

AN3961NFBPA, AN3963NFBPA

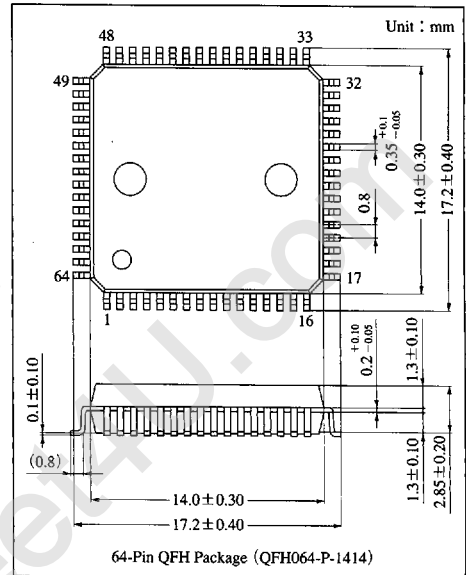
Audio Signal Processor ICs for Hi-Fi VCR

Overview

The AN3961NFBPA and the AN3963NFBPA are audio signal processing ICs with necessary all functions, included linear audio, for recording and playback of VHS-HiFi VCR. Each of them is in small outline of 64-pin flat package, and is multi-functional IC.

Features

- Supply voltages : 5V, 12V
- Full audio signal processing
- Compatible with the NTSC and PAL standards
- No need of BPF frequency characteristics adjustment
- BS monitoring built-in
- 3-wire serial control
- f_H trap is incorporated in linear-audio playback system for AN3963NFBPA



ICs for
VCR

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC1}	6.0	V
	V_{CC2}	13.0	
Supply current ^{Note1)}	I_{CC1}	130	mA
	I_{CC2}	40	
Power dissipation ^{Note1) Note2)}	P_D	1,300	mW
Operating ambient temperature ^{Note1)}	T_{opr}	-20 to +75	°C
Storage temperature ^{Note1)}	T_{stg}	-55 to +150	°C

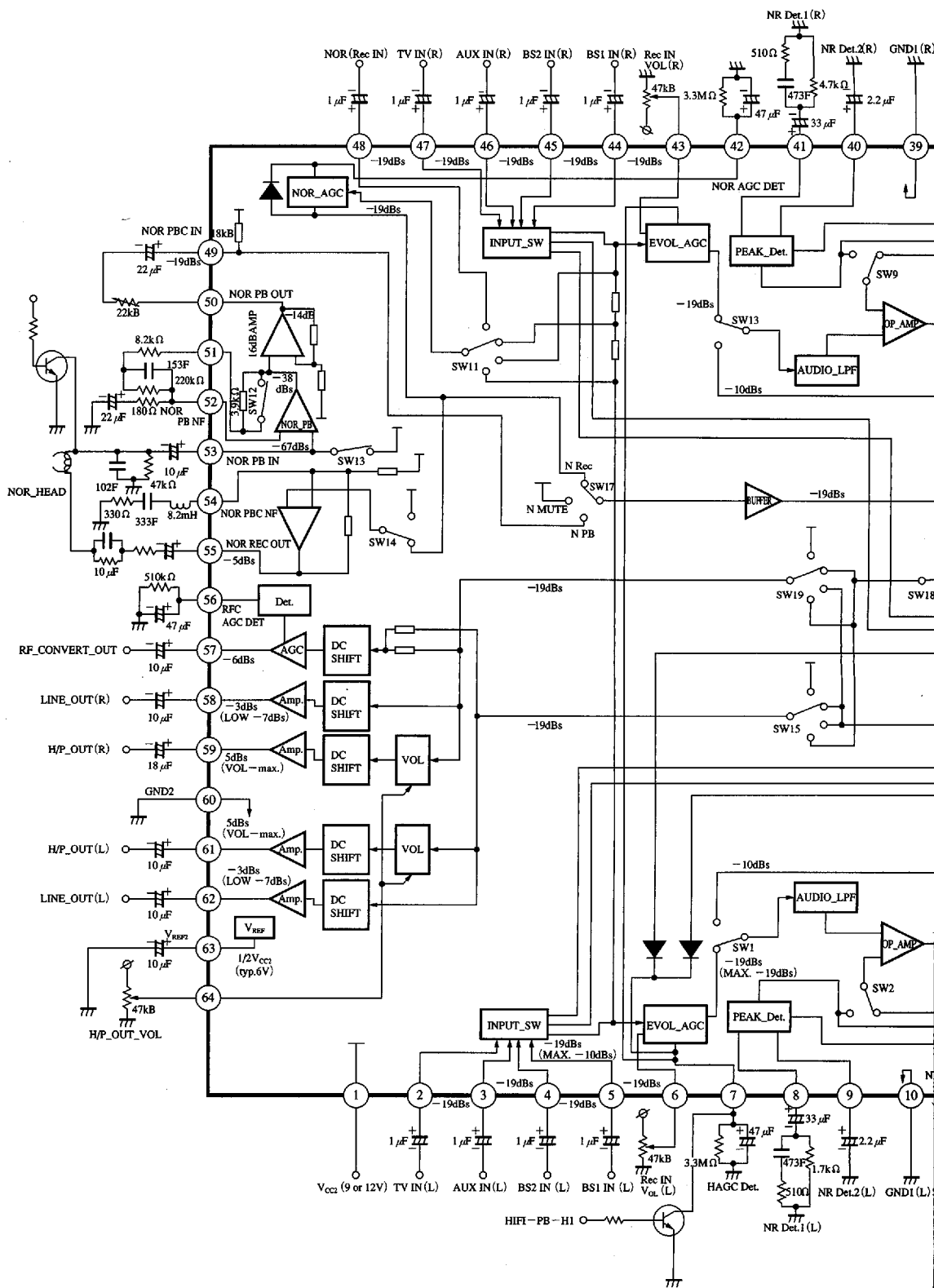
Note 1) $T_a = 25^\circ\text{C}$ except operating ambient temperature and storage temperature.

Note 2) Allowable power dissipation of the package at $T_a = 70^\circ\text{C}$.

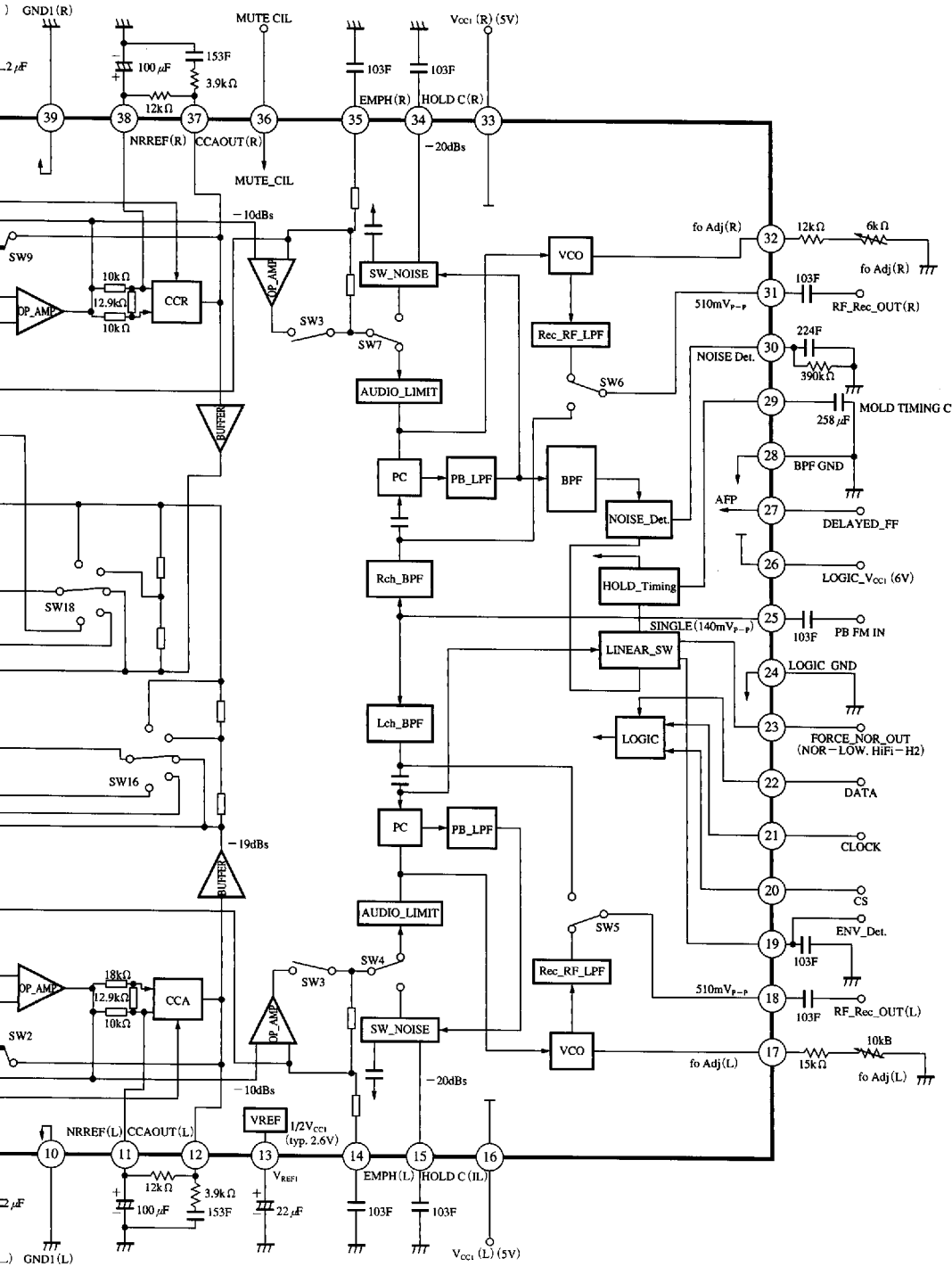
Recommended Operating Range ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Range
Operating supply voltage range (1)	V_{CC1}	4.5V to 5.5V
Operating supply voltage range (2)	V_{CC2}	8.0V to 12.5V

Block Diagram AN3961NFBPA



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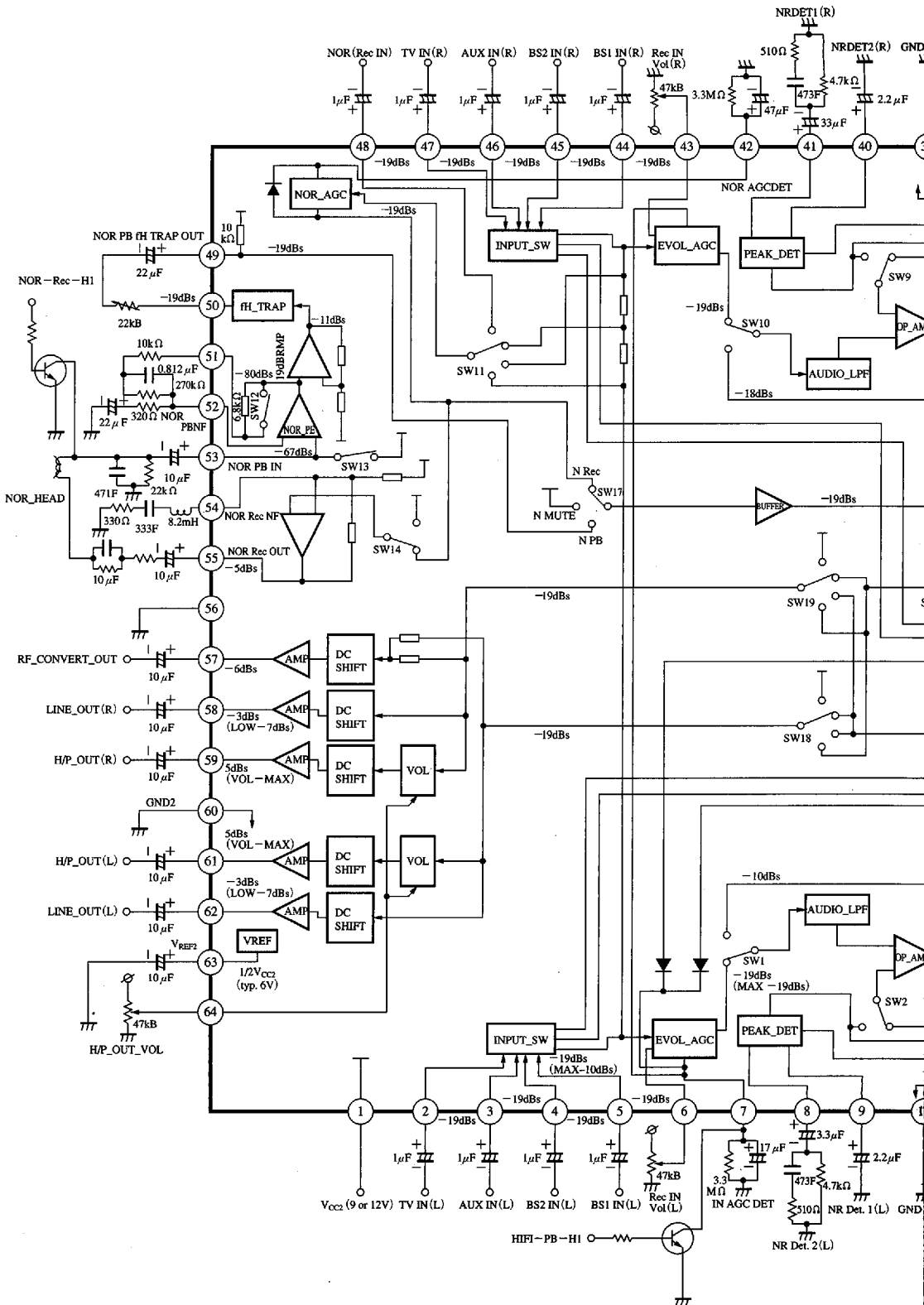


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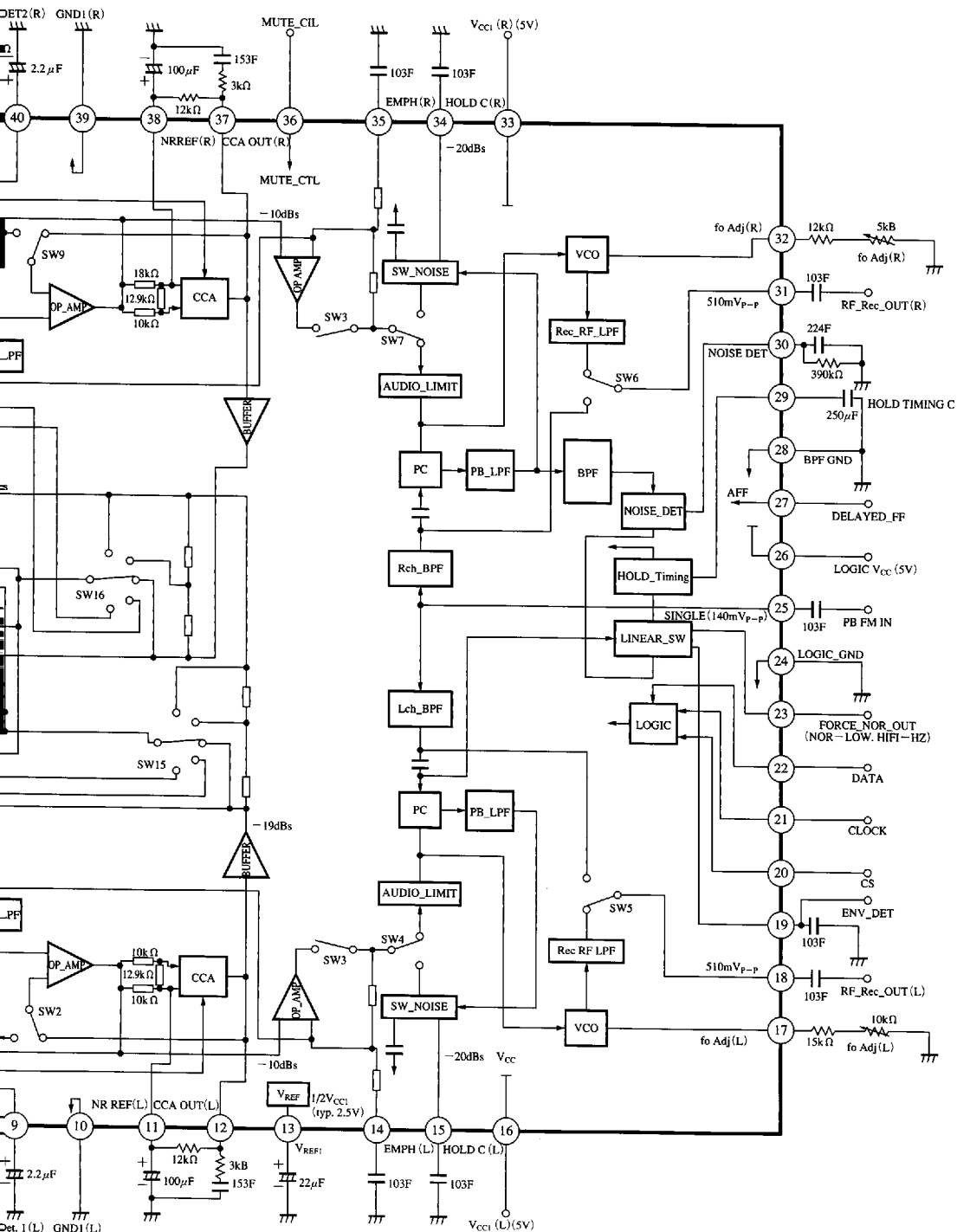
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Block Diagram AN3963NFBPA



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Electrical Characteristics ($V_{CC1}=5V$, $V_{CC2}=12V$, $T_a=25\pm 2^\circ C$)

Parameter	Symbol	Condition	min	typ	max	Unit
Circuit current in Rec (5V)	I_{CCR1}	Rec mode	48	60	82	mA
Circuit current in Rec (12V)	I_{CCR2}	Rec mode	13	23	32	mA
Circuit current in PB (5V)	I_{CCP1}	PB mode	74	93	118	mA
Circuit current in PB (12V)	I_{CCP2}	PB mode	14	24	34	mA
ENC Out level 1-L	V_{HRO1L}	$V_{in} = -29dBs, 1kHz$ D/A, GAIN-LOW, $V_{OL} = max.$	-13.0	-11.5	-10.0	dBs
ENC Out level 1-R	V_{HRO1R}	$V_{in} = -29dBs, 1kHz$ D/A, GAIN-LOW, $V_{OL} = max.$	-13.0	-11.5	-10.0	dBs
ENC Out level 2-L	V_{HRO2L}	$V_{in} = -9dBs, 1kHz$ D/A, G=LOW, V_{HRO2L}/V_{HRO1L} , $V_{OL} = max.$	9	10	11	dB
ENC Out level 2-R	V_{HRO2R}	$V_{in} = -9dBs, 1kHz$ D/A, G=LOW, V_{HRO2R}/V_{HRO1R} , $V_{OL} = max.$	9	10	11	dB
ENC Out level 3-L	V_{HRO3L}	$V_{in} = -89dBs, 1kHz$ D/A, G=LOW, V_{HRO3L}/V_{HRO1L} , $V_{OL} = max.$	-33.5	-31.0	-29.0	dB
ENC Out level 3-R	V_{HRO3R}	$V_{in} = -89dBs, 1kHz$ D/A, G=LOW, V_{HRO3R}/V_{HRO1R} , $V_{OL} = max.$	-33.5	-31.0	-29.0	dB
Normal Rec level	V_{NRO}	$V_{in} = -19dBs, 1kHz$ GAIN-LOW	-7.5	-6.0	-4.5	dBs
Normal Rec THD	T_{NRO}	$V_{in} = -19dBs, 1kHz$ GAIN-LOW	—	—	0.2	%
Normal AGC level	V_{NRA}	$V_{in} = -9dBs, 1kHz$ GAIN-LOW	-6.3	-4.3	-2.3	dBs
Normal PB level	V_{NPO}	$V_{in} = -67dBs, 1kHz$ GAIN-LOW	-9.5	-7.5	-5.5	dBs
Normal PB THD	T_{NPO}	$V_{in} = -67dBs, 1kHz$ GAIN-LOW	—	—	0.7	%
Vol. level L	V_{VOLL}	$V_{in} = -19dBs, 1kHz$ $V_{OL} = 3.4V$, G=LOW	-10	-8	-6	dBs
Vol. level R	V_{VOLR}	$V_{in} = -19dBs, 1kHz$ $V_{OL} = 3.4V$, G=LOW	-10	-8	-6	dBs
Vol. L/R balance	B_{VOL}	T18-T19 GAIN-LOW	-1.2	0.0	1.2	dB
Vol. Min. *1	V_{VOLM}	$V_{in} = -19dBs, 1kHz$ $V_{OL} = 1.7V$, G=LOW	—	—	-60	dBs
Lout G-Hi level L	V_{GHL}	$V_{in} = -19dBs, 1kHz$ Gain=Hi, BS monitor	-5	-3	-1	dBs
Lout G-Hi level R	V_{GHR}	$V_{in} = -19dBs, 1kHz$ Gain=Hi, BS monitor	-5	-3	-1	dBs
Line Out THD (L)	T_{HRML}	$V_{in} = -19dBs, 1kHz$ $V_{OL} = 3.4V$, G=LOW	—	—	0.1	%
Line Out THD (R)	T_{HRMR}	$V_{in} = -19dBs, 1kHz$ $V_{OL} = 3.4V$, G=LOW	—	—	0.1	%
Line Out Vmax L	V_{MLOL}	$f_{in} = 1kHz$, G=LOW At output distortion 3%	10	—	—	dBs
Line Out Vmax R	V_{MLOR}	$f_{in} = 1kHz$, G=LOW At output distortion 3%	10	—	—	dBs
ENC OUT Vmax L	V_{MFEL}	$f_{in} = 1kHz$, $V_{ol} = 5V$ At output distortion 3%	-2	—	—	dBs
ENC OUT Vmax R	V_{MFER}	$f_{in} = 1kHz$, $V_{ol} = 5V$ At output distortion 3%	-2	—	—	dBs
HiFi AGC level L	V_{AGCAL}	$V_{in} = +1dBs, 1kHz$ GAIN-LOW	1.7	4.2	6.7	dBs
HiFi AGC level R	V_{AGCAR}	$V_{in} = +1dBs, 1kHz$ GAIN-LOW	1.7	4.2	6.7	dBs
HiFi AGC mode EE level L	V_{AGCEEL}	$V_{in} = -19dBs, 1kHz$ GAIN-LOW	-9.5	-7.5	-5.5	dBs

*1 The recording volume control voltage applied to Pin⑤ or ④ must be in the range 1 to 5V to agree with the overvoltage specification of the IC ($V_{OL} = 1V$).

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Electrical Characteristics (cont.) ($V_{CC1}=5V$, $V_{CC2}=12V$, $T_a=25\pm 2^\circ C$)

Parameter	Symbol	Condition	min	typ	max	Unit
HiFi AGC mode EE level R	V_{AGCEER}	$V_{in} = -19dBs$, 1kHz GAIN-LOW	-9.5	-7.5	-5.5	dBs
RFconv.Out level	V_{RFC}	$V_{in} = -19dBs$, 1kHz BS monitor mode, G=LOW	-6.5	-5.0	-3.5	dBs
HP Out level 1-L	V_{HP1L}	$V_{in} = -19dBs$, 1kHz HPvol=5V, G=LOW	3.0	5.0	7.0	dBs
HP Out level 1-R	V_{HP1R}	$V_{in} = -19dBs$, 1kHz HPvol=5V, G=LOW	3.0	5.0	7.0	dBs
HP Out level 2-L	V_{HP2L}	$V_{in} = -19dBs$, 1kHz HPvol=3.4V, G=LOW	-9	-5	-1	dBs
HP Out balance R	B_{HPR}	$V_{in} = -19dBs$, 1kHz HPvol=3.4V, B_{HPR}/V_{HP2L}	-1.5	0.0	1.5	dB
HP Out THD L	T_{HPL}	$V_{in} = -9dBs$, 1kHz HPvol=3.4V, G=LOW	—	—	1	%
HP Out THD R	T_{HPR}	$V_{in} = -9dBs$, 1kHz HPvol=3.4V, G=LOW	—	—	1	%
Line Out S/N L	N_{HLOL}	$R_g = 2.2k\Omega$ D/A, GAIN-LOW	75	—	—	dB
Line Out S/N R	N_{HLOR}	$R_g = 2.2k\Omega$ D/A, GAIN-LOW	75	—	—	dB
Normal PB Out S/N	N_{HPO}	$R_g = 2.2k\Omega$ D/A, GAIN-LOW	43	48	—	dB
TV mode crosstalk *2	C_{TIT}	Line & BSin = -9dBs D/A, RFconv. out	—	—	-70	dB
AUX mode crosstalk *2	C_{TIA}	TV & BSin = -9dBs D/A, RFconv. out	—	—	-70	dB
BS1 mode crosstalk *2	C_{TIB1}	TV, A & BS2in = -9dBs D/A, RFconv. out	—	—	-70	dB
BS2 mode crosstalk *2	C_{TIB2}	TV, A & BS1in = -9dBs D/A, RFconv. out	—	—	-70	dB
Between channels crosstalk L *2	C_{TRL}	AUXinRch = -9dBs D/A, C_{TRL}/V_{VOLL} , G=L	—	—	-65	dB
Between channels crosstalk R *2	C_{TLR}	AUXinLch = -9dBs D/A, C_{TLR}/V_{VOLR} , G=L	—	—	-65	dB
Normal input crosstalk 1 *2	C_{TNNO}	AUXin = -9dBs D/A, C_{TNNO}/V_{NRO} , G=L	—	—	-65	dB
Normal input crosstalk 2 *2	C_{TNLR}	NorRECin = -9dBs D/A, C_{TNLR}/V_{NRO} , G=L	—	—	-65	dB
Normal input crosstalk 3 *2	C_{TNRR}	NRec & AUXL = -9dBs D/A, C_{TNRR}/V_{NRO} , G=L	—	—	-65	dB
Normal input crosstalk 4 *2	C_{TNLL}	NRec & AUXR = -9dBs D/A, C_{TNLL}/V_{NRO} , G=L	—	—	-65	dB
Between mode crosstalk 1 *2	C_{THN}	LINEin = -9dBs, G=L D/A, RFconv. out	—	—	-60	dB
Between mode crosstalk 2 *2	C_{TNH}	NRec & BSin = -9dBs D/A, RFconv. out	—	—	-70	dB
Between mode crosstalk 3 *2	C_{TB1}	NRec & BS2in = -9dBs D/A, RFconv. out	—	—	-70	dB
Between mode crosstalk 4 *2	C_{TB2}	NRec & BS1in = -9dBs D/A, RFconv. out	—	—	-70	dB
ENC crosstalk R→L *3	C_{ENL}	AUXinR = -9dBs D/A, C_{ENL}/V_{HROI1} , G=LOW	—	-38	-33	dB
ENC crosstalk L→R *3	C_{ENR}	AUXinL = -9dBs D/A, C_{ENR}/V_{HROI1} , G=LOW	—	-38	-33	dB
Normal PB→Rec crosstalk *3	C_{TNPR}	Normal PBin = -57dBs D/A, C_{TNPR}/V_{NRO} , G=L	—	—	-65	dB

*2 As a condition, subtract 10dB from a calculated value (to increase input level by 10dB).

*3 Subtract 5dB from a calculated value for ENC output.*1

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Electrical Characteristics (cont.) ($V_{CC1}=5V$, $V_{CC2}=12V$, $T_a=25\pm 2^\circ C$)

Parameter	Symbol	Condition	min	typ	max	Unit
Normal Rec→PB crosstalk *2	C_{TNRP}	Normal Recin = -9dBs D/A, C_{TNRP}/V_{NFO} , G=L	—	—	-48	dB
Muting ratio *2	MUTE	AUXin = -9dBs, G=L D/A, RFconv. out	—	—	-70	dB
Normal Muting ratio *2	NMUTE	Normal Recin = -9dBs D/A, NMUTE/ V_{NRO} , G=L	—	—	-45	dB
VCO free-run frequency L	IFL	RFRecOut(Lch), GAIN-LOW	1.05	1.30	1.55	MHz
VCO free-run frequency R	IFR	RFRecOut(Rch), GAIN-LOW	1.40	1.70	2.00	MHz
VCO output amplitude L	V_{OVCOL}	RFRecOut(Lch), GAIN-LOW	400	510	600	mV _{P-P}
VCO output amplitude R	V_{OVCOR}	RFRecOut(Rch), GAIN-LOW	400	510	600	mV _{P-P}
Carrier 3rd harmonics component L	3HDL	RFRecOut, GAIN-LOW	—	—	-38	dB
Carrier 3rd harmonics component R	3HDR	RFRecOut, GAIN-LOW	—	—	-38	dB
Limiter level NTSC-1-L	LIMN1L	Pin④=5V LIMN1L- f_0 , GAIN-LOW	-156	-140	-124	kHz
Limiter level NTSC-1-R	LIMN1R	Pin⑤=5V LIMN1R, GAIN-LOW	-156	-140	-124	kHz
Limiter level NTSC-2-L	LIMN2L	Pin④=0V LIMN2L, GAIN-LOW	127	143	159	kHz
Limiter level NTSC-2-R	LIMN2R	Pin⑤=0V LIMN2R, GAIN-LOW	127	143	159	kHz
Limiter level PAL-1-L	LIMP1L	Pin④=5V LIMP1L-LIMN1L, G=LOW	1	8	15	kHz
Limiter level PAL-1-R	LIMP1R	Pin⑤=5V LIMP1R-LIMN1R, G=LOW	1	8	15	kHz
Limiter level PAL-2-L	LIMP2L	Pin④=0V LIMP2L-LIMN2L, G=LOW	-18	-11	-4	kHz
Limiter level PAL-2-R	LIMP2R	Pin⑤=0V LIMP2R-LIMN2R, G=LOW	-18	-11	-4	kHz
FM deviation L	DEVL	Vin = -29dBs, 1kHz RFRecOut, G=LOW	44	50	56	kHz Dev
FM deviation R	DEVR	Vin = -29dBs, 1kHz RFRecOut, G=LOW	44	50	56	kHz Dev
FM deviation L/R difference	DEVLR	DEVL-DEVR, GAIN-LOW	-6	0	6	kHz
FM modulation THD L	T_{HFEL}	AUX = -19dBs 1kHz Standard demodulator output	—	—	0.7	%
FM modulation THD R	T_{HFER}	AUX = -19dBs 1kHz Standard demodulator output	—	—	0.7	%
FM modulation S/NL	N_{HFEL}	D/A, DEVL- N_{HFEL} , GAIN-LOW	36	40	—	dB
FM modulation S/NR	N_{HFER}	D/A, DEVR- N_{HFER} , GAIN-LOW	36	40	—	dB
1.3 MBPF f characteristics 1 *4	B_{PF11}	$f_c=1.3MHz$, G=LOW BPFmonitor (Lch)	90	135	180	mV _{P-P}
1.3 MBPF f characteristics 2 *4	B_{PF12}	$f_c=1.45MHz$ B_{PF12}/B_{PF11} , GAIN-LOW	-8	—	-1	dB
1.3 MBPF f characteristics 3 *4	B_{PF13}	$f_c=1.15MHz$ B_{PF13}/B_{PF11} , GAIN-LOW	-3	0	3	dB
1.3 MBPF f characteristics 4 *4	B_{PF14}	$f_c=0.95MHz$ B_{PF14}/B_{PF11} , GAIN-LOW	—	—	-10	dB
1.3 MBPF f characteristics 5 *4	B_{PF15}	$f_c=1.7MHz$ B_{PF15}/B_{PF11} , GAIN-LOW	—	—	-20	dB
1.7 MBPF f characteristics 1 *4	B_{PF21}	$f_c=1.7MHz$, G=LOW BPFmonitor (Rch)	105	155	205	mV _{P-P}
1.7 MBPF f characteristics 2 *4	B_{PF22}	$f_c=1.85MHz$ B_{PF22}/B_{PF21} , GAIN-LOW	-3.5	1.0	3.5	dB

*2 As a condition, subtract 10dB from a calculated value (to increase input level by 10dB).

*4 BPF frequency characteristics measurement condition : Playback FM input level = 140mV_{P-P} (measured after VCO f_0 -adjustment at 1.3MHz±10kHz and 1.7MHz±10kHz)

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Electrical Characteristics (cont.) ($V_{CC1}=5V$, $V_{CC2}=12V$, $T_a=25\pm 2^\circ C$)

Parameter	Symbol	Condition	min	typ	max	Unit
1.7 MBPF f characteristics 3 *4	B_{PF23}	$f_c=1.55MHz$ B_{PF23}/B_{PF21} , GAIN-LOW	-9	-3.5	0	dB
1.7 MBPF f characteristics 4 *4	B_{PF24}	$f_c=2.1MHz$ B_{PF24}/B_{PF21} , GAIN-LOW	—	—	-8	dB
1.7 MBPF f characteristics 5 *4	B_{PF25}	$f_c=1.3MHz$ B_{PF25}/B_{PF21} , GAIN-LOW	—	—	-20	dB
PB Out level 1-L	V_{HPO1L}	$V_{in}=50kDev$, 1kHz D/A, LINEout, G=L	-9.0	-7.5	-6.0	dBs
PB Out level 1-R	V_{HPO1R}	$V_{in}=50kDev$, 1kHz D/A, LINEout, G=L	-9.0	-7.5	-6.0	dBs
PB Out level L/R difference	BHP	(V_{HPO1L}/V_{HPO1R}) , GAIN-LOW	-1.3	0	1.3	dB
PB Out level 2-L	V_{HPO2L}	$V_{in}=+6dB$, 1kHz D/A, V_{HPO2L}/V_{HPO1L} , G=L	10.5	12.0	13.5	dB
PB Out level 2-R	V_{HPO2R}	$V_{in}=+6dB$, 1kHz D/A, V_{HPO2R}/V_{HPO1R} , G=L	10.5	12.0	13.5	dB
PB Out level 3-L	V_{HPO3L}	$V_{in}=-30dB$, 1kHz D/A, V_{HPO3L}/V_{HPO1L} , G=L	-64	-60	-57	dB
PB Out level 3-R	V_{HPO3R}	$V_{in}=-30dB$, 1kHz D/A, V_{HPO3R}/V_{HPO1R} , G=L	-64	-60	-57	dB
PB Out f characteristics L	V_{HPFL}	$V_{in}=50kDev$, 70kHz D/A, V_{HPFL}/V_{HPO1L} , G=L	-48	-40	-32	dB
PB Out f characteristics R	V_{HPFR}	$V_{in}=50kDev$, 70kHz D/A, V_{HPFR}/V_{HPO1R} , G=L	-48	-40	-32	dB
PB Out THD L	T_{HPOL}	$V_{in}=100kDev$, 1kHz LINEout, GAIN-LOW	—	—	0.8	%
PB Out THD R	T_{HPOR}	$V_{in}=100kDev$, 1kHz LINEout, GAIN-LOW	—	—	0.8	%
PB Out S/N L	N_{HPOL}	LINEout without modulation D/A, V_{HPO1L}/N_{HPOL} , G=L	75	81	—	dB
PB Out S/N R	N_{HPOR}	LINEout without modulation D/A, V_{HPO1R}/N_{HPOR} , G=L	75	81	—	dB
DOC ON level	DOC1	$f_c=1.3MHz$, G=LOW Vf in which V (15) < 1V	10	18	30	mV _{P-P}
DOC hysteresis	DOC2	$f_c=1.3MHz$, G=LOW Vf in which V (15) > 2V	1	3	6	dB
Forced normal detection level 1	ND1	f=150kHz mode 00 Dev. in which V (23) < 0.5V	35	69	104	kHz Dev
Envelope out 1	ENV1	V=100mV _{P-P} , 1.3MHz V (19), GAIN-LOW	3.1	3.4	3.9	V
Envelope out 2	ENV2	V=170mV _{P-P} , 1.3MHz V (19), ENV2-ENV1	0.2	0.5	0.7	V
R/P crosstalk 1 *2	C_{TPR}	$V_{in}=-9dBm$, 1kHz D/A, PB mode, REC, C_{TPR}/V_{HPO1L} , REC OUT in V_{HPO1R}	—	-84	-70	dB
Between PB CH crosstalk 1	C_{TP1}	$V_{in}=50kDev$, 1kHz D/A, R>L, C_{TP1}/V_{HPO1L}	—	—	-60	dB
Between PB CH crosstalk 2	C_{TP2}	$V_{in}=50kDev$, 1kHz D/A, L>R, C_{TP2}/V_{HPO1R}	—	—	-60	dB
1.4 MBPF f characteristics 1 *5	B_{PF31}	$f_c=1.4MHz$ (PAL) BPFmonitor, G=LOW	90	135	180	mV _{P-P}
1.4 MBPF f characteristics 2 *5	B_{PF32}	$f_c=1.55M$ (PAL) B_{PF32}/B_{PF31} , G=LOW	-8	—	-1	dB
1.4 MBPF f characteristics 3 *5	B_{PF33}	$f_c=1.25MHz$ (PAL) B_{PF33}/B_{PF31} , G=LOW	-3	0	3	dB
1.4 MBPF f characteristics 4 *5	B_{PF34}	$f_c=1.05MHz$ (PAL) B_{PF34}/B_{PF31} , G=LOW	—	—	-8	dB

*2 As a condition, subtract 10dB from a calculated value (to increase input level by 10dB).

*4 BPF frequency characteristics measurement condition : Playback FM input level=140mV_{P-P} (measured after VCO f₀-adjustment at 1.3MHz±10kHz and 1.7MHz±10kHz)

*5 BPF frequency characteristics measurement condition : Playback FM input level=140mV_{P-P} (measured after VCO f₀-adjustment at 1.4MHz±10kHz and 1.8MHz±10kHz)

Electrical Characteristics (cont.) ($V_{CC1}=5V$, $V_{CC2}=12V$, $T_a=25\pm 2^\circ C$)

Parameter	Symbol	Condition	min	typ	max	Unit
1.4 MBPF f characteristics 5 *5	B_{PF35}	$f_c=1.8MHz$ (PAL) B_{PF35}/B_{PF31} , $G=LOW$	—	—	-20	dB
1.8 MBPF f characteristics 1 *5	B_{PF41}	$f_c=1.8MHz$ (PAL) BPFmonitor, $G=LOW$	110	165	220	mV _{P-P}
1.8 MBPF f characteristics 2 *5	B_{PF42}	$f_c=1.65MHz$ (PAL) B_{PF42}/B_{PF41} , $G=LOW$	-10	-4.5	0.0	dB
1.8 MBPF f characteristics 3 *5	B_{PF43}	$f_c=1.95MHz$ (PAL) B_{PF43}/B_{PF41} , $G=LOW$	-6	-1	3	dB
1.8 MBPF f characteristics 4 *5	B_{PF44}	$f_c=2.2MHz$ (PAL) B_{PF44}/B_{PF41} , $G=LOW$	—	—	-10	dB
1.8 MBPF f characteristics 5 *5	B_{PF45}	$f_c=1.4MHz$ (PAL) B_{PF45}/B_{PF41} , $G=LOW$	—	—	-20	dB
MUTE CTL input Hi level	V_{IHMUT}	MUTE-ON	3.6	—	5.0	V
MUTE CTL input LOW level	V_{ILMUT}	MUTE-OFF	0	—	1.0	V
Normal PB input terminal resistor	R_{NPB}	DC measurement (Rec mode) Pin⑤ impedance	—	20	40	Ω
SP/EP change-over SW resistor	R_{NSPEP}	DC measurement (PBSP mode) Pin⑥ impedance	—	240	400	Ω
HPvol.Min. level L	V_{HPML}	$V_{in}=-19dBs$, 1kHz HPvol=1.0V, $G=Low$	—	—	-55	dBs
HPvol.Min. level R	V_{HPMR}	$V_{in}=-19dBs$, 1kHz HPvol=1.0V, $G=Low$	—	—	-55	dBs
DATA input Hi level	V_{HDATA}	At $V_{CC}=5V$	(3.5)	—	(5.0)	V
DATA input LOW level	V_{LDATA}	At $V_{CC}=5V$	(0)	—	(1.5)	V
CLOCK input Hi level	V_{HCLOCK}	At $V_{CC}=5V$	(3.5)	—	(5.0)	V
CLOCK input LOW level	V_{LCLOCK}	At $V_{CC}=5V$	(0)	—	(1.5)	V
CS input Hi level	V_{HCS}	At $V_{CC}=5V$	(3.5)	—	(5.0)	V
CS input LOW level	V_{LCS}	At $V_{CC}=5V$	(0)	—	(1.5)	V
Forced normal detection level 2	ND2	$f=150kHz$ mode 01 DEV in which $V(23) < 0.5V$	(20)	(38)	(70)	kHz Dev
Forced normal detection level 3	ND3	$f=150kHz$ mode 10 DEV in which $V(23) < 0.5V$	(15)	(27)	(50)	kHz Dev
Forced normal detection level 4	ND4	$f=150kHz$ mode 11 DEV in which $V(23) < 0.5V$	(6)	(12)	(23)	kHz Dev
1.3 MBPF f characteristics 6	B_{PF16}	BPFmonitor(Lch) 1.1MHz/1.55MHz	(4)	—	—	dB
1.7 MBPF f characteristics 6	B_{PF26}	BPFmonitor(Rch) 1.85MHz/1.45MHz	(7)	—	—	dB
1.4 MBPF f characteristics 6	B_{PF36}	BPFmonitor(Lch) 1.2MHz/1.65MHz	(4)	—	—	dB
1.8 MBPF f characteristics 6	B_{PF46}	BPFmonitor(Rch) 2.0MHz/1.55MHz	(4)	—	—	dB
VCO f_0 temperature dependency	T_{VCO}	$f_0(T=-10^\circ C) - f_0(T=75^\circ C)$	(-10)	—	(5)	kHz
EVOL V_{CC} dependency	V_{EVOL}	$V_{CC1}=5\pm 0.1V$ Gain variation in variation	(-0.7)	(0.3)	(1.3)	dB
H/PVOL V_{CC} dependency	V_{HPVOL}	$V_{CC1}=5\pm 0.1V$ Gain variation in variation	(-1)	(0.1)	(1)	dB
NOR→HiFi mono-multi time constant 1	MON1	Mode 1 (short time) Defined by FF timing	(6)	—	(7)	FF
NOR→HiFi mono-multi time constant 2	MON2	Mode 2 (short time) Defined by FF timing	(2)	—	(3)	FF
ENC attack time	ENAT		(4)	(5)	(6)	ms

*5 BPF frequency characteristics measurement condition : Playback FM input level=140mV_{P-P} (measured after VCO f_0 -adjustment at 1.4MHz \pm 10kHz and 1.8MHz \pm 10kHz)

Note) The characteristics value in parentheses is not a guaranteed value, but reference one on design.

Electrical Characteristics (cont.) ($V_{CC1}=5V$, $V_{CC2}=12V$, $T_a=25\pm 2^\circ C$)

Parameter	Symbol	Condition	min	typ	max	Unit
ENC recovery time	ENRT		(56)	(70)	(84)	ms
BPF group delay difference ($f_0 \pm 100kHz$)	GDBPF	$f_0 \pm 100kHz$	—	—	(0.5)	μs

Note) The values in parentheses are for reference only (not guaranteed).

Pin Descriptions (AN3961NFBPA)

Pin No.	Pin name	Pin No.	Pin name
1	V_{CC} ($V_{CC2}=12V$)	33	R channel V_{CC} ($V_{CC1}=5V$)
2	TV-IN (L channel)	34	To a HOLD capacitor (R channel)
3	AUX-IN (L channel)	35	EMPHA/DEEMPHA (R channel)
4	BS2-IN (L channel)	36	MUTE control
5	BS1-IN (L channel)	37	CCA output (R channel)
6	Rec. input volume control (L channel)	38	NRREF (R channel)
7	Stereo AGC detection	39	GND (R channel)
8	NRDET 1 (L channel)	40	NRDET 2 (R channel)
9	NRDET 2 (L channel)	41	NRDET 1 (R channel)
10	GND (L channel)	42	Normal AGC detection
11	NRREF (L channel)	43	Rec. input volume control (R channel)
12	CCA output (L channel)	44	BS1-IN (R channel)
13	V_{REF1} ($1/2V_{CC1}$)	45	BS2-IN (R channel)
14	EMPHA/DEEMPHA (L channel)	46	AUX-IN (R channel)
15	To a HOLD capacitor (L channel)	47	TV-IN (R channel)
16	L channel V_{CC} ($V_{CC1}=5V$)	48	Normal recording input
17	f_0 control (L channel)	49	Normal playback input
18	RF Rec. output and BPF monitor (L channel)	50	Normal playback output
19	ENV-DET	51	Normal playback EQ switching
20	CS input	52	Normal playback amp. NF
21	CLOCK input	53	Normal playback head signal input
22	DATA input	54	Normal recording amp. EQ
23	Forced NOR output	55	Normal recording amp. output
24	Logical GND	56	GND (in place of RFconv detection)
25	Playback FM input	57	RFconv amp. output
26	Logic V_{CC} (5V)	58	LINE amp. output (R channel)
27	Delayed FF input	59	H/P amp. output (R channel)
28	BPF GND	60	GND
29	HOLD time setting	61	H/P amp. output (L channel)
30	Noise detection	62	LINE amp. output (L channel)
31	RF Rec. output and BPF monitor (R channel)	63	V_{REF2} ($1/2V_{CC2}$)
32	f_0 control (R channel)	64	H/P volume control

■ Pin Descriptions (AN3963NFBPA)

Pin No.	Pin name	Pin No.	Pin name
1	V _{CC} (V _{CC2} =12V)	33	R channel V _{CC} (V _{CC1} =5V)
2	TV-IN (L channel)	34	To a HOLD capacitor (R channel)
3	AUX-IN (L channel)	35	EMPHA/DEEMPHA (R channel)
4	BS2-IN (L channel)	36	MUTE control
5	BS1-IN (L channel)	37	CCA output (R channel)
6	Rec. input volume control (L channel)	38	NRREF (R channel)
7	Stereo AGC detection	39	GND (R channel)
8	NRDET 1 (L channel)	40	NRDET 2 (R channel)
9	NRDET 2 (L channel)	41	NRDET 1 (R channel)
10	GND (L channel)	42	Normal AGC detection
11	NRREF (L channel)	43	Rec. input volume control (R channel)
12	CCA output (L channel)	44	BS1-IN (R channel)
13	V _{REF1} (1/2V _{CC1})	45	BS2-IN (R channel)
14	EMPHA/DEEMPHA (L channel)	46	AUX-IN (R channel)
15	To a HOLD capacitor (L channel)	47	TV-IN (R channel)
16	L channel V _{CC} (V _{CC1} =5V)	48	Normal recording input
17	f ₀ control (L channel)	49	Normal playback input
18	RF Rec. output and BPF monitor (L channel)	50	Normal playback output
19	ENV-DET	51	Normal playback EQ switching
20	CS input	52	Normal playback amp. NF
21	CLOCK input	53	Normal playback head signal input
22	DATA input	54	Normal recording amp. EQ
23	Forced NOR output	55	Normal recording amp. output
24	Logical GND	56	GND (in place of RFconv detection)
25	Playback FM input	57	RFconv amp. output
26	Logic V _{CC} (5V)	58	LINE amp. output (R channel)
27	Delayed FF input	59	H/P amp. output (R channel)
28	BPF GND	60	GND
29	HOLD time setting	61	H/P amp. output (L channel)
30	Noise detection	62	LINE amp. output (L channel)
31	RF Rec. output and BPF monitor (R channel)	63	V _{REF2} (1/2V _{CC2})
32	f ₀ control (R channel)	64	H/P volume control

■ Pin Descriptions

Pin No.	Function	Pin voltage (typ)	Equivalent circuit	Remark
1	12V V _{CC}	12V		
2	TV IN (Lch)	2.5V		
3	AUX IN (Lch)			
46	AUX IN (Rch)			
47	TV IN (Rch)			
4	BS2 IN (Lch)	2.5V		
5	BS1 IN (Lch)			
44	BS1 IN (Rch)			
45	BS2 IN (Rch)			
6	Rec. input volume (L channel)	3.4V		
43	Rec. input volume (L channel)			
7	IN AGC Det.			

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■ Pin Descriptions (cont.)

Pin No.	Function	Pin voltage (typ)	Equivalent circuit	Remark
8	NR Det. 1 (Lch)	2.5V		—
41	NR Det. 1 (Rch)			
9	NR Det. 2 (Lch)	1.7V		—
40	NR Det. 2 (Rch)			
10	GND1 (Lch)	0V	/	—
39	GND1 (Rch)			
11	NR REF (Lch)	2.5V		—
38	NR REF (Rch)			
12	CCA OUT (Lch)	2.5V		—
37	CCA OUT (Rch)			

■ Pin Descriptions (cont.)

Pin No.	Function	Pin voltage (typ)	Equivalent circuit	Remark
13	V _{REF1}	2.5V		—
14	EMPH NF (Lch)	2.5V		—
35	EMPH NF (Rch)			
15	HOLD-C (Lch)	Unsteady		—
34	HOLD-C (Rch)			
16	V _{CC1} (Lch)	5V		—
17	f _o ADJ (Lch)	2.4V		—
32	f _o ADJ (Rch)			
18	FM OUT (Lch)	1.8V		In the playback mode, BPF monitor output becomes available when the TEST mode is selected.
31	FM OUT (Rch)			

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Pin Descriptions (cont.)

Pin No.	Function	Pin voltage (typ)	Equivalent circuit	Remark
19	ENV. Det.	3.7V		Pin voltage depends on L channel input carrier level.
20	CS IN	 Serial data		—
21	CLOCK IN			
22	DATA IN			
23	FORCE NOR OUT	5V for Hi-Fi, and 0V for normal		—
24	LOGIC GND	0V	/	
25	PB FM IN	2.5V		—
26	LOGIC V _{cc}	5V	/	
27	DELAYD FF			—

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■ Pin Descriptions (cont.)

Pin No.	Function	Pin voltage (typ)	Equivalent circuit	Remark
28	BPF GND	0V		
29	HOLD TIME C	Variable		
30	NOISE Det.	1.8V to		
33	V _{CC1} (Rch)	5V		
36	MUTE CTL			
42	NOR AGC Det.	2.5V		
48	NOR Rec IN	2.5V	See the equivalent circuit for Pin ② (R1 = 10 kΩ).	
49	NOR PBC IN	2.5V		

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Pin Descriptions (cont.)

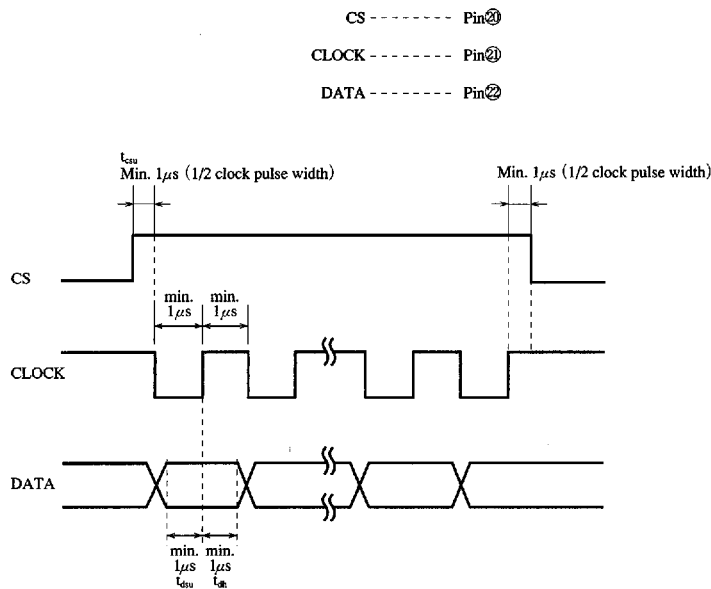
Pin No.	Function	Pin voltage (typ)	Equivalent circuit	Remark
50	NOR PB OUT	2.5V		—
51	NOR PB EQ-SW	2.5V		—
52	NOR PB NF	2.5V		—
53	NOR PB IN	2.5V		
54	NOR Rec NF	2.5V		—
55	NOR Rec OUT	6V		—
56	REC AGC Det. (AN3961NFBPA) (in case of AN3963NFBPA, this pin is GND)	Variable		—

■ Pin Descriptions (cont.)

Pin No.	Function	Pin voltage (typ)	Equivalent circuit	Remark
57	RF CONVERT OUT	6V		—
58	LINE OUT (R)	6V		—
62	LINE OUT (L)			
59	H/P OUT (R)	6V		—
61	H/P OUT (L)			
60	GND2	0V		—
63	V _{REF2}	6V		—
64	H/P OUT VOL	3.4V		—

ICs for VCR

■ Functional Descriptions
 • Serial control timing chart



< Recommended Operating conditions >

Parameter	Symbol	min	typ	max	Unit
Clock frequency	f_{clock}	—	250	500	kHz
Data setup time	t_{dsu}	1	—	—	μs
Data hold time	t_{dh}	1	—	—	μs
CS setup time	t_{csu}	1	—	—	μs

• Serial control data configuration

LSB																MSB	
No.	AD0	AD1	AD2	AL0	AL1	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DA
1	0	0	0	0	0	HIFI EE (L)	NOR EE (L)	EP (L)	Hi-Fi input SW			NOR input SW		TAPE REF	TEST	※	※
2	0	0	0	0	1	NOR A—MUTE	Output mode SW	BS monitor SW	Output channel SW		Mono/multi time set	NOISE-DET threshold		※	※		
3	0	0	0	1	0	Rec LEVEL (L)					Rec LEVEL (R)					※	
4	0	0	0	1	1	H/P LEVEL					Rec LEV SW	H/P LEV SW	Rec LEV SET	Rec LEV AGC/MAN	NTSC/PAL	LINE AMP GAIN	
					Device address (0 to 2)		Internal latch address (3 to 4)				Data (5 to 15)						

Note 1) The internal latch address selects one of the four data sets to be sent. CS must be turned low when each data set has been sent.

Note 2) Data must be input earlier than the LSB.

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• Serial control data mode table 1

Control signal	Bit No.	Control value	Input mode	Default	
HiFi EE (L)	D10	0	HiFi EE	0 (HiFi EE)	
		1	HiFi PB		
NOR EE (L)	D11	0	NOR EE	0 (NOR EE)	
		1	NOR PB		
EP (L)	D12	0	EP OR LP	0 (EP)	(SW12 OFF)
		1	SP		(SW12 ON)
HiFi input SW	D13 D14	00	TUNER	00 (TUNER)	(INPUT SW L/R)
		01	AUX		(INPUT SW L/R)
		10	BS2		(INPUT SW L/R)
		11	BS1		(INPUT SW L/R)
NOR input SW	D15 D16	00	NOR	0 1 (FM L+R)	(SW11)
		01	FM L+R		(SW11)
		10	FM (L)		(SW11)
		11	FM (R)		(SW11)
TAPE REFRESH (HiFi-Rec-MUTE)	D17	0	Rec MUTE OFF	0 (Rec MUTE OFF)	(Normal)
		1	Rec MUTE ON		(Fixed to FM-OUT fo)
TEST	D18	0	BPF MON ON	0 (BPF MON ON)	(BPF output from RF-Rec Out in playback)
		1	BPF MON OFF		(No BPF output)

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• Serial control data mode table 2

Control signal	Bit No.	Control value	Input mode	Default	
NOR A-MUTE	D20	0	MUTE OFF	1 (MUTE ON)	(SW17)
		1	MUTE ON		(SW17)
Output mode SW	D21 D22	00	HiFi	00 (HiFi)	(SW15&16)
		01	MIX		(SW15&16)
		10	NOR		(SW15&16)
		11	BS MONITOR		(SW15&16)
BS monitor SW	D23	0	BS1	0 (BS1)	(SW15&16)
		1	BS2		(SW15&16)
Output channel SW	D24 D25	00	STEREO	00 (STEREO)	(SW18&19)
		01	L CH		(SW18&19)
		10	R CH		(SW18&19)
		11	※		(SW18&19)
Mono/multi time set	D26	0	LONG	0 (LONG)	(6 to 7×FF)
		1	SHORT		(2 to 3×FF)
Noise dead threshold set	D27 D28	00	V1	00 (V1)	(69kHz DEV at 150 kHz)
Forced normal detection level set		01	V2		(38kHz DEV at 150kHz)
(Note) V1>V2>V3>V4		10	V3		(27kHz DEV at 150kHz)
		11	V4		(12kHz DEV at 150kHz)

• Serial control data mode table 3

Control signal	Bit No.	Control value	Input mode	Default
Rec LEVEL (L)	D30 D31D32D33D34	00000	min.	※
(L channel rec. input volume)		↑	↑	
		↓	↓	
		11111	max.	
Rec LEVEL (R)	D35 D36D37D38D39	00000	min.	※
(R channel rec. input volume)		↑	↑	
		↓	↓	
		11111	max.	

Note) The serial volume is not automatically set to an initial value at power ON.
It must be set manually after power ON.

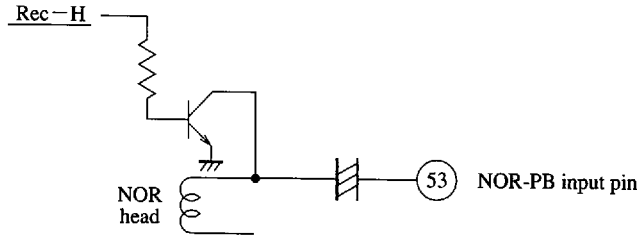
• Serial control data mode table 4

Control signal	Bit No.	Control value	Input mode	Default
H/P LEVEL	D40 D41 D42 D43 D44	00000	min.	※
(H/P output volume) serial setting		↑	↑	
		↓	↓	
		11111	max.	
Rec LEVEL CTL SW	D45	0	DC-CTL ON	0 (DC-CTL ON)
		1	Serial CTL ON	
H/P LEVEL CTL SW	D46	0	DC-CTL ON	0 (DC-CTL ON)
		1	Serial CTL ON	
Rec LEVEL CTL setting	D47	0	LCH-L/R combined	0 (LCH-L/R combined)
		1	L/R only	
Rec LEVEL AGC/MANUAL	D48	0	AGC	1 (MANUAL)
		1	MANUAL	
BPF NTSC/PAL	D49	0	NTSC	0 (NTSC)
		1	PAL	
LINE AMP GAIN ADJ	D4A	0	GAIN LOW	0 (GAIN LOW) (-7dBs typ.)
		1	GAIN HI	(-3dBs typ.)

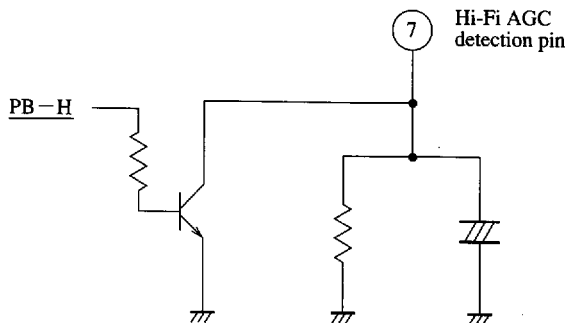
Note) The serial volume is not automatically set to an initial value at power ON.
It must be set manually after power ON.

Usage Notes

1. V_{CC1} power supply pins, that is Pin①⑥ (L channel) and Pin③③ (R channel), must be connected together on the PC board. The difference in voltage among each V_{CC1} point must not exceed 50mV.
2. It is recommended to install a NOR-PB common switch externally as shown below to prevent Hi-Fi recording signal amplitude fluctuation from disturbance by bias oscillation signals which might otherwise leak into the IC at normal audio recording.



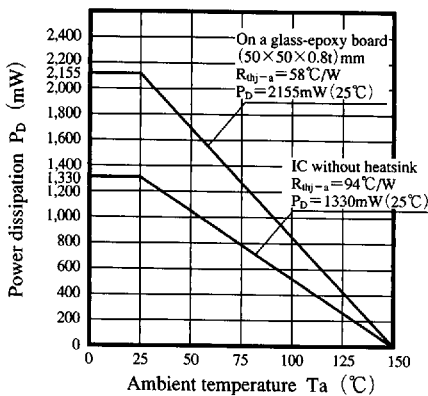
3. When using the Hi-Fi AGC mode, the capacitor at Pin⑦ (stereo AGC detection) may be charged if the playback level is not normal, because the Hi-Fi AGC detection circuit is active in the playback mode. If this occurs, signals are blocked when the mode changes from playback to recording. To prevent this, it is recommended to take one of the following measures :
 - 3-1 AGC must be set to OFF during the Hi-Fi playback mode by means of serial data.
 - 3-2 Connect the following network to Pin⑦.



ICs for VCR

Reference

$P_D - T_a$



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Panasonic