Flash-ROM Module 16MByte (4Mx32Bit), 72Pin-SIMM, 3.3V Design
Part No. HMF4M32M8V

GENERAL DESCRIPTION

The HMF4M32M8V is a high-speed flash read only memory (FROM) module containing 8,388,608 words organized in a x32bit configuration. The module consists of eight 2M x 8bit FROM mounted on a 72-pin, double -sided, FR4-printed circuit board.
Commands are written to the command register using standard microprocessor write timings.
Register contents serve as input to an internal state-machine, which controls the erase and programming circuitry. Write cycles also internally latch addresses and data needed for the programming and erase operations. Reading data out of the device is similar to reading from 12.0V flash or EPROM devices.
Four chip enable inputs, ,(/CE_1L, /CE_1H, /CE_2L, /CE_2H) are used to enable the module's 16 bits independently. Output enable (/OE) and write enable (/WE) can set the memory input and output.
When FROM module is disable condition the module is becoming power standby mode, system designer can get low -power design. All module components may be powered from a single +3.3V DC power supply and all inputs and outputs are TTL-compatible.

FEATURES

- Access time : 70, 80, 90, 120ns
- High-density 16MByte design
- High-reliability, low-power design
- Single + 3.3V ± 0.3V power supply
- Easy memory expansion
- All inputs and outputs are TTL-compatible
- FR4-PCB design
- Low profile 72-pin SIMM
- Minimum 1,000,000 write/erase cycle
- Sectors erase architecture
- Sector group protection
- Temporary sector group unprotection

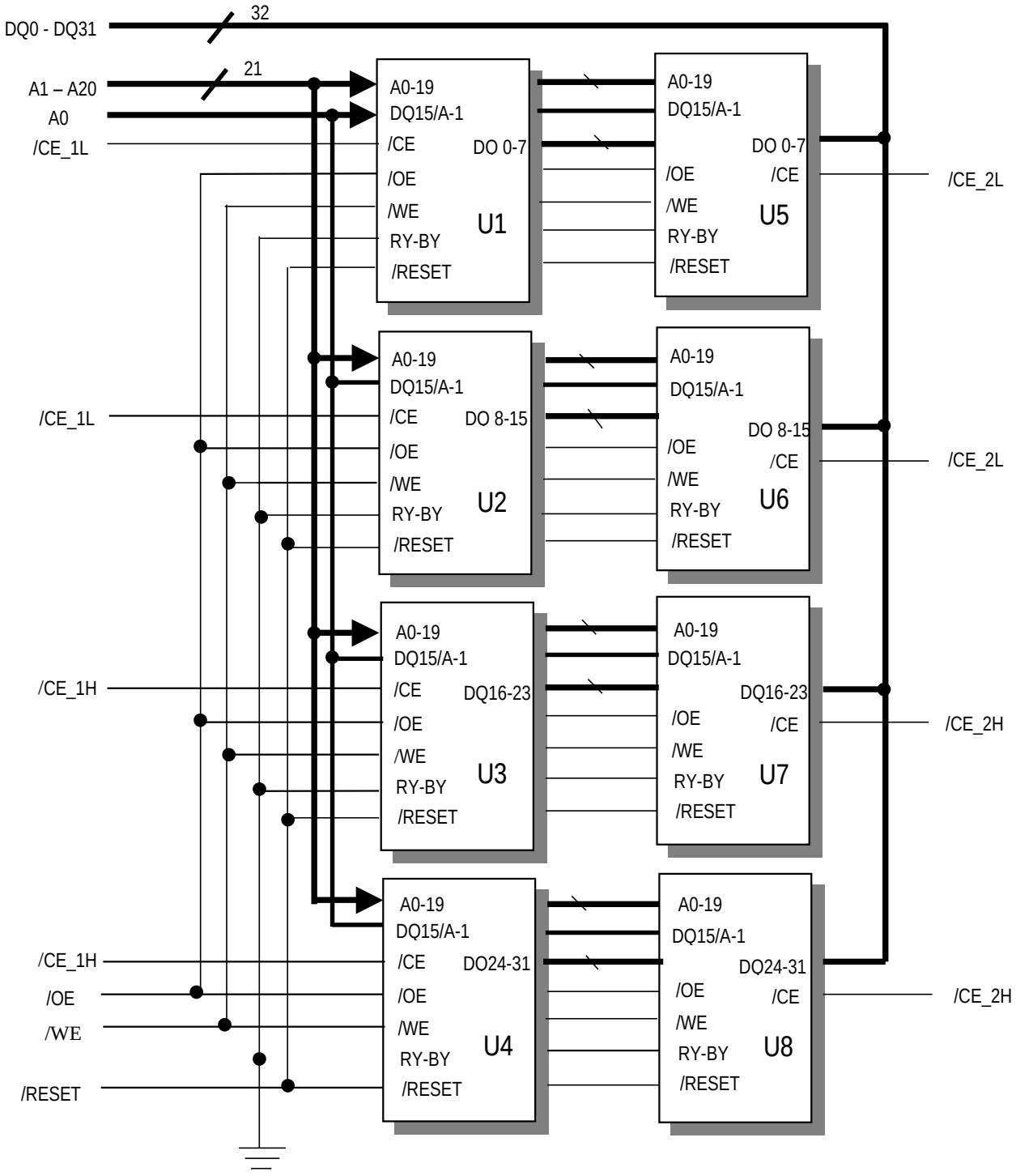
OPTIONS MARKING

- Timing
  - 70ns access -70
  - 80ns access -80
  - 90ns access -90
  - 120ns access -120
- Packages
  - 72-pin SIMM M

PIN ASSIGNMENT

PIN	Symbol	PIN	Symbol	PIN	Symbol
1	Vss	25	DQ17	49	/WE
2	/RESET	26	DQ18	50	A18
3	DQ0	27	DQ19	51	A17
4	DQ1	28	DQ20	52	A16
5	DQ2	29	DQ21	53	A15
6	DQ3	30	Vcc	54	A14
7	DQ4	31	DQ22	55	A13
8	DQ5	32	DQ23	56	A12
9	DQ6	33	/CE_1H	57	A11
10	Vcc	34	/CE_2H	58	A10
11	DQ7	35	DQ24	59	Vcc
12	/CE_1L	36	DQ25	60	A9
13	/CE_2L	37	DQ26	61	A8
14	DQ8	38	DQ27	62	A7
15	DQ9	39	Vss	63	A6
16	DQ10	40	DQ28	64	A5
17	DQ11	41	DQ29	65	A4
18	DQ12	42	DQ30	66	A3
19	DQ13	43	DQ31	67	A2
20	DQ14	44	NC	68	A1
21	DQ15	45	NC	69	A0
22	NC	46	Vcc	70	A20
23	NC	47	A19	71	NC(A21)
24	DQ16	48	/OE	72	Vss

FUNCTIONAL BLOCK DIAGRAM



TRUTH TABLE

MODE	/OE	/CE	/WE	/RESET	DQ (/BYTE=L)	POWER
STANDBY	X	H	X	Vcc±0.3V	HIGH-Z	STANDBY
NOT SELECTED	H	L	H	H	HIGH-Z	ACTIVE
READ	L	L	H	H	D_{OUT}	ACTIVE
WRITE or ERASE	X	L	L	H	D_{IN}	ACTIVE

NOTE: X means don't care

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING
Voltage with respect to ground all other pins	$V_{IN,OUT}$	-0.5V to Vcc+0.5V
Voltage with respect to ground Vcc	V_{CC}	-0.5V to +4.0V
Power dissipation	PD	8W
Storage Temperature	T_{STG}	-65°C to +150°C
Operating Temperature	T_A	-55°C to +125°C

w Stresses greater than 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 these or any other conditions above those indicated in the operating section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

RECOMMENDED DC OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP.	MAX
Vcc for ± 10% device Supply Voltages	Vcc	2.7V		3.6V
Ground	V_{SS}	0	0	0

DC AND OPERATING CHARACTERISTICS ($0^oC \leq T_A \leq 70\ ^oC$)

PARAMETER	TEST CONDITIONS		SYMBOL	MIN	MAX	UNIT
Input Load Current	Vcc=Vcc max, V_{IN}= VSS to Vcc		I_{L1}		±1.0	µA
Output Leakage Current	Vcc=Vcc max, V_{OUT}= VSS to Vcc		I_{L0}		±1.0	µA
Output High Voltage	I_{OH} = -2.0mA, Vcc = Vcc min		V_{OH}	0.85x Vcc		V
Output Low Voltage	I_{OL} = 4.0mA, Vcc =Vcc min		V_{OL}		0.45	V
Vcc Active Read Current (1)	/CE = V_{IL}, /OE = V_{IH},	5MHZ	I_{CC1}	72(Tpy)	128	mA
		1MHZ		16(Tpy)	32	
Vcc Active Write Current (2)	/CE = V_{IL}, /OE=V_{IH}		I_{CC2}	160(Tpy)	240	mA
Vcc Standby Current	/CE, /RESET=Vcc±0.3V		I_{CC3}	1.6(Tpy)	40.0	µA
Low Vcc Lock-Out Voltage			V_{LKO}	2.3	2.5	V

Notes: 1. The Icc current listed is typically less than 2mA/MHz, with /OE at V_{IH}.

2. Icc active while embedded algorithm (program or erase) is in progress

3. Maximum Icc current specifications are tested with Vcc=Vcc max

ERASE AND PROGRAMMING PERFORMANCE

PARAMETER	LIMITS			UNIT	COMMENTS
	MIN.	TYP.	MAX.		
Sector Erase Time	-	0.7	15	sec	Excludes 00H programming prior to erasure
Chip Erase Time		25		sec	
Byte Programming Time	-	9	300	μs	Excludes system-level overhead
Chip Programming Time	-	12	36	sec	

TSOP CAPACITANCE

PARAMETER SYMBOL	PARAMETER DESCRIPTION	TEST SETUP	TYP.	MAX	UNIT
C_{IN}	Input Capacitance	V_{IN} = 0	6	7.5	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0	8.5	12	pF
C_{IN2}	Control Pin Capacitance	V_{IN} = 0	7.5	9	pF

Notes : Test conditions T_A = 25°C, f=1.0 MHz.

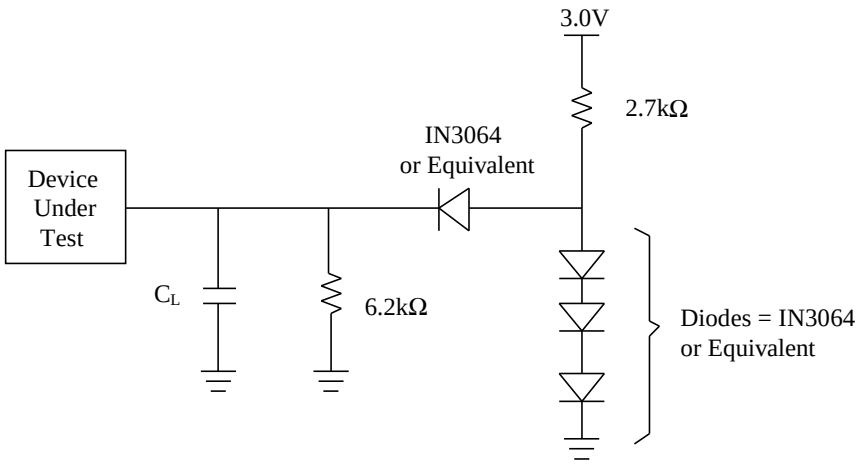
AC CHARACTERISTICS

u Read Only Operations Characteristics

PARAMETER SYMBOLS		DESCRIPTION	TEST SETUP		Speed Options				UNIT
JEDEC	STANDARD				-70R	-80	-90	-120	
t_{AVAV}	t_{RC}	Read Cycle Time		Min	70	80	90	120	ns
t_{AVQV}	t_{ACC}	Address to Output Delay	/CE = V_{IL} /OE = V_{IL}	Max	70	80	90	120	ns
t_{ELQV}	t_{CE}	Chip Enable to Output Delay	/OE = V_{IL}	Max	70	80	90	120	ns
t_{GLQV}	t_{OE}	Output Enable to Output Delay		Max	30	30	35	50	ns
t_{EHQZ}	t_{DF}	Chip Enable to Output High-Z		Max	25	25	30	30	ns
t_{GHQZ}	t_{DF}	Output Enable to Output High-Z		Max	25	25	30	30	ns
t_{AXQX}	t_{OH}	Output Hold Time From Addresses, /CE or /OE, Whichever Occurs First		Min	0				ns

TEST SPECIFICATIONS

TEST CONDITION	70R, 80	90, 120	UNIT
Output load	1TTL gate		
Output load capacitance, C_L (Including jig capacitance)	30	100	pF
Input rise and fall times	5		ns
Input pulse levels	0.0-3.0		V
Input timing measurement reference levels	1.5		V
Output timing measurement reference levels	1.5		V



Note : C_L = 100pF including jig capacitance

u Erase/Program Operations

PARAMETER SYMBOLS		DESCRIPTION		Speed Options				UNIT
JEDEC	STANDARD			70R	80	90	120	
t_{AVAV}	t_{WC}	Write Cycle Time	Min	70	80	90	120	ns
t_{AVWL}	t_{AS}	Address Setup Time	Min	0				ns
t_{WLAX}	t_{AH}	Address Hold Time	Min	45	45	45	50	ns
t_{DVWH}	t_{DS}	Data Setup Time	Min	35	35	45	50	ns
t_{WHDX}	t_{DH}	Data Hold Time	Min	0				ns
	t_{OES}	Output Enable Setup Time	Min	0				ns
t_{GHWL}	t_{GHWL}	Read Recovery Time Before Write	Min	0				ns
t_{ELWL}	t_{CS}	/CE Setup Time	Min	0				ns
t_{WHEH}	t_{CH}	/CE Hold Time	Min	0				ns
t_{WLWH}	t_{WP}	Write Pulse Width	Min	35	35	35	50	ns
t_{WHWL}	t_{WPH}	Write Pulse Width High	Min	30				ns
t_{WHWH1}	t_{WHWH1}	Byte Programming Operation	Typ	9				µs
t_{WHWH2}	t_{WHWH2}	Sector Erase Operation (Note1)	Typ	0.7				sec
	t_{VCS}	Vcc set up time	Min	50				µs

Notes : 1 . This does not include the preprogramming time

2 . This timing is only for Sector Protect operations

u Erase/Program Operations

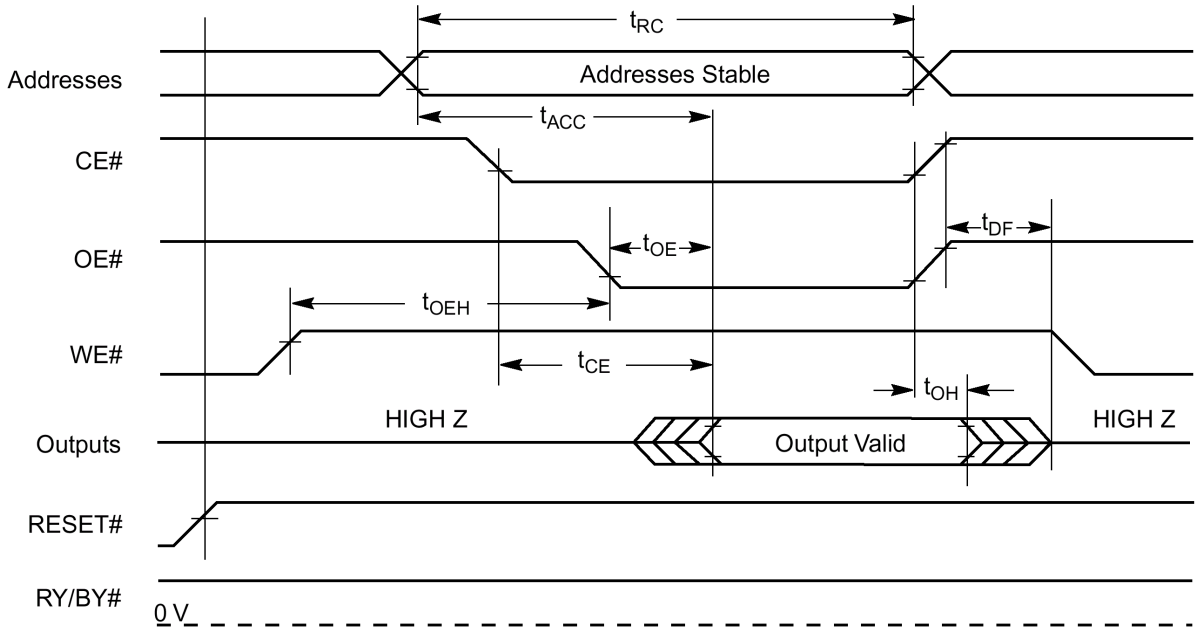
Alternate /CE Controlled Writes

PARAMETER SYMBOLS		DESCRIPTION		Speed Options				UNIT
JEDEC	STANDARD			-70R	-80	-90	120	
t_{AVAV}	t_{WC}	Write Cycle Time	Min	70	80	90	120	ns
t_{AVWL}	t_{AS}	Address Setup Time	Min	0				ns
t_{WLAX}	t_{AH}	Address Hold Time	Min	45	45	45	50	ns
t_{DVWH}	t_{DS}	Data Setup Time	Min	35	35	45	50	ns
t_{WHDX}	t_{DH}	Data Hold Time	Min	0				ns
	t_{OES}	Output Enable Setup Time	Min	0				ns
t_{GHWL}	t_{GHWL}	Read Recovery Time Before Write	Min	0				ns
t_{ELWL}	t_{CS}	/CE Setup Time	Min	0				ns
t_{WHEH}	t_{CH}	/CE Hold Time	Min	0				ns
t_{WLWH}	t_{WP}	Write Pulse Width	Min	35	35	35	50	ns
t_{WHWL}	t_{WPH}	Write Pulse Width High	Min	30				ns
t_{WHWH1}	t_{WHWH1}	Byte Programming Operation	Typ	9				µs
t_{WHWH2}	t_{WHWH2}	Sector Erase Operation (Note1)	Typ	0.7				sec

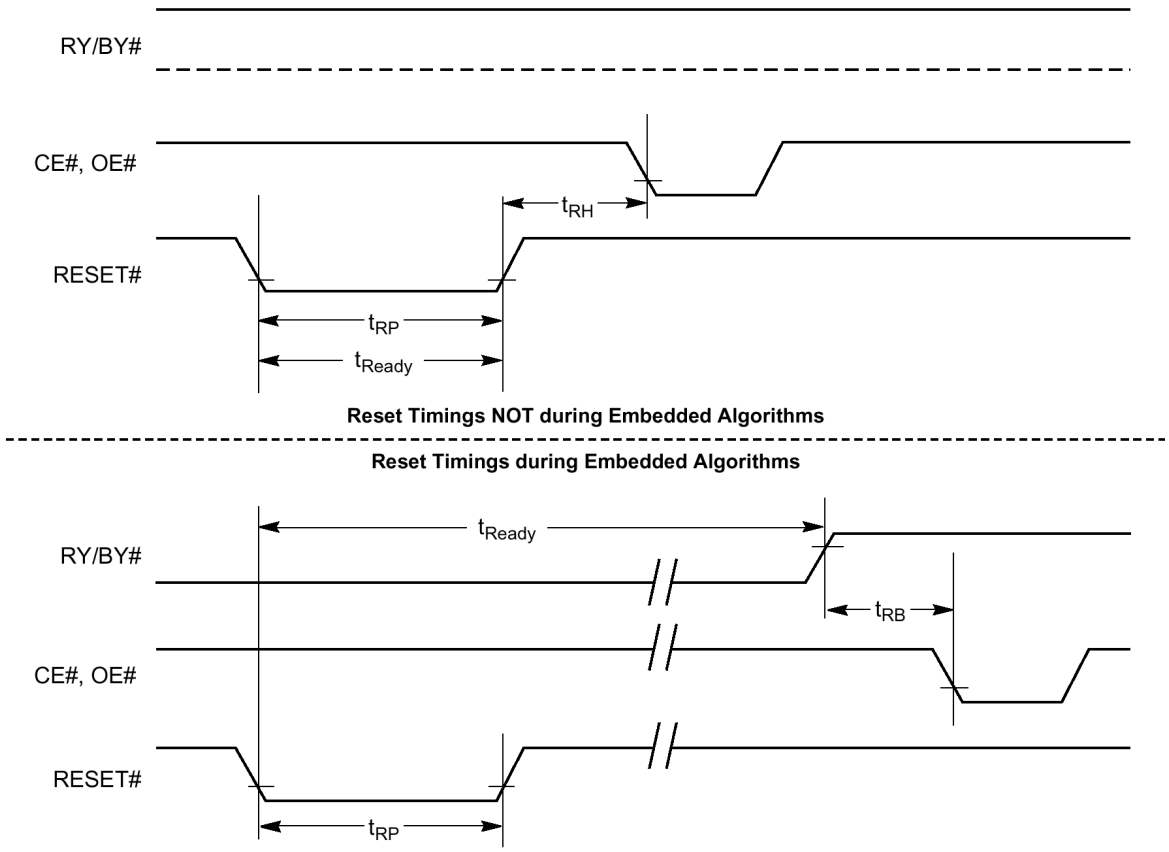
Notes : 1. This does not include the preprogramming time

2 . This timing is only for Sector Protect operations

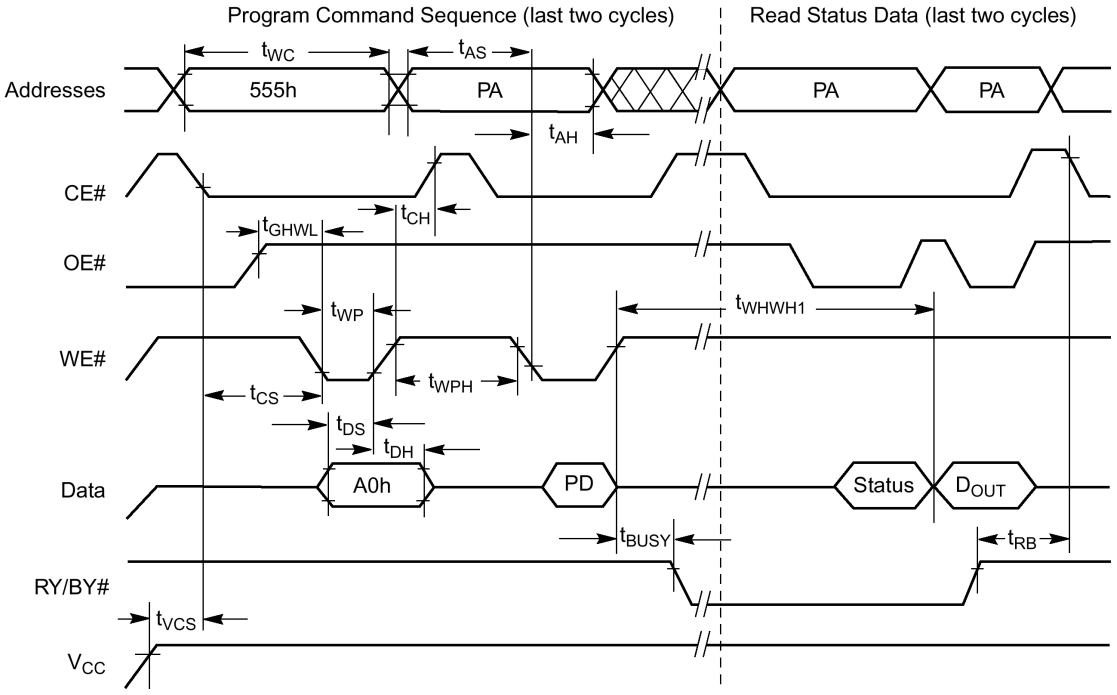
u READ OPERATIONS TIMING



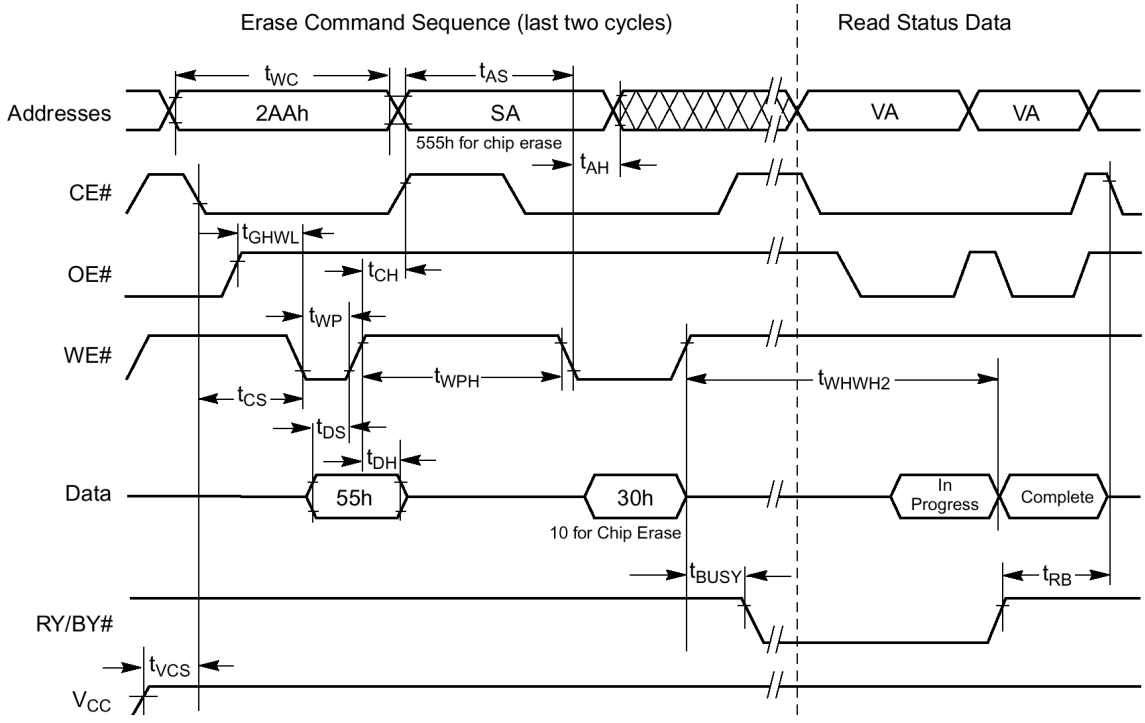
u RESET TIMING



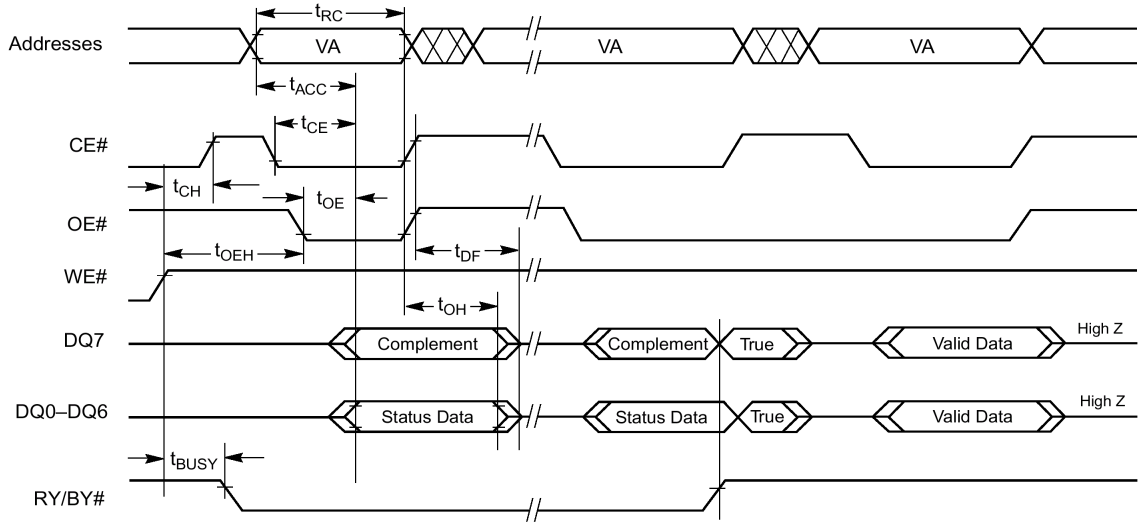
u PROGRAM OPERATIONS TIMING



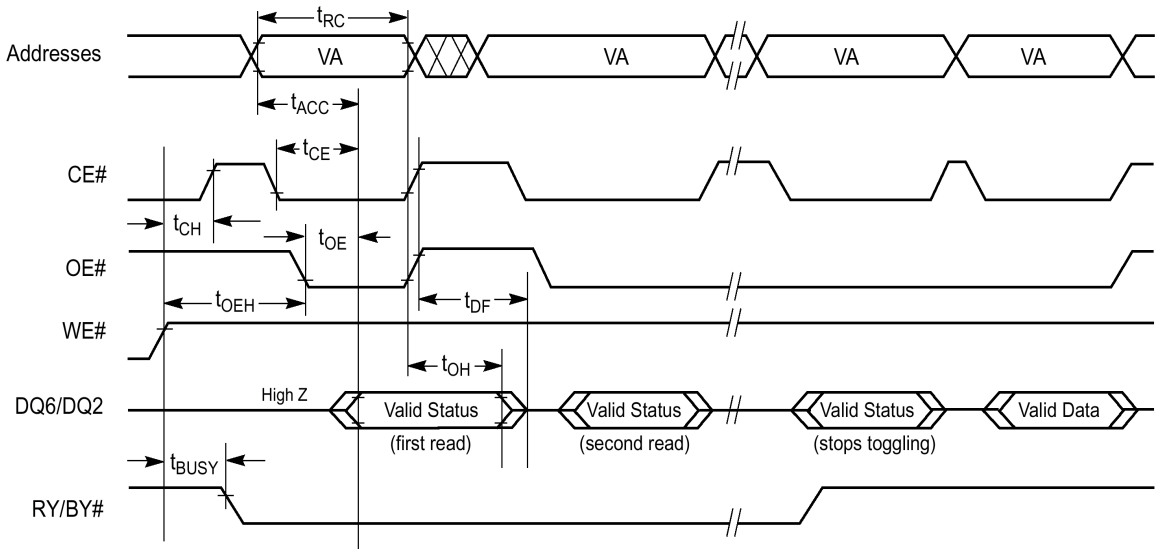
u CHIP/SECTOR ERASE OPERATION TIMINGS



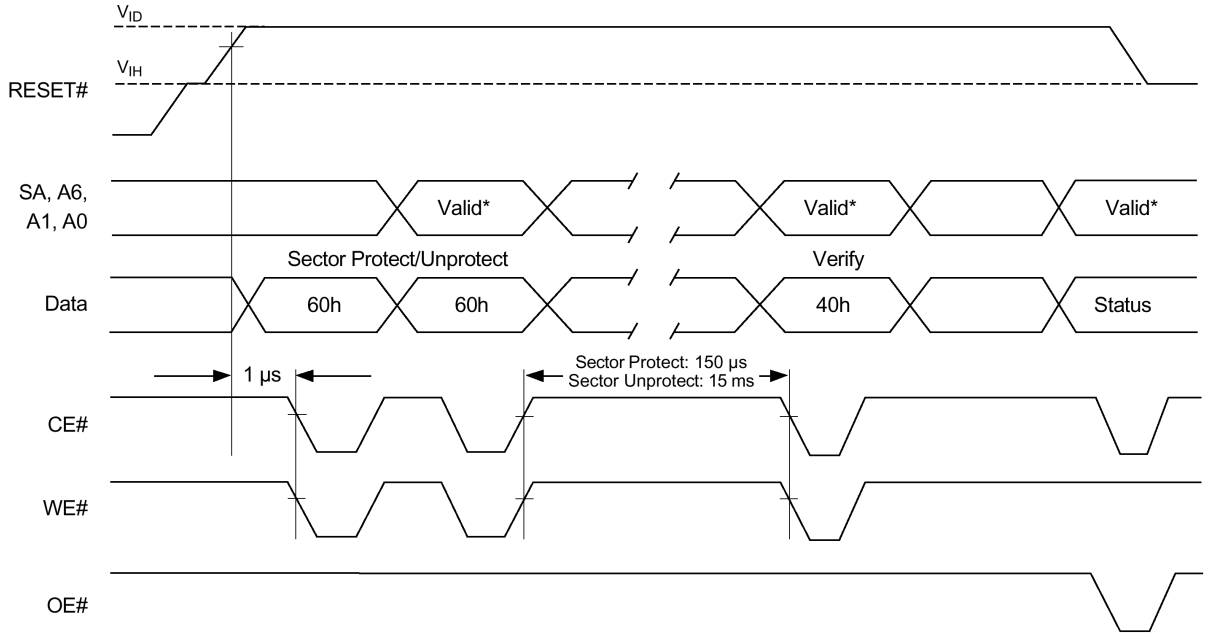
u DATA# POLLING TIMES(DURING EMBEDDED ALGORITHMS)



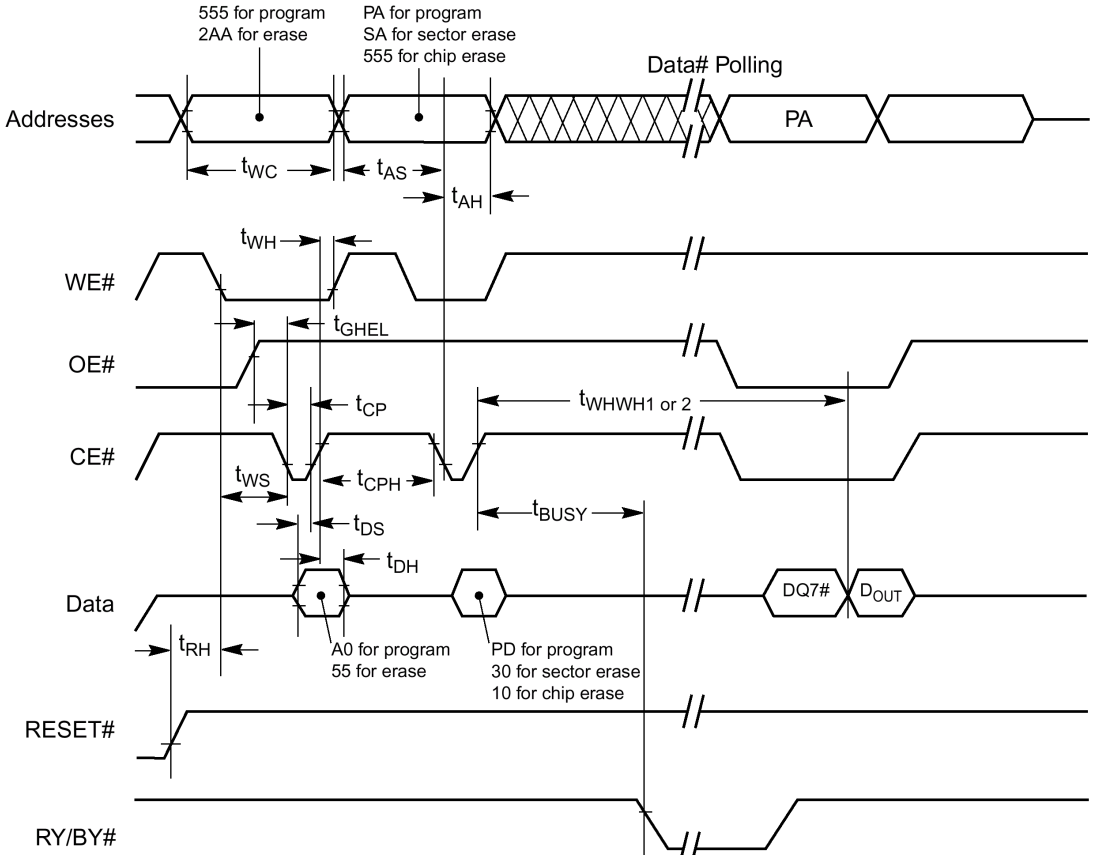
u TOGGLE# BIT TIMINGS (DURING EMBEDDED ALGORITHMS)



u SECTOR PROTECT UNPROTECT TIMEING DIAGRAM

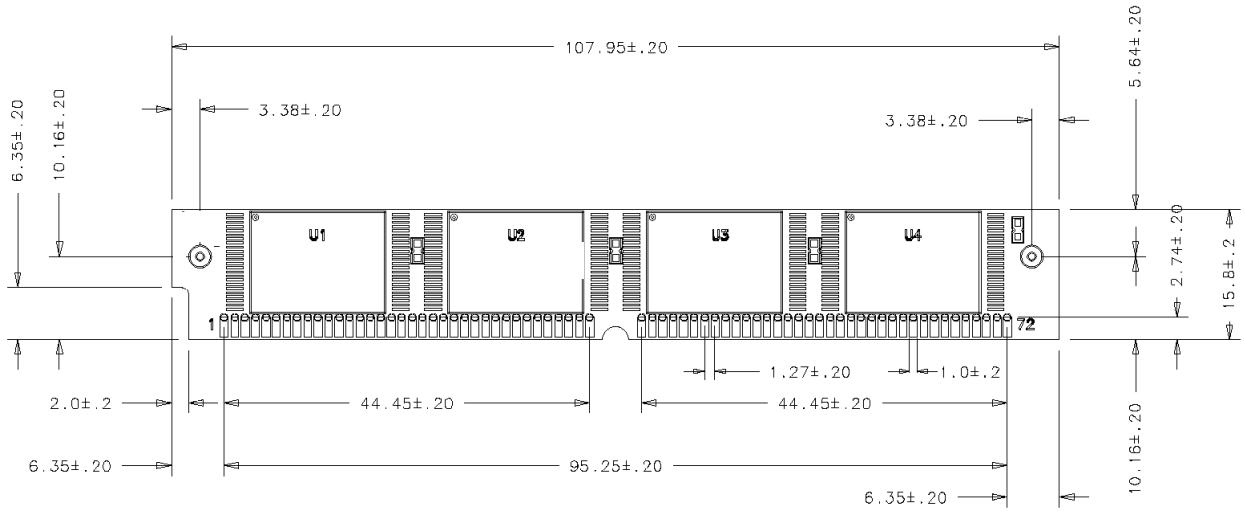


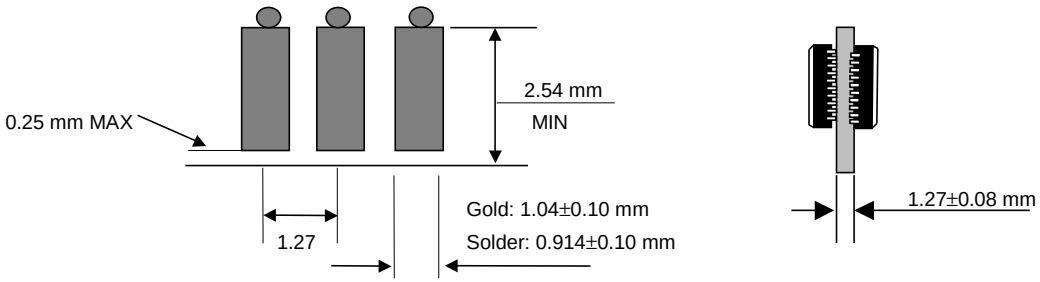
u ALTERNATE CE# CONTROLLED WRITE OPERATING TIMINGS



PACKAGE DIMENSIONS

(UNIT : mm)





(Solder & Gold Plating)

ORDERING INFORMATION

Part Number	Density	Org.	Package	Component Number	Vcc	SPEED
HMF4M32M8V-70	16MByte	4Mx 32bit	72Pin -SIMM	8EA	3.3V	70ns
HMF4M32M8V-80	16MByte	4Mx 32bit	72Pin -SIMM	8EA	3.3V	80ns
HMF4M32M8V-90	16MByte	4Mx 32bit	72Pin -SIMM	8EA	3.3V	90ns
HMF4M32M8V-120	16MByte	4Mx 32bit	72Pin -SIMM	8EA	3.3V	120ns