OKI Semiconductor

MSM6652/53/54/55/56-xxx, MSM6652A/53A/ 54A/55A/56A/58A-xxx, MSM66P54-xx, MSM66P56-xx, MSM6650

Internal Mask ROM Voice Synthesis IC, Internal One-Time-Programmable (OTP) ROM Voice Synthesis IC, External ROM Drive Voice Synthesis IC

This document contains minimum specifications. For full specifications, please contact your nearest Oki office or representative.

GENERAL DESCRIPTION

The MSM6650 family is the successor to OKI's MSM6375 family. To ensure high-quality voice synthesis, the MSM6650 family members offer adaptive differential pulse-code modulation (ADPCM) playback, pulse-code modulation (PCM) playback, 12-bit D/A conversion, and on-chip -40 dB/ octave low-pass filter (LPF).

The conventional "beep" tones and 2-channel playback are now easier to use. OKI has added additional functions such as melody play, fade-out, and random playback. OKI has improved external control by adding an Edit ROM. The Edit ROM can be used to form sentences by linking phrases.

The MSM6650 family members can support a variety of applications as it can function in either Standalone Mode or Microcontroller Interface Mode. In Microcontroller Interface Mode, serial input control is available. Serial input control minimizes the number of microcontroller port pins required for voice synthesis control. The MSM6650 family includes an internal mask ROM version, internal one-time-programmable (OTP) ROM version, and external ROM version. The features of the MSM6650 family devices are as follows.

• MSM6652/53/54/55/56-xxx

These devices are single-chip voice synthesizers with an on-chip mask ROM using the CMOS technology.

Standalone Mode or Microcontroller Interface Mode can be selected by mask option.

- MSM6652A/53A/54A/55A/56A/58A-xxx The trial production period for these devices is shorter than those described above. These devices are suitable for developing prototype models and concept demonstration of new products.
- MSM66P54-xx, MSM66P56-xx
 The device is a single-chip CMOS voice synthesizer with one-time-programmable (OTP) ROM.
 Standalone and Microcontroller Interface Modes are selected by using a code (01-04).
 The user can easily write voice data using the development tool AR761 or AR762, or P54 adapter.
 Unlike the mask ROM version, the OTP version is suited to applications which requires a small lot
 production of different type devices or short delivery time.
- MSM6650

The MSM6650 device can directly connect external ROM or EPROM of up to 64 Mbits, which stores voice data.

This device is ideally suited to an evaluation IC for the MSM6650 family because its circuit configuration is identical to those of the mask ROM-based and OTP version devices.

• Option Table

	Din Nomo	Microcontroller	Interface Mode	Standalo	ne Mode	-		
	Finname	Serial Input	Parallel Input	With Standby	No Standby	-		
MSM6652/53/54/55/56			Mack Option					
MSM6652A/53A/54A/55A/56A/58A		Mask Option						
MSM66P54/P56	—	-01	-02	-03	-04	*2		
	CPU	"H"	"H"	"L"	"L"			
MSM6650	SERIAL	"H"	"L"	"L"	"L"	-		
	STBY		—	"L"	"H"	-		

- *1. The options for the mask ROM-based devices are mask options. The user should send OKI an option list before starting development. A sample of option list is shown below.
- *2. A code of OTP version device corresponds to one of the options. The user should specify either MSM66P54-03 or MSM66P54-04 or MSM66P56-03 or MSM66P56-04. (In this case, no option list is required.)

						Date:
		<u>0</u>	ption Li	i <u>st</u>		
ou are rec	uested to develo	o MSM665X-XXX on ti	he follow	ing conditions.		
Options						
ere are fo loose and	our options for the circle the desired	e MSM6650 family. 1 option.				
	Option	Interface mode	•	Input	Standby conversion	
	Option A	Microcontroller		Serial	_	
	Option B	Microcontroller		Parallel	_	
	Option C	Standalone		_	Yes	
	Option D	Standalone		_	No	
Package	and quantity					
Item	(circle	Package the desired one)		Quantity	Note	
Ceramic sample	18-pin DIP (ceramic)	24-pin SOP (ceramic)	chip	pcs	Up to 10 samples. Operating temp. : 10 to 30°C	
	18-pin DIP (plastic)	24-pin SOP (plastic)	chip	pcs	Up to 50 samples	
Mold sample		04.000	chin	ncs per lot	t	
Mold sample Mass produc- tion	18-pin DIP (plastic)	(plastic)	omp	monthly		

STANDALONE MODE

FEATURES

Dovice name	POM size	Maximum playback time (sec)						
Device name	NOW SIZE	f _{SAM} =4.0 kHz	f _{SAM} =6.4 kHz	f _{SAM} =8.0 kHz	f _{SAM} =16 kHz			
MSM6652, 6652A	288 Kbits	16.9	10.5	8.4	4.2			
MSM6653, 6653A	544 Kbits	31.2	19.5	15.6	7.8			
MSM6654, 6654A	1 Mbit	63.8	39.9	31.9	15.9			
MSM6655, 6655A	1.5 Mbits	96.5	60.3	48.2	24.1			
MSM6656, 6656A	2 Mbits	129.1	80.7	64.5	32.2			
MSM6658A	4 Mbits	259.7	162.9	129.8	64.9			
MSM66P54	1 Mbit	63.8	39.9	31.9	15.9			
MSM66P56	2 Mbit	129.1	80.7	64.5	32.2			
MSM6650	64 Mbits (Max)	4194.3	2620.5	2096.4	1048.2			

Note: Actual voice ROM area is smaller by 22 Kbits.

- 4-bit ADPCM or 8-bit PCM sound generation
- Melody function
- Edit ROM function
- Two-channel mixing function
- Built-in random playback function
- Fade-out function via four-step sound volume attenuation
- Built-in beep tone of 0.5 kHz, 1.0 kHz, 1.3 kHz, or 2.0 kHz selectable with a specific code
- Sampling frequency of 4.0 kHz, 5.3 kHz, 6.4 kHz, 8.0 kHz, 10.6 kHz, 12.8 kHz, 16.0 kHz, or 32.0 kHz (32 kHz sampling is not possible when using RC oscillation)
- Up to 120 phrases
- Built-in 12-bit D/A converter
- Built-in –40 dB/octave low-pass filter
- Standby function
- Selectable RC or ceramic oscillation
- Package options: 18-pin plastic DIP (DIP18-P-300-2.54) (Product name: MSM6652-xxxRS/MSM6653-xxxRS/ MSM6654-xxxRS/MSM6655-xxxRS/ MSM6656-xxxRS/MSM6652A-xxxRS/ MSM6653A-xxxRS/MSM6654A-xxxRS/ MSM6655A-xxxRS/MSM6656A-xxxRS/ MSM6658A-xxxRS) 24-pin plastic SOP (SOP24-P-430-1.27-K) (Product name: MSM6652-xxxGS-K/MSM6653-xxxGS-K/ MSM6654-xxxGS-K/MSM6655-xxxGS-K/ MSM6656-xxxGS-K/MSM6652A-xxxGS-K/ MSM6653A-xxxGS-K/MSM6654A-xxxGS-K/ MSM6655A-xxxGS-K/MSM6656A-xxxGS-K/ MSM6658A-xxxGS-K/MSM66P54-03GS-K/ MSM66P54-04GS-K/MSM66P56-03GS-K/ MSM66P56-04GS-K) 20-pin plastic DIP (DIP20-P-300-2.54-W1) (Product name: MSM66P54-03RS/MSM66P54-04RS/ MSM66P56-03RS/MSM66P56-04RS) 64-pin plastic QFP (QFP64-P-1420-1.00-BK) (Product name: MSM6650GS-BK) 64-pin plastic SDIP (SDIP64-P-750-1.778) (Product name: MSM6650SS)

BLOCK DIAGRAMS

MSM6652/53/54/55/56-xxx MSM6652A/53A/54A/55A/56A/58A-xxx





MSM66P54/P56-xx

MSM6650 Family

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MSM6650

MSM6650 Family



PIN CONFIGURATION (TOP VIEW)

MSM6656-xxxGS-K, MSM6652A-xxxGS-K, MSM6653A-xxxGS-K, MSM6654A-xxxGS-K, MSM6655A-xxxGS-K, MSM6656A-xxxGS-K,

MSM6658A-xxxGS-K

The MSM66P54-xx and MSM66P56-xx has two more pins than the MSM6652-6658A while their pin configurations are identical.

The additional two pins (V_{PP}, \overline{PGM}) of the MSM66P54-xx/P56-xx may be open at playback after completion of writing.



MSM6650

Product name: MSM6650GS-BK



NC : No connection

64-Pin Plastic QFP

Product name: MSM6650SS





64-Pin Plastic SDIP

PIN DESCRIPTIONS

1	MSM6652/53/54/55/56-xxx, MSM6652A/53A/54A/55A/56A/58A-xx	x
	18-Pin plastic DIP	

Pin	Symbol	Туре	Description
5	RESET	I	Reset. Setting this pin to "L" puts the LSI in standby status. At this time, oscillation stops, AOUT is pulled to GND, and the deveice is initialized. This pin has an internal pull-up resistor.
6	BUSY	0	Busy. This pin outputs a "L" level during playback. At power-on, this pin is at "H" level.
7	XT/CR	I	XT/CR selectable pin. Set to "H" level when using ceramic oscillation. Set to "L" level when using RC oscillation.
8	AOUT	0	Sound Output. This is the synthesized output pin of the internal low-pass filter.
11	OSC1	I	Oscillator 1. This pin is a ceramic oscillator connection pin when using ceramic oscillation. This pin is an RC connection pin when using RC oscillation. When using an external clock, use this pin as the clock input.
12	OSC2	0	Oscillator 2. This pin is a ceramic oscillator connection pin when using a ceramic oscillator. This is an RC connection pin when using RC oscillation. Leave open if using an external clock. OSC2 outputs a "L" level in standby status.
13	OSC3	0	Oscillator 3. Leave open if using a ceramic oscillator. This pin is the RC connection pin when using RC oscillation. When RC oscillation is selected, OSC3 outputs a "H" level in standby status.
14	RND	I	Random Playback. Random playback starts when the RND pin is set to a "L" level. At the fall of RND, addresses from the random address playback circuit inside the IC are fetched. Set to a "H" level if random playback is not used. This pin has an internal pull-up resistor.
15-18	SW0-SW3	I	Phrase Inputs. These pins are phrase input pins corresponding to playback. If the input changes, SW0 to SW3 pins capture address data after 16 ms and speech playback commences. These pins have internal pull-down resistors.
1-3	A0-A2	I	Phrase Inputs. Phrase input pins correspoding to playback. The A0 input becomes invalid when the random playback function is used.
9	GND	_	Ground.
10	V _{DD}		Power supply. Insert a $0.1\mu F$ or more bypass capacitor between this pin and GND.
4	TEST		Test Mode. Set to "H" level. This pin has an internal pull-up resistor.

2.MSM66P54-xx, MSM66P56-xx

20-Pin plastic DIP

Pin	Symbol	Туре	Description
6	RESET	I	Reset. Setting this pin to "L" puts the LSI in standby status. At this time, oscillation stops, AOUT is pulled to GND, and the deveice is initialized. This pin has an internal pull-up resistor.
7	BUSY	0	Busy. This pin outputs a "L" level during playback. At power-on, this pin is at "H" level.
8	XT/CR	I	XT/CR selectable pin. Set to "H" level when using ceramic oscillation. Set to "L" level when using RC oscillation.
9	AOUT	0	Sound Output. This is the synthesized output pin of the internal low-pass filter.
12	OSC1	I	Oscillator 1. This pin is a ceramic oscillator connection pin when using ceramic oscillation. This pin is an RC connection pin when using RC oscillation. When using an external clock, use this pin as the clock input.
13	OSC2	0	Oscillator 2. This pin is a ceramic oscillator connection pin when using a ceramic oscillator. This is an RC connection pin when using RC oscillation. Leave open if using an external clock. OSC2 outputs a "L" level in standby status.
14	OSC3	0	Oscillator 3. Leave open if using a ceramic oscillator. This pin is the RC connection pin when using RC oscillation. When RC oscillation is selected, OSC3 outputs a "H" level in standby status.
15	RND	I	Random Playback. Random playback starts when the RND pin is set to a "L" level. At the fall of RND, addresses from the random address playback circuit inside the IC are fetched. Set to a "H" level if random playback is not used. This pin has an internal pull-up resistor.
16-19	SW0-SW3	I	Phrase Inputs. These pins are phrase input pins corresponding to playback. If the input changes, SW0 to SW3 pins capture address data after 16 ms and speech playback commences. These pins have internal pull-down resistors.
2-4	A0-A2	I	Phrase Inputs. Phrase input pins correspoding to playback. The A0 input becomes invalid when the random playback function is used.
10	GND	_	Ground.
11	V _{DD}	—	Power supply. Insert a $0.1\mu F$ or more bypass capacitor between this pin and GND
5	TEST	I	Test Mode. Set to "H" level. This pin has an internal pull-up resistor.
1	V _{PP}		Power supply used when writing data to internal OTP ROM. Leave open or set to "H" level during playback.
20	PGM	I	Interface with voice analysis edit tool AR203 or AR204. Set to "L" level or leave open during playback.

3.MSM6652/53/54/55/56-xxx, MSM6652A/53A/54A/55A/56A/58A-xxx, MSM66P54-xx, MSM66P56-xx 24-Pin plastic SOP

Pin	Symbol	Туре	Description
17	RESET	I	Reset. Setting this pin to "L" puts the LSI in standby status. At this time, oscillation stops, AOUT is pulled to GND, and the deveice is initialized. This pin has an internal pull-up resistor.
20	BUSY	0	Busy. This pin outputs a "L" level during playback. At power-on, this pin is at "H" level.
22	XT/CR	I	XT/CR selectable pin. Set to "H" level when using ceramic oscillation. Set to "L" level when using RC oscillation.
23	AOUT	0	Sound Output. This is the synthesized output pin of the internal low-pass filter.
2	OSC1	I	Oscillator 1. This pin is a ceramic oscillator connection pin when using ceramic oscillation. This pin is an RC connection pin when using RC oscillation. When using an external clock, use this pin as the clock input.
3	OSC2	0	Oscillator 2. This pin is a ceramic oscillator connection pin when using a ceramic oscillator. This is an RC connection pin when using RC oscillation. Leave open if using an external clock. OSC2 outputs a "L" level in standby status.
5	OSC3	0	Oscillator 3. Leave open if using a ceramic oscillator. This pin is the RC connection pin when using RC oscillation. When RC oscillation is selected, OSC3 outputs a "H" level in standby status.
8	RND	I	Random Playback. Random playback starts when the RND pin is set to a "L" level. At the fall of RND, addresses from the random address playback circuit inside the IC are fetched. Set to a "H" level if random playback is not used. This pin has an internal pull-up resistor.
9-12	SW0-SW3	I	Phrase Inputs. These pins are phrase input pins corresponding to playback. If the input changes, SW0 to SW3 pins capture address data after 16 ms and speech playback commences. These pins have internal pull-down resistors.
13-15	A0-A2	I	Phrase Inputs. Phrase input pins correspoding to playback. The A0 input becomes invalid when the random playback function is used.
24	GND		Ground.
1	V _{DD}		Power supply. Insert a $0.1\mu F$ or more bypass capacitor between this pin and GND.
16	TEST	Ι	Test Mode. Set to "H" level. This pin has an internal pull-up resistor.
18	V _{PP} *	_	Power supply used when writing data to internal OTP ROM. Leave open or set to "H" level during playback.
7	PGM*	I	Interface with voice analysis edit tool AR203 or AR204. Set to "L" level or leave open during playback.

* Pins for MSM66P54/56-xx only

4.MSM6650

64-Pin plastic QFP (64-Pin plastic SDIP)

Pin	Symbol	Туре	Description			
29(19)	RESET	I	Reset. Setting this pin to "L" puts the LSI in standby status. At this time, oscillation stops, AOUT is pulled to GND, and the deveice is initialized. This pin has an internal pull-up resistor.			
3(57)	BUSY	0	Busy. This pin outputs a "L" level during playback. At power-on, this pin is at "H" level.			
15(5)	XT/CR	I	XT/CR selectable pin. Set to "H" level when using ceramic oscillation. Set to "L" level when using RC oscillation.			
5 (59)	AOUT	0	Sound Output. This is the synthesized output pin of the internal low-pass filter.			
10(64)	XT/OSC1	I	Oscillator 1. This pin is a ceramic oscillator connection pin when using ceramic oscillation. This pin is an RC connection pin when using RC oscillation. When using an external clock, use this pin as the clock input.			
11(1)	XT/0SC2	0	Oscillator 2. This pin is a ceramic oscillator connection pin when using a ceramic oscillator. This is an RC connection pin when using RC oscillation. Leave open if using an external clock. OSC2 outputs a "L" level in standby status.			
12(2)	OSC3	0	Oscillator 3. Leave open if using a ceramic oscillator. This pin is the RC connection pin when using RC oscillation. When RC oscillation is selected, OSC3 outputs a "H" level in standby status.			
14(4)	RND	I	Random Playback. Random playback starts when the RND pin is set to a "L" level. At the fall of RND, addresses from the random address playback circuit inside the IC are fetched. Set to a "H" level if random playback is not used. This pin has an internal pull-up resistor.			
21-24 (11-14)	SW0-SW3	I	Phrase Inputs. These pins are phrase input pins corresponding to playback. If the input changes, SW0 to SW3 pins capture address data after 16 ms and speech playback commences. These pins have internal pull-down resistors.			
25-27	A0 A0		Phrase Inputs. Phrase input pins correspoding to playback. The A0 input			
(15-17)	AU-AZ		becomes invalid when the random playback function is used.			

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Pin	Symbol	Туре	Description
6 (60)	AGND	_	Analog ground pin.
7 (61)	DGND	_	Digital ground pin.
8 (62)	AV _{DD}		Analog power pin. Insert a 0.1 μ F or more bypass capacitor in between this pin and AGND.
9 (63)	DV _{DD}		Digiral power pin. Insert a 0.1 μ F or more bypass capacitor in between this pin and DGND.
16 (6)	CPU	I	CPU Mode. Set to "L" level to select Standalone Mode. Set to "H" level to select Microcontroller Interface Mode.
13, 28 (3, 18)	TEST1, 3	I	Test. Set these pins to "H" level. The $\overline{\text{TEST1}}$ and $\overline{\text{TEST3}}$ pins have internal pull-up resistor.
17 (7)	TEST2	Ι	Test. Set this pin to "L" level.
18 (8)	IBUSY	0	I Busy. Outputs a "L" level during voice playback (except during standby conversion time), or when the AOUT pin is at half V _{DD} level.
20 (10)	STANDBY	0	Standby Indicator. This output pin remains at "L" level during oscillation.
30 (20)	CE	0	Chip Enable. \overline{CE} is a timing output pin to control read of external memory. This pin outputs when \overline{RCS} is at the "L" level. This pin goes high impedance when \overline{RCS} is at the "H" level.
31 (21)	RCS	I	Read Chip Select. The data bits D0-D7 are internally pulled down when $\overline{\text{RCS}}$ is high. Addresses and $\overline{\text{CE}}$ are output when $\overline{\text{RCS}}$ is at "L" level. The RA22-RA0 address pins and $\overline{\text{CE}}$ pin become high impedance.
32, 34-40 (22, 24-30)	D0-D7	I	External Memory Data Bus. Data is input when \overline{RCS} is low. When \overline{RCS} is high, these pins become low due to internal pull-down resistors.
41-63 (31-40, 42-54)	RA0-RA22	0	External Memory Address. These are address pins for an external memory output when RCS is low. These pins become high impedance status if RCS is in "H" level.
64 (55)	STBY	I	Standby Contorl. If set to "L" level, the MSM6650 enters standby mode 0.2 seconds after voice ends. If set to "H" level, the MSM6650 AOUT output maintains half V_{DD} after voice ends.

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}	14 - 20 0	-0.3 to V _{DD} +0.3	V
Storage temperature	T _{STG}	—	-55 to +150	°C

RECOMMENDED OPERATING CONDITIONS

						(GND=0 V)	
Parameter	Symbol	Condition		Range		Unit	
Power supply voltage	Vaa	MSM6652-56, MSM6650,		0.4 += 5.5			
	VDD	MSM6652A-56A		V			
	V _{DD}	MSM6658A, MSM66P54/P56	3.5 to 5.5			V	
Operating temperature	T _{op}	_	-40 to +85			°C	
Master clock frequency 1		When ervetal selected	Min.	Тур.	Max.	MHz	
Master Clock Hequelicy I	TOSC1	WHEN GIYSIAI SEIEGIEU	3.5	4.096	4.5		
Master clock frequency 2	fosc2	When RC selected (*)	200	256	300	kHz	

* If RC oscillation is selected, 32kHz sampling frequency cannot be selected.

ELECTRICAL CHARACTERISTICS

DC Characteristics

		(V _{DD} =4.5	5 to 5.5 V, 0	GND=0 V,	Ta=-40 to	+85°C)
Parameter	Symbol	Condition	Min.	Тур.	Max.	Unit
"H" input voltage	V _{IH}		0.84×V _{DD}		—	V
"L" input voltage	VIL	—	—		$0.17 \times V_{DD}$	V
"H" output voltage	V _{OH}	I _{OH} =-1 mA	4.6		_	V
"L" output voltage	V _{OL}	I _{OL} =2 mA	_		0.4	V
"H" input current 1	I _{IH1}	V _{IH} =V _{DD}			10	μA
"H" input current 2	I _{IH2}	Internal pull-down resistance	30	90	200	μA
"L" input current 1	l _{IL1}	V _{IL} =GND	-10	_	_	μA
"L" input current 2 (note)	I _{IL2}	Internal pull-up resistance	-200	-90	-30	μA
Operating power consumption	I _{DD}	f _{OSC} =4.096 MHz, No load	_	6	10	mA
Standby power consumption		Ta=-40°C to +50°C		_	10	μA
	IDS	Ta=-40°C to +85°C	_	_	30	μA

DC Characteristics

(V_{DD}=2.4 to 3.6 V, GND=0 V, Ta=-40 to +85°C)

Parameter	Symbol	Condition	Min.	Тур.	Max.	Unit
"H" input voltage	V _{IH}	—	0.84×V _{DD}	—	—	V
"L" input voltage	VIL	—	_	—	0.17×V _{DD}	V
"H" output voltage	V _{OH}	I _{0H} =-1 mA	2.6	—	—	V
"L" output voltage	V _{OL}	I _{OL} =2 mA	_	—	0.4	V
"H" input current 1	I _{IH1}	V _{IH} =V _{DD}	—	—	10	μA
"H" input current 2	I _{IH2}	Internal pull-down resistance	10	30	100	μA
"L" input current 1	l _{IL1}	V _{IL} =GND	-10	—	—	μA
"L" input current 2	I _{IL2}	Internal pull-up resistance	-100	-30	-10	μA
Operating power consumiption	I _{DD}	f _{OSC} =4.096 MHz, No load	_	4	7	mA
Standby power consumption		Ta=-40°C to +50°C	—	—	5	μA
	IDS	Ta=-40°C to +85°C	_	_	20	μA
LPF driving resistance	R _{AOUT}	When LPF output is selected	50	—	—	kΩ
LPF output impedance	R _{LPF}	I _F =100 μA	_	1	3	kΩ

APPLICATION CIRCUITS

(MSM6652/53/54/55/56-xxx, MSM6652A/53A/54A/55A/56A/58A-xxx, MSM66P54/P56-xx)





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(MSM6652/53/54/55/56-xxx, MSM6652A/53A/54A/55A/56A/58A-xxx, MSM66P54/P56-xx)

Application Circuit in Standalone Mode Supporting Four Switch-Selected Words

GND

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A2

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	A2	A1	A 0	SW3	SW2	SW1	SW0	ADR
S1	0	0	0	0	0	0	1	01
S2	0	0	0	0	0	1	0	02
S3	0	0	0	0	1	0	0	04
S4	0	0	0	1	0	0	0	08

Switches and Playback Addresses





Application Circuit in Standalone Mode Supporting 15 Switch-Selected Phrases

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Application Circuit in Standalone Mode Supporting Four 1-Mbit EPROMs

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MICROCONTROLLER INTERFACE MODE

FEATURES

Dovice name	Data ROM	Maximum playback time (sec)						
Device name	size	f _{SAM} =4.0 kHz	f _{SAM} =6.4 kHz	f _{SAM} =8.0 kHz	f _{SAM} =16 kHz	f _{SAM} =32 kHz		
MSM6652, 6652A	288 Kbits	16.9	10.5	8.4	4.2	2.1		
MSM6653, 6653A	544 Kbits	31.2	19.5	15.6	7.8	3.9		
MSM6654, 6654A	1 Mbit	63.8	39.9	31.9	15.9	7.9		
MSM6655, 6655A	1.5 Mbits	96.5	60.3	48.2	24.1	12.0		
MSM6656, 6656A	2 Mbits	129.1	80.7	64.5	32.2	16.1		
MSM6658A	4 Mbits	259.7	162.9	129.8	64.9	32.4		
MSM66P54	1 Mbit	63.8	39.9	31.9	15.9	7.9		
MSM66P56	2 Mbit	129.1	80.7	64.5	32.2	16.1		
MSM6650	64 Mbits (Max)	4194.3	2620.5	2096.4	1048.2	524.1		

Note: Actual voice ROM area is smaller by 22 Kbits.

- 4-bit ADPCM or 8-bit PCM sound generation
- Melody function
- Edit ROM function
- Two-channel mixing function
- Fade-out function via four-step sound volume attenuation
- Serial input or parallel input selectable
- Built-in beep tone of 0.5 kHz, 1.0 kHz, 1.3 kHz, or 2.0 kHz selectable with a specific code
- Sampling frequency of 4.0 kHz, 5.3 kHz, 6.4 kHz, 8.0 kHz, 10.6 kHz, 12.8 kHz, 16.0 kHz, or 32.0 kHz (32 kHz sampling is not possible when using RC oscillation)
- Up to 127 phrases
- Built-in 12-bit D/A converter
- Built-in -40 dB/octave low-pass filter
- Standby function
- Package options:

18-pin plastic DIP (DIP18-P-300-2.54)	(Product name: MSM6652-xxxRS/MSM6653-xxxRS/
* *	MSM6654-xxxRS/MSM6655-xxxRS/
	MSM6656-xxxRS/MSM6652A-xxxRS/
	MSM6653A-xxxRS/MSM6654A-xxxRS/
	MSM6655A-xxxRS/MSM6656A-xxxRS/
	MSM6658A-xxxRS)
24-pin plastic SOP (SOP24-P-430-1.27-K)	(Product name:MSM6652-xxxGS-K/MSM6653-xxxGS-K/
	MSM6654-xxxGS-K/MSM6655-xxxGS-K/
	MSM6656-xxxGS-K/MSM6652A-xxxGS-K/
	MSM6653A-xxxGS-K/MSM6654A-xxxGS-K/
	MSM6655A-xxxGS-K/MSM6656A-xxxGS-K/
	MSM6658A-xxxGS-K/MSM66P54-01GS-K/
	MSM66P54-02GS-K/MSM66P56-01GS-K/
	MSM66P56-02GS-K)
20-pin plastic DIP (DIP20-P-300-2.54-W1)	(Product name: MSM66P54-01RS/MSM66P54-02RS/
	MSM66P56-01RS/MSM66P56-02RS)
64-pin plastic QFP (QFP64-P-1420-1.00-BK)(Product name: MSM6650GS-BK)
64-pin plastic SDIP (SDIP64-P-750-1.778)	(Product name: MSM6650SS)

BLOCK DIAGRAMS

MSM6652/53/54/55/56-xxx MSM6652A/53A/54A/55A/56A/58A-xxx





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MSM6650 Family

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MSM6650

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MSM6650 Family



PIN CONFIGURATION (TOP VIEW)

The MSM66P54/P56-xx has two more pins than the MSM6652-6658A while their pin configurations are identical.

The additional two pins (V_{PP}, \overline{PGM}) of the MSM66P54/P56-xx may be open at playback after completion of writing.





MSM6652-xxxRS, MSM6653-xxxRS, MSM6654-xxxRS, MSM6655-xxxRS, MSM6656-xxxRS, MSM6652A-xxxRS, MSM6653A-xxxRS, MSM6654A-xxxRS, MSM6655A-xxxRS, MSM6656A-xxxRS, MSM6658A-xxxRS

MSM6653A-xxxGS-K, MSM6654A-xxxGS-K, MSM6655A-xxxGS-K, MSM6656A-xxxGS-K,

MSM6658A-xxxGS-K



MSM66P54-01/-02RS MSM66P56-01/-02RS

MSM6650

Product name: MSM6650GS-BK



NC : No connection

64-Pin Plastic QFP

Product name: MSM6650SS



NC : No connection

64-Pin Plastic SDIP

PIN DESCRIPTIONS

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1.MSM6652/53/54/55/56-xxx, MSM6652A/53A/54A/55A/56A/58A-xxx
18-Pin plastic DIP
```

Pin	Symbol	Туре	Description
			Reset. The devices enter stanby status when a low level is input to this pin.
5	RESET		When RESET, oscillation stops. The AOUT output goes to ground and the IC
·	5 RESEI		status is reinitialized.
			This pin has an internal pull-up resistor.
6	BUSY	0	Busy. Outputs a "L" level during playback and a "H" level when power is turned ON.
			The CMD and ST inputs become effective when high. NAR indicates whether the
7	NAR	0	address bus (10 through 16) is ready to accept another address. When high, it is
			ready to accept. NAR goes high when power is turned ON.
8	AOUT	0	Analog Speech Output. D/A converter output or LPF output is selected by entering the command.
			Ceramic Oscillator Input. This pin has an internal 0.5 to 5 M Ω feedback
11	XI		resistor between XT and XT. If an external clock is used, this is the clock input pin.
12	XT	0	Ceramic Oscillator Output. If an external clock is used, leave this pin open.
13	CMD	I	Command Input and Option Control. This pin is used as command and option input when CMD is at the high level with \overline{ST} low. If this pin is not used or serial input is optioned, set this pin to "H" level. This pin has an internal pull-up resistor.
14	ST	I	Start. Speech playback starts at the fall of the \overline{ST} pulse. The IO - I6 addresses are latched at the rise of the \overline{ST} pulse. Input a \overline{ST} pulse when NAR goes to the high level for channels 1 and 2. This pin has an internal pull-up resistor.
4	CH	I	Channel Control. Channel 1 is selected when the input is pulled high. Channel 2 is selected when the input is low. This pin has an internal pull-up resistor.
3	I6/SD	I	This pin is command and user-defined phrase input when parallel input is optioned. This pin is serial data (command and address) input when serial input is optioned.
			This pin is command and user-defined phrase input when parallel input is optioned.
2	15/SI		This pin is used as serial clock input when serial input is optioned.
1	14	I	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, set this pin to "L" level. This pin has an internal pull-down resistor.
18	I3/PORT1	I/O	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, this pin is a port output. The port output is controlled by entering external silence insertion code.
			This pin is command and user-defined phrase input when parallel input is optioned.
17	I2/PORT0	I/0	When serial input is optioned, this pin is a port output. The port output is controlled
			by entering external silence insertion code.
			This pin is command and user-defined phrase input when parallel input is optioned.
15, 16	10.11		When serial input is optioned, set this pin to "L" level. This pin has an internal
,	,		pull-down resistor.
9	GND	_	Ground pin.
10	V _{DD}	_	Power supply. Insert a $0.1\mu F$ ro more bypass capacitor between this pin and GND.

2.MSM66P54/P56-xx

20-Pin plastic DIP

Pin	Symbol	Туре	Description
			Reset. The devices enter stanby status when a low level is input to this pin.
6	RESET		When RESET, oscillation stops. The AOUT output goes to ground and the IC $% \mathcal{A}$
-			status is reinitialized.
			This pin has an internal pull-up resistor.
7	BUSY	0	Busy. Outputs a "L" level during playback and a "H" level when power is turned ON.
			The CMD and ST inputs become effective when high. NAR indicates whether the
8	NAR	0	address bus (10 through 16) is ready to accept another address. When high, it is
			ready to accept. NAR goes high when power is turned ON.
0	ΛΟΙΙΤ	0	Analog Speech Output. D/A converter output or LPF output is selected by
	AUUT	0	entering the command.
10	VT		Ceramic Oscillator Input. This pin has an internal 0.5 to 5 $M\Omega$ feedback
12			resistor between XT and $\overline{\text{XT}}$. If an external clock is used, this is the clock input pin.
13	XT	0	Ceramic Oscillator Output. If an external clock is used, leave this pin open.
14	CMD	I	Command Input and Option Control. This pin is used as command and option input when CMD is at the high level with \overline{ST} low. If this pin is not used or serial input is optioned, set this pin to "H" level. This pin has an internal pull-up resistor.
15	ST	I	Start. Speech playback starts at the fall of the \overline{ST} pulse. The IO - I6 addresses are latched at the rise of the \overline{ST} pulse. Input a \overline{ST} pulse when NAR goes to the high level for channels 1 and 2. This pin has an internal pull-up resistor.
5	CH	I	Channel Control. Channel 1 is selected when the input is pulled high. Channel 2 is selected when the input is low. This pin has an internal pull-up resistor.
4	I6/SD	I	This pin is command and user-defined phrase input when parallel input is optioned. This pin is serial data (command and address) input when serial input is optioned.
			This pin is command and user-defined phrase input when parallel input is optioned.
3	15/SI		This pin is used as serial clock input when serial input is optioned.
2	14	I	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, set this pin to "L" level. This pin has an internal pull-down resistor.
			This pin is command and user-defined phrase input when parallel input is optioned.
19	I3/PORT1	I/0	When serial input is optioned, this pin is a port output. The port output is controlled
			by entering external silence insertion code.
			This pin is command and user-defined phrase input when parallel input is optioned.
18	I2/PORT0	I/0	When serial input is optioned, this pin is a port output. The port output is controlled
			by entering external silence insertion code.
			This pin is command and user-defined phrase input when parallel input is optioned.
16, 17	10, 11	1	When serial input is optioned, set this pin to "L" level. This pin has an internal
			pull-down resistor.
10	GND	_	Ground pin.
11	Vnn	_	Power supply. Insert a 0.1µF ro more bypass capacitor between this pin and GND.
1	Vpp	_	Supply voltage for writing data to internal OTP ROM.
			Interface with voice analysis edit tools AR203 and AR204. Set to "L" level or leave
20	PGM		open during playback. This pin has an internal pull-down resistor.

3.MSM6652/53/54/55/56-xxx, MSM6652A/53A/54A/55A/56A/58A-xxx, MSM66P54/P56-xx 24-Pin plastic SOP

Pin	Symbol	Туре	Description			
17	RESET	I	Reset. The devices enter stanby status when a low level is input to this pin. When RESET, oscillation stops. The AOUT output goes to ground and the IC status is reinitialized. This pin has an internal pull-up resistor.			
20	BUSY	0	Busy. Outputs a "L" level during playback and a "H" level when power is turned ON.			
22	NAR	0	The CMD and ST inputs become effective when high. NAR indicates whether the address bus (I0 through I6) is ready to accept another address. When high, it is ready to accept. NAR goes high when power is turned ON.			
23	AOUT	0	Analog Speech Output. D/A converter output or LPF output is selected by entering the command.			
2	XT	I	Ceramic Oscillator Input. This pin has an internal 0.5 to 5 M Ω feedback resistor between XT and \overline{XT} . If an external clock is used, this is the clock input pin.			
3	XT	0	Ceramic Oscillator Output. If an external clock is used, leave this pin open.			
5	CMD	I	Command Input and Option Control. This pin is used as command and option input when CMD is at the high level with ST low. If this pin is not used or serial input is optioned, set this pin to "H" level. This pin has an internal pull-up resistor.			
8	ST	I	Start. Speech playback starts at the fall of the \overline{ST} pulse. The IO - I6 addresses are latched at the rise of the \overline{ST} pulse. Input a \overline{ST} pulse when NAR goes to the high level for channels 1 and 2. This pin has an internal pull-up resistor.			
16	CH	I	Channel Control. Channel 1 is selected when the input is pulled high. Channel 2 is selected when the input is low. This pin has an internal pull-up resistor.			
15	I6/SD	I	This pin is command and user-defined phrase input when parallel input is optioned. This pin is serial data (command and address) input when serial input is optioned.			
14	15/SI	I	This pin is command and user-defined phrase input when parallel input is optioned. This pin is used as serial clock input when serial input is optioned.			
13	14	I	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, set this pin to "L" level. This pin has an internal pull-down resistor.			
12	I3/PORT1	I/O	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, this pin is a port output. The port output is controlled by entering external silence insertion code.			
11	I2/PORT0	I/O	This pin is command and user-defined phrase input when parallel input is optioned When serial input is optioned, this pin is a port output. The port output is controlled by entering external silence insertion code.			

Pin	Symbol	Туре	Description
9, 10	10, 11	I	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, set this pin to "L" level. This pin has an internal pull-down resistor.
24	GND	_	Ground pin.
1	V _{DD}		Power supply. Insert a 0.1μ F ro more bypass capacitor between this pin and GND.
18	V _{PP} *	_	Supply voltage for writing data to internal OTP ROM.
7	PGM *	I	Interface with voice analysis edit tools AR761 and AR762. Set to "L" level or leave open during playback. This pin has an internal pull-down resistor.

* Pins for MSM66P54/56-xx only

4.MSM6650

64-Pin plastic QFP (64-Pin plastic SDIP)

Pin	Symbol	Туре	Description
29 (19)	RESET	I	Reset. The devices enter stanby status when a low level is input to this pin. When RESET, oscillation stops. The AOUT output goes to ground and the IC status is reinitalized. This pin has an internal pull-up resistor.
3 (57)	BUSY	0	Busy. Outputs a "L" level during playback and a "H" level when power is turned ON.
4 (58)	NAR	0	The CMD and ST inputs become effective when high. NAR indicates whether the address bus (I0 through I6) is ready to accept another address. When high, it is ready to accept. NAR goes high when power is turned ON.
5 (59)	AOUT	0	Analog Speech Output. D/A converter output or LPF output is selected by entering the command.
10 (64)	ХТ	I	Ceramic Oscillator Input. This pin has an internal 0.5 to 5 M Ω feedback resistor between XT and \overline{XT} . If an external clock is used, this is the clock input pin.
11 (1)	ΧT	0	Ceramic Oscillator Output. If an external clock is used, leave this pin open.
13 (3)	CMD	I	Command Input and Option Control. This pin is used as command and option input when CMD is at the high level with \overline{ST} low. If this pin is not used or serial input is optioned, set this pin to "H" level. This pin has an internal pull-up resistor.
14 (4)	ST	I	Start. Speech playback starts at the fall of the \overline{ST} pulse. The IO - I6 addresses are latched at the rise of the \overline{ST} pulse. Input a \overline{ST} pulse when NAR goes to the high level for channels 1 and 2. This pin has an internal pull-up resistor.
28 (18)	CH	I	Channel Control. Channel 1 is selected when the input is pulled high. Channel 2 is selected when the input is low. This pin has an internal pull-up resistor.
27 (17)	I6/SD	I	This pin is command and user-defined phrase input when parallel input is optioned. This pin is serial data (command and address) input when serial input is optioned.
26 (16)	15/SI	I	This pin is command and user-defined phrase input when parallel input is optioned. This pin is used as serial clock input when serial input is optioned.
25 (15)	14	I	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, set this pin to "L" level. This pin has an internal pull-down resistor.
24 (14)	13/PORT1	I/O	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, this pin is a port output. The port output is controlled by entering external silence insertion code.
23 (13)	I2/PORT0	I/O	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, this pin is a port output. The port output is controlled by entering external silence insertion code.
21, 22 (11, 12)	10, 11	I	This pin is command and user-defined phrase input when parallel input is optioned. When serial input is optioned, set this pin to "L" level. This pin has an internal pull-down resistor.

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Pin	Symbol	Туре	Description			
6 (60)	AGND	—	Analog ground pin.			
7 (61)	DGND	_	Digital ground pin.			
8 (62)	AV _{DD}	_	Analog power pin. Insert a 0.1µF or more bypass capacitor between this pin and AGND.			
9 (63)	DV _{DD}	—	Digital power pin. Insert a 0.1μ F or more bypass capacitor between this pin and DGND.			
10 (0)	MOK	•	Main clock output pin. Use MCK as a connection pin for the MSC1192, etc.			
12 (2)	MUK	0	When the IC is in standby status, MCK is held high.			
16 (6)	CPU	Ι	CPU Mode. Set to "H" level to select Microcontroller Interface Mode.			
			Serial/Parallel Interface Select. This input selects either the parallel or the			
17 (7)	SERIAL	I	serial input interface. The serial input interface is selected with a high level; the			
			parallel input interface is selected with a low level.			
		0	Chip Enable. CE is a timing output pin to control read of external memory. This pin outputs			
30 (20)	6E	U	when $\overline{\text{RCS}}$ is at the "L" level. This pin goes high impedance when $\overline{\text{RCS}}$ is at the "H" level.			
31 (21)	RCS	Ι	Read Chip Select. The data bits D0-D7 are internally pulled down when $\overline{\text{RCS}}$ is high.			
32, 34-40			External Memory Data Bus. Data is input when RCS is low. When RCS is high,			
(22, 24-30)	00-07	I	these pins become low due to internal pull-down resistors.			
41-63		0	External Memory Address. These are address pins for an external memory output			
(31-40, 42-54)	NAU - NAZZ	U	when $\overline{\text{RCS}}$ is low. These pins become high impedance status if $\overline{\text{RCS}}$ is in "H" level.			
15, 64			Test Catthese pipe to "II" level			
(5, 55)		I	rest. Set these phils to H level.			
18 (8)	IBUSY	0	Outputs a "L" level during playback or when AOUT is at 1/2 V _{DD} (except standby conversion)			
20 (10)	STANDBY	0	Outputs a "L" level during which the device is oscillating.			

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	VIN	10-200	-0.3 to V _{DD+} 0.3	V
Storage temperature	T _{STG}	_	-55 to +150	°C

RECOMMENDED OPERATING CONDITIONS

						(GND=0 V)	
Parameter	Symbol	Condition		Range		Unit	
		MSM6652-56, MSM6650,		0.4. 5.5			
Power supply voltage	V _{DD}	MSM6652A-56A		2.4 10 5.5			
		MSM6658A, MSM66P54/P56		V			
Operating temperature	T _{op}	—	-40 to +85			°C	
Master clock frequency	f _{OSC}		Min.	Тур.	Max.	MH7	
waster clock nequelicy			3.5	4.096	4.5		

ELECTRICAL CHARACTERISTICS

DC Characteristics

DC Characteristics	5 to 5.5 V, G	, GND=0 V, Ta=–40 to +85°C)				
Parameter	Symbol	Condition	Min.	Тур.	Max.	Unit
High level input voltage	V _{IH}	—	0.84×V _{DD}	—	—	٧
Low level input voltage	VIL	—	—	—	$0.17 \times V_{DD}$	V
High level output voltage	V _{OH}	I _{OH} =-1 mA	4.6	_	—	٧
Low level output voltage	V _{OL}	I _{OL} =2 mA	—	—	0.4	٧
High level input current 1	I _{IH1}	V _{IH} =V _{DD}	—	—	10	μA
High level input current 2	I _{IH2}	Internal pull-down resistor	30	90	200	μA
Low level input current 1	l _{IL1}	V _{IL} =GND	-10	—	—	μA
Low level input current 2 *1	I _{IL2}	Internal pull-up resistor	-200	-90	-30	μA
Operating current	I _{DD}	f _{OSC} =4.096 MHz, No load	—	6	10	mA
Standby current	I _{DS} -	Ta=-40°C to +50°C	—	_	10	μA
		Ta=-40°C to +85°C		—	30	μA
D/A output relative accuracy	V _{DAE}	When D/A output selected	—	—	40	mV
D/A output impedance	R _{DAO}	When D/A output selected *2	15	25	35	kΩ
		When D/A output selected *3	15	30	45	kΩ
LPF driving resisance	R _{AOUT}	When LPF output selected	50	_		kΩ
LPF output impedance	R _{LPF}	I _F =100 μA	—	1	3	kΩ

*1. Applied to $\overline{\text{RESET}}$, $\overline{\text{CMD}}$, $\overline{\text{ST}}$, $\overline{\text{CH}}$.

*2. Applied to MSM6652/53/54/55/56, MSM6652A/53A/54A/55A/56A/58A, MSM6650.

*3. Applied to MSM66P54/P56.

DC Characteristics

(V_{DD}=2.4 to 3.6 V, GND=0 V, Ta=-40 to +85°C)

Parameter	Symbol	Condition	Min.	Тур.	Max.	Unit
High level input voltage	V _{IH}	_	0.84×V _{DD}		—	V
Low level input voltage	VIL	—	—	—	0.17×V _{DD}	V
High level output voltage	V _{OH}	I _{OH} =-1 mA	2.6		—	V
Low level output voltage	V _{OL}	I _{OL} =2 mA	—	—	0.4	V
High level input current 1	I _{IH1}	V _{IH} =V _{DD}	—		10	μA
High level input current 2	I _{IH2}	Internal pull-down resistor	10	30	100	μA
Low level input current 1	l _{IL1}	V _{IL} =GND	-10	—	—	μA
Low level input current 2 (Note)	I _{IL2}	Internal pull-up resistor	-100	-30	-10	μA
Operating current	I _{DD}	f _{OSC} =4.096 MHz, No load	—	4	7	mA
Standby current	I _{DS}	Ta=-40°C to +50°C	—		5	μA
		Ta=-40°C to +85°C	—		20	μA
D/A output relative accuracy	V _{DAE}	When D/A output selected	—	—	20	mV
D/A output impedance	R _{DAO}	When D/A output selected	15	25	35	kΩ
LPF driving resistance	R _{AOUT}	When LPF output selected	50	_	—	kΩ
LPF output impedance	R _{LPF}	I _F =100 μA	—	1	3	kΩ

Note: Applied to RESET, CMD, ST, CH.

APPLICATION CIRCUITS

(MSM6652/53/54/55/56-xxx, MSM6652A/53A/54A/55A/56A/58A-xxx, MSM66P54/P56-xx)



Application Circuit in Serial Input Interface Mode





Application circuit in Parallel Input Interface Mode





Application Circuit in Microcontroller Interface Mode Using Four 1-Mbit EPROMs (Serial Input Interface)

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(MSM6650)



Application Circuit in Microcontroller Interface Mode Using Four 1-Mbit EPROMs (Parallel Input Interface)

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PACKAGE DIMENSIONS

(Unit : mm)



(Unit : mm)



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)



(Unit : mm)



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).

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MSM6650 Family

(Unit : mm)

