

Features

Regulated Converters

- Highest power density in SIP8 package
- 1.6kVDC/1 minute isolation
- Efficiency up to 88%
- -40°C to +75°C operating temperature range @ full load
- EN60950 and IEC/EN62368-1 certified
- Industry standard pinout



RS6

**6 Watt
SIP8
Single and Dual
Output**



EN60950-1 certified
IEC/EN62368-1 certified
EN55022 compliant

Description

The RS6 series offer very high power density (2.7W/cm³), wide input voltage range and an industrial operating temperature range of -40°C to +75°C without derating. High efficiency, tight regulation, 2kVDC isolation and remote on/off are just some of the characteristics of this advanced SIP8 6W converter which is ideal for high density power supply designs in demanding industrial applications.

Selection Guide

| Part Number | Input Voltage Range [VDC] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ. ⁽¹⁾ [%] | max. Capacitive Load ⁽²⁾ [µF] |
|-------------|---------------------------|----------------------|---------------------|------------------------------------|--|
| RS6-053.3S | 4.5 - 9 | 3.3 | 1300 | 83 | 6600 |
| RS6-0505S | 4.5 - 9 | 5 | 1200 | 86 | 3300 |
| RS6-0512S | 4.5 - 9 | 12 | 500 | 87 | 1600 |
| RS6-0515S | 4.5 - 9 | 15 | 400 | 86 | 1400 |
| RS6-0505D | 4.5 - 9 | ±5 | ±600 | 84 | ±2000 |
| RS6-0512D | 4.5 - 9 | ±12 | ±250 | 87 | ±900 |
| RS6-0515D | 4.5 - 9 | ±15 | ±200 | 86 | ±660 |
| RS6-123.3S | 9 - 18 | 3.3 | 1300 | 81 | 6600 |
| RS6-1205S | 9 - 18 | 5 | 1200 | 86 | 3300 |
| RS6-1212S | 9 - 18 | 12 | 500 | 87 | 1600 |
| RS6-1215S | 9 - 18 | 15 | 400 | 87 | 1400 |
| RS6-1205D | 9 - 18 | ±5 | ±600 | 85 | ±2000 |
| RS6-1212D | 9 - 18 | ±12 | ±250 | 87 | ±900 |
| RS6-1215D | 9 - 18 | ±15 | ±200 | 87 | ±660 |
| RS6-243.3S | 18 - 36 | 3.3 | 1300 | 81 | 6600 |
| RS6-2405S | 18 - 36 | 5 | 1200 | 87 | 3300 |
| RS6-2412S | 18 - 36 | 12 | 500 | 87 | 1600 |
| RS6-2415S | 18 - 36 | 15 | 400 | 87 | 1400 |
| RS6-2405D | 18 - 36 | ±5 | ±600 | 85 | ±2000 |
| RS6-2412D | 18 - 36 | ±12 | ±250 | 87 | ±900 |
| RS6-2415D | 18 - 36 | ±15 | ±200 | 87 | ±660 |
| RS6-483.3S | 36 - 75 | 3.3 | 1300 | 81 | 6600 |
| RS6-4805S | 36 - 75 | 5 | 1200 | 87 | 3300 |
| RS6-4812S | 36 - 75 | 12 | 500 | 87 | 1600 |
| RS6-4815S | 36 - 75 | 15 | 400 | 88 | 1400 |
| RS6-4805D | 36 - 75 | ±5 | ±600 | 85 | ±2000 |
| RS6-4812D | 36 - 75 | ±12 | ±250 | 87 | ±900 |
| RS6-4815D | 36 - 75 | ±15 | ±200 | 88 | ±660 |

Notes:

Note1: Efficiency is tested by nominal input and full load at +25°C ambient

Note2: Max Cap Load is tested by minimum input and constant resistor load

Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm up unless otherwise specified)

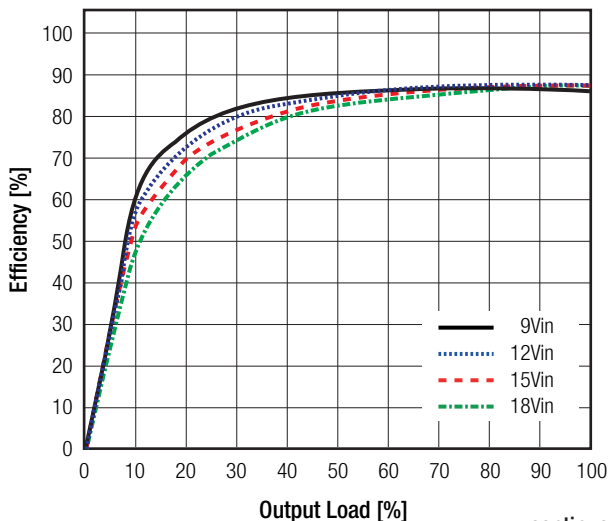
| BASIC CHARACTERISTICS | | | | | |
|--|------------------------------|---------------------------------|----------------------------------|---------------------------------|-----------------------------------|
| Parameter | Condition | | Min. | Typ. | Max. |
| Input Filter | capacitor | | | | |
| Input Voltage Range | nom. Vin= | 5VDC 12VDC 24VDC 48VDC | 4.5VDC 9VDC 18VDC 36VDC | 5VDC 12VDC 24VDC 48VDC | 9VDC 18VDC 36VDC 75VDC |
| Input Surge Voltage | 1 second max. | nom. Vin= | | | 15VDC 25VDC 50VDC 100VDC |
| Quiescent Current | nom. Vin= | 5VDC 2VDC 24VDC 48VDC | | | 105mA 55mA 28mA 14mA |
| Output Voltage Trimming | see calculation on next page | Trim up Trim down | | | +10% -8% |
| Start-up Time | | | | 2ms | |
| Under Voltage Lockout | nom. Vin= 5V | DC-DC ON DC-DC OFF | | 4.5VDC 2.7VDC | |
| | nom. Vin= 12V | DC-DC ON DC-DC OFF | | 9VDC 7VDC | |
| | nom. Vin= 24V | DC-DC ON DC-DC OFF | | 18VDC 15VDC | |
| | nom. Vin= 48V | DC-DC ON DC-DC OFF | | 36VDC 30VDC | |
| ON/OFF CTRL | DC-DC ON DC-DC OFF | | Open 5V < Vr < 12VDC | | |
| Input Current of CTRL Pin | | | 1.5mA | 2.5mA | 3.3mA |
| Standby Current | | | | 2mA | |
| Internal Operating Frequency | 0-100% load | | 200kHz | | |
| Minimum Load | | | 0% | | |
| Output Ripple and Noise ⁽³⁾ | 20MHz BW | | 50mVp-p | | 75mVp-p |

Notes:

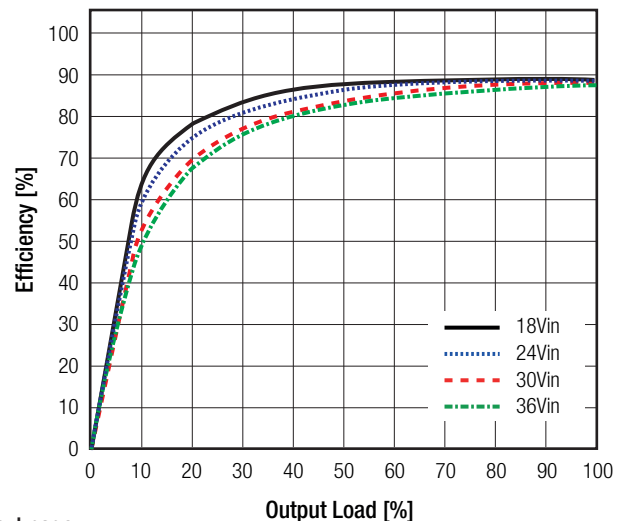
Note3: Measurements are made with a 1.0µF MLCC across output (low ESR)

Efficiency vs. Load

RS6-1205S



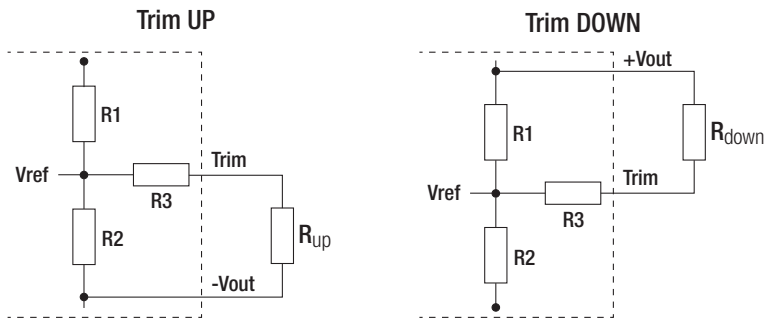
RS6-2405S



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Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm up unless otherwise specified)

Output Voltage Trimming



| Vout | 3.3V | 5V | 12V | 15V |
|------|---------|------|------|------|
| R1 | 16.74kΩ | 10kΩ | 38kΩ | 50kΩ |
| R2 | 10kΩ | | | |
| R3 | 52.3kΩ | 39kΩ | 68kΩ | 68kΩ |
| Vref | 1.24V | | 2.5V | |

Trim Calculation

Vout = nom. Output Voltage

ΔVout = Output Voltage Trim

R_{up} = Trim up resistor

R_{down} = trim down resistor

a = trim up factor

b = trim down factor

$$\Delta V_{out} = V_{out} - V_{out_{trimmed}}$$

$$R_{up} = \left[\frac{a \cdot R2}{R2 - a} \right] - R3 = k\Omega$$

$$R_{down} = \left[\frac{b \cdot R1}{R1 - b} \right] - R3 = k\Omega$$

$$a = \left[\frac{V_{ref}}{(V_{out} + \Delta V_{out}) - V_{ref}} \right] * R1 = k\Omega$$

$$b = \left[\frac{(V_{out} + \Delta V_{out}) - V_{ref}}{V_{ref}} \right] * R2 = k\Omega$$

Practical Example:

Trim Up:

Vout = 5V, ΔVout = 0.5V (10%), Vref = 2.5V

$$a = \left[\frac{2.5V}{(5V + 0.5V) - 2.5V} \right] * 10k\Omega = 8.33k\Omega$$

$$R_{up} = \left[\frac{8.33k\Omega * 10k\Omega}{10k\Omega - 8.33k\Omega} \right] - 39 = 11.0k\Omega$$

RS6-xx03.3S

| Trim up | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | % |
|-------------------|---------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| Vout = | 3.33 | 3.36 | 3.39 | 3.43 | 3.46 | 3.49 | 3.53 | 3.56 | 3.59 | 3.63 | Volts |
| R _{up} = | 1151.73 | 360.87 | 197.07 | 126.28 | 86.79 | 61.60 | 44.14 | 31.32 | 21.15 | 13.76 | kOhms |

RS6-xx05S

| Trim up | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | % |
|-------------------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| Vout = | 5.05 | 5.10 | 5.15 | 5.20 | 5.25 | 5.30 | 5.35 | 5.4 | 5.45 | 5.50 | Volts |
| R _{up} = | 461.00 | 211.00 | 127.67 | 86.00 | 61.00 | 44.33 | 32.43 | 23.50 | 16.56 | 11.00 | kOhms |

RS6-xx12S

| Trim up | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | % |
|-------------------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| Vout = | 12.12 | 12.24 | 12.36 | 12.48 | 12.60 | 12.72 | 12.84 | 12.96 | 13.08 | 13.20 | Volts |
| R _{up} = | 723.67 | 327.83 | 195.89 | 129.92 | 90.33 | 63.94 | 45.10 | 30.96 | 19.96 | 11.17 | kOhms |

RS6-xx15S

| Trim up | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | % |
|-------------------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| Vout = | 15.15 | 15.3 | 15.45 | 15.60 | 15.75 | 15.90 | 16.05 | 16.20 | 16.35 | 16.50 | Volts |
| R _{up} = | 765.33 | 348.67 | 209.78 | 140.33 | 98.67 | 70.89 | 51.05 | 36.17 | 24.59 | 15.33 | kOhms |

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Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm up unless otherwise specified)

Trim down:

Vout = 5V, ΔVout = -0.4V (-8%), Vref= 2.5V

$$b = \left[\frac{[5V + (-0.4V)] - 2.5V}{2.5V} \right] * 10k\Omega = 8.4k\Omega \quad R_{down} = \left[\frac{8.4k\Omega * 10k\Omega}{10k\Omega - 8.4k\Omega} \right] - 39k\Omega = 13.5k\Omega$$

RS6-xx03.3S

| Trim down | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 | % |
|---------------------|--------|--------|--------|--------|--------|-------|-------|-------|-------|
| Vout = | 3.267 | 3.234 | 3.201 | 3.168 | 3.135 | 3.102 | 3.069 | 3.036 | Volts |
| R _{down} = | 643.60 | 355.96 | 233.75 | 166.13 | 123.19 | 93.52 | 71.78 | 55.17 | kOhms |

RS6-xx05S

| Trim down | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 | % |
|---------------------|--------|--------|--------|-------|-------|-------|-------|-------|-------|
| Vout = | 4.95 | 4.90 | 4.85 | 4.80 | 4.75 | 4.70 | 4.65 | 4.60 | Volts |
| R _{down} = | 451.00 | 201.00 | 117.67 | 76.00 | 51.00 | 34.33 | 22.43 | 13.50 | kOhms |

RS6-xx12S

| Trim down | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 | % |
|---------------------|---------|---------|--------|--------|--------|--------|--------|--------|-------|
| Vout = | 11.88 | 11.76 | 11.64 | 11.52 | 11.40 | 11.28 | 11.16 | 11.04 | Volts |
| R _{down} = | 2902.33 | 1398.17 | 896.78 | 646.08 | 495.67 | 395.39 | 323.76 | 270.04 | kOhms |

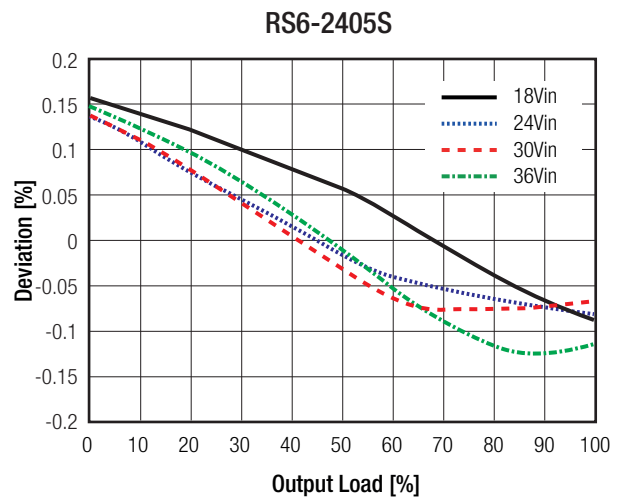
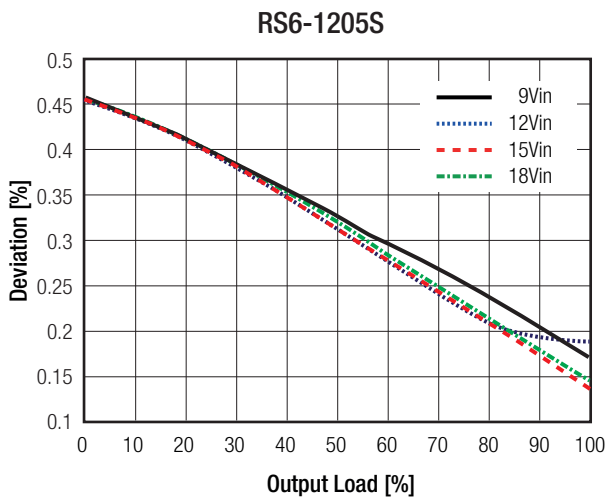
RS6-xx15S

| Trim down | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 | % |
|---------------------|---------|---------|---------|--------|--------|--------|--------|--------|-------|
| Vout = | 14.85 | 14.70 | 14.55 | 14.40 | 14.25 | 14.10 | 13.95 | 13.80 | Volts |
| R _{down} = | 4048.67 | 1965.33 | 1270.89 | 923.67 | 715.33 | 576.44 | 477.24 | 402.83 | kOhms |

REGULATIONS

| Parameter | Condition | Values |
|--------------------|-----------------------|------------|
| Output Accuracy | | ±1.0% typ. |
| Line Regulation | low line to high line | ±0.2% typ. |
| Load Regulation | 0% to 100% load | 1.0% typ. |
| Cross Regulation | 25% to 100% load | ±5.0% typ. |
| Transient Response | 25% load step change | 500µs typ. |

Accuracy vs Load

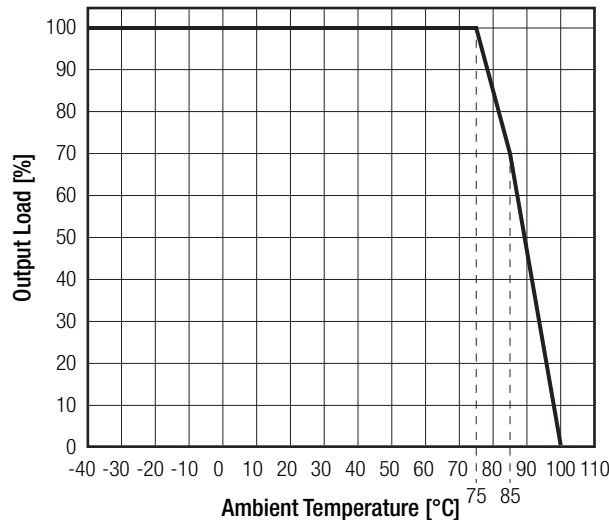


Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm up unless otherwise specified)

| PROTECTIONS | | | |
|---|-------------|---|---|
| Parameter | Condition | | Value |
| Short Circuit Protection (SCP) | below 100mΩ | | continuous, automatic recovery |
| Over Load Protection (OLP) | | | 150% load, continuous, automatic recovery |
| Isolation Voltage ⁽⁴⁾ | I/P to O/P | tested for 1 second rated for 1 minute | 2kVDC 1.6kVDC |
| Isolation Capacitance | | | 110pF max. |
| Isolation Resistance | | | 1GΩ typ. |
| Isolation Grade | | | functional |
| Notes: | | | |
| Note4: For repeat Hi-Pot testing, reduce the time and/or the test voltage | | | |

| ENVIRONMENTAL | | | |
|--|----------------------------------|-------|------------------------------|
| Parameter | Condition | | Value |
| Operating Temperature Range ⁽⁶⁾ | full load (see graph) | | -40°C to +75°C |
| Maximum Case Temperature | | | +105°C |
| Temperature Coefficient | | | ±0.02%/°C |
| Operating Humidity | non-condensing | | 5% - 95% RH max. |
| Vibration | | | MIL-STD-202G |
| MTBF | according to MIL-HDBK-217F, G.B. | +25°C | 1776 x 10 ³ hours |

Derating Graph
(@ Chamber and natural convection 0.1m/s)



Notes:
Note5: Derating Graph is referring to RS6-0505S. For more details, please contact our technical support service at TechsupportAT@recom-power.com

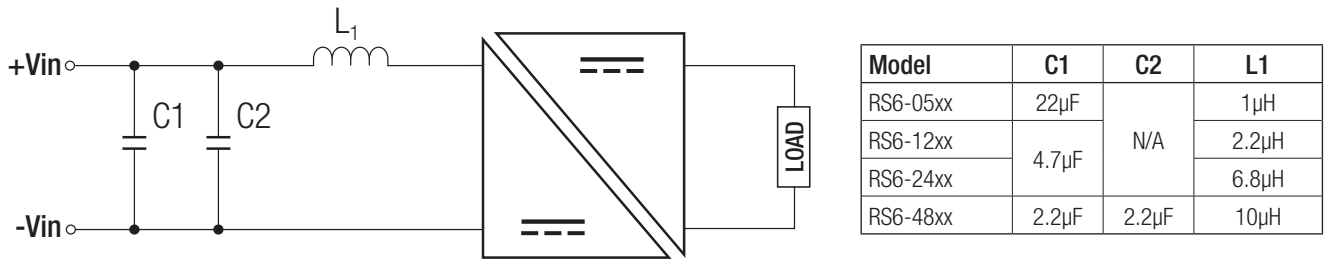
| SAFETY AND CERTIFICATIONS | | |
|--|--------------------------|-----------------------------------|
| Certificate Type | Report / File Number | Standard |
| Information Technology Equipment, General Requirements for Safety (LVD) | L0339m26-B1-L | EN60950-1, 2nd Edition AM2 , 2013 |
| Audio/video, information and communication technology equipment - Safety requirements | L0339m27-B1-L | ICE/EN62368-1, 2014 |
| RoHS2 | | RoHS-2011/65/EU + AM-2015/863 |
| EMC Compliance | Condition | Standard / Criterion |
| Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement | with external filter | EN55022, Class A |
| | (see filter suggestions) | EN55022, Class B |
| Information technology equipment - Immunity characteristics - Limits and methods of measurement | | EN55024, 2010 |

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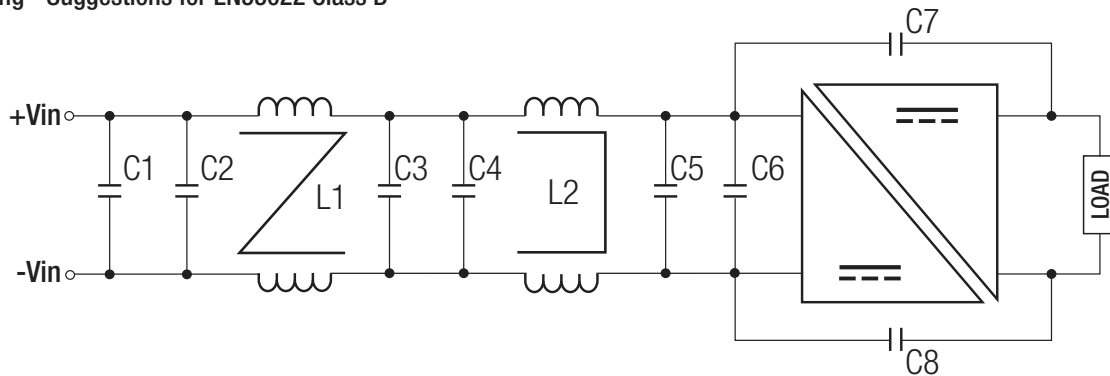
Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm up unless otherwise specified)

| | | |
|---|---|-------------------------|
| ESD Electrostatic discharge immunity test | ±8kV Air Discharge, ±4kV Contact Discharge | EN61000-4-2, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test | 3V/m | EN61000-4-3, Criteria A |
| Fast Transient and Burst Immunity | ±0.5kV | EN61000-4-4, Criteria A |
| Surge Immunity | ±0.5kV | EN61000-4-5, Criteria A |
| Immunity to conducted disturbances, induced by radio-frequency fields | 3Vr.m.s | EN61000-4-6, Criteria A |
| Power Magnetic Field Immunity | 50Hz, 1A/m | EN61000-4-8, Criteria A |

EMC Filtering - Suggestions for EN55022 Class A

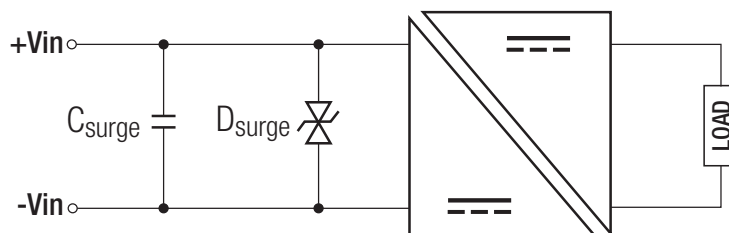


EMC Filtering - Suggestions for EN55022 Class B



| Model | C1 | C2 | L1 | C3 | C4 | L2 | C5 | C6 | C7 | C8 |
|----------|-------|-------|-----------|-------|-------|-----------|------|-----|------|-------|
| RS6-05xx | 22µF | N/A | 1µH CMC | 10µF | N/A | 200µH DMC | 10µF | N/A | 47pF | 100pF |
| RS6-12xx | 10µF | | 6.8µH CMC | | | | | | | |
| RS6-24xx | 4.7µF | | 10µH CMC | 4.7µF | | | | | | |
| RS6-48xx | 2.2µF | 2.2µF | 22µH CMC | 2.2µF | 2.2µF | 600µH DMC | 1µF | N/A | 47pF | 680pF |

Surge Protection Circuit according to EN61000-4-5, Criteria A



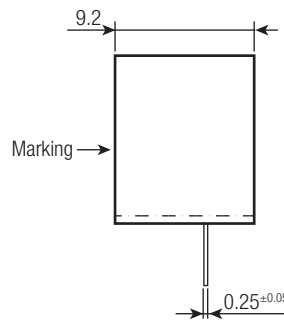
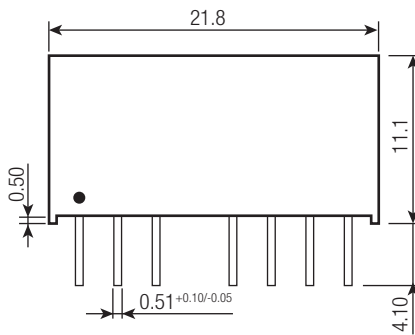
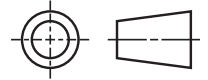
| nom. VIN | Csurge | Dsurge | max. Surge Voltage |
|----------|----------------------|------------------|--------------------|
| 5VDC | 100V, 220µF E/Cap | TVS (P4SMAJ15CA) | ±1kVDC |
| 12VDC | | N/A | |
| 24VDC | | | |
| 48VDC | | | |

Specifications (measured @ Ta= 25°C, nominal input voltage, full load and after warm up unless otherwise specified)

DIMENSION and PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|-------------------|--------------|---|
| Material | case potting | non conductive plastic (UL94V-0) epoxy (UL94V-0) |
| Dimension (LxWxH) | | 21.8 x 9.2 x 11.1mm |
| Weight | | 4.0g |

Dimension Drawing (mm)

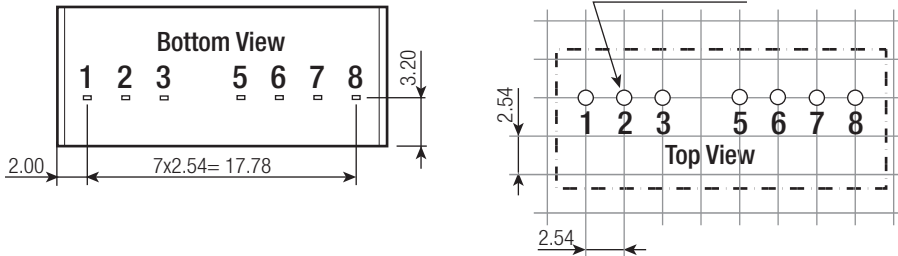


Pin Connections

| Pin # | Single | Dual |
|-------|---------------------|---------------------|
| 1 | -Vin | -Vin |
| 2 | +Vin | +Vin |
| 3 | CTRL ⁽⁶⁾ | CTRL ⁽⁶⁾ |
| 5 | Trim | NC |
| 6 | +Vout | +Vout |
| 7 | -Vout | Com |
| 8 | NC | -Vout |

NC= no connection
Tolerance: xx.x= ±0.5mm
 xx.xx= ±0.25mm
Pin dimension: ±0.1mm
Pin pitch: ±0.25mm

Recommended Footprint Details



Notes:

Note6: This pin provides an Off function which puts the converter into a low power mode. When the pin is 'high' the converter is OFF and when the pin is high 'Z' the converter is ON. There is no allowed low state for this pin

PACKAGING INFORMATION

| Parameter | Type | Value |
|-----------------------------|----------------|-----------------------|
| Packaging Dimension (LxWxH) | tube | 520.0 x 18.2 x 11.2mm |
| Packaging Quantity | | 22pcs |
| Storage Temperature Range | | -55°C to +125°C |
| Storage Humidity | non-condensing | 95% RH max. |

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