OKI Semiconductor

This version: Sep. 1999
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MSM6585

ADPCM Voice Synthesis IC

GENERAL DESCRIPTION

The MSM6585 is an version-up product of the MSM5205 voice synthesis IC. Mainly improved points are improvement for the precision of an internal DA converter, a built-in low-pass filter, and expansion on the sampling frequency. The MSM6585 does not include a control circuit to drive an external memory similar to the MSM5205. Therefore, the MSM6585 can be connected with not only semiconductor memories, but other memory media (CD-ROM, etc.) by the control of CPU.

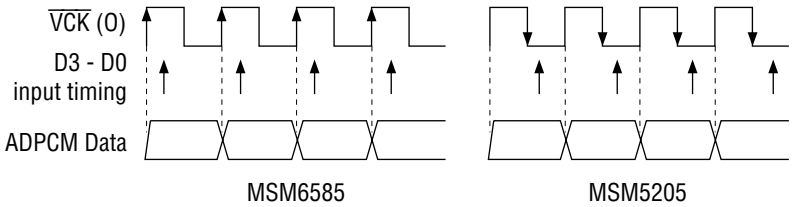
FEATURES

- 4-bit ADPCM method
- Built-in 12-bit DA converter
- Built-in low-pass filter (LPF) (–40dB/oct)
- Sampling frequencies: 4k/8k/16k/32kHz
- Master clock frequency (ceramic oscillator) : 640kHz
- Voice data synthesis : Supported by voice analysis editing tools AR203 and AR204
- Package options :
  18-pin plastic DIP (DIP18-P-300-2.54) (Product name : MSM6585RS)
  24-pin plastic SOP (SOP24-P-430-1.27-K) (Product name : MSM6585 GS-K)
  30-pin plastic SSOP (SSOP30-P-56-0.65-K) (Product name : MSM6585 GS-AK)

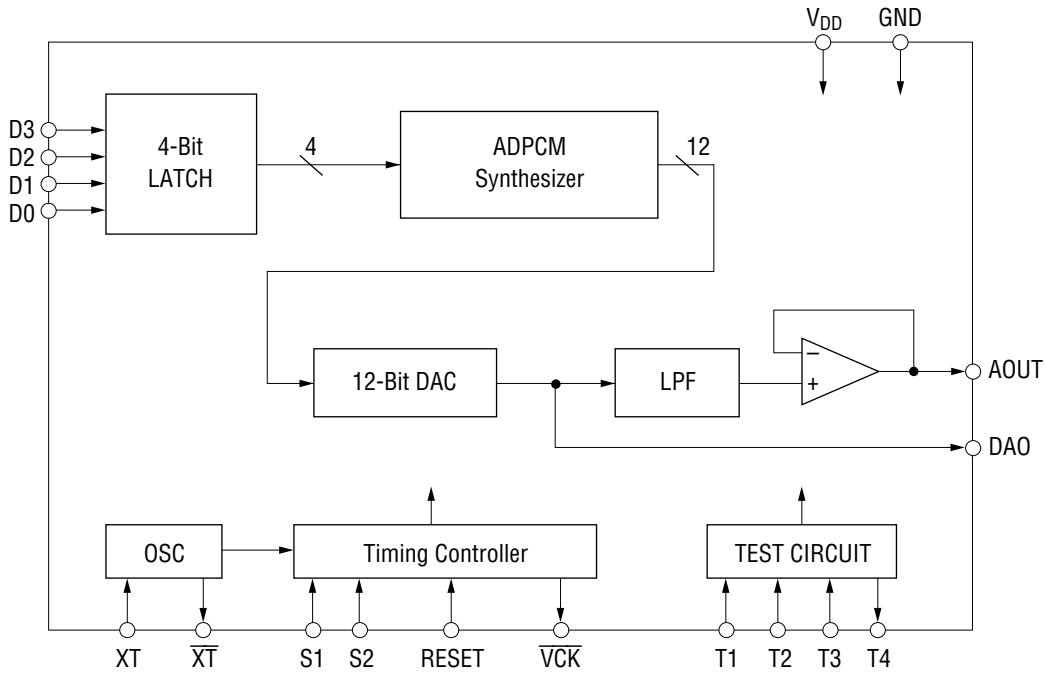
DIFFERENCES BETWEEN MSM6585 AND MSM5205

	MSM6585	MSM5205
• Master clock frequency:	640kHz	384kHz
• Sampling frequency:	4k/8k/16k/32kHz	4k/6k/8kHz
• ADPCM bit length:	4-bit	3-bit/4-bit
• DA Converter:	12-bit	10-bit
• Low-pass filter:	Included (–40dB/oct)	Not included
• Overflow preventing circuit:	Included	Not included
• Power supply voltage:	4.5 to 5.5V	3.0 to 6.0V
• Operating current consumption:	10mA	4mA
• Operating temperature:	–40 to +85°C	–30 to +70°C

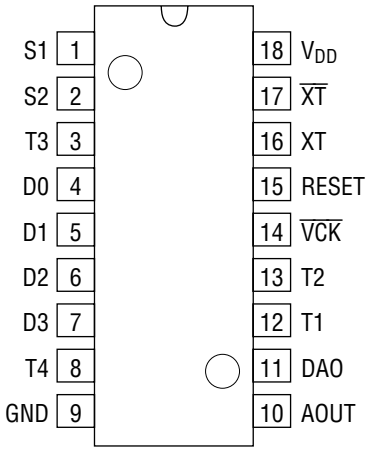
• D3 to D0 input timing



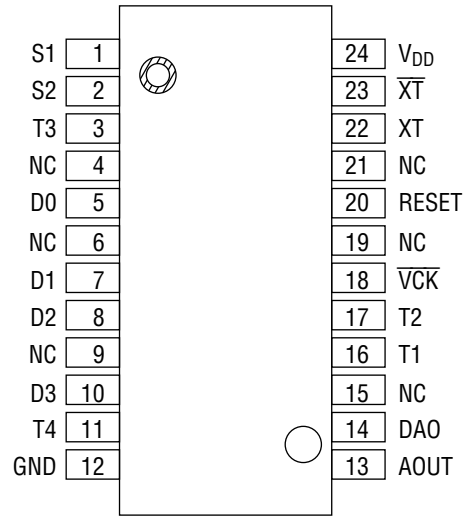
BLOCK DIAGRAM



PIN CONFIGURATION (TOP VIEW)

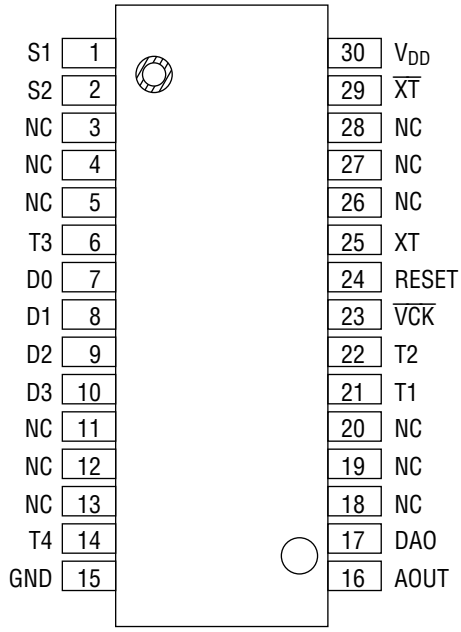


18-Pin Plastic DIP



NC : No connection

24-Pin Plastic SOP



NC : No connection

30-Pin Plastic SSOP

PIN DESCRIPTION

Pin			Symbol	Type	Description
DIP	SOP	SSOP			
1	1	1	S1	I	Pins to determine the sampling frequency. The sampling frequencies of 32k, 16k, 8k, and 4kHz can be selected by combinations. (See the sampling frequencies in FUNCTIONAL DESCRIPTION on the selection of combinations.)
2	2	2	S2		
3	3	6	T3	I	Pin to test the internal circuit. Set this pin to a high level or make it open because it has a built-in pull-up resistor.
4-7	5, 7, 8, 10	7-10	D0-D3	I	Input pins for ADPCM data. Pin to test the internal circuit. Make this pin open.
8	11	14	T4	O	Pin to test the internal circuit. Make this pin open.
9	12	15	GND	—	Ground pin
10	13	16	AOUT	O	Pin to output the analog voice from the low-pass filter. Connect a 0.01 μF capacitor to this pin. (See the AOUT connecting circuit in FUNCTIONAL DESCRIPTION on the connecting circuit.)
11	14	17	DAO	O	Pin to output the analog voice from the DA converter.
12	16	21	T1	I	Pins to test the internal circuit. Set these pins to a low level or make them open because pull-down resistors are included.
13	17	22	T2		
14	18	23	$\overline{VCK}$	O	This pin outputs the sampling frequency selected by the combinations of S1 and S2. The voice synthesis starts or stops by synchronizing with $\overline{VCK}$.
15	20	24	RESET	I	Reset pin. The voice synthesis circuit is initialized by synchronizing with $\overline{VCK}$. If this pin is set to a high level, the D0 to D3 data inputs are disabled by synchronizing with $\overline{VCK}$. The AOUT and DA0 pins output 1/2 V_{DD} and become the state of no voice.
16	22	25	XT	I	Pin to connect an oscillator. When the external clock is used, input it from this pin.
17	23	29	$\overline{XT}$	O	Pin to connect an oscillator. When the external clock is used, make this pin open.
18	24	30	V_{DD}	—	Power supply pin. Insert a bypass capacitor of 0.1 μF or more between this pin and the GND pin.

ABSOLUTE MAXIMUM RATINGS

(GND=0 V)

Parameter	Symbol	Condition	Rating	Unit
Power Supply Voltage	V_{DD}	Ta = 25°C	–0.3 to +7.0	V
Input Voltage	V_{IN}	Ta = 25°C	–0.3 to V_{DD}+0.3	V
Storage Temperature	T_{STG}	—	–55 to +150	°C

RECOMMENDED OPERATING CONDITIONS

(GND = 0V)

Parameter	Symbol	Condition	Range	Unit
Power Supply Voltage	V_{DD}	—	4.5 to 5.5	V
Operating Temperature	T_{op}	—	–40 to +85	°C
Master Clock Frequency	f_{OSC}	oscillator connection	640	kHz

ELECTRICAL CHARACTERISTICS

DC Characteristics

(V_{DD}=4.5 to 5.5V, GND=0V, Ta=–40 to +85°C)

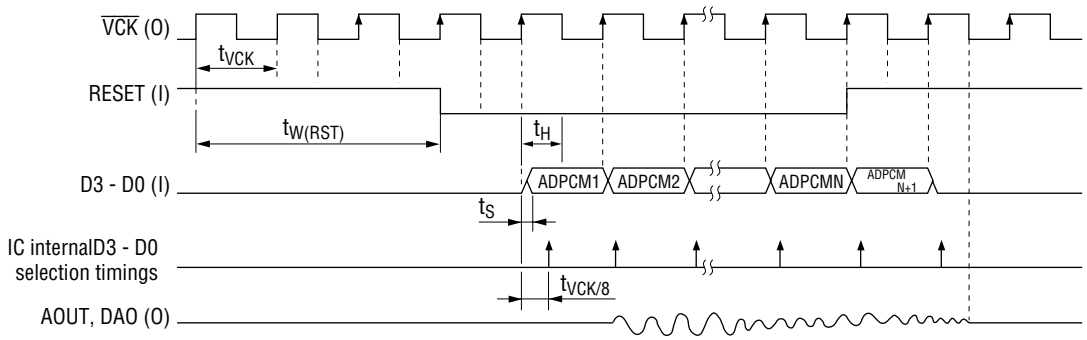
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
"H" Input Voltage	V_{IH}	—	0.8×V_{DD}	—	V_{DD}+0.1	V
"L" Input Voltage	V_{IL}	—	–0.1	—	0.2×V_{DD}	V
"H" Output Voltage	V_{OH}	VCK: I_{OH} = –40µA	V_{DD}–0.4	—	—	V
"L" Output Voltage	V_{OL}	VCK: I_{OL} = 40µA	—	—	0.4	V
"H" Input Current	I_{IH1}	T1, T2, RESET: V_{IH} = V_{DD}	20	150	400	µA
"H" Input Current	I_{IH2}	S1, S2, D0 - D3, T3: V_{IH} = V_{DD}	—	—	10	µA
"H" Input Current	I_{IH3}	XT: V_{IH} = V_{DD}	—	—	20	µA
"L" Input Current	I_{IL1}	T3: V_{IL} = 0V	–400	–120	–20	µA
"L" Input Current	I_{IL2}	S1, S2, D0 - D3, T1, T2, RESET: V_{IL}=0V	–10	—	—	µA
"L" Input Current	I_{IL3}	XT=V_{IL}=0V	–20	—	—	µA
Current Consumption	I_{DD}	f_{OSC}=640kHz, No load	—	5	10	mA
DA Output Relative Error	$\lvert V_{DAE} \rvert$	No load	—	—	40	mV
DA Output Impedance	R_{DAO}	—	10	—	40	kΩ
LPF Load Resistance	R_{AOUT}	—	50	—	—	kΩ

AC Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Original Oscillation Duty Cycle	f_{duty}	—	40	50	60	%
RESET Input Pulse Width	$t_{W(RST)}$	f_{SAM} = 4kHz ··· t_{VCK} = 250µs = 8kHz ··· = 125µs =16kHz ··· = 62.5µs =32kHz ··· =31.25µs	$2 \times t_{VCK}$	—	—	µs
Data Setup Time	t_S		—	—	3	µs
Data Hold Time	t_H		$t_{VCK}/2$	—	—	µs

When data is shared with the MSM5205, note that the D3 to D0 selection timings of the MSM6585 and MSM5205 are different. (Refer to DIFFERENCES BETWEEN MSM6585 AND MSM5205.)

TIMING DIAGRAM



The $\overline{VCK}$ clock rising and falling edges are reversed between the MSM5205 and the MSM6588, as indicated in DIFFERENCES BETWEEN MSM6585 AND MSM5205.
Note that the MSM6585 cannot accept data if the MSM5205 controls to repeat valid and invalid each half cycle, when the MSM5205 is replaced with the MSM6585.

FUNCTIONAL DESCRIPTION

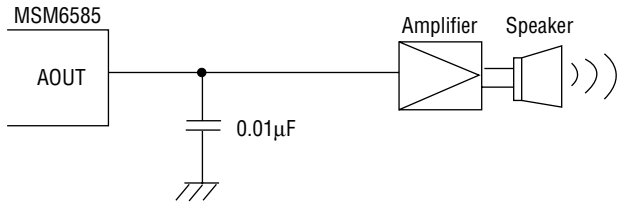
1. Sampling Frequency

The relationship of the sampling frequencies on S1 and S2, and the cutoff frequencies are listed below.

S1	S2	Sampling frequency (f_{SAM})	Cutoff frequency (f_{CUT})
L	L	4 kHz	1.6 kHz
H	L	8 kHz	3.2 kHz
L	H	16 kHz	6.4 kHz
H	H	32 kHz	12.8 kHz

2. AOUT Connecting Circuit

Connect a 0.01µF capacitor to the AOUT pin. The circuit diagram is as shown below.



Even when the DAO pin is used, connect a 0.01µF capacitor to the AOUT pin. This capacitor is used for the improvement of a voice quality.

3. Voice Output

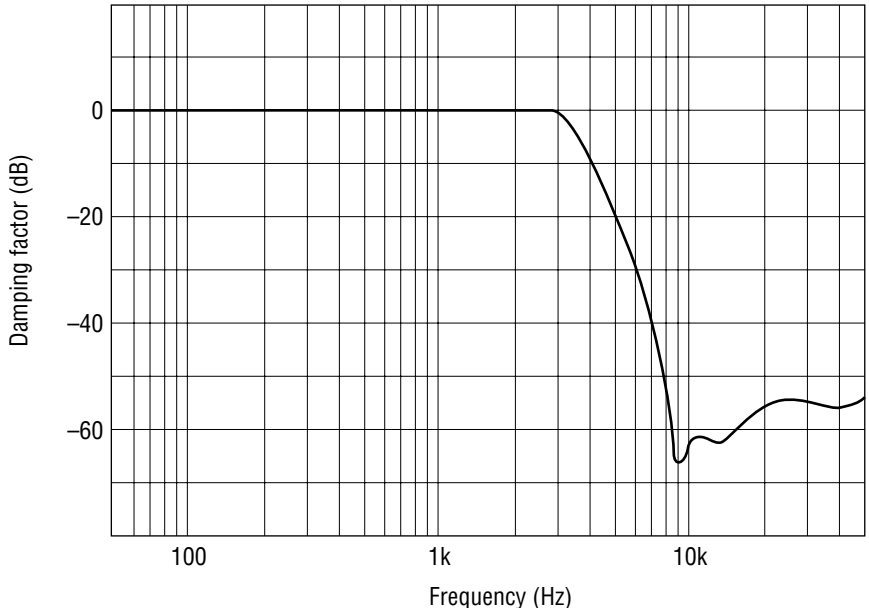
The MSM6585 has two voice output pins. The DAO is direct output pin from the internal DA converter. The AOUT is a pin to output a voice after which the DAO output passed a built-in LPF.

3.1 DA Converter Output Waveform

The output amplitude from the DA converter is max. $(4095/4096) \times V_{DD}$ and becomes a stair step waveform synchronized with the sampling frequency. The DAO output impedance varies in the ranges from 10kΩ to 40kΩ. Therefore, determine the filter constant so that the resistor variation does not have influence on the cutoff frequency of the filter.

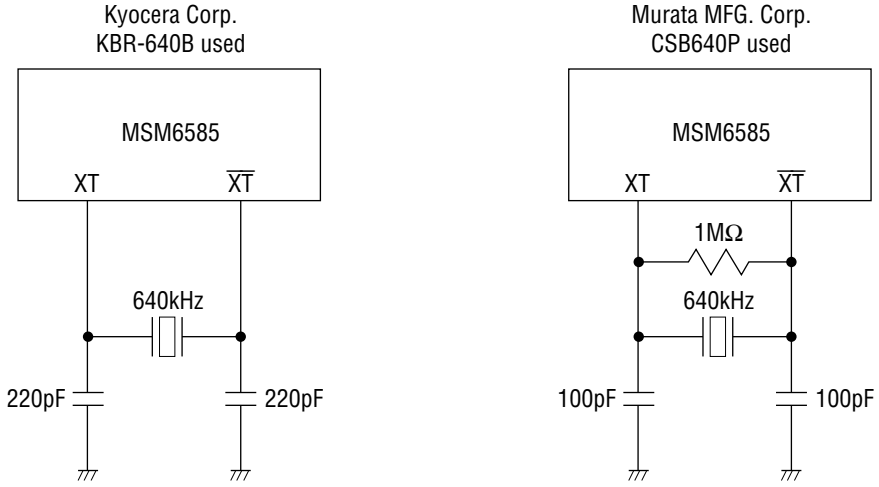
3.2 Low-pass Filter Output

The cutoff frequency of the low-pass filter varies in proportion to the sampling frequency. The following figure shows the low-pass filter characteristics in the sampling frequency 8kHz.



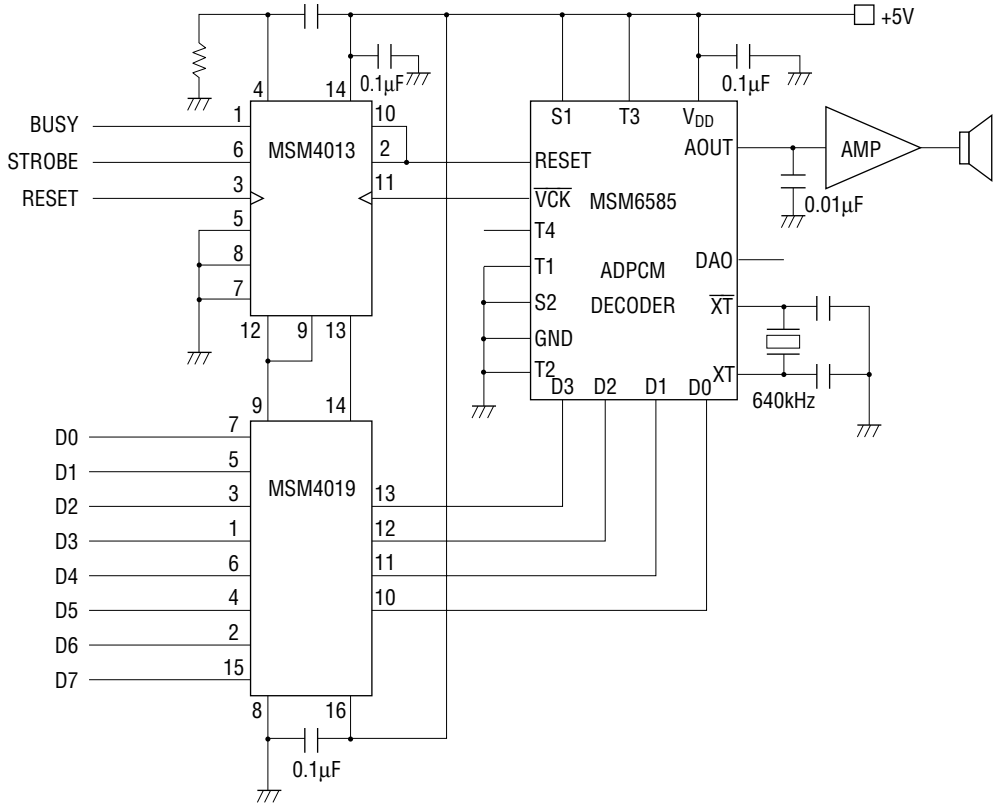
4. Oscillation

Following show external circuit diagrams using a ceramic resonator, KBR-640B made by Kyocera Corp. and CSB640P made by Murata MFG. Co., Ltd.

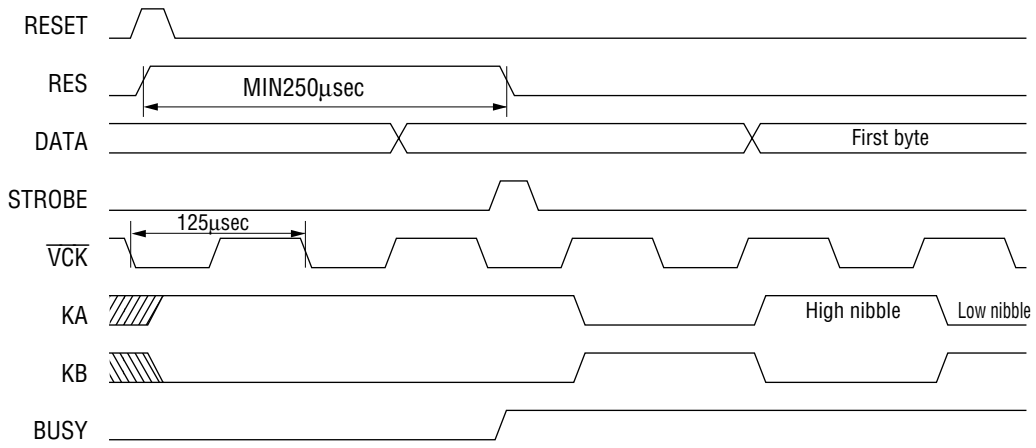


APPLICATION CIRCUITS

Centronics Interface Circuit (sampling frequency : 8kHz)

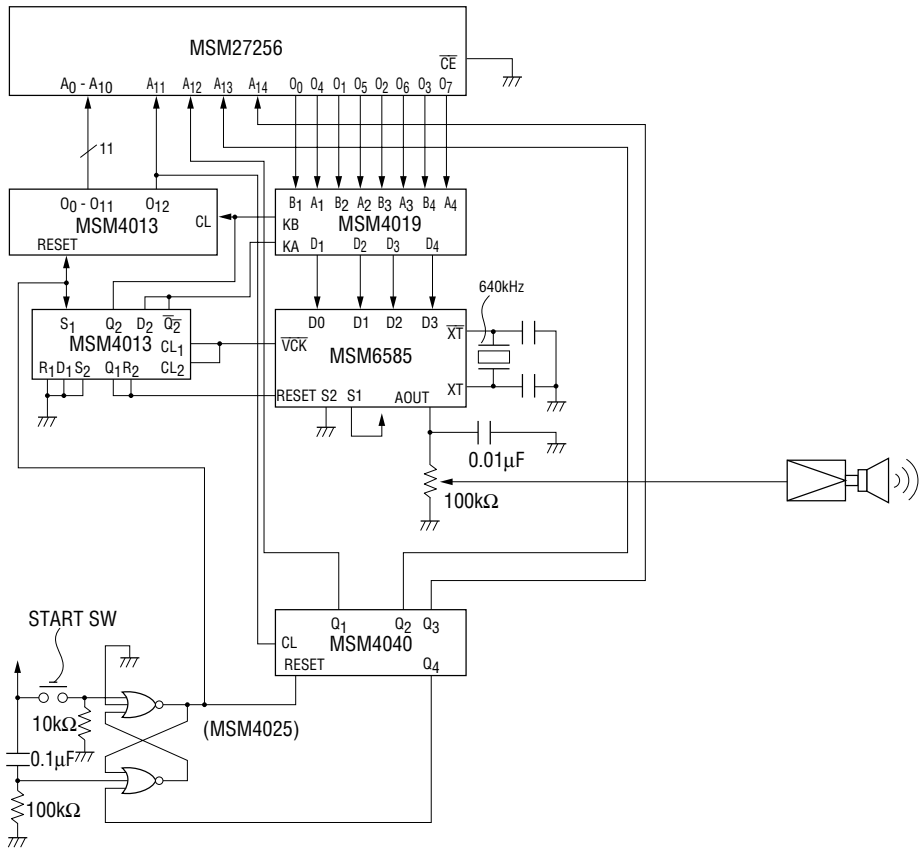


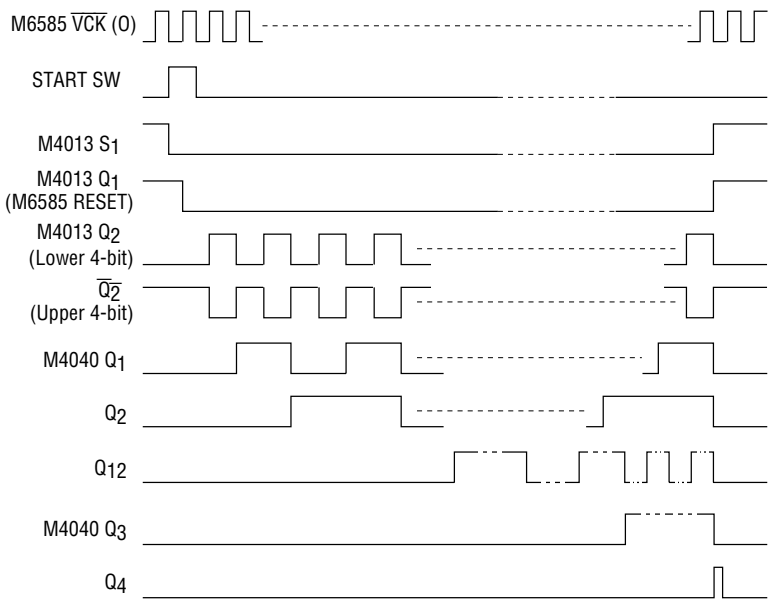
Centronics Timing Chart



Example of Interface Circuit with 256K-bit EPROM

The circuit example and timing diagram that used the 256K-bit EPROM are shown below.

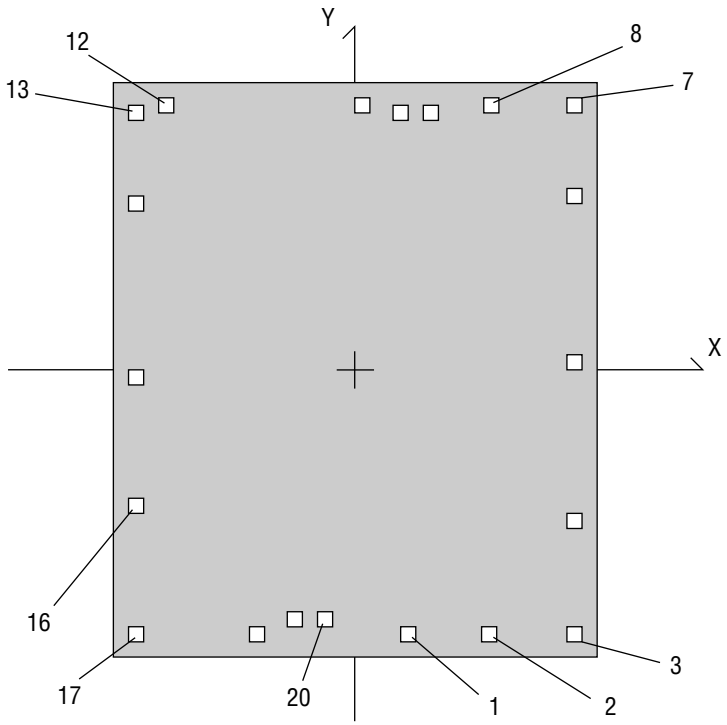




PAD CONFIGURATION

Pad Layout

Product name	MSM6585
Function	ADPCM voice synthesis IC
Die size	× = 2.92 mm, Y = 3.58 mm
Die thickness	350 µm ±30 µm
Pad size	130 µm × 130 µm
Substrate voltage	GND



Pad Coordiantes

(The die center is located at X=0, Y=0)

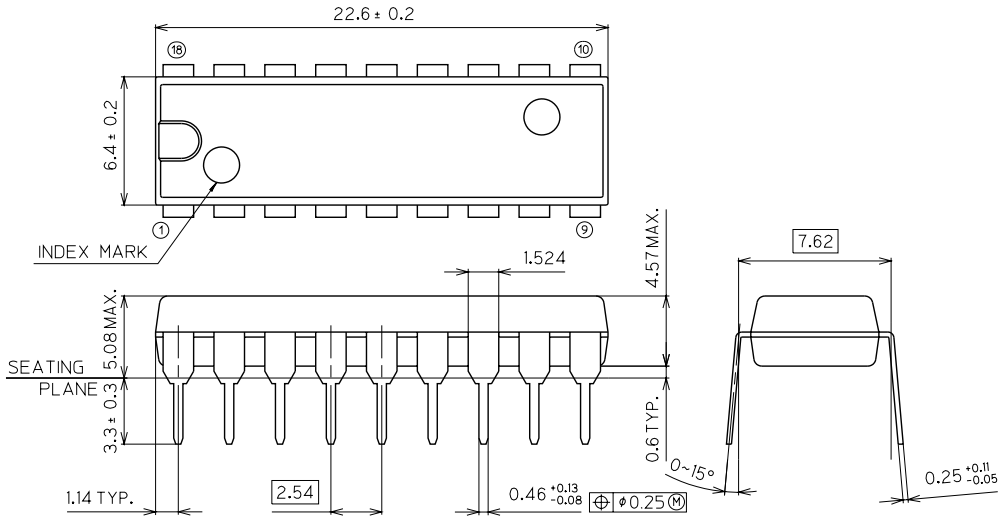
(Unit: µm)

PAD No.	PAD Name	X-axis	Y-axis	PAD No.	PAD Name	X-axis	Y-axis
1	S1	377	–1635	11	AOUT	38	1635
2	S2	819	–1635	12	DAO	–1125	1635
3	T3	1305	–1635	13	T1	–1305	1579
4	D0	1305	–943	14	T2	–1305	1009
5	D1	1305	44	15	$\overline{VCK}$	–1305	–88
6	D2	1305	1095	16	RESET	–1305	–818
7	D3	1305	1635	17	XT	–1281	–1635
8	T4	830	1635	18	$\overline{XT}$	–529	–1635
9	AV_{SS}	447	1580	19	V_{DD}	–299	–1549
10	V_{SS}	267	1580	20	AV_{DD}	–119	–1549

PACKAGE DIMENSIONS

(Unit : mm)

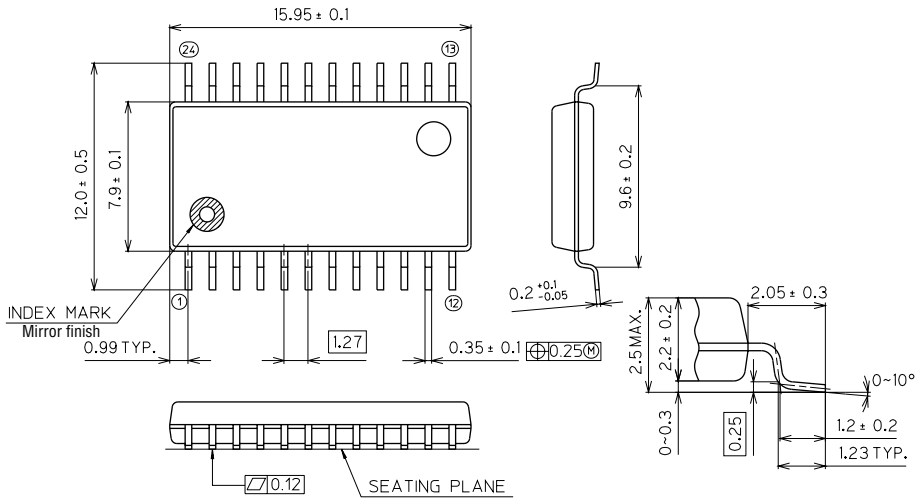
DIP18-P-300-2.54



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating
Solder plate thickness	5 μm or more
Package weight (g)	1.30 TYP.

(Unit : mm)

SOP24-P-430-1.27-K



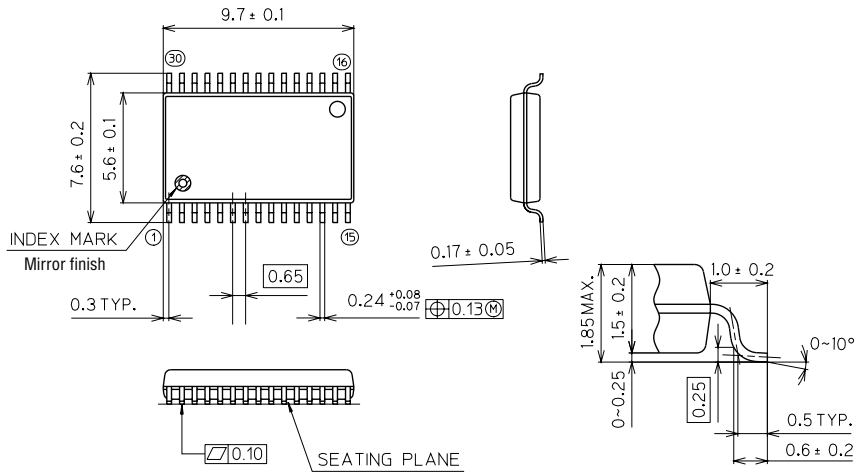
Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating
Solder plate thickness	5 μm or more
Package weight (g)	0.58 TYP.

Notes for Mounting the Surface Mount Type Package

The SOP, QFP, TSOP, TQFP, LQFP, SOJ, QFJ (PLCC), SHP, and BGA are surface mount type packages, which are very susceptible to heat in reflow mounting and humidity absorbed in storage. Therefore, before you perform reflow mounting, contact Oki's responsible sales person on the product name, package name, pin number, package code and desired mounting conditions (reflow method, temperature and times).

(Unit : mm)

SSOP30-P-56-0.65-K



Package material	Epoxy resin
Lead frame material	42 alloy
Pin treatment	Solder plating
Solder plate thickness	5 μm or more
Package weight (g)	0.19 TYP.

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