

MSR7810WUP Series

Low Cost, Non-isolated UnPotted, Single Output POL Switching Regulators



Key Features:

- Efficiency to 96%
- 1.0A Output Current
- Miniature Construction
- EN 60950 Approved
- LM78xx Replacement
- Wide Input Range
- Negative Output Capability
- Short Circuit Protected
- Low Noise
- **Low Low Cost**



MicroPower Direct



Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Input

Parameter	Conditions	Min.	Typ.	Max.	Units
No-Load Input Current	Positive Output Connection		0.1	1.0	mA
Input Filter	Capacitor Filter				
Reverse Polarity Input	Not Allowed, Could Damage the Unit				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	3.3 VDC Output		±2.0	±4.0	%
	All Other Outputs		±2.0	±3.0	
Line Regulation	V _{IN} = Min to Max		±0.2	±0.4	%
Load Regulation	I _{OUT} = 10% to 100%		±0.4	±0.6	%
Ripple & Noise (20 MHz)	See Note 2		20	75	mV P - P
Temperature Coefficient				±0.03	%/°C
Transient Recovery Time, See Note 3	25% Load Step Change		0.1	1.0	mS
Transient Response Deviation			50	300	mV
Output Short Circuit	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	Not Isolated				
Switching Frequency	3.3 & 5.0 VDC Output	420	520	620	kHz
	All Other Outputs	580	680	780	

EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions, See Note 4	EN 55022		B
Conducted Emissions, See note 4	EN 55022		B
ESD	EN 61000-4-2	B	±4 kV Contact
RS	EN 61000-4-3	A	10V/m
EFT, See Note 5	EN 61000-4-4	B	±1 kV
Surge, See Note 5	EN 61000-4-5	B	±1 kV
CS	EN61000-4-6	A	3V rms

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+85	°C
Storage Temperature Range		-55		+125	°C
Lead Temperature	See Note 6			260	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical

Size	See Mechanical Diagram (Page 4)
Weight	0.0735 Oz (2.1g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	2.0			MHours
Safety Standards	UL 60950, EN 60950				

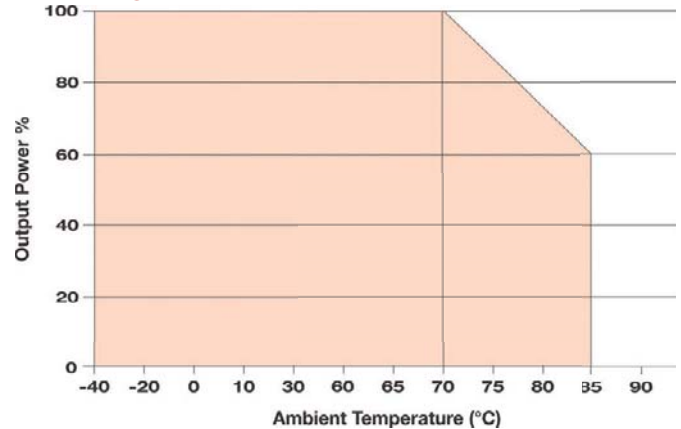
Model Selection Guide

Model Number	Input Voltage (VDC)		Output		Efficiency (% Typ)		Capacitive Load (µF, Max)
	Nom.	Range	Voltage (VDC)	Current (mA, Max)	Min V _{IN}	Max V _{IN}	
MSR7810-033WUP	24	6.00 - 36.0	3.3	1,000.0	90	81	680
	24	8.00 - 36.0	5.0	1,000.0	93	86	680
MSR7810-05WUP	12	8.00 - 27.0	-5.0	-500.0	86	82	330
	24	16.0 - 36.0	12.0	1,000.0	96	93	680
MSR7810-12WUP	12	8.00 - 20.0	-12.0	-300.0	89	88	330
	24	20.0 - 36.0	15.0	1,000.0	96	94	680
MSR7810-15WUP	12	8.00 - 18.0	-15.0	-300.0	89	89	330

Notes:

- For many applications, no external components are required. If the input is over 30V, a 22 µF/50V input capacitor (C₁) is required. See the typical application note below.
- Output ripple is measured with a nominal input and is specified for a load range of 10% to 100%. When measuring output ripple, two external capacitors (1 µF and 10 µF) must be placed from the V_{out} to the Gnd pins.
- Transient recovery is measured to within a 1% error band for a load step change of 25% - 50% - 25%, and 50% - 75% - 50%.
- The unit may not meet emissions to class B without the addition of external components as shown in the typical circuit 4 diagram on page 4.
- The unit meets EFT & surge EMS specifications with the addition of external components as shown in the typical circuit 4 diagram on page 4.
- Soldering temperature is measured 1.5 mm from the pins. Soldering time should not exceed 10S.
- This regulator is not designed to be used in parallel with another unit to increase output power.
- A reverse polarity connection on the input could damage the unit.
- The input should not exceed the range given in the model selection chart. Exceeding this limit could damage the unit.
- It is recommended that an external fuse be used. The fuse should be selected based upon the actual input current of the application. For more information please call the factory.

Derating Curve



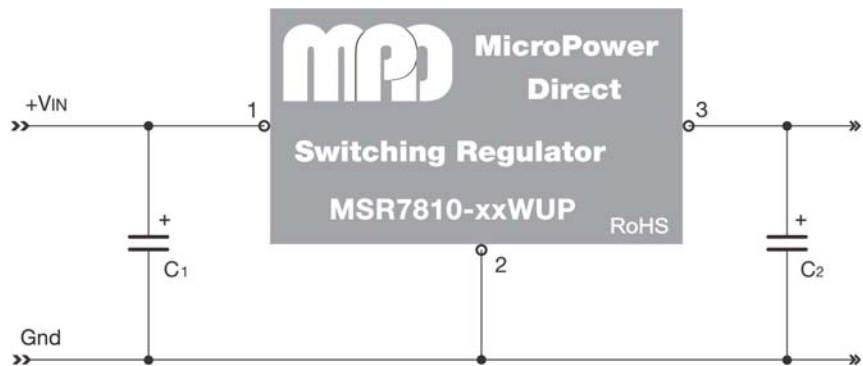
Typical Application Circuit 1, Positive Output

For many applications, the **MSR7810-xxWUP** can be used without external components. However, if the application requires meeting EMC/EMI standards or operation at inputs over 30V, a minimum of external components is needed.

A typical connection (for a positive output voltage) is shown at right. Here, C₁ has been added to improve stability over the input range (and over the operating temperature range). Capacitor C₂ is added to reduce the output ripple.

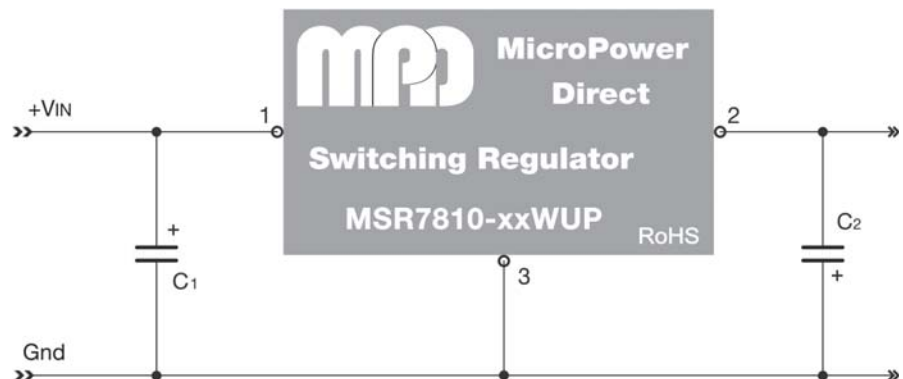
Suggested values for these capacitors are given in the "Component Values" table below. These capacitors are ceramic and should be placed as close to the unit as possible. Tantalum or low ESR electrolytic capacitors may also be used.

If very low noise is required, an LC filter may be added to the output. For suggested component values contact the factory. To meet EMI standards, see the typical circuit 4 diagram on page 4.



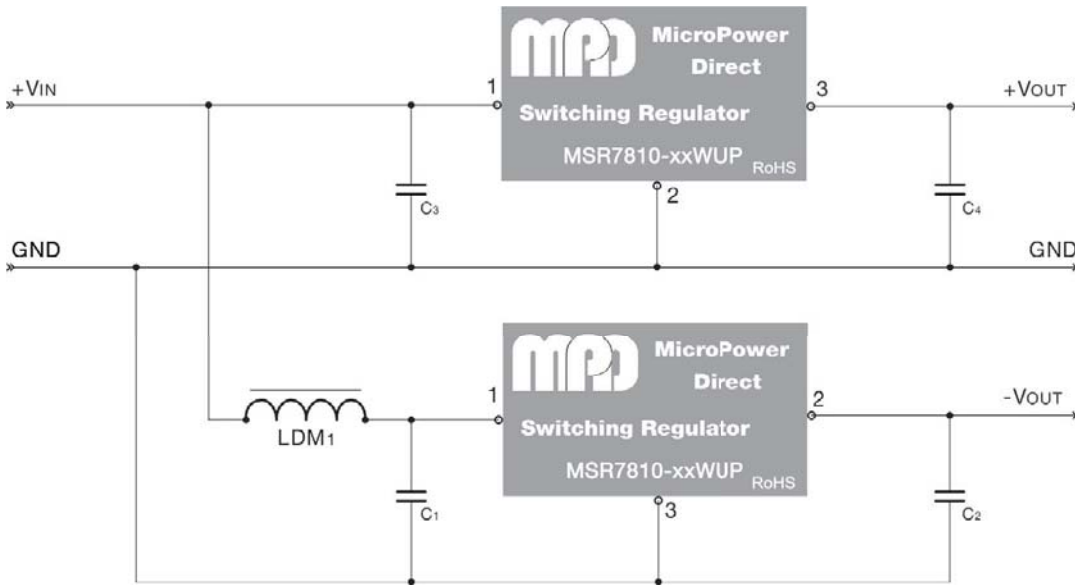
Typical Application Circuit 2, Negative Output

Model Number	C ₁	C ₂
MSR7810-033WUP	10 µF/50V	22 µF/10V
MSR7810-05WUP	10 µF/50V	22 µF/10V
MSR7810-12WUP	10 µF/50V	22 µF/25V
MSR7810-15WUP	10 µF/50V	22 µF/25V



To produce a negative output, connect the output to pin 2 and ground to pin 3, as shown in the diagram above.

Typical Application Circuit 3, Pos/Neg Output

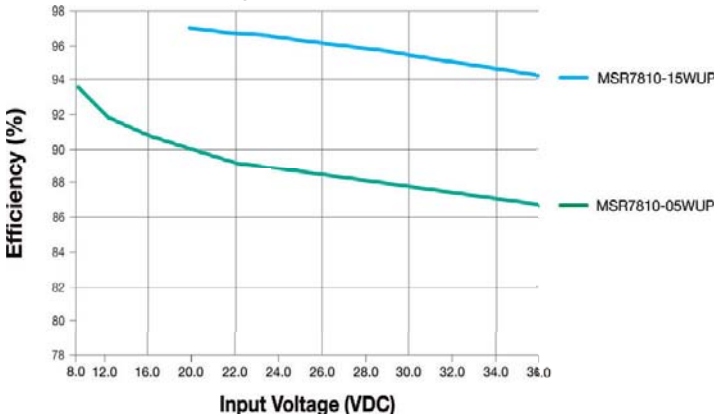


Typical application circuit 3 shows two units configured with a common input connection to produce positive and negative outputs. The inductor LDM1 is added to reduce interference between the units. The recommended values for all the external components are given in the table at right.

Model Number	C1/C3	C2/C4	LDM1
MSR7810-033WUP	10 μ F/50V	22 μ F/10V	10 μ H
MSR7810-05WUP	10 μ F/50V	22 μ F/10V	10 μ H
MSR7810-12WUP	10 μ F/50V	22 μ F/25V	10 μ H
MSR7810-15WUP	10 μ F/50V	22 μ F/25V	10 μ H

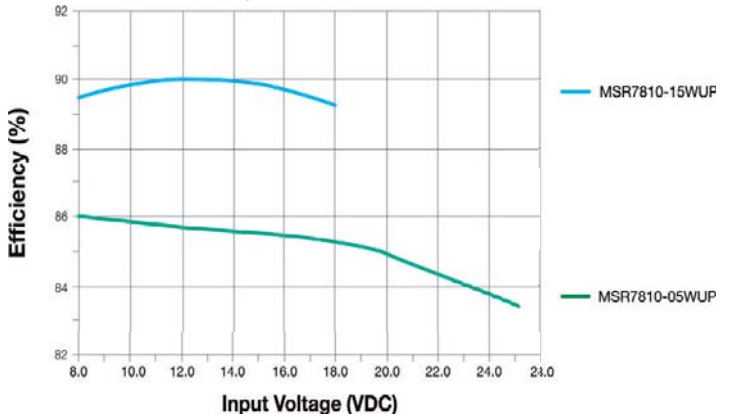
Characteristic Curves, Positive Output

Efficiency vs Input Voltage - (Full Load)

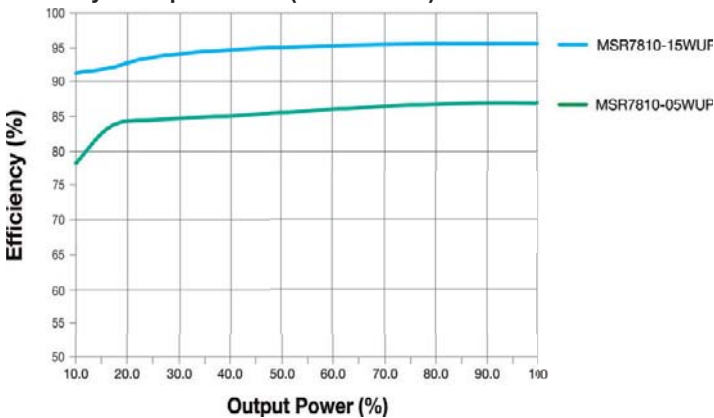


Characteristic Curves, Negative Output

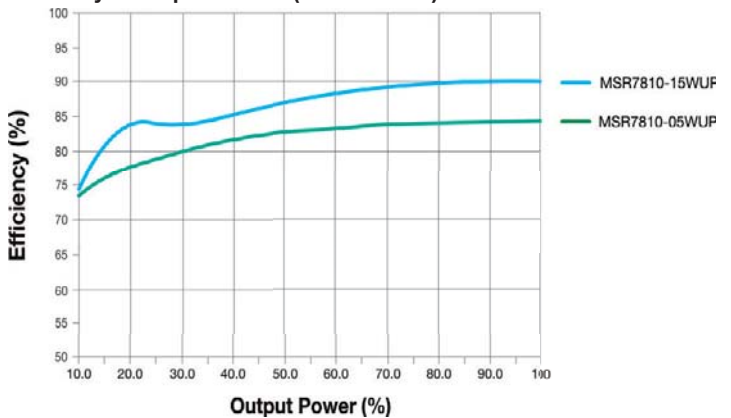
Efficiency vs Input Voltage - (Full Load)



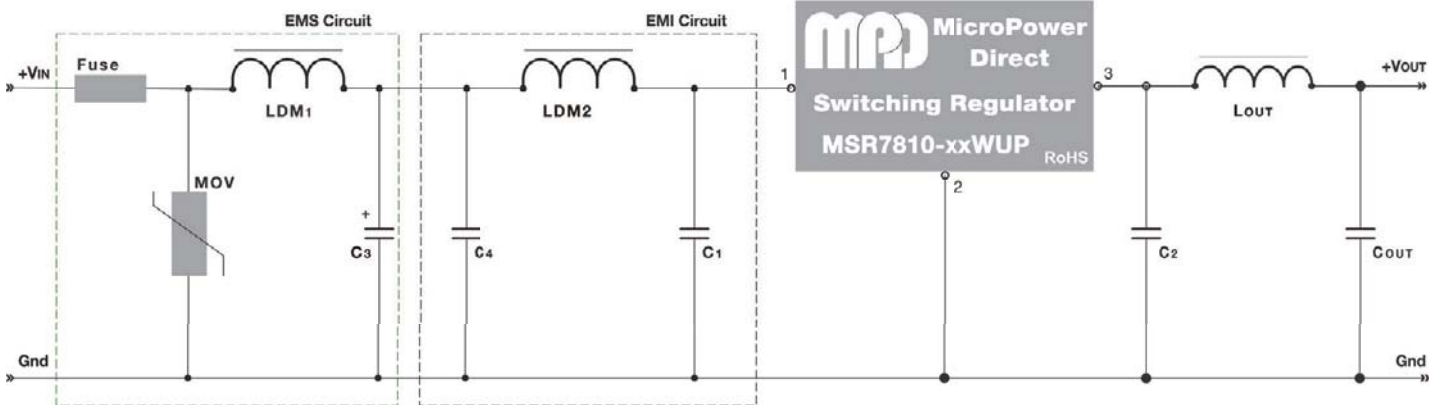
Efficiency vs Output Power - (VIN = Nominal)



Efficiency vs Output Power - (VIN = Nominal)



Typical Application Circuit 4: External EMC Components



The diagram above illustrates a typical connection of the **MSR7810WUP** series for applications that require meeting EMC standards. Some notes on this diagram (starting with the input circuit) are:

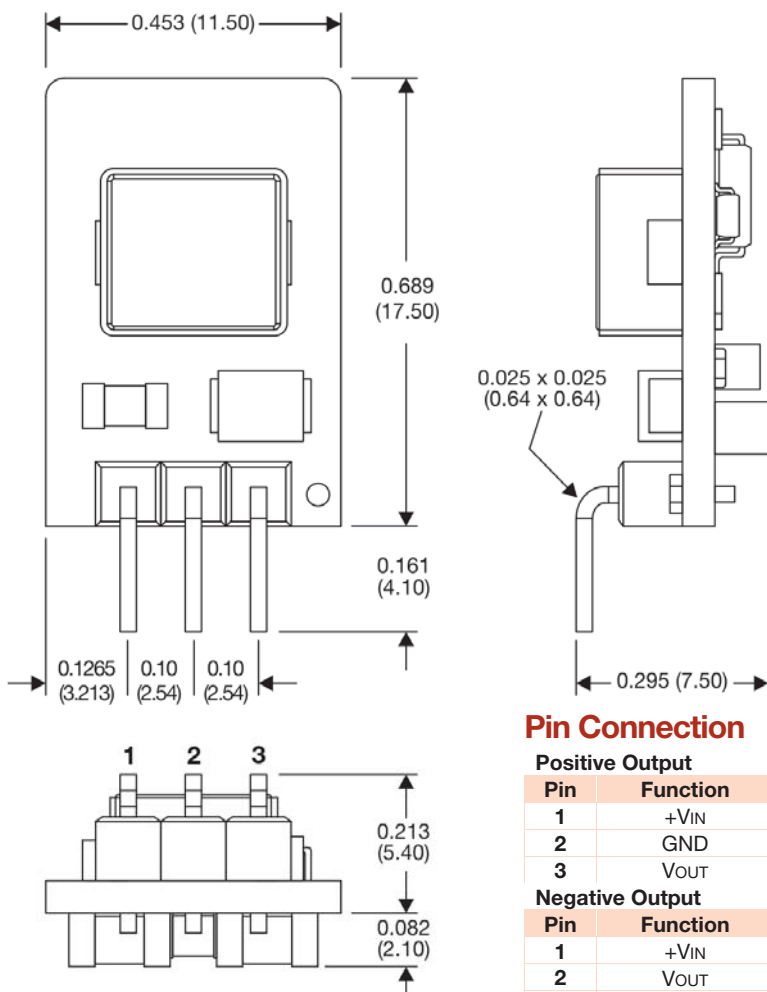
1. It is recommended that an external fuse be used. The fuse should be selected based upon the actual input current of the application. For more information please call the factory.
2. An external MOV is recommended on the input to protect the unit in the event of a surge. A recommended value is given in the table at right.

3. Recommended values for components are:

Component	Value	Component	Value
MOV	S20K30	LDM2	12 μ H
LDM1	82 μ H	C1	See Note 4
C3	680 μ F/50V	C2	See Note 4
C4	4.7 μ F/50V		

4. The values for C1 and C2 are given in the "Component Values" table on page 2.
5. The LC filter Lout & Cout is only needed if very low ripple is required. For recommended values for these components, please contact the factory.

Mechanical Dimensions



Pin Connection

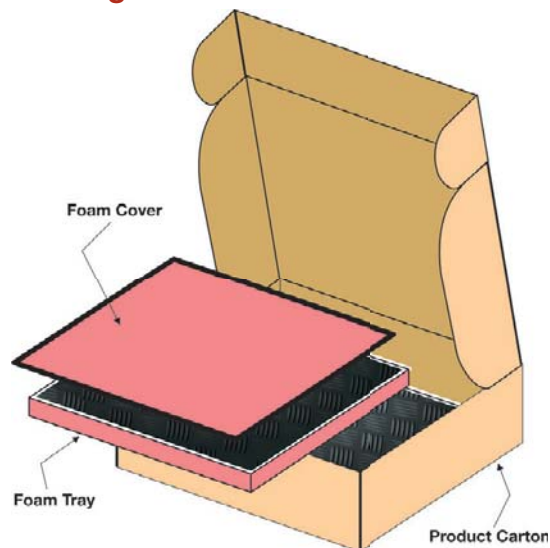
Positive Output	
Pin	Function
1	+VIN
2	GND
3	VOUT

Negative Output	
Pin	Function
1	+VIN
2	VOUT
3	GND

Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ± 0.01 (± 0.25)
- Pin 1 is marked by a "dot" on the front of the unit

Packing Carton



Notes:

1. MSR7810WUP units are shipped in a product carton (inner carton) which is then packed into a shipping carton. The shipping carton will hold two product cartons.
2. Products are placed into individual slots cut into foam trays. A foam cover is then secured to the tray. Each tray will hold 140 units. Up to four trays will fit into a product carton.