Winbond Electronics Corp.

128K × 8 CMOS FLASH MEMORY

Table of Contents-

1. GENERAL DESCRIPTION 3
2. FEATURES 3
3. PIN CONFIGURATIONS 4
4. BLOCK DIAGRAM 5
5. PIN DESCRIPTION 5
6. FUNCTIONAL DESCRIPTION 6
   - 6.1 Read Mode 6
   - 6.2 Page Write Mode 6
   - 6.3 Software-protected Data Write 6
   - 6.4 Hardware Data Protection 7
   - 6.5 Data Polling (DQ7)-Write Status Detection 7
   - 6.6 Toggle Bit (DQ6)-Write Status Detection 7
   - 6.7 5-Volt-only Software Chip Erase 7
   - 6.8 Product Identification 7
7. TABLE OF OPERATING MODES 8
   - 7.1 Operating Mode Selection 8
   - 7.2 Command Codes for Software Data Protection 8
     - 7.2.1 Software Data Protection Acquisition Flow 9
   - 7.3 Command Codes for Software Chip Erase 10
     - 7.3.1 Software Chip Erase Acquisition Flow 10
   - 7.4 Command Codes for Product Identification 11
     - 7.4.1 Software Product Identification Acquisition Flow 11
8. ELECTRICAL CHARACTERISTICS 12
   - 8.1 Absolute Maximum Ratings 12
   - 8.2 DC Characteristics 12
     - 8.2.1 Operating Characteristics 12
     - 8.2.2 Power-up Timing 12
     - 8.2.3 Capacitance 13
   - 8.3 AC Characteristics 13
     - 8.3.1 AC Test Conditions 13
     - 8.3.2 AC Test Load and Waveforms 13
     - 8.3.3 Read Cycle Timing Parameters 14
     - 8.3.4 Byte/Page-write Cycle Timing Parameters 14
     - 8.3.5 Data Polling and Toggle Bit Timing Parameters 15
9. TIMING WAVEFORMS 16
   - 9.1 Read Cycle Timing Diagram 16
   - 9.2 #WE Controlled Write Cycle Timing Diagram 16
   - 9.3 #CE Controlled Write Cycle Timing Diagram 17

9.4 Page Write Cycle Timing Diagram 17
9.5 #DATA Polling Timing Diagram 18
9.6 Toggle Bit Timing Diagram 18
9.7 Page Write Timing Diagram Software Data Protection Mode 19
9.8 Reset Software Data Protection Timing Diagram 19
9.9 5 Volt-only Software Chip Erase Timing Diagram 20
10. ORDERING INFORMATION 21
11. HOW TO READ THE TOP MARKING 22
12. PACKAGE DIMENSIONS 23
12.1 32-pin P-DIP 23
12.2 32-pin PLCC 23
12.3 32-pin TSOP (8 x 20 mm) 24
12.4 32-pin STSOP (8 x 14 mm) 24
13. VERSION HISTORY 25

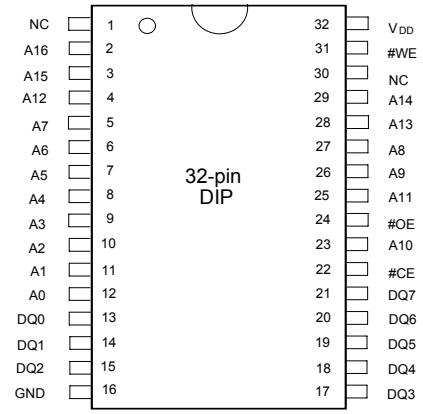
1. GENERAL DESCRIPTION

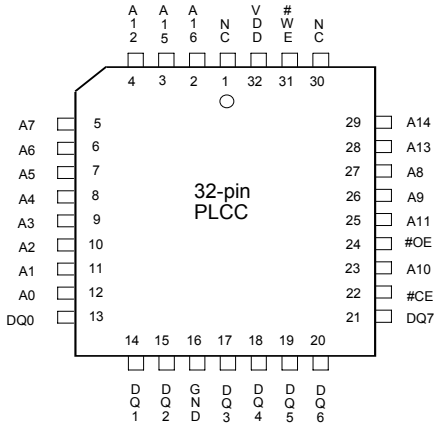
The W29EE011 is a 1-megabit, 5-volt only CMOS flash memory organized as 128K × 8 bits. The device can be programmed and erased in-system with a standard 5V power supply. A 12-volt V_{PP} is not required. The unique cell architecture of the W29EE011 results in fast program/erase operations with extremely low current consumption (compared to other comparable 5-volt flash memory products). The device can also be programmed and erased using standard EPROM programmers.

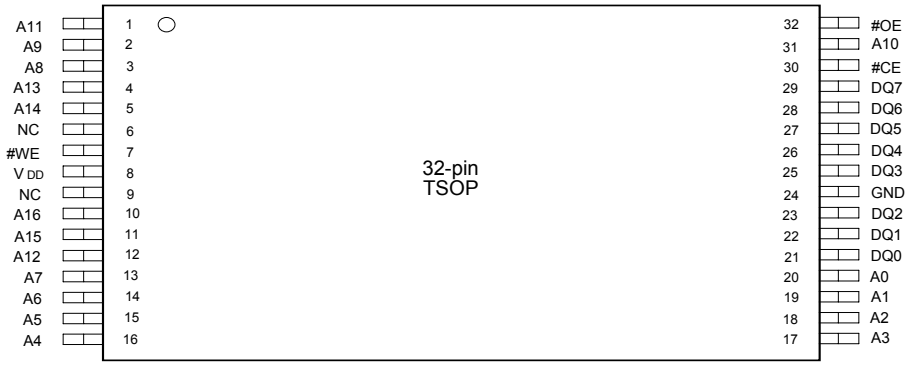
2. FEATURES

- Single 5-volt program and erase operations
- Fast page-write operations
  - 128 bytes per page
  - Page program cycle: 10 mS (max.)
  - Effective byte-program cycle time: 39 μS
  - Optional software-protected data write
- Fast chip-erase operation: 50 mS
- Read access time: 90/150 nS
- Page program/erase cycles: 1K/10K
- Ten-year data retention
- Software and hardware data protection
- Low power consumption
  - Active current: 25 mA (typ.)
  - Standby current: 20 μA (typ.)
- Automatic program timing with internal V_{PP} generation
- End of program detection
  - Toggle bit
  - Data polling
- Latched address and data
- TTL compatible I/O
- JEDEC standard byte-wide pinouts
- Available packages: 32-pin 600 mil DIP, 32-pin TSOP (8 x 20 mm), 32-pin STSOP (8 x 14 mm), 32-pin PLCC, and Lead-free 32-pin PLCC

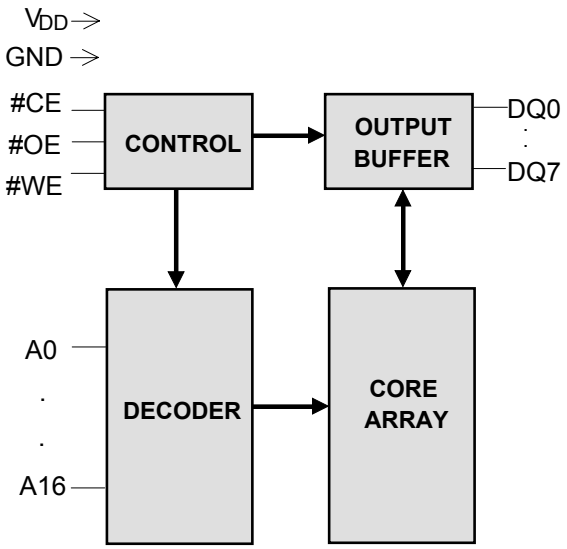
3. PIN CONFIGURATIONS







4. BLOCK DIAGRAM



5. PIN DESCRIPTION

SYMBOL	PIN NAME
A0 – A16	Address Inputs
DQ0 – DQ7	Data Inputs/Outputs
#CE	Chip Enable
#OE	Output Enable
#WE	Write Enable
VDD	Power Supply
GND	Ground
NC	No Connection

6. FUNCTIONAL DESCRIPTION

6.1 Read Mode

The read operation of the W29EE011 is controlled by #CE and #OE, both of which have to be low for the host to obtain data from the outputs. #CE is used for device selection. When #CE is high, the chip is de-selected and only standby power will be consumed. #OE is the output control and is used to gate data from the output pins. The data bus is in high impedance state when either #CE or #OE is high. Refer to the timing waveforms for further details.

6.2 Page Write Mode

The W29EE011 is programmed on a page basis. Every page contains 128 bytes of data. If a byte of data within a page is to be changed, data for the entire page must be loaded into the device. Any byte that is not loaded will be erased to "FFh" during programming of the page.

The write operation is initiated by forcing #CE and #WE low and #OE high. The write procedure consists of two steps. Step 1 is the byte-load cycle, in which the host writes to the page buffer of the device. Step 2 is an internal programming cycle, during which the data in the page buffers are simultaneously written into the memory array for non-volatile storage.

During the byte-load cycle, the addresses are latched by the falling edge of either #CE or #WE, whichever occurs last. The data are latched by the rising edge of either #CE or #WE, whichever occurs first. If the host loads a second byte into the page buffer within a byte-load cycle time (T_{BLC}) of 200 μS, after the initial byte-load cycle, the W29EE011 will stay in the page load cycle. Additional bytes can then be loaded consecutively. The page load cycle will be terminated and the internal programming cycle will start if no additional byte is loaded into the page buffer within 300 μS (T_{BLCO}) from the last byte-load cycle, i.e., there is no subsequent #WE high-to-low transition after the last rising edge of #WE. A_7 to A_{16} specify the page address. All bytes that are loaded into the page buffer must have the same page address. A_0 to A_6 specify the byte address within the page. The bytes may be loaded in any order; sequential loading is not required.

In the internal programming cycle, all data in the page buffers, i.e., 128 bytes of data, are written simultaneously into the memory array. Before the completion of the internal programming cycle, the host is free to perform other tasks such as fetching data from other locations in the system to prepare to write the next page.

6.3 Software-protected Data Write

The device provides a JEDEC-approved optional software-protected data write. Once this scheme is enabled, any write operation requires a series of three-byte program commands (with specific data to a specific address) to be performed before the data load operation. The three-byte load command sequence begins the page load cycle, without which the write operation will not be activated. This write scheme provides optimal protection against inadvertent write cycles, such as cycles triggered by noise during system power-up and power-down.

The W29EE011 is shipped with the software data protection enabled. To enable the software data protection scheme, perform the three-byte command cycle at the beginning of a page load cycle. The device will then enter the software data protection mode, and any subsequent write operation must be preceded by the three-byte program command cycle. Once enabled, the software data protection will remain enabled unless the disable commands are issued. A power transition will not reset the software data protection feature. To reset the device to unprotected mode, a six-byte command sequence is required. See Table 3 for specific codes and Figure 10 for the timing diagram.

6.4 Hardware Data Protection

The integrity of the data stored in the W29EE011 is also hardware protected in the following ways:

(1) Noise/Glitch Protection: A #WE pulse of less than 15 nS in duration will not initiate a write cycle.

(2) V_{DD} Power Up/Down Detection: The programming and read operation are inhibited when V_{DD} is less than 3.8V.

(3) Write Inhibit Mode: Forcing #OE low, #CE high, or #WE high will inhibit the write operation. This prevents inadvertent writes during power-up or power-down periods.

6.5 Data Polling (DQ7)-Write Status Detection

The W29EE011 includes a data polling feature to indicate the end of a programming cycle. When the W29EE011 is in the internal programming cycle, any attempt to read DQ_7 of the last byte loaded during the page/byte-load cycle will receive the complement of the true data. Once the programming cycle is completed. DQ_7 will show the true data.

6.6 Toggle Bit (DQ6)-Write Status Detection

In addition to data polling, the W29EE011 provides another method for determining the end of a program cycle. During the internal programming cycle, any consecutive attempts to read DQ_6 will produce alternating 0's and 1's. When the programming cycle is completed, this toggling between 0's and 1's will stop. The device is then ready for the next operation.

6.7 5-Volt-only Software Chip Erase

The chip-erase mode can be initiated by a six-byte command sequence. After the command loading cycles, the device enters the internal chip erase mode, which is automatically timed and will be completed in 50 mS. The host system is not required to provide any control or timing during this operation.

6.8 Product Identification

The product ID operation outputs the manufacturer code and device code. Programming equipment automatically matches the device with its proper erase and programming algorithms.

The manufacturer and device codes can be accessed by software or hardware operation. In the software access mode, a six-byte command sequence can be used to access the product ID. A read from address 0000H outputs the manufacturer code (DAh). A read from address 0001H outputs the device code (C1h). The product ID operation can be terminated by a three-byte command sequence.

In the hardware access mode, access to the product ID is activated by forcing #CE and #OE low, #WE high, and raising A9 to 12 volts.

Note: The hardware SID read function is not included in all parts; please refer to Ordering Information for details.

7. TABLE OF OPERATING MODES

7.1 Operating Mode Selection

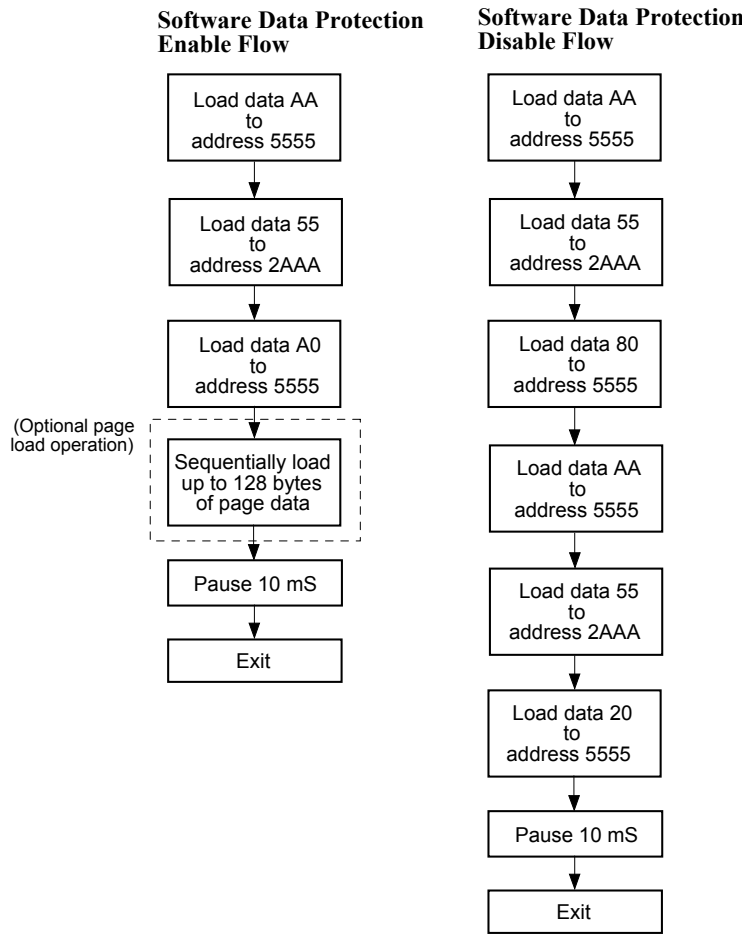
Operating Range = 0 to 70°C (Ambient Temperature), V_{DD} = 5V ±10%, V_{SS} = 0V, V_{HH} = 12V

MODE	PINS				
	#CE	#OE	#WE	ADDRESS	DQ.
Read	V_{IL}	V_{IL}	V_{IH}	A_{IN}	Dout
Write	V_{IL}	V_{IH}	V_{IL}	A_{IN}	Din
Standby	V_{IH}	X	X	X	High Z
Write Inhibit	X	V_{IL}	X	X	High Z/D_{OUT}
	X	X	V_{IH}	X	High Z/D_{OUT}
Output Disable	X	V_{IH}	X	X	High Z
5-Volt Software Chip Erase	V_{IL}	V_{IH}	V_{IL}	A_{IN}	D_{IN}
Product ID	V_{IL}	V_{IL}	V_{IH}	A0 = V_{IL}; A1 – A16 = V_{IL}; A9 = V_{HH}	Manufacturer Code DA (Hex)
	V_{IL}	V_{IL}	V_{IH}	A0 = V_{IH}; A1 – A16 = V_{IL}; A9 = V_{HH}	Device Code C1 (Hex)

7.2 Command Codes for Software Data Protection

BYTE SEQUENCE	TO ENABLE PROTECTION		TO DISABLE PROTECTION	
	ADDRESS	DATA	ADDRESS	DATA
0 Write	5555H	AAH	5555H	AAH
1 Write	2AAAH	55H	2AAAH	55H
2 Write	5555H	A0H	5555H	80H
3 Write	-	-	5555H	AAH
4 Write	-	-	2AAAH	55H
5 Write	-	-	5555H	20H

7.2.1 Software Data Protection Acquisition Flow

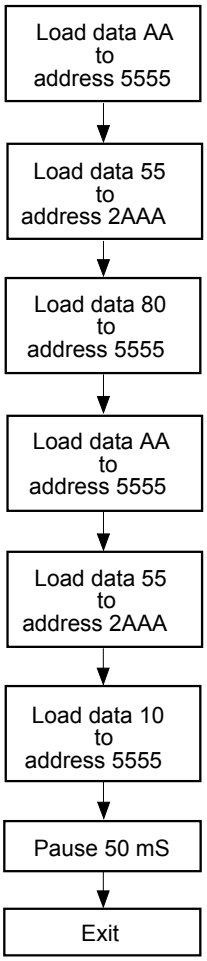


Notes for software program code:
Data Format: DQ7 – DQ0 (Hex)
Address Format: A14 – A0 (Hex)

7.3 Command Codes for Software Chip Erase

BYTE SEQUENCE	ADDRESS	DATA
0 Write	5555H	AAH
1 Write	2AAAH	55H
2 Write	5555H	80H
3 Write	5555H	AAH
4 Write	2AAAH	55H
5 Write	5555H	10H

7.3.1 Software Chip Erase Acquisition Flow

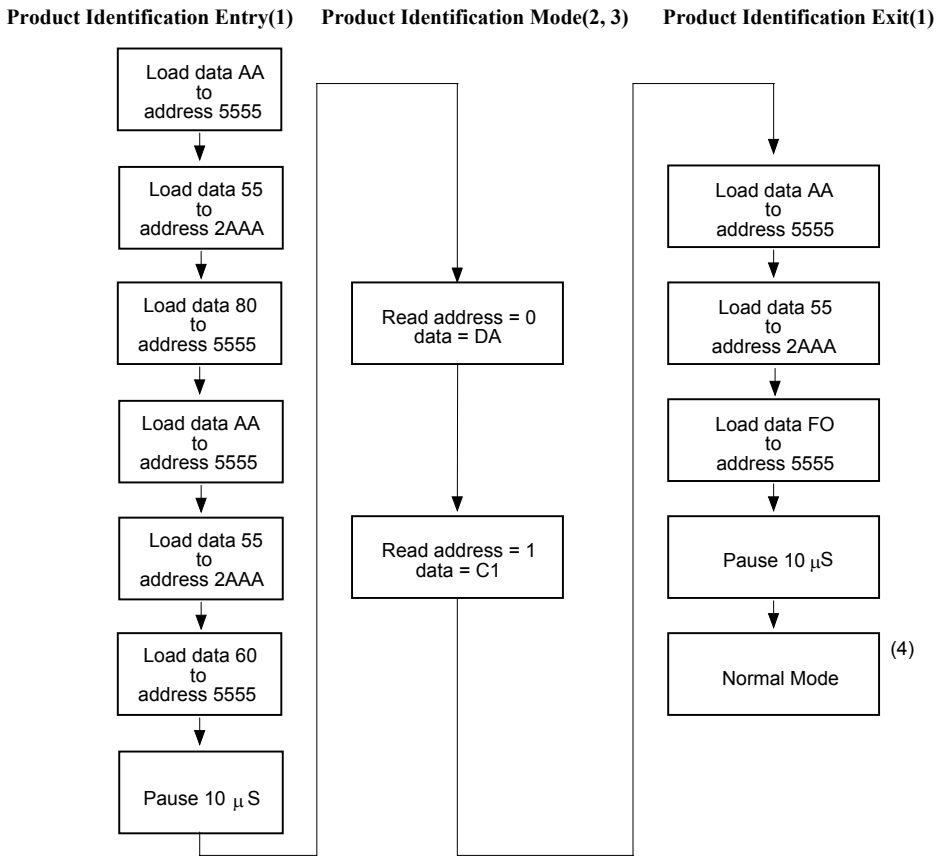


Notes for software chip erase:
Data Format: DQ7 – DQ0 (Hex)
Address Format: A14 – A0 (Hex)

7.4 Command Codes for Product Identification

BYTE SEQUENCE	SOFTWARE PRODUCT IDENTIFICATION ENTRY		SOFTWARE PRODUCT IDENTIFICATION EXIT	
	ADDRESS	DATA	ADDRESS	DATA
0 Write	5555H	AAH	5555H	AAH
1 Write	2AAAH	55H	2AAAH	55H
2 Write	5555H	80H	5555H	F0H
3 Write	5555H	AAH	-	-
4 Write	2AAAH	55H	-	-
5 Write	5555H	60H	-	-
	Pause 10 μS		Pause 10 μS	

7.4.1 Software Product Identification Acquisition Flow



Notes for software product identification:
(1) Data format: DQ7 – DQ0 (Hex); address format: A14 – A0 (Hex).
(2) A1 – A16 = V_{IL}; manufacture code is read for A0 = V_{IL}; device code is read for A0 = V_{IH}.
(3) The device does not remain in identification mode if power down.
(4) The device returns to standard operation mode.

8. ELECTRICAL CHARACTERISTICS

8.1 Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Power Supply Voltage to GND Potential	-0.5 to +7.0	V
Operating Temperature	0 to +70	°C
Storage Temperature	-65 to +150	°C
D.C. Voltage on Any Pin to Ground Potential Except #OE	-0.5 to V_{DD} +1.0	V
Transient Voltage (< 20 nS) on Any Pin to Ground Potential	-1.0 to V_{DD} +1.0	V
Voltage on #OE Pin to Ground Potential	-0.5 to 12.5	V

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

8.2 DC Characteristics

8.2.1 Operating Characteristics

(V_{DD} = 5.0V ±10%, GND = 0V, T_A = 0 to 70° C)

PARAMETER	SYM.	TEST CONDITIONS	LIMITS			UNIT
			MIN.	TYP.	MAX.	
Power Supply Current	I_{CC}	#CE = #OE = V_{IL}, #WE = V_{IH}, all I/Os open Address inputs = V_{IL}/V_{IH}, at f = 5 MHz	-	-	50	mA
Standby V_{DD} Current (TTL input)	I_{SB1}	#CE = V_{IH}, all I/Os open Other inputs = V_{IL}/V_{IH}	-	2	3	mA
Standby V_{DD} Current (CMOS input)	I_{SB2}	#CE = V_{DD} -0.3V, all I/Os open Other inputs = V_{DD} -0.3V/GND	-	20	100	µA
Input Leakage Current	I_{LI}	V_{IN} = GND to V_{DD}	-	-	1	µA
Output Leakage Current	I_{LO}	V_{IN} = GND to V_{DD}	-	-	10	µA
Input Low Voltage	V_{IL}	-	-0.3	-	0.8	V
Input High Voltage	V_{IH}	-	2.0	-	V_{DD} +0.5	V
Output Low Voltage	V_{OL}	I_{OL} = 2.1 mA	-	-	0.45	V
Output High Voltage	V_{OH}	I_{OH} = -0.4 mA	2.4	-	-	V

8.2.2 Power-up Timing

PARAMETER	SYMBOL	TYPICAL	UNIT
Power-up to Read Operation	$T_{PU.READ}$	100	µS
Power-up to Write Operation	$T_{PU.WRITE}$	5	mS

8.2.3 Capacitance

(V_{DD} = 5.0V, T_A = 25° C, f = 1 MHz)

PARAMETER	SYMBOL	CONDITIONS	MAX.	UNIT
I/O Pin Capacitance	$C_{I/O}$	$V_{I/O}$ = 0V	12	pF
Input Capacitance	C_{IN}	V_{IN} = 0V	6	pF

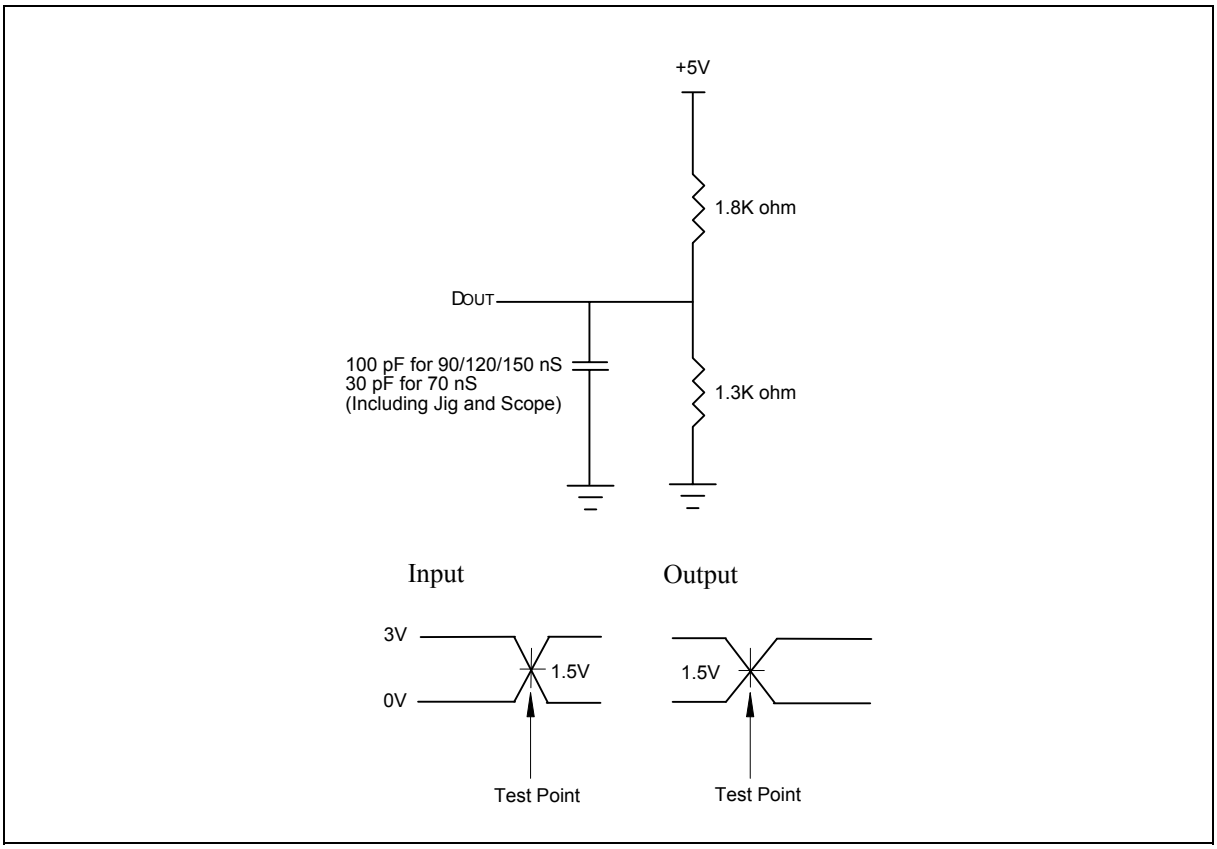
8.3 AC Characteristics

8.3.1 AC Test Conditions

(V_{DD} = 5V ±10%)

PARAMETER	CONDITIONS
Input Pulse Levels	0V to 3V
Input Rise/Fall Time	< 5 nS
Input/Output Timing Level	1.5V/1.5V
Output Load	1 TTL Gate and C_L = 30 pF for 70 nS and 100 pF for others.

8.3.2 AC Test Load and Waveforms



8.3.3 Read Cycle Timing Parameters

(V_{DD} = 5.0V ±10 %, V_{DD} = 5.0 ±5 % for 70 nS, GND = 0V, T_A = 0 to 70° C)

PARAMETER	SYMBOL	W29EE011-90		W29EE011-15		UNIT
		MIN.	MAX.	MIN.	MAX.	
Read Cycle Time	TRC	90	-	150	-	nS
Chip Enable Access Time	TCE	-	90	-	150	nS
Address Access Time	TAA	-	90	-	150	nS
Output Enable Access Time	TOE	-	45	-	70	nS
#CE Low to Active Output	TCLZ	0	-	0	-	nS
#OE Low to Active Output	TOLZ	0	-	0	-	nS
#CE High to High-Z Output	TCHZ	-	45	-	45	nS
#OE High to High-Z Output	TOHZ	-	45	-	45	nS
Output Hold from Address Change	TOH	0	-	0	-	nS

8.3.4 Byte/Page-write Cycle Timing Parameters

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Write Cycle (Erase and Program)	TWC	-	-	10	mS
Address Setup Time	TAS	0	-	-	nS
Address Hold Time	TAH	50	-	-	nS
#WE and #CE Setup Time	TCS	0	-	-	nS
#WE and #CE Hold Time	TCH	0	-	-	nS
#OE High Setup Time	TOES	10	-	-	nS
#OE High Hold Time	TOEH	10	-	-	nS
#CE Pulse Width	TCP	70	-	-	nS
#WE Pulse Width	TWP	70	-	-	nS
#WE High Width	TWPH	150	-	-	nS
Data Setup Time	TDS	50	-	-	nS
Data Hold Time	TDH	10	-	-	nS
Byte Load Cycle Time	TBLC	0.22	-	200	µS
Byte Load Cycle Time-out	TBLCO	300	-	-	µS

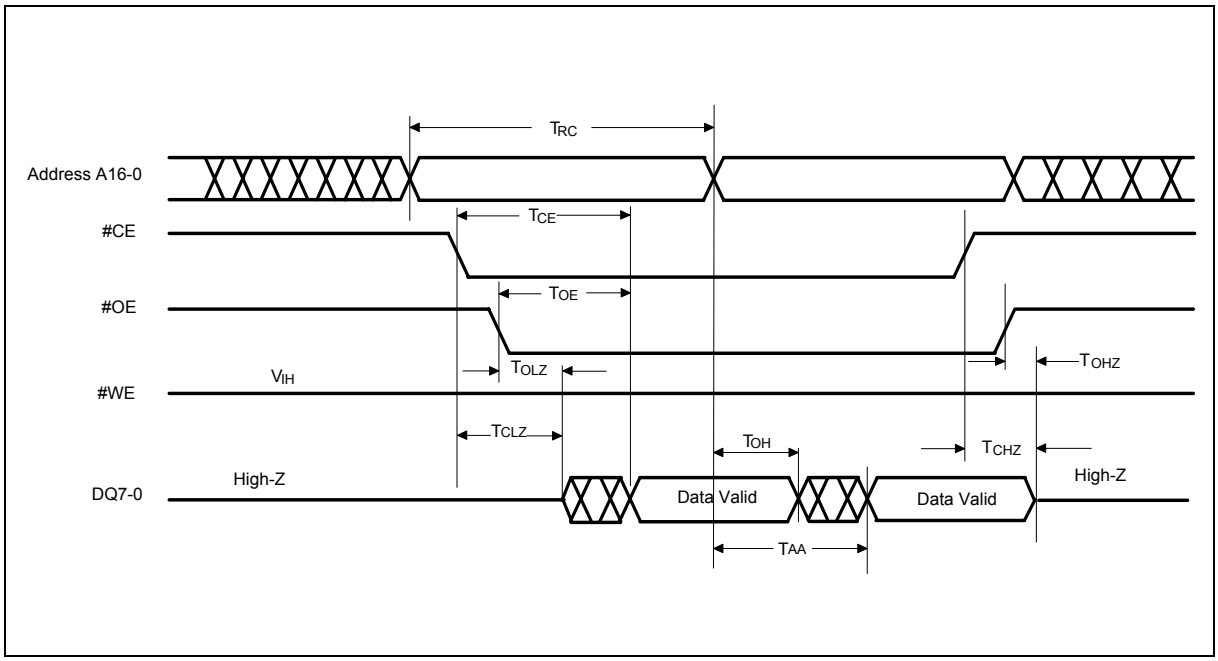
Note: All AC timing signals observe the following guidelines for determining setup and hold times:
(a) High level signal's reference level is V_{IH} and (b) low level signal's reference level is V_{IL}.

8.3.5 Data Polling and Toggle Bit Timing Parameters

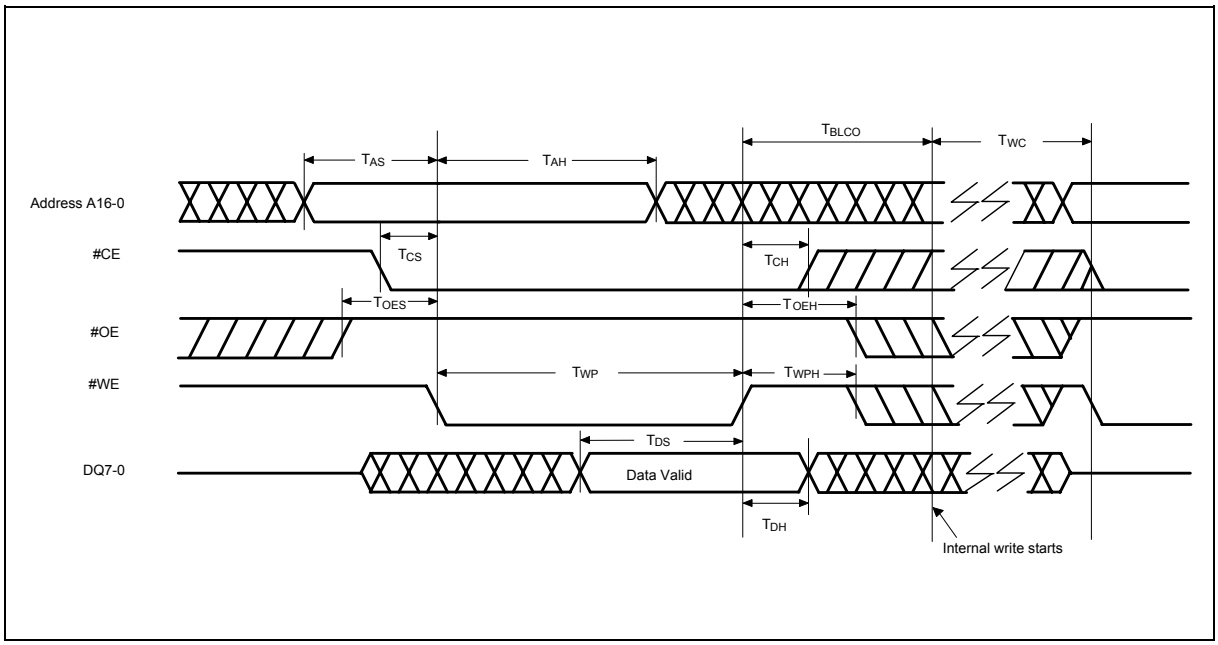
PARAMETER	SYM.	W29EE011-90		W29EE011-15		UNIT
		MIN.	MAX.	MIN.	MAX.	
#OE to Data Polling Output Delay	TOEP	-	45	-	70	nS
#CE to Data Polling Output Delay	TCEP	-	90	-	150	nS
#OE to Toggle Bit Output Delay	TOET	-	45	-	70	nS
#CE to Toggle Bit Output Delay	TCET	-	90	-	150	nS

9. TIMING WAVEFORMS

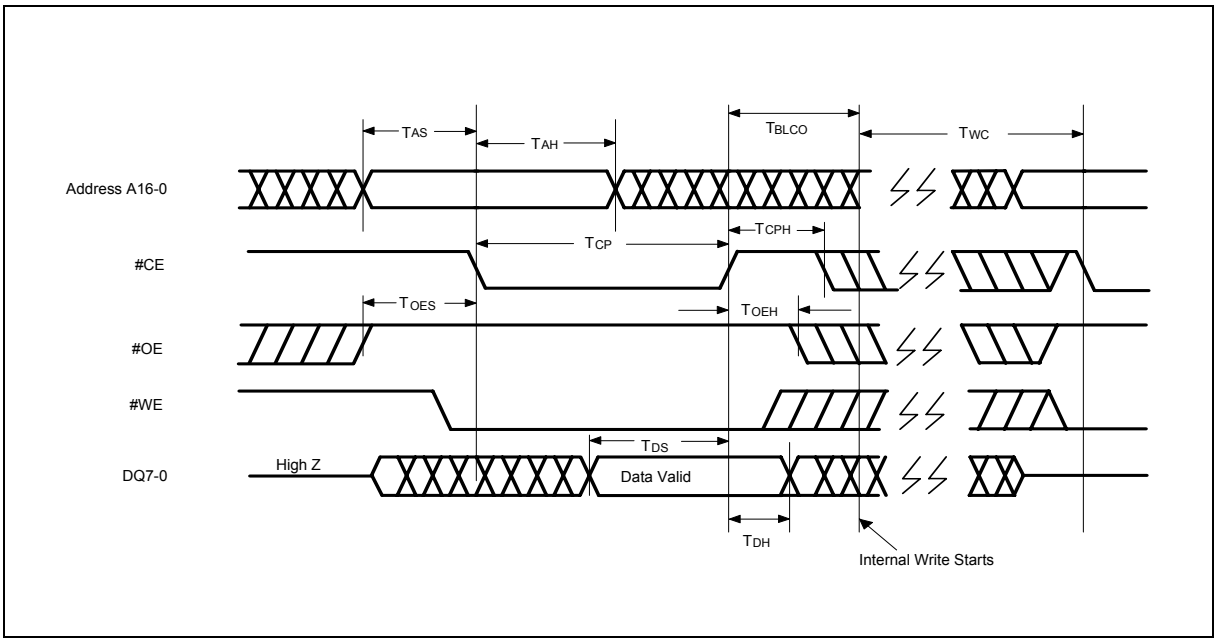
9.1 Read Cycle Timing Diagram



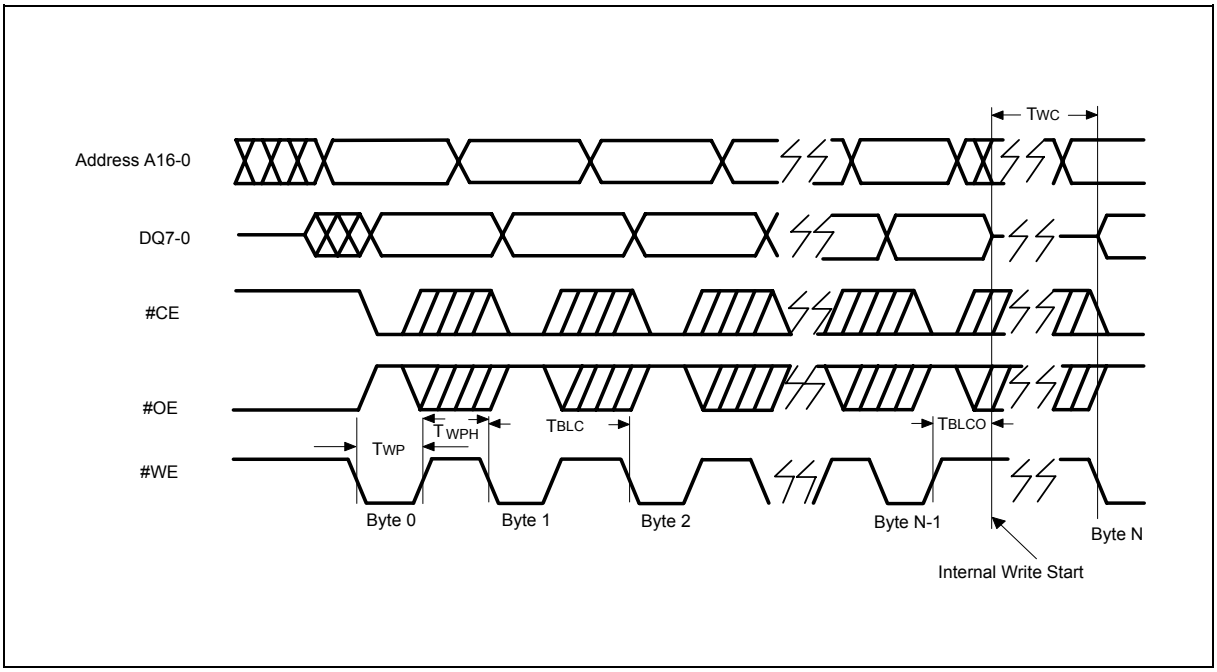
9.2 #WE Controlled Write Cycle Timing Diagram



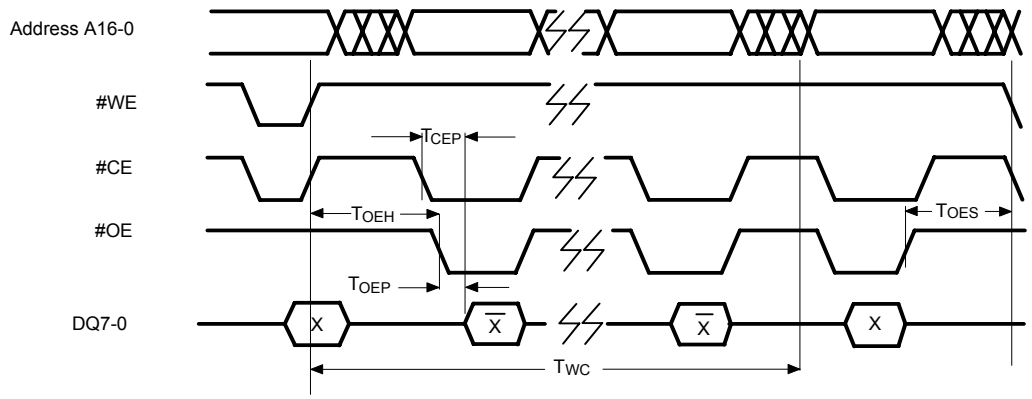
9.3 #CE Controlled Write Cycle Timing Diagram



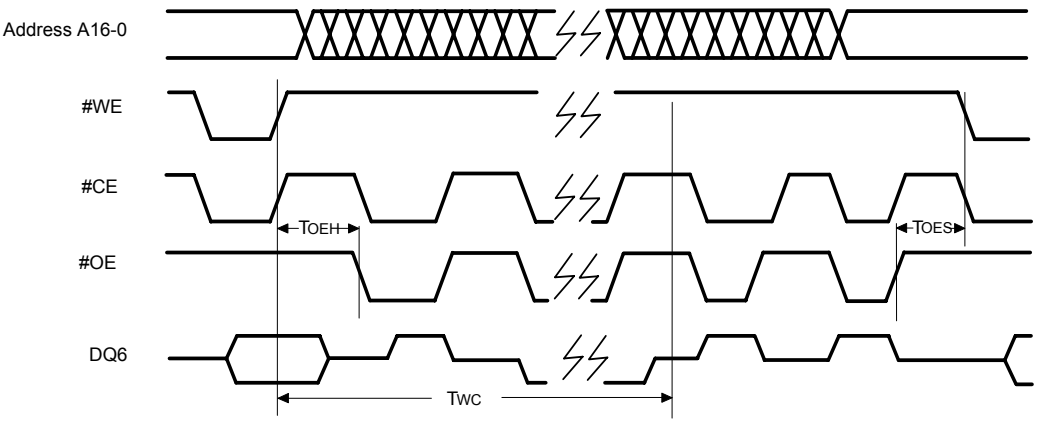
9.4 Page Write Cycle Timing Diagram



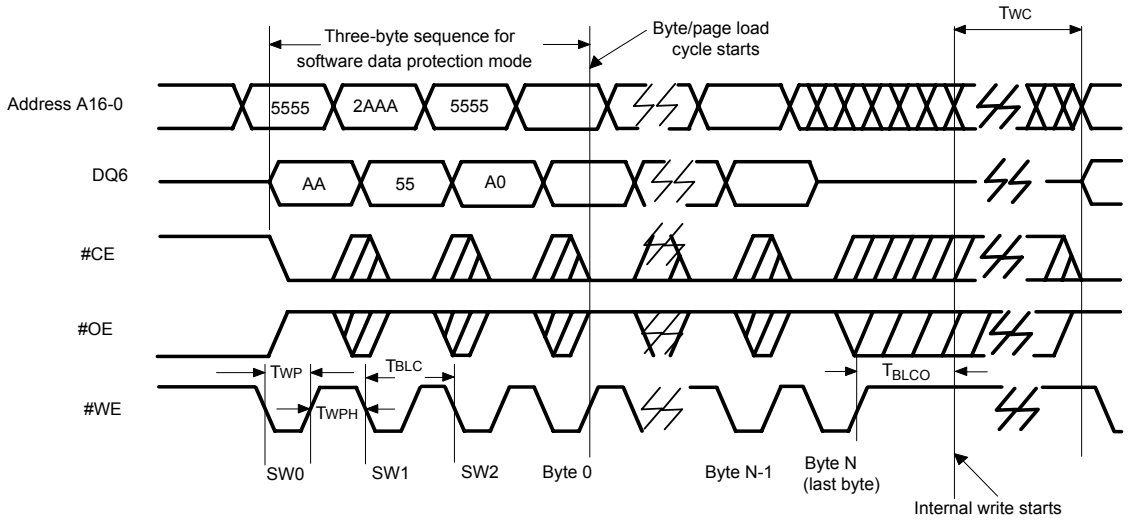
9.5 #DATA Polling Timing Diagram



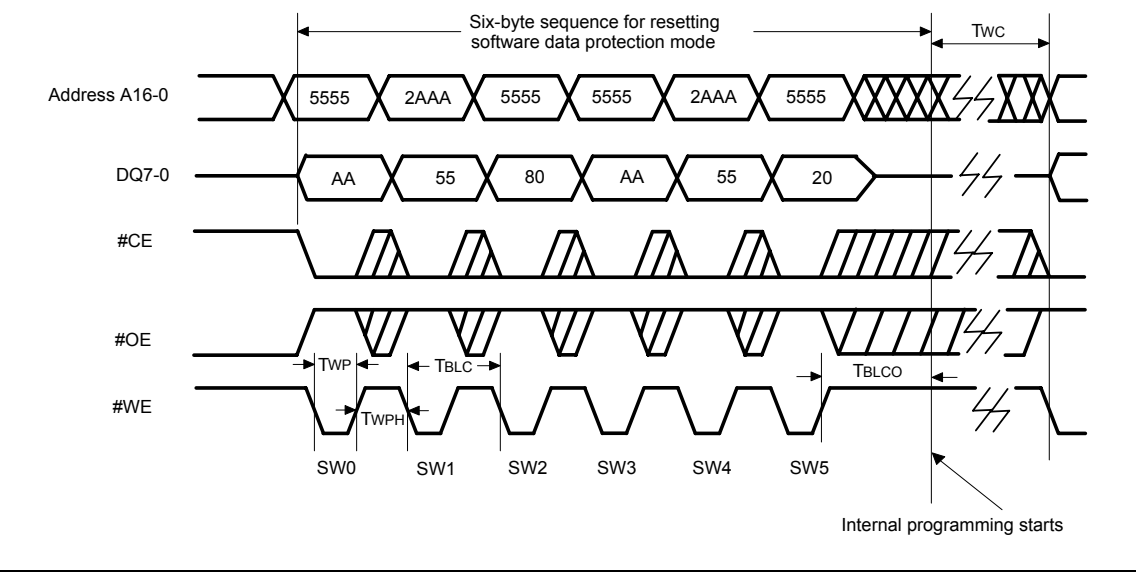
9.6 Toggle Bit Timing Diagram



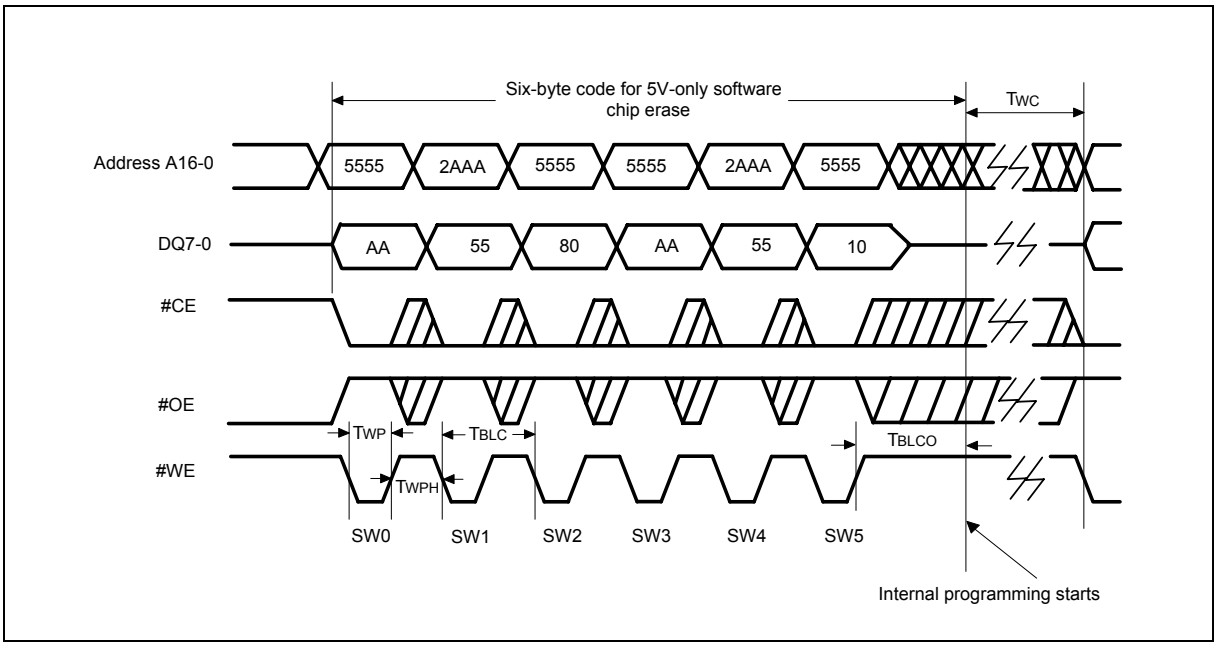
9.7 Page Write Timing Diagram Software Data Protection Mode



9.8 Reset Software Data Protection Timing Diagram



9.9 5 Volt-only Software Chip Erase Timing Diagram



10. ORDERING INFORMATION

PART NO.	ACCESS TIME (NS)	POWER SUPPLY CURRENT MAX. (MA)	STANDBY VDD CURRENT MAX. (μA)	PACKAGE	CYCLING	HARDWARE SID READ FUNCTION
W29EE011-90	90	50	100	600 mil DIP	1K	Y
W29EE011-15	150	50	100	600 mil DIP	1K	Y
W29EE011T-90	90	50	100	TSOP (8 x 20 mm)	1K	Y
W29EE011T-15	150	50	100	TSOP (8 x 20 mm)	1K	Y
W29EE011Q-90	90	50	100	STSOP (8 x 14 mm)	1K	Y
W29EE011Q-15	150	50	100	STSOP (8 x 14 mm)	1K	Y
W29EE011P-90	90	50	100	32-pin PLCC	1K	Y
W29EE011P-15	150	50	100	32-pin PLCC	1K	Y
W29EE011-90B	90	50	100	600 mil DIP	10K	Y
W29EE011-15B	150	50	100	600 mil DIP	10K	Y
W29EE011T90B	90	50	100	TSOP (8x20mm)	10K	Y
W29EE011T15B	150	50	100	TSOP (8x20mm)	10K	Y
W29EE011Q90B	90	50	100	STSOP (8x14mm)	10K	Y
W29EE011Q15B	150	50	100	STSOP (8x14mm)	10K	Y
W29EE011P90B	90	50	100	32-pin PLCC	10K	Y
W29EE011P15B	150	50	100	32-pin PLCC	10K	Y
W29EE011-90N	90	50	100	600 mil DIP	1K	N
W29EE011-15N	150	50	100	600 mil DIP	1K	N
W29EE011P90N	90	50	100	32-pin PLCC	1K	N
W29EE011P15N	150	50	100	32-pin PLCC	1K	N
W29EE011P90Z	90	50	100	Lead-free 32-pin PLCC	1K	Y
W29EE011P15Z	150	50	100	Lead-free 32-pin PLCC	1K	Y
W29EE011Q90Z	90	50	100	STSOP (8x14mm)	10K	Y

Notes:

1. Winbond reserves the right to make changes to its products without prior notice.
2. Purchasers are responsible for performing appropriate quality assurance testing on products intended for use in applications where personal injury might occur as a consequence of product failure.
3. In Hardware SID Read column: Y = with SID read function; N = without SID read function.

11. HOW TO READ THE TOP MARKING

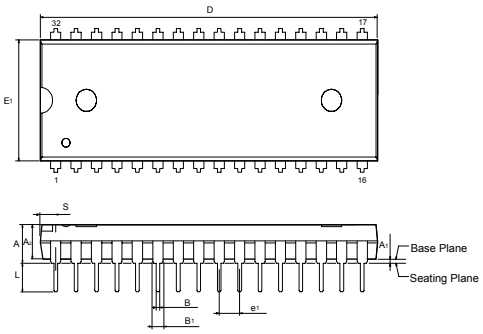
Example: The top marking of 32L-PLCC W29EE011P15N

1st line: winbond logo
2nd line: the part number: W29EE011P15N
3rd line: the lot number
4th line: the tracking code: 149 O B RA

149: Packages made in '01, week 49
O: Assembly house ID: A means ASE, O means OSE, ...etc.
B: IC revision; A means version A, B means version B, ...etc.
RA: Process code

12. PACKAGE DIMENSIONS

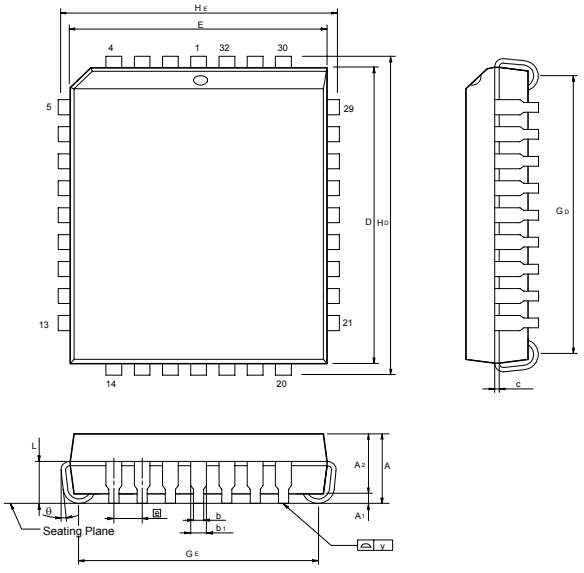
12.1 32-pin P-DIP



Symbol	Dimension in inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.210	—	—	5.33
A_1	0.010	—	—	0.25	—	—
A_2	0.150	0.155	0.160	3.81	3.94	4.06
B	0.016	0.018	0.022	0.41	0.46	0.56
B_1	0.048	0.050	0.054	1.22	1.27	1.37
c	0.008	0.010	0.014	0.20	0.25	0.36
D	—	1.650	1.660	—	41.91	42.16
E	0.590	0.600	0.610	14.99	15.24	15.49
E_1	0.545	0.550	0.555	13.84	13.97	14.10
e_1	0.090	0.100	0.110	2.29	2.54	2.79
L	0.120	0.130	0.140	3.05	3.30	3.56
a	0	—	15	0	—	15
e_A	0.630	0.650	0.670	16.00	16.51	17.02
S	—	—	0.085	—	—	2.16

Notes:
1. Dimensions D Max. & S include mold flash or tie bar burrs.
2. Dimension E1 does not include interlead flash.
3. Dimensions D & E1 include mold mismatch and are determined at the mold parting line.
4. Dimension B1 does not include dambar protrusion/intrusion.
5. Controlling dimension: Inches
6. General appearance spec. should be based on final visual inspection spec.

12.2 32-pin PLCC

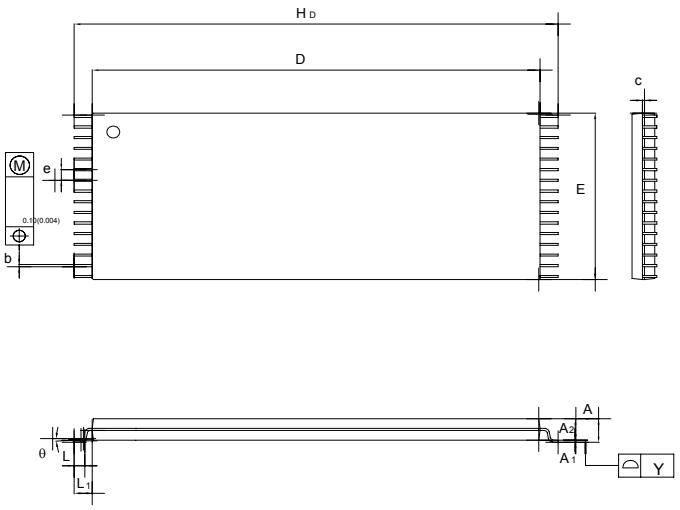


Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.140	—	—	3.56
A_1	0.020	—	—	0.50	—	—
A_2	0.105	0.110	0.115	2.67	2.80	2.93
b_1	0.026	0.028	0.032	0.66	0.71	0.81
b	0.016	0.018	0.022	0.41	0.46	0.56
c	0.008	0.010	0.014	0.20	0.25	0.35
D	0.547	0.550	0.553	13.89	13.97	14.05
E	0.447	0.450	0.453	11.35	11.43	11.51
e	0.044	0.050	0.056	1.12	1.27	1.42
G_D	0.490	0.51	0.530	12.45	12.9	13.46
G_E	0.390	0.410	0.430	9.91	10.41	10.92
H_D	0.585	0.590	0.595	14.86	14.99	15.11
H_E	0.485	0.49	0.495	12.32	12.45	12.57
L	0.075	0.090	0.095	1.91	2.29	2.41
y	—	—	0.004	—	—	0.10
θ	0°	—	10°	0°	—	10°

Notes:
1. Dimensions D & E do not include interlead flash.
2. Dimension b1 does not include dambar protrusion/intrusion.
3. Controlling dimension: Inches
4. General appearance spec. should be based on final visual inspection sepc.

Package Dimensions, continued

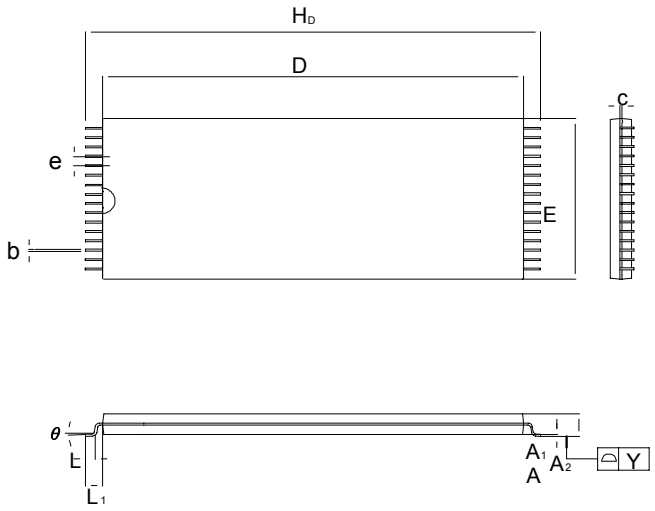
12.3 32-pin TSOP (8 x 20 mm)



Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	—	—	0.047	—	—	1.20
A_1	0.002	—	0.006	0.05	—	0.15
A_2	0.037	0.039	0.041	0.95	1.00	1.05
b	0.007	0.008	0.009	0.17	0.20	0.23
c	0.005	0.006	0.007	0.12	0.15	0.17
D	0.720	0.724	0.728	18.30	18.40	18.50
E	0.311	0.315	0.319	7.90	8.00	8.10
H_D	0.780	0.787	0.795	19.80	20.00	20.20
e	—	0.020	—	—	0.50	—
L	0.016	0.020	0.024	0.40	0.50	0.60
L_1	—	0.031	—	—	0.80	—
Y	0.000	—	0.004	0.00	—	0.10
θ	1	3	5	1	3	5

Note:
Controlling dimension: Millimeters

12.4 32-pin STSOP (8 x 14 mm)



Symbol	Dimension in Inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A			0.047			1.20
A_1	0.002		0.006	0.05		0.15
A_2	0.035	0.040	0.041	0.95	1.00	1.05
b	0.007	0.009	0.010	0.17	0.22	0.27
c	0.004	-----	0.008	0.10	-----	0.21
D		0.488			12.40	
E		0.315			8.00	
H_D		0.551			14.00	
e		0.020			0.50	
L	0.020	0.024	0.028	0.50	0.60	0.70
L_1		0.031			0.80	
Y	0.000		0.004	0.00		0.10
θ	0	3	5	0	3	5

13. VERSION HISTORY

VERSION	DATE	PAGE	DESCRIPTION
A9	Feb. 1998	6	Add pause 10 mS
		7	Add pause 50 mS
		8	Correct the time 10 mS to 10 μS
		1, 17	Add cycing 100 item
A10	Jun. 1998	1, 10, 11, 12, 17	Add 70 nS bining
A11	Aug. 1998	1, 2, 17, 19	Add TSOP package
A12	Jul. 1999	1, 17	Change endurance cycles as 1K/10K
		1, 11, 12, 17	Delete 70, 120 nS bining
		1, 17, 18	Delete SOP package
A13	Dec. 2000	4, 17	Add in Hardware SID Read Function note
A14	Mar. 2001	1, 17, 18	Add in TSOP (8 x 14 mm) package
		17	Correct Part No. in Ordering Information
A15	Feb. 19, 2002	4	Modify V_{DD} Power Up/Down Detection in Hardware Data Protection
		18	Add HOW TO READ THE TOP MARKING
		1, 17, 20	Rename TSOP (8 x 14 mm) as STSOP (8 X 14 mm)
A16	Feb. 17, 2004	1, 17	Add in Lead-free 32-pin PLCC package
A17	April 15 ,2005	23	Add important notice
A18	April 11, 2006	21	Add W29EE011Q90Z package

Important Notice

Winbond products are not designed, intended, authorized or warranted for use as components in systems or equipment intended for surgical implantation, atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, or for other applications intended to support or sustain life. Further more, Winbond products are not intended for applications wherein failure of Winbond products could result or lead to a situation wherein personal injury, death or severe property or environmental damage could occur.

Winbond customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Winbond for any damages resulting from such improper use or sales.

Headquarters
No. 4, Creation Rd. III,
Science-Based Industrial Park,
Hsinchu, Taiwan
TEL: 886-3-5770066
FAX: 886-3-5665577
http://www.winbond.com.tw/

Winbond Electronics Corporation America
2727 North First Street, San Jose,
CA 95134, U.S.A.
TEL: 1-408-9436666
FAX: 1-408-5441798

Winbond Electronics (Shanghai) Ltd.
27F, 2299 Yan An W. Rd. Shanghai,
200336 China
TEL: 86-21-62365999
FAX: 86-21-62365998

Taipei Office
9F, No.480, Rueiguang Rd.,
Neihu District, Taipei, 114,
Taiwan, R.O.C.
TEL: 886-2-8177-7168
FAX: 886-2-8751-3579

Winbond Electronics Corporation Japan
7F Daini-ueno BLDG, 3-7-18
Shinyokohama Kohoku-ku,
Yokohama, 222-0033
TEL: 81-45-4781881
FAX: 81-45-4781800

Winbond Electronics (H.K.) Ltd.
Unit 9-15, 22F, Millennium City,
No. 378 Kwun Tong Rd.,
Kowloon, Hong Kong
TEL: 852-27513100
FAX: 852-27552064