MR37V12841A

128M × 1–Bit Serial Production Programmed ROM (P2ROM)

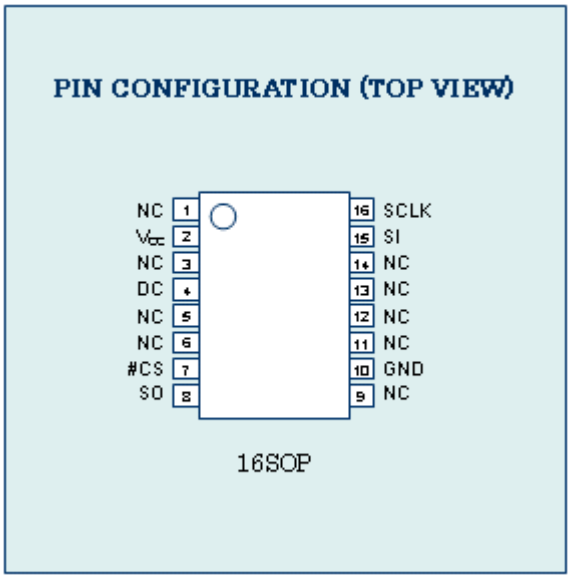
GENERAL DESCRIPTION

The MR37V12841A is a 128Mbit Production Programmed Read-Only Memory, which is configured as 134,217,728word × 1-bit. The MR37V12841A supports a simple read operation using a single 3.3V power supply and a Serial Peripheral Interface (SPI) compatible serial bus.
The MR37V12841A have data programmed and have functions tested at LAPIS Semiconductor factory. (Using the DC pins for the programming function is NOT allowed)

FEATURES

·Read Operation
- +3.3 V power supply
- 134,217,728 × 1-bit
- Access time: 33MHz serial clock (FAST-READ)
- 20MHz serial clock (READ)
- Read Identification Instruction
- Active read current: 30mA(FAST-READ)
- 20mA(READ)
- Standby current : 50 µA
- Serial Clock Input and Data Input/Output
- Input Data Format :

1-byte Command code, 3-byte address, 1-byte dummy (FAST-READ)
1-byte Command code, 3-byte address (READ)



PACKAGES

· MR37V12841A-xxxMP
- 16-pin plastic SOP (P-SOP16-375-1.27-K)

PIN DESCRIPTIONS

Pin name	Functions under Read Operation
#CS	Chip Select
SI	Serial Data Input
SO	Serial Data Output
SCLK	Clock Input
V_{CC}	Power supply voltage
GND	Ground
DC	Don't care (0v - Vcc) <for reference> Program power supply voltage Vpp under Programming operation
NC	Non connection

READ COMMAND DEFINITION

Command	Read Array (byte)	Note
1st	03[H]	1
2nd	AD1	2
3rd	AD2	2
4th	AD3	2
Action	N byte read out until #CS goes high	3

Note:
1. The 1st command 03[H] is a Read command
2. AD1 to AD3 are address input data
3. Data output

Details of command and address are shown as follows.

1-byte command code								
READ	0	0	0	0	0	0	1	1
3-byte address								
AD1:	A23	A22	A21	A20	A19	A18	A17	A16
AD2:	A15	A14	A13	A12	A11	A10	A9	A8
AD3:	A7	A6	A5	A4	A3	A2	A1	A0

FAST READ COMMAND DEFINITION

Command	Read Array (byte)	Note
1st	0B[H]	1
2nd	AD1	2
3rd	AD2	2
4th	AD3	2
5th	X	3
Action	N byte read out until #CS goes high	4

Note:
1. The 1st command 0B[H] is a Read command
2. AD1 to AD3 are address input data
3. X is a dummy cycle
4. Data output

Details of command and address are shown as follows.

1-byte command code								
FAST-READ	0	0	0	0	1	0	1	1
3-byte address								
AD1:	A23	A22	A21	A20	A19	A18	A17	A16
AD2:	A15	A14	A13	A12	A11	A10	A9	A8
AD3:	A7	A6	A5	A4	A3	A2	A1	A0

READ IDENTIFICATION COMMAND DEFINITION

Command	Read Array (byte)	Note
1st	9F[H]	1
Action	3 byte read out	2

Note:
1. The 1st command 9F[H] is a Read Identification command
2. Identification output

Details of command and address are shown as follows.

1-byte command code								
RDID	1	0	0	1	1	1	1	1

IDENTIFICATION DEFINITION

Manufacturer Identification	Device Identification	
	Type	Capacity
AE[H]	41[H]	16[H]

DEVICE OPERATION

1. Command “03h” or “0Bh” makes this LSI become and keep active mode until next #CS High.
2. Incorrect command makes this LSI become and keep standby mode until next #CS Low. In standby mode, SO pin is High-Z.

COMMAND DESCRIPTION

1. Read Array
   This command consists of the 4-byte code. The 1st code is a command which decides if the device becomes standby or active mode. The 1st code “03h” activates the device. The 2nd code to the 4th code are address inputs.

2. Fast Read Array
   This command consists of the 5-byte code. The 1st code is a command which decides if the device becomes standby or active mode. The 1st code “0Bh”activates the device. The 2nd code to the 4th code are address. The 5th code is a dummy cycle.

3. Identification Read Array
   This command consists of the 1-byte code. The 1st code is a command which decides if the device becomes standby or active mode. The 1st code “9Fh”activates the device.

4. Standby
   When #CS is high, the device is put in standby mode at the next rising edge of SCLK. Maximum standby current is 10uA. When the above-mentioned 1st code is incorrect command, the device is put in standby mode at the next rising edge of SCLK.

DATA SEQUENCE

The data is serially sent out through SO pin, synchronized with the falling edge of SCLK. Meanwhile input data is also serially read in through SI pin, synchronized with the rising edge of SCLK. The bit sequence for both input and output data are bit7 (MSB) first, bit6, bit 5, …, and bit0(LSB).

ADDRESS SEQUENCE

The address assignment is described at the COMMAND DEFINITION on page 2, 3.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Value	Unit
Storage temperature	Tstg	—	–55 to 125	℃
Input voltage	V_I	relative to V_{SS}	–0.5 to V_{CC}+0.5	V
Output voltage	V_O		–0.5 to V_{CC}+0.5	V
Power supply voltage	V_{CC}		–0.5 to 5	V
Power dissipation per package	P_D	Ta = 25℃	1.0	W
Output short circuit current	I_{OS}	—	10	mA

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating temperature under bias	Ta	V_{CC} = 3.0 to 3.6 V	0	—	70	℃
V_{CC} power supply voltage	V_{CC}		3.0	—	3.6	V
Input “H” level	V_{IH}		2.4	—	V_{CC}+0.5*	V
Input “L” level	V_{IL}		–0.5**	—	0.6	V

Voltage is relative to V_{SS}.
* : Vcc+1.5V(Max.) when pulse width of positive overshoot is less than 10ns.
** : -1.5V(Min.) when pulse width of negative overshoot is less than 10ns.

PIN CAPACITANCE

(V_{CC} = 3.3 V, Ta = 25℃, f = 1 MHz)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	C_{IN1}	V_I = 0 V	—	—	8	pF
Output	C_{OUT}	V_O = 0 V	—	—	10	
DC	C_{DC}	V_I = 0 V	—	—	200	

ELECTRICAL CHARACTERISTICS

DC Characteristics

(V_{CC} = 3.0V-3.6V, Ta = 0 to 70℃)

parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I_{LI}	V_I = 0 to V_{CC}	—	—	10	μA
Output leakage current	I_{LO}	V_O = 0 to V_{CC}	—	—	10	μA
V_{CC} power supply current (Standby)	I_{SB1}	#CS = V_{CC}	—	—	50	μA
	I_{SB2}	#CS = V_{IH}	—	—	1	mA
V_{CC} power supply current (Read)	I_{CC1}	#CS = V_{IL} ,f = 20MHz SO= open	—	—	20	mA
V_{CC} power supply current (Fast Read)	$I_{CC1}F$	#CS = V_{IL} ,f = 33Hz SO= open	—	—	30	mA
Input “H” level	V_{IH}	—	2.4	—	V_{CC}+0.5*	V
Input “L” level	V_{IL}	—	–0.5**	—	0.6	V
Output “H” level	V_{OH}	I_{OH} = –100 μA	Vcc-0.2	—	—	V
Output “L” level	V_{OL}	I_{OL} = 500 μA	—	—	0.4	V

Voltage is relative to V_{SS}.

* : Vcc+1.5V(Max.) when pulse width of positive overshoot is less than 10ns.

** : -1.5V(Min.) when pulse width of negative overshoot is less than 10ns.

AC Characteristics

(tsclk=33MHz, V_{CC} = 3.0V-3.6V, Ta = 0 to 70℃)

Parameter	Symbol	Condition	Min.	Max.	Unit
Clock frequency	t_{SCLK}	—	—	33 *	MHz
Clock High time	t_{SKH}	—	11	—	ns
Clock Low time	t_{SKL}	—	11	—	ns
Clock Rise time	t_R	—	—	4	ns
Clock Fall time	t_F	—	—	4	ns
#CS Lead Clock Time	t_{CSA}	—	5	—	ns
#CS Setup Time	t_{CS}	—	5	—	ns
#CS Lag Clock Time	t_{CSB}	—	5	—	ns
#CS Hold Time	t_{CH}	—	5	—	ns
#CS High Time	t_{CSH}	—	100	—	ns
SI Setup Time	t_{DS}	—	2	—	ns
SI Hold Time	t_{DH}	—	10	—	ns
Access time	t_{AA}	—	—	8	ns
SO Hold Time	t_{DOH}	—	0	—	ns
SO Floating Time	t_{DOZ}	—	—	8	ns

(tsclk=20MHz V_{CC} = 3.0V-3.6V, Ta = 0 to 70℃)

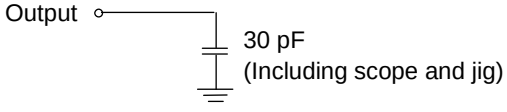
Parameter	Symbol	Condition	Min.	Max.	Unit
Clock frequency	t_{SCLK}	—	—	20 **	MHz
Clock High time	t_{SKH}	—	20	—	ns
Clock Low time	t_{SKL}	—	20	—	ns
Clock Rise time	t_R	—	—	5	ns
Clock Fall time	t_F	—	—	5	ns
#CS Lead Clock Time	t_{CSA}	—	10	—	ns
#CS Setup Time	t_{CS}	—	10	—	ns
#CS Lag Clock Time	t_{CSB}	—	5	—	ns
#CS Hold Time	t_{CH}	—	5	—	ns
#CS High Time	t_{CSH}	—	100	—	ns
SI Setup Time	t_{DS}	—	5	—	ns
SI Hold Time	t_{DH}	—	10	—	ns
Access time	t_{AA}	—	—	15	ns
SO Hold Time	t_{DOH}	—	0	—	ns
SO Floating Time	t_{DOZ}	—	—	10	ns

*: FAST-READ instructions
**: READ instructions

Measurement conditions

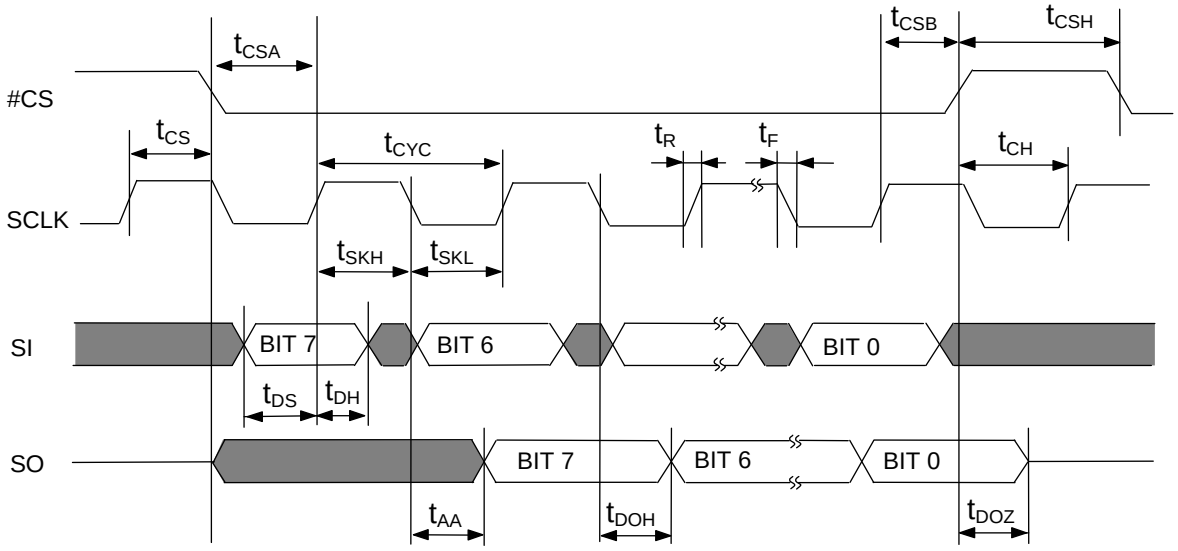
Input signal level	Vcc/0v
Input timing reference level	2.4V/ 0.6V
Output load	30 pF
Output timing reference level	0.5 Vcc

Output load

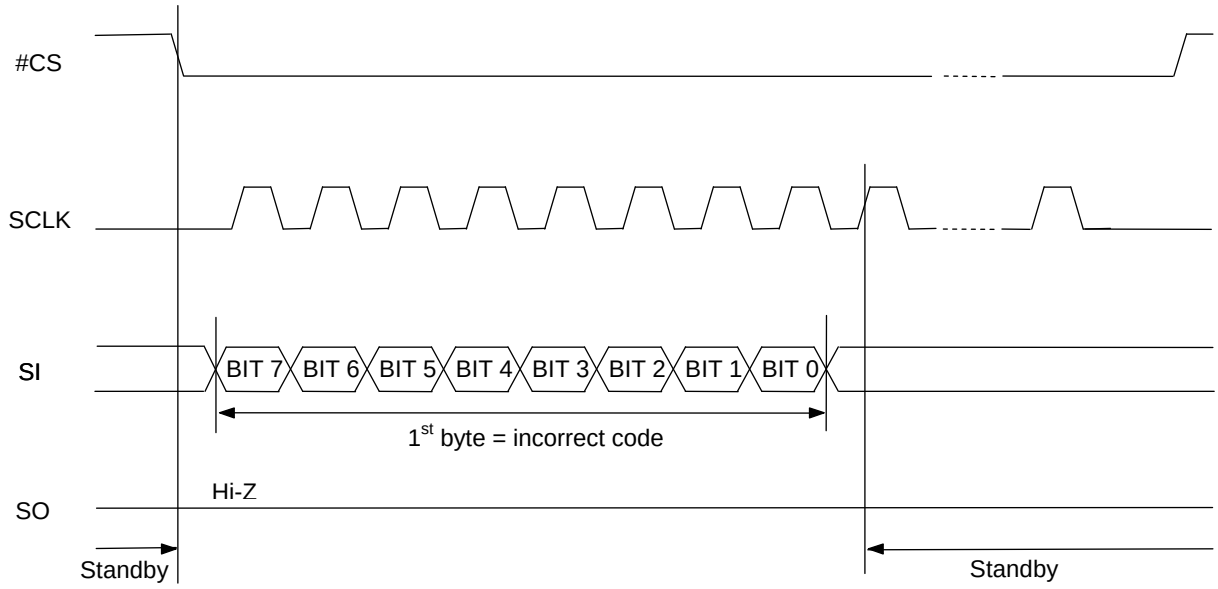


TIMING CHART (READ CYCLE)

Serial Data Input/Output Timing

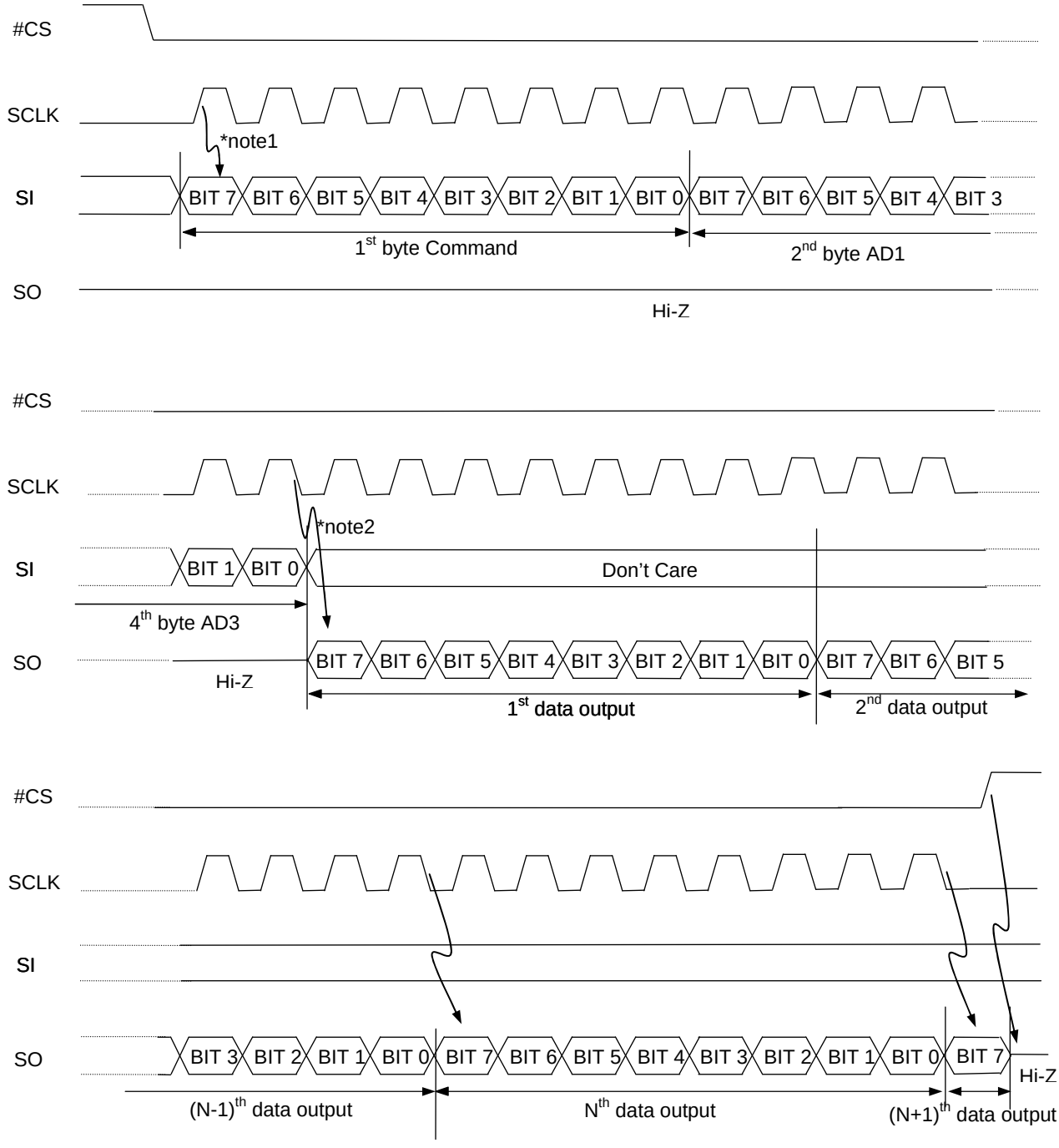


Standby Timing



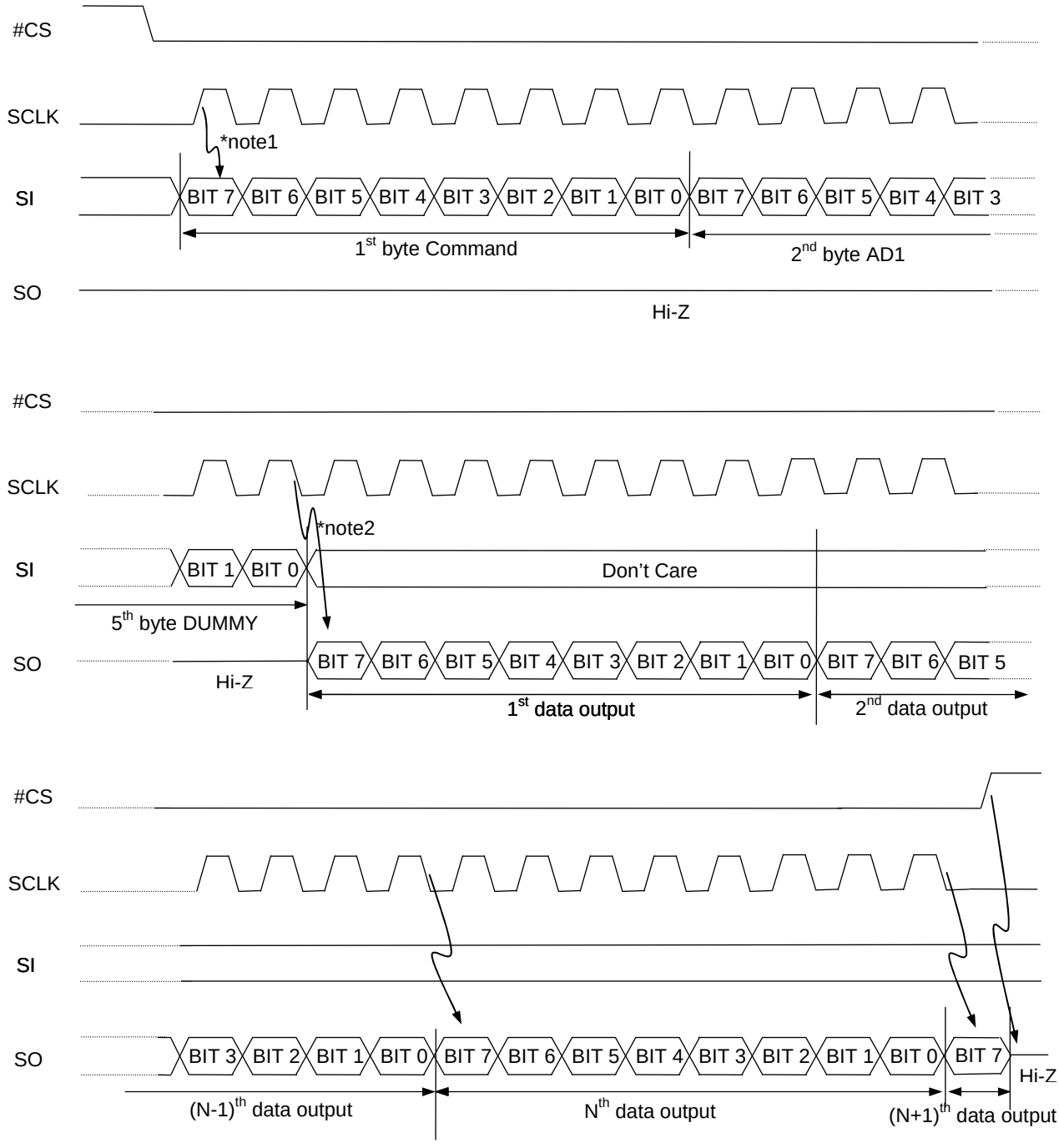
Incorrect command makes this LSI become and keep standby mode until next #CS rising edge. In standby mode, SO pin is High-Z.

Read Array Timing Waveform



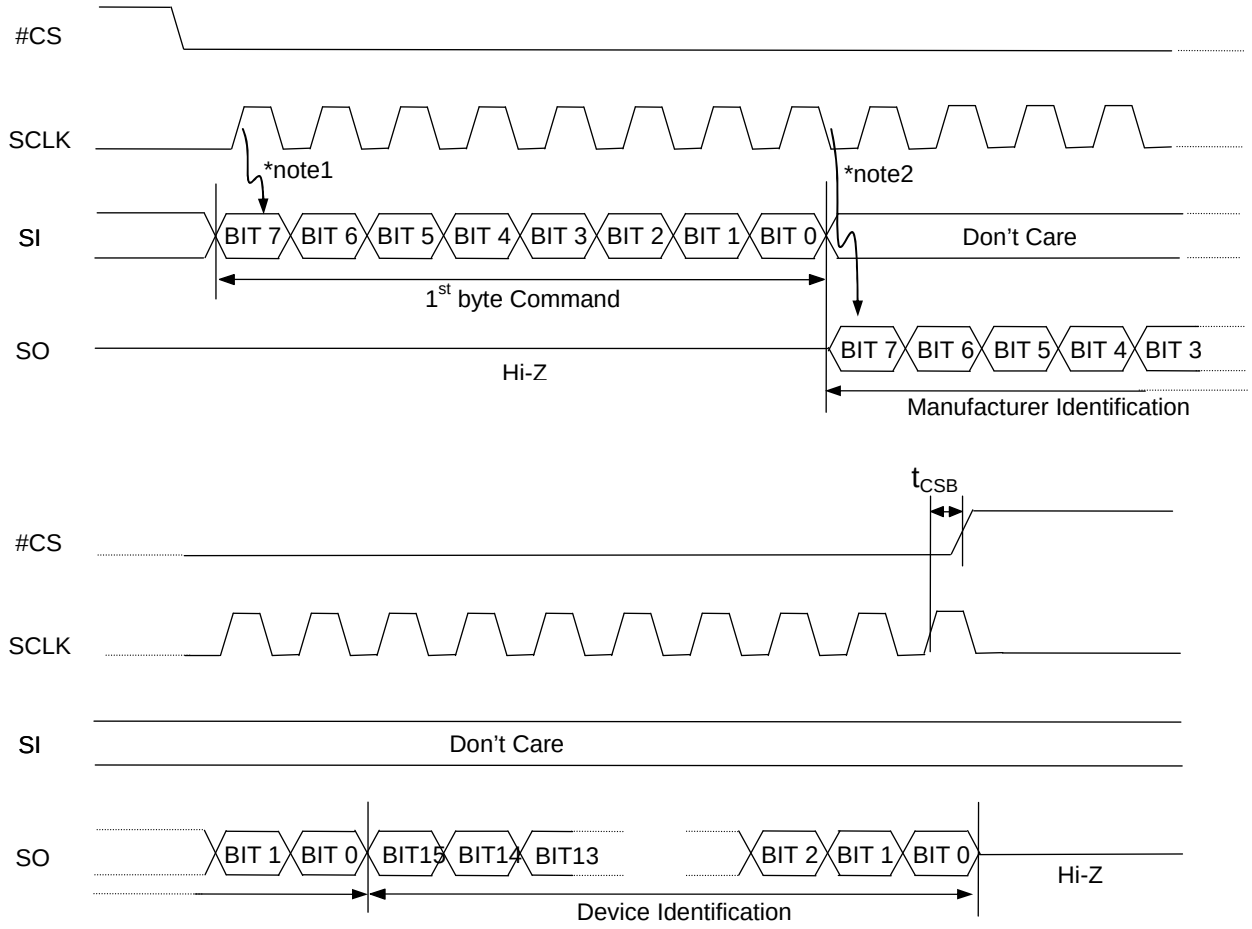
Note:
1. Input data are latched at SCLK-rising edge.
2. Data-output starts at SCLK-falling edge in bit0 of the 4th byte.

Fast Read Array Timing Waveform



Note:
1. Input data are latched at SCLK-rising edge.
2. Data-output starts at SCLK-falling edge in bit0 of the 5th byte.

Read Identification Timing Waveform

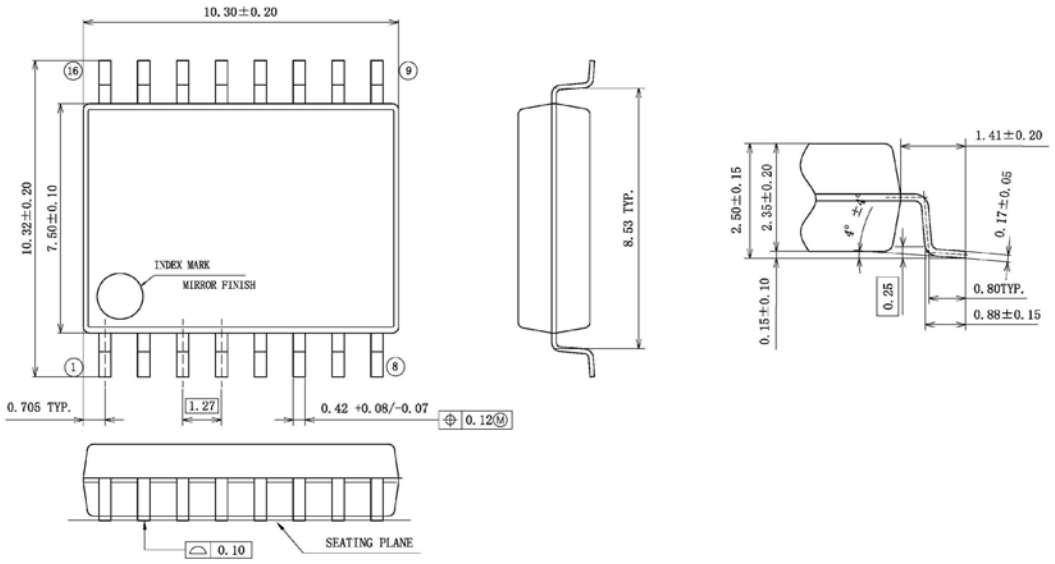


Note:
1. Input data are latched at SCLK-rising edge.
2. Data-output starts at SCLK-falling edge in bit0 of the 1st byte.

PACKAGE DIMENSIONS

(Unit: mm)

P-SOP16-375-1.27-K



Package material	Epoxy resin
Lead frame material	42 alloy
Lead finish	Sn-2Bi (Bi 2% typ.)
Pin treatment	Solder plating (≥5μm)
Package weight (g)	0.41 TYP.
Rev. No./Last Revised	1/Oct. 22, 2008

LAPIS Semiconductor Co.,Ltd.

Notes for Mounting the Surface Mount Type Package

The surface mount type packages are very susceptible to heat in reflow mounting and humidity absorbed in storage. Therefore, before you perform reflow mounting, contact ROHM's responsible sales person for the product name, package name, pin number, package code and desired mounting conditions (reflow method, temperature and times).

REVISION HISTORY

Document No.	Date	Page		Description
		Previous Edition	Current Edition	
FEDR37V12841A-02-01	Nov. 9, 2006	–	–	Final edition 1
FEDR37V12841A-02-02	Mar. 16, 2007	13	13	Replaced package diagram
FEDR37V12841A-002-02	Oct. 1, 2008	–	–	Changed company logo and name to OKI SEMICONDUCTOR

NOTICE

No copying or reproduction of this document, in part or in whole, is permitted without the consent of LAPIS Semiconductor Co., Ltd.

The content specified herein is subject to change for improvement without notice.

The content specified herein is for the purpose of introducing LAPIS Semiconductor's products (hereinafter "Products"). If you wish to use any such Product, please be sure to refer to the specifications, which can be obtained from LAPIS Semiconductor upon request.

Examples of application circuits, circuit constants and any other information contained herein illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

Great care was taken in ensuring the accuracy of the information specified in this document. However, should you incur any damage arising from any inaccuracy or misprint of such information, LAPIS Semiconductor shall bear no responsibility for such damage.

The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. LAPIS Semiconductor does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by LAPIS Semiconductor and other parties. LAPIS Semiconductor shall bear no responsibility whatsoever for any dispute arising from the use of such technical information.

The Products specified in this document are intended to be used with general-use electronic equipment or devices (such as audio visual equipment, office-automation equipment, communication devices, electronic appliances and amusement devices).

The Products specified in this document are not designed to be radiation tolerant.

While LAPIS Semiconductor always makes efforts to enhance the quality and reliability of its Products, a Product may fail or malfunction for a variety of reasons.

Please be sure to implement in your equipment using the Products safety measures to guard against the possibility of physical injury, fire or any other damage caused in the event of the failure of any Product, such as derating, redundancy, fire control and fail-safe designs. LAPIS Semiconductor shall bear no responsibility whatsoever for your use of any Product outside of the prescribed scope or not in accordance with the instruction manual.

The Products are not designed or manufactured to be used with any equipment, device or system which requires an extremely high level of reliability the failure or malfunction of which may result in a direct threat to human life or create a risk of human injury (such as a medical instrument, transportation equipment, aerospace machinery, nuclear-reactor controller, fuel-controller or other safety device). LAPIS Semiconductor shall bear no responsibility in any way for use of any of the Products for the above special purposes. If a Product is intended to be used for any such special purpose, please contact a ROHM sales representative before purchasing.

If you intend to export or ship overseas any Product or technology specified herein that may be controlled under the Foreign Exchange and the Foreign Trade Law, you will be required to obtain a license or permit under the Law.