



60W 2"x1" Package Reliable Railway DC-DC Converter **RSDW60 & RDDW60** series



■ Features

- Compliance with EN50155 railway standard
- 2"x1" compact size with low profile(10.5mm)
- 4:1 wide input range
- Wide operating temperature range -40 ~ +85°C
- No minimum load required
- Full encapsulated
- Protections: Short circuit (Continuous) / Overload / Over voltage / Over temperature / Input under voltage lock-out
- 1.6KVDC,3KVDC I/O isolation by models
- Remote ON/OFF control
- 3 years warranty

■ Applications

- Bus, tram, metro or railway system
- Telecom/datacom system
- Wireless network
- Industrial control facility
- Instrument
- Analyzer
- Highly vibrating, heavily dusty, extremely low or high temperature harsh environment

■ Description

RSDW60 and RDDW60 series are 60W module type DC-DC reliable railway converter with 2"x1" package. It features international standard pins, a high efficiency up to 92%, wide working temperature range -40~+85°C, 1.6KVDC(F/G models)/3KVDC(H models) I/P-O/P isolation voltage, compliance with EN50155 railway standard, continuous-mode short circuit protection, etc. The models account for different input voltage 9~36V, 18~75V and 40~160V 4:1 wide input range, and various output voltage, 3.3V/5V/12V/15V/24V/48V for single output and $\pm 12V/\pm 15V$ for dual outputs, which are suitable for railway, trams, buses and also can be used in the harsh environment with high vibration, high dust, extremely low or high temperature, etc.

■ Model Encoding

RSDW60H-12

- Output voltage (3.3/5/12/15/24/48Vdc , $\pm 12/\pm 15Vdc$)
- Input voltage (F: 9~36Vdc , G: 18~75Vdc , H: 40~160Vdc)
- Rated wattage
- Series name { S:Single output
D:Dual output

MODEL SELECTION TABLE							
ORDER NO.	INPUT			OUTPUT		EFFICIENCY (Typ.)	CAPACITOR LOAD (MAX.)
	INPUT VOLTAGE (RANGE)	INPUT CURRENT		OUTPUT VOLTAGE	OUTPUT CURRENT		
		NO LOAD	FULL LOAD				
RSDW60F-03	Normal 24V (9 ~ 36V)	15mA	1.9A	3.3V	12A	89%	28000μF
RSDW60F-05		15mA	2.85A	5V	12A	90%	28000μF
RSDW60F-12		15mA	2.85A	12V	5A	91%	5850μF
RSDW60F-15		15mA	2.85A	15V	4A	92%	3900μF
RSDW60F-24		15mA	2.85A	24V	2.5A	92%	2000μF
RDDW60F-12		15mA	2.85A	±12V	0 ~ ±2.5A	91%	*3900μF
RDDW60F-15		15mA	2.8A	±15V	0 ~ ±2.0A	91%	*2400μF
RSDW60G-03	Normal 48V (18 ~ 75V)	15mA	1A	3.3V	12A	89%	28000μF
RSDW60G-05		15mA	1.45A	5V	12A	91%	28000μF
RSDW60G-12		15mA	1.45A	12V	5A	92%	5850μF
RSDW60G-15		15mA	1.45A	15V	4A	92%	3900μF
RSDW60G-24		15mA	1.45A	24V	2.5A	92%	2000μF
RDDW60G-12		15mA	1.45A	±12V	0 ~ ±2.5A	90%	*3900μF
RDDW60G-15		15mA	1.45A	±15V	0 ~ ±2.0A	90%	*2400μF
RSDW60H-05	Normal 110V (40 ~ 160V)	10mA	630mA	5V	12A	89%	28000μF
RSDW60H-12		10mA	630mA	12V	5A	89%	5850μF
RSDW60H-24		10mA	610mA	24V	2.5A	89%	2000μF
RSDW60H-48		10mA	610mA	48V	1.25A	88.5%	390μF

* For each output

SPECIFICATION				
INPUT	VOLTAGE RANGE	F: 9~36Vdc , G: 18~75Vdc , H: 40~160Vdc		
	SURGE VOLTAGE (100ms max.)	24Vin models : 50Vdc, 48Vin models : 100Vdc, 110Vin models : 200Vdc		
	FILTER	Pi type		
	PROTECTION	Fuse recommended. 24Vin models: 12A delay time Type, 48Vin models: 6A delay time Type, 110Vin models: 3A delay time Type		
OUTPUT	VOLTAGE ACCURACY	± 1%		
	RATED POWER	60W		
	RIPPLE & NOISE Note.2	Single output models: 3.3Vo~5Vo: 100mVp-p, 12Vo~48Vo: 150mVp-p Dual output models: 125mVp-p		
	LINE REGULATION Note.3	Single output models: ±0.2%, Dual output models: ±0.5%		
	LOAD REGULATION Note.4	Single output models: ±0.5%, Dual output models: ±1%		
	CROSS REGULATION	±5% @ 25%~100% load for 24Vin/48Vin models		
	SWITCHING FREQUENCY (Typ.)	250KHz		
	EXTERNAL TRIM ADJ. RANGE (Typ.)	± 10% (Single output model only)		
PROTECTION	SHORT CIRCUIT	Protection type : Continuous, automatic recovery		
	OVERLOAD	125 ~ 210% rated output power		
		Protection type : Recovers automatically after fault condition is removed		
	OVER VOLTAGE	Protection type : Clamp by diode		
	OVER TEMPERATURE	Tcase temperature 110℃ max.		
	UNDER VOLTAGE LOCKOUT	24Vin: 8Vdc, 48Vin: 16Vdc, 110Vin: 34Vdc		
FUNCTION	REMOTE CONTROL	Power ON: R.C~-Vin >3~12Vdc or open circuit Power OFF: R.C~-Vin <1.2Vdc or short		
ENVIRONMENT	COOLING	Free-air convection		
	WORKING TEMP.	-40 ~ +85℃ (Refer to "Derating Curve")		
	CASE TEMPERATURE	+110℃ max.		
	WORKING HUMIDITY	20% ~ 90% RH non-condensing		
	STORAGE TEMP., HUMIDITY	-55 ~ +125℃, 10 ~ 95% RH non-condensing		
	TEMP. COEFFICIENT	0.05% / °C (0 ~ 55℃)		
	SOLDERING TEMPERATURE	1.5mm from case of 1 ~ 3sec./260℃ max.		
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes		
SAFETY & EMC (Note.5)	SAFETY STANDARDS	EAC TP TC 020/2011(EAC TP TC 004 for 48Vin/110Vin type only) approved		
	WITHSTAND VOLTAGE	24Vin / 48Vin models: I/P-O/P 1.6KVDC, 110Vin models: 3KVDC		
	ISOLATION RESISTANCE	I/P-O/P:1000M Ohms / 500VDC / 25℃ / 70% RH		
	ISOLATION CAPACITANCE (Typ.)	1500pF		
	EMC EMISSION	Parameter	Standard	Test Level / Note
		Conducted	BS EN/EN55032	Class A/B with external components (see page 6~7)
		Radiated	BS EN/EN55032	
	EMC IMMUNITY	Parameter	Standard	Test Level / Note
		ESD	BS EN/EN61000-4-2	Level 2, ±8KV air, ±6KV contact
		EFT/Burest	BS EN/EN61000-4-4	Level 1, ±2KV
		Surge	BS EN/EN61000-4-5	Level 1, ±2KV Line-Line
		Conducted	BS EN/EN61000-4-6	Level 2, 10V(e.m.f.)
Magnetic field		BS EN/EN61000-4-8	10A/m	
RAILWAY STANDARD		EN50155 / IEC60571 including EN61373 for shock & vibration, EN50121-3-2 for EMC		
OTHERS	MTBF	205Khrs MIL-HDBK-217F(25℃)		
	DIMENSION (L*W*H)	50.8*25.4*10.5mm (2*1*0.413 inch)		
	CASE MATERIAL	Metal Case		
	PACKING	F/G models: 37.6g, H models: 45g ; 18pcs/per tube, 288pcs/16 tube max./carton		
NOTE	1.All parameters are specified at normal input(F:24Vdc, G:48Vdc, H:110Vdc), rated load, 25℃ 70% RH ambient. 2.Ripple & noise are measured at 20MHz by using a 12" twisted pair terminated with a 0.1µf & 47µf capacitor. 3.Line regulation is measured from low line to high line at rated load. 4.Load regulation is measured from 0% to 100% rated load. 5.The final equipment must be re-confirm that it still meet EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies."(as available on http://www.meanwell.com) ※ Product Liability Disclaimer : For detailed information, please refer to https://www.meanwell.com/serviceDisclaimer.aspx			

External Output Trimming

In order to trim the voltage up or down one needs to connect the trim resistor either between the trim pin and -Vo for trim-up and between trim pin and +Vo for trim-down. The output voltage trim range is $\pm 10\%$. This is shown in Figures 1 and 2:

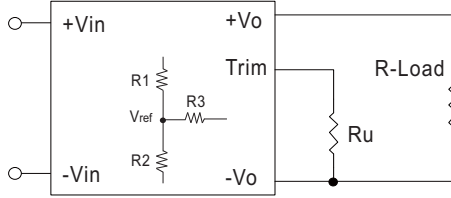


Figure 1. Trim-up Voltage Setup

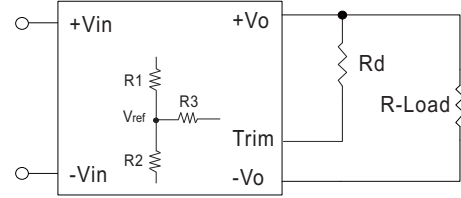


Figure 2. Trim-down Voltage Setup

1. The value of Rtrim-up defined as:

$$R_{\text{trim-up}} = \frac{aR_2}{R_2-a} - R_3, a = \frac{V_{\text{ref}}}{V_o' - V_{\text{ref}}} \times R_1$$

For example, to trim-up the output voltage of 5.0V module (RSDW60F-05) by 10% to 5.5V, $R_{\text{trim-up}}$ is calculated as follows:

$$V_o' = 5.5V$$

$$V_{\text{ref}} = 2.5V$$

$$R_1 = 10K\Omega$$

$$R_2 = 10K\Omega$$

$$R_3 = 35.7K\Omega$$

$$a = \frac{V_{\text{ref}}}{V_o' - V_{\text{ref}}} \times R_1$$

$$= \frac{2.5}{5.5 - 2.5} \times 10 = 8.333$$

$$R_{\text{trim-up}} = \frac{aR_2}{R_2-a} - R_3$$

$$= \frac{8.333 \times 10}{10 - 8.333} - 35.7$$

$$= \frac{83.33}{1.667} - 35.7$$

$$= 14.28K\Omega$$

Table 1 – Trim up and Trim down Resistor Values

Model No.	Vout	Vref	R1	R2	R3
RSDW60F RDDW60F	3.3V	1.24V	8.5K Ω	5.1K Ω	27K Ω
	5V	2.50V	10K Ω	10K Ω	35.7K Ω
	12V	2.50V	38K Ω	10K Ω	68K Ω
	15V	2.50V	50K Ω	10K Ω	73.2K Ω
	24V	2.50V	86K Ω	10K Ω	75K Ω
RSDW60G RDDW60G	3.3V	1.24V	8.5K Ω	5.1K Ω	27K Ω
	5V	1.24V	15.47K Ω	5.1K Ω	33K Ω
	12V	2.50V	38K Ω	10K Ω	68K Ω
	15V	2.50V	50K Ω	10K Ω	73.2K Ω
	24V	2.50V	86K Ω	10K Ω	75K Ω
RSDW60H	5V	1.24V	15.47K Ω	5.1K Ω	30K Ω
	12V	2.50V	38K Ω	10K Ω	68K Ω
	24V	2.50V	86K Ω	10K Ω	76.8K Ω
	48V	2.50V	182K Ω	10K Ω	80.6K Ω

Note:

1. $R_{\text{trim-up}}$, $R_{\text{trim-down}}$ is mean trim resistor, please check the formula.

2. a & b: user define parameter, no actual meanings.

3. V_o' is target trim voltage.

4. Value for R1, R2, R3 and Vref refer to below table.

2. The value of Rtrim-down defined as:

$$R_{\text{trim-down}} = \frac{bR_1}{R_1-b} - R_3, b = \frac{V_o' - V_{\text{ref}}}{V_{\text{ref}}} \times R_2$$

For example, to trim-down the output voltage of 5.0V module (RSDW60F-05) by 10% to 4.5V, $R_{\text{trim-down}}$ is calculated as follows:

$$V_o' = 4.5V$$

$$V_{\text{ref}} = 2.5V$$

$$R_1 = 10K\Omega$$

$$R_2 = 10K\Omega$$

$$R_3 = 35.7K\Omega$$

$$b = \frac{V_o' - V_{\text{ref}}}{V_{\text{ref}}} \times R_2$$

$$= \frac{4.5 - 2.5}{2.5} \times 10 = 0.8 \times 10 = 8$$

$$R_{\text{trim-down}} = \frac{bR_1}{R_1-b} - R_3$$

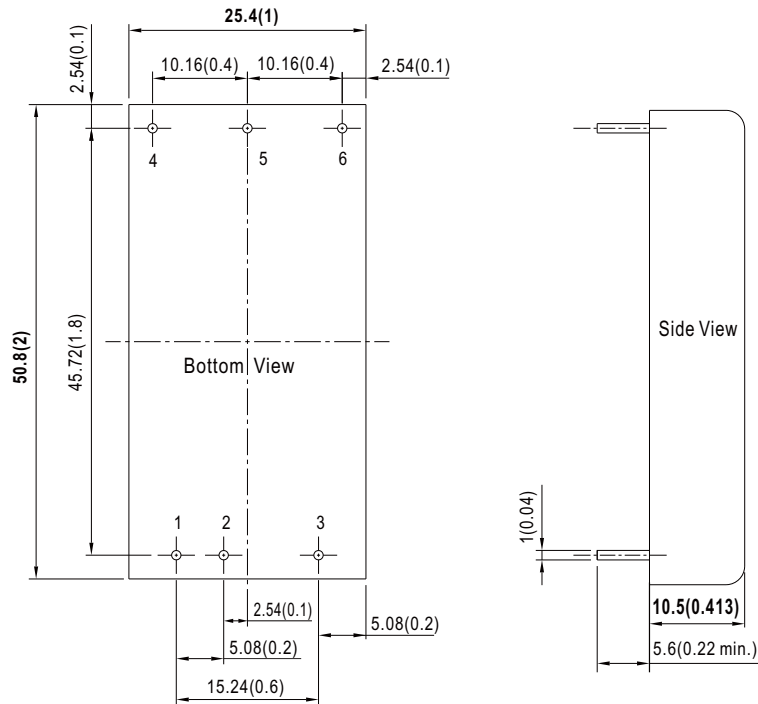
$$= \frac{8 \times 10}{10 - 8} - 35.7$$

$$= \frac{80}{2} - 35.7$$

$$= 4.3K\Omega$$

■ Mechanical Specification

- All dimensions in mm(inch)
- Tolerance: $x.xx \pm 0.35\text{mm}$ ($x.xxx \pm 0.013"$)
- Pin size is: $1 \pm 0.1\text{mm}$ ($0.04" \pm 0.005"$)

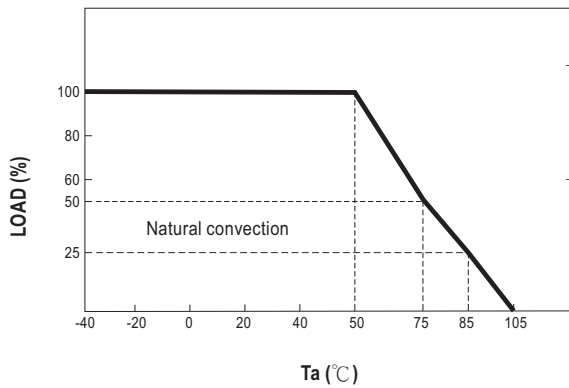


■ Plug Assignment

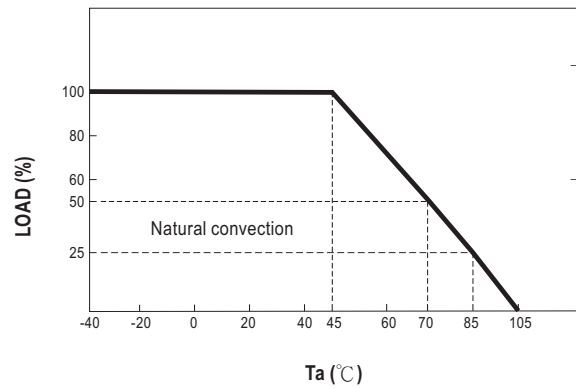
Pin-Out		
Pin No.	RSDW60 (Single output)	RDDW60 (Dual output)
1	+Vin	+Vin
2	-Vin	-Vin
3	Remote ON/OFF	Remote ON/OFF
4	+Vout	+Vout
5	-Vout	Common
6	Trim	-Vout

Derating Curve

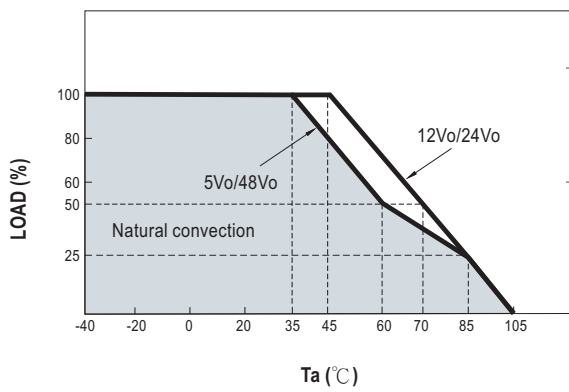
RSDW60F / RDDW60F (9~36Vin models):



RSDW60G / RDDW60G (18~75Vin models):



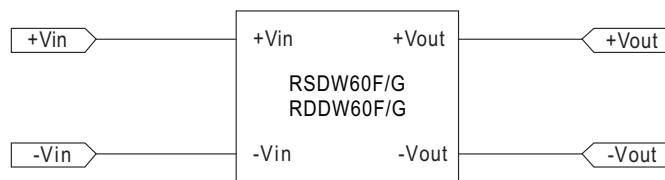
RSDW60H (40~160Vin models):



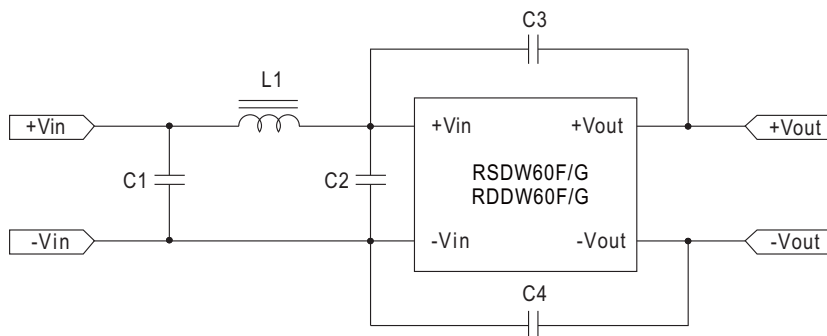
EMC Suggestion Circuit

F models(9~36Vin) and G models(18~75Vin):

※Comply to BS EN/EN55032 Class A emission without additional componets are as below:



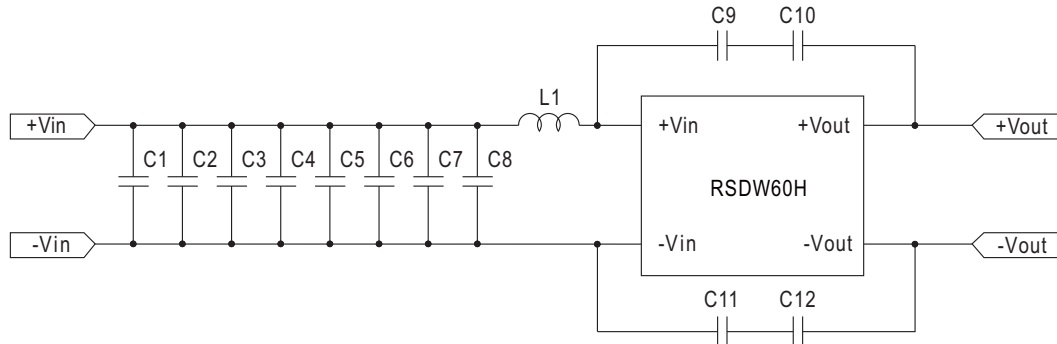
※Required external componets to meet BS EN/EN55032 Class B emission are as below:



Model No.	C1	L1	C2	C3	C4
RSDW60F-03/05/12/15/24 RDDW60F-12/15	10μF	1.5μH	10μF	2200pF	2200pF
RSDW60G-03/05/12/15/24 RDDW60G-12/15	4.7μF	3.3μH	4.7μF	2200pF	2200pF

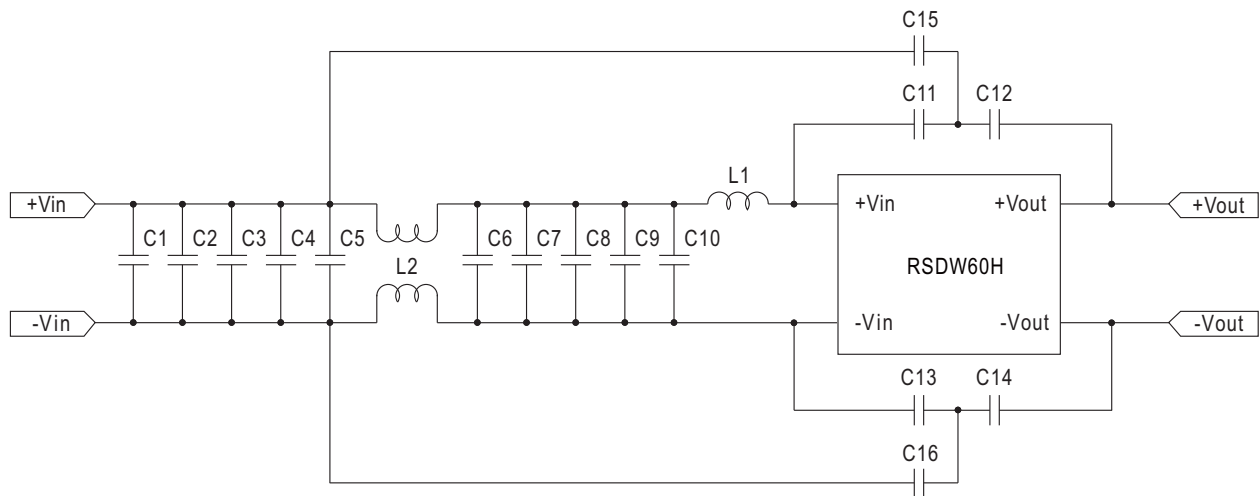
H models(40~160Vin):

※Required external componets to meet BS EN/EN55032 Class A emission are as below:



Model No.	L1	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
RSDW60H-5/12/24/48	68μH	0.68μH	0.68μH	0.68μH	0.68μH	0.68μH	0.68μH	0.68μH	0.68μH	4700pF	4700pF	4700pF	4700pF

※Required external componets to meet BS EN/EN55032 Class B emission are as below:



Model No.	L1	L2	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
RSDW60H-05/12	68μH	2.2mH	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	4700pF	4700pF	4700pF	4700pF	47pF	47pF
RSDW60H-24/48	68μH	2.2mH	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	0.68μF	4700pF	4700pF	4700pF	4700pF	33pF	33pF

■ Installation Manual

Please refer to : <http://www.meanwell.com/manual.html>