



**GC600 • GC610**

***Embedded Go***®

**Intel® Atom™ E3900 Series Processor • Apollo Lake SoC**

## Technical Features

### General

- ▶ Low power X86 based single board computer (SBC)
- ▶ Intended for rugged industrial applications, ready-for-use (Embedded Go®)
- ▶ Industrial PCB assembly
- ▶ PCB Dimensions 133.0mm x 138.0mm (h x w)
- ▶ Intel® Apollo Lake-I (APL-I) SoC E39xx processor series (scalable GC600/GC610 versions)
- ▶ Versatile standard I/O connector suite (dual DisplayPort, dual USB 3.0, dual M12-X GbE)
- ▶ Choice of two versions - without (GC600) or with (GC610) wireless networking WLAN & WWAN
- ▶ SMA/SMA-RP antenna connectors (GC610)
- ▶ M12 power connector
- ▶ Option terminal block power connector
- ▶ Wide range DC power input operation 9-57V

### I/O Connectors

- ▶ Dual M12-X Gigabit Ethernet circular connectors (railway and industrial standard)
- ▶ 1000BASE-T, 100BASE-TX, 10BASE-T compliant data transfer rate
- ▶ Dual USB 3.0 Type-A receptacles
- ▶ Dual DisplayPort connectors
- ▶ M12-A DC power connector
- ▶ Option terminal block 3.5mm pitch 4-position screw lock power input

### Additional I/O GC610

- ▶ GC610 is the wireless version of GC600
- ▶ Assembly of the GC600 base board and a GC610 4HP mezzanine module
- ▶ SMA/SMA-RP on-board antenna connectors for WWAN, Wi-Fi 6, Bluetooth 5, GNSS
- ▶ Module RF to PCB by MHF4 to MHF4 coaxial patch cables
- ▶ Optional SMA antenna connectors by MHF4 to SMA/SMA-RP pigtail cables
- ▶ Dual Micro-SIM card slot for WWAN modem up to 5G

### Processor

- ▶ Intel® Apollo Lake-I (APL-I) SoC E39xx Series
- ▶ x7-E3950 • 4 Cores • 1.6/2.0GHz • 12W TDP/cTDP • 500/650MHz graphics • 2MB LLC
- ▶ x5-E3940 • 4 Cores • 1.6/1.8GHz • 9.5W TDP/cTDP • 400/600MHz graphics • 2MB LLC
- ▶ x5-E3930 • 2 Cores • 1.3/1.8GHz • 6.5W TDP/cTDP • 400/550MHz graphics • 2MB LLC
- ▶ Graphics Burst, CPU Burst, Intel® Speedstep®
- ▶ Intel® Virtualization Technology (Intel® VT-x / VT-d)
- ▶ Intel® Trusted Execution Engine (Intel® TXE) 3.0

## Technical Features

### Firmware

- ▶ Phoenix® UEFI (Unified Extensible Firmware Interface) with CSM\*
- ▶ Fully customizable by EKF
- ▶ Secure Boot and Measured Boot supported - meeting all demands as specified by Microsoft®
- ▶ Windows®, Linux and other (RT)OS' supported

\* CSM (Compatibility Support Module) emulates a legacy BIOS environment, which allows to boot a legacy operating system such as DOS, 32-bit Windows and some RTOS'

### Main Memory

- ▶ Integrated memory controller up to 8GB DDR3L 1600 +ECC
- ▶ Soldered memory for rugged applications

### Mass Storage

- ▶ On-board M.2 SSD socket (autosensing PCIe® or SATA based, up to 2280 size)
- ▶ Up to 2TB capacity as of current - refer to GC600/610 SKUs
- ▶ Option Micro SD Card socket (SDHC, SDXC), available on request
- ▶ 128Mbit SPI Flash (UEFI firmware and customer application data)
- ▶ Option e•MMC (embedded MMC 5.0 up to 64GByte soldered)
- ▶ Option mezzanine storage expansion via HSE connector (up to 2 x PCIe®, 1 x USB 3.0)
- ▶ Option custom specific mezzanine board design on request

### Graphics

- ▶ Integrated graphics engine, Gen 9 LP
- ▶ DirectX 12.0, OpenCL 2.0 Full Profile, OpenGL 4.3
- ▶ HW media acceleration DXVA 2, VAAPI
- ▶ HW video decode H264 L5.2, H.265 HEVC, VP9, MVC, MPEG2, JPEG/MJPEG, VC1, WMV9, VP8
- ▶ HW video encode H264, SVC, AVC, MVC, MPEG-2
- ▶ Content protection PAVP, HDCP 1.4
- ▶ 2 x DisplayPort connectors
- ▶ DisplayPort™ 1.2a
- ▶ Max Resolution 4096 x 2160 @60Hz
- ▶ Audio streams encoded

## Technical Features

### Networking

- ▶ Dual networking interface controllers (NIC), 1000BASE-T, 100BASE-TX, 10BASE-T connections
- ▶ 2 x Intel® I210-IT GbE controllers w. integrated PHY, -40°C to +85°C operating temperature
- ▶ IPv4/IPv6 checksum offload, 9.5KB Jumbo Frame support, EEE Energy Efficient Ethernet
- ▶ IEEE 802.1Qav Audio-Video-Bridging (AVB) enhancements for time-sensitive streams
- ▶ IEEE 1588 and 802.1AS packets hardware-based time stamping for high-precision time synchronization
- ▶ Two M12-X circular connectors
- ▶ Option 1 x Intel® I210-IS (SerDes GbE for Ethernet switch port expansion (mezzanine module))

### Wireless Networking GC610

- ▶ Option Wi-Fi with M.2 mezzanine module (Wi-Fi-6 802.11AX, BT 5.0)
- ▶ Option WWAN with M.2 mezzanine module (3G/4G/5G & GNSS)

### APL SoC I/O Usage

- ▶ 2 x PCIe® and 1 x SATA to M.2 SSD connector (auto switching logic PCIe®/SATA)
- ▶ 2 x PCIe® to 2 x I210-IT networking controllers
- ▶ 2 x PCIe® to P-HSE high speed expansion port connector (only 1 x PCIe® if 3<sup>rd</sup> NIC I210-IS is populated)
- ▶ 1 x USB 3.0 to P-HSE high speed expansion port connector
- ▶ 2 x USB 3.0 to Type-A connectors
- ▶ 2 x DisplayPort to DP connectors
- ▶ 1 x HS400 (e•MMC) to embedded MMC 5.0 64GByte (ordering option, mass storage device)
- ▶ SDIO (Micro SD Card) slot (option)
- ▶ LPC to TPM 2.0 module (option)

### Building Blocks

- ▶ 2 x Gigabit Ethernet controllers Intel® I210-IT (front panel)
- ▶ Option 1 x Intel® I210-IS (for SerDes networking expansion port connector)
- ▶ M.2 socket for 2280 SSD
- ▶ Option e•MMC (embedded MMC 5.0 64GByte HS400)
- ▶ Option Trusted Platform Module TPM 2.0

### GC610 Additions

- ▶ M.2 socket for 2230 Wi-Fi module
- ▶ M.2 socket for 3042 WWAN module (up to 3052 & 3060 extended 5G module)

### Security

- ▶ Trusted Platform Module (option)
- ▶ TPM 2.0 for highest level of certified platform protection
- ▶ Infineon Optiga™ SLB 9665 cryptographic processor
- ▶ Conforming to TCG 2.0 specification
- ▶ AES hardware acceleration support (Intel® AES-NI)

## Technical Features

### *Local Expansion*

- ▶ Mezzanine card connectors HSE and SERDES for optional local expansion
- ▶ HSE: 2 x PCIe®, 1 x USB 3.0, 2 x USB 2.0
- ▶ Choice of HSE based mezzanine I/O or storage modules
- ▶ GC010 HSE based wireless module for Wi-Fi, Bluetooth, WWAN, GNSS connectivity (GC610)
- ▶ Custom specific HSE based mezzanine module design
- ▶ Option SERDES connector - Gigabit Ethernet SerDes I/F derived from I210-IS NIC
- ▶ Custom specific SERDES based mezzanine switching module design

### *Power Requirements*

- ▶ DC Input, 9V-57V (e.g. 12VDC, 24VDC, 48VDC nominal input voltage)
- ▶ Power consumption 25W max.
- ▶ Fast acting chip fuse (PCB soldered type - no replacement on-site)
- ▶ Protected against reverse polarity
- ▶ ESD protection (TVS)
- ▶ Common mode input filter
- ▶ M12-A 5-pin power connector
- ▶ Option terminal block 3.5mm pitch 4-position screw lock power input

### *Applications*

- ▶ Ultra compact industrial PC
- ▶ X86 code compatibility for rapid time to market
- ▶ Machine control
- ▶ Kiosk systems, information panels
- ▶ Dual 4k display solution, independent operation
- ▶ Single display or headless applications
- ▶ Industrial networks - IIoT
- ▶ Cable and wireless networking
- ▶ Router, bridges
- ▶ Rugged environments
- ▶ Edge computing
- ▶ Vehicles, transportation

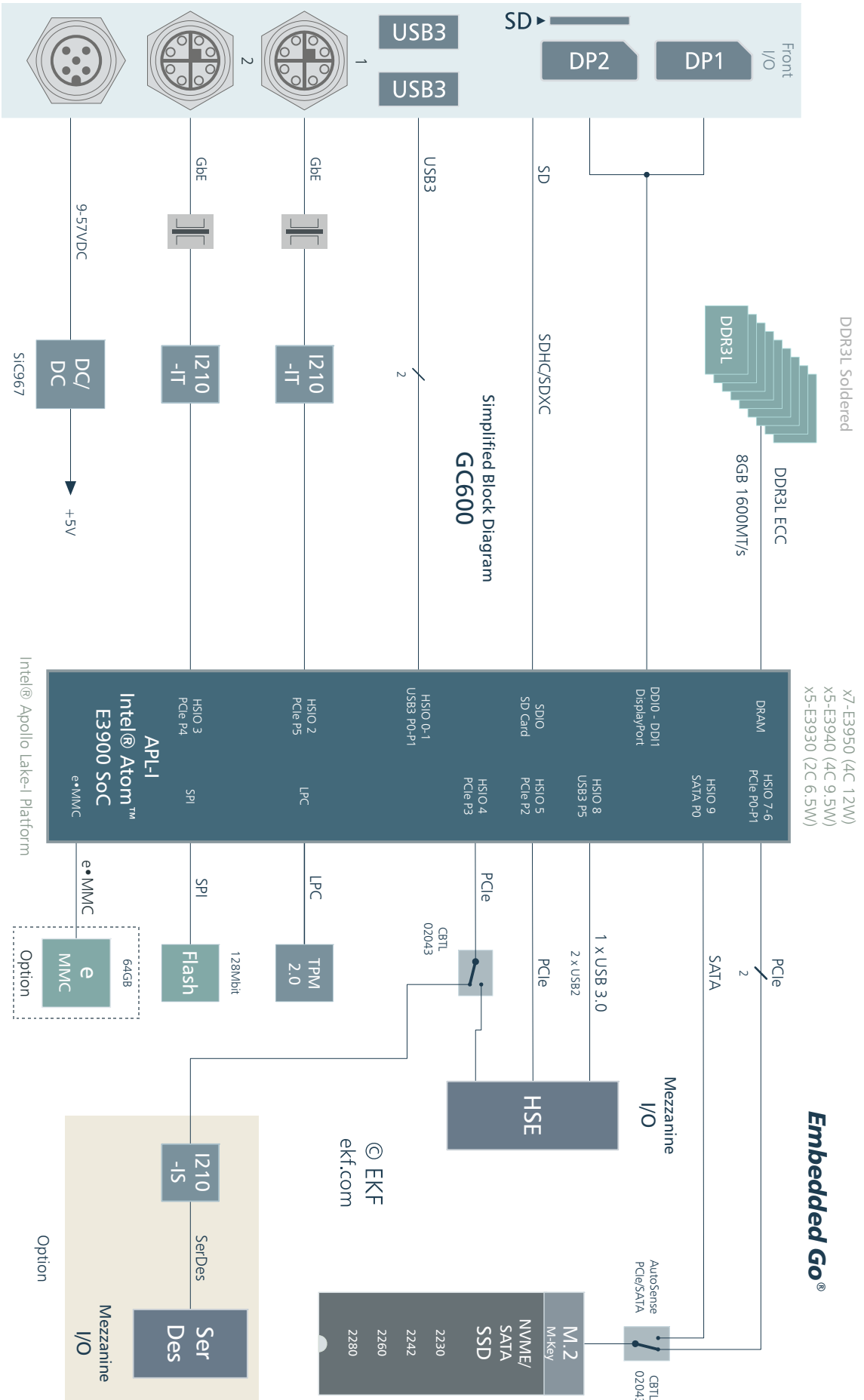
## Technical Features

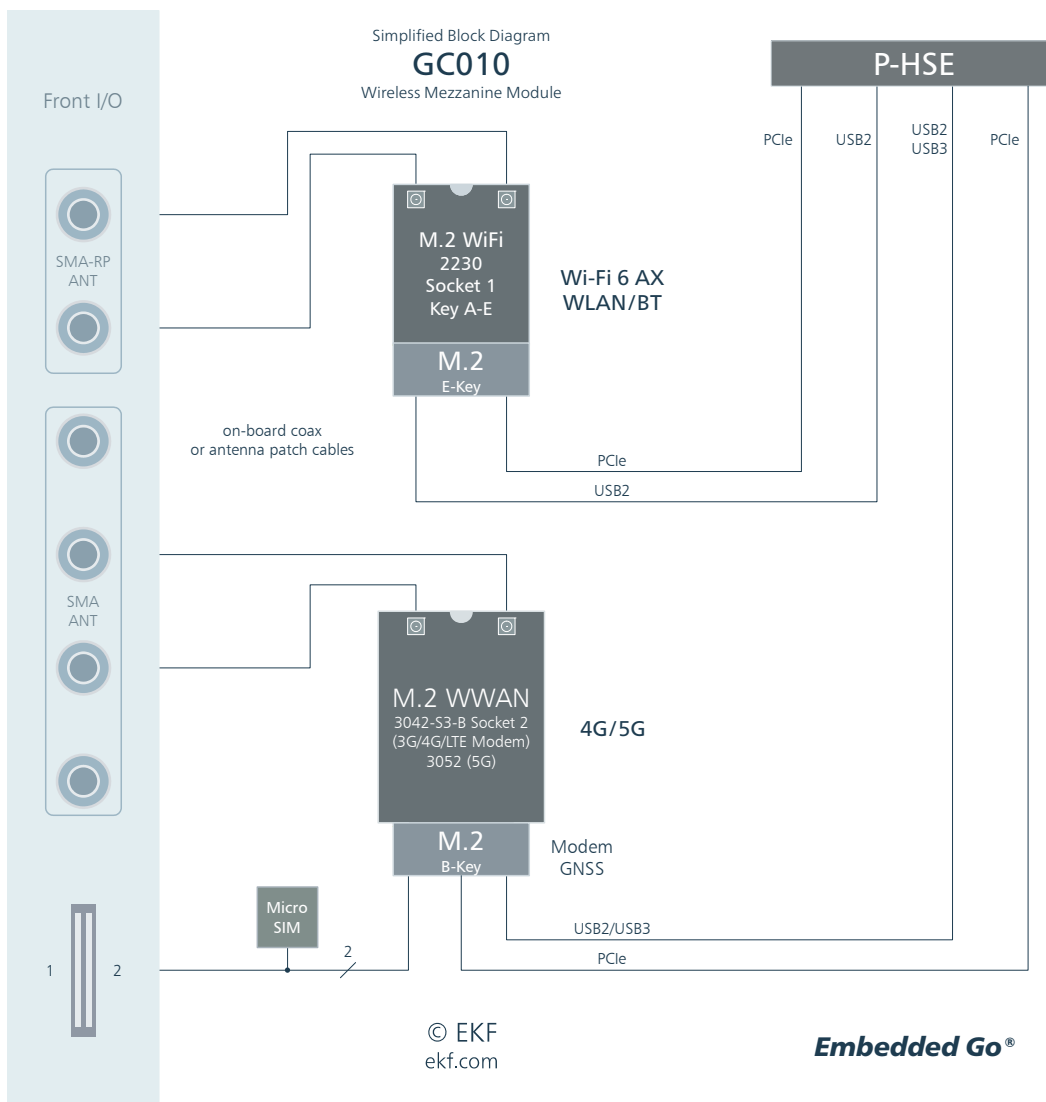
*Environmental, Regulatory*

- ▶ Designed & manufactured in Germany
- ▶ ISO 9001 certified quality management
- ▶ Long term availability
- ▶ Rugged solution
- ▶ Conformal coating, sealing, underfilling on request
- ▶ RoHS compliant
- ▶ Operating temperature -40°C to +85°C (industrial temperature range)
- ▶ Storage temperature -40°C to +85°C, max. gradient 5°C/min
- ▶ Humidity 5% ... 95% RH non condensing
- ▶ Altitude -300m ... +3000m
- ▶ Shock 15g 0.33ms, 6g 6ms
- ▶ Vibration 1g 5-2000Hz
- ▶ EC Regulatory EN55024, EN55032, EN62368-1 (CE)
- ▶ MTBF tbd years (GC600)
- ▶ MTBF tbd years (GC610)

all items may be subject to technical changes w/o further notice

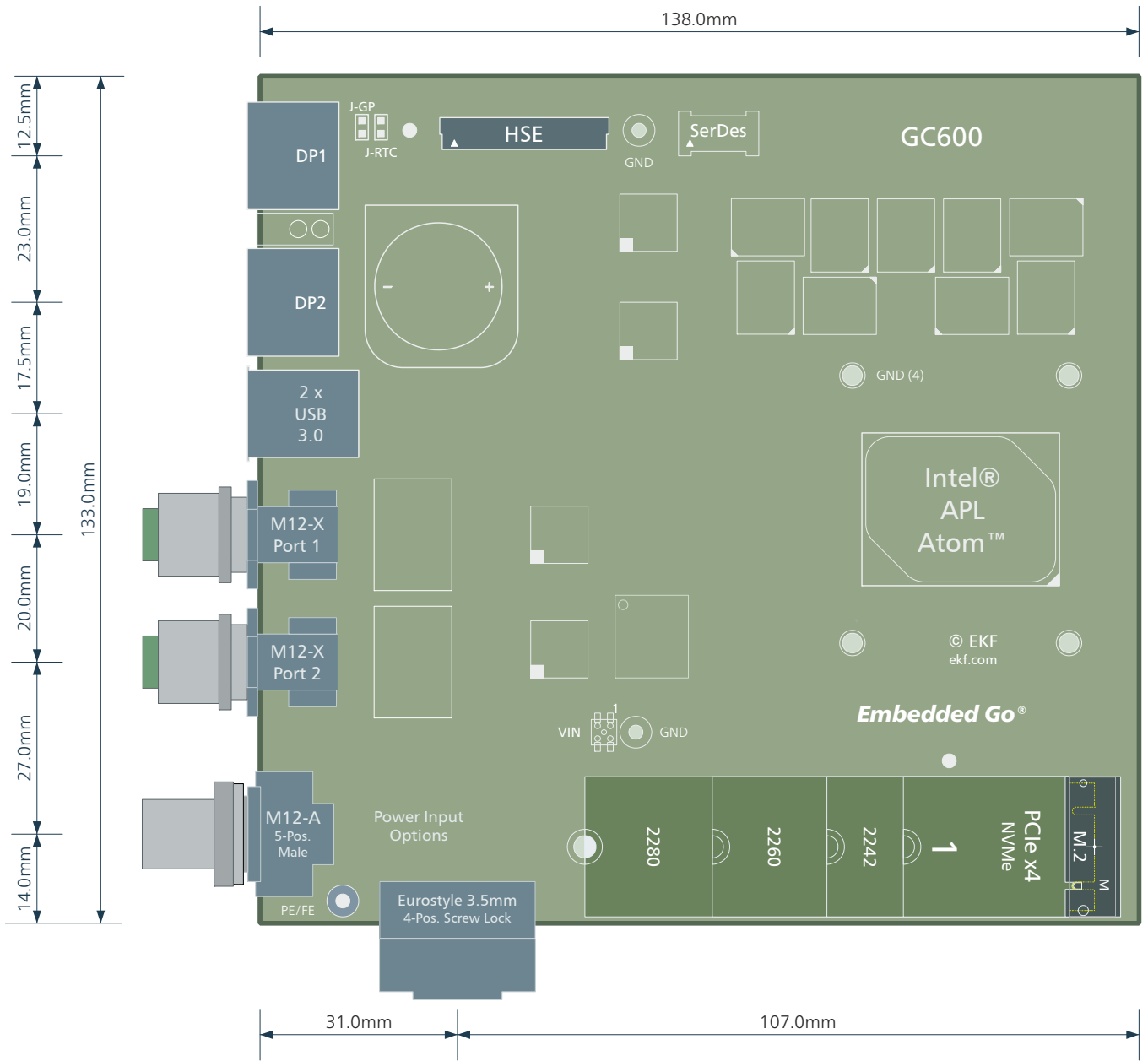
## Block Diagram



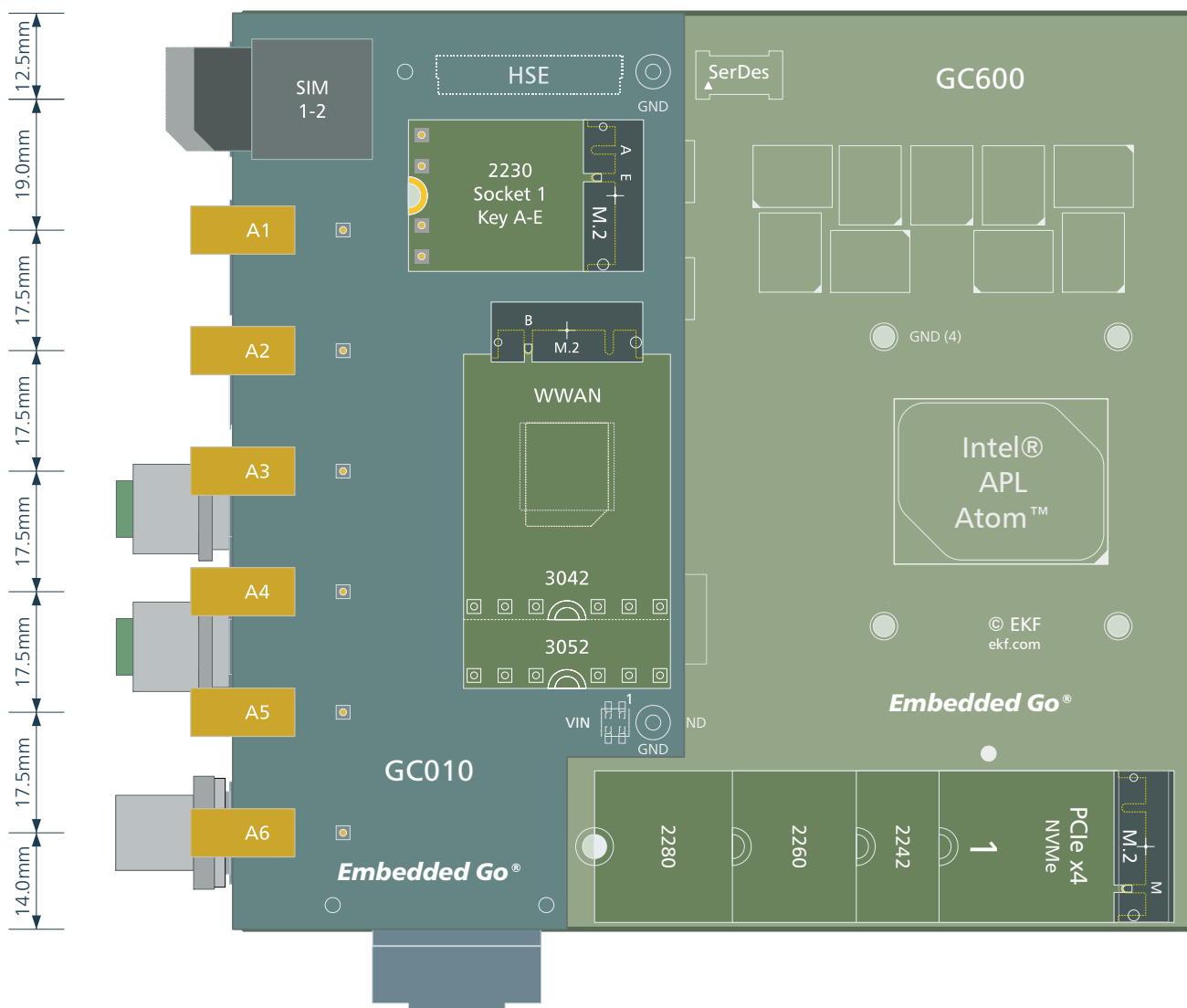




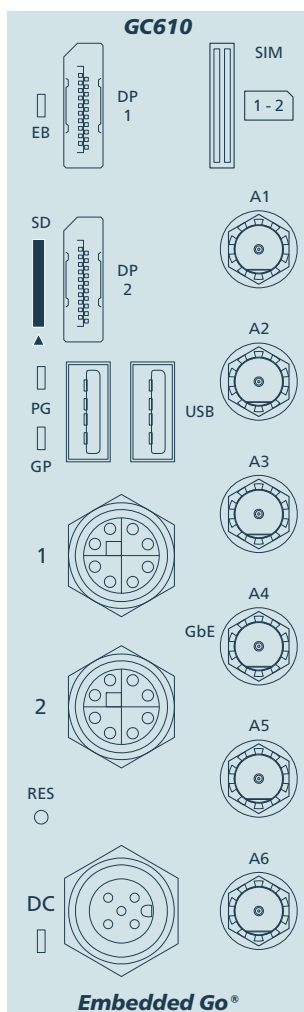
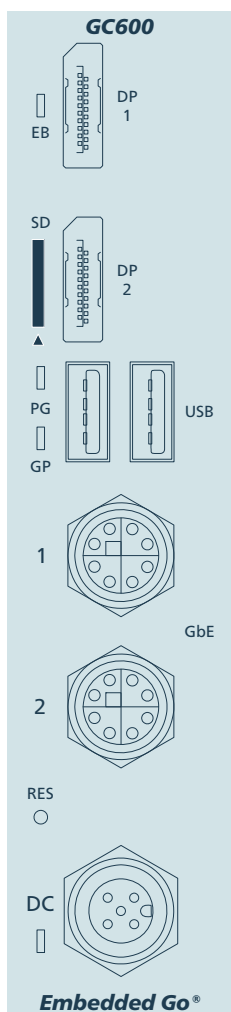
## Dimensions



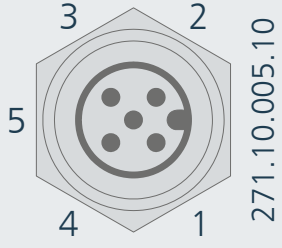
## Option Wireless Mezzanine



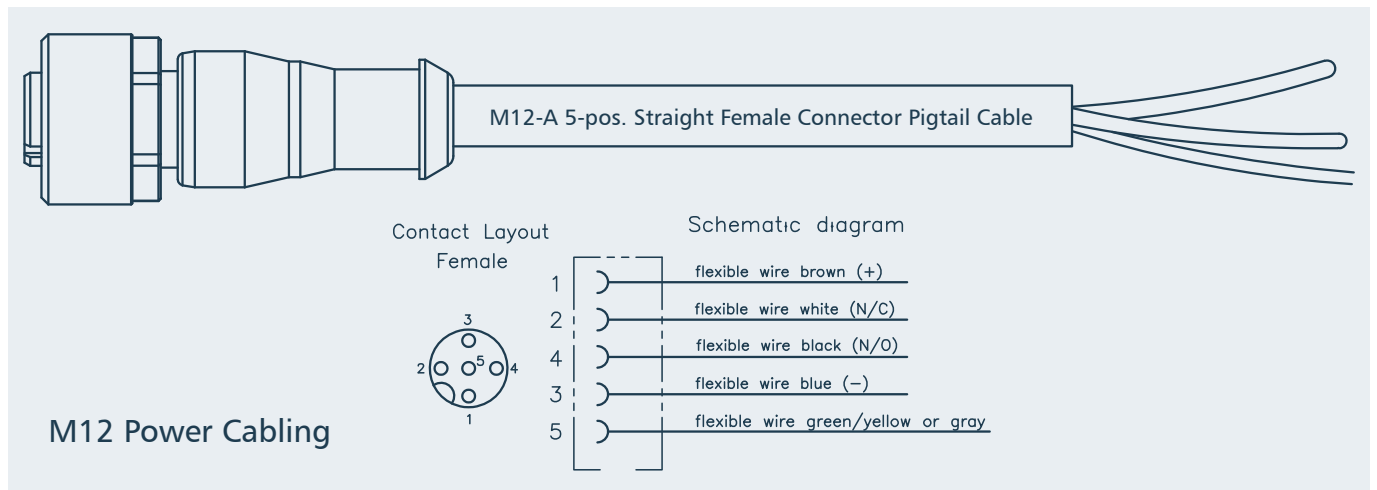
Sample F/P



## M12 Power Connector Pin Assignment

PCB Connector M12-A 5-Position Male 4A/Pin	
	V=9-57VDC
	1 +V
	2 RSV
	3 GND
	4 RSV
5 FE (Shield)	

Mating Pigtail Cable Assemblies 1.5m w. Female Straight Plug	
EKF	271.10.505.22.015
Phoenix Contact	1669822
Tyco (TE)	2273035-1



pre-assembled standard pigtail cables - wires #2 and #4 not in use with GL100 (reserved)

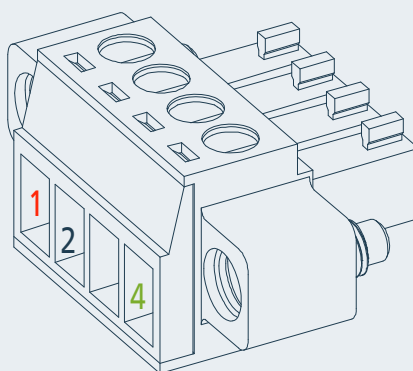
Mating DIN Rail Power Supply	
EKF	352.1.075.24.1
Meanwell	NDR-75-24, 75W 24VDC/3.2A

## Option Terminal Block Power Connector Pin Assignment

3.50mm 4-Position Terminal Block 8A/Contact		
<p>245.35.04.00</p> <p>1 2 3 4</p>	<p>V=9-57VDC</p>	1 +V
		2 GND
		3 RSV
		4 FE (Shield)

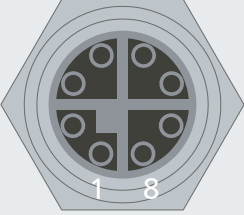
Mating Plugs w. Screw Lock	
EKF	245.35.04.20
FCI Amphenol	20020000-C041B01LF
Molex	39504-0004
Phoenix Contact	1847071
Tyco	284510-4

### Option Terminal Block Plug Power Cabling



245.35.04.20

## Gigabit Ethernet Ports M12-X

M12 X-Coded Front Panel I/O Receptacles			
Gigabit Ethernet • 271.12.008.20 • M12-X Flush-type socket Gigabit Ethernet			
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">271.12.008.00</p>  <p>© EKF • ekf.com Draft - Do Not Scale</p>	Ports 1-2	1	MDX0+
		2	MDX0-
		3	MDX1+
		4	MDX1-
		5	MDX3+
		6	MDX3-
		7	MDX2-
		8	MDX2+

The pin numbers of an M12 X-coded connector do not reflect the RJ45 Gigabit Ethernet signal assignment. For cross-over patch cables M12 to RJ45 please refer to the table below.

M12-X	Signal Colors T568B	RJ45
1	MDX0+ white/orange	1
2	MDX0- orange	2
3	MDX1+ white/green	3
4	MDX1- green	6
5	MDX3+ white/brown	7
6	MDX3- brown	8
7	MDX2- white/Go	5
8	MDX2+ Go	4

Suitable industrial Gigabit Ethernet M12-X cable assemblies can be ordered from EKF, or directly from well-known cable and connector manufacturers e.g. Metz, Phoenix, Escha and many others.

Ordering Information

For popular GC600 & GC610 SKUs please contact [sales@ekf.de](mailto:sales@ekf.de)

# ***Embedded Go***®

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