LPS6-Q12 Series : Isolated DC/DC Converters
9 – 36V Input Voltage Range, Maximum Power : 6W

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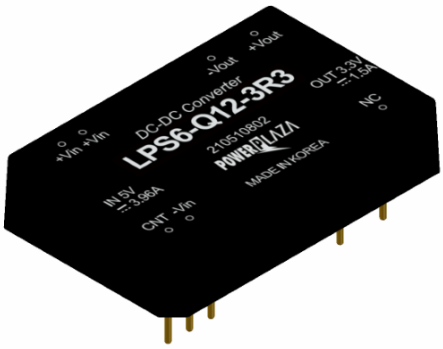
LPS6-Q12 : High isolated DC/DC converters

Features

- Compact DIP-24 plastic case
  (Low height : 7.5mm)
- Ultra wide 4:1 input voltage range
- High efficiency up to 87.1%
- I/O isolation voltage 3000Vac (1minute)
- Build-in remote On/off control
- Build-in overcurrent protection circuits
  (recovers automatically)
- High reliability :
  (no tantalum and electrolytic capacitor)
- Low no load power consumption
- Wide operating temperature range
  (-40℃ to 85℃ with derating)
- 5-year product warranty



Applications

- Telecommunication
- Datacom
- Instrumentation / Equipments
- Distributed Power Systems

LPS6_series are a high efficiency, 6watt isolated DC/DC converters in a DIP-24 plastic package with 7.5mm low height.

They offer designers 3000Vac I/O isolation, ultra wide 4:1 input voltage range, Remote on/off , precisely regulated, short circuit protection(Hiccup), and low no load power consumption.

The -40℃ to 85℃ operating temperature range makes the LPS6_series ideal for mixed analog/digital subsystems, data communication equipments, distributed power systems. They are an excellent choice for both new information network and upgrading older systems.

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Absolute Maximum Ratings

Parameter	Min.	Typ.	Max.	Unit
Input voltage continuous	9		36	Vdc
Operating temperature	-40		85	˚C
Storage temperature	-40		105	˚C
I/O isolation voltage			3000	Vac

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device.

Electrical Specifications

Ta=25℃, Vin=12Vdc unless otherwise noted.

Input Characteristics

Parameter	Min.	Typ.	Max.	Unit
Operating input voltage range	9	12 or 24	36	Vdc
Input under voltage lockout				
Turn-on threshold		8.4		Vdc
Turn-off threshold		7.8		Vdc
Maximum Input current				
(Vin_min. / Io_max.)		0.83		A
No load input current				
(Io = 0, Module enabled)				
LPS6-Q12-3R3		6		mA
LPS6-Q12-5		4		mA
LPS6-Q12-12		12		mA
LPS6-Q12-15		11		mA
LPS6-Q12-24		17		mA
LPD6-Q12-55		16		mA
LPD6-Q12-1212		20		mA
LPD6-Q12-1515		19		mA
Input filter	Internal Pi-type			

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Output Characteristics

Parameter	Min	Typ	Max	Unit
Output voltage set accuracy			±2	%
Output current				
LPS6-Q12-3R3			1.5	A
LPS6-Q12-5			1.2	A
LPS6-Q12-12			0.5	A
LPS6-Q12-15			0.4	A
LPS6-Q12-24			0.25	A
LPD6-Q12-55			0.6 @5V	A
			0.6 @-5V	A
LPD6-Q12-1212			0.25 @12V	A
			0.25 @-12V	A
LPD6-Q12-1515			0.2 @15V	A
			0.2 @-15V	A
Output regulation;				
- Line regulation(Vin_min. ~ Vin_max.)				
▪ Single output models			±1	%
- Load regulation(Io_min. ~ Io_max.)				
▪ Single output models			±1	%
- Cross regulation(25% of Io ~ Io_max.)				
▪ Dual ouput models			±5	%
Output current limit (Automatic recovery)	>105			%
Short circuit protection	Continuous, Automatic recovery			
Output ripple and noise, (Vin = 12V, Io_max., Bandwidth 20MHz, 1μF ceramic cap + 15μF Tantalum Probe ground 0.5 inch)			1% of Vo	mV
Efficiency (Vin = 12V, Io_max.)				
LPS6-Q12-3R3		79.4		%
LPS6-Q12-5		82.0		%
LPS6-Q12-12		85.7		%
LPS6-Q12-15		86.0		%

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LPS6-Q12-24		87.1		%
LPD6-Q12-55		81.6		%
LPD6-Q12-1212		85.1		%
LPD6-Q12-1515		85.9		%
Dynamic load response (Io = 50%↔75% , Slew rate=0.1A/μs, 1μF ceramic cap + 15μF Tantalum)			5% of Vo	mV
Start-up time			20	ms
Turn-on overshoot			5	%

General Specifications

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Parameter	Min	Typ	Max	Unit
Switching Frequency		215		KHz
I/O isolation voltage (1 min)	3000			Vac
Isolation Capacitance			50	pF
Internal clearance/creepage	5			mm
Operating temperature	-40		85	˚C
Operating Humidity (RH non-condensing)	5		95	%
Storage Temperature	-40		105	˚C
Housing material	Non-conductive plastic(UL94 V-0 rated)			
Cover material	Non-conductive plastic(UL94 V-0 rated)			
Potting material	Silicone (UL 94 V-0 rated)			
Pin material	Copper			
Pin surface plating	Gold(1~2 μm)			
Footprint type	DIP24			
Soldering profile	260℃ / 10s max.			
Remote On/off control(CNT) pin voltage Off On	 Short to Vin- or 0~0.5 Open or 4.5~15			 Vdc Vdc
MTBF	3.8 x 10^5			hrs
Dimensions	31.8 x 20.3 x 7.5 (L x W x H)			mm
Weight		9		g

Characteristic Curves

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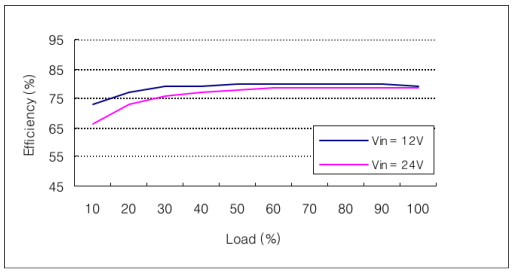
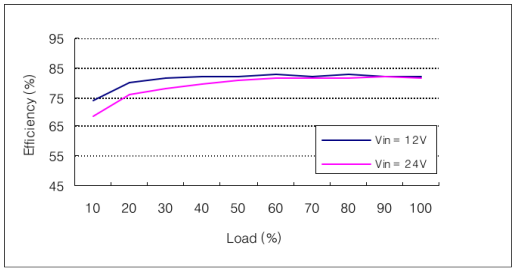
Efficiency

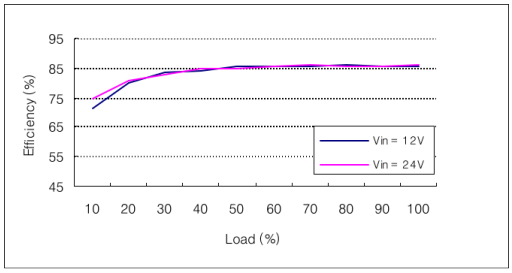
LPS6-Q12-3R3



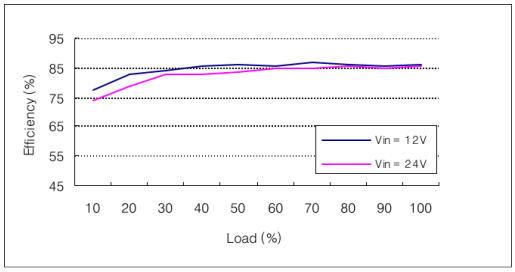
LPS6-Q12-5



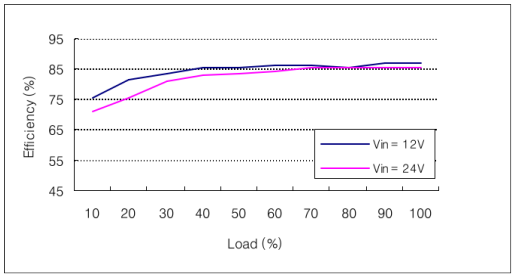
LPS6-Q12-12



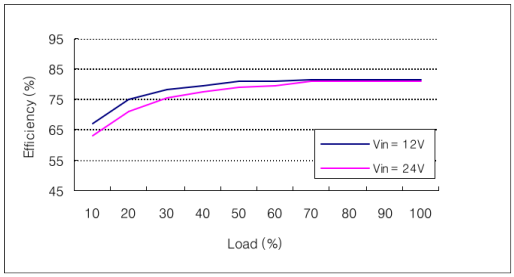
LPS6-Q12-15



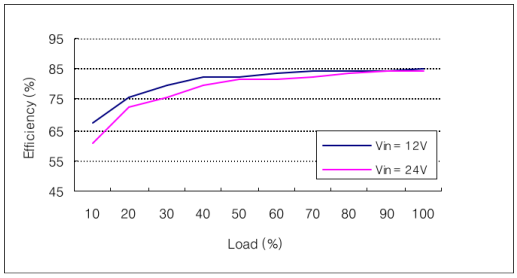
LPS6-Q12-24



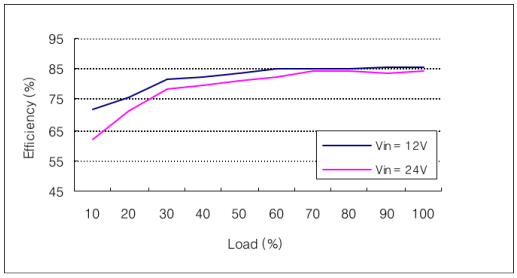
LPD6-Q12-55



LPD6-Q12-1212



LPD6-Q12-1515



Start-up from Vin

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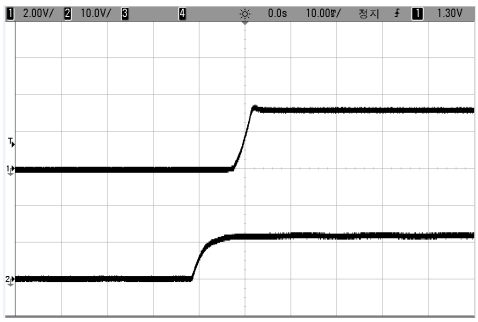
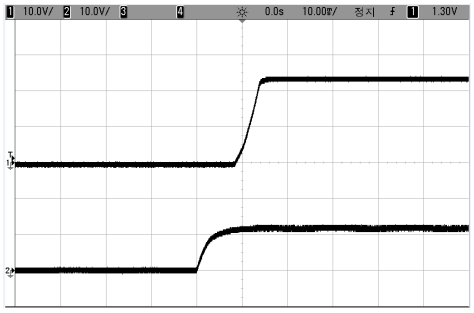
LPS6-Q12-3R3



LPS6-Q12-12

LPS6-Q12-24



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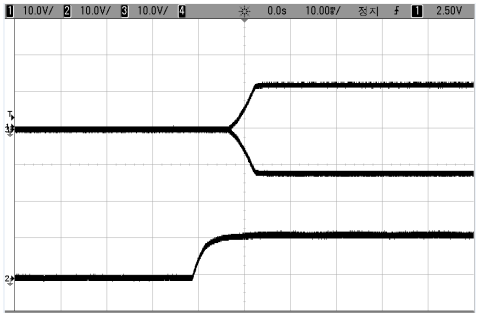
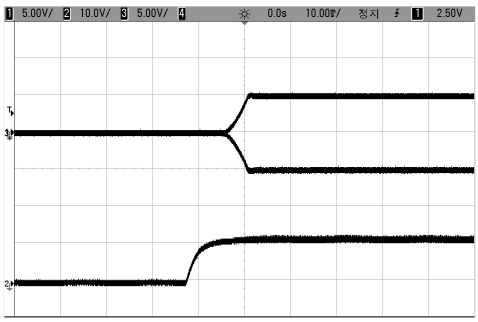


LPS6-Q12-5

LPS6-Q12-15

LPD6-Q12-55



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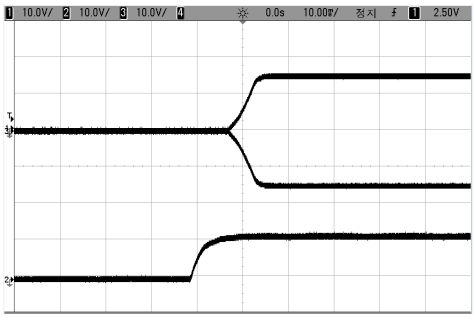

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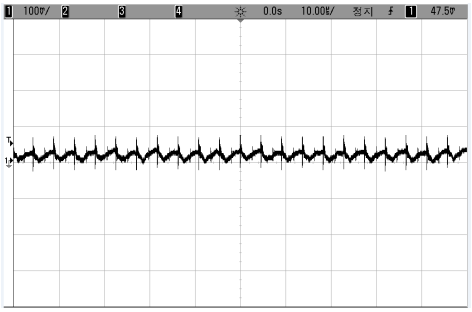
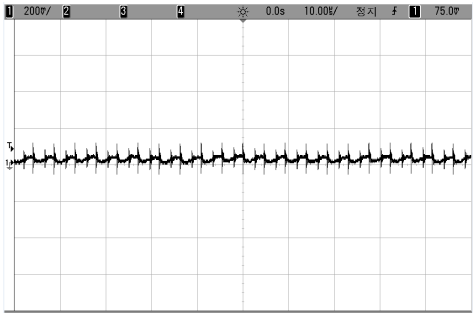
Output Ripple/Noise

(20MHz bandwidth / Probe ground 3inch
/ 0.1μF× 2 at output)

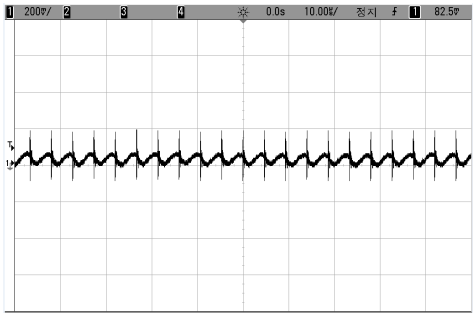
LPS6-Q12-3R3



LPS6-Q12-12

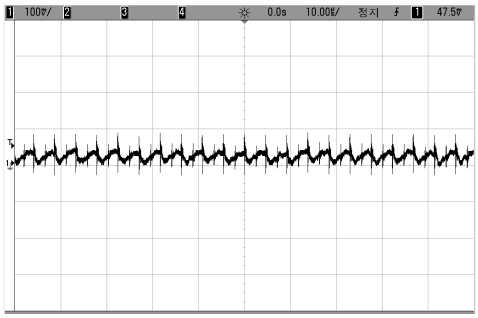


LPS6-Q12-24

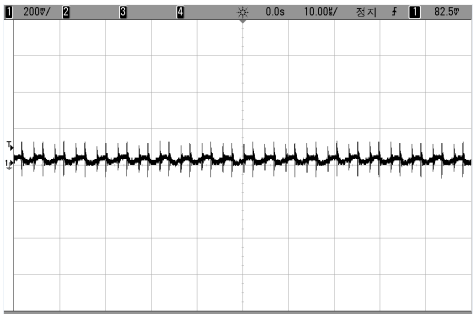


LPD6-Q12-1212

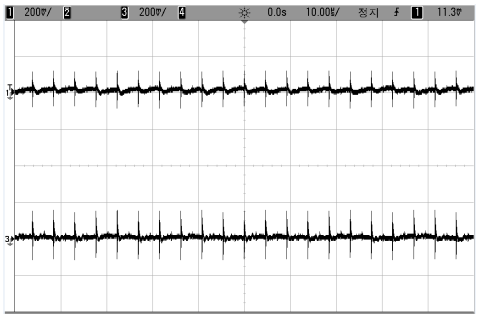
LPS6-Q12-5



LPS6-Q12-15



LPD6-Q12-55



LPD6-Q12-1515

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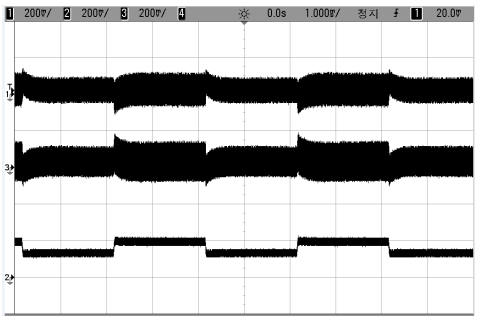
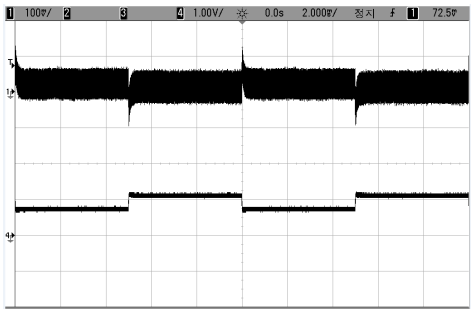


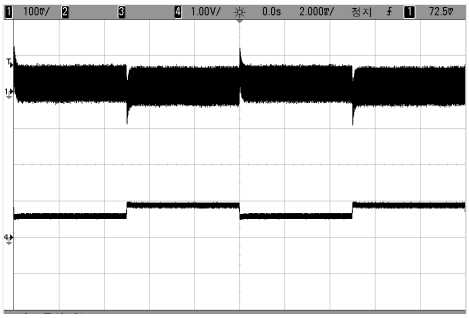
Output Load Transient Response

(Load step: 50%-75%-50% of Io, 0.1A/us)

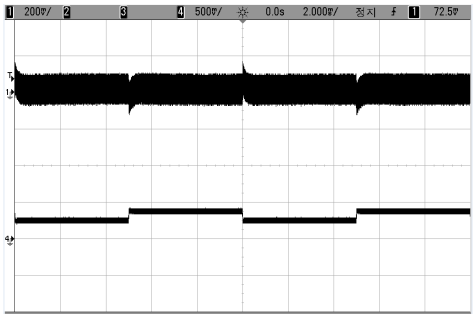
LPS6-Q12-3R3



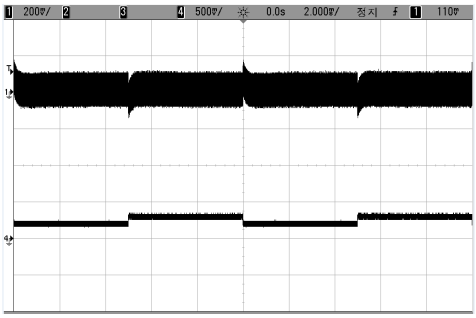
LPS6-Q12-5



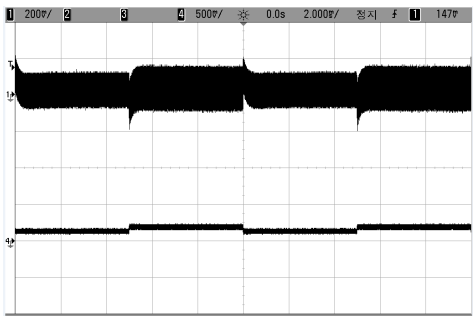
LPS6-Q12-12



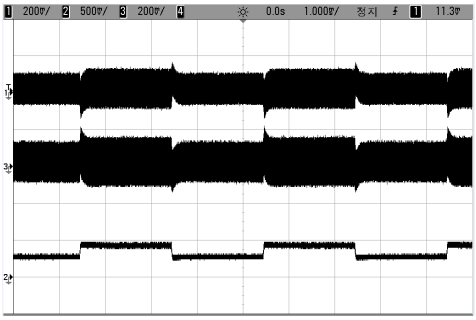
LPS6-Q12-15



LPS6-Q12-24



LPD6-Q12-55



LPD6-Q12-1212

LPD6-Q12-1515

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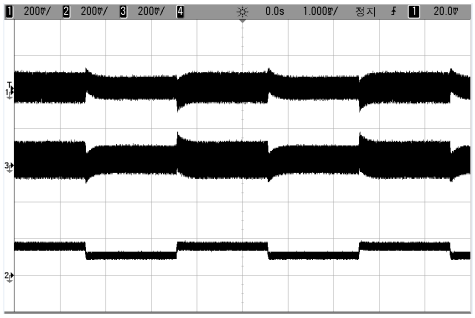


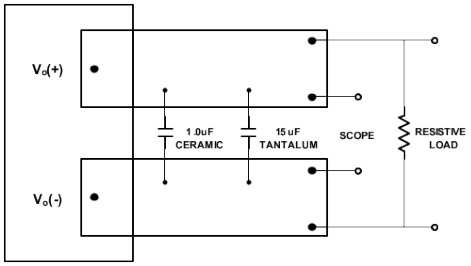
Efficiency

$$\eta = \left(\frac{[V_O(+) - V_O(-)] \times I_O}{[V_{in}(+) - V_{in}(-)] \times I_{in}} \right) \times 100\ \%$$

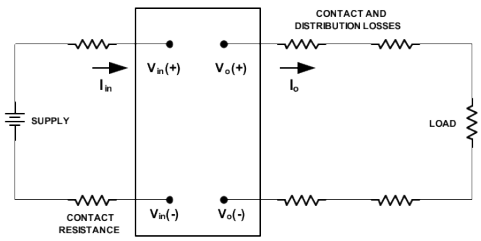
TEST Configurations

Output ripple & noise Test

The probe ground should be less than 1/2 inch and oscilloscope is set up 20MHz bandwidth to measure exact data.



Output Voltage and Efficiency Test

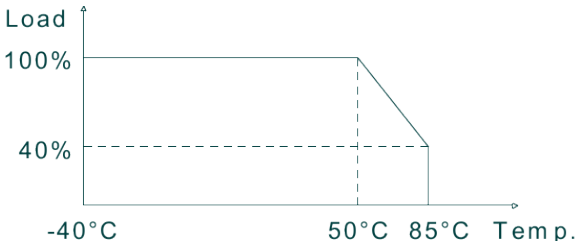


*All measurements are taken at the module terminals when socketing, place Kelvin connections at module terminals to Avoid measurement errors due to socket contact resistance.

Thermal Considerations

LPS6 series has wide operating temperature range from -40˚C to +85˚C.

However, it should be required an enough air flow for more reliable operation. Output derating curve provide designers with a quantity of a current under the desired ambient temperature and velocity of airflow.



If the device is installed in a system, the device's temperature of Point_A should be checked if does not exceed 100˚C.

Please make sure that the ambient temperature does not exceed 85˚C.

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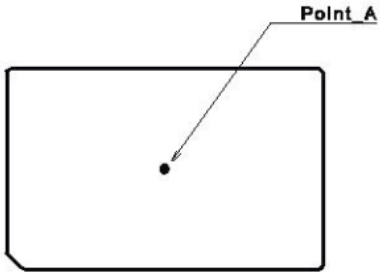

CNT	OUTPUT
OPEN	ON
SHORT TO VIN(-)	OFF

Feature Description

Input Fuse

LPS6 series has not a fuse built in.

In order to comply with safety requirements, you can set up a fuse externally.

	Q5	Q12	Q24
LPS6	5A	2.5A	2A

Input Filter / Output Filter

LPS6 series have an internal input filter. To minimize the ripple and noise of the input voltage, additional external capacitor is required 10uF~680uF.

To reduce a output ripple and noise, external capacitor is required at the output of the device.

Remote ON/OFF control (CNT)

LPS6 series have negative logic CNT.

Negative logic turns module on during a logic high voltage on the CNT pin, and off during a logic low voltage on the CNT pin.

Input under-voltage Lockout (UVLO)

At input voltages below the input under-voltage lockout(UVLO), the module operation is disabled. The module will begin to operate, when the input
voltage is raised above UVLO voltage.

Input Over Voltage Protection

LPS6 series has not built in Input over voltage protection circuit. So, you need to set up a circuit externally which can protect the input over voltage if necessary

Over current Protection (OCP)

LPS6 series built in over current protection circuit which operates when the output current is over 105% of rating and automatically recovers when over current condition is removed.

If load is connected to a inductive or constant current load such as lamp of motor, output may not start up.

Short Circuit Protection (SCP)

At the point of current-limit inception, the unit enters hiccup mode.

Also the module automatically recovers when over current condition is removed.

Output Over Voltage Protection (OVP)

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LPS6 series has not built in output over voltage protection circuit. So, you need to set up a circuit externally which can protect the output over voltage if necessary.

Over Temperature Protection (OTP)

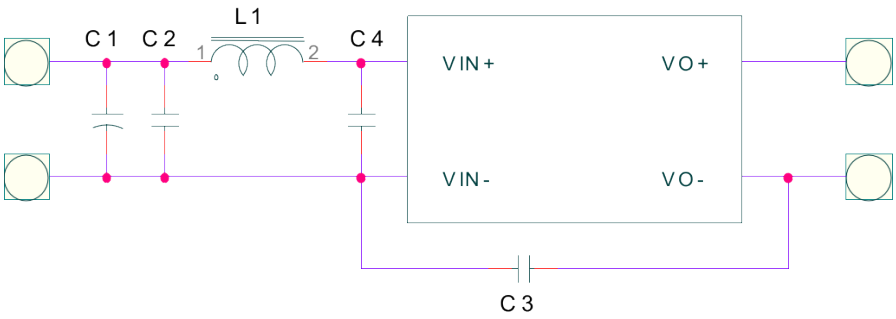
LPS6 series has not built in over temperature protection circuit. So, you need to set up a circuit externally which can protect the output over voltage if necessary

Soldering information

The product is intended for through hole mounting in a PCB. When wave soldering is used, the temperature on the pins is specified to maximum 260˚C for maximum 10seconds.
When hand soldering is used, care should be taken to avoid direct contact between the hot soldering iron tip and the pins for more than a few seconds in order to prevent overheating.

EMI characteristic (conducted emission)

In order to reduce conducted noise install an exernal input filter as shown in below.



Model	C1	C2	C3	L1	C4
LPS6-Q5-5	220μF/25V	106/25V (MLCC)	2.2nF (Y1-cap)	10μH	-
LPS6-Q12-5	220μF/50V	225/50V (MLCC)	2.2nF (Y1-cap)	15μH	-
LPS6-Q24-5	220μF/100V	105/100V (MLCC)	2.2nF (Y1-cap)	22μH	-

Connection for standard use

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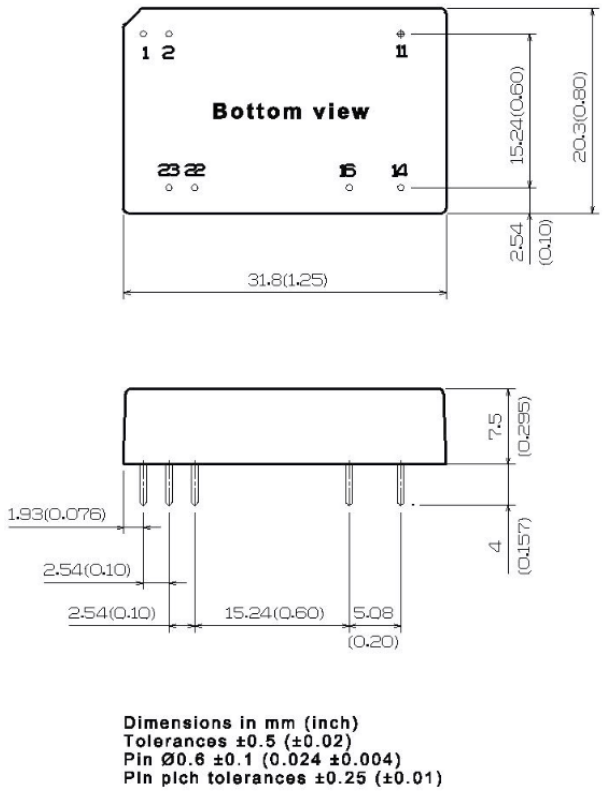
Mechanical Specification



Dimensions in mm (inch)
Tolerances ±0.5 (±0.02)
Pin Ø0.6 ±0.1 (0.024 ±0.004)
Pin pich tolerances ±0.25 (±0.01)

Pin Assignments

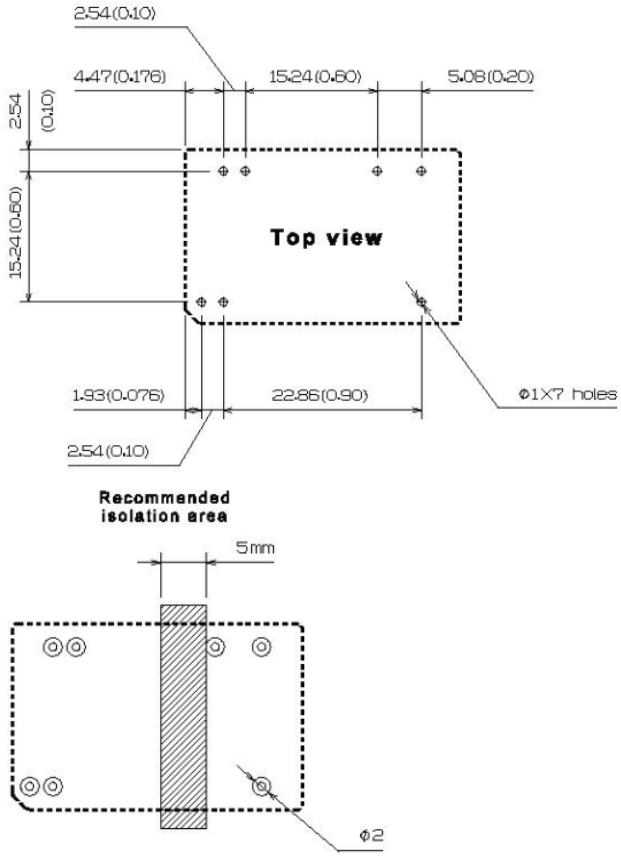
PIN	Single output	Dual output
1	CNT	CNT
2	-Vin	-Vin
11	NC	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

NC : No connection

Recommended Footprit Details

LPS6-Q12 Series : Isolated DC/DC Converters
9 – 36V Input Voltage Range, Maximum Power : 6W

Data Sheet
Oct. 01, 2024



Recommended Layout

Ordering Information

Input	Output	Power Max.	Ripple&Noise Max.	Efficiency Typ.	Model Number
4.5 - 18V	3.3V@1.5A	4.95W	50mVp-p	77.4%	LPS6-Q5-3R3
	5V @1.2A	6W	50mVp-p	79.2%	LPS6-Q5-5
	12V @0.5A	6W	120mVp-p	82.7%	LPS6-Q5-12
	15V @0.4A	6W	150mVp-p	83.1%	LPS6-Q5-15
	24V@0.25A	6W	240mVp-p	84.3%	LPS6-Q5-24
	+ 5V@0.6A / -5V@0.6A	6W	50mVp-p	80.0%	LPD6-Q5-55
	+ 12V@0.25A / -12V@0.25A	6W	120mVp-p	82.9%	LPD6-Q5-1212
	+ 15V@0.2A / -15V@0.2A	6W	150mVp-p	83.3%	LPD6-Q5-1515
9 - 36V	3.3V@1.5A	4.95W	50mVp-p	79.4%	LPS6-Q12-3R3

LPS6-Q12 Series : Isolated DC/DC Converters
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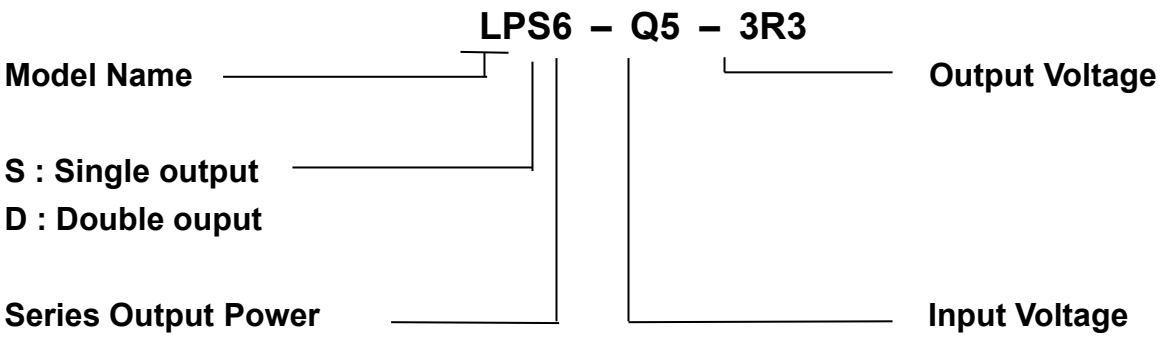
	5V @1.2A	6W	50mVp-p	82.0%	LPS6-Q12-5
	12V @0.5A	6W	120mVp-p	85.7%	LPS6-Q12-12
	15V @0.4A	6W	150mVp-p	86.0%	LPS6-Q12-15
	24V@0.25A	6W	240mVp-p	87.1%	LPS6-Q12-24
	+ 5V@0.6A / -5V@0.6A	6W	50mVp-p	81.6%	LPD6-Q12-55
	+ 12V@0.25A / -12V@0.25A	6W	120mVp-p	85.1%	LPD6-Q12-1212
	+ 15V@0.2A / -15V@0.2A	6W	150mVp-p	85.9%	LPD6-Q12-1515
18 - 72V	3.3V@1.5A	4.95W	50mVp-p	78.4%	LPS6-Q24-3R3
	5V @1.2A	6W	50mVp-p	80.0%	LPS6-Q24-5
	12V @0.5A	6W	120mVp-p	83.0%	LPS6-Q24-12
	15V @0.4A	6W	150mVp-p	84.1%	LPS6-Q24-15
	24V@0.25A	6W	240mVp-p	85.3%	LPS6-Q24-24
	+ 5V@0.6A / -5V@0.6A	6W	50mVp-p	80.2%	LPD6-Q24-55
	+ 12V@0.25A / -12V@0.25A	6W	120mVp-p	83.4%	LPD6-Q24-1212
	+ 15V@0.2A / -15V@0.2A	6W	150mVp-p	84.3%	LPD6-Q24-1515

Part Number Structure



LPS6-Q12 Series : Isolated DC/DC Converters
9 – 36V Input Voltage Range, Maximum Power : 6W

Data Sheet
Oct. 01, 2024

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