

IFX91041

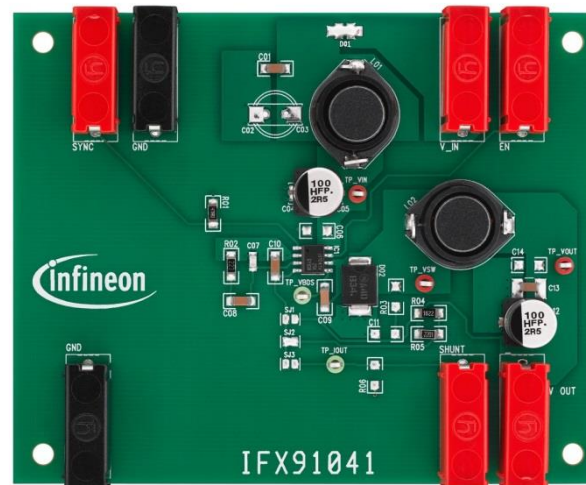
Buck Converter Application Board (Rev 2.1)



IFX91041 Demo Board

Introduction

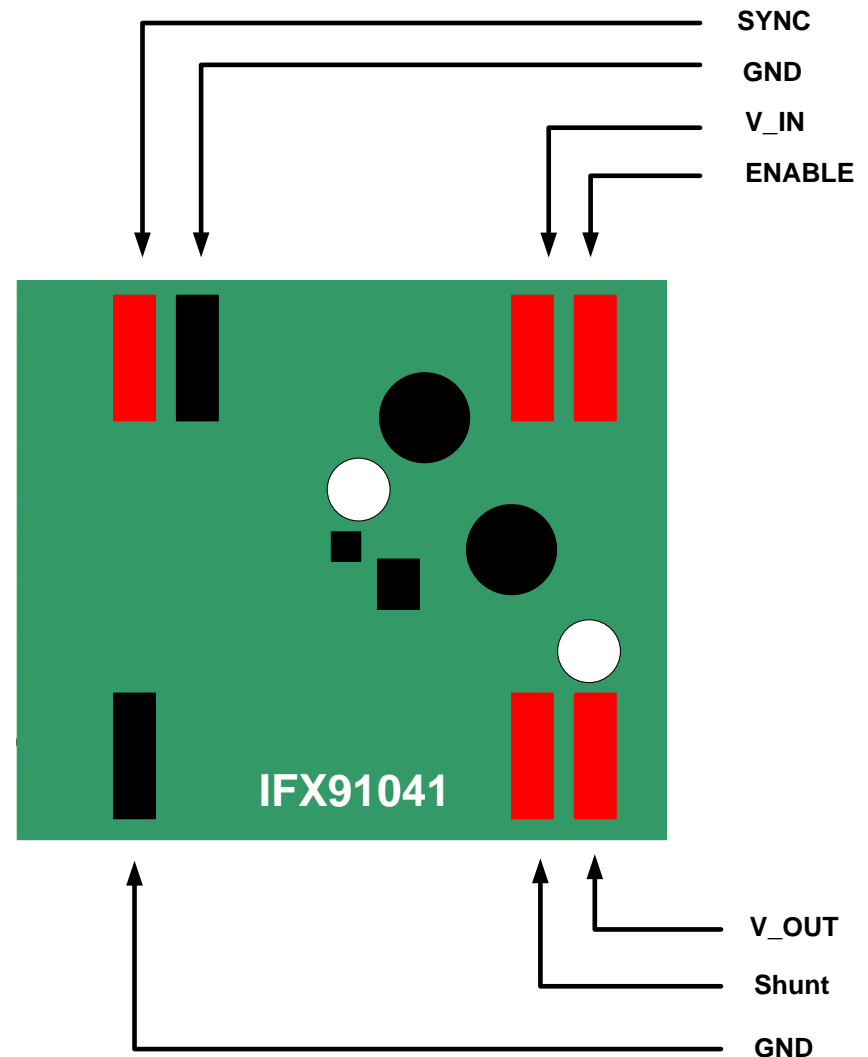
- › This application board will enable you to test the performance of the IFX91041, Buck converter with integrated power stage
- › The application board is equipped with a IFX91041EJV for variable out voltages, pre-adjusted in this case to a 5 V fixed output voltage
- › The board offers several possibilities to modify the schematic
- › The board also offers the possibility to use the IFX91041 as a current source



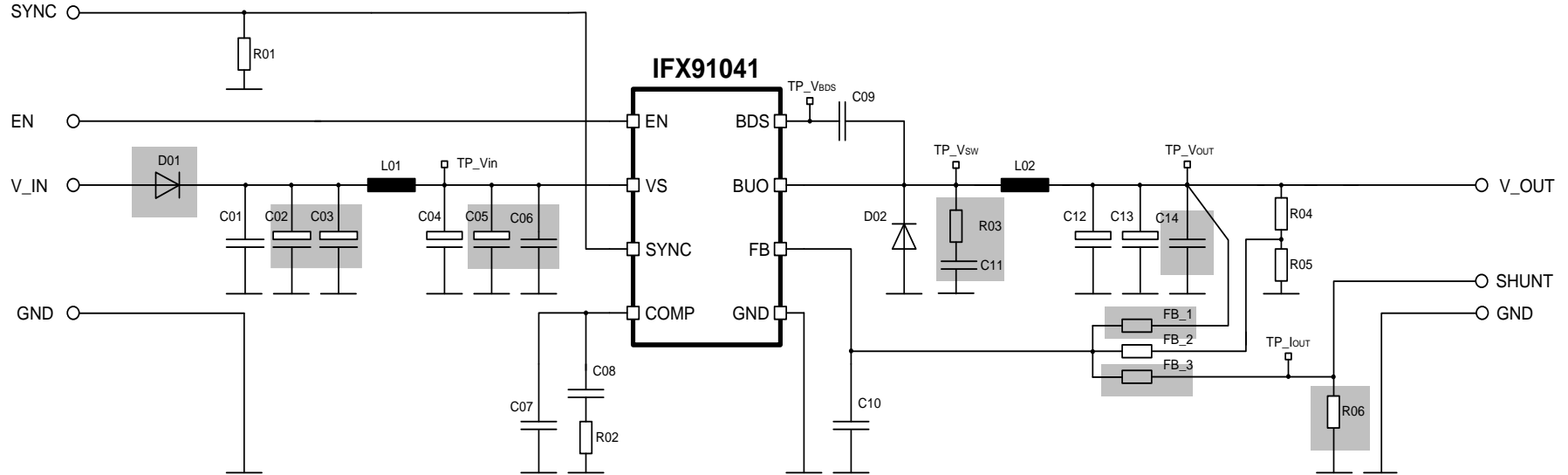
IFX91041 Demo Board

Getting Started

- › Connect **GND** to ground
- › Connect **V_IN** to the voltage supply
- › Connect **ENABLE** to V_IN to start the board
- › With **SYNC** You may synchronize the IFX91041 to an external frequency source
- › The output voltage to supply loads is present at **V_OUT**
- › **Shunt** offers You the output voltage for measuring



IFX91041 Demo Board Schematic & Gerber Files



Parts marked in grey are not mounted on the demo board



IFX90141.zip

Gerber Files

- › The output voltage of the IFX91041EJV can be adjusted by varying resistors R04 and R05
 - The output voltage is pre-adjusted on the demo board to 5V (R04 = 16.2kΩ & R05 = 2.2kΩ)
 - The output voltage can be adjusted using the following equation :

$$V_OUT = V_FB \times \left(\frac{R04 + R05}{R05} \right)$$

- › The IFX91041 can also be used as a current source
 - Mount shunt resistor R06 on the demo board
 - Connect FB_3 and leave FB_2 open
 - Connect a load between terminals V_OUT and Shunt
 - Refer to datasheet for information about dimensioning the shunt resistors

IFX91041 Demo Board

Parts List

Part Number	Value	Description
DUT	IFX91041EJV	Device under test
R01	47 Ω	Input resistor for synchronization signal
R02	22 k Ω	Resistor of compensation network - needs to be adjusted to output filter elements, input and output voltage and output current conditions
R03	N.C.	Snubber resistor
R04	16.2 k Ω	Only for variable output voltage version: High side voltage divider resistor (calculated for V_OUT = 5.0V)
R05	2.2 k Ω	Only for variable output voltage version: Low side voltage divider resistor (calculated for V_OUT = 5.0V)
R06	N.C.	Only for use as current source: shunt resistor for load current measurement
FB_1	N.C.	Only for fixed voltage version: FB_2 and FB_3 must be open
FB_2	0 Ω	Only for variable voltage version: FB_1 and FB_3 must be open
FB_3	N.C.	Only for constant current version: FB_1 and FB_2 must be open
C01	220 nF	Input capacitor (for EMC reason)
C02	N.C.	Mounting place for additional input filter capacitor (only if needed)
C03	N.C.	Mounting place for additional input filter capacitor (only if needed)

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Parts List (Cont..)

Part Number	Value	Description
C04	100 μ F / 50 V	Input filter capacitor (smoothing the alternate content of the input current) (Panasonic FP series; EEEFP1H101AP)
C05	N.C.	Mounting place for additional input capacitor (only if needed)
C06	N.C.	Mounting place for additional input capacitor (only if needed)
C07	100 pF	Capacitor of compensation network - needs to be adjusted to output filter elements, input and output voltage and output current conditions
C08	22 nF	Capacitor of compensation network - needs to be adjusted to output filter elements, input and output voltage and output current conditions
C09	220 nF	Bootstrap capacitor
C10	1 nF	Smoothing capacitor for feedback line (recommended for variable voltage version and current source)
C11	N.C.	Snubber capacitor
C12	100 μ F/50 V	Output filter capacitor (Panasonic FP series; EEEFP1H101AP)
C13	220 nF	Output filter capacitor (ceramic to lower ESR and for EMC improvement)
C14	N.C.	Mounting place for additional output filter capacitor (only if needed)
L01	47 μ H	Input Filter Inductor, (EPCOS B82479G1 series)
L02	47 μ H	Output Filter inductor, (EPCOS B82479G1 series)

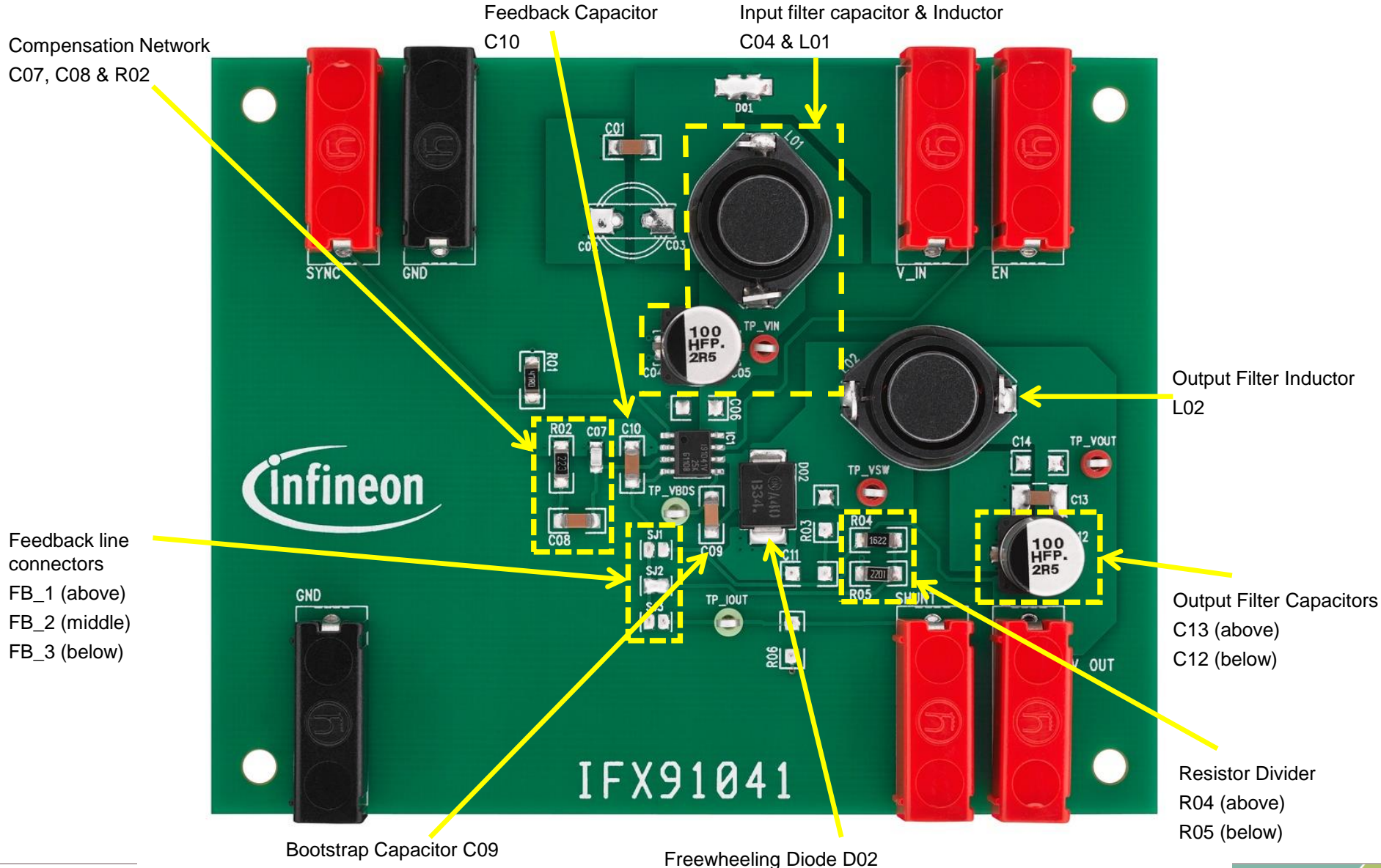
IFX91041 Demo Board

Parts List (Cont..)

Part Number	Value	Description
TP_Vin	Testpoint	Input voltage at pin VS
TP_Vbds	Testpoint	Bootstrap voltage
TP_Vsw	Testpoint	Output of internal Mosfet
TP_Vout	Testpoint	Output voltage
TP Iout	Testpoint	Output current signal (for current source only)
D01	0 Ω	Mounting place for reverse polarity protection diode (replaced by bridge)
D02	MBRS340T3 Schottky Diode	Freewheeling Diode
SYNC	4 mm Banana Jack RED	
EN	4 mm Banana Jack RED	
V_IN	4 mm Banana Jack RED	
GND	4 mm Banana Jack BLACK	
V_OUT	4 mm Banana Jack RED	
SHUNT	4 mm Banana Jack RED	
GND	4 mm Banana Jack BLACK	

IFX91041 Demo Board

Parts of the Demo Board



IFX91041 Demo Board

Output Filter – C12, C13 and L02

- › To avoid magnetic fields use of magnetically shielded inductors is recommended



- › SMT power inductor series B82479G1 from EPCOS has been used on the IFX91041 Demo Board

Characteristics and ordering codes

L_R μH	Tolerance	f_L MHz	I_R A	I_{sat} A	R_{max} Ω	Ordering code
10	$\pm 20\% \triangleq M$	0.1	3.90	8.00	0.040	B82479G1103M000
15		0.1	3.40	7.00	0.048	B82479G1153M000
22		0.1	3.10	6.00	0.059	B82479G1223M000
33		0.1	2.80	5.00	0.075	B82479G1333M000
47		0.1	2.40	4.00	0.097	B82479G1473M000
68		0.1	2.00	3.00	0.138	B82479G1683M000
100		0.1	1.70	2.40	0.207	B82479G1104M000

Extract from EPCOS Datasheet

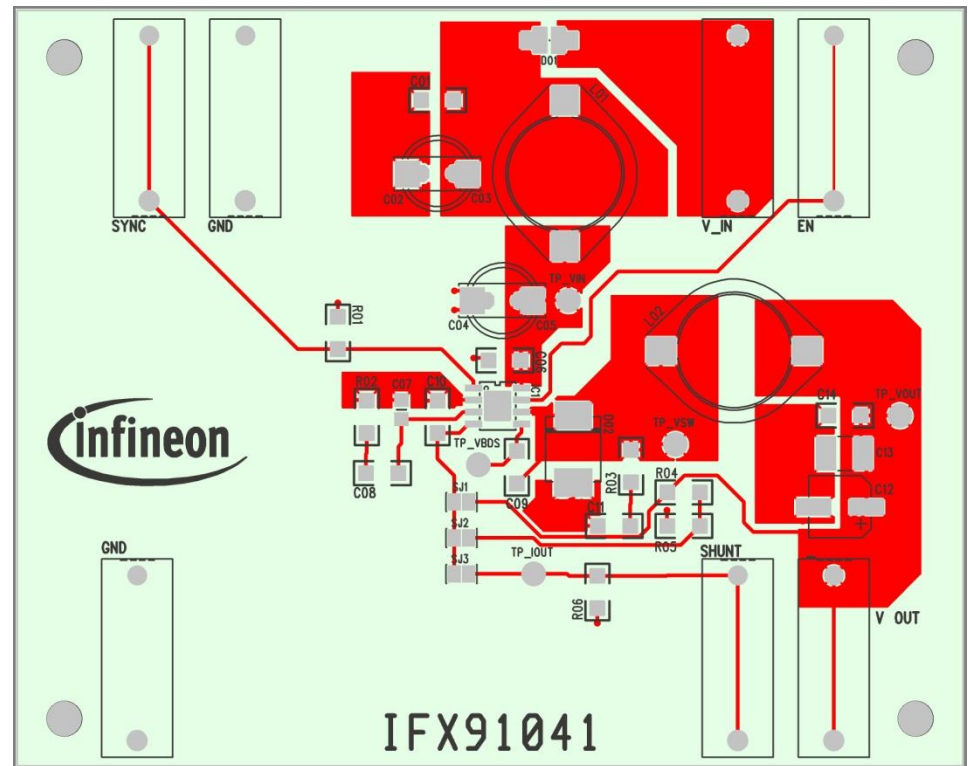
Output Filter – C12, C13 and L02 (Cont..)

- › SMD capacitor of FP series from Panasonic has been used on the IFX91041 Demo Board (Extract from Panasonic Datasheet)

W.V. (V)	Cap. ($\pm 20\%$) (μF)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	*Size Code	Ripple Current (100 kHz) (+105 °C) (mA r.m.s.)	E.S.R. (100 kHz) (+20 °C) (Ω)	$\tan \delta$ (120 Hz) (+20 °C)			Taping (pcs)
35	10	4	5.8	(B)	160	0.85	0.12	EEEFV100UAR	(5)	2000
	22	5	5.8	C	240	0.36	0.12	EEEFV1V220AR	(5)	1000
	33	6.3	5.8	D	300	0.26	0.12	EEEFV1V330AP	(5)	1000
	47	6.3	5.8	D	300	0.26	0.12	EEEFV1V470AP	(5)	1000
	68	6.3	7.7	D8	600	0.16	0.12	EEEFV680XAP	(5)	900
	100	6.3	7.7	D8	600	0.16	0.12	EEEFV101XAP	(5)	900
		8	10.2	F	850	0.08	0.12	EEEFV1V101AP	(6)	500
	150	8	10.2	F	850	0.08	0.12	EEEFV1V151AP	(6)	500
	220	8	10.2	F	850	0.08	0.12	EEEFV1V221AP	(6)	500
	330	10	10.2	G	1190	0.06	0.12	EEEFV1V331AP	(6)	500
50	390	10	10.2	(G)	850	0.08	0.12	EEEFV391UAP	(6)	500
	100	8	10.2	F	670	0.18	0.10	EEEFV1H101AP	(6)	500
	220	10	10.2	G	900	0.12	0.10	EEEFV1H221AP	(6)	500

IFX91041 Demo Board Layout Recommendations

- › This image offers you a design proposal for an EMI-optimized layout
- › A ground layer should cover the complete converter area
- › Switch node connections are a source of EMI and should be as short as possible and located as close as possible to the IFX91041
- › Avoid opening “large windows” with these lines
- › Filter capacitors with a very low ESR should be placed at the converter input and output to reduce conducted emissions on input and output lines
- › The feedback line should be connected directly to the output capacitor and kept free of the switch node connections, a filter capacitor directly at the pin is recommended



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