

GM76C28A

2,048 WORDS \times 8 BIT
CMOS STATIC RAM

Description

The GM76C28A is 2,048 words \times 8 bits asynchronous, static random access memory on a monolithic CMOS chip. Its very low standby power requirement makes it ideal for applications requiring non-volatile storage with back-up batteries. The asynchronous and static nature of the memory requires no external clock or refreshing circuit. Both the input and output ports are TTL compatible and the 3-state output allows easy expansion of memory capacity.

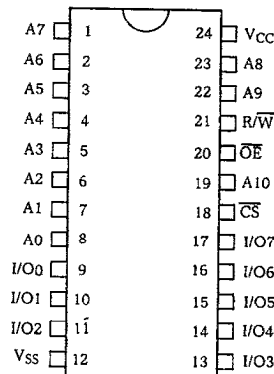
Features

- Access time: 100/120ns
- Low Power Consumption
Standby: $1\mu A$
Operation: 25/30mA
- Complete static operation
- Single power supply: $5V \pm 10\%$
- TTL compatible inputs and outputs
- 3-state output with Wired-OR capability
- Non-volatile storage with back-up batteries
- Standard 24 DIP, 24 SOP and 24 S-DIP

Pin Description

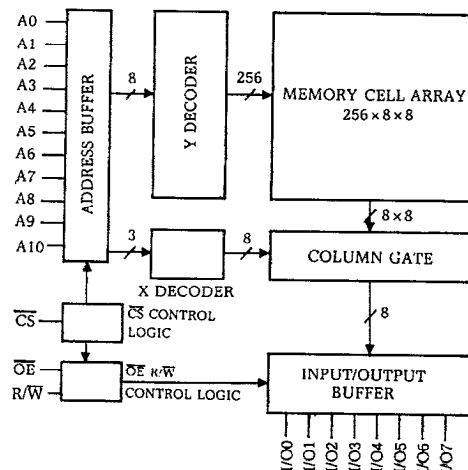
Pin	Function
A0 ~ A10	Address Inputs
R/W	Read/Write
OE	Output Enable
CS	Chip Select
I/O0 ~ 7	Data Input/Output
V _{CC}	Power Supply (+5V)
V _{SS}	Ground

Pin Configuration



(Top View)

Block Diagram



Absolute Maximum Ratings*

Symbol	Parameter	Rating	Unit
T _A	Ambient Temperature under Bias	0 ~ 70	°C
T _{STG}	Storage Temperature	-65 ~ 150	°C
V _{IN} /V _{OUT}	Voltage on any Pin Relative to V _{SS}	-0.5 ~ 7.0	V
P _D	Power Dissipation	1.0	W

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

Recommended Operating Conditions (T_A=0 ~ 70°C)

Symbol	Parameter	Min	Typ	Max	Unit
V _{CC}	Supply Voltage	4.5	5.0	5.5	V
V _{IH}	Input High Voltage	2.2	—	6.0	V
V _{IL}	Input Low Voltage	-0.5	—	0.8	V

*All voltages are referenced to V_{SS} pin = 0V.

Truth Table

CS	OE	R/W	A0 to A10	DATA I/O	MODE	I _{CC}
H	X	X	X	Hi-Z	Unselected	I _{CCS1} , I _{CCS2}
L	L	H	Stable	Output Data	Read	I _{CC}
L	H	L	Stable	Input Data	Write	I _{CC}
L	L	L	Stable	Input Data	Write	I _{CC}

Note: X means "H", "L" or "Hi-Z"

Electrical Characteristics

DC Electrical Characteristics (V_{CC}=5V ± 10%, V_{SS}=0V, T_A=0 ~ 70°C)

Symbol	Parameter	Conditions	GM76C28A-10			GM76C28A-12			Unit
			Min	Typ*	Max	Min	Typ*	Max	
V _{OL}	Low Level Output Voltage	I _{OL} = 4.0mA			0.4			0.4	V
V _{OH}	High Level Output Voltage	I _{OH} = -1.0mA	2.4			2.4			V
I _{CC1}	Operating Supply Current	CS = V _{IL} , I _{I/O} = 0mA		30	60		25	50	mA
I _{CC2}		V _{IH} = 3.5V, V _{IL} = 0.6V, I _{I/O} = 0mA		16			16		mA
I _{CC}	Average Operating Current	Min cycle, duty = 100%, I _{I/O} = 0mA		30	60		25	50	mA
I _{CCS1}	Standby Supply Current	CS = V _{IH}		1.5	3.0		1.5	3.0	mA
I _{CCS2}		CS = V _{CC} - 0.2V		1	50		1	50	μA
I _{IL}	Input Leakage Current	V _{CC} = 5.5V, V _I = 0 to V _{CC}	-1		1	-1		1	μA
I _{OL}	Output Leakage Current	CS = V _{IH} , or OE = V _{IH} , V _{I/O} = 0 to V _{CC}	-1		1	-1		1	μA

*Typical values are for reference with V_{CC} = 5V and T_A = 25°C assumed.

AC Electrical Characteristics:

Read Cycle ($V_{CC}=5V \pm 10\%$, $T_A=0 \sim 70^\circ\text{C}$)

Symbol	Parameter	Conditions	GM76C28A-10		GM76C28A-12		Unit
			Min	Max	Min	Max	
t_{RC}	Read Cycle Time	*1	100		120		ns
t_{AA}	Address Access Time			100		120	ns
t_{ACS}	\overline{CS} Access Time			100		120	ns
t_{CLZ}	\overline{CS} Output Setup Time	*2	10		10		ns
t_{OE}	\overline{OE} Access Time	*1		55		60	ns
t_{OLZ}	\overline{OE} Output Setup Time	*2	5		10		ns
t_{CHZ}	\overline{CS} Output Floating		0	40	0	40	ns
t_{OHZ}	\overline{OE} Output Floating		0	40	0	40	ns
t_{OH}	Output Hold Time	*1	10		10		ns

Write Cycle: ($V_{CC}=5V \pm 10\%$, $T_A=0 \sim 70^\circ\text{C}$)

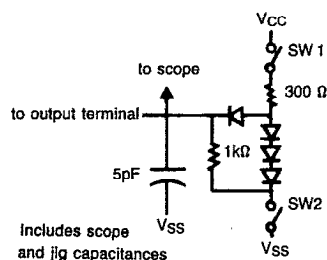
Symbol	Parameter	Conditions	GM76C28A-10		GM76C28A-12		Unit
			Min	Max	Min	Max	
t_{WC}	Write Cycle Time	1	100	—	120	—	ns
t_{CW}	Chip Select Time (\overline{CS})		80	—	85	—	ns
t_{AW}	Address Enable Time		80	—	85	—	ns
t_{AS}	Address Setup Time		0	—	0	—	ns
t_{WP}	Write Pulse Width		65	—	70	—	ns
t_{OHZ}	\overline{OE} Output Floating	*2	0	40	0	40	ns
t_{WHZ}	R/W Output Floating	*3	0	45	0	50	ns
t_{DW}	Input Data Setup Time	*1	45	—	50	—	ns
t_{WR}	Address Hold Time		0	—	0	—	ns
t_{DH}	Input Data Hold Time		0	—	0	—	ns
t_{OW}	R/W Output Setup Time	*3	5	—	10	—	ns

*1 Test conditions.

1. Input pulse level: 0.8V to 2.2V
2. $t_r = t_f = 10\text{ns}$
3. Input/output timing reference level: 1.5V
4. Output load: 1 TTL + $C_L = 100\text{pF}$

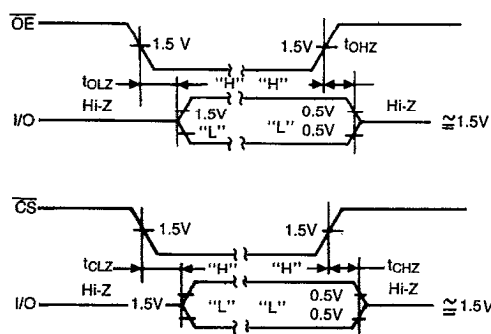
*2 Test conditions.

1. Input pulse level: 0.8V to 2.2V
2. $t_r = t_f = 10\text{ns}$
3. Test circuit



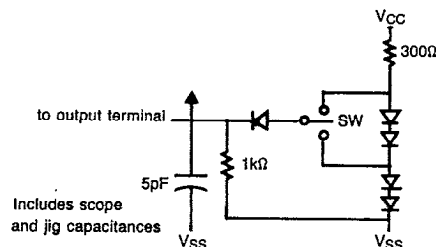
- Both SW1 and SW2 are closed when measuring t_{CHZ} or t_{OHZ} .
- SW1 is open and SW2 is closed when measuring Hi-Z-high of t_{CLZ} or t_{OLZ}
- SW1 is closed and SW2 is open when measuring Hi-Z-low t_{CLZ} or t_{OLZ}

Output turn-on turn-off time



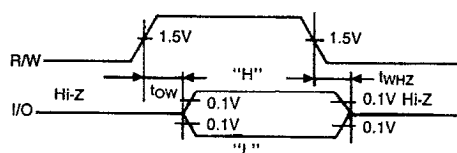
*3 Test conditions.

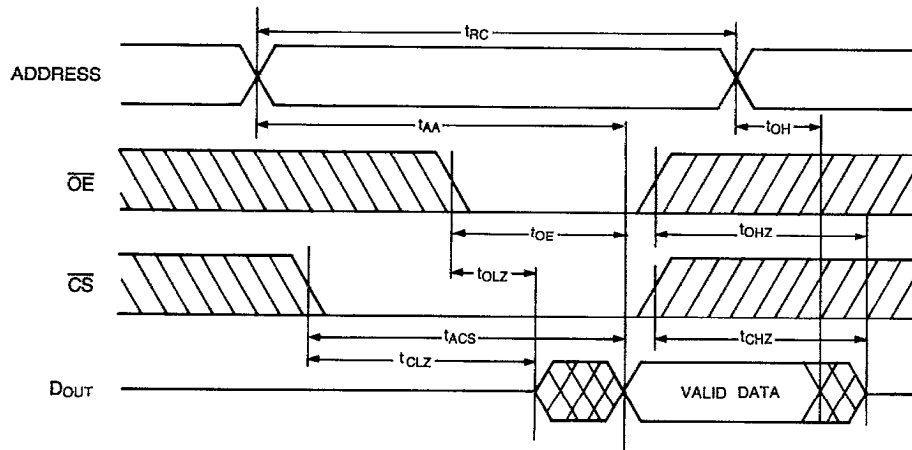
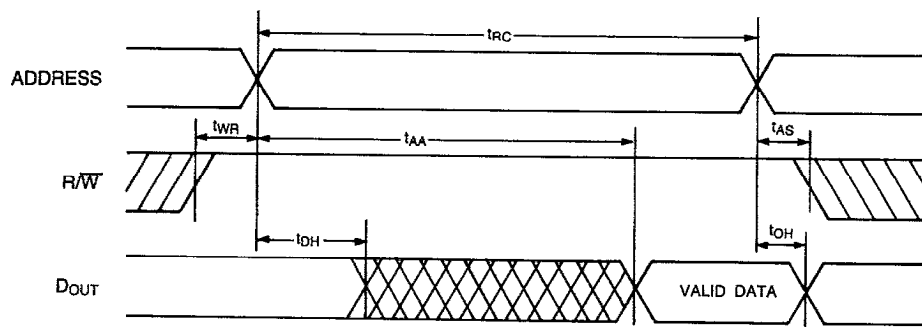
1. Input pulse level: 0.8V to 2.2V
2. $t_r = t_f = 10\text{ns}$
3. Test circuit

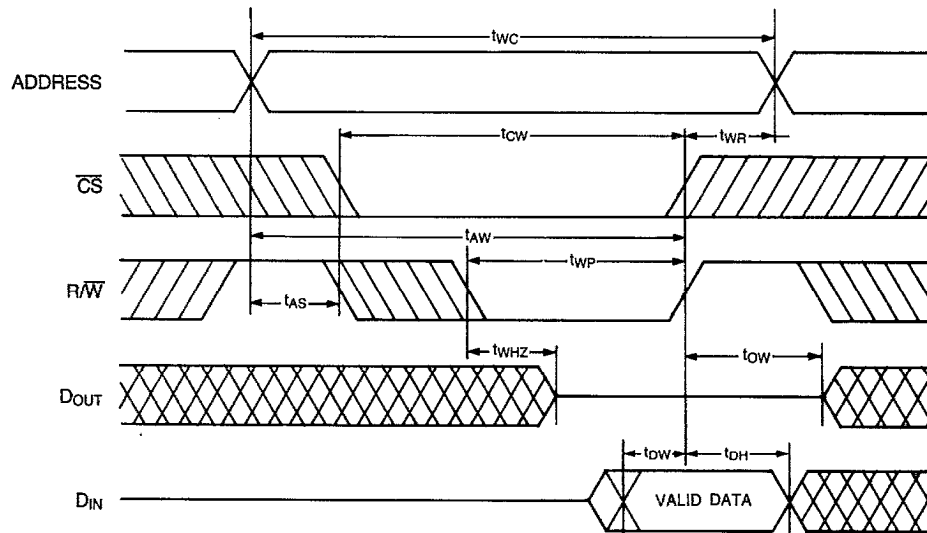
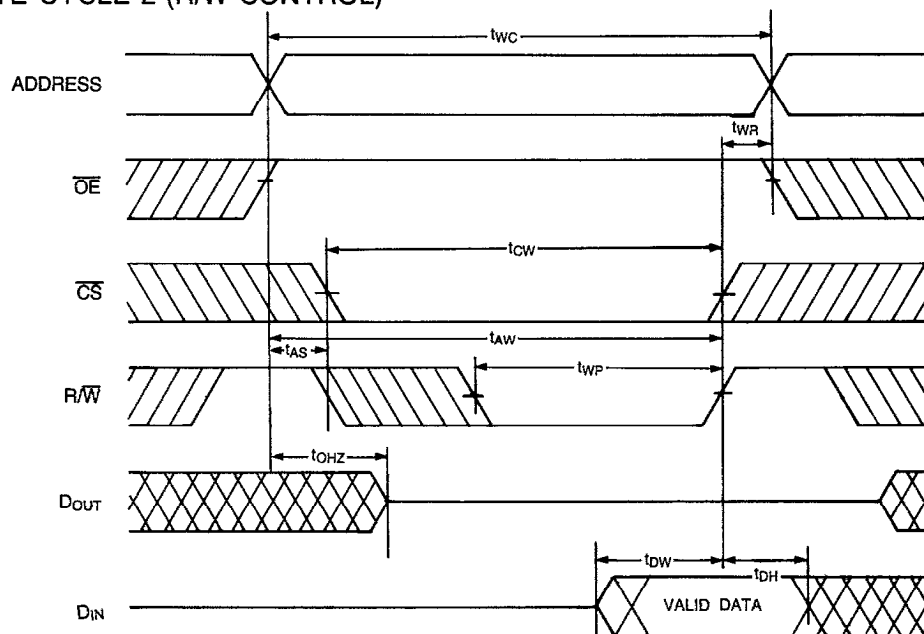


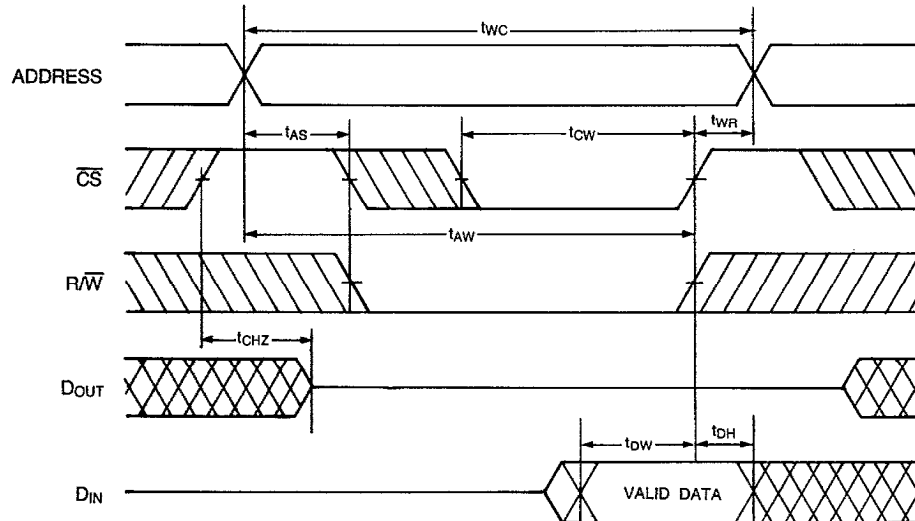
- SW is set to the V_{CC} side when measuring Hi-Z-high and high-Hi-Z of t_{ow} or t_{whz}
- SW is set to the V_{SS} side when measuring Hi-Z-low and low-Hi-Z of t_{ow} or t_{whz}

Output turn-on turn-off time



READ CYCLE 1 (\overline{OE} , \overline{CS} CONTROL, R/\overline{W} = HIGH)READ CYCLE 2 (R/\overline{W} CONTROL, \overline{OE} = LOW, \overline{CS} = LOW)

WRITE CYCLE 1 (R/\overline{W} CONTROL, $\overline{OE} = \text{LOW}$)WRITE CYCLE 2 (R/\overline{W} CONTROL)

WRITE CYCLE 3 (\overline{CS} CONTROL, $\overline{OE} = \text{LOW}$)

Capacitance ($f = 1\text{MHz}$, $T_A = 25^\circ\text{C}$)

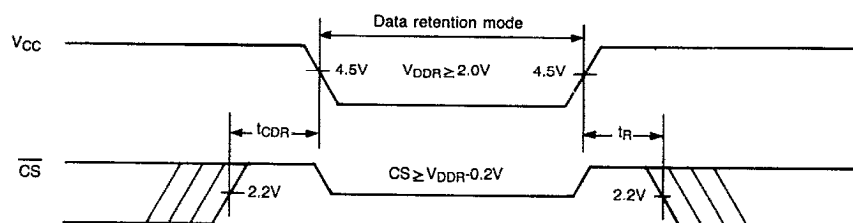
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_i	Input Capacitance	$V_i = 0\text{V}$		4	6	pF
$C_{i/o}$	I/O Capacitance	$V_{i/o} = 0\text{V}$		6	8	pF

Data Retention Characteristics ($T_A = 0 \sim 70^\circ\text{C}$)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CCR}	Data Retention Supply Voltage	$\overline{CS} \geq V_{CCR} - 0.2\text{V}$	2.0	—	5.5	V
I_{CCR}	Data Retention Current	$V_{CC} = 3.0\text{V}$, $\overline{CS} \geq 2.8\text{V}$	—	—	25	μA
t_{CDR}	Chip Select Data Hold Time	Refer to the figure below	0	—	—	ns
t_R	Operation Recovery Time		t_{RC}^*	—	—	ns

* t_{RC} : read cycle time

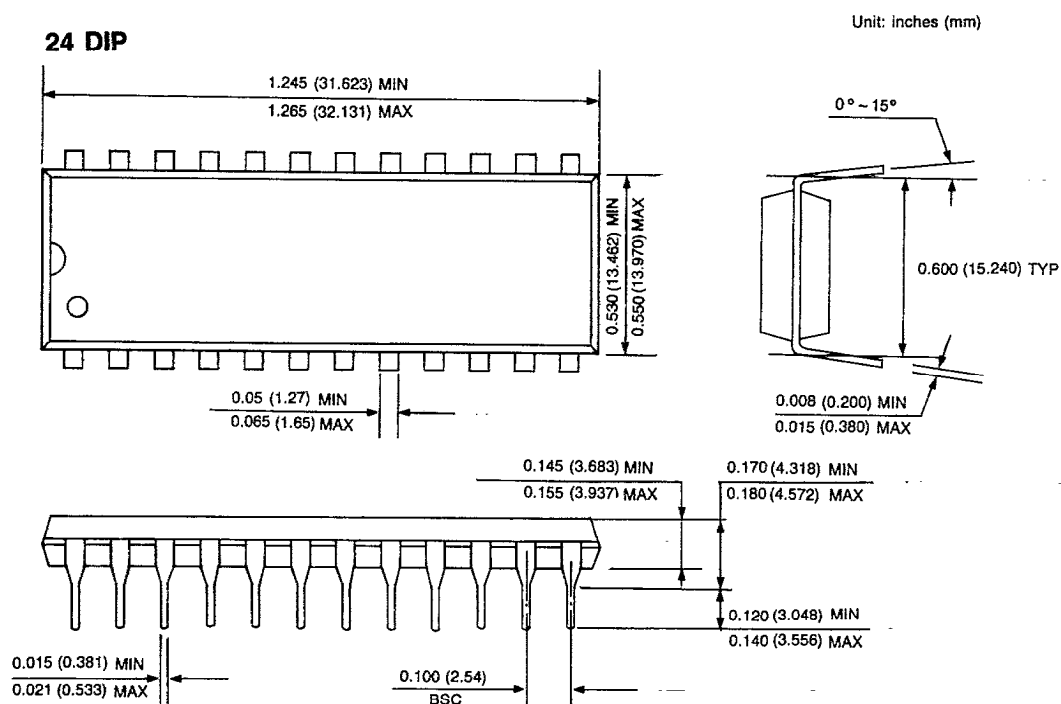
Data retention timing



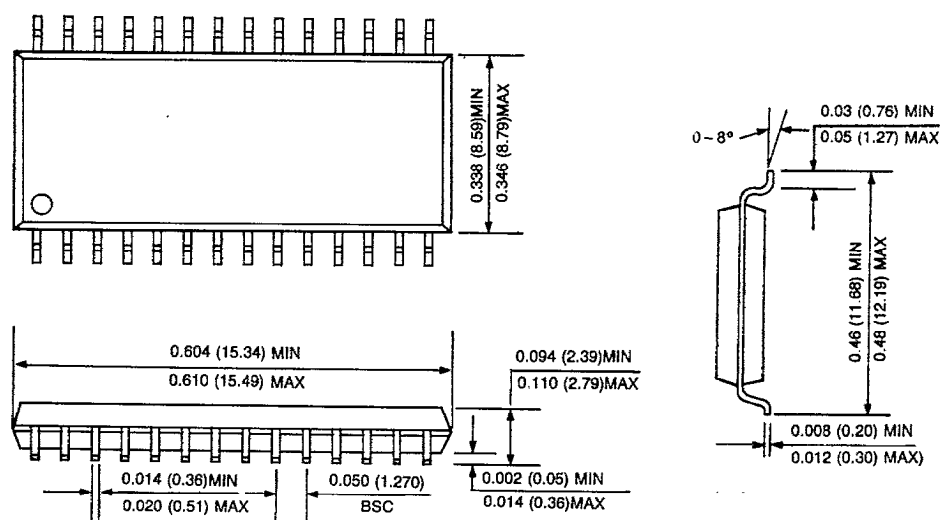
Note: When retaining data in standby mode, supply voltage can be lowered within a certain range. Read or write cycle cannot be performed while the supply voltage is low.

Package Dimensions

24 DIP

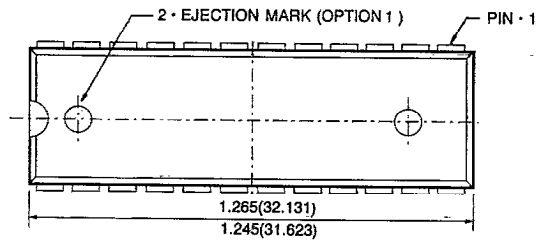


24 SOP



24 SKINNY

UNIT: INCH (mm) MAX
MIN



- NOTE
1. LEAD FRAME, COPPER TTT
 2. LEAD FINISH, SOLDER PLATED OR SOLDER COATED.
 3. BACK EJECTOR PIN MARKED "KOREA"
 4. BOTH PACKAGE LENGTH AND WIDTH DO NOT INCLUDE FLASH.
 5. CONTROLLING DIMENSION; INCHES (mm)

