



## Zilog's ZMOTION™ Detection and Control Family Featuring PIR Technology



### ZMOTION™ DETECTION & CONTROL FAMILY ADVANTAGES

- MCU, PIR SENSOR, AND LENS SOLUTION
- MOTION DETECTION ALGORITHMS BUILT INTO MCU
- 4 KB FLASH FOR APPLICATION CODE
- OPTIMIZED DETECTION PERFORMANCE AND RELIABILITY
- BETTER STABILITY AND SENSITIVITY THAN TRADITIONAL DESIGNS
- NO TEMPERATURE COMPENSATION REQUIRED
- NO NEED TO DEVELOP COMPLEX MOTION DETECTION SOFTWARE
- LARGE SELECTION OF LENSES AVAILABLE WITH OPTIMIZED SETTINGS PROVIDED
- ZMOTION MCU AVAILABLE SEPARATELY TO USE WITH YOUR OWN LENS/PYRO
- DIRECT SENSOR INTERFACE ELIMINATES EXTERNAL COMPONENTS
- REDUCED BOM COSTS
- COMPLETE YOUR DESIGNS FASTER

### Superior Motion Detection Solutions Enabling Faster Development Cycles

#### Overview

Zilog's ZMOTION™ Detection and Control Product Family is a series of high-performance microcontrollers with integrated motion detection algorithms combined with a selection of lenses and Passive Infrared (PIR) sensors to fit a wide range of application requirements. Optimized configuration parameters for the ZMOTION™

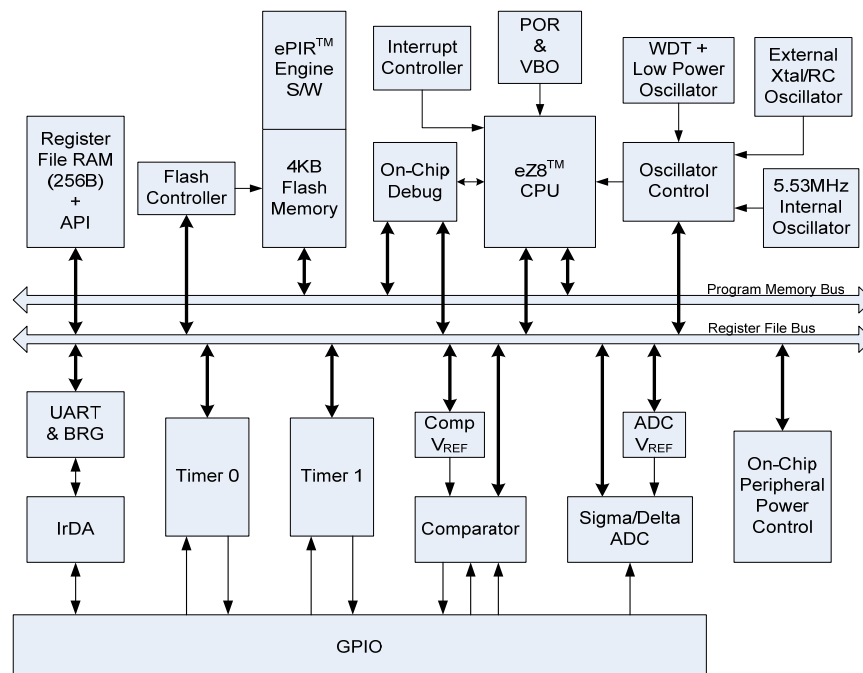
MCU are provided for each lens/sensor combination ensuring the best possible performance while significantly reducing development risk and minimizing time to market.

Zilog's ZMOTION™ MCU combines the programmability and rich peripheral set of the Flash-based Z8F042A Encore! XP® MCU with built-in software-based motion detection algorithms. These motion detection algorithms comprise the PIR engine and run in the background of the MCU while control and status of the engine is accessed through a software API (Application Programming Interface). Create your own application-specific software while taking advantage of Zilog's Enhanced PIR motion-detection technology.

Optimize the performance of your product by choosing a lens that closely matches your application. Use your own or select from our family of lenses spanning 360 degree ceiling, 180 degree wall mount, 25 meter long range, and 5 meter short range. API settings are provided to match the PIR engine operation to each of the lens and PIR sensor combinations provided.

Zilog's Enhanced PIR motion-detection technology provides a dramatic improvement in both sensitivity and stability over traditional designs and is scalable to many market segments including Lighting Control, HVAC, Access Control, Vending, Display, Proximity, Power Management, Occupancy Sensing, and many others.

### ZMOTION™ MCU Block Diagram



## KEY FEATURES

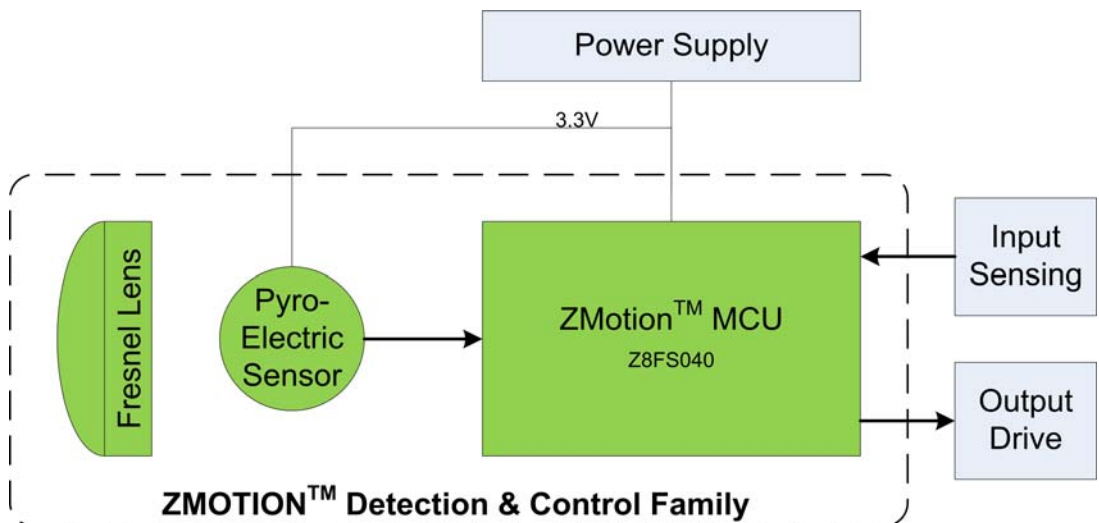
- ADVANCED STATISTICALLY BASED MOTION DETECTION PROCESSING
- 4 KB FLASH FOR APPLICATION CODE
- SUPPORTS DESIGNS REQUIRING 1 OR 2 PIR SENSORS
- HYPERSENSE MODE FOR LIGHTING APPLICATIONS
- HIGH RESOLUTION SIGMA DELTA ADC
- LOW POWER MODES
- API PROVIDES FULL CONTROL AND STATUS OF MOTION DETECTION ENGINE
- WORLD CLASS ZDS-II DEVELOPMENT ENVIRONMENT

## ZMOTION™ Detection and Control Family Feature Set

- Optimized assemblage of MCU, Lens, and PIR Sensor
- High-performance eZ8® MCU core
- 4 KB in-circuit programmable Flash available for application code
- Single-pin debug with unlimited breakpoints
- Internal precision oscillator running at 5.53 MHz
- External oscillator operating up to 20 MHz
- Sigma Delta ADC with up to 6 channels single ended or 3 channels differential available
- On-chip analog comparator with independent programmable reference voltage
- Full-duplex UART with dedicated BRG
- Two 16-bit timers with input capture, output compare, and PWM capability (11 modes total)
- Watchdog timer (WDT) with dedicated internal oscillator
- 6 to 25 I/O pins depending upon package
- 2.7 V to 3.6 V operating voltage with extended operating temperature range  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$
- Enhanced PIR software engine controlled and monitored through software API registers
- Select from an assortment of lenses and pyroelectric sensors to best fit your application
- Optimized API settings provided for each lens and pyroelectric sensor combination
- Create your own API settings to match your own lens
- Directly supports 1 or 2 pyroelectric sensors
- Sensitivity control, range control, and directionality detection
- Hypersense detection mode for Occupancy sensing
- Low power modes

With Zilog's ZMOTION™ Detection and Control Solution, the system bill of materials is significantly reduced. The pyroelectric sensor is directly interfaced to the MCU eliminating external op-amps, electrolytic capacitors, and other components used in traditional designs. The new statistical processing algorithms provided by the Enhanced PIR motion-detection engine also eliminate the need for a discrete temperature compensation circuit.

This all leads to a simpler and smaller circuit design, providing better reliability, sensitivity, and stability than traditional designs.



## APPLICATIONS

- LIGHTING CONTROL
- ACCESS CONTROL
- CUSTOMER SENSING
- HVAC CONTROL
- OCCUPANCY SENSING
- VENDING APPLICATIONS
- AUTOMATIC DISPLAYS
- PROXIMITY
- POWER MANGEMENT

## Ordering Information

The ZMOTION™ Detection and Control Family is comprised of the ZMOTION™ MCU, Lens, and Pyroelectric sensor. Construct your part number based on the specific combination of MCU, Lens, and Pyroelectric sensor you wish to order. There are four fields in the part number that determine this combination. The ZMOTION™ MCU is also available separately.

Order the ZMOTION™ Detection and Control product from Zilog® using the following guide.

| Position: | 1 | 2 | 3 | 4 | 5   | 6 | 7           | 8 | 9    | 10 | 11  | 12 | 13               |  |
|-----------|---|---|---|---|-----|---|-------------|---|------|----|-----|----|------------------|--|
| Field     | Z | M | O | T | MCU |   | MCU Package |   | Lens |    | PIR |    | G                |  |
|           |   |   |   |   |     |   |             |   |      |    |     |    | Selected Options |  |

For complete ordering information, please refer to the ZMOTION™ Product Specification (PS0285).

For more information about Zilog's motion detection products, ordering or product collateral, please consult your local Zilog distributor or representative. You can find sales office locations and the most current product information on our website; please visit us at [www.zilog.com](http://www.zilog.com).

## ZMOTION™ MCU Options

Three MCU options provide you with the flexibility needed to optimize for size and functionality.

| ZMOTION™<br>Detection MCU<br>Part Number | Flash<br>Memory | GP<br>I/O | ADC<br>Channels | Package     | MCU<br>Field | MCU<br>Package<br>Field |
|--|-----------------|-----------|-----------------|-------------|--------------|-------------------------|
| Z8FS040BSB20EG                           | 4 KB            | 5         | 3               | 8-pin SOIC  | 0B           | SB                      |
| Z8FS040BHH20EG                           | 4 KB            | 16        | 4               | 20-pin SSOP | 0B           | HH                      |
| Z8FS040BHJ20EG                           | 4 KB            | 22        | 6               | 28-pin SSOP | 0B           | HJ                      |

Order the ZMOTION MCU separately using part numbers from the above table.

## Pyroelectric Sensor Options

Choose from the three PIR Sensors available depending on your application requirements. Not all sensors are suitable for all lenses.

| Part Number  | Description          | PIR Field |
|--------------|----------------------|-----------|
| RE200B-P     | Basic Dual Element   | 0A        |
| SDA02-54-P   | Premium Dual Element | 0B        |
| SBDI46-504AA | Quad Element         | 0C        |

## Lens Options

A selection of matched lenses and pyroelectric sensors are available to meet a variety of applications. The Lens Field and PIR Fields columns in the table below correspond to Zilog part numbers; please see Ordering Information on the previous page. For detailed information about each lens type, refer to the ZMOTION Lens and Pyroelectric Sensor Product Specification (PS0286).

| Description & Part Number   | Typical Applications   | Lens Fields | PIR Fields | Pyro Sensor  |
|---|--|-------------|------------|--------------|
| <b>Animal Alley Array (88°)</b><br><b>AA 0.9 GI T1 Lens Specification</b><br><ul style="list-style-type: none"> <li>• 35.6 mm x 49.9 mm flat Fresnel</li> <li>• 22.9 mm focal length</li> <li>• 25 meter range</li> <li>• 22 equal segments</li> </ul>                                      | Corner wall mount or very high ceiling with rectangular floor pattern<br><ul style="list-style-type: none"> <li>• Warehouse lighting (bay light)</li> <li>• Large-area lighting control</li> <li>• HVAC</li> </ul>             | 0A          | 0A         | RE200B-P     |
|   |  |             | 0B         | SDA02-54-P   |
| <b>Ceiling Mount Array (360°)</b><br><b>CM 0.77 GI V3 Lens Specification</b><br><ul style="list-style-type: none"> <li>• 37 mm diameter circular lens</li> <li>• 19.6 mm focal length</li> <li>• 3.7 m radius at 2.4 m height</li> <li>• 3:1 diameter-to-height floor coverage</li> </ul>   | Ceiling mount for standard commercial heights<br><ul style="list-style-type: none"> <li>• Lighting control</li> <li>• HVAC control</li> <li>• Meeting rooms</li> </ul>   | 0B          | 0A         | RE200B-P     |
|   |  |             | 0C         | SBD146-504AA |
| <b>Ceiling Mount Array (360°)</b><br><b>CM 0.77 GI V5 Lens Specification</b><br><ul style="list-style-type: none"> <li>• 37 mm diameter circular lens</li> <li>• 19.6 mm focal length</li> <li>• 12.2 m radius at 12.2 m height</li> <li>• 2:1 diameter-to-height floor coverage</li> </ul> | High ceiling mount for commercial and industrial applications<br><ul style="list-style-type: none"> <li>• Commercial lighting control</li> <li>• Commercial HVAC control</li> <li>• Street lighting</li> </ul>                 | 0C          | 0A         | RE200B-P     |
|   |  |             | 0C         | SBD146-504AA |
| <b>Ceiling/Wall Mount Array (180°)</b><br><b>CWM 0.5 GI V1 Lens Specification</b><br><ul style="list-style-type: none"> <li>• Circular lens with 24 mm x 24 mm square base</li> <li>• 14.2 mm focal length</li> <li>• Board mount clip-in</li> </ul>  | Wall or ceiling mount for office or meeting room lighting and HVAC control<br><ul style="list-style-type: none"> <li>• Room lighting control</li> <li>• HVAC control</li> </ul>  | 0D          | 0A         | RE200B-P     |
|   |  |             | 0C         | SBD146-504AA |
| <b>Clip-on 15 mm Array (360°)</b><br><b>NCL-9(26) Lens Specification</b><br><ul style="list-style-type: none"> <li>• Clips on to pyroelectric sensor</li> <li>• 2.25 m radius at 2 m height</li> <li>• 2.1:1 diameter-to-height floor coverage</li> </ul>                                   | Room occupancy and proximity sensing<br><ul style="list-style-type: none"> <li>• Lighting control</li> <li>• HVAC control</li> <li>• Appliance</li> <li>• Kiosk/display control</li> <li>• Vending power management</li> </ul> | 1A          | 0A         | RE200B-P     |
|   |  |             | 0C         | SBD146-504AA |
| <b>10 mm Wall Mount Array (70°)</b><br><b>NCL-10IL Lens Specification</b><br><ul style="list-style-type: none"> <li>• Clips on to pyroelectric sensor</li> <li>• 6 beams (X); 2 beams (Y)</li> <li>• 10 meter range</li> </ul>  | Proximity sensing or entrance detection<br><ul style="list-style-type: none"> <li>• Kiosk</li> <li>• Vending</li> <li>• HVAC</li> <li>• Display counters</li> </ul>  | 1B          | 0A         | RE200B-P     |
| <b>10 mm Wall Mount Array (40°)</b><br><b>NCL-3B Lens Specification</b><br><ul style="list-style-type: none"> <li>• Clips on to pyroelectric sensor</li> <li>• 4 beams (X); 2 beams (Y)</li> <li>• 10 meter range</li> </ul>  | Proximity sensing or entrance detection<br><ul style="list-style-type: none"> <li>• Kiosk</li> <li>• Vending</li> <li>• HVAC</li> <li>• Display counters</li> </ul>  | 1C          | 0A         | RE200B-P     |

| Description & Part Number  | Typical Applications   | Lens Fields | PIR Fields | Pyro Sensor  |
|--|--|-------------|------------|--------------|
| <b>10 mm Ceiling/Wall Mount Array (360°)</b><br><b>NCL-3R Lens Specification</b> <ul style="list-style-type: none"> <li>Clips on to pyroelectric sensor</li> <li>2:1 diameter-to-height coverage</li> <li>14 zones</li> <li>5 meter range</li> </ul> | Room occupancy and proximity sensing <ul style="list-style-type: none"> <li>Lighting control</li> <li>HVAC control</li> <li>Appliances</li> <li>Kiosk/display control</li> <li>Vending power management</li> </ul> | 1D          | 0A         | RE200B-P     |
|  |  |             | 0C         | SBD146-504AA |
| <b>10 mm Wall Mount Array (18°)</b><br><b>NCL-10S Lens Specification</b> <ul style="list-style-type: none"> <li>Clips on to pyroelectric sensor</li> <li>2 beams X (27°)</li> <li>1 beam Y (18°)</li> <li>10 meter range</li> </ul>                  | Entrance detection with directional detection <ul style="list-style-type: none"> <li>Kiosk/display counters</li> <li>Vending</li> <li>HVAC</li> <li>Entrance/access control</li> </ul>                             | 1E          | 0A         | RE200B-P     |

### Documentation

For a complete listing of all available application notes, data sheets, user manuals, and sample libraries, please visit us at [www.zilog.com](http://www.zilog.com).

| Document Number | Description  |
|-----------------|--|
| PS0285          | ZMOTION™ Detection and Control Family Product Specification    |
| PS0286          | ZMOTION™ Lens and Pyroelectric Sensor Product Specification    |
| PS0228          | Z8 Encore! XP Series Product Specification                     |
| WP0017          | A New PIR Motion Detection Architecture White Paper            |
| UM0230          | ZMOTION™ Detection & Control Development Kit User Manual       |
| QS0076          | ZMOTION™ Detection & Control Development Kit Quick Start Guide |

### Related Products

Zilog carries a number of motion detection products to suit your application requirements. For more information about the following products, please visit us at [www.zilog.com](http://www.zilog.com).

| Product Name                                | Part Number     | Description  |
|---|-----------------|--|
| ZMOTION Detection & Control Development Kit | ZMOTIONL100ZCOG | Development Kit for the ZMOTION Detection & Control Family |
| ZMOTION Detection Module                    | ZEPIROAAS02MODG | Low-profile motion detection module                        |
| ZMOTION Detection Module Development Kit    | ZEPIR000102ZCOG | Development Kit for the ZMOTION Detection Module           |
| Z8 Encore! XP F08xA Series                  | Z8F082A         | Z8 Encore! XP Microcontroller                              |





**Warning: DO NOT USE THIS PRODUCT IN LIFE SUPPORT SYSTEMS.**

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