

## URB2412S-3W-7892-8740K1

## 9-36V Input, 12V Output 3W Isolated Power Supply

## 1. Description

URB2412S-3W-7892-8740K1 is isolated 3W DC-DC converter module with a wide 4:1 input voltage range (9-36V), and a regulated output of 12V. The product has a relatively compact open-frame SIP-7 package. The power module features high efficiency, operating ambient temperature of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , remote control, and continuous short-circuit protection. The smaller size and cost-effective design make the module an ideal solution in communication, instruments, and industrial electronics applications.

| VIN (V) | VOUT (V) | PO (W) | Isolation voltage (kV) | Peak Efficiency (%) |
|---------|----------|--------|------------------------|---------------------|
| 9-36    | 12       | 3      | 1.5                    | 81                  |

### 1.1. Functional Block Diagram

URB2412S-3W-7892-8740K1 module employs an isolated flyback architecture with primary-side regulation. The system primarily comprises a flyback controller IC, a transformer, input and output capacitors, and associated peripheral components.

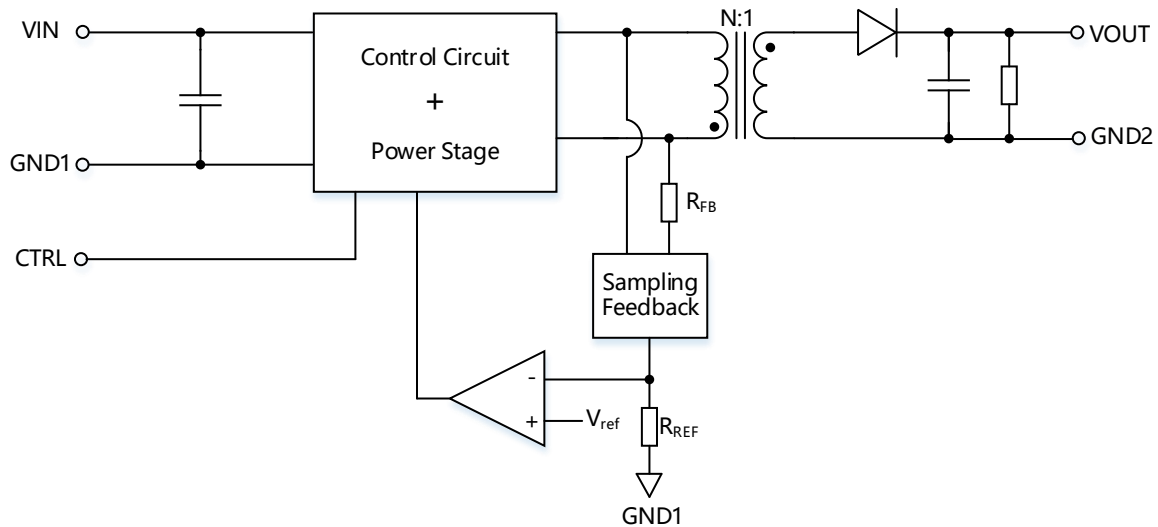


Fig. 1.1 Functional Block Diagram

During the off-time ( $T_{off}$ ), the voltage across the primary winding is  $V_{IN} + N \cdot V_{OUT}$ . Consequently, the voltage across resistor  $R_{FB}$  equals  $N \cdot V_{OUT}$ , generating a current of  $N \cdot V_{OUT} / R_{FB}$ . This current flows through resistor  $R_{REF}$ , producing a voltage drop of  $(N \cdot V_{OUT} / R_{FB}) \cdot R_{REF}$ . This voltage is compared against the error amplifier's internal 1V reference to generate an error signal. The signal is subsequently amplified and processed by the control circuit to drive the power MOSFET.

## 2. Features

- Ultra compact SIP package
- Cost-effective open-frame solution
- No-opto solution for higher reliability
- Wide 4:1 input voltage range
- Isolation test voltage: 1.5kVDC
- Short circuit protection (Auto-recovery)
- Remote ON/OFF

## 3. Pin Configuration and Functions

### 3.1. Product

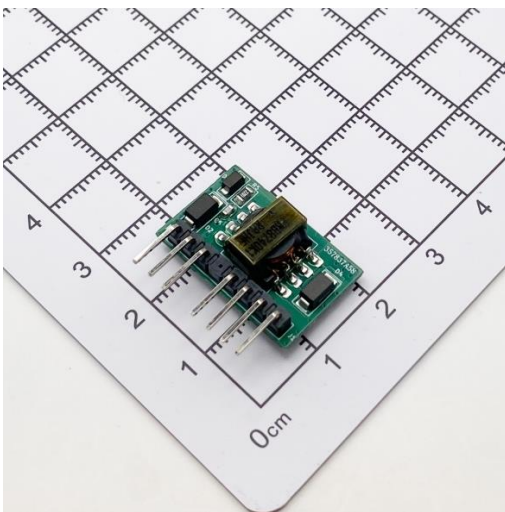


Fig. 3.1 Front side of Product

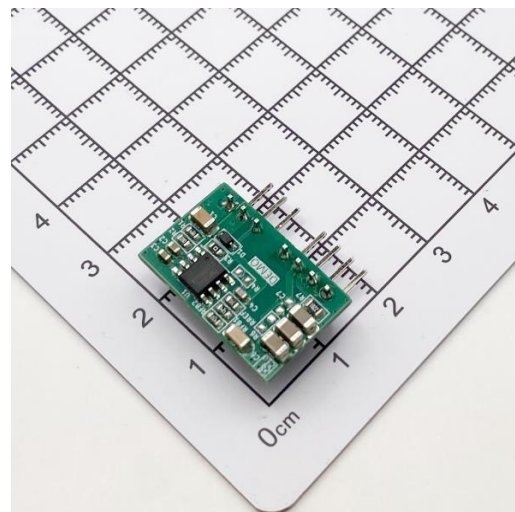


Fig. 3.2 Back side of Product

3.2. Package Outline and Functional Pin Description (Unit: mm)

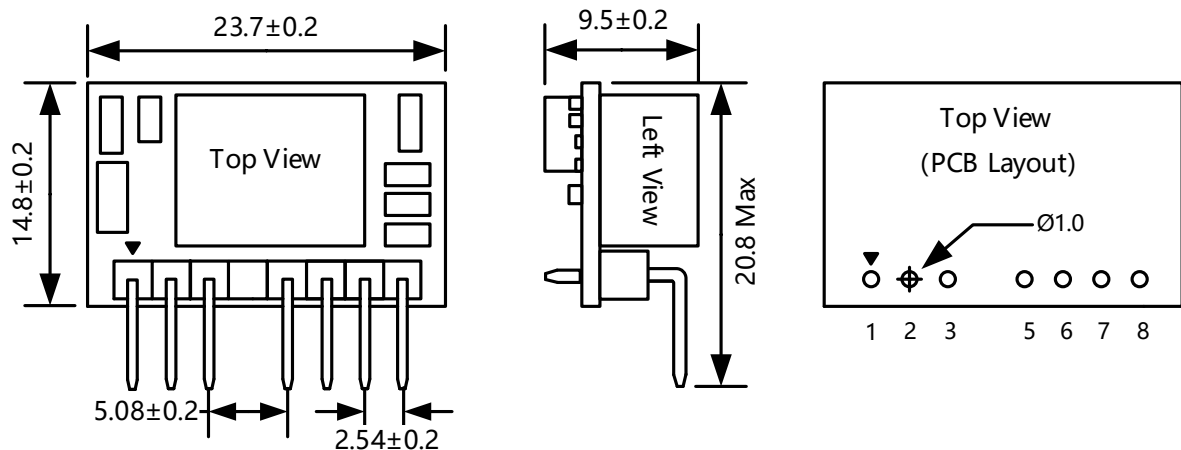


Fig. 3.3 Package Outline

| Pin  |      | Description            |
|------|------|------------------------|
| Name | No.  |                        |
| GND1 | 1    | Negative Power Input   |
| VIN  | 2    | Positive Power Input   |
| CTRL | 3    | Remote Controller      |
| NC   | 5, 8 | No Internal Connection |
| VOUT | 6    | Positive Power Output  |
| GND2 | 7    | Negative Power Output  |

4. Electrical Characteristics

| INPUT CHARACTERISTICS  |                    |                                              |      |      |       |
|------------------------|--------------------|----------------------------------------------|------|------|-------|
| Parameter              | Conditions         | Min.                                         | Typ. | Max. | Units |
| Input Current          | VIN=24V, 100% Load |                                              | 155  |      | mA    |
|                        | VIN=24V, No Load   |                                              | 4    |      | mA    |
| UVLO                   |                    | 5.5                                          | 7.5  |      | V     |
| Input Filter Type      | Capacitive Filter  |                                              |      |      |       |
| Ctrl                   | Module Enable      | The CTRL pin is left floating or driven high |      |      |       |
|                        | Module Disable     | The CTRL pin is pulled low                   |      |      |       |
| OUTPUT CHARACTERISTICS |                    |                                              |      |      |       |
| Parameter              | Conditions         | Min.                                         | Typ. | Max. | Units |

|                              |                                                                              |                           |       |       |       |
|------------------------------|------------------------------------------------------------------------------|---------------------------|-------|-------|-------|
| Voltage accuracy             | Input Voltage Range ,5%-100% Load                                            |                           | ±1    | ±3    | %     |
| Line voltage regulation      | VIN=(Min-Max) at full Load                                                   |                           | ±0.5  | ±1    | %     |
| Load voltage regulation      | Nominal Input, 5%-100% Load                                                  |                           | ±0.5  | ±1    | %     |
| Transient Recovery time      | 25% load step change                                                         |                           | 0.5   | 3     | ms    |
| Transient response deviation |                                                                              |                           | ±3    | ±5    | %     |
| Temperature Coefficient      | 100% Load                                                                    |                           | ±0.02 | ±0.03 | %/°C  |
| Efficiency                   | Nominal Input Voltage, 100% Load                                             |                           | 81    |       | %     |
| Ripple & Noise               | 20MHz Bandwidth, Nominal Input Voltage                                       |                           | 70    |       | mV    |
| Switching Frequency          | 100% Load, Nominal Input Voltage                                             |                           | 300   |       | kHz   |
| Short Circuit protection     |                                                                              | Continuous, Auto recovery |       |       |       |
| GENERAL CHARACTERISTICS      |                                                                              |                           |       |       |       |
| Parameter                    | Conditions                                                                   | Min.                      | Typ.  | Max.  | Units |
| Isolation voltage            | Input-to-Output, tested for 1 minute, leakage current shall be less than 1mA | 1500                      |       |       | VDC   |
| Isolation Capacitor          | Input-to-Output, 100kHz/0.1V                                                 |                           | 1000  |       | pF    |
| Operating temperature        |                                                                              | -40                       |       | 85    | °C    |
| Dimensions                   | 23.7 X 14.8 X 9.5                                                            |                           |       |       | mm    |

## 5. Typical Characteristics

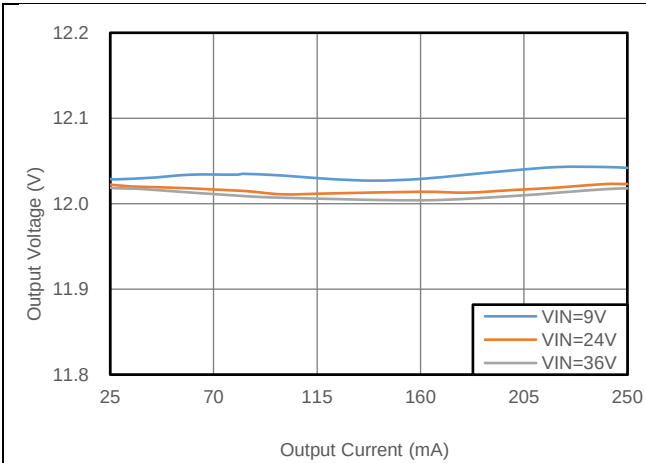


Fig. 5.1 Output Voltage vs. Output Current

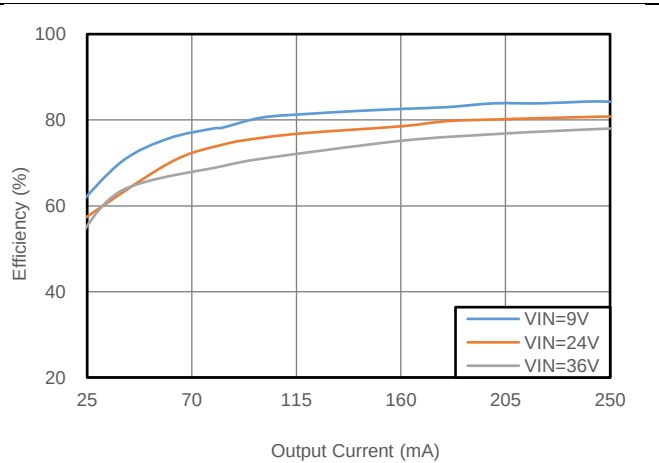


Fig. 5.2 Efficiency vs. Output Current

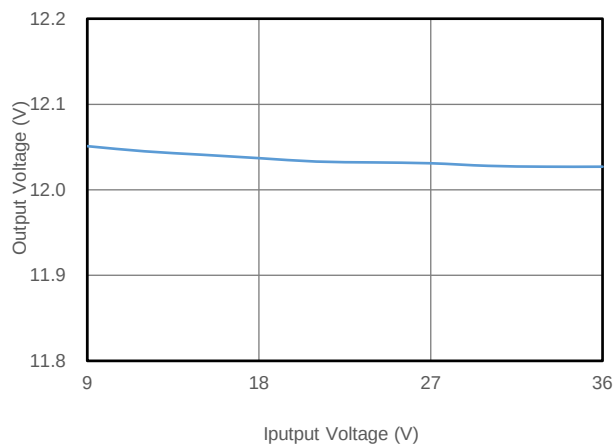


Fig. 5.3 Output Voltage vs. Input Voltage  
(100% Load)

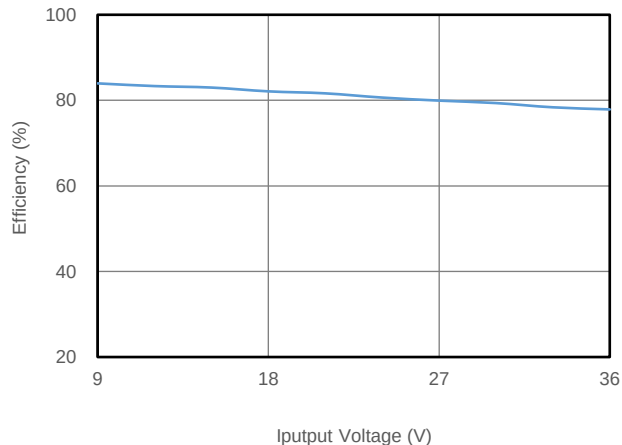


Fig. 5.4 Efficiency vs. Input Voltage  
(100% Load)



Fig. 5.5 Output voltage ripple waveform  
(VIN=24V, 5% Load)



Fig. 5.6 Output voltage ripple waveform  
(VIN=24V, 100% Load)



Fig. 5.7 25% -50% -25%IO Dynamic waveform  
(VIN=24V)



Fig. 5.8 50% -75% -50%IO Dynamic waveform  
(VIN=24V)



Fig. 5.9 MOS Voltage stress waveform  
(VIN=36V, 100% Load)



Fig. 5.10 Secondary-side output diode stress  
waveform (VIN=36V, 100% Load)