

PSSI2021SAY

Constant current source in SOT353 package

Rev. 03 — 27 August 2009

Product data sheet

1. Product profile

1.1 General description

Resistor-equipped PNP transistor with two diodes on one chip in a SOT353 (SC-88A) plastic package. Stabilized output current of between 15 μ A and 50 mA by connection of an external resistor between pins 4 and 5.

1.2 Features

- One chip integrated constant current source
- Output current setting by use of an external resistor
- Very small package
- Reduces component count and board space

1.3 Applications

- Automotive applications
- Generic constant current source
- Constant current LED driver
- Active bias control for audio amplifiers

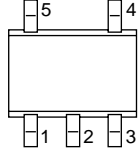
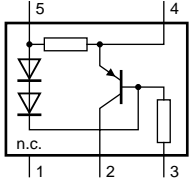
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{out}	output current		0.015	-	50	mA
V_S	supply voltage		-	-	75	V

2. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Symbol
1	n.c.	not connected		 <p style="text-align: right; font-size: small;">sym049</p>
2	IOUT	output current		
3	GND	ground		
4	REXT	external resistor		
5	VS	supply voltage		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSSI2021SAY	SC-88A	plastic surface mounted package; 5 leads	SOT353

4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
PSSI2021SAY	S1*

- [1] * = -: made in Hong Kong
 * = t: made in Malaysia
 * = W: made in China

5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
I_{out}	stabilized output current	see Figure 2	0.015	50	mA
V_S	supply voltage		-	75	V
V_{out}	output voltage	$V_S = 75\text{ V}$	-	73	V
V_R	reverse voltage		[1] -	0.5	V
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[2] -	335	mW
T_{stg}	storage temperature		-65	+150	°C
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		-65	+150	°C

[1] Between all terminals

[2] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint

6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] -	-	370	K/W

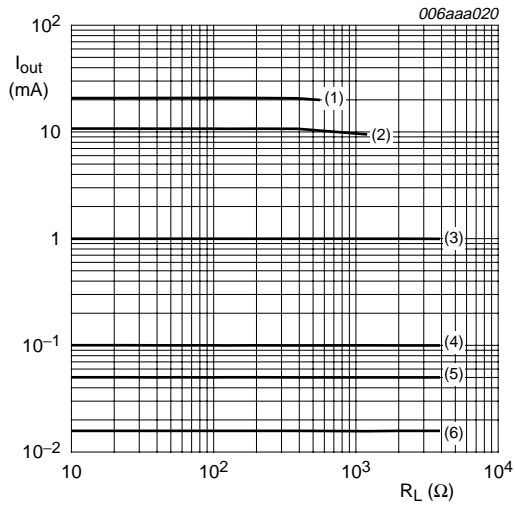
[1] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint

7. Characteristics

Table 7. Characteristics

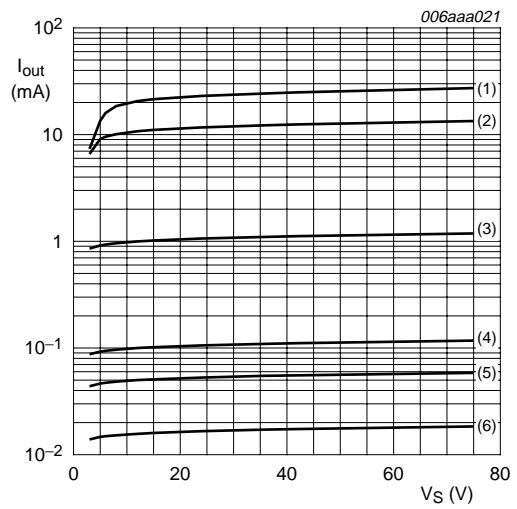
$T_{amb} = 25\text{ °C}$ unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{out}	stabilized output current	$V_S = 12\text{ V}$; $R_{ext} = \text{open}$; $V_{out} = 0\text{ V}$ to 10 V ; see Figure 2	10	15	20	μA
I_S	supply current	$V_S = 12\text{ V}$; $I_{out} = 15\text{ }\mu\text{A}$; $V_{out} = 0\text{ V}$ to 10 V ; see Figure 4	-	240	370	μA
		$V_S = 75\text{ V}$; $I_{out} = 15\text{ }\mu\text{A}$; $V_{out} = 0\text{ V}$; see Figure 4	-	1.5	2.2	mA
$\Delta I_{out} / (I_{out} \times \Delta T_{amb})$	output current change over ambient temperature	$V_S = 12\text{ V}$; $V_{out} = 1\text{ V}$; $T_{amb} = -55\text{ °C}$ to 150 °C	-	0.15	-	%/K
$\Delta I_{out} / I_{out}$	load stability of stabilized output current	$V_S = 12\text{ V}$; $V_{out} = 1\text{ V}$ to 10 V	-	0.5	-	%
R_{int}	internal resistor value		-	48	-	k Ω



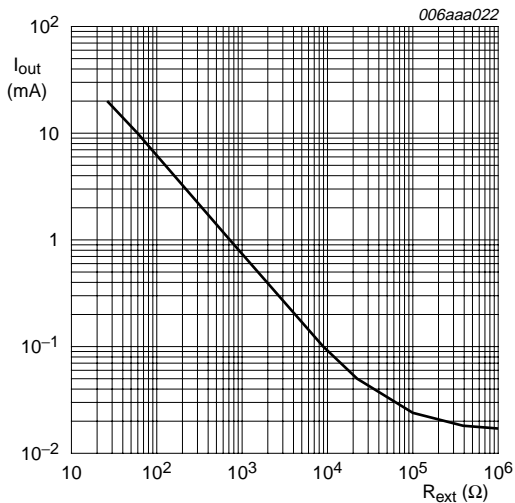
- $V_S = 12\text{ V}$
- (1) $I_{out} = 20\text{ mA}$
 - (2) $I_{out} = 10\text{ mA}$
 - (3) $I_{out} = 1\text{ mA}$
 - (4) $I_{out} = 100\text{ }\mu\text{A}$
 - (5) $I_{out} = 50\text{ }\mu\text{A}$
 - (6) $I_{out} = 15\text{ }\mu\text{A}$

Fig 1. Output current as a function of load resistance; typical values



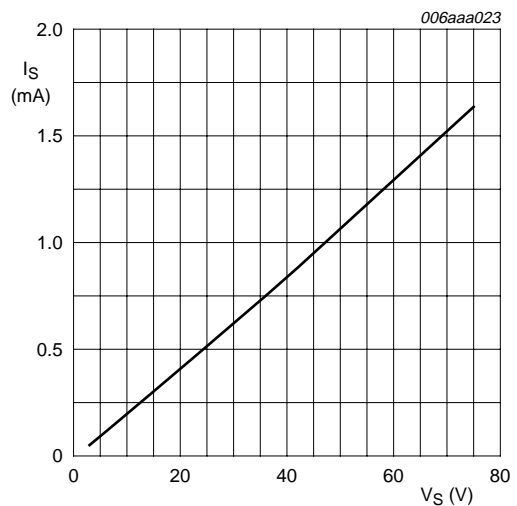
- (1) $I_{out} = 20\text{ mA}$
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- (3) $I_{out} = 1\text{ mA}$
- (4) $I_{out} = 100\text{ }\mu\text{A}$
- (5) $I_{out} = 50\text{ }\mu\text{A}$
- (6) $I_{out} = 15\text{ }\mu\text{A}$

Fig 2. Output current as a function of supply voltage; typical values



$V_S = 12\text{ V}; R_L = 100\text{ }\Omega$

Fig 3. Output current as a function of external resistance; typical values



$R_{ext} = \infty; R_L = 100\text{ }\Omega$

Fig 4. Supply current as a function of supply voltage; typical values

8. Application information

External resistor calculation

The output current can be set by connecting an external resistor between VS (pin 5) and REXT (pin 4).

I_{out} then calculates to:
$$I_{out} = \frac{0.617}{R_{ext}} + 15 \mu A$$

Without an external resistor the output current will be typically 15 μA .

Typical output currents versus supply voltage V_S

The applied supply voltage determines the output current. [Table 8](#) gives typical I_{out} values at specified supply voltages, assuming that the working output current is 70% of the maximum possible output current.

Table 8. Typical output currents at specified supply voltages

V_S (V)	I_{out} (mA)
5	6
12	18
24	38
36	60

8.1 Typical application circuits

LED driver

Figure 5 shows a typical application circuit for an LED driver. The constant current ensures a constant LED brightness.

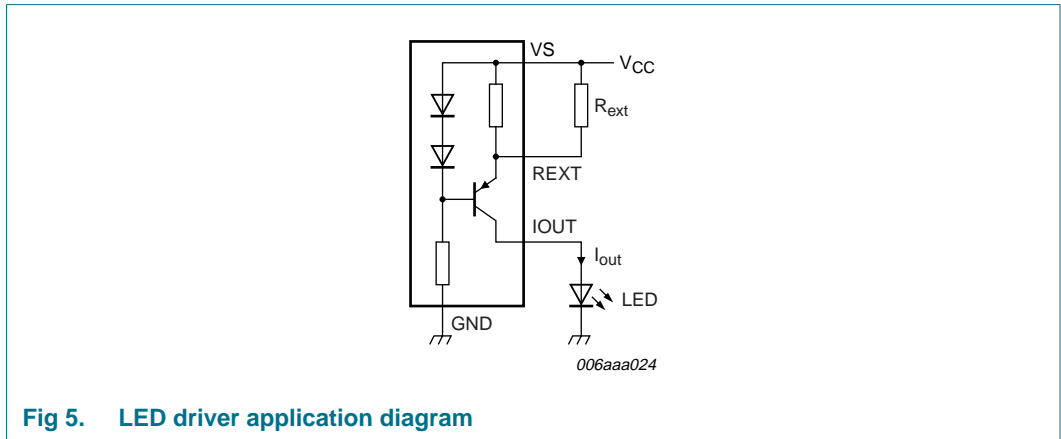


Fig 5. LED driver application diagram

Switching the current ON/OFF

The output can be switched ON and OFF by connecting a resistor-equipped transistor (RET, e.g. PDTC124XU) as shown in Figure 6.

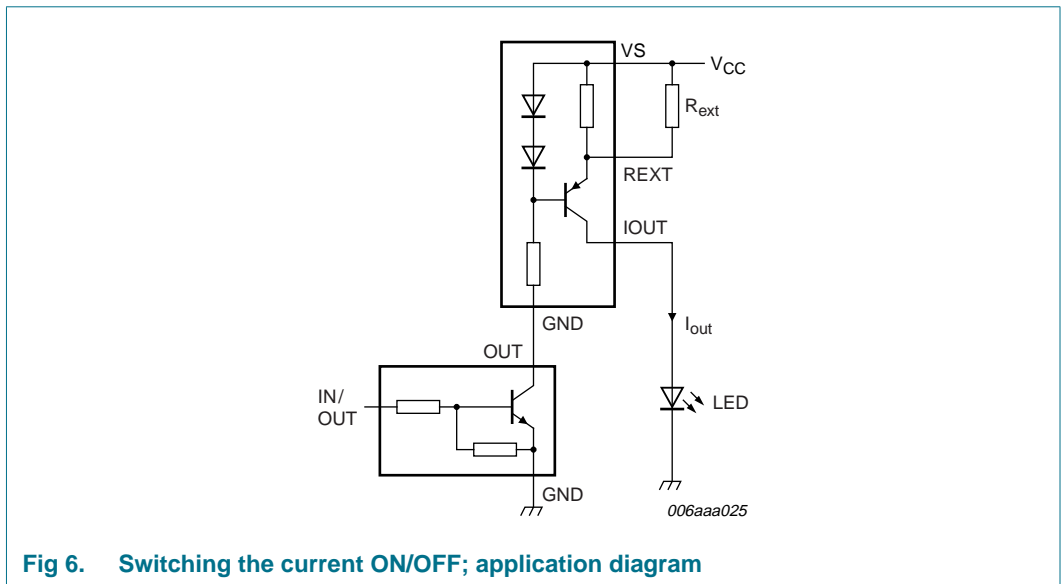


Fig 6. Switching the current ON/OFF; application diagram

Voltage reference

The PSSI2021SAY supplies a constant current to the Zener diode regardless of supply voltage variation, resulting in a constant reference voltage (see [Figure 7](#)).

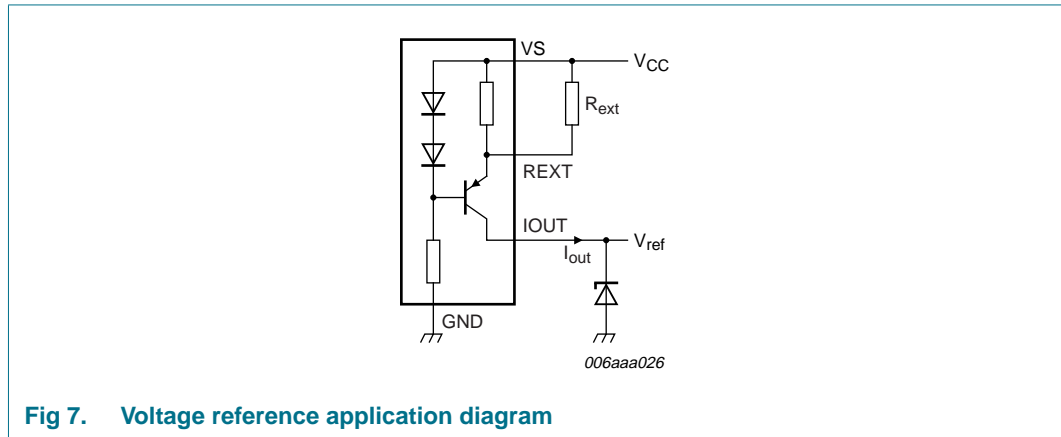


Fig 7. Voltage reference application diagram

9. Package outline

Plastic surface-mounted package; 5 leads

SOT353

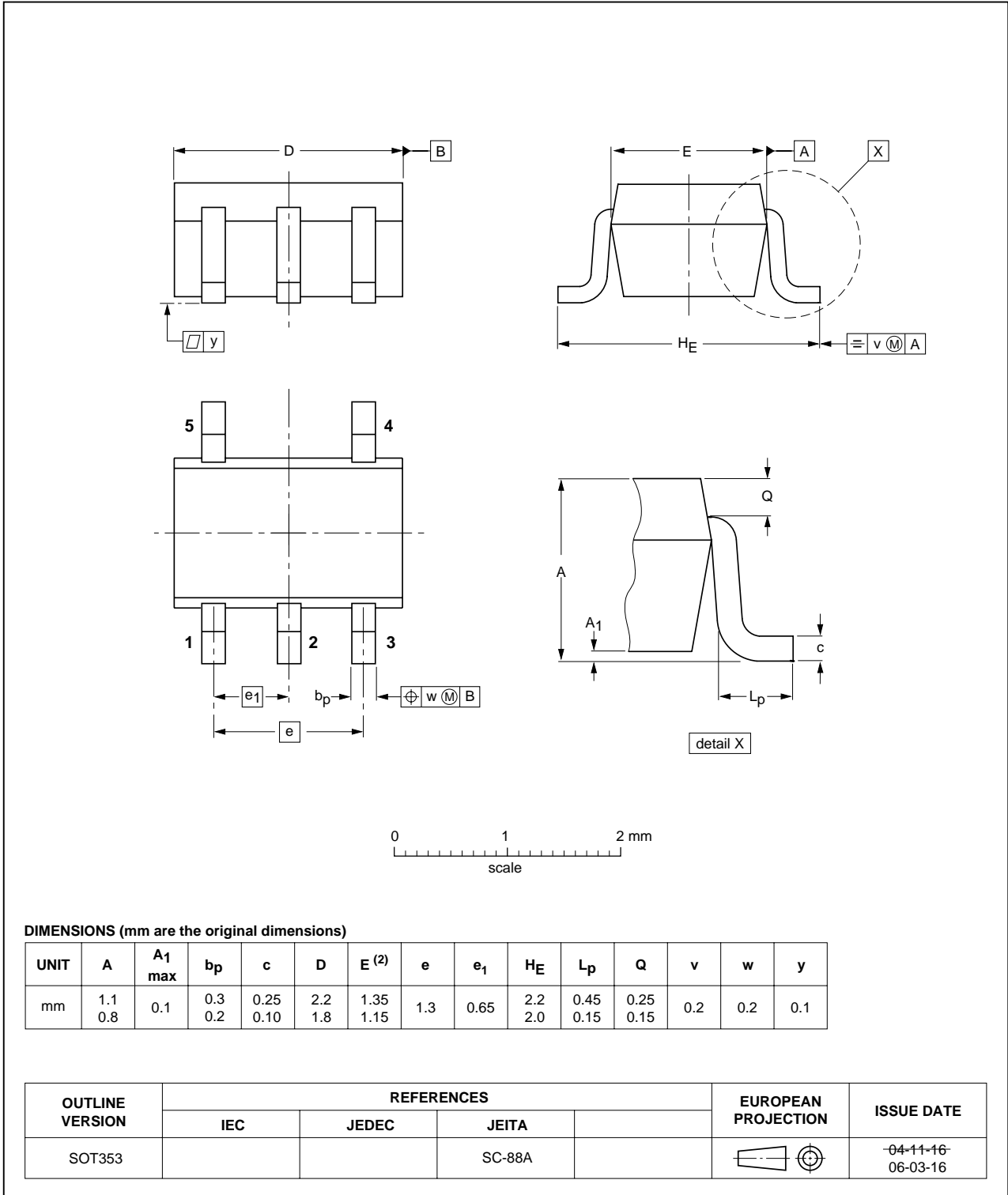


Fig 8. Package outline SOT353 (SC-88A)

10. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

Type number	Package	Description	Packing quantity
			3000
PSSI2021SAY	SOT353	4 mm pitch, 8 mm tape and reel	-115

[1] For further information and the availability of packing methods, see [Section 13](#).

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSSI2021SAY_3	20090827	Product data sheet	-	PSSI2021SAY_2
Modifications:		<ul style="list-style-type: none">This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.Table 2 "Pinning": amendedFigure 8 "Package outline SOT353 (SC-88A)": updated		
PSSI2021SAY_2	20041020	Product data sheet	-	PSSI2021SAY_1
PSSI2021SAY_1	20010507	Product specification	-	-

12. Legal information

12.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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