◇ STRUCTURE Silicon Monolithic Integrated Circuit
◇ PRODUCT SPI BUS Serial EEPROMs
◇ SERIES ADVANTAGE SERIES
◇ FAMILY BR25□□0 family
◇ TYPE Supply voltage 1.8V～5.5V/Opreating temperature -40℃～+85℃type

◇ PART NUMBER BR25□□0-10□U-1.8

PART NUMBER	PACKAGE	DENSITY
BR25010N -10SU-1.8	8-lead JEDECSOIC	1Kbit
BR25020N -10SU-1.8		2Kbit
BR25040N -10SU-1.8		4Kbit
BR25080N -10SU-1.8		8Kbit
BR25160N -10SU-1.8		16Kbit
BR25320N -10SU-1.8		32Kbit
BR25010 -10TU-1.8	8-lead TSSOP	1Kbit
BR25020 -10TU-1.8		2Kbit
BR25040 -10TU-1.8		4Kbit
BR25080 -10TU-1.8		8Kbit
BR25160 -10TU-1.8		16Kbit

◇ FEATURES
SPI BUS interface
Endurance : 1,000,000 erase/write cycles
Data retention : 100 years
Intial Data: Memory array FFh

◇ ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min.	Max.	Unit
T_{STG}	Storage Temperature	-65	125	℃
V_{IN}	Input range	-0.3	V_{CC}+0.3	V
V_{CC}	Supply Voltage	-0.3	6.5	V

◇ POWER DISSIPATION (Ta=25℃)

PACKAGE	Rating	Unit
8-lead JEDEC SOIC	450 *1	mW
8-lead TSSOP	330 *2	mW

* Degradation is done at 4.5mW/℃(*1), 3.3mW/℃(*2)for operation above 25℃

◇ DC OPERATING CHARACTERISTICS

(BR25010/020/040, Unless otherwise specified, T_A=-40℃ to 85℃, VCC=+1.8V to +5.5V)

Palameter	Symbol	Specification			Units	Test Conditions	
		Min.	Typ.	Max.			
Supply Current	I_{CC1}	-	-	3.0	mA	Vcc=5.0V, f_{SCK}=1MHz, SO=Open, Read	
Supply Current	I_{CC2}	-	-	6.0	mA	Vcc=5.0V, f_{SCK}=2MHz, SO=Open, Read, Write	
Standby Current	I_{SB1}	-	-	1.0	μA	Vcc=1.8V,$\overline{CS}$=$\overline{HOLD}$=$\overline{WP}$=Vcc, SCK=SI=Vcc or GND, SO=OPEN	
Standby Current	I_{SB2}	-	-	5.0	μA	Vcc=2.7V,$\overline{CS}$=$\overline{HOLD}$=$\overline{WP}$=Vcc, SCK=SI=Vcc or GND, SO=OPEN	
Standby Current	I_{SB3}	-	-	10.0	μA	Vcc=5.0V,$\overline{CS}$=$\overline{HOLD}$=$\overline{WP}$=Vcc, SCK=SI=Vcc or GND, SO=OPEN	
Input Leakage	I_{LI}	-0.6	-	3.0	μA	V_{IN}=0V~Vcc	
Output Leakage	I_{LO}	-0.6	-	3.0	μA	V_{IN}=0V~Vcc, T_{AC}=0℃~70℃	
Input Low Voltage	V_{IL}	-	-	Vccx0.3	V	-	
Input High Voltage	V_{IH}	Vccx0.7	-	-	V	-	
Output Low Voltage	V_{OL1}	-	-	0.4	V	4.5V≦Vcc≦5.5V	I_{OL}=2.0mA
Output High Voltage	V_{OH1}	Vcc-0.8	-	-	V		I_{OH}=-1.0mA
Output Low Voltage	V_{OL2}	-	-	0.2	V	1.8V≦Vcc≦5.5V	I_{OL}=0.15mA
Output High Voltage	V_{OH2}	Vcc-0.2	-	-	V		I_{OH}=-100μA

◇ DC OPERATING CHARACTERISTICS

(BR25080/160/320, Unless otherwise specified, T_A=-40℃ to 85℃, VCC=+1.8V to +5.5V)

Palameter	Symbol	Specification			Units	Test Conditions	
		Min.	Typ.	Max.			
Supply Current	I_{CC1}	-	-	3.0	mA	Vcc=5.0V, f_{SCK}=1MHz, SO=Open, Read	
Supply Current	I_{CC2}	-	-	5.0	mA	Vcc=5.0V, f_{SCK}=2MHz, SO=Open, Read, Write	
Standby Current	I_{SB1}	-	0.1	1.0	μA	Vcc=1.8V,$\overline{CS}$=$\overline{HOLD}$=$\overline{WP}$=Vcc, SCK=SI=Vcc or GND, SO=OPEN	
Standby Current	I_{SB2}	-	0.2	2.0	μA	Vcc=2.7V,$\overline{CS}$=$\overline{HOLD}$=$\overline{WP}$=Vcc, SCK=SI=Vcc or GND, SO=OPEN	
Standby Current	I_{SB3}	-	2.0	5.0	μA	Vcc=5.0V,$\overline{CS}$=$\overline{HOLD}$=$\overline{WP}$=Vcc, SCK=SI=Vcc or GND, SO=OPEN	
Input Leakage	I_{LI}	-3.0	-	3.0	μA	V_{IN}=0V~Vcc	
Output Leakage	I_{LO}	-3.0	-	3.0	μA	V_{IN}=0V~Vcc, T_{AC}=0℃~70℃	
Input Low Voltage	V_{IL}	-	-	Vccx0.3	V	-	
Input High Voltage	V_{IH}	Vccx0.7	-	-	V	-	
Output Low Voltage	V_{OL1}	-	-	0.4	V	4.5V≦Vcc≦5.5V	I_{OL}=3.0mA
Output High Voltage	V_{OH1}	Vcc-0.8	-	-	V		I_{OH}=-1.6mA
Output Low Voltage	V_{OL2}	-	-	0.2	V	1.8V≦Vcc≦3.6V	I_{OL}=0.15mA
Output High Voltage	V_{OH2}	Vcc-0.2	-	-	V		I_{OH}=-100μA

◇ AC OPERATING CHARACTERISTICS

(BR25010/020/040, Unless otherwise specified, T_A=-40℃ to 85℃, VCC=+1.8V to +5.5V, C_L=100pF)

Parameter	Symbol	Specification			Unit	Test Condition
		Min.	Typ.	Max.		
SCK Clock Frequency	f_{SCK}	0	-	3.0	MHz	4.5V≦Vcc≦5.5V
		0	-	2.1		2.7V≦Vcc≦5.5V
		0	-	0.5		1.8V≦Vcc≦5.5V
Input Rise Time	t_{RI}	-	-	2	μs	4.5V≦Vcc≦5.5V
		-	-	2		2.7V≦Vcc≦5.5V
		-	-	2		1.8V≦Vcc≦5.5V
Input Fall Time	t_{FI}	-	-	2	μs	4.5V≦Vcc≦5.5V
		-	-	2		2.7V≦Vcc≦5.5V
		-	-	2		1.8V≦Vcc≦5.5V
SCK High Time	t_{WH}	133	-	-	ns	4.5V≦Vcc≦5.5V
		200	-	-		2.7V≦Vcc≦5.5V
		800	-	-		1.8V≦Vcc≦5.5V
SCK Low Time	t_{WL}	133	-	-	ns	4.5V≦Vcc≦5.5V
		200	-	-		2.7V≦Vcc≦5.5V
		800	-	-		1.8V≦Vcc≦5.5V
$\overline{CS}$ High Time	t_{CS}	250	-	-	ns	4.5V≦Vcc≦5.5V
		250	-	-		2.7V≦Vcc≦5.5V
		1000	-	-		1.8V≦Vcc≦5.5V
$\overline{CS}$ Setup Time	t_{CSS}	250	-	-	ns	4.5V≦Vcc≦5.5V
		250	-	-		2.7V≦Vcc≦5.5V
		1000	-	-		1.8V≦Vcc≦5.5V
$\overline{CS}$ Hold Time	t_{CSH}	250	-	-	ns	4.5V≦Vcc≦5.5V
		250	-	-		2.7V≦Vcc≦5.5V
		1000	-	-		1.8V≦Vcc≦5.5V
Data In Setup Time	t_{SU}	50	-	-	ns	4.5V≦Vcc≦5.5V
		50	-	-		2.7V≦Vcc≦5.5V
		100	-	-		1.8V≦Vcc≦5.5V
Data In Hold Time	t_H	50	-	-	ns	4.5V≦Vcc≦5.5V
		100	-	-		2.7V≦Vcc≦5.5V
		100	-	-		1.8V≦Vcc≦5.5V
$\overline{Hold}$ Setup Time	t_{HD}	100	-	-	ns	4.5V≦Vcc≦5.5V
		100	-	-		2.7V≦Vcc≦5.5V
		400	-	-		1.8V≦Vcc≦5.5V
$\overline{Hold}$ Hold Time	t_{CD}	200	-	-	ns	4.5V≦Vcc≦5.5V
		200	-	-		2.7V≦Vcc≦5.5V
		400	-	-		1.8V≦Vcc≦5.5V
Output Valid	t_V	0	-	133	ns	4.5V≦Vcc≦5.5V
		0	-	200		2.7V≦Vcc≦5.5V
		0	-	800		1.8V≦Vcc≦5.5V
Output Hold Time	t_{HO}	0	-	-	ns	4.5V≦Vcc≦5.5V
		0	-	-		2.7V≦Vcc≦5.5V
		0	-	-		1.8V≦Vcc≦5.5V
$\overline{Hold}$ to Output Low Z	t_{LZ}	0	-	100	ns	4.5V≦Vcc≦5.5V
		0	-	100		2.7V≦Vcc≦5.5V
		0	-	100		1.8V≦Vcc≦5.5V
$\overline{Hold}$ to Output High Z	t_{HZ}	-	-	100	ns	4.5V≦Vcc≦5.5V
		-	-	100		2.7V≦Vcc≦5.5V
		-	-	100		1.8V≦Vcc≦5.5V
Output Disable Time	t_{DIS}	-	-	250	ns	4.5V≦Vcc≦5.5V
		-	-	500		2.7V≦Vcc≦5.5V
		-	-	1000		1.8V≦Vcc≦5.5V
Write Cycle Time	t_{WC}	-	-	5	ms	4.5V≦Vcc≦5.5V
		-	-	10		2.7V≦Vcc≦5.5V
		-	-	20		1.8V≦Vcc≦5.5V
Endurance *1 5.0V, 25℃, Page Mode	-	1M	-	-	Write Cycles	-

*1 This parameter is characterized and is not 100% tested.

OThis product is not designed for protection against radioactive rays.

◇ AC OPERATING CHARACTERISTICS

(BR25080/160/320, Unless otherwise specified, T_A=-40℃ to 85℃, VCC=+1.8V to +5.5V, C_L=100pF)

Parameter	Symbol	Specification			Unit	Test Condition
		Min.	Typ.	Max.		
SCK Clock Frequency	f_{SCK}	0	-	3.0	MHz	4.5V≦Vcc≦5.5V
		0	-	2.1		2.7V≦Vcc≦5.5V
		0	-	0.5		1.8V≦Vcc≦5.5V
Input Rise Time	t_{RI}	-	-	2	μs	4.5V≦Vcc≦5.5V
		-	-	2		2.7V≦Vcc≦5.5V
		-	-	2		1.8V≦Vcc≦5.5V
Input Fall Time	t_{FI}	-	-	2	μs	4.5V≦Vcc≦5.5V
		-	-	2		2.7V≦Vcc≦5.5V
		-	-	2		1.8V≦Vcc≦5.5V
SCK High Time	t_{WH}	133	-	-	ns	4.5V≦Vcc≦5.5V
		200	-	-		2.7V≦Vcc≦5.5V
		800	-	-		1.8V≦Vcc≦5.5V
SCK Low Time	t_{WL}	133	-	-	ns	4.5V≦Vcc≦5.5V
		200	-	-		2.7V≦Vcc≦5.5V
		800	-	-		1.8V≦Vcc≦5.5V
$\overline{CS}$ High Time	t_{CS}	250	-	-	ns	4.5V≦Vcc≦5.5V
		250	-	-		2.7V≦Vcc≦5.5V
		1000	-	-		1.8V≦Vcc≦5.5V
$\overline{CS}$ Setup Time	t_{CSS}	250	-	-	ns	4.5V≦Vcc≦5.5V
		250	-	-		2.7V≦Vcc≦5.5V
		1000	-	-		1.8V≦Vcc≦5.5V
$\overline{CS}$ Hold Time	t_{CSH}	250	-	-	ns	4.5V≦Vcc≦5.5V
		250	-	-		2.7V≦Vcc≦5.5V
		1000	-	-		1.8V≦Vcc≦5.5V
Data In Setup Time	t_{SU}	50	-	-	ns	4.5V≦Vcc≦5.5V
		50	-	-		2.7V≦Vcc≦5.5V
		100	-	-		1.8V≦Vcc≦5.5V
Data In Hold Time	t_H	50	-	-	ns	4.5V≦Vcc≦5.5V
		50	-	-		2.7V≦Vcc≦5.5V
		100	-	-		1.8V≦Vcc≦5.5V
$\overline{Hold}$ Setup Time	t_{HD}	100	-	-	ns	4.5V≦Vcc≦5.5V
		100	-	-		2.7V≦Vcc≦5.5V
		400	-	-		1.8V≦Vcc≦5.5V
$\overline{Hold}$ Hold Time	t_{CD}	200	-	-	ns	4.5V≦Vcc≦5.5V
		200	-	-		2.7V≦Vcc≦5.5V
		400	-	-		1.8V≦Vcc≦5.5V
Output Valid	t_V	0	-	133	ns	4.5V≦Vcc≦5.5V
		0	-	200		2.7V≦Vcc≦5.5V
		0	-	800		1.8V≦Vcc≦5.5V
Output Hold Time	t_{HO}	0	-	-	ns	4.5V≦Vcc≦5.5V
		0	-	-		2.7V≦Vcc≦5.5V
		0	-	-		1.8V≦Vcc≦5.5V
$\overline{Hold}$ to Output Low Z	t_{LZ}	0	-	100	ns	4.5V≦Vcc≦5.5V
		0	-	100		2.7V≦Vcc≦5.5V
		0	-	100		1.8V≦Vcc≦5.5V
$\overline{Hold}$ to Output High Z	t_{HZ}	-	-	100	ns	4.5V≦Vcc≦5.5V
		-	-	100		2.7V≦Vcc≦5.5V
		-	-	100		1.8V≦Vcc≦5.5V
Output Disable Time	t_{DIS}	-	-	250	ns	4.5V≦Vcc≦5.5V
		-	-	250		2.7V≦Vcc≦5.5V
		-	-	1000		1.8V≦Vcc≦5.5V
Write Cycle Time	t_{WC}	-	-	5	ms	4.5V≦Vcc≦5.5V
		-	-	10		2.7V≦Vcc≦5.5V
		-	-	20		1.8V≦Vcc≦5.5V
Endurance *1 5.0V, 25℃, Page Mode	-	1M	-	-	Write Cycles	-

*1 This parameter is characterized and is not 100% tested.

◇ BLOCK DIAGRAM

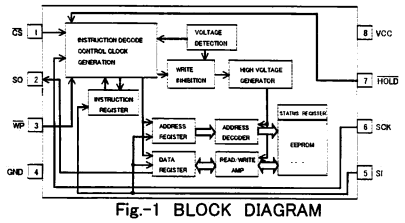


Fig.-1 BLOCK DIAGRAM

◇ PIN No., PIN NAME

PIN No.	PIN NAME
1	$\overline{CS}$
2	SO
3	$\overline{WP}$
4	GND
5	SI
6	SCK
7	$\overline{HOLD}$
8	VCC

◇NOTES FOR POWER SUPPLY

In order to prevent an inadvertent write, the device has the feature of P.O.R.
After the power is on, the device is in the write disable mode. P.O.R. works only during power up. The noise may force the device write enable mode with $\overline{CS}$="H"during power ON/OFF. In the case of power up, keep the following conditions to ensure to make the function of P.O.R.

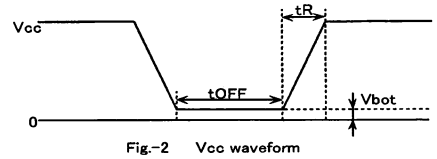


Fig.-2 Vcc waveform

◇RECOMMENDED CONDITIONS OF tR, tOFF, Vbot

tR	tOFF	Vbot
Below 10ms	Above 10ms	Below 0.3V
Below 100ms	Above 10ms	Below 0.2V

Please keep $\overline{CS}$ "H" during power ON/OFF.
The device is an active state during $\overline{CS}$ is low. The extraordinary function or data collaption may occur because of noise etc., if power-up is done with $\overline{CS}$ "L". In order to prevent above errors from happening, keep $\overline{CS}$ "H" (=Vcc) during power ON. (The device does not receive any command during $\overline{CS}$ is high.)
It may continue at low Vcc by capacitance of Vcc line during power off.
Please keep $\overline{CS}$ "H" during power off because of the device may make malfunction and inadvertent write.

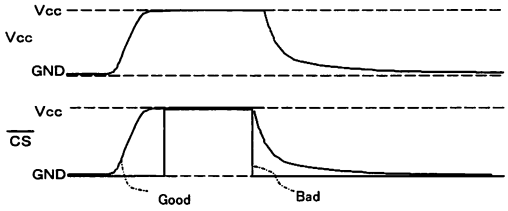


Fig.-3 $\overline{CS}$ TIMING DURING POWER ON/OFF

(Good example)
$\overline{CS}$ follows Vcc. ($\overline{CS}$ is pull up to Vcc)

(Bad example)
$\overline{CS}$ is low during power ON/OFF.
Please take more than 10ms between power ON and power OFF, or the internal circuit is not always reset.

◇CAUTIONS ON USE

(1) Absolute maximum ratings
If the absolute maximum ratings such as impressed voltage and action temperature range and so forth are exceeded, LSI may be destructed. Do not impress voltage and temperature exceeding the absolute maximum ratings. In the case of fear exceeding the absolute maximum ratings, take physical safety countermeasures such as fuses, and see to it that conditions exceeding the absolute maximum ratings should not be impressed to LSI.

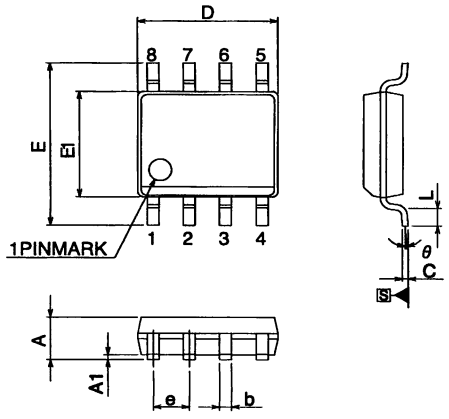
(2) GND electric potential
Set the voltage of GND terminal lowest at any action condition. Make sure that each terminal voltage is lower than that of GND terminal.

(3) Thermal design
In consideration of permissible loss in actual use condition, carry out heat design with sufficient margin.

(4) Terminal to terminal shortcircuit and wrong packaging
When to package LSI onto a board, pay sufficient attention to LSI direction and displacement. Wrong packaging may destruct LSI. And in the case of shortcircuit between LSI terminals and terminals and power source, terminal and GND owing to foreign matter, LSI may be destructed.

(5) Use in a strong electromagnetic field may cause malfunction, therefore, evaluated design sufficiently.

◇ PHYSICAL DIMENSION

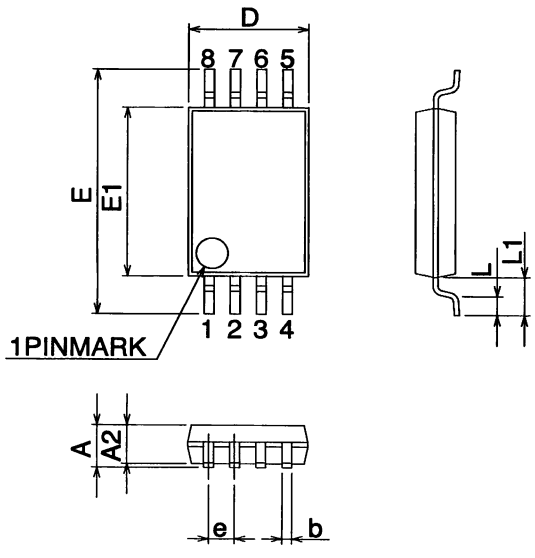


Notes
1.This drawing is subject to change without notice.
2.Body dimensions do not include mold flash or protrusion, or gate burns.
3.Reference JEDEC MS-012 variation AA.

Fig.-4 8-lead JEDEC SOIC Package Outline

◇ 8-lead JEDEC SOIC Package Size Data

Symbol	mm			inches		
	Typ.	Min.	Max	Typ.	Min.	Max
A	-	1.35	1.75	-	0.053	0.069
A1	-	0.10	0.25	-	0.004	0.010
b	-	0.31	0.51	-	0.012	0.020
c	-	0.17	0.25	-	0.007	0.010
D	-	4.80	5.00	-	0.189	0.197
e	1.27 BSC	-	-	0.050 BSC	-	-
E	-	5.79	6.20	-	0.228	0.244
E1	-	3.81	3.99	-	0.150	0.157
L	-	0.40	1.27	-	0.016	0.050
θ	-	0°	8°	-	0°	8°



Notes
1.This drawing is subject to change without notice.
2.Body dimensions do not include mold flash or protrusion, or gate burns.
3.Reference JEDEC MO-153.

Fig.-5 8-lead TSSOP Package Outline

◇ 8-lead TSSOP Package Size Data

Symbol	mm			inches		
	Typ.	Min.	Max	Typ.	Min.	Max
A	-	-	1.20	-	-	0.047
A2	1.00	0.80	1.05	0.039	0.031	0.041
b	-	0.19	0.30	-	0.007	0.012
D	3.00	2.90	3.10	0.118	0.114	0.122
e	0.65 BSC	-	-	0.025	-	-
E	6.40 BSC	-	-	0.252	-	-
E1	4.40	4.30	4.50	0.173	0.169	0.177
L	0.60	0.45	0.75	0.023	0.017	0.030
L1	1.00 BSC	-	-	0.039	-	-

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Shanghai	TEL : +86(21)6279-2727	FAX : +86(21)6247-2066
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Taiwan / Taipei	TEL : +866(2)2500-6956	FAX : +866(2)2503-2869
Korea / Seoul	TEL : +82(2)8182-700	FAX : +82(2)8182-715
Singapore	TEL : +65-6332-2322	FAX : +65-6332-5662
Malaysia / Kuala Lumpur	TEL : +60(3)7958-8355	FAX : +60(3)7958-8377
Philippines / Manila	TEL : +63(2)807-6872	FAX : +63(2)809-1422
Thailand / Bangkok	TEL : +66(2)254-4890	FAX : +66(2)256-6334

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(Internal Sales)

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(Contact address for overseas customers in Japan)

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Mouser Electronics

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