To our customers,

Old Company Name in Catalogs and Other Documents

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April 1st, 2010
Renesas Electronics Corporation

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RENESAS

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M61303FP

I^2C BUS Controlled 3channel Video Pre-amplifier for LCD Display Monitor

REJ03F0198-0201
Rev.2.01
Mar 31, 2008

Description

M61303FP is integrated circuit for LCD display monitor. It is controlled I^2C BUS and band wide is 180 MHz.

It includes OSD blanking, OSD mixing, wide band amplifier, main/sub contrast, main/sub brightness, and 2 input routes.

V_{CC} voltage is 5 V and flat package is used.

Then it is the suitable to LCD monitor.

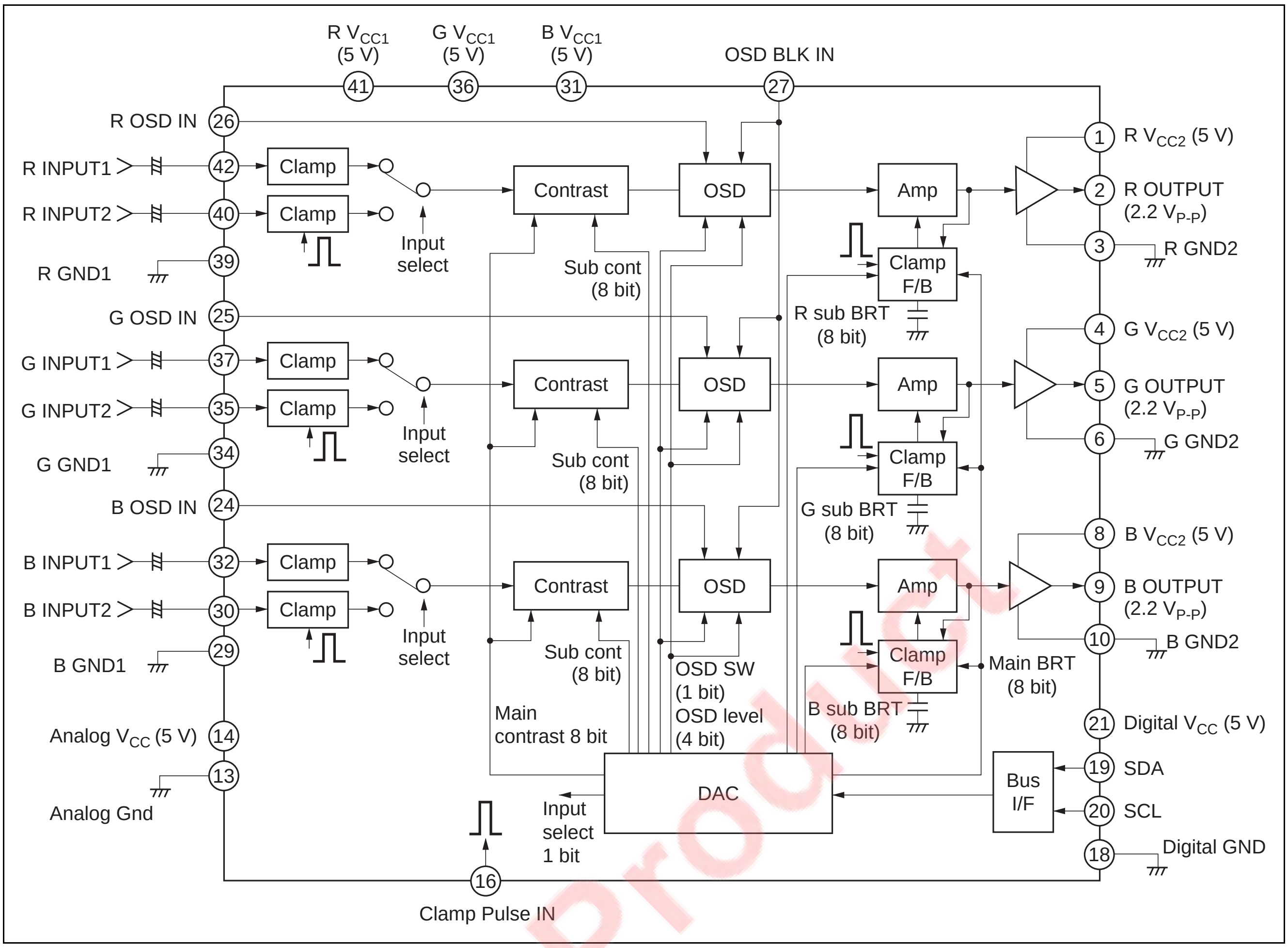
Features

- Frequency band width: RGB 180 MHz (at –3 dB)
  OSD 80 MHz
- Input: RGB input dynamic range Max 1 V_{P-P} positive
  2 input routes is changed by I^2C BUS
  RGB OSD 3.5 V_{P-P} to 5.0 V_{P-P} (positive)
  OSD BLK 3.5 V_{P-P} to 5.0 V_{P-P} (positive)
  Output: RGB 2.2 V_{P-P} (Max)
  OSD 2.0 V_{P-P} (Max)
  Output dynamic range 0.5 to 2.2 V
  It can drive 14 pF
- Contrast: Both of sub and main contrast are controlled by I^2C BUS (8 bit).
  Control range: –15 dB to +15 dB.
- Brightness: Both of sub and main contrast are controlled by I^2C BUS (8 bit).
  Control range: 0.5 V to 2.2 V.
- OSD adjust: 2 control ranges (Max 1 V_{P-P} or Max 2 V_{P-P}) are able to be changed by I^2C BUS.

Recommended Operating Conditions

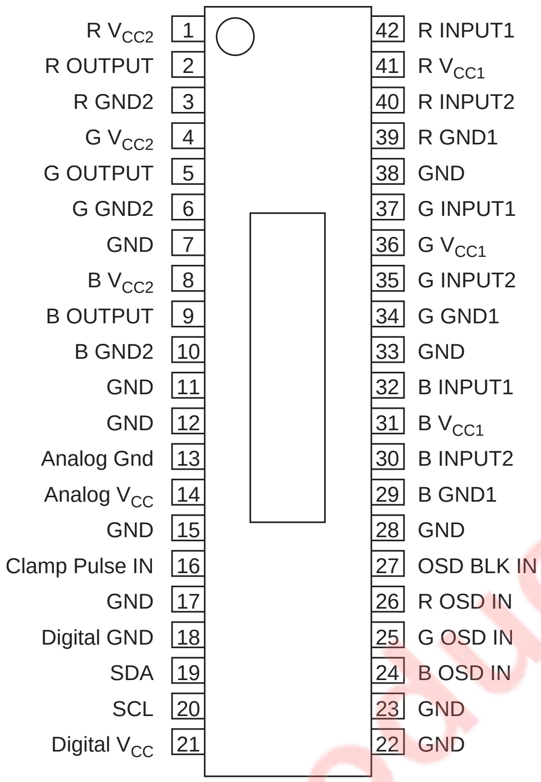
Supply voltage range:	4.7 V to 5.3 V
Rated supply voltage:	5.0 V
Consumption of electricity:	800 mW

Block Diagram



Pin Arrangement

M61303FP



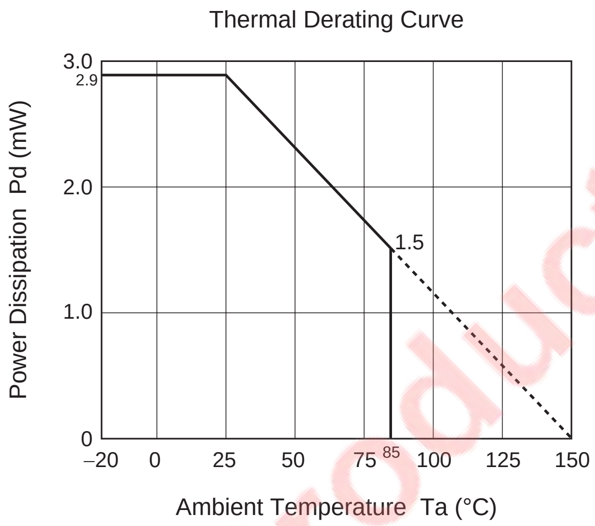
(Top view)

Outline: PRSP0042GB-B (42P9R-B)

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	6.0	V
Power dissipation	Pd	2900	mW
Ambient temperature	Topr	–20 to +85	°C
Storage temperature	Tstg	–40 to +150	°C
Recommended supply	Vopr	5.0	V
Voltage range	Vopr'	4.7 to 5.3	V



BUS Control Table

(1) Slave address:

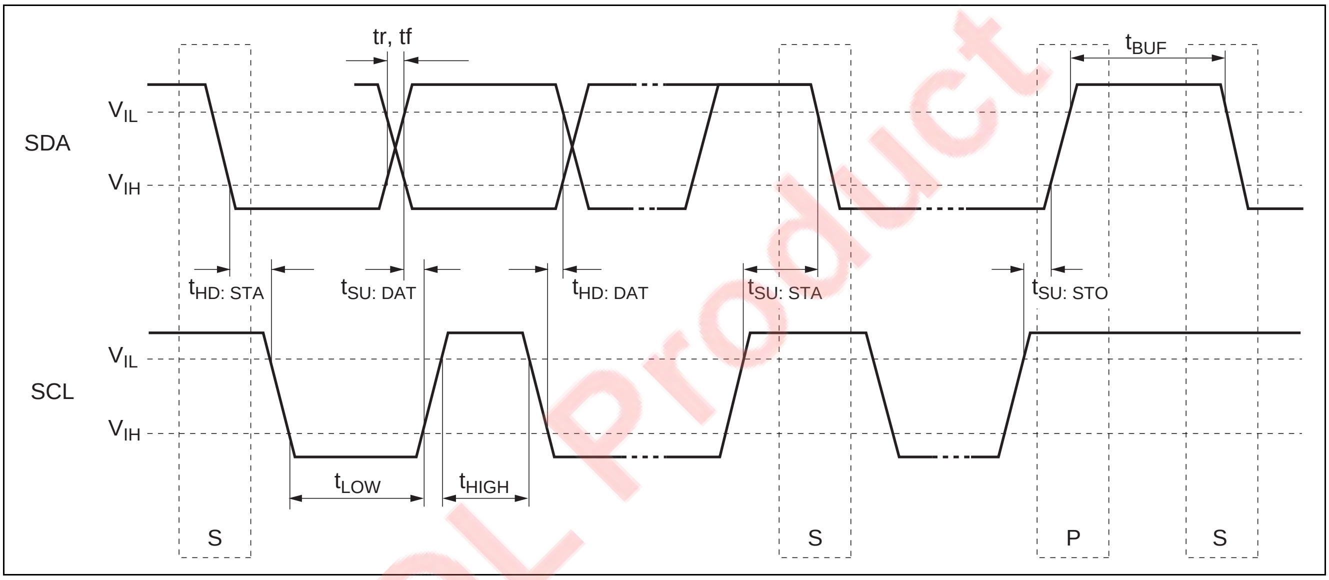
D7	D6	D5	D4	D3	D2	D1	R/W	
1	0	0	0	1	0	0	0	= 88H

(2) Each function's sub address:

Function	Bit	Sub Add.	Data Byte							
			D7	D6	D5	D4	D3	D2	D1	D0
Main contrast	8	00H	A07	A06	A05	A04	A03	A02	A01	A00
			0	1	0	0	0	0	0	0
Sub contrast R	8	01H	A17	A16	A15	A14	A13	A12	A11	A10
			1	0	0	0	0	0	0	0
Sub contrast G	8	02H	A27	A26	A25	A24	A23	A22	A21	A20
			1	0	0	0	0	0	0	0
Sub contrast B	8	03H	A37	A36	A35	A34	A33	A32	A31	A30
			1	0	0	0	0	0	0	0
Main bright	8	04H	A47	A46	A45	A44	A43	A42	A41	A40
			1	0	0	0	0	0	0	0
Sub bright R	8	05H	A57	A56	A55	A54	A53	A52	A51	A50
			1	0	0	0	0	0	0	0
Sub bright G	8	06H	A67	A66	A65	A64	A63	A62	A61	A60
			1	0	0	0	0	0	0	0
Sub bright B	8	07H	A77	A76	A75	A74	A73	A72	A71	A70
			1	0	0	0	0	0	0	0
OSD level	4	08H	—	—	—	—	A83	A82	A81	A80
			0	0	0	0	0	0	0	0
INPUT SW	1	09H	—	—	—	—	—	—	—	A90
			0	0	0	0	0	0	0	0
OSD SW	1	0AH	—	—	—	—	—	—	—	AA0
			0	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	100	kHz
Time the bus must be free before a new transmission can start	t_{BUF}	4.7	—	µs
Hold time start condition. After this period the first clock pulse is generated	$t_{HD:STA}$	4.0	—	µs
The LOW period of the clock	t_{LOW}	4.7	—	µs
The HIGH period of the clock	t_{HIGH}	4.0	—	µs
Set up time for start condition (Only relevant for a repeated start condition)	$t_{SU:STA}$	4.7	—	µs
Hold time DATA	$t_{HD:DAT}$	0	—	µs
Set-up time DATA	$t_{SU:DAT}$	250	—	ns
Rise time of both SDA and SCL lines	tr	—	1000	ns
Fall time of both SDA and SCL lines	tf	—	300	ns
Set-up time for stop condition	$t_{SU:STO}$	4.0	—	µs



Electrical Characteristics

If SW connect is not designated RGB Input SW: SW (30, 35, 40) = a (b) SW (32, 37, 42) = b (a), SW (2, 5, 9, 16, 19, 20, 24, 25, 26, 27) = a

(V_{CC} = 5 V, Ta = 25°C)

Item	Symbol	Limits Min.	Limits Typ.	Limits Max.	Unit	Test Point	RGB Input Signal	SW Connect	BUS CTL (H) 00H Main Cont	01H Sub Cont 1	02H Sub Cont 2	03H Sub Cont 3	04H Main brt	05H Sub brt 1	06H Sub brt 2	07H Sub brt 3	08H OSD Adj	09H Input SW	0AH OSD SW	Re-mark
Circuit current1	I_{CC1}	—	155	185	mA	I_A	—	RGB Input SW = a (All)	A6H 166	A6H 166	A6H 166	A6H 166	00H 0	00H 0	00H 0	00H 0	00H 0	—	—	—
Output dynamic range	Vomax	2.2	—	—	V_{P-P}	OUT	SG2	—	↓	↓	↓	↓	vari-able	vari-able	vari-able	vari-able	↓	↓	↓	—
Maximum input1	Vimax1	1.0	—	—	V_{P-P}	IN OUT	SG2 Amplitude Variable	↓	7FH 127	7FH 127	7FH 127	7FH 127	40H 64	7FH 127	7FH 127	7FH 127	↓	↓	↓	—
Maximum input2	Vimax2	1.0	—	—	V_{P-P}	IN OUT	SG2 Amplitude Variable	SW (30, 35, 40) = b SW (32, 37, 42) = a	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Maximum gain	GV	11.9	13.9	15.9	dB	OUT	SG1	—	FFH 255	FFH 255	FFH 255	FFH 255	↓	↓	↓	↓	↓	↓	↓	—
Relative maximum gain	ΔGV	0.8	1.0	1.2	—	—	—	↓	—	—	—	—	↓	↓	↓	↓	↓	↓	↓	—
Main contrast control characteristics1	VC1	6.4	7.9	9.4	dB	OUT	SG1	↓	C8H 200	7FH 127	7FH 127	7FH 127	↓	↓	↓	↓	↓	↓	↓	—
Main contrast control characteristics2	VC2	2.3	4.1	5.9	dB	OUT	SG1	↓	64H 100	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Main contrast control characteristics3	VC3	0.2	0.4	0.6	V_{P-P}	OUT	SG1	↓	00H 0	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Sub contrast control characteristics1	VSC1	6.3	7.8	9.4	dB	OUT	SG1	↓	7FH 127	C8H 200	C8H 200	C8H 200	↓	↓	↓	↓	↓	↓	↓	—
Sub contrast control characteristics2	VSC2	2.6	4.3	6.0	dB	OUT	SG1	↓	↓	64H 100	64H 100	64H 100	↓	↓	↓	↓	↓	↓	↓	—
Sub contrast control characteristics3	VSC3	0.2	0.4	0.6	V_{P-P}	OUT	SG1	↓	↓	00H 0	00H 0	00H 0	↓	↓	↓	↓	↓	↓	↓	—
Main/sub contrast control characteristics	VMSC	1.7	2.0	2.3	V_{P-P}	OUT	SG1	↓	A6H 166	A6H 166	A6H 166	A6H 166	↓	↓	↓	↓	↓	↓	↓	—
Main brightness control characteristics1	VB1	1.3	1.7	2.0	V	OUT	—	RGB Input SW = a (All)	A6H 166	A6H 166	A6H 166	A6H 166	7FH 127	↓	↓	↓	↓	↓	↓	—
Main brightness control characteristics2	VB2	0.4	0.6	0.8	V	OUT	—	↓	↓	↓	↓	↓	00H 0	↓	↓	↓	↓	↓	↓	—
Sub brightness control characteristics1	VSB1	1.7	2.2	2.6	V	OUT	—	↓	↓	↓	↓	↓	7FH 127	FFH 255	FFH 255	FFH 255	↓	↓	↓	—
Sub brightness control characteristics2	VSB2	1.3	1.7	2.0	V	OUT	—	↓	↓	↓	↓	↓	↓	7FH 127	7FH 127	7FH 127	↓	↓	↓	—
Sub brightness control characteristics3	VSB3	0.7	1.0	1.3	V	OUT	—	↓	↓	↓	↓	↓	↓	00H 0	00H 0	00H 0	↓	↓	↓	—
Frequency characteristics1 (50 MHz-2 V_{P-P})	FC1	–3.0	0	3.0	dB	OUT	SG3	—	vari-able	↓	↓	↓	40H 64	7FH 127	7FH 127	7FH 127	00H 0	—	—	refer-ence
Frequency relative characteristics1 (180 MHz-2 V_{P-P})	ΔFC1	–1.0	0	1.0	dB	—	—	↓	A6H 166	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Frequency characteristics2 (50 MHz-2 V_{P-P})	FC2	–4.0	–3.0	1.0	dB	OUT	SG3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Frequency relative characteristics2 (50 MHz-2 V_{P-P})	ΔFC2	–1.0	0	1.0	dB	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Frequency characteristics3 (180 MHz-1 V_{P-P})	FC3	–1.0	0	1.0	dB	OUT	SG3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Frequency relative characteristics3 (180 MHz-1 V_{P-P})	ΔFC3	–1.0	0	1.0	dB	—	—	↓	37H 55	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Frequency characteristics4 (180 MHz-2 V_{P-P}-Cap)	FC4	–4.0	–3.0	1.0	dB	OUT	SG3	SW (2, 5, 9) = b	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Frequency relative characteristics4 (180 MHz-2 V_{P-P}-Cap)	ΔFC4	–1.0	0	1.0	dB	—	—	—	A6H 166	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

Electrical Characteristics (cont.)

Item	Symbol	Limits Min.	Typ.	Max.	Unit	Test Point	RGB Input Signal	SW Connect	BUS CTL (H) 00H Main Cont	01H Sub Cont 1	02H Sub Cont 2	03H Sub Cont 3	04H Main brt	05H Sub brt 1	06H Sub brt 2	07H Sub brt 3	08H OSD Adj	09H Input SW	0AH OSD SW	Re-mark
Crosstalk1 input1-2 50 MHz-1	INCT1	—	–35	–30	dB	OUT (2) OUT (5) OUT (9)	SG3	SW (42) = b, Other SW = a SW (37) = b, Other SW = a SW (32) = b, Other SW = a	A6H 166	A6H 166	A6H 166	A6H 166	40H 64	7FH 127	7FH 127	7FH 127	00H 0	00H 0	—	refer- ence
Crosstalk1' input1-2 50 MHz-1	INCT1'	—	–15	–10	dB	OUT (2) OUT (5) OUT (9)	SG3	↓										↓		
Crosstalk2 input1-2 50 MHz-2	INCT2	—	–35	–30	dB	OUT (2) OUT (5) OUT (9)	SG3	SW (40) = b, Other SW = a SW (35) = b, Other SW = a SW (30) = b, Other SW = a										01H 1		
Crosstalk2' input1-2 50 MHz-2	INCT2'	—	–15	–10	dB	OUT (2) OUT (5) OUT (9)	SG3	↓										↓		
Crosstalk1 between RGB ch 50 MHz-1	CHCT1	—	–25	–20	dB	OUT	SG3	SW (42) = b, Other SW = a										—		
Crosstalk1' between RGB ch 180 MHz-1	CHCT1'	—	–15	–10	dB	OUT	SG3	↓												
Crosstalk2 between RGB ch 50 MHz-2	CHCT2	—	–25	–20	dB	OUT	SG3	SW (37) = b, Other SW = a												
Crosstalk2' between RGB ch 180 MHz-2	CHCT2'	—	–15	–10	dB	OUT	SG3	↓												
Crosstalk3 between RGB ch 50 MHz-3	CHCT3	—	–25	–20	dB	OUT	SG3	SW (32) = b, Other SW = a												
Crosstalk3' between RGB ch 50 MHz-3	CHCT3'	—	–15	–10	dB	OUT	SG3	↓												
Pulse characteristics Tr1	Tr1	—	1.1	—	ns	OUT	SG1	—												
Relative pulse characteristics Tr1	ΔTr1	–0.8	0.0	0.8	ns	—	—													
Pulse characteristics Tf1	Tf1	—	1.1	—	—	OUT	SG1													
Relative pulse characteristics Tf1	ΔTf1	–0.8	0.0	0.8	—	—	—	↓												
Pulse characteristics Tr2	Tr2	—	2.0	—	ns	OUT	SG1	SW (2, 5, 9) = b												
Relative pulse characteristics Tr2	ΔTr2	–0.8	0.0	0.8	ns	—	—	—												
Pulse characteristics Tf2	Tf2	—	2.0	—	—	OUT	SG1	SW (2, 5, 9) = b												
Relative pulse characteristics Tf2	ΔTf2	–0.8	0.0	0.8	—	—	—	—												↓
Clamp pulse threshold voltage	VthCP	1.5	2.0	2.5	V	OUT	SG1	—												—
Clamp pulse minimum width	WCP	0.2	0.5	—	µs	OUT	SG1	—	↓	↓	↓	↓	↓	↓	↓	↓	↓		↓	—
OSD pulse characteristics Tr	OTr	—	3.0	6.0	ns	OUT	—	SW (24, 25, 26, 27) = b	00H 0	00H 0	00H 0	00H 0	40H 64	7FH 127	7FH 127	7FH 127	0FH 15		00H 0	refer- ence
OSD pulse characteristics Tf	OTf	—	3.0	6.0	ns	—	—		↓	↓	↓	↓					↓		↓	↓
OSD adjust control characteristics1	Oaj1	0	0	0.2	V_{P-P}	OUT	—		A6H 166	A6H 166	A6H 166	A6H 166					00H 0		00H 0	—
OSD adjust control characteristics2	Oaj2	0.9	1.2	1.5	V_{P-P}	OUT	—										01H 1		00H 0	—
OSD adjust control relative characteristics2	ΔOaj2	0.75	1.0	1.25	—	—	—										—		—	—
OSD adjust control characteristics3	Oaj3	1.8	2.1	2.5	V_{P-P}	OUT	—										0FH 15		00H 0	—
OSD adjust control relative characteristics3	ΔOaj3	0.75	1.0	1.25	—	—	—										—		—	—
OSD adjust control characteristics4	Oaj4	0	0	0.2	V_{P-P}	OUT	—										00H 0		01H 1	—
OSD adjust control characteristics5	Oaj5	0.4	0.6	0.8	V_{P-P}	OUT	—										01H 1		01H 1	—
OSD adjust control relative characteristics5	ΔOaj5	0.75	1.0	1.25	—	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	—	↓	—	—

Electrical Characteristics (cont.)

Item	Symbol	Limits Min.	Limits Typ.	Limits Max.	Unit	Test Point	RGB Input Signal	SW Connect	BUS CTL (H) 00H Main Cont	01H Sub Cont 1	02H Sub Cont 2	03H Sub Cont 3	04H Main brt	05H Sub brt 1	06H Sub brt 2	07H Sub brt 3	08H OSD Adj	09H Input SW	0AH OSD SW	Re-mark
OSD adjust control characteristics6	Oaj6	0.9	1.2	1.5	V_{P-P}	OUT	—	SW (24, 25, 26, 27) = b	A6H 166	A6H 166	A6H 166	A6H 166	40H 64	7FH 127	7FH 127	7FH 127	0FH 15	—	01H 1	—
OSD adjust control relative characteristics6	ΔOaj6	0.75	1.0	1.25	—	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	—	↓	—	—
OSD BLK characteristics	OBLK	0.0	0.1	0.3	V_{P-P}	OUT	—	SW (24, 25, 26) = a SW (27) = b	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
OSD BLK relative characteristics	ΔOBLK	–0.15	0.0	0.15	V	—	—	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
OSD input threshold voltage	VthOSD	2.0	2.5	3.0	V	OUT	—	SW (24, 25, 26, 27) = a	↓	↓	↓	↓	↓	↓	↓	↓	0FH 15	↓	00H 0	—
OSD BLK input threshold voltage	VthBLK	2.0	2.5	3.0	V	OUT	SG1	SW (27) = b	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Pin 19 Input current H	I_{19H}	–1.0	0.0	—	μA	I_{19}	—	SW (19) = b V19 = 5 V	—	—	—	—	—	—	—	—	—	—	—	—
Pin 19 Input current L	I_{19L}	—	0.6	2.0	μA	I_{19}	—	SW (19) = b V19 = 0 V	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Pin 20 Input current H	I_{20H}	–1.0	0.0	—	μA	I_{20}	—	SW (20) = b V20 = 5 V	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Pin 20 Input current L	I_{20L}	—	0.6	2.0	μA	I_{20}	—	SW (20) = b V20 = 0 V	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Pin 24, 25, 26 Input current H	I_{OSDH}	–2.0	–1.3	—	mA	I_{24} I_{25} I_{26}	—	SW (24, 25, 26) = b VOSD = 5 V	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Pin 24, 25, 26 Input current L	I_{OSDL}	—	1.3	2.0	mA	I_{24} I_{25} I_{26}	—	SW (24, 25, 26) = b VOSD = 0 V	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Pin 27 Input current H	I_{27H}	–2.0	–1.3	—	mA	I_{27}	—	SW (27) = b V27 = 5 V	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—
Pin 27 Input current L	I_{27L}	—	1.3	2.0	mA	I_{27}	—	SW (27) = b V27 = 0 V	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	—

Electrical Characteristics Test Method

I_{CC1} Circuit Current1

Measuring conditions are as listed in supplementary Table.

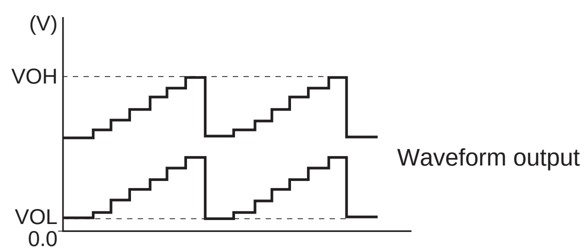
Measured with a current meter at test point I_A.

Vomax Output Dynamic Range

Decrease main bat or sub bat gradually, and measure the voltage when the bottom of waveform output is distorted. The voltage is called VOL.

Next, increase V30 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:

Vomax = VOH – VOL



Vimax1 Maximum Input1

Increase the input signal (SG2) at Input1 amplitude gradually, starting from 700 mV_{P-P}. Measure the amplitude of the input signal when the output signal starts becoming distorted.

Vimax2 Maximum Input2

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

GV Maximum Gain

Input SG1, and read the amplitude output at OUT (2, 5, 9). The amplitude is called VOUT (2, 5, 9). Maximum gain GV is calculated by the equation below:

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

ΔGV Relative Maximum Gain

Relative maximum gain ΔGV is calculated by the equation below:

$$\Delta GV = VOUT\ (2)\ /\ VOUT\ (5),$$
$$VOUT\ (5)\ /\ VOUT\ (9),$$
$$VOUT\ (9)\ /\ VOUT\ (2)$$

VC1 Main Contrast Control Characteristics1

Measuring the amplitude output at OUT (2, 5, 9). The measured value is called VOUT (2, 5, 9).

$$VC1 = 20\log \frac{VOUT}{0.7} \quad (dB)$$

VC2 Main Contrast Control Characteristics2

Measuring condition and procedure are the same as described in VC1.

VC3 Main Contrast Control Characteristics3

Measuring condition and procedure are the same as described in VC1.

VSC1 Sub Contrast Control Characteristics1

Measuring condition and procedure are the same as described in VC1.

VSC2 Sub Contrast Control Characteristics2

Measuring condition and procedure are the same as described in VC1.

VSC3 Sub Contrast Control Characteristics3

Measuring condition and procedure are the same as described in VC1.

VMSC Main/sub Contrast Control Characteristics

Measuring condition and procedure are the same as described in VC1.

VB1 Main Brightness Control Characteristics1

Measure the DC voltage output at OUT (2, 5, 9). The measured value is called VB1.

VB2 Main Brightness Control Characteristics2

Measuring condition and procedure are the same as described in VB1.

VSB1 Sub Brightness Control Characteristics1

Measuring condition and procedure are the same as described in VB1.

VSB2 Sub Brightness Control Characteristics2

Measuring condition and procedure are the same as described in VB1.

VSB3 Sub Brightness Control Characteristics3

Measuring condition and procedure are the same as described in VB1.

FC1 Frequency Characteristics1 (50 MHz-2 V_{P-P})

First, SG3 to 1 MHz is as input signal.

Control the main contrast in order that the amplitude of sine wave output is 2.0 V_{P-P}. Control the brightness in order that the bottom of sine wave output is 1.0 V. By the same way, measure the output amplitude when SG3 to 50 MHz is as input signal. The measured value is called VOUT (2, 5, 9).

Frequency characteristics FC1 (2, 5, 9) is calculated by the equation below:

$$FC1 = 20\log \frac{\text{VOUT } V_{P-P}}{\text{Output amplitude when inputted SG3 (1 MHz): 2.0 } V_{P-P}} \quad \text{(dB)}$$

ΔFC1 Frequency Relative Characteristics1 (180 MHz-2 V_{P-P})

Relative characteristics ΔFC1 is calculated by the difference in the output between the channels.

FC2 Frequency Characteristics2 (50 MHz-2 V_{P-P})

Measuring condition and procedure are the same as described in FC1, expect SG3.

ΔFC2 Frequency Relative Characteristics2 (50 MHz-2 V_{P-P})

Relative characteristics ΔFC2 is calculated by the difference in the output between the channels.

FC3 Frequency Characteristics3 (180 MHz-1 V_{P-P})

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 180 MHz is as input signal.

ΔFC3 Frequency Relative Characteristics3 (180 MHz-1 V_{P-P})

Relative characteristics ΔFC3 is calculated by the difference in the output between the channels.

FC4 Frequency Characteristics4 (180 MHz-2 V_{P-P}-Cap)

Change OUT SW from a to b. Measuring condition and procedure are the same as described in FC1.

ΔFC4 Frequency Relative Characteristics4 (180 MHz-2 V_{P-P}-Cap)

Relative characteristics ΔFC4 is calculated by the difference in the output between the channels.

INCT1 Crosstalk1 Input1-2 50 MHz-1

Input SG3 (50 MHz) to pin 42 only, set Input SW of I^2C BUS to 0 and then measure the waveform amplitude output at OUT (2). The measured value is called VOUT (2). On equal terms set Input SW of I^2C BUS to 1. And then measure the waveform amplitude output at OUT (2)'. Crosstalk INCT1 is calculated by the equation below:

$$INCT1 = 20\log \frac{VOUT\ (2)'}{VOUT\ (2)} \quad (dB)$$

Similarly measure the waveform amplitude output at OUT (5) when signal input only pin 37 and OUT when signal input only pin 32 and calculate crosstalk.

INCT1' Crosstalk1' Input1-2 50 MHz-1

Measuring condition and procedure are the same as described in INCT1, expect SG3 to 180 MHz.

INCT2 Crosstalk2 Input1-2 50 MHz-2

Input SG3 (50 MHz) to pin 40 only, set Input SW of I^2C BUS to 1 and then measure the waveform amplitude output at OUT (2). The measured value is called VOUT (2). On equal terms set Input SW of I^2C BUS to 0. And then measure the waveform amplitude output at OUT (2)'. Crosstalk INCT2 is calculated by the equation below:

$$INCT2 = 20\log \frac{VOUT\ (2)'}{VOUT\ (2)} \quad (dB)$$

Similarly measure the waveform amplitude output at OUT (5) when signal input only pin 35 and OUT when signal input only pin 30 and calculate crosstalk.

INCT2' Crosstalk2' Input1-2 50 MHz-2

Measuring condition and procedure are the same as described in INCT2, expect SG3 to 180 MHz.

CHCT1 Crosstalk1 between RGB Ch 50 MHz-1

Input SG3 (50 MHz) to pin 42 only, and then measure the waveform amplitude output at OUT (2, 5, 9). The measured value is called VOUT (2, 5, 9). Crosstalk CHCT1 is calculated by the equation below:

$$CHCT1 = 20\log \frac{VOUT\ (5,\ 9)}{VOUT\ (2)} \quad (dB)$$

CHCT1' Crosstalk1' between RGB Ch 180 MHz-1

Measuring condition and procedure are the same as described in CHCT1, expect SG3 to 180 MHz.

CHCT2 Crosstalk2 between RGB Ch 50 MHz-2

Input SG3 (50 MHz) to pin 37 only, and then measure the waveform amplitude output at OUT (2, 5, 9). The measured value is called VOUT (2, 5, 9). Crosstalk CHCT2 is calculated by the equation below:

$$CHCT2 = 20\log \frac{VOUT\ (2,\ 9)}{VOUT\ (5)} \quad (dB)$$

CHCT2' Crosstalk2' between RGB Ch 180 MHz-2

Measuring condition and procedure are the same as described in CHCT2, expect SG3 to 180 MHz.

CHCT3 Crosstalk3 between RGB Ch 50 MHz-3

Input SG3 (50 MHz) to pin 32 only, and then measure the waveform amplitude output at OUT (2, 5, 9). The measured value is called VOUT (2, 5, 9). Crosstalk CHCT3 is calculated by the equation below:

$$CHCT3 = 20\log \frac{VOUT\ (2,\ 5)}{VOUT\ (9)} \quad (dB)$$

CHCT3' Crosstalk3' between RGB Ch 50 MHz-3

Measuring condition and procedure are the same as described in CHCT3, expect SG3 to 180 MHz.

Tr1 Pulse Characteristics Tr1

Control the contrast in order that the amplitude of output signal is 2.0 V_{P-P}.

Control the brightness in order that the Black level of output signal is 1.0 V.

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

Pulse characteristics Tr1 is calculated by the equations below:

$$Tr1 = \sqrt{(Trin)^2 - (Trout)^2} \quad (ns)$$

ΔTr1 Relative Pulse Characteristics Tr1

Relative Pulse characteristics ΔTr1 is calculated by the equation below:

ΔTr1 = VOUT (2) – VOUT (5),
VOUT (5) – VOUT (9),
VOUT (9) – VOUT (2)

Tf1 Pulse Characteristics Tf1

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

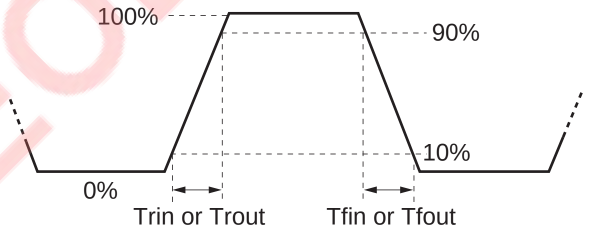
Pulse characteristics Tf1 is calculated by the equations below:

$$Tf1 = \sqrt{(Tfin)^2 - (Tfout)^2} \quad (ns)$$

ΔTf1 Relative Pulse Characteristics Tf1

Relative Pulse characteristics ΔTf1 is calculated by the equation below:

ΔTf1 = VOUT (2) – VOUT (5),
VOUT (5) – VOUT (9),
VOUT (9) – VOUT (2)



Tr2 Pulse Characteristics Tr2

Change SW (2, 5, 9) from (a) to (b). Measuring condition and procedure are the same as described in Tr1.

ΔTr2 Relative Pulse Characteristics Tr2

Measuring condition and procedure are the same as described in ΔTr1, except of SW (2, 5, 9) condition.

Tf2 Pulse Characteristics Tf2

Change SW (2, 5, 9) from (a) to (b). Measuring condition and procedure are the same as described in Tf1.

ΔTf2 Relative Pulse Characteristics Tf2

Measuring condition and procedure are the same as described in ΔTf1, except of SW (2, 5, 9) condition.

VthCP Clamp Pulse Threshold Voltage

Reduce the SG4 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 SG4 pulse width gradually from 0.G µs, monitoring the output. Measure the SG4 pulse width (a point of 1.5 V) when the output pedestal voltage turn decrease with unstable.

OTr OSD Pulse Characteristics Tr

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

OTf OSD Pulse Characteristics Tf

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 (2, 5, 9). The measured value is called VOUT (2, 5, 9), and is treated as Oaj1.

Oaj2 OSD Adjust Control Characteristics2

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

ΔOaj2 OSD Adjust Control Relative Characteristics2

Relative characteristics ΔOaj2 is calculated by the equation below:

$$\Delta Oaj2 = VOUT (2) / VOUT (5),$$
$$VOUT (5) / VOUT (9),$$
$$VOUT (9) / VOUT (2)$$

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 ΔOaj2.

Oaj4 OSD Adjust Control Characteristics4

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

Oaj5 OSD Adjust Control Characteristics5

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

ΔOaj5 OSD Adjust Control Relative Characteristics5

Measuring condition and procedure are the same as described in ΔOaj2.

Oaj6 OSD Adjust Control Characteristics6

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

ΔOaj6 OSD Adjust Control Relative Characteristics6

Measuring condition and procedure are the same as described ΔOaj2.

OBLK OSD BLK Characteristics

Measuring the amplitude output at OUT (2, 5, 9). The measured value is called OBLK.

ΔOBLK OSD BLK Relative Characteristics

Relative OSD BLK characteristics ΔOBLK is calculated by the equation below:

ΔOBLK = VOUT (2) / VOUT (5),
VOUT (5) / VOUT (9),
VOUT (9) / VOUT (2)

VthOSD OSD Input Threshold Voltage

Reduce the SG5 input level gradually, monitoring output. Measure the SG5 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 SG5 at the time.

Monitoring to output signal, decreasing the level of SG5. Measure the top level of SG6 when the blanking period is disappeared. The measured value is called VthBLK.

I_{19H} Pin 19 Input Current H

Supply 5 V to V19, and then measure input current into pin 19.

I_{19L} Pin 19 Input Current L

Supply 0 V to V19, and then measure input current into pin 19.

I_{20H} Pin 20 Input Current H

Supply 5 V to V20, and then measure input current into pin 20.

I_{20L} Pin 20 Input Current L

Supply 0 V to V20, and then measure input current into pin 20.

I_{OSDH} Pin 24, 25, 26 Input Current H

Supply 5 V to V (24, 25, 26) and then measure input current into pin (24, 25, 26)

I_{OSDL} Pin 24, 25, 26 Input Current L

Supply 0 V to V (24, 25, 26) and then measure input current into pin (24, 25, 26)

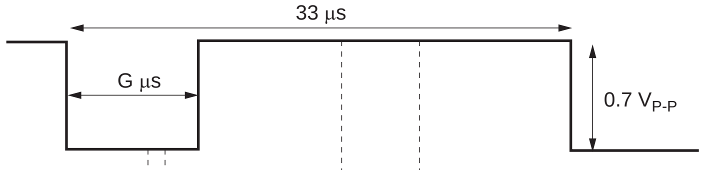
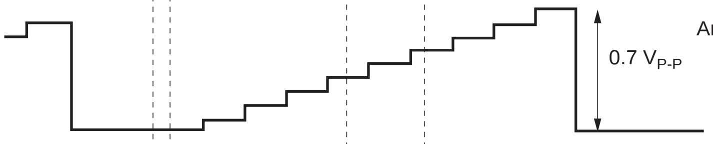
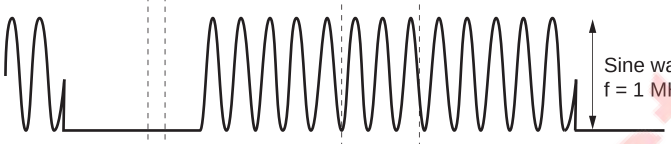
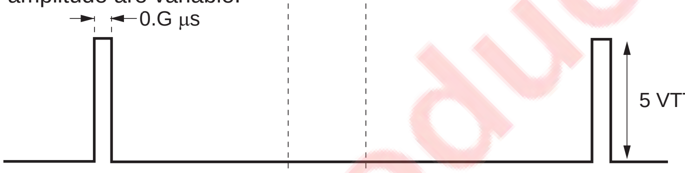
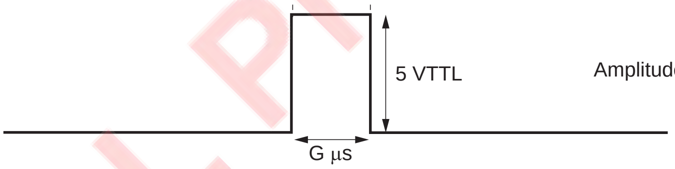
I_{27H} Pin 27 Input Current H

Supply 5 V to V27, and then measure input current into pin 27.

I_{27L} Pin 27 Input Current L

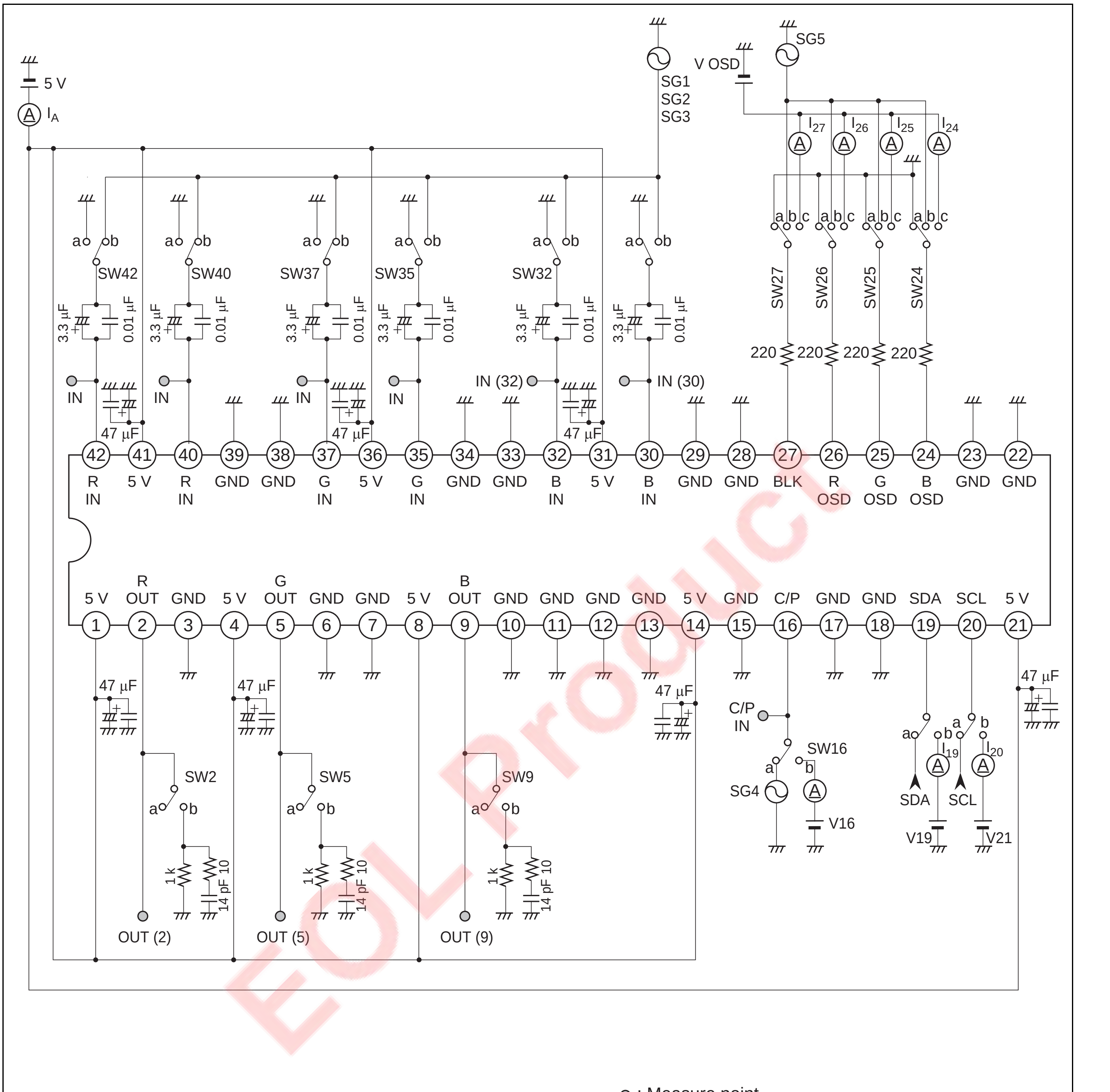
Supply 0 V to V27, and then measure input current into pin 27.

Input Signal

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 free. char.)	
SG4 Clamp pulse	Pulse width and amplitude are variable. 
SG5 OSD pulse	

Note: fH = 30 kHz

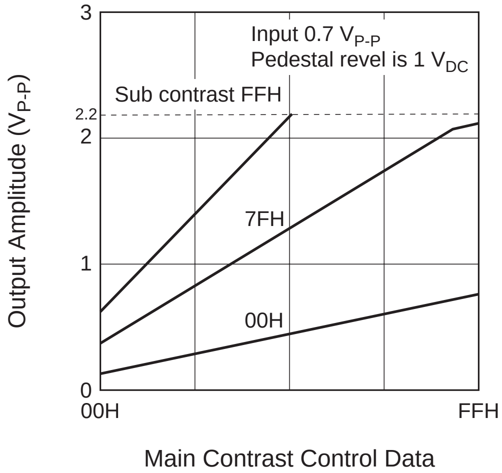
Test Circuit



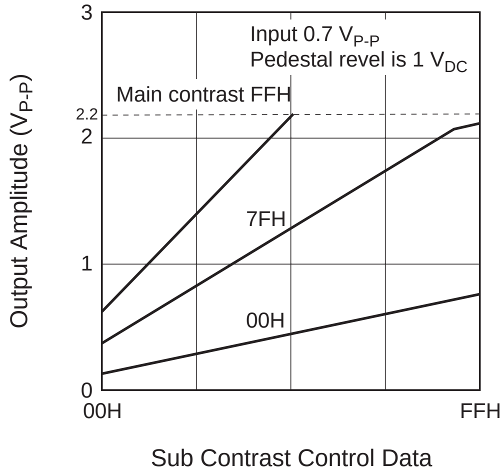
○ : Measure point
Condenser: 0.01 µF (unless otherwise specified.)

Typical Characteristics

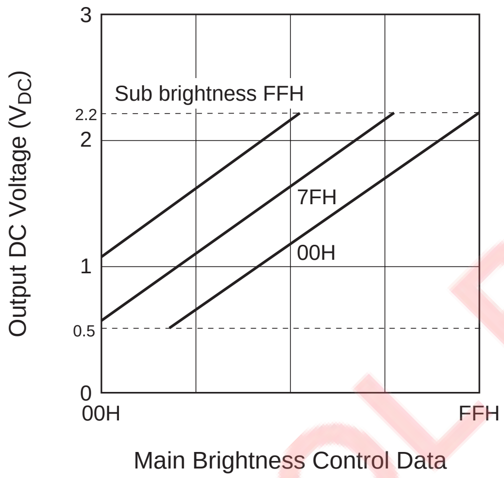
Main Contrast Control Characteristics



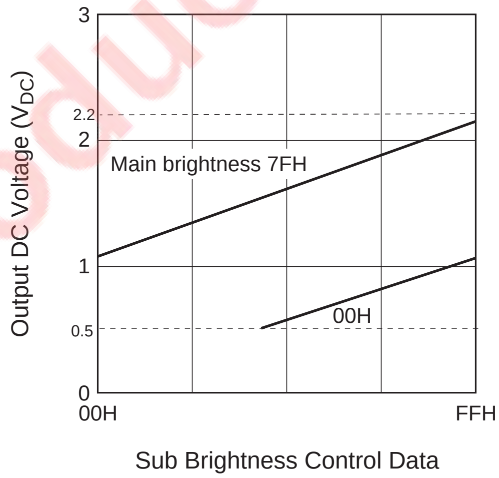
Sub Contrast Control Characteristics



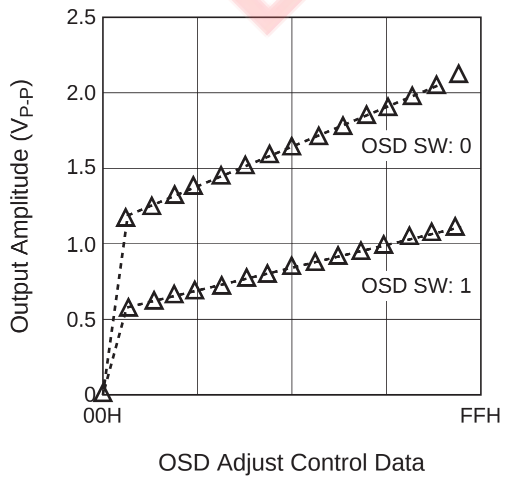
Main Brightness Control Characteristics



Sub Brightness Control Characteristics



OSD Adjust Control Characteristics



Application Method

Clamp Pulse Input

Clamp pulse width is recommended

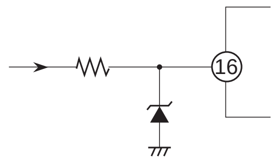
above 15 kHz, 1.0 μs

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.

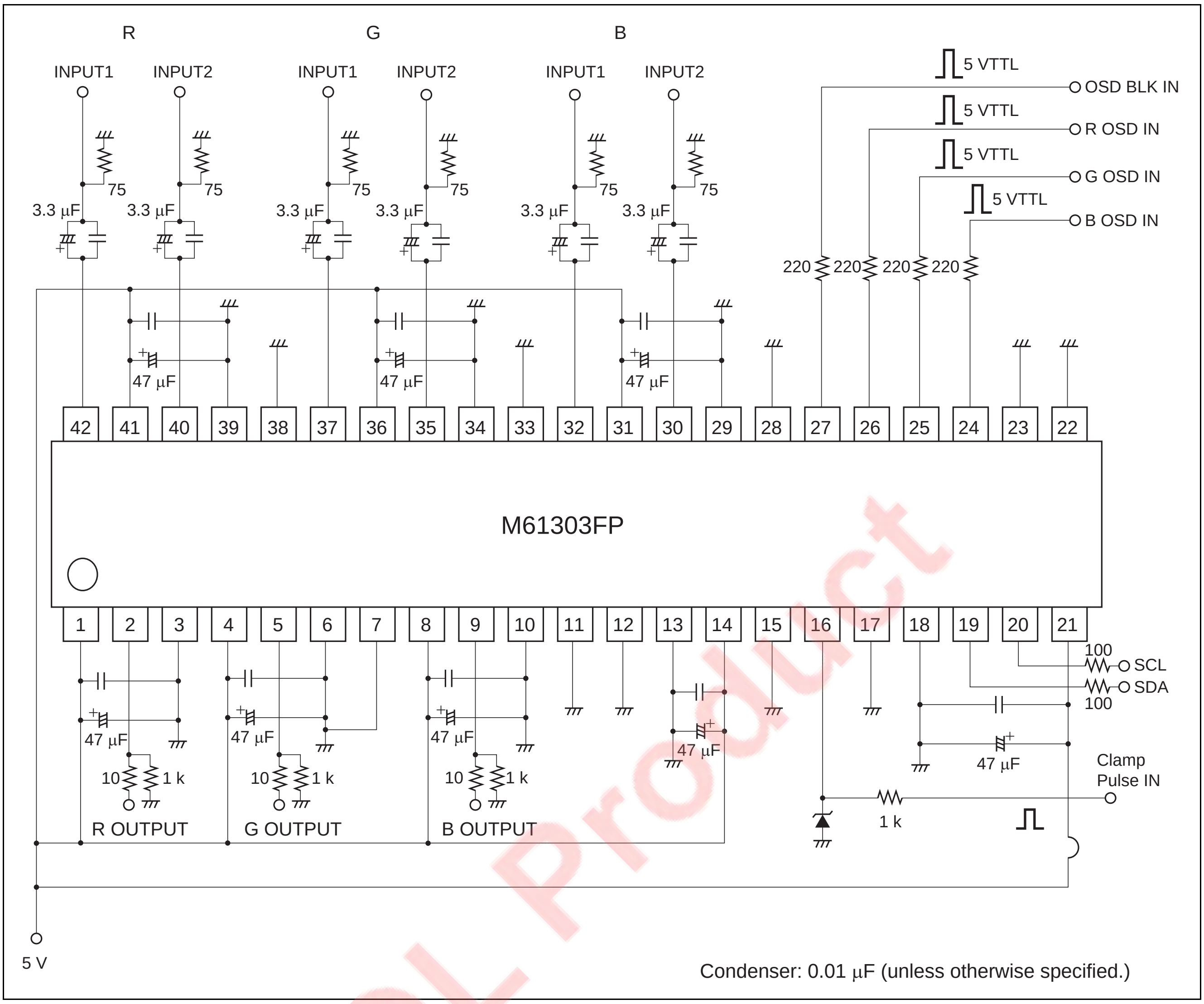
Therefore, the figure shown right is recommended.



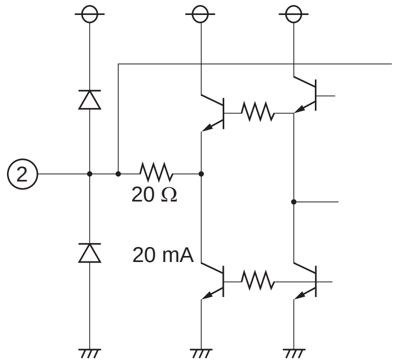
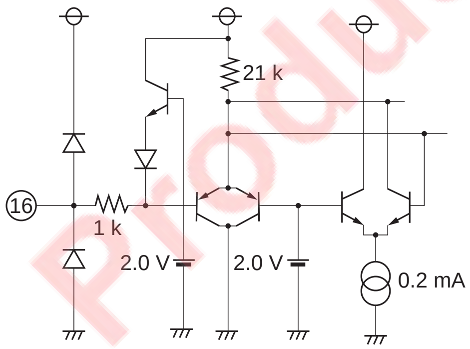
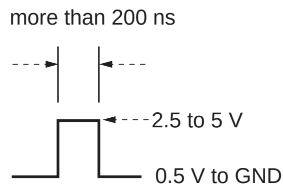
Notice of Application

1. Recommended pedestal voltage of IC output signal is l V.
2. This IC has 2 Input routes. When the 2 Input signal input at different timing, clamp pulses which synchronize with selected signals is needed. In this case, it is necessary to change clamp pulses by the outside circuit.
3. Connect coupling cap (0.01 μ) as nearer as can to V_{CC} pin. If not response of waveform is getting wrong.

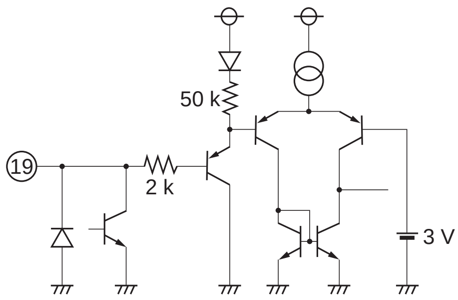
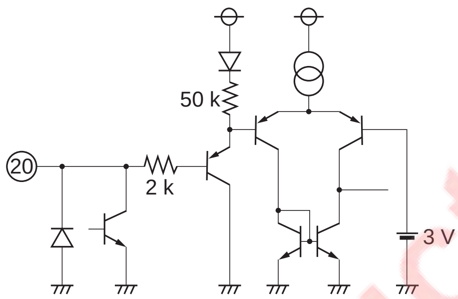
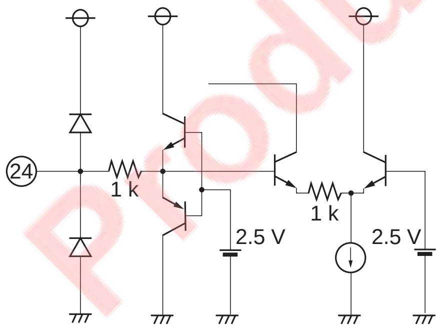
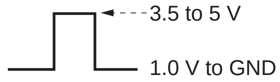
Application Example



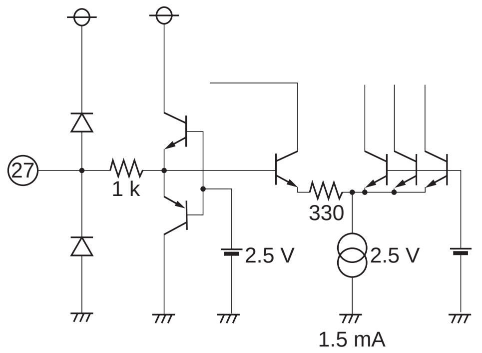
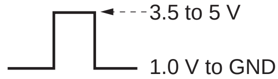
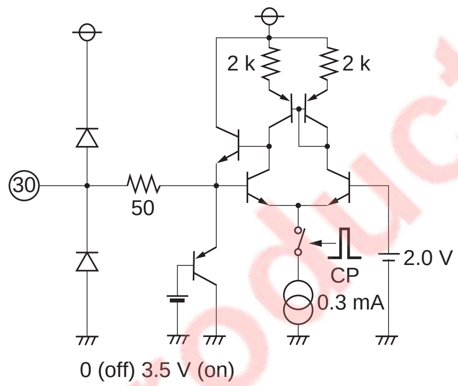
Pin Description

Pin No.	Name	DC Voltage (V)	Peripheral Circuit	Function
1 4 8	R V_{CC2} G V_{CC2} B V_{CC2}	5	—	—
2 5 9	OUTPUT (R) OUTPUT (G) OUTPUT (B)	—		Pull down about 1 k for valance control Tr and Tf
3 6 10	R GND 2 G GND 2 B GND 2	GND	—	—
13	Analog Gnd	GND	—	—
14	Analog V_{CC}	5	—	—
16	Clamp Pulse In	—		 Input at low impedance.

Pin Description (cont.)

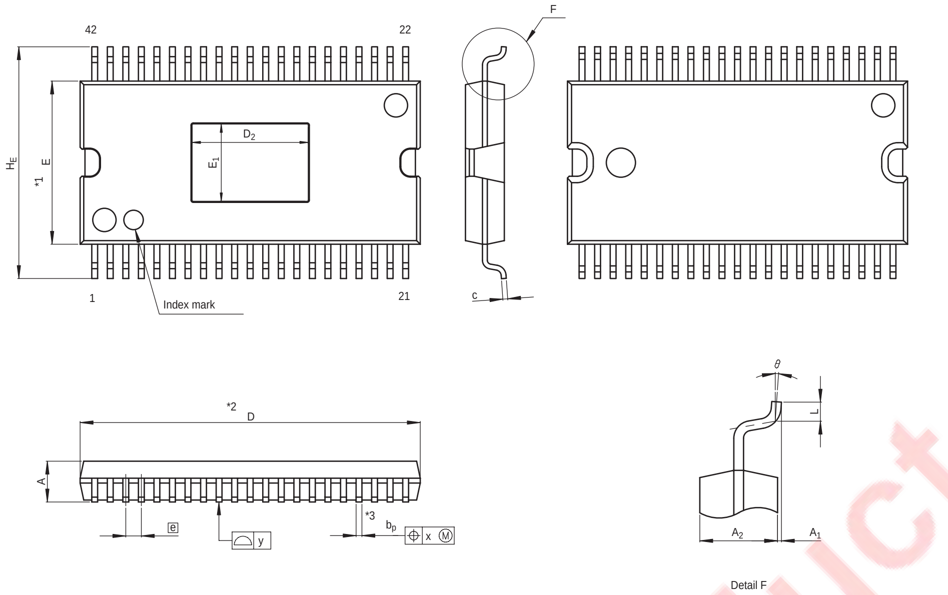
Pin No.	Name	DC Voltage (V)	Peripheral Circuit	Function
18	Digital GND	GND	—	—
19	SDA	—		SDA for I^2C (Serial data line) VTH = 2.3 V
20	SCL	—		SCL of I^2C (Serial clock line) VTH = 2.3 V
21	Digital V_{CC}	5V	—	—
24 25 26	B OSD IN G OSD IN R OSD IN	—		Input pulses 

Pin Description (cont.)

Pin No.	Name	DC Voltage (V)	Peripheral Circuit	Function
27	OSD BLK IN	—		Input pulses  Connected to GND if not used.
29 34 39	B GND 1 G GND 1 R GND 1	GND	—	—
30 32 35 37 40 42	B INPUT 2 B INPUT 1 G INPUT 2 G INPUT 1 R INPUT 2 R INPUT 1	2.1 V		Clamped to about 2.1 V due to clamp pulses from pin 16. Input at low impedance.
31 36 41	B V_{CC1} G V_{CC1} R V_{CC1}	5	—	—
7 11 12 15 17 22 23 28 33 38	NC	—	—	Connect GND for radiation of heat

Package Dimensions

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

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.
Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7858/7898

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2377-3473

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 3518-3399

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510

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