

WRA2412S-3W-7892-8740K1**18-36V Input, $\pm 12V$ Output 3W Isolated Power Supply****1. Description**

WRA2412S-3W-7892-8740K1 is isolated 3W DC-DC converter module with a wide 2:1 input voltage range (18-36V), and a regulated output of $\pm 12V$. The product has a relatively compact open-frame SIP-7 package. The power module features high efficiency, operating ambient temperature of -40°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)	VO (V)	PO (W)	Isolation voltage (kV)	Peak Efficiency (%)
18-36	± 12	3	1.5	78

1.1. Functional Block Diagram

WRA2412S-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.

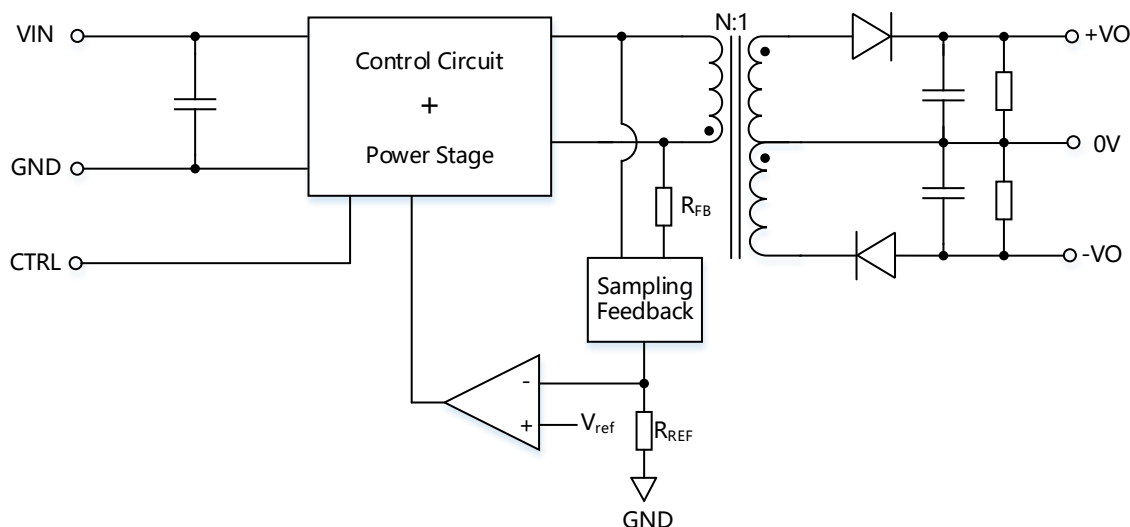


Fig. 1.1 Functional Block Diagram

During the off-time (T_{off}), the voltage across the primary winding is $V_{IN} + N \cdot V_O$. Consequently, the voltage across resistor R_{FB} equals $N \cdot V_O$, generating a current of $N \cdot V_O / R_{FB}$. This current flows through resistor R_{REF} , producing a voltage drop of $(N \cdot V_O / R_{FB}) \cdot R_{REF}$. 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 2:1 input voltage range
- Isolation test voltage: 1.5kVDC
- Short circuit protection (Auto-recovery)
- Remote ON/OFF

3. Pin Configuration and Functions

3.1. Product

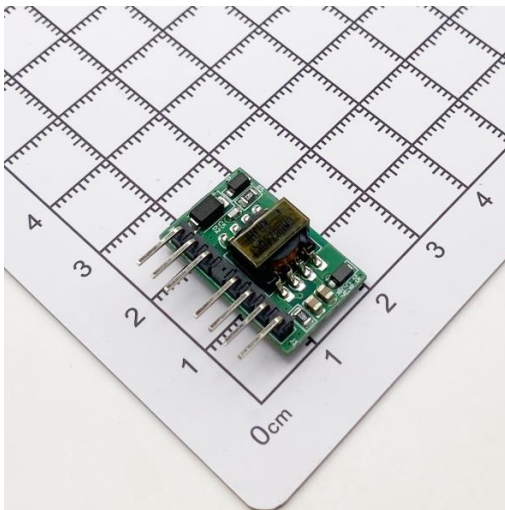


Fig. 3.1 Front side of Product

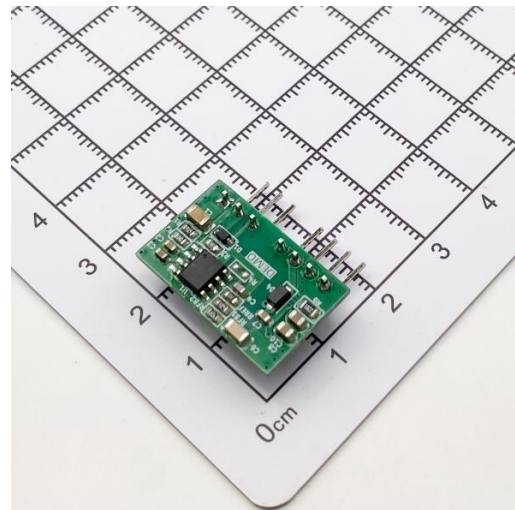


Fig. 3.2 Back side of Product

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

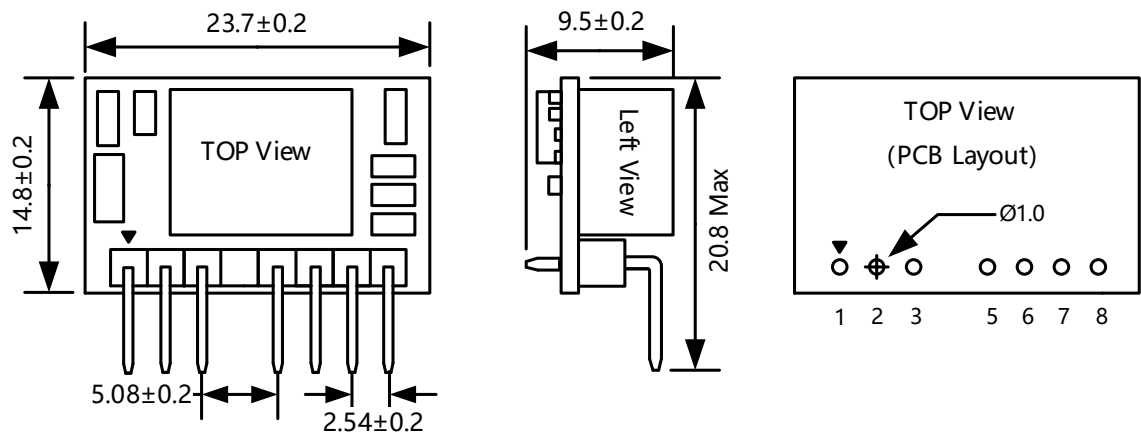


Fig. 3.3 Package Outline

Pin		Description
Name	No.	
GND	1	Negative Power Input
VIN	2	Positive Power Input
CTRL	3	Remote Controller
NC	5	No Internal Connection
+VO	6	+VO Output
0V	7	Negative Power Output
-VO	8	-VO Output

4. Electrical Characteristics

INPUT CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Input Current	VIN=24V, 100% Load		159		mA
	VIN=24V, No Load		8		mA
UVLO		12	15.5		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		±2	±3	%
Line voltage regulation	VIN=(Min-Max) at full Load		±0.2	±0.5	%
Load voltage regulation	Nominal Input, 5%-100% Load		±0.6	±1	%
Transient Recovery time	25% load step change		0.5	3	ms
Transient response deviation			±2.5	±5	%
Temperature Coefficient	100% Load		±0.02	±0.03	%/°C
Efficiency	Nominal Input Voltage, 100% Load		78		%
Ripple & Noise	20MHz Bandwidth, Nominal Input Voltage		100		mV
Switching Frequency	100% Load, Nominal Input Voltage		320		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

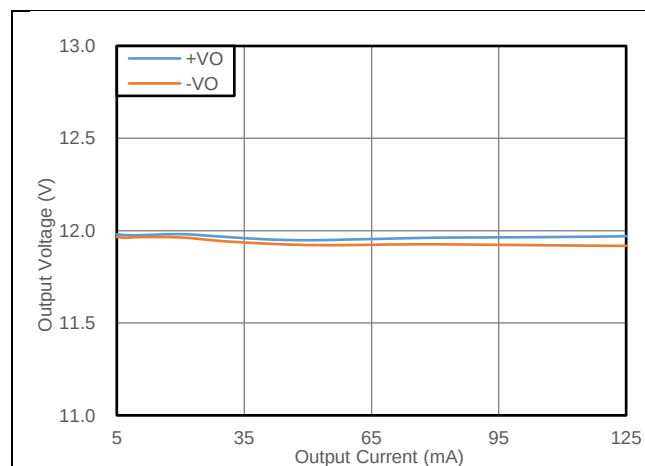


Fig. 5.1 Output Voltage vs. Output Current
(VIN=24V)

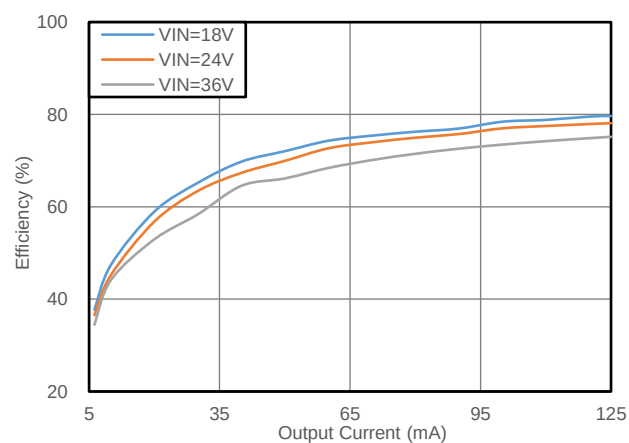


Fig. 5.2 Efficiency vs. Output Current

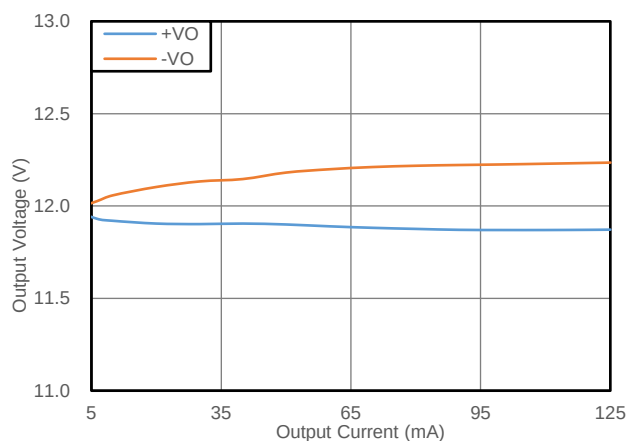


Fig. 5.3 Output Voltage vs. Output Current
(VIN=24V, -V0 No Load)

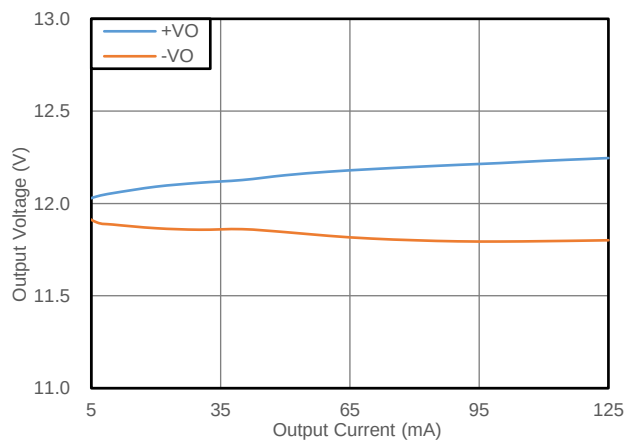


Fig. 5.4 Output Voltage vs. Output Current
(VIN=24V, +V0 No Load)

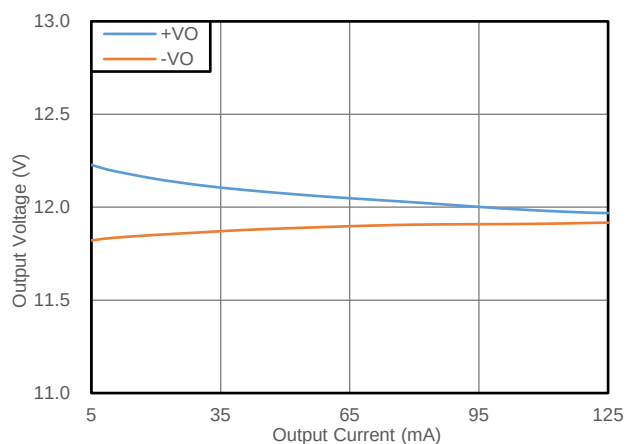


Fig. 5.5 Output Voltage vs. Output Current
(VIN=24V, -V0 100% Load)

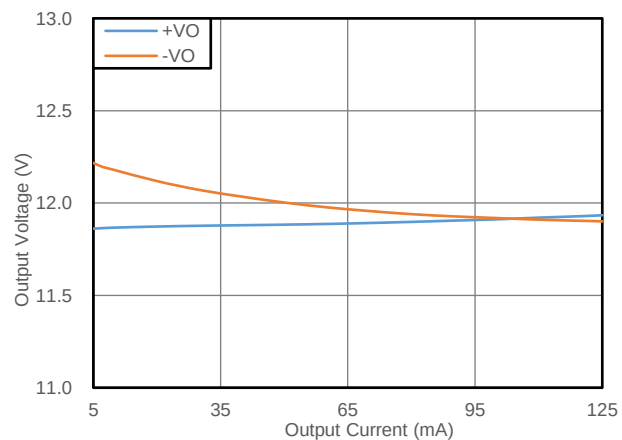


Fig. 5.6 Output Voltage vs. Output Current
(VIN=24V, +V0 100% Load)

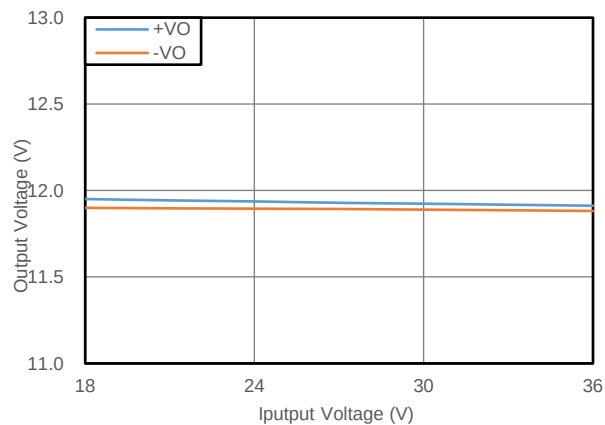


Fig. 5.7 Output Voltage vs. Input Voltage
(100% Load)

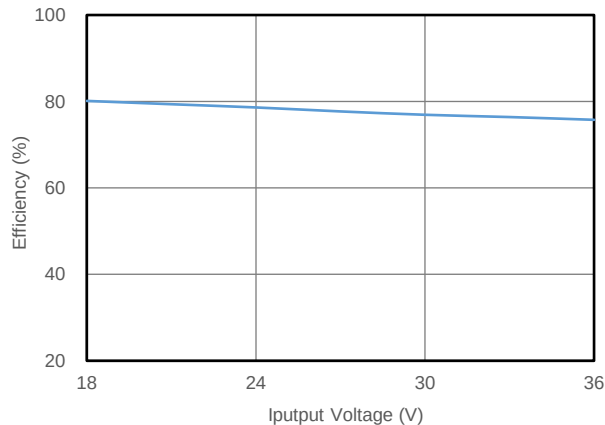


Fig. 5.8 Efficiency vs. Input Voltage
(100% Load)



Fig. 5.9 Output voltage ripple waveform
(VIN=24V, 5% Load)



Fig. 5.10 Output voltage ripple waveform
(VIN=24V, 100% Load)

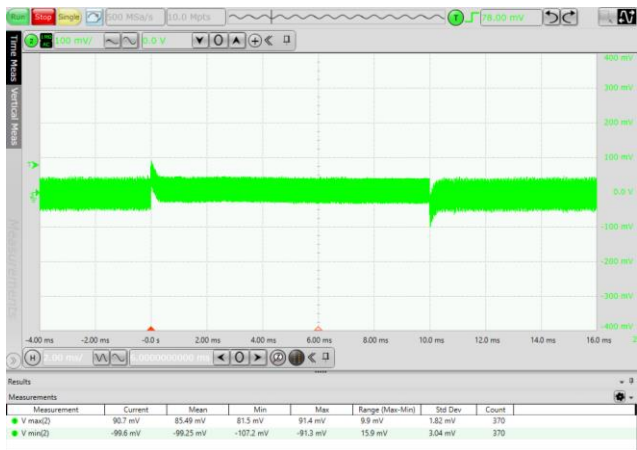


Fig. 5.11 25% -50% -25%IO Dynamic waveform
(VIN=24V)

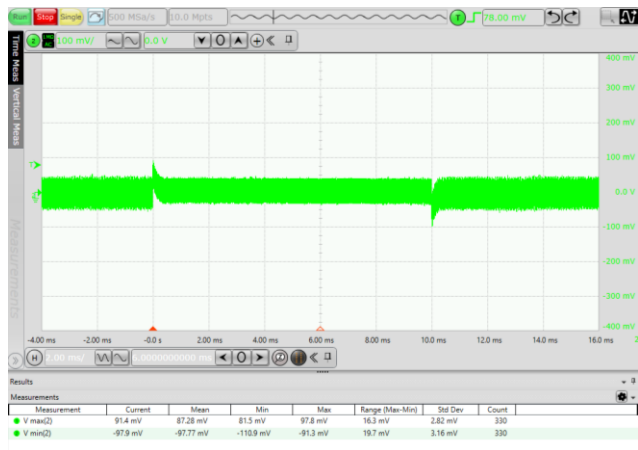


Fig. 5.12 50% -75% -50%IO Dynamic waveform
(VIN=24V)



Fig. 5.13 MOS Voltage stress waveform
(VIN=36V, 100% Load)



Fig. 5.14 Secondary-side output diode stress
waveform (VIN=36V, 100% Load)