

## FEATURES

- Ultra-wide DIN rail mount DC-DC
  - 9...36Vdc
  - 18...75Vdc
- Efficiency up to 91%
- I/O isolation test voltage 1.5k VDC
- Inhibit and trim
- Operating temperature range - 40°C to +105°C
- Input under-voltage protection, output short circuit, over-current, over-voltage protection.
- EMI performance meets CISPR32 / EN55032
- IEC62368, UL62368, EN62368 Approved

## RS PRO 20W PCB mount wide input DC-DC

- 2351373
- 2351377
- 2351381
- 2351386
- 2351390



RS Professionally Approved Products bring to you professional quality parts across all product categories. Our product range has been tested by engineers and provides a comparable quality to the leading brands without paying a premium price.

## Embedded Switch Mode Power Supplies (SMPS)

### Product Description

PCB mount DC-DC converters feature an ultra-wide 4:1 input voltage with efficiencies of up to 91%, 1500VDC input to output isolation, an operating ambient temperature range of -40°C to +105°C, input undervoltage protection, output overvoltage, overcurrent, short circuit protection, CISPR32/EN55032 CLASS A EMI compliant without external components, which makes them widely used in industrial control, instrumentation and communications applications.

### General Specifications

<b>Model</b>	DC-DC 20W Industrial PCB power supply
<b>Mounting Type</b>	PCB mount
<b>MTBF</b>	MIL-HDBK-217F@25°C > 1,000,000 hrs
<b>Applications</b>	Industrial control systems, instrumentation and equipment

RS Stock#	Input (Vdc)		Output Voltage	Output Current	Max. Capacitive Load(μF)	Efficiency (Typ)
	Input range	Max				
2351373	9 to 36Vdc	40	5V	4A	10000	90%
2351377			12V	1.66A	1600	90%
2351381			15V	1.33A	1000	91%
2351386	18 to 75Vdc	80	5V	4A	10000	90%
2351390			12V	1.66A	1600	91%

## Input Specifications

Input Specification						
Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Input Current (full load / no-load)	24VDC nominal input series, nominal input voltage	5V output	-	782/30	800/50	mA
		12V output	-	926/6	947/15	
		15V output	-	916/6	937/15	
	48VDC nominal input series, nominal input	5V output	-	463/20	474/30	
		12V output	-	458/3	469/15	
Reflected Ripple Current	Nominal input voltage	-	30	-		
Surge Voltage (1sec. max.)	24VDC nominal input series	-0.7	-	50	VDC	
	48VDC nominal input series	-0.7	-	100		
Start-up Voltage	24VDC nominal input series	-	-	9		
	48VDC nominal input series	-	-	18		
Input under-voltage protection	24VDC nominal input series	5.5	6.5	-		
	48VDC nominal input series	12	15.5	-		
Start-up Time	Nominal input voltage & constant resistance load	-	10	-	ms	
Input Filter		Pi filter				
Hot Plug		Unavailable				
Ctrl*	Module on	Ctrl pin open or pulled high (TTL 3.5-12VDC)				
	Module off	Ctrl pin pulled low to GND (0-1.2VDC)				
	Input current when off	-	2	7	mA	
Note: *The Ctrl pin voltage is referenced to input GND						

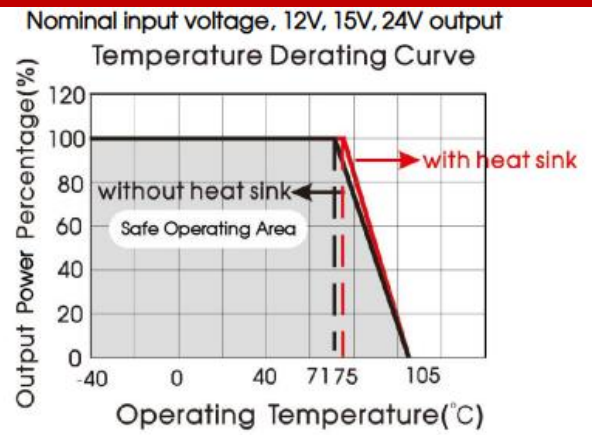
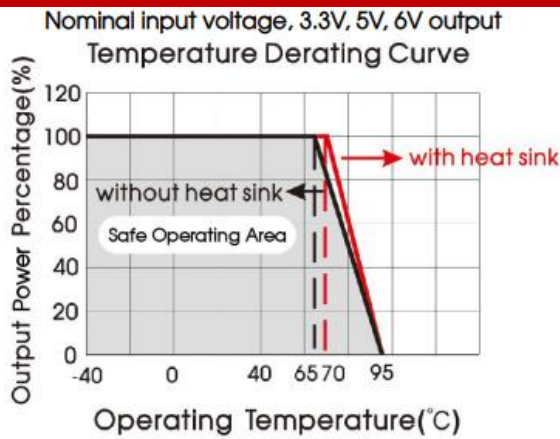
## Output Specifications

Output Specification						
Item	Operating Conditions	Min	Typ.	Max	Unit	
Voltage Accuracy	0%-100% load	-	±1	±3	%	
Linear Regulation	Input voltage variation from low to high at full load	-	±0.2	±0.5		
Load Regulation	5%-100% load	-	±0.5	±1		
Transient Recovery Time	25% load step change, nominal input voltage	-	300	500	µs	
Transient Response Deviation		5V output	-	±3	±8	%
Transient Response Deviation		Others	-	±3	±5	
Temperature Coefficient	Full load	-	-	±0.03	%/°C	
Ripple & Noise *	20MHz bandwidth, 100% load	-	50	100	mV p-p	
Trim	Input voltage range	90	-	110	%Vo	
Over-voltage Protection		110	-	160		
Over-current Protection		110	150	190	%Io	
Short circuit Protection		Continuous, self-recovery				

Note: \*Ripple & Noise at < 5% load is 5%Vo max. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

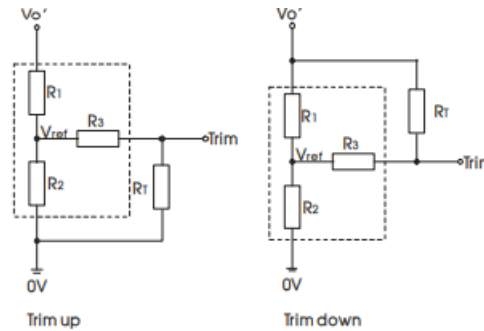
## Derating

# Embedded Switch Mode Power Supplies (SMPS)



## Trim Function

Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} \cdot R_3 & \alpha &= \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} \cdot R_3 & \alpha &= \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

$R_T$  = Trim Resistor value;  
 $\alpha$  = self-defined parameter;  
 $V_{o'}$  = desired output voltage

Vout(V)	R1(K $\Omega$ )	R2(K $\Omega$ )	R3(K $\Omega$ )	Vref(V)
3.3	4.829	2.87	15	1.24
5	2.894	2.87	10	2.5
6	4.064	2.87	10	2.5
12	11.000	2.87	17.4	2.5
15	14.494	2.87	17.4	2.5
24	24.872	2.87	20	2.5

## General Specifications

Item	Operating Conditions	Min	Typ	Max.	Unit
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## Embedded Switch Mode Power Supplies (SMPS)

Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	-	-	VDC
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.	1000	-	-	
Insulation Resistance	Input-output resistance at 500VDC	1000	-	-	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		2000		pF
Operating Temperature	3.3, 5V output	-40	-	+95	°C
	Others	-40	-	+105	
Storage Temperature		-55	-	+125	
Storage Humidity	Non-condensing	5	-	95	%RH
MTBF	MIL-HDBK-217F@25°C	1000			K hours

### EMC Specifications

Emissions	CE	CISPR32/EN55032 CLASS B (see Fig.3 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS B (see Fig.3 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 Contact ±6KV, Air ±8KV	Perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	Perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2KV (see Fig.3 for recommended circuit)	Perf. Criteria A
	Surge	EC/EN61000-4-5 line to line ±2KV (see Fig.3 for recommended circuit)	Perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s	Perf. Criteria A

### Typical Application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values  $C_{in}$  and  $C_{out}$  and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.



Fig. 2

Vout (VDC)	Cin (μF)	Cout (μF)
3.3/5/6/12/15	100	100
24		47

### EMC compliance circuit

# Embedded Switch Mode Power Supplies (SMPS)

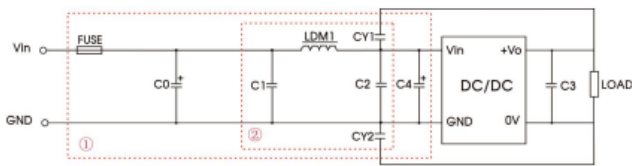


Fig. 3

Notes: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test. Selecting based on needs.

Parameter description:

Model	Vin:24V	Vin:48V
FUSE	Select fuse value according to actual input current	
C0, C4	330 $\mu$ F/50V	330 $\mu$ F/100V
C1, C2	4.7 $\mu$ F/50V	4.7 $\mu$ F/100V
C3	Refer to the Cout in Fig.2	
LDM1	2.2 $\mu$ H/4A	2.2 $\mu$ H/2A
CY1, CY2	1nF/2KV	

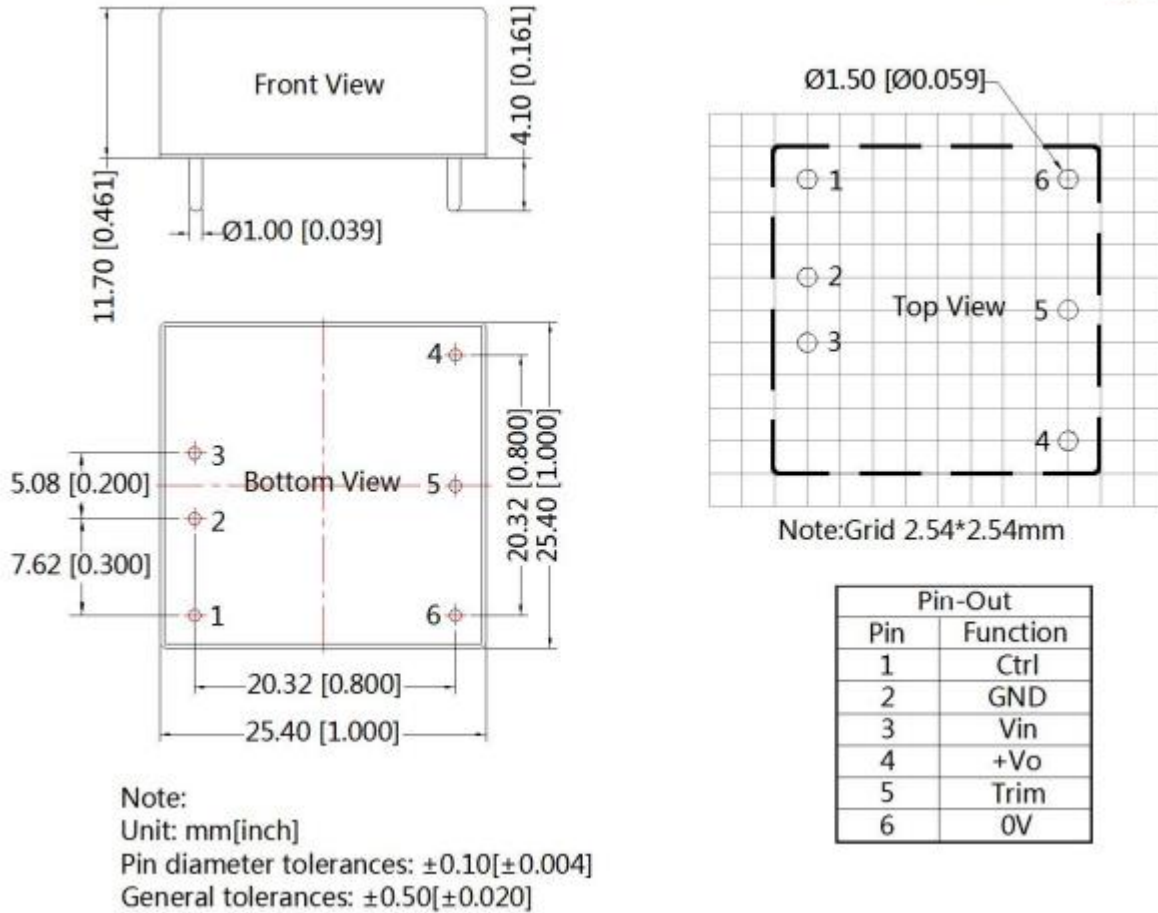
## Mechanical Specifications

Case material	Aluminium alloy
Dimensions	25.40 × 25.40 × 11.70 mm
Weight	15g (Typ.)
Cooling Method	Free air convection

## Dimensions and recommended layout

# Embedded Switch Mode Power Supplies (SMPS)

THIRD ANGLE PROJECTION



## Approvals

<b>Safety Certification</b>	IEC62368, UL62368, EN62368
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1. 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.
2. The maximum capacitive load offered were tested at input voltage range and full load.
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity