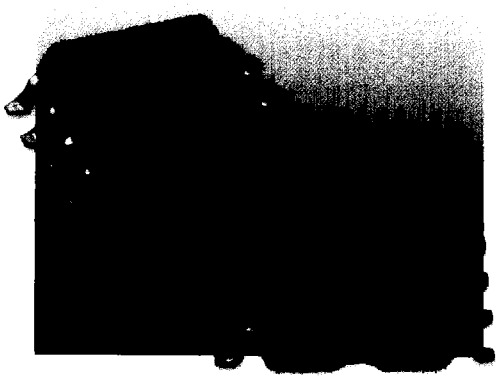


S-29LXX1A Series
3-WIRE CMOS SERIAL E²PROM WITH MEMORY PROTECTION

The S-29LXX1A Series is low power 1K/2K/4K-bit serial E²PROM with a low operating voltage range. They are organized as 64-word x 16-bit, 128-word x 16-bit and 256-word x 16-bit, respectively. Each is capable of sequential read, where addresses are automatically incremented in 16-bit blocks. The instruction code is compatible with the NM93CSXX Series.

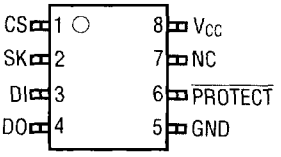
The S-29LXX1A Series is capable of protecting the memory, 50% of which can be protected starting from address 00.

FEATURES

- Low power consumption
  - Standby: 0.8 µA Max. (V_{CC}=5.5V)
  - Operating: 0.8 mA Max. (V_{CC}=5.5V)
    0.4 mA Max. (V_{CC}=2.7V)
- Low operating voltage range
  - Write: 1.8 to 5.5V
  - Read: 1.8 to 5.5V
- Sequential read capable
- Memory protection
- Endurance: 10^5 cycles/word
- Data retention: 10 years
- S-29L131A: 1K bit NM93CS46 instruction code compatible
- S-29L221A: 2K bit NM93CS56 instruction code compatible
- S-29L331A: 4K bit NM93CS66 instruction code compatible

PIN ASSIGNMENT

8-pin SOP2
Top View



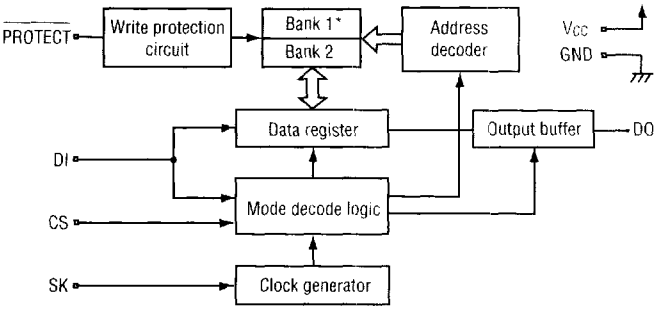
S-29L131ADFE-TB
S-29L221ADFE-TB
S-29L331ADFE-TB

SSOP package is also available.
Contact Seiko Instruments, Inc.

PIN FUNCTIONS

Name	Pin Number SOP2	Function
CS	1	Chip select input
SK	2	Serial clock input
DI	3	Serial data input
DO	4	Serial data output
GND	5	Ground
$\overline{\text{PROTECT}}$	6	Memory Protection Control Input Connected to GND or Open : Protection valid Connected to V_{CC} : Protection invalid
NC	7	No Connection
Vcc	8	Power supply

BLOCK DIAGRAM



*50% of the memory can be protected starting from address 00

INSTRUCTION SET

Instruction	Start Bit	Op code	Address S-29L131A	Address S-29L221A	Address S-29L331A	Data
READ (Read data)	1	10	A_5 to A_0	XA_6 to A_0	A_7 to A_0	D_{15} to D_0 Output*
WRITE (Write data)	1	01	A_5 to A_0	XA_6 to A_0	A_7 to A_0	D_{15} to D_0 Input
ERASE (Erase data)	1	11	A_5 to A_0	XA_6 to A_0	A_7 to A_0	–
EWEN (Program enable)	1	00	11xxxx	11xxxxxx	11xxxxxx	–
EWDS (Program disable)	1	00	00xxxx	00xxxxxx	00xxxxxx	–

x: Doesn't matter.
*: When 16-bit data of the specified address is output, the data of the next address is output.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Power supply voltage	V_{CC}	-0.3 to +7.0	V
Input voltage	V_{IN}	-0.3 to V_{CC} +0.3	V
Output voltage	V_{OUT}	-0.3 to V_{CC}	V
Storage temperature under bias	T_{BIAS}	-50 to +95	°C
Storage temperature	T_{STG}	-65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	Read Operation Write Enable/Disable	1.8	--	5.5	V
		Write Operation	1.8	--	5.5	V
High level input voltage	V_{IH}		0.8 x V_{CC}	--	V_{CC}	V
Low level input voltage	V_{IL}		0.0	--	0.2 x V_{CC}	V
Operating temperature	T_{OPR}		-40	--	+ 85	°C

DC ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Conditions	Vcc=4.5 to 5.5V			Vcc=2.7 to 4.5V			Vcc=1.8 to 2.7V			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max	
Current consumption (READ)	I_{CC1}	DO unloaded	–	–	0.8	–	–	0.6	–	–	0.4	mA
Current consumption (PROGRAM)	I_{CC2}	DO unloaded	–	–	2.0	–	–	1.5	–	–	1.0	mA

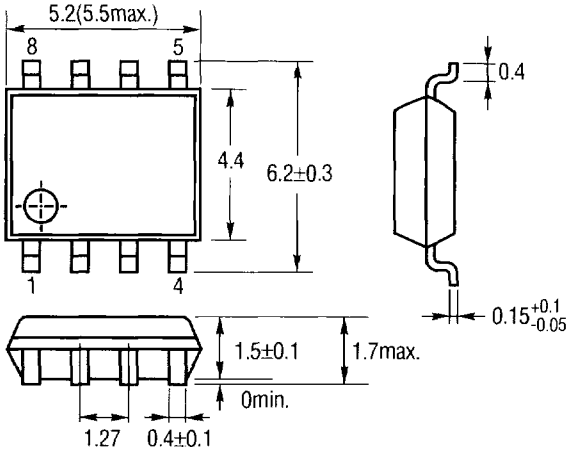
Parameter	Symbol	Conditions	Vcc=4.5 to 5.5V			Vcc=2.7 to 4.5V			Vcc=1.8 to 2.7V			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Standby current consumption	I_{SB}	CS=GND DO=Open Other input: Connected to V_{CC} or GND	–	–	0.8	–	–	0.6	–	–	0.4	µA
Input leakage current	I_{LI}	V_{IN}=GND to V_{CC}	–	0.1	1.0	–	0.1	1.0	–	0.1	1.0	µA
Output leakage current	I_{LO}	V_{OUT}=GND to V_{CC}	–	0.1	1.0	–	0.1	1.0	–	0.1	1.0	µA
Low level output voltage	V_{OL}	I_{OL}=2.1mA I_{OL}=100µA	– –	– –	0.45 0.1	–	–	0.1	–	–	0.1	V V
High level output voltage	V_{OH}	I_{OH}=-400 µA I_{OH}=-100 µA I_{OH}=-10 µA	2.4 V_{CC}-0.7 V_{CC}-0.7	– – –	– – –	 V_{CC}-0.7 V_{CC}-0.7	 – –	 – –	 V_{CC}-0.3	 –	 –	V V V
Write enable latch data hold voltage	V_{DH}	Only when write disable mode	1.5	–	–	1.5	–	–	1.5	–	–	V
Pull-down current	I_{PD}	$\overline{\text{PROTECT}}$ terminal=V_{CC}	15	–	80	4	–	50	1	–	15	µA

MEMORY PROTECTION

The S-29LXX1A Series is capable of protecting memory. So, the contents of the memory will not be miswritten due to error run or malfunction of the CPU. When the PROTECT terminal is connected to GND or OPEN, writing to Bank 1 in the memory array is prohibited (50% of the memory can be protected starting from address 00). Because the pull-down resistance is connected to the PROTECT terminal internally, the memory can be automatically protected when the PROTECT terminal is OPEN. When the protection is valid, the data in the memory of Bank 1 will not be rewritten. However, because the write control circuit inside the IC functions, the next instruction cannot be executed during the time period of writing. While write instruction is being input and write is being executed, always connect the PROTECT terminal to "H", "L" or OPEN, and leave the input signal unchanged.

DIMENSIONS

8-pin SOP



Dimensions (Unit: mm)

ORDERING INFORMATION

Part #	Description	Order As
S-29L131ADFE-TB	1Kb (64 x 16) EEPROM, 3-wire, Low Power, Low Operating Voltage, with Memory Protection, SOP2	S-29L131ADFETB
S-29L221ADFE-TB	2Kb (128 x 16) EEPROM, 3-wire, Low Power, Low Operating Voltage, with Memory Protection, SOP2	S-29L221ADFETB
S-29L331ADFE-TB	4Kb (256 x 16) EEPROM, 3-wire, Low Power, Low Operating Voltage, with Memory Protection, SOP2	S-29L331ADFETB