SERIES: PRF20 | DESCRIPTION: DC-DC CONVERTER
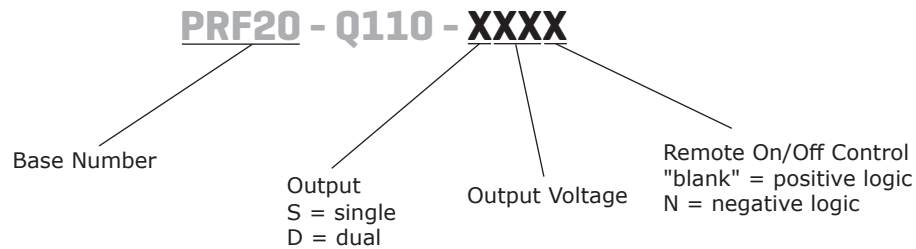
FEATURES

- up to 20 W isolated output
- 4:1 input range (43~160 V)
- smaller package
- single/dual regulated outputs
- meets European EN 50155 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	input voltage		output voltage	output current		output power	ripple and noise[1]	efficiency
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	max (mVp-p)	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	90.0
PRF20-Q110-S15	110	43~160	15	0	1330	20	100	89.5
PRF20-Q110-D12	110	43~160	±12	0	±833	20	100	89.0
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

PRF20 - Q110 - XXXX

Base Number

Output
S = single
D = dual

Output Voltage

Remote On/Off Control
"blank" = positive logic
N = negative logic

INPUT

parameter	conditions/description		min	typ	max	units
operating input voltage			43	110	160	Vdc
under voltage shutdown	power up			40		Vdc
	power down			38		Vdc
surge voltage	for maximum of 100 ms				200	Vdc
start-up time	single output models			15		ms
	dual output models			25		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			5600	µF
	12V output model			1000	µF
	15V output model			1000	µF
	±12V output model			±680	µF
	±15V output model			±350	µF
line regulation	from high line to low line			±0.2	%
load regulation	from full load to no load				
	single output models			±0.5	%
	dual output models			±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		6.2		Vdc
	12V output model		15		Vdc
	15V output model		18		Vdc
	±12V output model		±15		Vdc
	±15V output model		±18		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	certified to 60950-1: UL				
EMI/EMC	EN55022 class A, EN50155 (external circuit required)				
RoHS	yes				

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
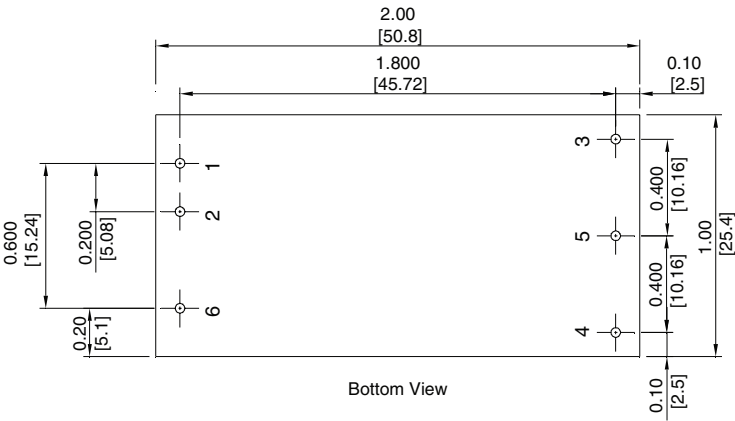5. Ramp down rate during cooling: -10°C/s (from 260°C to 150°C)
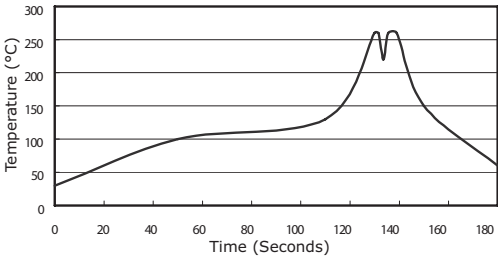
MECHANICAL

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

Bottom View

PCB Layout
Top View

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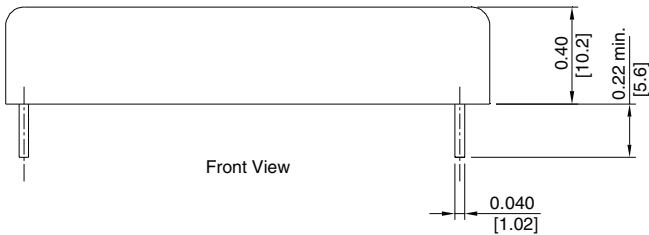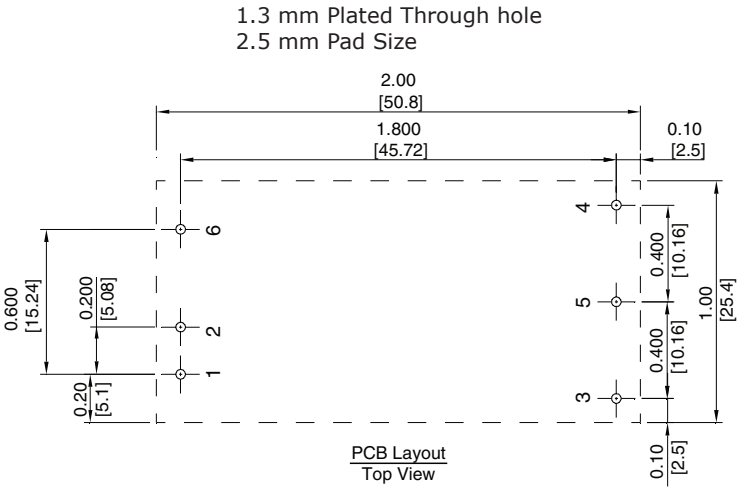
PIN CONNECTIONS		
Pin	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	-Vout
5	-Vout	common
6	Remote ON/OFF	

DERATING CURVES

TEMPERATURE DERATING CURVE
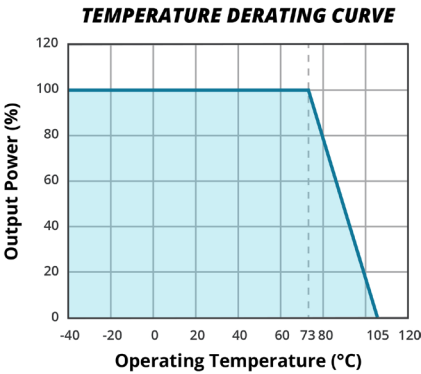
EMC RECOMMENDED CIRCUIT

EN50155(EN50121-3-2)

Figure 1
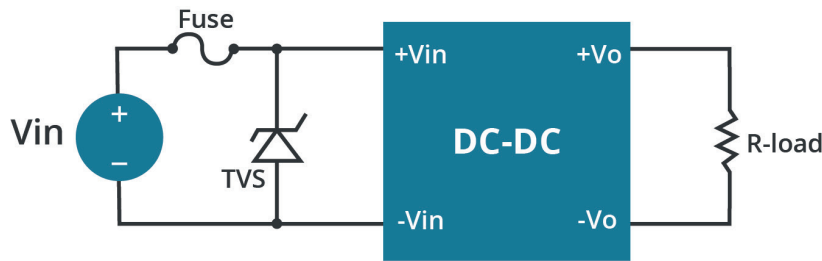
Table 1

External components
3A time delay fuse
TVS

TEST CONFIGURATION

Figure 2
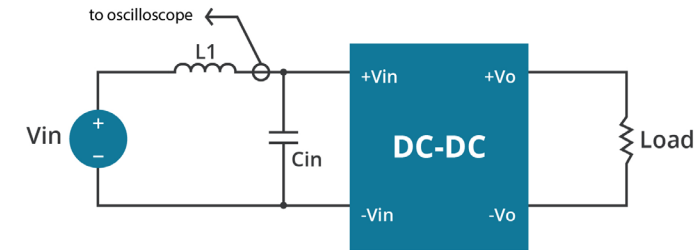
Table 2

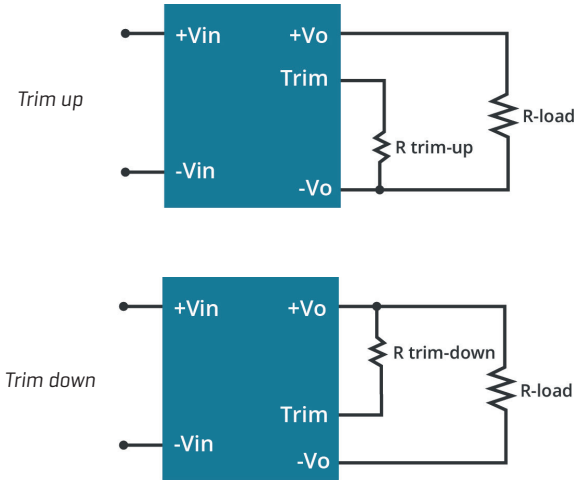| External components	
Lin	12µH
Cin	22µF, ESR < 0.2Ω at 100 KHz

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

Trim up

Trim down

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

V_{NOM}	R_1	R_2	R_3	R_T	V_R
(Vdc)	(kΩ)	(kΩ)	(kΩ)	(kΩ)	(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
1.04	company address updated	11/05/2024
1.05	datasheet updated	05/01/2025

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

CUI INC
a bel group

Headquarters
15575 SW Sequoia Pkwy #100   Fax 503.612.2383
Portland, OR 97224   **cui**.com
800.275.4899   techsupport@cui.com