GM76C28A

2,048 WORDS x 8 BIT
CMOS STATIC RAM

Description

The GM76C28A is 2,048 words x 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 cicuit. Both the input and output ports are TTL compatible and the 3-state output allows easy expansion of memory capacity.

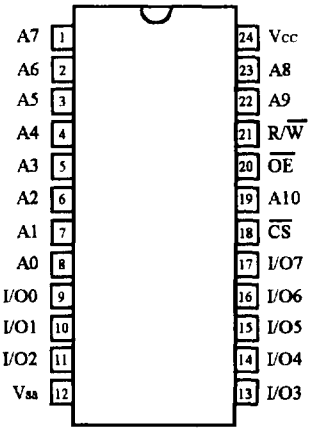
Features

- Access time : 100/120ns
- Low Power Consumption
  Standby : 1μA (Typ.)
  Operation : 25/30mA (Typ.)
- Complete static operation
- Single power supply : 5V±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

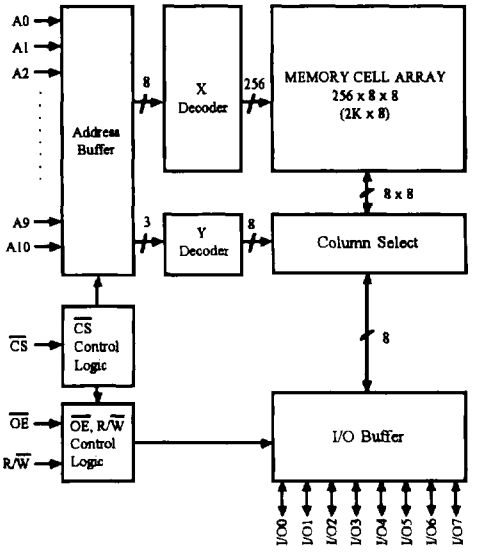
Pin	Function
A0-A10	Address Inputs
R/$\overline{W}$	Read/Write
$\overline{OE}$	Output Enable
$\overline{CS}$	Chip Select
I/O0-I/O7	Data Input/Output
Vcc	Power Supply (+5V)
Vss	Ground

Pin Configuration



(Top View)

Block Diagram



Absolute Maximum Ratings*

Symbol	Parameter	Rating	Unit
T_A	Ambient Temperature under Bias	0 ~ 70	℃
T_{STO}	Storage Temperature	-65 ~ 150	℃
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 ($T_A = 0 \sim 70℃$)

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

$\overline{CS}$	$\overline{OE}$	R/$\overline{W}$	A0 to A10	DATA I/O	MODE	Icc
H	X	X	X	Hi-Z	Unselected	I_{CC1}, I_{CC2}
L	L	H	Stable	Output Data	Read	Icc
L	H	L	Stable	Input Data	Write	Icc
L	L	L	Stable	Input Data	Write	Icc

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

DC Electrical Characteristics: ($V_{CC} = 5V \pm 10\%$, $T_A = 0 \sim 70℃$)

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}	Operation Supply Current	$\overline{CS}$ = 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
Icc	Average Operating Current	Min cycle, duty=100%,$I_{I/O}$=0mA		30	60		25	50	mA
I_{CC1}	Standby Supply Current	$\overline{CS}$ = V_{IH}		1.5	3.0		1.5	3.0	mA
I_{CC2}		$\overline{CS}$ = Vcc-0.2V		1	50		1	50	μA
$I_{I(L)}$	Input Leakage Current	Vcc=5.5V, V_I=0 to Vcc	-1		1	-1		1	μA
$I_{O(I)}$	Output Leakage Current	$\overline{CS}$=V_{IH}, or $\overline{OE}$=V_{IH}, $V_{I/O}$=0 to Vcc	-1		1	-1		1	μA

*Typical values are for reference with Vcc = 5V and T_A = 25℃ assumed.

AC Operating Characteristics

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

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_{OE}	$\overline{OE}$ Access Time			55		60	ns
t_{OH}	Output Hold Time		10		10		ns
t_{CLZ}	$\overline{CS}$ Output Set-up Time	*2	10		10		ns
t_{OLZ}	$\overline{OE}$ Output Set-up Time		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

Write Cycle ($V_{CC} = 5V \pm 10\%$, $T_A = 0 \sim 70℃$)

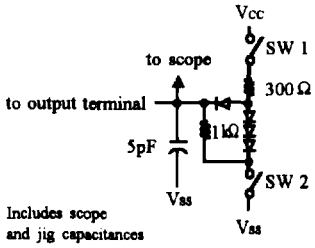
Symbol	Parameter	Conditions	GM76C28A-10		GM76C28A-12		Unit
			Min	Max	Min	Max	
t_{WC}	Write Cycle Time	*1	100	-	120	-	ns
t_{CW}	Chip Select Time ($\overline{CS}$)		80	-	85	-	ns
t_{AW}	Address Enable Time		80	-	85	-	ns
t_{AS}	Address Set-up Time		0	-	0	-	ns
t_{WP}	Write Pulse Width		65	-	70	-	ns
t_{WR}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

*1 Test Conditions.

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

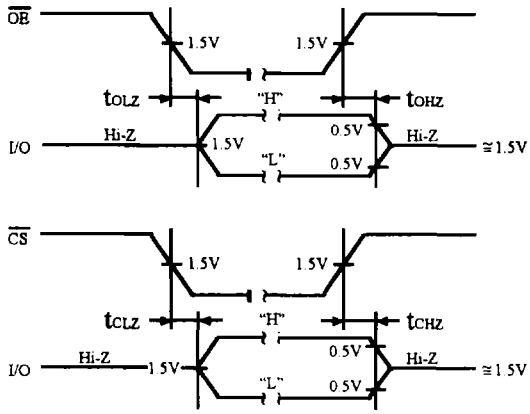
*2 Test Conditions.

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



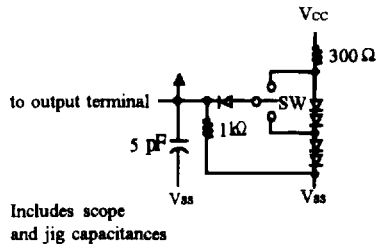
- Both SW1 and SW2 are closed when measuring t_{CHZ} or t_{OHZ}
- SW1 is open and SW2 is closed when measuring Hi-Z-high of t_{CLZ} or t_{OLZ}
- SW1 is closed and SW2 is open when measuring Hi-Z-low of t_{CLZ} or t_{OLZ}

Output turn-on turn-off time



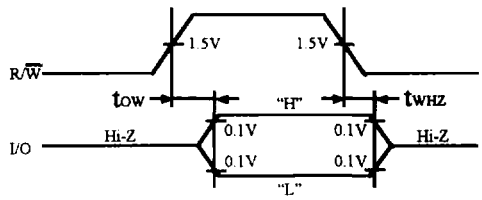
*3 Test Conditions.

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

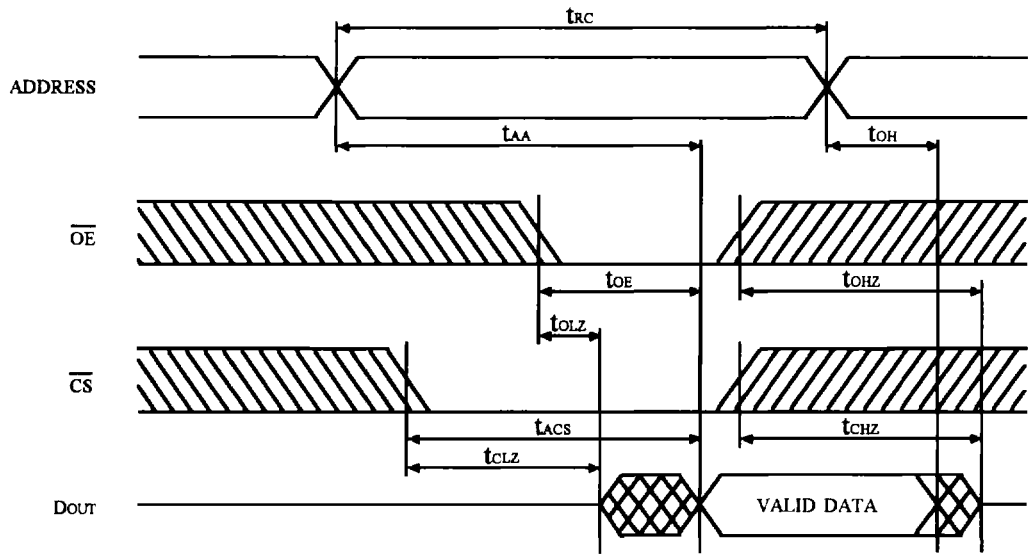


- SW is set to the V_{CC} side when measuring Hi-Z-high and high-Hi-Z of tow or t_{WHZ}
- SW is set to the V_{SS} side when measuring Hi-Z-low and low-Hi-Z of tow or t_{WHZ}

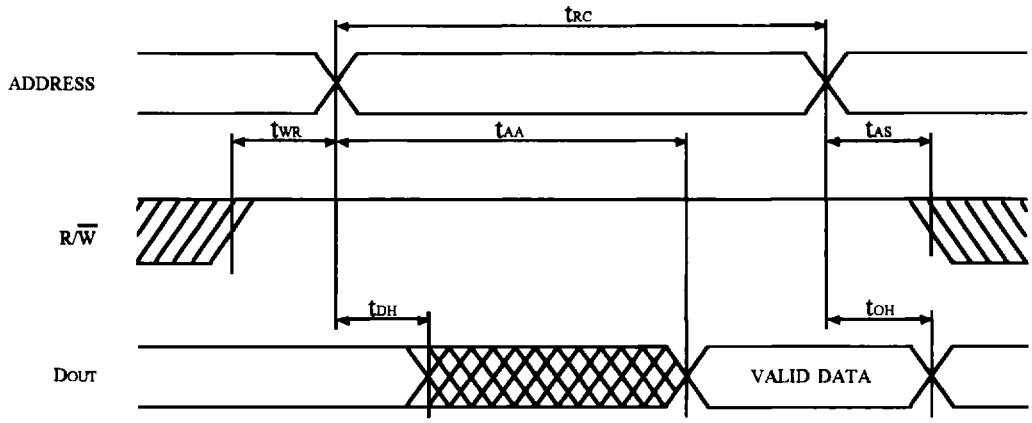
Output turn-on turn-off time



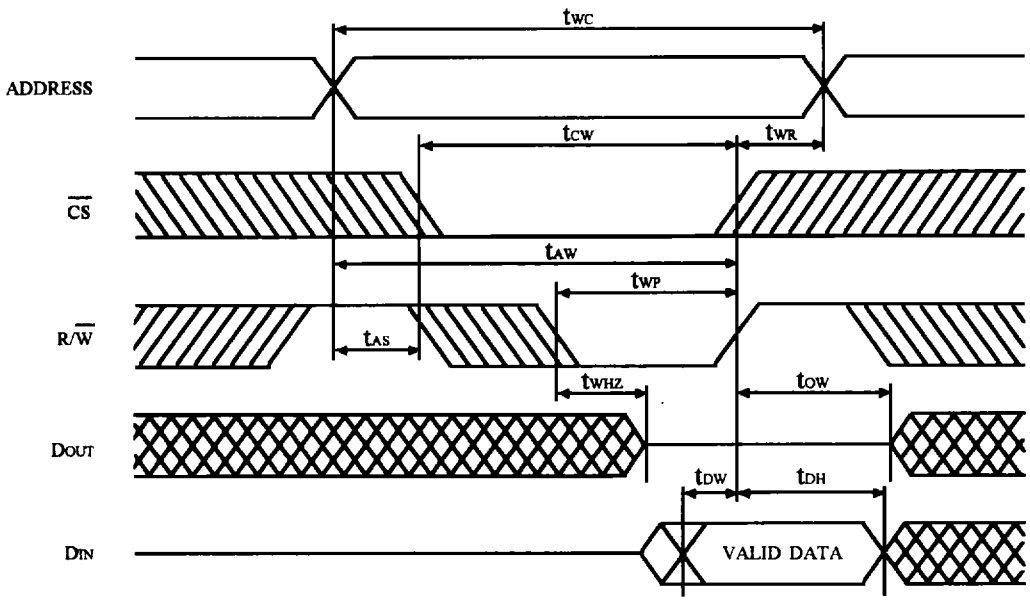
READ CYCLE 1 ($\overline{OE}$, $\overline{CS}$ CONTROL, R/$\overline{W}$ = HIGH)



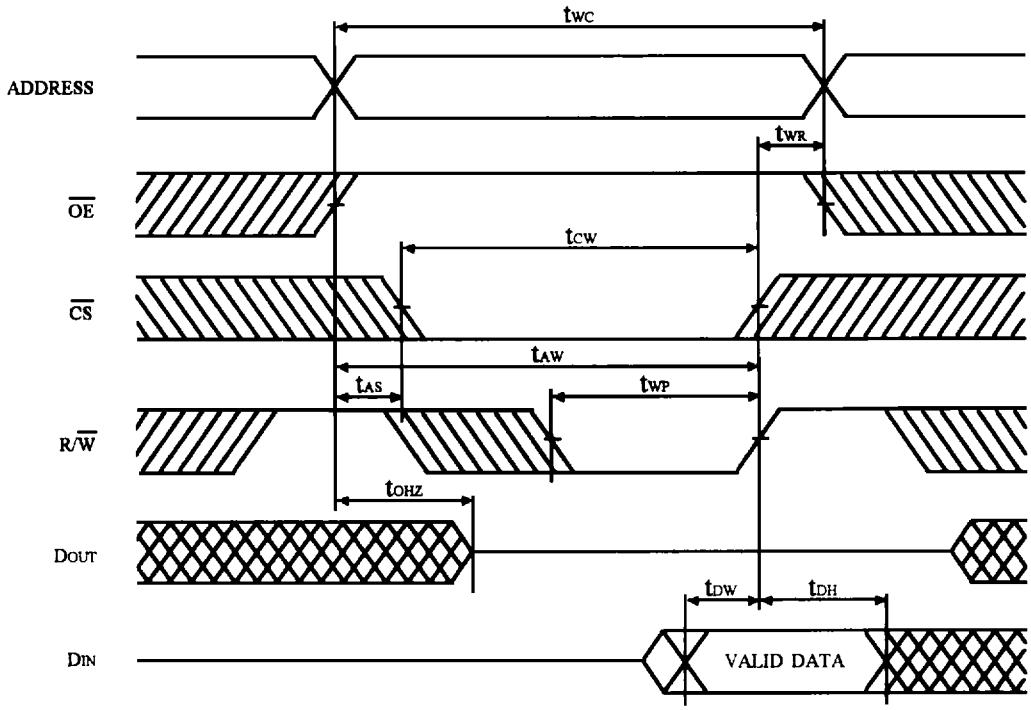
READ CYCLE 2 (R/$\overline{W}$ CONTROL, $\overline{OE}$ = LOW, $\overline{CS}$ = LOW)



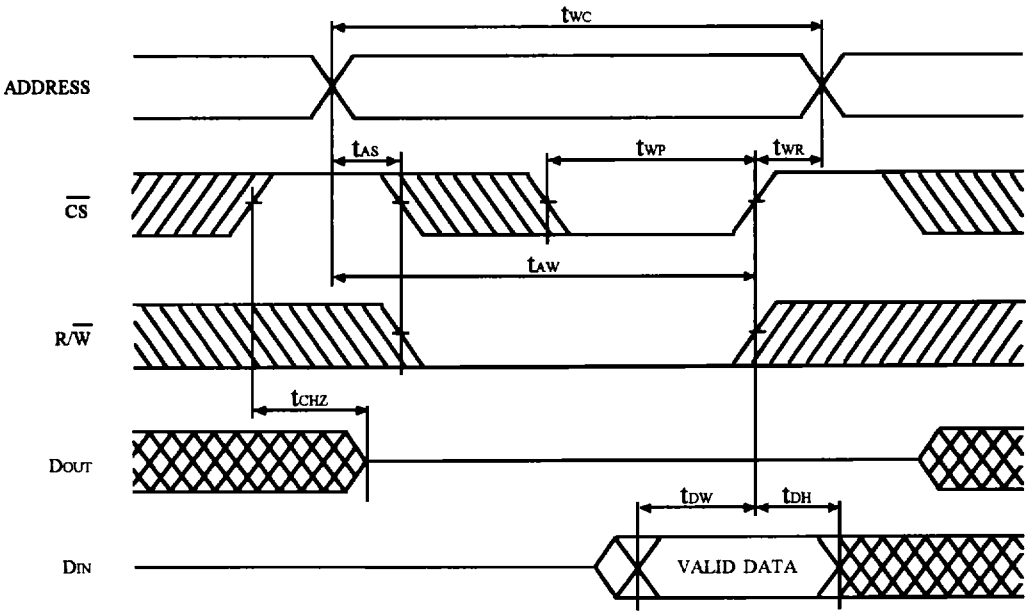
WRITE CYCLE 1 (R/$\overline{W}$ CONTROL, $\overline{OE}$ = LOW)



WRITE CYCLE 2 (R/$\overline{W}$ CONTROL)



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



Capacitance ($f = 1MHz$, $T_A = 25℃$)

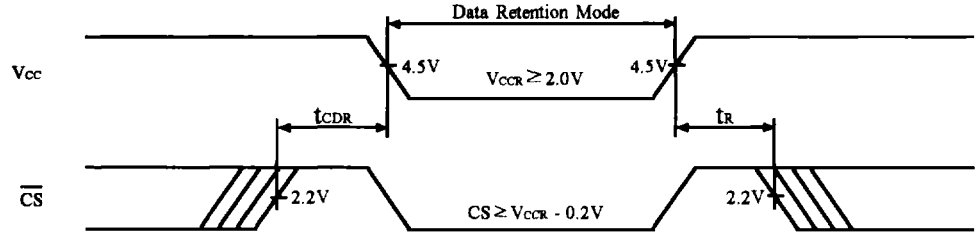
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_I	Input Capacitance	$V_I = 0V$	-	4	6	pF
$C_{I/O}$	I/O Capacitance	$V_{I/O} = 0V$	-	6	8	pF

Data Retention Characteristics ($T_A = 0 \sim 70℃$)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CCR}	Data Retention Supply Voltage	$\overline{CS} \geq V_{CC} - 0.2V$	2.0	-	5.5	V
I_{CCR}	Data Retention Current	$V_{CC} = 3.0V$, $\overline{CS} \geq 2.8V$	-	-	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

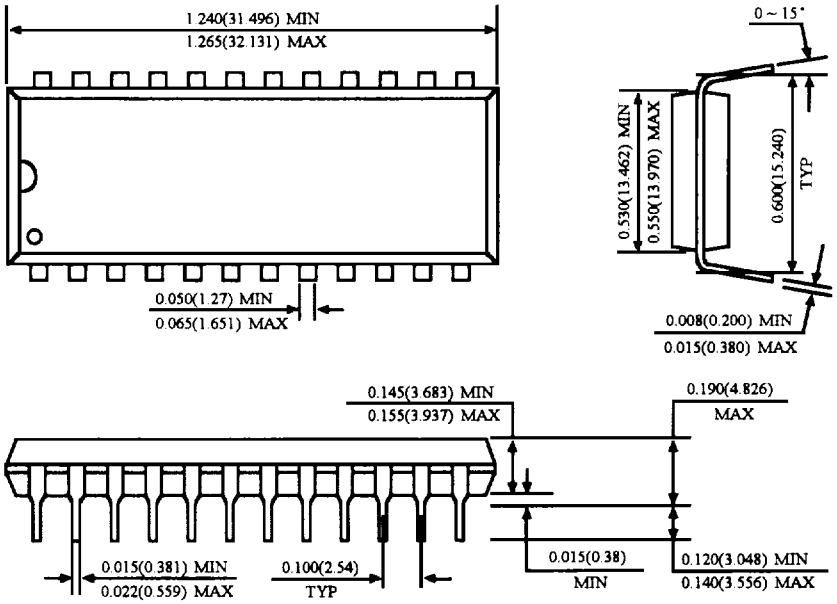


*Note: When retaining data in standby mode, supply voltage can be lowered within a certain range. Read or write cycle cannot be performed while the supply voltage is low.

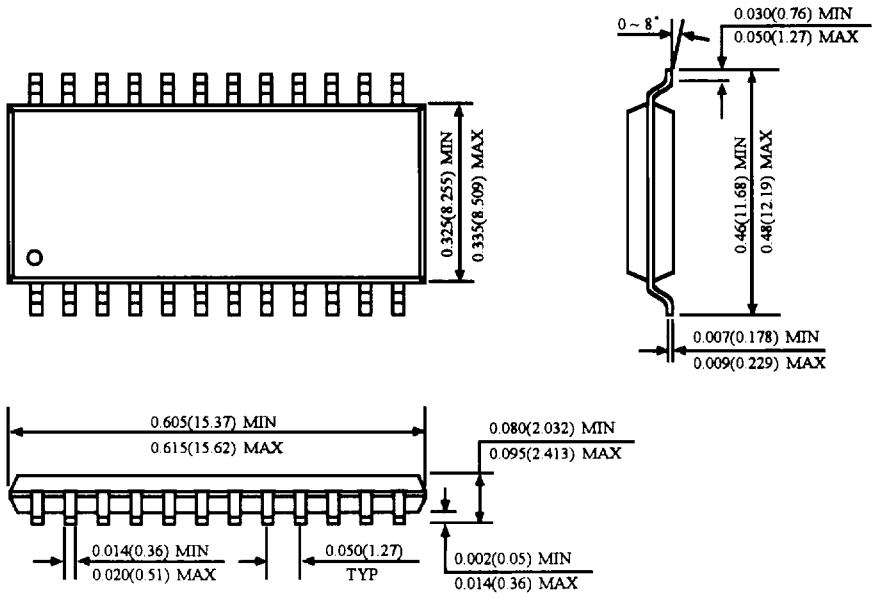
Package Dimensions

Unit: Inches (mm)

24 DIP



24 SOP



Unit: Inches (mm)

24 SKINNY DIP