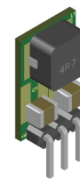


### Features

- 7~36Vin(3.3 & 5Vout).15-36Vin(12Vout)
- Fixed Output: 3.3 or 5V @ 1.5A or 12V @ 1.0A
- Vertical SIP, small footprint package
- “No heat sink” direct replacement for 3-terminal78xx-series linear regulators
- High efficiency with no external components
- Short circuit protection
- Outstanding thermal derating performance
- UL/EN/IEC 60950-1, 2nd Edition safety meets



### Description

The B78OXX-1R5 Series are non-isolated DC/DC converters suited to replace 1.5 Amp LM78xx linear regulators. Designed with highly efficiency, allow the operating temperature range of these units to be -40°C to +85°C in a 10×15×6.5mm. Further features include wide 7~36VDC input voltage range, short-circuits protection and over temperature protection.

### Technical Specification

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.

Model Number	Input Voltage Range	Output Voltage (V)	Output Current (mA)		Eff . <sup>(2)</sup> (%)		Capacitive Load, max. <sup>(3)</sup> (uF)
			Min. Load <sup>(1)</sup>	Full. Load	Vin_min	Vin_Typ.	
B78O03-1R5	7-36V Nominal:12V	3.3	0	1500	93	91	1200
B78O05-1R5	7-36V Nominal:12V	5	0	1500	95	92	660
B78O12-1R0	15-36V Nominal:24V	12	0	1000	97	95	470

### Input Specifications

Input voltage	B78O03-1R5	12V nominal input	7-36V
	B78O05-1R5	12V nominal input	7-36V
	B78O12-1R0	24V nominal input	15-36V

Input filter Capacitor type

Input Reverse Polarity None, install external fuse(2A Fast blow)

No Load Input Current 15mA max.

Hot swap is not supported

### Environmental Specifications

Operating ambient temperature -40°C to +85°C (with derating)

Storage temperature range -55°C to +125°C

Relative humidity 5% TO 95% RH max.

Temperature coefficient ±0.02% / °C Typ.

RoHS Compliant RoHS 2.0

### Output Specifications

Output current (3.3V &5V)1.5A max.  
(12V)1.0A max.

Voltage accuracy	At 50% load	-4% Min. +4% Max.
Minimum load	(No minimum load)	0mA
Line regulation	Vin=min. to max. Vout=nom.	±0.25% Typ ±0.7% max.
Load Regulation	25 -100% load	±0.7% max.
Ripple and Noise (20MHz Bandwidth)		(3.3V) 40mVp-p max. (5V & 12V)75mVp-p max.
Over Current Protection(OCP)	100%=1.5A	200~500%
Short Circuit Protection(SCP)	Continuous, autorecovery	

### General Specifications

Efficiency		See table
Switching frequency (Fixed)	Pulse width modulation (PWM)	410kHz Typ
Dynamic load response	50-100-50% load step	75uS Typ
Reliability, calculated MTBF	B78O03-1R5/ B78O05-1R5 B78O12-1R0	78.7×10 <sup>6</sup> Hrs 25.9×10 <sup>6</sup> Hrs
Safety <sup>(5)</sup>	UL-60950-1,IEC/EN60950-1,2nd Edition	meet

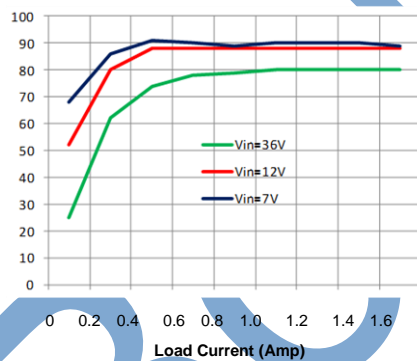
### Physical Specifications

Dimensions		0.4 × 0.59 × 0.26 Inch (10 × 15 × 6.5 mm)
Weight		2.0g (0.071oz) typ.

### Efficiency Curve

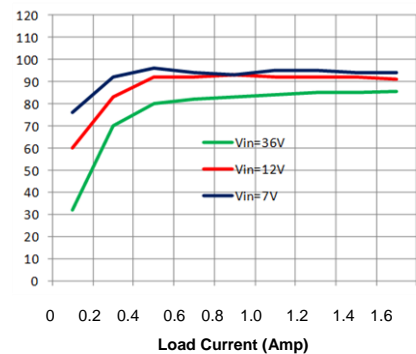
#### B78O03-1R5

Efficiency vs Line Voltage and Load Current@+25°C(Vout=Vnom.)



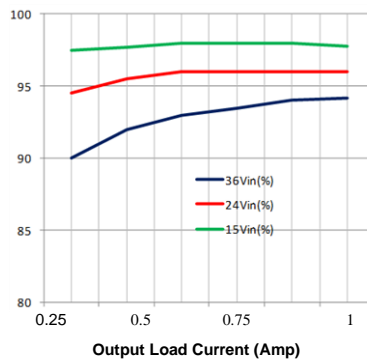
#### B78O05-1R5

Efficiency vs Line Voltage and Load Current@+25°C(Vout=Vnom.)

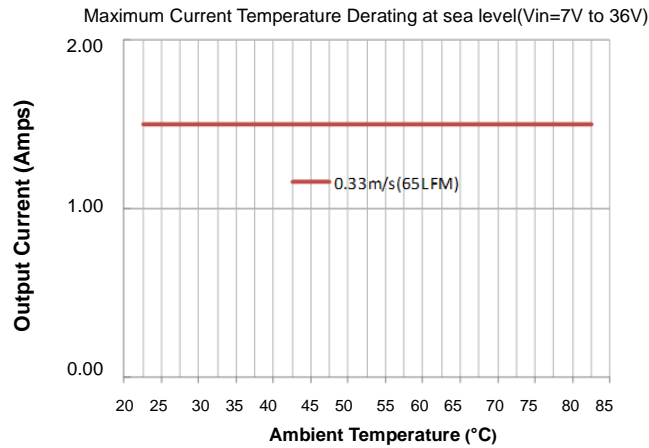


#### B78O12-1R0

Efficiency vs Line Voltage and Load Current@+25°C(Vout=Vnom.)



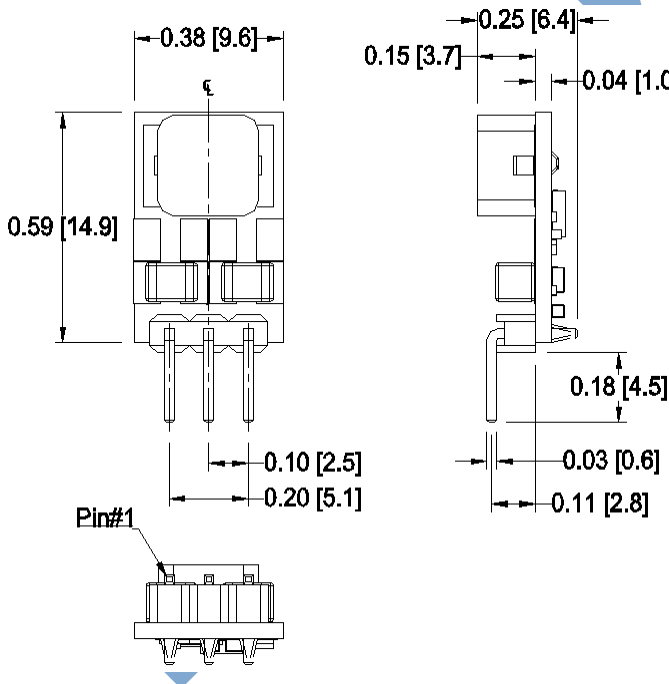
### Power Derating Curve



### Note

1. Io below this value will not damage these converters, however, they may not meet all listed specifications.
2. Typical value, tested at nominal input and full load.
3. Specifications subject to change without notice.
4. This power module is not internally fused. The input line fuse must always be used.
5. Input Back Ripple Current is tested and specified over a 5 Hz to 20 MHz bandwidth.  
Input filtering is  $C_{in}=2 \times 100 \mu F$ ,  $C_{bus}=1000 \mu F$ ,  $L_{bus}=1 \mu H$ . All caps are low ESR types.(see page 4 EMI Filter)

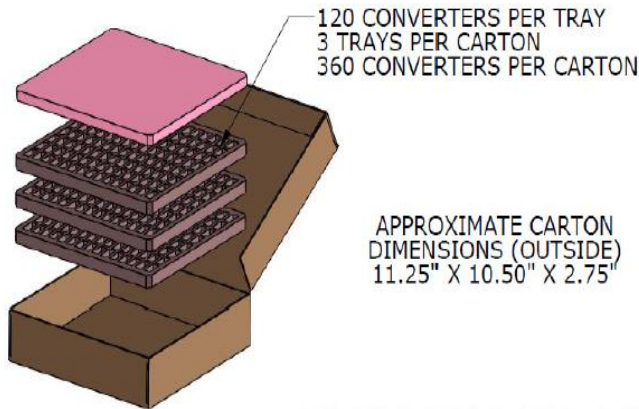
### Mechanical Dimensions



Pin Assignment	
Pin	Define
1	Positive Input
2	Common(Ground)
3	Positive Output

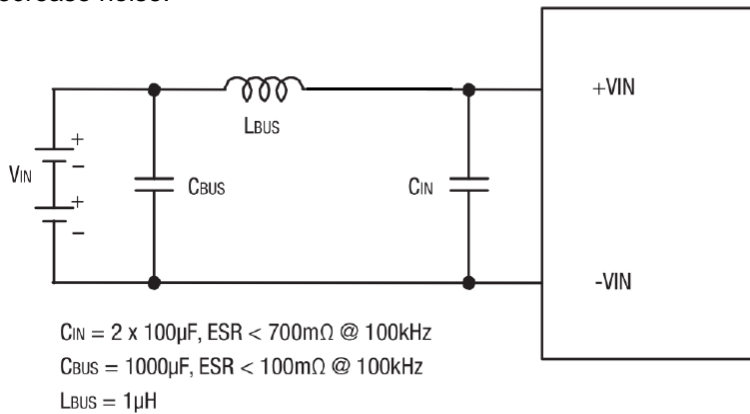
Unit: mm  
Tolerance: XX.X=±0.5, XX.XX=±0.25

## Package Information



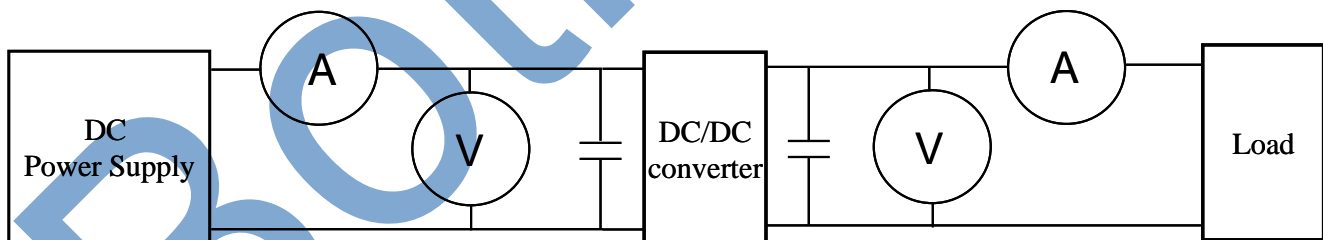
## EMI Filter

Input filter components are used to meet emissions requirement for the module. These components should be mounted as close as possible to the module; and all leads should be minimized to decrease noise.



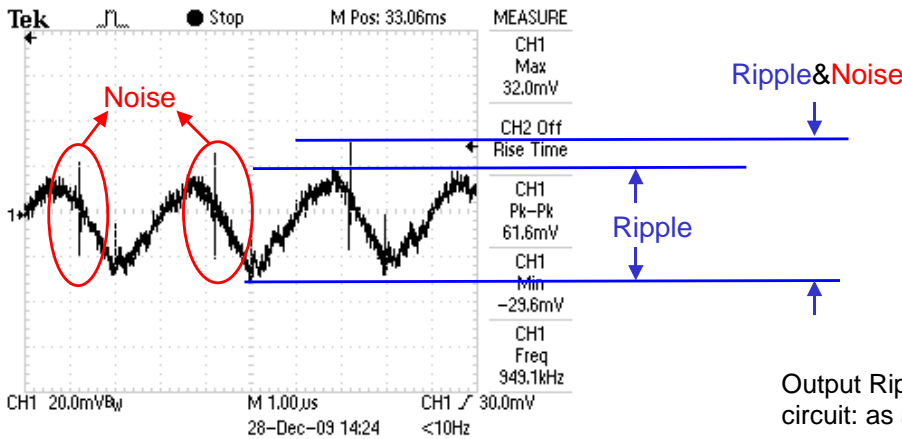
## Test Configurations

All specifications are typical at nominal input, full load and 25°C unless otherwise stated.

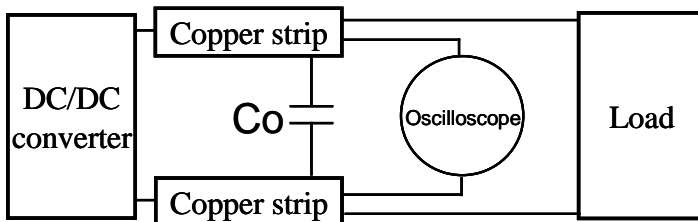


- ⊙DC Power Supply: It offers a wide voltage and current range precisely.
- ⊙Current meter (A): Accuracy → 200 $\mu\text{A}$  ~ 200mA 4 ranges  $\pm(0.2\%$  rdg + 2 digits)  
2000mA ~ 20A 2 ranges  $\pm(0.3\%$  rdg + 2 digits).
- ⊙Voltage meter (V): Accuracy →  $\pm(0.03\%$  rdg + 4 digits).
- ⊙Load: At full load.
- ⊙Wires: The resistance of the wires must be small.

1. **Ripple and Noise**: as shown below. The bandwidth is 0-20MHz.

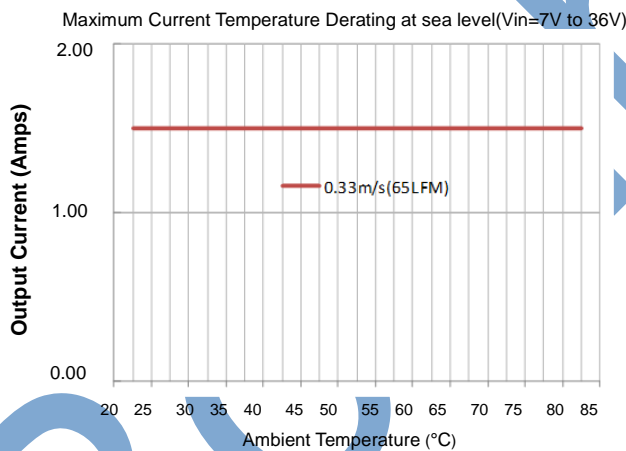


Output Ripple&Noise measurement test circuit: as shown below.

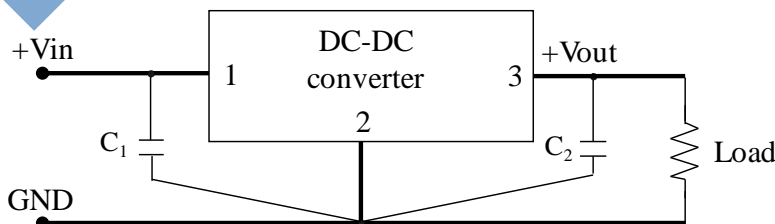


Co: usually 47uF use low-ESR ceramic.

2. **Temperature derating curve**: The DC-DC converter will operate over a wider temperature range if less power is drawn from the output and the device is already running. The temperature derating curve shows the operating power-temperature range. As shown below.



3. **Input source impedance**: The power module should be connected to low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. Capacitor mounted close to the power module helps ensure stability of the unit, it is commended to use a good quality low Equivalent Series Resistance (ESR < 0.1Ω at 100kHz) capacitor of a 22uF for the power module.



as shown below. C1=22uF/50V MLCC, C2=47uF/16V MLCC