Low-voltage IR Receiver ASSP

T2526

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 ±2.5%**
- **TTL and CMOS Compatible**

Applications

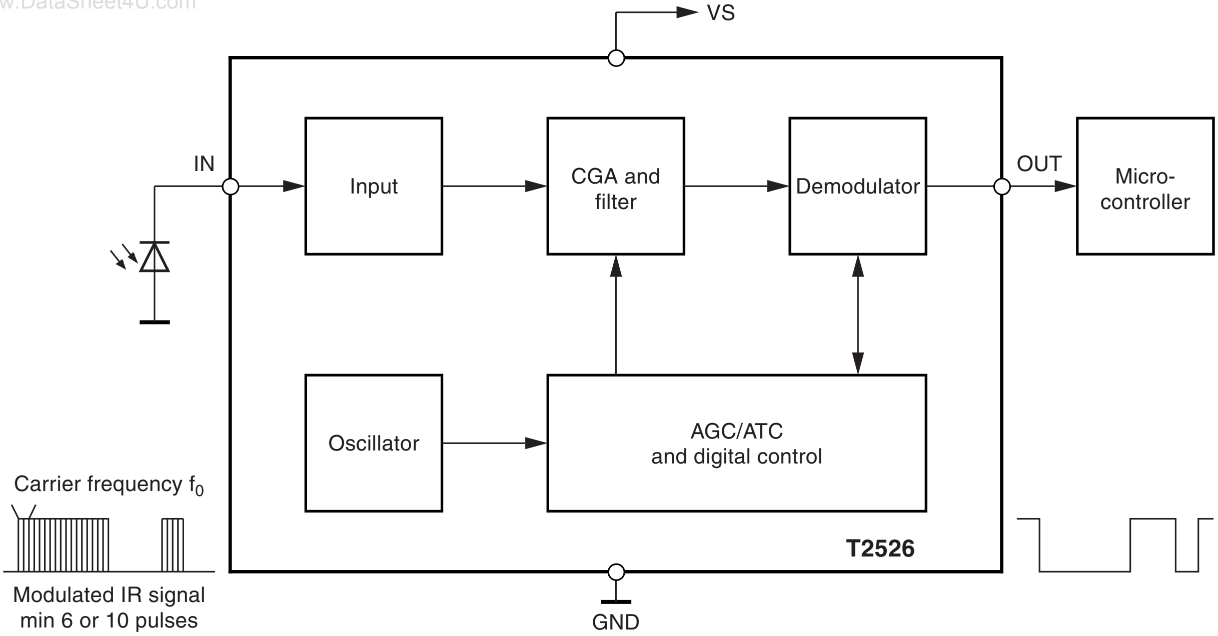
- **Home Entertainment Applications (Audio/Video)**
- **Home Appliances**
- **Remote Control Equipment**

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.

Figure 1-1. Block Diagram



2. Pin Configuration

Figure 2-1. Pinning TSSOP8

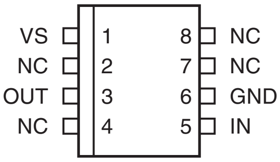


Table 2-1. Pin Description

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 $T_{amb} = 25°C$	P_{tot}	30	mW

4. Thermal Resistance

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

5. Electrical Characteristics, 3-V Operation

T_{amb} = 25°C, V_S = 3V unless otherwise specified.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
1	**Supply**								
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
2	**Output**								
2.1	Internal pull-up resistor(1)	T_{amb} = 25°C See Figure 7-10 on page 10	1, 3	R_{PU}		30/40		kΩ	A
2.2	Output voltage low	R_2 = 2.4 kΩ See Figure 7-10 on page 10	3, 6	V_{OL}			250	mV	B
2.3	**Output voltage high**		3, 1	V_{OH}	$V_S - 0.25$		Vs	V	B
2.4	Output current clamping	R_2 = 0 See Figure 7-10 on page 10	3, 6	I_{OCL}		8		mA	B
3	**Input**								
3.1	Input DC current	V_{IN} = 0 See Figure 7-10 on page 10	5	I_{IN_DCMAX}	–150			µA	C
3.2	Input DC current See Figure 7-3 on page 7	V_{IN} = 0; Vs = 3V T_{amb} = 25°C	5	I_{IN_DCMAX}		–350		µA	B
3.3	Minimum detection threshold current See Figure 7-1 on page 7	Test signal: See Figure 7-9 on page 10 V_S = 3V T_{amb}= 25°C, I_{IN_DC}=1 µA square pp burst N = 16 f = f_0; t_{PER} = 10 ms Figure 7-8 on page 9 BER = 50(2)	3	I_{Eemin}		–700		pA	B
3.4	Minimum detection threshold current with AC current disturbance IIN_AC100 = 3 µA at 100 Hz		3	I_{Eemin}		–1300		pA	C
3.5	Maximum detection threshold current with V_{IN} > 0V	Test signal: See Figure 7-9 on page 10 V_S = 3V, T_{amb} = 25°C I_{IN_DC} = 1 µA square pp burst N = 16 f = f_0; t_{PER} = 10 ms Figure 7-8 on page 9 BER = 5%(2)	3	I_{Eemax}	–200			µA	D

*) 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

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

T_{amb} = 25°C, V_S = 3V unless otherwise specified.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
4	**Controlled Amplifier and Filter**								
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(3)			G_{MAX}		71		dB	D
4.4	Center frequency fusing accuracy of bandpass	V_S = 3V, T_{amb} = 25°C		f_{03V_FUSE}	–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°C		f_{03V}	–4.5	f_0	+3.0	%	C
4.7	BPF bandwidth	–3 dB; f_0 = 38 kHz; See Figure 7-7 on page 9		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°C, V_S = 5V unless otherwise specified.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
5	**Supply**								
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
6	**Output**								
6.1	Internal pull-up resistor(1)	T_{amb} = 25°C See Figure 7-10 on page 10	1, 3	R_{PU}		30/40		kΩ	A
6.2	Output voltage low	R_2 = 2.4 kΩ See Figure 7-10 on page 10	3, 6	V_{OL}			250	mV	B
6.3	Output voltage high		3, 1	V_{OH}	V_S – 0.25		Vs	V	B
6.4	Output current clamping	R_2 = 0 See Figure 7-10 on page 10	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°C, V_S = 5V unless otherwise specified.

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*
7	**Input**								
7.1	Input DC current	V_{IN} = 0 See Figure 7-10 on page 10	5	I_{IN_DCMAX}	–400			µA	C
7.2	Input DC-current See Figure 7-4 on page 8	V_{IN} = 0; Vs = 5V T_{amb} = 25°C	5	I_{IN_DCMAX}		–700		µA	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 = 5V T_{amb} = 25°C I_{IN_DC} = 1 µA square pp burst N = 16 f = f_0; t_{PER} = 10 ms Figure 7-8 on page 9 BER = 50(2)	3	I_{Eemin}		–850		pA	B
7.4	Min. detection threshold current with AC current disturbance IIN_AC100 = 3 µA at 100 Hz		3	I_{Eemin}		–2000		pA	C
7.5	Max. detection threshold current with V_{IN} > 0V	Test signal: See Figure 7-9 on page 10 V_S = 5V, T_{amb} = 25° C I_{IN_DC} = 1 µA square pp burst N = 16 f = f_0; t_{PER} = 10 ms Figure 7-8 on page 9 BER = 5%(2)	3	I_{Eemax}	–500			µA	D
8	**Controlled Amplifier and Filter**								
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(3)			G_{MAX}		71		dB	D
8.4	Resulting center frequency fusing accuracy	f_0 fused at V_S = 3V V_S = 5V, T_{amb} = 25°C		f_{05V}		$f_{03V\text{-}FUSE}$ + 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 ⇒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°C

Figure 7-1. I_{Eemin} versus I_{IN_DC}, V_S = 3V

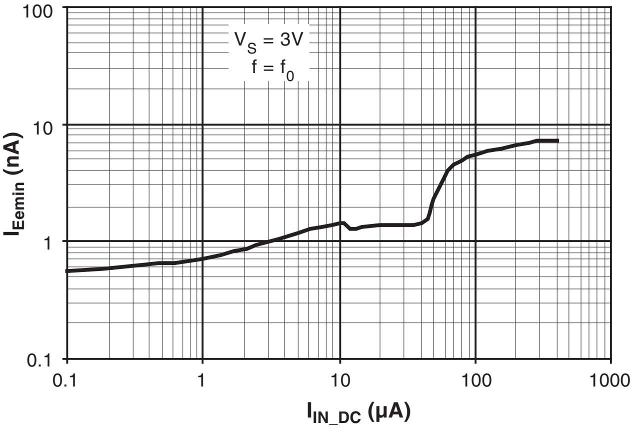


Figure 7-2. I_{Eemin} versus I_{IN_DC}, V_S = 5V

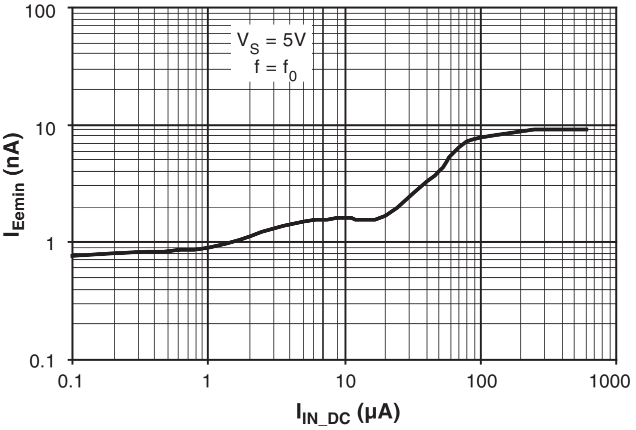


Figure 7-3. V_{IN} versus I_{IN_DC}, V_S = 3V

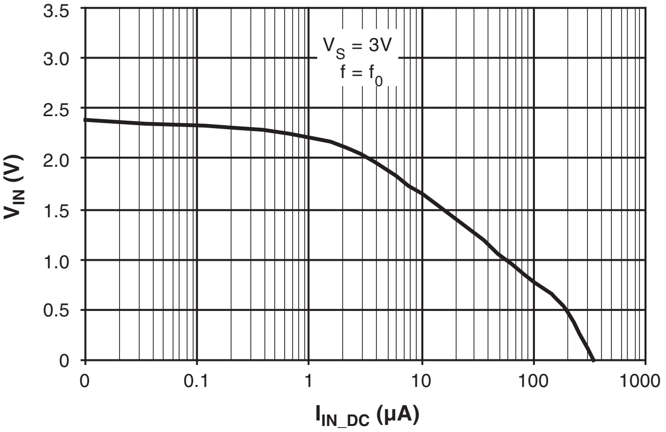


Figure 7-4. V_{IN} versus I_{IN_DC}, V_S = 5V

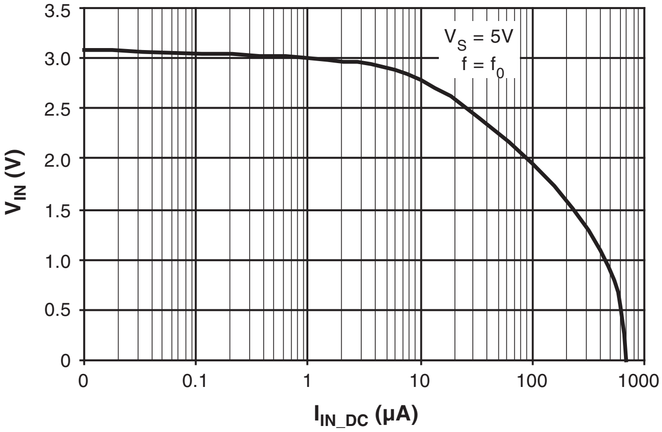


Figure 7-5. Data Transmission Rate, V_S = 3V

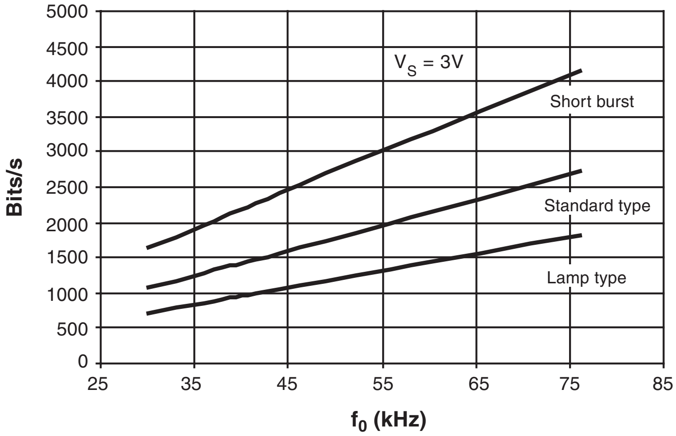


Figure 7-6. Data Transmission Rate, V_S = 5V

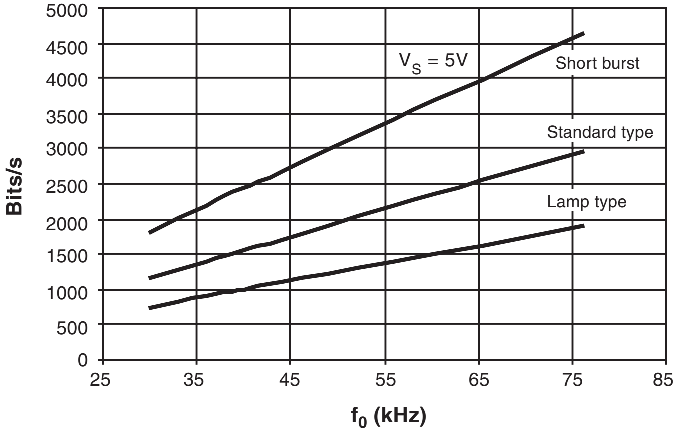
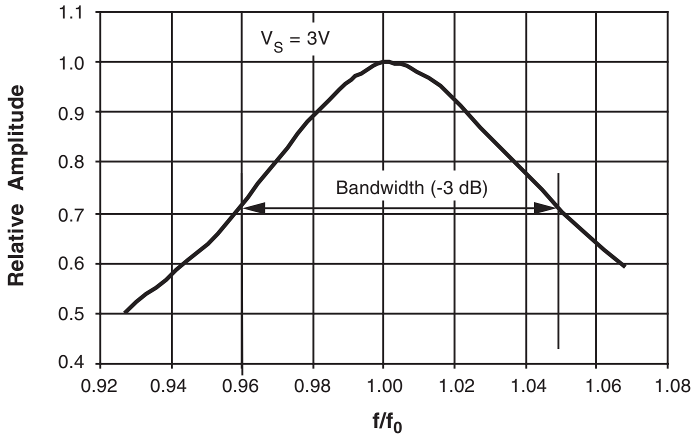


Figure 7-7. Typical Bandpass Curve



Q = $f/f_0/B$; B => –3 dB values.

Example: Q = 1/(1.047 – 0.954) = 11

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

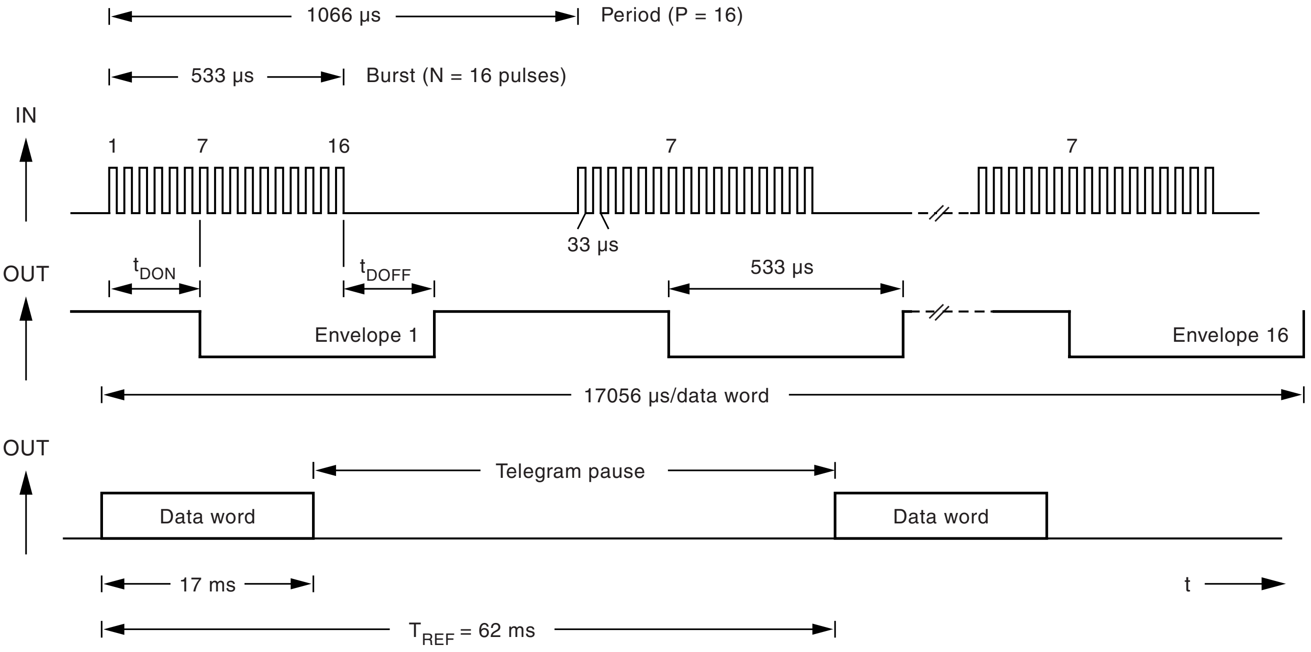


Figure 7-9. Test Circuit

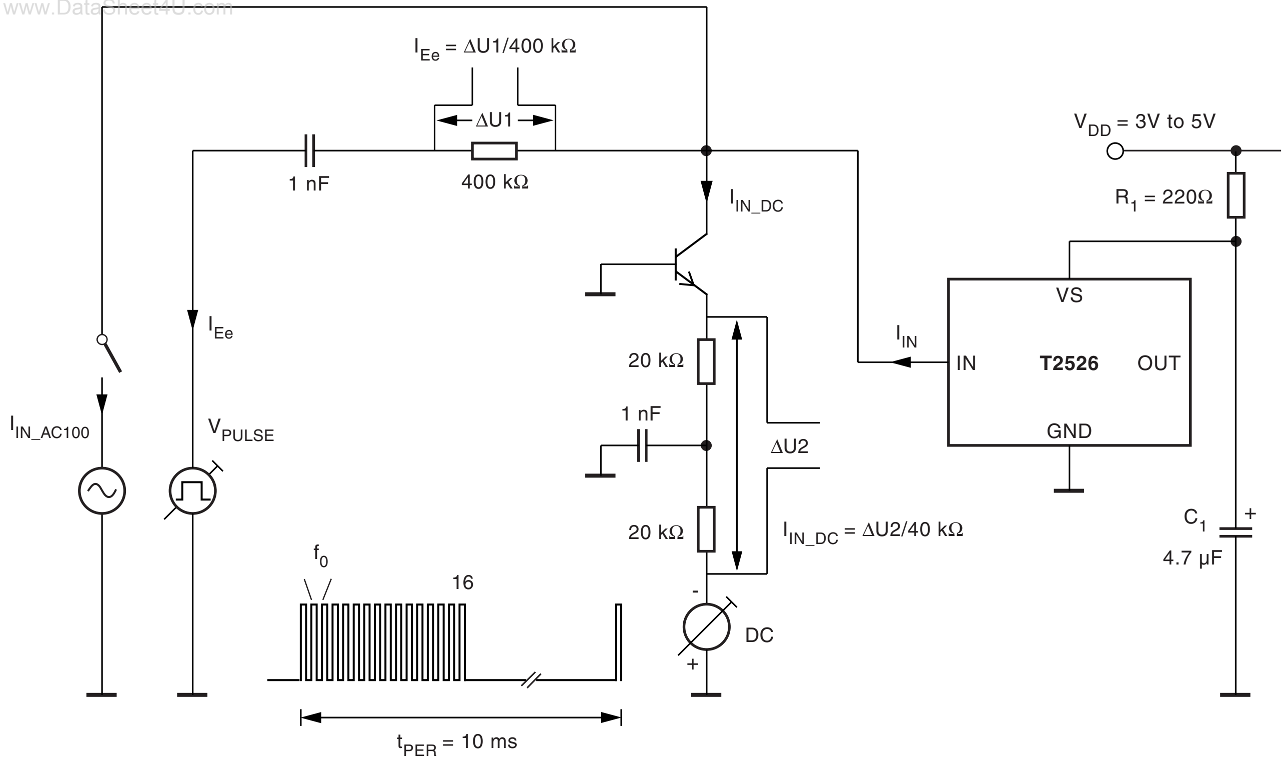
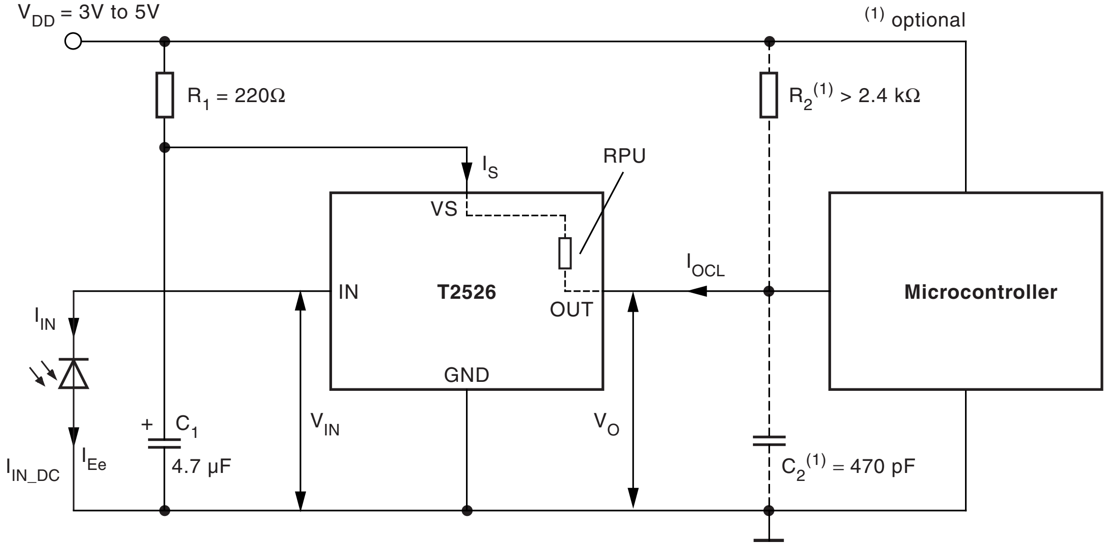
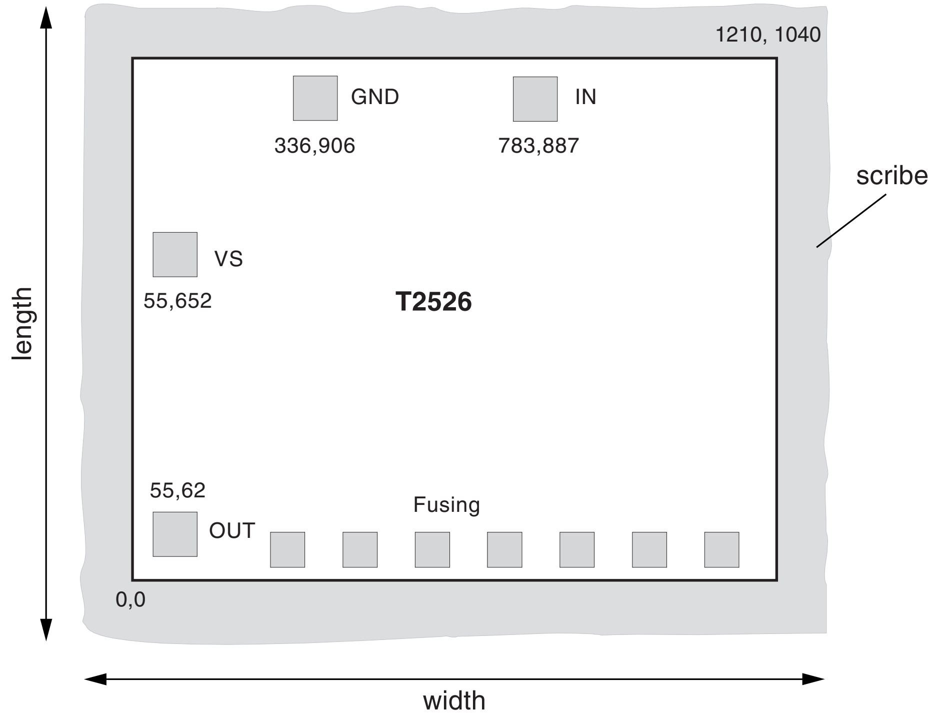


Figure 7-10. Application Circuit



8. Chip Dimensions

Figure 8-1. Chip Size in µm



Note: Pad coordinates are given for lower left corner of the pad in µm from the origin 0,0

Dimensions	Length inclusive scribe	1.16 mm
	Width inclusive scribe	1.37 mm
	Thickness	290 µ ± 5%
	Pads	90 µ × 90 µ
	Fusing pads	70 µ × 70 µ
Pad metallurgy	Material	AlCu/AlSiTi[1]
	Thickness	0.8 µm
Finish	Material	Si_3N_4/SiO_2
	Thickness	0.7/0.3 µm

Note: 1. Value depends on manufacture location.

9. Ordering Information

Delivery: unsawn wafers (DDW) in box

Extended Type Number	PL[2]	R_{PU}[3]	D[4]	Type[5]
T2526N0xx[1]-DDW	2	30	2179	**Standard type:** ≥ 10 pulses, enhanced sensibility, high data rate
T2526N1xx[1]-DDW	1	30	2179	
T2526N2xx[1]-DDW	2	40	1404	**Lamp type:** ≥ 10 pulses, enhanced suppression of disturbances, secure data transmission
T2526N3xx[1]-DDW	1	40	1404	
T2526N6xx[1]-DDW	2	30	3415	**Short burst type:** ≥ 6 pulses, enhanced data rate
T2526N7xx[1]-DDW	1	30	3415	

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

9.1 Pad Layout

Figure 9-1. Pad Layout 1

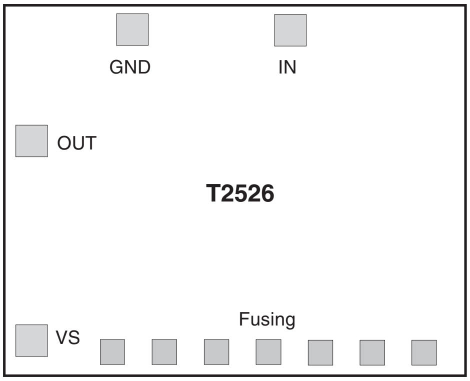
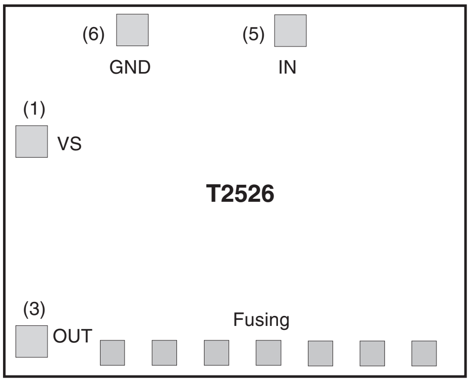


Figure 9-2. Pad Layout 2



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	• Features on page 1 changed • Applications on page 1 changed • Section 1 “Description” on page 1 changed • Section 5 “Electrical Characteristics, 3-V Operation” number 3.4 on page 3 changed • Section 6 “Electrical Characteristics, 5-V Operation” number 7.3 and 7.4 on page 5 changed • Section 9 “Ordering Information” on page 11 changed
4597F-AUTO-04/06	• Section 9 “Ordering Information” on page 11 changed
4597E-AUTO-04/06	• Put datasheet in a new template • Section 8 “Chip Dimensions” on page 10 changed
4597D-AUTO-08/05	• Put datasheet in a new template • First page: Pb-free logo added • Page 11: Ordering Information changed • Page 2, 3, 5, 11, 13: SO8 deleted

www.DataSheet4U.com

Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

Regional Headquarters

Europe
Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

Asia
Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

Japan
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Atmel Operations

Memory
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

Microcontrollers
2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
Tel: (33) 2-40-18-18-18
Fax: (33) 2-40-18-19-60

ASIC/ASSP/Smart Cards
Zone Industrielle
13106 Rousset Cedex, France
Tel: (33) 4-42-53-60-00
Fax: (33) 4-42-53-60-01

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

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

RF/Automotive
Theresienstrasse 2
Postfach 3535
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
Avenue de Rochepleine
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