Winbond Electronics Corp.

Power Speech LOW VOLTAGE ADPCM VOICE SYNTHESIZER

GENERAL DESCRIPTION

The W523X is a programmable speech synthesis IC that utilizes the ADPCM coding method to generate all types of voice effects. The W523X's LOAD and JUMP commands and four programmable registers provide powerful user-programmable functions that make this chip suitable for an extremely wide range of speech IC applications.

The W523X family includes the W5231, W5232, W5233, and W5234. The ROM size of each of these products is shown below:

BODY	W5231	W5232	W5233	W5234
Second	3 Sec	6 Sec	9 Sec	12 Sec

Note: All of the playback lengths are estimated by typical applications.

FEATURES

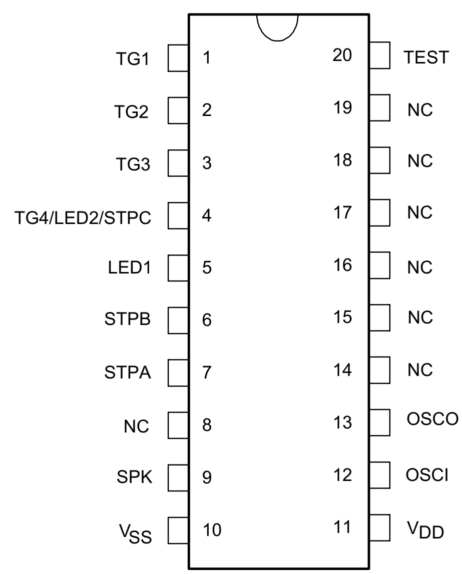
- Wide operating voltage range: 1.2 to 3.6 volts
- Programmable speech synthesizer
- 4-bit ADPCM synthesis method and 8-bit D/A converter
- RC oscillator with built-in capacitor; voice output frequency typically at 6 KHz
- Provides 4 trigger inputs
- Drives 2 flash LEDs for two batteries
- 3 STOP output signals
- Flexible functions programmable through the following:
  - LD (load), JP (jump) commands
  - Four registers: R0, EN, STOP, and MODE
  - Conditional instructions
  - Speech equation
  - Global repeat (GR) setting
- Programmable power-on initialization (POI), which can be interrupted by trigger inputs
- Interrupt or non-interrupt for rising or falling edge of each trigger pin (this feature determines retriggerable, non-retriggerable, overwrite, and non-overwrite features of each trigger pin)
- LED On/Off control can be set independently in each GO instruction of speech equation
- Independent control of LED1 and LED2
- Total of 256 voice group entries available for programming
  (including eight hardware and 248 software group entry points)
- 20 to 40 mS debounce time

Publication Release Date: March 1996

Revision A2

- Provides the following mask options:
  - – LED flash frequency: 3 Hz/6 Hz/Off
  - – LED flash type: synchronous/alternate
  - – LED1 section-controlled: Yes/No
  - – LED2 section-controlled/STPC-controlled
  - – AUD output current: 1 mA for one battery, 3 mA for two batteries
- Packaged in 20-pin DIP

PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	I/O	FUNCTION
1	TG1	I	Trigger Input 1
2	TG2	I	Trigger Input 2
3	TG3	I	Trigger Input 3
4	TG4/LED2/STPC	I/O	Trigger Input 4 or LED 2 or Stop Signal C
5	LED1	O	LED 1
6	STPB	O	Stop Signal B
7	STPA	O	Stop Signal A
8	NC	-	Not Connected
9	SPK	O	Current Output for Speaker
10	VSS	-	Negative Power Supply
11	VDD	-	Positive Power Supply
12	OSCI	I	Oscillator Input Connect Resistor
13	OSCO	O	Oscillator Output Connect Resistor
14	NC	-	Not Connected
15	NC	-	Not Connected
16	NC	-	Not Connected
17	NC	-	Not Connected
18	NC	-	Not Connected
19	NC	-	Not Connected
20	TEST	I	Test Pin

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	CONDITIONS	RATED VALUE	UNIT
Power Supply	VDD−VSS		-0.3 to +5.0	V
Input Voltage	VIN	All Inputs	VSS -0.3 to VDD +0.3	V
Storage Temp.	TSTG		-55 to +150	°C
Operating Temp.	TOPR		0 to +70	°C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

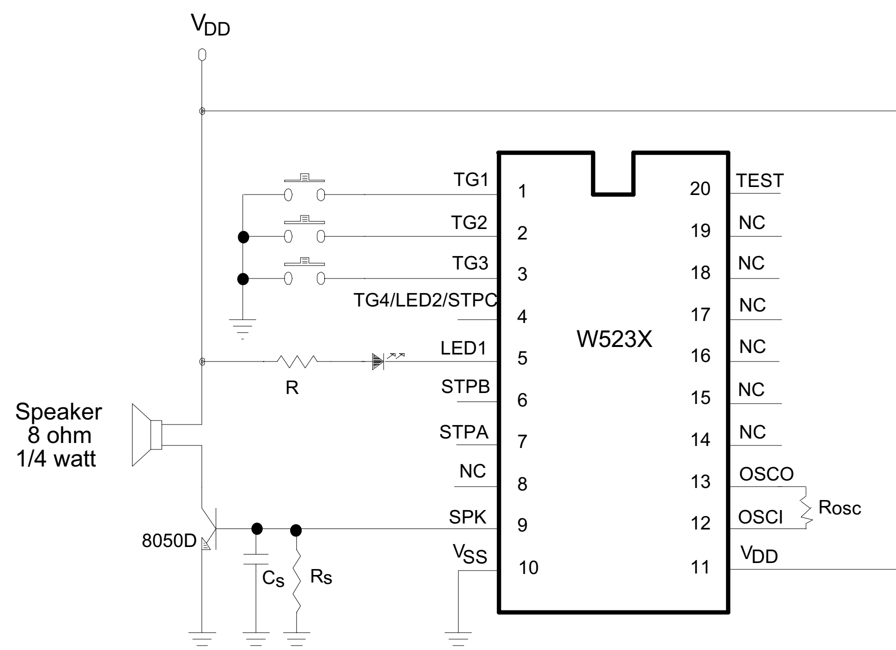
ELECTRICAL CHARACTERISTICS

(T_A = 25° C, V_{SS} = 0 V)

PARAMETER		SYMBOL	CONDITIONS	LIMITS			UNIT
				MIN.	TYP.	MAX.	
Operating Voltage		V_{DD}	For One or Two Batteries	1.2	2.4	3.6	V
Input Voltage		V_{IL}	All Input Pins	V_{SS} -0.3	-	0.3 V_{DD}	V
		V_{IH}		0.7 V_{DD}	-	V_{DD}	
Standby Current		I_{DD1}	V_{DD} = 3 V, No Playing	-	-	0.5	μA
		I_{DD2}	V_{DD} = 1.5 V, No Playing	-	-	0.3	
Operating Current		I_{OP1}	V_{DD} = 3 V, No Load	-	-	400	μA
		I_{OP2}	V_{DD} = 1.5 V, No Load	-	-	250	
Input Current For TG1–TG4		I_{IN1}	V_{DD} = 3 V, V_{IN} = 0 V	-	-	5	μA
		I_{IN2}	V_{DD} = 1.5 V, V_{IN} = 0 V	-	-	2.5	
SPK (D/A Full scale)	Option1	I_{O1}	V_{DD} = 1.5 V, R_L = 200 Ω	-0.8	-1.0	-1.2	mA
	Option2	I_{O2}	V_{DD} = 3 V, R_L = 200 Ω	-2.0	-3.0	-4.0	
Output Current of SPTC		I_{OL1}	V_{DD} = 3V, V_{OUT} = 0.4V	1	-	-	mA
		I_{OL2}	V_{DD} = 1.5V, V_{OUT} = 0.4V	1	-	-	
		I_{OH1}	V_{DD} = 3 V, V_{OUT} = 2.7 V	-0.5	-	-	
		I_{OH2}	V_{DD} = 1.5 V, V_{OUT} = 1.2 V	-0.3	-	-	
Output Current	LED	I_O	V_{DD} = 3 V, V_{OUT} = 1 V	6	-	-	mA
	STPA STPB	I_{OL1}	V_{DD} = 3 V, V_{OUT} = 0.4 V	1	3	-	
		I_{OL2}	V_{DD} = 1.5 V, V_{OUT} = 0.4 V	1	2	-	
		I_{OH1}	V_{DD} = 3 V, V_{OUT} = 2.7 V	-1	-3	-	
		I_{OH2}	V_{DD} = 1.5 V, V_{OUT} = 1.2 V	-0.3	-	-	
Oscillation Freq.		F_{OSC1}	V_{DD} = 3 V, R_{OSC} = Typ.	320	384	460	KHz
		F_{OSC2}	V_{DD} = 1.5 V, R_{OSC} = Typ.	320	384	460	
Oscillation Freq. Deviation by Voltage Drop		$\frac{\Delta F_{OSC}}{F_{OSC}}$	$\frac{F(1.5\ V) - F(1.2\ V)}{F(1.5\ V)}$	0	10	20	%
Oscillation Freq. Deviation by Voltage Drop		$\frac{\Delta F_{OSC}}{F_{OSC}}$	$\frac{F(1.8\ V) - F(1.5\ V)}{F(1.8\ V)}$	0	4	7.5	%
Oscillation Freq. Deviation by Voltage Drop		$\frac{\Delta F_{OSC}}{F_{OSC}}$	$\frac{F(3.0\ V) - F(2.4\ V)}{F(3.0\ V)}$	0	4	7.5	%
Input Debounce Time		T_{DEB}	F_{OSC} = 384 KHz	20	30	40	mS

Note: R_{OSC} = Typ.= 100 KΩ for one battery; 110 KΩ for two batteries.

TYPICAL APPLICATION CIRCUIT



Notes:

1. In principle, the playing speed determined by ROSC should correspond to the sampling rate during the coding phase. The playing speed may be adjusted by varying ROSC, however.
2. Rs is an optional current-dividing resistor. If Rs is added, the resistance should be between 470 and 750 Ω.
3. R is used to limit the current on the LED.
4. Cs is optional.
5. The DC current gain β of transistor 8050 ranges from 120 to 200.
6. All unused trigger pins can be left open because of their internal pull-high resistance.
7. No warranty for production!

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