ATSAME70 100-Pin Motor Control Plug-In Module Information Sheet

Introduction

The ATSAME70 100-Pin Motor Control Plug-in Module (PIM), MA320024, is designed to demonstrate the capabilities of ATSAME70 144-pin Motor Control devices using external op amps with the following hardware:

- dsPICDEM™ MCLV-2 development board (DM330021-2)
- dsPICDEM™ MCHV-3 development board (DM330023-3)

Both development boards support 100-pin PIM interfaces. ATSAME70 Motor Control PIM is designed to utilize on board external op amps for signal conditioning of analog feedback inputs.

For dsPICDEM™ MCLV-2 development board, insert external op amp configuration board (included with the development board) at header J4.

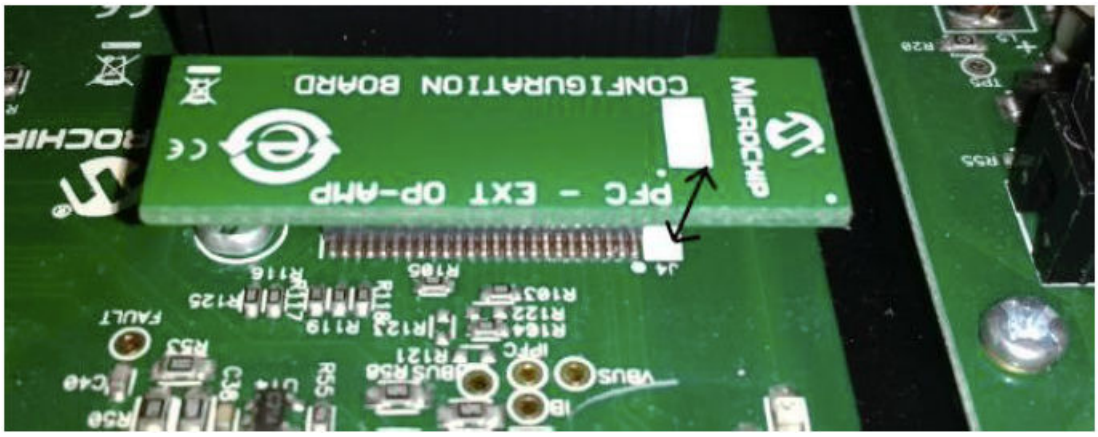
For dsPICDEM™ MCHV-3 development board, insert PFC–EXT-OPAMP configuration board (included with the development board) at header J14.

Figure 1. Op amp Configuration Board for dsPICDEM™ MCLV-2



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Figure 2. Op amp Configuration Board for dsPICDEM™ MCHV-3



⚠WARNING Do not connect non-isolated oscilloscope probes to probe any traces while using the PIM with the dsPICDEM MCHV-3 development boards. Instead, use a high-voltage differential probe, rated in excess of 600 VRMS (Common mode). Failure to heed this warning could result in hardware damage.

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1. PIM to MCU Mapping

The following table provides the static mapping between the 100-pin PIM pins and the 144-pin device pins.

Table 1-1.

PIM Connector PIN	MCLV2 100-pin connection		MCHV3 100-pin connection		100-pin connector signal name	SAME70 MCU Pin	MCU Pin Number
	Pin Name	Functionality	Pin Name	Functionality			
1	DBG_LED2	Debug LED 2	DBG_LED1	Debug LED 1	LED2	PA24_LED	56
2	VDD	NC	VDD	NC	VDD	-	5, 30, 43, 80, 72, 96, 134, 143
3	PWM1H3	PWM Output - 3H	PWM1H3	PWM Output - 3H	PWM1H3	PA13_PWM0_WH	42
4	NC	NC	NC	NC	NC	-	-
5	NC	NC	NC	NC	NC	-	-
6	NC	NC	NC	NC	NC	-	-
7	NC	NC	NC	NC	NC	-	-
8	NC	NC	NC	NC	NC	-	-
9	NC	NC	NC	NC	NC	-	-
10	NC	NC	NC	NC	NC	-	-
11	NC	NC	NC	NC	NC	-	-
12	NC	NC	NC	NC	NC	-	-
13	MCLR	Device Master Clear	MCLR	Device Master Clear	NRST	NRST	83
14	NC	NC	NC	NC	NC	-	-
15	VSS	NC	VSS	NC	VSS	-	44, 61, 95, 115, 135, 138
16	VDD	NC	VDD	NC	VDD	-	5, 30, 43, 80, 72, 96, 134, 143
17	NC	NC	NC	NC	NC	-	-
18	FAULT	DC bus Current Fault (active low logic)	FAULT	DC bus Current Fault (active low logic)	FAULT_PWM	PD09_FAULT_PWM	110
19	TX	UART Transmit	PFC_FLT	IPFC Fault (overvoltage or overcurrent)	PFC_EN_FLT	PA02_PFCFLT_PFCEN	93
20	PIM_V_M3	Voltage feedback signal	PIM_INDX/POT/V_M3	Hall Sensor/Current Sense/Voltage Feedback Signal	NA	-	-
21	PIM_V_M2	Voltage feedback signal	PIM_QEB/IB/V_M2	Hall Sensor/Current Sense/Voltage Feedback Signal	NA	-	-
22	PIM_V_M1	Voltage feedback signal	PIM_QEA/IA/V_M1	Hall Sensor/Current Sense/Voltage Feedback Signal	NA	-	-
23	PIM_IMOTOR_SUM	DC bus current signal	PIM_IBUS/VBUS	DC bus Voltage (downscaled)	VBUS2	PA20_AFE0_CH9_VDC_ISHUNT	22
24	PIM_IMOTOR2	Phase current signal	PIM_IB/POT	AC Input Zero Cross/AC Input Voltage (downscaled)/ Potentiometer	NA	-	-
25	PIM_IMOTOR1	Phase current signal	PIM_IA/IPFC	PFC Current (buffered)	NA	-	-
26	PGC	Device programming clock line	PGC	Device programming clock line	NC	PB07_SWCLK	89
27	PGD	Device programming data line	PGD	Device programming data line	NC	PB06_SWDIO	79
28	VREF	Reference voltage (half of AVDD voltage)	AVDD/2	Reference voltage (half of AVDD voltage)	VREF	-	-
29	PIM_REC_NEUTR	Reconstructed motor neutral line voltage	PIM_REC_NEUTR	Reconstructed motor neutral line voltage	NEUTR	PB03_AFE0_CH2_REC_NEUTR	31

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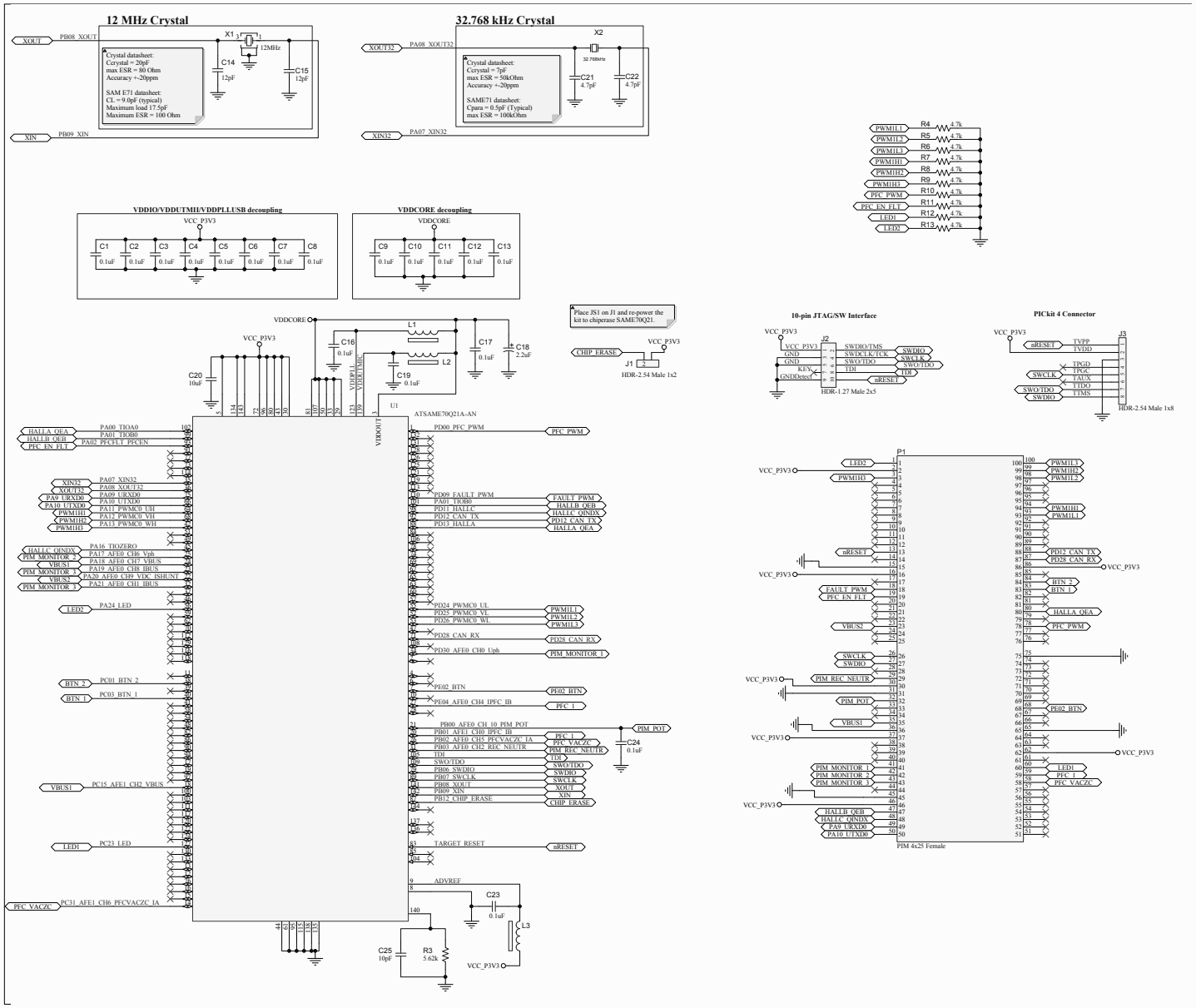
PIM Connector PIN	MCLV2 100-pin connection		MCHV3 100-pin connection		100-pin connector signal name	SAME70 MCU Pin	MCU Pin Number
	Pin Name	Functionality	Pin Name	Functionality			
30	AVDD	Analog supply	AVDD	Analog supply	AVDD	-	5, 30, 43, 80, 72, 96, 134, 143
31	AVSS	Analog supply	AVSS	Analog supply	GND	-	44, 61, 95, 115, 135, 138
32	PIM_POT	Potentiometer signal	PIM_POT	Potentiometer signal	POT	PB00_AFE0_CH10_PIM_POT	21
33	NC	NC	PIM_POT	Potentiometer signal	NC	PB00_AFE0_CH10_PIM_POT	-
34	PIM_GEN2	General I/O	PIM_GEN2	General I/O	NC	-	-
35	PIM_VBUS	DC bus voltage (downscaled)	PIM_VBUS	DC bus voltage (downscaled)	VBUS1	PA18_AFE0_CH7_VBUS; PC15_AFEC1_CH2_VBUS	24, 18
36	VSS	NC	VSS	NC	VSS	-	44, 61, 95, 115, 135, 138
37	VDD	NC	VDD	NC	VDD	-	5, 30, 43, 80, 72, 96, 134, 143
38	NC	NC	PIM_VAC_VOL2	AC input voltage (unbuffered)	NC	-	-
39	NC	NC	PB00_AFE0_CH10_BEMF_W_ADC	PFC shunt signal	NC	-	-
40	NC	NC	PIM_PFC_L	PFC shunt signal	NC	-	-
41	PIM_MONITOR_1	Hall sensor/Current sense/Voltage feedback signal	PIM_V_M1/POT	Hall Sensor/Current Sense/Voltage Feedback Signal	Ph_Cur_1	PD30_AFE0_CH0_Uph	34
42	PIM_MONITOR_2	Hall sensor/Current sense/Voltage feedback signal	PIM_V_M2	Hall Sensor/Current Sense/Voltage Feedback Signal	Ph_Cur_2	PA17_AFE0_CH6_Vph	25
43	PIM_MONITOR_3	Hall sensor/Current sense/Voltage feedback signal	PIM_V_M3/IBUS	Hall Sensor/Current Sense/Voltage Feedback Signal	I_Shunt	PA21_AFE0_CH1_IBUS & PA19_AFE0_CH8_IBUS	32, 33
44	NC	NC	NC	NC	NC	-	-
45	VSS	NC	VSS	NC	VSS	-	44, 61, 95, 115, 135, 138
46	VDD	NC	VDD	NC	VDD	-	5, 30, 43, 80, 72, 96, 134, 143
47	HALLB	Hall sensor/QEI input	HB/QEB	Hall sensor/QEI input	HALLB_QEB	PD10_HALLB & PA01_TIOB0	101, 99
48	HALLC	Hall sensor/QEI input	HC/INDX	Hall sensor/QEI input	HALLC_QINDX	PD11_HALLC & PA16_TIOZERO	98, 45
49	RX	UART Receive	RX	UART Receive	PA09_URXD0	PA09_URXD0	75
50	TX	UART Transmit	TX	UART Transmit	PA10_UTXD0	PA10_UTXD0	66
51	USB_TX	UART Transmit (connected directly to U7)	NC	NC	NC	-	-
52	USB_RX	UART Receive (connected directly to U7)	NC	NC	NC	-	-
53	NC	NC	NC	NC	NC	-	-
54	NC	NC	NC	NC	NC	-	-
55	NC	NC	NC	NC	NC	-	-
56	NC	NC	NC	NC	NC	-	-
57	NC	NC	NC	NC	NC	-	-
58	PIM_FLT_OUT2	General I/O	PIM_FLT_OUT2 (VACZC)	General I/O	PFC_VACZC	PC31_AFE1_CH6_PFCVACZC_IA; PB02_AFE0_CH5_PFCVACZC_IA	14, 26
59	PIM_FLT_OUT1	General I/O	PIM_FLT_OUT1 (IPFC)	General I/O	PFC_I	PB01_AFE1_CH0_IPFC_IB; PE04_AFE0_CH4_IPFC_IB	20, 27
60	DBG_LED1	Debug LED 1	DBG_LED2	Debug LED 2	LED1	PC23_LED (Pull down with 4.7K)	127
61	HOME	Home signal for QEI	HOME	Home signal for QEI	NC	-	-
62	VDD	NC	VDD	NC	VDD	-	5, 30, 43, 80, 72, 96, 134, 143
63	OSC1/CLKO	Crystal oscillator in	OSCI	Crystal oscillator in	NC	-	-
64	OSC2/CLKI	Crystal oscillator out	OSCO	Crystal oscillator out	NC	-	-
65	VSS	NC	VSS	NC	VSS	-	44, 61, 95, 115, 135, 138

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PIM Connector PIN	MCLV2 100-pin connection		MCHV3 100-pin connection		100-pin connector signal name	SAME70 MCU Pin	MCU Pin Number
	Pin Name	Functionality	Pin Name	Functionality			
66	PIM_IBUS+	BUS current shunt signal	PIM_IBUS+	BUS current shunt signal	NC	-	-
67	PIM_IBUS-	BUS current shunt signal	PIM_IBUS-	BUS current shunt signal	NC	-	-
68	LIN_CS	LIN Chip Select signal	BTN	Push Button	NC	PE02_BTN	7
69	LIN_FAULT	LIN Fault signal	NC	NC	NC	-	-
70	RX	UART Receive	RX	UART Receive	NC	-	-
71	NC	NC	PIM_PFC_PWM	PFC PWM Output	NC	-	-
72	USB_RX	UART Receive (connected directly to U7)	HA/QEA	Hall Sensor/QEI Input	NC	-	-
73	PIM_IB+	IMOTOR1 shunt signal	PIM_IB+	IB Shunt Signal	NC	-	-
74	PIM_IA+	IMOTOR2 shunt signal	PIM_IA+	IA Shunt Signal	NC	-	-
75	VSS	NC	VSS	NC	VSS	-	44, 61, 95, 115, 135, 138
76	USB_TX	UART Transmit (connected directly to U7)	HB/QEB	Hall Sensor/QEI Input	NC	-	-
77	CAN_TX	CAN Transmit	PIM_HALLC/INDX/STP_PWM	Hall Sensor/QEI Input	NC	-	-
78	CAN_RX	CAN Receive	PIM_PFC_PWM	PFC PWM Output	PFC_PWM	PD00_PFC_PWM	1
79	NC	NC	VACZX	AC Input Zero Cross	NC	-	-
80	HALLA	Hall sensor/QEI input	HA/QEA	Hall Sensor/QEI Input	HALLA_QEA	PD13_HALLA & PA00_TIOA0	88, 102
81	NC	NC	NC	NC	NC	-	-
82	PIM_GEN1	General I/O	PIM_GEN1	General I/O	NC	-	-
83	BTN_1	Push-button S2 input	NC	NC	BTN1	PC03_BTN1	40
84	BTN_2	Push-button S3 input	TX	UART Transmit	BTN2	PC01_BTN2	38
85	NC	NC	NC	NC	NC	-	-
86	VDD	NC	VDD	NC	VDD	-	5, 30, 43, 80, 72, 96, 134, 143
87	CAN_RX	CAN Receive	NC	NC	NC	PD28_CAN_RX	71
88	CAN_TX	CAN Transmit	NC	NC	NC	PD12_CAN_TX	92
89	NC	NC	NC	NC	NC	-	-
90	NC	NC	NC	NC	NC	-	-
91	NC	NC	NC	NC	NC	-	-
92	NC	NC	NC	NC	NC	-	-
93	PWM1L1	PWM Output - 1L	PWM1L1	PWM Output - 1L	PWM1L1	PD24_PWMC0_UL	55
94	PWM1H1	PWM Output - 1H	PWM1H1	PWM Output - 1H	PWM1H1	PA11_PWMC0_UH	64
95	NC	NC	NC	NC	NC	-	-
96	NC	NC	NC	NC	NC	-	-
97	NC	NC	NC	NC	NC	-	-
98	PWM1L2	PWM Output - 2L	PWM1L2	PWM Output - 2L	PWM1L2	PD25_PWMC0_VL	52
99	PWM1H2	PWM Output - 2H	PWM1H2	PWM Output - 2H	PWM1H2	PA12_PWMC0_VH	68
100	PWM1L3	PWM Output - 3L	PWM1L3	PWM Output - 3L	PWM1L3	PD26_PWMC0_WL	53

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Figure 1-1. ATSAME70 Motor Control PIM Schematic



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