OVERVIEW

The SM1155 series are CMOS melody LSIs that, together with a battery and piezoelectric buzzer. They also feature an oscillator stop function in non-play mode and a variable pull-down resistance function that responds to input levels in order to reduce power consumption, reduce cost, and extend battery life, making them ideal in a wide range of applications including the hold sound for telephones and toys.

FEATURES

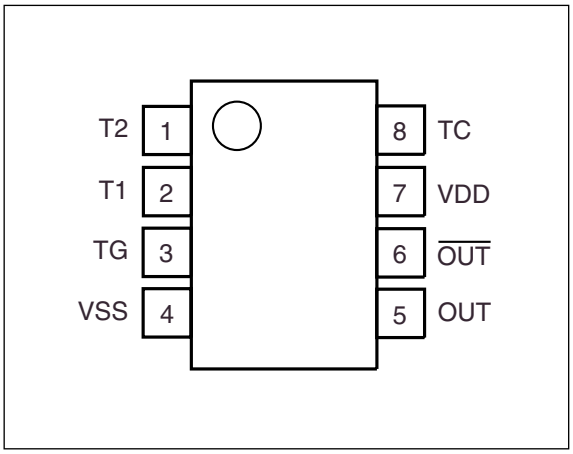
- Requires few external components
- 1.2 to 3.6V wide operating voltage range
- Low power consumption
- Melody modes: Level hold 1
- Oscillator stop function in non-play mode
- Power saving pull-down resistor built-in
- RC oscillator circuit
- Power-ON initialization function
- Wide pitch dynamic range (G_3 to D_7)
- 8-pin SOP package

ORDERING INFORMATION

Device	Package
SM1155×××1S	8-pin SOP

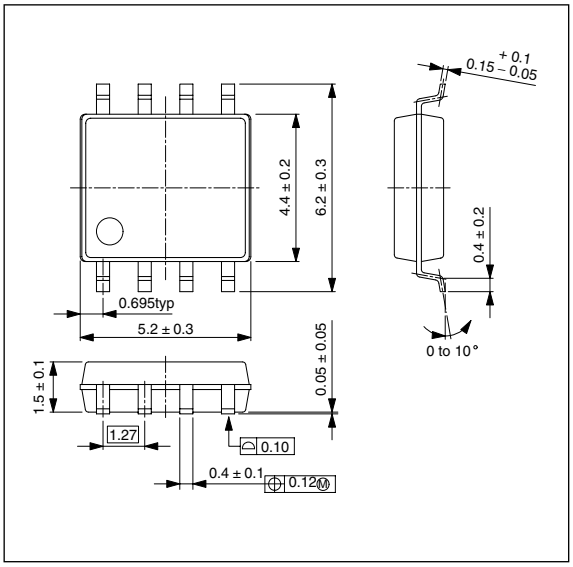
PINOUT

(Top view)



PACKAGE DIMENSIONS

(Unit: mm)



PAD DESCRIPTION

Number	Name	I/O	Function
1	T2	–	Test pins (must be open)
2	T1		
3	TG	Ip[1]	Melody mode control input H: Play L/ Open: Non-play
4	VSS	–	Ground
5	OUT	O	Piezoelectric speaker driver outputs. Both pins are LOW in non-play mode. OUT is LOW and $\overline{OUT}$ is HIGH during output for a musical rest note. Both pins are HIGH during the gap between musical notes.
6	$\overline{OUT}$		
7	VDD	–	Supply. The rear surface of the chip is V_{DD} level.
8	TC	–	Test pins (must be open)

1. Built-in pull-down resistor (the resistance of the pull-down resistor varies with the applied voltage, as described in the Electrical Characteristics).

SPECIFICATIONS

Absolute Maximum Ratings

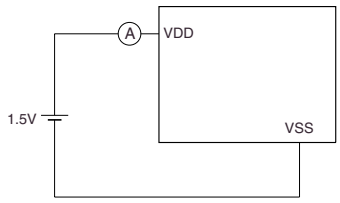
Parameter	Symbol	Condition	Rating	Unit
Supply voltage range	$V_{DD} - V_{SS}$		–0.3 to 5.0	V
Input voltage range	V_{IN}		V_{SS} – 0.2 to V_{DD} + 0.2	V
Operating temperature range	T_{opr}		–20 to 80	°C
Storage temperature range	T_{stg}		–55 to 125	°C

Electrical Characteristics

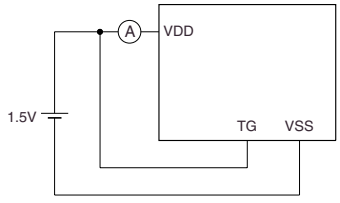
Ta = 25°C, V_{SS} = 0V, V_{DD} = 1.5V

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Operating voltage	V_{DD}		1.2	1.5	3.6	V
Current consumption[1]	I_{DD1}	Non-play mode	–	0.01	0.3	µA
Current consumption[2]	I_{DD2}	Melody modes: OUT, $\overline{OUT}$ open	–	25	50	µA
TG LOW-level input voltage	V_{IL}		–	–	V_{SS} + 0.2	V
TG HIGH-level input voltage	V_{IH}		V_{DD} – 0.2	–	–	V
TG LOW-level input current	I_{IL}	V_{IL} = 0.4V	1.4	3.0	6.0	µA
TG HIGH-level input current	I_{IH}	V_{IH} = 1.5V	1.4	3.0	6.0	µA
OUT, $\overline{OUT}$ LOW-level output current	I_{OL}	V_{OL} = 0.75V	2.0	–	–	mA
OUT, $\overline{OUT}$ HIGH-level output current	I_{OH}	V_{OH} = 0.75V	2.0	–	–	mA
Internal oscillator frequency	f_{OSC}	f_0 = 50kHz	–20	–	+20	%

1. Measurement circuit



2. Measurement circuit



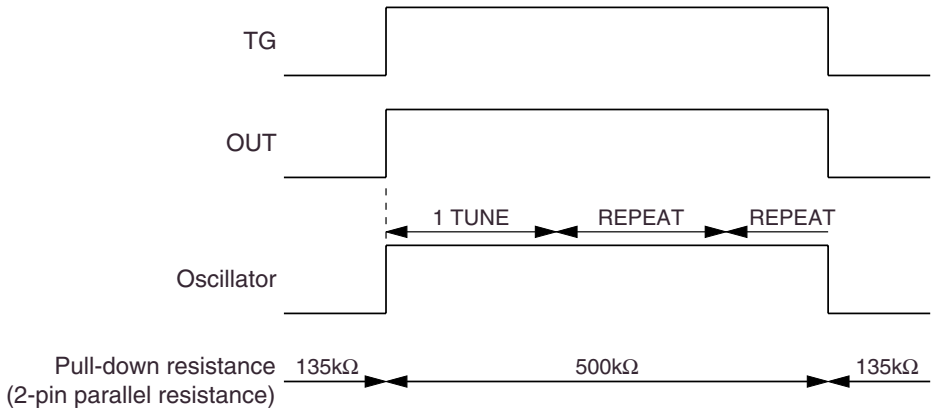
FUNCTIONAL DESCRIPTION

Melody Modes

When TG goes HIGH (V_{DD}), melody play starts.

Level hold 1

When TG goes HIGH, melody play starts and continues while TG is held HIGH. When TG goes open circuit or LOW, melody play stops, even if during mid melody.



Power-save Function

As shown in the preceding timing diagrams, the oscillator stops during non-play mode and the pull-down resistance value changes in response to both HIGH-level and LOW-level inputs (power-save pull-down resistor) to reduce power consumption and extend battery life.

Non-play oscillator stop function

When melody play ends, regardless of the state of TG, the internal oscillator stops and is placed in a standby state. In this state, the current consumption, including input pin pull-down resistor current (I_{IH} max), does not exceed 3.3μA.

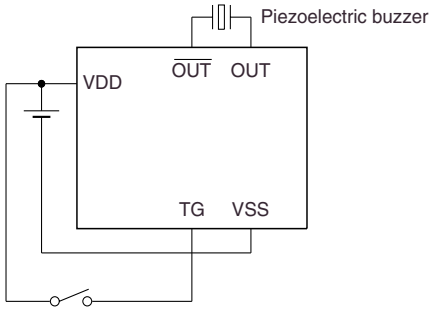
Power-save pull-down resistor

The resistance of the TG input pull-down resistor changes in response to the input voltage. The pull-down resistance is 500kΩ when the input is HIGH, and the pull-down resistance is 135kΩ when the input is LOW.

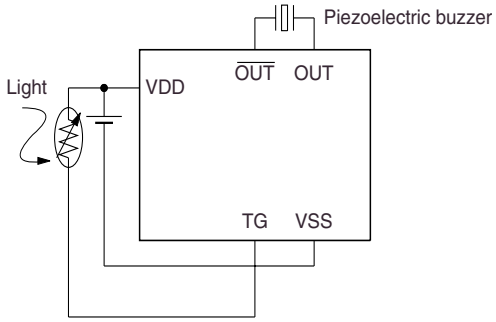
Furthermore, if a light-dependent resistor (CdS) cell is employed as a switch (the pull-down resistance is maximum when the CdS resistance is minimum (light) and the pull-down resistance is minimum when the CdS resistance is maximum (dark)), the combined resistance can be increased, decreasing current consumption.

TYPICAL APPLICATION

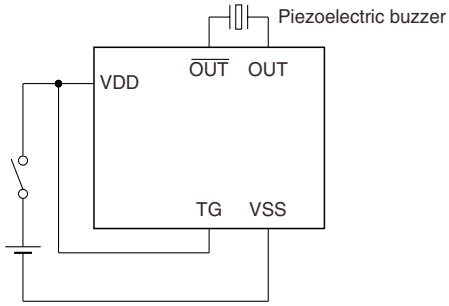
The circuits below represent the standard connections for SM1155 series devices.



Circuit 1



Circuit 3



Circuit 2

SONG LIST

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Device	Song Title	Version	Composer	Time [s]
SM1155	It's a small world	AAA	Sherman Richard M/Sherman Robert B	45.97
SM1155	Twinkle Twinkle Little Star	AAM[1]	–	25.86
SM1155	Bolero	AAN[1]	Ravel Maurice Joseph	19.83
SM1155	Baroque Hoedown	AAP[1]	Kingsley Gershon/Perrey Jean Jacques	20.69
SM1155	Mickey Mouse March	AAQ[1]	Dodd Jimmie	31.03

1. The sample of this version is available anytime.

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