

AN5395FBP

Contour correction IC for HDTV

Overview

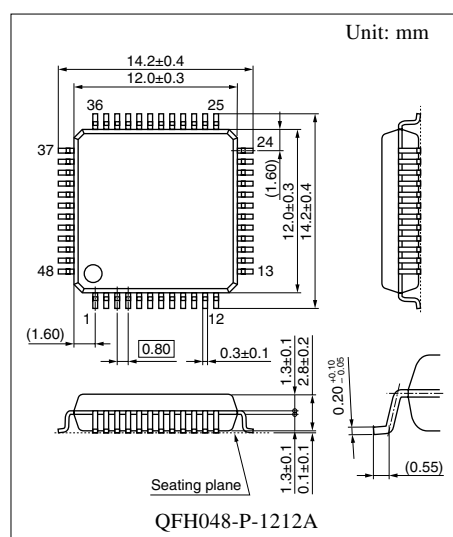
The AN5395FBP is a contour correction IC which enables correction band changeover for base band HDTV, MUSE, progressive NTSC TV.

Features

- Contour correction for HDTV
- Contour correction for progressive TV

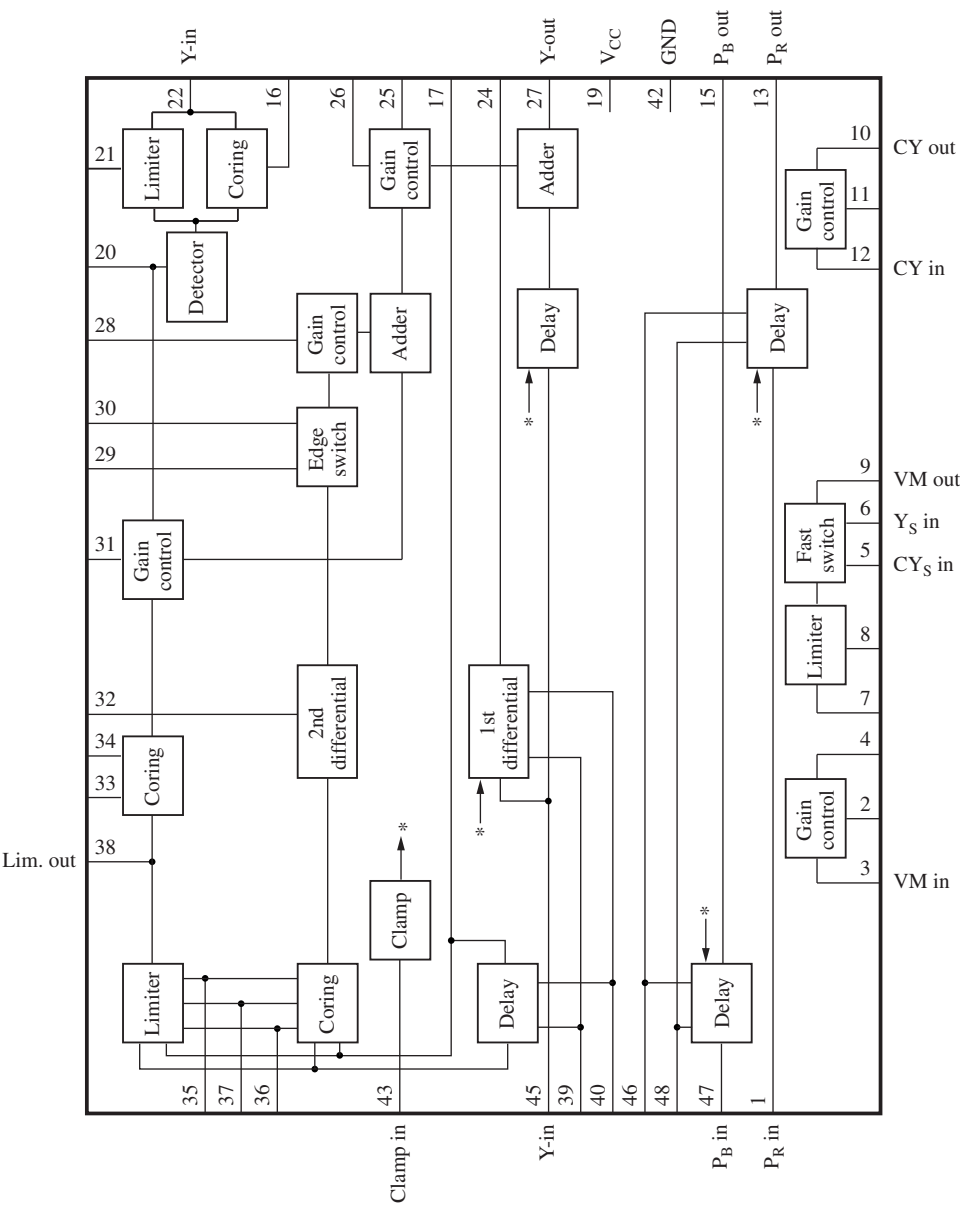
Applications

- HDTV



Note) The package of this product will be changed to lead-free type (QFH048-P-1212C). See the new package dimensions section later of this datasheet.

■ Block Diagram



■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	P _R input	25	Sharpness mute control
2	VM pre-amp. gain control	26	Sharpness control
3	VM pre-amp. input	27	Y output
4	VM pre-amp. output	28	Contour block gain control
5	Child picture Y _S input	29	Contour block bias
6	Y _S input	30	Secondary differentiating input
7	VM limiter amp. input	31	Detail gain control
8	VM limiter amp. gain control	32	Primary differentiating output after correction
9	VM limiter amp. output	33	Detail coring control
10	Child picture amp. output	34	Detail coring bias
11	Child picture amp. gain control	35	Differentiating signal bias 1
12	Child picture amp. input	36	Contour block and detail separation level control
13	P _R output		
14	N.C.	37	Differentiating signal bias 2
15	P _B output	38	Detail limiter output
16	DSC large signal gain control	39	Y delay line changeover switch 1
17	Primary differentiating input before correction	40	Y delay line changeover switch 2
18	N.C.	41	N.C.
19	V _{CC}	42	GND
20	DSC detection output	43	Clamp pulse input
21	DSC small signal gain control	44	N.C.
22	DSC input	45	Y input
23	DSC bias	46	C delay line changeover switch 1
24	Primary differentiating output before correction	47	P _B input
		48	C delay line changeover switch 2

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V _{CC}	10.0	V
Supply current	I _{CC}	100	mA
Power dissipation ^{*2}	P _D	650	mW
Operating ambient temperature ^{*1}	T _{opr}	−20 to +70	°C
Storage temperature ^{*1}	T _{stg}	−55 to +150	°C

Note) *1: Except for the operating ambient temperature and storage temperature, all ratings are for T_a = 25°C.

*2: The power dissipation shown is the value for T_a = 70°C.

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V _{CC}	8.1 to 9.9	V

■ Electrical Characteristics at T_a = 25°C

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Circuit current	I _{CC}		50	70	90	mA
Circuit voltage	V ₁		4.50	5.63	6.76	V
Circuit voltage	V ₂		4.40	5.86	7.33	V
Circuit voltage	V ₃		2.04	2.55	3.06	V
Circuit voltage	V ₄		4.64	5.80	6.96	V
Circuit voltage	V ₇		2.04	2.55	3.06	V
Circuit voltage	V ₉		4.60	5.75	6.90	V
Circuit voltage	V ₁₀		4.64	5.80	6.96	V
Circuit voltage	V ₁₁		4.40	5.86	7.33	V
Circuit voltage	V ₁₂		2.04	2.55	3.06	V
Circuit voltage	V ₁₃		3.74	4.67	5.60	V
Circuit voltage	V ₁₅		3.74	4.67	5.60	V
Circuit voltage	V ₁₆		3.80	4.75	5.70	V
Circuit voltage	V ₁₇		4.50	5.63	6.76	V
Circuit voltage	V ₂₁		3.40	4.25	5.10	V
Circuit voltage	V ₂₂		2.12	2.65	3.18	V
Circuit voltage	V ₂₄		3.70	4.62	5.54	V
Circuit voltage	V ₂₇		3.44	4.30	5.16	V
Circuit voltage	V ₂₉		2.93	3.66	4.39	V
Circuit voltage	V ₃₀		1.96	2.45	2.94	V
Circuit voltage	V ₃₁		2.71	3.61	4.51	V
Circuit voltage	V ₃₂		2.12	2.65	3.18	V
Circuit voltage	V ₃₃		4.27	5.34	6.41	V
Circuit voltage	V ₃₄		4.55	5.69	6.83	V
Circuit voltage	V ₃₅		2.65	3.31	3.97	V
Circuit voltage	V ₃₆		2.40	3.00	3.60	V
Circuit voltage	V ₃₇		2.65	3.31	3.97	V
Circuit voltage	V ₃₈		6.25	7.81	9.37	V
Circuit voltage	V ₃₉		1.80	2.90	4.00	V
Circuit voltage	V ₄₀		1.80	2.90	4.00	V
Circuit voltage	V ₄₅		4.50	5.63	6.76	V

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Circuit voltage	V_{46}		1.80	2.90	4.00	V
Circuit voltage	V_{47}		4.50	5.63	6.76	V
Circuit voltage	V_{48}		1.80	2.90	4.00	V
Circuit current	I_{23}		-1.50	0.00	1.50	μA
Circuit current	I_{43}		-1.50	0.00	1.50	μA
C-D.L block						
P_B output dynamic range	V_{DR15}	$V_{IN47} = 5.18 \text{ V to } 6.08 \text{ V}$	0.9	1.2	1.5	V[p-p]
P_R output dynamic range	V_{DR13}	$V_{IN1} = 5.18 \text{ V to } 6.08 \text{ V}$	0.9	1.2	1.5	V[p-p]
Delay time changeover switch C1 threshold level	V_{TH46}		0.9	1.5	2.1	V
Delay time changeover switch C2 threshold level	V_{TH48}		0.9	1.5	2.1	V
P_B signal output gain (HD)	$G_{A(PB,1)}$	$V_{A(PB,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
P_B signal output gain (MUSE)	$G_{B(PB,1)}$	$V_{B(PB,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
P_B signal output gain (NTSC1)	$G_{C(PB,1)}$	$V_{C(PB,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
P_B signal output gain (NTSC2)	$G_{D(PB,1)}$	$V_{D(PB,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
P_B signal output gain difference (MUSE/HD)	$G_{B/A(PB)}$	$V_{B(PB,1)} / V_{A(PB,1)}$	-1	0	1	dB
P_B signal output gain difference (NTSC1/HD)	$G_{C/A(PB)}$	$V_{C(PB,1)} / V_{A(PB,1)}$	-1	0	1	dB
P_B signal output gain difference (NTSC2/HD)	$G_{D/A(PB)}$	$V_{D(PB,1)} / V_{A(PB,1)}$	-1	0	1	dB
P_R signal output gain (HD)	$G_{A(PR,1)}$	$V_{A(PR,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
P_R signal output gain (MUSE)	$G_{B(PR,1)}$	$V_{B(PR,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
P_R signal output gain (NTSC1)	$G_{C(PR,1)}$	$V_{C(PR,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
P_R signal output gain (NTSC2)	$G_{D(PR,1)}$	$V_{D(PR,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
P_R signal output gain difference (MUSE/HD)	$G_{B/A(PR)}$	$V_{B(PR,1)} / V_{A(PR,1)}$	-1	0	1	dB
P_R signal output gain difference (NTSC1/HD)	$G_{C/A(PR)}$	$V_{C(PR,1)} / V_{A(PR,1)}$	-1	0	1	dB
P_R signal output gain difference (NTSC2/HD)	$G_{D/A(PR)}$	$V_{D(PR,1)} / V_{A(PR,1)}$	-1	0	1	dB
P_B, P_R signal output gain difference (HD)	$\Delta G_{A(C)}$	$V_{A(PB,1)} / V_{A(PR,1)}$	-1	0	1	dB
P_B, P_R signal output gain difference (MUSE)	$\Delta G_{B(C)}$	$V_{B(PB,1)} / V_{B(PR,1)}$	-1	0	1	dB
P_B, P_R signal output gain difference (NTSC1)	$\Delta G_{C(C)}$	$V_{C(PB,1)} / V_{C(PR,1)}$	-1	0	1	dB
P_B, P_R signal output gain difference (NTSC2)	$\Delta G_{D(C)}$	$V_{D(PB,1)} / V_{D(PR,1)}$	-1	0	1	dB
P_B signal frequency characteristics (HD)	$G_{A(PB,F)}$	$V_{A(PB,20)} / V_{A(PB,1)}$	-6	-3	0	dB
P_B signal frequency characteristics (MUSE)	$G_{B(PB,F)}$	$V_{B(PB,20)} / V_{B(PB,1)}$	-6	-3	0	dB
P_B signal frequency characteristics (NTSC1)	$G_{C(PB,F)}$	$V_{C(PB,16)} / V_{C(PB,1)}$	-6	-3	0	dB

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
C-D.L block (continued)						
P_B signal frequency characteristics (NTSC2)	$G_{D(PB,F)}$	$V_{D(PB,16)} / V_{D(PB,1)}$	-6	-3	0	dB
P_R signal frequency characteristics (HD)	$G_{A(PR,F)}$	$V_{A(PR,20)} / V_{A(PR,1)}$	-6	-3	0	dB
P_R signal frequency characteristics (MUSE)	$G_{B(PR,F)}$	$V_{B(PR,20)} / V_{B(PR,1)}$	-6	-3	0	dB
P_R signal frequency characteristics (NTSC1)	$G_{C(PR,F)}$	$V_{C(PR,16)} / V_{C(PR,1)}$	-6	-3	0	dB
P_R signal frequency characteristics (NTSC2)	$G_{D(PR,F)}$	$V_{D(PR,16)} / V_{D(PR,1)}$	-6	-3	0	dB
Y-D.L block						
Y output dynamic range	V_{DR27}	$V_{IN45} = 5.23 \text{ V to } 6.43 \text{ V}$	1.2	1.6	2.0	V[p-p]
Clamp pulse input threshold level	V_{TH43}		0.9	1.5	2.1	V
Delay time changeover switch Y1 threshold level	V_{TH39}		0.9	1.5	2.1	V
Delay time changeover switch Y2 threshold level	V_{TH40}		0.9	1.5	2.1	V
Y signal output gain (HD)	$G_{A(Y,1)}$	$V_{A(Y,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
Y signal output gain (MUSE)	$G_{B(Y,1)}$	$V_{B(Y,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
Y signal output gain (NTSC1)	$G_{C(Y,1)}$	$V_{C(Y,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
Y signal output gain (NTSC2)	$G_{D(Y,1)}$	$V_{D(Y,1)} / 0.1 \text{ V[p-p]}$	1.81	2.92	3.91	dB
Y signal output gain difference (MUSE/HD)	$G_{B/A(Y)}$	$V_{B(Y,1)} / V_{A(Y,1)}$	-1	0	1	dB
Y signal output gain difference (NTSC1/HD)	$G_{C/A(Y)}$	$V_{C(Y,1)} / V_{A(Y,1)}$	-1	0	1	dB
Y signal output gain difference (NTSC2/HD)	$G_{D/A(Y)}$	$V_{D(Y,1)} / V_{A(Y,1)}$	-1	0	1	dB
Y_1 signal output gain (HD)	$G_{A(Y1,1)}$	$V_{A(Y1,1)} / 0.1 \text{ V[p-p]}$	12	15	18	dB
Y_1 signal output gain (MUSE)	$G_{B(Y1,1)}$	$V_{B(Y1,1)} / 0.1 \text{ V[p-p]}$	12	15	18	dB
Y_1 signal output gain (NTSC1)	$G_{C(Y1,1)}$	$V_{C(Y1,1)} / 0.1 \text{ V[p-p]}$	12	15	18	dB
Y_1 signal output gain (NTSC2)	$G_{D(Y1,1)}$	$V_{D(Y1,1)} / 0.1 \text{ V[p-p]}$	12	15	18	dB
Y_1 signal output gain difference (MUSE/HD)	$G_{B/A(Y1)}$	$V_{B(Y1,1)} / V_{A(Y1,1)}$	-1	0	1	dB
Y_1 signal output gain difference (NTSC1/HD)	$G_{C/A(Y1)}$	$V_{C(Y1,1)} / V_{A(Y1,1)}$	-1	0	1	dB
Y_1 signal output gain difference (NTSC2/HD)	$G_{D/A(Y1)}$	$V_{D(Y1,1)} / V_{A(Y1,1)}$	-1	0	1	dB
Y signal frequency characteristics (HD)	$G_{A(Y,F)}$	$V_{A(Y,30)} / V_{A(Y,1)}$	-4	-1	2	dB
Y signal frequency characteristics (MUSE)	$G_{B(Y,F)}$	$V_{B(Y,20)} / V_{B(Y,1)}$	-4	-1	2	dB
Y signal frequency characteristics (NTSC1)	$G_{C(Y,F)}$	$V_{C(Y,16)} / V_{C(Y,1)}$	-4	-1	2	dB
Y signal frequency characteristics (NTSC2)	$G_{D(Y,F)}$	$V_{D(Y,16)} / V_{D(Y,1)}$	-4	-1	2	dB

■ Electrical Characteristics at T_a = 25°C (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Sharpness block						
Sharpness mute switch threshold level	V _{TH25}		1.10	2.65	4.20	V
Contour part max. gain	V _{Rmax}		1.40	1.75	2.10	V[p-p]
Contour part sharpness typ. gain	V _{R.SHtyp}		640	800	960	mV[p-p]
Contour part sharpness min. gain	V _{R.SHmin}		0	15	30	mV[p-p]
Contour part sharpness gain ratio	G _{R.SHtyp/max}	V _{R.SHtyp} /V _{Rmax}	-8	-6	-4	dB
Detail part max. gain	V _{Smax}		390	520	650	mV[p-p]
Detail part sharpness typ. gain	V _{S.SHtyp}		195	260	325	mV[p-p]
Detail part sharpness min. gain	V _{S.SHmin}		0	5	10	mV[p-p]
Detail part sharpness gain ratio	G _{S.SHtyp/max}	V _{S.SHtyp} /V _{Smax}	-9	-6	-3	dB
Detail part sharpness mute max. gain (on)	V _{S.SH(M.ON)}		0	5	10	mV[p-p]
Detail part sharpness mute gain ratio (on/off)	G _{S.SH(M.ON/OFF)}	V _{S.SH(M.ON)} /V _{Smax}	-60	-50	-40	dB
Contour part						
Coring characteristics (on)	V _{R.CO(ON)}		210	280	350	mV[p-p]
Coring characteristics (off)	V _{R.CO(OFF)}		0	30	60	mV[p-p]
Correction primary differentiating signal gain (8 MHz)	V _{R.CO(8M)}		0.64	0.8	0.96	V[p-p]
Correction primary differentiating signal gain (4 MHz)	V _{R.CO(4M)}		1.16	1.45	1.74	V[p-p]
Correction primary differentiating signal gain ratio	G _{R.CO(8M/4M)}	V _{R.CO(8M)} /V _{R.CO(4M)}	-7	-5	-3	dB
Contour gain switch (LO)	V _{R.SW(LO)}		0.88	1.1	1.32	V[p-p]
Contour gain switch gain ratio	G _{R.SW(L/H)}	V _{R.SW(LO)} /V _{Rmax}	-5	-3	-1	dB
Detail part						
Typ. gain 1	V _{SG1typ}		210	280	350	mV[p-p]
Typ. gain 2	V _{SG2typ}		210	280	350	mV[p-p]
Gain ratio 1	G _{SG1typ/max}	V _{SG1typ} /V _{Smax}	-7	-5	-3	dB
Gain ratio 2	G _{SG2typ/max}	V _{SG2typ} /V _{Smax}	-7	-5	-3	dB
Detail part coring typ. gain	V _{S.COtyp}		225	315	445	mV[p-p]
Detail part coring min. gain	V _{S.COmin}		0	75	150	mV[p-p]
Detail part coring gain ratio	G _{S.COtyp/max}	V _{S.COtyp} /V _{Smax}	-8	-5	-2	dB
Detail part limiter max. gain	V _{S.Lmax}		460	580	700	mV[p-p]
Detail part limiter typ. gain	V _{S.Ltyp}		320	400	480	mV[p-p]
Detail part limiter gain ratio	G _{S.Ltyp/max}	V _{S.Ltyp} /V _{S.Lmax}	-5.5	-3.5	-1.5	dB

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
DSC block						
DSC detection characteristics (−35 dB)	$V_{\text{DSC}(-35)}$		2.7	3.4	4.1	V
DSC detection characteristics (−20 dB)	$V_{\text{DSC}(-20)}$		7	8.7	9	V
DSC detection characteristics (−15 dB)	$V_{\text{DSC}(-15)}$		6.9	8.6	9	V
DSC detection characteristics (−5 dB)	$V_{\text{DSC}(-5)}$		0.26	0.33	0.40	V
DSC coring characteristics	$V_{\text{D.CO}(-5)}$		6.9	8.6	9	V
DSC limiter characteristics	$V_{\text{D.LIM}(-20)}$		2.7	3.4	4.1	V
Child picture amp. block						
Child picture amp. max. gain	G_{CAmax}		10	12	14	dB
Child picture amp. typ. gain	G_{CAtyp}		3.5	5.5	7.5	dB
Child picture amp. gain ratio	$G_{\text{CAtyp}/\text{max}}$	$V_{\text{CAtyp}}/V_{\text{CAmax}}$	−8.5	−6.5	−4.5	dB
Child picture amp. frequency characteristics 1	$G_{\text{CA}(20\text{M})}$	$V_{\text{CA}(20\text{M})}/0.1\text{ V[p-p]}$	9.5	11.5	13.5	dB
Child picture amp. frequency characteristics 2	$G_{\text{CA}(1\text{M})}$	$V_{\text{CA}(1\text{M})}/0.1\text{ V[p-p]}$	9.5	11.5	13.5	dB
Child picture amp. frequency characteristics 3	$G_{\text{CA}(F)}$	$V_{\text{CA}(20\text{M})}/V_{\text{CA}(1\text{M})}$	−1	0	1	dB
VM pre-amp. block						
VM pre-amp. max. gain	G_{VMPmax}		10	12	14	dB
VM pre-amp. typ. gain	G_{VMPtyp}		3.5	5.5	7.5	dB
VM pre-amp. gain ratio	$G_{\text{VMPtyp}/\text{max}}$	$V_{\text{VMPtyp}}/V_{\text{VMPmax}}$	−8.5	−6.5	−4.5	dB
VM pre-amp. frequency characteristics 1	$G_{\text{VMP}(20\text{M})}$	$V_{\text{VMP}(20\text{M})}/0.1\text{ V[p-p]}$	9.5	11.5	13.5	dB
VM pre-amp. frequency characteristics 2	$G_{\text{VMP}(1\text{M})}$	$V_{\text{VMP}(1\text{M})}/0.1\text{ V[p-p]}$	9.5	11.5	13.5	dB
VM pre-amp. frequency characteristics 3	$G_{\text{VMP}(F)}$	$V_{\text{VMP}(20\text{M})}/V_{\text{VMP}(1\text{M})}$	−1	0	1	dB
VM limiter amp. block						
CY_S switch threshold level	V_{TH5}		0.45	0.75	1.05	V
Y_S switch threshold level	V_{TH6}		0.45	0.75	1.05	V
Output DC step (CY_S)	$\Delta V_{\text{VML}(\text{CYS})}$		−50	0	50	mV
Output DC step (Y_S)	$\Delta V_{\text{VML}(\text{YS})}$		−50	0	50	mV
VM limiter amp. max. gain	G_{VMLmax}	$V_{\text{VMLmax}}/0.1\text{ V[p-p]}$	13.5	15.5	17.5	dB
VM limiter amp. typ. gain	G_{VMLtyp}	$V_{\text{VMLtyp}}/0.1\text{ V[p-p]}$	10.5	12.5	14.5	dB
VM limiter amp. gain ratio	$G_{\text{VMLtyp}/\text{max}}$	$V_{\text{VMLtyp}}/V_{\text{VMLmax}}$	−4.5	−2.5	−0.5	dB
VM limiter amp. frequency characteristics 1	$G_{\text{VML}(20\text{M})}$	$V_{\text{VML}(20\text{M})}/0.1\text{ V[p-p]}$	12.5	14.5	16.5	dB
VM limiter amp. frequency characteristics 2	$G_{\text{VML}(1\text{M})}$	$V_{\text{VML}(1\text{M})}/0.1\text{ V[p-p]}$	14.5	16.5	18.5	dB

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
VM limiter amp. block (continued)						
VM limiter amp. frequency characteristics 3	$G_{V_{ML}(F)}$	$V_{V_{ML}(20M)} / V_{V_{ML}(1M)}$	-4	-2	0	dB
VM limiter amp. limiter characteristics 1	$G_{V_{ML}(LIMmax)}$	$V_{V_{ML}(LIM.max)} / 0.2 \text{ V[p-p]}$	14	16	18	dB
VM limiter amp. limiter characteristics 2	$G_{V_{ML}(LIMtyp)}$	$V_{V_{ML}(LIM.typ)} / 0.2 \text{ V[p-p]}$	6	8	10	dB
VM limiter amp. limiter characteristics 3	$G_{V_{ML}(LIM)}$	$V_{V_{ML}(LIM.typ)} / V_{V_{ML}(LIM.max)}$	-10	-8	-6	dB
Y_S operation characteristics	$G_{V_{ML}(YS)}$	$V_{V_{ML}(YS)} / V_{V_{ML}(max)}$	-36	-30	-24	dB
CY_S operation characteristics	$G_{V_{ML}(CYS)}$	$V_{V_{ML}(CYS)} / V_{V_{ML}(max)}$	-36	-30	-24	dB

• Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
C-D.L block						
P_B signal delay time (HD)	$t_{A(PB)}$	At DL = HD	40	50	60	ns
P_B signal delay time (MUSE)	$t_{B(PB)}$	At DL = MUSE	52	65	78	ns
P_B signal delay time (NTSC1)	$t_{C(PB)}$	At DL = NTSC1	60	75	90	ns
P_B signal delay time (NTSC2)	$t_{D(PB)}$	At DL = NTSC2	72	90	108	ns
P_B signal delay time variation amount (MUSE to HD)	$t_{1(PB)}$	$t_{B(PB)} - t_{A(PB)}$	12	16	20	ns
P_B signal delay time variation amount (NTSC1 to HD)	$t_{2(PB)}$	$t_{C(PB)} - t_{A(PB)}$	20	26	32	ns
P_R signal delay time (HD)	$t_{A(PR)}$	At DL = HD	40	50	60	ns
P_R signal delay time (MUSE)	$t_{B(PR)}$	At DL = MUSE	52	65	78	ns
P_R signal delay time (NTSC1)	$t_{C(PR)}$	At DL = NTSC1	60	75	90	ns
P_R signal delay time (NTSC2)	$t_{D(PR)}$	At DL = NTSC2	72	90	108	ns
P_R signal delay time variation amount (MUSE to HD)	$t_{1(PR)}$	$t_{B(PR)} - t_{A(PR)}$	12	16	20	ns
P_R signal delay time variation amount (NTSC1 to HD)	$t_{2(PR)}$	$t_{C(PR)} - t_{A(PR)}$	20	26	32	ns
P_B, P_R delay time difference (HD)	$\Delta t_{A(C)}$	$t_{A(PB)} - t_{A(PR)}$	-6	0	6	ns
P_B, P_R delay time difference (MUSE)	$\Delta t_{B(C)}$	$t_{B(PB)} - t_{B(PR)}$	-6	0	6	ns
P_B, P_R delay time difference (NTSC1)	$\Delta t_{C(C)}$	$t_{C(PB)} - t_{C(PR)}$	-6	0	6	ns
P_B, P_R delay time difference (NTSC2)	$\Delta t_{D(C)}$	$t_{D(PB)} - t_{D(PR)}$	-6	0	6	ns

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Y-D.L block						
Y signal delay time (HD)	$t_{A(Y)}$	At DL = HD	40	50	60	ns
Y signal delay time (MUSE)	$t_{B(Y)}$	At DL = MUSE	52	65	78	ns
Y signal delay time (NTSC1)	$t_{C(Y)}$	At DL = NTSC1	60	75	90	ns
Y signal delay time (NTSC2)	$t_{D(Y)}$	At DL = NTSC2	72	90	108	ns
Y signal delay time variation amount (MUSE to HD)	$t_{1(Y)}$	$t_{B(Y)} - t_{A(Y)}$	12	16	20	ns
Y signal delay time variation amount (NTSC1 to HD)	$t_{2(Y)}$	$t_{C(Y)} - t_{A(Y)}$	20	26	32	ns
Y_1 signal delay time (HD)	$t_{A(Y1)}$	At DL = HD	32	40	48	ns
Y_1 signal delay time (MUSE)	$t_{B(Y1)}$	At DL = MUSE	40	50	60	ns
Y_1 signal delay time (NTSC1)	$t_{C(Y1)}$	At DL = NTSC1	44	55	66	ns
Y_1 signal delay time (NTSC2)	$t_{D(Y1)}$	At DL = NTSC2	48	60	72	ns
Y_1 signal delay time variation amount (MUSE to HD)	$t_{1(Y1)}$	$t_{B(Y1)} - t_{A(Y1)}$	4	8	12	ns
Y_1 signal delay time variation amount (NTSC1 to HD)	$t_{2(Y1)}$	$t_{C(Y1)} - t_{A(Y1)}$	10	14	18	ns

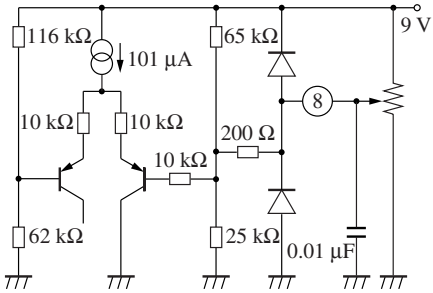
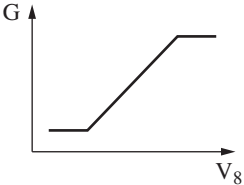
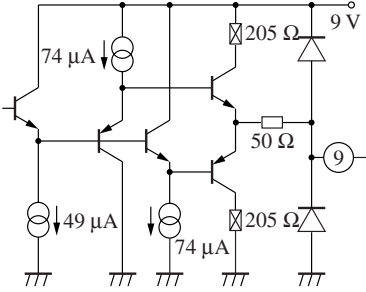
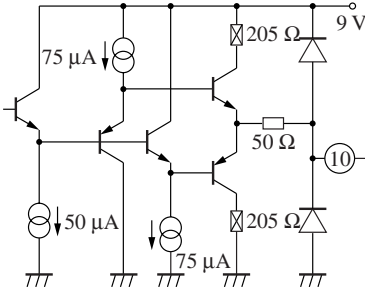
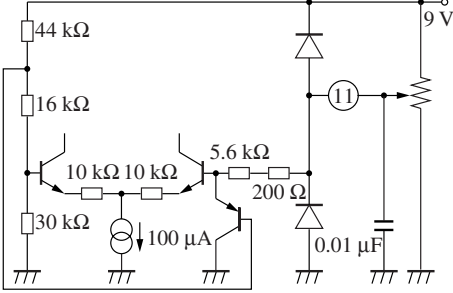
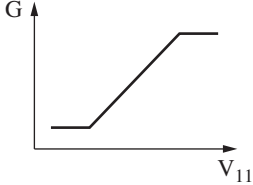
■ Terminal Equivalent Circuits

Pin No.	Equivalent circuit	Description
1		Pin 1: P_R input signal pin: Pin 47: P_B input signal pin: - Clamps input signal with clamp pulse of pin 43 - Drive with low impedance. - Recommended application method: Don't apply DC voltage directly to pin.
2		VM pre-amp. input pin: - Control voltage: typ. 3V - Recommended application range: 0 V to V_{CC}

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description
3		VM pre-amp. input pin: • Drive with low impedance. • Recommended application method: Don't apply DC voltage directly to pin.
4		VM pre-amp. output pin: • Recommended application range: −3.2 mA to +3.2 mA
5 6		Pin5: Child picture Y_S input pin: Pin6: Y_S input pin: • Control pin for on/off of VM limiter amp. High: Off Low: On ($V_{TH} = 0.75$ V) • Recommended application range: 0 V to V_{CC}
7		VM limiter amp. input pin: • Drive with low impedance. • Recommended application method: Don't apply DC voltage directly to pin.

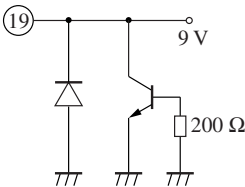
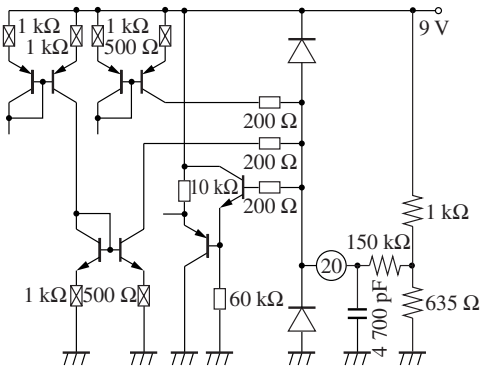
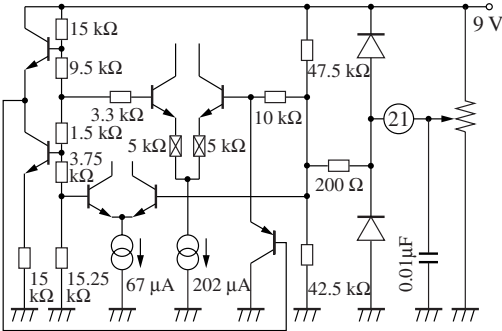
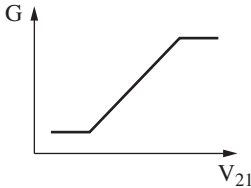
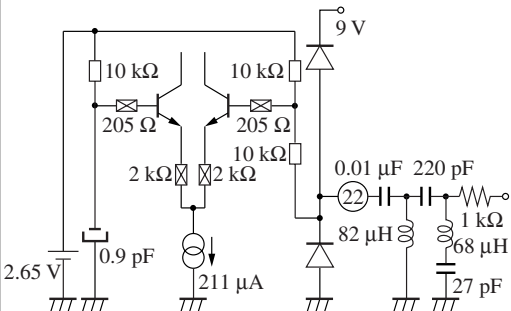
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description
8		VM limiter amp. gain control pin: • Control voltage: typ. 2.5 V  • Recommended application range: 0 V to V_{CC}
9		VM limiter amp. output pin: • Recommended application range: -3.2 mA to +3.2 mA
10		Child picture amp. output pin: • Recommended application range: -3.2 mA to +3.2 mA
11		Child picture amp. gain control pin: • Control voltage: typ. 3 V  • Recommended use range: 0 V to V_{CC}

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description
12		Child picture amp. input pin: • Drive with low impedance. • Recommended application method: Don't apply DC voltage directly to pin.
13		Pin 13: P_R output signal pin: Pin 15: P_B output signal pin: • Recommended application range: -1.6 mA to +1.6 mA
14	—	N.C. pin: • Keep grounded
15	Refer to pin 13	Refer to pin 13
16		DSC large signal gain control pin: • Controls gain of large signal coring amp. on DSC detection. • Control voltage: typ. 3 V • Recommended application range: 0 V to V_{CC}
17		Primary differentiating input pin before correction: • Y1 primary differentiating signal outputted from pin 24 is inputted with capacitor coupling. • Drive with low impedance. • Recommended application method: Don't apply DC voltage directly to pin.

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description
18	—	N.C. pin: • Keep grounded
19		Power supply pin: • Apply 9 V when use
20		DSC detection output pin: • Controls voltage of DSC. • Left diagram shows recommended external circuit. • Recommended application range: -1.6 mA to +1.6 mA
21		DSC small signal gain control pin: • Controls gain of small signal limiter amp. on DSC detection. • Control voltage: typ. 3 V  • Recommended application range: 0 V to V_{CC}
22		DSC input pin: • Y signal is inputted for DSC detection. • Left diagram shows recommended external circuit. • Recommended application method: Not apply DC voltage directly to pin.

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description
23		DSC bias pin: • No use. Keep it connected to V_{CC} • Recommended application range: 0 V to V_{CC}
24		Primary differentiating input pin before correction: • Output Y1 primary differentiating signal which is made by Y signal inputted from pin 45. • Recommended application range: -1.6 mA to +1.6 mA
25 26		Pin 25: Sharpness mute control pin: Pin 26: Sharpness gain control pin: • Controls contour correction amount of pin 27 Y output signal by pin 26 voltage. $V_{26typ} = 3\text{ V}$ Correction amount V_{26} • On/off pin of contour correction signal by high/low of pin 25. • High: Off Low: On ($V_{TH} = 2.65\text{ V}$) • Recommended application range: 0 V to V_{CC}
27		Y output pin: • Outputs Y signal in which contour correction signal has been added on Y signal inputted from pin 45. • Recommended application range: -3.2 mA to +3.2 mA

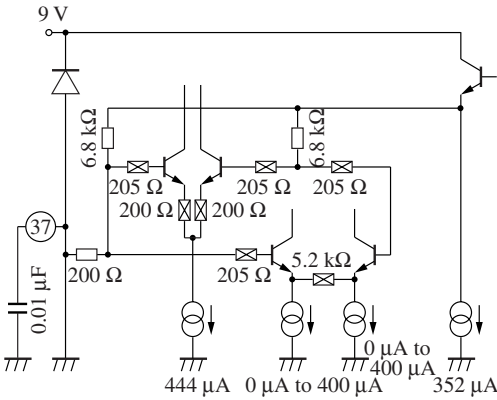
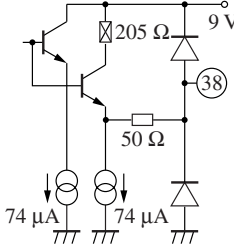
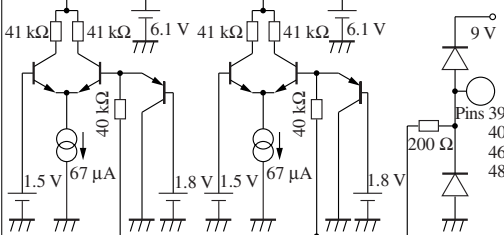
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description
28 29		Pin 28: Contour part gain control pin: Pin 29: Contour part bias pin: - Contour part amp. gain can be switched in 2 steps by high/low of pin 28 voltage. - High: Contour part gain high Low: Contour part gain low ($V_{TH} = 1.5\text{ V}$) - Smoothes pin 29 signal by an external capacitor. - Recommended application range (pin 28): 0 V to V_{CC} - Recommended application method (pin 29): Don't apply DC voltage directly to pin.
30		Secondary differentiating input pin: - With an external circuit, differentiate the primary differential signal that has been done contour correction and which is outputted from pin 32, then input it to pin 30. - Recommended application method: Don't apply DC voltage directly to pin.
31		Detail part gain control pin: - Controls gain of small signal detail part amp. by pin 31 voltage. $V_{31typ} = 3\text{ V}$ Detail part gain - Recommended application range: 0 V to V_{CC}
32		Primary differentiating output after correction pin: - Outputs a primary differentiated signal as a signal for contour part edge switching. - Recommended application range: -1.6 mA to +1.6 mA

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description
33 34		Pin 33: Detail part coring control pin: Pin 34: Detail part coring bias pin: - Controls gain of detail part coring amp. by pin 33 voltage. $V_{33typ} = 3\text{ V}$ - Smooths pin 34 signal with an external capacitor. - Recommended application range (pin 33): 0 V to V_{CC} - Recommended application method (pin 34): Don't apply DC voltage directly to pin.
35		Differentiating signal bias 1 pin: - Makes a necessary bias by smoothing with an external capacitor to run a contour correction for the primary differentiating signal inputted from pin 17. - Recommended application method: Don't apply DC voltage directly to pin.
36		Contour part and detail part separation level control pin: - Controls separation level of contour part (large signal) and detail part (small signal) by pin 36 voltage $V_{36typ} = 3\text{ V}$ - Recommended application range: 0 V to V_{CC}

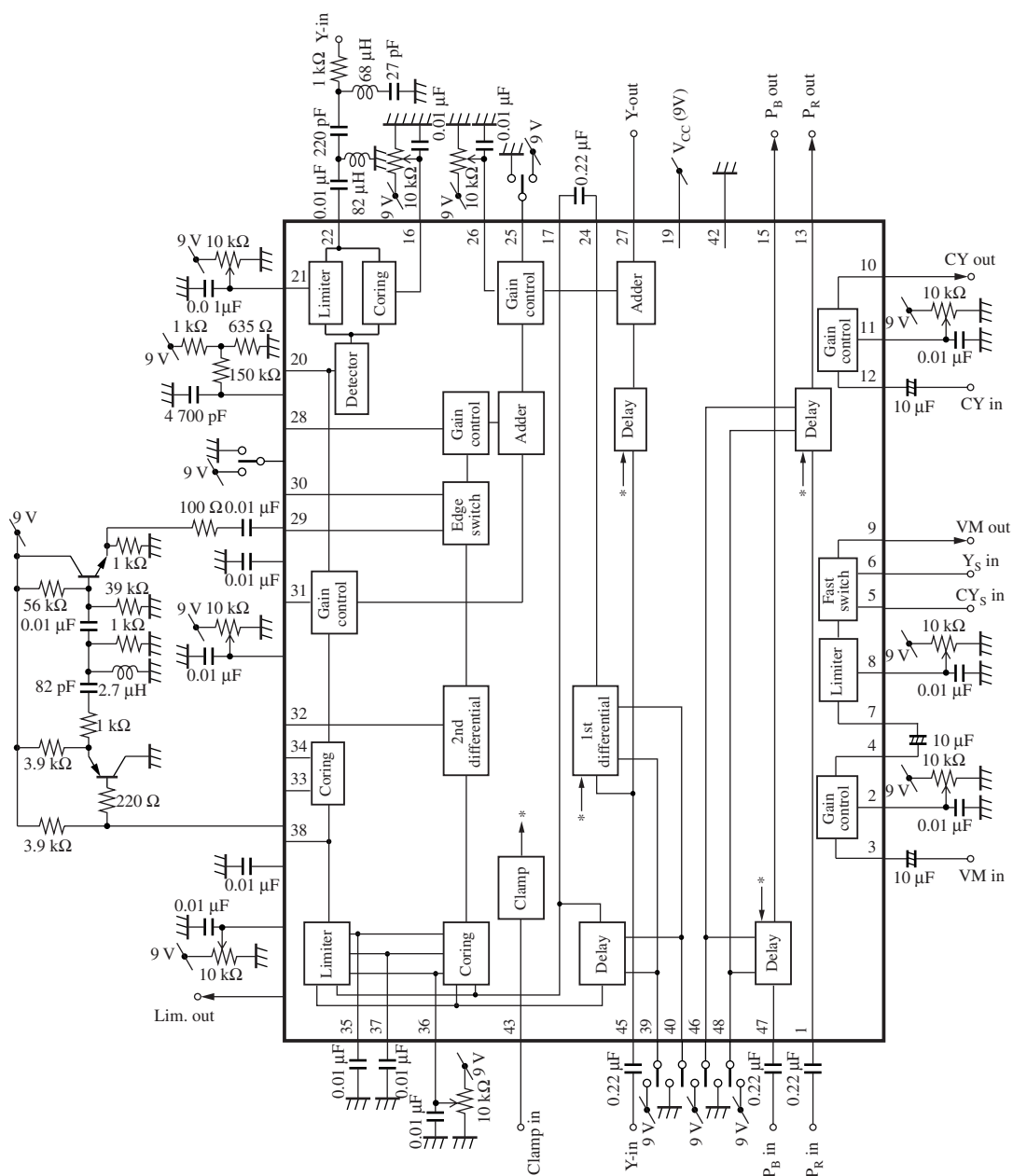
■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description
37		Differentiating signal bias 2 pin: • Necessary bias is made by an smoothing external capacitor in order to correct contour of primary differentiating signal inputted from Pin17 • Recommended application method: Don't apply DC voltage directly to pin.
38		Detail part limiter output pin: • Outputs detail part limiter signal • Recommended application range: -1.6 mA to +1.6 mA
39 40		Pin 39: Y delay line changeover switch-1 pin: Pin 40: Y delay line changeover switch-2 pin: Pin 46: C delay line changeover switch-1 pin: Pin 48: C delay line changeover switch-2 pin: • Correction amount of Y, C delay line are switched by high/low of each pin voltage. ($V_{TH} = 1.5 V$) • Pin 39, pin 46 High: Off, low: +10 ns • Pin 40, pin 48 High: Off, low: +20 ns • Recommended application range: 0 V to V_{CC}
41	—	N.C. pin: • Keep grounded
42	—	GND pin:

■ Terminal Equivalent Circuits (continued)

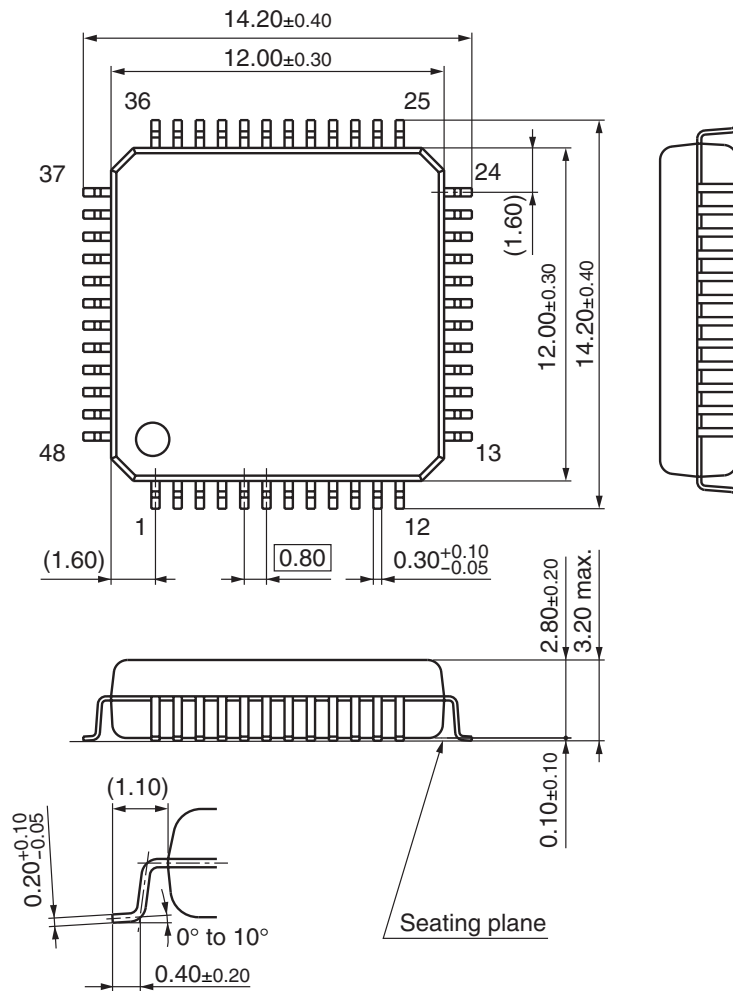
Pin No.	Equivalent circuit	Description
43		Clamp pulse input pin: • Clamps inputted signal from each pin of pin 45, pin 47, pin 1 ($V_{TH} = 1.5\text{ V}$) • High: Clamp on • Low: Clamp off • Recommended pulse width (clamp on period) NTSC: $2.5\text{ }\mu\text{s}$ HD: $1.0\text{ }\mu\text{s}$ • Recommended application range: 0 V to V_{CC}
44	—	N.C. pin: • Keep grounded
45		Y input signal pin: • Clamps input signal with Pin43 clamp pulse • Drive with low impedance • Recommended application method: Don't apply DC voltage directly to pin.
46	Refer to pin 39	Refer to pin 39
47	Refer to pin 1	Refer to pin 1
48	Refer to pin 39	Refer to pin 39

Application Circuit Example (Basic Circuit)



■ New Package Dimensions (Unit: mm)

- QFH048-P-1212C (Lead-free package)



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