PRELIMINARY
Notice ; This is not a final specification.
some parametric limits are subject to change.

MITSUBISHI SOUND PROCESSORS

M62465FP

Dolby Pro Logic Surround

DESCRIPTION

The M62465FP is a single chip LSI supporting the Dolby Prolgic surround.This LSI contains all functions necessary for Dolby Pro Logic surround. In addition,it has Digtal Space Surround functions (Disco,Hall,Live mode etc.) and echo function for karaoke.
Note:Use of this LSI requires the license of Dolby Laboratories Licensing Corporation

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Licensing and application information may be obtained from Dolby Lab.

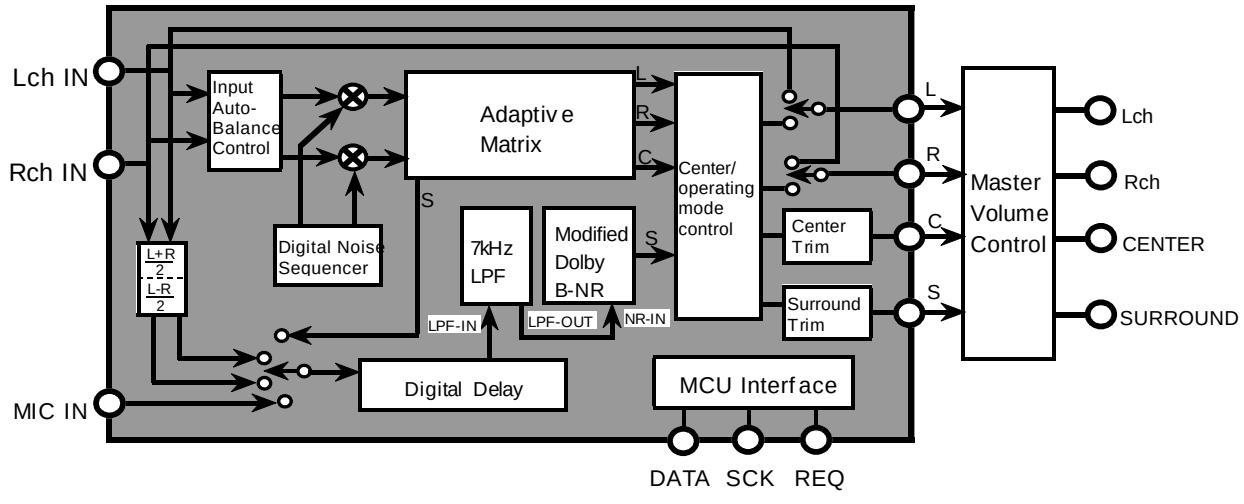
Outline

Outline 80P6N
0.8mm pich QFP
(20.0mm×14.0mm×2.8mm)

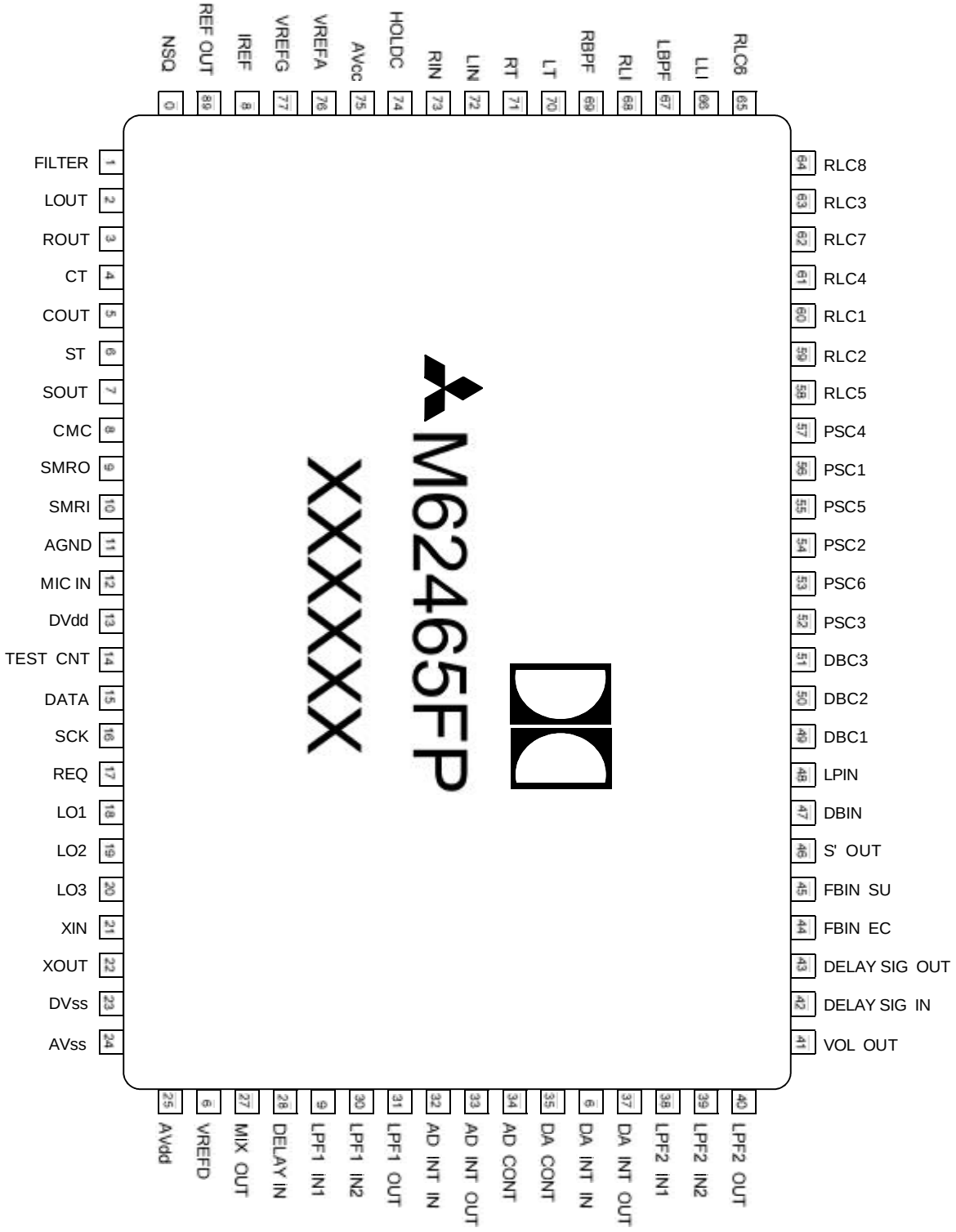
Features (Mode)

- Upper compatible for M62460FP and less external parts than M62460FP.
- Includes all functions requires for Dolby Pro Logic Surround.
  - •Adaptive Matrix.
  - •Noise Sequencer by digital noise source and switched capacitor filter.
  - •Center Mode Control(Wide/Normal/PHANTOM/OFF).
  - •Modified Dolby B Type Noise Reduction.
  - •4ch/3ch Stereo Selectable.
  - •Digital Delay: 15.4, 20, 28.6ms for Dolby Pro Logic Surround.
- C/Sch Trimmer: 0 to -31dB/1dB Step.
- Digital Space Surround Mode: Disco/Hall/Live mode and 5 delay time positions.
- Digital Echo function for KARAOKE: (Short echo) Delay time=147.5ms, (Long echo) Delay time=196.6ms.
- BY-PASS Mode: Input signal through output.

System Configuration

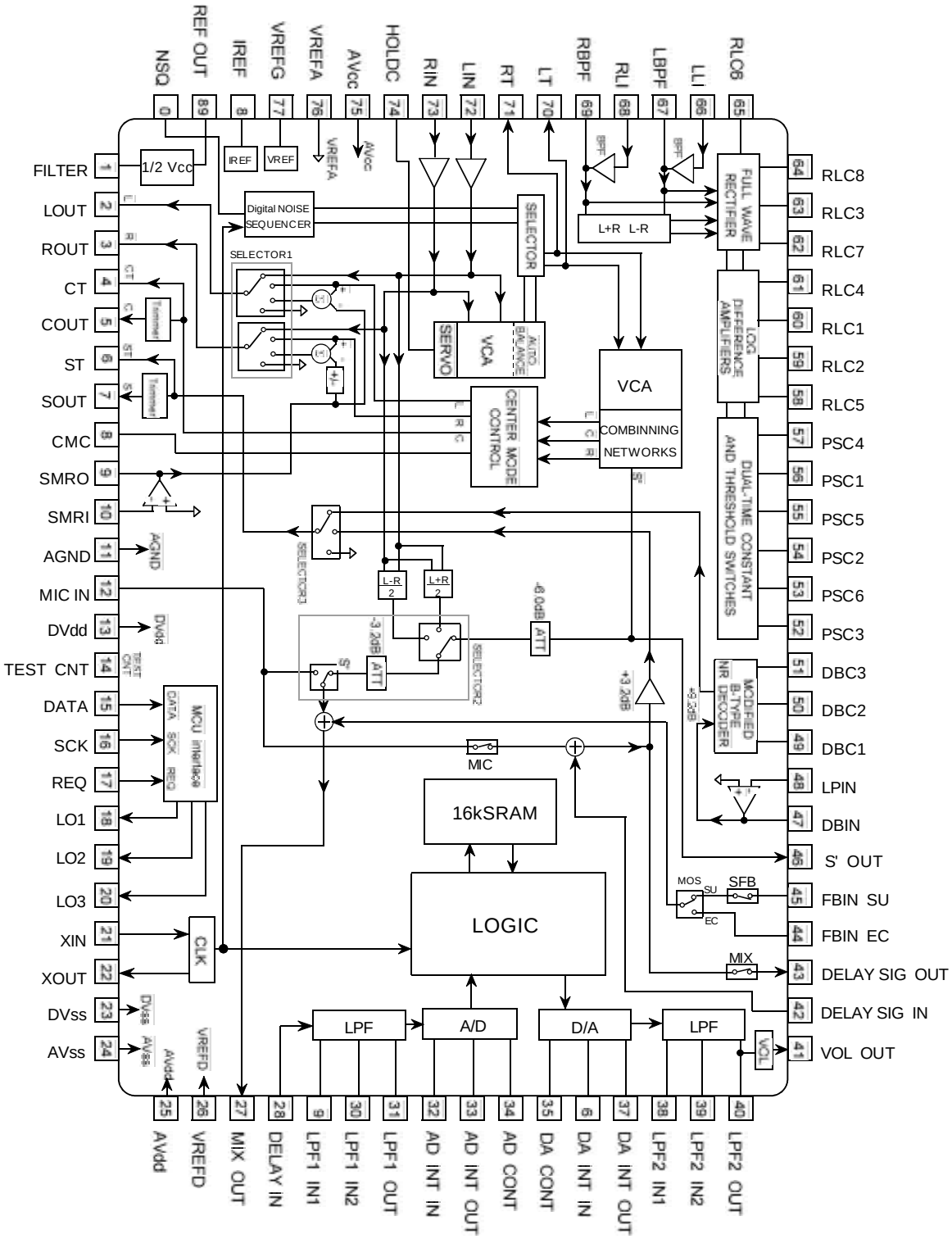


PIN CONFIGURATION



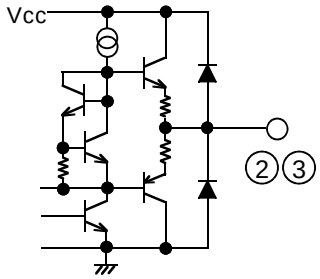
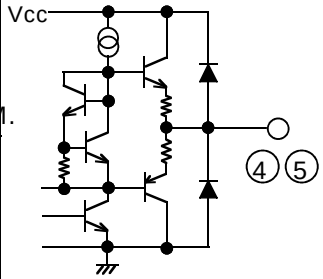
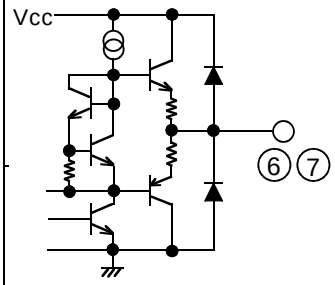
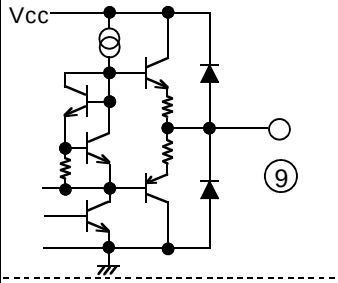
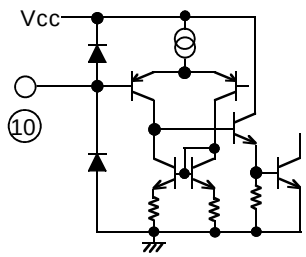
(Note) The function of pin No. 1,79,80 is different from that of M62460FP.

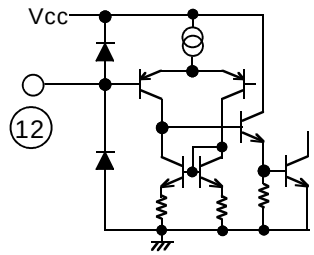
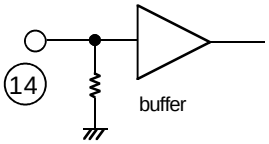
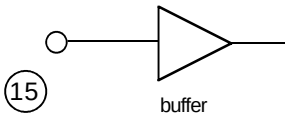
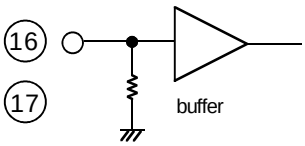
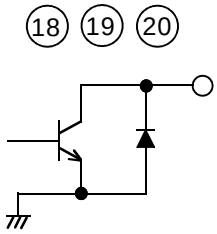
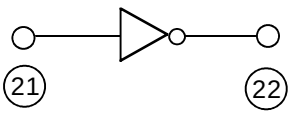
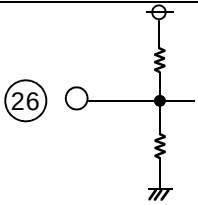
BLOCK DIAGRAM

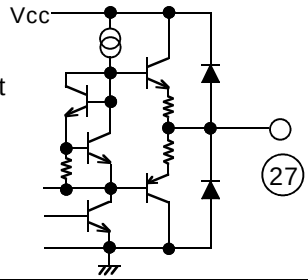
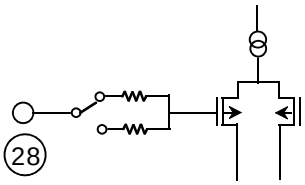
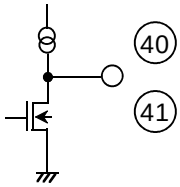
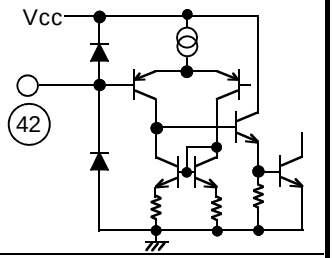
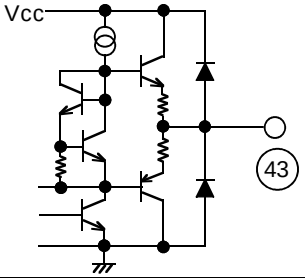
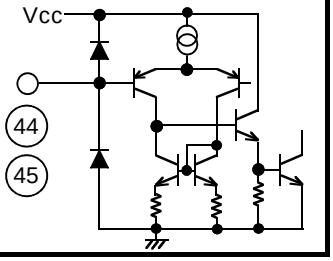


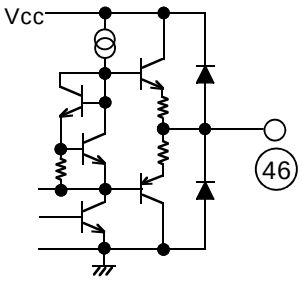
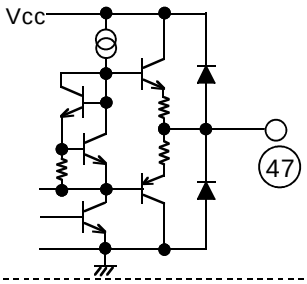
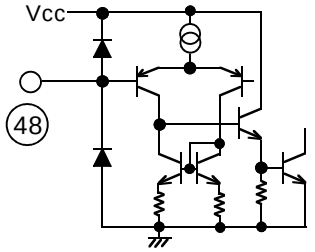
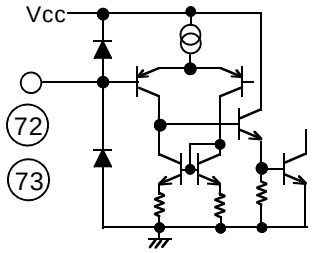
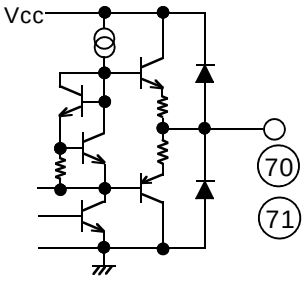
(Note) The function of pin No. 1,79,80 is different from that of M62460FP.

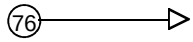
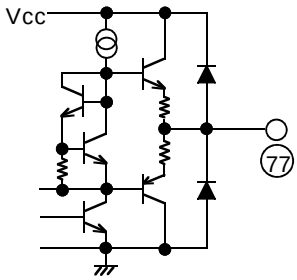
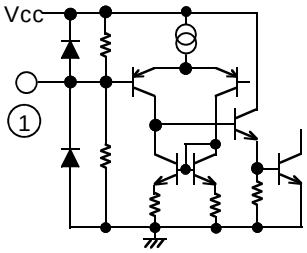
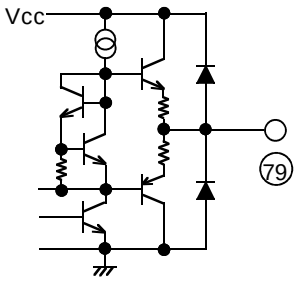
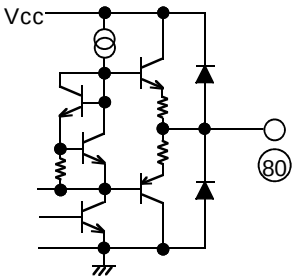
Discription of pin

No.	Symbol	Funtion	Voltage	Discription of pin	Equivalent circuit
②	LOUT	Lch output	4V	Direct output R-/ L-channel when the operation mode is BY-PASS. When the mode is 4channel, they output Dolby prologic R-/ L-channel signals.	
③	ROUT	Rch output			
④	CT	Cch output	4V	No output any signals when the operation mode is center mode is OFF or set to PHANTOM.	
⑤	COUT	Cch output		COUT is output from C.Trimmer.	
⑥	ST	Sch output	4V	This pin output surrund signals.Output is selected from BNRout,Dout No output signal when the operation mode is 3STEREO/MUTE.	
⑦	SOUT	Sch output		SOUT is output from S.Trimmer.	
⑨	SMRO	amplifier output	4V	This is a amplifier to control mixed level of surround output with external resistance.	
⑩	SMRI	amplifier input			

No.	Symbol	Funtion	Voltage	Discription of pin	Equivalent circuit
⑫	MIC IN	MIC input	4V	Microphone input with ECHO MODE	
⑭	TEST CNT	TEST control	0	Fixed to GND	
⑮	DATA	serial data "DATA" input	—	input via serial data from MCU.	
⑯	SCK	serial data "SCK" input	0		
⑰	REQ	serial data "REQ" input			
⑱	LO1	port output	—	Open collector output pin (NPN Tr)	
⑲	LO2				
⑳	LO3				
㉑	XIN	Osillator input	—	connect 4 - MHz ceramic resonator	
㉒	XOUT	Osillator output			
㉖	VREFD	reference output	2.5V	1/2 Vcc output. Connect a filter capacitor.	

No.	Symbol	Funtion	Voltage	Discription of pin	Equivalent circuit
(27)	MIX OUT	S',L+R,L-R and MIC output	4V	Signal output precedent to delay generator. that is S',L+R,L-R and MIC output.	
(28)	DELAY IN	delay input	2.5V	This is s delay input. Please input by AC cuppring.	
(40)	LPF2 OUT	delay signal output	2.5V	delay signal output	
(41)	VOL OUT	output of a delay volum		This is output of a delay volum that possible to control +3dB to -∞.	
(42)	DELAYSIG IN		4V	Delay signal input to a mixing amplifier	
(43)	DELAYSIG OUT	input from mixing amplifier	4V	Delay signal output from a mixing amplifier	
(44)	FBIN EC	Feedback signal input	4V	Feedback signal input with ECHO MODE	
(45)	FBIN SU			Feedback signal input with SURROUND MODE	

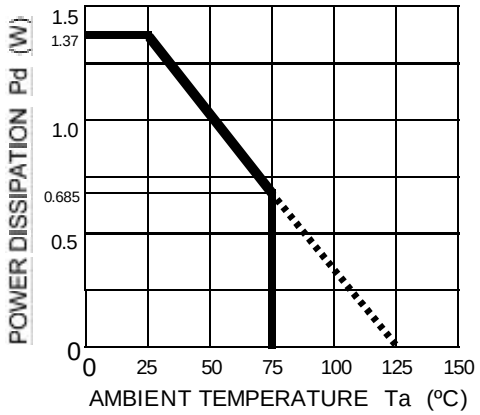
No.	Symbol	Funtion	Voltage	Discription of pin	Equivalent circuit
(46)	S'OUT	Sch output	4V	Sorround channel output precedent to delay generator. Always outputs signals,irrespectiv of the operation mode (2-/3-/4-channel)	
(47)	DBIN	LPF output	4V	This amplifier compornent 7KHz-LPF with external resistances and capaciters. LPF output is conected to input of Modifide BNR.	
(48)	LPIN	Negative input of LPF			
(72)	LIN	Lch input	4V	Input of Lch and Rch that is non-inverted input type. Please pul-up to VREF by external resistances for DC bias.	
(73)	RIN	Rch input			
(70)	LT	Autobalance Lch output	4V	Autobalance output.	
(71)	RT	Autobalance Rch output			

No.	Symbol	Funtion	Voltage	Discription of pin	Equivalent circuit
⑯	VREFA	reference voltage input	—	It is a reference voltage input terminal to each circuit inside the IC.	
⑰	VREFG	reference voltage output	4V	Reference voltage output. Voltage is the fixed at 4V.	
①	FILTER New future of M62465FP	1/2Vcc Auxiliary 1/2Vcc reference generator.	1/2 Vcc	The terminal which make a 1/2Vcc voltage by the resistance. When it is used,a filter capacitor is connected.	
⑲	REF OUT New future of M62465FP	1/2Vcc output	1/2 Vcc	1/2Vcc voltage output. It is used to change reference voltage except 4V.	
⑳	NSQ New future of M62465FP	Noise sequencer monitor	4V	Noise sequencer monitor output. It is only for test.	

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Test conditions	Limits	Unit
Vcc	Supply voltage		10.5	V
V_{DD}			6.5	V
Pd	Power dissipation	standard board	1.37	W
Kθ	Thermal derating	Ta≥25ºC	13.7	mW/ºC
Topr	Operating temperature		-20 to +75	ºC
Tstg	Storage temperature		-40 to +125	ºC

TERMAL DERATING



* Standard board

- board size 70mm×70mm
- board thickness 1.6mm
- board material glass epoxy
- copper pattern 18µm
  copper thickness 0.25mm(width)
  copper size 30mm(length / lead)

RECOMMENDED OPERATING CONDITION

Symbol	Parameter	Conditions	Ratings			Unit
			Min	Typ	Max	
Vcc	Analog supply voltage		8.0	9.0	10.0	V
V_{DD}	Digital supply voltage		4.5	5.0	5.5	V
fck	OSC clock			4		MHz

ELECTRICAL CHARACTERRISTICS (DECODER)

Vcc=9V,V_{DD}=5V 0dB Reference=300mVrms/1KHz at C-OUT unless otherwise noted.(Cch Trimmer=0dB)

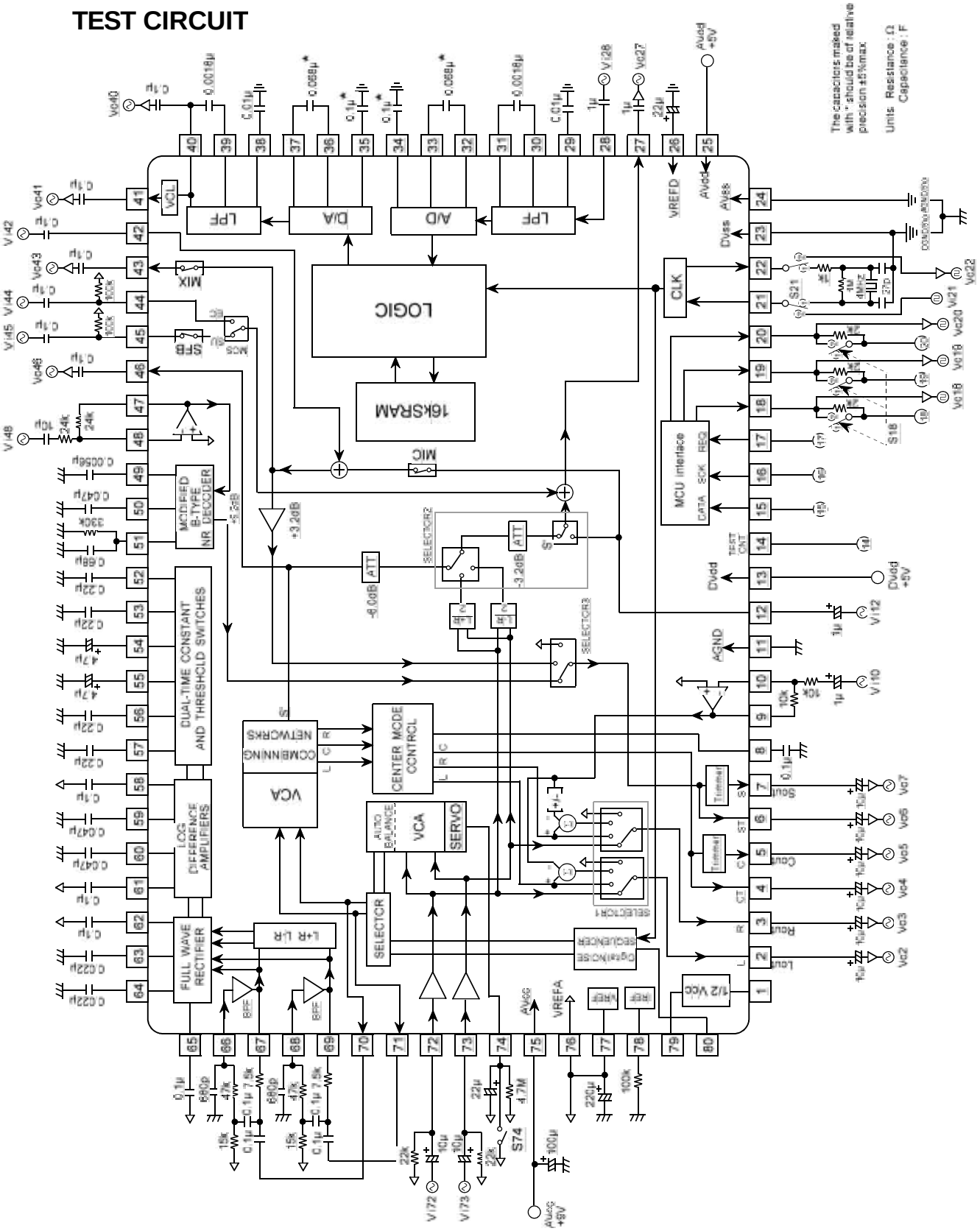
Symbol	Parameter	Conditions	Limits Min	Limits Typ	Limits Max	Unit
Overall						
Icc	**Circuit Current**	**Quiescent**	—	25	50	mA
I_{DD}	**Circuit Current**	**Quiescent**	—	25	50	mA
Vref	**Reference Voltage**	**Quiescent**	3.5	4.0	4.5	V
Input Auto Balance						
CPR	**Capture Range**		—	±5	—	dB
CER	**Error Correction**		—	±4	—	dB
Adaptive Matrix						
ΔVoL	**Output Level Accuracy relative to C ch**	L, R, S'ch out	-0.5	0	0.5	dB
MR	**Matrix Rejection relative**	L, R, C, S'ch out	25	40	—	dB
HRAM	**Headroom**	L, R, C, S' out	15	17	—	dB
THDAM	**Total Harmonic Distortion**	L, R, C, S'ch out 4ch mode	—	0.05	0.2	%
		L, Rch out 2ch mode	—	0.002	0.05	
SNAM	**Signal to Noise Ratio**	Rg=0Ω,weighted CCIR/AMR 4ch mode	75	80	—	dB
		L, Rch out 2ch mode	95	100	—	
NopAM	**Peak Noise**	measurement time =40msec 4ch mode	—	—	±0.3	mV0-p
		measurement time =40msec 2ch mode	—	—	±0.3	
Noise Sequencer	**(0dBd Reference is input at NR-IN when adjust to 0dB (300mVrms/100Hz) at S out.**					
Vno	**Output Noise Level**		-15	-12.5	-10	dB
ΔVno	**Output Level Accuracy relative to C ch**	L, R, S'ch out	-0.5	0	0.5	dB
Vnop	**Output Noise peak**	measurement time=6sec	—	—	±550	mV0-p
Modified B type Noise Reduction						
VGNR	**Voltage Gain**	Vin=0dBd,f=100Hz	—	9.2	—	dB
DEC1	**Decode Responce 1**	Vin=0dBd,f=1.0kHz	-1.6	-0.1	1.4	dB
DEC2	**Decode Responce 2**	Vin=-15dBd,f=1.4kHz	-3.0	-1.5	0	
DEC3	**Decode Responce 3**	Vin=-20dBd,f=1.4kHz	-4.9	-3.4	-1.9	
DEC4	**Decode Responce 4**	Vin=-40dBd,f=5.0kHz	-6.8	-5.3	-3.8	
THDNR	**Total Harmonic Distortion**	Vin=0dBd,f=1kHz	—	0.0	0.3	%
HRNR	**Headroom**	THD=1%	15	17	—	dB
SNNR	**Signal to Noise Ratio**	Rg=0Ω, weighted CCIR/AMR	73	78	—	dB
NoPNR	**Peak Noise**	measurement time=40msec	—	—	±0.3	mV0-p
C,S ch Trimmer						
ATT_{-12dB}	**attenuation level**:-12dB	Digital Input=-12	-14	-12	-10	dB
ATT_{max}	**Maximum attenuation**	Digital Input=-31	-37	-31	-25	dB
TS	**Trimmer step**		0.6	1.0	1.4	dB
Surround (L+R,L-R) <MIXOUT>						
THDSU	**Total Harmonic Distortion**	Vin=0dBd,f=1kHz	—	0.05	0.2	%
SNSU	**Signal to Noise Ratio**	Rg=0Ω, weighted CCIR/AMR	85	90	—	dB

ELECTRICAL CHARACTERRISTICS (DIGITAL DELAY)

(Ta=25•C,Vcc=9V,VDD=5V,Vin=200mVrms, fck=4MHz unless otherwise noted)

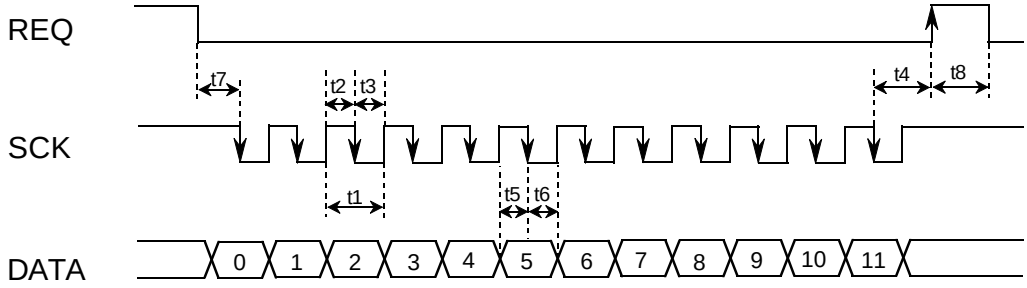
Symbol	Parameter	Conditions		Limits Min	Limits Typ	Limits Max	Unit
Digital Delay							
Td	Delay time	See Delay time contorol (15/24) fordelay time setting.		12.4	15.4	18.4	ms
				17.0	20.0	23.0	
				25.6	28.6	31.6	
				38.0	41.0	44.0	
				46.2	49.2	52.2	
				137.5	147.5	157.5	
				186.6	196.6	206.6	
Gv	Input-output gain			-3.0	0	3.0	dB
THD	Output distortion	30kHz LPF	Td=15.4ms	—	0.3	0.6	%
			Td=20.0ms	—	0.3	0.6	
			Td=28.6ms	—	0.5	1.0	
			Td=41.0ms	—	0.6	1.2	
			Td=49.2ms	—	0.7	1.4	
			Td=147.5ms	—	1.5	3.0	
			Td=196.6ms	—	2.0	4.0	
Vomax	Maximum output voltage	30kHz LPF,THD=10%		0.7	1.0	—	Vrms
No	Output noise voltage	Rg=620Ω, Vi=0mVrms, IHF-A	Td=15.4ms	—	-92	-80	dBv
			Td=20.0ms	—	-92	-80	
			Td=28.6ms	—	-92	-80	
			Td=41.0ms	—	-90	-75	
			Td=49.2ms	—	-90	-75	
			Td=147.5ms	—	-82	-67	
			Td=196.6ms	—	-77	-62	
Delay Volume (VOL OUT)							
Gv	Input-output gain	Volume max		0	3	6	dB
ATTmax	Maximum attenuation	Delay off mode,Volume min,IHF-A		—	-70	-60	dB

TEST CIRCUIT



DIGITAL CONTROL SPECIFICATIONS

(1)DATA TIMING



(note1) SCK is diseble when REQ is high
(Note2)REQ must turn to high after SCK pulse turn to high.

Symbol	Name	Min	Typ	Max	Unit
t1	SCK clock duration	2	—	—	µs
t2	SCK "H" pulse width	0.8	—	—	µs
t3	SCK "L" pulse width	0.8	—	—	µs
t4	REQ hold time	1.6	—	—	µs
t5	DATA setup time	0.8	—	—	µs
t6	DATA hold time	0.8	—	—	µs
t7	SCK setup time	0.8	—	—	µs
t8	REQ "H" pulse width	1.6	—	—	µs

(2)DATA FORMAT

Serial Data Format

DATA										ADDRESS	
BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7	BIT 8	BIT 9	BIT 10	BIT 11
ADD/SUB	NOISE SEQ			SELECTOR1		CENTER MODE		No use		0	0
SELECTOR2		SELECTOR3		MIX	LO1	LO2	LO3	No use		0	1
Cch. TRIMMER					Sch. TRIMMER					1	0
S1	S2	S3	V1	V2	V3	V4	SFB	MOS	MIC	1	1

(3)DECODER

♦ ADDRESS(BIT10,11)=0,0

ADD/SUB	
mode	BIT0
ADD	0
SUB	1

NOISE SEQ				
mode	BIT1	mode	BIT2	BIT3
OFF	0	L	0	0
ON	1	C	0	1
		R	1	0
		S	1	1

SELECTOR1		
mode	BIT4	BIT5
PRO LOGIC	0	0
BY-PASS	0	1
OTHER SUR	1	0
L/R MUTE	1	1

CENTER MODE		
mode	BIT6	BIT7
WIDE	0	0
NORMAL	0	1
PHANTOM	1	0
OFF	1	1

♦ ADDRESS(BIT10,11)=0,1

SELECTOR2		
mode	BIT0	BIT1
S'	0	0
L+R	0	1
L-R	1	0
MIC	1	1

SELECTOR3		
mode	BIT2	BIT3
BNR OUT	0	0
D OUT	0	1
3STEREO/MUTE	1	0
	1	1

DELAY MIX SWITCH		
BIT4(MIX)	DMIXSW	Remarks
0	OFF	Mixing OFF
1	ON	Mixing ON

LO(LOGIC DATA OUT) Open Collector			
mode	BIT5 (LO1)	BIT6 (LO2)	BIT7 (LO3)
OUTPUT DATA "L"	0	0	0
OUTPUT DATA "H"	1	1	1

• ADDRESS(BIT10,11)=1,0

Cch. TRIMMER					
DATA	BIT0	BIT1	BIT2	BIT3	BIT4
0	±0dB	±0dB	±0dB	±0dB	±0dB
1	–1dB	–2dB	–4dB	–8dB	–16dB

Sch. TRIMMER					
DATA	BIT5	BIT6	BIT7	BIT8	BIT9
0	±0dB	±0dB	±0dB	±0dB	±0dB
1	–1dB	–2dB	–4dB	–8dB	–16dB

Volume code

C(S)ch. TRIMMER											
ATT(dB)	BIT0(5)	BIT1(6)	BIT2(7)	BIT3(8)	BIT4(9)	ATT(dB)	BIT0(5)	BIT1(6)	BIT2(7)	BIT3(8)	BIT4(9)
±0	0	0	0	0	0	–16	0	0	0	0	1
–1	1	0	0	0	0	–17	1	0	0	0	1
–2	0	1	0	0	0	–18	0	1	0	0	1
–3	1	1	0	0	0	–19	1	1	0	0	1
–4	0	0	1	0	0	–20	0	0	1	0	1
–5	1	0	1	0	0	–21	1	0	1	0	1
–6	0	1	1	0	0	–22	0	1	1	0	1
–7	1	1	1	0	0	–23	1	1	1	0	1
–8	0	0	0	1	0	–24	0	0	0	1	1
–9	1	0	0	1	0	–25	1	0	0	1	1
–10	0	1	0	1	0	–26	0	1	0	1	1
–11	1	1	0	1	0	–27	1	1	0	1	1
–12	0	0	1	1	0	–28	0	0	1	1	1
–13	1	0	1	1	0	–29	1	0	1	1	1
–14	0	1	1	1	0	–30	0	1	1	1	1
–15	1	1	1	1	0	–31	1	1	1	1	1

(4)DELAY

ADDRESS(BIT10,11)=1,1

DELAY TIME CONTROL				
BIT0 (S1)	BIT1 (S2)	BIT2 (S3)	DELAY TIME (Sampling frequency)	Delay LPF (Cut-off frequency)
0	0	0	15.4 ms (1MHz)	7.0kHz
0	0	1	20.0 ms (667kHz)	
0	1	0	28.6 ms (500kHz)	
0	1	1	41.0 ms (400kHz)	
1	0	0	49.2 ms (333kHz)	
1	0	1	147.5ms (111.1kHz)	3.0kHz
1	1	0	196.6ms (83.3kHz)	
1	1	1	Delay off mode (clock off)	

VOLUME CONTROL				
BIT3 (V1)	BIT4 (V2)	BIT5 (V3)	BIT6 (V4)	VOL attenuation
1	1	1	1	+3dB
1	1	1	0	0dB
1	1	0	1	-2dB
1	1	0	0	-3dB
1	0	1	1	-4dB
1	0	1	0	-6dB
1	0	0	1	-8dB
1	0	0	0	-9dB
0	1	1	1	-10dB
0	1	1	0	-12dB
0	1	0	1	-15dB
0	1	0	0	−∞
0	0	1	1	−∞
0	0	1	0	−∞
0	0	0	1	−∞
0	0	0	0	−∞

FEEDBACK SWITCH		
BIT7(SFB)	SFB SW	Remarks
0	OFF	Feedback OFF
1	ON	Feedback ON

(In surround mode only)

MODE SELECTOR	
BIT8(MOS)	MODESEL
0	SU line
1	EC line

MICROPHONE MIXING SWITCH		
BIT9(MIC)	MICMIXSW	Remarks
0	OFF	Mic mixing OFF
1	ON	Mic mixing ON

(Note1)Settings in power up

When power is turned on, data is setting in under table by power on reset circuit.

DECODER		DELAY	
Mode	Settings	Mode	Settings
ADD/SUB	ADD	DELAY TIME CONTROL	20.0ms
NOISE SEQ	OFF	VOLUME CONTROL	−∞
SELECTOR1	PRO LOGIC	FEEDBACK SWITCH	OFF
CENTER MODE	WIDE	MODE SELECTOR	SU line
SELECTOR2	S'	DELAY MIX SWITCH	OFF
SELECTOR3	BNR OUT	MICROPHONE MIXING SWITCH	OFF
LO(LOGIC OUT)	"L"		
Cch.TRIMMER	0dB, ATT(-)		
Sch.TRIMMER	0dB, ATT(-)		

(Note2)

The digital the noise sequencer stop when the clock is off.

FUNCTION MODE (EXAMPLE)

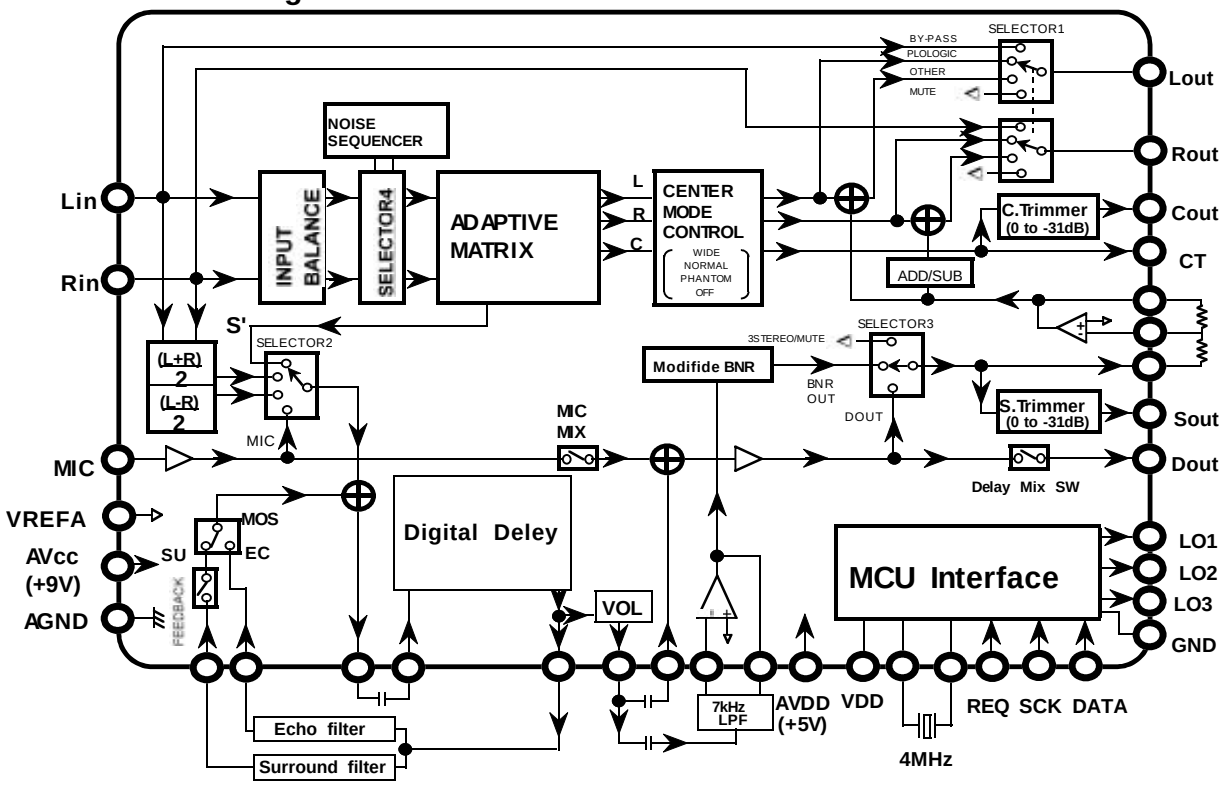
MODE	SUB-MODE	DIGITAL DELAY	VOLUME LEVEL: Cch Trimmer	VOLUME LEVEL: Sch Trimmer	VOLUME LEVEL: Delay VOL	SWITCH CONDITION: SELECTOR 1	SELECTOR 2	SELECTOR 3	CENTER MODE	ADD/SUB	Delay MIX SW	MODE	FEEDBACK	MIC MIX	DIGITAL DELAY INPUT	NOTE
DOLBY PRO LOGIC	WIDE	td=15.4ms, 20.0ms, 28.6ms	0 to -31dB 1dB/step	0 to -31dB 1dB/step	VOL OFF (0dB)	PLO LOGIC	S'	BNR OUT	WIDE	—	OFF	SU	OFF	OFF	S'	Feedback level can be changed by output port control(see block diagram)
	NORMAL							\	NORMAL							
	PHANTOM							3STEREO	PHANTOM							
DIGITAL SPACE SURROUND	DISCO	td=20ms	*Pro Logic decoder function is alive. For example C/S trimmer can be available.		VOL ATT +3dB 0dB -2dB -3dB -4dB -6dB -8dB -9dB -10dB -12dB -15dB -∞	OTHER SUR	L-R	DOUT	PHANTOM	SUB	OFF	SU	ON	OFF	(L-R)/2	
	Hall	td=49.2ms														
	LIVE	td=28.6ms					L+R			ADD			OFF		(L+R)/2	
	Option	5step delay time (BW=7kHz,fck=4MHz)					S'/L+R/L-R	BNROUT/3STEREO/DOUT	WIDE/NORMAL/PHANTOM	ADD/SUB			ON/OFF			
KARAOKE/ECHO	SHORT ECHO	td=147.5ms				BY PASS	MIC	3STEREO	OFF	ADD	ON	EC	OFF	ON	MIC	
	LONG ECHO	td=196.6ms														
BY-PASS	BY-PASS	td=20.0ms	-31dB		-∞	BY PASS	S'	3STEREO	OFF	ADD	OFF	SU	OFF	OFF	S'	

BW=3KHz

*Delay time can be set to 5position(15.4, 20.0,28.6,41.0 49.2mSec).

FUNCTION

Block Diagram



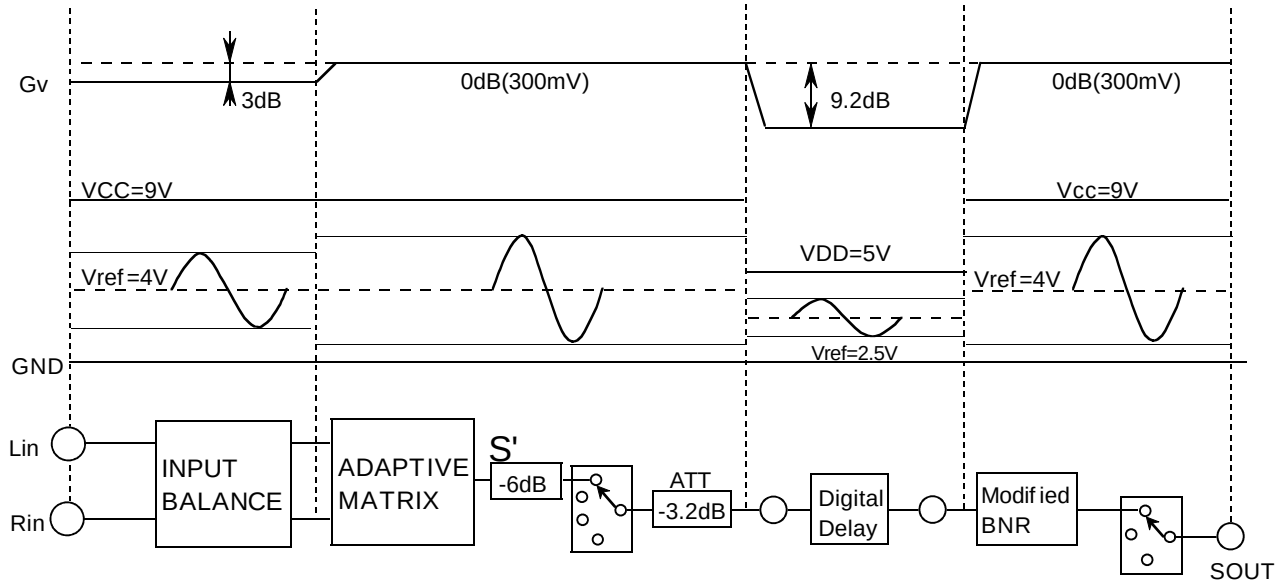
Block name	Function
INPUT BALANCE	Revises a level error between the input Lch and Rch for optimum decorder performance.
NOISE SEQUENCER	A simple noise sequencer circuit for ajustment of output level.
ADAPTIVE MATRIX	Contineuously analyze the two-channel matrixed audio input to determine the direction and relative magnitude of encoded soundfield.
CENTER MODE CONTROL	Possible to select 4 - center mode position. (WIDE,NORMAL,PHANTOM,OFF)
C.Trimmer **S.Trimmer**	This is the level ajustment volum of Cch and Sch. (0 to -30 dB : 1dB/step)

Block name	Function
Modifide BNR	This block restores the signal to its original spectrum while reducing noise and certain crosstalk signals in a final stage of the surround chain.
ADD/SUB	Select a positive phase signal or a negative phase signal with DIGITAL SPACE SURROUND MODE.
SELECTOR1	This is a selective switch to select the output signal of Lout and Rout from BY-PASS,PRO LOGIC,OTHER SUR and MUTE .
SELECTOR2	This is a selective switch to select the output signal of Sout from S',L+R,L-R and MIC.
SELECTOR3	This is a selective switch to select the output signal of Sout from BNRout,Dout and 3STEREO/MUTE.
SELECTOR4	This is a switch to connect a simple noise sequencer output to ADAPTIVE MATRIX stage for level ajust-ment.
Digital Deley	Make 7 kinds of delay signal s.(15.4msec to 196.6msec) The delay function and CLK signal stop at the time of DELAY OFF MODE. This mode is for suppress bad effect of digital noize.
FEEDBACK	This is a switch to select feedback mode(ON/OFF) for SURROUND MODE .
MODE SEL(MOS)	This is a switch to select a feedback signal from surround signal and echo signal.
VOL	Control the ATT level of delay signal from 3dB to -∞ (12-step)
MIC MIX	This is a switch to mix miclophone signal to a main signal (Lch,Rch).
Delay Mix SW	This is a switch to select output or not a mixed signal to DOUT pin.

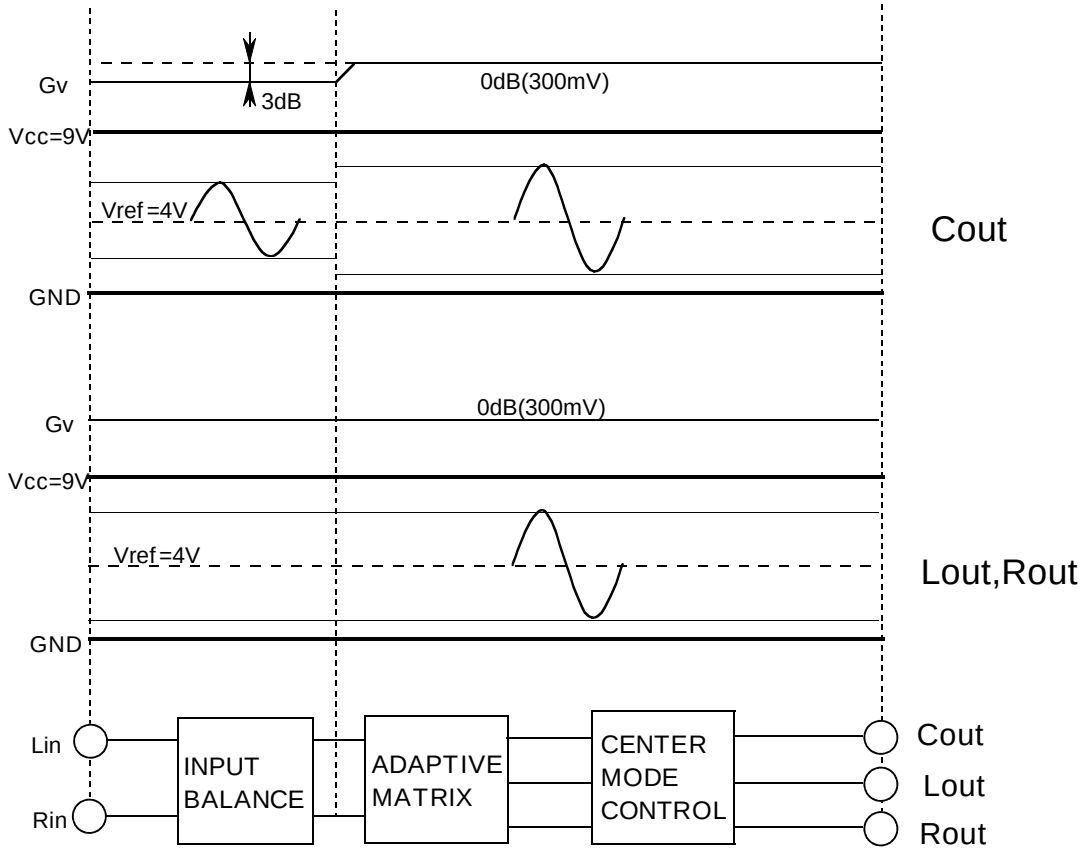
LEVEL DIAGRAM

• Dolby Pro Logic mode

Sout

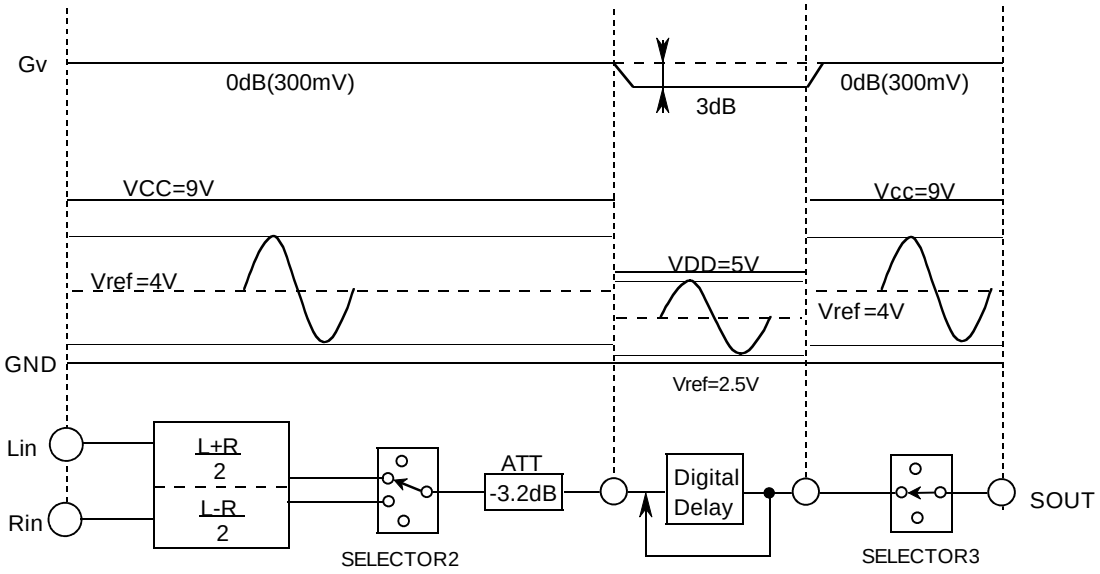


Lout,Rout,Cout

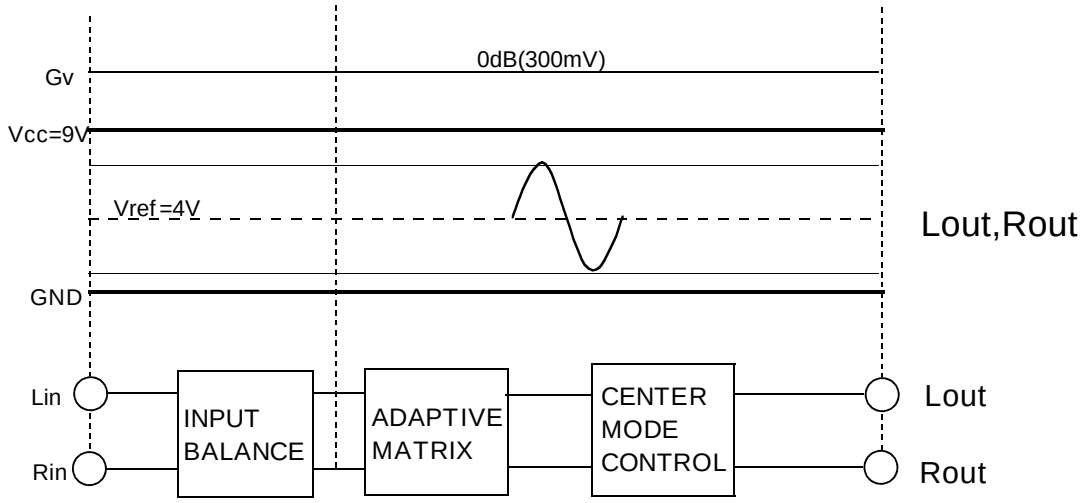


• Digital Space Surround mode

Sout



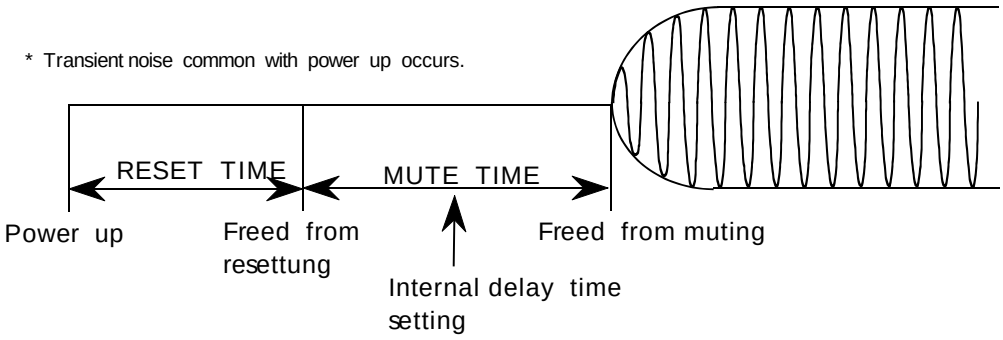
Lout,Rout



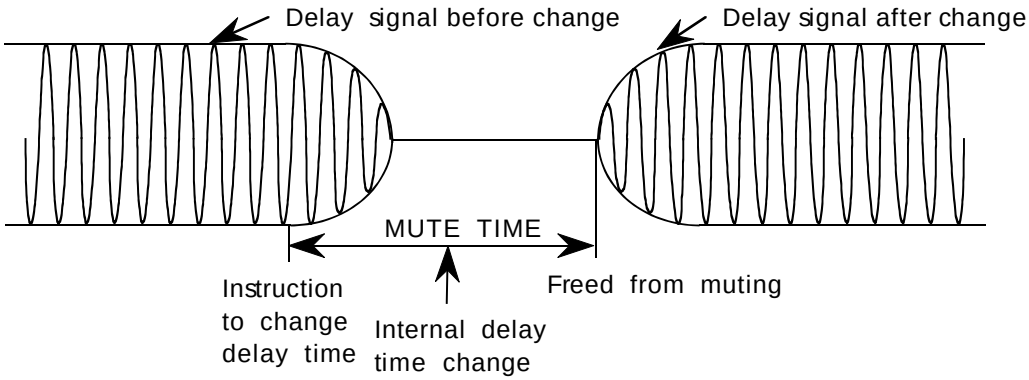
AUTO MUTE FUNCTION

The IC carries out auto mute function at the time of powerring up, delay time setting change, and cancelling delay off mode, in order to suppress shock noise that the digital delay may produce.

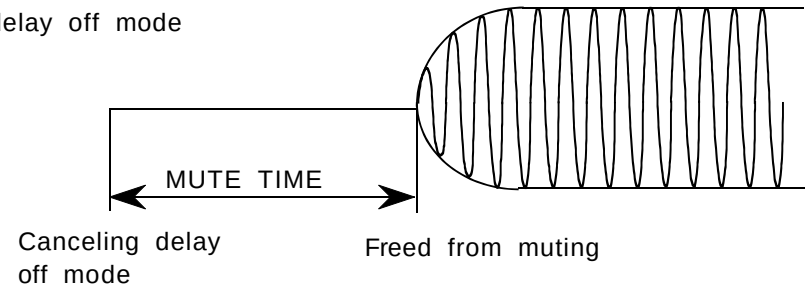
• At power up



• At delay time setting change



• At canceling delay off mode

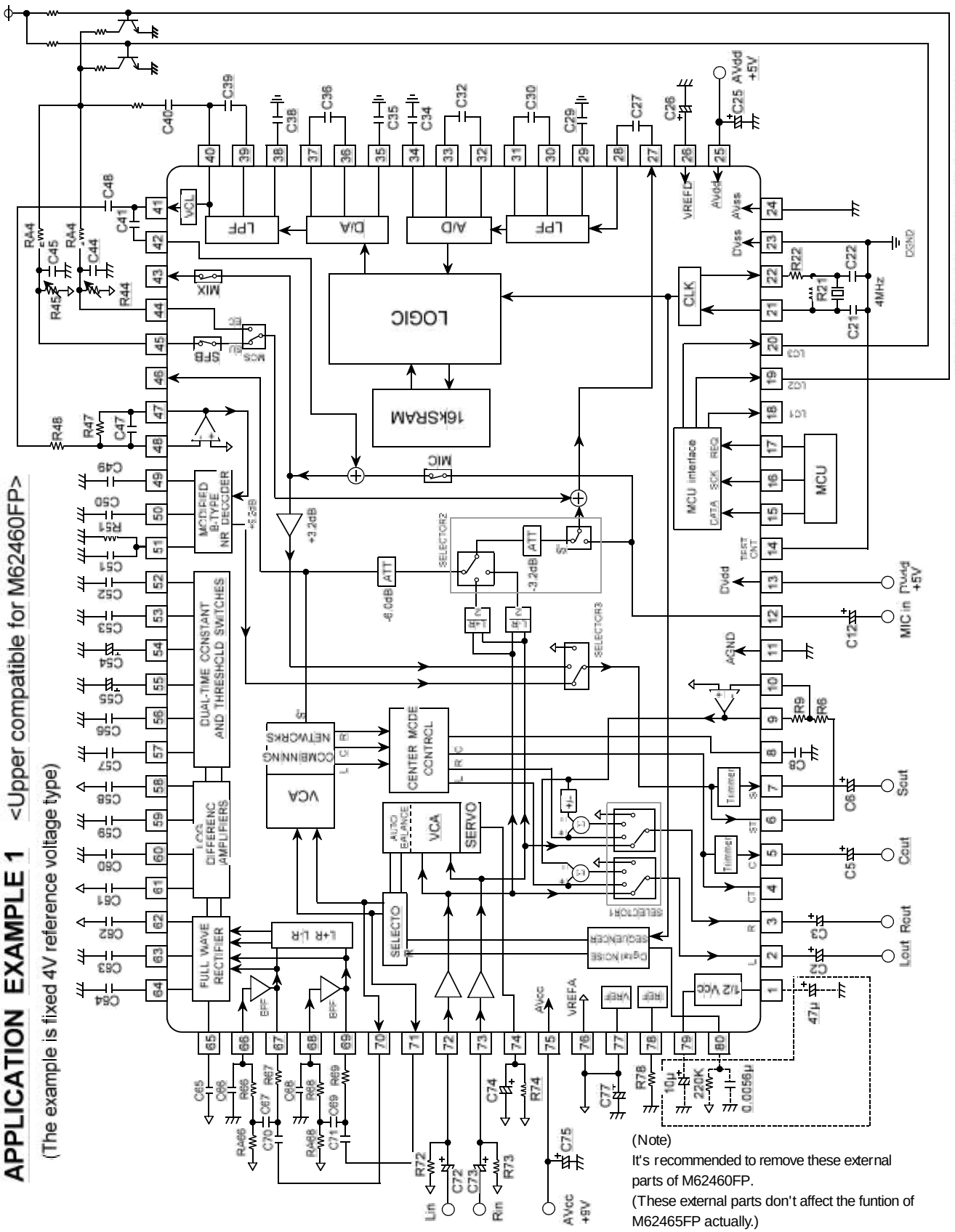


Mute time changes depending on set (or preset) delay time.

DELAY TIME	MUTE TIME
15.4 to 49.2 ms	123 ms
147.5 ,196.6 ms	492 ms

APPLICATION EXAMPLE 1 <Upper compatible for M62460FP>

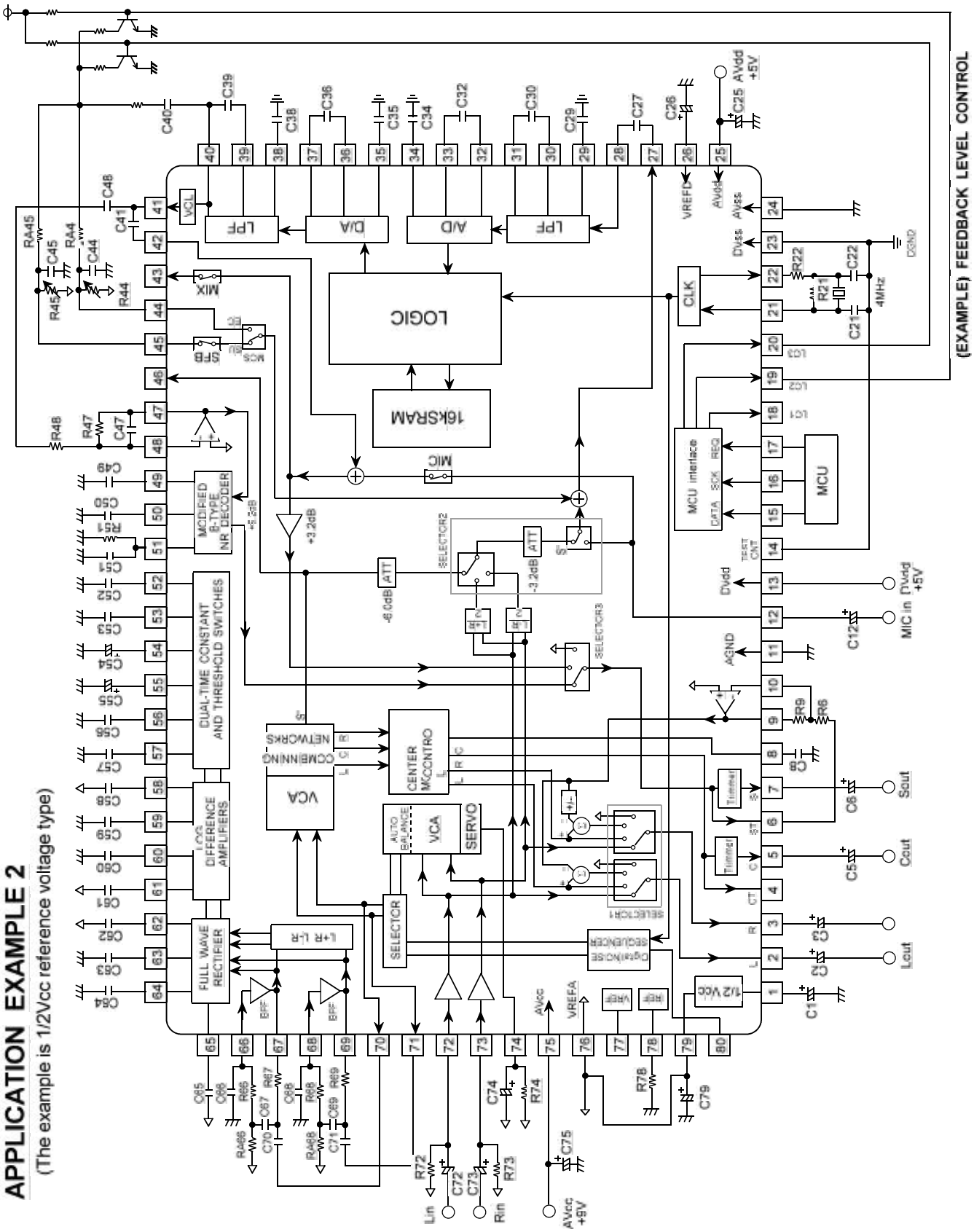
(The example is fixed 4V reference voltage type)



(Note)
It's recommended to remove these external parts of M62460FP.
(These external parts don't affect the funtion of M62465FP actually.)

APPLICATION EXAMPLE 2

(The example is 1/2Vcc reference voltage type)



OPTIONAL PARTS LIST

Parts No.	Values	Unit	Tol.	Parts No.	Values	Unit	Tol.
C1	47	µF		C65	0.1	µF	20%
C2	10	µF		C66	680	pF	5%
C3	10	µF		C67	0.1	µF	5%
C5	10	µF		C68	680	pF	5%
C6	10	µF		C69	0.1	µF	5%
C8	0.1	µF	10%	C70	0.1	µF	5%
C12	1	µF		C71	0.1	µF	5%
C21	27	pF		C72	10	µF	
C22	27	pF		C73	10	µF	
C25	100	µF		C74	22	µF	20%
C26	22	µF		C75	100	µF	
C27	1	µF	5%	C77	220	µF	
C29	0.01	µF	5%	C79	220	µF	
C30	0.0018	µF	5%				
C32	0.068	µF	5%				
C34	0.1	µF	5%				
C35	0.1	µF	5%	R6	10	KΩ	
C36	0.068	µF	5%	R9	20	KΩ	
C38	0.01	µF	5%	R21	1	MΩ	
C39	0.0018	µF	5%	R22	1	KΩ	
C40	0.1	µF		RA44	51	KΩ	
C41	0.1	µF		RA45	51	KΩ	
C44	1200	pF		R44	Vol		
C45	470	pF		R45	Vol		
C47	680	pF	10%	R47	24	KΩ	5%
C48	0.1	µF		R48	24	KΩ	5%
C49	0.0056	µF	5%	R51	330	KΩ	10%
C50	0.047	µF	5%	R66	47	KΩ	5%
C51	0.68	µF	10%	RA66	15	KΩ	5%
C52	0.22	µF	10%	R67	7.5	KΩ	5%
C53	0.22	µF	10%	R68	47	KΩ	5%
C54	4.7	µF	20%	RA68	15	KΩ	5%
C55	4.7	µF	20%	R69	7.5	KΩ	5%
C56	0.22	µF	10%	R72	22	KΩ	
C57	0.22	µF	10%	R73	22	KΩ	
C58	0.1	µF	20%	R74	4.7	MΩ	10%
C59	0.047	µF	5%	R78	100	KΩ	1%
C60	0.047	µF	5%				
C61	0.1	µF	20%				
C62	0.1	µF	20%				
C63	0.022	µF	5%				
C64	0.022	µF	5%				