

S1V3F351/352 (rev1.2_20240819)

Voice/Sound LSI

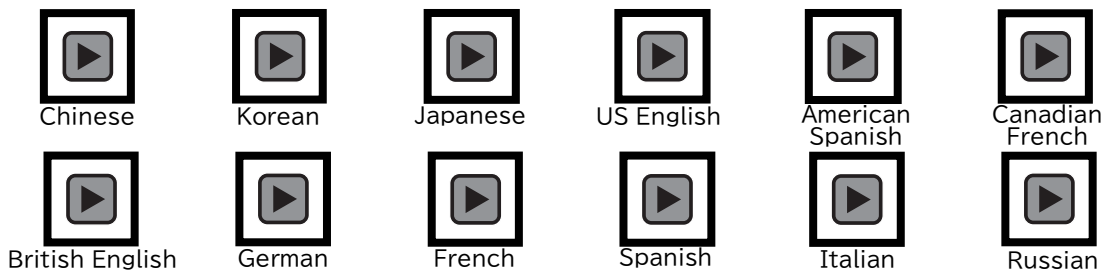
■ Overview

S1V3F351/352 is an LSI incorporating high-compression, high-quality sound decoding functions, making it ideal for use in voice guidance products.

Use of a “Epson Voice Creation PC Tool” dedicated to the S1V3F351/352 enables the generation of high-quality sound data from texts with ease without the bother of studio recording. All the functions are controlled by commands over a serial interface and thus easily added onto any existing systems with a processor. And stand-alone mode can be used to support existing systems without a processor.

The S1V3F351/352 will shorten the time to market for products with voice guidance.


* Sounds when pressed.




■ High-compression, High-quality Sound Algorithm

- ▶ EOV(Epson original data format)
- ▶ Sampling rate: 16 kHz
- ▶ Bitrate: 16/24/32/40 kbps


■ 2ch Mixing Play

- ▶ Ch0:Voice / Ch1:Background music 


■ Realtime Voice Speed Conversion

- ▶ 75% to 125% (5% steps) 

■ Realtime Voice Pitch Conversion

- ▶ 90% to 110% (5% steps) 

■ Gapless Play

- ▶ Play without interrupt on looping 
Gapless loop 1.2sec sound

■ Buzzer Voice/Melody

- ▶ Electro Magnetic Buzzer
- ▶ Piezo Buzzer

■ Record/Play

■ Embedded Flash for Sound ROM

- ▶ S1V3F351: approx. 30sec.
- ▶ S1V3F352: approx. 80sec.

■ Host Interface Mode

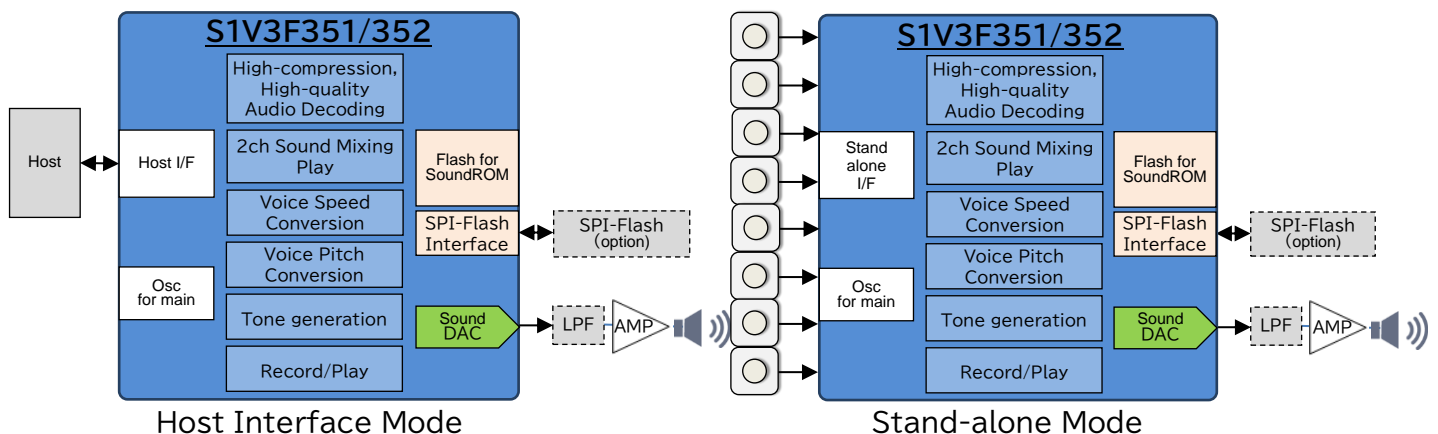
- ▶ Synchronized serial interface (SPI)
- ▶ UART
- ▶ I2C

■ Stand-alone Mode

- ▶ Easy audio play by assigning GPIOs

■ Tone generation

- ▶ Patterned tone output with a combination of a maximum of four tone frequencies



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■ Features

Model	S1V3F351	S1V3F352
SOUND PLAYBACK		
Sound Formats		
EPSON original high-compression / high-quality audio format (EOV)	16 / 24 kbps, 15625 Hz	16 / 24 / 32 / 40 kbps, 15625 Hz
Uncompressed audio format (PCM)	16 bits	
Sound Processing Functions		
Sound mixing	2-channel mixing playback (e.g., Ch.0: Voice, Ch.1: BGM)	
Playback speed conversion function	75% to 125% (5% steps), supported only in Ch.0	
Playback pitch conversion function	90% to 110% (5% steps), supported only in Ch.0. Not available with mixing.	–
Tone generation function	Patterned tone output with a combination of a maximum of four tone frequencies	
Sound data protection	Available	
Repeat playback	1 to 254 times or endless * 1 to 127 times for sound playback in standalone mode	
Volume setting	0 dB to -63 dB (0.5 dB steps) or silence	
Sound recording function	Usable when an external QSPI flash memory is connected	
Sound ROM Data		
Maximum phrase count for sequence playback	64 phrases per 1 sentence	
Programmable delay time between phrases	Ch.0: 0 (gapless) to 2000 ms (25 ms steps) Ch.1: 25 ms to 2000 ms (25 ms steps)	
Multiple Sound ROMs	Supported only in Host Interface mode	
Sound Control Commands		
Main commands	Start / Stop / Mute	
HOST INTERFACE		
Synchronous serial interface (SPI)	One channel of these interfaces can be used.	
UART		
I ² C		
STANDALONE MODE		
Standalone playback	Maximum 30 sentences can be played using the #CHn.PLAY[3:0] pins x 2 channels without using the host interface.	
EMBEDDED FLASH MEMORY		
Capacity	64K bytes (About 30 seconds of data at EOVS 16 kbps can be stored.)	160K bytes (About 80 seconds of data at EOVS 16 kbps can be stored.)
Erase / program count	1000 times (Min.)	
EXTERNAL SERIAL FLASH MEMORY INTERFACE		
Quad synchronous serial interface (QSPI)	1 channel A QSPI flash memory that supports XIP (eXecute-In-Place) mode can be connected.	
SOUND OUTPUT		
Speaker output	1 channel	
Electromagnetic / piezo buzzer output	1 channel	
STANDBY MODE		
Supported standby mode	Sleep and Deep Sleep mode	
POWER SUPPLY VOLTAGE		
V _{DD} operating voltage	1.8 V to 5.5 V	
V _{DD} operating voltage for Flash programming	2.2 V to 5.5 V	2.4 V to 5.5 V
QSPI-Flash interface power supply voltage (V _{DDQSPI})	3.0 V to 3.6 V	

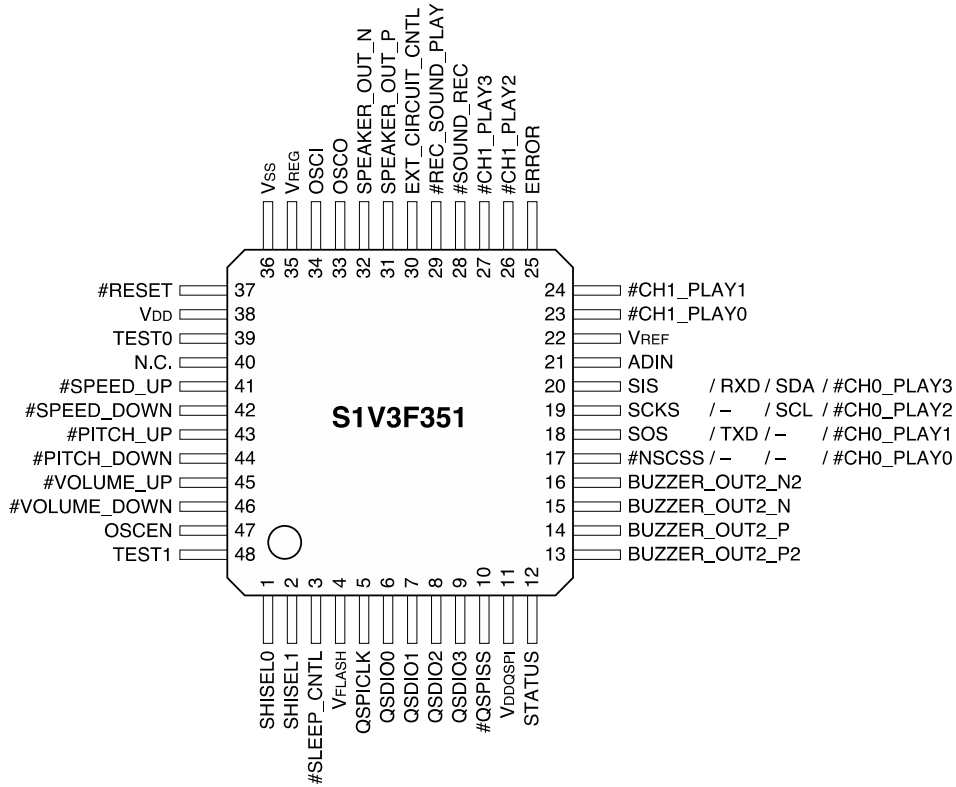
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Model	S1V3F351	S1V3F352
OPERATING TEMPERATURE		
Operating temperature range	-40°C to 85°C	
CURRENT CONSUMPTION (Typ. value)		
During idle	4.6 mA (internal oscillation)	5.8 mA (internal oscillation)
During playing	7.4 mA (internal oscillation)	7.2 mA (internal oscillation)
During standby	0.34 μ A (Deep Sleep mode)	0.46 μ A (Deep Sleep mode)
SHIPPING FORM		
Package	TQFP12-48PIN (P-TQFP048-0707-0.50, 7 x 7 mm, t = 1.2 mm, 0.5 mm pitch)	

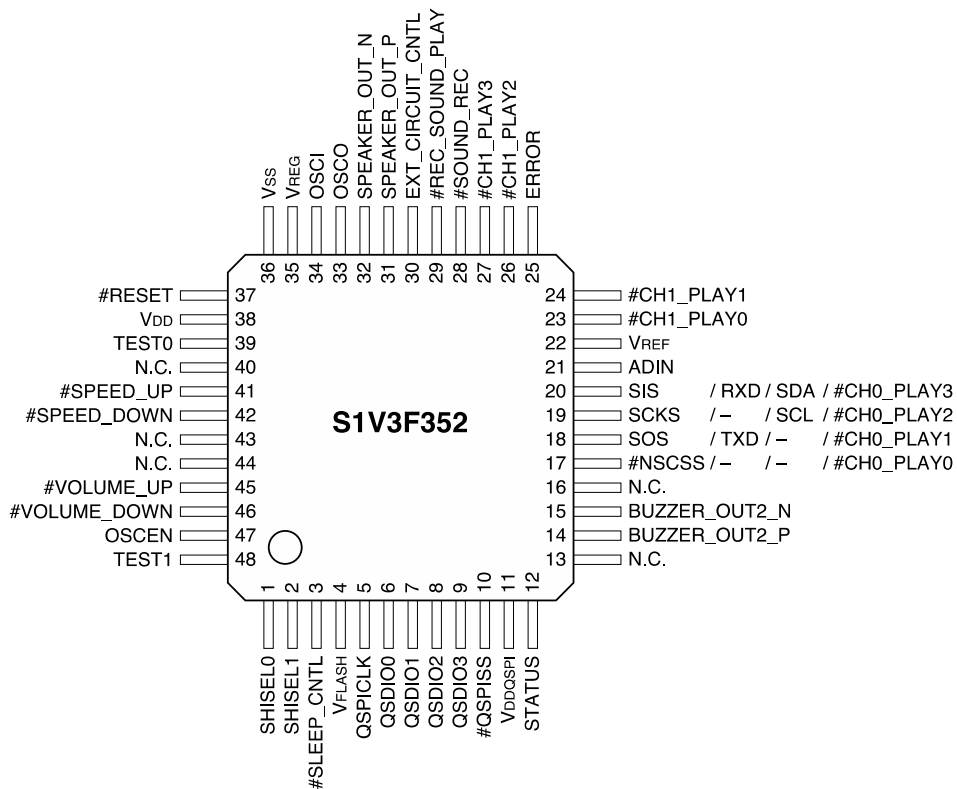
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■ Pin Diagram

S1V3F351 (P-TQFP048-0707-0.50)



S1V3F352 (P-TQFP048-0707-0.50)



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■ Pin Description

Symbols in pin tables

I/O:	P	=	Power supply
	A	=	Analog signal
	I	=	Input
	I (Pull-up)	=	Input with pulled up
	I (Pull-down)	=	Input with pulled down
	O	=	Output
	I/O	=	Input/output
	Hi-Z	=	High impedance state

Pin name	Pin No.	I/O		Function
		During reset	Initial status	
V _{DD}	38	P	P	Power supply (+)
V _{SS}	36	P	P	GND
V _{DDQSPI}	11	P	P	[QSPI-Flash connected] QSPI interface power supply (3.0 V to 3.6 V) [QSPI-Flash unconnected] Power supply (V _{DD})
V _{FLASH}	4	A	A	Flash programming voltage regulator output
V _{REG}	35	A	A	V _{D1} regulator output
TEST1	48	I (Pull-down)	I (Pull-down)	Test mode enable input. Connect to V _{SS} .
TEST0	39	Hi-Z	Hi-Z	Connect to V _{SS} .
#RESET	37	I (Pull-up)	I (Pull-up)	Reset input
N.C.	40	Hi-Z	Hi-Z	Open
SHISELO	1	Hi-Z	I	Serial host interface selection SHISEL[1:0] = LL: SPI SHISEL[1:0] = LH: UART SHISEL[1:0] = HL: I ² C SHISEL[1:0] = HH: Standalone
SHISEL1	2	Hi-Z	I	
SIS / RXD / SDA / #CH0.PLAY3	20	Hi-Z	I	[SPI] SIS (Serial data input) [UART] RXD (Serial data input) [I ² C] SDA (Serial data input/output) [Standalone] CH0.PLAY3 (Ch.0 sentence select / play)
SCKS / - / SCL / #CH0.PLAY2	19	Hi-Z	I	[SPI] SCKS (Serial clock input) [UART] N.C. [I ² C] SCL (Serial clock input) [Standalone] CH0.PLAY2 (Ch.0 sentence select / play)
SOS / TXD / - / #CH0.PLAY1	18	Hi-Z	O	[SPI] SOS (Serial data output) [UART] TXD (Serial data output) [I ² C] N.C. [Standalone] CH0.PLAY1 (Ch.0 sentence select / play)
#NSCSS / - / - / #CH0.PLAY0	17	Hi-Z	I	[SPI] #NSCSS (Slave-select input) [UART] N.C. [I ² C] N.C. [Standalone] CH0.PLAY0 (Ch.0 sentence select / play)
#CH1.PLAY3	27	Hi-Z	I (Pull-up)	[Standalone] CH1.PLAY3 (Ch.1 sentence select / play)
#CH1.PLAY2	26	Hi-Z	Hi-Z	[SPI / UART / I ² C] N.C.
#CH1.PLAY1	24	Hi-Z	I (Pull-up)	[Standalone] CH1.PLAY1 (Ch.1 sentence select / play)
#CH1.PLAY0	23	Hi-Z	Hi-Z	[SPI / UART / I ² C] N.C.
ERROR	25	Hi-Z	O	Error output H: An error has occurred. L: Normal
#SPEED_UP	41	Hi-Z	I (Pull-up)	[Standalone] Playback speed up
#SPEED_DOWN	42	Hi-Z	Hi-Z	[SPI / UART / I ² C] N.C.
			I (Pull-up)	[Standalone] Playback speed down
			Hi-Z	[SPI / UART / I ² C] N.C.

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Pin name	Pin No.	I/O		Function
		During reset	Initial status	
#PITCH_UP	43	Hi-Z	I (Pull-up)	[Standalone (S1V3F351)] Playback pitch up
			Hi-Z	[Standalone (S1V3F352)] N.C.
			Hi-Z	[SPI / UART / I ² C] N.C.
#PITCH_DOWN	44	Hi-Z	I (Pull-up)	[Standalone (S1V3F351)] Playback pitch down
			Hi-Z	[Standalone (S1V3F352)] N.C.
			Hi-Z	[SPI / UART / I ² C] N.C.
#VOLUME_UP	45	Hi-Z	I (Pull-up)	[Standalone] Volume up
			Hi-Z	[SPI / UART / I ² C] N.C.
#VOLUME_DOWN	46	Hi-Z	I (Pull-up)	[Standalone] Volume down
			Hi-Z	[SPI / UART / I ² C] N.C.
#SOUND_REC	28	Hi-Z	I (Pull-up)	[Standalone] Recording (Recorded at Low level)
			Hi-Z	[SPI / UART / I ² C] N.C.
#REC_SOUND_PLAY	29	Hi-Z	I (Pull-up)	[Standalone] Recorded sound playback
			Hi-Z	[SPI / UART / I ² C] N.C.
#QSPISS	10	Hi-Z	O * ¹	Quad synchronous serial interface slave-select output
			Hi-Z	No external QSPI flash memory connected
QSPICLK	5	Hi-Z	O * ¹	Quad synchronous serial interface clock output
			Hi-Z	No external QSPI flash memory connected
QSDIO0	6	Hi-Z	Hi-Z * ¹	Quad synchronous serial interface data input/output
			Hi-Z	No external QSPI flash memory connected
QSDIO1	7	Hi-Z	Hi-Z * ¹	Quad synchronous serial interface data input/output
			Hi-Z	No external QSPI flash memory connected
QSDIO2	8	Hi-Z	Hi-Z * ¹	Quad synchronous serial interface data input/output
			Hi-Z	No external QSPI flash memory connected
QSDIO3	9	Hi-Z	Hi-Z * ¹	Quad synchronous serial interface data input/output
			Hi-Z	No external QSPI flash memory connected
SPEAKER_OUT_N	32	O	O	[Speaker output] Speaker negative output
			Hi-Z	[2-pin buzzer output] N.C.
			Hi-Z	[4-pin buzzer output] N.C.
SPEAKER_OUT_P	31	O	O	[Speaker output] Speaker positive output
			Hi-Z	[2-pin buzzer output] N.C.
			Hi-Z	[4-pin buzzer output] N.C.
BUZZER_OUT_N2	16	Hi-Z	Hi-Z	[Speaker output] N.C.
			Hi-Z	[2-pin buzzer output] N.C.
			O	[4-pin buzzer output] Buzzer negative output 2 (S1V3F351 only)
BUZZER_OUT_N	15	Hi-Z	Hi-Z	[Speaker output] N.C.
			O	[2-pin buzzer output] Buzzer negative output 1
			O	[4-pin buzzer output] Buzzer negative output 1
BUZZER_OUT_P	14	Hi-Z	Hi-Z	[Speaker output] N.C.
			O	[2-pin buzzer output] Buzzer positive output 1
			O	[4-pin buzzer output] Buzzer positive output 1
BUZZER_OUT_P2	13	Hi-Z	Hi-Z	[Speaker output] N.C.
			Hi-Z	[2-pin buzzer output] N.C.
			O	[4-pin buzzer output] Buzzer positive output 2 (S1V3F351 only)
EXT_CIRCUIT_CTRL	30	Hi-Z	Hi-Z / O	External speaker / buzzer amplifier control output In Host Interface mode, this pin is switched to output mode from a Hi-Z state when the ISC.SOUND.OUTPUT.CONFIG.REQ message is received. In Standalone mode, this pin is switched to output mode from a Hi-Z state according to the parameter information.
STATUS	12	Hi-Z	O	Status output H: During sound playing, sound recording, tone outputting, flash memory operating, memory checking, self-checking, or initializing L: Other than above
V _{REF}	22	Hi-Z	Hi-Z	[No recording] N.C.
			A	[Recording] Reference voltage for sound input
ADIN	21	Hi-Z	Hi-Z	[No recording] N.C.
			A	[Recording] Sound input
OSCEN	47	Hi-Z	I	Oscillator selection H: Crystal / ceramic oscillator (OSCI / OSCO) Connect a resonator to OSCI / OSCO. L: Embedded oscillator

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Pin name	Pin No.	I/O		Function
		During reset	Initial status	
OSCI	34	Hi-Z	Hi-Z / A	Oscillator input (Leave open when the embedded oscillator is used.) Enabled when OSCEN = H; Hi-Z when OSCEN = L
OSCO	33	Hi-Z	Hi-Z / A	Oscillator output (Leave open when the embedded oscillator is used.) Enabled when OSCEN = H; Hi-Z when OSCEN = L
#SLEEP_CTRL	3	Hi-Z	I (Pull-up)	[Standalone] Sleep control H: During Normal Operating mode H → L → H: Set to Sleep mode
			Hi-Z	[SPI / UART / I ² C] N.C.

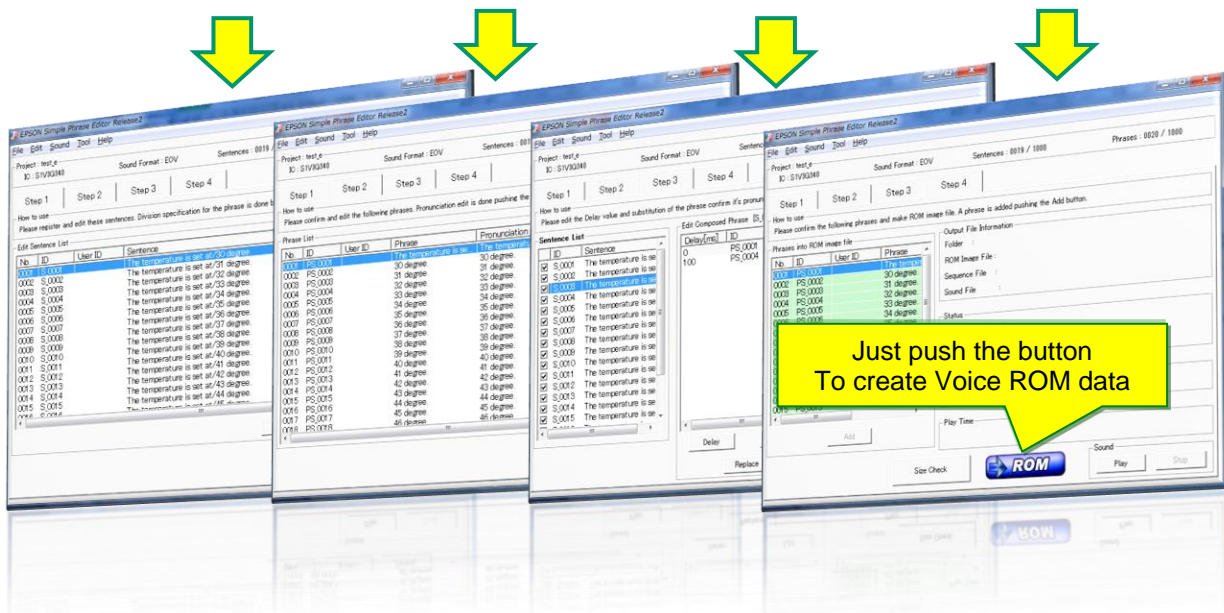
*1: After reset state is canceled, this IC checks if an external flash memory is connected. The pin goes into Hi-Z state if no flash memory is connected.

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■ Epson Voice Creation PC Tool

Epson Voice creation PC tool makes voice related development easy because of **no-studio recording, no narrator arrangement**. This tool supports languages in the table below (all female voice), and easily creation, modification can be done, by “wav file” import function, existing wav file can be used.

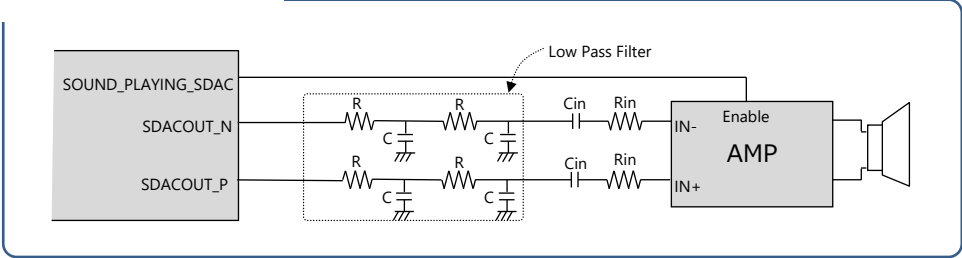
Asia	America	Europe
Japanese	American English	British English
Chinese	American Spanish	German
Korean	Canadian French	French
—	—	Spanish
—	—	Italian
—	—	Russian



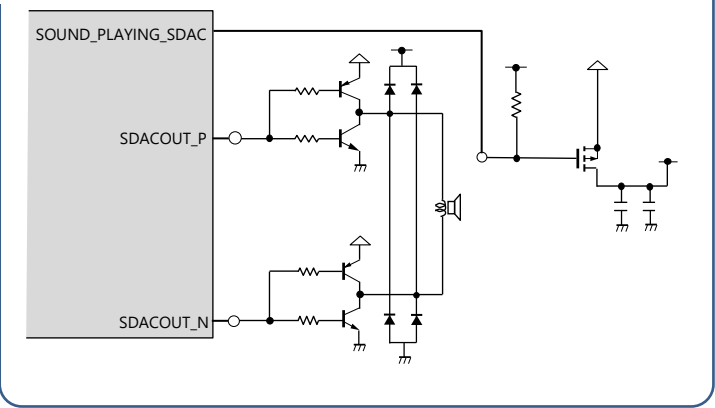
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■ Basic Speaker/Buzzer External Connection Diagram

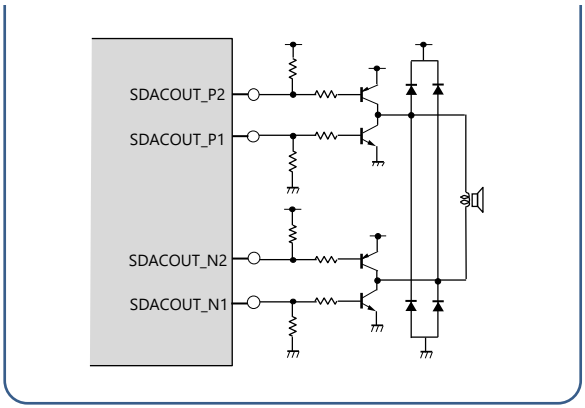
1. AMP ⇒ Speaker



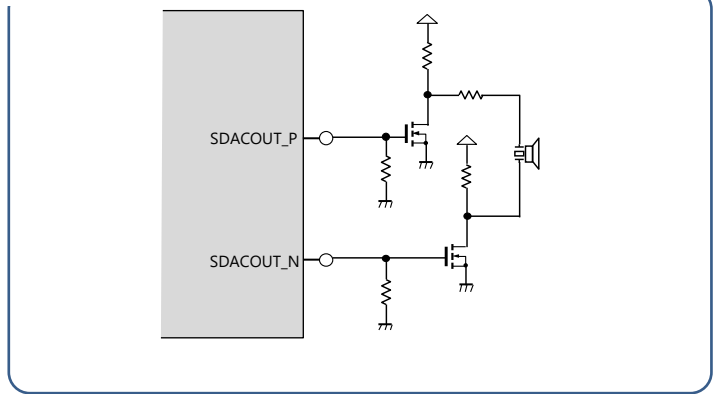
2.1. Differential circuit ⇒ Speaker/Electromagnetic Buzzer



2.2. differential circuit ⇒ Speaker/Electromagnetic Buzzer(S1V3F351)



3. Differential circuit ⇒ Piezoelectric buzzer



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■ Revision History

Contents				
Date	Rev.	Page	Type	Details
2023/03/24	0.8	All	New	New release
2023/09/25	1.0	2-6, 9-11	Changed	Modified "Features", "Pin Diagram", "Pin Description", "Basic Speaker/Buzzer External Connection Diagram".
2024/02/21	1.1	1-8	Changed	Modified "Overview", "Features", "Pin Diagram", "Pin Description".
2024/08/19	1.2	1-2	Changed	Modified range of pitch conversion. Added note about pitch conversion. Added note number of repeats in stand-alone mode.

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Medical equipment / Relay equipment to be placed on ocean floor /
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Rev. e1.4, 2023. 4

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Document code: 414424003
First issue March, 2023
Revised August, 2024