dsPIC33AK256MPS306 Motor Control Dual In-Line Module (DIM) Information Sheet

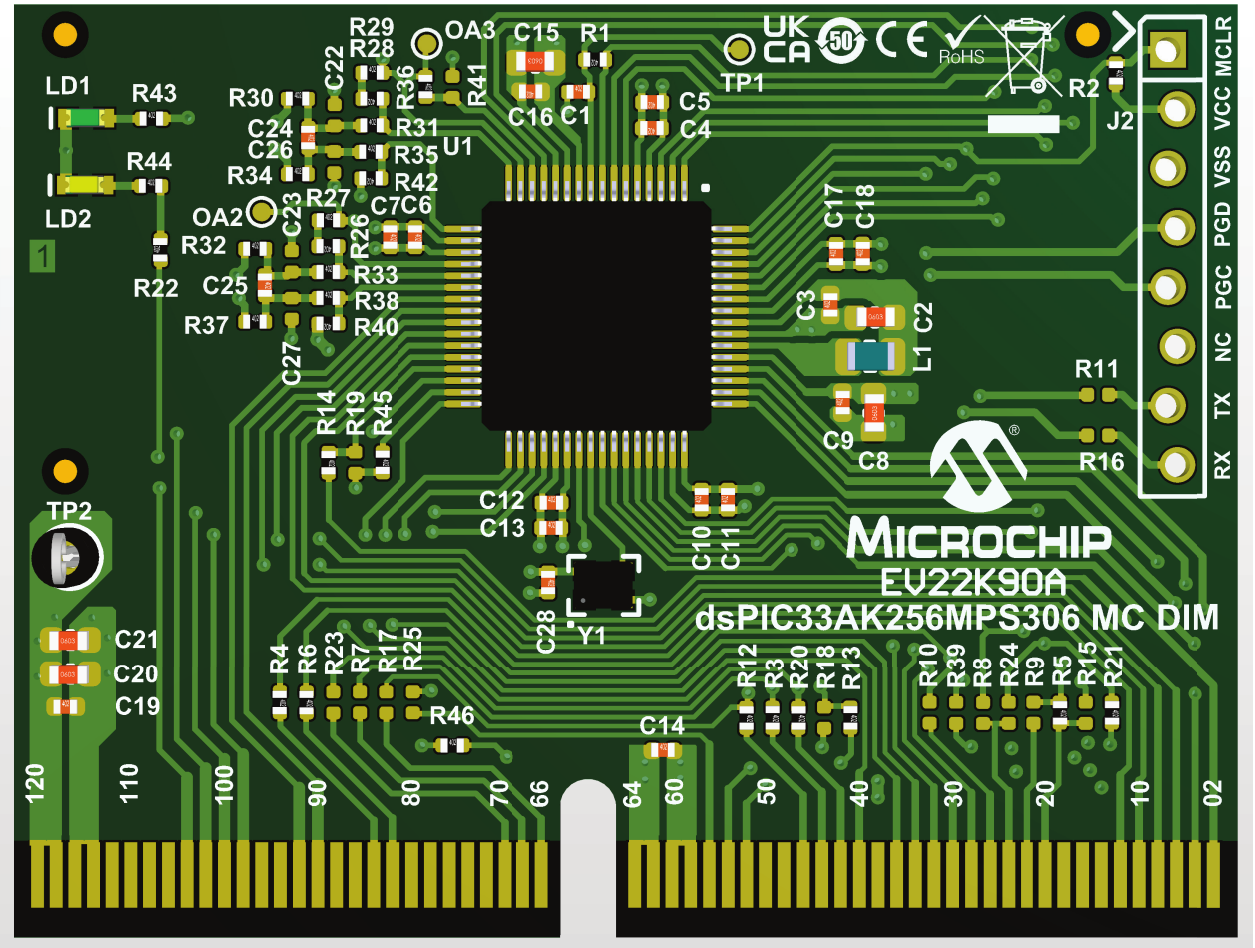
Introduction

The dsPIC33AK256MPS306 Motor Control DIM (P/N: EV22K90A) is designed to demonstrate the motor control capabilities of the dsPIC33AK256MPS306 device. This dsPIC® DSC features a 200 MHz, single-core Digital Signal Controller (DSC) with a 64-bit floating-point unit (FPU) and enhanced on-chip peripherals.

This motor control DIM is designed to take advantage of the high-speed motor control PWM generators, A/D converters, operational amplifiers, comparators and DACs.

The DIM can be used to demonstrate and develop motor control applications by inserting it in the DIM interface header, provided on the compatible motor control development boards. The DIM is designed to run a single motor with all the compatible development boards. Table 1 provides information on the hardware versions of the motor control development boards that are compatible with this DIM. For additional information regarding development boards, see the respective user's guide available on the Microchip website (www.microchip.com).

Figure 1. dsPIC33AK256MPS306 Motor Control DIM (Part Number: EV22K90A)



The LED LD1 (green) indicates the power-on status of the DIM. A general purpose LED LD2 (yellow) is provided on the board for debug purposes. The clock for the dsPIC DSC is generated by the MEMS Oscillator (Y1—DSC6011JI2B-008.0000) provided on the DIM. The 8-pin header J2 is provided for interfacing with the programmer/debugger. Any 8-pin, single-row, 0.100 inch (2.54 mm) pitch, unshrouded male header can be used (for example, P/N: 61300811121 from Würth Elektronik).

Table 1. Hardware Compatibility[1]

Development Board	Part Number	Compatible Hardware Revision
MCLV-48V-300W	EV18H47A	All revisions
MCHV-230VAC-1.5kW	EV78U65A	All revisions

Note:

1. The DIM is not compatible with earlier motor control development boards (for example, dsPICDEM™ MCLV-2 Development Board, dsPICDEM MCHV-3 Development Board).

WARNING Do not connect non-isolated oscilloscope probes to the test points on the DIM when inserted in a High-Voltage Development Board. Failure to heed this warning could result in hardware damage.

1. Pin Mapping

Table 1-1 provides pin mapping from the 64-pin dsPIC33AK256MPS306 device to the DIM interface connector.

Table 1-1. Pin Mapping—dsPIC33AK256MPS306 to DIM Interface Connector (Sorted By Device Pin Number)

Device Pin No.	dsPIC33AK256MPS306 Pin Function	DIM Pin No.	Remarks
1	PGD2/AD1ANN1/AD1AN4/CVDAN0/RP1/SCL2/IOMAF2/RA0	DIM:028	Direct connection
2	AD3AN1/CVDAN7/RP8/SDA2/IOMAF1/RA7	DIM:084	Connected via 0R (R4) resistor
		DIM:024	Can be connected via 0R (R8) resistor
3	PGC2/DACOUT1/AD3ANN1/AD3AN0/CVDAN1/ CMP4D/RP2/RA1	DIM:082	Connected via 0R (R6) resistor
		DIM:026	Can be connected via 0R (R10) resistor
		DIM:020	Can be connected via 0R (R15) resistor
4	VSS	DIM:061 to DIM:064, DIM:117 to DIM:120	Digital ground (VSS)
5	VDD	DIM:057 to DIM:060, DIM:113 to DIM:116	Digital power (VCC)
6	CVDAN11/CMPFN/RP12/RA11	DIM:041	Connected via 0R (R13) resistor
		DIM:043	Can be connected via 0R (R18) resistor
7	AD3AN3/CVDAN8/CMP5A/IBIAS3/ISRC3/RP9/RA8	DIM:011	Connected via 0R (R21) resistor
		DIM:024	Can be connected via 0R (R24) resistor
8	AD1AN3/CVDAN9/CMP5B/IBIAS2/ISRC2/RP10/RA9	DIM:035	Direct connection
9	CVDAN10/CMPEN/CMP5C/RP11/RA10		Connected via RC (R1, C1) filter
10	AVSS	DIM:061 to DIM:064, DIM:117 to DIM:120	Digital ground (VSS)
11	AVDD	DIM:057 to DIM:060, DIM:113 to DIM:116	Digital power (VCC)
12	OA1OUT/AD1AN0/CVDAN2/CMP1A/RP3/RA2	DIM:020	Connected via 0R (R5) resistor
		DIM:022	Can be connected via 0R (R9) resistor
13	OA1IN-/AD1ANN2/AD1AN2/CVDAN3/CMPCN/ CMP1C/RP4/RA3	DIM:039	Direct connection
14	UREF/OA1IN+/AD1AN1/AD2AN5/AD3AN4/CVDAN4/ CMP1B/RP5/RA4	DIM:017	Connected to output of Op Amp3 (OA3) via 0R (R36) resistor. Ensure resistor R41 is removed.
		DIM:019	Can be connected via 0R (R41) resistor. When connecting the signal: • Disable amplifier Op Amp3 (OA3). • Remove resistor R29 and R36.
15	OA3OUT/CVDAN5/CMP3A/RP6/INT0/RA5	DIM:017	The output of Op Amp3 (OA3) when configured and enabled.

Table 1-1. Pin Mapping—dsPIC33AK256MPS306 to DIM Interface Connector (Sorted By Device Pin Number) (continued)

Device Pin No.	dsPIC33AK256MPS306 Pin Function	DIM Pin No.	Remarks
16	OA3IN-/CVDAN6/CMPDN/CMP3C/RP7/RA6	DIM:015	Op Amp3 negative input-connected via amplifier input resistors
17	OA3IN+/CVDAN21/CVDTX5/CMP3B/RP22/RB5	DIM:013	Op Amp3 positive input-connected via amplifier input resistors
18	VSS	DIM:061 to DIM:064, DIM:117 to DIM:120	Digital ground (VSS)
19	VDD	DIM:057 to DIM:060, DIM:113 to DIM:116	Digital power (VCC)
20	OA2OUT/AD2AN0/CVDAN16/CVDTX0/CMP2A/RP17/RB0	DIM:025	The output of Op Amp2 (OA2) when configured and enabled. Ensure resistor R39 is removed.
		DIM:027	Can be connected via 0R (R39) resistor. When connecting the signal: • Disable amplifier Op Amp2 (OA2). • Remove resistor R27.
21	TMS/OA2IN-/AD2ANN2/AD2AN2/CVDAN17/CVDTX1/CMP2C/RP18/RB1	DIM:023	Op Amp2 negative input-connected via amplifier input resistors
22	OA2IN+/AD2AN1/CVDAN18/CVDTX2/CMP2B/RP19/RB2	DIM:021	Op Amp2 positive input-connected via amplifier input resistors
23	CVDAN24/CVDTX8/CMP2D/RP25/RB8	DIM:092	Direct connection
24	CVDAN25/CVDTX9/RP26/RB9	DIM:090	Direct connection
25	RP29/RB12	DIM:008	Direct connection
26	RP30/RB13	DIM:006	Direct connection
27	PGD1/AD2ANN1/AD2AN3/CVDAN19/CVDTX3/CMP4A/RP20/SDA1/RB3	DIM:012	Direct connection
28	PGC1/AD2AN4/CVDAN20/CVDTX4/CMP4B/RP21/SCL1/RB4	DIM:010	Direct connection
29	AD3ANN2/AD3AN2/CVDAN22/CVDTX6/ALLCMP/IBIAS0/ISRC0/RP23/I3CASCL1/RB6	DIM:009	Connected via 0R (R14) resistor
29	AD3ANN2/AD3AN2/CVDAN22/CVDTX6/ALLCMP/IBIAS0/ISRC0/RP23/I3CASCL1/RB6	DIM:104	Can be connected via 0R (R19) resistor
30	CVDAN23/CVDTX7/CMP4C/IBIAS1/ISRC1/RP24/I3CASDA1/IOMAF0/RB7	DIM:102	Direct connection
31	CVDAN26/CVDTX10/RP27/SCK2/RB10	DIM:104	Connected via 0R (R45) resistor
32	CVDAN27/CVDTX11/RP28/SDI2/RB11	DIM:040	Direct connection
33	RP41/RC8	DIM:036	Direct connection
34	RP42/SDO2/RC9	DIM:034	Direct connection
35	RP39/ASCL1/RC6	DIM:100	Direct connection
36	RP40/ASDA1/IOMAF7/RC7	DIM:098	Direct connection
37	VSS	DIM:061 to DIM:064, DIM:117 to DIM:120	Digital ground (VSS)
38	VDD	DIM:057 to DIM:060, DIM:113 to DIM:116	Digital power (VCC)

Table 1-1. Pin Mapping—dsPIC33AK256MPS306 to DIM Interface Connector (Sorted By Device Pin Number) (continued)

Device Pin No.	dsPIC33AK256MPS306 Pin Function	DIM Pin No.	Remarks
39	OSCO/CLKO/RP33/IOMAF5/RC0	—	Connected to a general purpose LED (LD2—Yellow) on the DIM via 0R (R22) resistor
		DIM:056	Can be connected via 0R (R25) resistor
40	OSCI/RP34/IOMAF6/RC1	—	CLKI—clock output of MEMS Oscillator (Y1) is connected as an input clock of dsPIC DSC (U1)
41	PGC3/RP35/PWM4H/IOMAD7/SS2/FSYNC2/RC2	DIM:051 (PGC)	Direct connection; also directly connected to Pin 5 of Header J2
42	PGD3/RP38/I3CSCL1/PWM4L/IOMAD6/RC5	DIM:049 (PGD)	Direct connection; also directly connected to Pin 4 of Header J2
43	RP36/PWM3H/IOMAD5/RC3	DIM:002	Direct connection
44	RP37/I3CSDA1/PWM3L/IOMAD4/RC4	DIM:004	Direct connection
45	RP43/RC10	DIM:030	Direct connection
46	RP44/RC11	DIM:032	Direct connection
47	VSS	DIM:061 to DIM:064, DIM:117 to DIM:120	Digital ground (VSS)
48	VDD	DIM:057 to DIM:060, DIM:113 to DIM:116	Digital power (VCC)
49	RP49/PWM2H/IOMAD3/RD0	DIM:005	Direct connection
50	TCK/RP50/PWM2L/IOMAD2/RD1	DIM:007	Direct connection
51	TDO/RP51/PWM1H/IOMAD1/RD2	DIM:001	Direct connection
52	TDI/RP52/PWM1L/IOMAD0/RD3	DIM:003	Direct connection
53	SWVDD	—	Connected to Digital power (VCC)
54	Lx	—	Connected to Inductor L1
55	SWVSS	—	Connected to Digital ground (VSS)
56	VDDCORE	—	Connected to Inductor L1, Capacitors C2 and C3
57	VSS	DIM:061 to DIM:064, DIM:117 to DIM:120	Digital ground (VSS)
58	VDD	DIM:057 to DIM:060, DIM:113 to DIM:116	Digital power (VCC)
59	RP54/RD5	DIM:044	Connected via 0R (R3) resistor
		DIM:068	Can be connected via 0R (R7) resistor
60	RP55/RD6	DIM:046	Connected via 0R (R12) resistor
		DIM:066	Can be connected via 0R (R17) resistor
61	CVDTX16/RP53/RD4	DIM:042	Connected via 0R (R20) resistor
		DIM:070	Can be connected via 0R (R23) resistor
62	CVDTX17/RP56/ASCL2/IOMAF4/RD7	DIM:054	Direct connection; can be connected to Pin 8 of Header J2 via 0R (R16) resistor

Table 1-1. Pin Mapping—dsPIC33AK256MPS306 to DIM Interface Connector (Sorted By Device Pin Number) (continued)

Device Pin No.	dsPIC33AK256MPS306 Pin Function	DIM Pin No.	Remarks
63	CVDTX18/RP57/ASDA2/IOMAF3/RD8	DIM:052	Direct connection; can be connected to Pin 7 of Header J2 via 0R (R11) resistor
64	$\overline{\text{MCLR}}$	DIM:047 ($\overline{\text{MCLR}}$)	Direct connection; also directly connected to Pin 1 of Header J2

Table 1-2 provides pin mapping from the DIM interface connector to the 64-pin dsPIC33AK256MPS306 device.

Table 1-2. Pin Mapping—DIM Interface Connector to dsPIC33AK256MPS306 (Sorted by DIM Pin Number)

DIM Pin No.	Device Pin No.	dsPIC33AK256MPS306 Pin Function	Remarks
DIM:001	51	TDO/RP51/PWM1H/IOMAD1/RD2	Direct connection
DIM:002	43	RP36/PWM3H/IOMAD5/RC3	Direct connection
DIM:003	52	TDI/RP52/PWM1L/IOMAD0/RD3	Direct connection
DIM:004	44	RP37/I3CSDA1/PWM3L/IOMAD4/RC4	Direct connection
DIM:005	49	RP49/PWM2H/IOMAD3/RD0	Direct connection
DIM:006	26	RP30/RB13	Direct connection
DIM:007	50	TCK/RP50/PWM2L/IOMAD2/RD1	Direct connection
DIM:008	25	RP29/RB12	Direct connection
DIM:009	29	AD3ANN2/AD3AN2/CVDAN22/CVDTX6/ ALLCMP/IBIAS0/ISRC0/RP23/I3CASCL1/RB6	Connected via 0R (R14) resistor
DIM:010	28	PGC1/AD2AN4/CVDAN20/CVDTX4/CMP4B/ RP21/SCL1/RB4	Direct connection
DIM:011	7	AD3AN3/CVDAN8/CMP5A/IBIAS3/ ISRC3/RP9/RA8	Connected via 0R (R21) resistor
DIM:012	27	PGD1/AD2ANN1/AD2AN3/CVDAN19/ CVDTX3/CMP4A/RP20/SDA1/RB3	Direct connection
DIM:013	17	OA3IN+/CVDAN21/CVDTX5/CMP3B/ RP22/RB5	Op Amp3 positive input-connected via amplifier input resistors
DIM:014	—	—	No connection
DIM:015	16	OA3IN-/CVDAN6/CMPDN/CMP3C/RP7/RA6	Op Amp3 negative input-connected via amplifier input resistors
DIM:016	—	—	No connection
DIM:017	14	UREF/OA1IN+/AD1AN1/AD2AN5/AD3AN4/ CVDAN4/CMP1B/RP5/RA4	Connected via 0R (R36) resistor. Ensure that the resistor R41 is removed.
	15	OA3OUT/CVDAN5/CMP3A/RP6/INT0/RA5	Connected to output of Op Amp3 (OA3)
DIM:018	—	—	No connection
DIM:019	14	UREF/OA1IN+/AD1AN1/AD2AN5/AD3AN4/ CVDAN4/CMP1B/RP5/RA4	Can be connected via 0R (R41) resistor. When connecting the signal: • Disable amplifier Op Amp3 (OA3). • Remove resistor R29 and R36.
DIM:020	12	OA1OUT/AD1AN0/CVDAN2/CMP1A/RP3/RA2	Connected via 0R (R5) resistor
	3	PGC2/DACOUT1/AD3ANN1/AD3AN0/ CVDAN1/CMP4D/RP2/RA1	Can be connected via 0R (R15) resistor
DIM:021	22	OA2IN+/AD2AN1/CVDAN18/CVDTX2/CMP2B/ RP19/RB2	Op Amp2 positive input-connected via amplifier input resistors
DIM:022	12	OA1OUT/AD1AN0/CVDAN2/CMP1A/RP3/RA2	Can be connected via 0R (R9) resistor
DIM:023	21	TMS/OA2IN-/AD2ANN2/AD2AN2/CVDAN17/ CVDTX1/CMP2C/RP18/RB1	Op Amp2 negative input-connected via amplifier input resistors
DIM:024	2	AD3AN1/CVDAN7/RP8/SDA2/IOMAF1/RA7	Can be connected via 0R (R8) resistor
	7	AD3AN3/CVDAN8/CMP5A/IBIAS3/ ISRC3/RP9/RA8	Can be connected via 0R (R24) resistor
DIM:025	20	OA2OUT/AD2AN0/CVDAN16/CVDTX0/ CMP2A/RP17/RB0	The output of Op Amp2 (OA2) when configured and enabled. Ensure resistor R39 is removed.

Table 1-2. Pin Mapping—DIM Interface Connector to dsPIC33AK256MPS306 (Sorted by DIM Pin Number) (continued)

DIM Pin No.	Device Pin No.	dsPIC33AK256MPS306 Pin Function	Remarks
DIM:026	3	PGC2/DACOUT1/AD3ANN1/AD3AN0/ CVDAN1/CMP4D/RP2/RA1	Can be connected via 0R (R10) resistor
DIM:027	20	OA2OUT/AD2AN0/CVDAN16/CVDTX0/ CMP2A/RP17/RB0	Can be connected via 0R (R39) resistor. When connecting the signal: • Disable amplifier Op Amp2 (OA2). • Remove resistor R27.
DIM:028	1	PGD2/AD1ANN1/AD1AN4/CVDAN0/RP1/ SCL2/IOMAF2/RA0	Direct connection
DIM:029	—	—	No connection
DIM:030	45	RP43/RC10	Direct connection
DIM:031	—	—	No connection
DIM:032	46	RP44/RC11	Direct connection
DIM:033	—	—	No connection
DIM:034	34	RP42/SDO2/RC9	Direct connection
DIM:035	8	AD1AN3/CVDAN9/CMP5B/IBIAS2/ISRC2/ RP10/RA9	Direct connection
	9	CVDAN10/CMPEN/CMP5C/RP11/RA10	Connected via RC (R1, C1) filter
DIM:036	33	RP41/RC8	Direct connection
DIM:037 (VREF)	17, 22	Connected to positive input of amplifiers OA2 and OA3 through gain resistors	VREF (+1.65V) input from the motor control development board
DIM:038	—	—	No connection
DIM:039	13	OA1IN-/AD1ANN2/AD1AN2/CVDAN3/ CMPCN/CMP1C/RP4/RA3	Direct connection
DIM:040	32	CVDAN27/CVDTX11/RP28/SDI2/RB11	Direct connection
DIM:041	6	CVDAN11/CMPFN/RP12/RA11	Connected via 0R (R13) resistor
DIM:042	61	CVDTX16/RP53/RD4	Connected via 0R (R20) resistor
DIM:043	6	CVDAN11/CMPFN/RP12/RA11	Can be connected via 0R (R18) resistor
DIM:044	59	RP54/RD5	Connected via 0R (R3) resistor
DIM:045	—	—	No connection
DIM:046	60	RP55/RD6	Connected via 0R (R12) resistor
DIM:047 ($\overline{\text{MCLR}}$)	64	$\overline{\text{MCLR}}$	Direct connection; also directly connected to Pin 1 of Header J2
DIM:048	—	—	No connection
DIM:049 (PGD)	42	PGD3/RP38/I3CSCL1/PWM4L/IOMAD6/RC5	Direct connection; also directly connected to Pin 4 of Header J2
DIM:050	—	—	No connection
DIM:051 (PGC)	41	PGC3/RP35/PWM4H/IOMAD7/SS2/ FSYNC2/RC2	Direct connection; also directly connected to Pin 5 of Header J2
DIM:052	63	CVDTX18/RP57/ASDA2/IOMAF3/RD8	Direct connection; can be connected to Pin 7 of Header J2 via 0R (R11) resistor
DIM:053	—	—	No connection
DIM:054	62	CVDTX17/RP56/ASCL2/IOMAF4/RD7	Direct connection; can be connected to Pin 8 of Header J2 via 0R (R16) resistor
DIM:055 (VCC_SELECT)	—	—	Connected to Digital ground (VSS) via 0R (R46) resistor
DIM:056	39	OSCO/CLKO/RP33/IOMAF5/RC0	Can be connected via 0R (R25) resistor
DIM:057 to DIM:060	5, 11, 19, 38, 48, 58	VDD	Digital power (VCC)

Table 1-2. Pin Mapping—DIM Interface Connector to dsPIC33AK256MPS306 (Sorted by DIM Pin Number) (continued)

DIM Pin No.	Device Pin No.	dsPIC33AK256MPS306 Pin Function	Remarks
DIM:061 to DIM:064	4, 10, 18, 37, 47, 57	VSS	Digital ground (VSS)
DIM:065	—	—	No connection
DIM:066	60	RP55/RD6	Can be connected via 0R (R17) resistor
DIM:067	—	—	No connection
DIM:068	59	RP54/RD5	Can be connected via 0R (R7) resistor
DIM:069	—	—	No connection
DIM:070	61	CVDTX16/RP53/RD4	Can be connected via 0R (R23) resistor
DIM:071 to DIM:081	—	—	No connection
DIM:082	3	PGC2/DACOUT1/AD3ANN1/AD3AN0/ CVDAN1/CMP4D/RP2/RA1	Connected via 0R (R6) resistor
DIM:083	—	—	No connection
DIM:084	2	AD3AN1/CVDAN7/RP8/SDA2/IOMAF1/RA7	Connected via 0R (R4) resistor
DIM:085 to DIM:089	—	—	No connection
DIM:090	24	CVDAN25/CVDTX9/RP26/RB9	Direct connection
DIM:091	—	—	No connection
DIM:092	23	CVDAN24/CVDTX8/CMP2D/RP25/RB8	Direct connection
DIM:093 to DIM:097	—	—	No connection
DIM:098	36	RP40/ASDA1/IOMAF7/RC7	Direct connection
DIM:099	—	—	No connection
DIM:100	35	RP39/ASCL1/RC6	Direct connection
DIM:101	—	—	No connection
DIM:102	30	CVDAN23/CVDTX7/CMP4C/IBIAS1/ISRC1/ RP24/I3CASDA1/IOMAF0/RB7	Direct connection
DIM:103	—	—	No connection
DIM:104	31	CVDAN26/CVDTX10/RP27/SCK2/RB10	Connected via 0R (R45) resistor
	29	AD3ANN2/AD3AN2/CVDAN22/CVDTX6/ ALLCMP/IBIAS0/ISRC0/RP23/I3CASCL1/RB6	Can be connected via 0R (R19) resistor
DIM:105 to DIM:112	—	—	No connection
DIM:113 to DIM:116	5, 11, 19, 38, 48, 58	VDD	Digital power (VCC)
DIM:117 to DIM:120	4, 10, 18, 37, 47, 57	VSS	Digital ground (VSS)

2. Internal Amplifier

Operational amplifiers internal to the dsPIC33AK256MPS306 can be configured and enabled for amplifying motor currents (internal Op Amp configuration). The amplifier circuits are shown in the Figure 2-1 and Figure 4-2. The detailed schematics of the block, “Filter, Feedback and Bias Circuit” used in Figure 2-1, are shown in Figure 2-2.

Figure 2-1. dsPIC® DSC Internal Amplifiers

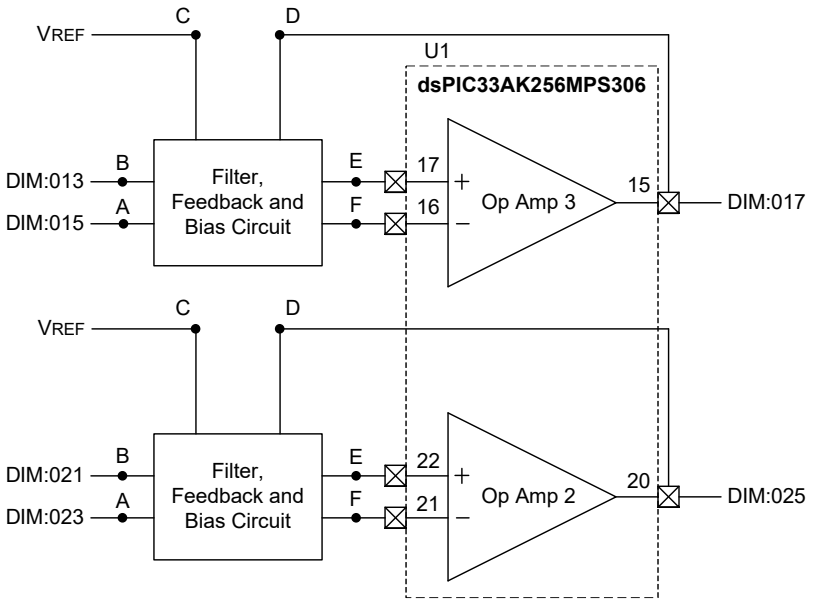
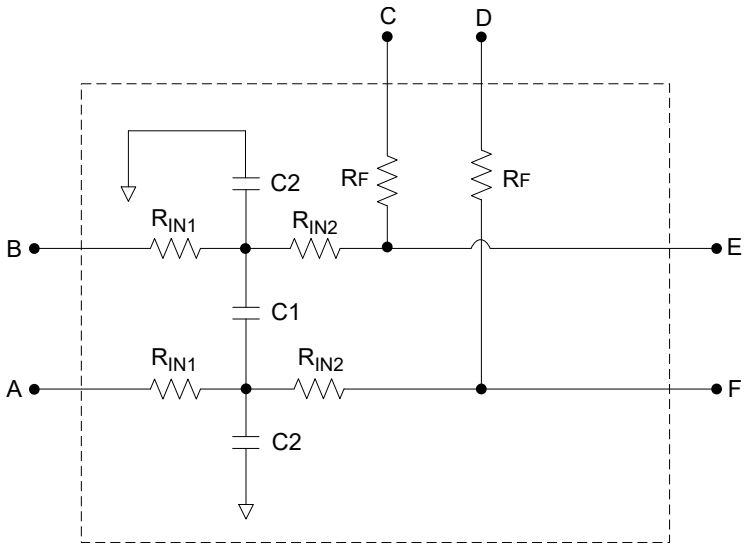


Figure 2-2. Filter, Feedback and Bias Circuit



Equation 2-1 provides the amplifier gain calculations. Equation 2-2 and Equation 2-3 provide the equations to calculate cutoff frequencies of the Differential-mode and Common-mode filters.

Equation 2-1. Amplifier Gain

$$Differential\ Amplifier\ Gain = \frac{Rf}{(R_{IN1} + R_{IN2})}$$

Equation 2-2. Cutoff Frequency Differential-Mode Filter

$$Differential\text{-}mode\ f_{-3\ dB} \cong \frac{1}{2\pi(R_{IN1} + R_{IN2})\left(\frac{C2}{2} + C1\right)}$$

Equation 2-3. Cutoff Frequency Common-Mode Filter

$$Common\text{-}mode\ f_{-3\ dB} \cong \frac{1}{2\pi(R_{IN1})(C2)}$$

Table 2-1 summarizes the amplifier gain and filter cutoff frequencies for the amplifier circuit used in the DIM. The customer can select different values based on the application requirements, ensuring peak current is within the operating range of the motor control development board in which the DIM is inserted.

Table 2-1. Amplifier Gain and Cutoff Frequencies

Component Values					Amplifier Gain	Differential-Mode Filter Cutoff Frequency	Common-Mode Filter Cutoff Frequency
R_{IN1}	R_{IN2}	R_F	C1	C2			
100Ω	100Ω	4.99 kΩ	1000 pF	Not Populated	24.95	796 kHz	—

3. External Amplifier

Some motor control development boards (see Table 1) are equipped with Operational Amplifiers to amplify the motor phase currents and DC bus current (external Op Amp configuration). To obtain information on amplifier gain, see the user's guide of the specific development board.

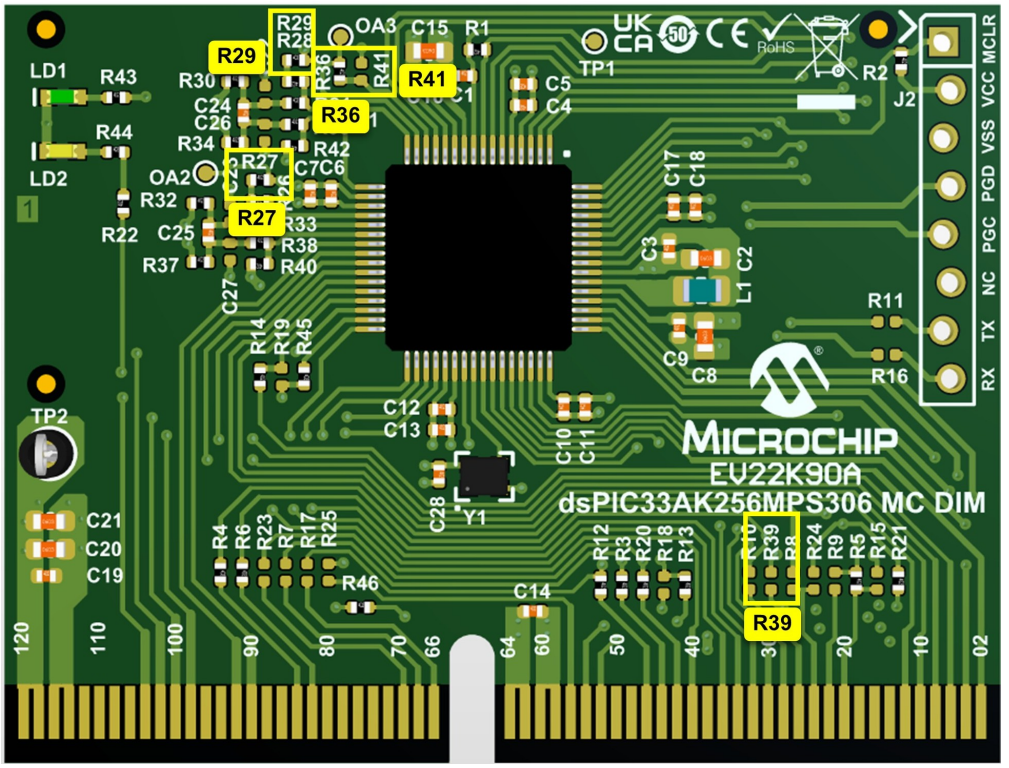
The external amplifier outputs from the development board and the internal amplifier outputs of the dsPIC® DSC are connected to a single analog channel on the DIM.

The DIM is configured to use the internal amplifier outputs of the dsPIC® DSC by default. Table 3-1 summarizes the jumper resistors to be populated and removed to convert the DIM from "internal Op Amp configuration" to "external Op Amp configuration" or vice versa.

Table 3-1. Selection Between Internal and External Amplifier Configuration

Operational Amplifier	Jumper Resistor (0R) Settings on the DIM				Firmware Setting
	Internal Amplifier Configuration (default)		External Amplifier Configuration		
	Populate	Remove	Populate	Remove	
OA2	R27	R39	R39	R27	• Configure and enable internal amplifiers in "internal Op Amp configuration". • Ensure the internal amplifiers are disabled in the "external Op Amp configuration".
OA3	R29, R36	R41	R41	R29, R36	

Figure 3-1. Jumper Resistors (0R) on the DIM for Amplifier Output Selection



4. Board Schematics: Motor Control Dual In-Line Module (MC DIM)

Figure 4-1. Schematic Revision 1.0, Page 1 of 2

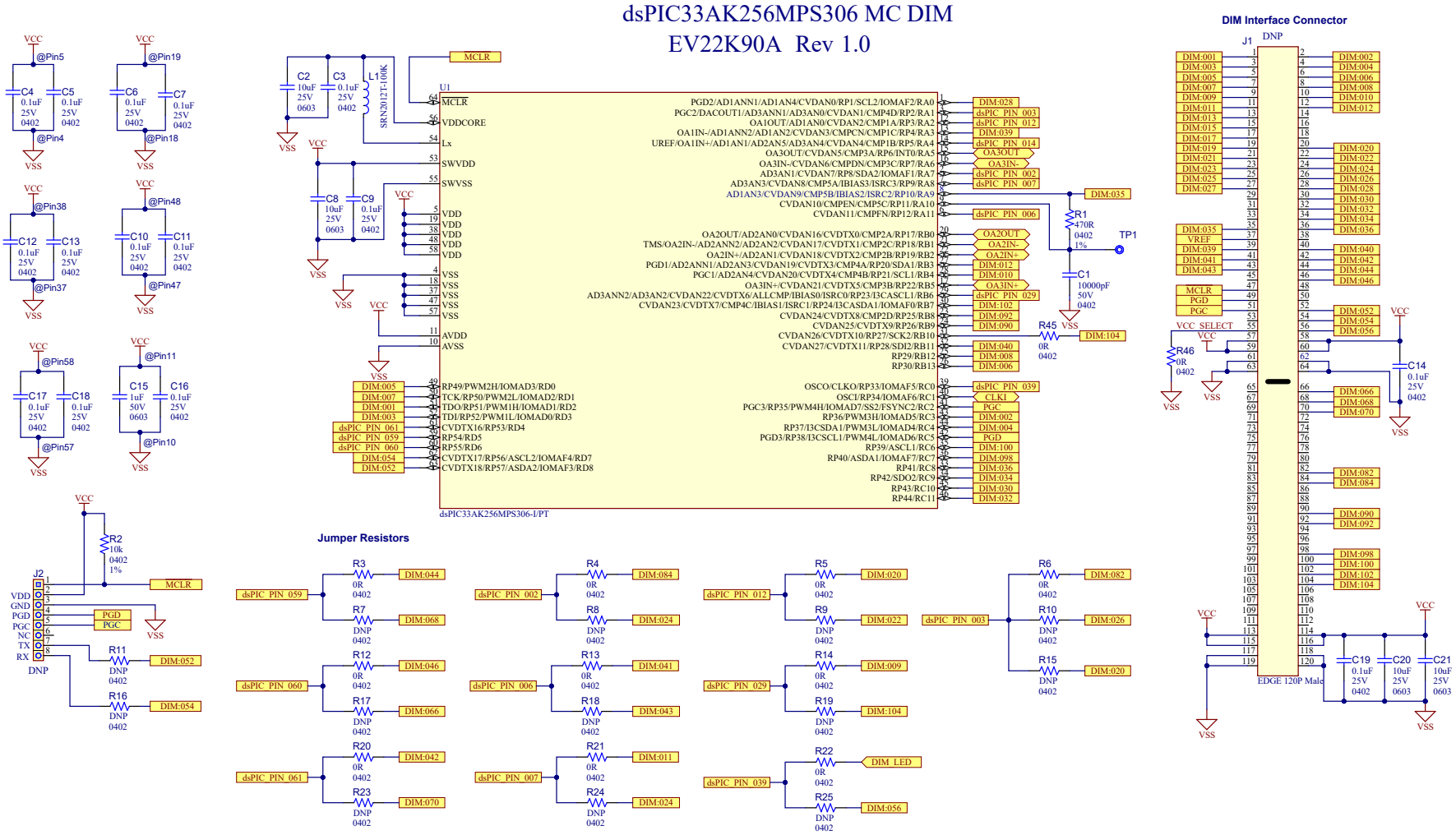
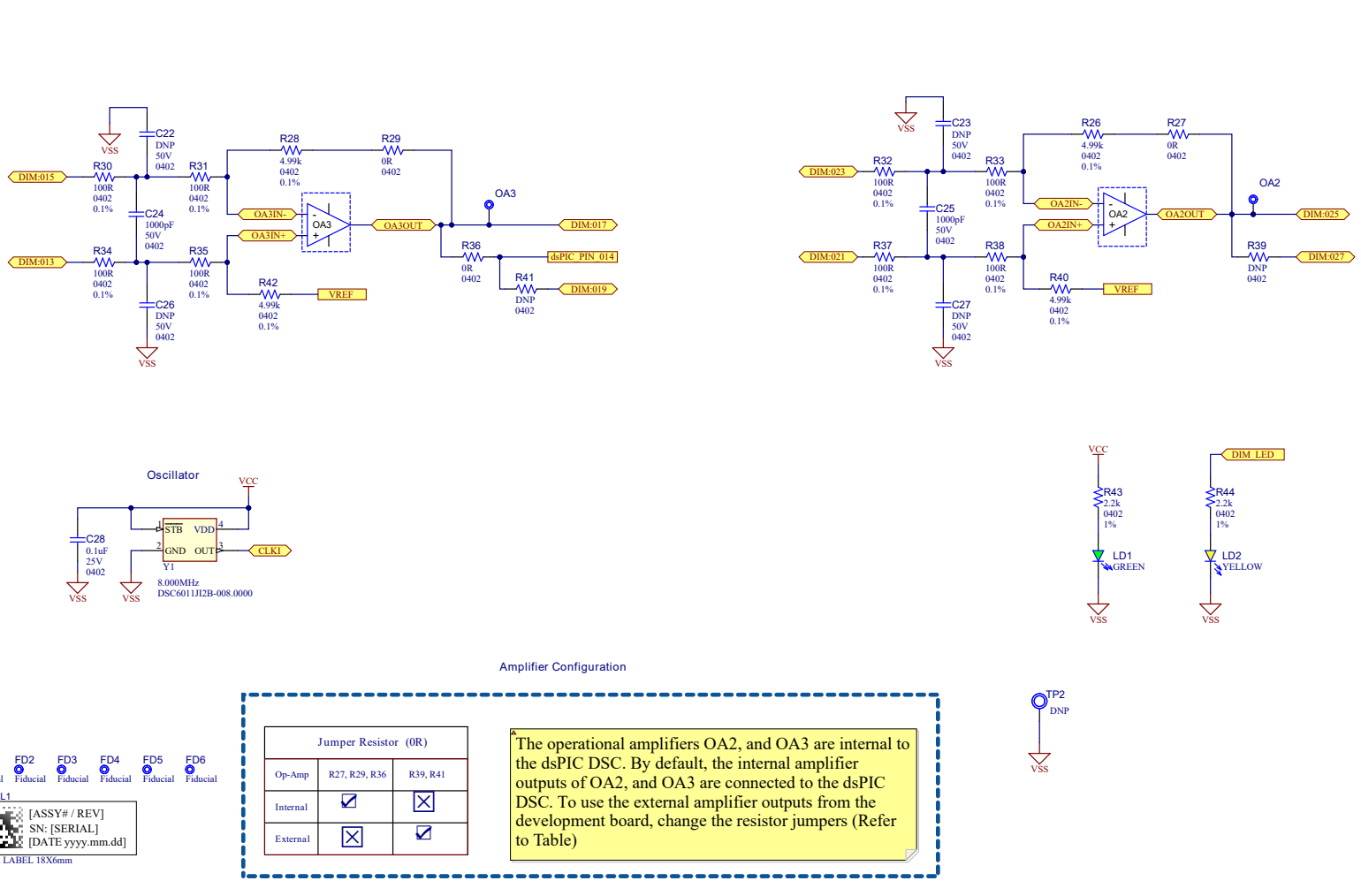


Figure 4-2. Schematic Revision 1.0, Page 2 of 2



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ISBN: 979-8-3371-1828-4

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