

AN1281SSM

Ripple filter IC

■ Overview

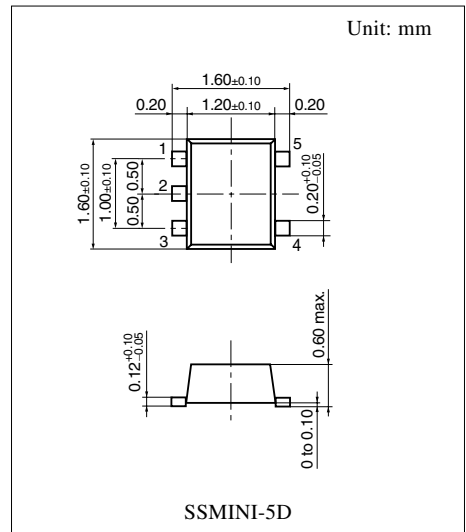
The AN1281SSM is a ripple filter IC that rejects the ripple component superimposed on the regulator output. Use for the VCO bias of cellular phones improves C/N and S/N.

■ Features

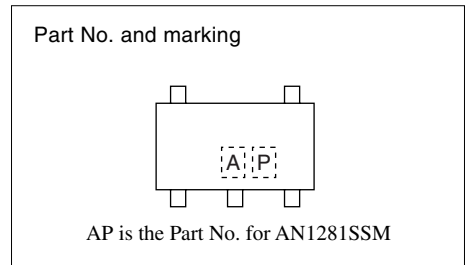
- Small I/O voltage difference
- The mounting area is reduced by adopting the SSmini-type package

■ Applications

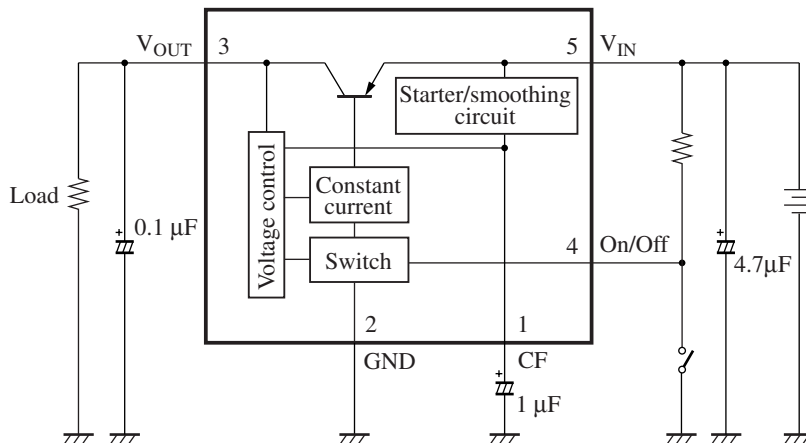
- Cellular phones and others



Note) The package of this product will be changed to lead-free type (SSMINI-5DA). See the new package dimensions section later of this datasheet.



■ 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} | $V_{IN} = 2.5\text{ V}, I_{OUT} = -1\ \mu\text{A}$ | 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} | $V_{IN} = 3.0\text{ V}, I_{OUT} = -1\ \mu\text{A}$ | 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} | $V_{IN} = 4.3\text{ V}, I_{OUT} = -1\ \mu\text{A}$ | 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} | $V_{IN} = 2.5\text{ V}, I_{OUT} = -1\ \mu\text{A}$ | -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} | $V_{IN} = 3.0\text{ V}, I_{OUT} = -1\ \mu\text{A}$ | -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} | $V_{IN} = 4.3\text{ V}, I_{OUT} = -1\ \mu\text{A}$ | -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} | $V_{IN} = 2.5\text{ V}, I_{OUT} = -1\ \mu\text{A}$ to -15 mA | 0 | 130 | 230 | mV |
| Load regulation 2 | REG_{L2} | $V_{IN} = 3.0\text{ V}, I_{OUT} = -1\ \mu\text{A}$ to -15 mA | 0 | 120 | 220 | mV |
| Load regulation 3 | REG_{L3} | $V_{IN} = 4.3\text{ V}, I_{OUT} = -1\ \mu\text{A}$ to -15 mA | 0 | 120 | 220 | mV |
| Consumption current against load change 1 | I_{REG1} | $V_{IN} = 2.5\text{ V}, I_{OUT} = -1\ \mu\text{A}$ to -15 mA | 0 | 49 | 110 | μA |
| Consumption current against load change 2 | I_{REG2} | $V_{IN} = 3.0\text{ V}, I_{OUT} = -1\ \mu\text{A}$ to -15 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_{REG3} | $V_{\text{IN}} = 4.3\text{ V}$, $I_{\text{OUT}} = -1\ \mu\text{A}$ to $-15\ \text{mA}$ | 0 | 51 | 110 | μA |
| Ripple rejection ratio 1 | RR_1 | $V_{\text{IN}} = 3\ \text{V} \pm 0.1\ \text{V}$, $I_{\text{OUT}} = -15\ \text{mA}$ $f = 1\ \text{kHz}$ | 26.5 | 29.5 | — | dB |
| Ripple rejection ratio 2 | RR_2 | $V_{\text{IN}} = 3\ \text{V} \pm 0.1\ \text{V}$, $I_{\text{OUT}} = -15\ \text{mA}$ $f = 25\ \text{kHz}$ | 30.5 | 33.5 | — | dB |
| Ripple rejection ratio 3 | RR_3 | $V_{\text{IN}} = 3\ \text{V} \pm 0.1\ \text{V}$, $I_{\text{OUT}} = -15\ \text{mA}$ $f = 100\ \text{kHz}$ | 26.5 | 29.1 | — | dB |
| Consumption current at off | I_{OFF} | $V_{\text{IN}} = 4.3\ \text{V}$, On/Off = 0 V | — | — | 1 | μA |

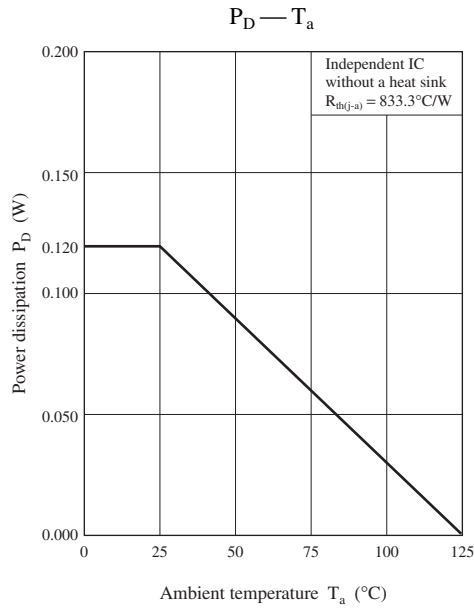
• Design reference data

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_{O7} | $V_{\text{IN}} = 3.0\ \text{V}$, $I_{\text{OUT}} = -15\ \text{mA}$ $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | 2.50 to 2.8 | V |
| Consumption current 7 | I_{CC7} | $V_{\text{IN}} = 3.0\ \text{V}$, $I_{\text{OUT}} = -15\ \text{mA}$ $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | 400 to 800 | μA |
| Load regulation 4 | REG_{L4} | $V_{\text{IN}} = 3.0\ \text{V}$, $I_{\text{OUT}} = -1\ \mu\text{A}$ to $-15\ \text{mA}$ $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | 100 to 350 | mV |
| Consumption current against load change 4 | I_{REG4} | $V_{\text{IN}} = 3.0\ \text{V}$, $I_{\text{OUT}} = -1\ \mu\text{A}$ to $-15\ \text{mA}$ $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | to 200 | μA |
| Ripple rejection ratio 4 | RR_4 | $V_{\text{IN}} = 3.0\ \text{V} \pm 0.1\ \text{V}$, $I_{\text{OUT}} = -15\ \text{mA}$ $f = 1\ \text{kHz}$, $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | 20 to | dB |
| Ripple rejection ratio 5 | RR_5 | $V_{\text{IN}} = 3.0\ \text{V} \pm 0.1\ \text{V}$, $I_{\text{OUT}} = -15\ \text{mA}$ $f = 25\ \text{kHz}$, $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | 20 to | dB |
| Ripple rejection ratio 6 | RR_6 | $V_{\text{IN}} = 3.0\ \text{V} \pm 0.1\ \text{V}$, $I_{\text{OUT}} = -15\ \text{mA}$ $f = 100\ \text{kHz}$, $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | 18 to | dB |
| Output voltage rise time | t_r | $V_{\text{IN}} = 3\ \text{V}$, $V_{\text{ON/OFF}} = 0\ \text{V} \rightarrow 3\ \text{V}$ $I_{\text{OUT}} = -15\ \text{mA}$, $V_{\text{OUT}}: 10\% \rightarrow 90\%$ $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | to 10 | μs |
| Output voltage fall time | t_f | $V_{\text{IN}} = 3\ \text{V}$, $V_{\text{ON/OFF}} = 3\ \text{V} \rightarrow 0\ \text{V}$ $I_{\text{OUT}} = -15\ \text{mA}$, $V_{\text{OUT}}: 90\% \rightarrow 10\%$ $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | to 500 | μs |
| Oscillation frequency margin | G_f | $C_{\text{OUT}} \geq 0.1\ \mu\text{F}$, $V_{\text{IN}} = 3.0\ \text{V}$ $I_{\text{OUT}} = -1\ \mu\text{A}$ to $-15\ \text{mA}$ $T_a = -25^\circ\text{C}$ to $+75^\circ\text{C}$ | Without abnormal oscillation. | |

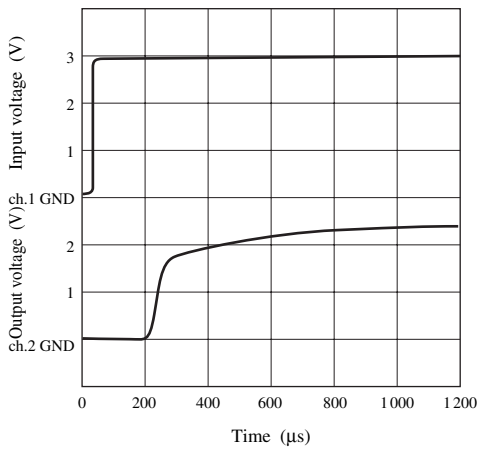
■ Application Notes

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

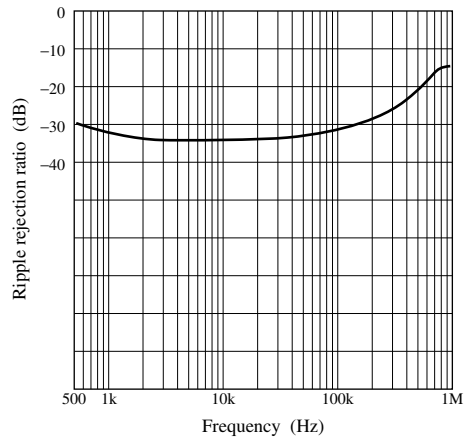


• Main characteristics

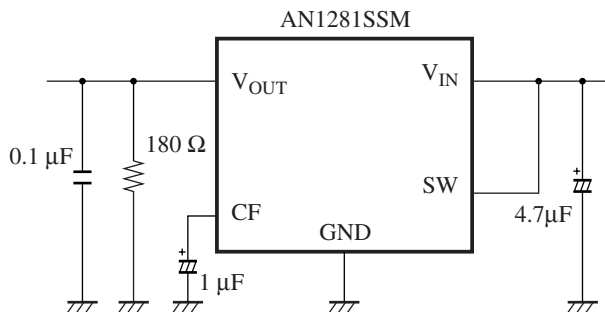
Output voltage rise time



Ripple rejection ratio — Frequency

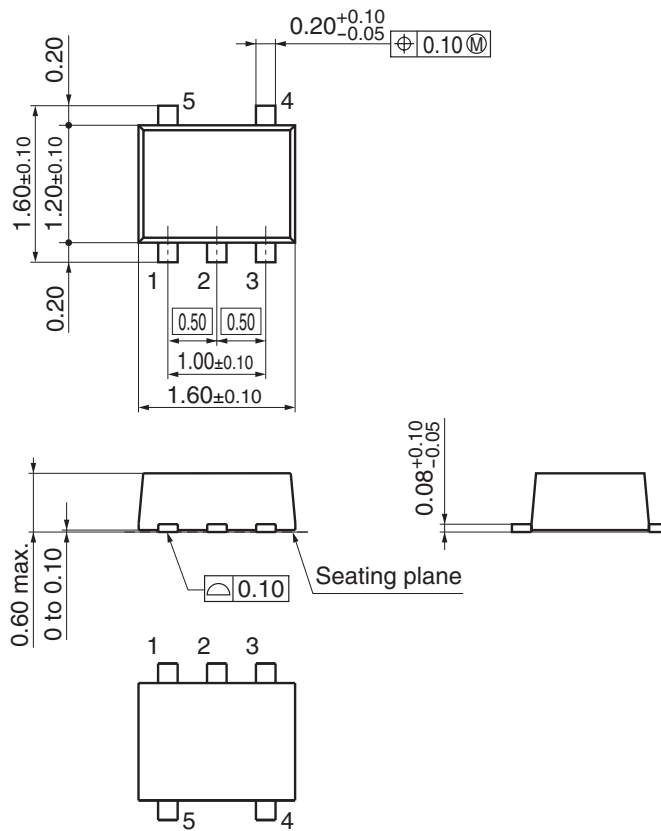


Measurement circuit



■ New Package Dimensions (Unit: mm)

- SSMINI-5DA (Lead-free package)



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

- (1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.
- (2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.
- (3) The products described in this material 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 material are subject to change without notice for reasons of 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 guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. 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, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.
- (6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.
- (7) No part of this material may be reprinted or reproduced by any means without written permission from our company.

Please read the following notes before using the datasheets

- A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.
- B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.
- C. These materials are solely intended for a customer's individual use.
Therefore, without the prior written approval of Panasonic, any other use such as reproducing, selling, or distributing this material to a third party, via the Internet or in any other way, is prohibited.