REVISION HISTORY

Revision	Description	Issue Date
Rev. 0.1	Initial Issued	May.19. 2016
Rev. 0.2	Revised the address bit length from 32 bits to 24 bits	Oct.13. 2016

Lyontek Inc.

LY68S6400

Rev. 0.2

64M Bits Serial Pseudo-SRAM with SPI and QPI

FEATURES

- SPI compatible bus interface
  - -Clock rate:
    - 33MHz(max) for normal read
    - 100MHz(max) for fast read
  - -Mode: SPI/QPI
- **Low power consumption:**
  Operating current:
  - 30mA(MAX./SPI@33MHz)
  - 60mA(MAX./QPI@100MHz)
- Single 1.8V power supply
- Unlimited read/write cycle
- Fast write time as minimum cycle time
- 8M x 8-bit organization
  - -1K byte per page
- High Reliability
- **Green package available**
- Package : 8-pin 150 mil SOP

GENERAL DESCRIPTION

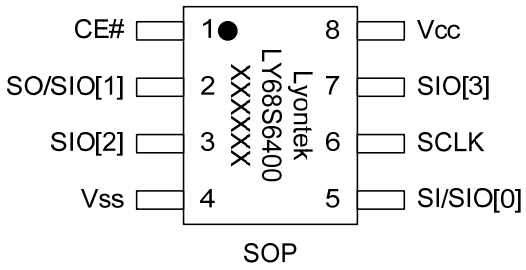
The LY68S6400 is a 64M-bit serial pseudo SRAM device organized as 8Mx8 bits. It is fabricated using very high performance, high reliability CMOS technology.

The LY68S6400 is accessed via a simple Serial Peripheral Interface(SPI) compatible serial bus. Additionally, Quad Peripheral Interface(QPI) is supported if your application needs faster data rates. This device also supports unlimited reads and writes to the memory array.

The LY68S6400 operates from a single power supply of 1.8V and can offer high data bandwidth at 100MHz clock rate and Serial Quad interface.

The LY68S6400 offers 8-lead SOP package.

PIN CONFIGURATION



SOP

PIN DESCRIPTION

SYMBOL	SPI MODE	SQI MODE
SI/SIOI[0]	Serial Input	Serial I/O[0]
SO/SIO[1]	Serial Output	Serial I/O[1]
SIO[2]	-	Serial I/O[2]
SIO[3]	-	Serial I/O[3]
CE#	Chip Select Input	
SCLK	Clock Signal Input	
V_{CC}	Power Supply	
V_{SS}	Ground	

ABSOLUTE MAXIMUN RATINGS*

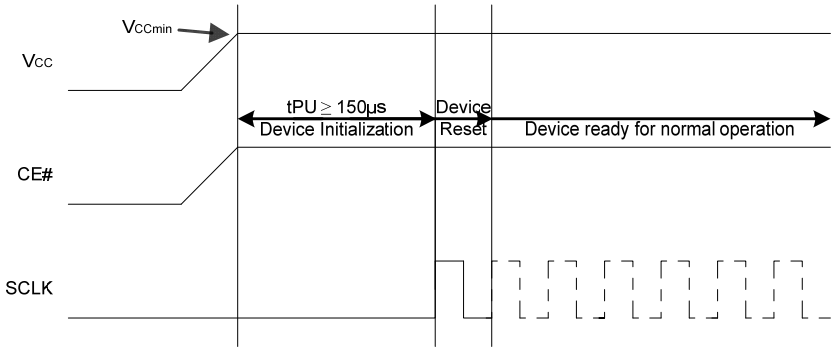
PARAMETER	SYMBOL	RATING	UNIT
Voltage on V_{CC} relative to V_{SS}	V_{T1}	-0.5 to 2.3	V
Voltage on any other pin relative to V_{SS}	V_{T2}	-0.5 to V_{CC}+0.5	V
Operating Temperature	T_A	-25 to 85	℃
Storage Temperature	T_{STG}	-65 to 150	℃

*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.

POWER-UP INITIALIZATION

The LY68S6400 includes an on-chip voltage sensor used to start the self-initialization process. When V_{CC} reaches a stable level at or above minimum V_{CC}, the device will require 150µs to complete its self-initialization process. From the beginning of power ramp to the end of the 150µs period, SCLK should remain LOW, CE# should remain HIGH(track V_{CC} within 200mV) and SI/SO/SIO[3:0] should remain LOW.

After the 150µs period, the device requires at least one clock during CE# high to properly reset the device, and then the device is ready for normal opearion.



Command/Address Latching Truth Table

		SPI Mode					QPI Mode				
Command	**Code**	**Cmd**	**Addr**	**Wait Cycle**	**DIO**	**Max Freq.**	**Cmd**	**Addr**	**Wait Cycle**	**DIO**	**Max Freq.**
Read	03h	S	S	0	S	33	N/A				
Fast Read	0Bh	S	S	8	S	100	N/A				
Quad Read	EBh	S	Q	6	Q	100	Q	Q	6	Q	100
Write	02h	S	S	0	S	100	Q	Q	0	Q	100
Quad Write	38h	S	Q	0	Q	100	Q	Q	0	Q	100
Enter QPI Mode	35h	S	-	-	-	100	N/A				
Exit QPI Mode	F5h	N/A					Q	-	-	-	100

Note: S = Serial IO, Q = Quad IO

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		MIN.	TYP. *1	MAX.	UNIT
Supply Voltage	V_{CC}			1.65	1.8	1.95	V
Input High Voltage	V_{IH}			Vcc-0.4	-	V_{CC}+0.2	V
Input Low Voltage	V_{IL}			- 0.2	-	0.4	V
Input Leakage Current	I_{LI}	$V_{CC} \geqq V_{IN} \geqq V_{SS}$		- 1	-	1	µA
Output Leakage Current	I_{LO}	$V_{CC} \geqq V_{OUT} \geqq V_{SS}$, Output Disabled		- 1	-	1	µA
Output High Voltage	V_{OH}	I_{OH} = -0.2mA		0.8*Vcc	-	-	V
Output Low Voltage	V_{OL}	I_{OL} = +0.2mA		-	-	0.2*Vcc	V
Average Operating Power Supply Current	I_{CC1}	CE# ≦0.2, Others at 0.2V or Vcc-0.2V $I_{I/O}$ = 0mA;f=max	SPI@33MHz	-	6	15	mA
			QPI@100MHz	-	20	30	mA
Standby Power Supply Current	I_{SB1}	CE# ≧V_{CC} - 0.2V, Others at 0.2V or V_{CC} - 0.2V		-	-	200	µA

Notes:
1. Typical values are included for reference only and are not guaranteed or tested.
   Typical valued are measured at V_{CC} = V_{CC}(TYP.) and T_A = 25℃

CAPACITANCE (T_A = 25℃, 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 Vcc-0.2V
Input Rise and Fall Times	1.5ns
Input and Output Timing Reference Levels	$V_{CC}/2$
Output Load	C_L = 30pF + 1TTL, I_{OH}/I_{OL} = -0.2mA/+0.2mA

AC ELECTRICAL CHARACTERISTICS

PARAMETER	SYM.	LY68S6400		UNIT
		MIN.	MAX.	
Clock Cycle Time	$t_{CLK@33MHz}$	30	-	ns
	$t_{CLK@100MHz}$	10	-	ns
Clock low width	t_{CL}	0.45	0.55	t_{CLK}
Clock high width	t_{CH}	0.45	0.55	t_{CLK}
Clock rise time	t_R	-	1.5	ns
Clock fall time	t_F	-	1.5	ns
CE# setup time to CLK rising edge	t_{CSP}	2.5	-	ns
Setup time to active CLK edge	t_S	2.5	-	ns
Hold time from active CLK edge	t_H	2	-	ns
Chip disable to DQ output high-Z	t_{HZ}	-	7	ns
CLK falling to output valid	t_{ACLK}	-	7	ns
Output Hold from Clock falling	t_{OH}	1.5	-	ns
CE# low pulse width	t_{CEM}	-	5	us

SPI MODE OPERATIONS

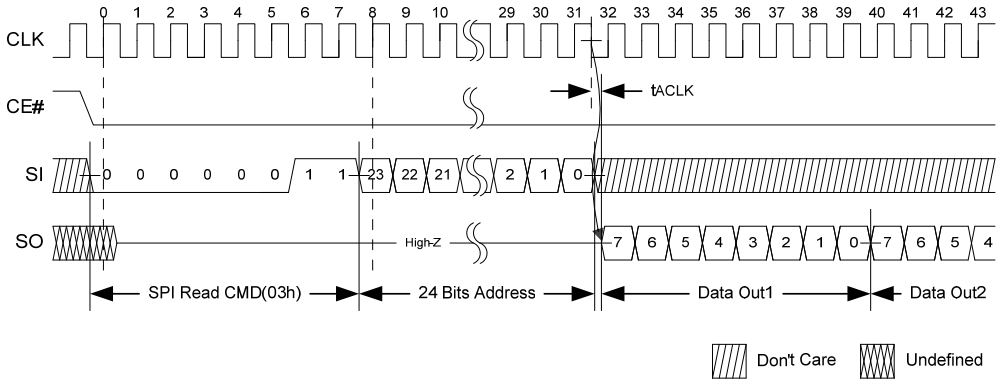
The device powers up into SPI mode by default, but can also be switched into QPI mode.

1. SPI Mode : Read Operations

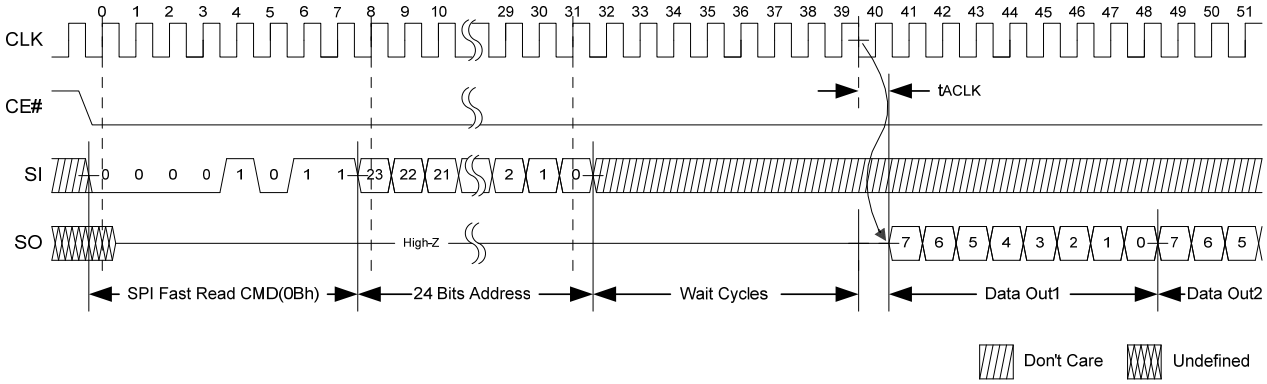
For all reads, data will be available t_{ACLK} after the falling edge of CLK.

SPI Reads can be done in three ways:
1.1. 03h : Serial CMD, Serial IO, slow frequency
1.2. 0Bh : Serial CMD, Serial IO, fast frequency
1.3 EBh : Serial CMD, Quad IO, fast frequency

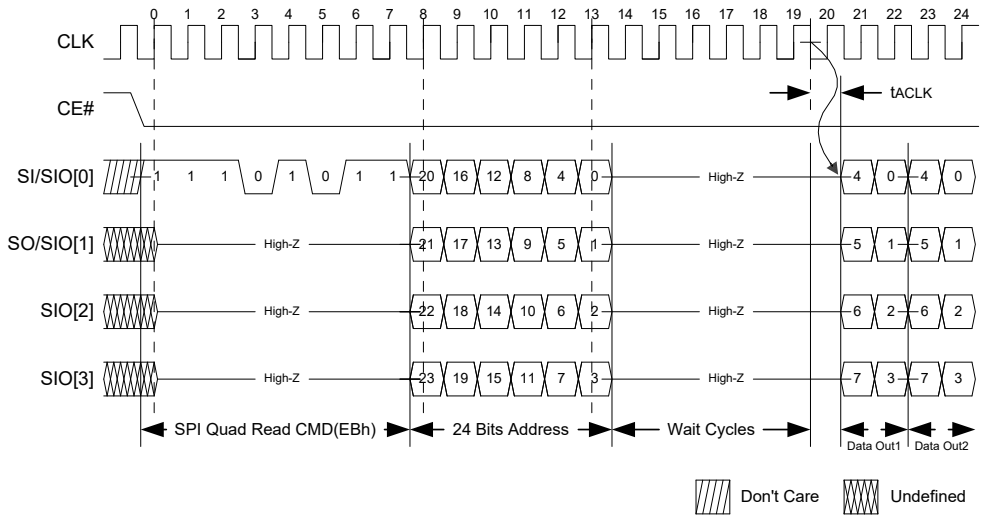
1.1 SPI Read(03h)



1.2 SPI Fast Read(0Bh)



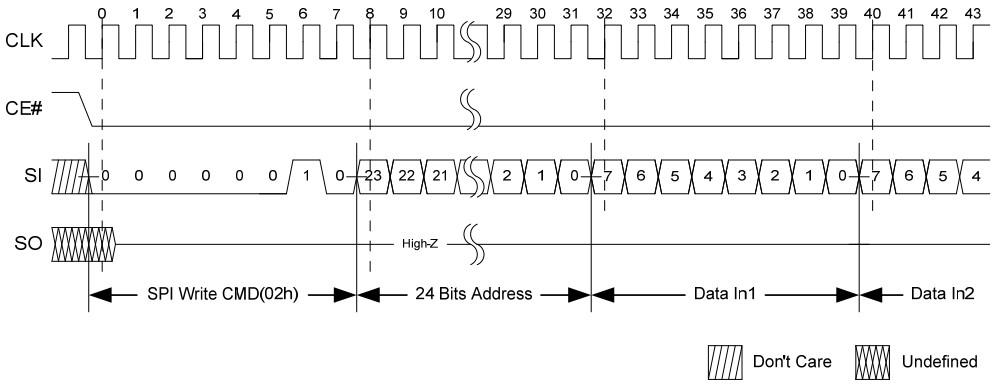
1.3 SPI Quad Read(EBh)



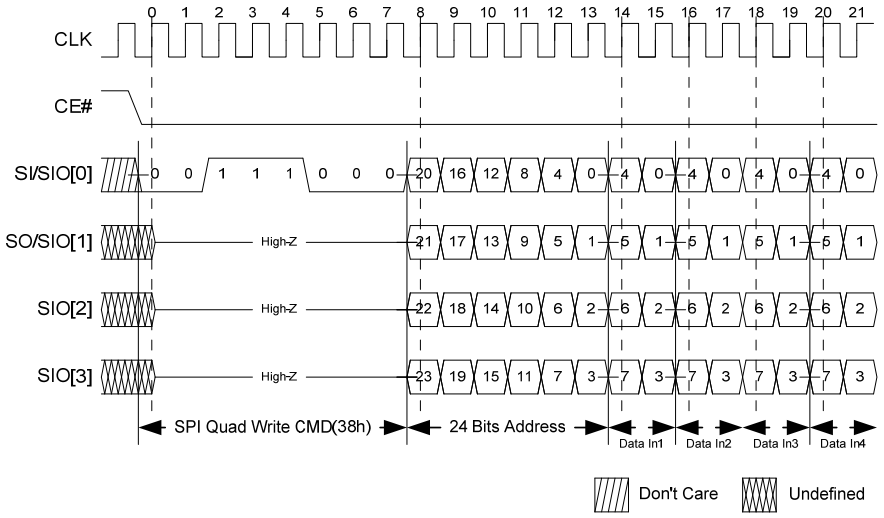
2. SPI Mode : Write Operations

SPI Writes can be done in two ways:
2.1 02h : Serial CMD, Serial IO, slow frequency
2.1 38h : Serial CMD, Quad IO, fast frequency

2.1 SPI Write(02h)

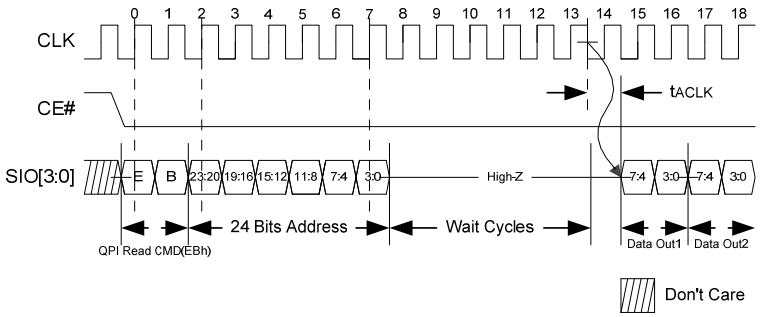


2.2 SPI Quad Write(38h)

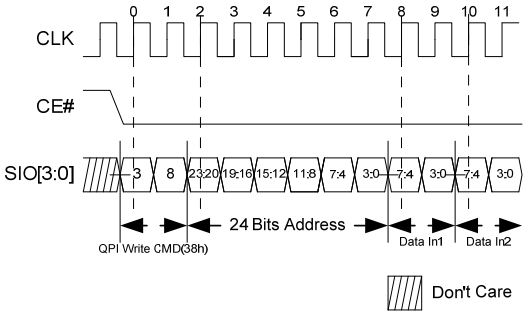


QPI MODE OPERATIONS

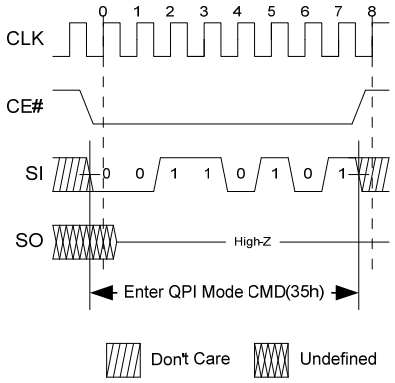
3. QPI Mode : Read Operations (EBh)



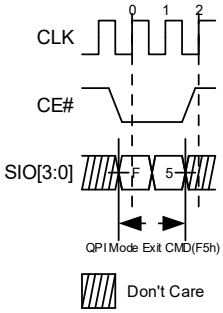
4. QPI Mode : Write Operations(38h or 02h)



5. QPI Mode : Enable Operation(35h)

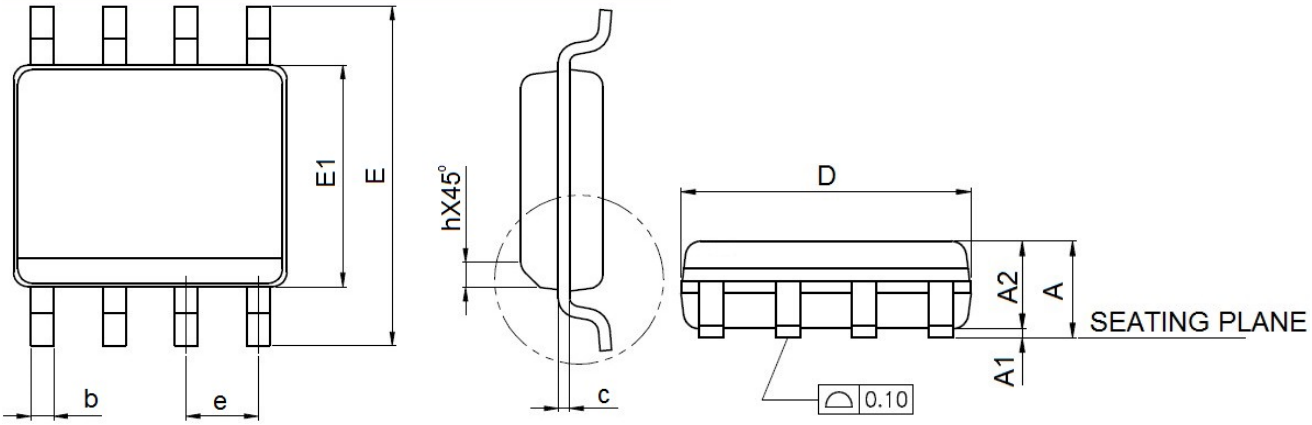


6. QPI Mode : Quit Operation(F5h)



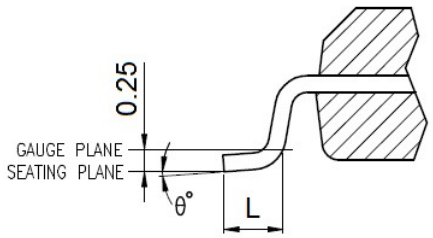
PACKAGE OUTLINE DIMENSION

8-pin 150mil SOP Package Outline Dimension



VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	STANDARD	
	MIN.	MAX.
A	—	1.75
A1	0.10	0.25
A2	1.25	—
b	0.31	0.51
c	0.10	0.25
D	4.90 BSC	
E	6.00 BSC	
E1	3.90 BSC	
e	1.27 BSC	
L	0.40	1.27
h	0.25	0.50
θ°	0	8



NOTES:
1. JEDEC OUTLINE : MS-012 AA REV.F (STANDARD)
   MS-012 BA REV.F (THERMAL)
2. DIMENSIONS "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.15mm. PER SIDE.
3. DIMENSIONS "E1" DOES NOT INCLUDE INTER-LEAD FLASH, OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.25mm PER SIDE.

ORDERING INFORMATION

Package Type	Maximum Clock Rate(MHz)	Temperature Range(℃)	Packing Type	Lyontek Item No.
8-Pin 150mil SOP	100	-25℃~85℃	Tube	LY68S6400SL
			Tape Reel	LY68S6400SLT

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