Speech Synthesizer (Voice ROM)

FEATURES

- Single power supply can operate at 2.4V through 5V.
- Direct drive buzzer and one current output to drive speaker.
- 6 seconds speech duration that can be separated into 4 sections.
- Duration of the 4 sections that can be different and the total maximum duration is about 6 seconds.
- Automatic power down.
- Repeat function that can repeat up to 16 times for each selected section.
- Cascade function that can extend the speech duration by 6 x n seconds with n pieces of MSS0601.
- Mask option for edge trigger (CDS photo-Resistor Application) or level trigger.
- BUSY signal indicates that the device is operating.

DESCRIPTION

The MSS0601 is a single-chip speech synthesizing CMOS VLSI that can synthesize voice and other sounds up to 6 seconds. The chip contains most of the necessary circuit such as the RC oscillator, ROM, D/A converter, output buffer control and timing logic. Sound generation is possible with a minimum of external components. Several chips can be cascaded to reach longer voice duration (longer than 6 seconds). Customer speech data will be edited and programmed into ROM by changing only one mask during the device fabrication. MOSEL provides sound analysis, digitizing and editing from customer provided audio tapes.

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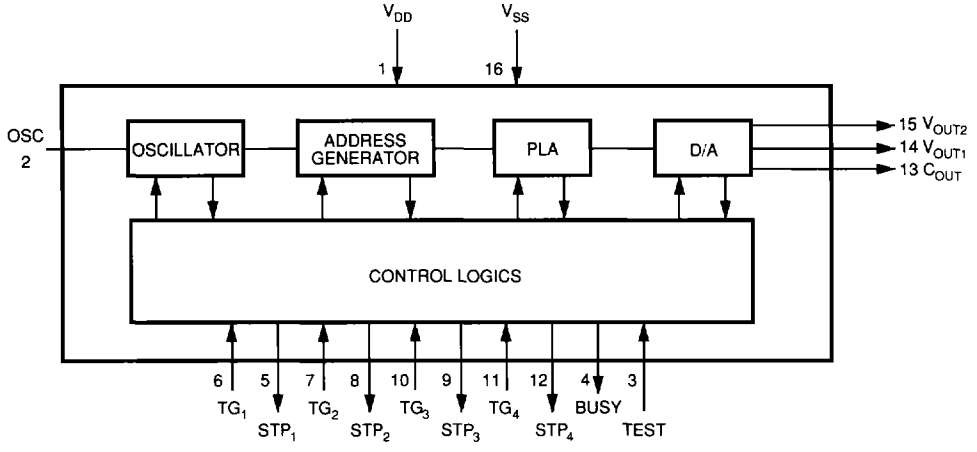
BLOCK DIAGRAM



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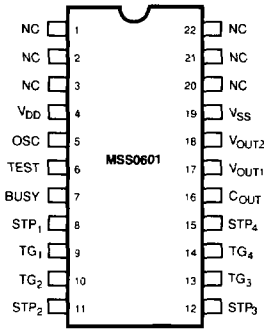
MSS0601

PIN DESCRIPTIONS

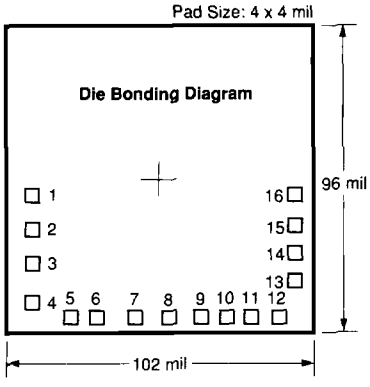
PIN NO.	SYMBOL	FUNCTION
1	V_{DD}	Positive power supply
2	OSC	RC oscillator input
3	TEST	Test mode for production test only
4	BUSY	Active high
5	STP_1	Section 1 one-shot stop signal output
6	TG_1	Section 1 trigger input, active high
7	TG_2	Section 2 trigger input, active high
8	STP_2	Section 2 one-shot stop signal output
9	STP_3	Section 3 one-shot stop signal output
10	TG_3	Section 3 trigger input, active high
11	TG_4	Section 4 trigger input, active high
12	STP_4	Section 4 one-shot stop signal output
13	C_{OUT}	Speech signal current output (for speaker)
14	V_{OUT1}	Speech signal voltage output (for buzzer)
15	V_{OUT2}	Speech signal voltage output (for buzzer)
16	V_{SS}	Negative power supply

Note: Substrate is V_{DD}

PIN CONFIGURATION



BONDING DIAGRAM



1. V_{DD} (−1145.7, −141.4)
2. OSC (−1097.4, −375.6)
3. TEST (−1092.2, −663.4)
4. BUSY (−1095.0, −935.9)
5. STP_1 (−793.0, −1020.4)
6. TG_1 (−586.1, −1012.5)
7. TG_2 (−298.3, −1017.8)
8. STP_2 (−25.8, −1020.4)
9. STP_3 (278.1, −1020.4)
10. TG_3 (485.1, −1012.5)
11. TG_4 (773.0, −1017.8)
12. STP_4 (1045.6, −1020.4)
13. C_{OUT} (1085.4, −801.4)
14. V_{OUT1} (1054.9, −590.6)
15. V_{OUT2} (1054.9, −382.8)
16. V_{SS} (1131.7, 131.3)

Note: Substrate is V_{DD} Unit: μM

ABSOLUTE MAXIMUM RATINGS

SYMBOL	RATING	UNITS
V_{DD} - V_{SS}	–0.5 ~ +0.7	V
V_{IN} (TG_1 ~ TG_4)	V_{SS}–0.3 < V_{IN} < V_{DD}+0.3	V
V_{OUT} (STP_1 ~ STP_4)	V_{SS} < V_{OUT} < V_{DD}	V
T(Operating)	–10 ~ +60	°C
T(Storage)	–55 ~ +125	°C

DC ELECTRICAL CHARACTERISTICS

PARAMETER NAME	PARAMETER		TEST CONDITIONS	MSS0601 MIN.	TYP.	MAX.	UNITS
V_{DD}	Operating Voltage			2.4	4.5	5	V
I_{SB}	Supply	Stand by	V_{DD} = 4.5V	-	-	0.1	μA
I_{OP}	Current	Operating	I/O Open	-	-	70	
V_{IH}	Input Voltage		V_{DD} = 4.5	4	4.5	4.5	V
V_{IL}	(TG_1 ~ TG_4)			–0.3	0	0.3	
I_{IH}	Input Current		V_{DD} = 4.5	-	-	5	μA
I_{IL}	(TG_1 ~ TG_4)			-	0	-	
I_{OH}	O/P Current	Drive	V_{DD} = 4.5V, $V_{O/P}$ = 4V	-	–5	-	mA
I_{OL}	V_{OUT1}, V_{OUT2}	Sink	V_{DD} = 4.5V, $V_{O/P}$ = 0.5V	-	5	-	
I_{CO}	Output Current (cout)		V_{DD} = 4.5V	-	–1	-	mA
I_{OH}	Output Current		V_{DD} = 4.5V, $V_{O/P}$ = 4V	-	–1	-	mA
I_{OL}	STP_1 ~ STP_4		V_{DD} = 4.5V, $V_{O/P}$ = 0.5V	-	1	-	
T_{STP}	Pulse Width STP_1 ~ STP_4		V_{DD} = 4.5V	-	-	5	μS
ΔF/F	Frequency Stability		F_{OSC}(4.5V)–F_{OSC}(4V) / F_{OSC}(4.5V)	-	-	5	%
ΔF/F	Frequency Variation		V_{DD} = 4.5V, R_{OSC} = 1.2MΩ	-	-	15	%

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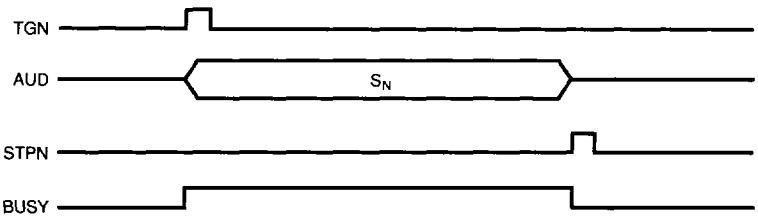
TIMING WAVEFORMS

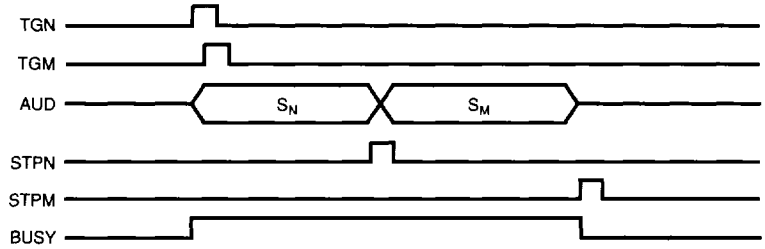
I. Edge Mode

1. Edge trigger

a.

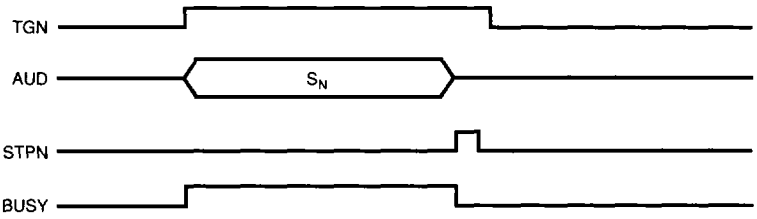


b.

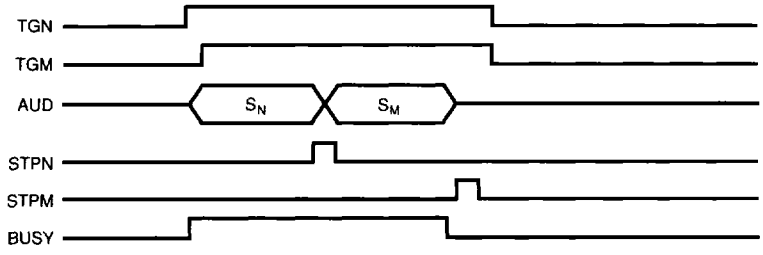


2. Level trigger

a.



b.

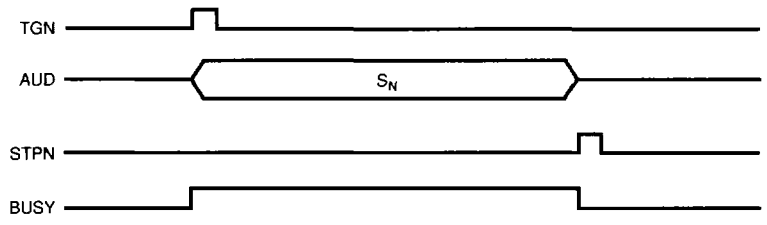


TIMING WAVEFORMS

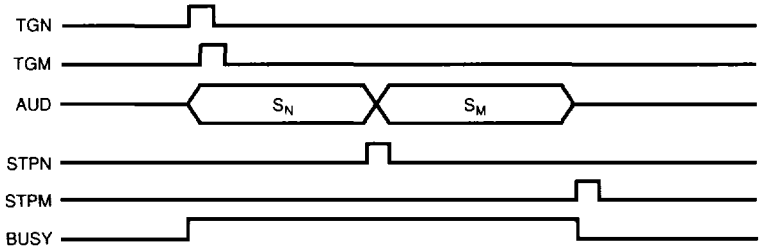
II. Stand-alone Edge Mode

1. Edge trigger

a.

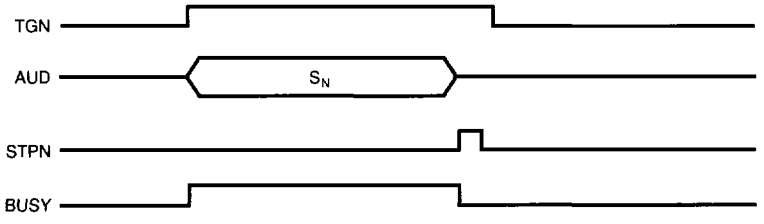


b.

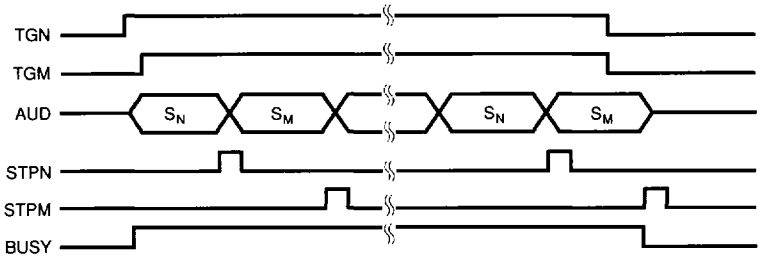


2. *Level trigger*

a.



b.



Notes:
a. TGN and TGM could be any one of TG_1 ~ TG_4.
b. AUD is the speech signal output V_{OUT1}, V_{OUT2} or C_{OUT}.
c. STPN and STPM could be any one of STP_1 ~ STP_4.

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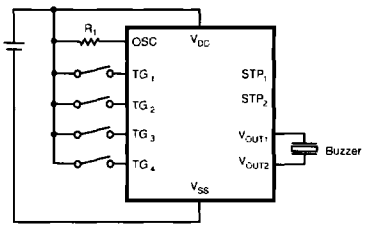
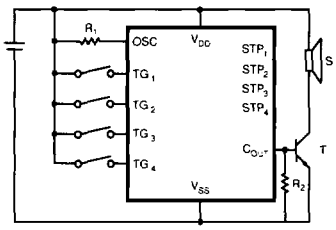
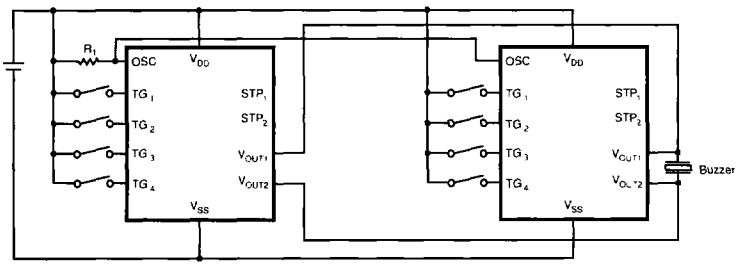
APPLICATION CIRCUITS

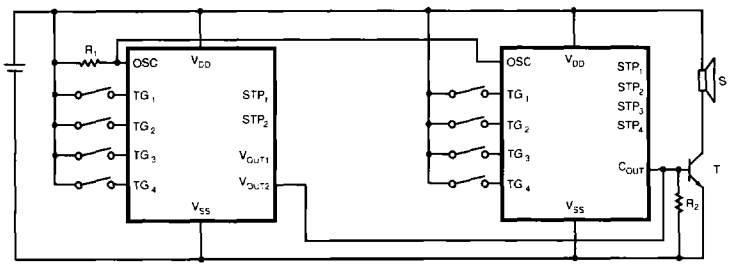
1. **Typical application**





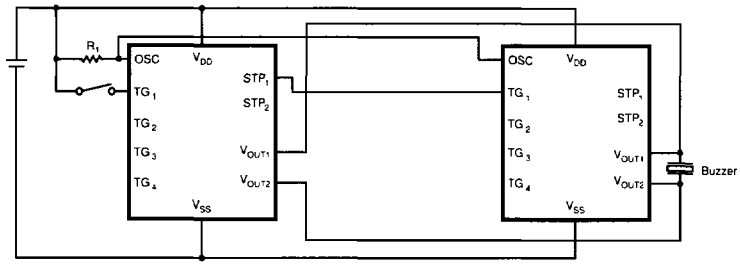
2. **Parallel application**
(Could extend up to desired voice sections in parallel arrangement)

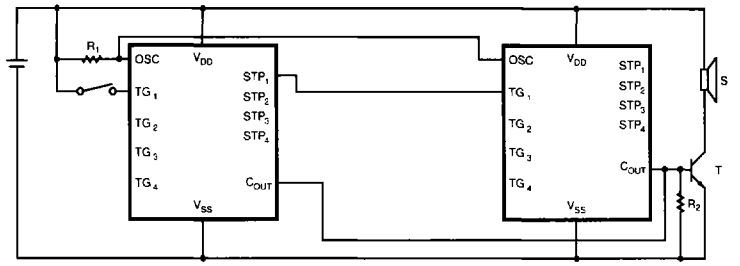




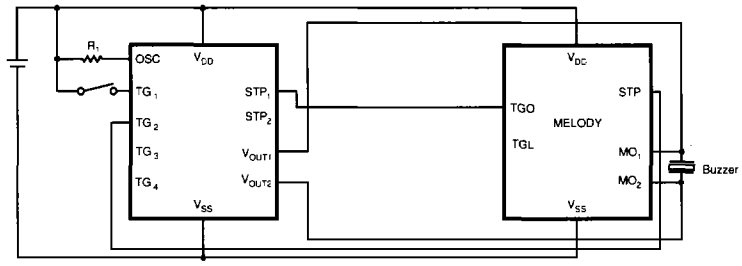
APPLICATION CIRCUITS

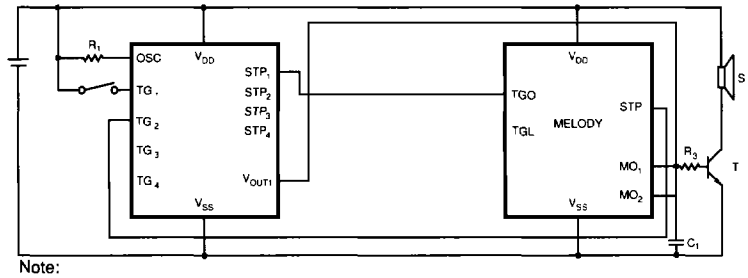
3. Cascade application (for long sentence)
(Could extend to desired voice length in serial arrangement)





4. Speech with melody application

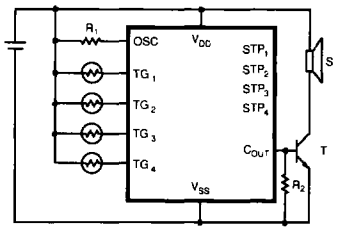




Note:
a. For some melody IC which needs longer pulse trigger, a delay circuit is needed.
b. R3 = 1KΩ typical.

APPLICATION CIRCUITS

5. CDS Application



Notes:

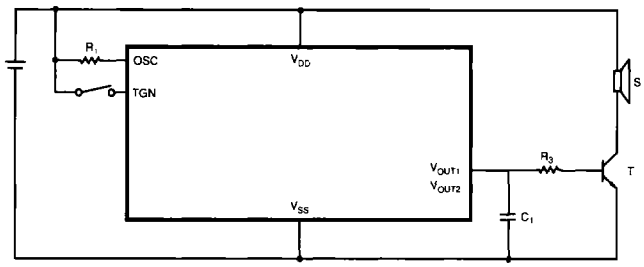
a. R1 = 1.2MΩ, R2 = 470Ω, C1 = 0.1μf, T (transistor) = with β > 150, S (speaker) = 1/4W, 8Ω, CDS = Resistance variation range (50K ~ 1.5M). all typical.

b. Piezzo buzzer resonant frequency is around 1KHz.

c. In the melody cascade application, melody I.C. must have tristate output.

d. It is recommended to bond all the unused trigger pad to ground and add a capacitor (0.1μf typical) between used trigger pad and ground for noise immunity purpose.

6. Use V_{OUT1} to drive speaker.



Note: R3 = 1KΩ, C1 = 0.1μf typical