

Introduction:

The V3PD is a high performance Single Board Computer (SBC) based on the 3U OpenVPX™ (VITA 65) form factor. Offered in both convection cooled and ruggedized conduction cooled variants, the V3PD will meet the needs of numerous commercial and military applications requiring maximum processing power, low power consumption, and small physical footprint.

At the heart of the V3PD is an Intel® Core™ I7 Arrandale Processor and Ixex Peak QM57 Platform Controller Hub (PCH). These two devices form the central processing backbone of the design. With a dual-channel memory controller integrated in the processor, the V3PD supports up to 8 GBytes of DDR3 SDRAM running at up to 1066 MHz. The processor utilizes its x8 PCI Express (PCIe) port to connect to an Intel® 82599 Niantic EB82599 Dual 10 Gigabit Ethernet Controller providing 10GBASE-BX4 backplane Data Plane fabric connectivity.

The QM57 PCH supports the following interfaces: PCI Express; PCI; Serial ATA (SATA); Universal Serial Bus; DVI; VGA; SMBus; and, General Purpose I/O. One x4 PCIe port is connected to the XMC Site supporting VITA 42.3. The second x4 PCIe port is attached to an Intel® 82580V Dual Gigabit Ethernet Controller for 1000Base-BX backplane control plane connectivity. A 32-Bit 33MHz PCI bus is connected to the PMC site. Four SATA ports and six USB ports are connected to the backplane. HDMI/DVI and VGA interfaces provide graphics capability via RTM connections. Additional backplane I/O from the PCH include 8 GPIO lines and one SMBus. Finally, one SATA port is connected to an SM2240 Flash Controller to support 16GBytes of solid state storage, and a 32Mbit SPI PROM provides 8MBytes of in-circuit programmable boot code.

The V3PD adheres to the OpenVPX™ standard for a 3U Payload Module Profile designated as MOD3-PAY-2F1F2U-16.2.1-5. Data and Control planes are sourced by the 82599 and 28580 on the V3PD. The expansion plane is sourced from the XMC Site and can support a wide variety of fabric interconnects.

Features:

CPU

- One Intel® dual-core Arrandale Processor running at 1.04 GHz
- Direct Media Interface Bus supporting 2GByte/Sec transfer rates
- Dual Memory Controller supporting up to 8GBytes DDR3 SDRAM at 533/667 MHz (1066 MHz DDR)
- x8 PCIe Interface connected to Intel 82599 10GigE Controller
- Integrated Graphics Controller
- A 32-KB instruction and 32-KB data first-level cache (L1) for each core
- A 256-KB shared instruction/data second-level cache (L2) for each core
- Up to 4-MB shared instruction/data third-level cache (L3), shared among all cores
- Intel® Virtualization Technology (Intel® VT-x)
- Intel® Virtualization Technology for Directed I/O (Intel® VT-d)
- Intel® Trusted Execution Technology (Intel® TXT)
- Intel® Streaming SIMD Extensions 4.1 (Intel® SSE4.1)
- Supplemental Streaming SIMD Extensions 4.2 (Intel® SSE4.2)
- Intel® Hyper-Threading Technology (Intel® HT Technology)
- Intel® 64 architecture
- Intel® Turbo Boost Technology

Platform Controller Hub (PCH)

- Intel® Ibex Peak QM57 Platform Controller Hub
- PCI Express Base Specification, Revision 2.0 support for up to eight ports
- PCI Local Bus Specification, Revision 2.3 support for 33 MHz PCI operations
- ACPI Power Management Logic Support, Revision 3.0b
- Enhanced DMA controller, interrupt controller, and timer functions
- Integrated Serial ATA host controllers with independent DMA operation on up to six ports
- FIS-based Port Multiplier support on SATA Ports 4 and 5 in AHCI/RAID mode.
- USB host interface with support for up to fourteen USB ports; two EHCI high-speed USB 2.0 Host controllers and 2 rate matching hubs
- Integrated 10/100/1000 Gigabit Ethernet MAC with System Defense
- System Management Bus (SMBus) Specification, Version 2.0 with additional support for I2C devices
- Supports Intel® High Definition Audio
- Supports Intel® Rapid Storage Technology
- Supports Intel® Active Management Technology
- Supports Intel® Virtualization Technology for Directed I/O
- Supports Intel® Trusted Execution Technology
- Supports buffered mode generating extra clocks from a clock chip
- Digital Display port (HDMI/DVI)
- Analog Display port (VGA)
- Low Pin Count (LPC) interface
- Firmware Hub (FWH) interface support
- Serial Peripheral Interface (SPI) support
- Intel® Quiet System Technology (Desktop only)
- Intel® Anti-Theft Technology
- JTAG Boundary Scan support

Intel 82599EB Dual 10 Gigabit Ethernet Controller

- Complies with 10Gb/Sec Ethernet/802.3ae (XAUI)
- x8 Gen2 PCI Express interface to Processor
- IEEE1588 Precision Time Protocol (PTP) support
- 4-Wire SPI EEPROM Interface

Intel 82580DB Dual 1 Gigabit Ethernet Controller

- Complies with 1Gb/Sec Ethernet/802.3ap
- x4 PCI Express interface to PCH
- 4-Wire SPI EEPROM Interface

SMSC SCH3112 Super I/O

- LPC Interface to PCH
- Dual Serial Ports with asynchronous baud rates up to 1.5Mbps
- RS485 Auto Direction Control Mode

Silicon Motion SM2240 Serial ATA to NAND Flash Controller

- Compliant with SATA Rev. 2.6 Specification
- Dual channel 8-bit flash interface
- Up to 50MB/Sec for Read, 40MByte/Sec Write
- ECC and wear leveling support

PMC/XMC Site

- 33MHz 32-bit PCI Bus to J11-J12 (3.3VIO only)
- x4 PCI Express Bus from PCH to XMC via J15
- VPX Expansion Port Fat-Pipe connectivity from XMC J16 to VPX P1, capable of 3.125Gbit/Sec rate per differential pair (8 pairs total)

VPX Rear I/O

- P0 Utility Connectivity per VITA 46.0
- P1 Fabric Connectivity per VITA 65, MOD3-PAY-2F1F2U-16.2.1-5
- P2 User Defined I/O: SATA, USB, DVI, VGA, SMBus, and GPIO

Non-Volatile Storage

- 64Mbit EEPROM on PCH SPI bus
- 16GByte Solid State Flash Drive

Power Consumption

- +3.3V @ 5.6A (typ)
- +5V @ 3.9A (typ)
- +12V @ 0.6A (typ)
- Total Power: 45W (typ)
- Actual power depends on V3PD product configuration and PMC/XMC and USB loads.

(Power consumption values subject to change without notice)

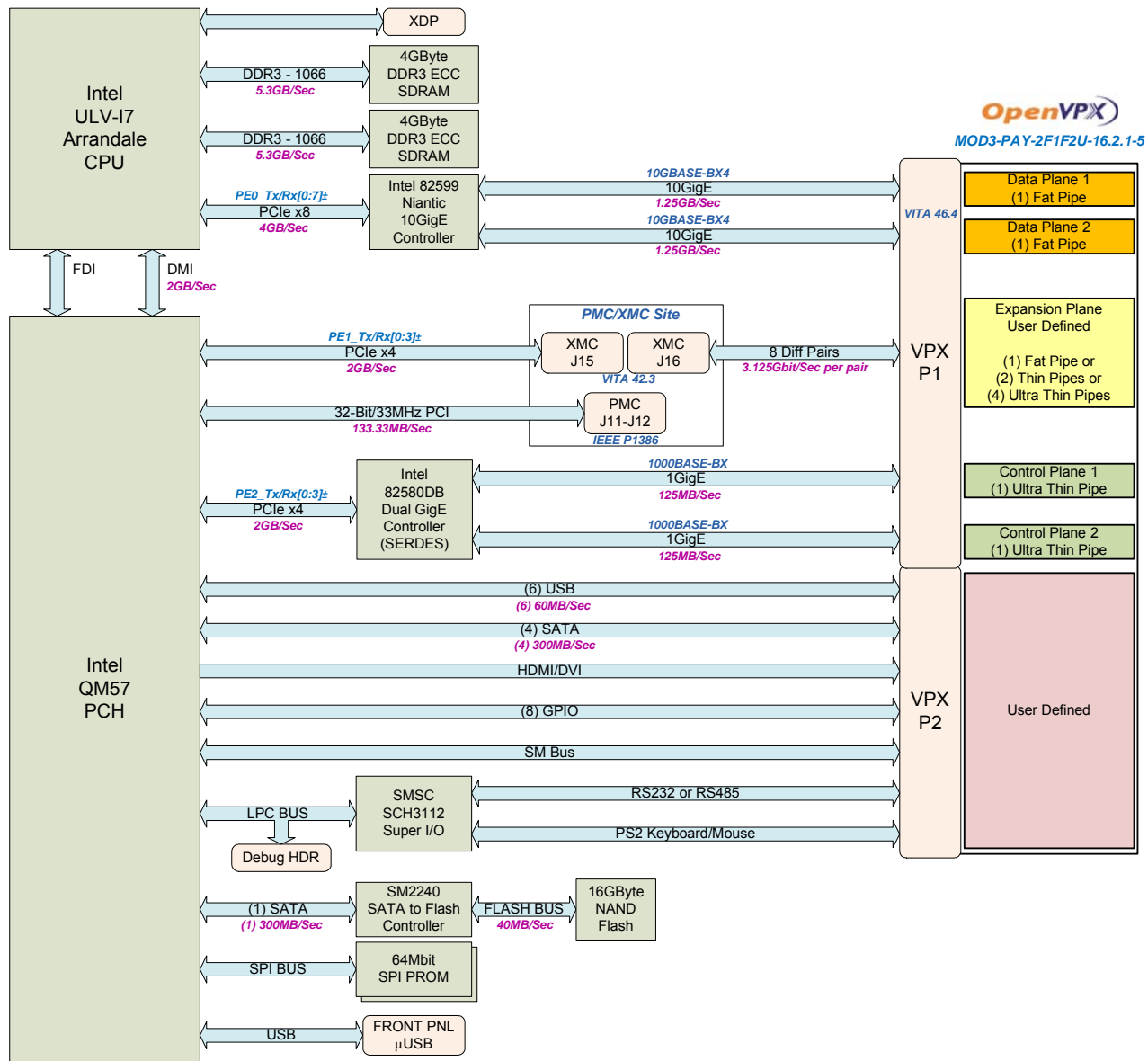
Form Factor

- 3U VITA 65 OpenVPX

Rugged/Conduction Cooled

- V3RD is a conduction cooled version of the V3PD
- V3RD wedge locks provide high shock and vibration immunity per MIL-STD-810F
- Convection and Conduction cooled versions have conformal coating as an option

V3PD Block Diagram:



V3PD I/O Summary:

I/O	Front Panel	VPX P1	VPX P2
10 Gigabit Ethernet (10GBASE-BX4)		Data Plane (2) Fat Pipes	
1 Gigabit Ethernet (1000BASE-BX)		Control Plane (2) Ultra-Thin pipes	
XMC Site J16		Expansion Plane (1) Fat Pipe	
Serial ATA			4
USB 2.0	1		6
HDMI/DVI			1
SVGA			1
RS485 or RS232			2
SMBus			1
GPIO			8

VPX Pin-outs for V3PD:

P0 - UTILITY CONNECTOR

Pin	Wafer Type	Row G	Row F	Row E	Row D	Row C	Row B	Row A
1	Power	Vs1 (12V)	Vs1 (12V)	Vs1 (12V)	No Pad	Vs2 (3.3V)	Vs2 (3.3V)	Vs2 (3.3V)
2	Power	Vs1 (12V)	Vs1 (12V)	Vs1 (12V)	No Pad	Vs2 (3.3V)	Vs2 (3.3V)	Vs2 (3.3V)
3	Power	Vs3 (5V)	Vs3 (5V)	Vs3 (5V)	No Pad	Vs3 (5V)	Vs3 (5V)	Vs3 (5V)
4	Single-ended			GND	-12V_AUX	GND	SYSRESET#	NVMRO
5	Single-ended	GAP#	GA4#	GND	3.3V_AUX	GND		
6	Single-ended	GA3#	GA2#	GND	+12V_AUX	GND	GA1#	GA0#
7	Differential	TCK	GND	TDO	TDI	GND	TMS	TRST#
8	Differential	GND			GND			GND

P1 – PAYLOAD CONNECTOR



	Wafer Type	Row G	Row F	Row E	Row D	Row C	Row B	Row A	
1	Differential	GDISCRETE1	GND	DP1_TX0-	DP1_TX0+	GND	DP1_RX0-	DP1_RX0+	Data Plane 1 (Fat Pipe)
2	Differential	GND	DP1_TX1-	DP1_TX1+	GND	DP1_RX1-	DP1_RX1+	GND	
3	Differential	P1_VBAT	GND	DP1_TX2-	DP1_TX2+	GND	DP1_RX2-	DP1_RX2+	
4	Differential	GND	DP1_TX3-	DP1_TX3+	GND	DP1_RX3-	DP1_RX3+	GND	
5	Differential	SYSCON#	GND	DP2_TX0-	DP2_TX0+	GND	DP2_RX0-	DP2_RX0+	Data Plane 2 (Fat Pipe)
6	Differential	GND	DP2_TX1-	DP2_TX1+	GND	DP2_RX1-	DP2_RX1+	GND	
7	Differential		GND	DP2_TX2-	DP2_TX2+	GND	DP2_RX2-	DP2_RX2+	
8	Differential	GND	DP2_TX3-	DP2_TX3+	GND	DP2_RX3-	DP2_RX3+	GND	
9	Differential		GND	XMC_DP1-	XMC_DP1+	GND	XMC_DP0-	XMC_DP0+	XMC Expansion Plane User Defined
10	Differential	GND	XMC_DP3-	XMC_DP3+	GND	XMC_DP2-	XMC_DP2+	GND	
11	Differential		GND	XMC_DP5-	XMC_DP5+	GND	XMC_DP4-	XMC_DP4+	
12	Differential	GND	XMC_DP7-	XMC_DP7+	GND	XMC_DP6-	XMC_DP6+	GND	
13	Differential		GND			GND			
14	Differential	GND			GND			GND	
15	Differential	MASK_RST#	GND	CP2_TD-	CP2_TD+	GND	CP2_RD0-	CP2_RD+	Control Planes 1 & 2 (Ultra-Thin Pipe)
16	Differential	GND	CP1_TD-	CP1_TD+	GND	CP1_RD-	CP1_RD+	GND	

P2 – PAYLOAD CONNECTOR

	Wafer Type	Row G	Row F	Row E	Row D	Row C	Row B	Row A	
1	Differential	RTM_PWREN	GND	SATA1_TX-	SATA1_TX+	GND	SATA1_RX-	SATA1_RX+	User Defined
2	Differential	GND	SATA2_TX-	SATA2_TX+	GND	SATA2_RX-	SATA2_RX+	GND	(4) Serial ATA
3	Differential	VGA_SDA	GND	SATA3_TX-	SATA3_TX+	GND	SATA3_RX-	SATA3_RX+	
4	Differential	GND	SATA4_TX-	SATA4_TX+	GND	SATA4_RX-	SATA4_RX+	GND	
5	Differential	VGA_SCL	GND	USB0-	USB0+	GND	USB1-	USB1+	
6	Differential	GND	USB2-	USB2+	GND	USB3-	USB3+	GND	(6) Universal Serial Bus
7	Differential	VGA_HS	GND	USB4-	USB4+	GND	USB5-	USB5+	
8	Differential	GND	DVI_TX1-	DVI_TX1+	GND	DVI_TX0-	DVI_TX0+	GND	User Defined
9	Differential	VGA_VS	GND	DVI_TXC-	DVI_TXC+	GND	DVI_TX2-	DVI_TX2+	Digital Video Interface
10	Differential	GND	RS485_TX0-	RS485_TX0+	GND	RS485_RX0-	RS485_RX0+	GND	User Defined
11	Differential	VGA-R	GND	RS485_TX1-	RS485_TX1+	GND	RS485_RX1-	RS485_RX1+	Serial Communications & PS2 Interface
12	Differential	GND	RS232_RX1	RS232_TX1	GND	RS232_RX0	RS232_TX0	GND	
13	Differential	VGA-B	GND	KB_CLK	KB_DAT	GND	M_CLK	M_DAT	
14	Differential	GND			GND	SMB_DAT	SMB_CLK	GND	User Defined
15	Differential	VGA-G	GND	GPIO3	GPIO2	GND	GPIO1	GPIO0	SMBus and General Purpose I/O
16	Differential	GND	GPIO7	GPIO6	GND	GPIO5	GPIO4	GND	

User Defined
VGA Graphics

PMC/XMC Pin-outs for V3PD:

J11, J12 PMC CONNECTORS per IEEE 1386.1

Pin	J11		Pin	Pin	J12		Pin
1		-12V	2	1	+12V		2
3	GND	INTA#	4	3			4
5	INTB#	INTC#	6	5		GND	6
7		5V	8	7	GND		8
9	INTD#		10	9			10
11	GND	3.3V_AUX	12	11		3.3V	12
13	CLK	GND	14	13	RESET#		14
15	GND	GNT#	16	15	3.3V		16
17	REQ#	5V	18	17	PME#	GND	18
19	VIO	AD[31]	20	19	AD[30]	AD[29]	20
21	AD[28]	AD[27]	22	21	GND	AD[26]	22
23	AD[25]	GND	24	23	AD[24]	3.3V	24
25	GND	C/BE[3]#	26	25	IDSEL	AD[23]	26
27	AD[22]	AD[21]	28	27	3.3V	AD[20]	28
29	AD[19]	5V	30	29	AD[18]	GND	30
31	VIO	AD[17]	32	31	AD[16]	C/BE[2]#	32
33	FRAME#	GND	34	33	GND		34
35	GND	IRDY#	36	35	TRDY#	3.3V	36
37	DEVSEL#	5V	38	37	GND	STOP#	38
39	GND	LOCK#	40	39	PERR#	GND	40
41			42	41	3.3V	SERR#	42
43	PAR	GND	44	43	C/BE[1]#	GND	44
45	VIO	AD[15]	46	45	AD[14]	AD[13]	46
47	AD[12]	AD[11]	48	47	M66EN	AD[10]	48
49	AD[9]	5V	50	49	AD[8]	3.3V	50
51	GND	C/BE[0]#	52	51	AD[7]		52
53	AD[6]	AD[5]	54	53	3.3V		54
55	AD[4]	GND	56	55		GND	56
57	VIO	AD[3]	58	57			58
59	AD[2]	AD[1]	60	59	GND		60
61	AD[0]	5V	62	61	ACK64#	3.3V	62
63	GND	REQ64#	64	63	GND		64

J15 – Primary Site 1 XMC Connector per VITA 42.0, 42.3

	Row F	Row E	Row D	Row C	Row B	Row A	
1	VPWR	PE0_TX1n	PE0_TX1p	3.3V	PE0_TX0n	PE0_TX0p	1
2	RESET#	GND	GND		GND	GND	2
3	VPWR	PE0_TX3n	PE0_TX3p	3.3V	PE0_TX2n	PE0_TX2p	3
4		GND	GND		GND	GND	4
5	VPWR			3.3V			5
6	+12V	GND	GND		GND	GND	6
7	VPWR			3.3V			7
8	-12V	GND	GND		GND	GND	8
9	VPWR						9
10	GA0 ('b0)	GND	GND		GND	GND	10
11	VPWR	PE0_RX1n	PE0_RX1p		PE0_RX0n	PE0_RX0p	11
12		GND	GND	GA1 ('b0)	GND	GND	12
13	VPWR	PE0_RX3n	PE0_RX3p	3.3V_AUX	PE0_RX2n	PE0_RX2p	13
14	SMB_DAT	GND	GND	GA2 ('b0)	GND	GND	14
15	VPWR						15
16	SMB_CLK	GND	GND	NVMRO	GND	GND	16
17							17
18		GND	GND		GND	GND	18
19			WAKE#		REFCLKn	REFCLKp	19

J16 – Secondary Site 1 XMC Connector per VITA 42.0

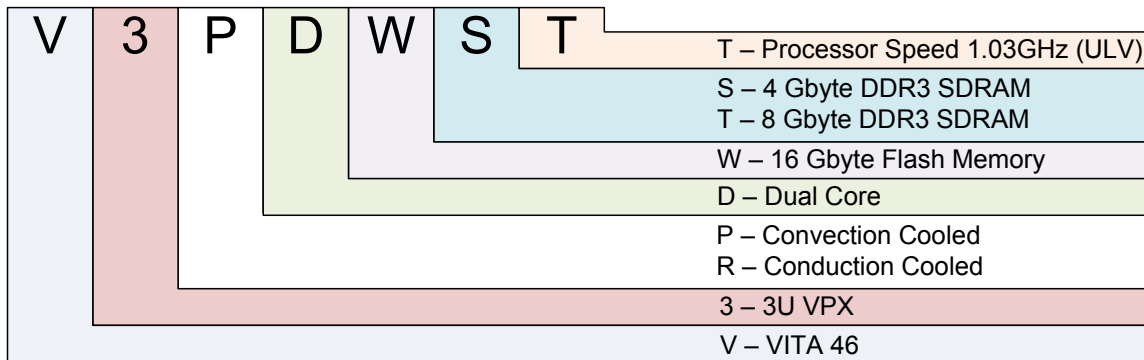
	Row F	Row E	Row D	Row C	Row B	Row A	
1		XMC_DP01n	XMC_DP01p		XMC_DP00n	XMC_DP00p	1
2		GND	GND		GND	GND	2
3		XMC_DP03n	XMC_DP03p		XMC_DP02n	XMC_DP02p	3
4		GND	GND		GND	GND	4
5		XMC_DP05n	XMC_DP05p		XMC_DP04n	XMC_DP04p	5
6		GND	GND		GND	GND	6
7		XMC_DP07n	XMC_DP07p		XMC_DP06n	XMC_DP06p	7
8		GND	GND		GND	GND	8
9							9
10		GND	GND		GND	GND	10
11							11
12		GND	GND		GND	GND	12
13							13
14		GND	GND		GND	GND	14
15							15
16		GND	GND		GND	GND	16
17							17
18		GND	GND		GND	GND	18
19							19

V3PD Environmental Specifications:

Parameter	Condition	Range	Comment
Temperature	Operating	-10°C to +50°C	Clock throttling can be implemented for wider temperature ranges
	Storage	-50°C to +85°C	
Humidity	Operating	20 to 95% non-condensing	±4% relative humidity, per MIL-STD-810F
	Storage	0 to 100% non-condensing	
Altitude		Unlimited	
Vibration	Sine	10g peak 15-2 kHz	All levels based on a sweep duration of 10 minutes per axis, each of three mutually perpendicular axes. Qualification testing is displacement limited below 44 Hz.
	Random	0.1 g ² /Hz 15-2 kHz (14.1 g _{rms})	
	Shock	40 g peak	

V3PD Ordering Information:

The Dynatem part numbering system is explained as follows.



Other configuration options are available. For example, the board can be ordered without 10 Gigabit Ethernet support, or no VGA capability. Please contact Dynatem sales for a quotation for other configuration options.