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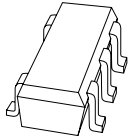Should be replaced with:
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Kind regards,

Team Nexperia

# 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 μA 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
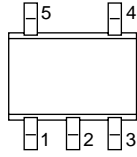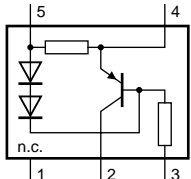- Active bias control for audio amplifiers

### 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 | | |
| 2 | IOUT | output current | | |
| 3 | GND | ground | | |
| 4 | REXT | external resistor | | |
| 5 | VS | supply voltage | | |

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## 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 | $V_S = 75$ V | | - | 73 | V |
| $V_R$ | reverse voltage | | [1] | - | 0.5 | V |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °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**
*$T_{amb} = 25$ °C unless otherwise specified*

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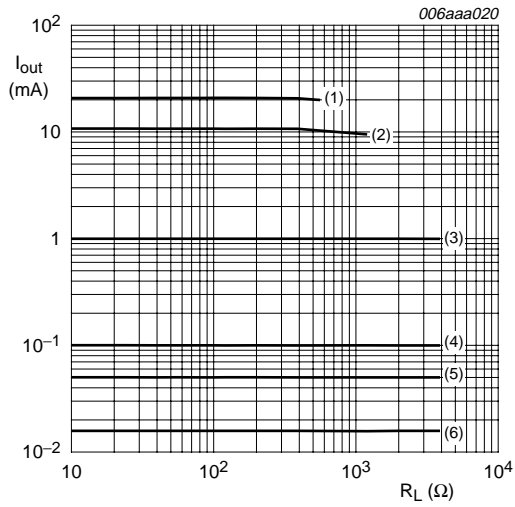
$V_S$ = 12 V

(1)  $I_{out}$ = 20 mA
(2)  $I_{out}$ = 10 mA
(3)  $I_{out}$ = 1mA
(4)  $I_{out}$ = 100 µA
(5)  $I_{out}$ = 50 µA
(6)  $I_{out}$ = 15 µA

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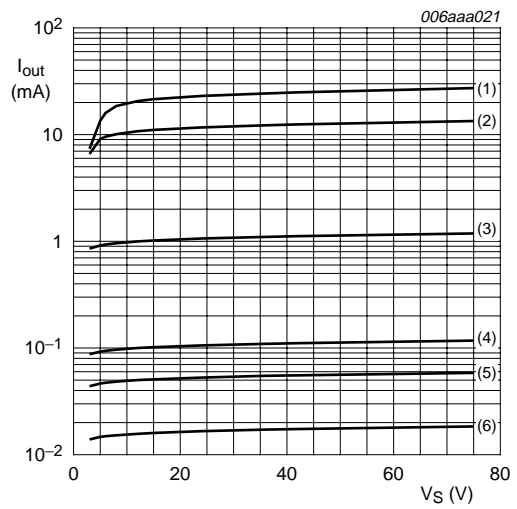


(1)  $I_{out}$ = 20 mA
(2)  $I_{out}$ = 10 mA
(3)  $I_{out}$ = 1mA
(4)  $I_{out}$ = 100 µA
(5)  $I_{out}$ = 50 µA
(6)  $I_{out}$ = 15 µA

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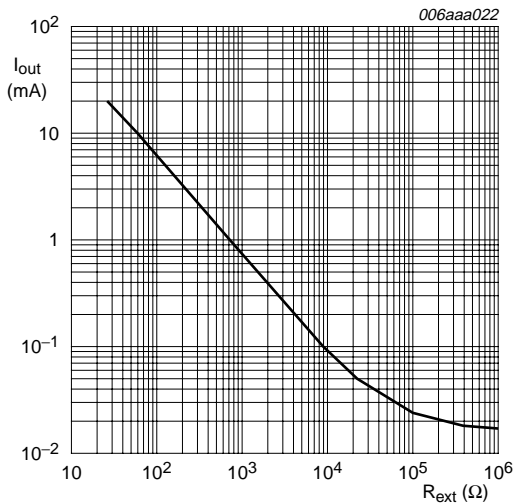


$V_S$ = 12 V; $R_L$ = 100 Ω

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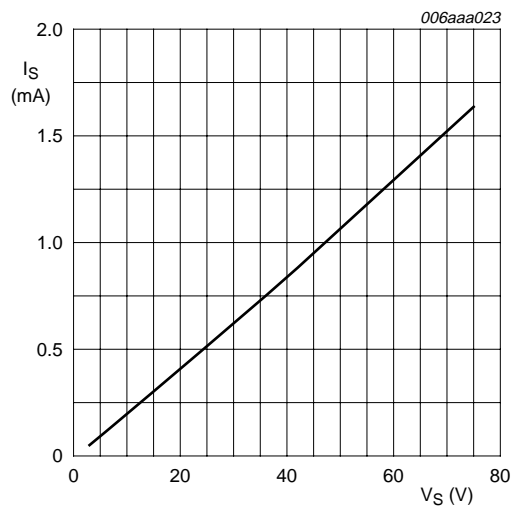


$R_{ext}$ = ∞; $R_L$ = 100 Ω

**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:        $I_{out} = \dfrac{0.617}{R_{ext}} + 15\ \mu A$

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**

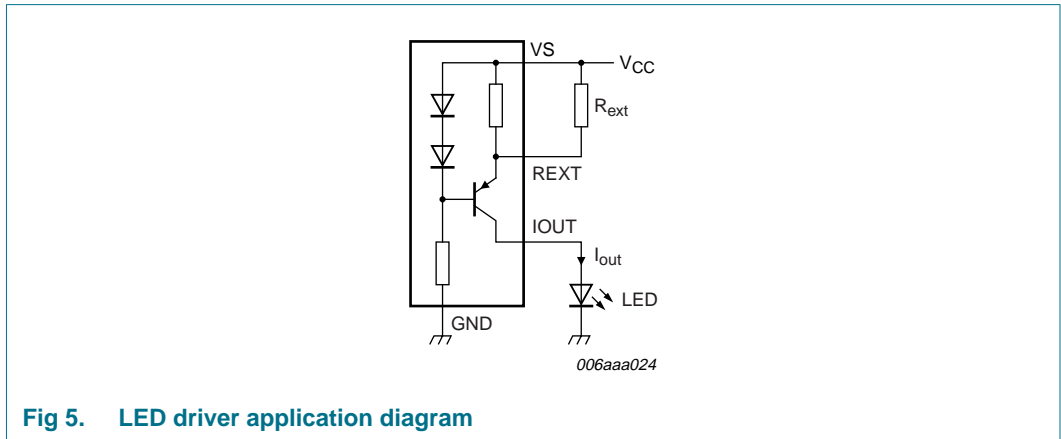Figure 5 shows a typical application circuit for an LED driver. The constant current ensures a constant LED brightness.



*006aaa024*

**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.
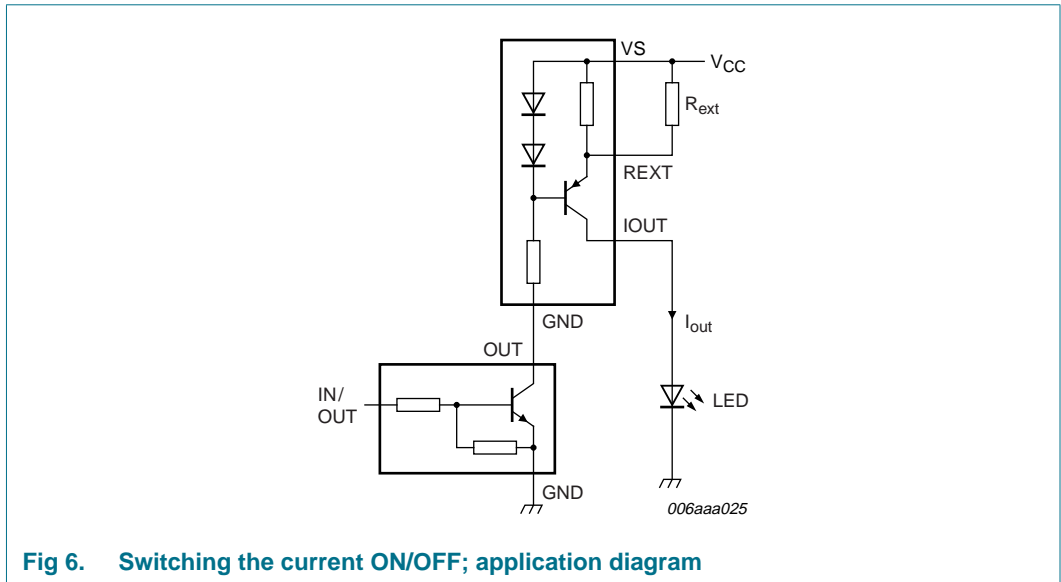


*006aaa025*

**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).
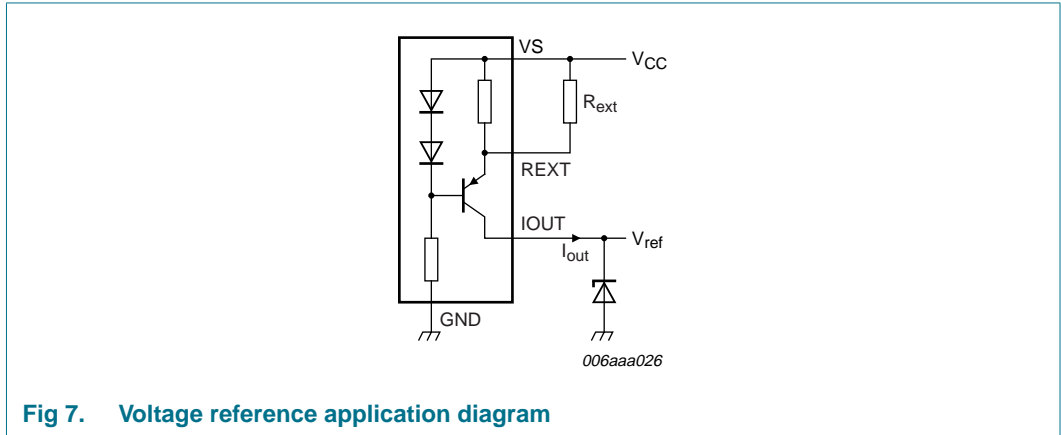


*006aaa026*

**Fig 7.    Voltage reference application diagram**

## 9. Package outline

**Plastic surface-mounted package; 5 leads**                                        **SOT353**



**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | A₁ max | bp | c | D | E (2) | e | e₁ | H_E | Lp | Q | v | w | y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1<br>0.8 | 0.1 | 0.3<br>0.2 | 0.25<br>0.10 | 2.2<br>1.8 | 1.35<br>1.15 | 1.3 | 0.65 | 2.2<br>2.0 | 0.45<br>0.15 | 0.25<br>0.15 | 0.2 | 0.2 | 0.1 |

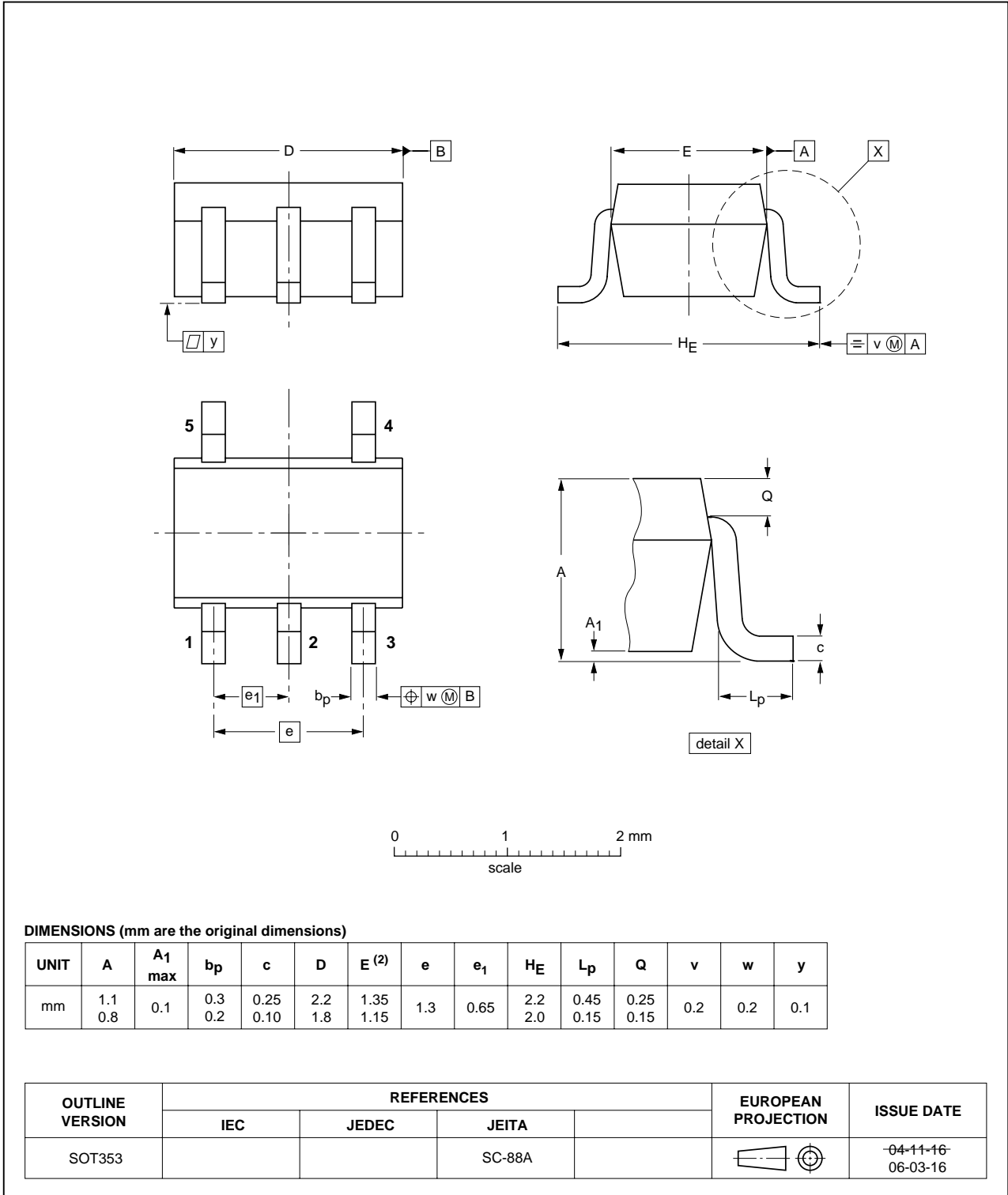| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT353 | | | SC-88A | | | ~~04-11-16~~<br>06-03-16 |

**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: | • 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.<br>• Table 2 "Pinning": amended<br>• Figure 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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