DATA SHEET

Part No.	AN7709SP
Package Code No.	SP-3SUA

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Contents

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AN7709SP

3-pin, positive output, low dropout voltage regulator (1.2 A type)

■ Overview

AN77xxSP series is suitable for low-voltage, battery driven equipment, and home appliances and industrial equipment with great fluctuation of the supply voltage.

The output voltage ranges : 3.3 V, 3.5 V, 5 V, 6 V, 7 V, 8 V, 9 V, 10 V, 12 V, and 15 V

The AN7709SP is the 9 V output voltage type in these series.

■ Features

- Minimum I/O voltage difference: 0.5 V typ.
- On-chip overcurrent limiter
- On-chip thermal protection circuit
- On-chip inrush current protection circuit at the time of input voltage start-up
- On-chip input short-circuit protection circuit
  (When the input pin is short-circuited to the ground, the circuit between pins 1 and 3 is shut down to prevent current flow.)

■ Applications
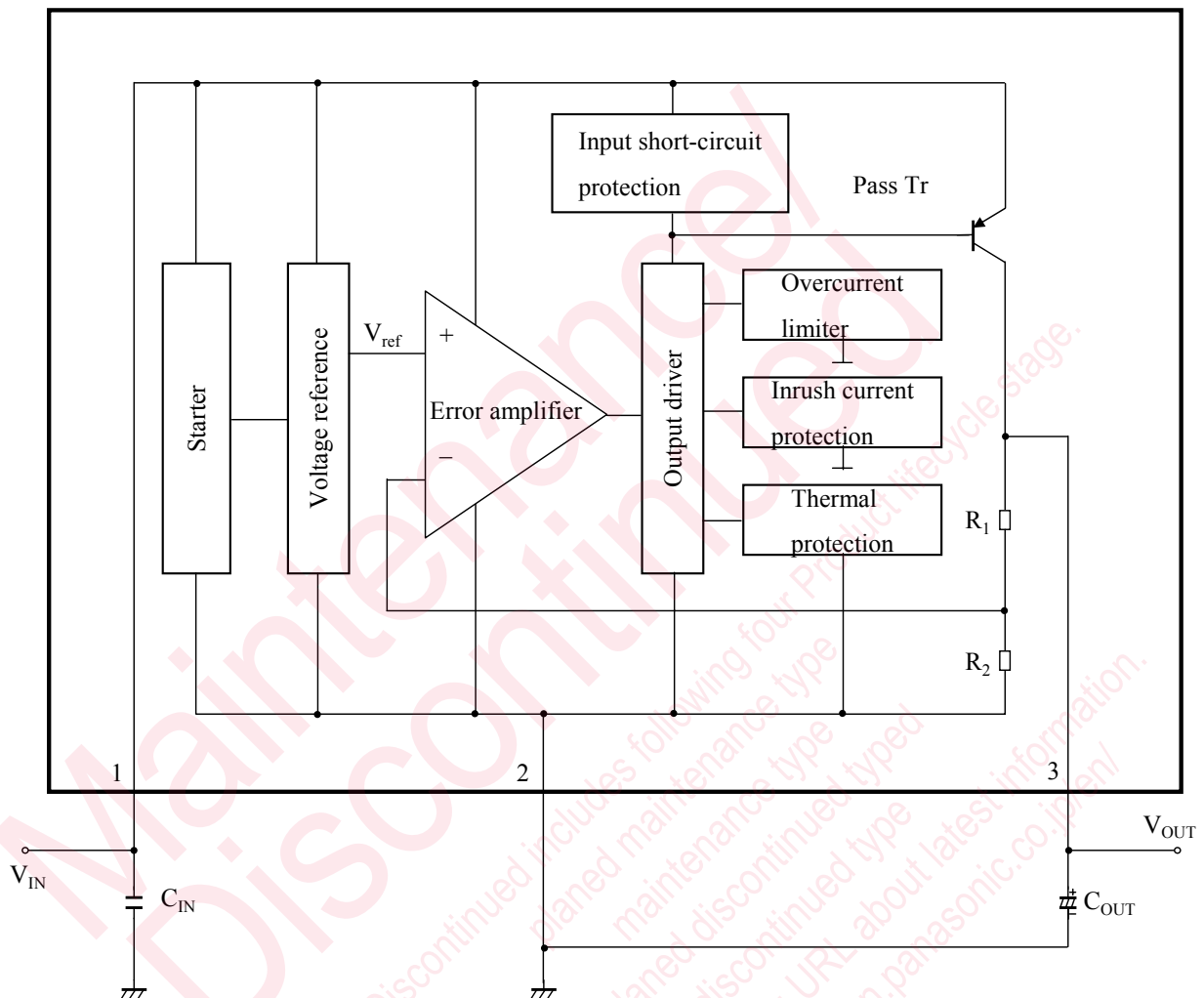
- Power supply equipment.

■ Package

- 3 pin Plastic Surface Mount Power Package (SP Type).

■ Type

- Silicon monolithic bipolar IC.

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■ Block Diagram

C_{IN} : 0.33 μF
C_{OUT} : 33 μF

■ Pin Descriptions

Pin No.	Pin name	Type	Description
1	Input	Input	Input pin
2	Common	GND	Ground pin
3	Output	Output	Output pin

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■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Note
1	Supply voltage	V_{CC}	30	V	*1
2	Supply current	I_{CC}	2.4	A	*2
3	Power dissipation	P_D	364.9	mW	*3
4	Operating ambient temperature	T_{opr}	−30 to +85	°C	*4
5	Storage temperature	T_{stg}	−55 to +150	°C	*4

Note) 1. This IC is not applicable to automotive electronic parts.

    2. *1: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

           At the application of V_{CC} = 30 V, the overvoltage protection may be operated by the ASO protection circuit, leading to the output shut down.

     *2: The current value does not exceed this criterion because of the on-chip current limiter.

     *3: The internal circuit shuts off the output when $T_j \geq 150$°C (designed value).

        The power dissipation shown is the value at T_a = 85°C for the independent (unmounted) IC package without a heat sink.

        When using this IC, refer to the ● P_D – T_a diagram in the ■ Technical Data and use under the condition not exceeding the allowable value.

     *4: Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for T_a = 25°C

■ Operating supply voltage range

Parameter	Symbol	Range	Unit	Note
Supply voltage range	V_{CC}	10 to 20	V	—

Note) The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

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■ Electrical Characteristics

Note) Unless otherwise specified, $T_a = 25°C \pm 2°C$

B No.	Parameter	Symbol	Conditions	Min	Typ	Max	Unit	Note
1	Output voltage	V_{OUT}	$V_{IN} = 10$ V, $T_j = 25°C$ $I_{OUT} = 500$ mA	8.73	9.00	9.27	V	—
2	Line regulation	REG_{IN}	$V_{IN} = 10$ V to 20 V $I_{OUT} = 500$ mA, $T_j = 25°C$	—	9	90	mV	—
3	Load regulation	REG_{LOA}	$V_{IN} = 10$ V, $T_j = 25°C$ $I_{OUT} = 0$ mA to 1 200 mA,	—	45	180	mV	—
4	Input dependency of bias current	$\Delta I_{bias(IN)}$	$V_{IN} = 10$ V to 20 V, $I_{OUT} = 500$ mA , $T_j = 25°C$	—	1	10	mA	—
5	Load dependency of bias current	$\Delta I_{bias(LOA)}$	$V_{IN} = 10$ V, $I_{OUT} = 0$ mA to 1 200 mA, $T_j = 25°C$	—	10	50	mA	—
6	Bias current at no load	Ibias	$V_{IN} = 10$ V, $I_{OUT} = 0$ mA	—	2.6	5.0	mA	—
7	Bias current before the regulation starts	Irush	$V_{IN} = 8.1$ V, $I_{OUT} = 0$ mA	—	3.0	5.0	mA	—
8	Minimum I/O voltage difference 1	$V_{DIF(min)1}$	$V_{IN} = 8.1$ V, $I_{OUT} = 500$ mA $T_j = 25°C$	—	0.4	0.6	V	—
9	Minimum I/O voltage difference 2	$V_{DIF(min)2}$	$V_{IN} = 8.1$ V, $I_{OUT} = 1\ 200$ mA $T_j = 25°C$	—	0.5	1.0	V	—
10	Peak output current 1	$I_{O(peak)1}$	$V_{IN} = 10$ V, $T_j = 25°C$	1.2	1.8	2.4	A	*
11	Ripple rejection ratio	R.R	$V_{IN} = 10$ V to 12 V, $I_{OUT} = 100$ mA, $f = 120$ Hz	45	65	—	dB	—

Note) *: This current exceeds $P_{D(max)}$ because it is a parameter during abnormal (overcurrent) operation. However, normally, it shall conform to the ● $P_D - T_a$ diagram in the ■ Technical Data.

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■ Electrical Characteristics (Reference values for design)

Note) Unless otherwise specified, $T_a = 25°C\pm2°C$
The characteristics listed below are reference values for design of the IC and are not guaranteed by inspection.
If a problem does occur related to these characteristics, Panasonic will respond in good faith to user concerns.
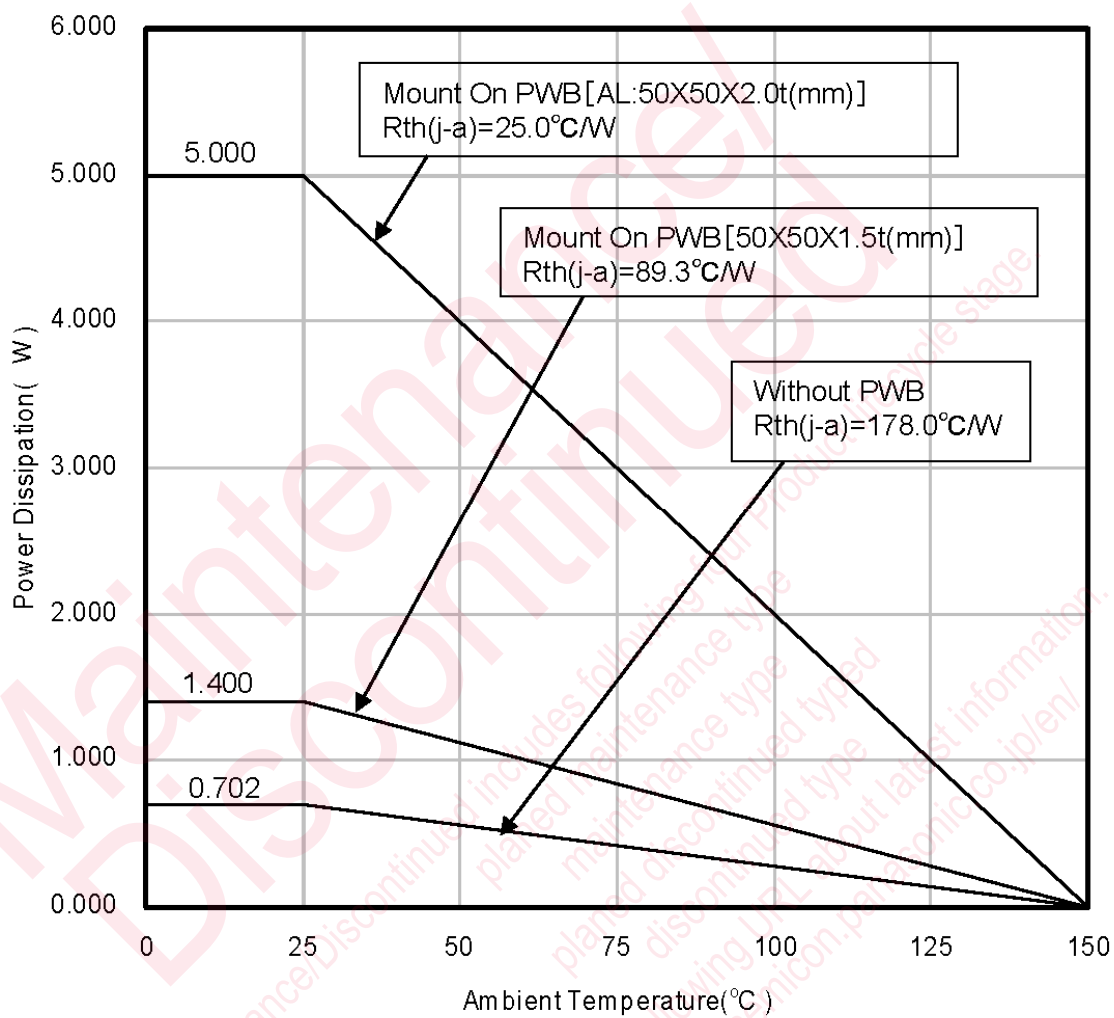
B No.	Parameter	Symbol	Conditions	Reference values			Unit	Note
				Min	Typ	Max		
1	Peak output current 2	$I_{O(peak)2}$	$V_{IN} = 19$ V, $T_j = 25°C$	—	1.5	—	A	*
2	Peak output current 3	$I_{O(peak)3}$	$V_{IN} = 24$ V, $T_j = 25°C$	—	1.0	—	A	*
3	Output short-circuit current	$I_{O(short)}$	$V_{IN} = 30$ V, $T_j = 25°C$ The load is shorted.	—	10	—	mA	—
4	Thermal protection operating temperature	$T_{j(TH)}$	$V_{IN} = 10$ V	—	150	—	°C	—
5	Output voltage temperature coefficient	a	$V_{IN} = 10$ V $T_j = 25°C$ to $125°C$	—	−40	—	ppm/°C	—
6	Output noise voltage	Vno	$V_{IN} = 10$ V, $T_j = 25°C$ $I_{OUT} = 500$ mA $f = 10$ Hz to 100 kHz	—	128	—	µV[rms]	—

Note) *: This current exceeds $P_{D(max)}$ because it is a parameter during abnormal (overcurrent) operation. However, normally, it shall conform to the ● $P_D – T_a$ diagram in the ■ Technical Data.

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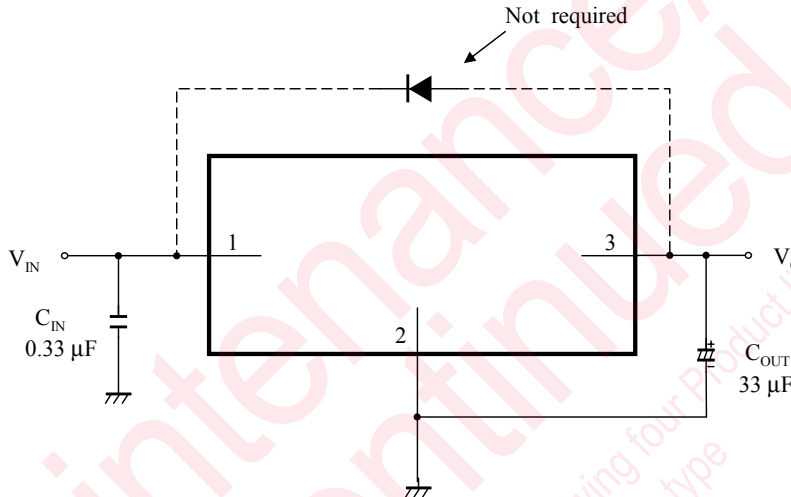■ Technical Data

• P_D — T_a diagram

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■ Usage Notes

1. Input short-circuit protection circuit

When the DC input pin (pin 1) and the ground pin (pin 2) of our conventional three-pin regulators (AN78xx/SP series, etc.) were short-circuited at normal use conditions in some cases, the voltage of the output pin (pin 3) becomes higher than that of the DC input pin and electrons charged in the output capacitor C_{OUT} flow into the input side, resulting in break of the element.
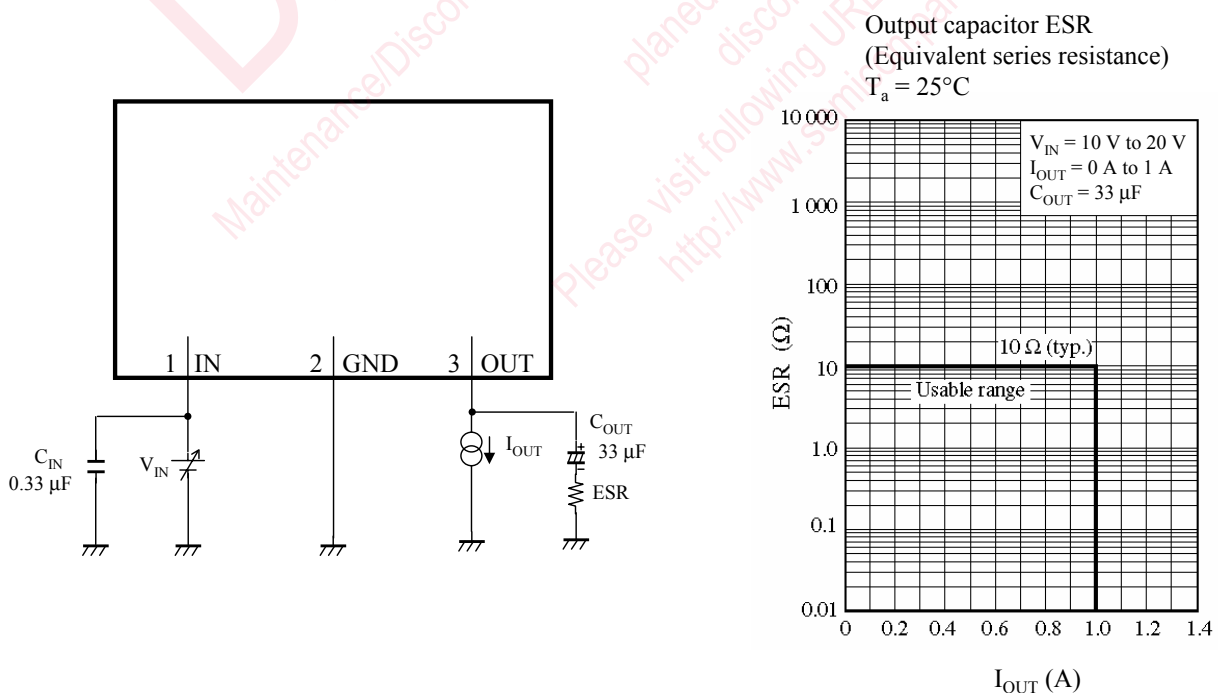
In those cases, it was necessary for you to connect a general silicon diode as shown in the figure on the right. In the AN77xxSP series, however, it is not necessary to connect the protection diode because these series have a built-in protection circuit to safeguard the element from discharge current.

2. Capacitor for external compensation

To maintain the stability, insert a 33 μF capacitor as close to pin 3 and pin 2 as possible. In case of using at low temperature, decrease in capacity of the aluminum electrolytic capacitor and increase of ESR of this capacitor may lead to oscillation.

In the AN77xxSP series, for the output capacitor C_{OUT}, it is recommended to use an aluminum electrolytic capacitor or tantalum capacitor whose equivalent series resistance (ESR) has the temperature characteristic within the recommended area shown on the right.

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