

## Features

- No External Components Except PIN Diode
- Supply-voltage Range: 4.5V to 5.5V
- High Sensitivity Due to Automatic Sensitivity Adaption (AGC) and Automatic Strong Signal Adaption (ATC)
- High Immunity Against Disturbances from Daylight and Lamps
- Small Size and Innovative Pad Layout
- Available for Carrier Frequencies between 33 kHz to 40 kHz; Adjusted by Zener Diode Fusing
- TTL and CMOS Compatible
- Suitable Minimum Burst Length  $\geq 10$  Pulses/Burst

## Applications

- Home Entertainment Applications
- Home Appliances
- Remote Control Equipment

## 1. Description

The IC ATA2525 is a complete IR receiver for data communication that was 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 ATA2525 is available with standard carrier frequencies (33, 36, 37, 38, 40 kHz) and 3 different noise suppression regulation types (standard, lamp, noise) covering requirements of different high-volume remote control solutions (please refer to selection guide available for ATA2525/ATA2526). The ATA2525 operates in a supply voltage range of 4.5V to 5.5V.

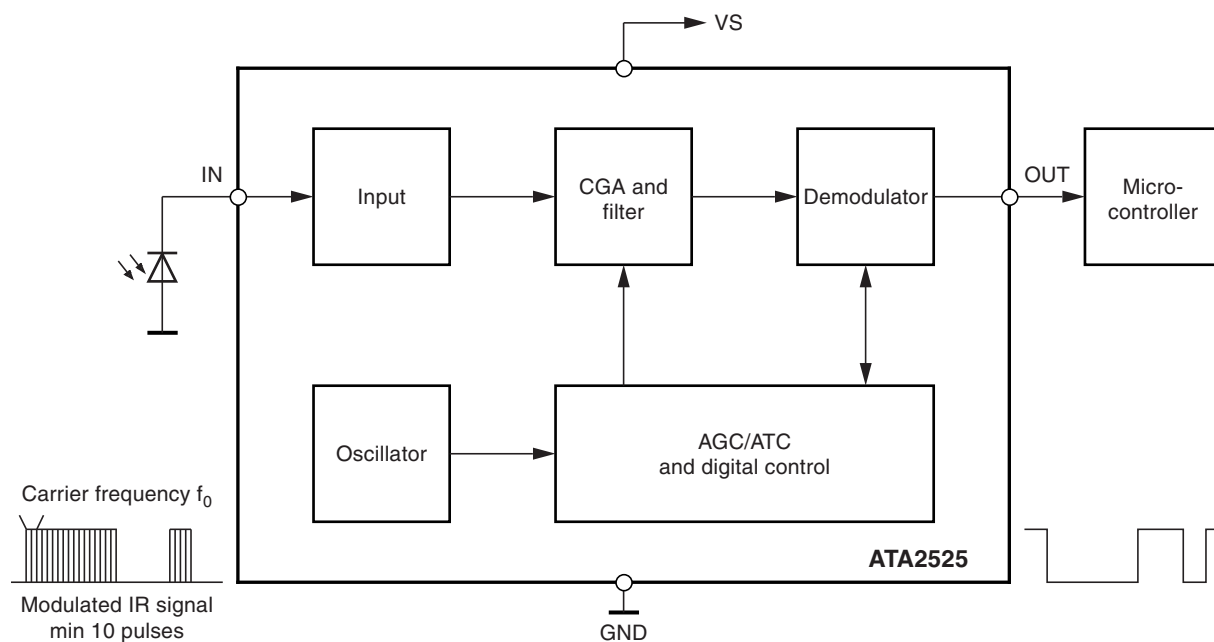
The function of ATA2525 can be described using the block diagram (see [Figure 1-1 on page 2](#)). The input stage meets two main functions. First, it provides a suitable bias voltage for the PIN diode. Secondly, the pulsed photo-current signals are transformed into a voltage by a special circuit which 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 to convert the input burst signal into 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 condition (ambient light, modulated lamps etc.). Other special features are used to adapt to the current application to secure best transmission quality.



## IR Receiver ASSP

## ATA2525

**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.

| Parameters                                  | 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   |

## 3. Electrical Characteristics

$T_{amb} = -25^\circ C$  to  $+85^\circ C$ ,  $V_S = 4.5V$  to  $5.5V$  unless otherwise specified.

| No.      | Parameters                                                    | Test Conditions                                                      | Symbol          | Min.         | Typ. | Max.  | Unit       | Type* |
|----------|---------------------------------------------------------------|----------------------------------------------------------------------|-----------------|--------------|------|-------|------------|-------|
| <b>1</b> | <b>Supply</b>                                                 |                                                                      |                 |              |      |       |            |       |
| 1.1      | Supply-voltage range                                          |                                                                      | $V_S$           | 4.5          | 5    | 5.5   | V          | C     |
| 1.2      | Supply current                                                | $I_{IN} = 0$                                                         | $I_S$           | 0.8          | 1.1  | 1.4   | mA         | B     |
| <b>2</b> | <b>Output</b>                                                 |                                                                      |                 |              |      |       |            |       |
| 2.1      | Internal pull-up resistor                                     | $T_{amb} = 25^\circ C$ ;<br>see <a href="#">Figure 5-7 on page 8</a> | $R_{PU}$        |              | 40   |       | k $\Omega$ | A     |
| 2.2      | Output voltage low                                            | $I_L = 2$ mA;<br>see <a href="#">Figure 5-7 on page 8</a>            | $V_{OL}$        |              |      | 250   | mV         | B     |
| 2.3      | Output voltage high                                           | $T_{amb} = 25^\circ C$                                               | $V_{OH}$        | $V_S - 0.25$ |      | $V_S$ | V          | A     |
| 2.4      | Output current clamping                                       | $R_2 = 0$ ;<br>see <a href="#">Figure 5-7 on page 8</a>              | $I_{OCL}$       |              | 8    |       | mA         | B     |
| <b>3</b> | <b>Input</b>                                                  |                                                                      |                 |              |      |       |            |       |
| 3.1      | Input DC current                                              | $V_{IN} = 0$ ;<br>see <a href="#">Figure 5-7 on page 8</a>           | $I_{IN\_DCMAX}$ | –85          |      |       | $\mu A$    | C     |
| 3.2      | Input DC current;<br>see <a href="#">Figure 5-1 on page 5</a> | $V_{IN} = 0$ ; $V_S = 5V$ ,<br>$T_{amb} = 25^\circ C$                | $I_{IN\_DCMAX}$ | –530         | –960 |       | $\mu A$    | B     |

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

- Notes:
- 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

### 3. Electrical Characteristics (Continued)

$T_{amb} = -25^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_S = 4.5\text{V}$  to  $5.5\text{V}$  unless otherwise specified.

| No.      | Parameters                                                                                                          | Test Conditions                                                                                                                                                                                                                                                                                              | Symbol        | Min. | Typ.  | Max. | Unit          | Type* |
|----------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------|-------|------|---------------|-------|
| 3.3      | Minimum detection threshold current;<br>see <a href="#">Figure 5-2 on page 5</a>                                    | Test signal:<br>see <a href="#">Figure 5-6 on page 7</a><br>$V_S = 5\text{V}$ ,<br>$T_{amb} = 25^{\circ}\text{C}$ ,<br>$I_{IN\_DC} = 1\text{ }\mu\text{A}$ ;<br>square pp,<br>burst $N = 16$ ,<br>$f = f_0$ ; $t_{PER} = 10\text{ ms}$ ,<br>see <a href="#">Figure 5-6 on page 7</a> ;<br>$BER = 50^{(1)}$   | $I_{Eemin}$   |      | -600  |      | pA            | B     |
| 3.4      | Minimum detection threshold current with AC current disturbance<br>$I_{IN\_AC100} = 3\text{ }\mu\text{A}$ at 100 Hz | Test signal:<br>see <a href="#">Figure 5-6 on page 7</a><br>$V_S = 5\text{V}$ ,<br>$T_{amb} = 25^{\circ}\text{C}$ ,<br>$I_{IN\_DC} = 1\text{ }\mu\text{A}$ ,<br>square pp,<br>burst $N = 16$ ,<br>$f = f_0$ ; $t_{PER} = 10\text{ ms}$ ,<br>see <a href="#">Figure 5-6 on page 7</a> ;<br>$BER = 50\%^{(1)}$ | $I_{Eemin}$   |      | -850  |      | pA            | C     |
| 3.5      | Maximum detection threshold current                                                                                 | Test signal:<br>see <a href="#">Figure 5-6 on page 7</a><br>$V_S = 5\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$ ,<br>$I_{IN\_DC} = 1\text{ }\mu\text{A}$ ;<br>square pp,<br>burst $N = 16$ ,<br>$f = f_0$ ; $t_{PER} = 10\text{ ms}$ ,<br>see <a href="#">Figure 5-6 on page 7</a> ;<br>$BER = 5\%^{(1)}$     | $I_{Eemax}$   | -400 |       |      | $\mu\text{A}$ | D     |
| <b>4</b> | <b>Controlled Amplifier and Filter</b>                                                                              |                                                                                                                                                                                                                                                                                                              |               |      |       |      |               |       |
| 4.1      | Maximum value of variable gain (CGA)                                                                                | $V_S = 5\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$                                                                                                                                                                                                                                                           | $G_{VARMAX}$  |      | 51    |      | dB            | D     |
| 4.2      | Minimum value of variable gain (CGA)                                                                                | $V_S = 5\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$                                                                                                                                                                                                                                                           | $G_{VARMIN}$  |      | -5    |      | dB            | D     |
| 4.3      | Total internal amplification <sup>(2)</sup>                                                                         | $V_S = 5\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$                                                                                                                                                                                                                                                           | $G_{MAX}$     |      | 71    |      | dB            | D     |
| 4.4      | Center frequency fusing accuracy of bandpass                                                                        | $V_S = 5\text{V}$ , $T_{amb} = 25^{\circ}\text{C}$                                                                                                                                                                                                                                                           | $f_{0\_FUSE}$ | -3   | $f_0$ | +3   | %             | A     |
| 4.5      | Overall accuracy center frequency of bandpass                                                                       |                                                                                                                                                                                                                                                                                                              | $f_0$         | -6.7 | $f_0$ | +4.1 | %             | C     |
| 4.6      | BPF bandwidth                                                                                                       | -3 dB; $f_0 = 38\text{ kHz}$ ;<br>see <a href="#">Figure 5-4 on page 6</a>                                                                                                                                                                                                                                   | B             |      | 3.5   |      | kHz           | B     |

\*) 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. Reliability

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

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

Figure 5-1.  $V_{IN}$  versus  $I_{IN\_DC}$ ,  $V_S = 5V$

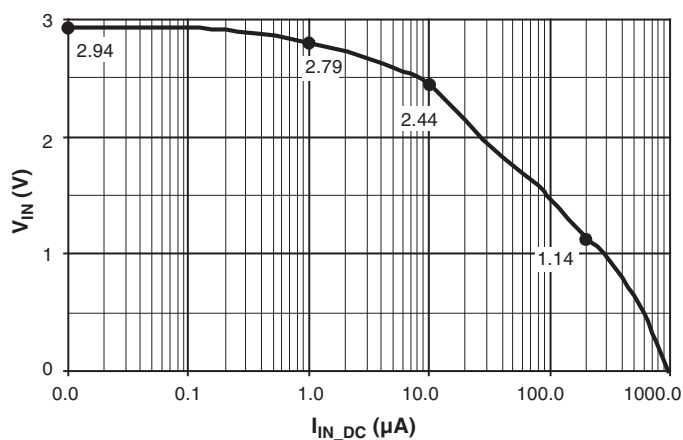
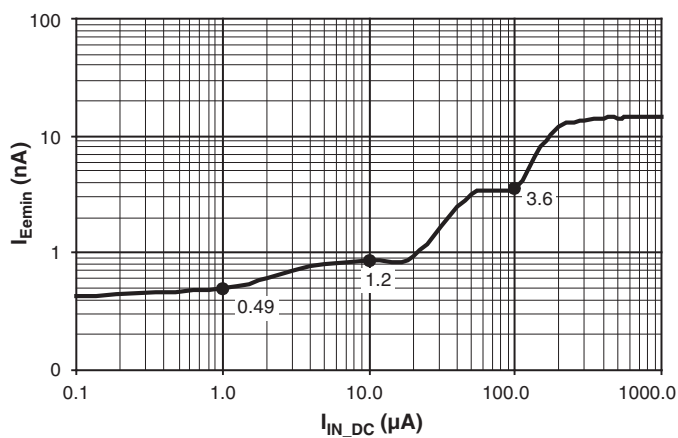
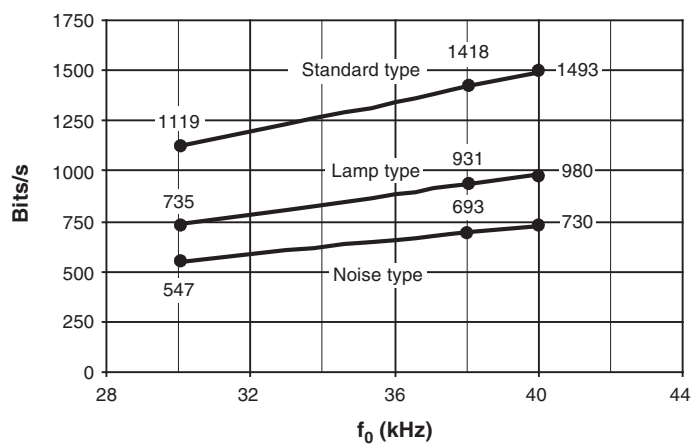


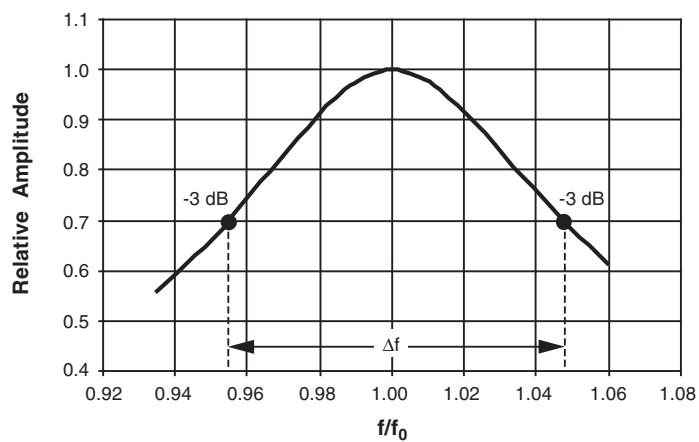
Figure 5-2.  $I_{Eemin}$  versus  $I_{IN\_DC}$ ,  $V_S = 5V$



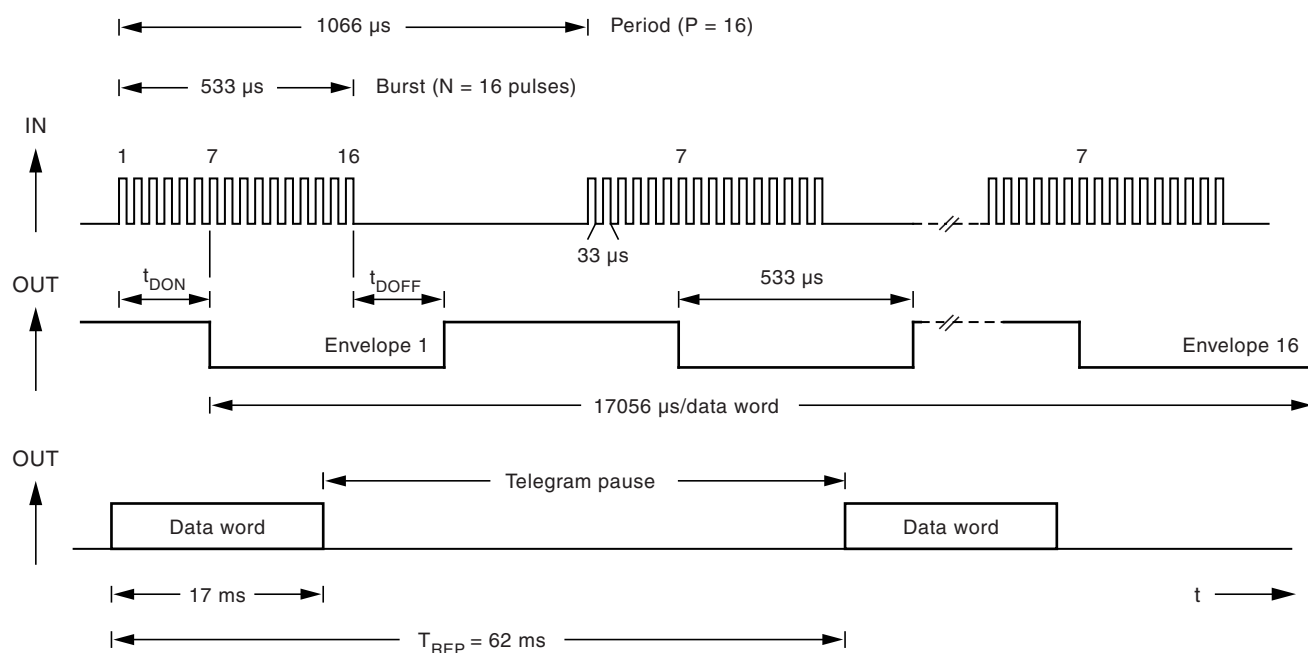
**Figure 5-3.** Data Transmission Rate,  $V_S = 5V$



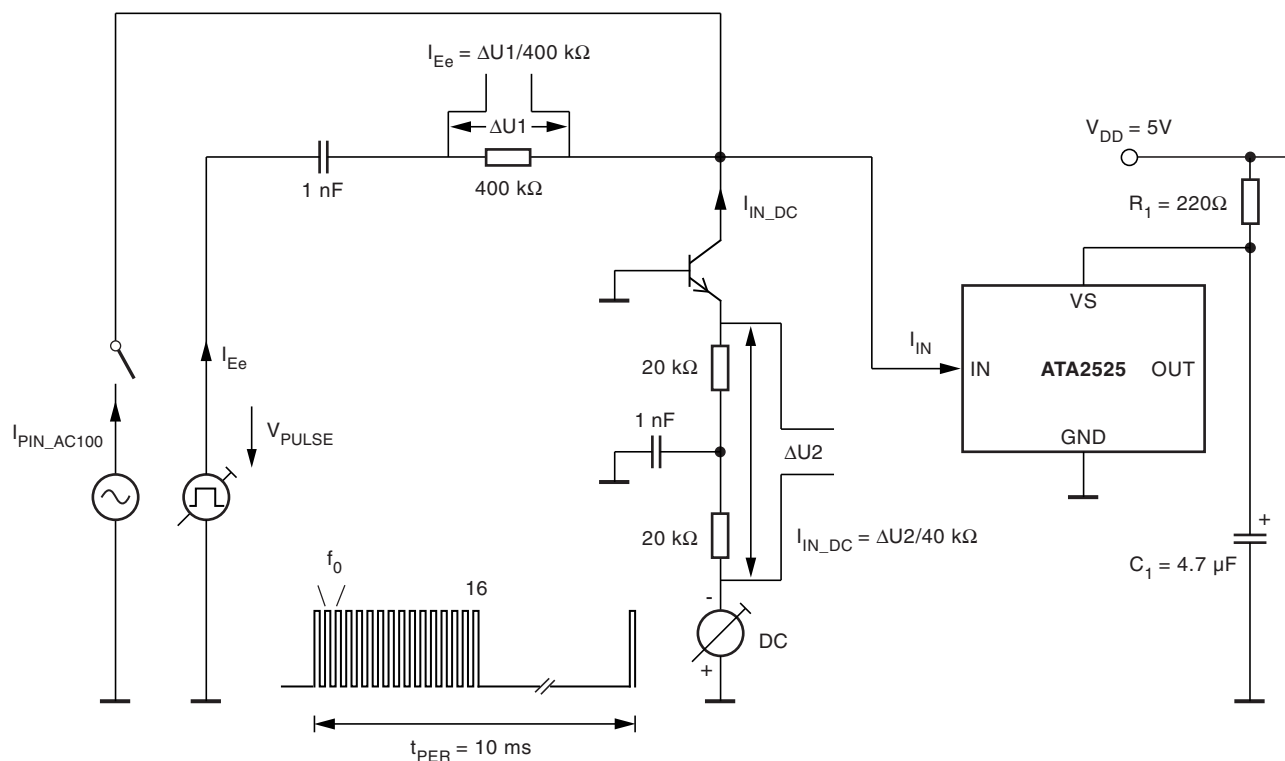
**Figure 5-4.** Typical Bandpass Curve

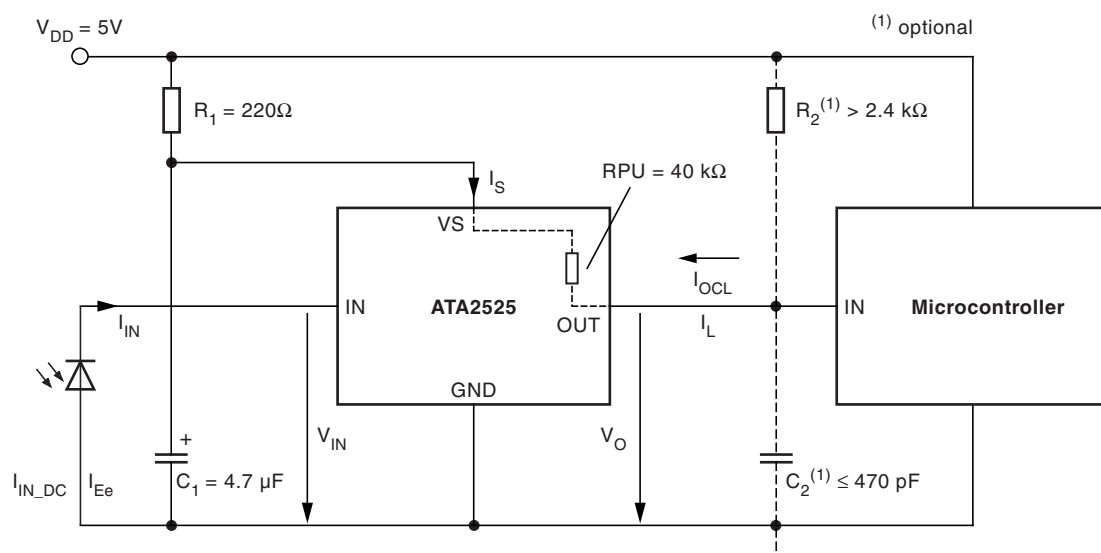


$$Q = f_0/\Delta f; \Delta f = -3 \text{ dB values. Example: } Q = 1/(1.047 - 0.954) = 11$$

**Figure 5-5.** Illustration of Used Terms

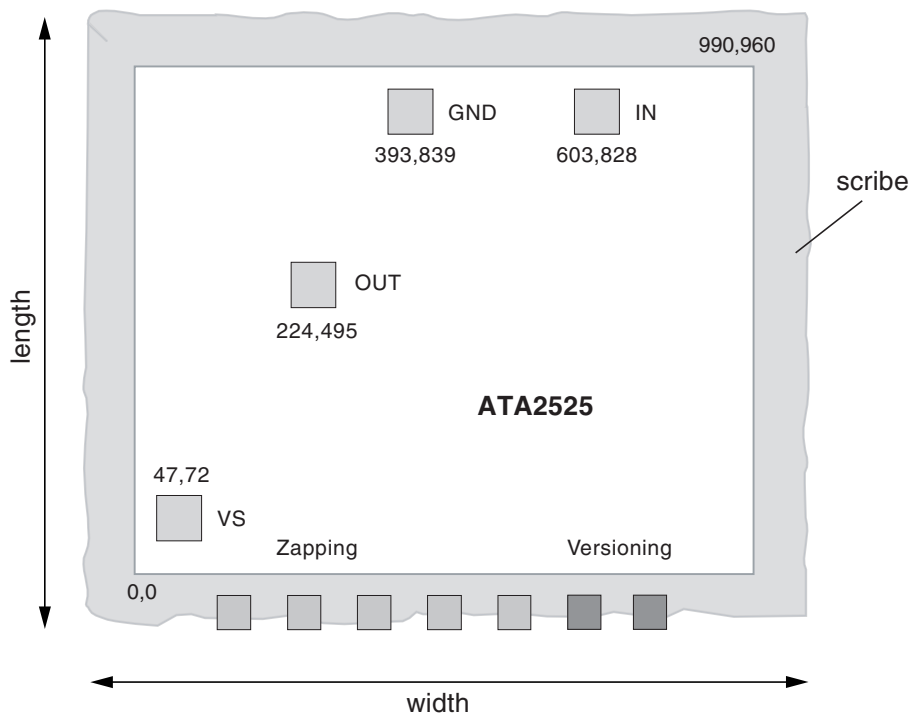
Example:  $f = 30 \text{ kHz}$ , burst with 16 pulses, 16 periods

**Figure 5-6.** Test Circuit



## 6. Chip Dimensions

Figure 6-1. Chip Size in  $\mu\text{m}$



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

|                       |                         |                                                                 |
|-----------------------|-------------------------|-----------------------------------------------------------------|
| <b>Dimensions</b>     | Length inclusive scribe | 1.04 mm                                                         |
|                       | Width inclusive scribe  | 1.11 mm                                                         |
|                       | Thickness               | $290\mu \pm 5\%$                                                |
|                       | Pads                    | $80\mu \times 80\mu$                                            |
|                       | Fusing pads             | $60\mu \times 60\mu$                                            |
| <b>Pad metallurgy</b> | Material                | AlCu/AlSiTi <sup>(1)</sup>                                      |
|                       | Thickness               | 0.8 $\mu\text{m}$                                               |
| <b>Finish</b>         | Material                | Si <sub>3</sub> N <sub>4</sub> /SiO <sub>2</sub> <sup>(1)</sup> |
|                       | Thickness               | 0.7/0.3 $\mu\text{m}$                                           |

Note: 1. Value depends on manufacture location.

## 7. Ordering Information

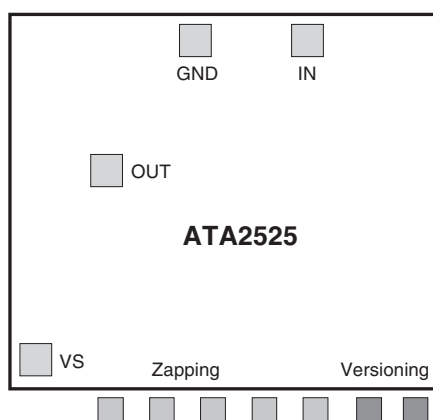
Delivery: unsawn wafers (DDW) in box

| Extended Type Number             | D <sup>(2)</sup> | Type                                                                             |
|----------------------------------|------------------|----------------------------------------------------------------------------------|
| ATA2525S1xx <sup>(1)</sup> C-DDW | 1493             | <b>Standard type:</b> high data rate                                             |
| ATA2525S3xx <sup>(1)</sup> C-DDW | 980              | <b>Lamp type:</b> enhanced suppression of disturbances, secure data transmission |
| ATA2525S5xx <sup>(1)</sup> C-DDW | 730              | <b>Noise type:</b> best suppression of disturbances, low data rate               |

- Notes:
- xx means the used carrier frequency value (33, 36, 37, 38 or 40 kHz)
  - Maximum data transmission rate up to bits/s with  $f_0 = 40$  kHz,  $V_S = 5$  V (see [Figure 5-2 on page 5](#))

## 8. Pad Layout

**Figure 8-1.** Pad Layout



**Table 8-1.** Pin Description

| Symbol     | Function        |
|------------|-----------------|
| OUT        | Data output     |
| VS         | Supply voltage  |
| GND        | GND             |
| IN         | Input pin diode |
| Zapping    | $f_0$ adjust    |
| Versioning | Type adjust     |

## 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4854G-AUTO-05/10 | <ul style="list-style-type: none"> <li>• Page 3: Thermal Resistance table deleted</li> <li>• Page 3 and 4: Pin column in Electrical Characteristics table deleted</li> </ul>                                                                                                                                                                                                                                                                                                                                        |
| 4854F-AUTO-09/09 | <ul style="list-style-type: none"> <li>• Put datasheet in newest template</li> <li>• Ordering Information table changed</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                  |
| 4854E-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 2 "Pin Configuration" on page 2 deleted</li> <li>• Section 4 "Electrical Characteristics" number 3.3 on page 4 changed</li> <li>• Section 4 "Electrical Characteristics" number 3.4 on page 4 changed</li> <li>• Section 6 "ESD" on page 5 deleted</li> <li>• Section 10 "Ordering Information" on page 10 changed</li> </ul> |
| 4854D-AUTO-04/06 | <ul style="list-style-type: none"> <li>• Put datasheet in a new template</li> <li>• Section 10 "Ordering Information" on page 10 changed</li> </ul>                                                                                                                                                                                                                                                                                                                                                                 |



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