SIGNAL PROCESSING **IQ** : **FPGA** EXPERTISE

RFEL LTD SPECIALISTS IN HIGH SPEED AND LOW POWER SIGNAL PROCESSING FOR FPGA

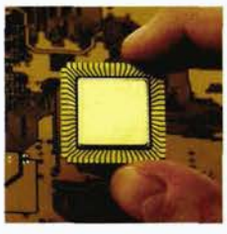
RFEL's Engineers form a highly flexible team, strongly committed to realising the highest standards of product quality and to continuously striving to push the limits of the latest technology. This mind-set and an optimal mixture of skill-sets including systems, modelling, firmware, software and board design, founded on over 300 man-years of industrial experience in the team, have combined to create world class and multi award winning products and helped grateful clients to create ground-breaking systems.

» CONSULTANCY

Make use of RFEL's full engineering expertise through RFEL's technical consultancy services. These services are accessed through extensive technology or feasibility studies, on-site FPGA and VHDL consultancy, digital signal and video processing algorithm development or VHDL code optimisation and reviewing. Boost your development results today by applying our multi-award winning FPGA and system expertise to ensure improved design efficiency within your internal developments.

» SIGNAL AND VIDEO PROCESSING HARDWARE

RFEL offers FPGA based Signal Processing and Real-Time Video Processing Hardware Solutions which deliver fully tested and qualified Sub-Systems. Available as fully qualified stand-alone products, or as OEM versions ready for integration, RFEL's hardware supports you by de-risking product development plans and by improving system performance.



» FPGA IP CORES

RFEL's off-the-shelf FPGA IP Cores include a comprehensive range of digital signal processing and video processing IP-Cores. The complexity ranges from small, optimised, system support IP-Cores called Corelets, to complex and feature-rich, multi-award winning System-on-Chip designs.

» DESIGN SERVICES

RFEL offers a wide range of Design Services. Designs can be developed in partnership with a customer to a high-level user-orientated brief, or can be produced in response to a detailed specification. High quality traceability is assured throughout and in-house skills and tools are employed for all stages of the design process, including FPGA design, PCB and software engineering.

XILINX.
ALLIANCE PROGRAM
CERTIFIED MEMBER – BASE

Altera Design Services Network

MathWorks
Partner

CERTIFICATION INTERNATIONAL
ISO 9001
Cert No: CU5303

www.rfel.com

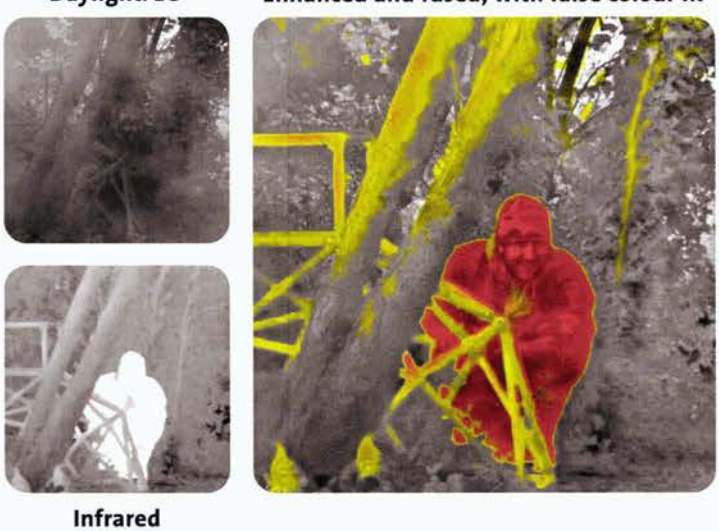
IMAGE FUSION TECHNOLOGY

HALO-FSE

Day/Night, All Weather, Superior Imaging Capability

Benefits

- » Real-time, Size/Weight/Power optimised processing platform
- » Increases range of identification
- » Increases situational awareness in all conditions
- » Reduces operator workload
- » Reduces data bandwidth



SIGNAL PROCESSING **IQ** : **FPGA** EXPERTISE

IMAGE FUSION TECHNOLOGY

HALO-FSE

Day/Night, All Weather, Superior Imaging Capability

For the military and security user who needs improved surveillance and identification performance in a range of missions and applications, the HALO-FSE video processing platform offers a state-of-the-art multi-channel video Fusion capability, augmented by high performance motion Stabilisation and Image Enhancement functions.

HALO-FSE provides specialist users with enhanced vision for day / night operation and under poor weather and in-theatre conditions, leading to a significant operational advantage. It is packaged in a small, robust and low-power standards qualified hardware format designed for ease of integration with modern and legacy vision systems. The flexibility provided through HALO-FSE offers military and security users a highly cost-effective means of enhancing situational awareness through legacy and in-service cameras as well as new procurements.

Registration and Fusion Processing

High performance registration is delivered through a combination of support for factory alignment and automated feature-based processing. The level of registration accuracy underpins a state-of-the-art video fusion design which coherently combines information from two video sources. Typically, these sources are from the visible and infrared spectral bands although different input combinations are possible. The fusion process increases the user's situational awareness, particularly under difficult or complicated viewing conditions. Additional benefits afforded include enhanced target detection and recognition whilst reducing the user's workload and minimising demands on the available data bandwidth.

Stabilisation

Motion stabilisation is performed in real-time and entirely electronically on the HALO-FSE output. The algorithm compensates for overall x-y shift and roll of a scene, improving end-user vision and reducing work-load. Object tracking may be improved in certain down-stream tracking applications.

Image Enhancement

A range of advanced image enhancement processing functions is included to assure the highest quality video output. These functions include noise reduction, correction of image distortion, contrast enhancement, and digital zoom. HALO-FSE allows the user to create a bespoke output using configurable full graphic or symbolic overlays and data formatting options which can be set during installation and then stored in non-volatile memory.

Benefits

- Real-time, Size/Weight/Power optimised processing platform
- Increases range of identification
- Increases situational awareness in all conditions
- Reduces operator workload
- Reduces data bandwidth

Features

- Designed, built and tested to military specifications
- 2 input and 2 output video ports (supports all formats up to Full HD)
- High performance and robust video processing on either one or two video channels
- Base functionality includes image fusion, electronic stabilisation, image enhancement, digital zoom, video compression and user specific display overlays
- Real-time and low-latency video processing (up to 60Hz full frame and 150Hz for region of interest)
- Interoperable with Industry and Mil Standard video distribution systems and cameras: GigE, Camera Link, and Analogue/CCTV amongst others
- Low power.

Specifications

Video Input	GigE, CameraLink, Def Stan 00-82, SDI or CVBS
Video Output	GigE, CameraLink, SDI, CVBS or VESA System Diagnostics
Size and Weight	105mm * 105mm * 80mm nominal (connector dimensions may vary) < 900g
Power Supply	4.7 - 27V DC @ 0.60 - 0.11A
Standard compliance	• Compatible with Def-Stan 23-09 (General Vehicle Architecture) • Qualification to DEF STAN 00-35 & 59-411(EMC) • CE(Industrial)

Also available as 150mm x 75mm OEM board and 90mm x 75mm system-on-module

Company background

RFEL Ltd is a UK-based electronic systems designer, providing high specification signal, image and video processing IP solutions that run on FPGAs, as well as supplying digital receiver and complete product solutions for the defense, communications and homeland security markets. RFEL has a range of capabilities for other real-time video enhancement processing functions and application specific video processing and a wide range of hardware and programmable turn-key system solutions which can be tailored to any customer specific requirement.

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2009

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2012

RFEL Limited
Unit B, The Apex, St Cross Business Park, Newport, Isle of Wight PO30 5XW, UK
T +44 (0)1983 216600 **F** +44 (0)1983 216611 **E** info@rfel.com **www.rfel.com**

www.rfel.com

RFEL

PRODUCTS AND CAPABILITIES

IMAGING

High Performance Optimised Image Processing for FPGA Systems

High quality services and products for Image Processing System designers, including:

- Image processing expertise across a range of applications
  - Defence
  - Security and surveillance
  - Industrial, automotive and simulation vision or display systems
- High performance, optimised standard FPGA IP Cores
- System modelling and consultancy services
- Low power and flexible
- Easily customised
- Low latency, programmable solutions

SIGNAL PROCESSING **IQ** : **FPGA** EXPERTISE

PRODUCTS AND CAPABILITIES

IMAGING

High Performance Optimised Image Processing for FPGA Systems

The challenges facing designers of modern defence, security and other machine vision systems are increasing exponentially.

The available resolutions and frame rates are rapidly increasing, whilst end-user expectations are becoming more sophisticated, driven by a ubiquity of video information appearing in increasingly embedded, mobile and/or critical systems. RFEL offers a range of high quality image processing solutions to meet these challenges and deliver the performance required by users.

RFEL award winning capabilities in low-power, optimised FPGA IP cores have been deployed to great effect across the Digital Signal Processing application domain for 12 years. Whether the requirement is for a single low-risk, pre-qualified standard image processing building block to integrate into an embedded product, or if it is for a complete turn-key product design service, including preliminary critical performance studies and technology consultancy, RFEL has the proven solutions to assist.

Standard software interface frameworks may be provided to allow the system designer to utilise RFEL FPGA IP with little or no FPGA experience. RFEL can also modify standard products to optimally meet the requirements of constrained resources or legacy platforms.

Example Image Processing Capabilities

Digital Rotation

This IP core offers an alternative to mechanical rotation hardware with state of the art digital processing. Many of the digital rotation IP core features can be configured while the system is still running, keeping the user fully in control. Reliable, maintenance-free and targeted to low-cost FPGA devices.

Digital Re-sizing

RFEL's Digital Zoom (DZ) core is a compelling solution in the field of image magnification. It far exceeds the power efficiency and determinism of software-based solutions. High-performance image processing systems can now crop and enlarge dynamically.

Image Enhancement

A range of advanced image enhancement processing functions is available to assure the highest quality video output. These functions include noise reduction, correction of image distortion, contrast enhancement, and digital re-sizing and full graphic or symbolic overlays.

Stabilisation

Motion Stabilisation is an example of a complex and high performance system core. Stabilisation is performed in real-time and entirely electronically. The algorithm compensates for overall x-y shift and roll of a scene, improving end-user vision and reducing work-load. Complex, adaptive system configurations are available that utilise embedded software elements closely coupled to the FPGA functions, typically supplied as system-on-module designs.

Capabilities

- Image processing design expertise
- Matlab modelling
- World-class optimised FPGA design
- High quality, formal software design
- Interface and hardware design
- Multi-layer PCB & Rugged design
- Product compliance expertise
- Re-usable and pre-qualified IP components.

Example IP Cores

DIGITAL ROTATION

- Run-time programmable
- Sub-degree angle of rotation
- Three selectable HD input streams
- Two modes of pixel interpolation
- HD (1920×1080) or SD (720×576)
- Native camera interfaces
- Efficient memory interfacing
- Optimised for low-cost memory
- Simplified, 90° rotation variant available

DIGITAL RE-SIZING

- Dynamically programmable zoom window
- Real-time, low-latency computation
- Support for both up-scaling and down-scaling.
- A range of supported video formats.
- Bilinear interpolation support
- No need for external memory

DISTORTION CORRECTION

- Run-time programmable
- Real-time, very low-latency computation
- Barrel and pincushion correction on all lens types
- A range of supported video formats
- Efficient memory interfacing
- Optimised for low-cost memory
- Optional cylindrical projection function
- Compatibility calibration via OPENCV 2.3

Company background

RFEL Ltd is a UK-based electronic systems designer, providing high specification signal, image and video processing IP solutions that run on FPGAs, as well as supplying digital receiver and complete product solutions for the defense, communications and homeland security markets. RFEL has a range of capabilities for other real-time video enhancement processing functions and application specific video processing and a wide range of hardware and programmable turn-key system solutions which can be tailored to any customer specific requirement.

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2009

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2012

RFEL Limited
Unit B, The Apex, St Cross Business Park, Newport, Isle of Wight PO30 5XW, UK
T +44 (0)1983 216600 **F** +44 (0)1983 216611 **E** info@rfel.com **www.rfel.com**

» Highest FPGA Efficiency

» Hardware Proven IP

» Award Winning Innovation

» SWaP+C Optimised

» On Time, On Budget Delivery

» 100% ITAR Free

» www.rfel.com