

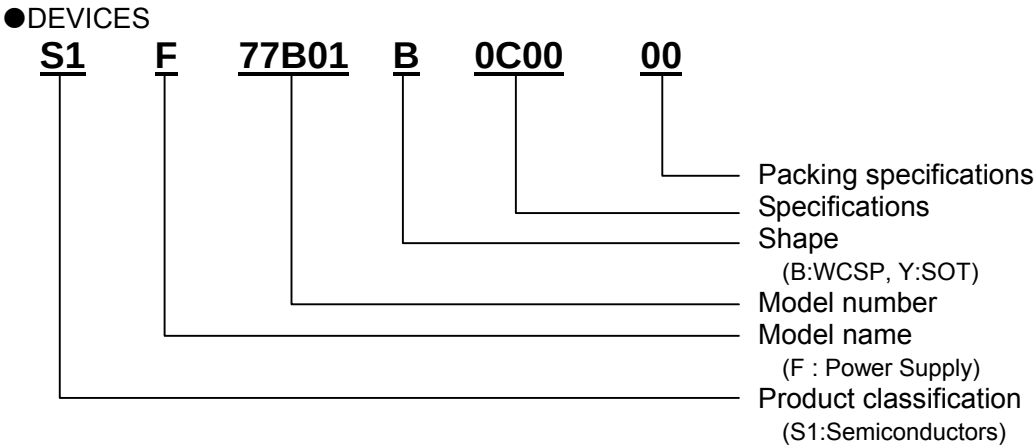
Power Supply IC
S1F77B01
Technical Manual

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



CONTENTS

1. DESCRIPTION	1
2. FEATURES	1
3. PACKAGE	1
4. APPLICATION	1
5. BLOCK DIAGRAM.....	2
6. SELECTION GUIDE.....	3
7. PIN ASSIGNMENT	3
8. MARKING	4
9. MARKING	5
10. PIN DESCRIPTION	6
11. ABSOLUTE MAXIMUM RATINGS	6
12. TIMING CHARTS AND RECOMMENDED CIRCUIT DIAGRAMS.....	7
13. ELECTRICAL CHARACTERISTICS, DELAY CIRCUIT BUILT-IN PRODUCTS.....	8
14. CHARACTERISTIC MEASURING CIRCUITS	9
15. DIMENSIONS.....	12
16. CHARACTERISTIC EXAMPLE	14

1. DESCRIPTION

The S1F77B01 is a CMOS detector that runs at superlow consumption current 350nA (Typ.).

The detecting voltage can be selected in the range from 1.5V to 4.6V which is set to high accuracy $\pm 2.0\%$ in 0.1V steps. The power voltage is allowable in the range of low voltage 0.9 to 5.5V.

This detector adopts a compact package, which is available in a compact mobile device.

2. FEATURES

- | | |
|---|-----------------------------------|
| • Superlow power consumption: | 350nA ($V_{DD}=3.0V$, Typ.) |
| • Range of detecting voltage: | 1.5 to 4.6V (in 0.1V steps) |
| • Accuracy of detecting voltage: | $\pm 2.0\%$ |
| • Hysteresis characteristics: | 5.0% Typ. |
| • Temperature characteristics of detecting voltage: | ± 100 ppm/ $^{\circ}C$ (Typ.) |
| • Output type: | CMOS, Nch open drain |

3. PACKAGE

SOT23 5pin

WCSP 4pin

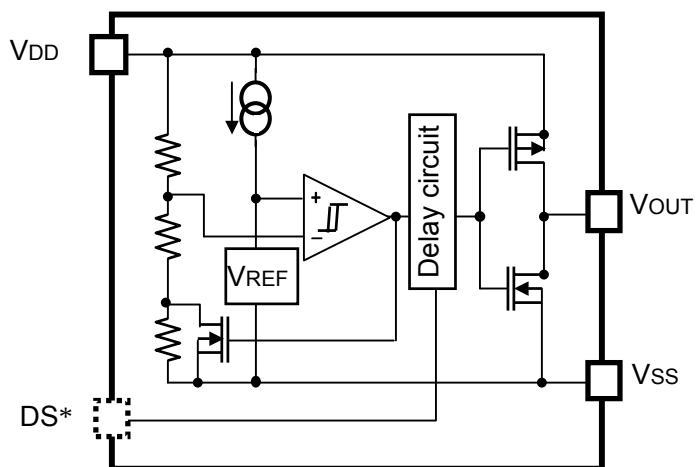
4. APPLICATION

- Microcomputer and logic circuit resetting
- Battery checker
- Level discriminator
- Waveform rectifier circuit
- Backup power switching circuit
- Power failure detector
- Overcurrent protection circuit

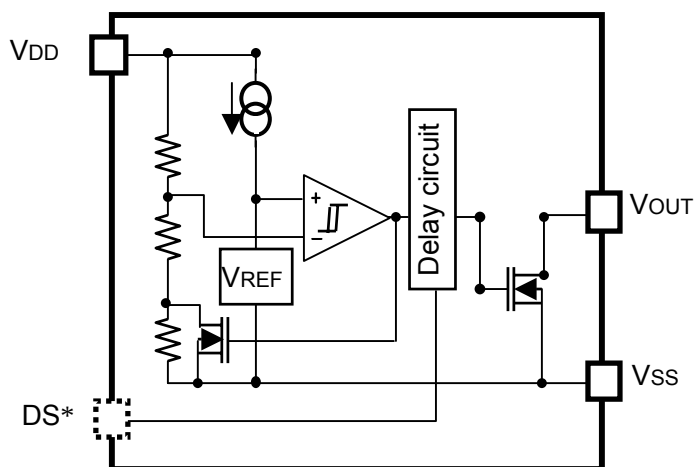
5. BLOCK DIAGRAM

5. BLOCK DIAGRAM

●CMOS output



●Nch open drain output



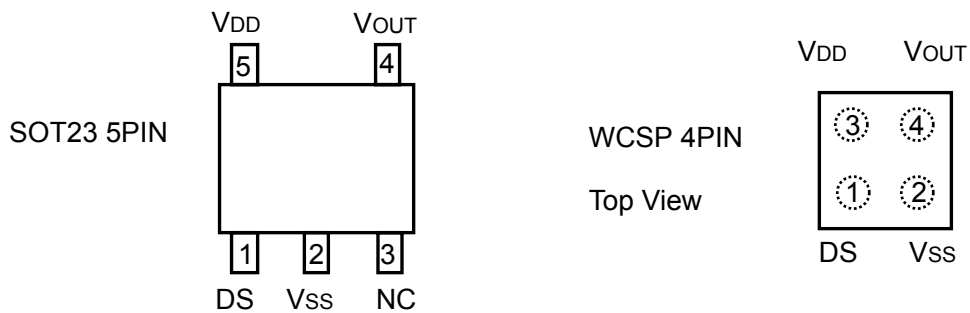
Note: SOT23 package product only; otherwise, a product with DS pin set to NC
The DS pin must be fixed to "LOW" outside the IC.

6. SELECTION GUIDE

S1F77B01 $\frac{** * 0 **}{a \quad b \quad c \quad d \quad e}$

a	Package type SOT23 5PIN "Y" WCSP 4PIN "B"
b	Indicates a value that is ten times the detecting voltage.
c	For CMOS output, delay 50ms "C" For CMOS output, delay 100ms "D" For CMOS output, delay 200ms "E" For Nch open drain output, delay 50ms "L" For Nch open drain output, delay 100ms "M" For Nch open drain output, delay 200ms "N"
d	Fixed to 0 in this IC.
e	Taping form TR type "0R"

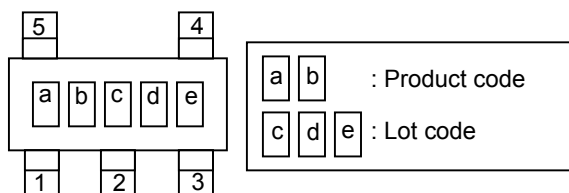
7. PIN ASSIGNMENT



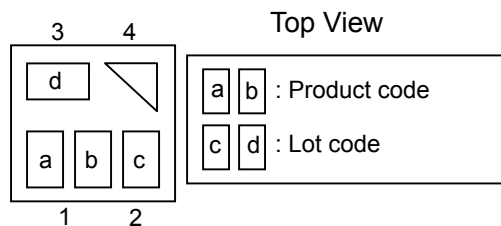
8. MARKING

8. MARKING

SOT23 5PIN



WCSP 4PIN



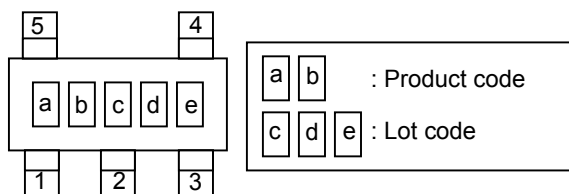
Top View

CMOS

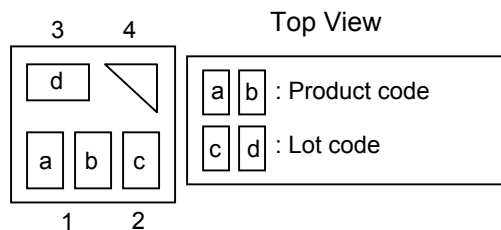
Vdet- Option	Delay time 50ms		Delay time 100ms		Delay time 200ms	
	a	b	a	b	a	b
1.5V	B	<u>5</u>	B	5	B	<u>5</u>
1.6V	B	<u>6</u>	B	6	B	<u>6</u>
1.7V	B	<u>7</u>	B	7	B	<u>7</u>
1.8V	B	<u>8</u>	B	8	B	<u>8</u>
1.9V	B	<u>9</u>	B	9	B	<u>9</u>
2.0V	J	<u>0</u>	J	0	J	<u>0</u>
2.1V	J	<u>1</u>	J	1	J	<u>1</u>
2.2V	J	<u>2</u>	J	2	J	<u>2</u>
2.3V	J	<u>3</u>	J	3	J	<u>3</u>
2.4V	J	<u>4</u>	J	4	J	<u>4</u>
2.5V	J	<u>5</u>	J	5	J	<u>5</u>
2.6V	J	<u>6</u>	J	6	J	<u>6</u>
2.7V	J	<u>7</u>	J	7	J	<u>7</u>
2.8V	J	<u>8</u>	J	8	J	<u>8</u>
2.9V	J	<u>9</u>	J	9	J	<u>9</u>
3.0V	J	<u>A</u>	J	A	J	<u>A</u>
3.1V	J	<u>B</u>	J	B	J	<u>B</u>
3.2V	J	<u>C</u>	J	C	J	<u>C</u>
3.3V	J	<u>D</u>	J	D	J	<u>D</u>
3.4V	J	<u>E</u>	J	E	J	<u>E</u>
3.5V	J	<u>F</u>	J	F	J	<u>F</u>
3.6V	J	<u>G</u>	J	G	J	<u>G</u>
3.7V	J	<u>H</u>	J	H	J	<u>H</u>
3.8V	J	<u>J</u>	J	J	J	<u>J</u>
3.9V	J	<u>K</u>	J	K	J	<u>K</u>
4.0V	J	<u>L</u>	J	L	J	<u>L</u>
4.1V	J	<u>M</u>	J	M	J	<u>M</u>
4.2V	J	<u>N</u>	J	N	J	<u>N</u>
4.3V	J	<u>P</u>	J	P	J	<u>P</u>
4.4V	J	<u>Q</u>	J	Q	J	<u>Q</u>
4.5V	J	<u>R</u>	J	R	J	<u>R</u>
4.6V	J	<u>S</u>	J	S	J	<u>S</u>

9. MARKING

SOT23 5PIN



WCSP 4PIN



Nch open drain

Vdet- Option	Delay time 50ms		Delay time 100ms		Delay time 200ms	
	a	b	a	b	a	b
1.5V	B	<u>5</u>	B	5	B	<u>5</u>
1.6V	B	<u>6</u>	B	6	B	<u>6</u>
1.7V	B	<u>7</u>	B	7	B	<u>7</u>
1.8V	B	<u>8</u>	B	8	B	<u>8</u>
1.9V	B	<u>9</u>	B	9	B	<u>9</u>
2.0V	J	<u>0</u>	J	0	J	<u>0</u>
2.1V	J	<u>1</u>	J	1	J	<u>1</u>
2.2V	J	<u>2</u>	J	2	J	<u>2</u>
2.3V	J	<u>3</u>	J	3	J	<u>3</u>
2.4V	J	<u>4</u>	J	4	J	<u>4</u>
2.5V	J	<u>5</u>	J	5	J	<u>5</u>
2.6V	J	<u>6</u>	J	6	J	<u>6</u>
2.7V	J	<u>7</u>	J	7	J	<u>7</u>
2.8V	J	<u>8</u>	J	8	J	<u>8</u>
2.9V	J	<u>9</u>	J	9	J	<u>9</u>
3.0V	J	<u>A</u>	J	A	J	<u>A</u>
3.1V	J	<u>B</u>	J	B	J	<u>B</u>
3.2V	J	<u>C</u>	J	C	J	<u>C</u>
3.3V	J	<u>D</u>	J	D	J	<u>D</u>
3.4V	J	<u>E</u>	J	E	J	<u>E</u>
3.5V	J	<u>F</u>	J	F	J	<u>F</u>
3.6V	J	<u>G</u>	J	G	J	<u>G</u>
3.7V	J	<u>H</u>	J	H	J	<u>H</u>
3.8V	J	<u>J</u>	J	J	J	<u>J</u>
3.9V	J	<u>K</u>	J	K	J	<u>K</u>
4.0V	J	<u>L</u>	J	L	J	<u>L</u>
4.1V	J	<u>M</u>	J	M	J	<u>M</u>
4.2V	J	<u>N</u>	J	N	J	<u>N</u>
4.3V	J	<u>P</u>	J	P	J	<u>P</u>
4.4V	J	<u>Q</u>	J	Q	J	<u>Q</u>
4.5V	J	<u>R</u>	J	R	J	<u>R</u>
4.6V	J	<u>S</u>	J	S	J	<u>S</u>

10. PIN DESCRIPTION

10. PIN DESCRIPTION

For SOT-23-5

Pin No.	Pin Name	Function
1	DS	Fixed to "LOW".
2	VSS	GND pin.
3	NC	No connection
4	VOUT	Voltage detection output pin
5	VDD	Power input pin

For WCSP

Pin No.	Pin Name	Function
1	DS	Fixed to "LOW".
2	VSS	GND pin.
3	VDD	Voltage output pin
4	VOUT	Power detection output pin

11. ABSOLUTE MAXIMUM RATINGS

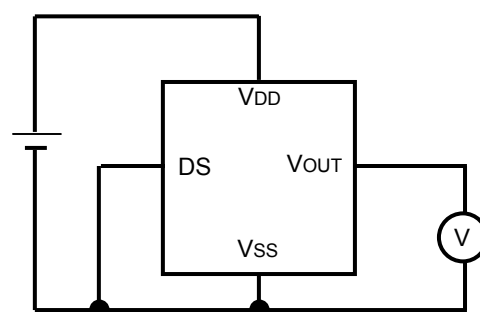
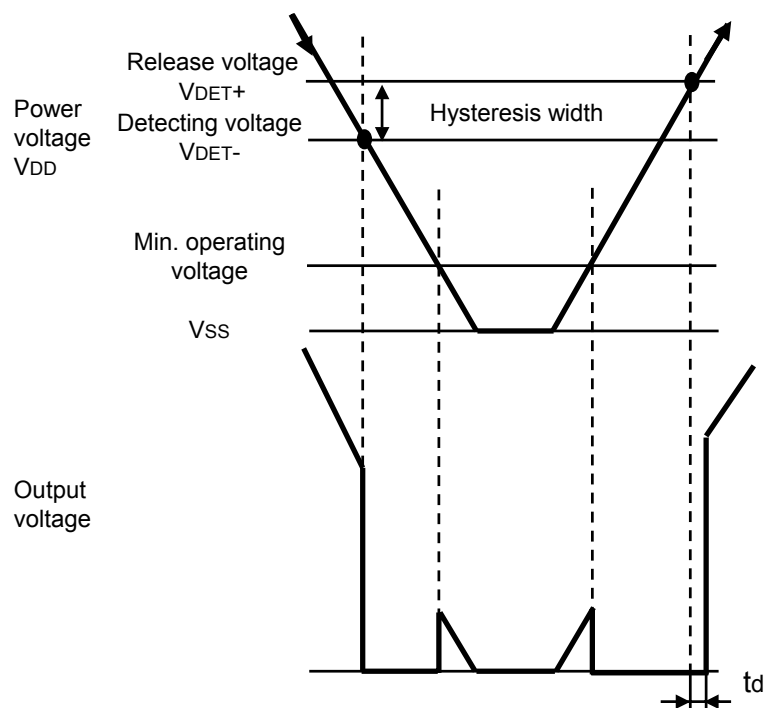
(Ta=25°C RL=∞ unless otherwise specified)

Item		Symbol	Rating	Unit
Power voltage		VDD-VSS	7.0	V
Output voltage	Nch open drain output	VOUT	Vss-0.3V to 7.0	V
	CMOS output		Vss-0.3V to VDD+0.3V	
Output current		IOUT	20	mA
Allowable dissipation	PD	SOT23	300	mW
		WCSP	100	mW
Guaranteed operating temperature range		Topr	-40 to +85	°C
Storage temperature range		Tstg	-40 to +125	°C

Note: To stabilize the IC, insert the decoupling capacitor between VDD and VSS.

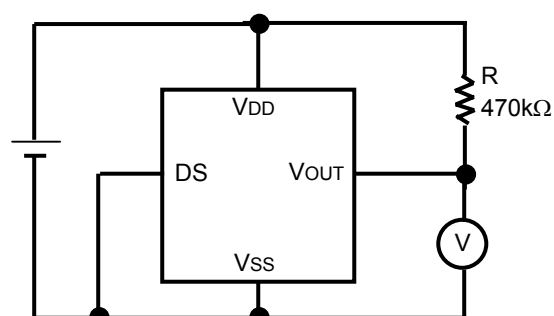
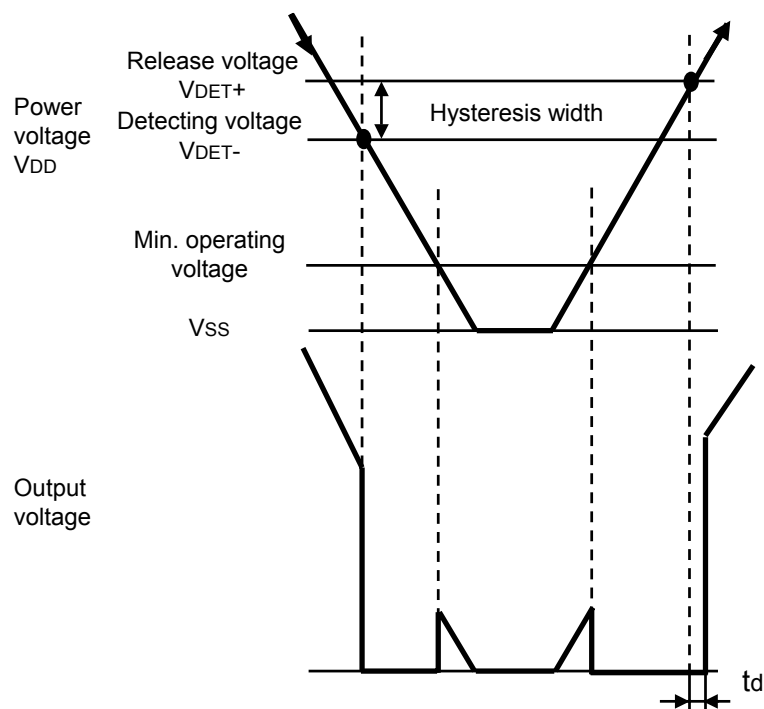
12. TIMING CHARTS AND RECOMMENDED CIRCUIT DIAGRAMS

●CMOS



Recommended circuit diagram

●Nch open drain



Recommended circuit diagram

13. ELECTRICAL CHARACTERISTICS, DELAY CIRCUIT BUILT-IN PRODUCTS

13. ELECTRICAL CHARACTERISTICS, DELAY CIRCUIT BUILT-IN PRODUCTS

(1) CMOS output

(T_a=25°C R_L=∞ unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Detecting voltage	V _{DET-}	—	V _{DET-(S)} ×0.98	V _{DET-(S)}	V _{DET-(S)} ×1.02	V
Hysteresis width	V _{HYS}	V _{HYS} =(V _{DET+})-(V _{DET-})	V _{DET-} ×0.03	V _{DET-} ×0.05	V _{DET-} ×0.07	V
Consumption current 1	I _{SS1}	V _{DD} =2.5V, V _{DET-(S)} =1.5V	—	350	700	nA
		V _{DD} =3.7V, V _{DET-(S)} =2.7V	—	350	700	
		V _{DD} =5.5V, V _{DET-(S)} =4.6V	—	350	700	
Consumption current 2	I _{SS2}	V _{DD} =1.3V, V _{DET-(S)} =1.5V	—	280	560	nA
		V _{DD} =2.5V, V _{DET-(S)} =2.7V	—	280	560	
		V _{DD} =4.4V, V _{DET-(S)} =4.6V	—	280	560	
Max. operating voltage	V _{DDH}	—	—	—	5.5	V
Min. operating voltage	V _{DDL}	—	0.9	—	—	V
Output current	I _{OUTN}	[Nch] V _{DD} <V _{DET-}	V _{DD} =0.9V, V _{DS} =0.5V	0.2	0.8	mA
			V _{DD} =1.2V, V _{DS} =0.5V	1.0	2.2	
			V _{DD} =2.4V, V _{DS} =0.5V	5.5	6.8	
	I _{OUTP}	[Pch] V _{DD} >V _{DET-}	V _{DD} =3.0V, V _{DS} =V _{DD} -0.5V	2.5	4.5	
			V _{DD} =4.0V, V _{DS} =V _{DD} -0.5V	4.5	6.2	
			V _{DD} =5.5V, V _{DS} =V _{DD} -0.5V	6.5	8.2	
Delay time	t _d	t _d =50ms	42.5	50	57.5	ms
		t _d =100ms	85	100	115	
		t _d =200ms	170	200	230	
Response time	t _{PHL}	V _{DD} : (V _{DET-(S)})+1.0V ==> 0.9V	—	—	80	μs
Detecting voltage temperature coefficient	$\frac{\Delta V_{DET}}{\Delta T_{opt}}$	-40°C ≤ T _{opt} ≤ 85°C	—	±100	—	ppm/°C

(2) Nch open drain output

(T_a=25°C R_L=∞ unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Detecting voltage	V _{DET-}	—	V _{DET-(S)} ×0.98	V _{DET-(S)}	V _{DET-(S)} ×1.02	V
Hysteresis width	V _{HYS}	V _{HYS} =(V _{DET+})-(V _{DET-})	V _{DET-} ×0.03	V _{DET-} ×0.05	V _{DET-} ×0.07	V
Consumption current 1	I _{SS1}	V _{DD} =2.5V, V _{DET-(S)} =1.5V	—	350	700	nA
		V _{DD} =3.7V, V _{DET-(S)} =2.7V	—	350	700	
		V _{DD} =5.5V, V _{DET-(S)} =4.6V	—	350	700	
Consumption current 2	I _{SS2}	V _{DD} =1.3V, V _{DET-(S)} =1.5V	—	280	560	nA
		V _{DD} =2.5V, V _{DET-(S)} =2.7V	—	280	560	
		V _{DD} =4.4V, V _{DET-(S)} =4.6V	—	280	560	
Max. operating voltage	V _{DDH}	—	—	—	5.5	V
Min. operating voltage	V _{DDL}	—	0.9	—	—	V
Output current of output transistor	I _{OUTN}	[Nch] V _{DD} <V _{DET-}	V _{DD} =0.9V, V _{DS} =0.5V	0.2	0.8	mA
			V _{DD} =1.2V, V _{DS} =0.5V	1.0	2.2	
			V _{DD} =2.4V, V _{DS} =0.5V	5.5	6.8	
Leak current of output transistor	I _{LEAK}	V _{DD} =5.5V, V _{DS} =5.5V	—	—	0.1	μA
Delay time	t _d	t _d =50ms	42.5	50	57.5	ms
		t _d =100ms	85	100	115	
		t _d =200ms	170	200	230	
Response time	t _{PHL}	V _{DD} : (V _{DET-(S)})+1.0V ==> 0.9V	—	—	80	μs
Detecting voltage temperature coefficient	$\frac{\Delta V_{DET}}{\Delta T_{opt}}$	-40°C ≤ T _{opt} ≤ 85°C	—	±100	—	ppm/°C

14. CHARACTERISTIC MEASURING CIRCUITS

V_{DET-} , V_{HYS} , t_{PLH} , t_d

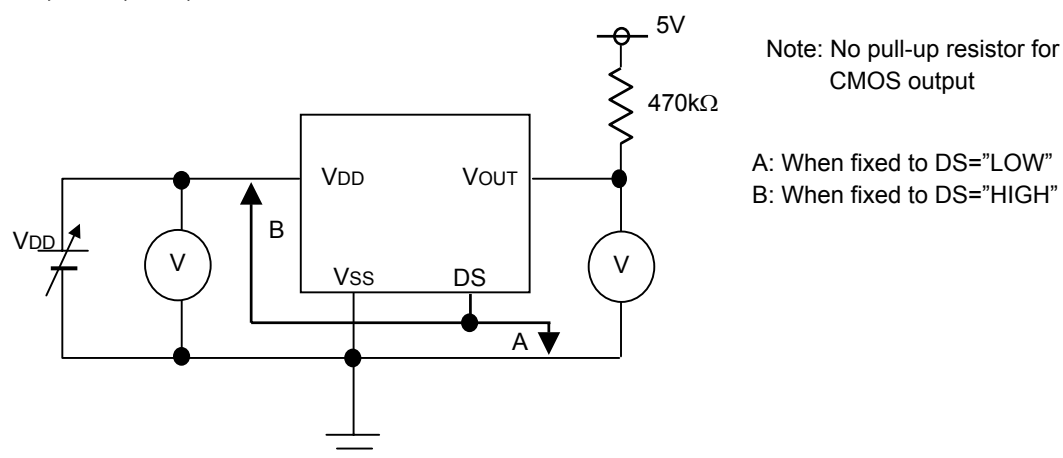


Fig.1

I_{SS1} , I_{SS2}

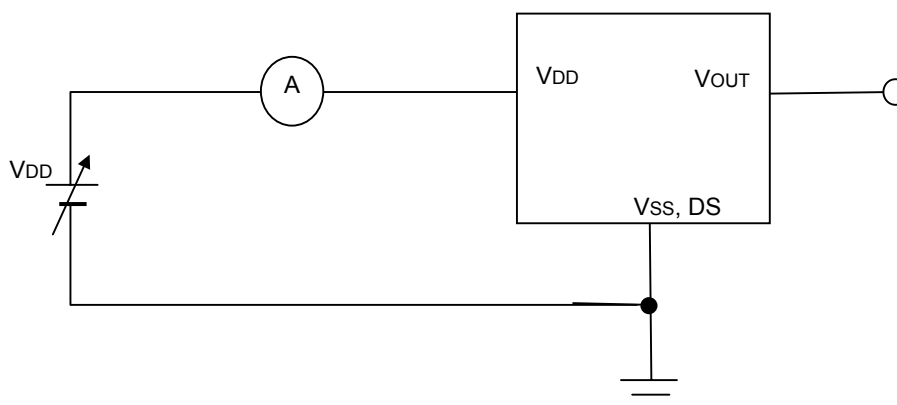


Fig.2

14. CHARACTERISTIC MEASURING CIRCUITS

$I_{OUT\ Nch}$, I_{LEAK}

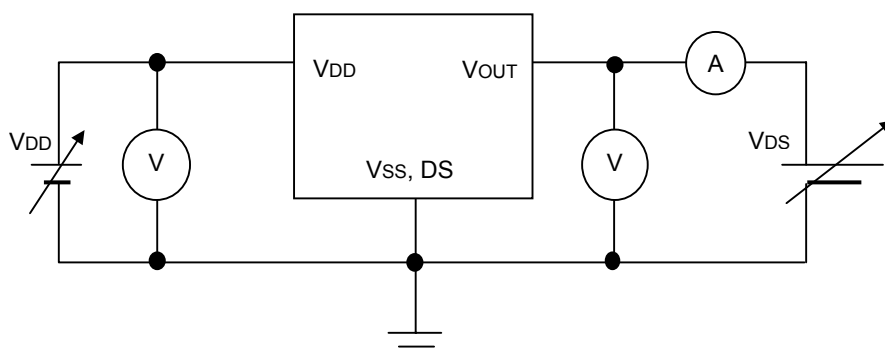


Fig.3

$I_{OUT\ Pch}$

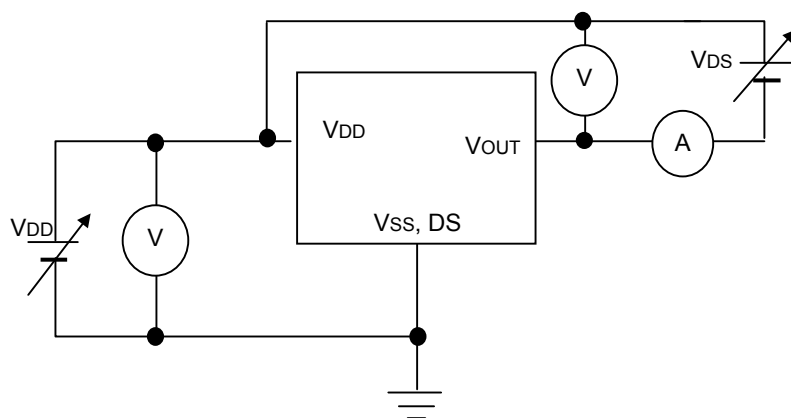
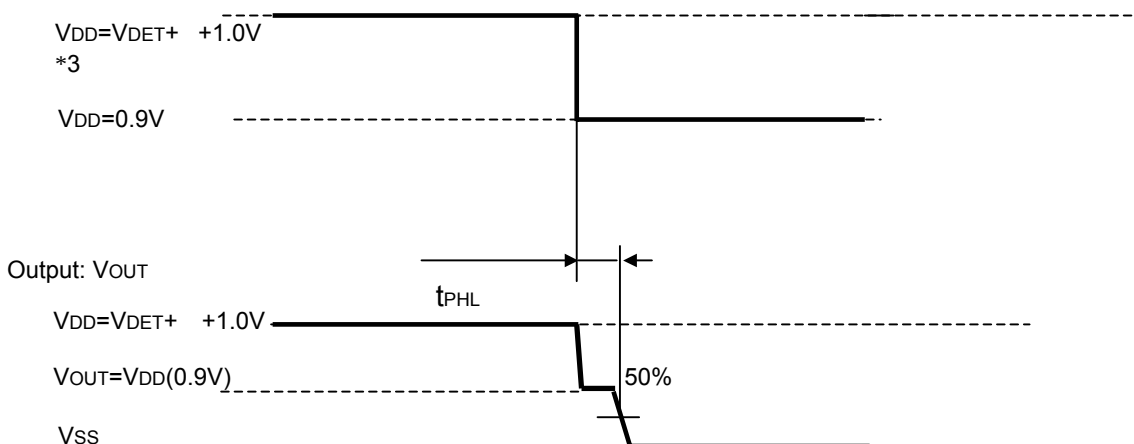


Fig.4

14. CHARACTERISTIC MEASURING CIRCUITS

●Description of t_{PHL}

Input: VDD



*3: V_{DET+} indicates the actual release voltage. $V_{DET+}=V_{DET}\times 1.05$ (Typ.)

(1) For CMOS output

t_{PHL} provides the timeframe ranging from a time when the pulse voltage $(V_{DET+})+1.0V \rightarrow 0.9V$ is applied to VDD, to a time when the output voltage reaches $V_{DD}/2$.

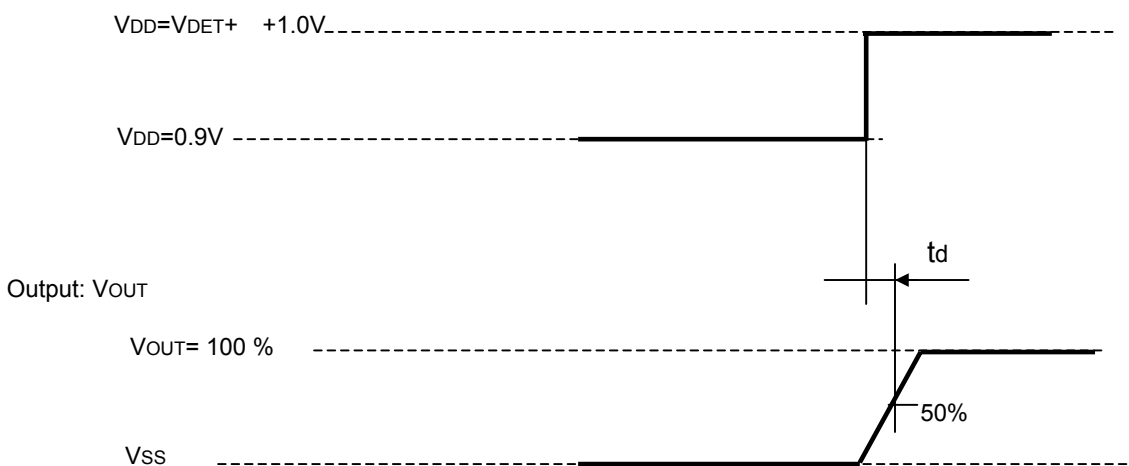
(2) Nch open drain output

t_{PHL} provides the timeframe ranging from a time when the pulse voltage $(V_{DET+})+1.0V \rightarrow 0.9V$ is applied to VDD, to a time when the output voltage reaches $V_{DD}/2$.

The output pin is pulled up with 470k Ω resistance and VDD power for measurement.

●Description of t_d

Input: VDD



(1) For CMOS output

t_d provides the timeframe ranging from a time when the pulse voltage $0.9V \rightarrow (V_{DET+})+1.0V$ is applied to VDD, to a time when the output voltage reaches $V_{DD}/2$.

(2) For Nch open drain output

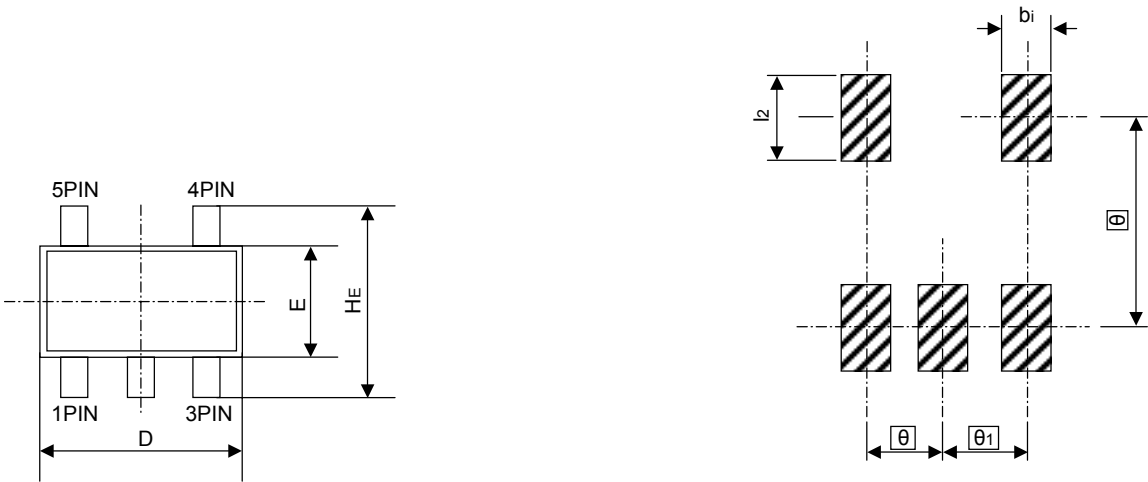
t_d provides the timeframe ranging from a time when the pulse voltage $0.9V \rightarrow (V_{DET+})+1.0V$ is applied to VDD, to a time when the output voltage reaches $V_{DD}/2$.

The output pin is pulled up with 470k Ω resistance and VDD power for measurement.

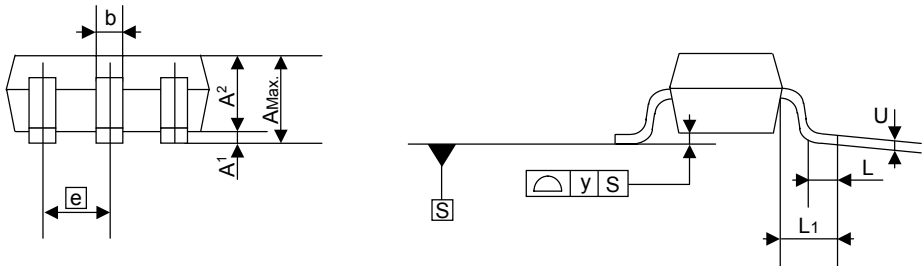
15. DIMENSIONS

15. DIMENSIONS

•SOT23 5PIN



θ_1	2.40
l_2	1.00
θ	0.95
b_i	0.80

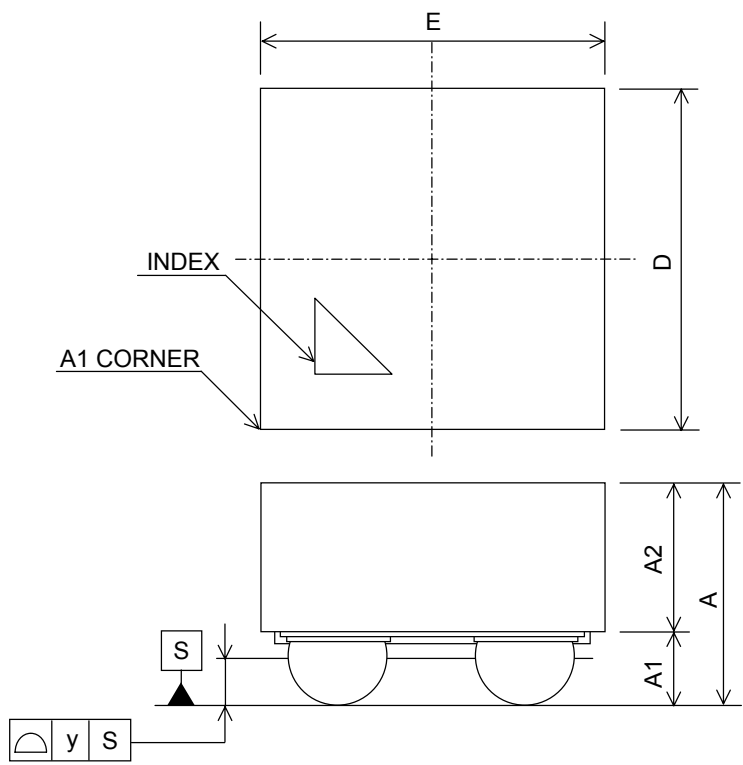


Symbol	Dimention In Millimeters		
	Min.	Nom.	Max.
D	—	2.9	—
E	—	1.6	—
AMax.	—	—	1.40
AL	0	—	0.15
Ae	—	1.1	—
e	—	0.95	—
lo	0.3	—	0.5
C	0.1	—	0.26
L	0.2	—	0.6
L1	—	0.6	—
HE	—	2.8	—
y	—	—	0.1

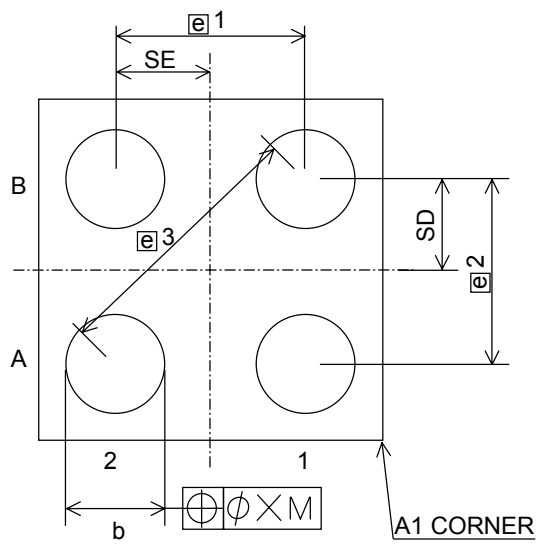
1 = 1mm

•WCSP 4PIN

Top View



Bottom View



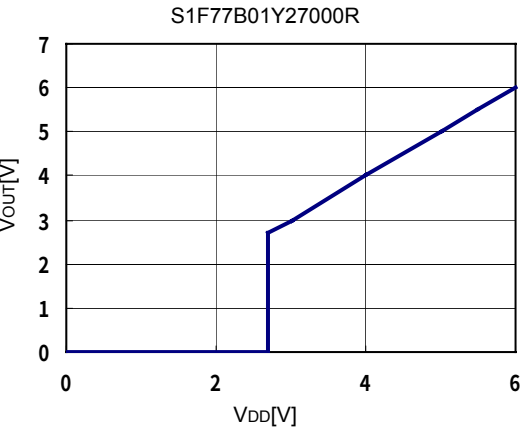
[Unit: mm]

Symbol	Dimention In Millimeters		
	Min.	Nom.	Max.
D	0.82	0.92	1.02
E	0.82	0.92	1.02
A	—	—	0.67
A1	0.18	0.21	0.24
A2	—	0.40	—
e1	—	0.50	—
e2	—	0.50	—
e3	—	0.71	—
b	0.23	0.26	0.29
x	—	—	0.08
y	—	—	0.05
SD	—	0.25	—
SE	—	0.25	—

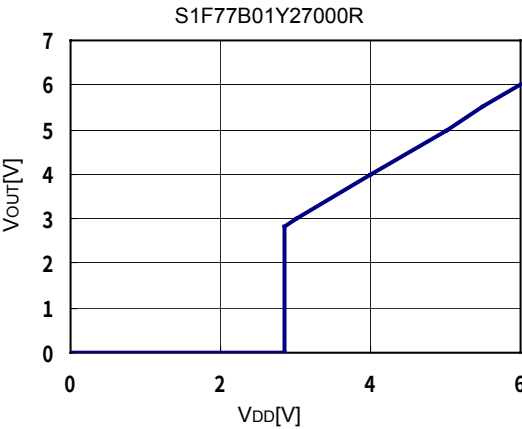
16. CHARACTERISTIC EXAMPLE

16. CHARACTERISTIC EXAMPLE

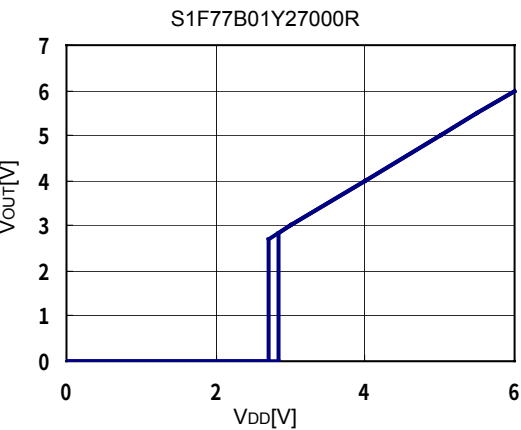
(1) Detecting voltage



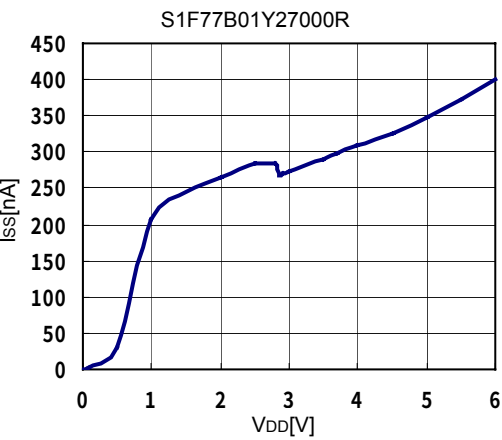
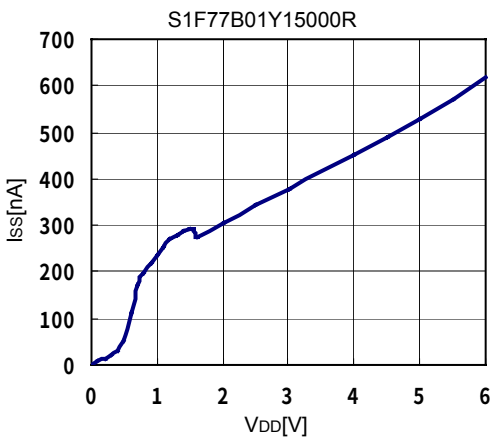
(2) Release voltage



(3) Hysteresis width

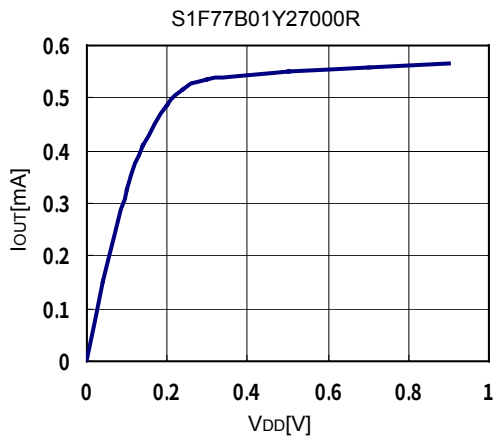


(4) Consumption current

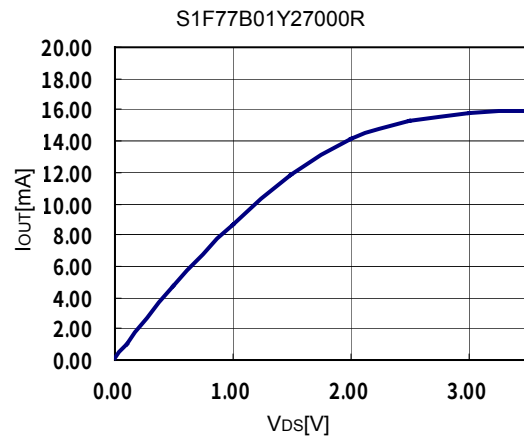


16. CHARACTERISTIC EXAMPLE

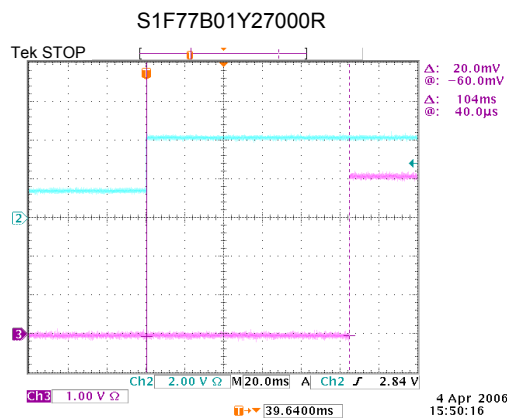
(5) Nch output current $V_{DS}=0.5V$ (CMOS)



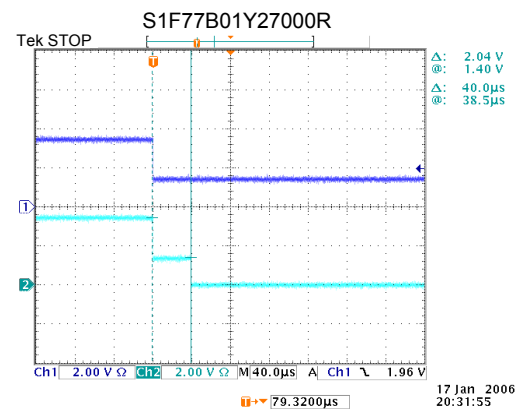
(6) Pch output current $V_{DS}=0.5V$ (CMOS)



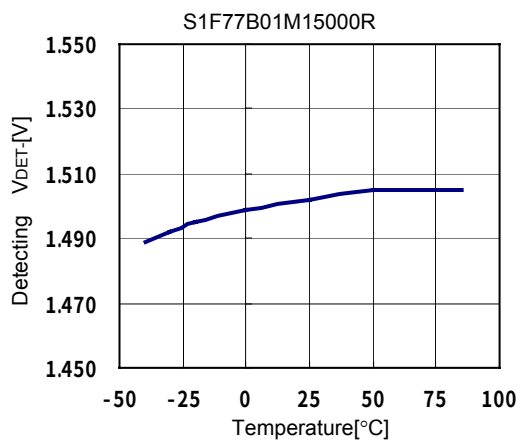
(7) Delay time (100ms)



(8) Response time



(9) Characteristics between detecting voltage and ambient temperature



* $T_a=25^{\circ}C$ unless otherwise specified

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

Northeast

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

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

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 Electronic Technology Development (Shenzhen) LTD.

12/F, Dawning Mansion, Keji South 12th Road,
Hi-Tech Park, Shenzhen
Phone: +86-755-2699-3828 FAX: +86-755-2699-3838

EPSON TAIWAN TECHNOLOGY & TRADING LTD.

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

EPSON SINGAPORE PTE., LTD.

1 HarbourFront Place,
#03-02 HarbourFront Tower One, Singapore 098633
Phone: +65-6586-5500 FAX: +65-6271-3182

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

2F, Grand B/D, 457-4 Songjeong-dong,
Gumi-City, 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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Epson:

[S1F77B01B](#) [S1F77B01Y](#)