

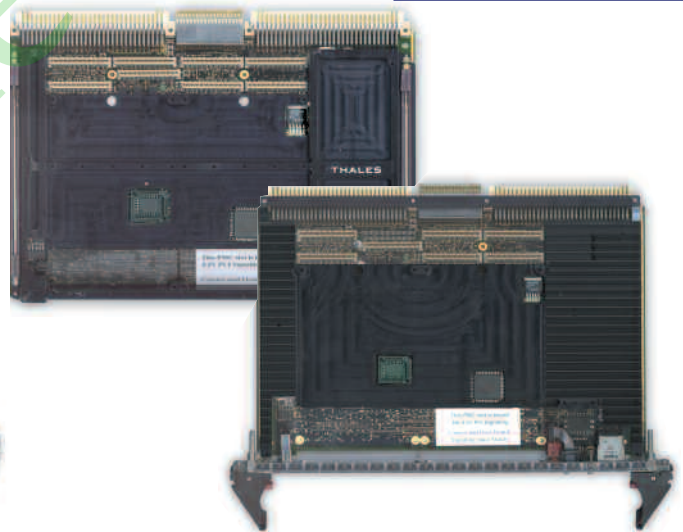
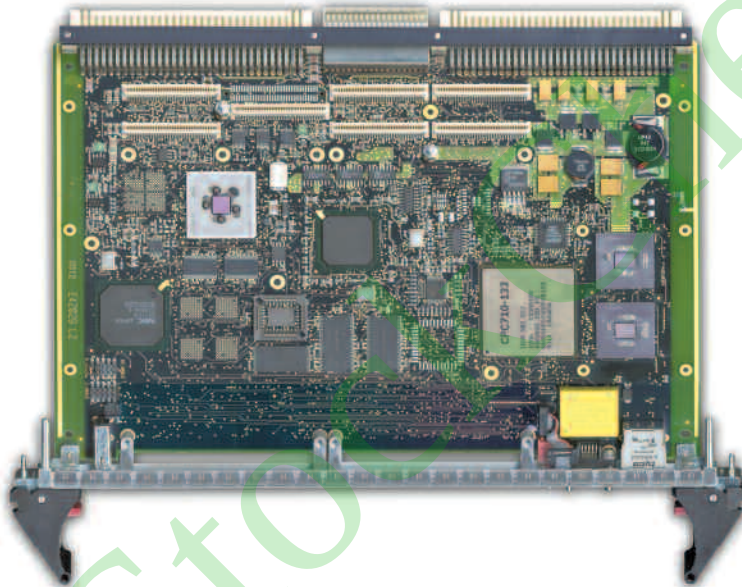
THALES



Thales Computers, Real COTS Systems in Real Time



PowerEngine7 Single or Dual PowerPC 750FX/GX



Outstanding Computing Performance with Very Low Power Dissipation

- > Single or Dual PowerPC 750FX/GX Operating at up to 1 GHz
- > Two PCI Mezzanine Card Sites
- > 512 KB/1 MB Internal L2 Cache Clocked at Processor Frequency
- > Low Power ALMA2e PCI/VME64 Bridge, Featuring 2eSST Capabilities
- > Available in All 4 Environmental Ruggedization Levels
- > Supports VxWorks, LynxOS, GreenHills Integrity, and Linux

www.thalescomputers.com

PowerEngine7 Series

>> General Overview

The PowerEngine7 is a major leap forward in Thales Computers' technological excellence. The PowerEngine7 meets Thales Computers' technology insertion policy which offers customers a clear performance upgrade path while protecting long-term investments in application software.

PowerPC 750FX/GX: Outstanding Performance PowerPC for Power-Conscious Applications

The PowerEngine7 features the latest PowerPC 750FX/GX microprocessor from IBM which delivers 700 MHz to 1 GHz performance for networking, storage, imaging, and other high-performance embedded applications. The PowerPC 750FX/GX fully complies with the PowerPC architecture. It is the first to combine IBM's most advanced process technologies onto one chip, reducing power consumption by up to 50 percent or increasing performance by up to 30 percent. Manufactured in IBM's advanced 0.13 micron process, the chip is the first to include copper interconnects, silicon-on-insulator (SOI) transistors, and low-k dielectric insulation technologies.

The PowerPC 750FX and 750GX have respectively an internal L2 cache capacity of 512 KB and 1 MB. The cache is two-way set associative; each way contains 4096 blocks and each block consists of two 32-byte sectors. Array read and write operations execute in one processor cycle. Moreover, the L1 data cache path to the 60x bus interface unit (BIU) and the L2 cache reload path to the L1 data cache are each 256 bits, a fourfold improvement compared with previous 7xx processors. Additional buffers between

the L1 data cache, L2 cache, and the BIU enable the processor to improve both latency and bandwidth by allowing two cache miss transactions to be active simultaneously on the 60x bus. The memory management unit (MMU) has eight data and eight instruction block address translation (BAT) registers to provide flexibility in defining larger blocks of memory for simpler management. Up to 4 GB of memory can be configured, eliminating the need for page-level translation in some embedded applications.

Single and Dual Processing

The PowerEngine7 is available in both single- and dual-processor configurations for performance and design flexibility. A dual-processor SBC is a cost-effective, better-performing, and more-reliable alternative to using two single-processor boards. On a dual-processor board, computing tasks can be assigned to one processor, while the other processor handles device drivers and I/O, improving compute time and eliminating the frequent I/O interrupts encountered on a single-processor board. Moreover, the shared memory of a dual-processor board results in very efficient processor communication, removing the need for interboard communication protocol. Finally, a dual-processor SBC ensures a much higher MTBF value, as well as a lower price, than two single boards.

ASIC Innovation for Better Performance, Seamless Software Upgrade and Long-Term Support

To offer the best board-level solutions, Thales Computers teamed with IBM to develop the key chips of the PowerEngine architecture and to take advantage of IBM technology for low power consumption. AVIGNON, the host bridge, and ALMA2e, the low power VME bridge, benefit from the accumulated experience of both partners since the beginning of the PowerPC and VME.

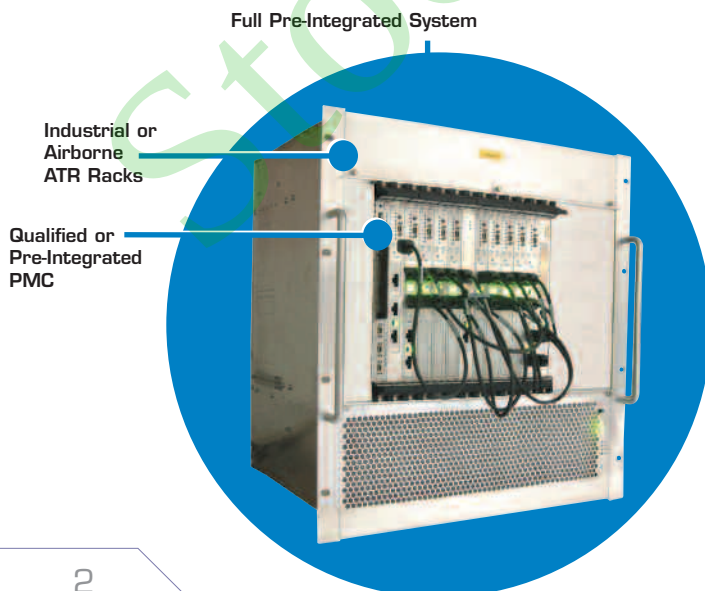
Single-Source Customer Service

Leveraging more than 15 years of new product development and customer support in embedded and rugged computers, Thales Computers offers a wide range of integration and maintenance services, from product warranty and start-up assistance to the delivery of fully tested pre-integrated systems and one-stop-shop delivery of qualified racks and PMCs.

Product Warranty and Services

- > All of Thales Computers' hardware products are covered by a two-year return-to-factory warranty.
- > Several service programs are available, including update services, hotline access, product repair and exchange services, technical assistance, on-site or remote technical assistance.
- > ISO 9001: Thales Computers' ISO 9001 certification is just another way for us to back our commitment to quality products and customer service.

Finally, in addition to its standard support services, Thales Computers offers customized consultation to system integrators.





Technical Data

PowerPC Processor

- > PowerPC 750FX or 750GX processor
- > Either one or two PowerPC operating at up to 1 GHz
- > Dual issue superscalar control processor
- > L1 cache: 32 KB, 32-byte line, 8-way set associative instruction cache and 32 KB, 32-byte line, 8-way set associative data cache
- > Dual Integer Unit
- > IEEE-754 Floating Point Unit, one madd per cycle
- > Instruction and Data Memory Management Units (MMU)
- > Internal 512 KB (750FX) or 1 MB (750GX) L2 cache with ECC: operates at processor frequency
- > Very low power implementation

AVIGNON High- Performance Host Bridge

AVIGNON, the host bridge, benefits from the accumulated experience of both IBM and Thales Computers since the beginning of the PowerPC. It performs as a crossbar between the processors, the main memory, and two PCI busses. This crossbar function is the key to implementing a high-performance computing node. The PowerEngine7 is equipped with the latest release of this bridge, which features backward compatibility with previous releases in order to protect customers' long-term investment in application software. The features and performance of the AVIGNON bridge are adapted to the PowerPC versions. Such features include double-bank SDRAM memory with ECC, support of dual processors with 133 MHz bus (100 MHz for extended temperature versions), and management of two PCI busses: one 32-bit PCI bus and a second 64-bit PCI bus at up to 66 MHz.

SDRAM Memory

- > 128, 256 or 512 MB of onboard SDRAM with ECC
- > Double bank memory management handled by the AVIGNON host bridge
- > The 1 GHz version of the PowerEngine7 is available only with 512 MB SDRAM.

FLASH Memory

- > User Flash: Up to 128 MB of contiguous directly-accessible, 32-bit wide Flash memory for OS and application code
- > System Flash: 2 MB TSOP Flash device organized as Dual Boot Sites; A link selects which device is the boot device on power up

RT Board Controller ASIC

The COBRA chip brings a highly integrated single chip solution to control interrupts by providing up to 32 I/O device interrupt inputs and 4 interprocessor interrupts.

Thales Computers' COBRA technology is also optimized for real-time applications and offers:

- > Connection to PCI bus Rev. 2 (slave mode)
- > ISA-like interface for serial ports
- > Large non-volatile memory interface (NVRAM, Flash, etc.)
- > Optimized message passing with four high-density FIFOs
- > General purpose I/Os (six on VME P2)
- > Four highly programmable 32-bit global timers



1 GHz PowerPC 750GX

17.5W typical (single)

23W typical (dual)

COP/JTAG debug

A powerful diagnostic and test interface of any of the PowerPC 750FX through Common-On-Chip processor and IEEE 1149.1 COP/JTAG interface is available onboard using a PMC-type connector. A specific PMC-shaped breakout board can be used in development for easy connection to standard cables.

PCI Interface

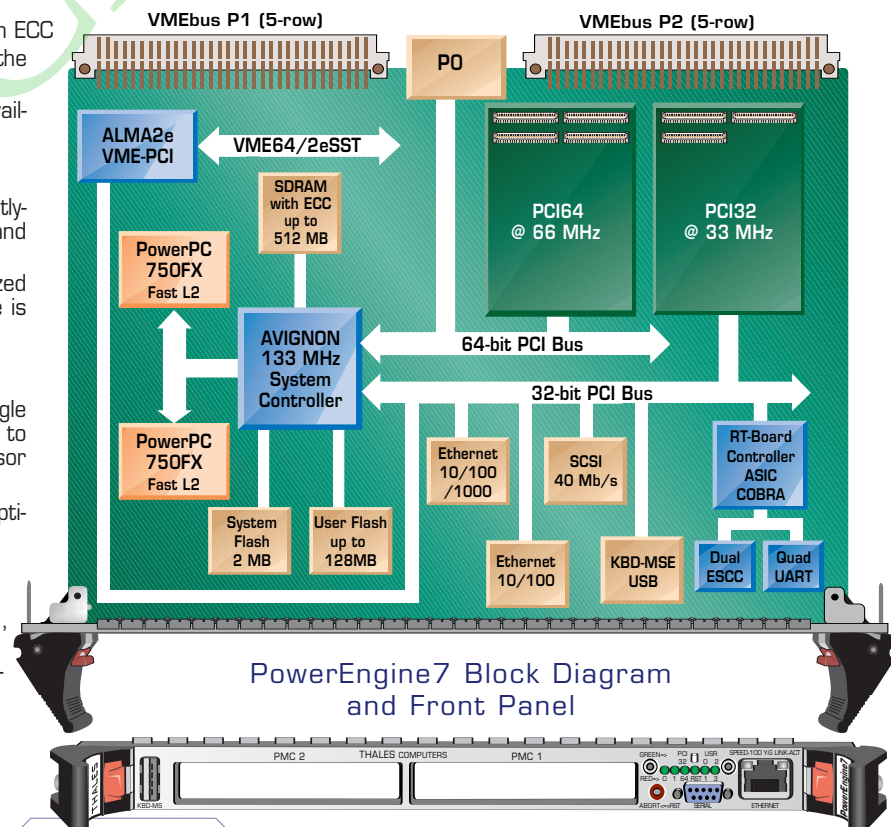
Two PCI interfaces (master/slave with burst capability) are implemented on the PowerEngine7 and can operate concurrently:

- > The first PCI bus provides a high-speed backbone for local interconnect (local I/O, VME bridge, one PMC-32 slot) and is fully compliant to the PCI specification, Rev. 2 (32-bit).

Depending on the ordering option, the PCI signaling level of this PCI bus is either 3.3V or 5V, allowing the host of either a 3.3V signaling, 5V signaling, or Universal signaling PMC on the PMC 32 expansion slot.

- > The second PCI bus is dedicated for the connection of PMCs. It provides a Rev. 2 standard 64-bit PCI interface that can operate at either 33 or 66 MHz. It operates only at 33 MHz in extended temperature versions. The PCI signaling level of this PCI bus is 3.3V only. Depending on the manufacturing option, this 64-bit PCI bus is routed onto the VME PO connector allowing the customer to bridgelessly expand the number of PMC slots using Thales Computers' V2PMC PMC carrier.

The PowerEngine7 generates onboard stable 3.3V and $\pm 12V$ power supplies for the PMC, allowing their use in VME racks with as little as 3 rows.



PMC Expansion

For configurations requiring additional PCI connectivity, Thales Computers offers a PMC carrier card, the V2PMC, that provides two extra PMC slots. The PMC carrier card is fitted in an adjacent VMEbus slot. Applications requiring up to four PCI slots, such as redundant configurations, can therefore be easily implemented. The Carrier Card is connected to the PowerEngine7 with the PCI bus on PO option, via a PO overlay on the backplane for optimum flexibility and modularity. The following table summarizes the number of PMC slots available with/without the carrier board:

Configuration	Bridgeless PMC Slots	VME Slots
PowerEngine7 without Carrier Card	2	1
PowerEngine7 with PCI on PO option and Carrier Card	4	2
PowerEngine7 with PCI on PO option and Dual Carrier Card	Contact Thales Computers	

ALMA2e VME Interface

- > Managed by the ALMA PCI-to-VME bridge component, a highly integrated low-power, single-chip solution
- > VME64 ANSI/VITA-1 1994 compliant
- > VMEbus system controller
- > VMEbus requester (Level 1-4)
- > VMEbus interrupter and interrupt handler (IRQ1-7)
- > VMEbus master/slave A32, A24, A16:D32, D16, D8, UAT
- > VMEbus master/slave A32, A24: D32BLT, D64MBLT
- > Programmable VME slave image base address and size (8 VME slave channels)
- > PCI-to-VME access conversion through 8 MB granularity mapping table
- > Transmit/Receive FIFOs
- > Programmable posted write, prefetch read, coupled mode
- > Programmable BB2BLT mode: mapping of multiple single PCI accesses to a VMEbus BLT/MBLT cycle
- > Programmable 2eSST support:
 - A32/64 - D64 2eSST
 - A32/64 - D64 broadcast 2eSST modes. Please contact Thales Computers to learn how to optimize your system integration.
- > Semaphore registers
- > VME/PCI 2-channel DMA controller
- > Hardware watchdog feature

Firm Plug System

Dedicated rigid bars enable a firm connection and increase reliability.

PBIT, IBIT

Automatically triggered at power up, PBIT executes several simple checks of main board functions before launching the debug monitor.

IBIT can then be executed, on demand, by using the "auto" firmware command. IBIT executes a comprehensive suite of functional tests and leaves results in the main DRAM of the board. These non-intrusive IBIT tests cover more than 95% of the board's functional nodes, and test results can be read back by the board's operating system or collected by the rack supervision board.

Local I/O

The PowerEngine7 is loaded with all the I/O you'd expect from a Single Board Computer. Due to the limited number of I/O pins available on the VME backplane, please consult the PowerEngine7 Users' Manual for a detailed description of the availability of all the I/O.

Port	Description	I/O Location
Quad UART ⁽¹⁾ 16550 compliant	Software Configurable as either: > One single channel full modem > Two or Four channels Tx,Rx only	Front or Rear
Dual ESCC ⁽¹⁾	Synchronous/Asynchronous	Rear
Keyboard and Mouse	USB interface	Front and Rear
General Purpose I/O	Up to six TTL I/O	Rear
SCSI ⁽²⁾	8/16 bits, 40MB/s	Rear
Ethernet 10/100 ⁽²⁾	10/100BASE-T	Front or Rear
Ethernet 10/100/1000 ⁽²⁾	10/100/1000BASE-T	Front or Rear

⁽¹⁾ Depending on the version, serial lines support either EIA-232 or software configurable EIA-232/422/485 >> Please contact Thales Computers for additional information.

⁽²⁾ SCSI speed is reduced when used in extended temperature versions. Narrow or wide depending on the I/O routing option on VME-P2

Board Support Packages

The PowerEngine7 supports Tornado 2.0.2, Tornado 2.2 and 2.2.1 from WindRiver, LynxOS 4.0 from LynxWorks, and BlueCat 4.0 Linux as well as INTEGRITY® 4.09 from Green Hills.

Thales Computers provides real-time OS extensions for the PowerEngine7 that facilitate development of high-end real-time data and signal processing applications on multi-processor clusters (see PowerLine data sheet).

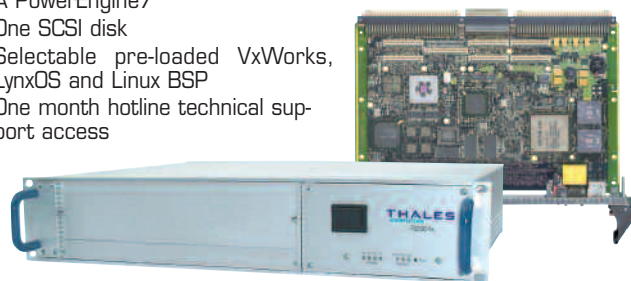
Paddle Boards

Thales Computers' VITA36 compliant or compact size paddle boards provide a connection interface for the PowerEngine7 board's I/O ports and PMC sites I/O that are connected to P2 and/or PO of the back panel

Easy PowerPC System

The Easy System is an unique turnkey VME system offering:

- > A PowerEngine7
- > One SCSI disk
- > Selectable pre-loaded VxWorks, LynxOS and Linux BSP
- > One month hotline technical support access



Miscellaneous

- > Board size: VME double Eurocard (6U: 233.3 mm x 160 mm)
- > Single VME slot
- > Convection-cooled version carries the Ruggedizer but keeps the front panel I/O.
- > Conduction-cooled version is IEEE 1101.2-1992 compliant and is a single VME slot solution.
- > Electromagnetic compatibility:
 - NF EN 55022 Class B
 - NF EN 50082-2
- > All Thales Computers boards are EC-compliant.

PowerEngine7 Technical Features

CPU		PCI INTERFACE (PMC 1)												
Processor	One or two PowerPC 750FX or 750GX	• PCI revision 2 compliant • PMC#1: PCI 32-bit/33 MHz, 3.3V and 5V signaling build option • PMC#2: PCI 64-bit/33 or 66 MHz selectable, 3.3V signaling (33 MHz in extended temperature versions or with V2PMC carrier board)												
Clock Frequency	700 MHz to 1 GHz													
MIPS	2300 DMips @ 1 GHz (Dhrystone 2.1 MIPS)													
MEMORY		MISCELLANEOUS												
Global Memory	128, 256, 512 MB onboard	• 4 async. serial lines selectable on either front or rear • Optional 2 ESCC sync./async. serial lines on rear panel • Ethernet 10/100 and optional Ethernet 10/100/1000 available on either front or rear panel • 6 TTL level general purpose I/O												
ECC	Standard													
L2 Cache Memory	Fast 512 KB internal													
VME INTERFACE		TYPICAL POWER REQUIREMENTS												
• ALMA2e V64 VME/PCI bridge with semaphore registers • A32/A24/A16 master / slave • D64 (MBLT) / D32 (BLT) / D16 / D08 master / slave • 5-row connectors, 3-row compatible • 2eSST enhancements: Contact Thales Computers		<table><tr><td>+5V (+5%, -2.5%)</td><td>Single</td><td>Dual</td></tr><tr><td>733 MHz</td><td>2.9A/14.4W</td><td>3.2A/17.0W</td></tr><tr><td>1 GHz</td><td>3.5A/17.5W</td><td>4.6A/23W</td></tr></table>				+5V (+5%, -2.5%)	Single	Dual	733 MHz	2.9A/14.4W	3.2A/17.0W	1 GHz	3.5A/17.5W	4.6A/23W
+5V (+5%, -2.5%)	Single	Dual												
733 MHz	2.9A/14.4W	3.2A/17.0W												
1 GHz	3.5A/17.5W	4.6A/23W												
		+12V (±2.5%) only when serial line O on P2 is used												
ENVIRONMENTAL SPECIFICATIONS														
	SA	WA	RA	RC										
Temperature range														
Airflow	1.2 m/s	1.5 m/s	1.5 m/s		NA									
Operating	0° to +55°C	-20° to +65°C	-40° to +75°C		-40° to +85°C									
Storage	-40° to +85°C	-45° to +100°C	-45° to +100°C		-45° to +100°C									
Conformal Coating	Optional	Standard	Standard		Standard									
Relative Humidity	no condensation 90%	95% 10 cycles 240 hours	95% 10 cycles 240 hours		95% 10 cycles 240 hours									
Mechanical														
Vibration Sine	5-200 Hz - 2g Peak	5-200 Hz - 2g Peak	5-2,000 Hz - 2.5g Peak		5-2,000 Hz - 5g Peak									
Vibration	0.01 g²/Hz 10-40 Hz	0.01 g²/Hz 10-40 Hz	0.04 g²/Hz		0.1 g²/Hz									
Random	0.0007 g²/Hz 100-200 Hz - 0.00005 g²/Hz 2,000 Hz		with a flat response to 1,000 Hz 6 dB/Oct roll-off from 1 KHz-2 KHz											
Shock	10g Peak 16 ms Half Sine Pulse		40g Peak 20 ms Half Sine Pulse											
Bumps			40g Peak 6 ms Half Sine Pulse											
			3 bumps/sec and 1,000 bumps/direction											
Altitude	-1,000 to 15,000 ft	-1,000 to 33,000 ft	-1,000 to 33,000 ft		-1,000 to 50,000 ft									

Order Code		VMPC7-														
		SA	WA	RA	RC											
Processors:	Single	X	X	X	X	1										
	Dual	X	X	X	X	2										
Environment Class:	Standard (Air)	X				SA										
	Extended Temperature (Air)		X			WA										
	Rugged Convection-Cooled (Air)			X		RA										
	Rugged Conduction-Cooled				X	RC										
Clock Speed:	PPC 750FX 700 MHz/100 MHz	X	X	X	X	6										
	PPC 750FX 733 MHz/133 MHz	X				7										
	PPC 750GX 1 GHz/100 MHz	X	X	X	X	9										
	PPC 750GX 1 GHz/133 MHz	X				A										
SDRAM:	128 MB (PowerPC 750FX)	X	X	X	X	2										
	256 MB (PowerPC 750FX)	X	X	X	X	3										
	512 MB (PowerPC 750FX and GX)	X	X	X	X	4										
Flash:	No User Flash	X	X	X	X	N										
	64 MB	X	X	X	X	3										
	128 MB	X	X	X	X	4										
I/O routing on PO & P2	VMPC6a like															
	PCI 64 on PO, PMC64 on P2-46 dz	X	X	X	X	00										
	PMC-P4 on PO & P2															
	VITA 31 Gigabit Ethernet	X	X	X	X	10										
Ethernet 10/100/1000																
	Single Ethernet 10/100 front panel	X	X	X		0										
	GBE front panel, Ethernet 10/100 rear P2	X				1										
	Single Ethernet 10/100 rear P2	X	X	X	Default	2										
	Dual Ethernet on rear	X	X	X	X	3										
Dual ESCC ports	Not equipped	X	X	X	X	0										
	Option available	X	X	X	X	1										
PMC32 slot VIO key (PCI Signaling Voltage)	5V	Default	Default	Default	Default	0										
	3.3V	Option	Option	Option	Option	1										
Other Options	PO Connector	Default	Default	Default	Default	0										
	No PO connector (Ask)					N										
Coating		X	Default	Default	Default	V										

Add code V only when not default

Add code V only when not default





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2000 Version
Certification,
Thales Computers
guarantees Total
Customer Satisfaction.

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