ATSAME70

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

Figure 2. Op amp Configuration Board for dsPICDEM™ MCHV-3
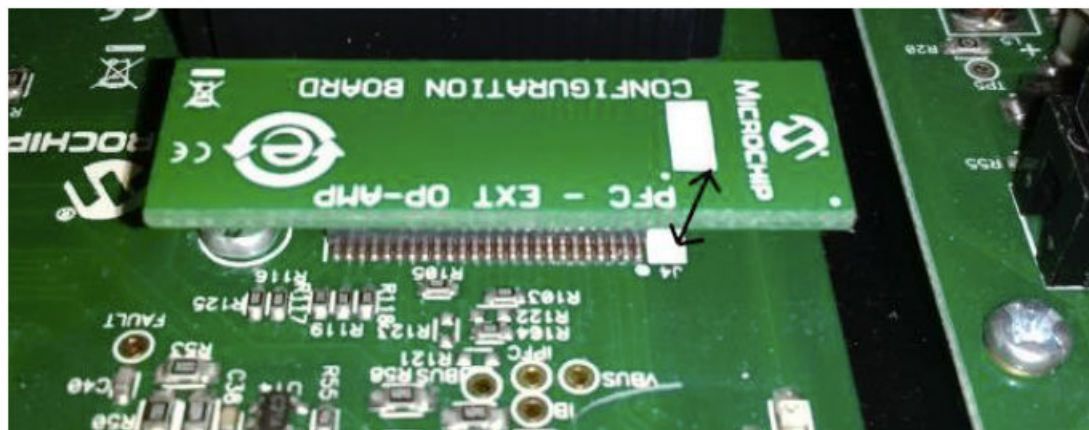
⚠WARNING	Do not connect non-isolated oscilloscope probes to probe any traces while using the PIM with the dsPICDEM MCHV-3 development boards. Instead, use a high-voltage differential probe, rated in excess of 600 VRMS (Common mode). Failure to heed this warning could result in hardware damage.

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

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

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

Figure 1-1. ATSAME70 Motor Control PIM Schematic

ATSAME70

PIM to MCU Mapping
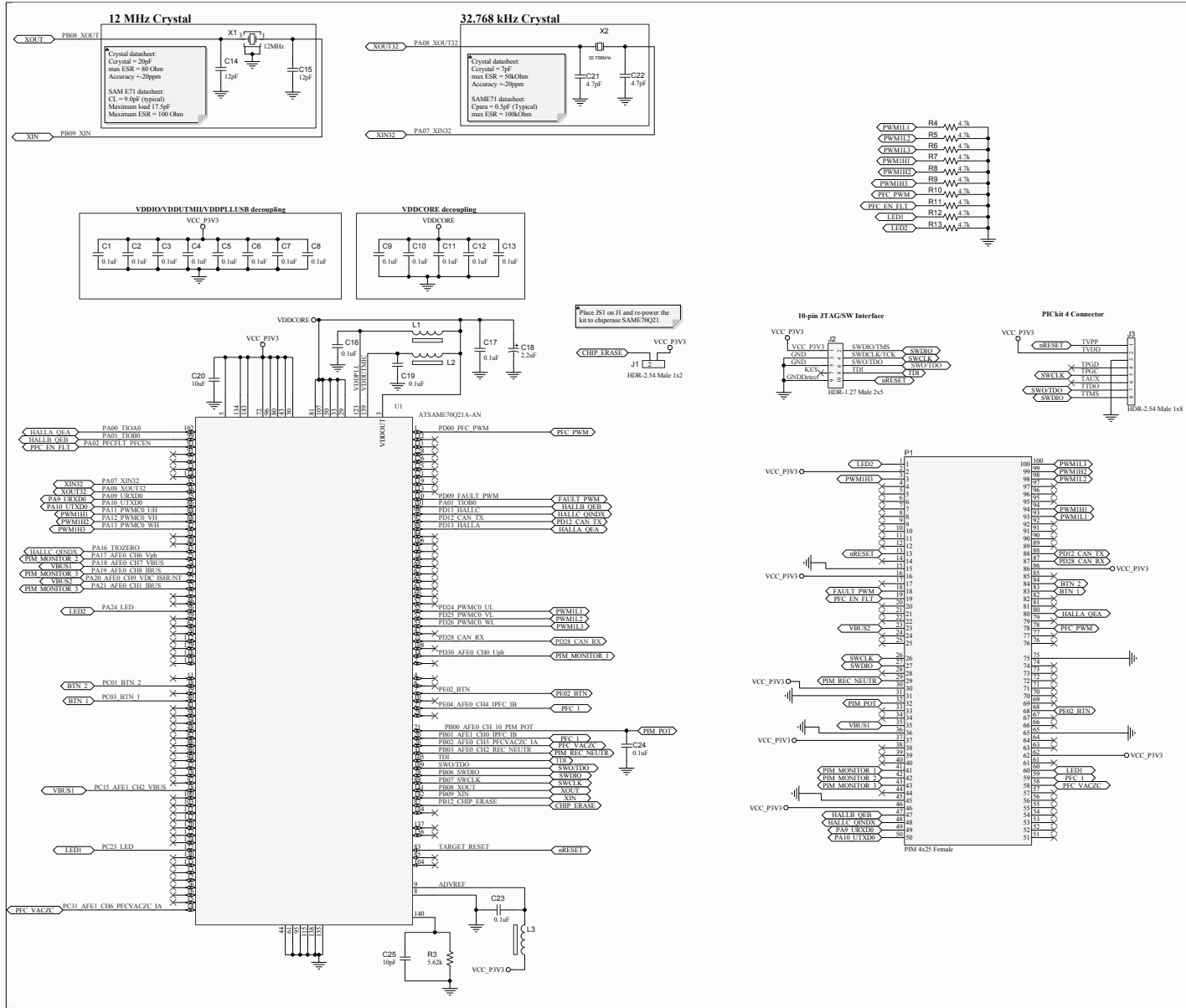
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