

Small and High Accuracy Temperature Sensor IC Series



Detect Temperature Changeable Thermostat Output Temperature Sensor IC

BDE□□□0G Series

No.09047EAT03

●Description

Low quiescent current (16μA), high accuracy thermostat (temperature switch) ICs. Built in temperature sensor, reference voltage regulator, D/A converter, and comparator. Detecting temperature by itself, OS terminal state is changed at logically. Open Drain Output (Active L) is available in BDE□□□0G series.

●Features

- 1) Detection Temperature Range -25~+125°C by 15 products.
- 2) ±5°C Step Selectable Detection Temperature with CTRL.
- 3) Hysteresis Temperature (typically 10°C)
- 4) High Accuracy Analog Output (typically ±3.5°C@Ta=30°C)
- 5) Analog Output Temperature Sensitivity (typically -10.8mV/°C)
- 6) Low Supply Current (typically 16μA)
- 7) Small Package (typically 2.90mm×2.80mm×1.25mm)
- 8) ESD Rating 8kV (HBM)
- 9) Excellent Ripple Rejection Characteristic

●Applications

Thermal Protection for Electrical Equipment (NoteBook PC, Cell phone, FPD-TV, etc.) FAN Control for Thermal Management

●Products Line up

BDE
□□□

Detection Temperature
(Center Temperature)

120:120°C	040: 40°C
110:110°C	030: 30°C
100:100°C	020: 20°C
090: 90°C	010: 10°C
080: 80°C	000: 0°C
070: 70°C	910:-10°C
060: 60°C	920:-20°C
050: 50°C	

0

Output Format
(OpenDrain, Active Low)

G

Package
(SSOP5)

Temperature / Output Format Table

CTRL status description (L : Low, O : Open, H : High)

Product Name	Detection Temperature (°C)			OS Output Format		Marking
	CTRL					
	L	H	O			
BDE1200G	115	120	125	Open Drain	Active L	eA
BDE1100G	105	110	115	Open Drain	Active L	eB
BDE1000G	95	100	105	Open Drain	Active L	eC
BDE0900G	85	90	95	Open Drain	Active L	eD
BDE0800G	75	80	85	Open Drain	Active L	eE
BDE0700G	65	70	75	Open Drain	Active L	eF
BDE0600G	55	60	65	Open Drain	Active L	eG
BDE0500G	45	50	55	Open Drain	Active L	eH

Product Name	Detection Temperature (°C)			OS Output Format		Marking
	CTRL					
	L	H	O			
BDE0400G	35	40	45	Open Drain	Active L	eJ
BDE0300G	25	30	35	Open Drain	Active L	eK
BDE0200G	15	20	25	Open Drain	Active L	eL
BDE0100G	5	10	15	Open Drain	Active L	eM
BDE0000G	-5	0	5	Open Drain	Active L	eN
BDE9100G	-15	-10	-5	Open Drain	Active L	eP
BDE9200G	-25	-20	-15	Open Drain	Active L	eQ

●Absolute Maximum Ratings (Ta = 25°C)

Parameters	Symbol	Limit	Unit
Power Supply Voltage	V _{DD}	-0.3 to 7.0 ^{*1}	V
Input Voltage (CTRL)	V _{IN}	-0.3 to V _{DD} +0.3	V
Input Current (CTRL)	I _{IN}	-1.0, +0.1	mA
OS terminal Voltage	V _{OS}	-0.3 to 7.0	V
OS terminal Current	I _{OS}	5.0	mA
Power dissipation	P _d	540 ^{*2}	mW
Storage Temperature Range	T _{stg}	-55 to 150	°C

*1. Not to exceed P_d

*2. Reduced by 5.40mW for each increase in Ta of 1°C over 25°C(mounted on 70mm×70mm×1.6mm Glass-epoxy PCB)

●Recommended Operating Condition

Parameters	Symbol	Min.	Typ.	Max.	Unit
Power Supply Voltage	V _{DD}	2.9	3.0	5.5	V
Operating Temperature Range	T _{opr}	-30	-	130	°C

●Temperature Accuracy (Unless otherwise specified, V_{DD} = 3.0V)

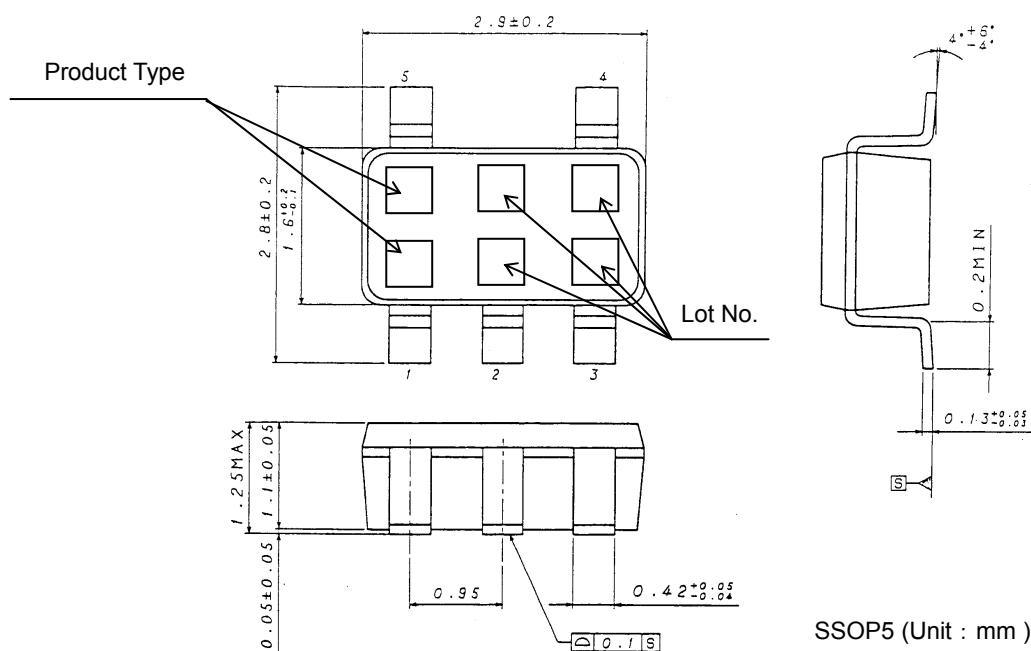
Temperature Accuracy (Unless otherwise specified, V _{DD} = 3.0V)							
Parameters		Symbol	Limit			Unit	Conditions
			Min.	Typ.	Max.		
Thermostat (Temperature Switch)							
	Detection TemperatureAccuracy	Tacc	-	0	±4.0 ±5.0	℃	Ta = -20℃~115℃ Ta = ~125℃
	Detection Temperature Hysteresis	Thys	7.5	10.0	12.5	℃	
Analog Output							
	VTemp Temperature Accuracy	TTemp	-	-	±3.5	℃	Ta = 30℃

●Electrical Characteristics (Unless otherwise specified, V_{DD} = 3.0V, Ta = 25°C)

PARAMETER	SYMBOL	LIMIT			UNIT	CONDITIONS
		MIN.	TYP.	MAX.		
Supply Current	IDD	-	16.0	20.0	μA	CTRL = 3.0V
Analog Output						
VTemp Output Voltage	VTemp	1.716	1.753	1.790	V	Ta = 30°C
VTemp Temperature Sensitivity	VSE	-10.28	-10.68	-11.08	mV/°C	Ta = -30 to 100°C
VTemp Load Regulation	ΔVTempRL	-	-	1	mV	difference of IOUT : 0μA / 2μA
OS Output Open Drain						
OS Leakage Current	IL	-	-	1.0	μA	OS : 5.0V
OS Output Voltage	VOL	-	-	0.4	V	IinOS = 1.2mA
CTRL						
Input L Voltage	VIL	GND	-	0.6	V	
Input H Voltage	VIH	2.4	-	VDD	V	

*Radiation hardness is not designed.

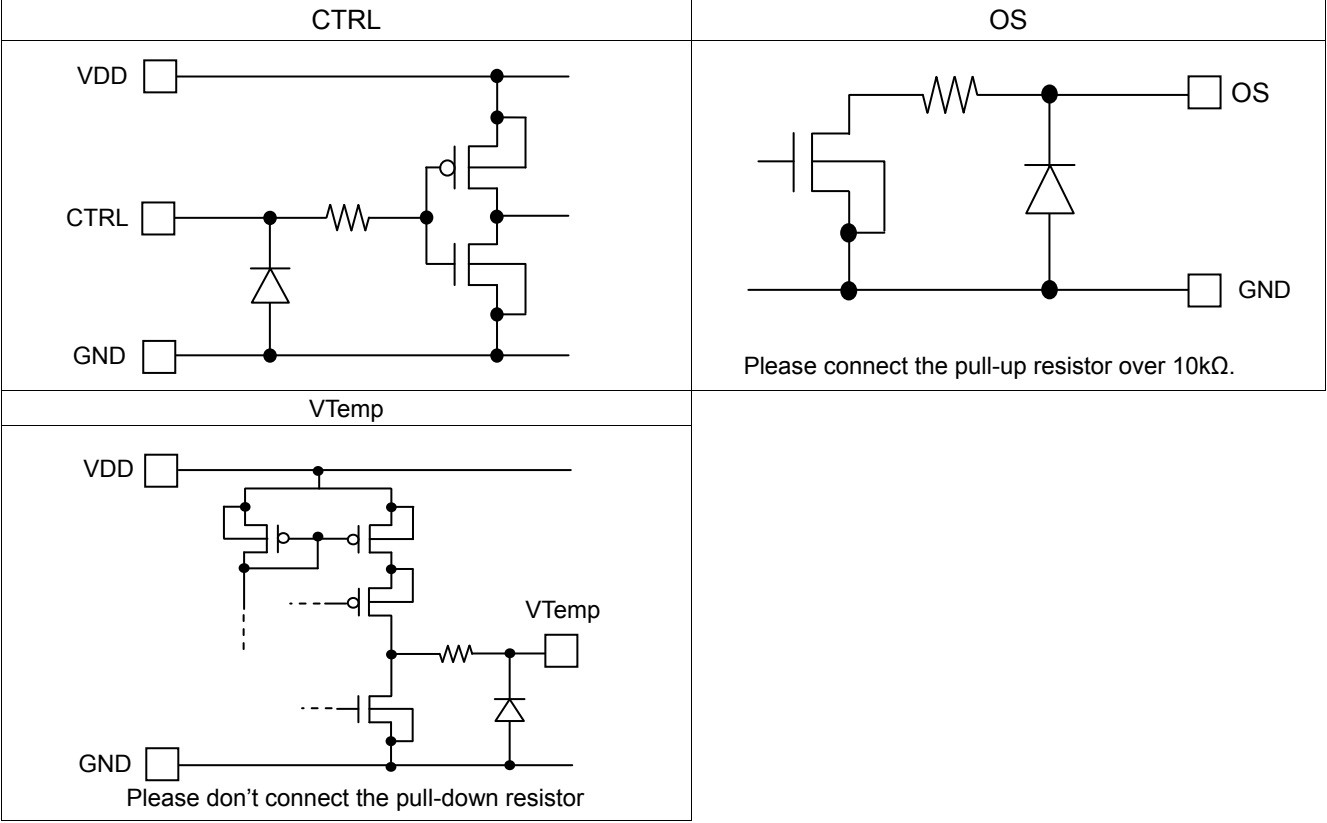
●Package Outline



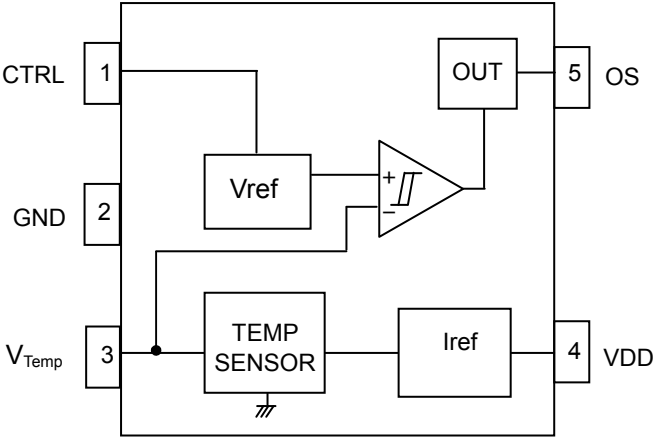
●Pin Description

Pin No.	Pin Name	Function	Comment
1	CTRL	Detection temperature setting	Refer to 2/7 page for the emperature set. (Temperature / Output Format Table)
2	GND	GROUND	-
3	Vtemp	Output voltage in inverse proportion to the temperature(TYP. $-10.68\text{mV}/^{\circ}\text{C}$)	Set the OPEN state or Connect high impedance input node.
4	VDD	POWER SUPPLY	-
5	OS	Digital thermostat output	Open Drain type Use the pull-up resistor over $10\text{k}\Omega$.

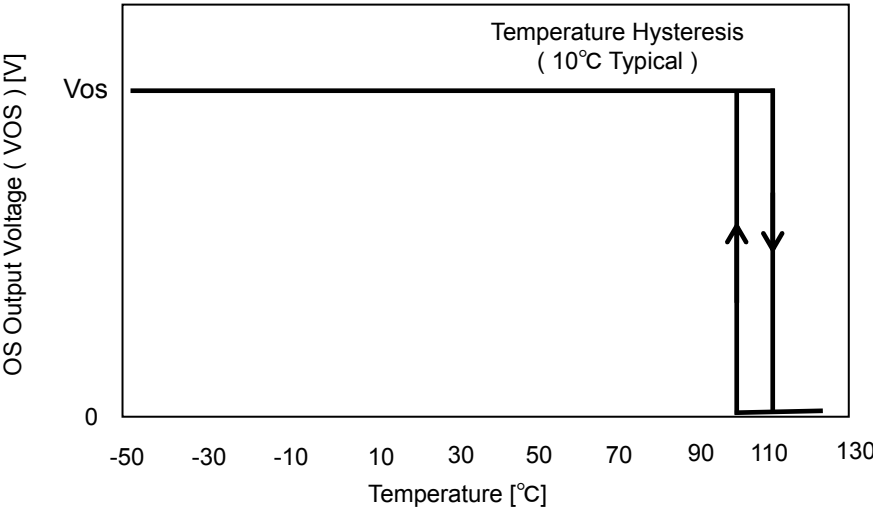
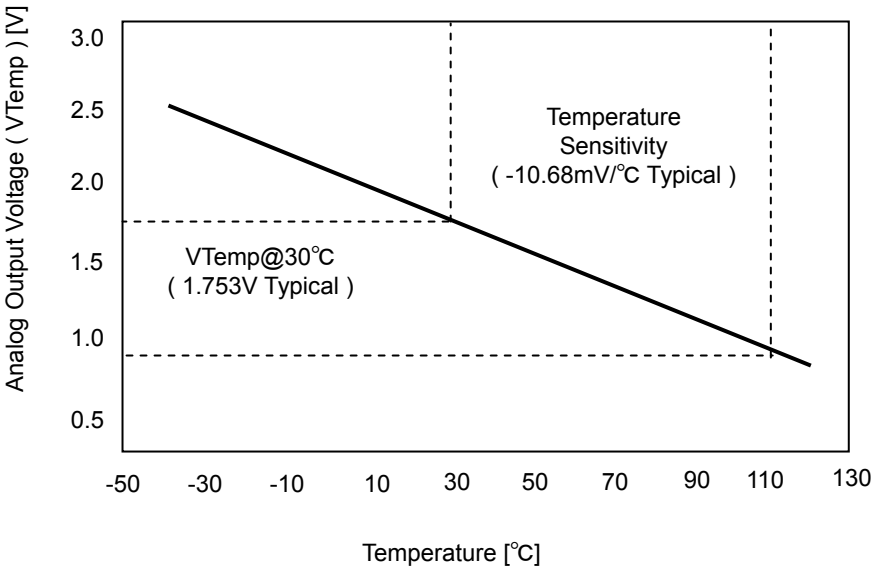
●Equivalence Circuit



●Block Diagram



●Functional Diagram (ex. Detection Temperature 110°C)



●Reference Data

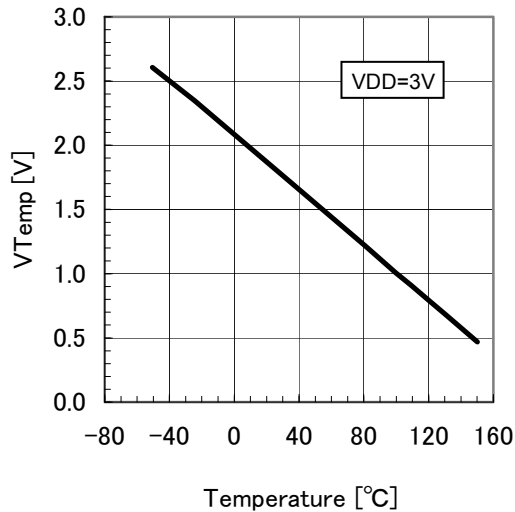


Fig1. VTemp Voltage vs. Temperature (Temperature Sensitivity)

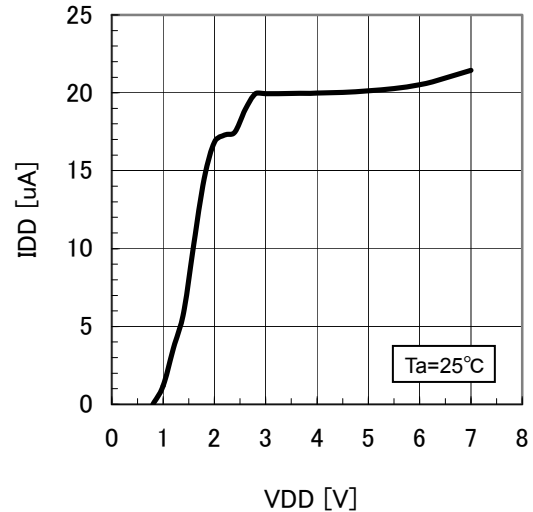


Fig2. Supply Current vs. Supply Voltage

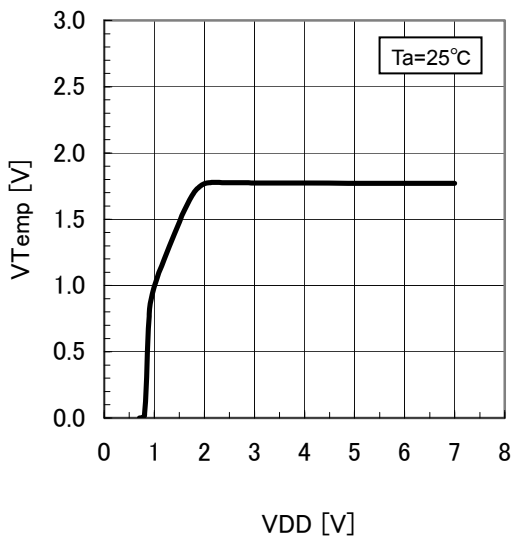


Fig3. VTemp Voltage vs. Supply Voltage

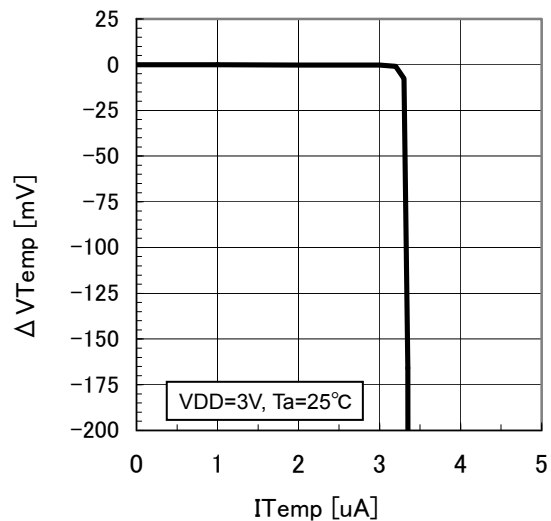


Fig4. VTemp Voltage vs. Output Current

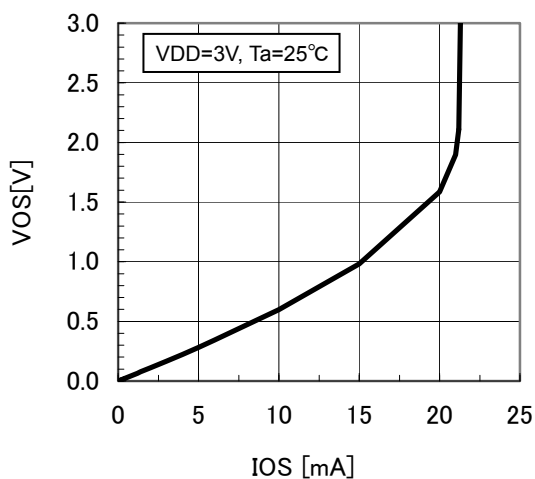


Fig5. OS Output Voltage vs. Load Current

●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.

●Ordering part number

B	D	E
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Part No.

0	0	0	0
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Part No.

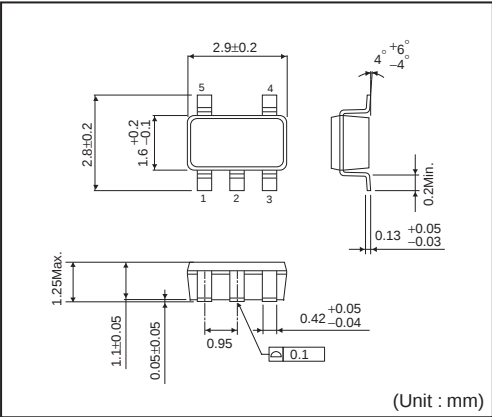
0000	0100	0200
0300	0400	0500
0600	0700	0800
0900	1000	1100
1200	9100	9200

G	-	T	R
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Package
G: SSOP5

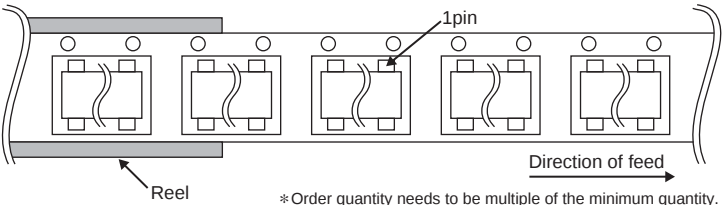
Packaging and forming specification
TR: Embossed tape and reel
(SSOP5)

SSOP5



<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)



Notes

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