SOFI Modules

## High Performance Signal Conversion Subsystems

SOFI Module Concept

The **S**erial **O**ptimized **F**PGA **I**nterface (SOFI) module concept is proprietary to VadaTech. It supports rapid product development but is not intended for field interoperability. Key characteristics of this approach are as follows:

- Makes use of FMC physical form factor but is not compatible with FMC carriers.

- Re-purposes pins on the mezzanine interface connector to support many more SERDES connections. This allows the mezzanine to provide more ADC/DAC with JESD connections to the FPGA.

- Achieves higher SERDES count without the need for secondary connector, so making it suitable on compact form factor products (e.g. AMCs and 3U VPX modules).

- The SOFI module concept can be used in conduction cooled products.

- Some SOFI modules include a daughter-card assembly for even higher performance density. Such modules may be limited in temperature range supported. Check with VadaTech sales for details.

- SOFI modules are compatible with SOFI carriers in various form factors, allowing rapid porting of designs from commercial to mil/aero products.

Each combination of SOFI module and carrier requires engineering development in thermal design, board support package and reference design firmware. This datasheet summarizes the SOFI/carrier combinations currently available. **Contact your local VadaTech sales team for the latest information if a required combination is not listed here**.

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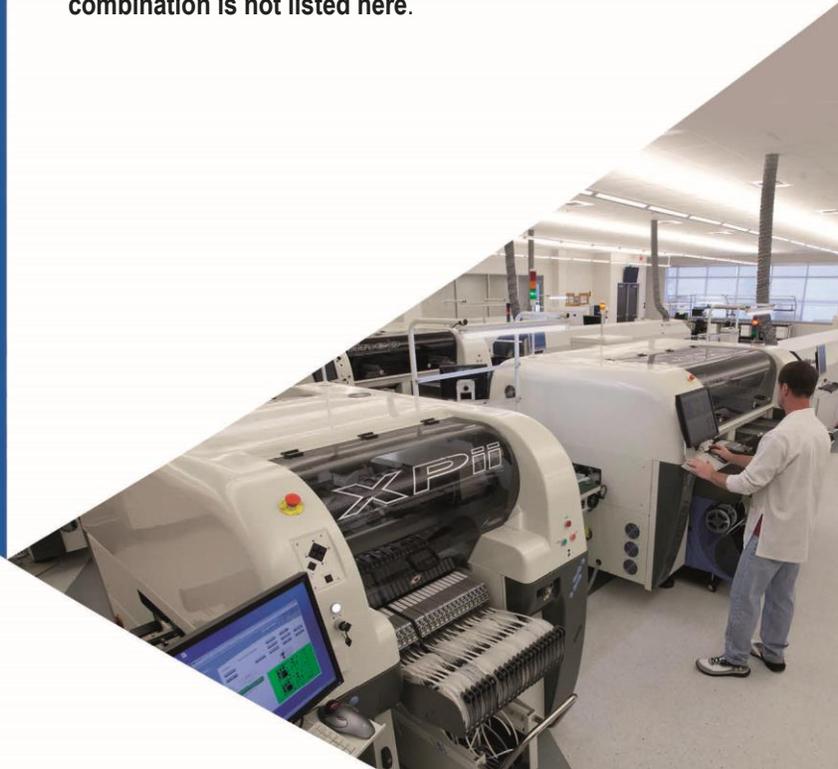
SOFI Assemblies

Each SOFI product comprises a carrier and one or more SOFI modules, as illustrated below. The carrier includes the FPGA, memory and IPMI interface, while the SOFI module includes ADCs, DACs, or RF transceivers. Clocking sub-system for the FPGA resides on the carrier, and clocking for ADCs and DACs can be sourced from front panel or the carrier, depending on the particular SOFI module.
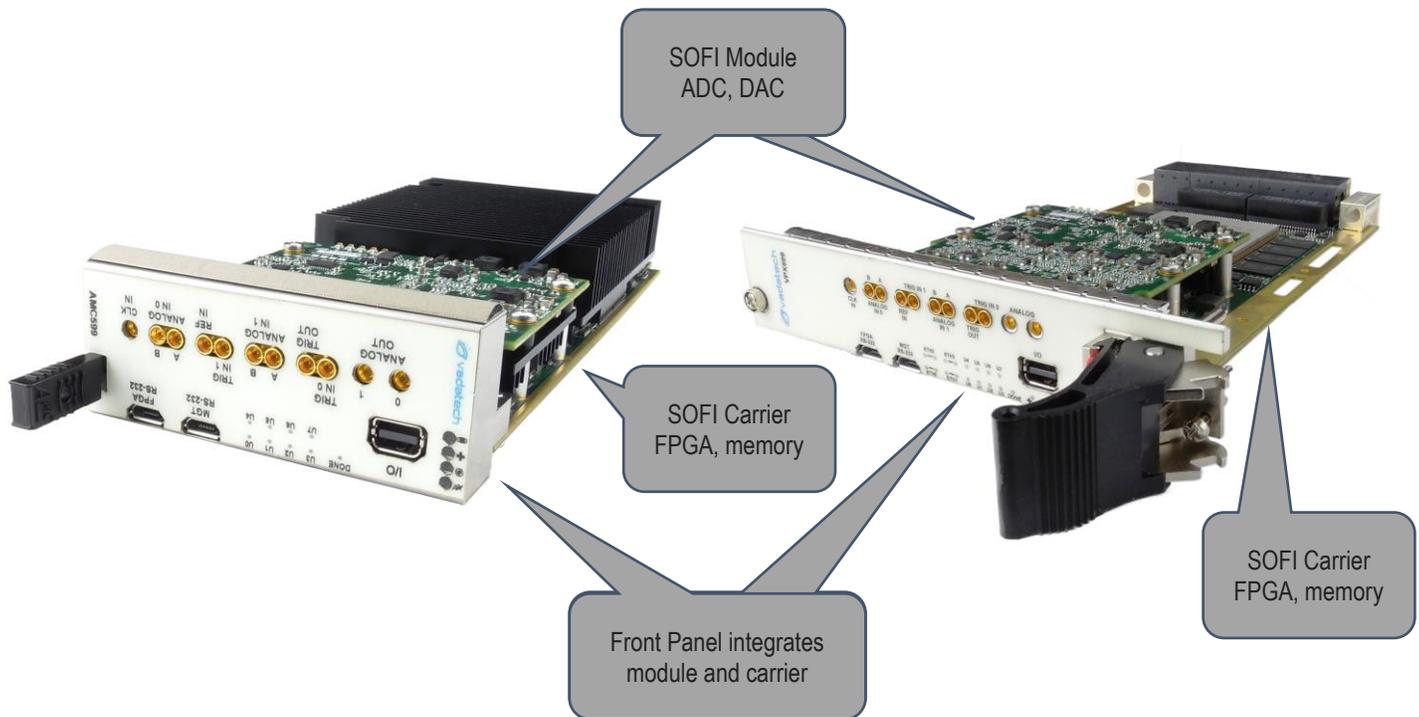
Products are manufactured and sold as complete units. SOFI modules are not designed to be user-accessible parts. Mechanical integration and supporting software are specific to the carrier/module combination, with the integrated product forming a single Field Replaceable Unit (FRU).

Selecting SOFI Products

This overview provides two ways of looking up SOFI-based products to meet your requirements.

1. See Table 1 for AMC products and Table 2 for VPX products
2. To find a product with a particular front end (ADC and/or DAC) functionality, see Table 3 SOFI modules, then to choose the appropriate base board for the form factor you require, see Table 4. If the particular combination needed is not shown in the table then contact your local VadaTech sales team for assistance.

AMC Modules

The table below shows the carrier and SOFI module(s) that make up each AMC product. Follow the links from this table to open individual data sheets. This table will be updated periodically and may not reflect all currently available combinations.

Table 1: AMC Products - SOFI/Carrier Make-up

Part No.	Product	Carrier	SOFI	Description
AMC565	AMC565-ABC-DEF-10J	-	SOF220	Quad ADC09SJ1300 9-bit, 1.3-GSPS
AMC587	AMC587ABC-DEF-GHJ	ASB589	SOF200	Dual ADC @ 6.4 GSPS and Dual DAC @ 12 GSPS XCVU13P UltraScale+, AMC Clock from onboard Wideband PLL
AMC588	AMC588-ABC-DEF-GHJ	ASB589	SOF201	300 MHz to 6 GHz Octal Versatile Wideband Transceiver (MIMO) XCVU13P UltraScale+™, AMC Clock from onboard Wideband PLL or direct RF clock
AMC589	AMC589-**0**BC-DEF-GHJ	ASB589	SOF203	Quad ADC @ 3 GSPS with Quad DAC @ 12 GSPS XCVU13P UltraScale +™, AMC. Direct RF clock
	AMC589-**1**BC-DEF-GHJ	ASB589	SOF205	Quad ADC @ 3 GSPS with Quad DAC @ 12 GSPS XCVU13P UltraScale +™, AMC Clock from onboard Wideband PLL
AMC597	AMC597-**1**0C-0EF-G0J	ASB599	SOF201	300 MHz to 6 GHz Octal Versatile Wideband Transceiver (MIMO) Kintex UltraScale ™, AMC Clock from onboard Wideband PLL
AMC598	AMC598-**0**BC-DEF-GHJ B=0 or 1, **H = 0 or 1**	ASB599	SOF203+DA746	Quad ADC @ 3 GSPS with Quad DAC @ 12 GSPS, Kintex UltraScale, AMC. Direct RF clock
	AMC598-**0**BC-DEF-G**2**J B = 0 or 1	ASB599	SOF203	No ADC; Quad DAC @ 12 GSPS, Kintex UltraScale, AMC. Direct RF clock
	AMC598-**1**BC-DEF-GHJ B=0 or 1, **H = 0 or 1**	ASB599	SOF205+DA771	Quad ADC @ 3 GSPS with Quad DAC @ 12 GSPS, Kintex UltraScale, AMC. Onboard PLL
	AMC598-**1**BC-DEF-G**2**J B=0 or 1	ASB599	SOF205	No ADC; Quad DAC @ 12 GSPS Kintex UltraScale ™, AMC Clock from onboard Wideband PLL
	AMC598-**02**C-DEF-G**3**J	ASB599	SOF207+DA746	Octal ADC @ 3 GSPS; No DAC, Kintex UltraScale, AMC. Direct RF clock
	AMC598-**02**C-DEF-GHJ **H=0 or 1**	ASB599	SOF207	Quad ADC @ 3 GSPS; No DAC, Kintex UltraScale, AMC. Direct RF clock
	AMC598-**12**C-DEF-G**2**J	ASB599	SOF209+DA771	Octal ADC @ 3 GSPS; No DAC, Kintex UltraScale, AMC. Clock from onboard Wideband PLL
	AMC598-**12**C-DEF-GHJ **H=0 or 1**	ASB599	SOF209	Quad ADC @ 3 GSPS (AD9208), No DAC Kintex UltraScale ™, AMC Clock from onboard Wideband PLL
	AMC598-12C-DEF-G**4**J	ASB599	SOF218	Quad ADC @ 3 GSPS (AD9208) with input attenuators. No DAC, Kintex UltraScale ™, AMC Clock from onboard Wideband PLL
	AMC598-1**6**C-DEF-G2J	ASB599	SOF219+DA788	No ADC; Octal DAC @ 12 GSPS w/ attenuator; Kintex UltraScale ™, AMC Clock from onboard Wideband PLL
	AMC598-1**5**C-DEF-G2J	ASB599	SOF219	No ADC; Quad DAC @ 12 GSPS w/ attenuator; Kintex UltraScale ™, AMC

Part No.	Product	Carrier	SOFI	Description
				Clock from onboard Wideband PLL
AMC599	AMC599-**1**BC-DEF-GHJ	ASB599	SOF200	Dual ADC @ 6.4 GSPS and Dual DAC @ 12 GSPS, UltraScale, AMC; Clock from onboard Wideband PLL
	AMC599-**0**BC-DEF-GHJ	ASB599	SOF202	Dual ADC @ 6.4 GSPS and Dual DAC @ 12 GSPS, UltraScale, AMC; Direct RF clock
	On-demand	ASB599	SOF217	Dual ADC @ 6.4 GSPS w/ 2~7G balun and Dual DAC @ 12 GSPS, UltraScale, AMC; Clock from onboard Wideband PLL LMX2594

VPX Modules

The table below shows the carrier and SOFI module(s) that make up each 3U VPX product. Follow the links from this table to go to individual data sheets. This table will be updated periodically and may not reflect all currently available combinations.

Table 2: VPX Products - SOFI/Carrier Make-up

Part No.	Assembly	Carrier	SOFI	Description
VPX587	VPX587-100-200-000	VSB589	SOF201	300 MHz to 6 GHz Octal Versatile Wideband Transceiver (MIMO), Virtex UltraScale+™, 3U VPX; Clock from Onboard Wideband PLL
VPX588	VPX588-100-000-000	VSB589	SOF205	Quad ADC @ 3 GSPS with Quad DAC @ 12 GSPS, Virtex UltraScale+™, 3U VPX
	VPX588-000-000-000	VSB589	SOF203	Quad ADC @ 3 GSPS with Quad DAC @ 12 GSPS, Virtex UltraScale+™, 3U VPX
VPX589	VPX589-100-201-000	VSB589	SOF200	Dual ADC @ 6.4 GSPS and Dual DAC @ 12 GSPS, Virtex UltraScale+™, 3U VPX; Clock from onboard Wideband PLL
VPX596	VPX596-1XX-XXX-XXX	VSB599	SOF200	Dual ADC @ 6.4 GSPS and Dual DAC @ 12 GSPS, Kintex UltraScale™, 3U VPX; Clock from onboard Wideband PLL
VPX597	VPX597-1XX-XXX-XXX	VSB599	SOF201	300 MHz to 6 GHz Octal Versatile Wideband Transceiver (MIMO), Kintex UltraScale™, 3U VPX; Clock from Onboard Wideband PLL
VPX598	VPX598-100-000-000	VSB599	SOF205	Quad 14bit ADC @ 3GSPS and Quad 16bit DAC @ 12GSPS, UltraScale™ 3U VPX, Clock from Onboard Wideband PLL
	VPX598-000-000-000	VSB599	SOF203	Quad 14bit ADC @ 3GSPS and Quad 16bit DAC @ 12GSPS, Kintex UltraScale™ 3U VPX, Direct RF Clock
VPX599	VPX599-100-111-0XX	VSB599	SOF200	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) - Dual DAC @ 12 GSPS (AD9162 or AD9164) – Clock from onboard Wideband PLL
	VPX599-000-111-000	VSB599	SOF202	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) - Dual DAC 16-bit @ 12 GSPS (AD9162 or AD9164) - Direct RF clock
	VPX599-100-111-032	VSB599	SOF200C1	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) - Dual DAC @ 12 GSPS (AD9162 or AD9164) – Clock from onboard Wideband PLL (Conduction cooled)
	VPX599-020-10x-100-000	VSB599	SOF206	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) - Dual DAC TI-DAC38RF82- Direct RF clock
	VPX599-120-10x-100-000	VSB599	SOF208	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) - Dual DAC TI-DAC38RF82- Onboard Wideband PLL

SOFI Modules

The following SOFI modules are currently available. The product range is under constant development so contact VadaTech Sales for additional functionality or variations on these. The table below shows which products currently use each SOFI module, so can be used to find products that meet specific ADC, DAC and clocking requirements.

Table 3: SOFI Modules

SOFI	Description	AMC Products	VPX Products
SOF200	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) Dual DAC @ 12 GSPS (AD9162 or AD9164) Clock from onboard Wideband PLL	AMC587 AMC597 AMC599	VPX589 VPX599
SOF201	Octal wideband Transceiver, 300 MHz to 6 GHz Clock from onboard Wideband PLL	AMC588	VPX597
SOF202	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) Dual DAC 16-bit @ 12 GSPS (AD9162 or AD9164) Direct RF clock	AMC599	VPX599
SOF203	Quad ADC 14-bit @ 3 GSPS (AD9208) Quad DAC 16-bit @ 12 GSPS (AD9162 or AD9164); Direct RF clock	AMC589 AMC598	
SOF205	Quad ADC 14-bit @ 3 GSPS (AD9208) Quad DAC 16-bit @ 12 GSPS (AD9162 or AD9164) Clock from Onboard Wideband PLL	AMC589 AMC598	
SOF206	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) Dual DAC TI-DAC38RF82 Direct RF Clock	AMC599	VPX599
SOF208	Dual ADC @ 6.4 GSPS or 5.4 GSPS (ADC12DJ3200 or ADC12DJ2700) Dual DAC 16-bit @ 12 GSPS (TI-DAC38RF82) Clock from Onboard Wideband PLL w/ sync capability*	AMC599	VPX599
SOF209	Quad ADC 14-bit @ 3 GSPS (AD9208); No DAC Clock from Onboard Wideband PLL	AMC598	
SOF217	Dual ADC @ 6.4 GSPS (ADC12DJ3200 or ADC12DJ2700) with 2000 to 7000 MHz Balun; Dual DAC @ 12 GSPS (AD9162 or AD9164) Clock from onboard Wideband PLL (LMX2594)	AMC599	
SOF218	Quad ADC 14-bit @ 3 GSPS (AD9208) with input attenuators; No DAC Clock from Onboard Wideband PLL	AMC599	VPX599
SOF219	Quad AD9162/AD9164 with option to load DA788 for Octal DAC; Clock from onboard Wideband PLL	AMC599	VPX599
SOF220	Quad ADC09SJ1300-Q; Clock from onboard Wideband PLL	AMC565	

Notes:

*Onboard clock sub-system supports multi-module synchronization. This requires a one-off platform calibration prior to shipment, which VadaTech performs as a costed service. Contact VadaTech sales for details.

SOFI Carriers

AMC form factor SOFI carriers are designated ASBnnn (**A**MC **S**OFI **B**ase) while 3U VPX form factor SOFI carriers are designated VSBnnn (**V**PX **S**OFI **B**ase). All currently available SOFI carriers and their associated VadaTech products are listed in the table below to assist customers when searching for products with specific FPGA and form factor requirements.

Table 4: SOFI Carriers

Base	Description	AMC Products	VPX Products
ASB589	XCVU13P 8 GB DDR4, single bank, 64-bit wide Direct clocking or onboard PLL, Stratum-3 clock option	AMC587 AMC588 AMC589	
ASB599	XCKU115 20 GB DDR4 (two banks 64-bit wide, one bank 32-bit wide) Direct clocking or onboard PLL, Stratum-3 clock option	AMC597 AMC598 AMC599	
VSB589	XCVU13P 8 GB DDR4, single bank, 64-bit wide Direct clocking or onboard PLL, Stratum-3 clock option		VPX587 VPX588 VPX589
VSB599	XCKU115 20 GB DDR4 (two banks 64-bit wide, one bank 32-bit wide) Direct clocking or onboard PLL, Stratum-3 clock option		VPX597 VPX598 VPX599

Example Products

AMC597

- Xilinx UltraScale™ XCKU115 FPGA

- Octo complete transceiver signal chain solution

- Based on quad Analog Devices AD9371

AMC599

- Xilinx UltraScale™ XCKU115 FPGA

- Dual ADC 12-bit @ 6.4 GSPS or quad ADC @ 3.2 GSPS with TI ADC12DJ3200

- Option for ADC12DJ3200 or ADC12DJ2700

VPX599

- 3U FPGA Dual ADC and Dual DAC per VITA 46

- Xilinx Kintex UltraScale™ XCKU115 FPGA

- Dual ADC 12-bit @ 6.4 GSPS or quad ADC at 3.2 GSPS with TI ADC12DJ3200

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