

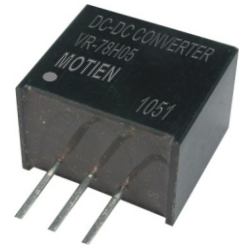
# VR-78H Series



0.4A - 0.5A Output Current, Non-Isolated DC/DC converter

## Features

- 3 Pin SIL, Full SMD Technology
- Non isolated, No need for heatsinks
- Low Quiescence Current at no load
- High voltage input range, up to 72V
- Continuous Short Circuit Protection
- Pin-out compatible with LM78XX three terminals positive Regulator
- Efficiency up to 95%
- Low ripple and noise



The VR-78H series is a family of cost effective 1.65~6.0W single output buck DC-DC converters. These converters are encapsulated in a non-conductive black plastic package 3-pin SIL case, continuous short circuit protection with automatic restart, good line / load regulation and ultra low quiescence current. Devices are filled up with flame retardant resin. Input voltages of 9~72, 14~72, 17~72, and 21~72 with output voltage of 3.3, 5, 6.5, 7.2, 9, 12 and 15Vdc. High performance features include high efficiency operation up to 95%.

All specifications typical at Ta=25°C, nominal input voltage and full load unless otherwise specified

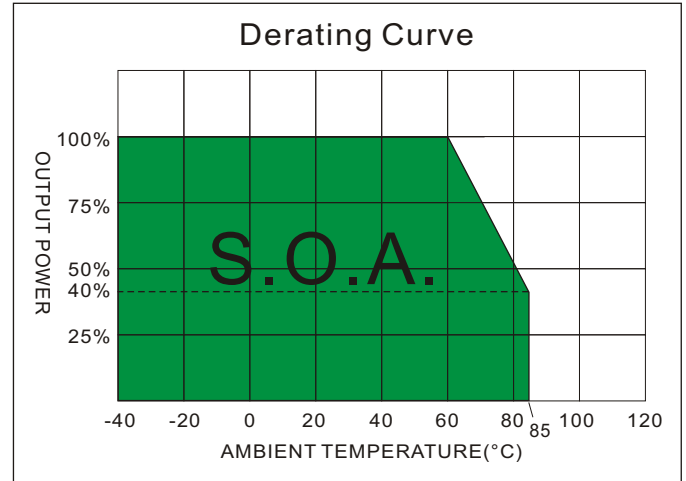
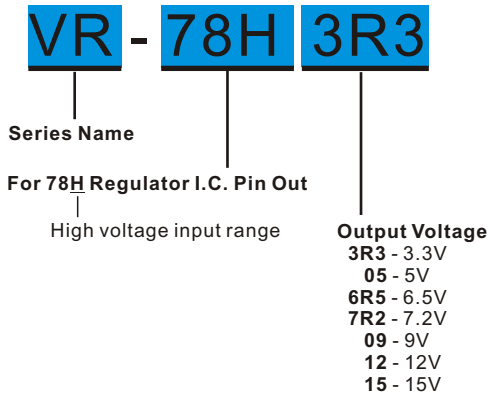
OUTPUT SPECIFICATIONS		PHYSICAL SPECIFICATIONS	
Voltage Accuracy	±3%, max.	Case Material	Non-conductive Black Plastic(UL94V-0 rated)
Output Current(Full Load)	See table, max.	Pin Material	C5191R-H Solder-coated
Line Regulation	±1%, max.	Potting Material	Silicon (UL94V-0 rated)
Load Regulation	(From 10% to 100% Load) ±1%, max.	Weight	2.0g
Ripple & Noise (20 MHz bandwidth)(1)	75mVpk-pk, max.	Dimensions	0.46"x0.29"x0.40"
Short Circuit Protection	Indefinite(Automatic Recovery)	EMC CHARACTERISTICS(5)	
Temperature Coefficient	±0.02%/°C	Radiated Emissions	EN55032 CLASS B
Capacitor Load(2)	See table, max.	Conducted Emissions	EN55032 CLASS B
INPUT SPECIFICATIONS		ESD	IEC61000-4-2 Perf. Criteria A
Input Voltage Range	See table	RS	IEC61000-4-3 Perf. Criteria A
Input Current (No-Load)	See table, max.	EFT	IEC61000-4-4 Perf. Criteria A
Input Current (Full-Load)	See table, typ.	Surge	IEC61000-4-5 Perf. Criteria A
Input Filter	Capacitors	CS	IEC61000-4-6 Perf. Criteria A
Input Reflected Ripple Current(3)	35mApk-pk, typ.	PFMF	IEC61000-4-8 Perf. Criteria A
GENERAL SPECIFICATIONS		ABSOLUTE MAXIMUM RATINGS(6)	
Efficiency	See table, typ.	These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.	
Switching Frequency(4)	120-800kHz	Input Surge Voltage (100mS)	75Vdc, max.
Humidity	95% rel H	Soldering Temperature	260°C, max.
Reliability Calculated MTBF(MIL-HDBK-217 F)	>4.5Mhrs	(1.5mm from case 10sec max.)	
ENVIRONMENT SPECIFICATIONS			
Operating Temperature	-40°C~85°C (See Derating Curve)		
Maximum Case Temperature	100°C		
Storage Temperature	-40°C~125°C		
Cooling	Nature Convection		

## NOTE

1. Ripple/Noise measured with 20MHz bandwidth. Load condition : 10% ~ 100%, output noise arise when load is under 10%.
2. Tested by minimal Vin and constant resistive load.
3. Measured Input reflected ripple current with a simulated source inductance of 12μH.
4. The switching frequency is different according to output voltage models.
5. Input filter components (C1, C2, L) are used to help meet EMI & EMS requirement for the module.  
These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.
6. Do not operate the unit(s) exceeding the absolute maximum rating, over rating causes damage to the units.
7. Operation under no-load conditions will not damage these devices, however they may not meet all listed specifications.

The information and specifications contained in this data sheet are believed to be correct at time of publication. However, MOTIEN Technologies accepts no responsibility for consequences arising from printing errors or inaccuracies. Specifications are subject to change without notice. No rights under any patent accompany the sale of any such product(s) or information contained herein.

#### PART NUMBER STRUCTURE



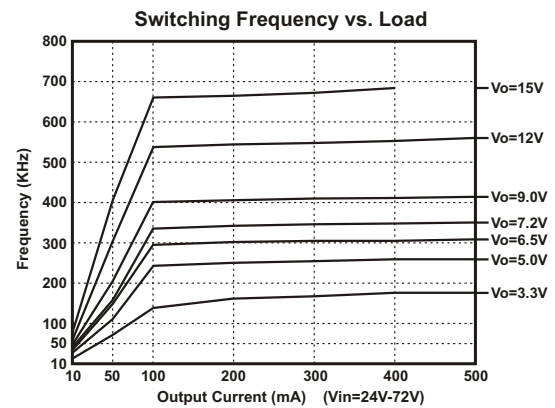
#### MODEL SELECTION GUIDE

MODEL NUMBER	INPUT	INPUT Current (mA)			OUTPUT		EFFICIENCY		Capacitor Load @FL (μF, max.)
	Voltage Range (Vdc)	No-Load (mA, max.)	Full Load (mA, typ.)		Voltage (Vdc)	Current (mA)	Full Load (% , typ.)		
			@Min. Vin	@Max. Vin			@Min. Vin	@Max. Vin	
VR-78H3R3	9 - 72	3	224	31	3.3	500	82	75	100
VR-78H05	9 - 72	3	316	44	5	500	88	80	100
VR-78H6R5	9 - 72	3	397	55	6.5	500	91	83	100
VR-78H7R2	14 - 72	3	283	60	7.2	500	91	84	100
VR-78H09	14 - 72	3	350	73	9	500	92	86	100
VR-78H12	17 - 72	3	376	94	12	500	94	89	100
VR-78H15	21 - 72	3	301	94	15	400	95	89	100

#### TYPICAL OPERATING CONDITIONS

##### Switching Frequency

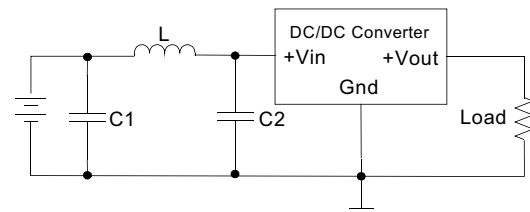
The switching frequency is different according to output voltage models.  
 Operation under no load will not damage these devices, however they may not meet all specifications.  
 A minimum load of 10mA is recommended.



#### EMC COUNTERMEASURES

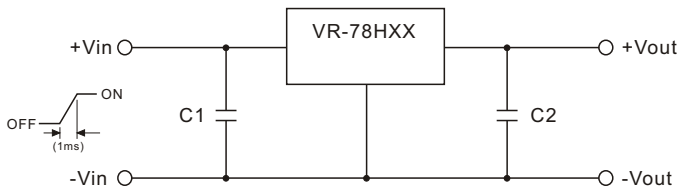
##### EMC Countermeasures

Input filter components (C1, C2, L) are used to help meet EMI & EMS requirement for the module.  
 These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.



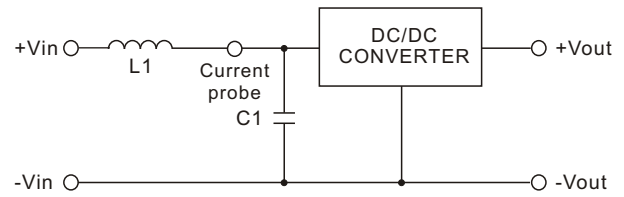
	C1	L	C2
VR-78HXX	220μF,100V	12μH	220μF,100V

## STANDARD APPLICATION CIRCUIT



1. If  $V_{in} > 50V$ , in order to protect the converter during power-up, add an external capacitor of  $C1 = 3.3\mu F / 100V$  is required.
2.  $C2 = 100\mu F$  (Optional)

## TEST CONFIGURATIONS

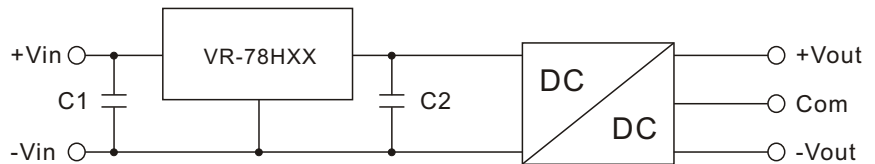


Input reflected ripple current is measured through a source inductor  $L1 (12\mu H)$  and a source capacitor  $C1 = 47\mu F$  at nominal input and full load.

## APPLICATION EXAMPLES

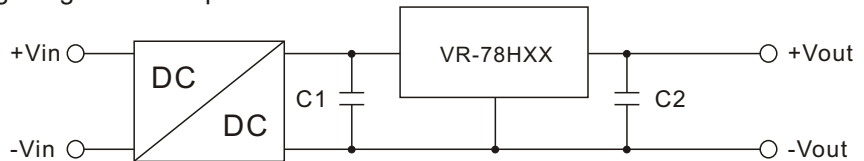
High efficiency, isolated, dual unregulated outputs, one economic way to build up isolated dual output

- Isolated dual outputs
- Wide input range
- C1: Optional
- C2: Required (further decoupling filtering may be necessary between the two converters)

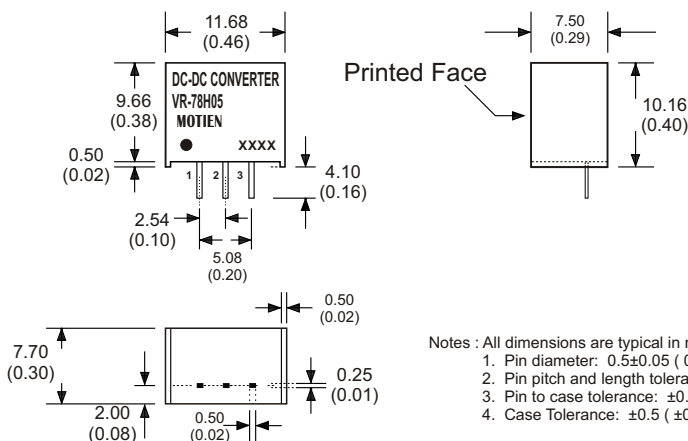


Isolated (up to 6KV), wide input range regulated output

- High isolation voltage
- Improved loading / line regulation
- Wide input voltage range
- Point-of-load Architecture
- C1: Required (further decoupling filtering may be necessary between the two converters)
- C2: Optional



## MECHANICAL SPECIFICATIONS



PIN CONNECTIONS	
PIN NUMBER	SINGLE
1	+V Input
2	GND
3	+V Output