

# DATA SHEET

## **SA57026**

300 mA LDO with ON/OFF control and independent delayed RESET function

Product data

2001 Oct 03

File under Integrated Circuits, Standard Analog

# 300 mA LDO with ON/OFF control and independent delayed RESET function

SA57026

## GENERAL DESCRIPTION

The SA57026 has an extremely precise fixed output with a typical accuracy of  $\pm 2\%$ . It is designed to provide very low dropout and low noise in CD-ROM drives, battery-operated systems, and portable computers applications. This regulator consists of an internal voltage reference, an error amplifier, a driver with current limiter, and a thermal shut-down mechanism.

An Active-LOW  $\overline{\text{RESET}}$  is asserted when the detected voltage ( $V_{\text{DET}}$ ) falls below the reset voltage threshold. The  $\overline{\text{RESET}}$  output remains low for 30  $\mu\text{s}$  (typical) when zero capacitance connected to Cd pin. The reset time delay can be adjusted by replacing capacitance values from Cd pin to Ground.

The device is available in the SOP-7B package.

## FEATURES

- Very low dropout voltage: 500 mV typ. ( $I_{\text{out}} = 50 \text{ mA}$ )
- High precision output voltage:  $\pm 2\%$
- Output current capacity: 300 mA
- Low noise: 40 mV<sub>rms</sub> typ. @ 20 Hz to 80 KHz and for  $C_n = 10 \text{ nF}$
- Extremely good line regulation: 10 mV typical
- Extremely good load regulation: 20 mV typical
- Low temperature drift co-efficient to  $V_{\text{out}}$ :  $\pm 100 \text{ ppm}/^\circ\text{C}$
- Internal current limit and thermal shut-down circuits
- Adjustment-free reset detection voltage: 4.2 V typ.
- Delay time can be adjusted by external capacitor
- Wide operating temperature range:  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$

## APPLICATIONS

- CD-ROM drives
- Electronic notebooks, PDAs and palmtop computers
- Cameras, VCRs and camcorders
- PCMCIA cards
- Modems
- Battery-operated or hand-held instruments

## BLOCK DIAGRAM

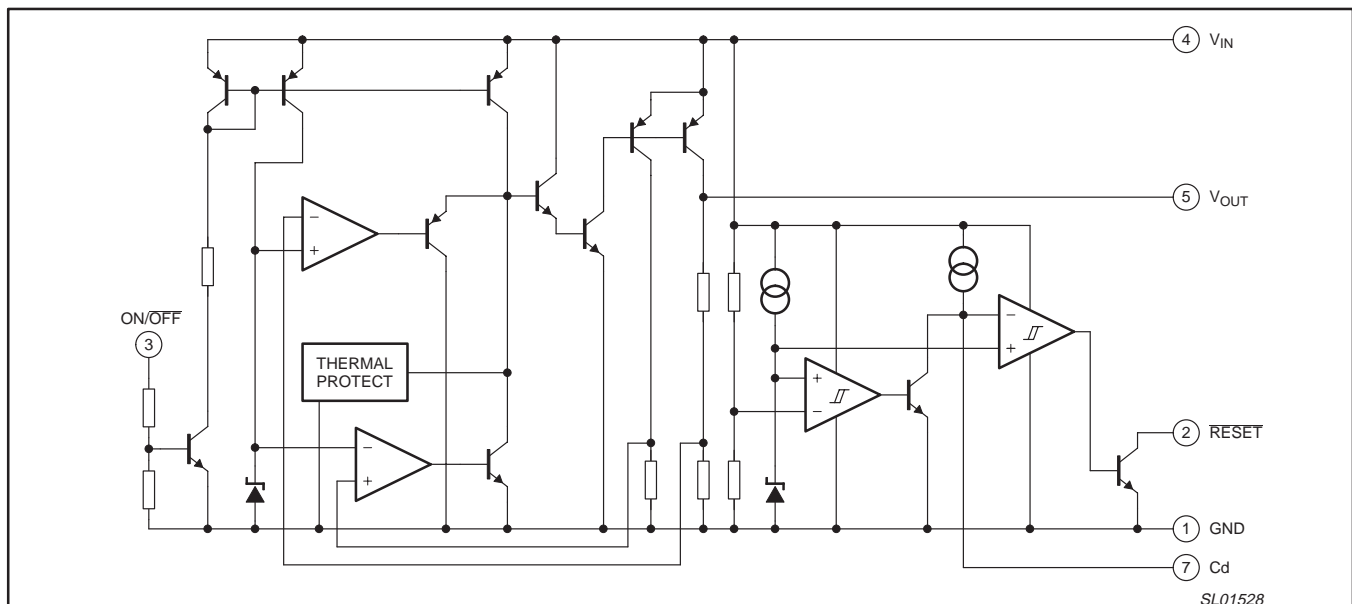


Figure 1. Block diagram.

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## ORDERING INFORMATION

TYPE NUMBER	PACKAGE		TEMPERATURE RANGE
	NAME	DESCRIPTION	
SA57026	SOP-7B	small outline 7-pin surface mount (see dimensional drawing)	-40 to +85 °C

### NOTE:

The device has two reset threshold options.

XX	Output voltage (Typ.)	Reset threshold (Typ.)
SA57026D	3.3 V	4.20 V
SA57026F	3.3 V	3.90 V

### Part number marking

Part number	Marking
SA57026DD	A L U
SA57026FD	A L V

## PIN CONFIGURATION

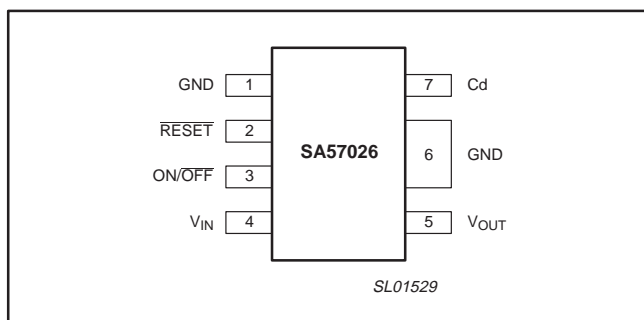


Figure 2. Pin configuration.

## PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	GND	Ground.
2	RESET	RESET signal output pin. The output remains low while $V_{DET}$ is below the reset voltage threshold, and for an external set time delay Cd pin after $V_{DET}$ rises above reset threshold.
3	ON/OFF	Output voltage on/off control pin. Connect to $V_{IN}$ if not used. ON/OFF = LOW: Voltage output (Pin 5) OFF ON/OFF = HIGH: Voltage output (Pin 5) ON
4	$V_{IN}$	Voltage supply input pin.
5	$V_{OUT}$	Regulated voltage output pin.
6	GND	Ground pin and heat sink.
7	Cd	Reset delay time capacitor pin. RESET pin output delay time can be set by capacitance connected to the Cd pin. $t_{PLH} = 100000 \times C$ $t_{PLH}$ : transmission delay time (s). C: capacitor value (F).

## MAXIMUM RATINGS

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
$V_{IN}$	Supply voltage	-0.3	+10	V
$I_{OUT}$	Output current	0	400	mA
$T_{oper}$	Operating temperature	-40	+85	°C
$T_{stg}$	Storage temperature	-40	+125	°C
$P_D$	Power dissipation (Note 1)	-	800	mW

### NOTE:

1. When mounted on a 25 × 40 × 1 mm glass epoxy board.

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## ELECTRICAL CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{ON/OFF} = 1.6\text{ V}$ , unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{ccq1}$	No-load input current 1	$V_{IN} = 5\text{ V}$ ; $I_{OUT} = 0\text{ mA}$	–	3	8	mA
$I_{ccq2}$	No-load input current 2	$V_{IN} = 4\text{ V}$ ; $I_{OUT} = 0\text{ mA}$	–	4	–	mA
$I_{ccq3}$	Input current (OFF)	$V_{IN} = 5\text{ V}$ ; $V_{ON/OFF} = 0.4\text{ V}$	–	250	–	$\mu\text{A}$
<b>Regulator</b>						
$V_{OUT}$	Output voltage	$V_{IN} = 5\text{ V}$ ; $I_{OUT} = 30\text{ mA}$ SA57026D SA57025F	3.25 3.25	3.30 3.30	3.35 3.35	V V
$V_{IO}$	Input/output differential voltage	$V_{IN} = 3.2\text{ V}$ ; $I_{OUT} = 150\text{ mA}$	–	0.15	0.3	V
$V_1$	Line regulation	$V_{IN} = 4.4\text{ to }5.5\text{ V}$ ; $I_{OUT} = 30\text{ mA}$	–	10	20	mV
$V_2$	Load regulation	$V_{IN} = 5\text{ V}$ ; $I_{OUT} = 0\text{ to }300\text{ mA}$	–	20	120	mV
$\Delta V_{OUT}/\Delta T$	$V_{OUT}$ Temperature coefficient (Note 1)	$T_j = -20\text{ to }+85\text{ }^{\circ}\text{C}$ ; $V_{IN} = 5\text{ V}$	–	100	–	ppm/ $^{\circ}\text{C}$
RR	Ripple rejection (Note 1)	$V_{IN} = 5\text{ V}$ ; $f = 120\text{ Hz}$ ; $V_{ripple} = 1\text{ V}_{p-p}$ ; $I_{OUT} = 30\text{ mA}$	–	50	80	dB
$V_n$	Output noise voltage (Note 1)	$V_{IN} = 5\text{ V}$ ; $f = 20\text{ to }80\text{ kHz}$ ; $V_{ripple} = 1\text{ V}_{p-p}$ ; $I_{OUT} = 30\text{ mA}$	–	40	120	$\mu\text{V}_{rms}$
$I_{ON}$	ON/OFF terminal current	$V_{ON/OFF} = 1.6\text{ V}$	–	5	10	$\mu\text{A}$
$V_{th(H)}$	HIGH threshold voltage		1.6	–	$V_{IN}+0.3$	V
$V_{th(L)}$	LOW threshold voltage		–0.3	–	0.4	V
<b>Reset</b>						
$V_{DET}$	Detection voltage	$V_{IN} = \text{HIGH-to-LOW}$ SA57026D SA57025F	4.11 3.81	4.20 3.90	4.29 3.99	V V
$\Delta V_S/\Delta T$	$V_S$ temperature coefficient (Note 1)	$T_j = -20\text{ to }+85\text{ }^{\circ}\text{C}$	–	100	–	ppm/ $^{\circ}\text{C}$
$\Delta V_S$	Hysteresis voltage	$V_{IN} = \text{HIGH-to-LOW-to-HIGH}$	100	–	200	mV
$V_{OL}$	LOW-level output voltage	$V_{IN} = 3.9\text{ V}$ ; $R_L = 4.7\text{ k}\Omega$	–	100	200	mV
$I_{LO}$	Output leakage current	$V_{IN} = 5\text{ V}$	–	–	$\pm 0.1$	$\mu\text{A}$
$I_{OL1}$	LOW-level output current 1	$V_{IN} = 3.9\text{ V}$ ; $R_L = 0\text{ }\Omega$	5	–	–	mA
$I_{OL2}$	LOW-level output current 2 (Note 1)	$V_{IN} = 3.9\text{ V}$ ; $R_L = 0\text{ }\Omega$ ; $T_{amb} = -20\text{ to }+80\text{ }^{\circ}\text{C}$	3	–	–	mA
$t_{PLH}$	LOW-to-HIGH transmission delay time (Note 1)	$C_d = 0.0\text{ }\mu\text{F}$	–	30	90	$\mu\text{s}$
$t_{PLH1}$	Reset delay time	$V_{IN} = 4\text{ V to }5\text{ V}$ ; $C_d = 0.1\text{ }\mu\text{F}$	5	10	20	ms
$t_{PHL}$	HIGH-to-LOW transmission delay time (Note 1)		–	30	90	$\mu\text{s}$
$V_{OPL}$	Threshold operating voltage	$V_{OL} = 0.4\text{ V}$	–	0.65	0.85	V

### NOTE:

1. The parameter is guaranteed by design.

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## APPLICATION INFORMATION

### Input capacitor

An input capacitor of  $\geq 1 \mu\text{F}$  is required to eliminate the AC coupling noise. This capacitor must be located as close as possible to  $V_{\text{IN}}$  or GND pin (not more than 1 cm) and returned to a clean analog ground. Any good quality ceramic, tantalum or film capacitor will work.

### Output capacitor

Phase compensation is made for securing stable operation, even if the load current varies. For this reason, an output capacitor with good frequency characteristics is needed. Set it as close to the circuit as possible, with wires as short as possible.

The value of the output capacitance has to be at least  $47 \mu\text{F}$  connected from  $V_{\text{OUT}}$  to GND. When operating from sources other than batteries, supply-noise rejection and transient response can be improved by increasing the value of the input and output capacitors and employing passive filtering techniques.

### ON/OFF

The regulator is fully enabled when a logic HIGH is applied to this input. The regulator enters shutdown when a logic LOW is applied to this input. During shutdown, regulator output voltage falls to zero, RESET remains valid and supply current is reduced to  $5 \mu\text{A}$  (typ). If the function is not to be used, the ON/OFF pin should be tied to  $V_{\text{IN}}$ .

### RESET output

The SA57066 has an Active-LOW RESET output. The RESET output is driven Active-LOW within  $30 \mu\text{s}$  typical (when  $C_d$  is zero capacitance). The time delay can be adjusted up to  $10 \text{ms}$  typical (when  $C_d$  is  $0.1 \mu\text{F}$ ) of  $V_{\text{DET}}$  falling through the reset voltage threshold. RESET is maintained Active-HIGH after  $V_{\text{DET}}$  rises above the reset threshold.

### RESET output delay operation with an external capacitor from Cd pin to GND

When the supply voltage crosses the release voltage ( $V_{\text{DET}}$ ) from a low value to a value higher than the released voltage ( $V_{\text{DET}}$ ), the Cd pin voltage starts to increase (charges up the external capacitor). While the RESET output remains at LOW state condition until the Cd pin voltage reaches the threshold operating voltage ( $V_{\text{OPL}}$ )  $0.4 \text{V}$  typical; after that, the RESET output is reversed to HIGH state condition.

The transmission delay time ( $t_{\text{PLH}}$ ) can be set with the capacitance Cd of an external capacitor as shown in Equation (1):

$$t_{\text{PLH}} = 10^6 \times C \quad \text{Eqn. (1)}$$

(Time is expressed in seconds; capacitance in Farads.)

### PCB layout

The component placement around the LDO should be done carefully to achieve good dynamic line and load response. The input and noise capacitors should be kept close to the LDO.

The rise in junction temperature depends on how efficiently the heat is carried away from the junction to ambient. The junction to lead thermal impedance is a characteristic of the package and fixed. The thermal impedance between lead to ambient can be reduced by increasing the copper area on the PCB. Increase the input, output and ground trace area to reduce the junction-to-ambient impedance.

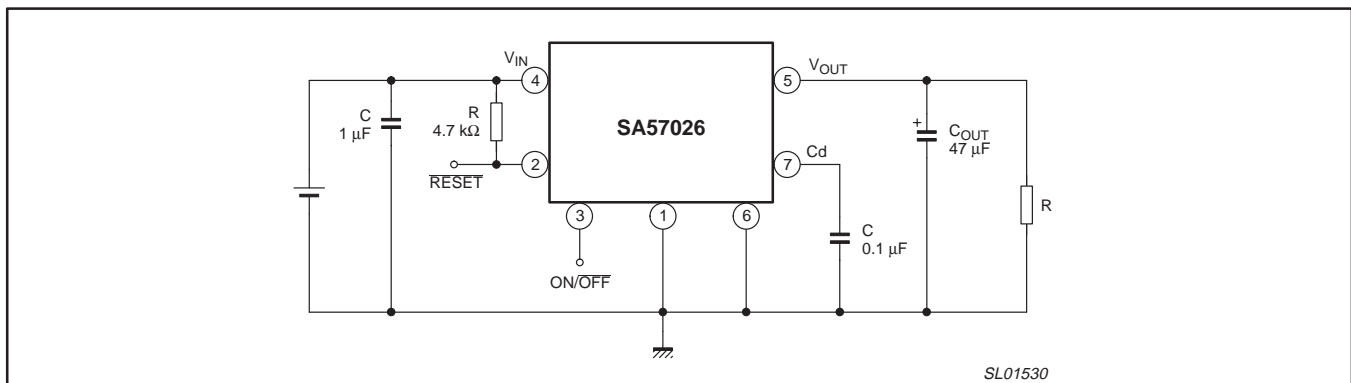


Figure 3. Typical application circuit.

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## PACKING METHOD

The SA57026 is packed in reels, as shown in Figure 4.

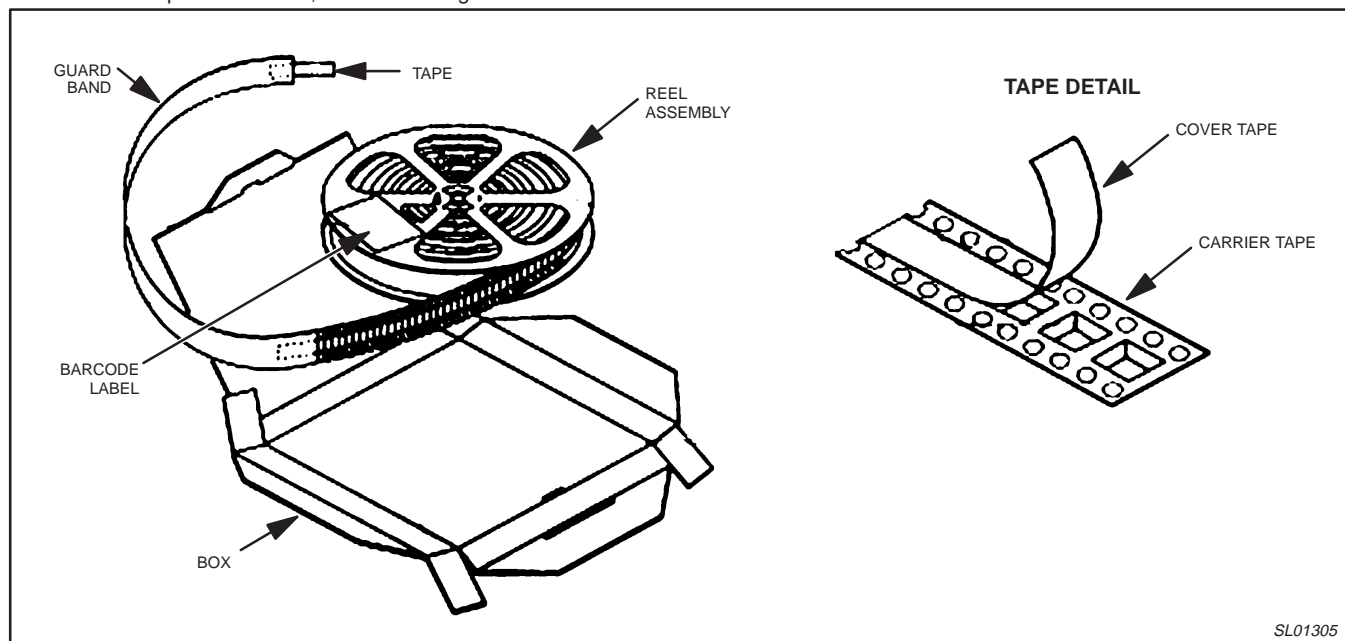


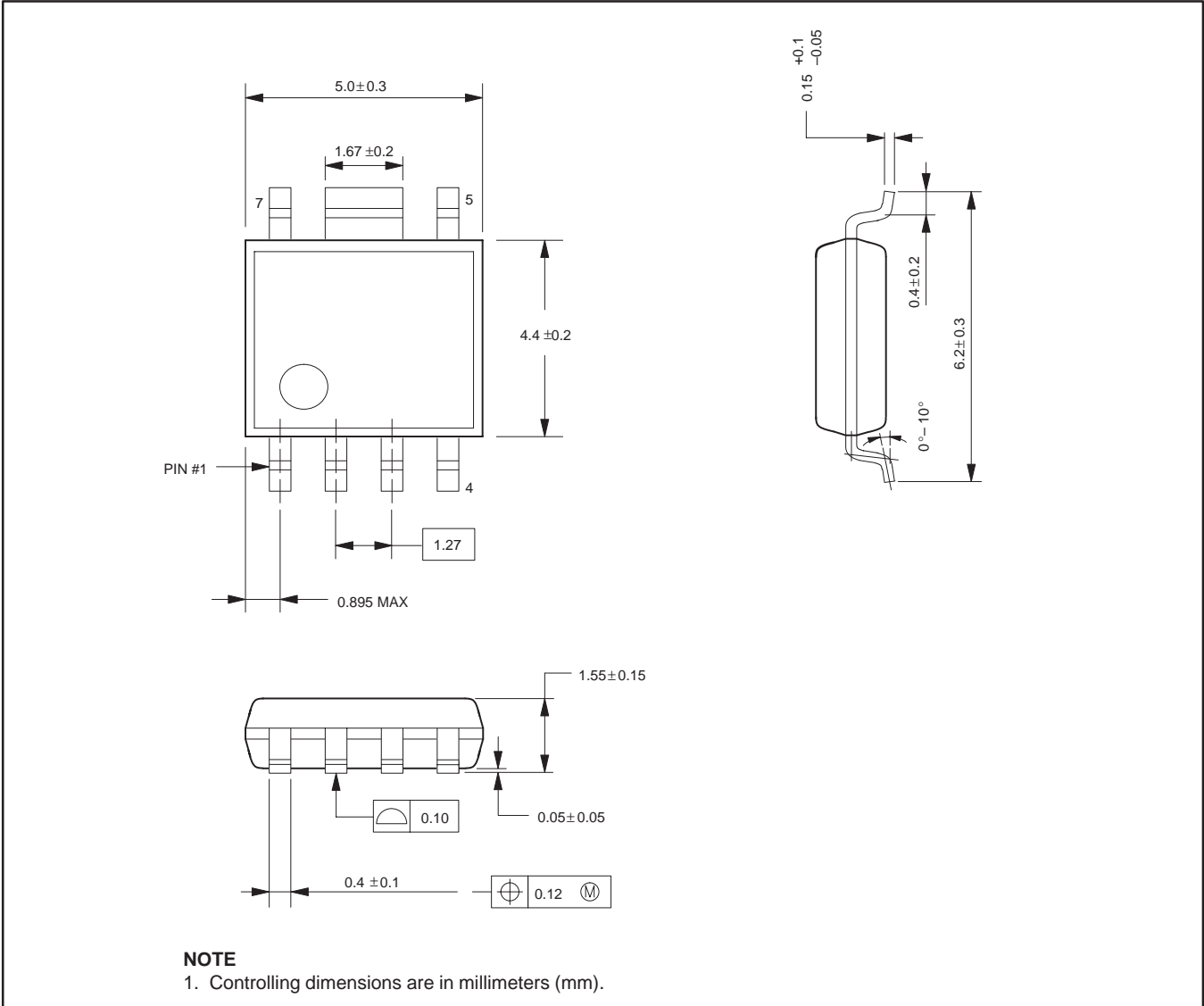
Figure 4. Tape and reel packing method

SL01305

# 300 mA LDO with ON/OFF control and independent delayed RESET function

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## SOP-7B: small outline 7-pin surface mount package



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