# DBW SERIES

**10W 8:1 DC-DC Converter**


## ■ FEATURES

- **DIP 1“x 1” package with standard pinout**
- **8:1 Wide input range**
- **High efficiency up to 88%**
- **No minimum load required**
- **No external components required internal filtering**
- **Power saving load for high efficiency at light load**
- **Overload protection & UVLO**
- **3000Vdc I/O isolation**
- **Low cost**

## ■ APPLICATIONS

- **Automation equipment**
- **Power supplies**
- **Industrial PC**
- **Data communications**
- **Distributed power system**

## ■ DESCRIPTION

DBW series is a 10W DC-DC converter product with 1”x1” standard industrial package. It contains 8:1 extra wide input voltage range, and features high efficiency up to 88%, 3000Vdc isolation voltage between input and output, and wide working temperature range from –40ºC up to +85ºC with no additional heat-sink. The models meet radiated Class A of EN55032 without external components, and suit all kinds of systems like industrial control, automation field, and so on.

| DBW | S | - | 24 | 05 | E | R |
|---|---|---|---|---|---|---|
| **Series Name** | **Output Quantity** | | **Input Voltage** | **Output Voltage** | **Input Range** | **Function** |
| | S : Single<br>D : Dual | | 24 : 9~75V | 03.3 : 3.3V<br>05 : 5V；±5V<br>09 : 9V<br>12 : 12V；±12V<br>15 : 15V；±15V<br>24 : 24V | E: 8:1 , 3KVdc Isolation | Blank : No Pin<br>R : Remote On/Off |

## ■ 8:1 MODEL SELECTION TABLE

| MODEL NUMBER | INPUT | | | | OUTPUT | | EFF. (%) | CAPACITOR LOAD (Max.) |
|---|---|---|---|---|---|---|---|---|
| | VOLTAGE (VDC) | | CURRENT (mA) | | VOLTAGE (VDC) | CURRENT (mA) | | |
| | NOMINAL | RANGE | NO LOAD | FULL LOAD | | | | |
| **DBWS-2403.3ER** | 24 | 9~75 | 10 | 503 | 3.3 | 0~3000 | 82 | 680uF |
| **DBWS-2405ER** | | | 10 | 484 | 5 | 0~2000 | 86 | 680uF |
| **DBWS-2409ER** | | | 10 | 485 | 9 | 0~1100 | 85 | 470uF |
| **DBWS-2412ER** | | | 10 | 478 | 12 | 0~833 | 87 | 330uF |
| **DBWS-2415ER** | | | 10 | 473 | 15 | 0~666 | 88 | 220uF |
| **DBWS-2424ER** | | | 10 | 478 | 24 | 0~417 | 87 | 100uF |
| **DBWD-2405ER** | 24 | 9~75 | 10 | 484 | ±5 | ±0~1000 | 86 | ±330uF |
| **DBWD-2412ER** | | | 10 | 478 | ±12 | ±0~417 | 87 | ±150uF |
| **DBWD-2415ER** | | | 10 | 473 | ±15 | ±0~333 | 88 | ±100uF |

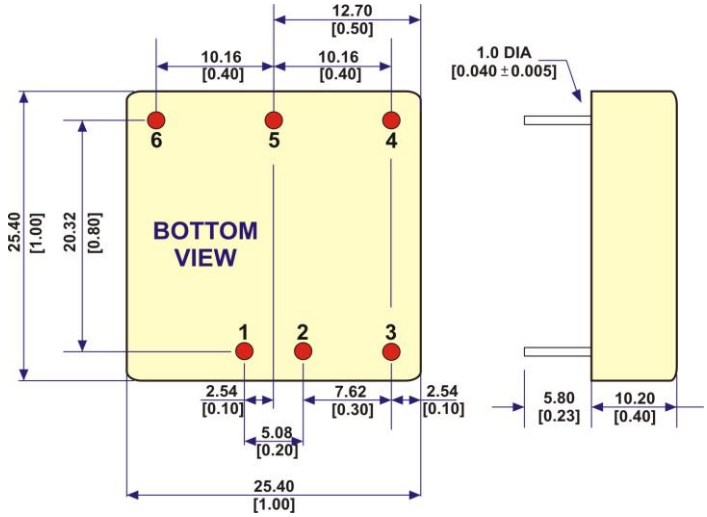
**Note: Efficiency and input current are measured at nominal input voltage and full load.**

**Other input to output voltages may be available. Please contact factory.**

## ■ SPECIFICATION

| | | | | |
|---|---|---|---|---|
| | Voltage Range | 9~75V | | |
| | Surge Voltage(100ms max.) | 24Vin models : 100Vdc | | |
| | Filter | Pi network | | |
| | Remote Control | See page 4 | | |
| | Under Voltage Lockout | Start-up voltage：8.8 Vdc | | |
| | | Shutdown voltage：8 Vdc | | |
| | Protection | Fuse recommended (see page 7) | | |
| **OUTPUT** | Voltage Accuracy | ±2% max. | | |
| | Rated Power | 10W | | |
| | Ripple & Noise[1] | 150mVp-p max. | | |
| | Line Regulation[2] | ±0.5% | | |
| | Load Regulation[3] | ±0.5% | ±1% for 3.3Vdc & ±5Vdc output | |
| | Cross Regulation | ±5% | Dual：asymmetrical load 25%/100% FL | |
| | Switching Frequency | 300KHz typ.( PWM ) | | |
| | External Trim Adj. Range | ±10% typ. | | |
| **PROTECTION** | Short Circuit | Protection type : continuous, recovery | | |
| | Overload | 110%~230% | | |
| | | Protection type : recovers automatically after fault condition is removed | | |
| | Over Voltage | Clamp by TVS diode | | |
| **ENVIRONMENT** | Cooling | Free-air convection | | |
| | Working Temperature | -40~ +85°C (refer to “Derating Curve”) | | |
| | Case Temperature | +110 °C max. | | |
| | Working Humidity | 5% ~ 95% RH non-condensing | | |
| | Storage Temp., Humidity | -55 ~ +125°C, 10 ~ 95% RH non-condensing | | |
| | Temperature Coefficient | ±0.05% / °C | | |
| | Soldering Temperature | 1.5mm from case of 3~5 sec./265°C(max.) | | |
| | Vibration | 10~500Hz, 2G 10min./1cycle, period for 60 min. each along X, Y, Z axes | | |
| **SAFETY & EMC** | Isolation Voltage | I/P-O/P：3KVdc | | |
| | Isolation Resistance | I/P-O/P : 1000M Ohms / 500VDC / 25°C / 70% RH | | |
| | Isolation Capacitance | 1000pF typ. | | |
| | EMC Emission | **Parameter** | **Standard** | **Test Level / Note** |
| | | Conducted | EN55032(CISPR32) | N/A |
| | | Radiated | EN55032(CISPR32) | Class A |
| | EMC Immunity | **Parameter** | **Standard** | **Test Level / Note** |
| | | ESD | BS IEC 61000-4-2 | Contact ±4KV |
| | | Radiated Susceptibility | BS IEC 61000-4-3 | 3V/m |
| | | EFT/Burst | BS IEC 61000-4-4 | ±0.5KV |
| | | Surge | BS IEC 61000-4-5 | Line-Line ±0.5KV |
| | | Conducted | BS IEC 61000-4-6 | 3Vrms |
| | | Magnetic field immunity | BS IEC 61000-4-8 | 1A/m |
| **OTHERS** | MTBF[4] | >880,000Hours | | |
| | Weight | 20.0g typ. | | |
| | Dimension(L*W*H) | 25.4mm*25.4mm*10.2mm | | |
| | Case Material | Five-side shielded case | | |
| **NOTE** | **[1] Ripple & noise are measured at 20MHz BW with 1uF ceramic capacitor connect to the output pins.**<br>**[2] High line to low line.**<br>**[3] Load regulation is for output load current change from 0% to 100%.**<br>**[4] MIL-HDBK-217F @25 °C, Ground Benign.**<br>***All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.** | | | |

## MECHANICAL SPECIFICATION




| PIN CONNECTION | | |
|---|---|---|
| PIN | SINGLE | DUAL |
| 1 | +Vin | +Vin |
| 2 | -Vin | -Vin |
| 3 | Remote / NP* | |
| 4 | -Vout | -Vout |
| 5 | Trim / NP** | Common |
| 6 | +Vout | +Vout |

All dimensions are in mm[Inches]

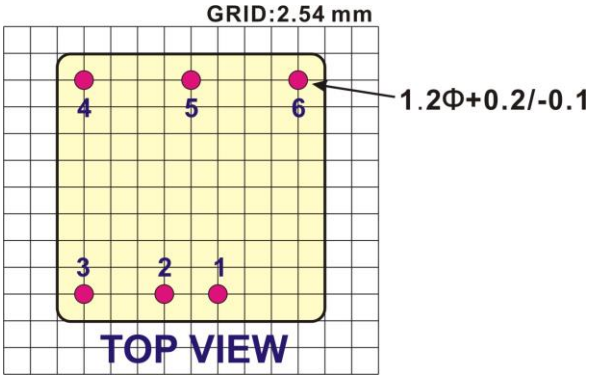
NP：No pin

*If Remote is not selected, there is no pin on corresponding number.

**Single output for 24V: PIN 5 = NP

Pin size is 1.0Φ ±0.10mm

Tolerance .X or .XX= ±0.5mm

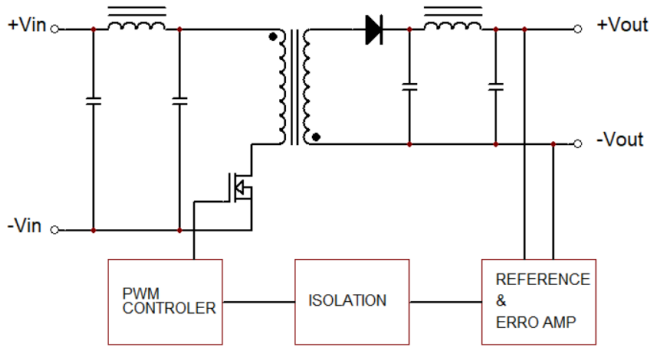



## REMOTE ON/OFF CONTROL

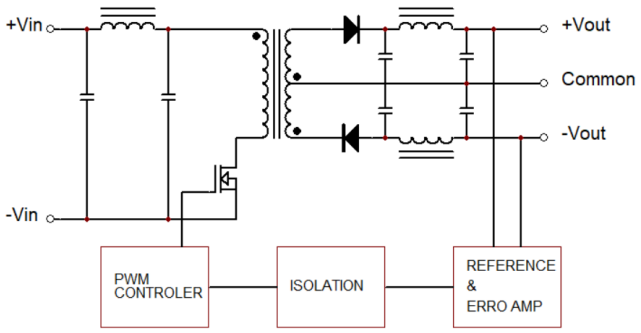
| Remote On/Off Control | | | |
|---|---|---|---|
| Control Input | PIN3 | Control Common | PIN2 |
| Control Voltage | | Converter Shutdown Idle Current | 10mA |
| ON | > 4 ~ 30VDC or Open Circuit | Logic Compatibility | CMOS or Open Collector TTL |
| OFF | < 1.0VDC or Jumper to PIN2 | | |

## ■ SIMPLIFIED SCHEMATIC

**Single output**



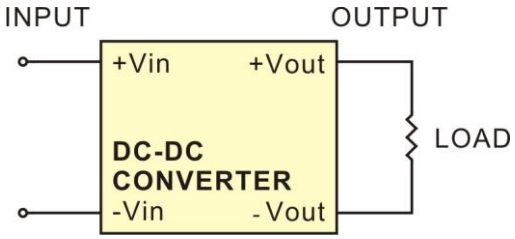

**Dual output**




## ■ TYPICAL APPLICATIONS

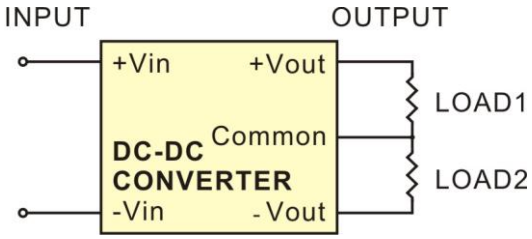
**Single output**

**FIXED VOLTAGE OUTPUT**

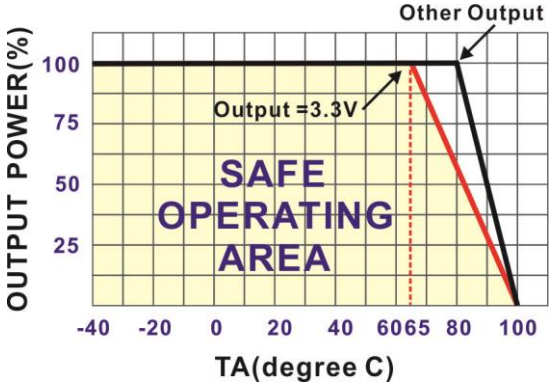



**Dual output**

**FIXED VOLTAGE OUTPUT**

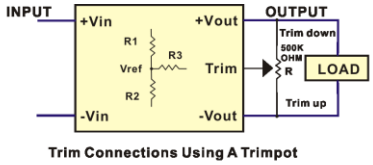



## ■ DERATING CURVE

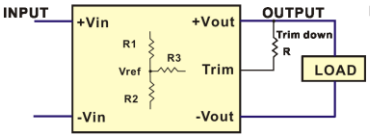


## ■ EXTERNAL OUTPUT TRIMMING

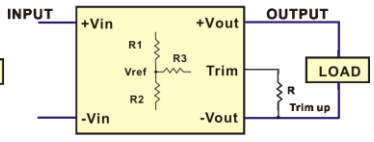
**Trim up and trim down resistor values**




Trim Connections Using A Trimpot




Fixed-ValueTrim Down Resistor




Fixed-ValueTrim Up Resistor

| Vout | R1(KΩ) | R2(KΩ) | R3(KΩ) | Vref |
|---|---|---|---|---|
| 5 | 1 | 1 | 3.9 | 2.5 |
| 12 | 3.83 | 1 | 7.5 | 2.5 |
| 15 | 7.5 | 1.5 | 11 | 2.5 |

Trim-down:

A=[(Vo'-Vref)/Vref] *R2

RT-down=[(A*R1)/(R1-A)]-R3

Trim-up:

A=[Vref/(Vo'-Vref) ]*R1

RT-up=[(A*R2)/(R2-A)]-R3

For example :

Vout=12V

Trim=+/-10% ( 13.2V / 10.8V)=Vo'

trim=-10% (-10.8v)=Vo'

Trim-down:

A=[(Vo'-Vref)/Vref] *R2

=[(10.8-2.5)/2.5]*1

=3.32

RT-down=[(A*R1)/(R1-A)]-R3

=[(3.32*3.83)/(3.83-3.32)]-7.5

=(12.715/0.51)-7.5

=24.931-7.5

=17.431KΩ

trim=+10% (+13.2V)=Vo'

Trim-up:

A=[Vref/(Vo'-Vref) ]*R1

= [2.5/(13.2-2.5)]*3.83

=0.894

RT-up=[(A*R2)/(R2-A)]-R3

=[(0.894*1)/(1-0.894)]-7.5

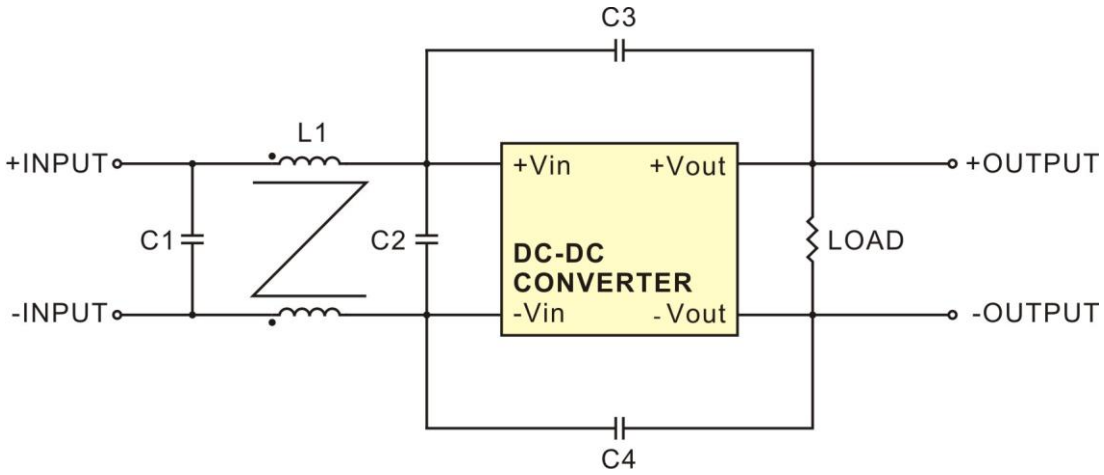
=(0.894/0.106)-7.5

=8.433-7.5

=0.933KΩ

## ■ RECOMMENDED FILTER FOR EN55032 CLASS B

The components used in the under figure, together with the manufacturer's part numbers for these components, are as follows:



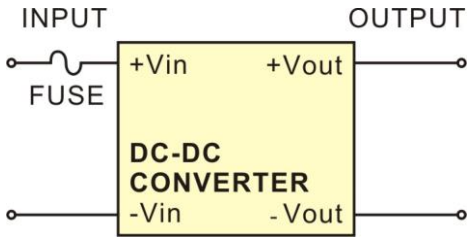

| MODEL NUMBER | C1 | C2 | C3 | C4 | L1 |
|---|---|---|---|---|---|
| **DBWX-24XXER** | 2.2uF/100V MLCC | X | X | X | 500uH Common Choke |

***Note: All of capacitors are ceramic capacitors.***

## ■ INPUT FUSE SELECTION GUIDE

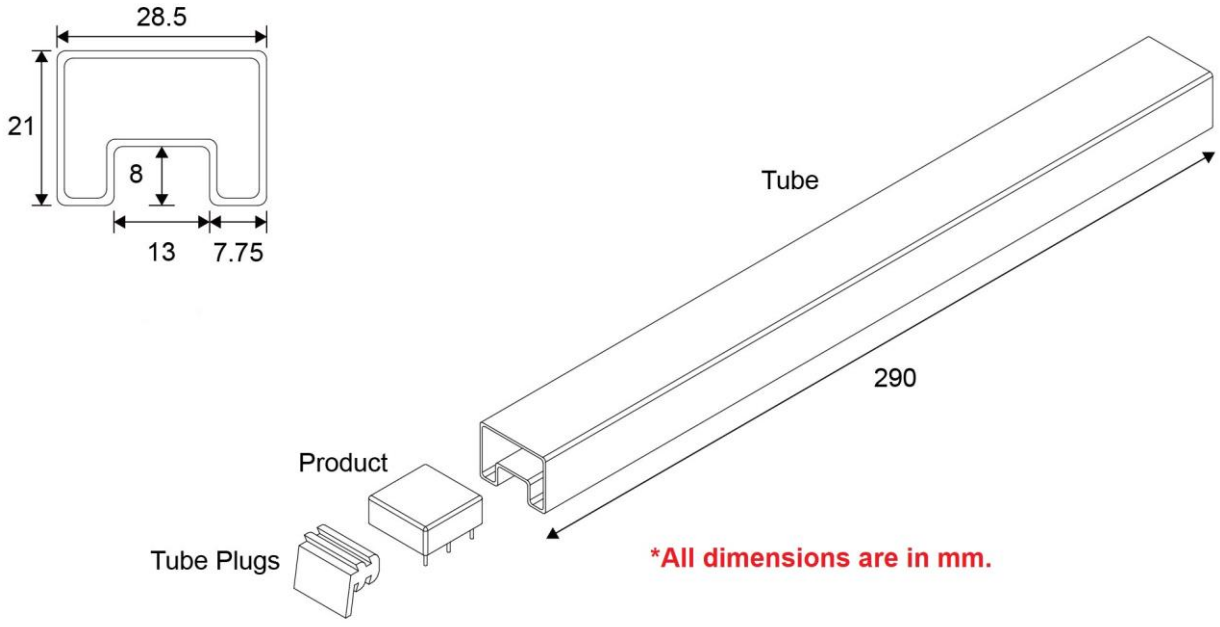
**9-75V Input Voltage (Vdc)**

**3000mA Slow-Blow Type**




**Note: Certain applications may require the installation of external fuse in front of the input.**

## ■ PACKAGING INFORMATION




**Packaging Quantity: 10 pcs converter per tube**

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