RENESAS

M52749FP

BUS Controlled 3ch Video Pre-amp for CRT Display Monitor

REJ03F0194-0201
Rev.2.01
Mar 31, 2008

Description

M52749FP is semiconductor integrated circuit for CRT display monitor.

It includes OSD blanking, OSD mixing, retrace blanking, wide band amplifier, brightness control, main/sub contrast and OSD adjust function.

Features

- Frequency Band Width: RGB 180 MHz (3 V_{P-P} at –3 dB)
  OSD 80 MHz
  Input: RGB 0.7 V_{P-P} (typ.)
  OSD 3 V_{P-P} min. (positive)
  BLK (for OSD) 3 V_{P-P} min. (positive)
  Retrace BLK 3 V_{P-P} min. (positive)
  Output: RGB 5.5 V_{P-P} (max.)
  OSD 3.5 V_{P-P} (max.)
- Main contrast, sub contrast, OSD adjust and 5ch D/A OUT can be controlled by I^2C BUS.

Application

CRT display monitor

Recommended Operating Conditions

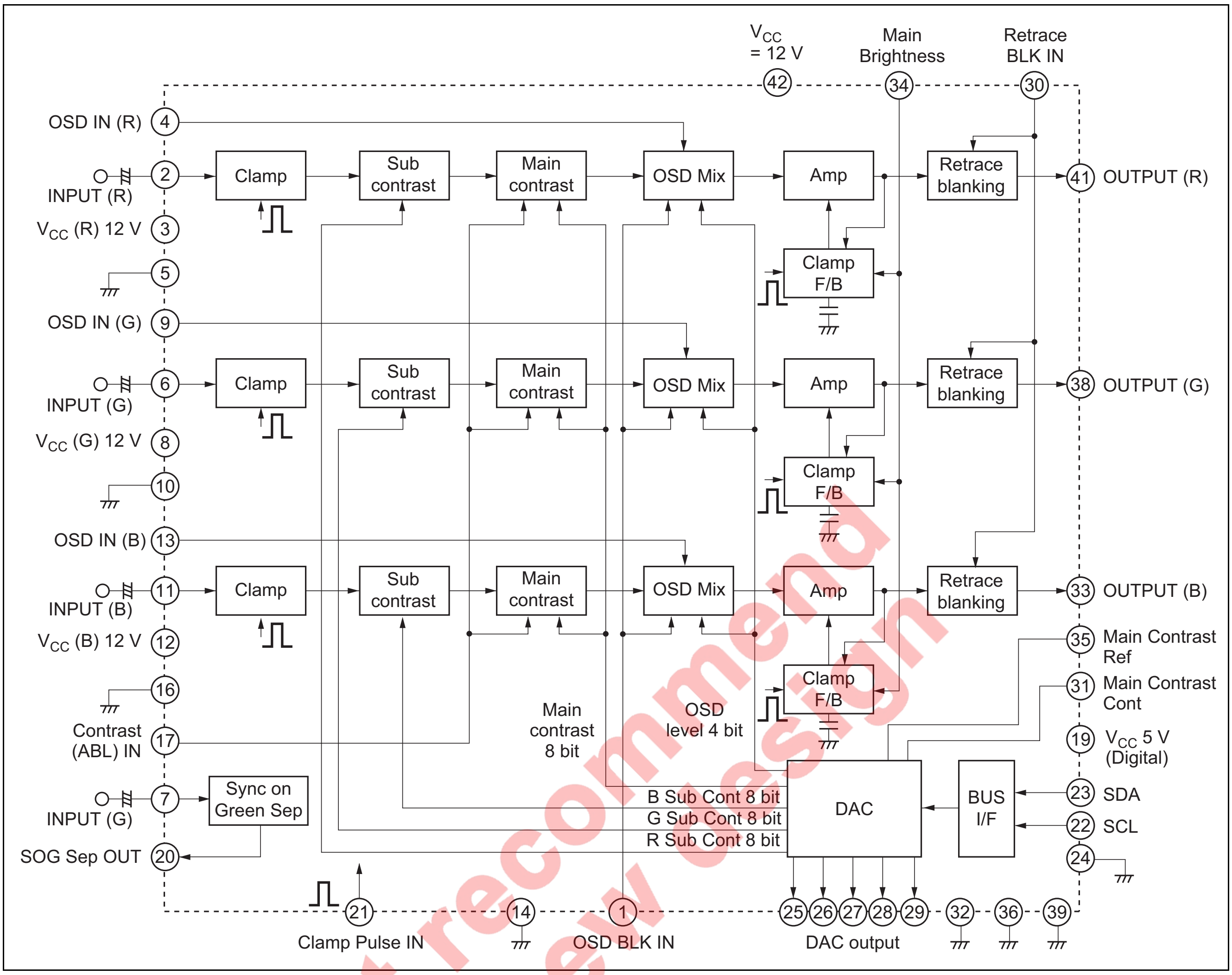
Supply voltage range: 11.5 V to 12.5 V (V3, V8, V12, V42)
4.5 V to 5.5 V (V19)

Rated supply voltage: 12.0 V (V3, V8, V12, V42)
5.0 V (V19)

Major Specification

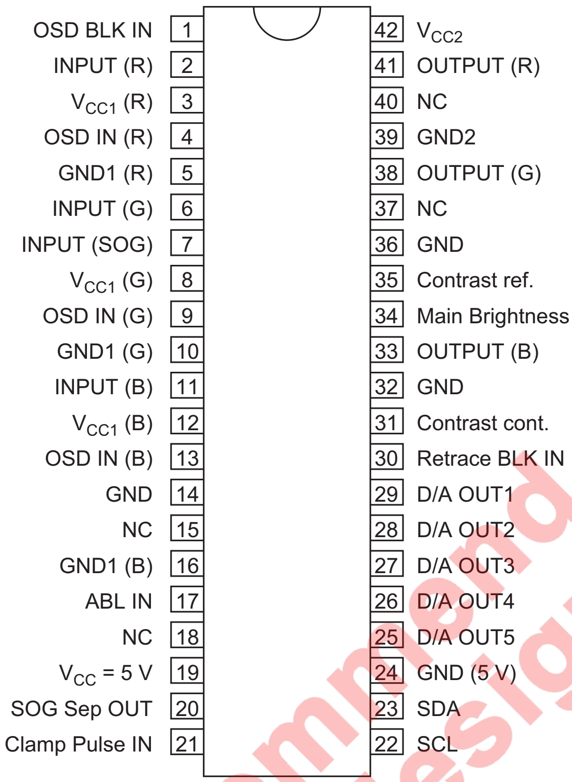
BUS controlled 3ch video pre-amp with OSD mixing function and retrace blanking function

Block Diagram



Pin Arrangement

M52749FP



(Top view)

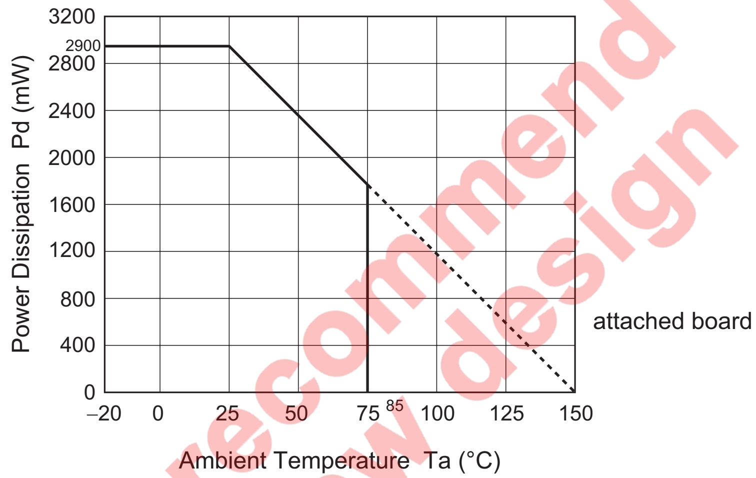
Outline: PRSP0042GB-A (42P9R-A)

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Supply voltage (Pin 3, 8, 12, 42)	$V_{CC}12$	13.0	V
Supply voltage (Pin 19)	$V_{CC}5$	6.0	V
Power dissipation	Pd	2900	mW
Ambient temperature	Topr	–20 to +75	°C
Storage temperature	Tstg	–40 to +150	°C
Recommended supply12	Vopr12	12.0	V
Recommended supply5	Vopr5	5.0	V
Voltage range12	Vopr'12	11.5 to 12.5 (Typ 12.0)	V
Voltage range5	Vopr'5	4.5 to 5.5 (Typ 5.0)	V

Thermal Derating Curve



BUS Control Table

(1) Slave address:

D7	D6	D5	D4	D3	D2	D1	R/W	
1	0	0	0	1	0	0	0	= 88H

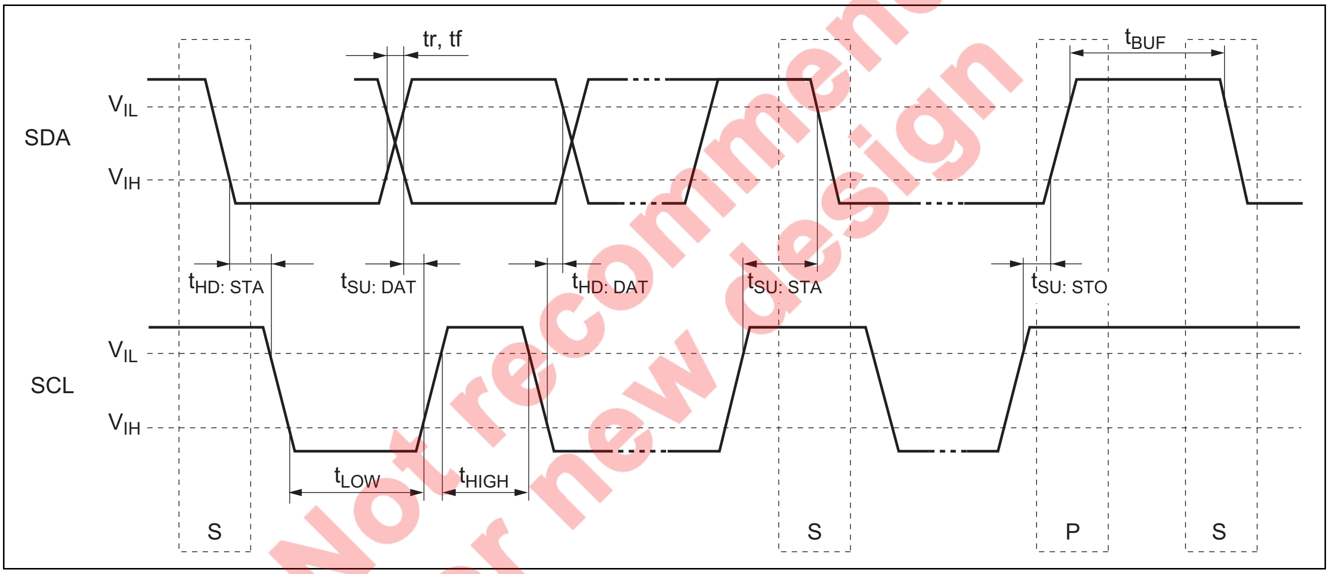
(2) Each function's sub address:

No.	Function	Bit	Sub Add.	Data Byte (Up: Bit, Information Down: Preset)							
				D7	D6	D5	D4	D3	D2	D1	D0
1	Main contrast	8	00H	A07	A06	A05	A04	A03	A02	A01	A00
				0	1	0	0	0	0	0	0
2	Sub contrast R	8	01H	A17	A16	A15	A14	A13	A12	A11	A10
				1	0	0	0	0	0	0	0
3	Sub contrast G	8	02H	A27	A26	A25	A24	A23	A22	A21	A20
				1	0	0	0	0	0	0	0
4	Sub contrast B	8	03H	A37	A36	A35	A34	A33	A32	A31	A30
				1	0	0	0	0	0	0	0
5	OSD level	4	04H	—	—	—	—	A43	A42	A41	A40
				0	0	0	0	1	0	0	0
6	D/A OUT1	8	06H	A67	A66	A65	A64	A63	A62	A61	A60
				1	0	0	0	0	0	0	0
7	D/A OUT2	8	07H	A77	A76	A75	A74	A73	A72	A71	A70
				1	0	0	0	0	0	0	0
8	D/A OUT3	8	08H	A87	A86	A85	A84	A83	A82	A81	A80
				1	0	0	0	0	0	0	0
9	D/A OUT4	8	09H	A97	A96	A95	A94	A93	A92	A91	A90
				1	0	0	0	0	0	0	0
10	D/A OUT5	8	0AH	AA7	AA6	AA5	AA4	AA3	AA2	AA1	AA0
				1	0	0	0	0	0	0	0

I^2C BUS Control Section SDA, SCL Characteristics

Item	Symbol	Min.	Max.	Unit
Min. input LOW voltage	V_{IL}	–0.5	1.5	V
Max. input HIGH voltage	V_{IH}	3.0	5.5	V
SCL clock frequency	f_{SCL}	0	400	kHz
Time the bus must be free before a new transmission can start	t_{BUF}	1.3	—	µs
Hold time start condition. After this period the first clock pulse is generated	$t_{HD:STA}$	0.6	—	µs
The LOW period of the clock	t_{LOW}	1.3	—	µs
The HIGH period of the clock	t_{HIGH}	0.6	—	µs
Set up time for start condition (Only relevant for a repeated start condition)	$t_{SU:STA}$	0.6	—	µs
Hold time DATA	$t_{HD:DAT}$	0.1	—	µs
Set-up time DATA	$t_{SU:DAT}$	100	—	ns
Rise time of both SDA and SCL lines	tr	—	300	ns
Fall time of both SDA and SCL lines	tf	—	300	ns
Set-up time for stop condition	$t_{SU:STO}$	0.6	—	µs

Timing Chart



Electrical Characteristics

(V_{CC} = 12 V, 5 V; Ta = 25°C unless otherwise specified)

Item	Symbol	Limits Min.	Limits Typ.	Limits Max.	Unit	Test Point (s)	Input 2, 6, 11 RGB in	Input 1 OSD BLK	Input 4, 9, 13 OSD in	Input 21 CP in	Input 30 ReT BLK	Input 7 SOG in	CTL Voltage 34 Bri-ght	CTL Voltage 17 ABL	BUS CTL (H) 00H Main Cont	01H Sub Cont 1	02H Sub Cont 2	03H Sub Cont 3	04H OSD Adj	06H D/A OUT 1	07H D/A OUT 2	08H D/A OUT 3	09H D/A OUT 4	0AH D/A OUT 5
Circuit current1	I_{CC1}	—	110	130	mA	I_A	a	a	a	b SG5	a	a	4.0	5.0	FFH 255	FFH 255	FFH 255	FFH 255	00H 0	FFH 255	FFH 255	FFH 255	FFH 255	FFH 255
Circuit current2	I_{CC2}	—	18	22	mA	I_B	a	a	a	b SG5	a	a	4.0	5.0	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Output dynamic range	Vomax	6.0	8.0	—	V_{P-P}	OUT	b SG2	a	a	b SG5	a	a	Variable	5.0	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Maximum input	Vimax	1.6	—	—	V_{P-P}	IN OUT	b SG2 Variable	a	a	b SG5	a	a	2.0	5.0	64H 100	↓	↓	↓	↓	↓	↓	↓	↓	↓
Maximum gain	G_V	16.5	17.7	19.4	dB	OUT	b SG1	a	a	b SG5	a	a	2.0	5.0	FFH 255	↓	↓	↓	↓	↓	↓	↓	↓	↓
Relative maximum gain	ΔG_V	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓
Main contrast control characteristics1	V_{C1}	15.5	17.0	18.5	dB	OUT	b SG1	a	a	b SG5	a	a	2.0	5.0	C8H 200	↓	↓	↓	↓	↓	↓	↓	↓	↓
Main contrast control relative characteristics1	ΔV_{C1}	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓
Main contrast control characteristics2	V_{C2}	9.0	10.5	12.0	dB	OUT	b SG1	a	a	b SG5	a	a	2.0	5.0	64H 100	↓	↓	↓	↓	↓	↓	↓	↓	↓
Main contrast control relative characteristics2	ΔV_{C2}	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓
Main contrast control characteristics3	V_{C3}	0.2	0.4	0.6	V_{P-P}	OUT	b SG1	a	a	b SG5	a	a	2.0	5.0	14H 20	↓	↓	↓	↓	↓	↓	↓	↓	↓
Main contrast control relative characteristics3	ΔV_{C3}	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓
Sub contrast control characteristics1	V_{SC1}	15.5	17.0	18.5	dB	OUT	b SG1	a	a	b SG5	a	a	2.0	5.0	FFH 255	C8H 200	C8H 200	C8H 200	↓	↓	↓	↓	↓	↓
Sub contrast control relative characteristics1	ΔV_{SC1}	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓
Sub contrast control characteristics2	V_{SC2}	10.5	12.0	13.5	dB	OUT	b SG1	a	a	b SG5	a	a	2.0	5.0	FFH 255	64H 100	64H 100	64H 100	↓	↓	↓	↓	↓	↓
Sub contrast control relative characteristics2	ΔV_{SC2}	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓
Sub contrast control characteristics3	V_{SC3}	0.7	1.2	1.5	V_{P-P}	OUT	b SG1	a	a	b SG5	a	a	2.0	5.0	FFH 255	14H 20	14H 20	14H 20	↓	↓	↓	↓	↓	↓
Sub contrast control relative characteristics3	ΔV_{SC3}	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓
Main/sub contrast control characteristics	VMSC	3.4	4.0	4.6	V_{P-P}	OUT	b SG1	a	a	b SG5	a	a	2.0	5.0	C8H 200	C8H 200	C8H 200	C8H 200	↓	↓	↓	↓	↓	↓
Main/sub contrast control relative characteristics	ΔVMSC	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓
ABL control characteristics1	ABL1	4.6	5.4	6.2	V_{P-P}	OUT	b SG1	a	a	b SG5	a	a	2.0	4.0	FFH 255	FFH 255	FFH 255	FFH 255	↓	↓	↓	↓	↓	↓
ABL control relative characteristics1	ΔABL1	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
ABL control characteristics2	ABL2	2.3	2.8	3.3	V_{P-P}	OUT	b SG1	a	a	b SG5	a	a	2.0	2.0	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
ABL control relative characteristics2	ΔABL2	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

Item	Symbol	Limits Min.	Limits Typ.	Limits Max.	Unit	Test Point (s)	Input 2, 6, 11 RGB in	Input 1 OSD BLK	Input 4, 9, 13 OSD in	Input 21 CP in	Input 30 ReT BLK	Input 7 SOG in	CTL Voltage 34 Bri-ght	CTL Voltage 17 ABL	BUS CTL (H) 00H Main Cont	BUS CTL (H) 01H Sub Cont 1	BUS CTL (H) 02H Sub Cont 2	BUS CTL (H) 03H Sub Cont 3	BUS CTL (H) 04H OSD Adj	BUS CTL (H) 06H D/A OUT 1	BUS CTL (H) 07H D/A OUT 2	BUS CTL (H) 08H D/A OUT 3	BUS CTL (H) 09H D/A OUT 4	BUS CTL (H) 0AH D/A OUT 5
Brightness control characteristics1	V_{B1}	3.6	4.0	4.4	V	OUT	a	a	a	b SG5	a	a	4.0	5.0	FFH 255	FFH 255	FFH 255	FFH 255	00H 0	FFH 255	FFH 255	FFH 255	FFH 255	FFH 255
Brightness control relative characteristics1	ΔV_{B1}	–0.3	0	0.3	V	—	—	—	—	—	—	—	—	—										
Brightness control characteristics2	V_{B2}	1.8	2.1	2.4	V	OUT	a	a	a	b SG5	a	a	2.0	5.0										
Brightness control relative characteristics2	ΔV_{B2}	–0.3	0	0.3	V	—	—	—	—	—	—	—	—	—										
Brightness control characteristics3	V_{B3}	0.9	1.1	1.3	V	OUT	a	a	a	b SG5	a	a	1.0	5.0										
Brightness control relative characteristics3	ΔV_{B3}	–0.3	0	0.3	V	—	—	—	—	—	—	—	—	—	↓									
Frequency characteristics1 (f = 50 MHz)	F_{C1}	–2.0	0	2.5	dB	OUT	b SG3	a	a	a 5 V	a	a	Vari able	5.0	Vari able									
Frequency relative characteristics1 (f = 50 MHz)	ΔF_{C1}	–1.0	0	1.0	dB	—	—	—	—	—	—	—	—	—	—									
Frequency characteristics1 (f = 180 MHz)	F_{C1}'	–3.0	0	3.0	dB	OUT	b SG3	a	a	a 5 V	a	a	Vari able	5.0	Vari able									
Frequency relative characteristics1 (f = 180 MHz)	$\Delta F_{C1}'$	–1.0	0	1.0	dB	—	—	—	—	—	—	—	—	—	—									
Frequency characteristics2 (f = 180 MHz)	F_{C2}	–3.0	3.0	5.0	dB	OUT	b SG3	a	a	a 5 V	a	a	Vari able	5.0										
Frequency relative characteristics2 (f = 180 MHz)	ΔF_{C2}	–1.0	0	1.0	dB	—	—	—	—	—	—	—	—	—	↓									
Crosstalk1 (f = 50 MHz)	C.T.1	—	–25	–20	dB	OUT (33) OUT (38)	2b SG3 6a 11a	a	a	a 5 V	a	a	Vari able	5.0	FFH 255									
Crosstalk1 (f = 180 MHz)	C.T.1'	—	–20	–15	dB	OUT (33) OUT (38)	2b SG3 6a 11a	a	a	a 5 V	a	a	Vari able	5.0										
Crosstalk2 (f = 50 MHz)	C.T.2	—	–25	–20	dB	OUT (33) OUT (41)	2a 6b SG3 11a	a	a	a 5 V	a	a	Vari able	5.0										
Crosstalk2 (f = 180 MHz)	C.T.2'	—	–20	–15	dB	OUT (33) OUT (41)	2a 6b SG3 11a	a	a	a 5 V	a	a	Vari able	5.0										
Crosstalk3 (f = 50 MHz)	C.T.3	—	–25	–20	dB	OUT (38) OUT (41)	2a 6a 11b SG3	a	a	a 5 V	a	a	Vari able	5.0										
Crosstalk3 (f = 180 MHz)	C.T.3'	—	–20	–15	dB	OUT (38) OUT (41)	2a 6a 11b SG3	a	a	a 5 V	a	a	Vari able	5.0	↓									
Pulse characteristics1 (3 V_{P-P})	Tr	—	2.0	2.8	ns	OUT	b SG1	a	a	b SG5	a	a	Vari able	5.0	Vari able									
Pulse characteristics2 (3 V_{P-P})	Tf	—	2.0	2.8	ns	OUT	b SG1	a	a	b SG5	a	a	Vari able	5.0	Vari able									
Clamp pulse threshold voltage	VthCP	1.0	1.5	2.0	V	OUT	b SG1	a	a	b SG5 Variable	a	a	2.0	5.0	FFH 255									
Clamp pulse minimum width	WCP	0.2	—	—	µs	OUT	b SG1	a	a	b SG5 Variable	a	a	2.0	5.0					↓					
OSD pulse characteristics1	OTr	—	3.0	6.0	ns	OUT	a	a	b SG6	b SG5	a	a	2.0	5.0					08H 8					
OSD pulse characteristics2	OTf	—	3.0	6.0	ns	OUT	a	a	b SG6	b SG5	a	a	2.0	5.0	↓	↓	↓	↓	08H 8	↓	↓	↓	↓	↓

Item	Symbol	Limits Min.	Limits Typ.	Limits Max.	Unit	Test Point (s)	Input: 2, 6, 11 RGB in	Input: 1 OSD BLK	Input: 4, 9, 13 OSD in	Input: 21 CP in	Input: 30 ReT BLK	Input: 7 SOG in	CTL Voltage: 34 Bri-ght	CTL Voltage: 17 ABL	BUS CTL (H): 00H Main Cont	01H Sub Cont 1	02H Sub Cont 2	03H Sub Cont 3	04H OSD Adj	06H D/A OUT 1	07H D/A OUT 2	08H D/A OUT 3	09H D/A OUT 4	0AH D/A OUT 5
OSD adjust control characteristics1	Oaj1	2.8	3.5	4.2	V_{P-P}	OUT	a	b SG6	b SG6	b SG5	a	a	2.0	5.0	FFH 255	FFH 255	FFH 255	FFH 255	0FH 15	FFH 255	FFH 255	FFH 255	FFH 255	FFH 255
OSD adjust control relative characteristics1	ΔOaj1	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	—	↓	↓	↓	↓	↓
OSD adjust control characteristics2	Oaj2	2.25	2.8	3.35	V_{P-P}	OUT	a	b SG6	b SG6	b SG5	a	a	2.0	5.0	↓	↓	↓	↓	08H 8	↓	↓	↓	↓	↓
OSD adjust control relative characteristics2	ΔOaj2	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	—	↓	↓	↓	↓	↓
OSD adjust control characteristics3	Oaj3	1.2	1.5	1.8	V_{P-P}	OUT	a	b SG6	b SG6	b SG5	a	a	2.0	5.0	↓	↓	↓	↓	00H 0	↓	↓	↓	↓	↓
OSD adjust control relative characteristics3	ΔOaj3	0.8	1.0	1.2	—	—	—	—	—	—	—	—	—	—	↓	↓	↓	↓	—	↓	↓	↓	↓	↓
OSD input threshold voltage	VthOSD	2.2	2.7	3.2	V	OUT	a	b SG6	b SG6 Variable	b SG5	a	a	2.0	5.0	↓	↓	↓	↓	08H 8	↓	↓	↓	↓	↓
OSD BLK input threshold voltage	VthBLK	2.2	2.7	3.2	V	OUT	b SG1	b SG6 Variable	a	b SG5	a	a	2.0	5.0	↓	↓	↓	↓	00H 0	↓	↓	↓	↓	↓
Retrace BLK characteristics1	HBLK1	—	0.3	0.6	V	OUT	a	a	a	b SG5	b SG7	a	2.0	5.0	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Retrace BLK input threshold voltage	VthRET	1.0	1.5	2.0	V	OUT	a	a	a	b SG5	b SG7 Variable	a	2.0	5.0	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
SOG input maximum noise voltage	SS-NV	—	—	0.03	V_{P-P}	SonG IN SyncOUT	a	a	a	a	a	b SG4 Variable	2.0	5.0	—	—	—	—	—	—	—	—	—	—
SOG minimum input voltage	SS-SV	0.2	—	—	V_{P-P}	SonG IN SyncOUT	a	a	a	a	a	b SG4 Variable	2.0	5.0	—	—	—	—	—	—	—	—	—	—
Sync output high level	VSH	4.5	4.9	5.0	V	Sync OUT	a	a	a	a	a	b SG4	2.0	5.0	—	—	—	—	—	—	—	—	—	—
Sync output low level	VSL	0	0.3	0.6	V	Sync OUT	a	a	a	a	a	b SG4	2.0	5.0	—	—	—	—	—	—	—	—	—	—
Sync output delay time1	TDS-F	0	60	90	ns	Sync OUT	a	a	a	a	a	b SG4	2.0	5.0	—	—	—	—	—	—	—	—	—	—
Sync output delay time2	TDS-R	0	60	90	ns	Sync OUT	a	a	a	a	a	b SG4	2.0	5.0	—	—	—	—	—	—	—	—	—	—
D/A H output voltage	VOH	4.5	5.0	5.5	V_{DC}	D/A OUT	a	a	a	a	a	a	2.0	5.0	FFH 255	FFH 255	FFH 255	FFH 255	00H 0	FFH 255	FFH 255	FFH 255	FFH 255	FFH 255
D/A L output voltage	VOL	0	0.5	1.0	V_{DC}	D/A OUT	a	a	a	a	a	a	2.0	5.0	↓	↓	↓	↓	↓	00H 0	00H 0	00H 0	00H 0	00H 0
D/A OUT input current	IA−	0.18	—	—	mA	D/A OUT	a	a	a	a	a	a	2.0	5.0	00H 0	00H 0	00H 0	00H 0	00H 0	00H 0	00H 0	00H 0	00H 0	00H 0
D/A OUT output current	IA+	—	—	1.0	mA	D/A OUT	a	a	a	a	a	a	2.0	5.0	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
D/A nonlinearity	DNL	−1.0	—	1.0	LSB	D/A OUT	a	a	a	a	a	a	2.0	5.0	FFH 255	FFH 255	FFH 255	FFH 255	00H 0	Variable	Variable	Variable	Variable	Variable

Electrical Characteristics Test Method

I_{CC1} Circuit Current1

Measuring conditions are as listed in supplementary Table.

Measured with a current meter at test point I_A.

I_{CC2} Circuit Current2

Measuring conditions are as listed in supplementary Table.

Measured with a current meter at test point I_B.

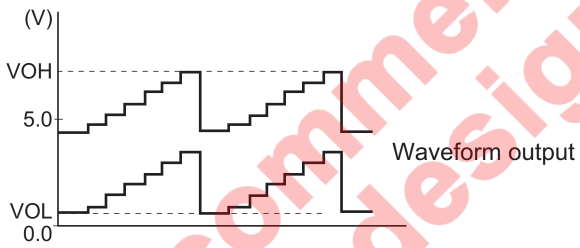
Vomax Output Dynamic Range

Decrease V34 gradually, and measure the voltage when the bottom of waveform output is distorted. The voltage is called VOL.

Next, increase V34 gradually, and measure the voltage when the top of waveform output is distorted. The voltage is called VOH.

Voltage Vomax is calculated by the equation below:

$$\text{Vomax} = \text{VOH} - \text{VOL}$$



Vimax Maximum Input

Increase the input signal (SG2) amplitude gradually, starting from 700 mV_{P-P}. Measure the amplitude of the input signal when the output signal starts becoming distorted.

G_V Maximum Gain

Input SG1, and read the amplitude output at OUT (33, 38, 41). The amplitude is called VOUT (33, 38, 41).

Maximum gain G_V is calculated by the equation below:

$$G_V = 20\log\frac{\text{VOUT}}{0.7}\ \text{(dB)}$$

ΔG_V Relative Maximum Gain

Relative maximum gain ΔG_V is calculated by the equation below:

$$\Delta G_V = \text{VOUT (33) / VOUT (38)},$$
$$\text{VOUT (38) / VOUT (41)},$$
$$\text{VOUT (41) / VOUT (33)}$$

V_{C1} Main Contrast Control Characteristics1

Measuring the amplitude output at OUT (33, 38, 41). The measured value is called VOUT (33, 38, 41).
Main contrast control characteristics V_{C1} is calculated by the equation below:

$$V_{C1} = 20\log \frac{VOUT}{0.7} \quad (dB)$$

ΔV_{C1} Main Contrast Control Relative Characteristics1

Relative characteristics ΔV_{C1} is calculated by the equation below:

$$\Delta V_{C1} = VOUT\ (33) / VOUT\ (38)\ ,$$
$$VOUT\ (38) / VOUT\ (41)\ ,$$
$$VOUT\ (41) / VOUT\ (33)$$

V_{C2} Main Contrast Control Characteristics2

Measuring condition and procedure are the same as described in V_{C1}.

ΔV_{C2} Main Contrast Control Relative Characteristics2

Measuring condition and procedure are the same as described in ΔV_{C1}.

V_{C3} Main Contrast Control Characteristics3

Measure the amplitude output at OUT (33, 38, 41). The measured value is called VOUT (33, 38, 41).

ΔV_{C3} Main Contrast Control Relative Characteristics3

Measuring condition and procedure are the same as described in ΔV_{C1}.

V_{SC1} Sub Contrast Control Characteristics1

Measure the amplitude output at OUT (33, 38, 41). The measured value is called VOUT (33, 38, 41).

Sub contrast control characteristics V_{SC1} is calculated by the equation below:

$$V_{SC1} = 20\log \frac{VOUT}{0.7} \quad (dB)$$

ΔV_{SC1} Sub Contrast Control Relative Characteristics1

Relative characteristics ΔV_{SC1} is calculated by the equation below:

$$\Delta V_{SC1} = VOUT\ (33) / VOUT\ (38),$$
$$VOUT\ (38) / VOUT\ (41),$$
$$VOUT\ (41) / VOUT\ (33).$$

V_{SC2} Sub Contrast Control Characteristics2

Measuring condition and procedure are the same as described in V_{SC1}.

ΔV_{SC2} Sub Contrast Control Relative Characteristics2

Measuring condition and procedure are the same as described in ΔV_{SC1}.

V_{SC3} Sub Contrast Control Characteristics3

Measure the amplitude output at OUT (33, 38, 41). The measured value is called VOUT (33, 38, 41).

ΔV_{SC3} Sub Contrast Control Relative Characteristics3

Measuring condition and procedure are the same as described in ΔV_{SC1}.

VMSC Main/sub Contrast Control Characteristics

Measure the amplitude output at OUT (33, 38, 41). The measured value is called VMSC.

ΔVMSC Main/sub Contrast Control Relative Characteristics

Relative characteristics ΔVMSC is calculated by the equation below:

ΔVMSC = VOUT (33) / VOUT (38),
VOUT (38) / VOUT (41),
VOUT (41) / VOUT (33).

ABL1 ABL Control Characteristics1

Measure the amplitude output at OUT (33, 38, 41). The measured value is called VOUT (33, 38, 41), and is treated as ABL1.

ΔABL1 ABL Control Relative Characteristics1

Relative characteristics ΔABL1 is calculated by the equation below:

ΔABL1 = VOUT (33) / VOUT (38),
VOUT (38) / VOUT (41),
VOUT (41) / VOUT (33).

ABL2 ABL Control Characteristics2

Measuring condition and procedure are the same as described in ABL1.

ΔABL2 ABL Control Relative Characteristics2

Measuring condition and procedure are the same as described in ΔABL1.

V_{B1} Brightness Control Characteristics1

Measure the DC voltage at OUT (33, 38, 41) with a voltmeter. The measured value is called VOUT (33, 38, 41), and is treated as V_{B1}.

ΔV_{B1} Brightness Control Relative Characteristics1

Relative characteristics ΔV_{B1} is calculated by the difference in the output between the channels.

ΔV_{B1} = VOUT (33) – VOUT (38),
VOUT (38) – VOUT (41),
VOUT (41) – VOUT (33).

V_{B2} Brightness Control Characteristics2

Measuring condition and procedure are the same as described in V_{B1}.

ΔV_{B2} Brightness Control Relative Characteristics2

Measuring condition and procedure are the same as described in ΔV_{B1}.

V_{B3} Brightness Control Characteristics3

Measuring condition and procedure are the same as described in V_{B1}.

ΔV_{B3} Brightness Control Relative Characteristics3

Measuring condition and procedure are the same as described in ΔV_{B1}.

F_{C1} Frequency Characteristics1 (f = 50 MHz)

First, SG3 to 1 MHz is as input signal. Input a resister that is about 2 kΩ to offer the voltage at input pins (2, 6, 11) in order that the bottom of input signal is 2.5 V.

Control the main contrast in order that the amplitude of sine wave output is 4.0 V_{P-P}.

Control the brightness in order that the bottom of sine wave output is 2.0 V_{P-P}.

By the same way, measure the output amplitude when SG3 to 50 MHz is as input signal.

The measured value is called VOUT (33, 38, 41). Frequency characteristics F_{C1} (33, 38, 41) is calculated by the equation below:

$$F_{C1} = 20\log \frac{\text{VOUT } V_{P-P}}{\text{Output amplitude when inputted SG3 (1 MHz): 4.0 } V_{P-P}} \quad \text{(dB)}$$

ΔF_{C1} Frequency Relative Characteristics1 (f = 50 MHz)

Relative characteristics ΔF_{C1} is calculated by the difference in the output between the channels.

F_{C1}' Frequency Characteristics1 (f = 180 MHz)

Measuring condition and procedure are the same as described in F_{C1}, expect SG3 to 180 MHz.

ΔF_{C1}' Frequency Relative Characteristics1 (f = 180 MHz)

Relative characteristics ΔF_{C1}' is calculated by the difference in the output between the channels.

F_{C2} Frequency Characteristics2 (f = 180 MHz)

SG3 to 1 MHz is as input signal. Control the main contrast in order that the amplitude of sine wave output is 1.0 V_{P-P}. By the same way, measure the output amplitude when SG3 to 150 MHz is as input signal.

The measured value is called VOUT (33, 38, 41).

Frequency characteristics F_{C2} (33, 38, 41) is calculated by the equation below:

$$F_{C2} = 20\log \frac{\text{VOUT } V_{P-P}}{\text{Output amplitude when inputted SG3 (1 MHz): 4.0 } V_{P-P}} \quad \text{(dB)}$$

ΔF_{C2} Frequency Relative Characteristics2 (f = 180 MHz)

Relative characteristics ΔF_{C2} is calculated by the difference in the output between the channels.

C.T.1 Crosstalk1 (f = 50 MHz)

Input SG3 (50 MHz) to pin 2 only, and then measure the waveform amplitude output at OUT (33, 38, 41). The measured value is called VOUT (33, 38, 41). Crosstalk C.T.1 is calculated by the equation below:

$$\text{C.T.1} = 20\log \frac{\text{VOUT (33, 38)}}{\text{VOUT (41)}} \quad \text{(dB)}$$

C.T.1' Crosstalk1 (f = 180 MHz)

Measuring condition and procedure are the same as described in C.T.1, expect SG3 to 180 MHz.

C.T.2 Crosstalk2 (f = 50 MHz)

Input SG3 (50 MHz) to pin 6 only, and then measure the waveform amplitude output at OUT (33, 38, 41).

The measured value is called VOUT (33, 38, 41). Crosstalk C.T.2 is calculated by the equation below:

$$\text{C.T.2} = 20\log \frac{\text{VOUT (33, 41)}}{\text{VOUT (38)}} \quad \text{(dB)}$$

C.T.2' Crosstalk2 (f = 180 MHz)

Measuring condition and procedure are the same as described in C.T.2, expect SG3 to 180 MHz.

C.T.3 Crosstalk3 (f = 50 MHz)

Input SG3 (50 MHz) to pin 11 only, and then measure the waveform amplitude output at OUT (33, 38, 41).

The measured value is called VOUT (33, 38, 41). Crosstalk C.T.3 is calculated by the equation below:

$$\text{C.T.3} = 20\log\frac{\text{VOUT (38, 41)}}{\text{VOUT (33)}} \quad \text{(dB)}$$

C.T.3' Crosstalk3 (f = 180 MHz)

Measuring condition and procedure are the same as described in C.T.3, expect SG3 to 180 MHz.

Tr Pulse Characteristics1 (3 V_{P-P})

Control the main contrast (00H) in order that the amplitude of output signal is 3.0 V_{P-P}.

Control the brightness (V34) in order that the Black level of output signal is 2.0 V.

Measure the time needed for the input pulse to rise from 10% to 90% (Tr1) and for the output pulse to rise from 10% to 90% (Tr2) with an active probe.

Pulse characteristics Tr is calculated by the equations below:

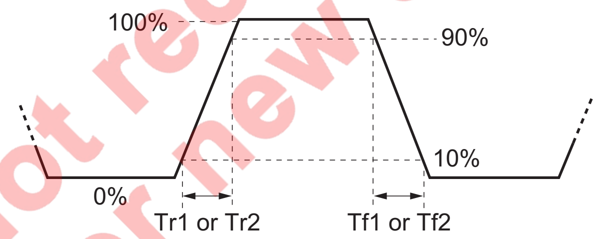
$$\text{Tr} = \sqrt{(\text{Tr2})^2 - (\text{Tr1})^2} \quad \text{(ns)}$$

Tf Pulse Characteristics2 (3 V_{P-P})

Measure the time needed for the input pulse to fall from 90% to 10% (Tf1) and for the output pulse to fall from 90% to 10% (Tf2) with an active probe.

Pulse characteristics Tf is calculated by the equations below:

$$\text{Tf} = \sqrt{(\text{Tf2})^2 - (\text{Tf1})^2} \quad \text{(ns)}$$



VthCP Clamp Pulse Threshold Voltage

Turn down the SG5 input level gradually from 5.0 V_{P-P}, monitoring the waveform output.

Measure the top level of input pulse when the output pedestal voltage turn decrease with unstable.

WCP Clamp Pulse Minimum Width

Decrease the SG5 pulse width gradually from 0.5 µs, monitoring the output. Measure the SG5 pulse width (a point of 1.5 V) when the output pedestal voltage turn decrease with unstable.

OTr OSD Pulse Characteristics1

Measure the time needed for the output pulse to rise from 10% to 90% (OTr) with an active probe.

OTf OSD Pulse Characteristics2

Measure the time needed for the output pulse to fall from 90% to 10% (OTf) with an active probe.

Oaj1 OSD Adjust Control Characteristics1

Measure the amplitude output at OUT (33, 38, 41). The measured value is called VOUT (33, 38, 41), and is treated as Oaj1.

ΔOaj1 OSD Adjust Control Relative Characteristics1

Relative characteristics ΔOaj1 is calculated by the equation below:

ΔOaj1 = VOUT (33) / VOUT (38),

VOUT (38) / VOUT (41),

VOUT (41) / VOUT (33).

Oaj2 OSD Adjust Control Characteristics2

Measuring condition and procedure are the same as described in Oaj1.

ΔOaj2 OSD Adjust Control Relative Characteristics2

Measuring condition and procedure are the same as described in ΔOaj1.

Oaj3 OSD Adjust Control Characteristics3

Measuring condition and procedure are the same as described in Oaj1.

ΔOaj3 OSD Adjust Control Relative Characteristics3

Measuring condition and procedure are the same as described in ΔOaj1.

VthOSD OSD Input Threshold Voltage

Reduce the SG6 input level gradually, monitoring output. Measure the SG6 level when the output reaches 0 V.

The measured value is called VthOSD.

VthBLK OSD BLK Input Threshold Voltage

Confirm that output signal is being blanked by the SG6 at the time.

Monitoring to output signal, decreasing the level of SG6. Measure the top level of SG6 when the blanking period is disappeared. The measured value is called VthBLK.

HBLK1 Retrace BLK Characteristics1

Measure the amplitude output is blanked by the SG7 at OUT (33, 38, 41).
The measured value is called VOUT (33, 38, 41), and is treated as HBLK1.

VthRET Retrace BLK Input Threshold Voltage

Confirm that output signal is being blanked by the SG7 at the time.

Monitoring to output signal, decreasing the level of SG7. Measure the top level of SG7 when the blanking period is disappeared. The measured value is called VthRET.

SS-NV SOG Input Maximum Noise Voltage

The sync's amplitude of SG4 be changed all white into all black, increase from 0 V_{P-P} to 0.02 V_{P-P}. No pulse output permitted.

SS-SV SOG Minimum Input Voltage

The sync's amplitude of SG4 be changed all white or all black, decrease from 0.3 V_{P-P} to 0.2 V_{P-P}. Confirm no malfunction produced by noise.

VSH Sync Output High level

Measure the high voltage at SyncOUT. The measured value is treated as VSH.

VSL Sync Output Low Level

Measure the low voltage at SyncOUT. The measured value is treated as VSL.

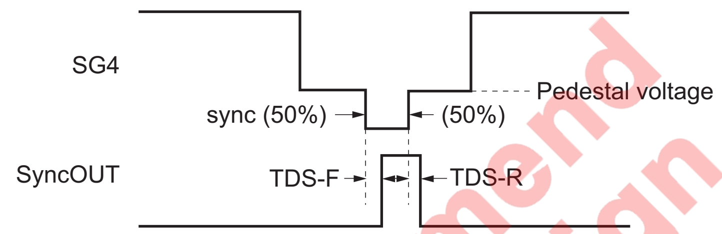
TDS-F Sync Output Delay Time1

SyncOUT becomes High with sync part of SG4.

Measure the time needed for the rear edge of SG4 sync to fall from 50% and for SyncOUT to rise from 50% with an active probe. The measured value is treated as TDS-F, less than 90 ns.

TDS-R Sync Output Delay Time2

Measure the time needed for the rear edge of SG4 sync to rise from 50% and for SyncOUT to fall from 50% with an active probe. The measured value is treated as TDS-R, less than 90 ns.



VOH D/A H Output Voltage

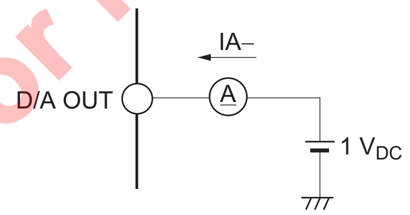
Measure the DC voltage at D/A OUT. The measured value is treated as VOH.

VOL D/A L Output Voltage

Measure the DC voltage at D/A OUT. The measured value is treated as VOL.

IA– D/A OUT Input Current

IA– is minimum input-current when input 1 V_{DC} to D/A OUT

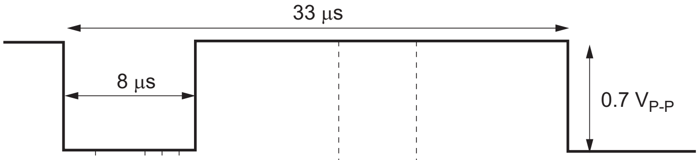
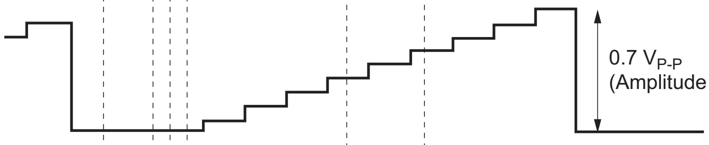
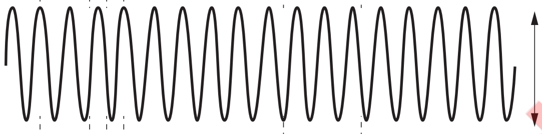
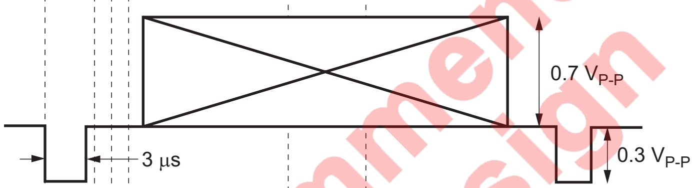
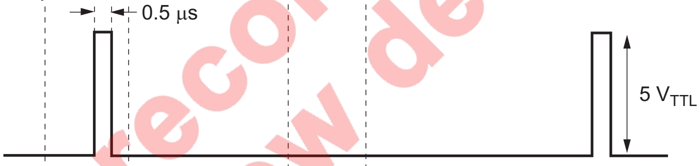
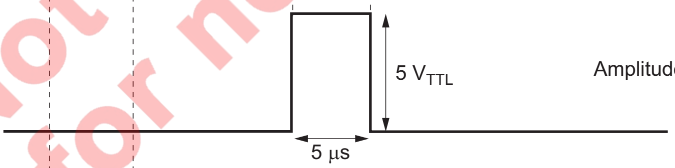


IA+ D/A OUT Output Current

IA+ is maximum output-current from D/A OUT

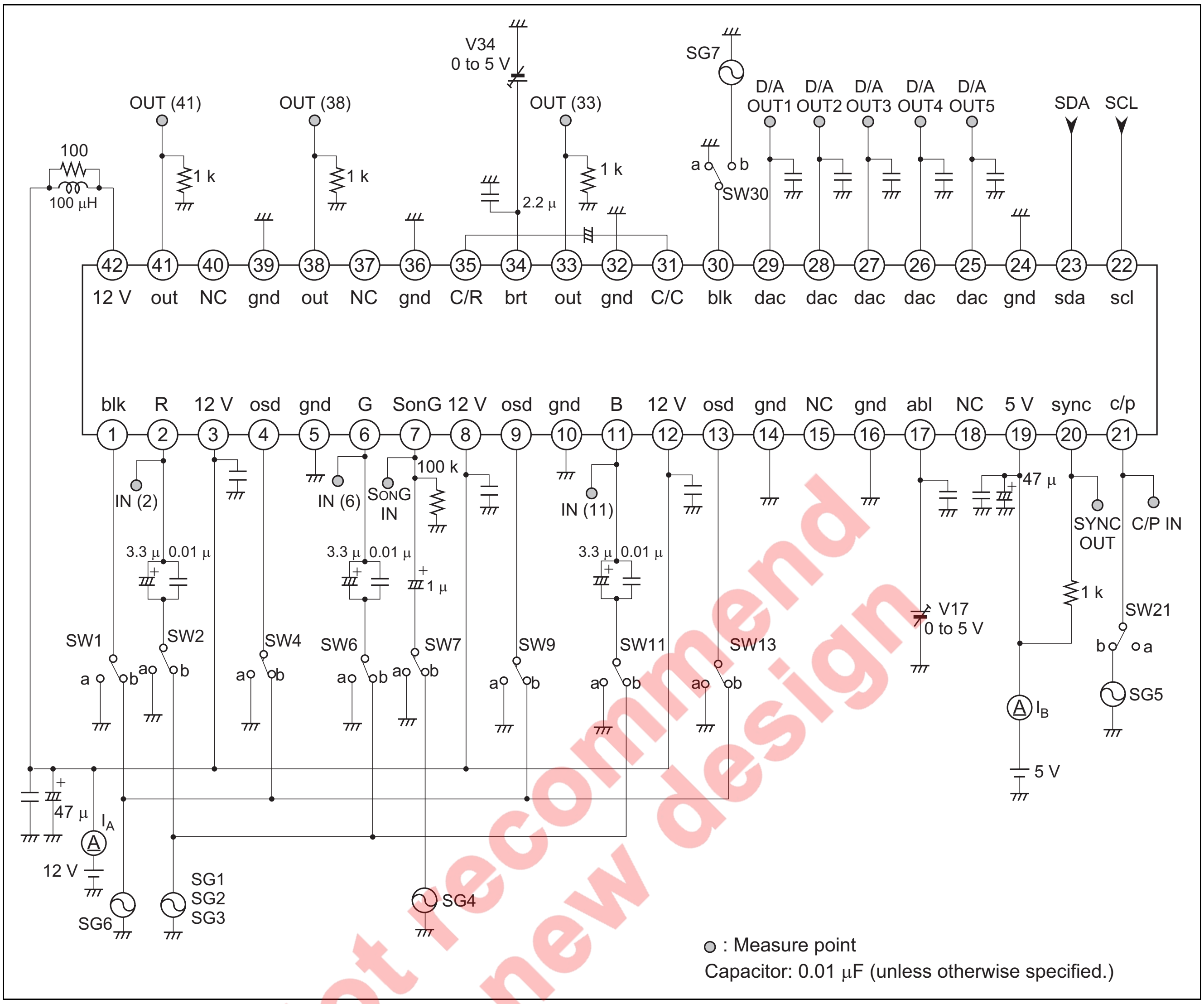
DNL D/A Nonlinearity

The difference of differential non-linearity of D/A OUT must be less than ±1.0 LSB.

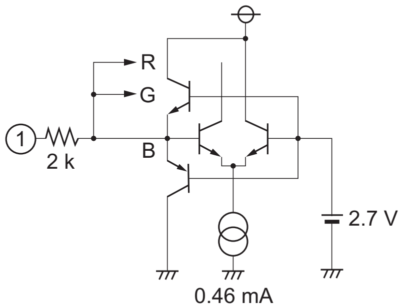
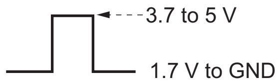
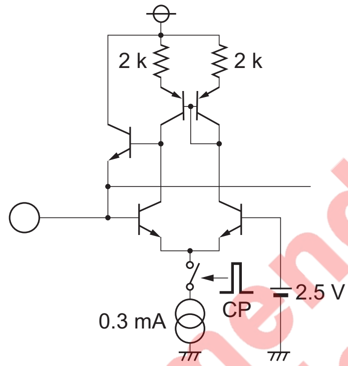
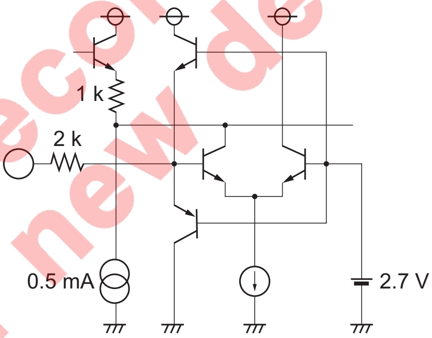
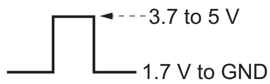
SG No.	Signals
SG1 Video signal (all white)	Pulse with amplitude of 0.7 V_{P-P} (f = 30 kHz). Video width of 25 µs. (75%) 
SG2 Video signal (step wave)	
SG3 Sine wave (for freq. char.)	
SG4 Video signal (all white, all black)	Video width of 25 µs. (75%) 
SG5 Clamp pulse	Pulse width and amplitude are variable. 
SG6 OSD pulse	
SG7 BLK pulse	

Note: f = 30 kHz

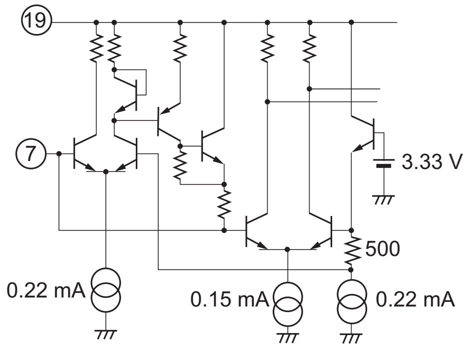
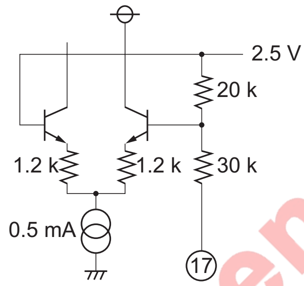
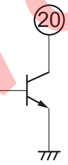
Test Circuit



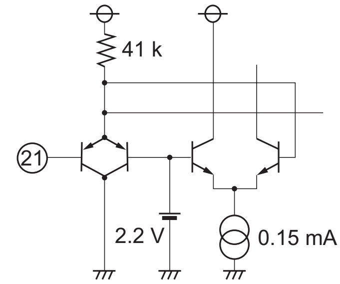
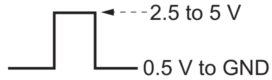
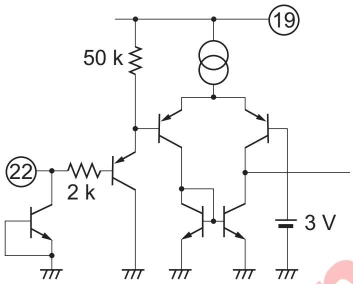
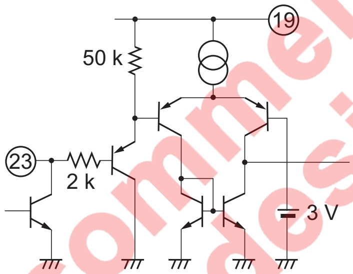
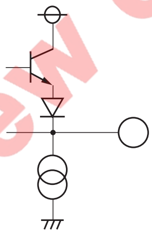
Pin Description

Pin No.	Name	DC Voltage (V)	Peripheral Circuit	Function
1	OSD BLK IN	—		Input pulses  Connected to GND if not used.
2 6 11	INPUT (R) INPUT (G) INPUT (B)	2.5		Clamped to about 2.5 V due to clamp pulses from pin 21. Input at low impedance.
3 8 12	V_{CC1} (R) V_{CC1} (G) V_{CC1} (B)	12	—	Apply equivalent voltage to 3 channels.
4 9 13	OSD IN (R) OSD IN (G) OSD IN (B)	—		Input pulses  Connected to GND if not used.
5 10 14 16 24 32 36 39	GND1 (R) GND1 (G) GND GND1 (B) GND (5 V) GND GND GND 2	GND	—	—

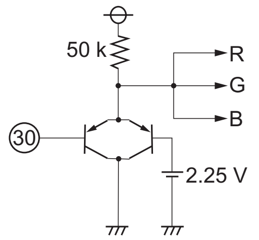
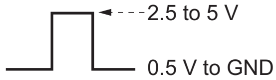
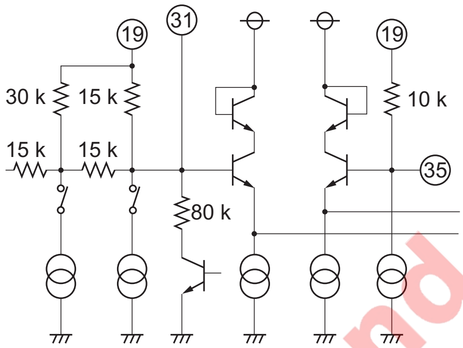
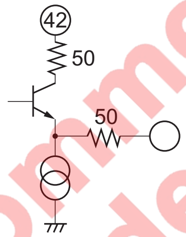
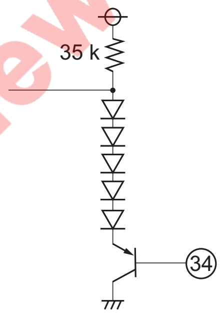
Pin Description (cont.)

Pin No.	Name	DC Voltage (V)	Peripheral Circuit	Function
7	INPUT (S on G)	When open 2.5 V		SYNC ON VIDEO input pin. Sync is negative. Input signal at pin 7, compare with the reference voltage of internal circuit in order to separate sync signal from Sync on Green signal.
17	ABL IN	When open 2.5 V		ABL (Automatic Beam Limiter) input pin. Recommended voltage range is 0 to 5 V. When ABL function is not used, set to 5 V.
15 18 37 40	NC	—	—	—
19	V_{CC} (5 V)	5	—	—
20	SonG Sep OUT	—		Sync signal output pin, being of open collector output type.

Pin Description (cont.)

Pin No.	Name	DC Voltage (V)	Peripheral Circuit	Function
21	Clamp Pulse IN	—		Input pulses  Input at low impedance
22	SCL	—		SCL of I^2C BUS (Serial clock line) V_{TH} = 2.3 V
23	SDA	—		SDA of I^2C BUS (Serial data line) V_{TH} = 2.3 V
25 26 27 28 29	D/A OUT	—		D/A output pin. Output voltage range is 0 to 5 V. Min input current is 0.18 mA when D/A output pin is 1 V. Max output current is 1.0 mA.

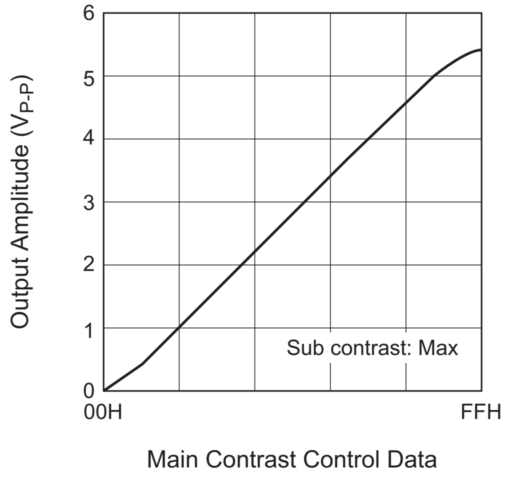
Pin Description (cont.)

Pin No.	Name	DC Voltage (V)	Peripheral Circuit of Pin	Description of Function
30	Retrace BLK IN	—		Input pulses  Connected to GND if not used.
31 35	Main Contrast Cont Main Contrast Ref	3.5 to 5.5 4.5		Non-polar capacitance is required between pin 31 and pin 35.
33 38 41	OUTPUT (B) OUTPUT (G) OUTPUT (R)	Variable		A resistor is needed on the GND side. Set discretionally to maximum 15 mA, depending on the required driving capacity.
42	V_{CC2}	12		Used to supply power to output emitter follower only.
34	Main Brightness	—		It is recommended that the IC be used between pedestal voltage 2 V and 3 V.

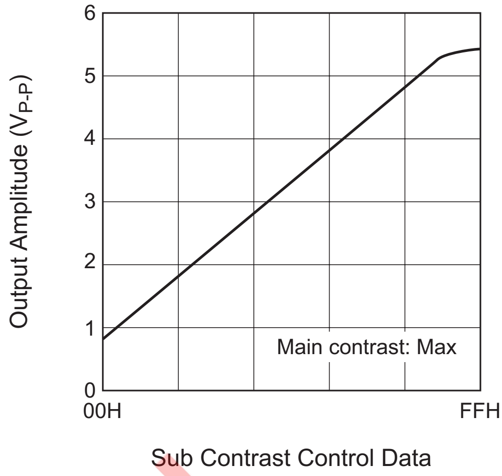
RENESAS

Typical Characteristics

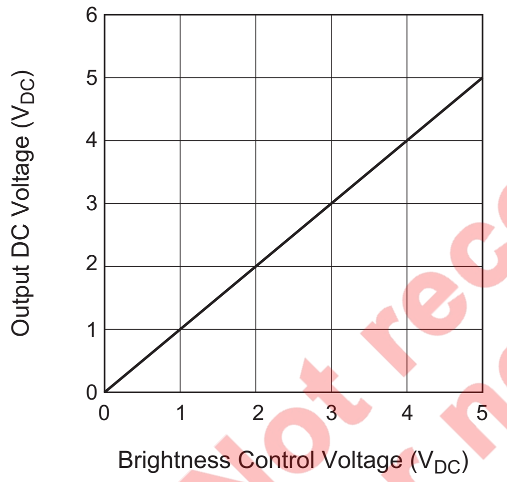
Main Contrast Control Characteristics



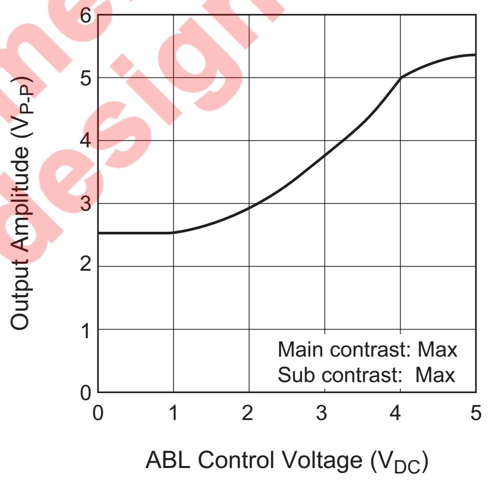
Sub Contrast Control Characteristics



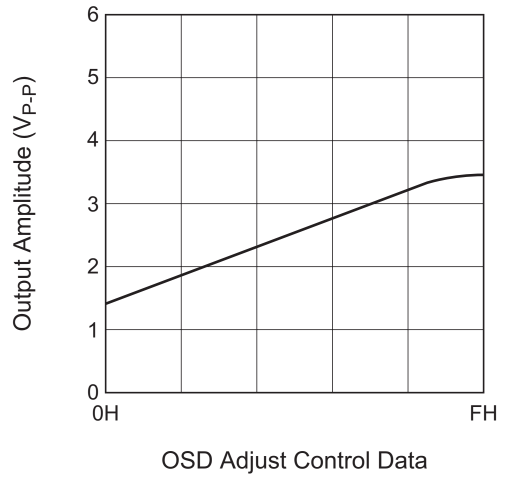
Brightness Control Characteristics



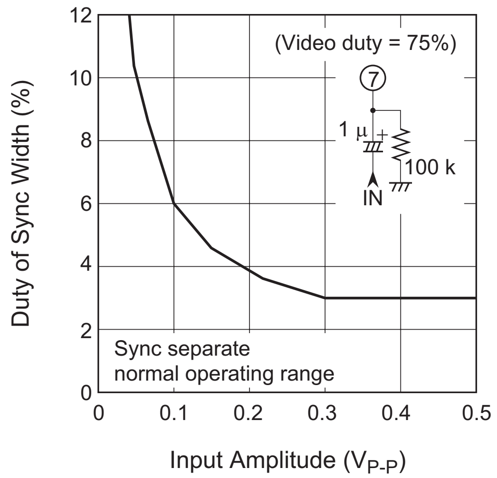
ABL Characteristics



OSD Adjust Control Characteristics



Sync Separate Input Min. Sync Width



Application Method for M52749FP

Clamp Pulse Input

Clamp pulse width is recommended

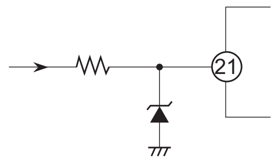
above 15 kHz, 1.0 μs

above 30 kHz, 0.5 μs

above 64 kHz, 0.3 μs

The clamp pulse circuit in ordinary set is a long round about way, and beside high voltage, sometimes connected to external terminal, it is very easy affected by large surge.

Therefore, the figure shown below is recommended.

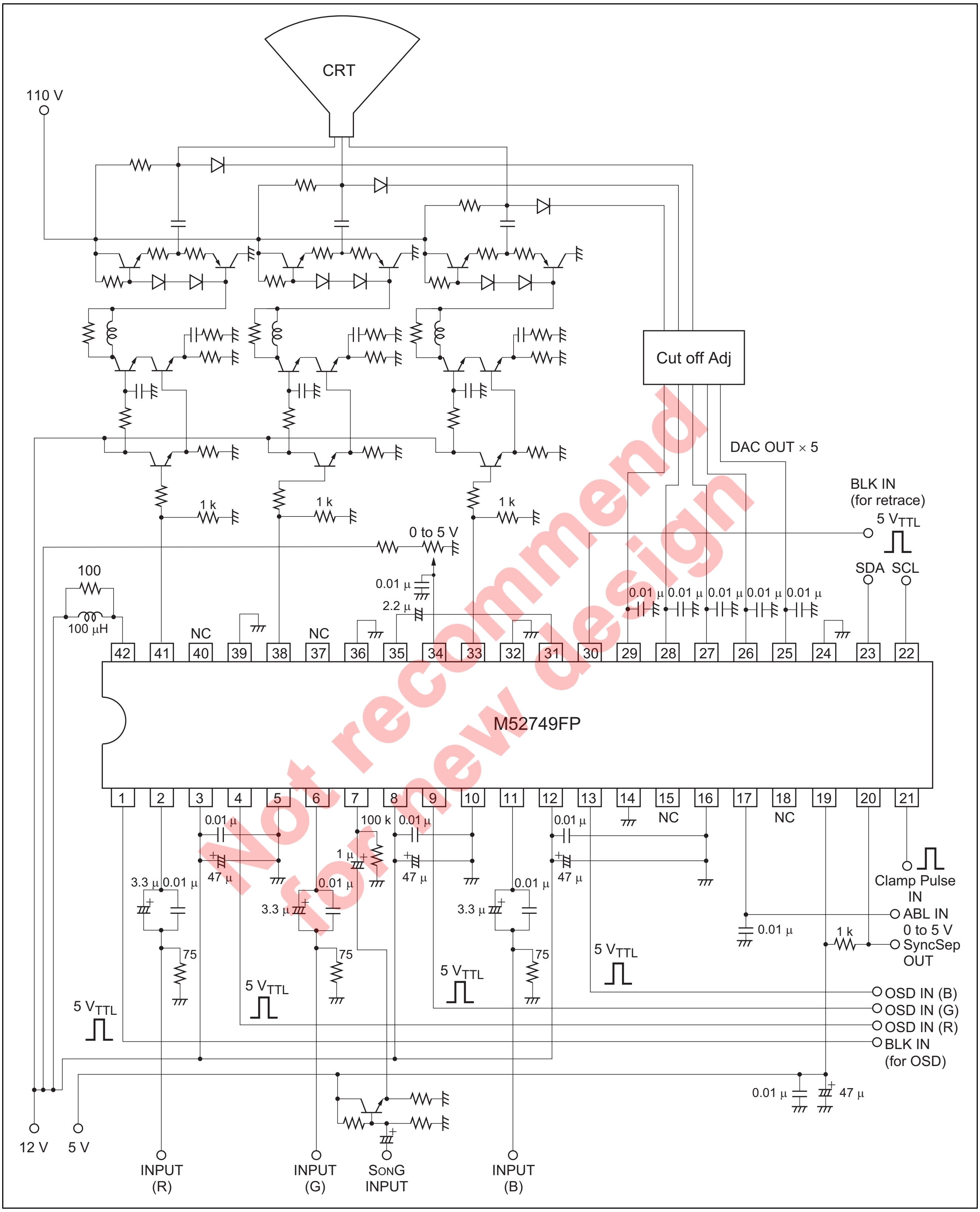


Notice of Application

Make the nearest distance between output pin and pull down resister.

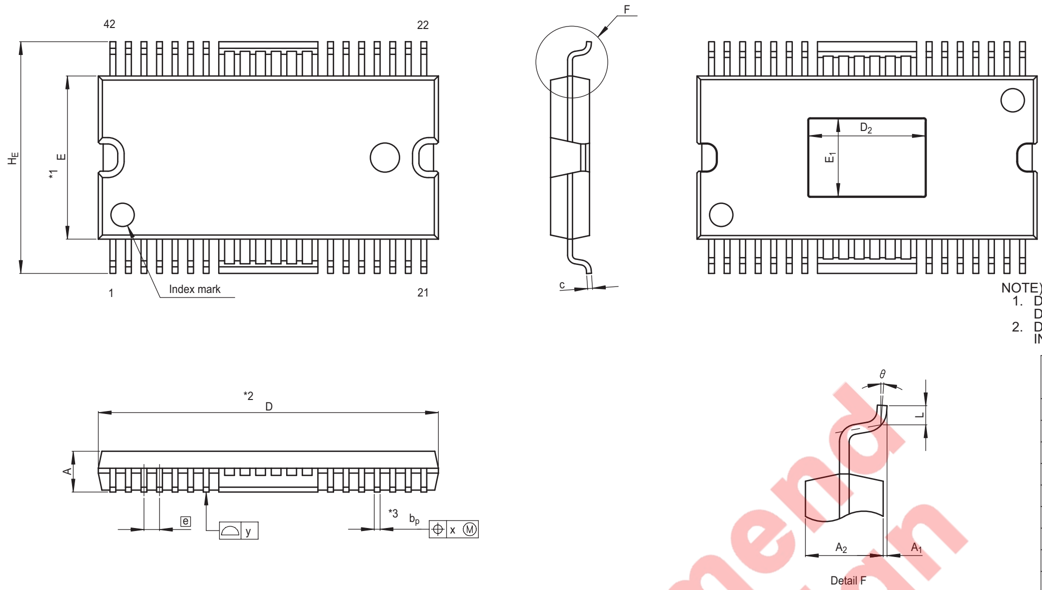
Recommended pedestal voltage of IC output signal is 2 V.

Application Example



Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-HSSOP42-8.4x17.5-0.80	PRSP0042GB-A	42P9R-A	0.7g



NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	17.3	17.5	17.7
E	8.2	8.4	8.6
A_2	—	2.0	—
A	—	—	2.2
A_1	0	0.1	0.2
b_p	0.27	0.32	0.37
c	0.23	0.25	0.3
θ	0°	—	10°
H_E	11.63	11.93	12.23
e	—	0.8	—
x	—	—	0.12
y	—	—	0.10
L	0.3	0.5	0.7
D_2	5.8	6.0	6.2
E_1	3.8	4.0	4.2

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Colophon .7.2