DATA SHEET

Part No.	AN78L09M
Package Code No.	HSIP003-P-0000Q

Contents

AN78L09M

3-pin positive output voltage regulator (100 mA type)

■ Overview

The AN78LxxM series are 3-pin, fixed positive output type monolithic voltage regulators.
Stabilized fixed output voltage is obtained from unstable DC input voltage without using any external components.
12 types of fixed output voltage are available; 4 V, 5 V, 6 V, 7 V, 8 V, 9 V, 10 V, 12 V, 15 V, 18 V, 20 V and 24 V.
They can be used widely in power circuits with current capacity of up to 100 mA.
The AN78L09M is the 9 V output voltage type in these series.

■ Features

- No external components
- Output voltage: 9 V
- Built-in overcurrent limit circuit
- Built-in thermal overload protection circuit

■ Applications

- 3-pin positive output voltage regulator (100 mA type)

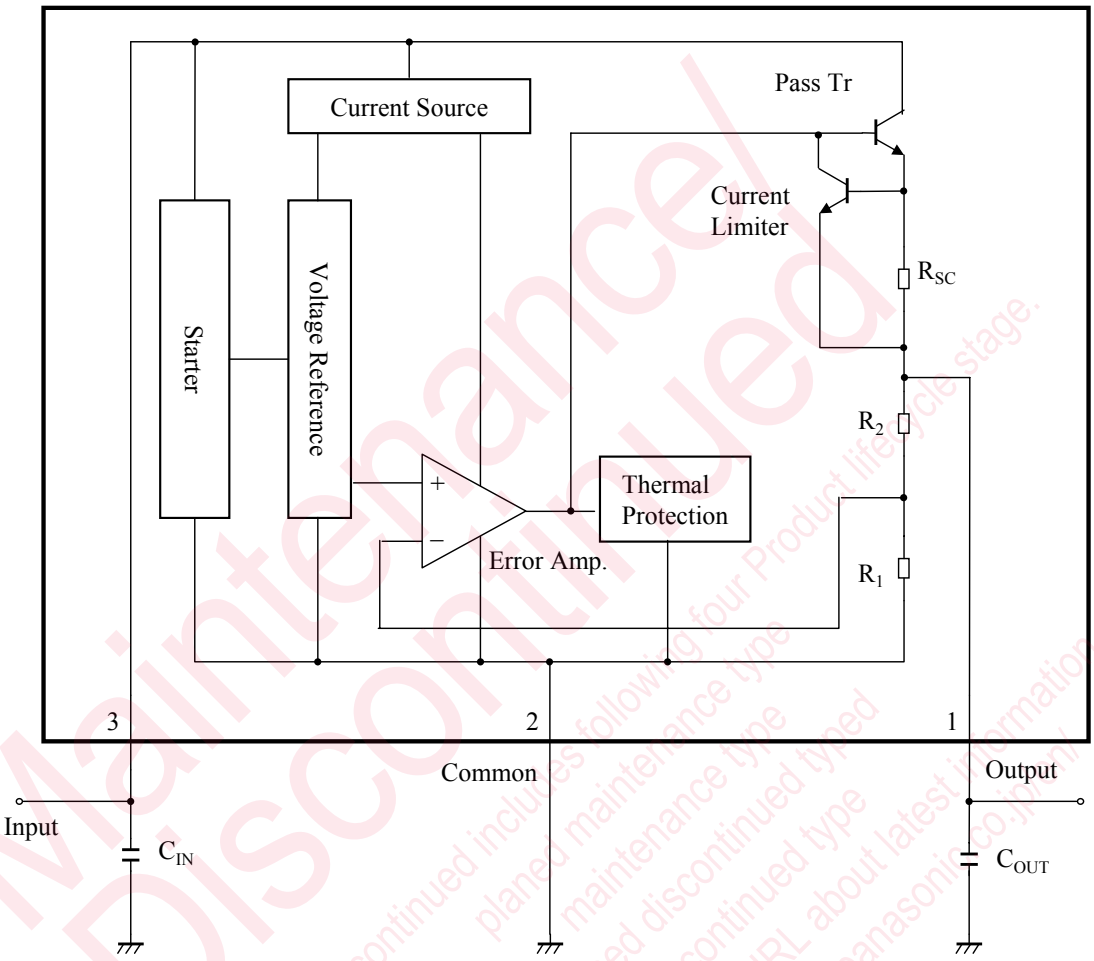
■ Package

- 3-pin plastic single inline package with heat sink (SIP type)

■ Type

- Silicon monolithic bipolar IC

■ Block Diagram



C_{IN} : 0.33 µF
C_{OUT} : 0.1 µF
R_1 : 4 kΩ
R_2 : 5 kΩ

■ Pin Descriptions

Pin No.	Pin name	Type	Description
1	Output	Output	Regulated power output
2	Common	GND	Ground
3	Input	Input	Input supplies power to the internal circuitry

■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Note
1	Input voltage	V_{IN}	35	V	*1
2	Supply current	I_{CC}	200	mA	*2
3	Power dissipation	P_D	270	mW	*3
4	Operating ambient temperature	T_{opr}	−30 to + 80	°C	*4
5	Storage temperature	T_{stg}	−55 to +150	°C	*4

Note) *1: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.
*2: Since current limiting circuit is built in, current value never exceeds the limit.
*3: The power dissipation shown is the value at T_a = 80°C.
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.
When T_j exceeds 150°C, the internal circuit cuts off the output.
*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}	11.5 to 24	V	—

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

■ Electrical Characteristics

Note) Unless otherwise specified, T_a = 25°C±2°C, V_{IN} = 15 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF and C_{OUT} = 0.1 µF, T_j = 0°C to 125°C

B No.	Parameter	Symbol	Conditions	Limits			Unit	Note
				Min	Typ	Max		
1	Output voltage	V_{OUT}	T_j = 25°C	8.64	9.0	9.36	V	*1
2	Output voltage tolerance	V_{OUT}	V_{IN} = 11.5 V to 24 V, I_{OUT} = 1 mA to 70 mA	8.55	—	9.45	V	*1
3	Line regulation	REG_{IN}	V_{IN} = 11.5 V to 24 V, T_j = 25°C	—	90	190	mV	*1
			V_{IN} = 12 V to 24 V, T_j = 25°C	—	80	140		
4	Load regulation	REG_L	I_{OUT} = 1 mA to 100 mA, T_j = 25°C	—	16	85	mV	*1
			I_{OUT} = 1 mA to 40 mA, T_j = 25°C	—	8	45		
5	Bias current	I_{Bias}	T_j = 25°C	—	2.0	3.0	mA	*1
6	Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	V_{IN} = 12 V to 24 V, T_j = 25°C	—	—	1.0	mA	*1
7	Bias current fluctuation to load	$\Delta I_{Bias(L)}$	I_{OUT} = 1 mA to 40 mA, T_j = 25°C	—	—	0.1	mA	*1
8	Ripple rejection ratio	RR	V_{IN} = 12 V to 22 V, I_{OUT} = 40 mA, f = 120 Hz	43	53	—	dB	—

Note) *1: The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.

■ Electrical Characteristics (Reference values for design)

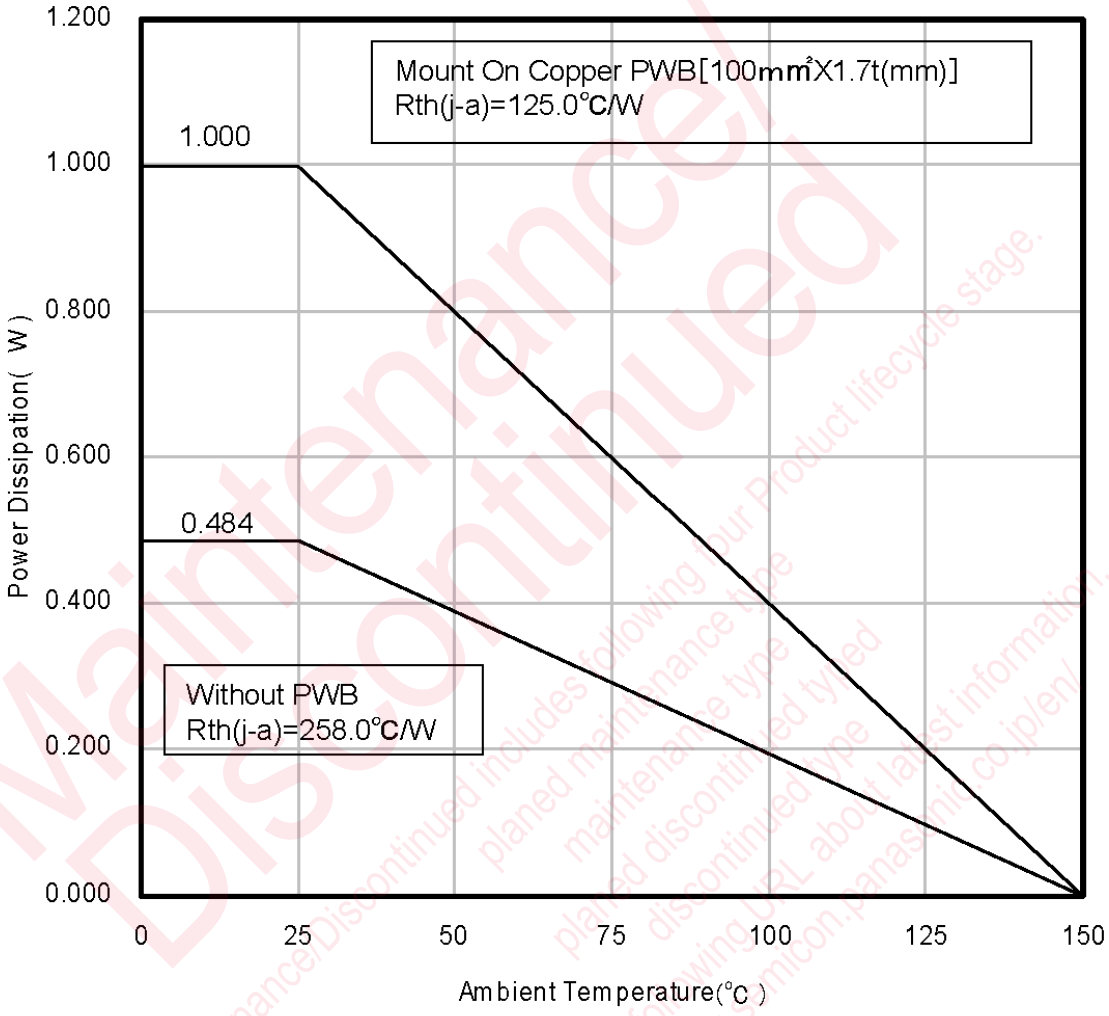
Note) Unless otherwise specified, T_a = 25°C±2°C, V_{IN} = 15 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF and C_{OUT} = 0.1 µF, T_j = 0°C to 125°C
The characteristics listed below are reference values for design of the IC and are not guaranteed by inspection.
If a problem does occur related to these characteristics, Panasonic will respond in good faith to user concerns.

B No.	Parameter	Symbol	Conditions	Reference values			Unit	Note
				Min	Typ	Max		
1	Output noise voltage	Vno	f = 10 Hz to 100 kHz	—	65	—	µV	—
2	Minimum input/output voltage difference	$V_{DIF(min)}$	T_j = 25°C	—	1.7	—	V	*1
3	Output short-circuit current	$I_{O(Short)}$	T_j = 25°C	—	140	—	mA	*1
4	Output voltage temperature coefficient	$\frac{\Delta V_{OUT}}{T_a}$	I_{OUT} = 5 mA, T_j = 0°C to 125°C	—	– 0.85	—	mV/°C	—

Note) *1: The specified condition T_j = 25°C means that the test should be carried out within so short a test time (within 10ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.

■ Technical Data

• P_D — T_a diagram



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. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation 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.

20080805