

life is analog.



ASIC Design and Production



english edition

life is analog. are asics analog?



The digital revolution led to an unforeseen growth of features integrated into ICs.

Real life is analog, so all circuits need to adapt to the analog world.

To support the increasing demand, PREMA has developed a unique semiconductor process, optimized for the needs of analog circuits.

Our daily business is the design and production of analog ICs specifically for our customer's products in medium to high volumes in our own facility.

ASIC design and production

With over 30 years of experience in design and production of full-custom ICs and complete in-house wafer processing facilities, PREMA offers turnkey services from design, prototypes, test, to series production in high volumes. Our processes range among state of the art as well as most economic technologies for bipolar analog and mixed signal ICs. The high energy ion implantation is the unique key feature of the process developed by PREMA and allows a variety of devices that other standard processes cannot provide, or only at high cost, leading to efficient system-on-chip solutions. PREMA's location in the Frankfurt area is perfectly suited for close cooperations with international customers.

ASIC applications

Analog and mixed-signal ASICs such as

- > switching power supplies
- > light sensors
- > hall sensors
- > temperature sensors
- > LED drivers
- > infrared sensors and receivers
- > ICs for motion detectors
- > ICs for audio processors
- > ICs for security electronics

benefit from the performance of PREMA's process and know-how.

All products are manufactured in our plant in Europe, copy protected by process.

... life is analog.

life is analog.



prema asics are (not only) analog.



PREMA's processes allow to fabricate a variety of semiconductor devices in a cost-efficient way:

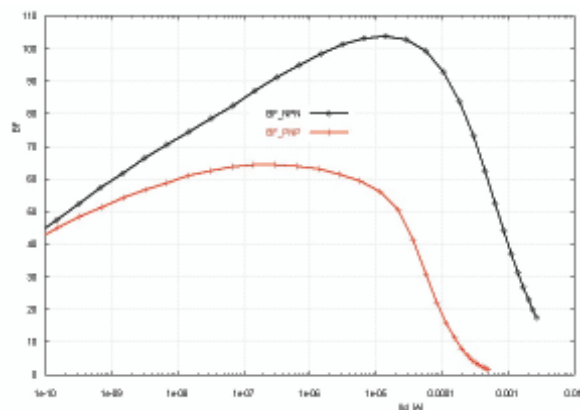
- > bipolar transistors with excellent analog performance
- > P-channel junction FETs
- > super-beta NPN transistors
- > photo diodes
- > magnetic sensors
- > super-beta phototransistors
- > logic circuits supporting analog functions.

Easy design on a versatile process

A wide range of components available without extra mask layers makes design with PREMA processes easy:

- > vertical NPN and PNP transistors
- > Super-beta NPN transistors
- > High-voltage NPN and PNP for up to 80V
- > NMOS and PMOS transistors*
- > DMOS transistors* with low $R_{DS(on)}$
- > Bipolar low-noise constant-current logic
- > JFET transistors
- > constant current diodes
- > N-type and P-type implanted resistors
- > MIM* and junction capacitors
- > Photo diodes and phototransistors
- > Hall sensor cells

* in qualification



One of the outstanding characteristics of bipolar transistors is the high gain of NPN and PNP transistors over many decades of collector current.

Standard NPN transistors have a V_{CE0} of 25V. Special high-voltage NPN and PNP transistors are qualified for collector-emitter voltages of 80V.

life is analog.



switching power supplies are analog.



Switching power supplies can be part of ASICs by PREMA - step-up or step-down, from less than 1V up to 80V input voltage.

They can be used to supply your circuit with constant voltage or to drive your motor.

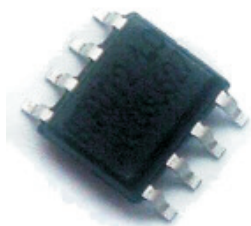
They can drive white LEDs or charge your mobile phone from a single battery cell.

There are proven solutions for use in ASIC designs, and our extended portfolio includes standard ICs you can buy from stock.

A 65V buck converter for energy saving circuits

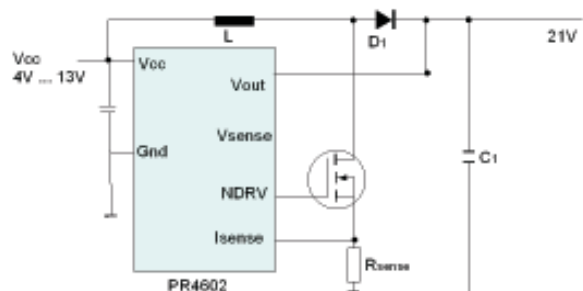
PR6502 is a good example of what PREMA's unique semiconductor process can do. With a minimum of external components it can convert a voltage of up to 65V, coming from a capacitive power supply, down to convenient voltages of 5V or 3.3V. There it powers typical standby circuits like an IR receiver, a timer or a micro-controller.

The high-voltage performance allows to control chains of relays and LEDs used for status display in standby mode, leading to a low current consumption from the mains.



Boost converters for high powers

With PR6602, PREMA offers a boost converter that converts 4 to 13V input voltage to max. 24V output voltage. Using an external power switch, very high currents of several amps can be achieved. In current regulated mode it can be used as LED driver as well.



life is analog.

led drivers are analog.



Requirements to LED drivers are manifold, not all applications are covered by available ICs.

Why not design an ASIC suitable for your demands?

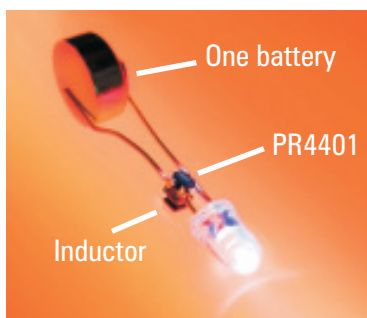
Why not combine the LED driver with other features in your circuit, such as an IR remote control receiver, or a bus interface?

Our drivers can boost the voltage up from a mere 1V, or regulate it downwards from up to 80V, using the flexibility of our process flow.

0.9V Boost driver for white LEDs

PR4401 and PR4402 are LED boost converters in a tiny SOT23 package that drive white LEDs from a single battery

cell. Output currents of 20mA (PR 4401) and 40mA (PR 4402) can be achieved. The only other component needed is an inductor. A cleverly devised control circuit produces a constant output current. Maximum performance at minimum space and cost is the goal of this smart IC.

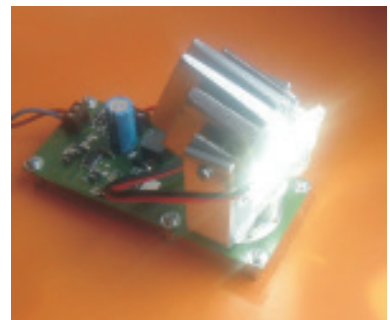


Buck driver for power LEDs

PR4101 is a buck driver for up to 40V input voltage. Its versatility and its dimming input make it ideal for

halogen lamp replacement and general lighting. PR4101 is offered in SO-08 and SO-14 package, as well as a smaller variant in a tiny SOT23-5L package.

Versatility and high power are key features of these LED drivers, which can also be used as proven standard cells in an ASIC project.



life is analog.



sensor signals are analog.



Sensor signals and PREMA ASICs - a perfect fit:

We can integrate photosensors together with the circuit on the same chip.

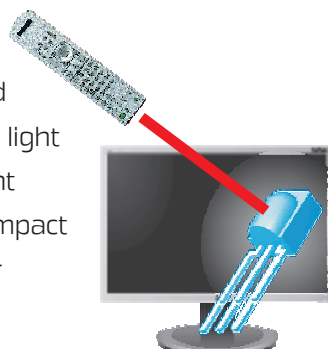
Hall elements can sense magnetic fields, and diodes produce temperature-dependent signals.

In addition the ASIC can process signals from external sensors, such as pressure transducers, capacitive sensors, fire detectors, humidity sensors, microphones, and others.

Monolithic infrared remote control receiver

PR8802 is a fully integrated IR receiver for remote control systems, containing the infrared photodiode, variable gain amplifier, bandpass filter, integrator and digital output stage. The monolithically integrated photodiode allows very easy assembly with only three bond wires. Because of its small size it is well suited for SMD packaging.

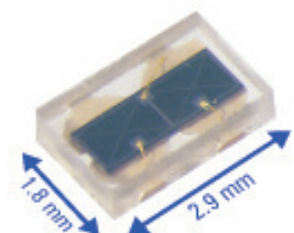
The filter and gain control techniques give it an unmatched rejection of spurious light from all common light sources, such as compact fluorescent lamps or plasma displays.



Ambient light sensor

PR5001 is a dual-element Si photodiode molded into a very small plastic leadless optical package. The photo diodes offer a good symmetry, low dark current and high sensitivity. The spectral sensitivity starts at 400nm and ranges to the near infrared at 1050nm.

An ambient light sensor for automotive applications has been realised with the same package. A monolithically integrated amplifier and voltage-to-current converter allows the use of a two-wire interface.



life is analog.



safety and comfort are analog.



Analog circuits make life in your house more comfortable and safe: They detect fire and smoke, they measure residual currents, they control and supervise your gas burners, and watch out for burglars.

They switch your light on when you enter your room, they control your sunshades, and maintain the room temperature.

Analog ASICs by PREMA make these circuits more powerful, versatile and unique.

Residual-current circuit breaker

A low-offset amplifier and rectifier measures the residual current and breaks the supply line in case of danger. Different methods of detecting the residual current can be used.



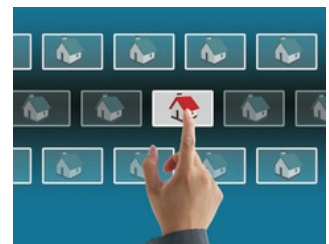
Smoke detector

A highly sensitive low-noise amplifier detects the light scattered by smoke. It is combined with control circuits that initiate the alarm and other actions.



House bus transceiver

Transceivers work at voltages up to 50V, and their drivers have to draw currents up to 500mA. This application is perfect for the high-voltage transistors in the PREMA process.



Gas burner control

The ASIC supervises the flame by measuring ion current. It also contains drivers to control valves and interfaces for keys and status displays.



life is analog. sound is analog.



Intelligent electronics get the best out of small speakers and produce clear sound from microphones in noisy environments.

The low noise, wide voltage range and excellent analog performance of the PREMA process is well-suited for audio circuits.

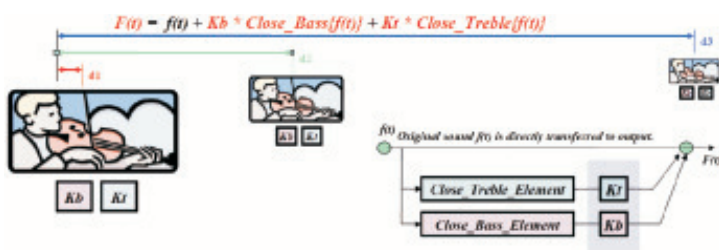
It covers battery-operated applications as well as circuits with voltages up to 80V.

Sound enhancement chip MZ-01

Together with the Speaten filter by Dedekind R&D (Japan), MZ-01 makes small speakers, built in laptop computers, portable audio devices, flatscreen or CRT TV sets or car stereo, sound like much larger speaker systems.

The sound source is perceived much closer to the listener.

MZ-01 is a controlled amplifier combining low noise, low distortion and a wide supply voltage range designed for use with the Speaten filter.



Microphone amplifier

The excellent analog performance of transistors, including low noise and a wide dynamic range from pA to mA allow the amplification of small signals from microphones or other signal sources.

The full benefit of an ASIC comes from the combination of different functions that are specific for your application, such as power control, battery charging, status display driver etc., to build a system on chip.



life is analog. motion is analog.



Wherever things move, analog signals are present.

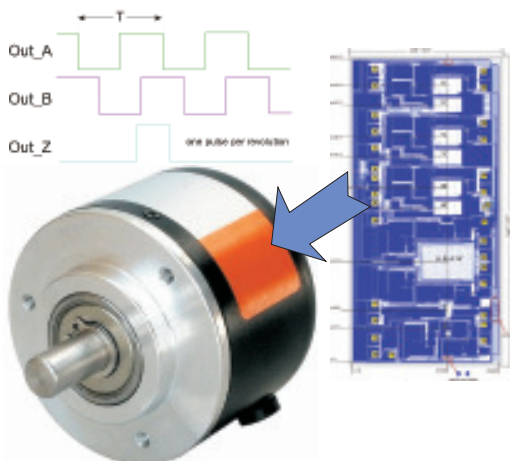
Movements must be detected, measured and controlled.

With PREMA ASICs you can sense movements of persons in a room by infrared, the position of a cover by magnetic fields, the temperature of a liquid, or the rotation of a motor shaft with optics.

Our ASICs can control motion with motor controllers or drivers for piezo actors.

Incremental optical encoder chip

A chip for optical encoders, based on an innovative method to generate sharp and precise Z channel pulses, allows a resolution of 2500 and more increments per revolution without interpolation. The basic diode layout can be adapted to the needs of the application.

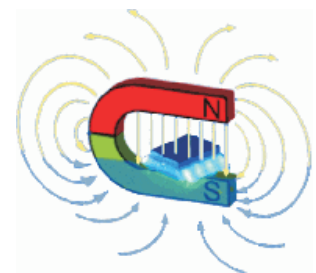


Hall effect sensors detect rotary speeds

The PREMA process can integrate Hall effect sensors without requiring additional layers. A high sensitivity of the Hall elements and the low offset of the following instrumentation amplifiers allow a low detection threshold of the system.

The chips are bonded into non-ferrous packages and embedded into soft material.

Hall effect sensors are proven solutions for successful ASIC designs.



life is analog. invent your own asic.



ASICs are integrated circuits designed and produced exclusively for you.

They contain some of your system know-how and give you a unique position in the market.

ASICs will be designed based on your specification.

PREMA has a design team for all engineering phases. We are open for different business models, sharing phases of the design with you or with third parties.

Steps of an ASIC project

An ASIC design has to pass different stages:

- > specification and concept study
- > circuit design and simulation
- > layout and design-rule-check
- > prototype production (first silicon)
- > evaluation of prototypes
- > series release
- > production mask writing
- > development of production test
- > series production

PREMA offers all engineering and production services.

In-house services by PREMA

Our production hall with an area of 8000m² provides all process steps required for prototype and high-volume wafer production. To offer quick prototype cycles we have an e-beam mask writer that allows quick proceedings from layout data to first silicon. Wafer probing and chip test are located in our facility.



life is analog.



copy protected by process.



Circuits with standard ICs are simple to steal.

With ASICs made in conventional processes counterfeits are more difficult, yet still possible.

The unique features of PREMA's processes, not available in other lines, make it near impossible to copy your circuit: copy protection by process.

Trust is the key

The basic idea of an ASIC is to embed part of your system know-how and to obtain a unique selling point for your product. Most important is the choice of a trusted cooperation partner for design and production.

PREMA is a mid-sized independent company, located in Mainz (Germany).

All design and production facilities are combined under one roof.

The unique features of our process make it near impossible to reverse-engineer your circuit, and further protects your know-how from counterfeiting.

Please contact us

ASICs are no standard commodities listed in a catalogue. The goal is to design a circuit that suits your product idea.

This brochure is intended to give general information and some examples that outline the possibilities.

Our advice: contact us with your product idea, a block diagram or specification of your circuit. We can check feasibility, and give recommendations how to proceed. We provide estimates of the costs involved.

Call us to establish a first contact, or send us an email. We cordially invite you to discuss your ideas with us.

life is analog.
love is analog.



Change your analog circuit into an ASIC by PREMA, to give your product a better performance, better protection against imitation, to set you ahead of the field.

Your customers will love your product even more with PREMA ASICs inside.

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