TPS-HCP2 Series
DC/DC Converter

Product Feature

- Package Type: DIP14
- Operating temperature range: -40℃ - +85℃
- Isolation voltage: 1500VDC
- High efficiency up to: 89% (Type)
- Equipped with input undervoltage protection, output short circuit protection, and overcurrent protection mechanisms.
- Fields of application: Electricity, Industrial control, Communication, Internet of Things, Automotive, Rail transit.

Selection Guide

Part No.	Input Voltage (VDC) Nominal(Range)	Output Voltage (VDC)	Output Current (mA)Max.	Full Load Efficiency%(Typ.)	Capacity Load (μF) Max.
TPS-HCP203S03	3.3(2.97-3.63)	3.3	400	77	2400
TPS-HCP203S05	3.3(2.97-3.63)	5	400	79	2400
TPS-HCP203S09	3.3(2.97-3.63)	9	222	80	1000
TPS-HCP203S12	3.3(2.97-3.63)	12	167	81	560
TPS-HCP205S03	5(4.5-5.5)	3.3	400	83	2400
TPS-HCP205S05	5(4.5-5.5)	5	400	85	2400
TPS-HCP205S09	5(4.5-5.5)	9	222	85	1000
TPS-HCP205S12	5(4.5-5.5)	12	167	86	560
TPS-HCP205S15	5(4.5-5.5)	15	133	87	560
TPS-HCP205S24	5(4.5-5.5)	24	83	88	220
TPS-HCP205D03	5(4.5-5.5)	±3.3	±303	83	#1000
TPS-HCP205D05	5(4.5-5.5)	±5	±200	85	#1000
TPS-HCP205D09	5(4.5-5.5)	±9	±111	85	#560
TPS-HCP205D12	5(4.5-5.5)	±12	±83	86	#220
TPS-HCP205D15	5(4.5-5.5)	±15	±67	87	#220
TPS-HCP212S03	12 (10.8-13.2)	3.3	400	84	2400
TPS-HCP212S05	12 (10.8-13.2)	5	400	85	2400
TPS-HCP212S09	12 (10.8-13.2)	9	222	86	1000
TPS-HCP212S12	12 (10.8-13.2)	12	167	87	560
TPS-HCP212S15	12 (10.8-13.2)	15	133	88	680
TPS-HCP212S24	12 (10.8-13.2)	24	83	89	220
TPS-HCP212D03	12 (10.8-13.2)	±3.3	±303	84	#1000
TPS-HCP212D05	12 (10.8-13.2)	±5	±200	85	#1000
TPS-HCP212D09	12 (10.8-13.2)	±9	±111	86	#560
TPS-HCP212D12	12 (10.8-13.2)	±12	±83	87	#220
TPS-HCP212D15	12 (10.8-13.2)	±15	±67	88	#220
TPS-HCP215S03	15(13.5-16.5)	3.3	400	84	2400
TPS-HCP215S05	15(13.5-16.5)	5	400	85	2400
TPS-HCP215S09	15(13.5-16.5)	9	222	86	1000

Part No.	Input Voltage (VDC) Nominal(Range)	Output Voltage (VDC)	Output Current (mA)Max.	Full Load Efficiency%(Typ.)	Capacity Load (μF) Max.
HCP2-15S12	15(13.5-16.5)	12	167	87	560
HCP2-15S15	15(13.5-16.5)	15	133	88	560
HCP2-15S24	15(13.5-16.5)	24	83	89	220
HCP2-15D03	15(13.5-16.5)	±3.3	±303	84	#1000
HCP2-15D05	15(13.5-16.5)	±5	±200	85	#1000
HCP2-15D09	15(13.5-16.5)	±9	±111	86	#560
HCP2-15D12	15(13.5-16.5)	±12	±83	87	#220
HCP2-15D15	15(13.5-16.5)	±15	±67	88	#220
HCP2-24503	24 (21.6-26.4)	3.3	400	84	2400
HCP2-24S05	24 (21.6-26.4)	5	400	86	2400
HCP2-24S09	24 (21.6-26.4)	9	222	87	1000
HCP2-24S12	24 (21.6-26.4)	12	167	88	560
HCP2-24S15	24 (21.6-26.4)	15	133	89	560
HCP2-24S24	24 (21.6-26.4)	24	83	90	220
HCP2-24D03	24 (21.6-26.4)	±3.3	±303	84	#1000
HCP2-24D05	24 (21.6-26.4)	±5	±200	86	#1000
HCP2-24D09	24 (21.6-26.4)	±9	±111	87	#560
HCP2-24D12	24 (21.6-26.4)	±12	±83	88	#220
HCP2-24D15	24 (21.6-26.4)	±15	±67	89	#220

Each Output

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no load)	5VDC Input	--	506/4	--/15	mA
	9VDC Input	--	268/4	--/15	
	12VDC Input	--	208/4	--/15	
	12VDC Input	--	167/4	--/15	
	24VDC Input	--	104/4	--/15	
Reflected Ripple Current		--	15	--	mA
Impulse Voltage	5VDC Input	-0.7	--	9	VDC
	9VDC Input	-0.7	--	12	
	12VDC Input	-0.7	--	18	
	12VDC Input	-0.7	--	21	
	24VDC Input	-0.7	--	30	
Input Filter		Capacitance Filter			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy			See Figure1			
Linear Regulation Rate	Input voltage change of ± 1%	3.3VDC output	--	±1.5	±1.5	%
		Other output	--	±1.2	±1.2	
Load Regulation Rate	10% -100% load	3.3VDC output	--	10	--	%
		5VDC output	--	8	--	
		9VDC output	--	8	--	
		12VDC output	--	7	--	
		15VDC output	--	6	--	
		24VDC output	--	6	--	
Ripple & Noise	20 MHz bandwidth		--	45	120	mV
Temperature Coeffcient	Full Load		--	±0.03	±0.03	%/°C
Short-circuit Protection			Continuous, Self-Recovery			

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Insulation Voltage	Input-output, test time 1 minute, leakage current less than 1mA	5000	--	--	VDC
Insulation Resistance	Input-output, insulated voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	20	--	pF
Operating Temperature	Derating when operating temperature≥85°C(See Figure 2)	-40	--	85	°C
Storage Temperature		-55	--	125	°C
Storage Humidity	Non-condensing	--	--	95	°C
Heating of the casing during operation	Ta=25°C, Input nominal, output full load	--	25	--	%RH
Pin welding can withstand the highest temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	300	°C
Switching Frequency	Full Load, Nominal Input Voltage	--	220	--	KHz
MTBF	MIL-HDBK-217F@25°C	>3500Kh			

Mechanical Specifications

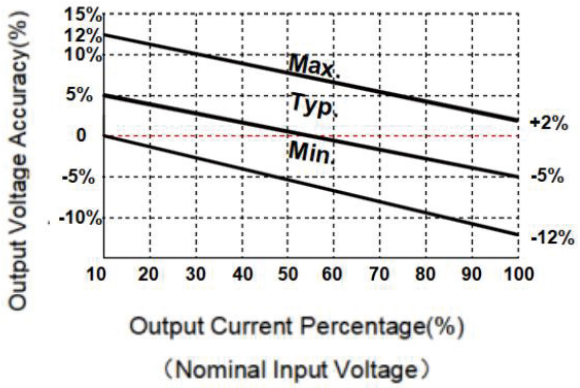
Case Material	Black plastic; flame-retardant and heat-resistant(UL 94V-0 rated)
Package Dimensions	19.50 x 9.80 x 8.00 mm
Weight	2.35g(Typ.)
Cooling Method	Free air convection

EMC Characteristics

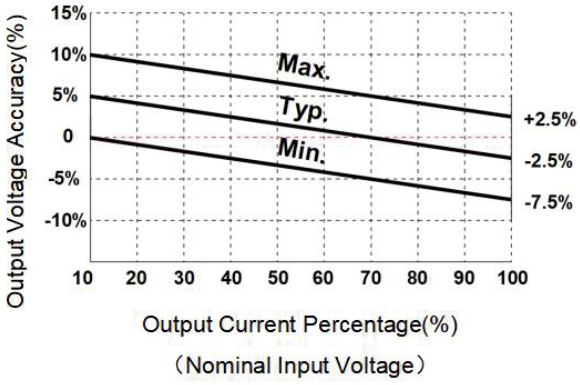
EMI	CE	CISPR32/EN55032 CLASS B(Application circuit 4)	
	RE	CISPR32/EN55032 CLASS B(Application circuit 4)	
EMS	ESD	HCP2-xxDxx:IEC/EN61000-4-2 Contact ±6KV	Perf. Criteria B
		HCP2-xxSxx:IEC/EN61000-4-2 Contact ±8KV	Perf. Criteria B

Typical Characteristic Curves

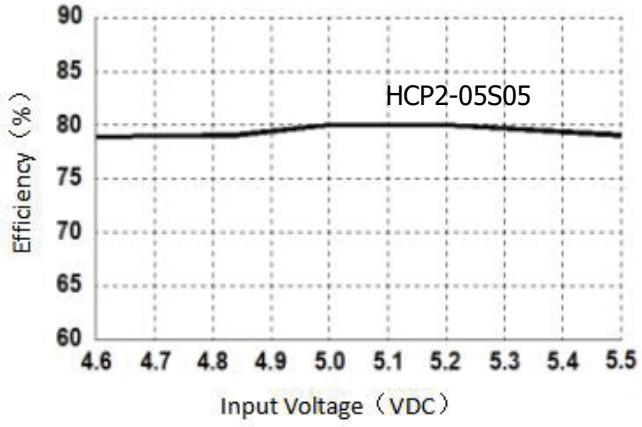
Output Regulation Curve 3.3VDC Output (Figure1-1)



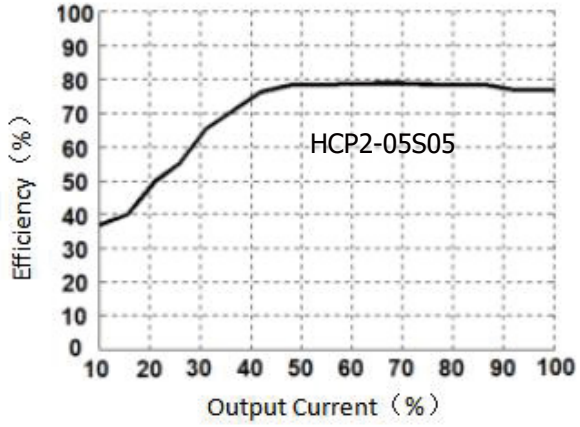
Output Regulation Curve(Figure1-2)



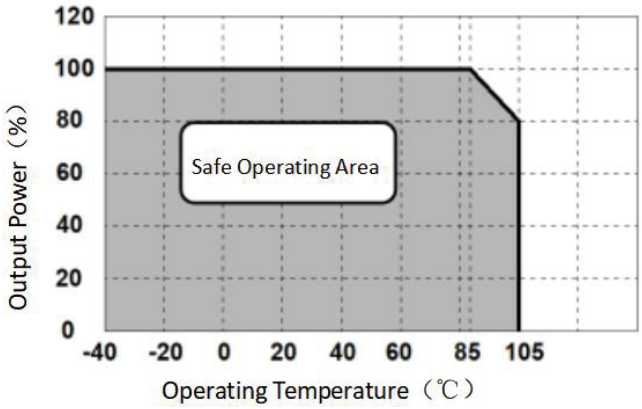
Efficiency VS Input Voltage (full load)



Efficiency VS Output Load (Vin=5V)

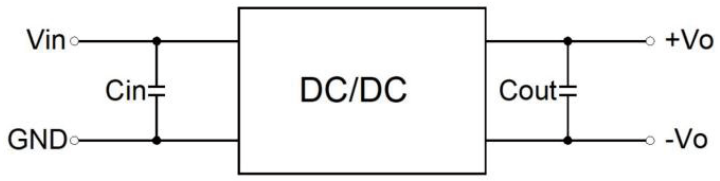


Temperature Derating Curve (Figure 2)



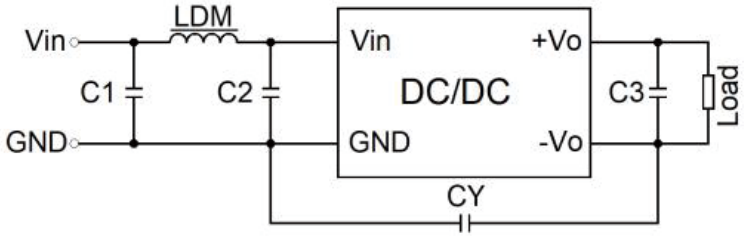
Typical Circuit Design And Application

• Figure 3



Recommended Component Parameters					
Vin(VDC)	Cin(μF)	Single Output Vo(VDC)	Cout	Dula Output Vo(VDC)	Cout(μF)
5	4.7	3.3/5	10	±3.3/±5	4.7
9/12	2.2	9/12	2.2	±9/±12	1.0
15	2.2	15/24	1.0	±15/±24	0.47
24	1.0	--	--	--	--

• Figure 4



EMI Recommended Parameter Table	
C1/C2	4.7μF/50V
CY	1nF/2KV
C3	Refer to the Cout parameters in Figure 3
LDM	6.8μH

• 1. Typical application

If further reduction of input and output ripple is required, a capacitor filtering network can be connected at the input and output terminals, and the application circuit is shown in Figure 3.

However, attention should be paid to selecting appropriate filtering capacitors. If the capacitance is too large, it is likely to cause startup problems. For each output, while ensuring safe and reliable operation, the recommended capacitive load values are detailed in the table.

• 2.EMC typical recommended circuit

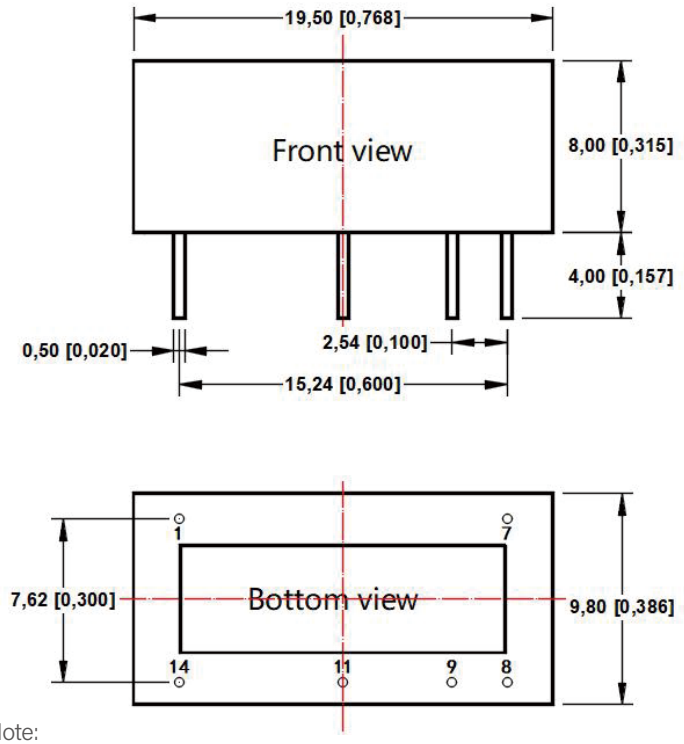
See Figure 4.

• 3.Output load requirements.

To ensure the efficient and reliable operation of the module, its minimum output load should not be less than 10% of the rated load when in use. If your required power is indeed small, please connect a resistor in parallel at the output end (the sum of the power consumed by the resistor and the actual power used is greater than or equal to 10% of the rated power).

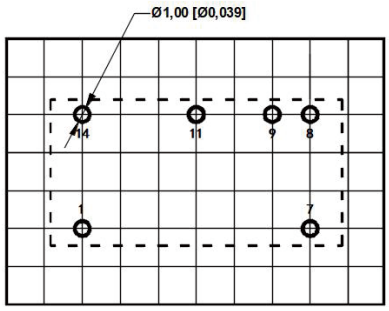
Dimensions and Recommended Layout

- Dimensions



Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

- PCB Printing Layout



The grid distance is 2.54mm x 2.54mm

Pin Definition Table

Pin	Single	Dual
1	GND	GND
7	NC	NC
8	-Vo	COM
9	+Vo	+Vo
11	No Pin	-Vo
14	Vin	Vin

Note

- The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
- It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
- Suggested dual output module load imbalance: ≤ ± 5%. If it exceeds ± 5%, it cannot be guaranteed that the product performance meets all performance indicators in this manual;
- The maximum capacitive load is tested within the input voltage range and under full load conditions;
- Unless otherwise specified, all indicators in this manual are measured at Ta=25 °C, humidity<75% RH, nominal input voltage, and output rated load;
- All indicator testing methods in this manual are based on our company's corporate standards;
- Our company can provide product customization, and specific requirements can be directly contacted by our technical personnel;
- Product specifications are subject to change without prior notice.