GAPTEC®
GREEN TECHNOLOGY

60DDW Series

60W - Single Output - Wide Input - Isolated & Regulated
DIP DC-DC Converter

DC-DC Converter 60 Watt

- **High efficiency up to 91%**
- **2:1 wide input voltage range**
- **Isolation voltage 1500VDC**
- **Six-sided metal shield**
- **Short circuit protection (SCP) (automatic recovery)**
- **Operating temperature: -40°C to +85°C**
- **Over temperature protection**
- **Industry standard pinout**
- **Under voltage lockout**

The 60DDW series offers 60W of output, wide input voltage of 18-36VDC, 36-75VDC and features 1500VDC isolation, six-sided metal shield over current and short circuit protection.

All models are particularly suited to tele-communications, industrial, test equipments power etc.

Common specifications

Cooling:	Free air convection
Short circuit protection:	Continuous, auto-recovery
Operation temperature range:	-40°C~+85°C
Storage temperature range:	-55°C~+125°C
Case temperature:	105°C MAX
Lead temperature range:	265°C MAX, 1.5mm from case for 10 sec
Switching frequency (PWM mode):	300kHz TYP
Humidity:	non-condensing, 95% MAX
Case material:	Black coated copper (or nickel coated) with non-conductive Bbase
Potting material:	Epoxy (UL94V-0 rated)
MTBF (MIL-HDBK-217F @25°C)*:	>110,000 hours
Weight:	70g

* BELLCORE TR-NWT-000332. Case 1: 50% Stress, Temperature at 40°C MIL-STD-217F Notice2 @Ta=25 °C, Full load (Ground, Benign, controlled environment)

Input specifications

Item	Test condition	Min	Typ	Max	Units
Start-up voltage / under voltage lockout	• 24Vin • 48Vin		17.3/16.8 34/32		VDC VDC
Surge voltage	100ms max. • 24Vin • 48Vin			50 100	 V V
Conducted noise*	EN 55022 level A, FCC part 15, level A with external capacitor				
Filter	Pi type				

* The 60DDW series can meet EN55022 Class A with parallel an external capacitor to the input pins.
Recommend:
24Vin : 4.7μF/50V X7R 1812 MLCC
48Vin : 2.2μF/100V X7R 1812 MLCC

Model selection:
WCTV_xxyyN##
W= Watt; **C=**Case; **T=** Type; **V=** Voltage Variation (omitted ± 10%);
xx= Vin; **yy=** Vout; **N=** Numbers of Output; **##=** Isolation (kVDC)

Example:
60DDW_2415S1.5
60= 60Watt; D= DIP; D= series; W= wide input (4:1) 18-36Vin; 15Vout; S= single output; 1.5= 1500VDC

Output specifications

Item	Test condition	Min	Typ	Max	Units
Voltage tolerance				±2	%
Output voltage adjustment[1]				±10	%
Line regulation	Vin min. to Vin max.			±0.5	%
Load regulation	+Vin Short to +Sense, -Vin Short to -Sense			±0.5	%
Cross variation	25% / 100% (Dual output)			±5	%
Ripple and noise[2]	20MHz Bandwidth			100	mV
Start-up time	nominal Vin and constant resistive load		25		ms
Transient response time	25% load step change		300		μs
Over load protection	Input voltage range		150		%Io
Over voltage protection	• 3.3VDC • 5VDC • 12VDC • 15VDC		3.9 6.2 15 18		V V V V
Remote ON/OFF[3]	• ON • OFF • Off idle current	Open Short to -Vin		2.5	 mA

1) Maximum output deviation is 10% inclusive of remote sense and trim. If remote sense is not being used, the +sense should be connected to its corresponding +OUTPUT and likewise the –sense should be connected to its corresponding -OUTPUT.
2) Test ripple and noise by "parallel cable" method. Typical value at nominal input voltage and no load.
3) The ON/OFF control pin voltage is referenced to -Input. (Leave open if not used.)

Isolation specifications

Item	Test condition	Min	Typ	Max	Units
Isolation voltage	Input/Output, tested for 1 minute			1500	VDC
Isolation resistance	Input/Output	1000			MΩ
Isolation capacitance	Input/Output			2500	pF

Note:
1. Input voltage can't exceed this value, or will cause the permanent damage.
2. The load shouldn't be less than 5%, otherwise ripple will increase dramatically.
3. Max. Capacitive Load is tested on Vin-nominal and full load.
4. All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
5. In this datasheet, all the test methods of indications are based on corporate standards.
6. Only typical models listed, other models may be different, please contact our technical person for more details.
7. Specifications subject to change without notice.

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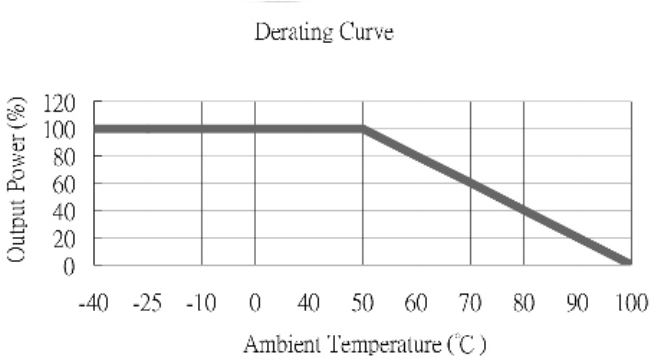
DIP DC-DC Converter

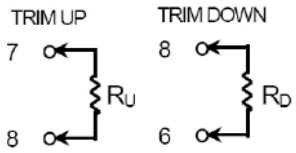
Part Number	Input Voltage Range [VDC]	Input current [mA, typ] no load	full load	Output Voltage [VDC]	Output Current [mA]	Efficiency [%, Typ.]	Capacitive load [µF, max.]
60DDW_2403S1.5	18-36	70	2162	3.3	14000	89	28800
60DDW_2405S1.5	18-36	120	2777	5	12000	90	15000
60DDW_2412S1.5	18-36	30	2777	12	5000	90	2800
60DDW_2415S1.5	18-36	30	2777	15	4000	90	1800
60DDW_4803S1.5	36-75	60	1081	3.3	14000	89	28800
60DDW_4805S1.5	36-75	70	1388	5	12000	90	15000
60DDW_4812S1.5	36-75	25	1388	12	5000	90	2800
60DDW_4815S1.5	36-75	25	1388	15	4000	90	1800

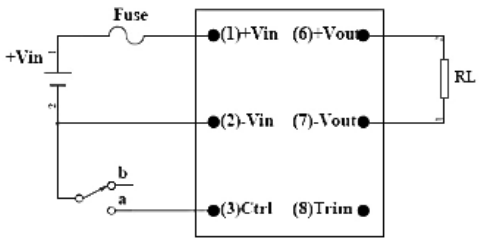
Typical characteristics

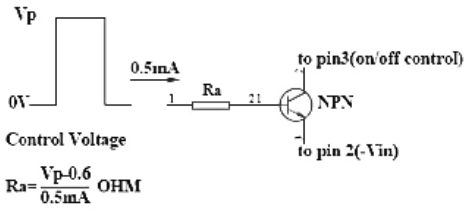


Output voltage adjustment, Control PIN suggest circuit

Output can be externally trimmed by using the method shown below.

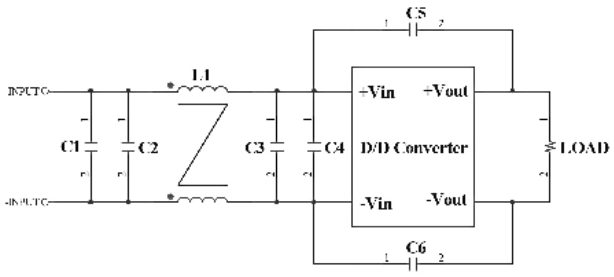




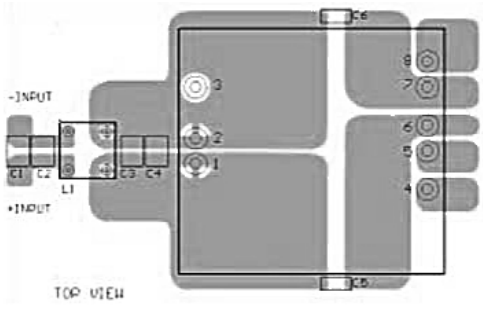


When pin3 short to pin2,D/D ON=>OFF
When pin3 leave open,D/D => ON

EMC considerations



Suggested Schematic to comply with Conducted Noise according to EN55022 Class B



Recommended Layout with input Filter

Following components are needed to comply with EN55022 Class B conducted noise:

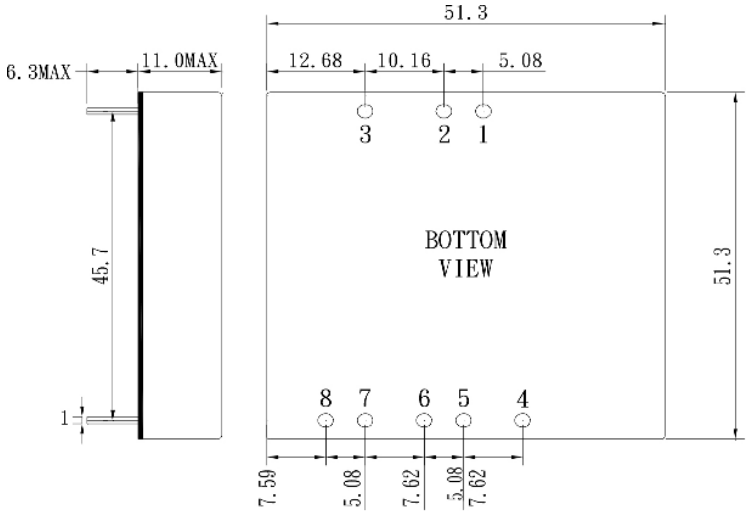
60DDW_24xx

Component	Value	Voltage	Reference
C1, C3	4.7µF	50V	1812 MLCC
C5, C6	1000pF	2KV	1206 MLCC
L1	450µH		Common mode choke

60DDW_48xx

Component	Value	Voltage	Reference
C1, C2, C3, C4	2.2µF	100V	1812 MLCC
C5, C6	1000pF	2KV	1206 MLCC
L1	830µH		Common mode choke

Mechanical dimensions



Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.05mm [±0.002inch]
General tolerances: ±0.25mm [±0.010inch]

PIN connection								
PIN	1	2	3	4	5	6	7	8
Single	+Vin	-Vin	Ctrl	-Sense	+Sense	+Vout	-Vout	Trim