

# SERIES: VX78-500 | DESCRIPTION: NON-ISOLATED DC SWITCHING REGULATOR

#### FEATURES

- wide input
- pin-out compatible with linear regulators
- encapsulated
- UL & CSA approved
- high efficiency up to 95%
- no-load input current as low as 0.2 mA
- wide operating temp: -40°C to +85°C
- supports negative output
- short circuit protection on the output
- designed to meet EN/BS EN 62368-1



MODEL	in vol	input voltage <sup>1</sup>		output current	output power	ripple & noise <sup>2</sup>	efficiency <sup>3</sup>
	<b>typ</b> (Vdc)	range (Vdc)	(Vdc)	<b>max</b> (mA)	<b>max</b> (W)	<b>max</b> (mVp-p)	<b>typ</b> (%)
VX7803-500	24	4.75~36	3.3	500	1.65	75	86
VX7805-500	24 12	6.5~36 7~31	5 -5	500 -300	2.5 1.5	100 100	90 80
VX78039-500	24	12~36	9	500	4.5	75	93
VX78012-500	24 12	15~36 8~24	12 -12	500 -150	6 1.8	75 75	94 84
VX7815-500	24 12	19~36 8~21	15 -15	500 -150	7.5 2.25	100 100	95 85

Notes: 1. For input voltages higher than 30 Vdc, a 22  $\mu$ F / 50 V input capacitor is required.

2. Tested at nominal input, 10 $\times$ 100% load, 20 MHz bandwidth, with 10  $\mu$ F electrolytic and 1  $\mu$ F ceramic capacitor on the output. At loads below 10%, the max ripple and noise of the 3.3 & 5 Vdc outputs will be 150 mVp-p, and the other outputs will be 2% Vo. 3. Measured at min Vin, full load.

4. All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

## **PART NUMBER KEY**

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#### **INPUT**

parameter	conditions/description	min	typ	max	units
operating input voltage <sup>1</sup>	for positive output applications for negative output applications	4.75 7	24 12	36 31	Vdc Vdc
filter	capacitor filter				
input reverse polartiy protection	no				
no-load input current	positive outputs 5 & 15 Vdc output models all other models		5.0 0.2	8.0 1.5	mA mA

Note: 1. See Model section on page 1 for specific input voltage ranges.

## OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load <sup>2</sup>	for positive output applications for negative output applications			680 330	μF μF
voltage accuracy	at full load, input voltage range 3.3 Vdc output model all other models		±2 ±2	±4 ±3	% %
line regulation	at full load, input voltage range		±0.2	±0.4	%
load regulation	at nominal input, 10~100% load		±0.4	±0.6	%
switching frequency	at nominal input voltage, full load 5 & 15 Vdc output models all other models	750 550		1,250 850	kHz kHz
transient recovery time	at nominal input voltage, 25% load step change		0.2	1	ms
transient response deviation	at nominal input voltage, 25% load step change		50	250	mV
temperature coefficient	at full load			±0.03	%/°C
Noto: 2 The maximum canacitive l	and was tested at nominal input voltage, full load				

Note: 2. The maximum capacitive load was tested at nominal input voltage, full load.

### **PROTECTIONS**

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous, auto recoverv				

# **SAFETY AND COMPLIANCE**

parameter	conditions/description	min	typ	max	units
safety approvals	certified to 60950-1: UL designed to meet 62368-1: EN, BS EN				
EMI/EMC	EN 55032, EN 55024				
conducted emissions <sup>3</sup>	CISPR22/EN55022, class B (external circ	cuit required, see Figure 6	5-b)		
radiated emissions3	CISPR22/EN55022, class B (external circ	uit required, see Figure 6	5-b)		
ESD	IEC/EN61000-4-2, contact $\pm$ 4kV, class E	3			
radiated immunity	IEC/EN61000-4-3, 10V/m, class A				
EFT/burst	IEC/EN61000-4-4, $\pm$ 1kV, class B (extern	nal circuit required, see F	igure 6-a)		
surge	IEC/EN61000-4-5, line-line $\pm$ 1kV, class	B (external circuit require	ed, see Figur	e 6-a)	
conducted immunity	IEC/EN61000-4-6, 3 Vr.m.s, class A				
MTBF	as per MIL-HDBK-217F, 25°C	2,000,000			hours
RoHS	2011/65/EU				

Note: 3. CISPR22/EN55022, class A for the 5 & 15 Vdc output model.

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### **ENVIRONMENTAL**

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		85	°C
storage temperature		-55		125	°C
storage humidity	non-condensing	5		95	%

#### **SOLDERABILITY**

parameter	conditions/description	min	typ	max	units
wave soldering	see wave soldering profile			260	°C



# **MECHANICAL**

parameter	conditions/description	min	typ	max	units
dimensions	11.60 x 7.55 x 10.16 [0.457 x 0.297 x 0.400 inch]				mm
case material	black flame-retardant heat-proof plastic (UL94V-0)				
weight			1.8		g

# **MECHANICAL DRAWING**

units: mm [inch] tolerance: ±0.25[±0.010] pin diameter tolerance: ±0.10[±0.004]

PIN CONNECTIONS			
PIN	+OUTPUT	-OUTPUT	
1	+VIN	+VIN	
2	GND	-VOUT	
3	+VOUT	GND	

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# **DERATING CURVE**



## **EFFICIENCY CURVES**



# **EFFICIENCY CURVES (CONTINUED)**



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## **TYPICAL APPLICATION CIRCUIT**



Positive and Negative Output Paralleling Application Circuit





External Capacitor Table

Model Number	C1, C3 (ceramic capacitor)	C2, C4 (ceramic capacitor)
VX7803-500	10 µF/50 V	22 µF/10 V
VX7805-500	10 µF/50 V	22 µF/10 V
VX78039-500	10 µF/50 V	22 µF/16 V
VX78012-500	10 µF/50 V	22 µF/25 V
VX7815-500	10 µF/50 V	22 µF/25 V

Figure 4
Positive Output Ripple Reduction Circuit



**EMC RECOMMENDED CIRCUIT** 

Note:

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Figure 5 Negative Output Ripple Reduction Circuit



Table 2

Recommended external circuit components			
FUSE	choose according to actual input current		
MOV	S20K30		
LDM1	82 µH		
C0	680 μF/50 V		
C1, C2	see Table 1		
C5	4.7 µF/50 V		
LDM2	12 µH		

1. C1 & C2 (C3 & C4) are required and should be connected as close to the module pins as possible.

To reduce the output ripple further, it is recommended to connect an "LC" filter at the output terminal with a recommended value of 10~47 µH for the L component. (See Figures 4 & 5).

3. When using application circuit in Figure 3, a 10 µH LDM component is recommended to reduce the interference.

# **REVISION HISTORY**

rev.	description	date
1.0	initial release	05/18/2017
1.01	features and safety line updated, packaging removed	01/14/2021
1.02	derating curve and circuit figures updated	09/14/2021
1.03	safeties updated	12/20/2022
1.04	application circuits updated	04/04/2023
1.05	switching frequency, no load input current, ripple & noise, and emissions updated for 5 & 15 Vdc output models	05/23/2023

The revision history provided is for informational purposes only and is believed to be accurate.



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CUI offers a two (2) year limited warranty. Complete warranty information is listed on our website.

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