
Low-voltage IR Receiver ASSP

DATASHEET

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 30kHz to 56kHz; adjusted by zener-diode fusing $\pm 2.5\%$
- TTL and CMOS compatible

Applications

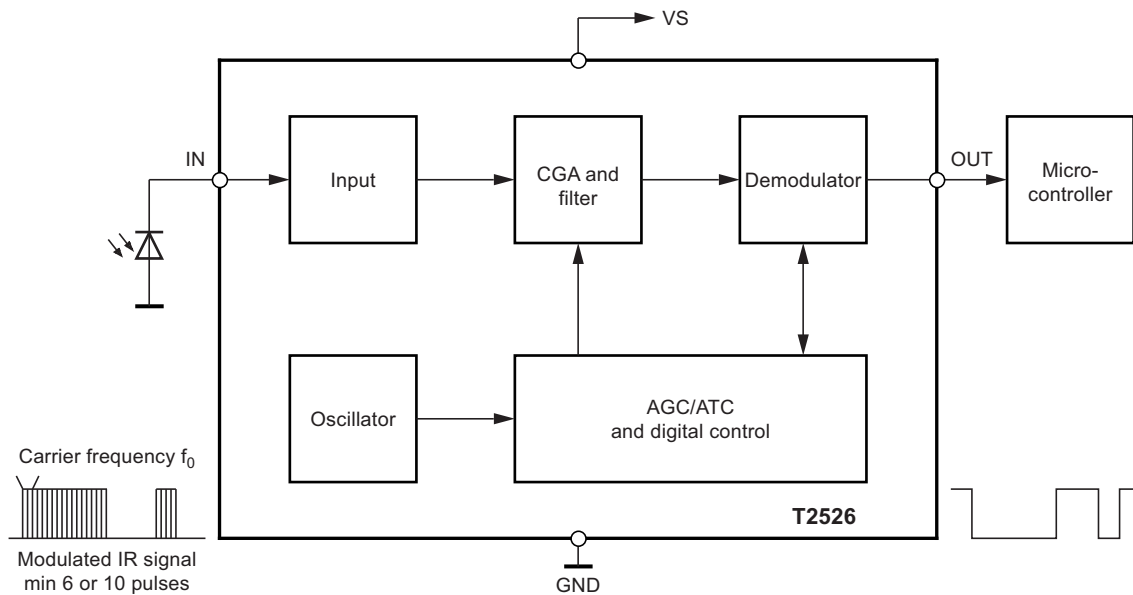
- Home entertainment applications (audio/video)
- Home appliances
- Remote control equipment

1. Description

The Atmel® 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 Atmel T2526 is available with broadest range of frequencies (30, 33, 36, 37, 38, 40, 44, 56kHz) and 3 different noise suppression regulation types (standard, lamp, short burst) covering requirements of high-end remote control solutions (please refer to selection guide available for Atmel T2525/T2526). Atmel The T2526 operates in a supply voltage range of 2.7V to 5.5V.

The function of the Atmel 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 Description

Table 2-1. Pin Description

Symbol	Function
VS	Supply voltage
OUT	Data output
IN	Input PIN-diode
GND	Ground

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. Electrical Characteristics, 3-V Operation

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

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit	Type*
1 Supply								
1.1	Supply-voltage range		V_S	2.7	3.0	3.3	V	C
1.2	Supply current	$I_{IN} = 0$	I_S	0.7	0.9	1.3	mA	B
2 Output								
2.1	Internal pull-up resistor ⁽¹⁾	$T_{amb} = 25^\circ C$ See Figure 6-10 on page 9	R_{PU}		30/40		k Ω	A
2.2	Output voltage low	$R_2 = 2.4\text{ k}\Omega$ See Figure 6-10 on page 9	V_{OL}			250	mV	B
2.3	Output voltage high		V_{OH}	$V_S - 0.25$		V_S	V	B
2.4	Output current clamping	$R_2 = 0$ See Figure 6-10 on page 9	I_{OCL}		8		mA	B
3 Input								
3.1	Input DC current	$V_{IN} = 0$ See Figure 6-10 on page 9	I_{IN_DCMAX}	-150			μA	C
3.2	Input DC current See Figure 6-3 on page 6	$V_{IN} = 0$; $V_S = 3V$ $T_{amb} = 25^\circ C$	I_{IN_DCMAX}		-350		μA	B
3.3	Minimum detection threshold current See Figure 6-1 on page 6	Test signal: See Figure 6-9 on page 9 $V_S = 3V$	I_{Eemin}		-700		pA	B
3.4	Minimum detection threshold current with AC current disturbance $I_{IN_AC100} = 3\mu A$ at 100Hz	$T_{amb} = 25^\circ C$, $I_{IN_DC} = 1\mu A$ square pp burst N = 16 $f = f_0$; $t_{PER} = 10ms$ Figure 6-8 on page 8 BER = 50 ⁽²⁾	I_{Eemin}		-1300		pA	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

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

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

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit	Type*
3.5	Maximum detection threshold current with $V_{IN} > 0\text{V}$	Test signal: See Figure 6-9 on page 9 $V_S = 3\text{V}$, $T_{amb} = 25^{\circ}\text{C}$ $I_{IN_DC} = 1\mu\text{A}$ square pp burst $N = 16$ $f = f_0$; $t_{PER} = 10\text{ms}$ Figure 6-8 on page 8 $\text{BER} = 5\%^{(2)}$	I_{Eemax}	-200			μA	D
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	$V_S = 3\text{V}$, $T_{amb} = 25^{\circ}\text{C}$	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	-3dB; $f_0 = 38\text{kHz}$; See Figure 6-7 on page 8	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

5. Electrical Characteristics, 5-V Operation

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

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit	Type*
5	Supply							
5.1	Supply-voltage range		V_S	4.5	5.0	5.5	V	C
5.2	Supply current	$I_{IN} = 0$	I_S	0.9	1.2	1.6	mA	B
6	Output							
6.1	Internal pull-up resistor ⁽¹⁾	$T_{amb} = 25^{\circ}\text{C}$ See Figure 6-10 on page 9	R_{PU}		30/40		k Ω	A
6.2	Output voltage low	$R_2 = 2.4\text{ k}\Omega$ See Figure 6-10 on page 9	V_{OL}			250	mV	B
6.3	Output voltage high		V_{OH}	$V_S - 0.25$		V_S	V	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

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

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

No.	Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit	Type*
6.4	Output current clamping	$R_2 = 0$ See Figure 6-10 on page 9	I_{OCL}		8		mA	B
7 Input								
7.1	Input DC current	$V_{IN} = 0$ See Figure 6-10 on page 9	I_{IN_DCMAX}	-400			μA	C
7.2	Input DC-current See Figure 6-4 on page 7	$V_{IN} = 0$; $V_S = 5\text{V}$ $T_{amb} = 25^{\circ}\text{C}$	I_{IN_DCMAX}		-700		μA	B
7.3	Min. detection threshold current See Figure 6-2 on page 6	Test signal: See Figure 6-9 on page 9 $V_S = 5\text{V}$	I_{Eemin}		-850		μA	B
7.4	Min. detection threshold current with AC current disturbance $I_{IN_AC100} = 3\ \mu\text{A}$ at 100 Hz	$T_{amb} = 25^{\circ}\text{C}$ $I_{IN_DC} = 1\ \mu\text{A}$ square pp burst $N = 16$ $f = f_0$; $t_{PER} = 10\text{ms}$ Figure 6-8 on page 8 $\text{BER} = 50^{(2)}$	I_{Eemin}		-2000		μA	C
7.5	Max. detection threshold current with $V_{IN} > 0\text{V}$	Test signal: See Figure 6-9 on page 9 $V_S = 5\text{V}$, $T_{amb} = 25^{\circ}\text{C}$, $I_{IN_DC} = 1\ \mu\text{A}$ square pp burst $N = 16$ $f = f_0$; $t_{PER} = 10\text{ms}$ Figure 6-8 on page 8 $\text{BER} = 5\%^{(2)}$	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 $V_S = 3\text{V}$ $V_S = 5\text{V}$, $T_{amb} = 25^{\circ}\text{C}$	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

5.1 ESD

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

5.2 Reliability

Electrical qualification (1000h) in molded plastic package

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

Figure 6-1. I_{Eemin} versus I_{IN_DC} , $V_S = 3\text{V}$

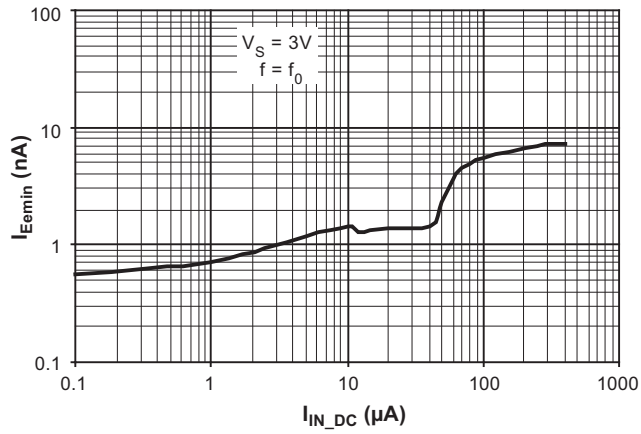


Figure 6-2. I_{Eemin} versus I_{IN_DC} , $V_S = 5\text{V}$

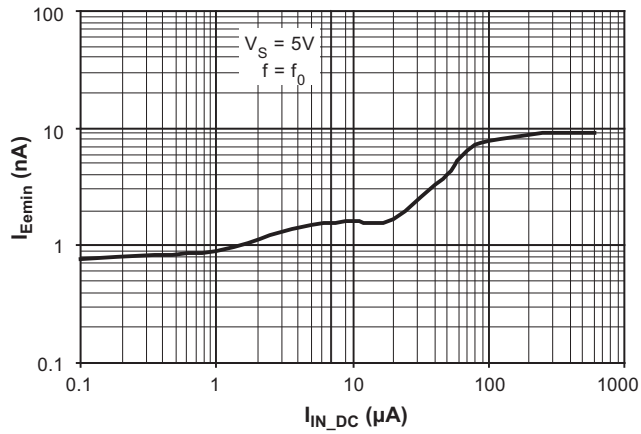


Figure 6-3. V_{IN} versus I_{IN_DC} , $V_S = 3\text{V}$

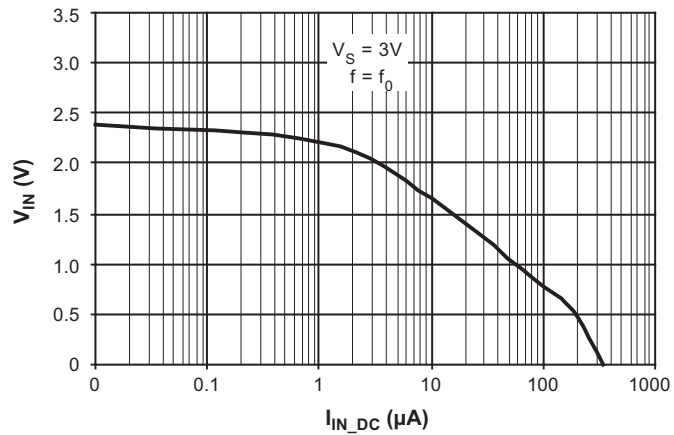


Figure 6-4. V_{IN} versus I_{IN_DC} , $V_S = 5V$

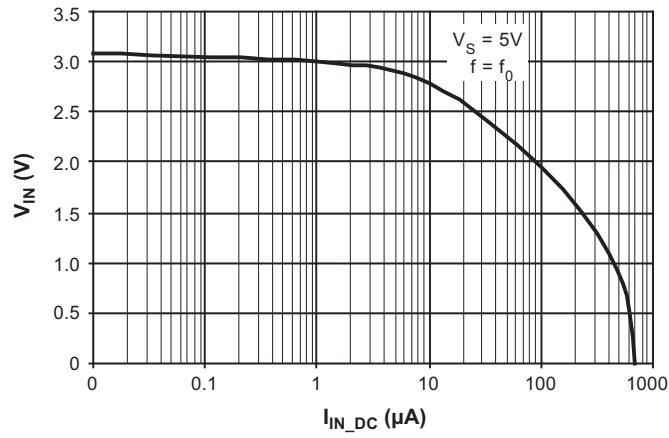


Figure 6-5. Data Transmission Rate, $V_S = 3V$

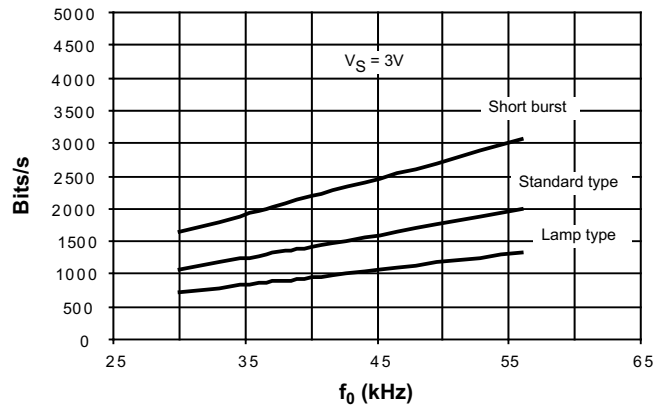


Figure 6-6. Data Transmission Rate, $V_S = 5V$

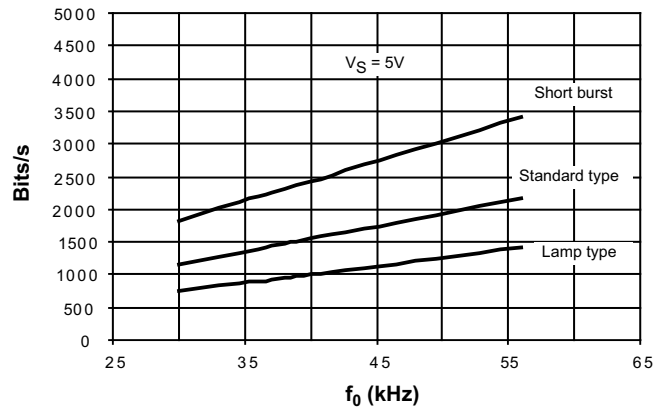


Figure 6-9. Test Circuit

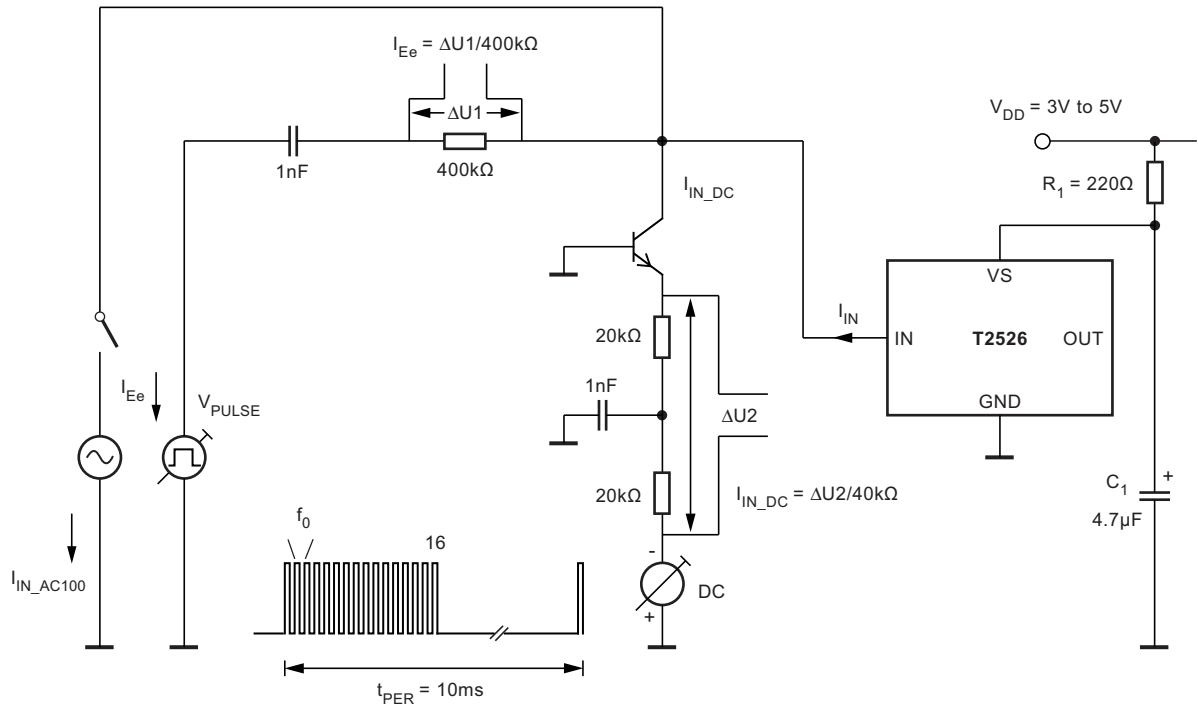
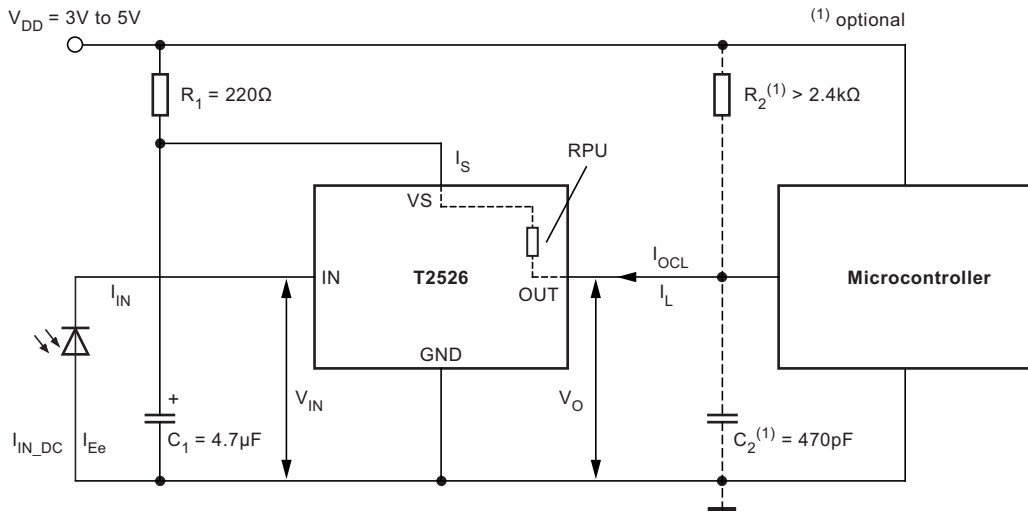
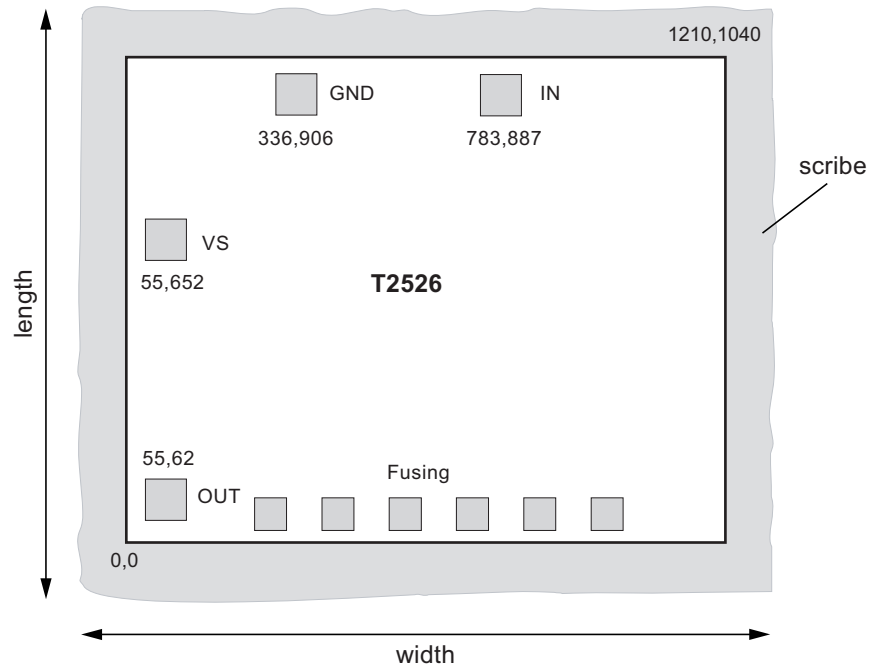


Figure 6-10. Application Circuit



7. Chip Dimensions

Figure 7-1. 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	1.16mm
	Width inclusive scribe	1.37mm
	Thickness	$290\mu \pm 5\%$
Pads	Pads	$90\mu \times 90\mu$
	Fusing pads	$70\mu \times 70\mu$
Pad metallurgy	Material	AlCu/AlSiTi ⁽¹⁾
	Thickness	$0.8\mu\text{m}$
Finish	Material	$\text{Si}_3\text{N}_4/\text{SiO}_2$
	Thickness	$0.7/0.3\mu\text{m}$

Note: 1. Value depends on manufacture location.

8. Ordering Information

Delivery: unsawn wafers (DDW) in box

Extended Type Number	PL ⁽²⁾	R _{PU} ⁽³⁾	D ⁽⁴⁾	Type ⁽⁵⁾
T2526S0xx ⁽¹⁾ C-DDW	2	30	2179	Standard type: ≥ 10 pulses, enhanced sensibility, high data rate
T2526S1xx ⁽¹⁾ C-DDW	1	30	2179	
T2526S2xx ⁽¹⁾ C-DDW	2	40	1404	Lamp type: ≥ 10 pulses, enhanced suppression of disturbances, secure data transmission
T2526S3xx ⁽¹⁾ C-DDW	1	40	1404	
T2526S6xx ⁽¹⁾ C-DDW	2	30	3415	Short burst type: ≥ 6 pulses, enhanced data rate
T2526S7xx ⁽¹⁾ C-DDW	1	30	3415	

- Notes:
- xx means the used carrier frequency value f_0 30, 33, 36, 38, 40, 44 or 56kHz
 - Two pad layout versions (see [Figure 8-1](#) and [Figure 8-2](#)) available for different assembly demand
 - Integrated pull-up resistor at pin OUT (see electrical characteristics)
 - Typical data transmission rate up to bit/s with $f_0 = 56\text{kHz}$, $V_S = 5\text{V}$ (see [Figure 6-8 on page 8](#))
 - On request: noise type, data rate type

8.1 Pad Layout

Figure 8-1. Pad Layout 1

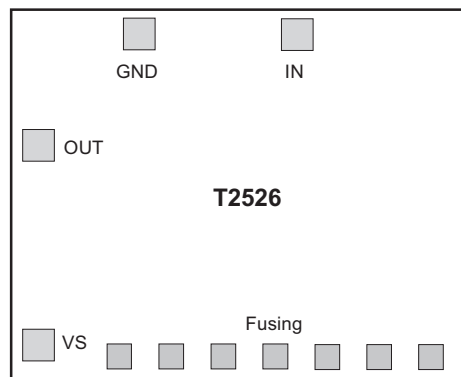
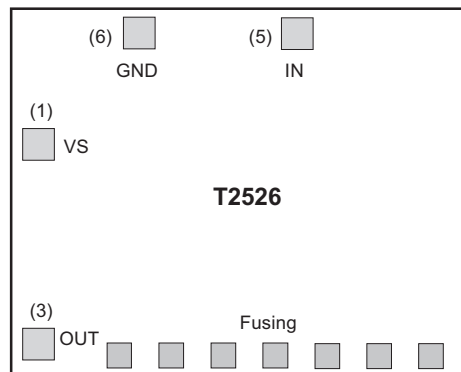


Figure 8-2. Pad Layout 2



9. 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
4597J-AUTO-04/04	<ul style="list-style-type: none">• Put datasheet in the latest template
4597I-AUTO-05/10	<ul style="list-style-type: none">• Features on page 1 changed• Section 1 “Description” on page 1 changed• Section 2 “Pin Description” on page 3 changed• Section 4 “Thermal Resistance” on page 3 deleted• Section 4 “Electrical Characteristics, 3-V Operation” on pages 4 to 5 changed• Section 5 “Electrical Characteristics, 5-V Operation” on pages 5 to 6 changed• Figure 6-5 “Data Transmission Rate, $V_S = 3V$” on page 8 changed• Figure 6-6 “Data Transmission Rate, $V_S = 5V$” on page 8 changed
4597H-AUTO-09/09	<ul style="list-style-type: none">• Put datasheet in the latest template• Ordering Information table changed
4597G-AUTO-10/06	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Section 9 “Ordering Information” on page 11 changed
4597E-AUTO-04/06	<ul style="list-style-type: none">• Put datasheet in the latest template• Section 8 “Chip Dimensions” on page 10 changed
4597D-AUTO-08/05	<ul style="list-style-type: none">• Put datasheet in the latest template• First page: Pb-free logo added• Page 11: Ordering Information changed• Page 2, 3, 5, 11, 13: SO8 deleted

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