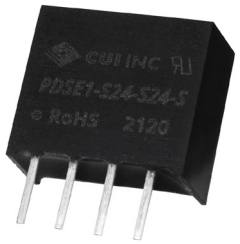
SERIES: PDSE1-S | **DESCRIPTION:** DC-DC CONVERTER

FEATURES

- 1 W isolated output
- unregulated output
- compact SIP package
- single output models
- continuous short circuit protection
- extended temperature range (-40~105°C)
- 1500 Vdc isolation
- no load input current as low as 5 mA
- efficiency up to 85%
- UL 62368-1 certified
- designed to meet EN/BS EN 62368



RoHS c UL us

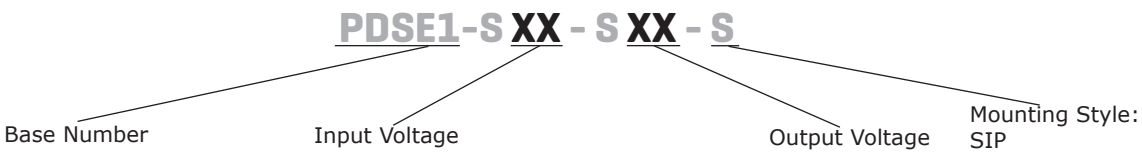
MODEL	input voltage		output voltage	output current		output power	ripple & noise[1]	efficiency[2]
	typ (Vdc)	range (Vdc)	(Vdc)	min (mA)	max (mA)	max (W)	max (mVp-p)	typ (%)
PDSE1-S3-S3-S	3.3	2.97~3.63	3.3	30	303	1	75	79
PDSE1-S3-S5-S	3.3	2.97~3.63	5	20	200	1	75	82
PDSE1-S3-S9-S[4]	3.3	2.97~3.63	9	11	111	1	75	85
PDSE1-S3-S12-S	3.3	2.97~3.63	12	8	83	1	75	82
PDSE1-S3-S15-S[4]	3.3	2.97~3.63	15	7	67	1	75	82
PDSE1-S3-S24-S[4]	3.3	2.97~3.63	24	4	42	1	100	84
PDSE1-S5-S3-S	5	4.5~5.5	3.3	30	303	1	75	74
PDSE1-S5-S5-S	5	4.5~5.5	5	20	200	1	75	82
PDSE1-S5-S9-S	5	4.5~5.5	9	12	111	1	75	83
PDSE1-S5-S12-S	5	4.5~5.5	12	9	84	1	75	83
PDSE1-S5-S15-S	5	4.5~5.5	15	7	67	1	75	83
PDSE1-S5-S24-S	5	4.5~5.5	24	4	42	1	100	85
PDSE1-S12-S3-S	12	10.8~13.2	3.3	30	303	1	75	75
PDSE1-S12-S5-S	12	10.8~13.2	5	20	200	1	75	80
PDSE1-S12-S9-S	12	10.8~13.2	9	12	111	1	75	80
PDSE1-S12-S12-S	12	10.8~13.2	12	9	83	1	75	80
PDSE1-S12-S15-S	12	10.8~13.2	15	7	67	1	75	81
PDSE1-S12-S24-S	12	10.8~13.2	24	5	42	1	100	81
PDSE1-S15-S5-S	15	13.5~16.5	5	20	200	1	75	80
PDSE1-S15-S9-S	15	13.5~16.5	9	12	111	1	75	80
PDSE1-S15-S12-S	15	13.5~16.5	12	9	83	1	75	80
PDSE1-S15-S15-S	15	13.5~16.5	15	7	67	1	75	81
PDSE1-S15-S24-S[4]	15	13.5~16.5	24	5	42	1	100	81
PDSE1-S24-S3-S	24	21.6~26.4	3.3	30	303	1	75	75
PDSE1-S24-S5-S	24	21.6~26.4	5	20	200	1	75	79
PDSE1-S24-S9-S	24	21.6~26.4	9	12	111	1	75	80
PDSE1-S24-S12-S	24	21.6~26.4	12	9	83	1	75	81

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 (%)
PDSE1-S24-S15-S	24	21.6~26.4	15	7	67	1	75	81
PDSE1-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. All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.
4. Model is not UL certified.

PART NUMBER KEY



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	3.3 Vdc input models	3.3 Vdc output models			405	mA
		all other output models			389	mA
	5 Vdc input models	3.3, 5 Vdc output models			286	mA
		9, 12 Vdc output models			254	mA
		all other output models			254	mA
	12 Vdc input models	3.3 Vdc output models			118	mA
		5, 9, 12 Vdc output models			110	mA
		all other output models			109	mA
	15 Vdc input models	5, 9, 12 Vdc output models			88	mA
		all other output models			87	mA
	24 Vdc input models	3.3 Vdc output models			61	mA
		5 Vdc output models			58	mA
		9 Vdc output models			57	mA
		all other output models			56	mA
filter	filter capacitor					

OUTPUT

parameter	conditions/description		min	typ	max	units
maximum capacitive load[4]	3.3, 5 Vdc output models 9 Vdc output models 12, 15 Vdc output models all other models				2,400 1,000 560 220	µF µF µF µF
voltage accuracy	see tolerance envelope curves					
line regulation	for Vin change of 1% 3.3 Vdc output models all other models				 ±1.5 ±1.2	 % %
load regulation	from 10% to full load					
	3.3 Vdc input models	3.3 Vdc output models all other models			±18 ±15	% %
	all other input models	3.3 Vdc output models 5 Vdc output models all other models			±20 ±15 ±10	% % %
switching frequency	100% load, nominal input voltage 3.3 Vdc input models all other input models			 220 270		 kHz kHz
temperature coefficient	at full load			±0.02		%/°C

Note: 4. 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

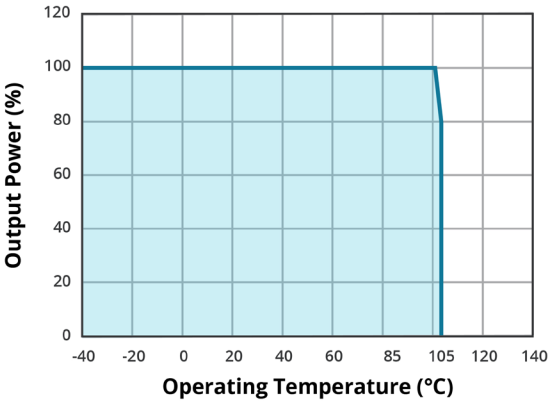
parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 1 mA input to output for 1 second at 1 mA	1,500 3,000			Vdc Vdc
isolation resistance	input to output at 500 Vdc	1,000			MΩ
isolation capacitance	input to output, 100 kHz / 0.1 V		20		pF
safety approvals	certified to 62368-1: UL designed to meet 62368: EN/BS EN				
conducted emissions	CISPR32/EN55032, class B (external circuit required, see Figure 2)				
radiated emissions	CISPR32/EN55032, class B (external circuit required, see Figure 2)				
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				

ENVIRONMENTAL

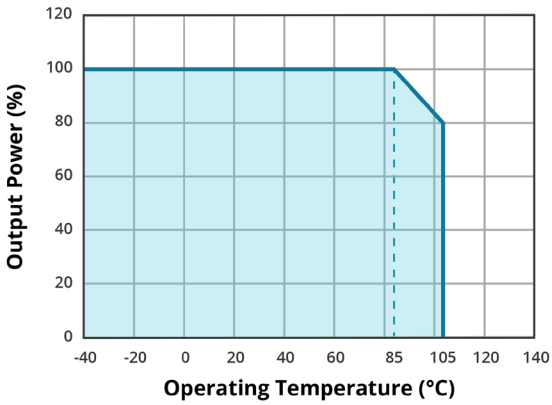
parameter	conditions/description		min	typ	max	units
operating temperature	see derating curves		-40		105	°C
storage temperature			-55		125	°C
storage humidity	non-condensing				95	%
case temperature rise	3.3 Vdc input models	all output models		25		°C
	all other input models	3.3 Vdc output model at 25°C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

DERATING CURVES

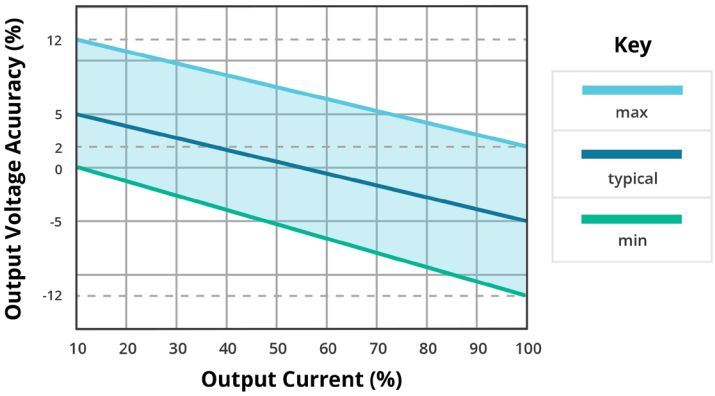
TEMPERATURE DERATING CURVE
3.3 Vdc input models



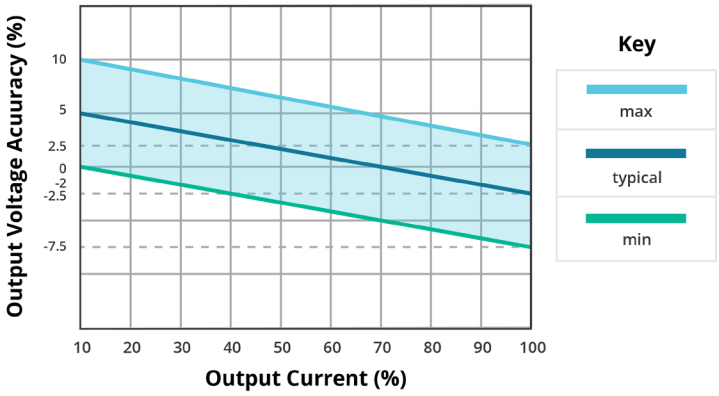
TEMPERATURE DERATING CURVE
all other input models



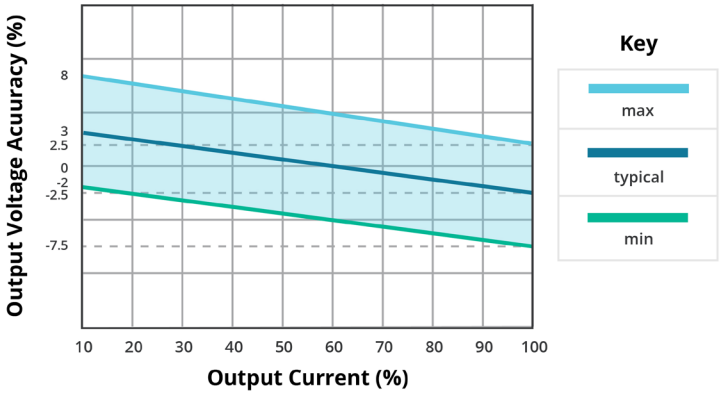
OUTPUT REGULATION CURVE
3.3 Vdc output models
(nominal input)



OUTPUT REGULATION CURVE
3.3, 5 Vdc input model / 5, 9, 12, 15, 24 Vdc output models
(nominal input)

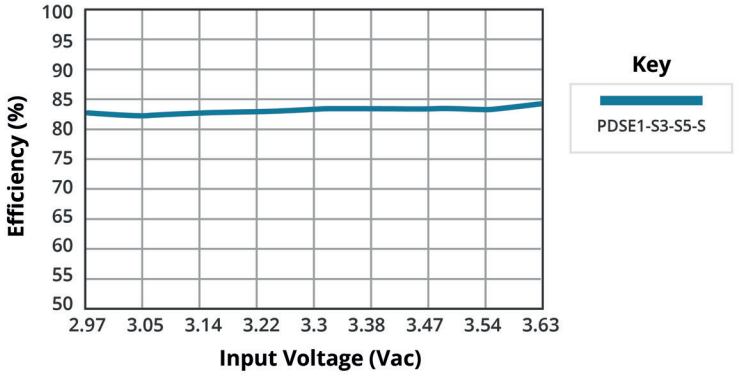


OUTPUT REGULATION CURVE
all other input models / 5, 9, 12, 15, 24 Vdc output models
(nominal input)

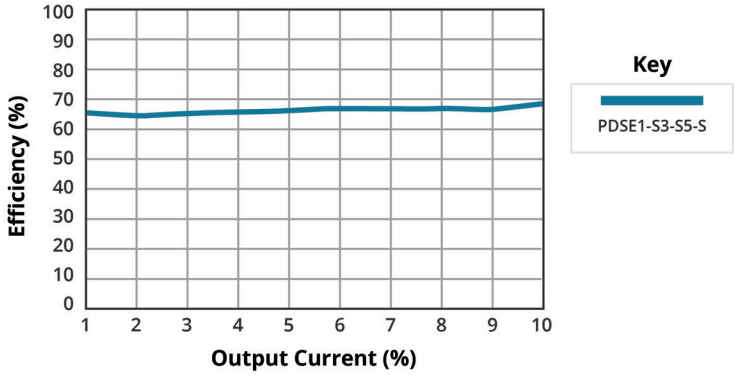


EFFICIENCY CURVES

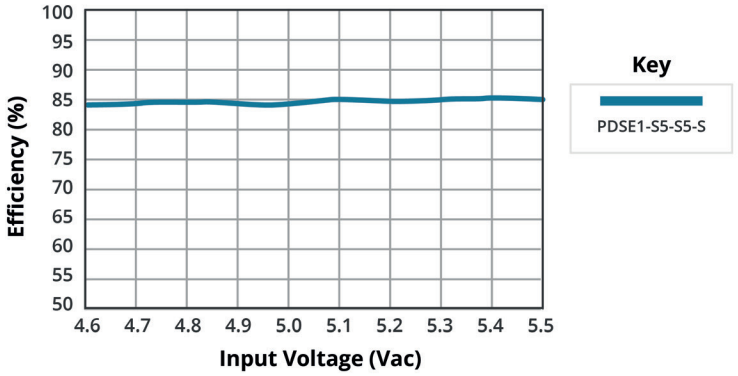
EFFICIENCY VS INPUT VOLTAGE (full load)



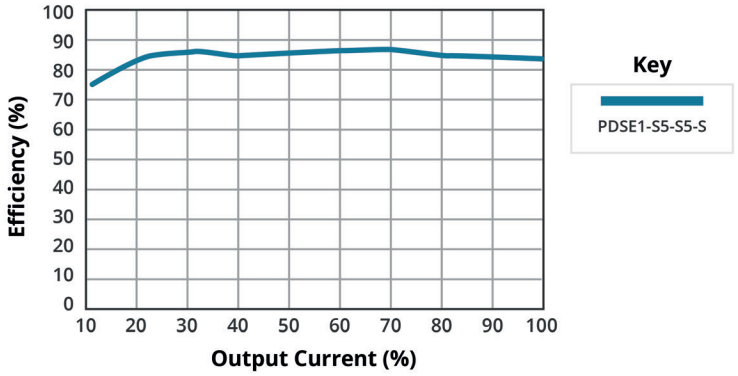
EFFICIENCY VS OUTPUT LOAD (Vin = 3.3V)



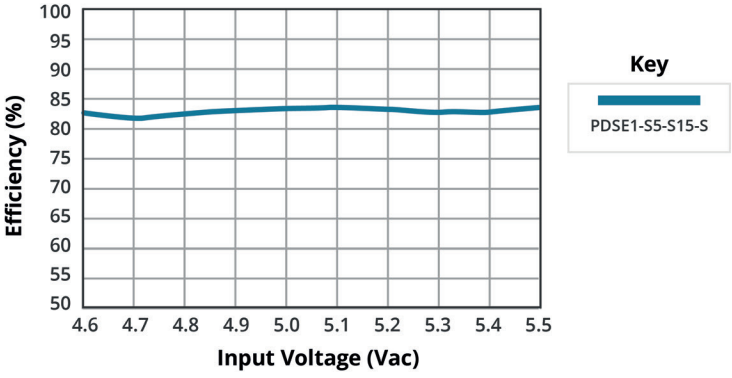
EFFICIENCY VS INPUT VOLTAGE (full load)



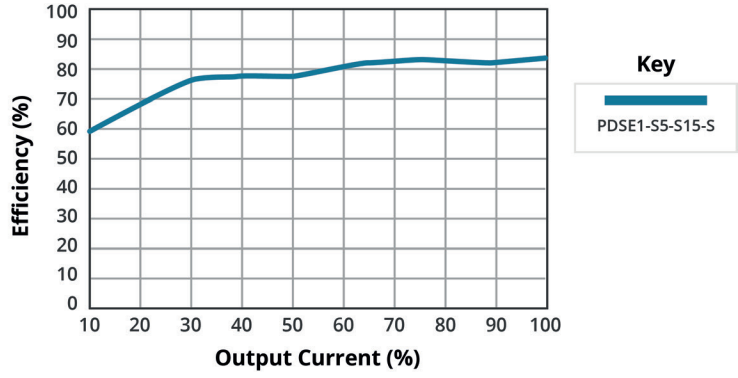
EFFICIENCY VS OUTPUT LOAD (Vin = 5V)



EFFICIENCY VS INPUT VOLTAGE (full load)

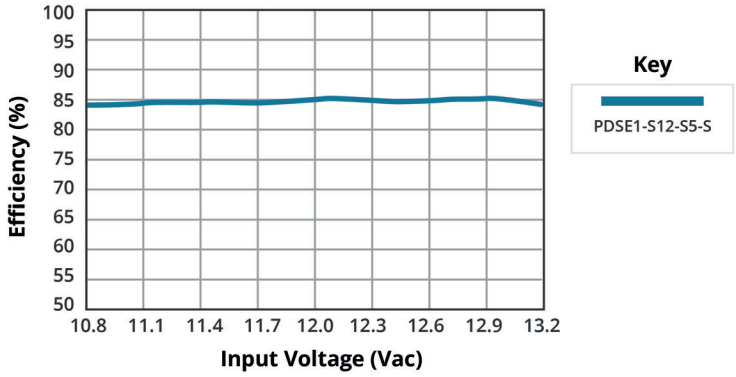


EFFICIENCY VS OUTPUT LOAD (Vin = 5V)

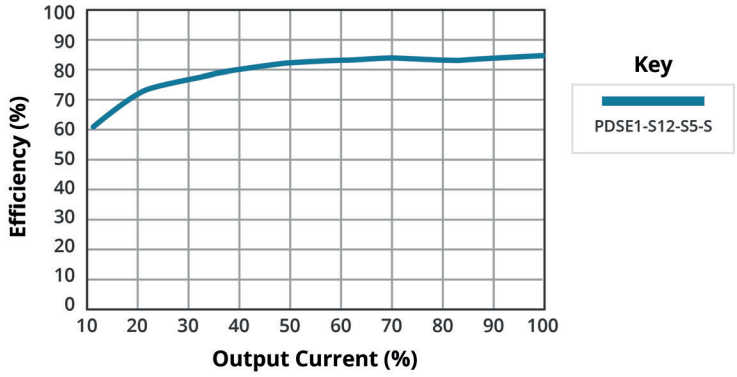


EFFICIENCY CURVES (CONTINUED)

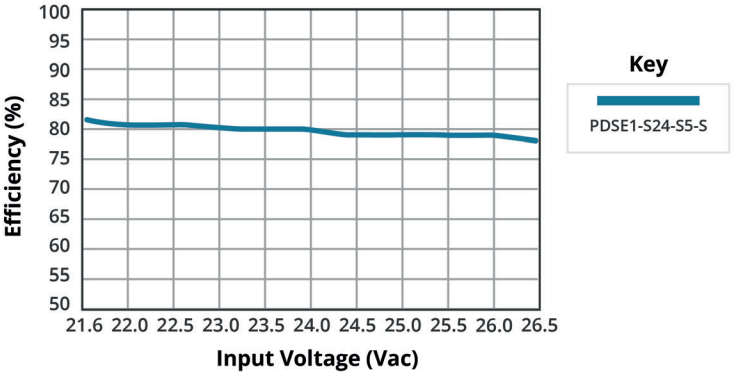
EFFICIENCY VS INPUT VOLTAGE (full load)



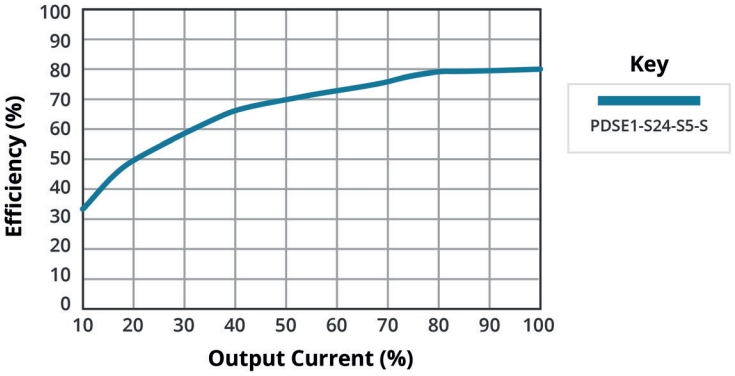
EFFICIENCY VS OUTPUT LOAD (Vin = 12V)



EFFICIENCY VS INPUT VOLTAGE (full load)



EFFICIENCY VS OUTPUT LOAD (Vin = 24V)



SOLDERABILITY

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

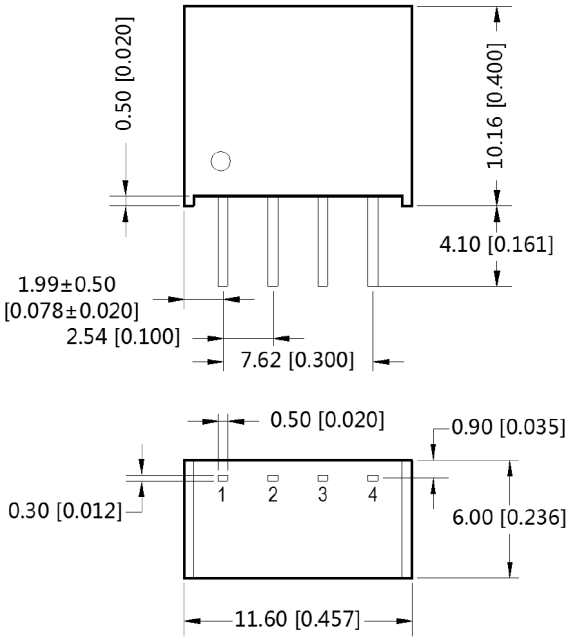
MECHANICAL

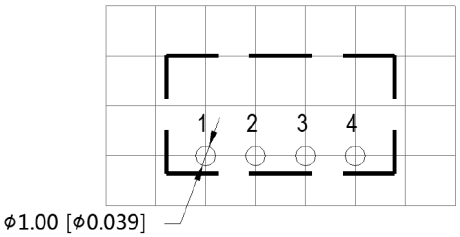
parameter	conditions/description	min	typ	max	units
dimensions	11.60 x 6.00 x 10.16 [0.457 x 0.236 x 0.400 inch]				mm
case material	black flame-retardant and heat-resistant plastic (UL94V-0)				
weight			1.3		g

MECHANICAL DRAWING

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

PIN CONNECTIONS	
PIN	Function
1	GND
2	Vin
3	0V
4	+Vout





Note : Grid 2.54*2.54mm

Recommended PCB Layout
Top View

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 (Figure 1) 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

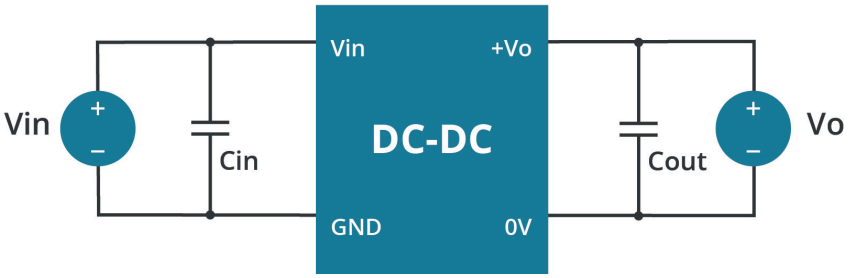


Table 1

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

EMC RECOMMENDED CIRCUIT

Figure 2

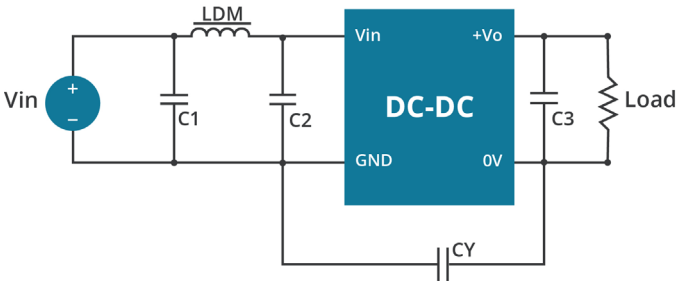


Table 2

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

REVISION HISTORY

rev.	description	date
1.0	initial release	05/10/2019
1.01	safeties updated in features and safety line, packaging removed	01/18/2021
1.02	datasheet updated	06/21/2021
1.03	CE certification removed	11/07/2022
1.04	3.3V input models added	03/08/2024

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

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