

# Microminiature Low-Power Consumption Low-Saturation Regulator Monolithic IC MM1385

## Outline

This IC is a microminiature stabilized power supply device featuring an output voltage precision of within  $\pm 2\%$  and output currents of up to 200mA; the input/output voltage difference at 50mA is only 0.1V.

This chip is provided with an output noise reduction pin and output on/off control pin, and is ideal for use in portable equipment.

## Features

- |                           |  |
|---------------------------|--|
| 1. No-load input current  | 95 $\mu$ A typ.  |
| 2. I/O voltage difference | 0.1V typ.(I <sub>o</sub> =50mA)                        |
| 3. Ripple rejection ratio | 70dB typ.  |
| 4. Output current         | 150mA max.   |
| 5. Output noise voltage   | 35 $\mu$ Vrms typ.                                     |
| 6. Output voltage rank    | 2~3.3V(0.1V step), 3.5V/3.8V/4V/4.2V/4.5V/4.8V/5V/5.2V |
| 7. Output on/off control  | High→ON, Low→OFF                                       |

## Package

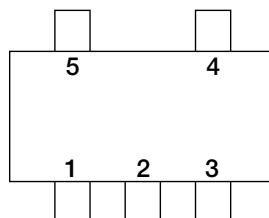
SOT-25A (MM1385□N)

\*The output voltage rank appears in the boxes.

## Applications

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

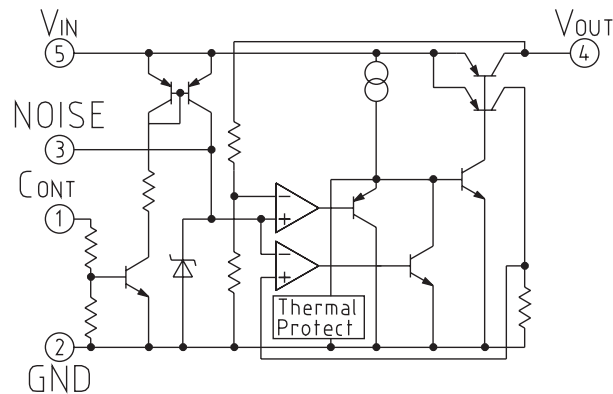
## Pin Assignment



SOT-25A  
(TOP VIEW)

|   |                  |
|---|------------------|
| 1 | CONT             |
| 2 | GND              |
| 3 | NOISE            |
| 4 | V <sub>OUT</sub> |
| 5 | V <sub>IN</sub>  |

## Block Diagram



## 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    |

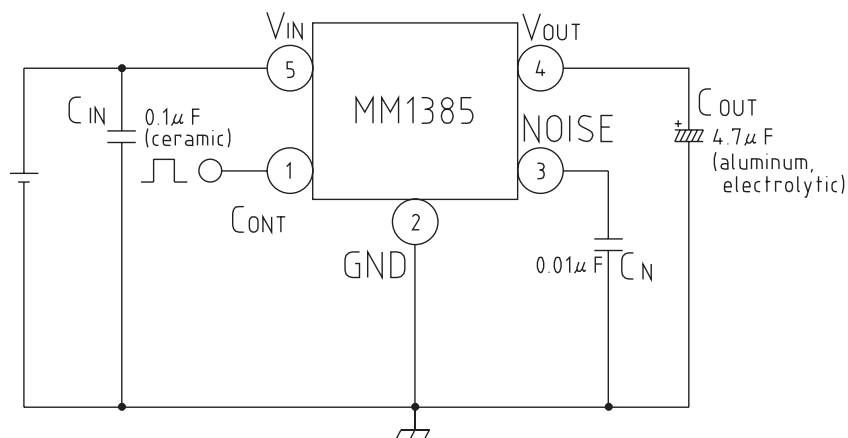
## Recommended Operating Conditions

| Item                  | Symbol          | Ratings | Units |
|-----------------------|-----------------|---------|-------|
| Operating temperature | T <sub>OP</sub> | -20~+75 | °C    |
| Output current        | I <sub>OP</sub> | 0~150   | mA    |
| Operating voltage     | V <sub>OP</sub> | 1.8~12  | V     |

**Electrical Characteristics** (Except where noted otherwise,  $T_a=25^\circ\text{C}$ )

| Item                                   | Symbol                | Measurement conditions   | Min.             | Typ.                       | Max.              | Units                 |
|--|-----------------------|--|------------------|----------------------------|-------------------|-----------------------|
| Output voltage                         | $V_o$                 | $V_{IN}=V_o+1\text{V}$ , $I_o=30\text{mA}$ ,   | $V_{OUT}$<br>-2% | $V_{OUT}$                  | $V_{OUT}$<br>+2%  | V                     |
| No-load consumption current            | $I_{ccq1}$            | $V_{IN}=V_o+1\text{V}$ , $I_o=0\text{mA}$  |                  | 95                         | 190               | $\mu\text{A}$         |
| Input current while off                | $I_{ccq2}$            | $V_{IN}=V_o+1\text{V}$ , $V_{CONT}=0\text{V}$  |                  |                            | 0.1               | $\mu\text{A}$         |
| I/O voltage difference                 | $V_d$ min.            | $V_{IN}=V_o-0.2\text{V}$ , $I_o=50\text{mA}$   |                  | 0.1                        | 0.2               | V                     |
| Input fluctuations                     | $\Delta V_1$          | $V_{IN}=V_o+1\text{V}\sim 10\text{V}$ , $I_o=50\text{mA}$                                    |                  | 10                         | 20                | mV                    |
| Load fluctuation                       | $\Delta V_2$          | $V_{IN}=V_o+1\text{V}$ , $I_o=0\sim 100\text{mA}$  |                  | 30                         | 60                | mV                    |
| Output voltage temperature coefficient | $\Delta V_o/\Delta T$ | $T_j=-20\sim 75^\circ\text{C}$ , $V_{IN}=V_o+1\text{V}$ , $I_o=30\text{mA}$                  |                  | 100                        |                   | ppm/ $^\circ\text{C}$ |
| Ripple rejection rate                  | RR                    | $V_{IN}=V_o+1\text{V}$ , $I_o=30\text{mA}$ , $V_{RIPPLE}=1\text{V}_{P-P}$ , $f=120\text{Hz}$ | 50               | 70                         |                   | dB                    |
| Output noise voltage                   | $V_n$                 | $V_{IN}=V_o+1\text{V}$ , $f=20\sim 80\text{kHz}$ , $I_o=30\text{mA}$ , $C_n=0.01\mu\text{F}$ |                  | <sup>35</sup><br>(3V item) |                   | $\mu\text{V}_{rms}$   |
| $C_{ONT}$ pin current while on         | $I_{ON}$              | $V_{CONT}=1.6\text{V}$   |                  | 5                          | 10                | $\mu\text{A}$         |
| $C_{ONT}$ pin high level               | H                     |  | 1.6              |                            | $V_{IN}$<br>+0.3V | V                     |
| $C_{ONT}$ pin low level                | L                     |  | -0.3             |                            | 0.4               | V                     |

**Measuring Circuit**

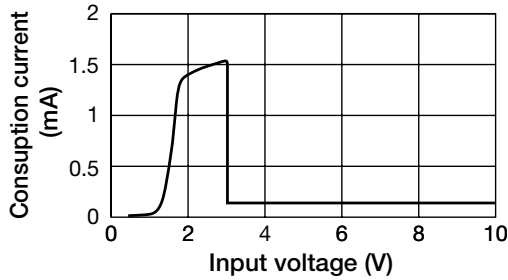


**Output Voltage Rank**

| Rank | Voltage | Rank | Voltage |
|------|---------|------|---------|
| W    | 5.2V    | G    | 3.1V    |
| A    | 5.0V    | H    | 3.0V    |
| Q    | 4.9V    | J    | 2.9V    |
| Z    | 4.8V    | K    | 2.8V    |
| X    | 4.6V    | L    | 2.7V    |
| B    | 4.5V    | M    | 2.6V    |
| V    | 4.2V    | N    | 2.5V    |
| C    | 4.0V    | P    | 2.4V    |
| Y    | 3.8V    | R    | 2.3V    |
| I    | 3.6V    | S    | 2.2V    |
| D    | 3.5V    | T    | 2.1V    |
| E    | 3.3V    | U    | 2.0V    |
| F    | 3.2V    |      |         |

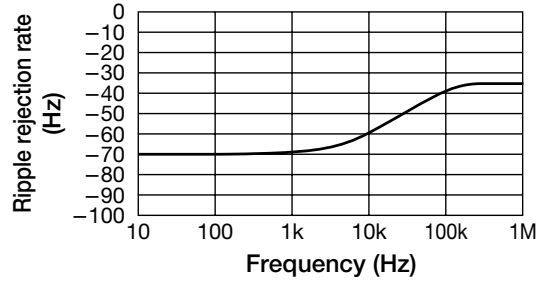
**Characteristics** (Represent data. H rank)

**No-load input current**

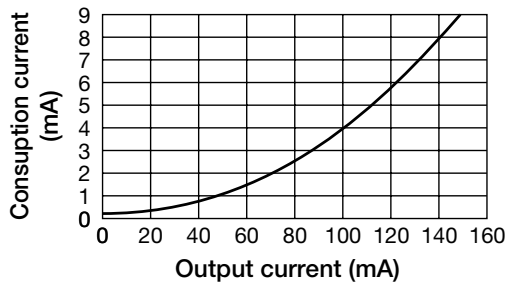


**Ripple rejection rate**

( $V_{IN}=4V, I_o=30mA, V_{ripple}=1V, C_{OUT}=4.7\mu F$ )

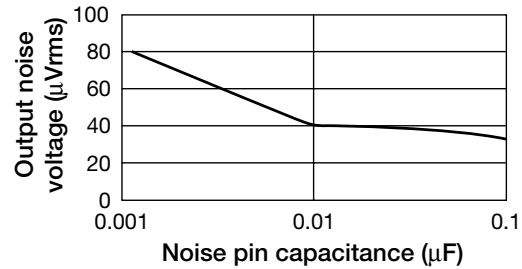


**Consumption current ( $V_{IN}=4V$ )**

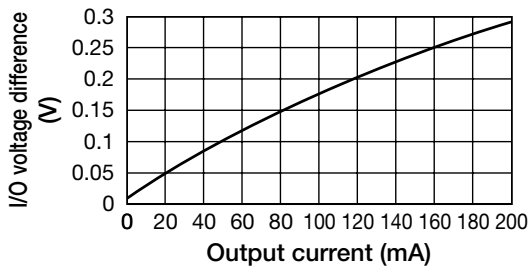


**Output noise voltage**

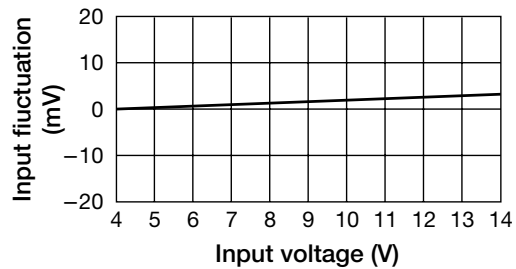
( $V_{IN}=4V, I_o=30mA, C_{OUT}=4.7\mu F$ )



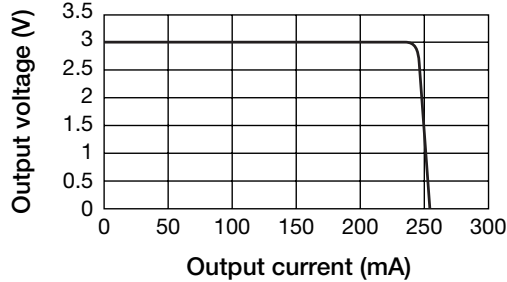
**I/O voltage difference ( $V_{IN}=2.8V$ )**



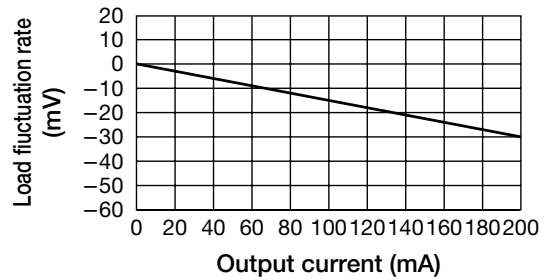
**Input fluctuation ( $I_o=30mA$ )**



**Current limit ( $V_{IN}=4V$ )**



**Load fluctuation rate ( $V_{IN}=4V$ )**



**ESR Stable region**

