



REVISION HISTORY

| <u>Revision</u> | <u>Description</u> | <u>Issue Date</u> |
|-----------------|---|-------------------|
| Rev. 0.1 | Initial Issue | Dec.25.2008 |
| Rev. 0.2 | Revised FEATURES & ORDERING INFORMATION Lead free and green package available to Green package available Added packing type in ORDERING INFORMATION | May.20.2009 |
| Rev. 0.3 | Deleted T _{SOLDER} in ABSOLUTE MAXIMUM RATINGS Revised V _{DR} | Sep.11.2009 |

FEATURES

- Fast access time : 55/70ns
- Low power consumption:
Operating current : 45/30mA (TYP.)
Standby current : 8 μ A (TYP.) LL-version
- Single 4.5V ~ 5.5V power supply
- All inputs and outputs TTL compatible
- Fully static operation
- Tri-state output
- Data byte control : LB# (DQ0 ~ DQ7)
UB# (DQ8 ~ DQ15)
- Data retention voltage : 1.5V (MIN.)
- **Green package available**
- Package : 48-pin 12mm x 20mm TSOP-I
48-ball 6mm x 8mm TFBGA

GENERAL DESCRIPTION

The LY6251316 is a 8,388,608-bit low power CMOS static random access memory organized as 524,288 words by 16 bits. It is fabricated using very high performance, high reliability CMOS technology. Its standby current is stable within the range of operating temperature.

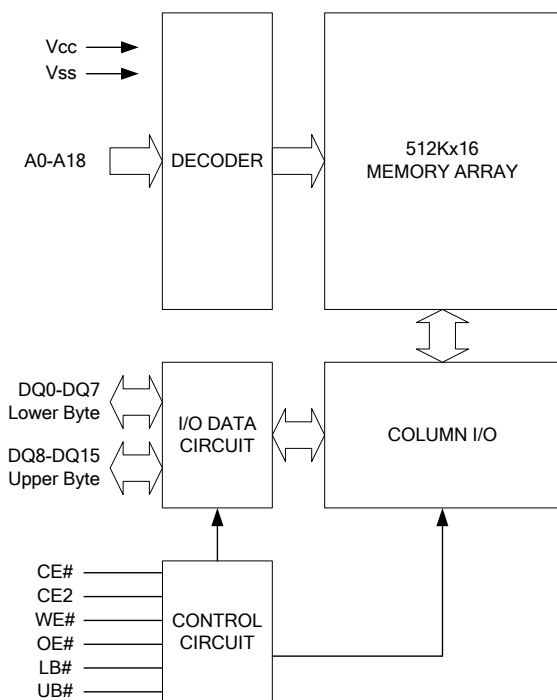
The LY6251316 is well designed for low power application, and particularly well suited for battery back-up nonvolatile memory application.

The LY6251316 operates from a single power supply of 4.5V ~ 5.5V and all inputs and outputs are fully TTL compatible

PRODUCT FAMILY

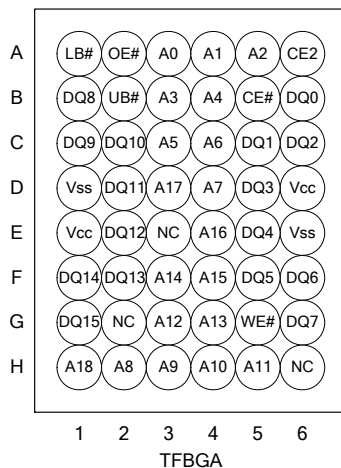
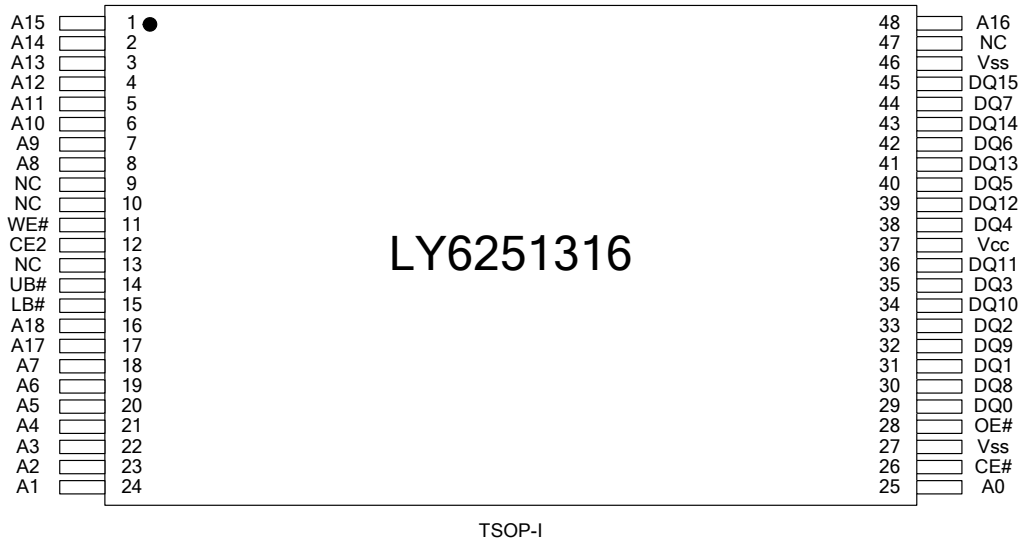
| Product Family | Operating Temperature | Vcc Range | Speed | Power Dissipation | |
|----------------|-----------------------|------------|---------|--------------------|---------------------|
| | | | | Standby(Isb1,TYP.) | Operating(Icc,TYP.) |
| LY62L51316 | 0 ~ 70°C | 4.5 ~ 5.5V | 55/70ns | 8 μ A(LL) | 45/30mA |
| LY62L51316(E) | -20 ~ 80°C | 4.5 ~ 5.5V | 55/70ns | 8 μ A(LL) | 45/30mA |
| LY62L51316(I) | -40 ~ 85°C | 4.5 ~ 5.5V | 55/70ns | 8 μ A(LL) | 45/30mA |

FUNCTIONAL BLOCK DIAGRAM



PIN DESCRIPTION

| SYMBOL | DESCRIPTION |
|------------|---------------------|
| A0 - A18 | Address Inputs |
| DQ0 - DQ15 | Data Inputs/Outputs |
| CE#, CE2 | Chip Enable Input |
| WE# | Write Enable Input |
| OE# | Output Enable Input |
| LB# | Lower Byte Control |
| UB# | Upper Byte Control |
| Vcc | Power Supply |
| Vss | Ground |

PIN CONFIGURATION

ABSOLUTE MAXIMUM RATINGS*

| PARAMETER | SYMBOL | RATING | UNIT |
|--|------------------|------------------------------|------|
| Voltage on Vcc relative to Vss | V _{T1} | -0.5 to 6.5 | V |
| Voltage on any other pin relative to Vss | V _{T2} | -0.5 to V _{cc} +0.5 | V |
| Operating Temperature | T _A | 0 to 70(C grade) | °C |
| | | -20 to 80(E grade) | |
| | | -40 to 85(I grade) | |
| Storage Temperature | T _{STG} | -65 to 150 | °C |
| Power Dissipation | P _D | 1 | W |
| DC Output Current | I _{OUT} | 50 | mA |

*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 or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to the absolute maximum rating conditions for extended period may affect device reliability.



TRUTH TABLE

| MODE | CE# | CE2 | OE# | WE# | LB# | UB# | I/O OPERATION | | SUPPLY CURRENT |
|----------------|-----|-----|-----|-----|-----|-----|------------------|------------------|------------------------------------|
| | | | | | | | DQ0-DQ7 | DQ8-DQ15 | |
| Standby | H | X | X | X | X | X | High - Z | High - Z | I _{SB} , I _{SB1} |
| | X | L | X | X | X | X | High - Z | High - Z | |
| | X | X | X | X | H | H | High - Z | High - Z | |
| Output Disable | L | H | H | H | L | X | High - Z | High - Z | I _{CC} , I _{CC1} |
| | L | H | H | H | X | L | High - Z | High - Z | |
| Read | L | H | L | H | L | H | D _{OUT} | High - Z | I _{CC} , I _{CC1} |
| | L | H | L | H | H | L | High - Z | D _{OUT} | |
| | L | H | L | H | L | L | D _{OUT} | D _{OUT} | |
| Write | L | H | X | L | L | H | D _{IN} | High - Z | I _{CC} , I _{CC1} |
| | L | H | X | L | H | L | High - Z | D _{IN} | |
| | L | H | X | L | L | L | D _{IN} | D _{IN} | |

Note: H = V_{IH}, L = V_{IL}, X = Don't care.

DC ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. ⁴ | MAX. | UNIT | |
|--|------------------------------|--|------------------|---|----------------------|------|----|
| Supply Voltage | V _{CC} | | 4.5 | 5.0 | 5.5 | V | |
| Input High Voltage | V _{IH} ¹ | | 2.4 | - | V _{CC} +0.3 | V | |
| Input Low Voltage | V _{IL} ² | | -0.2 | - | 0.6 | V | |
| Input Leakage Current | I _{LI} | V _{CC} ≥ V _{IN} ≥ V _{SS} | -1 | - | 1 | μA | |
| Output Leakage Current | I _{LO} | V _{CC} ≥ V _{OUT} ≥ V _{SS} Output Disabled | -1 | - | 1 | μA | |
| Output High Voltage | V _{OH} | I _{OH} = -1mA | 2.4 | - | - | V | |
| Output Low Voltage | V _{OL} | I _{OL} = 2mA | - | - | 0.4 | V | |
| Average Operating Power supply Current | I _{CC} | Cycle time = Min. CE# = V _{IL} and CE2 = V _{IH} I _{I/O} = 0mA Other pins at V _{IL} or V _{IH} | -55 | - | 45 | 60 | mA |
| | | | -70 | - | 30 | 50 | mA |
| | I _{CC1} | Cycle time = 1μs CE# ≤ 0.2V and CE2 ≥ V _{CC} -0.2V I _{I/O} = 0mA other pins at 0.2V or V _{CC} -0.2V | - | 6 | 12 | mA | |
| Standby Power Supply Current | I _{SB} | CE# = V _{IH} or CE2 = V _{IL} Other pins at V _{IL} or V _{IH} | - | 0.2 | 2 | mA | |
| | | | I _{SB1} | CE# ≥ V _{CC} -0.2V or CE2 ≤ 0.2V Other pins at 0.2V or V _{CC} -0.2V | -LL | - | 8 |
| | -LLE | - | | | 8 | 50 | μA |
| | -LLI | - | | | 8 | 80 | μA |

Notes:

- V_{IH}(max) = V_{CC} + 3.0V for pulse width less than 10ns.
- V_{IL}(min) = V_{SS} - 3.0V for pulse width less than 10ns.
- Over/Undershoot specifications are characterized, not 100% tested.
- Typical values are included for reference only and are not guaranteed or tested.
Typical values are measured at V_{CC} = V_{CC}(TYP.) and T_A = 25°C



CAPACITANCE (T_A = 25°C, f = 1.0MHz)

| PARAMETER | SYMBOL | MIN. | MAX | UNIT |
|--------------------------|------------------|------|-----|------|
| Input Capacitance | C _{IN} | - | 6 | pF |
| Input/Output Capacitance | C _{I/O} | - | 8 | pF |

Note : These parameters are guaranteed by device characterization, but not production tested.

AC TEST CONDITIONS

| | |
|--|---|
| Input Pulse Levels | 0.2V to V _{CC} - 0.2V |
| Input Rise and Fall Times | 3ns |
| Input and Output Timing Reference Levels | 1.5V |
| Output Load | C _L = 30pF + 1TTL, I _{OH} /I _{OL} = -1mA/2mA |

AC ELECTRICAL CHARACTERISTICS

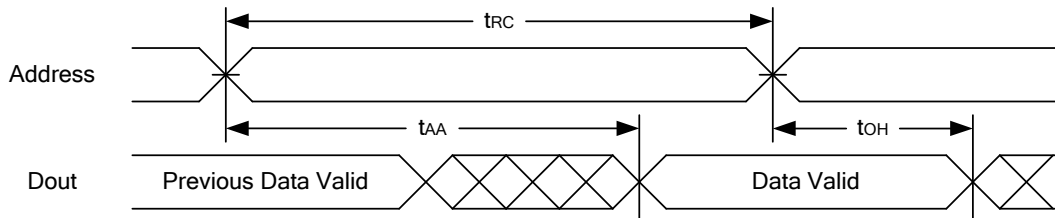
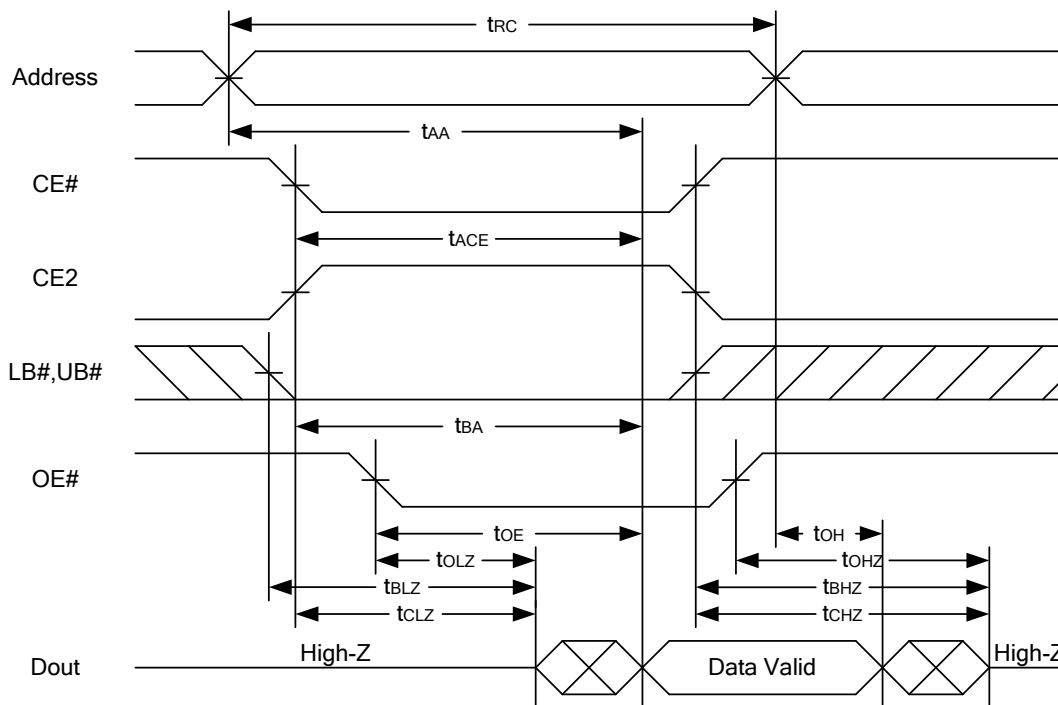
(1) READ CYCLE

| PARAMETER | SYM. | LY6251316-55 | | LY6251316-70 | | UNIT |
|------------------------------------|---------------------|--------------|------|--------------|------|------|
| | | MIN. | MAX. | MIN. | MAX. | |
| Read Cycle Time | t _{RC} | 55 | - | 70 | - | ns |
| Address Access Time | t _{AA} | - | 55 | - | 70 | ns |
| Chip Enable Access Time | t _{ACE} | - | 55 | - | 70 | ns |
| Output Enable Access Time | t _{OE} | - | 30 | - | 35 | ns |
| Chip Enable to Output in Low-Z | t _{CLZ} * | 10 | - | 10 | - | ns |
| Output Enable to Output in Low-Z | t _{OLZ} * | 5 | - | 5 | - | ns |
| Chip Disable to Output in High-Z | t _{CHZ} * | - | 20 | - | 25 | ns |
| Output Disable to Output in High-Z | t _{OHZ} * | - | 20 | - | 25 | ns |
| Output Hold from Address Change | t _{OH} | 10 | - | 10 | - | ns |
| LB#, UB# Access Time | t _{BA} | - | 55 | - | 70 | ns |
| LB#, UB# to High-Z Output | t _{BHZ} * | - | 25 | - | 30 | ns |
| LB#, UB# to Low-Z Output | t _{B LZ} * | 10 | - | 10 | - | ns |

(2) WRITE CYCLE

| PARAMETER | SYM. | LY6251316-55 | | LY6251316-70 | | UNIT |
|----------------------------------|--------------------|--------------|------|--------------|------|------|
| | | MIN. | MAX. | MIN. | MAX. | |
| Write Cycle Time | t _{WC} | 55 | - | 70 | - | ns |
| Address Valid to End of Write | t _{AW} | 50 | - | 60 | - | ns |
| Chip Enable to End of Write | t _{CW} | 50 | - | 60 | - | ns |
| Address Set-up Time | t _{AS} | 0 | - | 0 | - | ns |
| Write Pulse Width | t _{WP} | 45 | - | 55 | - | ns |
| Write Recovery Time | t _{WR} | 0 | - | 0 | - | ns |
| Data to Write Time Overlap | t _{DW} | 25 | - | 30 | - | ns |
| Data Hold from End of Write Time | t _{DH} | 0 | - | 0 | - | ns |
| Output Active from End of Write | t _{OW} * | 5 | - | 5 | - | ns |
| Write to Output in High-Z | t _{WHZ} * | - | 20 | - | 25 | ns |
| LB#, UB# Valid to End of Write | t _{BW} | 45 | - | 60 | - | ns |

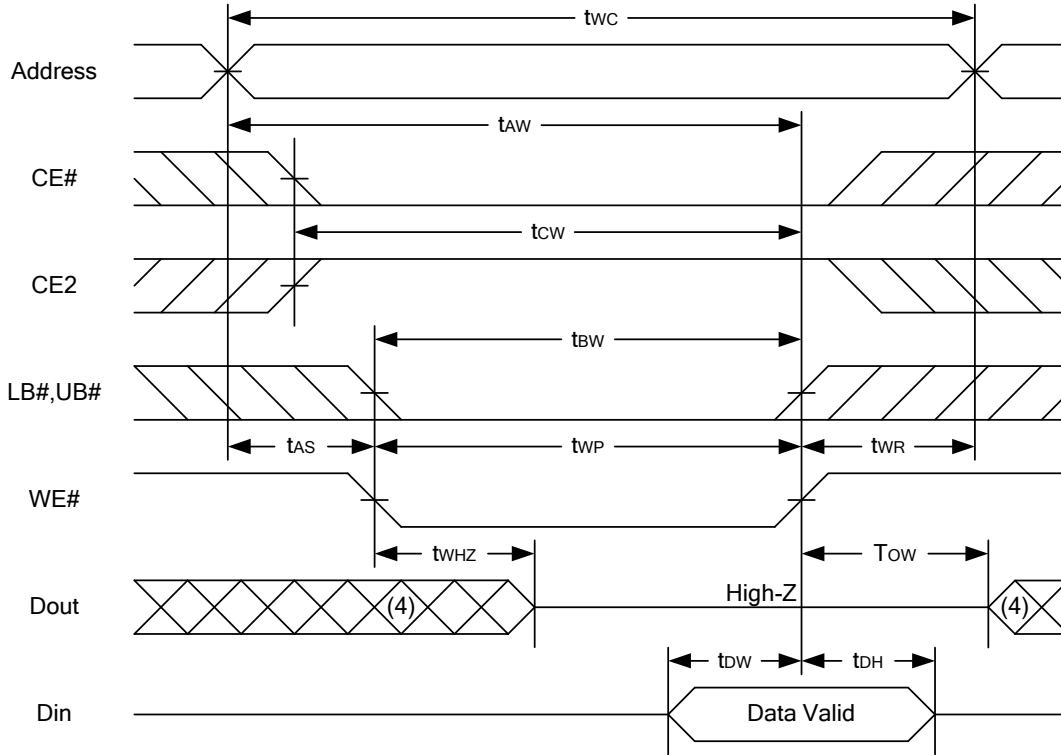
*These parameters are guaranteed by device characterization, but not production tested.

TIMING WAVEFORMS
READ CYCLE 1 (Address Controlled) (1,2)

READ CYCLE 2 (CE# and CE2 and OE# Controlled) (1,3,4,5)

Notes :

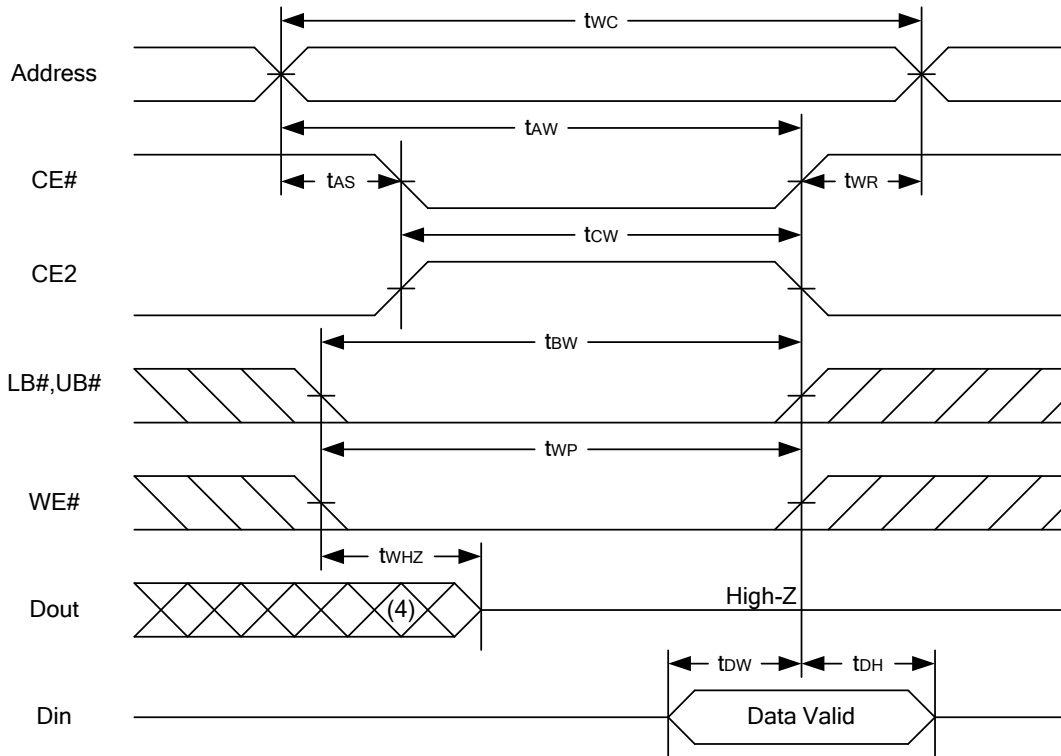
1. WE# is high for read cycle.
2. Device is continuously selected OE# = low, CE# = low, CE2 = high, LB# or UB# = low.
3. Address must be valid prior to or coincident with CE# = low, CE2 = high, LB# or UB# = low transition; otherwise tAA is the limiting parameter.
4. tCLZ, tBLZ, tOLZ, tCHZ, tBHZ and tOHZ are specified with CL = 5pF. Transition is measured ±500mV from steady state.
5. At any given temperature and voltage condition, tCHZ is less than tCLZ, tBHZ is less than tBLZ, tOHZ is less than tOLZ.



WRITE CYCLE 1 (WE# Controlled) (1,2,3,5,6)

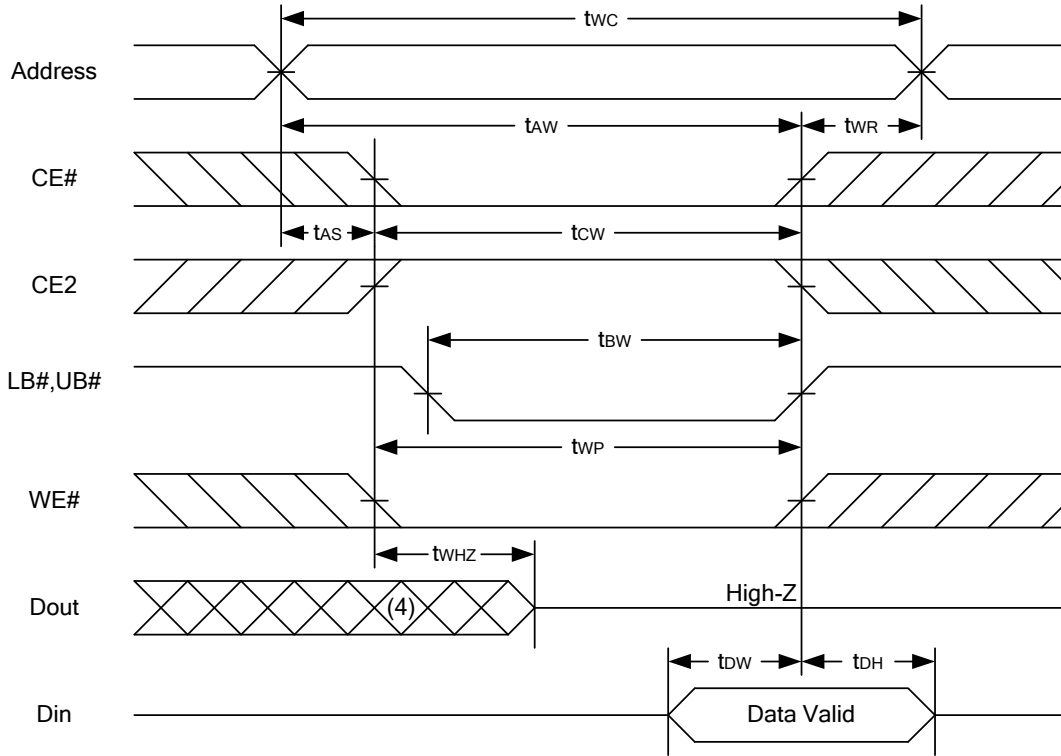


WRITE CYCLE 2 (CE# and CE2 Controlled) (1,2,5,6)





WRITE CYCLE 3 (LB#,UB# Controlled) (1,2,5,6)



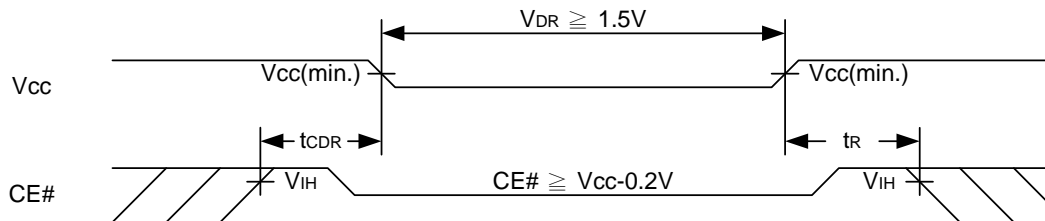
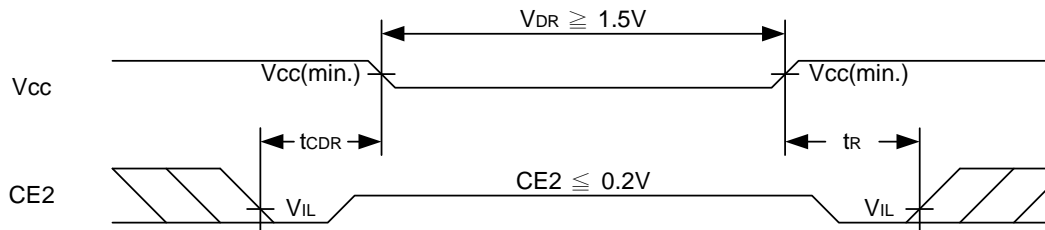
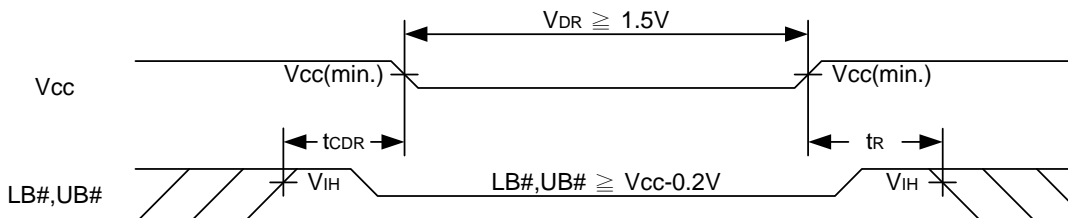
Notes :

1. WE#, CE#, LB#, UB# must be high or CE2 must be low during all address transitions.
2. A write occurs during the overlap of a low CE#, high CE2, low WE#, LB# or UB# = low.
3. During a WE# controlled write cycle with OE# low, tWP must be greater than tWHZ + tDW to allow the drivers to turn off and data to be placed on the bus.
4. During this period, I/O pins are in the output state, and input signals must not be applied.
5. If the CE#, LB#, UB# low transition and CE2 high transition occurs simultaneously with or after WE# low transition, the outputs remain in a high impedance state.
6. tOW and tWHZ are specified with CL = 5pF. Transition is measured ±500mV from steady state.

DATA RETENTION CHARACTERISTICS

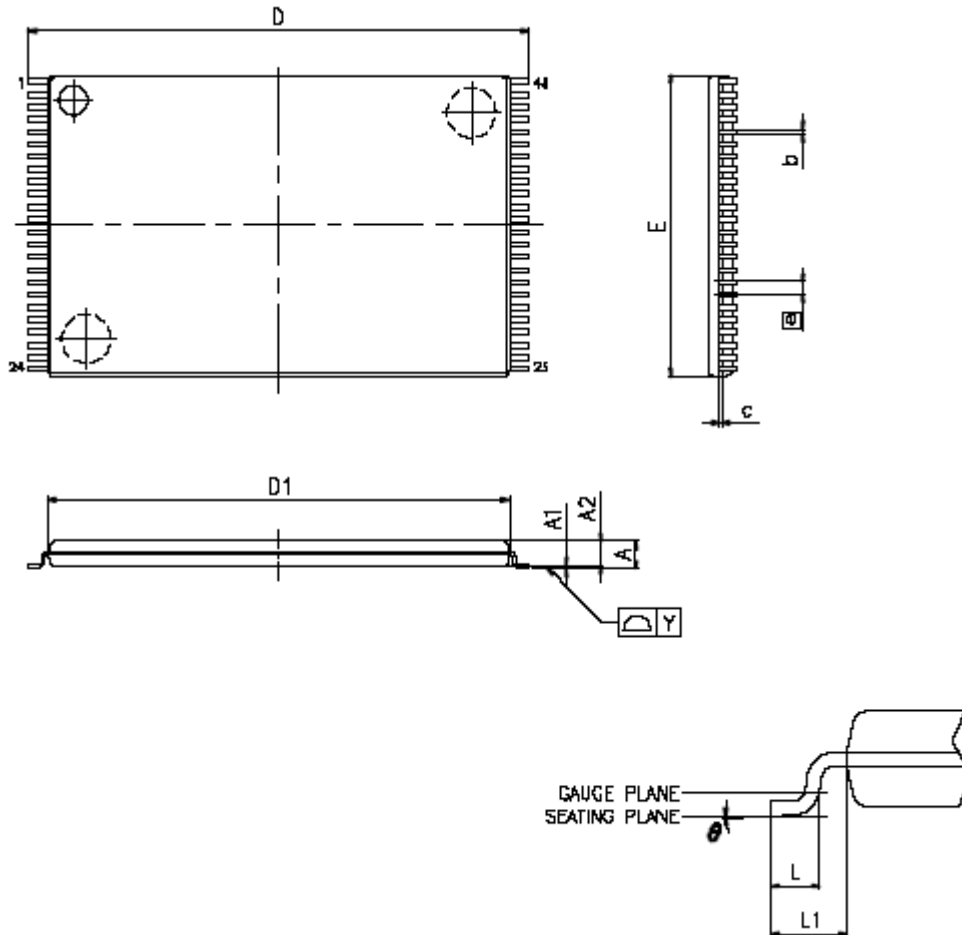
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|-------------------------------------|------------------|--|-------------------|------|------|------|----|
| V _{CC} for Data Retention | V _{DR} | CE# ≥ V _{CC} - 0.2V or CE2 ≤ 0.2V | 1.5 | - | 5.5 | V | |
| Data Retention Current | I _{DR} | V _{CC} = 1.5V | -LL | - | 5 | 30 | μA |
| | | CE# ≥ V _{CC} -0.2V or CE2 ≤ 0.2V other pins at 0.2V or V _{CC} -0.2V | -LLE | - | 5 | 40 | μA |
| | | | -LLI | - | 5 | 50 | μA |
| Chip Disable to Data Retention Time | t _{CDR} | See Data Retention Waveforms (below) | 0 | - | - | ns | |
| Recovery Time | t _R | | t _{RC} * | - | - | ns | |

 t_{RC}* = Read Cycle Time

DATA RETENTION WAVEFORM
Low V_{CC} Data Retention Waveform (1) (CE# controlled)

Low V_{CC} Data Retention Waveform (2) (CE2 controlled)

Low V_{CC} Data Retention Waveform (3) (LB#, UB# controlled)


PACKAGE OUTLINE DIMENSION

48-pin 12mm x 20mm TSOP-I Package Outline Dimension



VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

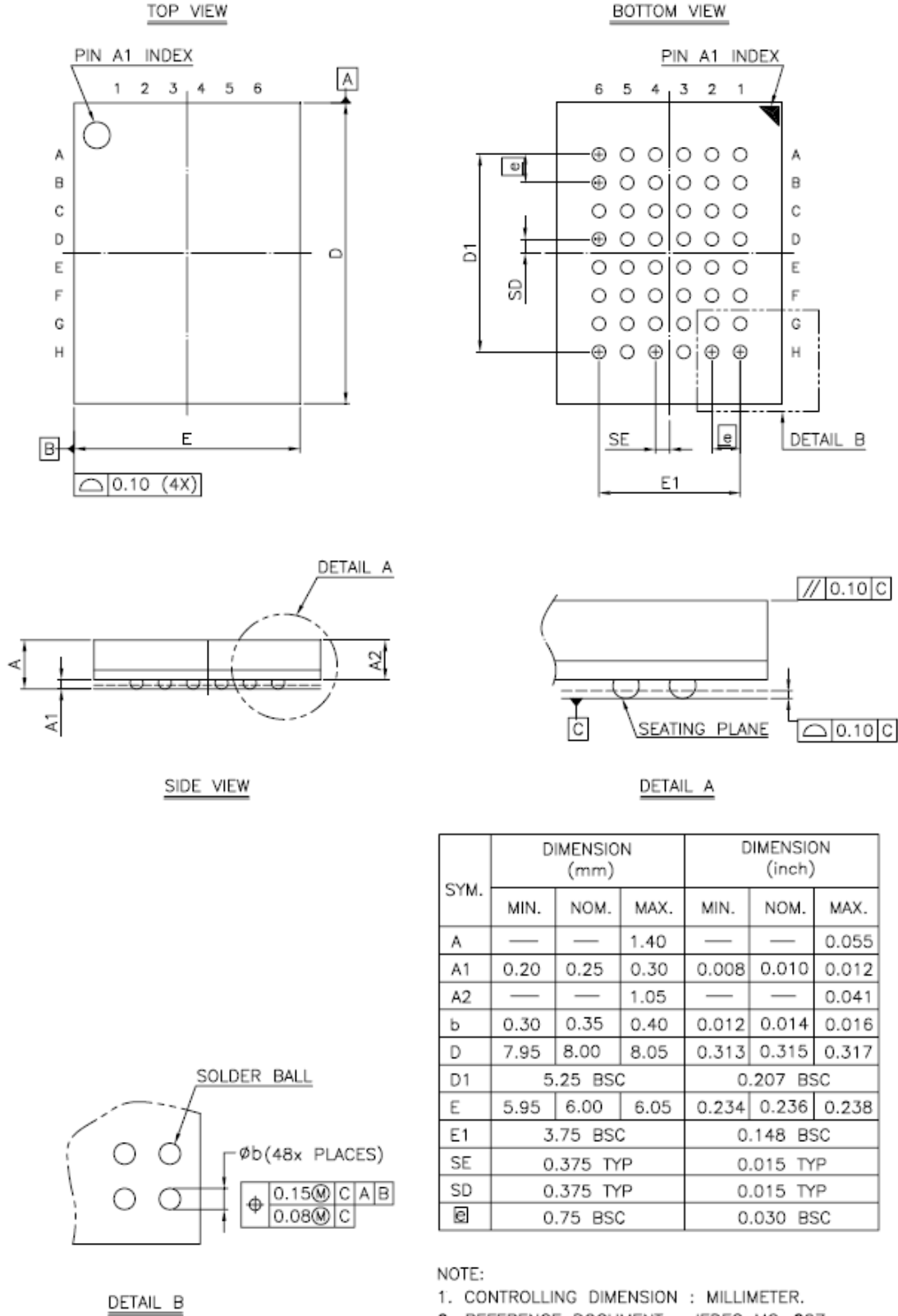
| SYMBOLS | MIN. | NOM. | MAX |
|---------|------------|-------|-------|
| A | - | - | 1.20 |
| A1 | 0.05 | - | 0.15 |
| A2 | 0.95 | 1.00 | 1.05 |
| b | 0.17 | 0.22 | 0.27 |
| c | 0.10 | - | 0.21 |
| D | 19.80 | 20.00 | 20.20 |
| D1 | 18.30 | 18.40 | 18.50 |
| E | 11.90 | 12.00 | 12.10 |
| a | 0.50 BASIC | | |
| L | 0.50 | 0.60 | 0.70 |
| L1 | - | 0.80 | - |
| Y | - | - | 0.10 |
| θ | 0° | - | 5° |

NOTES:

1. JEDEC OUTLINE : MO-142 DD
2. PROFILE TOLERANCE ZONES FOR D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION ON E IS 0.15mm PER SIDE AND ON D1 IS 0.25mm PER SIDE.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08mm TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT.



48-ball 6mm x 8mm TFBGA Package Outline Dimension





ORDERING INFORMATION

LY6251316 U V - WW XX Y Z

- Z** : Packing Type
Blank : Tube or Tray
T : Tape Reel
- Y** : Temperature Range
Blank : (Commercial) 0°C ~ 70°C
E : (Extended) -20°C ~ +80°C
I : (Industrial) -40°C ~ +85°C
- XX** : Power Type
LL : Ultra Low Power
- WW** : Access Time(Speed)
- V** : Lead Information
L : Green Package
- U** : Package Type
L : 48-pin 12 mm x 20 mm TSOP-I
G : 48-ball 6 mm x 8 mm TFBGA



Lyontek Inc.

LY6251316

Rev. 0.3

512K X 16 BIT LOW POWER CMOS SRAM

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