

i7CxxA-CC3-EVK-P2

Parallel Evaluation Kit Manual for i7C Non-Isolated DC-DC Series

Contents

1. Introduction.....	2
2. Ordering Information	2
3. General Features	3
4. Turn-on / Turn-off module by switch	4
5. Change Output Voltage.....	4
6. Change Output Current Limit	4
7. Using clock to synchronize the modules.....	4
8. If you want to operate two modules independently.....	4
9. Schematic.....	5
10. PCB Layout (Top view)	6
11. Parts List: i7CxxA-CC3-EVK-P2	8

1. Introduction

This evaluation kit has been designed to provide an easy way to characterize the product performance and its features. It is intended to aid customers and determine the product suitability for the target application. The evaluation board incorporates the required external components to demonstrate the complete product functionality including the Itrim feature that can allow i7C parallel operation. It also includes other components (e.g., test points, screw terminals, etc...) to help facilitate a successful end-user experience. Not all these external components are required if the product features are not needed. Details of the external components, schematics, and PCB layout are provided in this documentation for reference only. Final design and qualification need to be verified at customer's end system level.

2. Ordering Information

TDK-Lambda offers a wide variety of non-isolated dc-dc power modules in the i7C series. Not every product is currently available in an evaluation kit. The table below includes descriptions and ratings which should help in selecting the most applicable evaluation kit.

Evaluation Kit Part Number	Non-Isolated DC-DC Module (Included and Mounted on the Evaluation Board)				
	DC-DC Module Part Number	# of Modules	Input Range	Output Range	Output Power*
i7C08A-CC3-EVK-P2	i7C4W008A120V-P03-R	2	Vin: 9.0 – 53 V *lin: 30A(max)	Vout: 12 – 48 V **	*600W (max)
i7C12A-CC3-EVK-P2	i7C4W012A050V-P03-R	2	Vin: 9.0 – 53 V *lin: 40A(max)	Vout: 10 – 28 V	*600W (max)
i7C20A-CC3-EVK-P2	i7C2W020A120V-P03-R	2	Vin: 9.0 – 36 V *lin: 50A(max)	Vout: 8 – 24 V	*600W (max)

* Maximum current and power of the parallel system are for reference – actual limitation is determined by thermal capability of the power modules and will vary based upon input voltage applied, output voltage setting, load, ambient temperature, and airflow.

** The i7C power modules installed are rated for up to 48V output. The evaluation kit configuration might limit the maximum adjustment range to 46.6V. Contact Technical support if 48V output is required.



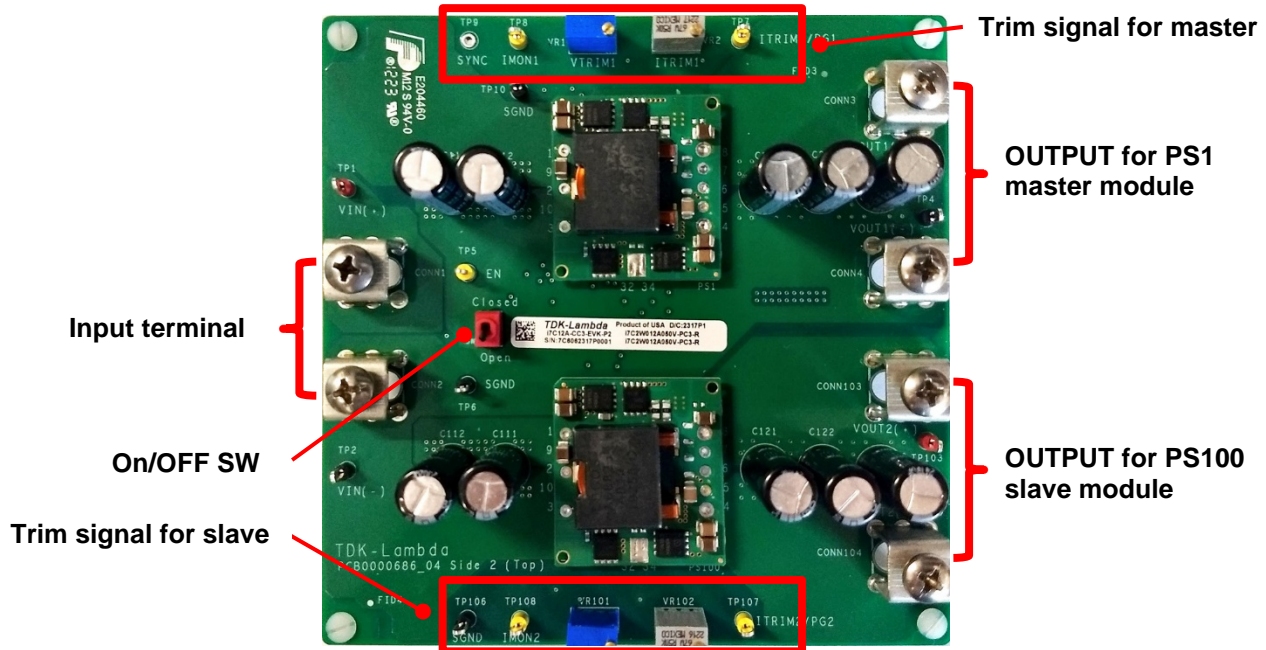
IMPORTANT INFORMATION

- Observe proper safety and laboratory procedures when testing electronic products. This list serves as general guide only and not a substitute for common sense and best practices.
- Before applying power, double-check and ensure all connections to the evaluation board interface are correct (e.g., Input source polarity connections, etc...).
- This evaluation board is not populated with an input fuse. An input fuse can be populated in PCB location F1/F2. Check the product specifications for the input fuse ratings and the evaluation board schematics included in this manual.
- Although highly efficient, these high-power density modules can dissipate significant amounts of power, especially at heavy load. Care should be taken to ensure adequate cooling is provided and the modules are operated within the thermal specifications outlined in the product data sheets. Heat sink and base plated versions of the i7C family are available for use in demanding environments.
- This evaluation kit is designed for general laboratory use. It is not intended for installation in end customer product or equipment.
- Please check the pertinent product (DC-DC Module) datasheets and specifications for complete information.

3. General Features

- Independent two module operation or parallel operation
- Screw Terminals for secured input and output connections
- Toggle switch for Remote ON/OFF
- Test points for ease of measurement
- Trim Potentiometer for adjusting the output voltage / output current setting

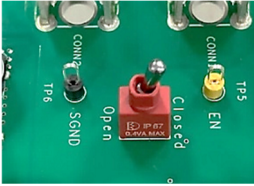
* Note the output capacitor value may need to be adjusted to meet transient response or ripple requirements of the final application. Refer to product data sheet for a range of acceptable values.



Test Point	Description	Test Point	Description
TP1	Vin (+)		
TP2	Vin (-) / Power GND		
TP3	Vout 1(+)	TP103	Vout 2(+)
TP4	Vout 1(-) / Power GND	TP104	Vout (-) / Power GND
TP5	ON/OFF		
TP6	Signal GND	TP106	Signal GND
TP7	Itrim1	TP107	Itrim2
TP8	IMON1	TP108	IMON2
TP9	(Not populated)		
TP10	Signal GND		

Screw Terminal	Description	Screw Terminal	Description
CONN1	Vin (+)		
CONN2	Vin (-) / Power GND		
CONN3	Vout 1(+)	CONN103	Vout 2(+)
CONN4	Vout 1(-) / Power GND	CONN104	Vout (-) / Power GND

4. Turn-On / Turn-Off module by switch



Changing position of toggle switch SW1 to “Closed” turns-on both PS1 (Master) and PS100 (Slave) DC-DC modules. By default, SW1 is connected to the ON/OFF pins of both PS1 and PS100 modules through R1 and R101 (See schematic for more details).

5. Change Output Voltage



The user can change the output voltage through the trim potentiometer. VTRIM1(VR1) is for PS1, VTRIM2(VR101) is for PS100.

Turn clockwise direction → increase output voltage.

***Default Configuration (as shipped) is for Parallel operation.**

Output voltage is regulated by only master module during parallel operation. VTRIM2 function has to be disabled, R105 is populated with 0ohm for parallel operation.

6. Change Output Current Limit



The user can change output current limit by trim pot. ITRIM1(VR2) is for PS1, ITRIM2(VR102) is for PS100.

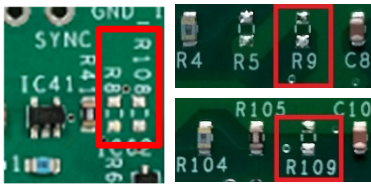
Turn clockwise direction → increase output current limit.

***Default Configuration (as shipped) is for Parallel operation.**

The current sharing signal provided by master module controls the slave module. R12 is populated with 10ohms for current sharing.

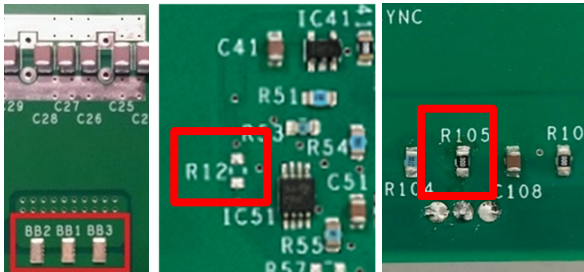
ITRIM2 signal is only valid at independent operation mode.

7. Using external clock to synchronize the modules



The two i7C modules must be synchronized to a common switching frequency during parallel operation. This function is enabled as default setting and the required clock signal (refer to i7C product specification) is provided on the evaluation board to synchronize the module’s switching at approximately 250KHz. To disable the sync during independent operation (not required), remove R8 and R108 and install R9 and R109.

8. If you want to operate two modules independently



i7CxA-CC3-EVK-P2 has 2 modules.

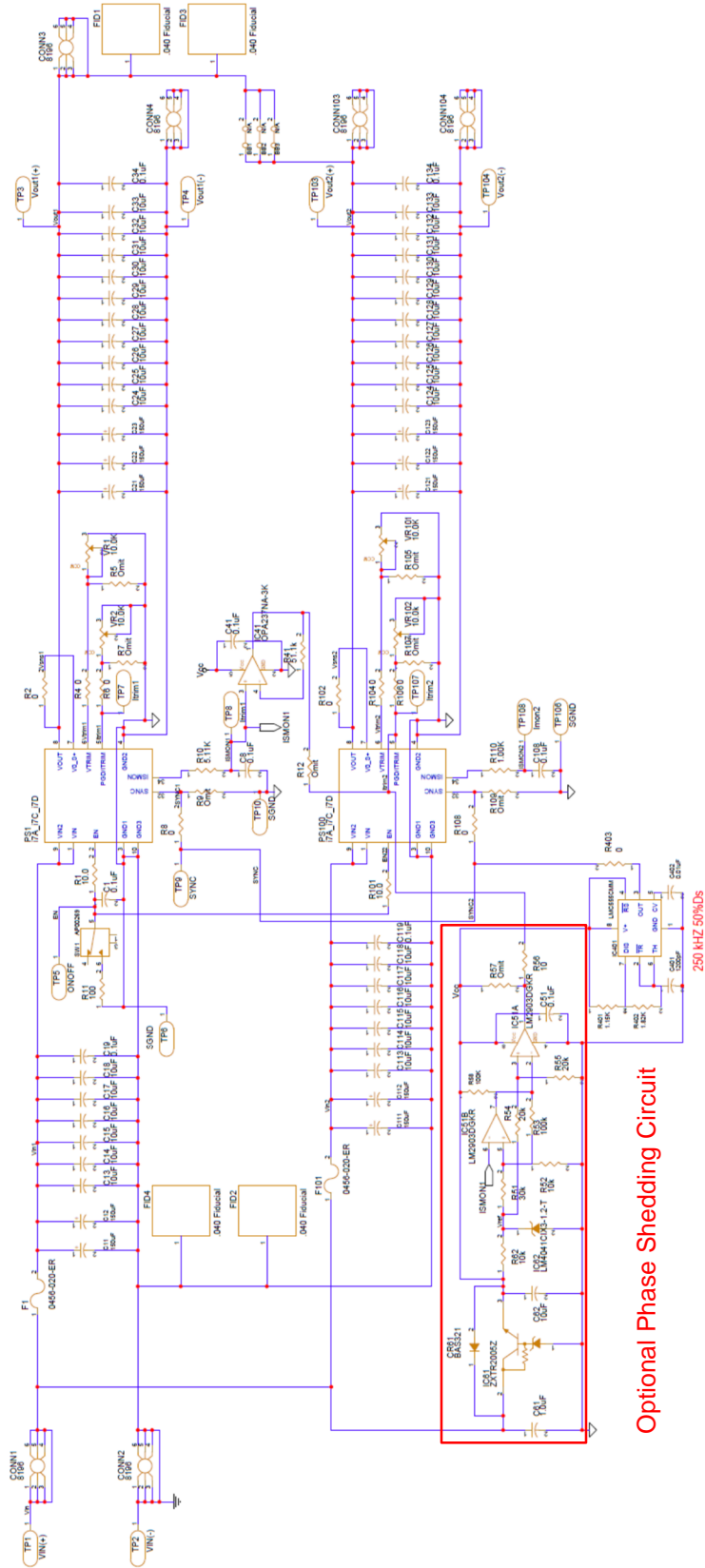
Default configuration is set for “parallel operation”.

*** Configuration for independent operation***

- Disconnect BB1- BB3 to separate the output connections between PS1 and PS100.
- Disconnect R12 & R56 to separate current sharing signal between PS1 and PS100.
- Disconnect R105 to enable VTRIM2 function.
- Connect R106 to enable ITRIM2 function.

	Independent Operation	Parallel Operation
Connect	R106	BB1-BB3, R12, R105
Disconnect	BB1-BB3, R12, R105	R106

9. Schematic



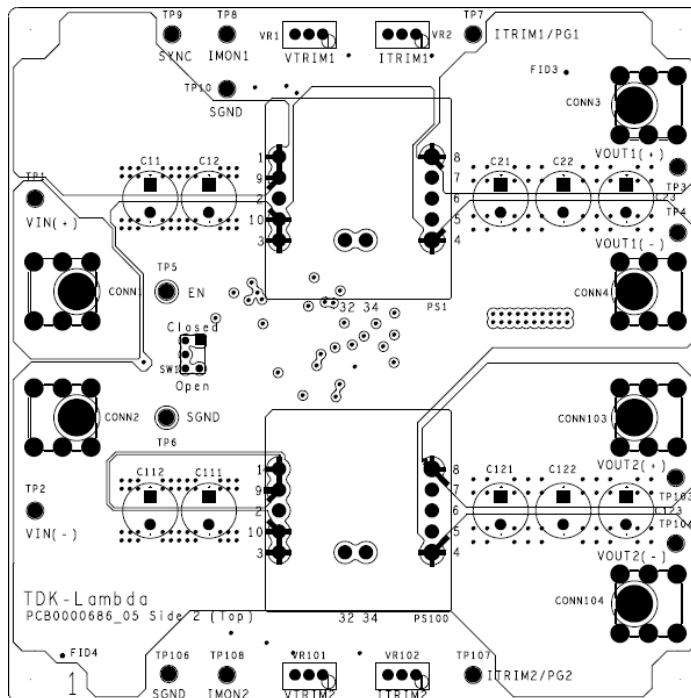
Optional Phase Shedding Circuit

General Schematic: Check the accompanying parts list that pertains to the actual Evaluation Kit part number to see which circuit codes/components are used.

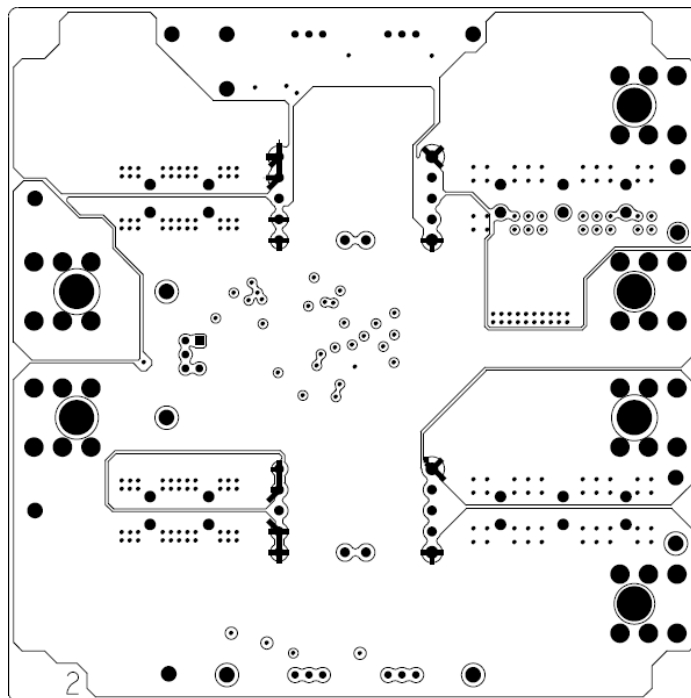
The optional phase shedding circuit can enhance system performance under light load conditions and when transitioning from light to heavy loads. It can be tested by populating resistor R56.

10. PCB Layout (Top view)

Top Layer (2oz)



Layer 2 (3oz)



11. Parts List: i7CxxA-CC3-EVK-P2

Evaluation Kit Part Number			i7C08A-CC3-EVK-P2		i7C12A-CC3-EVK-P2		i7C20A-CC3-EVK-P2	
Schematic Circuit Code	Part Type	QTY	Manufacturer (Mfr)	Mfr Part No.	Manufacturer (Mfr)	Mfr Part No.	Manufacturer (Mfr)	Mfr Part No.
PS1,PS101	DC-DC Module	2	TDK Lambda	I7C4W008A120V-P03-R	TDK Lambda	I7C4W012A050V-P03-R	TDK Lambda	I7C2W020A120V-P03-R
BB1,BB2,BB3	Busbar	3	Keystone Electronics Corp.	5108	<--	<--	<--	<--
C1,C19,C34,C41,C51,C108,C119,C134	Capacitor	8	TDK	C2012X7R2A104K125AA	<--	<--	<--	<--
C8		1	TDK	C2012X7R2A104K125AA	TDK	C2012X7R1H334K125AA	TDK	C2012X7R2A104K125AA
C11,C12,C111,C112	Capacitor	4	Panasonic Corp	EEU-FS1J331L	Panasonic Corp	EEU-FS1J331L	Panasonic Corp	EEU-FS1V102LB
C21,C22,C23,C121,C122,C123	Capacitor	6	Panasonic Corp	EEU-FS1J331L	Panasonic Corp	EEU-FS1V102LB	Panasonic Corp	EEU-FS1V102LB
C13,C14,C15,C16,C17,C18, C24,C25,C26,C27,C28,C29, C30,C31,C32,C33, C61, C113,C114,C115,C116,C117,C118, C124,C125,C126,C127,C128,C129, C130,C131,C132,C133	Capacitor	33	TDK	C3225X7R1N106K250AC	<--	<--	<--	<--
C401	Capacitor	1	AVX Corporation	06035C122KAT2A	<--	<--	<--	<--
C402	Capacitor	1	TDK	C1608X7R2A103KT	<--	<--	<--	<--
C62	Capacitor	1	TDK	C3216X7S2A225MT	<--	<--	<--	<--
CONN1,CONN2,CONN3,CONN4, CONN103,CONN104	Terminal	6	Keystone Electronics Corp.	8196	<--	<--	<--	<--
CR61	Diode	1	Nexperia	BAS321	<--	<--	<--	<--
F1,F101	Fuse	2	Littelfuse, Inc.	0456025.ER	<--	<--	<--	<--
IC41	OPAMP	1	Texas Instruments	OPA237NA-3K	<--	<--	<--	<--
IC51	Comparator	1	Texas Instruments	LM2903DGKR	<--	<--	<--	<--
IC61	LDO	1	Diodes Incorporated	ZXTR2005Z	<--	<--	<--	<--
IC62	Voltage Shunt	1	Analog Devices, Inc.	LM4041CIX3-1.2+T	<--	<--	<--	<--
IC401	555 Timer	1	Texas Instruments	LMC555CMM NOPB	<--	<--	<--	<--
LBL1	Label	1	IDENTCO	TTL107-700-10	<--	<--	<--	<--
PWB1	PCB	1	FASTPRINT CIRCUIT TECH	PCB0000686	<--	<--	<--	<--
R1,R12,R101	Resistor	3	KOA Speer Electronics	RK73H2ATTE10R0F	<--	<--	<--	<--
R10	Resistor	1	KOA Speer Electronics	RK73H2ATTE5111F	<--	<--	<--	<--
R11	Resistor	1	KOA Speer Electronics	RK73H2ATTE1000F	<--	<--	<--	<--
R110	Resistor	1	KOA Speer Electronics	RK73H2ATTE1001F	<--	<--	<--	<--
R2,R8,R102,R105,R108,R403	Resistor	6	KOA Speer Electronics	RK73Z2ATTE	<--	<--	<--	<--
R4,R104	Resistor	2	KOA Speer Electronics	RK73H2ATTD22R0F	KOA	RK73H2ATTD2200F	KOA	RK73H2ATTD47R0F
R401	Resistor	1	KOA Speer Electronics	RK73H1JTTD1151F	<--	<--	<--	<--
R402	Resistor	1	KOA Speer Electronics	RK73H1JTTD1821F	<--	<--	<--	<--
R41	Resistor	1	KOA Speer Electronics	RK73H2ATTE51R1F	<--	<--	<--	<--
R51	Resistor	1	KOA Speer Electronics	RK73H2ATTE3012F	<--	<--	<--	<--
R52	Resistor	1	KOA Speer Electronics	RK73H2ATTE1212F	KOA	RK73H2ATTE1212F	KOA	RK73H2ATTE1002F
R53	Resistor	1	KOA Speer Electronics	RK73H2ATTE7502F	KOA	RK73H2ATTE6492F	KOA	RK73H2ATTE1003F
R58	Resistor	1	KOA Speer Electronics	RK73H2ATTE1003F	<--	<--	<--	<--
R54,R55	Resistor	2	KOA Speer Electronics	RK73H2ATTE2002F	<--	<--	<--	<--
R56 (Phase shedding option, not populated)	Resistor	3	KOA Speer Electronics	RK73H2ATTE10R0F	<--	<--	<--	<--
R6	Resistor	1	KOA Speer Electronics	RK73H2ATTD3001F	KOA	RK73H2ATTD5101F	KOA	RK73H2ATTE1002F
R62	Resistor	1	KOA Speer Electronics	RK73H2ATTE1002F	<--	<--	<--	<--
SCR1,SCR2,SCR3,SCR4	Screw	4	Keystone Electronics Corp.	9427	<--	<--	<--	<--
SO1,SO2,SO3,SO4	Standoff	4	Keystone Electronics Corp.	1902C	<--	<--	<--	<--
SW1	SPDT SWITCH	2	Multicomp Pro	2US1T1A1M2RE	<--	<--	<--	<--
TP1,TP3,TP103	Test Point, (Red)	3	Keystone Electronics Corp.	5010	<--	<--	<--	<--
TP2,TP4,TP6,TP10,TP104,TP106	Test Point, (Blk)	6	Keystone Electronics Corp.	5011	<--	<--	<--	<--
TP5,TP7,TP8,TP107,TP108	Test Point, (Yel)	5	Keystone Electronics Corp.	5014	<--	<--	<--	<--
VR1,VR101	Trim Resistor	2	Bourns, Inc.	3296W-1-203LF	Bourns, Inc.	3296W-1-103LF	Bourns, Inc.	3296W-1-103LF
VR2,VR102	Trim Resistor	2	Bourns, Inc.	3296W-1-503LF	Bourns, Inc.	3296W-1-503LF	Bourns, Inc.	3296W-1-104LF



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