



<http://www.cubesatkit.com/>

CubeSat Kit™

Pluggable Socketed Processor Module (PSPM) D
Hardware Revision: A

PSPM for Microchip® PIC24/dsPIC33 and CubeSat Kit Development Board

Applications

- CubeSat nanosatellite control, C&DH, TT&C
- General-purpose low-power computing for CubeSat Kit architecture
- Remote sensing for harsh environments

Features

- For CubeSat Kit Development Board (DB)
- For Microchip® PIC24FJ256GA110 16-bit microcontroller (MCU) or dsPIC33FJ256GP710 16-bit digital signal controller (DSC)¹
- 8.000MHz & 32.768kHz clock crystals
- AT25DF641 64Mbit SPI serial Flash memory
- Independent latching (device overcurrent) protection
- Independent external reset supervisor (POR/BOR)
- With 100-pin clamshell ZIF socket
- 4-layer gold-plated green-soldermask PCB
- Compatible with Pumpkin's Salvo™ RTOS and HCC-Embedded's EFFS-THIN SD Card file FAT file system for ease of programming



ORDERING INFORMATION

Pumpkin P/N 710-00608

Option Code	PPM Connector Height
/00 (standard)	+6mm

Contact factory for availability of optional configurations.
Option code /00 shown.



CAUTION

Electrostatic
Sensitive
Devices

Handle with
Care



¹ For a list of integrated peripherals and other controller-specific features when PSPM D is outfitted with a particular processor, see the CubeSat Kit PPM D1 and PPM D2 datasheets.

CHANGELOG

Rev.	Date	Author	Comments
A	20100302	AEK	Initial revision.
B	20101021	AEK	Added typical operating current.
C	20110731	AEK	Added picture.

OPERATIONAL DESCRIPTION

PSPM D enables CubeSat Kit customers to utilize a PIC24 or dsPIC33 processor on a CubeSat Kit Development Board (DB). With its 100-pin clamshell ZIF socket, PSPM D accepts the 100-pin PIC24FJ256GA110-I/PF or dsPIC33FJ256GP710-I/PF, with a wide selection of on-chip peripherals. Additionally, a 64Mbit external serial Flash memory is present for off-chip storage.

When fitted with a PIC24FJ256GA110-I/PF, PSPM D is electrically identical to PPM D1.

When fitted with a dsPIC33FJ256GP710-I/PF, PSPM D is electrically identical to PPM D2.

Note: PSPM D is not compatible with the PIC24FJ256GB210 – use PSPM E instead.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Units
Operating temperature	T_A	-40 to +85	°C
Voltage on +5V <u>USB</u> bus		-0.3 to +6.0	V
Voltage on +5V <u>SYS</u> bus			
Voltage on <u>-FAULT</u> _oc open-collector output			
Voltage on <u>VCC</u> bus		-0.3 to +3.6	V
Voltage on <u>VCC</u> _SD bus			
Voltage on any mixed analog/digital processor I/O pin		-0.3 to (<u>VCC</u> + 0.3)	V
Voltage on any digital-only processor I/O pin		-0.3 to 6.0	
DC current through any pin of PPM connector <u>H1</u>	I_{PIN_MAX}	1.2	A

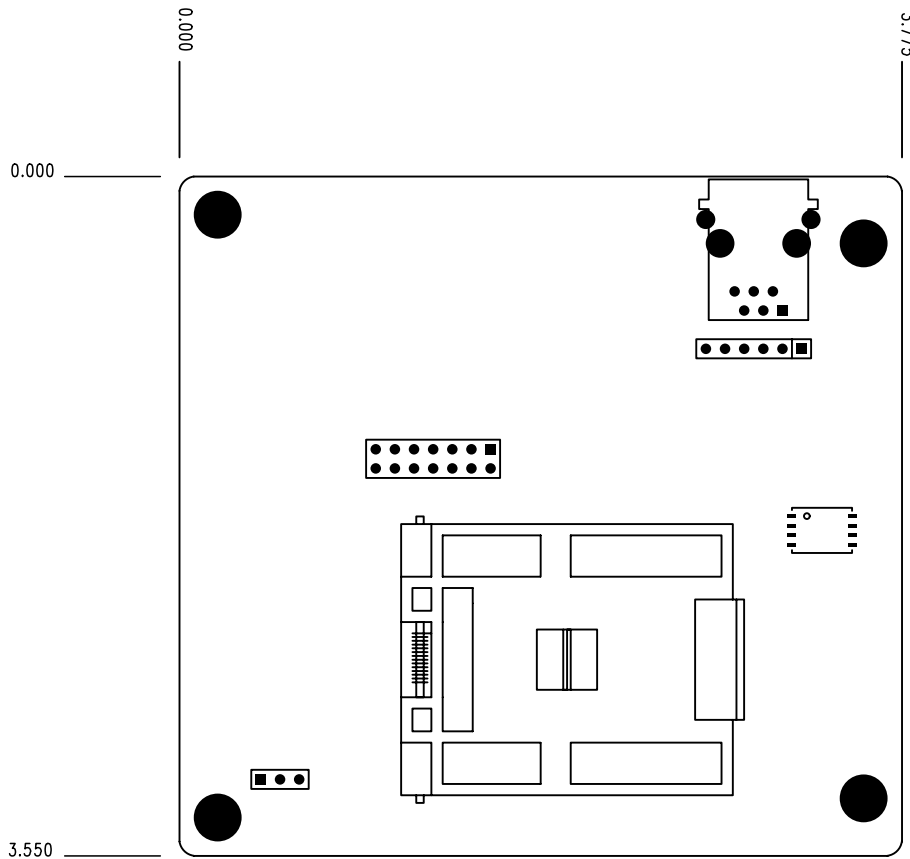
Refer to the Microchip® PIC24FJxxxGAx10 or dsPIC33FJxxxGPx10 family datasheets for additional absolute maximum ratings associated with processor U1, especially per-pin current limits.

PHYSICAL CHARACTERISTICS

Parameter	Conditions / Notes	Symbol	Min	Typ	Max	Units
Mass				68		g
Height of components above PCB					19	mm
Height of components below PCB ²					3	mm
PCB width	Same size as CubeSat Kit Module			90		mm
PCB length				96		mm
PCB thickness				1.6		mm

SIMPLIFIED MECHANICAL LAYOUT³

PSPM D is implemented on PCB that is the same size as a CubeSat Kit module, as shown below.



² Not including connector H1.

³ Dimensions in inches.

ELECTRICAL CHARACTERISTICS

(T = 25°C, +5V bus = +5V unless otherwise noted)

Parameter	Conditions / Notes	Symbol	Min	Typ	Max	Units
Reset voltage	+5V_SYS reduced until MCU resets	V _{RESET_MAX}			3.1	V
Operating Voltage		V _{CC}		3.3		V
SD Card Voltage		V _{CC_SD}		3.3		V
Operating current	Typical operation ⁴	I _{OP}		20		mA
	All control outputs inactive, PSPM asleep	I _{SLEEP}		TBD	TBD	µA
Primary crystal frequency		f _{CLK_OSC}	8.000 ± 0.01			MHz
Secondary crystal frequency		f _{CLK_SOSC}	32.768 ± 0.001			kHz
Overcurrent trip point for VCC	Set by R3	I _{TRIP_VCC}		220		mA
Time to switch between +5V_SYS and +5V_USB power sources	Automatic				1	µs

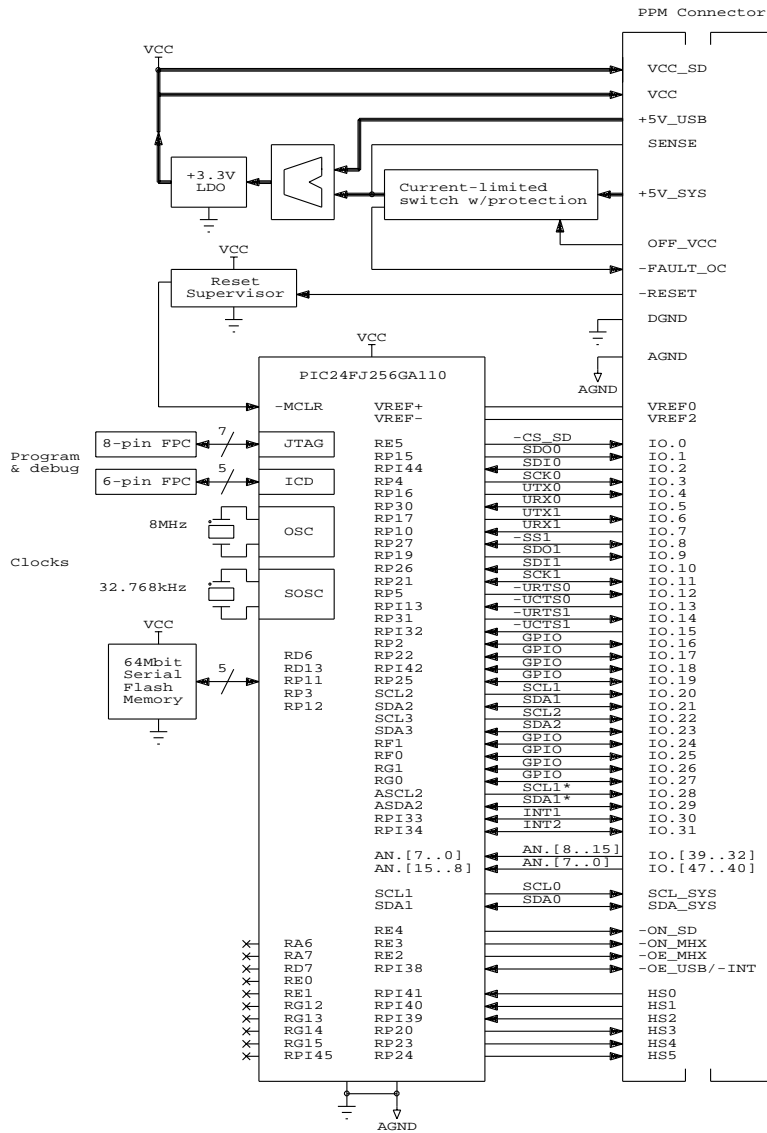
⁴ Running CubeSat Kit test/test1 application v1.2.2.

BLOCK DIAGRAM

PSPM D provides regulated and current-limited +3.3V power, an external POR/BOR reset supervisor, JTAG and ICD interfaces for programming and debugging, two clock sources, an external high-speed 64Mbit serial Flash memory, connections to all 48 I/O pins of the PPM connector, dedicated DB control and radio handshaking signals, a single-point analog/digital ground, and a careful assignment of the mappable and non-mappable PIC24 or dsPIC33 peripherals to the PPM connector and CubeSat Kit bus.

PSPM D accepts a PIC24FJ256GA110 or dsPIC33FJ256GP710 via a 100-pin clamshell ZIF socket, permitting the simple replacement of the processor should inadvertent damage to it occur, or to permit switching between a PIC24 MCU-centric and a dsPIC33 DSC-centric CubeSat Kit implementation.

A few of the PIC24's or dsPIC33's 100 pins are not used.



PPM PIN DESCRIPTIONS

The PPM connector H1 connects the PSPM to resources residing on the DB and to resources accessible via the CubeSat Kit Bus connector.⁵

Those signals that are connected directly to the PPM connector and to the CubeSat Kit Bus connectors are tagged under the CSKB label below.⁶ Signals marked with an "*" are associated with dedicated peripherals on the DB. They may also be used with off-board peripherals through the proper use of DB peripheral enables and DB power control.

The *potential* for a pin's function is described by the I/O field. The *recommended usage* (as a digital or analog input or output, or as a power pin) is listed in the Description field. I/O pins can generally be configured as general-purpose I/O if the recommended usage is not desired.

Inputs are signals from the DB to the PSPM's processor U1 or other circuitry. *Outputs* are signals from the PSPM's processor U1 or other circuitry to the DB.

H1			
LSS-150-01-L-DV			
IO.23	2	1	IO.47
IO.22	4	3	IO.46
IO.21	6	5	IO.45
IO.20	8	7	IO.44
IO.19	10	9	IO.43
IO.18	12	11	IO.42
IO.17	14	13	IO.41
IO.16	16	15	IO.40
IO.15	18	17	IO.39
IO.14	20	19	IO.38
IO.13	22	21	IO.37
IO.12	24	23	IO.36
IO.11	24	23	IO.35
IO.10	26	25	IO.34
IO.9	28	27	IO.33
IO.8	30	29	IO.32
IO.7	* 32	31	IO.31
IO.6	* 34	33	IO.30
IO.5	36	35	IO.29
IO.4	38	37	IO.28
IO.3	* 40	39	IO.27
IO.2	* 42	41	IO.26
IO.1	* 44	43	IO.25
IO.0	* 46	45	IO.24
+5V_USB	48	47	+5V_USB
+5V_SYS	50	49	+5V_SYS
VCC_SD	52	51	VCC_SD
VCC	54	53	VCC
DGND	56	55	DGND
AGND	58	57	AGND
VBATT	60	59	VBATT
VBACKUP	62	61	VBACKUP
VREF0	64	63	* -FAULT_OC <--
	66	65	SENSE <--
VREF2	X 68	67	-RESET -->
		70	OFF VCC -->
	X 72	71	SDA_SYS <--
	X 74	73	SCL_SYS <--
	X 76	75	
	X 78	77	X
	X 80	79	X
--> -ON_SD	* 82	81	X
--> -ON_MHX	* 84	83	X
--> -OE_MHX	* 86	85	X
--> -OE_USB/-INT	* 88	87	X
<-- HS0	* 90	89	X
<-- HS1	* 92	91	X
<-- HS2	* 94	93	X
--> HS3	* 96	95	X
--> HS4	* 98	97	X
--> HS5	* 100	99	X

Important Note: In the pin listings below, the pin names listed are first for the PIC24, followed by the dsPIC33 pin name.

⁵ Not included. DBs are purchased separately from PPMs.

⁶ The CubeSat Kit's system peripherals are numbered from 0 onwards (e.g., UART0, SPI0, etc.), and this nomenclature is used when referring to a PPM or CSK bus signal. The PIC24's and dsPIC33's peripheral nomenclature begins with 1 (e.g., U1, SPI1, etc.), and is used when referring to peripherals, signals and registers internal to the PIC24/dsPIC33.

PPM PIN DESCRIPTIONS – I/O

Name	Pin	I/O	CSKB	Description
IO.0	H1.48	I/O	•	-cs_sd. Controls SD Card interface. From RE5 (U1.3). Part of the DB's SD card interface. RE5 is normally configured as a simple output.
IO.1	H1.46	I/O	•	SDO0. SPI0 (master) data out. From RP15/SDO1 (U1.53). Part of the DB's SD card interface. RP15/SDO1 is normally configured as output function SDO1.
IO.2	H1.44	I/O	•	SDI0. SPI0 (master) data in. To RPI44/SDI1 (U1.54). Part of the DB's SD card interface. RPI44/SDI1 is normally configured as input function SDI1.
IO.3	H1.42	I/O	•	SCK0. SPI0 clock. From RP4(U1.69)/SCK1(U1.55). Part of the DB's SD card interface. RP4/SCK1 is normally configured as output function SCK1OUT. Jumper JP1 must be set accordingly to properly route the SCK1OUT function.
IO.4	H1.40	I/O	•	UTX0. Tx0 data out. From RP16/U1TX (U1.51). RP16/U1TX is normally configured as output function U1TX.
IO.5	H1.38	I/O	•	URX0. Rx0 data in. To RP30/U1RX (U1.52). RP30/U1RX is normally configured as input function U1RX.
IO.6	H1.36	I/O	•	UTX1. Tx1 data out. From RP17/U2TX (U1.50). Part of the DB's MHX/USB interface. RP17/U2TX is normally configured as output function U2TX.
IO.7	H1.34	I/O	•	URX1. Rx1 data in. To RP10/U2RX (U1.49). Part of the DB's MHX/USB interface. RP10/U2RX is normally configured as input function U2RX.
IO.8	H1.32	I/O	•	-SS1. SPI1 slave select. From RP27/-SS2 (U1.14). Part of the second SPI interface. RP27/-SS2 is normally configured as output function SS2OUT/-SS2. Can also be used as general-purpose I/O.
IO.9	H1.30	I/O	•	SDO1. SPI1 (master) data out. From RP19/SDO2 (U1.12). Part of the second SPI interface. RP19/SDO2 is normally configured as output function SDO2. Can also be used as general-purpose I/O.
IO.10	H1.28	I/O	•	SDI1. SPI1 (master) data in. To RP26/SDI2 (U1.11). Part of the second SPI interface. RP26/SDI2 is normally configured as input function SDI2. Can also be used as general-purpose I/O.
IO.11	H1.26	I/O	•	SCK1. SPI1 clock. From RP21/SCK2 (U1.10). Part of the second SPI interface. RP21/SCK2 is normally configured as output function SCK2OUT/SCK2. Can also be used as general-purpose I/O.
IO.12	H1.24	I/O	•	-URTS0. UART0 request-to-send. From RP5/-U1RTS (U1.48). Part of the first UART interface. RP5/-U1RTS is normally configured as output function -U1RTS. Can also be used as general-purpose I/O.
IO.13	H1.22	I/O	•	-UCTS0. UART0 clear-to-send. To RPI43/-U1CTS (U1.47). Part of the first UART interface. RPI43/-U1CTS is normally configured as input function -U1CTS. Can also be used as general-purpose I/O.
IO.14	H1.20	I/O	•	-URTS1. UART1 request-to-send. From RP31/-U2RTS (U1.39). Part of the second UART interface. RP31/-U2RTS is normally configured as output function -U2RTS. Can also be used as general-purpose I/O.
IO.15	H1.18	I/O	•	-UCTS1. UART1 clear-to-send. To RPI31/-U2CTS (U1.40). Part of the second UART interface. RPI31/-U2CTS is normally configured as input function -U2CTS. Can also be used as general-purpose I/O.

CubeSat Kit PSPM D Rev. A

IO.16	H1.16	I/O	•	General-purpose I/O. To/from RP2/RD8 (U1.68).
IO.17	H1.14	I/O	•	General-purpose I/O. To/from RP22/RD3 (U1.78).
IO.18	H1.12	I/O	•	General-purpose I/O. To/from RPI42/RD12 (U1.79).
IO.19	H1.10	I/O	•	General-purpose I/O. To/from RP25/RD4 (U1.81).
IO.20	H1.8	I/O	•	SCL1 . I2C1 clock. From SCL2 (U1.58). <i>Part of the second I2C interface. SCL2 is normally configured as an I2C clock output. Can also be used as general-purpose I/O.</i>
IO.21	H1.6	I/O	•	SDA1 . I2C1 data. To/from SDA2 (U1.59). <i>Part of the second I2C interface. SDA2 is normally configured as an I2C data input/output. Can also be used as general-purpose I/O.</i>
IO.22	H1.4	I/O	•	SCL2 . I2C2 clock. To/from SCL3/RE6 (U1.4). <i>Part of the third I2C interface (PIC24 only). SCL3 is normally configured as an I2C clock output. Can also be used as general-purpose I/O.</i>
IO.23	H1.2	I/O	•	SDA2 . I2C2 data. To/from SDA3/RE7 (U1.5). <i>Part of the third I2C interface (PIC24 only). SDA3 is normally configured as an I2C data input/output. Can also be used as general-purpose I/O.</i>
IO.24	H1.47	I/O	•	C0TX . CANbus 0 transmit data. From RF1/C1TX (U1.88). <i>Part of the first CAN interface (dsPIC33 only). C1TX is normally configured as a CAN output. Can also be used as general-purpose I/O.</i>
IO.25	H1.45	I/O	•	C0RX . CANbus 0 receive data. From RF0/C1RX (U1.87). <i>Part of the first CAN interface (dsPIC33 only). C1RX is normally configured as a CAN input. Can also be used as general-purpose I/O.</i>
IO.26	H1.43	I/O	•	C1TX . CANbus 1 transmit data. From RG1/C2TX (U1.89). <i>Part of the second CAN interface (dsPIC33 only). C2TX is normally configured as a CAN output. Can also be used as general-purpose I/O.</i>
IO.27	H1.41	I/O	•	C1RX . CANbus 1 receive data. From RG0/C2RX (U1.90). <i>Part of the second CAN interface (dsPIC33 only). C2RX is normally configured as a CAN input. Can also be used as general-purpose I/O.</i>
IO.28	H1.39	I/O	•	SCL1*/INT3 . I2C1 clock (alternate) / external interrupt. To/from ASCL2/INT4 (U1.66). <i>Provides an alternate location for the second I2C interface (PIC24) or an external interrupt (dsPIC33). If used, ASCL2 is normally configured as an I2C clock output. INT3 is normally configured as input function INT3. Can also be used as general-purpose I/O.</i>
IO.29	H1.37	I/O	•	SDA1*/INT4 . I2C1 data (alternate) / external interrupt. To/from ASDA2/INT3 (U1.67). <i>Provides an alternate location for the second I2C interface (PIC24) or an external interrupt (dsPIC33). If used, ASCL3 is normally configured as an I2C data input/output. INT4 is normally configured as input function INT4. Can also be used as general-purpose I/O.</i>
IO.30	H1.35	I/O	•	INT1 . External interrupt. To RPI33/INT1 (U1.18). <i>RPI33 is normally configured as input function INT1. Can also be used as general-purpose I/O.</i>
IO.31	H1.33	I/O	•	INT2 . External interrupt. To RPI34/INT2 (U1.19). <i>RPI34 is normally configured as input function INT2. Can also be used as general-purpose I/O.</i>
IO.32	H1.31	I/O	•	AN8 . Analog input 8. To AN5 (U1.20). <i>Can also be used as general-purpose I/O.</i>
IO.33	H1.29	I/O	•	AN9 . Analog input 9. To AN4 (U1.21). <i>Can also be used as general-purpose I/O.</i>
IO.34	H1.27	I/O	•	AN10 . Analog input 10. To AN3 (U1.22). <i>Can also be used as general-purpose I/O.</i>

CubeSat Kit PSPM D Rev. A

IO.35	H1.25	I/O	•	AN11. Analog input 11. To AN2 (U1.23). Can also be used as general-purpose I/O.
IO.36	H1.23	I/O	•	AN12. Analog input 12. To AN1 (U1.24). Also used for PGEC (ICD clock). Can also be used as general-purpose I/O.
IO.37	H1.21	I/O	•	AN13. Analog input 13. To AN0 (U1.25). Also used for PGED (ICD data). Can also be used as general-purpose I/O.
IO.38	H1.19	I/O	•	AN14. Analog input 14. To AN6 (U1.26). Can also be used as general-purpose I/O.
IO.39	H1.17	I/O	•	AN15. Analog input 15. To AN7 (U1.27). Can also be used as general-purpose I/O.
IO.40	H1.15	I/O	•	AN0. Analog input 0. To AN8 (U1.32). Can also be used as general-purpose I/O.
IO.41	H1.13	I/O	•	AN1. Analog input 1. To AN9 (U1.33). Can also be used as general-purpose I/O.
IO.42	H1.11	I/O	•	AN2. Analog input 2. To AN10 (U1.34). Can also be used as general-purpose I/O.
IO.43	H1.9	I/O	•	AN3. Analog input 3. To AN11 (U1.35). Can also be used as general-purpose I/O.
IO.44	H1.7	I/O	•	AN4. Analog input 4. To AN12 (U1.41). Can also be used as general-purpose I/O.
IO.45	H1.5	I/O	•	AN5. Analog input 5. To AN13 (U1.42). Can also be used as general-purpose I/O.
IO.46	H1.3	I/O	•	AN6. Analog input 6. To AN14 (U1.43). Can also be used as general-purpose I/O.
IO.47	H1.1	I/O	•	AN7. Analog input 7. To AN15 (U1.44). Can also be used as general-purpose I/O.

PPM PIN DESCRIPTIONS – Power

Name	Pin	I/O	CSKB	Description
+5V_USB	H1.49 H1.50	–	•	+5V USB power. From USB host. Powers PSPM.
+5V_SYS	H1.51 H1.52	–	•	+5V system power. From EPS or external +5V connector. Powers PSPM.
VCC_SD	H1.53 H1.54	–		+3.3V SD Card power. From PSPM's vcc.
VCC	H1.55 H1.56	–		+3.3V PSPM power, DB power and I/O level. From PSPM LDO U4 using +5V_SYS and/or +5V_USB.
DGND	H1.57 H1.58	–	•	Digital ground.
AGND	H1.59 H1.60	–	•	Analog ground.
VBATT	H1.61 H1.62	–	•	Not connected.
VBACKUP	H1.63 H1.64	–	•	Not connected.

PPM PIN DESCRIPTIONS – Analog References

Name	Pin	I/O	CSKB	Description
VREF0	H1.66	–	•	Positive analog voltage reference. To/from VREF+ (U1.29).
VREF1	H1.68	–	•	Not connected.
VREF2	H1.70	–	•	Negative analog voltage reference. To/from VREF- (U1.28).

PPM PIN DESCRIPTIONS – Reserved

Name	Pin	I/O	CSKB	Description
RSVD0	H1.72	–	•	Not connected. Reserved for future use.

RSVD1	H1.74	–	•	Not connected. Reserved for future use.
RSVD2	H1.76	–	•	Not connected. Reserved for future use.

PPM PIN DESCRIPTIONS – DB-Specific

Name	Pin	I/O	CSKB	Description
CB4 USBDP	H1.78	I		Not connected.
CB2 USBDM				
-ON_SD	H1.82	O		Control signal for SD Card power. From RE4 (U1.100). Active LOW, pulled high on the DB. When active, enables VCC_CARD on the DB, thereby powering SC Card socket and SD Card level translators / isolators. <i>Normally configured as a digital output.</i>
-ON_MHX	H1.84	O		Control signal for MHX socket power. From RE3 (U1.99). Active LOW, pulled high on the DB. When active, enables PWR_MHX on the DB, thereby powering MHX socket and MHX level translators / isolators. <i>Normally configured as a digital output.</i>
-OE_MHX	H1.86	O		Control signal for MHX interface. From RE2 (U1.98). Active LOW, pulled high on the DB. When active, enables signals to pass through MHX level translators / isolators. <i>Normally configured as a digital output.</i>
-OE_USB	H1.88	O		Control signal for USB interface. From RC1 (U1.6). Active LOW, pulled high on the DB. When active, enables signals to pass through USB level translators / isolators. <i>Normally configured as a digital output.</i>
-INT		I		Output from RTC's -IRQ open-collector output. To RPI38/RC1 (U1.6). When properly configured, can be used to interrupt Processor via DB RTC. <i>Normally configured as a digital input with change-on input interrupt capability.</i>
HS0	H1.90	I		Handshake signal. -RTS (USB) or -CTS (MHX). To RPI41/RC4 (U1.9). <i>Can be configured as an external interrupt to U1 or input handshake signal via its Peripheral Pin Select. Requires that R10 be fitted on the DB.</i>
HS1	H1.92	I		Handshake signal. -DTR (USB) or -DSR (MHX). To RPI40/RC3 (U1.8). <i>Can be configured as an external interrupt to U1 or input handshake signal via its Peripheral Pin Select. Requires that R11 be fitted on the DB.</i>
HS2	H1.94	I		Handshake signal. -PWE (USB) or -DCD (MHX). To RPI39/RC2 (U1.7). <i>Can be configured as an external interrupt to U1 or input handshake signal via its Peripheral Pin Select. Requires that R12 be fitted on the DB.</i>
HS3	H1.96	O		Handshake signal. -CTS (USB) or -RTS (MHX). From RP20/RD5 (U1.82). <i>Can be configured as an output handshake signal via its Peripheral Pin Select. Requires that R75 be fitted on the DB.</i>
HS4	H1.98	O		Handshake signal. -RI (USB) or -DTR (MHX). From RP23/RD2 (U1.77). <i>Can be configured as an output handshake signal via its Peripheral Pin Select. Requires that R76 be fitted on the DB.</i>
HS5	H1.100	O		Handshake (reset) signal. -RST (USB) or -RST (MHX). From RP24/RD1 (U1.76). <i>Can be configured as an output handshake signal via its Peripheral Pin Select. Requires that R77 be fitted on the DB.</i>

PPM PIN DESCRIPTIONS – Control & Status

Name	Pin	I/O	CSKB	Description
-FAULT_OC	H1.65	O		Open-collector output from PSPM's latchup prevention overcurrent switch. Active LOW. Wire-ORed to -FAULT_OC on the DB.
SENSE	H1.67	-	•	Can be used to measure PSPM's current consumption. The current used by the PSPM from a single source is (source - SENSE) / 75mΩ. Depends on PSPM implementation.
-RESET	H1.69	I	•	Reset signal to PSPM's reset supervisor. Active LOW.
OFF_VCC	H1.71	I	•	Control signal to PSPM's power circuit(s). Active HIGH.

PPM PIN DESCRIPTIONS – I2C Bus

Name	Pin	I/O	CSKB	Description
SDA_SYS	H1.73	I/O	•	I2C data. To/from SDA1 (U1.56). Part of the first I2C interface. SDA1 is normally configured as an I2C data input/output. Can also be used as general-purpose I/O.
SCL_SYS	H1.75	O	•	I2C clock. From SCL1 (U1.57). Part of the first I2C interface. SCL1 is normally configured as an I2C clock output. Can also be used as general-purpose I/O.

PPM PIN DESCRIPTIONS – User-defined

Name	Pin	I/O	CSKB	Description
USER0	H1.77	I/O	•	Not connected.
USER1	H1.79	I/O	•	Not connected.
USER2	H1.81	I/O	•	Not connected.
USER3	H1.83	I/O	•	Not connected.
USER4	H1.85	I/O	•	Not connected.
USER5	H1.87	I/O	•	Not connected.
USER6	H1.89	I/O	•	Not connected.
USER7	H1.91	I/O	•	Not connected.
USER8	H1.93	I/O	•	Not connected.
USER9	H1.95	I/O	•	Not connected.
USER10	H1.97	I/O	•	Not connected.
USER11	H1.99	I/O	•	Not connected.

SERIAL FLASH MEMORY INTERFACE – PIC24

PSPM D has an external 64Mbit serial flash memory (SFM) peripheral implemented via an SPI interface to an Atmel AT25DF641 (U5). The preferred method of interfacing to U5 is by using U1's third SPI interface (SPI3) — this will permit a very high-speed interface to U5. The pin assignments associated with this interface are listed below.

If the user desires to map SPI3 to the PPM connector instead, the SFM interface pins can be configured as simple I/O, using a software SPI driver to read and write from/to the SFM.

SERIAL FLASH MEMORY INTERFACE – dsPIC33

PSPM D has an external 64Mbit serial flash memory (SFM) peripheral implemented via an SPI interface to an Atmel AT25DF641 (U5). A software SPI driver is required to read and write from/to the SFM via this interface. The pin assignments associated with this interface are listed below.

PIN DESCRIPTIONS – Serial Flash Memory Interface

Name	Pin	I/O	Description
-WP	U5.3	I/O	-WP_SFM. SFM write-protect function. From RD6 (U1.83) . Part of the third SPI interface (PIC24) or a software SPI interface (dsPIC33). RD6 is normally configured as a simple output.
-CS	U5.1	I/O	-CS_SFM. SFM chip select. From RD13 (U1.80) . Part of the third SPI interface (PIC24) or a software SPI interface (dsPIC33). RD13 is normally configured as a simple output.
SDI	U5.5	I/O	SDO_SFM. SPI2 (master) data out. From RP11/RD0 (U1.72) . Part of the third SPI interface (PIC24) or a software SPI interface (dsPIC33). RP11/RD0 is normally configured as output function SDO3 (PIC24) or a simple output (dsPIC33).
SDO	U5.2	I/O	SDI_SFM. SPI2 (master) data in. From RP3/RD10 (U1.70) . Part of the third SPI interface (PIC24) or a software SPI interface (dsPIC33). RP3/RD10 is normally configured as input function SDI3 (PIC24) or a simple input (dsPIC33).
SCK	U5.6	I/O	SCK_SFM. SPI2 clock. From RP12/RD11 (U1.71) . Part of the third SPI interface (PIC24) or a software SPI interface (dsPIC33). RP12/RD11 is normally configured as output function SCK3OUT (PIC24) or a simple output (dsPIC33).

CONNECTORS

Item	Description	Source	Part Number	Application
1	100-pin, hermaphroditic	Samtec	LSS-150-02-L-DV	PPM connector (PSPM-specific, +6mm)

This connector information is provided for reference only.

PROGRAMMING & DEBUGGING

PSPM D provides two interfaces for programming and debugging – the popular and low-cost In-Circuit Debugging (ICD) interface, and a JTAG interface. The ICD interface is implemented via a 6-pin RJ11 modular connector on the PSPM. The JTAG interface is implemented via a 0.100" pitch header on the PSPM.

6-pin RJ11⁷ 6P6C modular connector **J1** is for the ICD. Customers can connect either a traditional Microchip® ICD like the ICD2 or ICD3, with its 6-pin modular cable, or a Microchip PICKit, to the PSPM's 6-pin 1x6 0.100" pitch inline header **J3**. **PGEC (U1.24)** and **PGED (U1.25)** are used as the clock/data pair for the ICD. No isolation from these signals to the CSK bus is provided – therefore care should be taken in connecting circuitry to **IO.36** and **IO.37** of the CSK bus.

14-pin 2x7 0.100" pitch dual-inline header **J2** is for JTAG, and is compatible with 14-conductor IDC ribbon cables for use with Microchip's Real ICE™ and other compatible ICES.

NOTES

The PIC24's Peripheral Pin Select system enables the user to place digital peripherals at the selected I/O pins of choice. When PSPM D is fitted with a PIC24 processor, the peripheral functions (e.g., second and third I2C interfaces, second SPI interface, third and fourth UART interfaces) beyond those that interact with peripheral hardware on the DB have been arranged in a logical manner on the PPM connector, and will correspond to the same arrangement on other PPMs where such additional peripherals present in the processor utilized on that PPM.

Additionally, some mappable PIC24 peripherals (e.g., the third and fourth UARTs) are not assigned pins on the PPM connector. The user can bring them to the CubeSat Kit bus – and thereby to any CubeSat Kit-compatible modules – by mapping them to unused **RP/RPI** pins (e.g., those on **IO.16** through

⁷ Also called RJ25.

IO.19), or to other ~~RP~~/RPI pins of choice. In all cases, IO.0 through IO.7 should remain with the peripheral assignments outlined above, as they correspond to resources on the CSK DB.

TRADEMARKS

The following are Pumpkin trademarks. All other names are the property of their respective owners.

- Pumpkin™ and the Pumpkin logo
- Salvo™ and the Salvo logo
- CubeSat Kit™ and the CubeSat Kit logo
- MISC™ and the MISC logo

DISCLAIMER

PUMPKIN RESERVES THE RIGHT TO MAKE ANY CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO CORRECT ERRORS AND IMPROVE RELIABILITY, FUNCTION, APPEARANCE OR DESIGN. PUMPKIN DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.



744 Naples Street
San Francisco, CA 94112 USA
tel: (415) 584-6360
fax: (415) 585-7948

web: <http://www.pumpkininc.com/>
email: info@pumpkininc.com

web: <http://www.cubesatkit.com/>
email: info@cubesatkit.com