Power Management LSI Series for Automotive Body Control

LED Driver

BD8105FV

●Description

The BD8105FV is a serial parallel control LED driver with 35V input voltage rating.
Responding to the 3-line serial data, it turns the 12ch open drain output on/off.
Due to its compact size, it is optimal for small spaces.

●Features

1) Open Drain Output
2) 3-line Serial Control + Enable Signal
3) Internal Temperature Protection Circuit (TSD)
4) Cascade Connection Compatible
5) SSOP-B20W
6) Internal 12ch Power Transistor

●Applications

These ICs can be used with car and consumer electronic.

●Absolute Maximum Ratings (Ta=25℃)

Item	Symbol	Value	Unit
Power Supply Voltage	VCC	7	V
Output Voltage（Pin No : 4～9, 11～16）	VDmax	35	V
Input Voltage（Pin No : 1, 2, 3, 17, 18）	VIN	-0.3～VCC	V
Power Dissipation	Pd	1187*	mW
Operating Temperature Range	Topr	-40～+105	℃
Storage Temperature Range	Tstg	-55～+150	℃
Drive Current (DC)	IomaxD	50	mA
Drive Current（Pulse）	IomaxP	150**	mA
Junction Temperature	Tjmax	150	℃

* Pd decreased at 9.50mW/℃ for temperatures above Ta=25℃,mounted on 70×70×1.6mm Glass-epoxy PCB.
** Do not however exceed Pd. Time to impress≦200msec

Downloaded from Elcodis.com electronic components distributor

●Operational Conditions (Ta=-40~105℃)

Item	Symbol	Standard Value			Unit
		Min	Typ	Max	
Power Supply Voltage	Vcc	4.5	5	5.5	V
Drive Current	Io	-	20	40	mA

* This product is not designed for protection against radioactive rays.

●Electrical Characteristics (Unless specified, Ta=-40~105℃ Vcc=4.5～5.5V)

Item	Symbol	Standard Value			Unit	Conditions
		Min	Typ	Max		
【Output D0～D11】(Pin No : 4～9, 11～16)						
ON Resistor	RON	-	6	12	Ω	ID=20mA
Output leakage current	IDL	-	0	5	uA	VD=34V
【Logic input】(Pin No : 1, 2, 3, 17, 18)						
Upper limit threshold voltage	VTH	Vcc ×0.8	-	-	V	
Bottom limit threshold voltage	VTL	-	-	Vcc ×0.2	V	
Serial clock frequency	FCLK	-	-	1	MHz	
Input Current	IIN	20	50	100	uA	VIN=5V
Input leakage Current	IINL	-	0	5	uA	VIN=0V
【WHOLE】						
Circuit Current	ICC	-	0.3	5	mA	Serial Data Input, VCC=5V,CLK=500KHz, SEROUT=OPEN
Static Current	ISTN	-	0	50	uA	RST_B=OPEN, SEROUT=OPEN
【SER OUT】(Pin No. : 20)						
Output Voltage high	VOH	4.6	4.8	-	V	VCC=5V, ISO=-5mA
Output voltage Low	VOL	-	0.2	0.4	V	VCC=5V, ISO=5mA

* This product is not designed for protection against radioactive rays.

Downloaded from Elcodis.com electronic components distributor

●Electrical Characteristic Diagrams (Unless otherwise specified Ta=25℃)

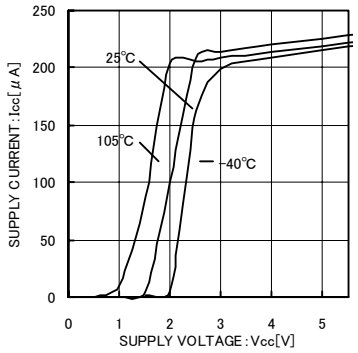


Fig.1 Circuit current 1

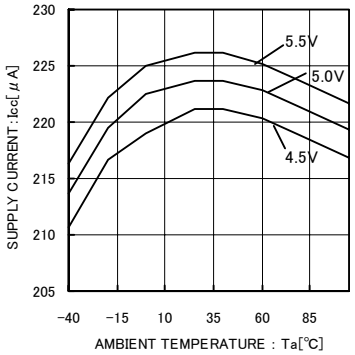


Fig.2 Circuit current 2

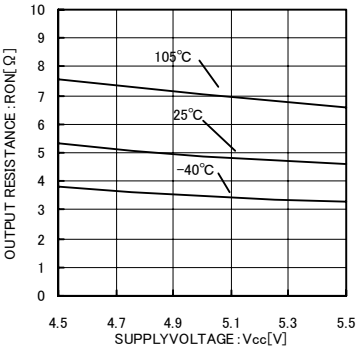


Fig.3 Dxx on resistance 1
(at IDD=20mA)

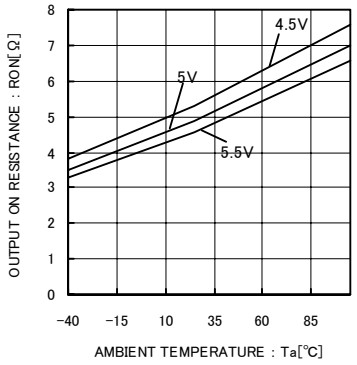


Fig.4 Dxx on resistance 2
(at IDD=20mA)

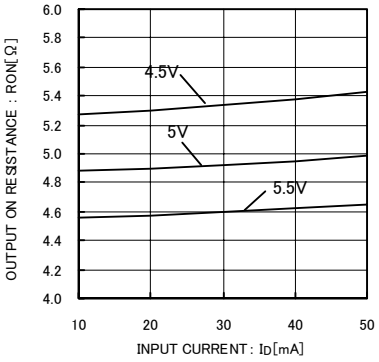


Fig.5 Dxx on resistance

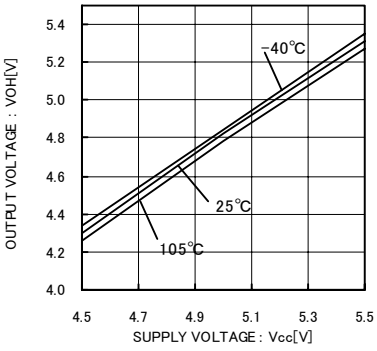


Fig.6 SEROUT high side voltage 1
(at ISO=-5mA)

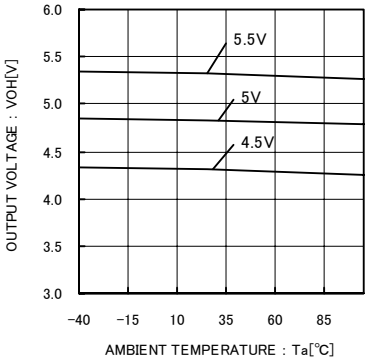


Fig.7 SEROUT high side voltage 2
(at ISO=-5mA)

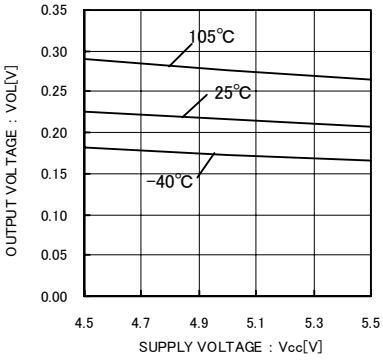


Fig.8 SEROUT low side voltage 1
(at ISO=5mA)

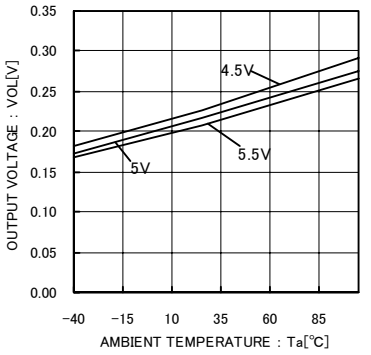


Fig.9 SEROUT low side voltage 2
(at ISO=5mA)

Downloaded from Elcodis.com electronic components distributor

●Block Diagram

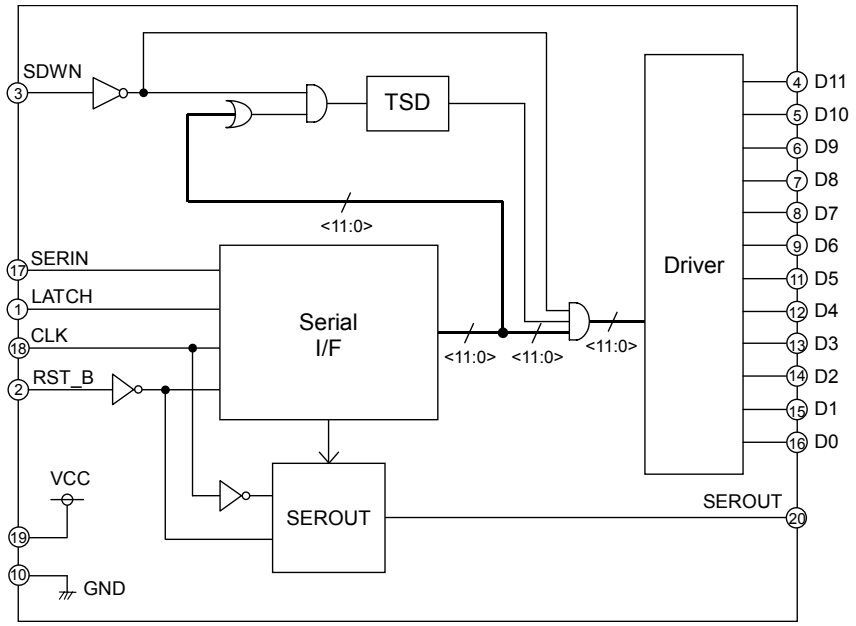


Fig.10

●Pin Setup Diagram
BD8105FV（SSOP-B20W）

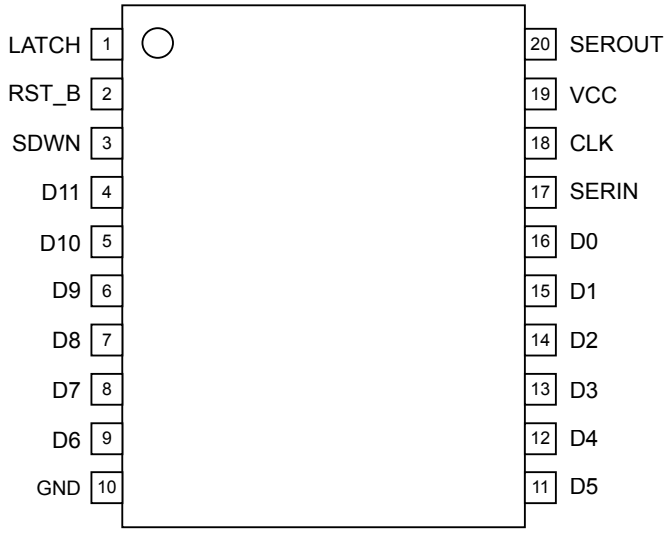


Fig.11

●Terminal Number・Terminal Name

Pin Number	Terminal Name	Function
1	LATCH	Latch Signal Input Terminal (H: Latches Data)
2	RST_B	Reset Reversal Input Terminal (L: FF Data 0)
3	SDWN	Shutdown Input Terminal (H: Output Off)
4	D11	Drain Output Terminal 11
5	D10	Drain Output Terminal 10
6	D9	Drain Output Terminal 9
7	D8	Drain Output Terminal 8
8	D7	Drain Output Terminal 7
9	D6	Drain Output Terminal 6
10	GND	Ground Terminal
11	D5	Drain Output Terminal 5
12	D4	Drain Output Terminal 4
13	D3	Drain Output Terminal 3
14	D2	Drain Output Terminal 2
15	D1	Drain Output Terminal 1
16	D0	Drain Output Terminal 0
17	SERIN	Serial Data Input Terminal
18	CLK	Clock Input Terminal
19	VCC	Supply Voltage Input Terminal
20	SEROUT	Serial Data Output Terminal

Downloaded from Elcodis.com electronic components distributor

●Block Operation

1) Serial I/F

The I/F is a 3-line serial (LATCH, CLK, SERIN) style.

12-bit output ON/OFF can be set-up. This is composed of shift register. + 12-bit register.

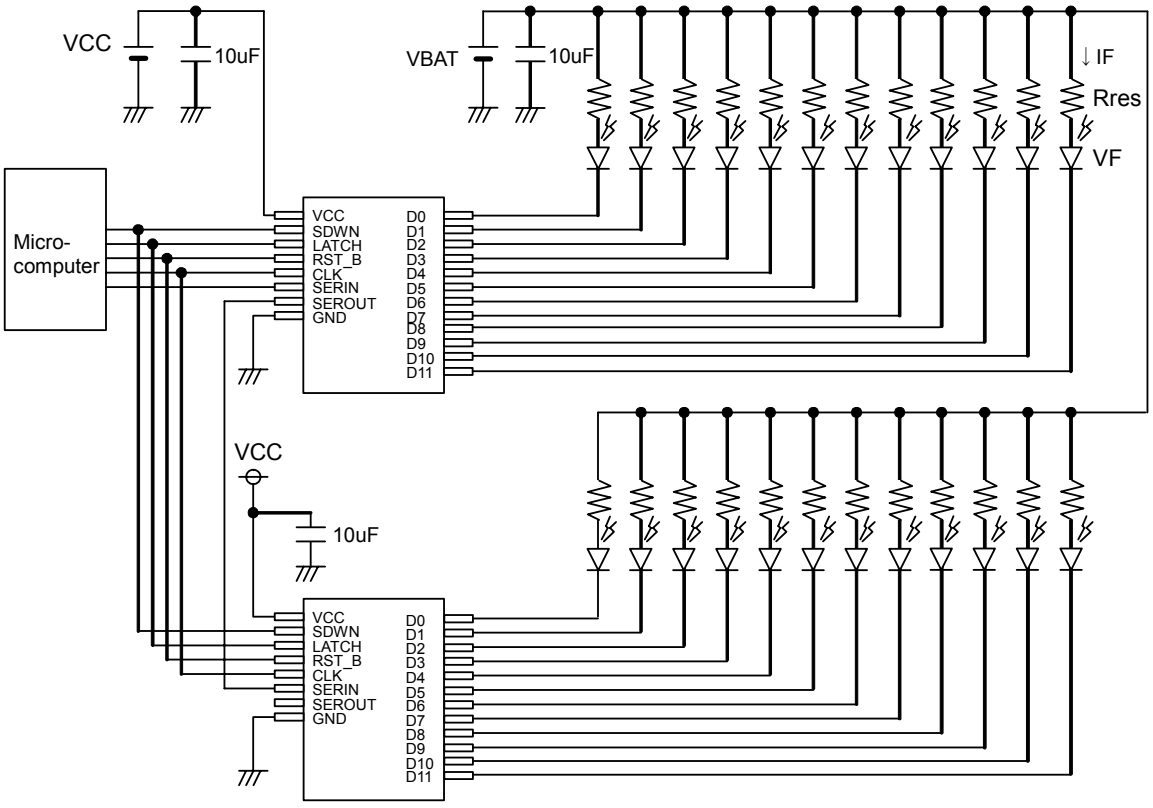
2) Driver

It is a 12-bit open drain output.

3) TSD (Thermal Shut Down)

To prevent heat damage and overheating, when the chip temperature goes over approximately 175℃, the output turns off. When the temperature goes back down, normal operation resumes. However, the intended use of the temperature protection circuit is to protect the IC, so please construct thermal design with the junction temperature Tjmax under 150℃.

●Application Circuit



$$IF = \frac{VBAT - VF}{Rres + RON}$$

Fig.12

Downloaded from Elcodis.com electronic components distributor

●Serial Communication

The serial I/F is composed of a shift register which changes the CLK and SERIN serial signals to parallel signals, and a register to remember those signals with a LATCH signal. The registers are reset by applying a voltage under VCC×0.2 to the RST_B terminal or opening it, and D11~D0 become open. To prevent erroneous LED lighting, please apply voltage under VCC×0.2 to RST_B or make it open during start-up.

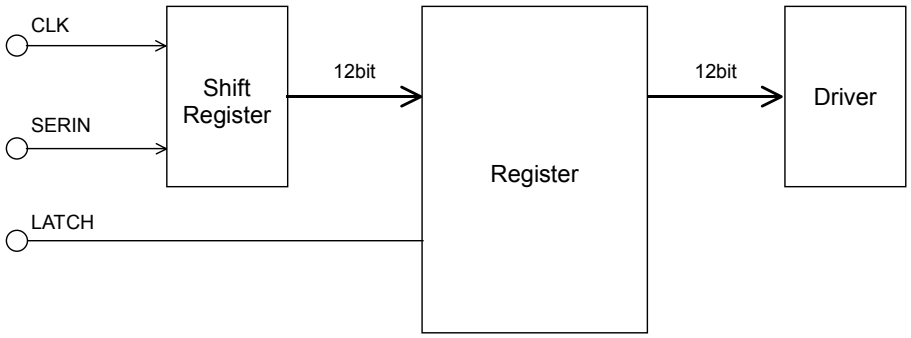


Fig.13

1) Serial Communication Timing

The 12-bit serial data input from SERIN is taken into the shift register by the rise edge of the CLK signal, and is recorded in the register by the rise edge of the LATCH signal. The recorded data is valid until the next rise edge of the LATCH signal.

2) Serial Communication Data

The serial data input configuration of SERIN terminal is shown below:

First →　　→Last

d11	d10	d9	d8	d7	d6	d5	d4	d3	d2	d1	d0
Data											

Terminal Name	Output Status	Data											
		d11	d10	d9	d8	d7	d6	d5	d4	d3	d2	d1	d0
D11	ON	1	*	*	*	*	*	*	*	*	*	*	*
	OFF	0	*	*	*	*	*	*	*	*	*	*	*
D10	ON	*	1	*	*	*	*	*	*	*	*	*	*
	OFF	*	0	*	*	*	*	*	*	*	*	*	*
D9	ON	*	*	1	*	*	*	*	*	*	*	*	*
	OFF	*	*	0	*	*	*	*	*	*	*	*	*
D8	ON	*	*	*	1	*	*	*	*	*	*	*	*
	OFF	*	*	*	0	*	*	*	*	*	*	*	*
D7	ON	*	*	*	*	1	*	*	*	*	*	*	*
	OFF	*	*	*	*	0	*	*	*	*	*	*	*
D6	ON	*	*	*	*	*	1	*	*	*	*	*	*
	OFF	*	*	*	*	*	0	*	*	*	*	*	*
D5	ON	*	*	*	*	*	*	1	*	*	*	*	*
	OFF	*	*	*	*	*	*	0	*	*	*	*	*
D4	ON	*	*	*	*	*	*	*	1	*	*	*	*
	OFF	*	*	*	*	*	*	*	0	*	*	*	*
D3	ON	*	*	*	*	*	*	*	*	1	*	*	*
	OFF	*	*	*	*	*	*	*	*	0	*	*	*
D2	ON	*	*	*	*	*	*	*	*	*	1	*	*
	OFF	*	*	*	*	*	*	*	*	*	0	*	*
D1	ON	*	*	*	*	*	*	*	*	*	*	1	*
	OFF	*	*	*	*	*	*	*	*	*	*	0	*
D0	ON	*	*	*	*	*	*	*	*	*	*	*	1
	OFF	*	*	*	*	*	*	*	*	*	*	*	0

* represents “Don’t care”.

Downloaded from Elcodis.com electronic components distributor

3) Enable Signal

By applying voltage at least VCC×0.8 or more to the SDWN terminal, D0 (16 pin)~D11 (4 pin) become open forcibly. At this time, the temperature protection circuit (TSD) stops. D11～D0 become PWM operation by inputting PWM to SDWN(3 pin).

4) SEROUT

A cascade connection can be made (connecting at least 2 or more IC's in serial).

Serial signal input from SERIN is transferred into receiver IC by the fall edge of the CLK signal.

Since this functionality gives enough margins for the setup time prior to the rise edge of the CLK signal on the receiver IC (using the exact same CLK signal of sender IC), the application reliability can be improved as cascade connection functionality.

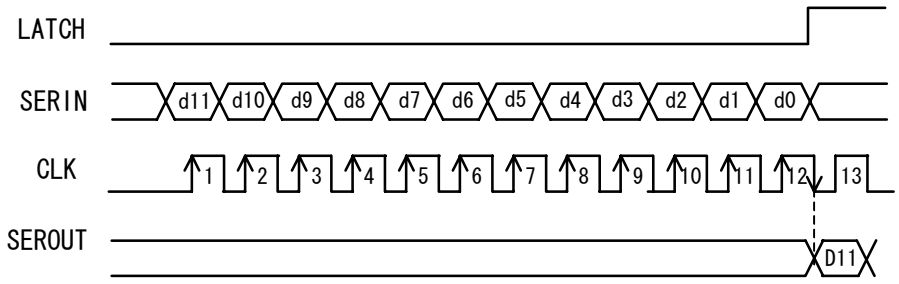


Fig.14

●Cascade Connection

By using (at least) 2 ICs, each IC's D11~D0, at (at least) 24ch, can be controlled by the 24-bit SERIN signal. The serial data input to the sender IC can be transferred to the receiver IC by inputting 12CLK to the CLK terminal.

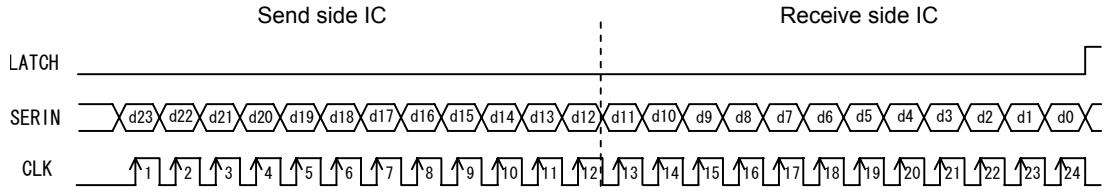


Fig.15

Downloaded from Elcodis.com electronic components distributor

●INPUT SIGNAL'S TIMING CHART

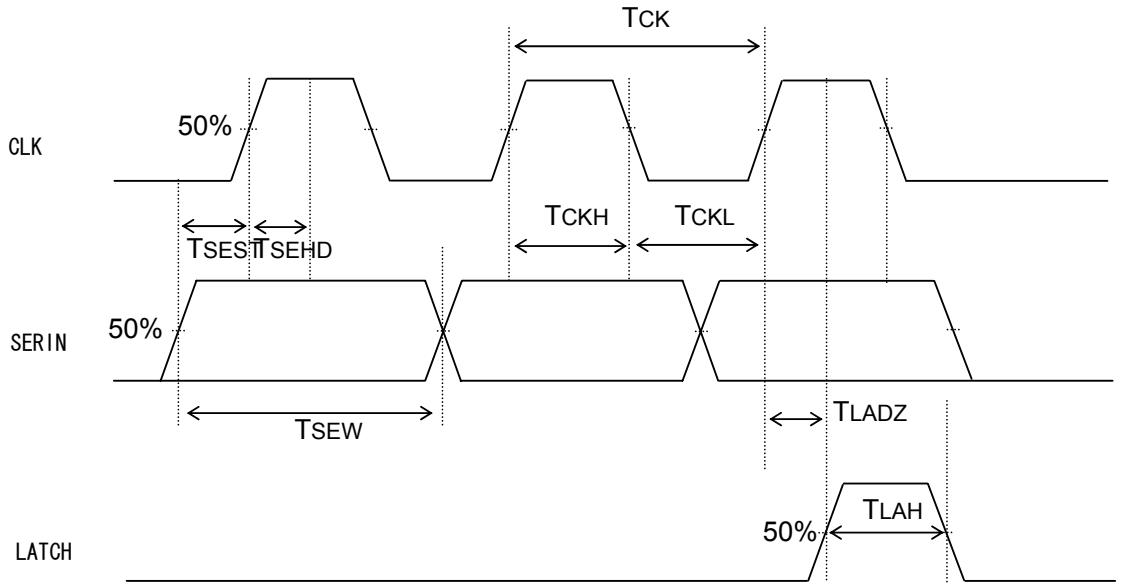


Fig.16

●INPUT SIGNAL'S TIMING RULE (Ta=-40～105℃ Vcc=4.5～5.5V)

Parameter	Symbol	Min	Unit
CLK period	TCK	1000	ns
CLK high pulse width	TCKH	480	ns
CLK low pulse width	TCKL	480	ns
SERIN high and low pulse width	TSEW	980	ns
SERIN setup time prior to CLK rise	TSEST	150	ns
SERIN hold time after CLK fall	TSEHD	150	ns
LATCH high pulse time	TLAH	480	ns
Last CLK rise to LATCH rise	TLADZ	250	ns

Downloaded from Elcodis.com electronic components distributor

●OUTPUT SIGNAL'S DELAY CHART

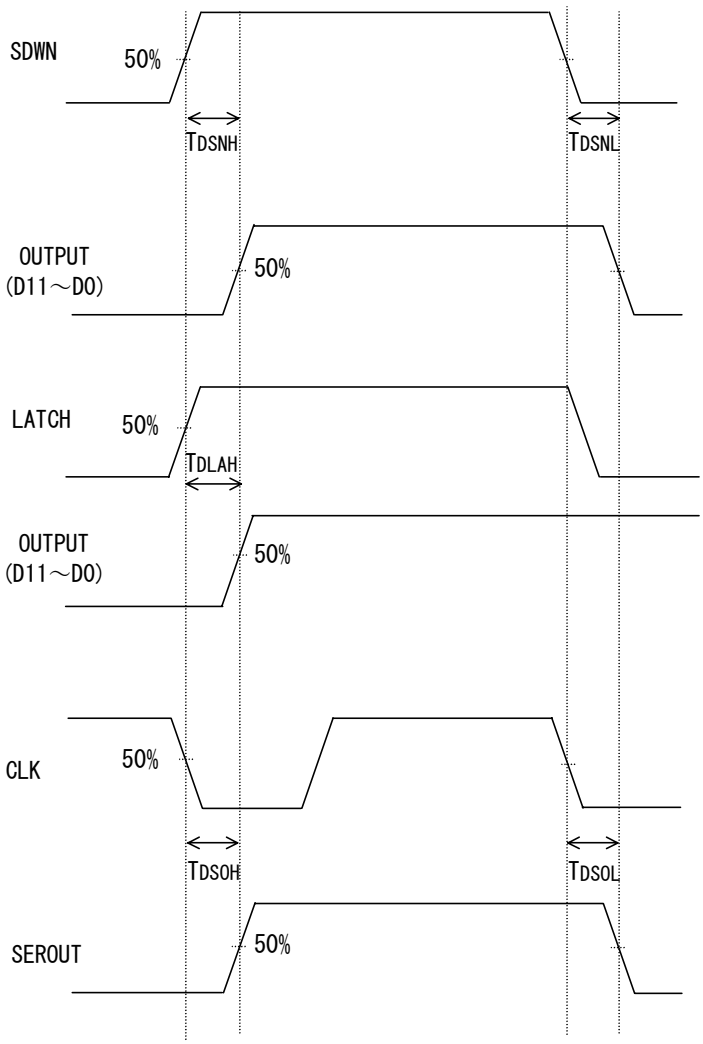


Fig.17

●OUTPUT SIGNAL'S DELAY TIME (Ta=-40～105℃ Vcc=4.5～5.5V)

Parameter	Symbol	Max	Unit
SDWN Switching Time(L→H)	TDSNH	300	ns
SDWN Switching Time(H→L)	TDSNL	300	ns
LATCH Switching Delay Time	TDLAH	300	ns
SEROUT Propagation Delay Time(L→H)	TDSOH	350	ns
SEROUT Propagation Delay Time (H→L)	TDSOL	350	ns

Downloaded from Elcodis.com electronic components distributor

●INPUT/OUTPUT EQUIVALENT CIRCUIT (PIN NAME)

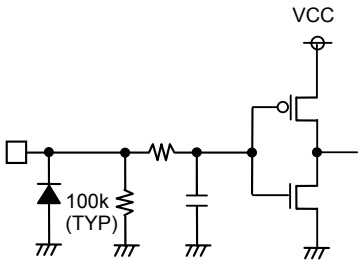
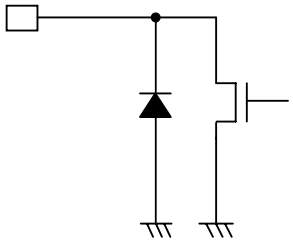
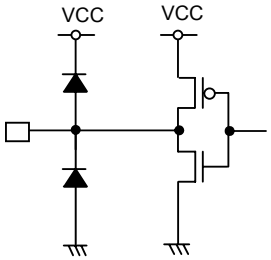
1PIN (LATCH) 2PIN (RST_B) 3PIN (SDWN) 17PIN (SERIN) 18PIN (CLK)	4PIN (D11), 5PIN (D10) 6PIN (D9), 7PIN (D8) 8PIN (D7), 9PIN (D6) 11PIN (D5), 12PIN (D4) 13PIN (D3), 14PIN (D2) 15PIN (D1), 16PIN (D0)	20PIN (SEROUT)
		

Fig.18

Downloaded from Elcodis.com electronic components distributor

●Operation Notes

(1) Absolute maximum ratings

Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered.

A physical safety measure such as a fuse should be implemented when use of the IC in a special mode where the absolute maximum ratings may be exceeded is anticipated.

(2) Reverse connection of a power supply connector

If the connector of power is wrong connected, it may result in IC breakage. In order to prevent the breakage from the wrong connection, the diode should be connected between external power and the power terminal of IC as protection solution.

(3) GND potential

Ensure a minimum GND pin potential in all operating conditions.

(4) Setting of heat

Use a setting of heat that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions.

(5) Pin short and mistake fitting

Use caution when orienting and positioning the IC for mounting on printed circuit boards. Improper mounting may result in damage to the IC. Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range may result in IC damage.

(6) Actions in strong magnetic field

Use caution when using the IC in the presence of a strong electromagnetic field as doing so may cause the IC to malfunction.

(7) Thermal shutdown circuit(TSD)

This IC built-in a Thermal shutdown circuit (TSD circuit). If Chip temperature becomes 175□(TYP.), make the output an Open state. Eventually, warmly clearing the circuit is decided by the condition of whether the heat excesses over the assigned limit, resulting the cutoff of the circuit of IC, and not by the purpose of preventing and ensuring the IC. Therefore, the warm switch-off should not be applied in the premise of continuous employing and operation after the circuit is switched on.

(8) Testing on application boards

When testing the IC on an application board, connecting a capacitor to a pin with low impedance subjects the IC to stress.

Always discharge capacitors after each process or step. Ground the IC during assembly steps as an antistatic measure, and use similar caution when transporting or storing the IC. Always turn the IC's power supply off before connecting it to or removing it from a jig or fixture during the inspection process

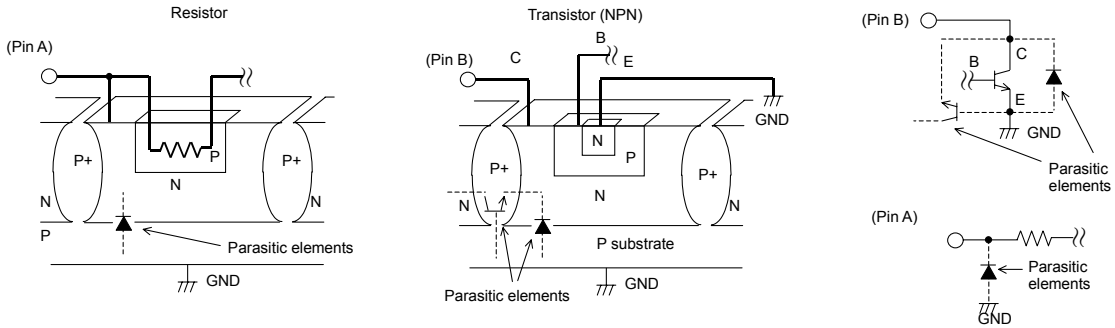
(9) IC terminal input

This monolithic IC contains P+ isolation and P substrate layers between adjacent elements in order to keep them isolated. P/N junctions are formed at the intersection of these P layers with the N layers of other elements to create a variety of parasitic elements.

For example, when a resistor and transistor are connected to pins. (See the chart below.)

- ○the P/N junction functions as a parasitic diode when GND > (Pin A) for the resistor or GND > (Pin B) for the transistor (NPN).
- ○Similarly, when GND > (Pin B) for the transistor (NPN), the parasitic diode described above combines with the N layer of other adjacent elements to operate as a parasitic NPN transistor.

The formation of parasitic elements as a result of the relationships of the potentials of different pins is an inevitable result of the IC's architecture. The operation of parasitic elements can cause interference with circuit operation as well as IC malfunction and damage. For these reasons, it is necessary to use caution so that the IC is not used in a way that will trigger the operation of parasitic elements, such as by the application of voltages lower than the GND (PCB) voltage to input pins.



(10) Ground wiring patterns

When using both small signal and large current GND patterns, it is recommended to isolate the two ground patterns, placing a single ground point at the application's reference point so that the pattern wiring resistance and voltage variations caused by large currents do not cause variations in the small signal ground voltage. Be careful not to change the GND wiring patterns of any external components.

Downloaded from Elcodis.com electronic components distributor

●Selecting a Model Name When Ordering

B	D	8	1	0	5	F	V	–	E	2

ROHM model

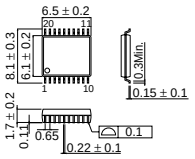
Part number

Package type
FV : SSOP-B20W

E2 = Reel-wound embossed taping

SSOP-B20W

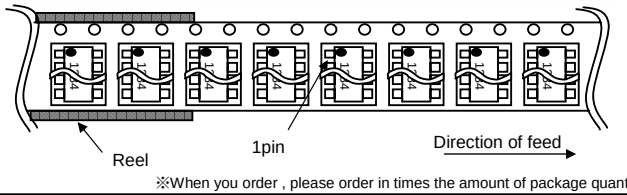
<Dimension>



(Unit:mm)

<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	2000pcs
Direction of feed	E2 (The direction is the 1pin of product is at the upper left when you hold reel on the left hand and you pull out the tape on the right hand)



※When you order , please order in times the amount of package quantity.

● The contents described herein are correct as of December, 2007
● The contents described herein are subject to change without notice. For updates of the latest information, please contact and confirm with ROHM CO.,LTD.
● Any part of this application note must not be duplicated or copied without our permission.
● Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
● Any data, including, but not limited to application circuit diagrams and information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
● Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by ROHM CO., LTD. is granted to any such buyer.
● The products described herein utilize silicon as the main material.
● The products described herein are not designed to be X ray proof.

The products listed in this catalog are designed to be used with ordinary electronic equipment or devices (such as audio visual equipment, office-automation equipment, communications devices, electrical appliances and electronic toys).
Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

Excellence in Electronics

ROHM

ROHM CO., LTD.

21, Saiin Mizosaki-cho, Ukyo-ku, Kyoto
615-8585, Japan
TEL: +81-75-311-2121 FAX: +81-75-315-0172
URL http: // www. rohm. com

Published by
LSI Business Promotion Dept.

Contact us for further information about the products.

San Diego	TEL: +1-858-625-3630	FAX: +1-858-625-3670
Atlanta	TEL: +1-770-754-5972	FAX: +1-770-754-0691
Boston	TEL: +1-978-371-0382	FAX: +1-928-438-7164
Chicago	TEL: +1-847-368-1006	FAX: +1-847-368-1008
Dallas	TEL: +1-469-287-5366	FAX: +1-469-362-7973
Denver	TEL: +1-303-708-0908	FAX: +1-303-708-0858
Detroit	TEL: +1-248-348-9920	FAX: +1-248-348-9942
Nashville	TEL: +1-615-620-6700	FAX: +1-615-620-6702
Mexico	TEL: +52-33-3123-2001	FAX: +52-33-3123-2002
Düsseldorf	TEL: +49-2154-9210	FAX: +49-2154-921400
Munich	TEL: +49-8161-48310	FAX: +49-8161-483120
Stuttgart	TEL: +49-711-72723710	FAX: +49-711-72723720
France	TEL: +33-1-5697-3060	FAX: +33-1-5697-3080
United Kingdom	TEL: +44-1-908-306700	FAX: +44-1-908-235788
Denmark	TEL: +45-3694-4739	FAX: +45-3694-4789
Barcelona	TEL: +34-9375-24320	FAX: +34-9375-24410
Hungary	TEL: +36-1-4719338	FAX: +36-1-4719339
Poland	TEL: +48-22-5757213	FAX: +48-22-5757001
Russia	TEL: +7-95-980-6755	FAX: +7-95-937-8290
Seoul	TEL: +82-2-8182-700	FAX: +82-2-8182-715
Masan	TEL: +82-55-240-6234	FAX: +82-55-240-6236
Dalian	TEL: +86-411-8230-8549	FAX: +86-411-8230-8537
Beijing	TEL: +86-10-8525-2483	FAX: +86-10-8525-2489
Tianjin	TEL: +86-22-23029181	FAX: +86-22-23029183
Shanghai	TEL: +86-21-6279-2727	FAX: +86-21-6247-2066
Hangzhou	TEL: +86-571-87658072	FAX: +86-571-87658071
Nanjing	TEL: +86-25-8689-0015	FAX: +86-25-8689-0393
Ningbo	TEL: +86-574-87654201	FAX: +86-574-87654208
Qingdao	TEL: +86-532-5779-312	FAX:+86-532-5779-653
Suzhou	TEL: +86-512-6807-1300	FAX: +86-512-6807-2300
Wuxi	TEL: +86-510-82702693	FAX: +86-510-82702992
Shenzhen	TEL: +86-755-8307-3008	FAX: +86-755-8307-3003
Dongguan	TEL: +86-769-8393-3320	FAX: +86-769-8398-4140
Fuzhou	TEL: +86-591-8801-8698	FAX: +86-591-8801-8690
Guangzhou	TEL: +86-20-8364-9796	FAX: +86-20-8364-9707
Huizhou	TEL: +86-752-205-1054	FAX: +86-752-205-1059
Xiamen	TEL: +86-592-238-5705	FAX: +86-592-239-8380
Zhuhai	TEL: +86-756-3232-480	FAX: +86-756-3232-460
Hong Kong	TEL: +852-2-740-6262	FAX: +852-2-375-8971
Taipei	TEL: +886-2-2500-6956	FAX: +886-2-2503-2869
Kaohsiung	TEL: +886-7-237-0881	FAX: +886-7-238-7332
Singapore	TEL: +65-6332-2322	FAX: +65-6332-5662
Philippines	TEL: +63-2-807-6872	FAX: +63-2-809-1422
Thailand	TEL: +66-2-254-4890	FAX: +66-2-256-6334
Kuala Lumpur	TEL: +60-3-7958-8355	FAX: +60-3-7958-8377
Penang	TEL: +60-4-2286453	FAX: +60-4-2286452
Kyoto	TEL: +81-75-365-1218	FAX: +81-75-365-1228
Yokohama	TEL: +81-45-476-2290	FAX: +81-45-476-2295

Catalog No.07T352A '07.12 ROHM © 1000 NZ

Downloaded from Elcodis.com electronic components distributor

Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are designed to be used with ordinary electronic equipment or devices (such as audio visual equipment, office-automation equipment, communications devices, electrical appliances and electronic toys).
Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.
It is our top priority to supply products with the utmost quality and reliability. However, there is always a chance of failure due to unexpected factors. Therefore, please take into account the derating characteristics and allow for sufficient safety features, such as extra margin, anti-flammability, and fail-safe measures when designing in order to prevent possible accidents that may result in bodily harm or fire caused by component failure. ROHM cannot be held responsible for any damages arising from the use of the products under conditions out of the range of the specifications or due to non-compliance with the NOTES specified in this catalog.

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact your nearest sales office.

ROHM Customer Support System **THE AMERICAS / EUROPE / ASIA / JAPAN**

www.rohm.com **Contact us** : webmaster@rohm.co.jp

Copyright © 2008 ROHM CO.,LTD.
ROHM CO., LTD. 21 Saiin Mizosaki-cho, Ukyo-ku, Kyoto 615-8585, Japan
TEL : +81-75-311-2121
FAX : +81-75-315-0172

Downloaded from Elcodis.com electronic components distributor