



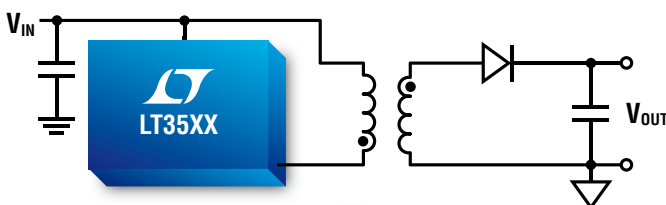
## Easy Isolated Flyback DC/DC Converter Design Solution Evaluation Kits



To offer easy isolated flyback design solutions for the LT3748 & LT357x family of ICs and WE-FB flyback transformers, Linear Technology and Würth Elektronik have developed evaluation kits with five different power output configurations:

1. Kit **750105**: 2.5 Watt LT3574 including Flyback Transformers for 3.3V, 5V and 12V
2. Kit **750103**: 7 Watt LT3573 including Flyback Transformer for 5V
3. Kit **750106**: 10 Watt LT3575 including Flyback Transformers for 3.3V, 5V and 12V
4. Kit **750107**: 12 Watt LT3748 including Flyback Transformers for 3.3V, 5V and 12V
5. Kit **750108**: 30 Watt LT3748 including Flyback Transformers for 12V, 15V and 24V

### ACCURATE $V_{OUT}$ WITHOUT OPTOCOUPLER OR SIGNAL TRANSFORMER



**NO Feedback  
Signal Transformer**



**NO Feedback  
Optocoupler**

- **Easy Design**
- **High Reliability**
- **Few Components**
- **$V_{OUT}$  Accuracy**

The output voltage of all these Linear Technology parts is easily set with two external resistors and the transformer turns ratio. Over 60 additional off-the-shelf transformers from Würth Elektronik are available for many applications, with other output voltages stocked at Farnell.

The **key advantages** of the evaluation kits are:

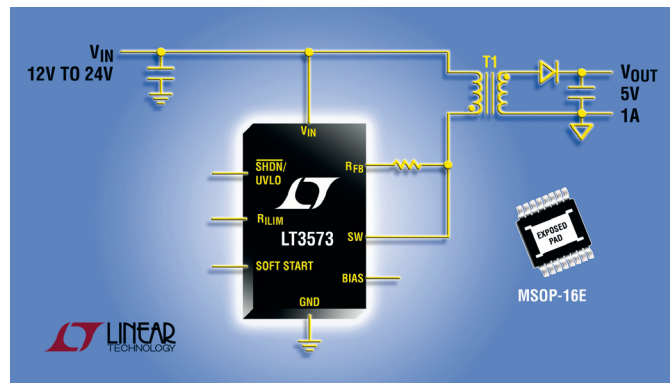
- **Ready-made demo board / circuit / application**
- **Easy design with standard components**
- **Adjustable to different input and output voltages**

## Isolated Monolithic Flyback Simplifies Design & Eliminates Optocoupler – LT3573

- $V_{IN}$  Range from 3V to 40V
- Onboard 1.25A, 60V Integrated NPN Power Switch
- No Transformer, Third Winding or Opto-Isolator Required for Feedback
- Current Mode Control
- Boundary Mode Operation
- $V_{OUT}$  Set with Two External Resistors
- Programmable Soft-Start
- Programmable Undervoltage Lockout
- Output Voltage Temperature Compensation
- Adjustable Current Limit

The LT3573 is an isolated monolithic flyback switching regulator with an integrated 1.25A NPN power switch. This device significantly simplifies the design of a flyback converter since it does not require a third winding or optoisolator and can sense the output voltage directly from the primary side flyback waveform. The LT3573 operates over an input voltage range of 3V to 40V at output power levels up to 7 watts, and can be used in a wide variety of industrial, medical, datacom and automotive applications requiring isolated power.

The LT3573 operates in boundary mode, which is a variable frequency current mode switching scheme, resulting in a total regulation band of  $\pm 5\%$  over a wide input voltage range and



output load current in a typical application. Boundary mode operation also permits the use of a smaller transformer when compared to equivalent continuous conduction mode designs. The output voltage is easily set by two external resistors.

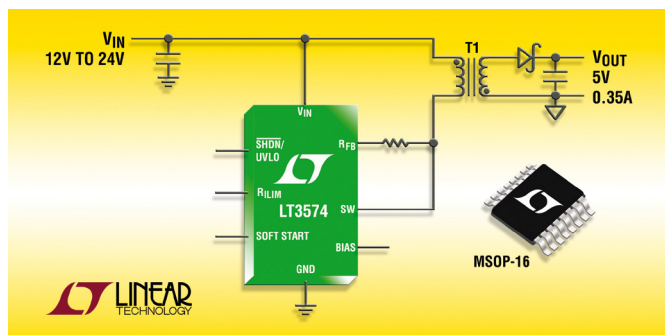
The LT3573 has additional features that include an onboard LDO, programmable soft start, undervoltage lockout, adjustable current limit and output voltage temperature compensation.

The LT3573 is available in a small thermally enhanced MSOP-16 package and is offered in an extended and industrial operating junction temperature range at  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

More info: [www.linear.com/3573](http://www.linear.com/3573)

## Low Power Isolated Monolithic Flyback Switching Regulator Simplifies Design & Eliminates Optocoupler – LT3574

- $V_{IN}$  Range from 3V to 40V
- Onboard 0.65A, 60V Integrated NPN Power Switch
- No Transformer, Third Winding or Opto-Isolator Required for Feedback
- Current Mode Control
- Boundary Mode Operation
- $V_{OUT}$  Set with Two External Resistors
- Off-the-Shelf Transformers
- Programmable Soft-Start
- Programmable Undervoltage Lockout
- Output Voltage Temperature Compensation
- Adjustable Current Limit



More info: [www.linear.com/3574](http://www.linear.com/3574)

The LT3574 is an isolated monolithic flyback switching regulator that significantly simplifies the design of a low power isolated DC/DC converter. No opto-isolator, third winding or signal transformer is required for feedback since the output voltage is sensed from the primary-side flyback signal. The LT3574 operates over a 3V to 40V input voltage range, has a 0.65A NPN power switch and can deliver up to 3 watts of output power, making it well suited for a wide variety of industrial, medical, telecom, datacom and automotive applications.

The LT3574 operates in boundary mode, which is a variable frequency current mode control switching scheme, resulting in  $\pm 5\%$  regulation over the full line, load and temperature range. Boundary mode also permits the use of a smaller transformer compared to equivalent continuous conduction mode designs. The output voltage is easily set by two external resistors and the transformers turns ratio. Several off-the-shelf transformers identified in the data sheet can be used for numerous applications. The high level of integration and use of boundary mode operation results in a simple, clean application solution to the traditionally tough problem of isolated power delivery.

Additional features include an onboard low dropout regulator for IC power, programmable soft-start, undervoltage lockout, adjustable current limit and output voltage temperature compensation.

The LT3574 is available in a small MSOP-16 package and is offered in an extended and industrial operating junction temperature range at  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .

## Isolated Monolithic Flyback Regulator Simplifies Design & Eliminates Optocoupler – LT3575

- $V_{IN}$  Range from 3V to 40V
- Onboard 2.5A, 60V Integrated Power Switch
- No Transformer, Third Winding or Opto-Isolator Required for Feedback
- Current-Mode Control
- Boundary-Mode Operation
- $V_{OUT}$  Set with Two External Resistors
- Off-the-Shelf Transformers
- Programmable Soft-Start
- Programmable Undervoltage Lockout
- Output Voltage Temperature Compensation
- Adjustable Current Limit

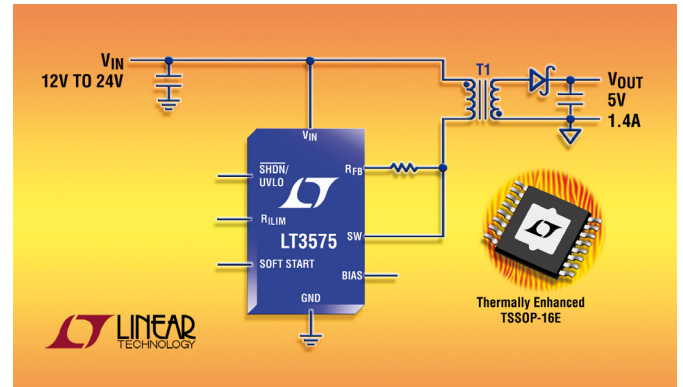
The LT3575 is an isolated monolithic flyback switching regulator that significantly simplifies the design of an isolated DC/DC converter. No opto-isolator, third winding or signal transformer is required for feedback since the output voltage is sensed from the primary-side flyback signal. The LT3575 operates over a 3V to 40V input voltage range, has a 2.5A power switch and delivers up to 14 Watts of output power.

The LT3575 operates in boundary mode, which is a variable frequency current-mode control switching scheme, typically resulting in  $\pm 5\%$  regulation over the full line, load and temperature range. Boundary mode also permits the use of a smaller transformer compared to equivalent continuous conduction-mode

designs. The high level of integration and the use of boundary-mode operation results in a simple, clean application solution to the traditionally tough problem of isolated power delivery.

Additional features include an onboard low dropout regulator for IC power, programmable soft-start, undervoltage lockout, adjustable current limit and output voltage temperature compensation.

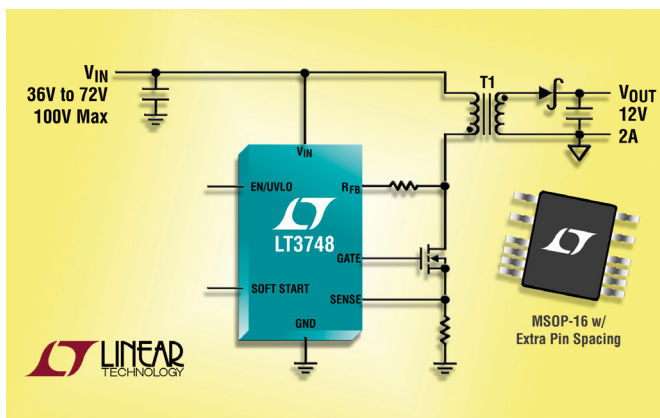
The LT3575 is available in a small thermally enhanced TSSOP-16 package and is offered in an extended and industrial operating junction temperature range from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .



More info: [www.linear.com/3575](http://www.linear.com/3575)

## 100V Isolated Flyback DC/DC Controller Simplifies Design & Eliminates Optocoupler – LT3748

- $V_{IN}$  Range from 5V to 100V
- No Opto-Isolator, Transformer or Third Winding Required for Feedback
- Drives External N-channel Power MOSFET
- Current Mode Control
- Boundary Mode Operation
- $V_{OUT}$  Set with Two External Resistors
- Off-the-Shelf Transformers
- Programmable Soft-Start
- Programmable Undervoltage Lockout
- Output Voltage Temperature Compensation



The LT3748 is a high input voltage isolated flyback DC/DC controller that significantly simplifies the design of an isolated DC/DC converter. No opto-isolator, third winding or signal transformer is required for feedback since the output voltage is sensed from the primary-side flyback signal. The LT3748 operates over a 5V to 100V input voltage range and drives an external N-channel power MOSFET, making it well suited for a wide variety of industrial, medical, telecom, datacom and automotive applications.

The LT3748 operates in boundary mode, which is a variable frequency current mode control switching scheme, resulting in  $\pm 5\%$  typical regulation over the full line, load and temperature range. Boundary mode also permits the use of a smaller transformer compared to equivalent continuous conduction mode designs. The output voltage is easily set by two external resistors and the transformer turns ratio. Several off-the-shelf transformers identified in the data sheet can be used for numerous applications. The high level of integration and the use of boundary mode operation results in a simple, clean application solution to the traditionally tough problem of isolated power delivery.

Additional features include an onboard low dropout regulator for IC power, programmable soft-start, undervoltage lockout, adjustable current limit and output voltage temperature compensation.

The LT3748 is available in a small MSOP-16 package with 4 pins removed for additional high voltage pin spacing.

More info: [www.linear.com/3748](http://www.linear.com/3748)

## Transformers for LT3573/3574/3575 and LT3748

Linear Technology launched a family of ICs for isolated flyback converters which allow a very simple. In close cooperation with Würth Elektronik, there are more than 60 standard transformers developed which comply with the requirements of these ICs.

By selecting the correct transformers and simply changing two resistors on the board, users can select the output voltage required.

All transformers are optimized for a very low leakage inductance in order to maximize efficiency of the circuit. High leakage inductances cause high voltage spikes on the switch, which therefore need to be reduced by a snubber network. The losses generated in the snubber are related to the height of the voltage spike. This means lower leakage inductance causes a lower voltage peak and therefore lower losses.

The low leakage inductance is achieved by full flat layers and split windings. Wire is selected to fill the layers. When needed multiple strands are used to fully fill the layer.

As an example Figure 1 shows the winding build of transformer 750311675. You can clearly see that primary and secondary are constructed from multiple strands (bifilar resp. quadfilar). In addition, they are split in parallel.

So the winding order is:

*Secondary 1 => Primary 1 => Auxiliary => Secondary 2 => Primary 2*  
 Secondary 1 and 2 resp. Primary 1 and 2 are connected in parallel.

With this structure, the typical leakage inductance of the 750311675 transformer is 130nH inductance at 100kHz.

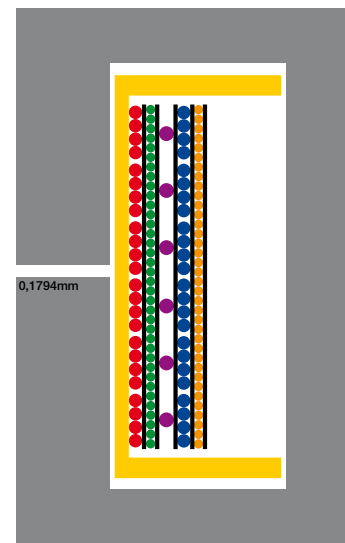
As shown, Würth Elektronik offers a wide range of standard transformers which are suited for the LT357x and LT3748 IC families. These are optimized for a very low leakage inductance. Würth Elektronik provides LTSpice® models for all standard transformers.

The demo boards feature simple design and small solution size. Würth Elektronik offers a wide variety of demo kits, each of which includes a demo board. This board can be adjusted to input and output requirements by changing only two resistors and the transformer, thus offering a quick and easy solution for an isolated switch mode supply.

**Figure 1**

Winding build of 750311675 as example of an advanced winding build.

- Red:** Secondary 1
- Green:** Primary 1
- Violet:** Auxilliary
- Blue:** Secondary 2
- Orange:** Primary 2



### Chart of Design Kits

Order Code	LTC IC	Demo Board	Power (W)	Transformer assembled onboard		Transformer 2**		Transformer 3**	
				Order Code	Output Voltage	Order Code	Output Voltage	Order Code	Output Voltage
750 105	LT3574	DC1636A	2.5	750 370 041	5V / 0.35A	750 311 304	3.3V / 0.7A	750 310 799	12V / 0.15A
750 103	LT3573	DC1228A	7	750 370 047	5V / 1A	-	-	-	-
750 106	LT3575	DC1643A	10	750 311 675	5V / 1.4A	750 310 564	12V / 0.5A	750 310 559	3.3V / 1.5A
750 107	LT3748	DC1557A	12	750 311 439	12V / 1A	750 310 688	3.3V / 4A	750 311 689	5V / 3A
750 108	LT3748	DC1694A	30	750 311 607	12V / 2.5A	750 311 599	15V / 2A	750 311 608	24V / 1.3A



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