MICROCHIP

24AA64F/24LC64F

64K I^{2}C™ Serial EEPROM with Quarter-Array Write-Protect

Device Selection Table

| Part Number	Vcc Range	Max. Clock Frequency	Temp. Ranges
24AA64F	1.7-5.5	400 kHz[1]	I
24LC64F	2.5-5.5	400 kHz	I, E

Note 1: 100 kHz for V_{CC} <2.5V.

Features:

- Single-Supply with Operation down to 1.7V for 24AA64F devices, 2.5V for 24LC64F devices
- Low-Power CMOS Technology:
  - Read current 400 μA, max.
  - Standby current 1 μA, max. (I-temp)
- 2-Wire Serial Interface, I^{2}C™ Compatible
- Packages with 3 Address Pins are cascadable up to 8 Devices
- Schmitt Trigger Inputs for Noise Suppression
- Output Slope Control to Eliminate Ground Bounce
- 100 kHz and 400 kHz Clock Compatibility
- Page Write Time 5 ms, typical
- Self-timed Erase/Write Cycle
- 32-Byte Page Write Buffer
- Hardware Write-protect for 1/4 Array (1800h-1FFFh)
- ESD Protection > 4,000V
- More than 1 Million Erase/Write Cycles
- Data Retention > 200 Years
- Factory Programming Available
- Packages include 8-lead PDIP, SOIC, TSSOP, MSOP, TDFN, 5-lead SOT-23
- Pb-Free and RoHS Compliant
- Temperature Ranges:
  - Industrial (I): -40°C to +85°C
 - Automotive (E): -40°C to +125°C

Description:

The Microchip Technology Inc. 24AA64F/24LC64F (24XX64F*) is a 64 Kbit Electrically Erasable PROM. The device is organized as a single block of 8K x 8-bit memory with a 2-wire serial interface. Low-voltage design permits operation down to 1.7V, with standby and read currents of only 1 μA and 400 μA, respectively. It has been developed for advanced, low-power applications such as personal communications or data acquisition. The 24XX64F also has a page write capability for up to 32 bytes of data. Functional address lines allow up to eight devices on the same bus, for up to 512 Kbits address space. The 24XX64F is available in the standard 8-pin PDIP, surface mount SOIC, TSSOP, TDFN and MSOP packages. The 24XX64F is also available in the 5-lead SOT-23 package.

Block Diagram
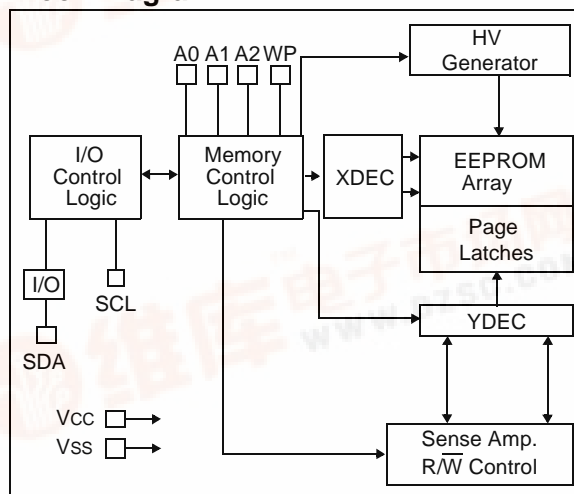
Package Types
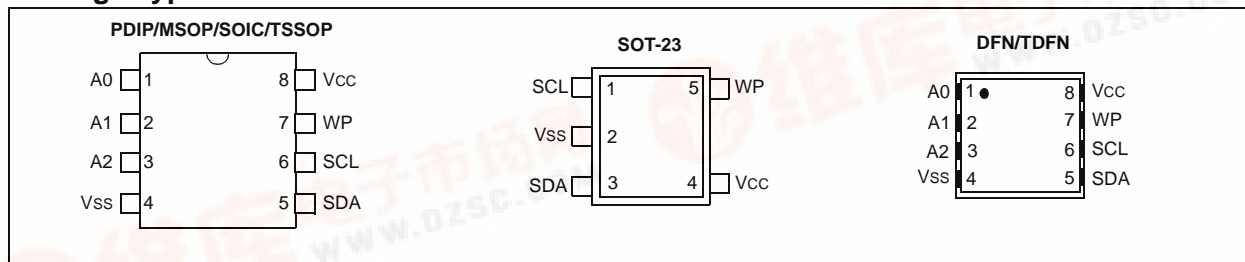
* 24XX64F is used in this document as a generic part number for the 24AA64F/24LC64F devices.

24AA64F/24LC64F

1.0   ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings [†]

Vcc...6.5V

All inputs and outputs w.r.t. Vss .... -0.3V 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 1-1:   DC CHARACTERISTICS

DC CHARACTERISTICS			Industrial (I): T_A = -40°C to +85°C, Vcc = +1.7V to +5.5V Automotive (E): T_A = -40°C to +125°C, Vcc = +2.5V to +5.5V					
Param. No.	Sym.	Characteristic	Min.	Typ.	Max.	Units	Conditions	
	—	**A0, A1, A2, WP, SCL and SDA pins**	—	—	—	—	—	
D1	V_{IH}	High-level input voltage	0.7 Vcc	—	—	V	—	
D2	V_{IL}	Low-level input voltage	—	—	0.3 Vcc 0.2 Vcc	V V	Vcc ≥ 2.5V Vcc < 2.5V	
D3	V_{HYS}	Hysteresis of Schmitt Trigger inputs (SDA, SCL pins)	0.05 Vcc	—	—	V	Vcc ≥ 2.5V **(Note 1)**	
D4	V_{OL}	Low-level output voltage	—	—	0.40	V	I_{OL} = 3.0 mA @ Vcc = 4.5V I_{OL} = 2.1 mA @ Vcc = 2.5V	
D5	I_{LI}	**Input leakage current**	—	—	±1	μA	V_{IN} = Vss or Vcc	
D6	I_{LO}	**Output leakage current**	—	—	±1	μA	V_{OUT} = Vss or Vcc	
D7	C_{IN}, C_{OUT}	Pin capacitance (all inputs/outputs)	—	—	10	pF	Vcc = 5.0V **(Note 1)** T_A = 25°C, F_{CLK} = 1 MHz	
D8	I_{CC} write	**Operating current**	—	0.1	3	mA	Vcc = 5.5V, SCL = 400 kHz	
D9	I_{CC} read		—	0.05	400	μA		
D10	I_{CCS}	**Standby current**	— —	.01 —	1 5	μA μA	Industrial Automotive SDA = SCL = Vcc A0, A1, A2, WP = Vss	

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

2:   Typical measurements taken at room temperature.

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TABLE 1-2:   AC CHARACTERISTICS

AC CHARACTERISTICS			Electrical Characteristics: Industrial (I): V_{CC} = +1.7V to 5.5V T_A = -40°C to +85°C Automotive (E): V_{CC} = +2.5V to 5.5V T_A = -40°C to 125°C			
Param. No.	Sym.	Characteristic	Min.	Max.	Units	Conditions
1	F_{CLK}	Clock frequency	— —	100 400	kHz	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
2	T_{HIGH}	Clock high time	4000 600	— —	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
3	T_{LOW}	Clock low time	4700 1300	— —	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
4	T_R	SDA and SCL rise time **(Note 1)**	— —	1000 300	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
5	T_F	SDA and SCL fall time **(Note 1)**	—	300	ns	—
6	$T_{HD:STA}$	Start condition hold time	4000 600	— —	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
7	$T_{SU:STA}$	Start condition setup time	4700 600	— —	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
8	$T_{HD:DAT}$	Data input hold time	0	—	ns	**(Note 2)**
9	$T_{SU:DAT}$	Data input setup time	250 100	— —	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
10	$T_{SU:STO}$	Stop condition setup time	4000 600	— —	ns	$1.7 V \leq V_{CC} < 2.5V$ $2.5 V \leq V_{CC} \leq 5.5V$
11	$T_{SU:WP}$	WP setup time	4000 600	— —	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
12	$T_{HD:WP}$	WP hold time	4700 1300	— —	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
13	T_{AA}	Output valid from clock **(Note 2)**	— —	3500 900	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
14	T_{BUF}	Bus free time: Time the bus must be free before a new transmission can start	4700 1300	— —	ns	$1.7V \leq V_{CC} < 2.5V$ $2.5V \leq V_{CC} \leq 5.5V$
15	T_{OF}	Output fall time from V_{IH} minimum to V_{IL} maximum $C_B \leq 100$ pF	$10 + 0.1C_B$	250	ns	**(Note 1)**
16	T_{SP}	Input filter spike suppression (SDA and SCL pins)	—	50	ns	**(Notes 1 and 3)**
17	T_{WC}	Write cycle time (byte or page)	—	5	ms	—
18	—	Endurance	1,000,000	—	cycles	25°C **(Note 4)**

Note 1: Not 100% tested. C_B = total capacitance of one bus line in pF.

2: As a transmitter, the device must provide an internal minimum delay time to bridge the undefined region (minimum 300 ns) of the falling edge of SCL to avoid unintended generation of Start or Stop conditions.

3: The combined T_{SP} and V_{HYS} specifications are due to new Schmitt Trigger inputs, which provide improved noise spike suppression. This eliminates the need for a T_I specification for standard operation.

4: 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 from Microchip's web site at www.microchip.com.

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FIGURE 1-1: **BUS TIMING DATA**
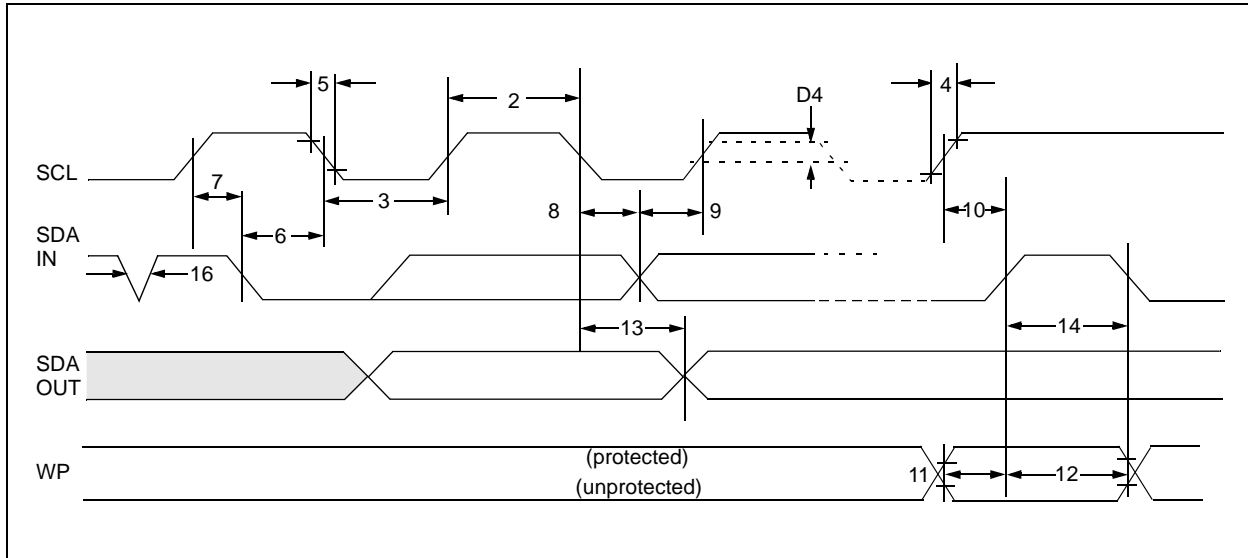
2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Name	PDIP	SOIC	TSSOP	TDFN	MSOP	SOT-23	Description
A0	1	1	1	1	1	—	Chip Address Input
A1	2	2	2	2	2	—	Chip Address Input
A2	3	3	3	3	3	—	Chip Address Input
Vss	4	4	4	4	4	2	Ground
SDA	5	5	5	5	5	3	Serial Address/Data I/O
SCL	6	6	6	6	6	1	Serial Clock
WP	7	7	7	7	7	5	Write-Protect Input
Vcc	8	8	8	8	8	4	+1.7V to 5.5V Power Supply

2.1 A0, A1, A2 Chip Address Inputs

The A0, A1 and A2 inputs are used by the 24XX64F for multiple device operation. The levels on these inputs are compared with the corresponding bits in the slave address. The chip is selected if the compare is true.

Up to eight devices may be connected to the same bus by using different Chip Select bit combinations. These inputs must be connected to either Vcc or Vss.

In most applications, the chip address inputs A0, A1 and A2 are hard-wired to logic '0' or logic '1'. For applications in which these pins are controlled by a microcontroller or other programmable device, the chip address pins must be driven to logic '0' or logic '1' before normal device operation can proceed. Address pins are not available in the SOT-23 package.

2.2 Serial Data (SDA)

SDA is a bidirectional pin used to transfer addresses and data into and out of the device. Since it is an open-drain terminal, the SDA bus requires a pull-up resistor to Vcc (typical 10 kΩ for 100 kHz, 2 kΩ for 400 kHz).

For normal data transfer, SDA is allowed to change only during SCL low. Changes during SCL high are reserved for indicating the Start and Stop conditions.

2.3 Serial Clock (SCL)

The SCL input is used to synchronize the data transfer from and to the device.

2.4 Write-Protect (WP)

This pin must be connected to either Vss or Vcc. If tied to Vss, write operations are enabled. If tied to Vcc, write operations are inhibited for upper 1/4 of the array (1800h-1FFFh), but read operations are not affected.

3.0 FUNCTIONAL DESCRIPTION

The 24XX64F supports a bidirectional, 2-wire bus and data transmission protocol. A device that sends data onto the bus is defined as transmitter, while a device receiving data is defined as a receiver. The bus has to be controlled by a master device which generates the Serial Clock (SCL), controls the bus access and generates the Start and Stop conditions, while the 24XX64F works as slave. Both master and slave can operate as transmitter or receiver, but the master device determines which mode is activated.

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4.0   BUS CHARACTERISTICS

The following **bus protocol** has been defined:

• Data transfer may be initiated only when the bus is not busy

• During data transfer, the data line must remain stable whenever the clock line is high. Changes in the data line while the clock line is high will be interpreted as a Start or Stop condition

Accordingly, the following bus conditions have been defined (Figure 4-1).

4.1   Bus Not Busy (A)

Both data and clock lines remain high.

4.2   Start Data Transfer (B)

A high-to-low transition of the SDA line while the clock (SCL) is high determines a Start condition. All commands must be preceded by a Start condition.

4.3   Stop Data Transfer (C)

A low-to-high transition of the SDA line while the clock (SCL) is high determines a Stop condition. All operations must be ended with a Stop condition.

4.4   Data Valid (D)

The state of the data line represents valid data when, after a Start condition, the data line is stable for the duration of the high period of the clock signal.

The data on the line must be changed during the low period of the clock signal. There is one clock pulse per bit of data.

Each data transfer is initiated with a Start condition and terminated with a Stop condition. The number of data bytes transferred between Start and Stop conditions is determined by the master device and is, theoretically, unlimited (although only the last thirty two will be stored when doing a write operation). When an overwrite does occur, it will replace data in a first-in first-out (FIFO) fashion.

4.5   Acknowledge

Each receiving device, when addressed, is obliged to generate an acknowledge after the reception of each byte. The master device must generate an extra clock pulse which is associated with this Acknowledge bit.

> **Note:**   The 24XX64F does not generate any Acknowledge bits if an internal programming cycle is in progress.

The device that acknowledges has to pull down the SDA line during the Acknowledge clock pulse in such a way that the SDA line is stable low during the high period of the acknowledge related clock pulse. Of course, setup and hold times must be taken into account. During reads, a master must signal an end of data to the slave by not generating an Acknowledge bit on the last byte that has been clocked out of the slave. In this case, the slave (24XX64F) will leave the data line high to enable the master to generate the Stop condition.

FIGURE 4-1:   DATA TRANSFER SEQUENCE ON THE SERIAL BUS
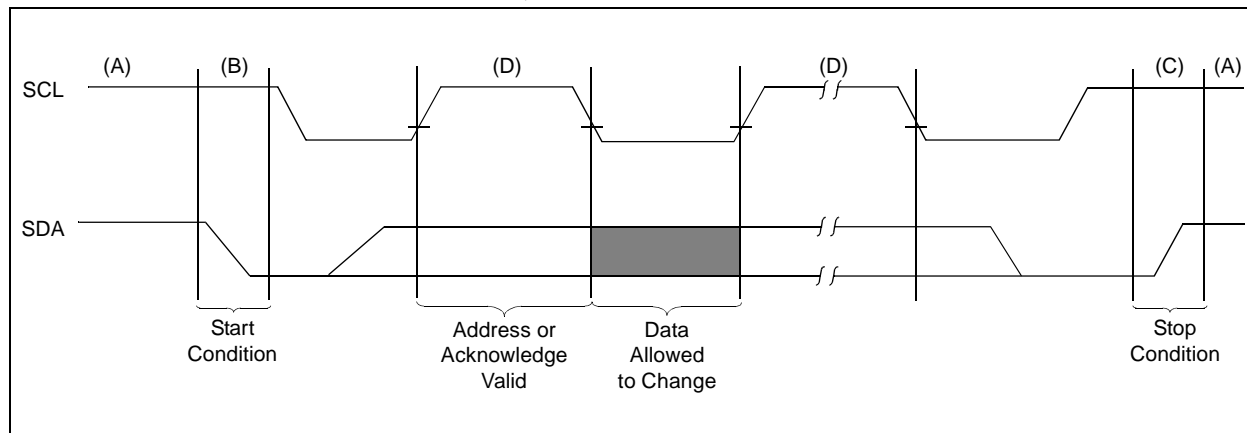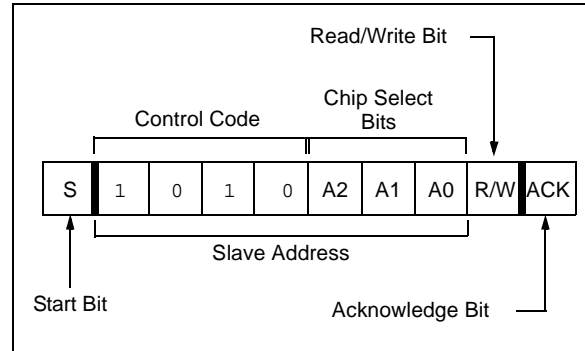
5.0 DEVICE ADDRESSING

A control byte is the first byte received following the Start condition from the master device (Figure 5-1). The control byte consists of a four-bit control code. For the 24XX64F, this is set as '1010' binary for read and write operations. The next three bits of the control byte are the Chip Select bits (A2, A1, A0). The Chip Select bits allow the use of up to eight 24XX64F devices on the same bus and are used to select which device is accessed. The Chip Select bits in the control byte must correspond to the logic levels on the corresponding A2, A1 and A0 pins for the device to respond. These bits are, in effect, the three Most Significant bits of the word address.

For the SOT-23 package, the address pins are not available. During device addressing, the A2, A1 and A0 Chip Select bits (Figure 5-2) should be set to '0'.

The last bit of the control byte defines the operation to be performed. When set to a '1', a read operation is selected. When set to a '0', a write operation is selected. The next two bytes received define the address of the first data byte (Figure 5-2). Because only A12...A0 are used, the upper-three address bits are "don't care" bits. The upper-address bits are transferred first, followed by the Less Significant bits.

Following the Start condition, the 24XX64F monitors the SDA bus, checking the device-type identifier being transmitted. Upon receiving a '1010' code and appropriate device-select bits, the slave device outputs an Acknowledge signal on the SDA line. Depending on the state of the R/$\overline{W}$ bit, the 24XX64F will select a read or write operation.

FIGURE 5-1: **CONTROL BYTE FORMAT**

5.1 Contiguous Addressing Across Multiple Devices

The Chip Select bits A2, A1 and A0 can be used to expand the contiguous address space for up to 512K bits by adding up to eight 24XX64F devices on the same bus. In this case, software can use A0 of the control byte as address bit A13; A1 as address bit A14; and A2 as address bit A15. It is not possible to sequentially read across device boundaries.

The SOT-23 package does not support multiple device addressing on the same bus.

FIGURE 5-2: **ADDRESS SEQUENCE BIT ASSIGNMENTS**
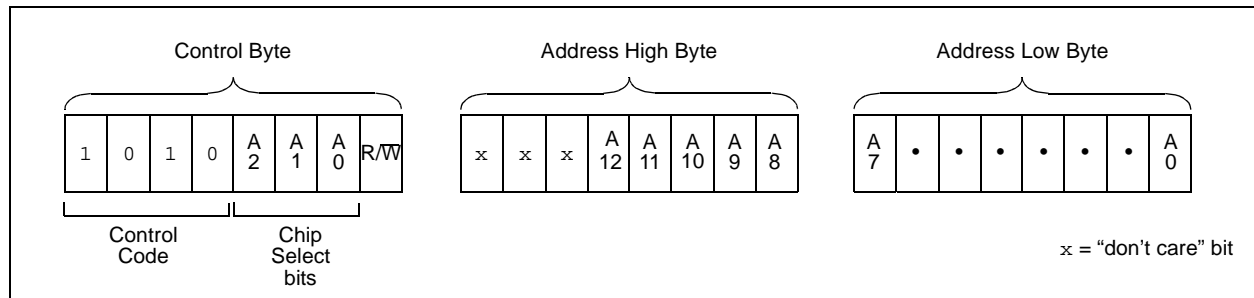
24AA64F/24LC64F

6.0   WRITE OPERATIONS

6.1   Byte Write

Following the Start condition from the master, the control code (four bits), the Chip Select (three bits) and the R/$\overline{W}$ bit (which is a logic low) are clocked onto the bus by the master transmitter. This indicates to the addressed slave receiver that the address high byte will follow once it has generated an Acknowledge bit during the ninth clock cycle. Therefore, the next byte transmitted by the master is the high-order byte of the word address and will be written into the Address Pointer of the 24XX64F. The next byte is the Least Significant Address Byte. After receiving another Acknowledge signal from the 24XX64F, the master device will transmit the data word to be written into the addressed memory location. The 24XX64F acknowledges again and the master generates a Stop condition. This initiates the internal write cycle and, during this time, the 24XX64F will not generate Acknowledge signals (Figure 6-1). If an attempt is made to write to the array with the WP pin held high, the device will acknowledge the command, but no write cycle will occur, no data will be written and the device will immediately accept a new command. After a byte Write command, the internal address counter will point to the address location following the one that was just written.

6.2   Page Write

The write control byte, word address and the first data byte are transmitted to the 24XX64F in the same way as in a byte write. However, instead of generating a Stop condition, the master transmits up to 31 additional bytes which are temporarily stored in the on-chip page buffer and will be written into memory once the master has transmitted a Stop condition. Upon receipt of each word, the five lower Address Pointer bits are internally incremented by one. If the master should transmit more than 32 bytes prior to generating the Stop condition, the address counter will roll over and the previously received data will be overwritten. As with the byte write operation, once the Stop condition is received, an internal write cycle will begin (Figure 6-2). If an attempt is made to write to the array with the WP pin held high, the device will acknowledge the command, but no write cycle will occur, no data will be written, and the device will immediately accept a new command.

> **Note:**   Page write operations are limited to writing bytes within a single physical page, **regardless** of the number of bytes actually being written. Physical page boundaries start at addresses that are integer multiples of the page buffer size (or 'page size') and end at addresses that are integer multiples of [page size – 1]. If a Page Write command attempts to write across a physical page boundary, the result is that the data wraps around to the beginning of the current page (overwriting data previously stored there), instead of being written to the next page, as might be expected. It is therefore necessary for the application software to prevent page write operations that would attempt to cross a page boundary.

6.3   Write Protection

The WP pin allows the user to write-protect 1/4 of the array (1800h-1FFFh) when the pin is tied to V$_{CC}$. If tied to V$_{SS}$ the write protection is disabled. The WP pin is sampled at the Stop bit for every Write command (Figure 4-1). Toggling the WP pin after the Stop bit will have no effect on the execution of the write cycle.
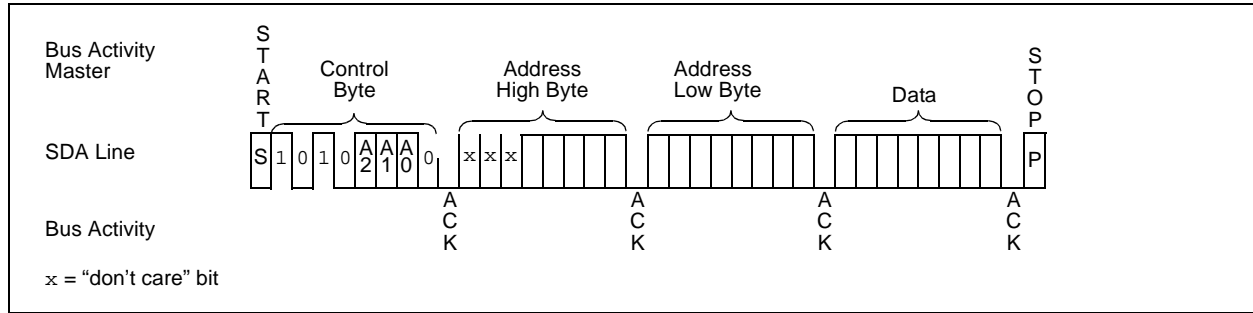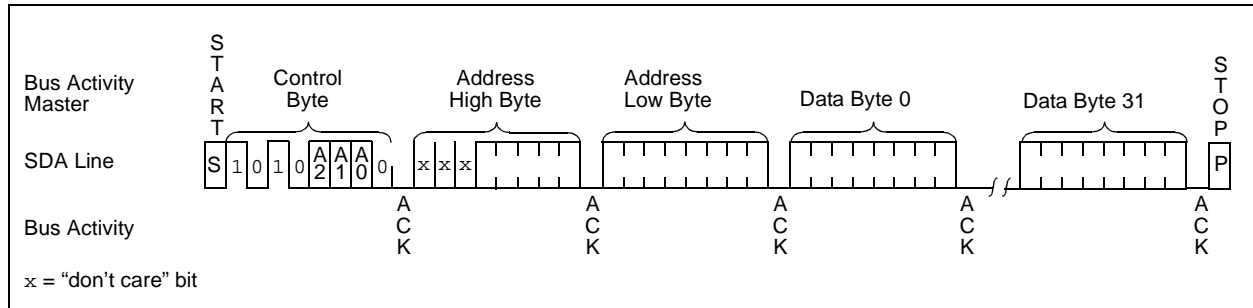
FIGURE 6-1: **BYTE WRITE**

FIGURE 6-2: **PAGE WRITE**

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7.0   ACKNOWLEDGE POLLING

Since the device will not acknowledge during a write cycle, this can be used to determine when the cycle is complete (this feature can be used to maximize bus throughput). Once the Stop condition for a Write command has been issued from the master, the device initiates the internally-timed write cycle and ACK polling can then be initiated immediately. This involves the master sending a Start condition followed by the control byte for a Write command ($R/\overline{W} = 0$). If the device is still busy with the write cycle, then no ACK will be returned. If no ACK is returned, the Start bit and control byte must be re-sent. If the cycle is complete, the device will return the ACK and the master can then proceed with the next Read or Write command. See Figure 7-1 for a flow diagram of this operation.

FIGURE 7-1:   **ACKNOWLEDGE POLLING FLOW**
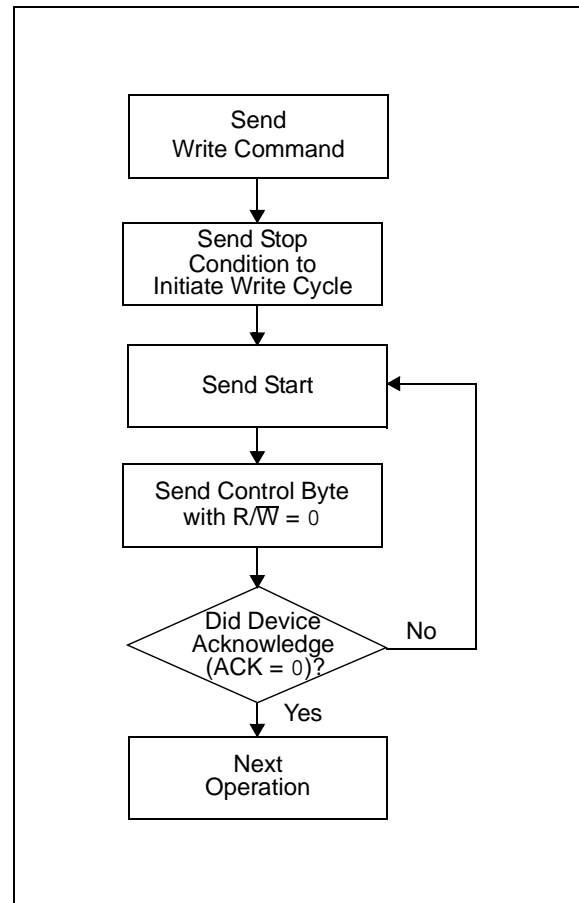
8.0 READ OPERATION

Read operations are initiated in the same way as write operations, with the exception that the R/$\overline{W}$ bit of the control byte is set to one. There are three basic types of read operations: current address read, random read and sequential read.

8.1 Current Address Read

The 24XX64F contains an address counter that maintains the address of the last word accessed, internally incremented by one. Therefore, if the previous read access was to address 'n' (n is any legal address), the next current address read operation would access data from address n + 1.

Upon receipt of the control byte with R/$\overline{W}$ bit set to one, the 24XX64F issues an acknowledge and transmits the eight-bit data word. The master will not acknowledge the transfer, but does generate a Stop condition and the 24XX64F discontinues transmission (Figure 8-1).

8.2 Random Read

Random read operations allow the master to access any memory location in a random manner. To perform this type of read operation, the word address must first be set. This is accomplished by sending the word address to the 24XX64F as part of a write operation (R/$\overline{W}$ bit set to '0'). Once the word address is sent, the master generates a Start condition following the acknowledge.

This terminates the write operation, but not before the internal Address Pointer is set. The master then issues the control byte again, but with the R/$\overline{W}$ bit set to a one. The 24XX64F will then issue an acknowledge and transmit the 8-bit data word. The master will not acknowledge the transfer, but does generate a Stop condition, which causes the 24XX64F to discontinue transmission (Figure 8-2). After a random Read command, the internal address counter will point to the address location following the one that was just read.

8.3 Sequential Read

Sequential reads are initiated in the same way as random reads, except that once the 24XX64F transmits the first data byte, the master issues an acknowledge as opposed to the Stop condition used in a random read. This acknowledge directs the 24XX64F to transmit the next sequentially-addressed 8-bit word (Figure 8-3). Following the final byte being transmitted to the master, the master will NOT generate an acknowledge, but will generate a Stop condition. To provide sequential reads, the 24XX64F contains an internal Address Pointer which is incremented by one at the completion of each operation. This Address Pointer allows the entire memory contents to be serially read during one operation. The internal Address Pointer will automatically roll over from address 1FFF to address 0000 if the master acknowledges the byte received from the array address 1FFF.

FIGURE 8-1:   CURRENT ADDRESS READ
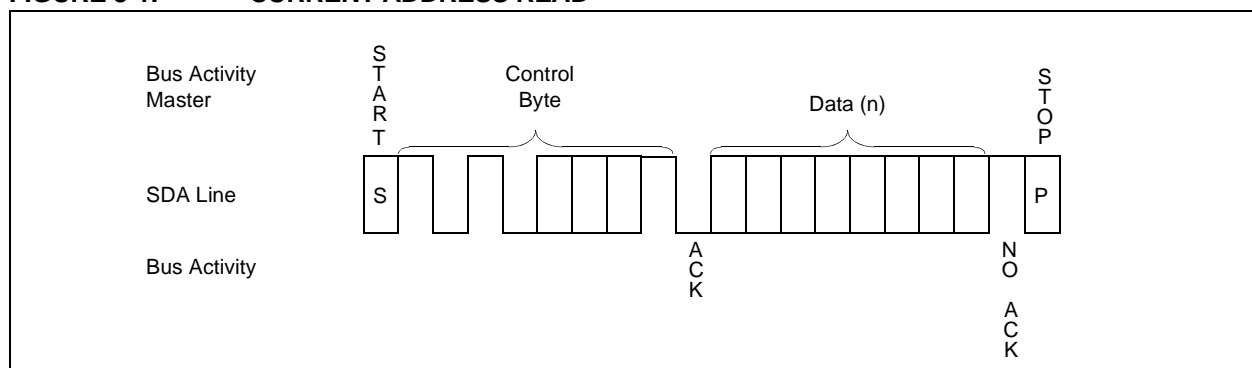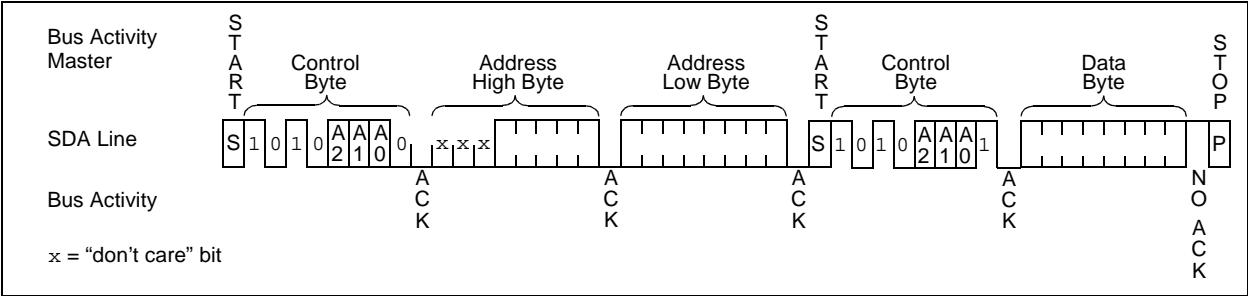
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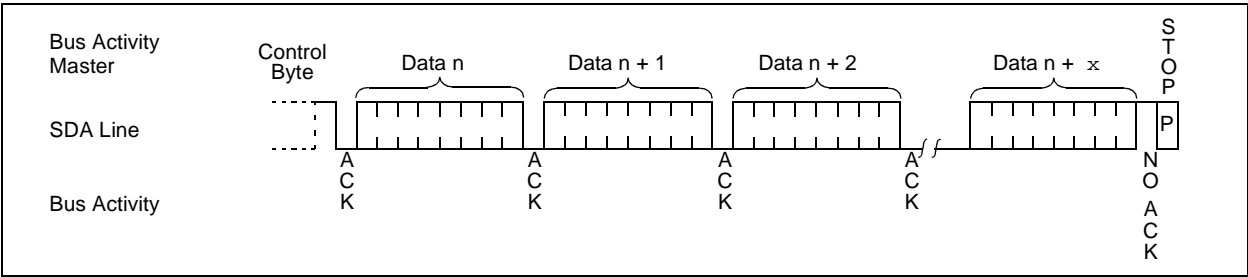**FIGURE 8-2:** **RANDOM READ**
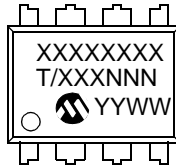

x = "don't care" bit

FIGURE 8-3: **SEQUENTIAL READ**

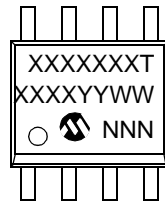# 9.0 PACKAGING INFORMATION

9.1 Package Marking Information
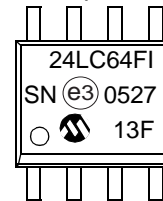
8-Lead PDIP (300 mil)
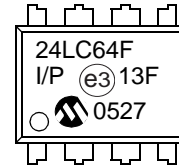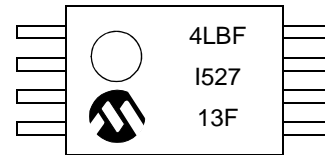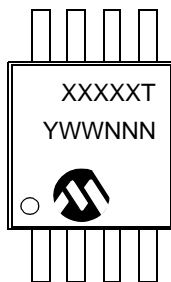
```
XXXXXXXX
T/XXXNNN
   YYWW
```

Example:

```
24LC64F
I/P  (e3) 13F
    0527
```

8-Lead SOIC (3.90 mm)

```
XXXXXXXT
XXXXYYWW
     NNN
```

Example:

```
24LC64FI
SN (e3) 0527
      13F
```

8-Lead TSSOP

```
    XXXX
    TYWW
    NNN
```

Example:

```
    4LBF
    I527
    13F
```

8-Lead MSOP

```
XXXXXT
YWWNNN
```

Example:

```
4L64FI
52713F
```

8-Lead 2x3 TDFN

```
XXX
YWW
NN
```

Example:

```
AT4
527
I3
```

24AA64F/24LC64F

5-Lead SOT-23

XXNN
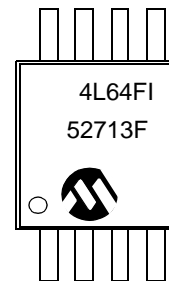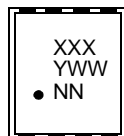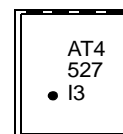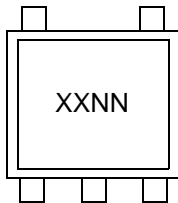
Example:
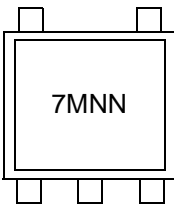
7MNN

Part Number	1st Line Marking Codes					
	TSSOP	**MSOP**	**TDFN**		**SOT-23**	
			I Temp.	**E Temp.**	**I Temp.**	**E Temp.**
24AA64F	4ABF	4A64FT	AT1	—	7MNN	—
24LC64F	4LBF	4L64FT	AT4	AT5	7QNN	7RNN

Note: T = Temperature grade (I, E)

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) – 300 mil Body [PDIP]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging
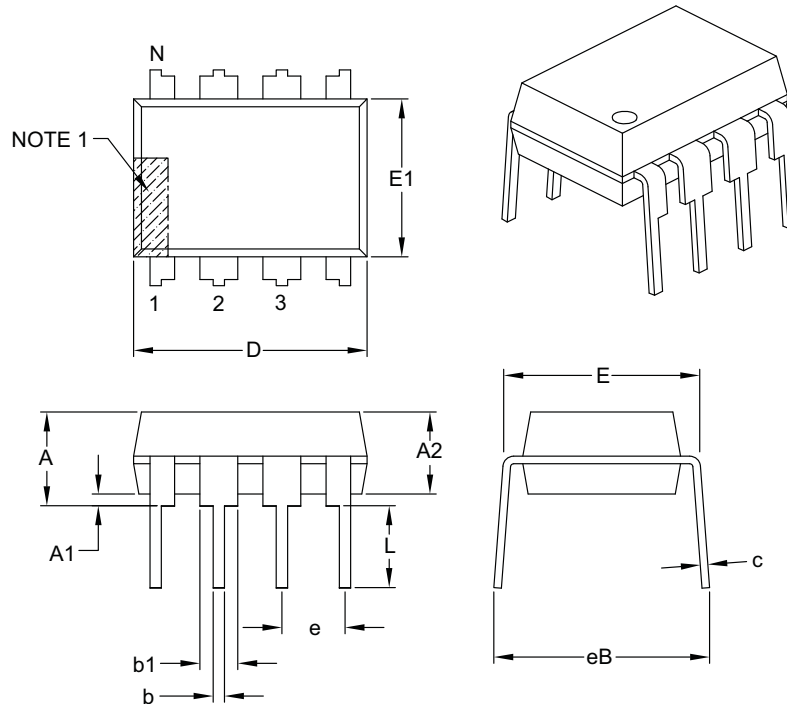
Units		INCHES		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		.100 BSC	
Top to Seating Plane	A	–	–	.210
Molded Package Thickness	A2	.115	.130	.195
Base to Seating Plane	A1	.015	–	–
Shoulder to Shoulder Width	E	.290	.310	.325
Molded Package Width	E1	.240	.250	.280
Overall Length	D	.348	.365	.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.
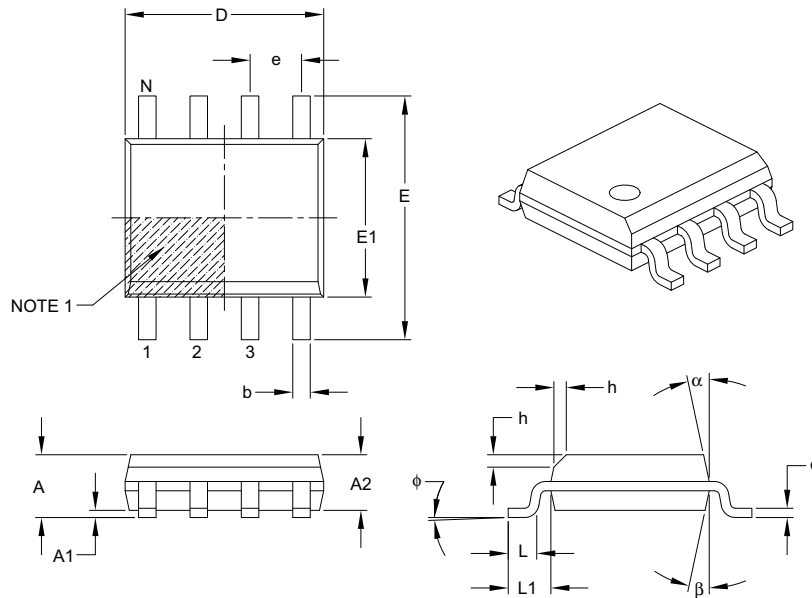   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-018B

24AA64F/24LC64F

8-Lead Plastic Small Outline (SN) – 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.
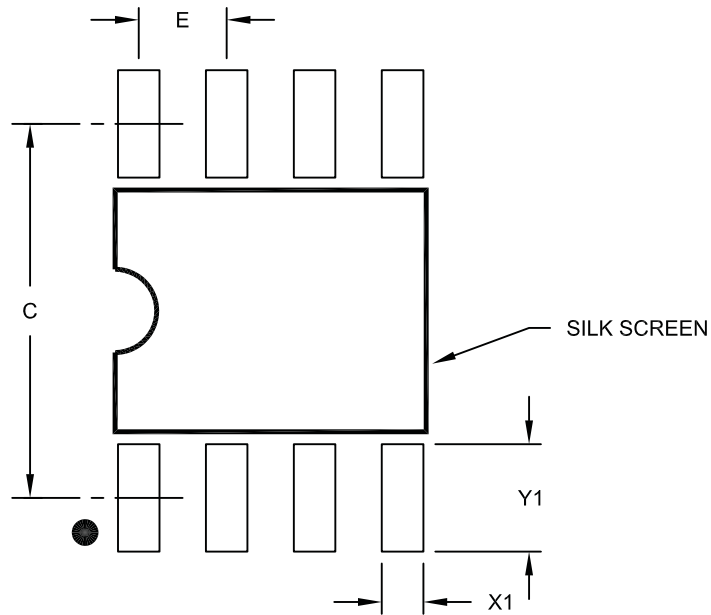4. Dimensioning and tolerancing per ASME Y14.5M.

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

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

Microchip Technology Drawing C04-057B

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8-Lead Plastic Small Outline (SN) – 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

RECOMMENDED LAND PATTERN

	Units	MILLIMETERS		
	Dimension Limits	MIN	NOM	MAX
Contact Pitch	E		1.27 BSC	
Contact Pad Spacing	C		5.40	
Contact Pad Width (X8)	X1			0.60
Contact Pad Length (X8)	Y1			1.55

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

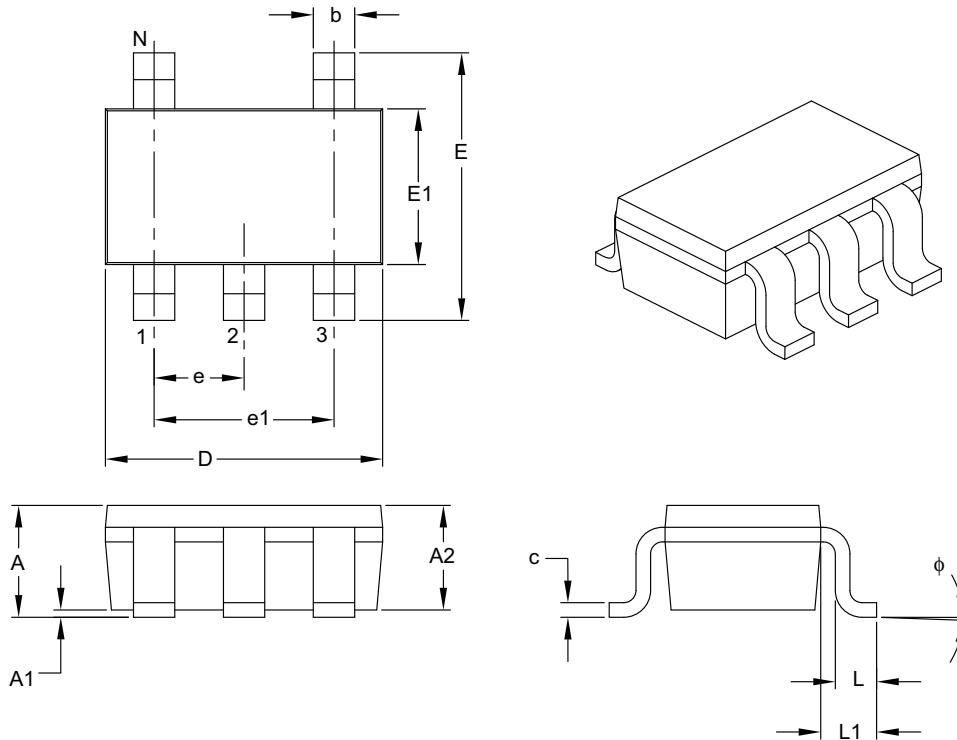BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2057A

24AA64F/24LC64F

5-Lead Plastic Small Outline Transistor (OT) [SOT-23]

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

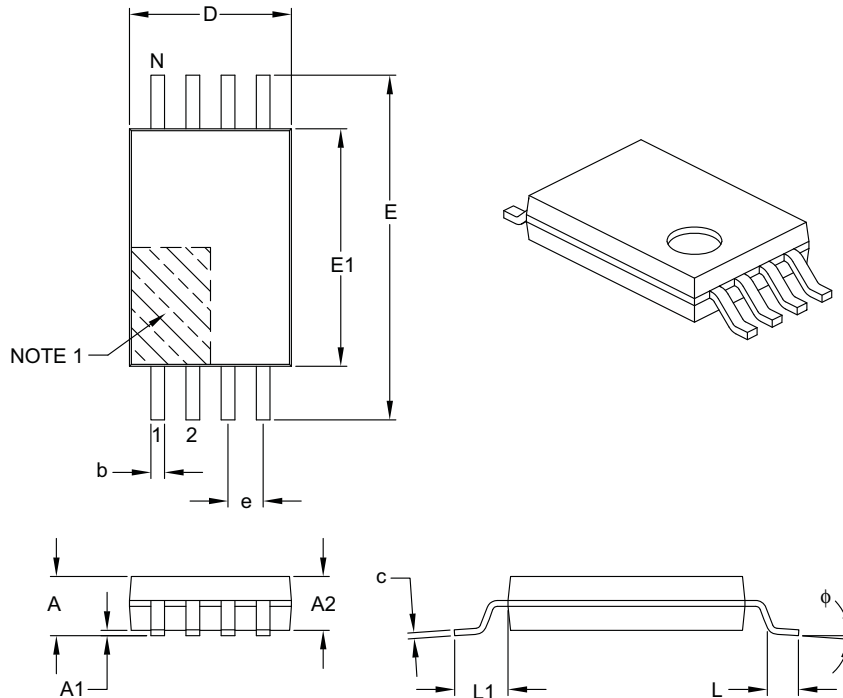| Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		5	
Lead Pitch	e		0.95 BSC	
Outside Lead Pitch	e1		1.90 BSC	
Overall Height	A	0.90	–	1.45
Molded Package Thickness	A2	0.89	–	1.30
Standoff	A1	0.00	–	0.15
Overall Width	E	2.20	–	3.20
Molded Package Width	E1	1.30	–	1.80
Overall Length	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 C04-091B

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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.

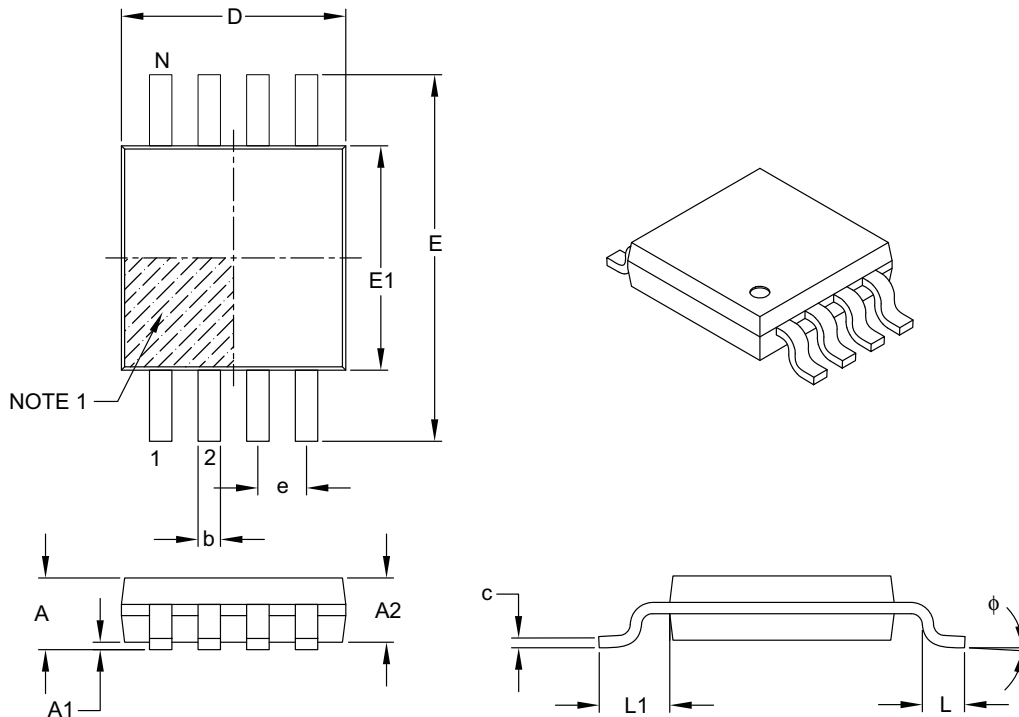REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-086B

24AA64F/24LC64F

8-Lead Plastic Micro Small Outline Package (MS) [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 Dual Flat, No Lead Package (MN) – 2x3x0.75 mm Body [TDFN]

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

TOP VIEW

BOTTOM VIEW

DETAIL A
ALTERNATE
CONTACT
SHAPES
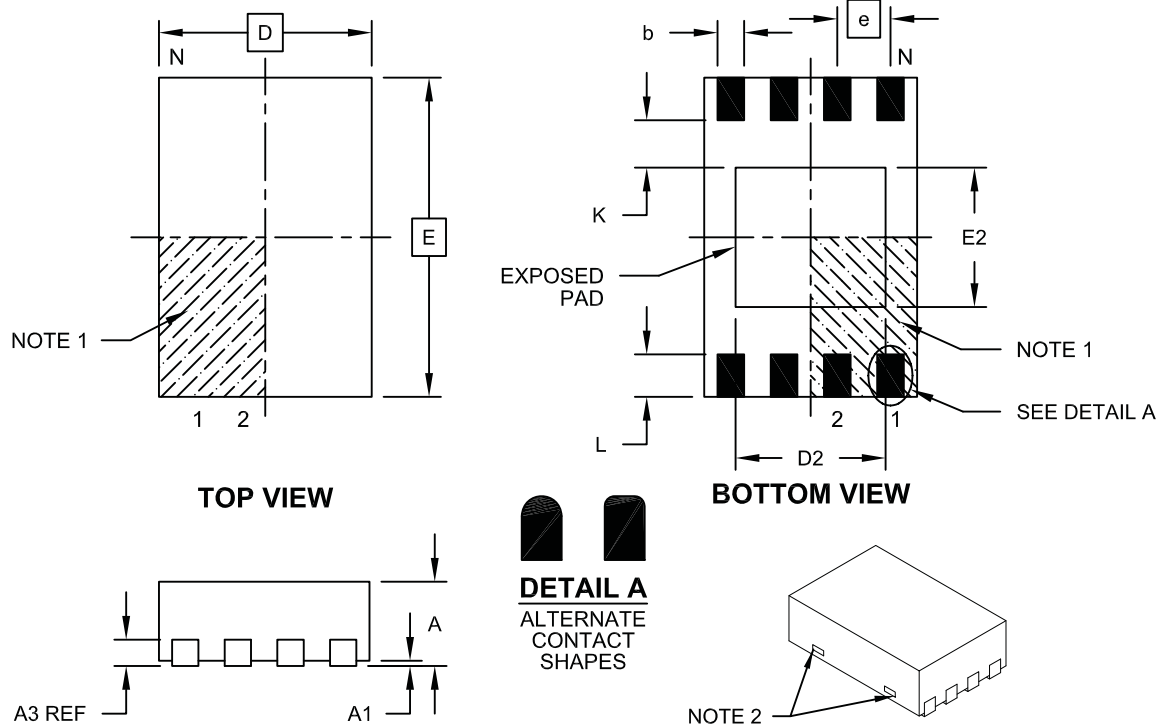
	Units	MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		0.50 BSC	
Overall Height	A	0.70	0.75	0.80
Standoff	A1	0.00	0.02	0.05
Contact Thickness	A3		0.20 REF	
Overall Length	D		2.00 BSC	
Overall Width	E		3.00 BSC	
Exposed Pad Length	D2	1.20	-	1.60
Exposed Pad Width	E2	1.20	-	1.60
Contact Width	b	0.20	0.25	0.30
Contact Length	L	0.25	0.30	0.45
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 No. C04-129B

24AA64F/24LC64F

8-Lead Plastic Dual Flat, No Lead Package (MN) – 2x3x0.75 mm Body [TDFN]

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

RECOMMENDED LAND PATTERN
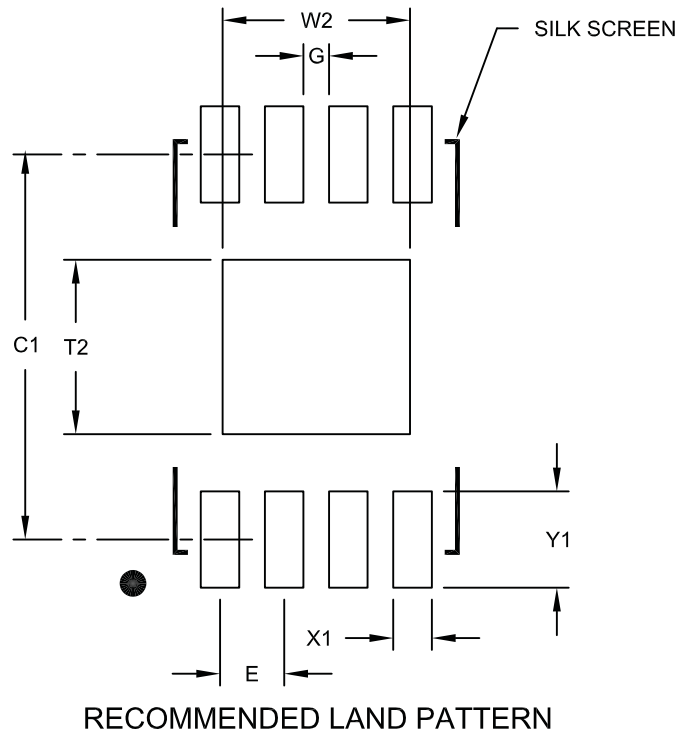
Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Optional Center Pad Width	W2			1.46
Optional Center Pad Length	T2			1.36
Contact Pad Spacing	C1		3.00	
Contact Pad Width (X8)	X1			0.30
Contact Pad Length (X8)	Y1			0.75
Distance Between Pads	G	0.20		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing No. C04-2129A

APPENDIX A: REVISION HISTORY

Revision A

Original Release.

NOTES:

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24AA64F/24LC64F

查询24LC64F供应商

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Questions:

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     _____

     _____

2. How does this document meet your hardware and software development needs?

     _____

     _____

3. Do you find the organization of this document easy to follow? If not, why?

     _____

     _____

4. What additions to the document do you think would enhance the structure and subject?

     _____

     _____

5. What deletions from the document could be made without affecting the overall usefulness?

     _____

     _____

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

     _____

     _____

7. How would you improve this document?

     _____

     _____

查询24LC64F供应商

PRODUCT IDENTIFICATION SYSTEM

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

PART NO.	X	/XX
Device	Temperature Range	Package

Device: 24AA64F: 1.7V, 64 Kbit I^{2}C™ Serial EEPROM
24AA64FT: 1.7V, 64 Kbit I^{2}C Serial EEPROM (Tape and Reel)
24LC64F: 2.5V, 64 Kbit I^{2}C Serial EEPROM
24LC64FT: 2.5V, 64 Kbit I^{2}C Serial EEPROM (Tape and Reel)

Temperature I = -40°C to +85°C
Range: E = -40°C to +125°C

Package: P = Plastic DIP (300 mil body), 8-lead
SN = Plastic SOIC (3.90 mm body), 8-lead
ST = Plastic TSSOP (4.4 mm), 8-lead
MS = Plastic Micro Small Outline (MSOP), 8-lead
MNY[1] = TDFN (2x3x0.75 mm body), 8-lead
OT = SOT-23 (Tape and Reel only), 5-lead

Note 1: "Y" indicates a Nickel Palladium Gold (NiPdAu) finish.

Examples:

a) 24AA64F-I/P: Industrial Temperature, 1.7V, PDIP package

b) 24AA64F-I/SN: Industrial Temperature, 1.7V, SOIC package

c) 24AA64FT-I/ST: Industrial Temperature, 1.7V, TSSOP package, tape and reel

d) 24LC64F-I/P: Industrial Temperature, 2.5V, PDIP package

e) 24LC64F-E/SN: Extended Temperature, 2.5V, SOIC package

f) 24LC64F-I/ST: Industrial Temperature, 2.5V, TSSOP package

24AA64F/24LC64F

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