Features

- **Highly Integrated Device with No External Components Except PIN Diode**
- **Supply-voltage Range: 2.7V to 5.5V**
- **High Sensitivity Due to Automatic Sensitivity Adaption (AGC) and Automatic Strong Signal Adaption (ATC)**
- **Automatic Supply Voltage Adaptation**
- **High Immunity against Disturbances from Daylight and Lamps**
- **Small Size and Innovative Pad Layout**
- **Available for Carrier Frequencies between 36kHz to 40kHz**
- **TTL and CMOS Compatible**

Applications

- **Home Entertainment Applications**
- **Home Appliances**
- **Remote Control Equipment**

Low-voltage IR Receiver ASSP

Atmel ATA2536T

1. Description

The Atmel® IC ATA2536T is a complete IR receiver for data communication developed and optimized for use in carrier-frequency-modulated transmission applications. The IC combines small size with high sensitivity as well as high suppression of noise from daylight and lamps. An innovative and patented pad layout offers unique flexibility for assembly of IR receiver modules. The Atmel ATA2536T is recommended in LCD TV application (noise environment by backlight interference) with IR protocols using 375µs maximum burst length of data bits, available with standard frequencies (36, 37, 38, 40kHz) and 3 different noise suppression regulation types (standard, lamp, short burst). The ATA2536T operates in a supply voltage range of 2.7V to 5.5V.

The function of the Atmel ATA2536T can be described using the block diagram of Figure 1-1 on page 2. The input stage has two main functions. Firstly, 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 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.

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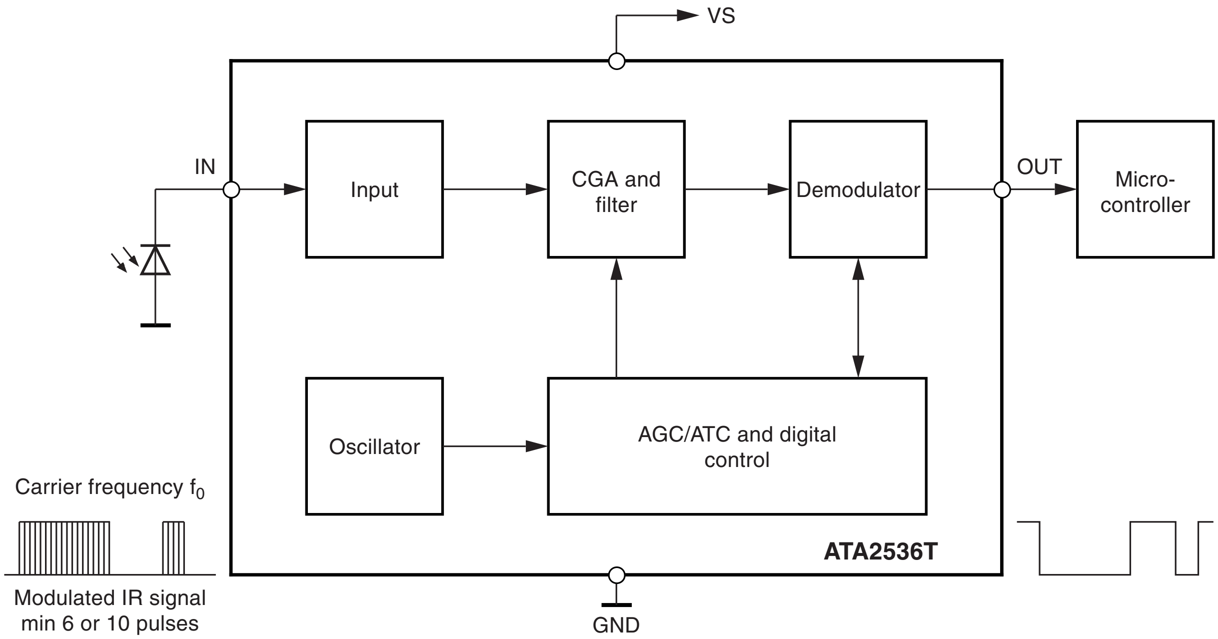
Figure 1-1. Block Diagram



2. 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

3. Electrical Characteristics, 3-V Operation

T_{amb} = –25°C to +85°C, V_S = 2.7V to 3.3V 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	0.45	0.6	0.85	mA	B
2	**Output**							
2.1	Internal pull-up resistor	T_{amb} = 25°C	R_{PU}		40		kΩ	A
2.2	Output voltage low	R_2 = 1.4kΩ	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	I_{OCL}		8		mA	B
3	**Input**							
3.1	Input DC current	I_{IN} = –150µA, V_S = 2.7V measure V_{IN}	I_{IN_DCMAX}	0			V	B
3.2	Input DC current	V_{IN} = 0; V_S = 3V T_{amb} = 25°C	I_{IN_DCMAX}		–350		µA	C
3.3	Minimum detection threshold current	Test signal: V_S = 3V T_{amb}= 25°C, I_{IN_DC}=1µA square pp burst N = 16 f = f_0; t_{PER} = 10ms BER = 50(1)	I_{Eemin}		–850		pA	B
3.4	Minimum detection threshold current with AC current disturbance IIN_AC100 = 3 µA at 100 Hz		I_{Eemin}		–1300		pA	C
3.5	Maximum detection threshold current with V_{IN} > 0V	Test signal: V_S = 3V, T_{amb} = 25°C I_{IN_DC} = 1µA square pp burst N = 16 f = f_0; t_{PER} = 10ms BER = 5%(1)	I_{Eemax}	–200			µA	D
4	**Controlled Amplifier and Filter**							
4.1	Maximum value of variable gain (CGA)	V_S = 3V, T_{amb} = 25°C	G_{VARMAX}		50		dB	D
4.2	Minimum value of variable gain (CGA)	V_S = 3V, T_{amb} = 25°C	G_{VARMIN}		–6		dB	D
4.3	Total internal amplification(2)	V_S = 3V, T_{amb} = 25°C	G_{MAX}		72		dB	D
4.4	Center frequency fusing accuracy of bandpass	V_S = 3V, T_{amb} = 25°C 0.5% accuracy	f_{03V_FUSE}	–2.5	f_0	+2.5	%	A
4.5	Overall accuracy center frequency of bandpass		f_{03V}	–6.5	f_0	+3.5	%	C
4.6	Overall accuracy center frequency of bandpass	T_{amb} = 0 to 70°C	f_{03V}	–5.5	f_0	+3.0	%	C
4.7	BPF bandwidth	–3dB; f_0 = 38kHz	B		4.5		kHz	C

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

Notes:
1. 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
2. After transformation of input current into voltage

4. Electrical Characteristics, 5-V Operation

T_{amb} = –25°C to +85°C, V_S = 4.5V to 5.5V 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	0.5	0.7	0.95	mA	B
6	**Output**							
6.1	Internal pull-up resistor	T_{amb} = 25°C	R_{PU}		40		kΩ	C
6.2	Output voltage low	R_2 = 2.4kΩ	V_{OL}			250	mV	C
6.3	Output voltage high		V_{OH}	V_S – 0.25		V_S	V	C
6.4	Output current clamping	R_2 = 0	I_{OCL}		8		mA	C
7	**Input**							
7.1	Input DC current	I_{IN} = –370µA, V_S = 4.5V measure V_{IN}	I_{IN_DCMAX}	0			V	B
7.2	Input DC-current	V_{IN} = 0; V_S = 5V T_{amb} = 25°C	I_{IN_DCMAX}		–700		µA	C
7.3	Min. detection threshold current	Test signal: V_S = 5V T_{amb} = 25°C I_{IN_DC} = 1µA square pp burst N = 16 f = f_0; t_{PER} = 10ms BER = 50(1)	I_{Eemin}		–1000		pA	B
7.4	Min. detection threshold current with AC current disturbance IIN_AC100 = 3µA at 100Hz		I_{Eemin}		–2000		pA	C
7.5	Max. detection threshold current with V_{IN} > 0V	Test signal: V_S = 5V, T_{amb} = 25°C I_{IN_DC} = 1µA square pp burst N = 16 f = f_0; t_{PER} = 10ms BER = 5%(1)	I_{Eemax}	–500			µA	D
8	**Controlled Amplifier and Filter**							
8.1	Maximum value of variable gain (CGA)	V_S = 5V, T_{amb} = 25°C	G_{VARMAX}		50		dB	D
8.2	Minimum value of variable gain (CGA)	V_S = 5V, T_{amb} = 25°C	G_{VARMIN}		–6		dB	D
8.3	Total internal amplification(2)	V_S = 5V, T_{amb} = 25°C	G_{MAX}		72		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		kHz	C

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

Notes: 1. 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

2. After transformation of input current into voltage

4.1 ESD

2000V HBM; ESD STM5.1-2007, JESD22-A114F 2008, AEC-Q100-002-Ref-D 750V CDM; ESD STM.5.3.1-1999

4.2 Reliability

Electrical qualification (1000h at 150°C) in molded SO8 plastic package.

5. Typical Electrical Curves at T_{amb} = 25°C

Figure 5-1. I_{Eemin} versus I_{IN_DC}, V_S = 3V

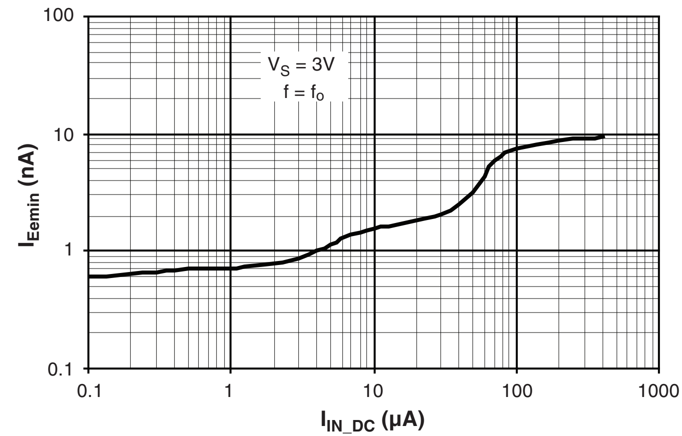


Figure 5-2. I_{Eemin} versus I_{IN_DC}, V_S = 5V

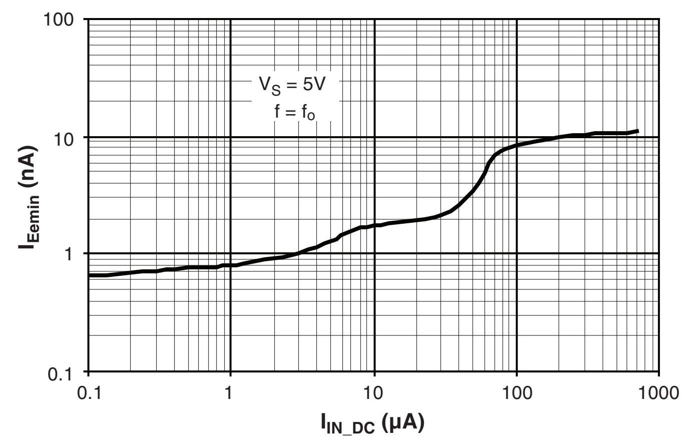


Figure 5-3. V_{IN} versus I_{IN_DC}, V_S = 3V

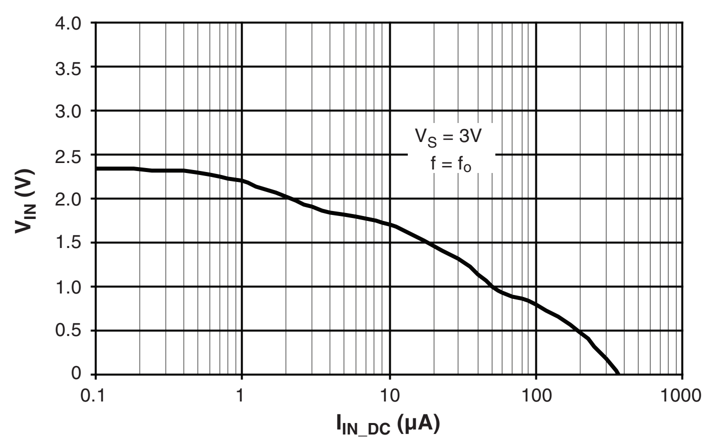


Figure 5-4. V_{IN} versus I_{IN_DC}, V_S = 5V

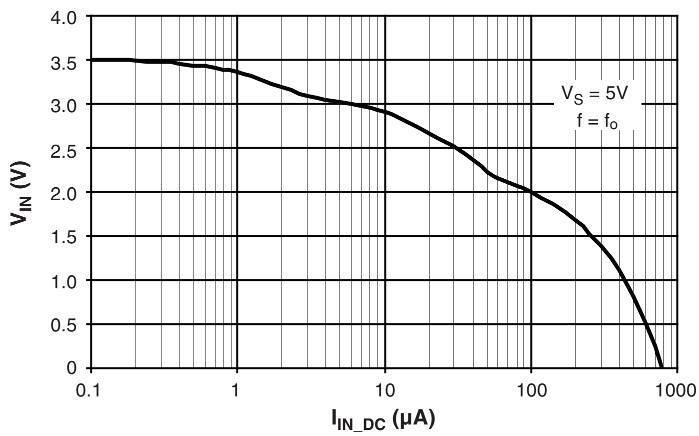


Figure 5-5. Data Transmission Rate, V_S = 3V

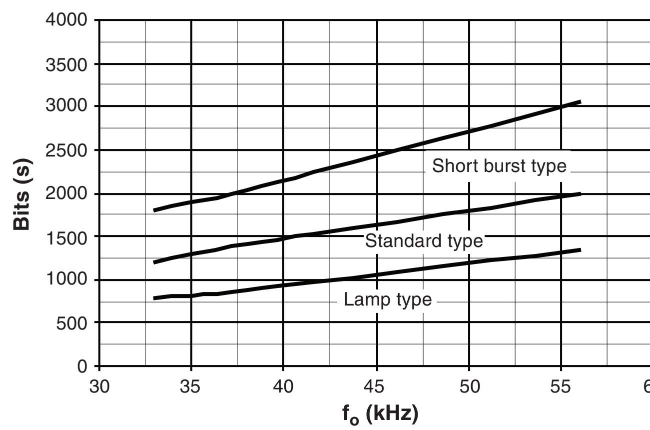


Figure 5-6. Data Transmission Rate, V_S = 5V

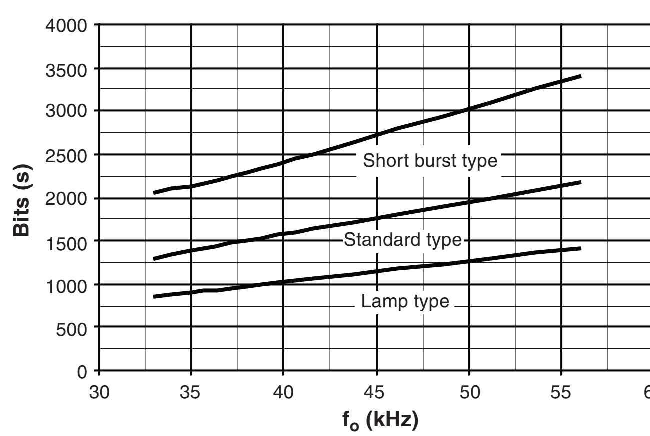
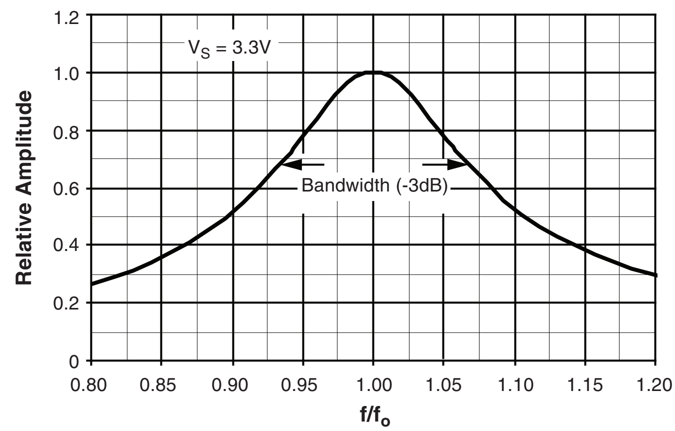
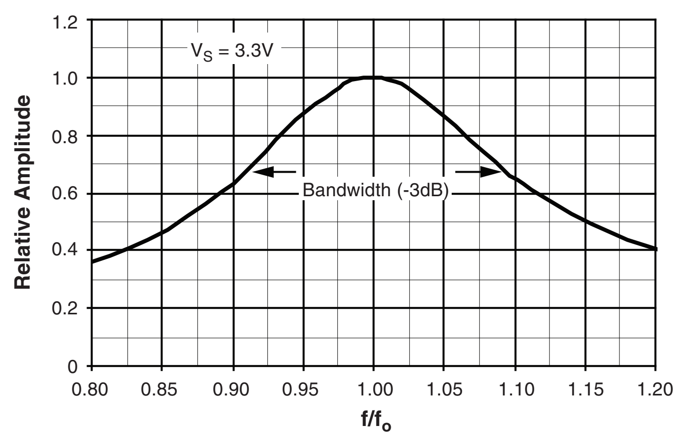


Figure 5-7. Typical Bandpass Curve Standard and Lamp Type



Q = (f/fo) /B; B -> –3dB values
Example: Q = 1/(1.06 – 0.94) = 8.3

Figure 5-8. Typical Bandpass Curve Short Burst Type



Q = (f/fo) /B; B -> –3dB values
Example: Q = 1/(1.08 – 0.93) = 6.7

Figure 5-9. Illustration of Used Terms, Example: f = 38kHz, burst with 16 pulses, 16 periods

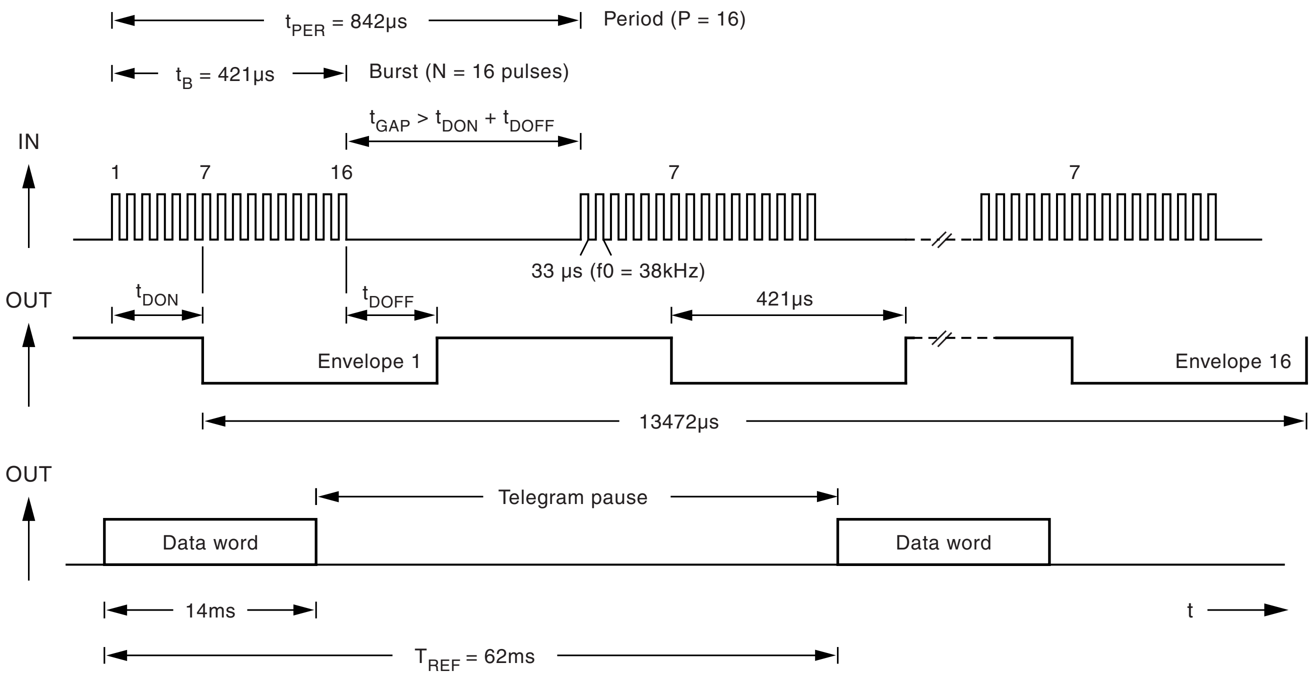


Figure 5-10. Test Circuit

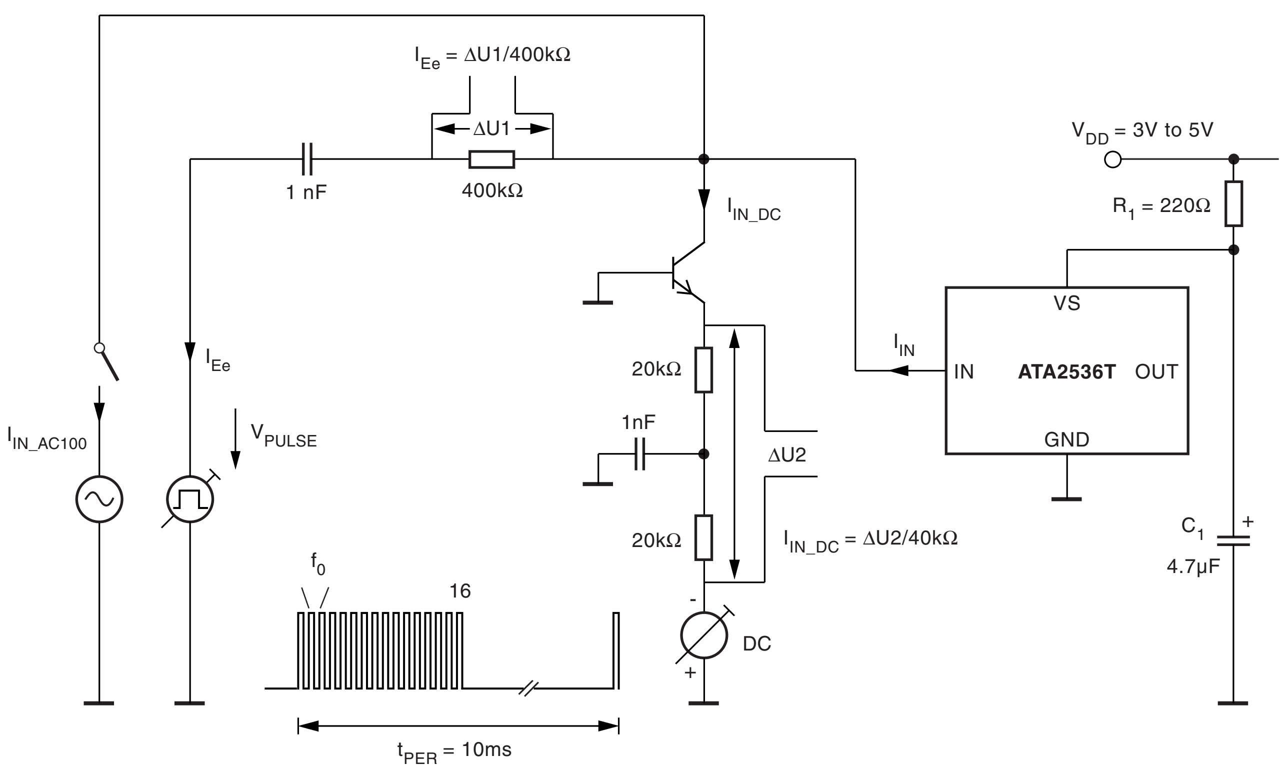
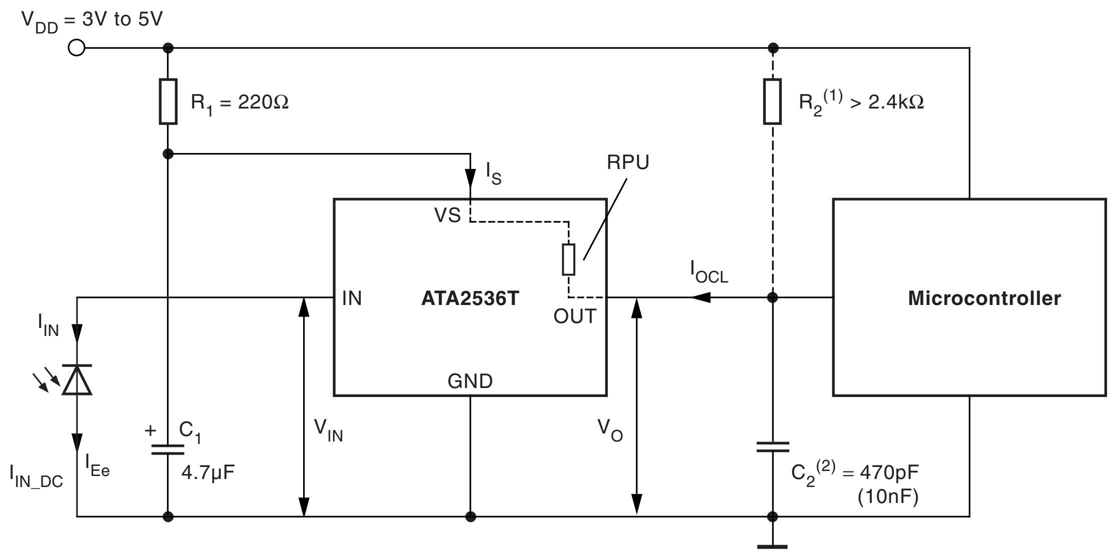


Figure 5-11. Application Circuit



(1) Optional

(2) The value of C_2 is dimensioned for the short burst type ATA2536T7xx. For the other types C_2 can be omitted.

In case of an optional resistor R_2 > 2.4kΩ the value of C_2 must be increased to C_2 = 10nF. For the other types C_2 = 470pF is sufficient.

6. Ordering Information

Delivery: unsawn wafers (DDW) in box

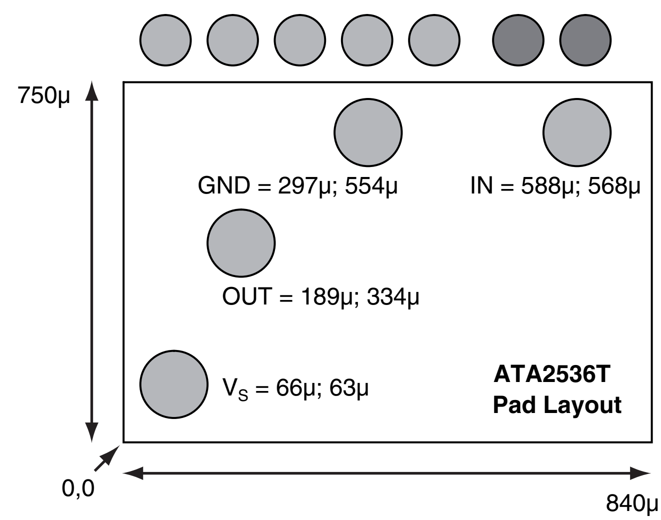
Extended Type Number	D(2)	Type
ATA2536T1xx(1)-DDW	2175	**Standard type:** ≥ 10 pulses, high data rate
ATA2536T3xx(1)-DDW	1400	**Lamp type:** ≥ 10 pulses, enhanced suppression of disturbances, secure data transmission
ATA2536T7xx(1)-DDW	3415	**Short burst type:** ≥ 6 pulses, highest data rate

Notes: 1. xx means carrier frequency value (36, 37, 38 or 40kHz typical), frequency value 33kHz and 56kHz on request

2. Maximum data transmission rate up to bits/s with f_0 = 56kHz, V_S = 5V

6.1 Pad Layout and Dimensions

Figure 6-1. Pad Layout



Note: The pad coordinates are given for the centre of the pad, values in µm from the origin (0;0)

Dimensions	Length inclusive scribe	0.75mm
	Width inclusive scribe	0.84mm
	Thickness	290µm ± 5%
	Pads	80µm diameter
	Fusing pads	60µm diameter
Pad metallurgy	Material	AlSiCu
	Thickness	1.0µm
Finish	Material	PSG + Si_3N_4
	Thickness	1.0µm

Table 6-1. Pin Description

SYMBOL	FUNCTION
OUT	Data output
VS	Supply voltage
GND	GND
IN	Input pin diode
Zapping	f_0 adjust
Versioning	Type adjust

7. 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
9226B-AUTO-09/11	• Figure 5-11 “Application Circuit” on page 11 updated

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