Driving future mobility

Elmos ICs bring innovation into the customer’s system. Innovation Matters - this is our claim. We are one of the world’s most experienced semiconductor companies for the automotive industry. Our components communicate, measure, regulate and control safety, comfort, powertrain and network functions. For over 35 years, Elmos has been bringing new functions to life and making mobility worldwide safer, more comfortable and more energy efficient. With our solutions we are already the worldwide #1 in applications with great future potential, such as ultrasonic distance measurement, ambient light and intuitive HMI.

Elmos ICs serve the following global megatrends:
- Autonomous driving
- Electromobility/CO₂ reduction
- Safety, connectivity and comfort

With locations all over the world, we are represented in all key markets and always close to the customer. Our business model encompasses the entire process of a semiconductor: innovative teams create ideas and develop, produce and market the electronic components that make the difference.

For driving future mobility, we provide our customers
- Highly specialised research and development teams
- International customer support
- Worldwide production and distribution network

Made for you: Perfectly fitting ICs

Next to a broad range of ASSPs (Application Specific Standard Product) Elmos offers ASICs (Application Specific Integrated Circuit), that are specifically designed to the customer’s needs. The advantage of an ASIC: The special chip is tailor-made for use in the customer application and its individual design stays protected.

Best possible system integration, which means creating a higher functionality whilst simultaneously reducing the complexity at system level, is the target of the work. System knowledge combined with expertise and the optimal choice of possible integration strategies are prerequisites for success.

Our design teams are experts in the following application fields:
- Sensor ICs
  Ultrasonic Distance, Sensor Signal Processor, Optical IR, Smoke Detector, Passive Infrared
- Motor Control ICs
  Stepper Motor, Brushless DC, DC Motor
- Interface ICs
  PSIS, LIN/CAN, KNX/EIB
- Power Management ICs
  LED Driver, DC/DC Converter, Low Dropout (LDO) Regulator
- Other applications requiring a smart mixed-signal semiconductor solution.

Regardless of which solution you prefer, may it be a standard ASSP or a customized ASIC, Elmos always offers you the perfectly fitting semiconductor for your application.
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# Sensors - Ultrasonic

## IO pt-to-pt Interface

<table>
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<tr>
<th>Part No. / Description</th>
<th>V_{SUPPLY}</th>
<th>Transducer frequency</th>
<th>Architecture</th>
<th>Transducer driver type / output</th>
<th>Measurable Distance*</th>
<th>Interface</th>
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</table>
| ES24.08 2nd Generation Ultrasonic Transducer Driver and Signal Processor | 6V to 18V | 30kHz to 83kHz | pt-to-pt | transformer / 168mA to 354mA | 10cm - 600cm | proprietary bidirectional IO (2-wire) | QFN20L4 | ▪ Excellent short and long range performance  
▪ High robustness and sensor diagnostics  
▪ Advanced IO communication interface |
| ES24.09 2nd Generation Ultrasonic Transducer Driver and Signal Processor | 6V to 18V | 30kHz to 83kHz | pt-to-pt | transformer / 168mA to 354mA | 10cm - 600cm | proprietary bidirectional IO (3-wire) | QFN20L4 | ▪ Excellent short and long range performance  
▪ High robustness and sensor diagnostics  
▪ Advanced IO communication interface |
| ES24.32 High Voltage Direct Drive Ultrasonic Sensor IC | 6V to 18V | 30kHz to 83kHz | pt-to-pt | direct drive | 10cm - 400cm | proprietary bidirectional IO (2-wire) | QFN20L4 | ▪ Best measurement performance without transformer  
▪ High robustness and sensor diagnostics  
▪ Near field detection |
| ES24.33/34/35 High Voltage Direct Drive Ultrasonic Sensor IC | 6V to 18V | 30kHz to 83kHz | pt-to-pt | direct drive | 10cm - 400cm | proprietary bidirectional IO (3-wire) | QFN20L4 | ▪ Best measurement performance without transformer  
▪ High robustness and sensor diagnostics  
▪ Near field detection |

## LIN Bus (or pt-to-pt) Interface

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<thead>
<tr>
<th>Part No. / Description</th>
<th>V_{SUPPLY}</th>
<th>Transducer frequency</th>
<th>Architecture</th>
<th>Transducer driver type / output</th>
<th>Measurable Distance*</th>
<th>Interface</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
</table>
| ES24.14 LIN Smart Ultrasonic Parking Assist (Flash) | 8V to 18V | 30kHz to 125kHz | Bus or pt-to-pt | transformer / 188mA to 518mA | 15cm - 500cm | LIN 2.2 | QFN20L5 | ▪ Embedded, customer programmable controller  
▪ LIN Interface supports SNPD and pin-coding |
| ES24.24 LIN Smart Ultrasonic Parking Assist (ROM) | 8V to 18V | 30kHz to 125kHz | Bus or pt-to-pt | transformer / 188mA to 518mA | 15cm - 500cm | LIN 2.2 | QFN20L5 | ▪ Optimized ready-to-use and flexible standard software  
▪ Cost optimized ROM version of ES24.14 |
| ES24.16 Smart Direct Drive 1st Gen. with LIN Interface and 8bit Controller | 7V to 24V | 30kHz to 83kHz | Bus or pt-to-pt or ECU less | direct drive | 10cm - 300cm | LIN 2.2 | QFN20L5 | ▪ Customer programmable controller  
▪ System cost optimized direct drive solution  
▪ Optional use in ECU less systems |

* Reachable detection range for a standard pole (75mm diameter, 1m height).  
Overall system performance depends on external components (transducer, transformer, PCB layout, ...) and environmental conditions (supply voltage, noise, ambient temperature, ...)

Elmos Product Catalog | 2021/2022
### DSI3 (or pt-to-pt) Interface

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<th>V\textsubscript{SUPPLY}</th>
<th>Transducer frequency</th>
<th>Architecture</th>
<th>Transducer driver type / output</th>
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<td>30kHz to 125kHz</td>
<td>Bus or pt-to-pt transformer / 190mA to 500mA</td>
<td>10cm - 600cm</td>
<td>DSI3</td>
<td>QFN20L5</td>
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<td>Smart Ultrasonic Sensor IC with DSI Interface</td>
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<td>Ultrasound signal coding</td>
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<td>Advanced DSI3 communication interface</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High robustness and sensor diagnosis</td>
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</table>

* Reachable detection range for a standard pole (75mm diameter, 1m height).
Overall system performance depends on external components (transducer, transformer, PCB layout, …) and environmental conditions (supply voltage, noise, ambient temperature, …)

### Master

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<td>-</td>
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<td>6</td>
<td>125kbit/s (master→slave) up to 444kbit/s (slave to master)</td>
<td>QFN20L4</td>
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<tr>
<td>Dual Automotive DSI3 Master Transceiver</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
2nd Gen. Ultrasonic Transducer Driver and Signal Processor | E524.08/09

Key Features
- Drives ultrasonic transducer via center-tapped transformer
- Excellent short & long range performance due to:
  - Wide signal gain range / Sensitivity time control / Static and automatic thresholds / Near-field threshold / Echo peak detection / Fast time constant algorithm
- Advanced IO protocol with configurable measurement profiles
- IC and transducer diagnosis information
- E524.08: 2-wire Interface
- E524.09: 3-wire Interface

Board
- Order No. see page 28

Applications
- Ultrasonic park assist (USPA/PDS/UPA)
- Automatic parking (SPAS/APA)
- Advanced driver assistance systems (ADAS)
- Industrial distance measurement

Application Diagram

High Voltage Direct Drive Ultrasonic Sensor IC | E524.32/33/34/35

Key Features
- Supports directly driven transducers
- Best measurement performance due to:
  - Smart damping algorithm / Two static and one automatic thresholds / Near field detection / Noise suppression
  - High robustness and diagnostics
  - Transducer diagnosis information / Temperature sensor
  - Advanced IO protocol with configurable measurement profiles
- E524.32: 2-wire Interface | E524.33: 3-wire Interface | E524.34: 3-wire Interface 3.3V | E524.35: 3-wire Interface 5.0V

Board
- Order No. see page 28

Applications
- Ultrasonic park assist (USPA/PDS/UPA)
- Automatic parking (SPAS/APA)
- Industrial distance measurement

Application Diagram
### LIN Smart Ultrasonic Parking Assist (Flash/ROM) | E524.14/24

**Key Features**
- Drives ultrasonic transducer via center-tapped transformer
- Good measurement performance due to flexible software
- IC and transducer diagnosis information
- Embedded 8bit microcontroller with 8kByte Flash or ROM / 512Byte SRAM / 128Byte EEPROM
- LIN 2.2 Interface with slave node position detection (SNPD) and alternative pin-coding capabilities
- E524.14: User programmable Flash memory
- E524.24: Ready-to-use and flexible standard software (ROM)

**Applications**
- Ultrasonic park assist (USPA/PDS/UPA)
  - Automatic parking (SPAS/APA)
  - Advanced driver assistance systems (ADAS)
  - Distance and level metering

**Package**
- QFN20L5

**Application Diagram**

---

### Direct Drive Smart LIN Ultrasonic Sensor IC | E524.16

**Key Features**
- Supports directly driven transducers
- Best measurement performance due to:
  - Static and automatic thresholds / Near-field detection / Noise suppression
- IC and transducer diagnosis information
- Embedded 8bit microcontroller with 16kByte OTP / 1024Byte SRAM / 256Byte EEPROM
- LIN 2.2 Interface with slave node position detection (SNPD)
- 4 High-voltage GPIOs for ECU-less parking systems

**Applications**
- Ultrasonic park assist (USPA/PDS/UPA)
- ECU-less low cost systems
  - Industrial distance measurement

**Package**
- QFN20L5

**Application Diagram**

---
Smart Ultrasonic Sensor IC with DSI Interface | E524.17

Key Features
- Outstanding performance
  - Advanced analog & digital signal processing
  - Ultrasound signal coding / Adaptive thresholds
- High robustness and good diagnostics
  - Ringing time and ringing frequency measurement
  - Self-test capabilities / Impedance measurement
- Flexible high-speed DSI3 communication interface
- ISO26262 with safety requirements rated up to ASIL B
- Arm® Cortex®-M0 with 32kB OTP | 4kB SRAM | 256 Byte EEPROM

Applications
- Ultrasonic park assist (USPA/PDS/UPA)
- Automatic parking (SPAS/APA)
- Advanced driver assistance systems (ADAS)

Packages
- QFN20L5

Order No. see page 28

Applications Diagram

---

Dual Automotive DSI3 Master Transceiver | E521.42

Key Features
- Suitable for fast data acquisition of sensors in signal function class
- Supports:
  - Point-to-point/ Daisy chain bus/ Parallel bus
- Versatile in-circuit configuration:
  - up to 15 DSI3-slaves
  - up to 16 packets per frame
  - 2 .. 63 bytes of average payload data per packet
- ISO26262 with safety requirements rated up to ASIL B

Applications
- Ultrasonic parking assistant system
- DSI3 bus networks

Packages
- QFN20L4

Order No. see page 28

Applications Diagram
**Sensors - Ultrasonic Product Portfolio**

**IO pt-to-pt Interface**
- Proprietary (1 level) interface
- Most signal evaluation in Park ECU

**LIN BUS (or pt-to-pt) Interface**
- LIN Bus System with less wiring
- Signal pre conditioning in sensor
- Potentially without Park ECU or ECU less

**DSI3 BUS (or pt-to-pt) Interface**
- High bandwidth (up to 444kbit/s)
- Low latency time for fast system reaction
- Direct integration into ADAS systems

---

**Sensor-IC**

**Transformer Driven**
- E524.08/09
  - Transformer Drive 2nd Gen. with advanced IO Interface (10cm – 600cm)

**Direct Driven**
- E524.32/33/34/35
  - Direct Drive 2nd Gen. with advanced IO Interface (10cm – 400cm)

**Master-IC**
- E521.42
  - Master IC
    - 2ch DSI3 Transceiver for DSI3 Bus Systems
    - ISO26262-ASIL B

**Smart Transformer Drive**
- E524.14/24
  - Smart Transformer Drive 1st Gen. with LIN Interface and 8bit Controller (Flash and ROM versions) (15cm – 500cm)

- E524.17
  - Smart Transformer Drive 1st Gen. with DSI3 Interface and 32bit µC ISO26262-ASIL B (10cm – 600cm)

- E524.16
  - Smart Direct Drive 1st Gen. with LIN Interface and 8bit Controller (10cm – 300cm)
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<td>5V Ratiometric Voltage</td>
<td>Sensor Sensitivity 0.8mV/V to 50mV/V</td>
<td>QFN20L4</td>
<td>- Automotive protection +40/-28V</td>
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<td>SENT interface</td>
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<td>Bare-Die</td>
<td>- Very low noise front-end</td>
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<td>- Trimmable input low-pass filter</td>
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<td></td>
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<td>- Comprehensive self diagnostics</td>
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<td>Bare-Die</td>
<td>- Two fully redundant sensor bridge inputs</td>
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<td>- ISO26262 development for ASIL C support</td>
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<td>- Configurable SENT interface</td>
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<td>SPI or I²C with CRC, Analog voltage, PWM or FM, End of Conversion/Alarm</td>
<td>Sensor Sensitivity 2mV/V to 88mV/V</td>
<td>DFN14_3x4</td>
<td>- Developed for Industrial Applications</td>
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<td>Bare-Die</td>
<td>- Precision front end with two 16-bit ADC’s</td>
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<td>- Configurable sample rate (2.50kS/s)</td>
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<td>- 3rd order polynomial sensor correction</td>
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<td>- Sleep mode available (I&lt;20µA)</td>
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<td>E703.21 Sensor Signal Processor for Industrial Pressure Transmitter</td>
<td>4.75V to 32V</td>
<td>4..20mA Current Loop 0.5V/10V Absolute Voltage 5V Ratiometric Voltage</td>
<td>Sensor Sensitivity 2mV/V to 88mV/V</td>
<td>DFN14_3x4</td>
<td>- Developed for Industrial Applications</td>
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<td>Bare-Die</td>
<td>- Precision front end with two 16-bit ADC’s</td>
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<td>- Sensor Calibration via Output Pins</td>
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<td>- Precise current sense shunt</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Integrated voltage regulator</td>
</tr>
</tbody>
</table>
Automotive SSP with Analog or Sent Output | E520.42

### Key Features
- Very low noise front-end amplifier and ADC allows SNR $> 70\,\text{dB}$ for inputs down to $1\,\text{mV}\,\text{FS}$
- PGA configurable to $50\,\text{mV}/\text{V FS}$ and adjustable offset of $\pm 150\% \text{FS}$
- Digital compensation of offset- and gain-drift and non-linearity up to 3rd order
- Analog voltage or digital SENT output (SAE J2716, JAN2010)
- Supply $5.0 \pm 0.5\,\text{V}$, over-voltage and reverse polarity protection ($28\,\text{V}$)
- Single-wire programming interface

### Applications
- Automotive sensor applications
- Conditioning of resistive bridge sensors

### Packages
- QFN20L4
- Bare-Die

### Application Diagram

---

Dual-Bridge Sensor Signal Processor with SENT Interface | E520.47

### Key Features
- Supply and output protection: $-18/+35\,\text{V}$
- Simultaneous signal processing for two sensors
- Fully digital calibration; no external trim components
- 10-step coarse gain trimming
- Low noise input with 15-bit ADC
- Configurable digital low-pass: $13\,\text{Hz} \ldots 1.1\,\text{kHz}$
- Additional NTC channel with on-chip linearization
- ISO26262 development with safety requirements rated up to ASIL C

### Applications
- Automotive sensor applications
- Functional Safety Sensors, e.g. braking systems
- Conditioning of resistive bridge sensors

### Packages
- QFN20L4
- Bare-Die

### Application Diagram
Sensor Signal Processor for High Precision Applications | E703.11

**Key Features**
- High precision frontend
- PGA configurable to $2 \cdot 88$mV/V FS, offset adjustable to ±300% FS
- Output signal bandwidth widely configurable: (10Hz .. 8kHz), accuracy (10 .. 15 ENOB) and sample rate (2 .. 50kS/s)
- Ultra low latency: output update rate 2 .. 50kS/s, DSP time < 25µs
- 6th order polynomial sensor correction (16 coefficients)
- Temperature sources: chip, bridge and external (diode, NTC)

**Board**
- Order No. see page 28

**Applications**
- High precision industrial pressure sensors
- Ultra low pressure OEM modules
- Industrial products using resistive sensor bridges

**Packages**
- DFN14_3x4
- Bare-Die

**Application Diagram**

---

Sensor Signal Processor for Industrial Pressure Transmitter | E703.21

**Key Features**
- Pressure signal bandwidth, accuracy and output update rate widely configurable
- Two fully differential 16 bit ADCs for pressure and temperature signal acquisition
- Configurable 4 .. 20mA / absolute 0 .. 10V / ratometric 0 .. 5 V analog output with 16 bit DAC
- Ultra low latency, limited only by -3dB signal bandwidth
- Traceability by unique 48bit serial number

**Board**
- Order No. see page 28

**Applications**
- Industrial pressure transmitters
- Resistive MEMS & thick/thin film sensors with and without laser trimmed offset (offset up to 36 .. 114 mV/V

**Packages**
- DFN14_3x4

**Application Diagram**
ESC Correction: Apply brake pressure
## Sensors - IAPS: Integrated Absolute Pressure System

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>$V_{\text{SUPPLY}}$</th>
<th>Output</th>
<th>Pressure Range</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
</table>
| E524.71 Barometric Air Pressure Sensor with SPI Interface | 3V to 5.5V | SPI               | 40kPa to 115kPa     | SOIC8   | - Fully Calibrated up to 1% FS  
- Very Small Footprint (6 x 5 mm²)  
- Application Range -40°C to +125°C  
- Temperature and diagnostic data via digital interface available  
- AECQ qualified |
| E524.72 Barometric Air Pressure Sensor with I²C Interface | 3V to 5.5V | I²C               | 40kPa to 180kPa     | SOIC8   | - Fully Calibrated up to 1% FS  
- Very Small Footprint (6 x 5 mm²)  
- Application Range -40°C to +125°C  
- Temperature and diagnostic data via digital interface available  
- AECQ qualified |
| E524.73 Barometric Air Pressure Sensor with Analog Output | 5V ±0.5V | 5V Ratiometric Voltage | 15kPa to 115kPa or 60kPa to 165kPa | SOIC8   | - Fully Calibrated up to 1% FS  
- Very Small Footprint (6 x 5 mm²)  
- Application Range -40°C to +125°C  
- AECQ qualified |
| E524.75 Integrated Absolute Pressure Sensor with Analog Output | 5V ±0.5V | 5V Ratiometric Voltage | 10kPa to 115kPa     | SOIC20  | - Integrated over-and reverse voltage protection  
- Superior EMC performance  
- Application Range -40°C to +130°C  
- AECQ qualified |
Barometric Air Pressure Sensor | E524.71/72/73

Key Features
- Fully integrated pressure sensor
- Full thermal compensation to accuracy ±1.0 kPa
- Two 16-bit ADCs for acquisition of pressure and temperature inputs; pressure acquired at 20kS/s
- Diagnosis of sensor, sensor supply and wiring, and NVM check-sum supervision at power-on

Applications
- Automotive applications
- Industrial applications
- Medical applications

Integrated Absolute Pressure Sensor with Analog Output | E524.75

Key Features
- Fully integrated and compensated pressure sensor
- Different measurement ranges of absolute pressure available
- 10 to 115kPa with clipping of output
- Full thermal compensation to accuracy ±2 %FS
- Ratiometric analog output
- Wide linear range of analog output
- Diagnosis of sensor, sensor supply wiring, and NVM CRC check at power-on

Applications
- Automotive Pressure Sensor
- Manifold Absolute Pressure Sensing

Applications Diagram
# Sensors - Optical IR Sensor (HALIOS®)

## Rain and Light

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>$V_{\text{supply}}$</th>
<th>$I_q$</th>
<th>Functionality</th>
<th>Package</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>E527.04 Rain and Light Sensor</td>
<td>3.1V to 3.5V</td>
<td>4.7mA (typical)**</td>
<td>Rain sensing</td>
<td>QFN20L4</td>
<td>◼ Rain-Light sensor signa processor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8μA (sleep mode)</td>
<td>Ambient light measurement</td>
<td></td>
<td>◼ Built-in sunlight rejection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ Two rain channels and ambient light channels</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ SPI interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ Internal diagnosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ Integrated temperature sensor</td>
</tr>
</tbody>
</table>

## Proximity and Gesture

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>$V_{\text{supply}}$</th>
<th>$I_q$</th>
<th>Functionality</th>
<th>Package</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>E909.21 HALIOS® Controller for Proximity and Gesture Recognition</td>
<td>3V to 3.6V</td>
<td>15mA (typical)*</td>
<td>Proximity detection</td>
<td>QFN32L5</td>
<td>◼ 16 Bit μC with flash, SPI and I²C Interface</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 .. 3 dimensional input devices</td>
<td></td>
<td>◼ Two independent receiving channels</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Touch</td>
<td></td>
<td>◼ Real time measurement results for rapid gesture detection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ 100mA LED output per channel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ Extrinsic light measurement</td>
</tr>
<tr>
<td>E909.22 HALIOS® Signal Conditioner for Proximity and Gesture Recognition</td>
<td>2.2V to 3.6V</td>
<td>9mA (typical)**</td>
<td>Proximity detection</td>
<td>QFN20L4</td>
<td>◼ Companion chip for E909.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 .. 3 dimensional input devices</td>
<td></td>
<td>◼ Two independent receiving channels</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Touch</td>
<td></td>
<td>◼ Real time measurement results for rapid gesture detection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ 100mA LED output per channel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ Extrinsic light measurement</td>
</tr>
<tr>
<td>E909.23 HALIOS® Low Power Signal Conditioner</td>
<td>2.2V to 3.6V</td>
<td>9mA (typical)**</td>
<td>Proximity detection</td>
<td>QFN20L4</td>
<td>◼ One receiving channel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;150μA (idle mode)</td>
<td>1 .. 3 dimensional input devices</td>
<td></td>
<td>◼ Real time measurement results for rapid gesture detection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;1.5μA (sleep mode)</td>
<td>Touch</td>
<td></td>
<td>◼ 100mA LED output channel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>◼ Extrinsic light measurement</td>
</tr>
</tbody>
</table>

* Without LED current and photo diode current
** Without LED current
## Consumer

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>$V_{\text{supply}}$</th>
<th>$I_q$</th>
<th>Functionality</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E527.16 HALIOS® Gesture Switch</td>
<td>2.25V to 2.75V</td>
<td>4mA (typical)</td>
<td>Proximity</td>
<td>QFN32L5</td>
<td>Advanced ready-to-use function, Implemented gesture recognition, PWM-Output for innovative motion-controlled lighting application</td>
</tr>
<tr>
<td></td>
<td>3.0V to 3.6V</td>
<td></td>
<td>Awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acknowledge</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*SUPPLY* $I_q$ Functionality Package Comment

- Advanced ready-to-use function
- Implemented gesture recognition
- PWM-Output for innovative motion-controlled lighting application
Rain and Light Sensor | E527.04

Key Features
- Front end Optical Rain Sensor signal processor
- Four input channels for ambient light measurements
- High sensitivity, no total reflection needed
- Very high robustness against ambient influences like sun light, aging and dirt
- Two embedded LED drivers, driving up to 40mA
- Provides a rain drop signal via the WS pin - SPI interface
- Temperature sensor
- Extensive diagnosis during operation

Board
- Order No. see page 29

Applications
- Optical Rain Sensor (wiping systems)
  - Windshield, Security Cameras
- Ambient Light Sensor (measurement) to control
  - Headlight, Head-up Displays, Air Conditioning
- Pollution Sensor

Packages
- QFN20L4

Application Diagram

HALIOS® Controller for Proximity and Gesture Recognition | E909.21

Key Features
- Patented HALIOS® control loop
- 4 LED sending channels, 100mA per channel
- 2 receiving channels, 1 compensator channel
- Scalable HALIOS® frequency up to 1MHz
-SSI serial sensor interface
- 16 bit Harvard Architecture H430 CPU
- 32kB Flash, 4kB SRAM and 8kB SysROM
- Temperature range -40°C to +105°C
- Automotive qualified (AEC-Q100)

Band
- Order No. see page 29

Applications
- Proximity a. gesture recognition for automotive touch displays
- Driver and passenger detection
- Wake-up function for displays
- Touchless control in harsh environments (e.g. explosion protected areas)

Packages
- QFN32L5

Application Diagram
HALIOS® Signal Conditioner f. Proximity a. Gesture Recognition | E909.22

Key Features
- Patented HALIOS® control loop
- 4 LED sending channels, 100mA per channel
- 2 receiving channels
- 1 compensator channel
- Scalable HALIOS® frequency up to 1MHz
- SSI serial sensor interface
- Ambient light immunity up to 200,000 lux
- Temperature range -40°C to +105°C
- Automotive qualified (AEC-Q100)

Applications
- Proximity a. gesture recognition for automotive touch displays
- Driver and passenger detection
- Wake-up function for displays
- Touchless control in harsh environments (e.g. explosion protected areas)

Application Diagram

HALIOS® Low Power Signal Conditioner | E909.23

Key Features
- Patented HALIOS® control loop
- 4 LED sending channels, 100mA per channel
- 1 receiving channels
- 1 compensator channel
- I²C interface
- Ambient light immunity up to 200,000 lux
- Temperature range -40°C to +105°C
- Automotive qualified (AEC-Q100)

Applications
- Wide Sensor Bars
- Door Handles
- Control Panels
- Focal point of Interest

Application Diagram
HALIOS® Gesture Switch | E527.16

Key Features
- Ready-to-use functions
- Implemented gesture recognition
- Detection approx. 25cm
- Direct light control possible
- PWM-Output (125 Hz, 8 Bit)
- Reference schematics and reference layout are available

Applications
- Innovative motion controlled light
- Optical push buttons and controls
- Wake-up function for saving energy
- Pre-selection to simplify menu structures

Board
- Order No. see page 29

Packages
- QFN32L5

Application Diagram
HALIOS® - Proximity and Gesture Recognition
## Sensors - ToF Imager

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>( V_{\text{supply}} )</th>
<th>( I_q )</th>
<th>Functionality</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
</table>
| E527.31 3D Image Sensor | 4.75V to 5.25V | 2.6mA (typical) 14µA (sleep mode) | Absolute distance measurement | QFN44L7 | • Gesture and object recognition  
• Dedicated for distance measurements  
• Ambient light suppression  
• SPI Interface |
3D Image Sensor | E527.31

Key Features
- Optical sensor for gesture and object recognition
- 32 x 32 active pixels
- 3D information enables object classification in real time
- Ambient light suppression by 850nm bandpass filter and background light subtraction
- Very low power consumption
- Integrated temperature sensor for temperature compensation
- Automotive qualified (AEC-Q100)

Applications
- Finger gesture detection in HMI applications
- Passenger monitoring
- Easy open liftgate
- Contactless door access

Board
- Order No. see page 29

Packages
- QFN44L7

Application Diagram
Sensors - Passive Infrared Sensors

Pyroelectric Sensor Signal Processor (SSP)

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>( V_{\text{supply}} )</th>
<th>( I_{\text{supply}} )</th>
<th>Output</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
</table>
| E931.06 Pyroelectric SSP     | 2.7V to 3.6V             | 15\( \mu \)A            | PIR Signal and Temperature (DOCI™)          | Wafer: Bare-Die | - Digital signal processing  
- Single wire interface (DOCI™)                                           |
| E931.62 Dual Channel Pyroelectric SSP | 2.7V to 3.6V             | 18\( \mu \)A            | PIR Signal and Temperature (DOCI™)          | Wafer: Bare-Die | - Dual channel  
- Digital signal processing  
- Single wire interface (DOCI™)                                           |
| E931.96 Low Power Pyroelectric SSP | 2.5V to 3.6V             | 6\( \mu \)A             | Motion DETECT, Supply voltage for PIR Detector | SOIC8: Wafer: Bare-Die | - Ultra low power consumption  
- Excellent power supply rejection  
- Programmable detection criteria and operating modes                      |

Pyroelectric Sensor Signal Controller (SSC)

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>( V_{\text{supply}} )</th>
<th>( I_{\text{supply}} )</th>
<th>Output</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
</table>
| E910.97 Pyroelectric SSC with Relay Output | 2.7V to 3.6V             | 15\( \mu \)A            | PIR Signal, digital                         | Wafer: Bare-Die | - Outputs for motion detect  
- Insensitive to RF interference  
- Inputs for sensitivity and on time                                        |
| E931.97 Pyroelectric SSC with Relay/LED Output | 2.7V to 3.6V             | 25\( \mu \)A            | Motion DETECT, Threshold                    | SOIC14N: TSSOP14: Wafer: Bare-Die | - Outputs for relay and LED  
- Insensitive to RF interference  
- Instanteous settling after power up                                        |
| E931.98 Pyroelectric SSC with Zero Crossing Detection | 2.7V to 3.6V             | 18\( \mu \)A            | Motion DETECT, Threshold                    | SOIC14N: TSSOP14 | - Insensitive to RF interference  
- Instanteous settling after power up  
- Adaptive mains zero cross switching                                          |
Pyroelectric SSP | E931.06

Key Features
- Direct connection to PIR sensor elements
- Temperature measurement
- Differential PIR sensor input
- Low Current Consumption
- Excellent power supply rejection
- High dynamic range

Applications
- Integration with PIR sensor elements
- High end PIR systems
- Building management

Application Diagram

---

Dual Channel Pyroelectric SSP | E931.62

Key Features
- Direct connection to PIR sensor elements
- Temperature measurement
- Differential PIR inputs
- Digital Signal Processing (DSP)
- Single wire serial interface (DOC1™)
- Operating voltage down to 2.7V
- Low current consumption
- High dynamic range
- High supply rejection

Applications
- Integration with PIR sensor elements (hybrid modules)
- Gas sensors
- High end PIR systems

Application Diagram

---

Elmos Product Catalog | 2021/2022
Low Power Pyroelectric SSP | E931.96

**Key Features**
- Programmable detection criteria and operating modes
- Digital signal processing
- On chip supply regulator for conventional PIR detectors
- Ultra low power consumption
- Differential PIR sensor input
- Excellent power supply rejection
- Insensitive to RF interference
- Instantaneous settling after power up

**Board**
- Order No. see page 29

**Applications**
- Wireless intruder detectors
- Battery powered door chimes
- Emergency lighting
- Motion and presence detection

**Application Diagram**

---

Pyroelectric SSC with Relay Output | E910.97

**Key Features**
- Digital Signal Processing
- On chip shunt regulator
- Low Power Consumption
- Differential PIR sensor input
- Excellent power supply rejection
- Inputs for sensitivity and on time

**Applications**
- PIR motion detection
- Intruder detection
- Occupancy detection
- Motion sensor lights

**Packages**
- Wafer
- Bare-Die

**Application Diagram**
Pyroelectric SSC with Relay/LED Output | E931.97

Key Features
- Digital Signal Processing
- On chip shunt regulator
- Low Power Consumption
- Differential PIR sensor input
- Excellent power supply rejection
- Outputs for relay and LED

Applications
- PIR motion detection
- Intruder detection
- Occupancy detection
- Motion sensor lights

Application Diagram

Pyroelectric SSC with Zero Crossing Detection | E931.98

Key Features
- One pulse trigger
- Adaptive zero crossing switching
- On chip shunt regulator
- Low power consumption
- Differential PIR sensor input
- Excellent power supply rejection

Applications
- PIR motion detection
- Intruder detection
- Occupancy detection
- Motion sensor lights

Application Diagram
## Sensors - Boards

### Ultrasonic

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E520.08</td>
<td>Ultrasonic Sensor Application Board</td>
<td></td>
<td>K52408-0001</td>
</tr>
<tr>
<td>E520.09</td>
<td>Ultrasonic Sensor Application Board</td>
<td></td>
<td>K52409-0001</td>
</tr>
<tr>
<td>E524.08</td>
<td>Ultrasonic Sensor Application Board</td>
<td>Demoboard</td>
<td>K52408-0001</td>
</tr>
<tr>
<td>E524.09</td>
<td>Ultrasonic Demonstration Kit (Board + Lin Adapter + Docu)</td>
<td></td>
<td>K52414-0001</td>
</tr>
<tr>
<td>E521.42</td>
<td>Ultrasonic Sensor Application Board</td>
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<td>K52417-0002</td>
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<td>E521.43</td>
<td>Ultrasonic Sensor Socket Board</td>
<td>Evaluationboard</td>
<td>K52416-0001</td>
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<tr>
<td>E521.47</td>
<td>Ultrasonic Sensor Socket Board</td>
<td>Evaluationboard</td>
<td>K52417-0003</td>
</tr>
<tr>
<td>E524.24</td>
<td>Ultrasonic Demonstration Kit (Board + Lin Adapter + Docu)</td>
<td></td>
<td>K52424-0001</td>
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<tr>
<td>E524.25</td>
<td>Ultrasonic Sensor Application Board</td>
<td>Demoboard</td>
<td>K52424-0002</td>
</tr>
<tr>
<td>E524.32</td>
<td>Ultrasonic Sensor Socket Board</td>
<td>Evaluationboard</td>
<td>K52432-0001</td>
</tr>
<tr>
<td>E524.33</td>
<td>Ultrasonic Sensor Socket Board</td>
<td>Demoboard</td>
<td>K52433-0001</td>
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<tr>
<td>E524.0X</td>
<td>Ultrasonic IO Master Board (Board + Adapter + Docu)</td>
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<td>K5240X-0001</td>
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<tr>
<td>E521.42</td>
<td>Ultrasonic DSI3 Master Board (Board + Adapter + Docu)</td>
<td></td>
<td>K52142-0002</td>
</tr>
</tbody>
</table>

### SSP: Sensor Signal Processor for Resistive Bridges

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
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</thead>
<tbody>
<tr>
<td>E520.42</td>
<td>SSP2 Board + Adapter</td>
<td>Evaluation Kit</td>
<td>K52042-0001</td>
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<tr>
<td>E520.47</td>
<td>SSP2 Board + Adapter</td>
<td>Evaluation Kit</td>
<td>K52047-0001</td>
</tr>
<tr>
<td>E703.11</td>
<td>SSP3 Board + Adapter</td>
<td>Evaluation Kit</td>
<td>K70311-0001</td>
</tr>
<tr>
<td>E703.11</td>
<td>Multi Sensor Calibration</td>
<td>Evaluation Kit</td>
<td>K70311-0002</td>
</tr>
<tr>
<td>E703.21</td>
<td>SSP3 Board + Adapter</td>
<td>Evaluation Kit</td>
<td>K70321-0001</td>
</tr>
<tr>
<td>E703.21</td>
<td>Multi Sensor Calibration</td>
<td>Evaluation Kit</td>
<td>K70321-0002</td>
</tr>
</tbody>
</table>
### IAPS: Integrated Absolute Pressure System

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E524.71</td>
<td>Application Circuit Board</td>
<td>Demoboard</td>
<td>K52471-0001</td>
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<tr>
<td>E524.72</td>
<td>Application Circuit Board</td>
<td>Demoboard</td>
<td>K52472-0001</td>
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<tr>
<td>E524.73</td>
<td>Application Circuit Board</td>
<td>Demoboard</td>
<td>K52473-0001</td>
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</table>

### HALIOS®

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
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<tbody>
<tr>
<td>E527.04</td>
<td>Rain Sensing Evaluation Kit</td>
<td>Evaluation Kit</td>
<td>KI 1210005</td>
</tr>
<tr>
<td>E527.16</td>
<td>HALIOS® Reference Board</td>
<td>Demoboard</td>
<td>RD 1210001</td>
</tr>
<tr>
<td>E909.21</td>
<td>10 inch Bottom G2 Evaluation Kit</td>
<td>Evaluation Kit</td>
<td>M141 or M142</td>
</tr>
<tr>
<td>E909.21/22</td>
<td>10inch Bottom G2 Reference Design Package</td>
<td>Reference Design</td>
<td>M1003D</td>
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<tr>
<td>E909.21/22</td>
<td>13 inch Bottom G2 Evaluation Kit</td>
<td>Evaluation Kit</td>
<td>M143</td>
</tr>
<tr>
<td>E909.21/22</td>
<td>15inch Bottom G2 Evaluation Kit</td>
<td>Evaluation Kit</td>
<td>M144</td>
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<tr>
<td>E909.21</td>
<td>Mini ComBoard-03</td>
<td>Accessory</td>
<td>M1006</td>
</tr>
<tr>
<td>E909.21</td>
<td>MAZ JTAG Adapter-00</td>
<td>Accessory</td>
<td>M1007</td>
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</table>

### ToF Imager

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E527.31</td>
<td>GDE ToF Evaluation Kit (850nm)</td>
<td>Evaluation Kit</td>
<td>K52731-0002</td>
</tr>
</tbody>
</table>

### Pyroelectric Sensor Signal Processor (SSP)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E931.96</td>
<td>Motion Sensing, Ultra Low Power PIR controller, Evaluation Module</td>
<td>Demoboard</td>
<td>K93196-0001</td>
</tr>
</tbody>
</table>
## Motor Control - Stepper Motor

<table>
<thead>
<tr>
<th>Part No. / Function</th>
<th>V(_{\text{SUPPLY}})</th>
<th>I(_{\text{PEAK}})</th>
<th>P(Motor)(_{\text{peak}})</th>
<th>RDS(_{\text{ON}})</th>
<th>Interface</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
</table>
| **E523.30** *SoC*   | 5.5V to 20V (42V)    | 2 channel        | =25W                 | 550mΩ (HS)       | LIN 2 x (1.3 comp.) or SAE-J2602 or PWM Interface Optional LIN Auto-Addressing (SNPD) only E523.30 or LIN Flash update | QFN32L6 | Current chopper motor control  
Supply and read-out of up to 3 sensors  
Embedded 8bit µC  
8k Flash  
\(T_{\text{junc peak}} = +170^\circ\text{C}\) |
| Power Stepper Controller with Stall Detection  
with/without Auto-Addressing (LIN/PWM Interface) |
| **E523.31** *Plug & Play* | 5.5V to 20V (42V) | 2 channel | =25W | 550mΩ (HS) | LIN 2 x (1.3 comp.) or SAE-J2602 | QFN32L6 | Current chopper motor control  
Supply and read-out of up to 3 sensors  
Embedded 8bit µC  
8k Flash  
\(T_{\text{junc peak}} = +170^\circ\text{C}\) |
| Power Stepper Controller with Stall Detection  
with standard application software (LIN Interface) |
| **E523.39** *Plug & Play* | 5.5V to 28V (42V) | 2 channel | 40W | 0.5Ω (HS) 0.5Ω (LS) | SPI-compatible (3.3/5V) | QFN20L5 QFN32L6 | Stall-Detection / analysis / position correction  
Sensitive Fail-Current-Detection  
Over modulation with customized waveforms  
Supporting Adaptive-Holding-Torque  
Supporting Adaptive-Run-Current  
\(T_{\text{junc peak}} = +170^\circ\text{C}\) |
| SPI Stepper Driver |
| **E520.01/02** *Driver IC* | 3V to 25V (42V) | 12 channel | =12x 8.75W | 1.5Ω | SPI-compatible (3.3/5V) | QFN32L5 SOIC28 | Stall detection for stepper motors (E520.01) suitable for Full Step, Half Step, Wave Drive  
245Hz LED mode  
25kHz relay mode  
25kHz linear PWM  
\(T_{\text{junc peak}} = +150^\circ\text{C}\) |
| 12x Low-Side for 3 Stepper Motors with/without Stall Detection |
| **E520.03/08** *Driver IC* | 3V to 25V (42V) | 8 channel | =8x 8.75W | 1.5Ω | SPI-compatible (3.3/5V) | QFN20L5 QFN32L5 | Stall detection for stepper motors (E520.03) suitable for Full Step, Half Step, Wave Drive  
245Hz LED mode  
25kHz relay mode  
25kHz linear PWM  
\(T_{\text{junc peak}} = +150^\circ\text{C}\) |
| 8x Low-Side for 2 Stepper Motors with/without Stall Detection |
Power Stepper Controller with Stall Detection | E523.30/31

Key Features
- Drives a bipolar stepper motor
- Sensorless “stall detection”
- 1 - Coil current up to 2 x 800mA (prog. chopper)
- 5.5V - 20V supply voltage (load dump 42V)
- Sleep mode current typically 30µA
- Embedded 8bit µC 256 Byte RAM, 8k Flash, 64 Byte E2PROM
- Versions: LIN/PWM Interface, optional LIN Auto-Addressing

Applications
- Stepper or DC motor actuators
- Grill-Shutter
- Head-Light adjust
- Water valve

Application Diagram

SPI Stepper Driver | E523.39

Key Features
- 5V, 28V motor run; VBAT,max 40V (42V for 500ms)
- “Stop/Start” & “cold crank” compliant
- Stall-Detection
- Fail-Current-Detection
- Adaptive-Holding and Running-Torque supported
- Custom Current Waveform: increase of speed and peak power at high temperatures or low VBAT
- AEC-Q 100 Grade 0

Applications
- Automotive, High-Temperature, Industrial
- 4-phase positioning actuators, fans, pumps

Application Diagram

Elmos Product Catalog | 2021/2022
12/8x Low-Side Driver with Stall Detection | E520.01/02/03/08

**Key Features**
- 12 high current outputs (RDS, on typ. 1.5Ω / I, max = 350mA)
- Low standby current (typically <1µA)
- Serial interface (SPI) for direct µC interfacing
- Short circuit / Open load detection, diagnosis
- Stall detection for full-/half-step, wave drive
- Stall detection qualification service
- T, junc, peak = +150°C

**Board**
- Order No. see page 46

**Applications**
- Stepper motor driver with/without stall detection
- DC motor driver with PWM
- Relay driver with VBAT- automatically PWM
- LED driver with 3 logarithmic PWM sources

**Packages**
- E520.01/02
  QFN32L5, SOIC28
- E520.03/08
  QFN32L5, QFN20L5, SOIC20

---

**Application Diagram**

*Driver IC*
Head Light Adjustment
## Motor Control - BLDC Motor | Switched Reluctance Motor

### BLDC Motor Controller

<table>
<thead>
<tr>
<th>Part No. / Function</th>
<th>V&lt;sub&gt;supply&lt;/sub&gt;</th>
<th>I&lt;sub&gt;peak&lt;/sub&gt;</th>
<th>P(Motor)peak</th>
<th>RDS&lt;sub&gt;ON&lt;/sub&gt;</th>
<th>Interface</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E523.06</strong> <em>SoC</em></td>
<td>7V to 28V (5V to 42V)</td>
<td>6 channel</td>
<td>1.5kW (external FETs)</td>
<td>8Ω (HS) 4Ω (LS)</td>
<td>LIN 2.x (1.3 comp.), SAE-J2602 or PWM bidirectional</td>
<td>QFN48L7</td>
<td>16bit/48 MHz CPU assisted by 2 powerful co-processors, Library ROM for LIN-stack software update via LIN, Software support on request, T&lt;sub&gt;junction peak&lt;/sub&gt; = +150°C</td>
</tr>
<tr>
<td><em>Plug &amp; Play</em> Demosoftware for - sensorless HVAC fan engine cooling fan - field oriented control (FOC) for pumps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E523.05</strong> <em>SoC</em></td>
<td>7V to 28V (5V to 42V)</td>
<td>6 channel</td>
<td>1.5kW (external FETs)</td>
<td>8Ω (HS) 4Ω (LS)</td>
<td>LIN 2.x (1.3 comp.), SAE-J2602 or PWM bidirectional</td>
<td>QFN48L7</td>
<td>For new designs E523.06 is recommended, 16bit/48 MHz CPU assisted by 2 powerful co-processors, Library ROM for LIN-stack software update via LIN, Software support on request, T&lt;sub&gt;junction peak&lt;/sub&gt; = +125°C (contact supplier for higher temperature)</td>
</tr>
<tr>
<td><strong>E523.52</strong> <em>SoC</em></td>
<td>12V to 72V (7V to 76V)</td>
<td>6 channel</td>
<td>1.5kW (external FETs)</td>
<td>10Ω (HS) 5Ω (LS)</td>
<td>LIN Interface with external, PWM Interface with external components</td>
<td>QFN36L7</td>
<td>Usable for 24/48V automotive Board Net, 16bit/48 MHz CPU assisted by 2 powerful co-processors, Library ROM for LIN-stack software update via LIN (software support on request), T&lt;sub&gt;junction peak&lt;/sub&gt; = +150°C</td>
</tr>
<tr>
<td><em>Plug &amp; Play</em> Demosoftware on request</td>
<td></td>
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</tr>
</tbody>
</table>

*Plug & Play* Chip with defined functionality | no controller programming necessary
*SoC* System-on-a-Chip | with integrated microcontroller
*SBC* System-Basic-Chip | with Voltage Regulator Reset, Watchdog, physical Interface
*Driver IC* Driver Chip without SBC or SoC features

** Please contact Elmos for selecting the right product for SR Motors
## BLDC Motor Driver

<table>
<thead>
<tr>
<th>Part No. / Function</th>
<th>V_{SUPPLY}</th>
<th>I_{PEAK}</th>
<th>P(Motor)peak</th>
<th>RDS_{ON}</th>
<th>Interface</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E523.42 *SoC</td>
<td>7V to 28V (6V to 42V)</td>
<td>6 channel</td>
<td>14W</td>
<td>6Ω (HS) 6Ω (LS)</td>
<td>LIN 2.x (1.3 comp.), SAE-J2602 or PWM bidirectional</td>
<td>QFN32L5</td>
<td>32bit / 24MHz ARM® Cortex®-M0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LIN Flash Update</td>
<td></td>
<td>Library ROM for LIN-stack software update via LIN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>JTAG</td>
<td></td>
<td>T_{Junc} peak = +150°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Software support on request</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E523.81 *Plug &amp; Play</td>
<td>6V to 28V (5V to 42V)</td>
<td>1 channel</td>
<td>7kW</td>
<td>10Ω (HS) 5Ω (LS)</td>
<td>PWM bidirectional</td>
<td>QFN20L5</td>
<td>State Machine control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>analog 0 - 2.5V</td>
<td></td>
<td>Fully parametrisable via JTAG</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>JTAG</td>
<td></td>
<td>True Sinusoidal SVM (Space Vector Modulation) Drive</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>T_{Junc} peak = +170°C</td>
</tr>
<tr>
<td>E523.01/11 *SBC</td>
<td>7V to 28V (5V to 42V)</td>
<td>6 channel</td>
<td>1.5kW (external FETs) 3W (direct drive)</td>
<td>8Ω (HS) 4Ω (LS)</td>
<td>LIN 2.x (1.3 comp.), SAE-J2602 (only E523.01) or PWM bidirectional</td>
<td>QFN44L7</td>
<td>Voltage Regulator (3.3V/5V) selectable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LIN Flash update</td>
<td></td>
<td>Precise deadtime generation</td>
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<tr>
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<td></td>
<td></td>
<td>JTAG</td>
<td></td>
<td>Watchdog/Diagnostics</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>T_{Junc} peak = +170°C</td>
</tr>
<tr>
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<td></td>
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<td></td>
<td>Demo software on request (sensorless sinus)</td>
<td></td>
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</tr>
<tr>
<td>E523.10 *SBC</td>
<td>7V to 28V (4.5V to 42V)</td>
<td>6 channel</td>
<td>1.5kW (external FETs) 3W (direct drive)</td>
<td>8Ω (HS) 4Ω (LS)</td>
<td>PWM bidirectional</td>
<td>QFN44L7</td>
<td>Voltage Regulator (3.3V/5V) selectable</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>SPI for configuration</td>
<td></td>
<td>Precise deadtime generation</td>
</tr>
<tr>
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<td></td>
<td>JTAG</td>
<td></td>
<td>Watchdog/Diagnostics</td>
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<tr>
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<td></td>
<td></td>
<td>T_{Junc} peak = +170°C</td>
</tr>
<tr>
<td>E523.50 *SBC</td>
<td>12V to 72V (7V to 76V)</td>
<td>6 channel</td>
<td>1kW (external FETs)</td>
<td>10Ω (HS) 5Ω (LS)</td>
<td>PWM for motor control</td>
<td>QFN36L7</td>
<td>Usable for 24/48V automotive Board Net</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Diagnostic PINs</td>
<td></td>
<td>DC/DC converter for gate supply</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.3V/20mA supply for external µC</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>T_{Junc} peak = +150°C</td>
</tr>
</tbody>
</table>

*Plug & Play Chip with defined functionality | no controller programming necessary
*SoC System-on-a-Chip | with integrated microcontroller
*SBC System-Basic-Chip | with Voltage Regulator Reset, Watchdog, physical Interface
*Driver IC Driver Chip without SBC or SoC features
** Please contact Elmos for selecting the right product for SR Motors
Field-Oriented BLDC Motor Controller with 16 Bit CPU | E523.06

Key Features
- IC supply voltage range 7 to 28V (extended 5V to 42V)
- CPU 16 bit, 24 - 48MHz for application tasks
- 32 kbyte Flash, ECC protected
- 24 kbyte Masked ROM
- 4 kbyte SRAM, parity protected
- Typical deep-sleep mode current 20µA
- 2nd window watchdog and two independent clocks
- LIN 2.x (1.3, SAE-J2602 comp.) or PWM bidirectional
- Fast OpAmp for foot current measurement

Board
- Order No. see page 46

Applications
- BLDC(EC) motor control, multiple DC motor control
- Cooling fans, HVAC fans, positioning systems
- Fuel, hydraulic, oil and water pumps
- Position system

Application Diagram

---

72V Brushless Motor Gate Driver with 16bit CPU | E523.52

Key Features
- Voltage range 12V to 72V (7V to 76V peak)
- CPU 16 bit, 24 - 48MHz for application tasks
- 32kByte Flash, 16kByte MaskROM, 4kByte SRAM
- 10 bit 1 Msample SAR ADC
- 4x 16 bit PWM generation (edge/center aligned)
- Adjustable window watchdog (independent clock)
- 6x 200mA gate drivers with programmable dead time and protection features
- Fast OpAmp for foot current measurement

Board
- Order No. see page 47

Applications
- BLDC(EC) motors in industrial 24V to 60V applications
- Commercial vehicles
- Fuel, hydraulic, oil, water and urea pumps
- Cooling fans, HVAC fans, positioning systems

Application Diagram

---
Fully Integrated 3 Phase Motor Controller | E523.42

Key Features
- Voltage range 7V to 28V (6V to 42V peak)
- Monitor and diagnosis features
- LIN 2.x (1.3, SAE-J2602 comp.)
- Area and power optimized 32bit ARM® Cortex®-M0
  - 32 KByte OTP, 256 Byte customer EEPROM
  - 24 KByte SysROM (3 for LIN protocol and bootloader)
- Smart supply block for 12V automotive boardnet
  - Configurable low supply voltage (<7V) operation
  - 30µA sleep mode current (25°C typ.)

Applications
- Three motor (BLDC), a three phase stepper motor or two conventional DC motors
- Sensorless motion detection

BLDC Motor Driver (LIN/PWM Interface) | E523.01/11

Key Features
- Gate drive circuit for B6-NMOS bridge
- Voltage range 7V to 28V (5V to 42V peak)
- LIN 2.x (1.3, SAE-J2602 comp.) or PWM bidirectional
- Software update via LIN high speed mode
- Precise, dynamical dead-time generation
- Voltage regulator for µC 3.3V or 5V, up to 70mA direct load
- Separate short-circuit protection for each MOS-FET
  - dynamically adjustable
- Configurable over-current protection

Applications
- BLDC (EC) motor control, multiple DC motor control
- Fuel, Hydraulic, Oil and Water pump
- Cooling fan, HVAC fan, positioning systems
- Turbo charger adjustment
- BLDC actuators and servo systems

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**BLDC-Motor Driver with Cold-Crank Capability | E523.10**

**Key Features**
- Gate drive circuit for B6-NMOS bridge
- Voltage range 4.5V to 28V (42V peak) for start-stop systems
- Sleep mode current 20µA typically
- Microcontroller supply 3.3V or 5V
- Adjustable watchdog and reset generation
- Motor current measurement amplifier
- Over current switch-off (dynamical change)
- FET short circuit protections (dynamical change)
- Configurable voltage monitoring

**Applications**
- BLDC (EC) motor control, multiple DC motor control
- Fuel, hydraulic, oil and water pumps
- Cooling fans, HVAC fans, positioning systems
- Turbo charger adjustment

**Application Diagram**

---

**72V Brushless Motor Gate Driver | E523.50**

**Key Features**
- Gate drive circuit for B6-NMOS bridge
- Voltage range 12V to 72V (7V to 76V peak)
- DC/DC converter for 11V/100mA
- µC supply 3.3V up to 20mA direct load, higher loads with external boost transistor possible
- 200mA gate drivers including protection features
- Integrated back EMF detection
- $T_{J,\text{peak}} = +150^\circ\text{C}$

**Applications**
- BLDC (EC) motors in industrial 24V to 60V applications
- Commercial vehicles
- Fuel, hydraulic, oil, water and urea pumps
- Cooling fans, HVAC fans, positioning systems

**Application Diagram**

---
500mA BLDC Motor Controller | E523.81

Key Features
- IC for standalone PMSM applications
- Internal power bridge up to 500mA (rms)
- Selectable PWM speed and error interface or analog speed interface
- Tacho output
- Current controlled start up
- Integrated configurable error handling
- Stall detection
- Automatic restart and rotor delocking

Board
- Order No. see page 47

Applications
- Small PMSM / BLDC FANs
- Small PMSM / BLDC Pumps

Packages
- QFN20L5

Application Diagram

*Plug and Play
# Motor Control - DC Motor

<table>
<thead>
<tr>
<th>Part No. / Function</th>
<th>( V_{\text{supply}} )</th>
<th>( I_{\text{peak}} )</th>
<th>( P(\text{Motor})_{\text{max}} )</th>
<th>( RDS_{\text{ON}} )</th>
<th>Interface</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E523.26 *SoC DC Motor Driver with 16kB Flash</td>
<td>5V to 20V (5V to 40V)</td>
<td>1 channel</td>
<td>( \approx 1.5 \text{ kW} ) (external FETs) ( \approx 1.3 \text{ W} ) (direct drive)</td>
<td>8Ω (HS) 8Ω (LS)</td>
<td>LIN 2.x (1.3) or SAE-J2602 SPI for configuration</td>
<td>QFN32L6</td>
<td>Includes µC, memory, interfaces, high side gate driver, supply and measurement functions ( T_{\text{junc, peak}} = +150^\circ C )</td>
</tr>
<tr>
<td>E523.03/04/13/14 *SBC DC Motor LS FET Driver (LIN / PWM Interface)</td>
<td>7V to 28V (5V to 42V)</td>
<td>1 channel</td>
<td>( \approx 1.5 \text{ kW} ) (external FETs) ( \approx 1.3 \text{ W} ) (direct drive)</td>
<td>8Ω (HS) 4Ω (LS)</td>
<td>LIN 2.x (1.3) or SAE-J2602 (only E523.03/13) or PWM bidirectional SPI for configuration</td>
<td>QFN20L4 QFN32L5 (with high voltage spacer)</td>
<td>Voltage Regulator E523.03/13: 5V E523.04/14: 3.3V Watchdog/Diagnostics Fast LIN Flash update ( T_{\text{junc, peak}} = +170^\circ C )</td>
</tr>
<tr>
<td>E910.72 *Driver IC 6x Half-Bridge DC Motor with sensorless positioning</td>
<td>6V to 19V (40V)</td>
<td>-</td>
<td>( \approx 7 \text{ W} ) (1 Motor Mode)</td>
<td>1.25Ω</td>
<td>SPI for configuration</td>
<td>QFN32L5</td>
<td>Sensorless motor positioning 3 independent pulse detectors Excellent positioning performance Drives 3 or 5 DC actuators ( T_{\text{junc, peak}} = +150^\circ C )</td>
</tr>
</tbody>
</table>

*Plug & Play | Chip with defined functionality | no controller programming necessary
*SoC | System-on-a-Chip | with integrated microcontroller
*SBC | System-Basic-Chip | with Voltage Regulator Reset, Watchdog, physical Interface
*Driver IC | Driver Chip without SBC or SoC features
<table>
<thead>
<tr>
<th>Part No. / Function</th>
<th>V\text{supply}</th>
<th>I\text{peak}</th>
<th>P\text{(Motor)max}</th>
<th>RDS\text{ON}</th>
<th>Interface</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E523.30 *SoC</td>
<td>7V to 20V (5.5V to 42V)</td>
<td>2 channel</td>
<td>25W (per Motor)</td>
<td>225mΩ (HS) 275mΩ (LS)</td>
<td>LIN 2.x (1.3) or SAE-J2602 or PWM bidirectional</td>
<td>QFN32L6</td>
<td>Drives 1 or 2 DC motors 8bit CPU, 8k Flash, 64Byte EEPROM Current chopper motor control Supply and read-out of up to 3, potentiometers or sensors GPIO-pins T\text{junc, peak} = +170°C (contact supplier for higher temperatures)</td>
</tr>
<tr>
<td>E523.39 *Driver IC</td>
<td>5.5V to 20V (42V)</td>
<td>2 channel</td>
<td>40W</td>
<td>0.5Ω (HS) 0.5Ω (LS)</td>
<td>SPI for configuration</td>
<td>QFN20L5 QFN32L6</td>
<td>Stall-Detection / analysis / position correction Sensitive Fail-Current-Detection Over modulation with customized waveforms Supporting Adaptive-Holding-Torque Supporting Adaptive-Run-Current T\text{junc, peak} = +170°C</td>
</tr>
<tr>
<td>E523.06 *SoC</td>
<td>7V to 28V (5V to 42V)</td>
<td>6 channel</td>
<td>1.5kW (external FETs) 1.3W (direct drive)</td>
<td>8Ω (HS) 4Ω (LS)</td>
<td>LIN 2.x (1.3) or SAE-J2602 or PWM bidirectional</td>
<td>QFN48L7</td>
<td>16bit/48 MHz CPU assisted by 2 powerful co-processors Library ROM for LIN-stack software update via LIN Charge Pump Driver included T\text{junc, peak} = +125°C (Contact supplier for higher temperature)</td>
</tr>
</tbody>
</table>

*Plug & Play Chip with defined functionality | no controller programming necessary
*SoC System-on-a-Chip | with integrated microcontroller
*SBC System-Basic-Chip | with Voltage Regulator Reset, Watchdog, physical Interface
*Driver IC Driver Chip without SBC or SoC features
DC Motor Driver with 16kB Flash | E523.26

Key Features
- Includes µC, memory, interfaces, high side gate driver, supply and measurement functions
- 8-bit processor core, EL3.5, 512 Bytes RAM
- 16k Flash memory
- 16 words EEPROM Customer Data
- On-Chip ADC for measurement of motor current, supply voltage, temperature and up to three other analog voltages
- Gate driver for NMOS high side FET
- AEC-Q100 Qualified

Applications
- Control of brush DC motors of fans/blowers in automotive applications

Application Diagram

<table>
<thead>
<tr>
<th>Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No. see page 46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Packages</th>
</tr>
</thead>
<tbody>
<tr>
<td>QFN32L6</td>
</tr>
</tbody>
</table>

DC Motor LS FET Driver (LIN / PWM Interface) | E523.03/04/13/14

Key Features
- Voltage range 7 to 28V (5V to 42V peak)
- LIN 2x (1.3, SAE-J2602 comp.) or PWM bidirectional
- Deep sleep mode current $I_s < 30\mu A$
- Voltage Regulator for ext.µC: $3.3V/5V, I_{MAX} = 30mA$
- Window watchdog, dynamical change via SPI
- Amplifier for low side motor current measurement
- Over-current switch-off, dynamical change via SPI
- Monitoring battery voltage, gate supply, temperature

Applications
- DC Wiper
- DC HVAC fan, engine cooling fan
- DC fuel pump, hydraulic pump, oil pump
- Multiple DC motor control
- Without external FETs: direct driving of small loads

Application Diagram

<table>
<thead>
<tr>
<th>Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No. see page 46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Packages</th>
</tr>
</thead>
<tbody>
<tr>
<td>QFN20L4</td>
</tr>
<tr>
<td>QFN32L5 (with high voltage spacer)</td>
</tr>
</tbody>
</table>
Field-Oriented DC Motor Controller with 16 Bit CPU | E523.06

Key Features
- Gate drive circuit for B6-NMOS bridge
- IC supply voltage range 7 to 28V (extended 5V to 42V)
- CPU 16 bit, 24 - 48MHz for application tasks
- 32 kByte Flash, ECC protected
- 24 kByte Masked ROM
- 4 kByte SRAM, parity protected
- Typical deep-sleep mode current 20µA
- LIN2.x, LIN1.3 or bidirectional PWM Interface

Board
- Order No. see page 46

Applications
- EC, BLDC, PMSM motors 50W to ~1500W
- Cooling fans, HVAC fans, positioning systems
- Fuel, hydraulic, oil and water pumps

Packages
- QFN48L7
- LQFP48L7EP

Application Diagram

2x 800mA DC Motor 2x Full Bridge Controller (LIN / PWM Interface) | E523.30

Key Features
- Voltage range 7V to 20V (5.5V to 42V)
- LIN 2.x (1.3, SAE-J2602 comp.) or PWM bidirectional
- Drives 1 or 2 DC Motors
- 800mA (2 Motor Mode)
- Programmable chopper current
- Slave node position detection / auto-addressing
- 8bit CPU, 8k Flash, 64Byte E²PROM
- 3 GPIO pins and sensor supply

Board
- Order No. see page 46

Applications
- Headlight adjust
- Grille shutter
- Water valves
- Multi purpose LIN slave

Packages
- QFN32L6

Application Diagram

*SoC / *Plug & Play
**2x Full Bridge Driver (SPI Interface) | E523.39**

**Key Features**
- 5V - 28V motor run; VBAT, max 40V (42V for 500ms)
- “Stop/Start” & “cold crank” compliant
- Stall-Detection
- Fail-Current-Detection
- Adaptive-Holding and Running-Torque supported
- Custom Current Waveform: increase of speed and peak power at high temperatures or low VBAT
- AEC-Q 100 Grade 0

**Board**
- Order No. see page 46

**Applications**
- Automotive, High-Temperature, Industrial
- 4-phase positioning actuators, fans, pumps

**Packages**
- QFN20L5
- QFN32L6

**Application Diagram**

---

**6x Half-Bridge DC Motor with Sensorless Positioning | E910.72**

**Key Features**
- Operating supply voltage range 6V to 19V
- 6 half bridges to drive 3, 4, or 5 DC motors
- $R_{DS(ON)}$ of one half bridge typ. 1.25Ω
- Independent pulse detectors for three motors
- 2 different pulse detectors covering the complete speed range
- Adjustable parameters to drive a high number of different motor types
- Diagnostic data via SPI

**Board**
- Order No. see page 46

**Applications**
- Automotive HVAC flap
- DC motor servo systems

**Packages**
- QFN32L5

**Application Diagram**

---
Engine Cooling Fan Control
## Motor Control - Boards

### Stepper Motor

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Demo also relative for</th>
<th>Function</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E520.01</td>
<td>E520.02, E520.03, E520.08</td>
<td>12x Low-Side for 3 Stepper Motors with/without Stall Detection</td>
<td>Demo- / Evaluation Board</td>
<td>K52001-0001</td>
</tr>
<tr>
<td>E523.30*</td>
<td>E523.31, E523.34, E523.37</td>
<td>LIN Stepper Evakit (Standard)</td>
<td>Demo- / Evaluation Board</td>
<td>K52330-0001</td>
</tr>
<tr>
<td>E523.30*</td>
<td>E523.31, E523.34, E523.37</td>
<td>LIN Stepper Evakit (Generic)</td>
<td>Demo- / Evaluation Board</td>
<td>K52330-0002</td>
</tr>
<tr>
<td>E523.30*</td>
<td>E523.31, E523.34, E523.37</td>
<td>LIN Stepper SW Evakit (Standard)</td>
<td>Demo- / Evaluation Board</td>
<td>K52330-0003</td>
</tr>
<tr>
<td>E523.30*</td>
<td>E523.31, E523.34, E523.37</td>
<td>LIN Stepper SW Evakit (Generic)</td>
<td>Demo- / Evaluation Board</td>
<td>K52330-0004</td>
</tr>
<tr>
<td>E523.39*</td>
<td>-</td>
<td>-</td>
<td>Evaluation Board</td>
<td>K52339-0001</td>
</tr>
<tr>
<td>E523.39*</td>
<td>-</td>
<td>-</td>
<td>Smart-GUI Kit</td>
<td>K52339-0002</td>
</tr>
</tbody>
</table>

* also valid for DC Motor boards

### DC Motor

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Demo also relative for</th>
<th>Function</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E523.06</td>
<td>-</td>
<td>Field-Oriented DC Motor Controller with 16 Bit CPU (Standard)</td>
<td>Demoboard</td>
<td>K52306-0001</td>
</tr>
<tr>
<td>E523.06</td>
<td>-</td>
<td>Field-Oriented DC Motor Controller with 16 Bit CPU 50W</td>
<td>Demoboard</td>
<td>K52306-0003</td>
</tr>
<tr>
<td>E523.06</td>
<td>-</td>
<td>Field-Oriented DC Motor Controller with 16 Bit CPU 300W FOC</td>
<td>Demoboard</td>
<td>K52306-0004</td>
</tr>
<tr>
<td>E523.06</td>
<td>-</td>
<td>Field-Oriented DC Motor Controller with 16 Bit CPU 300W CZCD (Current Zero Cross Detection)</td>
<td>Demoboard</td>
<td>K52306-0005</td>
</tr>
<tr>
<td>E523.06</td>
<td>-</td>
<td>Field-Oriented DC Motor Controller with 16 Bit CPU 1kW FOC</td>
<td>Demoboard</td>
<td>K52306-0006</td>
</tr>
<tr>
<td>E523.26</td>
<td>-</td>
<td>DC Motor Driver with 16k8 Flash with LIN</td>
<td>Demoboard</td>
<td>K52326-0001</td>
</tr>
<tr>
<td>E910.72</td>
<td>-</td>
<td>6x Half-Bridge DC Motor with Sensorless Positioning</td>
<td>Demo- / Evaluation Board</td>
<td>K91072-0001</td>
</tr>
</tbody>
</table>
## BLDC Motor

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Function</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E523.01/11</td>
<td>B6 Bridge FET Driver (LIN / PWM Interface)</td>
<td>Demo- / Evaluation Board</td>
<td>K52301-0001</td>
</tr>
<tr>
<td>E523.01/11 V1 Fan</td>
<td>B6 Bridge FET Driver (LIN / PWM Interface)</td>
<td>Demo- / Evaluation Board</td>
<td>K52301-0002</td>
</tr>
<tr>
<td>E523.01/11 V2 Pump</td>
<td>B6 Bridge FET Driver (LIN / PWM Interface)</td>
<td>Demo- / Evaluation Board</td>
<td>K52301-0003</td>
</tr>
<tr>
<td>E523.01/11 V4 Water Pump</td>
<td>B6 Bridge FET Driver (LIN / PWM Interface)</td>
<td>Demo- / Evaluation Board</td>
<td>K52301-0005</td>
</tr>
<tr>
<td>E523.10</td>
<td>BLDC Motor Driver with Cold Crank Capability</td>
<td>Demoboard</td>
<td>K52310-0001</td>
</tr>
<tr>
<td>E523.42</td>
<td>3-Phase Motor Controller</td>
<td>Evaluation Board</td>
<td>K52342-0001</td>
</tr>
<tr>
<td>E523.42</td>
<td>3-Phase Motor Controller</td>
<td>Socket Board</td>
<td>K52342-0002</td>
</tr>
<tr>
<td>E523.50</td>
<td>72V Brushless Motor Gate Driver</td>
<td>Demo- / Evaluation Board</td>
<td>K52350-0001</td>
</tr>
<tr>
<td>E523.52</td>
<td>72V Brushless Motor Gate Driver with 16bit</td>
<td>Demo- / Evaluation Board</td>
<td>K52352-0001</td>
</tr>
<tr>
<td>E523.52</td>
<td>72V Brushless Motor Gate Driver with 16bit (High Power)</td>
<td>Evaluation Board</td>
<td>K52352-0002</td>
</tr>
<tr>
<td>E523.81</td>
<td>500mA BLDC Motor Controller</td>
<td>Demoboard</td>
<td>K52381-0001</td>
</tr>
</tbody>
</table>
## Power Management - LED Drivers

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>Efficiency</th>
<th>$V_{\text{Supply}}$</th>
<th>$I_{\text{OUT}}$</th>
<th>Package</th>
<th>Comment / Converter Topology</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.31 LIN Controller with Position Detection</td>
<td>-</td>
<td>5V to 28V (max. 40V)</td>
<td>4 x 50mA</td>
<td>QFN32L5</td>
<td>Linear Controller</td>
</tr>
<tr>
<td>E521.36 RGB LIN Controller with Current Source</td>
<td>-</td>
<td>5V to 28V (max. 40V)</td>
<td>3 x 40mA</td>
<td>SOIC8-EI</td>
<td>Linear Controller</td>
</tr>
<tr>
<td>E522.80-83 Triple Linear LED Controller (High Current Version 48 to 151mA)</td>
<td>-</td>
<td>5V to 25V</td>
<td>3 x 150 or 450mA</td>
<td>SOIC16N-EI</td>
<td>Linear Controller</td>
</tr>
<tr>
<td>E522.84-87 Triple Linear LED Controller (Low Current Version 20 to 60mA)</td>
<td>-</td>
<td>5V to 25V</td>
<td>3 x 60 or 180mA</td>
<td>SOIC8-EI</td>
<td>Linear Controller</td>
</tr>
<tr>
<td>E522.90-93 Triple 55mA Linear LED Controller (14 to 55mA)</td>
<td>-</td>
<td>5V to 25V</td>
<td>3 x 55 or 165mA</td>
<td>SOIC16N-EI</td>
<td>Linear Controller</td>
</tr>
<tr>
<td>E522.46 8 Channel LED Driver with I²C Interface</td>
<td>-</td>
<td>3.3V to 32V (max. 40V)</td>
<td>212 mA</td>
<td>DFN18L5040</td>
<td>Linear Controller</td>
</tr>
<tr>
<td>E522.48 16 Channel LED Driver with I²C Interface</td>
<td>-</td>
<td>5V to 40V</td>
<td>-</td>
<td>QFN32L6</td>
<td>Linear Controller, ISO26262 - ASIL-B, Power Zeroing Function</td>
</tr>
<tr>
<td>E522.49 16 Channel LED Driver with Diff. Bus Interface</td>
<td>-</td>
<td>5V to 40V</td>
<td>-</td>
<td>QFN32L6</td>
<td>Linear Controller, ISO26262 - ASIL-B, Power Zeroing Function</td>
</tr>
<tr>
<td>E522.31/33 1 Channel Switched-Mode Constant Current LED Controller (Oscillator Spectrum Spread/Narrow)</td>
<td>&gt;90%</td>
<td>5V to 35V</td>
<td>-</td>
<td>QFN32L5</td>
<td>Linear Controller, Boost, SEPIC, Buck-Boost or Buck</td>
</tr>
<tr>
<td>E522.32/34 2 Channel Switched-Mode Constant Current LED Controller (Oscillator Spectrum Spread/Narrow)</td>
<td>&gt;90%</td>
<td>5V to 35V</td>
<td>-</td>
<td>QFN32L5</td>
<td>Linear Controller, Boost, SEPIC, Buck-Boost or Buck</td>
</tr>
<tr>
<td>E521.71 DRL &amp; Position Light Driver IC for 2 Wheeled Vehicles</td>
<td>-</td>
<td>5V to 24V (max. 40V)</td>
<td>3 x 150 or 450mA</td>
<td>SOIC16N-EI</td>
<td>Linear Controller</td>
</tr>
</tbody>
</table>

Not automotive qualified
LIN Controller with Position Detection | E521.31

Key Features
- Transceiver compliant with LIN 2.1, LIN 2.2 and SAE-J2602
- Linear voltage regulator with 5V, 100mA
- State of the art 16bit µC
- Integrated 32kbyte Flash (Flexible EEPROM emulation by SW)
- 4x PWM driven High Side drivers with 5V and up to 50mA each
- µC window watchdog
- ADC 12bit accuracy

Applications
- Interior light modules

Board
- Order No. see page 60

RGB LIN Controller with Current Source | E521.36

Key Features
- Input voltage range 5V to 28V
- Integrated 16 bit microcontroller
- 32kbyte OTP
- 128Byte customer usable non-volatile memory
- 1.25kByte RAM 16kByte SysROM containing standard LIN routines and boot loader
- 4 PWM generators with 48MHz and 16bit resolution
- 2 Timers with 16bit resolution
- 3 LED drivers with currents up to 40mA and fast slopes

Applications
- Interior light modules
- Ambient lighting

Board
- Order No. see page 60

Application Diagram: LIN Controller with Position Detection | E521.31

Application Diagram: RGB LIN Controller with Current Source | E521.36
Linear LED Controller (High Current Version 48 to 151mA) | E522.80-83

Key Features

- Three independent linear current drivers (3*150mA)
- Operating input voltage range 5V to 25V, max. 40V
- Advanced diagnostic features
  - Open / short detection
  - Diagnostic “RUN” bus to link multiple ICs
- Different start-up voltages for open diagnostics can be chosen: VS=7.5V, 9V, 10V and 15V
- “Single Lamp” mode disables all LEDs in case of a failure
- Automotive qualified (AEC-Q100)

Board

- Order No. see page 61

Package

- SOIC16N-EP

Applications

- Automotive LED lighting
- Rear lighting
- Turn indicator driver
- Low current interior lighting
- Industrial LED applications or simple RGB drivers

Application Diagram

Linear LED Controller (Low Current Version 20 to 60mA) | E522.84-87

Key Features

- Three integrated linear current drivers (3*60mA)
- Operating input voltage range 5V to 25V, max. 40V
- Advanced diagnostic features
  - Open / short detection
  - Diagnostic “RUN” bus to link multiple ICs
- Different start-up voltages for open diagnostics can be chosen: VS=7.5V, 9V, 10V and 15V
- “Single Lamp” mode disables all LEDs in case of a failure
- Automotive qualified (AEC-Q100)

Board

- Order No. see page 61

Package

- SOIC8EP

Applications

- Automotive LED Lighting, Rear Lighting
- Turn Indicator Driver
- Low Current Interior Lighting
- Industrial LED Applications or simple RGB Drivers

Application Diagram
**Triple Linear LED Controller (14 to 55mA) | E522.90-93**

**Key Features**
- Operating input voltage range 5V to 25V, max. 40V
- Three independent high-side Current Sources (3*55mA)
- Parallel Operation for up to 165mA
- Low Power Standby / Sleep Mode
- Thermal Management Option per Channel
- Automotive qualified (AEC-Q100)

**Applications**
- Automotive LED lighting application
  - Rear Lamp (e.g. Brake Lamp, Reverse Light, Back Up Light, Rear Fog Light, Rear Light Module)
  - Driving of OLEDs in cathode to GND topology

**Application Diagram**

---

**8 Channel LED Driver with I²C Interface | E522.46**

**Key Features**
- Input voltage range 3.3V to 32V (max. 42V)
- 8-channel I²C programmable linear high side driver
- Parallel output operation for up to 200mA
- 8Bit adjustable LED master current 1mA to 26.5mA
- 8Bit PWM based LED luminous intensity level for LED binning calibration
- Global PWM and configurable analog dimming
- Configuration storable in integrated EEPROM
- Automotive qualified (AEC-Q100)

**Applications**
- Automotive LED lighting
- Multi-channel panel applications
- Low current interior lighting
- Dynamic rear light functions

**Application Diagram**
### 16 Channel LED Driver with I²C Interface | E522.48

**Key Features**
- Fast I²C bus interface for dynamic LED control
- 16 PWM generators with 10bit resolution
- 16 programmable LED drivers up to 100mA
- PWM interface with fallback data
- 10bit ADC for LED open, short and system diagnosis
- LED channel individual bin class brightness correction
- Single lamp mode behaviour option
- Developed according ISO26262 up to ASIL B

**Applications**
- Automotive interior and exterior light systems
- General LED Applications
- High speed LED light animations

**Application Diagram**

---

### 16 Channel LED Driver with Diff. Bus Interface | E522.49

**Key Features**
- Fast differential bus interface for dynamic LED control
- 16 PWM generators with 10bit resolution
- 16 programmable LED drivers up to 100mA
- PWM interface with fallback data
- 10bit ADC for LED open, short and system diagnosis
- LED channel individual bin class brightness correction
- Single lamp mode behaviour option
- Developed according ISO26262 up to ASIL B

**Applications**
- Automotive interior and exterior light systems
- General LED Applications
- High speed LED light animations

**Application Diagram**
1 Channel Switched-Mode Constant Current LED Controller | E522.31/33

Key Features
- 5.0V to 55V input, up to 80V boosted output voltage
- Boost-to-GND, Boost-to-Battery and SEPIC topologies supported
- Constant current regulation
- Analog dimming and digital dimming 3000:1 at 100Hz PWM
- Advanced In-System diagnostics (e.g. GND loss, output overload and highside feedback diagnostics)
- Very low sleep mode currents of typ. 8µA
- Automotive qualified (AEC-Q100)

Board
- Order No. see page 60

Applications
- Automotive interior and exterior light systems
- General LED Applications
- High speed LED light animations

Application Diagram

2 Channel Switched-Mode Constant Current LED Controller | E522.32/34

Key Features
- 5.0V to 55V input, up to 80V boosted output voltage
- Boost-to-GND, Boost-to-Battery and SEPIC topologies supported
- Constant current regulation
- Analog dimming and digital dimming 3000:1 at 100Hz PWM
- Advanced In-System diagnostics (e.g. GND loss, output overload and highside feedback diagnostics)
- Very low sleep mode currents of typ. 8µA
- PIN compatible to E522.31/33
- Automotive qualified (AEC-Q100)

Board
- Order No. see page 60

Applications
- Automotive LED lighting applications
- Exterior LED lighting
- TFT backlighting
- General current driven applications

Application Diagram
## Power Management - DC/DC Converters

### Automotive

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>$I_{\text{MAX}}$</th>
<th>Efficiency</th>
<th>$V_{\text{SUPPLY}}$</th>
<th>$V_{\text{OUT}}$</th>
<th>Package</th>
<th>Comment / Converter Topology</th>
</tr>
</thead>
<tbody>
<tr>
<td>E522.01 Low Quiescent Current PFM Step Down Converter (5V/500mA)</td>
<td>500mA</td>
<td>&gt;90%</td>
<td>4.5V to 40V</td>
<td>5V</td>
<td>QFN20L4 */ TSSOP16</td>
<td>Idle current of 12µA typ. &lt;br&gt; Sleep current of 8µA typ. &lt;br&gt; Input voltage up to 40V &lt;br&gt; Up to 100% duty cycle &lt;br&gt; Undervoltage lockout</td>
</tr>
<tr>
<td>E522.02 Low Quiescent Current PFM Step Down Converter (3.3V/500mA)</td>
<td>500mA</td>
<td>&gt;90%</td>
<td>4.5V to 40V</td>
<td>3.3V</td>
<td>QFN20L4 */ TSSOP16</td>
<td>Idle current of 12µA typ. &lt;br&gt; Sleep current of 8µA typ. &lt;br&gt; Input voltage up to 40V &lt;br&gt; Up to 100% duty cycle &lt;br&gt; Undervoltage lockout</td>
</tr>
<tr>
<td>E522.03 Low Quiescent Current PFM Step Down Converter (5V/350mA)</td>
<td>350mA</td>
<td>&gt;90%</td>
<td>4.5V to 40V</td>
<td>5V</td>
<td>QFN20L4 */ TSSOP16</td>
<td>Idle current of 12µA typ. &lt;br&gt; Sleep current of 8µA typ. &lt;br&gt; Input voltage up to 40V &lt;br&gt; Up to 100% duty cycle &lt;br&gt; Undervoltage lockout</td>
</tr>
<tr>
<td>E522.04 Low Quiescent Current PFM Step Down Converter (3.3V/350mA)</td>
<td>350mA</td>
<td>&gt;90%</td>
<td>4.5V to 40V</td>
<td>3.3V</td>
<td>QFN20L4 */ TSSOP16</td>
<td>Idle current of 12µA typ. &lt;br&gt; Sleep current of 8µA typ. &lt;br&gt; Input voltage up to 40V &lt;br&gt; Up to 100% duty cycle &lt;br&gt; Undervoltage lockout</td>
</tr>
<tr>
<td>E522.05 Low Quiescent Current PFM Step Down Converter (Adjustable Voltage/500mA)</td>
<td>500mA</td>
<td>&gt;90%</td>
<td>4.5V to 40V</td>
<td>1.5V to 40V</td>
<td>QFN20L4 */ TSSOP16</td>
<td>Idle current of 12µA typ. &lt;br&gt; Sleep current of 8µA typ. &lt;br&gt; Input voltage up to 40V &lt;br&gt; Up to 100% duty cycle &lt;br&gt; Undervoltage lockout</td>
</tr>
<tr>
<td>E522.06 Low Quiescent Current PFM Step Down Converter (Adjustable Voltage/350mA)</td>
<td>350mA</td>
<td>&gt;90%</td>
<td>4.5V to 40V</td>
<td>1.5V to 40V</td>
<td>QFN20L4 */ TSSOP16</td>
<td>Idle current of 12µA typ. &lt;br&gt; Sleep current of 8µA typ. &lt;br&gt; Input voltage up to 40V &lt;br&gt; Up to 100% duty cycle &lt;br&gt; Undervoltage lockout</td>
</tr>
</tbody>
</table>

* QFN both with/without wettable Flanks
<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>$I_{\text{MAX}}$</th>
<th>Efficiency</th>
<th>$V_{\text{SUPPLY}}$</th>
<th>$V_{\text{OUT}}$</th>
<th>Package</th>
<th>Comment / Converter Topology</th>
</tr>
</thead>
</table>
| E522.31/33             |            | >90%       | 5V to 55V       | up to 80V       | QFN32L5 | ▪ DC/DC Boost, SEPIC, Buck-Boost or Buck  
▪ incl.: charge pump for reverse polarity and HS Switch |
| 1 Channel Switched-Mode Constant Current LED Controller | -           |            |                |                |         |                               |
| E522.32/34             |            | >90%       | 5V to 55V       | up to 80V       | QFN32L5 | ▪ DC/DC Boost, SEPIC, Buck-Boost or Buck  
▪ incl.: charge pump for reverse polarity and HS Switch |
| 2 Channel Switched-Mode Constant Current LED Controller | -           |            |                |                |         |                               |
| E522.10                | 2000mA       | >90%       | 3.8V to 40V     | Adjustable with 200/800mV Vref | QFN20L4*/SOIC8-EP | ▪ Idle current of 15µA typ.  
▪ Sleep current of 10µA typ.  
▪ Input voltage up to 40V  
▪ Up to 100% duty cycle  
▪ Undervoltage lockout |
| Low Quiescent Current PFM Step Down Converter |            |            |                |                |         |                               |
| E522.41/43             | 2500mA       | >90%       | 6.0V to 32V (tran. 42V) | 5V | QFN20L5 | ▪ Fixed frequency 250kHz - 2MHz  
▪ ± 25% synchronizable  
▪ Fixed 5V ±3% USB Bus voltage with seven programmable negative resistance adjustments  
▪ SDP, BC 1.2 CDP, DCP and individual USB charging modes |
| Automotive USB 2.0 Supply with Data Line Protection and I²C Interface |            |            |                |                |         |                               |

* QFN both with/without wettable Flanks
Low Quiescent Current PFM Step Down Converters | E522.01-06

Key Features
- Voltage range 4.3V to 40V
- PFM operation up to 1.33MHz
- Up to >92% efficiency
- Very low 8μA sleep mode current
- Ultra low 12μA standby current
- 100% duty cycle capability
- Junction temperature range -40°C to +150°C
- Automotive qualified (AEC-Q100)

Board
- Order No. see page 61

Applications
- Supply of
  - Microcontroller systems
  - Automotive telematics, dashboards
  - Partial networking systems
  - Peripheral control systems

Packages
- QFN20L4
- TSSOP16

Application Diagram

Low Quiescent Current PFM Step Down Converters | E522.10

Key Features
- Voltage range 3.6V to 40V
- PFM operation up to 1.33MHz
- Up to >92% efficiency
- Very low 10μA sleep mode current
- Idle current 15μA
- 100% duty cycle capability
- Junction temperature range -40°C to +150°C
- Automotive qualified (AEC-Q100)

Board
- Order No. see page 61

Applications
- Supply of
  - Microcontroller systems
  - Automotive telematics, dashboards
  - Partial networking systems
  - Peripheral control systems

Packages
- QFN20L4
- SOIC8-EP

Application Diagram
Automotive USB 2.0 Supply w. Data Line Protection a. I²C Interface | E522.41/43

Key Features
- Wide input voltage range from 6V to 32V (tran. 42V)
- PWM Step-Down converter 250kHz, 500kHz, 1MHz or 2MHz
- Advanced PWM voltage regulation with 100% duty cycle
- Fixed 5V±3% USB BUS voltage, w. negative resistance adjustm.
- Output currents of 0.5/1A/1.5A/2.5A w. fixed limits or regulation
- ±25% synchronizable to center frequencies
- Wake-on USB functionality
- Automotive qualified (AEC-Q100)

Board
- Order No. see page 61

Applications
- Automotive infotainment and navigation
- USB-Chargers

Packages
- QFN20L5

Application Diagram
<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>Recommended $I_{\text{MAX}}$</th>
<th>$V_{\text{SUPPLY}}$</th>
<th>$V_{\text{OUT}}$</th>
<th>Package</th>
<th>Comment / Converter Topology</th>
</tr>
</thead>
</table>
| E522.40                           | 2x 200mA                      | 4.5V to 25V               | 3.3V to $V_{\text{BAT}}$| QFN20L5     | • ADC capturing of relevant voltages and currents  
• I²C interface for programming and monitoring  
• Multiple protection features                                                                                                                                                    |
| E522.44                           | 1x 350mA  
1x 200mA  
1x 80mA | 4.5V to 40V               | 3V to 40V                | DFN18L5040-5LP | • Parallel regulator operation  
• ADC capturing of relevant voltages and currents  
• I²C interface for programming and monitoring  
• Multiple protection features                                                                                                                                                    |
### Dual LDO with Diagnosis | E522.40

**Key Features**
- Input voltage range from 4.5V to 25V
- Two accurate output voltages from 3.3V to V_{BAT}
- Up to 200mA load current with integrated current limit
- Programmable overcurrent and open load detection levels
- Over voltage, overtemperature a. output voltage error protection
- Open-drain error flag for interrupt generation
- 8bit ADC samples system voltages and current ranges
- Optional external NPN pre-regulator
- Programmable comparator for additional control functions

**Applications**
- Automotive antenna modules
- Navigation and radio units
- General voltage regulator applications

**Application Diagram**

#### Board
- Order No. see page 62

#### Packages
- QFN20L5

### Triple Antenna Supply | E522.44

**Key Features**
- Input voltage range from 4.5V to 40V
- Resistor programmable output voltage
- Output voltage range 3 to 40V
- Three channels with up to 350mA output current capability
- Parallel regulator operation
- Switch mode operation Output current and voltage sensing
- Thermal protection and temperature monitoring
- Over current/open load protection

**Applications**
- Automotive Antenna Modules
- Navigation and Radio Units
- General Voltage Regulator Applications
- Sensors

**Application Diagram**

#### Board
- Order No. see page 62

#### Packages
- DFN18L5040-SLP
## Power Management - Boards

### LED

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.31</td>
<td>Evaluation Board (without CPU boards)</td>
<td>Evaluation Kit</td>
<td>K52131-0001</td>
</tr>
<tr>
<td>E521.31</td>
<td>Adapter board</td>
<td>CPU Board</td>
<td>K52131-0002</td>
</tr>
<tr>
<td>E521.31</td>
<td>Mini-Demo</td>
<td>Demoboard</td>
<td>K52131-0003</td>
</tr>
<tr>
<td>E521.31</td>
<td>Evaluation Board Autoaddressing</td>
<td>Evaluation Board</td>
<td>K52131-0004</td>
</tr>
<tr>
<td>E521.31</td>
<td>MiniMux (Mini-Demo Multiplexer)</td>
<td>MiniMux (Mini-Demo Multiplexer)</td>
<td>K52131-0005</td>
</tr>
<tr>
<td>E521.31</td>
<td>Piggy Board. RBG Demonstrator</td>
<td>Demoboard</td>
<td>K52131-0006</td>
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<tr>
<td>E521.31</td>
<td>MiniMux CAN (Mini-Demo Multiplexer)</td>
<td>Demoboard</td>
<td>K52131-0007</td>
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<tr>
<td>E521.36</td>
<td>Evaluation Board</td>
<td>Evaluation Kit</td>
<td>K52136-0001</td>
</tr>
<tr>
<td>E521.36</td>
<td>CPU Board with removable socket ENPLAS</td>
<td>Evaluation Kit</td>
<td>K52136-0002</td>
</tr>
<tr>
<td>E521.36</td>
<td>CPU Board without removable socket</td>
<td>Evaluation Kit</td>
<td>K52136-0003</td>
</tr>
<tr>
<td>E521.36</td>
<td>Mini-Demo</td>
<td>Demo Board</td>
<td>K52136-0004</td>
</tr>
<tr>
<td>E521.36</td>
<td>CPU Board RAM Device</td>
<td>Development Board</td>
<td>K52136-0005</td>
</tr>
<tr>
<td>E521.36</td>
<td>Mini-Demo ENPLAS</td>
<td>Demoboard</td>
<td>K52136-0006</td>
</tr>
<tr>
<td>E521.36</td>
<td>Mini-Demo RAM</td>
<td>Demoboard</td>
<td>K52136-0007</td>
</tr>
<tr>
<td>E521.36</td>
<td>Mini-Demo with MiniMux SW</td>
<td>Demoboard</td>
<td>K52136-0008</td>
</tr>
<tr>
<td>E522.46</td>
<td>8 Channel LED Driver with I²C Interface</td>
<td>Evaluation Kit</td>
<td>K52246-0002</td>
</tr>
<tr>
<td>E522.48</td>
<td>16 Channel LED Driver with I²C Interface</td>
<td>Evaluation Board</td>
<td>K52248-0001</td>
</tr>
<tr>
<td>E522.48</td>
<td>16 Channel LED Driver with I²C Interface</td>
<td>Adapter board E522.48</td>
<td>K52248-0002</td>
</tr>
<tr>
<td>E522.48</td>
<td>16 Channel LED Driver with I²C Interface</td>
<td>Adapter board with Exchange socket</td>
<td>K52248-0003</td>
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<tr>
<td>E522.48</td>
<td>16 Channel LED Driver with I²C Interface</td>
<td>LED Board</td>
<td>K52295-0004</td>
</tr>
<tr>
<td>E522.48</td>
<td>16 Channel LED Driver with I²C Interface</td>
<td>Supply Board</td>
<td>K52248-0008</td>
</tr>
<tr>
<td>E522.48</td>
<td>16 Channel LED Driver with I²C Interface</td>
<td>Masterboard</td>
<td>K52248-0009</td>
</tr>
<tr>
<td>E522.49</td>
<td>16 Channel LED Driver with Differential Interface + UART</td>
<td>Evaluation Board</td>
<td>K52249-0001</td>
</tr>
<tr>
<td>E522.49</td>
<td>16 Channel LED Driver with Differential Interface + UART</td>
<td>Adapter board E522.49</td>
<td>K52249-0002</td>
</tr>
<tr>
<td>E522.49</td>
<td>16 Channel LED Driver with Differential Interface + UART</td>
<td>Adapter board with Exchange socket</td>
<td>K52249-0003</td>
</tr>
<tr>
<td>E522.49</td>
<td>16 Channel LED Driver with Differential Interface + UART</td>
<td>LED Board</td>
<td>K52249-0004</td>
</tr>
<tr>
<td>E522.49</td>
<td>16 Channel LED Driver with Differential Interface + UART</td>
<td>Supply Board</td>
<td>K52248-0008</td>
</tr>
<tr>
<td>E522.49</td>
<td>16 Channel LED Driver with Differential Interface + UART</td>
<td>Masterboard</td>
<td>K52249-0009</td>
</tr>
</tbody>
</table>
## LED

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E522.81</td>
<td>LED Slaveboard Red (3x3 red)</td>
<td>Demoboard</td>
<td>KS2281-0001</td>
</tr>
<tr>
<td>E522.83</td>
<td>LED Slaveboard RGB (3x red, 3x green, 3x)</td>
<td>Demoboard</td>
<td>KS2283-0001</td>
</tr>
<tr>
<td>E522.8x</td>
<td>Master Controllerboard</td>
<td>Demoboard</td>
<td>KS228x-0001</td>
</tr>
<tr>
<td>E522.9x</td>
<td>LED Slaveboard Red (3x3 red)</td>
<td>Demoboard</td>
<td>KS229X-0001</td>
</tr>
</tbody>
</table>

## DC/DC Converter

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E522.01</td>
<td>Low Quiescent Current PFM Step Down Converter (5V/500mA)</td>
<td>Demoboard</td>
<td>KS2201-0001</td>
</tr>
<tr>
<td>E522.02</td>
<td>Low Quiescent Current PFM Step Down Converter (3.3V/500mA)</td>
<td>Demoboard</td>
<td>KS2202-0001</td>
</tr>
<tr>
<td>E522.03</td>
<td>Low Quiescent Current PFM Step Down Converter (5V/350mA)</td>
<td>Demoboard</td>
<td>KS2203-0001</td>
</tr>
<tr>
<td>E522.04</td>
<td>Low Quiescent Current PFM Step Down Converter (3.3V/350mA)</td>
<td>Demoboard</td>
<td>KS2204-0001</td>
</tr>
<tr>
<td>E522.05</td>
<td>Low Quiescent Current PFM Step Down Converter (Adjustable Voltage/500mA)</td>
<td>Demoboard</td>
<td>KS2205-0001</td>
</tr>
<tr>
<td>E522.10</td>
<td>Low Quiescent Current PFM Step Down Converter (2A Buck Converter)</td>
<td>Demoboard Adjustible High Frequency Low Power 2A Step Down Converter (V-Demo)</td>
<td>KS2210-0001</td>
</tr>
<tr>
<td>E522.10</td>
<td>Low Quiescent Current PFM Step Down Converter (2A Buck Converter)</td>
<td>Demoboard Adjustible High Frequency Low Power 2A Step Down Converter for Constant Current Application (CC-Demo)</td>
<td>KS2210-0002</td>
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<tr>
<td>E522.10</td>
<td>Low Quiescent Current PFM Step Down Converter (2A Buck Converter)</td>
<td>Demoboard High Frequency Low Power Adjustable Voltage 2A Step Down / Step up Converter (ZETA-Topology)</td>
<td>KS2210-0003</td>
</tr>
<tr>
<td>E522.10</td>
<td>Low Quiescent Current PFM Step Down Converter (2A Buck Converter)</td>
<td>Demoboard High Frequency Constant Current (350mA) Step down / Step up Converter (ZETA-Topology)</td>
<td>KS2210-0004</td>
</tr>
<tr>
<td>E522.31</td>
<td>EMV Boost to Battery Converter (650mA)</td>
<td>Demoboard</td>
<td>KS2231-0002</td>
</tr>
<tr>
<td>E522.31</td>
<td>EMV Boost to GND Converter (500mA)</td>
<td>Demoboard</td>
<td>KS2231-0003</td>
</tr>
<tr>
<td>E522.31</td>
<td>Sepic Converter (750mA)</td>
<td>Demoboard</td>
<td>KS2231-0004</td>
</tr>
<tr>
<td>E522.31</td>
<td>Buck to Battery Converter (3A)</td>
<td>Demoboard</td>
<td>KS2231-0005</td>
</tr>
<tr>
<td>E522.32</td>
<td>Headlight LED Demo (2x Boost to Battery Topology) for High Beam, Low Beam (1A) and Daytime Running Light (750mA)</td>
<td>Demoboard</td>
<td>KS2232-0003</td>
</tr>
<tr>
<td>E522.32</td>
<td>Buck to Battery dual phase Converter (6A)</td>
<td>Demoboard</td>
<td>KS2232-0004</td>
</tr>
</tbody>
</table>
## LDO

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E522.40</td>
<td>Dual LDO with Diagnosis</td>
<td>Evaluation Board</td>
<td>K52240-0001</td>
</tr>
<tr>
<td>E522.44</td>
<td>Tripple Antenna Supply</td>
<td>Evaluation Board</td>
<td>K52244-0001</td>
</tr>
</tbody>
</table>
Dynamic Rear Light
## Interface - PSI5 Transceiver

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>V&lt;sub&gt;supply&lt;/sub&gt;</th>
<th>Iq (mA)</th>
<th>ESD (kV)</th>
<th>Bitrate</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E521.40</strong> 2-Channel Multi-Mode PSI5 Transceiver</td>
<td>5.3V to 19V</td>
<td>1</td>
<td>4</td>
<td>up to 189 Kbit/s</td>
<td>QFN20L5</td>
</tr>
<tr>
<td><strong>E521.41</strong> 4-Channel Multi-Mode PSI5 Transceiver</td>
<td>5.3V to 19V</td>
<td>2</td>
<td>4</td>
<td>up to 189 Kbit/s</td>
<td>QFN20L5</td>
</tr>
<tr>
<td><strong>E981.07</strong> 2-Channel Sensor Interface PSI5</td>
<td>8.5V to 25V</td>
<td>1</td>
<td>4</td>
<td>125 Kbit/s</td>
<td>QFN20L5</td>
</tr>
<tr>
<td><strong>E981.08</strong> 4-Channel Sensor Interface PSI5</td>
<td>8.5V to 25V</td>
<td>1</td>
<td>4</td>
<td>125 Kbit/s</td>
<td>QFN32L7</td>
</tr>
</tbody>
</table>
2-/4-Channel Multi-Mode PSi5 Transceiver | E521.40/41

Key Features
- Provides two respective, four master channels compliant with PSi5 standard v1.3 and v2.1
- Support 125 Kbit/s, 189 Kbit/s, synchronous and asynchronous modes
- Internal sync-voltage generation
- Programmable bus-voltage 4.6V to 11V
- Automatic threshold adaption to sensor quiescent current
- Reverse polarity protected bus outputs up to 40V

Applications
- Safety (airbag) control systems
- Powertrain control systems
- Vehicle dynamics control system

Board
- Order No. see page 76

Application Diagram

2-/4-Channel Sensor Interface PSi5 | E981.07/08

Key Features
- Two respective, four independent operating channels
- Device parameters comply with PSi5-P10P-S003L (PSi5 spec 1.3)
- Applicable for parallel and universal mode (standard) as well as daisy chain mode (increased)
- Channel output short circuit protected against 40V and GND

Applications
- Passenger restraint systems

Board
- Order No. see page 76

Applications
- Safety (airbag) control systems
- Powertrain control systems
- Vehicle dynamics control system

Packages
- QFN20L5 respective

Application Diagram
# Interface - CAN Transceiver and System Basis Chip

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>Interface</th>
<th>$V_{\text{SUPPLY}}$</th>
<th>$I_q$ (µA)</th>
<th>$V_{\text{DD}}$</th>
<th>ESD (kV)</th>
<th>Bitrate</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.21 CAN-FD SBC with DC/DC and Higside Switch</td>
<td>11898-2/-5</td>
<td>5.5V to 40V</td>
<td>30</td>
<td>3.3V</td>
<td>8</td>
<td>up to 2 Mbit/s</td>
<td>QFN32L5</td>
</tr>
<tr>
<td>E521.22 CAN-FD SBC with LDO and Higside Switch</td>
<td>11898-2/-5</td>
<td>5.5V to 40V</td>
<td>30</td>
<td>3.3V</td>
<td>8</td>
<td>up to 2 Mbit/s</td>
<td>QFN32L5</td>
</tr>
<tr>
<td>E521.23 CAN-FD SBC with DC/DC and Higside Switch</td>
<td>11898-2/-5</td>
<td>5.5V to 40V</td>
<td>30</td>
<td>5V</td>
<td>8</td>
<td>up to 2 Mbit/s</td>
<td>QFN32L5</td>
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<tr>
<td>E521.24 CAN-FD SBC with LDO and Higside Switch</td>
<td>11898-2/-5</td>
<td>5.5V to 40V</td>
<td>30</td>
<td>5V</td>
<td>8</td>
<td>up to 2 Mbit/s</td>
<td>QFN32L5</td>
</tr>
</tbody>
</table>
**Key Features**

- Voltage regulator 3.3V/5V
- DC/DC buck converter up to 200mA
- HS-CAN-FD transceiver (ISO 11898-2:2016) up to 2 Mbit
- Charge pump for external active reverse polarity protection
- Sensor supply voltage regulator 5V/50mA
- Integrated high-side switch typ. 0.15Ω with current sense
- Gate control for external high-side driver (NMOS power FET)

**Applications**

- ECU connected to the CAN bus
- Front light modules
- Body computer

**Packages**

- QFN32L5

---

**Key Features**

- Voltage regulator 3.3V/5V
- Linear Regulator up to 200mA
- HS-CAN-FD transceiver (ISO 11898-2:2016) up to 2 Mbit
- Charge pump for external active reverse polarity protection
- Sensor supply voltage regulator 5V/50mA
- Integrated high-side switch typ. 0.15Ω with current sense
- Gate control for external high-side driver (NMOS power FET)

**Applications**

- ECU connected to the CAN bus
- Front light modules
- Body computer

**Packages**

- QFN32L5
# Interface - LIN Transceiver and System Basis Chip

## LIN Transceiver and System Basis Chip

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>Interface</th>
<th>$V_{\text{supply}}$</th>
<th>$I_q$ (µA)</th>
<th>$V_{\text{DD}}$</th>
<th>ESD (kV)</th>
<th>Bitrate</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.25 LIN SBC with Voltage</td>
<td>LIN 2.1, LIN 2.2, SAE-J2602, ISO9141</td>
<td>5V to 28V</td>
<td>10</td>
<td>3.3V</td>
<td>8</td>
<td>up to 20 Kbit/s</td>
<td>QFN20L5</td>
</tr>
</tbody>
</table>

## LIN RGB Controller

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>Interface</th>
<th>$V_{\text{supply}}$</th>
<th>$I_q$ (µA)</th>
<th>$V_{\text{DD}}$</th>
<th>ESD (kV)</th>
<th>Bitrate</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.31 SoC LIN Controller</td>
<td>LIN 2.1, LIN 2.2, SAE-J2602</td>
<td>5V to 28V, max. 40V</td>
<td>10</td>
<td>5V</td>
<td>8</td>
<td>up to 20 Kbit/s</td>
<td>QFN32L5</td>
</tr>
<tr>
<td>E521.36 SoC RGB LIN Controller</td>
<td>LIN 2.1, LIN 2.2, SAE-J2602</td>
<td>5V to 28V, max. 40V</td>
<td>15</td>
<td>-</td>
<td>8</td>
<td>up to 20 Kbit/s</td>
<td>SOIC8-EP</td>
</tr>
</tbody>
</table>

*SoC  System-on-a-Chip with integrated microcontroller
LIN SBC with Voltage Regulator | E521.25

Key Features
- LIN transceiver, V 2.1, V2.2 SAE-J2602, ISO9141
- Operating range V5 5V up to 28V
- Limited functional range 3.8V up to 40V
- Typ. 10µA sleep current consumption
- Very low BUS leakage current
- Reset generation
- µC window watchdog
- Internal 1.6 Voltage Divider for V_{bat} Sensing
- 3.3V (2%) in active mode, (5%) in standby mode

Applications
- Smart applications connected to the LIN bus

Packages
- QFN20L5

Application Diagram
LIN Controller with Position Detection | E521.31

**Key Features**
- Transceiver compliant with LIN 2.1, LIN 2.2 and SAE-J2602
- Linear voltage regulator with 5V, 100mA
- State of the art 16bit μC
- Integrated 32kbyte Flash (Flexible EEPROM emulation by SW)
- 4x PWM driven High Side drivers with 5V and up to 50mA each
- μC window watchdog
- ADC 12bit accuracy

**Applications**
- Interior light modules

**Board**
- Order No. see page 76

**Packages**
- QFN32L5

---

RGB LIN Controller with Current Source | E521.36

**Key Features**
- Input voltage range 5V to 28V
- Integrated 16 bit microcontroller
- 32kByte OTP
- 128Byte customer usable non-volatile memory
- 1.25kByte RAM 16kByte SysROM containing standard LIN routines and boot loader
- 4 PWM generators with 48MHz and 16bit resolution
- 2 Timers with 16bit resolution
- 3 LED drivers with currents up to 40mA and fast slopes

**Applications**
- Interior light modules
- Ambient lighting

**Board**
- Order No. see page 76

**Packages**
- SOIC8-EP

---

**Application Diagram**

---

**Application Diagram**

---
LED Ambient Light
## Interface - KNX/EIB Transceiver

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>V(_\text{SUPPLY})</th>
<th>Iq (mA)</th>
<th>V(_\text{DD})</th>
<th>ESD (kV)</th>
<th>Bitrate</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>E981.03 KNX/EIB Transceiver</td>
<td>19V to 33V</td>
<td>1.9 (^1)</td>
<td>3.3V/5V</td>
<td>2</td>
<td>9.6 Kbit/s, 19.2 Kbit/s, 115.2 Kbit/s</td>
<td>QFN32L7</td>
</tr>
<tr>
<td>E981.23 KNX-Transceiver with Hardware Programming</td>
<td>19V to 33V</td>
<td>1.9 (^1)</td>
<td>3.3V/5V</td>
<td>2</td>
<td>9.6 Kbit/s, 19.2 Kbit/s, 115.2 Kbit/s</td>
<td>QFN32L7</td>
</tr>
<tr>
<td>E981.33 KNX-Bit Transceiver with Hardware Programming</td>
<td>19V to 33V</td>
<td>1.9 (^1)</td>
<td>3.3V/5V</td>
<td>2</td>
<td>9.6 Kbit/s</td>
<td>QFN32L7</td>
</tr>
</tbody>
</table>

\(^1\) Typical value for V\(_\text{DD}\) = 3.3V
KNX/EIB Transceiver | E981.03

Key Features
- KNX/EIB transceiver, certified according to KNX TP1-256
- Analog mode supported
- Configurable bus current (maximum current and slew rate)
- Voltage regulators
  - 20V: current capability up to 20mA
  - 3.3V or 5V DC/DC converter: current capability up to 70mA
- UART host interface (data rate up to 115.2 Kbit/s)
- SPI for configuration (optional)

Board
- Order No. see page 77

Applications
- Sensors, actuators, routers, gateways,
  Bus-powered or externally supplied
- Security applications

Application Diagram

KNX-Transceiver with Hardware Current Programming | E981.23

Key Features
- KNX/EIB transceiver, certified according to KNX TP1-256
- Analog mode supported
- Configuration pins for bus current & slope
- Configuration pins for external clock frequency 8 or 7.3728 MHz
- Further configuration and diagnosis via UART
- Voltage regulators
  - 20V: current capability up to 25mA
  - 3.3V or 5V DC/DC converter: current capability up to 100mA

Board
- Order No. see page 77

Applications
- Sensors, actuators, routers, gateways,
  Bus-powered or externally supplied
- Security applications

Application Diagram
KNX-Bit Transceiver with Hardware Current Programming | E981.33

Key Features
- KNX/EIB transceiver, certified according to KNX TP1-256
- Analog mode supported
- Configuration pins for bus current & slope
- Further configuration and diagnosis via bit transceiver
- Voltage regulators
  - 20V: current capability up to 25mA
  - 3.3V or 5V DC/DC converter: current capability up to 100mA

Applications
- Sensors, actuators, routers, gateways,
  Bus-powered or externally supplied
- Security applications

Board
- Order No. see page 77

Packages
- QFN32L7

Application Diagram

<table>
<thead>
<tr>
<th></th>
<th>E981.03</th>
<th>E981.23</th>
<th>E981.33</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNX EIB transceiver analog mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KNX EIB transceiver with medium access control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compatible to KNX TP1-256 supporting extended frames up to 254 Bytes payload</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration pins for bus current &amp; slope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration pins for external clock frequency 8 or 7.3728 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Further configuration and diagnosis via SPI UART</td>
<td>UART</td>
<td>UART</td>
<td></td>
</tr>
<tr>
<td>UART host interface up to 115kBaud with optional CRC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power management functionality with host wake up on received KNX telegram content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buck voltage regulator for 3.3 or 5V for up to 70mA 100mA 100mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linear voltage regulator for 20V up to 25mA</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Over temperature monitoring/protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature range –25°C to +85°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QFN32L7 package (all pin compatible)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Make your home smart with KNX network solutions
## Interface - Boards

### PSIS Transceiver

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.41</td>
<td>4-Channel Multi-Mode PSIS Transceiver</td>
<td>Demoboard</td>
<td>K52141-0001</td>
</tr>
<tr>
<td>E981.07</td>
<td>2-Channel Sensor Interface PSIS</td>
<td>Evaluation Board</td>
<td>K98107-0001</td>
</tr>
<tr>
<td>E981.07</td>
<td>2-Channel Sensor Interface PSIS</td>
<td>Adapter Board</td>
<td>K98107-0002</td>
</tr>
</tbody>
</table>

### Interior Lighting & LIN Controller

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.31</td>
<td>LIN RGB Controller with Position Detection</td>
<td>Evaluation Board</td>
<td>K52131-0001</td>
</tr>
<tr>
<td>E521.31</td>
<td>LIN RGB Controller with Position Detection (CPU Board for K52131-0001)</td>
<td>CPU Board</td>
<td>K52131-0002</td>
</tr>
<tr>
<td>E521.31</td>
<td>LIN RGB Controller with Position Detection (Full Application in Small Size)</td>
<td>Mini-Demo</td>
<td>K52131-0003</td>
</tr>
<tr>
<td>E521.31</td>
<td>LIN RGB Controller with Position Detection (Auto-Addressing Test Board)</td>
<td>Evaluation Board</td>
<td>K52131-0004</td>
</tr>
<tr>
<td>E521.31</td>
<td>MiniMux (Mini-Demo Multiplexer)</td>
<td>Mini-Demo</td>
<td>K52131-0005</td>
</tr>
<tr>
<td>E521.31</td>
<td>RGB LIN Controller with Current Source (CPU Board with removable socket)</td>
<td>Evaluation Board</td>
<td>K52136-0001</td>
</tr>
<tr>
<td>E521.31</td>
<td>RGB LIN Controller with Current Source (CPU Board with removable socket ENPLAS)</td>
<td>CPU Board ENPLAS</td>
<td>K52136-0002</td>
</tr>
<tr>
<td>E521.36</td>
<td>RGB LIN Controller with Current Source (CPU Board without removable socket)</td>
<td>CPU Board</td>
<td>K52136-0003</td>
</tr>
<tr>
<td>E521.36</td>
<td>RGB LIN Controller with Current Source</td>
<td>Mini-Demo</td>
<td>K52136-0004</td>
</tr>
<tr>
<td>E521.36</td>
<td>RGB LIN Controller with Current Source (CPU Board RAM Device)</td>
<td>CPU Board</td>
<td>K52136-0005</td>
</tr>
<tr>
<td>E521.36</td>
<td>RGB LIN Controller with Current Source</td>
<td>Mini-Demo ENPLAS</td>
<td>K52136-0006</td>
</tr>
<tr>
<td>E521.36</td>
<td>RGB LIN Controller with Current Source</td>
<td>Mini-Demo RAM</td>
<td>K52136-0007</td>
</tr>
<tr>
<td>Part No.</td>
<td>Function</td>
<td>Board type</td>
<td>Order No.</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------</td>
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<tr>
<td>E981.03</td>
<td>KNX/EIB Transceiver</td>
<td>KNX TP Demoboard</td>
<td>K98103-0001</td>
</tr>
<tr>
<td>E981.03</td>
<td>KNX/EIB Transceiver</td>
<td>KNX TP 815 Evaluation Board V2</td>
<td>K98103-0002</td>
</tr>
<tr>
<td>E981.23</td>
<td>KNX/EIB Transceiver</td>
<td>KNX TP 815 Evaluation Board V2</td>
<td>K98123-0001</td>
</tr>
<tr>
<td>E981.33</td>
<td>KNX/EIB Transceiver</td>
<td>KNX TP 815 Evaluation Board V2</td>
<td>K98133-0001</td>
</tr>
</tbody>
</table>
## Special Projects - Safety

<table>
<thead>
<tr>
<th>Part No. / Description</th>
<th>$V_{\text{supply}}$</th>
<th>Interfaces / Features</th>
<th>$\mu$C Interface</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.40 2-Channel Multi-Mode PSI5 Transceiver</td>
<td>5.3V to 19V</td>
<td>2 PSI5 Master rev 2.1 / 1.3 Standard / fast Sync (int. Chargepump) / async</td>
<td>SPI (16 bit, 5MHz) / UART (16 bit, 6.4 Mbps)</td>
<td>QFN20L5 SOIC20</td>
</tr>
<tr>
<td>E521.41 4-Channel Multi-Mode PSI5 Transceiver</td>
<td>5.3V to 19V</td>
<td>4 PSI5 Master rev 2.1 / 1.3 Standard / fast Sync (int. Chargepump) / async</td>
<td>SPI (16 bit, 5MHz) / UART (16 bit, 6.4 Mbps)</td>
<td>QFN20L5 SOIC20</td>
</tr>
<tr>
<td>E981.07 2-Channel Sensor Interface PSI5</td>
<td>3.3V to 5.5V</td>
<td>2 PSI5 Master rev 1.3 Standard speed Sync / SPI (16 bit, 8 MHz)</td>
<td></td>
<td>QFN20L5</td>
</tr>
<tr>
<td>E981.08 4-Channel Sensor Interface PSI5</td>
<td>3.3V to 5.5V</td>
<td>4 PSI5 Master rev 1.3 Standard speed Sync / SPI (16 bit, 8 MHz)</td>
<td></td>
<td>QFN32L7</td>
</tr>
<tr>
<td>E981.17 4-Channel Airbag Squib Driver</td>
<td>4.5V to 5.5V</td>
<td>4 Squib HS/LS Driver LCM / HCM</td>
<td>SPI (8/16bit, 8 MHz)</td>
<td>QFN44L7</td>
</tr>
<tr>
<td>E981.18 8-Channel Airbag Squib Driver</td>
<td>4.5V to 5.5V</td>
<td>8 Squib HS/LS Driver LCM / HCM</td>
<td>SPI (8/16 bit, 8 MHz)</td>
<td>QFN44L7</td>
</tr>
<tr>
<td>E981.20 4-Channel Squib Driver with Current Counter</td>
<td>4.5V to 5.5V</td>
<td>4 Squib HS/LS Driver LCM, HCM1 and HCM2</td>
<td>SPI (8/16/32 bit, 8 MHz)</td>
<td>QFN44L7</td>
</tr>
<tr>
<td>E981.21 8-Channel Squib Driver with Current Counter</td>
<td>4.5V to 5.5V</td>
<td>8 Squib HS/LS Driver LCM, HCM1 and HCM2</td>
<td>SPI (8/16/32 bit, 8 MHz)</td>
<td>QFN44L7</td>
</tr>
</tbody>
</table>
2-/4-Channel Multi-Mode PSI5 Transceiver | E521.40/41

Key Features
- Provides two respective, four master channels compliant with PSI5 standard v1.3 and v2.1
- Support 125 Kbit/s, 189 Kbit/s, synchronous and asynchronous modes
- Internal sync-voltage generation
- Programmable bus-voltage 4.6V to 11V
- Automatic threshold adaption to sensor quiescent current
- Reverse polarity protected bus outputs up to 40V

Applications
- Safety (airbag) control systems
- Powertrain control systems
- Vehicle dynamics control system

Board
- Order No. see page 88

Application Diagram

2-/4-Channel Sensor Interface PSI5 | E981.07/08

Key Features
- Two respective, four independent operating channels
- Device parameters comply with PSI5-P10P-500/3L (PSI5 spec 1.3)
- Applicable for parallel and universal mode (standard) as well as daisy chain mode (increased)
- Channel output short circuit protected against 40V and GND

Applications
- Passenger restraint systems

Board
- Order No. see page 88

Application Diagram
4-/8-Channel Airbag Squib Driver | E981.17/18

Key Features
- Two squib current modes (LCM and HCM) selectable via SPI commands
- Simultaneously firing of 4 loops possible
- Squib channel diagnostics and monitoring
- Autarky voltage & squib supply voltage diagnostics
- Separate low side and high side driver control
- Serial interface (SPI synchronous communication) to μC (3.3V and 5V tolerant inputs)

Applications
- Squib driver in a restraint diagnostic and control module (RDM)

Packages
- QFN44L7

Application Diagram

4-/8-Channel Squib Driver with Current Counter | E981.20/21

Key Features
- Two squib current modes (LCM and HCM) selectable via SPI commands
- Simultaneously firing of 4 loops possible
- Squib channel diagnostics, monitoring and current counter
- Autarky voltage & squib supply voltage diagnostics
- Separate low side and high side driver control
- Serial interface (SPI synchronous communication) to μC (3.3V and 5V tolerant inputs)

Applications
- Squib driver in a restraint diagnostic and control module (RDM)

Packages
- QFN44L7

Application Diagram
Passenger Safety Solutions
## Special Projects - Engine Management

<table>
<thead>
<tr>
<th>Part No. / Function</th>
<th>$V_{\text{SUPPLY}}$</th>
<th>$RDS_{\text{ON}}$</th>
<th>Interface</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E525.07 Glow Plug Control IC</td>
<td>5.5V to 16V (45V)</td>
<td>4x Gate driver</td>
<td>PWM, SPI</td>
<td>QFN32L6</td>
<td>- Slew rate controlled gate driver</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Gate sequencing</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>- Advanced diagnosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Ground shift compensating</td>
</tr>
</tbody>
</table>
Glow Plug Control IC | E525.07

Key Features
- 4 gate drivers for external hi-side power-NMOS
- PWM controlled gate output with integrated charge pump
- Adjustable gate charge / discharge currents
- Gate sequencing for minimum current ripple
- MOS protection by gate-source voltage limitation
- Glow plug current sense with over-current shut-off
- Battery measurement, over-voltage and undervoltage, shut-down, charge pump monitoring

Applications
- Quick start Diesel engine controls for Euro 6
- Ceramic glow plugs
- Steel glow plugs
- For direct and indirect injection

Packages
- QFN32L6

Application Diagram
## Special Projects - Relay Driver

<table>
<thead>
<tr>
<th>Part No. / Function</th>
<th>High-Side Driven</th>
<th>Low-Side Driven</th>
<th>Bi-Stabil</th>
<th>Included µC</th>
<th>Interface</th>
<th>Feed-Back Inputs</th>
<th>Package</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E520.02/08</td>
<td>-</td>
<td>12/08</td>
<td>-</td>
<td>External</td>
<td>· SPI</td>
<td>0 ( to ext.µC)</td>
<td>QFN32L5</td>
<td>Automatical VBAT dependent PWM generation for constant holding current</td>
</tr>
<tr>
<td>E523.03/04</td>
<td>*SBC</td>
<td>1 or</td>
<td>1</td>
<td>External 3.3V/5V</td>
<td>· LIN1 3/2.x/PWM</td>
<td>0 ( to ext.µC)</td>
<td>QFN20L4</td>
<td>Regulator</td>
</tr>
<tr>
<td>E523.13/14</td>
<td>LIN2 x Relay Node SBC for 1 Relay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>QFN32L5</td>
<td>Regulator</td>
</tr>
<tr>
<td>E523.01/11</td>
<td>*SBC</td>
<td>6 or</td>
<td>6 or</td>
<td>External 3.3V/5V</td>
<td>· LIN1 3/2.x/PWM</td>
<td>0 ( to ext.µC)</td>
<td>QFN44L7</td>
<td>Regulator</td>
</tr>
<tr>
<td>E523.02/12</td>
<td>LIN2 x Relay Node SBC for 4/3 Relays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>QFN44L7</td>
<td>Regulator</td>
</tr>
<tr>
<td>E523.06</td>
<td>*SoC</td>
<td>6 or</td>
<td>6 or</td>
<td>External 3.3V/5V</td>
<td>· LIN1 3/2.x/PWM</td>
<td>0 ( to ext.µC)</td>
<td>QFN48L7</td>
<td>32k Flash (free programmable)</td>
</tr>
<tr>
<td>E523.30/34</td>
<td>Free Programmable LIN2 x Relay Node for 2-4 Relays</td>
<td>2 or</td>
<td>2 or</td>
<td>3</td>
<td>· LIN1 3/2.x/PWM</td>
<td>8</td>
<td>QFN32L6</td>
<td>8k Flash and ROM + 4k SysROM library</td>
</tr>
<tr>
<td>E523.31/37</td>
<td>*SoC</td>
<td>2 or</td>
<td>2 or</td>
<td>3</td>
<td>· LIN1 3/2.x/PWM</td>
<td>3</td>
<td>QFN32L6</td>
<td>switchable 5V supply for external needs</td>
</tr>
</tbody>
</table>

*Plug & Play* Chip with defined functionality | no controller programming necessary

*SoC* System-on-a-Chip | with integrated microcontroller

*SBC* System-Basic Chip | with Voltage Regulator Reset, Watchdog, physical Interface

*Driver IC* Driver Chip without SBC or SoC features
**12/8x Low-Side Relay Driver with Constant Holding Current | E520.02/08**

**Key Features**
- 12 high current outputs (RDS\_on\_typ. 1.5Ω / I\_MAX = 350mA)
- Low standby current (typically <1µA)
- Serial interface (SPI) for direct µC interfacing
- Short circuit / Open load detection, diagnosis
- T\_J\_peak = +150°C

**Applications**
- Relay Driver with automatically V\_BAT\_dependent WM duty cycle generation
- Low power dissipating relay boards

**Application Diagram**

![Application Diagram](image1.png)  
*Driver IC*  
**E520.02, E520.08**  
**E520.02 only**

**LIN2.x Relay Node SBC for 1 Relay | E523.03/04/13/14**

**Key Features**
- Voltage range 7V to 28V (5V to 42V peak)
- Controlling 1 low side driven relay or 1 high side driven relay
- Relay pull-in and holding current can be controlled via PWM input
- Power supply 3.3V or 5V for external controller
- LIN2.x(1.3), SAE-J2602 interface or bidirectional PWM
- Several Diagnostic and protection functions
- Adjustable window watchdog
- T\_J\_peak = +170°C

**Applications**
- LIN2.x or LIN1.3 relay nodes

**Packages**
- QFN32L5
- QFN20L5
- SOIC20
- SOIC28

**Application Diagram**

![Application Diagram](image2.png)  
*SBC*  
**E523.03/04/13/14**
LIN2.x Relay Node SBC for 6/5 relays | E523.01/11

Key Features
- Voltage range 7V to 28V (5V to 42V peak)
- Controls 6 relays, low- or high-side driven or 5 bistable relays
- Relay pull-in and holding current can be controlled via PWM input
- Power supply 3.3V or 5Vc for external controller
- LIN 2.x interface (1.3), SAE-J2602 or PWM bidirectional
- Several diagnostic and protection functions
- Adjustable window watchdog
- \( T_{junc, \text{peak}} = +170°C \)

Applications
- LIN2.x or LIN1.3 relay nodes

Packages
- QFN44L7
- QSOP44
- QFN48L7

Application Diagram

LIN2.x Relay Node SBC for 4/3 Relays | E523.02/12

Key Features
- Voltage range 7V to 28V (5V to 42V peak)
- Controls 4 relays, low- or high-side driven or 3 bistable relays
- Relay pull-in and holding current can be controlled via PWM input
- Power supply 3.3V or 5Vc for external controller
- LIN 2.x interface (1.3), SAE-J2602 or PWM bidirectional
- Several diagnostic and protection functions
- Adjustable window watchdog
- \( T_{junc, \text{peak}} = +170°C \)

Applications
- LIN2.x or LIN1.3 relay nodes

Packages
- QFN44L7
- QSOP44

Application Diagram
Free Programmable LIN2.x Relay Node for 6/5 relays | E523.06

Key Features
- Voltage range 7V to 28V (5V to 42V peak)
- Controls 6 relays high- or low-side driven or 5 bistable relays
- Relay pull-in and holding current can be controlled via PWM input
- LIN2.x(1.3)(SAE-J2602) interface or bidirectional PWM interface
- 16 bit RISC CPU 32k Flash 16k SysROM 4k SRAM
- 10 bit 1 Msample SAR ADC
- 4x 16 bit PWM generation (edge/center aligned)
- T_{junc, peak} = +150°C

Applications
- LIN2.x or LIN1.3 relay nodes

Packages
- QFN48L7

Application Diagram

Free Programmable LIN2.x Relay Node for 2-4 relays | E523.30/31/34/37

Key Features
- Controls 4 high side driven relays or 2 low side driven relays or 3 bistable relays
- Programmable holding current for low-side up to 800mA
- 5.5V to 20V supply voltage (load dump 42V)
- Embedded 8bit µC 256 Byte RAM, 8k Flash + 4k SysROM, 64 Byte E²
- LIN2.x(1.3), SAE-J2602 or PWM Interface, LIN Auto-Addressing
- T_{junc, peak} = +170°C

Applications
- LIN2.x or LIN1.3 relay nodes

Packages
- QFN32L6

Application Diagram
## Special Projects - Boards

### Safety

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Function</th>
<th>Board type</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E521.41</td>
<td>4-Channel Multi-Mode PSI5 Transceiver</td>
<td>Demoboard</td>
<td>K52141-0001</td>
</tr>
<tr>
<td>E981.07</td>
<td>2-Channel Sensor Interface PSI5</td>
<td>Evaluation Board</td>
<td>K98107-0001</td>
</tr>
<tr>
<td>E981.07</td>
<td>2-Channel Sensor Interface PSI5</td>
<td>Adapter Board</td>
<td>K98107-0002</td>
</tr>
</tbody>
</table>
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