UltraCP™ MYC0409-NA's EVM

Document Category: User guide

Ultra-thin High Efficiency 72W DCDC converter module

ABSTRACT

The user's guide provides information on the correct usage of the test board and an explanation of the test points and jumpers on the board. The test board features the MYC0409-NA configured for Divide by Four operation. The test board operates over the entire input voltage range of the MYC0409-NA. The minimum input and the output capacitors are included on the board.

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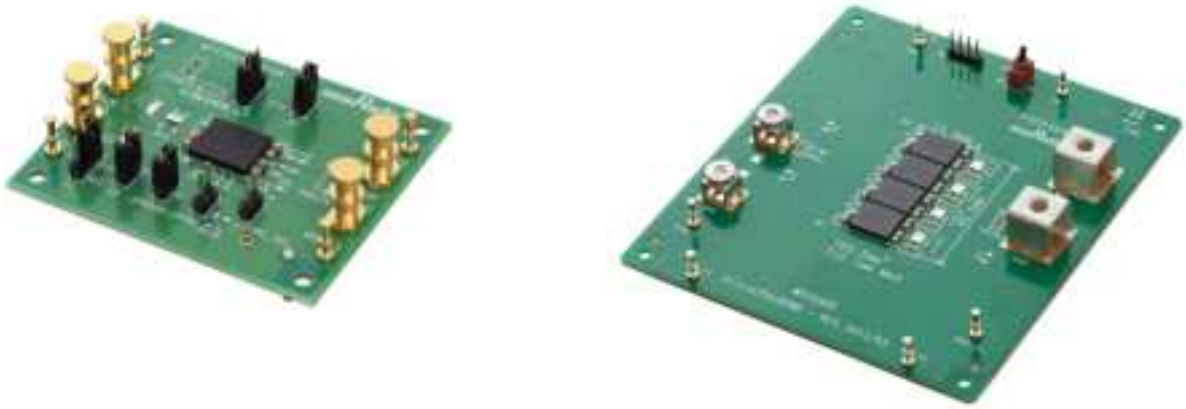
Description

Two EVMs feature single or four in parallel of the MYC0409-NA charge pump module which configured for operation with 20 to 60V input voltage range. The output voltage is fixed divide-by-4 conversion ratio from input voltage. The full output current rating of the device can be supplied by the EVM.
Input and output capacitors are mounted on the board to accommodate the entire range of input and output voltages. Monitoring test points are provided to allow measurement of voltage, efficiency, power dissipation and load regulation.
Control jumpers and component footprints are provided for use of the ENABLE, PGOOD, and CLK features of the module. Two EVMs use a recommended PCB layout that minimizes output ripple and noise.
Detailed application information with MYC0409-NA is available in the datasheet.



a) MYC0409-NA-EVM b) MYC0409-NA-PARA-EVM

Figure 1. Evaluation Board

Performance Summary

Table 1. Performance Summary

PARAMETER	SYMBOL	CONDITIONS		MIN	TYPICAL	MAX	UNITS
INPUT SUPPLY							
Input voltage range	V_{IN}			20	48	60	V
OUTPUT							
Efficiency Full Load		MYC0409-NA-EVM	V_{IN} = 48V, I_{OUT} = 6A	-	95.0	-	%
		MYC0409-NA-PARA-EVM	V_{IN} = 48V, I_{OUT} = 20A	-	95.0	-	%
Switching Frequency	F_{SW}			-	270	-	kHz
Output Current (Continuous)	I_{OUT}	MYC0409-NA-EVM	Inside recommended OP range	0	-	6	A
		MYC0409-NA-PARA-EVM		0	-	20	A
VOUT Voltage	V_{OUT}	ILOAD=No load, DC		-	VIN/4	-	V

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Quick Start Guide of MYC0409-NA-EVM

Figure 2. Highlights the user interface items associated with the EVM.

The VIN Power terminals are used for connection to the host input supply and the *VOUT Power* terminals are used for connection to the load. Sense(+/-) test points for both VIN and VOUT, located near the power terminals are intended to be used as voltage monitoring points where voltmeters can be connected to measure VIN and VOUT. **Do not connect these S+ and S- monitoring test points as the input supply or output load connection points.**

Control jumpers located to the top and bottom of the device are made available to test the features of the device. The VDD must be applied to the PGOOD for the PGOOD signal using the PGOOD jumper (JPGOOD).

The SYNCSEL jumper (JSYNC_SEL) is provided for selecting synchronization. The EN jumper (JEN) can be controlled ON/ OFF. Always remove input power before changing the jumper settings.

Evaluation Overview

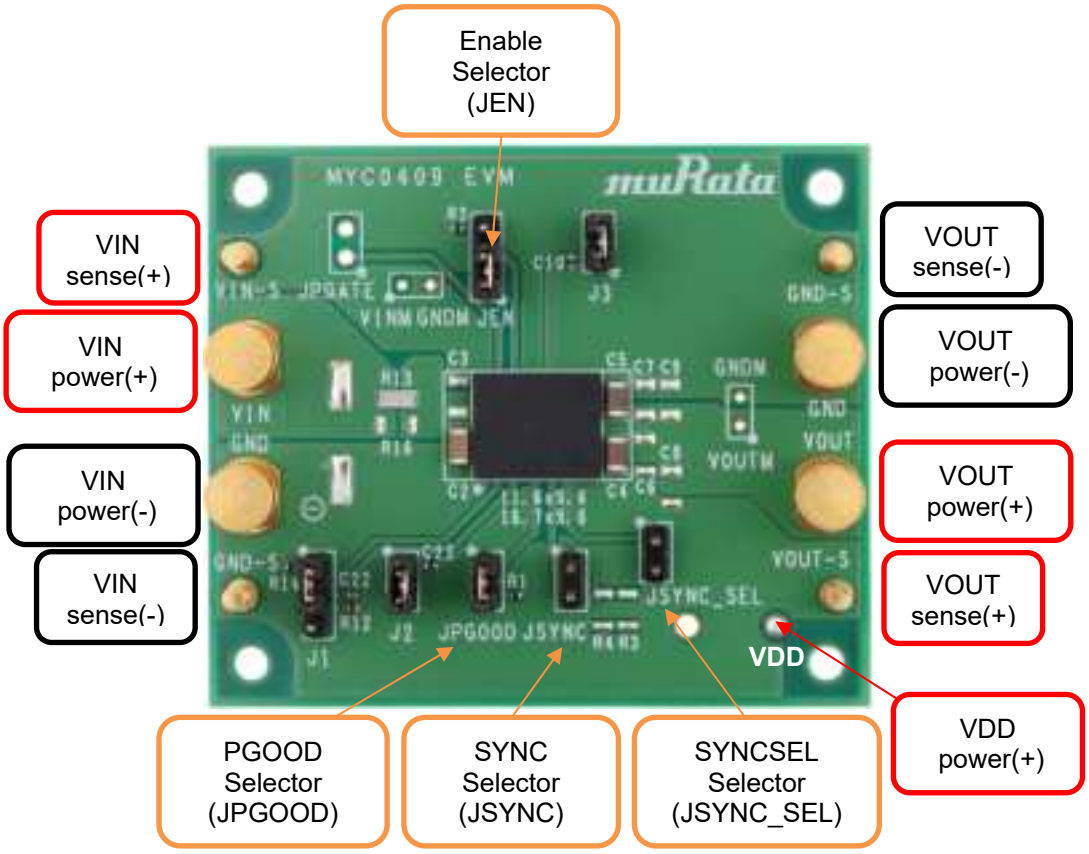

Figure 2. MYC0409-NA-EVM User Interface (Top view)

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Terminal Functions and Jumper Settings

Table 2. MYC0409-NA-EVM Terminal Functions and Jumper Settings

FUNCTION/TERMINAL	JUMPER (RECOMMENDATION)	DESCRIPTION
VIN power (+/-)		Power input pin and Input Ground pin.
VOUT power (+/-)		Power output pin and output Ground pin.
VIN sense (+/-)		Sensing pin for measuring the input voltage.
VOUT sense (+/-)		Sensing pin for measuring the output voltage.
VDD power (+)		Power input pin. The VDD must be input 3.3 - 5V. It pulls PGOOD up to VDD.
EN (JEN)	Short (1 and 2)	Enable pin. Open: It can be used to control EN input. Short (1 and 2): It pulls EN up to VIN.
PGOOD (JPGOOD)	Short	Power GOOD pin. It pulls PGOOD up to VDD. Do not open this pin.
SYNCSEL (JSYNC_SEL)	Open	SYNCSEL pin. Open: SYNC= disabled. Short: SYNC= Clock output.
SYNC (JSYNC)	Open	CLOCK IN / OUT pin. Do not short this pin.
J1	Open	Unused jumper pin. Do not short this pin.
J2, J3	Short	Unused jumper pin. Do not open these pins.

Power Input and Output Descriptions

The VIN power terminal is used to connect to the input supply, and the VOUT power terminal is used to connect to the load. The VDD power terminal is used to connect to pull PGOOD up.

Caution: Do not use these sense(+) and sense(-) terminals as the input supply or output load connection points. The PCB traces connecting to these sense terminals are not designed to support high currents. High currents may cause damage the PCB traces.

Test Point Descriptions

The sense(+) and sense(-) test points for both VIN and VOUT, located near the power terminal are intended to be used as voltage monitoring points where voltmeters can be connected to measure VIN and VOUT.

Jumper Descriptions

The SYNCSEL SELECT jumper (**JSYNC_SEL**) is provided for selecting the SYNC terminal control.

Before applying power to the EVM, ensure that the jumper is present and properly positioned for the SYNC terminal control. Refer to Table 2 for the recommended jumper settings. The EN jumper (**JEN**) is provided for pulling up Vin. The PGOOD jumper (**JPGOOD**) is provided for pulling up VDD. Always remove input power before changing the jumper settings.

J1, J2 and J3 are unused jumper pins. Do not change the initial setting.

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EVM Connection

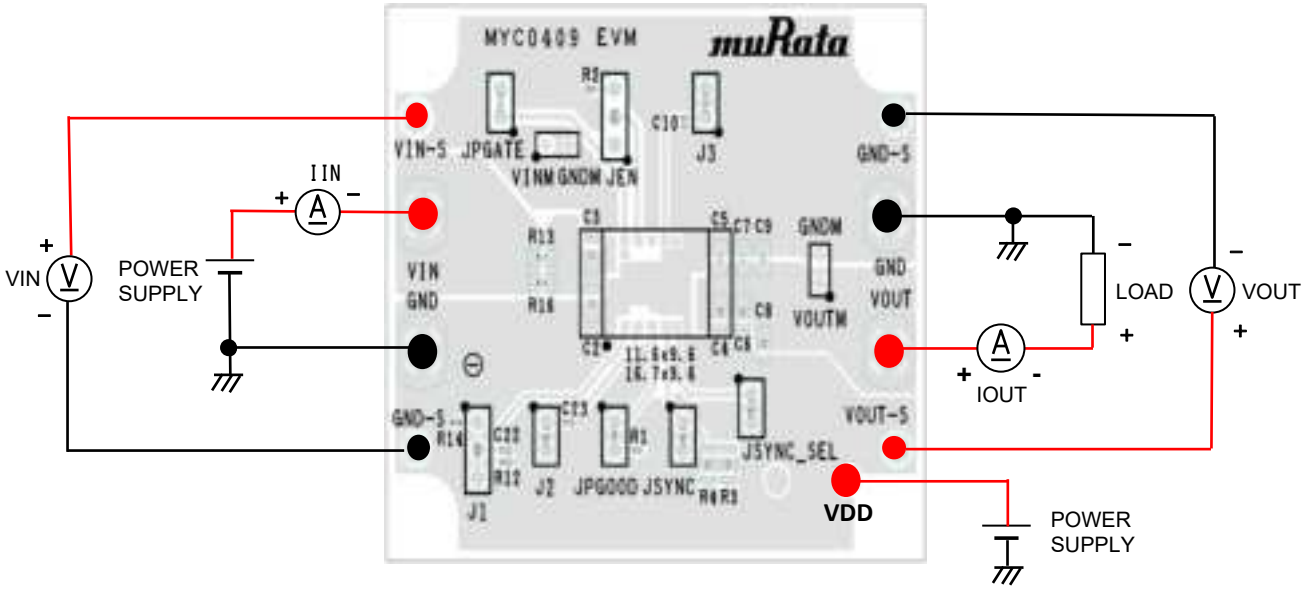

Figure 3. MYC0409-NA- EVM Connection

Start-Up Procedure

1. Set the power supply current limit to at least 2A. Connect the power supply to VIN power(+) and VIN power(-).
2. Set the power supply current limit to at least 1mA. Connect the power supply to VDD and VOUT power(-).
3. Connect one electronic load with more than 6A capacity between Vout power(+) and Vout power(-). Do not turn on the load before PGOOD become high.
4. Set the PGOOD jumper (**JPGOOD**) pull up VDD. The EN jumper (**JEN**) pull up Vin, it is written dot on the board. The SYNCSEL SELECT jumper (**JSYNC_SEL**) you desire.
5. Set VDD voltage to 5V and turn it on.
6. Set input voltage to 48V and turn it on.
7. Measure the output voltages. VOUT should be Vin/4=12V.
8. Slowly increase the load current while monitoring the output voltages. The outputs should drop because this module is just divider.

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Quick Start Guide of MYC0409-NA-PARA-EVM

Figure 4. Highlights the user interface items associated with the EVM.

The VIN Power terminals are used for connection to the host input supply and the *VOUT Power* terminals are used for connection to the load. Sense(+/-) test points for both VIN and VOUT, located near the power terminals are intended to be used as voltage monitoring points where voltmeters can be connected to measure VIN and VOUT. **Do not connect these S+ and S- monitoring test points as the input supply or output load connection points.**

The VPG must be applied to 3.3 voltage or 5 voltage for using the PGOOD signal. The switch can be controlled to enable or disable the module.

Evaluation Overview

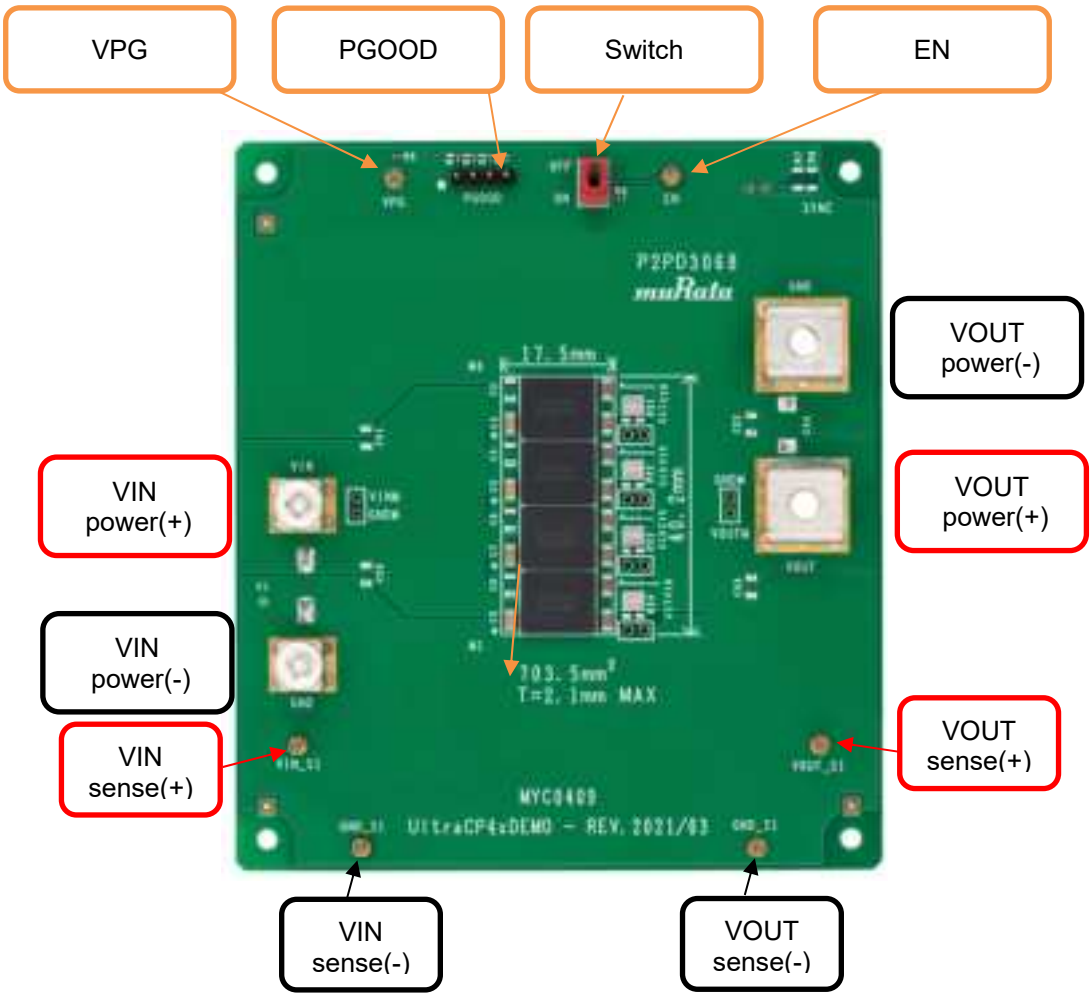

Figure 4. MYC0409-NA-PARA-EVM User Interface (Top view)

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Terminal Functions and Jumper Settings

Table 3. MYC0409-NA-PARA-EVM Terminal Functions and Jumper Settings

FUNCTION/TERMINAL	JUMPER (RECOMMENDATION)	DESCRIPTION
VIN power (+/-)		Power input pin and Input Ground pin.
VOUT power (+/-)		Power output pin and output Ground pin.
VIN sense (+/-)		Sensing pin for measuring the input voltage.
VOUT sense (+/-)		Sensing pin for measuring the output voltage.
EN		EN can be used to monitor voltage at the enable pin in the module.
Switch		The switch can be controlled to enable or disable the module.
PGOOD		PGOOD is Power GOOD pin. VPG must be applied to 3.3 voltage or 5V voltage for using the PGOOD signal.
VPG		VPG is bias pin for PGOOD.

Power Input and Output Descriptions

The VIN power terminal is used to connect to the input supply, and the VOUT power terminal is used to connect to the load.

Caution: Do not use these sense(+) and sense(-) terminals as the input supply or output load connection points. The PCB traces connecting to these sense terminals are not designed to support high currents. High currents may cause damage the PCB traces.

Test Point Descriptions

The sense(+) and sense(-) test points for both VIN and VOUT, located near the power terminal are intended to be used as voltage monitoring points where voltmeters can be connected to measure VIN and VOUT.

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EVM Connection

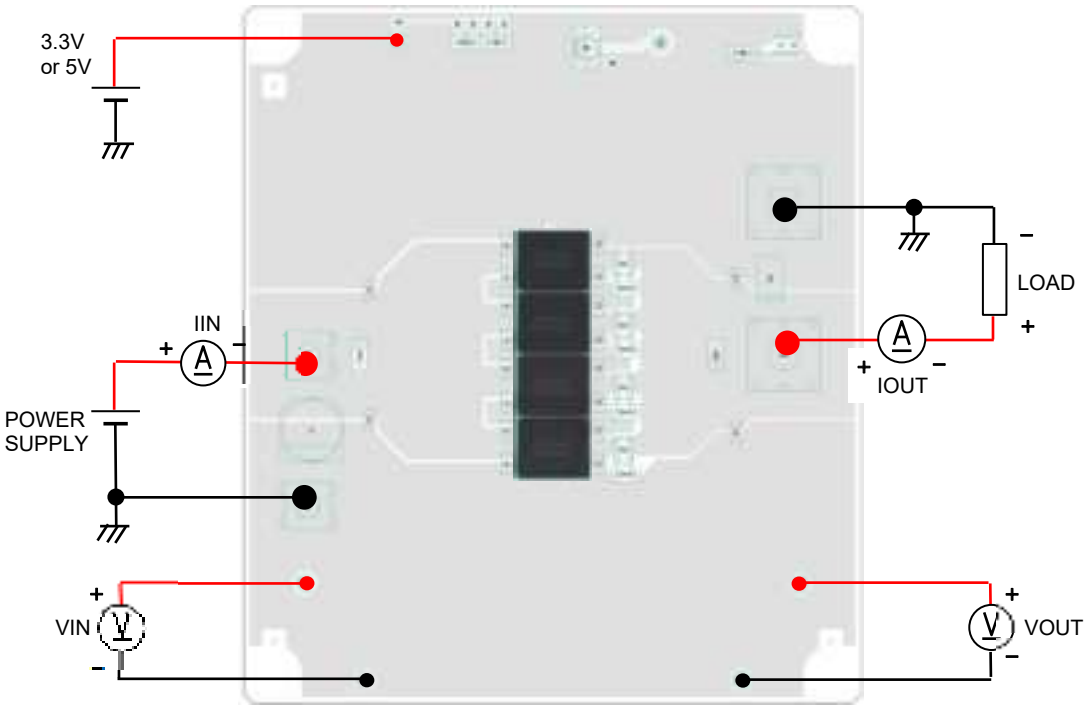

Figure 5. EVM Connection

Start-Up Procedure

1. Set the power supply current limit to at least 8A. Connect the power supply to VIN power(+) and VIN power(-).
2. Connect the power supply for 3.3V or 5V to VPG.
3. Connect one electronic load with more than 20A capacity between Vout power(+) and Vout power(-). Do not turn on the load before PGOOD become high.
4. Turn on the power supply for 3.3V or 5V.
5. Set input voltage to 48V and turn it on.
6. Measure the output voltages. VOUT should be Vin/4=12V.
7. Slowly increase the load current while monitoring the output voltages. The outputs should drop because this module is just divider.

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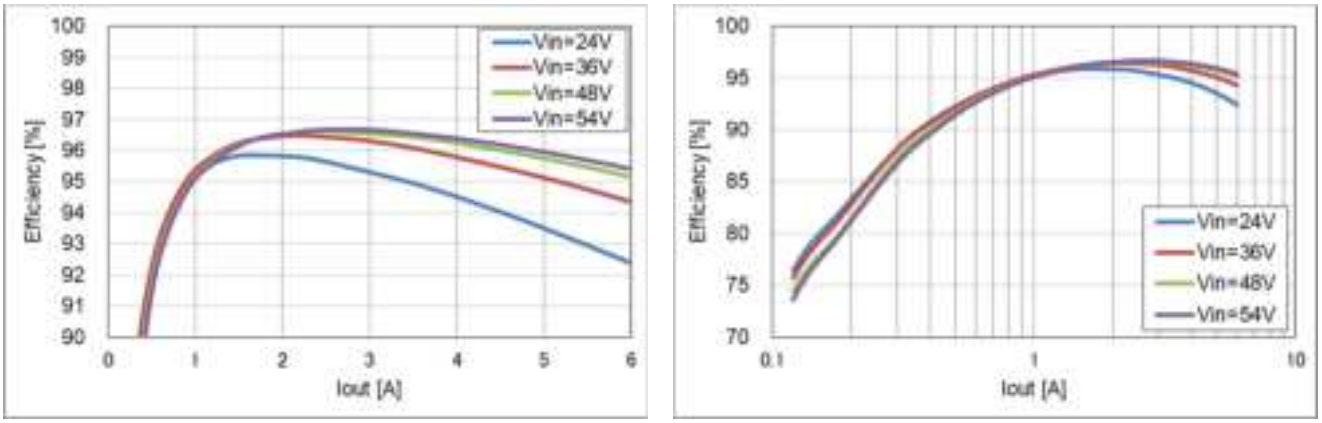
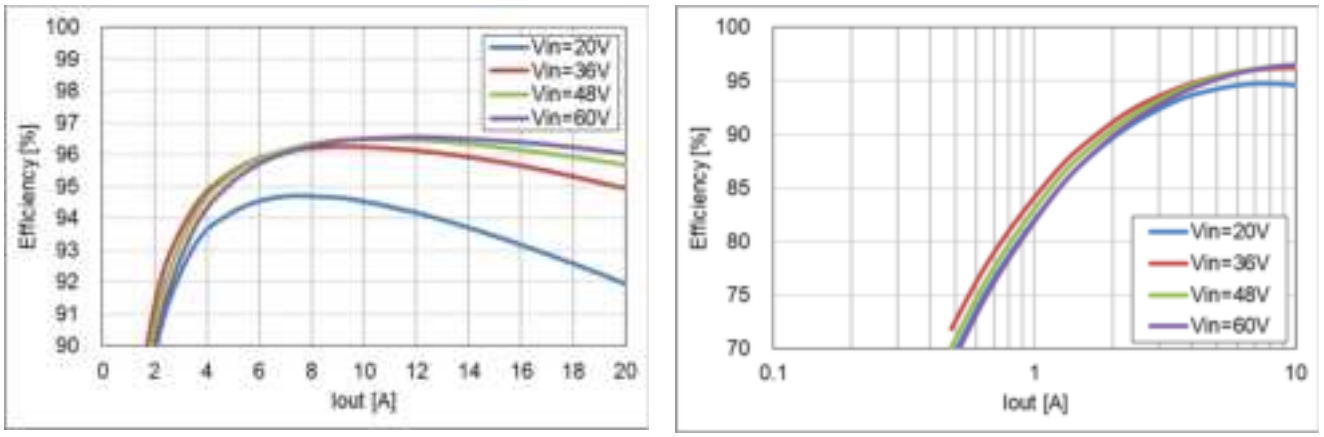
Performance Data

Figure 6. through Figure 12. demonstrate the MYC0409-NA-EVM and MYC0409-NA-PARA-EVM performance. The following test results show the typical performance of the evaluation board.

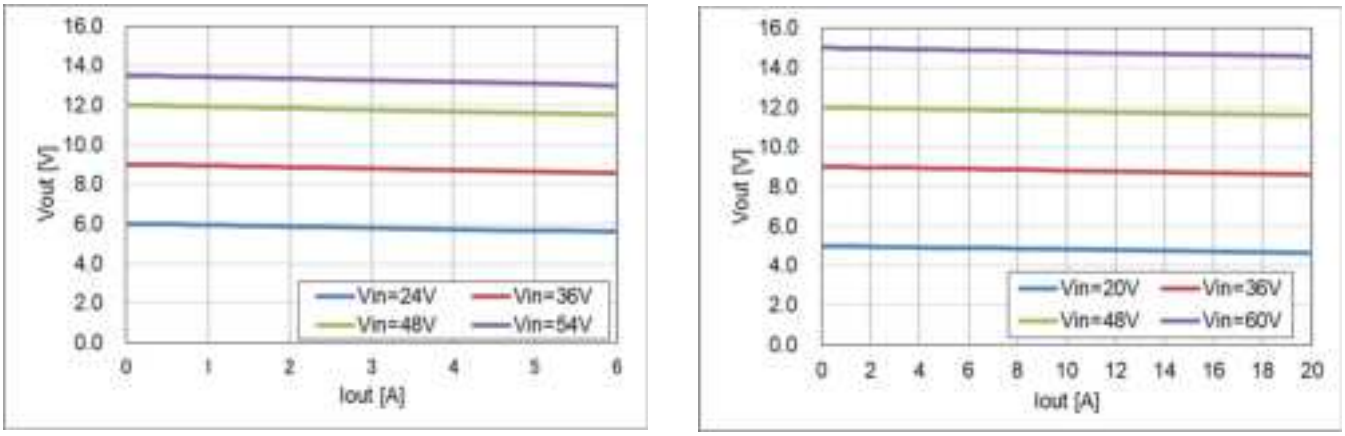


(a)MYC0409-NA-EVM



(b)MYC0409-NA-PARA-EVM

Figure 6. Efficiency (Linear, Log scale)



(a)MYC0409-NA-EVM (b)MYC0409-NA-PARA-EVM

Figure 7. Output Voltage

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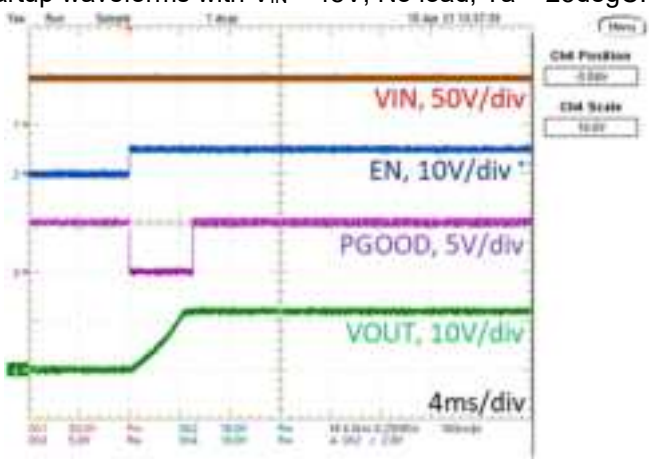
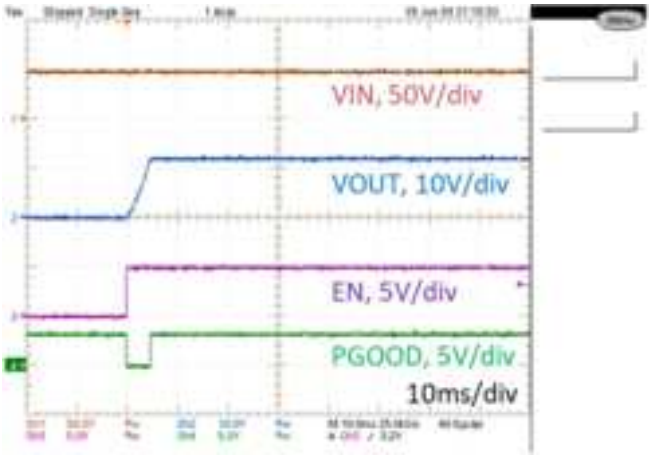
Startup waveforms with V_{IN} = 48V, No load, Ta = 25degC.



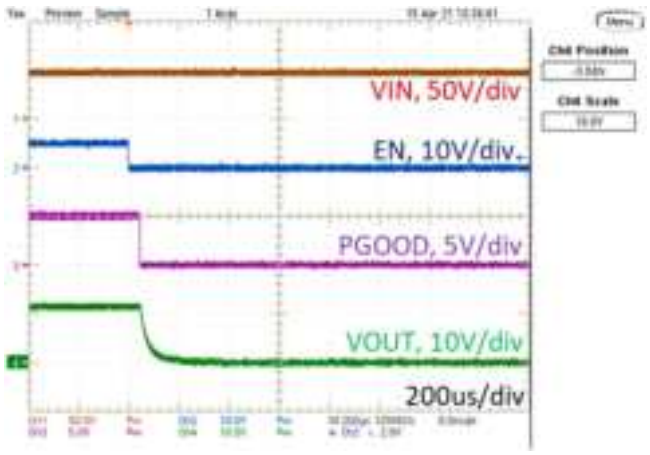
(a)MYC0409-NA-EVM



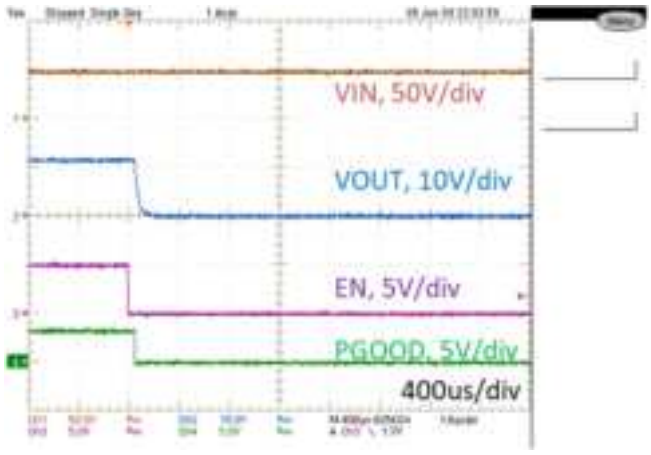
(b)MYC0409-NA-PARA-EVM

Figure 8. Start-up Waveform

Shutdown waveforms with V_{IN}=48V, I_{OUT}=max, Ta=25degC.



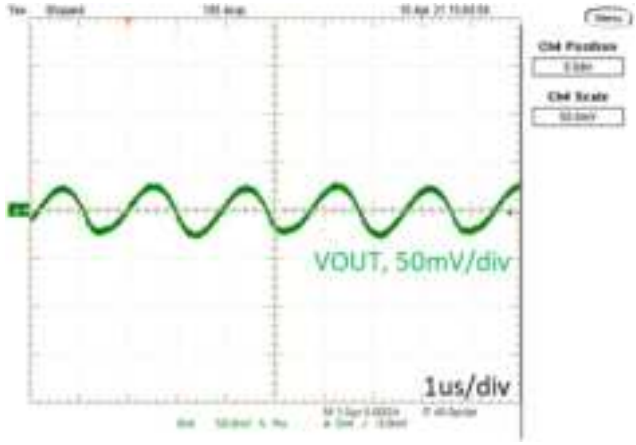
(a)MYC0409-NA-EVM (I_{OUT} = 6A)



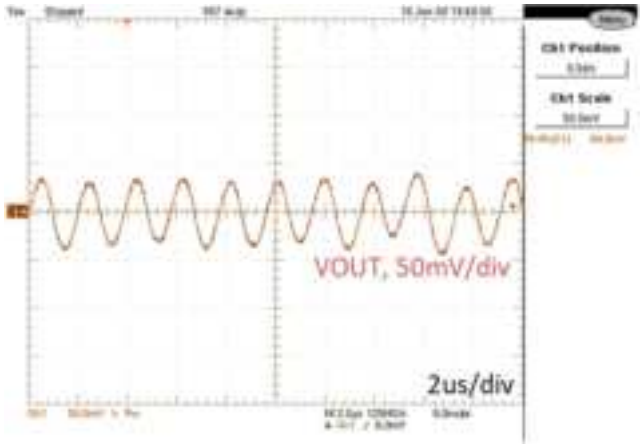
(b)MYC0409-NA-PARA-EVM (I_{OUT} = 20A)

Figure 9. Shutdown Waveform

VOUT ripple waveforms with V_{IN}=48V, I_{OUT}=max, Ta=25degC.



(a)MYC0409-NA-EVM (I_{OUT} = 6A)



(b)MYC0409-NA-PARA-EVM (I_{OUT} = 20A)

Figure 10. V_{OUT} Ripple Waveform

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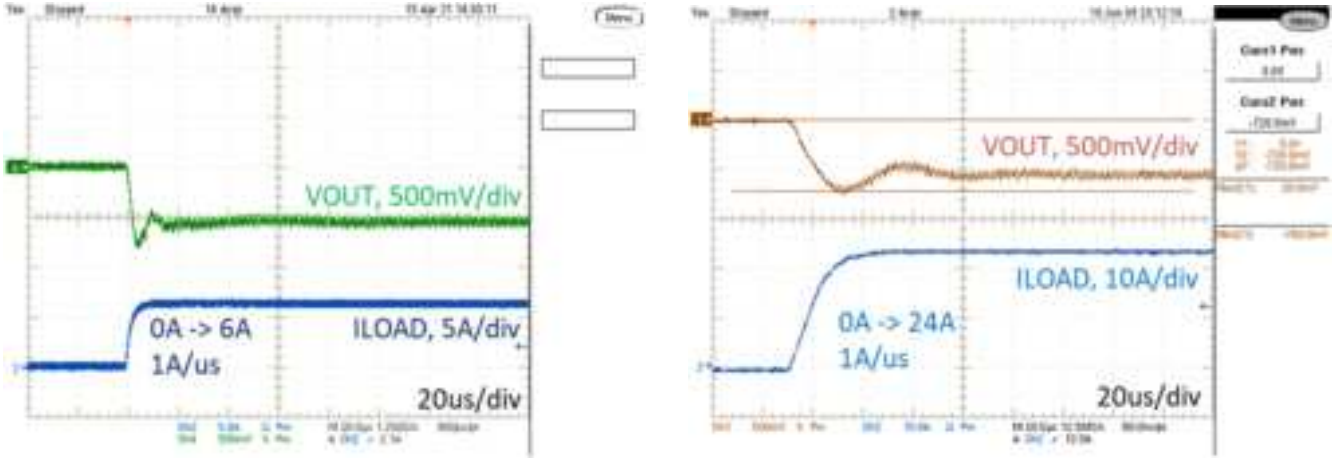
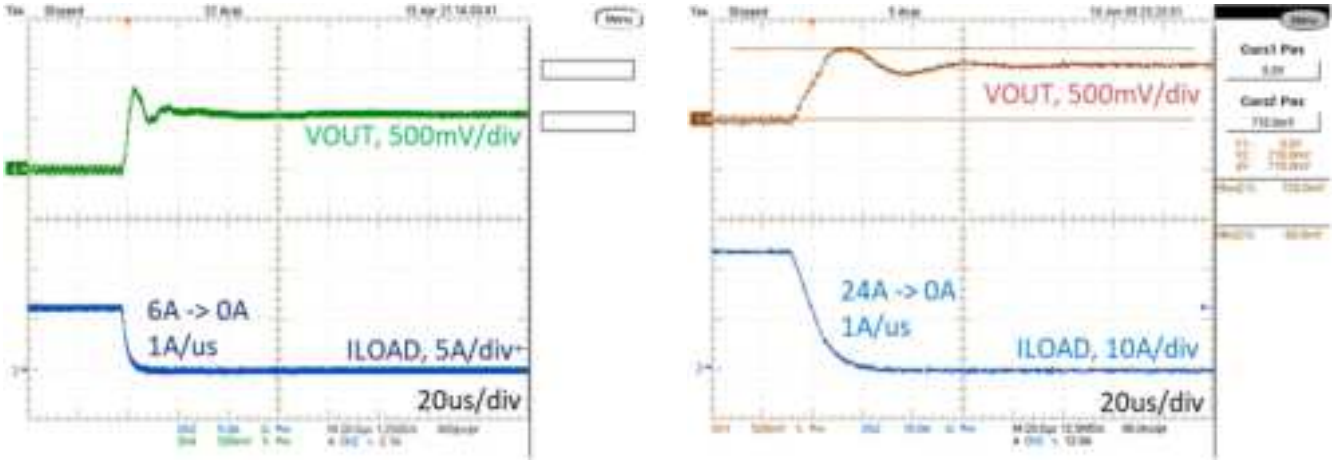
Load transient response waveforms with V_{IN} = 48V, I_{OUT} = 0A to max, Ta = 25degC.



(a)MYC0409-NA-EVM (I_{OUT} = 0A to 6A) (b)MYC0409-NA-PARA-EVM (I_{OUT} = 0 to 20A)

Figure 11. Load Transient Response Waveform (0A to max)

Load transient response waveforms with V_{IN}=48V, I_{OUT}=max to 0A, Ta=25degC.



(a)MYC0409-NA-EVM (I_{OUT} = 6A to 0A) (b)MYC0409-NA-PARA-EVM (I_{OUT} = 20A to 0A)

Figure 12. Load Transient Response Waveform (max to 0A)

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MYC0409-NA-EVM Bill of Materials (BOM)

Table 4. MYC0409-NA-EVM Bill of Materials

REFERENCE	VALUE	DESCRIPTION	SIZE	PART NUMBER	MANUFACTURER
C1	100uF	Input Capacitor 100uF,			
C2	4.7uF	Input Capacitor 4.7uF, 100V,+/-10%, X7S	1206	GRM31CC72A475KE11	Murata
C4, C5	22uF	Output Capacitor 22uF, 25V,+/-20%, X7S	1206	GRM31CC71E226ME15	Murata
R1, R2	10KOhm	Pull up resistor for Power Good Indication Pull down resistor for Enable function 5%, 0.1W	0402	RK73B1ETTP103J	KOA
R13		Jumper	1206	TLRZ2BTTD	KOA
M1		Power module		MYC0409-NA	Murata

Table 5. MYC0409-NA-PARA-EVM Bill of Materials

REFERENCE	VALUE	DESCRIPTION	SIZE	PART NUMBER	MANUFACTURER
C1	100uF	Input Capacitor 100uF,			
C3, C5, C7, C9	4.7uF	Input Capacitor 4.7uF, 100V,+/-10%, X7S	1206	GRM31CC72A475KE11	Murata
C10, C11 C12, C13, C14, C15 C16, C17	22uF	Output Capacitor 22uF, 25V,+/-20%, X7S	1206	GRM31CC71E226ME15	Murata
R1, R2, R3, R4, R9, R10 R11, R12, R14 R17, R19, R20 R22, R23, R25 R26, R28		Jumper	0402	RK73Z1ETTP	KOA
R31, R32, R33 R34		Jumper	1206	TLRZ2BTTD	KOA
R5, R6	10KOhm	5%, 0.1W	0402	RK73B1ETTP103J	KOA
SW1		Switch		G-12AP	
M1, M2, M3 M4		Power module		MYC0409-NA	Murata

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MYC0409-NA-EVM Schematic

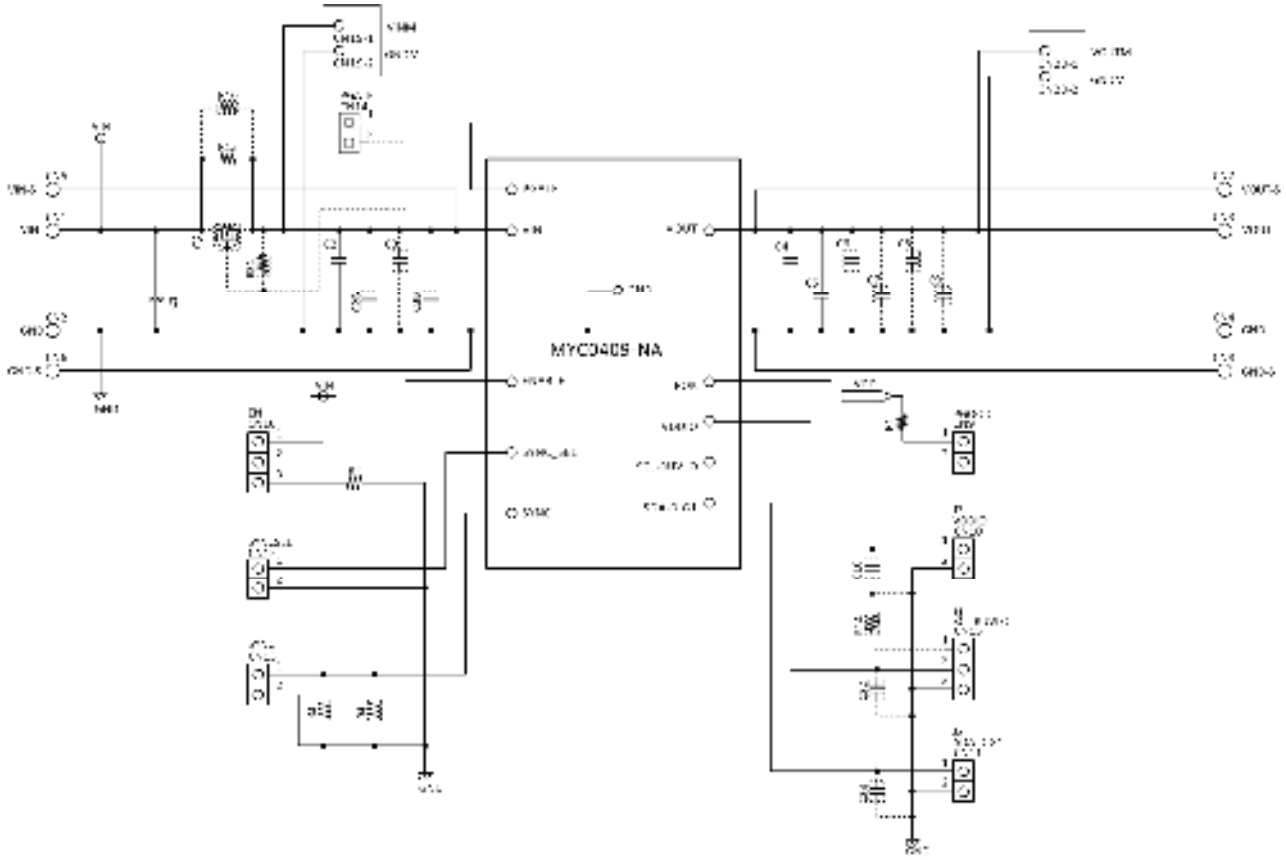

Figure 13. MYC0409-NA EVM Schematic

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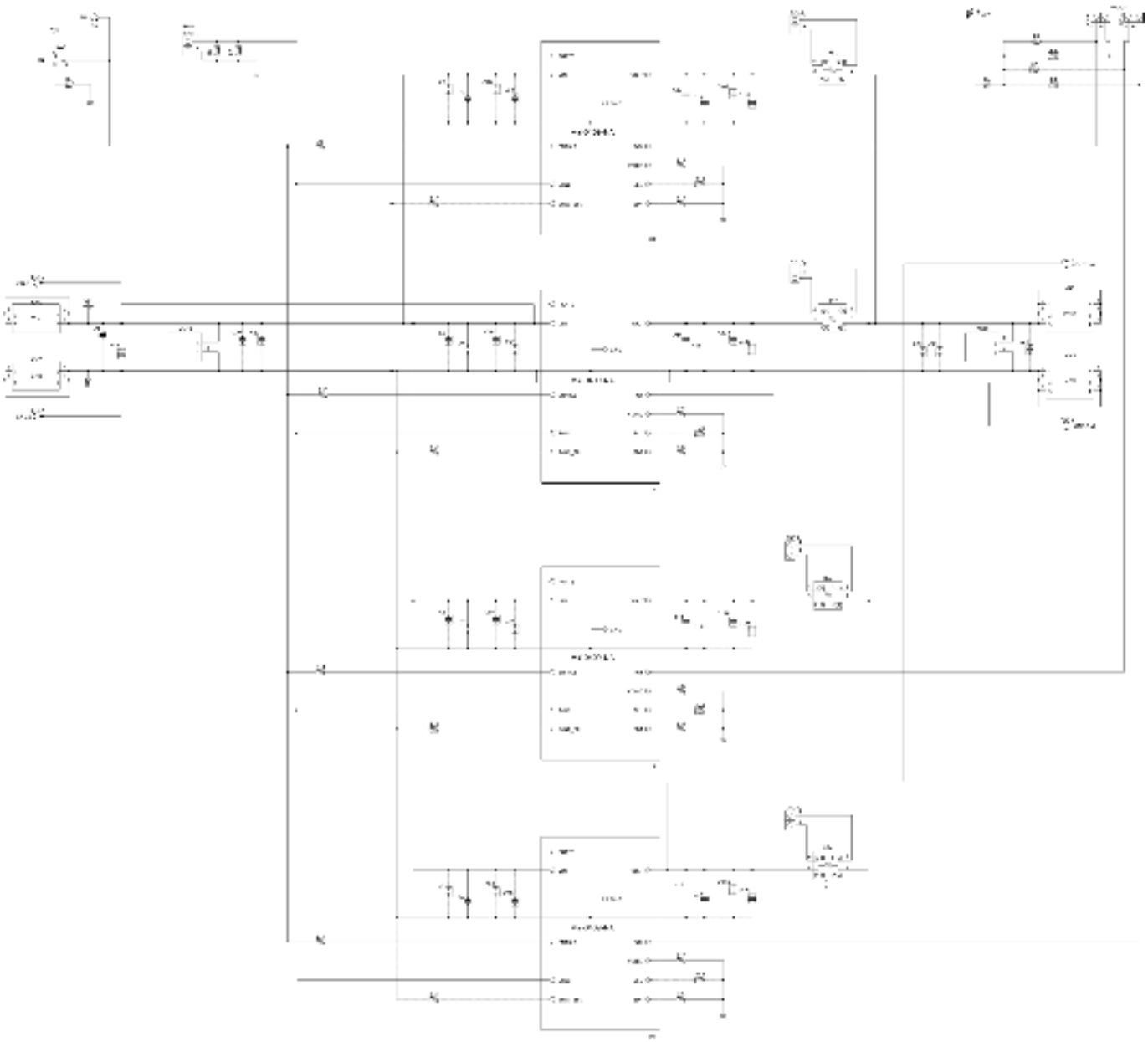

Figure 14. MYC0409-NA-PARA-EVM Schematic

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EVM PCB Layout

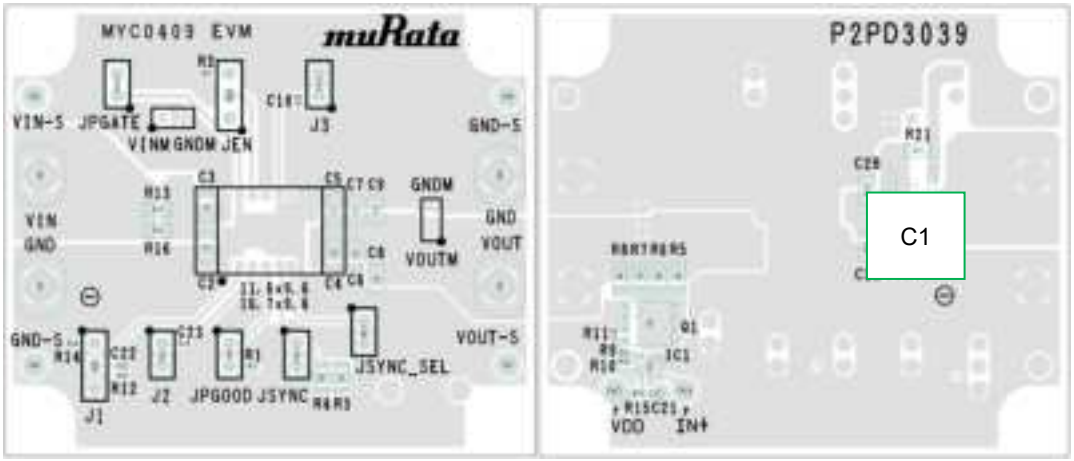

Figure 15. MYC0409-NA-EVM Evaluation Board Layout (Top and Bottom)

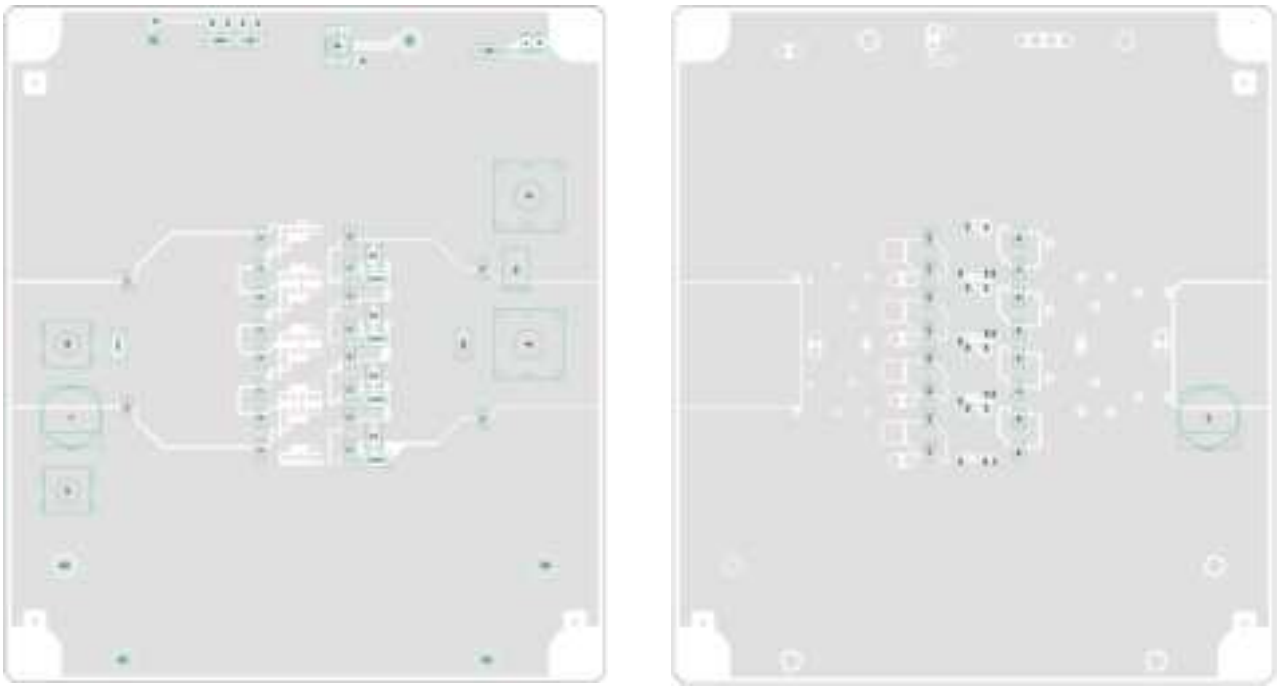

Figure 16. MYC0409-NA-PARA-EVM Evaluation Board Layout (Top and Bottom)

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Notices

⚠ CAUTION

1. EVMs are not finished products. Murata delivers EVM for use in a research and development evaluation purpose only.
2. Please make sure that your product has been evaluated and confirmed to your specifications when our product is used in your product.
3. All the items and parameters in this approval sheet for product specification are based on the premise that our product is used for the purpose, under the condition and in the environment agreed upon between you and us. You are requested not to use our product in a manner deviating from such agreement.
4. If you have any concerns about materials other than those listed in the RoHS directive, please contact us.
5. Be sure to provide an appropriate fail-safe functionality in your product to prevent secondary damage that could be caused by the abnormal function or failure of our product.
6. Do not allow our product to be exposed to excess moisture under any circumstances.

Sales Contact

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