



## PUMA™ 300, 600 OR 900 MICROTCA™ AC POWER MODULE

**LIBLADE®**

MicroBlade™

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The Puma 300, 600 and 900  $\mu$ TCA Power Modules are MicroTCA.0 R1.0 specification compliant. All versions of the Puma are Full-Size /Single-Width form factor modules which are fully enclosed for electrical protection. Each unit provides 16 pairs of management power and payload power outputs that are digitally monitored for over or under voltage and over current.

Puma power modules provide full monitoring capability with only SMP (Standby Mgmt Power) so input and output voltage monitoring is possible without input power.

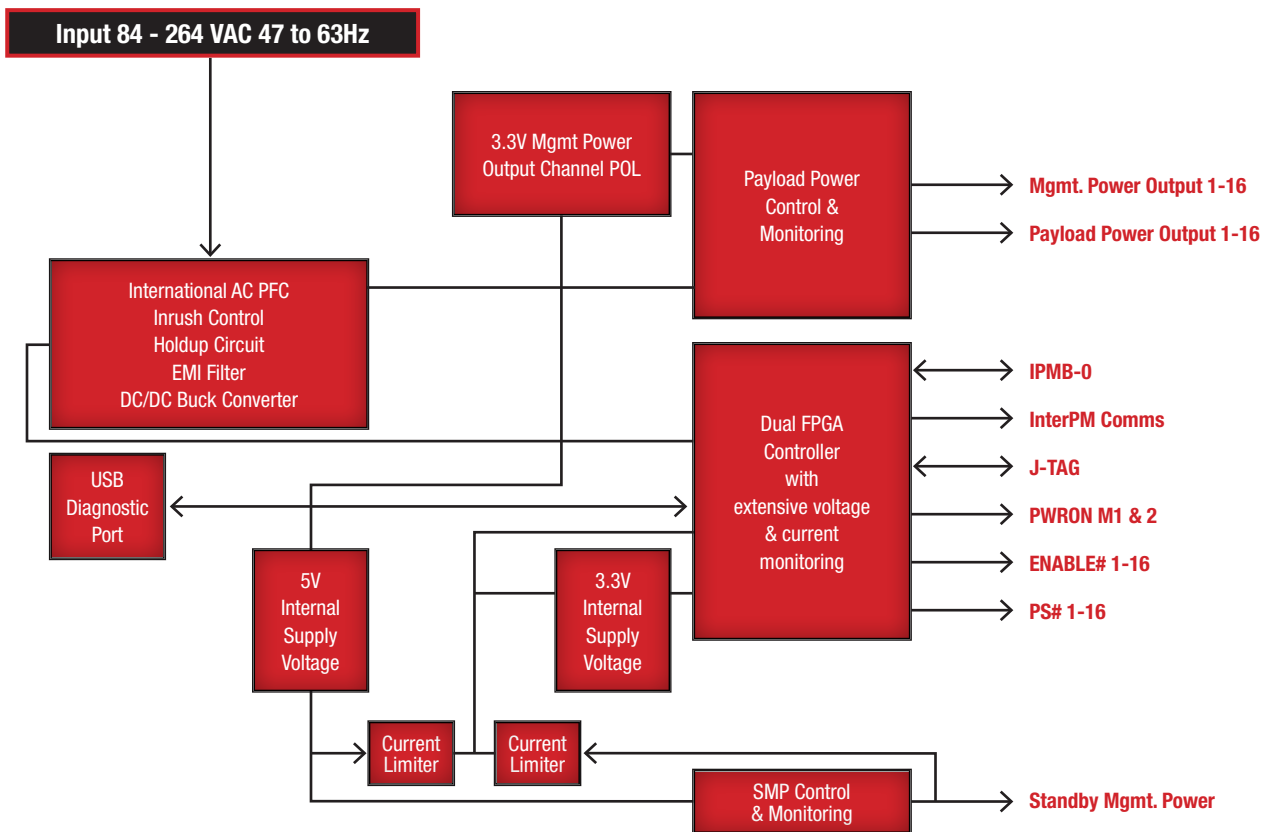
The design is based on a state of the art FPGA and advanced technologies for energy management and remote monitoring, diagnostics, software updating and reconfiguration. Each output channel is individually configurable as primary, backup or disabled. This provides the  $\mu$ TCA form of shared power, i.e. redundant power modules can be configured so that one PM powers about the half the loads on a per channel basis and the other PM powers the rest of the loads.

Payload power channels can have individually programmed current limits with load specific values. This enables improved MTBFs of the power system, more tightly managed power budgeting and the ability to determine an accurate power consumption history of each component of the system.

Hot swappable and fully redundant operation coupled with extremely high efficiency and wide temperature range operation make Puma power modules ideally suited for all air cooled MicroTCA™ applications.

# PUMA™ 300, 600 OR 900

## MICROTCA™ POWER MODULE



The Puma  $\mu$ TCA power module provides international power input. This input includes all of the typical features: input protection, power factor correction, input isolation, inrush current control, EMI filtering, holdup circuit and high efficiency power conversion.

The power module provides up to 12 Watts of management power so that if all 16 management power channels are running at the maximum current there is no possible interaction due to current limiting of the 3.3V Mgmt Power Output Channel POL. Each management channel is individually digitized and monitored for under or over voltage. Each MP output has over current monitoring with individual channel indicators.

Each payload channel voltage and current is digitized and monitored. The readings are compared to digital references to detect under-voltage, over-voltage, transient over-current and average over-current. Detection of any of these conditions results in disabling of that specific primary channel. In Redundant operation if the primary payload power voltage drops more than a set voltage below the backup payload power voltage, the backup output will automatically start to conduct.

For redundancy purposes all payload and management power outputs are designed for parallel connections to other power modules. Inflow currents are not permitted for these outputs. However the SMP channel does permit inflow current up to 150mA.

A standard USB port is provided for system development, monitoring and integration purposes. The  $\mu$ TCA spec indicators are present, green for ready, red for out of service and blue for hot swap.

The Puma utilizes a microprocessor which provides an EMMC (Enhanced Module Management Controller), per the  $\mu$ TCA spec, for Intelligent Platform Management Interface, IPMI to MCH and for control of the power module. An important Puma feature is that the power module does not rely on the microprocessor for any system critical functions such as current limiting or channel failover control. All such functions are designed into the FPGA gates and will fully function with the microprocessor halted.

### REDUNDANCY

Power modules should be installed and removed with the input power disconnected. However the Puma is hot swappable with or without input power connected. As already mentioned the power module will power the control circuitry from the SMP input if it is active, otherwise the power module remains in a quiescence state until input power is connected. When the control circuitry does power up it recognizes that it is not the "startup PM" and waits for MCH control messaging before enabling any outputs.

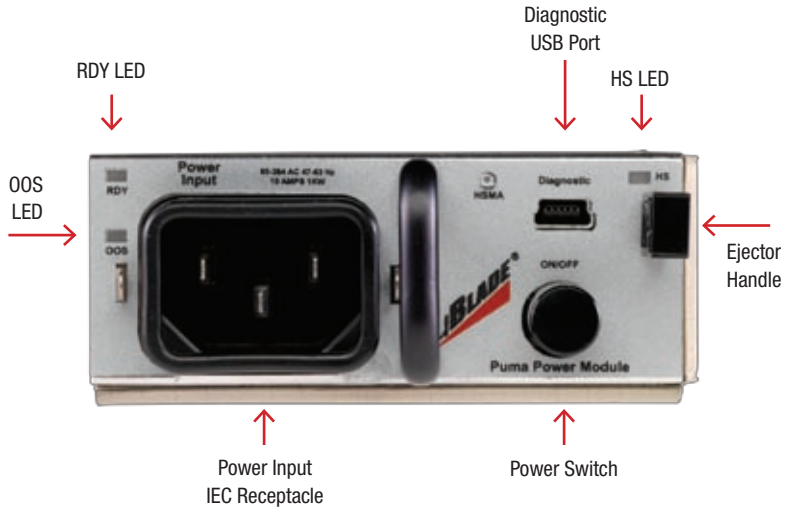
# INPUT

The power module is designed for use in international AC applications and uses IEC C14 AC power input connector.

Mounted on the face plate is an ON/OFF pushbutton switch, USB diagnostics port and MicroTCA standard EMC gaskets, Ready, Out Of Service, Hot Swap indicators and the power module latch / retention mechanism.

INPUT POWER	
Max input power Puma	990W @ 900W Output Power
Normal voltage	85-265 VAC, 47 to 63 Hz
Normal voltage (full performance)	120V to 264 VAC
Abnormal voltage (non-destruction)	0-84V, 264-275 VAC
Conducted emission	Class B
Hold-up, 100% load	20ms

SMP (STANDBY POWER MODE) INPUT	
Input voltage	5.0-5.5V
Input current typical	125ma
Input current maximum	150ma



## TOTAL PAYLOAD POWER

The Puma payload power can be calculated as follows.  $PP = (900 - MP/95\% - SMP/95\%)$

Where PP = Payload Power, MP = Total power load of all MP channels, SMP = Total power load of SMP output

# OUTPUT

OUTPUT SPECIFICATIONS		
	PAYLOAD POWER	MANAGEMENT POWER
Output Power	900 Watts (VIN = 120VAC)	12W
Output Voltage	12.5V (13.5V to 10.75V)	3.3V (3.43V to 3.17V)
Output current limit 25mS average Transient ≤100µs	Average 0 to 10.2A programmable 7.6A default configuration Transient 0 to 10.2A programmable 9.4A default configuration	Minimum 100ma Maximum 225ma
Output current limit accuracy	± 50ma or ±LSB	na
Current limit response time	3µs to 90µs	2µs
Outrush current control	1600µF in 25ms	150µF in 25ms
Output channel resistance	14.6mΩ typical	145mΩ maximum
Output ripple 5Hz to 20MHz	<200mv	<100mv
Efficiency @20°C, 120V Input	92%	na
Operation temperature	-5 to 55°C with 2m/s	na
SMP (STANDBY POWER MANAGEMENT) OUTPUT MODE		
Output voltage	5.0-5.5V	
Output current limit	500ma min to 750ma max	

Note - The SMP output defaults to enabled mode, but can be configured to boot disabled

# OTHER I/O

## JTAG

The Puma power module supports JTAG diagnostics and be software or firmware (VHDL) upgraded from the JTAG port. The JTAG signals are buffered to insure good signal integrity and fault free operation.

## USB DIAGNOSTIC PORT

This is a true USB port which is powered only by the terminal device. This port can be used to monitor power module boot sequencing and IPMI messaging or used to interface to the µBlade Dashboard which will show the detailed operating status of the Puma power module

