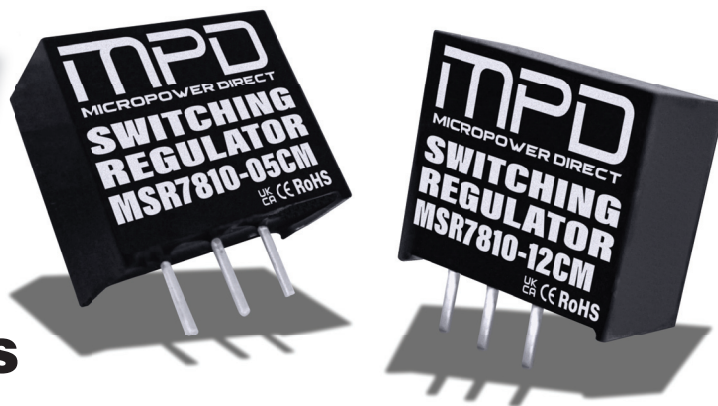


MSR7810CM



Low Cost, Non-isolated Wide Input, Single Output POL Switching Regulators

Key Features:

- Efficiency to 95%
- 1.0A Output Current
- Short Circuit Protected
- Low No Load Input Current
- Compact SIP Case
- LM78xx Replacement
- Wide Input Range
- Negative Output Capability
- -40°C to +85°C Operation
- Low Noise
- Low Cost



MicroPower Direct

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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		0.3	1.0	mA
	Negative Output		1.0	4.0	
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 VOUT Model		±2.0	±4.0	%
	All Other Models		±1.5	±3.0	
Line Regulation	Full Load, VIN = Min to Max		±0.2	±0.4	%
Load Regulation, See Note 2	Positive Output		±0.4	±0.6	%
	Negative Output		±0.4	±0.8	
Ripple & Noise (20 MHz)	See Note 3		25	75	mV P - P
Temperature Coefficient				±0.03	%/°C
Transient Recovery Time, See Note 4	25% Load Step Change			1.0	mS
Transient Response Deviation			±60	±200	mV
Output Short Circuit	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	Not Isolated				
Switching Frequency			520		kHz

EMI Characteristics

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

Environmental

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

Physical

Case Size	See Mechanical Diagram (Page 5)				
Case Material	Non-Conductive Black Plastic (UL-94V0)				
Weight	0.066 Oz (1.9g)				

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	2.0			MHours
Lead Temperature, See Note 5				260	°C

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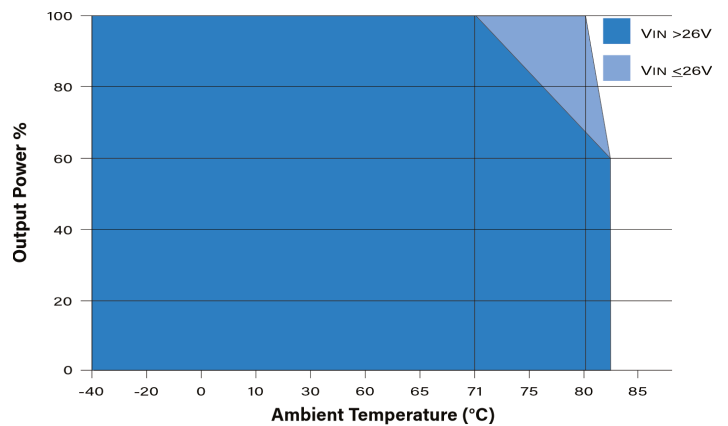
Model Selection Guide

Model Number	Input Voltage (VDC)		Output		Efficiency (% Typ)		Capacitive Load (μF, Max)
	Nom.	Range	Voltage (VDC)	Current (mA, Max)	Min VIN	Max VIN	
MSR7810-3.3CM	24	6.00 - 36.0	3.3	1,000	90	80	680
MSR7810-05CM	24	8.00 - 36.0	5.0	1,000	93	85	680
	12	8.00 - 27.0	-5.0	-500	85	81	330
MSR7810-6.5CM	24	10.0 - 36.0	6.5	1,000	93	85	680
MSR7810-09CM	24	13.0 - 36.0	9.0	1,000	94	89	680
MSR7810-12CM	24	16.0 - 36.0	12.0	1,000	95	92	680
	12	8.00 - 20.0	-12.0	-300	88	87	330
MSR7810-15CM	24	20.0 - 36.0	15.0	1,000	96	93	680
	12	8.00 - 18.0	-15.0	-300	87	88	330

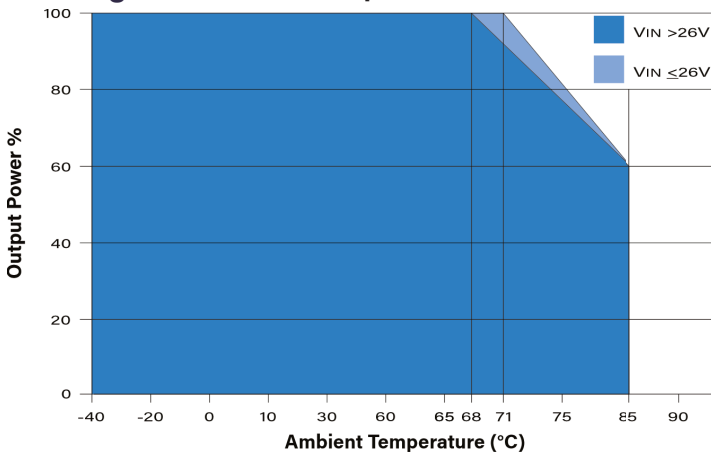
Notes:

- For proper operation, a small capacitor is required in the input/output circuits of the regulator. See the typical application notes on pages 3 & 4 for more information.
- Load regulation is measured at nominal input with the output load varied from 10% to 100%.
- Output ripple is measured with a nominal input and is specified for a load range of 20% to 100%. When measuring output ripple, two external capacitors (1 μF and 10 μF) must be placed from the Vout to the Gnd pins. At light loads (≤ 20%), output ripple is 100 mV pk-pk for 3.3/5 Vout models and 2% Vout max for other models.
- Transient recovery is measured to within a 1% error band for a load step change of 25%.
- 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 (selected based on the actual input current) be used. For more information please call the factory.

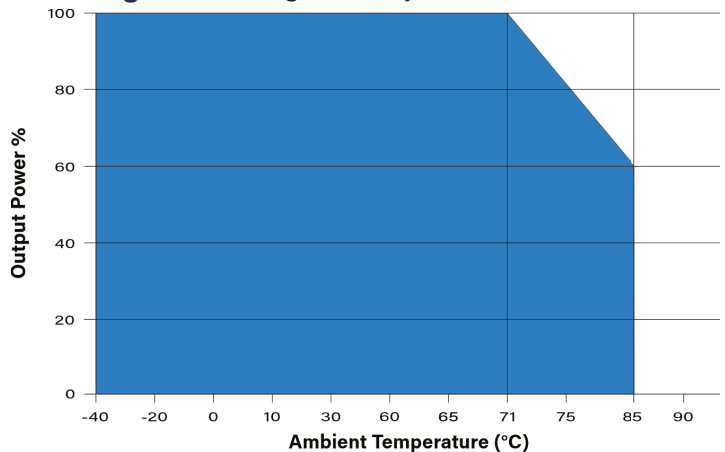
Derating Curve, 3.3/5 Vout - Positive Output



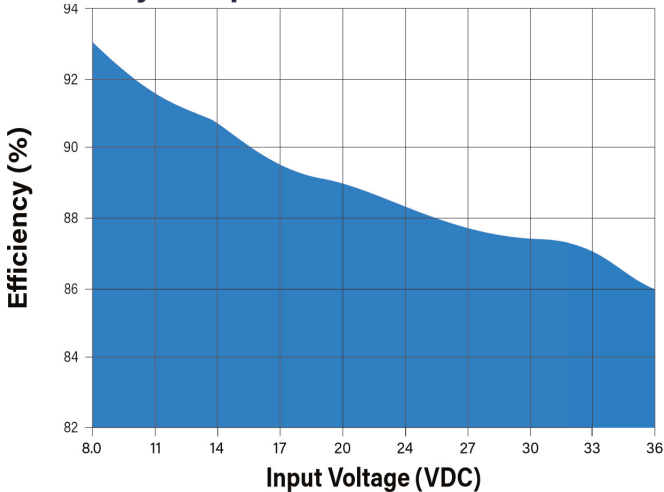
Derating Curve, Positive Output: 6.5/9/12/15 Vout



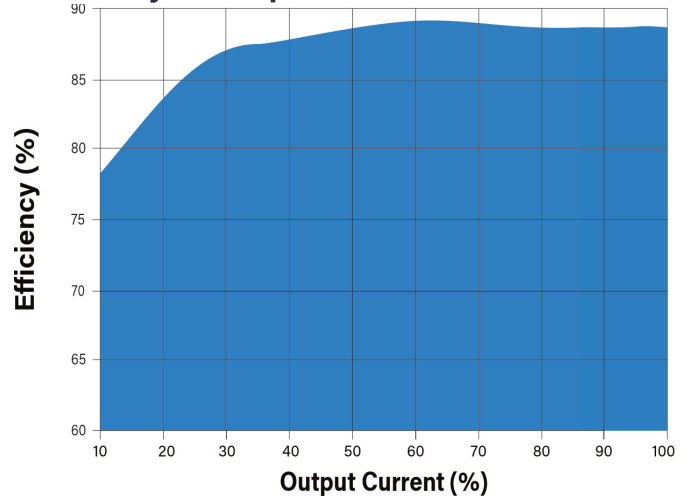
Derating Curve, Negative Output



Efficiency vs Input: MSR7810-05CM



Efficiency vs Output Load: MSR7810-05CM



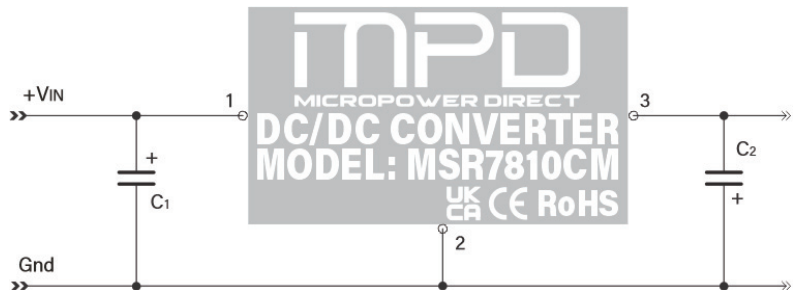
For many applications, the **MSR7810CM** can be used without external components. However, if the application requires meeting EMC/EMI standards or operation at inputs over 30V, a minimum of external components is needed.

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.

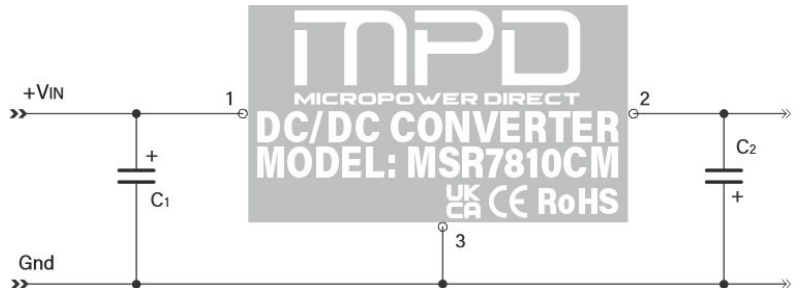
Suggested values for these capacitors are given in the "Component Values" table below. These capacitors are ceramic and should be placed as close to the unit as possible. Tantalum or low ESR electrolytic capacitors may also be used.

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 1, Positive Output



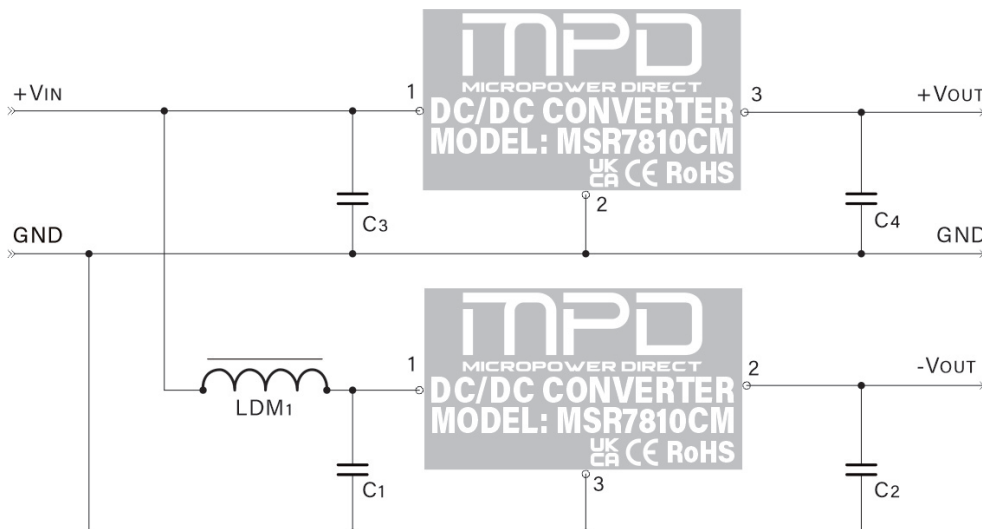
Typical Application Circuit 2, Negative Output



Model Number	C1	C2
MSR7810-3.3CM	10 μ F/50V	22 μ F/10V
MSR7810-05CM	10 μ F/50V	22 μ F/10V
MSR7810-06CM	10 μ F/50V	22 μ F/16V
MSR7810-09CM	10 μ F/50V	22 μ F/16V
MSR7810-12CM	10 μ F/50V	22 μ F/25V
MSR7810-15CM	10 μ F/50V	22 μ F/25V

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

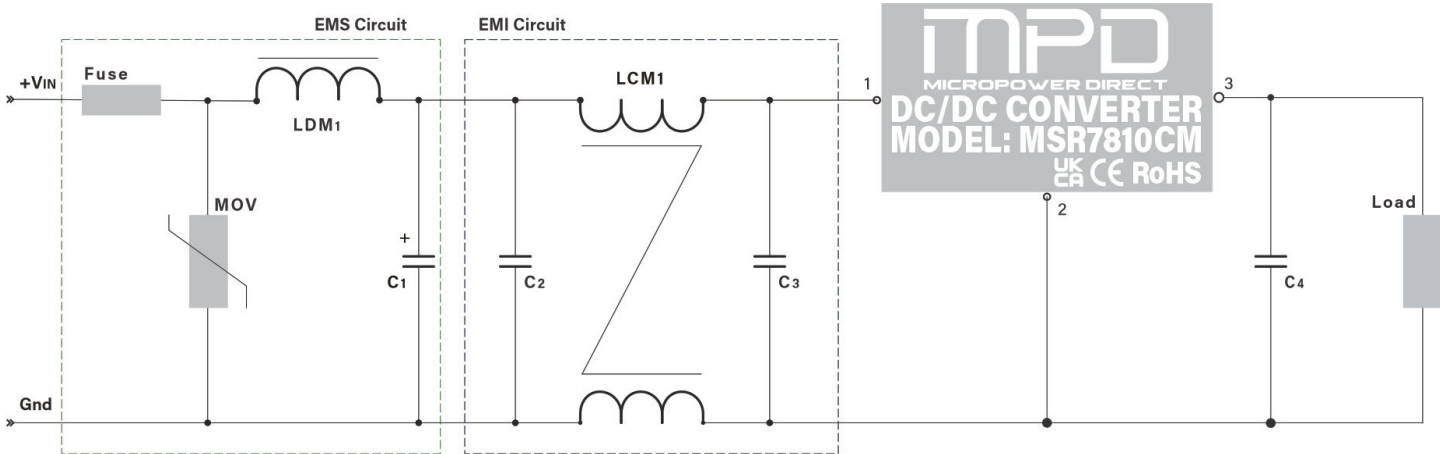
Typical Application Circuit 3, Pos/Neg Output



Typical application circuit 3 shows two units configured with a common input connection to produce positive and negative outputs. The inductor **LDM1** (up to 10 μ H) is added to reduce interference between the units. The recommended values for all the external components are given in the table below.

Output V	C1/C3	C2/C4
3.3	10 μ F/50V	22 μ F/10V
5.0	10 μ F/50V	22 μ F/10V
6.5	10 μ F/50V	22 μ F/16V
9.0	10 μ F/50V	22 μ F/16V
12	10 μ F/50V	22 μ F/25V
15	10 μ F/50V	22 μ F/25V

Typical Application Circuit 4: External EMC Components, Positive Output



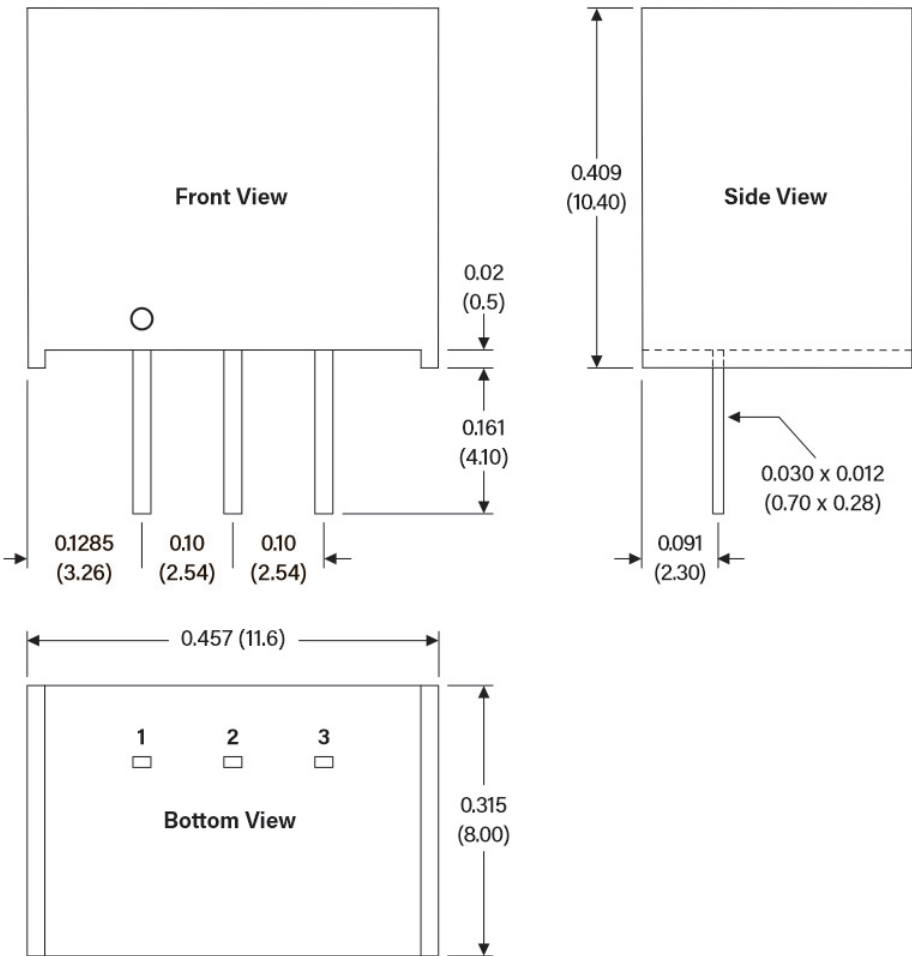
The diagram above illustrates a typical connection of the **MSR7810CM** series for negative output applications that require meeting EMC standards. The circuit shows two filters, one for EMS compliance and the other for EMI compliance. They can be used separately or together (as shown above) depending on the application requirements. 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 on the actual input current of the application. Contact the factory for more information.
2. An external MOV is recommended on the input to protect the unit if an input surge occurs. A recommended value is given in the table at right.

Component	Value
MOV	S20K30
LDM1	82 μ H
C1	680 μ F/50V
C2	4.7 μ F/50V

Component	Value
LCM1	4.7 mH
C3	4.7 μ F/50V
C4	4.7 μ F/50V

Mechanical Dimensions



Pin Connection

Positive Output

Pin	Function
1	V _{IN}
2	GND
3	+V _{OUT}

Negative Output

Pin	Function
1	V _{IN}
2	-V _{OUT}
3	GND

Notes:

- All dimensions are typical in inches (mm)
- General tolerance x.xx = ± 0.02 (± 0.50)
- Pin tolerance x.xxx = ± 0.004 (± 0.10)