

1/16 Brick DC-DC Power module

KD series (Full digital)

# Evaluation board user's manual

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**FPKD-EVB01**

**Evaluation Board Manual**

1 Overview

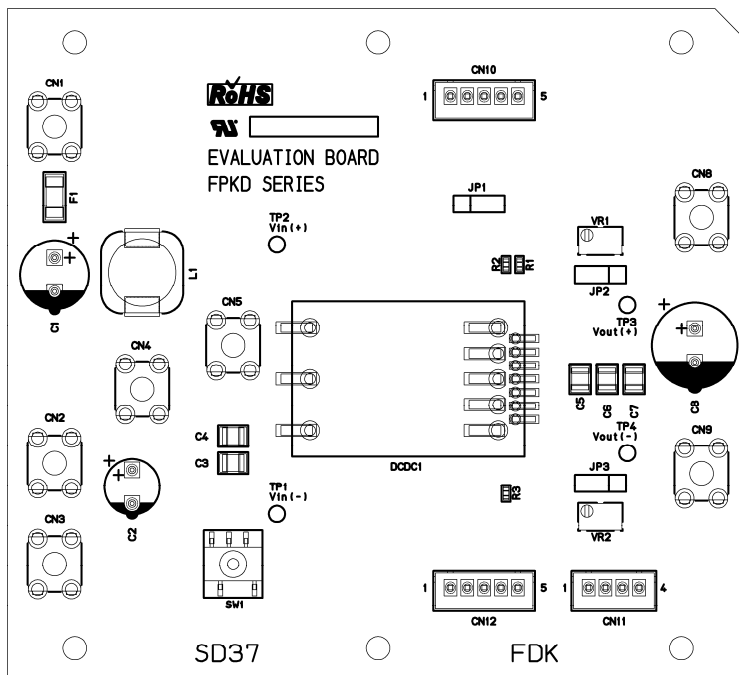
This is an evaluation board for KD series (full digital) brick power module. PMBus interface can be used to set the output voltage, turn on/off delay, rise/fall time etc. and also can be used to get the input voltage, output voltage, output current etc. . Control from PC is available, via our USB-PMBus communication interface adapter.

2 Specification of evaluation board

**Table 1 List of specification**

Input voltage operation range	36V~60V
Output voltage default settings	FPKD48*3R330*A evaluation board→3.3V FPKD48*6R018*A evaluation board→6V FPKD48*01208*A evaluation board→12V FPKD48*01806*A evaluation board→18V
Output voltage variable range	-50%~+20% of default setting
Rated output current	FPKD48*3R330*A evaluation board→30A FPKD48*6R018*A evaluation board→:16A FPKD48*01208*A evaluation board→8A FPKD48*01806*A evaluation board→5.5A
Communication system	PMBus Specification Rev.1.2 compliant

3 Layout



**Figure 1 Evaluation board top view**

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## 4 Terminal and switch descriptions

**Table 2 List of terminal, switch**

Name	Function
CN1	Power module input pin (+)
CN2	Power module input pin (-)
CN3	Remote ON/OFF control pin
CN4	Input current measurement-use pin (+)
CN5	Input current measurement-use pin (-)
CN8	Load connection pin (+)
CN9	Load connection pin (-)
CN10	For parallel connection PMBus in, out signal pin 1 (PMBus slave connector 1)
CN11	PMBus communication pin ※connect to our USB-PMBus communication interface adaptor (PMBus Master connector)
CN12	For parallel connection PMBus in, out signal pin 2 (PMBus slave connector 2)
TP1	Input voltage measurement-use pin (-)
TP2	Input voltage measurement-use pin (+)
TP3	Output voltage measurement-use pin (+)
TP4	Output voltage measurement-use pin (-)
JP1	Short pin for Output voltage (+)- Remote-sense (+)
JP2	Short pin for TRIM-UP
JP3	Short pin for TRIM-DOWN
VR1	TRIM-UP volume adjustment
VR2	TRIM-DOWN volume adjustment
SW1	Manual remote ON/OFF switch

## 5 Handling method (details of power module, please refer to each KD series data sheet)

### 5.1 Connection

- Connect the power module input pins (CN1, CN2) to DC Power.
- Connect the load connection pins (CN8, CN9) to the target Load.
- In order to measure the input current, placed and connect an ammeter within the input current measurement pins (CN4, CN5). (Short these pins CN4,CN5 by a cable if you are not intent to measure the input current)
- In order to measure the input voltage, please connect the input measurement-use pins (TP1, TP2) to the voltmeter.
- In order to measure the output voltage, please connect the output measurement-use pins (TP3, TP4) to the voltmeter.
- Connect the Remote ON/OFF control pin (CN3) if you are intent to Remote ON/OFF outside the evaluation board.(Voltage level of CN3 must be in the range of  $-0.5V \sim 20V$  with reference to the CN2)
- Connect the PMBus interface pin (CN11) to USB-PMBus communication interface adaptor if you are intent to use the communication function to control the evaluation board. (Details of the USB-PMBus communication interface adaptor please refer to USB-PMBus communication interface adaptor user's manual)
- Parallel connection of the evaluation boards or connected to other PMBus devises needs parallel connection pin (CN10, CN12) to enable the communications.
- If the remote sense is unnecessary please short jumper pin (JP1) which short the Output voltage (+) and Remote-sense (+). (open jumper to enable the remote sense, connect Load(+) with the first pin of JP1)
- Short jumper pin (JP2) to trim-up the output voltage to adjust output voltage higher than the rated output voltage by using TRIM-UP adjustment volume (VR1).
- Short jumper pin (JP3) to trim-down the output voltage to adjust output voltage lower than the rated output voltage by using TRIM-DOWN adjustment volume (VR2). (Please refer to KD series user's manual and each KD series Data sheets for further details)

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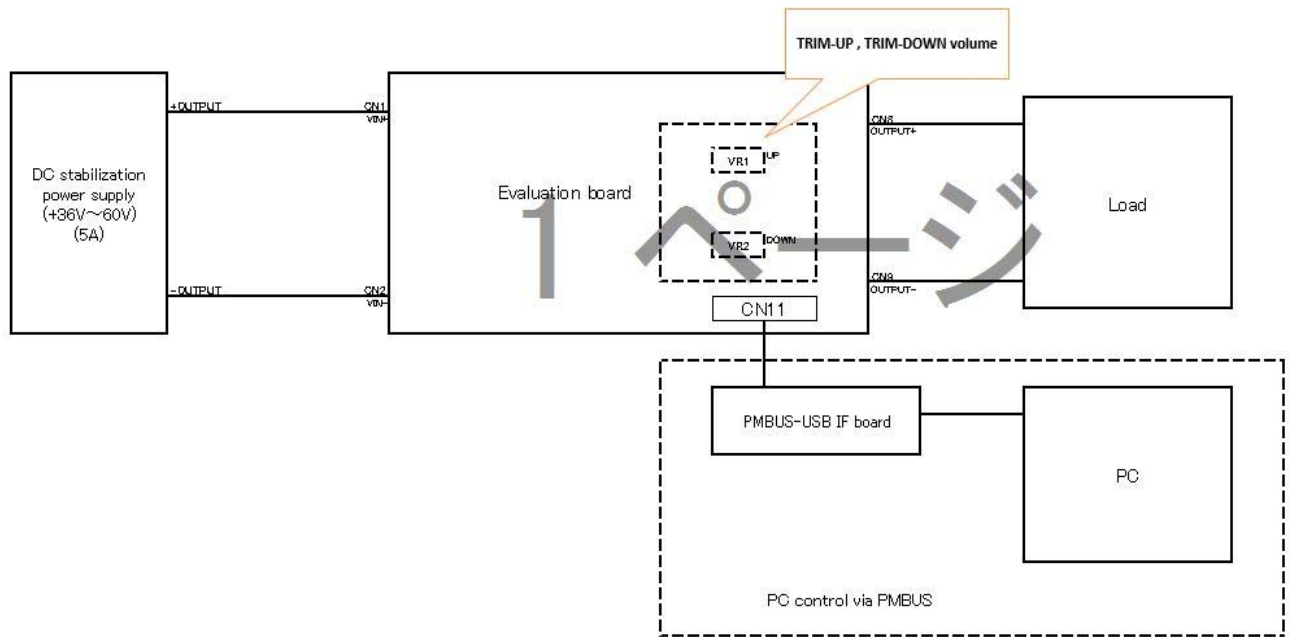


Figure 2 Connection image

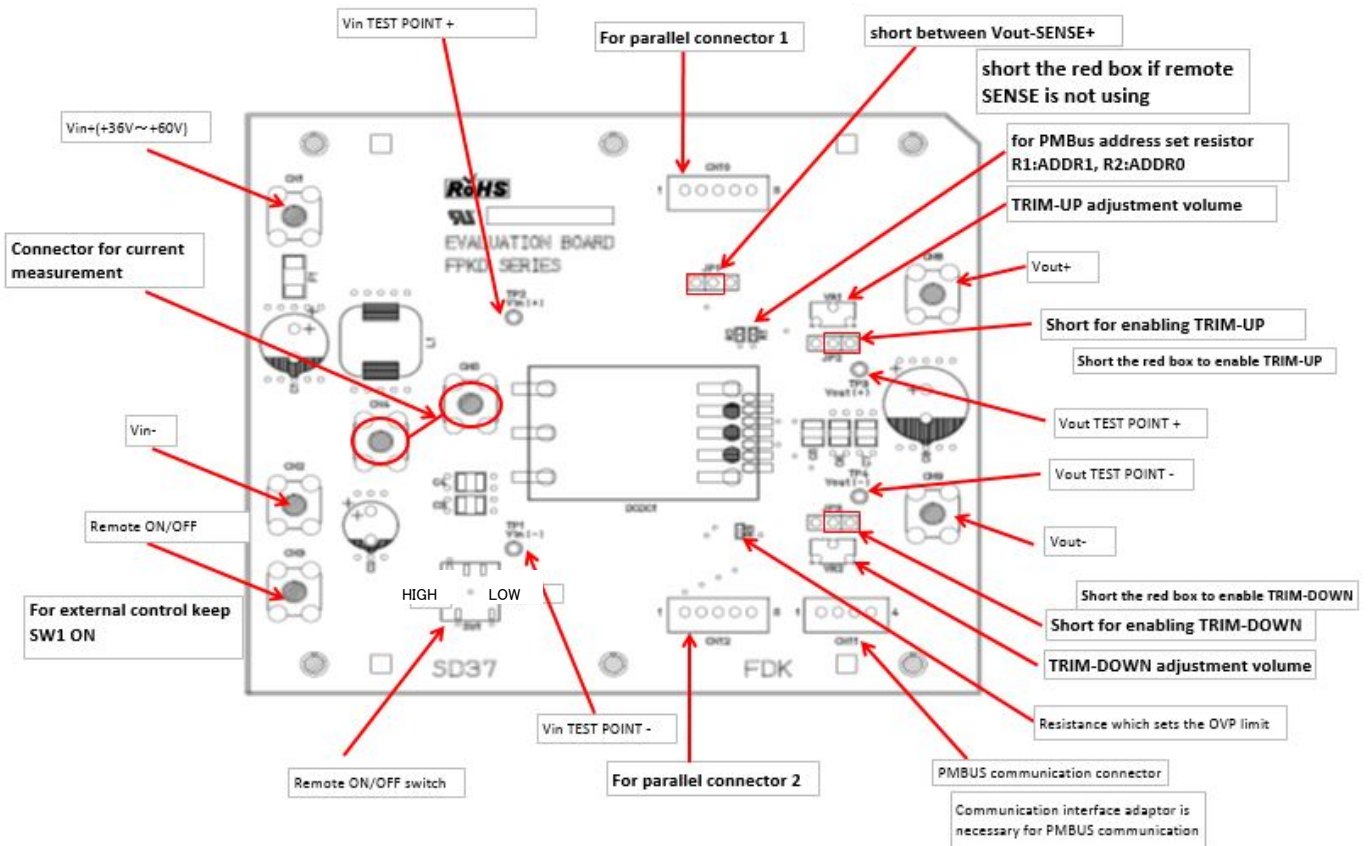


Figure 3 Detailed description view

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5.2 Remote ON/OFF function

The output ON/OFF control is available by changing the manual remote ON/OFF switch (SW1). However, it is under the condition of the remote ON/OFF control pin (CN3) either OPEN or in H level.

5.3 Settings of the PMBus devise address

- Devise address of the PMBus is sets by mounting the resistances (R1, R2).
- Corresponding value of resistances and addresses are shown in the Table3. Please use nearest value of E24 series for R1 and R2.
- The addresses 0 to 8, 12, 40 and 55 in decimal are reserved according to the SMBus specifications and may not be usable. Please do not set those resistance values.

**Table 3 Corresponding Addresses and resistance values**

External resistance(R1) Resistance value(kΩ)	External resistance(R2) Resistance value(kΩ)	PMBus devise address (DEC)	External resistance(R1) Resistance value(kΩ)	External resistance(R2) Resistance value(kΩ)	PMBus devise address (DEC)
10.0	10.0	0	34.9	10.0	32
	15.4	1		15.4	33
	23.7	2		23.7	34
	36.5	3		36.5	35
	54.9	4		54.9	36
	84.5	5		84.5	37
	130.0	6		130.0	38
	200.0	7		200.0	39
15.4	10.0	8	84.5	10.0	40
	15.4	9		15.4	41
	23.7	10		23.7	42
	36.5	11		36.5	43
	54.9	12		54.9	44
	84.5	13		84.5	45
	130.0	14		130.0	46
	200.0	15		200.0	47
23.7	10.0	16	130.0	10.0	48
	15.4	17		15.4	49
	23.7	18		23.7	50
	36.5	19		36.5	51
	54.9	20		54.9	52
	84.5	21		84.5	53
	130.0	22		130.0	54
	200.0	23		200.0	55
36.5	10.0	24	200.0	10.0	56
	15.4	25		15.4	57
	23.7	26		23.7	58
	36.5	27		36.5	59
	54.9	28		54.9	60
	84.5	29		84.5	61
	130.0	30		130.0	62
	200.0	31		200.0	63

5.4 Output voltage setting

Default output voltage settings can be changed either by using the TRIM adjustment volume or by using the PMBus interface command. Please refer to the KD series data sheets or user's manual for further details.

### 5.5 Variable over current limit function

Over current limit can be set by mounting resistance R3. Corresponding value of resistance and the over current limit are shown in the Table4.

**Table 4 Limited current and resistance value**

External resistance(R3)	Over current protection circuit
Resistance value(K $\Omega$ )	Operation start current value (%)
10.000	15
15.400	30
23.700	45
36.500	60
54.900	75
84.500	90
130.000	100
OPEN	125

※(%) is the ratio of rated current value



6 Primary functions list

Supported primary functions and their initial configurations, setting/changing method of this product are listed in the table below.

**Table 5 List of functions**

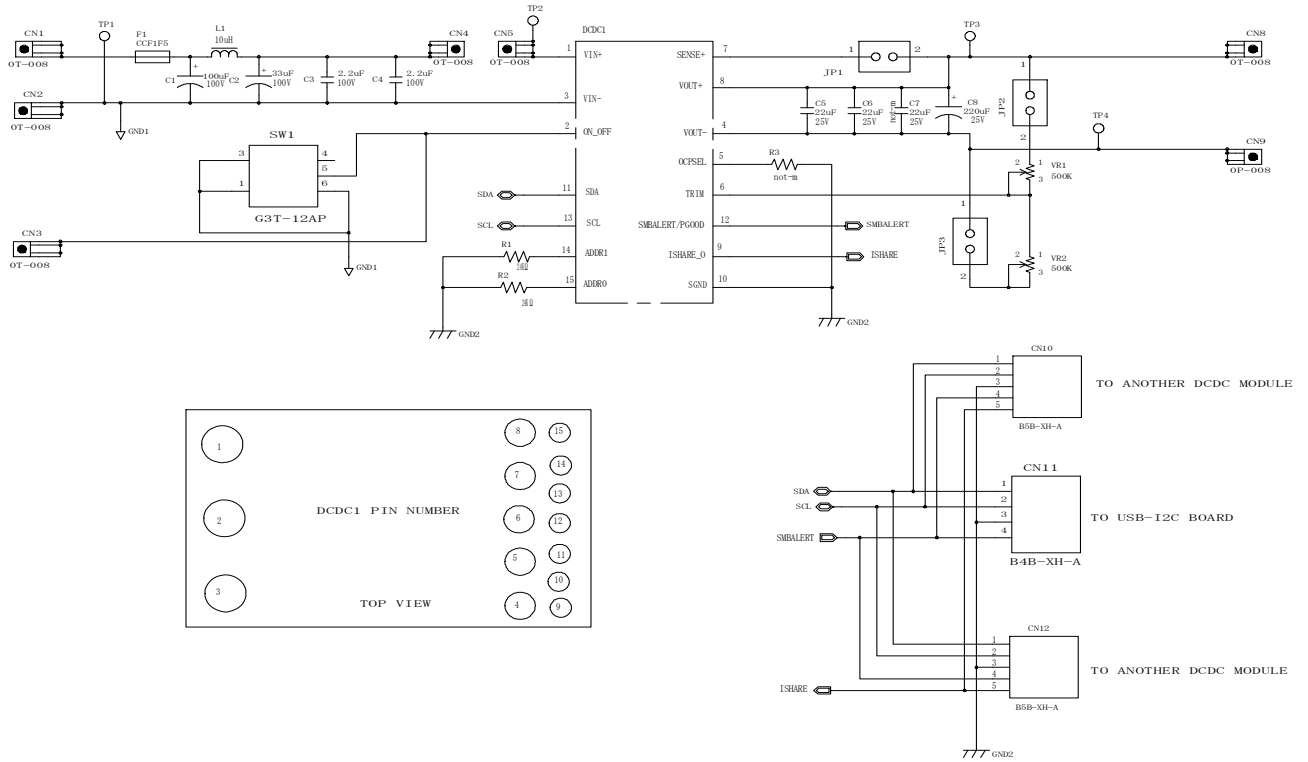
Function	Default configuration	Setting changing method
PMBus devise address setting	18(DEC) (12h(HEX))	By attaching resistance
Manual remote ON/OFF switch	OFF	SW1
Remote ON/OFF control	Remote ON/OFF pin or PMBus communication	Signal through Remote ON/OFF pin or by PMBus command
Maximum output voltage control	135% of rated voltage	By PMBus command
Output voltage trimming	0V	By PMBus command
Margin voltage setting	High: 105% of rated voltage Low: 95% of rated voltage	By PMBus command
Margin voltage ON/OFF control	OFF	By PMBus command
Turn on delay control	10msec	By PMBus command
Rise time control	15msec	By PMBus command
Output over voltage protection	130% of rated voltage	By PMBus command
Output under voltage protection	40% of rated voltage	By PMBus command
Output over current protection	125% of rated current	By PMBus command
Over temperature protection	125°C	By PMBus command
Input under voltage protection	Start:34.5V Stop:32.5V	By PMBus command
Input over voltage protection	103V	By PMBus command

※Please refer to the KD series data sheet for further details information of available PMBus commands in this product.

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Circuit diagram



**Figure 4 Evaluation board circuit diagram**