



ADPCM VOICE SYNTHESIZER (PowerSpeech II)

GENERAL DESCRIPTION

The W529XX family comprises 4-bit ADPCM and 8-bit PCM voice synthesizers that provide basic *PowerSpeech* instructions and a number of more powerful commands, which include basic ALU operations, data move, branch, and random number generation.

The W529XX family includes the W52904, W52905, W52906, W52910, W52915, and W52920. The playback duration time of each of these products is shown below:

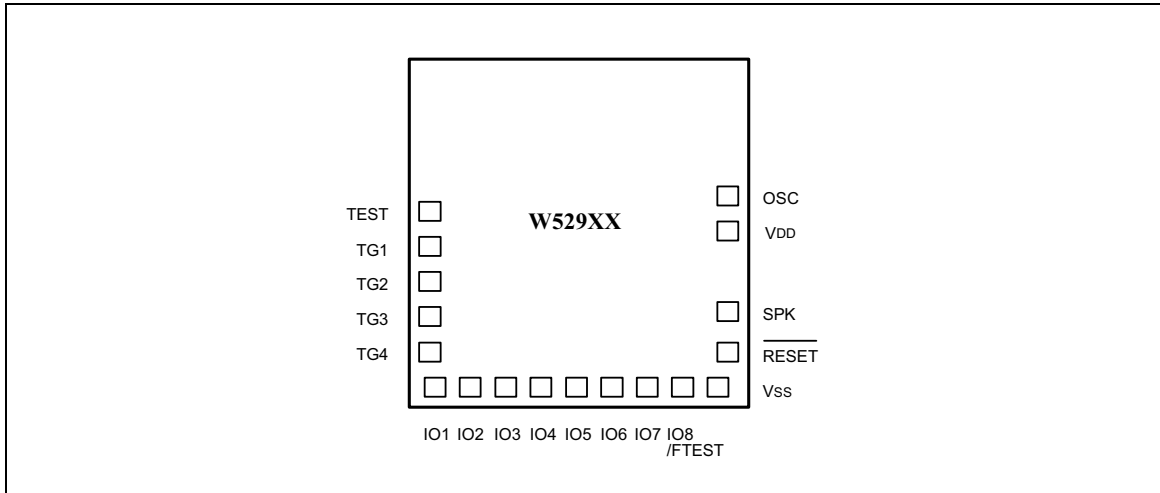
BODY	DURATION
W52902	6 sec.
W52904	12 sec.
W52905	20 sec.
W52906	30 sec.
W52910	40 sec.
W52915	60 sec.
W52920	80 sec.

Note: All playback lengths are estimated for typical applications.

FEATURES

- Powerful programmable speech synthesizer
- Wide operating voltage range: 2.4 to 5.5 volts
- Both 4-bit ADPCM and 8-bit PCM synthesis methods can be used
- Provides 4 trigger pins with separate control of falling/rising edge
- Two trigger input debounce times (160 to 320 μ S or 20 to 40 mS) can be set
- 8 multiplexed pins can be set as SCAN, FTEST, LED, STOP, or INPUT
- Supports ALU operations, including
 - Branch decisions
 - Logic operations
 - Binary addition/subtraction
 - Data move
 - Bit operand
- Provides eight general purpose registers: R0 to R7
- Provides four special registers: EN, MODEn (n: 1, 2), OUTPUT, and ACC
- Maximum 32 matrix keys can be defined by H/W or S/W
- Provides random number generation by H/W
- Section control provided for each GO instruction
 - Variable frequency: 4.8/6/8/12 KHz
 - LED: ON/OFF
- Three LED flash types provided: 3 Hz, circular, and random
- System clock uses 1.5 MHz frequency
- Total of 256 label entries available for programming

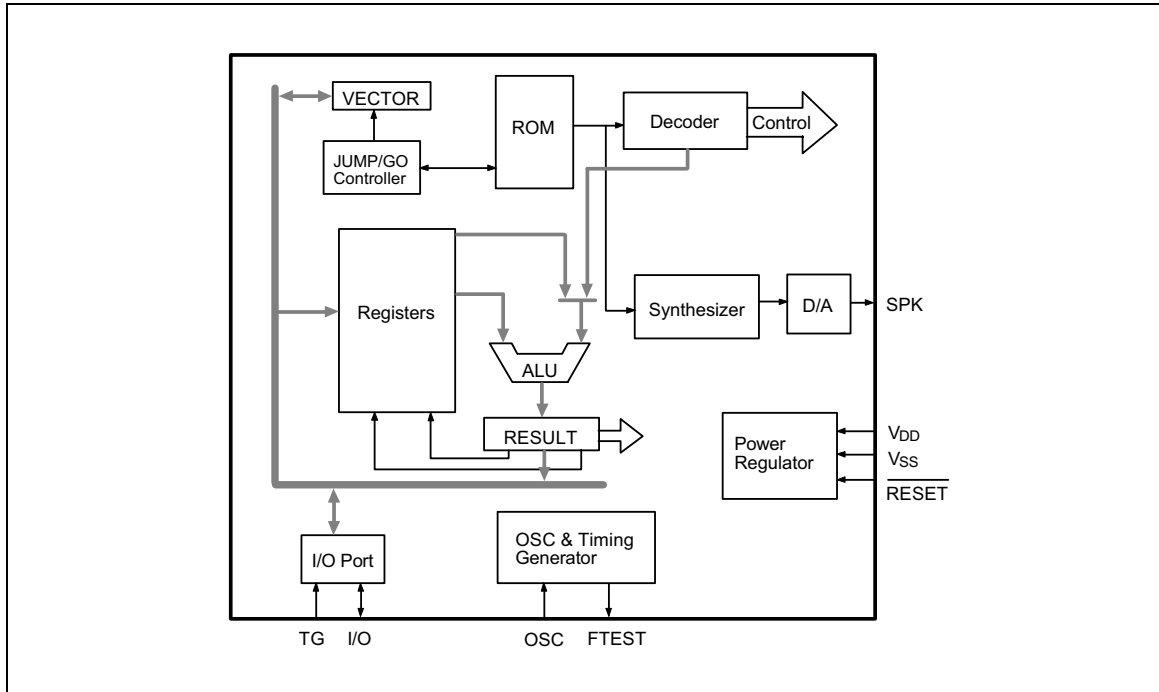
PAD CONFIGURATION



PIN DESCRIPTION

NAME	I/O	DESCRIPTION
TEST	I	Test pin, internally pulled low
TG1	I	Direct trigger input 1, internally pulled high
TG2	I	Direct trigger input 2, internally pulled high
TG3	I	Direct trigger input 3, internally pulled high
TG4	I	Direct trigger input 4, internally pulled high
IO1	I/O	SCAN/LED/STOP/INPUT multiplexed pin 1
IO2	I/O	SCAN/LED/STOP/INPUT multiplexed pin 2
IO3	I/O	SCAN/LED/STOP/INPUT multiplexed pin 3
IO4	I/O	SCAN/LED/STOP/INPUT multiplexed pin 4
IO5	I/O	SCAN/LED/STOP/INPUT multiplexed pin 5
IO6	I/O	SCAN/LED/STOP/INPUT multiplexed pin 6
IO7	I/O	SCAN/LED/STOP/INPUT multiplexed pin 7
IO8/FTEST	I/O	LED/STOP/INPUT multiplexed pin 8 or frequency test pin
VSS	-	Negative power supply
RESET	I	Reset; functions as POR; low active
SPK	O	Current type output for speaker
VDD	-	Positive power supply
OSC	I	Oscillator input, connect ROsc to VDD

BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

Trigger Inputs

The W529XX provides four direct trigger input pins that are pulled high internally. All of these trigger inputs can be independently defined to be enabled or disabled for the rising or falling edges. The debounce time of the trigger inputs can be set as 160 μ S to 320 μ S or 20 mS to 40 mS.

SPK Output

This pin is a current-type voice output, which is connected to the output of the internal D/A converter. The full-scale output of the 8-bit D/A converter is 5 mA, which is sufficient to drive an external 8 Ω speaker through the amplification of a low-power NPN transistor with a β of 120 to 160.

I/O Pin

The I/O pins, IO1 to IO8, are multiplexed for four different functions: SCAN/FTEST, LED, STOP, and INPUT. All of these pins can be defined independently as shown in the following table.

GROUP	IO8	IO7	IO6	IO5	IO4	IO3	IO2	IO1
0	INPUT/STOP				INPUT/LED			
1	FTEST/LED	SCAN/LED			SCAN/LED			
2	INPUT/LED				SCAN/STOP			
3	LED/STOP				LED/STOP			



Oscillator

The oscillator is used to generate the system frequency of around 1.5 MHz. The OSC pin is connected directly to VDD by an ROSC resistor, which is used to provide a bias current for the oscillator.

RESET

This is an active low reset input with an internal pull-high resistance. If the W529XX is turned off and then on again without discharging the VDD to ground level, the chip may function abnormally, causing unpredictable operation. The W529XX can be reset by sending a pulse through the $\overline{\text{RESET}}$ pin to restart the operation from the beginning.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	CONDITIONS	RATED VALUE	UNIT
Power Supply	VDD-VSS	-	-0.3 to +7.0	V
Input Voltage	V _{IN}	All Inputs	VSS -0.3 to VDD +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.

DC CHARACTERISTICS

(T_A = 25° C, V_{SS} = 0V)

PARAMETER	SYM.	CONDITIONS	LIMITS			UNIT
			MIN.	TYP.	MAX.	
Operating Voltage	VDD	-	2.4	4.5	5.5	V
Input Voltage	V _{IL}	All Input Pins	VSS -0.3	-	0.3 VDD	V
	V _{IH}		0.7 VDD	-	VDD	
Standby Current	I _{DD}	VDD = 5V, No Playing	-	-	1	μA
Operating Current (except W52915, W52920)	I _{OP1}	VDD = 3V, No Load	-	-	400	μA
	I _{OP2}	VDD = 5V, No Load	-	-	800	
Operating Current (W52915, W52920)	I _{OP1}	VDD = 3V, No Load	-	-	0.5	mA
	I _{OP2}	VDD = 5V, No Load	-	-	1	
Input Current for TGn	I _{IN}	VDD = 3V, V _{IN} = 0V	-	-	-3	μA
SPK (D/A Full Scale)	I _O	VDD = 4.5V, R _L = 100 Ω	-4.0	-5.0	-6.0	mA
Output Current for IOn	I _{OL}	VDD = 3V, V _{OUT} = 0.4V	0.8	-	-	mA
	I _{OH}	VDD = 3V, V _{OUT} = 2.7V	-0.4	-	-	

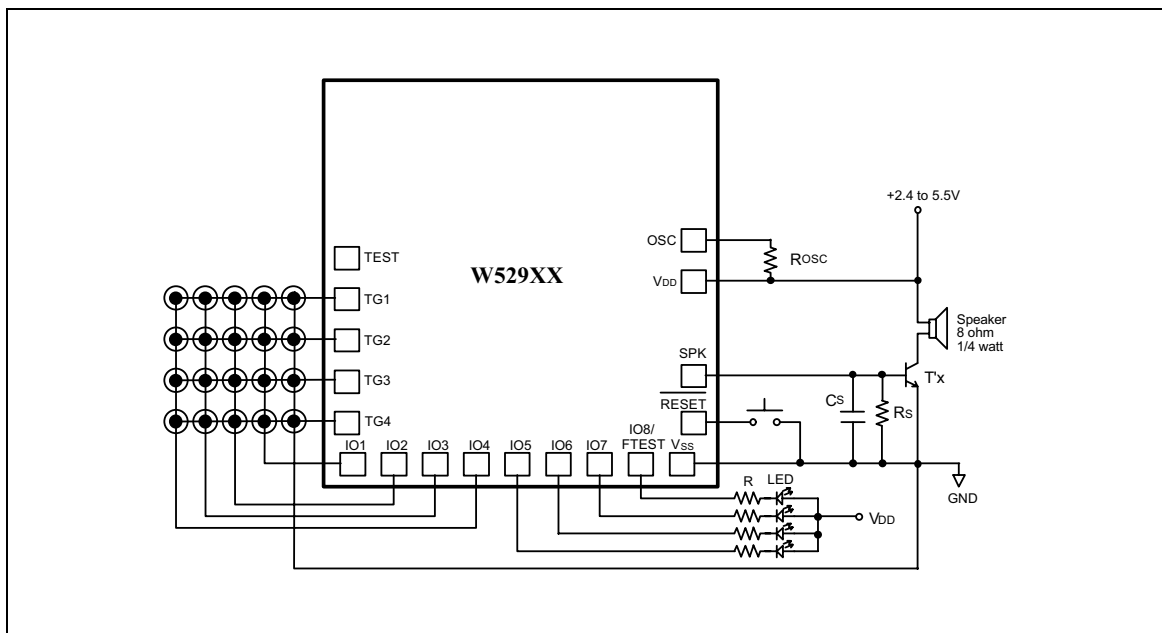


DC Characteristics, continued

PARAMETER	SYM.	CONDITIONS	LIMITS			UNIT
			MIN.	TYP.	MAX.	
Oscillation Frequency	FOSC	Rosc = Typ.	1.35	1.5	1.65	MHz
Oscillation Frequency Deviation by Voltage Drop	$\frac{ \Delta F_{OSC} }{F_{OSC}}$	$\frac{ F(3V) - F(2.4V) }{F(3V)}$	0	4	7.5	%
Input Debounce Time	TDEB1	FOSC = 1.5 MHz	20	30	40	mS
	TDEB2		160	240	320	μ S

Note: Rosc = Typ. = 120 K Ω .

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. Cs is optional.
4. The DC current gain β of transistor 8050 ranges from 120 to 160.
5. All unused trigger pins can be left open because of their internal pull-high resistance.
6. Typical Rosc is 120 K Ω .
7. R is used to limit the current on the LED.
8. No warranty on mass production.



Headquarters

No. 4, Creation Rd. III,
Science-Based Industrial Park,
Hsinchu, Taiwan
TEL: 886-3-5770066
FAX: 886-3-5792697
<http://www.winbond.com.tw/>
Voice & Fax-on-demand: 886-2-7197006

Taipei Office

11F, No. 115, Sec. 3, Min-Sheng East Rd.,
Taipei, Taiwan
TEL: 886-2-7190505
FAX: 886-2-7197502

Winbond Electronics (H.K.) Ltd.

Rm. 803, World Trade Square, Tower II,
123 Hoi Bun Rd., Kwun Tong,
Kowloon, Hong Kong
TEL: 852-27513100
FAX: 852-27552064

Winbond Electronics North America Corp.

Winbond Memory Lab.
Winbond Microelectronics Corp.
Winbond Systems Lab.
2730 Orchard Parkway, San Jose,
CA 95134, U.S.A.
TEL: 1-408-9436666
FAX: 1-408-9436668

Note: All data and specifications are subject to change without notice.