

## Features

- No External Components Except PIN Diode
- Supply-voltage Range: 2.7V to 5.5V
- Highest Sensitivity Due to Automatic Sensitivity Adaption (AGC) and Automatic Strong Signal Adaption (ATC)
- Automatic Supply Voltage Adaptation
- Highest Immunity against Disturbances from Daylight and Lamps
- Available for Carrier Frequencies between 30 kHz to 76 kHz; adjusted by Zener-Diode Fusing  $\pm 2.5\%$
- TTL and CMOS Compatible

## Applications

- Home Entertainment Applications (Audio/Video)
- Home Appliances
- Remote Control Equipment

## 1. Description

The IC T2526 is a complete IR receiver for data communication developed and optimized for use in carrier-frequency-modulated transmission applications. The IC offers highest sensitivity as well as highest suppression of noise from daylight and lamps. The T2526 is available with broadest range of frequencies (30, 33, 36, 37, 38, 40, 44, 56, 76 kHz) and 5 different noise suppression regulation types (standard, lamp, noise, short burst, data rate) covering requirements of high-end remote control solutions (please refer to selection guide available for T2525/T2526). The T2526 operates in a supply voltage range of 2.7V to 5.5V.

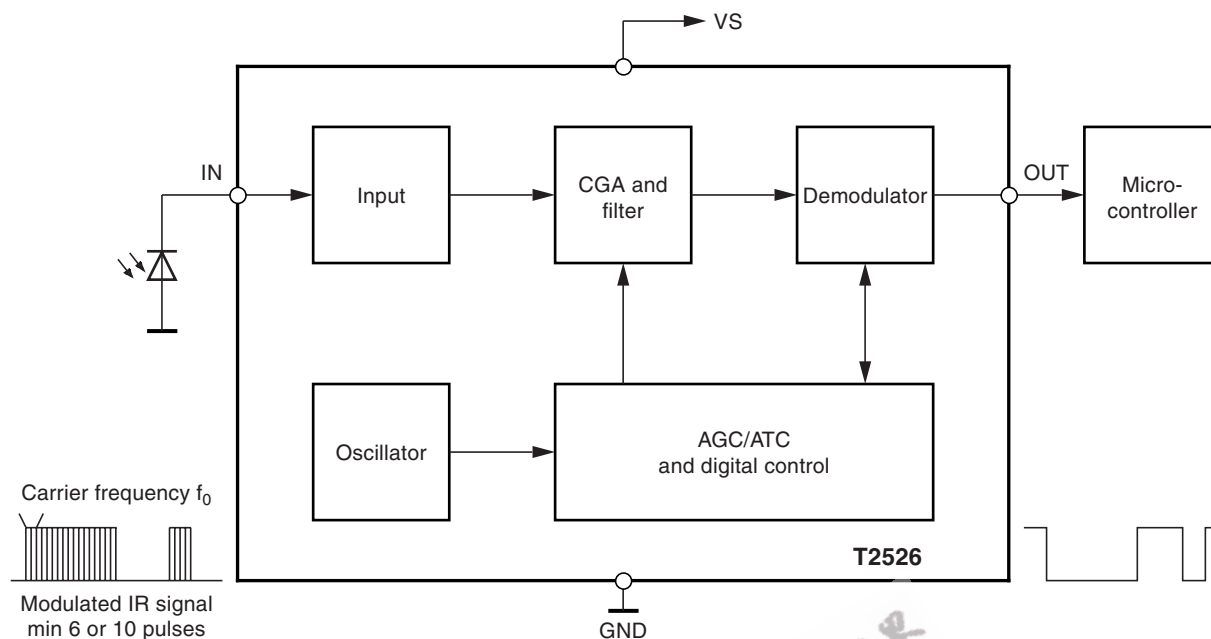
The function of the T2526 can be described using the block diagram of [Figure 1-1 on page 2](#). The input stage meets two main functions. First it provides a suitable bias voltage for the PIN diode. Secondly the pulsed photo-current signals are transformed into a voltage by a special circuit which is optimized for low noise applications. After amplification by a Controlled Gain Amplifier (CGA) the signals have to pass a tuned integrated narrow bandpass filter with a center frequency  $f_0$  which is equivalent to the chosen carrier frequency of the input signal. The demodulator is used first to convert the input burst signal to a digital envelope output pulse and to evaluate the signal information quality, i.e., unwanted pulses will be suppressed at the output pin. All this is done by means of an integrated dynamic feedback circuit which varies the gain as a function of the present environmental conditions (ambient light, modulated lamps etc.). Other special features are used to adapt to the current application to secure best transmission quality.



## Low-voltage IR Receiver ASSP

## T2526

Figure 1-1. Block Diagram



## 2. Pin Configuration

Figure 2-1. Pinning TSSOP8

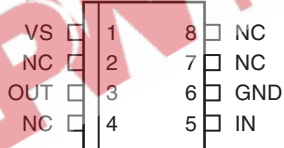


Table 2-1. Pin Description

Pin	Symbol	Function
1	VS	Supply voltage
2	NC	Not connected
3	OUT	Data output
4	NC	Not connected
5	IN	Input PIN-diode
6	GND	Ground
7	NC	Not connected
8	NC	Not connected

### 3. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter	Symbol	Value	Unit
Supply voltage	$V_S$	-0.3 to +6	V
Supply current	$I_S$	3	mA
Input voltage	$V_{IN}$	-0.3 to $V_S$	V
Input DC current at $V_S = 5V$	$I_{IN}$	0.75	mA
Output voltage	$V_O$	-0.3 to $V_S$	V
Output current	$I_O$	10	mA
Operating temperature	$T_{amb}$	-25 to +85	°C
Storage temperature	$T_{stg}$	-40 to +125	°C
Power dissipation at $T_{amb} = 25^\circ C$	$P_{tot}$	30	mW

### 4. Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient TSSOP8	$R_{thJA}$	TBD	K/W

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## 5. Electrical Characteristics, 3-V Operation

$T_{amb} = 25^{\circ}\text{C}$ ,  $V_S = 3\text{V}$  unless otherwise specified.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
<b>1</b>	<b>Supply</b>								
1.1	Supply-voltage range		1	$V_S$	2.7	3.0	3.3	V	C
1.2	Supply current	$I_{IN} = 0$	1	$I_S$	0.7	0.9	1.3	mA	B
<b>2</b>	<b>Output</b>								
2.1	Internal pull-up resistor <sup>(1)</sup>	$T_{amb} = 25^{\circ}\text{C}$ See <a href="#">Figure 7-10 on page 10</a>	1, 3	$R_{PU}$		30/40		k $\Omega$	A
2.2	Output voltage low	$R_2 = 2.4\text{ k}\Omega$ See <a href="#">Figure 7-10 on page 10</a>	3, 6	$V_{OL}$			250	mV	B
<b>2.3</b>	<b>Output voltage high</b>		3, 1	$V_{OH}$	$V_S - 0.25$		$V_S$	V	B
2.4	Output current clamping	$R_2 = 0$ See <a href="#">Figure 7-10 on page 10</a>	3, 6	$I_{OCL}$		8		mA	B
<b>3</b>	<b>Input</b>								
3.1	Input DC current	$V_{IN} = 0$ See <a href="#">Figure 7-10 on page 10</a>	5	$I_{IN\_DCMAX}$	-150			$\mu\text{A}$	C
3.2	Input DC current See <a href="#">Figure 7-3 on page 7</a>	$V_{IN} = 0$ ; $V_S = 3\text{V}$ $T_{amb} = 25^{\circ}\text{C}$	5	$I_{IN\_DCMAX}$		-350		$\mu\text{A}$	B
3.3	Minimum detection threshold current See <a href="#">Figure 7-1 on page 7</a>	Test signal: See <a href="#">Figure 7-9 on page 10</a> $V_S = 3\text{V}$	3	$I_{Eemin}$		-700		pA	B
3.4	Minimum detection threshold current with AC current disturbance $I_{IN\_AC100} = 3\text{ }\mu\text{A}$ at 100 Hz	$T_{amb} = 25^{\circ}\text{C}$ , $I_{IN\_DC} = 1\text{ }\mu\text{A}$ square pp burst N = 16 $f = f_0$ ; $t_{PER} = 10\text{ ms}$ <a href="#">Figure 7-8 on page 9</a> BER = 50% <sup>(2)</sup>	3	$I_{Eemin}$		-1300		pA	C
3.5	Maximum detection threshold current with $V_{IN} > 0\text{V}$	Test signal: See <a href="#">Figure 7-9 on page 10</a> $V_S = 3\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$ $I_{IN\_DC} = 1\text{ }\mu\text{A}$ square pp burst N = 16 $f = f_0$ ; $t_{PER} = 10\text{ ms}$ <a href="#">Figure 7-8 on page 9</a> BER = 5% <sup>(2)</sup>	3	$I_{Eemax}$	-200			$\mu\text{A}$	D

\*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

- Notes:
- Depending on version, see "Ordering Information"
  - BER = bit error rate; e.g., BER = 5% means that with P = 20 at the input pin 19...21 pulses can appear at the pin OUT
  - After transformation of input current into voltage

## 5. Electrical Characteristics, 3-V Operation (Continued)

$T_{amb} = 25^{\circ}\text{C}$ ,  $V_S = 3\text{V}$  unless otherwise specified.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
<b>4</b>	<b>Controlled Amplifier and Filter</b>								
4.1	Maximum value of variable gain (CGA)			$G_{VARMAX}$		51		dB	D
4.2	Minimum value of variable gain (CGA)			$G_{VARMIN}$		-5		dB	D
4.3	Total internal amplification <sup>(3)</sup>			$G_{MAX}$		71		dB	D
4.4	Center frequency fusing accuracy of bandpass	$V_S = 3\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$		$f_{03V\_FUZE}$	-2.5	$f_0$	+2.5	%	A
4.5	Overall accuracy center frequency of bandpass			$f_{03V}$	-5.5	$f_0$	+3.5	%	C
4.6	Overall accuracy center frequency of bandpass	$T_{amb} = 0$ to $70^{\circ}\text{C}$		$f_{03V}$	-4.5	$f_0$	+3.0	%	C
4.7	BPF bandwidth	-3 dB; $f_0 = 38\text{ kHz}$ ; See <a href="#">Figure 7-7 on page 9</a>		B		3.8		kHz	C

\*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Notes: 1. Depending on version, see "Ordering Information"

2. BER = bit error rate; e.g., BER = 5% means that with P = 20 at the input pin 19...21 pulses can appear at the pin OUT

3. After transformation of input current into voltage

## 6. Electrical Characteristics, 5-V Operation

$T_{amb} = 25^{\circ}\text{C}$ ,  $V_S = 5\text{V}$  unless otherwise specified.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
<b>5</b>	<b>Supply</b>								
5.1	Supply-voltage range		1	$V_S$	4.5	5.0	5.5	V	C
5.2	Supply current	$I_{IN} = 0$	1	$I_S$	0.9	1.2	1.6	mA	B
<b>6</b>	<b>Output</b>								
6.1	Internal pull-up resistor <sup>(1)</sup>	$T_{amb} = 25^{\circ}\text{C}$ See <a href="#">Figure 7-10 on page 10</a>	1, 3	$R_{PU}$		30/40		k $\Omega$	A
6.2	Output voltage low	$R_2 = 2.4\text{ k}\Omega$ See <a href="#">Figure 7-10 on page 10</a>	3, 6	$V_{OL}$			250	mV	B
6.3	Output voltage high		3, 1	$V_{OH}$	$V_S - 0.25$		$V_S$	V	B
6.4	Output current clamping	$R_2 = 0$ See <a href="#">Figure 7-10 on page 10</a>	3, 6	$I_{OCL}$		8		mA	B

\*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Notes: 1. Depending on version, see "Ordering Information"

2. BER = bit error rate; e.g., BER = 5% means that with P = 20 at the input pin 19...21 pulses can appear at the pin OUT

3. After transformation of input current into voltage

## 6. Electrical Characteristics, 5-V Operation (Continued)

$T_{amb} = 25^{\circ}\text{C}$ ,  $V_S = 5\text{V}$  unless otherwise specified.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
<b>7</b>	<b>Input</b>								
7.1	Input DC current	$V_{IN} = 0$ See Figure 7-10 on page 10	5	$I_{IN\_DCMAX}$	-400			$\mu\text{A}$	C
7.2	Input DC-current See Figure 7-4 on page 8	$V_{IN} = 0$ ; $V_S = 5\text{V}$ $T_{amb} = 25^{\circ}\text{C}$	5	$I_{IN\_DCMAX}$		-700		$\mu\text{A}$	B
7.3	Min. detection threshold current See Figure 7-2 on page 7	Test signal: See Figure 7-9 on page 10 $V_S = 5\text{V}$ $T_{amb} = 25^{\circ}\text{C}$	3	$I_{Eemin}$		-850		$\mu\text{A}$	B
7.4	Min. detection threshold current with AC current disturbance $I_{IN\_AC100} = 3 \mu\text{A}$ at 100 Hz	$I_{IN\_DC} = 1 \mu\text{A}$ square pp burst $N = 16$ $f = f_0$ ; $t_{PER} = 10 \text{ms}$ Figure 7-8 on page 9 $BER = 50^{(2)}$	3	$I_{Eemin}$		-2000		$\mu\text{A}$	C
7.5	Max. detection threshold current with $V_{IN} > 0\text{V}$	Test signal: See Figure 7-9 on page 10 $V_S = 5\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$ $I_{IN\_DC} = 1 \mu\text{A}$ square pp burst $N = 16$ $f = f_0$ ; $t_{PER} = 10 \text{ms}$ Figure 7-8 on page 9 $BER = 5\%^{(2)}$	3	$I_{Eemax}$	-500			$\mu\text{A}$	D
<b>8</b>	<b>Controlled Amplifier and Filter</b>								
8.1	Maximum value of variable gain (CGA)			$G_{VARMAX}$		51		dB	D
8.2	Minimum value of variable gain (CGA)			$G_{VARMIN}$		-5		dB	D
8.3	Total internal amplification <sup>(3)</sup>			$G_{MAX}$		71		dB	D
8.4	Resulting center frequency fusing accuracy	$f_0$ fused at $V_S = 3\text{V}$ $V_S = 5\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$		$f_{05V}$		$f_{03V-FUSE} + 0.5$		%	A

\*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Notes: 1. Depending on version, see "Ordering Information"

2. BER = bit error rate; e.g., BER = 5% means that with  $P = 20$  at the input pin 19...21 pulses can appear at the pin OUT

3. After transformation of input current into voltage

### 6.1 ESD

All pins  $\Rightarrow$  2000V HBM; 200V MM, MIL-STD-883C, Method 3015.7

### 6.2 Reliability

Electrical qualification (1000h) in molded plastic package

7. Typical Electrical Curves at  $T_{amb} = 25^{\circ}C$

Figure 7-1.  $I_{Eemin}$  versus  $I_{IN\_DC}$ ,  $V_S = 3V$

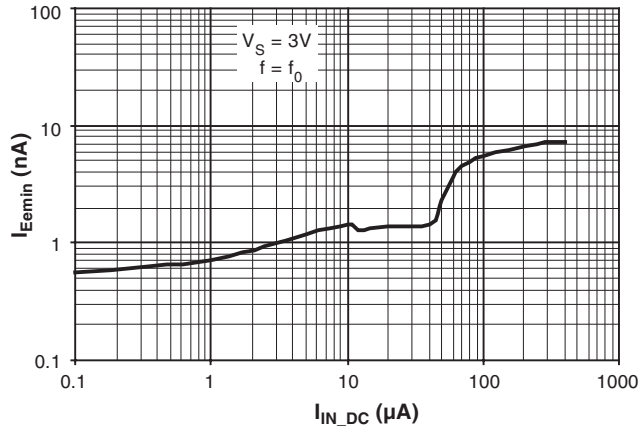


Figure 7-2.  $I_{Eemin}$  versus  $I_{IN\_DC}$ ,  $V_S = 5V$

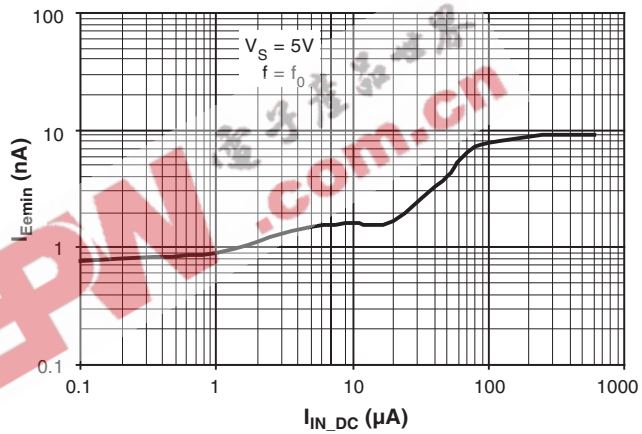


Figure 7-3.  $V_{IN}$  versus  $I_{IN\_DC}$ ,  $V_S = 3V$

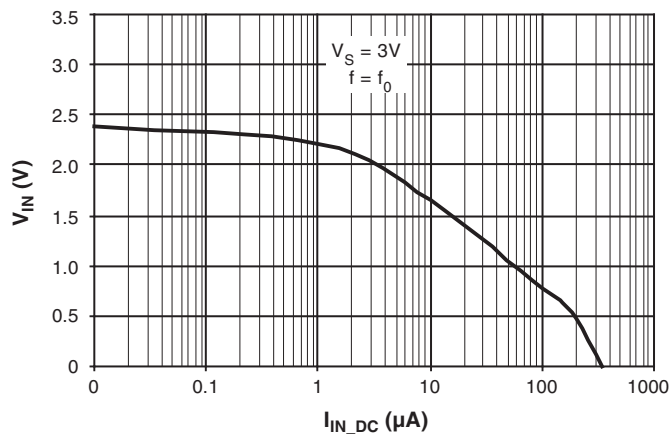


Figure 7-4.  $V_{IN}$  versus  $I_{IN\_DC}$ ,  $V_S = 5V$

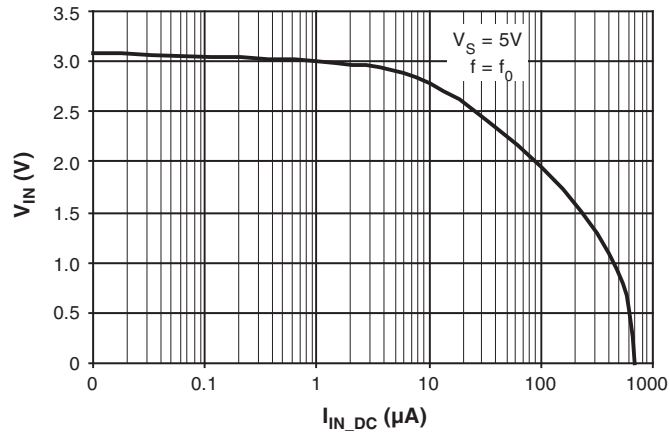


Figure 7-5. Data Transmission Rate,  $V_S = 3V$

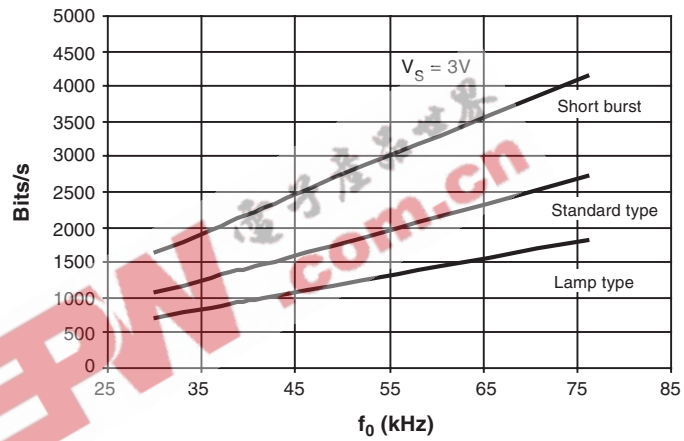


Figure 7-6. Data Transmission Rate,  $V_S = 5V$

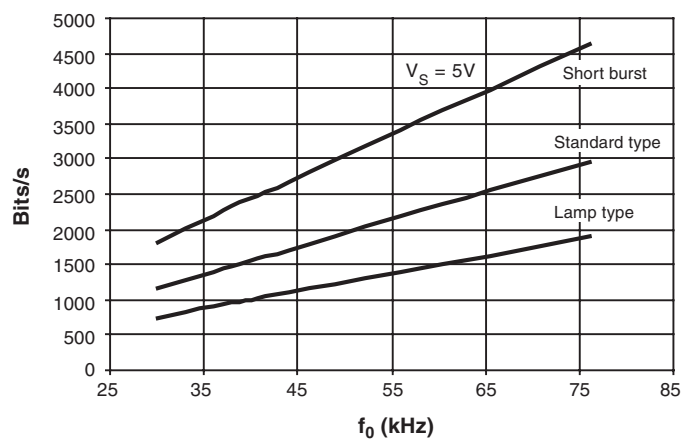
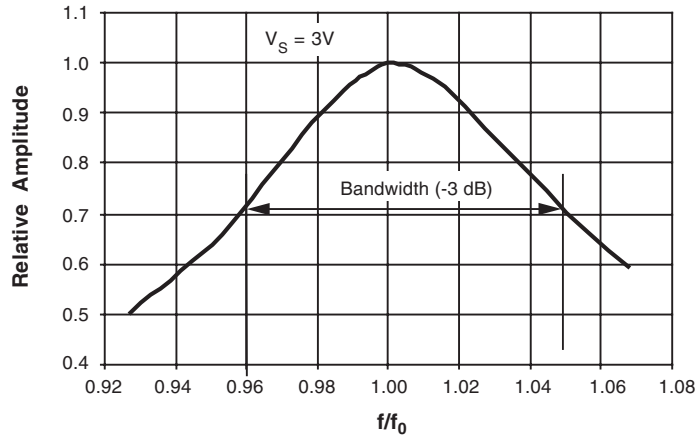




Figure 7-7. Typical Bandpass Curve



$Q = f/f_0/B$ ;  $B \Rightarrow -3 \text{ dB values.}$

Example:  $Q = 1/(1.047 - 0.954) = 11$

Figure 7-8. Illustration of Used Terms  
Example:  $f = 30 \text{ kHz}$ , burst with 16 pulses, 16 periods

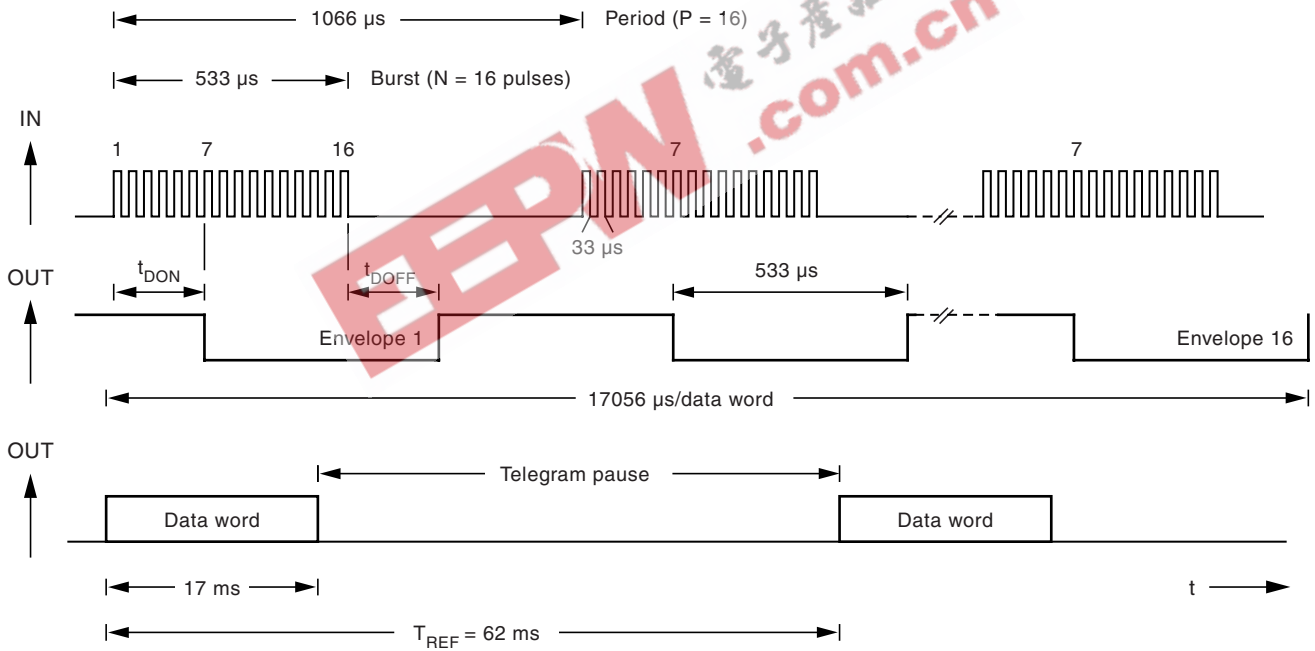


Figure 7-9. Test Circuit

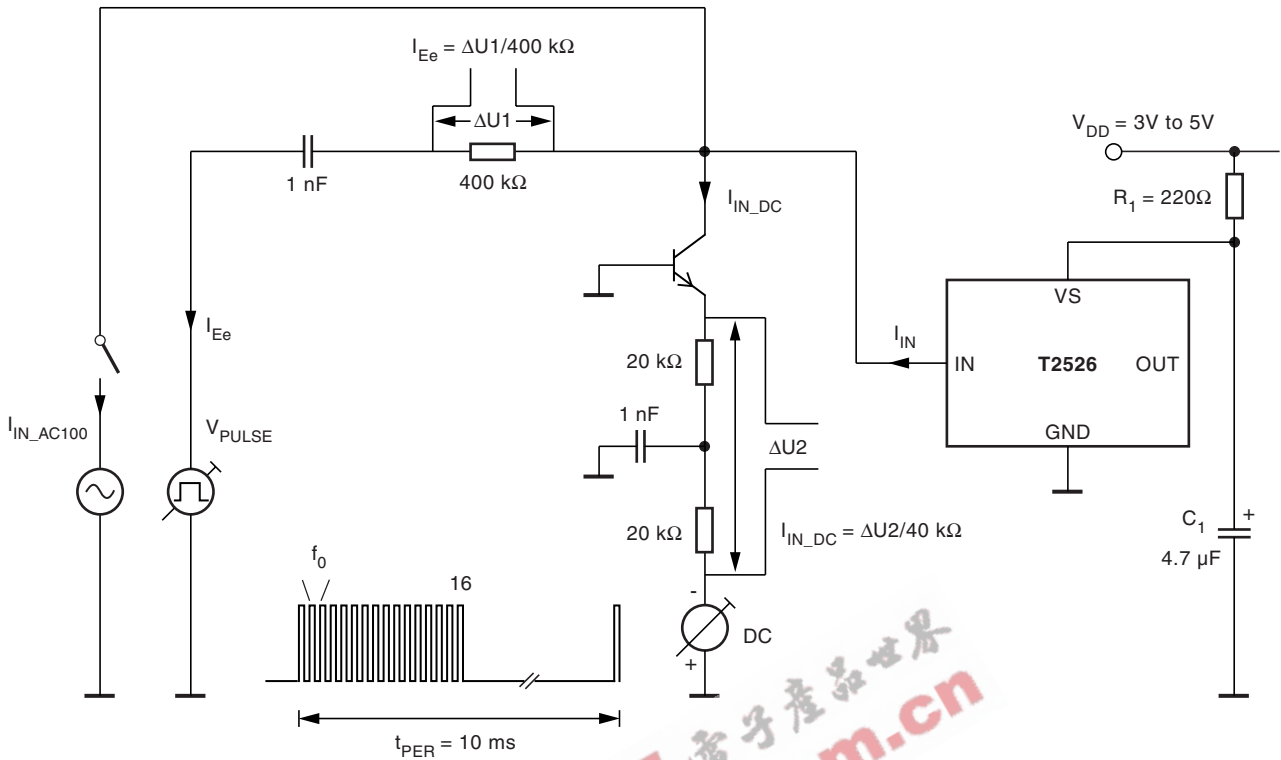
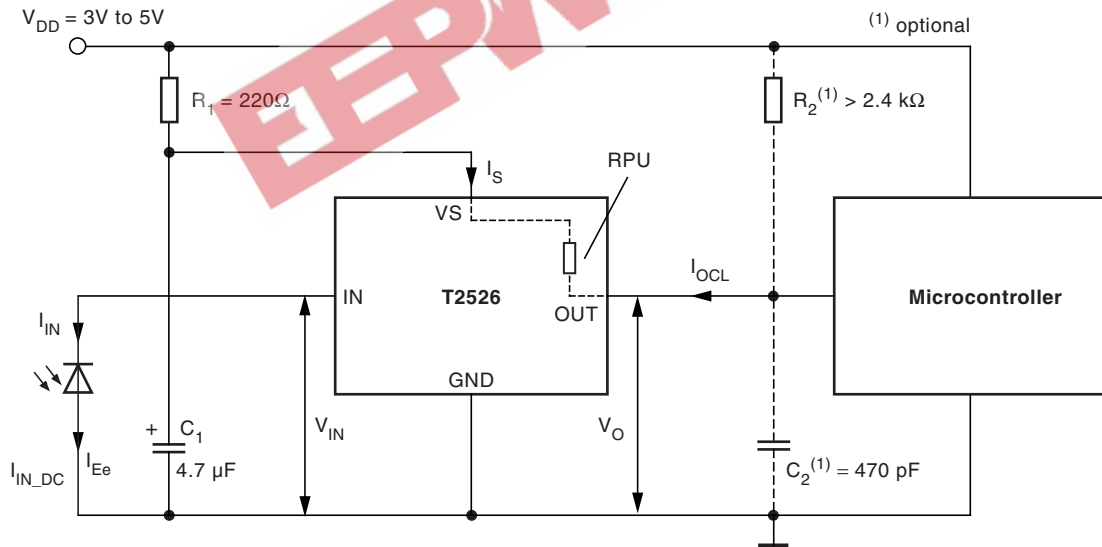
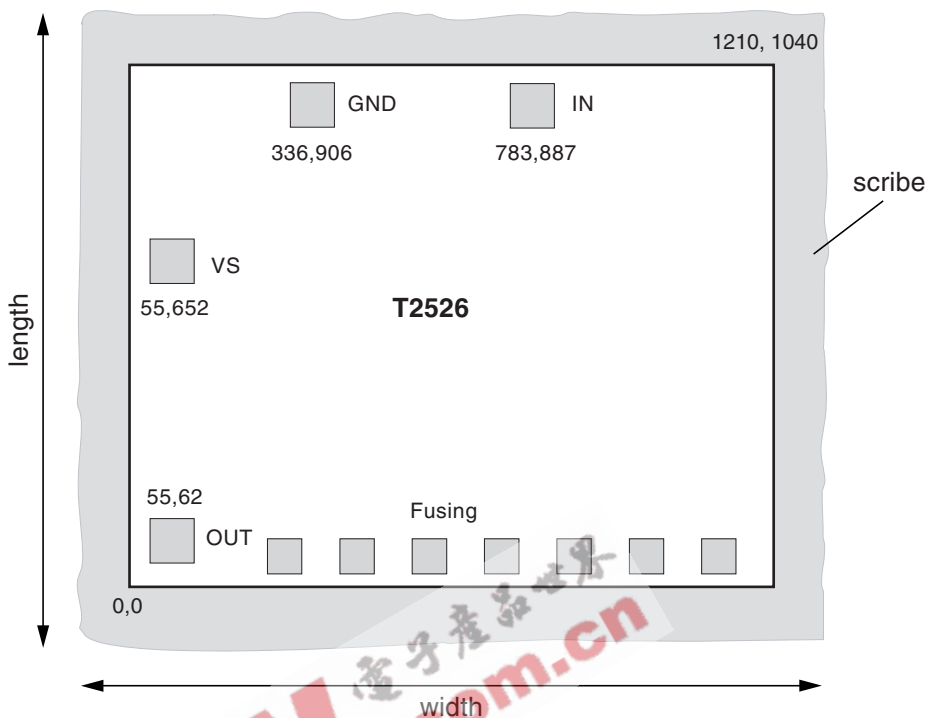


Figure 7-10. Application Circuit



## 8. Chip Dimensions

Figure 8-1. Chip Size in  $\mu\text{m}$



Note: Pad coordinates are given for lower left corner of the pad in  $\mu\text{m}$  from the origin 0,0

Dimensions	Length inclusive scribe	1.16 mm
	Width inclusive scribe	1.37 mm
	Thickness	$290 \mu \pm 5\%$
Pads	Pads	$90 \mu \times 90 \mu$
	Fusing pads	$70 \mu \times 70 \mu$
Pad metallurgy	Material	AlCu/AlSiTi <sup>(1)</sup>
	Thickness	$0.8 \mu\text{m}$
Finish	Material	Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub>
	Thickness	$0.7/0.3 \mu\text{m}$

Note: 1. Value depends on manufacture location.

## 9. Ordering Information

Delivery: unsawn wafers (DDW) in box

Extended Type Number	PL <sup>(2)</sup>	R <sub>PU</sub> <sup>(3)</sup>	D <sup>(4)</sup>	Type <sup>(5)</sup>
T2526N0xx <sup>(1)</sup> -DDW	2	30	2179	<b>Standard type:</b> ≥ 10 pulses, enhanced sensibility, high data rate
T2526N1xx <sup>(1)</sup> -DDW	1	30	2179	
T2526N2xx <sup>(1)</sup> -DDW	2	40	1404	<b>Lamp type:</b> ≥ 10 pulses, enhanced suppression of disturbances, secure data transmission
T2526N3xx <sup>(1)</sup> -DDW	1	40	1404	
T2526N6xx <sup>(1)</sup> -DDW	2	30	3415	<b>Short burst type:</b> ≥ 6 pulses, enhanced data rate
T2526N7xx <sup>(1)</sup> -DDW	1	30	3415	

- Notes:
- xx means the used carrier frequency value  $f_0$  30, 33, 36, 38, 40, 44 or 56 kHz (76 kHz type on request)
  - Two pad layout versions (see [Figure 9-1](#) and [Figure 9-2](#)) available for different assembly demand
  - Integrated pull-up resistor at pin OUT (see electrical characteristics)
  - Typical data transmission rate up to bit/s with  $f_0 = 56$  kHz,  $V_S = 5$  V (see [Figure 7-8 on page 9](#))
  - On request: noise type, data rate type

### 9.1 Pad Layout

Figure 9-1. Pad Layout 1

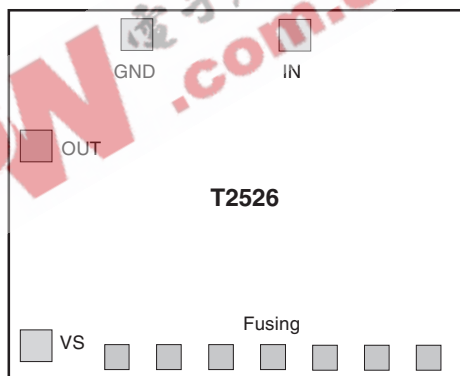
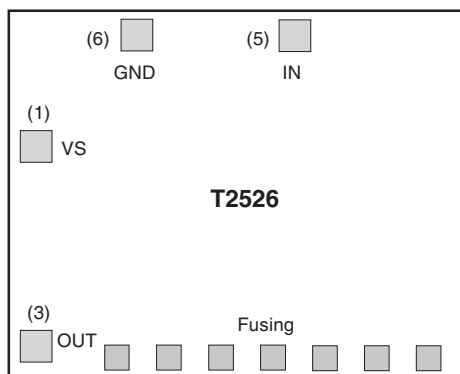


Figure 9-2. Pad Layout 2



## 10. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	History
4597G-AUTO-10/06	<ul style="list-style-type: none"> <li>• Features on page 1 changed</li> <li>• Applications on page 1 changed</li> <li>• Section 1 “Description” on page 1 changed</li> <li>• Section 5 “Electrical Characteristics, 3-V Operation” number 3.4 on page 3 changed</li> <li>• Section 6 “Electrical Characteristics, 5-V Operation” number 7.3 and 7.4 on page 5 changed</li> <li>• Section 9 “Ordering Information” on page 11 changed</li> </ul>
4597F-AUTO-04/06	<ul style="list-style-type: none"> <li>• Section 9 “Ordering Information” on page 11 changed</li> </ul>
4597E-AUTO-04/06	<ul style="list-style-type: none"> <li>• Put datasheet in a new template</li> <li>• Section 8 “Chip Dimensions” on page 10 changed</li> </ul>
4597D-AUTO-08/05	<ul style="list-style-type: none"> <li>• Put datasheet in a new template</li> <li>• First page: Pb-free logo added</li> <li>• Page 11: Ordering Information changed</li> <li>• Page 2, 3, 5, 11, 13: SO8 deleted</li> </ul>

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Scottish Enterprise Technology Park  
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East Kilbride G75 0QR, Scotland  
Tel: (44) 1355-803-000  
Fax: (44) 1355-242-743

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74025 Heilbronn, Germany  
Tel: (49) 71-31-67-0  
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906, USA  
Tel: 1(719) 576-3300  
Fax: 1(719) 540-1759

### Biometrics/Imaging/Hi-Rel MPU/ High-Speed Converters/RF Datacom

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38521 Saint-Egreve Cedex, France  
Tel: (33) 4-76-58-30-00  
Fax: (33) 4-76-58-34-80

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