



### APPLICATIONS

Wireless Network  
Telecom/Datacom  
Industry Control System  
Measurement Equipment  
Semiconductor Equipment  
Railway System

### FEATURES

- RAILWAY APPLICATION
- 20 WATTS MAXIMUM OUTPUT POWER
- ULTRA LOW QUIESCENT CURRENT
- SINGLE OUTPUT UP TO 4.5A
- STANDARD 2.00 X 1.00 X 0.40 INCH
- HIGH EFFICIENCY UP TO 89%
- 4:1 ULTRA WIDE INPUT VOLTAGE RANGE
- SIX-SIDED CONTINUOUS SHIELD
- FIXED SWITCHING FREQUENCY
- CE MARK MEETS 2006/95/EC, 2011/95/EC AND 2004/108/EC
- SAFETY MEETS UL60950-1, EN60950-1, IEC60950-1 AND EN50155
- COMPLIANT TO RoHS EU DIRECTIVE 2011/65/EU



### OPTIONS

Positive logic Remote On/Off, Without trim pin, Without On/Off control pin

### DESCRIPTION

RED20W DC/DC converters provide up to 20 watts of output power in an industry standard package and footprint. RED20W series have 4:1 ultra wide input voltage of 9~36, 18~75 and 43~160VDC. The RED20W have features 1600VDC of isolation, short circuit protection, over-current protection, over-voltage protection and six sided shielding.

## TECHNICAL SPECIFICATION

All specifications are typical at nominal input, full load and 25°C otherwise noted

OUTPUT SPECIFICATIONS			
Output power			20 Watts
Voltage accuracy			± 1%
Minimum load			0%
Voltage adjustability (Note 5)		Single	±10%
Line regulation	LL to HL at Full Load	Single	± 0.2%
		Dual	± 0.5%
Load regulation	No Load to Full Load	Single	± 0.2%
		Dual	± 1.0%
	10% Load to 90% Load	Single	± 0.1%
		Dual	± 0.8%
Cross regulation	Asymmetrical load 25% / 100% FL	Dual	± 5%
Ripple and noise	20MHz bandwidth (Measured with a 1µF/50V X7R MLCC)		See table
Temperature coefficient			±0.02% / °C, max.
Transient response recovery time	25% load step change		250µs
Over voltage protection	3.3VDC output	3.7VDC~5.4VDC	
	5VDC output	5.6VDC~7.0VDC	
	12VDC output	13.5VDC~19.6VDC	
	15VDC output	16.8VDC~20.5VDC	
Over load protection	% of FL at nominal input		150%
Short circuit protection			Continuous, automatic recovery

GENERAL SPECIFICATIONS			
Efficiency			See table
Isolation voltage	Input to Output	1600VDC, min. 1minute	
	Input(Output) to Case	1000VDC, min. 1minute	
Isolation resistance	500VDC	10 <sup>9</sup> ohms, min.	
Isolation capacitance		3000pF, max.	
Switching frequency		330kHz±10%	
Design meet safety standard		IEC60950-1, UL60950-1, EN60950-1, EN50155	
Case material		Nickel-coated copper	
Base material		FR4 PCB	
Potting material		Silicone (UL94 V-0)	
Dimensions		2.00 X 1.00 X 0.40 Inch (50.8X 25.4 X 10.2 mm)	
Weight		30g(1.06oz)	
MTBF (Note 1)	MIL-HDBK-217F	1.523x10 <sup>6</sup> hrs	

INPUT SPECIFICATIONS			
Input voltage range	24VDC nominal input		9 ~ 36VDC
	48VDC nominal input		18 ~ 75VDC
	110VDC nominal input		43 ~ 160VDC
Input filter	24VDC, 48VDC input		Common Chock
	110VDC input		Pi Filter
Input surge voltage	24VDC input		50VDC 1sec, max.
	48VDC input		100VDC 1sec, max.
	110VDC input		170VDC 1sec, max.
Input reflected ripple current	Nominal input and full load		30mA <sub>p-p</sub>
Start up time	Nominal input and constant resistive load	Power up	30ms, max.
		Remote ON/OFF	30ms, max.
Start-up voltage	24VDC input		9VDC, max.
	48VDC input		18VDC, max.
	110VDC input		43VDC, max.
Shutdown voltage	24VDC input		8VDC
	48VDC input		16VDC
	110VDC input		40VDC
Remote ON/OFF (Note 6)			
Positive logic(Optional)	DC-DC ON		Open or 3V < Vr < 15V
	DC-DC OFF		Short or 0V < Vr < 1.2V
Negative logic(Standard)	DC-DC ON		Short or 0V < Vr < 1.2V
	DC-DC OFF		Open or 3V < Vr < 15V
Input current of Remote control pin	Nominal input		-0.5mA~1.0mA
Remote off state input current	Nominal input		2.5mA

ENVIRONMENTAL SPECIFICATIONS		
Operating ambient temperature (Note 7)	-40°C ~ +101°C (with derating)	
Maximum case temperature	+105°C	
Storage temperature range	-55°C ~ +125°C	
Thermal impedance (Note 8)	Natural convection	12°C/Watt
	Natural convection with heat-sink	10°C/Watt
Thermal shock	MIL-STD-810F	
Shock	EN61373, MIL-STD-810F	
Vibration	EN61373, MIL-STD-810F	
Relative humidity	5% to 95% RH	

EMC CHARACTERISTICS			
EMI (Note 9)	EN55022, EN55011		Class A, Class B
ESD	EN61000-4-2	Air	± 8kV
		Contact	± 6kV
Radiated immunity	EN61000-4-3	20 V/m	Perf. Criteria A
Fast transient (Note 10)	EN61000-4-4	± 2kV	Perf. Criteria A
Surge (Note 10)	EN61000-4-5	± 2kV	Perf. Criteria A
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A

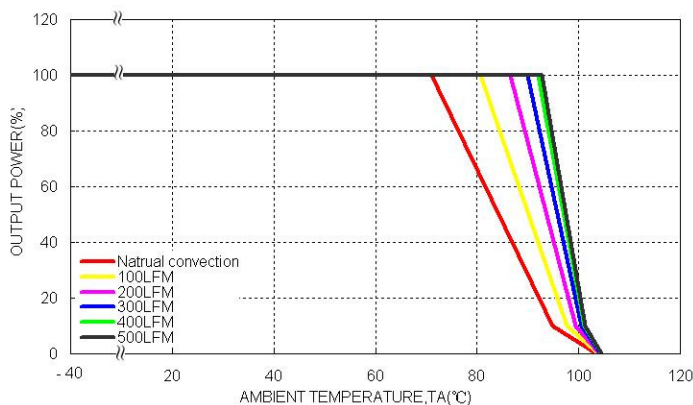
Model Number	Input Range	Output Voltage	Output Current		Output <sup>(3)</sup> Ripple & Noise	No Load <sup>(2)</sup> Input Current	Eff <sup>(3)</sup> (%)	Capacitor <sup>(4)</sup> Load max
			Min. Load	Full Load				
RED20-24S3P3W	9 ~ 36 VDC	3.3 VDC	0mA	4500mA	75mVp-p	6mA	85	7000μF
RED20-24S05W	9 ~ 36 VDC	5 VDC	0mA	4000mA	75mVp-p	6mA	88	5000μF
RED20-24S12W	9 ~ 36 VDC	12 VDC	0mA	1670mA	100mVp-p	6mA	89	850μF
RED20-24S15W	9 ~ 36 VDC	15 VDC	0mA	1330mA	100mVp-p	6mA	88	700μF
RED20-24D12W	9 ~ 36 VDC	± 12 VDC	0mA	± 833mA	100mVp-p	6mA	88	± 500μF
RED20-24D15W	9 ~ 36 VDC	± 15 VDC	0mA	± 667mA	100mVp-p	6mA	89	± 350μF
RED20-48S3P3W	18 ~ 75 VDC	3.3 VDC	0mA	4500mA	75mVp-p	4mA	85	7000μF
RED20-48S05W	18 ~ 75 VDC	5 VDC	0mA	4000mA	75mVp-p	4mA	88	5000μF
RED20-48S12W	18 ~ 75 VDC	12 VDC	0mA	1670mA	100mVp-p	4mA	89	850μF
RED20-48S15W	18 ~ 75 VDC	15 VDC	0mA	1330mA	100mVp-p	4mA	89	700μF
RED20-48D12W	18 ~ 75 VDC	± 12 VDC	0mA	± 833mA	100mVp-p	4mA	88	± 500μF
RED20-48D15W	18 ~ 75 VDC	± 15 VDC	0mA	± 667mA	100mVp-p	4mA	89	± 350μF
RED20-110S3P3W	43 ~ 160 VDC	3.3 VDC	0mA	4500mA	75mVp-p	3mA	85	7000μF
RED20-110S05W	43 ~ 160 VDC	5 VDC	0mA	4000mA	75mVp-p	3mA	87	5000μF
RED20-110S12W	43 ~ 160 VDC	12 VDC	0mA	1670mA	100mVp-p	3mA	88	850μF
RED20-110S15W	43 ~ 160 VDC	15 VDC	0mA	1330mA	100mVp-p	3mA	88	700μF
RED20-110D12W	43 ~ 160 VDC	± 12 VDC	0mA	± 833mA	100mVp-p	3mA	88	± 500μF
RED20-110D15W	43 ~ 160 VDC	± 15 VDC	0mA	± 667mA	100mVp-p	3mA	89	± 350μF

**Note**

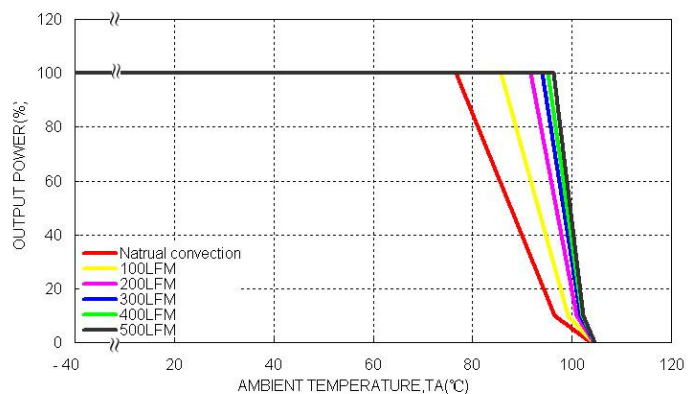
1. MIL-HDBK-217F @Ta=25 °C, Full load.
2. Typical value at nominal input and no load.
3. Typical value at nominal input and full load.
4. Test by minimum input and constant resistive load.
5. Trimming allows the user to increase or decrease the output voltage set point of the module. This is accomplished by connecting an external resistor between the TRIM pin and either the +OUTPUT pin or the -OUTPUT pin.
6. The CTRL pin voltage is reference to -INPUT.  
The order number please see product standard table.
7. Operating ambient temperature:  
Converter can meet the railway T2 and TX temperature requirement.  
T2: -40°C ~ +70°C as all models, TX: -40°C ~ +85°C as power derating to 55% output power.(with Heat-sink as power derating to 70% output power)  
Test condition with vertical direction by natural convection (20LFM).
8. Heat-sink is optional and P/N: 7G-0020C-F
9. The RED20W series 24VDC & 48VDC input standard module meet EN55022 & EN55011 Class B without external components, 110VDC input meet EN55022 Class A without external components and meet Class B with external components. For more detail information, please contact with P-DUKE.
10. An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.  
The filter capacitor Power Mate suggest: 24VDC & 48VDC input: Nippon chemi-con KY series, 220μF/100V.  
110VDC input: Rubycon BXF series, 100μF/250V.

**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

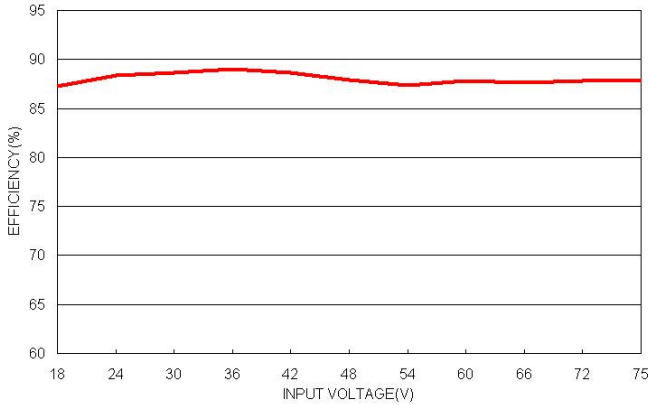
RED20-48S05W Derating Curve



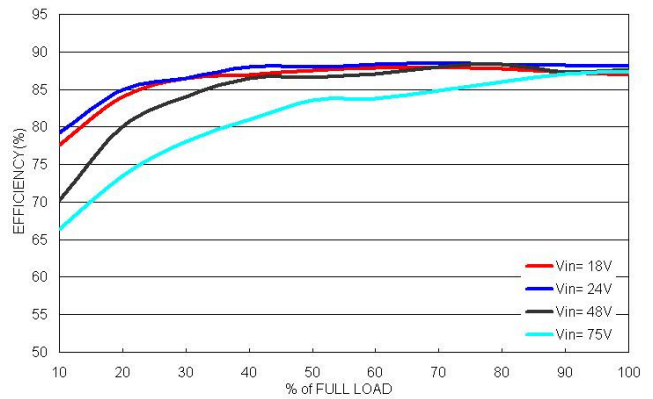
RED20-48S05W Derating Curve With Heat-sink ( Note 8)



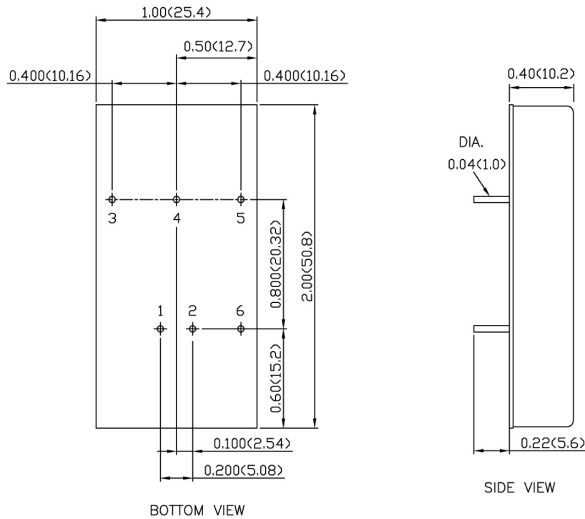
RED20-48S05W Efficiency VS Input Voltage



RED20-48S05W Efficiency VS Output Load



**MECHANICAL DRAWING :**



- All dimensions in Inch (mm)  
Tolerance: X.XX±0.02 (X.X±0.5)  
X.XXX±0.01 (X.XX±0.25)
- Pin pitch tolerance ±0.01 (0.25)
- Pin dimension tolerance ±0.004 (0.1)

PIN CONNECTION		
PIN	SINGLE	DUAL
1	+ INPUT	+ INPUT
2	- INPUT	- INPUT
3	+ OUTPUT	+ OUTPUT
4	TRIM	COMMON
5	- OUTPUT	- OUTPUT
6	CTRL	CTRL

**EXTERNAL OUTPUT TRIMMING**

Output can be externally trimmed by using the method shown below.

TRIM UP

TRIM DOWN

PRODUCT STANDARD TABLE	
Option	Suffix
Negative logic remote ON/OFF (Standard)	
Positive logic remote ON/OFF	-A
Without ON/OFF logic pin	-B
Negative remote logic ON/OFF without TRIM pin	-C
Without ON/OFF logic & TRIM pin	-D
Positive remote logic ON/OFF without TRIM pin	-E