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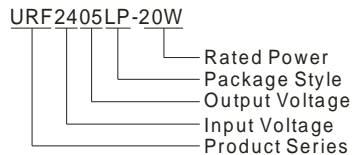
URF_LP-20W SERIES

20W, WIDE INPUT, HIGH ISOLATED & REGULATED SINGLE OUTPUT DC-DC CONVERTER



Patent Protected RoHS

PART NUMBER SYSTEM



FEATURES

- Efficiency up to 89%
- 4:1 wide input voltage range
- Low temperature rise
- Short circuit protection
- 3KVAC isolation
- Operating temperature range: -40°C ~ +85°C
- Industry standard pinout
- Industrial level specifications
- Meet CISPR22/EN55022 CLASS A

APPLICATION

URF_LP-20W series are applied to wide voltage range input situation such as power systems, data transmission device, battery power supply device, telecommunication device, distributed power supply system, remote control system, industrial robot system etc.

SELECTION GUIDE

Model ①	Input Voltage(VDC)		Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		Reflected Ripple Current (mA,typ.)	Max. Capacitive Load (μF)	Efficiency ③ (% , typ.) @Max. Load
	Nominal (Range)	Max ②		Max.	Min.	@Max. Load	@No Load			
URF2405LP-20W	24 (9-36)	40	5	4000	200	947	60	30	10000	88
URF2412LP-20W			12	1667	84	947	15		1600	88
URF2415LP-20W			15	1334	67	937	15		1000	89
URF2424LP-20W			24	834	42	937	20		500	89
URF4805LP-20W	48 (18-75)	80	5	4000	200	473	35		10000	88
URF4812LP-20W			12	1667	84	473	10		1600	88
URF4815LP-20W			15	1334	67	469	10		1000	89
URF4824LP-20W			24	834	42	469	10		500	89

Note: ①series with suffix "A2S" are chassis mounting, with suffix "A4S" are DIN-Rail mounting, for example URF2405LP-20WA2S is chassis mounting ,URF2405LP-20WA4S is DIN-Rail mounting ;
 ②Absolute maximum rating without damage on the converter;
 ③The efficiency of "A2S" and "A4S" is approx. 2% lower for the protection of inverse polarity.

INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec.max.)	24VDC input	-0.7	--	50	VDC
	48VDC input	-0.7	--	100	
Start-up Voltage	24VDC input	--	--	9	
	48VDC input	--	--	17.8	
Under Voltage Shutdown	24VDC input	7.8	--	--	
	48VDC input	16	--	--	
Start-up Time	Nominal input& constant resistance load	--	10	--	ms
Ctrl*	Models ON	Ctrl open or connect TTL high level (2.5-12VDC)			
	Models OFF	Ctrl connect GND or low level (0-1.2VDC)			
	Input current (Models OFF)	--	1	--	mA
Input Filter		Pi Filter			

Note: *The Ctrl control pin voltage is refer to GND.

OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		--	±1	±3	%
Line Regulation	Full load, input voltage from low to high	--	±0.2	±0.5	
Load Regulation	5% to 100% load	--	±0.5	±1	
Transient Recovery Time	25% load step change	--	300	500	µs
Transient Response Deviation		--	±3	±5	%
Temperature Drift	100% load	--	±0.02	--	%/°C
Ripple & Noise*	20MHz bandwidth	--	70	100	mVp-p
Trim		--	±10%	--	VDC
Output Over Voltage Protection	5VDC output	--	6.2	--	
	12VDC output	--	15	--	
	15VDC output	--	18	--	
	24VDC output	--	28.8	--	
Over Current Protection		--	150	--	%
Short Circuit Protection	Input voltage range	Hiccup, Continuous, automatic recovery			

Note:* Ripple and noise tested with "parallel cable" method. See detailed operation instructions at *DC-DC application notes*.

COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-Output, Tested for 1 minute and leakage current less than 5 mA (Except the pin of Ctrl)	3000	--	--	VAC
Isolation Resistance	Input-Output, Test at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-Output, 100KHz/0.1V	--	1000	--	pF
Switching Frequency	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F @25°C	1000	--	--	K hours
Case Material		Plastic (UL94-V0)			
Size	PCB mounting	51.50×26.50×12.00			mm
	A2S Chassis mounting	76.00×31.50×21.20			
	A4S DIN-Rail mounting	76.00×31.50×25.80			
Weight	PCB mounting	--	25	--	g
	A2S Chassis mounting	--	47	--	
	A4S DIN-Rail mounting	--	67	--	

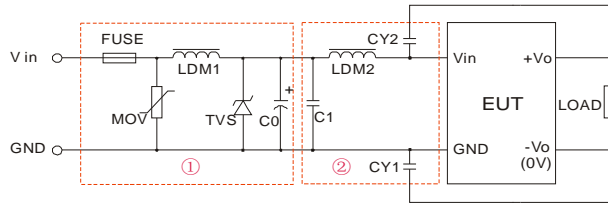
ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	Power derating (above 65°C, see Figure 3)	-40	--	85	°C
Storage Temperature		-40	--	125	
The Max. Case Temperature	Operating Temperature curve range	--	--	105	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			
Shake		10-55Hz, 10G, 30 Min. along X, Y and Z			

EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022 CLASS A (Without External Circuit) / CLASS B(External Circuit Refer to Figure1-②)			
	RE	CISPR22/EN55022 CLASS A (Without External Circuit) / CLASS B(External Circuit Refer to Figure1-②)			
EMS	ESD	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B	
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A	
	EFT	IEC/EN61000-4-4	±2KV (External Circuit Refer to Figure1-①)	perf. Criteria B	
	Surge	IEC/EN61000-4-5	±2KV (External Circuit Refer to Figure1-①)	perf. Criteria B	
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A	
	Voltage dips, short and interruptions immunity	IEC/EN61000-4-29	0%-70%	perf. Criteria B	

EMC RECOMMENDED CIRCUIT



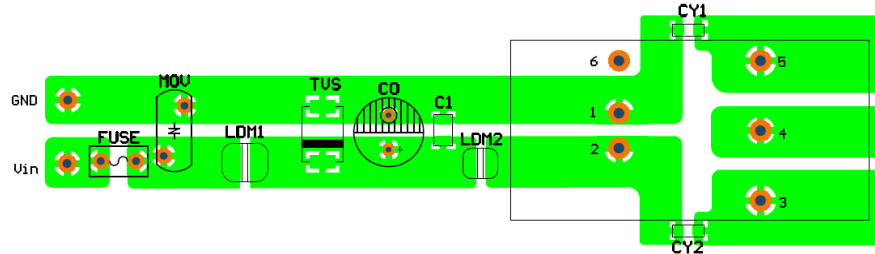
(Figure 1)

Note: In Figure 1, part ① is EMS recommended external circuit, part ② is EMI recommended external circuit. Choose according to requirements.

Recommended external circuit parameters:

Model	Vin:24V	Vin:48V
FUSE	Choose according to actual input current	
MOV	S14K35	S14K60
LDM1	56μH	
TVS	SMCJ48A	SMCJ90A
C0	330μF/50V	330μF/100V
C1	1μF /50V	1μF /100V
LDM2	4.7μH	
CY1,CY2	1nF/5KV	

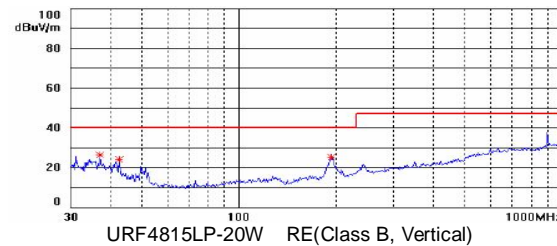
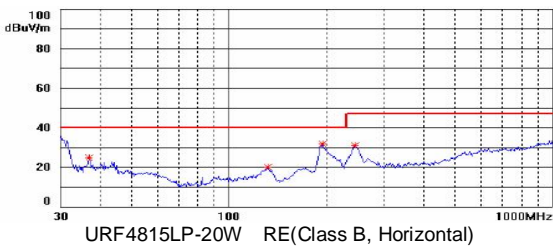
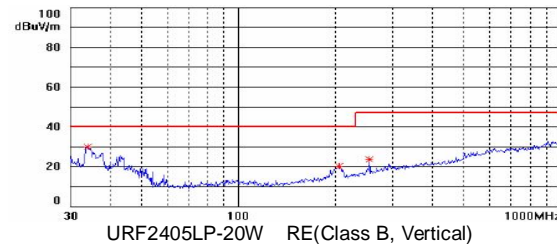
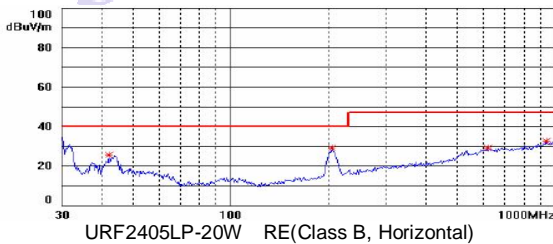
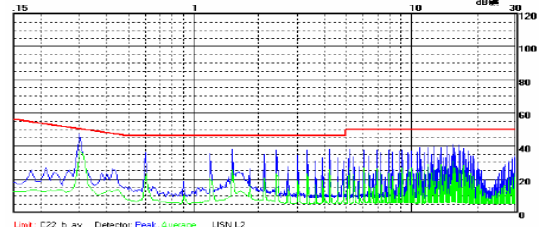
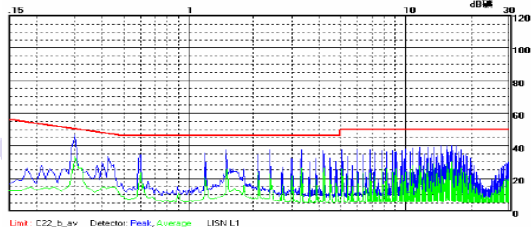
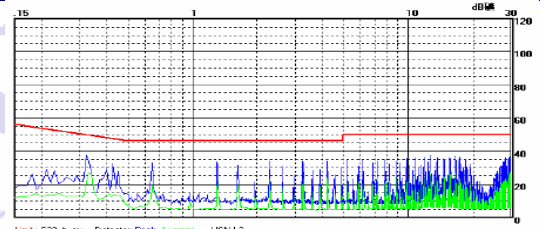
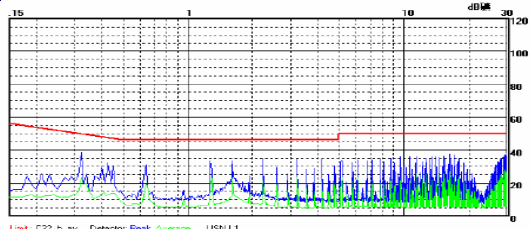
EMC RECOMMENDED CIRCUIT PCB LAYOUT



(Figure 2)

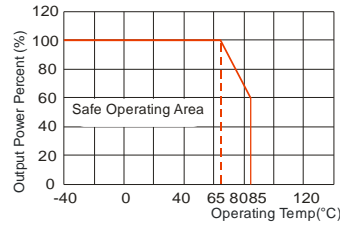
Note: The pad space between input and output (CY1/CY2) must $\geq 2\text{mm}$.

EMI TEST WAVEFORM(RECOMMENDED CIRCUIT 1-②)



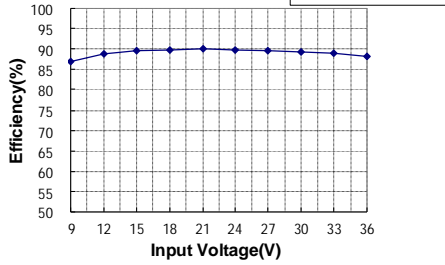
PRODUCT TYPICAL PERFORMANCE CURVE

Temperature Derating Graph

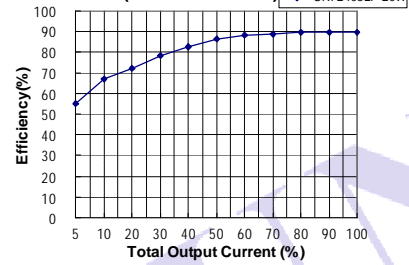


(Figure 3)

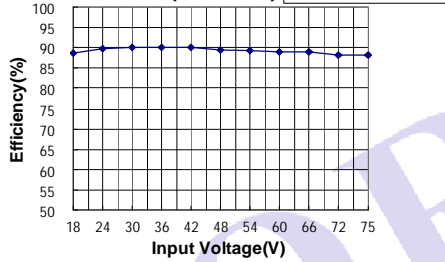
Efficiency VS Input Voltage curve (Full Load)



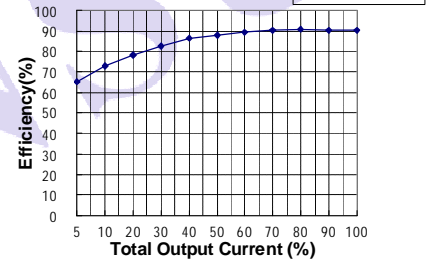
Efficiency VS Output Load curve (Vin=Vin-nominal)



Efficiency VS Input Voltage curve (Full Load)

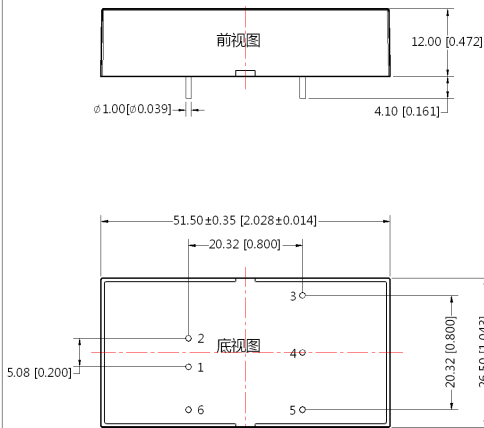


Efficiency VS Output Load curve (Vin=Vin-nominal)

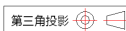


URF-LP-20W OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT

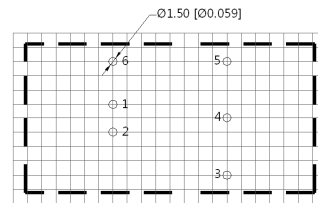
MECHANICAL DIMENSIONS



Note:
Unit :mm[inch]
Pin diameter tolerances :±0.10[±0.004]
General tolerances:±0.50[±0.020]



RECOMMENDED FOOTPRINT DETAILS



PIN CONNECTION	
Pin	Function
1	GND
2	Vin
3	+Vo
4	Trim
5	0V
6	Ctrl

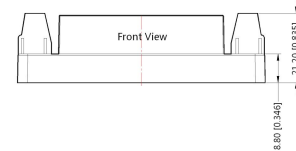
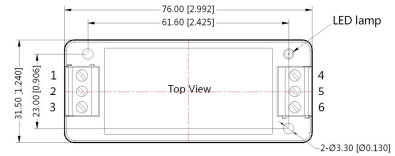
URF_LP-20WA2S SCHASSIS MOUNTING OUTLINE DIMENSIONS



Footprint Details:

Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo

MECHANICAL DIMENSIONS



Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

THIRD ANGLE PROJECTION

URF_LP-20WA4S DIN-RAIL MOUNTING OUTLINE DIMENSIONS

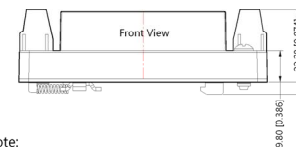


DIN-rail modules are fitting to TS35 rails

Footprint Details:

Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	0V	Trim	+Vo

MECHANICAL DIMENSIONS



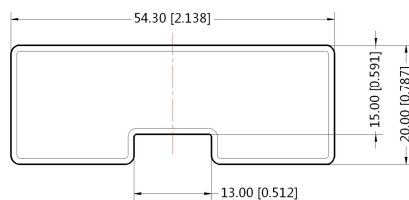
Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

THIRD ANGLE PROJECTION

PACKAGE DIAGRAM

PCB mounting Series (Without heat sink)

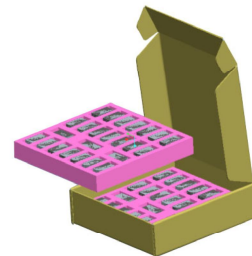
TUBE PACKAGING DIMENSIONS



Note:
Unit :mm[inch]
General tolerances :±0.50[±0.020]
L=230mm[9.055] Tube Quantity:7 PCS
Short tube inner package dimentions:L*W*H=255*170*80
Short tube outer package dimentions:L*W*H=375*280*270

Special Package Series (A2S/A4S)

PACKAGE DIAGRAM

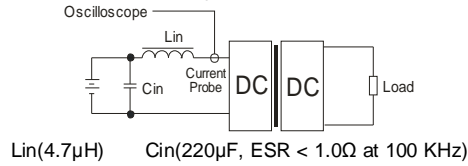


Note:
Inner carton dimensions L*W*H=365*350*105mm
Packaging quantity : 48 PCS
Outer carton dimensions: L*W*H=390*360*245mm
Packaging quantity : 96 PCS

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

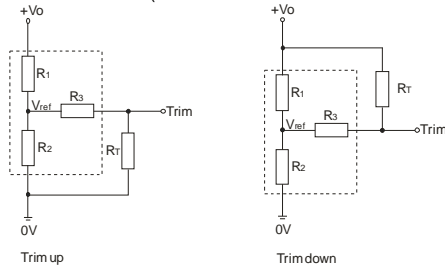
Input reflected-ripple current is measured with an inductor L_{in} and Capacitor C_{in} to simulate source impedance.



TRIM APPLICATION & TRIM RESISTANCE

Application circuit for TRIM (Part in broken line is the interior of models)

Formula for resistance of TRIM



$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3$$

$$a = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

$$a = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

Note: Leave open if not used. Value for R_1 , R_2 , R_3 , and V_{ref} refer to the above table 1. R_T : Resistance of Trim. a : User-defined parameter, no actual meanings. V_o' : The trim up/down voltage.

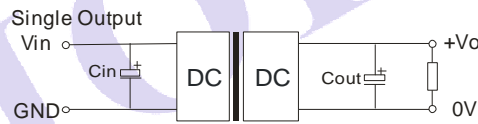
(Table 1)

Parameter \ V_o	5(VDC)	12(VDC)	15(VDC)	24 (VDC)
$R_1(K\Omega)$	2.883	10.971	14.497	24.872
$R_2(K\Omega)$	2.864	2.864	2.864	2.863
$R_3(K\Omega)$	12.1	17.8	17.8	20
$V_{ref}(V)$	2.5	2.5	2.5	2.5

DESIGN CONSIDERATIONS

1) Recommended circuit

All the URF_LP-20W Series have been tested according to the following recommended test circuit before leaving the factory (see Figure 4). If you want to further decrease the input/output ripple, you can increase a capacitance-values properly or choose capacitors with low ESR, but the total capacitance of the filter capacitor must not exceed the Max Capacitive Load. The recommended capacitance of its filter capacitor sees Table 2.



(Figure 4)

Output voltage (VDC)	$C_{out} (\mu F)$	$C_{in} (\mu F)$
5	470	100
12/15	220	
24	100	

(Table 2)

2) It is not recommended to increase the output power capability by connecting two or more converters in parallel. The product is not hot-swappable

Note:

1. Min. load shouldn't be less than 5%, otherwise ripple maybe increased dramatically, If the product operates under min. load, it may not be guaranteed to meet all specifications listed. Operation under minimum load will not damage the converter.
2. Max. Capacitive Load is tested at input voltage range and full load.
3. All specifications measured at $T_a=25^\circ C$, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
4. In this datasheet, all test methods are based on our corporate standards.
5. All characteristics are for listed models, and non-standard models may perform differently. Please contact our technical support for more details.
6. Please contact our technical support for any specific requirement.
7. Specifications of this product are subject to changes without prior notice.

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