

DESCRIPTION

The M62409FP is an electric attenuator with the loudness for car-audio and home-audio

Attenuator, loudness in the M62409FP can be controlled by the serial data from the micro-processor since there are the attenuator circuits, the buffer amplifiers, and the control logic circuits in it.

FEATURES

- Controlled by the serial data
Attenuator..... 0~ -81dB(1dB/step), -∞ loudness
- Low noise and low distortion
- Reference voltage circuit (1/2Vcc)

APPLICATION

Car-audio, Home-audio

RECOMMENDED OPERATING CONDITIONS

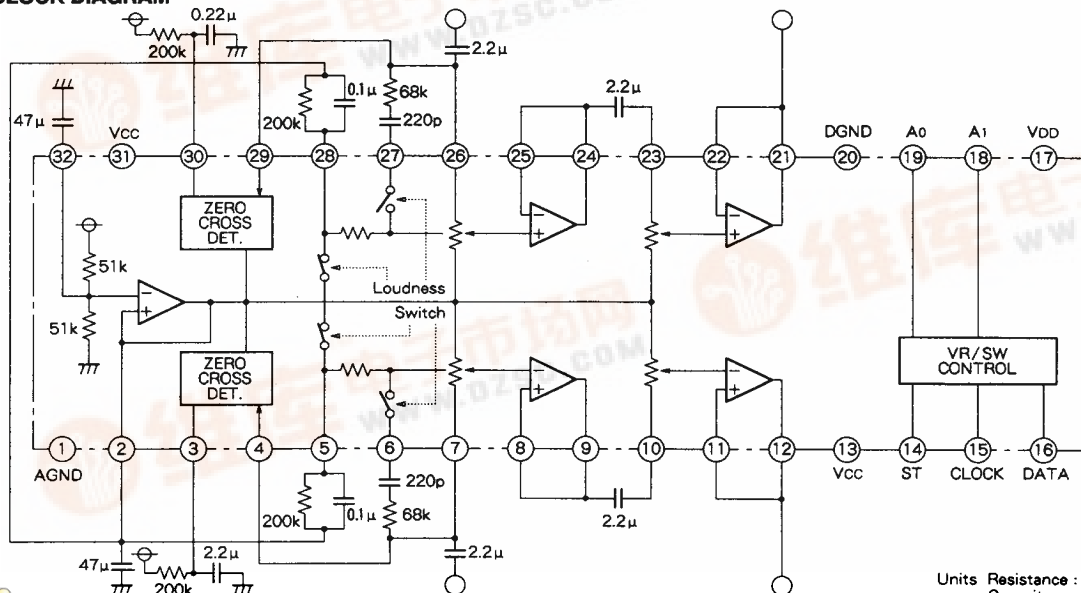
- Supply voltage range..... 6~9V
Rated supply voltage..... 8V

PIN CONFIGURATION (TOP VIEW)

AGND	1	32	1/2Vcc IN
1/2Vcc OUT	2	31	Vcc
TIM1	3	30	TIM2
ZERO 1	4	29	ZERO 2
LB1	5	28	LB2
HB1	6	27	HB2
ATTF IN1	7	26	ATTF IN2
ATTF M1	8	25	ATTF M2
ATTF OUT1	9	24	ATTF OUT2
ATTR IN1	10	23	ATTR IN2
ATTR M1	11	22	ATTR M2
ATTR OUT1	12	21	ATTR OUT2
Vcc	13	20	DGND
ST	14	19	A0
CLOCK	15	18	A1
DATA	16	17	VDD

Outline 32P2U-B

BLOCK DIAGRAM



Units Resistance : Ω
Capacitance : F

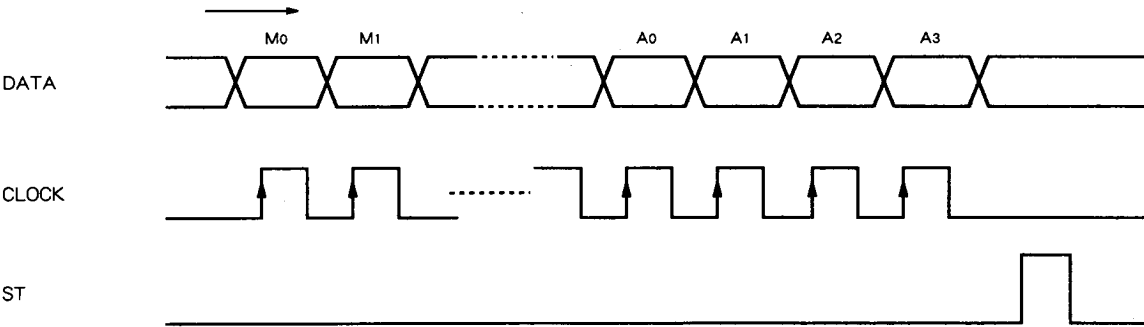
ABSOLUTE MAXIMUM RATINGS (Ta = 25℃, unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
Vcc	Supply voltage		10	V
Pa	Power dissipation		790	mW
Ke	Thermal derating		7.9	mW/℃
Topr	Operating temperature		- 30 ~ + 85	℃
Tstg	Storage temperature		- 40 ~ + 125	℃

ELECTRICAL CHARACTERISTICS (Ta = 25℃, Vcc = 8V, unless otherwise noted)

Symbol	Parameter		Test conditions	Limits			Unit
				Min	Typ	Max	
Icc	Circuit current				14		mA
ATT(VOL)	ATT	ATT max.	ATT(VOL) = - ∞		- 90	- 80	dB
ΔATT(VOL)		ATT error	ATT(VOL) = 0	- 2.0	0	2.0	dB
GLB	LOUDNESS	Voltage gain	f = 100Hz, ATT = -30dB	6.5	9	11.5	dB
GLT			f = 10kHz, ATT = -30dB	4	6	8	dB
VOM		Maximun input voltage	THD= 1 %	2.0	2.8		Vrms
VOM	Maximun output voltage		THD= 1 %	1.8	2.2		Vrms
THD	Total harmonic distortion		f = 1kHz, Vo = 0.5Vrms, loudness = off, ATT(VOL) = 0		0.003	0.05	%
VNO1	Output noise voltage		ATT(VOL) = 0, Rg = 0, BW : 10Hz~20kHz		7	15	μVrms
VNO2			ATT(VOL) = - ∞, Rg = 0, BW : 10Hz~20kHz		4	8	μVrms
CS	Channel separation		f = 1kHz		- 90	- 80	dB

TIMING DIAGRAM



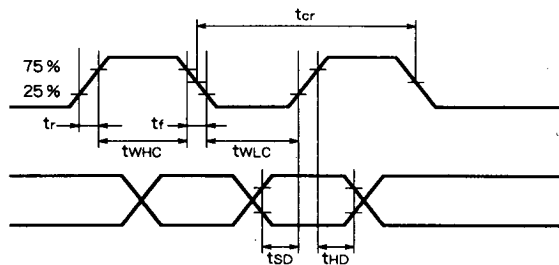
DIGITAL PART DC CHARACTERISTICS ($T_a = -30 \sim 85^\circ\text{C}$, $V_{CC} = 8\text{V}$, $V_{DD} = 5\text{V}$, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_{IL}	Low-level input voltage	DATA, CLOCK, ST	0	~	$0.2V_{DD}$	V
V_{IH}	High-level input voltage		$0.8V_{DD}$	~	V_{DD}	V
I_{IL}	Low-level input current	$V_I = 0$	-10		10	μA
I_{IH}	High-level input current	$V_I = V_{DD}$			10	μA

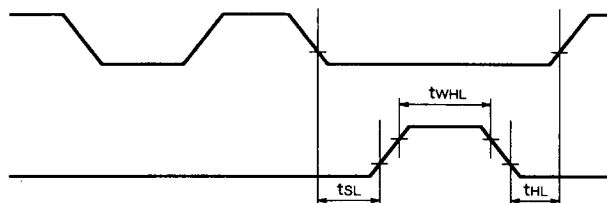
DIGITAL PART AC CHARACTERISTICS ($T_a = -30 \sim 85^\circ\text{C}$, $V_{CC} = 8\text{V}$, $V_{DD} = 5\text{V}$, unless otherwise noted)

Symbol	Parameter		Test conditions	Limits			Unit
				Min	Typ	Max	
t_{cr}	CLOCK	Cycle time		2			μs
t_{WHC}		Pulse width("H" level)		0.8			μs
t_{WLC}		Pulse width("L" level)		0.8			μs
t_r		Raise time				0.2	μs
t_f		Fall time				0.2	μs
t_{SD}	DATA	Set up time		0.4			μs
t_{HD}		Hold time		0.4			μs
t_{SL}	ST	Set up time		0.8			μs
t_{HL}		Hold time		1			μs
t_{WHL}		Pulse width		0.8			μs

DATA, CLOCK TIMING



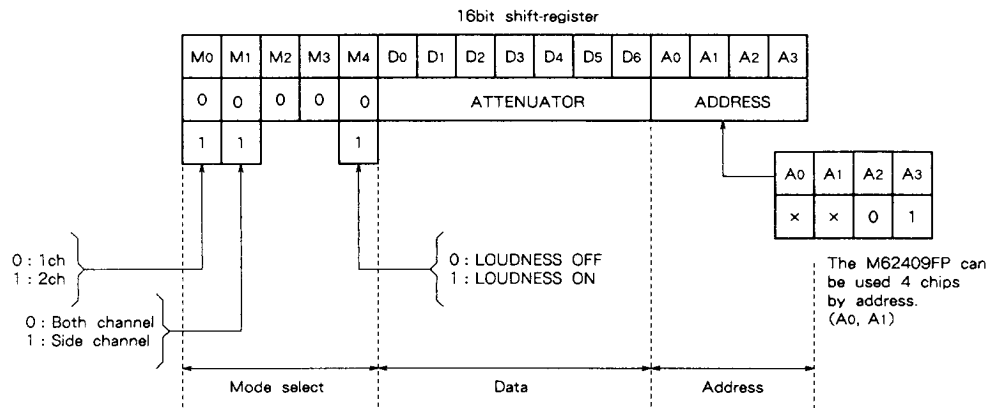
ST TIMING



M62409FP

DIGITAL SOUND CONTROLLER

DATA FORMAT



ATTENUATOR CODE

ATT1	D0	D1	D2	D3	D4
0dB	H	H	H	H	H
- 2dB	L	H	H	H	H
- 4dB	H	L	H	H	H
- 6dB	L	L	H	H	H
- 8dB	H	H	L	H	H
- 10dB	L	H	L	H	H
- 12dB	H	L	L	H	H
- 14dB	L	L	L	H	H
- 16dB	H	H	H	L	H
- 18dB	L	H	H	L	H
- 20dB	H	L	H	L	H
- 22dB	L	L	H	L	H
- 24dB	H	H	L	L	H
- 26dB	L	H	L	L	H
- 28dB	H	L	L	L	H
- 30dB	L	L	L	L	H
- 32dB	H	H	H	H	L
- 34dB	L	H	H	H	L
- 36dB	H	L	H	H	L
- 38dB	L	L	H	H	L
- 40dB	H	H	L	H	L
- 42dB	L	H	L	H	L
- 46dB	H	L	L	H	L
- 50dB	L	L	L	H	L
- 54dB	H	H	H	L	L
- 58dB	L	H	H	L	L
- 62dB	H	L	H	L	L
- 66dB	L	L	H	L	L
- 70dB	H	H	L	L	L
- 74dB	L	H	L	L	L
- 78dB	H	L	L	L	L
- ∞	L	L	L	L	L

ATT2	D5	D6
0dB	H	H
- 1dB	L	H
- 2dB	H	L
- 3dB	L	L

FREQUENCY RESPONSE (LOUDNESS)

