To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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M62465FP

Dolby Pro Logic Surround

REJ03F0219-0201
Rev.2.01
Mar 31, 2008

Description

The M62465FP is a single chip LSI supporting the Dolby Pro Logic surround. This LSI contains all functions necessary for Dolby Pro Logic surround. In addition, it has Digital 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
Dolby and the double-D symbol are trademarks of Dolby Laboratories Licensing Corporation. San Francisco, CA94103-4813, USA.
This device available only to licensees of Dolby Lab.
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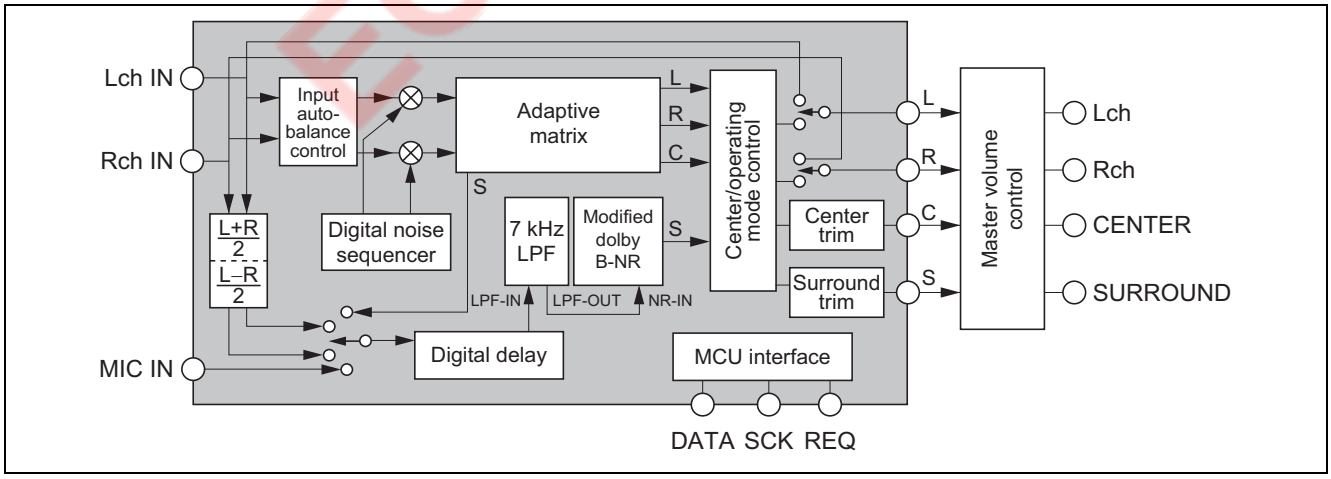
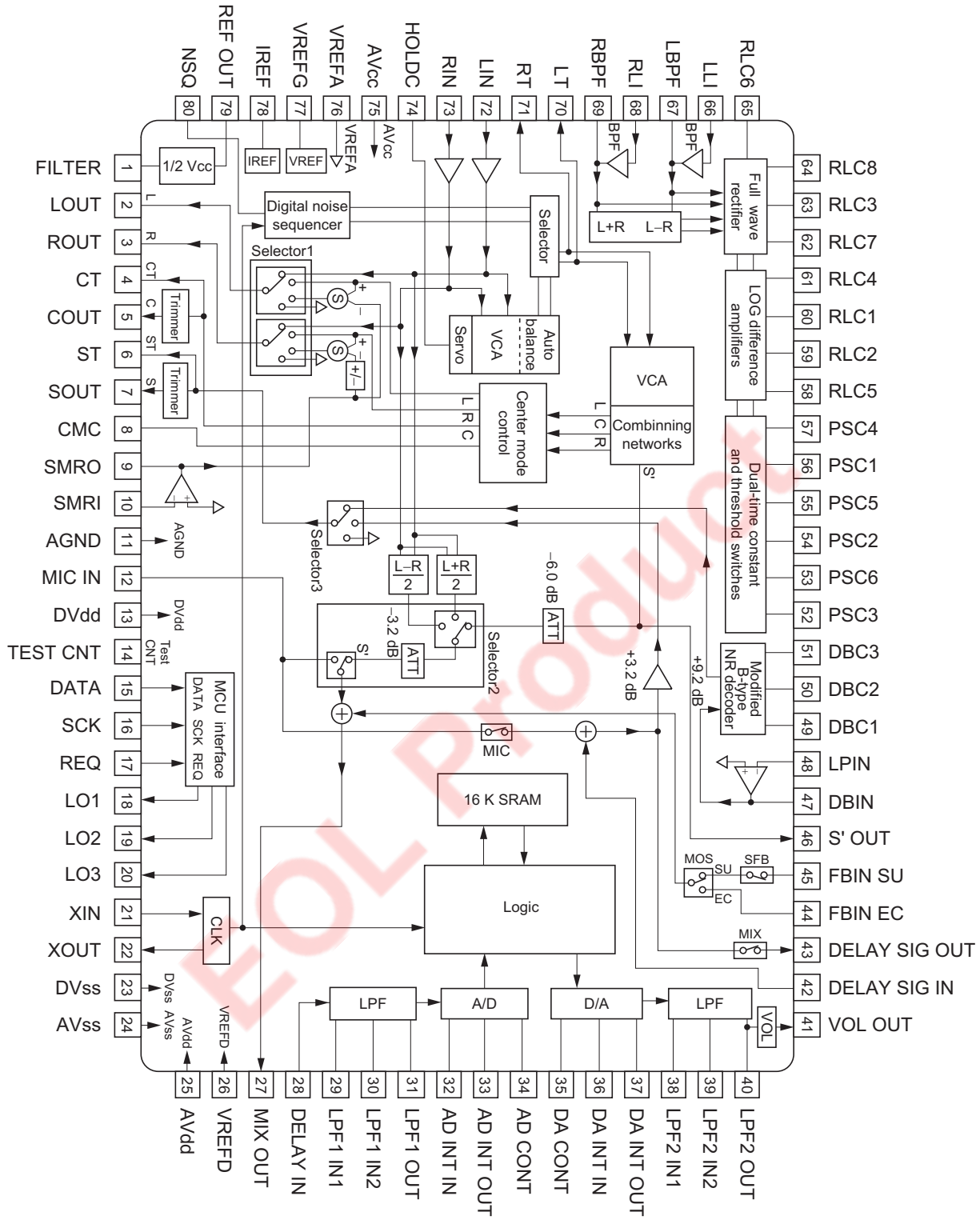
Features (Mode)

- 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, 28.6 ms for Dolby Pro Logic Surround.
- C/Sch Trimmer: 0 to –31 dB/1 dB Step.
- Digital Space Surround Mode: Disco/Hall/Live mode and 5 delay time positions.
- Digital Echo function for KARAOKE: (Short echo) Delay time = 147.5 ms, (Long echo) Delay time = 196.6 ms.
- BY-PASS Mode: Input signal through output.

System Block Diagram

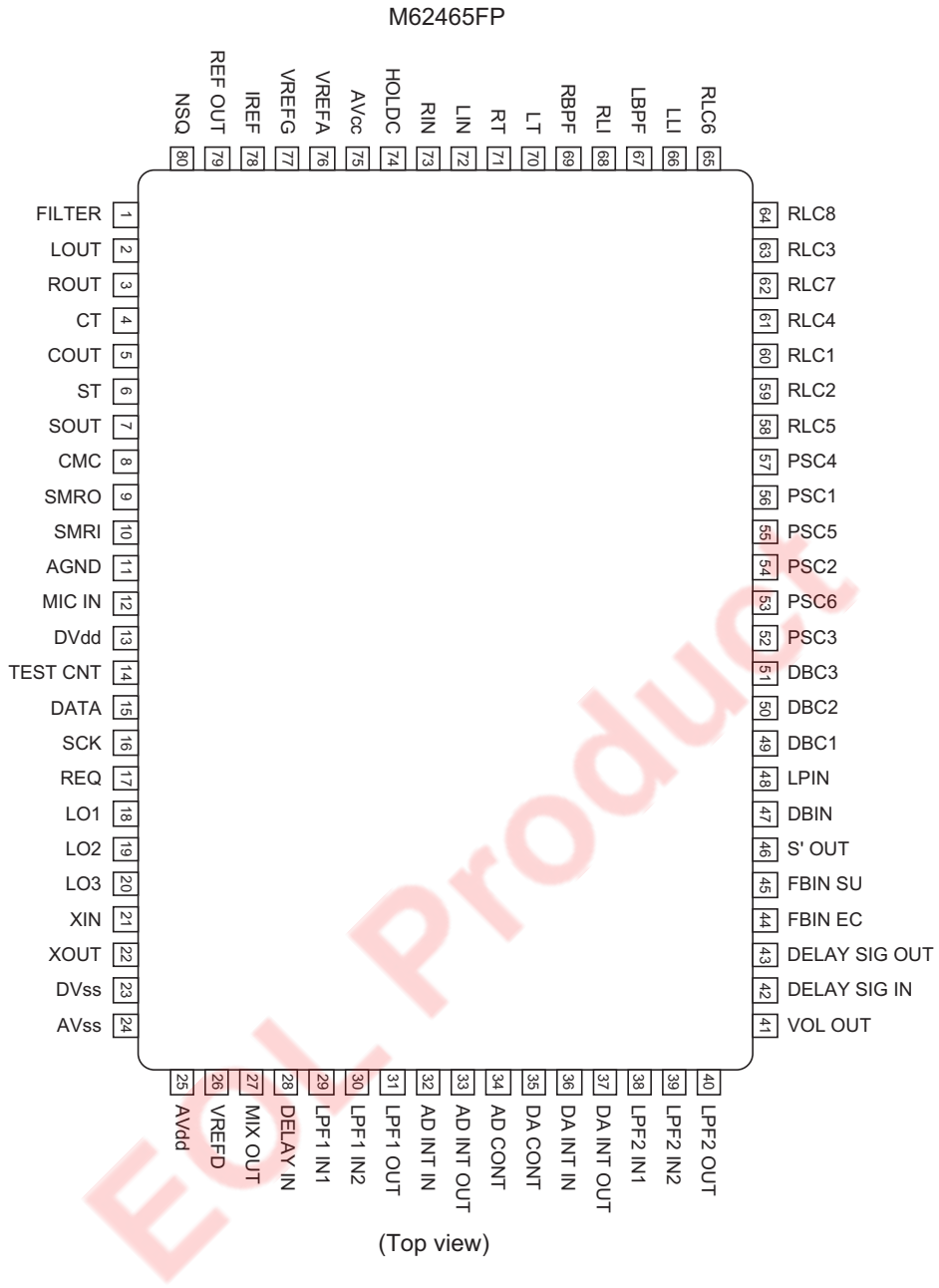


Block Diagram



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

Pin Arrangement

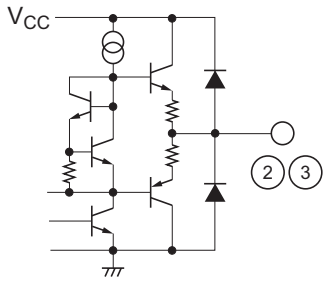
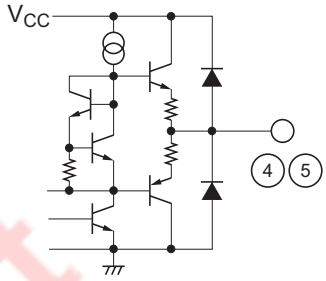
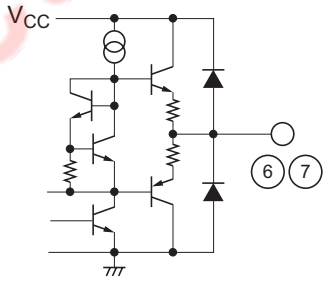
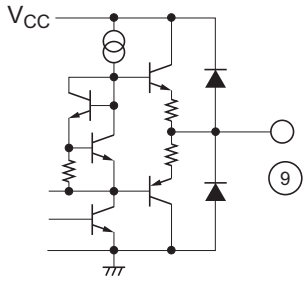
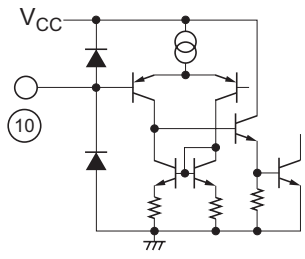
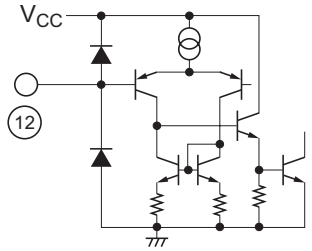


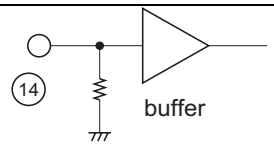
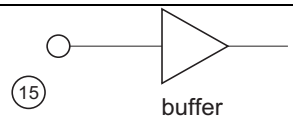
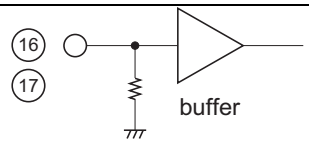
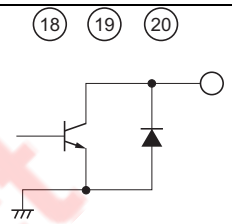
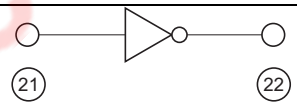
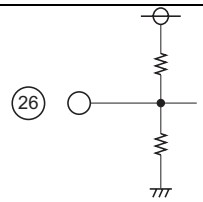
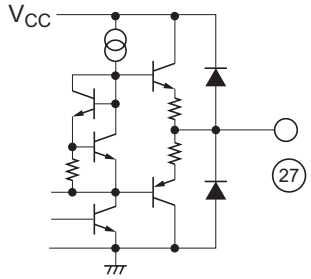
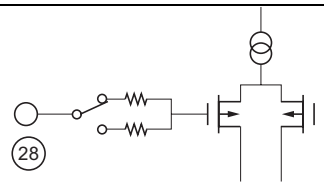
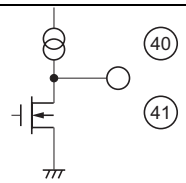
(Top view)

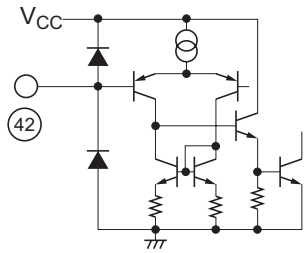
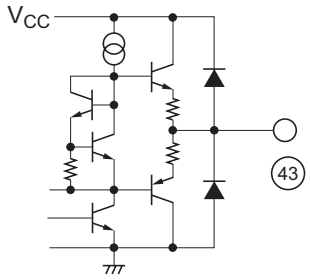
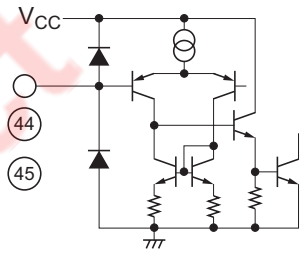
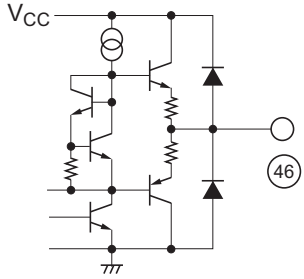
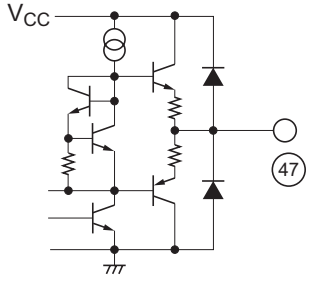
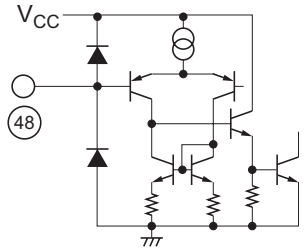
Outline: PRQP0080GB-A (80P6N-A)

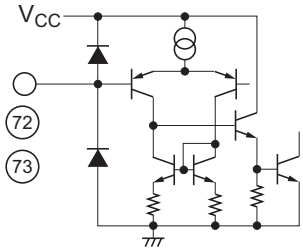
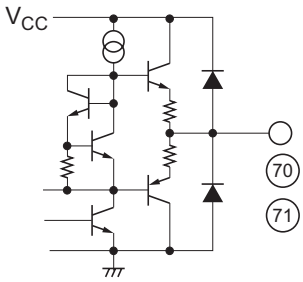
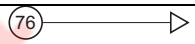
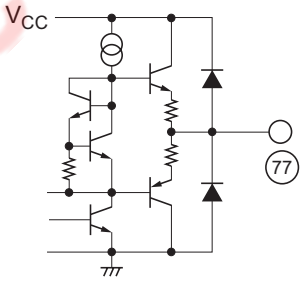
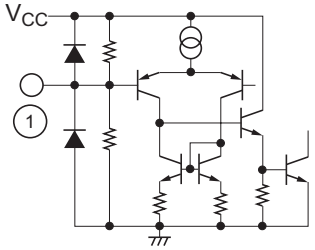
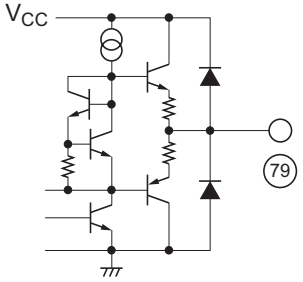
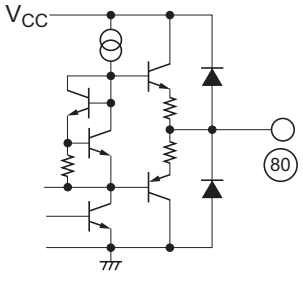
Note: The function of pin No.1, 79, 80 is different from that of M62460FP.

Pin Description

No.	Symbol	Function	Voltage	Description	Equivalent Circuit
2	LOUT	Lch output	4 V	Direct output R-/L-channel when the operation mode is BY-PASS. When the mode is 4channel, they output Dolby Pro Logic R-/L-channel signals.	
3	ROUT	Rch output			
4	CT	Cch output	4 V	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	4 V	This pin output surround 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	4 V	This is a amplifier to control mixed level of surround output with external resistance.	
10	SMRI	Amplifier input			
12	MIC IN	MIC input	4 V	Microphone input with ECHO MODE	

No.	Symbol	Function	Voltage	Description	Equivalent Circuit
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	Oscillator input	—	Connect 4 MHz ceramic resonator	
22	XOUT	Oscillator output			
26	VREFD	Reference output	2.5 V	1/2 V_{CC} output Connect a filter capacitor.	
27	MIX OUT	S′, L+R, L–R and MIC output	4 V	Signal output precedent to delay generator. That is S′, L+R, L–R and MIC output.	
28	DELAY IN	Delay input	2.5 V	This is s delay input. Please input by AC coupling.	
40	LPF2 OUT	Delay signal output	2.5 V	Delay signal output	
41	VOL OUT	Output of a delay volume		This is output of a delay volume that possible to control +3 dB to −∞.	

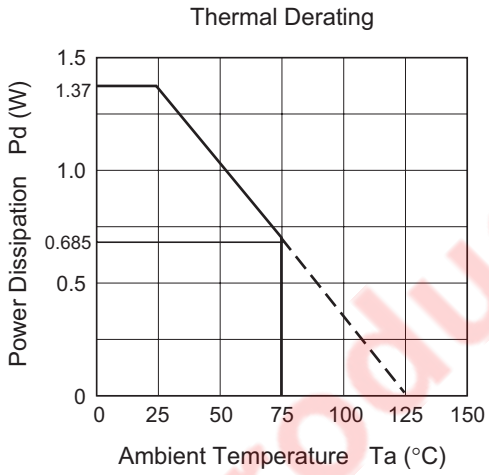
No.	Symbol	Function	Voltage	Description	Equivalent Circuit
42	DELAYSIG IN	—	4 V	Delay signal input to a mixing amplifier	
43	DELAYSIG OUT	Input from mixing amplifier	4 V	Delay signal output from a mixing amplifier	
44	FBIN EC	Feedback signal input	4 V	Feedback signal input with ECHO MODE	
45	FBIN SU			Feedback signal input with SURROUND MODE	
46	S′OUT	Sch output	4 V	Sorround channel output precedent to delay generator. Always outputs signals, irrespectiv of the operation mode (2-/3-/4-channel)	
47	DBIN	LPF output	4 V	This amplifier compornent 7 kHz-LPF with external resistances and capaciters. LPF output is conected to input of Modifide BNR.	
48	LPIN	Negative input of LPF			

No.	Symbol	Function	Voltage	Description	Equivalent Circuit
72	LIN	Lch input	4 V	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	4 V	Autobalance output.	
71	RT	Autobalance Rch output			
76	VREFA	Reference voltage input	—	It is a reference voltage input terminal to each circuit inside the IC.	
77	VREFG	Reference voltage output	4 V	Reference voltage output. Voltage is the fixed at 4V.	
1	FILTER New future of M62465FP	$1/2V_{CC}$ Auxiliary $1/2V_{CC}$ reference generator.	$1/2V_{CC}$	The terminal which make a $1/2V_{CC}$ voltage by the resistance. When it is used, a filter capacitor is connected.	
79	REFOUT New future of M62465FP	$1/2V_{CC}$ output Auxiliary $1/2V_{CC}$ reference generator.	$1/2V_{CC}$	$1/2V_{CC}$ voltage output. It is used to change reference voltage except 4V.	
80	NSQ New future of M62465FP	Noise sequencer monitor	4 V	Noise sequencer monitor output. It is only for test.	

Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

Item	Symbol	Ratings	Unit	Condition
Supply voltage	V_{CC}	10.5	V	
	V_{DD}	6.5	V	
Power dissipation	Pd	1.37	W	Standard board
Thermal derating	Kθ	13.7	mW/°C	Ta ≥ 25°C
Operating temperature	Topr	−20 to +75	°C	
Storage temperature	Tstg	−40 to +125	°C	



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

Recommended Operating Condition

Item	Symbol	Limits			Unit	Condition
		Min	Typ	Max		
Analog supply voltage	V_{CC}	8.0	9.0	10.0	V	
Digital supply voltage	V_{DD}	4.5	5.0	5.5	V	
OSC clock	fck	—	4	—	MHz	

Electrical Characteristics (Decoder)

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

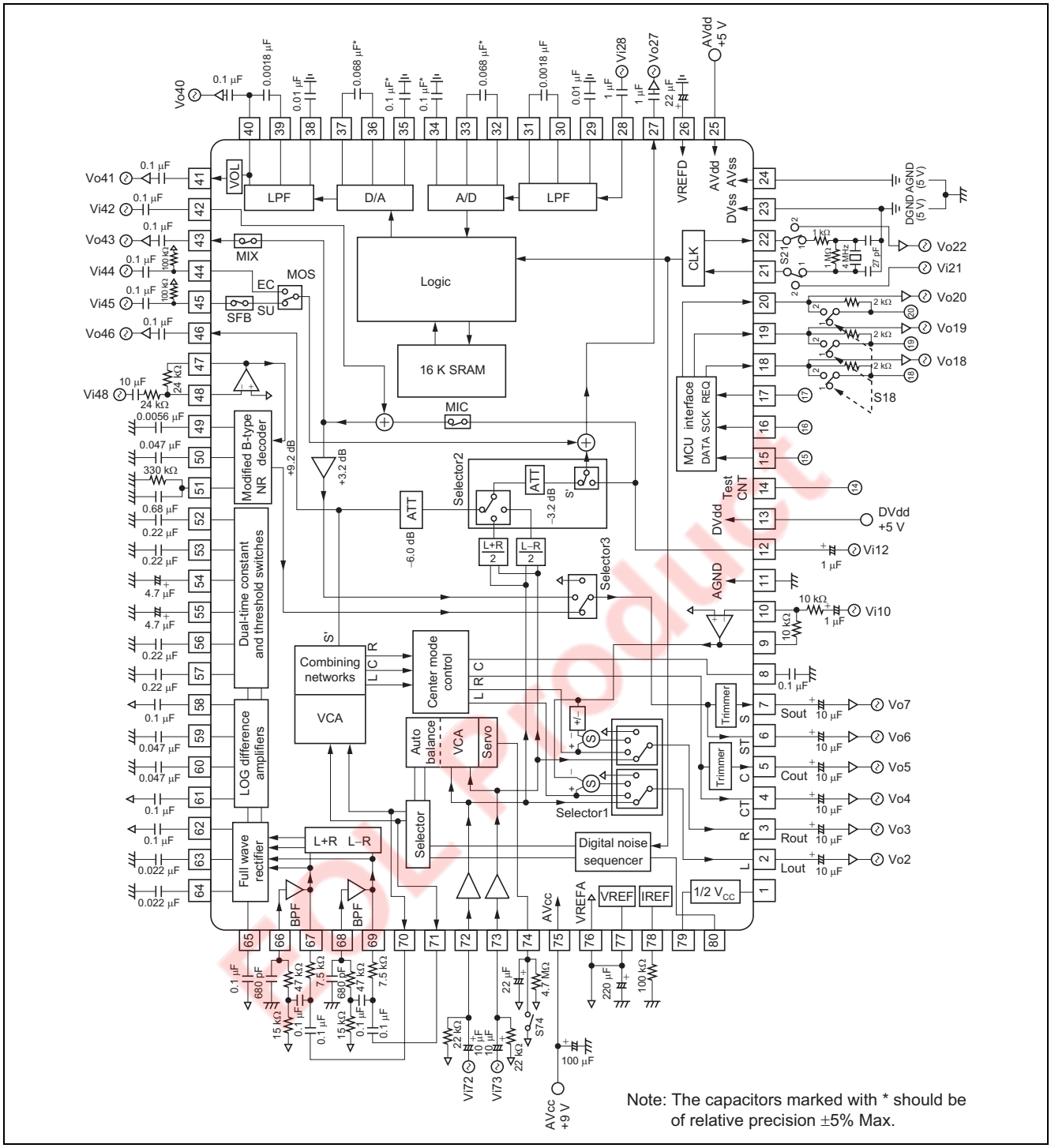
Item	Symbol	Limits			Unit	Conditions	
		Min	Typ	Max			
Overall							
Circuit current	I_{CC}	—	25	50	mA	Quiescent	
Circuit current	I_{DD}	—	25	50	mA	Quiescent	
Reference voltage	Vref	3.5	4.0	4.5	V	Quiescent	
Input auto valance							
Capture range	CPR	—	±5	—	dB		
Error correction	CER	—	±4	—	dB		
Adaptive matrix							
Output level accuracy relative to Cch	ΔVOL	–0.5	0	0.5	dB	L, R, S′ch out	
Matrix rejection relative.	MR	25	40	—	dB	L, R, C, S′ch out	
Headroom	HRAM	15	17	—	dB	L, R, C, S′ out	
Total harmonic Distortion	THDAM	—	0.05	0.2	%	L, R, C, S′ch out 4ch mode	
		—	0.002	0.05		L, Rch out 2ch mode	
Signal to noise ratio	SNAM	75	80	—	dB	Rg = 0 Ω, weighted CCIR/AMR 4ch mode	
		95	100	—		L, Rch out 2ch mode	
Peak noise	NopAM	—	—	±0.3	mVp-p	measurement time = 40ms	4ch mode
		—	—	±0.3			2ch mode
Noise sequencer (0 dBd Reference is input at NR–IN when adjust to 0 dB (300 mVrms/100 Hz) at S out.							
Output noise level	Vno	–15	–12.5	–10	dB		
Output level accuracy relative to Cch	ΔVno	–0.5	0	0.5	dB	L, R, S′ch out	
Output noise peak	Vnop	—	—	±550	mVp-p	Measurement time = 6 s	
Modified B type noise reduction							
Voltage gain	VGNR	—	9.2	—	dB	Vin = 0 dBd, f = 100 Hz	
Decode response 1	DEC1	–1.6	–0.1	1.4	dB	Vin = 0 dBd, f = 1.0 kHz	
Decode response 2	DEC2	–3.0	–1.5	0		Vin = –15 dBd, f = 1.4 kHz	
Decode response 3	DEC3	–4.9	–3.4	–1.9		Vin = –20 dBd, f = 1.4 kHz	
Decode response 4	DEC4	–6.8	–5.3	–3.8		Vin = –40 dBd, f = 5.0 kHz	
Total harmonic distortion	THDNR	—	0.0	0.3	%	Vin = 0 dBd, f = 1 kHz	
Headroom	HRNR	15	717	—	dB	THD = 1%	
Signal to noise ratio	SNNR	73	78	—	dB	Rg = 0 Ω weighted CCIR/AMR	
Peak noise	NoPNR	—	—	±0.3	mVp-p	Measurement time = 40 ms	
C, Sch trimmer							
Attenuation level: –12dB	ATT_{-12dB}	–14	–12	–10	dB	Digital input = –12	
Maximum attenuation	ATTmax	–37	–31	–25	dB	Digital input = –31	
Trimmer step	TS	0.6	1.0	1.4	dB		
Surround (L+R, L–R) <MIXOUT>							
Total harmonic distortion	THDSU	—	0.05	0.2	%	Vin = 0 dBd, f = 1 kHz	
Signal to noise ratio	SNSU	85	90	—	dB	Rg = 0 Ω weighted CCIR/AMR	

Electrical Characteristics (Digital Delay)

(Ta = 25°C, V_{CC} = 9 V, V_{DD} = 5 V, Vin = 200 mVrms, fck = 4 MHz unless otherwise noted)

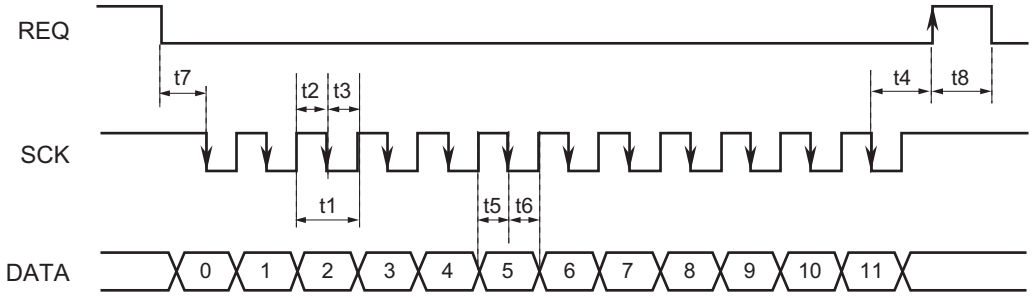
Item	Symbol	Limits			Unit	Conditions	
		Min	Typ	Max			
Digital delay							
Delay time	Td	12.4	15.4	18.4	ms	See delay time control (15/24) fordelay time setting.	
		17.0	20.0	23.0			
		25.6	28.6	31.6			
		38.0	41.0	44.0			
		46.2	49.2	52.2			
		137.5	147.5	157.5			
		186.6	196.6	206.6			
Input-output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

Test Circuit



Digital Control Specifications

(1) Data timing



Notes: 1. SCK is disable when REQ is high.
2. REQ must turn to high after SCK pulse turn to high.

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

(2) Data Format

Serial Data Format											
Data										Address	
BIT0	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	BIT8	BIT9	BIT10	BIT11
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

SELECTOR 1		
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

SELECTOR 2		
Mode	**BIT0**	**BIT1**
S′	0	0
L+R	0	1
L–R	1	0
MIC	1	1

SELECTOR 3		
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	±0 dB	±0 dB	±0 dB	±0 dB	±0 dB
1	–1 dB	–2 dB	–4 dB	–8 dB	–16 dB

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

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 (1 MHz)	7.0 kHz
0	0	1	20.0 ms (667 kHz)	
0	1	0	28.6 ms (500 kHz)	
0	1	1	41.0 ms (400 kHz)	
1	0	0	49.2 ms (333 kHz)	
1	0	1	147.5 ms (111.1 kHz)	3.0 kHz
1	1	0	196.6 ms (83.3 kHz)	
1	1	1	Delay off mode (clock off)	

Feedback Switch		
BIT7 (SFB)	SFB SW	Remarks
0	OFF	Feedback OFF
1	ON	Feedback ON

Note: 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

Note: 1. 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	20.0 ms
Noise SEQ	OFF	Volume control	–∞
SELECTOR1	PROLOGIC	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	0 dB, ATT (–)		
Sch. Trimmer	0 dB, ATT (–)		

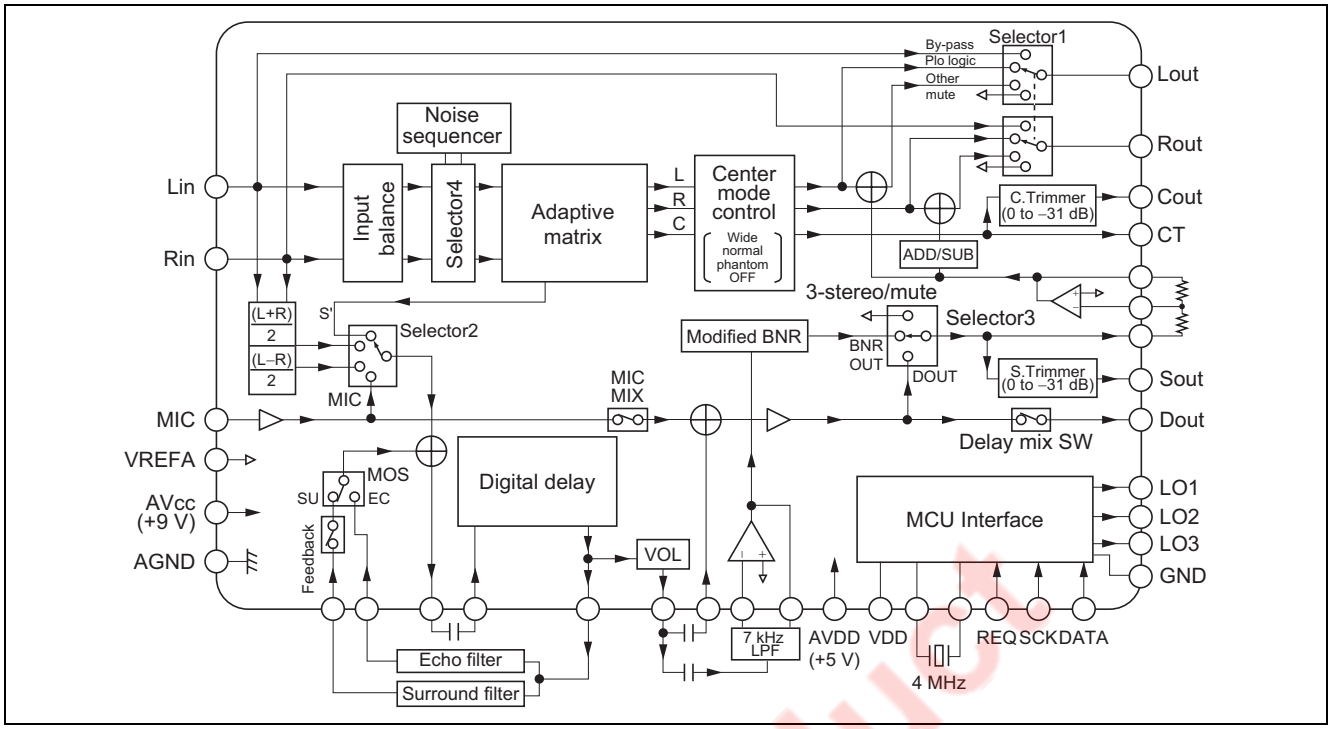
Notes: 2. The digital the noise sequencer stop when the clock is off.

Volume Control				
BIT3 (V1)	**BIT4 (V2)**	**BIT5 (V3)**	**BIT6 (V4)**	**VOL Attenuation**
1	1	1	1	+3 dB
1	1	1	0	0 dB
1	1	0	1	–2 dB
1	1	0	0	–3 dB
1	0	1	1	–4 dB
1	0	1	0	–6 dB
1	0	0	1	–8 dB
1	0	0	0	–9 dB
0	1	1	1	–10 dB
0	1	1	0	–12 dB
0	1	0	1	–15 dB
0	1	0	0	–∞
0	0	1	1	–∞
0	0	1	0	–∞
0	0	0	1	–∞
0	0	0	0	–∞

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 = 15.4 ms, 20.0 ms, 28.6 ms	0 to –31 dB 1 dB/step	0 to –31 dB 1 dB/step	VOL OFF (0 dB)	Pro Logic	S'	BNROUT/ 3 Stereo	Wide	—	OFF	SU	OFF	OFF	S'	Feedback level can be changed by output port control (see block diagram)
	Normal								Normal							
	Phantom								Phantom							
Digital space surround	Disco	td = 20 ms	* Pro Logic decoder function is alive. For example C/S trimmer can be available.		VOL ATT: +3 dB / 0 dB / –2 dB / –3 dB / –4 dB / –6 dB / –8 dB / –9 dB / –10 dB / –12 dB / –15 dB / –∞	Other SUR	L–R	DOUT	Phantom	SUB	OFF	SU	ON	OFF	$\frac{(L-R)}{2}$	OFF
	Hall	td = 49.2 ms					L+R			ADD			OFF		$\frac{(L+R)}{2}$	
	Live	td = 28.6 ms					S'/ L+R/ L–R	BNROUT/ 3 Stereo/ DOUT	Wide/ Normal/ Phantom	ADD/ SUB			ON/ OFF			
	Option	5 step delay time (BW = 7 kHz, fck = 4 MHz)				By-pass	MIC	3 Stereo	OFF	ADD	ON	EC	OFF	ON	MIC	
Karaoke/ echo	Short echo	td = 147.5 ms														
	Long echo	td = 195.5 ms														
By-pass	By-pass	td = 20.0 ms	–31 dB		–∞	By-pass	S'	3 Stereo	OFF	ADD	OFF	SU	OFF	OFF	S'	

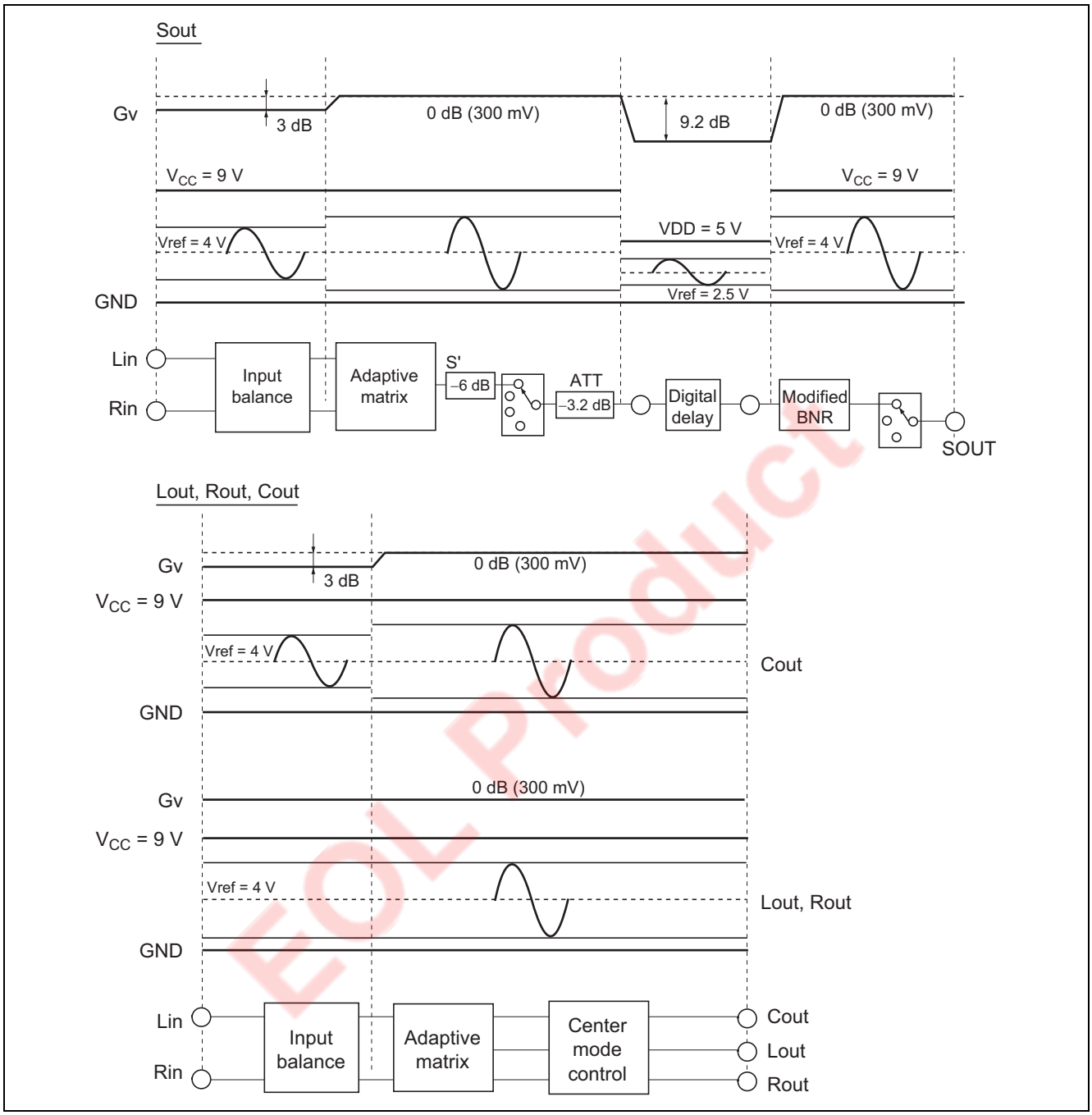
Function Block Diagram



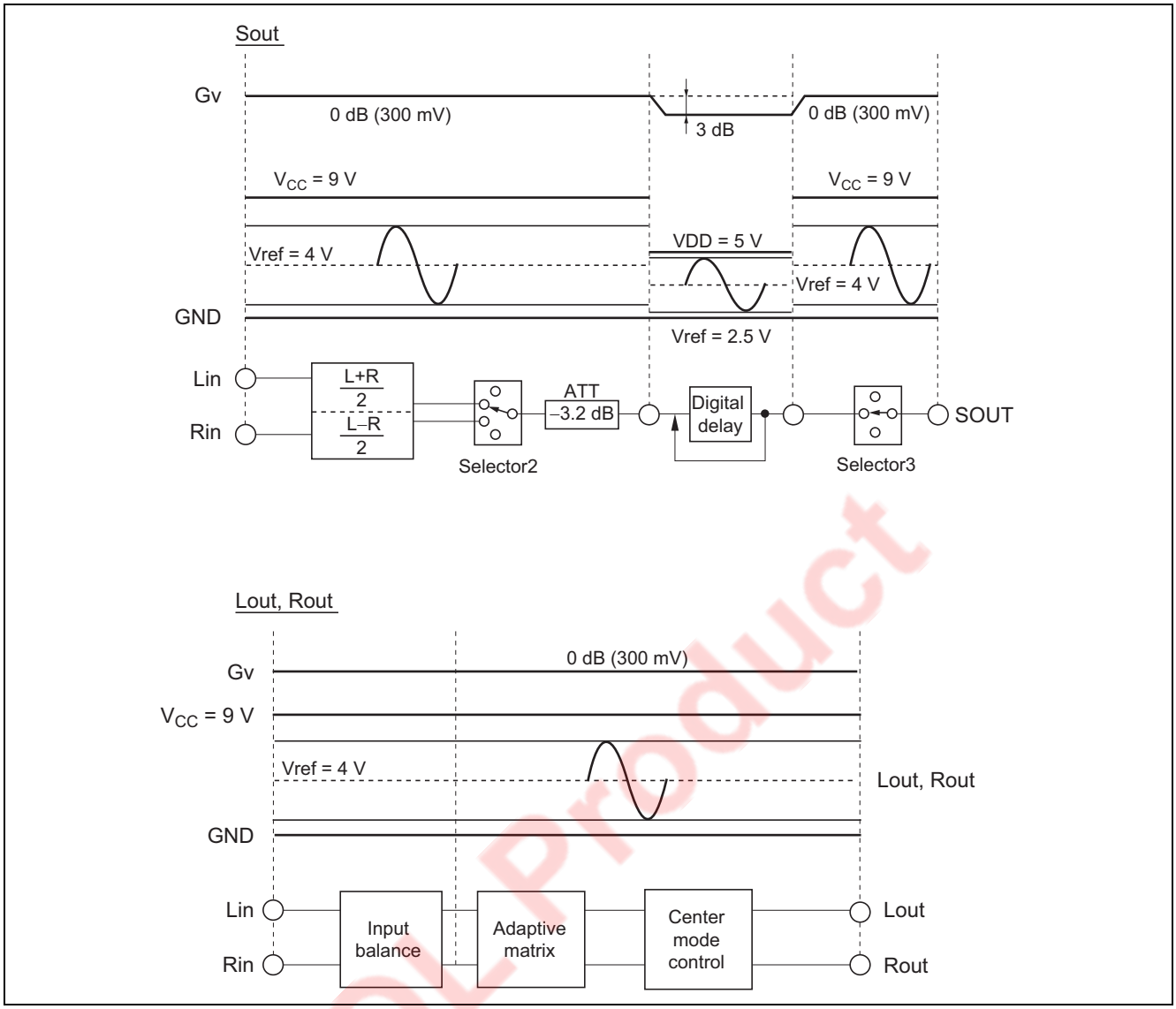
Block Name	Function
Input balance	Revises a level error between the input Lch and Rch for optimum decoder performance.
Noise sequencer	A simple noise sequencer circuit adjustment of output level.
Adaptive matrix	Continuously analyze the two-channel matrixes audio input to determine the direction and relative magnitude of encoded sound fields.
Center mode control	Possible to select 4-center mode position. (WIDE, NORMAL, PHANTOM, OFF)
C.Trimmer, S.Trimmer	This is the level adjustment volume of Cch and Sch. (0 to –30 dB: 1 dB/step)
Modified BNR	This block restores the signal to its original spectrum while reducing noise and certain cross talk 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 BNR out, Dout and 3STEREO/MUTE.
Selector4	This is a switch to connect a simple noise sequencer output to ADAPTIVE MATRIX stage for level adjustment.
Digital delay	Make 7 kinds of delay signal s. (15.4 ms to196.6 ms) The delay function and CLK signal stop at the time of DELAY OFF MODE. This mode is for suppress bad effect of digital noise.
Feedback	This is a switch to select feedback mode (ON/OFF) for SURROUND MODE.
Mode sel (MOS)	This is a switch to select feedback signal from surround signal and echo signal.
VOL	Control the ATT level of delay signal from 3 dB to –∞ (12-step)
MIC MIX	This is a switch to mix microphone 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

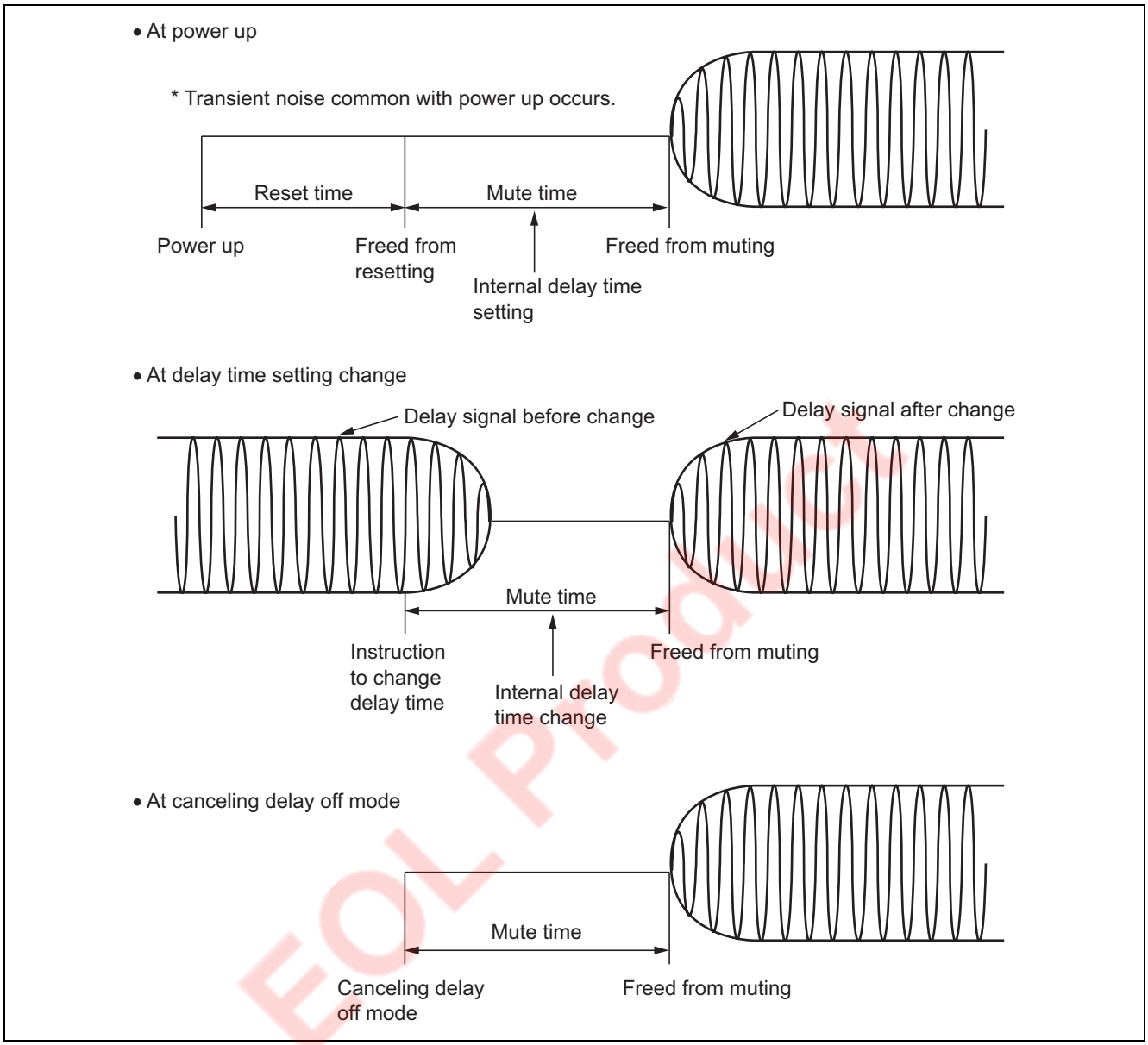


Digital Space Surround Mode



Auto Mute Function

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

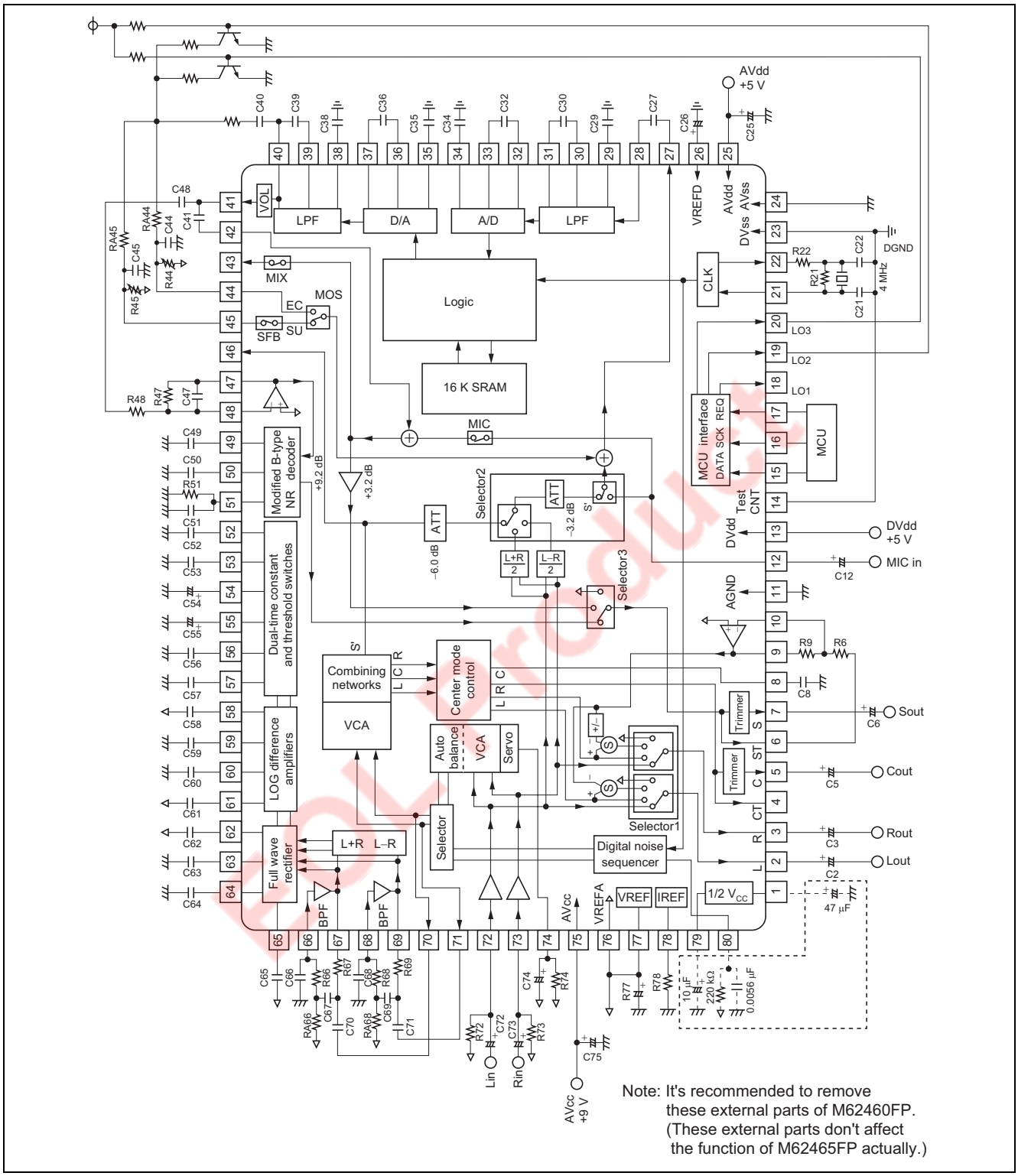


Mute time changes depending on set (or preset) delay time.

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)

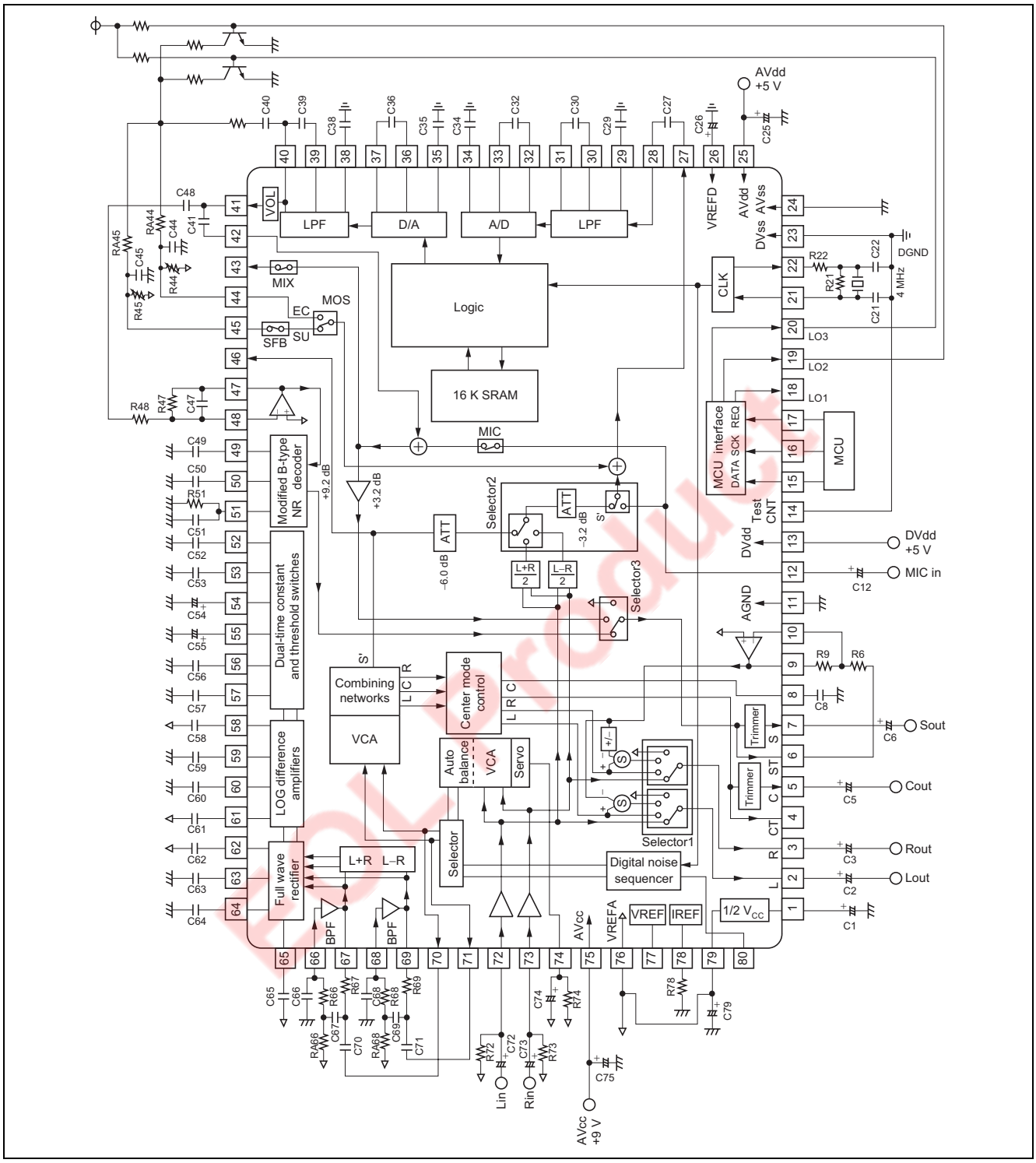
The example is fixed 4 V reference voltage type.



(Example) Feedback Level Control

Application Example 2

The example is $1/2V_{CC}$ reference voltage type.



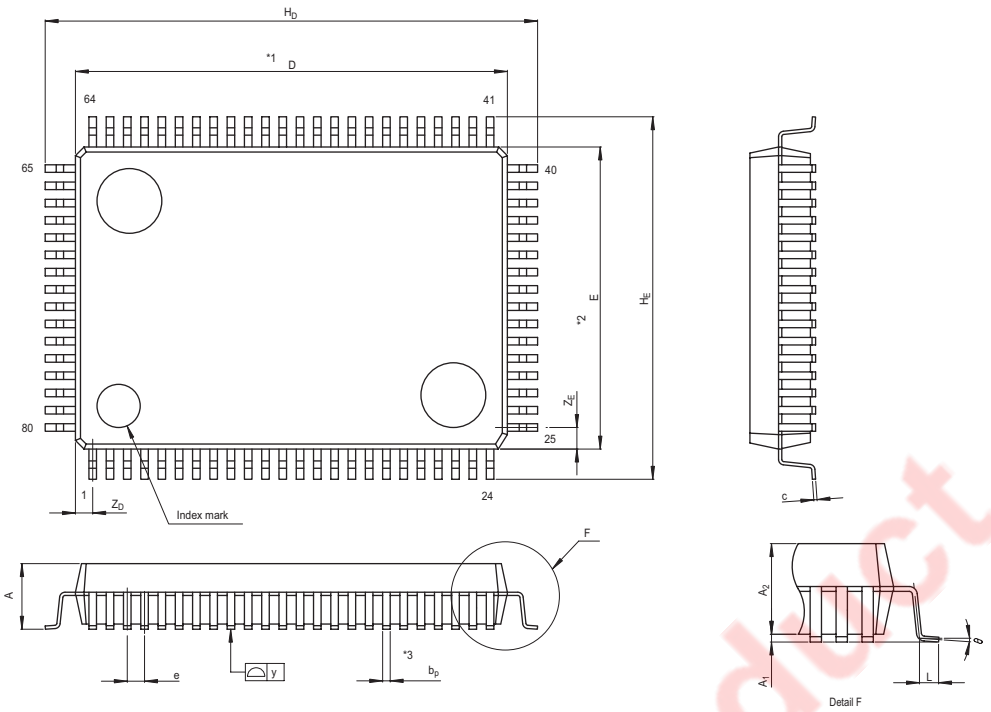
(Example) Feedback Level Control

External 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%				

Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-QFP80-14x20-0.80	PRQP0080GB-A	80P6N-A	1.6g



NOTE)
1. DIMENSIONS "*1" AND "*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION "*3" DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	19.8	20.0	20.2
E	13.8	14.0	14.2
A_2	—	2.8	—
H_D	22.5	22.8	23.1
H_E	16.5	16.8	17.1
A	—	—	3.05
A_1	0	0.1	0.2
b_p	0.3	0.35	0.45
c	0.13	0.15	0.2
θ	0°	—	10°
e	0.65	0.8	0.95
y	—	—	0.10
Z_D	—	0.8	—
Z_E	—	1.0	—
L	0.4	0.6	0.8

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