

# OKI Semiconductor

## MSM9894AL

### 8M-bit Serial Voice Flash Memory

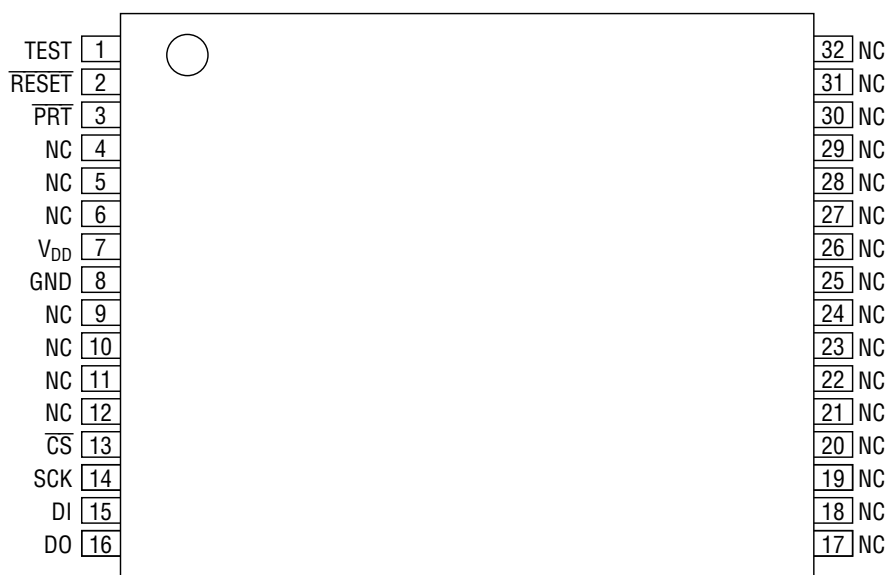
#### GENERAL DESCRIPTION

The MSM9894AL is a 8Mb flash memory that operates at 2.7 V to 3.6 V. Since backup is not needed, the number of pins is small, and the chip is contained in a small-package 32-pin TSOP, the MSM9894AL is a flash memory suitable for applications such as handy terminals. In combination with Oki's recording/playback IC (MSM9888L/MSM9889L), a solid-state recording/playback system can be easily constructed.

#### FEATURES

- Small page size : 2,112 bits per page  
(one time write unit)
- Configuration : 4096 pages × 2112 bits
- Power supply voltage : Single 2.7 to 3.6 V
- Operating current : Supply current : Up to 35 mA  
: Standby current : Up to 10  $\mu$ A
- Operating temperature : -10 to +70°C
- Write Cycles : 10,000 cycles per page
- Package:  
32-pin plastic TSOP (TSOPI32-P-820-0.50-K) (Product name: MSM9894ALTS-KT)

#### PIN CONFIGURATION (TOP VIEW)



NC : No connection

**32-Pin Plastic TSOP**

## PIN DESCRIPTIONS

Pin	Symbol	I/O	Description
15	DI	I	Command, address, or data input pin.
16	DO	O	Data output pin.
14	SCK	I	Inputs the data transfer clock for the DI and DO pins.
13	$\overline{CS}$	I	The device accepts the SCK pulse when $\overline{CS}$ is at "L" level and does not accept the SCK pulse when $\overline{CS}$ is at "H" level.
1	TEST	O	Output pin for test. Leave this pin open.
3	$\overline{PRT}$	I	Prohibits flash memory programming at "L" level.
2	$\overline{RESET}$	I	The device is reset when $\overline{RESET}$ is at "L" level.
7	$V_{DD}$	I	Power supply pin (2.7 to 3.6 V)
8	GND	I	GND pin (0 V)

## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Rating	Unit
Power Supply Voltage	$V_{DD}$	$T_a=25^\circ\text{C}$	-0.3 to +7.0	V
Input Voltage	$V_{IN}$	$T_a=25^\circ\text{C}$	-0.6 to $V_{DD}+0.6$	V
Storage Temperature	$T_{STG}$	—	-55 to +150	$^\circ\text{C}$

## RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Condition	Range	Unit
Power Supply Voltage	$V_{DD}$	GND=0V	2.7 to 3.6	V
Operating Temperature	$T_{op}$	—	-10 to +70	$^\circ\text{C}$

## ELECTRICAL CHARACTERISTICS

## DC Characteristics

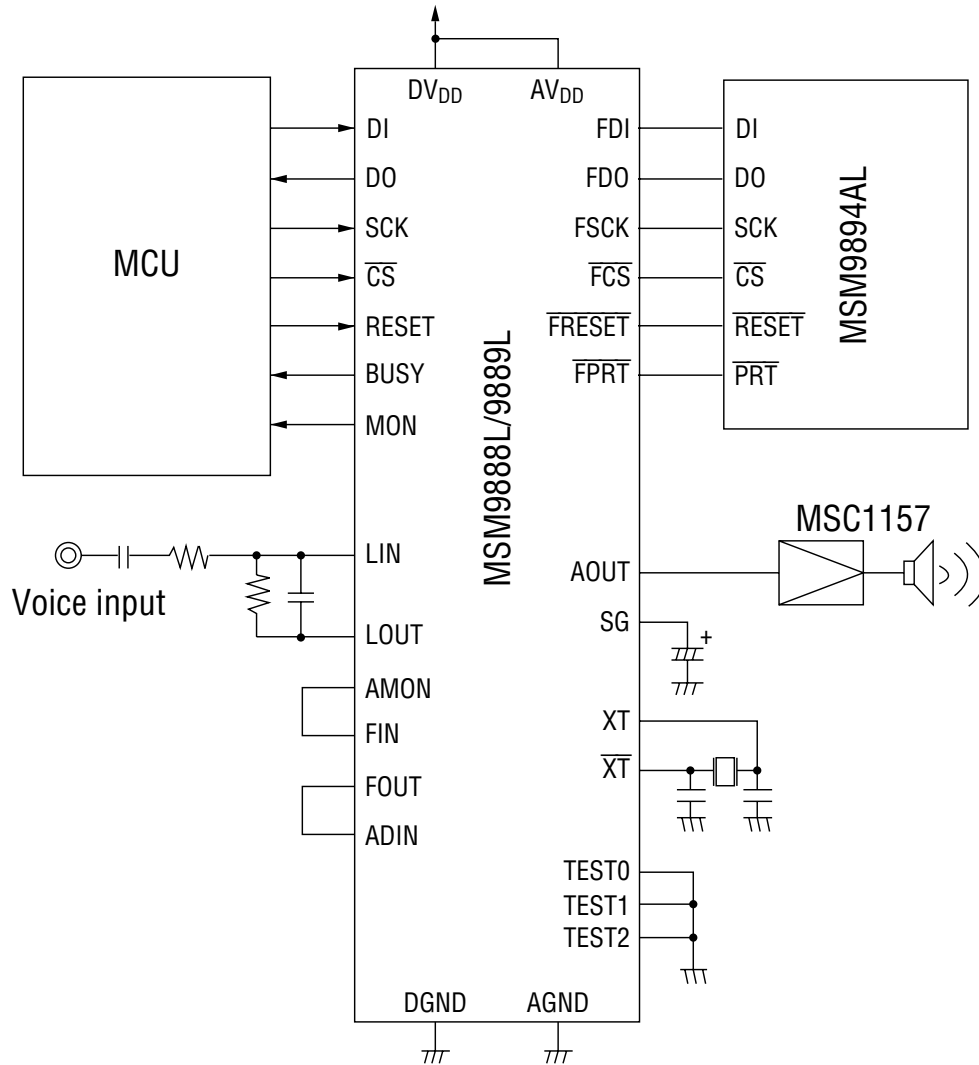
Parameter	Symbol	Min.	Typ.	Max.	Unit.
Operating Current	$I_{CC}$	—	15	35	mA
Standby Current	$I_{SB}$	—	—	10	$\mu\text{A}$
Input Leakage Current	$I_{IL}$	—	—	1	$\mu\text{A}$
Output Leakage Current	$I_{OL}$	—	—	1	$\mu\text{A}$
Input Low Voltage	$V_{IL}$	—	—	0.6	V
Input High Voltage	$V_{IH}$	2.0	—	—	V
Output Low Voltage	$V_{OL}$	—	—	0.4	V
Output High Voltage	$V_{OH}$	2.0	—	—	V

**PROGRAMMING/ERASE CHARACTERISTICS**

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Erase/Programming Cycle	$C_{EP}$	—	—	—	10,000	Cycles
Data Retention Time	$T_{DR}$	—	—	—	10	Years
Write Disturb *1)	$C_{PD}$	Bit error : non	—	—	20,000	Cycles
		Bit error : 1bit	—	—	50,000	Cycles
		Bit error : 3bits	—	—	100,000	Cycles

- \*1) "Write Disturb" means a phenomenon that frequent write cycles executed to pages in Flash memory may cause a data error in another page to which write operations are not performed.  
For example, 20,001 to 50,000 write operations performed to pages other than page "n" may cause a 1-bit error in page "n".

### APPLICATION CIRCUIT



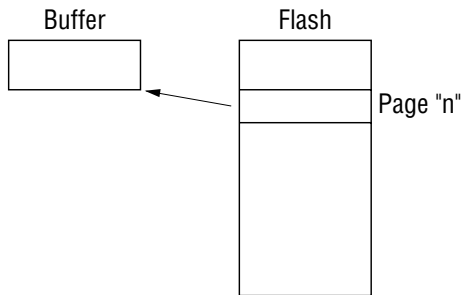
## WRITE DISTURB

"Write Disturb" means a phenomenon that the change from digital "0" to "1" may occur in a Flash memory page to which data is scarcely written.

The above change can be avoided by refreshing Flash memory data with the DTRW command and WEND command of the MSM9888L/MSM9889L.

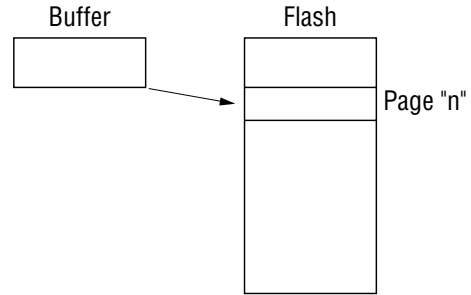
### ① DTRW command

This command moves some Flash memory page data to buffer.



### ② WEND command

This command programs buffer data to Flash memory.

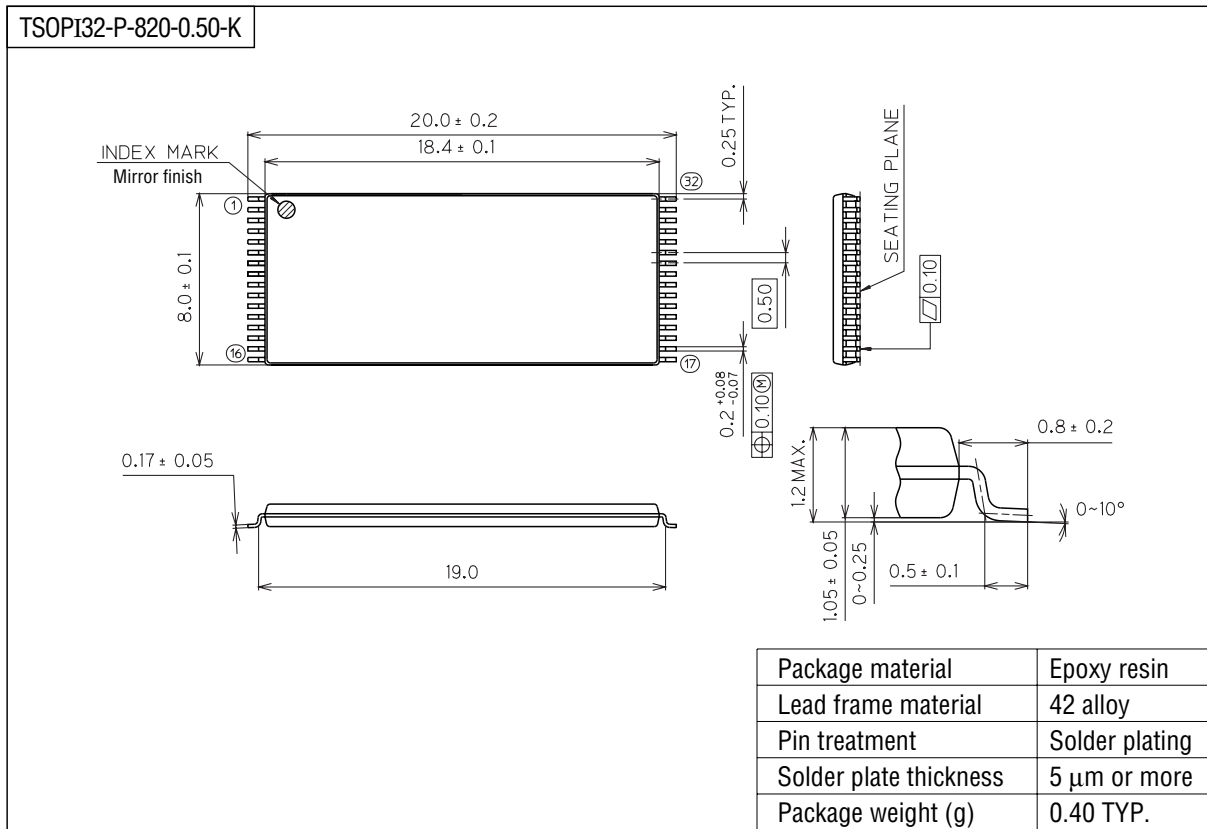


## TIMING WHEN POWER IS ON

Refer to the MSM9888L/MSM9889L Data Sheet. If the timing diagrams described in the MSM9888L/MSM9889L Data Sheet are not satisfied, errors such as "Recording is disabled" or "Recorded message is erased" may occur.

PACKAGE DIMENSIONS

(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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