Features

- **Identification transponder in plastic cube**
- **Basic component: e5530 IDIC®**
- **Includes coil and capacitor for tuned circuit antenna**
- **Adjusted to 125 kHz carrier frequency**

Application

- **Car immobilizer**
- **Access control**
- **Alarm systems**
- **Other identification systems**

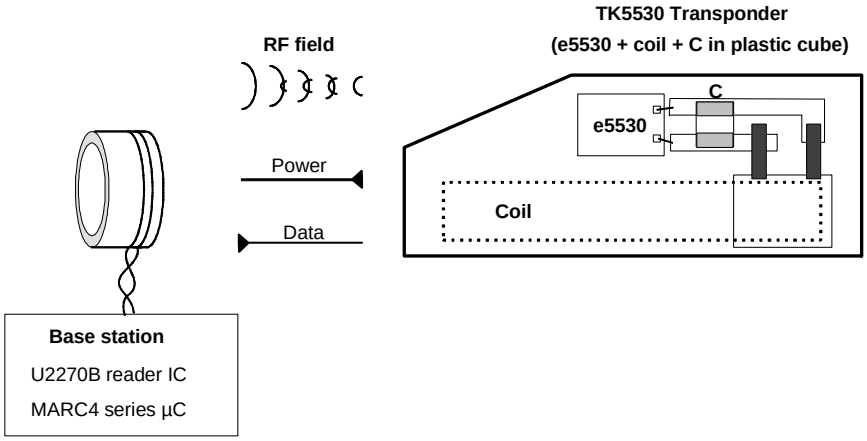
Description

The TK5530 is a complete transponder, which implements all important functions for immobilizer and identification systems. It consists of a plastic cube which accommodates the read-only IDIC® *) e5530 and the antenna is realized by a LC-circuit.The identifying data are stored in a 128 bit PROM on the e5530, realized as an array of laser-programmable fuses. The logic block diagram for the e5530 is shown in figure 2. The data are sent bit-serially as a code.

Any attempt to fake the base station with a wrong transponder will be recognized immediately.

System Block Diagram

Figure 1.



Read-Only Transponder

TK5530

*) IDIC® stands for **ID**entification **I**ntegrated **C**ircuit and is a trademark of Atmel.

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General

The transponder consists of a plastic cube which accommodates following components:

- Read-only IDIC® with ROM (e5530)
- Antenna realized as tuned LC-circuit

Read-Only IDIC®

with ROM (e5530)

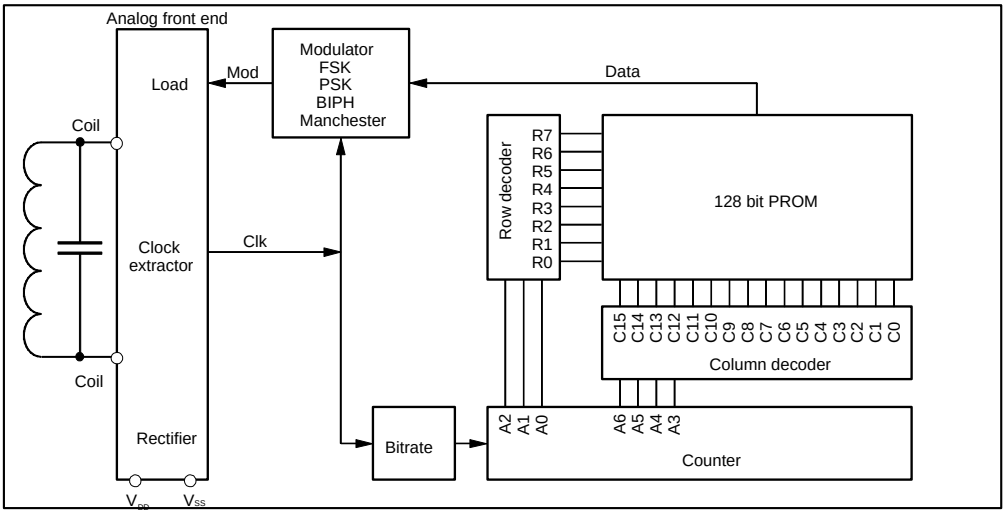
The e5530 is part of a closed coupled identification system (see figure 1). It receives power from a RF transmitter (reader) which is coupled inductively to the IDIC. The TK5530 transponder operates at a nominal frequency of 125 kHz. Receiving RF, the IDIC responds with a data stream by damping the incoming RF via an internal load. This damping in turn can be detected by the reader. The identifying data are stored in a 128-bit PROM on the e5530, which is factory programmed with a unique code (see specification of the e5530).

The e5530 has several possible options regarding modulation, bitrate, memory size etc.

Antenna

The antenna consists of a coil and a capacitor for tuning the circuit to the nominal carrier frequency of 125 kHz. The coil has a ferrite-core for improving the readout distance.

Figure 2.



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Operating temperature range	T_{amb}	-40 to +85	°C
Storage temperature range	T_{stg}	-40 to +125	°C
Assembly temperature t < 5 min	T_{ass}	170	°C
Magnetic field strength at 125 kHz	H_{pp}	1000	A/m

Operating Characteristics Transponder

T_{amb} = 25°C, f = 125 kHz unless otherwise specified

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Inductance		L		3.95		mH
LC circuit, $H_{pp = 20 A/m}$						
Resonance frequency	Room temperature	f_r	121.4	125	129.2	kHz
Resonance frequency	T_{amb} = -40 to +85°C	f_r	120.0		131.0	kHz
Quality factor		Q_{LC}		13		
Magnetic Field Strength (H)						
Max. field strength where tag does not modulate	No influence to other tags in the field	$H_{pp\ not}$		2		A/m
Field strength for operation	T_{amb} = -40°C	$H_{pp\ -40}$		30		A/m
Field strength for operation	T_{amb} = 25°C	$H_{pp\ 25}$		18		A/m
Field strength for operation	T_{amb} = 85°C	$H_{pp\ 85}$		17		A/m
Maximun field strength		$H_{pp\ max}$			600	A/m
Modulation Range (see also H-DV curve)						
Modulation range	H_{pp} = 20 A/m H_{pp} = 30 A/m H_{pp} = 50 A/m H_{pp} = 100 A/m	DV		4.0 6.0 8.0 8.0		V

Figure 3. Typical T_K-range of resonance frequency

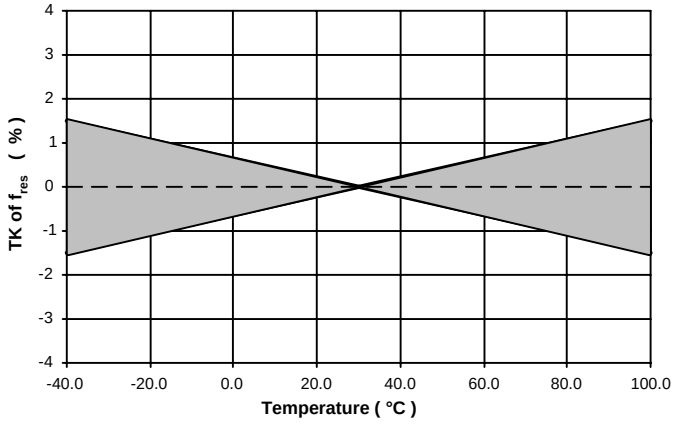


Figure 4. Typical H-DV curve

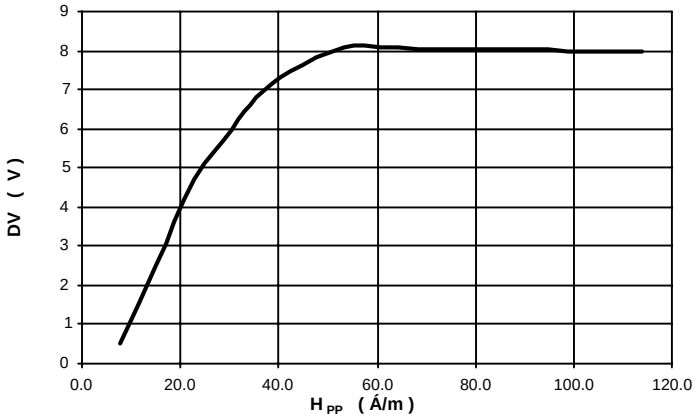
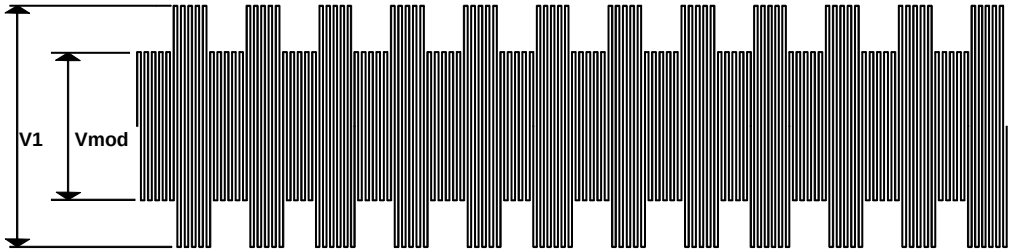


Figure 5. Measurement of the modulation range DV

Output voltage of the testing application (see figure 6 and 7)



DV = V1-Vmod

Measurement Assembly

All parameters are measured in a Helmholtz-arrangement, which generates a homogenous magnetic field (see figure 6 and 7). A function generator drives the field generating coils, so the magnetic field can be varied in frequency and field strength.

Figure 6. Testing application

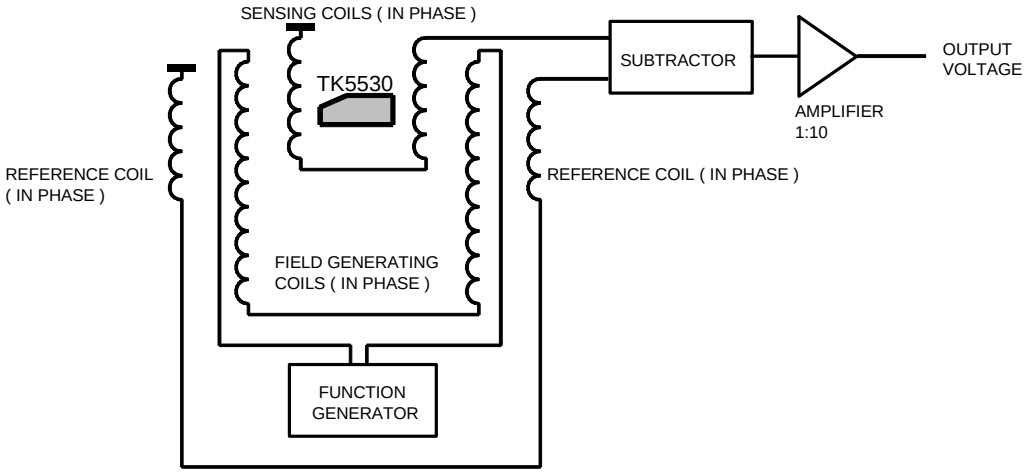
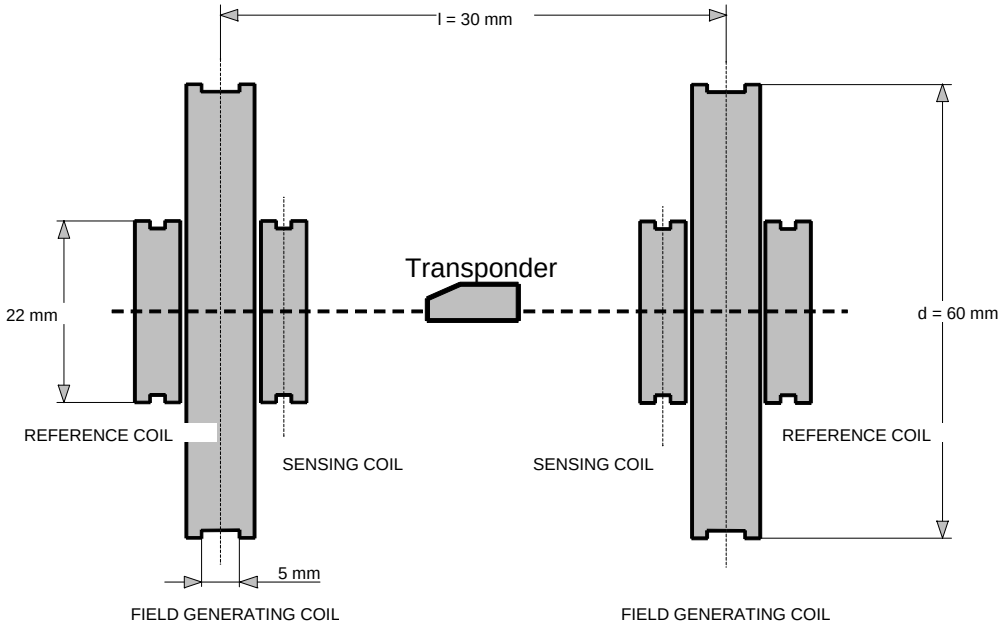


Figure 7. Testing geometry



IDIC® (Reference Data Sheet e5530)

Memory size maximum	128 Bit (details see “Coding”)
Memory type	ROM
Programming	Laser cutting
Data rate	RF/32 - RF/64
Encoding	Manchester or Bi-phase
Modulation	AM
Maximum coil voltage (internally limited) V_{pp} (I = 5 mA)	16 V

Coding

The memory of the TK5530 can be selected to be a 64- or 128-bit rolling code. In the non-standard version, the first 8 bits are a customer-specific pattern. This can be selected by the customer, provided that Atmel agrees to the customer’s proposal. This pattern is unique within the serial rolling code data stream. The ID code and further bit informations following the 8-bit header can also be defined within the customer’s specification.

The set-up of a suitable coding scheme can be provided on customer’s request.

Read Distance

The maximum distance between the base station and the TK5530 mainly depends on the base station, the coil geometries and the modulation options chosen (see U2270B Antenna Design Hints and the U2270B data sheet). When generating an appropriate field with a suitable reader technique, a distance of 10 cm and more can be obtained. When using the Atmel U2270B demo board, the typical distances in the range of 0 to 5 cm can be achieved. Maximum distance values which are generally valid can not be given in this data sheet. The exact measuring of the maximum distance should be carried out with the TK5530 being integrated into the specific application.

Ordering Information

Extended Type Number	Modul.	Data Rate	Con-figuration	Check-sum	Header	ID Code	SPQ (Minimum Volume)	Minimum Order Volume
TK5530HM-232-PP	Manch.	RF/32	64 bit	no check-sum	E6	fixed and unique code	10 kpcs	>1 kpcs (per order, from stock)
TK5530HM-zzz-PP	defined by customer							> 300 kpcs p.a.

Note: 1) Definition of customized part number basing on orders for first year volume (300 kpcs)
2) Definition of header, ID code, checksum etc. according to customers data base
3) 8.000 US$ initial cost for metal mask
4) Lead time 5 month
5) Low volume customized application can be covered by TK5550F-PP programming, for identical application, as TK5530H-zzz-PP.

Ordering number for standard version: TK5530HM-232-PP

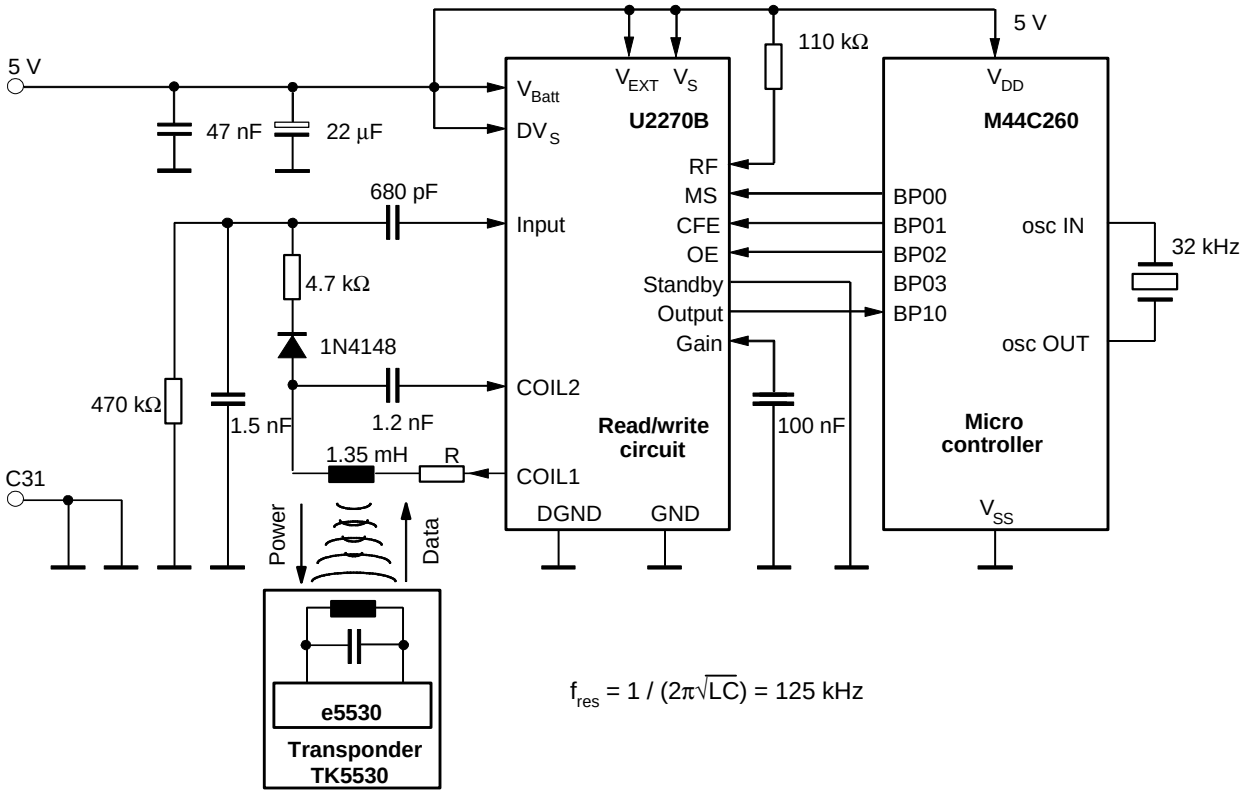
Ordering number for customized version:

TK5530xy-zzz-PP

- Plastic package
- Custom code
- Modulation
  - M -> Manchester code
  - B -> Biphase code
- Mask version of die

Application

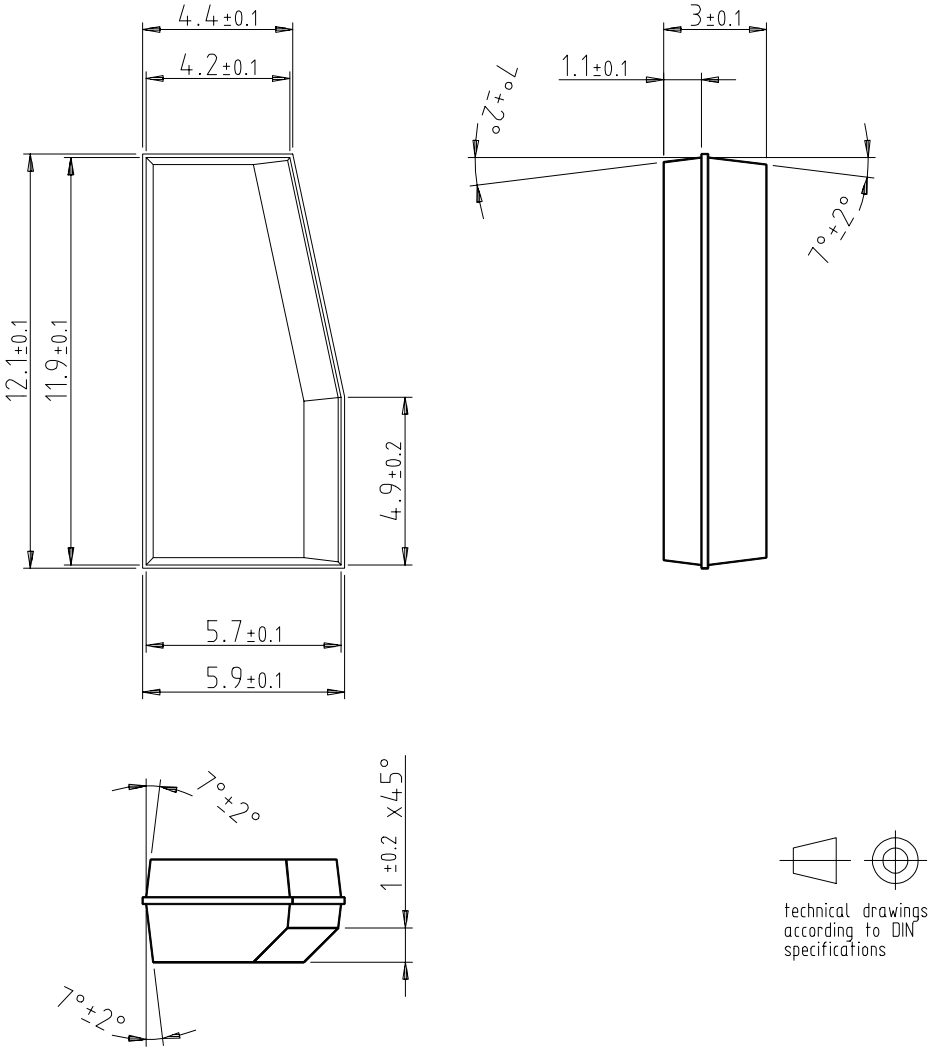
Figure 8. Complete transponder system with the read/write base-station IC U2270B



$f_{res} = 1 / (2\pi\sqrt{LC}) = 125$ kHz

Package Information

Dimensions in mm



Ozone Depleting Substances Policy Statement

It is the policy of **Atmel Germany GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Atmel Germany GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Atmel Germany GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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Data sheets can also be retrieved from the Internet: http://www.atmel-wm.com

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