

High-performance Regulator IC Series for PCs

# 300mA Linear Regulators for Desktop PC



**BD35613HFV/EFJ/HFN, BD35615HFV/EFJ/HFN, BD35618HFV/EFJ/HFN**

### ●Description

BD3561□ series is a LDO regulator with output current 300mA. The output accuracy is  $\pm 1\%$  of output voltage. BD3561□ series has some kinds of output voltage line-up and package line-up. Thus, it is used for the wide applications of digital appliances. Over current protection (for protecting the IC destruction by output short circuit), shutdown ON/OFF switch (for setting the circuit current  $0\mu\text{A}$  at shutdown mode), and thermal shutdown circuit (for protecting ICs from heat destruction by over load condition) are all built in.

### ●Features

- 1) Output current 300mA
- 2) Output voltage accuracy :  $\pm 1\%$
- 3) Built-in Over Current Protection circuit (OCP)
- 4) Built-in Thermal Shut Down circuit (TSD)
- 5) With shut down switch
- 6) Rich package line-up : HSON8, HTSOP-J8, HVSO6

### ●Line-up

Product name	8.0V	5.0V	3.3V	Package
BD3561□HFN	○	○	○	HSON8
BD3561□EFJ	○	○	○	HTSOP-J8
BD3561□HFV	○	○	○	HVSO6

Product name : BD3561□ □□□  
↑ ↑  
a b

Symbol			
a		b	
1□	Output Voltage (V)	□□□	Package
18	8.0V typ.	HFN	HSON8
15	5.0V typ.	EFJ	HTSOP-J8
13	3.3V typ.	HFV	HVSO6

● Absolute maximum ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Power Supply Voltage	Vcc	15.0 * <sup>1</sup>	V
EN Voltage	VEN	15.0	V
Power Dissipation	HSO8	Pd	1350 * <sup>2</sup>
	HTSOP-J8		2110 * <sup>3</sup>
	HVSOF6		850.0 * <sup>4</sup>
Operating Temperature Range	Topr	-10~+100	°C
Storage Temperature Range	Tstg	-55~+150	°C
Junction Temperature	Tjmax	+150	°C

\*1 Not to exceed Pd

\*2 Reduced by 10.8mW for each increase in Ta of 1°C over 25°C.

(when mounted on a board 70.0mm × 70mm × 1.6mm Glass-epoxy PCB. (copper foil area:100mm<sup>2</sup>))

\*3 Reduced by 16.9mW for each increase in Ta of 1°C over 25°C.

(when mounted on a board 70.0mm × 70mm × 1.6mm Glass-epoxy PCB, 2 layer)

\*4 Reduced by 6.8mW for each increase in Ta of 1°C over 25°C.

(when mounted on a board 70.0mm × 70mm × 1.6mm Glass-epoxy PCB. (copper foil area:100mm<sup>2</sup>))

● Operating Conditions (Ta=25°C)

Parameter	Symbol	Min.	Max.	Unit
Input Power Supply Voltage	VCC	Vo+1.8	14.0	V
EN Voltage	VEN	-	14.0	V
Output Current	Io	-	300	mA

★ This product should not be used in a radioactive environment.

● ELECTRICAL CHARACTERISTICS

BD3561 □ HFN/EFJ/HFV (Unless otherwise noted, Ta=25°C, EN=3V, Vcc=12V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Output Voltage 1	Vo1	Vo(T) × 0.99	Vo(T)	Vo(T) × 1.01	V	Io=0mA
Output Voltage 2	Vo2	Vo(T) × 0.985	Vo(T)	Vo(T) × 1.015	V	Tj=0 to 100°C Io=0mA→300mA
Circuit Current at shutdown mode	Isd	-	0	5	μA	EN=0V, @OFF mode
Bias Current	Icc	-	200	300	μA	
Output Current Ability	Io	300	-	-	mA	
Line Regulation	Reg.I	-	25	50	MV	Vcc=(Vo+1.8V)→14.0V, Io=300mA
EN Low Voltage	VEN (Low)	0	-	0.8	V	
EN High Voltage	VEN (High)	2.4	-	14.0	V	
EN Bias Current	IEN	0.5	1.0	5.0	μA	

● Reference Data

BD35618HFV (Unless otherwise specified,  $T_a=25^\circ\text{C}$ ,  $V_{EN}=3\text{V}$ ,  $V_{CC}=12\text{V}$ )

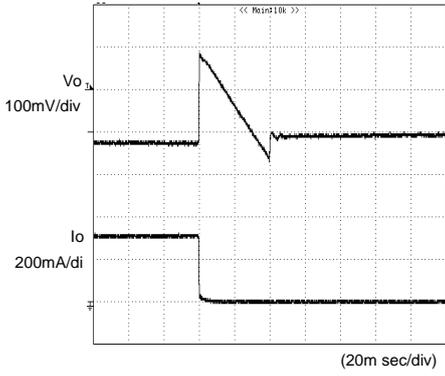


Fig.1 Transient Response  
(50→0mA)  
 $C_o=1\ \mu\text{F}$

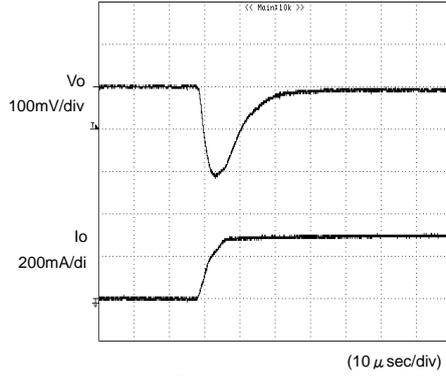


Fig.2 Transient Response  
(0→50mA)  
 $C_o=1\ \mu\text{F}$

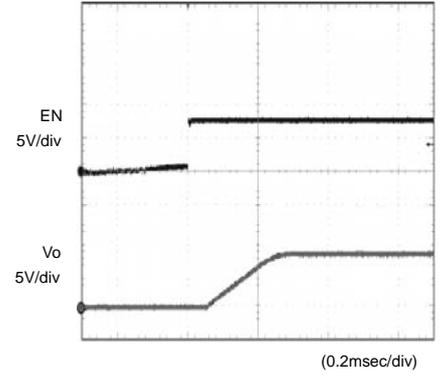


Fig.3 Waveform at output start  
 $C_o=1\ \mu\text{F}$

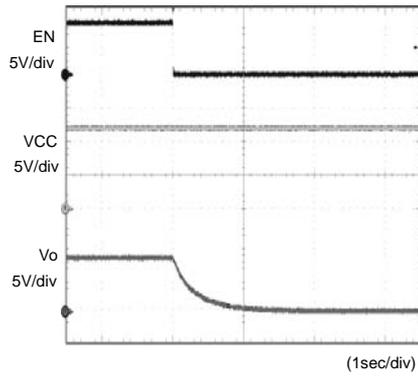


Fig.4 Waveform at output OFF  
 $C_o=1\ \mu\text{F}$

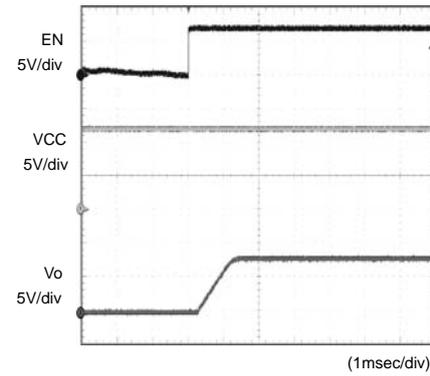


Fig.5 Input sequence 1  
 $C_o=1\ \mu\text{F}$

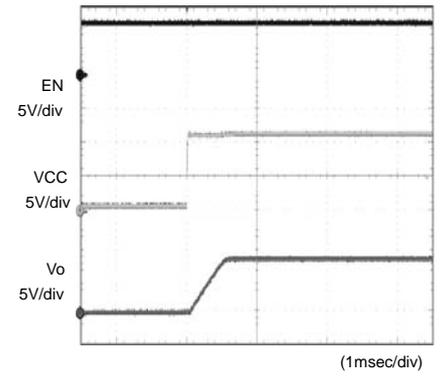


Fig.6 Input sequence 2  
 $C_o=1\ \mu\text{F}$

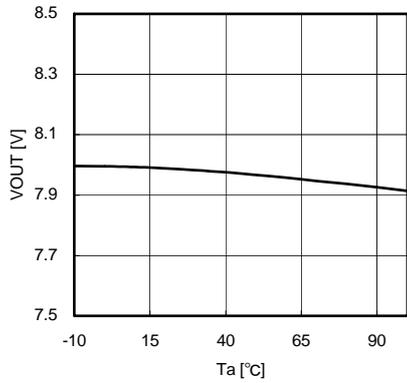


Fig.7  $T_a$ - $V_o$  ( $I_o=0\text{mA}$ )

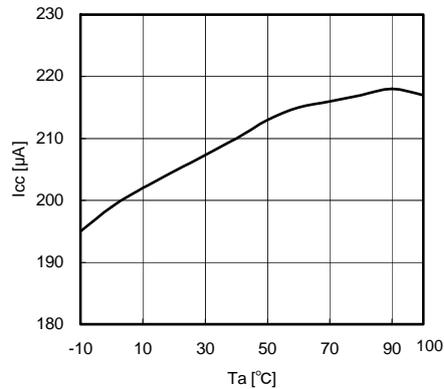


Fig.8  $T_a$ - $I_{CC}$   
( $V_{EN}=12\text{V}$ )

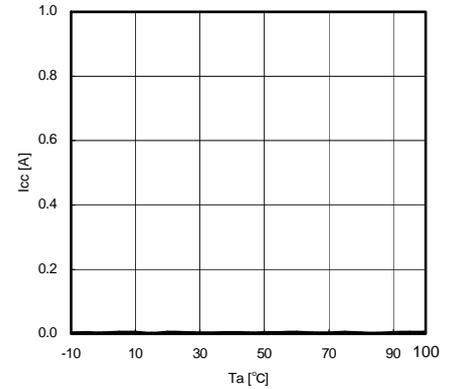


Fig.9  $T_a$ - $I_{CC}$   
( $V_{CC}=12\text{V}$ ,  $V_{EN}=0\text{V}$ )

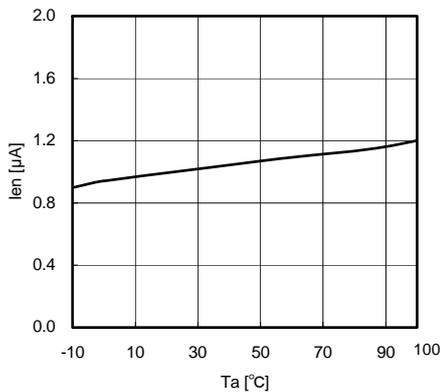


Fig.10  $T_a$ - $I_{EN}$   
( $V_{CC}=12\text{V}$ ,  $V_{EN}=3\text{V}$ )

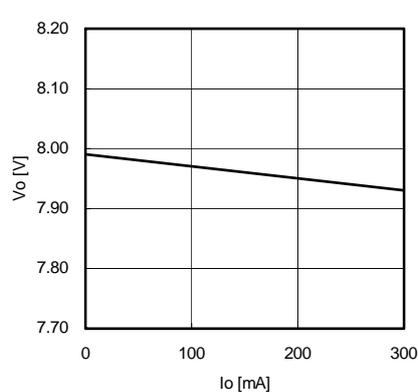


Fig.11  $I_o$ - $V_o$

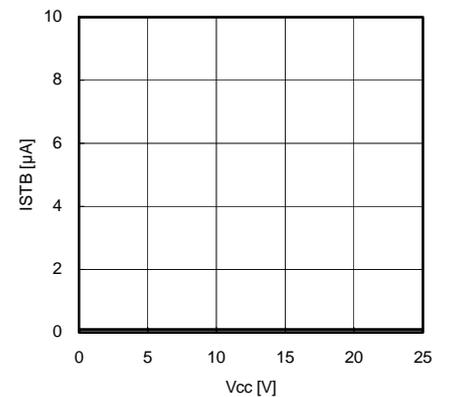


Fig.12  $V_{CC}$ - $I_{STB}$   
( $V_{CC}=12\text{V}$ ,  $V_{EN}=3\text{V}$ )

●Reference Data

BD35618HFV (Unless otherwise specified, Ta=25°C, EN=3V, Vcc=12V)

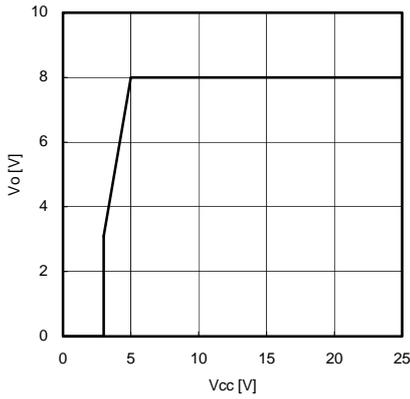
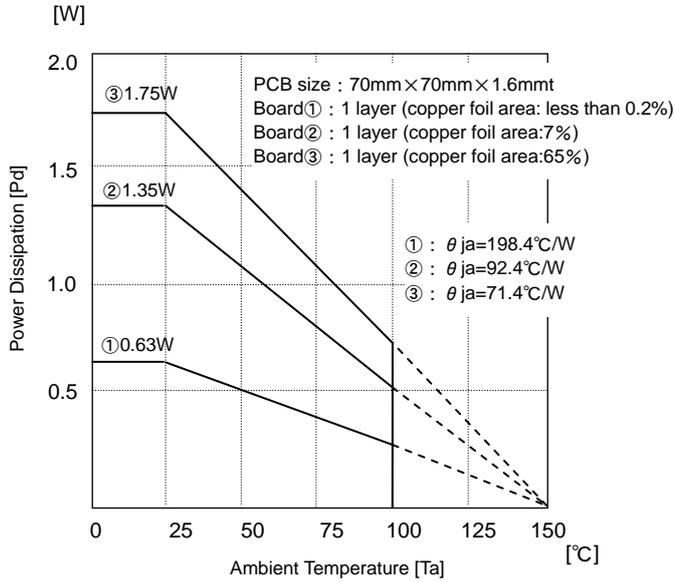


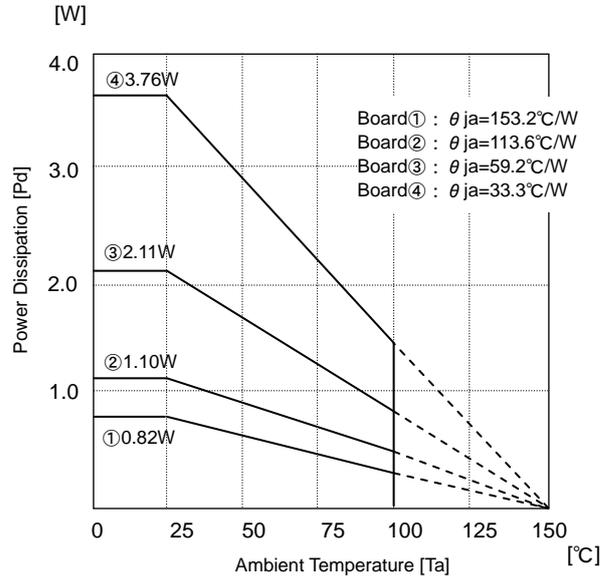
Fig.13 Vcc-Vo

●Heat Dissipation Characteristics

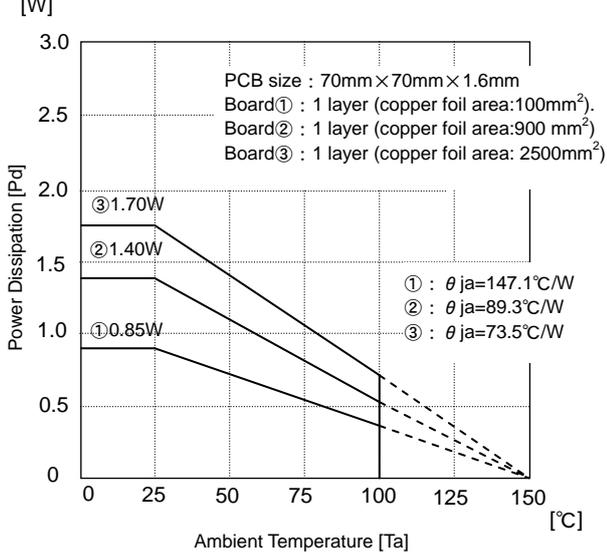
◎HSON8



◎HTSOP-J8



◎HVSOF6





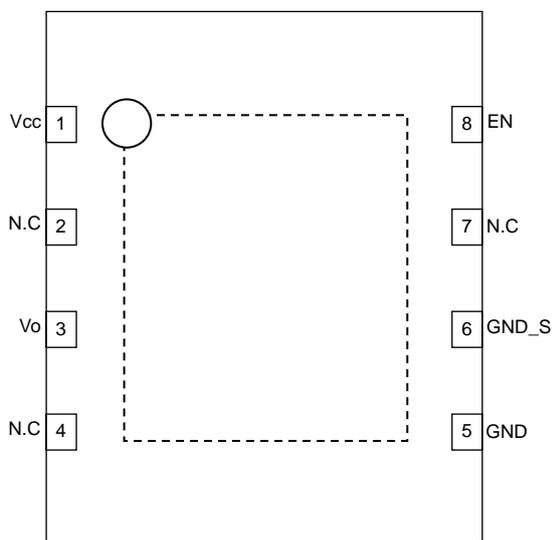
● Pin Function Table (HSON8, HTSOP-J8)

Pin No.	Pin name	Pin Function
1	Vcc	Input Voltage Pin
2	N.C.	Open
3	Vo	Output Voltage Pin
4	N.C.	Open
5	GND	GND Pin
6	GND_S	GND Sense Pin
7	N.C.	Open
8	EN	Enable Pin

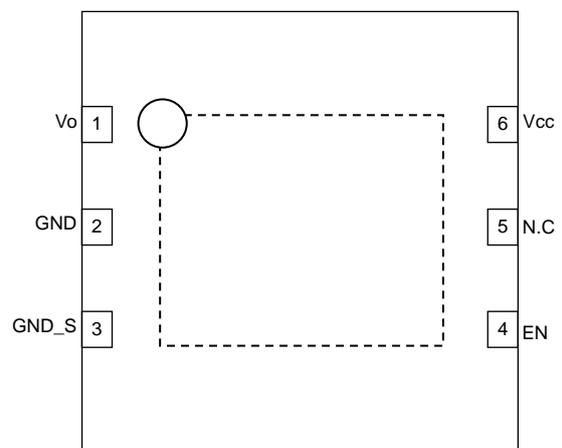
(HVSOF6)

Pin No.	Pin name	Pin Function
1	Vo	Output Voltage Pin
2	GND	GND Pin
3	GND_S	GND Sense Pin
4	EN	Enable Pin
5	N.C	Open
6	Vcc	Input Voltage Pin

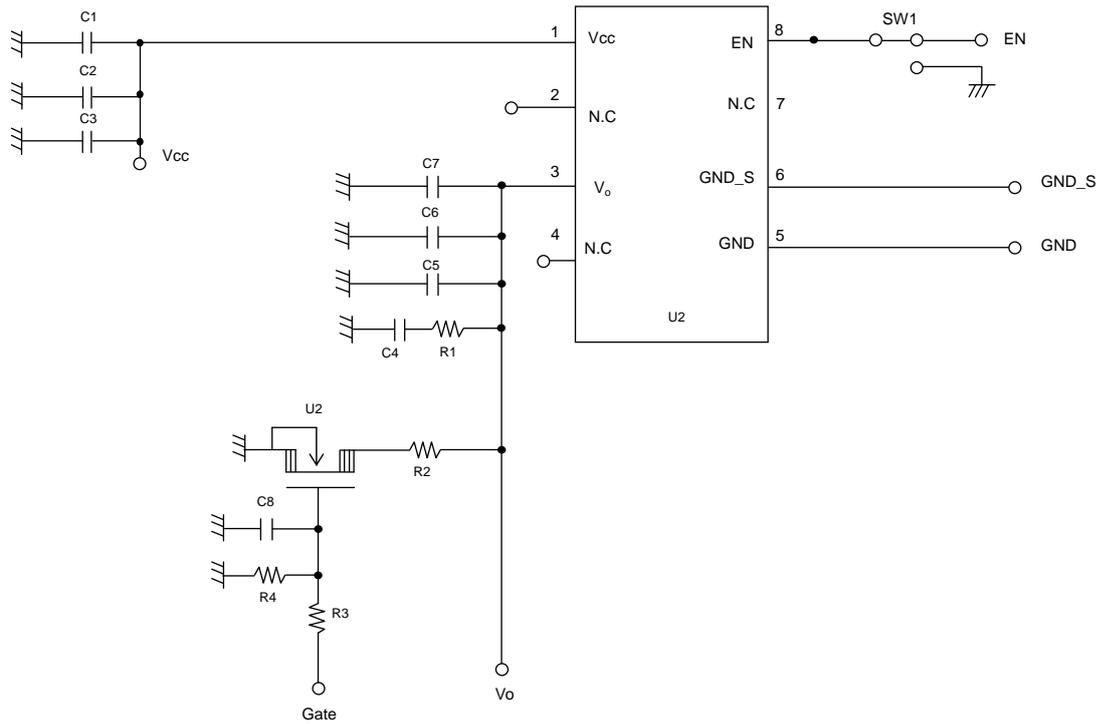
● Pin Layout (HSON8, HTSOP-J8)



(HVSOF6)



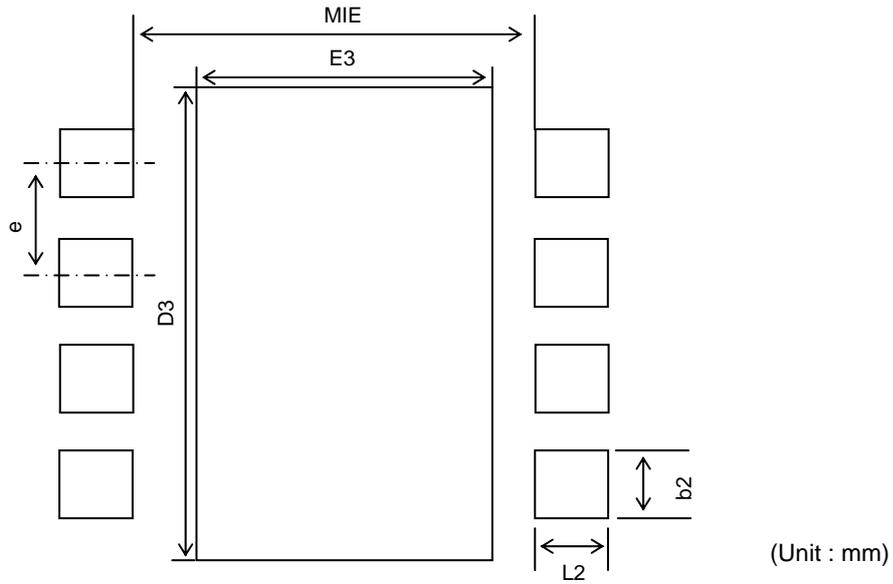
●Evaluation Board Circuit (Vo=8.0V)



●Evaluation Board Parts List

Designation	Value	Part No.	Company
R1	-	-	-
R2	-	-	-
R3	-	-	-
R4	-	-	-
C1	-	-	-
C2	1uF	CM105B105K10A	KYOCERA
C3	-	-	-
C4	-	-	-
C5	-	-	-
C6	1uF	CM105B105K16A	KYOCERA
C7	-	-	-
C8	-	-	-
U1	-	BD3561XHFV	ROHM
U2	-	-	-

●Reference landing pattern  
 ©HSON8

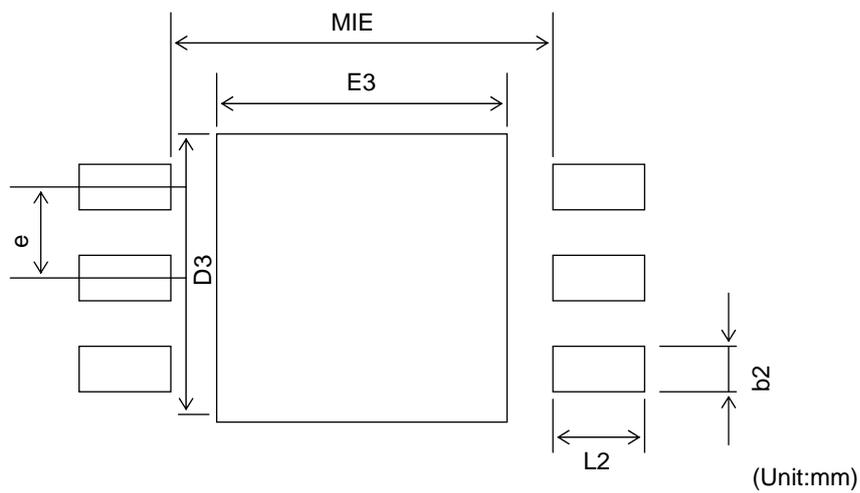


(Unit : mm)

Lead pitch e	landing pitch MIE	landing length ≥l2	landing pitc b2
0.65	2.50	0.40	0.35
central pad length D3	central pad pitch E3		
2.90	1.90		

\*It is recommended to design suitable for the actual application.

©HVSOF6



(Unit:mm)

Lead pitch e	landing pitch MIE	landing length l2	landing pitch b2
0.50	3.00	0.55	0.25

central pad length D3	central pad pitch E3
1.60	2.60

\*It is recommended to design suitable for the actual application.

● Operation Notes

1. Absolute maximum ratings

An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down the devices, thus making impossible to identify breaking mode, such as a short circuit or an open circuit. If any over rated values will expect to exceed the absolute maximum ratings, consider adding circuit protection devices, such as fuses.

2. Connecting the power supply connector backward

Connecting of the power supply in reverse polarity can damage IC. Take precautions when connecting the power supply lines. An external direction diode can be added.

3. Power supply lines

Design PCB layout pattern to provide low impedance GND and supply lines. To obtain a low noise ground and supply line, separate the ground section and supply lines of the digital and analog blocks. Furthermore, for all power supply terminals to ICs, connect a capacitor between the power supply and the GND terminal. When applying electrolytic capacitors in the circuit, not that capacitance characteristic values are reduced at low temperatures.

4. GND voltage

The potential of GND pin must be minimum potential in all operating conditions.

5. Thermal design

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

6. Inter-pin shorts and mounting errors

Use caution when positioning the IC for mounting on printed circuit boards. The IC may be damaged if there is any connection error or if pins are shorted together.

7. Actions in strong electromagnetic field

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

8. ASO

When using the IC, set the output transistor so that it does not exceed absolute maximum ratings or ASO.

9. Thermal shutdown circuit

The IC incorporates a built-in thermal shutdown circuit (TSD circuit). The thermal shutdown circuit (TSD circuit) is designed only to shut the IC off to prevent thermal runaway. It is not designed to protect the IC or guarantee its operation. Do not continue to use the IC after operating this circuit or use the IC in an environment where the operation of this circuit is assumed.

	TSD on temperature [°C] (typ.)	Hysteresis temperature [°C] (typ.)
BD3561XHFN/EFJ/HFV	175	15

10. 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. Always turn the IC's power supply off before connecting it to or removing it from a jig or fixture during the inspection process. Ground the IC during assembly steps as an antistatic measure. Use similar precaution when transporting or storing the IC.

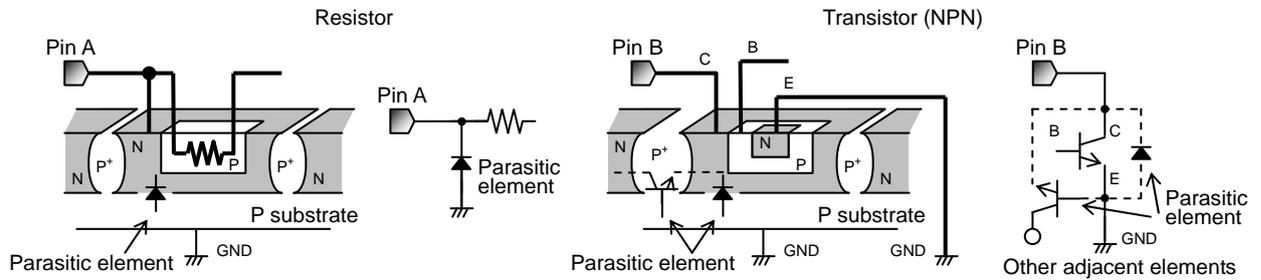
11. Regarding input pin of the IC

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, creating a parasitic diode or transistor. For example, the relation between each potential is as follows:

When  $GND > Pin A$  and  $GND > Pin B$ , the P-N junction operates as a parasitic diode.

When  $GND > Pin B$ , the P-N junction operates as a parasitic transistor.

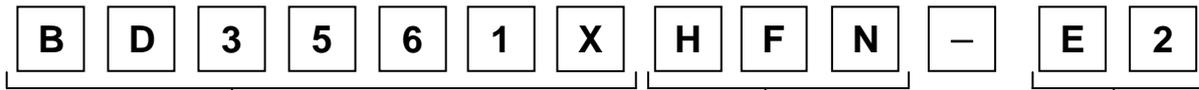
Parasitic diodes can occur inevitable in the structure of the IC. The operation of parasitic diodes can result in mutual interference among circuits, operational faults, or physical damage. Accordingly, methods by which parasitic diodes operate, such as applying a voltage that is lower than the GND (P substrate) voltage to an input pin, should not be used.



12. Ground Wiring Pattern.

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 ground potential of application 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 pattern of any external components, either.

●Type Designations (Ordering Information)



Product Name

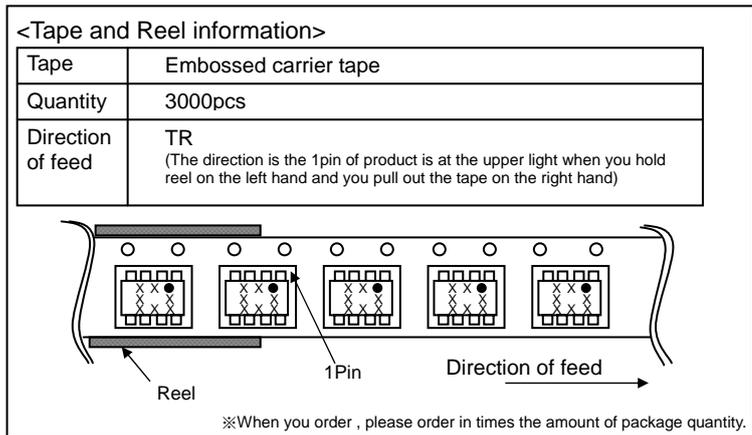
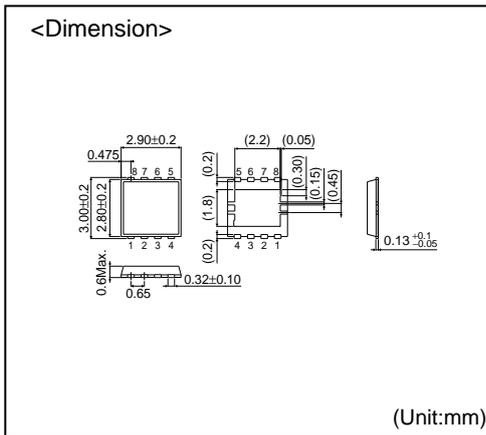
- BD35618
- BD35615
- BD35613

Package Type

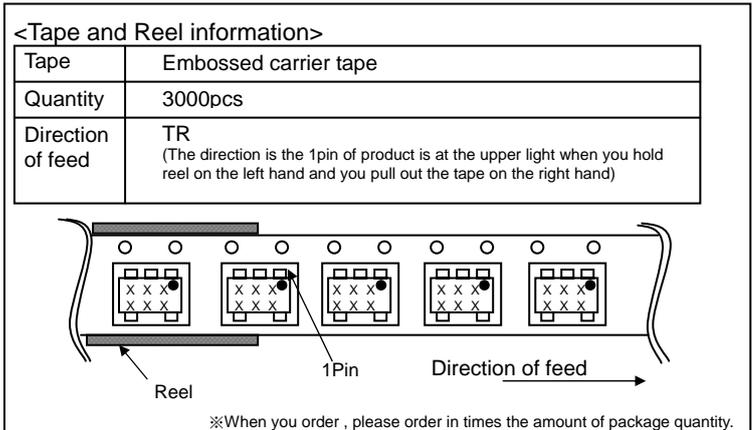
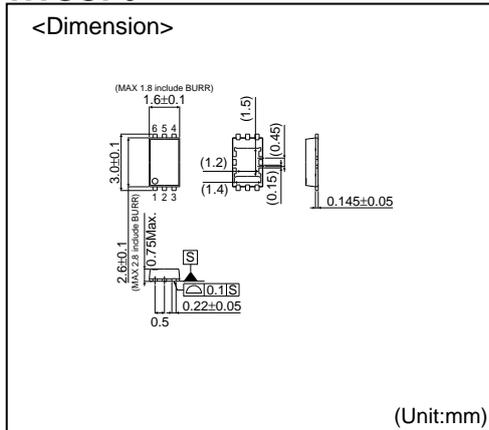
- HFN : HSON8
- EFJ : HTSOP-J8
- HFV : HVSO6

E2 Emboss tape reel opposite draw-out side: 1 pin  
TR Emboss tape reel opposite draw-out side: 1 pin

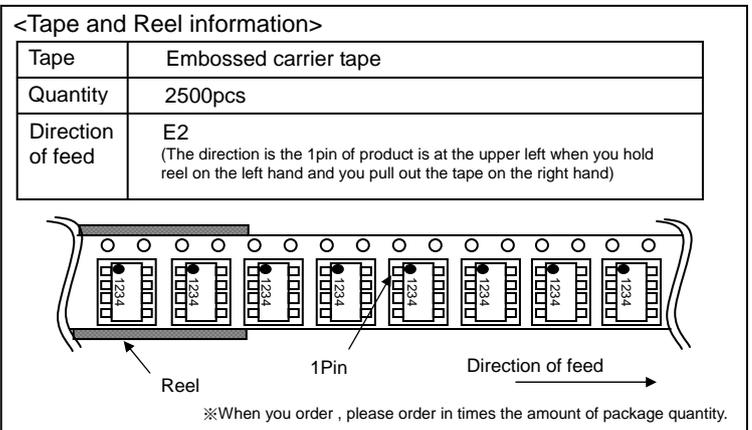
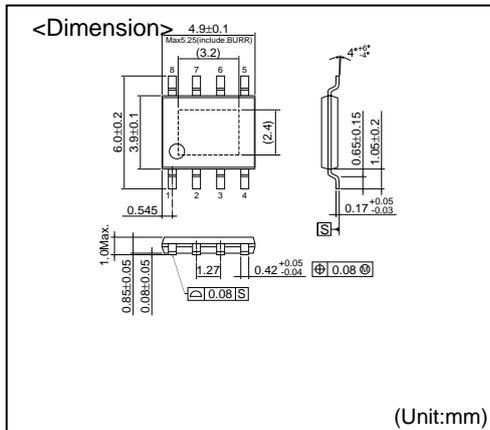
**HSON8**



**HVSO6**



**HTSOP-J8**



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- The products described herein utilize silicon as the main material.
- The products described herein are not designed to be X ray proof.

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<b>Mexico</b>	TEL: +52-33-3123-2001	FAX: +52-33-3123-2002	<b>Shenzhen</b>	TEL: +86-755-8307-3008	FAX: +86-755-8307-3003
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<b>Munich</b>	TEL: +49-8999-216168	FAX: +49-8999-216176	<b>Fuzhou</b>	TEL: +86-591-8801-8698	FAX: +86-591-8801-8690
<b>Stuttgart</b>	TEL: +49-711-7272-370	FAX: +49-711-7272-3720	<b>Guangzhou</b>	TEL: +86-20-3878-8100	FAX: +86-20-3825-5965
<b>France</b>	TEL: +33-1-5697-3060	FAX: +33-1-5697-3080	<b>Huizhou</b>	TEL: +86-752-205-1054	FAX: +86-752-205-1059
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<b>Espoo</b>	TEL: +358-9725-54491	FAX: +358-9-7255-4499	<b>Hong Kong</b>	TEL: +852-2-740-6262	FAX: +852-2-375-8971
<b>Salo</b>	TEL: +358-2-7332234	FAX: +358-2-7332237	<b>Taipei</b>	TEL: +886-2-2500-6956	FAX: +886-2-2503-2869
<b>Oulu</b>	TEL: +358-8-5372930	FAX: +358-8-5372931	<b>Kaohsiung</b>	TEL: +886-7-237-0881	FAX: +886-7-238-7332
<b>Barcelona</b>	TEL: +34-9375-24320	FAX: +34-9375-24410	<b>Singapore</b>	TEL: +65-6332-2322	FAX: +65-6332-5662
<b>Hungary</b>	TEL: +36-1-4719338	FAX: +36-1-4719339	<b>Philippines</b>	TEL: +63-2-807-6872	FAX: +63-2-809-1422
<b>Poland</b>	TEL: +48-22-5757213	FAX: +48-22-5757001	<b>Thailand</b>	TEL: +66-2-254-4890	FAX: +66-2-256-6334
<b>Russia</b>	TEL: +7-495-739-41-74	FAX: +7-495-739-41-74	<b>Kuala Lumpur</b>	TEL: +60-3-7958-8355	FAX: +60-3-7958-8377
<b>Seoul</b>	TEL: +82-2-8182-700	FAX: +82-2-8182-715	<b>Penang</b>	TEL: +60-4-2286453	FAX: +60-4-2286452
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