dsPIC33CK256MC506

dsPIC33CK256MC506 Motor Control Plug-In Module (PIM) Information Sheet for External Amplifier Configuration
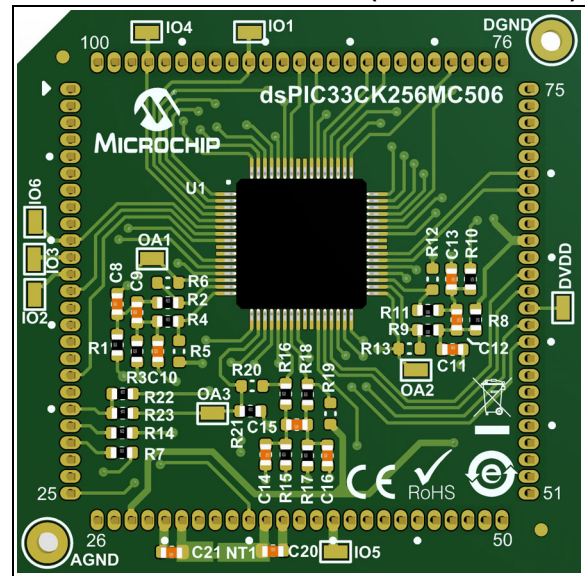
The dsPIC33CK256MC506 External Op Amp Motor Control PIM (P/N: EV00X65A) is designed to demonstrate the motor control capabilities of the dsPIC33CK256MC506 device. The dsPIC33CK256MC506 device is a high-performance, 16-bit Digital Signal Controller (DSC).

This Motor Control PIM is designed to take advantage of the high-speed PWM module and a shared ADC core in the device to enable various motor control applications.

The PIM can be used to demonstrate and develop motor control applications by inserting it in the 100-pin PIM interface header provided on the compatible motor control development boards (see Table 1). The PIM is designed to run a single motor with all the compatible development boards. When operating this PIM on the dsPICDEM™ MCLV-2 Development Board, insert an external op amp configuration matrix board (see Figure 2) on the J14 header provided on the board. In the case of dsPICDEM MCHV-2/MCHV-3 Development Boards, insert an external op amp configuration matrix board onto the J4 header (as shown in Figure 2) on the board. This PIM can be used on the dsPICDEM MCHV-3 Development Board to implement and demonstrate single-stage boost Power Factor Correction (PFC) control, along with Field-Oriented Control (FOC). For additional information regarding development boards, refer to the respective user's guide available on the Microchip website (www.microchip.com). Table 1 provides information on the hardware versions of the motor control boards that are compatible with this PIM. The PIM design also enables stepper motor control using the dsPICDEM MCSM Development Board (DM330022/DM330022-1).

Refer to the specific motor control board user's guide for the hardware version identification information.

FIGURE 1: dsPIC33CK256MC506 EXTERNAL OP AMP MOTOR CONTROL PIM (P/N: EV00X65A)

FIGURE 2: EXTERNAL OP AMP CONFIGURATION BOARD

dsPIC33CK256MC506

TABLE 1: HARDWARE COMPATIBILITY

Compatible Development Board	Part Number	Compatible Hardware Revision
dsPICDEM™ MCHV Development Board	DM330023	Not Compatible
dsPICDEM MCHV-2 Development Board	DM330023-2	All Revisions
dsPICDEM MCHV-3 Development Board	DM330023-3	All Revisions
dsPICDEM MCLV Development Board	DM330021	Not Compatible
dsPICDEM MCLV-2 Development Board	DM330021-2	All Revisions
Low-Voltage Motor Control Development Bundle	DV330100	Not Compatible
dsPICDEM MCSM Development Board	DM330022/DM330022-1	All Revisions

WARNING

Do not connect non-isolated oscilloscope probes to the test points on the PIM when inserted and in use with the dsPICDEM™ MCHV-2 or MCHV-3 Development Board. Failure to heed this warning could result in hardware damage.

Table 2 provides the mapping between the 64-pin dsPIC33CK256MC506 device and the 100-pin PIM.

TABLE 2: DEVICE TO PIM MAPPING (ORDERED BY DEVICE PIN NUMBER)

Device Pin #	PIM Pin #	dsPIC33CK256MC506 Device Functional Description	Remarks
1	PIM:94	RP46/PWM1H/RB14	Direct Connection.
2	PIM:93	RP47/PWM1L/RB15	Direct Connection.
3	PIM:82	RP60/RC12	Direct Connection.
4	PIM:91	RP61/RC13	Direct Connection. Test point IO1 is provided on the pin.
5	PIM:97	RP62/RC14	Direct Connection. Test point IO4 is provided on the pin.
6	PIM:10	RP63/RC15	Direct Connection. Test point IO6 is provided on the pin.
7	PIM:13	$\overline{\text{MCLR}}$	Direct Connection.
8	PIM:18	RP79/PCI22/RD15	Direct Connection.
9	PIM:15, 36, 45, 65, 75[2]	Vss	Digital Ground (DGND).
10	PIM:02, 16, 37, 46, 62, 86[1]	VDD	Digital Power (DVDD).
11	PIM:11	RP78/PCI21/RD14	Direct Connection. Test point IO3 is provided on the pin.
12	PIM:12	ANN0/RP77/RD13	Direct Connection. Test point IO2 is provided on the pin.
13	PIM:35	AN12/RP48/RC0	Direct Connection.
14	—	OA1OUT/AN0/CMP1A/IBIAS0/RA0	The output of Op Amp 1 (OA1) when configured and enabled. Used in internal amplifier configuration.
14	PIM:22[4]		Connected via a 0 Ohm resistor (R7).
15	PIM:66	OA1IN-/AN16/RA1	Op Amp 1 Negative Input.
16	PIM:74	OA1IN+/AN9/RA2	Op Amp 1 Positive Input.
17	PIM:25	DACOUT1/AN3/CMP1C/RA3	Direct Connection.
18	—	OA3OUT/AN4/IBIAS3/RA4	The output of Op Amp 3 (OA3) when configured and enabled. Used in internal amplifier configuration.
18	PIM:20[4]		Connected via a 0 Ohm resistor (R23).
19	PIM:30	AVDD	Analog Power (AVDD).
20	PIM:31	AVss	Analog Ground (AVSS).
21	PIM:40	RP76/RD12	Direct Connection. Test point IO5 is provided on the pin.
22	PIM:67	OA3IN-/AN13/CMP1B/ISRC0/RP49/RC1	Op Amp 3 Negative Input.
23	PIM:66	OA3IN+/AN14/CMP2B/ISRC1/RP50/RC2	Op Amp 3 Positive Input.
24	PIM:60	AN19/IBIAS1/RP54/RC6	Direct Connection.
25	PIM:02, 16, 37, 46, 62, 86[1]	VDD	Digital Power (DVDD).
26	PIM:15, 36, 45, 65, 75[2]	Vss	Digital Ground (DGND).
27	PIM:32	AN15/CMP2A/IBIAS2/RP51/RC3	Direct Connection.
28	PIM:63	OSCI/CLKI/AN5/RP32/RB0	Direct Connection (OSCI).
29	PIM:64	OSCO/CLKO/AN6/RP33/RB1	Direct Connection (OSCO).

Note 1: Digital Power (DVDD) pins are shorted together on the PIM.

2: Digital Ground (DGND) pins are shorted together on the PIM.

3: The signal connects to the device pin via a jumper resistor(0 Ohm). When needed, remove the jumper resistor to disconnect the signal.

4: The PIM pin is connected to the device pin through a jumper resistor. This is populated in the external amplifier configuration, where the amplifier is disabled and the amplifier feedback resistors are removed.

dsPIC33CK256MC506

TABLE 2: DEVICE TO PIM MAPPING (ORDERED BY DEVICE PIN NUMBER) (CONTINUED)

Device Pin #	PIM Pin #	dsPIC33CK256MC506 Device Functional Description	Remarks
30	—	CMP2C/RP75/RD11	The signal on the PIM:20 connects to an input of Comparator 2 (CMP2C) via a 0 Ohm resistor (R21). If the signal on PIM:20 is bus current, then configure CMP2 to generate an overcurrent trip if desired.
31	PIM:61	AN18/ISRC3/RP74/RD10	Direct Connection.
32[3]	PIM:20	AN7/ISRC2/RP55/RC7	Connected via a 0 Ohm resistor (R22). An alternate analog channel to sample the signal on PIM:20.
33	—	OA2OUT/AN1/CMP1D/CMP2D/RP34/INT0/RB2	The output of Op Amp 2 (OA2) when configured and enabled. Used in internal amplifier configuration.
	PIM:21[4]		Connected via a 0 Ohm resistor (R14).
34	PIM:66	PGD2/OA2IN-/AN8/RP35/RB3	Op Amp 2 Negative Input.
35	PIM:73	PGC2/OA2IN+/AN17/RP36/RB4	Op Amp 2 Positive Input.
36	PIM:49	RP56/ASDA1/SCK2/RC8	Direct Connection.
37	PIM:50	RP57/ASCL1/SDI2/RC9	Direct Connection.
38	PIM:69	RP73/PCI20/RD9	Direct Connection.
39	PIM:70	RP72/SDO2/PCI19/RD8	Direct Connection.
40	PIM:15, 36, 45, 65, 75[2]	Vss	Digital Ground (DGND).
41	PIM:02, 16, 37, 46, 62, 86[1]	VDD	Digital Power (DVDD).
42	PIM:48	RP71/RD7	Direct Connection.
43	PIM:47	RP70/RD6	Direct Connection.
44	PIM:80	RP69/RD5	Direct Connection.
45	PIM:27	PGD3/RP37/RB5	Direct Connection (PGD).
46	PIM:26	PGC3/RP38/RB6	Direct Connection (PGC).
47	PIM:24	TDO/AN2/RP39/RB7	Direct Connection.
48	PIM:23	PGD1/AN10/RP40/SCL1/RB8	Direct Connection.
49	PIM:79	PGC1/AN11/RP41/SDA1/RB9	Direct Connection.
50	PIM:68	RP52/RC4	Direct Connection.
51	PIM:76	RP53/RC5	Direct Connection.
52	PIM:83	RP58/RC10	Direct Connection.
53	PIM:84	RP59/RC116	Direct Connection.
54	PIM:01	RP68/RD4	Direct Connection.
55	PIM:87	RP67/RD3	Direct Connection.
56	PIM:15, 36, 45, 65, 75[2]	Vss	Digital Ground (DGND).
57	PIM:02, 16, 37, 46, 62, 86[1]	VDD	Digital Power (DVDD).
58	PIM:88	RP66/RD2	Direct Connection.
59	PIM:78	RP65/PWM4H/RD1	Direct Connection.
60	PIM:19	RP64/PWM4L/RD0	Direct Connection.
61	PIM:03	TMS/RP42/PWM3H/RB10	Direct Connection.
62	PIM:100	TCK/RP43/PWM3L/RB11	Direct Connection.
63	PIM:99	TDI/RP44/PWM2H/RB12	Direct Connection.
64	PIM:98	RP45/PWM2L/RB13	Direct Connection.

Note 1: Digital Power (DVDD) pins are shorted together on the PIM.

2: Digital Ground (DGND) pins are shorted together on the PIM.

3: The signal connects to the device pin via a jumper resistor(0 Ohm). When needed, remove the jumper resistor to disconnect the signal.

4: The PIM pin is connected to the device pin through a jumper resistor. This is populated in the external amplifier configuration, where the amplifier is disabled and the amplifier feedback resistors are removed.

Table 3 provides the mapping between the 100-pin PIM and the 64-pin dsPIC33CK256MC506 device.

TABLE 3:   PIM TO DEVICE MAPPING (ORDERED BY PIM PIN NUMBER)

PIM Pin #	Device Pin #	dsPIC33CK256MC506 Pin Functional Description	Remarks
PIM:01	54	RP68/RD4	Direct Connection.
PIM:02[1]	10, 25, 41, 57	V$_{DD}$	Digital Power (DV$_{DD}$).
PIM:03	61	TMS/RP42/PWM3H/RB10	Direct Connection.
PIM:04	—	—	Not Connected.
PIM:05	—	—	Not Connected.
PIM:06	—	—	Not Connected.
PIM:07	—	—	Not Connected.
PIM:08	—	—	Not Connected.
PIM:09	—	—	Not Connected.
PIM:10	6	RP63/RC15	Direct Connection. Test point IO6 is provided on the pin.
PIM:11	11	RP78/PCI21/RD14	Direct Connection. Test point IO3 is provided on the pin.
PIM:12	12	ANN0/RP77/RD13	Direct Connection. Test point IO2 is provided on the pin.
PIM:13	7	$\overline{MCLR}$	Direct Connection.
PIM:14	—	—	Not Connected.
PIM:15[2]	9, 26, 40, 56	V$_{SS}$	Digital Ground (DGND).
PIM:16[1]	10, 25, 41, 57	V$_{DD}$	Digital Power (DV$_{DD}$).
PIM:17	—	—	Not Connected.
PIM:18	8	RP79/PCI22/RD15	Direct Connection.
PIM:19	60	RP64/PWM4L/RD0	Direct Connection.
PIM:20	32[3]	AN7/ISRC2/RP55/RC7	Connected via a 0 Ohm resistor (R22). An alternate analog channel to sample the signal on PIM:20.
	18[4]	OA3OUT/AN4/IBIAS3/RA4	Connected via a 0 Ohm resistor (R23).
PIM:21	33[4]	OA2OUT/AN1/CMP1D/CMP2D/RP34/INT0/RB2	Connected via a 0 Ohm resistor (R14).
PIM:22	14[4]	OA1OUT/AN0/CMP1A/IBIAS0/RA0	Connected via a 0 Ohm resistor (R7).
PIM:23	48	PGD1/AN10/RP40/SCL1/RB8	Direct Connection.
PIM:24	47	TDO/AN2/RP39/RB7	Direct Connection.
PIM:25	17	DACOUT1/AN3/CMP1C/RA3	Direct Connection.
PIM:26	46	PGC3/RP38/RB6	Direct Connection (PGC).
PIM:27	45	PGD3/RP37/RB5	Direct Connection (PGD).
PIM:28	—	V$_{REF}$	External 1.65V reference.
PIM:29	—	—	Not Connected.

Note 1: Digital Power (DV$_{DD}$) pins are shorted together on the PIM.

2: Digital Ground (DGND) pins are shorted together on the PIM.

3: The signal connects to the device pin via a jumper resistor (0 Ohm). When needed, remove the jumper resistor to disconnect the signal.

4: The PIM pin is connected to the device pin through a jumper resistor. This is populated in the external amplifier configuration, where the amplifier is disabled and the amplifier feedback resistors are removed.

dsPIC33CK256MC506

TABLE 3: PIM TO DEVICE MAPPING (ORDERED BY PIM PIN NUMBER) (CONTINUED)

PIM Pin #	Device Pin #	dsPIC33CK256MC506 Pin Functional Description	Remarks
PIM:30	19	AV$_{DD}$	Analog Power (AV$_{DD}$).
PIM:31	20	AV$_{SS}$	Analog ground (AV$_{SS}$).
PIM:32	27	AN15/CMP2A/IBIAS2/RP51/RC3	Direct Connection.
PIM:33	—	—	Not Connected.
PIM:34	—	—	Not Connected.
PIM:35	13	AN12/RP48/RC0	Direct Connection.
PIM:36[2]	9, 26, 40, 56	V$_{SS}$	Digital Ground (DGND).
PIM:37[1]	10, 25, 41, 57	V$_{DD}$	Digital Power (DV$_{DD}$).
PIM:38	—	—	Not Connected.
PIM:39	—	—	Not Connected.
PIM:40	21	RP76/RD12	Direct Connection. Test point IO5 is provided on the pin.
PIM:41	—	—	Not Connected.
PIM:42	—	—	Not Connected.
PIM:43	—	—	Not Connected.
PIM:44	—	—	Not Connected.
PIM:45[2]	9, 26, 40, 56	V$_{SS}$	Digital Ground (DGND).
PIM:46[1]	10, 25, 41, 57	V$_{DD}$	Digital Power (DV$_{DD}$).
PIM:47	43	RP70/RD6	Direct Connection.
PIM:48	42	RP71/RD7	Direct Connection.
PIM:49	36	RP56/ASDA1/SCK2/RC8	Direct Connection.
PIM:50	37	RP57/ASCL1/SDI2/RC9	Direct Connection.
PIM:51	—	—	Not Connected.
PIM:52	—	—	Not Connected.
PIM:53	—	—	Not Connected.
PIM:54	—	—	Not Connected.
PIM:55	—	—	Not Connected.
PIM:56	—	—	Not Connected.
PIM:57	—	—	Not Connected.
PIM:58	—	—	Not Connected.
PIM:59	—	—	Not Connected.
PIM:60	24	AN19/IBIAS1/RP54/RC6	Direct Connection.
PIM:61	31	AN18/ISRC3/RP74/RD10	Direct Connection.
PIM:62[1]	10, 25, 41, 57	V$_{DD}$	Digital Power (DV$_{DD}$).
PIM:63	28	OSCI/CLKI/AN5/RP32/RB0	Direct Connection (OSCI).
PIM:64	29	OSCO/CLKO/AN6/RP33/RB1	Direct Connection (OSCO).
PIM:65[2]	9, 26, 40, 56	V$_{SS}$	Digital Ground (DGND).

Note 1: Digital Power (DV$_{DD}$) pins are shorted together on the PIM.
   2: Digital Ground (DGND) pins are shorted together on the PIM.
   3: The signal connects to the device pin via a jumper resistor (0 Ohm). When needed, remove the jumper resistor to disconnect the signal.
   4: The PIM pin is connected to the device pin through a jumper resistor. This is populated in the external amplifier configuration, where the amplifier is disabled and the amplifier feedback resistors are removed.

TABLE 3: PIM TO DEVICE MAPPING (ORDERED BY PIM PIN NUMBER) (CONTINUED)

PIM Pin #	Device Pin #	dsPIC33CK256MC506 Pin Functional Description	Remarks
PIM:66	15	OA1IN-/AN16/RA1	Op Amp 1 Negative Input.
	23	OA3IN+/AN14/CMP2B/ISRC1/RP50/RC2	Op Amp 3 Positive Input.
	34	PGD2/OA2IN-/AN8/RP35/RB3	Op Amp 2 Negative Input.
PIM:67	22	OA3IN-/AN13/CMP1B/ISRC0/RP49/RC1	Op Amp 3 Negative Input.
PIM:68	50	RP52/RC4	Direct Connection.
PIM:69	38	RP73/PCI20/RD9	Direct Connection.
PIM:70	39	RP72/SDO2/PCI19/RD8	Direct Connection.
PIM:71	—	—	Not Connected.
PIM:72	—	—	Not Connected.
PIM:73	35	PGC2/OA2IN+/AN17/RP36/RB4	Op Amp 2 Positive Input.
PIM:74	16	OA1IN+/AN9/RA2	Op Amp 1 Positive Input.
PIM:75[2]	9, 26, 40, 56	Vss	Digital Ground (DGND).
PIM:76	51	RP53/RC5	Direct Connection.
PIM:77	—	—	Not Connected.
PIM:78	59	RP65/PWM4H/RD1	Direct Connection.
PIM:79	49	PGC1/AN11/RP41/SDA1/RB9	Direct Connection.
PIM:80	44	RP69/RD5	Direct Connection.
PIM:81	—	—	Not Connected.
PIM:82	3	RP60/RC12	Direct Connection.
PIM:83	52	RP58/RC10	Direct Connection.
PIM:84	53	RP59/RC11	Direct Connection.
PIM:85	—	—	Not Connected.
PIM:86[1]	10, 25, 41, 57	VDD	Digital Power (DVDD).
PIM:87	55	RP67/RD3	Direct Connection.
PIM:88	58	RP66/RD2	Direct Connection.
PIM:89	—	—	Not Connected.
PIM:90	—	—	Not Connected.
PIM:91	4	RP61/RC13	Direct Connection. Test point IO1 is provided on the pin.
PIM:92	—	—	Not Connected.
PIM:93	2	RP47/PWM1L/RB15	Direct Connection.
PIM:94	1	RP46/PWM1H/RB14	Direct Connection.
PIM:95	—	—	Not Connected.
PIM:96	—	—	Not Connected.
PIM:97	5	RP62/RC14	Direct Connection. Test point IO4 is provided on the pin.
PIM:98	64	RP45/PWM2L/RB13	Direct Connection.
PIM:99	63	TDI/RP44/PWM2H/RB12	Direct Connection.
PIM:100	62	TCK/RP43/PWM3L/RB11	Direct Connection.

Note 1: Digital Power (DVDD) pins are shorted together on the PIM.
2: Digital Ground (DGND) pins are shorted together on the PIM.
3: The signal connects to the device pin via a jumper resistor (0 Ohm). When needed, remove the jumper resistor to disconnect the signal.
4: The PIM pin is connected to the device pin through a jumper resistor. This is populated in the external amplifier configuration, where the amplifier is disabled and the amplifier feedback resistors are removed.

dsPIC33CK256MC506

TABLE 4:   RESISTOR CONFIGURATION – INTERNAL AMPLIFIER CONFIGURATION

Amplifier	Populate	Remove	Remarks
Op Amp 1 (OA1)	R6 = R5 = R_F[1]	R7 (0 Ohm)	In the firmware, configure and enable Op Amp 1 (OA1)
Op Amp 2 (OA2)	R12 = R13 = R_F[1]	R14 (0 Ohm)	In the firmware, configure and enable Op Amp 2 (OA2)
Op Amp 3 (OA3)	R19 = R20 = R_F[1]	R23 (0 Ohm)	In the firmware, configure and enable Op Amp 3 (OA3)

Note 1: The customer can select the appropriate value of feedback resistor, R_F (ex., P/N: RR0816P-302-D; Value: 3 kOhms), based on the application requirements. However, ensure the peak current of the motor control board where the PIM is mounted is within its operating range.

dsPIC33CK256MC506 Motor Control Plug-In Module (PIM) for External Op Amp Configuration

Schematic Revision 1.0

dsPIC33CK256MC506 External Op Amp Motor Control PIM
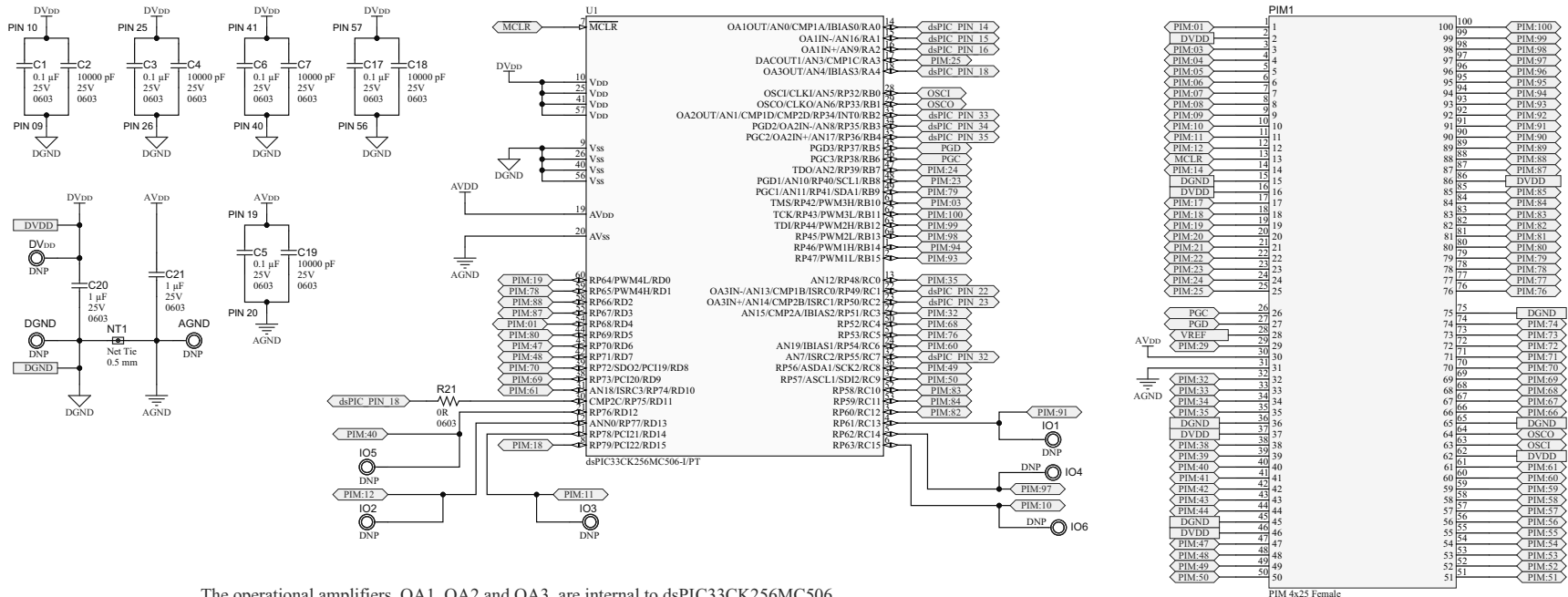
The operational amplifiers, OA1, OA2 and OA3, are internal to dsPIC33CK256MC506
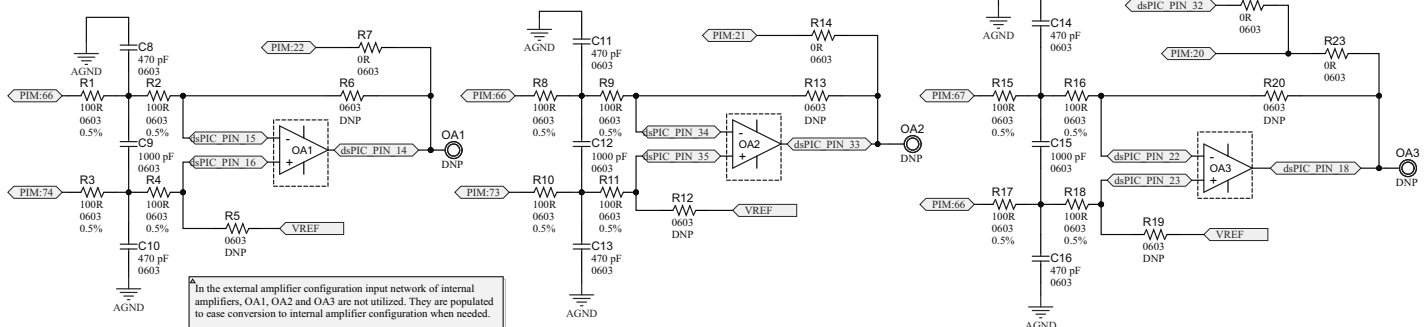
In the external amplifier configuration input network of internal amplifiers, OA1, OA2 and OA3 are not utilized. They are populated to ease conversion to internal amplifier configuration when needed.

dsPIC33CK256MC506

NOTES:

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://www.microchip.com/
support
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Australia - Sydney
Tel: 61-2-9868-6733

China - Beijing
Tel: 86-10-8569-7000

China - Chengdu
Tel: 86-28-8665-5511

China - Chongqing
Tel: 86-23-8980-9588

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444

India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

Japan - Tokyo
Tel: 81-3-6880- 3770

Korea - Daegu
Tel: 82-53-744-4301

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

Malaysia - Penang
Tel: 60-4-227-8870

Philippines - Manila
Tel: 63-2-634-9065

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600

Thailand - Bangkok
Tel: 66-2-694-1351

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4485-5910
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-72400

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Development Boards & Kits - PIC/DSPIC *category:*

Click to view products by Microchip *manufacturer:*

Other Similar products are found below :

TDGL025 EV01G21A EV72J15A EV73T25A EV97U97A MIKROE-5314 DV330021 DM160230 DM164141 DM164142 DM164143 DM240016 DM320010 DM320101 DM320105 DM320107 DM330028 DM320008 DM320008-C DM320010-C DM330026 MIKROE-2639 TCHIP005 MIKROE-2651 MIKROE-2645 MIKROE-2643 MIKROE-2655 MIKROE-2637 MIKROE-2642 MIKROE-2644 MIKROE-2647 MIKROE-2654 MIKROE-2648 MIKROE-2788 MIKROE-1907 MIKROE-2567 SC70EV STM32F103ZET6 510-000 DLP-UCF2321 DLP-UCF4420 DLP-UCF917 EV53Z50A ECC383116EU AC103011 AC243026 AC323027 ARD00906 DM160228 DM163025-1