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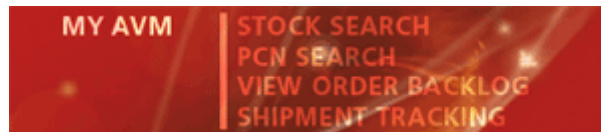


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**EPIR: REVOLUTIONARY PASSIVE INFRARED MOTION**

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## DETECTION

Zilog's ePIR with Sigma-Delta Technology is a unique PIR solution that delivers a significant performance improvement over today's digital solutions while being cost competitive with analog solutions. It provides a dramatic improvement in both sensitivity and stability (false alarm & pet immunity), and meets or exceeds all applicable standards (present and proposed). The new solution enables additional features without additional cost, like White Light Immunity, Pet Immunity, Auto LED, Real Time Diagnostics (self test), etc.

Traditional PIR designs are mature, sold largely on price, with little room for improvements and differentiation. The inherent limitations remain: high component count, bulky electrolytic capacitors required, time consuming to assemble and test, with various tricks applied to overcome system design pitfalls.

### The key market requirements for Motion Detection in Security Applications are:

- Outstanding reliability & performance
- Balance between sensitivity and stability
- Low false alarm rate
- Pet immunity
- Easy installation and configuration
- Low Bill of Materials Cost
- Meet Applicable World Wide Standards

The challenges to the system design require the designer to extract a very small signal from a noisy background with a large DC offset. The system must perform equally over temperature and pet immunity requires frequency discrimination and profile analysis (in digital designs). Trade-off's have to be made between stability (low false alarms) and sensitivity, meaning low bill of materials cost and minimal design complexity needs to be balanced without impacting performance and accuracy. Additionally both current and future EMC requirements must be met.

Zilog's ePIR™ with Sigma-Delta Technology provides innate noise immunity, excellent bit resolution and ample dynamic range. The ADC in differential mode with internal Vref allows sufficient dynamic range to overcome the DC offset issues. The major advantage of this solution is that the raw signal is available for processing with no requirement for external gain or filtering. All pertinent signal information remains available for further processing. By nature, statistical processing algorithms are inherently independent of temperature, dispensing of the



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necessity for temperature compensation. High bit resolution combined with statistical processing algorithms significantly reduces the need to trade off stability vs. sensitivity, resulting in a better performing product; particularly in the key areas of false alarm immunity, pet immunity and overall performance. The accurate internal oscillator yields precise frequency discrimination, so combined with the statistical processing it delivers excellent pet immunity and sets a new standard: the ability to ignore larger breed pets up to and exceeding 40kg (industry standard maximum today is 25kg). It also means it is not necessary to provide different lens or masking options to realize pet immunity. Significant reduction in component count is achieved, reducing BOM, manufacturing cost and field reliability, while improving all other figures of merit. ePIRTM has been designed to meet and exceed current (2GHz immunity) and future standards (6GHz immunity), consequently has passed the current standards easily and is expected to pass future standards without additional costs. Meaning there will be no need to redesign products to meet new and upcoming standards.

#### **What makes ePIRTM with Sigma-Delta Technology possible?**

The inherent qualities of the Z8 Encore! combined with modified and new MCU features unique to the market, have allowed a revised look at the overall PIR detector design. Unique software techniques have been developed that overcome previous design limitations. This "fresh" look has produced a revolutionary step in PIR detector technology called the ePIRTM with Sigma-Delta Technology.

Pyroelectric sensor data provides a serious design challenge. The signal of interest is in the 1mV to 10mV range, and 0.1Hz to 10Hz frequency range. Out of band noise is typically 10 times the signal level, while all of this is riding on a 1V to 2V DC offset. Therefore the data sampled in differential mode with the 1VDC internal reference tied to the (-) ADC input provides a voltage range from 0 to 2 VDC, meaning all Pyroelectric sensors are covered. The Sigma Delta architecture in itself already provides good noise immunity, and over-sampling gives 15 bits of resolution, further improving noise immunity. An effective data acquisition rate of 600Hz easily captures the frequency of interest. By applying advanced statistical processing to the raw Pyro signal, a lot of problems are solved, and unmatched performance is achieved. An alarm condition is only generated after sufficient statistical change has occurred, virtually eliminating false alarms, while being intrinsically immune to noise. It also means there is no need for temperature compensation, as the relative amplitude of the pyro signal is not significant to the statistical processing. White Light Immunity has been tested to 10,000 lux in pulsed, swept and continuous modes. Target motion is still detected under strong white light, meaning the sensor can not be blinded, the key requirement for outdoor motion detection and security applications. Because the ambient light level is obtained from using the LED in "reverse mode" and the raw pyroelectric sensor signal and DC offset are processed, no additional filtering or components are required to achieve White Light Immunity.

#### **Why Chose ePIRTM with Sigma-Delta Technology?**

- Significantly improved performance & reliability over existing solutions
- Can drop into existing plastics & optics
- Superior sensitivity and range with existing low cost optics
- Extreme false alarm immunity

- Eliminates electrolytic capacitors
- Exceptional pet immunity – Tested to 48Kg
- Integral white light immunity (without cost)
- Exceeds 10,000 Lux White Light Immunity (Pulsed, Swept, Continuous)
- Detector remains non-blinded
- Auto LED feature (without cost)
- Full environmental compensation
- Meets the 2GHz EMC standards and testing underway for compliance to the upcoming 6GHz standards.

Available in 8SOIC, 20SSOP and 28SSOP, the parts include factory programmed ePIRTM motion detection algorithms. These motion detection algorithms comprise the ePIRTM Engine running in the background of the MCU while control and status of the Engine is accessible through a software API. This allows the designer to take advantage of Zilog's ePIRTM Motion Detection Technology and integrate other MCU tasks specific to the application. 4KB of Flash is still available for custom applications. Schematic, reference design and lens requirements are all available.

**Part Numbers**

8 pin SOIC: Z8FS040ASB20SG

20 pin SSOP: Z8FS040AHH20SG

28 pin SSOP: Z8FS040AHJ20SG

Development Kit: ZEPHIR000101ZCOG

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