# 30W Reliable Railway DC-DC Converter

# RSD-30 series

## Features

- Compliance to EN50155 and EN45545-2 railway standard
- Ultra compact and 1U low profile(25mm)
- 4:1 wide input range
- No minimum load required
- Protections: Short circuit / Overload / Over voltage /

## Applications

- Bus,tram,metro or railway system
- Wireless network
- Telecom or datacom system
- Highly vibrating, highly dusty, extremely low or high temperature harsh environment

## SPECIFICATION

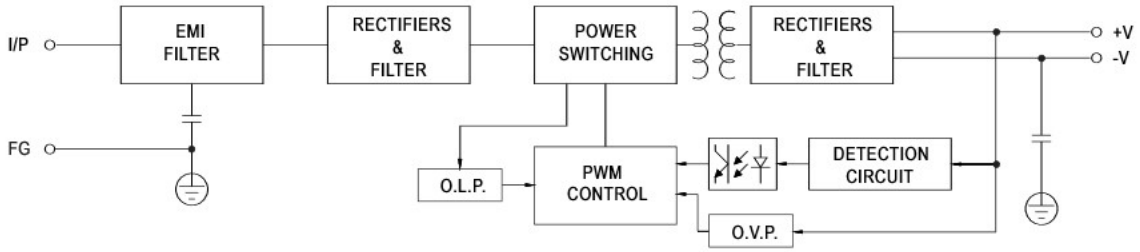
| MODEL | | RSD-30G-3.3 | RSD-30G-5 | RSD-30G-12 | RSD-30G-24 | RSD-30L-3.3 | RSD-30L-5 | RSD-30L-12 | RSD-30L-24 |
|---|---|---|---|---|---|---|---|---|---|
| OUTPUT | DC VOLTAGE | 3.3V | 5V | 12V | 24V | 3.3V | 5V | 12V | 24V |
| | RATED CURRENT | 6A | 6A | 2.5A | 1.25A | 6A | 6A | 2.5A | 1.25A |
| | CURRENT RANGE | 0 ~ 6A | 0 ~ 6A | 0 ~ 2.5A | 0 ~ 1.25A | 0 ~ 6A | 0 ~ 6A | 0 ~ 2.5A | 0 ~ 1.25A |
| | RATED POWER | 19.8W | 30W | 30W | 30W | 19.8W | 30W | 30W | 30W |
| | RIPPLE & NOISE (max.) Note.2 | 70mVp-p | 70mVp-p | 60mVp-p | 50mVp-p | 70mVp-p | 70mVp-p | 60mVp-p | 50mVp-p |
| | VOLTAGE TOLERANCE Note.3 | ±2.0% | ±2.0% | ±2.0% | ±2.0% | ±2.0% | ±2.0% | ±2.0% | ±2.0% |
| | LINE REGULATION | ±0.5% | ±0.5% | ±0.3% | ±0.2% | ±0.5% | ±0.5% | ±0.3% | ±0.2% |
| | LOAD REGULATION | ±0.5% | ±0.5% | ±0.3% | ±0.2% | ±0.5% | ±0.5% | ±0.3% | ±0.2% |
| | SETUP, RISE TIME | 120ms, 85ms at full load | | | | | | | |
| | HOLD UP TIME (Typ.) | Please refer to page 5 Hold up Time( Load de-rating curve ) | | | | | | | |
| INPUT | VOLTAGE RANGE CONTINUOUS | 9 ~ 36VDC | | | | 18 ~ 72VDC | | | |
| | EFFICIENCY (Typ.) | 84% | 84% | 86.5% | 89% | 84% | 86% | 90% | 91% |
| | DC CURRENT (Typ.) | 1.1A/24V | 1.5A/24V | | | 0.52A/48V | 0.8A/48V | | |
| | INRUSH CURRENT (Typ.) | 20A/24VDC | | | | 20A/48VDC | | | |
| | INTERRUPTION OF VOLTAGE SUPPLY | EN50155:2007-G type comply with S1 level(3ms) @full load,S2 level(10ms) @80% load; L type comply with S2 level(10ms) @full load | | | | | | | |
| | | EN50155:2017-Comply with S1 level | | | | | | | |
| PROTECTION | OVERLOAD | 105 ~ 135% rated output power | | | | | | | |
| | | Protection type : Constant current limiting, recovers automatically after fault condition is removed | | | | | | | |
| | OVER VOLTAGE | 3.8 ~ 4.5V | 5.75 ~ 7V | 13.8 ~ 16.2V | 27.6 ~ 32.4V | 3.8 ~ 4.5V | 5.75 ~ 7V | 13.8 ~ 16.2V | 27.6 ~ 32.4V |
| | | Protection type : Shut down o/p voltage, re-power on to recover | | | | | | | |
| ENVIRONMENT | WORKING TEMP. | -40 ~ +55℃ (no derating) ; +70℃ @ 60% load by free air convection ; +70℃ (no derating with external base plate) | | | | | | | |
| | WORKING HUMIDITY | 5 ~ 95% RH non-condensing | | | | | | | |
| | STORAGE TEMP. | -40 ~ +85℃ | | | | | | | |

## SPECIFICATION

| MODEL | | RSD-30H-3.3 | RSD-30H-5 | RSD-30H-12 | RSD-30H-24 |
|---|---|---|---|---|---|
| OUTPUT | DC VOLTAGE | 3.3V | 5V | 12V | 24V |
| | RATED CURRENT | 6A | 6A | 2.5A | 1.25A |
| | CURRENT RANGE | 0 ~ 6A | 0 ~ 6A | 0 ~ 2.5A | 0 ~ 1.25A |
| | RATED POWER | 19.8W | 30W | 30W | 30W |
| | RIPPLE & NOISE (max.) Note.2 | 70mVp-p | 70mVp-p | 60mVp-p | 50mVp-p |
| | VOLTAGE TOLERANCE Note.3 | ±2.0% | ±2.0% | ±2.0% | ±2.0% |
| | LINE REGULATION | ±0.5% | ±0.5% | ±0.3% | ±0.2% |
| | LOAD REGULATION | ±0.5% | ±0.5% | ±0.3% | ±0.2% |
| | SETUP, RISE TIME | 120ms, 85ms at full load | | | |
| | HOLD UP TIME (Typ.) | Please refer to page 5 Hold up Time( Load de-rating curve ) | | | |
| INPUT | VOLTAGE RANGE CONTINUOUS | 40 ~ 160VDC | | | |
| | EFFICIENCY (Typ.) | 87% | 89% | 89% | 89% |
| | DC CURRENT (Typ.) | 0.23A/110V | 0.35A/110V | | |
| | INRUSH CURRENT (Typ.) | 20A/110VDC | | | |
| | INTERRUPTION OF VOLTAGE SUPPLY | EN50155:2007-H-type comply with S2 level(10ms) @ full load | | | |
| | | EN50155:2017-Comply with S1 level | | | |
| PROTECTION | OVERLOAD | 105 ~ 135% rated output power | | | |
| | | Protection type : Constant current limiting, recovers automatically after fault condition is removed | | | |
| | OVER VOLTAGE | 3.8 ~ 4.5V | 5.75 ~ 7V | 13.8 ~ 16.2V | 27.6 ~ 32.4V |
| | | Protection type : Shut down o/p voltage, re-power on to recover | | | |
| ENVIRONMENT | WORKING TEMP. | -40 ~ +55℃ (no derating) ; +70℃ @ 60% load by free air convection ; +70℃ (no derating with external base plate) | | | |
| | WORKING HUMIDITY | 5 ~ 95% RH non-condensing | | | |
| | STORAGE TEMP. | -40 ~ +85℃ | | | |
| | TEMP. COEFFICIENT | ±0.03%/℃ (0 ~ 50℃) | | | |

## ■ Block Diagram

fosc : 110KHz




## ■ Input Fuse

There is one fuse connected in series to the positive input line, which is used to protect against abnormal surge. Fuse specifications of each model are shown as below.

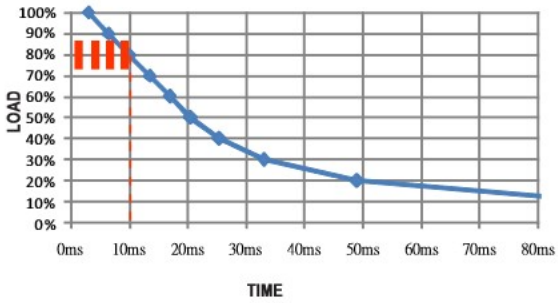
| Type | Fuse Type | Reference and Rating |
|---|---|---|
| G | Time-Lag | CONQUE MST, 6.3A, 250V |
| L | Time-Lag | CONQUE MST, 3.15A, 250V |
| H | Time-Lag | CONQUE MST, 2A, 250V |

## ■ Input Reverse Polarity Protection

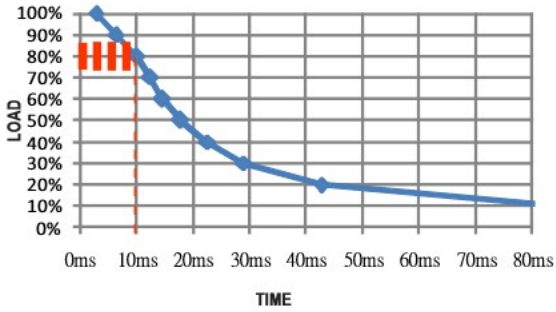
## ■ Hold-up Time

- EN50155: 2007 version - H type is in compliance with S2 level (10ms), while G and L types are in compliance with S1 level (3ms) at full load output condition. To fulfil the requirements of S2 level (10ms), G types require de-rating their output load to 80%, please refer to the curve diagrams below.

RSD-30G-3.3




RSD-30G-5



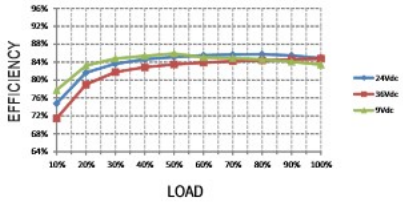

RSD-30G-12


RSD-30G-24

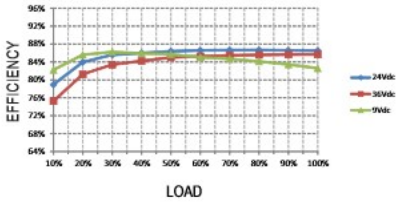
## ■ Efficiency vs Load & Vin Curve

The efficiency vs load & Vin curves of each model are shown as below.

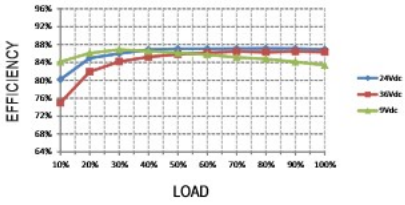
RSD-30G-3.3



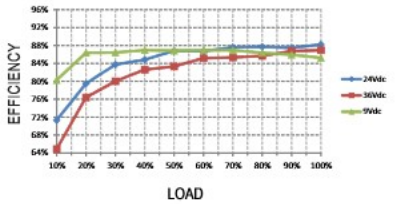

RSD-30G-5



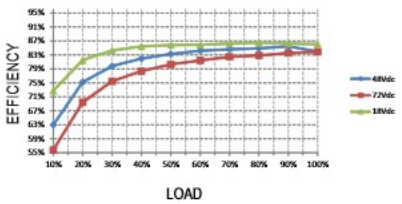

RSD-30G-12



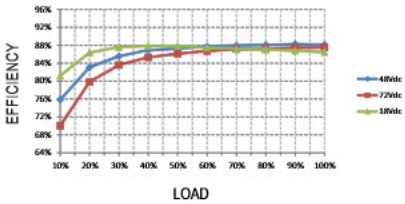

RSD-30G-24



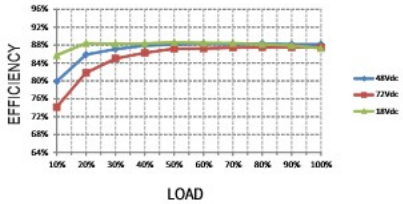

RSD-30L-3.3



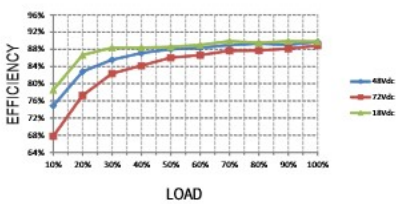

RSD-30L-5



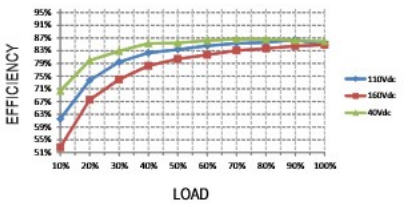

RSD-30L-12



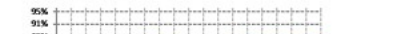

RSD-30L-24




RSD-30H-3.3



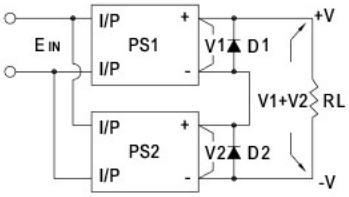

RSD-30H-5



RSD-30H-12

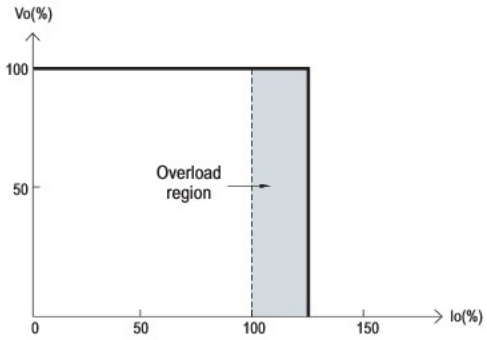
RSD-30H-24

2.Increase the output voltage (current does not change). Because RSD-30 series have no reverse blocking diode in the unit, you should add an external blocking diode to prevent the damage of every unit while starting up. The voltage rating of the external diode should be larger than V1+V2 (as shown as below).

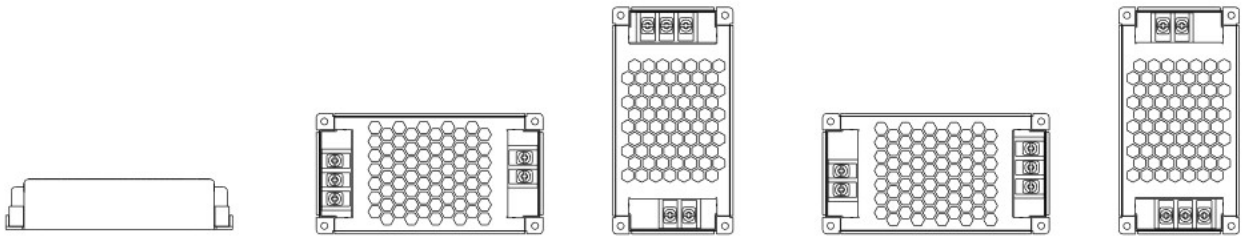



## ■ Overload Protection

If the output draw up to 105~135% of its output power rating, the converter will go into overload protection which is constant current mode. After the faulty condition is removed, it will recover automatically. Please refer to the diagram below for the detail operation characteristic. Please note that it's not suitable to operate within the overload region continuously, or it may cause to over temperature and reduce the life of the power supply unit or even damage it.



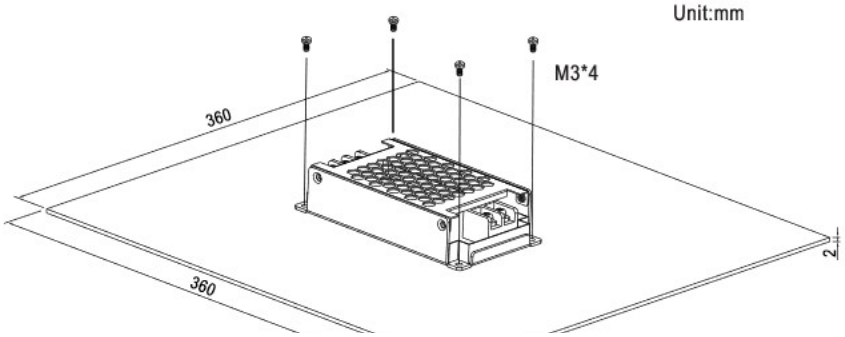
Suitable installation methods are shown as below. Since RSD-30 is a semi-potted model, its thermal performances for the following installation methods are similar and share the same derating curve.



**b.Operate with additional iron plate**

If it is necessary to fulfil the requirements of EN50155 TX level that operate the unit fully-loaded at 70℃, RSD-30 series must be installed onto an iron plate on the bottom. The size of the suggested iron plate is shown as below. In order for optimal thermal performance, the iron plate must have an even & smooth surface and RSD-30 series must be firmly mounted at the center of the iron plate.

Unit:mm



## ■ Immunity to Environmental Conditions

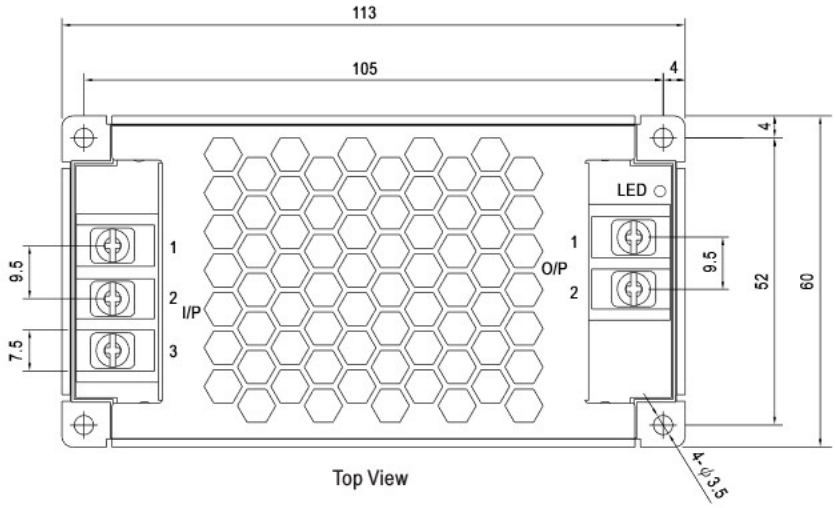
| Test method | Standard | Test conditions | Status |
|---|---|---|---|
| Cooling Test | EN 50155 section 12.2.3 (Column 2, Class TX)<br>EN 60068-2-1 | Temperature: -40℃<br>Dwell Time: 2 hrs/cycle | No damage |
| Dry Heat Test | EN 50155 section 12.2.4 (Column 2, Class TX)<br>EN 50155 section 12.2.4 (Column 3, Class TX & Column 4, Class TX)<br>EN 60068-2-2 | Temperature: 70℃ / 85℃<br>Duration: 6 hrs / 10min | PASS |
| Damp Heat Test, Cyclic | EN 50155 section 12.2.5<br>EN 60068-2-30 | Temperature: 25℃~55℃<br>Humidity: 90%~100% RH<br>Duration: 48 hrs | PASS |
| Vibration Test | EN 50155 section 12.2.11<br>EN 61373 | Temperature: 19℃<br>Humidity: 65%<br>Duration: 10 mins | PASS |
| Increased Vibration Test | EN 50155 section 12.2.11<br>EN 61373 | Temperature: 19℃<br>Humidity: 65%<br>Duration: 5 hrs | PASS |
| Shock Test | EN 50155 section 12.2.11<br>EN 61373 | Temperature: 21± 3℃<br>Humidity: 65 ± 5%<br>Duration: 30ms*18 | PASS |
| Low Temperature Storage Test | EN 50155 section 12.2.3 (Column 2, Class TX)<br>EN 60068-2-1 | Temperature: -40℃<br>Dwell Time: 16 hrs | PASS |
| Salt Mist Test | EN 50155 section 12.2.10 (Class ST4) | Temperature: 35℃ ±2℃<br>Duration: 96 hrs | PASS |

## ■ EN45545-2 Fire Test Conditions

## ■ Mechanical Specification

Case No.253A Unit:mm


Side View




Top View