RAFAEL
ADVANCED DEFENSE SYSTEMS LTD.

52nd Annual Fuze Conference

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SBF – Smart Barometric Fuze

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Scope

- Introducing RAFAEL Advanced Defense Systems LTD
- Introducing RAFAEL's Expendable Decoy Systems
- Motivation for the SBF development
- Challenges
- Classical problematic aspects
- SBF Logic and Block diagram
- Critical components
- Conclusions and Future

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Rafael's Mission

- RAFAEL as a system house aspires to provide a quality defense products to the international defense market, while maintaining its special contact with the IDF.

- RAFAEL predicts the needs of current and future combat forces worldwide and provides the technologies and systems required by those forces.

By Air

RAFAEL
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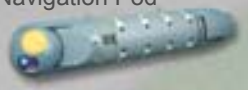
Space Systems
Micro Satellites &
Space Propulsion

Litening
Targeting and
Navigation Pod



Reccelite
Reconnaissance Pod

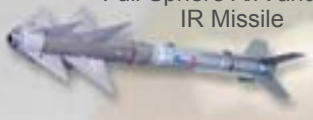
RITA
Flight Safety

HeliCOAT
Avionics and Weapon
Suite

Spike-ER
Tactical Precision Weapon
System

Popeye
(AGM-142)Have Lite
A/S Missile System

Python 5
Full Sphere A/A and S/A
IR Missile



Airborne EW
Systems

Jam-Air
Directional IR Countermeasure

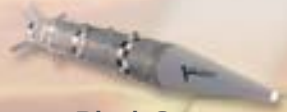
SkyLite B
Mini-UAV System

Derby
Active A/A and S/A BVR
Missile

Toplite
Electro-Optical System

REAPS
Rotorcraft Airbag
Protection

Spice Family
Autonomous
Guidance Kits



Black Sparrow
Blue Sparrow
Short-Medium Range
Airborne Ballistic Targets

Spyder
Air Defense Systems

TAOS
Aerostat-Borne
Surveillance Systems

Communication Systems
Data Links and Networks

Golden Bay
Real Time Imagery
Processing System

Blue Bay
Ground Imagery
Exploitation System

On Land

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TACS
Total Area Control System

SkyLite B
Mini-UAV System

Helispot
Helicopter Detection System

Trophy
Active Protection System

Thor
Mobile Counter-IED Solution

Samson RCWS
Remote Controlled Weapon Systems

Terra Sonic
Pipeline Protection

SADS
Small Arms Detection System

Stalker
Mobile Reconnaissance & Surveillance

Toplite
Electro-Optic System

Matador AS
Anti-Structure Munition

Add-on Armor
Passive and Reactive Protection

Tycoon
Tactical C4I System

Matador MP
Multi-Purpose Breaching Munition

Urban Star
Static Assault Round

Spyder
Air Defense Systems

Spike Family
Tactical Precision Weapon System

Matador WB
Wall Breaching Munition

Simon
Door Breaching Rifle Grenade

ORCHID
Biometric Face Recognition

Carpet
Minefield breaching and counter-IED solution

Hotspur
Counter-IED Solution

SpotLite-Mk2
E/O Small Arms Detection System

Training and Simulation
For Land Applications

At Sea

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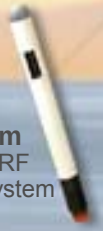
Sea Com
Naval
Communication
System

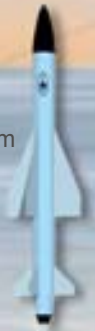
SEWS
Naval EW Suite

Typhoon
Stabilized Weapon
Station



C-Gem
Active RF
Decoy System

Barak
Naval Air
Defense System



Dafco
Fire Control System
for Naval Guns

Toplite
Electro-Optic
System

IDS
Integrated
Decoy System

Sea Spotter
IR Search, Track &
Situational Awareness

Protector
Unmanned
Surface Vehicle

ATDS
Advanced Torpedo
Defense System

Mini-Typhoon
Stabilized Weapon Station'
For Small Vessels

Sim4Sea
Naval Gun Embedded
Trainer

Diveguard
Personal Distress
Communication

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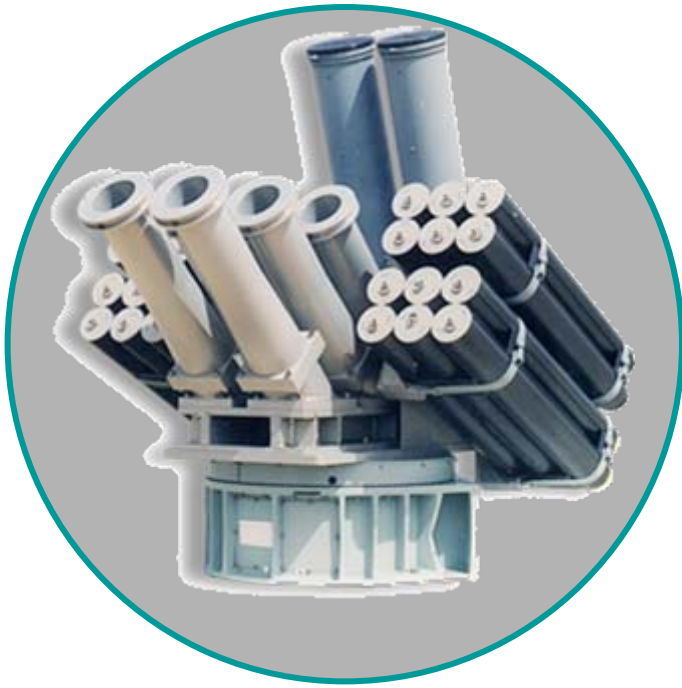
EW Expendable Decoy Systems

Rotatable Launcher

Decoys And Launcher Controller



Rotatable Launcher With SRBOC Tubes

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EW Expendable Decoys Clips

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EW Expendable Decoy Systems

Integrated Ship-Defense

- **Rotatable launchers**
- **Three lines of defense**
- **Precise decoy location**
- **Computerized operation**

Launcher & Decoys Controller

WIZARD

MRCR

LRCR

BT-4

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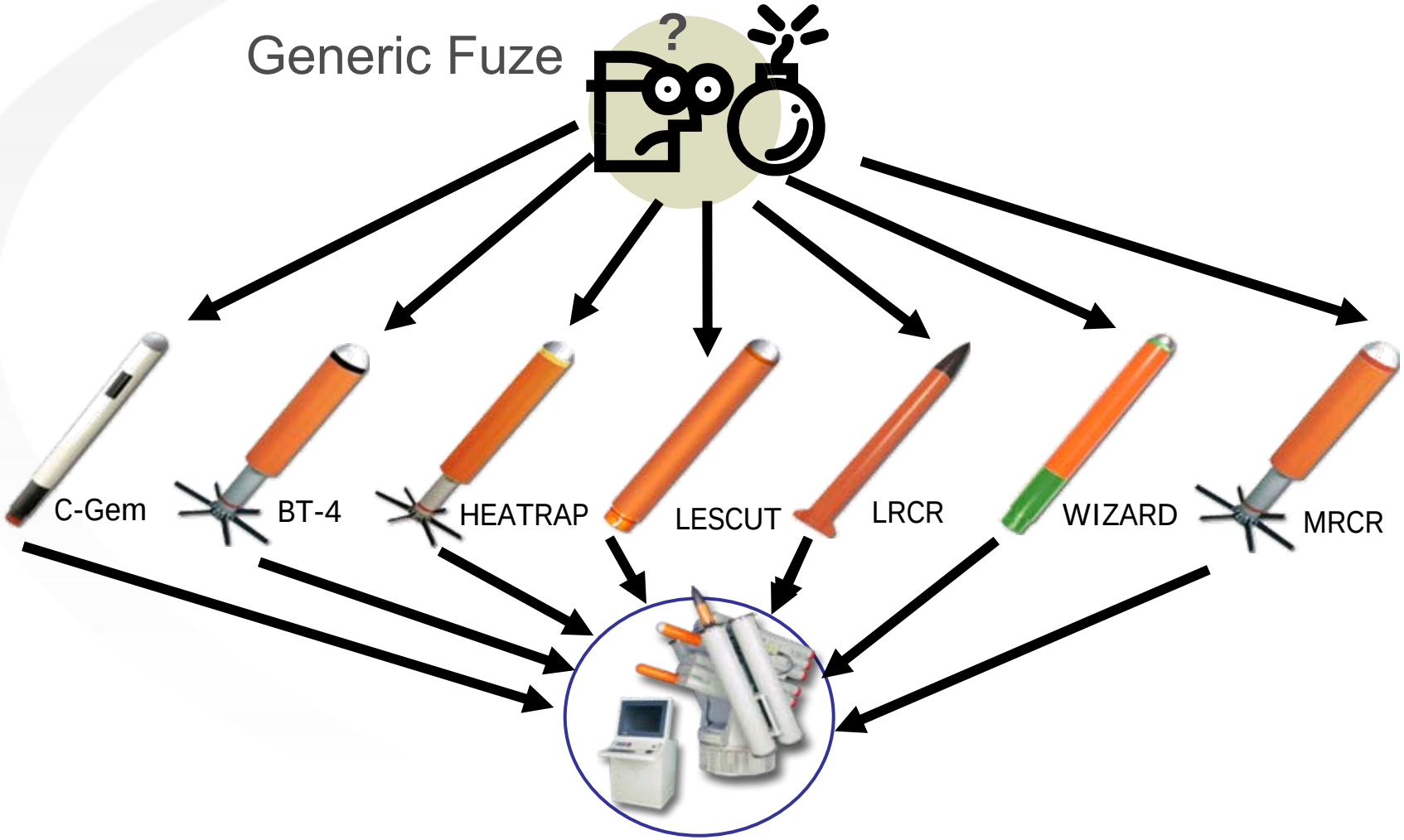
EW Expendable Decoy Systems



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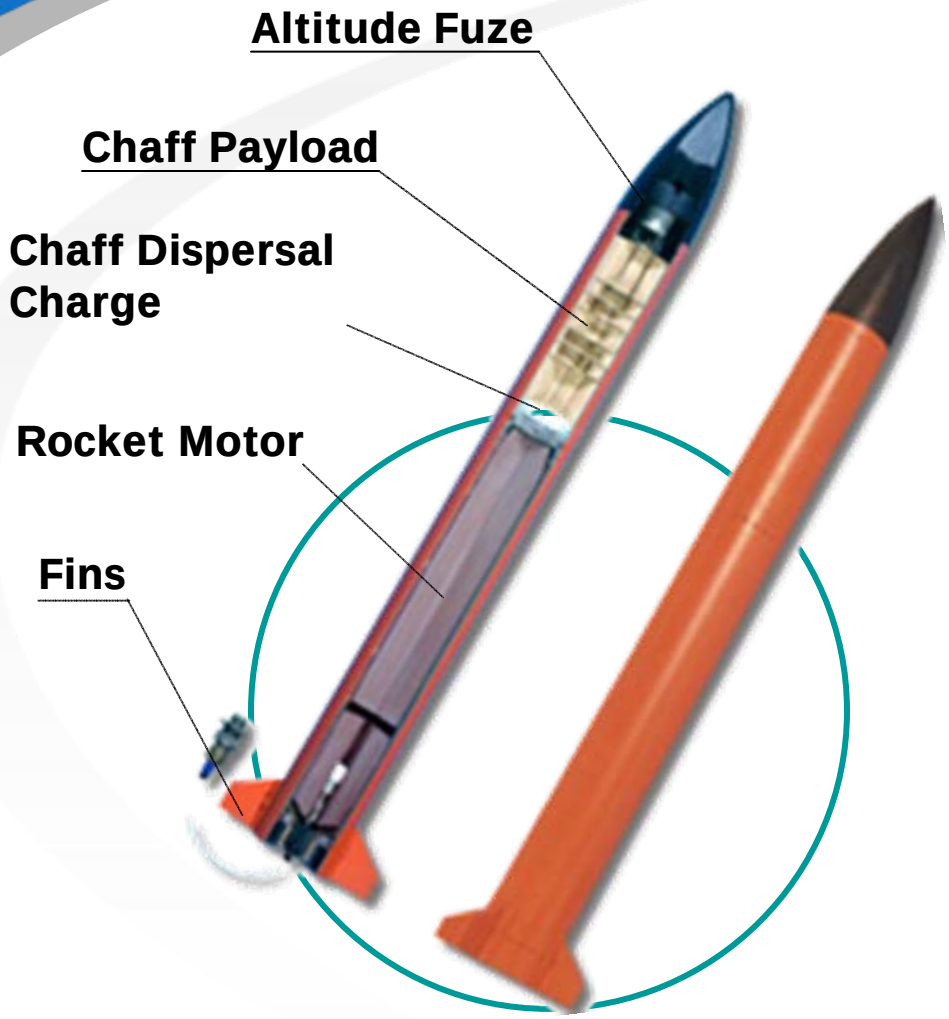

LRCR

Performance	
RCS	Ship Size
Frequency	X,C,S
Range	12-14km.
Altitude	900m.
Rise Time	less than 10 sec.
Persistence	up to 10 min.

Dimensions	
Rocket Diameter	90mm.
Rocket Length	922mm.
Fins Span	179mm.
Rocket Weight	9.4kg.
Chaff Weight	1.3kg.

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Motivation for the SBF Development

- Answer the Fuze's classical problems
- Better safety
- Better reliability
- One fuze for all decoys and launchers
- Programmable electronics
- Miniaturization

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Challenges

- Flexibility
- Compatibility with launchers
- Adaptation to Rocket's Type
- Mode of Operation Selection

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Classical Problematic Aspects

- Low Power / Energy Consumption
- Safety
- Environmental Conditions
- Reliability
- Low cost

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Energy Consumption

- The current fuze approach
  - Energized by a limited pulse width
  - Input capacitance check before launch
  - Electro-Mechanical pressure switch
  - Analog electronics design
- SBF approach
  - Energized by the same pulse
  - Same Input capacitance
  - Low power electronic pressure sensor
  - Low power CPU – TI's MSP430

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Safety

- 2 CPUs in series arming
- BIT before launching
- Capacitors discharge
- S&A Device
- Safety delay
- Time out – fail safe

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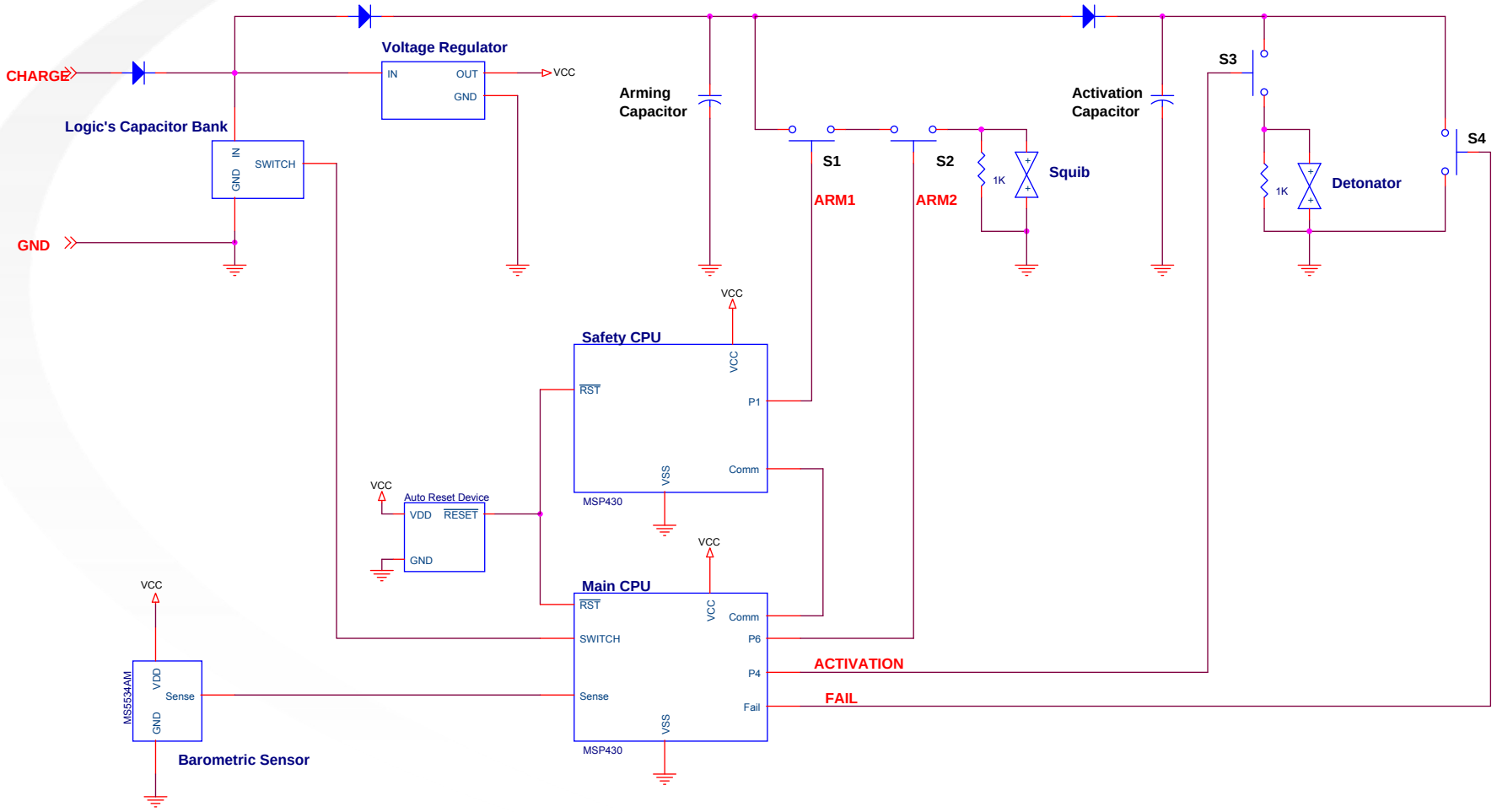
Block Diagram



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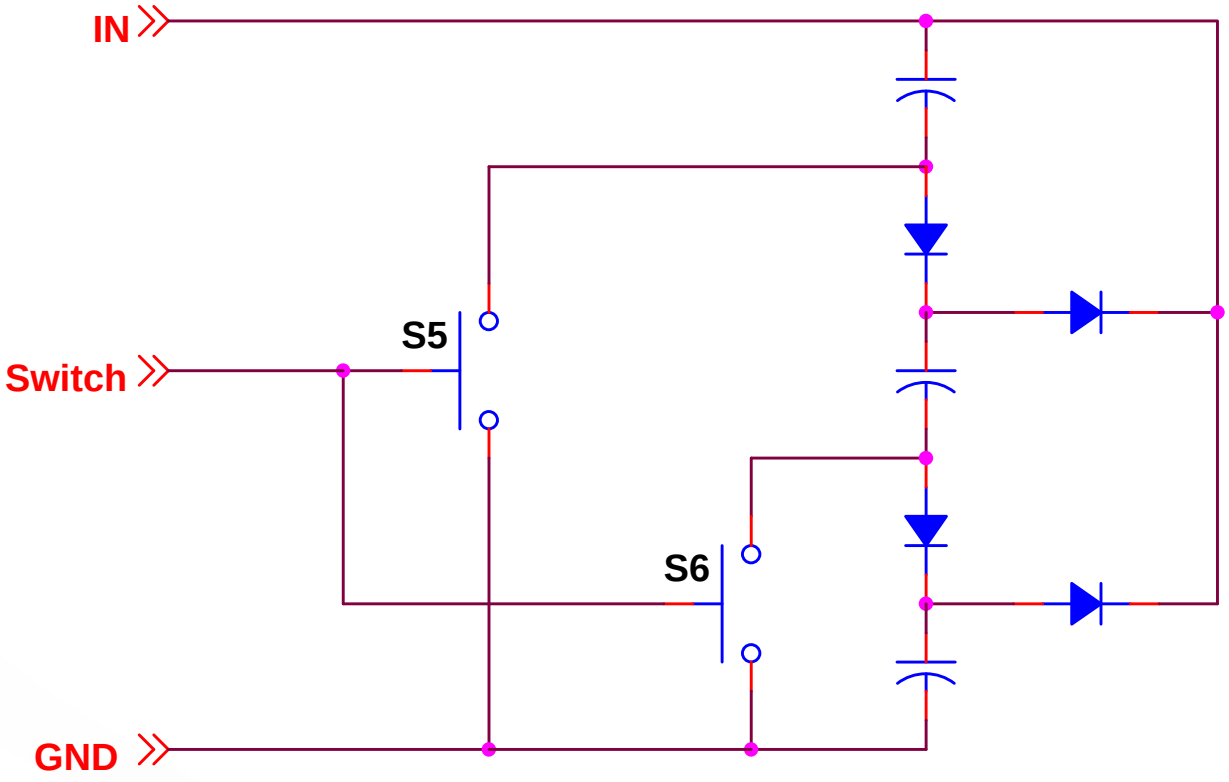
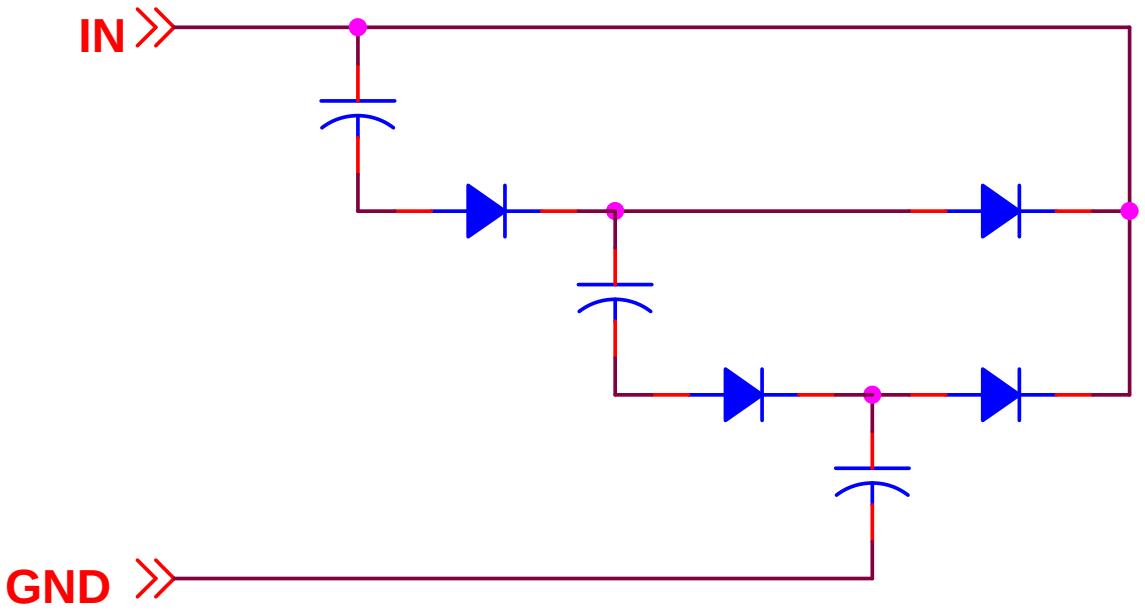
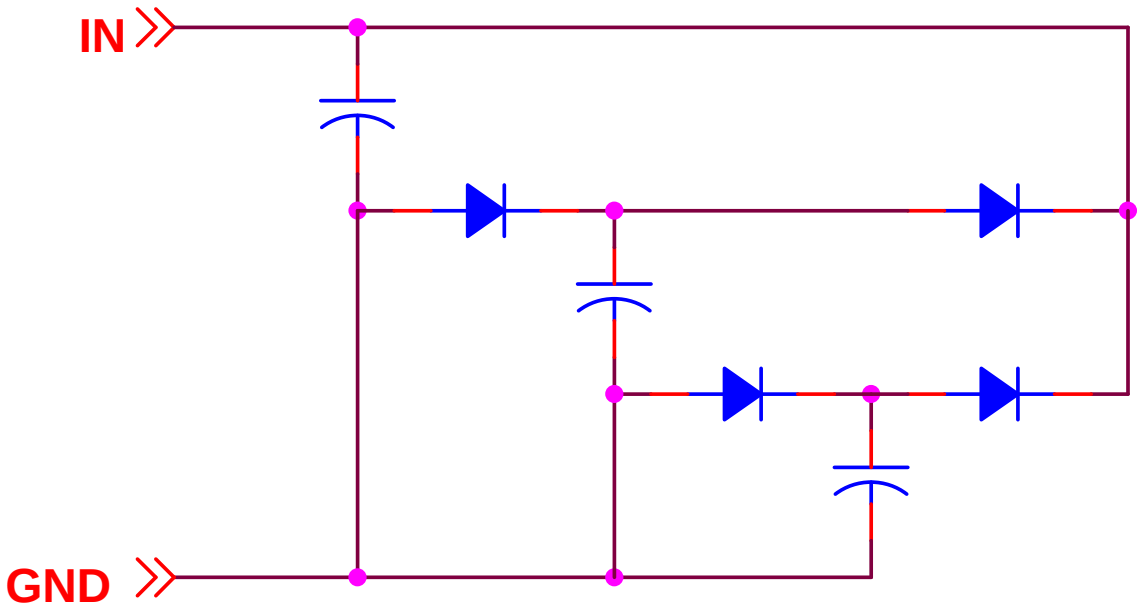
Logic's Capacitors Bank



Logic's Capacitors Bank Before switching – Serial charge



Logic's Capacitors Bank
After switching – Parallel Discharge



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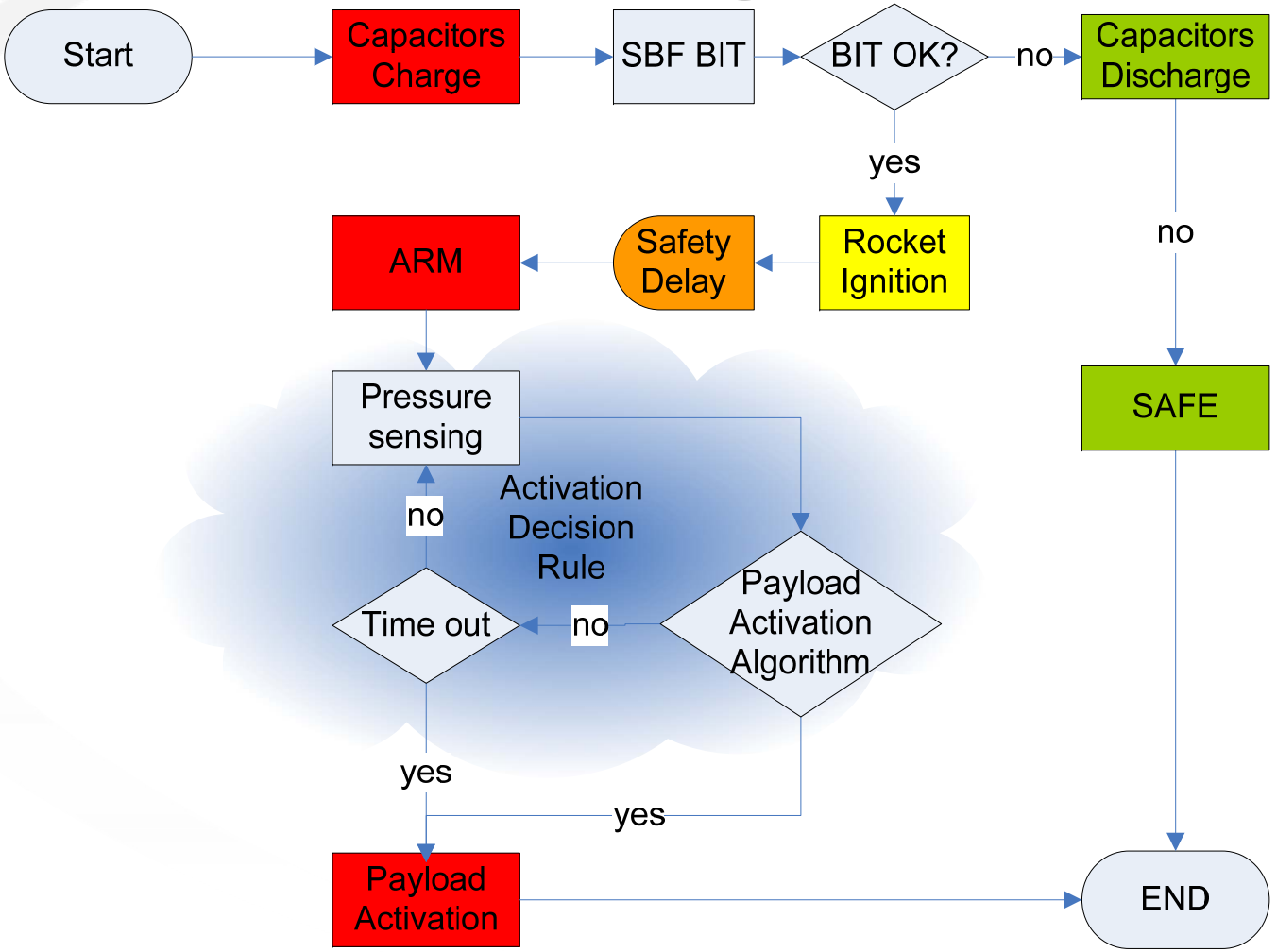
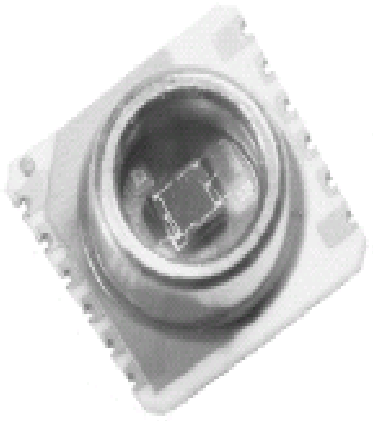
SBF Logic



The Pressure Sensor

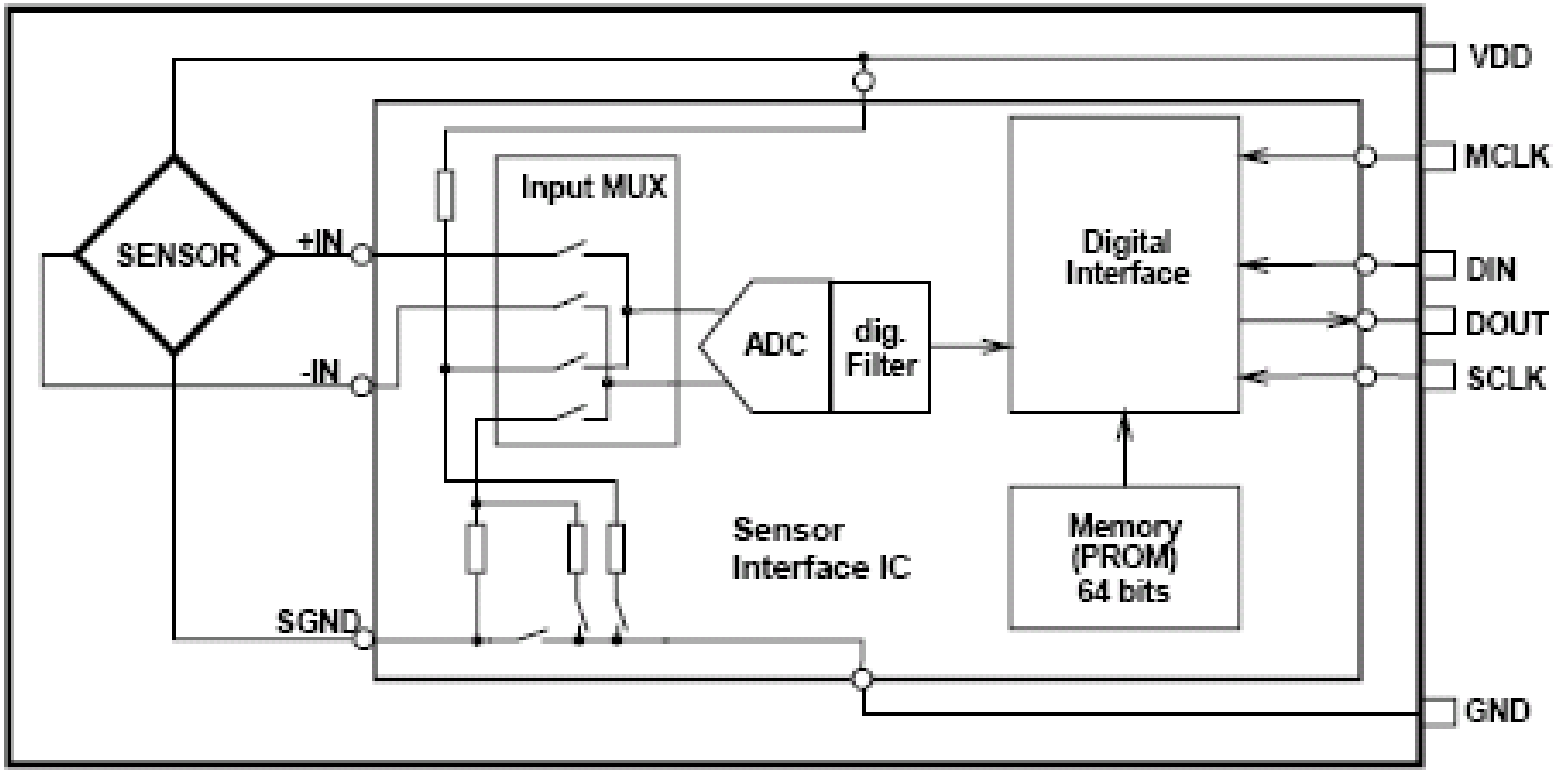
intersema

MS5534A BAROMETER MODULE



- Integrated pressure sensor
- Pressure range 300-1100 mbar
- 15 Bit ADC
- 6 coefficients for a software compensation stored on-chip
- 3-wire serial interface
- 1 system clock line (32.768 kHz)
- Low voltage / low power

Pressure Sensor Block Diagram



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CPU

- Main Performances
  - Low power microcontrollers – TI's MSP430
  - 2 serial CPUs for arming
  - Idle state while not in use – energy conservation
  - Flexibility in design
  - Activation algorithm, performance and accuracy are mainly software dependent
  - Variable sampling rate along mission
  - Low cost

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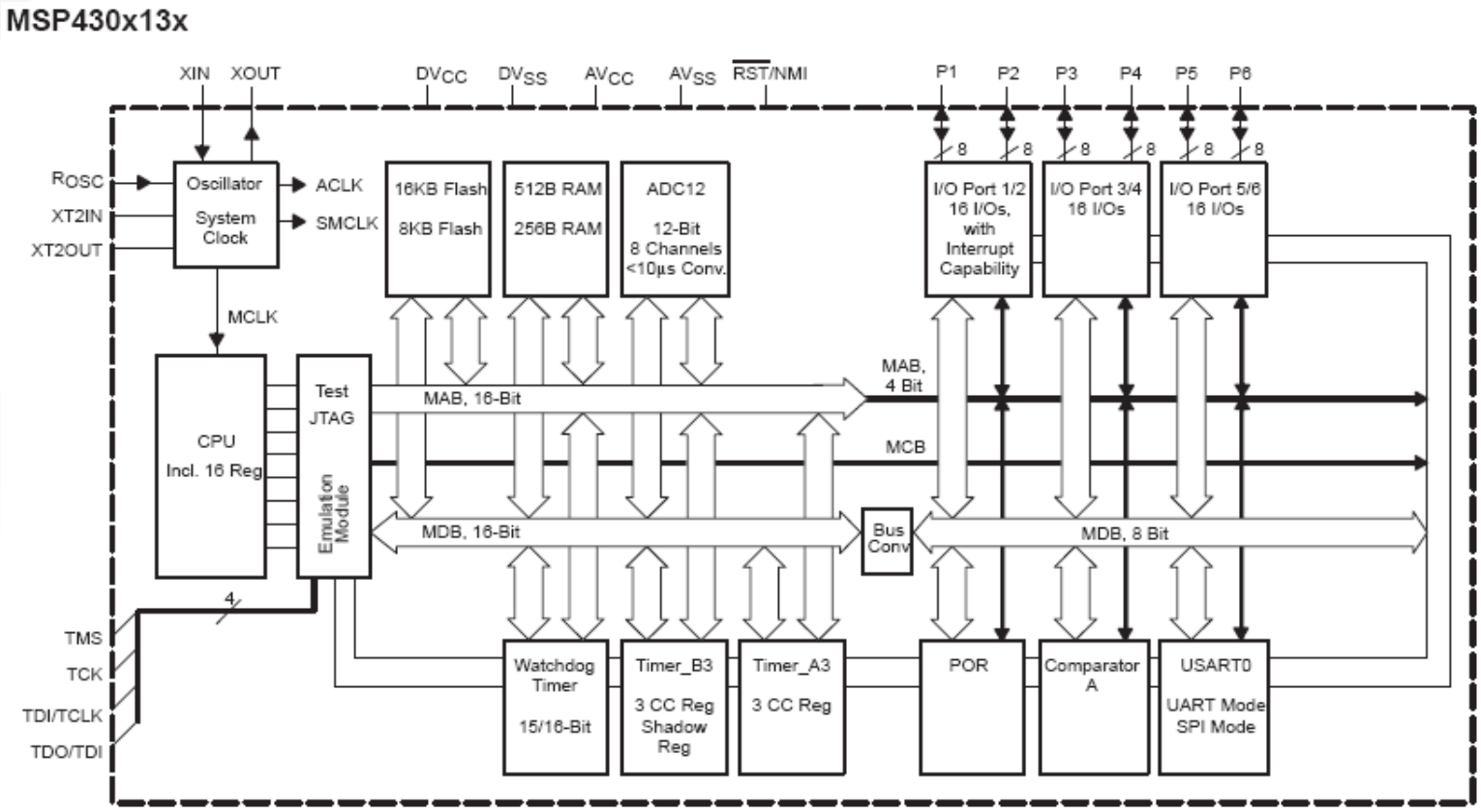
CPU

- Electrical Characteristics
  - –Low Supply-Voltage Range, 1.8 V . . . 3.6 V
  - –Ultralow-Power Consumption:
    - •Active Mode: 280 µA at 1 MHz, 2.2V
    - •Standby Mode: 1.6 µA
  - –Wake-Up From Standby Mode in less than 6 µs
  - –Two 16-Bit Timers
  - –On-Chip Comparator
  - –Serial Onboard Programming

CPU

Functional block diagram



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Conclusions and Future

- The SBF new design fits all its specification and requirements
- Prototypes has been assembled and successfully tested
- We believe that the SBF is the next generation fuze for EW Expendable Decoys

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Thank you

?Questions?