



11AA010/11LC010
11AA020/11LC020
11AA040/11LC040

11AA080/11LC080
11AA160/11LC160

1K-16K UNI/O® Serial EEPROM Family Data Sheet

Features:

- Single I/O, UNI/O® Serial Interface Bus
- Low-Power CMOS Technology
 - 1 mA active current, typical
 - 1 µA standby current (max.) (I-temp)
- 128 x 8 through 2,048 x 8 Bit Organizations
- Schmitt Trigger Inputs for Noise Suppression
- Output Slope Control to Eliminate Ground Bounce
- 100 kbps Max. Bit Rate – Equivalent to 100 kHz Clock Frequency
- Self-Timed Write Cycle (including Auto-Erase)
- Page-Write Buffer for up to 16 Bytes
- STATUS Register for Added Control:
 - Write enable latch bit
 - Write-In-Progress bit
- Block Write Protection
 - Protect none, 1/4, 1/2 or all of array
- Built-in Write Protection
 - Power-on/off data protection circuitry
 - Write enable latch
- High Reliability
 - Endurance: 1,000,000 erase/write cycles
 - Data retention: > 200 years
 - ESD protection: > 4,000V
- 3-lead SOT-23 Package
- 8-lead PDIP, SOIC, MSOP, TDFN Packages
- Pb-Free and RoHS Compliant
- Available Temperature Ranges:
 - Industrial (I): -40°C to +85°C
 - Automotive (E): -40°C to +125°C

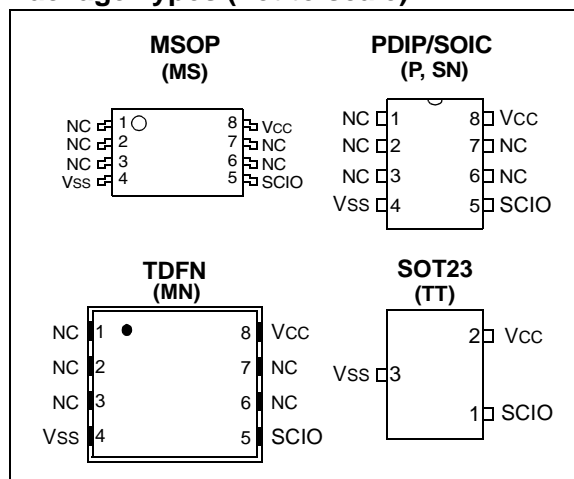
Description:

The Microchip Technology Inc. 11AAXXX/11LCXXX (11XX*) devices are a family of 1 Kbit through 16 Kbit Serial Electrically Erasable PROMs. The devices are organized in blocks of x8-bit memory and support the patented** single I/O UNI/O® serial bus. By using Manchester encoding techniques, the clock and data are combined into a single, serial bit stream (SCIO), where the clock signal is extracted by the receiver to correctly decode the timing and value of each bit.

Low-voltage design permits operation down to 1.8V (for 11AAXXX devices), with standby and active currents of only 1 µA and 1 mA, respectively.

The 11XX family is available in standard packages including 8-lead PDIP and SOIC, and advanced packaging including 3-lead SOT-23, 8-lead TDFN, and 8-lead MSOP.

Package Types (not to scale)



Pin Function Table

Name	Function
SCIO	Serial Clock, Data Input/Output
Vss	Ground
Vcc	Supply Voltage

* 11XX is used in this document as a generic part number for the 11 series devices.

** Microchip's UNI/O® Bus products are covered by the following patent issued in the U.S.A.: 7,376,020.

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DEVICE SELECTION TABLE

Part Number	Density (bits)	Organization	Vcc Range	Page Size (Bytes)	Temp. Ranges	Packages
11LC010	1K	128 x 8	2.5-5.5V	16	I,E	P, SN, MS, MN, TT
11AA010	1K	128 x 8	1.8-5.5V	16	I	P, SN, MS, MN, TT
11LC020	2K	256 x 8	2.5-5.5V	16	I,E	P, SN, MS, MN, TT
11AA020	2K	256 x 8	1.8-5.5V	16	I	P, SN, MS, MN, TT
11LC040	4K	512 x 8	2.5-5.5V	16	I,E	P, SN, MS, MN, TT
11AA040	4K	512 x 8	1.8-5.5V	16	I	P, SN, MS, MN, TT
11LC080	8K	1,024 x 8	2.5-5.5V	16	I,E	P, SN, MS, MN, TT
11AA080	8K	1,024 x 8	1.8-5.5V	16	I	P, SN, MS, MN, TT
11LC160	16K	2,048 x 8	2.5-5.5V	16	I,E	P, SN, MS, MN, TT
11AA160	16K	2,048 x 8	1.8-5.5V	16	I	P, SN, MS, MN, TT

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings (†)

V _{CC}	6.5V
SCIO w.r.t. V _{SS}	-0.6V to V _{CC} +1.0V
Storage temperature	-65°C to 150°C
Ambient temperature under bias	-40°C to 125°C
ESD protection on all pins.....	4 kV

† NOTICE: Stresses above those listed under ‘Absolute Maximum Ratings’ may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for an extended period of time may affect device reliability.

TABLE 1-1: DC CHARACTERISTICS

DC CHARACTERISTICS			Electrical Characteristics:			
			Industrial (I):		TA = -40°C to +85°C	
					V _{CC} = 2.5V to 5.5V	
					V _{CC} = 1.8V to 2.5V	
			Automotive (E):		TA = -20°C to +85°C	
					V _{CC} = 2.5V to 5.5V	
					TA = -40°C to +125°C	
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Test Conditions
D1	V _{IH}	High-level input voltage	0.7*V _{CC}	V _{CC} +1	V	
D2	V _{IL}	Low-level input voltage	-0.3	0.3*V _{CC}	V	V _{CC} ≥ 2.5V
			-0.3	0.2*V _{CC}	V	V _{CC} < 2.5V
D3	V _{HYS}	Hysteresis of Schmitt Trigger inputs (SCIO)	0.05*V _{CC}	—	V	V _{CC} ≥ 2.5V (Note 1)
D4	V _{OH}	High-level output voltage	V _{CC} -0.5	—	V	I _{OH} = -300 μA, V _{CC} = 5.5V
			V _{CC} -0.5	—	V	I _{OH} = -200 μA, V _{CC} = 2.5V
D5	V _{OL}	Low-level output voltage	—	0.4	V	I _{OL} = 300 μA, V _{CC} = 5.5V
			—	0.4	V	I _{OL} = 200 μA, V _{CC} = 2.5V
D6	I _O	Output current limit (Note 2)	—	±4	mA	V _{CC} = 5.5V (Note 1)
			—	±3	mA	V _{CC} = 2.5V (Note 1)
D7	I _{LI}	Input leakage current (SCIO)	—	±1	μA	V _{IN} = V _{SS} or V _{CC}
D8	C _{INT}	Internal Capacitance (all inputs and outputs)	—	7	pF	TA = 25°C, F _{CLK} = 1 MHz, V _{CC} = 5.0V (Note 1)
D9	I _{CC} Read	Read Operating Current	—	3	mA	V _{CC} =5.5V; F _{BUS} =100 kHz, C _B =100 pF
			—	1	mA	V _{CC} =2.5V; F _{BUS} =100 kHz, C _B =100 pF
D10	I _{CC} Write	Write Operating Current	—	5	mA	V _{CC} = 5.5V
			—	3	mA	V _{CC} = 2.5V
D11	I _{CCS}	Standby Current	—	5	μA	V _{CC} = 5.5V TA = 125°C
			—	1	μA	V _{CC} = 5.5V TA = 85°C
D12	I _{CCI}	Idle Mode Current	—	50	μA	V _{CC} = 5.5V

Note 1: This parameter is periodically sampled and not 100% tested.

2: The SCIO output driver impedance will vary to ensure I_O is not exceeded.

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TABLE 1-2: AC CHARACTERISTICS

AC CHARACTERISTICS			Electrical Characteristics:			
			Industrial (I):		VCC = 2.5V to 5.5V	TA = -40°C to +85°C
					VCC = 1.8V to 2.5V	TA = -20°C to +85°C
			Automotive (E):		VCC = 2.5V to 5.5V	TA = -40°C to +125°C
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Test Conditions
1	FBUS	Serial bus frequency	10	100	kHz	—
2	TE	Bit period	10	100	μs	—
3	TIJIT	Input edge jitter tolerance	—	±0.08	UI	(Note 3)
4	FDRIFT	Serial bus frequency drift rate tolerance	—	±0.75	% per byte	—
5	FDEV	Serial bus frequency drift limit	—	±5	% per command	—
6	TOJIT	Output edge jitter	—	±0.25	UI	(Note 3)
7	TR	SCIO input rise time (Note 1)	—	100	ns	—
8	TF	SCIO input fall time (Note 1)	—	100	ns	—
9	TSTBY	Standby pulse time	600	—	μs	—
10	TSS	Start header setup time	10	—	μs	—
11	THDR	Start header low pulse time	5	—	μs	—
12	TSP	Input filter spike suppression (SCIO)	—	50	ns	(Note 1)
13	TWC	Write cycle time (byte or page)	—	5 10	ms ms	Write, WRSR commands ERAL, SETAL commands
14	—	Endurance (per page)	1M	—	cycles	25°C, VCC = 5.5V (Note 2)

Note 1: This parameter is periodically sampled and not 100% tested.

Note 2: This parameter is not tested but ensured by characterization. For endurance estimates in a specific application, please consult the Total Endurance™ Model which can be obtained on Microchip's web site:

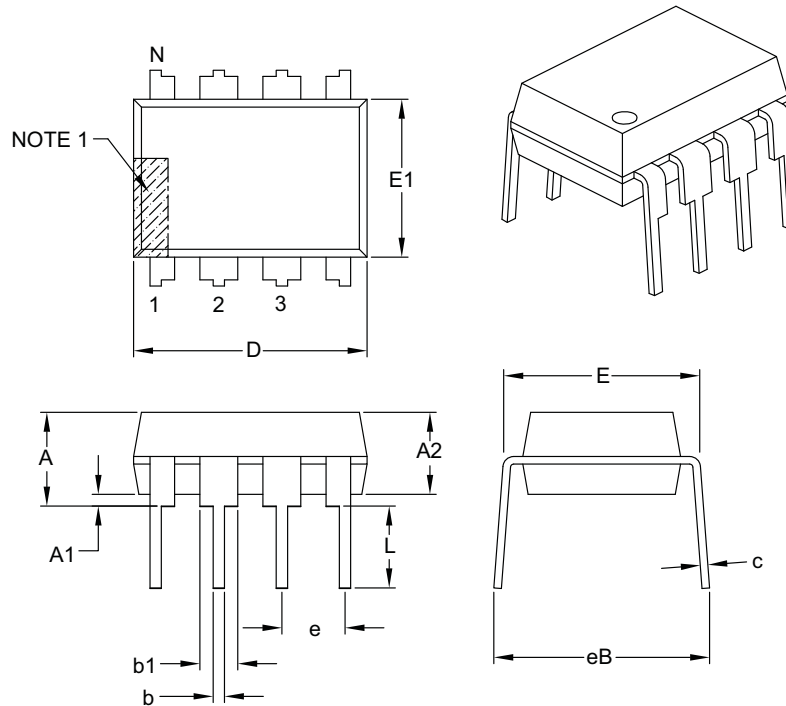
Note 3: A Unit Interval (UI) is equal to 1-bit period (TE) at the current bus frequency.

TABLE 1-3: AC TEST CONDITIONS

AC Waveform:	
VLO = 0.2V	
VHI = VCC - 0.2V	
CL = 100 pF	
Timing Measurement Reference Level	
Input	0.5 VCC
Output	0.5 VCC

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8-Lead Plastic Dual In-Line (P) – 300 mil Body [PDIP]



Units		INCHES		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N	8		
Pitch	e	.100 BSC		
Top to Seating Plane	A	–	–	.210
Molded Package Thickness	A2	.115	.130	.195
Base to Seating Plane	A1	.015	–	–
Shoulder to Shoulder Width	E	.290	.310	.325
Molded Package Width	E1	.240	.250	.280
Overall Length	D	.348	.365	.400
Tip to Seating Plane	L	.115	.130	.150
Lead Thickness	c	.008	.010	.015
Upper Lead Width	b1	.040	.060	.070
Lower Lead Width	b	.014	.018	.022
Overall Row Spacing §	eB	–	–	.430

Notes:

- Pin 1 visual index feature may vary, but must be located with the hatched area.
- § Significant Characteristic.
- Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" per side.
- Dimensioning and tolerancing per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-018B

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

<u>PART NO.</u>	<u>X</u>	—	<u>X</u>	<u>/XXX</u>
Device	Tape & Reel	Temperature Range	Package	
Device:				
11AA010	=	1 Kbit, 1.8V UNI/O Serial EEPROM		
11LC010	=	1 Kbit, 2.5V UNI/O Serial EEPROM		
11AA020	=	2 Kbit, 1.8V UNI/O Serial EEPROM		
11LC020	=	2 Kbit, 2.5V UNI/O Serial EEPROM		
11AA040	=	4 Kbit, 1.8V UNI/O Serial EEPROM		
11LC040	=	4 Kbit, 2.5V UNI/O Serial EEPROM		
11AA080	=	8 Kbit, 1.8V UNI/O Serial EEPROM		
11LC080	=	8 Kbit, 2.5V UNI/O Serial EEPROM		
11AA160	=	16 Kbit, 1.8V UNI/O Serial EEPROM		
11LC160	=	16 Kbit, 2.5V UNI/O Serial EEPROM		
Tape & Reel:				
T	=	Tape and Reel		
Blank	=	Tube		
Temperature Range:				
I	=	-40°C to +85°C (Industrial)		
E	=	-40°C to +125°C (Extended)		
Package:				
P	=	8-lead Plastic DIP (300 mil body)		
SN	=	8-lead Plastic SOIC (3.90 mm body)		
MS	=	8-lead Plastic Micro Small Outline (MSOP)		
MNY ⁽¹⁾	=	8-lead 2x3 mm TDFN		
TT	=	3-lead SOT 23 (Tape and Reel only)		
Note 1: "Y" indicates a Nickel Palladium Gold (NiPdAu) finish.				

Examples:

a) 11AA010-I/P = 1 Kbit, 1.8V Serial EEPROM, Industrial temp., PDIP package

b) 11LC160T-E/TT = 16 Kbit, 2.5V Serial EEPROM, Extended temp., Tape & Reel, SOT-23 package

c) 11AA080-I/MS = 8 Kbit, 1.8V Serial EEPROM, Industrial temp., MSOP package

d) 11LC020T-I/SN = 2 Kbit, 2.5V Serial EEPROM, Industrial temp., Tape & Reel, SOIC package

e) 11AA040T-I/MNY = 4 Kbit, 1.8V Serial EEPROM, Industrial temp., Tape and Reel, 2x3 mm TDFN package, Nickel Palladium Gold finish

Examples:

- 11AA010-I/P = 1 Kbit, 1.8V Serial EEPROM, Industrial temp., PDIP package
- 11LC160T-E/TT = 16 Kbit, 2.5V Serial EEPROM, Extended temp., Tape & Reel, SOT-23 package
- 11AA080-I/MS = 8 Kbit, 1.8V Serial EEPROM, Industrial temp., MSOP package
- 11LC020T-I/SN = 2 Kbit, 2.5V Serial EEPROM, Industrial temp., Tape & Reel, SOIC package
- 11AA040T-I/MNY = 4 Kbit, 1.8V Serial EEPROM, Industrial temp., Tape and Reel, 2x3 mm TDFN package, Nickel Palladium Gold finish