CUI INC
a bel group

SERIES: PRF20 | DESCRIPTION: DC-DC CONVERTER

FEATURES

- up to 20 W isolated output
- 4:1 input range (43~160 V)
- smaller package
- single/dual regulated outputs
- meets European EN50155 railway standard
- 2,250 Vdc isolation
- continuous short circuit, over current protection, over voltage protection
- built-in remote on/off
- wide operating temperature range (-40~85°C)
- efficiency up to 90%

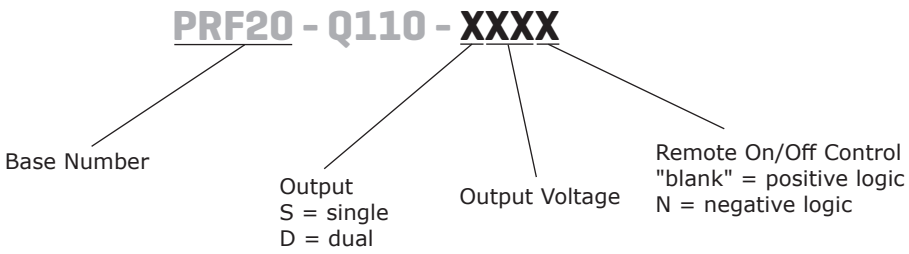


MODEL

MODEL	input voltage typ (Vdc)	input voltage range (Vdc)	output voltage (Vdc)	output current min (mA)	output current max (mA)	output power max (W)	ripple and noise[1] max (mVp-p)	efficiency typ (%)
PRF20-Q110-S5	110	43~160	5	0	4000	20	75	88.5
PRF20-Q110-S12	110	43~160	12	0	1670	20	100	90
PRF20-Q110-S15	110	43~160	15	0	1330	20	100	89.5
PRF20-Q110-D12	110	43~160	±12	0	±833	20	100	89
PRF20-Q110-D15	110	43~160	±15	0	±667	20	100	88.5

Note: 1. Ripple and noise are measured at 20 MHz BW by and 1μF ceramic capacitor across each output.

PART NUMBER KEY



INPUT

parameter	conditions/description		min	typ	max	units
operating input voltage			43	110	160	Vdc
under voltage shutdown	power up power down			40 38		Vdc Vdc
surge voltage	for maximum of 100 ms				200	Vdc
start-up time	single output models dual output models			15 25		ms ms
remote[1]	positive logic	models ON (open or 3.5~75 Vdc)				
		models OFF (0~1.2 Vdc)				
	negative logic	models ON (0~1.2 Vdc)				
		models OFF (open or 3.5~75 Vdc)				
filter	pi filter					

Note: 1. Open collector refer to -Vin.

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	5V output model 12V output model 15V output model ±12V output model ±15V output model			5600 1000 1000 ±680 ±350	µF µF µF µF µF
line regulation	from high line to low line			±0.2	%
load regulation	from full load to no load single output models dual output models			 ±0.5 ±1	 % %
cross regulation	dual output models, load cross variation 10%/100%			±5	%
voltage accuracy				±1.5	%
adjustability[2]			±10		%
switching frequency			250		KHz
transient response	25% load step change			250	µs
temperature coefficient				±0.03	%/°C

Note: 2. Output trimming available on single output models only

PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous				
over current protection		110		160	%
over voltage protection	protected by internal zener or TVS clamp 5V output model 12V output model 15V output model ±12V output model ±15V output model		 6.2 15 18 ±15 ±18		 Vdc Vdc Vdc Vdc Vdc

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute	2,250			Vdc
isolation resistance		1000			MΩ
safety approvals	UL60950-1				
EMI/EMC	EN55022 class A, EN50155 (external circuit required)				
RoHS	2011/65/EU				

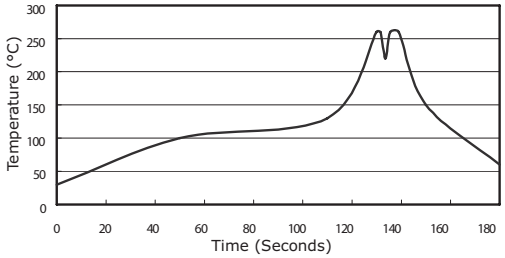
ENVIRONMENTAL

parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		85	°C
storage temperature		-55		125	°C
humidity	non-condensing			95	%
case temperature				105	°C
vibration	EN50155 (EN61373)				

SOLDERABILITY

parameter	conditions/description	min	typ	max	units
wave soldering	see wave soldering profile			260	°C

Notes:
1. Soldering materials: Sn/Cu/Ni
2. Ramp up rate during preheat: 1.4°C/s (from 50°C to 100°C)
3. Soaking temperature: 0.5°C/s (from 100°C to 130°C), 60±20 seconds
4. Peak temperature: 260°C, above 250°C for 3~6 seconds
5. Ramp down rate during cooling: -10°C/s (from 260°C to 150°C)



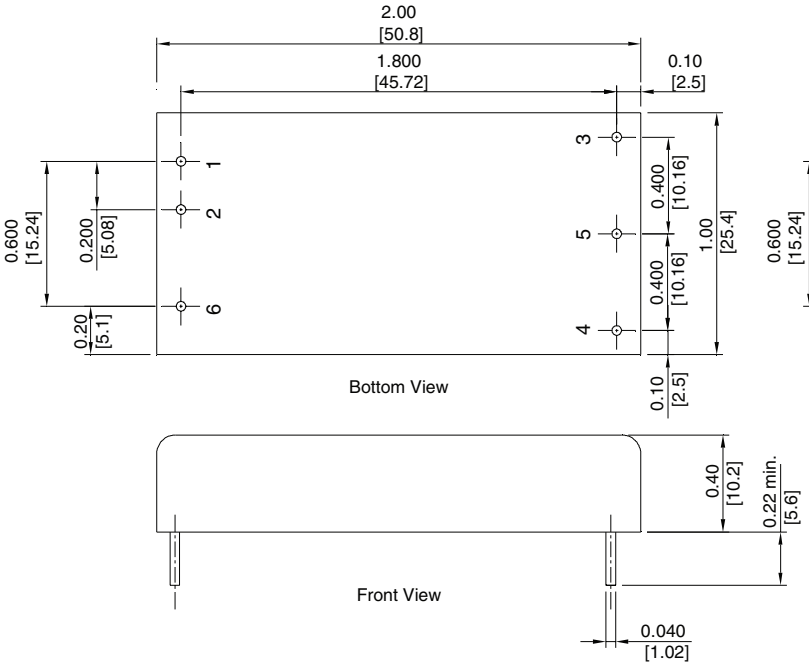
MECHANICAL

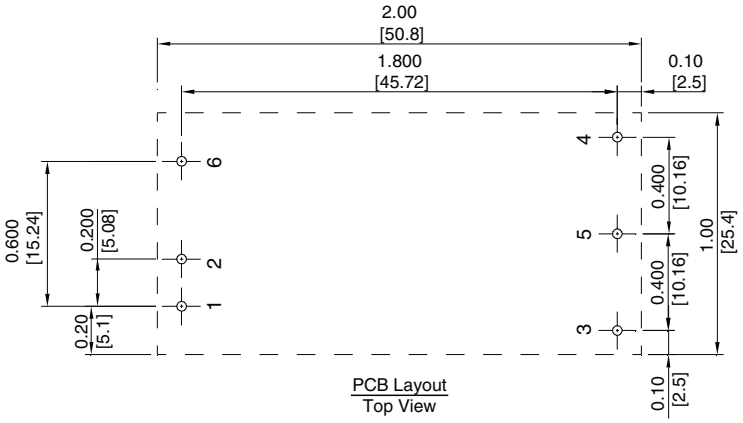
parameter	conditions/description	min	typ	max	units
dimensions	2.00 x 1.00 x 0.40 (50.8 x 25.4 x 10.2 mm)				inch
case material	black coated copper with non-conductive base				
weight			35		g

MECHANICAL DRAWING

units: inch[mm]
tolerance: X.XX = ±0.02[±0.5]
X.XXX = ±0.010[±0.25]

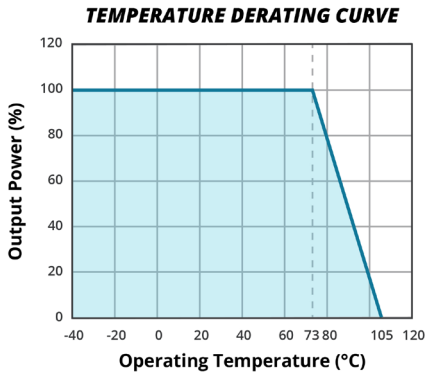
1.3 mm Plated Through hole
2.5 mm Pad Size





PIN CONNECTIONS		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	-Vout
5	-Vout	common
6	Remote ON/OFF	

DERATING CURVES



EMC RECOMMENDED CIRCUIT

EN50155(EN50121-3-2)

Figure 1

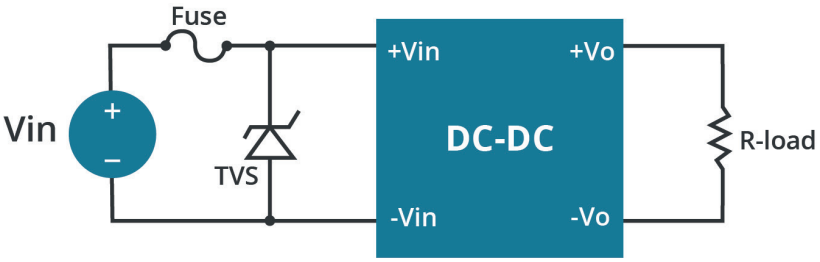


Table 1

External components
3A time delay fuse
TVS

TEST CONFIGURATION

Figure 2

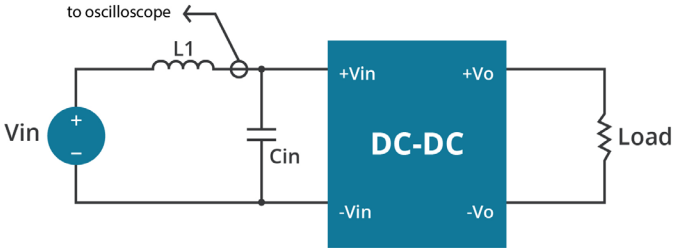


Table 2

External components	
Lin	12µH
Cin	22µF, ESR < 0.2Ω at 100 KHz

Note: Input reflected-ripple current is measured with an inductor L1 to simulate source impedance.

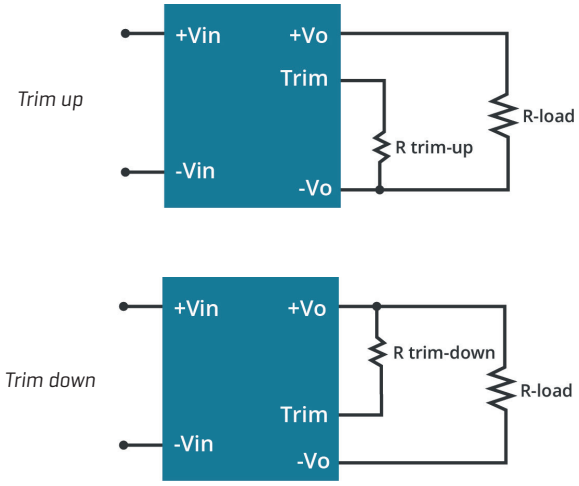
APPLICATION NOTES

Output Voltage Trimming

Leave open if not used.

Figure 3

Application Circuit for Trim pin



Formula for Trim Resistor

$$Rtrim\text{ - }up = \left(\frac{Vr \times R1 \times (R2 + R3)}{(Vo - Vo,\ nom) \times R2}\right) - Rt\ (K\Omega)$$

$$Rtrim\text{ - }down = R1 \times \left(\frac{Vr \times R1}{(Vo,\ nom - Vo) \times R2} - 1\right) - Rt\ (K\Omega)$$

Note: $R_{trim\text{-}up}$ is the external resistor in KΩ
$R_{trim\text{-}down}$ is the external resistor in KΩ
$V_{O,\ nom}$ is the nominal output voltage
V_O is the desired output voltage
R1, R2, R3, Rt, and Vr are internal (see table 3).

Table 3

Vout (Vdc)	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	Rt (KΩ)	Vr (V)
5	2.32	2.32	0	8.2	2.5
12	6.8	2.4	2.32	22	2.5
15	8.06	2.4	3.9	27	2.5

Note: 1. All specifications are measured at Ta=25°C, nominal input voltage and full output load unless otherwise specified.

REVISION HISTORY

rev.	description	date
1.0	initial release	02/12/2014
1.01	company logo updated	02/16/2021
1.02	derating curve and circuit figures updated	08/23/2021
1.03	input section updated	03/10/2022

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

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