



FEATURES

- ◆Footprint from 1.05cm²
- ◆I/O isolation voltage 1500VDC
- ◆Operating Temperature: -40°C ~ + 85°C
- ◆High efficiency up to 85%
- ◆Fully encapsulated toroidal magnetics
- ◆Internal SMD construction
- ◆Custom solutions available
- ◆No electrolytic or tantalum capacitors
- ◆5V,9V,12V and 15V output
- ◆No heatsink required
- ◆Pin compatible with B-XS series
- ◆UL 94V-0 package material
- ◆No external components required
- ◆Industry standard pinout
- ◆Power density 2.01W/cm³
- ◆MTTF up to 2.3 million hours

MODEL SELECTION

3B^①05^②05^③X^④M^⑤

- ①Product Series ②Input Voltage
③Output Voltage ④Fixed Input
⑤Package Style

APPLICATIONS

The 3B-XM series of DC/DC Converters is particularly suited to isolating and/or converting DC power rails. The galvanic isolation allows the device to be configured to provide an isolated negative rail in systems where only positive rails exist. The wide temperature range guarantees startup from -40°C and full 3 watt output at 85°C. Pin compatibility with the B-X(S)D ensures ease of upgradeability.



Order code	Input Voltage (V)	Output Voltage (V)	Output Current (mA)	Max Capacitive Load (μF)	Efficiency (%)
3B0503XM	5	3.3	700	2400	78
3B0505XM	5	5	600	2400	83
3B0509XM	5	9	333	2000	85
3B0512XM	5	12	250	560	85
3B0515XM	5	15	200	560	86
3B1205XM	12	5	600	2400	83
3B1209XM	12	9	333	2000	85
3B1212XM	12	12	250	560	85
3B1215XM	12	15	200	560	88
3B1224XM	12	24	125	220	88
3B2405XM	24	5	600	2400	84
3B2409XM	24	9	333	2000	85
3B2412XM	24	12	250	560	85
3B2415XM	24	15	200	560	89

Input Characteristics

Parameter	Conditions	Min	Typ	Max.	Units
Voltage range	Continuous operation, 5V input types	4.5	5	5.5	V
	Continuous operation, 12V input types	10.8	12	13.2	
	Continuous operation, 24V input types	21.6	24	26.4	
Reflected ripple current	5V input types		33		mA p-p
	12V input types		38		mA p-p

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min	Typ.	Max.	Units
Rated Power	TA = -40° C to 85° C			2	W
Voltage Set Point Accuracy	See tolerance envelope				
Line regulation	High VIN to low VIN		1.0	1.2	%%
Load regulation 10% load to rated load	5V output		7	8.5	%
	9V output		4.5	5.2	%
	12V output		4.5	5.5	%
	15V output		3.7	8.5	%
Ripple and Noise	3B0505XM, BW=DC to 20MHz		96	200	mA p-p
	3B0509XM, BW=DC to 20MHz		67	200	mA p-p
	3B0512XM, BW=DC to 20MHz		59	200	mA p-p
	3B0515XM, BW=DC to 20MHz		53	200	mA p-p
	3B1205XM, BW=DC to 20MHz		76	200	mA p-p
	3B1209XM, BW=DC to 20MHz		63	200	mA p-p
	3B1212XM, BW=DC to 20MHz		53	200	mA p-p
	3B1215XM, BW=DC to 20MHz		45	200	mA p-p

Absolute Maximum Ratings

Short-circuit protection ²	1 second
Lead temperature 1.5mm from case for 10 seconds	300°C
Internal power dissipation	805mW
Input voltage VIN, 3B05 types	7V
Input voltage VIN, 3B12 types	15V
Input voltage VIN, 3B24 types	28V

Isolation characteristics

Parameter	Conditions	Min.	Typ	Max.	Unit
Isolation test voltage	1 second	1000			VDC
Resistance	Viso = 500VDC	10			GΩ

1. Calculated using MIL-HDBK-217FN2 calculation model with nominal input voltage at full load.

2. Supply voltage must be disconnected at the end of the short circuit duration.

All specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified.

Minimum load

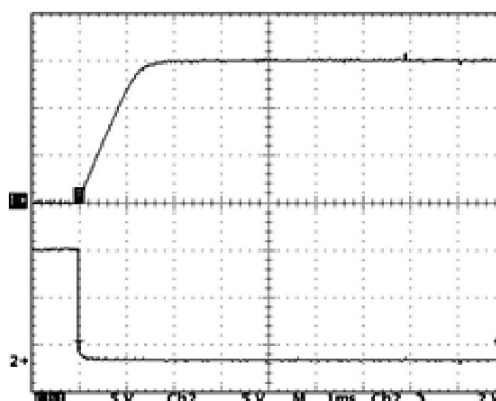
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

Capacitive loading and start up

Typical start up times for this series, with a typical input voltage rise time of 2.2s and output capacitance of 10F, are shown in the table below. The product series will start into a capacitance of 47F with an increased start time, however, the maximum recommended output capacitance is 10F.

	Start-up time
	μ s
3B0505XM	790
3B0509XM	1154
3B0512XM	2265
3B0515XM	2998
3B1205XM	396
3B1209XM	880
3B1212XM	1156
3B1215XM	2394

Typical Start-Up Wave Form



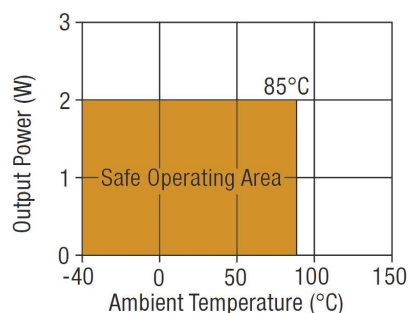
General Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	5V input types		90		kHz
	12V input types		90		kHz

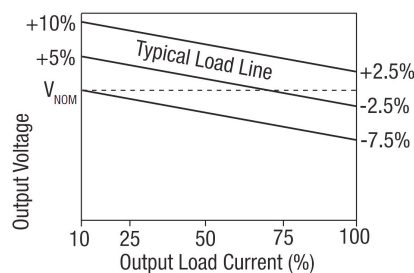
Temperature Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types	-40		85	°C
Storage		-50		130	
Case temperature above ambient	5V output types			45	
	All other output types			36	
Cooling	Free air convection				

Temperature derating graph



Tolerance envelope



The voltage tolerance envelope shows typical load regulation characteristics for this product series. The tolerance envelope is the maximum output voltage variation due to changes in output loading.

OUTPUT RIPPLE REDUCTION

Output ripple reduction

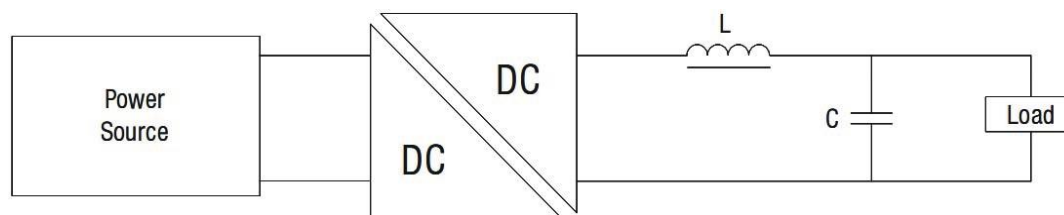
By using the values of inductance and capacitance stated, the output ripple at the rated load is lowered to 5mV p-p max.

Component selection

Capacitor: Ceramic chip capacitors are recommended. It is required that the ESR(Equivalent Series Resistance) should be as low as possible. X7R types are recommended.

The voltage rating should be at least twice(except for 15V output), the rated output voltage of the DC/DC converter.

Inductor: The rated current of the inductor should not be less than of the output of the DC/DC converter. At the rated current, the DC resistance of the inductor should be such that the voltage drop across the inductor is <2% of the rated voltage of the DC/DC converter. The SRF(Self Resonant Frequency) should be >20MHz.



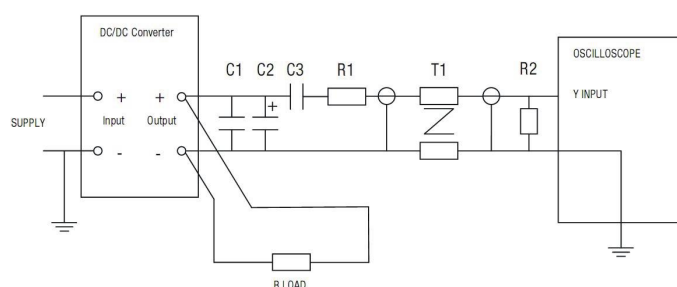
CHARACTERISATION TEST METHODS

Ripple & Noise Characterization Method

Ripple and noise measurements are performed with the following test configuration.

C1	1 μ F X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC/DC converter
C2	10 μ F tantalum capacitor, voltage rating to be a minimum of 1.5 times the output voltage of the DC/DC converter with an ESR of less than 100m Ω at 100 KHz
C3	100nF multilayer ceramic capacitor, general purpose
R1	450 Ω resistor, carbon fi 1m, $\pm$ 1% tolerance
R2	50 Ω BNC termination
T1	3T of the coax cable through a ferrite toroid
RLOAD	Resistive load to the maximum power rating of the DC/DC converter. Connections should be made via twisted wires
Measured values are multiplied by 10 to obtain the specified values.	

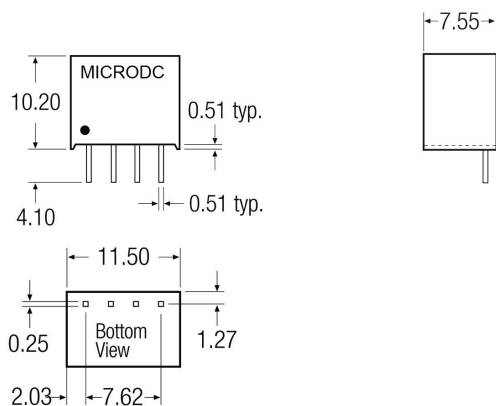
Differential Mode Noise Test Schematic



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS

SIP Package



All dimensions in inches ± 0.01 (mm ± 0.25 mm).

All pins on a 0.1(2.54) pitch and within ± 0.01 (0.25) of true position.

Weight: 2.0g

FOOTPRINT DETAILS

PIN CONNECTIONS-4 PIN SIP

PIN	Function		"N" SUFFIX
1	-Vin		+Vin
2	+Vin		-Vin
3	-Vout		-Vout
4	+Vout		+Vout

Specifications can be changed any time without notice.

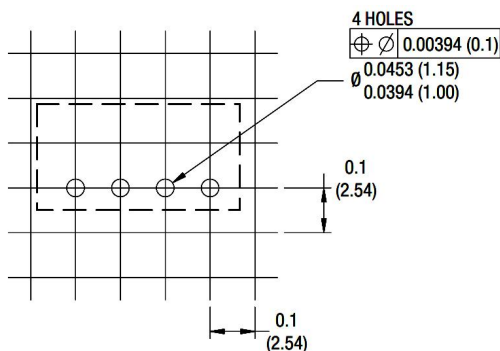
No parallel connection or plug and play.

Note:

1. The load shouldn't be less than 10%, otherwise ripple will increase dramatically.
2. Operation under 10% load will not damage the converter; However, they may not meet all specification listed.
3. All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on corporate standards.

RECOMMENDED FOOTPRINT DETAILS

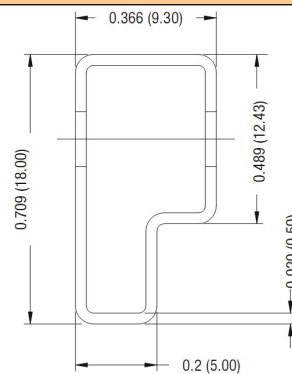
4 Pin SIP Package



Unless otherwise stated all dimensions in inches (mm) ± 0.5 mm.

TUBE OUTLINE DIMENSIONS

4 PIN SIP Tube



Unless otherwise stated all dimensions in inches (mm) ± 0.5 mm.

Tube length (4 Pin SIP) : 20.47 (520mm ± 2 mm).

Tube Quantity :35