

**BuiltSAFE™**

## ROCK-2 Rugged, 3U OpenVPX Mission Computing Chassis

*Low-SWaP, versatile chassis for flight safety certifiable application*

- Rugged, low-SWaP 3U OpenVPX™ chassis
- Certifiable to DAL-C (DO-178C/DO-254)
- Up to 4 Freescale QorIQ™ P3041 processor (2GB DDR3L/ea.)
- Optional Intel® Core™ i7
- Full I/O avionics interface with advanced video and graphics processing
- Sealed, forced-air, conduction-cooled chassis (-40°C to +70°C operating temperature)
- Pre-integrated and pre-qualified to DO-160 and MIL-STD-810



HIGHEST DAL

Mercury's BuiltSAFE™ products bring the highest level of flight safety assurance to aerospace and defense applications. Our proven, reusable Design Assurance Level (DAL) certified artifacts for mission computing, avionics, networking and datalink comms processing save time and cost while decreasing risk.

The BuiltSAFE ROCK-2 is a series of rugged, modular, pre-qualified chassis' for subsystem pre-integration for low-SWaP C4ISR applications that require flight safety certification. "Designed for Safety" is a Mercury core competency. From the outset, BuiltSAFE ROCK-2 chassis have been engineered with DO-178C/DO-254 design safety rules, documentation and independent verification and validation applied across the whole development process.

ROCK-2 supports mixed safety-critical levels of HWCI and CSCI via their multi-slot/multi-processor partitioned architecture. BuiltSAFE ROCK-2 solutions may be delivered with all the documentation and artifacts required for RTCA DO-178C/DO-254 certification up to level C (although, please contact Mercury directly for other and higher DAL level certifications).

### BuiltSAFE for Avionics

Mercury's expertise and experience in safety certifiable solutions has been built on successful execution of dozens of programs over three decades. This domain knowledge is the foundation of our BuiltSAFE portfolio of open architecture modules, systems and software for avionics, communications, video servers, and mission computing.

### Customizable to C4ISR and specific applications

With the ability to interact with sensors, acquire and process data and share it over a network or other standard avionics bus, BuiltSAFE ROCK-2 solutions feature all the core functions required for modern C4ISR applications.

Every mission computer configuration serves specific purposes, each requiring certain interfaces to the outside world. ROCK-2's front-panel and custom I/O board are easily modified to suit needs. Additional application tailoring is achieved via a spare chassis slot which may be loaded with application functions and/or off-load the main CPU(s).

*Mercury Systems is a leading commercial provider of secure sensor and mission processing subsystems. Optimized for customer and mission success, Mercury's solutions power a wide variety of critical defense and intelligence programs.*

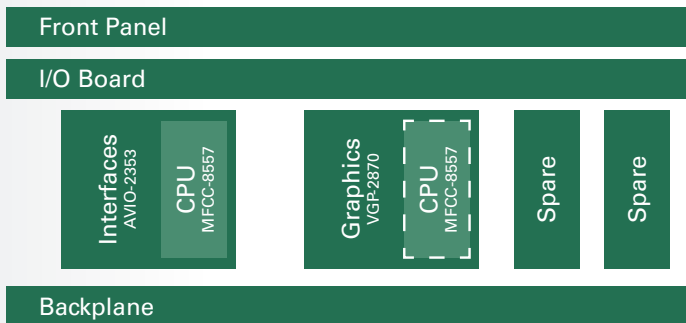


## Chassis Configurations

### Avionics mission computer

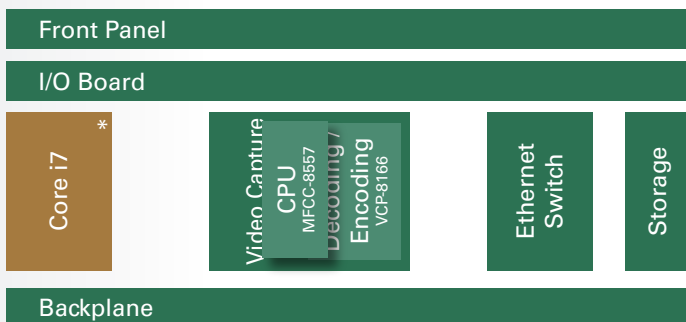
Our avionics mission computer configuration adopts the Integrated Modular Avionics (IMA) concept and is ideal for airborne applications requiring a central mission computer that manages several functions of differing criticality levels, ranging from DAL-E to DAL-C. This configuration leverages the DAL safety-certifiable of its three major building blocks within the BuiltSAFE ROCK-2 series: AVIO-2353, MFCC-8557 and VGP-2870.

With up to two Freescale QorIQ™ P3041, the avionics mission computer configuration delivers all the DMIPS required to process the video/sensor payload acquired through various MIL-STD-1553, ARINC-429, RS-232/422/485, GPIO, HD-SDI and 3G-SDI interfaces and to display information via 6 DVI and DisplayPort video outputs.



### Intel configuration

The Intel configuration offers an Intel processor based alternative to the avionics mission computer configuration. This configuration provides similar I/O communication functionalities driving the BuiltSAFE AVIO-2353 through the VPX PCIe bus. The BuiltSAFE VCP-2864 enables the capture of two 1080p30 video streams (frame grabbing) with optional H.264 video compression (both streams) using the BuiltSAFE VCP-8166 XMC. Driven through the OpenVPX PCIe bus, this combination is both low-power and low-latency (typically 1-2 frames).



### 3U VPX slot configuration

Mercury's 3U OpenVPX slot configuration addresses the increasing need for I/O and processing power with extended product lifecycle support. This configuration's I/O and graphics functions are implemented as XMC mezzanines. The processor mounted on a SBC XMC mezzanine that uses the Computer-On-Module (COM) architecture, enabling the processing to be easily upgraded. The MFCC-8557 is the first of a series of SBC XMC mezzanines. The Freescale T1/T2 version will soon be available.

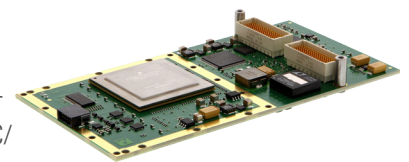


### Building Blocks

#### BuiltSAFE MFCC-8557: COTS, safety-certifiable SBC XMC

The BuiltSAFE MFCC-8557 is a DAL-C certifiable XMC 2.0 SBC. It is specifically designed to meet the DO-178C/DO-254 certification process

of your system. The MFCC-8557 can be delivered with all documentation, certification evidences and supporting artifacts required to prove compliance with avionics industry design assurance qualifications.



Built for reliability, the BuiltSAFE MFCC-8557 is provided with a comprehensive set of Power-On, continuous and initiated Built-In-Tests.

- DAL-C (DO-178C/DO-254)
- Conduction-cooled (-40°C to +85°C)
- Freescale Qorl P3041 CPU
- 4x PCIe Gen2 interfaces on XMC (full mesh support)
- 1x DAL-C certifiable Fast Ethernet interface on XMC
- Low power: 15W typical
- Maintenance interfaces:
  - 1x 1000BASE-BX
  - 1x SGMII
  - 1x USB 2.0 OTG
  - 1x USB 2.0 HOST
  - 2x UARTs
  - 1x SATA 2.0

### **BuiltSAFE AVIO-2353: Avionics communication interface board**

The BuiltSAFE AVIO-2353 is a 3U OpenVPX board featuring a rich set of avionics I/Os. Featuring MIL-STD-1553, ARINC-429, RS232/422/485



and GPIOs, it provides all the standard interfaces used to communicate with electronic sensors for avionics and other processing subsystems. Utilizing Mercury FlexIO™ technology, the BuiltSAFE AVIO-2353 pinout can be customized (number and type of I/O) to the specific application requirements. The AVIO-2353 can be driven either through the OpenVPX PCIe bus or via a XMC SBC (BuiltSAFE MFCC-8557) installed on its XMC mezzanine site. Engineered with DAL certification in mind, the AVIO-2353 can be optionally delivered with a certification kit ensuring success in the process which results in a DO-178C/DO-254 DAL-C certified system.

- DAL-C (DO-178C/DO-254)
- Conduction-cooled (-40°C to +85°C)
- Low power: 11W typical
- Mercury FlexIO technology
- I/O set optimized for avionics:
  - 2x dual redundant MIL-STD-1553
  - 16x Rx and 8x Tx ARINC-429 channels
  - 10x configurable RS-232/422/485 serial channels
  - 5x LVTTTL compatible 5V tolerant GPIOs

### **BuiltSAFE VGP-2870: Video I/O graphics processor**

The BuiltSAFE VGP-2870 is a 3U OpenVPX high-performance embedded GPU board. It is capable of performing 2D and 3D graphics generation func-



tions as well as operating as a general purpose GPGPU for intensive data computation. Featuring 6 independent video outputs and 2 video inputs, the VGP-2870 covers all major video processing scenarios such as capture, overlay, encoding and decoding. The BuiltSAFE VGP-2870 can be driven either through the OpenVPX PCIe bus or from a XMC SBC (BuiltSAFE MFCC-8557) installed on its XMC mezzanine site. Engineered with DAL certification in mind, the BuiltSAFE VGP-2870 can be optionally delivered with a certification kit ensuring success in the process which results in a DO-178C/DO-254 DAL-C certified system.

- DAL-C (DO-178C/DO-254)
- Conduction-cooled (-40°C to +85°C)
- AMD Radeon™ E8860 embedded graphics processor
- 2D and 3D graphics generation
- GPGPU data computation
- On-board analogue and digital video input
- Up to 6 independent video outputs
- Supporting major video use case:
  - Capture
  - Overlay
  - Encode
  - Decode
  - Recording
  - Streaming

## Technical Specifications

### Compliance

Mechanical environment: MIL-STD-810G, DO-160G

Electromagnetic environment: DO-160G

Climatic environment: DO-160G

Electrical power supply VITA 62

### Power Consumption

Minimum	Typical	Maximum	Units
40	150	180	Watts

### Memory

Up to 512GB flash disk

### Interfaces

ARINC 429 Tx and Rx for high and low speed

Dual redundant MIL-STD-1553

RS232/422/485 configurable serial channels

Fast Ethernet (100BASE-T)

Gigabit Ethernet (1000BASE-T)

USB 2.0 HOST

USB 2.0 OTG

Discrete configurable I/Os

Analog audio IN

Digital and/or analogue video inputs

Digital and/or video outputs

### Software

Maintenance/mission mode

Board support package: VxWorks®653, INTEGRITY-178 tuMP®, Linux

Built-In-Tests (PBIT, CBIT and IBIT)

Drivers: MIL-STD-1553, ARINC 429, RS232/422/485, Gigabit Ethernet, DSIO, USB, audio, video

### Dimensions

Without connectors: 124 x 194 x up to 335 mm (W x H x D)

### Weight

4Kg to 8Kg

### MTBF

>5,000 hours AIC @ +40°C

## BuiltSAFE Product Ordering

ROCK-2Axxxx01	ROCK-2 3U OpenVPX, SWaP optimized, rugged, modular, pre-qualified, COTS subsystems, evaluation platform
ROCK-2Cxxxx01	ROCK-2 3U OpenVPX, SWaP optimized, rugged, modular, pre-qualified, COTS subsystems
OW6-8557	MFCC-8557 VxWorks653 board support package
OWX-8557	MFCC-8557 Linux board support package
CERT-8557S*	MFCC-8557 DO-178C certification kit
CERT-8557H*	MFCC-8557 DO-254 certification kit
DW6-2353	AVIO-2353 VxWorks653 driver
DWX-2353	AVIO-2353 Linux driver
CERT-2353S*	AVIO-2353 DO-178C certification kit
CERT-2353H*	AVIO-2353 DO-254 certification kit
DW6-2870	AVIO-2870 VxWorks653 driver
DWX-2870	AVIO-2870 Linux driver
CERT-2870S*	AVIO-2870 DO-178C certification kit
CERT-2870H*	AVIO-2870 DO-254 certification kit

\*For more information contact factory

## Related BuiltSAFE Hardware Products

ACS-6076	4-slot 3U OpenVPX sealed forced air, conduction-cooled chassis (0.8", 0.85", 1.0" Pitch, 250 Watts) with MIL connectors
MFCC-8557	Freescale QorIQ P3041 XMC safety critical SBC
AVIO-2353	3U OpenVPX avionics I/O board
VGP-2870	3U OpenVPX video I/O and graphic processor
RIOV-2478	3U OpenVPX conduction-cooled high-performance embedded computing SBC
FDISK-8432	Flash disk storage XMC

## Environmental Specification

Condition	Limits/standards
Operating temperature	-40°C to +70°C
Storage temperature	-55°C to +85°C
Temperature variation	5°C per minute
Altitude	Up to 25000 feet
Vibrations	DO-160G Section 8
Operational shocks and crash safety	DO-160G, Section 7
Humidity	DO-160G, Section 6
Fungus resistance	DO-160G, Section 13
Salt spray	DO-160G, Section 14
Waterproofness	DO-160G, Section 10
Sand and dust	DO-160G, Section 12
EMI/RFI	DO-160G: Section 15 to 22, Section 25
Bench handling	MIL-STD-810F: Method 516.4

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