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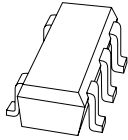
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Kind regards,

Team Nexperia



# PSS12021SAY

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  $\mu$ 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

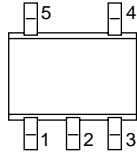
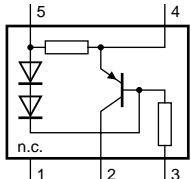
### 1.4 Quick reference data

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 <sup>[1]</sup>
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 <a href="#">Figure 2</a>	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

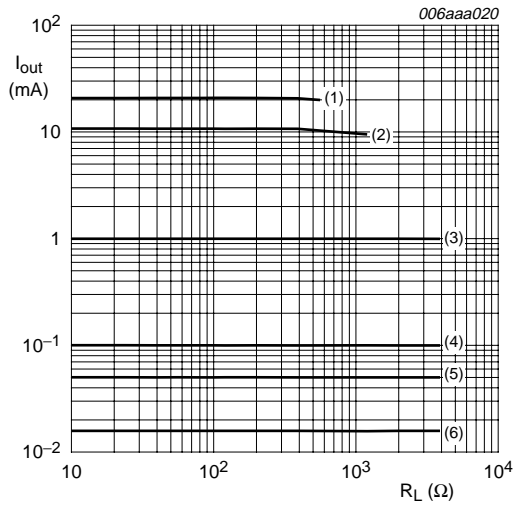
[1] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint

## 7. Characteristics

**Table 7. Characteristics**

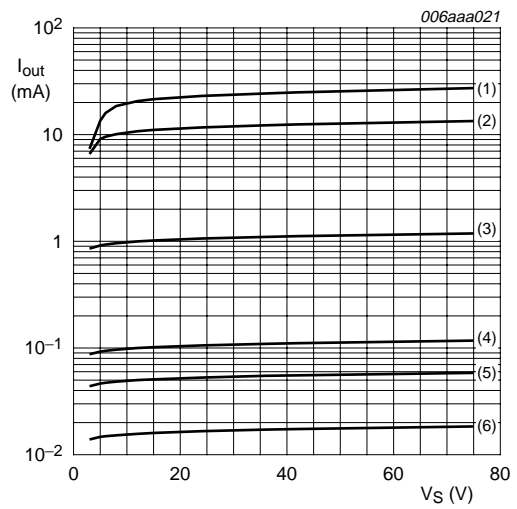
$T_{amb} = 25\text{ °C}$  unless otherwise specified

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 $10\text{ V}$ ; see <a href="#">Figure 2</a>	10	15	20	$\mu\text{A}$
$I_S$	supply current	$V_S = 12\text{ V}$ ; $I_{out} = 15\text{ }\mu\text{A}$ ; $V_{out} = 0\text{ V}$ to $10\text{ V}$ ; see <a href="#">Figure 4</a>	-	240	370	$\mu\text{A}$
		$V_S = 75\text{ V}$ ; $I_{out} = 15\text{ }\mu\text{A}$ ; $V_{out} = 0\text{ V}$ ; see <a href="#">Figure 4</a>	-	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 $150\text{ °C}$	-	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 $10\text{ V}$	-	0.5	-	%
$R_{int}$	internal resistor value		-	48	-	k $\Omega$



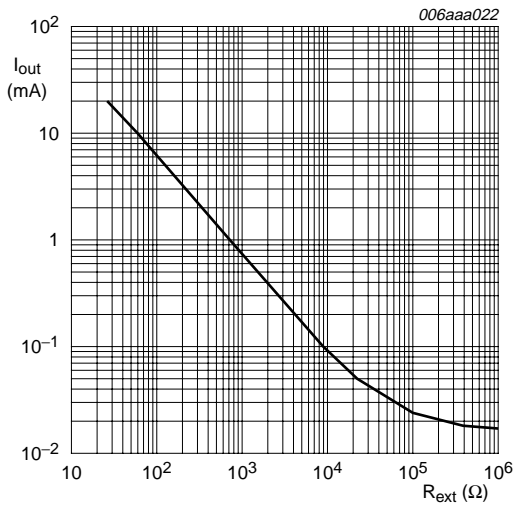
- $V_S = 12\text{ V}$
- (1)  $I_{out} = 20\text{ mA}$
  - (2)  $I_{out} = 10\text{ mA}$
  - (3)  $I_{out} = 1\text{ mA}$
  - (4)  $I_{out} = 100\text{ }\mu\text{A}$
  - (5)  $I_{out} = 50\text{ }\mu\text{A}$
  - (6)  $I_{out} = 15\text{ }\mu\text{A}$

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



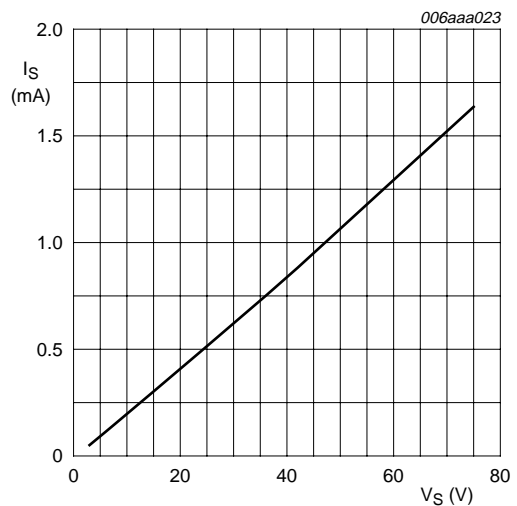
- (1)  $I_{out} = 20\text{ mA}$
- (2)  $I_{out} = 10\text{ mA}$
- (3)  $I_{out} = 1\text{ mA}$
- (4)  $I_{out} = 100\text{ }\mu\text{A}$
- (5)  $I_{out} = 50\text{ }\mu\text{A}$
- (6)  $I_{out} = 15\text{ }\mu\text{A}$

**Fig 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  $\mu A$ .

### 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.

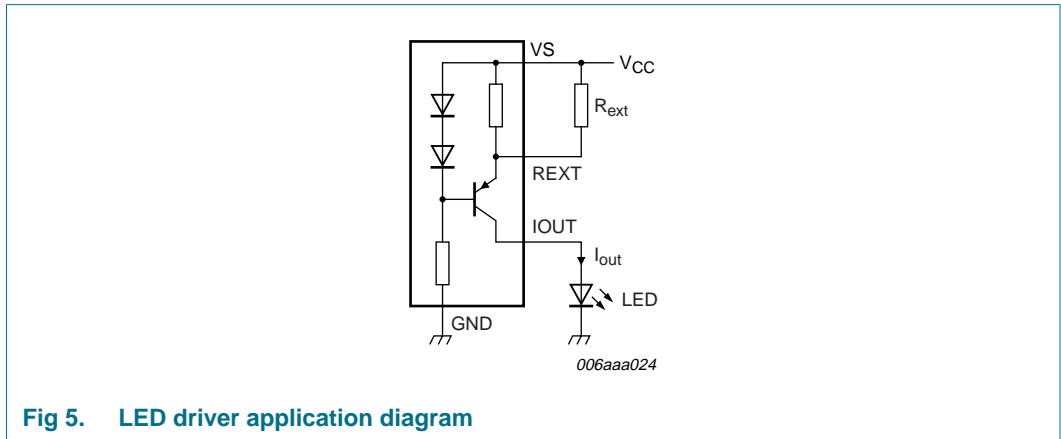


Fig 5. LED driver application diagram

#### 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.

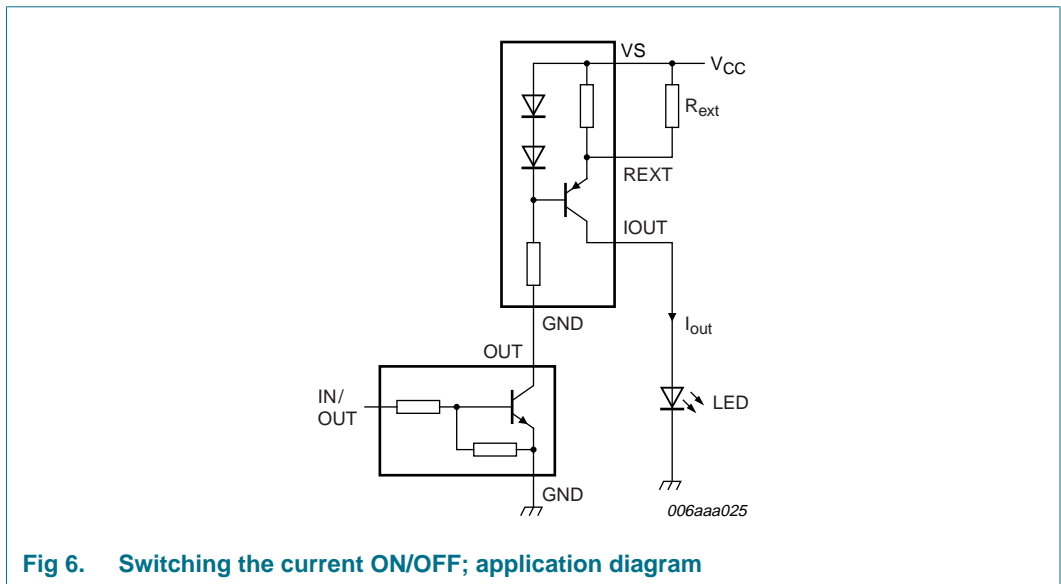
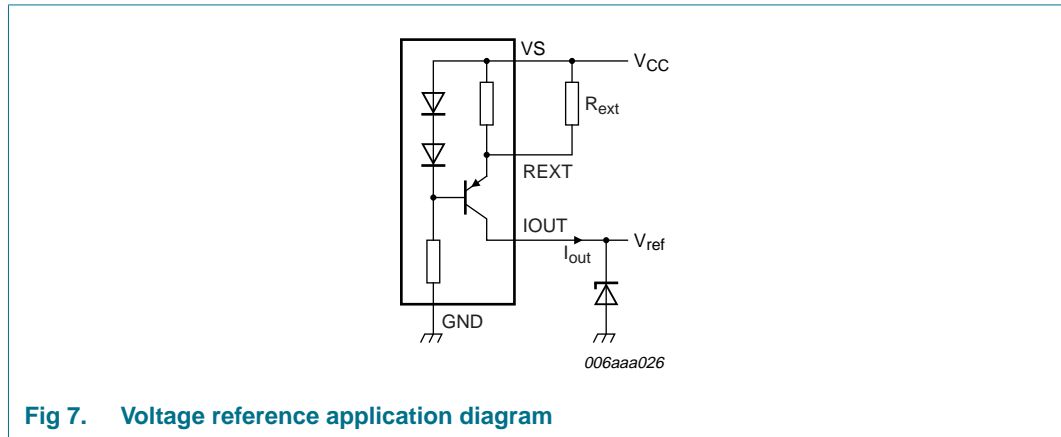


Fig 6. Switching the current ON/OFF; application diagram

**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

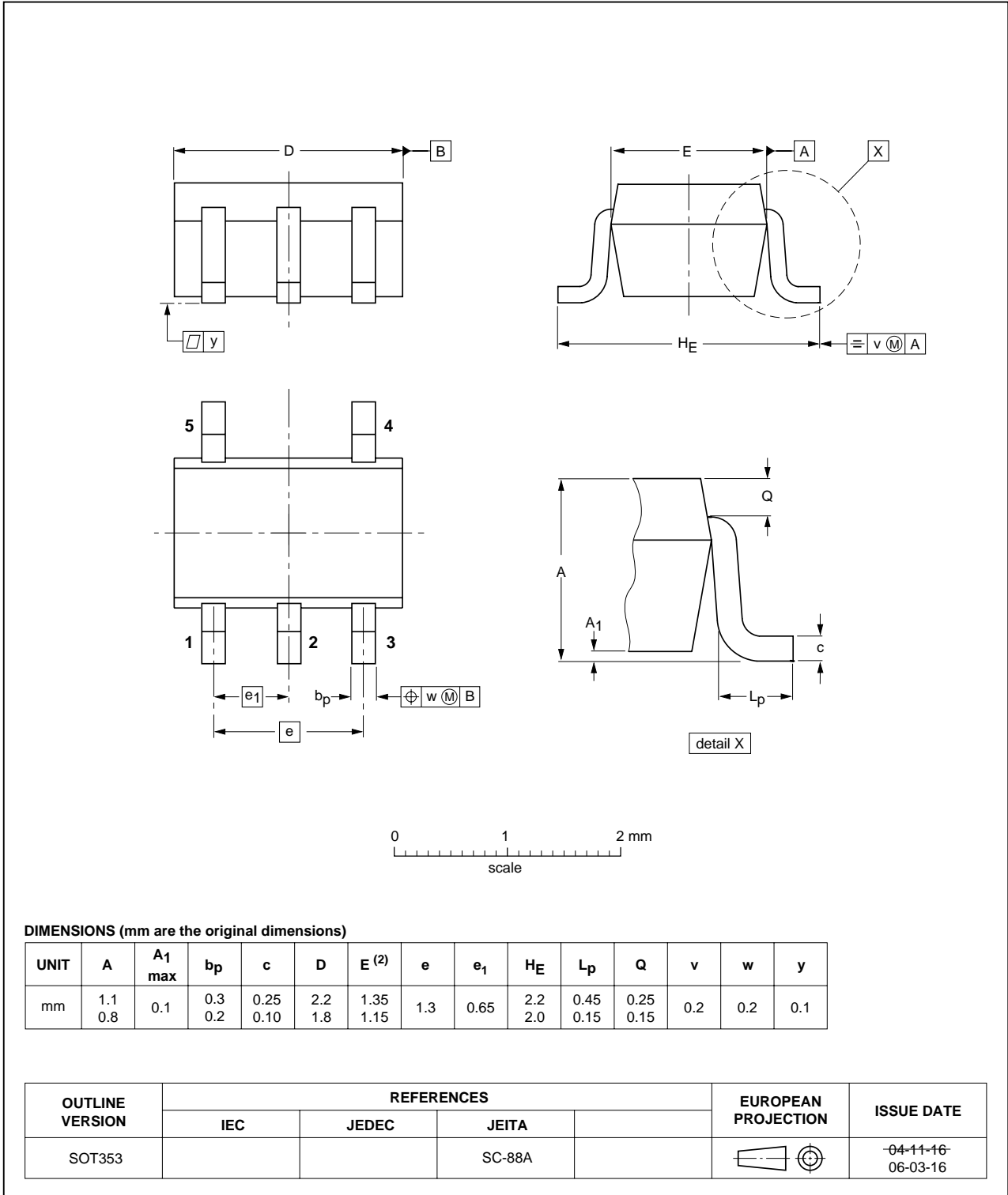


Fig 8. Package outline SOT353 (SC-88A)

## 10. Packing information

**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

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"><li>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.</li><li><a href="#">Table 2 "Pinning"</a>: amended</li><li><a href="#">Figure 8 "Package outline SOT353 (SC-88A)"</a>: updated</li></ul>		
PSSI2021SAY_2	20041020	Product data sheet	-	PSSI2021SAY_1
PSSI2021SAY_1	20010507	Product specification	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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