

## Evaluation Board for 10W Single-Output Switch-Mode Power Supply

### 1 Description

The iW1818-EVAL evaluation board implements a 10W power supply based on Dialog Semiconductor's iW1818 **AccuSwitch**™ digital off-line power supply controller IC. The evaluation board supplies a 5V, 2A regulated output voltage using a primary-side controlled quasi-resonant flyback converter that meets the U.S. Department of Energy's most recent level VI efficiency standard and the EU's Code of Conduct, Version 5, Tier 2 standard for both active mode and no-load standby power consumption.

The iW1818 controller integrates an 800V power BJT transistor 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 iW1818 to meet stringent international standards for power supply efficiency.



### 2 Features

- Wide input voltage range: 90V<sub>AC</sub> to 264V<sub>AC</sub>
- Output voltage: 5V
- Output current: 2A
- Total output power: 10W max.
- Integrated 800V BJT
- Active mode efficiency > 80%
- Supports high capacitance loads up to 6,000μF
- Low no-load power: < 50mW (at 230 V<sub>AC</sub>)
- **EZ-EMI**® technology: excellent EMI performance with a minimum of EMI filtering components
- Quasi-resonant operation
- Low component count and small PCB footprint
- iW1818 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

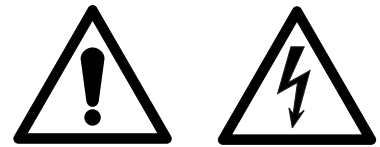
Evaluation Board for 10W Single-Output  
Switch-Mode Power Supply

**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  |
|-------------------------------------|--|------|-------|------|-------------------|--|
| <b>Input</b>                        |  |      |       |      |                   |  |
| Voltage                             | $V_{IN}$   | 90   |       | 264  | $V_{AC}$          | 2 wire   |
| Frequency                           | $f_{LINE}$   | 47   | 50/60 | 63   | Hz                |  |
| No-load input power (230 $V_{AC}$ ) |  |      |       | 50   | mW                |  |
| <b>Output</b>                       |  |      |       |      |                   |  |
| Output voltage                      | $V_{OUT}$  | 4.75 | 5.00  | 5.25 | V                 | Measured at the end of PCB   |
| Output current                      | $I_{OUT}$  | 0    |       | 2    | A                 |  |
| Output ripple voltage               | $V_{RIPPLE}$   |      |       | 200  | mV <sub>P-P</sub> | Connected with 10 $\mu\text{F}$ E-cap and 100nF C-cap; $I_{OUT} = 2\text{A}@T_A = 25^\circ\text{C}$<br>20MHz Bandwidth |
| <b>Total Output Power</b>           |  |      |       |      |                   |  |
| Continuous output power             | $P_{OUT}$  |      | 10    |      | W                 |  |
| Over current protection             | OCP  |      |       | 2.8  | A                 | Auto-restart   |
| Active mode efficiency              | $\eta$   | 80.7 |       |      | %                 | Average of efficiency measured at 25%/50%/75%/100%<br>$V_{IN} = 115V_{AC}$   |
| <b>Environmental</b>                |  |      |       |      |                   |  |
| Safety (Note 1)                     | Designed to Meet UL1310 (up to 120 $V_{AC}$ )<br>Designed to Meet EN60335-1:2012 |      |       |      |                   |  |
| Ambient temperature                 | $T_{AMB}$  | 0    |       | 40   | $^\circ\text{C}$  | Free convection, sea level   |

Note 1: The iW1818-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.

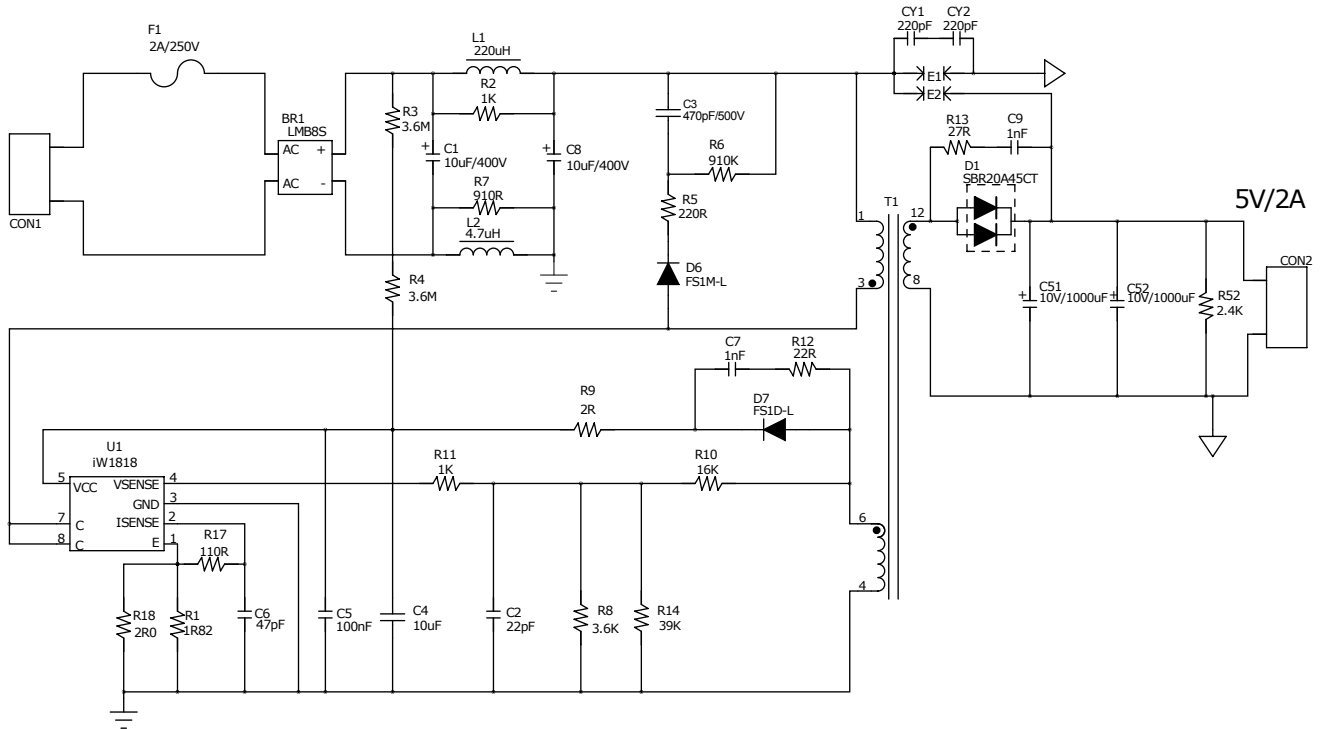


Figure 5.1 : Complete Evaluation Board Schematic for the iW1818-EVAL Board.

## Evaluation Board for 10W Single-Output Switch-Mode Power Supply

### 6 Bill of Materials

Table 1: Bill-of-Materials List for EVB iW1818-EVAL

| Item | Qty. | Ref.      | Description   | Footprint    | Mfg. Part Number   | Manufacturer                      |
|------|------|-----------|---|--------------|--------------------|-----------------------------------|
| 1    | 1    | U1        | iW1818, Off-line digital PWM Controller with 4A/800V BJT co-packed, DIP 7                             | DIP-7        | iW1818-00          | Dialog Semiconductor              |
| 2    | 1    | BR1       | LMB8S,800V,1A,Bridge rectifier  | LMBS -1      | LMB8S-TP           | Micro Commercial Components Corp. |
| 3    | 2    | C1, C8    | CAP ALUM 10uF 20%,400V, Φ10X16mm, Lead Spacing: 5mm   | 10mmx16mm    | EKXJ401ELL100MJ16S | Nippon Chemi-Con                  |
| 4    | 1    | C2        | 22pF,25V,NPO,SMD-0603   | 0603         | CC603JRNPO8BN220   | YAGEO Corporation                 |
| 5    | 1    | C3        | 470pF,500V,X7R,SMD-1206   | 1206         | CC1206KKX7RBBBB471 | YAGEO Corporation                 |
| 6    | 1    | C4        | 10uF 10%,50V,X5R,SMD-1206   | 1206         | GRM31CR61H106KA12L | Murata Electronics                |
| 7    | 1    | C5        | 100nF 10%,50V,X7R,SMD-0805  | 0805         | CC0805KRX7R9BB104  | YAGEO Corporation                 |
| 8    | 1    | C6        | 47pF 10%,10V,SMD-0603   | 0603         | CC0603KRNPO9BN470  | YAGEO Corporation                 |
| 9    | 2    | C7,C9     | 1nF 10%,100V,X7R,SMD-0805   | 0805         | CC0805KRX7R0BB102  | YAGEO Corporation                 |
| 10   | 2    | CY1,CY2   | 220pF,250V ,Y-cap   | Radial, Disc | DE1B3KX221KN4AN01F | Murata Electronics                |
| 11   | 2    | C51,C52   | 1000uF,10V,Φ8X20,E-CAP  | CE8X15       | UPA1A102MPD1TD     | Nichicon                          |
| 12   | 1    | D1        | SBR20A45CT,20A,45V  | TO-220AB     | SBR20A45CT         | 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    | F1        | 2A,250V, Fuse, Φ3.6X10mm  | Axial-3.6x10 | 0874002.MXEP       | Littelfuse Inc.                   |
| 16   | 1    | L1        | 220uH,155mA,Color Ring Inductor, 0410   | Axial-04x10  | 77F221J-TR-RC      | Bourns Inc.                       |
| 17   | 1    | L2        | 4.7uH,Chip Inductor(Chip Coil)  | 0805         | LQM21FN4R7M80L     | Murata Electronics                |
| 18   | 1    | R1        | 1.82Ω±1%,SMD-1206   | 1206         | RC1206FR-071R82L   | YAGEO Corporation                 |
| 19   | 1    | R2        | 1KΩ±5%,SMD-0805   | 0805         | RC0805JR-071KL     | YAGEO Corporation                 |
| 20   | 2    | R3,R4     | 3.6MΩ±5%,SMD-1206   | 1206         | RC1206JR-073M6L    | YAGEO Corporation                 |
| 21   | 1    | R5        | 220Ω±5%,SMD-1206  | 1206         | RC1206JR-07220RL   | YAGEO Corporation                 |
| 22   | 1    | R6        | 910KΩ±5%,SMD-1206   | 1206         | RC1206JR-07910KL   | YAGEO Corporation                 |
| 23   | 1    | R7        | 910Ω±5%,SMD-0805  | 0805         | RC0805JR-07910RL   | YAGEO Corporation                 |
| 24   | 1    | R8        | 3.6KΩ±1%,SMD-0603   | 0603         | RC0603FR-073K6L    | YAGEO Corporation                 |
| 25   | 1    | R9        | 2Ω±5%,SMD-0603  | 0603         | RC0603JR-072RL     | YAGEO Corporation                 |
| 26   | 1    | R10       | 16KΩ±1%,SMD-0603  | RS0603       | RC0603FR-0716KL    | YAGEO Corporation                 |
| 27   | 1    | R11       | 1KΩ±5%,SMD-0603   | 0603         | RC0603JR-071KL     | YAGEO Corporation                 |
| 28   | 1    | R12       | 22Ω±5%,SMD-0805   | 0805         | RC0805JR-0722RL    | YAGEO Corporation                 |
| 29   | 1    | R13       | 27Ω±5%,SMD-0805   | 0805         | RC0805JR-0727RL    | YAGEO Corporation                 |
| 30   | 1    | R14       | 39KΩ±1%,SMD-0603  | 0603         | RC0603FR-0739KL    | YAGEO Corporation                 |
| 31   | 1    | R17       | 110Ω±5%,SMD-0603  | 0603         | RC0603JR-07110RL   | YAGEO Corporation                 |
| 32   | 1    | R18       | 2.0Ω±1%,SMD-1206  | 1206         | RC1206FR-072RL     | YAGEO Corporation                 |
| 33   | 1    | R52       | 2.4KΩ±5%,SMD-0805   | 0805         | RC0805JR-072K4L    | YAGEO Corporation                 |
| 34   | 1    | CON1      | Serie 2169 - 7.50mm Horizontal Entry Modular with Rising Cage Clamp - 3.5mm <sup>2</sup> Wires WR-TBL |              | 691 216 910 002    | Würth Elektronik                  |
| 35   | 1    | CON2      | WR-TBL Terminal block-serie 101, 5.00mm - Modular-blue-Horizontal entry with pressure clamp - 12.6mm  |              | 691 101 710 002    | Würth Elektronik                  |
| 36   | 1    | T1        | EE20/10/6 (EF20),14-Pin EXT, THT, Horizontal for 5V2A   |              | 750 343 107        | Würth Elektronik                  |
| 37   | 4    | Supporter | Self-Retaining Spacer WA-SNSR ,Nylon 66, natural  |              | 702 917 000        | Würth Elektronik                  |

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