

# 2S9W4 series

2W - Single/Dual Output - Wide Input - Isolated & Regulated SIP - DC-DC Converter

- 9 Pin SIL
   Wide 4:1 Input Range
- Full SMD Technology
- 1500 VDC Isolation
- Ť **Continuous Short Circuit** Protection



- Efficiency up to 85% **Operation Temp Range**



Common specifications	
Short circuit protection:	Indefinite (hiccup), automatic recovery
Operation temperature range:	-40°C~+85°C (See Derating Curve) -40°C ~ +75°C (For 100% load)
Storage temperature range:	-40°C~125°C
MAX. Case Temperature:	100°C
Soldering Temperature	260°C,max. (1.5mm from case 10sec max.)
Storage humidity:	< 95% RH
Safety Standard	IEC60950 (design to meet)
MTBF (MIL-HDBK-217F @25°C):	>1,212,000 hours
Cooling:	Nature Convection
Case material:	Epoxy (UL94V-0 rated)
Pin Material:	C5191R-H Solder-coated
Dimensions	25.9mm x 9.2mm x 12.5mm
Weight:	6.5g,typ

### Input specifications

ltem	Test condition	Min	Тур	Max	Units
Input filter	Capacitance filter				
Input Surge Voltage (100ms max)	• 24VDC vin • 48VDC vin	50VDC 100VD	C, Max. C, Max.		
Input Reflected Ripple Current	20mA pk-pk, typ.				
Start-up Time		10			ms
Remote on/off	ON: OFF: Off stand by input current(Nominal Vin)	0 ~ 0.6 2.7~15 5mA n	6VDC or 6 6.0VDC	open ciro	cuit
			lian.		

Isolation specifications								
Item	Test condition	Min	Тур	Max	Units			
Isolation voltage	Tested for 1 minute and leakage 1mA max	1500			VDC			
Isolation resistance	Test at 500VDC	1000			MΩ			
Isolation capacitance	Input/Output			500	pF			



# **DC-DC Converter**

2 Watt

The 2S9W4 series is a family of cost effective 2W single & dual output DC-DC converters. converters. These converters combine non-conductive black plastic package in a 9-pin SIL compatible case with high performance features such as 1500 VDC input/output isolation voltage, continuous short circuit protection with automatic restart and high line / load regulation. Wide range devices operate over 4:1 input voltage range providing stable output voltage. Devices are encapsulated using flame retardant resin. Input voltages of 24 and 48 with output voltage of 3.3, 5, 12, 15, ±5, ±12, ±15 VDC. High performance features include high efficiency operation up to 85% and output voltage accuracy of ±1% maximum.

### **Output specifications**

Item	Test condition	Min	Тур	Max	Units
Voltage accuracy				±1	%
Line regulation				±0.5	%
Load regulation <sup>1</sup>	<ul> <li>10% to 100% Loading</li> <li>0% to 100% Loading Vout=12VDC and 15VDC</li> </ul>			±0.5 ±0.5	%
	<ul> <li>Vout=3.3VDC and 5VDC</li> </ul>			±1	%
Cross Regulation (dual output) <sup>2</sup>				±5	%
Ripple & Noise <sup>3</sup>	20MHz Bandwidth			50	mVp-p
Temperature Coefficient	100% full load			±0.02	%/°C
Transient Recovery Time⁵	25% load step change		300		ms

# Example:

2S9W4\_2405S1.5RP 2 = 2 Watt; S9 = SIP9; W4 = wide input (4:1); 24 = 9-36Vin; 05 = 5Vout; S = Single Output; 1.5 = 1500VDC isolation; R = Regulated Output; P = Short Circuit Protection

EMC specifications								
Emissions	CE(8)	EN55022	CLASS A					
Emissions	RE	EN55022	CLASS A					
Immunity	ESD	IEC 61000-4-2	Perf. Criteria A					
Immunity	RS	IEC 61000-4-3	Perf. Criteria A					
Immunity	EFT(9)	IEC 61000-4-4	Perf. Criteria A					
Immunity	Surge (9)	IEC 61000-4-5	Perf. Criteria B					
Immunity	CS	IEC 61000-4-6	Perf. Criteria A					
Immunity	PFMF	IEC 61000-4-8	Perf. Criteria A					

#### Note:

1. Operation at no load condition will not damage the product ; however, it will not meet all specifications.

- 2. One load is 25% to 100% load, the other load is 100% load, the output voltage variable rate is within ±5%.
- 3. Operation at lower load and no load may have bigger ripple and noise.
- 4. Test by minimal Vin and constant resistive load.
- 5. Test by normal Vin and 100%-25% load,25% load step change; If the output voltage is 3.3V then the Transient Response Deviation is ±5%.
- 6. Measured Input reflected ripple current with a simulated source inductance of 12 $\mu$ H and a source capacitor Cin (47 $\mu$ F, ESR<1.0 $\Omega$  at 100KHz).
- 7. Exceeding the absolute ratings of the unit could cause damage. It's not allowed for continuous operating ratings.

8. Input filter components are be required to help meet conducted emission class A, which application refer to the EMI Filter of design & feature configuration.

9. An external filter capacitor is required if the module has to meet IEC61000-4-4 and IEC61000-4-5.

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# Selection Guide

<b>ut Voltage [V</b> minal	<b>'DC]</b> Range No	Input Current [ o load Fi	mA] Outj Jll load	out Voltage [VDC]	Current [mA] Max	l Min	Efficiency [%, Typ.]	Capacitor Load(uF)
<u>4</u>	9-36	10	92	3.3	500	0	75	2200uF
<u>4</u>	9-36	10	103	5	400	0	81	1000uF
<u>4</u>	9-36	10	100	12	165	0	84	165uF
<u>4</u>	9-36	10	98	15	135	0	85	100uF
8 1	8-75	5	46	3.3	500	0	75	2200uF
8 1	8-75	5	53	5	400	0	80	1000uF
8 1	8-75	5	50	12	165	0	84	165uF
8 1	8-75	5	50	15	135	0	84	100uF
	It Voltage [V           ininal           i	It Voltage     [VDC]       Ninal     Range       9-36       9-36       9-36       9-36       18-75       8     18-75       8     18-75	Input Voltage         [VDC]         Input Current [n           No load         Fu           9-36         10           9-36         10           9-36         10           9-36         10           9-36         10           9-36         10           9-36         10           10	Input Current [mA] No load         Output Full load           9-36         10         92           9-36         10         103           9-36         10         103           9-36         10         98           3         18-75         5         46           18-75         5         53           8         18-75         5         50	Input Current [mA] No load         Output Voltage [VDC]           9-36         10         92         3.3           9-36         10         103         5           9-36         10         103         5           9-36         10         100         12           9-36         10         98         15           18-75         5         46         3.3           18-75         5         53         5           18-75         5         50         12           8         18-75         5         50         12           8         18-75         5         50         12	It Voltage [VDC] ninal         Input Current [mA] No load         Output Voltage [VDC]         Current [mA] Max           9-36         10         92         3.3         500           9-36         10         103         5         400           9-36         10         100         12         165           9-36         10         98         15         135           9-36         10         98         15         3500           18-75         5         46         3.3         500           8         18-75         5         53         5         400           8         18-75         5         50         12         165           8         18-75         5         50         12         165	Input Current [mA] No load         Output Voltage (VDC)         Current [mA] Max         Min         Min           9-36         10         92         3.3         500         0           9-36         10         103         5         400         0           9-36         10         103         5         400         0           9-36         10         103         5         400         0           9-36         10         98         15         135         0           4         9-36         10         98         15         135         0           3         18-75         5         46         3.3         500         0           8         18-75         5         53         5         400         0           8         18-75         5         50         12         165         0           8         18-75         5         50         15         135         0	I Voltage [VDC] minalInput Current [mA] Full loadOutput Voltage [VDC]Current [mA] MaxEfficiency [%, Typ.]9-3610923.35000759-361010354000819-3610100121650849-3610981513508549-361098500075818-755463.3500075818-7555012165084818-7555015135084

Part Number	<b>Input Voltag</b> Nominal	<b>e [VDC]</b> Range	Input Cur No load	<b>rent [mA]</b> Full load	Output Voltage [VDC]	Current Max	[mA] Min	Efficiency [%, Typ.]	Capacitor Load(uF)
2S9W4_2405D1.5RP	24	9-36	10	103	±5	±200	0	81	±470uF
2S9W4_2412D1.5RP	24	9-36	10	101	±12	±85	0	83	±100uF
2S9W4_2415D1.5RP	24	9-36	15	102	±15	±65	0	82	±47uF
2S9W4_4805D1.5RP	48	18-75	5	53	±5	±200	0	80	±470uF
2S9W4_4812D1.5RP	48	18-75	5	52	±12	±85	0	81	±100uF
2S9W4_4815D1.5RP	48	18-75	5	50	±15	±65	0	84	±47uF

# Typical Characteristics



# Efficiency



EFFICIENCY VS OUTPUT CURRENT

24 Models

### EFFICIENCY VS OUTPUT CURRENT





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# Test Configurations

### Input Reflected Ripple Current Test Step

Input reflected ripple current is measured through a source inductor  $\text{Lin}(12\mu\text{H})$  and a source capacitor  $Cin(47\mu F,\, ESR{<}1.0\Omega$  at 100KHz) at nominal input and full load.



### Output Ripple & Noise Measurement Test

The Scope measurement bandwidth is 20MHz



# **EMI** Filter

Input filter components (C1, L) are used to help meet conducted emissions requirement for the module.

These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise



	C1	L
24VDC	1210,225K/100V,X7R * 2PCS	6.8uH
48VDC	1210,105K/100V,X7R	56uH

#### TRL Module ON / OFF

ON: 0~0.6VDC or open circuit OFF: 2.7VDC~15.0VDC



# Mechanical dimensions







9 Pin SIL Package Non-Conductive Plastic

### PIN CONNECTIONS

PIN NUMBER	SINGLE	DUAL
1	-V Input	-V Input
2	+V Input	+V Input
3	Remote On/Off	Remote On/Off
6	+V Output	+V Output
7	N.C	Common
8	N.C.	N.C.
9	-V Output	-V Output

Notes: All dimensions are typical in millimeters ( inches ). 1. Pin diameter: 0.5 ±0.05 ( 0.02 ±0.002 )

Pin pitch and length tolerance: ±0.35 (±0.014)
 Case Tolerance: ±0.5 (±0.02)