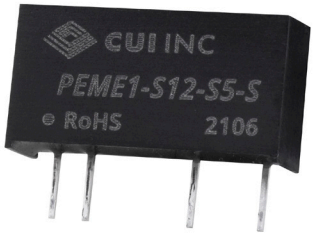
SERIES: PEME1-S | **DESCRIPTION:** DC-DC CONVERTER

FEATURES

- 1 W isolated output
- unregulated output
- single/dual output models
- continuous short circuit protection
- extended temperature range (-40~105°C)
- 3k Vdc isolation
- no load input current as low as 5 mA
- certified to UL 62368-1
- efficiency up to 85%
- designed to meet EN/BS EN 62368



MODEL	input voltage		output voltage	output current		output power	ripple & noise[1]	efficiency[2]
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	max (mVp-p)	typ (%)
PEME1-S3-D3-S[3]	3.3	2.97~3.63	±3.3	±15	±150	1	75	78
PEME1-S3-D5-S[3]	3.3	2.97~3.63	±5	±10	±100	1	75	82
PEME1-S3-D9-S[3]	3.3	2.97~3.63	±9	±6	±56	1	75	85
PEME1-S3-D12-S[3]	3.3	2.97~3.63	±12	±5	±42	1	75	82
PEME1-S3-D15-S[3]	3.3	2.97~3.63	±15	±4	±34	1	75	82
PEME1-S3-D24-S[3]	3.3	2.97~3.63	±24	±2	±21	1	100	84
PEME1-S3-S3-S[3]	3.3	2.97~3.63	3.3	30	303	1	75	79
PEME1-S3-S5-S[3]	3.3	2.97~3.63	5	20	200	1	75	82
PEME1-S3-S9-S[3]	3.3	2.97~3.63	9	11	111	1	75	85
PEME1-S3-S12-S[3]	3.3	2.97~3.63	12	8	83	1	75	82
PEME1-S3-S15-S[3]	3.3	2.97~3.63	15	7	67	1	75	82
PEME1-S3-S24-S[3]	3.3	2.97~3.63	24	4	42	1	100	84
PEME1-S5-D3-S[3]	5	4.5~5.5	±3.3	±15	±152	1	75	74
PEME1-S5-D5-S	5	4.5~5.5	±5	±10	±100	1	75	82
PEME1-S5-D9-S	5	4.5~5.5	±9	±6	±56	1	75	83
PEME1-S5-D12-S	5	4.5~5.5	±12	±5	±42	1	75	83
PEME1-S5-D15-S	5	4.5~5.5	±15	±4	±34	1	75	83
PEME1-S5-D24-S	5	4.5~5.5	±24	±3	±21	1	100	85
PEME1-S5-S3-S	5	4.5~5.5	3.3	30	303	1	75	74
PEME1-S5-S5-S	5	4.5~5.5	5	20	200	1	75	82
PEME1-S5-S9-S	5	4.5~5.5	9	12	111	1	75	83
PEME1-S5-S12-S	5	4.5~5.5	12	9	84	1	75	83
PEME1-S5-S15-S	5	4.5~5.5	15	7	67	1	75	83
PEME1-S5-S24-S	5	4.5~5.5	24	4	42	1	100	85
PEME1-S12-D3-S	12	10.8~13.2	±3.3	±15	±152	1	75	75
PEME1-S12-D5-S	12	10.8~13.2	±5	±10	±100	1	75	80
PEME1-S12-D12-S	12	10.8~13.2	±12	±5	±42	1	75	81
PEME1-S12-D15-S	12	10.8~13.2	±15	±4	±34	1	75	81
PEME1-S12-D24-S	12	10.8~13.2	±24	±2	±21	1	100	80

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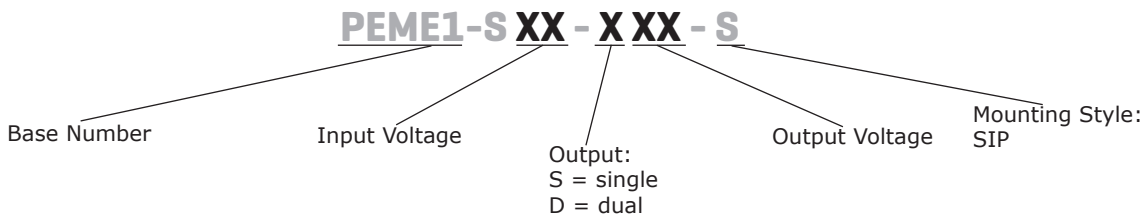
MODEL (CONTINUED)

	input voltage		output voltage	output current		output power	ripple & noise[1]	efficiency[2]
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	max (mVp-p)	typ (%)
PEME1-S12-S3-S	12	10.8~13.2	3.3	30	303	1	75	75
PEME1-S12-S5-S	12	10.8~13.2	5	20	200	1	75	80
PEME1-S12-S9-S	12	10.8~13.2	9	12	111	1	75	80
PEME1-S12-S12-S	12	10.8~13.2	12	9	83	1	75	80
PEME1-S12-S15-S	12	10.8~13.2	15	7	67	1	75	81
PEME1-S12-S24-S	12	10.8~13.2	24	5	42	1	100	81
PEME1-S15-D5-S	15	13.5~16.5	±5	±10	±100	1	75	80
PEME1-S15-D12-S	15	13.5~16.5	±12	±5	±42	1	75	80
PEME1-S15-D15-S	15	13.5~16.5	±15	±4	±34	1	75	81
PEME1-S15-S5-S	15	13.5~16.5	5	20	200	1	75	80
PEME1-S15-S9-S	15	13.5~16.5	9	12	111	1	75	80
PEME1-S15-S12-S	15	13.5~16.5	12	9	83	1	75	80
PEME1-S15-S15-S	15	13.5~16.5	15	7	67	1	75	81
PEME1-S24-D5-S	24	21.6~26.4	±5	±10	±100	1	75	80
PEME1-S24-D12-S	24	21.6~26.4	±12	±5	±42	1	75	81
PEME1-S24-D15-S	24	21.6~26.4	±15	±4	±34	1	75	79
PEME1-S24-D24-S	24	21.6~26.4	±24	±2	±21	1	100	80
PEME1-S24-S3-S	24	21.6~26.4	3.3	30	303	1	75	75
PEME1-S24-S5-S	24	21.6~26.4	5	20	200	1	75	79
PEME1-S24-S9-S	24	21.6~26.4	9	12	111	1	75	80
PEME1-S24-S12-S	24	21.6~26.4	12	9	83	1	75	81
PEME1-S24-S15-S	24	21.6~26.4	15	7	67	1	75	81
PEME1-S24-S24-S	24	21.6~26.4	24	5	42	1	100	81

Notes:
1. Measured at nominal input, 20 MHz bandwidth oscilloscope, with 10 µF tantalum and 1 µF ceramic capacitors on the output.
2. Measured at nominal input voltage, full load.
3. Model is not UL certified.
4. All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

PART NUMBER KEY



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INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage	3.3 Vdc input models	2.97	3.3	3.63	Vdc
	5 Vdc input models	4.5	5	5.5	Vdc
	12 Vdc input models	10.8	12	13.2	Vdc
	15 Vdc input models	13.5	15	16.5	Vdc
	24 Vdc input models	21.6	24	26.4	Vdc
surge voltage	for maximum of 1 second				
	3.3 Vdc input models	-0.7		5	Vdc
	5 Vdc input models	-0.7		9	Vdc
	12 Vdc input models	-0.7		18	Vdc
	15 Vdc input models	-0.7		21	Vdc
	24 Vdc input models	-0.7		30	Vdc
current	at full load				
	3.3 Vdc input models; 3.3 Vdc output			405	mA
	3.3 Vdc input models; all other outputs			389	mA
	5 Vdc input models; 3.3, 5 Vdc output			286	mA
	5 Vdc input models; 9, 12 Vdc output			254	mA
	5 Vdc input models; 15, 24 Vdc output			254	mA
	12 Vdc input models			118	mA
	15 Vdc input models			88	mA
	24 Vdc input models			59	mA
filter	filter capacitor				

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load[5]	3.3, 5 Vdc output models			2,400	µF
	9 Vdc output models			1,000	µF
	12, 15 Vdc output models			560	µF
	24, ±12, ±15 Vdc output models			220	µF
	±3.3, ±5 Vdc output models			1,200	µF
	±9 Vdc output models			470	µF
	all other models			100	µF
voltage accuracy	see tolerance envelope curves				
line regulation	for Vin change of 1%				
	3.3 Vdc output models			±1.5	%
	all other models			±1.2	%
load regulation	from 10% to full load				
	3.3 Vdc input; 3.3 Vdc output			18	%
	3.3 Vdc input; all other outputs			15	%
	5, 12 & 15 Vdc input; 3.3 Vdc output models			20	%
	5, 12 & 15 Vdc input; 5 Vdc output models			15	%
	all other models			10	%
switching frequency	at nominal input, full load				
	3.3 Vdc input		220		kHz
	all other models		270		kHz
temperature coefficient	at full load		±0.02		%/°C

Note: 5. Tested at input voltage range and full load.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous, self recovery				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 1 mA	3,000			Vdc
isolation resistance	input to output at 500 Vdc	1,000			MΩ
isolation capacitance	input to output, 100 kHz / 0.1 V		20		pF

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SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
safety approvals[6]	certified to 62368-1: UL designed to meet 62368: EN/BS EN				
conducted emissions	CISPR32/EN55032, class B (external circuit required, see Figure 3)				
radiated emissions	CISPR32/EN55032, class B (external circuit required, see Figure 3)				
ESD	IEC/EN61000-4-2, air ± 8 kV; contact ± 4 kV, class B				
MTBF	as per MIL-HDBK-217F, 25°C	3,500,000			hours
RoHS	yes				

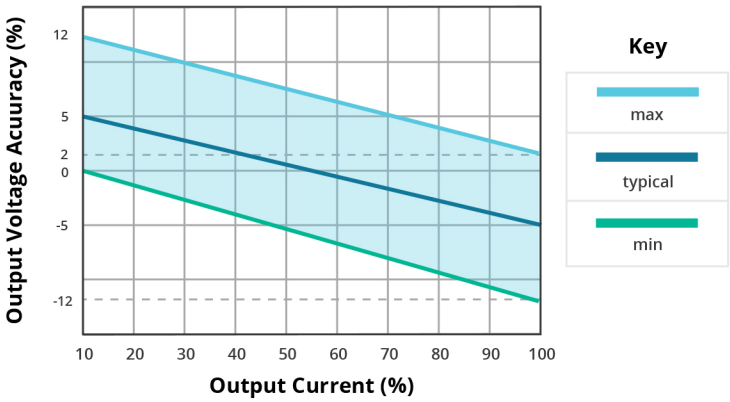
Note: 6. See the model table for additonal info.

ENVIRONMENTAL

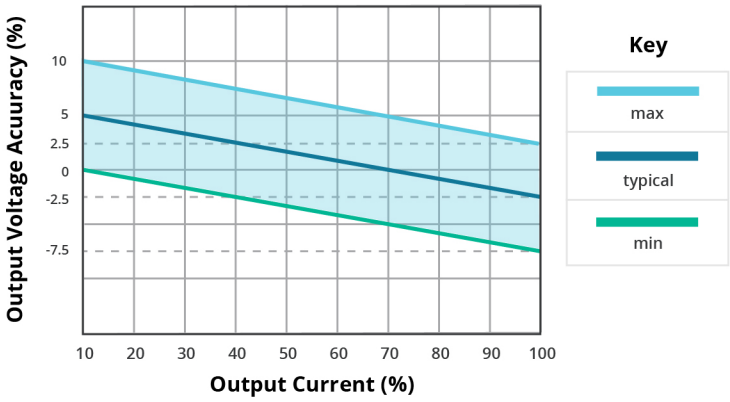
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curves	-40		105	°C
storage temperature		-55		125	°C
storage humidity	non-condensing			95	%
case temperature rise	3.3 Vdc output model at 25°C all other models at 25°C		25 15		°C °C

DERATING CURVES

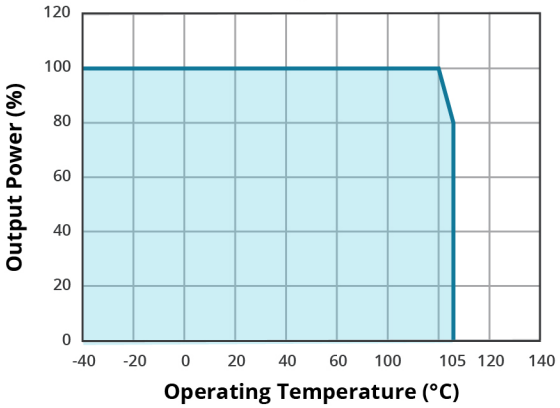
OUTPUT REGULATION CURVE
3.3 Vdc output model
(nominal input)



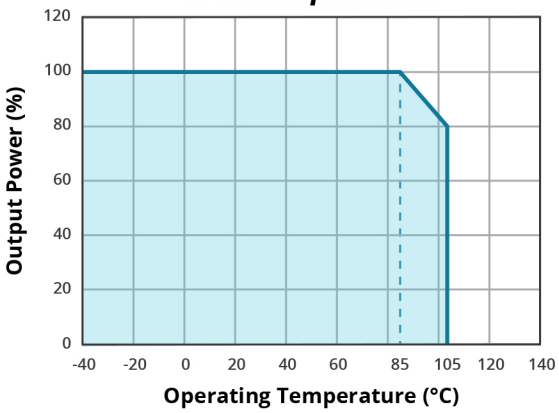
OUTPUT REGULATION CURVE
all other output models
(nominal input)



TEMPERATURE DERATING CURVE
3.3 Vdc input models



TEMPERATURE DERATING CURVE
all other input models



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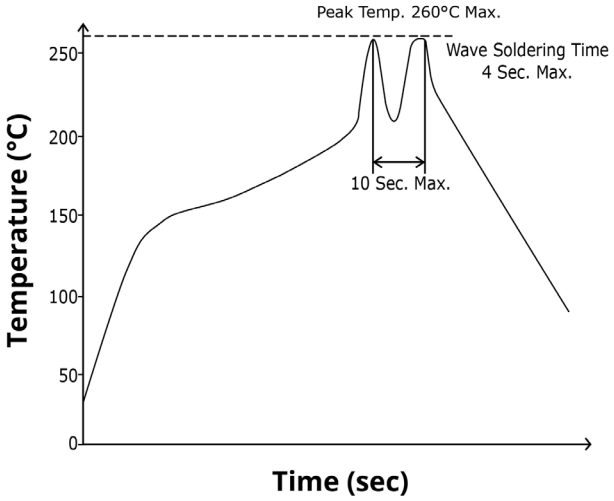
SOLDERABILITY

parameter	conditions/description	min	typ	max	units
hand soldering	1.5 mm from case for 10 seconds			300	°C
wave soldering	see wave soldering profile			260	°C

WAVE SOLDERING PROFILE



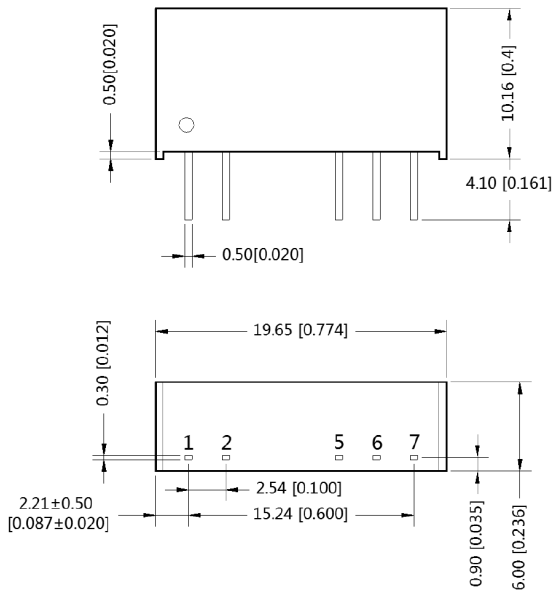
MECHANICAL

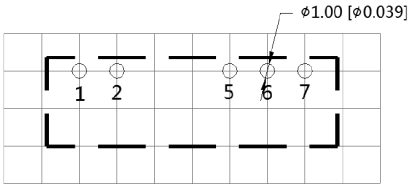
parameter	conditions/description	min	typ	max	units
dimensions	19.65 x 6.00 x 10.16[0.774 x 0.236 x 0.400 inch]				mm
case material	black flame-retardant and heat-resistant plastic (UL94V-0)				
weight			2.1		g

MECHANICAL DRAWING

units: mm [inch]
tolerance: ±0.25[±0.010]
pin section tolerance: ±0.10[±0.004]

PIN CONNECTIONS		
PIN	Function	
	Single	Dual
1	Vin	Vin
2	GND	GND
5	0V	-Vout
6	No Pin	0V
7	+Vout	+Vout





Note : Grid 2.54*2.54mm
Recommended PCB Layout
Top View

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APPLICATION CIRCUIT

If you want to further reduce the input and output ripple, a filter capacitor may be connected to the input and output terminals (Figures 1 & 2) provided that the capacitance is less than the maximum capacitive load of the model, otherwise start-up problems may be caused if the capacitance is too large.

Figure 1
Single Output Models

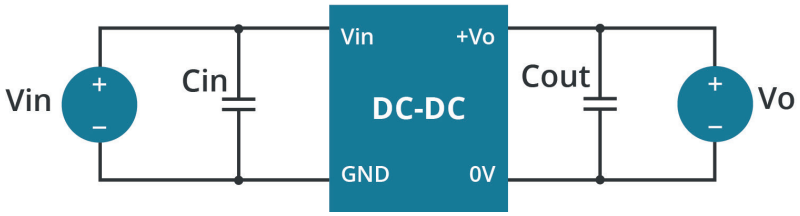

Table 1

Vin (Vdc)	Cin (µF/V)	Vo (Vdc)	Cout (µF/V)
3.3	10 µF/16 V	3.3, 5	10 µF/16 V
		9, 12	2.2 µF/25 V
		15, 24	1 µF/50 V
5	4.7	3.3, 5	10 µF/16 V
		9, 12	2.2 µF/25 V
		15, 24	1 µF/50 V
12	2.2 µF/25 V	3.3	10 µF/16 V
15	2.2 µF/25 V	5	10 µF/16 V
24	1 µF/50 V	9	2.2 µF/16 V
-	-	12	2.2 µF/25 V
-	-	15	1 µF/25 V
-	-	24	1 µF/50 V

Figure 2
Dual Output Models

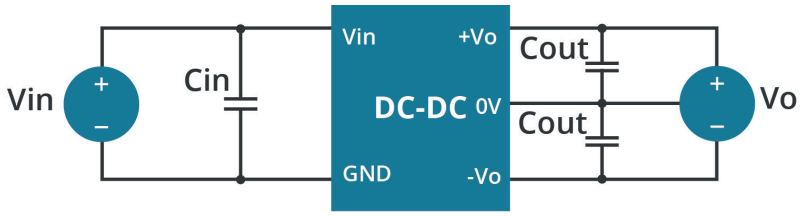

Table 2

Vin (Vdc)	Cin (µF)	Vo (Vdc)	Cout (µF)
3.3	10 µF/16 V	±3.3, ±5	10 µF/16 V
		±9, ±12	2.2 µF/25 V
		±15, ±24	1 µF/50 V
5	4.7 µF/16 V	±3.3, ±5	4.7 µF/16 V
		±9, ±12	1 µF/25 V
		±15, ±24	0.47 µF/50 V
12	2.2 µF/25 V	±3.3	4.7 µF/16 V
15	2.2 µF/25 V	±5	4.7 µF/16 V
24	1 µF/50 V	±12	1 µF/25 V
-	-	±15	0.47 µF/25 V
-	-	±24	0.47 µF/50 V

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EMC RECOMMENDED CIRCUIT

Figure 3
Single Output Models

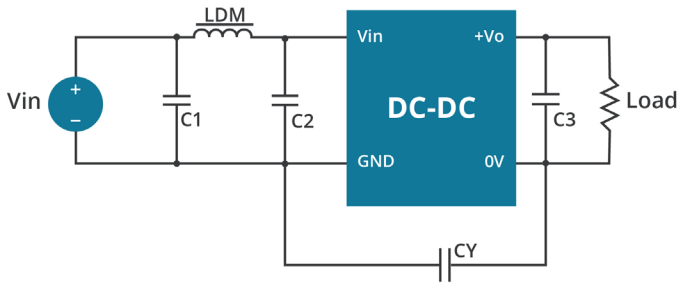

Figure 4
Dual Output Models

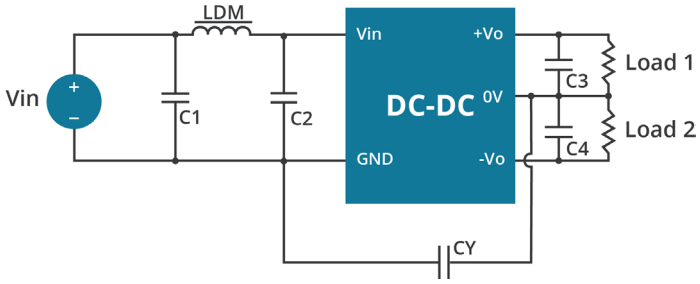

Table 3

Recommended External Circuit Components			
Vin (Vdc)	Vo (Vdc)	3.3, 5	9,12, 15, 24
3.3	C1/C2	4.7 nF/16 V	4.7 nF/16 V
	CY	--	270 pF/4 kVdc
	C3	refer to Cout in Tables 1, 2	
	LDM	6.8 µH	6.8 µH
Vin (Vdc)	Vo (Vdc)	3.3, 5, 9	12, 15, 24
5	CY	--	1 nF / 4kVdc
	C3	refer to Cout in Tables 1, 2	
	C1, C2	4.7 µF / 25 V	4.7 µF / 25 V
	LDM	6.8 µH	6.8 µH
Vin (Vdc)	Vo (Vdc)	3.3, 5, 9, 12, 15, 24	
12/15/24	C1/C2	4.7 µF / 50 V	4.7 µF / 50 V
	CY	270 pF/3 kVdc	270 pF/3 kVdc
	C3, C4	refer to Cout in Tables 1, 2	
	LDM	6.8 µH	6.8 µH

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REVISION HISTORY

rev.	description	date
1.0	initial release	05/10/2019
1.01	safeties updated in features and safety line, packaging removed	01/14/2021
1.02	model table updated	03/08/2021
1.03	derating curves and circuit figures updated	07/07/2021
1.04	CE certification removed	11/04/2022
1.05	3.3 Vin models added	08/24/2023

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

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