

Evaluation Board for 15W Dual-Output Switch-Mode Power Supply

1 Description

The iW1830-EVAL evaluation board implements a dual-output, 15W power supply based on Dialog Semiconductor's iW1830 **AccuSwitch™** digital off-line power supply controller IC. The evaluation board supplies two outputs, 12V/1A and 5V/0.5A, using a single primary-side controlled quasi-resonant flyback converter.

The design implements two output voltages using one primary-side controller and achieves the tight regulation required by high-reliability applications such as white goods, home appliances and industrial control.

The iW1830 controller integrates a 700V power MOSFET to lower the power supply BOM cost and uses Dialog's advanced **PrimAccurate™** digital control technology to eliminate the need for external secondary-side feedback components, further reducing component count and cost, while improving reliability. It operates in quasi-resonant mode to improve efficiency and help meet EMI standards. This quasi-resonant operation and Dialog's **EZ-EMI®** technology enable excellent EMI performance with minimal external filtering. Proprietary control technology allows high efficiency across a broad range of loads, which enables the iW1830 to meet stringent international standards for power supply efficiency.



2 Features

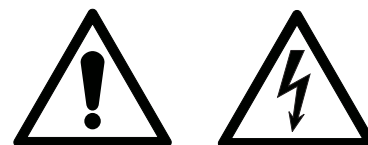
- Wide input voltage range: 90V_{AC} to 264V_{AC}
- Output voltages: 12V and 5V
- Output current: 12V - 1A, 5V - 500mA
- Total output power: 15W max.
- Integrated 700V MOSFET
- Active mode efficiency > 84%
- Supports high capacitance loads up to 6,000μF
- Low no-load power: < 100mW (at 230 V_{AC})
- **EZ-EMI®** technology: excellent EMI performance with a minimum of external EMI filtering components
- Quasi-resonant operation
- Low component count and small PCB footprint
- iW1830 IC protections:
 - » Output short-circuit, over-current, over-voltage
 - » Input voltage protection: brown-out, brown-in, unplug
 - » Over-temperature protection - internal sensor

3 Applications

- Power Supplies for:
 - » White Goods
 - » Home Appliances
 - » Industrial Control
 - » Network Devices

**Evaluation Board for 15W Dual-Output
Switch-Mode Power Supply****WARNING****Disclaimer for High Voltage (Mains Powered) Evaluation Boards****Warning**

This evaluation board is powered by AC mains voltage. When powered, this evaluation board generates non-insulated high voltages which may produce electrical shock, burn, and/or fire hazards, resulting in risk of property damage, personal injury, and/or death.



When the evaluation board is powered, never touch the board or its electrical circuits since they may be operating at high voltages that can cause an electrical shock hazard.

TO BE USED FOR EVALUATION PURPOSES ONLY

This board is intended for evaluation purposes only and not intended for commercial use in an end product. Any other use is strictly prohibited by Dialog Semiconductor.

WORK AREA AND PERSONAL SAFETY

This board should be used in a test area/laboratory specifically designed and designated for working with, and evaluating high-voltage electrical devices. Only trained and qualified professional personnel with experience, knowledge and training in the use of high-voltage electrical circuits should use this evaluation board. Trained personnel must use required personal protective equipment and required laboratory equipment when working with the evaluation board.

The professional personnel operating this evaluation board and the test area/laboratory in which it is operated must be qualified according to the local regulations, guidelines and labor laws applicable to working with non-isolated mains voltages and high voltage circuits.

An isolated housing is highly recommended when using this evaluation board.

Use this evaluation board at your own risk.

NOT AGENCY APPROVED

This evaluation board has not been agency tested or approved for safety, technical performance, and/or regulatory requirements, such as electromagnetic interference or other technical regulatory or safety requirements.

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4 Evaluation Board Specifications

The table below shows the electrical specifications of the evaluation board specified at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Description	Symbol	Min	Typ	Max	Units	Comment
Input						
Voltage	V _{IN}	90		264	V _{AC}	2 wire
Frequency	f _{LINE}	47	50/60	63	Hz	
No-load input power (230V _{AC})				100	mW	
Output						
Output voltage	V _{OUT1}	4.75	5.00	5.25	V	Measured at the end of PCB
	V _{OUT2}	10.8	12	13.2	V	
Output current	I _{OUT1}	0		0.5	A	
	I _{OUT2}	0		1.0	A	
Output ripple voltage	V _{RIPPLE (5V)}			200	mV _{P-P}	Connected with 10μF E-cap and 100nF C-cap; I _{OUT1} = 0.5A , I _{OUT2} = 1A@T _A = 25°C 20MHz Bandwidth
	V _{RIPPLE (12V)}			200	mV _{P-P}	
Total Output Power						
Continuous output power	P _{OUT}		14.6		W	
Over power protection	OPP			17	W	Auto-restart
Active mode efficiency	η	84.5			%	Average of efficiency measured at 25%/50%/75%/100% V _{IN} = 115V _{AC}
Environmental						
Safety (Note 1)	Designed to Meet UL1310 (up to 120V _{AC}) Designed to Meet EN60335-1:2012					
Ambient temperature	T _{AMB}	0		40	°C	Free convection, sea level

Note 1: The iW1830-EVAL has been designed to meet EN60335-1:2012 and UL1310 (up to 120 V_{AC}), however individual boards have not been tested or verified to these standards.

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5 Schematic

The schematic shown in Figure 5.1 is the complete schematic for the evaluation board. The specific part numbers can be found in the Bill-of-Materials in section 6.

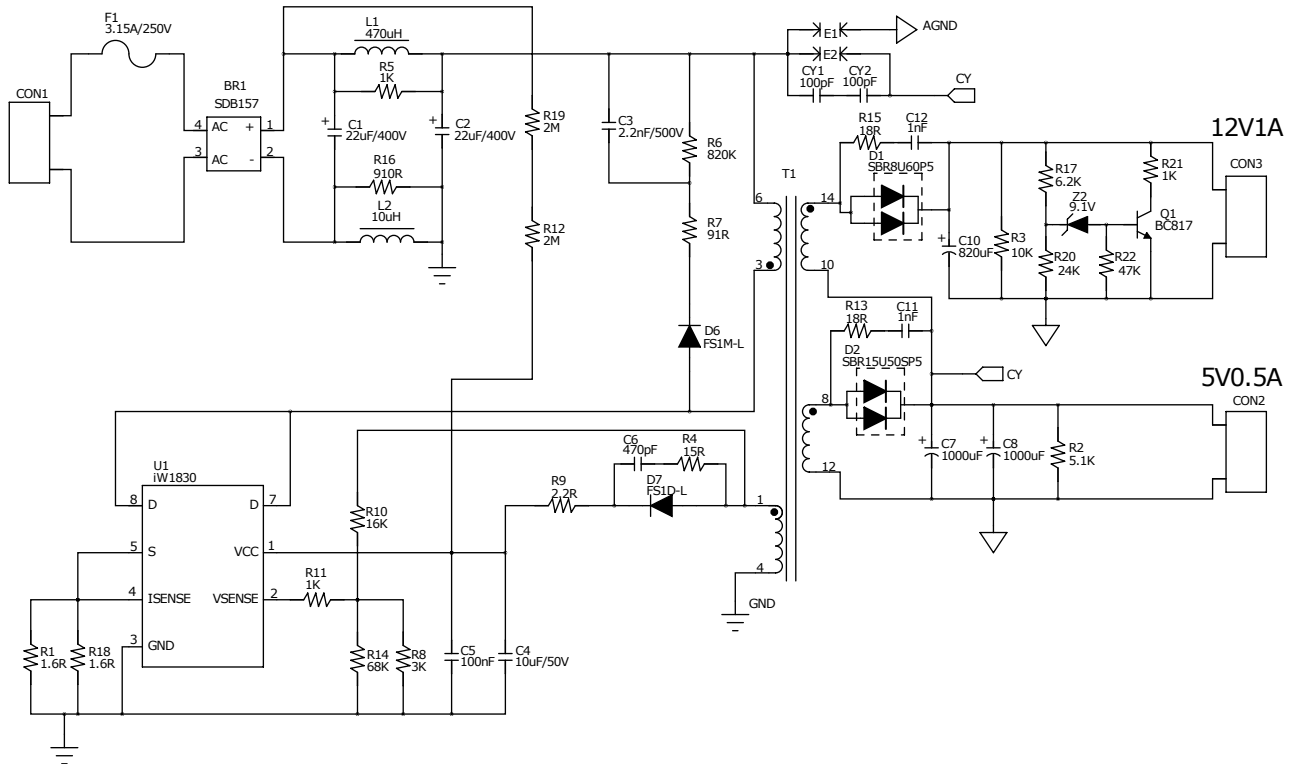


Figure 5.1 : Complete Evaluation Board Schematic for the iW1830-EVAL Board.

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6 Bill of Materials

Table 1: Bill-of-Materials List for EVB iW1830-EVAL

Item	Qty.	Ref.	Description	Footprint	Mfg. Part Number	Manufacturer
1	1	U1	iW1830, Off-line digital PWM Controller with 4A/700V MOS co-packed, DIP 7	DIP-7	iW1830-00	Dialog Semiconductor
2	1	BR1	SDB157,1000V,1.5A,Bridge rectifier	SDB-1	SDB157-TP	Micro Commercial Components Corp.
3	2	C1, C2	22uF,400V, Φ 12.5X20,E-CAP	CE12.5x20	EKXG401ELL220MK20S	Nippon Chemi-Con
4	1	C3	2.2nF,500V,X7R,SMD-1206	CS1206	CC1206KKX7RBBB222	YAGEO Corporation
5	1	C4	10uF,50V,X5R,SMD-1206	CS1206	GRM32ER71H106KA12L	Murata Electronics
6	1	C5	100nF,50V,X7R,SMD-0805	CS0805	CC0805KRX7R9BB104	YAGEO Corporation
7	1	C6	470pF,250V,X7R,SMD-0805	CS0805	CC0805KRX7RYBB471	YAGEO Corporation
8	2	C7,C8	1000uF,10V, Φ 8X20,E-CAP	CE8X20	UPA1A102MPD1TD	Nichicon
9	1	C10	820uF,16V, Φ 8X20,E-CAP	CE8X20	UPA1C821MPD1TD	Nichicon
10	2	CY1,CY2	100pF,250V ,X2 ,Y1-cap	Radial, Disc	DE1B3KX101KA4BN01F	Murata Electronics
11	1	D1	SBR8U60P5,8A,60V	POWERDI5	SBR8U60P5	Diodes Incorporated
12	1	D2	SBR15U50SP5,15A,50V	POWERDI5	SBR15U50SP5	Diodes Incorporated
13	1	D6	FS1M-L, 1A1000V,Fast Recovery Rectifier (Trr=500ns)	DO-214AC	FS1M-LTP	Micro Commercial Components Corp.
14	1	D7	FS1D-L, 1A200V,Fast Recovery Rectifier (Trr=150ns)	DO-214AC	FS1D-LTP	Micro Commercial Components Corp.
15	1	Q1	BC817-25,TRANS NPN 45V 0.8A SOT-23	SOT-23	BC817-25-TP	Micro Commercial Components Corp.
16	1	Z2	9.1V Zener,Izt=5mA ,200MW SOD323	SOD-323	BZT52C9V1S-TP	Micro Commercial Components Corp.
17	1	F1	3.15A,250V, Fuse, Φ 3.6X10mm	Axial-3.6x10	08743.15MXEP	Littelfuse Inc.
18	1	L1	470uH,126mA,Color Ring Inductor, 0410	Axial-04x10	77F471J-RC	Bourns Inc.
19	1	L2	10uH,Chip Inductor(Chip Coil)	LS0805	LQM21FN100M80L	Murata Electronics
20	2	R1,R18	1.6 Ω ±1%,SMD-1206	RS1206	RC1206FR-071R6L	YAGEO Corporation
21	1	R2	5.1K Ω ±5%,SMD-0805	RS0805	RC0805JR-075K1L	YAGEO Corporation
22	1	R3	10K Ω ±5%,SMD-0805	RS0805	RC0805JR-0710KL	YAGEO Corporation
23	1	R4	15 Ω ±5%,SMD-0805	RS0805	RC0805JR-0715RL	YAGEO Corporation
24	1	R5	1K Ω ±5%,SMD-0805	RS0805	RC0805JR-071KL	YAGEO Corporation
25	1	R6	820K Ω ±5%,SMD-1206	RS1206	RC1206JR-07820KL	YAGEO Corporation
26	1	R7	91 Ω ±5%,SMD-1206	RS1206	RC1206JR-0791RL	YAGEO Corporation
27	1	R8	3K Ω ±1%,SMD-0603	RS0603	RC0603FR-073KL	YAGEO Corporation
28	1	R9	2.2 Ω ±5%,SMD-0603	RS0603	RC0603JR-072R2L	YAGEO Corporation
29	1	R10	16K Ω ±1%,SMD-0603	RS0603	RC0603FR-0716KL	YAGEO Corporation
30	1	R11	1K Ω ±5%,SMD-0603	RS0603	RC0603JR-071KL	YAGEO Corporation
31	2	R12,R19	2M Ω ±5%,SMD-1206	RS1206	RC1206JR-072ML	YAGEO Corporation
32	2	R13,R15	18 Ω ±5%,SMD-0805	RS0805	RC0805JR-0718RL	YAGEO Corporation
33	1	R14	68K Ω ±1%,SMD-0603	RS0603	RC0603FR-0768KL	YAGEO Corporation
34	1	R16	910 Ω ±5%,SMD-0805	RS0805	RC0805JR-07910RL	YAGEO Corporation
35	1	R17	6.2K Ω ±1%,SMD-0603	RS0603	RC0603FR-076K2L	YAGEO Corporation
36	1	R20	24K Ω ±1%,SMD-0603	RS0603	RC0603FR-0724KL	YAGEO Corporation
37	1	R21	1K Ω ±5%,SMD-1206	RS1206	RC1206JR-071KL	YAGEO Corporation
38	1	R22	47K Ω ±1%,SMD-0603	RS0603	RC0603FR-0747KL	YAGEO Corporation
39	1	CON1	Serie 2169 - 7.50mm Horizontal Entry Modular with Rising Cage Clamp - 3.5mm ² Wires WR-TBL		691 216 910 002	Würth Elektronik

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Item	Qty.	Ref.	Description	Footprint	Mfg. Part Number	Manufacturer
40	2	CON2 CON3	WR-TBL Terminal block-serie 101, 5.00mm - Modular-blue-Horizontal entry with pressure clamp - 12.6mm		691 101 710 002	Würth Elektronik
41	1	T1	EE20/10/6 (EF20),14-Pin EXT, THT, Horizontal for 12V1A 5V0.5A		750 343 108	Würth Elektronik
42	4	Support	Self-Retaining Spacer WA-SNSR ,Nylon 66, natural		702 917 000	Würth Elektronik
43	2	C11,C12	1nF,100V,X7R,SMD-0805	0805	CC0805KRX7R0BB102	YAGEO Corporation

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The user, and/or user's employer, if user is using this evaluation board for employer-related purposes, assumes all responsibility for using this evaluation board in a test area or laboratory which is qualified and/or certified according to the local regulations, guidelines and labor laws applicable to working with non-isolated mains voltages and high voltage circuits.

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