DATEL®
INNOVATION and EXCELLENCE

78SR Series

3.3V/5V/12V Outputs High-Efficiency Switching Regulators with LM78XX Pinouts

Order online at www.datel.com

Features

- **3.3V/0.5A, 5V/0.5A or 12V/0.4A outputs; Pin and size-compatible with LM7805 & LM7812 regulators**
- **Up to 95% efficiency – no heat sinks or thermal derating required!**
- **3-pin SIP fits existing TO-220 footprints; <0.1 square inch pc-board space**
- **+7.5-36Vdc operating input range; Low 3mA quiescent current**
- **Built-in filter capacitors – no external components required**
- **–40 to +70°C operation at full load**
- **Excellent load (±0.2%) and line (±0.3%) regulation**
- **Reverse-polarity and short-circuit protection**
- **Ideal for powering instrumentation from 9V/12V/24V/28V supplies or batteries**
- **Can be used with unregulated dc supplies**

DATEL's 7805SR (5V output), 7812SR (12V output) and 7803SR (3.3V output) step-down switching regulators are modern drop-in replacements for older, inefficient, LM7805 and LM7812 linear regulators. The 78XXSR's are pin- and size-compatible with industry-standard TO-220 SIP packages. A 260kHz switching frequency provides for efficiencies as high as 95%. Full-load (up to 0.5A) operation from 9V, 12V, 24V, or 36V supplies at ambient temperatures up to +70°C requires no heat sinks, no temperature derating, no forced-air cooling, and no external capacitors.

78SR switching regulators provide many significant improvements over their linear counterparts: lower quiescent current (3mA vs. 5 mA), reverse-polarity protection (–60V vs. none), higher input voltage (40V vs. 32V), and better output accuracy (±1.5% vs. ±5%). All these features combine to make 78SR regulators ideal for new or existing LM7805 & LM7812 applications requiring full-load operation at elevated voltages.

Technical Notes

1. Input/Output (I/O) Filtering: As shown in the noise and ripple graphs, 78SR switching regulators exhibit excellent low-noise performance with no external I/O capacitors. However, if additional noise reduction is required, be sure to use low-ESR capacitors that are rated for continuous operation (with an additional 20% safety margin) at the highest system voltages and temperatures. Adding external output capacitors will also improve the unit's load-transient response.

2. Input Fusing: 78SR switching regulators are not internally fused. If fusing their input and/or output terminals is required, use the data shown in the Efficiency Curves as a guide to selecting an appropriate slow-blow fuse.

3. Input-Output Isolation: 78SR regulators' internal input and output circuits share a common connection (GND, pin 2); there is no electrical isolation between the INPUT (pin 1) and OUTPUT (pin 3) terminals.

4. Overvoltage Protection: 78SR switching regulators do not provide input or output overvoltage protection. In the extremely rare situation in which a catastrophic failure occurs, the output voltage may rise to excessively high levels. If your load must be protected against all possible overvoltage situations, external voltage-limiting circuitry must be provided.

5. Operation at 40Vdc: Operating with inputs up to 40Vdc is permissible if, for inputs between 36 and 40Vdc, the maximum load current is reduced to 0.35A for 7805SR and 7803SR, and to 0.3A for 7812SR. Under no circumstances should the input voltage be allowed to exceed 45Vdc.

6. Operation at 6.5Vdc: Operation of 7803SR and 7805SR regulators down to 6.5V is permissible if the maximum load current is reduced to 0.2A and reverse-polarity-protection diode D6 is removed. Solder gap SG1 must be closed (shorted) after D1 is removed. See Mechanical Specifications for D6 and SG1 locations.

Please note, the removal of D6 has two effects: it disables the unit's ability to withstand reverse-polarity inputs, and it increases the regulator's overall efficiency by eliminating the power loss due to D6's diode drop.

7. Soldering & Handling Precautions: All units are designed to be hand soldered to pc-boards using no-clean solders (+260°C, 5 seconds max.). Water-soluble solders can also be used, but the units must be washed and dried using processes appropriate to the type of solder employed. See the Mechanical Specifications section for pin 1 orientation and recommended plated-through hole dimensions.

While 78SR regulators easily withstand a 2kV ESD discharge to any terminal (using human body model), they should always be treated as ESD sensitive devices.

Performance/Functional Specifications

Typical at T_A = +25°C

Input/Output			
Models	**7803SR**	**7805SR**	**7812SR**
Output Voltage	+3.3Vdc	+5.0Vdc	+12.0Vdc
Rated Output Current	0.5A	0.5A	0.4A
Output Voltage Accuracy	±2%	±1.5%	±2%
Input Voltage Range ①	+7.5-36Vdc	+7.5-36Vdc	+15-36Vdc
Line Regulation (100% load)	±0.3%	±0.3%	±0.3%
Load Regulation (0-100% load)	±0.2%	±0.2%	±0.2%
Quiescent Current	3mA typ., 5mA max.		
Input Current	See Performance Curves		
Efficiency	See Performance Curves		
Transient Response	See Performance Curves		
Input & Output Noise	See Performance Curves		
Reverse Polarity Protection	-60Vdc (max.)		
Short Circuit Protection ②	Continuous		
Isolation	None		
Overvoltage Protection	None		
Undervoltage Protection	None		

Environmental			
Models	**7803SR**	**7805SR**	**7812SR**
Operating Temperature	–40 to +70°C		
Storage Temperature	–40 to +85°C		
Cooling	Free Air Convection		
Humidity (Non-condensing)	0 to 85%		
Physical			
Mechanical	See Mechanical Specifications		
Package	Open-frame SIP		
Pins	0.025" (0.64mm) square, tin-lead plated bronze		
Weight	0.08 ounces (2.2g)		
Pin Soldering	+260°C for 5 seconds		

① See Technical Notes 5 and 6.

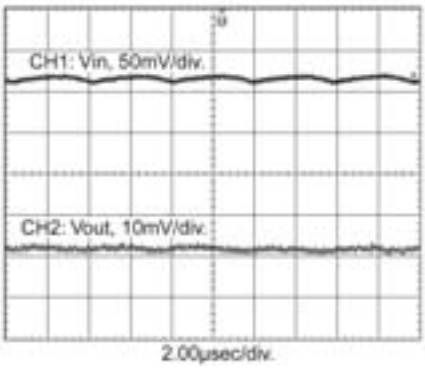
② While these regulators can withstand a continuous short-circuit across their output terminals, they will experience a significant temperature rise. Extended short-circuit operation will adversely affect the unit's reliability.

Typical Performance Curves

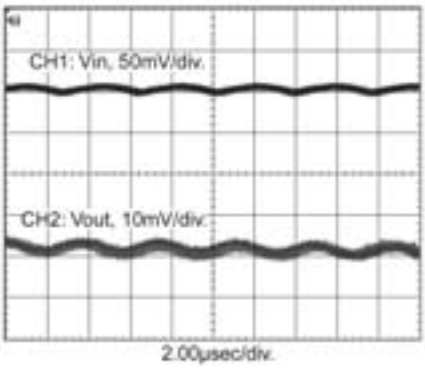
T_A = +25°C, V_{IN} as indicated

Noise and Ripple - 10% and 100% Load, 20MHz Bandwidth

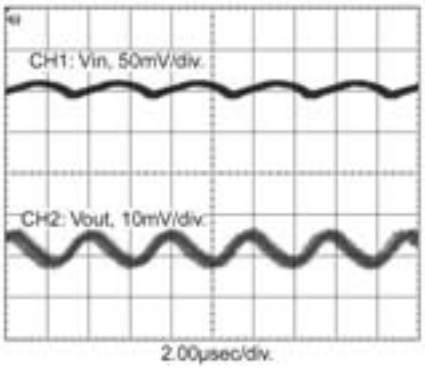
7803SR Vin = 12V, I_{LOAD} = 50mA



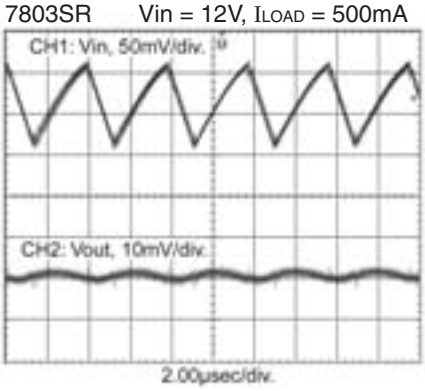
7805SR Vin = 12V, I_{LOAD} = 50mA



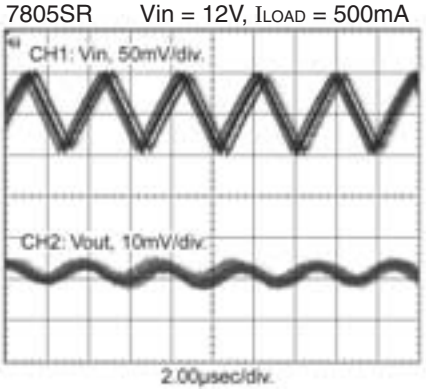
7812SR Vin = 24V, I_{LOAD} = 40mA



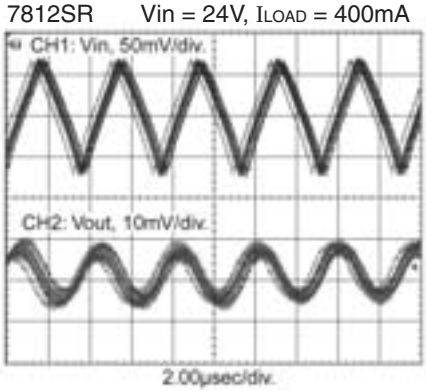
7803SR Vin = 12V, I_{LOAD} = 500mA



7805SR Vin = 12V, I_{LOAD} = 500mA

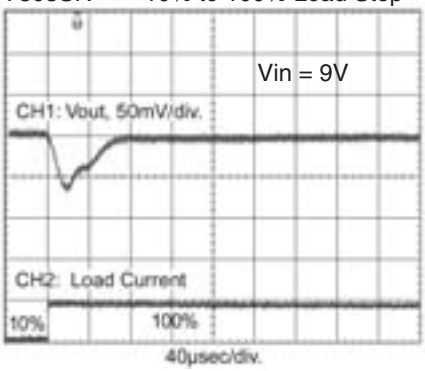


7812SR Vin = 24V, I_{LOAD} = 400mA

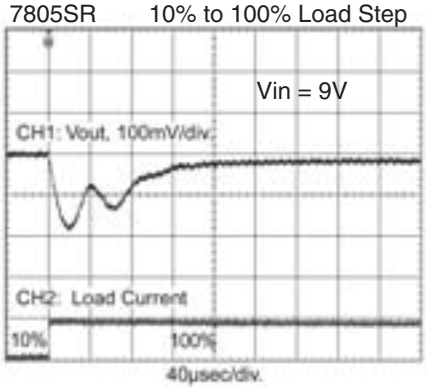


Transient Response - 90% Load Step

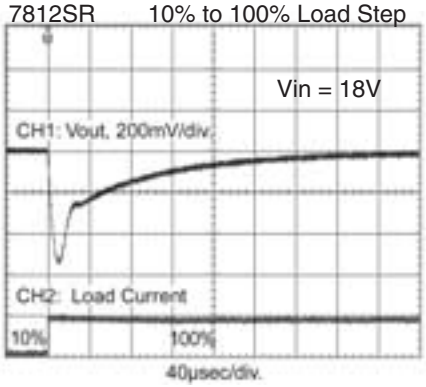
7803SR 10% to 100% Load Step



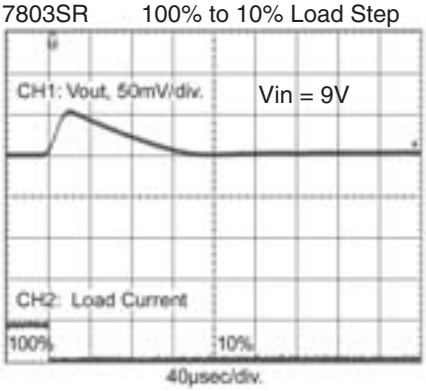
7805SR 10% to 100% Load Step



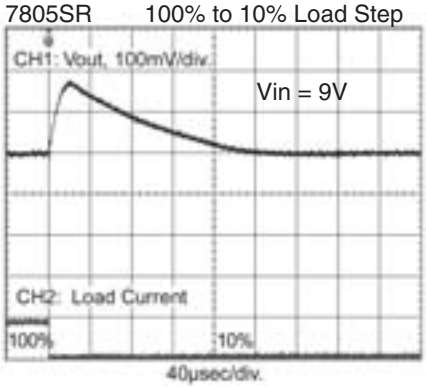
7812SR 10% to 100% Load Step



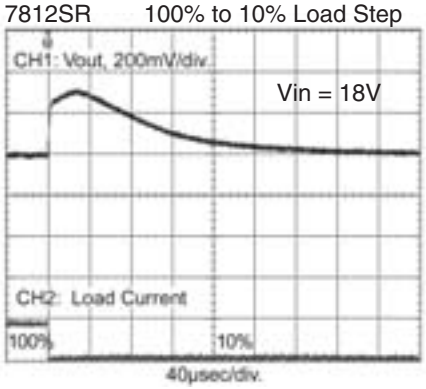
7803SR 100% to 10% Load Step



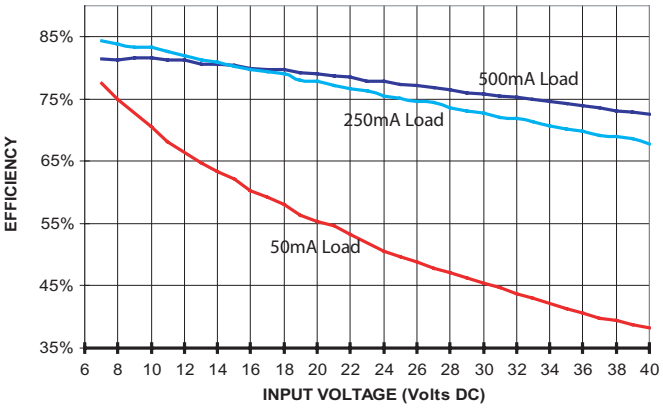
7805SR 100% to 10% Load Step



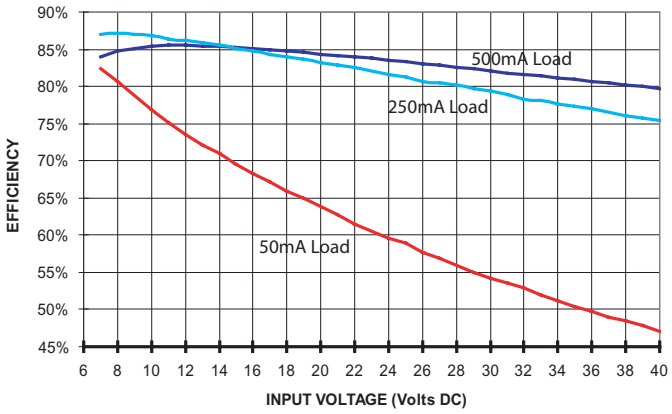
7812SR 100% to 10% Load Step



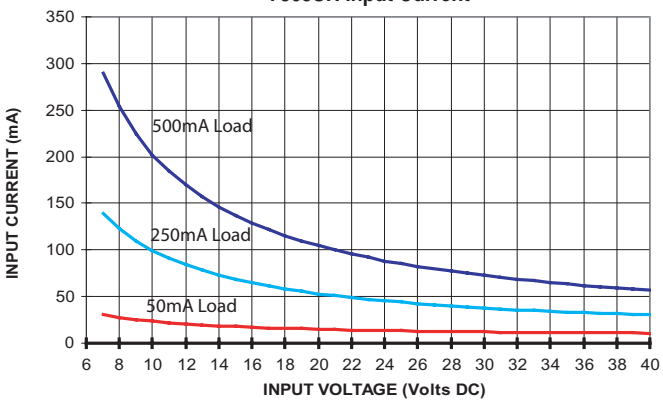
7803SR Efficiency



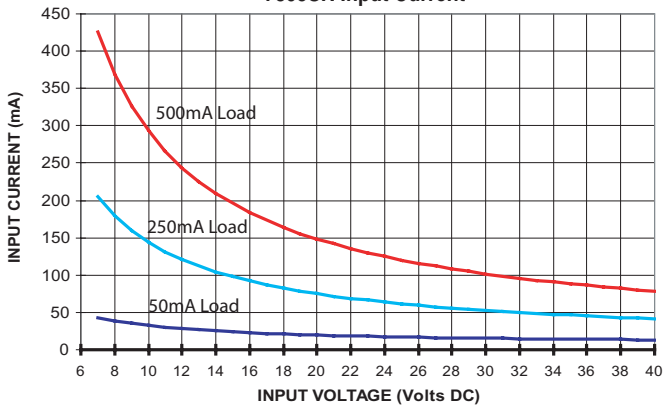
7805SR Efficiency

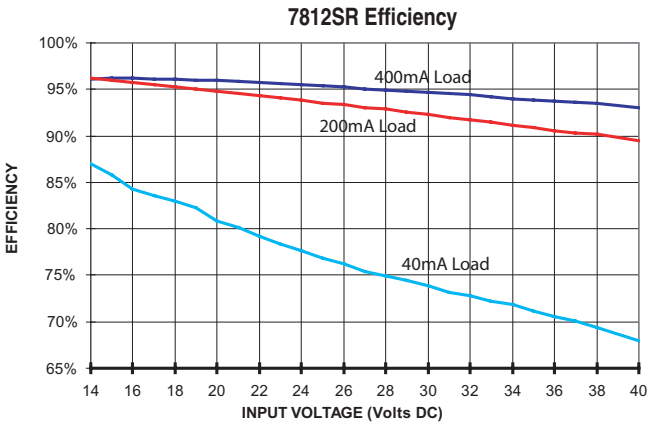


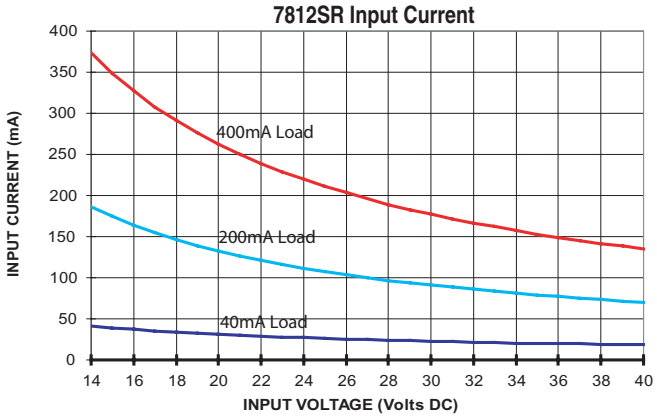
7803SR Input Current



7805SR Input Current







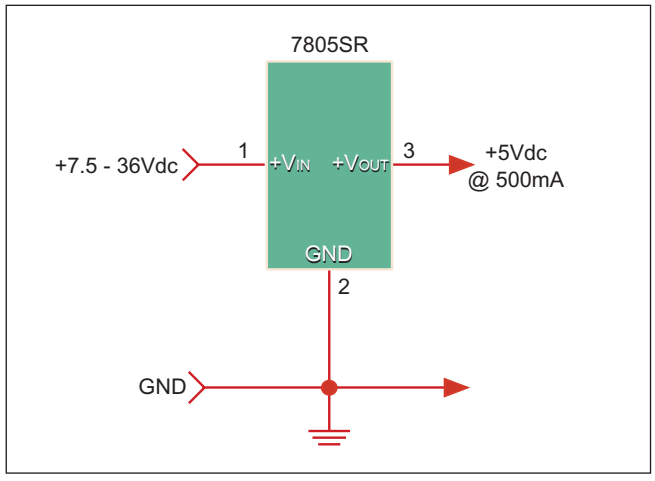
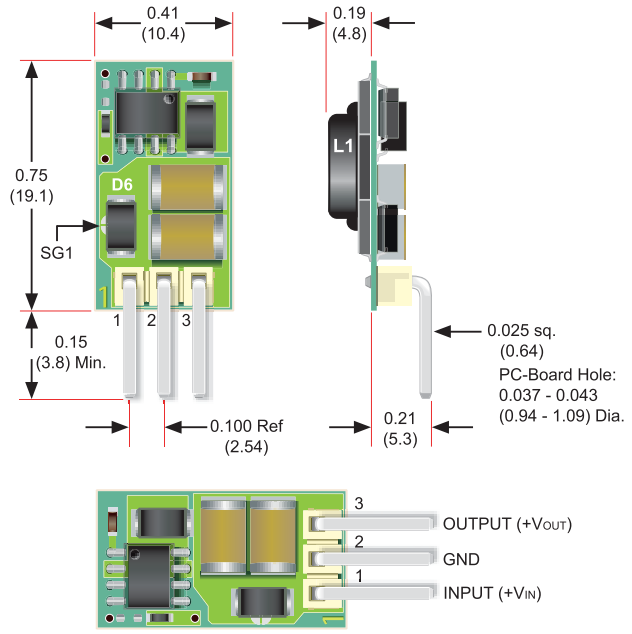


Figure 1. Typical Connections

Mechanical Specifications

MECHANICAL DIMENSIONS: Inches (mm)

TOLERANCES: 2 PL DEC ±0.02 (±0.51)
3 PL DEC ±0.010 (±0.254)



Ordering Information

DATEL Part No.	Output Voltage	Output Current	Input Voltage
7803SR	+3.3Vdc	0.5A	+7.5-36Vdc
7805SR	+5.0Vdc	0.5A	+7.5-36Vdc
7812SR	+12.0Vdc	0.4A	+15-36Vdc

DATEL, Inc. 11 Cabot Boulevard, Mansfield, MA 02048-1151
Tel: (508) 339-3000 (800) 233-2765 Fax: (508) 339-6356
Internet: www.datel.com E-mail: sales@datel.com

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DATEL (UK) LTD. Tadley, England Tel: (01256)-880444
Internet: www.datel-europe.com E-mail: datel.ltd@datel.com

DATEL S.A.R.L. Montigny Le Bretonneux, France Tel: 01-34-60-01-01
Internet: www.datel-europe.com E-mail: datel.sarl@datel.com

DATEL GmbH München, Germany Tel: 89-544334-0
Internet: www.datel-europe.com E-mail: datel.gmbh@datel.com

DATEL KK Tokyo, Japan Tel: 3-3779-1031, Osaka Tel: 6-6354-2025
Internet: www.datel-co.jp E-mail: salestko@datel.co.jp, salesosa@datel.co.jp

DATEL China Shanghai, China Tel: 011-86-51317131
E-mail: davidx@datel.com

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