

FEATURES

- ◆RoHS compliant
- ◆Efficiency up to 80%
- ◆Power density up to 0.9W/cm³
- ◆Wide temperature performance at full 1 Watt load, -40°C to 85 °C
- ◆Twin independent outputs
- ◆UV 94V-0 package material
- ◆No heatsink required
- ◆Footprint from 1.17cm²
- ◆Industry standard pinout
- ◆Power sharing on output
- ◆Input/output isolation 1KVDC
- ◆3.3V,5V,9V,12V and 15V output
- ◆Internal SMD construction
- ◆Fully encapsulated with toroidal Magnetics
- ◆No external components required
- ◆MTTF up to 1.6 million hours
- ◆PCB mounting
- ◆Custom solutions available

MODEL SELECTION

D^①05^②05^③05^④X^⑤N^⑥S^⑦

- ① Product Series
- ② Input Voltage
- ③ Output Voltage1
- ④ Output Voltage2
- ⑤ Fixed Input
- ⑥ -Vout&+Vout
- ⑦ SIP Package

APPLICATIONS

The D-XN(S)D series of DC/DC converters are ideally suited to applications where a potential difference exists between loads, e.g. Motor control circuits. The twin outputs offer cost and space savings by consolidating two DC/DC converters into one package. All of the rated power may be drawn from a single output provided the total load does not exceed 1 watt.



SELECTION GUIDE

| Order code | Input Voltage (V) | Output Voltage1 (V) | Output Voltage2 (V) | Output Current1 (mA) | Output Current2 (mA) | Efficiency (%) | MTTF ¹ (KHRS) |
|------------|-------------------|---------------------|---------------------|----------------------|----------------------|----------------|--------------------------|
| D050503XND | 5 | 5 | 3.3 | 100 | 152 | 70 | 1615 |
| D050505XND | 5 | 5 | 5 | 100 | 100 | 70 | 1615 |
| D050509XND | 5 | 5 | 9 | 100 | 56 | 80 | 669 |
| D050512XND | 5 | 5 | 12 | 100 | 42 | 80 | 339 |
| D050515XND | 5 | 5 | 15 | 100 | 34 | 80 | 187 |
| D050503XNS | 5 | 5 | 3.3 | 100 | 152 | 70 | 1615 |
| D050505XNS | 5 | 5 | 5 | 100 | 100 | 70 | 1615 |
| D050509XNS | 5 | 5 | 9 | 100 | 56 | 80 | 669 |
| D050512XNS | 5 | 5 | 12 | 100 | 42 | 80 | 339 |
| D050515XNS | 5 | 5 | 15 | 100 | 34 | 80 | 187 |
| D120505XND | 12 | 5 | 5 | 100 | 100 | 70 | 489 |
| D120509XND | 12 | 5 | 9 | 100 | 56 | 80 | 343 |
| D120512XND | 12 | 5 | 12 | 100 | 42 | 80 | 229 |
| D120515XND | 12 | 5 | 15 | 100 | 34 | 80 | 148 |
| D120505XNS | 12 | 5 | 5 | 100 | 100 | 70 | 489 |
| D120509XNS | 12 | 5 | 9 | 100 | 56 | 80 | 343 |
| D120512XNS | 12 | 5 | 12 | 100 | 42 | 80 | 229 |
| D120515XNS | 12 | 5 | 15 | 100 | 34 | 80 | 148 |
| D240505XNS | 24 | 5 | 5 | 100 | 100 | 81 | 395 |
| D240509XNS | 24 | 5 | 9 | 100 | 56 | 82 | 289 |
| D240512XNS | 24 | 5 | 12 | 100 | 42 | 84 | 186 |
| D240515XNS | 24 | 5 | 15 | 100 | 34 | 84 | 150 |
| D240505XND | 24 | 5 | 5 | 100 | 100 | 81 | 395 |
| D240509XND | 24 | 5 | 9 | 100 | 56 | 82 | 289 |
| D240512XND | 24 | 5 | 12 | 100 | 42 | 84 | 186 |
| D240515XND | 24 | 5 | 15 | 100 | 34 | 84 | 150 |

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 | V |
| | Continuous operation, 24V input types | 21.6 | 24 | 26.4 | V |

ABSOLUTE MAXIMUM RATINGS

| Parameter | Conditions |
|---|------------|
| Short-circuit protection ² | 1 second |
| Lead temperature 1.5mm from case for 10 seconds | 300° C |
| Input voltage VIN, D05 types | 7V |
| Input voltage VIN, D12 types | 15V |

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.

OUTPUT CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|------------------------------|--|------|------|------|-------|
| Rated Power ¹ | TA=-40° C to 120° C | | | 1 | W |
| Voltage Set Point Accuracy | See tolerance envelope | | | | |
| Line regulation | D050503XN(S)D (High Vin to low Vin) | | 1.0 | 1.25 | %% |
| | All other variants (High Vin to low Vin) | | 1.0 | 1.20 | %% |
| Load regulation ² | 10% load to rated load,3.3V output types | | | 15 | % |
| | 10% load to rated load,5V output types | | | 15 | % |
| | 10% load to rated load,9V output types | | | 10 | % |
| | 10% load to rated load,12V output types | | | 10 | % |
| | 10% load to rated load,15V output types | | | 10 | % |
| Ripple and Noise | BW=DC to 20MHz,All output types | | | 75 | mVp-p |

ISOLATION CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|------------------------|---------------------------|------|------|------|-------|
| Isolation test voltage | Flash tested for 1 second | 1000 | | | VDC |
| Resistance | Viso=500VDC | 1 | | | GΩ |

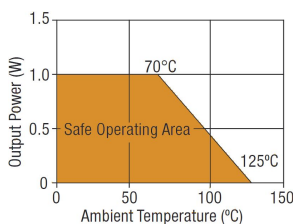
GENERAL CHARACTERISTICS

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---------------------|-----------------|------|------|------|-------|
| Switching frequency | All input types | | 100 | | kHz |

TEMPERATURE CHARACTERISTICS

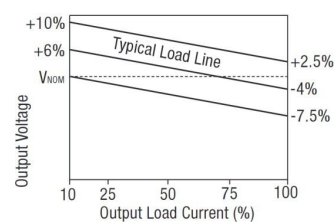
| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---------------|---------------------|------|------|------|-------|
| Specification | All output types | 0 | | 70 | °C |
| Storage | | -55 | | 150 | °C |
| Cooling | Free air convection | | | | |

TEMPERATURE DERATING GRAPH



TOLERANCE ENVELOPE

D-XN(S)D



1. See derating graph.
2. See derating curve.
All specifications typical at TA=25° C, nominal input voltage and rated output current unless otherwise specified. Another 24V & 48V products, please inquire Our technical department!

TECHNICAL NOTES

ISOLATION VOLTAGE

"Hi Pot Test", "Flash Tested", "Withstand Voltage", "Dielectric Withstand Voltage" & " Isolation Test Voltage" are all terms that relate to the same thing, a test voltage. Applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation. Professional Power Module D-XN(S)D series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1KVDC for 1 second.

A question commonly asked is, "What is the continuous voltage that can be applied across the part in normal operation?"

For a part holding no specific agency approvals, such as the D-XN(S)D series ,both input and output should normally be maintained within SELV limits i.e. less than 42.4V peak, or 60VDC. The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with several hundred volts offset applied continuously across the isolation barrier, but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

REPEATED HIGH-VOLTAGE ISOLATION TESTING

It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials. Construction and environment. The D-XN(S)D series has toroidal isolation transformers, with no additional insulation between primary and secondary windings of enameled wire. While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation. Any material, including this enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing. but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

This consideration equally applies to agency recognized parts for better than functional isolation where the wire enamel insulation is always supplemented by a further insulation system of physical spacing or barriers.

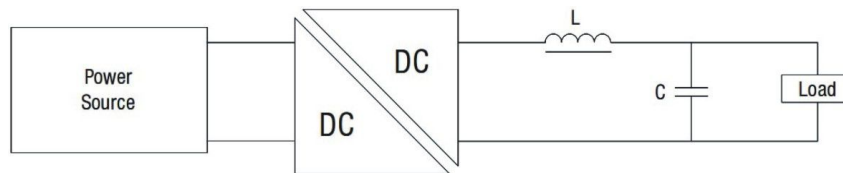
OUTPUT RIPPLE REDUCTION

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.



OUTPUT RIPPLE REDUCTION

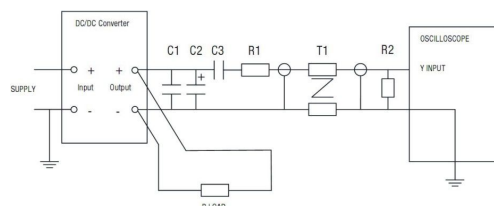
Ripple & Noise Characterisation Method

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

| | |
|-------|--|
| C1 | 1uF X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC/DC converter |
| C2 | 10uF 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 100mΩ at 100 KHz |
| C3 | 100nF multilayer ceramic capacitor, general purpose |
| R1 | 450 Ω resistor, carbon film, ±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 | | PIN CONNECTIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-------------|--|----------------------------|--|---------------------------|--|-----|----------|-----|----------|---|-----|---|------|---|----|---|-----|---|--------|---|--------|---|--------|---|--------|----|--------|---|--------|----|--------|---|--------|----|------|--|--|--|
| DIP package | SIP package | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th colspan="2">PIN CONNECTIONS-14 PIN DIP</th> <th colspan="2">PIN CONNECTIONS-7 PIN SIP</th> </tr> <tr> <th>pin</th> <th>Function</th> <th>pin</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>GND</td> <td>1</td> <td>+VIN</td> </tr> <tr> <td>7</td> <td>NC</td> <td>2</td> <td>GND</td> </tr> <tr> <td>8</td> <td>+VOUT2</td> <td>4</td> <td>-VOUT1</td> </tr> <tr> <td>9</td> <td>-VOUT2</td> <td>5</td> <td>+VOUT1</td> </tr> <tr> <td>10</td> <td>+VOUT1</td> <td>6</td> <td>-VOUT2</td> </tr> <tr> <td>11</td> <td>-VOUT1</td> <td>7</td> <td>+VOUT2</td> </tr> <tr> <td>14</td> <td>+VIN</td> <td></td> <td></td> </tr> </tbody> </table> <p>NC - Not available for electrical connection.</p> | PIN CONNECTIONS-14 PIN DIP | | PIN CONNECTIONS-7 PIN SIP | | pin | Function | pin | Function | 1 | GND | 1 | +VIN | 7 | NC | 2 | GND | 8 | +VOUT2 | 4 | -VOUT1 | 9 | -VOUT2 | 5 | +VOUT1 | 10 | +VOUT1 | 6 | -VOUT2 | 11 | -VOUT1 | 7 | +VOUT2 | 14 | +VIN | | | |
| PIN CONNECTIONS-14 PIN DIP | | PIN CONNECTIONS-7 PIN SIP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| pin | Function | pin | Function | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | GND | 1 | +VIN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | NC | 2 | GND | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | +VOUT2 | 4 | -VOUT1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | -VOUT2 | 5 | +VOUT1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | +VOUT1 | 6 | -VOUT2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | -VOUT1 | 7 | +VOUT2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | +VIN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>All dimensions in inches ± 0.01(mm± 0.25mm). All pins on a 0.1(2.54) pitch and within ± 0.01(0.25) of true position.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RECOMMENDED FOOTPRINT DETAILS

| 14 Pin DIP Package | 7 Pin SIP Package |
|--|-------------------|
| | |
| <p>Unless otherwise stated all dimensions in inches ± 0.01(mm ± 0.25mm).</p> | |

TUBE OUTLINE DIMENSIONS

| 14 Pin DIP Tube | 7 Pin SIP Tube |
|---|----------------|
| | |
| <p>Unless otherwise stated all dimensions in inches ± 0.02(mm ± 0.5mm). Tube length (14 Pin DIP) : 20.47 (520mm ± 2mm). Tube length (7 Pin SIP) : 20.47 (520mm ± 2mm). Tube Quantity :25</p> | |



RoHS COMPLIANT INFORMATION

This series is compatible with RoHS soldering systems with a peak wave solder temperature of 300°C for 10 seconds. The pin termination finish on the SIP package type is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The DIP types are Matte Tin over Nickel Preplate. Both types in this series are backward compatible with Sn/Pb soldering systems.



REACH COMPLIANT INFORMATION

This series has proven that this product does not contain harmful chemicals, it also has harmful chemical substances through the registration, inspection and approval.