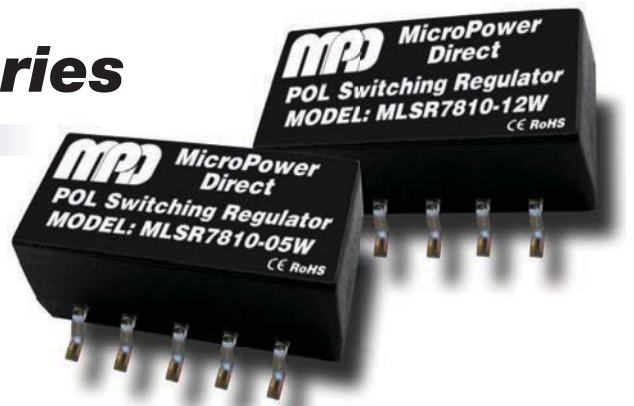


MLSR7810 Series



Miniature Surface Mount Low Cost, 1.0A POL Switching Regulators

Key Features:

- Efficiency to 95%
- 1.0A Output Current
- Meets EN 62368
- Miniature SMT Case
- Short Circuit Protected
- 0.2 mA No-Load Input Current
- -40°C to +85°C Operation
- Wide Input Range
- Adjustable Output Voltage
- LM78xx Replacement
- **Low Cost**

Electrical Specifications

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

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy, See Note 2	1.5, 1.8, 2.5 & 3.3V Output Models		±2.0	±4.0	%
	All Other Models		±2.0	±3.0	
Output Voltage Adjust			±10		%
Line Regulation	V _{IN} = Min to Max		±0.2	±0.4	%
Load Regulation, I _{OUT} = 10% to 100%	1.5, 1.8, 2.5, 3.3 & 5V Output Models		±0.6		%
	All Other Models		±0.3		
Ripple & Noise (20 MHz)	See Note 3		20	35	mV P - P
Temperature Coefficient				0.03	%/°C
Transient Response Time	See Note 4		0.2	1.0	mS
Transient Response Deviation			±50	±150	mV
Output Short Circuit	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	Not Isolated				
Switching Frequency	1.5, 1.8 & 2.5V Output Models		370		kHz
	3.3, 5 & 6.5V Output Models		520		
	9 & 12V Output Models		700		

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+85	°C
Storage Temperature Range		-55		+125	°C
Lead Temperature	1.5 mm From Case For 10 Sec			300	°C
Peak Reflow Temperature	See Note 5			245	°C
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 1 (See Note 6)			
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Remote On/Off

Parameter	Conditions	Min.	Typ.	Max.	Units
Unit On	See Note 7	3.2		5.5	VDC
Unit Off	See Note 7	0		0.8	VDC

Physical

Case Size	See Mechanical Diagram (Page 4)				
Case Material	Non-Conductive Black Plastic (UL-94V0)				
Weight	0.08 Oz (2.3g)				

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	2.0			MHours
Safety Standards	EN 62368 (CE Declaration)				



MicroPower Direct



Model Selection Guide

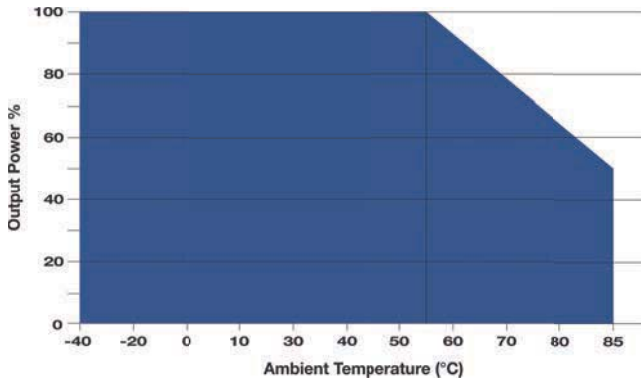
Model Number	Input Voltage (VDC)		Output		Efficiency (% Typ)		Capacitive Load (µF, Max)
	Nom.	Range	Voltage (VDC)	Current (A, Max)	Min V _{IN}	Max V _{IN}	
MLSR7810-015W	12	4.75 - 32.0	1.5	1.0	76	66	680
MLSR7810-018W	12	4.75 - 32.0	1.8	1.0	79	69	680
MLSR7810-02W	12	4.75 - 32.0	2.5	1.0	86	74	680
MLSR7810-03W	24	6.50 - 36.0	3.3	1.0	90	80	680
MLSR7810-05W	24	8.00 - 36.0	5.0	1.0	93	85	680
MLSR7810-06W	24	10.0 - 36.0	6.5	1.0	93	86	680
MLSR7810-09W	24	13.0 - 36.0	9.0	1.0	94	89	680
MLSR7810-12W	24	16.0 - 36.0	12.0	0.8	95	92	680

Notes:

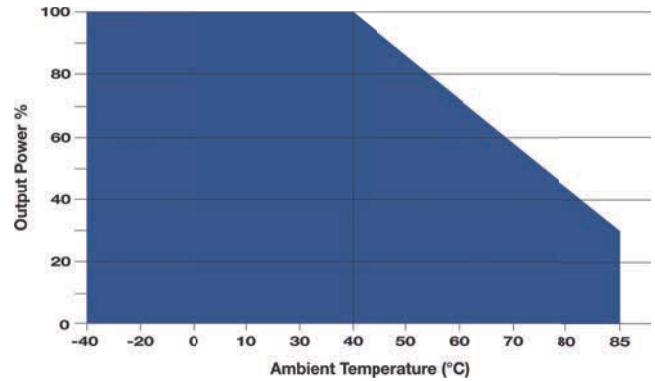
- For input voltages over 30VDC, a 22 µF/50V input capacitor is required.
- Specified at full load over the full input voltage range specified for the model being tested.
- Specified with the output filter components shown in the typical application circuit on page 4.
- Transient recovery is measured to within a 1% error band for a load step change of 25%.
- The recommended reflow settings are a peak temperature of 245 °C for a maximum period (TPK) of 10S and a time above liquidous (TL) of ≤60 seconds at 217 °C. For more information, please contact the factory.
- Any units that are not packaged in a vacuum sealed container should be stored in a controlled environment. Contact the factory for more information.
- If the remote On/Off pin is left open, the unit is on. If it is grounded, the unit shuts off.
- This regulator is not designed to be used in parallel with another unit to increase output power.
- 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 Curves

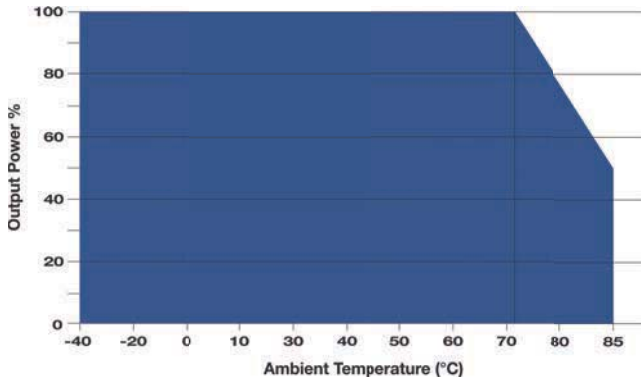
9VDC Output, V_{IN} = >26V To ≤36V



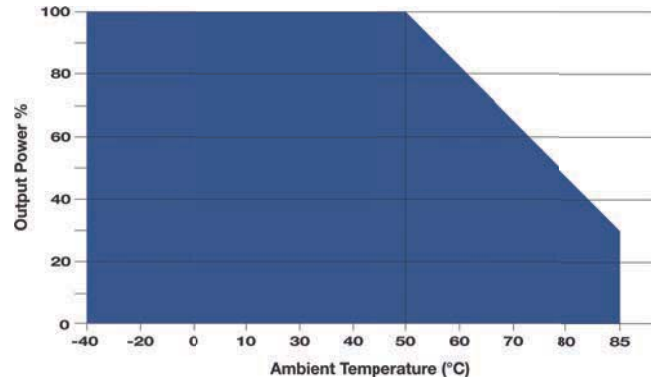
9VDC Output, V_{IN} = ≤26V



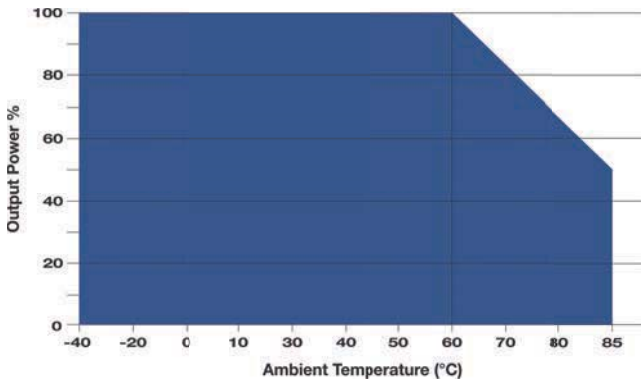
12VDC Output, V_{IN} = >26V To ≤36V



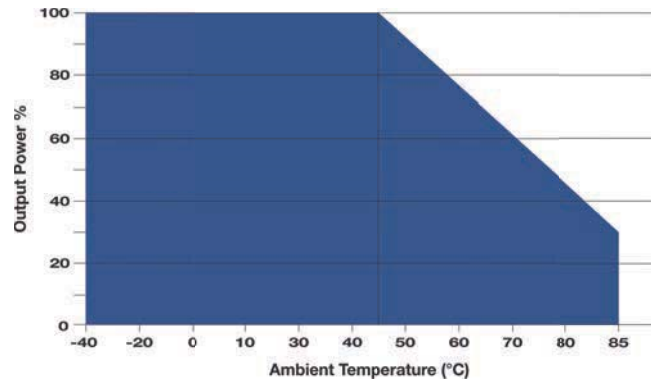
12VDC Output, V_{IN} = ≤26V



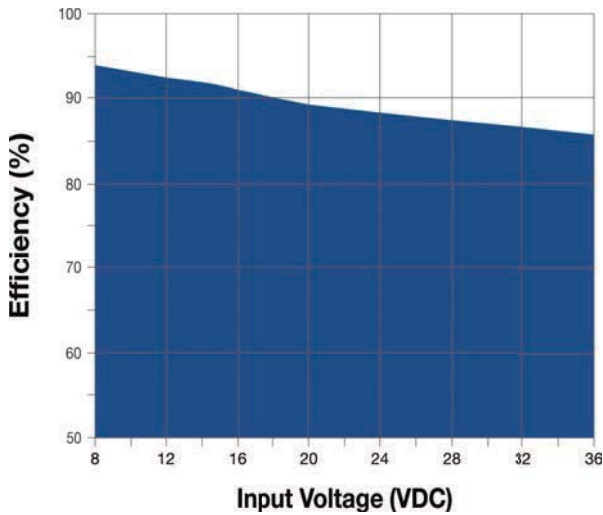
All Other Outputs, V_{IN} = >26V To ≤36V



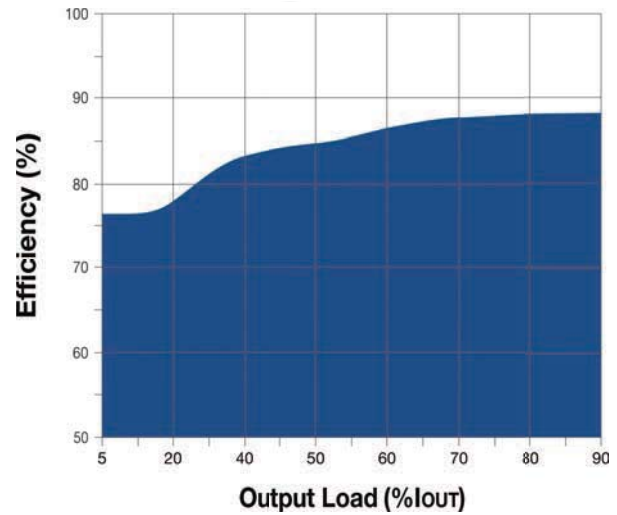
All Other Outputs, V_{IN} = ≤26V



Characteristic Curves

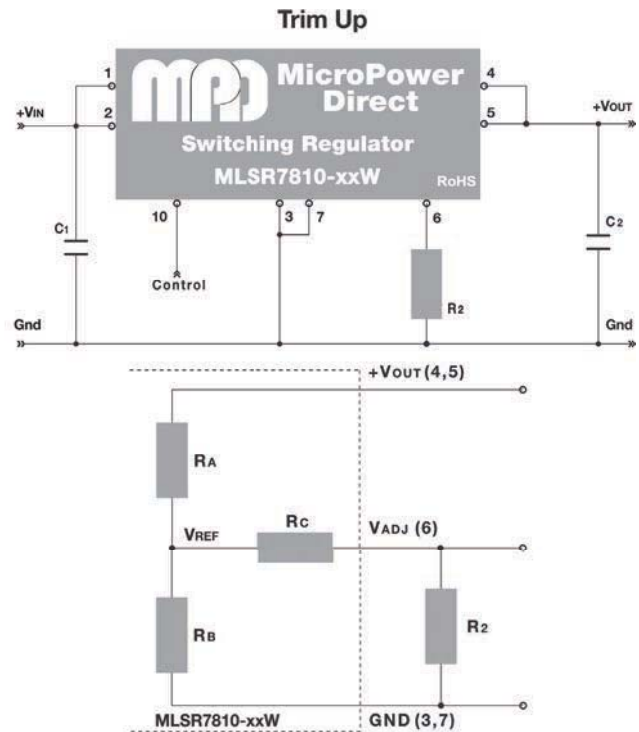
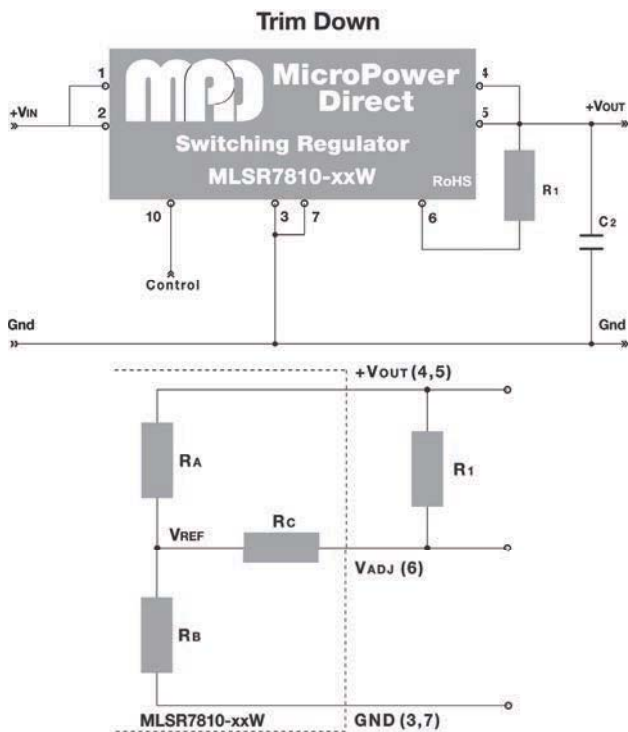


Efficiency vs Input Voltage (MLSR7810-05W)



Efficiency vs Output Load, Vin = 24V (MLSR7810-05W)

Output Adjustment



The output of the MLSR7810-xxW series may be adjusted by connecting either resistor R1 or R2 to the VADJ pin as shown above. Approximate resistor values are given in the table at right. If the output adjust is not required, pin (6) should be left open.

If the output is adjusted, it is important to stay within the specified adjustment range, or the unit could be damaged. The required resistor value is calculated by the formulas:

$$\text{Trim Down} = R_1 = \frac{A \times R_A}{R_A - A} - R_C \quad \text{Where } A = \frac{V_{OUT} - V_{REF}}{V_{REF}} \times R_B$$

$$\text{Trim Up} = R_2 = \frac{A \times R_B}{R_B - A} - R_C \quad \text{Where } A = \frac{V_{REF}}{V_{OUT} - V_{REF}} \times R_A$$

Where R1, R2 = The value of the external trim resistor
 A = A is defined as shown above

The values of RA, RB, RC and VREF are given in the table at right.

Output Trim Resistor Values

Output Voltage	Resistor Value			
	RA (kΩ)	RB (kΩ)	RC (kΩ)	VREF (V)
1.5 VDC	7.50	7.50	15.0	0.75
1.8 VDC	4.70	3.30	6.80	0.75
2.5 VDC	9.10	3.90	8.20	0.75
3.3 VDC	75.0	22.0	75.0	0.75
5.0 VDC	43.0	7.50	33.0	0.75
6.5 VDC	43.0	5.60	22.0	0.75
9.0 VDC	43.0	3.90	22.0	0.75
12.0 VDC	36.0	2.40	10.0	0.75

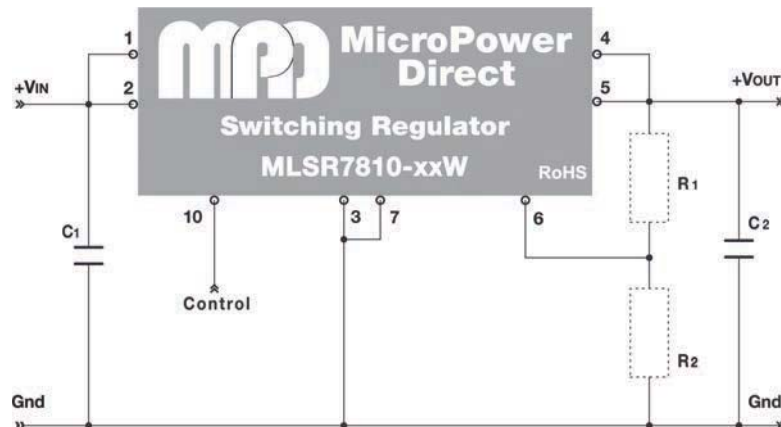
EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions, See Note 1	EN 55032	B	
Conducted Emissions, See note 2	EN 55032	B	
ESD	EN 61000-4-2	B	±4 kV Contact
RS	EN 61000-4-3	A	10V/m
EFT, See Note 3	EN 61000-4-4	B	±1 kV
Surge, See Note 3	EN 61000-4-5	B	±1 kV (L-L)
CS	EN61000-4-6	B	3V rms

Notes:

1. The unit meets radiated emissions to class B with the addition of external components C2, LDM2 and C3 as shown in the typical connection with external EMC components below.
2. The unit meets conducted emissions to class B with the addition of external components C2, LDM2 and C3 as shown in the typical connection with external EMC components below.
3. The unit meets EFT & surge EMS specifications with the addition of external components MOV1, LDM1 and C1 as shown in the typical connection with external EMC components below.

Typical Connection



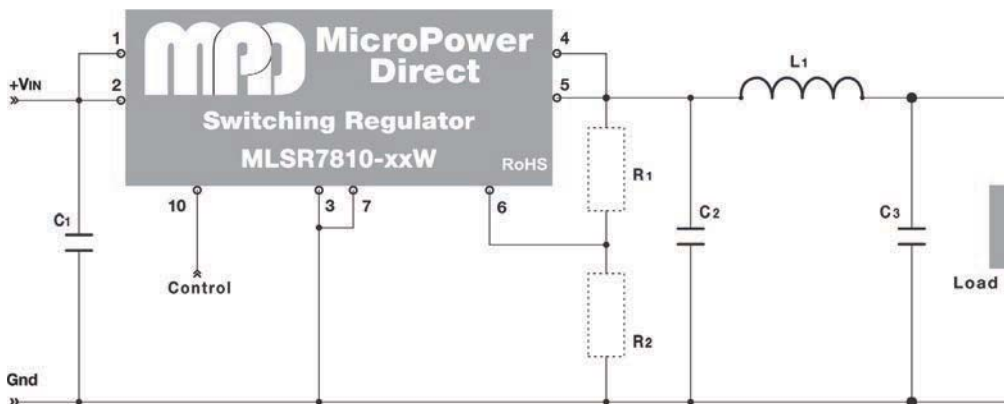
Component Values

Model Number	C1	C2	R1/R2
MLSR7810-015W	10 µF/50V	22 µF/10V	The resistors R1 and R2 are used to adjust the output voltage of the unit. See page 4.
MLSR7810-018W	10 µF/50V	22 µF/10V	
MLSR7810-02W	10 µF/50V	22 µF/10V	
MLSR7810-03W	10 µF/50V	10 µF/10V	
MLSR7810-05W	10 µF/50V	10 µF/16V	
MLSR7810-06W	10 µF/50V	10 µF/16V	
MLSR7810-09W	10 µF/50V	22 µF/16V	
MLSR7810-12W	10 µF/50V	10 µF/25V	

Notes:

1. C1 & C2 are low ESR ceramic capacitors used to minimize noise at the regulator. A tantalum or low ESR electrolytic capacitor may also be used.
2. C1 & C2 are required and should be mounted as close to the regulator pins as possible.

Typical Connection: With Output Filter

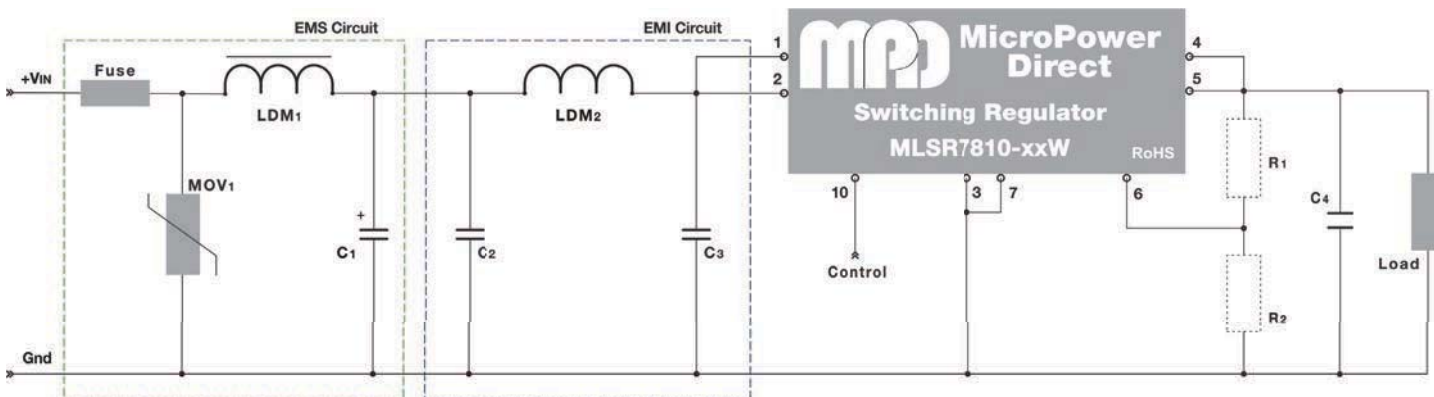


If required, the output ripple may be reduced by adding a simple LC filter, as shown at left. The recommended component values are as follows:

L1 - 10 µH to 47 µH

C3 - 22 µF

Typical Connection: With External EMC Components



The diagram above illustrates a typical connection of the MLD SR7810-xxW series for applications that require meeting EMC standards. This circuit will typically meet the requirements of EN 55032 class B. Some notes on this diagram (starting with the input circuit) are:

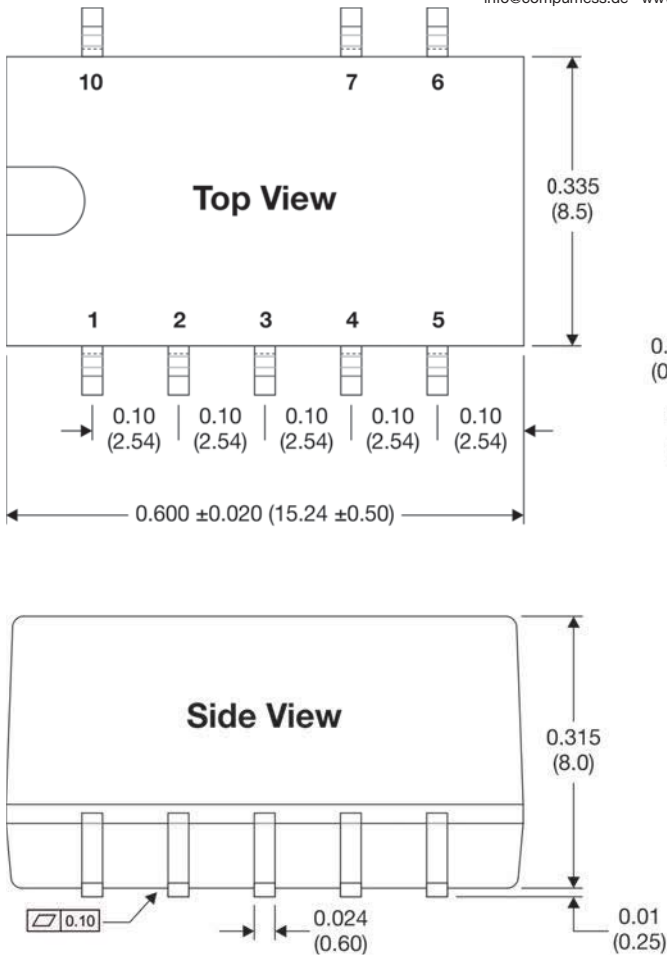
1. It is recommended that an external fuse be used. The fuse should be selected based upon the actual input current of the application. For more information please call the factory.
2. An external MOV is recommended on the input to protect the unit in the event of a surge. A recommended value is given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

3. Recommended values for components are:

Component	Value	Component	Value
MOV	S20K30	C2	4.7 µF/50V
LDM1	82 µH	LDM2	68 µH
C1	680 µF/50V	C3	4.7 µF/50V

4. In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. The input capacitor C1 and output capacitors C2 and C3 shown in the typical connection diagrams above.

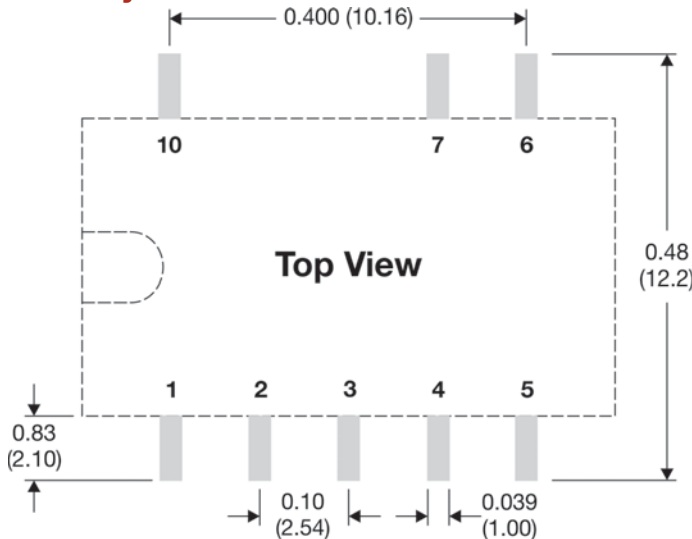
Mechanical Dimensions



Pin Connection

Pin	Function
1	+VIN
2	+VIN
3	Gnd
4	+VOUT
5	+VOUT
6	VADJ
7	Gnd
10	ON/OFF Control

Board Layout



Notes:

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

The MLR7810 series is available on Tape/Reel or packed in tubes. Contact the factory for more information.

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