AN4373
Application note

Galvanically-isolated 8 channel high-side driver based on the ISO8200B and ISO8200BQ

Introduction

The STEVAL-IFP015V2 and STEVAL-IFP033V1 evaluation boards work in combination with the STEVAL-PCC009V2 interface board to allow evaluation of all the features of the ISO8200B and ISO8200BQ devices respectively. The boards include a large GND to minimize noise effects and ensure good thermal performance.

The galvanically isolated ISO8200B and ISO800BQ 8-channel drivers feature a very low supply current with two independent galvanically isolated voltage domains (V_{CC} for the power stage and V_{DD} for the digital stage). The ICs are intended to drive any type of load with one side connected to ground. Active channel current limitation combined with thermal shutdown for each channel and automatic restart protect the devices against overload. Other embedded functions include loss-of-GND protection which automatically turns off the outputs in case of analog ground, undervoltage shutdown with hysteresis and a reset function for immediate power output shutdown.

Built-in thermal shutdown protects the driver against overtemperature and short-circuit. In overload condition, the channel turns off, then back on automatically after the driver temperature decreases below a reset threshold. If this condition causes the case temperature to reach the TCR limit, the overloaded channel is turned off and only restarts when case and junction temperatures have decreased down to the reset threshold. Non overloaded channels continue to operate normally.

An internal circuit provides an OR-wired non latched common FAULT indicator signaling channel OVT. The FAULT pin is an open-drain active-low fault indication pin.

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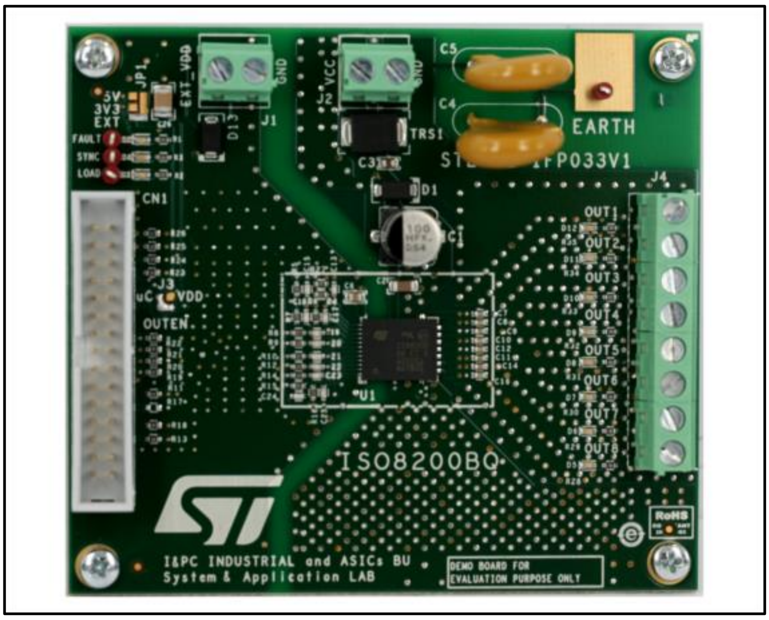
1 Features

- V_{CC} operating voltage from 10.5 to 33 V
- 0.7 A for each channel
- Reverse polarity protection on V_{CC} and V_{DD} supply voltage
- Digital supply voltage V_{DD} 3.3/5 V
- Microcontroller interface direct/synchronous mode communication
- Designed to meet requirements of IEC 61000-4-2, IEC 61000-4-4, IEC 61000-4-5 and IEC 61000-4-8 standards
- RoHS compliant

2 Board description

Figure 1: STEVAL-IFP015V2 board top view

Figure 2: STEVAL-IFP033V1 board top view



2.1 Board connectors and components

Table 1: STEVAL-IFP015V2 and STEVAL-IFP033V1 connectors and jumpers

Name	Type	Function
JP1	Drop jumper	V_{DD} digital supply voltage
J3	Drop Jumper	Output enable pin
J2	Screw connector	V_{CC} supply voltage

Name	Type	Function
J1	Screw connector	V_{DD} digital supply voltage
J4	Power outputs	Device power outputs
CN1	30 pin connector	Microcontroller interface

Table 2: CN1 30-pin signal connector description

Pin number	Description
1	3.3 V communication board digital output voltage
2	GND reference
3	Parallel Input pin IN1
4	Parallel input pin IN2
5	Parallel input pin IN3
6	Parallel input pin IN4
7-12	NC
13	GND reference
14	NC
15	Parallel input 8
16	Parallel input 5
17	Parallel input 6
18	Parallel input 7
19	Fault feedback for erroneous communication or thermal junction intervention
20	NC
21	NC
22	Not used
23	NC
24,25	Reserved
26,27	NC
28	GND reference
29,30	NC

Table 3: STEVAL-IFP015V2 electrical specifications (recommended values)

Parameter	Description	Test condition	Typ	Unit
V_{CC}	Main supply voltage		24	V
V_{DD}	Digital voltage supply		3.3 / 5	V
I_{Vcc}	Current consumption	V_{DD} = 5 V channels ON	8	mA
		V_{DD} = 5 V channels OFF	5	
V_{CLAMP}	integrated voltage clamp		48	V

Table 4: STEVAL-IFP015V2 and STEVAL-IFP033V1 component list

Reference	Description	Component	Part number
CN1	CON30	30 pin connector for flat cable	
C1	100 µF/50 V	Electrolytic capacitor	EEEFP1H101AP
C2	1 µF/50 V	Electrolytic capacitor Low ESR	GRM31MR71H105KA88L
C3	1 µF/50 V	Ceramic capacitor	
C4	4.7 nF Y1/4 kV	Single layer capacitor high	
Voltage	VY1472M63Y5UQ6*V0		
C5	4.7 nF Y1 /4 kV	Single layer high voltage capacitor	VY1472M63Y5UQ6*V0
C6	220 nF/10 V	Electrolytic capacitor low ESR	GRM188R71A224KA01D
C7,C8,C9,C10,C11, C12,C14,C16	22 nF/50 V	Ceramic capacitor	
C13,C15,C17,C18, C19,C20,C21,C22, C23,C24,C25	100 pF/10 V	Ceramic capacitor	
C26	47 µF/10 V	Ceramic capacitor	GRM32ER71A476KE15
D1	STPS1H100A	Schottky diode SMD	
D13	STPS1L60A	Schottky diode SMD	
D2	Red	LED	
D3	Green	LED	
D4	Yellow	LED	
D5, D6, D7, D8, D9, D10, D11, D12	Green	LED	
J1,J2	CON2	Screw connector 2 pole	
J3	OUT_EN	Drop jumper three way	
J4	CON8	Screw connector 8 pole	
JP1	V_{DD}	Drop jumper 4 way	
R1,R2,R3	680R	SMD resistor	

Reference	Description	Component	Part number
R4,R5,R6,R7,R8, R9,R10,R12, R14, R15, R16	270R	SMD resistor	
R11	10 k	SMD resistor 1%	
R19,R20,R21,R22 R23,R24, R25, R26, R27	10 k	SMD resistor	
R17	NC	Not connected	
R13	15 k	SMD resistor 1%	
R18	10 k	SMD resistor 1%	
R28, R29, R30, R31, R32, R33, R34, R35	6 k8	SMD resistor	
TP1,TP3,TP4	T POINT A	Test point	
TP2	T POINT R	Test point	
TRS1	SM15T33CA	Transil SMD	
U1	ISO8200B	Device PSO36	STEVAL-IFP015V2
U1	ISO8200BQ	TFQFPN32	STEVAL-IFP033V1

2.2 STEVAL-IFP015V2 silk screens

Figure 3: STEVAL-IFP015V2 component plane

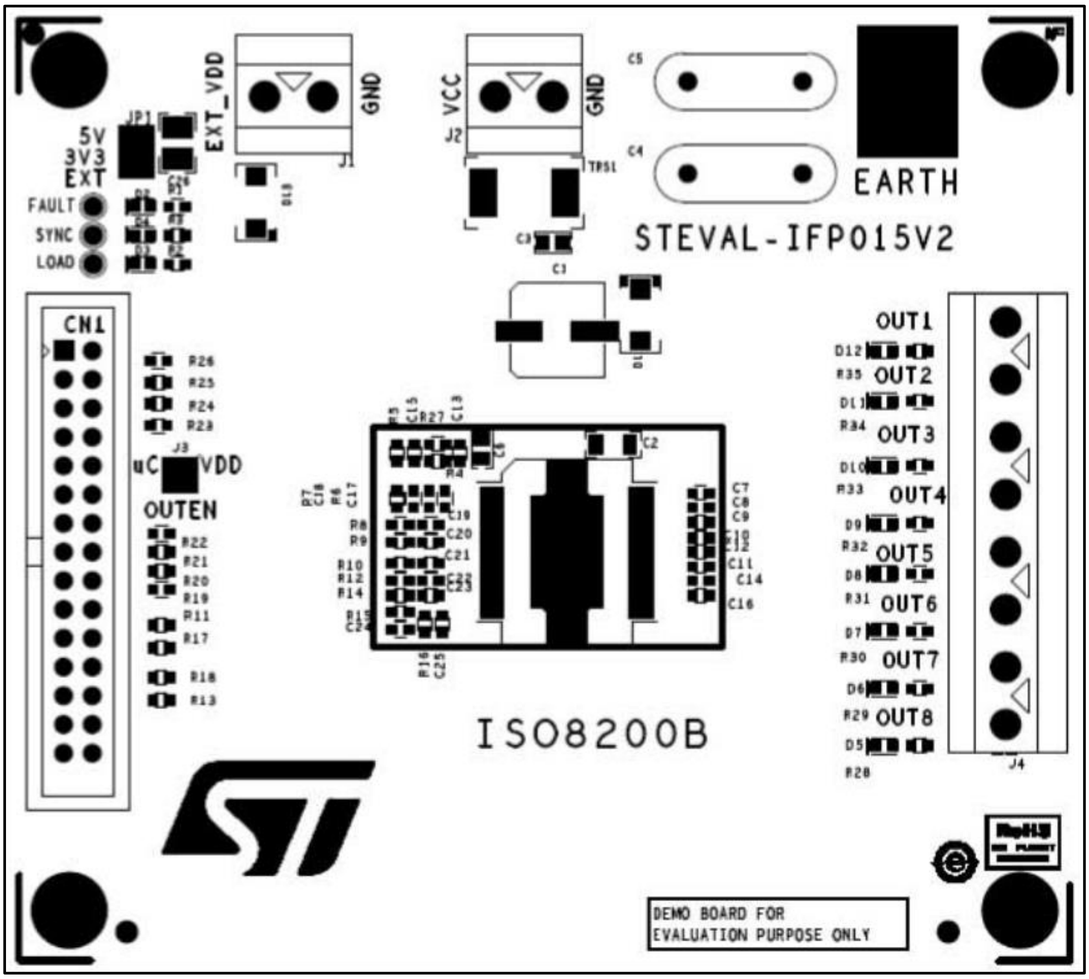


Figure 4: STEVAL-IFP015V2 top layer

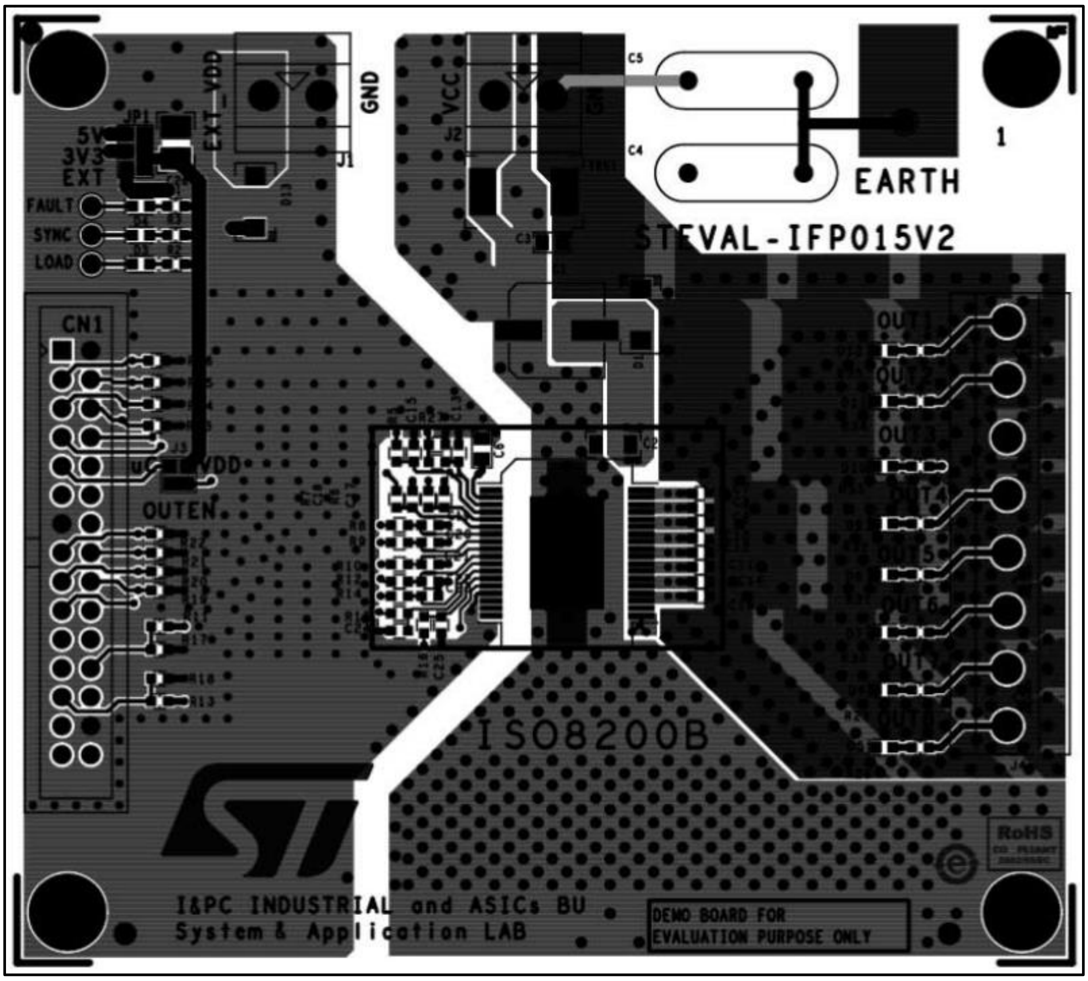


Figure 5: STEVAL-IFP015V2 internal layer 1

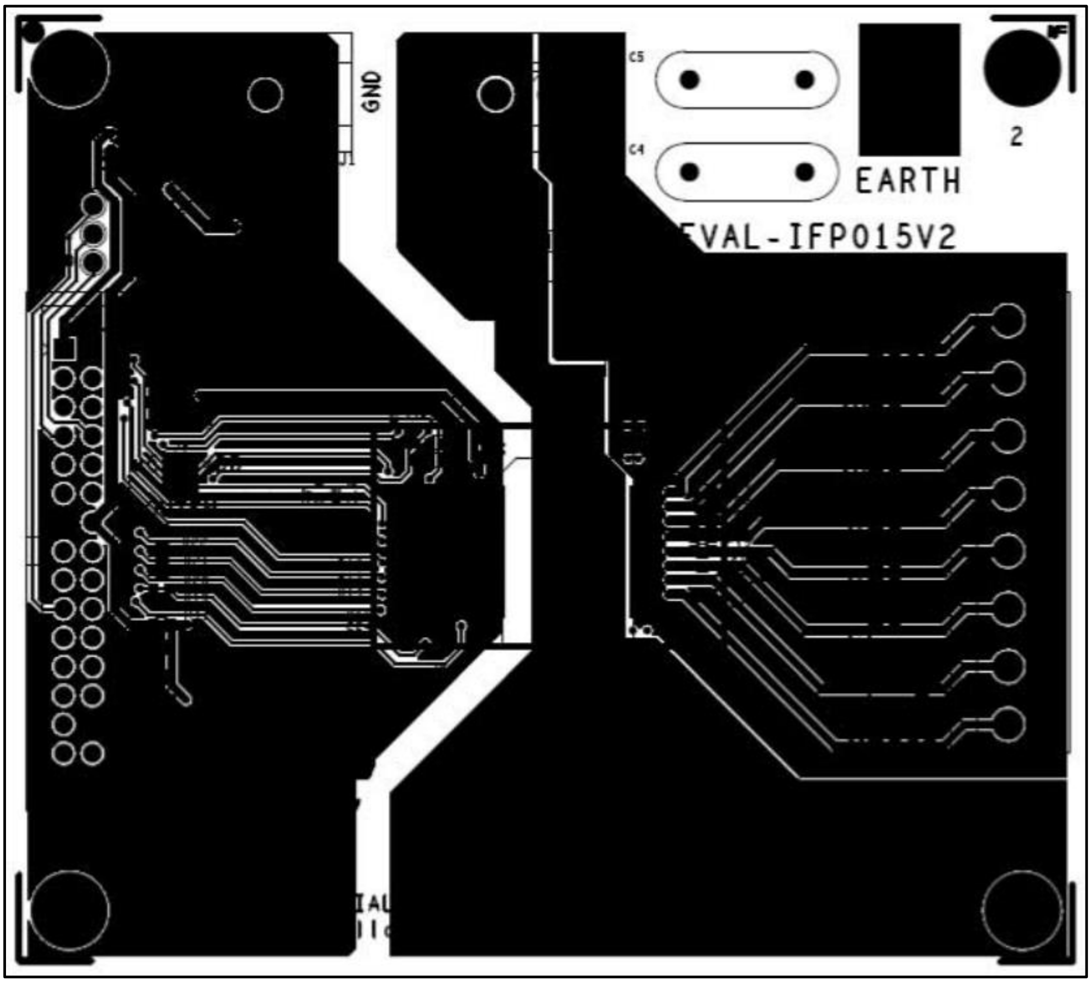


Figure 6: STEVAL-IFP015V2 internal layer 2

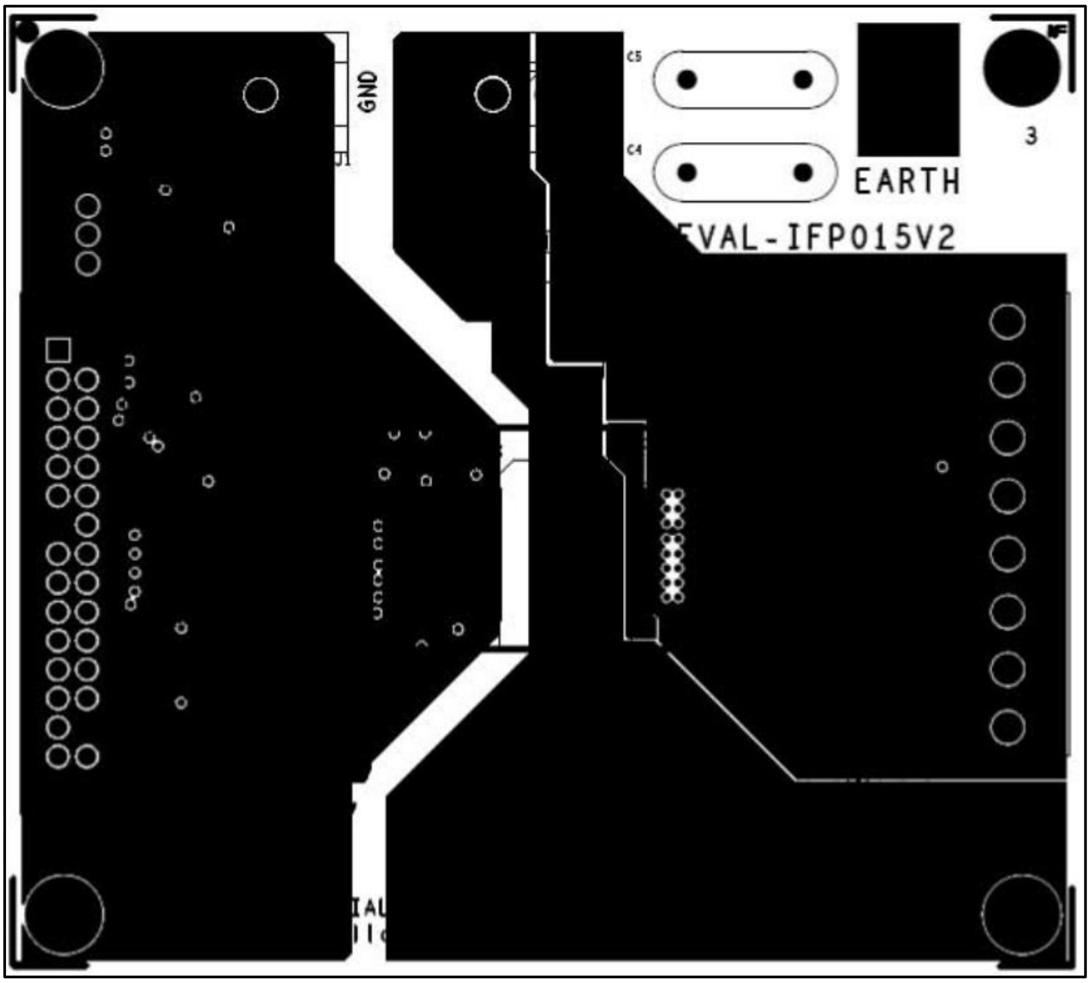
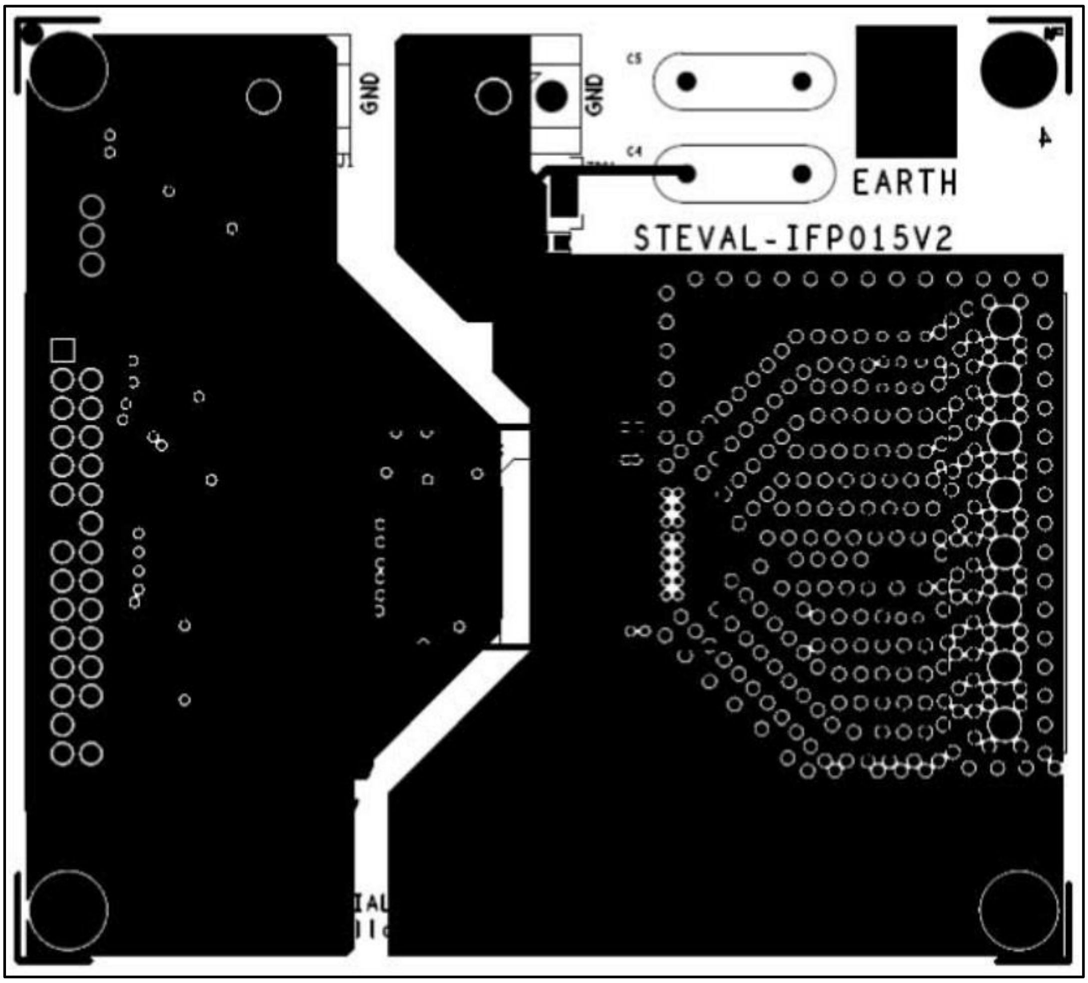


Figure 7: STEVAL-IFP015V2 bottom layer



2.3 STEVAL-IFP033V1 silk screens

Figure 8: STEVAL-IFP033V1 component plane

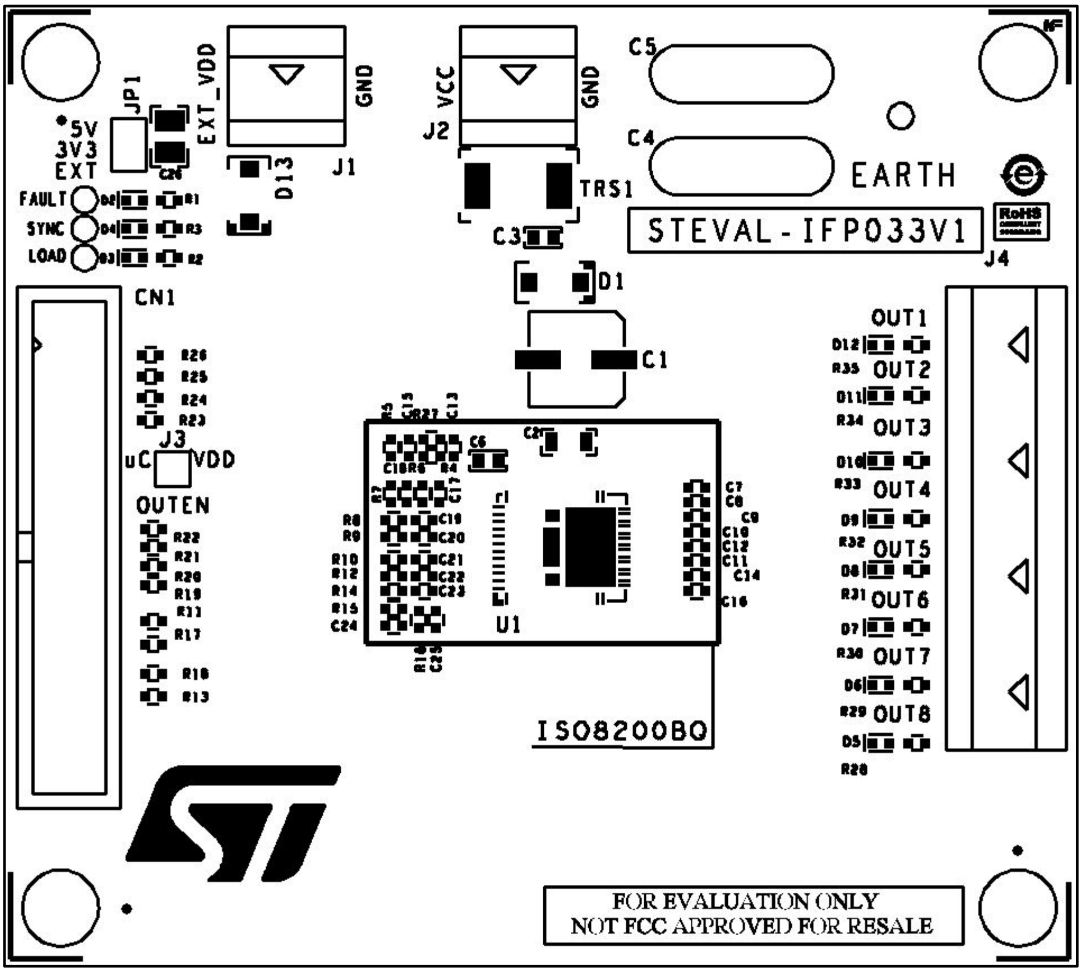


Figure 9: STEVAL-IFP033V1 top layer

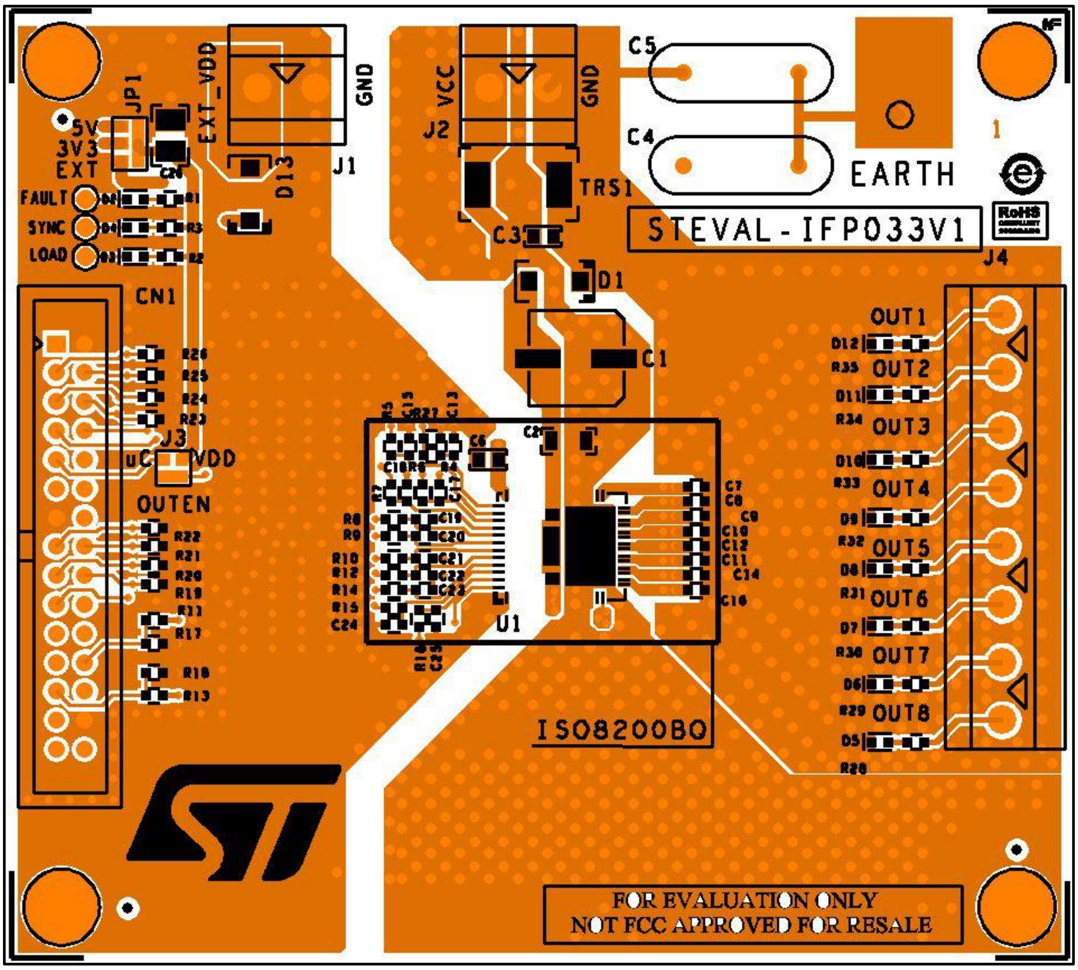


Figure 10: STEVAL-IFP033V1 internal layer 1

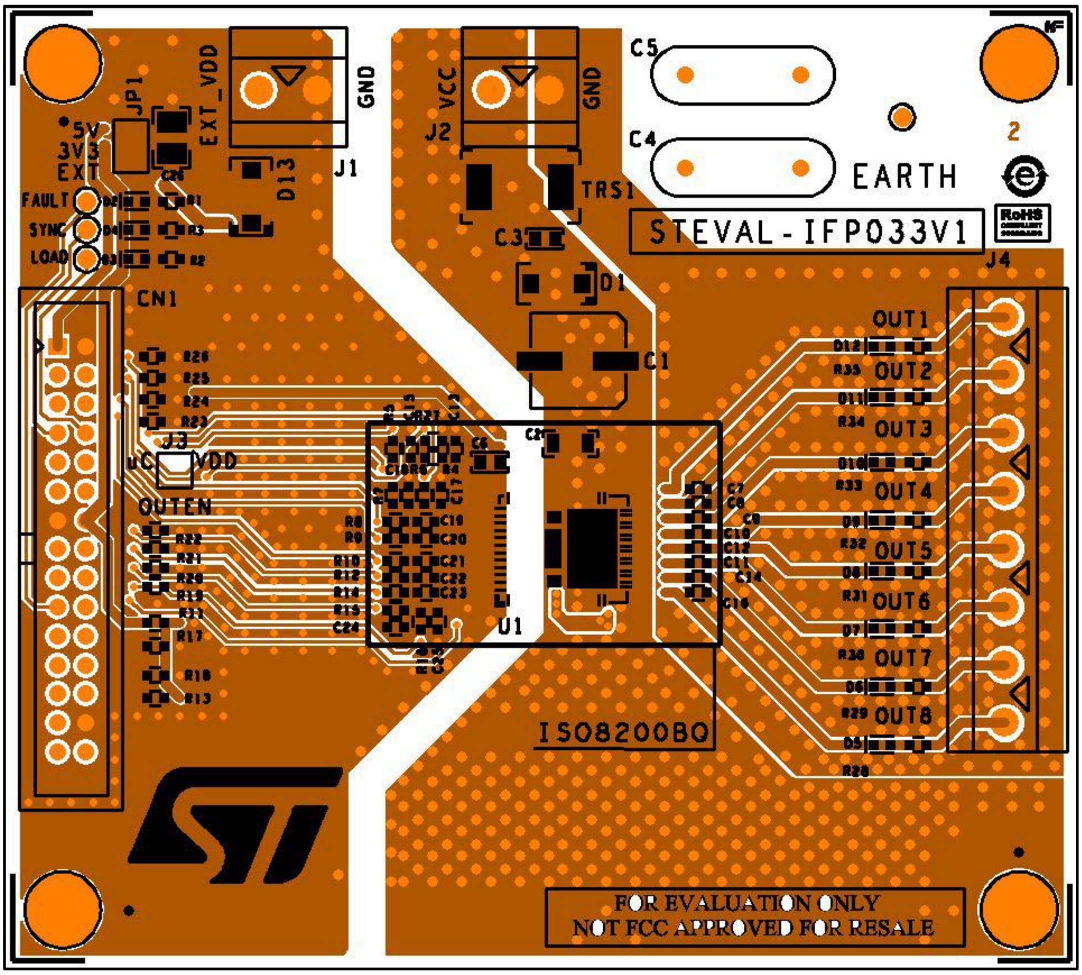


Figure 11: STEVAL-IFP033V1 internal layer 2

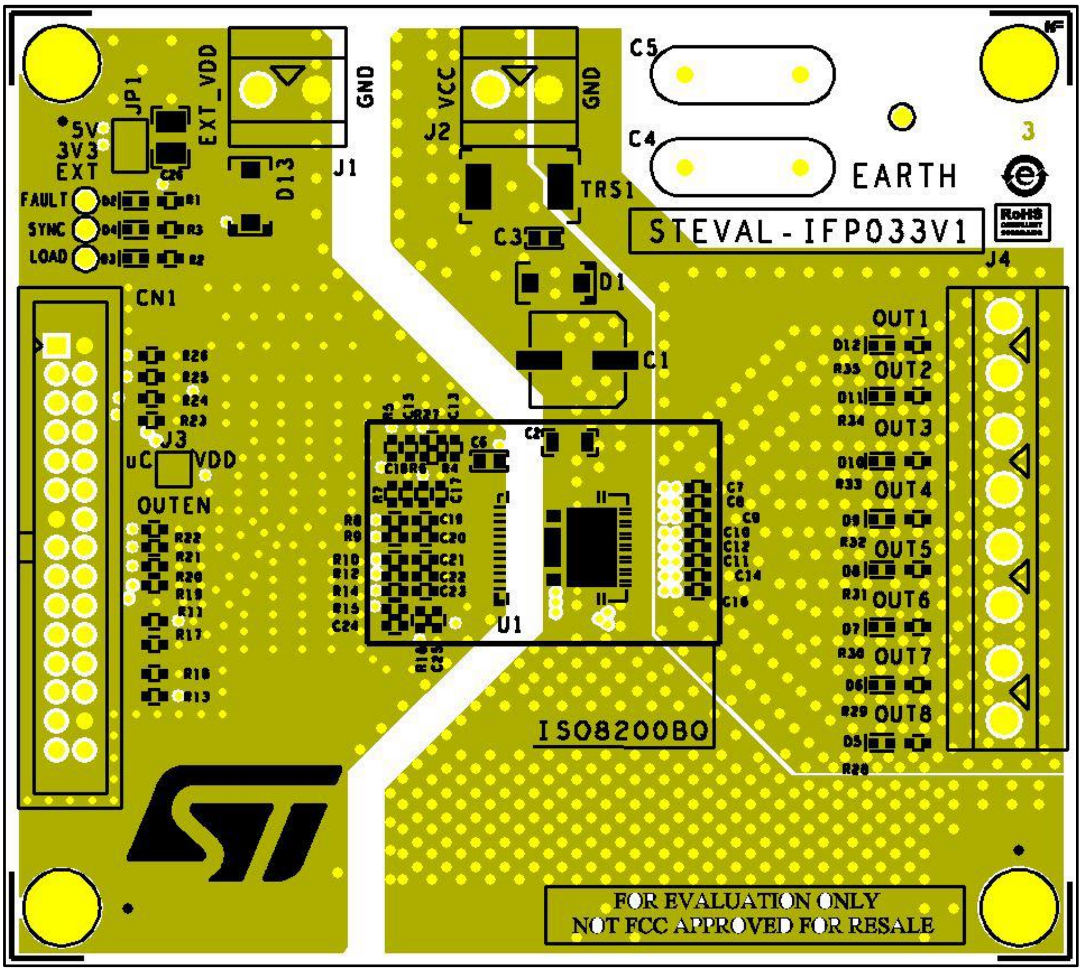
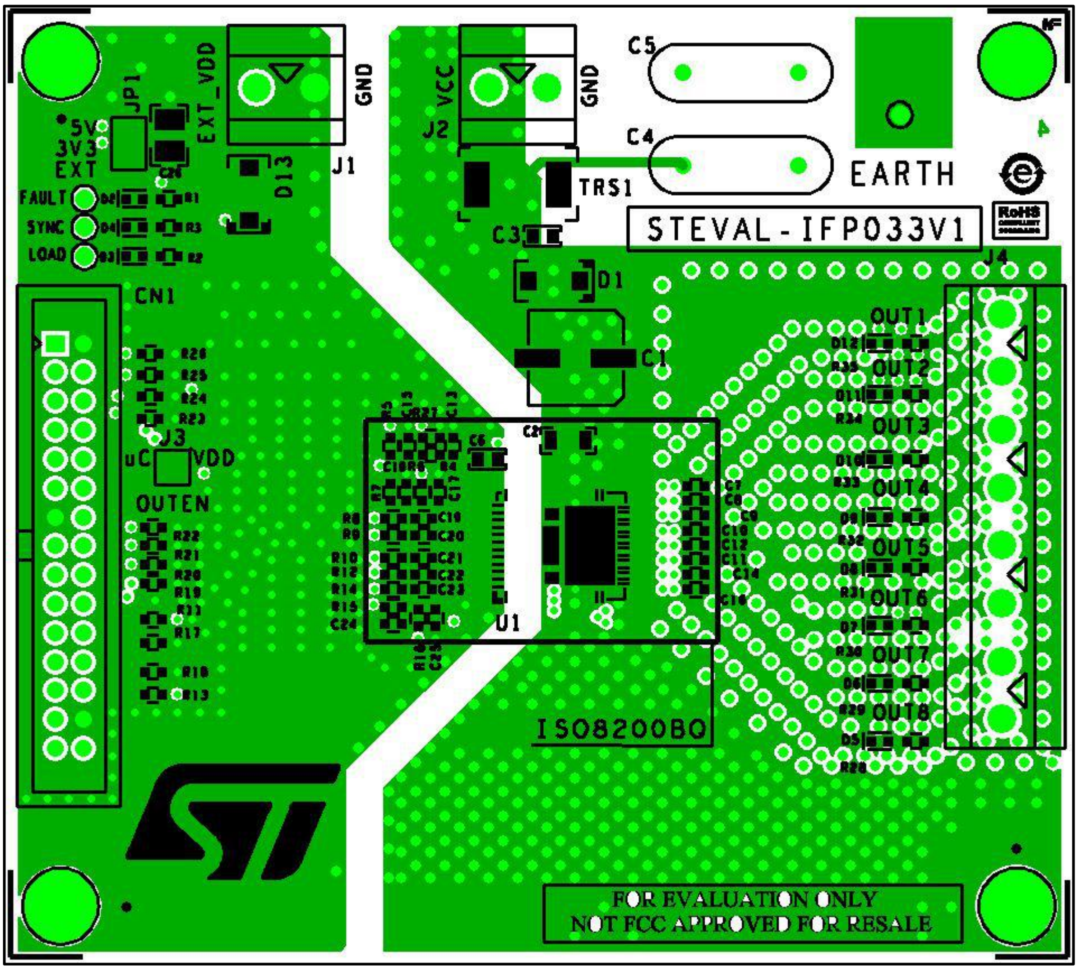


Figure 12: STEVAL-IFP033V1 bottom layer



2.4 Power section

Both ISO8200B and ISO8200BQ devices have two ground references due to internal galvanic isolation:

- GND_{DD} for V_{DD} digital supply
- GND_{CC} for V_{CC} main supply

Both supply voltages implement reverse polarity protection with the STPS1L60A diode on V_{DD} and with STPS1H100A diode on V_{CC} main voltage.

The operating supply values are variable:

- 10.5 V to 3.3 V for V_{CC}
- 3.1 V to 5.5 V for V_{DD}

This latter reference can be selected using the three-way drop jumper J1

The “5 V” and “3.3 V” labels identify connection with a 30 pin connector and the possibility to power the device by microcontroller board, whereas the “EXT” label identifies connection with screw connector.

A bidirectional transil diode SM15T33CA, connected on the V_{CC} supply improves EMC stress robustness; while capacitors C4 and C5 form a coupling network for EMC common mode tests.

2.5 Digital interface

Both STEVAL-IFP015V2 and STEVAL-IFP033V1 interfaces permit device driving in:

1. Direct Mode: for instantaneous output control
2. Synchronous Mode: for triggered output control - useful when a lower delay of all outputs is required.

Both modalities are managed by modifying the default state of the Sync and Load signals. By default, they are pulled up by the two signal LEDs D2 and D3. Direct Mode is activated by simultaneously pulling these two signals down, so it is sufficient to change the input state to change the corresponding output as well.

Sequential toggling of the Load and Sync signals can change the synchronous output state.

3 PC communication using the STEVAL-PCC009V2 connection and HSD GUI interface

The figures below refer to STEVAL-IFP015V2; the same applies for the STEVAL-IFP033V1.

Figure 13: GUI interface Direct Mode

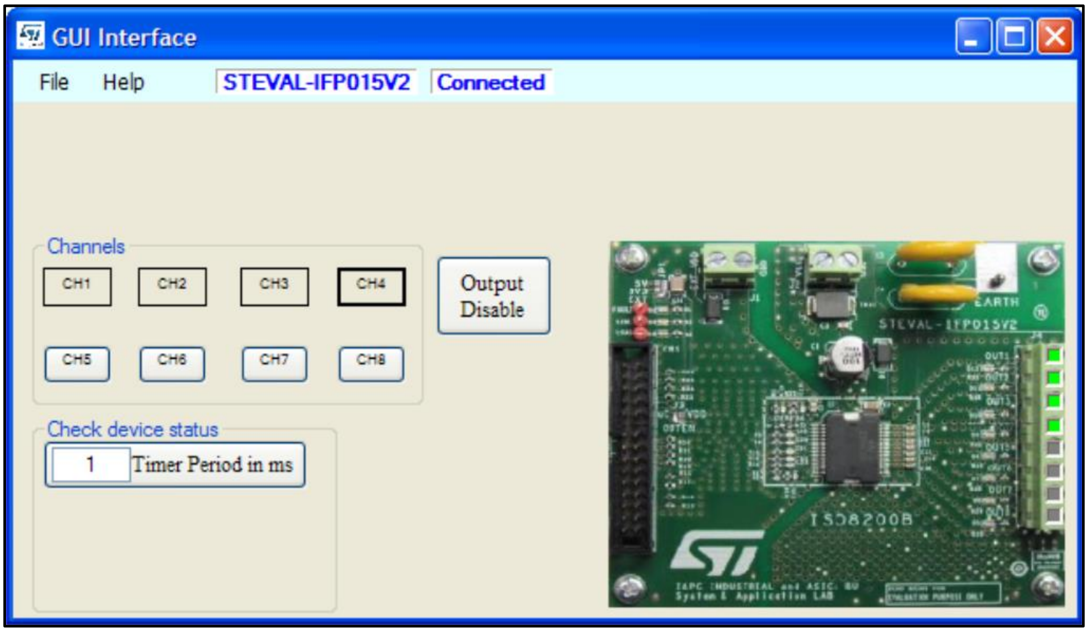
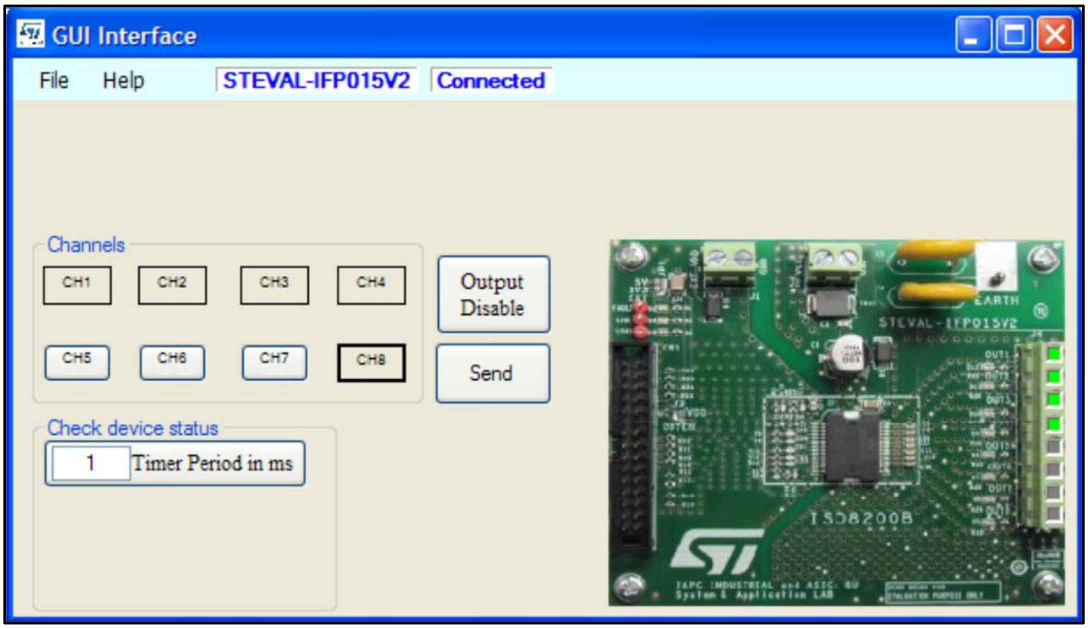


Figure 14: GUI interface Synchronous Mode



4 Reference documents

- **ISO8200B** and **ISO8200BQ** datasheets available on www.st.com
- IEC 61000-4-4:2012
  - Electromagnetic compatibility (EMC) - Part 4-4: *Testing and measurement techniques - Electrical fast transient/burst immunity test*
- IEC 61000-4-5:2014
  - Electromagnetic compatibility (EMC) - Part 4-5: *Testing and measurement techniques - Surge immunity test*
- IEC 61000-4-2:2008
  - Electromagnetic compatibility (EMC) - Part 4-2: *Testing and measurement techniques - Electrostatic discharge immunity test*
- IEC 61000-4-8:2009
  - Electromagnetic compatibility (EMC) – Part 4-8: *Testing and measurement techniques – Power frequency magnetic field immunity test*

5 Revision history

Table 5: Document revision history

Date	Revision	Changes
15-Oct-2013	1	Initial release.
05-Jun-2017	2	Throughout document: - added STEVAL-IFP033V1 board content and references - minor text and formatting changes

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