

AN3479FBP

VCR Signal(Luminance, Chroma and Normal Audio Signals) Processing IC

■ Overview

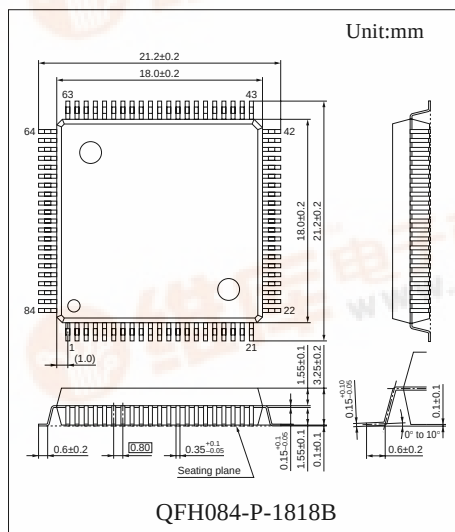
The AN3479FBP is an IC designed for NTSC-dedicated VHS VCR signal processing and incorporates circuits for processing RF and normal audio signals as well as luminance and chroma signals.

■ Features

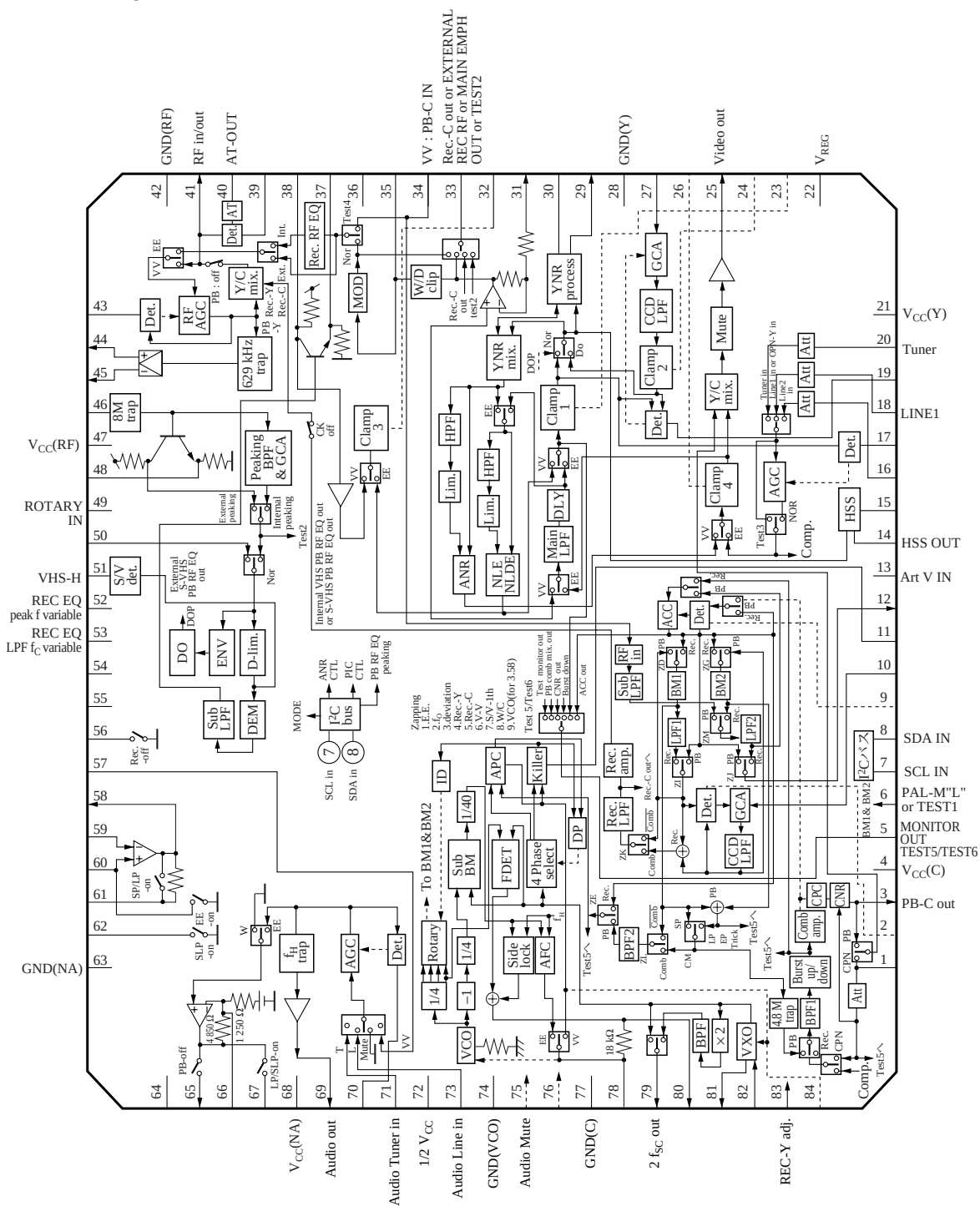
- Compatible with I²C-bus
- Totally free of adjustments
- Low-frequency comb system
- An improved chroma S/N ratio ensured by built-in CNR and CPC(chroma phase compensator) circuits
- Compatible with SQPB

■ Applications

- VCR(NTSC)



■ Block Diagram



■ Pin Descriptions

Pin No.	Descriptions	Impedance	Pin No.	Descriptions	Impedance
1	CCD DL In (C)/CPN C In	32 k Ω	36	REC RF EQ Peak Gain Adj.	125 k Ω
2	CCD AGC Det.(C)	Push-pull	37	Peaking	E.F.
3	CCD DL Out(C)	Push-pull	38	Main De-emphasis Out	5.6 k Ω
4	C-V _{CC}	—	39	Auto Tracking Gain Adj.	90 k Ω
5	Test5/Test Monitor	Push-pull	40	Auto Tracking Out	C.C
6	PAL-M : "L"/TEST1	29.6 k Ω	41	RF In/Out	27 k Ω /Push-pull
7	SCL In	Open base	42	RF GND	—
8	SDA In	Base collector	43	RF AGC Det.	540 Ω + E.F.
9	ACC Det.	920 + E.F.	44	Phase Shift POS./S-EQ Out	Push-pull
10	C-Comb In	21.6 k Ω	45	Phase Shift NEG.	Push-pull
11	Killer Det.	Push-pull	46	8M Trap In	10 k Ω
12	C-Comb Out	Push-pull	47	RF V _{CC}	—
13	Artificial Sync. Pluse In	76.6 k Ω	48	PB RF EQ Peaking (Normally open)	E.F.
14	HSS Out	C.C.	49	Rotary Pulse In	400 k Ω
15	Sync Sepa. Det.	500 + E.F.	50	S EQ In	30 k Ω
16	Line2 In	105 k Ω	51	S/V Det.(VHS : "H")	2.1 k Ω + E.F.
17	AGC Det.	60 + E.F.	52	REC RF EQ Peak F Adj.	125 k Ω
18	Line1 In	105 k Ω	53	REC RF EQ LPF f _C Adj.	125 k Ω
19	CCD AGC Det.(Y)	Push-pull	54	PB RF EQ INT/EXT SW	Open base
20	Tuner In	105 k Ω	55	Y MAIN LPF A/B SW	35 k Ω
21	Lumi V _{CC}	—	56	NA SW Control Out	Open collector
22	VREG(2.0 V)	E.F.	57	NA PB Amp. In	35 k Ω
23	F.B.Clamp Det. 1	Push-pull	58	NA PB EQ Out	E.F.
24	F.B.Clamp Det. 2	Push-pull	59	NA PB NF	800 Ω + E.F.
25	Video Out	E.F.	60	NA PB In	PB : 80 k Ω Rec. : E.F.
26	F.B.Clamp Det. 4	Push-pull	61	NA PB EQ SW	SP/LP : E.F. SLP : 12.5 k Ω
27	CCD DL In(Y)	30 k Ω	62	NA PB SLP SW	SP/LP : 100 k Ω SLP : <100 Ω
28	Lumi Gnd	—	63	NA GND	—
29	CCD DL Out(Y)	Push-pull	64	NA Auto Bias Detector In	C in
30	YNR Lim DC	10 k Ω	65	NA Rec. Out	Push-pull
31	Main Emphasis F.B. In	5.6 k Ω	66	NA Rec. NF	5 k Ω
32	F.B.Clamp Det. 3	Push-pull			
33	TEST2 Monitor	E.F.			
34	PB RF C In	20 k Ω			
35	External Trap	540 Ω			

■ Pin Descriptions(continued)

Pin No.	Descriptions	Impedance	Pin No.	Descriptions	Impedance
67	NA REC EQ LP/SLP SW	SP : 100 k Ω LP/SLP : Push-pull	75	NA Mute	211 k Ω
			76	REC C Adj	200 k Ω
			77	C Gnd	—
68	NA V _{CC}	—	78	REC AFC/PB APC Det	Collector base
69	NA Line Out	Push-pull	79	2f _{SC} Out/fsc Out	Push-pull
70	NA AGC Det	222 Ω + E.F.	80	Side Lock Det	C.C.
71	NA Tuner In	30 k Ω	81	XO/VCXO Out	Push-pull
72	NA V _{REF}	25 k Ω	82	XO/VCXO In	1 900 Ω
73	NA Line In	30 k Ω	83	REC Y Adj.	105 k Ω
74	VCO Gnd	—	84	REC APC Det	Collector base

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V _{CC}	5.5	V
Supply current	I _{CC}	222	mA
Power dissipation *2	P _D	958	mW
Operating ambient temperature *1	T _{opr}	−20 ~ +70	°C
Storage temperature *1	T _{stg}	−55 ~ +150	°C

Note) *1: T_a = 25 °C except operating ambient temperature and storage temperature.

*2: Power dissipation of the package at T_a = 70 °C.

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V _{CC}	4.7 ~ 5.3	V

■ Electrical Characteristics $T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Circuit current 1	I_{REC}	$V_{\text{CC}} = 5\text{ V}$, Rec.- mode	116	140	175	mA
Circuit current 2	I_{PB}	$V_{\text{CC}} = 5\text{ V}$, PB-mode	125	150	188	mA
Acknowledge output driver current	I_{ACK}	$V_{\text{CC}} = 5\text{ V}$	1.8	2.5	5.0	mA
SCL, SDA signals input "H" level	V_{SHI}	$V_{\text{CC}} = 5\text{ V}$	3.1	—	5.0	V
SCL, SDA signals input "L" level	V_{SLO}	$V_{\text{CC}} = 5\text{ V}$	0	—	0.9	V
SCL clock frequency	f_{SCL}	$V_{\text{CC}} = 5\text{ V}$	—	—	100	kHz
Video EE output amplitude	V_{EE}	Video(W–100 %), 1 V_{pp} In : Pin18, Out : Pin25	1.995	2.100	2.205	V_{pp}
Y tuner/line 1 crosstalk	CT_{TL1}	Sin 100 mV $_{\text{pp}}$, 1 MHz In : Pin18, Out : Pin25	—	—	– 45	dB
Y line 2/line 1 crosstalk	CT_{L2L1}	Sin 100 mV $_{\text{pp}}$, 1 MHz In : Pin18, Out : Pin25	—	—	– 45	dB
Y tuner/line 2 crosstalk	CT_{TL2}	Sin 100 mV $_{\text{pp}}$, 1 MHz In : Pin16, Out : Pin25	—	—	– 45	dB
Y line 1/line 2 crosstalk	CT_{L1L2}	Sin 100 mV $_{\text{pp}}$, 1 MHz In : Pin16, Out : Pin25	—	—	– 45	dB
Y line 1/tuner crosstalk	CT_{L1L}	Sin 100 mV $_{\text{pp}}$, 1 MHz In : Pin20, Out : Pin25	—	—	– 45	dB
Y line 2/tuner crosstalk	CT_{L2T}	Sin 100 mV $_{\text{pp}}$, 1 MHz In : Pin20, Out : Pin25	—	—	– 45	dB
Keyed AGC control sensitivity	S_{KAGC}	Video(W–100 %), 2.0 V_{pp} /0.5 V_{pp} In : Pin18, Out : Pin25	—	—	1.0	dB
Y AGC frequency characteristic	ΔG_{AGC}	Sin 100 mV $_{\text{pp}}$, 5 MHz/1 MHz In : Pin18, Out : Pin25	– 1.5	—	0.5	dB
Y MLPF frequency characteristic 1	ΔG_{YL1}	Sin 100 mV $_{\text{pp}}$, 2.7 MHz/320 kHz In : Pin18, Out : Pin5	– 7.8	– 6.3	– 4.8	dB
Y MLPF frequency characteristic 2	ΔG_{YL2}	Sin 100 mV $_{\text{pp}}$, 3.58 MHz/320 kHz In : Pin18, Out : Pin5	—	—	– 29	dB
Y MLPF group delay 1	t_{DYL1}	Sin 100 mV $_{\text{pp}}$, 320 kHz In : Pin18, Out : Pin5	970	1 050	1 130	ns
Y MLPF group delay 2	t_{DYL2}	Sin 100 mV $_{\text{pp}}$, 1.8 MHz In : Pin18, Out : Pin5	–100	–70	–40	ns
Sync.-sepa. min. input sensitivity	S_{SS}	Video(W–100 %) In : Pin18, Out : Pin14	—	—	33	%
Sync.-sepa. front edge delay	t_{DSS}	Video(W–100 %), 1 V_{pp} In : Pin18, Out : Pin14	1.6	1.8	2.0	μs
Sync.-sepa. output amplitude	V_{SS}	Video(W–100 %), 1 V_{pp} , LP-mode In : Pin18, Out : Pin14	4.0	—	—	V_{pp}

■ Electrical Characteristics(continued) $T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Vertical emphasis(1-K)value gain 1	G_{VE1}	Sin 400 mV _{pp} (Pin5)150 kHz,LP-mode In : Pin18,Out : Pin29	-3.0	-1.5	0	dB
Vertical emphasis(1-K)value gain 2	G_{VE2}	Sin 400 mV _{pp} (Pin5)2 MHz,LP-mode In : Pin18,Out : Pin29	-1.5	0	1.5	dB
Vertical emphasis differential signal amplitude	V_{VE}	Video(W-100 %),1 V _{pp} In : Pin18,Out : Pin30	—	—	100	mV _{pp}
Vertical emphasis X-value gain	G_{VEX}	Sin 40 mV _{pp} ,150 kHz,Pin31 : open In : Pin30,Out : Pin33	-15.0	-11.5	-8.0	dB
Non-linear emphasis frequency characteristic 1	ΔG_{NLE1}	Sin 400 mV _{pp} (0 dB),2 MHz/100 kHz SLP/EDIT-mode In : Pin18,Out : Pin33	-0.2	—	1.0	dB
Non-linear emphasis frequency characteristic 2	ΔG_{NLE2}	Sin 40 mV _{pp} (-20 dB),1 MHz/100 kHz SLP/EDIT-mode In : Pin18,Out : Pin33	3.67	—	6.47	dB
Non-linear emphasis frequency characteristic 3	ΔG_{NLE3}	Sin 40 mV _{pp} (-20 dB),2 MHz/100 kHz SLP/EDIT-mode In : Pin18,Out : Pin33	4.24	—	7.24	dB
Non-linear emphasis frequency characteristic 4	ΔG_{NLE4}	Sin 40 mV _{pp} (-20 dB),2 MHz SP/SLP-mode In : Pin18,Out : Pin33	-1.76	—	0.84	dB
Main emphasis gain	G_{ME}	Sin 60 mV _{pp} (Pin5),150 kHz Pin31 : 0.1 μ F In : Pin18,Out : Pin33	13.1	—	15.5	dB
Dark clip level	DC	Video(W-100 %),1 V _{pp} In : Pin18,Out : Pin33	51	61	71	%
White clip level	WC	Video(W-100 %),1 V _{pp} In : Pin18,Out : Pin33	190	200	210	%
FM carrier interleave	Δf_{CI}	f_H Pulse,5 V _{pp} ,SLP-mode In : Pin49,Out : Pin33	6.8	—	9.0	kHz
Sync. tip frequency	f_O	Out : Pin 33	3.43	3.50	3.57	MHz
FM deviation	Δf_{DEV}	Video(W-100 %),1 V _{pp} In : Pin18,Out : Pin33	0.95	1.00	1.05	MHz
Rec. FM output amplitude	V_{YR}	No input In : Pin18,Out : Pin41	188	200	212	mV _{pp}
FM modulator 2nd harmonic distortion	D_{2FMOD}	Out : Pin33	—	—	-35	dB
Rec. Y output variable range max.	v_{RY1}	No input In : Pin18,Out : Pin41	-8.5	—	-3.5	dB
Rec. Y output variable range min.	v_{RY2}	No input In : Pin18,Out : Pin41	1.0	—	6.0	dB
S/V discrimination frequency	f_{SV}	Sin 350 mV _{pp} ,Frequency variable SQPB $\rightarrow$ VHS In : Pin41,50,Out : Pin31	4.25	4.40	4.55	MHz

■ Electrical Characteristics(continued) $T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
FM demodulator sensitivity 1	S_{DEMV}	Sin 350 mV _{pp} , 3.5 MHz, 4.5 MHz VHS-mode In : Pin46, Out : Pin38	0.10	0.16	0.22	V/MHz
FM demodulator sensitivity 2	S_{DEMS}	Sin 350 mV _{pp} , 5.4 MHz, 7 MHz SQPB-mode In : Pin50, Out : Pin38	1.4	1.6	1.8	—
Sub LPF frequency characteristic	ΔG_{SL}	Sin 350 mV _{pp} , 4 MHz/3 MHz In : Pin46, Out : Pin37	-1.9	-0.4	1.1	dB
Drop-out detector on level	S_{DON}	Sin 350 mV _{pp} (0 dB), 4 MHz In : Pin50, Out : Pin25	-21	-17	-13	dB
Drop-out detector off level	S_{DOFF}	Sin 350 mV _{pp} (0 dB), 4 MHz (On level-off level) In : Pin50, Out : Pin25	0.9	2.5	4.5	dB
Drop-out compensator inhibition time	t_{DOFF}	AM 350 mV _{pp} , 1 kHz, 4 MHz In : Pin50, 14, Out : Pin25	180	222	270	μs
Drop-out compensator SW DC offset	ΔV_{DOC}	AM 350 mV _{pp} , 4 MHz In : Pin50, Out : Pin25	-125	0	125	mV
Non-linear de-emphasis frequency characteristic 1	ΔG_{NLD1}	Sin 200 mV _{pp} (0 dB), 2 MHz/150 kHz LP-mode In : Pin38, Out : Pin5	-4.8	—	-1.8	dB
Non-linear de-emphasis frequency characteristic 2	ΔG_{NLD2}	Sin 20 mV _{pp} (-20 dB), 2 MHz/150 kHz LP-mode In : Pin38, Out : Pin5	-9.3	—	-5.3	dB
Non-linear de-emphasis frequency characteristic 3	ΔG_{NLD3}	Sin 20 mV _{pp} (-20 dB), 2 MHz SP/LP-mode In : Pin38, Out : Pin5	1.8	—	4.2	dB
Non-linear de-emphasis frequency characteristic 4	ΔG_{NLD4}	Sin 20 mV _{pp} (-20 dB), 1 MHz/150 kHz LP-mode In : Pin38, Out : Pin5	-7.4	—	-3.4	dB
Non-linear de-emphasis frequency characteristic 5	ΔG_{NLD5}	Sin 20 mV _{pp} (-20 dB), 100 kHz SQPB/SLP-mode In : Pin38, Out : Pin5	0.3	—	1.8	dB
CCD AGC control sensitivity	V_{CCD}	f_H pulse, 800 mV _{pp} -400 mV _{pp} (Pin27) In : Pin38, Out : Pin29	-23	—	23	mV _{pp}
YNR EDNC(1-K)value gain	G_{EDK}	Sin 160 mV _{pp} , 150 kHz, LP/EDIT-mode In : Pin38, Out : Pin29	2.3	3.8	5.3	dB
YNR VNC(1-K)value gain	G_{VNK}	Sin 160 mV _{pp} , 150 kHz, LP-mode In : Pin38, Out : Pin29	0.5	2.0	3.5	dB
YNR EDNC differential signal amplitude	V_{ED}	f_H pulse 160 mV _{pp} , LP/EDIT mode In : Pin38, Out : Pin30	—	—	100	mV _{pp}

■ Electrical Characteristics(continued) $T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
YNR VNC differential signal amplitude	V_{VN}	f_H pulse 160 mV _{pp} , LP-mode In : Pin38, Out : Pin30	—	—	100	mV _{pp}
YNR EDNC X-value gain	G_{EDX}	Sin 40 mV _{pp} , 150 kHz, LP/EDIT-mode In : Pin30, Out : Pin25	-2.7	-0.7	1.0	dB
YNR VNC X-value gain	G_{VNX}	Sin 40 mV _{pp} , 150 kHz, LP-mode In : Pin30, Out : Pin25	1.8	3.3	4.8	dB
YNR limiter output amplitude 1	V_{YL1}	Sin 100 mV _{pp} , 150 kHz In : Pin30, Out : Pin25	12	25	90	mV _{pp}
YNR limiter output amplitude 2	V_{YL2}	Sin 300 mV _{pp} , 150 kHz In : Pin30, Out : Pin25	20	70	160	mV _{pp}
YNR limiter output amplitude 3	V_{YL3}	Sin 800 mV _{pp} , 150 kHz In : Pin30, Out : Pin25	25	85	190	mV _{pp}
Noise canceller frequency characteristic 1	ΔG_{NC1}	Sin 12.6 mV _{pp} (-30 dB), 1 MHz/150 kHz Normal-mode In : Pin27, Out : Pin25	-7	—	-1	dB
Noise canceller frequency characteristic 2	ΔG_{NC2}	Sin 12.6 mV _{pp} (-30 dB), 2 MHz/150 kHz Normal-mode In : Pin27, Out : Pin25	-9	—	-3	dB
Picture control frequency characteristic 1	ΔG_{PC1}	Sin 100 mV _{pp} , 3 MHz, Sharpest In : Pin27, Out : Pin25	-3.5	—	0.5	dB
Picture control frequency characteristic 2	ΔG_{PC2}	Sin 100 mV _{pp} , 3 MHz, Softest In : Pin27, Out : Pin25	-8.5	—	-2.0	dB
F.B. clamp det. DC voltage	V_{FBCL}	Video(W-100 %), 320 mV _{pp} In : Pin27, Out : Pin25	0.80	0.95	1.10	V
Video VV output artificial V DC offset	ΔV_{DV}	Pin13 = 5 V Out : Pin25	-80	0	80	mV
Video VV output amplitude	V_W	FM, 3.5 MHz, 4.5 MHz In : Pin41, Out : Pin25	1.995	2.100	2.205	V _{pp}
Rec. chrominance output amplitude	V_{RC}	Video(Y+C), 1 V _{pp} In : Pin18, Out : Pin41	60.5	65.0	69.5	mV _{pp}
Burst-up gain	G_{BU}	Sin 300 mV _{pp} , f_{SC} , SP-mode In : Pin14, 18, Out : Pin33	5	6	7	dB
Burst-up DC offset	ΔV_{BU}	Out : Pin41	—	—	16	mV
Rec. ACC control characteristic	S_{ACC1}	Burst : Chroma = 1 : 1 845 mV _{pp} /53 mV _{pp} , Rotary : "H" In : Pin14, 18, Out : Pin5	—	—	3	dB
VXO free-run frequency	f_{VXO}	Out : Pin79	-100	—	100	Hz
VXO control characteristic	β_{VXO}	Pin84 : DC, 2.6 V, 2.2 V, In : Pin14, Out : Pin79	1.0	—	4.0	Hz/mV

■ Electrical Characteristics(continued) $T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Rec. killer on sensitivity	S_{RKON}	Burst : Chroma=1 : 1,4.8 mV _{pp} In : Pin18, Out : Pin41	—	—	−39	dB
Rec. killer off sensitivity	S_{RKOFF}	Burst : Chroma=1 : 1,17 mV _{pp} In : Pin18, Out : Pin41	−22	—	—	dB
Rec. C MBPF frequency characteristic 1	ΔG_{RBP1}	Sin 286 mV _{pp} , 1.7 MHz/3.58 MHz In : Pin18, Out : Pin5	—	—	−15	dB
Rec. C MBPF frequency characteristic 2	ΔG_{RBP2}	Sin 286 mV _{pp} , 3.08 MHz/3.58 MHz In : Pin18, Out : Pin5	−4.6	—	−0.6	dB
Rec. C MBPF frequency characteristic 3	ΔG_{RBP3}	Sin 286 mV _{pp} , 4.08 MHz/3.58 MHz In : Pin18, Out : Pin5	−5.5	—	−1.5	dB
Rec. C MBPF frequency characteristic 4	ΔG_{RBP4}	Sin 286 mV _{pp} , 7 MHz/3.58 MHz In : Pin18, Out : Pin5	—	—	−10	dB
Rec. C MBPF group delay	t_{DRBP}	Sin 286 mV _{pp} , 3.58 MHz In : Pin18, Out : Pin5	540	—	660	ns
Rec. AFC pull-in range "H" level	f_{AFH}	Pulse 5 V _{pp} , $f_H + 1.22\text{ kHz}$ In : Pin18, 14, Out : Pin5	1.2	—	—	kHz
Rec. AFC pull-in range "L" level	f_{AFL}	Pulse 5 V _{pp} , $f_H - 1.22\text{ kHz}$ In : Pin18, 14, Out : Pin5	—	—	−1.2	kHz
VCO control characteristic	β_{VCO}	Pin78 : DC, 2.1 V, 1.9 V In : Pin82, 14, Out : Pin5	0.2	0.5	0.8	Hz/mV
Rec. APC pull-in range "H" level	f_{APH}	Sin 300 mV _{pp} , $f_{SC} + 500\text{ Hz}$ In : Pin18, 14, Out : Pin79	500	—	—	Hz
Rec. APC pull-in range "L" level	f_{APL}	Sin 300 mV _{pp} , $f_{SC} - 500\text{ Hz}$ In : Pin18, 14, Out : Pin79	—	—	−500	Hz
Rec. chrominance output variable range max.	V_{RC1}	Video signal 1 V _{pp} In : Pin18, Out : Pin41	2.0	4.7	7.0	dB
Rec. chrominance output variable range min.	V_{RC2}	Video signal 1 V _{pp} In : Pin18, Out : Pin41	−7.0	−4.2	−2.0	dB
VCO frequency (40 f_H equivalent)	f_{VCO}	Sin 300 mV _{pp} , $f_{SC} = 3.579545\text{ MHz}$ Pin78 = 2.0 V In : Pin82, Out : Pin5	469	629	789	kHz
Rec. comb depth	G_{RECC}	Sin 250 mV _{pp} , SLP In : Pin6, Out : Pin33	—	—	−27	dB
Rec. comb 40 f_H shift	Δt_{RECC}	Sin 250 mV _{pp} , SLP In : Pin6, Out : Pin33	−10	—	10	ns
Main BM carrier-leak	C_{LBM}	Sin 100 mV _{pp} , 629 kHz In : Pin34, 14, Out : Pin3	—	—	−38	dB
Burst-down gain 1	G_{BD1}	Sin 100 mV _{pp} , f_{SC} , SP-mode In : Pin34, 14, Out : Pin3	−5.1	−4.1	−3.1	dB

■ Electrical Characteristics(continued) $T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Burst-down gain 2	G_{BD2}	Sin 100 mV _{pp} , f_{SC} , LP-mode In : Pin34,14, Out : Pin3	0	—	2	dB
PB chrominance output amplitude	V_{PBC}	Sin 100 mV _{pp} , 629 kHz In : Pin34,14, Out : Pin3	365	450	535	mV _{pp}
PB ACC control characteristic	S_{ACC}	Sin 140/8.9 mV _{pp} , 629 kHz In : Pin34,14, Out : Pin12	-3	—	—	dB
PB killer on sensitivity	S_{PKON}	Sin 0.89 mV _{pp} , 629 kHz In : Pin34,14, Out : Pin3	—	—	-43	dB
PB killer off sensitivity	S_{PKOFF}	Sin 2.81 mV _{pp} , 629 kHz In : Pin34,14, Out : Pin3	-28	—	—	dB
PB chrominance undesired ingredient	ΔG_{PB}	Sin 35 mV _{pp} , 629 kHz In : Pin34,14, Out : Pin3	—	—	-33	dB
XO free-run frequency	f_{XO}	Out : Pin79	-50	—	50	Hz
2 f_{SC} output amplitude	V_{fSC}	Out : Pin79	290	435	580	mV _{pp}
Chrominance mix. gain	G_{MIX}	Sin 5 mV _{pp} , f_{SC} , SP-mode In : Pin6, Out : Pin25	4.8	—	8.8	dB
CNR output gain	G_{CNR}	Sin 200 mV _{pp} , f_{SC} In : Pin6, Out : Pin5	-2.5	—	3.5	dB
CNR limiter gain	G_{LIM}	Sin 5 mV _{pp} , f_{SC} In : Pin1, Out : Pin3	4.5	—	10.5	dB
CNR K-value gain	G_{CNRK}	Sin 5 mV _{pp} , f_{SC} In : Pin6, Out : Pin3	0.60	0.73	0.85	dB
CCD comb LPF frequency characteristic	ΔG_{CDL}	Sin 200 mV _{pp} , 7.16 MHz/630 kHz In : Pin10, Out : Pin5	—	—	-27	dB
CCD AGC control sensitivity	G_{PBCCD}	Sin 200 mV _{pp} , 629 kHz, SP In : Pin6, Out : Pin5	-1	—	1	dB
PB comb depth	G_{PBC}	Sin 200 mV _{pp} , 40 $f_{H-1}/2 f_H$ In : Pin6, Out : Pin5	—	—	-27	dB
PB comb 40 f_H shift	Δt_{PBC}	Sin 200 mV _{pp} , 40 $f_{H-1}/2 f_H$ In : Pin6, Out : Pin5	-10	—	10	ns
Rec. RF EQ frequency characteristic 1	ΔG_{REQ1}	Sin 40 mV _{pp} , 2.05 MHz/4 MHz In : Pin34, Out : Pin41	1.1	—	4.1	dB
Rec. RF EQ frequency characteristic 2	ΔG_{REQ2}	Sin 40 mV _{pp} , 5 MHz/8 MHz In : Pin34, Out : Pin41	1.4	—	4.9	dB
Auto tracking output DC voltage without signal	V_{ATO}	C-GND(Pin41) Out : Pin40	—	—	0.7	V
Auto tracking I/O characteristic 1	V_{AT1}	Sin 80 mV _{pp} , 4 MHz, SP-mode In : Pin41, Out : Pin40	1.3	—	1.8	V

■ Electrical Characteristics(continued) $T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Auto tracking I/O characteristic 2	V_{AT2}	Sin 200 mV _{pp} , 4 MHz, SP-mode In : Pin41, Out : Pin40	2.25	—	2.75	V
Auto tracking I/O characteristic 3	V_{AT3}	Sin 1 V _{pp} , 4 MHz, SP-mode In : Pin41, Out : Pin40	3.6	—	—	V
Auto tracking I/O characteristic 4	V_{AT4}	Sin 200 mV _{pp} , 4 MHz, SLP-mode In : Pin41, Out : Pin40	2.85	—	3.35	V
PB RF AGC output amplitude	V_{PRFA}	Sin 200 mV _{pp} , 4 MHz In : Pin41, Out : Pin44	110	—	250	mV _{pp}
PB RF AGC control sensitivity	S_{PRFA}	Sin 650/160 mV _{pp} , 4 MHz In : Pin41, Out : Pin44	-3	—	3	dB
PB RF EQ output amplitude	V_{PEQ}	Sin 200 mV _{pp} , 4 MHz In : Pin41, Out : Pin33	320	—	580	mV _{pp}
PB RF EQ frequency characteristic 1	ΔG_{PEQ1}	Sin 60 mV _{pp} , 630 kHz/4.9 MHz In : Pin41, Out : Pin33	—	—	-15	dB
PB RF EQ frequency characteristic 2	ΔG_{PEQ2}	Sin 60 mV _{pp} , 1 MHz/4.9 MHz In : Pin41, Out : Pin33	-14.5	—	-9.5	dB
PB RF EQ frequency characteristic 3	ΔG_{PEQ3}	Sin 60 mV _{pp} , 8 MHz/4.9 MHz In : Pin41, Out : Pin33	—	—	-23	dB
Line output gain	G_{LO}	Sin -29 dBV, 1 kHz In : Pin73, Out : Pin69	19.8	21.0	22.2	dB
Rec. output gain 1	ΔG_{RO1}	Sin -29 dBV, 1 kHz, SP-mode In : Pin71, Out : Pin65	4.9	5.9	6.9	dB
Rec. output gain 2	ΔG_{RO2}	Sin -29 dBV, 1 kHz, SLP-mode In : Pin71, Out : Pin65	0.2	0.7	1.2	dB
Rec. output harmonic distortion	D_{RO}	Sin -29 dBV, 1 kHz, SLP-mode In : Pin71, Out : Pin65	—	—	0.95	%
Rec. output S/N	v_{RO}	SLP-mode Out : Pin65	—	-68	-62	dB
AGC control sensitivity	S_{AGC}	Sin -9 dBV, 1 kHz In : Pin73, Out : Pin69	-1.0	1.0	3.0	dB
Line output harmonic distortion	D_{LO}	Sin -29 dBV, 1 kHz In : Pin73, Out : Pin69	—	—	0.6	%
f_H trap1 frequency characteristic	ΔG_{FT1}	Sin -29 dBV, 12 kHz In : Pin73, Out : Pin69	-2.5	0	2.5	dB
f_H trap2 frequency characteristic	ΔG_{FT2}	Sin -29 dBV, 15.75 kHz In : Pin73, Out : Pin69	—	—	-2	dB
Mute/Line DC offset	ΔV_{ML}	Out : Pin69	-65	—	65	mV
Mute/Tuner DC offset	ΔV_{MT}	Out : Pin69	-65	—	65	mV
Mute/PB-line DC offset	ΔV_{MP}	Out : Pin69	-40	—	60	mV

■ Electrical Characteristics(continued) $T_a = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$

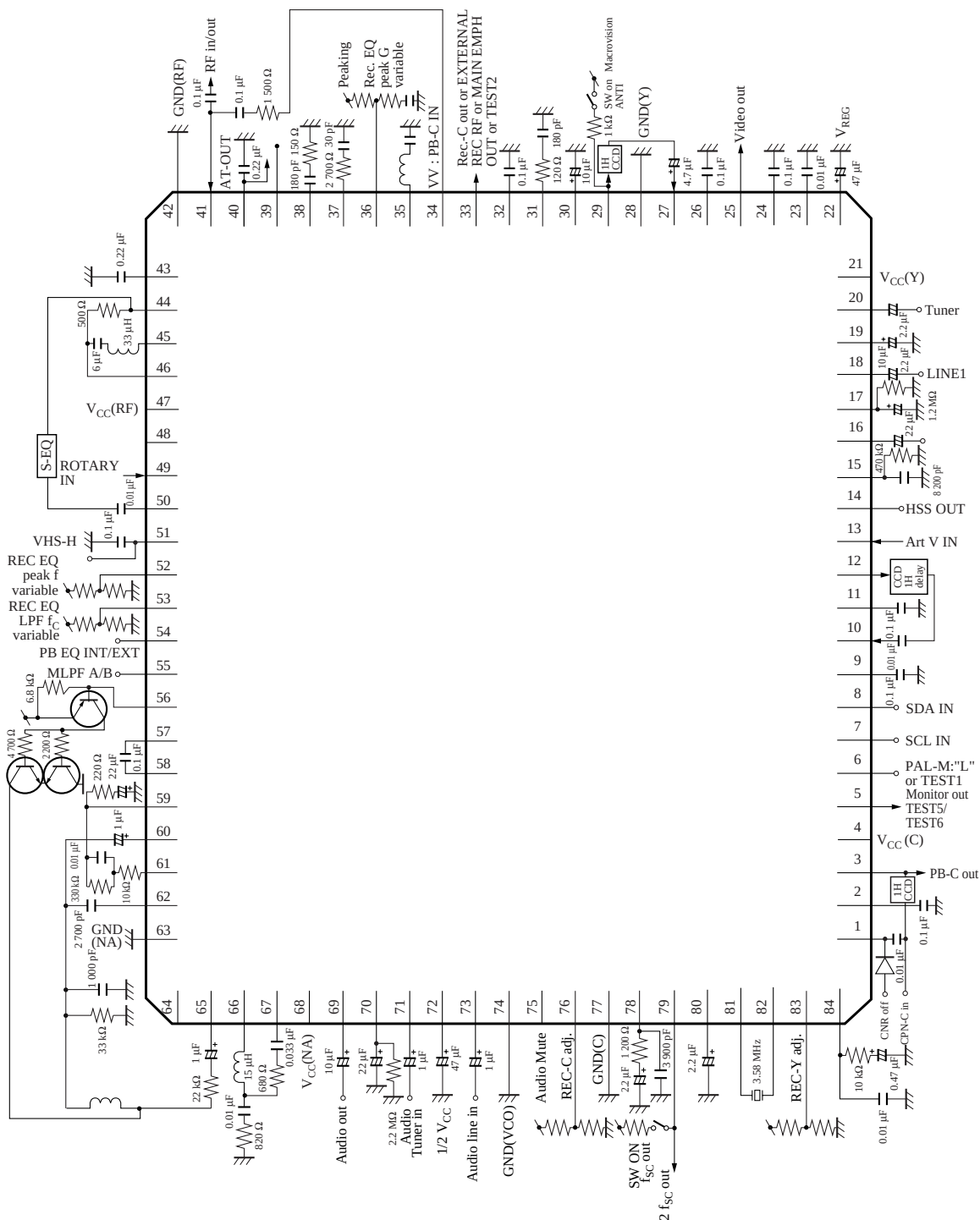
Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Mute gain attenuation	ΔG_M	Sin -68.3 dBV, 1 kHz In : Pin60, Out : Pin69	—	—	-80	dB
Rec. output max. level	v_{RMAX}	Sin -70.8 dBV, 1 kHz In : Pin73, Out : Pin65	-0.5	—	—	dBV
Non-rec. on SW output drive current	I_{NREC}	In : I ² C bus, Out : Pin56	500	—	—	μA
PB line output gain	G_{PLO}	Sin -68.3 dBV, 1 kHz, SP-mode In : Pin60, Out : Pin69	59.5	60.0	60.5	dB
PB line output differential signal gain	ΔG_{PLO}	Sin -70.8 dBV, 1 kHz, SLP-mode In : Pin60, Out : Pin69	2.6	3.1	3.6	dB
PB line output harmonic distortion	D_{PO}	Sin -70.8 dBV, 1 kHz, SLP-mode In : Pin60, Out : Pin69	—	0.50	0.95	%
PB line output S/N 1	V_{PSN1}	Pin60 = 1.5 k Ω , (R-GND), SLP-mode Out : Pin69	—	—	3.5	μV_{rms}
PB line output S/N 2	V_{PSN2}	Pin60 = 1.5 k Ω , (R-GND), SP-mode Out : Pin69	—	—	1.8	μV_{rms}
PB line output max. level	v_{LMAX}	Sin -70.8 dBV 1 kHz In : Pin60, Out : Pin69	-1.5	—	—	dBV

• Design reference data

Note) The characteristic values below are theoretical values for designing and not guaranteed.

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Before start bus free time	t_{BUF}	$V_{CC} = 5\text{ V}$	4.0	—	—	μs
Start condition set-up time	t_{SU-STA}	$V_{CC} = 5\text{ V}$	4.0	—	—	μs
Start condition hold time	t_{HD-STA}	$V_{CC} = 5\text{ V}$	4.0	—	—	μs
SCL clock "L" period	t_{LOW}	$V_{CC} = 5\text{ V}$	4.0	—	—	μs
SCL clock "H" period	t_{HIGH}	$V_{CC} = 5\text{ V}$	4.0	—	—	μs
SCL, SDA signals rise time	t_{RISE}	$V_{CC} = 5\text{ V}$	—	—	1.0	μs
SCL, SDA signals fall time	t_{FALL}	$V_{CC} = 5\text{ V}$	—	—	0.35	μs
Data set-up time(White)	$t_{SU-DATA}$	$V_{CC} = 5\text{ V}$	0.25	—	—	μs
Data hold time(White)	$t_{HD-DATA}$	$V_{CC} = 5\text{ V}$	0	—	—	μs
Acknowledge set-up time	t_{SU-ACK}	$V_{CC} = 5\text{ V}$	—	—	3.5	μs
Acknowledge hold time	t_{HD-ACK}	$V_{CC} = 5\text{ V}$	0	—	—	μs
Stop condition set-up time	t_{SU-STO}	$V_{CC} = 5\text{ V}$	4.0	—	—	μs

Application Circuit Example



■ Precautions for use

1. The latch-up level of pin 8 is low about 140 V(200 pF).
Please be careful when handling the pin.
2. Pay attention well to the handling because upside-down mounting may result in over-current, and characteristics deterioration or damage.

■ Technical Information

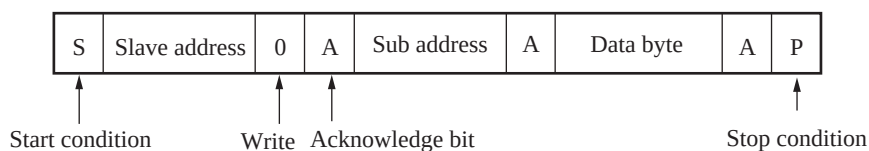
• I²C-bus

1. Provided with Auto-increment function

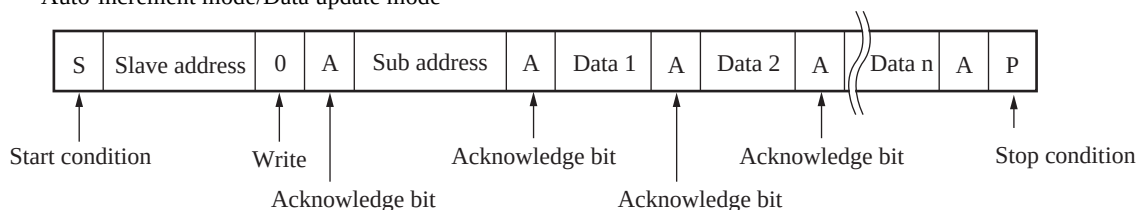
- Sub address 0* : Auto-increment mode
(Sending data sequentially, sub address changes sequentially and data are input.)
- Sub address 8* : Data update mode
(Sending data sequentially, data are input keeping the same sub address.)

2. I²C-bus protocol

- Slave address : 11100100(E4H)
- Format(normal)



- Auto-increment mode/Data update mode



■ Technical Information(continued)

• I²C-bus(continued)

3.Sub address byte and byte format : (80H) : Initial state

Sub	Data byte							
Address	D7	D6	D5	D4	D3	D2	D1	D0
00 (80 H)	Y/C1	Y/C2	Y/C3	Y/C4 PB comb On/Off	Y/C5	Y/C6	NA1	NA2
	0 : VV 1 : EE	0 : — 1 : Trick	0 : Rec. 1 : PB	0 : On 1 : Off	0 : Tuner 1 : Line	0 : Line1 1 : Line2	0 : EE 1 : VV	0 : ND-rec. 1 : D-rec.
	NA3			Rec.-comb 0 : SP=off LP/SLP=on 1 : Off	Edit 0 : Edit=off 1 : Edit=on	C-mix. 0 : Nor 1 : Combina- tion mode	Rec.-RFEQ Int./Ext. 0 : Int. 1 : Ext.	PB-RFEQ Peaking 0 : Int. 1 : Ext.
01 (80 H)	0 : Tuner 1 : Line	0 : SP 1 : LP	0 : — 1 : SLP					
	IIL-RSET	Color Killer1	Color Killer2	DOC Nor/On 0 : Nor 1 : On	Test1 Pin6 0 : Nor 1 : Test H1	Test2(Pin33) 000 : White clip 011 : RECCL 010 : MOLO 100 : MONI6		
02 (80 H)	0 : Reset 1 : Nor	0 : Auto 1 : Forced Off	0 : — 1 : Forced On					
	Test3 AGC/THRO	Test4 Rec.-RFEQ	Test5(Pin5) 000 : MONI1 100 : MONI5 001 : MONI2 101 : MONIY 010 : MONI3 110 : IILTEST 011 : MONI4			Test6(Pin5) 000 : 1/4 VCO 100 : PALFF2 001 : BLK 101 : CO180 010 : ROTCC 110 : FHT 011 : NN33B 111 : BGP		
	0 : AGC 1 : THRO	0 : Nor 1 : Test4						
03 (80 H)	ANR CTL 000 : ANR=off			Y/C7 0 : Composite 1 : Component	PB-RF-EQ (Peak gain control)			PB-RF-EQ (Peak f control)
	Picture CTL 000 : Pict=off			Test7 0 : Nor 1 : DEV- stop	PB-RF-EQ (Peak Q control)			
04 (80 H)								
05 (80 H)								

Note) *1 : There is no I²C-bus control on Rec.-Y/C level.

*2 : Refer to the following for other modes.

Pin No.	Function	Precaution	L	M	H	Note
1	C-mix.-in&VCO-ext.-in	—	Nor		CNR-off	Clock conditions : 1.25 ± 0.5, Pin81 = Low
6	System	—	PAL-M Pull-down with R		NTSC (With no external components)	Common to Test1

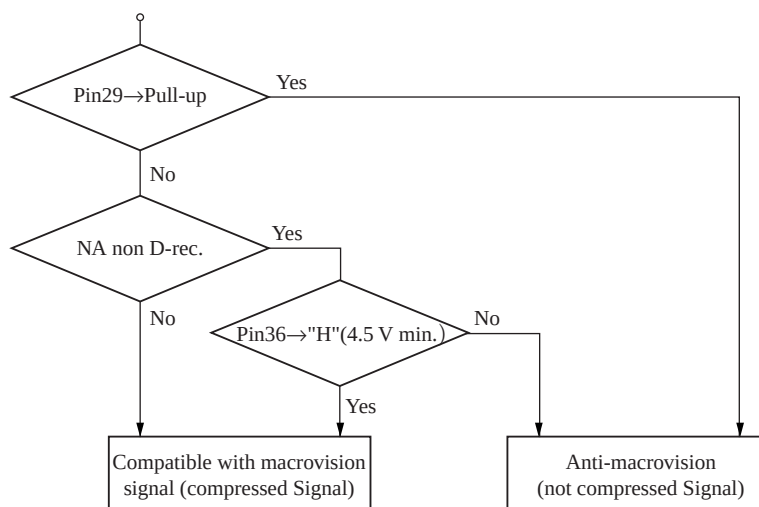
■ Technical Information(continued)

• I²C-bus(continued)

3.Sub address byte and byte format : (80H) : Initial state

Pin No.	Function	Precaution	L	M	H	Note
29	*	—	—			Anti-macrovision function selection
36	Rec. EQ peak-G variable	—	Rec. EQ peak-G variable		*	Anti-macrovision function selectable
52	Rec. EQ peak-F variable	—	Rec. EQ peak-F variable			—
53	Rec. EQ LPF f_C variable	—	Rec. EQ LPF f_C variable		Pin5 : CNR Pin33 : W/C	Monitor out fixed at V=5.0 V
54	PB RF EQ int./ext.	—	PB RF EQ int.		PB RF EQ ext.	Vth = 2.5 V
75	NA-mute	—	Nor	Mute		Vth = 2.0 V
79	$f_{SC}/2$ f_{SC}	—	2 f_{SC} (With no external components)		f_{SC} Pull-up with R	R = 1 k Ω

Note) * : Anti-macrovision Specifications.



■ Technical Information(continued)

• I²C-bus(continued)

4. Bus control

Function	Description	Appendx																																				
ANR control	<table><tr><th>D7</th><th>D6</th><th>D5</th><th></th></tr><tr><td>0</td><td>0</td><td>0</td><td>Off(Edit)</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Shallowest</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Shallower</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Shallow</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Typical</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Deep</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Deeper</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Deepest</td></tr></table>	D7	D6	D5		0	0	0	Off(Edit)	0	0	1	Shallowest	0	1	0	Shallower	0	1	1	Shallow	1	0	0	Typical	1	0	1	Deep	1	1	0	Deeper	1	1	1	Deepest	Sub address : 04
D7	D6	D5																																				
0	0	0	Off(Edit)																																			
0	0	1	Shallowest																																			
0	1	0	Shallower																																			
0	1	1	Shallow																																			
1	0	0	Typical																																			
1	0	1	Deep																																			
1	1	0	Deeper																																			
1	1	1	Deepest																																			
PB-RFEQ	<table><tr><th>D3</th><th>D2</th><th>D1</th><th></th></tr><tr><td>0</td><td>0</td><td>0</td><td>−2</td></tr><tr><td>0</td><td>0</td><td>1</td><td>−1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0(Typical)</td></tr><tr><td>0</td><td>1</td><td>1</td><td>+1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>+2</td></tr><tr><td>1</td><td>0</td><td>1</td><td>+3</td></tr><tr><td>1</td><td>1</td><td>0</td><td>+4</td></tr><tr><td>1</td><td>1</td><td>1</td><td>+5</td></tr></table>	D3	D2	D1		0	0	0	−2	0	0	1	−1	0	1	0	0(Typical)	0	1	1	+1	1	0	0	+2	1	0	1	+3	1	1	0	+4	1	1	1	+5	Sub address : 04
D3	D2	D1																																				
0	0	0	−2																																			
0	0	1	−1																																			
0	1	0	0(Typical)																																			
0	1	1	+1																																			
1	0	0	+2																																			
1	0	1	+3																																			
1	1	0	+4																																			
1	1	1	+5																																			
Peak gain control																																						
picture control	<table><tr><th>D7</th><th>D6</th><th>D5</th><th></th></tr><tr><td>0</td><td>0</td><td>0</td><td>Off(Edit)</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Softest</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Softer</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Soft</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Typical</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Sharp</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Sharper</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Sharpest</td></tr></table>	D7	D6	D5		0	0	0	Off(Edit)	0	0	1	Softest	0	1	0	Softer	0	1	1	Soft	1	0	0	Typical	1	0	1	Sharp	1	1	0	Sharper	1	1	1	Sharpest	Sub address : 05
D7	D6	D5																																				
0	0	0	Off(Edit)																																			
0	0	1	Softest																																			
0	1	0	Softer																																			
0	1	1	Soft																																			
1	0	0	Typical																																			
1	0	1	Sharp																																			
1	1	0	Sharper																																			
1	1	1	Sharpest																																			

■ Technical Information(continued)

• I²C-bus(continued)

4.Bus control(continued)

Function	Description	Appendx																																				
PB-RFEQ Peak Q control	<table><tr><th>D3</th><th>D2</th><th>D1</th><th></th></tr><tr><td>0</td><td>0</td><td>0</td><td>−2</td></tr><tr><td>0</td><td>0</td><td>1</td><td>−1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0(Typical)</td></tr><tr><td>0</td><td>1</td><td>1</td><td>+1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>+2</td></tr><tr><td>1</td><td>0</td><td>1</td><td>+3</td></tr><tr><td>1</td><td>1</td><td>0</td><td>+4</td></tr><tr><td>1</td><td>1</td><td>1</td><td>+5</td></tr></table>	D3	D2	D1		0	0	0	−2	0	0	1	−1	0	1	0	0(Typical)	0	1	1	+1	1	0	0	+2	1	0	1	+3	1	1	0	+4	1	1	1	+5	Sub address : 05
D3	D2	D1																																				
0	0	0	−2																																			
0	0	1	−1																																			
0	1	0	0(Typical)																																			
0	1	1	+1																																			
1	0	0	+2																																			
1	0	1	+3																																			
1	1	0	+4																																			
1	1	1	+5																																			
PB-RFEQ Peak f control	<table><tr><th>Sub AD : 04 D0</th><th>Sub AD : 05 D0</th><th></th></tr><tr><td>0</td><td>0</td><td>+1</td></tr><tr><td>1</td><td>0</td><td>0(Typical)</td></tr><tr><td>0</td><td>1</td><td>−1</td></tr><tr><td>1</td><td>1</td><td>−2</td></tr></table>	Sub AD : 04 D0	Sub AD : 05 D0		0	0	+1	1	0	0(Typical)	0	1	−1	1	1	−2	Sub address : 04 Sub address : 05																					
Sub AD : 04 D0	Sub AD : 05 D0																																					
0	0	+1																																				
1	0	0(Typical)																																				
0	1	−1																																				
1	1	−2																																				