Technical Note

Compact High Accuracy Temperature Sensor ICs

Low current Thermostat Output Temperature Sensor ICs

BDJ□□□0HFV Series

No.11047EBT05

●Description

BDJ□□□0HFV series is thermostat output temperature sensor IC with built-in temperature detection element,constant current circuit,high-accuracy reference voltage source in one chip.Temperature detection can be realized at ±2.5℃ accuracy without complicated design.It is the best temperature sensor IC for a portable equipment of micro and low current,the power down function, and the battery drive.It is possible to use it for a wide usage such as the heat detection and temperature monitors because it provides with the analog output in addition to the thermostat power output. BDJ□□□0HFV series has 5 products at 55℃,60℃,65℃,70℃,80℃ detection temperature.

●Features

1) Detection Temperature lineup at 55℃,60℃,65℃,70℃,80℃ (5 products)
2) Power supply Voltage range 2.4～5.5V.
3) High Accuracy thermostat (typ.±1.0℃, max.±2.5℃ @Ta=55～80℃)
4) High Accuracy Analog Output (typ.±1.0℃, max.±2.5℃ @Ta=-30～100℃)
5) Analog Output Temperature Sensitivity (typ. -8.2mV/℃)
6) Low Supply Current (typ. 7.5uA)
7) Power down control function built in.(PD interface Voltage min 1.5V)
8) Small Package (typ. 1.60mm × 1.60mm × 0.60mm)
9) Low thermal resistance package (typ. 187℃/W)
10) ESD Rating 8kV (HBM)

●Applications

Cell phone, Digital Camera,Thermal Protection for Electrical Equipment (NoteBook PC, FPD-TV, etc.)

●Line up matrix

Product Name	Detect Temp. (℃)	OS Output Format		Marking
BDJ0800HFV	80	Open Drain	Active L	ff
BDJ0700HFV	70	Open Drain	Active L	fh
BDJ0650HFV	65	Open Drain	Active L	fk

Product Name	Detect Temp. (℃)	OS Output Format		Marking
BDJ0600HFV	60	Open Drain	Active L	fm
BDJ0550HFV	55	Open Drain	Active L	fn

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●**Absolute Maximum Ratings** (Ta = 25℃)

Parameter	Symbol	Ratings	Unit
Power Supply Voltage	V_{DD}	-0.3 to 7.0[*1]	V
Input Voltage (PD)	V_{IN}	-0.3 to V_{DD}+0.3	V
OS terminal Voltage	V_{OS}	-0.3 to 7.0[*1]	V
OS terminal Current	I_{OS}	5.0	mA
Power dissipation	Pd	536[*2]	mW
Storage Temperature Range	Tstg	-55 to 150	℃

*1. Not to exceed Pd
*2. Reduced by 5.36mW for each increase in Ta of 1℃ over 25℃
(mounted on 70mm × 70mm × 1.6mm Glass-epoxy PCB)

●**Recommended Operating Conditions**

Parameter	Symbol	Ratings			Unit
		Min.	Typ.	Max.	
Power Supply Voltage	VDD	2.4	2.8	5.5	V
Operating Temperature Range	Topr	-30	-	100	℃

●**Electrical Characteristics** (Unless otherwise specified, VDD = 2.8V, Ta = 25℃)

Parameter		Symbol	Limits			Unit	Conditions
			Min.	Typ.	Max.		
Supply Current							
	Normal function mode	I_{DD}	-	7.5	12.0	μA	PD="H"
	Power Down mode	I_{DDPD}	-	0.3	1.0	μA	PD="L"
PD							
	Input L Voltage	V_{IL}	GND	-	0.2	V	
	Input H Voltage	V_{IH}	1.5	-	V_{DD}	V	
	PD Leakage Current	I_{LPD}	-	-	1.0	μA	PD=2.8V
Analog Output							
	V_{Temp} Output Voltage	Vtemp	1.279	1.300	1.321	V	Ta = 30℃
	V_{Temp} Temperature Sensitivity	V_{SE}	-8.00	-8.20	-8.40	mV/℃	Ta = -30 to 100℃
	V_{Temp} Load Regulation	ΔV_{tempRL}	-	-	1.0	mV	difference of I_{OUT} : 0uA / 2μA
	Vtemp VDD Regulation	$\Delta V_{tempVDD}$	-	-	4.0	mV	V_{DD}=2.4～5.5V
OS Output Open Drain							
	OS Leakage Current	I_L	-	-	1.0	μA	V_{OS} =5.0V
	OS Output Voltage	V_{OL}	-	-	0.4	V	I_{OS} = 1.0mA

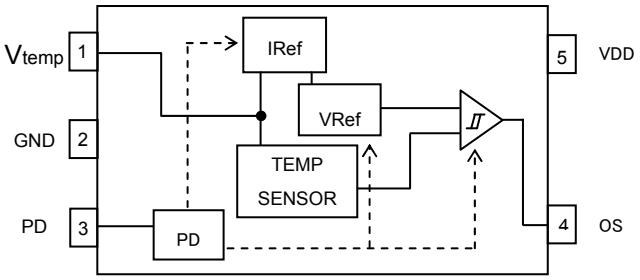
Radiation hardiness is not designed.

●**Temperature Accuracy** (Unless otherwise specified, VDD = 2.8V)

Parameter		Symbol	Limits			Unit	Conditions
			Min.	Typ.	Max.		
Thermostat							
	Sensing Temperature Accuracy	Tacc	-	±1.0	±2.5	℃	
	Sensing Temperature Hysteresis	Thys	7.5	10.0	12.5	℃	
Analog Output							
	Vtemp Temperature Accuracy	Ttemp	-	±1.0	±2.5	℃	V_{DD} = 2.8V Ta = -30 to 100℃

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●Block Diagram

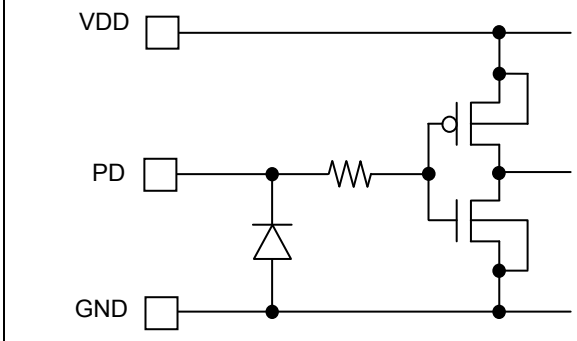


●Pin Description

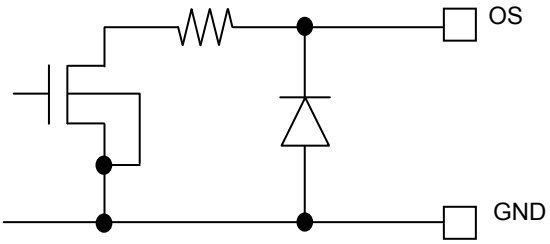
PIN NO.	PIN NAME	FUNCTION	COMMENT
1	Vtemp	Output voltage in inverse proportion to the temperature (TYP. -8.20mV/℃)	Set the OPEN state or connect high impedance input node.(over 10MΩ)
2	GND	GROUND	
3	PD	PD control H : Normal function mode L : Power Down mode	“H” Thermostat and Analog output operation. “L” Power Down state.
4	OS	Digital thermostat output	Open Drain Active L. Use the pull-up resistor more than 10kΩ.
5	VDD	POWER SUPPLY	

●Equivalent Circuit

PD

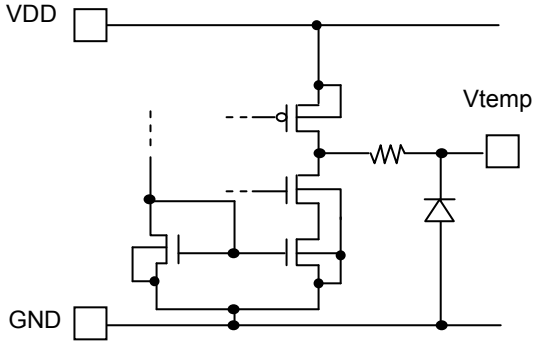


OS



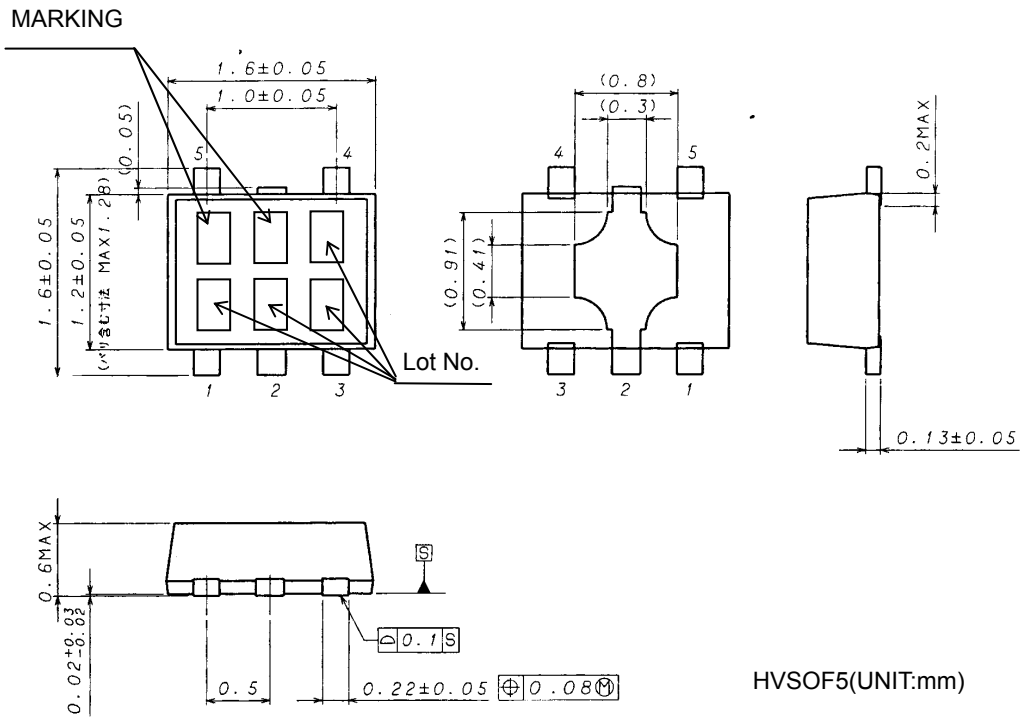
Use the pull-up resistor more than 10kΩ.

Vtemp



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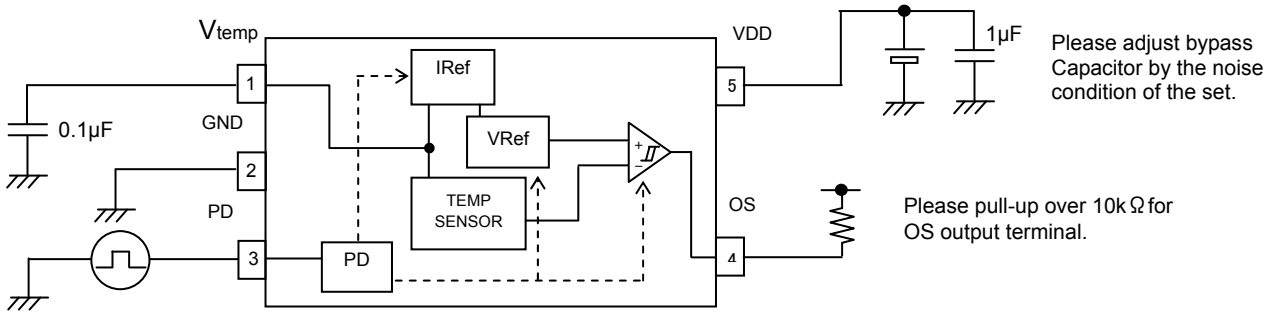
●Package Outlines (HVSOF5)



HVSOF5(UNIT:mm)

●Block Diagram

Please adjust Capacitor
by the noise condition of the set.



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●Reference Data

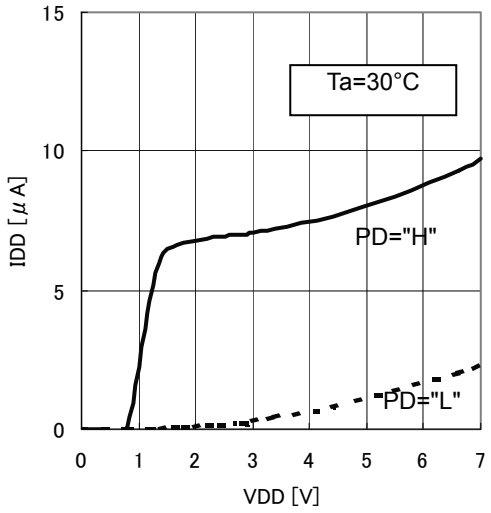


Fig1. Supply Current(IDD) vs. Supply Voltage

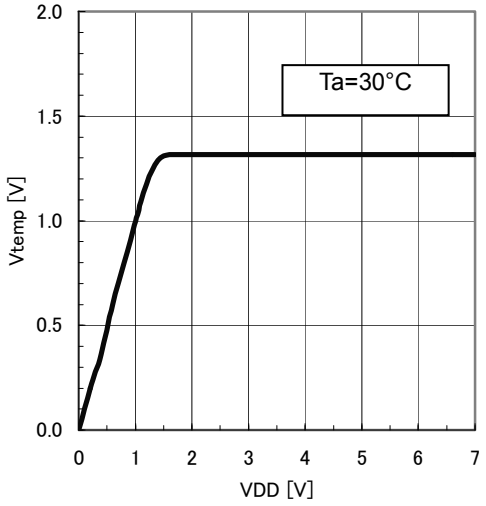


Fig2. Vtemp Voltage vs. Supply Voltage

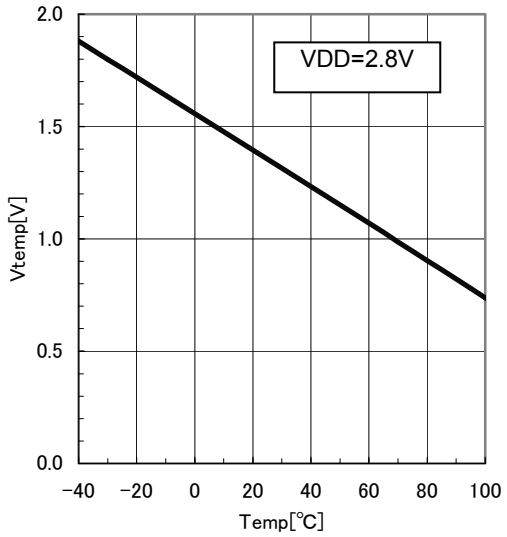


Fig3. Vtemp Voltage vs. Temperature

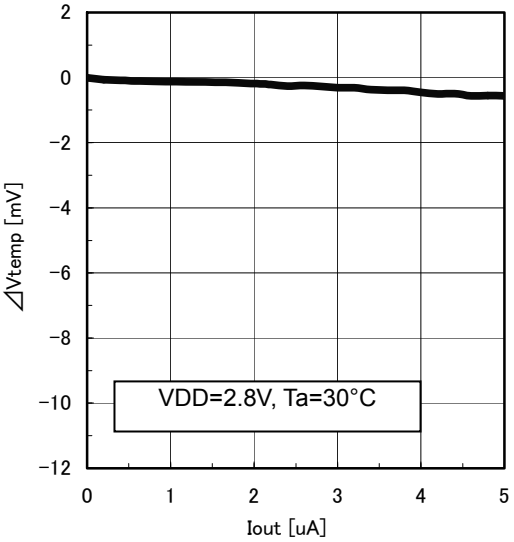


Fig4. Vtemp Voltage vs. Output Current

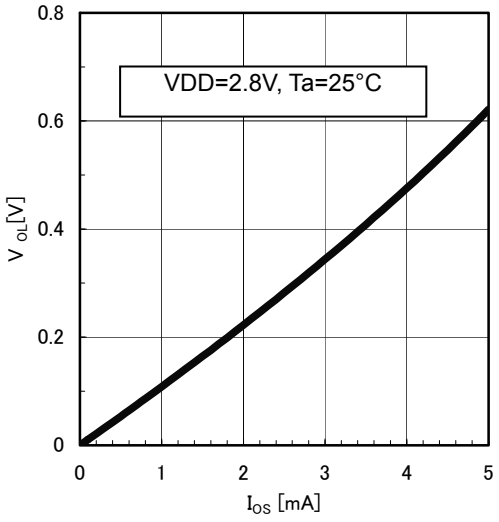
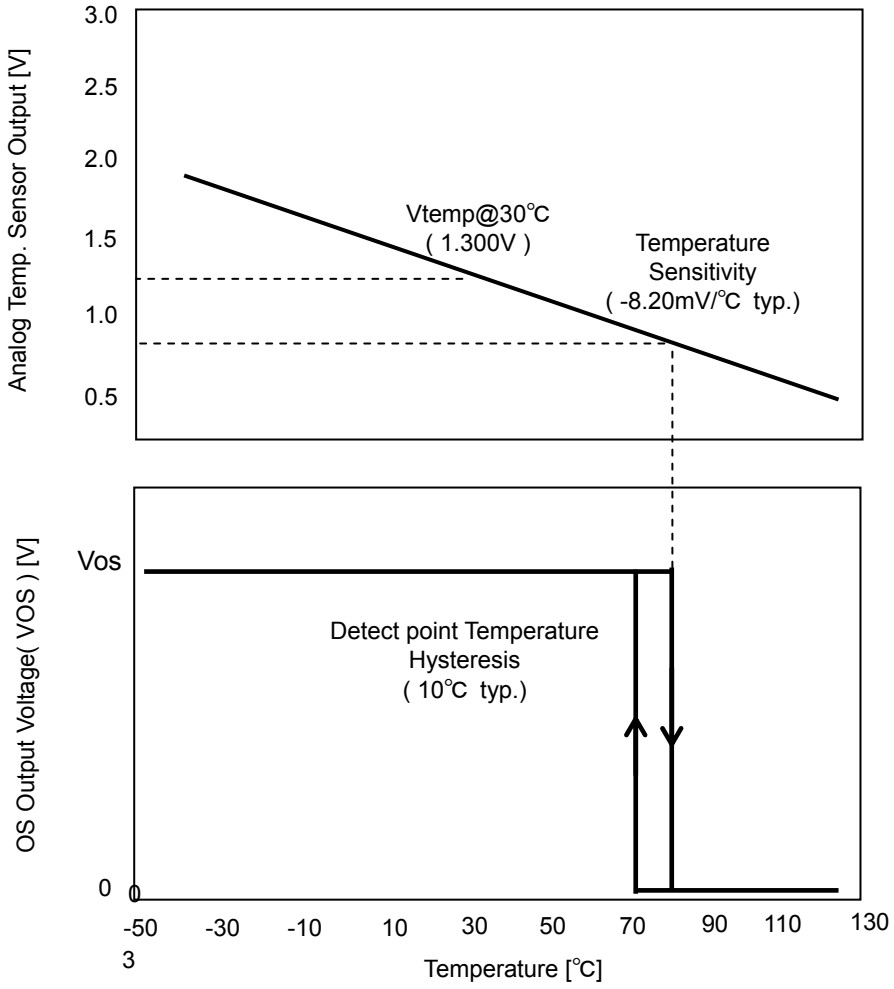


Fig5. OS Output Voltage vs. Load Current

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●Function Diagram(ex. 80℃ detect Active “L” type BDJ0800HFV)

Temperature sensor internal IC sense temperature, Vtemp terminal output voltage convert temperature.
Vtemp value is 1.300[V] at Ta = 30[℃].
The value of Vtemp voltage reduce reversely proportional temperature at rate of –8.2mV/℃.

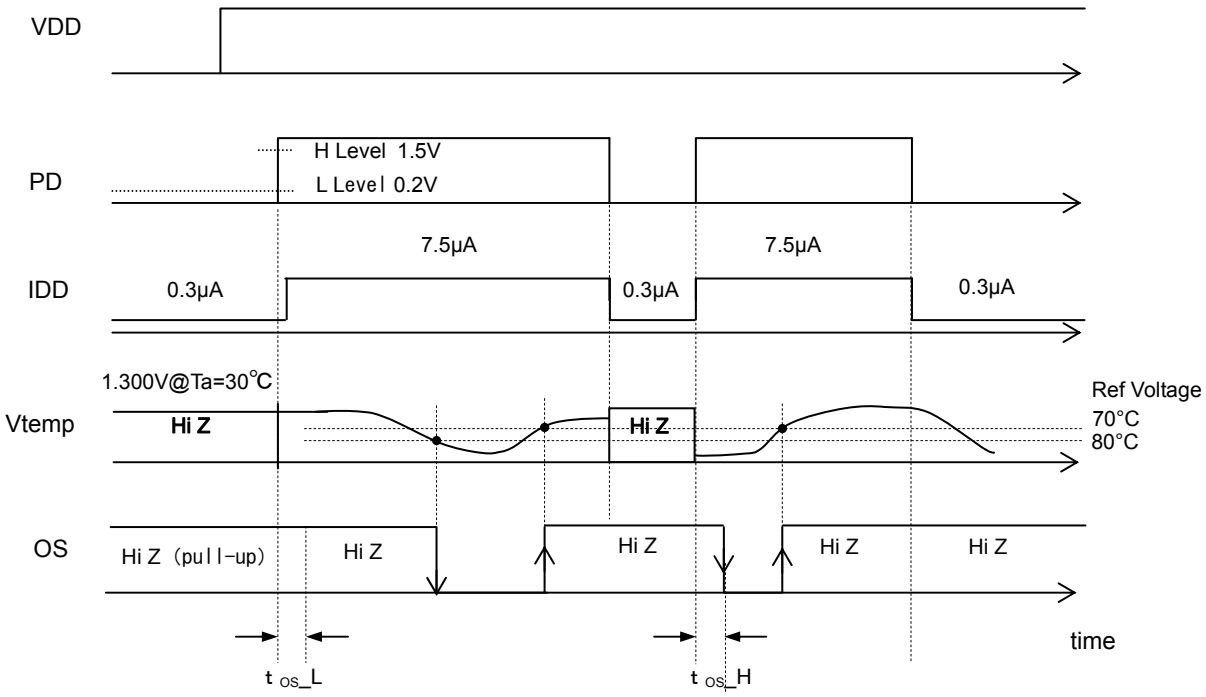


If the temperature over detect temperature, internal comparator operate OS output “H” to “L”.(ex.active “L” Type)
In case of OS return to “H”,the temperature 10℃ lower than detect temperature.

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●Operation Sequence

(ex.80℃ detect Active"L"type BDJ0800HFV)



BDJ0800HFV operate start after PD"H"Input.
Please read OS terminal signal below wait time after PD "H" Input.

Ta	Symbol	Wait time
Under detect Temp.	t_{OS}_L	200μs
Over detect Temp.	t_{OS}_H	1000μs

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●Notes for use

1) Absolute Maximum Ratings
An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down devices, thus making impossible to identify breaking mode such as a short circuit or an open circuit. If any special mode exceeding the absolute maximum ratings is assumed, consideration should be given to take physical safety measures including the use of fuses, etc.

2) GND voltage
Make setting of the potential of the GND terminal so that it will be maintained at the minimum in any operating state.

3) Pin short and mistake fitting
When mounting the IC on the PCB, pay attention to the orientation of the IC. If there is a placement mistake, the IC may be burned up.

4) Operation in strong electric field
Be noted that using ICs in the strong electric field can malfunction them.

5) Mutual impedance
Use short and wide wiring tracks for the power supply and ground to keep the mutual impedance as small as possible. Use a capacitor to keep ripple to a minimum.

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●Ordering part number

B	D	J	0	8	0	0	H	F	V	-	T	R

Series Name

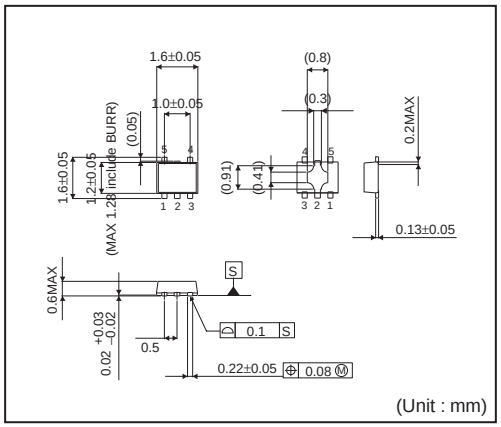
Detect Temp.
080: 80℃
070: 70℃
065: 65℃
060: 60℃
055: 55℃

Output Format
0 : active L
1 : active H

Package
HFV:HVSOF5

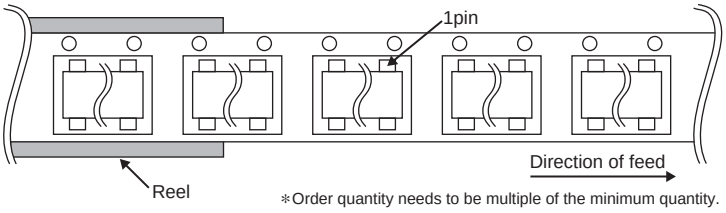
Packaging and forming specification
TR: Embossed tape and reel

HVSOF5



<Tape and Reel information>

Tape	Embossed carrier tape
Quantity	3000pcs
Direction of feed	TR (The direction is the 1pin of product is at the upper right when you hold reel on the left hand and you pull out the tape on the right hand)



∗Order quantity needs to be multiple of the minimum quantity.

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