Introducing the PIC24FJ128GA204 PIM

Overview

The PIC24FJ128GA204 PIM is designed to demonstrate the capabilities of the PIC24FJ128GA204 family using the Explorer 16 Demonstration Board kit and the PICtail™ Plus daughter boards. The PIC24FJ128GA204 is a 44-pin device with XLP Technology and Peripheral Pin Select (PPS) features. The PPS feature of this PIC24F family allows many of the digital peripherals on the part to be remapped to use any of a number of pins on the device. This allows for significant improvements in ease of design and helps to reduce cost by allowing for the smallest possible size devices to be used. The following two tables detail the pin mapping of the 44-pin device to the 100-pin PIM header.

- The 44-pin to 100-pin table (Table 1) lists the device pins and shows what functions are mapped to each pin. This table is most useful for viewing multiplexing conflicts which prevent some functions from being used simultaneously.
- The 100-pin to 44-pin table (Table 2) shows a listing of the Explorer 16 functions and what device pin is mapped to that function.

All supporting documentation and software for the Explorer 16 Development Board can be found at www.microchip.com/explorer16.

PIC24FJ128GA204 PIM Features

Due to the flexibility allowed by the PPS feature, the 44-pin device is capable of performing all of the base functions on the 100-pin Explorer 16 board. In addition, the PIM is compatible with most of the PICtail Plus daughter boards for the Explorer 16.

PIC24FJ128GA204 PIM Limitations

The result of multiplexing the functions from a 44-pin part to the 100-pin PIM header is that many of the functions cannot be used simultaneously. Explorer 16 board LEDs are multiplexed on switch and PMP lines, which means they will not always be usable if these functions are in use. The Explorer 16 potentiometer and temperature sensor cannot be used with PMP, and are selectable through Jumpers J1 and J2. Smart Card cannot be used along with PMP, and is selectable through Jumpers J3 and J4. The UART2 CTS signal cannot be used with PMP and is selectable through Jumper J6. The PICtail Plus daughter boards have similar limitations. All daughter boards will work by themselves, however, most PICtail Plus daughter boards will not work if two are installed simultaneously. Additionally, a PICtail Plus daughter board may not work with all of the default Explorer 16 functionality. If a PICtail Plus daughter board is designed to work with a Microchip Library, the respective system configuration may have to be modified to function with the PIM pinout and PPS feature. Please check the pinouts of the components you are using to ensure compatibility before attempting to use multiple peripheral functions or PICtail Plus daughter boards at the same time.

Tips for Using the PIC24FJ128GA204 PIM

- The Explorer 16 LEDs are multiplexed with a number of functions and so may not be useful in some situations. Make sure to check the mapping tables for conflicts.
- The PIC24FJ128GA204 port pins are not mapped to the corresponding port I/O on the Explorer 16. Make sure to use the following pinout tables as a cross reference to ensure you use the correct device pin in your application.
- Many of the peripherals used by the Explorer 16 and PICtail Plus daughter boards are implemented on pins with analog functionality. These peripherals may not conflict with analog features on other PIC24F PIMs. Make sure to add any necessary code to override this analog functionality in the application code used.
- Some Explorer 16 boards have a 5V LCD. If you are using a function which is multiplexed onto the PMP pins on one of these boards, it may be necessary to manually drive the pins initially. The pins must be driven in order to ensure the bus is driven to either VDD or VSS, instead of floating at 5V.
- **Jumper Settings:**

  Jumper J1 Pins (1-2) select the PMP Chip Select 2 strobe (PMCS2);
  Pins (2-3) select the Explorer 16 potentiometer function (POT).

  Jumper J2 Pins (1-2) select the PMP Byte Enable 1 strobe (PMBE1);
  Pins (2-3) select the Explorer 16 Analog Temperature Sensor (TEMP).

  Jumper J3 Pins (1-2) select the PMP Data<5> (PMD5);
  Pins (2-3) select the Smart Card's Rx pin (SC_RX).

  Jumper J4 Pins (1-2) select the PMP Read strobe (PMRD);
  Pins (2-3) select the Smart Card's Tx pin (SC_TX).

  Jumper J5 Pins (1-2) select the Explorer 16 Serial EEPROM CS (EE_CS);
  Pins (2-3) select the device PORTA<8> connection to Explorer 16 PORTD<1> (RD1).

  Jumper J6 Pins (1-2) select the PMP Write strobe (PMWR);
  Pins (2-3) select the UART2 CTS signal (U2CTS).
- Many PICtail Plus daughter boards use the EEPROM, SPI and UART2 (which has the RS-232 port functionality). These functions are mapped to ensure that they can be used together to allow support for these boards.

Table 1: 44-Pin to 100-Pin Pinout

Device Pin #	PIC24FJ128GA204 Pinout	Jumper	PIM Pin #	PIM Func #1	Jumper	PIM Pin #	PIM Func #2	Jumper	PIM Pin #	PIM Func #3	Jumper	PIM Pin #	PIM Func #4
1	C1INC/C2INC/C3INC/RP9/SDA1/ T1CK/CTED4/PMD3/CN21/RB9		56	RG3/SDA1(1)		99	RE3/PMD3						
2	RP22/PMA1/PMALH/CN18/RC6		1	RG15		23	RB2/SS1/ AN2(1)		43	RB14/ PMA1		92	RA7
3	RP23/PMA0/PMALL/CN17/RC7		39	RF13/U2RTS(1)		44	RB15/ PMA0		77	RD2			
4	RP24/PMA5/CN20/RC8		10	RG6/PMA5/ SCK2		48	RD15/ U1RTS(1)						
5	RP25/CTED7/PMA6/CN19/RC9		29	RA10/PMA6		50	RF5/PMA8/ U2TX		66	RA14/ INT3(1)		72	RD0(1)
6	VBAT		86	VBAT									
7	VCAP		85	VCAP									
8	RP10/CTED11/PMD2/CN16/PGD2/ RB10		98	RE2/PMD2									
9	REFI/RP11/CTED9/PMD1/CN15/ PGC2/RB11		94	RE1/PMD1									
10	AN8/HLVDIN/RP12/PMD0/CN14/ RB12		93	RE0/PMD0									
11	AN7/C1INC/REFO/RP13/CTPLS/ PMRD/PMWR/CN13/RB13	J4-SC_TX	51	RF3/U1TX	J4-PMRD	82	RD5/PMRD						
12	TMS/PMA2/PMALU/CN36/RA10		14	RG9/PMA2/SS2		17	RA0/TMS		69	RD9		83	RD6
13	TCK/PMA7/CN33/RA7		28	RA9/PMA7		38	RA1/TCK		80	RD13			
14	CVREF/AN6/C3INB/RP14/PMWR/ PMNEB/RTCC/CTED5/CN12/RB14	J6-U2CTS	40	RF12/U2CTS	J6-PMWR	81	RD4/ PMWR						
15	AN9/C3INA/RP15/T3CK/T2CK/ CTED6/PMA14/CN11/PMCS/PMCS1/ RB15		7	RC2(1)		33	RB9/AN9(1)		55	RF6/SCK1			
16	AVSS/VSS		31	AVSS									
17	AVDD		30	AVDD									
18	MCLR		13	MCLR									
19	CVREF+/VREF+/AN0/C3INC/CTED1/ CN2/RA0		25	RB0/AN0(1)									
20	CVREF-/VREF-/AN1/C3IND/CTED2/ CN3/RA1		24	RB1/AN1(1)									
21	AN2/CTCMP/C2INB/RP0/CN4/PGD1/ RB0		27	RB7/AN7/PGD									
22	AN3/C2INA/RP1/CTED12/CN5/ PGC1/RB1		26	RB6/AN6/PGC									
23	AN4/C1INB/RP2/SDA2/T5CK/T4CK/ CTED13/CN6/RB2		19	RE9/INT2(1)		49	RF4/PMA9/ U2RX		59	RA3/SDA2		87	RF0(1)
24	AN5/C1INA/RP3/SCL2/CTED8/CN7/ RB3		39	RF13/U2RTS(1)		47	RD14/ U1CTS(1)		58	RA2/SCL2		88	RF1(1)
25	AN10/RP16/PMBE1/CN8/RC0	J2-TEMP	21	RB4/AN4	J2-PMBE1	34	RB10/ PMA13		53	RF8/SDO1			
26	AN11/RP17/PMCS2/CN9/RC1	J1-POT	20	RB5/AN5		54	RF7/SDI1	J1-PMCS2	70	RD10/ PMCS2			
27	AN12/RP18/PMACK1/CN10/RC2		6	RC1(1)		18	RE8/INT1(1)		32	RB8/AN8(1)			
28	VDD		46	VDD		62	VDD						
29	VSS		15	VSS		45	VSS		75	VSS			
30	OSCI/CLKI/C1IND/PMCS1/CN30/RA2		63	OSC1		71	RD11/ PMCS1						
31	OSCO/CLKO/C2IND/CN29/RA3		64	OSC2									
32	TDO/PMA8/CN34/RA8		61	RA5/TDO	J5-RD1	76	RD1	J5-EE_CS	79	RD12			
33	SOSCI/CN1/RP4/RB4		XT on PIM										
34	SOSCO/SCLKI/CN0/RA4		XT on PIM										
35	TDI/PMA9/CN35/RA9		22	RB3/AN3(1)		60	RA4/TDI		84	RD7		96	RG12
36	RP19/PMBE0/CN28/RC3		67	RA15/INT4(1)		78	RD3/PMBE		95	RG14			
37	RP20/PMA4/CN25/RC4		11	PMA4/SDI2		96	RG12						
38	RP21/PMA3/CN26/RC5		12	PMA3/SDO2		91	RA6		97	RG13			
39	VSS		15	VSS		45	VSS		75	VSS			
40	VDD		46	VDD		62	VDD						
41	PGD3/RP5/ASDA1/PMD7/CN27/RB5		5	RE7/PMD7									
42	PGC3/RP6/ASCL1/PMD6/CN24/RB6		4	RE6/PMD6									
43	RP7/CTED3/INT0/CN23/PMD5/RB7	J3-PMD5	3	RE5/PMD5	J3-SC_RX	52	RF2/U1RX						
44	RP8/SCL1/CTED10/PMD4/CN22/RB8		57	RG2/SCL1(1)		100	RE4/PMD4						

Note 1: This pin is a common or required signal for PICtail™ Plus daughter boards.

Table 2: 100-Pin to 44-Pin Pinout

Exp 16 Pin #	PIM Function	Jumper	Device Pin #	PIC24FJ128GA204 Pinout
1	RG15		2	RP22/PMA1/PMALH/CN18/RC6
2	VDD			
3	RE5/PMD5	J3-PMD5	43	RP7/CTED3/INT0/CN23/PMD5/RB7
4	RE6/PMD6		42	PGC3/RP6/ASCL1/PMD6/CN24/RB6
5	RE7/PMD7		41	PGD3/RP5/ASDA1/PMD7/CN27/RB5
6	RC1(1)		27	AN12/RP18/PMACK1/CN10/RC2
7	RC2(1)		15	AN9/C3INA/RP15/T3CK/T2CK/CTED6/PMA14/CN11/PMCS/PMCS1/RB15
8	RC3			
9	RC4			
10	RG6/PMA5/SCK2		4	RP24/PMA5/CN20/RC8
11	PMA4/SDI2		37	RP20/PMA4/CN25/RC4
12	PMA3/SDO2		38	RP21/PMA3/CN26/RC5
13	MCLR		18	MCLR
14	RG9/PMA2/SS2		12	TMS/PMA2/PMALU/CN36/RA10
15	VSS		29	VSS
			39	VSS
16	VDD			
17	RA0/TMS		12	TMS/PMA2/PMALU/CN36/RA10
18	RE8/INT1(1)		27	AN12/RP18/PMACK1/CN10/RC2
19	RE9/INT2(1)		23	AN4/C1INB/RP2/SDA2/T5CK/T4CK/CTED13/CN6/RB2
20	RB5/AN5	J1-POT	26	AN11/RP17/PMCS2/CN9/RC1
21	RB4/AN4	J2-TEMP	25	AN10/RP16/PMBE1/CN8/RC0
22	RB3/AN3(1)		35	TDI/PMA9/CN35/RA9
23	RB2/SS1/AN2(1)		2	RP22/PMA1/PMALH/CN18/RC6
24	RB1/AN1(1)		20	CVREF-/VREF-/AN1/C3IND/CTED2/CN3/RA1
25	RB0/AN0(1)		19	CVREF+/VREF+/AN0/C3INC/CTED1/CN2/RA0
26	RB6/AN6/PGC		22	AN3/C2INA/RP1/CTED12/CN5/PGC1/RB1
27	RB7/AN7/PGD		21	AN2/CTCMP/C2INB/RP0/CN4/PGD1/RB0
28	RA9/PMA7		13	TCK/PMA7/CN33/RA7
29	RA10/PMA6		5	RP25/CTED7/PMA6/CN19/RC9
30	AVDD		17	AVDD
31	AVSS		16	AVSS/VSS
32	RB8/AN8(1)		27	AN12/RP18/PMACK1/CN10/RC2
33	RB9/AN9(1)		15	AN9/C3INA/RP15/T3CK/T2CK/CTED6/PMA14/CN11/PMCS/PMCS1/RB15
34	RB10/PMA13	J2-PMBE1	25	AN10/RP16/PMBE1/CN8/RC0
35	RB11/PMA12			
36	VSS			
37	VDD			
38	RA1/TCK		13	TCK/PMA7/CN33/RA7
39	RF13/U2RTS(1)		3	RP23/PMA0/PMALL/CN17/RC7
			24	AN5/C1INA/RP3/SCL2/CTED8/CN7/RB3
40	RF12/U2CTS	J6-U2CTS	14	CVREF/AN6/C3INB/RP14/PMWR/PMNEB/RTCC/CTED5/CN12/RB14
41	RB12/PMA11			
42	RB13/PMA10			
43	RB14/PMA1		2	RP22/PMA1/PMALH/CN18/RC6
44	RB15/PMA0		3	RP23/PMA0/PMALL/CN17/RC7
45	VSS		29	VSS
			39	VSS
46	VDD		28	VDD
			40	VDD
47	RD14/U1CTS(1)		24	AN5/C1INA/RP3/SCL2/CTED8/CN7/RB3
48	RD15/U1RTS(1)		4	RP24/PMA5/CN20/RC8
49	RF4/PMA9/U2RX		23	AN4/C1INB/RP2/SDA2/T5CK/T4CK/CTED13/CN6/RB2
50	RF5/PMA8/U2TX		5	RP25/CTED7/PMA6/CN19/RC9

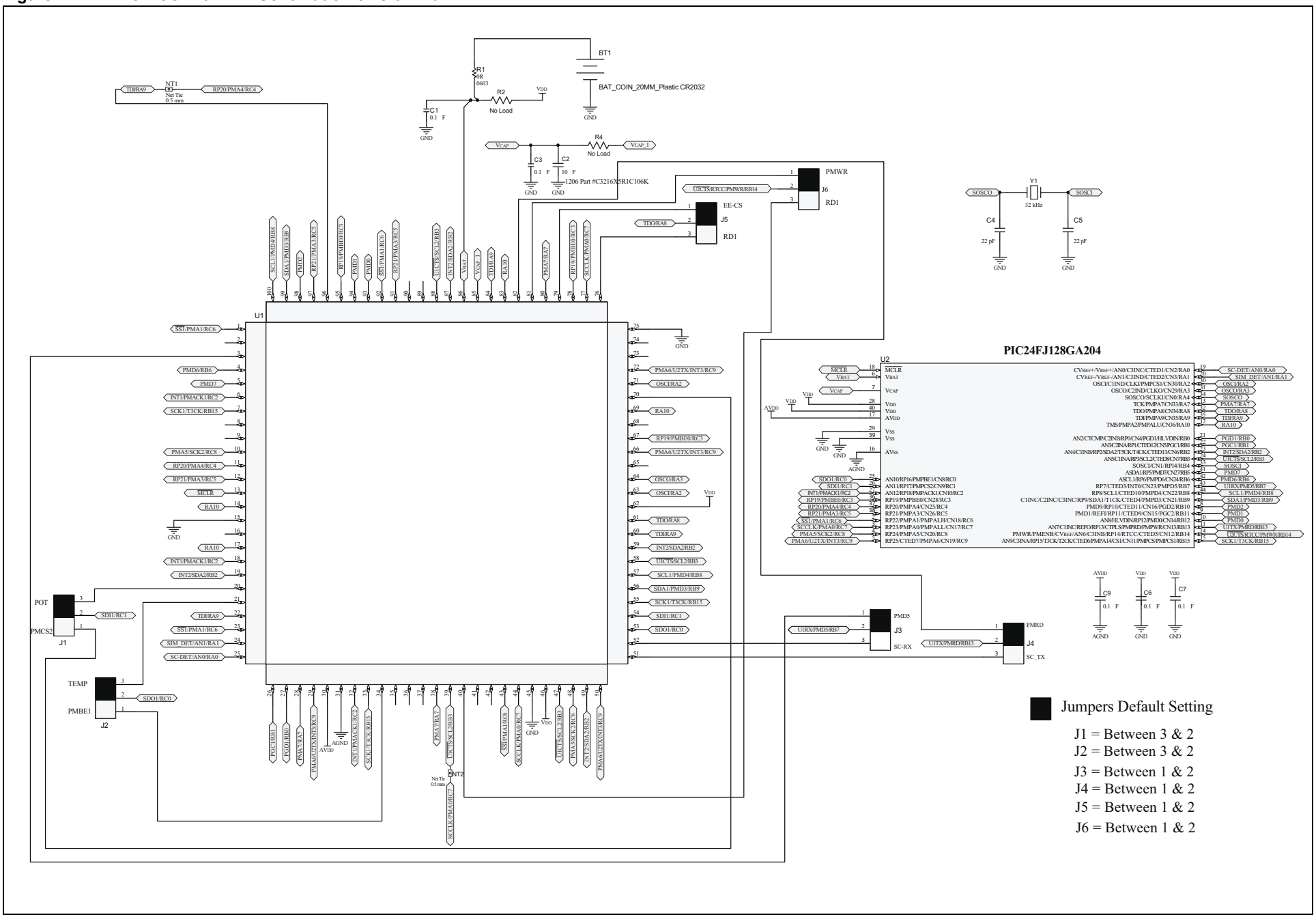
Note 1: This pin is a common or required signal for PICtail™ Plus daughter boards.

Table 2: 100-Pin to 44-Pin Pinout (Continued)

Exp 16 Pin #	PIM Function	Jumper	Device Pin #	PIC24FJ128GA204 Pinout
51	RF3/U1TX	J4-SC_TX	11	AN7/C1INC/REFO/RP13/CTPLS/PMRD/PMWR/CN13/RB13
52	RF2/U1RX	J3-SC_RX	43	RP7/CTED3/INT0/CN23/PMD5/RB7
53	RF8/SDO1		25	AN10/RP16/PMBE1/CN8/RC0
54	RF7/SDI1		26	AN11/RP17/PMCS2/CN9/RC1
55	RF6/SCK1		15	AN9/C3INA/RP15/T3CK/T2CK/CTED6/PMA14/CN11/PMCS/PMCS1/RB15
56	RG3/SDA1(1)		1	C1INC/C2INC/C3INC/RP9/SDA1/T1CK/CTED4/PMD3/CN21/RB9
57	RG2/SCL1(1)		44	RP8/SCL1/CTED10/PMD4/CN22/RB8
58	RA2/SCL2		24	AN5/C1INA/RP3/SCL2/CTED8/CN7/RB3
59	RA3/SDA2		23	AN4/C1INB/RP2/SDA2/T5CK/T4CK/CTED13/CN6/RB2
60	RA4/TDI		35	TDI/PMA9/CN35/RA9
61	RA5/TDO		32	TDO/PMA8/CN34/RA8
62	VDD		28	VDD
			40	VDD
63	OSC1		30	OSCI/CLKI/C1IND/PMCS1/CN30/RA2
64	OSC2		31	OSCO/CLKO/C2IND/CN29/RA3
65	VSS			
66	RA14/INT3(1)		5	RP25/CTED7/PMA6/CN19/RC9
67	RA15/INT4(1)		36	RP19/PMBE0/CN28/RC3
68	RD8			
69	RD9		12	TMS/PMA2/PMALU/CN36/RA10
70	RD10/PMCS2	J1-PMCS2	26	AN11/RP17/PMCS2/CN9/RC1
71	RD11/PMCS1		30	OSCI/CLKI/C1IND/PMCS1/CN30/RA2
72	RD0(1)		5	RP25/CTED7/PMA6/CN19/RC9
73	RC13/SOSCI			
74	RC14/SOSCO			
75	VSS		29	VSS
			39	VSS
76	RD1	J5-RD1	32	TDO/PMA8/CN34/RA8
77	RD2		3	RP23/PMA0/PMALL/CN17/RC7
78	RD3/PMBE		36	RP19/PMBE0/CN28/RC3
79	RD12	J5-EE_CS	32	TDO/PMA8/CN34/RA8
80	RD13		13	TCK/PMA7/CN33/RA7
81	RD4/PMWR	J6-PMWR	14	CVREF/AN6/C3INB/RP14/PMWR/PMNEB/RTCC/CTED5/CN12/RB14
82	RD5/PMRD	J4-PMRD	11	AN7/C1INC/REFO/RP13/CTPLS/PMRD/PMWR/CN13/RB13
83	RD6		12	TMS/PMA2/PMALU/CN36/RA10
84	RD7		35	TDI/PMA9/CN35/RA9
85	VCAP		7	VCAP
86	VBAT		6	VBAT
87	RF0(1)		23	AN4/C1INB/RP2/SDA2/T5CK/T4CK/CTED13/CN6/RB2
88	RF1(1)		24	AN5/C1INA/RP3/SCL2/CTED8/CN7/RB3
89	RG1			
90	RG0			
91	RA6		38	RP21/PMA3/CN26/RC5
92	RA7		2	RP22/PMA1/PMALH/CN18/RC6
93	RE0/PMD0		10	AN8/HLVDIN/RP12/PMD0/CN14/RB12
94	RE1/PMD1		9	REFI/RP11/CTED9/PMD1/CN15/PGC2/RB11
95	RG14		36	RP19/PMBE0/CN28/RC3
96	RG12		35	TDI/PMA9/CN35/RA9
			37	RP20/PMA4/CN25/RC4
97	RG13		38	RP21/PMA3/CN26/RC5
98	RE2/PMD2		8	RP10/CTED11/PMD2/CN16/PGD2/RB10
99	RE3/PMD3		1	C1INC/C2INC/C3INC/RP9/SDA1/T1CK/CTED4/PMD3/CN21/RB9
100	RE4/PMD4		44	RP8/SCL1/CTED10/PMD4/CN22/RB8

Note 1: This pin is a common or required signal for PICtail™ Plus daughter boards.

Figure 1: PIC24FJ128GA204 PIM Schematic Revision 1.0



Note on Secondary Oscillator Crystal Selection:

An example crystal circuit is shown here. Please refer to *AN1798, "Crystal Selection for Low-Power Secondary Oscillator"* for guidance on selecting the right crystal and the recommended layout for the application.

Americas
Atlanta - 678-957-9614
Austin - 512-257-3370
Boston - 774-760-0087
Chicago - 630-285-0071
Cleveland - 216-447-0464
Dallas - 972-818-7423
Detroit - 248-848-4000
Houston - 281-894-5983
Indianapolis - 317-773-8323
Los Angeles - 949-462-9523
New York - 631-435-6000
Phoenix - 480-792-7200
San Jose - 408-735-9110
Toronto - 905-673-0699

Asia/Pacific
Australia - Sydney - 61-2-9868-6733
China - Beijing - 86-10-8569-7000
China - Chengdu - 86-28-8665-5511
China - Chongqing - 86-23-8980-9588
China - Hangzhou - 86-571-8792-8115
China - Hong Kong SAR - 852-2943-5100
China - Nanjing- 86-25-8473-2460
China - Qingdao - 86-532-8502-7355
China - Shanghai - 86-21-5407-5533
China - Shenyang - 86-24-2334-2829
China - Shenzhen - 86-755-8864-2200
China - Wuhan - 86-27-5980-5300
China - Xiamen - 86-592-2388138
China - Xian - 86-29-8833-7252
China - Zhuhai - 86-756-3210040
India - Bangalore - 91-80-3090-4444
India - New Delhi - 91-11-4160-8631
India - Pune - 91-20-3019-1500
Japan - Osaka - 81-6-6152-7160
Japan - Tokyo - 81-3-6880-3770
Korea - Daegu - 82-53-744-4301
Korea - Seoul - 82-2-554-7200
Malaysia - Kuala Lumpur - 60-3-6201-9857
Malaysia - Penang - 60-4-227-8870
Philippines - Manila - 63-2-634-9065
Singapore - 65-6334-8870
Taiwan - Hsin Chu - 886-3-5778-366
Taiwan - Kaohsiung - 886-7-213-7830
Taiwan - Taipei - 886-2-2508-8600
Thailand - Bangkok - 66-2-694-1351

Europe
Austria - Weis - 43-7242-2244-39
Denmark - Copenhagen - 45-4450-2828
France - Paris - 33-1-69-53-63-20
Germany - Dusseldorf - 49-2129-3766400
Germany - Munich - 49-89-627-144-0
Germany - Pforzheim - 49-7231-424750
Italy - Milan - 39-0331-742611
Italy - Venice - 39-049-7625286
Netherlands - Drunen - 31-416-690399
Poland - Warsaw - 48-22-3325737
Spain - Madrid - 34-91-708-08-90
Sweden - Stockholm - 46-8-5090-4654
UK - Wokingham - 44-118-921-5800

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Microchip Technology Inc. • 2355 West Chandler Blvd. • Chandler, AZ 85224-6199
www.microchip.com

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