Winbond Electronics Corp.

PowerSpeech LOW VOLTAGE ADPCM VOICE SYNTHESIZER

GENERAL DESCRIPTION

The W5230 is a CMOS IC that is used solely for the purpose of demonstrating W523X series Low Voltage PowerSpeech products.

The W5230 employs the same JUMP-GO architecture as Winbond's other PowerSpeech products. Unlike standard products, however, the W5230 does not include built-in memory, because the chip is designed to serve only as a demonstration chip for the W523X series ICs. Hence the W5230 must be operated with an external memory device (e.g., an OTP memory). The W5230's LOAD and JUMP commands and four programmable registers provide powerful user-programmable functions that make this chip suitable for a wide range of speech IC applications.

FEATURES

- Wide operating voltage range: 1.2 to 3.6 volts
- Serves as demo chip for W523X series products (no built-in ROM)
- 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 LED 1 and LED 2
- Total of 256 voice group entries available for programming
  (Including eight hardware and 248 software group entry points)
- 20 to 40 mS debounce time
- Provides the following mask options:

Publication Release Date: March 1996
Revision A2

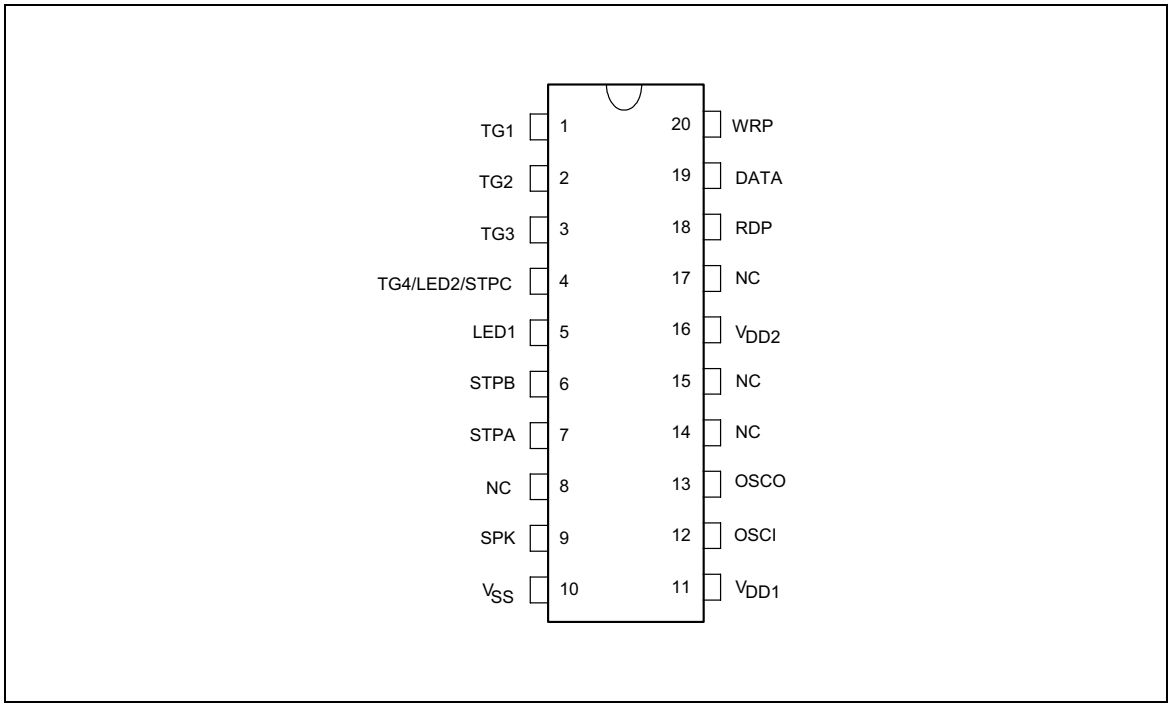
– LED flash frequency: 3 Hz/6 Hz/Off

– LED1 section-controlled: Yes/No

– LED2 section-controlled/STPC-controlled

– AUD output current: 1 mA with one battery, 3 mA with two batteries

PIN CONFIGURATION



PIN DESCRIPTION

NO.	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	V_{SS}	-	Negative Power Supply
11	V_{DD1}	-	1.5 V or 3 V 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	V_{DD2}	-	5 V Positive Power Supply
17	NC	-	Not Connected
18	RDP	O	Read Pulse Clock Output for Serial Interface
19	DATA	I/O	Bidirectional Data Pin for Serial Interface for OTP
20	WRP	O	Write Pulse Clock Output for Serial Interface

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	CONDITIONS	RATING	UNIT
Power Supply	V_{DD}–V_{SS}		-0.3 to +5.0	V
Input Voltage	V_{IN}	All Inputs	V_{SS} -0.3 to V_{DD} +0.3	V
Storage Temp.	T_{STG}		-55 to +150	°C
Operating Temp.	T_{OPR}		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.

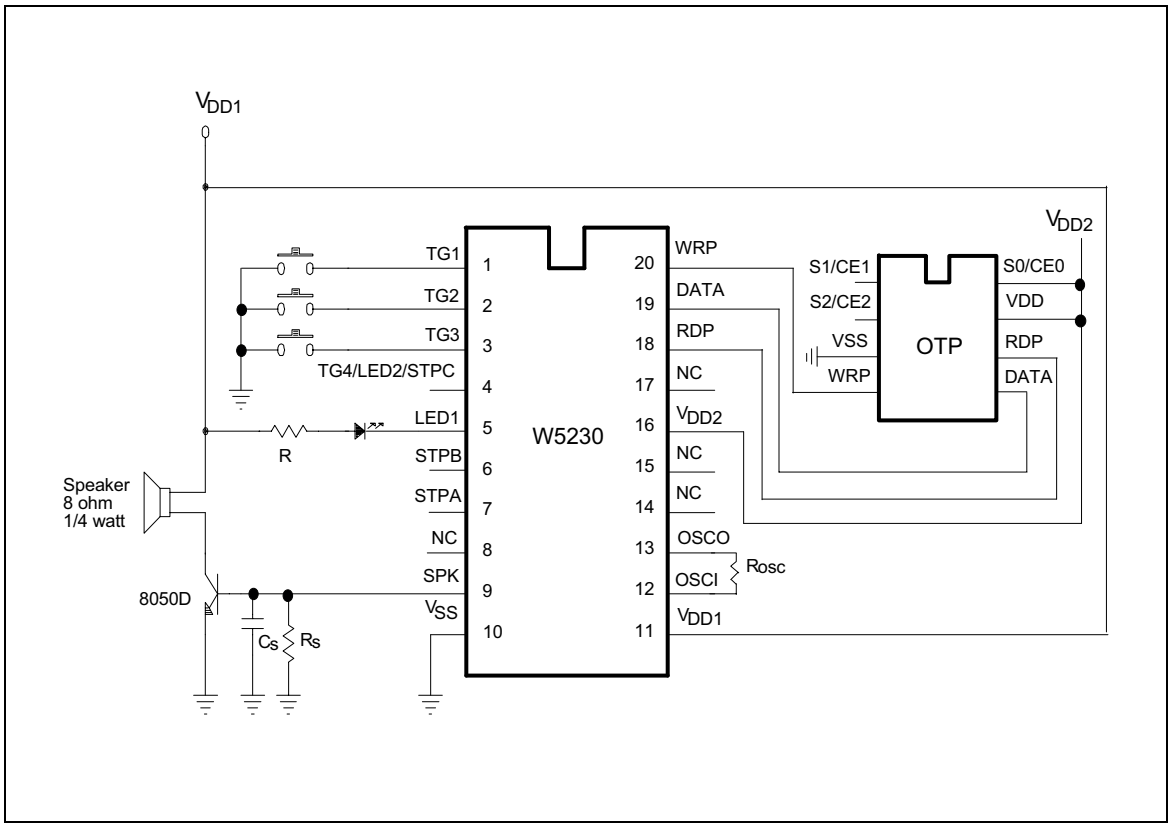
ELECTRICAL CHARACTERISTICS

(T_A = 25° C, V_{SS} = 0 V)

PARAMETER		SYMBOL	CONDITIONS	LIMITS			UNIT
				MIN.	TYP.	MAX.	
Operating Voltage		V_{DD}	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	-	-	2.5	µA
		I_{IN2}	V_{DD} = 1.5 V, V_{IN} = 0 V	-	-	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} = 3 V, V_{IN} = 0.4 V	1	-	-	mA
		I_{OL2}	V_{DD} = 1.5 V, V_{IN} = 0.4 V	1	-	-	
		I_{OH1}	V_{DD} = 3 V, V_{IN} = 2.7 V	-0.5	-	-	
		I_{OH2}	V_{DD} = 1.5 V, V_{OUT} = 1.2 V	-0.3	-	-	
Output Current	LED1	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	
Osc. Freq. Deviation by Voltage Drop		$\frac{\Delta F_{OSC}}{F_{OSC}}$	$\frac{F(1.5V)-F(1.2V)}{F(1.5V)}$	0	10	20	%
			$\frac{F(1.8V)-F(1.5V)}{F(1.8V)}$	0	4	7.5	%
			$\frac{F(3.0V)-F(2.4V)}{F(3.0V)}$	0	4	7.5	%
Input Debounce Time		T_{DEB}	F_{OSC} = 384 KHz	20	30	40	mS

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

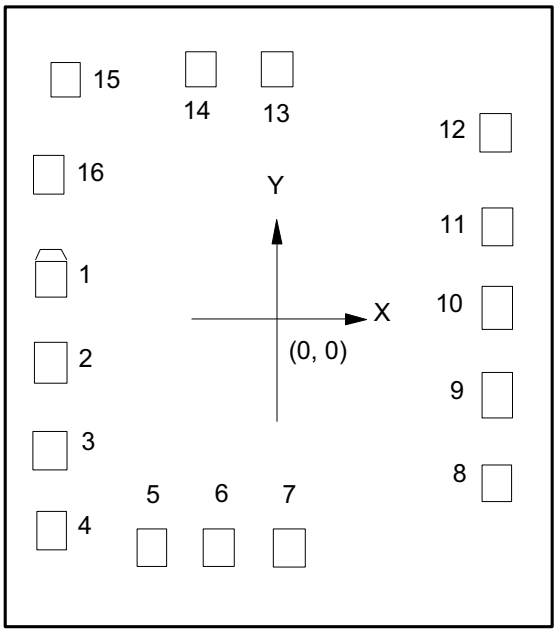
TYPICAL APPLICATION CIRCUIT



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.
3. R is used to limit the current 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.

BONDING PAD DIAGRAM



NO.	PAD NAME
1	TG1
2	TG2
3	TG3
4	TG4/LED2/STPC
5	LED1
6	STPB
7	STPA
8	SPK
9	V_{SS}
10	V_{DD1}
11	OSCI
12	OSCO
13	V_{DD2}
14	RDP
15	DATA
16	WRP

Note: Substrate is tied to V_{SS}.

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