

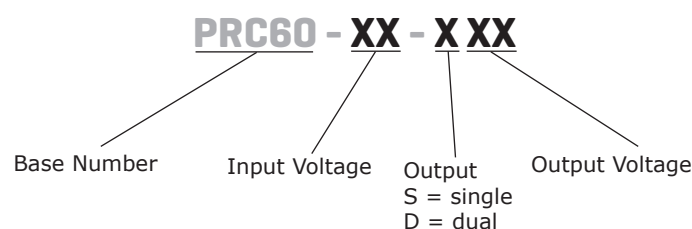
SERIES: PRC60 | DESCRIPTION: DC-DC CONVERTER
FEATURES

- up to 60 W continuous power
- single and dual regulated outputs
- 4:1 input range, 9~36 Vdc and 18~75 Vdc input voltage options
- certified to EN/IEC 62368-1
- meets EN 50155
- wide operating temperature range (-40 ~ +105°C)
- short circuit, over current, over temperature, and over voltage protection
- remote ON/OFF, output voltage trim



MODEL	input voltage		output voltage	output current ¹	output power	ripple & noise ²	efficiency ³
	typ (Vdc)	range (Vdc)	(Vdc)	max (mA)	max (W)	max (mVp-p)	typ (%)
PRC60-24-S3	24	9 ~ 36	3.3	12,000	39.6	100	89
PRC60-24-S5	24	9 ~ 36	5	12,000	60	100	91
PRC60-24-S12	24	9 ~ 36	12	5,000	60	125	91
PRC60-24-S15	24	9 ~ 36	15	4,000	60	125	92
PRC60-24-S24	24	9 ~ 36	24	2,500	60	200	92
PRC60-24-D12	24	9 ~ 36	±12	±2,500	60	125	91
PRC60-24-D15	24	9 ~ 36	±15	±2000	60	125	91
PRC60-24-D24	24	9 ~ 36	±24	±1,250	60	200	90
PRC60-48-S3	48	18 ~ 75	3.3	12,000	39.6	100	89
PRC60-48-S5	48	18 ~ 75	5	12,000	60	100	91
PRC60-48-S12	48	18 ~ 75	12	5,000	60	125	92
PRC60-48-S15	48	18 ~ 75	15	4,000	60	125	92
PRC60-48-S24	48	18 ~ 75	24	2,500	60	200	92
PRC60-48-D12	48	18 ~ 75	±12	±2,500	60	125	90
PRC60-48-D15	48	18 ~ 75	±15	±2,000	60	125	90
PRC60-48-D24	48	18 ~ 75	±24	±1,250	60	200	90

Notes: 1. At full load.
 2. Measured with 20MHz bandwidth and 1μF ceramic capacitor.
 3. The efficiency is test by nominal input and full load at 25°C.

PART NUMBER KEY


INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage	24 Vdc input	9	24	36	Vdc
	48 Vdc input	18	48	75	Vdc
surge voltage	24 Vdc input			50	Vdc
	48 Vdc input			100	Vdc
input undervoltage lockout	0% ~ 100% load				
	24 Vdc input		8		Vdc
	48 Vdc input		16		Vdc
no load input current	at nominal input voltage			15	mA
input filter	Pi filter				
start-up time				50	ms
start-up voltage	0% ~ 100% load				
	24 Vdc input			9	Vdc
	48 Vdc input			18	Vdc
remote ON/OFF	module on: CTRL pin open or pulled high (3~12 Vdc) module off: CTRL pin pulled low to GND (0~1.2 Vdc)				

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load	3.3 & 5 Vdc output			28,000	μF
	12 Vdc output			5,850	μF
	15 Vdc output			3,900	μF
	24 Vdc output			2,000	μF
	±12 Vdc output			±3,900	μF
	±15 Vdc output			±2,400	μF
	±24 Vdc output			±1,000	μF
voltage accuracy	at full load, nominal input		±1		%
voltage adjustability			±10		%
line regulation	low line to high line at full load				
	single output		±0.2		%
	dual output		±0.5		%
load regulation	0% ~ 100% load				
	single output		±0.5		%
	dual output		±1		%
cross regulation	asymmetrical load 25%/100%, dual output models		±5		%
operating frequency	at full load, nominal input		250		kHz
transient recovery time	75% to 100% load step change		500		μs
temperature coefficient			±0.05		%/°C

PROTECTIONS

parameter	conditions/description	min	typ	max	units
over voltage protection	zener diode clamp				
	3.3 Vdc output	3.7		5.3	Vdc
	5 Vdc output	5.6		8.0	Vdc
	12 Vdc output	13.4		19.2	Vdc
	15 Vdc output	16.8		24.0	Vdc
	24 Vdc output	26.9		38.4	Vdc
	±12 Vdc output	±13.4		±19.2	Vdc
	±15 Vdc output	±16.8		±24.0	Vdc
	±24 Vdc output	±26.9		±38.4	Vdc
over current protection			175		%
short circuit protection	continuous, auto recovery				
over temperature protection				115	°C

SAFETY AND COMPLIANCE (CONTINUED)

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output, for 1 minute	1,600			Vdc
isolation resistance	at 500 Vdc	1,000			MΩ
isolation capacitance			1,500		pF
safety approvals	certified to 62368-1: EN, BS EN				
EMI	EN 55032 Class A, Class B (external circuit required, see Figure 3)				
ESD	EN 61000-4-2, Air ± 8kV, Contact ± 6kV, perf. Criteria A				
fast transient ⁴	EN 61000-4-4, ±2kV, perf. Criteria A				
surge ⁴	EN 61000-4-5, ±2kV, perf. Criteria A				
conducted immunity	EN 61000-4-6, 10 Vrms, perf. Criteria A				
magnetic field immunity	EN 61000-4-8, 10 A/m, perf. Criteria A				
MTBF	at 25°C		205,000		hours
RoHS	yes				

Notes: 4. External 680µF/100V capacitor required.

ENVIRONMENTAL

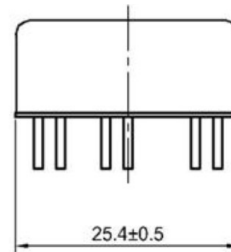
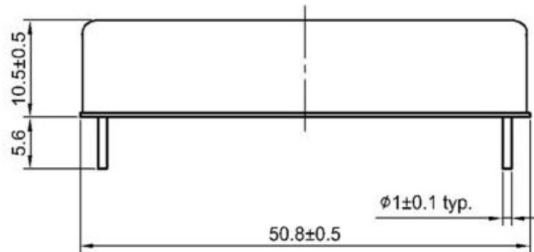
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curve	-40		105	°C
storage temperature		-55		125	°C
humidity	non-condensing	5		95	%
max. case temperature				110	°C

MECHANICAL

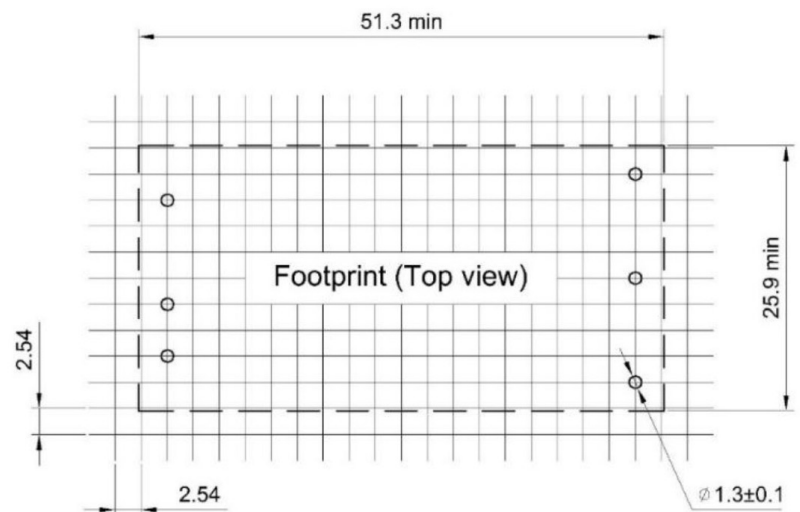
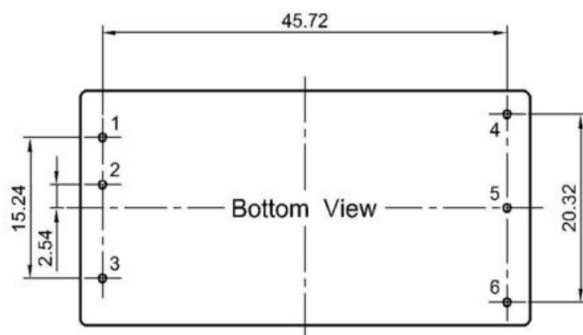
parameter	conditions/description	min	typ	max	units
dimensions	50.80 x 25.40 x 10.50				mm
weight			37.6		g
case material	metal case				
potting material	silicone (UL94V-0)				
cooling method	natural convection				

MECHANICAL DRAWING

units: inch [mm]
general tolerance: $\pm 0.35\text{mm}$

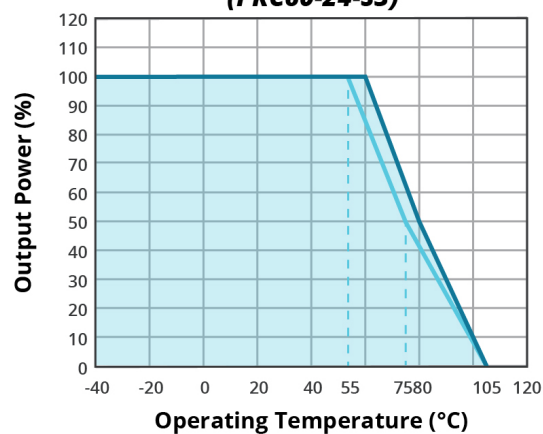


Pin Out		
PIN	Single outputs	Dual outputs
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL	CTRL
4	+Vout	+Vout
5	-Vout	0V
6	Trim	-Vout



DERATING CURVES

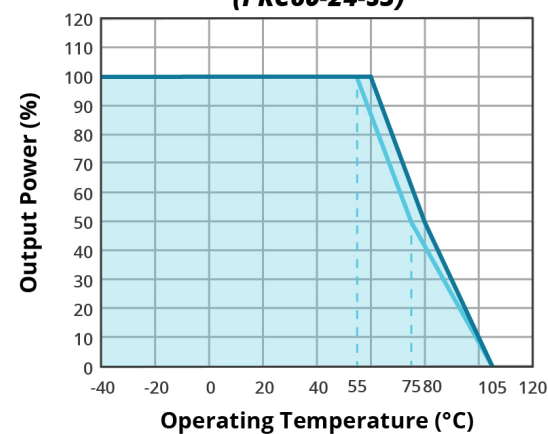
**TEMPERATURE DERATING CURVE
(PRC60-24-S3)**



Key

— with test board
— without test board

**TEMPERATURE DERATING CURVE
(PRC60-24-S5)**

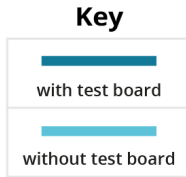
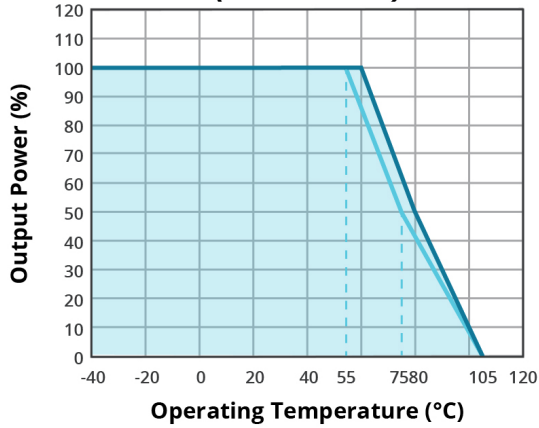


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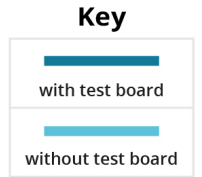
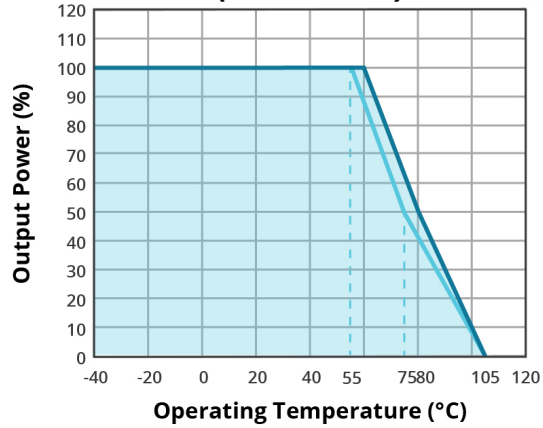
— with test board
— without test board

DERATING CURVES (CONTINUED)

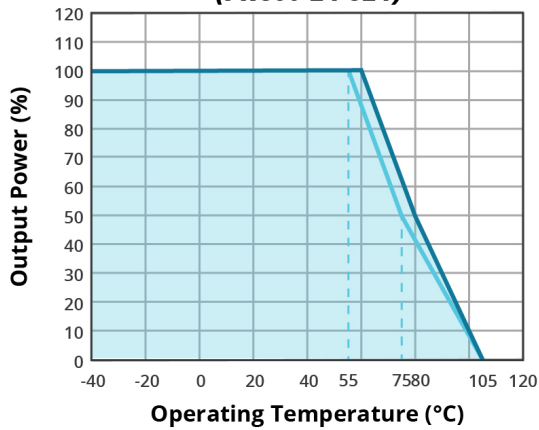
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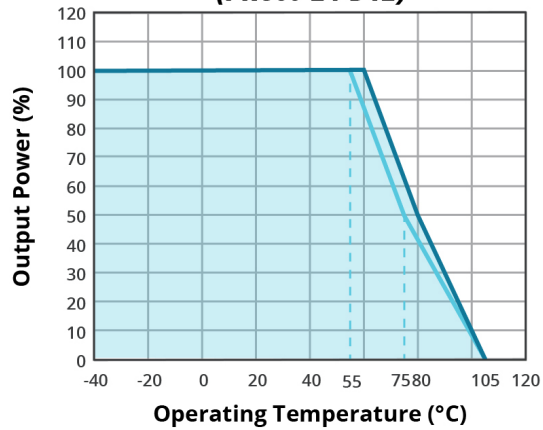
**TEMPERATURE DERATING CURVE
(PRC60-24-S15)**



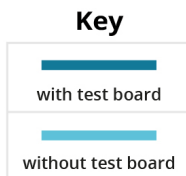
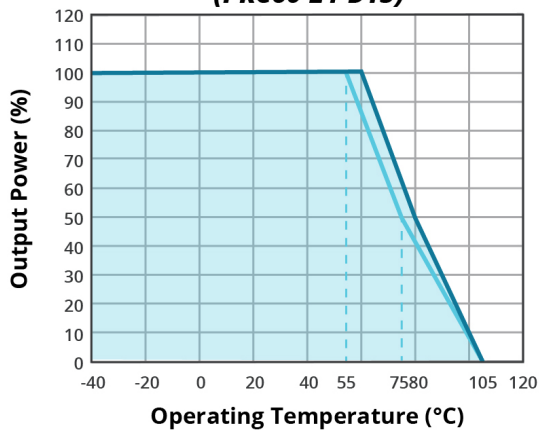
**TEMPERATURE DERATING CURVE
(PRC60-24-S24)**



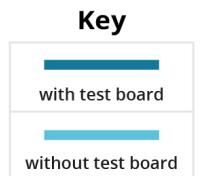
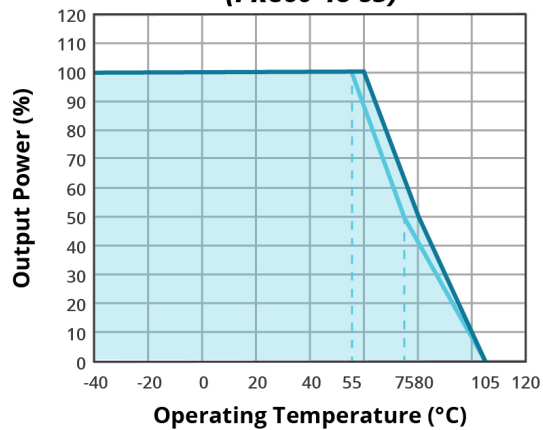
**TEMPERATURE DERATING CURVE
(PRC60-24-D12)**



**TEMPERATURE DERATING CURVE
(PRC60-24-D15)**

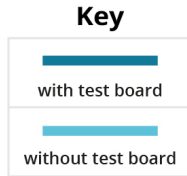
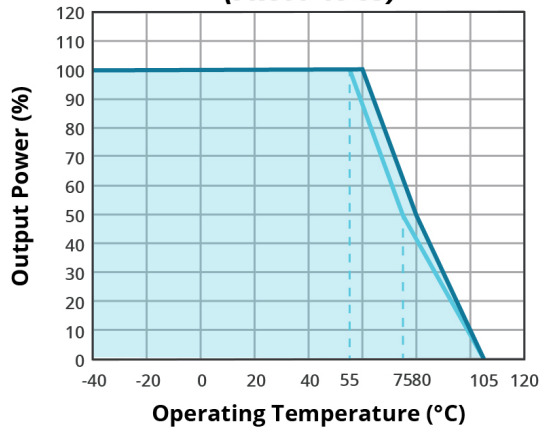


**TEMPERATURE DERATING CURVE
(PRC60-48-S3)**

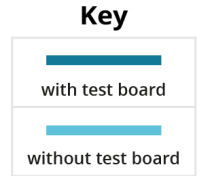
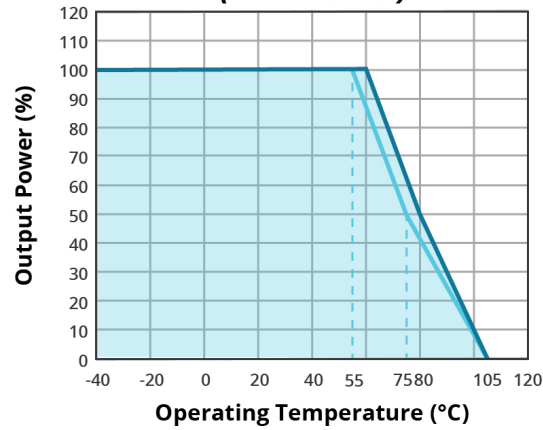


DERATING CURVES (CONTINUED)

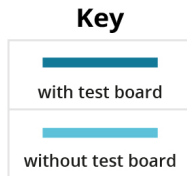
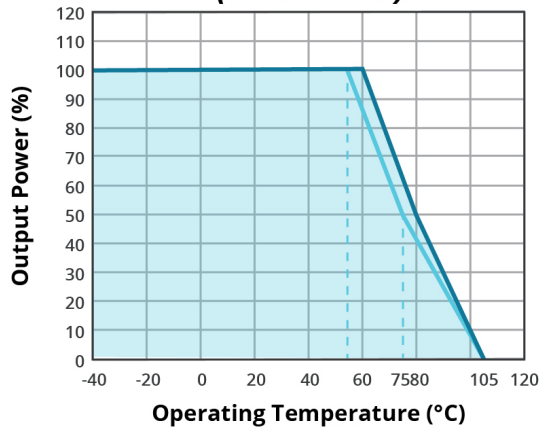
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(PRC60-48-S5)**



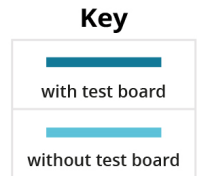
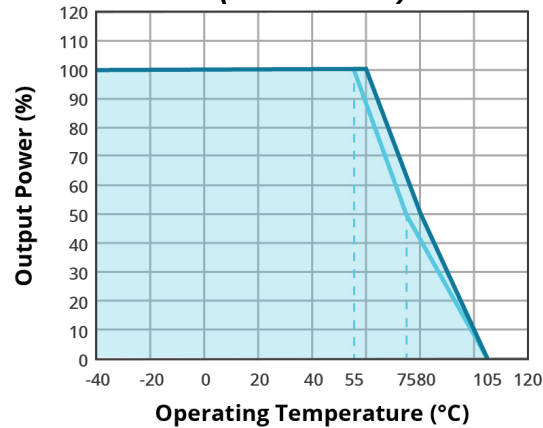
**TEMPERATURE DERATING CURVE
(PRC60-24-S12)**



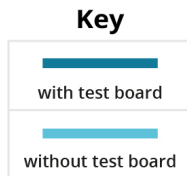
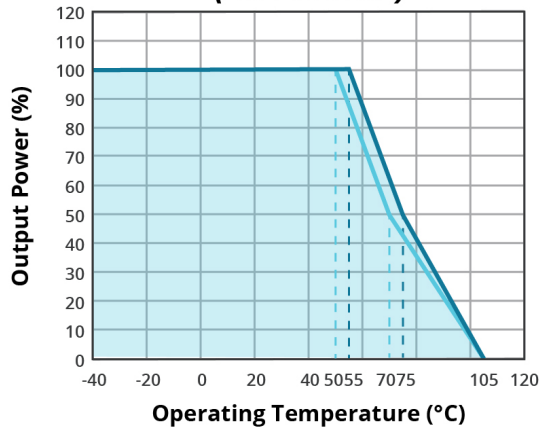
**TEMPERATURE DERATING CURVE
(PRC60-48-S15)**



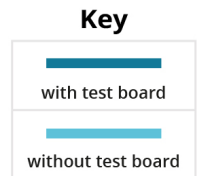
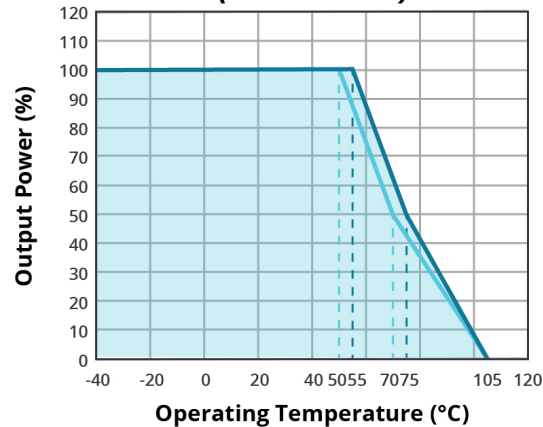
**TEMPERATURE DERATING CURVE
(PRC60-48-S24)**



**TEMPERATURE DERATING CURVE
(PRC60-48-D12)**



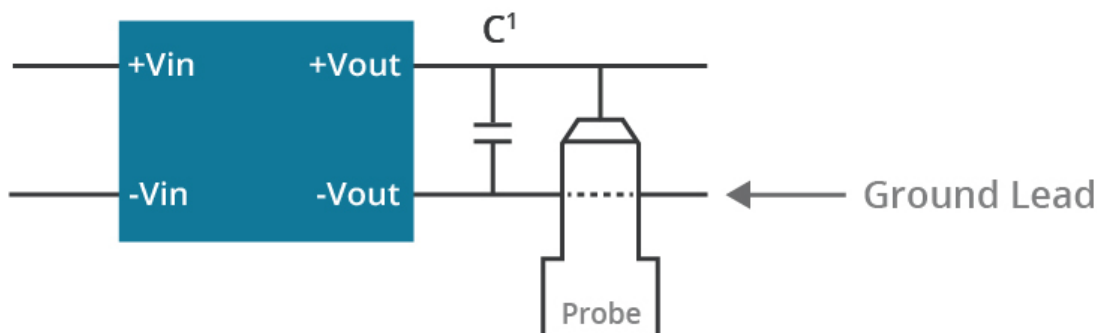
**TEMPERATURE DERATING CURVE
(PRC60-48-D15)**



Note:
 The derating curve was measured at nominal V_{in} in chamber with nature convection.
 The derating curve was measured with nominal line. Mounted test board 90 x 80 mm and each power pin with 43 x 40 mm, 2oz double layer.

RIPPLE AND NOISE MEASURE METHOD

Figure 1



Note: 1. Measured with 20MHz bandwidth, input voltage range 0~100%, and 1 μ F ceramic capacitor.

EMI RECOMMENDED CIRCUIT

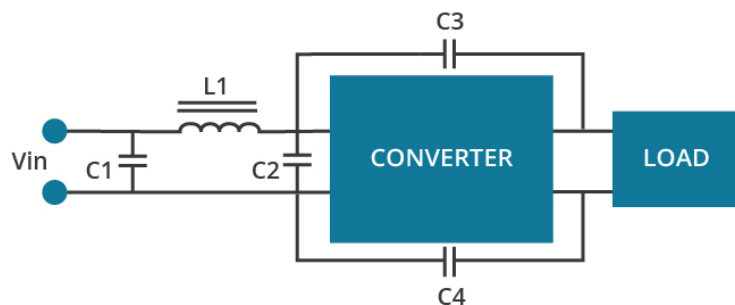
Figure 2

EN55032 CLASS A



Figure 3

Single output
EN55032 CLASS B



Dual output
EN55032 CLASS B

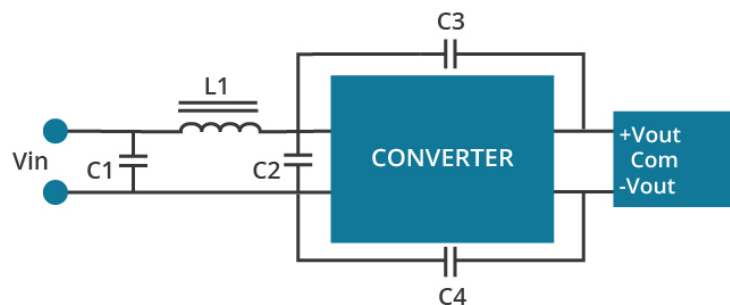


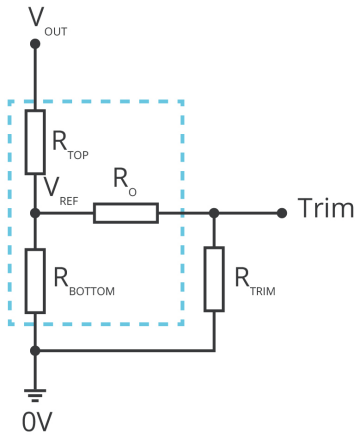
Table 2

Vin	C1	L1	C2	C3	C4
24V	10 μ F	1.5 μ H	10 μ F	2200pF	2200pF
48V	4.7 μ F	3.3 μ H	4.7 μ F	2200pF	2200pF

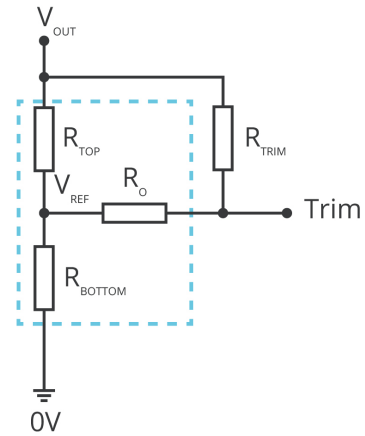
APPLICATION NOTES

Figure 4

Trim up



Trim down



$$R_{\text{TRIM}} = \frac{a \cdot R_{\text{BOTTOM}}}{R_{\text{BOTTOM}} - a} - R_O \quad a = \frac{V_{\text{REF}}}{V_{\text{OUT}} - V_{\text{REF}}} \cdot R_{\text{TOP}}$$

Formula for Trim up

$$R_{\text{TRIM}} = \frac{a \cdot R_{\text{TOP}}}{R_{\text{TOP}} - a} - R_O \quad a = \frac{V_{\text{OUT}} - V_{\text{REF}}}{V_{\text{REF}}} \cdot R_{\text{BOTTOM}}$$

Formula for Trim down

Table 3

V_{IN}	V_{NOM}	R_{TOP}	R_{BOTTOM}	R_O	V_{REF}
(Vdc)	(Vdc)	(kΩ)	(kΩ)	(kΩ)	(V)
24	3.3	8.5	5.1	27.0	1.24
24	5	10.0	10.0	35.7	2.50
24	12	38.0	10.0	68.0	2.50
24	15	50.0	10.0	73.2	2.50
24	24	86.0	10.0	75.0	2.50
48	3.3	8.5	5.1	27.0	1.24
48	5	15.47	5.1	33.0	1.24
48	12	38.0	10.0	68.0	2.50
48	15	50.0	10.0	73.2	2.50
48	24	86.0	10.0	75.0	2.50

Note: Value for R_{TOP} , R_{BOTTOM} , R_O , and V_{REF} refer to Table 3 (fixed internal values). R_{TRIM} : Trim resistance

a: User-defined parameter, no actual meanings

 V_{NOM} : Nominal output voltage V_{OUT} : Target output voltage

REVISION HISTORY

rev.	description	date
1.0	initial release	06/15/2023
1.01	company address updated	11/13/2024

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



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[PRC60-48-S3](#) [PRC60-48-S5](#)