



## GLT6400L08

### Ultra Low Power 512k x 8 CMOS SRAM

Feb 2001(Rev. 1.1)

#### Features :

- \* Low-power consumption.
  - active: 45mA at 85ns.
  - stand by :
    - 20  $\mu$ A (CMOS input / output)
    - 5  $\mu$ A (CMOS input / output, SL)
- \* Single +2.7 to 3.3V power supply.
- \* Equal access and cycle time.
- \* 85 ns access time at 2.7V to 3.3V 70ns access time at 3V to 3.6V
- \* 1.0V data retention mode.
- \* TTL compatible, tri-state input/output.
- \* Automatic power-down when deselected.
- \* Industrial grade (-40°C ~ 85°C) available.
- \* Package available: sTSOP , SOP.

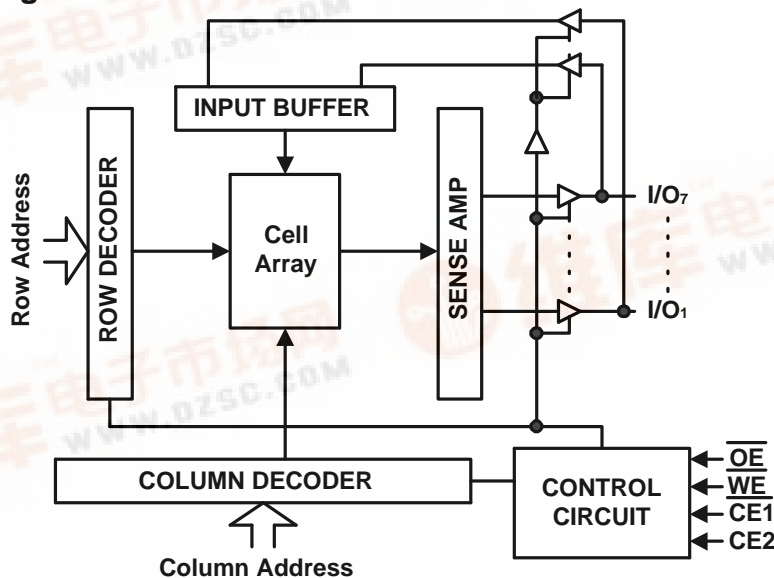
#### Description :

The GLT6400L08 is a low power CMOS Static RAM organized as 524,288 x 8 bits. Easy memory expansion is provided by an active LOW  $\overline{CE1}$  an active LOW  $\overline{OE}$  , and Tri-state I/O's. This device has an automatic power-down mode feature when deselected.

Writing to the device is accomplished by taking chip Enable 1 ( $\overline{CE1}$ ) with Write Enable ( $\overline{WE}$ ) LOW. Reading from the device is performed by taking Chip Enable 1 ( $\overline{CE1}$ ) with Output Enable ( $\overline{OE}$ ) LOW while Write Enable ( $\overline{WE}$ ) and Chip Enable 2 (CE2) is HIGH. The I/O pins are placed in a high-impedance state when the device is deselected : the outputs are disabled during a write cycle.

The GLT6400L08 comes with a 1V data retention feature and Lower Standby Power. The GLT6400L08 is available in a 32-pin sTSOP packages, and 32pin SOP package.

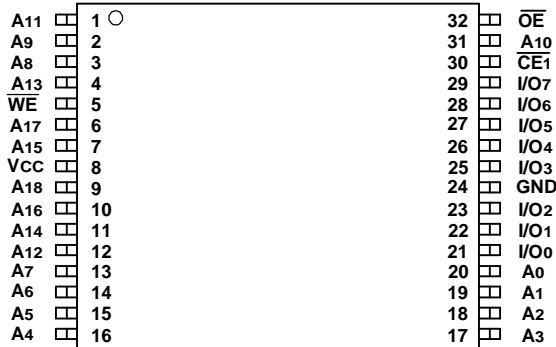
#### Function Block Diagram :



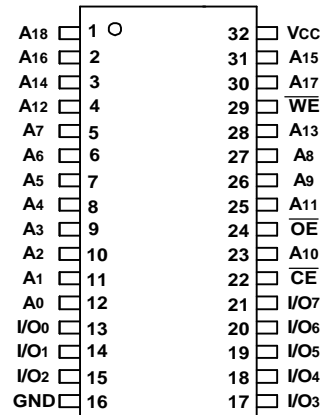


**Pin Configurations :**

**GLT6400L08**  
sTSOPI



**GLT6400L08**  
SOP



**Pin Descriptions:**

Name	Function
A <sub>0</sub> – A <sub>18</sub>	Address Inputs
CE <sub>1</sub>	Chip Enable Input
OE	Output Enable Input
WE	Write Enable Input
I/O <sub>0</sub> – I/O <sub>7</sub>	Data Input and Data Output
V <sub>CC</sub>	Power Supply
GND	Ground
NC	No Connection

**Truth Table:**

CE <sub>1</sub>	WE	OE	Data	Mode
H	X	X	High-Z	Standby
X	X	X	High-Z	Standby
L	H	L	Data Out	Active, Read
L	H	H	High-Z	Active, Output Disable
L	L	X	Data Out	Active, Write

\*Key : X = Don't Care, L = Low, H = High

### Absolute Maximum Ratings\*

Parameter	Symbol	Minimum	Maximum	Unit
Voltage on Any Pin Relative to Gnd	Vt	-0.5	V <sub>CC</sub> +0.3	V
Power Dissipation	P <sub>T</sub>	-	1.0	W
Storage Temperature (Plastic)	Tstg	-55	+150	°C
Temperature Under Bias	Tbias	-40	+85	°C

\*Note : Stresses greater than those listed above 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 conditions outside those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

### Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V <sub>CC</sub>	2.7	3	3.3	V
	Gnd	0.0	0.0	0.0	V
Input Voltage	V <sub>IH</sub>	2.0	-	V <sub>CC</sub> +0.2	V
	V <sub>IL</sub>	-0.5*	-	0.6	V

\* V<sub>IL</sub> min = -1.0V for pulse width less than t<sub>RC</sub>/2.

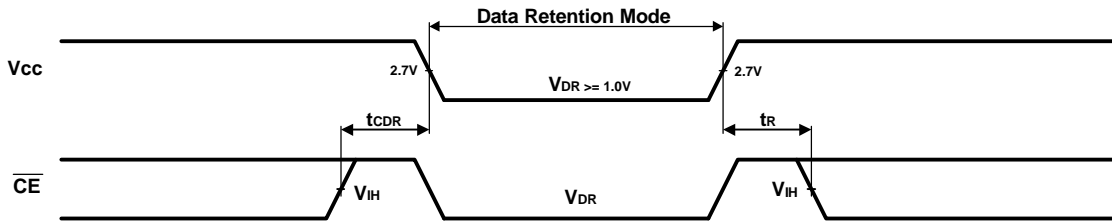
**DC Operating Characteristics ( 70ns V<sub>CC</sub>=3V to 3.6V , 85ns V<sub>CC</sub>=2.7V to 3.3V)**

Parameter	Sym.	Test Conditions	70		85		Unit
			Min	Max	Min	Max	
Input Leakage Current	I <sub>LI</sub>	V <sub>CC</sub> = Max, V <sub>IN</sub> = Gnd to V <sub>CC</sub>		1		1	μA
Output Leakage Current	I <sub>LO</sub>	$\overline{CE}_1 = V_{IH}$ V <sub>CC</sub> = Max, V <sub>OUT</sub> = Gnd to V <sub>CC</sub>		1		1	μA
Operating Power Supply Current	I <sub>CC</sub>	$\overline{CE}_1 = V_{IL}$ , V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , I <sub>OUT</sub> =0mA		3		5	mA
Average Operating Current	I <sub>CC1</sub>	$\overline{CE}_1 = V_{IL}$ , I <sub>OUT</sub> = 0mA, Min Cycle, 100% Duty		25		45	mA
	I <sub>CC2</sub>	$\overline{CE}_1 = 0.2V$ I <sub>OUT</sub> = 0mA, Cycle Time=1μs, 100% Duty		3		3	mA
Standby Power Supply Current(TTL Level)	I <sub>SB</sub>	$\overline{CE}_1 = V_{IH}$		0.5		0.3	mA
Standby Power Supply Current (CMOS Level)	I <sub>SB1</sub>	$\overline{CE}_1 \geq V_{CC}-0.2V$ or f=0 V <sub>IN</sub> ≤ 0.2V or V <sub>IN</sub> ≥ V <sub>CC</sub> -0.2V	GLT6400L08LL	5		20	μA
			GLT6400L08SL	1		5	μA
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 2 mA		0.4		0.4	V
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -1 mA	2.4		2.4		V

**Data Retention**

Parameter	Sym.	Test Conditions	Min.	Max.	Unit
V <sub>CC</sub> for Data retention	V <sub>DR</sub>	$\overline{CE}_1 \geq V_{CC} - 0.2V$ or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2V or V <sub>IN</sub> ≤ 0.2V	1.0	-	V
Data Retention Current	I <sub>CCDR</sub>		-	4	μA
Chip Deselect to Data Retention Time	t <sub>CDR</sub>		0	-	ns
Operating Recovery Time <sup>(2)</sup>	t <sub>R</sub>		t <sub>RC</sub>	-	ns

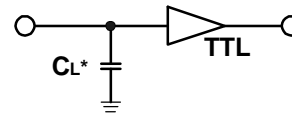
### Data Retention Waveform



### AC Test Conditions

Input Pulse Levels	0.4V to 2.4V
Input Rise and Fall Time	5 ns
Input and Output Timing Reference Level	1.4V

### AC Test Loads and Waveforms



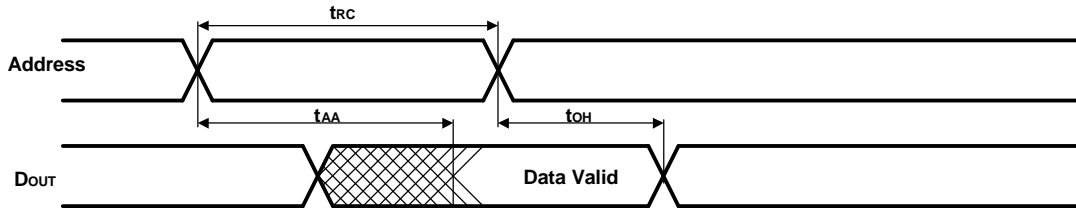
Output Load Condition  
 $C_L = 30\text{pf} + 1\text{TTL Load}$

\*Including Scope and Jig Capacitance

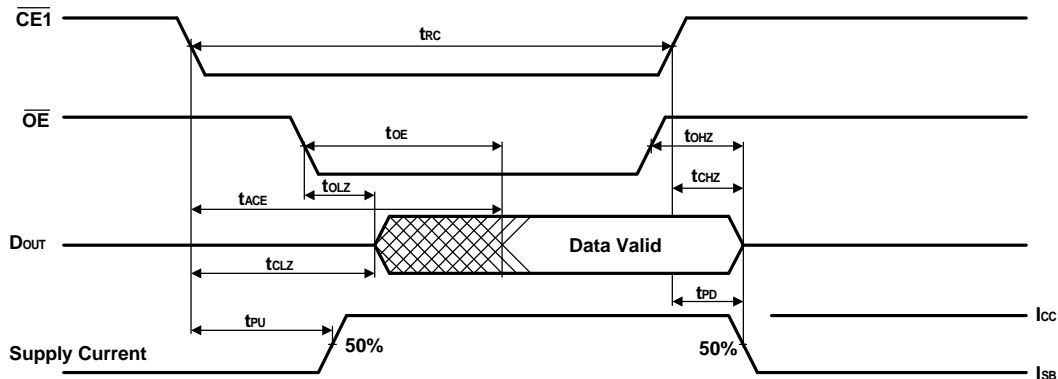
**Read Cycle** <sup>(3,9)</sup> ( 70ns  $V_{CC}=3V$  to 3.6V , 85ns  $V_{CC}=2.7V$  to 3.3V )

Parameter	Symbol	70		85		Unit	Note
		Min	Max	Min	Max		
Read Cycle Time	$t_{RC}$	70		85		ns	
Address Access Time	$t_{AA}$		70		85	ns	
Chip Enable Access Time	$t_{ACE}$		70		85	ns	
Output Enable Access Time	$t_{OE}$		40		40	ns	
Output Hold from address Change	$t_{OH}$	10		10		ns	
Chip Enable to Output in Low-Z	$t_{CLZ}$	10		10		ns	4,5
Chip Disable to Output in High-Z	$t_{CHZ}$		25		35	ns	4,5
Output Enable to Output in Low-Z	$t_{OLZ}$	5		5		ns	4,5
Output Disable to Output in High-Z	$t_{OHZ}$		25		30	ns	4,5
Power-Up Time	$t_{PU}$	0		0		ns	5
Power-Down Time	$t_{PD}$		70		85	ns	5

### Timing Waveform of Read Cycle 1 <sup>(3,6,7,9)</sup> (Address Controlled)



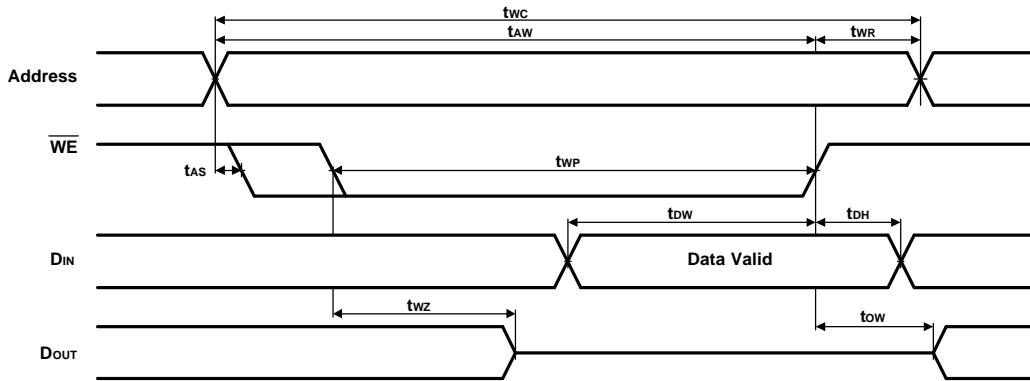
### Timing Waveform of Read Cycle 2 <sup>(5,6,8,9)</sup> ( $\overline{CE1}$ Controlled)



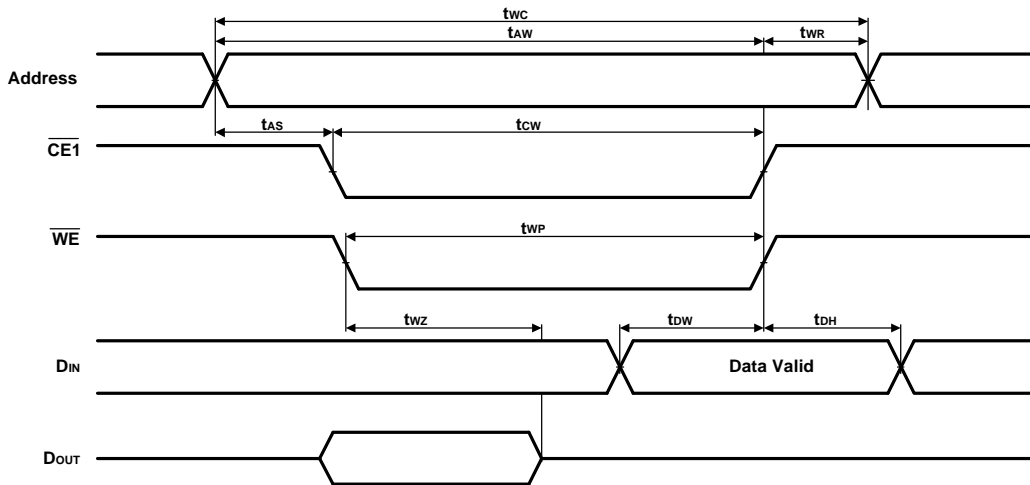
### Write Cycle <sup>(3,11)</sup> (70ns Vcc=3V to 3.6V , 85ns Vcc=2.7V to 3.3V )

Parameter	Symbol	70		85		Unit	Note
		Min	Max	Min	Max		
Write Cycle Time	t <sub>WC</sub>	70		85		ns	
Chip Enable to Write End	t <sub>CW</sub>	60		70		ns	
Address Setup to Write End	t <sub>AW</sub>	60		70		ns	
Address Setup Time	t <sub>AS</sub>	0		0		ns	
Write Pulse Width	t <sub>WP</sub>	50		60		ns	
Write Recovering Time	t <sub>WR</sub>	0		0		ns	
Data Valid to Write End	t <sub>DW</sub>	30		35		ns	
Data Hold Time	t <sub>DH</sub>	0		0		ns	
Write Enable to Output in High-Z	t <sub>WZ</sub>		25		35	ns	4,5
Output Active from Write End	t <sub>OW</sub>	5		5		ns	4,5

**Timing Waveform of Write Cycle 1 <sup>(10,11)</sup> ( $\overline{WE}$  Controlled)**



**Timing Waveform of Write Cycle 2 <sup>(10,11)</sup> ( $\overline{CE1}$  Controlled)**





Notes :

1. L-version includes this feature.
2. This Parameter is samples and not 100% tested.
3. For test conditions, see AC Test Condition.
4. This parameter is tested with CL = 5pF. Transition is measured  $\pm 500\text{mV}$  from steady – state voltage.
5. This parameter is guaranteed, but is not tested.
6.  $\overline{\text{WE}}$  is HIGH for read cycle.
7.  $\overline{\text{CE1}}$  and  $\overline{\text{OE}}$  are LOW and for read cycle.
8. Address valid prior to or coincident with  $\overline{\text{CE1}}$  transition LOW .
9. All read cycle timings are referenced from the last valid address to the first transition address.
10.  $\overline{\text{CE1}}$  or WE must be HIGH during address transition.
11. All write cycle timings are referenced from the last valid address to the first transition address.





# GLT6400L08

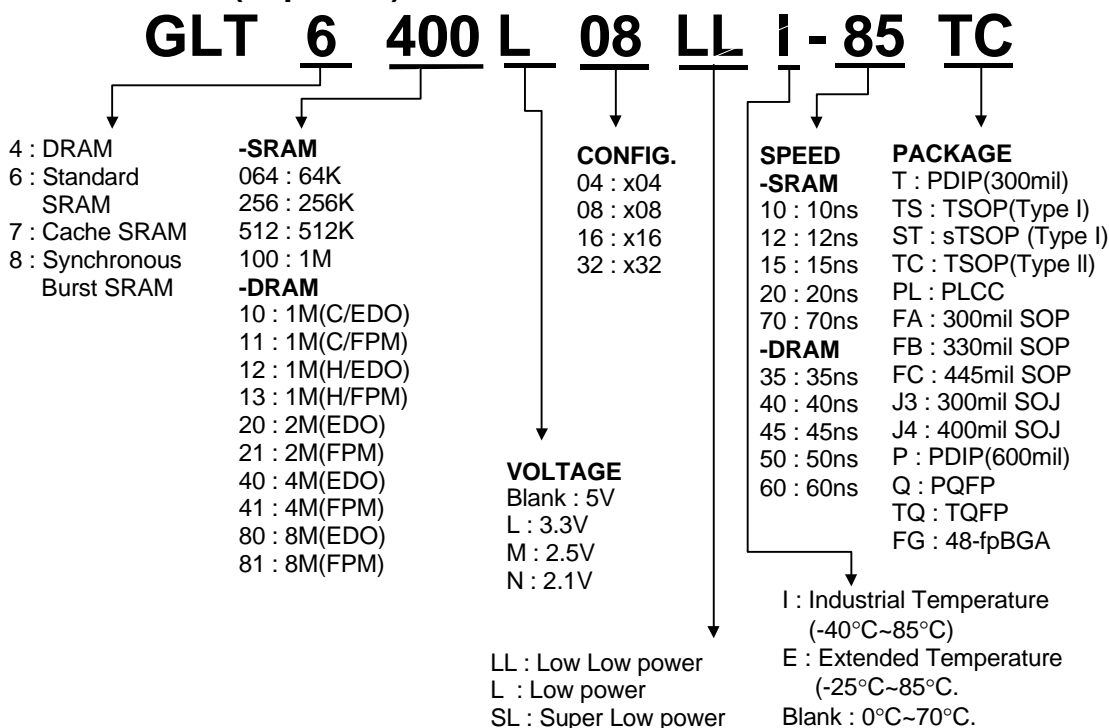
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Feb 2001(Rev. 1.1)

### Ordering Information

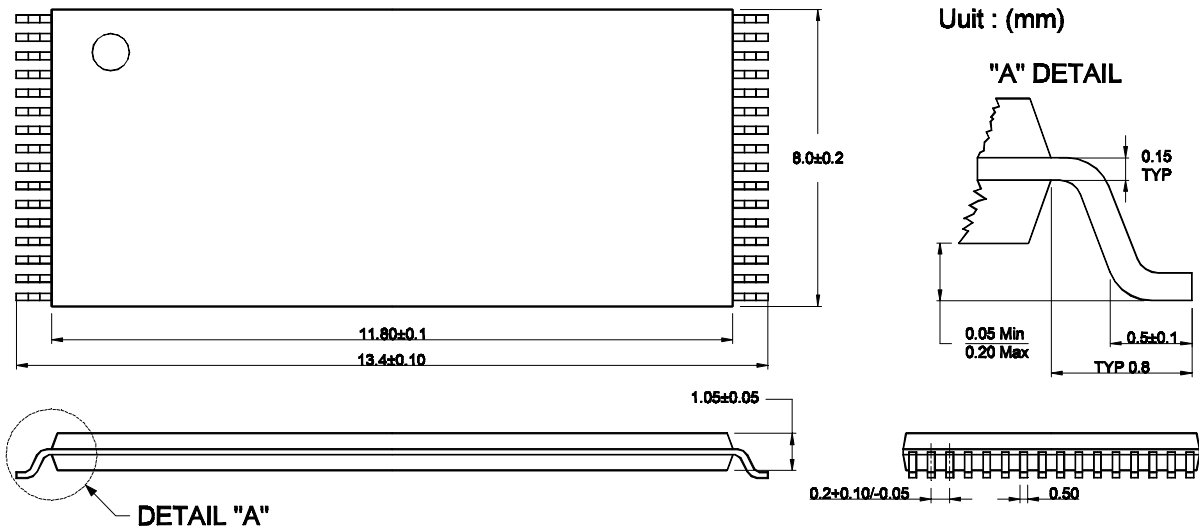
Part Number	SPEED	POWER	PACKAGE
GLT6400L08LL-70 ST	70ns	Normal	sTSOPI 32L
GLT6400L08SL-70 ST	70ns	Normal	sTSOPI 32L
GLT6400L08SLI-70 ST	70ns	Normal	sTSOPI 32L
GLT6400L08SLI-70 ST	70ns	Normal	sTSOPI 32L
GLT6400L08LL-85 ST	85ns	Normal	sTSOPI 32L
GLT6400L08SL-85 ST	85ns	Normal	sTSOPI 32L
GLT6400L08SLI-85 ST	85ns	Normal	sTSOPI 32L
GLT6400L08SLI-85 ST	85ns	Normal	sTSOPI 32L
GLT6400L08LL-70 FC	70ns	Normal	SOP 32L
GLT6400L08SL-70 FC	70ns	Normal	SOP 32L
GLT6400L08SLI-70 FC	70ns	Normal	SOP 32L
GLT6400L08SLI-70 FC	70ns	Normal	SOP 32L
GLT6400L08LL-85 FC	85ns	Normal	SOP 32L
GLT6400L08SL-85 FC	85ns	Normal	SOP 32L
GLT6400L08SLI-85 FC	85ns	Normal	SOP 32L
GLT6400L08SLI-85 FC	85ns	Normal	SOP 32L

### Parts Numbers (Top Mark) Definition :



### Package Information

32 pin 8x13.4mm Small Outline J-form Package (sTSOP)



32 pin 445mil Small Outline J-form Package SOP

