



GM71C17803C
GM71CS17803CL
2,097,152 WORDS x 8 BIT
CMOS DYNAMIC RAM

Description

The GM71C(S)17803C/CL is the new generation dynamic RAM organized 2,097,152 x 8 bit. GM71C(S)17803C/CL has realized higher density, higher performance and various functions by utilizing advanced CMOS process technology. The GM71C(S)17803C/CL offers Extended Data out(EDO) Page Mode as a high speed access mode. Multiplexed address inputs permit the GM71C(S)17803C/CL to be packaged in standard 400 mil 28 pin plastic SOJ, and standard 400mil 28pin plastic TSOP II. The package size provides high system bit densities and is compatible with widely available automated testing and insertion equipment.

Features

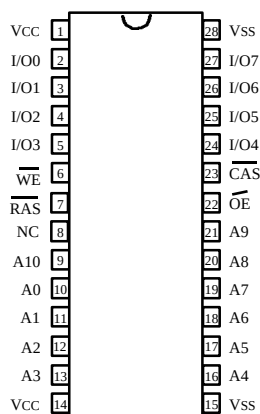
- * 2,097,152 Words x 8 Bit Organization
- * Extended Data Out Mode Capability
- * Single Power Supply (5V+/-10%)
- * Fast Access Time & Cycle Time (Unit: ns)

	t _{RAC}	t _{CAC}	t _{RC}	t _{HPC}
GM71C(S)17803C/CL-5	50	13	84	20
GM71C(S)17803C/CL-6	60	15	104	25
GM71C(S)17803C/CL-7	70	18	124	30

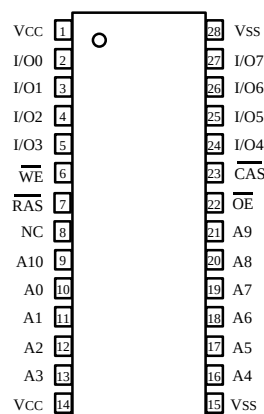
- * Low Power
Active : 715/660/605/550mW (MAX)
Standby : 11mW (CMOS level : MAX)
0.83mW (L-version : MAX)
- * RAS Only Refresh, CAS before RAS Refresh, Hidden Refresh Capability
- * All inputs and outputs TTL Compatible
- * 2048 Refresh Cycles/32ms
- * 2048 Refresh Cycles/128ms (L- version)
- * Battery Back Up Operation (L- version)
- * Self Refresh Operation (L-version)

Pin Configuration

28 SOJ



28 TSOP II



(Top View)



Pin Description

Pin	Function	Pin	Function
A0-A10	Address Inputs	$\overline{WE}$	Read/Write Enable
A0-A10	Refresh Address Inputs	$\overline{OE}$	Output Enable
I/O0-I/O7	Data-In/Out	V _{CC}	Power (+5V)
$\overline{RAS}$	Row Address Strobe	V _{SS}	Ground
$\overline{CAS}$	Column Address Strobe	NC	No Connection

Ordering Information

Type No.	Access Time	Package
GM71C(S)17803CJ/CLJ -5 GM71C(S)17803CJ/CLJ -6 GM71C(S)17803CJ/CLJ -7	50ns 60ns 70ns	400 Mil 28 Pin Plastic SOJ
GM71C(S)17803CT/CLT -5 GM71C(S)17803CT/CLT -6 GM71C(S)17803CT/CLT -7	50ns 60ns 70ns	400 Mil 28 Pin Plastic TSOP II

Absolute Maximum Ratings*

Symbol	Parameter	Rating	Unit
T _A	Ambient Temperature under Bias	0 ~ +70	C
T _{STG}	Storage Temperature (Plastic)	-55 ~ +125	C
V _{IN} /V _{OUT}	Voltage on any Pin Relative to V _{SS}	-1.0 ~ +7.0	V
V _{CC}	Supply voltage Relative to V _{SS}	-1.0 ~ +7.0	V
I _{OUT}	Short Circuit Output Current	50	mA
P _T	Power Dissipation	1.0	W

Note: Operation at or above Absolute Maximum Ratings can adversely affect device reliability.

Recommended DC Operating Conditions (T_A = 0 ~ +70C)

Symbol	Parameter	Min	Typ	Max	Unit
V _{CC}	Supply Voltage	4.5	5.0	5.5	V
V _{IH}	Input High Voltage	2.4	-	6.0	V
V _{IL}	Input Low Voltage	-1.0	-	0.8	V

Note: All voltage referred to V_{SS}.

DC Electrical Characteristics ($V_{CC} = 5V \pm 10\%$, $V_{SS} = 0V$, $T_A = 0 \sim 70^\circ C$)

Symbol	Parameter		Min	Max	Unit	Note
V _{OH}	Output Level Output "H" Level Voltage (I _{OUT} = -2mA)		2.0	V _{CC}	V	
V _{OL}	Output Level Output "L" Level Voltage (I _{OUT} = 2mA)		0	0.4	V	
I _{CC1}	Operating Current	50ns	-	130	mA	1, 2
	Average Power Supply Operating Current (RAS, CAS Cycling: t _{RC} = t _{RC min})	60ns	-	120		
		70ns	-	110		
I _{CC2}	Standby Current (TTL) Power Supply Standby Current (RAS, CAS = V _{IH} , D _{OUT} = High-Z)		-	2	mA	
I _{CC3}	RAS Only Refresh Current	50ns	-	130	mA	2
	Average Power Supply Current	60ns	-	120		
	RAS Only Refresh Mode (t _{RC} = t _{RC min})	70ns	-	110		
I _{CC4}	EDO Page Mode Current	50ns	-	130	mA	1, 3
	Average Power Supply Current	60ns	-	120		
	EDO Page Mode (t _{HPC} = t _{HPC min})	70ns	-	110		
I _{CC5}	Standby Current (CMOS) Power Supply Standby Current (RAS, CAS > V _{CC} - 0.2V, D _{OUT} = High-Z)		-	1	mA	
			-	150	uA	5
I _{CC6}	CAS-before-RAS Refresh Current (t _{RC} = t _{RC min})	50ns	-	130	mA	
		60ns	-	120		
		70ns	-	110		
I _{CC7}	Battery Back Up Operating Current(Standby with CBR Refresh) (CBR refresh, t _{RC} =62.5us, t _{TRAS} <=0.3us, D _{OUT} =High-Z ,CMOS interface)		-	500	uA	4,5
I _{CC8}	Standby Current $\overline{\text{RAS}} = V_{IH}$ $\overline{\text{CAS}} = V_{IL}$ D _{OUT} = Enable		-	5	mA	1
I _{CC9}	Self-Refresh Mode Current (RAS, CAS<=0.2V, D _{OUT} =High-Z)		-	300	uA	5
I _{L(I)}	Input Leakage Current Any Input (0V<=V _{IN} <= 6V)		-10	10	uA	
I _{L(O)}	Output Leakage Current (D _{OUT} is Disabled, 0V<=V _{OUT} <= 6V)		-10	10	uA	

Note: 1. I_{CC} depends on output load condition when the device is selected.

$I_{CC}(\max)$ is specified at the output open condition.

- Address can be changed once or less while $\overline{RAS} = V_{IL}$.
- Address can be changed once or less while CAS = V_{IH} .
- CAS = L ($\leq 0.2V$) while RAS = L ($\leq 0.2V$).
- L-version.

Capacitance ($V_{CC} = 5V \pm 10\%$, $T_A = 25^\circ C$)

Symbol	Parameter	Min	Max	Unit	Note
C_{I1}	Input Capacitance (Address)	-	5	pF	1
C_{I2}	Input Capacitance (Clocks)	-	7	pF	1
$C_{I/O}$	Output Capacitance (Data-In/Out)	-	7	pF	1, 2

Note: 1. Capacitance measured with Boonton Meter or effective capacitance measuring method.

2. $CAS = V_{IH}$ to disable D_{OUT} .

AC Characteristics ($V_{CC} = 5V \pm 10\%$, $T_A = 0 \sim +70^\circ C$, $V_{SS} = 0V$ Note 1, 2, 18)

Test Conditions

Input rise and fall times : 2 ns

Input timing reference levels : 0.8V, 2.4V

Output timing reference levels : 0.8V, 2.0V

Output load : 1TTL gate + C_L (100 pF)

(Including scope and jig)

Read, Write, Read-Modify-Write and Refresh Cycles (Common Parameters)

Symbol	Parameter	GM71C(S)17803 C/CL-5		GM71C(S)17803 C/CL-6		GM71C(S)17803 C/CL-7		Unit	Note
		Min	Max	Min	Max	Min	Max		
t_{RC}	Random Read or Write Cycle Time	84	-	104	-	124	-	ns	
t_{RP}	$\overline{RAS}$ Precharge Time	30	-	40	-	50	-	ns	
t_{CP}	$\overline{CAS}$ Precharge Time	7	-	10	-	13	-	ns	
t_{RAS}	$\overline{RAS}$ Pulse Width	50	10,000	60	10,000	70	10,000	ns	
t_{CAS}	$\overline{CAS}$ Pulse Width	7	10,000	10	10,000	13	10,000	ns	
t_{ASR}	Row Address Set up Time	0	-	0	-	0	-	ns	
t_{RAH}	Row Address Hold Time	7	-	10	-	10	-	ns	
t_{ASC}	Column Address Set-up Time	0	-	0	-	0	-	ns	
t_{CAH}	Column Address Hold Time	7	-	10	-	13	-	ns	
t_{RCD}	$\overline{RAS}$ to $\overline{CAS}$ Delay Time	11	37	14	45	14	52	ns	3
t_{RAD}	$\overline{RAS}$ to Column Address Delay Time	9	25	12	30	12	35	ns	4
t_{RSH}	$\overline{RAS}$ Hold Time	10	-	13	-	13	-	ns	
t_{CSH}	$\overline{CAS}$ Hold Time	35	-	40	-	45	-	ns	
t_{CRP}	$\overline{CAS}$ to $\overline{RAS}$ Precharge Time	5	-	5	-	5	-	ns	
t_{ODD}	$\overline{OE}$ to D_{IN} Delay Time	13	-	15	-	18	-	ns	5
t_{DZO}	$\overline{OE}$ Delay Time from D_{IN}	0	-	0	-	0	-	ns	6
t_{DZC}	$\overline{CAS}$ Delay Time from D_{IN}	0	-	0	-	0	-	ns	6
t_T	Transition Time (Rise and Fall)	2	50	2	50	2	50	ns	7

Read Cycle

Symbol	Parameter	GM71C(S)17803 C/CL-5		GM71C(S)17803 C/CL-6		GM71C(S)17803 C/CL-7		Unit	Note
		Min	Max	Min	Max	Min	Max		
t _{RAC}	Access Time from $\overline{\text{RAS}}$	-	50	-	60	-	70	ns	8,9
t _{CAC}	Access Time from $\overline{\text{CAS}}$	-	13	-	15	-	18	ns	9,10,17
t _{AA}	Access Time from Address	-	25	-	30	-	35	ns	9,11,17
t _{OAC}	Access Time from $\overline{\text{OE}}$	-	13	-	15	-	18	ns	9
t _{RCS}	Read Command Setup Time	0	-	0	-	0	-	ns	
t _{RCH}	Read Command Hold Time to $\overline{\text{CAS}}$	0	-	0	-	0	-	ns	12
t _{RRH}	Read Command Hold Time to $\overline{\text{RAS}}$	5	-	5	-	5	-	ns	12
t _{RAL}	Column Address to $\overline{\text{RAS}}$ Lead Time	25	-	30	-	35	-	ns	
t _{CAL}	Column Address to $\overline{\text{CAS}}$ Lead Time	15	-	18	-	23	-	ns	
t _{CLZ}	$\overline{\text{CAS}}$ to Output in Low-Z	0	-	0	-	0	-	ns	
t _{OH}	Output Data Hold Time	3	-	3	-	3	-	ns	
t _{OH0}	Output Data Hold Time from $\overline{\text{OE}}$	3	-	3	-	3	-	ns	
t _{OFF}	Output Buffer Turn-off Time	-	13	-	15	-	15	ns	13
t _{OEZ}	Output Buffer Turn-off Time to $\overline{\text{OE}}$	-	13	-	15	-	15	ns	13
t _{CDD}	$\overline{\text{CAS}}$ to D _{IN} Delay Time	13	-	15	-	18	-	ns	5
t _{RCHR}	Read Command Hold Time from $\overline{\text{RAS}}$	50	-	60	-	70	-	ns	
t _{OHR}	Output Data hold Time from $\overline{\text{RAS}}$	3	-	3	-	3	-	ns	
t _{OFR}	Output Buffer turn off to $\overline{\text{RAS}}$	-	13	-	15	-	15	ns	
t _{WEZ}	Output Buffer turn off to $\overline{\text{WE}}$	-	13	-	15	-	15	ns	
t _{WDD}	$\overline{\text{WE}}$ to D _{IN} Delay Time	13	-	15	-	18	-	ns	
t _{RDD}	$\overline{\text{RAS}}$ to D _{IN} Delay Time	13	-	15	-	18	-	ns	

Write Cycle

Symbol	Parameter	GM71C(S)17803 C/CL-5		GM71C(S)17803 C/CL-6		GM71C(S)17803 C/CL-7		Unit	Note
		Min	Max	Min	Max	Min	Max		
t _{WCS}	Write Command Setup Time	0	-	0	-	0	-	ns	14
t _{WCH}	Write Command Hold Time	7	-	10	-	13	-	ns	
t _{WP}	Write Command Pulse Width	7	-	10	-	10	-	ns	
t _{RWL}	Write Command to $\overline{\text{RAS}}$ Lead Time	7	-	10	-	13	-	ns	
t _{CWL}	Write Command to $\overline{\text{CAS}}$ Lead Time	7	-	10	-	13	-	ns	
t _{DS}	Data-in Setup Time	0	-	0	-	0	-	ns	15
t _{DH}	Data-in Hold Time	7	-	10	-	13	-	ns	15

Read- Modify-Write Cycle

Symbol	Parameter	GM71C(S)17803 C/CL-5		GM71C(S)17803 C/CL-6		GM71C(S)17803 C/CL-7		Unit	Note
		Min	Max	Min	Max	Min	Max		
t _{RWC}	Read-Modify-Write Cycle Time	111	-	136	-	161	-	ns	
t _{RWD}	$\overline{\text{RAS}}$ to $\overline{\text{WE}}$ Delay Time	67	-	79	-	92	-	ns	14
t _{CWD}	$\overline{\text{CAS}}$ to $\overline{\text{WE}}$ Delay Time	30	-	34	-	40	-	ns	14
t _{AWD}	Column Address to $\overline{\text{WE}}$ Delay Time	42	-	49	-	57	-	ns	14
t _{OEH}	$\overline{\text{OE}}$ Hold Time from $\overline{\text{WE}}$	13	-	15	-	18	-	ns	

Refresh Cycle

Symbol	Parameter	GM71C(S)17803 C/CL-5		GM71C(S)17803 C/CL-6		GM71C(S)17803 C/CL-7		Unit	Note
		Min	Max	Min	Max	Min	Max		
t _{CSR}	$\overline{\text{CAS}}$ Setup Time (CAS-before-RAS Refresh Cycle)	5	-	5	-	5	-	ns	
t _{CHR}	$\overline{\text{CAS}}$ Hold Time (CAS-before-RAS Refresh Cycle)	7	-	10	-	10	-	ns	
t _{WRP}	$\overline{\text{WE}}$ Setup Time (CAS-before-RAS Refresh Cycle)	0	-	0	-	0	-	ns	
t _{WRH}	$\overline{\text{WE}}$ Hold Time (CAS-before-RAS Refresh Cycle)	10	-	10	-	10	-	ns	
t _{RPC}	$\overline{\text{RAS}}$ Precharge to $\overline{\text{CAS}}$ Hold Time	5	-	5	-	5	-	ns	

EDO Page Mode Cycle

Symbol	Parameter	GM71C(S)17803 C/CL-5		GM71C(S)17803 C/CL-6		GM71C(S)17803 C/CL-7		Unit	Note
		Min	Max	Min	Max	Min	Max		
t _{HPC}	EDO Page Mode Cycle Time	20	-	25	-	30	-	ns	19
t _{RASP}	EDO Page Mode $\overline{\text{RAS}}$ Pulse Width	-	100,000	-	100,000	-	100,000	ns	16
t _{ACP}	Access Time from $\overline{\text{CAS}}$ Precharge	-	30	-	35	-	40	ns	9,17
t _{RHCP}	$\overline{\text{RAS}}$ Hold Time from $\overline{\text{CAS}}$ Precharge	30	-	35	-	40	-	ns	
t _{DOH}	Output data Hold Time from $\overline{\text{CAS}}$ low	3	-	3	-	3	-	ns	9
t _{COL}	$\overline{\text{CAS}}$ Hold Time referred $\overline{\text{OE}}$	7	-	10	-	13	-	ns	
t _{COP}	$\overline{\text{CAS}}$ to $\overline{\text{OE}}$ Setup Time	5	-	5	-	5	-	ns	
t _{RCHP}	Read <u>command</u> Hold Time from $\overline{\text{CAS}}$ Precharge	30	-	35	-	40	-	ns	

EDO Page Mode Read-Modify-Write Cycle

Symbol	Parameter	GM71C(S)17803 C/CL-5		GM71C(S)17803 C/CL-6		GM71C(S)17803 C/CL-7		Unit	Note
		Min	Max	Min	Max	Min	Max		
t _{HPRWC}	EDO Page Mode Read-Modify-Write Cycle Time	57	-	68	-	79	-	ns	
t _{CPW}	$\overline{\text{WE}}$ Delay Time from $\overline{\text{CAS}}$ Precharge	45	-	54	-	62	-	ns	14

Refresh

Symbol	Parameter	GM71C(S)17803 C/CL-5		GM71C(S)17803 C/CL-6		GM71C(S)17803 C/CL-7		Unit	Note
		Min	Max	Min	Max	Min	Max		
t _{REF}	Refresh period	-	32	-	32	-	32	ms	2048 cycles
t _{REF}	Refresh period (L -Series)	-	128	-	128	-	128	ms	2048 cycles

Self Refresh Mode (L-version)

Symbol	Parameter	GM71CS17803 CL-5		GM71CS17803 CL-5		GM71CS17803 CL-5		Unit	Note
		Min	Max	Min	Max	Min	Max		
t _{RASS}	$\overline{\text{RAS}}$ Pulse Width (Self-refresh)	100	-	100	-	100	-	μs	
t _{RPS}	$\overline{\text{RAS}}$ Precharge Time (Self-refresh)	90	-	110	-	130	-	ns	
t _{CHS}	$\overline{\text{CAS}}$ Hold Time (Self-refresh)	-50	-	-50	-	-50	-	ns	

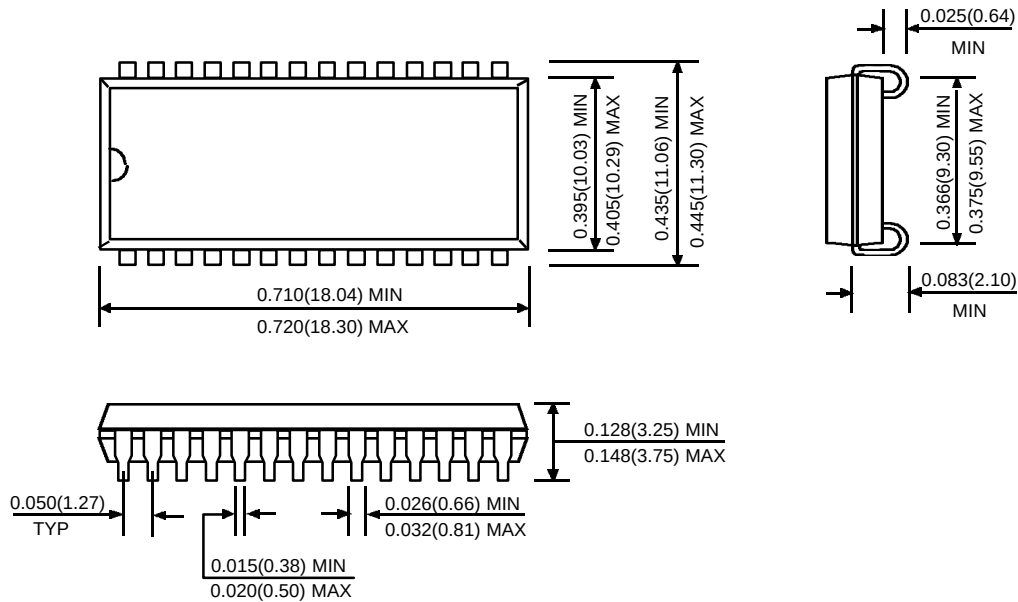
Notes:

1. AC Measurements assume $t_r = 2ns$.
2. An initial pause of 200us is required after power up followed by a minimum of eight initialization cycles (any combination of cycles containing $\overline{RAS}$ only refresh or $\overline{CAS}$ -before- $\overline{RAS}$ refresh). If the internal refresh counter is used, a minimum of eight $\overline{CAS}$ -before- $\overline{RAS}$ refresh cycles are required.
3. Operation with the $t_{RCD}(max)$ limit insures that $t_{RAC}(max)$ can be met, $t_{RCD}(max)$ is specified as a reference point only; if t_{RCD} is greater than the specified $t_{RCD}(max)$ limit, then access time is controlled exclusively by t_{CAC} .
4. Operation with the $t_{RAD}(max)$ limit insures that $t_{RAC}(max)$ can be met, $t_{RAD}(max)$ is specified as a reference point only; if t_{RAD} is greater than the specified $t_{RAD}(max)$ limit, then access time is controlled exclusively by t_{AA} .
5. Either t_{ODD} or t_{CDD} must be satisfied.
6. Either t_{DZO} or t_{DZC} must be satisfied.
7. V_{IH} (min) and V_{IL} (max) are reference levels for measuring timing of input signals. Also, transition times are measured between V_{IH} (min) and V_{IL} (max).
8. Assumes that $t_{RCD} \leq t_{RCD}(max)$ and $t_{RAD} \leq t_{RAD}(max)$. If t_{RCD} or t_{RAD} is greater than the maximum recommended value shown in this table, t_{RAC} exceeds the value shown.
9. Measured with a load circuit equivalent to 1TTL loads and 100pF.
10. Assumes that $t_{RCD} \geq t_{RCD}(max)$ and $t_{RAD} \leq t_{RAD}(max)$.
11. Assumes that $t_{RCD} \leq t_{RCD}(max)$ and $t_{RAD} \geq t_{RAD}(max)$.
12. Either t_{RCH} or t_{RRH} must be satisfied for a read cycles.
13. $t_{OFF}(max)$ and $t_{OEZ}(max)$ define the time at which the outputs achieve the open circuit condition and are not referred to output voltage levels.
14. t_{WCS} , t_{RWD} , t_{CWD} , t_{AWD} and t_{CPW} are not restrictive operating parameters. They are included in the data sheet as electrical characteristics only; if $t_{WCS} \geq t_{WCS}(min)$, the cycle is an early write cycle and the data out pin will remain open circuit (high impedance) throughout the entire cycle; if $t_{RWD} \geq t_{RWD}(min)$, $t_{CWD} \geq t_{CWD}(min)$ and $t_{AWD} \geq t_{AWD}(min)$, or $t_{CWD} \geq t_{CWD}(min)$, $t_{AWD} \geq t_{AWD}(min)$ and $t_{CPW} \geq t_{CPW}(min)$, the cycle is a read modify write and the data output will contain data read from the selected cell; if neither of the above sets of conditions is satisfied, the condition of the data out (at access time) is indeterminate.
15. These parameters are referred to $\overline{CAS}$ leading edge in early write cycle and to $\overline{WE}$ leading edge in a delayed write or a read modify write cycle.
16. t_{RASP} defines $\overline{RAS}$ pulse width in EDO page mode cycles.
17. Access time is determined by the longest among t_{AA} , t_{CAC} and t_{ACP} .
18. In delayed write or read-modify-write cycles, $\overline{OE}$ must disable output buffer prior to applying data to the device. After $\overline{RAS}$ is reset, if $t_{OEH} \geq t_{CWL}$, the I/O pin will remain open circuit (high impedance); if $t_{OEH} \leq t_{CWL}$, invalid data will be out at each I/O.
19. $t_{HPC}(min)$ can be achieved during a series of EDO page mode write cycles or EDO page mode read cycles. If both write and read operation are mixed in a EDO page mode $\overline{RAS}$ cycle (EDO page mode mix cycle (1)(2)), minimum value of $\overline{CAS}$ cycle ($t_{CAS} + t_{CP} + 2t_r$) becomes greater than the specified $t_{HPC}(min)$ value. The value of $\overline{CAS}$ cycle time of mixed EDO page mode is shown in EDO page mode mix cycle(1) and (2).

Package Dimensions

Unit: Inches (mm)

28 SOJ



28 TSOP (TYPE II)

