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MB39C031-EVB-01

2ch Buck DC/DC + LDO with I²C Interface Evaluation Board Operation Guide

Doc. No. 002-08673 Rev. *C

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Preface



This manual explains how to use the evaluation board. Be sure to read this manual before using the product. For this product, please consult with sales representatives or support representatives.

Handling and use

Handling and use of this product and notes regarding its safe use are described in the manuals.

Follow the instructions in the manuals to use this product.

Keep this manual at hand so that you can refer to it anytime during use of this product.

Notice on this document

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.


Please confirm the latest relevant information with the sales representatives.

Cautions




Caution of the products described in this document

The following precautions apply to the product described in this manual.

 WARNING	Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly.
--	---

Electric shock, Damage	Before performing any operation described in this manual, turn off all the power supplies to the system. Performing such an operation with the power on may cause an electric shock or device fault.
Electric shock, Damage	Once the product has been turned on, do not touch any metal part of it. Doing so may cause an electric shock or device fault.

 CAUTION	Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to lose software resources and other properties such as data, if the device is not used appropriately.
--	---

Cuts, Damage	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
Cuts	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
Damage	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
Damage	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
Damage	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
Damage	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.

Damage	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
Damage	Always turn the power off before connecting or disconnecting any cables from the product. When unplugging a cable, unplug the cable by holding the connector part without pulling on the cable itself. Pulling the cable itself or bending it may expose or disconnect the cable core, resulting in a fault.
Damage	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

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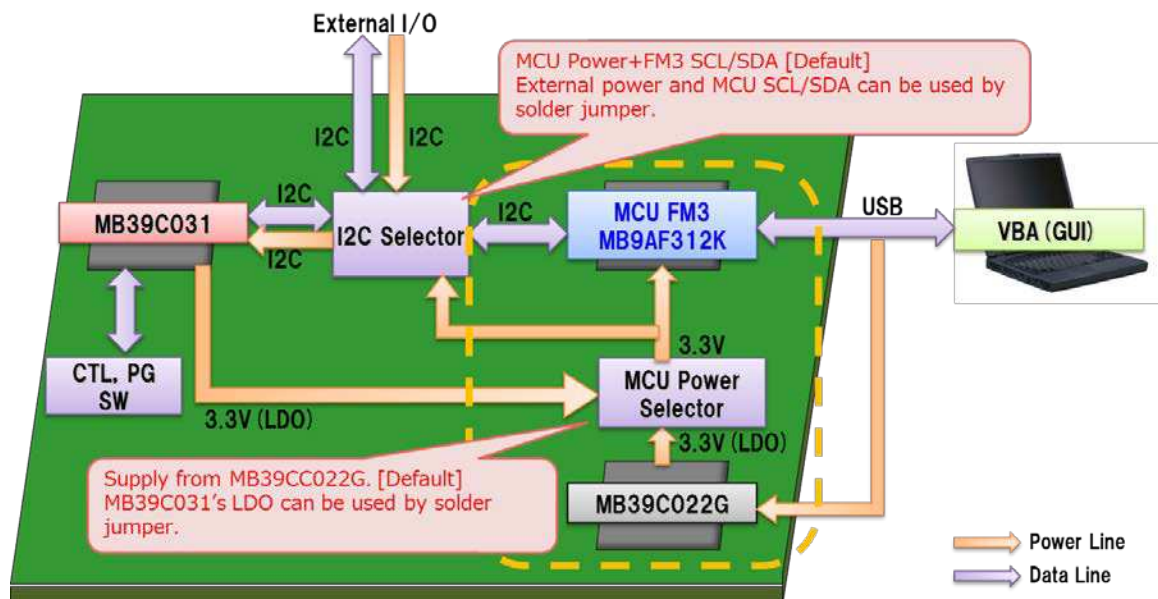
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1. Description



The MB39C031-EVB-01 is the evaluation board for 2ch Buck DC/DC + 1ch LDO, MB39C031. This board implements MB39C031: Option-code 342, and output preset voltage DD1:1.2V, DD2:1.8V, LDO:3.3V or selectable voltage controlled by I²C communication. This board implements our MCU : FM3(MB9AF312K) and can select the soft-start time, ON/OFF sequence, PFM/PWM mode easily with I²C communication using windows PC and prepared software.

Figure 1-1. Board Outline



2. Evaluation Board Specification



Table 2-1. Evaluation Board Specification

Item	Symbol	Min	Typ	Max	Unit
Input voltage	VIN	2.5	3.6	5.5	V
Output voltage	Vo1	1.19	1.20	1.21	V
Output current	Io1	-	-	1400	mA
Output voltage	Vo2	1.78	1.80	1.82	V
Output current	Io2	-	-	600	mA
Output voltage	LDO	3.24	3.30	3.36	V
Output current	Io3	-	-	250	mA

Board size : 80mm × 80mm

3. PIN Descriptions



3.1 Input/output Pin Descriptions

Table 3-1. Input/output Pin Descriptions

Block	Pin symbol	I/O	Function description
DD1	Vo1	O	DD1 output terminal
	PG1	O	DD1 POWERGOOD output monitor terminal
	Vo1_GND	O	DD1 ground terminal
DD2	Vo2	O	DD2 output terminal
	PG2	O	DD2 POWERGOOD output monitor terminal
	Vo2_GND	O	DD2 ground terminal
LDO	LDO	O	LDO output terminal
	PGL	O	LDO POWERGOOD output monitor terminal
	LDO_GND	O	LDO ground terminal
CTL	CTL1	I	DD1 control terminal
	CTL2	I	DD2 control terminal
	CTLL	I	LDO control terminal
	CTLMAIN	I	Control terminal for common block and MCU block
ERR	ERR	O	ERR signal output terminal
I ² C	VCCI2C	I	Power supply terminal for I ² C.
	SCL	I	I ² C clock terminal
	SDA	I/O	I ² C data I/O terminal
	ADDSEL	I	Switch terminal for slave address
COMMON	VIN	I	Control circuit block power supply terminal
	VREF	O	Reference voltage (2.4V) output terminal
	VR	O	Reference voltage (0.6V) output terminal
	GND	-	Control circuit block ground terminal
MCU	VBUS	O	VBUS output monitor
	3R3V	O	3R3V output monitor
	GND_1	-	GND for MCU
	GND_2	-	GND for MCU

3.2 Jumper, Switch descriptions

Table 3-2. Jumper, Switch Descriptions

Jumper, Switch	Description	Initial setting
JP1	Short VIN terminal and PVCC1 pin (power of DD1 block)	Short
JP2	Short Vo1 terminal and L1 inductor	Short
JP3	Short VIN terminal and R1 (Pull-up resistor for PG1 pin)	Short
JP4	Short VIN terminal and PVCC2 pin (power of DD2 block)	Short
JP5	Short Vo2 terminal and L2 inductor	Short
JP6	Short VIN terminal and R2 (Pull-up resistor for PG2 pin)	Short
JP7	Short VIN terminal and PVCC1 pin (power of LDO block)	Short
JP8	Short VIN terminal and R3 (Pull-up resistor for PGL pin)	Short
JP9	Short VIN terminal and R4 (Pull-up resistor for ERR pin)	Short
JP10 back side	Short VIN terminal and VCC_1 pin (power of common block)	Short
JP11 back side	Short VIN terminal and VCC_2 pin (power of common block)	Short
JP12	Short 3R3V terminal and VCCI2C pin	Short
JP13	Short SCL terminal and SCL pin	Short
JP14	Short SDA terminal and SDA pin	Short
JP15	Short SW1 and ADDSEL pin	Short
JP16	Short SW1 and CTLMAIN pin	Short
JP17	Short SW1 and CTL1 pin	Short
JP18	Short SW1 and CTL2 pin	Short
JP19	Short SW1 and CTLL pin	Short
JP101 back side	Short USB ID and MCU I/O port (30 pin)	Short
JP102	022 : 3.3V is supplied to 3R3V from MB39C022G LDO 031 : 3.3V is supplied to 3R3V from MB39C031 LDO	022
SW1	1 : ADDSEL=H at ON, ADDSEL=OPEN at OFF 2 : CTLMAIN=H at ON, CTLMAIN=OPEN at OFF 3 : CTL1=H at ON, CTL1=OPEN at OFF 4 : CTL2=H at ON, CTL2=OPEN at OFF 5 : CTLL=H at ON, CTLL=OPEN at OFF 6 : Unused	Short
SW101	Reset push switch for MCU	-
SW102	Test switch for MCU	OFF
CN1	1 : SCL pin 2 : SDA pin 3 : GND pin 4 : VCCI2C pin	-
CN2	1,7 : PG2 pin 2,4 : CTLL pin 3,9 : PG1 pin 5,11 : PGL pin 6,8 : CTL1 pin 10,12 : CTL2 pin	-

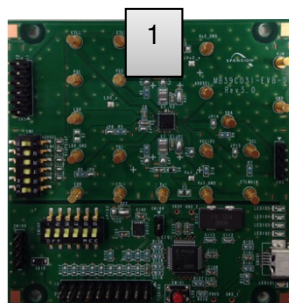
Jumper, Switch	Description	Initial setting
CN101	USB connector	-
CN102	JTAG connector for MCU	-
CN103	Expansion serial connector	-
CN104	Mode connector for MCU	-

4. Setup and Verification



4.1 Contents in a package

No.	Contents	Description	Quantity	Notes
1	MB39C031-EVBSK-01	Power management IC evaluation board	1	-
2	USB cable	USB to USB mini B cable	1	-



[Required item for evaluation of power block]

- MB39C031-EVB-01 1pic

- [Using items for evaluation with I²C control]
- MB39C031-EVB-01 1pic
- USB cable 1pic
- PC installed Windows7 or later OS 1pic

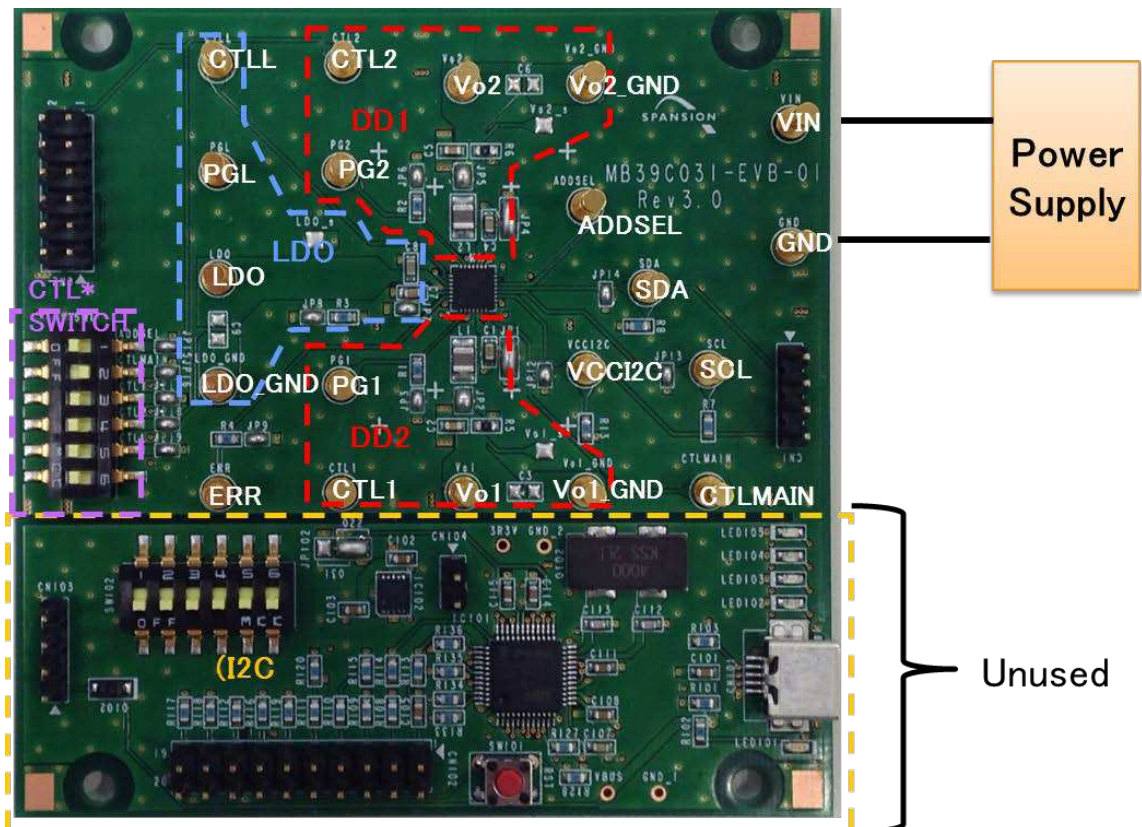
4.2 Evaluation with CTL (*1) switch

MB39C031 preset value can be evaluated with stabilized power supply.

*1: CTLMAIN, CTL1, CTL2, CTLL

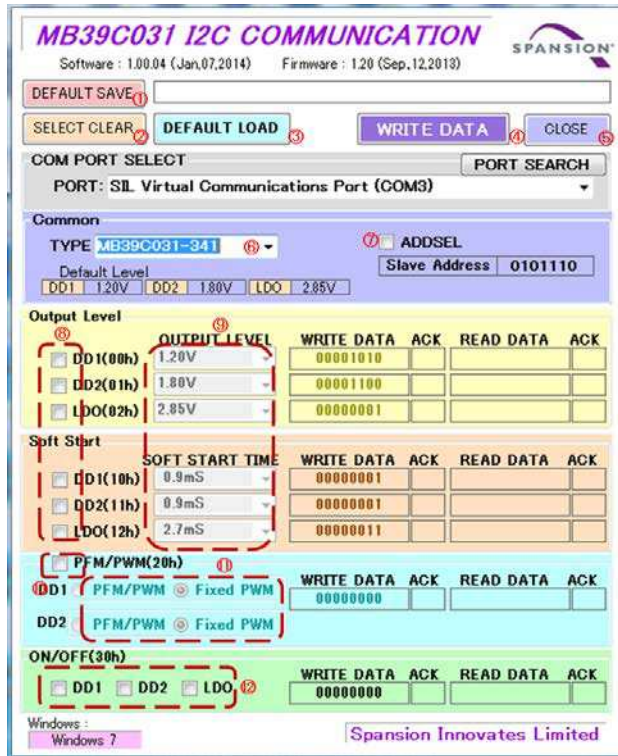
1. 3.6V is applied to VIN terminal.
2. CTLMAIN, CTL1, CTL2, CTLL switch are turned on
3. Vo1:1.2V, Vo2:1.8V, LDO:3.3V is output.

Figure 4-1. For Control Switch Evaluation



4.3 Evaluation with I²C control

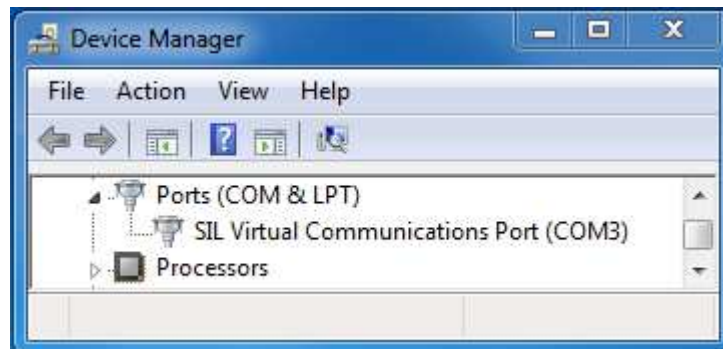
All setting of MB39C031 can be evaluated with Windows PC connected to USB port by I²C communication GUI.



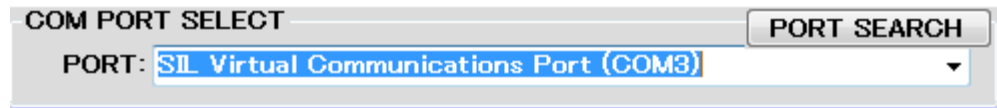
- ① : Save the setting data, which is shown next as default
- ② : Clear the of ⑧, ⑩, ⑫
- ③ : Reset the IC factory default
- ④ : Write the data to IC
- ⑤ : Close the window
- ⑥ : Select the preset option (ex. Select MB39C031-341)
- ⑦ : Select ADDSEL
- ⑧ : Set output voltage/soft star transfer
- ⑨ : Select the setting value after of ⑧
- ⑩ : Set PFM/PWM mode transfer
- ⑪ : Select PFM/PWM mode after of ⑩
- ⑫ : Set ON

4.3.1 PC Setup

1. Unpack the driver file to a folder of PC running Windows 7 or later version OS, and run install.bat file.
2. Connect MB39C031-EVB-01 to PC using USB cable.
3. After installed a device, open the device manager and confirm the new COM port.
Start menu → Control panel → Device manager



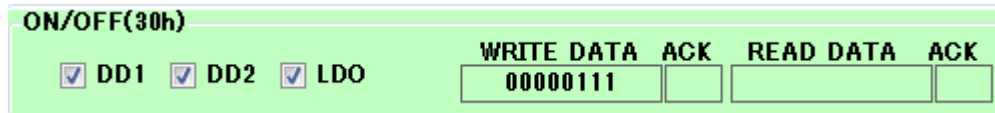
4. Run MB39C031_I2C.exe
5. Click "PORT SEARCH" at "COM PORT SELECT" field and select "SIL Virtual Communications Port (COMxx) "



6. Please unplug the USB cable after setup.

4.3.2 Operation check

1. 3.6V is applied to VIN terminal.
2. CTLMAIN switch is turned on.
3. USB cable is connected.
4. Run I²C communication software and click the box of ON/OFF field

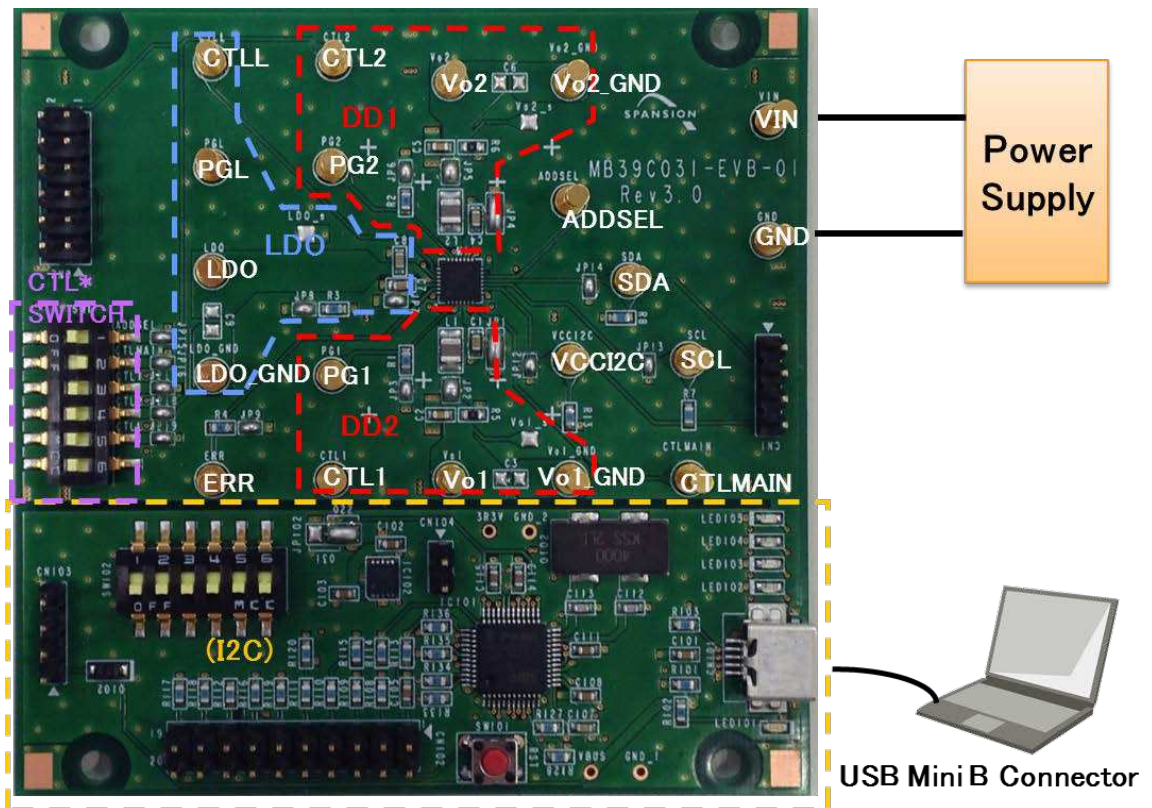


Click the WRITE DATA button.



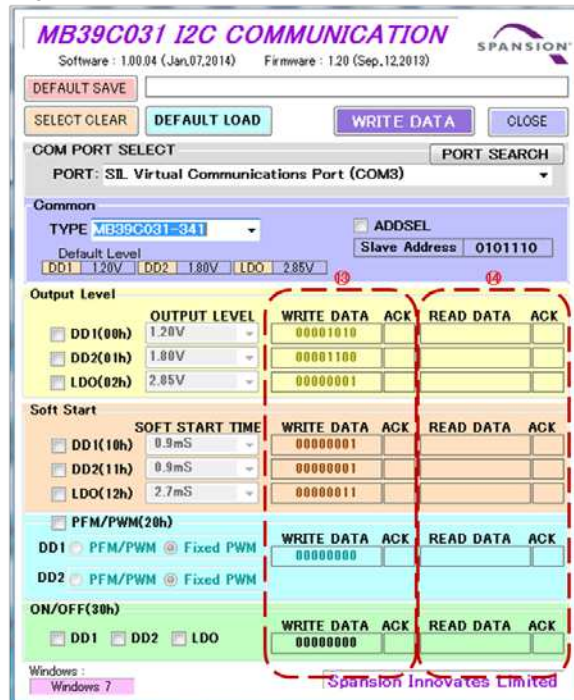
5. Vo1, Vo2 and LDO are output by software settings

Figure 4-2. For I2C control evaluation

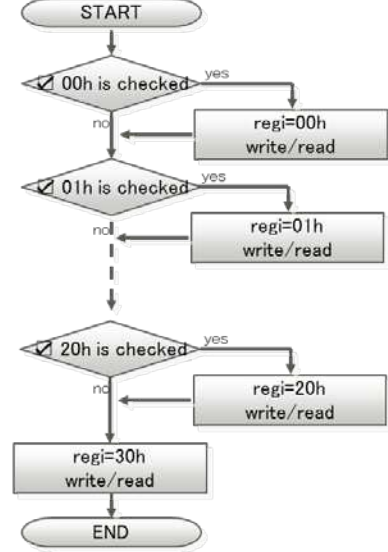


4.3.3 How to use I²C communication GUI

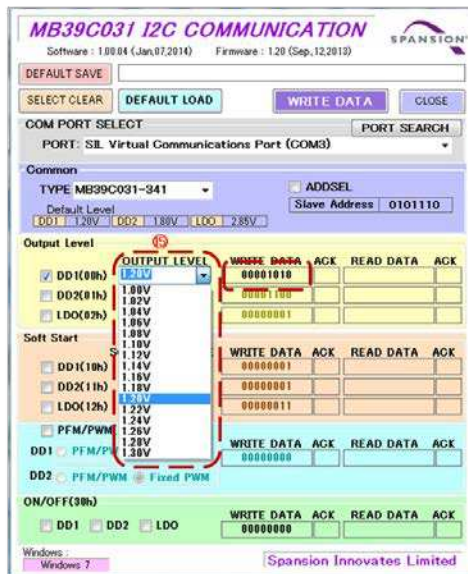
■ Operation at write DATA



- ⑬ : Data written to IC
 Data is transferred
- ⑭ : Data read from IC after write
 Data is output

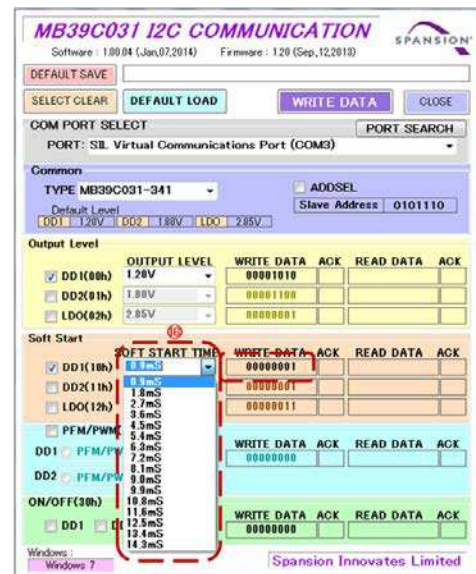


■ Selection of output voltage



- ⑮ : After checked register address , preset voltage can be selected and bit data is shown.

■ Selection of soft start time



- ⑯ : After checked register address , preset time can be selected and bit data is shown.

4.4 Specification of MB39C031

MB39C031-EVB-01 is preset the following output voltage and soft-start time.

Table 4-1. MB39C031(Option code : 342) Specification

CH	Symbol	Accuracy	Vo (V)			Io(mA)	ILIMIT(mA)	Architecture	FREQUENCY (MHz)	L (uH)	Co (uF)	Soft-Start time (ms)	Discharge R (kΩ)	REMARKS
			MIN	TYP	MAX									
DD1	Vo1	±1.2%	0.99	1.00	1.01	1400	2000	Buck (SYNQ) C-mode	3.0	1.5	10	14.3	5	Internal SWFET Internal Vo setting resistor Operation mode (Fixed PWM, PFM/PWM)
			0.9											
			1.8											
			2.7											
			3.6											
			4.5											
			5.4											
			6.3											
			7.2											
			8.1											
			9.0											
			9.9											
			10.8											
			11.6											
			12.5											
			13.4											
			DD2	Vo2	±1.2%							1.19		
0.9														
1.8														
2.7														
3.6														
4.5														
5.4														
6.3														
7.2														
8.1														
9.0														
9.9														
10.8														
11.6														
12.5														
13.4														
LDO	LDO	±1.8%				2.75	2.80	2.85	(250)	300	LDO	-	-	4.7
			0.9											
			1.8											
			2.7											
			3.6											
			4.5											
			5.4											
			6.3											
			7.2											
			8.1											
			9.0											
			9.9											
			10.8											
			11.6											
			12.5											
			13.4											
						Preset value								

5. Component and Wiring Layout



5.1 Component Layout

Figure 5-1. Component Layout (Layer 1)

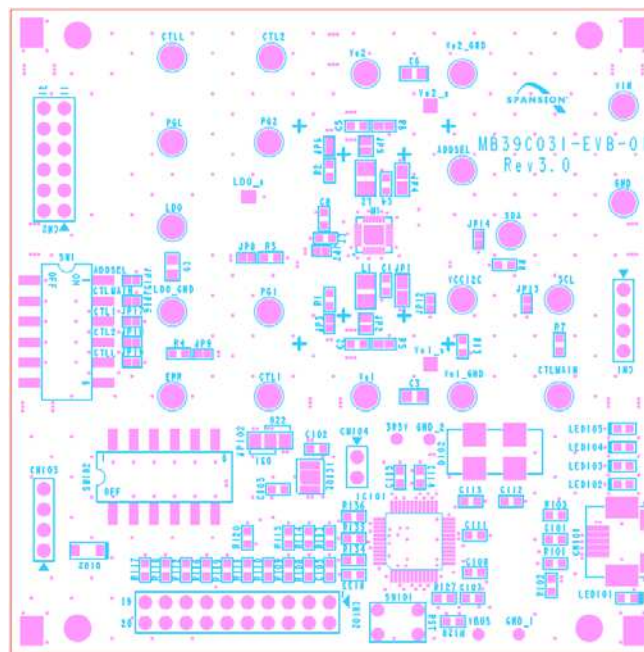
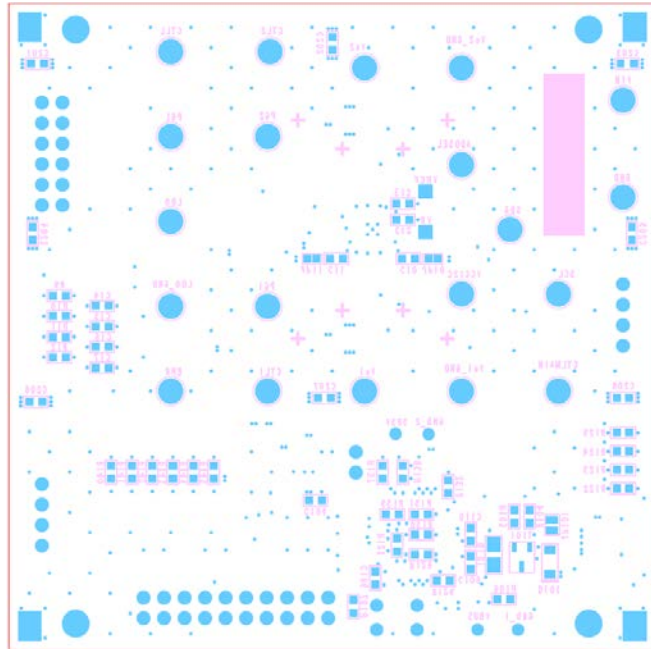


Figure 5-2. Component Layout (Layer 6)



5.2 Wiring layout

Figure 5-3. Wiring layout (layer 1)

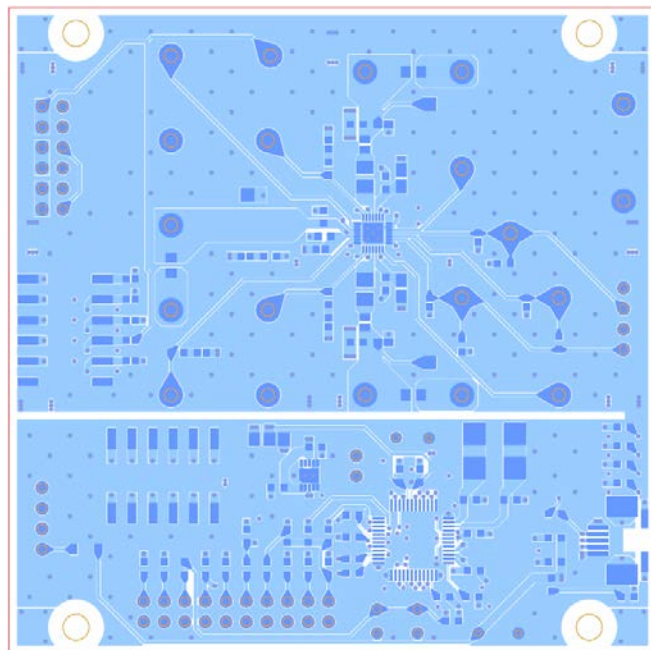


Figure 5-4. Wiring Layout (Layer 2)

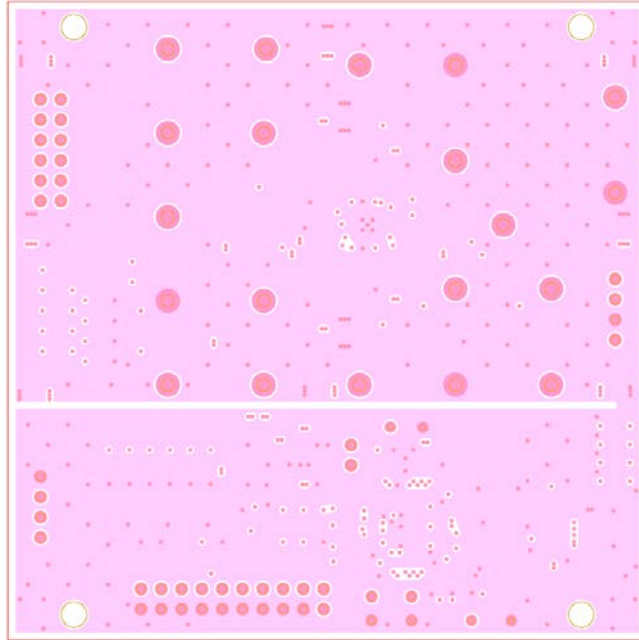


Figure 5-5. Wiring Layout (Layer 3)

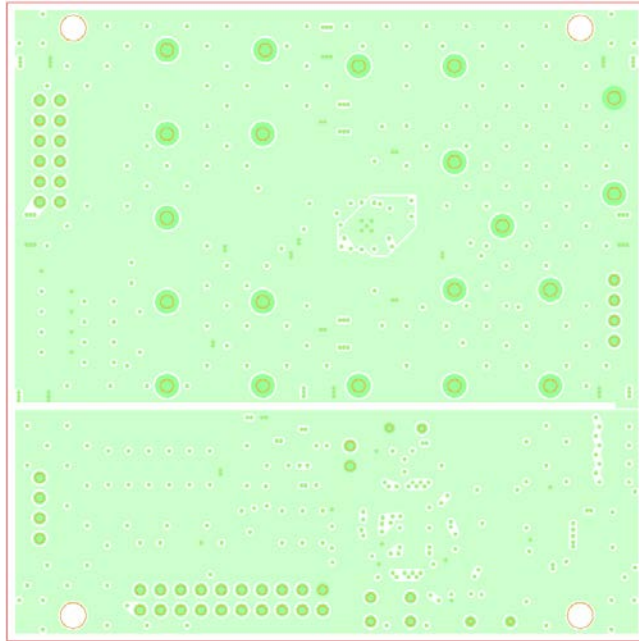


Figure 5-6. Wiring Layout (Layer 4)

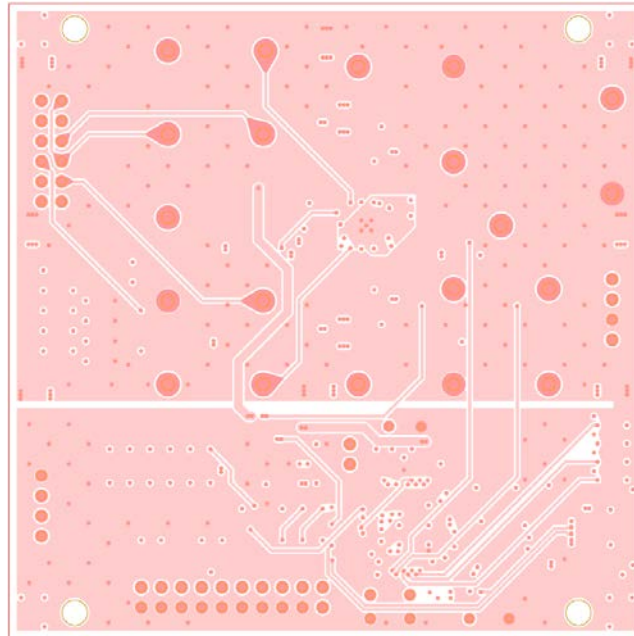


Figure 5-7. Wiring Layout (Layer 5)

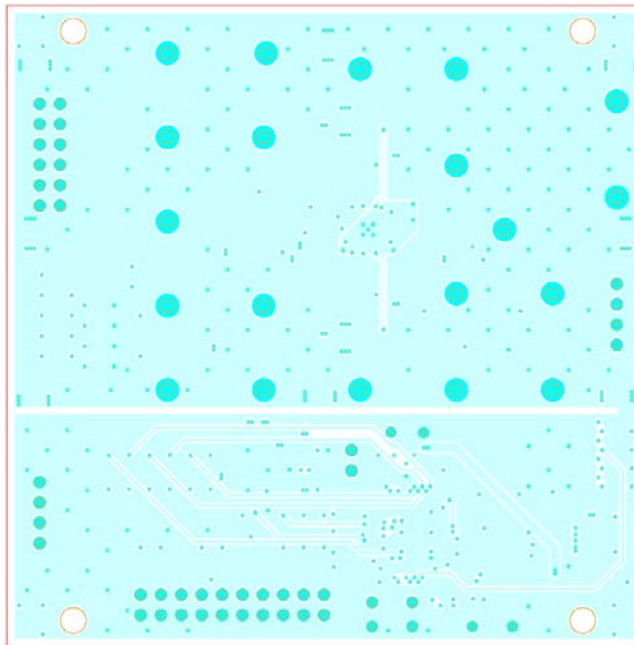
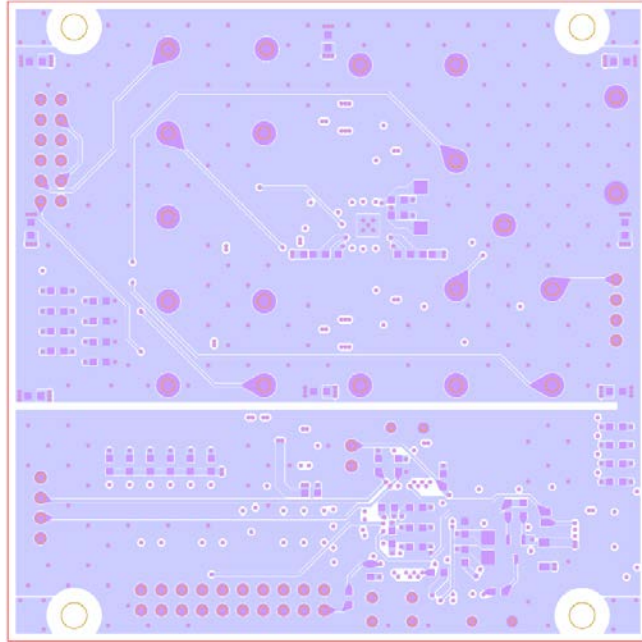


Figure 5-8. Wiring Layout (Layer 6)



6. Circuit Schematic



Figure 6-1. Circuit schematic for power block

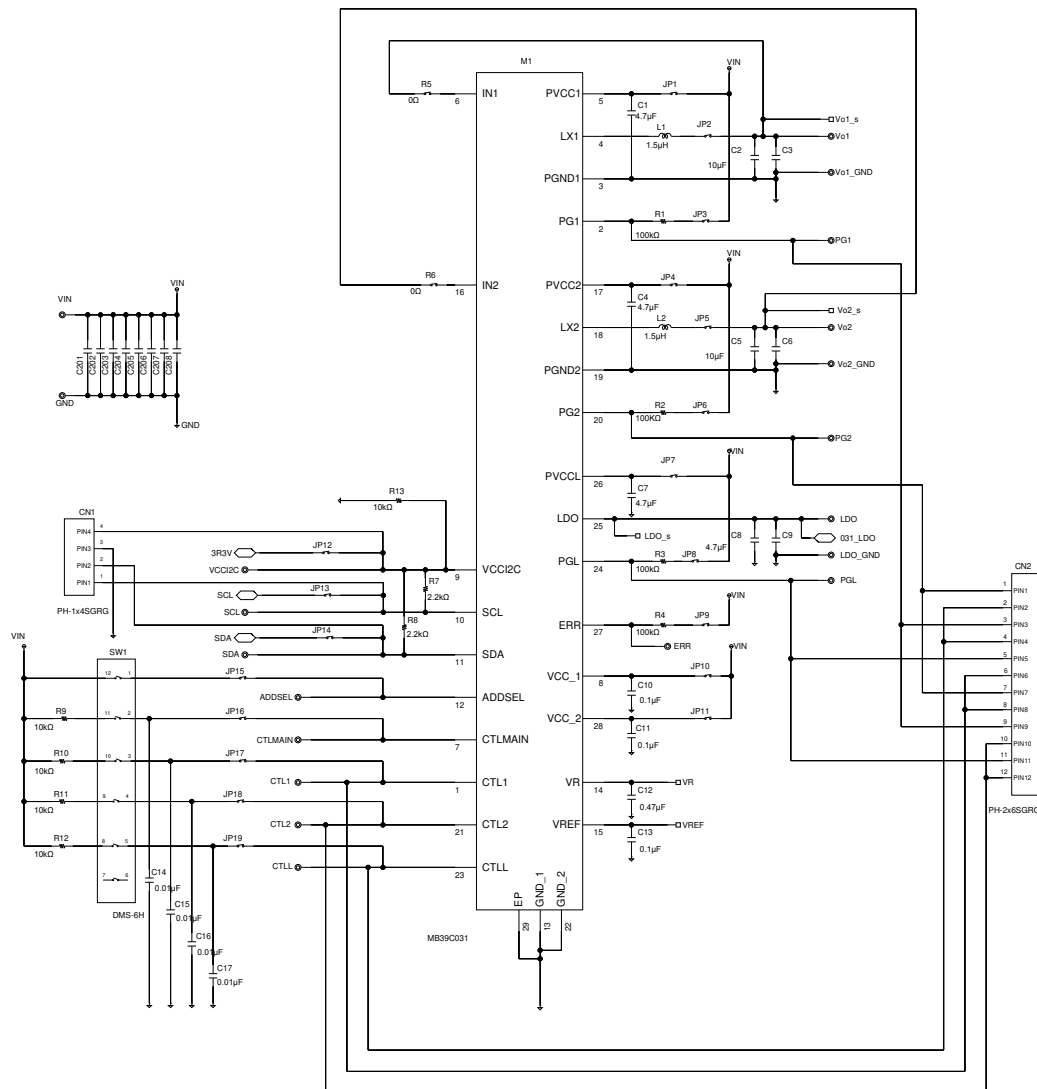
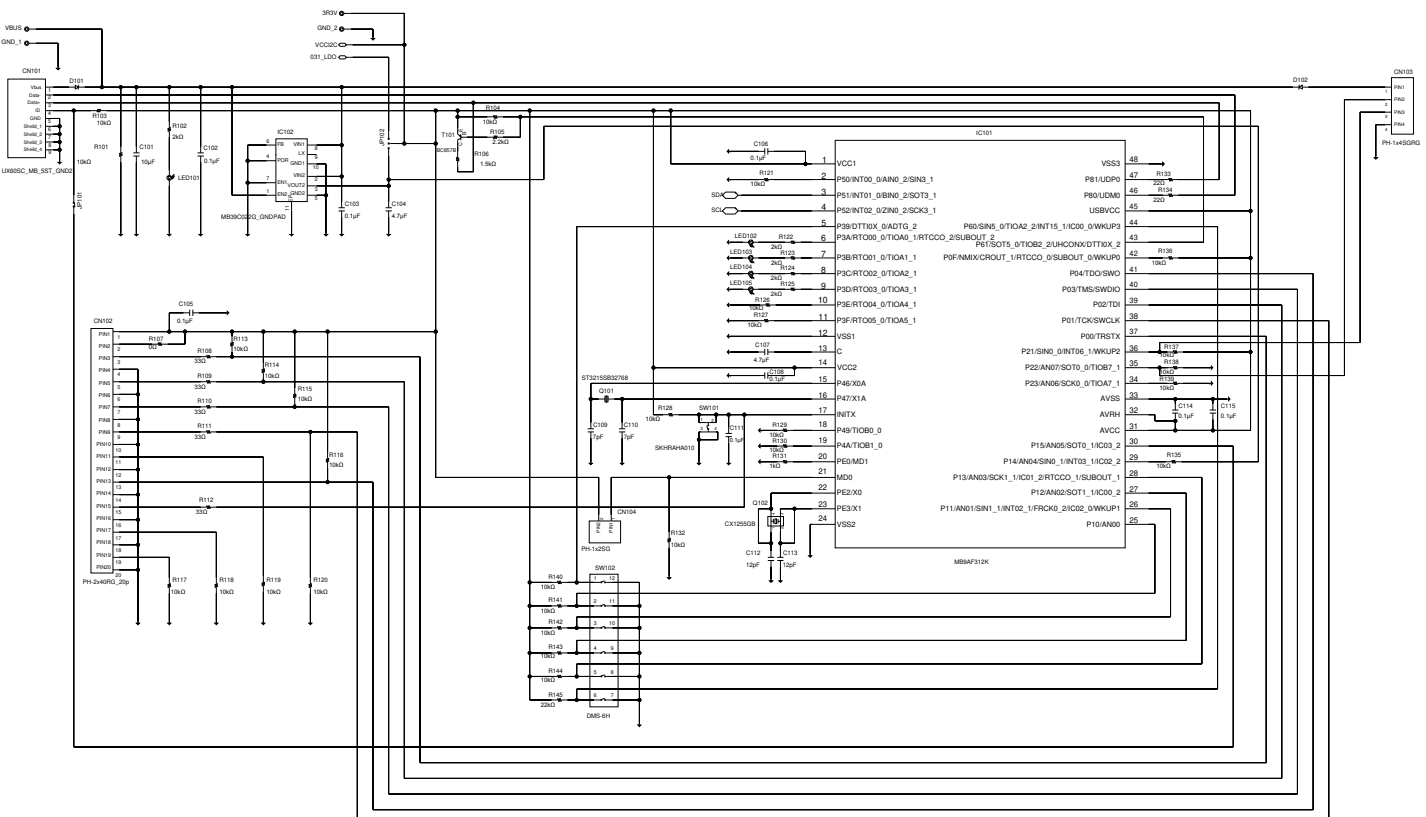


Figure 6-2. Circuit Schematic for MCU Boot



7. Component List



Table 7-1. Component list (Power)

No.	Component	Item	Parts number	Vendor	Value	Remarks
1	M1	PMIC	MB39C031	CYPRESS	-	-
2	L1	Inductor	1299AS-H-1R5N=P2	TOKO	1.5 μ H	-
3	L2	Inductor	1299AS-H-1R5N=P2	TOKO	1.5 μ H	-
4	C1	Ceramic Capacitor	C1608JB1V475K	TDK	4.7 μ F	35V
5	C2	Ceramic Capacitor	C1608X5R1E106M	TDK	10 μ F	25V
6	C3	Ceramic Capacitor	-	-	-	Unmounted
7	C4	Ceramic Capacitor	C1608JB1V475K	TDK	4.7 μ F	35V
8	C5	Ceramic Capacitor	C1608X5R1E106M	TDK	10 μ F	25V
9	C6	Ceramic Capacitor	-	-	-	Unmounted
10	C7	Ceramic Capacitor	C1608JB1V475K	TDK	4.7 μ F	35V
11	C8	Ceramic Capacitor	C1608JB1V475K	TDK	4.7 μ F	35V
12	C9	Ceramic Capacitor	-	-	-	Unmounted
13	C10	Ceramic Capacitor	C1608JB1H104K	TDK	0.1 μ F	50V
14	C11	Ceramic Capacitor	C1608JB1H104K	TDK	0.1 μ F	50V
15	C12	Ceramic Capacitor	C1608JB1H474K	TDK	0.47 μ F	50V
16	C13	Ceramic Capacitor	C1608JB1H104K	TDK	0.1 μ F	50V
17	C14	Ceramic Capacitor	C1608JB1H103K	TDK	0.01 μ F	50V
18	C15	Ceramic Capacitor	C1608JB1H103K	TDK	0.01 μ F	50V