CUI INC
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SERIES: PRFE20W-D | DESCRIPTION: DC-DC CONVERTER

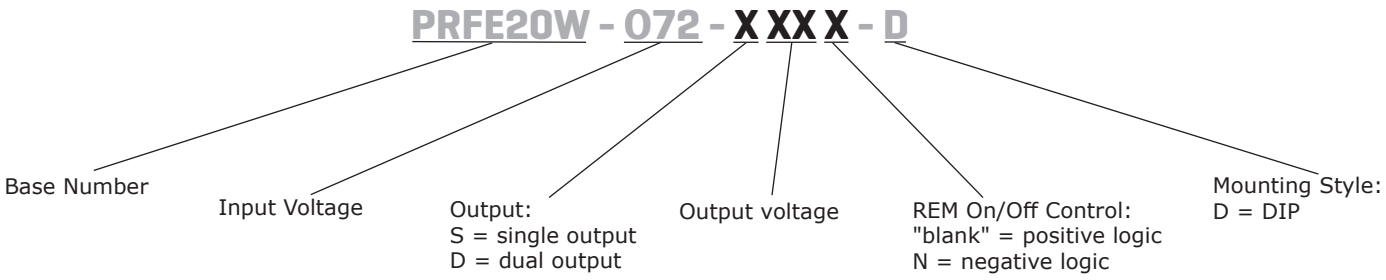
FEATURES

- 20 W isolated output
- ultra-wide 18:1 input range
- single/dual regulated outputs
- UL/EN 62368 certified
- meets EN 55032/55035/50155 with external circuits
- 4,200 Vdc isolation
- remote on/off
- wide operating temperature range (-40~105°C)

MODEL	input voltage		output voltage	output current	output power	ripple & noise[1] Vo1/Vo2	efficiency[2]
	nom (Vdc)	range (Vdc)	(Vdc)	max (A)	max (W)	max (mVp-p)	typ (%)
PRFE20W-O72-S5-D	72	8.5~160	5	4.00	20	75	86
PRFE20W-O72-S12-D	72	8.5~160	12	1.67	20	100	89
PRFE20W-O72-S15-D	72	8.5~160	15	1.33	20	100	89
PRFE20W-O72-D12-D	72	8.5~160	±12	±0.83	20	100	89
PRFE20W-O72-D15-D	72	8.5~160	±15	±0.66	20	100	89
PRFE20W-O72-D24-D	72	8.5~160	±24	±0.41	20	100	90

Notes: 1. Peak to peak, 5Hz to 20MHz bandwidth, full load, 22µF aluminum solid capacitor and 1µF ceramic capacitor.
2. 72Vdc input voltage.

PART NUMBER KEY



INPUT

parameter	conditions/description		min	typ	max	units
input voltage			8.5		160	Vdc
surge voltage	for maximum of 0.1 second				200	Vdc
current	at 12 Vdc input voltage, full load				2.2	A
inrush current					0.1	A^2s
filter	Pi filter					
remote on/off[3]	positive logic	models ON (4.0 ~160 Vdc or REM pin open circuit)				
		models OFF (REM pin 0~1.2 Vdc)				
	negative logic	models ON (REM pin 0~1.2 Vdc)				
		models OFF (4.0 ~160 Vdc or REM pin open circuit)				
under voltage lockout	turn on turn off		8.5 7		9.5 8	V V

Notes: 3. - Voltages referenced to -Vin pin.

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	5 Vdc output model 12 Vdc output model 15 Vdc output model ±12 Vdc output model ±15 Vdc output model ±24 Vdc output model			6,800 3,300 2,200 820 680 330	µF µF µF µF µF µF
voltage accuracy	at 72 Vdc input voltage, full load, 25°C			±1.0	%
line regulation	from low line to high line, full load			±0.2	%
load regulation	from full load to no load single output double output			 ±0.2 ±1.0	 % %
switching frequency	output ripple frequency		200		kHz
transient recovery time	75% ~ 100%, nominal input voltage			250	µs
transient response deviation	75% ~ 100%, nominal input voltage			±5	%
temperature coefficient	40°C ~ 105°C			±0.02	%/°C
adjustability	single output output power ≤ max. rated power, via trim pin	-20		15	%

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over current protection	auto recovery, hiccup	110		180	%
over voltage protection	5 Vdc output model, zener clamp 12 Vdc output model, zener clamp 15 Vdc output model, zener clamp ±12 Vdc output model, zener clamp ±15 Vdc output model, zener clamp ±24 Vdc output model, zener clamp		6.2 15 18 ±15 ±18 ±30		Vdc Vdc Vdc Vdc Vdc Vdc
over temperature protection	shutdown recovery		110 92		°C °C
short circuit protection	continuous, auto recovery				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output, for 2 seconds			3,000 4,200	Vac Vdc
isolation resistance	input to output	1,000			MΩ
isolation capacitance	input to output; output to case		20		pF
safety approvals	certified to 62368: UL/EN/IEC				
conducted emissions	EN 55032 & EN 50155 Class A (with external filter)				
radiated emissions	EN 55032 & EN 50155 Class A (with external filter)				
ESD	EN 61000-4-2 Level 3: Air ±8kV, Contact ±6kV Perf. Criteria A				
radiated immunity	EN 61000-4-3 Level 3: 80~1000MHz, 20V/m Perf. Criteria A				
EFT/burst	EN 61000-4-4 Level 3: On power input port, ±2kV, external input capacitor required (EN 50155); Level 4: On power input port, ±4kV, external input capacitor required (EN 55035) Perf. Criteria A				
surge	EN 61000-4-5 Level 4: Line to earth, ±4kV, Line to line, ±2kV (EN 50155); Level 4: Line to earth, ±4kV, Line to line, ±2kV (EN 55035) Perf. Criteria A				
conducted immunity	EN 61000-4-6 Level 3: 0.15~80MHz, 10V Perf. Criteria A				
magnetic immunity	EN 61000-4-8 Level 1: 50Hz, 1A/m for EN 55035:2017 Perf. Criteria A				
voltage dips and interruption	EN 50155 Class S3: 20ms interruptions Perf. Criteria A				
MTBF	as per MIL-HDBK-217F, 25°C 5 Vdc output model 12 Vdc output model 15 Vdc output model 24 Vdc output model		 1,242 1,397 1,631 1,341		 kHours kHours kHours kHours
RoHS	yes				

ENVIRONMENTAL

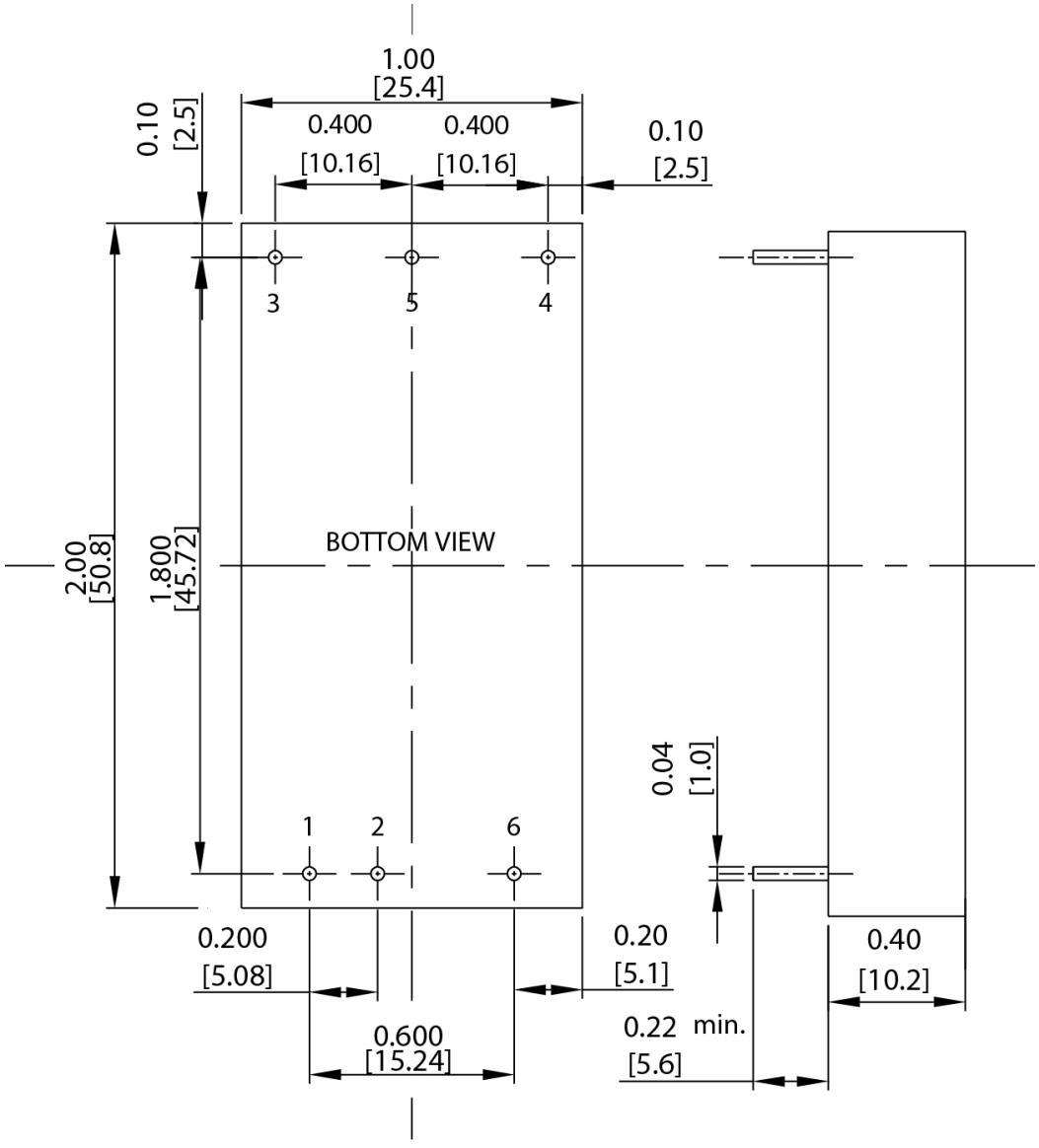
parameter	conditions/description	min	typ	max	units
operating case temperature	see derating curve	-40		105	°C
storage temperature		-55		125	°C
storage humidity	non-condensing	-		95	%

MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	2.00 × 1.00 × 0.40 [50.8 x 25.4 x 10.2 mm]				inch
case material	plastic, DAP, UL 94V-0				
weight			28.5		g

MECHANICAL DRAWING

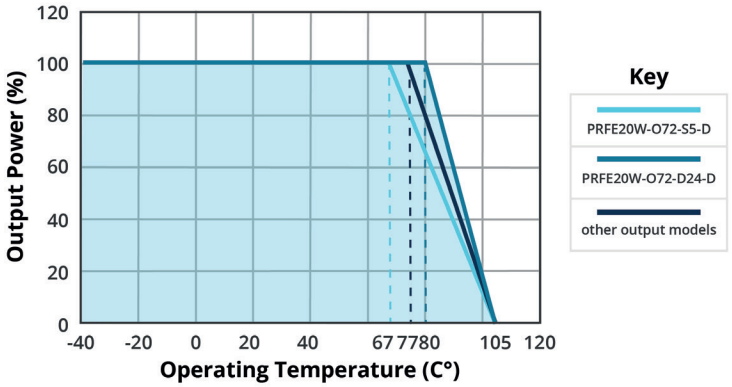
units: inch [mm]
tolerances: inch: x.xx = ±0.02, x.xxx = ±0.010
mm: x.x = ±0.5, x.xx = ±0.25
pin diameter: 0.04 ±0.004 inch [1.0 ±0.1 mm]



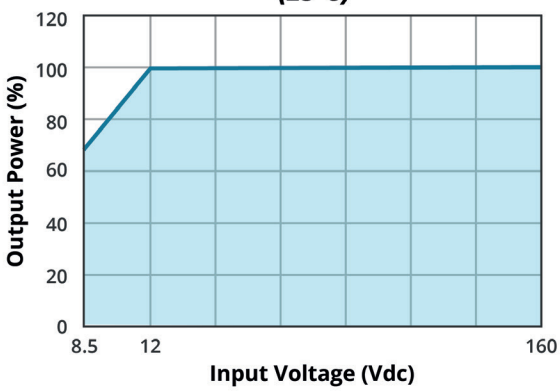
PIN Out		
PIN	Single output	Dual output
	Function	Function
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vo	+Vo
4	Trim	-Vo
5	-Vo	Common
6	Remote	Remote

DERATING CURVES

TEMPERATURE DERATING CURVE

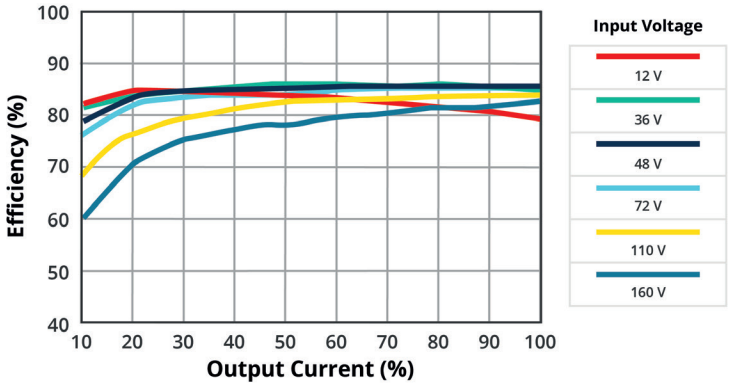


INPUT VOLTAGE DERATING CURVE (25°C)

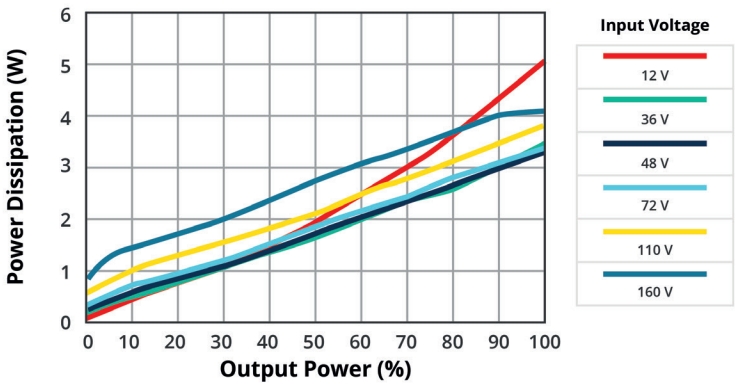


EFFICIENCY CURVES

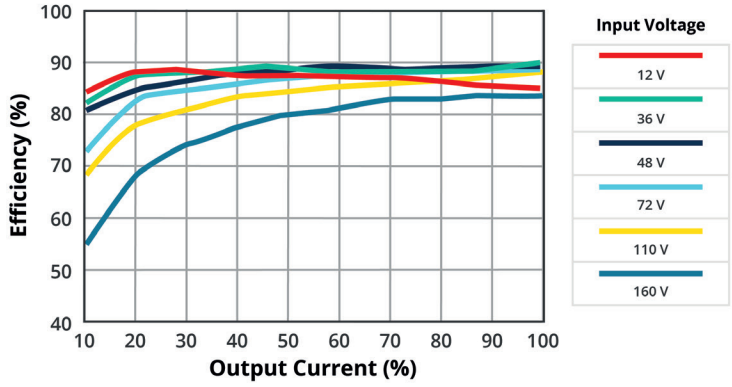
EFFICIENCY VS OUTPUT CURRENT PRFE20W-O72-S5-D (25°C)



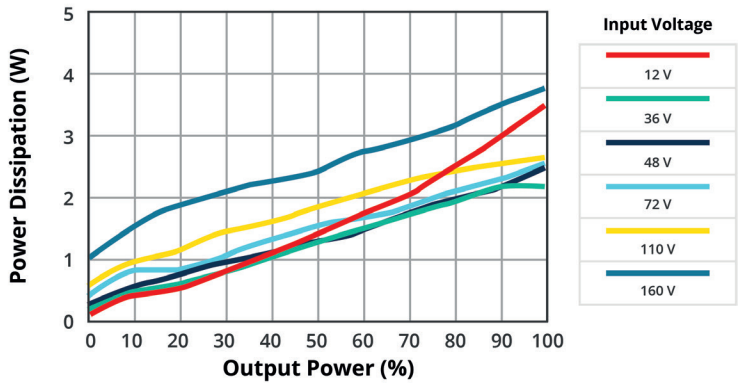
POWER DISSIPATION VS OUTPUT POWER PRFE20W-O72-S5-D (25°C)



EFFICIENCY VS OUTPUT CURRENT PRFE20W-O72-S12-D (25°C)

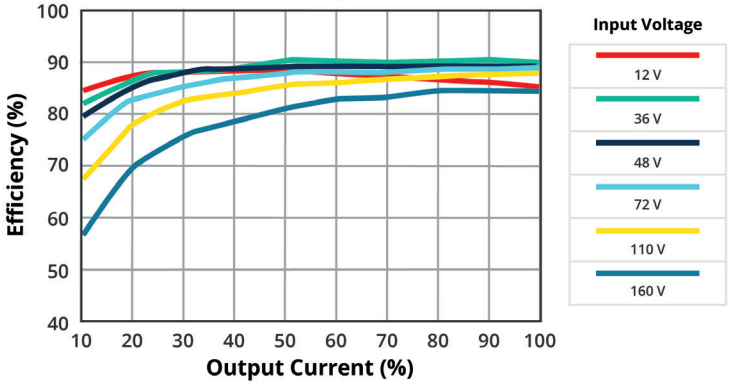


POWER DISSIPATION VS OUTPUT POWER PRFE20W-O72-S12-D (25°C)

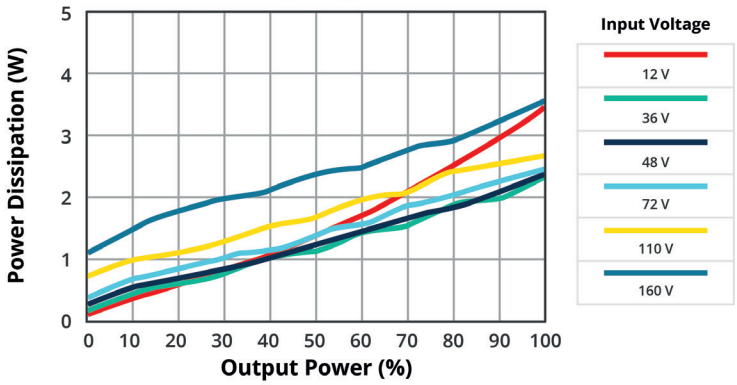


EFFICIENCY CURVES (CONTINUED)

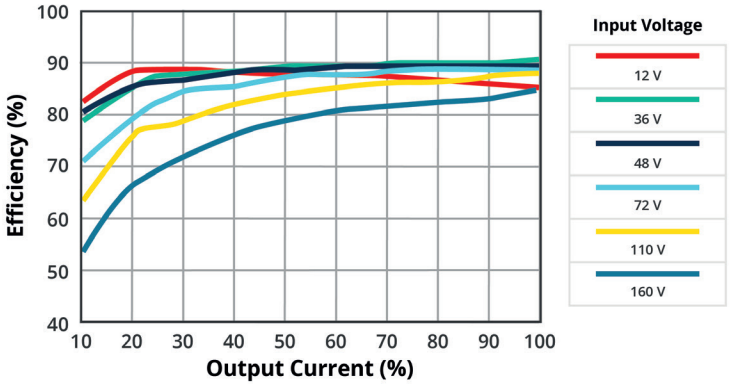
EFFICIENCY VS OUTPUT CURRENT
PRFE20W-O72-S15-D
(25°C)



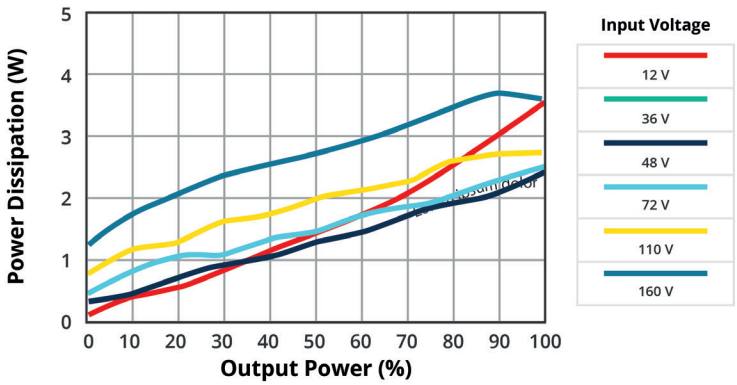
POWER DISSIPATION VS OUTPUT POWER
PRFE20W-O72-S15-D
(25°C)



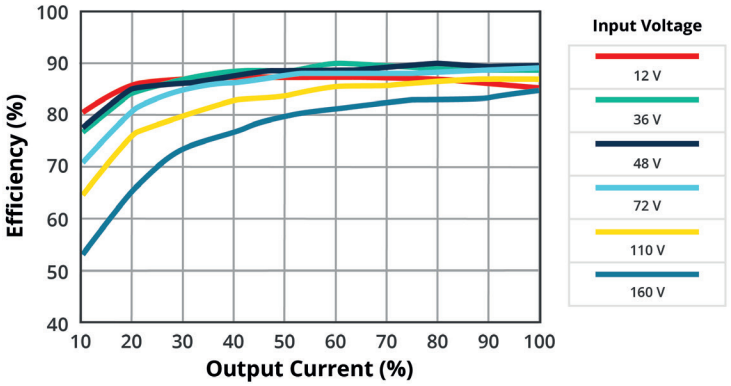
EFFICIENCY VS OUTPUT CURRENT
PRFE20W-O72-D12-D
(25°C)



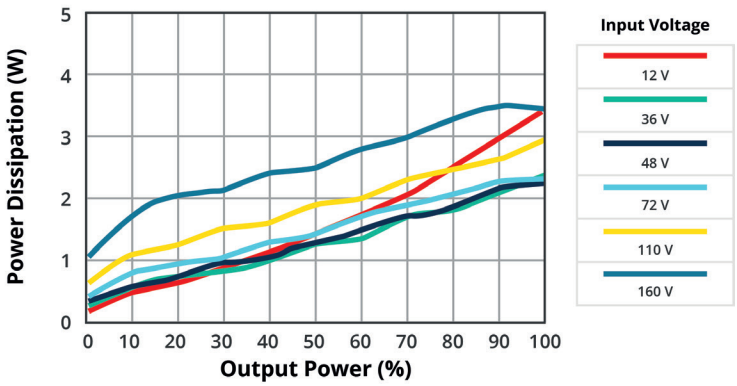
POWER DISSIPATION VS OUTPUT POWER
PRFE20W-O72-D12-D
(25°C)



EFFICIENCY VS OUTPUT CURRENT
PRFE20W-O72-D15-D
(25°C)

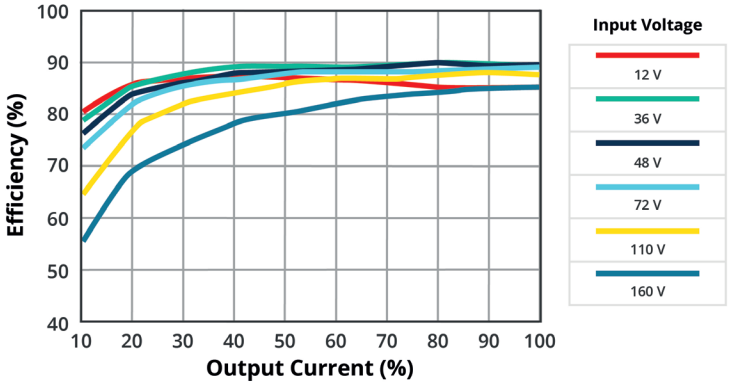


POWER DISSIPATION VS OUTPUT POWER
PRFE20W-O72-D15-D
(25°C)

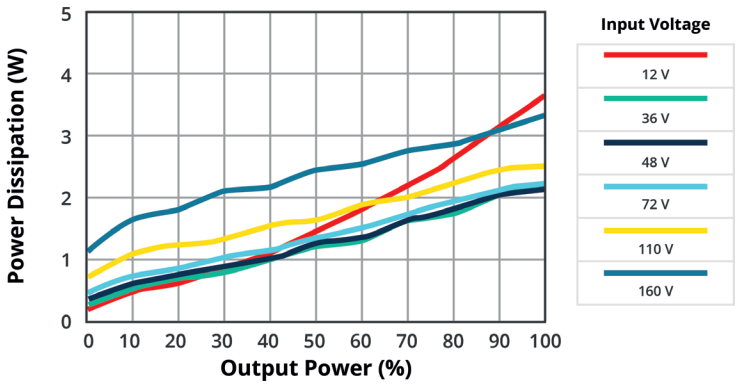


EFFICIENCY CURVES (CONTINUED)

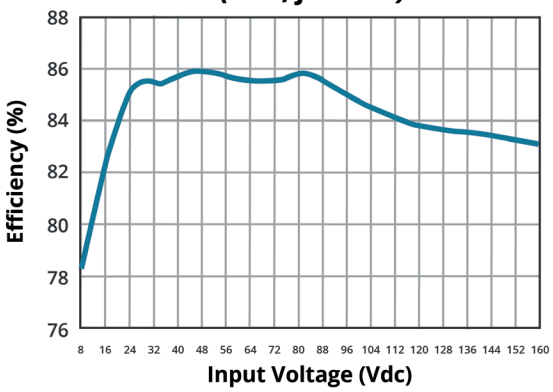
EFFICIENCY VS OUTPUT CURRENT
PRFE20W-O72-D24-D
(25°C)



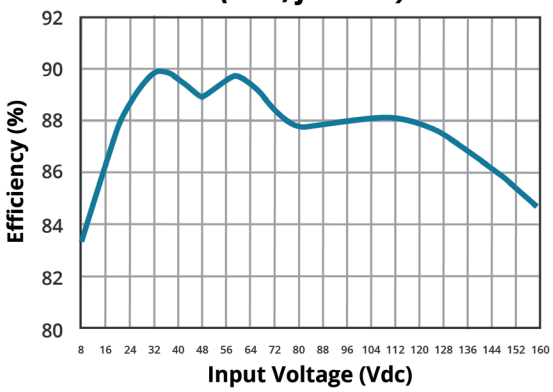
POWER DISSIPATION VS OUTPUT POWER
PRFE20W-O72-D24-D
(25°C)



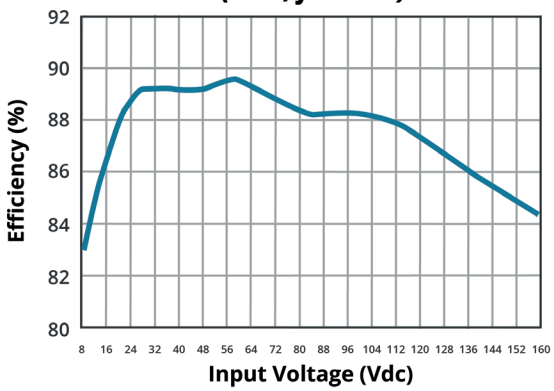
EFFICIENCY VS INPUT VOLTAGE
PRFE20W-O72-S5-D
(25°C, full load)



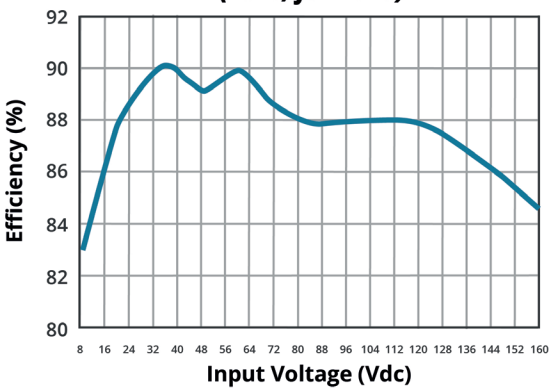
EFFICIENCY VS INPUT VOLTAGE
PRFE20W-O72-S12-D
(25°C, full load)



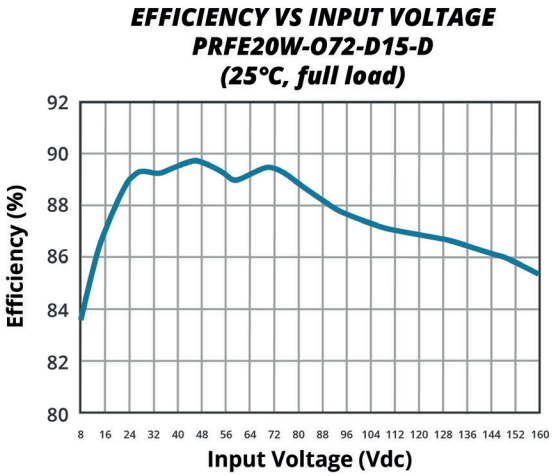
EFFICIENCY VS INPUT VOLTAGE
PRFE20W-O72-S15-D
(25°C, full load)

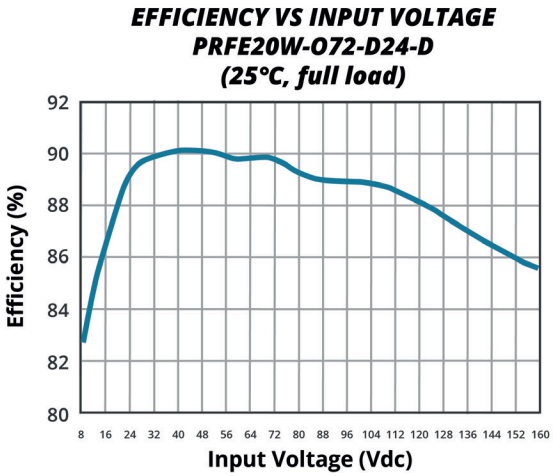


EFFICIENCY VS INPUT VOLTAGE
PRFE20W-O72-D12-D
(25°C, full load)



EFFICIENCY CURVES (CONTINUED)

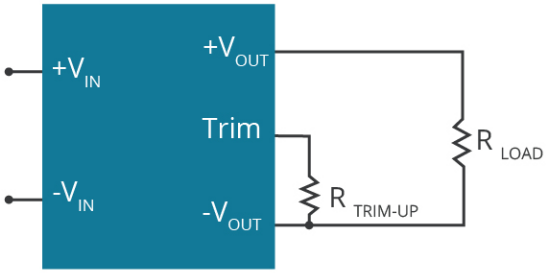




APPLICATION NOTES

Figure 1

Trim up



PRFE20W-072-S5-D

$$R_{TRIM} = \frac{22.13 - 3.976 \times (V_{OUT} - V_{OUT,\,NOM})}{7.017 \times (V_{OUT} - V_{OUT,\,NOM})} - 3.3\ (K\,\Omega)$$

Value of Trim up

PRFE20W-072-S12-D

$$R_{TRIM} = \frac{120.76}{3 \times (V_{OUT} - V_{OUT,\,NOM})} - 18\ (K\,\Omega)$$

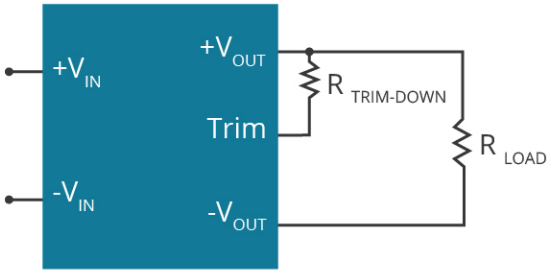
Value of Trim up

PRFE20W-072-S15-D

$$R_{TRIM} = \frac{104.42}{2.28 \times (V_{OUT} - V_{OUT,\,NOM})} - 18\ (K\,\Omega)$$

Value of Trim up

Trim down



PRFE20W-072-S5-D

$$R_{TRIM} = \frac{42 - 16.803 \times (V_{OUT,\,NOM} - V_{OUT})}{7.017 \times (V_{OUT,\,NOM} - V_{OUT})} - 3.3\ (K\,\Omega)$$

Value of Trim down

PRFE20W-072-S12-D

$$R_{TRIM} = \frac{206.116}{3 \times (V_{OUT,\,NOM} - V_{OUT})} - 27.08\ (K\,\Omega)$$

Value of Trim down

PRFE20W-072-S15-D

$$R_{TRIM} = \frac{206.116}{2.28 \times (V_{OUT,\,NOM} - V_{OUT})} - 27.08\ (K\,\Omega)$$

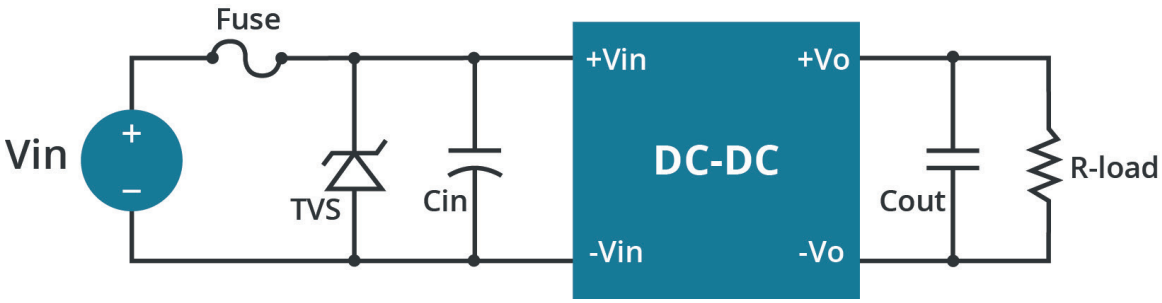
Value of Trim down

Note: R_{TRIM}: External resistor in kΩ
$V_{OUT,\,NOM}$: Nominal output voltage
V_{OUT}: Desired output voltage

INPUT FUSING AND SAFETY CONSIDERATION

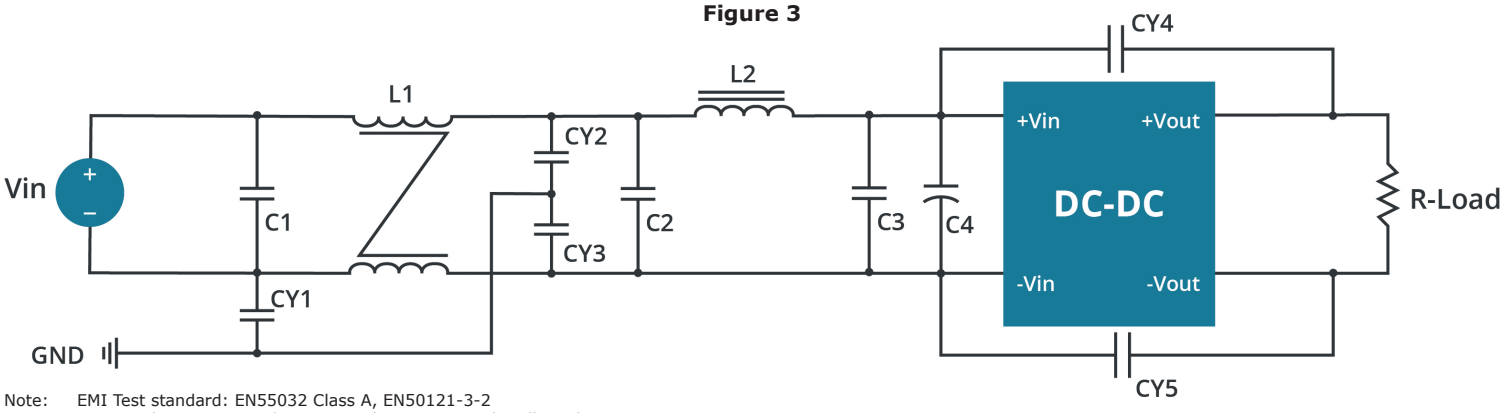
The PRFE20W-D series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 3.15A time delay fuse for all models. It is recommended that the circuit have a transient voltage suppressor diode (TVS) across the input terminal to protect the unit against surge or spike voltage and input reverse voltage (as shown).
The external TVS & input capacitor (Cin) is required if PRFE20W-D series has to meet EN61000-4-4 & EN61000-4-5
The PRFE20W-D series recommended a TVS & aluminum capacitor (120μF/220V) to connect parallel.

Figure 2



EMC CONSIDERATIONS

Figure 3



Note: EMI Test standard: EN55032 Class A, EN50121-3-2
Test Condition: Input Voltage: 110Vdc, Output Load: Full Load
(1) EMI meet EN55011 / EN55032 / EN50121-3-2

Table 1

MODEL NUMBER	C1 / C2 / C3	C4	CY1	CY2 / CY3	CY4 / CY5	L1	L2
PRFE20W-O72-S5-D	1μF/250V 1812 Ceramic capacitor	120μF/220V KXJ Series Aluminum capacitor	680pF 400Vac Y1 capacitor	1500pF 400Vac Y1 capacitor	2200pF 400Vac Y1 capacitor	1.4mH Ø0.4mmx1/13T ACME A151 T10x5x5C	10μH/7A 2525CZ Vishay
PRFE20W-O72-S12-D							
PRFE20W-O72-S15-D							
PRFE20W-O72-D12-D			470pF 400Vac Y1 Capacitor				
PRFE20W-O72-D15-D							
PRFE20W-O72-D24-D							

REVISION HISTORY

rev.	description	date
1.0	initial release	05/19/2022
1.01	remote on/off updated	10/11/2022
1.02	output voltage trimming updated	06/09/2023

The revision history provided is for informational purposes only and is believed to be accurate.

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