CHIPS.
Monthly Newsletter
August 2010

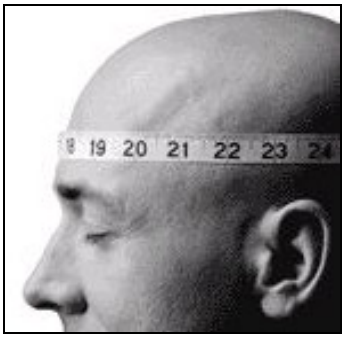
XMV

Xundä Mänschävärschtand!

(Swiss proverb)

What is Xundä Mänschäverschtand?

First, a short lesson in Swiss-German: "Xundä Mänschäverschtand" means "common sense". From this Swiss-German expression, you get the acronym "XMV" or even "Xundä Mänschäverschtand". Got it? Ok, not exactly a sought-after expression in English, but very popular with us.



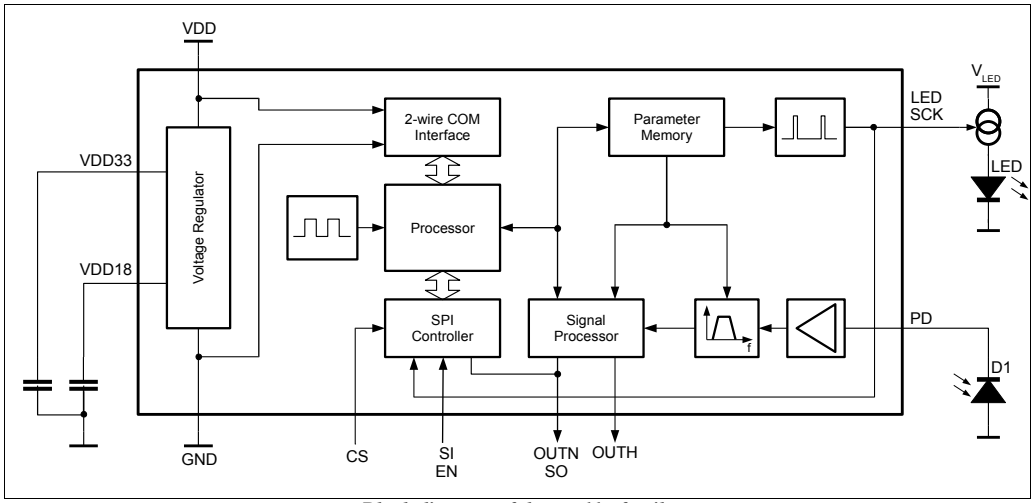
Now, what is actually meant by “common sense”? It is a person's ability to offer good judgement on a situation without special instruction, study, or other specific qualifications. It could also be called being "streetwise". How many people have we met that will continue to study ad nauseam? Then, when it comes to taking a decision, they fail. Why? Very simple: in real life most things cannot be interpreted that easily and then, the consequences are obvious. Often, there are many contributing factors that are never straight forward. The more someone knows, the more difficult it is for them to take a decision. Or in other words: "They can't see the forest for the trees!"

Now, please do not misunderstand me, I am not asking for less education. No, this is very important. In order to get a good job, you need the essential basics and one of the required specialisations as conclusive qualifications. But it is important that the right things are done. That is to say, it is essentially better that the right things are done before things are done right. I know that many top specialists will vehemently contradict me immediately but I can live with that. But then what is the use of a perfectly carried out job that no one wants to have. Better to be almost perfect, and with it the necessary decisiveness. After all, you do need XMV!

Beat De Coi

Light-Barrier Chip epc110 launched

The epc11x is a general-purpose, fully integrated self-contained CMOS circuit family to be used in light-barrier applications. The chips contain a controller which drives an LED, typically an IR-LED. The LED is used in a pulsed scheme to extend the signal-to-noise ratio (SNR) even in the presence of very strong sunlight.



Block diagram of the epc11x family

It contains also a highly sensitive photo-diode amplifier and a signal-conditioning circuitry to suppress unwanted environmental light including strong sunlight and pulsating light sources. The receiver is built around a time-gated detection circuitry implemented in a custom signal processor. Two output signals with a different threshold level are available in order to trigger the light-barrier output or to indicate light reserve. The chip also includes a power-supply circuitry to establish all internally required voltages from one source only. It can be used either as a standalone device, forming the whole core of an industrial light barrier or it can also be used together with a micro-controller for more advanced applications.

Various models within this chip family are currently available. Some of them are made to make the design of low-cost light barriers as simple as possible. These devices operate with just a few external low-cost components like a photo diode, a transmit LED with driver transistor(s), and some power supply decoupling capacitors. Other models are fully programmable to set the operating parameters to the specific requirements for a given application.

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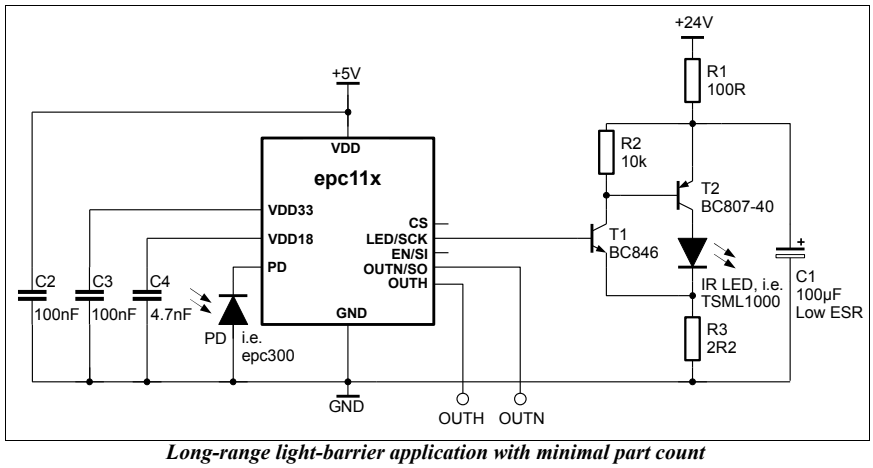
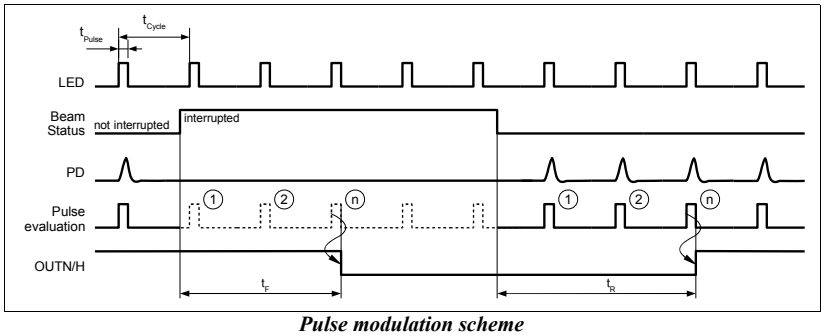
Continuation from page 1:

The epc11x chips operate the LED and the receiver path on a pulse-modulated concept. Thus, the LED is operated with short pulses where the receiver channel does as gated detection of the received current pulses generated by the photo diode. This concept allows a very high sensitivity, high-speed operation, and a high suppression level of DC input currents, generated by sunlight or DC light sources like light bulbs.



Long-range light-barrier application with minimal part count

In order to eliminate interference caused by modulated light, e.g., a flashing light or by other light barriers, the input signal from the photo diode is amplified, filtered, and processed by an integrated signal processor. If the photo-diode signal meets the required frequency, pattern and amplitude, the output(s) are triggered. The following timing diagram shows the basic concept:



Pulse modulation scheme

The signal-processing part of the pulse-modulation scheme is in fact implemented as a digital filter which counts received and missing light pulses to change the state of the outputs OUTN/H. Let's assume that the photo diode did not receive light pulses for a long time. Then, OUTN/H are at low level. If the photo diode now receives light pulses which are strong enough to trigger the OUTN threshold, the internal pulse-evaluation unit (designated in the timing diagram with 'Pulse evaluation') starts counting the pulses. If the consecutive number of valid pulses reaches the set level, the output turns to high level. Thus, single pulses cannot trigger the output and generate a false output signal. The same procedure is used when a beam is interrupted. The internal pulse-evaluation unit counts the missing pulses. If the consecutive missed pulses reach the set level, OUTN/H are returned to high level. The counter limit values are different, depending on the device.

The schematic diagram at the top of the next text column shows the epc11x chip in a long-range light-barrier application with minimal part count. Such a light barrier in a through-beam design can operate to a range of 20m and more with small lenses in front of the photo diode and the LED only. Even if it is used in an optical proximity-switch application, the operating range will be several meters. Such a performance can be achieved only with extremely sensitive and low-noise analog circuitry combined with powerful signal processing. epc11x combine these features in a virtually unbeatable design based on latest semiconductor technology.

The LED in the schematic above emits the modulated light, driven by a simple current source LED driver. If the light of the LED is reflected by a reflecting object or a retro reflector, the photo diode PD receives this light. If the received light fulfills the filter and signal processing criteria, the output signals OUTN (normal output) and OUTH (light-reserve output) are triggered.

The output to drive the LED is a current source capable to drive 1mA. For a high-performance light barrier, an LED peak current of up to 2A is required. To generate such high LED current pulses, an external amplifier is necessary. The circuitry in the picture above is a simple and extremely cost effective implementation of such an amplifier. The darlington circuit with T1 and T2 and R2 and R3 does the job, acting as a gated current source. It generates current pulses of approx. 1.5A. In order to avoid interference on the supply voltage, the supply is isolated (filtered) with R1 and C1. The high peak LED pulse current is delivered by the capacitor C1 which itself is charged more or less constantly by R1. Make sure, that there is no coupling of the high LED current to VDD33 of the epc11x, to the cathode of the photo diode (PD input), or in the GND wire of the chip and the photo diode.

The following models are currently available:

Type	Response Time	Sensitivity
epc110	Programmable	Programmable
epc111	Medium	High
epc112	Fast	Medium

Model family of epc11x

Options with integrated communication option will be available soon.

>>> epc111: C4/F 1.53 @1k, QFN16 <<<

Data sheets and samples are available upon request at sales@espros.ch.