



Product Information

SP4-MAMBO

CompactPCI® Serial • PCI Express® Mini Card Carrier

Supports Wireless Technologies: LTE, WiFi, GNSS

Document No. 7040 • 19 June 2015

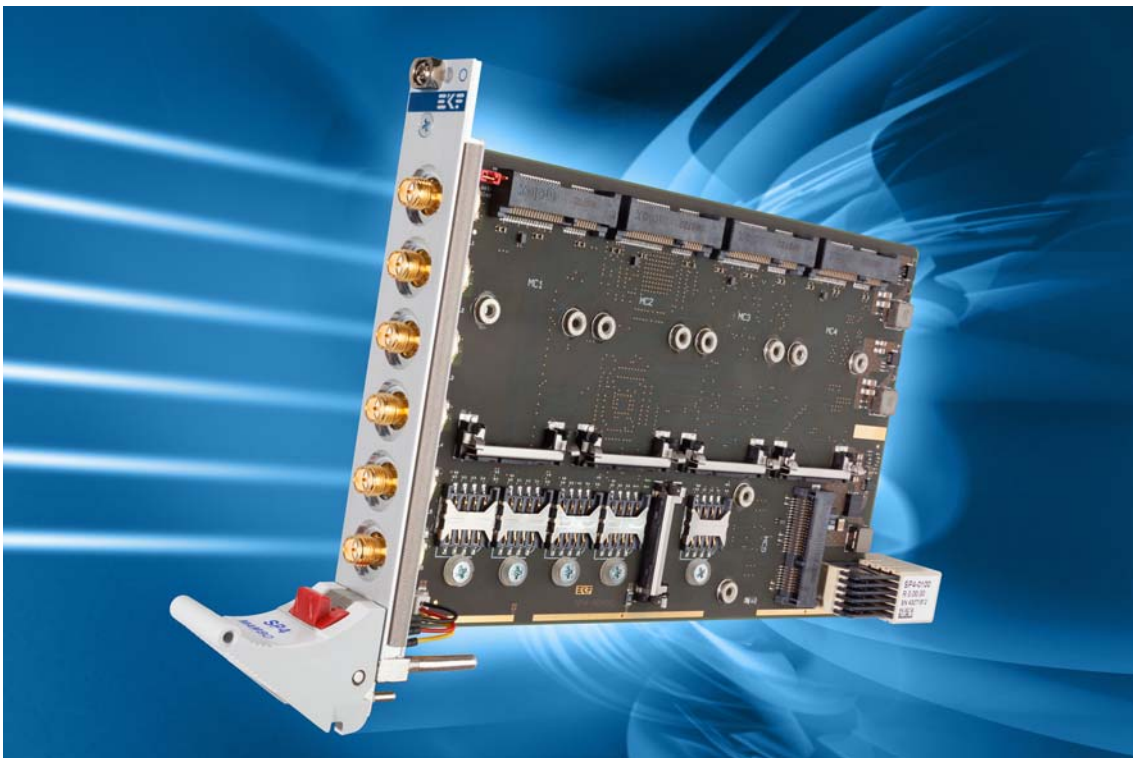


General

The SP4-MAMBO is a peripheral board for CompactPCI® Serial systems and serves as a quad PCI Express® Mini Card carrier, either full- or half-size style. An additional socket is provided for an optional mSATA module. Up to six SMA antenna connectors are available via the front panel, for MIMO operation of wireless Mini Cards, such as WiFi (WLAN) or GPRS/LTE (WWAN). Any module socket is wired to an individual Micro SIM card holder.

Each PCI Express® Mini Card socket can accommodate either an USB or PCIe based module. The mSATA socket is suitable for either a SATA SSD, or an USB controlled Mini Card.

The SP4-MAMBO is equipped with an on-board Gen2 PCI Express® packet switch and a PCIe to USB 2.0 bridge, and can be installed into any peripheral slot of a CompactPCI® Serial backplane.



SP4-MAMBO

Feature Summary

- ▶ **General**
 - ▶ PICMG® CompactPCI® Serial standard (CPCI-S.0) peripheral slot card
 - ▶ Single Size Eurocard 3U 4HP 100x160mm²
 - ▶ Backplane connector P1 (PCIe x 1, USB 2.0, SATA)
- ▶ **PCI Express® Interface**
 - ▶ Gen2 PCI Express® 6-port packet switch
 - ▶ Upstream port: PCI Express® x 1 Gen2 (5.0Gbps) or Gen1 (2.5Gbps) supported
 - ▶ Downstream ports: 4 x PCIe Mini Card, 1 x PCIe quad port USB controller
- ▶ **PCI Express® Mini Card**
 - ▶ 4 x PCI Express® Mini Card sockets, full-size or half-size modules
 - ▶ 4 x Micro SIM card holder associated (15mm x 12mm ETSI TS 102 221 V9.0.0, Mini-UICC)
 - ▶ PCI Express® Mini Cards of both styles supported: USB and PCIe based
 - ▶ Six F/P antenna connectors SMA R/P for MIMO wireless applications
 - ▶ Custom specific F/P design for additional pigtail antenna connectors (8HP width)
 - ▶ Typical applications WLAN (Dual-Band WiFi) & Bluetooth, WiMax, GPRS/LTE (WWAN) modems, GNSS (GPS) navigation
- ▶ **mSATA Socket**
 - ▶ socket suitable for a SATA SSD storage module or USB type Mini Card
 - ▶ SATA 6G redrivers on-board for optimum signal integrity
 - ▶ Micro SIM card holder associated (15mm x 12mm)
 - ▶ mSATA requires SATA channel available from P1 backplane connector
 - ▶ USB type Mini Card (mSATA socket) requires USB available from P1 backplane connector
- ▶ **Environment & Regulation**
 - ▶ Designed & Manufactured in Germany
 - ▶ ISO 9000 certified quality management
 - ▶ Long term availability
 - ▶ Rugged solution (coating, sealing, underfilling on request)
 - ▶ RoHS compliant 2002/95/EC
 - ▶ Operating temperature: 0°C to +70°C (industrial temperature range on request)
 - ▶ 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
 - ▶ MTBF tbd
 - ▶ EC Regulations EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)

Theory of Operation

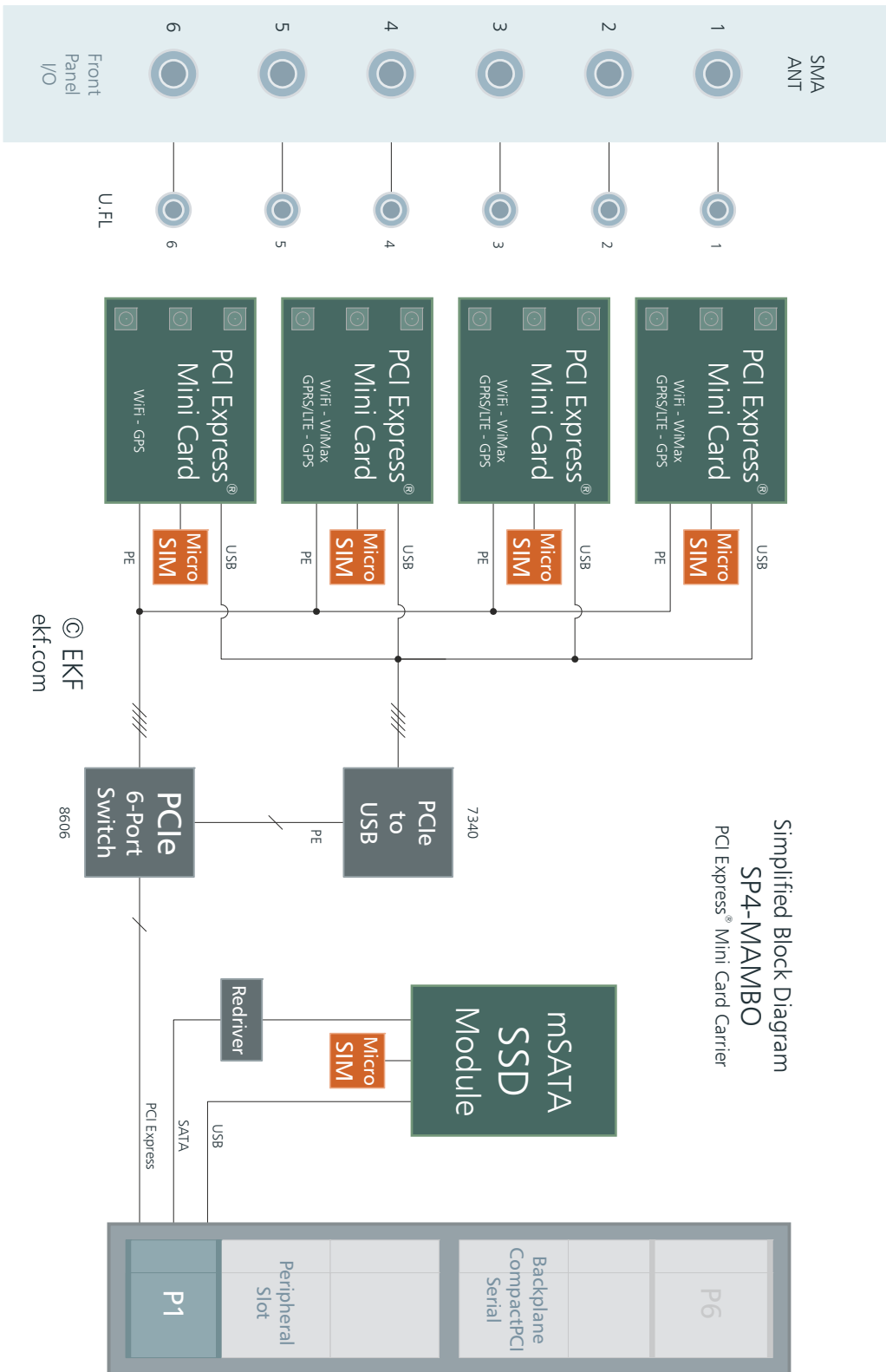
The SP4-MAMBO requires a single PCI Express® lane from the backplane, passed over across the connector P1 to a PCIe Gen2 packet switch (upstream port). The PCIe downstream ports from the switch are used to supply each Mini Card socket with an individual PCI Express® link, as required e.g. by WLAN Mini Cards. Another port from the PCIe packet switch feeds an on-board USB 2.0 controller, which is required for USB type Mini Cards, such as most modems. The related SIM card holders are suitable for 15mm x 12mm Micro SIM cards, which are most widely in use.

Any CompactPCI® Serial peripheral slot - in addition to its PCIe link - *may* provide a SATA channel and also an USB port, available from the backplane via connector P1. These ports are both routed to the optional on-board mSATA socket (SSD storage module). The SATA Rx/Tx signals are reconditioned by a 6Gbps SATA redriver, for optimum signal integrity. The mSATA connector can be used also with an USB style Mini Card. The associated Micro SIM card holder is positioned below the Mini Card module itself, due to space restrictions on the SP4-MAMBO PCB.

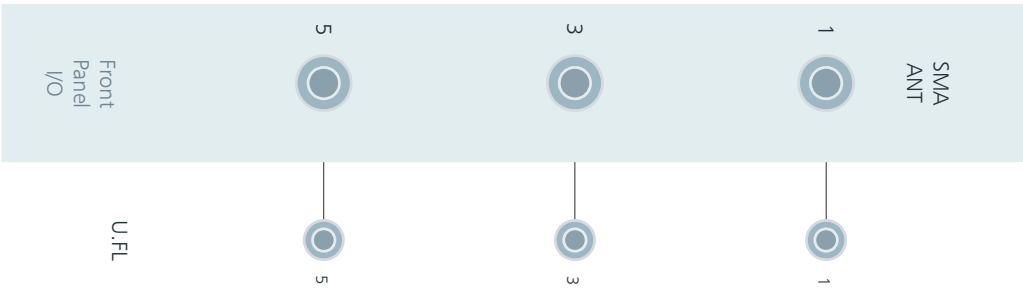


SP4-MAMBO • 4+1 Mini Card Sockets

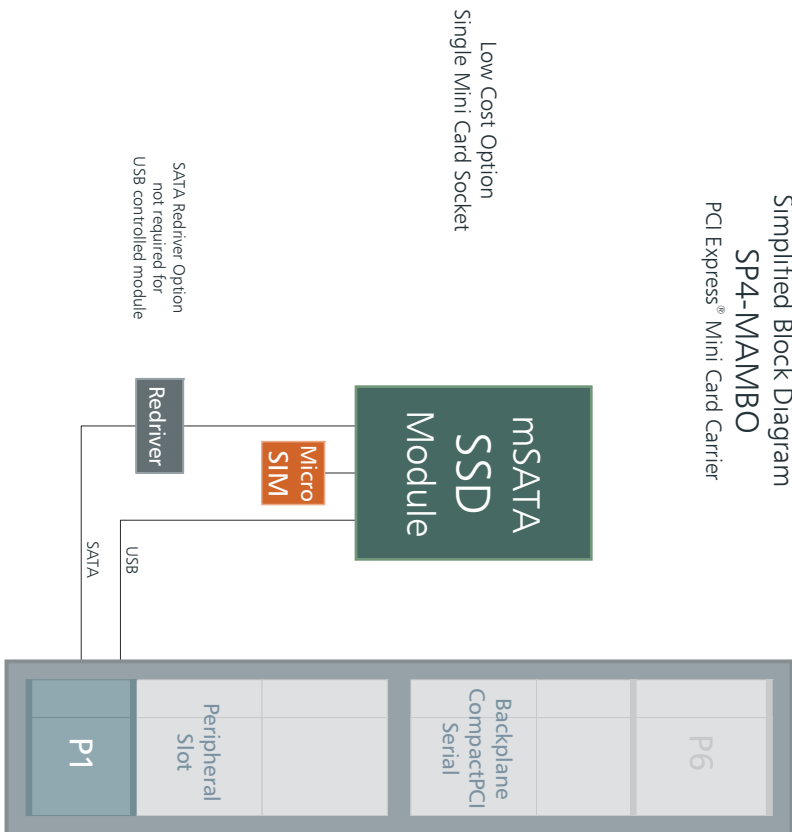
Block Diagram



SP4-MAMBO • MC1-MC5 Populated



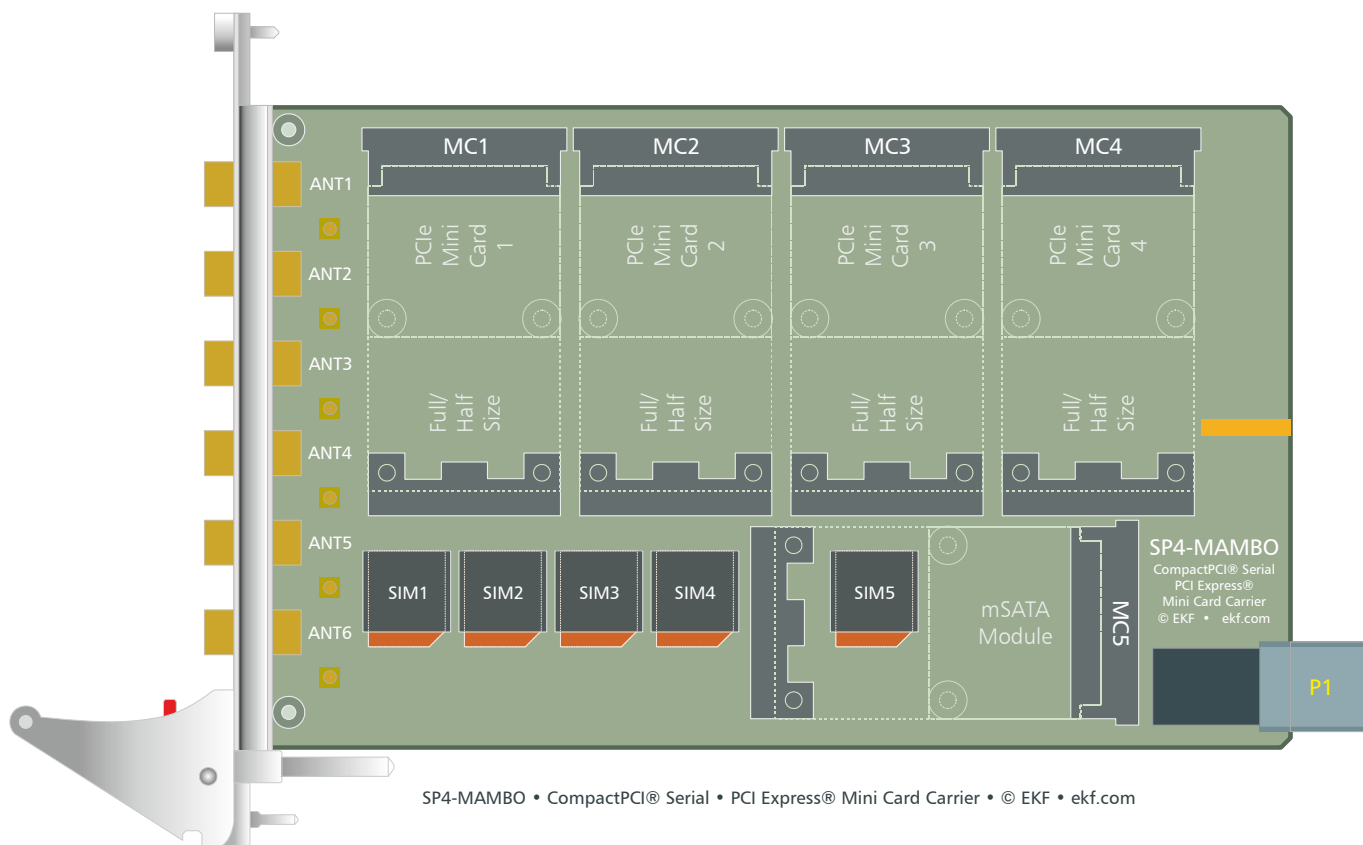
Simplified Block Diagram
 SP4-MAMBO
 PCI Express® Mini Card Carrier



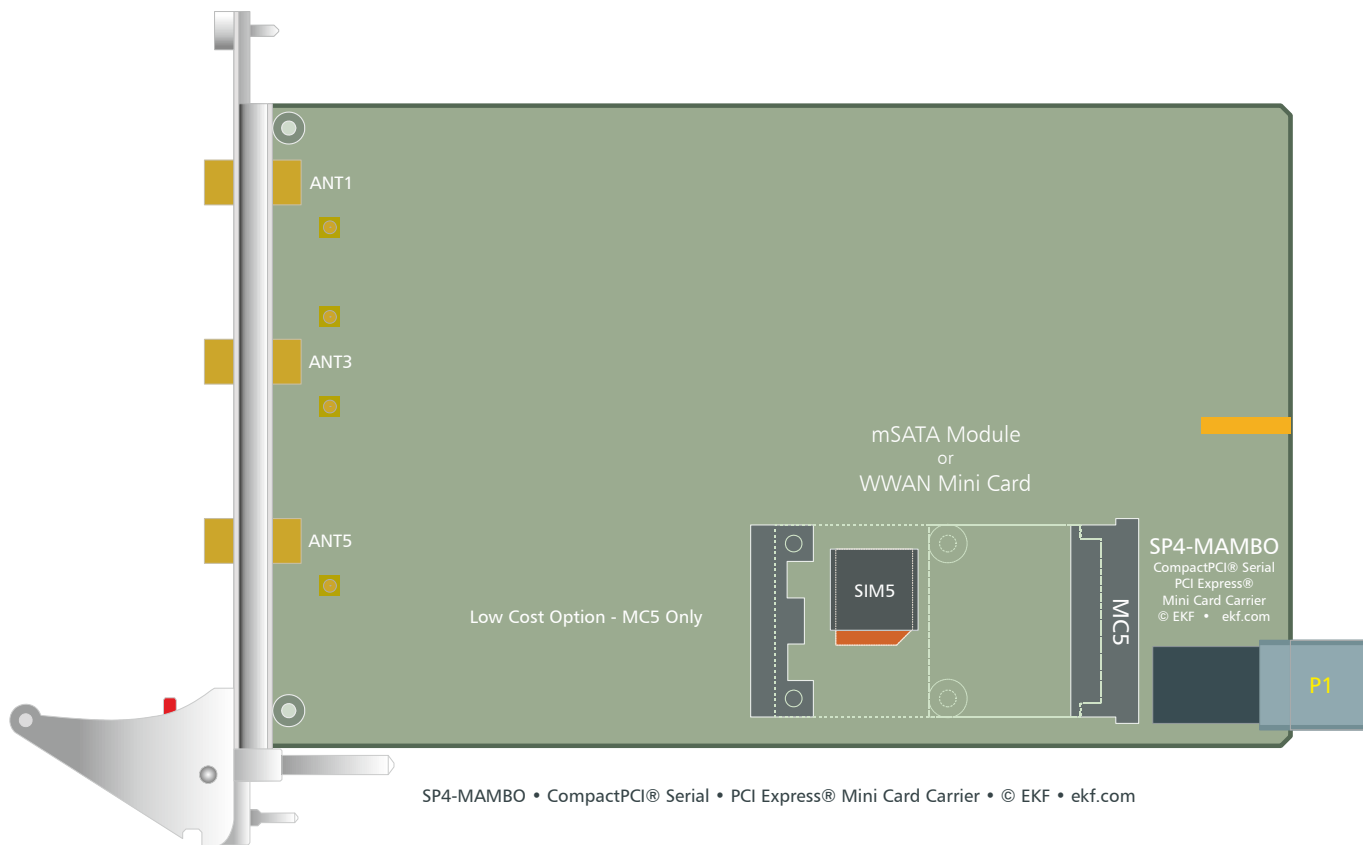
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SP4-MAMBO • MC5 Populated

Component Assembly



SP4-MAMBO • MC1-MC5 Populated



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SP4-MAMBO

Front Panel

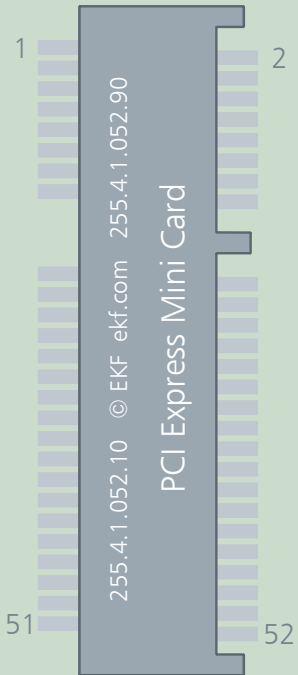


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SP4-MAMBO

Mini Card Host Connectors MC1 - MC4

The SP4-MAMBO is provided with four PCI Express® Mini Card host connectors. These are suitable for PCIe based modules, and also USB 2.0 driven Mini Card modules. After inserted, the Mini Card has to be fixed by a snap-in latch (full-size modules 50.80mm length), or will have to be secured manually by screws (mini size modules 26.80mm length), in order to withstand shock and vibration.

MC1 - MC4				
PCI Express® Mini Card Socket (255.4.1.052.14) & Latch (255.4.1.052.94)				
	PCIE_WAKE#	1	2	+3.3V
	COEX1 (GPIO2/6/10/14)	3	4	GND
	COEX2 (GPIO3/7/11/15)	5	6	+1.5V
	CLKREQ# (NC)	7	8	UIM_C1
	GND	9	10	UIM_C7
	PCIE_CLK-	11	12	UIM_C3
	PCIE_CLK+	13	14	UIM_C2
	GND	15	16	UIM_C6
	UIM_C8	17	18	GND
	UIM_C4	19	20	W_DIS1# (GPIO0/4/8/12)
	GND	21	22	RST#
	PCIE_RN	23	24	+3.3V
	PCIE_RP	25	26	GND
	GND	27	28	+1.5V
	GND	29	30	SMB_CLK
	PCIE_TN	31	32	SMB_DAT
	PCIE_TP	33	34	GND
	GND	35	36	USB_D- 1)
	GND	37	38	USB_D+ 1)
	+3.3V	39	40	GND
	+3.3V	41	42	LED_WWAN#
	GND	43	44	LED_WLAN#
	RSV (NC)	45	46	LED_WPAN#
	RSV (NC)	47	48	+1.5V
RSV (NC)	49	50	GND	
W_DIS2# (GPIO1/5/9/13)	51	52	+3.3V	

Power: Any socket MC1 - MC5 can supply a Mini Card with +3.3V/1.5A (7.5Amax. in total) and +1.5V/1A (5Amax. in total).

1) The on-board quad port USB controller is a Texas Instruments TUSB7340 which is USB 2.0 & USB3.0 compliant. With respect to the mini card sockets, only the USB 2.0 high speed internal controller section is in use, with native driver support by any recent operating system. Windows® however may show an alert in its device manager table for the xHCI (SuperSpeed) USB 3.0 controller section, which could be ignored. Just in order to remove this misleading alert, a suitable xHCI driver can be downloaded from <http://www.ti.com/product/tusb7340#toolssoftware>. Installation of this driver should have no further impact otherwise on the SP4-MAMBO mini card sockets.

The Mini Card sockets are not suitable for some proprietary modules, which may provide special services, e.g. voice I/O, resulting in conflicts with the host connector pin assignment. Be sure that your Mini Card complies with the PCI Express® Mini Card Specification (PCI-SIG). Furthermore, mSATA modules are not supported on MC1 - MC4 (use MC5 for a mSATA SSD instead).

Full size Mini Cards are fixed by a latching (snap-in) element at the module end. A half size Mini Card must be fastened manually by screws M2.5x4mm through corresponding M2.5 soldered nuts provided on the SP4-MAMBO PCB. 0.5mm height nylon washers are required in addition as spacing elements between the PCB nuts and the half size Mini Card. Another approach would be to use a mechanical extender on half size Mini Cards, as shown below:



U.FL style connectors are assigned to each front panel SMA antenna connector. Suitable U.FL double ended plug RF cable assemblies will be required between radio Mini Cards and the chosen F/P antenna connector, e.g. EKF part #268.4.09.2.13.100 (100mm length) or #268.4.09.2.13.150 (150mm). As an option, EKF can provide a 8HP front panel for the SP4-MAMBO, if more then 6 antenna connectors in total would be required. The additional antenna connectors are mounted directly into the front panel, by means of the #268.4.09.2.14.100 (100mm length) SMA to U.FL cable assembly.

Some radio module based applications may require operation under software control (e.g. cross-border railway). Typically, WWAN cards can be disabled if the pin 20 (wireless disable) of the corresponding socket MC1 - MC4 is pulled to low. This can be achieved through GPIO lines, which are provided by the on-board PCI Express® packet switch. Initially (after reset) all GPIO ports are set high, which enables all populated Mini Card RF radios. Please refer to the PLX PEX8606 datasheet for setting the GPIO(0-15) outputs to low in order to disable/enable a particular modem.

PEX8606 GPIO Usage		
GPIO	Function	MC 1-4 Pin
0 - 4 - 8 - 12	W_DIS1#	20
1 - 5 - 9 - 13	W_DIS2#	51
2 - 6 - 10 - 14	COEX1	3
3 - 7 - 11 - 15	COEX2	5



F/P SMA Connectors to be Used with Swivel Antennas or Coax Cables



Coax Connector Removing Tool



mSATA Host Connector MC5

Optionally, the SP4-MAMBO is provided with a mSATA Card host connector, for use with a mSATA SSD module. As an alternate, this socket is also suitable for population with an USB 2.0 driven Mini Card module. MC5 cannot be used with a PCIe controlled Mini Card module (PCIe lane signals replaced by SATA channel).

Usage of MC5 requires operation of the SP4-MAMBO in a CompactPCI® Serial backplane slot, which provides SATA and/or USB resources via backplane connector P1. The on-board SATA 6G redriver ensures optimum signal integrity.

A SIM card holder is associated to MC5, below the module. No software control is provided for a WWAN module populated on MC5 (W_DIS1/2# pins terminated with PU).

MC5				
PCI Express® Mini Card Socket (255.4.1.052.14) & Latch (255.4.1.052.94)				
	PCIE_WAKE#	1	2	+3.3V
	COEX1 (NC)	3	4	GND
	COEX2 (NC)	5	6	+1.5V
	CLKREQ# (NC)	7	8	UIM_C1
	GND	9	10	UIM_C7
	PCIE_CLK-	11	12	UIM_C3
	PCIE_CLK+	13	14	UIM_C2
	GND	15	16	UIM_C6
	UIM_C8	17	18	GND
	UIM_C4	19	20	W_DIS1# (PU)
	GND	21	22	RST#
	SATA_RXP	23	24	+3.3V
	SATA2_RXN	25	26	GND
	GND	27	28	+1.5V
	GND	29	30	SMB_CLK
	SATA2_TXN	31	32	SMB_DAT
	SATA_TXP	33	34	GND
	GND	35	36	USB1(2)_D-
	GND	37	38	USB1(2)_D+
	+3.3V	39	40	GND
	+3.3V	41	42	LED_WWAN#
	OR to GND	43	44	LED_WLAN#
	RSV (NC)	45	46	LED_WPAN#
	RSV (NC)	47	48	+1.5V
	RSV (NC)	49	50	GND
W_DIS2# (PU)	51	52	+3.3V	

Related Documents

Overview	
Concise Overview CompactPCI® Serial Boards	www.ekf.com/s/serial_concise.pdf
The Smart Solution - CompactPCI® Serial Concept	www.ekf.com/s/smart_solution.pdf

Suitable CPU Cards	
PC1-GROOVE	CompactPCI® PlusIO CPU Card, for Hybrid Backplanes www.ekf.com/p/pc1/pc1.html
PC3-ALLEGRO	CompactPCI® PlusIO CPU Card, for Hybrid Backplanes www.ekf.com/p/pc3/pc3.html
PC4-PRESTO	CompactPCI® PlusIO CPU Card, for Hybrid Backplanes www.ekf.com/p/pc4/pc4.html
SC1-ALLEGRO	CompactPCI® Serial CPU Card, for Native CompactPCI® Serial Backplanes www.ekf.com/s/sc1/sc1.html
SC2-PRESTO	CompactPCI® Serial CPU Card, for Native CompactPCI® Serial Backplanes www.ekf.com/s/sc2/sc2.html

Reference Documents		
Term	Document	Origin
mSATA	Jedec MO-300B mSATA SSD Assembly	www.jedec.org
PCI Express® Mini Card	PCI Express® Mini Card Electromechanical Specification	www.pcisig.com
SATA	Serial ATA Specification	www.sata-io.org
USB	Universal Serial Bus Specification	www.usb.org

Ordering Information

Ordering Information
For popular SP4-MAMBO SKUs please refer to www.ekf.com/liste/liste_21.html#SP4



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