

**BuiltSAFE™**



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

*Low-SWaP, versatile flight safety certifiable chassis for commercial and defense airborne applications*

- Integrated Modular Avionics (IMA)
- Certifiable to DAL-C/A(DO-178C/DO-254)
- Up to 4 Freescale QorIQ™ T2080 processors
- Optional Intel® Core™ i7 or Xeon processors
- 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™ technology 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 mission-critical 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.

### Scalable avionics application architecture

With the ability to interact with commercial avionics interfaces connected to various sensors to 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 Integrated Modular Avionics applications.

Most avionics computer configurations serve a specific purpose, each requiring certain interfaces to the outside world. ROCK-2's configurable front-panel and extensive catalog of COTS I/O boards support a wide range of commercial flight computers, display processors, and mission computers. ROCK-2 chassis are designed to grow from 2 to 8 application payload modules to SWaP optimize the system configuration easily.

*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.*



ACQUIRE



DIGITIZE



PROCESS



STORAGE



EXPLOIT



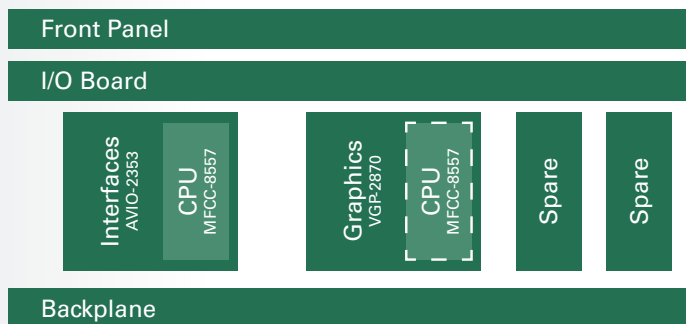
DISSEMINATE

## Chassis Configurations

### Avionics mission computer

Our avionics mission computer configuration adopts the Integrated Modular Avionics (IMA) architecture and is ideal for wide range of commercial and defense 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: Avionics IO, Processor, and Graphics Modules

With up to two Freescale QorIQ™ T2080, 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

An Intel configuration offers an Intel processing based environment 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-8558 is powered by a NXP T2080 processor and is the first of a series of SBC XMC mezzanines



### Building Blocks

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

The BuiltSAFE MFCC-8558 is a DAL-C/A certifiable XMC 2.0 SBC. It is specifically designed to meet the DO-178C/DO-254 certification process

of your system. The MFCC-8558 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-8558 is provided with a comprehensive set of Power-On, continuous and initiated Built-In-Tests.

- DAL-C/A (DO-178C/DO-254)
- Conduction-cooled (-40°C to +85°C)
- Freescale QorQ T2080 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 (MFCC-8558) 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/A (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-8558) 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® and 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
OW6-8558	MFCC-8558 VxWorks653 board support package
OWX-8558	MFCC-8558 Linux board support package
DW6-2353	AVIO-2353 VxWorks653 driver
DWX-2353	AVIO-2353 Linux driver
DW6-2870	AVIO-2870 VxWorks653 driver
DWX-2870	AVIO-2870 Linux driver

\*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 rugged connectors
MFCC-8558	Freescale QorIQ T2080 XMC safety-critical SBC
AVIO-2353	3U OpenVPX avionics I/O board
VGP-2870	3U OpenVPX video I/O and graphic processor
CIOV-2231	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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3234-04E-0919-ds-ROCK-2



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