

# Microminiature Low-Noise, Low-Saturation Three-Pin Regulator Monolithic IC MM1320

## Outline

This IC is a microminiature low-noise stabilized power supply device featuring a highly precise output voltage and a small input/output voltage difference of only 0.15V at an output current of 60mA.

The IC delivers output currents of up to 200mA, and through use of a noise pin output noise is diminished even further. An on/off pin can be used to turn the output on and off.

## Features

- |   |   |
|---|---|
| 1. Input/output voltage difference                                    | 0.15V typ. ( $I_o=60\text{mA}$ )                            |
| 2. Output noise voltage   | $30\mu\text{V}_{\text{RMS}}$ typ. ( $C_n=0.01\mu\text{F}$ ) |
| 3. Maximum output current   | 150mA max.  |
| 4. No-load input current  | $170\mu\text{A}$ typ.                                       |
| 5. With internal overcurrent protection and thermal shutdown circuits |   |
| 6. Output voltage ranks   | 2~3.3V (0.1 V steps)<br>3.5V, 4V, 4.5V, 5V                  |
| 7. Output on/off control function                                     | High : ON, Low : OFF  |

## Package

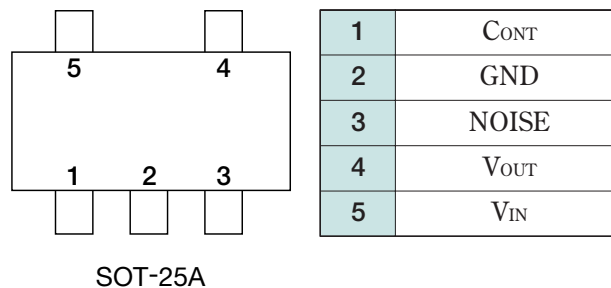
SOT-25A (MM1320□N)

\*The output voltage rank appears in the boxes.

## Applications

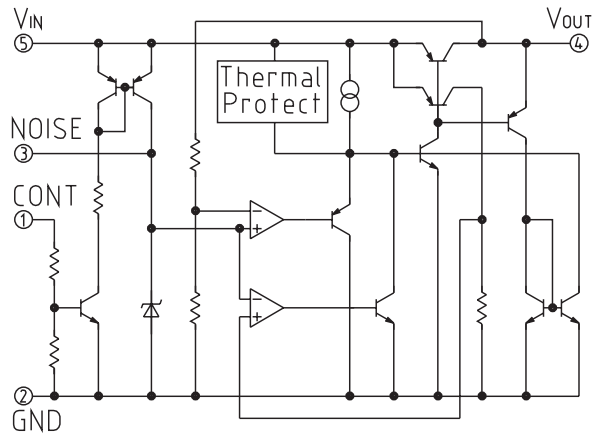
1. Cordless phones
2. Portable phones, PHS
3. Portable minidisks
4. Other portable equipment which uses batteries

## Pin Assignment



**Equivalent Circuit Diagram**

(MM1320)



**Absolute Maximum Ratings**

| Item                  | Symbol           | Ratings  | Units |
|-----------------------|------------------|----------|-------|
| Storage temperature   | T <sub>STG</sub> | -40~+125 | °C    |
| Operating temperature | T <sub>OPR</sub> | -20~+75  | °C    |
| Power supply current  | V <sub>CC</sub>  | -0.3~+12 | V     |
| Output current        | I <sub>OUT</sub> | 200      | mA    |
| Power consumption     | P <sub>d</sub>   | 150      | mW    |

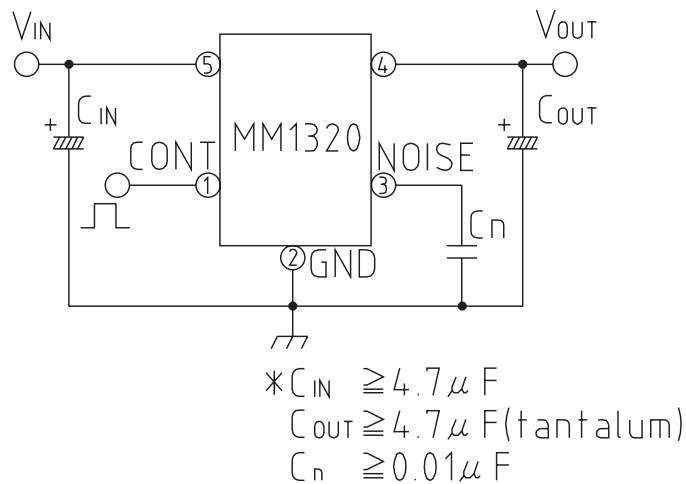
**Recommended Operating Conditions**

| Item                  | Symbol           | Ratings | Units |
|-----------------------|------------------|---------|-------|
| Operating temperature | T <sub>OPS</sub> | -20~+75 | °C    |
| Output current        | I <sub>OPS</sub> | 150     | mA    |
| Operating voltage     | V <sub>OP</sub>  | 1.8~10  | V     |

**Electrical Characteristics** (Except where noted otherwise, Ta=25°C)

| Item                                   | Symbol              | Measurement conditions  | Min.                 | Typ.             | Max.                 | Units             |
|--|---------------------|---|----------------------|------------------|----------------------|-------------------|
| Output voltage                         | V <sub>o</sub>      | V <sub>IN</sub> =V <sub>OUT</sub> +1V, I <sub>o</sub> =30mA   | V <sub>OUT</sub> -2% | V <sub>OUT</sub> | V <sub>OUT</sub> +2% | V                 |
| No-load consumption current            | I <sub>ccq1</sub>   | V <sub>IN</sub> =V <sub>OUT</sub> +1V, I <sub>o</sub> =0mA  |                      | 170              | 340                  | μA                |
| Input current while off                | I <sub>ccq2</sub>   | V <sub>IN</sub> =V <sub>OUT</sub> +1V, V <sub>cont</sub> =0V  |                      |                  | 1                    | μA                |
| I/O voltage difference                 | V <sub>d min.</sub> | V <sub>IN</sub> =V <sub>OUT</sub> -0.2V, I <sub>o</sub> =60mA   |                      | 0.15             | 0.25                 | V                 |
| Input fluctuations                     | ΔV <sub>1</sub>     | V <sub>IN</sub> =V <sub>OUT</sub> +1V~5V, I <sub>o</sub> =30mA  |                      | 10               | 20                   | mV                |
| Load fluctuation                       | ΔV <sub>2</sub>     | I <sub>o</sub> =0~100mA, V <sub>IN</sub> =V <sub>OUT</sub> +1V  |                      | 30               | 60                   | mV                |
| Output voltage temperature coefficient | ΔV <sub>o</sub> /ΔT | T <sub>j</sub> =-20~+75°C, I <sub>o</sub> =30mA<br>V <sub>IN</sub> =V <sub>OUT</sub> +1V              |                      | 100              |                      | ppm/°C            |
| Ripple rejection rate                  | RR                  | V <sub>IN</sub> =V <sub>OUT</sub> +1V, f=120Hz<br>V <sub>RIPPLE</sub> =1V, I <sub>o</sub> =30mA       | 50                   | 60               |                      | dB                |
| Output noise voltage                   | V <sub>n</sub>      | V <sub>IN</sub> =V <sub>OUT</sub> +1V, f=20~80kHz<br>I <sub>o</sub> =30mA, C <sub>noise</sub> =0.01μF |                      | 30<br>(3V item)  |                      | μV <sub>rms</sub> |
| CONT pin current while off             | I <sub>OFF</sub>    | V <sub>cont</sub> =0.4V   |                      | 1                | 3                    | μA                |
| CONT pin current while on              | I <sub>ON</sub>     | V <sub>cont</sub> =1.6V   |                      | 5                | 10                   | μA                |
| CONT pin high level                    | H                   |   | 1.6                  |                  | V <sub>IN</sub> +0.3 | V                 |
| CONT pin low level                     | L                   |   | -0.3                 |                  | 0.4                  | V                 |

**Measuring Circuit**

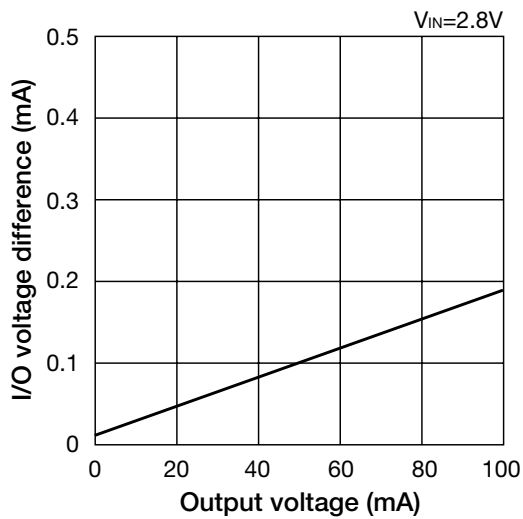


## Output voltage rank

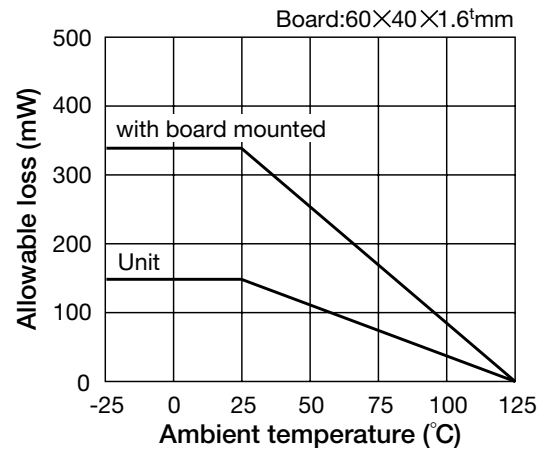
| Rnak | Voltage | Rnak | Voltage |
|------|---------|------|---------|
| A    | 5.0V    | K    | 2.8V    |
| B    | 4.5V    | L    | 2.7V    |
| C    | 4.0V    | M    | 2.6V    |
| D    | 3.5V    | N    | 2.5V    |
| E    | 3.3V    | P    | 2.4V    |
| F    | 3.2V    | R    | 2.3V    |
| G    | 3.1V    | S    | 2.2V    |
| H    | 3.0V    | T    | 2.1V    |
| J    | 2.9V    | U    | 2.0V    |

## Characteristics (MM1320)

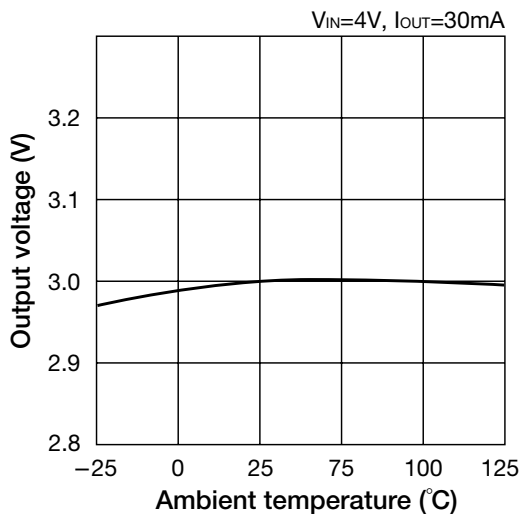
### I/O voltage difference



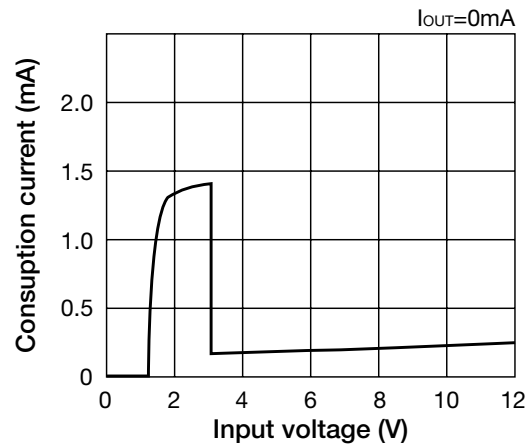
### Allowable loss



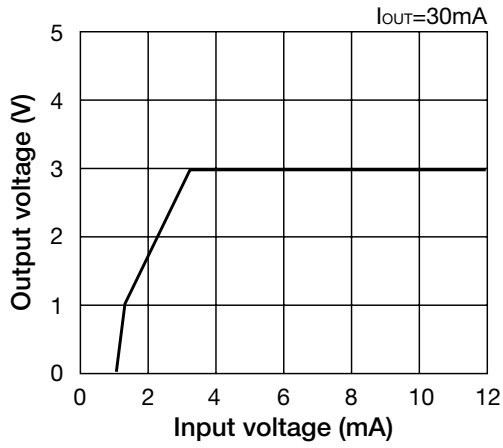
### Output voltage temperature characteristic



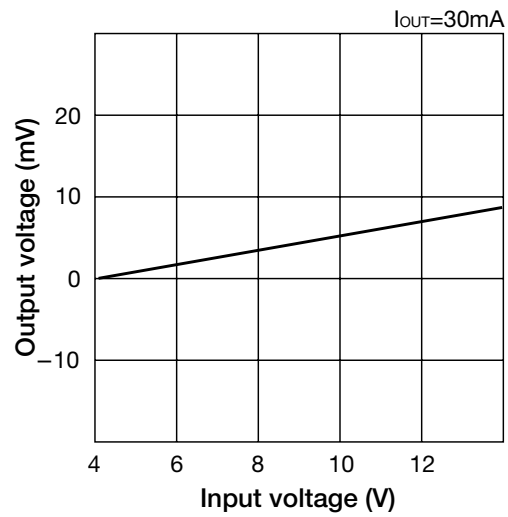
### No-load consumption current



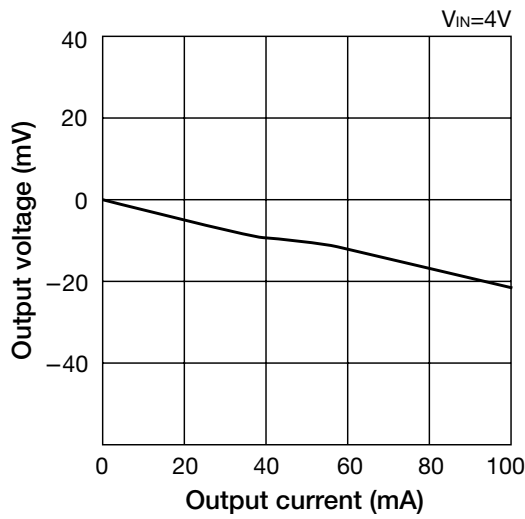
■ Output voltage



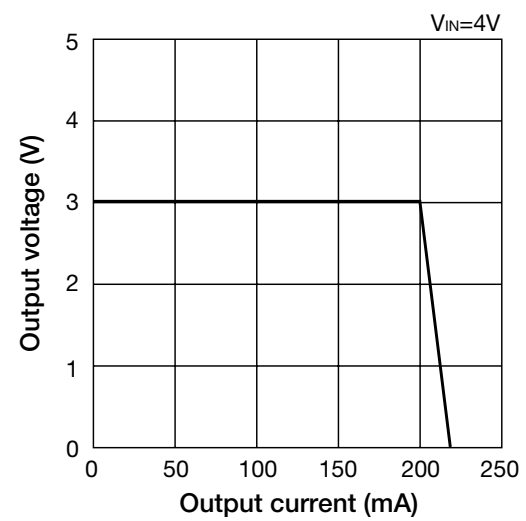
■ Input fluctuation



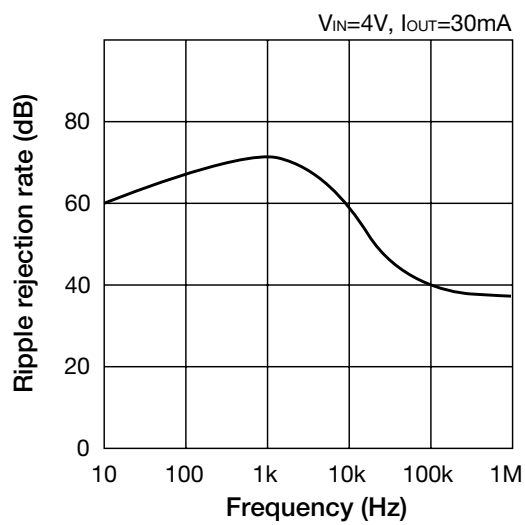
■ Load fluctuation



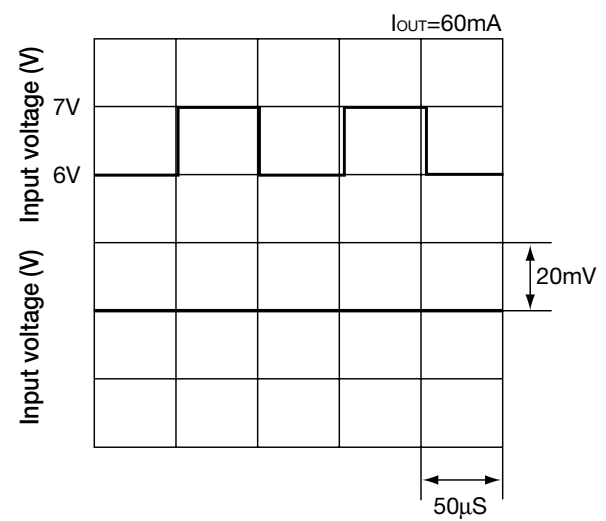
■ Current limit



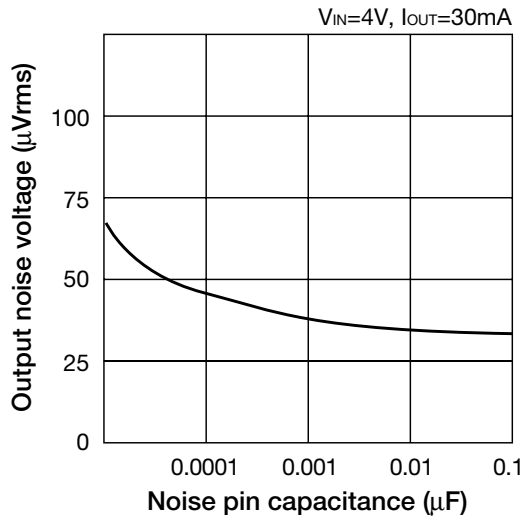
■ Ripple rejection rate



■ Input transient response



■ Output noise voltage



■ Input transient response

