

# AN1281SSM

## Ripple filter IC

### Overview

The AN1281SSM is a ripple filter IC that rejects the ripple component superimposed on the regulator output. Use for the VCO bias of cellular phones improves C/N and S/N.

### Features

- Small I/O voltage difference
- The mounting area is reduced by adopting the SSmini-type package

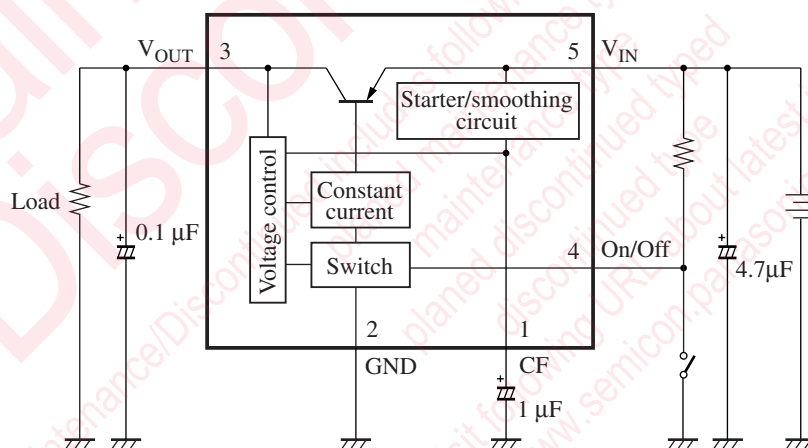
### Applications

- Cellular phones and others

### Package

- SSMINI-5DA

### Block Diagram



## ■ Absolute Maximum Ratings

| Parameter                                       | Symbol       | Rating      | Unit |
|-------------------------------------------------|--------------|-------------|------|
| Supply voltage                                  | $V_{IN}$     | 4.5         | V    |
| Supply current                                  | $I_{CC}$     | 20          | mA   |
| Power dissipation *2                            | $P_D$        | 60          | mW   |
| Operating ambient temperature *1                | $T_{opr}$    | -25 to +75  | °C   |
| Storage temperature *1                          | $T_{stg}$    | -40 to +125 | °C   |
| Output current                                  | $I_O$        | -15         | mA   |
| Allowable application voltage for on/off pin *3 | $V_{ON/OFF}$ | $V_{IN}$    | V    |
| Allowable maximum capacitance for CF pin        | CF           | 10          | μF   |

Note) 1. Do not apply external currents or voltages to any pins not specifically mentioned.

For circuit currents, '+' denotes current flowing into the IC, and '-' denotes current flowing out of the IC.

2. \*1: Except for the power dissipation, the operating ambient temperature and storage temperature, all ratings are for  $T_a = 25^\circ\text{C}$ .

\*2: The power dissipation shown is the value for  $T_a = 75^\circ\text{C}$ .

\*3: Do not over the supply voltage.

## ■ Recommended Operating Range

| Parameter      | Symbol   | Range      | Unit |
|----------------|----------|------------|------|
| Supply voltage | $V_{CC}$ | 2.5 to 4.3 | V    |

## ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$

| Parameter                                 | Symbol     | Conditions                                                                 | Min   | Typ   | Max | Unit |
|-------------------------------------------|------------|----------------------------------------------------------------------------|-------|-------|-----|------|
| Output voltage 1                          | $V_{O1}$   | $V_{IN} = 2.5\text{ V}, I_{OUT} = -1\text{ }\mu\text{A}$                   | 2.10  | 2.30  | —   | V    |
| Output voltage 2                          | $V_{O2}$   | $V_{IN} = 2.5\text{ V}, I_{OUT} = -15\text{ mA}$                           | 1.97  | 2.17  | —   | V    |
| Output voltage 3                          | $V_{O3}$   | $V_{IN} = 3.0\text{ V}, I_{OUT} = -1\text{ }\mu\text{A}$                   | 2.62  | 2.82  | —   | V    |
| Output voltage 4                          | $V_{O4}$   | $V_{IN} = 3.0\text{ V}, I_{OUT} = -15\text{ mA}$                           | 2.55  | 2.70  | —   | V    |
| Output voltage 5                          | $V_{O5}$   | $V_{IN} = 4.3\text{ V}, I_{OUT} = -1\text{ }\mu\text{A}$                   | 3.95  | 4.15  | —   | V    |
| Output voltage 6                          | $V_{O6}$   | $V_{IN} = 4.3\text{ V}, I_{OUT} = -15\text{ mA}$                           | 3.83  | 4.03  | —   | V    |
| Consumption current 1                     | $I_{CC1}$  | $V_{IN} = 2.5\text{ V}, I_{OUT} = -1\text{ }\mu\text{A}$                   | -485  | -370  | —   | μA   |
| Consumption current 2                     | $I_{CC2}$  | $V_{IN} = 2.5\text{ V}, I_{OUT} = -15\text{ mA}$                           | -420  | -320  | —   | μA   |
| Consumption current 3                     | $I_{CC3}$  | $V_{IN} = 3.0\text{ V}, I_{OUT} = -1\text{ }\mu\text{A}$                   | -735  | -565  | —   | μA   |
| Consumption current 4                     | $I_{CC4}$  | $V_{IN} = 3.0\text{ V}, I_{OUT} = -15\text{ mA}$                           | -670  | -515  | —   | μA   |
| Consumption current 5                     | $I_{CC5}$  | $V_{IN} = 4.3\text{ V}, I_{OUT} = -1\text{ }\mu\text{A}$                   | -1.42 | -1.09 | —   | mA   |
| Consumption current 6                     | $I_{CC6}$  | $V_{IN} = 4.3\text{ V}, I_{OUT} = -15\text{ mA}$                           | -1.36 | -1.04 | —   | mA   |
| Load regulation 1                         | $REG_{L1}$ | $V_{IN} = 2.5\text{ V}, I_{OUT} = -1\text{ }\mu\text{A to } -15\text{ mA}$ | 0     | 130   | 230 | mV   |
| Load regulation 2                         | $REG_{L2}$ | $V_{IN} = 3.0\text{ V}, I_{OUT} = -1\text{ }\mu\text{A to } -15\text{ mA}$ | 0     | 120   | 220 | mV   |
| Load regulation 3                         | $REG_{L3}$ | $V_{IN} = 4.3\text{ V}, I_{OUT} = -1\text{ }\mu\text{A to } -15\text{ mA}$ | 0     | 120   | 220 | mV   |
| Consumption current against load change 1 | $I_{REG1}$ | $V_{IN} = 2.5\text{ V}, I_{OUT} = -1\text{ }\mu\text{A to } -15\text{ mA}$ | 0     | 49    | 110 | μA   |
| Consumption current against load change 2 | $I_{REG2}$ | $V_{IN} = 3.0\text{ V}, I_{OUT} = -1\text{ }\mu\text{A to } -15\text{ mA}$ | 0     | 51    | 110 | μA   |

# ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

| Parameter                                 | Symbol            | Conditions                                                                                               | Min  | Typ  | Max | Unit          |
|-------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------|------|------|-----|---------------|
| Consumption current against load change 3 | $I_{\text{REG3}}$ | $V_{\text{IN}} = 4.3\text{ V}$ , $I_{\text{OUT}} = -1\text{ }\mu\text{A}$ to $-15\text{ mA}$             | 0    | 51   | 110 | $\mu\text{A}$ |
| Ripple rejection ratio 1                  | $\text{RR}_1$     | $V_{\text{IN}} = 3\text{ V} \pm 0.1\text{ V}$ , $I_{\text{OUT}} = -15\text{ mA}$<br>$f = 1\text{ kHz}$   | 26.5 | 29.5 | —   | dB            |
| Ripple rejection ratio 2                  | $\text{RR}_2$     | $V_{\text{IN}} = 3\text{ V} \pm 0.1\text{ V}$ , $I_{\text{OUT}} = -15\text{ mA}$<br>$f = 25\text{ kHz}$  | 30.5 | 33.5 | —   | dB            |
| Ripple rejection ratio 3                  | $\text{RR}_3$     | $V_{\text{IN}} = 3\text{ V} \pm 0.1\text{ V}$ , $I_{\text{OUT}} = -15\text{ mA}$<br>$f = 100\text{ kHz}$ | 26.5 | 29.1 | —   | dB            |
| Consumption current at off                | $I_{\text{OFF}}$  | $V_{\text{IN}} = 4.3\text{ V}$ , On/Off = 0 V                                                            | —    | —    | 1   | $\mu\text{A}$ |

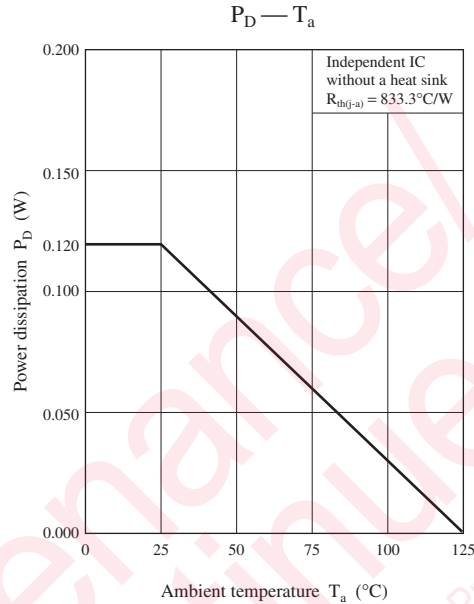
## • Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

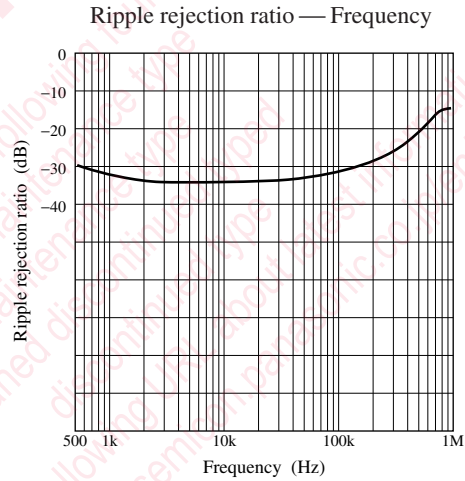
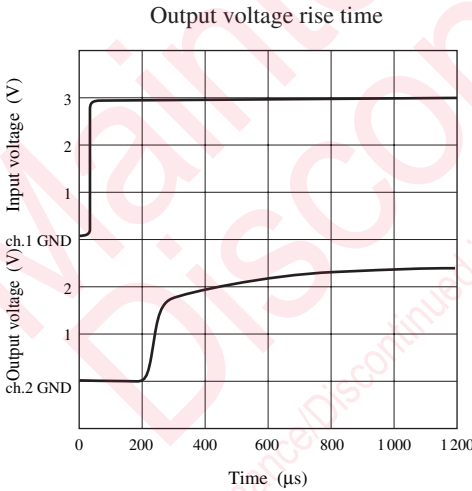
| Parameter                                 | Symbol                   | Conditions                                                                                                                                                                                                                | Reference value               | Unit          |
|-------------------------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------|
| Output voltage 7                          | $V_{\text{O7}}$          | $V_{\text{IN}} = 3.0\text{ V}$ , $I_{\text{OUT}} = -15\text{ mA}$<br>$T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$                                                                                                     | 2.50 to 2.8                   | V             |
| Consumption current 7                     | $I_{\text{CC7}}$         | $V_{\text{IN}} = 3.0\text{ V}$ , $I_{\text{OUT}} = -15\text{ mA}$<br>$T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$                                                                                                     | 400 to 800                    | $\mu\text{A}$ |
| Load regulation 4                         | $\text{REG}_{\text{L4}}$ | $V_{\text{IN}} = 3.0\text{ V}$ , $I_{\text{OUT}} = -1\text{ }\mu\text{A}$ to $-15\text{ mA}$<br>$T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$                                                                          | 100 to 350                    | mV            |
| Consumption current against load change 4 | $I_{\text{REG4}}$        | $V_{\text{IN}} = 3.0\text{ V}$ , $I_{\text{OUT}} = -1\text{ }\mu\text{A}$ to $-15\text{ mA}$<br>$T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$                                                                          | to 200                        | $\mu\text{A}$ |
| Ripple rejection ratio 4                  | $\text{RR}_4$            | $V_{\text{IN}} = 3.0\text{ V} \pm 0.1\text{ V}$ , $I_{\text{OUT}} = -15\text{ mA}$<br>$f = 1\text{ kHz}$ , $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$                                                               | 20 to                         | dB            |
| Ripple rejection ratio 5                  | $\text{RR}_5$            | $V_{\text{IN}} = 3.0\text{ V} \pm 0.1\text{ V}$ , $I_{\text{OUT}} = -15\text{ mA}$<br>$f = 25\text{ kHz}$ , $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$                                                              | 20 to                         | dB            |
| Ripple rejection ratio 6                  | $\text{RR}_6$            | $V_{\text{IN}} = 3.0\text{ V} \pm 0.1\text{ V}$ , $I_{\text{OUT}} = -15\text{ mA}$<br>$f = 100\text{ kHz}$ , $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$                                                             | 18 to                         | dB            |
| Output voltage rise time                  | $t_r$                    | $V_{\text{IN}} = 3\text{ V}$ , $V_{\text{ON/OFF}} = 0\text{ V} \rightarrow 3\text{ V}$<br>$I_{\text{OUT}} = -15\text{ mA}$ , $V_{\text{OUT}}$ : 10% $\rightarrow$ 90%<br>$T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | to 10                         | $\mu\text{s}$ |
| Output voltage fall time                  | $t_f$                    | $V_{\text{IN}} = 3\text{ V}$ , $V_{\text{ON/OFF}} = 3\text{ V} \rightarrow 0\text{ V}$<br>$I_{\text{OUT}} = -15\text{ mA}$ , $V_{\text{OUT}}$ : 90% $\rightarrow$ 10%<br>$T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | to 500                        | $\mu\text{s}$ |
| Oscillation frequency margin              | $G_f$                    | $C_{\text{OUT}} \geq 0.1\text{ }\mu\text{F}$ , $V_{\text{IN}} = 3.0\text{ V}$<br>$I_{\text{OUT}} = -1\text{ }\mu\text{A}$ to $-15\text{ mA}$<br>$T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$                          | Without abnormal oscillation. |               |

# ■ Application Notes

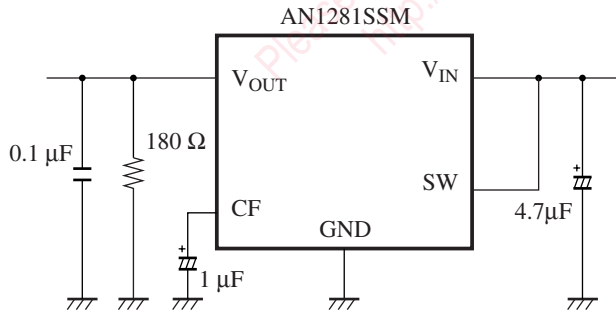
- $P_D - T_a$  curves of SSMINI-5DA package



## • Main characteristics



## Measurement circuit



**Request for your special attention and precautions in using the technical information and semiconductors described in this book**

- (1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.
- (2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products, and no license is granted under any intellectual property right or other right owned by our company or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.
- (3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).  
Consult our sales staff in advance for information on the following applications:
  - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
  - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
  - Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
- (6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.
- (7) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of Matsushita Electric Industrial Co., Ltd.

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9