# RECOM 100W CONVERTER MEETS EN 50155 HOLD-UP FOR RAIL SYSTEMS

**CHALLENGE:**

- Meet S2 hold-up time of 10ms defined in EN50155 with reinforced isolation, according to EN62368

**SOLUTION:**

- Semi-custom rail power supply customized 100W converter meeting:
  - 100ms operation time down to 14.4V input
  - Circuit proposal for 10ms hold-up time
  - Qualified for EN62368 reinforced isolation

**APPLICATION**:

- Railway Data Communication System
- Must be able to be used in 24V, 36V, 48V, 72V, 96V, and 110 V DC systems
  - Continuous voltage range: 0.7*Vin to 1.25*Vin
  - Transient voltage: 0.6*Vin (0.1s) and 1.4*Vin (1s)
- 12V / 100W is needed
  - The 200W version is available to support future planning and growth beyond 100W a pin-compatible, drop-in replacement for the 100W version
- Interruptions of supply voltages defined in EN50155
  - S1: no performance criteria defined
  - S2: Vout should not drop if Vin is interrupted for 10ms
  - S3: Vout should not drop if Vin is interrupted for 20ms
- Customer must meet the S2 standard
  - Hold-up circuit described in datasheet for meeting up to the S3 level of EN50155

## TEASER:

Secure rail traffic management systems managing today's railway traffic require voice and data transmission to work efficiently reliably even when the source voltage drops or is interrupted for several milliseconds (ms). Details of these voltage variation limits for continuous and transient input ranges are defined in EN50155. While transient protection or clamp circuits can suppress high voltage spikes and voltage drops can be managed by very low operating voltages of the converters, complete supply voltage interruptions of 10 or 20ms need more sophisticated solutions, as described in this article.

## STORY:

Managing today's complex railway communication system requires not only internal train communication networks (TCN) but also secure voice and data communication to the central infrastructure control (ground-to-train) and other trains (train-to-train). GSM-based radio communication systems are mounted on trains to enable this communication.

Rolling stock equipment, such as this radio communication system, must withstand the demanding environmental, mechanical and electrical conditions defined in standards such as EN50155.

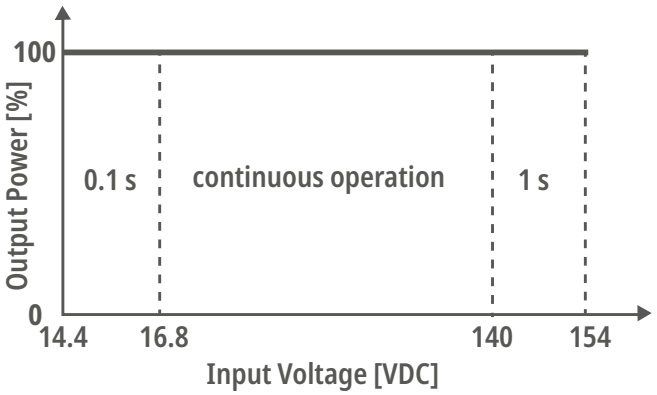
One challenging area is the input voltages specified in EN 50155. Trains can have a 24V, 36V, 48V, 72V, 96V, or 110VDC grid, and continuous operating voltages vary between 70 % and 125 % of these nominal voltages. In addition, this standard also defines short-term voltage fluctuation around the nominal voltage of 60 % for 100ms and 140 % for 1s.

Let's take a 24V system as an example. Continuous supply voltage ranges between 16.8 and 30V and can drop to 14.4V for up to 100ms or rise to 33.6V for up to 1 second. The absolute input voltage range of a 24V to 12V converter is therefore specified from 14.4V up to 33.6V.

In the case of faults such as short circuits, EN50155 specifies the voltage to drop to zero for up to 10ms (S2 level of EN50155) or up to 20ms (S3 level). During this time, systems have to work without interruption and the output voltage of a converter must ride through within the specified tolerances.

To cover all the different supply voltage variations in trains, the customer wanted the system to be able to work across the complete input range of down to 14.4V (60 % of 24V) and up to 154V (140 % of 110V).

### INPUT VOLTAGE RANGE



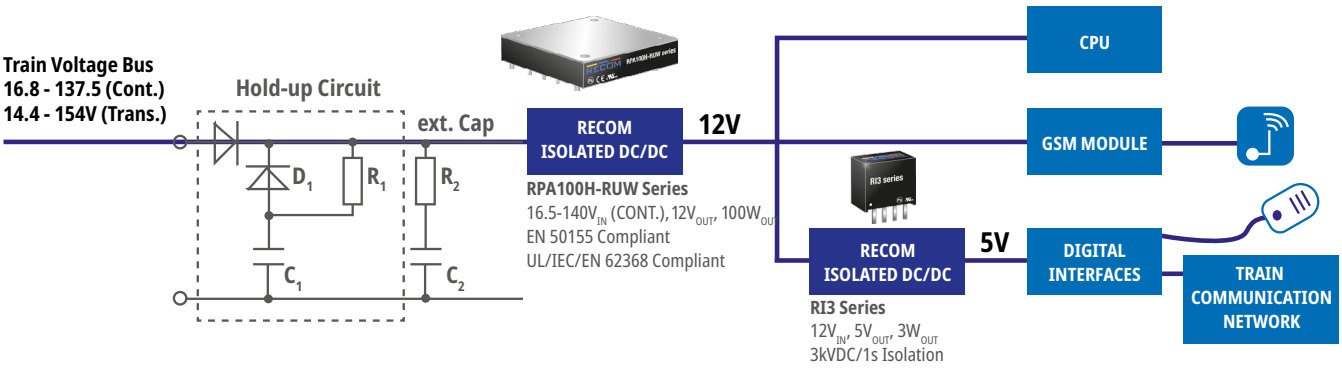

A further challenge includes the request to meet the reinforced isolation safety standards of EN62368 as higher input voltages are considered dangerous for humans.

The customer contacted RECOM for a solution, with a semi-custom converter version of a 100W railway power supply, all requirements were met. This certified converter has the necessary approvals for railway applications and the safety approvals according to EN62368. Another unique feature provided by RECOM was a hold-up circuit meeting the voltage interruption requirements of EN50155-S2. It is easy to implement and ensures that the system continues to work even during interruptions of 10ms.

The additional pin of this semi-custom converter can be used to drive a power-good indicator at the front panel. When driving an LED, it shows whether the converter is working or not.

For the next-generation, highly power-hungry radio communication system, the customer can use the RPA200 series, which has the same electrical performance and approvals as the RPA100 series. The standardized footprint of the half-brick format enables an existing design to upgrade its power budget for growing loads (NOTE: also requires increasing hold-up capacitance accordingly) or provide an easy leverage path for forward-looking variations.

## DIAGRAM: RAILWAY SIGNALING SYSTEM




## PRODUCTS:

| | RPA100H-11012SRUW/GP | RI3-1205S/H3 |
|---|---|---|
| Input | 16.5-140V | 12V |
| Output | 12V | 5V |
| Power | 100W max., 50W continuous | 3W |
| | (at Vin max & 75°C w/o additional heatsink/airflow) | |
| Size | Half Brick | SIP4 |
| Isolation | 4.242kVDC / 1 min | 3kVDC / 1s |

## PRODUCT BENEFITS FOR THIS APPLICATION:

### RPA100H SERIES:

- Extremely wide input range that matches the complete rail input voltage range defined in EN50155
- Simple hold-up solution to handle input voltage interruptions of 10ms and 20ms
- Reinforced isolation according to EN62368, not offered by several DC/DC modules for rail applications

### RI3 SERIES:

- 3W in a SIP4 package
- 1kVDC/s, 2kVDC/s or 3kVDC/s isolation
- Efficiency up to 90%
- -40°C to 100°C operating-temperature range
- IEC/EN/UL60950 certified
- CB Report

**FOR DETAILS PLEASE CONTACT:** Marco Kuhn, m.kuhn@recom-power.com