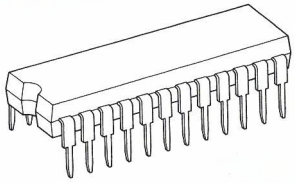
TOSHIBA Linear C-MOS Integrated Circuit Silicon Monolithic

TC90L01NG(TENTATIVE)

Audio/Video Switching IC for TVs

TC90L01NG



Weight
SDIP24-P-300-1.78 : 1.22 g (typ.)

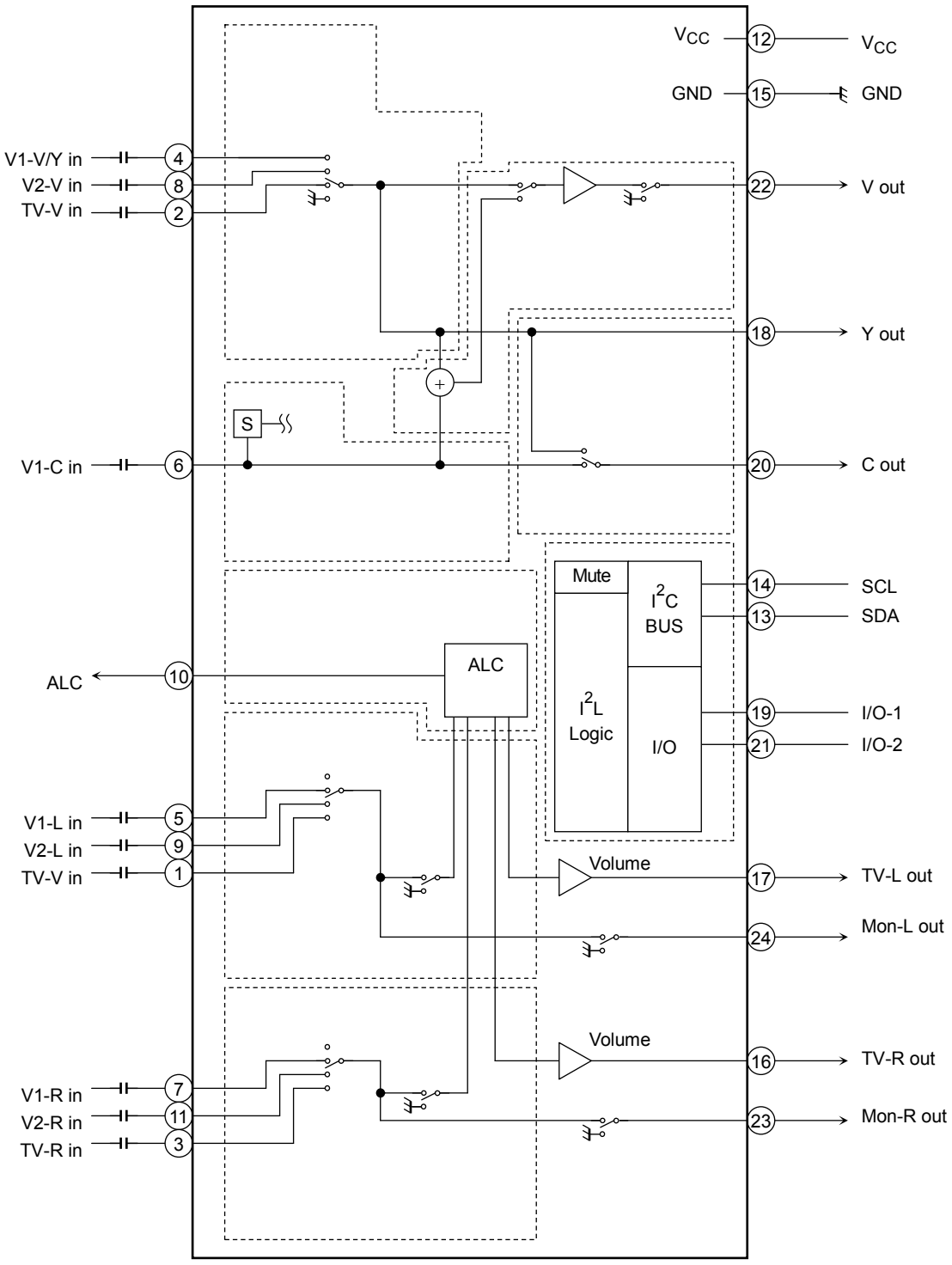
The TC90L01NG is an audio/video switching IC for TV sets.

Conforming to I^2C bus standards, it allows you to perform various switching operations through the bus lines by using a microcomputer. This IC has the functions of audio mute, ALC(Auto Level Control), audio volume and so on.

Features

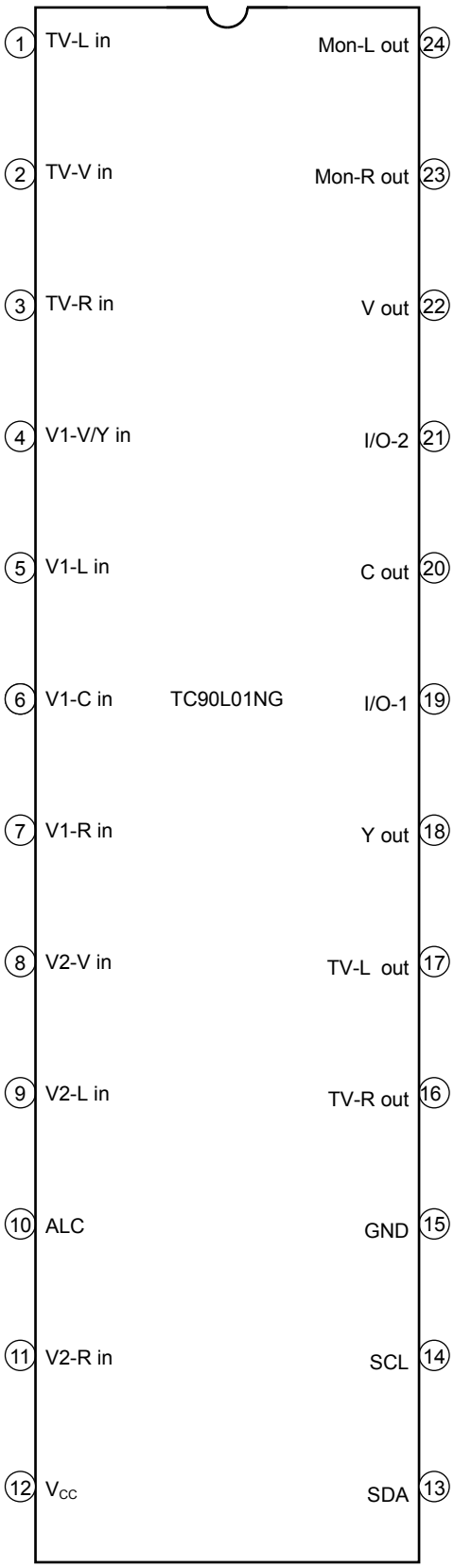
I^2C bus control
Video : 3-channel inputs and 1-channel outputs
(1 channels conforming to S system)
Audio : 3-channel inputs and 1-channel outputs
Monitor Audio out
ALC(Auto Level Control)
Audio volume by attenator circuit
Audio mute
2 I/O ports

Block Diagram

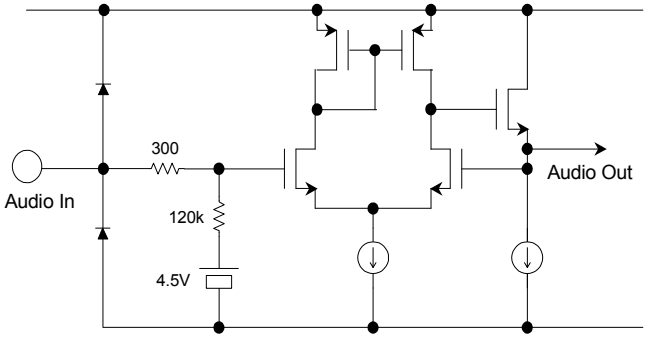
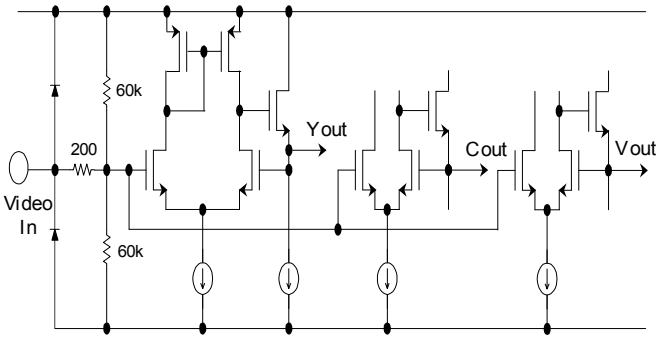
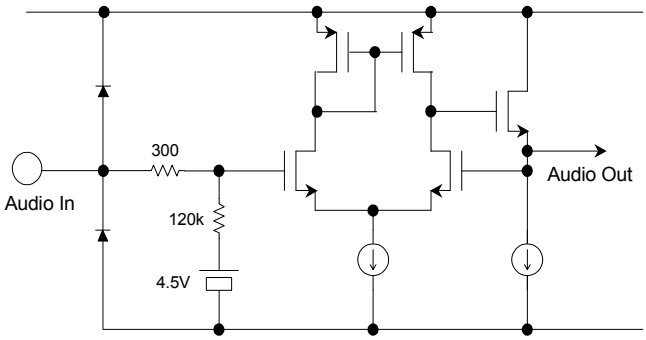
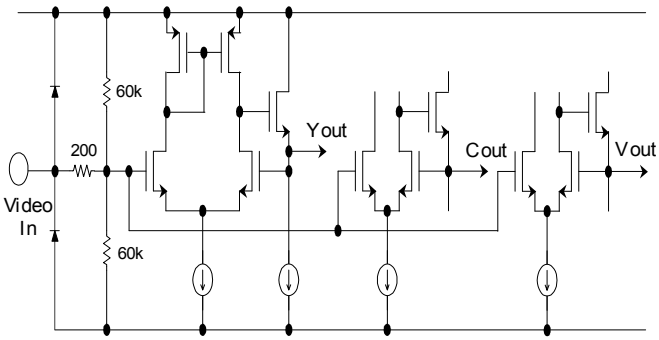


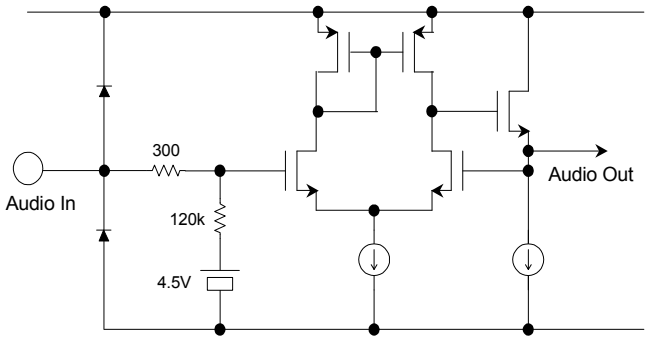
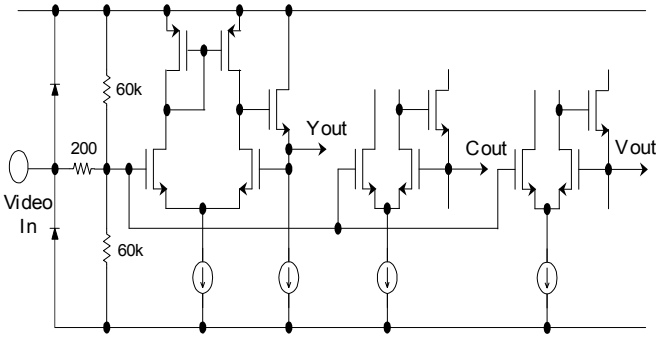
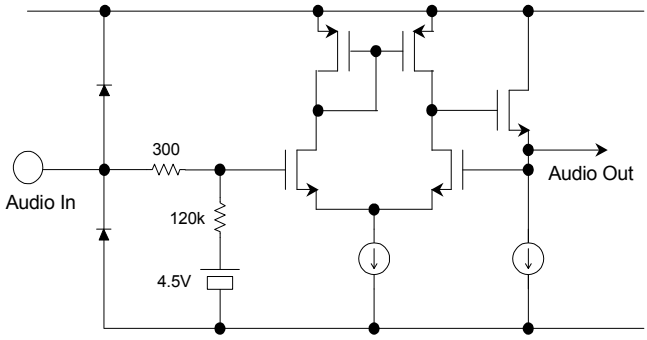
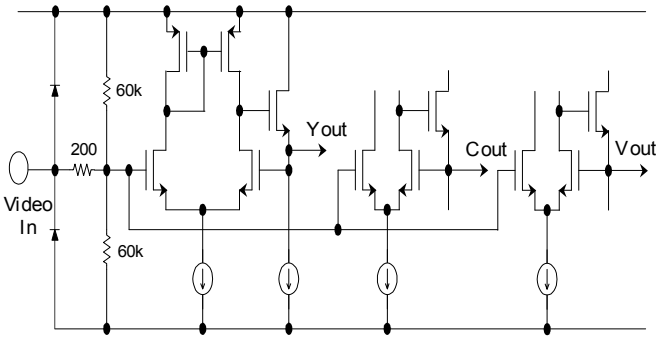
Pin Assignment

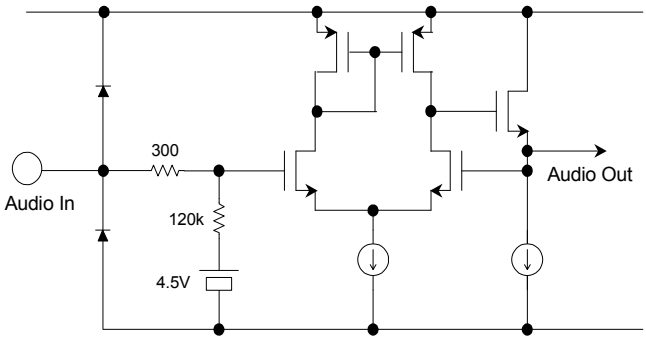
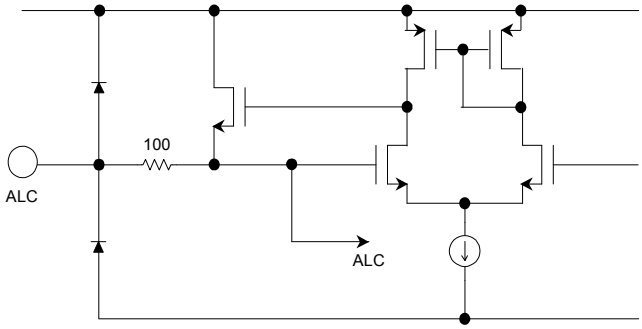
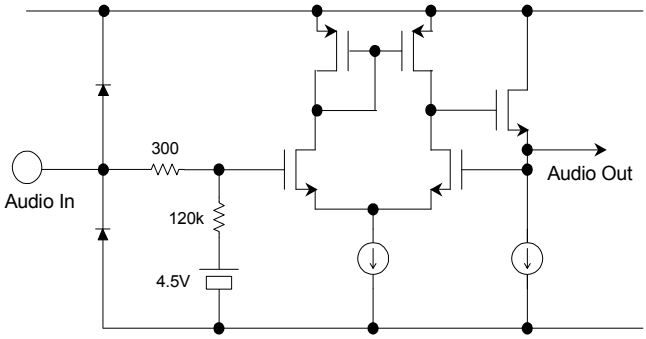
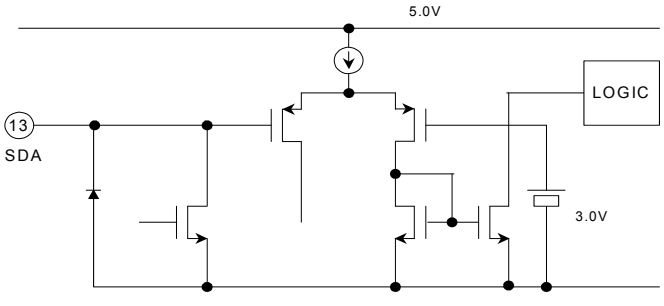
TC90L01NG

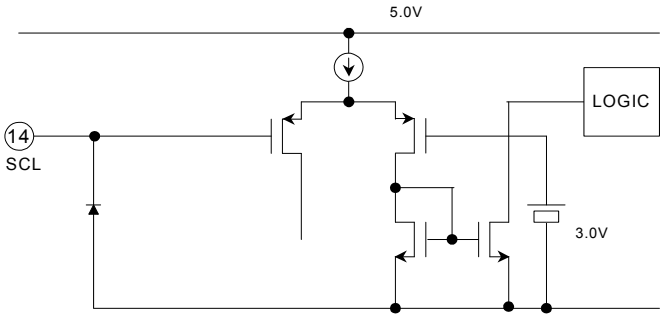
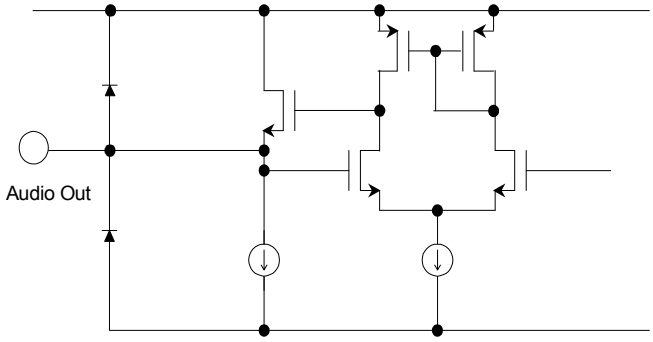
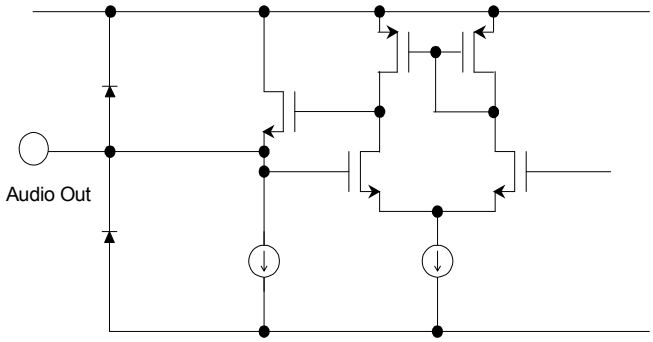
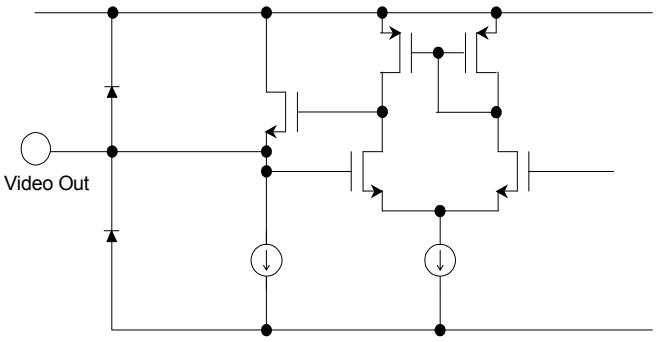


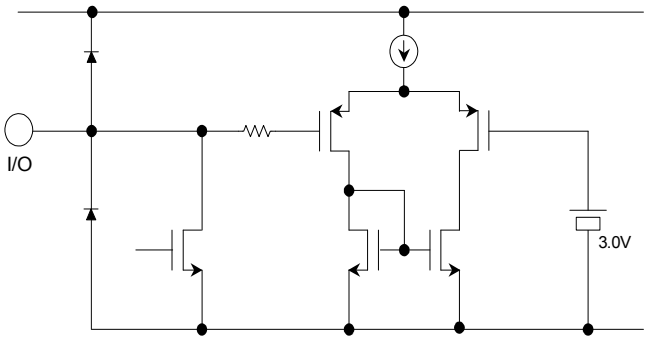
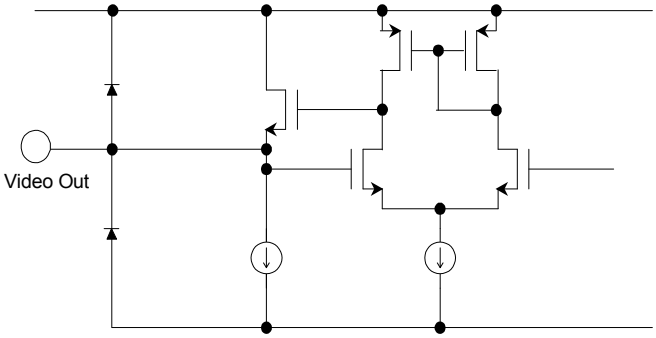
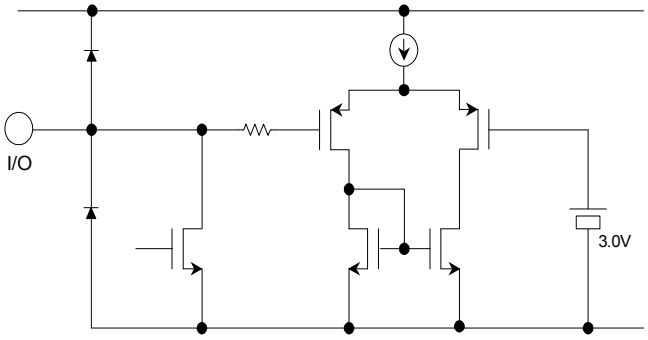
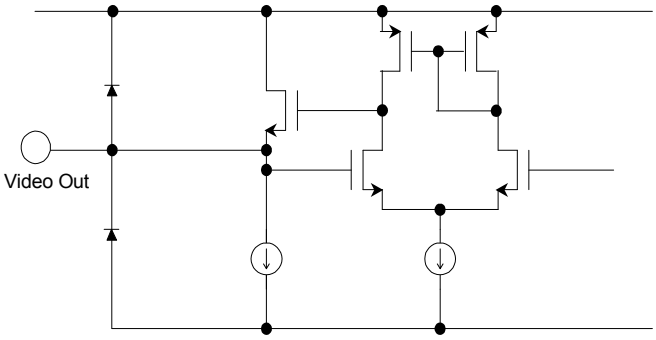
Pin Description

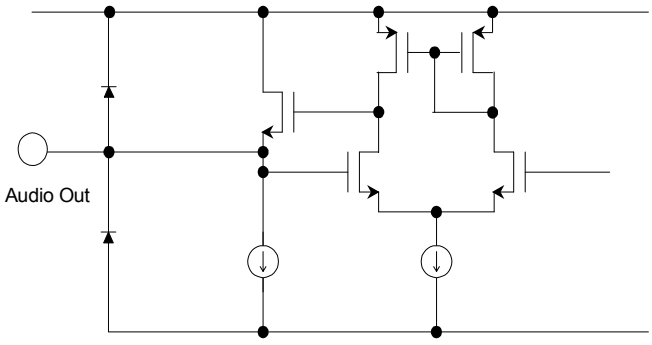
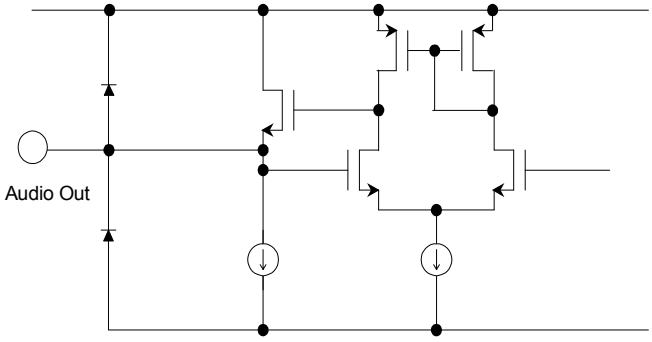
Pin No.	Name	Function	Interface
1	TV-L in	This pin is for input a left audio signal from the main demodulator in the TV set. The signal fed into this pin is presented to TV-L out, and Mon-L out. The input dynamic range of this pin is 5.0 V_{p-p} and the input resistance is 120 kΩ.	
2	TV-V in	This pin is for input a composite audio signal from the main demodulator in the TV set. The signal fed into this pin is presented to V out, Y out, and C out. The input dynamic range of this pin is 2.0 V_{p-p} and the input resistance is 30 kΩ.	
3	TV-R in	This pin is for input a right audio signal from the main demodulator in the TV set. The signal fed into this pin is presented to TV-R out, and Mon-R out. The input dynamic range of this pin is 5.0 V_{p-p} and the input resistance is 120 kΩ.	
4	V1-V/Y in	This pin is for input a luminance signal or composite video signal from an external source (V1 channel). The signal fed into this pin is presented to V out, Y out, and C out. The input dynamic range of this pin is 2.0 V_{p-p} and the input resistance is 30 kΩ.	

Pin No.	Name	Function	Interface
5	V1-L in	This pin is for input a left audio signal from an external source (V1 channel). The signal fed into this pin is presented to TV-L out, and Mon-L out. The input dynamic range of this pin is 5.0 V_{p-p} and the input resistance is 120kΩ.	
6	V1-C in	This pin is for input a chroma signal from an external source (S1 channel). The signal fed into this pin is presented to C out directly and to V out after being combined with the V1-Y in signal. The input dynamic range of this pin is 2.0 V_{p-p} and the input resistance is 30 kΩ.	
7	V1-R in	This pin is for input a right audio signal from an external source (V1 channel). The signal fed into this pin is presented to TV-R out, and Mon-R out. The input dynamic range of this pin is 5.0 V_{p-p} and the input resistance is 120 kΩ.	
8	V2-V in	This pin is for input a composite video signal from an external source (V2 channel). The signal fed into this pin is presented to V out, Y out, and C out. The input dynamic range of this pin is 2.0 V_{p-p} and the input resistance is 30 kΩ.	

Pin No.	Name	Function	Interface
9	V2-L in	This pin is for input a left audio signal from an external source (V2 channel). The signal fed into this pin is presented to TV-L out and Mon-L out. The input dynamic range of this pin is 5.0 V_{p-p} and the input resistance is 120Ω.	
10	ALC	This is an detect output pin of ALC[:Auto Level Control]. It controls ALC.	
11	V2-R in	This pin is for input a right audio signal from an external source (V2 channel). The signal fed into this pin is presented to TV-R out and Mon-R out. The input dynamic range of this pin is 5.0 V_{p-p} and the input resistance is 120 kΩ.	
12	V_{CC}	This is the power supply pin. Apply 9 V to this pin. The current consumption of this pin is 34 mA.	—
13	SDA	This is an I^2C bus data input/output pin. The input threshold level of this pin is 3.0 V. Make sure that the current flowing into this pin is 3.0 mA or less.	

Pin No.	Name	Function	Interface
14	SCL	This is an I^2C bus data input/output pin. The input threshold level of this pin is 3.0 V.	
15	GND	This is the GND pin.	—
16	TV-R out	This pin is for output right audio signal. The signal fed into TV-R in, V1-R in, or V2-R in is outputted from this pin. This outputted can be muted independently of TV-L out by bus control.	
17	TV-L out	This pin is for output left audio signal. The signal fed into TV-L in, V1-L in, or V2-L in is outputted from this pin. This output can be muted independently of TV-R out by bus control.	
18	Y out	This pin is for output a luminance signal. The signal fed into V1-V/Y in, V2-V in, or TV-V in is outputted from this pin.	

Pin No.	Name	Function	Interface
19	I/O－1	This is an ADC input/DAC output pin. The ADC is a 2-level detection type (1 bits). The threshold level is 3.0 V. The DAC (1 bit) is an open-drain output. Make sure that the current flowing into this pin is 2.0 mA or less.	
20	C out	This pin is for output a chroma signal. The signal fed into V1-C in, V1-V in, V2-V in , or TV-V in is outputted from this pin.	
21	I/O－2	This is an ADC input/DAC output pin. The ADC is a 2-level detection type (1 bits). The threshold level is 3.0 V. The DAC (1 bit) is an open-drain output. Make sure that the current flowing into this pin is 2.0 mA or less.	
22	V out	This pin is for output the main channel composite video signal. The signal fed into TV-V in, V1-V in, V2-V in, or V1-Y in ±V1-C in is outputted from this pin. This output can be muted by bus control.	

Pin No.	Name	Function	Interface
23	Mon-R out	This pin is for monitor-output right audio signal. The signals fed into the chip via V1-R in, V2-R in, or TV-R in is output from this pin. This output can be muted in combination with Mon-L out by bus control.	
24	Mon-L out	This pin is for monitor-output left audio signal. The signals fed into the chip via V1-L in, V2-L in, or TV-L in is output from this pin. This output can be muted in combination with Mon-R out by bus control.	

Bus Data Specifications

Contents of Data

Mode	Sub Add.	Data No. [Preset]	Contents of Data							
Write	00	Data 1 [00H]	B07	B06	B05	B04	B03	B02	B01	B00
			*	ALC Gain		Output switching				
						Select-D	Select-C	Select-B	Select-A	
	01	Data 2 [00H]	B17	B16	B15	B14	B13	B12	B11	B10
			Audio Mute	Audio attenator						
	02	Data 3 [03H]	B27	B26	B25	B24	B23	B22	B21	B20
			*	*	*	*	DAC output switching			
							*	*	I/O-2	I/O-1
Read	—	Data 4	B37	B36	B35	B34	B33	B32	B31	B30
			Power on Reset	*	*	ADC input discrimination				S input discrimination
						*	*	I/O-2	I/O-1	V1-C in

Note1: The data contents marked by a * are an unused bit (data free).

WRITE mode Slave Add.＝90H

Item	Bits	Descriptions	Preset
Select－A Sub; 00 h,D0～D1 （Note 2）	2	Select input function 00: ＴＶ 01: External 1 10: External 2 11: －（Inhibited）	00
Select－B Sub; 00 h,D2	1	ＣＶＢＳ or Ｓ-video switching 0: ＣＶＢＳ 1: Ｓ-video	0
Select－C Sub; 00 h,D3	1	Monitor-Video out 0: Normal 1: Mute	0
Select－D Sub; 00 h,D4	1	Monitor-Audio out 0: Normal 1: Mute	0
ＡＬＣ Level Sub; 00 h,D5～D6	2	Audio Level Control Gain 00: ＡＬＣ off 01: 1.1Vp-p 10: 1.6Vp-p 11: 2.3Vp-p	10
Audio Vol. Sub; 01h,D0～D6	7	Audio Volume 00: -∞ ～ 7F: 0dB	00
Audio mute on/off Sub; 01h,D7	1	Audio Mute 0: Normal 1: Mute	0
I/O-* High/Low Sub; 02h,D1,D2	1 × 2	DAC output switching 0: Low 1: High	1

Note 2：Select-A＝｛１１｝not use.

READ mode Slave Add.＝91H

Item	Bits	Description
POR	1	Power on Reset 0: Normal 1: Resister Preset
V1-C in	1	S input discrimination 0: GND 1: Open
I/O *	1 × 2	ADC input discrimination 0: Low 1: High

Video Select: Terminal 22 , 18 , 20 Output Signal

Audio Select: Terminal 17 , 16 , 24 , 23 Output Signal

Mode		Video Output Signal			Audio Output Signal		Bus Data		
							Input Select		
Input	S/V	V out	Y out	C out	TV-L out Mon-L out	TV-R out Mon-R out	B02	B01	B00
							B	A	
TV	CVBS	TV-V in	TV-V in	TV-V in	TV-L in	TV-R in	0	0	0
V1	CVBS	V1-V in	V1-V in	V1-V in	V1-L in	V1-R in	0	0	1
	S	V1-Y in + V1-C in	V1-Y in	V1-C in	V1-L in	V1-R in	1	0	1
V2	CVBS	V2-V in	V2-V in	V2-V in	V2-L in	V2-R in	0	1	0
V3	-	—	—	—	—	—	0	1	1

DAC Output Switching

Mode		Bus Data			
		DAC Output Switching			
Output	State	B23	B22	B21	B20
I/O-1	Low	*	*	*	0
	Open				1
I/O-2	Low	*	*	0	*
	Open			1	

Read Mode

Power-On Reset Discrimination

Mode		Bus Data
		Power-On Reset
		B37
Reset	On (Preset)	1
	off (Normal)	0

S Input Discrimination

Mode		Bus Data
		S Input Discrimination
Input	Voltage	B30
V1-C in	High (open)	1
	Low	0

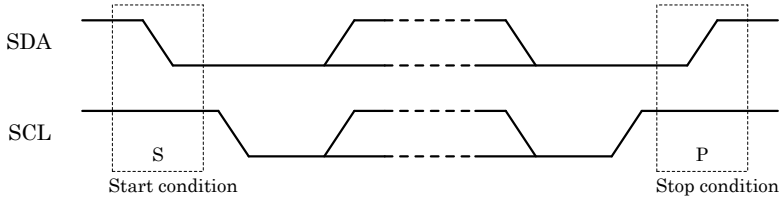
ADC Input Discrimination

Mode		Bus Data			
		ADC Input Discrimination			
Input	Voltage	B34	B33	B32	B31
I/O-1	High	*	*	*	1
	Low				0
I/O-2	High	*	*	1	*
	Low			0	

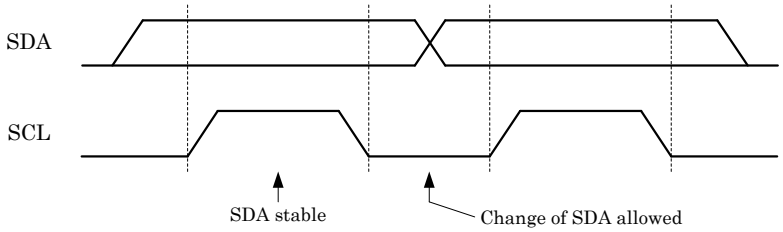
Outline of I^2C Bus Control Format

DATA TRANSFER FORMAT VIA I²C BUS

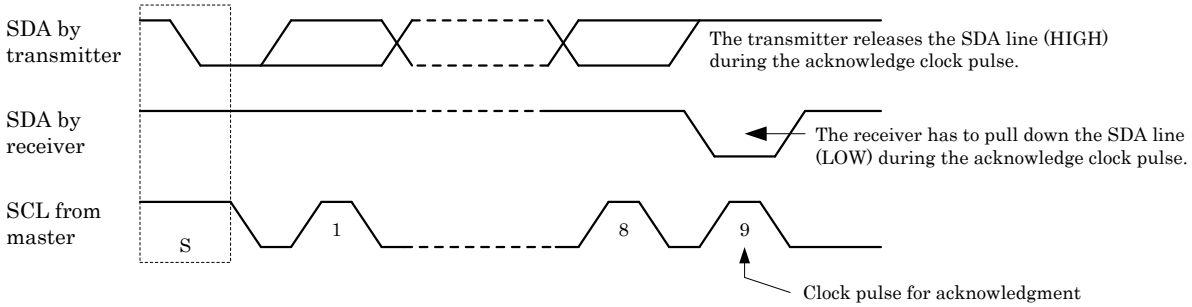
Start and stop condition



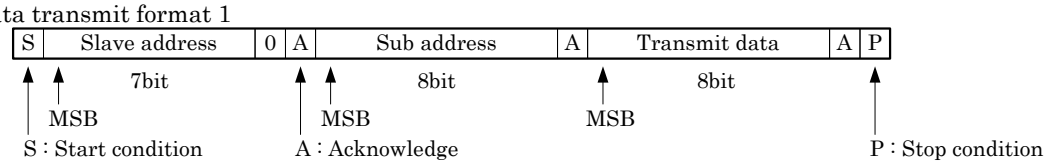
Bit transfer



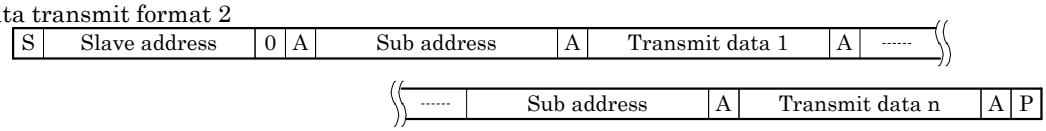
Acknowledge



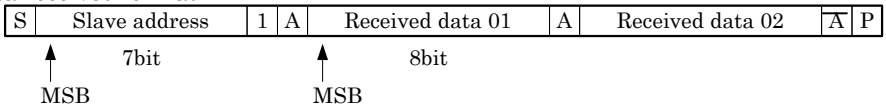
Data transmit format 1



Data transmit format 2

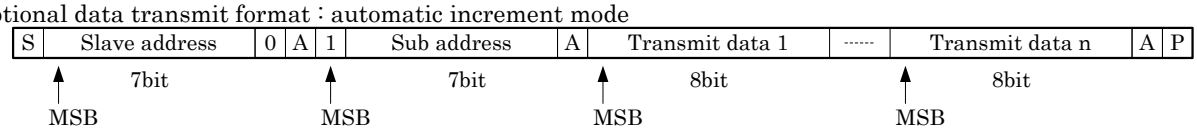


Data received format



At the moment of the first acknowledge, the master transmitter becomes a master receiver and the slave receiver becomes a slave transmitter. This acknowledge is still generated by the slave.
The Stop condition is generated by the master.

Optional data transmit format : automatic increment mode



In this transmission methods, data is set on automatically incremented sub-address from the specified sub-address.

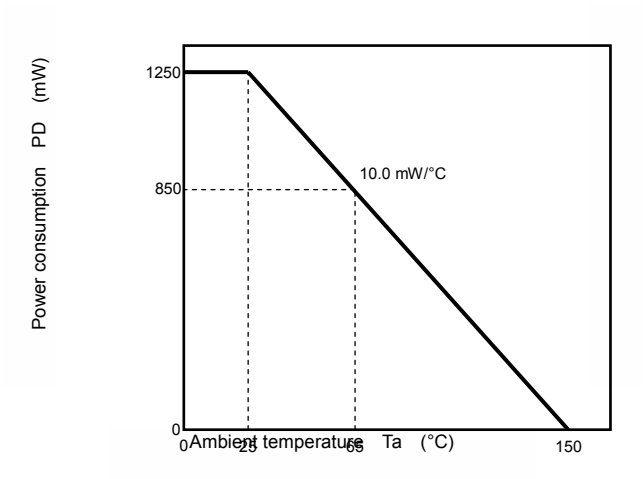
I^2C BUS Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Low level input voltage	V_{IL}	0	–	1.5	V
High level input voltage	V_{IH}	3.0	–	Vcc	V
Low level output voltage at 3 mA sink current	V_{OL1}	0	–	0.8	V
Input current each I/O pin with an input voltage between 0.1 VDD and 0.9 VDD	I_i	-10	–	10	μA
Capacitance for each I/O pin	C_i	–	–	10	pF
SCL clock frequency	f_{SCL}	0	–	100	kHz
Hold time START condition	$t_{HD;STA}$	4.0	–	–	μs
Low period of SCL clock	t_{LOW}	4.7	–	–	μs
High period of SCL clock	t_{HIGH}	4.0	–	–	μs
Set-up time for a repeated START condition	$t_{SU;STA}$	4.7	–	–	μs
Data hold time	$t_{HD;DAT}$	10	–	–	ns
Data set-up time	$t_{SU;DAT}$	250	–	–	ns
Set-up time for STOP condition	$t_{SU;STO}$	4.0	–	–	μs
Bus free time between a STOP and START condition	t_{BUF}	4.7	–	–	μs

Absolute Maximum Ratings

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	11	V
Input Pin Voltage	Vin	GND - 0.3 to Vcc + 0.3	V
Power dissipation	P_{DMAX} (Note3)	1250	mW
Operating temperature	T_{opr}	−20～65	°C
Storage temperature	T_{stg}	−55～150	°C

Note3: When using the device at temperatures above Ta = 25°C, reduce the rated power dissipation by 10.0 mW at TC90L01NG per degree of centigrade. (See the diagram below.)



Operating Conditions

Characteristics	Test Condition	Min	Typ.	Max	Unit	Remark
Supply voltage	12	8.1	9.0	9.9	V	—
Composite signal input amplitude	2, 4, 8	—	1.0	—	V_{p-p}	100IRE
Y input amplitude	4, 8	—	1.0	—	V_{p-p}	100IRE
Chroma input amplitude	6	—	286	—	mV_{p-p}	Burst
Audio input amplitude	1, 3, 5, 7, 9, 11	—	—	3.0	V_{p-p}	—

Electrical Characteristics
(referenced to V_{CC} = 9 V at Ta = 25°C unless otherwise specified)

Current Consumption

Pin No.	Pin Name	Symbol	Test Circuit	Min	Typ.	Max	Unit
12	V_{CC}	I_{CC}	—	20	34	48	mA

Pin Voltage

Pin No.	Pin Name	Symbol	Test Circuit	Min	Typ.	Max	Unit
1	TV-L in	V1	—	4.3	4.5	4.7	V
2	TV-V in	V2	—	4.1	4.3	4.5	V
3	TV-R in	V3	—	4.3	4.5	4.7	V
4	V2-V/Y in	V4	—	4.1	4.3	4.5	V
5	V1-L in	V5	—	4.3	4.5	4.7	V
6	V1-C in	V6	—	4.1	4.3	4.5	V
7	V1-R in	V7	—	4.3	4.5	4.7	V
8	V2-V in	V8	—	4.1	4.3	4.5	V
9	V2-L in	V9	—	4.3	4.5	4.7	V
10	ALC	V10	—	—	5.0	—	V
11	V2-R in	V11	—	4.3	4.5	4.7	V
12	V_{CC}	V12	—	—	9.0	—	V
15	GND	V15	—	—	0	—	V
16	TV-R out	V16	—	4.0	4.5	5.0	V
17	TV-L out	V17	—	4.0	4.5	5.0	V
18	Y out	V18	—	4.0	4.3	4.6	V
19	I/O-1	V19	—	—	—	—	V
20	C out	V20	—	4.0	4.3	4.6	V
21	I/O-2	V21	—	—	—	—	V
22	V out	V22	—	4.0	4.3	4.6	V
23	Mon-R out	V23	—	4.2	4.5	4.8	V
24	Mon-L out	V24	—	4.2	4.5	4.8	V

DC Characteristics

Characteristics	Measured Pin	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Remark
Input pin Input resistance	TV-V in	R2	—	20	30	40	kΩ	Measure a change ΔI in the current flowing into each pin when the voltage is raised by 0.5V. Then calculate the input resistance value R. R = 0.5 V/ΔI [Ω]
	V1-V/Y in	R4	—	20	30	40	kΩ	
	V2-V in	R8	—	20	30	40	kΩ	
	V1-C in	R6	—	20	30	40	kΩ	
	TV-L in	R1	—	80	120	160	kΩ	
	TV-R in	R3	—	80	120	160	kΩ	
	V1-L in	R5	—	80	120	160	kΩ	
	V1-R in	R7	—	80	120	160	kΩ	
	V2-L in	R9	—	80	120	160	kΩ	
	V2-R in	R11	—	80	120	160	kΩ	
Output pin Output resistance	V out	R22	—	30	50	80	Ω	Measure a voltage change ΔV on each pin when a current of 100 μA flows into the pin. Then calculate the output resistance value R. R = ΔV/100 μA [Ω]
	Y out	R18	—	30	50	80	Ω	
	C out	R20	—	30	50	80	Ω	
	TV-L out	R17	—	30	50	80	Ω	
	TV-R out	R16	—	30	50	80	Ω	
	Mon-L out	R24	—	30	50	80	Ω	
	Mon-R out	R23	—	30	50	80	Ω	
S mode discrimination voltage	V1-C in	VthC1	—	2.0	2.5	3.0	V	Voltage on pin 6 at which data B30 changes.
ADC input discrimination voltage	I/O 1	VthI1	—	2.5	3.0	3.5	V	High-Low threshold level of I/O-1 input (pin 19).
	I/O 2	VthI2	—	2.5	3.0	3.5	V	High-Low threshold level of I/O-2 input (pin 21).

AC Characteristics

Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
V out Input dynamic range	TV-V in	VDR2V1	—	1.5	—	—	V_{p-p}	(1) Apply a 15 kHz sine wave to each input pin. (2) In each select mode, measure an input amplitude at which the output waveform on pin 22 begins to be distorted.
	V1-V/Y in	VDR4V1	—	1.5	—.	—	V_{p-p}	
	V2-V in	VDR8V1	—	1.5	—	—	V_{p-p}	
	V2-C in	VDR6V1	—	1.5	—	—	V_{p-p}	
V out Gain	TV-V in	G2V1	—	5.5	6.0	6.5	dB	(1) Apply a 15 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, find the gain between input and output.
	V1-V/Y in	G4V1	—	5.5	6.0	6.5	dB	
	V2-V in	G8V1	—	5.5	6.0	6.5	dB	
	V2-C in	G6V1	—	5.5	6.0	6.5	dB	
V out Frequency response	TV-V in	F2V1	—	15	—	—	MHz	(1) Apply a 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, measure a frequency at which the output amplitude on pin 22 is 3dB down from the 15 kHz applied level.
	V1-V/Y in	F4V1	—	15	—	—	MHz	
	V2-V in	F8V1	—	15	—	—	MHz	
	V2-C in	F6V1	—	15	—	—	MHz	
V out Crosstalk	TV-V in	CT2V1	—	60	70	—	dB	(1) Apply a 3.58 MHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare signal output from the selected pin with leakage components from nonselected pins to find a crosstalk.
	V1-V/Y in	CT4V1	—	60	70	—	dB	
	V2-V in	CT8V1	—	60	70	—	dB	
	V2-C in	CT6V1	—	60	70	—	dB	

Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
Y out Input dynamic range	TV-V in	VDR2Y	—	3.0	4.0	—	V_{p-p}	(1) Apply a 15 kHz sine wave to each input pin. (2) In each select mode, measure an input amplitude at which the output waveform on pin 18 begins to be distorted.
	V1-V/Y in	VDR4Y	—	3.0	4.0	—	V_{p-p}	
	V2-V in	VDR8Y	—	3.0	4.0	—	V_{p-p}	
Y out Gain	TV-V in	G2Y	—	-0.5	0	0.5	dB	(1) Apply a 15 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, find the gain between input and output.
	V1-V/Y in	G4Y	—	-0.5	0	0.5	dB	
	V2-V in	G8Y	—	-0.5	0	0.5	dB	
Y out Frequency response	TV-V in	F2Y	—	15	—	—	MHz	(1) Apply a 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, measure a frequency at which the output amplitude on pin 18 is 3dB down from the 15 kHz applied level.
	V1-V/Y in	F4Y	—	15	—	—	MHz	
	V2-V in	F8Y	—	15	—	—	MHz	
Y out Crosstalk	TV-V in	CT2Y	—	60	70	—	dB	(1) Apply a 3.58 MHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare signal output from the selected pin with leakage components from nonselected pins to find a crosstalk.
	V1-V/Y in	CT4Y	—	60	70	—	dB	
	V2-V in	CT8Y	—	60	70	—	dB	

Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
C out Input dynamic range	TV-V in	VDR2C	—	1.5	2.0	—	V_{p-p}	(1) Apply a 3.58MHz sine wave to each input pin. (2) In each select mode, measure an input amplitude at which the output waveform on pin 20 begins to be distorted.
	V1-V/Y in	VDR4C	—	1.5	2.0	—	V_{p-p}	
	V2-V in	VDR8C	—	1.5	2.0	—	V_{p-p}	
	V2-C in	VDR6C	—	1.5	2.0	—	V_{p-p}	
C out Gain	TV-V in	G2C	—	-0.5	0	0.5	dB	(1) Apply a 15 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, find the gain between input and output.
	V1-V/Y in	G4C	—	-0.5	0	0.5	dB	
	V2-V in	G8C	—	-0.5	0	0.5	dB	
	V2-C in	G6C	—	-0.5	0	0.5	dB	
C out Frequency response	TV-V in	F2C	—	15	—	—	MHz	(1) Apply a 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, measure a frequency at which the output amplitude on pin 20 is 3dB down from the 15 kHz applied level.
	V1-V/Y in	F4C	—	15	—	—	MHz	
	V2-V in	F8C	—	15	—	—	MHz	
	V2-C in	F6C	—	15	—	—	MHz	
C out Crosstalk	TV-V in	CT2C	—	60	70	—	dB	(1) Apply a 3.58 MHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare signal output from the selected pin with leakage components from nonselected pins to find a crosstalk.
	V1-V/Y in	CT4C	—	60	70	—	dB	
	V2-V in	CT8C	—	60	70	—	dB	
	V2-C in	CT6C	—	50	55	—	dB	

Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
TV-L out Input dynamic range	TV-L in	VDR1L1	—	3.0	5.0	—	V_{p-p}	(1) Apply a 1 kHz sine wave to each input pin. (2) In each select mode, measure an input amplitude at which the output waveform on pin 17 begins to be distorted.
	V1-L in	VDR5L1	—	3.0	5.0	—	V_{p-p}	
	V2-L in	VDR9L1	—	3.0	5.0	—	V_{p-p}	
TV-L out Gain	TV-L in	G1L1	—	4.0	6.0	8.0	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, find the gain between input and output. (3) ALC:Off
	V1-L in	G5L1	—	4.0	6.0	8.0	dB	
	V2-L in	G9L1	—	4.0	6.0	8.0	dB	
TV-L out Output level	TV-L in	VOL1L1	—	1.1	1.6	2.1	V_{p-p}	(1) Apply a 1 kHz, 2.0 V_{p-p} sine wave to each input pin. Vol:7F (2) In each select mode, measure an output amplitude at pin 17. (3) ALC:"1.6Vp-p"
	V1-L in	VOL5L1	—	1.1	1.6	2.1	V_{p-p}	
	V2-L in	VOL9L1	—	1.1	1.6	2.1	V_{p-p}	
TV-L out ALC level Min. ALC level Max.	*	GANL1	—	-4.0	-3.0	-2.0	dB	(1) Set ALC level "1.1Vpp" and measure output level changes. Vol:7F (2) Set ALC level "2.3Vpp" and measure output level changes. Vol:7F
	*	GAXL1	—	2.0	3.0	4.0	dB	
TV-L out Frequency response	TV-L in	F1L1	—	0.1	—	—	MHz	(1) Apply a 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, measure a frequency at which the output amplitude on pin 17 is 3dB down from the 1 kHz applied level.
	V1-L in	F5L1	—	0.1	—	—	MHz	
	V2-L in	F9L1	—	0.1	—	—	MHz	
TV-L out	TV-L in	CT1L1	—	70	80	—	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select

Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
Crosstalk	V1-L in	CT5L1	—	70	80	—	dB	mode, compare signal output from the selected pin with leakage components from nonselected pins to find a crosstalk.
	V2-L in	CT9L1	—	70	80	—	dB	
TV-L out Mute attenuation	TV-L in	M1L1	—	70	90	—	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare the output amplitudes on pin 17 when mute is turned on and turned off to find mute attenuation.
	V1-L in	M5L1	—	70	90	—	dB	
	V2-L in	M9L1	—	70	90	—	dB	

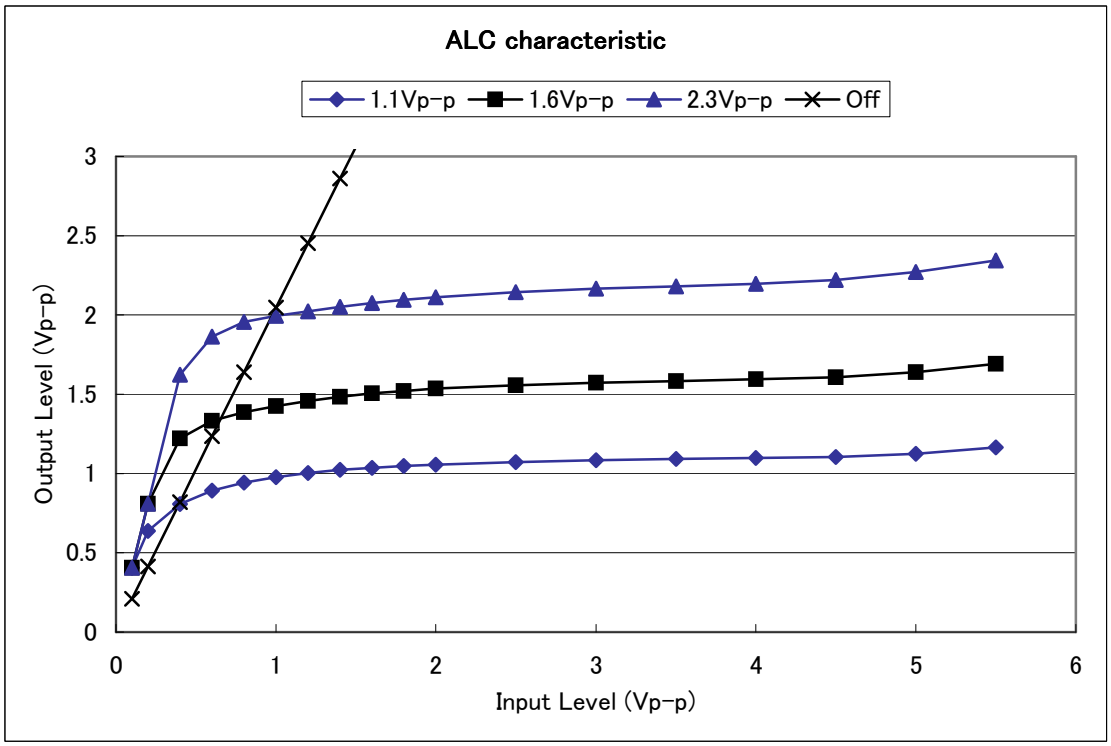
Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
TV-R out Input dynamic range	TV-R in	VDR3R1	—	3.0	5.0	—	V_{p-p}	(1) Apply a 1 kHz sine wave to each input pin. (2) In each select mode, measure an input amplitude at which the output waveform on pin 16 begins to be distorted.
	V1-R in	VDR7R1	—	3.0	5.0	—	V_{p-p}	
	V2-R in	VDR11R1	—	3.0	5.0	—	V_{p-p}	
TV-R out Gain	TV-R in	G3R1	—	4.0	6.0	8.0	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, find the gain between input and output. (3) ALC:Off
	V1-R in	G7R1	—	4.0	6.0	8.0	dB	
	V2-R in	G11R1	—	4.0	6.0	8.0	dB	
TV-R out Output level	TV-R in	VOL3R1	—	1.1	1.6	2.1	V_{p-p}	(1) Apply a 1 kHz, 2.0 V_{p-p} sine wave to each input pin. Vol:7F (2) In each select mode, measure an output amplitude at pin 16. (3) ALC:"1.6Vp-p"
	V1-R in	VOL7R1	—	1.1	1.6	2.1	V_{p-p}	
	V2-R in	VOL11R1	—	1.1	1.6	2.1	V_{p-p}	
TV-R out ALC level Min. ALC level Max.	*	GANR1	—	-4.0	-3.0	-2.0	dB	(1) Set ALC level "1.1Vpp" and measure output level changes. Vol:7F (2) Set ALC level "2.3Vpp" and measure output level changes. Vol:7F
	*	GAXR1	—	2.0	3.0	4.0	dB	
TV-R out Frequency response	TV-R in	F3R1	—	0.1	—	—	MHz	(1) Apply a 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, measure a frequency at which the output amplitude on pin 16 is 3dB down from the 1 kHz applied level.
	V1-R in	F7R1	—	0.1	—	—	MHz	
	V2-R in	F11R1	—	0.1	—	—	MHz	
TV-R out Crosstalk	TV-R in	CT3R1	—	70	80	—	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select

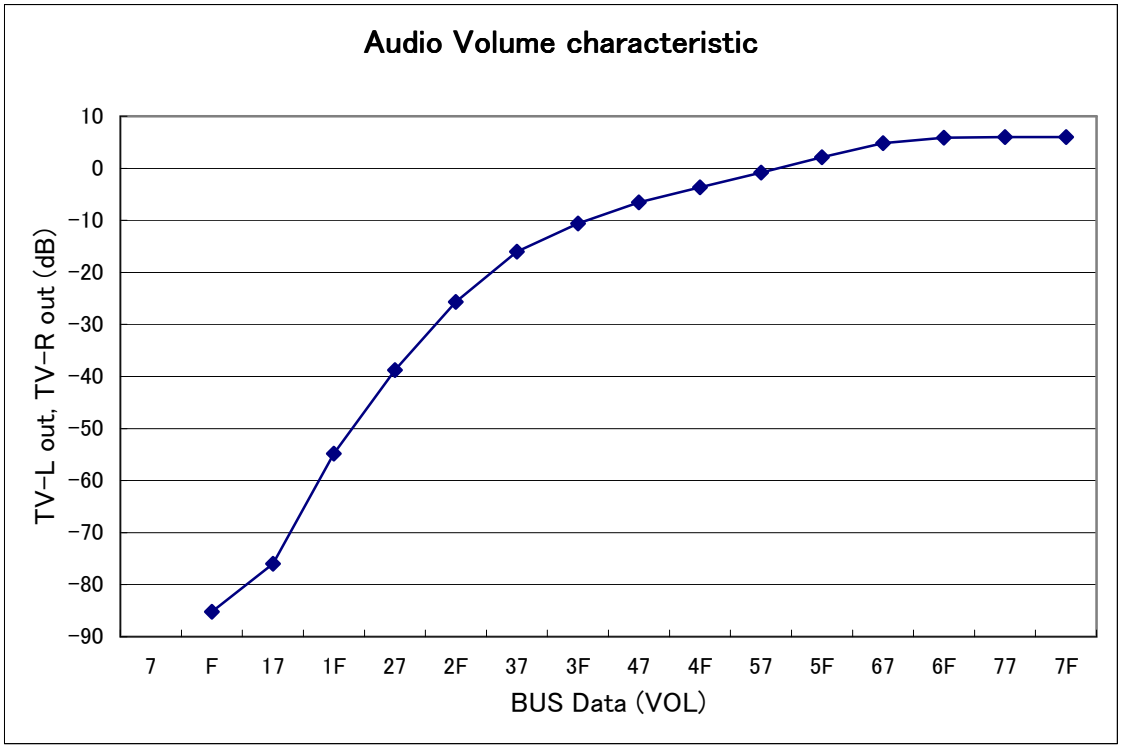
Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
	V1-R in	CT7R1	—	70	80	—	dB	mode, compare signal output from the selected pin with leakage components from nonselected pins to find a crosstalk.
	V2-R in	CT11R1	—	70	80	—	dB	
TV-R out Mute attenuation	TV-R in	M3R1	—	70	90	—	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare the output amplitudes on pin 16 when mute is turned on and turned off to find mute attenuation.
	V1-R in	M7R1	—	70	90	—	dB	
	V2-R in	M11R1	—	70	90	—	dB	

Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
Mon-L out Input dynamic range	TV-L in	VDR1L2	—	3.5	5.0	—	V_{p-p}	(1) Apply a 1 kHz sine wave to each input pin. (2) In each select mode, measure an input amplitude at which the output waveform on pin 24 begins to be distorted.
	V1-L in	VDR5L2	—	3.5	5.0	—	V_{p-p}	
	V2-L in	VDR9L2	—	3.5	5.0	—	V_{p-p}	
Mon-L out Gain	TV-L in	G1L2	—	-0.5	0	0.5	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, find the gain between input and output.
	V1-L in	G5L2	—	-0.5	0	0.5	dB	
	V2-L in	G9L2	—	-0.5	0	0.5	dB	
Mon-L out Frequency response	TV-L in	F1L2	—	0.1	—	—	MHz	(1) Apply a 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, measure a frequency at which the output amplitude on pin 24 is 3dB down from the 1 kHz applied level.
	V1-L in	F5L2	—	0.1	—	—	MHz	
	V2-L in	F9L2	—	0.1	—	—	MHz	
Mon-L out Crosstalk	TV-L in	CT1L2	—	70	90	—	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare signal output from the selected pin with leakage components from nonselected pins to find a crosstalk.
	V1-L in	CT5L2	—	70	90	—	dB	
	V2-L in	CT9L2	—	70	90	—	dB	
Mon-L out Mute attenuation	TV-L in	M1L2	—	70	80	—	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare the output amplitudes on pin 24 when mute is turned on and turned off to find mute attenuation.
	V1-L in	M5L2	—	70	80	—	dB	
	V2-L in	M9L2	—	70	80	—	dB	

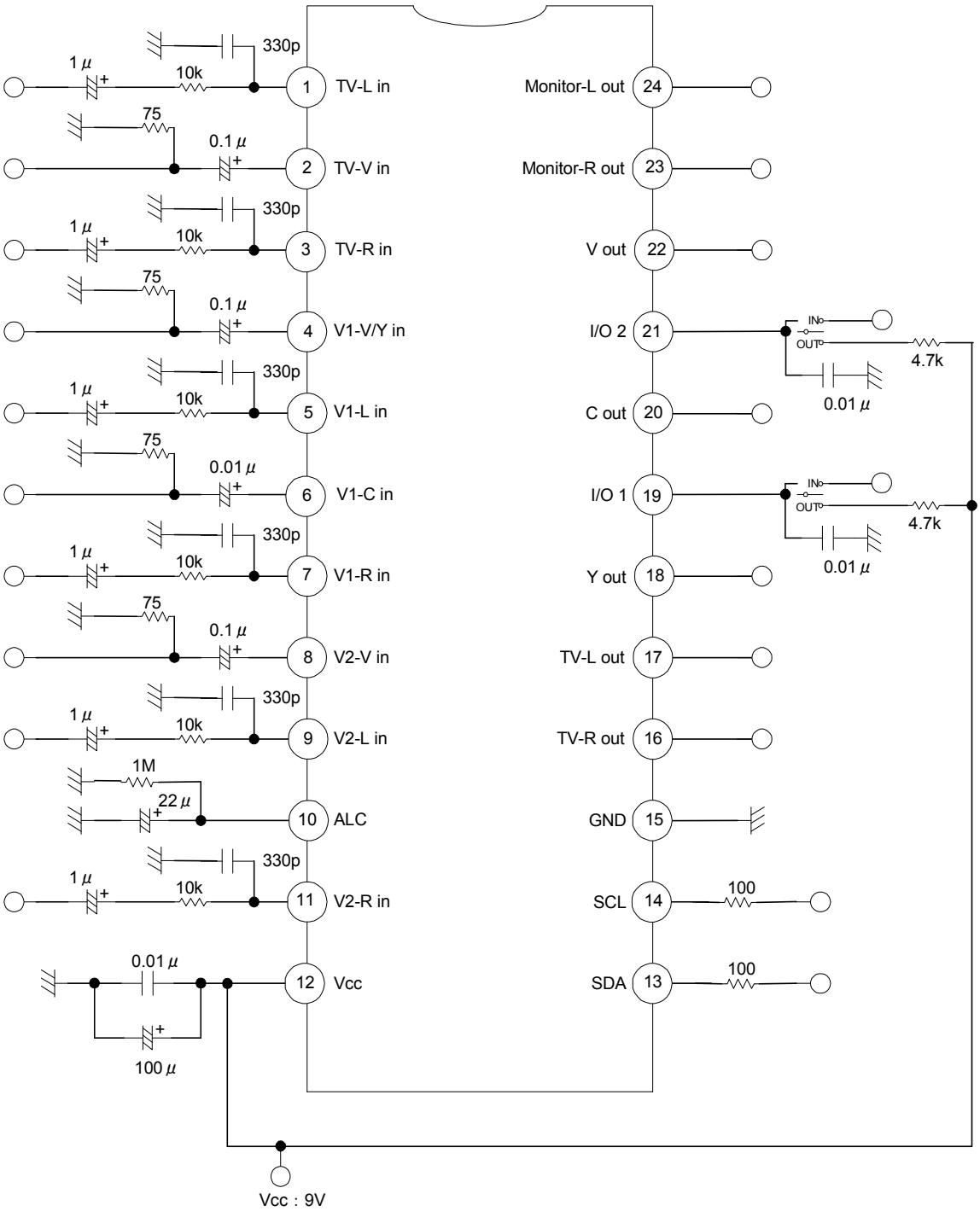
Characteristics	Select Mode	Symbol	Test Circuit	Min.	Typ.	Max.	Unit	Test Method
Mon-R out Input dynamic range	TV-R in	VDR3R2	—	3.5	5.0	—	V_{p-p}	(1) Apply a 1 kHz sine wave to each input pin. (2) In each select mode, measure an input amplitude at which the output waveform on pin 23 begins to be distorted.
	V1-R in	VDR7R2	—	3.5	5.0	—	V_{p-p}	
	V2-R in	VDR11R2	—	3.5	5.0	—	V_{p-p}	
Mon-R out Gain	TV-R in	G3R2	—	-0.5	0	0.5	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, find the gain between input and output.
	V1-R in	G7R2	—	-0.5	0	0.5	dB	
	V2-R in	G11R2	—	-0.5	0	0.5	dB	
Mon-R out Frequency response	TV-R in	F3R2	—	0.1	—	—	MHz	(1) Apply a 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, measure a frequency at which the output amplitude on pin 23 is 3dB down from the 1 kHz applied level.
	V1-R in	F7R2	—	0.1	—	—	MHz	
	V2-R in	F11R2	—	0.1	—	—	MHz	
Mon-R out Crosstalk	TV-R in	CT3R2	—	70	90	—	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare signal output from the selected pin with leakage components from nonselected pins to find a crosstalk.
	V1-R in	CT7R2	—	70	90	—	dB	
	V2-R in	CT11R2	—	70	90	—	dB	
Mon-R out Mute attenuation	TV-R in	M3R2	—	70	80	—	dB	(1) Apply a 1 kHz, 1.0 V_{p-p} sine wave to each input pin. (2) In each select mode, compare the output amplitudes on pin 23 when mute is turned on and turned off to find mute attenuation.
	V1-R in	M7R2	—	70	80	—	dB	
	V2-R in	M11R2	—	70	80	—	dB	

Reference data

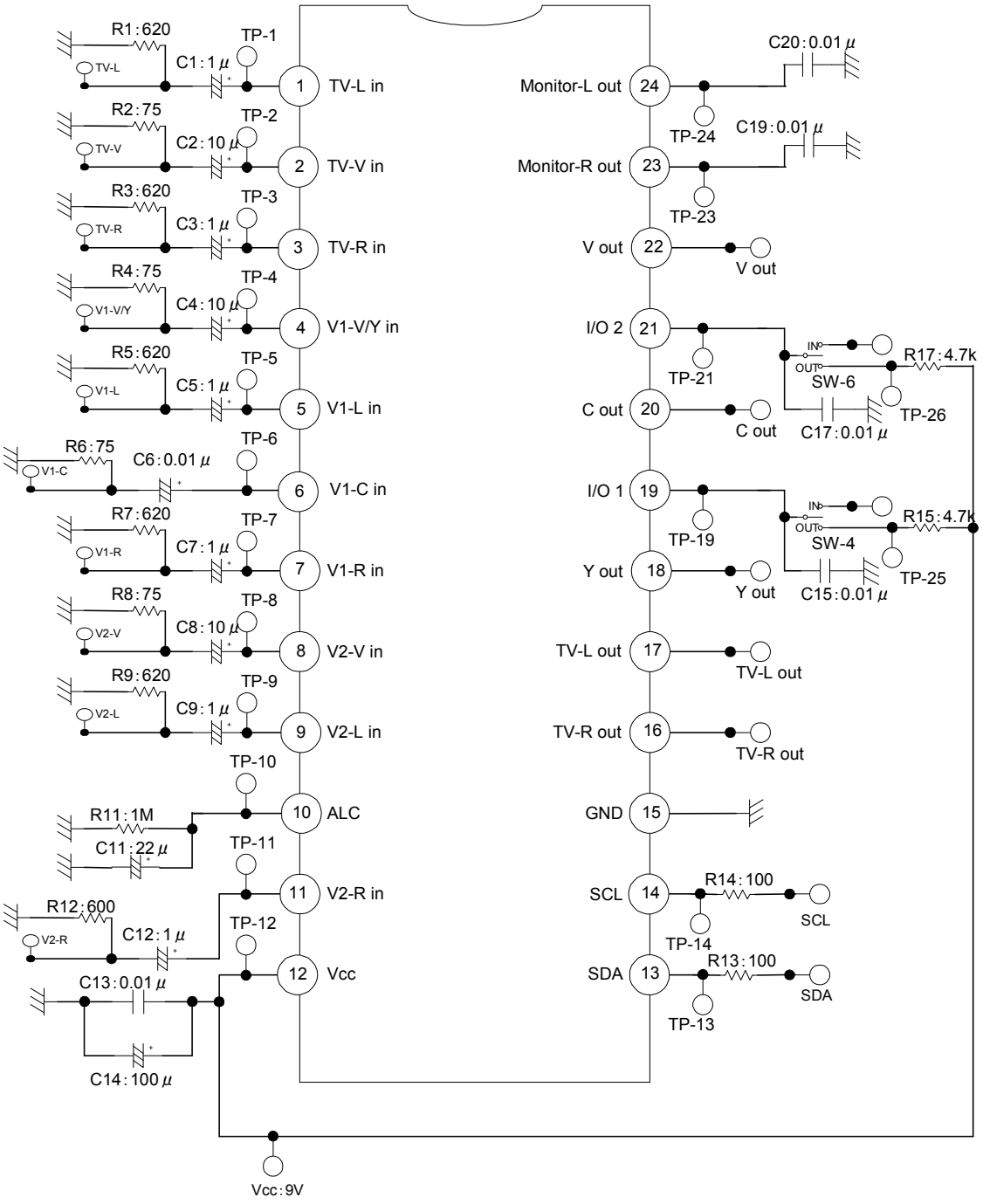




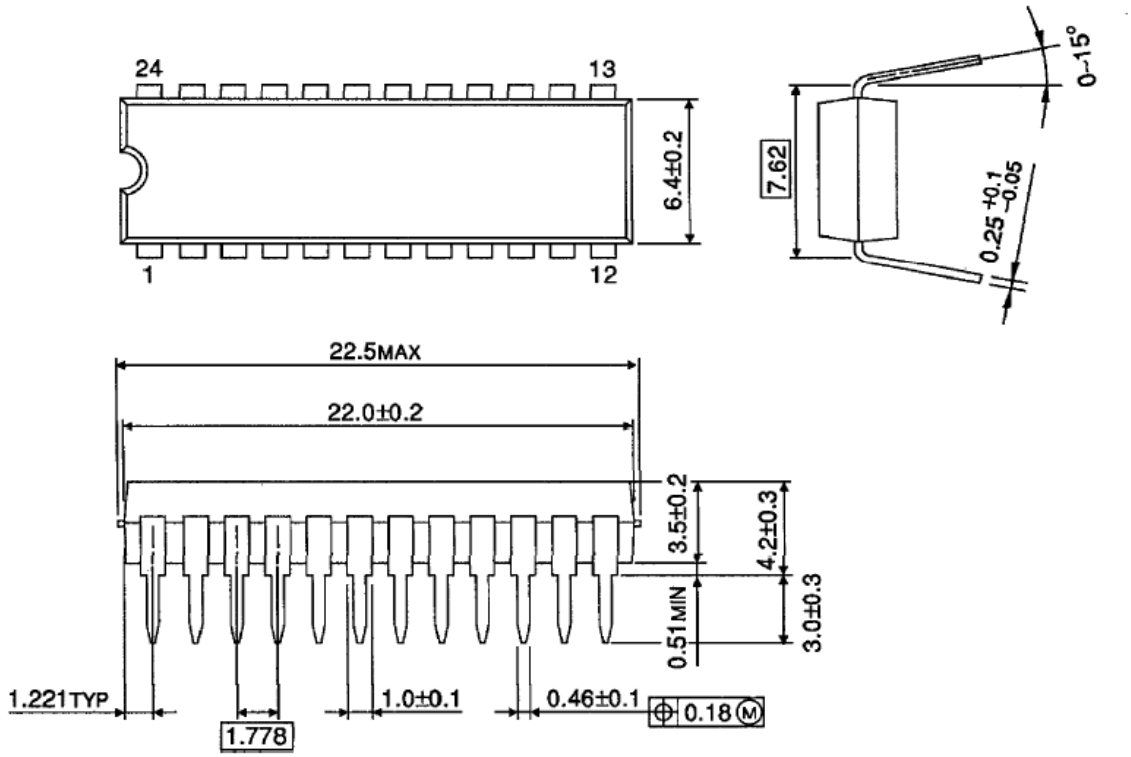
Application Circuit



Test Circuit



Package Dimensions



Weight: 1.22 g (typ.)

About solderability, following conditions were confirmed.

・Solderability

(1) Use of Sn-37Pb solder Bath
- ・ solder bath temperature = 230℃
- ・ dipping time = 5 seconds
- ・ the number of times = once
- ・ use of R-type flux

(2) Use of Sn-3.0Ag-0.5Cu solder
- ・ solder bath temperature = 245℃
- ・ dipping time = 5 seconds
- ・ the number of times = once