1.0 General Description

The SDL9186-10/SDL9186-15/DL9186-20 are simple SRAM recording/playback ICs. The duration of recording can be adjusted by changing the oscillation frequency. These devices can store one or two sections of message, and support both fixed and variable duration of dual messages. There is on-chip Low Pass Filter (LPF) to reduce the environment noise while recording. For low power consumption, they provide PWM output to drive speaker or buzzer directly. Except two recording/playback LED indicators, they also provide a special function of new message indicator. These devices are ideal for use in portable voice recorders, toys, and many other consumer applications.

2.0 Features

(1) Single power supply can operate from 2.4~5.5V.

(2) Oscillation mode: R oscillator.

(3) Low standby current, <1uA@3V.

(4) Built-in SRAM for voice recording. Adjust OSC resistor value from 4k~8KHz sample rate to select different voice duration.

	4.0KHz	**5.0KHz**	**5.3KHz**	***6.0KHz***	**6.4KHz**	**7.0KHz**	**8.0KHz**
SDL9186-10	15.0 sec	12.0 sec	11.3 sec	*10.0 sec*	9.4 sec	8.6 sec	7.5 sec
SDL9186-15	22.5 sec	18.0 sec	17.0 sec	*15.0 sec*	14.1 sec	12.9 sec	11.3 sec
SDL9186-20	30.0 sec	24.0 sec	22.6 sec	*20.0 sec*	18.8 sec	17.2 sec	15.0 sec

(5) Built-in Low Pass Filter (LPF) circuits.

(6) One or two recording sections. Two kinds of methods to define recording duration for each section: One is Fixed-duration, another is Variable-duration. ***(This function is bonding-option by Opt_F pad)***

(7) Four input triggers for recording and playback.
- Rec_E: Edge/Unhold trigger for voice recording, Toggle on/off function.
- Rec_L: Level/Hold trigger for voice recording.
- Play_E: Edge/Unhold trigger for voice playback, Toggle on/off function. *(Continuously playing voice if keeping key pressed)*
- Play_L: Level/Hold trigger for voice playback.

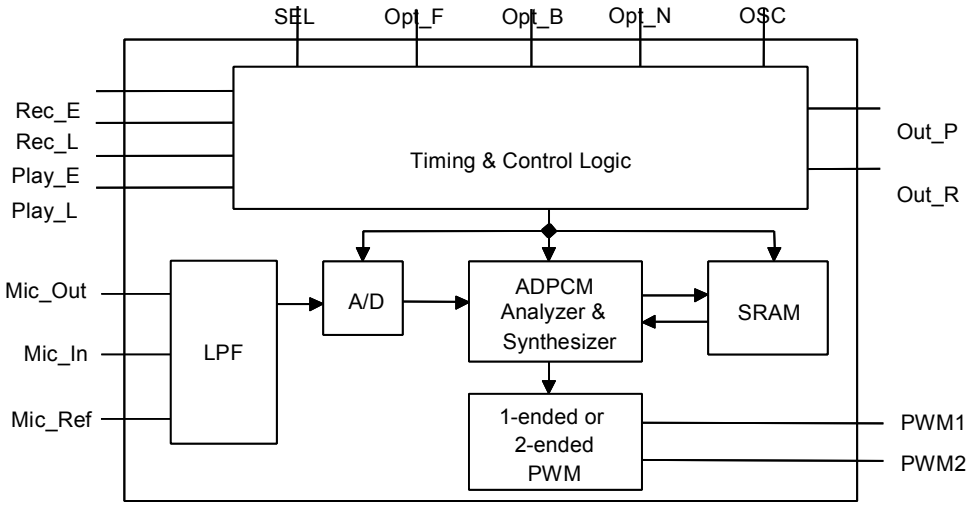
(8) Two output signal for recording/playback indicator which can drive LED or motor.
- Out_P: Active while playback only.
- Out_R: a) Active while recording.
  b) New message indicator, active before 1st-time playback, 0.5Hz flashing rate. ***(This function is bonding-option by Opt_N pad)***

(9) Play 'Bi' sound at the beginning of recording and play 'Bi-Bi' sound while memory full or recording stop. ***(This function is bonding-option by Opt_B pad)***

(10) User-selectable 1-ended/2-ended PWM output.

(11) Digital Serial Input/Output for pre-recording message and data output. *(Contact Alpha or her agent for this special function.)*

3.0 Block Diagram



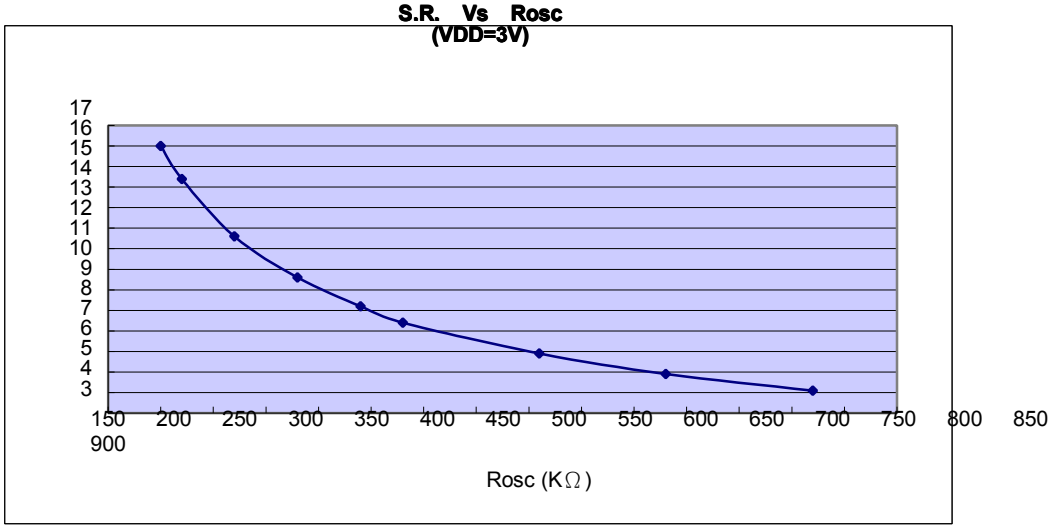
4.0 Pad Description

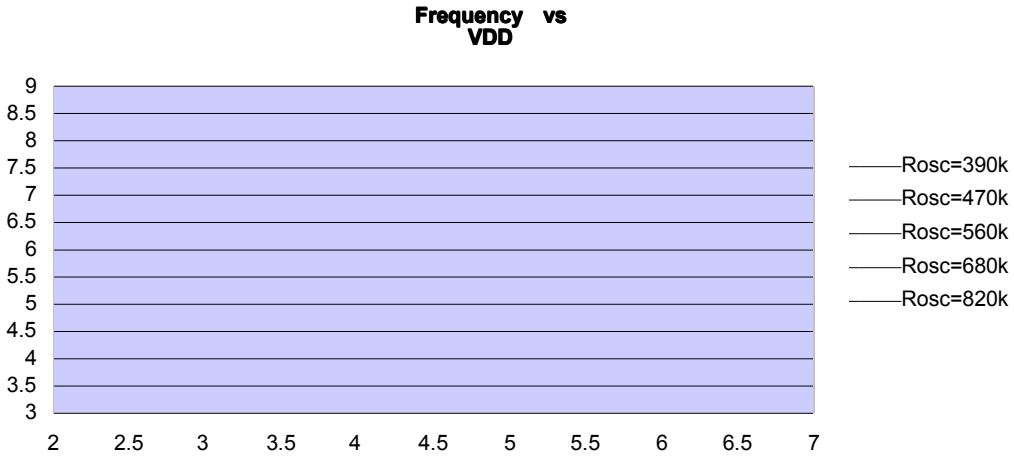
Pad Name	Pin Attr.	Description
VDD1~2	Power	Possitive power
GND1~2	Power	Negative power
OSC	I	R oscillator input
PWM1	O	PWM1 output. / Connect this pin to GND when 1-ended PWM output.
PWM2	O	PWM2 output. / 1-ended PWM output.
Mic_Ref	I	Microphone input as voltage reference
Mic_In	I	Microphone input as MIC pre-amplifier
Mic_Out	O	Microphone output as MIC pre-amplifier
Rec_E	I	Trigger input for recording, *Edge*/Unhold/Irretrigger mode. (i.e. One-shot)
Rec_L	I	Trigger input for recording, *Level*/Hold mode.
Play_E	I	Trigger input for playback, *Edge*/Unhold/Irretrigger mode. (i.e. One-shot)
Play_L	I	Trigger input for playback, *Level*/Hold mode.
SEL	I	Select pin to select 1st section (VDD) or 2nd section (GND).
Test	I	Test pin for internal test.
Out_P	O	Playback indicator, low active.
Out_R	O	Recording indicator, low active. New message indicator, low active only if there is a new message existed.
OPT_B	I	Option pin for “Bi sound” enable(VDD)/Disable(GND).
OPT_N	I	Option pin for “New message indicator” enable(VDD)/Disable(GND).
OPT_F	I	Option pin for fixed-duration(VDD)/variable-duration(GND) section.

** If you only want one section of message, just connect OPT_F pin to GND and fix SEL pin to VDD or GND.*

5.0 DC Characteristics (at Rosc=560kΩ, SR=6kHz)

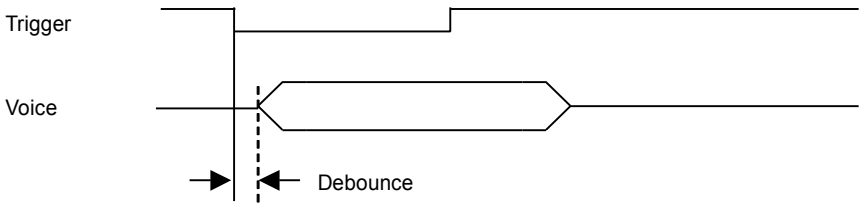
Symbol	Parameter		VDD	Min.	Typ.	Max.	Unit	Condition
VDD	Operating voltage		-	2.4	3	5.5	V	Depending on Freq.
I_{sb1}	Supply current	Standby1	3	-	-	1	uA	Sleep mode, Message Indicator OFF.
			4.5	-	-	2		
I_{sb2}		Standby2	3	-	3.5	-	uA	Sleep mode, Message Indicator ON, No load.
			4.5	-	7.5	-		
I_{op1}		Operating1	3	-	0.8	-	mA	Recording, No load
			4.5	-	4.2	-		
I_{op2}		Operating2	3	-	0.2	-	mA	Playback, No load
			4.5	-	0.3	-		
I_{il}	Input current (Internal pull-high 300kΩ)		3	-	6	-	uA	Vil=0v
			4.5	-	17	-		
I_{ol}	Output-low current (Open-drain)		3	-	24	-	mA	Vol=0.75V
			4.5	-	52	-		Vol=1.50V
I_{PWM}	PWM output current		3	-	40	-	mA	Load=8 ohms
			4.5	-	60	-		
dF/F	Frequency stability			-5	-	5	%	$\frac{Fosc(5.5v- 2.4v)}{Fosc (5.5v)}$
dF/F	Fosc lot variation			-10	-	10	%	Different lot wafer





6.0 Timing Diagram

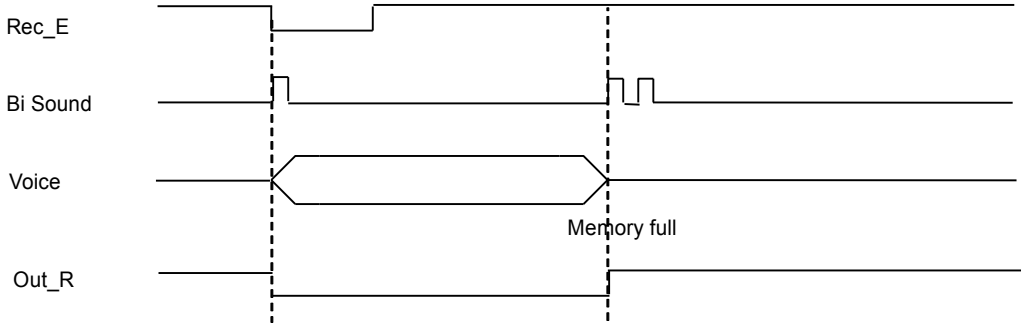
(1) Debounce Time

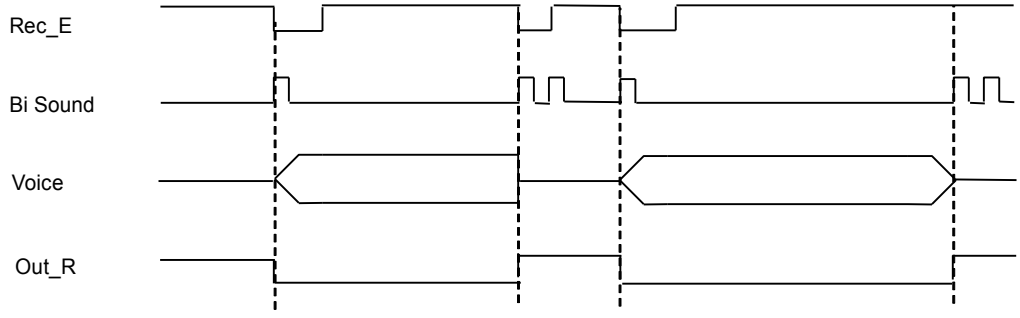


※ Debounce time is configured by 6 kHz S.R and the value is fixed. That is, Slow debounce=20ms. **(No Fast debounce)**

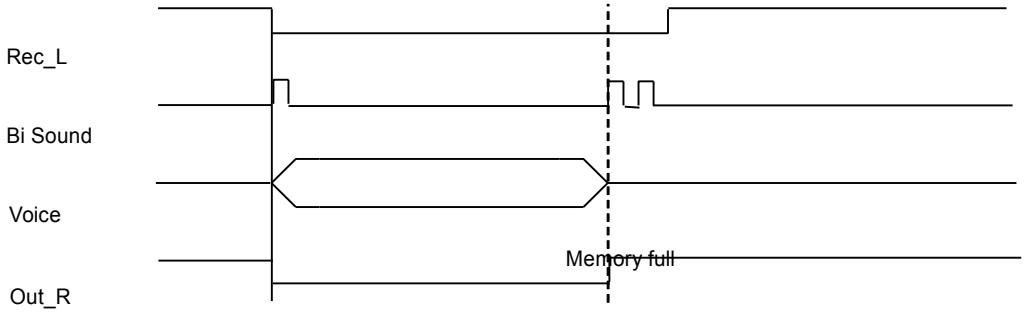
(2) Recording Mode

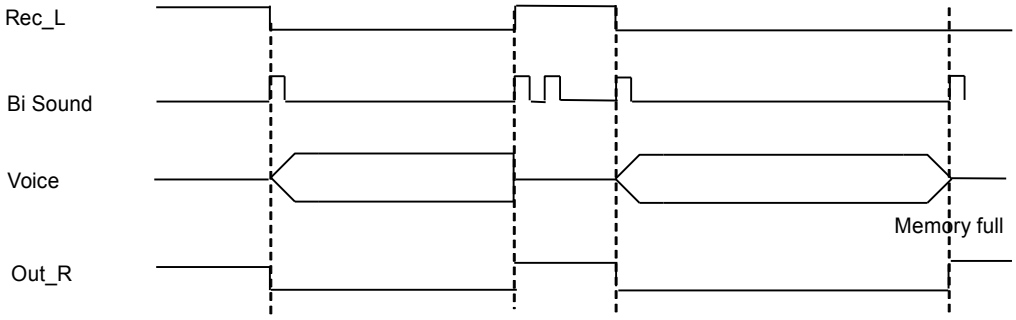
(a). Edge Trigger





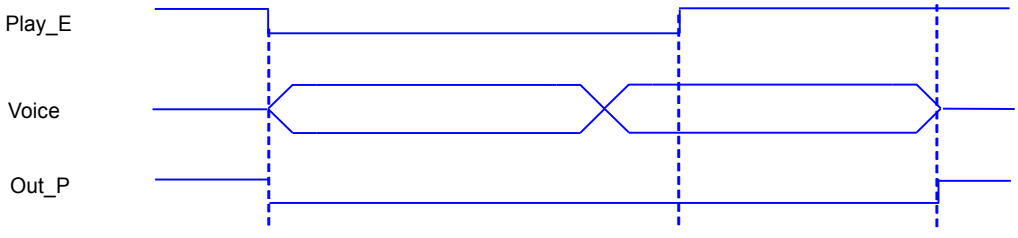
(b). Level Trigger



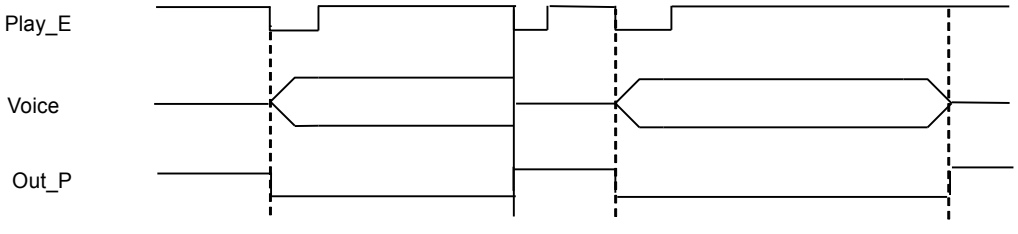


(3) Playback Mode

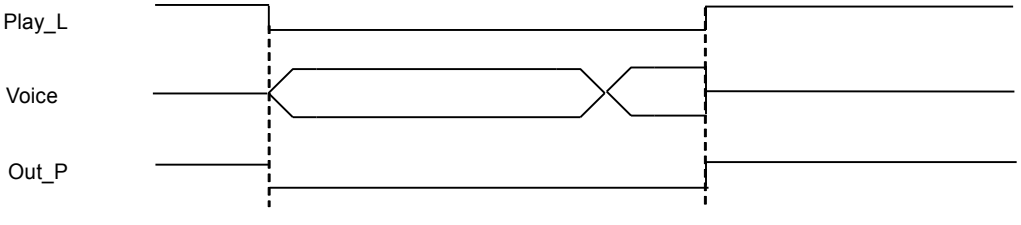
(a). Edge Trigger

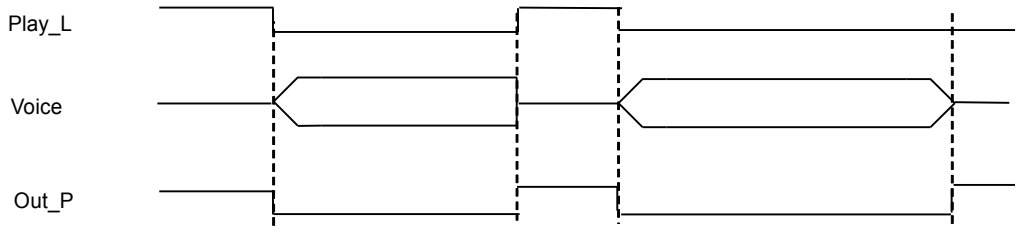


* Voice will be played continuously if keeping key pressed.



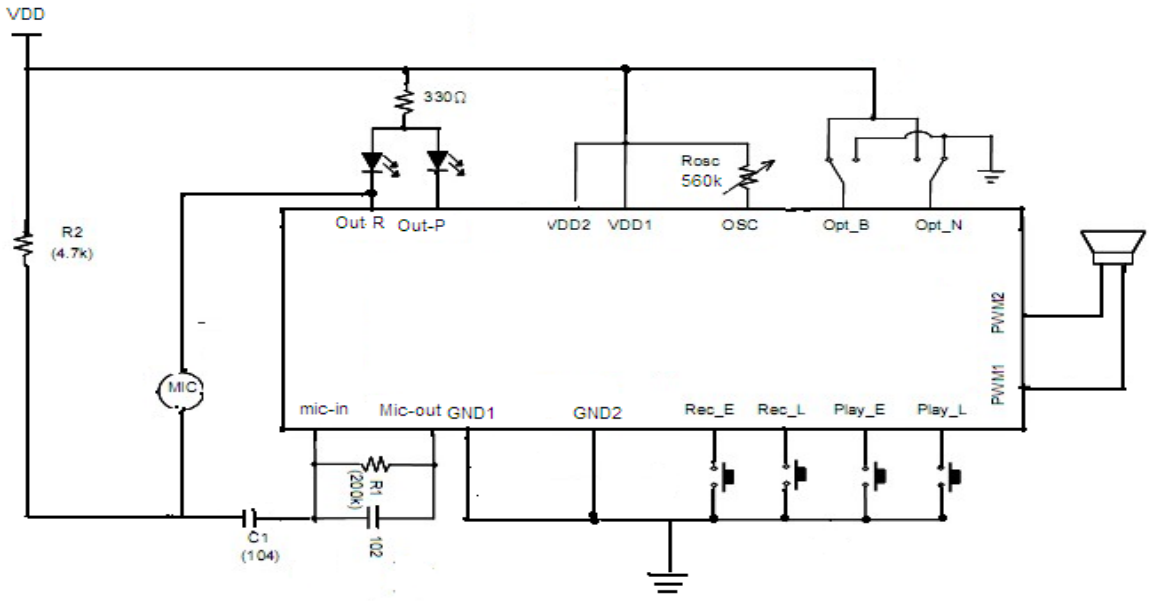
(b). Level Trigger





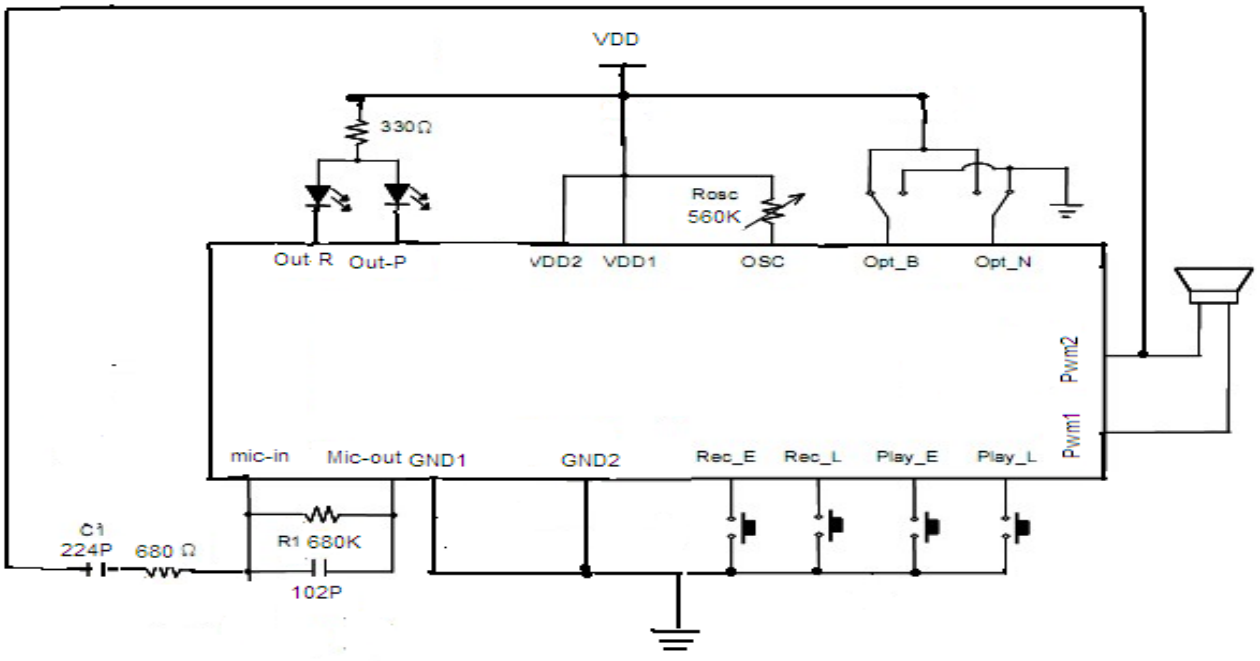
7.0 Application Circuit

a. PWM Direct Drive (MIC_SPK Alone, 2-Ended PWM)



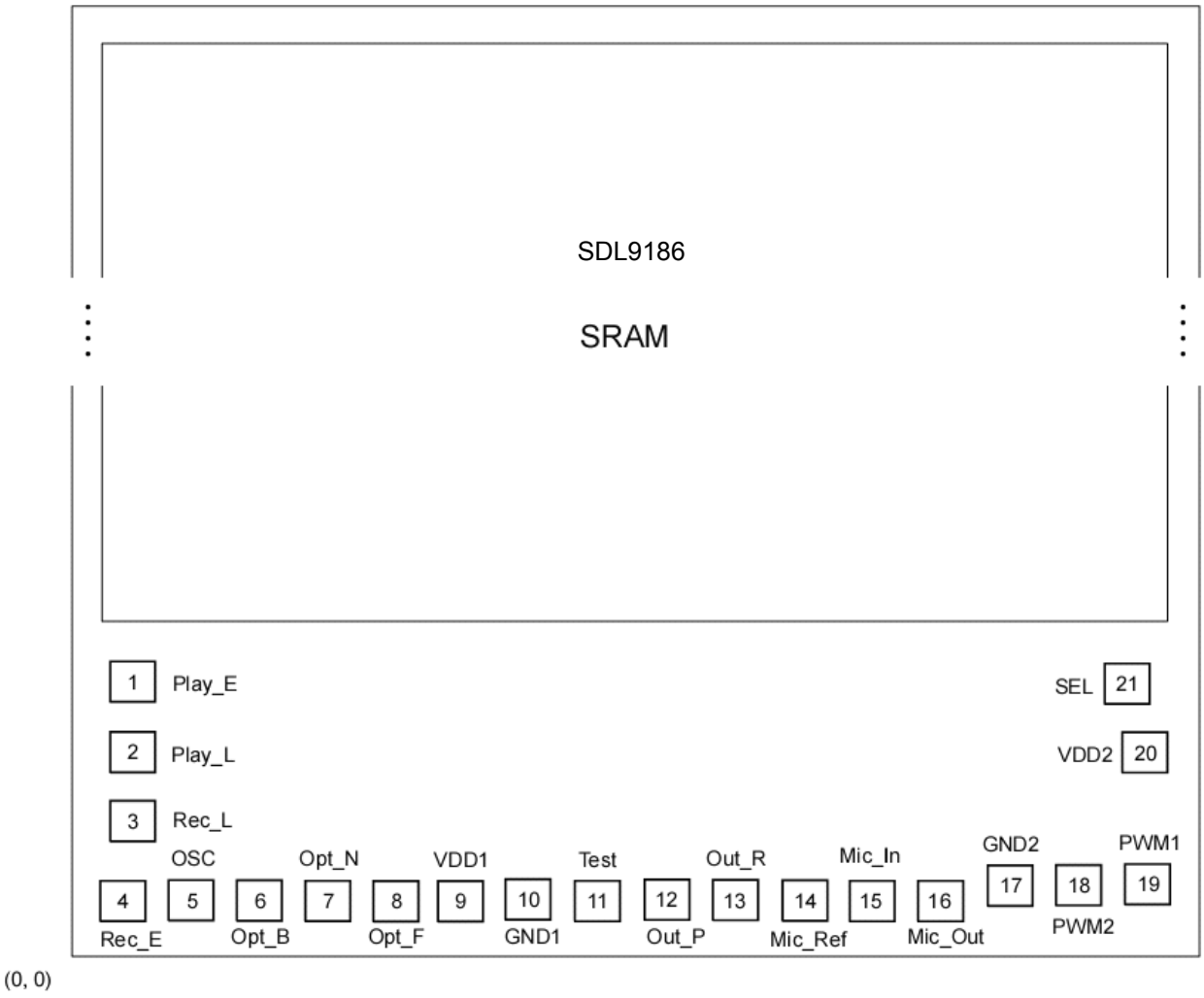
* R1 is used to control the gain of OP-Amp. A bigger R1 value will lead to larger voice volume. (100K~300KΩ)
* R2 is used to match the different microphone. A bigger R2 value will lead to larger voice volume and noise. (2K~4.7KΩ)
* C1 is used to control the gain and noise. A bigger C1 value will lead to larger voice volume and noise. (0.033u~0.1uF)

b. PWM Direct Drive (MIC_SPK Shared, 2-Ended PWM)



* R1 is used to control the gain of OP-Amp. A bigger R1 value will lead to larger voice volume. (470K~820KΩ)
* C1 is used to control the gain and noise. A bigger C1 value will lead to larger voice volume and noise. (0.1u~0.22uF)

8.0 Bonding Diagram



* The IC substrate must be connected to VDD.

Pad #	Pad Name	X	Y	Pad #	Pad Name	X	Y
1	Play_E	85	465	**12**	Out_P	1000	85
2	Play_L	85	345	**13**	Out_R	1116	85
3	Rec_L	85	225	**14**	Mic_Ref	1238	85
4	Rec_E	71	85	**15**	Mic_In	1363	85
5	OSC	198	85	**16**	Mic_Out	1474	85
6	Opt_B	308	85	**17**	GND2	1584	104
7	Opt_N	424	85	**18**	PWM2	1695	108
8	Opt_F	540	85	**19**	PWM1	1816	108
9	VDD1	657	85	**20**	VDD2	1819	309
10	GND1	767	85	**21**	SEL	1794	425
11	Test	877	85				