CONFIDENTIAL

R2A15906SP

DIGITAL ECHO WITH MIC MIXING AMP

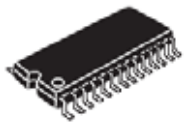
DISCRIPTION

The R2A15906SP is a CMOS IC that has a microphone peripheral circuit and an echo generation circuit for karaoke use, on a single chip.

FEATURES

- High-performance digital echo circuit using 44-Kbit RAM
- A mic amplifier with an ALC makes it possible to handle overload input, and the ALC operating voltage can be externally set to the desired value.
- Built-in mic volume, echo volume, and feedback volume
- Internal mic mixing amplifier
- The clock has an internal current control-type oscillation circuit, and the generation of unnecessary oscillation can be prevented because the clock does not affect anything external to the unit.
- Internal Auto Reset circuit that functions when the power supply is turned on.
- MIC Volume, Echo Volume, and Feedback Volume are controlled by I2C Bus or DC control. (Delay Time is only I2C Bus)
- 5 V single power supply

Package

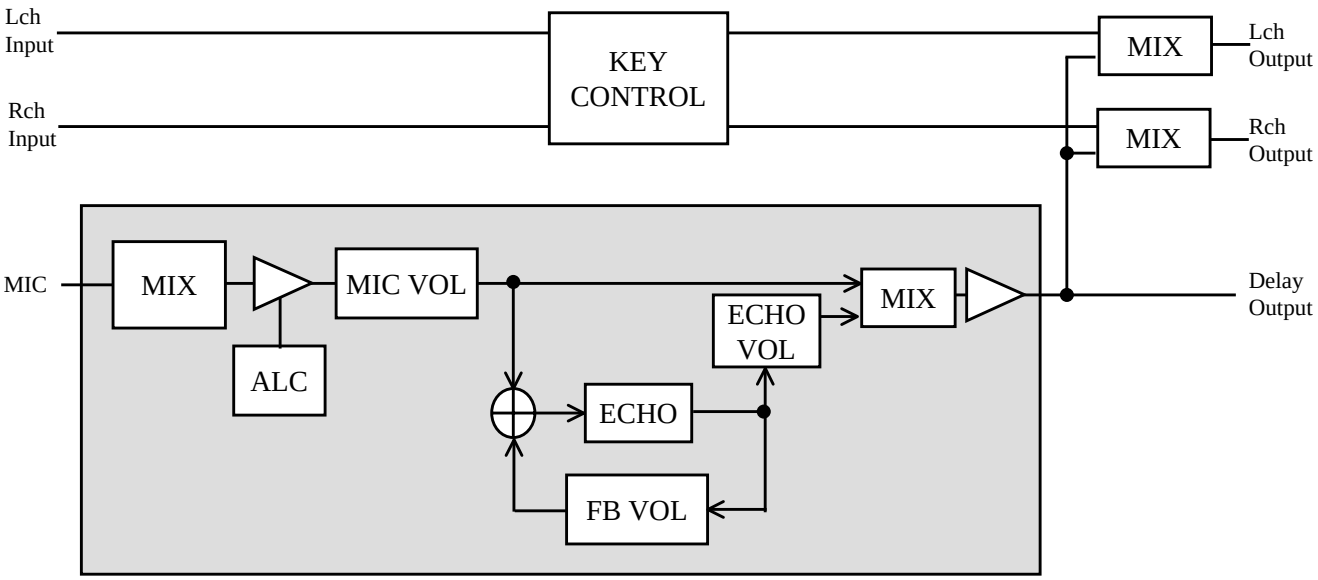


Outline 28Pin SOP
1.27mm pitch

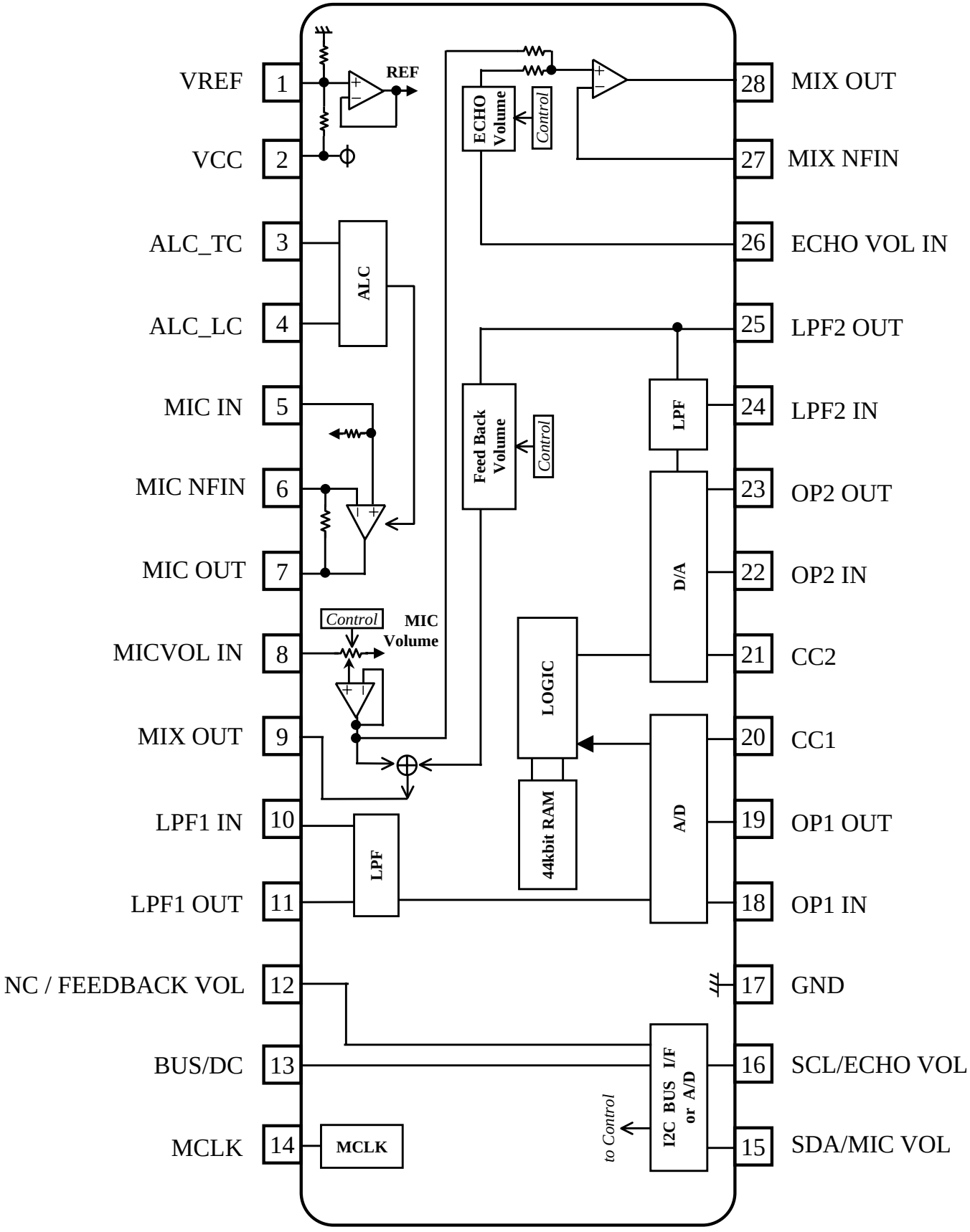
RECOMMENDED OPERATING CONDITION

Supply voltage …… VCC = 5.0V (typ)

SYSTEM CONFIGURATION



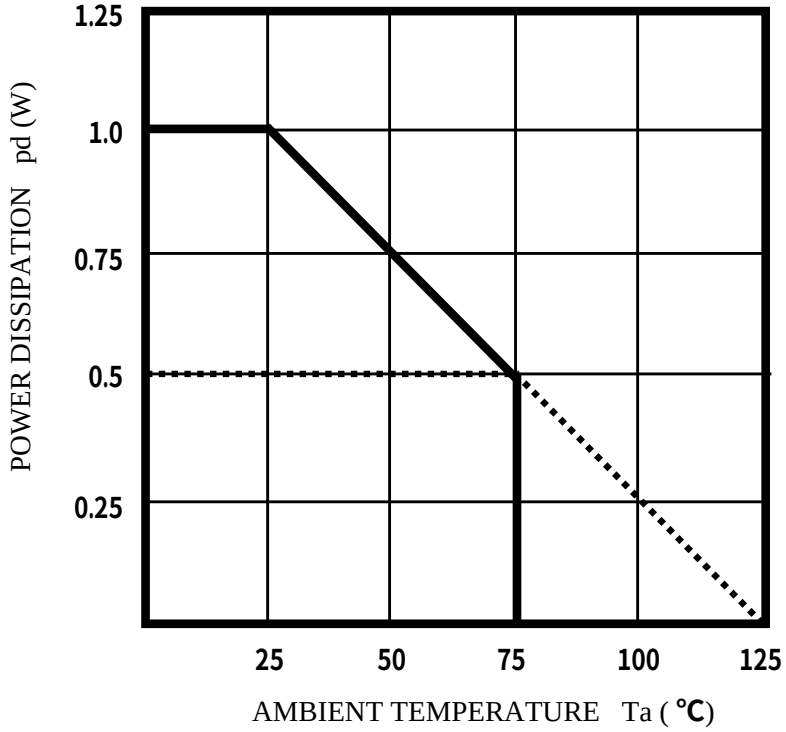
BLOCK DIAGRAM AND PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Condition	Ratings	Unit
VCC	Power supply		6.0	V
Pd	Power dissipation	Ta≦25℃	1.0	W
K	Thermal derating	Ta＞25℃ (Circuit board installation)	10	mW/℃
Topr	Operating temperature		-20 to +75	℃
Tstg	Storage temperature		-40 to +125	℃

THERMAL DERATINGS
(MAXIMUM RATING)



RECOMMENDED OPERATING CONDITION

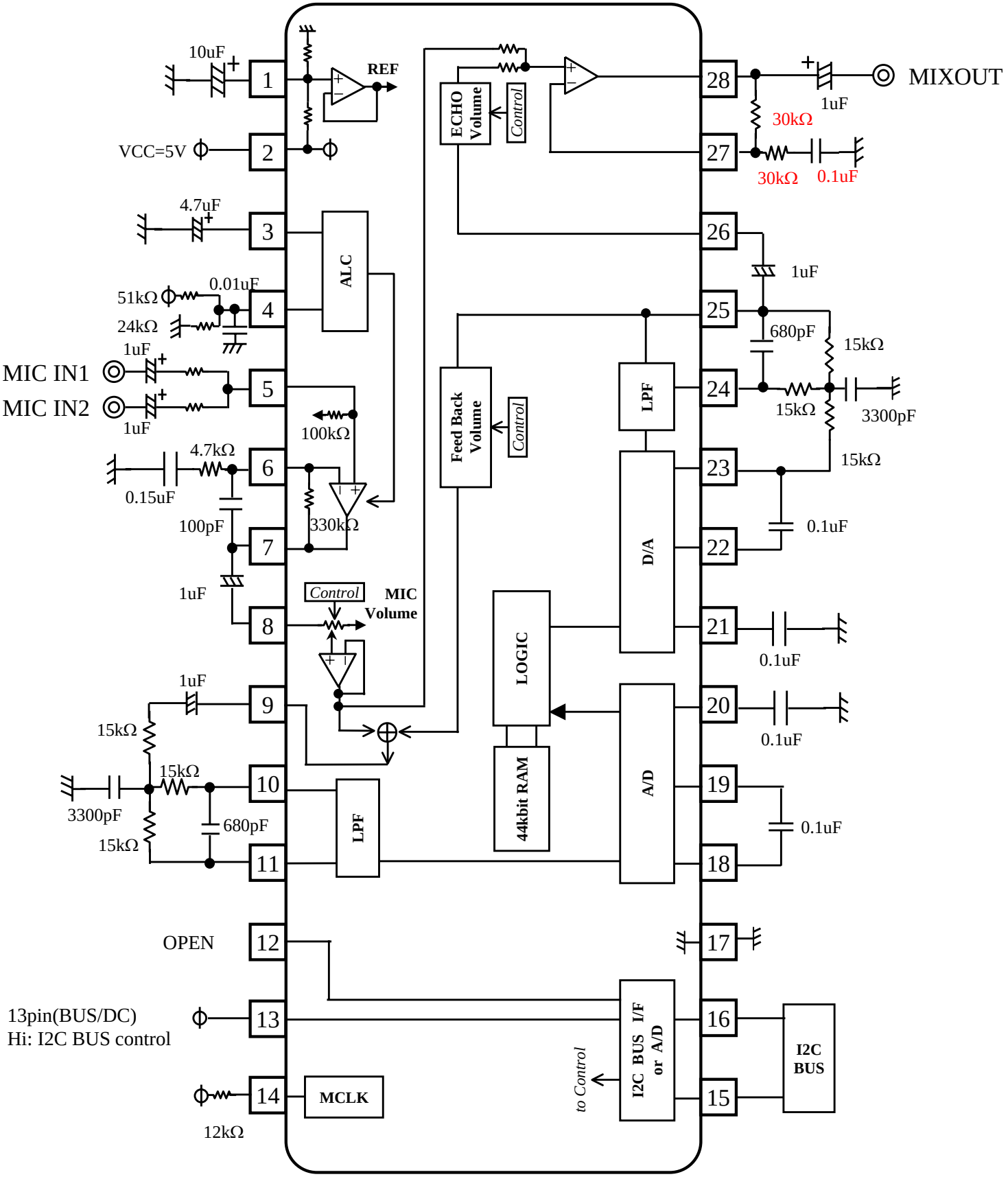
(Ta=25ºC,unless otherwise noted)

Parameter	Symbol	condition	Limits			Unit
			MIN	TYP	MAX	
Supply voltage	VCC		3.5	5	5.5	V
Clock Frequency	fck	VCC=5V	6.8	8	9.2	MHz

Symbol	Parameter	condition	Limits			Unit
			min	typ	max	
I²C BUS Interface						
V_{IL}	Low Level Input Voltage	VCC=5V	0	—	0.9	V
V_{IH}	High Level Input Voltage	VCC=5V	2.3	—	5	V
f_{SCL}	Maximum Clock Frequency				100	KHz

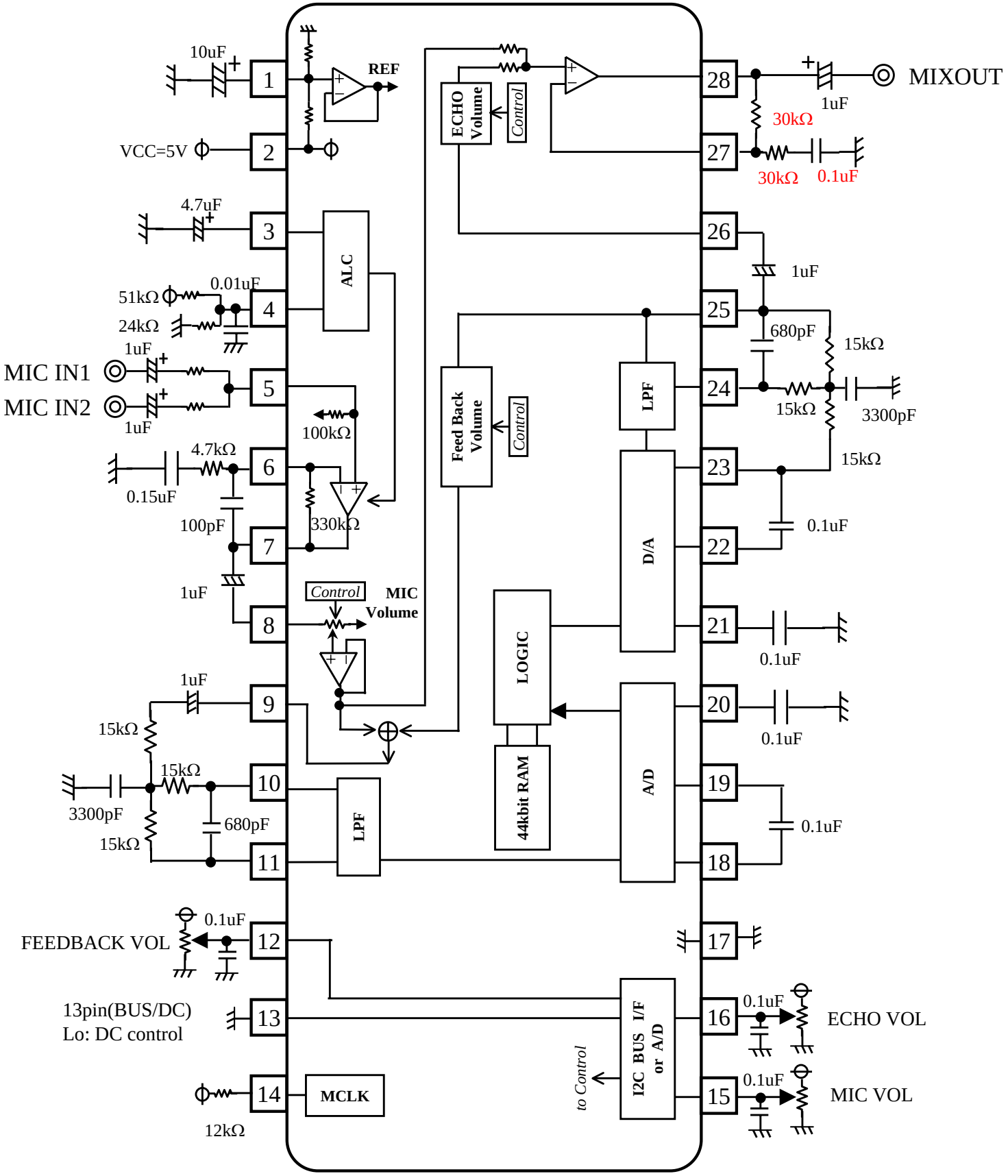
APPLICATION EXAMPLE 1

I2C BUS control
<13pin(BUS/DC)=H>



APPLICATION EXAMPLE 2

DC control
<13pin(BUS/DC)=L>



I²C BUS FORMAT

	MSB	LSB	MSB	LSB	MSB	LSB		
S	Slave Address	A	Sub Address	A	Data		A	P
1 bit	8 bit	1 bit	8 bit	1 bit	8 bit		1 bit	1 bit

S: Starting Term
A: Acknowledge Bit
P: Stop Term

If more than one Data Byte is transmitted, then the significant SUB ADDRESS bits are auto incremented.
00H→01H→00H

1. Slave Address

MSB							LSB
1	1	0	0	1	0	0	R/W_B

R/W_B=0 : Write mode for register setting
R/W_B=1 : Not available

2. Sub Address Table

Sub Address	BIT							
	D7	D6	D5	D4	D3	D2	D1	D0
00H	<1>MIC Volume				<2>Echo Volume			0
01H	<3>Feedback Volume			<4>Delay time			0	0

3. Data Table

<1> MIC Volume (Sub Address : 00H)

Gain	I2C BUS control				DC control(V)
	D7	D6	D5	D4	
0dB	1	1	1	1	5.0
-2dB	1	1	1	0	4.25
-4dB	1	1	0	1	4.0
-6dB	1	1	0	0	3.75
-8dB	1	0	1	1	3.5
-10dB	1	0	1	0	3.25
-12dB	1	0	0	1	3.0
-14dB	1	0	0	0	2.75
-16dB	0	1	1	1	2.5
-18dB	0	1	1	0	2.25
-20dB	0	1	0	1	2.0
-22dB	0	1	0	0	1.8
-24dB	0	0	1	1	1.6
-26dB	0	0	1	0	1.4
-28dB	0	0	0	1	1.2
● -∞	0	0	0	0	1.0
					0.0

<2> Echo Volume (Sub Address : 00H)

Gain	I2C BUS control			DC control(V)
	D3	D2	D1	
0dB	1	1	1	5.0
-3dB	1	1	0	4.0
-6dB	1	0	1	3.5
-9dB	1	0	0	3.0
-12dB	0	1	1	2.5
-15dB	0	1	0	2.0
-18dB	0	0	1	1.6
● -∞	0	0	0	1.2
				0.0

<3> Feedback Volume (Sub Address : 01H)

Gain	I2C BUS control			DC control(V)
	D7	D6	D5	
-2dB	1	1	1	5.0
-3dB	1	1	0	4.0
-4dB	1	0	1	3.5
-5dB	1	0	0	3.0
-6dB	0	1	1	2.5
-7dB	0	1	0	2.0
-8dB	0	0	1	1.6
● -∞	0	0	0	1.2
				0.0

<4> Delay time (Sub Address : 01H)

Time	I2C BUS control			
	D4	D3	D2	
111ms	1	0	1	
134ms	1	0	0	
156ms	0	1	1	
178ms	0	1	0	
200ms	0	0	1	
● 223ms	0	0	0	

●:It's initial setting when VCC turn on.

13pin(BUS/DC)
Lo: DC control
Hi: I2C BUS control

No guarantee except for these code.

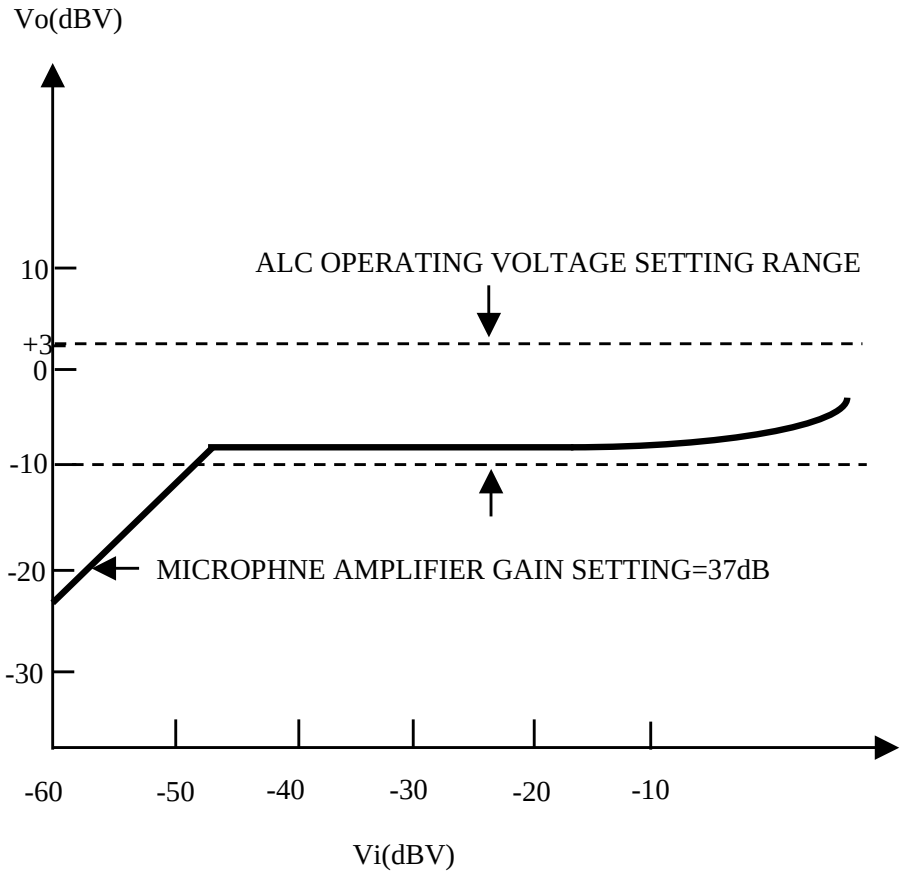
ELECTRICAL CHARACTERISTICS

(Vcc=5V, f=500Hz ,Vi=100mVrms, MICVOL=0dB, ECHOVOL=0dB, FEEDBACKVOL=∞, fck=2MHz(fs=250kHz), Ta=25℃, Unless otherwise noted)

Block	symbol	Parameter	Test Condition	Limits			Unit
				Min	Typ	Max	
Total	ICC	Circuit current	No signal input	-	-	-	mA
Microphone amplifier	THD1	Total harmonic distortion	Vo=-17dBV, with ALC not operated	-	0.1	0.5	%
	THD2	Total harmonic distortion	Vi=-27dBV, with ALC operated	-	3.0	6.0	%
	VoALC	ALC operating voltage measurement error	Measurement: -10 to +3 dBV	-3	0	+3	dB
	TALCAT	ALC attack time	C=4.7μF	25	40	55	msec
	TALCRE	ALC recovery time	C=4.7μF	1.0	1.5	2.0	sec
	VoMAX	Maximum output voltage	THD=10%	-1	2	-	dBV
	No	Output noise voltage	Gv=37dB, BW=100 to 5kHz	-	-78	-67	dBV
	Zi	Input impedance		50	100	200	kΩ
Digital echo	Gv	Voltage gain	f=1kHz	-3.0	0	+3.0	dB
	THD	Total harmonic distortion	f=1kHz	-	0.5	1.2	%
	VoMAX	Maximum output voltage	THD=10% f=1kHz	-3	0	-	dBV
	No	Output noise voltage	DIN AUDIO	-	-92	-80	dBV
Mix out	Gv	Voltage gain	MICVOLIN→MIXOUT, f=1kHz	-3	0	+3	dB
	THD	Total harmonic distortion	MICVOLIN→MIXOUT, f=1kHz	-	0.02	0.1	%
	VoMAX	Maximum output voltage	MICVOLIN→MIXOUT, THD=10%, f=1kHz	1	4	-	dBV
	No	Output noise voltage	MICVOLIN→MIXOUT, JIS-A	-	-97	-88	dBV

FUNCTION DESCRIPTION

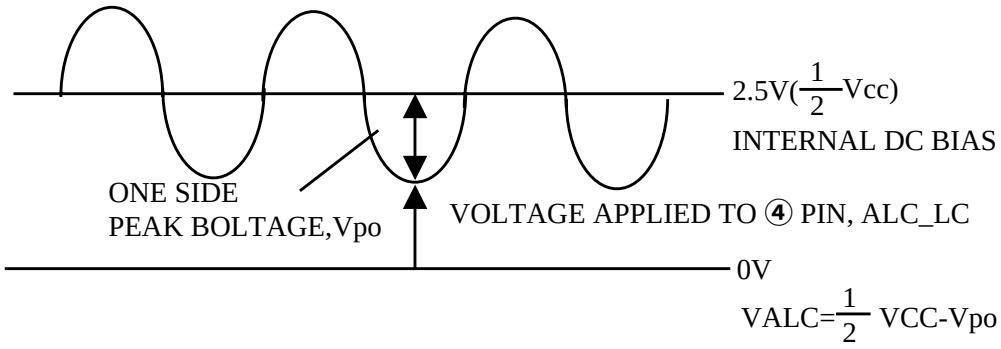
1. ALC level diagram



2. ALC operating voltage setting

ALC operating voltage can be set at a desired value between-10 and +3dBV by varying the DC voltage applied to pin ④ (ALC operating voltage setting terminal).

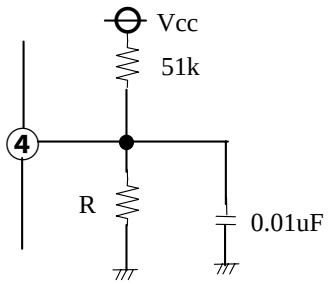
(Setting method)



To set ALC operating voltage at –5dB (Vcc=5V)

-5dBV=0.56Vrms=1.59Vp-p=0.8Vp-o
VALC=2.5-0.8=1.7V

Since the input impedance at pin ④ is high at 1 MΩ or more, it is possible to provide ALC operating voltage by dividing resistance.



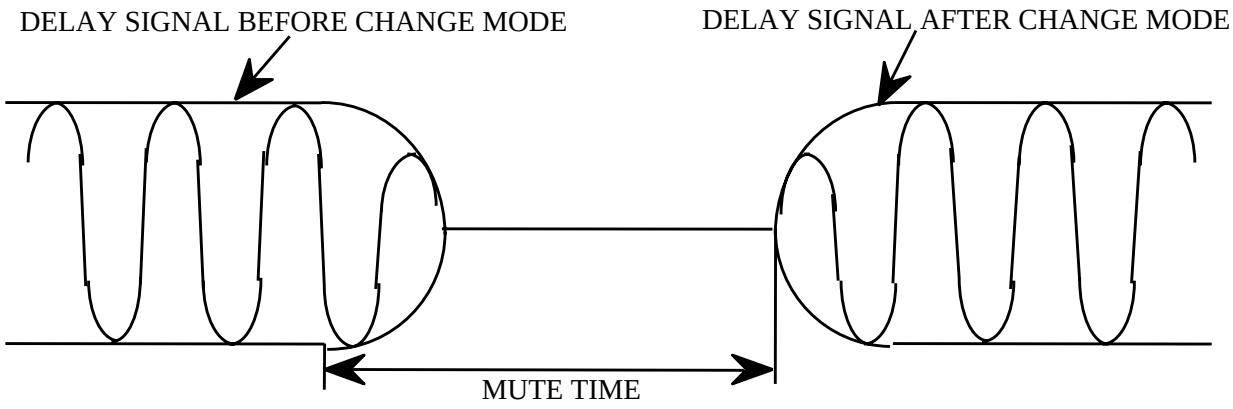
When Vcc=5V

ALC operating Voltage (dBV)	Voltage applied to pin ④ ALC_LC (V)	Resistance R (Ω)
+3	0.50	5.6k
0	1.09	15k
-2	1.38	20k
-4	1.61	24k
-6	1.79	27k
-8	1.94	33k
-10	2.05	36k

3. Muting

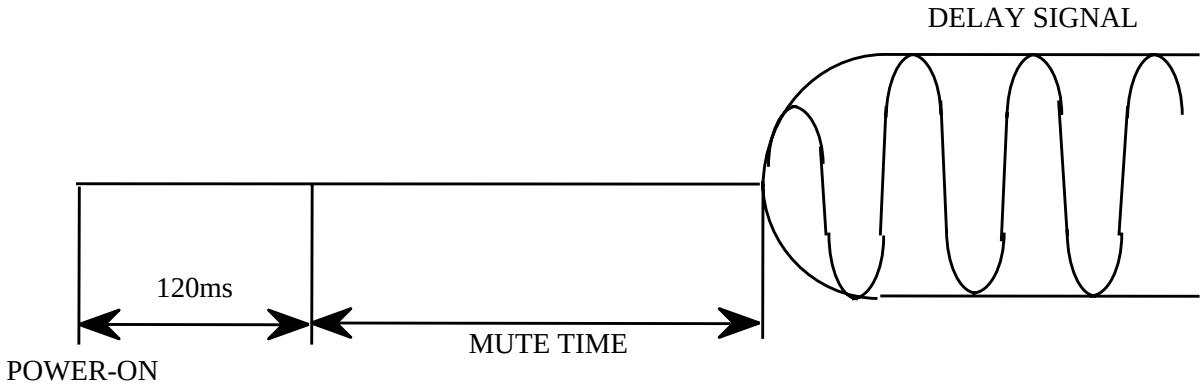
AUTOMATIC MUTE

(a)UPON CHANGING DELAY TIME



MUTE TIME=524ms (TYP)

(a)UPON POWER-ON



MUTE TIME=524ms (TYP)

4. Delay time Td

The delay time can be calculated by the equation :

Td= N / fs (N= the number of memory bits : 44544)

When fck=8MHz (fs=250kHz), Td can be set at 178ms. (at Td=178ms setting)

《Reference》

For clock frequency (fck)=8MHz, the sampling frequency (fs) is :

Td	fs
111ms	400kHz
134ms	333kHz
156ms	286kHz
178ms	250kHz
200ms	222kHz
223ms	200kHz

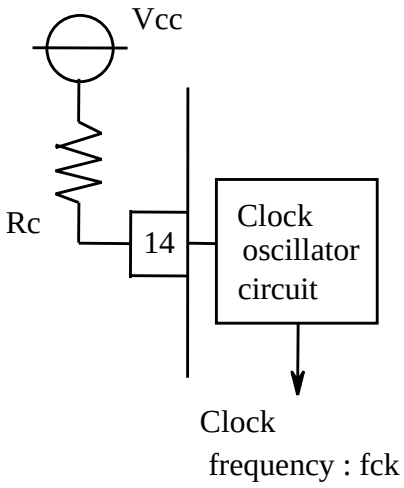
5. Clock oscillator circuit

The R2A15906SP incorporates a current control type clock oscillator circuit in it, thus providing circuit configuration just by connecting a resistor for current control to pin 14 (MCLK) CLOCK.

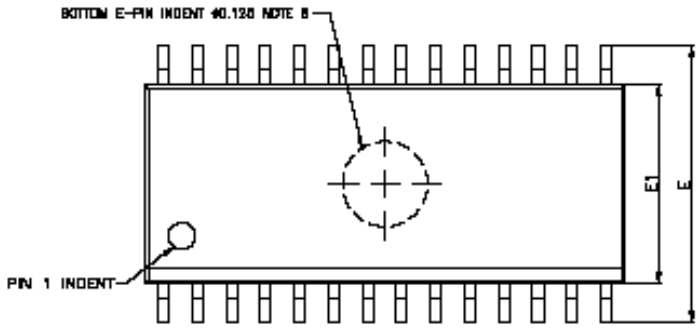
Fully internal clock supply prevents occurrence of undesired radiation without affecting any external circuit.

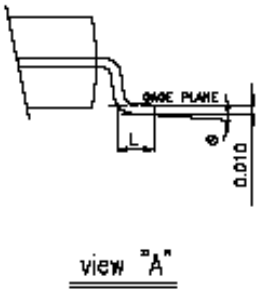
The oscillator frequency is:

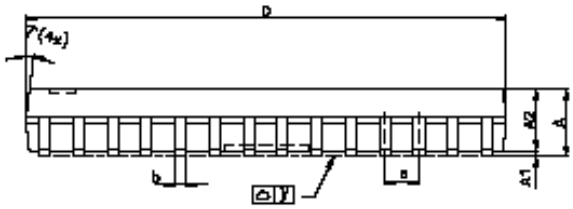
fck = 8 MHz. (Rc=12kΩ)

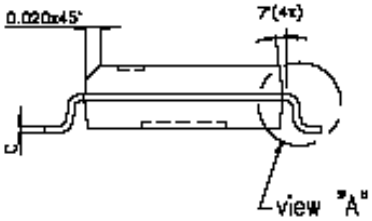


PACKAGE









SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	2.36	2.49	2.64	0.093	0.098	0.104
A1	0.10	—	0.30	0.004	—	0.012
A2	—	2.34	—	—	0.092	—
b	0.33	0.41	0.51	0.013	0.016	0.020
c	0.23	0.25	0.30	0.009	0.010	0.012
D	17.70	17.91	18.11	0.697	0.705	0.713
E	10.01	10.31	10.54	0.394	0.406	0.419
E1	7.39	7.49	7.59	0.291	0.295	0.299
e	—	1.27	—	—	0.050	—
L	0.38	0.81	1.27	0.015	0.032	0.050
y	—	—	0.076	—	—	0.003
θ	0°	—	8°	0°	—	8°