

# High-Accuracy Temperature Sensor Monolithic IC MM3154 Series

## Outline

This IC is a high-accuracy temperature sensor IC that can linearly output the voltage in response to changes in temperature. The operating temperature range is  $-40$  to  $100^{\circ}\text{C}$ , and the operating supply voltage range is  $+2.4$  to  $+6.5\text{V}$ .

Compared to conventional thermistors and similar devices, it has superior linearity and a maximum temperature accuracy error of  $\pm 2.5^{\circ}\text{C}$ . It is suitable for use in portable devices as the current consumption is as low as  $4.5\mu\text{A}$  typ. ( $T_a = 25^{\circ}\text{C}$ ).

## Features

1. High temperature accuracy
2. Low current consumption
3. Temperature - output voltage high linearity
4. Wide operating supply voltage
5. High input stability
6. High load stability

## Packages

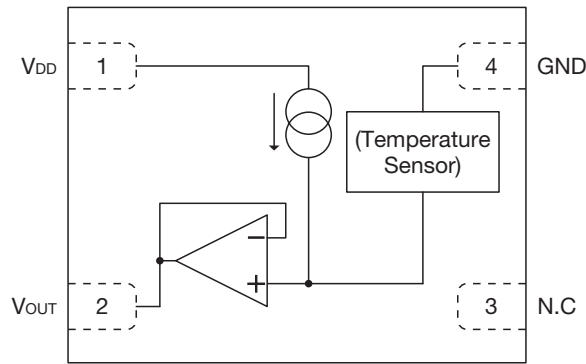
SC-82ABA  
SSON-4A

## Applications

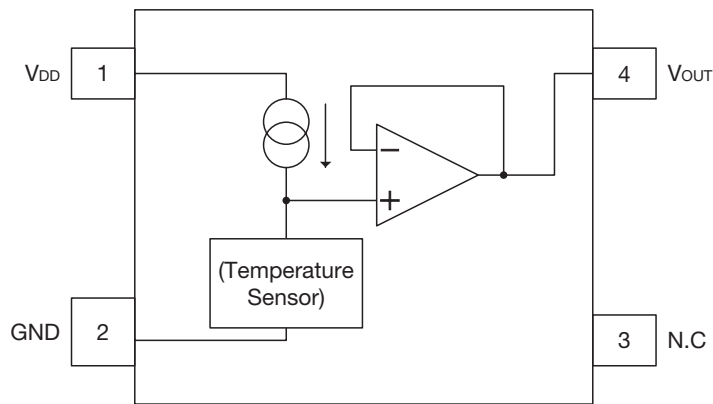
1. Cellular phones/PHS
2. Crystal oscillator modules
3. Computers
4. Power modules
5. Battery packs and chargers

**Block Diagram**

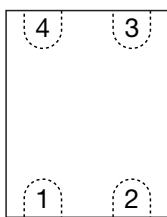
■ SSON-4A



■ SC-82ABA

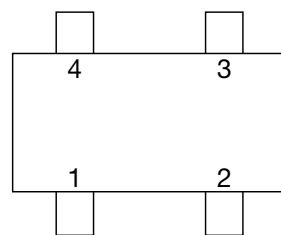


**Pin Assignment**



SSON-4A (TOP VIEW)

1	V <sub>DD</sub>
2	V <sub>OUT</sub>
3	N.C
4	GND



SC-82ABA (TOP VIEW)

1	V <sub>DD</sub>
2	GND
3	N.C
4	V <sub>OUT</sub>

**Pin Description**

■ SSON-4A

Pin No.	Pin name	Function
1	V <sub>DD</sub>	Power supply pin
2	V <sub>OUT</sub>	Output pin
3	N.C	No connect
4	GND	Ground pin

■ SC-82ABA

Pin No.	Pin name	Function
1	V <sub>DD</sub>	Power supply pin
2	GND	Ground pin
3	N.C	No connect
4	V <sub>OUT</sub>	Output pin

**Absolute Maximum Ratings** (Ta=25°C)

Item	Symbol	Ratings	Units
Maximum supply voltage	V <sub>DD max.</sub>	-0.3~+7.0	V
Maximum output voltage	V <sub>OUT</sub>	-0.3~V <sub>DD</sub> +0.3	V
Allowable loss	P <sub>d</sub>	150	mW
Storage temperature	T <sub>STG</sub>	-55~+150	°C

**Recommended Operating Conditions**

Item	Symbol	Ratings	Units
Operating supply voltage	V <sub>DDOPR</sub>	+2.4~+6.5	V
Operating temperature	T <sub>OPR</sub>	-40~+100	°C

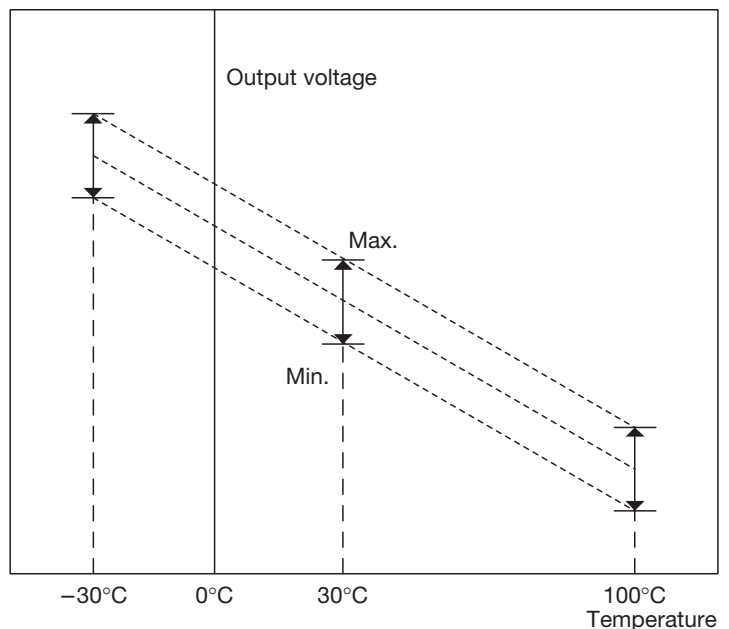
**Electrical Characteristics** (Except where noted otherwise, Ta=25°C, V<sub>DD</sub>=5V, I<sub>OUT</sub>=0A)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Accuracy	A <sub>c</sub>	-30°C ≤ Ta ≤ 100°C			±2.5	°C
Current consumption	I <sub>DD</sub>			4.5	8.0	μA
Output voltage (note 1)	V <sub>OUT</sub>	Ta=-30°C	1.931	1.951	1.971	V
		Ta=30°C	1.454	1.474	1.494	V
		Ta=100°C	0.862	0.882	0.902	V
Temperature sensitivity (note 2)	V <sub>SE</sub>	-30°C ≤ Ta ≤ 100°C	-8.40	-8.20	-8.00	mV/°C
Nonlinearity (note 3)	ΔNL	-20°C ≤ Ta ≤ 80°C		±0.5		%
Line regulation	ΔV <sub>OUT</sub> / ΔV <sub>DD</sub>	V <sub>DD</sub> =+2.4~+6.5V			0.03	%/V
Load regulation *	ΔV <sub>OUT</sub> / ΔI <sub>OUT</sub>	I <sub>OUT</sub> =0~200μA			1.0	mV

\* : Don't flow sink current into output pin (V<sub>OUT</sub>).

note 1 : Output voltage : V<sub>OUT</sub>

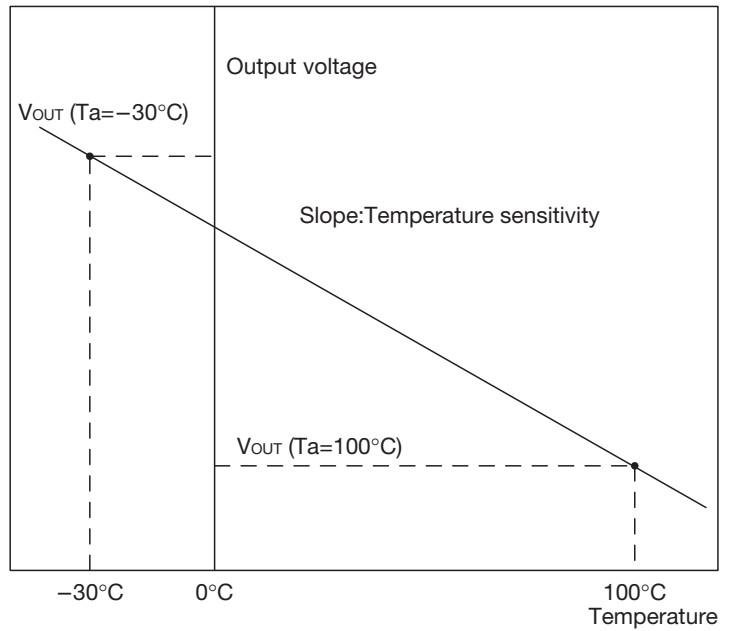
Terminal voltage at the time of Ta=-30°C, 30°C, and 100°C.



note 2 : Temperature sensitivity :  $V_{SE}$

Temperature coefficient of output voltage calculated from output voltage at the time of  $T_a = -30^\circ\text{C}$  and  $+100^\circ\text{C}$ .

$$V_{SE} = (V_{OUT}(100^\circ\text{C}) - V_{OUT}(-30^\circ\text{C})) / 130$$

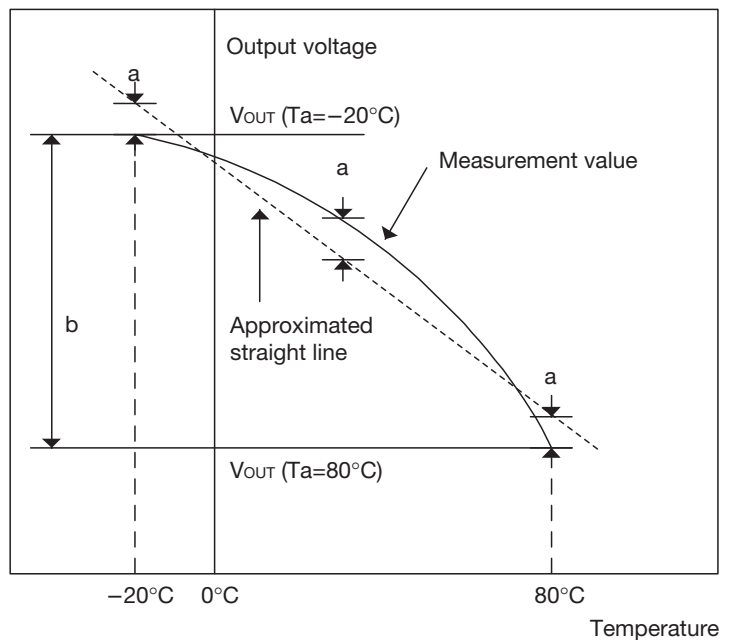


note 3 : Nonlinearity :  $\Delta NL$

Characteristic curve of output voltage and deflection with the approximation straight line.

In temperature range from  $-20$  to  $+80^\circ\text{C}$ , the approximation straight line and the maximum deflection of the measurement value among output voltages obtained from the approximation straight line.

It assumes the approximation straight line to be a straight line to which  $a$  is minimized.

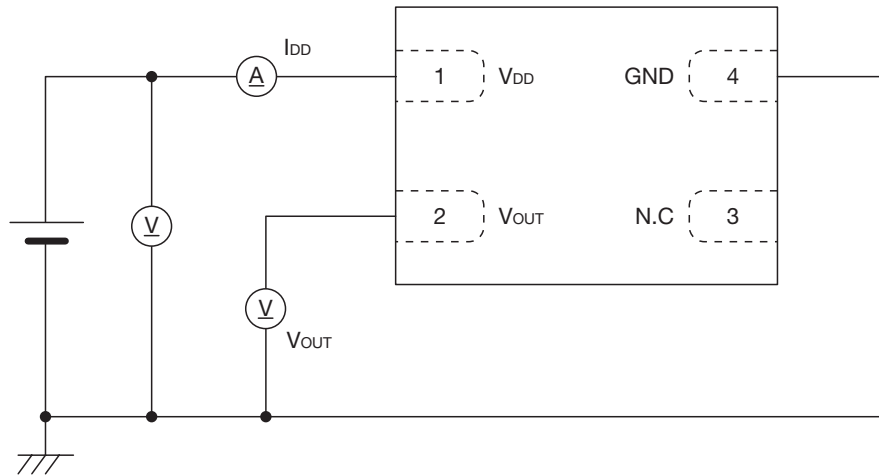


$$\Delta NL = a/b * 100$$

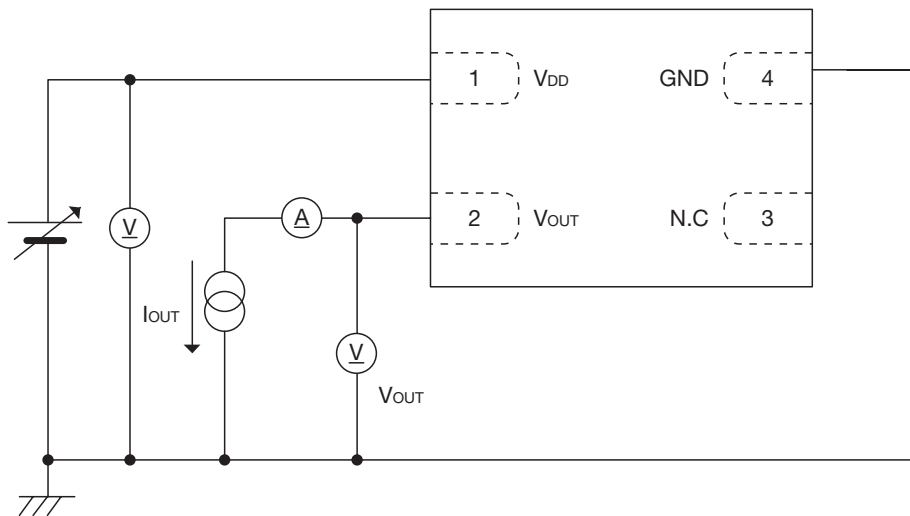
Measuring Circuit

SSON-4A

1

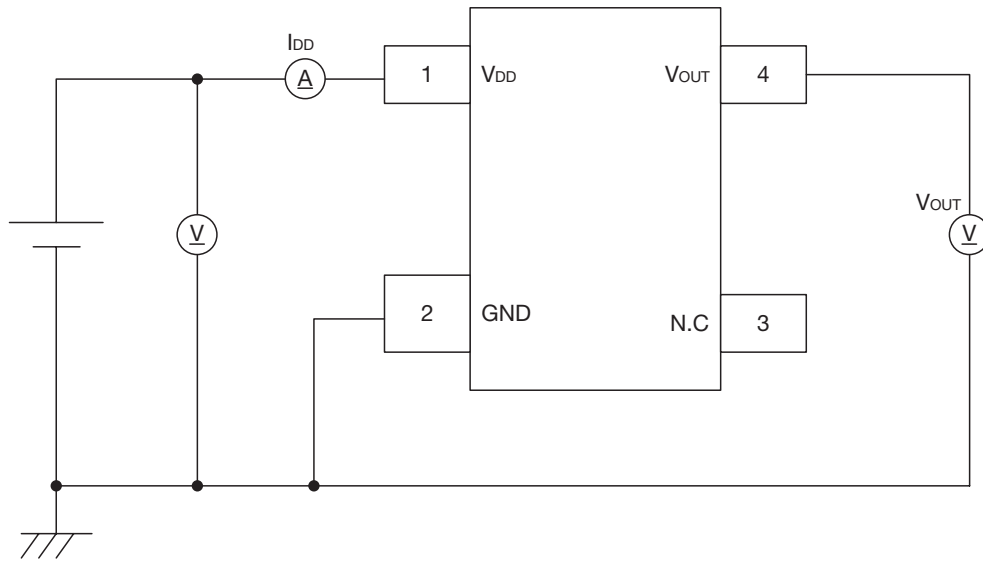


2

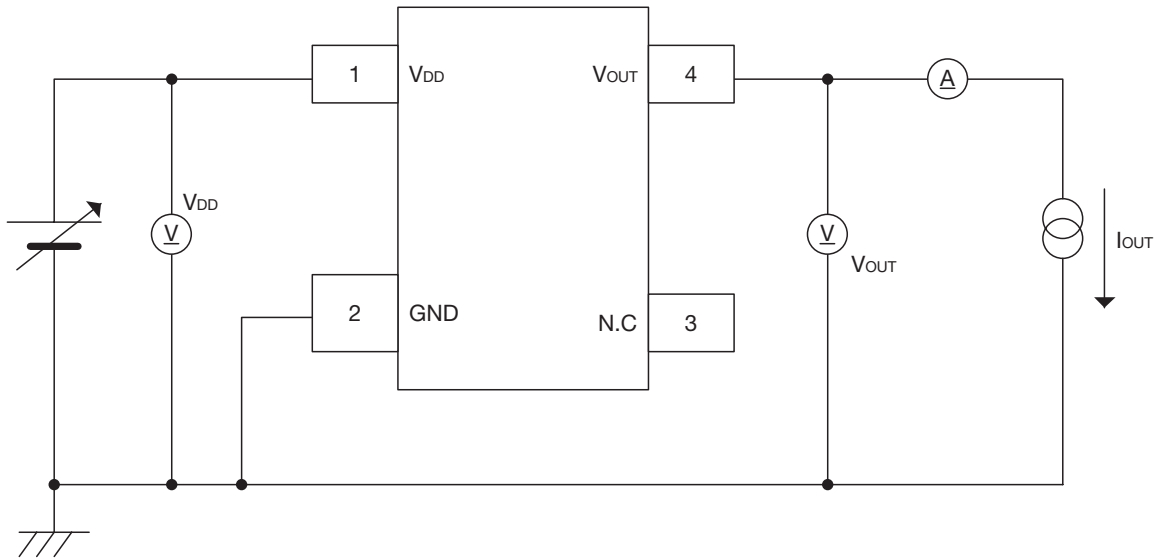


■ SC-82ABA

1

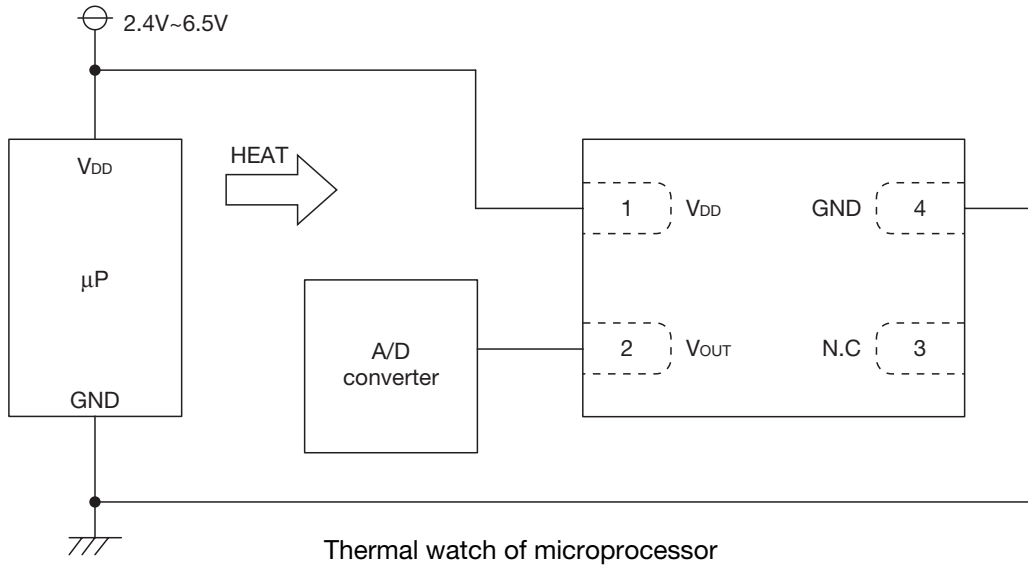


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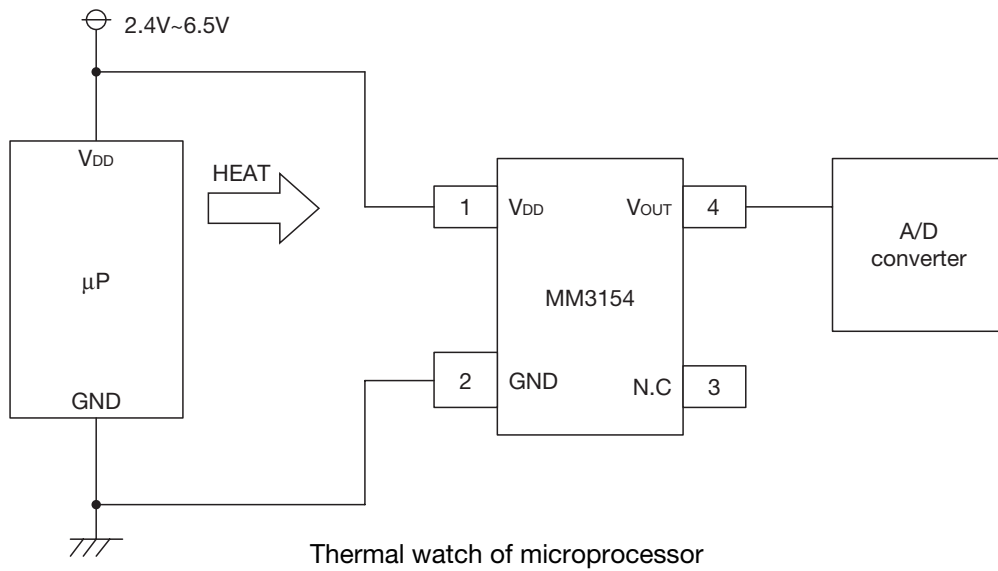


Application Circuit

SSON-4A



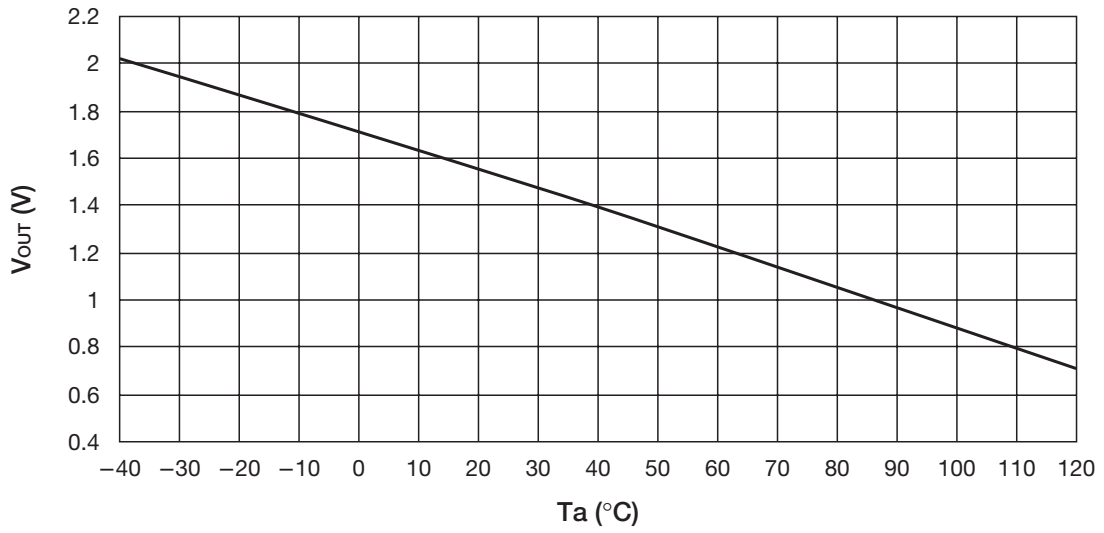
SC-82ABA



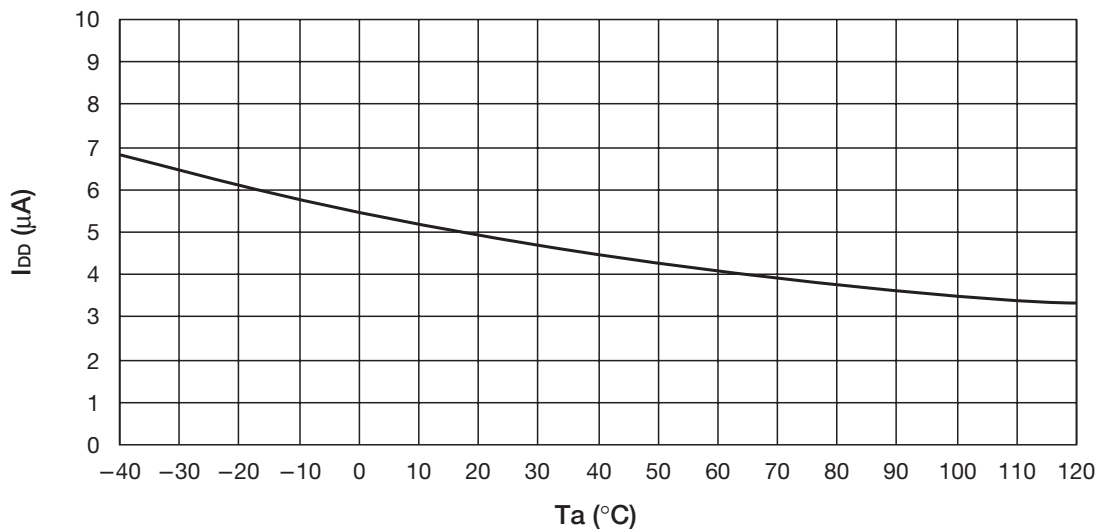
We shall not be liable for any trouble or damage caused by using this circuit.  
 In the event a problem which may affect industrial property or any other rights of us or a third party is encountered during the use of information described in these circuit, Mitsumi Electric Co., Ltd. shall not be liable for any such problem, nor grant a license therefore.

## Characteristics

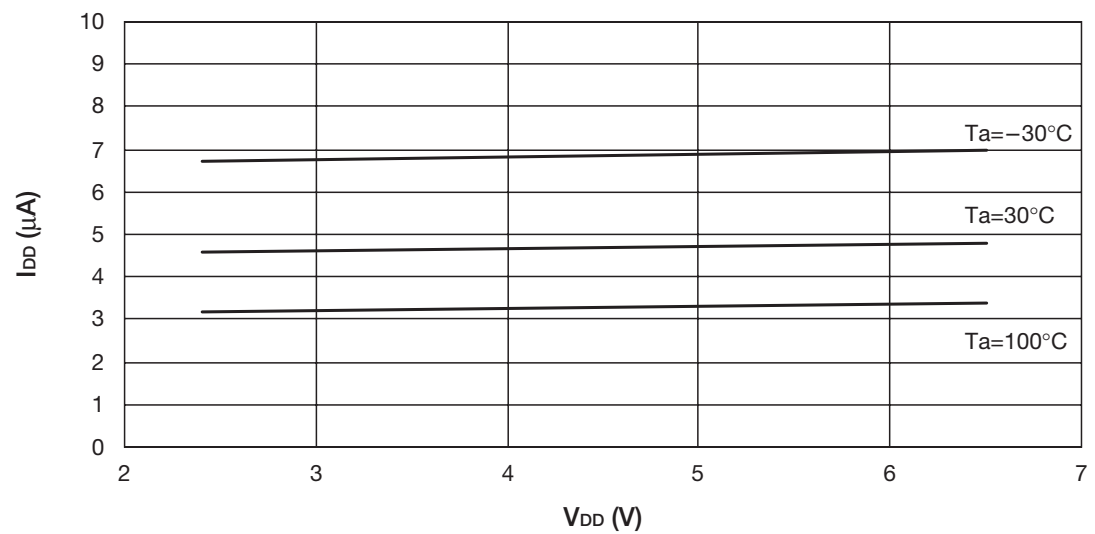
### Output voltage vs Temperature



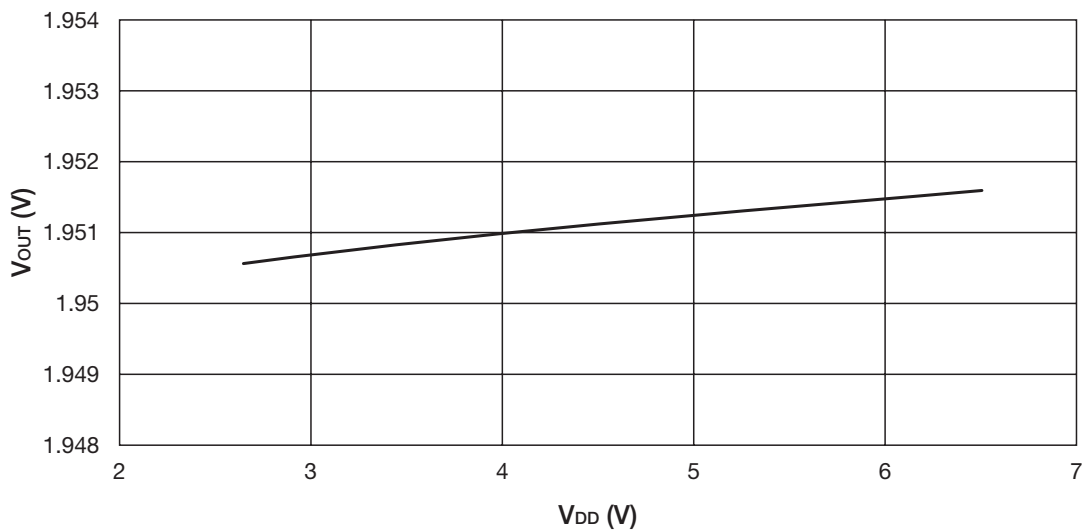
### Current consumption vs Temperature



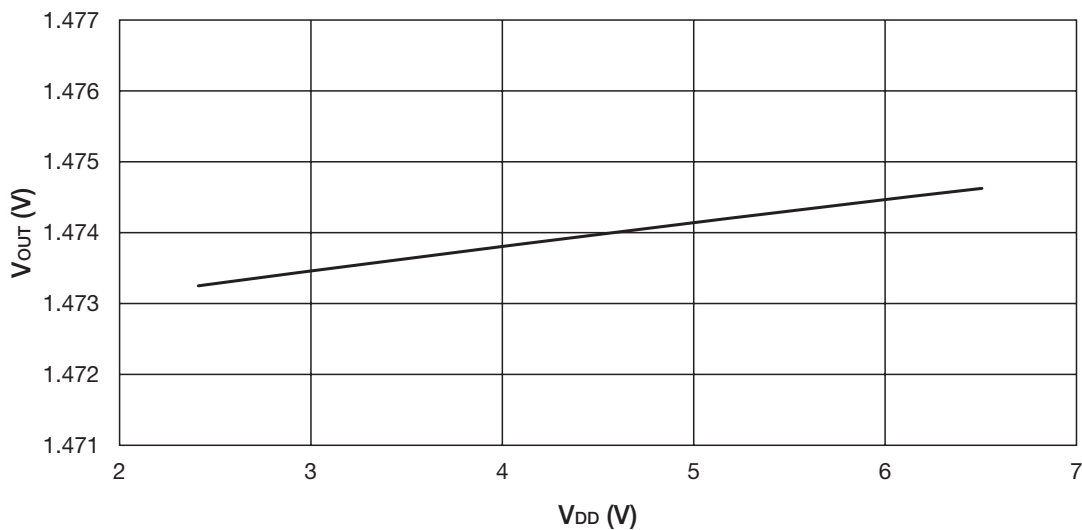
### Current consumption vs Supply voltage



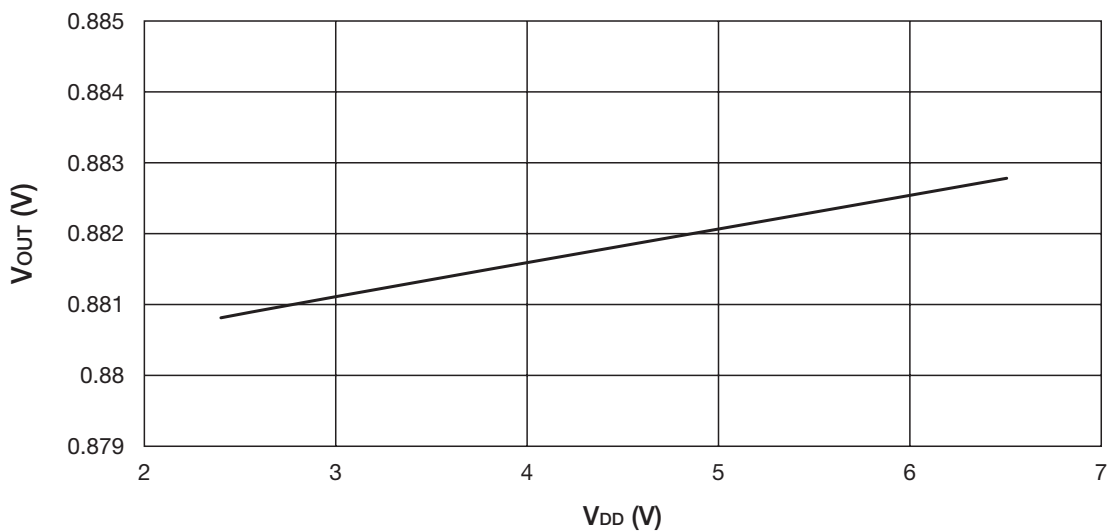
■ Output voltage vs Supply voltage  $T_a = -30^\circ\text{C}$



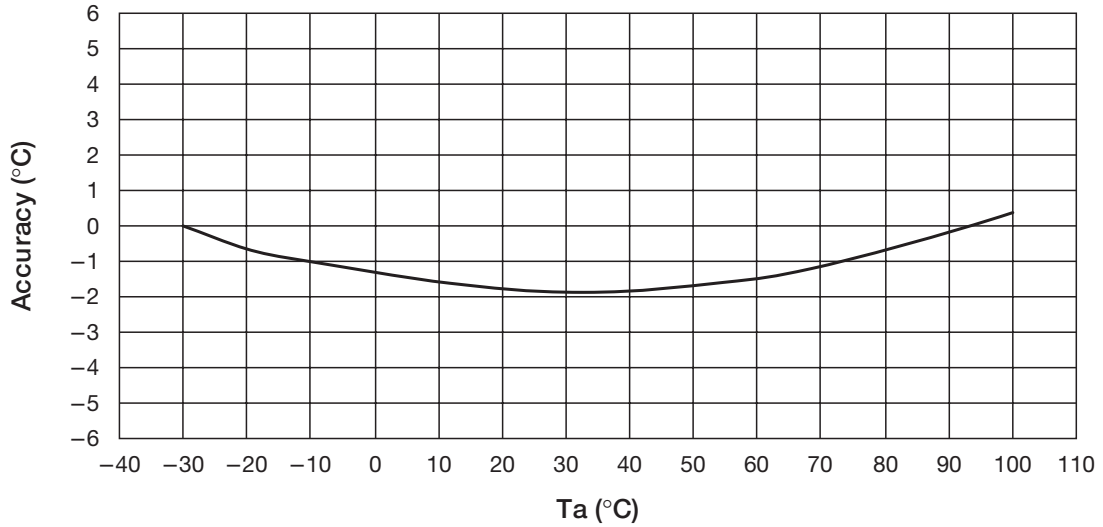
■ Output voltage vs Supply voltage  $T_a = 30^\circ\text{C}$



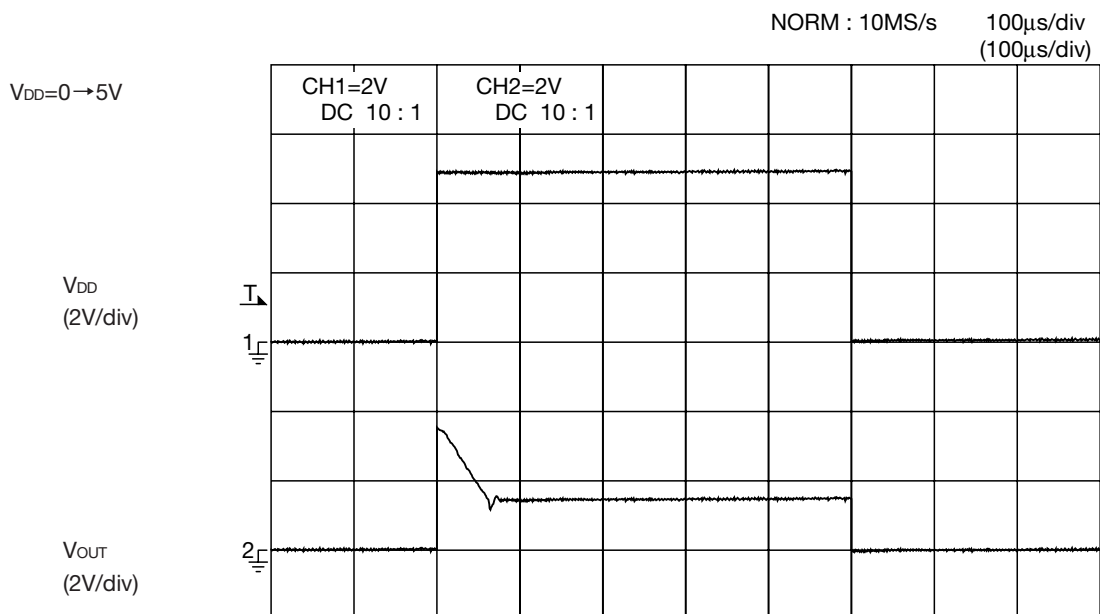
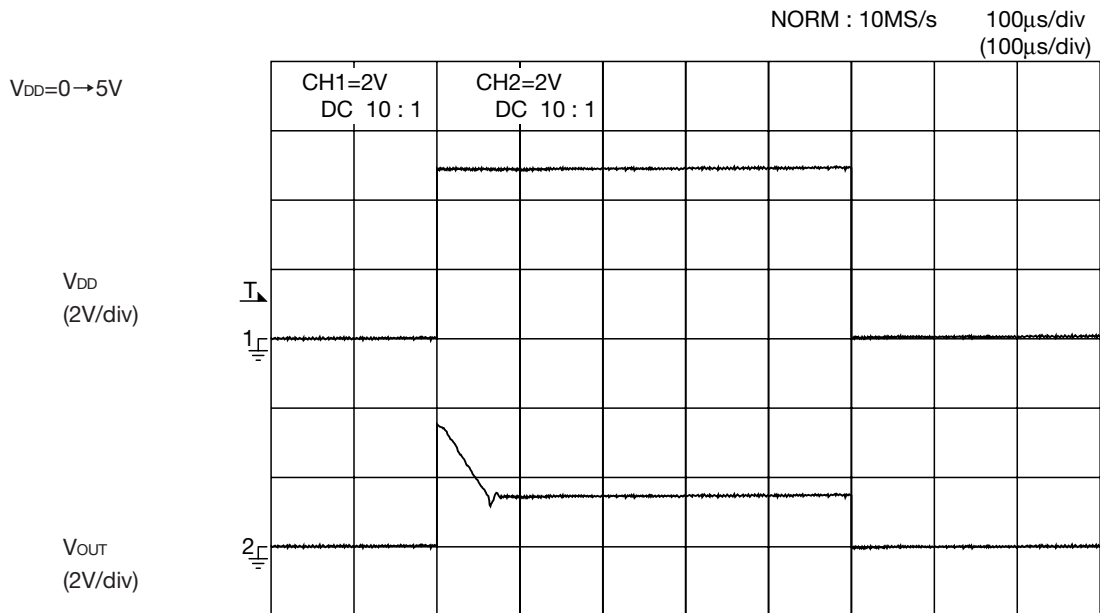
■ Output voltage vs Supply voltage  $T_a = 100^\circ\text{C}$



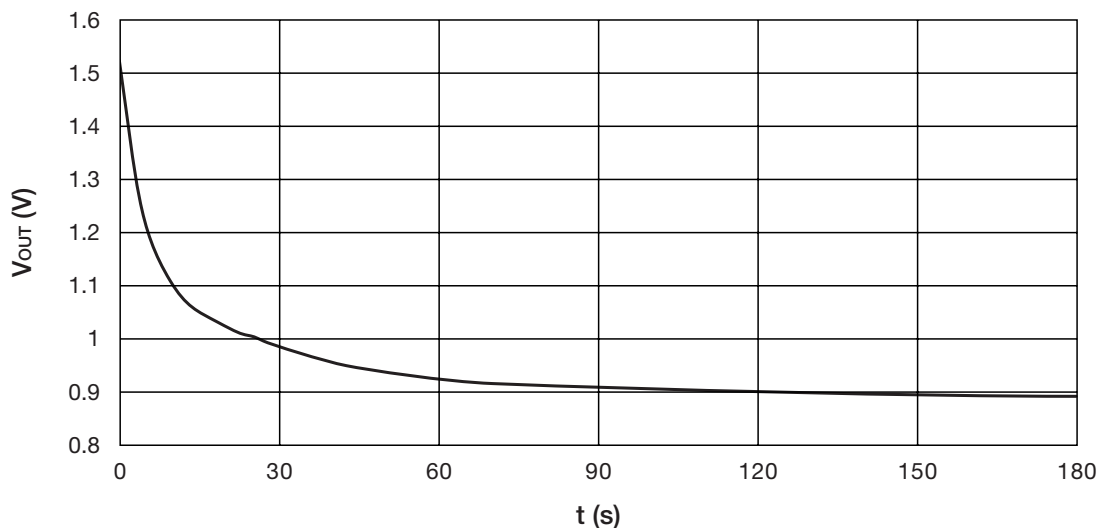
■ Accuracy vs Temperature



■ Start-up response



■ Thermal response characteristic in the air at 25°C → in the air at 100°C



■ Thermal response characteristic in the air at 25°C → in the liquid at 100°C

