input voltage	V_{IH}	MUXSEL, DISABLE, FC1, FC2, V_{CC} = 4.75 to 5.25V, Ta = –40 to +85°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	µA	I
LOW-level input leakage current	I_{LL}		–	–	1.0	µA	I

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

Analog Characteristics

Analog input characteristics

V_{CC} = 5.0V, Ta = 25°C, fin = 100kHz, V_{IN} = 1.0Vp-p, R_L = 75Ω, DISABLE = "L", unless otherwise noted.

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

Filter frequency characteristics

V_{CC} = 5.0V, Ta = 25°C, V_{IN} = 1.0Vp-p, R_L = 75Ω, DISABLE = "L", unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit	Test level
			min	typ	max		
Passband attenuation (30MHz)	A_{PB30}	HD mode, fin = 30MHz/100kHz	–2.0	–	+1.0	dB	I
Passband attenuation (13.5MHz)	A_{PB14}	SD2 mode, fin = 13.5MHz/100kHz	–1.5	–	+1.0	dB	I
Passband attenuation (6.75MHz)	A_{PB7}	SD1 mode, fin = 6.75MHz/100kHz	–1.5	–	+1.0	dB	I
Stopband attenuation (30MHz)	A_{SB30}	HD mode, fin =148MHz/100kHz	–	–30	–	dB	II
Stopband attenuation (13.5MHz)	A_{SB14}	SD2 mode, fin = 54MHz/100kHz	–	–30	–	dB	II
Stopband attenuation (6.75MHz)	A_{SB7}	SD1 mode, fin = 27MHz/100kHz	–	–30	–20	dB	I
Filter-bypass mode band width	f_{BP}	V_{IN} = 0.7 Vp-p, at –1dB falling from the gain of fin = 100kHz	–	80	–	MHz	II

Analog output characteristics

V_{CC} = 5.0V, Ta = 25°C, fin = 100kHz, V_{IN} = 1.0Vp-p, R_L = 75Ω, DISABLE = "L", unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit	Test level
			min	typ	max		
Output gain	A_V		5.5	6.0	6.5	dB	I
Channel-to-channel gain error	dA_V	Gain error between OUT1, OUT2 and OUT3	–	–	± 0.2	dB	I
Output distortion	THD	V_{IN} = 1.4Vp-p	–	0.2	1.0	%	I
Channel-to-channel crosstalk	X_{TLK1}	fin = 1MHz, V_{IN} = 0.5Vp-p, between any two channels	–	–60	–	dB	II
Input multiplexer crosstalk	X_{TLK2}	fin = 1MHz, V_{IN} = 0.5Vp-p, between INnA and INnB	–	–72	–	dB	II
S/N ratio	SNR	Up to 30MHz	–	70	–	dB	II
Drive load resistance	R_L	1 load = 150Ω	–	–	2	load	I

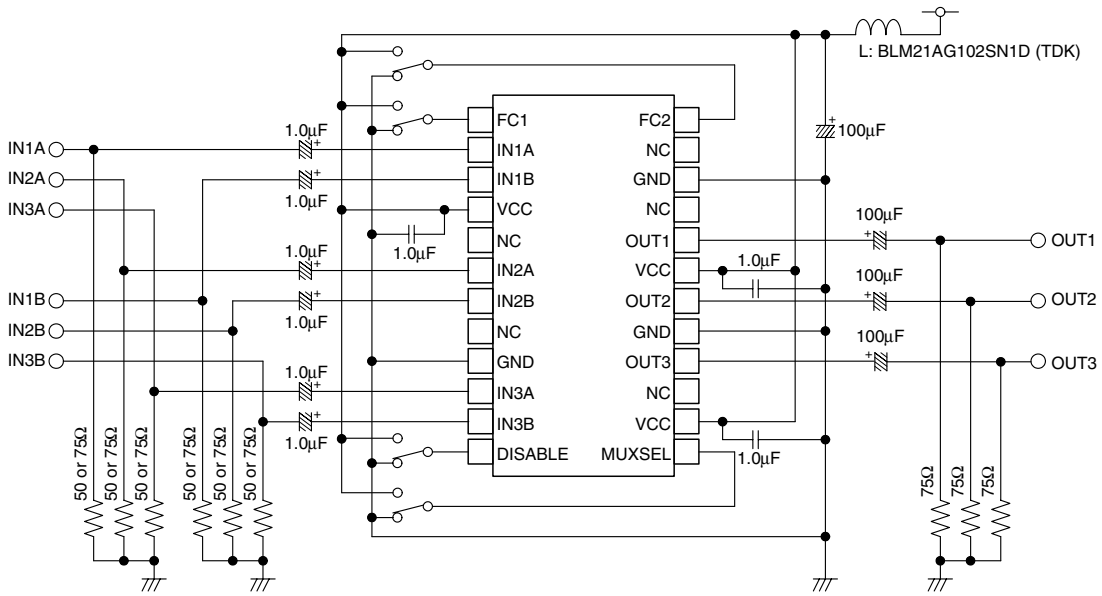
Test level

The definition of "Test Level" shown in the electrical characteristic table is as follows.

I : 100% of products tested at Ta = + 25°C.

II : Guaranteed as result of design and characteristics evaluation.

Evaluation circuit diagram



Note. This is the electrical characteristics evaluation circuit only, then it is not a recommended application circuit.

FUNCTIONAL DESCRIPTION

Filter Select and Filter-bypass Mode

The SM5307C 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	6.75MHz	6.75MHz
H	L	SD2 mode	13.5MHz	13.5MHz	13.5MHz
L	H	HD mode	30MHz	30MHz	30MHz
H	H	Filter-bypass mode	80MHz	80MHz	80MHz

Input Multiplexer

The SM5307C is mounted the two input multiplexer for each channels. The MUXSEL pin selects the input signals.

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

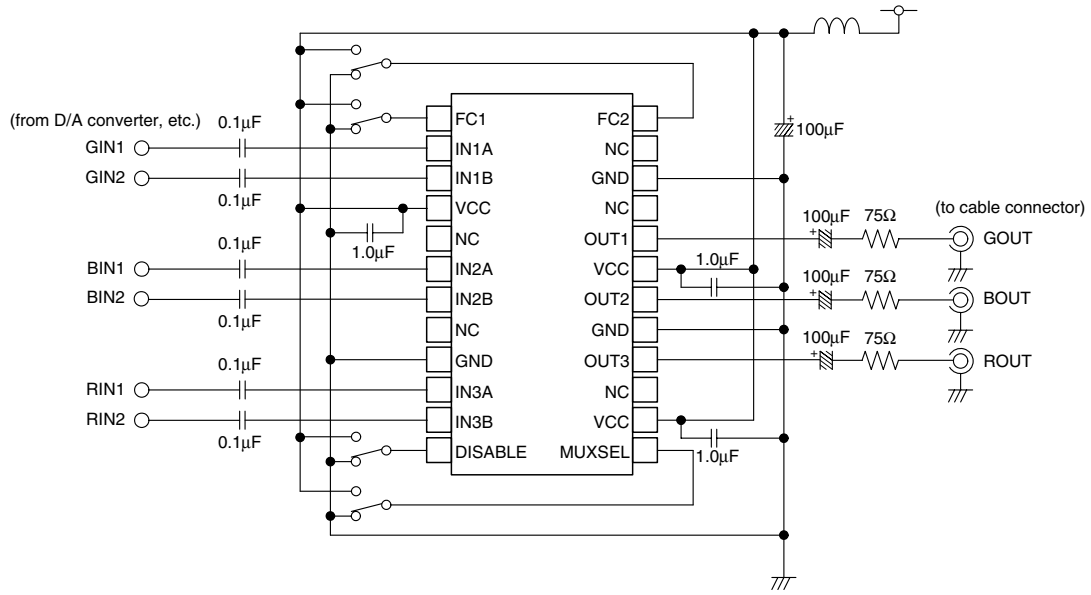
Disable Mode Function

The SM5307C has the disable mode function. When DISABLE pin set to “H”, The SM5307C operation becomes disable mode. In disable mode operation, current consumption becomes up to 2.5mA and video signal input and output pins are setting high-impedance.

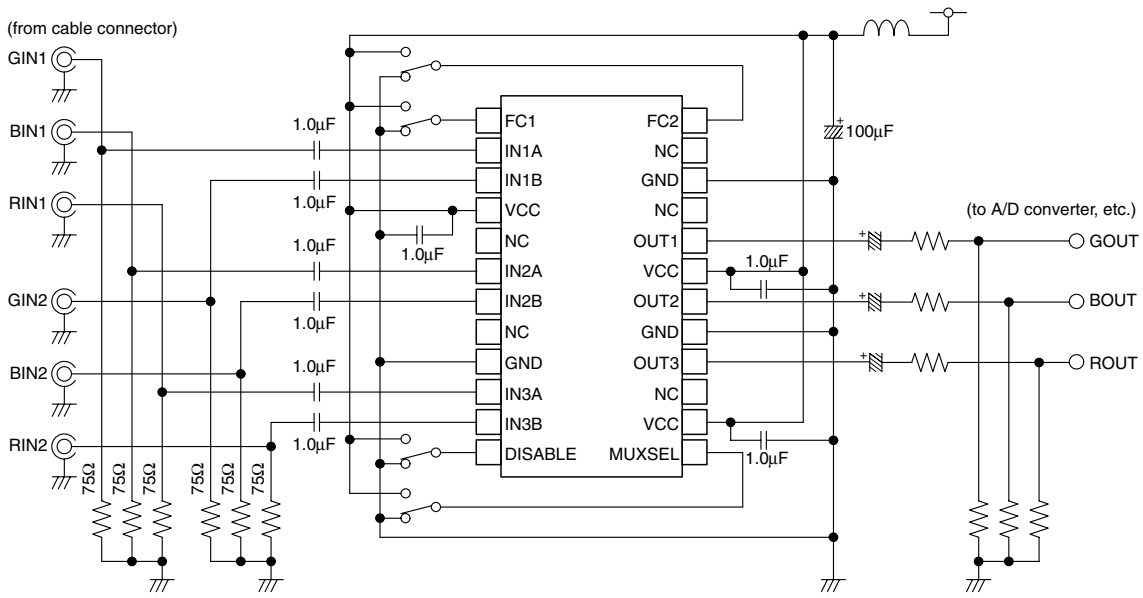
Control pin	SM5307C operation
DISABLE	
L	Normal operation
H	Disable mode

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, Ta = 25°C, V_{IN} = 1.0Vp-p, R_L = 75Ω, unless otherwise noted.

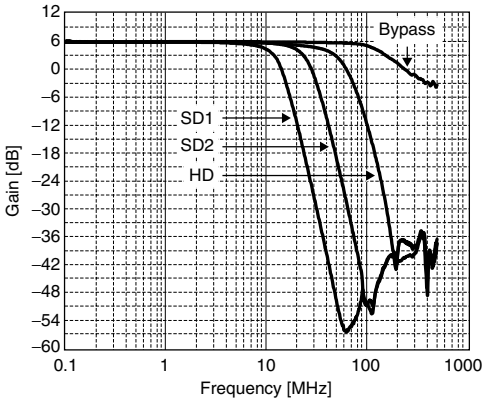


Figure 1. Gain vs. Frequency characteristics (CH-1)

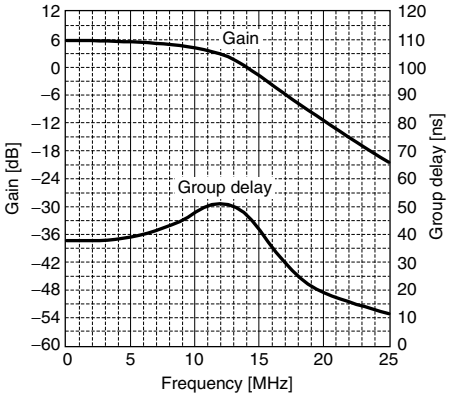


Figure 2. Gain and Group delay vs. Frequency characteristics (SD1 mode)

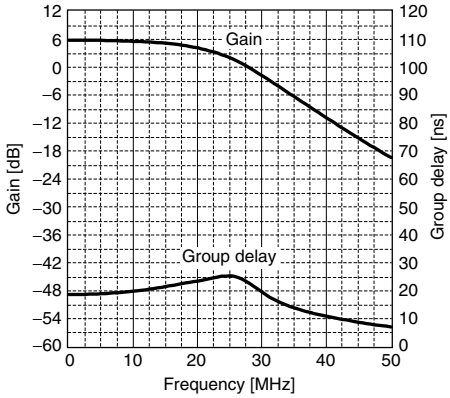


Figure 3. Gain and Group delay vs. Frequency characteristics (SD2 mode)

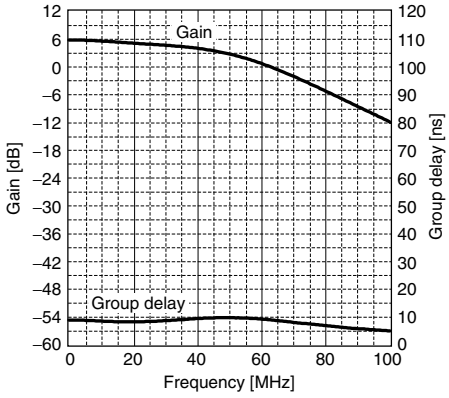


Figure 4. Gain and Group delay vs. Frequency characteristics (HD mode)

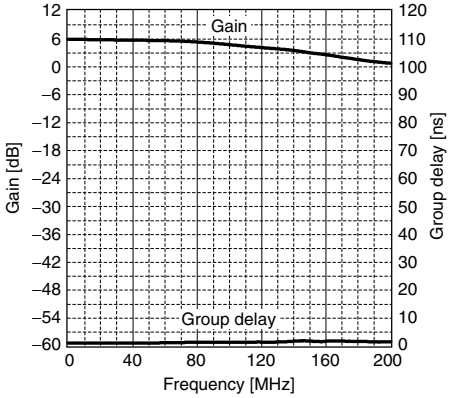


Figure 5. Gain and Group delay vs. Frequency characteristics (Filter-bypass mode)

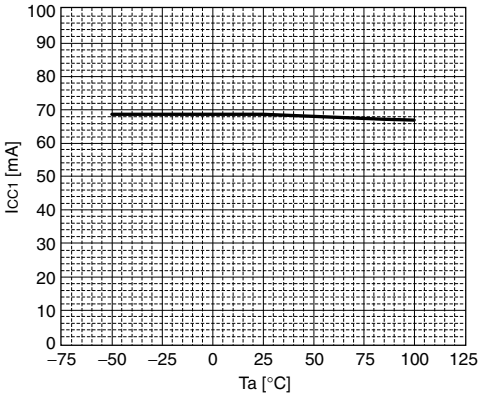


Figure 6. I_{CC1} vs. Ta
(no signal input)

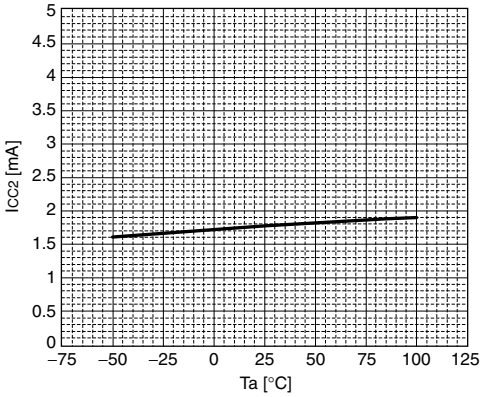


Figure 7. I_{CC2} vs. Ta
(no signal input)

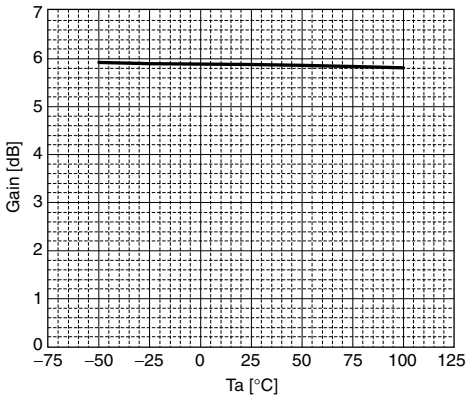


Figure 8. Gain vs. Ta
(fin = 100kHz)

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