1K-16K Microwire Compatible Serial EEPROMs

Features:

- Densities from 1 Kbits through 16 Kbits
- Low-power CMOS technology
- Available with or without ORG function:

  With ORG function:
  - ORG pin at Logic Low: 8-bit word
  - ORG pin at Logic High: 16-bit word

  Without ORG function:
  - 'A' version: 8-bit word
  - 'B' version: 16-bit word
- Program Enable pin:
  - Write-protect for entire array (93XX76C and 93XX86C only)
- Self-timed Erase/Write cycles (including auto-erase)
- Automatic ERAL before WRAL
- Power-on/off data protection circuitry
- Industry standard 3-wire serial I/O
- Device Status signal (Ready/Busy)
- Sequential Read function
- 1,000,000 E/W cycles
- Data retention > 200 years
- Pb-free and RoHS compliant
- Temperature ranges supported:
  - Industrial (I) -40°C to +85°C
  - Automotive (E) -40°C to +125°C

Pin Function Table

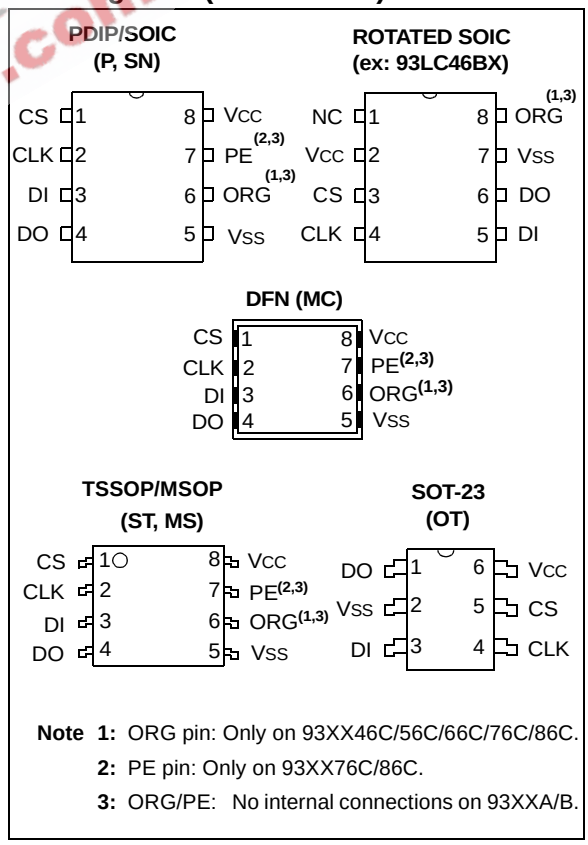
Name	Function
CS	Chip Select
CLK	Serial Data Clock
DI	Serial Data Input
DO	Serial Data Output
VSS	Ground
PE	Program Enable
ORG	Memory Configuration
VCC	Power Supply

Note: ORG and PE functionality not available in all products. See Table 1-1, Device Selection Table.

Description:

Microchip Technology Inc. supports the 3-wire Microwire bus with low-voltage serial Electrically Erasable PROMs (EEPROM) that range in density from 1 Kbits up to 16 Kbits. Each density is available with and without the ORG functionality, and selected by the part number ordered. Advanced CMOS technology makes these devices ideal for low-power, nonvolatile memory applications. The entire series of Microwire devices are available in the standard 8-lead PDIP and SOIC packages, as well as the more advanced packaging such as the 8-lead MSOP, 8-lead TSSOP, 6-lead SOT-23, and 8-lead DFN (2x3). All packages are Pb-free.

Pin Diagrams (not to scale)



Note 1: ORG pin: Only on 93XX46C/56C/66C/76C/86C.
2: PE pin: Only on 93XX76C/86C.
3: ORG/PE: No internal connections on 93XXA/B.

TABLE 1-1: DEVICE SELECTION TABLE

Part Number	Density (Kbits)	Vcc Range	ORG Pin	Organization (Words)	PE Pin	Temp Range	Packages
93XX46A/B/C							
93AA46A	1	1.8-5.5	No	128 x 8 bits	No	I	P, SN, ST, MS, OT, MC
93AA46B	1	1.8-5.5	No	64 x 16 bits	No	I	P, SN, ST, MS, OT, MC
93AA46C	1	1.8-5.5	Yes	Selectable x8 or x16	No	I	P, SN, ST, MS, MC
93LC46A	1	2.5-5.5	No	128 x 8 bits	No	I, E	P, SN, ST, MS, OT, MC
93LC46B	1	2.5-5.5	No	64 x 16 bits	No	I, E	P, SN, ST, MS, OT, MC
93LC46C	1	2.5-5.5	Yes	Selectable x8 or x16	No	I, E	P, SN, ST, MS, MC
93C46A	1	4.5-5.5	No	128 x 8 bits	No	I, E	P, SN, ST, MS, OT, MC
93C46B	1	4.5-5.5	No	64 x 16 bits	No	I, E	P, SN, ST, MS, OT, MC
93C46C	1	4.5-5.5	Yes	Selectable x8 or x16	No	I, E	P, SN, ST, MS, MC
93AA46AX/BX/CX, 93LC46AX/BX/CX, 93C46AX/BX/CX (Alternate pinout with die rotated 90°)							
93AA46AX	1	1.8-5.5	No	128 x 8 bits	No	I	P, SN, ST, MS, OT, MC
93AA46BX	1	1.8-5.5	No	64 x 16 bits	No	I	P, SN, ST, MS, OT, MC
93AA46CX	1	1.8-5.5	Yes	Selectable x8 or x16	No	I	P, SN, ST, MS, MC
93LC46AX	1	2.5-5.5	No	128 x 8 bits	No	I, E	P, SN, ST, MS, OT, MC
93LC46BX	1	2.5-5.5	No	64 x 16 bits	No	I, E	P, SN, ST, MS, OT, MC
93LC46CX	1	2.5-5.5	Yes	Selectable x8 or x16	No	I, E	P, SN, ST, MS, MC
93C46AX	1	4.5-5.5	No	128 x 8 bits	No	I, E	P, SN, ST, MS, OT, MC
93C46BX	1	4.5-5.5	No	64 x 16 bits	No	I, E	P, SN, ST, MS, OT, MC
93C46CX	1	4.5-5.5	Yes	Selectable x8 or x16	No	I, E	P, SN, ST, MS, MC
93XX56A/B/C							
93AA56A	2	1.8-5.5	No	256 x 8 bits	No	I	P, SN, ST, MS, OT, MC
93AA56B	2	1.8-5.5	No	128 x 16 bits	No	I	P, SN, ST, MS, OT, MC
93AA56C	2	1.8-5.5	Yes	Selectable x8 or x16	No	I	P, SN, ST, MS, MC
93LC56A	2	2.5-5.5	No	256 x 8 bits	No	I, E	P, SN, ST, MS, OT, MC
93LC56B	2	2.5-5.5	No	128 x 16 bits	No	I, E	P, SN, ST, MS, OT, MC
93LC56C	2	2.5-5.5	Yes	Selectable x8 or x16	No	I, E	P, SN, ST, MS, MC
93C56A	2	4.5-5.5	No	256 x 8 bits	No	I, E	P, SN, ST, MS, OT, MC
93C56B	2	4.5-5.5	No	128 x 16 bits	No	I, E	P, SN, ST, MS, OT, MC
93C56C	2	4.5-5.5	Yes	Selectable x8 or x16	No	I, E	P, SN, ST, MS, MC
93XX66A/B/C							
93AA66A	4	1.8-5.5	No	512 x 8 bits	No	I	P, SN, ST, MS, OT, MC
93AA66B	4	1.8-5.5	No	256 x 16 bits	No	I	P, SN, ST, MS, OT, MC
93AA66C	4	1.8-5.5	Yes	Selectable x8 or x16	No	I	P, SN, ST, MS, MC
93LC66A	4	2.5-5.5	No	512 x 8 bits	No	I, E	P, SN, ST, MS, OT, MC
93LC66B	4	2.5-5.5	No	256 x 16 bits	No	I, E	P, SN, ST, MS, OT, MC
93LC66C	4	2.5-5.5	Yes	Selectable x8 or x16	No	I, E	P, SN, ST, MS, MC
93C66A	4	4.5-5.5	No	512 x 8 bits	No	I, E	P, SN, ST, MS, OT, MC
93C66B	4	4.5-5.5	No	256 x 16 bits	No	I, E	P, SN, ST, MS, OT, MC
93C66C	4	4.5-5.5	Yes	Selectable x8 or x16	No	I, E	P, SN, ST, MS, MC

TABLE 1-1: DEVICE SELECTION TABLE (CONTINUED)

Part Number	Density (Kbits)	Vcc Range	ORG Pin	Organization (Words)	PE Pin	Temp Range	Packages
93XX76A/B/C							
93AA76A	8	1.8-5.5	No	1024 x 8 bits	No	I	OT
93AA76B	8	1.8-5.5	No	512 x 16 bits	No	I	OT
93AA76C	8	1.8-5.5	Yes	Selectable x8 or x16	Yes	I	P, SN, ST, MS, MC
93LC76A	8	2.5-5.5	No	1024 x 8 bits	No	I, E	OT
93LC76B	8	2.5-5.5	No	512 x 16 bits	No	I, E	OT
93LC76C	8	2.5-5.5	Yes	Selectable x8 or x16	Yes	I, E	P, SN, ST, MS, MC
93C76A	8	4.5-5.5	No	1024 x 8 bits	No	I, E	OT
93C76B	8	4.5-5.5	No	512 x 16 bits	No	I, E	OT
93C76C	8	4.5-5.5	Yes	Selectable x8 or x16	Yes	I, E	P, SN, ST, MS, MC
93XX86A/B/C							
93AA86A	16	1.8-5.5	No	2048 x 8 bits	No	I	OT
93AA86B	16	1.8-5.5	No	1024 x 16 bits	No	I	OT
93AA86C	16	1.8-5.5	Yes	Selectable x8 or x16	Yes	I	P, SN, ST, MS, MC
93LC86A	16	2.5-5.5	No	2048 x 8 bits	No	I, E	OT
93LC86B	16	2.5-5.5	No	1024 x 16 bits	No	I, E	OT
93LC86C	16	2.5-5.5	Yes	Selectable x8 or x16	Yes	I, E	P, SN, ST, MS, MC
93C86A	16	4.5-5.5	No	2048 x 8 bits	No	I, E	OT
93C86B	16	4.5-5.5	No	1024 x 16 bits	No	I, E	OT
93C86C	16	4.5-5.5	Yes	Selectable x8 or x16	Yes	I, E	P, SN, ST, MS, MC

2.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings(†)

VCC.....7.0V

All inputs and outputs w.r.t. VSS ..... -0.6V to VCC +1.0V

Storage temperature .....-65°C to +150°C

Ambient temperature with power applied.....-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 extended periods may affect device reliability.

TABLE 2-1: DC CHARACTERISTICS

All parameters apply over the specified ranges unless otherwise noted.			VCC = 1.8V to 5.5V Industrial (I): TA = -40°C to +85°C Automotive (E): TA = -40°C to +125°C				
Param. No.	**Symbol**	**Parameter**	**Min.**	**Typ.**	**Max.**	**Units**	**Conditions**
D1	VIH1 VIH2	High-level input voltage	2.0 0.7 VCC	— —	VCC +1 VCC +1	V V	VCC ≥ 2.7V VCC < 2.7V
D2	VIL1 VIL2	Low-level input voltage	-0.3 -0.3	— —	0.8 0.2 VCC	V V	VCC ≥ 2.7V VCC < 2.7V
D3	VOL1 VOL2	Low-level output voltage	— —	— —	0.4 0.2	V V	IOL = 2.1 mA, VCC = 4.5V IOL = 100 µA, VCC = 2.5V
D4	VOH1 VOH2	High-level output voltage	2.4 VCC-0.2	— —	— —	V V	IOH = -400 µA, VCC = 4.5V IOH = -100 µA, VCC = 2.5V
D5	ILI	Input leakage current	—	—	±1	µA	VIN = VSS to VCC
D6	ILO	Output leakage current	—	—	±1	µA	VOUT = VSS to VCC
D7	CIN, COUT	Pin capacitance (all inputs/outputs)	—	—	7	pF	VIN/VOUT = 0V **(Note 1)** TA = 25°C, FCLK = 1 MHz
D8	ICC write	Write current	—	—	2	mA	FCLK = 3 MHz, VCC = 5.5V (93XX46X/56X/66X)
			— —	— 500	3 —	mA µA	FCLK = 3 MHz, VCC = 5.5V (93XX76X/86X) FCLK = 2 MHz, VCC = 2.5V
D9	ICC read	Read current	— — —	— — 100	1 500 —	mA µA µA	FCLK = 3 MHz, VCC = 5.5V FCLK = 2 MHz, VCC = 3.0V FCLK = 2 MHz, VCC = 2.5V
D10	ICCS	Standby current	— —	— —	1 5	µA µA	I-Temp **(Note 2, 3)** E-Temp CLK = Cs = 0V ORG = DI = VSS or VCC
D11	VPOR	VCC voltage detect	— —	1.5V 3.8V	— —	V V	93AAX6A/B/C, 93LCX6A/B/C, 93CX6A/B/C **(Note 1)**

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

2: ORG and PE pins not available on ‘A’ or ‘B’ versions.

3: Ready/$\overline{\text{Busy}}$ status must be cleared from DO, see **Section 4.4 “Data Out (DO)”**.

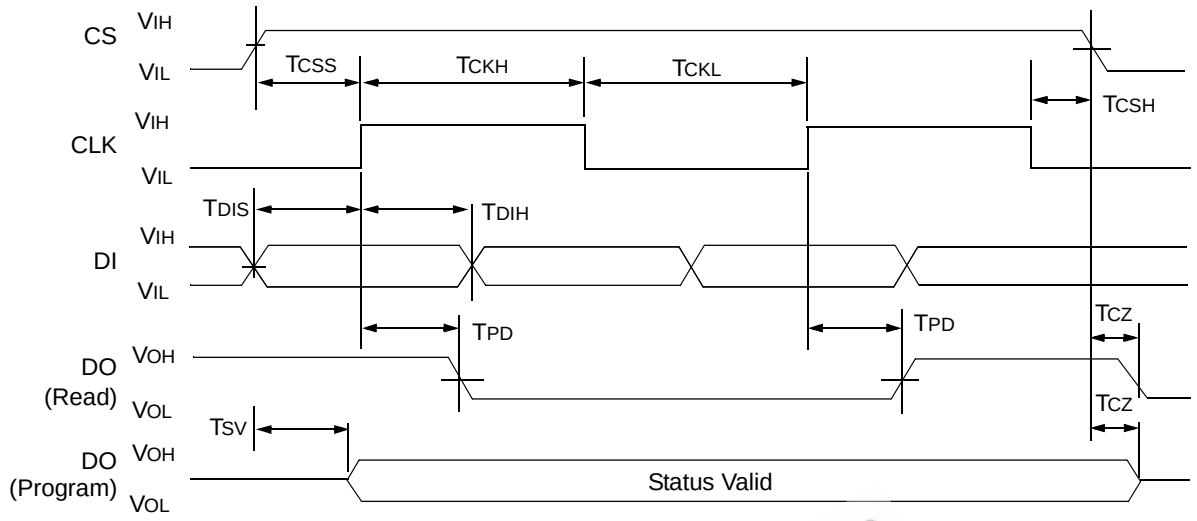
TABLE 2-2: AC CHARACTERISTICS

All parameters apply over the specified ranges unless otherwise noted.			VCC = 1.8V to 5.5V Industrial (I): TA = -40°C to +85°C Automotive (E): TA = -40°C to +125°C			
Param. No.	**Symbol**	**Parameter**	**Min.**	**Max.**	**Units**	**Conditions**
A1	FCLK	Clock frequency	—	3 2 1	MHz MHz MHz	4.5V ≤ VCC < 5.5V 2.5V ≤ VCC < 4.5V 1.8V ≤ VCC < 2.5V
A2	TCKH	Clock high time	200 250 450	—	ns ns ns	4.5V ≤ VCC < 5.5V 2.5V ≤ VCC < 4.5V 1.8V ≤ VCC < 2.5V
A3	TCKL	Clock low time	100 200 450	—	ns ns ns	4.5V ≤ VCC < 5.5V 2.5V ≤ VCC < 4.5V 1.8V ≤ VCC < 2.5V
A4	TCSS	Chip Select setup time	50 100 250	—	ns ns ns	4.5V ≤ VCC < 5.5V 2.5V ≤ VCC < 4.5V 1.8V ≤ VCC < 2.5V
A5	TCSH	Chip Select hold time	0	—	ns	1.8V ≤ VCC < 5.5V
A6	TCSL	Chip Select low time	250	—	ns	1.8V ≤ VCC < 5.5V
A7	TDIS	Data input setup time	50 100 250	—	ns ns ns	4.5V ≤ VCC < 5.5V 2.5V ≤ VCC < 4.5V 1.8V ≤ VCC < 2.5V
A8	TDIH	Data input hold time	50 100 250	—	ns ns ns	4.5V ≤ VCC < 5.5V 2.5V ≤ VCC < 4.5V 1.8V ≤ VCC < 2.5V
A9	TPD	Data output delay time	—	100	ns	4.5V ≤ VCC < 5.5V, CL = 100 pF (93C76X/86X)
			—	200 250 400	ns ns ns	4.5V ≤ VCC < 5.5V, CL = 100 pF 2.5V ≤ VCC < 4.5V, CL = 100 pF 1.8V ≤ VCC < 2.5V, CL = 100 pF
A10	TCZ	Data output disable time	—	100 200	ns ns	4.5V ≤ VCC < 5.5V, **(Note 1)** 1.8V ≤ VCC < 4.5V, **(Note 1)**
A11	TSV	Status valid time	—	200 300 500	ns ns ns	4.5V ≤ VCC < 5.5V, CL = 100 pF 2.5V ≤ VCC < 4.5V, CL = 100 pF 1.8V ≤ VCC < 2.5V, CL = 100 pF
A12	TWC	Program cycle time	—	5	ms	Erase/Write mode 93XX76X/86X (AA and LC versions)
			—	6	ms	93XX46X/56X/66X (AA and LC versions)
A13	TWC		—	2	ms	93C46X/56X/66X/76X/86X
A14	TEC	Program cycle time	—	6	ms	ERAL mode, 4.5V ≤ VCC ≤ 5.5V
A15	TWL		—	15	ms	WRAL mode, 4.5V ≤ VCC ≤ 5.5V
A16	—	Endurance	1M	—	cycles	25°C, VCC = 5.0V, **(Note 2)**

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

2: This application is not tested but ensured by characterization. For endurance estimates in a specific application, please consult the Total Endurance™ Model which may be downloaded from Microchip's web site at www.microchip.com.

FIGURE 2-1: SYNCHRONOUS DATA TIMING



Note: Status Valid Time (TSV) is relative to CS.

TABLE 2-3: INSTRUCTION SET FOR 93XX46A/B/C

Instruction	SB	Opcode	Address								Data In	Data Out	Req. CLK Cycles
93XX46B OR 93XX46C WITH ORG = 1 (16-BIT WORD ORGANIZATION)													
ERASE	1	11		A5	A4	A3	A2	A1	A0		—	(RDY/$\overline{BSY}$)	9
ERAL	1	00		1	0	x	x	x	x		—	(RDY/$\overline{BSY}$)	9
EWDS	1	00		0	0	x	x	x	x		—	High-Z	9
EWEN	1	00		1	1	x	x	x	x		—	High-Z	9
READ	1	10		A5	A4	A3	A2	A1	A0		—	D15-D0	25
WRITE	1	01		A5	A4	A3	A2	A1	A0		D15-D0	(RDY/$\overline{BSY}$)	25
WRAL	1	00		0	1	x	x	x	x		D15-D0	(RDY/$\overline{BSY}$)	25
93XX46A OR 93XX46C WITH ORG = 0 (8-BIT WORD ORGANIZATION)													
ERASE	1	11		A6	A5	A4	A3	A2	A1	A0	—	(RDY/$\overline{BSY}$)	10
ERAL	1	00		1	0	x	x	x	x	x	—	(RDY/$\overline{BSY}$)	10
EWDS	1	00		0	0	x	x	x	x	x	—	High-Z	10
EWEN	1	00		1	1	x	x	x	x	x	—	High-Z	10
READ	1	10		A6	A5	A4	A3	A2	A1	A0	—	D7-D0	18
WRITE	1	01		A6	A5	A4	A3	A2	A1	A0	D7-D0	(RDY/$\overline{BSY}$)	18
WRAL	1	00		0	1	x	x	x	x	x	D7-D0	(RDY/$\overline{BSY}$)	18

TABLE 2-4: INSTRUCTION SET FOR 93XX56A/B/C

Instruction	SB	Opcode	Address									Data In	Data Out	Req. CLK Cycles
93XX56B OR 93XX56C WITH ORG = 1 (16-BIT WORD ORGANIZATION)														
ERASE	1	11	x	A6	A5	A4	A3	A2	A1	A0		—	(RDY/$\overline{BSY}$)	11
ERAL	1	00	1	0	x	x	x	x	x	x		—	(RDY/$\overline{BSY}$)	11
EWDS	1	00	0	0	x	x	x	x	x	x		—	High-Z	11
EWEN	1	00	1	1	x	x	x	x	x	x		—	High-Z	11
READ	1	10	x	A6	A5	A4	A3	S2	A1	A0		—	D15-D0	27
WRITE	1	01	x	A6	A5	A4	A3	S2	A1	A0		D15-D0	(RDY/$\overline{BSY}$)	27
WRAL	1	00	0	1	x	x	x	x	x	x		D15-D0	(RDY/$\overline{BSY}$)	27
93XX56A OR 93XX56C WITH ORG = 0 (8-BIT WORD ORGANIZATION)														
ERASE	1	11	x	A7	A6	A5	A4	A3	A2	A1	A0	—	(RDY/$\overline{BSY}$)	12
ERAL	1	00	1	0	x	x	x	x	x	x	x	—	(RDY/$\overline{BSY}$)	12
EWDS	1	00	0	0	x	x	x	x	x	x	x	—	High-Z	12
EWEN	1	00	1	1	x	x	x	x	x	x	x	—	High-Z	12
READ	1	10	x	A7	A6	A5	A4	A3	A2	A1	A0	—	D7-D0	20
WRITE	1	01	x	A7	A6	A5	A4	A3	A2	A1	A0	D7-D0	(RDY/$\overline{BSY}$)	20
WRAL	1	00	0	1	x	x	x	x	x	x	x	D7-D0	(RDY/$\overline{BSY}$)	20

TABLE 2-5: INSTRUCTION SET FOR 93XX66A/B/C

Instruction	SB	Opcode	Address									Data In	Data Out	Req. CLK Cycles
93XX66B OR 93XX66C WITH ORG = 1 (16-BIT WORD ORGANIZATION)														
ERASE	1	11		A7	A6	A5	A4	A3	A2	A1	A0	—	(RDY/$\overline{BSY}$)	11
ERAL	1	00		1	0	x	x	x	x	x	x	—	(RDY/$\overline{BSY}$)	11
EWDS	1	00		0	0	x	x	x	x	x	x	—	High-Z	11
EWEN	1	00		1	1	x	x	x	x	x	x	—	High-Z	11
READ	1	10		A7	A6	A5	A4	A3	A2	A1	A0	—	D15-D0	27
WRITE	1	01		A7	A6	A5	A4	A3	A2	A1	A0	D15-D0	(RDY/$\overline{BSY}$)	27
WRAL	1	00		0	1	x	x	x	x	x	x	D15-D0	(RDY/$\overline{BSY}$)	27
93XX66A OR 93XX66C WITH ORG = 0 (8-BIT WORD ORGANIZATION)														
ERASE	1	11		A8	A7	A6	A5	A4	A3	A2	A1	A0	—	(RDY/$\overline{BSY}$)	12
ERAL	1	00		1	0	x	x	x	x	x	x	x	—	(RDY/$\overline{BSY}$)	12
EWDS	1	00		0	0	x	x	x	x	x	x	x	—	High-Z	12
EWEN	1	00		1	1	x	x	x	x	x	x	x	—	High-Z	12
READ	1	10		A8	A7	A6	A5	A4	A3	A2	A1	A0	—	D7-D0	20
WRITE	1	01		A8	A7	A6	A5	A4	A3	A2	A1	A0	D7-D0	(RDY/$\overline{BSY}$)	20
WRAL	1	00		0	1	x	x	x	x	x	x	x	D7-D0	(RDY/$\overline{BSY}$)	20

TABLE 2-6: INSTRUCTION SET FOR 93XX76A/B/C

Instruction	SB	Opcode	Address											Data In	Data Out	Req. CLK Cycles
93XX76B OR 93XX76C WITH ORG = 1 (16-BIT WORD ORGANIZATION)																
ERASE	1	11		x	A8	A7	A6	A5	A4	A3	A2	A1	A0	—	(RDY/$\overline{BSY}$)	13
ERAL	1	00		1	0	x	x	x	x	x	x	x	x	—	(RDY/$\overline{BSY}$)	13
EWDS	1	00		0	0	x	x	x	x	x	x	x	x	—	High-Z	13
EWEN	1	00		1	1	x	x	x	x	x	x	x	x	—	High-Z	13
READ	1	10		x	A8	A7	A6	A5	A4	A3	A2	A1	A0	—	D15-D0	29
WRITE	1	01		x	A8	A7	A6	A5	A4	A3	A2	A1	A0	D15-D0	(RDY/$\overline{BSY}$)	29
WRAL	1	00		0	1	x	x	x	x	x	x	x	x	D15-D0	(RDY/$\overline{BSY}$)	29
93XX76A OR 93XX76C WITH ORG = 0 (8-BIT WORD ORGANIZATION)																
ERASE	1	11	x	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	—	(RDY/$\overline{BSY}$)	14
ERAL	1	00	1	0	x	x	x	x	x	x	x	x	x	—	(RDY/$\overline{BSY}$)	14
EWDS	1	00	0	0	x	x	x	x	x	x	x	x	x	—	High-Z	14
EWEN	1	00	1	1	x	x	x	x	x	x	x	x	x	—	High-Z	14
READ	1	10	x	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	—	D7-D0	22
WRITE	1	01	x	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	D7-D0	(RDY/$\overline{BSY}$)	22
WRAL	1	00	0	1	x	x	x	x	x	x	x	x	x	D7-D0	(RDY/$\overline{BSY}$)	22

TABLE 2-7: INSTRUCTION SET FOR 93XX86A/B/C

Instruction	SB	Opcode	Address											Data In	Data Out	Req. CLK Cycles
93XX86B OR 93XX86C WITH ORG = 1 (16-BIT WORD ORGANIZATION)																
ERASE	1	11		A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	—	(RDY/$\overline{\text{BSY}}$)	13
ERAL	1	00		1	0	x	x	x	x	x	x	x	x	—	(RDY/$\overline{\text{BSY}}$)	13
EWDS	1	00		0	0	x	x	x	x	x	x	x	x	—	High-Z	13
EWEN	1	00		1	1	x	x	x	x	x	x	x	x	—	High-Z	13
READ	1	10		A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	—	D15-D0	29
WRITE	1	01		A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	D15-D0	(RDY/$\overline{\text{BSY}}$)	29
WRAL	1	00		0	1	x	x	x	x	x	x	x	x	D15-D0	(RDY/$\overline{\text{BSY}}$)	29
93XX86A OR 93XX86C WITH ORG = 0 (8-BIT WORD ORGANIZATION)																
ERASE	1	11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	—	(RDY/$\overline{\text{BSY}}$)	14
ERAL	1	00	1	0	x	x	x	x	x	x	x	x	x	—	(RDY/$\overline{\text{BSY}}$)	14
EWDS	1	00	0	0	x	x	x	x	x	x	x	x	x	—	High-Z	14
EWEN	1	00	1	1	x	x	x	x	x	x	x	x	x	—	High-Z	14
READ	1	10	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	—	D7-D0	22
WRITE	1	01	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	D7-D0	(RDY/$\overline{\text{BSY}}$)	22
WRAL	1	00	0	1	x	x	x	x	x	x	x	x	x	D7-D0	(RDY/$\overline{\text{BSY}}$)	22

3.0 FUNCTIONAL DESCRIPTION

When the ORG pin is connected to VCC, the (x16) organization is selected. When it is connected to ground, the (x8) organization is selected. Instructions, addresses and write data are clocked into the DI pin on the rising edge of the clock (CLK). The DO pin is normally held in a High-Z state except when reading data from the device, or when checking the Ready/Busy status during a programming operation. The Ready/Busy status can be verified during an Erase/Write operation by polling the DO pin; DO low indicates that programming is still in progress, while DO high indicates the device is ready. DO will enter the High-Z state on the falling edge of CS.

3.1 Start Condition

The Start bit is detected by the device if CS and DI are both high with respect to the positive edge of CLK for the first time.

Before a Start condition is detected, CS, CLK and DI may change in any combination (except to that of a Start condition), without resulting in any device operation (Read, Write, Erase, EWEN, EWDS, ERAL or WRAL). As soon as CS is high, the device is no longer in Standby mode.

An instruction following a Start condition will only be executed if the required opcode, address and data bits for any particular instruction are clocked in.

Note:	When preparing to transmit an instruction, either the CLK or DI signal levels must be at a logic low as CS is toggled active high.

3.2 Data In/Data Out (DI/DO)

It is possible to connect the Data In and Data Out pins together. However, with this configuration it is possible for a "bus conflict" to occur during the "dummy zero" that precedes the read operation, if A0 is a logic high level. Under such a condition the voltage level seen at Data Out is undefined and will depend upon the relative impedances of Data Out and the signal source driving A0. The higher the current sourcing capability of the driver, the higher the voltage at the Data Out pin. In order to limit this current, a resistor should be connected between DI and DO.

3.3 Data Protection

All modes of operation are inhibited when VCC is below a typical voltage of 1.5V for '93AAXX' and '93LCXX' devices or 3.8V for '93CXX' devices.

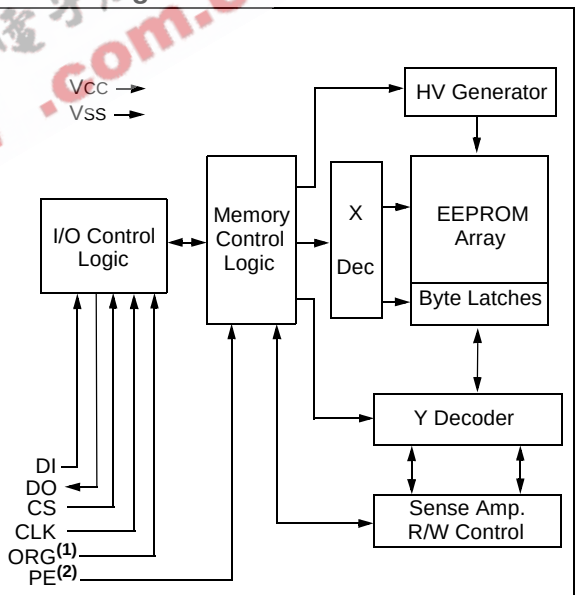
The EWEN and EWDS commands give additional protection against accidentally programming during normal operation.

Note:	For added protection, an EWDS command should be performed after every write operation and an external 10 kΩ pull-down protection resistor should be added to the CS pin.

After power-up, the device is automatically in the EWDS mode. Therefore, an `EWEN` instruction must be performed before the initial `ERASE` or `WRITE` instruction can be executed.

Note:	To prevent accidental writes to the array in the 93XX76C/86C devices, set the PE pin to a logic low.

Block Diagram



Note 1: ORG pin: Only on 93XX46C/56C/66C/76C/86C.

2: PE pin: Only on 93XX76C/86C.

3.4 ERASE

The ERASE instruction forces all data bits of the specified address to the logical '1' state. CS is brought low following the loading of the last address bit. This falling edge of the CS pin initiates the self-timed programming cycle, except on '93CXX' devices where the rising edge of CLK before the last address bit initiates the write cycle.

The DO pin indicates the Ready/$\overline{\text{Busy}}$ status of the device if CS is brought high after a minimum of 250 ns low (TCSL). DO at logical '0' indicates that programming is still in progress. DO at logical '1' indicates that the register at the specified address has been erased and the device is ready for another instruction.

Note:	After the Erase cycle is complete, issuing a Start bit and then taking CS low will clear the Ready/$\overline{\text{Busy}}$ status from DO.

FIGURE 3-1: ERASE TIMING FOR 93AAXX AND 93LCXX DEVICES

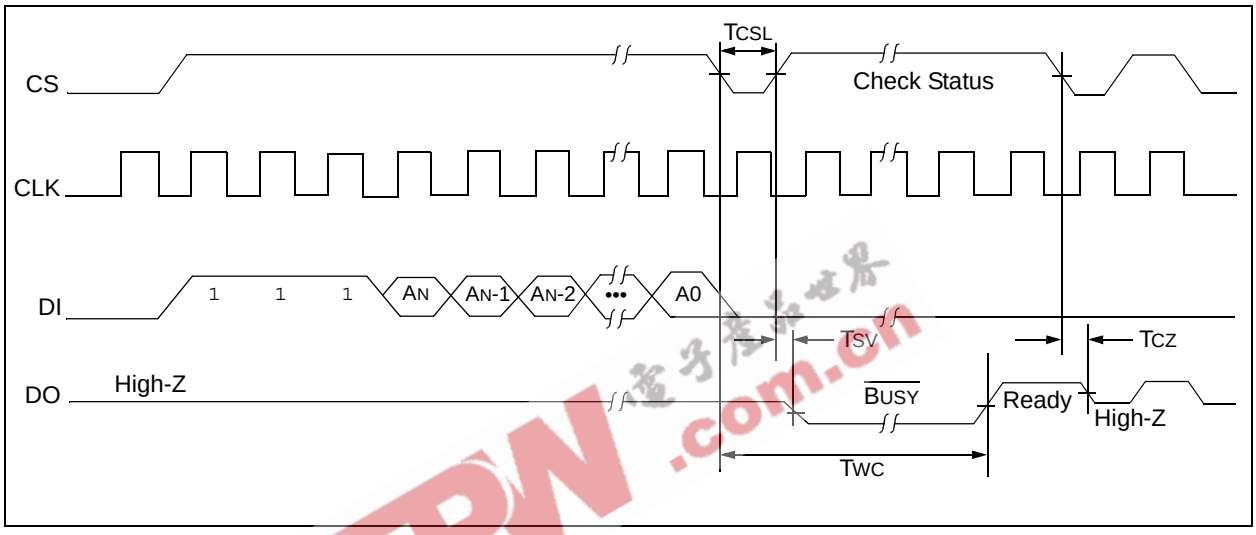
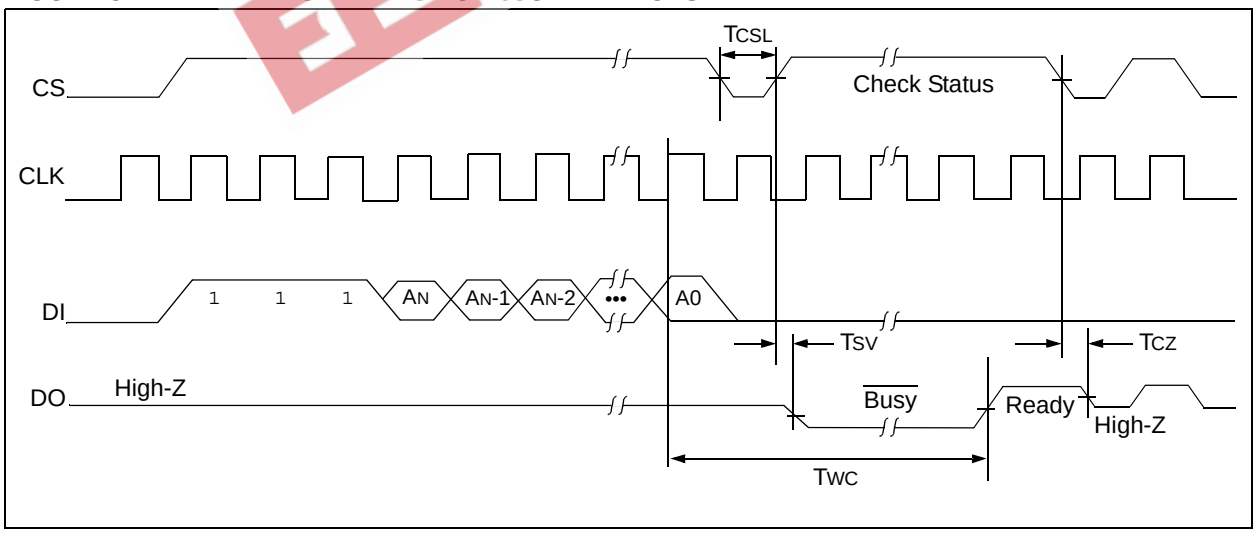


FIGURE 3-2: ERASE TIMING FOR 93CXX DEVICES



3.5 ERASE ALL (ERAL)

The Erase All (ERAL) instruction will erase the entire memory array to the logical '1' state. The ERAL cycle is identical to the Erase cycle, except for the different opcode. The ERAL cycle is completely self-timed and commences at the falling edge of the CS, except on '93CXX' devices where the rising edge of CLK before the last data bit initiates the write cycle. Clocking of the CLK pin is not necessary after the device has entered the ERAL cycle.

The DO pin indicates the Ready/$\overline{\text{Busy}}$ status of the device, if CS is brought high after a minimum of 250 ns low (TCSL).

VCC must be ≥ 4.5V for proper operation of ERAL.

Note:	After the ERAL command is complete, issuing a Start bit and then taking CS low will clear the Ready/$\overline{\text{Busy}}$ status from DO.

FIGURE 3-3: ERAL TIMING FOR 93AAXX AND 93LCXX DEVICES

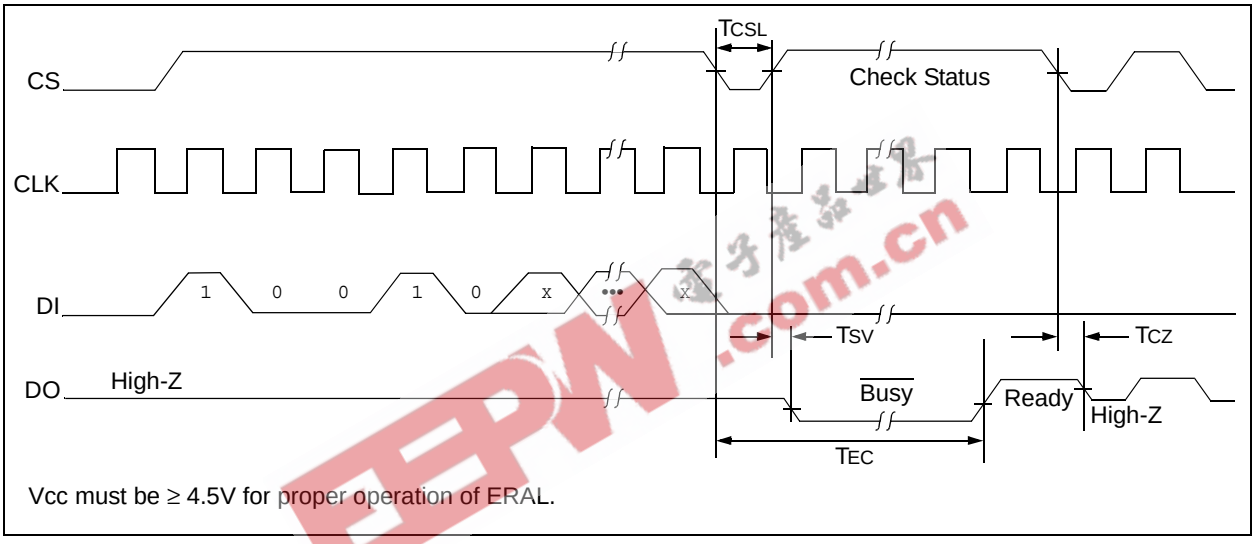
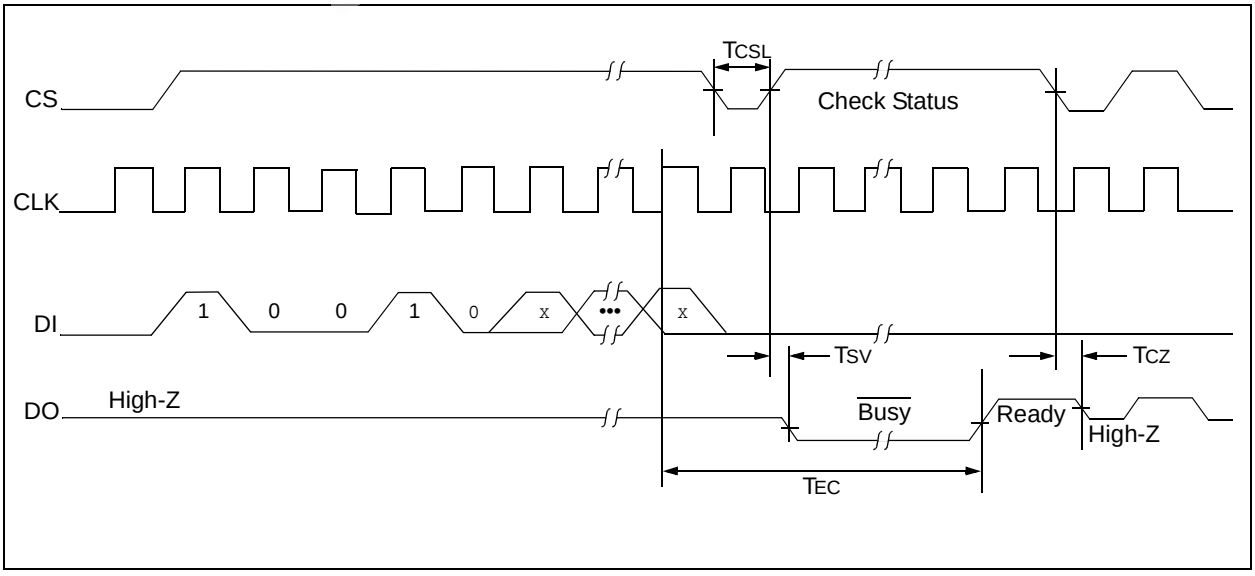


FIGURE 3-4: ERAL TIMING FOR 93CXX DEVICES



3.6 ERASE/WRITE DISABLE And ENABLE (EWDS/EWEN)

The 93XX series devices power-up in the Erase/Write Disable (EWDS) state. All programming modes must be preceded by an Erase/Write Enable (EWEN) instruction. Once the EWEN instruction is executed, programming remains enabled until an EWDS instruction is executed or VCC is removed from the device.

To protect against accidental data disturbance, the EWDS instruction can be used to disable all Erase/Write functions and should follow all programming operations. Execution of a READ instruction is independent of both the EWEN and EWDS instructions.

FIGURE 3-5: EWDS TIMING

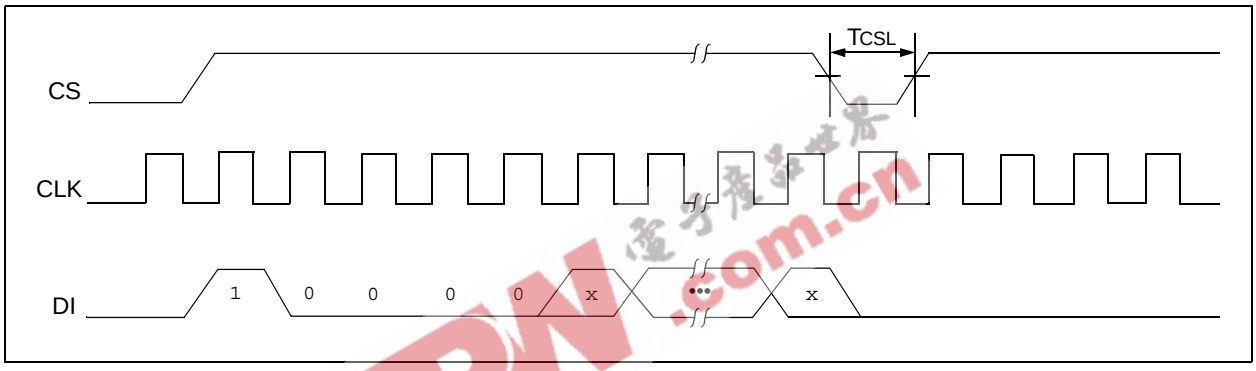
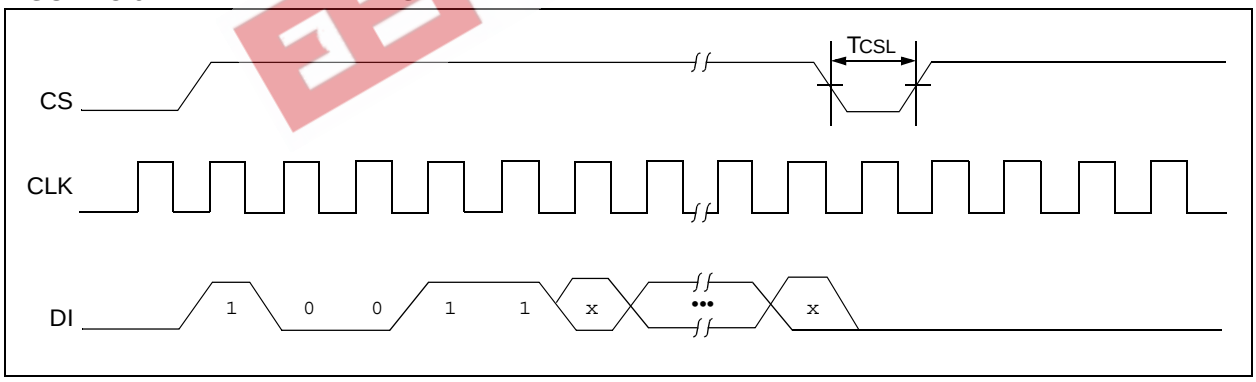


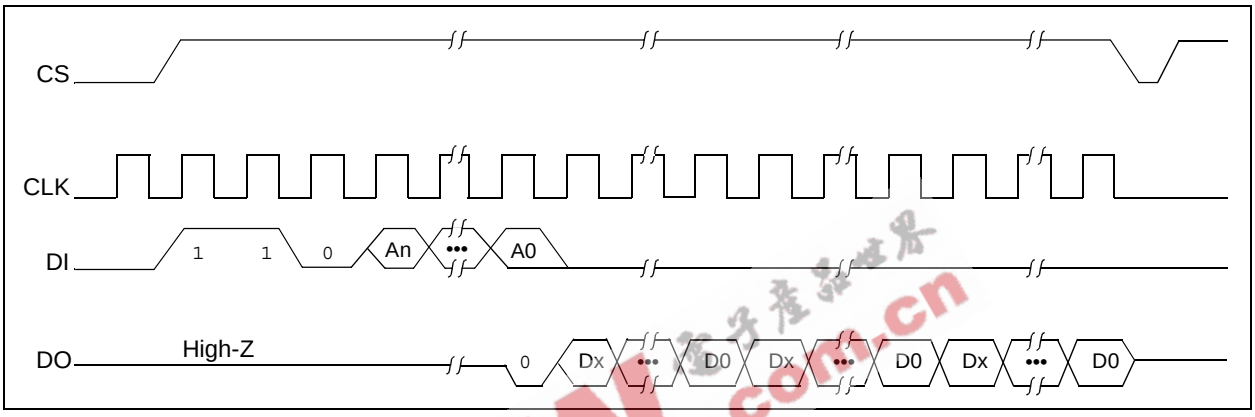
FIGURE 3-6: EWEN TIMING



3.7 READ

The READ instruction outputs the serial data of the addressed memory location on the DO pin. A dummy zero bit precedes the 8-bit (If ORG pin is low or A-version devices) or 16-bit (If ORG pin is high or B-version devices) output string. The output data bits will toggle on the rising edge of the CLK and are stable after the specified time delay (TPD). Sequential read is possible when CS is held high. The memory data will automatically cycle to the next register and output sequentially.

FIGURE 3-7: READ TIMING



3.8 WRITE

The WRITE instruction is followed by 8 bits (If ORG is low or A-version devices) or 16 bits (If ORG pin is high or B-version devices) of data which are written into the specified address. For 93AAXX and 93LCXX devices, after the last data bit is clocked into DI, the falling edge of CS initiates the self-timed auto-erase and programming cycle. For 93CXX devices, the self-timed auto-erase and programming cycle is initiated by the rising edge of CLK on the last data bit.

The DO pin indicates the Ready/$\overline{\text{Busy}}$ status of the device, if CS is brought high after a minimum of 250 ns low (TCSL). DO at logical '0' indicates that programming is still in progress. DO at logical '1' indicates that the register at the specified address has been written with the data specified and the device is ready for another instruction.

Note:	For devices with PE functionality such as the 93XX76C or 93XX86C, the write sequence requires a logic high signal on the PE pin prior to the rising edge of clock on the last data bit.

Note:	After the Write cycle is complete, issuing a Start bit and then taking CS low will clear the Ready/$\overline{\text{Busy}}$ status from DO.

FIGURE 3-8: WRITE TIMING FOR 93AAXX AND 93LCXX DEVICES

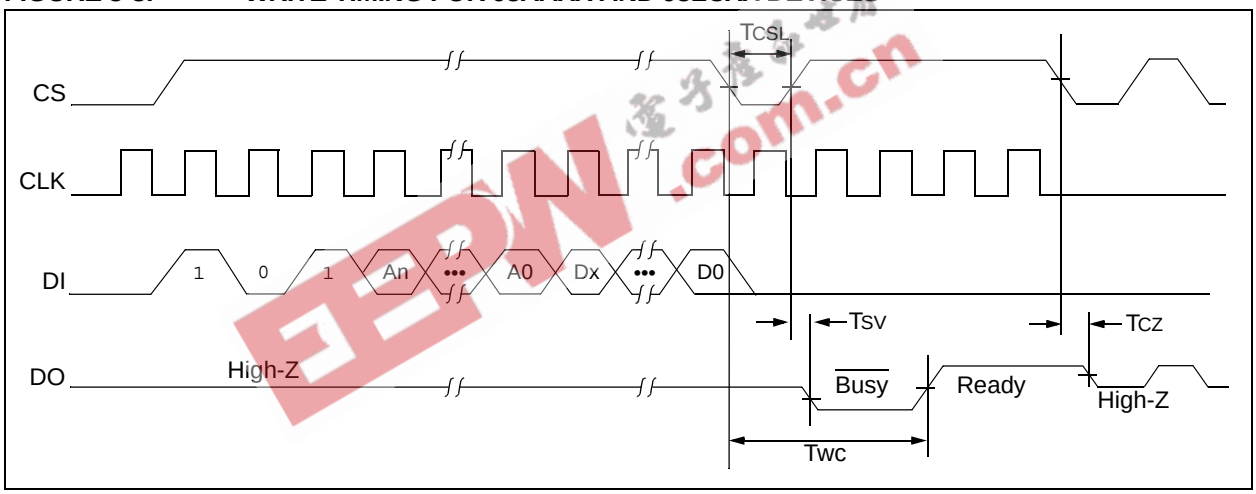
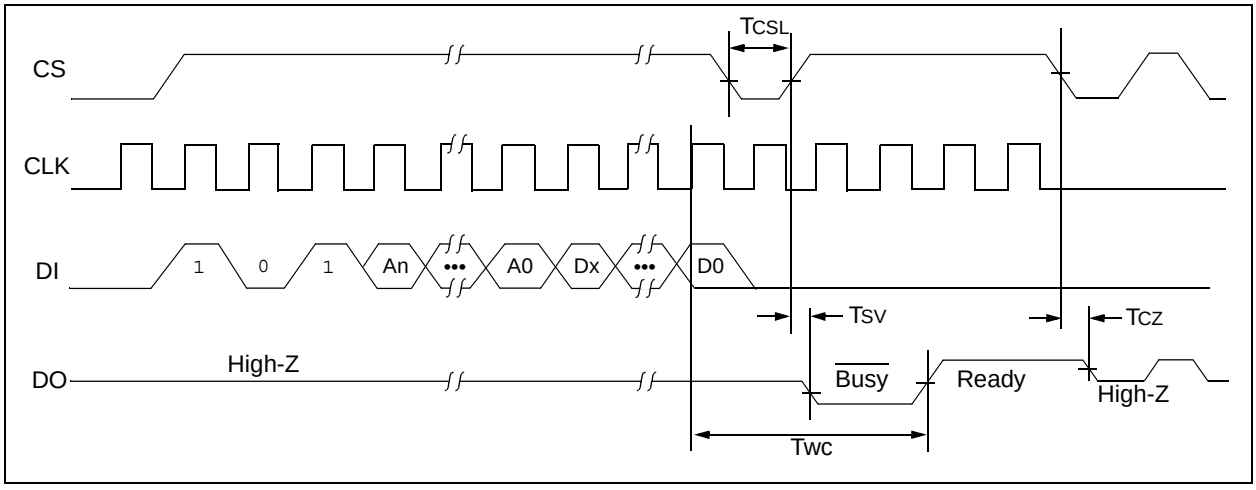


FIGURE 3-9: WRITE TIMING FOR 93CXX DEVICES



3.9 WRITE ALL (WRAL)

The Write All (WRAL) instruction will write the entire memory array with the data specified in the command. For 93AAXX and 93LCXX devices, after the last data bit is clocked into DI, the falling edge of CS initiates the self-timed auto-erase and programming cycle. For 93CXX devices, the self-timed auto-erase and programming cycle is initiated by the rising edge of CLK on the last data bit. Clocking of the CLK pin is not necessary after the device has entered the WRAL cycle. The WRAL command does include an automatic ERAL cycle for the device. Therefore, the WRAL instruction does not require an ERAL instruction, but the chip must be in the EWEN status.

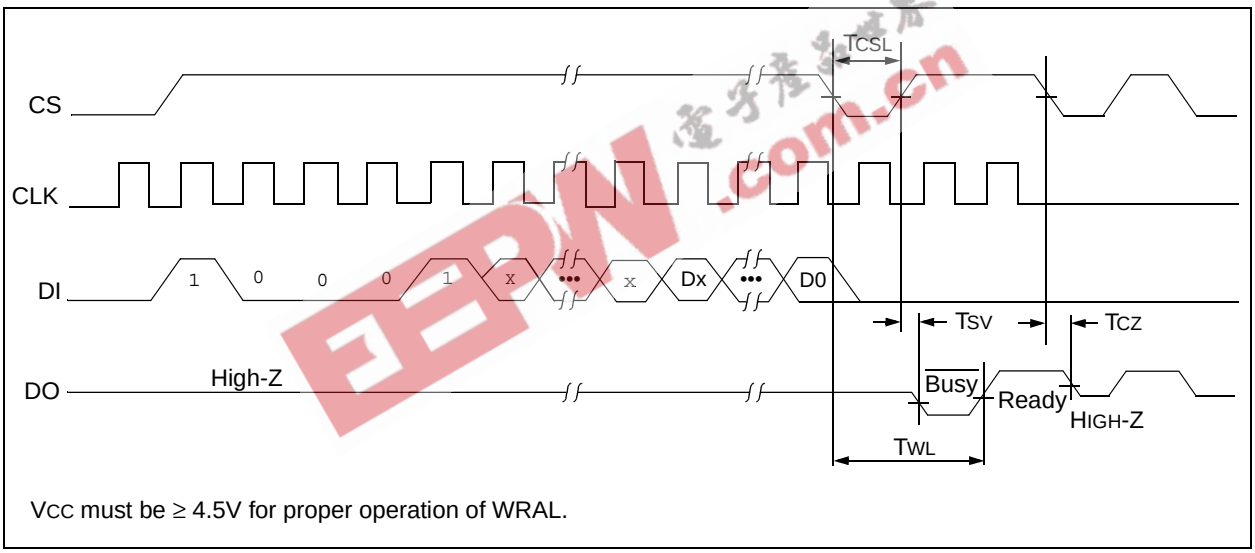
The DO pin indicates the Ready/$\overline{\text{Busy}}$ status of the device if CS is brought high after a minimum of 250 ns low (T_{CSL}).

V_{CC} must be ≥ 4.5V for proper operation of WRAL.

Note:	For devices with PE functionality such as the 93XX76C or 93XX86C, the write sequence requires a logic high signal on the PE pin prior to the rising edge of clock on the last data bit.

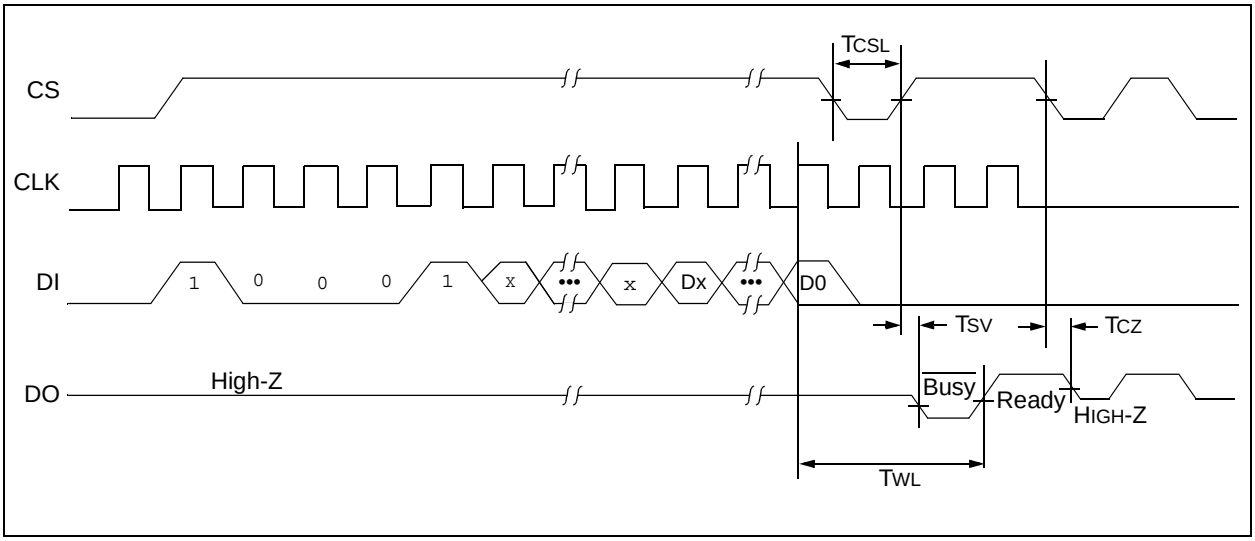
Note:	After the Write All cycle is complete, issuing a Start bit and then taking CS low will clear the Ready/$\overline{\text{Busy}}$ status from DO.

FIGURE 3-10: WRAL TIMING FOR 93AAXX AND 93LCXX DEVICES



V_{CC} must be ≥ 4.5V for proper operation of WRAL.

FIGURE 3-11: WRAL TIMING FOR 93CXX DEVICES



4.0 PIN DESCRIPTIONS

TABLE 4-1: PIN DESCRIPTIONS

Name	SOIC/PDIP/MSOP/ TSSOP/DFN	SOT-23	Function
CS	1	5	Chip Select
CLK	2	4	Serial Clock
DI	3	3	Data In
DO	4	1	Data Out
VSS	5	2	Ground
ORG	6	N/A	Organization (93XX46C/56C/66C/76C/86C)
NC(1)			No connect on 93XXA/B devices
PE	7	N/A	Program Enable (93XX76C/86C)
NC(1)			No connect on 93XXA/B devices
VCC	8	6	Power Supply

Note 1: With no internal connection, logic levels on NC pins are "don't cares."

4.1 Chip Select (CS)

A high level selects the device; a low level deselects the device and forces it into Standby mode. However, a programming cycle which is already in progress will be completed, regardless of the Chip Select (CS) input signal. If CS is brought low during a program cycle, the device will go into Standby mode as soon as the programming cycle is completed.

CS must be low for 250 ns minimum (TCSL) between consecutive instructions. If CS is low, the internal control logic is held in a Reset status.

4.2 Serial Clock (CLK)

The Serial Clock is used to synchronize the communication between a master device and the 93XX series device. Opcodes, address and data bits are clocked in on the positive edge of CLK. Data bits are also clocked out on the positive edge of CLK.

CLK can be stopped anywhere in the transmission sequence (at high or low level) and can be continued anytime with respect to Clock High Time (TCKH) and Clock Low Time (TCKL). This gives the controlling master freedom in preparing opcode, address and data.

CLK is a "don't care" if CS is low (device deselected). If CS is high, but the Start condition has not been detected (DI = 0), any number of clock cycles can be received by the device without changing its status (i.e., waiting for a Start condition).

CLK cycles are not required during the self-timed Write (i.e., auto Erase/Write) cycle.

After detection of a Start condition the specified number of clock cycles (respectively low-to-high transitions of CLK) must be provided. These clock cycles are required to clock in all required opcode, address and data bits before an instruction is executed. CLK and DI then become "don't care" inputs waiting for a new Start condition to be detected.

4.3 Data In (DI)

Data In (DI) is used to clock in a Start bit, opcode, address and data synchronously with the CLK input.

4.4 Data Out (DO)

Data Out (DO) is used in the Read mode to output data synchronously with the CLK input (TPD after the positive edge of CLK).

This pin also provides Ready/$\overline{\text{Busy}}$ status information during Erase and Write cycles. Ready/$\overline{\text{Busy}}$ status information is available on the DO pin if CS is brought high after being low for minimum Chip Select Low Time (TCSL) and an erase or write operation has been initiated.

The Status signal is not available on DO, if CS is held low during the entire Erase or Write cycle. In this case, DO is in the High-Z mode. If status is checked after the Erase/Write cycle, the data line will be high to indicate the device is ready.

Note:	After the Read cycle is complete, issuing a Start bit and then taking CS low will clear the Ready/$\overline{\text{Busy}}$ status from DO.

4.5 Organization (ORG)

When the ORG pin is connected to VCC or Logic HI, the (x16) memory organization is selected. When the ORG pin is tied to VSS or Logic LO, the (x8) memory organization is selected. For proper operation, ORG must be tied to a valid logic level.

For devices without the ORG functionality, there is no internal connection to the ORG pin. In these devices the functionality has been set at the factory to support a single word size.

'A' series devices – x8 organization

'B' series devices – x16 organization

4.6 Program Enable (PE)

A logic level on the PE pin will enable or disable the ability to write data to the memory array in only the 8-lead 93XX76C and 93XX86C devices. For all other devices the PE function is not present and the PE pin is a no connect. When driving the PE pin to a logic High, the device can be programmed, but when the PE pin is driven Low, programming is inhibited. This pin is used in parallel with the EWEN/EWDS latch to protect the memory array from inadvertent writes, as shown in Table 4-2.

In either the 93XX76C or 93XX86C devices, the PE pin must be tied to a specific logic level and cannot be floated. In all other devices without the PE function, the PE pin has no internal connections and programming is always enabled.

TABLE 4-2: WRITE PROTECTION SCHEME

EWEN/EWDS Latch	PE Pin*	Array WRITE
Enabled	1	Yes
Disabled	1	No
Enabled	0	No
Disabled	0	No

* PE pin level does not alter the state of the EWEN/EWDS latch.

Note: For devices with PE functionality such as 93XX76C or 93XX86C, the write sequence requires a logic high signal on the PE pin prior to the rising edge of clock on the last data bit.

APPENDIX A: REVISION HISTORY

Revision A

Original release of document. Combined all the 93-Series Microwire Serial EEPROM device data sheets.

Revision B

Revised 2x3 (MC) DFN package drawing.

Revision C

Correction to Table 2-6, 93XX76A (EWDS).

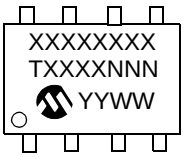
Revision D (03/2007)

Revised Description; Delete Pb-free notes; Replaced Package Drawings; Revised Product ID System.

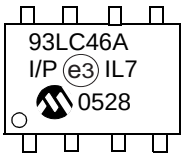
5.0 PACKAGING INFORMATION

5.1 Package Marking Information

8-Lead PDIP



Example: Pb-free



3-Wire 8-Lead PDIP Package Marking					
Part	**Line 1 Marking**	**Part**	**Line 1 Marking**	**Part**	**Line 1 Marking**
93AA46A	93AA46A	93LC46A	93LC46A	93C46A	93C46A
93AA46B	93AA46B	93LC46B	93LC46B	93C46B	93C46B
93AA46C	93AA46C	93LC46C	93LC46C	93C46C	93C46C
93AA56A	93AA56A	93LC56A	93LC56A	93C56A	93C56A
93AA56B	93AA56B	93LC56B	93LC56B	93C56B	93C56B
93AA56C	93AA56C	93LC56C	93LC56C	93C56C	93C56C
93AA66A	93AA66A	93LC66A	93LC66A	93C66A	93C66A
93AA66B	93AA66B	93LC66B	93LC66B	93C66B	93C66B
93AA66C	93AA66C	93LC66C	93LC66C	93C66C	93C66C
93AA76A	93AA76A	93LC76A	93LC76A	93C76A	93C76A
93AA76B	93AA76B	93LC76B	93LC76B	93C76B	93C76B
93AA76C	93AA76C	93LC76C	93LC76C	93C76C	93C76C
93AA86A	93AA86A	93LC86A	93LC86A	93C86A	93C86A
93AA86B	93AA86B	93LC86B	93LC86B	93C86B	93C86B
93AA86C	93AA86C	93LC86C	93LC86C	93C86C	93C86C

Note: Temperature range on second line.

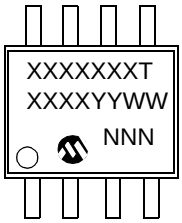
Legend:

XX...X	Part number or part number code
T	Temperature (I, E)
Y	Year code (last digit of calendar year)
YY	Year code (last 2 digits of calendar year)
WW	Week code (week of January 1 is week '01')
NNN	Alphanumeric traceability code (2 characters for small packages)
(e3)	Pb-free JEDEC designator for Matte Tin (Sn)

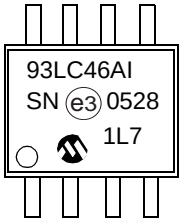
Note: For very small packages with no room for the Pb-free JEDEC designator (e3), the marking will only appear on the outer carton or reel label.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

8-Lead SOIC



Example: Pb-free



3-Wire 8-Lead SOIC (SN) Package Marking					
Part	**Line 1 Marking**	**Part**	**Line 1 Marking**	**Part**	**Line 1 Marking**
93AA46A	93AA46AT	93LC46A	93LC46AT	93C46A	93C46AT
93AA46B	93AA46BT	93LC46B	93LC46BT	93C46B	93C46BT
93AA46C	93AA46CT	93LC46C	93LC46CT	93C46C	93C46CT
93AA56A	93AA56AT	93LC56A	93LC56AT	93C56A	93C56AT
93AA56B	93AA56BT	93LC56B	93LC56BT	93C56B	93C56BT
93AA56C	93AA56CT	93LC56C	93LC56CT	93C56C	93C56CT
93AA66A	93AA66AT	93LC66A	93LC66AT	93C66A	93C66AT
93AA66B	93AA66BT	93LC66B	93LC66BT	93C66B	93C66BT
93AA66C	93AA66CT	93LC66C	93LC66CT	93C66C	93C66CT
93AA76A	93AA76AT	93LC76A	93LC76AT	93C76A	93C76AT
93AA76B	93AA76BT	93LC76B	93LC76BT	93C76B	93C76BT
93AA76C	93AA76CT	93LC76C	93LC76CT	93C76C	93C76CT
93AA86A	93AA86AT	93LC86A	93LC86AT	93C86A	93C86AT
93AA86B	93AA86BT	93LC86B	93LC86BT	93C86B	93C86BT
93AA86C	93AA86CT	93LC86C	93LC86CT	93C86C	93C86CT

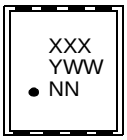
Note: T = Temperature Range: I = Industrial, E = Extended

Legend:	XX...X	Part number or part number code
	T	Temperature (I, E)
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code (2 characters for small packages)
	e3	Pb-free JEDEC designator for Matte Tin (Sn)

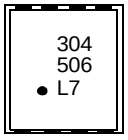
Note: For very small packages with no room for the Pb-free JEDEC designator e3, the marking will only appear on the outer carton or reel label.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

8-Lead 2x3 DFN



Example:



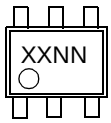
3-Wire 2x3 DFN Package Marking								
Part	**Industrial Line 1 Marking**	**E-Temp Line 1 Marking**	**Part**	**Industrial Line 1 Marking**	**E-Temp Line 1 Marking**	**Part**	**Industrial Line 1 Marking**	**E-Temp Line 1 Marking**
93AA46A	301	302	93LC46A	304	305	93C46A	307	308
93AA46B	311	312	93LC46B	314	315	93C46B	317	318
93AA46C	321	322	93LC46C	324	325	93C46C	327	328
93AA56A	331	332	93LC56A	334	335	93C56A	337	338
93AA56B	341	342	93LC56B	344	345	93C56B	347	348
93AA56C	351	352	93LC56C	354	355	93C56C	357	358
93AA66A	361	362	93LC66A	364	365	93C66A	367	368
93AA66B	371	372	93LC66B	374	375	93C66B	377	378
93AA66C	381	382	93LC66C	384	385	93C66C	387	388
93AA76C	3B1	3B2	93LC76C	3B4	3B5	93C76C	3B7	3B8
93AA86C	3E1	3E2	93LC86C	3E4	3E5	93C86C	3E7	3E8

Legend:	XX...X	Part number or part number code
	T	Temperature (I, E)
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code (2 characters for small packages)
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)

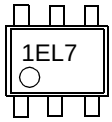
Note: For very small packages with no room for the Pb-free JEDEC designator (e3), the marking will only appear on the outer carton or reel label.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

6-Lead SOT-23



Example:



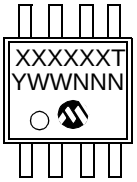
3-Wire 6-Lead SOT-23 Package Marking								
Part	**Industrial Line 1 Marking**	**E-Temp Line 1 Marking**	**Part**	**Industrial Line 1 Marking**	**E-Temp Line 1 Marking**	**Part**	**Industrial Line 1 Marking**	**E-Temp Line 1 Marking**
93AA46A	1BNN	1CNN	93LC46A	1ENN	1FNN	93C46A	1HNN	1JNN
93AA46B	1LNN	1MNN	93LC46B	1PNN	1RNN	93C46B	1TNN	1UNN
93AA56A	2BNN	2CNN	93LC56A	2ENN	2FNN	93C56A	2HNN	2JNN
93AA56B	2LNN	2MNN	93LC56B	2PNN	2RNN	93C56B	2TNN	2UNN
93AA66A	3BNN	3CNN	93LC66A	3ENN	3FNN	93C66A	3HNN	3JNN
93AA66B	3LNN	3MNN	93LC66B	3PNN	3RNN	93C66B	3TNN	3UNN
93AA76A	4BNN	4CNN	93LC76A	4ENN	4FNN	93C76A	4HNN	4JNN
93AA76B	4LNN	4MNN	93LC76B	4PNN	4RNN	93C76B	4TNN	4UNN
93AA86A	5BNN	5CNN	93LC86A	5ENN	5FNN	93C86A	5HNN	5JNN
93AA86B	5LNN	5MNN	93LC86B	5PNN	5RNN	93C86B	5TNN	5UNN

Legend:	XX...X	Part number or part number code
	T	Temperature (I, E)
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code (2 characters for small packages)
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)

Note: For very small packages with no room for the Pb-free JEDEC designator (e3), the marking will only appear on the outer carton or reel label.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

8-Lead MSOP (150 mil)



Example:

3-Wire 8-Lead MSOP Package Marking					
Part	**Line 1 Marking**	**Part**	**Line 1 Marking**	**Part**	**Line 1 Marking**
93AA46A	3A46AT	93LC46A	3L46AT	93C46A	3C46AT
93AA46B	3A46BT	93LC46B	3L46BT	93C46B	3C46BT
93AA46C	3A46CT	93LC46C	3L46CT	93C46C	3C46CT
93AA56A	3A56AT	93LC56A	3L56AT	93C56A	3C56AT
93AA56B	3A56BT	93LC56B	3L56BT	93C56B	3C56BT
93AA56C	3A56CT	93LC56C	3L56CT	93C56C	3C56CT
93AA66A	3A66AT	93LC66A	3L66AT	93C66A	3C66AT
93AA66B	3A66BT	93LC66B	3L66BT	93C66B	3C66BT
93AA66C	3A66CT	93LC66C	3L66CT	93C66C	3C66CT
93AA76A	3A76AT	93LC76A	3L76AT	93C76A	3C76AT
93AA76B	3A76BT	93LC76B	3L76BT	93C76B	3C76BT
93AA76C	3A76CT	93LC76C	3L76CT	93C76C	3C76CT
93AA86A	3A86AT	93LC86A	3L86AT	93C86A	3C86AT
93AA86B	3A86BT	93LC86B	3L86BT	93C86B	3C86BT
93AA86C	3A86CT	93LC86C	3L86CT	93C86C	3C86CT

Note: T = Temperature Range: I = Industrial, E = Extended

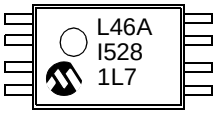
Legend:	XX...X	Part number or part number code
	T	Temperature (I, E)
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code (2 characters for small packages)
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)

Note: For very small packages with no room for the Pb-free JEDEC designator (e3), the marking will only appear on the outer carton or reel label.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

8-Lead TSSOP

Example:



3-Wire 8-Lead TSSOP Package Marking					
Part	**Line 1 Marking**	**Part**	**Line 1 Marking**	**Part**	**Line 1 Marking**
93AA46A	A46A	93LC46A	L46A	93C46A	C46A
93AA46B	A46B	93LC46B	L46B	93C46B	C46B
93AA46C	A46C	93LC46C	L46C	93C46C	C46C
93AA56A	A56A	93LC56A	L56A	93C56A	C56A
93AA56B	A56B	93LC56B	L56B	93C56B	C56B
93AA56C	A56C	93LC56C	L56C	93C56C	C56C
93AA66A	A66A	93LC66A	L66A	93C66A	C66A
93AA66B	A66B	93LC66B	L66B	93C66B	C66B
93AA66C	A66C	93LC66C	L66C	93C66C	C66C
93AA76A	A76A	93LC76A	L76A	93C76A	C76A
93AA76B	A76B	93LC76B	L76B	93C76B	C76B
93AA76C	A76C	93LC76C	L76C	93C76C	C76C
93AA86A	A86A	93LC86A	L86A	93C86A	C86A
93AA86B	A86B	93LC86B	L86B	93C86B	C86B
93AA86C	A86C	93LC86C	L86C	93C86C	C86C

Note: Temperature range on second line.

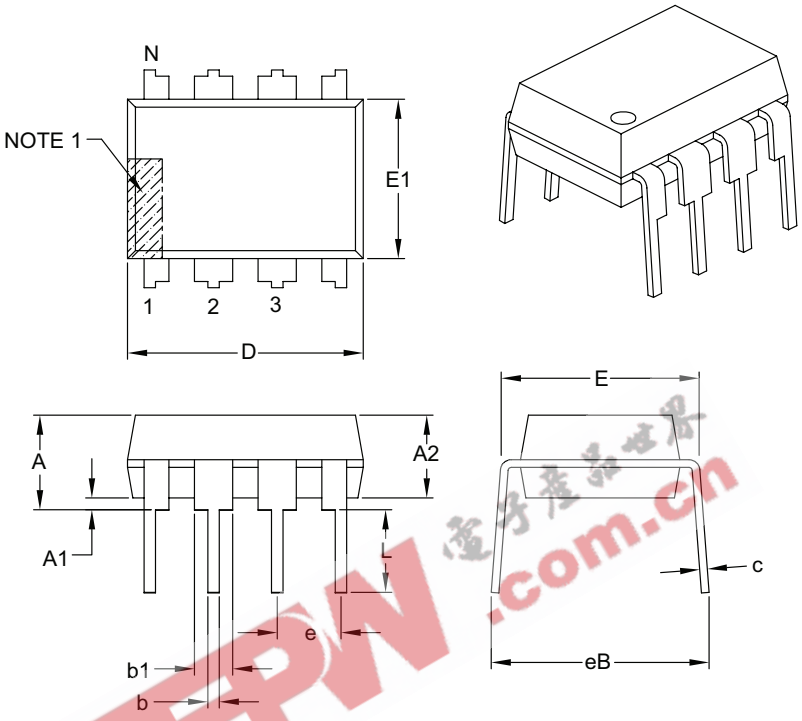
Legend:	XX...X	Part number or part number code
	T	Temperature (I, E)
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code (2 characters for small packages)
	(e3)	Pb-free JEDEC designator for Matte Tin (Sn)

Note: For very small packages with no room for the Pb-free JEDEC designator (e3), the marking will only appear on the outer carton or reel label.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information.

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

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



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:

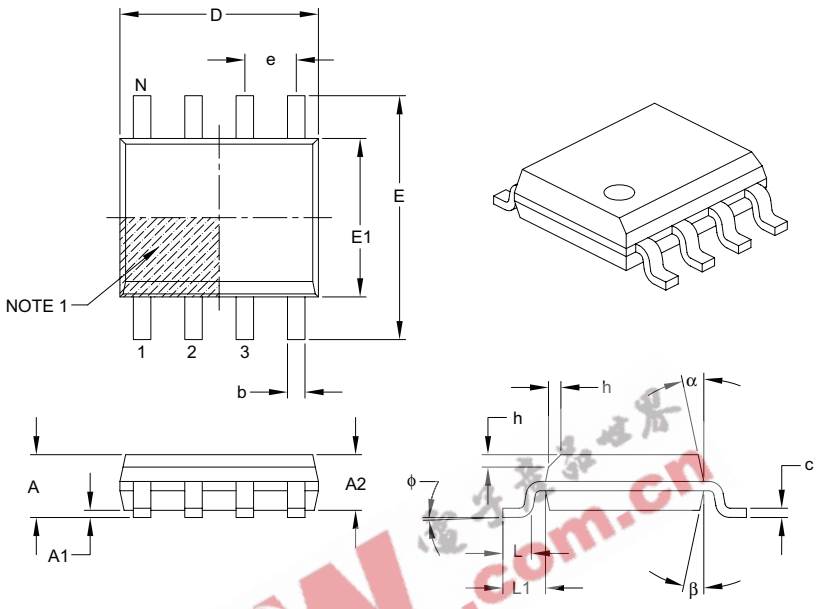
1. Pin 1 visual index feature may vary, but must be located with the hatched area.
2. § Significant Characteristic.
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" per side.
4. Dimensioning and tolerancing per ASME Y14.5M.

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

Microchip Technology Drawing C04-018B

8-Lead Plastic Small Outline (SN or OA) – Narrow, 3.90 mm Body [SOIC]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		1.27 BSC	
Overall Height	A	–	–	1.75
Molded Package Thickness	A2	1.25	–	–
Standoff §	A1	0.10	–	0.25
Overall Width	E		6.00 BSC	
Molded Package Width	E1		3.90 BSC	
Overall Length	D		4.90 BSC	
Chamfer (optional)	h	0.25	–	0.50
Foot Length	L	0.40	–	1.27
Footprint	L1		1.04 REF	
Foot Angle	ϕ	0°	–	8°
Lead Thickness	c	0.17	–	0.25
Lead Width	b	0.31	–	0.51
Mold Draft Angle Top	α	5°	–	15°
Mold Draft Angle Bottom	β	5°	–	15°

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic.
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15 mm per side.
4. Dimensioning and tolerancing per ASME Y14.5M.

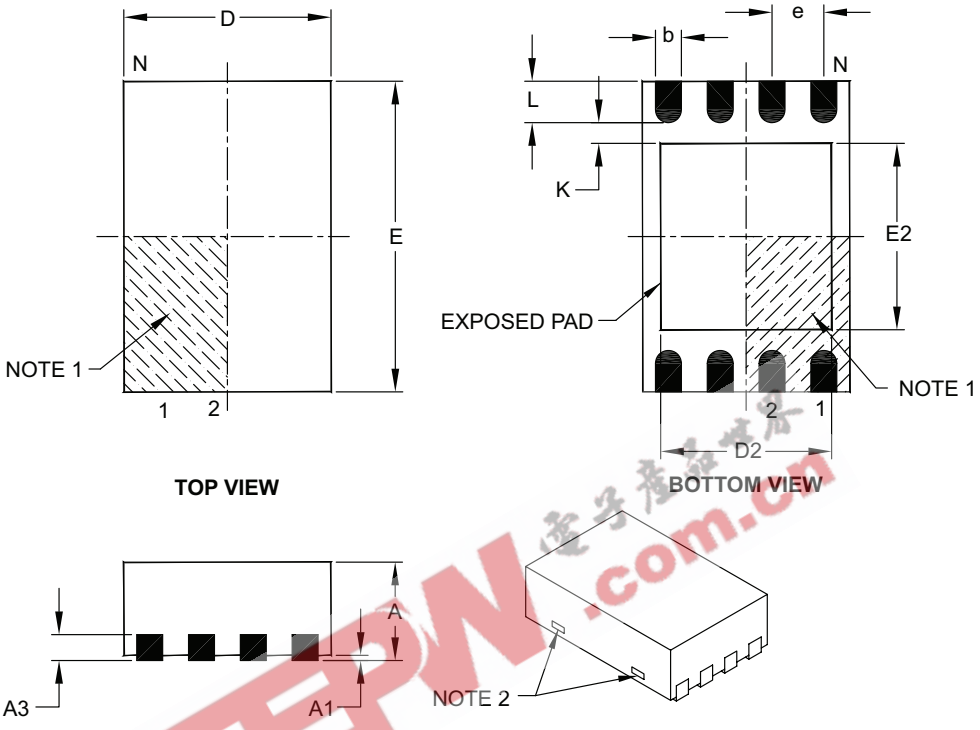
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-057B

8-Lead Plastic Dual Flat, No Lead Package (MC) – 2x3x0.9 mm Body [DFN]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		0.50 BSC	
Overall Height	A	0.80	0.90	1.00
Standoff	A1	0.00	0.02	0.05
Contact Thickness	A3		0.20 REF	
Overall Length	D		2.00 BSC	
Overall Width	E		3.00 BSC	
Exposed Pad Length	D2	1.30	–	1.75
Exposed Pad Width	E2	1.50	–	1.90
Contact Width	b	0.18	0.25	0.30
Contact Length	L	0.30	0.40	0.50
Contact-to-Exposed Pad	K	0.20	–	–

Notes:

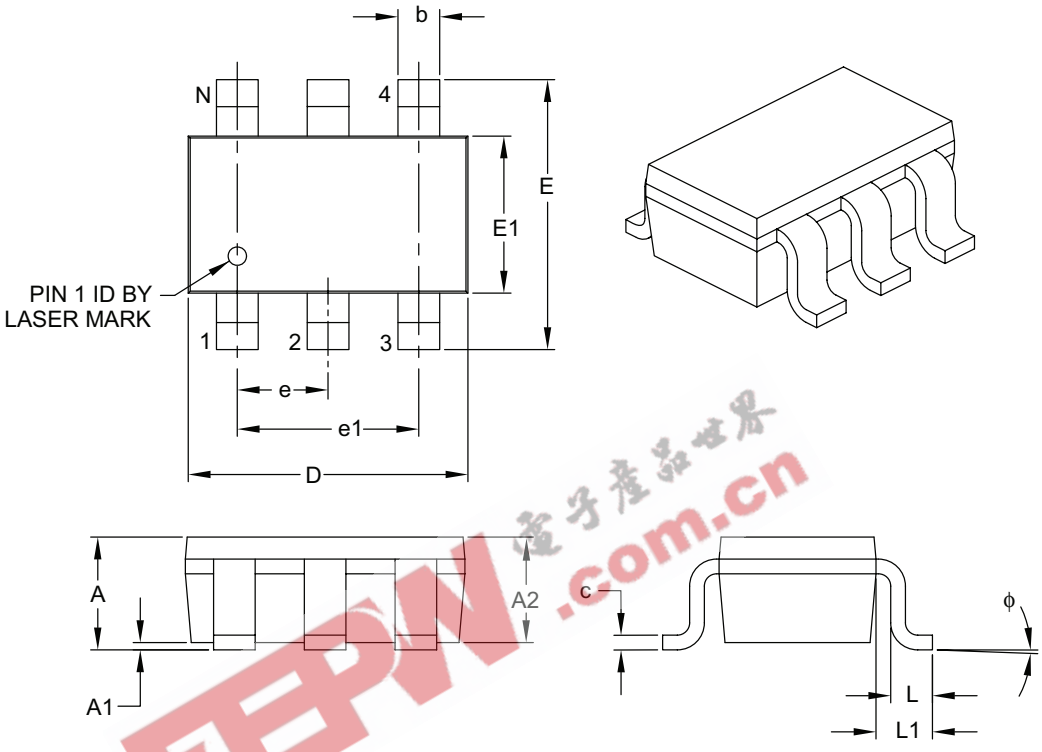
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package may have one or more exposed tie bars at ends.
3. Package is saw singulated.
4. Dimensioning and tolerancing per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-123B

6-Lead Plastic Small Outline Transistor (CH or OT) [SOT-23]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		6	
Pitch	e		0.95 BSC	
Outside Lead Pitch	e1		1.90 BSC	
Overall Height	A	0.90	–	1.45
Molded Package Thickness	A2	0.89	–	1.30
Standoff	A1	0.00	–	0.15
Overall Width	E	2.20	–	3.20
Molded Package Width	E1	1.30	–	1.80
Overall Length	D	2.70	–	3.10
Foot Length	L	0.10	–	0.60
Footprint	L1	0.35	–	0.80
Foot Angle	ϕ	0°	–	30°
Lead Thickness	c	0.08	–	0.26
Lead Width	b	0.20	–	0.51

Notes:

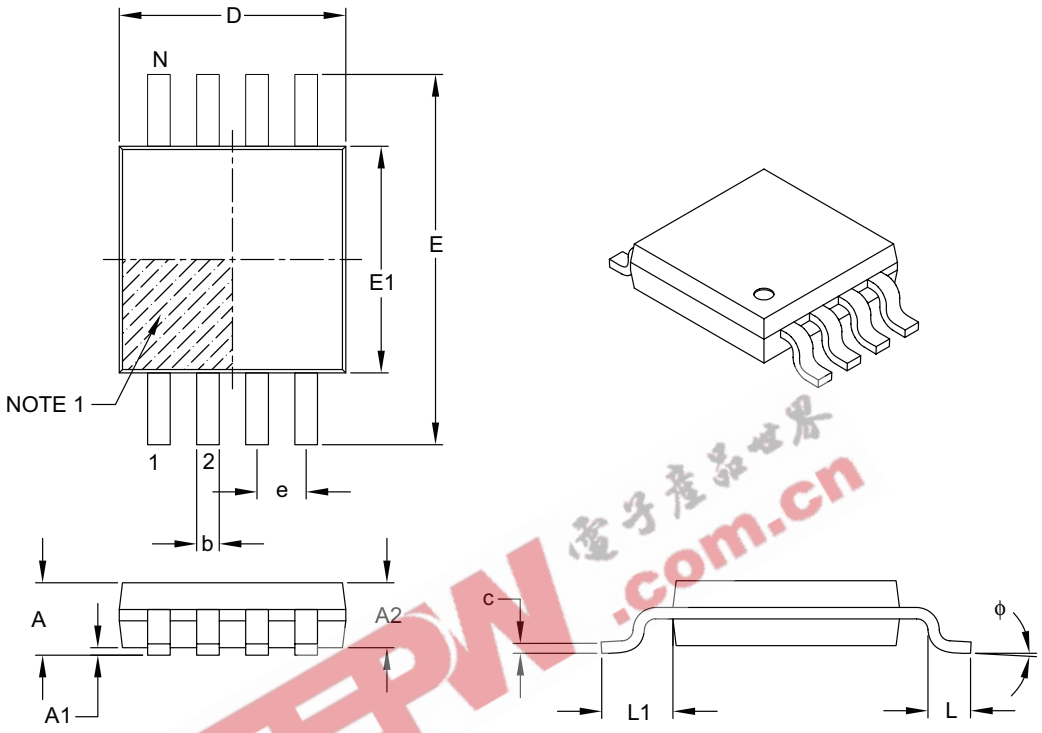
1. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.127 mm per side.
2. Dimensioning and tolerancing per ASME Y14.5M.

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

Microchip Technology Drawing C04-028B

8-Lead Plastic Micro Small Outline Package (MS or UA) [MSOP]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		0.65 BSC	
Overall Height	A	–	–	1.10
Molded Package Thickness	A2	0.75	0.85	0.95
Standoff	A1	0.00	–	0.15
Overall Width	E		4.90 BSC	
Molded Package Width	E1		3.00 BSC	
Overall Length	D		3.00 BSC	
Foot Length	L	0.40	0.60	0.80
Footprint	L1		0.95 REF	
Foot Angle	ϕ	0°	–	8°
Lead Thickness	c	0.08	–	0.23
Lead Width	b	0.22	–	0.40

Notes:

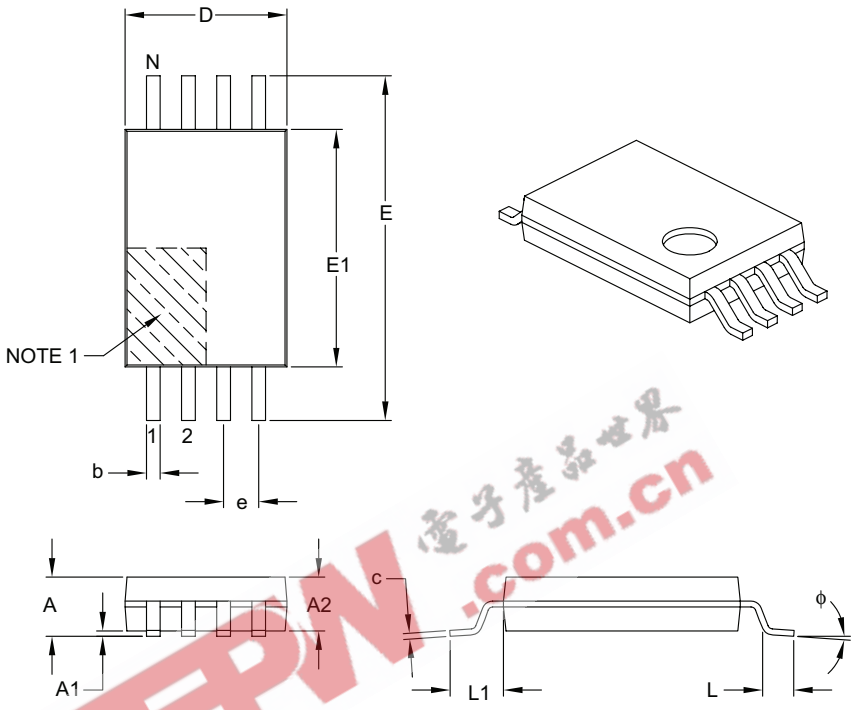
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15 mm per side.
3. Dimensioning and tolerancing per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-111B

8-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm Body [TSSOP]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		0.65 BSC	
Overall Height	A	–	–	1.20
Molded Package Thickness	A2	0.80	1.00	1.05
Standoff	A1	0.05	–	0.15
Overall Width	E		6.40 BSC	
Molded Package Width	E1	4.30	4.40	4.50
Molded Package Length	D	2.90	3.00	3.10
Foot Length	L	0.45	0.60	0.75
Footprint	L1		1.00 REF	
Foot Angle	ϕ	0°	–	8°
Lead Thickness	c	0.09	–	0.20
Lead Width	b	0.19	–	0.30

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15 mm per side.
3. Dimensioning and tolerancing per ASME Y14.5M.

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

   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-086B

NOTES:

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6. Is there any incorrect or misleading information (what and where)?

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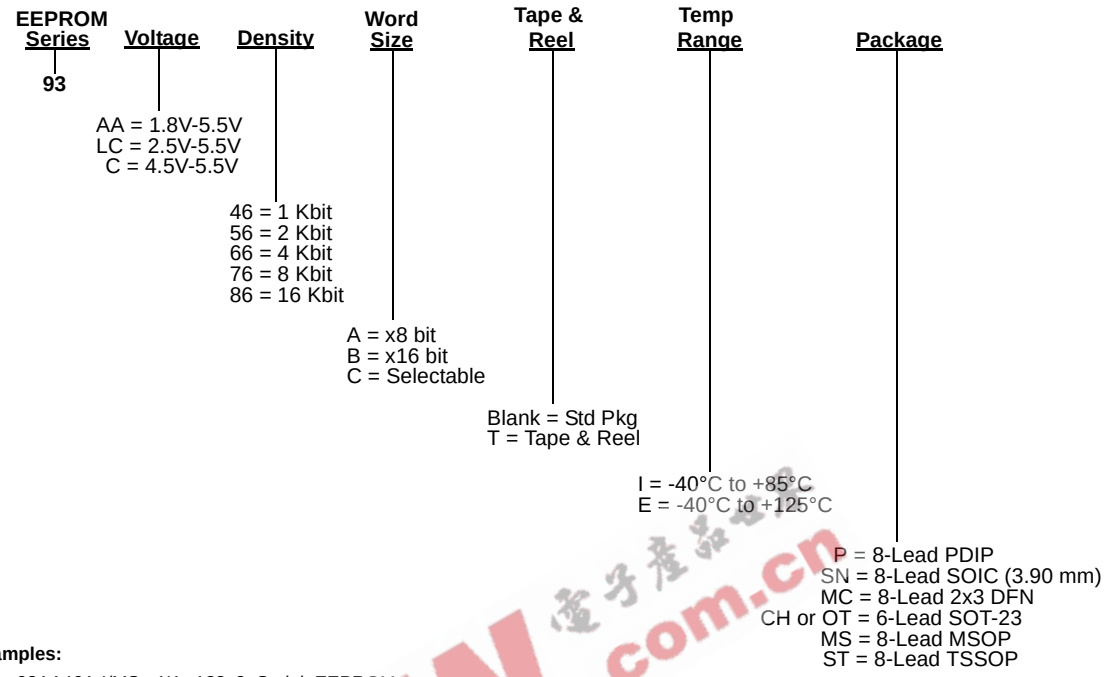
To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.



Examples:

a) 93AA46A-I/MS: 1K, 128x8 Serial EEPROM, Industrial Temperature, MSOP package, 1.8V

b) 93AA46BT-I/OT: 1K, 64x16 Serial EEPROM, SOT-23 package, tape and reel, 1.8V

c) 93AA46CT-I/MS: 1K, 128x8 or 64x16 Serial EEPROM, MSOP package, tape and reel, 1.8V

d) 93AA46BX-I/SN: 1K, 128x8 Serial EEPROM, Industrial temperature, SOIC package (alternate pinout), tape and reel package, 1.8V

e) 93LC66A-I/MS: 4K, 512x8 Serial EEPROM, MSOP package, 2.5V

f) 93LC66BT-I/OT: 4K, 256x16 Serial EEPROM, SOT-23 package, tape and reel, 2.5V

g) 93C86AT-I/OT: 16K, 2048x8 Serial EEPROM, SOT-23 package, tape and reel, 5.0V

h) 93C86BT-I/OT: 16K, 1024x16 Serial EEPROM, SOT-23 package, tape and reel, 5.0V

i) 93C86CT-I/MC: 16K, 2048x8 or 1024x16 Serial EEPROM, DFN Industrial temperature, tape and reel package, 5.0V

NOTES:

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- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

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