Sensor & Wireless Control Solutions for Industrial and Consumer Applications

[www.infineon.com/sensors]
MORE POWERFUL EQUIPMENT and more complex specifications in industrial and consumer applications require more intelligent sensors with high accuracy and fast data transfer for contactless control systems.

TODAY, SEMICONDUCTOR SENSORS fulfill these increasing requirements in a cost-effective way. State-of-the-art semiconductor sensors are small, robust and energy-efficient with low power consumption. Typical applications for semiconductor sensors are switches, index counting, position detection, current measurement or pressure measurements. A growing number of semiconductor sensors feature digital interfaces and have also started taking over functions from the microcontroller, such as pre-processing tasks.

HIGHER DEMANDS for convenience and cost-effectiveness are driving the application of wireless interconnections, such as in automatic metering reading, access control, heating and air-conditioning control or security applications.

THANKS TO THE MORE than 30 years of experience in electronics, we have steadily developed smarter sensors and combined different requirements taken from sensor and wireless technologies. Furthermore, the wide experience we have gained in industrial, consumer and automotive fields, enables us to provide sensors and wireless control solutions, which comply with the specific demands of industrial and consumer applications—even under extreme conditions. Worldwide, we supply pressure and magnetic sensors as well as wireless control ICs in all key applications.

This brochure includes details of our latest sensor and wireless control products.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetic Sensors</td>
<td>4</td>
</tr>
<tr>
<td>Pressure Sensors</td>
<td>14</td>
</tr>
<tr>
<td>Wireless Control</td>
<td>16</td>
</tr>
<tr>
<td>Packages</td>
<td>25</td>
</tr>
</tbody>
</table>
Magnetic Sensors

Position sensing is a key element for improving system performance in industrial and consumer applications. The TLE 49xx series provides a wide range of sensors for position detection, i.e. Hall-effect switches and linear Hall-effect sensors. Both types of sensors use the well-known Hall-effect to transform the position information into an electrical signal. This allows for the design of very robust systems, e.g. against wear and tear, dust and particles.
TLE 49x5: Uni- and Bipolar Hall IC Switches for Magnetic Field Applications

This integrated Hall IC switch series consists of uni- and bipolar Hall switches which offer high reliability at low cost. The products are intended for industrial and consumer applications.

Features
- Temperature-compensated magnetic performance
- Digital output signal
- For unipolar and alternating magnetic fields
- Large temperature range
- Protection against reversed polarity
- Output protection against electrical disturbances
- Available in leaded (PG-SSO-3-2, designator “L”) and SMD (SOT89, designator “G”) packages

Applications
- Position/proximity indicator
- Rotational indexing
- Brushless DC motor control

<table>
<thead>
<tr>
<th>Type</th>
<th>$B_{op}$</th>
<th>$B_{ip}$</th>
<th>$\Delta B_{op}$</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE 4905L/G</td>
<td>7 18</td>
<td>5 16</td>
<td>2 6</td>
<td>PG-SSO-3-2/SOT89</td>
<td>unipolar switch</td>
</tr>
<tr>
<td>TLE 4935L/G</td>
<td>10 20</td>
<td>-20 -10</td>
<td>20 40</td>
<td>PG-SSO-3-2/SOT89</td>
<td>bipolar latch</td>
</tr>
<tr>
<td>TLE 4945L</td>
<td>-6 10</td>
<td>-10 6</td>
<td>2 10</td>
<td>PG-SSO-3-2</td>
<td>bipolar switch</td>
</tr>
<tr>
<td>TLE 4945-2L/G</td>
<td>-3 6</td>
<td>-6 3</td>
<td>1 5</td>
<td>PG-SSO-3-2/SOT89</td>
<td>bipolar switch</td>
</tr>
</tbody>
</table>

in mT at $T_j = 25^\circ$C
TLE 49x6: Chopped Uni- and Bipolar Hall IC Switches for Magnetic Field Applications

The TLE 49x6 is a family of high-precision, uni- and bipolar Hall-effect switches based on chopped Hall probes. Building on the successful TLE 49x5 Hall-effect family of switches, the improved TLE 49x6 product family broadens the existing product portfolio. These new devices are ideal for industrial applications, such as sensing, commutation and index counting. The TLE 49x6 offers enhanced accuracy and robustness against electrical disturbances. This product is available as a two-wire sensor with current interface, a unipolar switch, a bipolar latch and a double Hall-effect latch with speed signal and direction information. Tiny SMD packages and slim leaded packages are available for high flexibility in design.

Features
- Chopped Hall system for high sensitivity and stability of magnetic switching points
- High jitter performance
- High resistance to mechanical stress due to active error compensation
- Low supply voltage capability
- Available in leaded (PG-SSO-3-2, PG-SSO-4-1, designator “L”) and SMD (SC59, TSOP6-3, designator “K”) packages
- Double Hall switch (TLE 4966L/K) with two independent Hall probes spaced at 1.45mm on one die, providing speed and direction information
- Two-wire current interface output (TLE 4976)

Applications
- Position detection systems (e.g. seat position)
- Brushless DC motor commutation
- Index counting

<table>
<thead>
<tr>
<th>Type</th>
<th>$B_{op}$</th>
<th>$B_{ap}$</th>
<th>$\Delta B_{off}$</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE 4906L/K</td>
<td>6 5</td>
<td>13.5 12</td>
<td>0.7 3</td>
<td>PG-SSO-3-2/SC59</td>
<td>unipolar switch</td>
</tr>
<tr>
<td>TLE 4946K</td>
<td>11 17</td>
<td>12 -12</td>
<td>22 34</td>
<td>SC59</td>
<td>latch</td>
</tr>
<tr>
<td>TLE 4946-1L</td>
<td>11 19</td>
<td>-19 -11</td>
<td>22 38</td>
<td>PG-SSO-3-2</td>
<td>latch</td>
</tr>
<tr>
<td>TLE 4946-2K/L</td>
<td>0.5 3.5</td>
<td>-0.5 -3.5</td>
<td>1.0 6.0</td>
<td>PG-SSO-3-2/SC59</td>
<td>latch</td>
</tr>
<tr>
<td>TLE 4966L/K</td>
<td>5 10</td>
<td>-10 -5</td>
<td>10 20</td>
<td>PG-SSO-4-1/TSOP6-3</td>
<td>double latch</td>
</tr>
<tr>
<td>TLE 4976L</td>
<td>1 6</td>
<td>3 8</td>
<td>0.5 3.5</td>
<td>PG-SSO-3-2</td>
<td>unipolar switch/ current interface</td>
</tr>
<tr>
<td>TLE 4976-1K</td>
<td>5.5 11</td>
<td>5 10.5</td>
<td>0.5 3</td>
<td>SC59</td>
<td>unipolar switch/ current interface</td>
</tr>
<tr>
<td>TLE 4976-2K</td>
<td>0.5 4.8</td>
<td>2 6</td>
<td>0.5 3</td>
<td>SC59</td>
<td>unipolar switch/ current interface</td>
</tr>
</tbody>
</table>

in mT at $T_j = 25^\circ C$
TLE 4913/17: Low Power Hall IC Switches

Extremely low power consumption and a tiny SMD package define both the TLE 4913 and the TLE 4917 as the ideal switches for applications such as cover detection in battery-powered devices (cellular phones, PDAs, etc.). Due to their outstanding sensitivity, small and low-cost magnets can be applied.

**Features**

- Low power consumption (10µW)
- Min. supply voltage of 2.4V
- Omnipolar magnetic switching characteristics
- TLE 4917: Output selectable by programming pin to regular or inverse
- SMD packages: TLE 4913 in SC59 and TLE 4917 in TSOP6
- Low harmful substances compliant to ROHS

<table>
<thead>
<tr>
<th>Type</th>
<th>$B_{oP}$</th>
<th>$B_{oP}$</th>
<th>$\Delta B_{Th}$</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLE 4913</td>
<td>3.5</td>
<td>2.7</td>
<td>0.8</td>
<td>SC59 (SOT23 pin compatible)</td>
</tr>
<tr>
<td>TLE 4917</td>
<td>5.0</td>
<td>4.0</td>
<td>1.0</td>
<td>TSOP6-1</td>
</tr>
</tbody>
</table>

in mT
Linear Hall ICs

All products of our Linear Hall family work on the basis of measuring the vertical component of a magnetic field. The output signal they generate is directly proportional to the sensed magnetic field. Based on these principles, our TLE 499x family of Linear Hall ICs has been specifically designed to meet the requirements of highly accurate angular and linear position detection, as well as for current measurement applications.

Typical Applications for our Linear Hall family include
- Linear and angular position sensing
- Suspension control
- Liquid level sensing, e.g. in fuel tanks, boilers
- High current sensing
- Battery management
- Robotics and automation
- Medical appliances and white goods
- Lever, valve, flap position sensing
- Auto focussing (camera lenses)

TLE 4990: Programmable Analog Linear Hall Sensor

The TLE 4990 is a Linear Hall sensor based on an analog signal path, providing a ratiometric analog output signal. Its gain and offset as well as the sensor’s clamping can be programmed with fuses. The sensor also incorporates a pre-programmed temperature compensation for increased stability.

Features
- Linear ratiometric output
- Programmable in sensitivity (gain), offset and clamping
- Temperature coefficient typically calibrated to 350ppm/°C
- Slim package PG-SSO-4-1 (1.0mm thickness)
- High voltage capability and reverse polarity protection
- On-board diagnostics (OBD) for broken wire detection
- Fully pre-programmed type (TLE 4990 E6782) available with sensitivity 20mV/mT, offset 2.5V and no clamping

<table>
<thead>
<tr>
<th>Parameter</th>
<th>TLE 4990</th>
<th>TLE 4997</th>
<th>TLE 4998P</th>
<th>TLE 4998S</th>
<th>TLE 4998C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>analog</td>
<td>analog</td>
<td>PWM</td>
<td>SENT</td>
<td>SPC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(digital)</td>
<td>(digital)</td>
<td>(digital)</td>
</tr>
<tr>
<td>Programmable</td>
<td>OTPROM</td>
<td>EEPROM</td>
<td>EEPROM</td>
<td>EEPROM</td>
<td>EEPROM</td>
</tr>
<tr>
<td>Number of pins</td>
<td>4</td>
<td>3</td>
<td>3/4</td>
<td>3/4</td>
<td>3/4</td>
</tr>
<tr>
<td>Package</td>
<td>PG-SSO-4-1</td>
<td>PG-SSO-3-10</td>
<td>PG-SSO-3-9</td>
<td>PG-SSO-3-9</td>
<td>PG-SSO-3-9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PG-SSO-3-10</td>
<td>PG-SSO-3-10</td>
<td>PG-SSO-3-10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PG-SSO-4-1</td>
<td>PG-SSO-4-1</td>
<td>PG-SSO-4-1</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>15 ... 180</td>
<td>±12.5 ... ±300</td>
<td>±0.2 ... ±6</td>
<td>±8.2 ... ±245</td>
<td>±8.2 ... ±245</td>
</tr>
<tr>
<td>Magnetic offset</td>
<td>–</td>
<td>±400</td>
<td>±400</td>
<td>±400</td>
<td>±400</td>
</tr>
<tr>
<td>Supply voltage (extended range)</td>
<td>5 ±10%</td>
<td>5 ±10% (7)</td>
<td>5 ±10% (16)</td>
<td>5 ±10% (16)</td>
<td>5 ±10% (16)</td>
</tr>
</tbody>
</table>
TLE 4997: Programmable Analog Linear Hall Sensor

The high-precision 12-bit Linear Hall sensor TLE 4997 provides a ratiometric analog output voltage and incorporates EEPROM memory for flexible programming of many parameters. Digital signal processing using a 16-bit DSP architecture and digital temperature compensation guarantees excellent temperature stability compared to analog compensation methods.

Features
- 20-bit digital signal processing
- 12-bit overall resolution at wide output range
- 3 magnetic ranges: ±50/100/200mT
- Low ratiometric error, low integral and excellent differential nonlinearity
- Fully digital and deterministic second order temperature compensation
- Programmable transfer function (gain, offset), clamping, bandwidth and temperature characteristic
- Wide temperature range: -40 ... 150°C
- Low zero field offset and exceptionally low offset drift
- On-board diagnostics for pull-up/down loads
- Over/under voltage detection
- Mechanical robustness
- EMC, micro-break, reverse polarity and short circuit robustness on all pins
- Ultra low noise figure
- Parameter EEPROM with single bit error correction

TLE 4998P/S/C: Programmable Digital Linear Hall Sensors

The TLE 4998 is based on a similar concept to the TLE 4997. The analog interface is replaced by a selection of digital output protocols. The interface options include Pulse Width Modulation (PWM), Single Edge Nibble Transmission (SENT) as well as Short PWM Codes (SPC). The sensor is conveniently programmable in EEPROM and is available in two different leaded packages. With its temperature and stress compensation features, it provides outstanding performance stability over both temperature and lifetime.

Features
- 20-bit digital signal processing
- 12-bit overall resolution
- 3 magnetic ranges: ±50/100/200mT
- Low drift of output signal over-temperature and lifetime
- Digital temperature compensation
- Programmable transfer function (gain, offset), clamping, bandwidth and temperature characteristic
- Wide temperature range: -40 ... 150°C
- Re-programmable until memory lock
- Single supply voltage 4.5–5.5V (4.1–16V in extended range)
- On-board diagnostics (overvoltage, EEPROM error)
- Reverse polarity and overvoltage protection for all pins as well as output short-circuit protection
- High immunity to EMC, ESD and mechanical stress (stress compensation)
- Temperature information transmitted in SENT and SPC types
- Synchronous operation, range selection and bus capability with SPC interface
TLE 4921-5U
The robust, economical solution for wheel speed sensing

Features
- Dynamic differential sensor
- Dynamic offset cancellation
- -40 ... 150°C temperature range
- Temperature compensated magnetic performance
- High sensitivity
- Customer-selectable cutoff frequency
- EMI, reverse-polarity, and over-voltage protection

Applications
- Crankshaft speed and position
- Transmission speed
- Speedometer
- Camshaft position

TLE 4927C
The robust, economical solution for wheel speed sensing

Features
- High sensitivity
- Single-chip solution
- Symmetrical thresholds
- High resistance to Piezo effects
- Advanced performance by dynamic self-calibration principle
- South and north pole preinduction possible
- 1Hz low cutoff frequency
- Digital output signal
- Two-wire and three-wire configuration possible
- Wide operating temperature range
- Fast start-up time
- Large operating air gaps
- Reverse voltage protection at $V_{S\text{-PIN}}$
- Short-circuit and over-temperature protection of output
- No external filter capacitor required
- Digital output signal (voltage interface)
- Module style package with two 4.7nF integrated capacitors
- Hidden adaptive hystereses

Applications
- Crankshaft speed and position
- Automatic transmissions
TLE 4926C-HT(N) E6747

Features
- High sensitivity
- Single-chip solution
- Symmetrical thresholds
- High resistance to Piezo effects
- Advanced performance by dynamic self-calibration principle
- South and north pole preinduction possible
- 1Hz low cutoff frequency
- Digital output signal
- Two-wire and three-wire configuration possible
- Wide operating temperature range
- Fast start-up time
- Large operating air gaps
- Reverse-voltage protection at $V_S$, PIN
- Short-circuit and over-temperature protection of output
- No external filter capacitor required
- Digital output signal (voltage interface)
- Module style package with two integrated capacitors
  - 4.7nF between Q and GND
  - 47nF between $V_S$ and GND: needed for micro cuts in power supply
- High temperature profile

Applications
- Crankshaft speed and position

TLE 4928C

Features
- High sensitivity
- Single-chip solution
- Symmetrical thresholds
- High resistance to Piezo effects
- Advanced performance by dynamic self-calibration principle
- South and north pole preinduction possible
- 1Hz low cutoff frequency
- Digital output signal
- Two-wire and three-wire configuration possible
- Wide operating temperature range
- Fast start-up time
- Large operating air gaps
- Reverse-voltage protection at $V_S$, PIN
- Short-circuit and over-temperature protection of output
- No external filter capacitor required
- Digital output signal (voltage interface)
- Module style package with two 4.7nF integrated capacitors

Applications
- Three-wire low-end automatic transmission applications
TLE 5011: GMR-Based Angular Sensor

The TLE 5011 is a 360° angle sensor, which detects the orientation of a magnetic field. This is achieved by measuring sine and cosine angle components with monolithic integrated Giant Magneto Resistance elements (iGMR). The data communication is accomplished via a bi-directional Synchronous Serial Communication (SSC) Interface that is SPI compatible.

Features
- Giant Magneto Resistance (GMR)-based principle
- Full 0° to 360° angle measurement
- Highly accurate single bit SD-ADC
- 16-bit representation of sine/cosine values on the interface
- Bi-directional SSC Interface up to 2Mbit/s
- 3-pin SSC Interface, SPI compatible with Open Drain
- Patented online diagnoses for sensor elements and circuitry with PRO-SIL™ support IEC 61508 and ISO WD 26262
- 0.25µm CMOS technology
- Automotive qualified: -40 ... 150°C (junction temperature)
- ESD > 2kV (HBM)
- Green package with lead-free (Pb-free) plating

Applications
- General angular sensing
- Robotics and automation
- Medical appliances and white goods
- Brushless DC motor commutation
- Industrial joysticks
- Potentiometer replacement
- Wearless control dial and rotary switches
Pressure Sensors

The KP12x pressure sensor family is an extension of Infineon’s proven pressure-sensing technology. Its products are ideally suited for industrial, automotive and consumer applications. The sensor is a miniaturized absolute-pressure sensor IC based on the capacitive principle. It is surface-micromachined with a monolithic integrated signal conditioning circuit, implemented in state-of-the-art 0.5 micron BiCMOS technology. The KP12x family products are high-precision ICs for cost-sensitive solutions packaged in a convenient “Green” SMD (Surface Mount Device) housing allowing environmentally conscious design. Also incorporated are open supply, open ground and broken pressure cell detection and inverse polarity protection in these sensors to assure customers more reliable products. Infineon provides a variety of sensor derivates with highest quality specially designed for various applications.
KP12x: Barometric Air Pressure Sensor IC Family

Features
- Family of derivatives (automotive/industrial/consumer) available
- Absolute air pressure measurement based on capacitive principle
- Excellent accuracy of 1.0kPa over a large temperature range
- Ratiometric analog output proportional to the applied pressure
- Output signal fully compensated over pressure and temperature
- Pressure range from 40 to 165kPa
- Temperature range from -40 ... 125°C
- Output clamping (optional)
- Serial service interface
- Open bond detection for supply and GND (OBD)
- Detection of broken pressure cells
- Inverse polarity protection
- “Green” SMD package
- KP Demonstrator USB-Stick available (SP000463010)
- Customized transfer functions (only KP126)

Applications
- Industrial and process controls
- Gas flow
- Level meter
- Barometric pressure
- Altitude compensation systems
- Weather stations
- Engine management systems
- Medical equipment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Derivatives</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KP123</td>
<td>KP124</td>
</tr>
<tr>
<td>Basic accuracy</td>
<td>Typ. 1.5% F.S.</td>
<td>1.5% F.S.</td>
</tr>
<tr>
<td>Transfer function pressure min.</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Transfer function pressure max.</td>
<td>115</td>
<td>115</td>
</tr>
<tr>
<td>Transfer function voltage min.</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Transfer function voltage max.</td>
<td>4.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Operating pressure range</td>
<td>40–115</td>
<td>40–115</td>
</tr>
</tbody>
</table>
Wireless Control

Wireless control has become an indispensable item of everyday life. Starting from routines like gate and garage door openers, window shutters and remote controls through meter reading and wireless fire alarms to any kind of wireless sensing application, wireless control devices have established themselves as a cost-efficient and robust solution.
Reliable Transmission with Wireless Control

Infineon offers a comprehensive and complementary product portfolio of transmitter, receiver and transceiver products for the sub 1GHz frequency bands. The new generation SmartLEWIS™ products stand for Smart Low Energy Wireless Systems, which have a high level of integration and help to reduce system complexity and current consumption in an intelligent way. The SmartLEWIS™ RX products have an integrated digital baseband, enabling autonomous receive functionality without the need to wake up the microcontroller, and as such minimizing the system’s current consumption. The SmartLEWIS™ MCU products include a transmitter with embedded 8051 microcontroller, on-chip memory and many exciting peripherals, and as such form a highly efficient system-on-a-chip solution.

Wireless Control Product Portfolio Overview:

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmitter</strong></td>
<td></td>
</tr>
<tr>
<td>TDK 510x /F</td>
<td>ASK/FSK Transmitter family for low power (2 – 5dBm)</td>
</tr>
<tr>
<td>TDK 511x /F</td>
<td>ASK/FSK Transmitter family for high power (10dBm)</td>
</tr>
<tr>
<td>TDA 7100</td>
<td>ASK/FSK Transmitter optimized for Consumer Applications</td>
</tr>
<tr>
<td><strong>Receiver</strong></td>
<td></td>
</tr>
<tr>
<td>TDA 520x</td>
<td>ASK Receiver family</td>
</tr>
<tr>
<td>TDA 521x</td>
<td>ASK/FSK Receiver family</td>
</tr>
<tr>
<td>TDA 522x</td>
<td>ASK/FSK Receiver family with switchable peak detector</td>
</tr>
<tr>
<td>TDA 7200</td>
<td>ASK/FSK Receiver optimized for Consumer Applications</td>
</tr>
<tr>
<td><strong>SmartLEWIS™ RX</strong></td>
<td></td>
</tr>
<tr>
<td>TDA 523x</td>
<td>ASK/FSK Receiver family with digital baseband processing, multi-channel</td>
</tr>
<tr>
<td><strong>SmartLEWIS™ MCU</strong></td>
<td></td>
</tr>
<tr>
<td>PMA 51xx</td>
<td>ASK/FSK Transmitter family with embedded 8051 Microcontroller</td>
</tr>
<tr>
<td>PMA 71xx</td>
<td>ASK/FSK Transmitter family with embedded 8051 Microcontroller</td>
</tr>
<tr>
<td><strong>Transceiver</strong></td>
<td></td>
</tr>
<tr>
<td>TDA 525x</td>
<td>ASK/FSK Transceiver family</td>
</tr>
</tbody>
</table>
TDK 510x Transmitter Series for Low and Medium Power (2dBm–5dBm)

Features
- Frequency ranges 433–435MHz / 311–317MHz / 868–870MHz
- VCO without external components
- ASK and FSK modulation
- High-efficiency power amplifier
- Low supply current (typically 7mA)
- Voltage supply range 2.1 ... 4V
- Temperature range -40 ... 125°C
- Power down mode
- FSK switch

Additional Features TDK 5100
- Switchable frequency ranges
  433–435MHz / 868–870MHz
- Selectable crystal oscillator
  6.78MHz / 13.56MHz

Transmitter ICs for Wireless Control

The wireless control transmitter series offers a high level of integration and needs only a few external components. The device contains a fully integrated PLL synthesizer and a high-efficiency power amplifier to drive a loop antenna. A special circuit design and a unique power amplifier design are used to save current consumption and therefore to save battery life. In addition, features like a power down mode, a low power detect, a selectable crystal oscillator frequency and a divided clock output are implemented. The ICs can be used for both ASK and FSK modulation. The TDK 51xx products are qualified according to highest automotive standards serving a wide temperature range, whereas the TDA 7100 is optimized for consumer application requirements.
TDK 511xF Transmitter Series for High Power (10dBm)

Features
- High-efficiency power amplifier, typically 10dBm @ 3V
- ASK/FSK modulation
- Voltage supply range 2.1–4V
- Low supply current (typically 14mA @ 3V)
- Fully integrated frequency synthesizer
- VCO without external components
- Power down mode
- FSK switch

TDA 7100 Transmitter optimized for Consumer Applications

Features
- Like TDK 5100F but optimized for Consumer Electronic Requirements
- Temperature range -20 ... 70°C
- Not automotive qualified

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency [MHz]</th>
<th>$P_{out}$ [dBm]</th>
<th>Modulation</th>
<th>$V_s$ [V]</th>
<th>$I_s$ [mA]</th>
<th>Temperature [°C]</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDA 5102</td>
<td>905–925</td>
<td>2</td>
<td>ASK/FSK</td>
<td>2.1 ... 4.0</td>
<td>7</td>
<td>-25 ... 85</td>
<td>PG-TSSOP-16</td>
</tr>
<tr>
<td>TDA 5103A</td>
<td>344–347</td>
<td>5</td>
<td>ASK</td>
<td>2.1 ... 4.0</td>
<td>7</td>
<td>-25 ... 85</td>
<td>PG-TSSOP-10</td>
</tr>
<tr>
<td>TDK 5100</td>
<td>433–435</td>
<td>5</td>
<td>ASK/FSK</td>
<td>2.1 ... 4.0</td>
<td>7</td>
<td>-40 ... 125</td>
<td>PG-TSSOP-16</td>
</tr>
<tr>
<td>TDK 5101</td>
<td>311–317</td>
<td>5</td>
<td>ASK/FSK</td>
<td>2.1 ... 4.0</td>
<td>7</td>
<td>-40 ... 125</td>
<td>PG-TSSOP-16</td>
</tr>
<tr>
<td>TDK 5100F</td>
<td>433–435</td>
<td>5</td>
<td>ASK</td>
<td>2.1 ... 4.0</td>
<td>7</td>
<td>-40 ... 125</td>
<td>PG-TSSOP-10</td>
</tr>
<tr>
<td>TDK 5101F</td>
<td>311–317</td>
<td>5</td>
<td>ASK/FSK</td>
<td>2.1 ... 4.0</td>
<td>7</td>
<td>-40 ... 125</td>
<td>PG-TSSOP-10</td>
</tr>
<tr>
<td>TDA 7100</td>
<td>433–435</td>
<td>5</td>
<td>ASK</td>
<td>2.1 ... 4.0</td>
<td>7</td>
<td>-20 ... 70</td>
<td>PG-TSSOP-10</td>
</tr>
</tbody>
</table>

High Power

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency [MHz]</th>
<th>$P_{out}$ [dBm]</th>
<th>Modulation</th>
<th>$V_s$ [V]</th>
<th>$I_s$ [mA]</th>
<th>Temperature [°C]</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDK 5110F</td>
<td>433–435</td>
<td>10</td>
<td>ASK</td>
<td>2.1 ... 4.0</td>
<td>13.8</td>
<td>-40 ... 125</td>
<td>PG-TSSOP-10</td>
</tr>
<tr>
<td>TDK 5111F</td>
<td>314–317</td>
<td>10</td>
<td>ASK</td>
<td>2.1 ... 4.0</td>
<td>14</td>
<td>-40 ... 125</td>
<td>PG-TSSOP-10</td>
</tr>
<tr>
<td>TDK 5116F</td>
<td>866–870</td>
<td>10</td>
<td>ASK</td>
<td>2.1 ... 4.0</td>
<td>14.2</td>
<td>-40 ... 125</td>
<td>PG-TSSOP-10</td>
</tr>
</tbody>
</table>
TDA 520x
ASK Receiver Family

Features
- Frequency ranges
  308–312MHz, 343–347MHz,
  433–435MHz and 868–870MHz
- ASK demodulation
- Fully integrated VCO and PLL synthesizer
- RF input sensitivity < -107dBm
- Limiter with RSSI generation, operating at 10.7MHz
- Selectable reference frequency
- 2nd order low pass data filter with external capacitors
- Data slicer with self-adjusting threshold
- Power down mode with very low supply current (typically 50nA)
- Low supply current
- Supply voltage range 5V ±10%
- Temperature range -40 ... 85°C

Receiver ICs for Wireless Control

The wireless control receiver series is made up of a group of very low power consumption single chip ASK and FSK/ASK Superheterodyne Receivers (SHR). The IC offers a high level of integration and needs only a few external components. The devices contain a low noise amplifier (LNA), a double balanced mixer, a fully integrated VCO, a PLL synthesizer and a crystal oscillator. The TDA522x family also integrates a limiter with RSSI generator, a PLL FSK demodulator, a data filter, a data comparator (slicer) and a peak detector. Additionally, there is a power down feature to save battery life.

The TDA 52xx products are qualified according to highest automotive standards serving a wide temperature range, whereas the TDA 7200 is optimized for consumer application requirements.
TDA 521x/TDA 522x, ASK/FSK Receiver Family

Features
- Frequency ranges 300–340MHz, 400–440MHz and 810–870MHz
- FSK and ASK demodulation
- Fully integrated VCO and PLL synthesizer
- ASK sensitivity < -107dBm, FSK sensitivity < -100dBm
- Limiter with RSSI generation, operating at 10.7MHz
- Selectable reference frequency
- 2nd order low pass data filter with external capacitors
- Data slicer with self-adjusting threshold
- Switchable peak detector (TDA 5220/21 only)
- Switchable comparator
- Power down mode with very low supply current (typically 50nA)
- Supply voltage range 5V ±10%
- Low supply current (typically at 868MHz $I_S = 5.7\, \text{mA}$ in FSK mode, $I_S = 5.0\, \text{mA}$ in ASK mode)
- Temperature range -40 ... 105°C

Additional Features TDA 5221
- Dual modulus PLL (315/317MHz, 316/318MHz)

---

TDA 7200 optimized for Consumer Applications

Features
- Like TDA 5220 but optimized for Consumer Electronic Requirements
- Temperature range -20 ... 70°C
- Not automotive qualified

---

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency [MHz]</th>
<th>Sensitivity [dBm]</th>
<th>1dBc Point [dBm]</th>
<th>$V_T$ [V]</th>
<th>$I_S$ [mA]</th>
<th>Temperature [°C]</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDA 5200</td>
<td>433–435</td>
<td>-107</td>
<td>-15</td>
<td>5</td>
<td>4.6</td>
<td>-40 ... 85</td>
<td>PG-TSSOP-28</td>
</tr>
<tr>
<td></td>
<td>868–870</td>
<td></td>
<td></td>
<td></td>
<td>4.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDA 5201</td>
<td>311–317</td>
<td>-110</td>
<td>-14</td>
<td>5</td>
<td>4.6</td>
<td>-40 ... 85</td>
<td>PG-TSSOP-28</td>
</tr>
<tr>
<td></td>
<td>343–347</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASK/FSK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDA 5210/</td>
<td>400–440</td>
<td>-106 (ASK)</td>
<td>-15</td>
<td>5</td>
<td>5.0 (ASK)</td>
<td>-40 ... 105</td>
<td>PG-TSSOP-28</td>
</tr>
<tr>
<td>TDA 5220/</td>
<td>810–870</td>
<td>-100 (FSK)</td>
<td></td>
<td></td>
<td>5.7 (FSK)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDA 5211/</td>
<td>300–340</td>
<td>-110 (ASK)</td>
<td>-14</td>
<td>5</td>
<td>5.6 (ASK)</td>
<td>-40 ... 105</td>
<td>PG-TSSOP-28</td>
</tr>
<tr>
<td>TDA 5221/</td>
<td>316–318</td>
<td>-102 (FSK)</td>
<td></td>
<td></td>
<td>6.4 (FSK)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>315/317</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDA 7200</td>
<td>400–440</td>
<td>-106 (ASK)</td>
<td>-15</td>
<td>5</td>
<td>5.0 (ASK)</td>
<td>-20 ... 70</td>
<td>PG-TSSOP-28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-100 (FSK)</td>
<td></td>
<td></td>
<td>5.7 (FSK)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SmartLEWIS™ RX, TDA 523x Series
ASK/FSK Autonomous Receiver Family

Wireless control—the TDA 523x series is a family of autonomous ASk/FSK receivers for the frequency bands 302–320MHz, 433–450MHz and 865–870MHz. A fully integrated RF synthesizer offers multi-channel capability. The IC integrates an image-reject RF front-end together with digital baseband processing. The digital baseband features fast symbol clock recovery based on a digital PLL plus automatic extraction of telegrams from run-in data. The data telegram can be screened for IDs before being stored in a FIFO data buffer. Autonomous self-polling reduces power consumption because it offloads the host in the receiver application. The device can switch between two configurations.

Features

- Frequency ranges
  - 302–320MHz, 433–450MHz
  - and 865–870MHz
- ASK/FSK demodulation
- Fully integrated RF synthesizer
- Multi-channel capability
- ASK sensitivity < -108dBm @ 434MHz
- Power down mode with very low supply current (typically 1µA)
- Low supply current (< 8mA active mode, < 50µA self-polling mode)
- Two supply voltage ranges possible:
  - 3.3V ±10% or 5V ±10%
- Temperature range -40 … 105°C
- Digital baseband processing with configurable data filter
- Fast symbol clock recovery
- Frame synchronization for automatic payload extraction
- Message content screening
- Dual configuration capability
- FIFO data buffer
- Digitally trimmable crystal oscillator
- External LNA controlled by receiver

<table>
<thead>
<tr>
<th>Type</th>
<th>TDA 5230</th>
<th>TDA 5231</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency range</td>
<td>433–450MHz, 865–870MHz</td>
<td>302–320MHz</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>&lt; -108dBm (ASK)</td>
<td>&lt; -108dBm (ASK)</td>
</tr>
<tr>
<td>Frequency setting</td>
<td>Integrated multi-channel PLL/VCO</td>
<td>Integrated multi-channel PLL/VCO</td>
</tr>
<tr>
<td>Loop filter</td>
<td>Internal</td>
<td>Internal</td>
</tr>
<tr>
<td>Data-rate</td>
<td>0.5 ... 20kbit/s Manchester</td>
<td>0.5 ... 20kbit/s Manchester</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>3.3V or 5V</td>
<td>3.3V or 5V</td>
</tr>
<tr>
<td>Supply current typ. (active mode/ self-polling mode)</td>
<td>8mA/50µA</td>
<td>8mA/50µA</td>
</tr>
<tr>
<td>Standby current (power down mode)</td>
<td>1µA</td>
<td>1µA</td>
</tr>
<tr>
<td>Demodulation</td>
<td>ASK/FSK</td>
<td>ASK/FSK</td>
</tr>
<tr>
<td>IP3</td>
<td>-22dBm</td>
<td>-22dBm</td>
</tr>
<tr>
<td>1dBc point</td>
<td>-33dBm</td>
<td>-33dBm</td>
</tr>
<tr>
<td>Package</td>
<td>PG-TSSOP-28</td>
<td>PG-TSSOP-28</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40 ... 105°C</td>
<td>-40 ... 105°C</td>
</tr>
</tbody>
</table>
SmartLEWIS™ MCU, PMA 71xx Family

Wireless control—the new SmartLEWIS™ MCU PMA 71xx Family comprises an ASK/FSK multiband transmitter for the sub 1GHz ISM frequency bands with embedded 8051 microcontroller as base functionality. Additionally, exciting peripheral functions are integrated, building a fully flexible product family. You can use the internal multi-channel 10-bit analog to digital converter with its flexible high-gain settings as interface for a broad variety of analog sensors. The integrated LF Receiver enables wireless wake-up in battery-operated applications with an ultra-long lifetime or even contactless configuration of the device.

An associated Software Function Library provides powerful functions like AES encryption. The combination with state-of-the-art software development tools makes RF easy to use for everyone, allowing simple and fast time-to-market. Additionally, with only a few external components, you can build a running system. The advanced power control system makes this family ideal for battery-operated applications where low current consumption is necessary. The PMA 51xx is dedicated for rough environment and high quality requirements.

Features

- Integrated RF transmitter
  - ISM band 315/434/868/915MHz
  - 5/8/10dBm output power supported
- Embedded 8051 microcontroller
  - 6 kbyte code flash
  - Comprehensive SW library in ROM reduces user code size for flash memory
  - 2*128 bytes flash for EEPROM emulation supporting, e.g. rolling codes
  - Four 16-bit timers
  - License-free encryption algorithms supported (e.g. AES)
- 125kHz LF ASK receiver
- 10-bit ADC with single-ended or differential inputs and four different high gain levels

- Embedded peripherals:
  - Manchester/biphase encoder/decoder
  - 16-bit CRC generator/checker
  - Pseudo-random number generator
  - Watchdog timer
- Multiple interfaces: I2C, SPI, 10 GPIOs
- Multiple wake-up sources
  - LF receiver, GPIOs, interval timer
- Embedded temperature and supply voltage sensors
- Ultra low power down current: < 0.5µA
- Operating voltage range: 1.9 ... 3.6V
- Temperature range: -40°C ... 125°C
- Quick-start development kit available with USB interface and rechargeable battery
- PG-TSSOP-38 package

<table>
<thead>
<tr>
<th>Type</th>
<th>8051 µC + Flash</th>
<th>ASK/FSK Transmitter</th>
<th>3-channel 10-bit ADC</th>
<th>LF Receiver 125kHz</th>
<th>Operating Temperature Range</th>
<th>Target Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMA 7105</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>–</td>
<td>-40°C ... +85°C</td>
<td>– Remote Controls</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Wireless sensors with digital sensor interface</td>
</tr>
<tr>
<td>PMA 7106</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>–</td>
<td>-40°C ... +85°C</td>
<td>– Wireless sensors with analog sensor interface</td>
</tr>
<tr>
<td>PMA 7107</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>-40°C ... +85°C</td>
<td>– Active tagging / door opener</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Remote control with contactless configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Wireless sensors with contactless trigger/configuration</td>
</tr>
<tr>
<td>PMA 7110</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-40°C ... +85°C</td>
<td>– Applications in rough environment and with high quality requirements (automotive qualification)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Remote Keyless Entry</td>
</tr>
<tr>
<td>PMA 5105</td>
<td>✓</td>
<td>✓</td>
<td>–</td>
<td>–</td>
<td>-40°C ... +125°C</td>
<td>– High-end applications in rough environments and with high quality requirements (automotive qualification)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Remote Keyless Entry</td>
</tr>
<tr>
<td>PMA 5110</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-40°C ... +125°C</td>
<td>– High-end applications in rough environments and with high quality requirements (automotive qualification)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>– Remote Keyless Entry</td>
</tr>
</tbody>
</table>
Transceiver ICs for Wireless Control

The wireless control transceiver series is a family of low power consumption single-chip FSK/ASK transceivers for half-duplex low data-rate communication in the 315MHz, 434MHz, 868MHz and 915MHz bands. The IC offers a very high level of integration and needs only a few external components. It contains a highly efficient power amplifier, a low noise amplifier (LNA) with AGC, a double-balanced mixer, a complex direct conversion stage, I/Q limiters with RSSI generation, an FSK demodulator, a fully integrated VCO and PLL synthesizer, a tunable crystal oscillator, an onboard data filter, a data comparator (slicer), positive and negative peak detectors, a data-rate detection circuit and a 2/3 wire bus interface. Additionally, there is a power down feature to save battery power.

Features

- Frequency ranges 315MHz, 434MHz, 868MHz, 915MHz
- Low supply current
- Supply voltage range 2.1 ... 5.5V
- Power down mode with very low supply current consumption
- FSK and ASK modulation and demodulation capability
- Fully integrated VCO and PLL synthesizer and loop filter on chip with on-chip crystal oscillator tuning
- I²C/3-wire microcontroller interface
- On-chip low pass channel select filter and data filter with tunable bandwidth
- Data slicer with self-adjusting threshold and 2 peak detectors
- FSK sensitivity < -109dBm, ASK sensitivity < -109dBm
- Transmit power up to +13dBm
- Data-rates up to 64kbit/s Manchester encoded
- Self-polling logic with ultra fast data-rate detection

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency [MHz]</th>
<th>Rx Sensitivity [dBm]</th>
<th>Tx P_out [dBm]</th>
<th>V_tx [V]</th>
<th>Tx I_tx [mA]</th>
<th>Rx I_rx [mA]</th>
<th>Temperature [°C]</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDA 5250</td>
<td>868</td>
<td>-109</td>
<td>9</td>
<td>2.1 ... 5.5</td>
<td>11.9</td>
<td>8.6 (ASK) 9.0 (FSK)</td>
<td>-40 ... 85</td>
<td>PG-TSSOP-38</td>
</tr>
<tr>
<td>TDA 5251</td>
<td>315</td>
<td>-109</td>
<td>9</td>
<td>2.1 ... 5.5</td>
<td>14.1</td>
<td>8.8 (ASK) 9.3 (FSK)</td>
<td>-40 ... 85</td>
<td>PG-TSSOP-38</td>
</tr>
<tr>
<td>TDA 5252</td>
<td>915</td>
<td>-109</td>
<td>9</td>
<td>2.1 ... 5.5</td>
<td>11.9</td>
<td>8.6 (ASK) 9.0 (FSK)</td>
<td>-40 ... 85</td>
<td>PG-TSSOP-38</td>
</tr>
<tr>
<td>TDA 5255</td>
<td>434</td>
<td>-109</td>
<td>9</td>
<td>2.1 ... 5.5</td>
<td>13.3</td>
<td>8.6 (ASK) 9.0 (FSK)</td>
<td>-40 ... 85</td>
<td>PG-TSSOP-38</td>
</tr>
</tbody>
</table>
SMD Hall ICs

Leaded Hall ICs

Pressure Sensor ICs

ICs for Wireless Control