

# RT1-S20DXv2

## SMD-DIP 8 Package

- Operating temperature range: -40°C to +105°C
- High efficiency up to 84%
- Miniature SMD package
- Isolation voltage: 1.5 or 3.0kVDC
- Internal surface mounted design
- No external component required
- International standard pin-out

RoHS



RT1-xyxyS20DXv2 series are specially designed for applications where an isolated voltage is required in a distributed power supply system. They are suitable when isolation between input and output is necessary (isolation voltage either 1500VDC or 3000VDC). Typical applications are digit circuit condition, normal low-frequency artificial circuit condition, relay drive circuit condition, etc.

### Model Selection Guide

| Part No.        | Input Voltage (VDC) | Output                  |                                   | Efficiency (%Min./Typ.)<br>@ Full Load | Max. Capacitive Load<br>(μF) |
|-----------------|---------------------|-------------------------|-----------------------------------|----------------------------------------|------------------------------|
|                 | Nominal<br>(Range)  | Output Voltage<br>(VDC) | Output Current<br>(mA)(Max./Min.) |                                        |                              |
| RT1-0503S20DXv2 | 5<br>(4.5-5.5)      | 3.3                     | 400/40                            | 68/72                                  | 220                          |
| RT1-0505S20DXv2 |                     | 5                       | 400/40                            | 75/79                                  |                              |
| RT1-0509S20DXv2 |                     | 9                       | 222/22                            | 78/82                                  |                              |
| RT1-0512S20DXv2 |                     | 12                      | 167/17                            | 78/82                                  |                              |
| RT1-0515S20DXv2 |                     | 15                      | 133/13                            | 79/83                                  |                              |
| RT1-1205S20DXv2 | 12<br>(10.8-13.2)   | 5                       | 400/40                            | 75/79                                  |                              |
| RT1-1209S20DXv2 |                     | 9                       | 222/22                            | 78/82                                  |                              |
| RT1-1212S20DXv2 |                     | 12                      | 167/17                            | 78/82                                  |                              |
| RT1-1215S20DXv2 |                     | 15                      | 133/13                            | 79/83                                  |                              |
| RT1-1224S20DXv2 |                     | 24                      | 83/8                              | 80/84                                  |                              |
| RT1-1515S20DXv2 | 15<br>(13.5-16.5)   | 15                      | 133/13                            | 79/83                                  |                              |
| RT1-2405S20DXv2 | 24<br>(21.6-26.4)   | 5                       | 400/40                            | 75/79                                  |                              |
| RT1-2409S20DXv2 |                     | 9                       | 222/22                            | 78/82                                  |                              |
| RT1-2412S20DXv2 |                     | 12                      | 167/17                            | 78/82                                  |                              |
| RT1-2415S20DXv2 |                     | 15                      | 133/13                            | 79/83                                  |                              |
| RT1-2424S20DXv2 |                     | 24                      | 83/8                              | 80/84                                  |                              |

Note: Suffix „X“ =  
1 for 1.5kVDC Isolation, 3 for 3.0kVDC Isolation

### Input Specifications

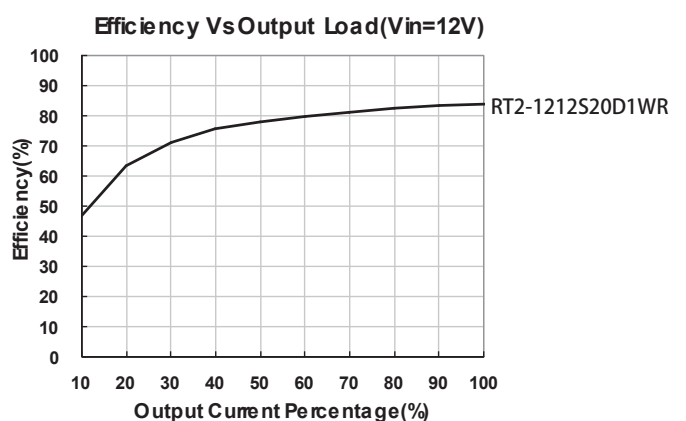
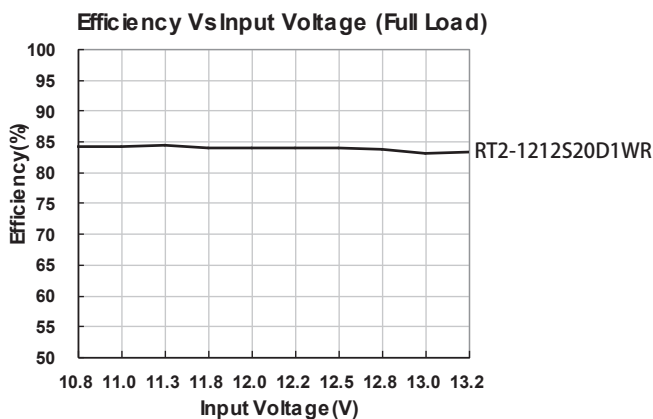
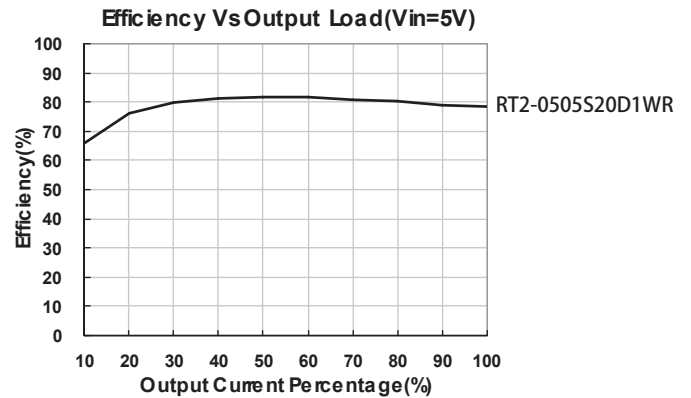
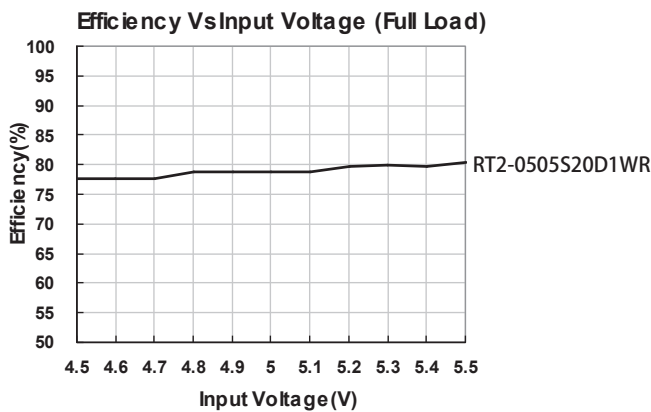
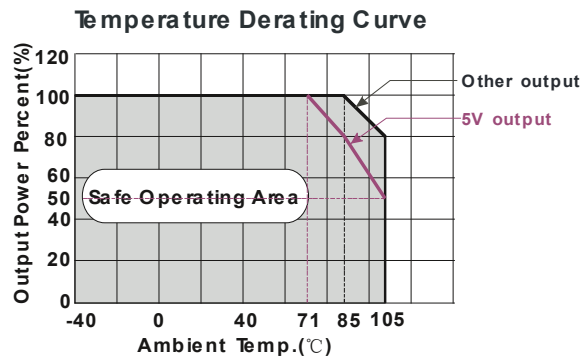
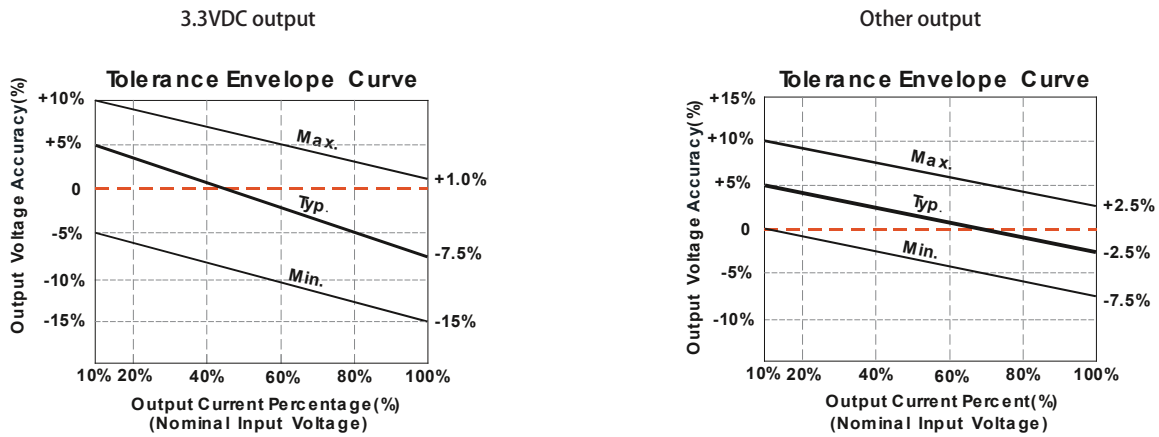
| Item                                   | Operating Conditions | Min.             | Typ.   | Max.  | Unit |
|----------------------------------------|----------------------|------------------|--------|-------|------|
| Input Current<br>(full load / no-load) | 5V input             | --               | 506/30 | --/60 | mA   |
|                                        | 12V input            | --               | 212/25 | --/50 |      |
|                                        | 15V input            | --               | 169/18 | --/35 |      |
|                                        | 24V input            | --               | 105/15 | --/30 |      |
| Reflected Ripple Current               |                      | --               | 15     | --    | mA   |
| Surge Voltage (1sec. max.)             | 5V input             | -0.7             | --     | 9     | VDC  |
|                                        | 12V input            | -0.7             | --     | 18    |      |
|                                        | 15V input            | -0.7             | --     | 21    |      |
|                                        | 24V input            | -0.7             | --     | 30    |      |
| Input Filter                           |                      | Filter capacitor |        |       |      |
| Hot Plug                               |                      | Unavailable      |        |       |      |

| Output Specifications                                                                                                                                                                                                |                                 |               |                                       |      |            |       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------|---------------------------------------|------|------------|-------|
| Item                                                                                                                                                                                                                 | Operating Conditions            |               | Min.                                  | Typ. | Max.       | Unit  |
| Output Voltage Accuracy                                                                                                                                                                                              |                                 |               | See tolerance envelope graph (Fig. 1) |      |            |       |
| Line Regulation                                                                                                                                                                                                      | Input voltage change: $\pm 1\%$ | 3.3VDC output | --                                    | --   | $\pm 1.5$  | --    |
|                                                                                                                                                                                                                      |                                 | Other output  | --                                    | --   | $\pm 1.2$  |       |
| Load Regulation                                                                                                                                                                                                      | 10%-100% load                   | 3.3VDC output | --                                    | 18   | --         | %     |
|                                                                                                                                                                                                                      |                                 | 5VDC output   | --                                    | 12   | --         |       |
|                                                                                                                                                                                                                      |                                 | 9VDC output   | --                                    | 9    | --         |       |
|                                                                                                                                                                                                                      |                                 | 12VDC output  | --                                    | 8    | --         |       |
|                                                                                                                                                                                                                      |                                 | 15VDC output  | --                                    | 7    | --         |       |
|                                                                                                                                                                                                                      |                                 | 24VDC output  | --                                    | 6    | --         |       |
| Ripple & Noise*                                                                                                                                                                                                      | 20MHz bandwidth                 | 24VDC output  | --                                    | 100  | 200        | mVp-p |
|                                                                                                                                                                                                                      |                                 | Other output  | --                                    | 100  | 150        |       |
| Temperature Coefficient                                                                                                                                                                                              | Full load                       |               | --                                    | --   | $\pm 0.03$ | %/°C  |
| Short Circuit Protection**                                                                                                                                                                                           |                                 |               | --                                    | --   | 1          | s     |
| Note: * Ripple and noise are measured by parallel cable method, please see DC-DC Converter Application Notes for specific operation;<br>** Supply voltage must be discontinued at the end of short circuit duration. |                                 |               |                                       |      |            |       |

| General Specifications             |                                                                                  |                                                                    |                                                                                                                                                                           |      |      |            |
|------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------------|
| Item                               | Operating Conditions                                                             |                                                                    | Min.                                                                                                                                                                      | Typ. | Max. | Unit       |
| Isolation Voltage                  | Input-output, with the test time of 1 minute and the leak current lower than 1mA |                                                                    | 1500                                                                                                                                                                      | --   | 3000 | VDC        |
| Isolation Resistance               | Input-output, isolation voltage 500VDC                                           |                                                                    | 1000                                                                                                                                                                      | --   | --   | M $\Omega$ |
| Isolation Capacitance              | Input-output, 100KHz/0.1V                                                        |                                                                    | --                                                                                                                                                                        | 20   | --   | pF         |
| Operating Temperature              | 5V output                                                                        | Derating if the temperature $\leq 71^\circ\text{C}$ , (see Fig. 2) | -40                                                                                                                                                                       | --   | 105  | °C         |
|                                    | Other output                                                                     | Derating if the temperature $\leq 85^\circ\text{C}$ , (see Fig. 2) |                                                                                                                                                                           |      |      |            |
| Storage Temperature                |                                                                                  |                                                                    | -55                                                                                                                                                                       | --   | 125  |            |
| Casing Temperature Rise            | $T_a=25^\circ\text{C}$ , nominal input, full load output                         |                                                                    | --                                                                                                                                                                        | 25   | --   |            |
| Pin Welding Resistance Temperature | Welding spot is 1.5mm away from the casing, 10 seconds                           |                                                                    | --                                                                                                                                                                        | --   | 300  |            |
| Storage Humidity                   | Non-condensing                                                                   |                                                                    | --                                                                                                                                                                        | --   | 95   | %RH        |
| Reflow Soldering Temperature       |                                                                                  |                                                                    | Peak temp. $\leq 245^\circ\text{C}$ , maximum duration time $\leq 60\text{s}$ at $217^\circ\text{C}$ .<br>For actual application, please refer to IPC/JEDEC J-STD-020D.1. |      |      |            |
| Switching Frequency                | Full load, nominal input voltage                                                 |                                                                    | --                                                                                                                                                                        | 100  | --   | KHz        |
| MTBF                               | MIL-HDFK-217F@ $25^\circ\text{C}$                                                |                                                                    | 3500                                                                                                                                                                      | --   | --   | K hours    |

| Physical Specifications |                       |
|-------------------------|-----------------------|
| Casing Material         | Epoxy resin (UL94-V0) |
| Dimensions              | 12.70*11.20*7.25 mm   |
| Weight                  | 1.6g(Typ.)            |
| Cooling Method          | Free convection       |

| EMC Specifications |     |                                                              |
|--------------------|-----|--------------------------------------------------------------|
| EMI                | RE  | CISPR22/EN55022 CLASS B (see Fig. 4 for recommended circuit) |
| EMS                | ESD | IEC/EN61000-4-2 Contact $\pm 8\text{KV}$ perf. Criteria B    |



## Design Reference

### 1. Typical application circuit

If it is required to further reduce input and output ripple, a filter capacitor may be connected to the input and output terminals, see Fig.3. Moreover, choosing a suitable filter capacitor is very important, start-up problems may be caused if the capacitance is too large. Under the condition of safe and reliable operation, the recommended capacitive load values are shown in Table 1.

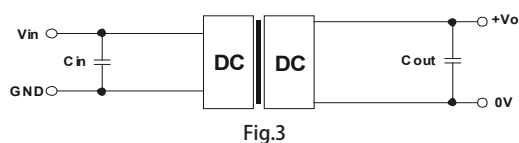


Fig.3

### 2. EMC solution-recommended circuit

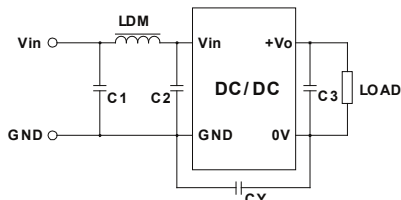


Fig. 4

Recommended capacitive load value table (Table 1)

| Vin(VDC) | Cin(μF) | Vo (VDC) | Cout(μF) |
|----------|---------|----------|----------|
| 5        | 4.7     | 3.3      | 10       |
| 12       | 2.2     | 5        | 10       |
| 15       | 2.2     | 9        | 4.7      |
| 24       | 1       | 12       | 2.2      |
| --       | --      | 15       | 1        |
| --       | --      | 24       | 0.47     |

| Input voltage (VDC) |     | 5/12/15                    | 24      |
|---------------------|-----|----------------------------|---------|
| EMI                 | C1  | 4.7μF /50V                 |         |
|                     | C2  | 4.7μF /50V                 |         |
|                     | C3  | Refer to the Cout in Fig.3 |         |
|                     | CY  | --                         | 1nF/2KV |
|                     | LDM | 6.8μH                      |         |

Notes: 1. 24V input series, 24V output series is subject to CY (CY : 1nF/2KV).

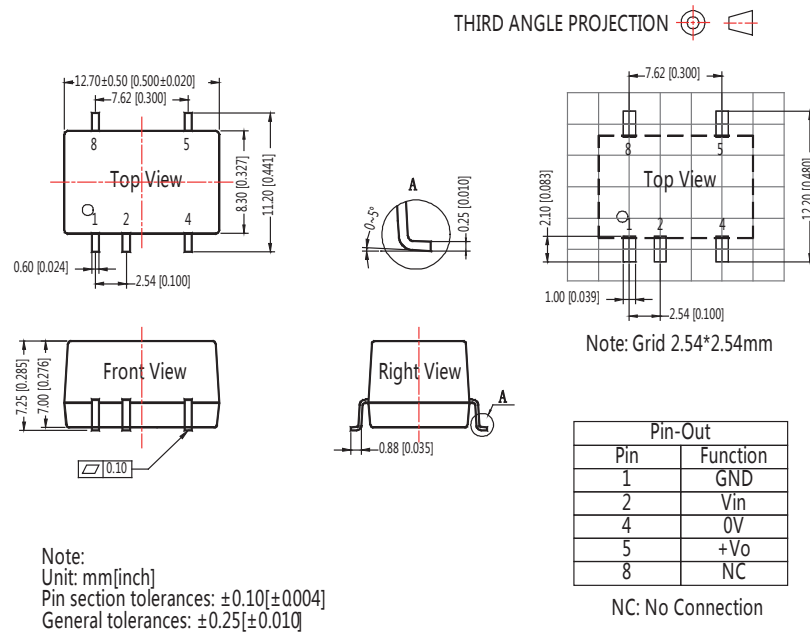
2. It is not needed to add the component in the peripheral circuit when parameter with the symbol of "--".

### 3. Output load requirements

When using, the minimum load of the module output should not be less than 10% of the nominal load. In order to meet the performance parameters of this datasheet, please connect a 10% dummy load in parallel at the output end, the dummy load is generally a resistor, Please note that the resistor needs to be used in derating.

RT1-S20DXv2

Dimensions and Recommended Layout



If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;

The maximum capacitive load offered were tested at nominal input voltage and full load;

Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^\circ\text{C}$ , humidity<75% with nominal input voltage and rated output load;

All index testing methods in this datasheet are based on our Company's corporate standards;

The performance parameters of the product models listed in this manual are as above, but some parameters of non-standard model products may exceed the requirements mentioned above. Please contact our technicians directly for specific information;

We can provide product customization service;

Specifications are subject to change without prior notice.

*The models listed here are just standard type. If you need a product with special specification or you have questions regarding packing standards (Tube oder Tape/Reel) as well as application support, please contact our specialists: sales@rsg-electronic.de or +49 69-984047-41/-28*