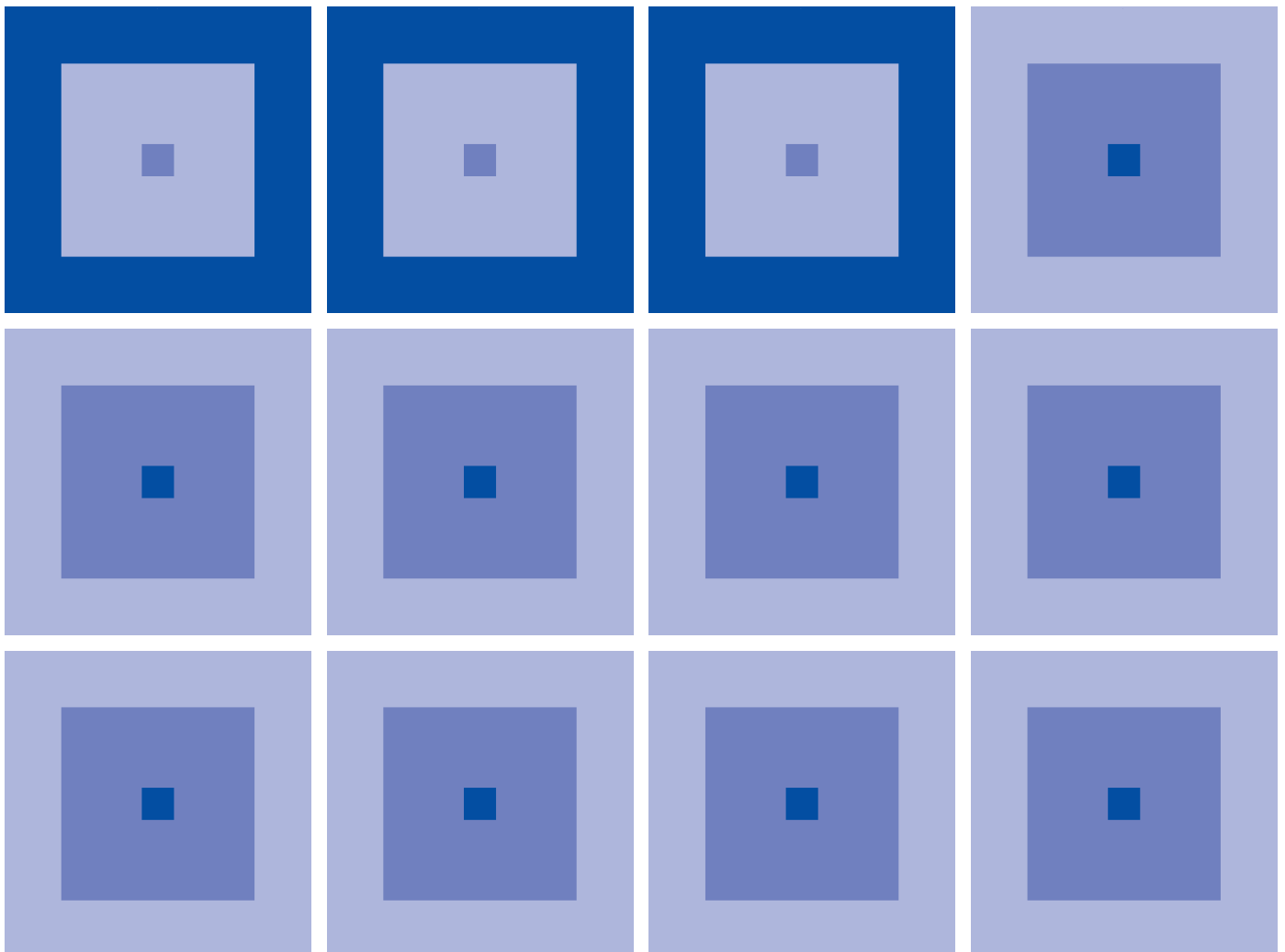


Power Supply IC  
**S1F78101Y**  
Technical Manual



## NOTICE

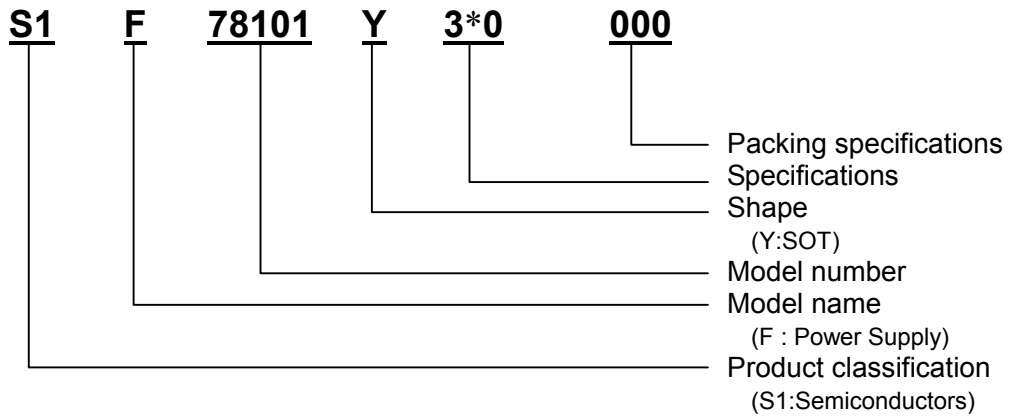
---

No part of this material may be reproduced or duplicated in any form or by any means without the written permission of Seiko Epson. Seiko Epson reserves the right to make changes to this material without notice. Seiko Epson does not assume any liability of any kind arising out of any inaccuracies contained in this material or due to its application or use in any product or circuit and, further, there is no representation that this material is applicable to products requiring high level reliability, such as, medical products. Moreover, no license to any intellectual property rights is granted by implication or otherwise, and there is no representation or warranty that anything made in accordance with this material will be free from any patent or copyright infringement of a third party. This material or portions thereof may contain technology or the subject relating to strategic products under the control of the Foreign Exchange and Foreign Trade Law of Japan and may require an export license from the Ministry of International Trade and Industry or other approval from another government agency.

All other product names mentioned herein are trademarks and/or registered trademarks of their respective companies.

## Configuration of product number

●DEVICES



# CONTENTS

<b>1. DESCRIPTION</b> .....	<b>1</b>
<b>2. FEATURES</b> .....	<b>1</b>
<b>3. BLOCK DIAGRAM</b> .....	<b>1</b>
<b>4. PIN DESCRIPTION</b> .....	<b>2</b>
4.1 Pin Functions .....	2
4.2 Pin Assignment .....	2
<b>5. FUNCTIONAL DESCRIPTION</b> .....	<b>3</b>
<b>6. SERIES PRODUCT NAME LIST</b> .....	<b>4</b>
<b>7. ABSOLUTE MAXIMUM RATINGS</b> .....	<b>4</b>
<b>8. RECOMMENDED OPERATING CONDITIONS</b> .....	<b>4</b>
<b>9. ELECTRICAL CHARACTERISTICS</b> .....	<b>5</b>
<b>10. EXTERNAL CONNECTION SAMPLES</b> .....	<b>8</b>
<b>11. EXTERNAL DIMENSIONS DRAWINGS</b> .....	<b>8</b>

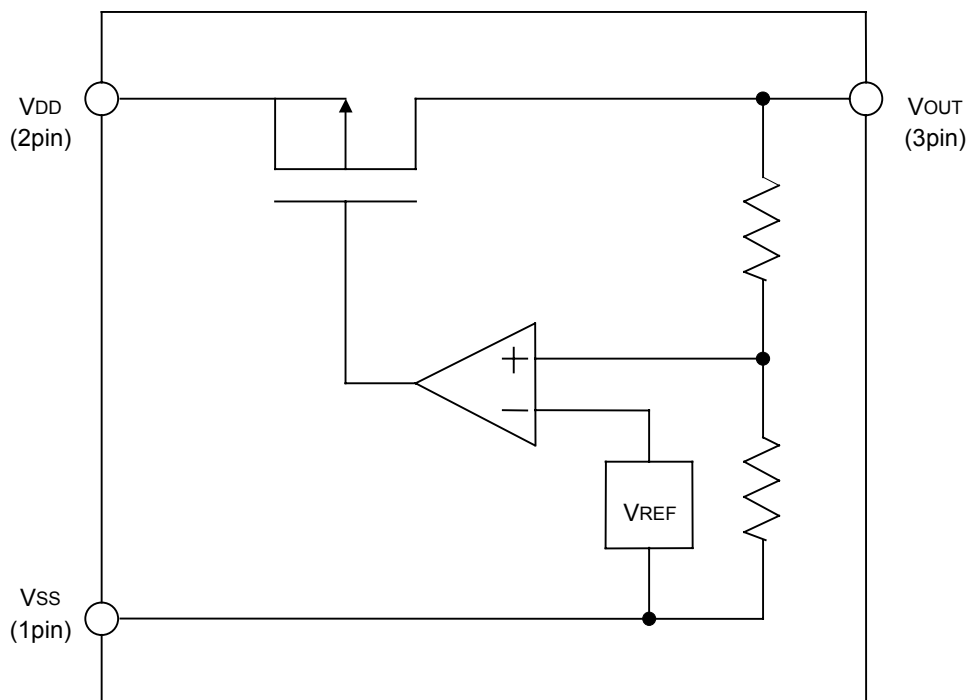
## 1. DESCRIPTION

The S1F78101Y3 series is a fixed-level, positive voltage regulator developed using a CMOS silicon gate process and mainly consists of reference voltage circuit with low current consumption, differential amplifier, output control transistor, and voltage setting resistances. The output voltage is fixed inside the IC. The package is an SOT89-3pin plastic package.

## 2. FEATURES

- Low current consumption : Typ.  $3.0\mu\text{A}$
- Small input-output voltage difference : Typ.  $0.11\text{V}$  ( $I_{\text{O}} = 10\text{mA}$ ,  $V_{\text{OUT}} = 5.0\text{V}$ )
- Highly stable, internal reference voltage source : Typ.  $1.0\text{V}$
- Absolute maximum rated voltage : Max.  $22\text{V}$
- Wide operating voltage range : Max.  $15\text{V}$

## 3. BLOCK DIAGRAM



## 4. PIN DESCRIPTION

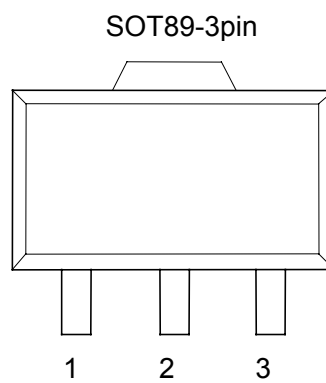
---

## 4. PIN DESCRIPTION

### 4.1 Pin Functions

Pin No.	Pin name	Pin function
1	VSS	Input voltage pin (negative side)
2	VDD	Input voltage pin (positive side)
3	VOUT	Output voltage pin

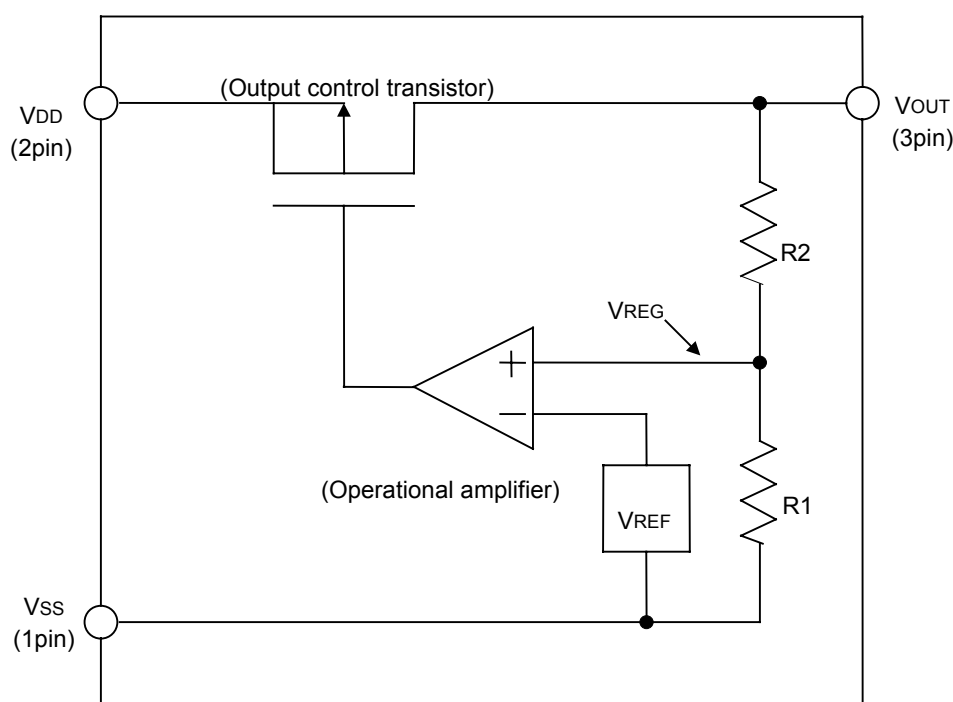
### 4.2 Pin Assignment



## 5. FUNCTIONAL DESCRIPTION

The S1F78101Y3 series is a fixed-level, positive output voltage series regulator using an output control MOS transistor between input and output pins, as shown below. It is designed to output stable voltage ( $V_O$ ) independent of input voltage by feeding the voltage ( $V_{REG}$ ) divided by internal resistances ( $R_1$  and  $R_2$ ) connected between the output ( $V_{OUT}$ ) and  $V_{SS}$  pins back to the operational amplifier and comparing it with the reference voltage ( $V_{REF}$ ) to control the gate voltage of the output control transistor. The output voltage is internally fixed, which is obtained from the formula below.

$$V_{OUT} = \frac{R_1 + R_2}{R_1} \cdot V_{REF}$$



This product has an internal inrush current limiter as a protective function.

The inrush current limiter function is designed to control power current to prevent excessive power current from flowing due to causes such as the load capacity connected to the output pin at power-on.

## 6. SERIES PRODUCT NAME LIST

---

## 6. SERIES PRODUCT NAME LIST

Product name	Output voltage		
	Min.	Typ.	Max.
S1F78101Y3B00	4.90	5.00	5.10
S1F78101Y3K00	3.80	3.90	4.00
S1F78101Y3T00	3.23	3.30	3.37
S1F78101Y3C00	3.13	3.20	3.27

Note: Output voltages not described above are also available.

## 7. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rated value	Unit
Input voltage	VDD - VSS	22	V
Output voltage	VOUT	VDD+0.3 to VSS-0.3	
Output current	IOUT	100	mA
Allowable dissipation	Pd	200	mW
Operating temperature	T <sub>opr</sub>	-40 to +85	°C
Storage ambient temperature	T <sub>stg</sub>	-65 to +150	
Soldering time	T <sub>sol</sub>	260°C	—
Soldering temperature		10 sec. (lead part)	

## 8. RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Min.	Typ.	Max.	Unit
Input voltage	VDD - VSS	—	—	15	V
Output current	IOUT	0.01	—	—	mA



## 9. ELECTRICAL CHARACTERISTICS

## ●S1F78101Y3B00

(If not specified, Ta = -40 to +85°C)

Item	Symbol	Condition (V <sub>SS</sub> = 0.0V)	Min.	Typ.	Max.	Unit
Input voltage	V <sub>I</sub>		—	—	15	V
Output voltage	V <sub>O</sub>	V <sub>DD</sub> = 7.0V, I <sub>O</sub> = -10mA Ta = 25°C	4.90	5.00	5.10	V
Current consumption	I <sub>OP</sub>	V <sub>DD</sub> = 5.0V to 15.0V Unloaded	—	3.0	6.2	μA
Input-output voltage difference	V <sub>I</sub> - V <sub>O</sub>	V <sub>OUT</sub> = 5.0V, I <sub>O</sub> = -10mA	—	0.11	0.22	V
Output voltage temperature characteristics	$\frac{\Delta V_{OUT}}{V_{OUT}}$		-320	-100	+40	ppm/°C
Input stability	$\frac{dV_O}{dV_I \cdot V_O}$	Ta = -30°C to +85°C (same temperature condition) V <sub>DD</sub> = 6.0V to 15.0V I <sub>O</sub> = -10mA	—	0.1	—	%/V
Load stability	ΔV <sub>O</sub>	Ta = -30°C to +85°C (same temperature condition) V <sub>DD</sub> = 7.0V I <sub>O</sub> = -1mA to -50mA	—	22	—	mV
Power supply rejection ratio	PSRR	V <sub>DD</sub> = 7.0V, f <sub>in</sub> = 40kHz CL = 10μF, I <sub>OUT</sub> = -5mA	—	-40	—	dB

## ●S1F78101Y3K00

(If not specified, Ta = -40 to +85°C)

Item	Symbol	Condition (V <sub>SS</sub> = 0.0V)	Min.	Typ.	Max.	Unit
Input voltage	V <sub>I</sub>		—	—	15	V
Output voltage	V <sub>O</sub>	V <sub>DD</sub> = 6.0V, I <sub>O</sub> = -10mA Ta = 25°C	3.80	3.90	4.00	V
Current consumption	I <sub>OP</sub>	V <sub>DD</sub> = 3.9V to 15.0V Unloaded	—	3.0	6.2	μA
Input-output voltage difference	V <sub>I</sub> - V <sub>O</sub>	V <sub>OUT</sub> = 3.9V, I <sub>O</sub> = -10mA	—	0.14	0.28	V
Output voltage temperature characteristics	$\frac{\Delta V_{OUT}}{V_{OUT}}$		-320	-100	+40	ppm/°C
Input stability	$\frac{dV_O}{dV_I \cdot V_O}$	Ta = -30°C to +85°C (same temperature condition) V <sub>DD</sub> = 5.0V to 15.0V I <sub>O</sub> = -10mA	—	0.1	—	%/V
Load stability	ΔV <sub>O</sub>	Ta = -30°C to +85°C (same temperature condition) V <sub>DD</sub> = 6.0V I <sub>O</sub> = -1mA to -40mA	—	19	—	mV
Power supply rejection ratio	PSRR	V <sub>DD</sub> = 6.0V, f <sub>in</sub> = 40kHz CL = 10μF, I <sub>OUT</sub> = -5mA	—	-40	—	dB

## 9. ELECTRICAL CHARACTERISTICS

### ●S1F78101Y3T00

(If not specified,  $T_a = -40$  to  $85^\circ\text{C}$ )

Item	Symbol	Condition ( $V_{SS} = 0.0\text{V}$ )	Min.	Typ.	Max.	Unit
Input voltage	$V_I$		—	—	15	V
Output voltage	$V_O$	$V_{DD} = 5.0\text{V}$ , $I_O = -10\text{mA}$ $T_a = 25^\circ\text{C}$	3.23	3.30	3.37	V
Current consumption	$I_{OP}$	$V_{DD} = 3.3\text{V}$ to $15.0\text{V}$ Unloaded	—	3.0	6.2	$\mu\text{A}$
Input-output voltage difference	$V_I - V_O$	$V_{OUT} = 3.3\text{V}$ , $I_O = -10\text{mA}$	—	0.16	0.32	V
Output voltage temperature characteristics	$\frac{\Delta V_{OUT}}{V_{OUT}}$		-320	-100	+40	ppm/ $^\circ\text{C}$
Input stability	$\frac{dV_O}{dV_I \cdot V_O}$	$T_a = -30^\circ\text{C}$ to $+85^\circ\text{C}$ (same temperature condition) $V_{DD} = 4.0\text{V}$ to $15.0\text{V}$ $I_O = -10\text{mA}$	—	0.1	—	%/V
Load stability	$\Delta V_O$	$T_a = -30^\circ\text{C}$ to $+85^\circ\text{C}$ (same temperature condition) $V_{DD} = 5.0\text{V}$ $I_O = -1\text{mA}$ to $-30\text{mA}$	—	17	—	mV
Power supply rejection ratio	PSRR	$V_{DD} = 5.0\text{V}$ , $f_{in} = 40\text{kHz}$ $CL = 10\mu\text{F}$ , $I_{OUT} = -5\text{mA}$	—	-40	—	dB

### ●S1F78101Y3C00

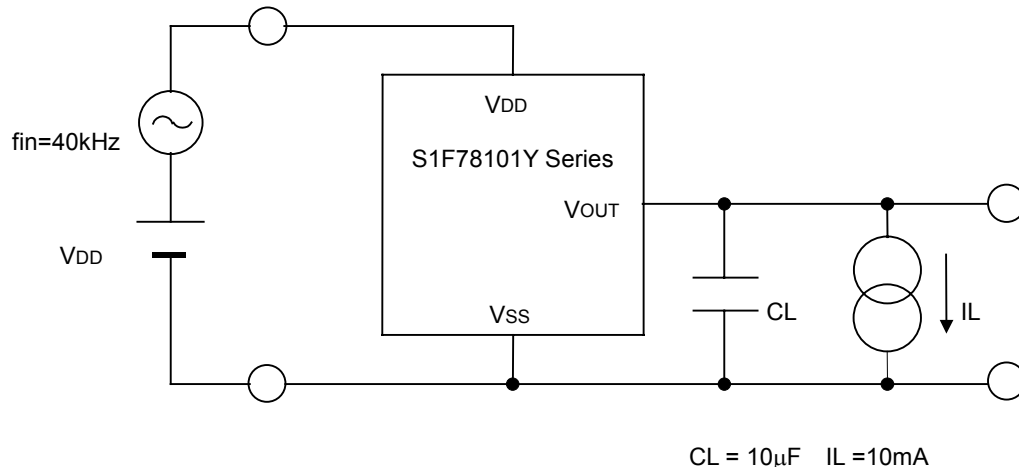
(If not specified,  $T_a = -40$  to  $85^\circ\text{C}$ )

Item	Symbol	Condition ( $V_{SS} = 0.0\text{V}$ )	Min.	Typ.	Max.	單位
Input voltage	$V_I$		—	—	15	V
Output voltage	$V_O$	$V_{DD} = 5.0\text{V}$ , $I_O = -10\text{mA}$ $T_a = 25^\circ\text{C}$	3.13	3.20	3.27	V
Current consumption	$I_{OP}$	$V_{DD} = 3.2\text{V}$ to $15.0\text{V}$ Unloaded	—	3.0	6.2	$\mu\text{A}$
Input-output voltage difference	$V_I - V_O$	$V_{OUT} = 3.2\text{V}$ , $I_O = -10\text{mA}$	—	0.16	0.32	V
Output voltage temperature characteristics	$\frac{\Delta V_{OUT}}{V_{OUT}}$		-320	-100	+40	ppm/ $^\circ\text{C}$
Input stability	$\frac{dV_O}{dV_I \cdot V_O}$	$T_a = -30^\circ\text{C}$ to $+85^\circ\text{C}$ (same temperature condition) $V_{DD} = 4.0\text{V}$ to $15.0\text{V}$ $I_O = -10\text{mA}$	—	0.1	—	%/V
Load stability	$\Delta V_O$	$T_a = -30^\circ\text{C}$ to $+85^\circ\text{C}$ (same temperature condition) $V_{DD} = 5.0\text{V}$ $I_O = -1\text{mA}$ to $-30\text{mA}$	—	16	—	mV
Power supply rejection ratio	PSRR	$V_{DD} = 5.0\text{V}$ , $f_{in} = 40\text{kHz}$ $CL = 10\mu\text{F}$ , $I_{OUT} = -5\text{mA}$	—	-40	—	dB

## 9. ELECTRICAL CHARACTERISTICS

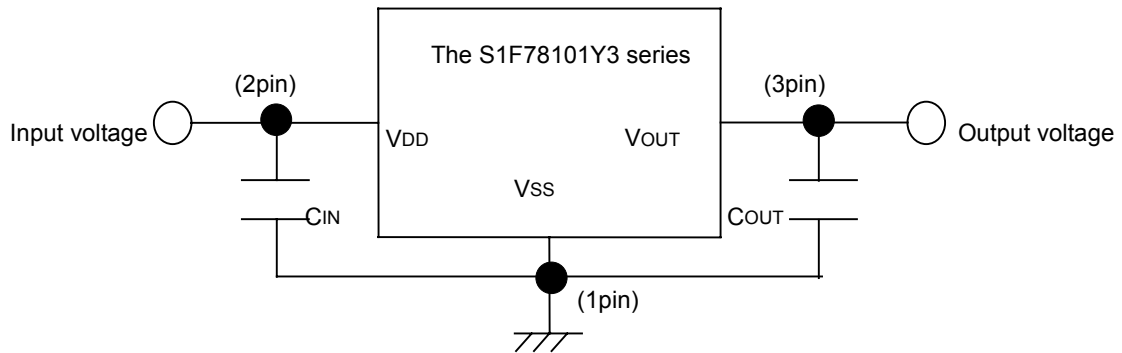
---

Note: Schematic diagram for measuring power supply rejection ratio characteristics



## 10. EXTERNAL CONNECTION SAMPLES

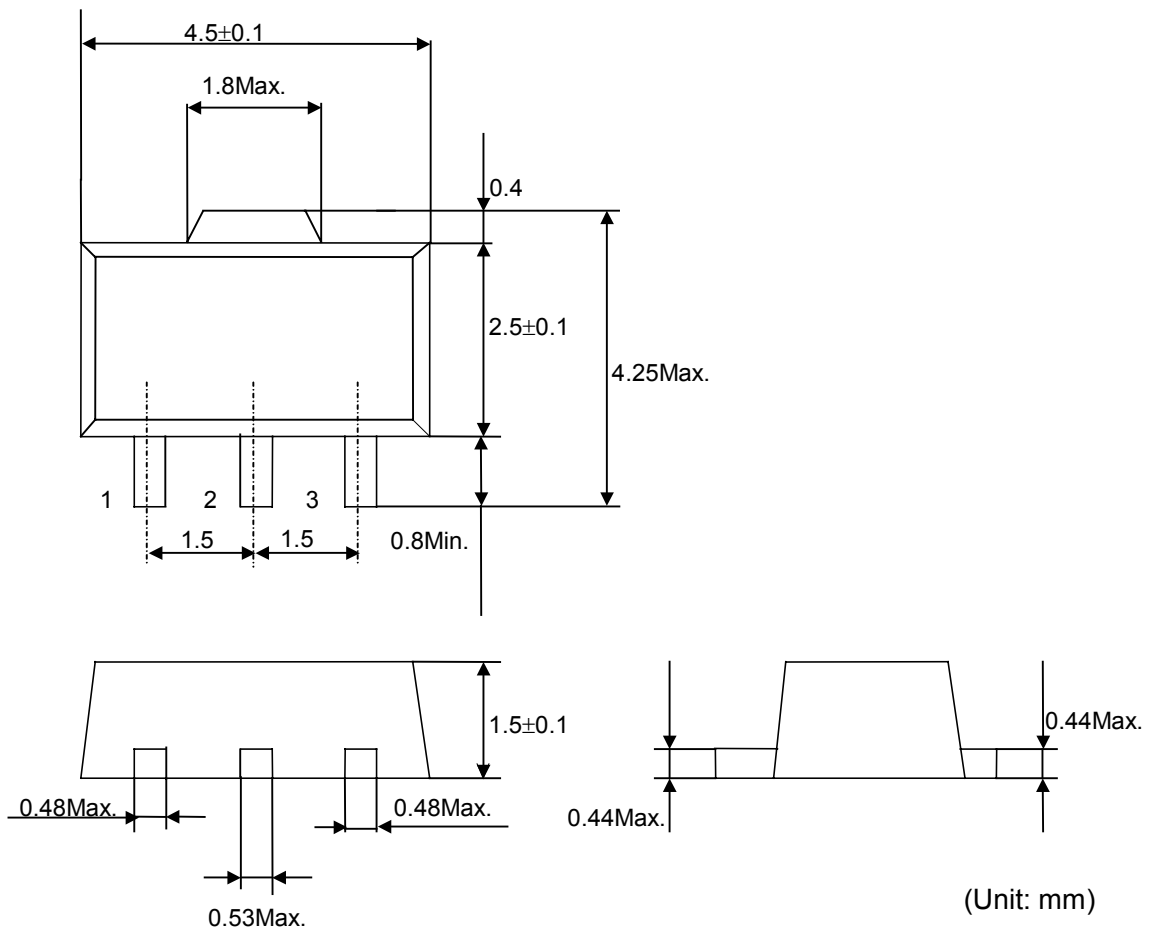
### 10. EXTERNAL CONNECTION SAMPLES



## 11. EXTERNAL DIMENSIONS DRAWINGS

Reference

SOT89-3pin



Note: The contents may be altered without prior notice according to the continual improvement.

**AMERICA**

---

**EPSON ELECTRONICS AMERICA, INC.**

**HEADQUARTERS**

150 River Oaks Parkway  
San Jose, CA 95134, U.S.A.  
Phone: +1-800-228-3964      FAX: +1-408-922-0238

**SALES OFFICES**

**West**

1960 E. Grand Avenue Fir 2  
El Segundo, CA 90245, U.S.A.  
Phone: +1-800-249-7730      FAX: +1-310-955-5400

**Central**

101 Virginia Street, Suite 290  
Crystal Lake, IL 60014, U.S.A.  
Phone: +1-800-853-3588      FAX: +1-815-455-7633

**Northeast**

301 Edgewater Place, Suite 210  
Wakefield, MA 01880, U.S.A.  
Phone: +1-800-922-7667      FAX: +1-781-246-5443

**Southeast**

3010 Royal Blvd. South, Suite 170  
Alpharetta, GA 30005, U.S.A.  
Phone: +1-877-332-0020      FAX: +1-770-777-2637

**EUROPE**

---

**EPSON EUROPE ELECTRONICS GmbH**

**HEADQUARTERS**

Riesstrasse 15  
80992 Munich, GERMANY  
Phone: +49-89-14005-0      FAX: +49-89-14005-110

**DÜSSELDORF BRANCH OFFICE**

Altstadtstrasse 176  
51379 Leverkusen, GERMANY  
Phone: +49-2171-5045-0      FAX: +49-2171-5045-10

**FRENCH BRANCH OFFICE**

1 Avenue de l'Atlantique, LP 915 Les Conquerants  
Z.A. de Courtaboeuf 2, F-91976 Les Ulis Cedex, FRANCE  
Phone: +33-1-64862350      FAX: +33-1-64862355

**BARCELONA BRANCH OFFICE**

**Barcelona Design Center**

Edificio Testa, C/Alcalde Barnils 64-68, Modulo C 2a planta  
E-08190 Sant Cugat del Vallès, SPAIN  
Phone: +34-93-544-2490      FAX: +34-93-544-2491

**UK & IRELAND BRANCH OFFICE**

8 The Square, Stockley Park, Uxbridge  
Middx UB11 1FW, UNITED KINGDOM  
Phone: +44-1295-750-216/+44-1342-824451  
FAX: +44-89-14005 446/447

**Scotland Design Center**

Integration House, The Alba Campus  
Livingston West Lothian, EH54 7EG, SCOTLAND  
Phone: +44-1506-605040      FAX: +44-1506-605041

**ASIA**

---

**EPSON (CHINA) CO., LTD.**

23F, Beijing Silver Tower 2# North RD DongSanHuan  
ChaoYang District, Beijing, CHINA  
Phone: +86-10-6410-6655      FAX: +86-10-6410-7320

**SHANGHAI BRANCH**

7F, High-Tech Bldg., 900, Yishan Road,  
Shanghai 200233, CHINA  
Phone: +86-21-5423-5522      FAX: +86-21-5423-5512

**EPSON HONG KONG LTD.**

20/F., Harbour Centre, 25 Harbour Road  
Wanchai, Hong Kong  
Phone: +852-2585-4600      FAX: +852-2827-4346  
Telex: 65542 EPSCO HX

**EPSON TAIWAN TECHNOLOGY & TRADING LTD.**

14F, No. 7, Song Ren Road,  
Taipei 110  
Phone: +886-2-8786-6688      FAX: +886-2-8786-6677

**HSINCHU OFFICE**

No. 99, Jiangong Road,  
Hsinchu City 300  
Phone: +886-3-573-9900      FAX: +886-3-573-9169

**EPSON SINGAPORE PTE., LTD.**

401 Commonwealth Drive, #07-01  
Haw Par Technocentre, SINGAPORE 149598  
Phone: +65-6586-3100      FAX: +65-6472-4291

**SEIKO EPSON CORPORATION**

**KOREA OFFICE**

50F, KLI 63 Bldg., 60 Yoido-dong  
Youngdeungpo-Ku, Seoul, 150-763, KOREA  
Phone: +82-2-784-6027      FAX: +82-2-767-3677

**GUMI OFFICE**

6F, Good Morning Securities Bldg., 56 Songjeong-Dong,  
Gumi-City, Seoul, 730-090, KOREA  
Phone: +82-54-454-6027      FAX: +82-54-454-6093

**SEIKO EPSON CORPORATION**

**SEMICONDUCTOR OPERATIONS DIVISION**

**IC Sales Dept.**

**IC International Sales Group**

421-8, Hino, Hino-shi, Tokyo 191-8501, JAPAN  
Phone: +81-42-587-5814      FAX: +81-42-587-5117



In pursuit of “**Saving**” **Technology**, Epson electronic devices.  
Our lineup of semiconductors, displays and quartz devices  
assists in creating the products of our customers’ dreams.  
**Epson IS energy savings.**

**SEIKO EPSON CORPORATION**  
SEMICONDUCTOR OPERATIONS DIVISION

- EPSON Electronic Devices Website

<http://www.epsondevice.com/>