

**DESCRIPTION: 2W 3KVDC Isolated Single & Dual Output DC/DC Converters**



The TPH series are miniature, isolated 2W DC/DC converters in a SIP and DIP package. They offer the ideal solution in many space critical applications for board level power distribution. The internal SMD construction makes it possible to offer a product with high performance at low cost. The series offers smaller size, improved efficiency, lower output ripple noise and 3KVDC isolation.

**FEATURES**

RoHS compliant	Efficiency up to 86%	Power density up to 1.44W/cm <sup>3</sup>
Operating temperature: -40°C to 105°C	Dual output from a single input rail	UL 94V-0 package material
Power sharing on output	3KVDC isolation	Industry standard pinout
Input voltage: 3.3V, 5V, 12V, 15V, 24V, 48V	Output voltage: ±5V, ±9V, ±12V, ±15V, ±24V / 3.3V, 5V, 9V, 12V, 15V, 24V	CE certification

**SELECTION GUIDE**

Part Number	Nominal Input Voltage	Output Voltage	Output Current (Max./Min)	Efficiency	Package Style
	V	V	mA	%	
TPH0505D	5	±5	±200/±20	80	DIP
TPH0509D	5	±9	±110/±11	80	DIP
TPH0512D	5	±12	±84/±8.4	81	DIP
TPH0515D	5	±15	±68/±6.8	84	DIP
TPH0505S	5	±5	±200/±20	80	SIP
TPH0509S	5	±9	±110/±11	80	SIP
TPH0512S	5	±12	±84/±8.4	82	SIP
TPH0515S	5	±15	±68/±6.8	83	SIP
TPH0524S	5	±24	±42/±4.2	84	SIP
TPH1205D	12	±5	±200/±20	80	DIP
TPH1209D	12	±9	±110/±11	83	DIP
TPH1212D	12	±12	±84/±8.4	84	DIP
TPH1215D	12	±15	±68/±6.8	86	DIP
TPH1224D	12	±24	±42/±4.2	85	SIP
TPH1205S	12	±5	±200/±20	80	SIP
TPH1209S	12	±9	±110/±11	83	SIP
TPH1212S	12	±12	±84/±8.4	84	SIP
TPH1215S	12	±15	±68/±6.8	86	SIP
TPH1224S	12	±24	±42/±4.2	85	SIP
TPH1505D	15	±5	±200/±20	80	DIP
TPH1505S	15	±5	±200/±20	80	SIP
TPH1515S	15	±15	±68/±6.8	86	SIP
TPH2405D	24	±5	±200/±20	80	DIP
TPH2409D	24	±9	±110/±11	85	DIP
TPH2412D	24	±12	±84/±8.4	86	DIP
TPH2415D	24	±15	±68/±6.8	86	DIP
TPH2424D	24	±24	±42/±4.2	85	DIP
TPH2405S	24	±5	±200/±20	82	SIP
TPH2409S	24	±9	±110/±11	85	SIP
TPH2412S	24	±12	±84/±8.4	85	SIP
TPH2415S	24	±15	±68/±6.8	85	SIP
TPH2424S	24	±24	±42/±4.2	85	SIP
TPH4805D	48	±5	±200/±20	82	DIP
TPH4809D	48	±9	±110/±11	82	DIP
TPH4812D	48	±12	±84/±8.4	85	DIP
TPH4815D	48	±15	±68/±6.8	85	DIP
TPH4805S	48	±5	±200/±20	82	SIP
TPH4809S	48	±9	±110/±11	83	SIP
TPH4812S	48	±12	±84/±8.4	85	SIP
TPH4815S	48	±15	±68/±6.8	84	SIP

**SELECTION GUIDE**

Part Number	Nominal Input Voltage	Output Voltage	Output Current(Max./Min)	Efficiency	Package Style
	V	V	mA	%	
TPH0303DA	3.3	3.3	606/60.6	73	DIP
TPH0305DA	3.3	5	400/40	79	DIP
TPH0503DA	5	3.3	606/60.6	74	DIP
TPH0505DA	5	5	400/40	80	DIP
TPH0509DA	5	9	220/22	80	DIP
TPH0512DA	5	12	168/16.8	81	DIP
TPH0515DA	5	15	136/13.6	84	DIP
TPH1205DA	12	5	400/40	80	DIP
TPH1209DA	12	9	220/22	83	DIP
TPH1212DA	12	12	168/16.8	84	DIP
TPH1215DA	12	15	136/13.6	86	DIP
TPH1224DA	12	24	83/8.3	87	DIP
TPH2405DA	24	5	400/40	80	DIP
TPH2409DA	24	9	220/22	85	DIP
TPH2412DA	24	12	168/16.8	86	DIP
TPH2415DA	24	15	136/13.6	86	DIP
TPH2424DA	24	24	84/8.4	85	DIP
TPH4805DA	48	5	400/40	82	DIP
TPH4809DA	48	9	220/22	82	DIP
TPH4812DA	48	12	168/16.8	85	DIP
TPH4815DA	48	15	136/13.6	85	DIP

Add suffix "P" for continuous short circuit protection, for example TPH0505SP.

**GENERAL CHARACTERISTICS**

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	3.3V & 5V input		90		kHz
Switching frequency	12V input		90		kHz
Switching frequency	15V input		90		kHz
Switching frequency	24V & 48V input		90		kHz

**INPUT CHARACTERISTICS**

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	3.3V input	2.9	3.3	3.6	V
Voltage range	5V input	4.5	5	5.5	V
Voltage range	12V input	11	12	13	V
Voltage range	24V input	22	24	26	V
Voltage range	48V input	43	48	53	V

**OUTPUT CHARACTERISTICS**

Parameter	Conditions	Min.	Max.	Units
Rated Power	TA=-40°C to 85°C		2	W
Voltage Set Point Accuracy	TPH0505D/S	-5	7.5	%
Voltage Set Point Accuracy	All other types	-5	5	%
Line regulation	High VIN to low VIN (voltage variation +/-5%)		1.2	%
Load Regulation(10% load to rated load)	5V output		10	%
Load Regulation(10% load to rated load)	9V output		10	%
Load Regulation(10% load to rated load)	12V output		10	%
Load Regulation(10% load to rated load)	15V output		10	%

**ISOLATION CHARACTERISTICS**

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Flash tested for 1 second	3000			VDC
Resistance	Viso= 1000V	1			GΩ

**ABSOLUTE MAXIMUM RATINGS**

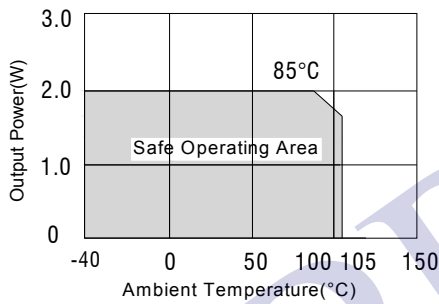
Short-circuit protection	1 second
Lead temperature 1.5mm from case for 10 seconds	300°C
Internal power dissipation	300mW
Input voltage $V_{in}$ , TPH03	5.5V
Input voltage $V_{in}$ , TPH05	7V
Input voltage $V_{in}$ , TPH12	15V
Input voltage $V_{in}$ , TPH15	18V
Input voltage $V_{in}$ , TPH24	28V
Input voltage $V_{in}$ , TPH48	54V

**TEMPERATURE CHARACTERISTICS**

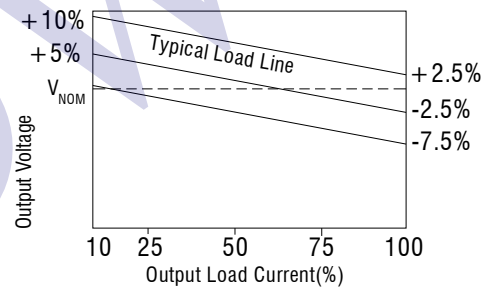
Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	Derating if the temperature $\geq 85^{\circ}\text{C}$	-40		105	$^{\circ}\text{C}$
Storage		-50		130	$^{\circ}\text{C}$
Case Temperature above	5V output		33		$^{\circ}\text{C}$
Case Temperature above	12V output		27		$^{\circ}\text{C}$
Cooling	Free air convection				

All specifications typical at  $T_A=25^{\circ}\text{C}$ , nominal input voltage and rated output current unless otherwise

**TEMPERATURE DERATING GRAPHS**

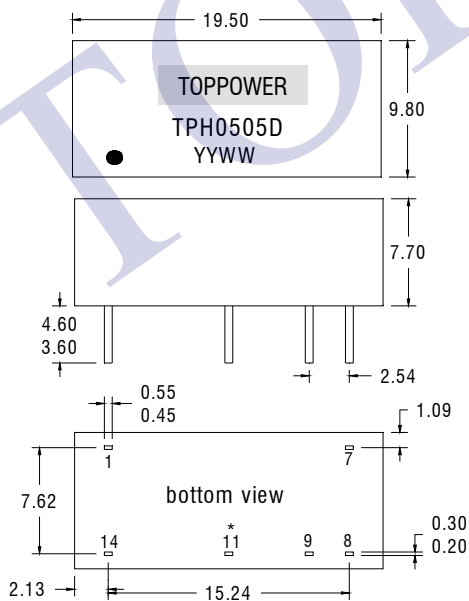


**TOLERANCE ENVELOPES**

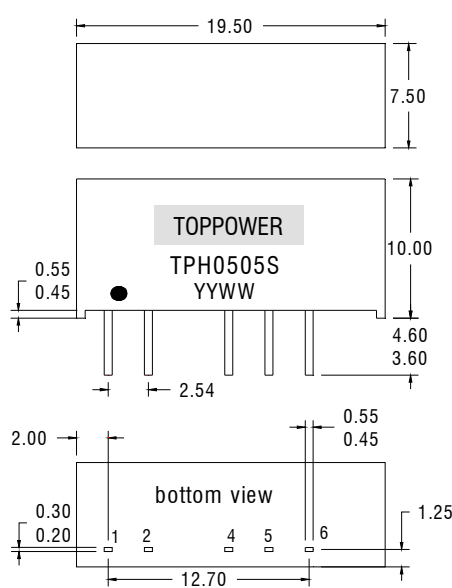


**MECHANICAL DIMENSIONS**

**DIP Package**



**SIP Package**



**PIN CONNECTIONS**

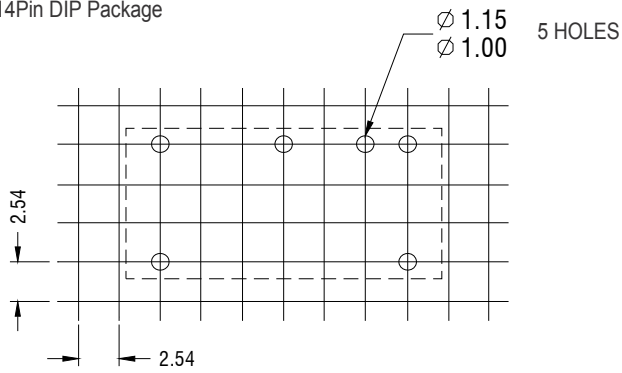
14 PIN DIP	
Pin	Function
1	-Vin
7	NC
8	OV
9	+Vout
11	-Vout
14	+Vin

7 PIN SIP	
Pin	Function
1	+Vin
2	-Vin
4	-Vout
5	OV
6	+Vout

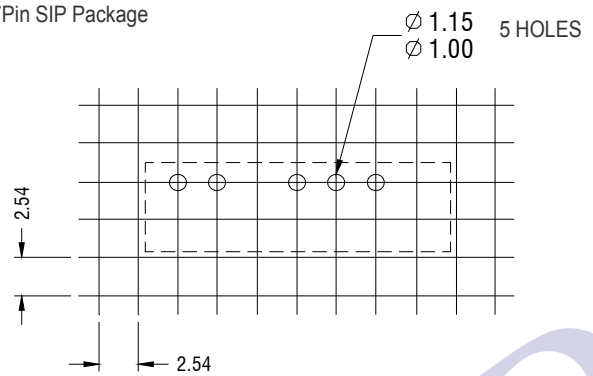
All dimensions in mm  $\pm 0.25\text{mm}$ . All pins on a 2.54 mm pitch and within  $\pm 0.25\text{mm}$  of true position.  
 Weight: 2.85g (DIP) 2.76g (SIP) \* Pin not fitted on single output variants.

**RECOMMENDED FOOTPRINT DETAILS**

14Pin DIP Package

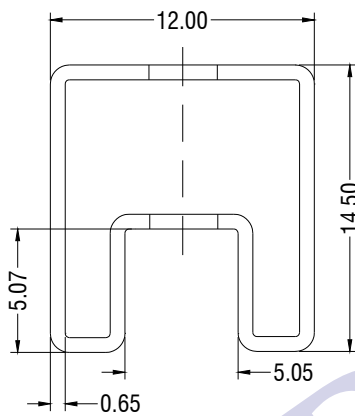


7Pin SIP Package

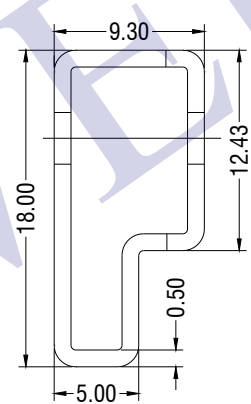


**TUBE OUTLINE DIMENSIONS**

14Pin DIP Tube



7Pin SIPTube



Unless otherwise stated all dimensions in mm  $\pm 0.5$ mm.

Tube length (14 Pin DIP) : 520mm  $\pm 2$ mm.

Tube length (7 Pin SIP) : 520mm  $\pm 2$ mm.

Tube Quantity:25PCS

**SOLDERING INFORMATION**

This series is compatible with RoHS soldering systems with a peak wave solder temperature of 300°C for 10 seconds. Both SIP and DIP types in this series are backward compatible with Sn/Pb soldering systems.