Smallest design for up to 10 W

WÜRTH ELEKTRONIK

LT3575

Simple Isolated Flyback Converter with primary side sensing

Order Code 750 106
Version 1.0

LINEAR TECHNOLOGY

Evaluation Board for LT3575

Input: 10-28 V
Output: 5 V up to 1.4 A
Input: 20-28 V
Output: 5 V up to 2 A

different setups possible:
Output: 3.3 V up to 1.5 A
Output: 12 V up to 0.5 A

Power	Order Code	IC
up to 2.5 W	750 105	LT3574
up to 7 W	750 103	LT3573
up to 10 W	750 106	LT3575
up to 12 W	750 107	LT3748
up to 30 W	750 108	LT3748

LT3575 – 8 Design Tips

1. Select the transformer turns ratio to accommodate the output.

$$N_{PS} = \frac{N_P}{N_S} \qquad V_{SW(MAX)} = V_{IN} + N_{PS}(V_{OUT} + V_F) < 50V$$

This voltage must not exceed 50V. Same equation determines, the maximum turns ratio.

Or rearranged to: $$N_{PS} < \frac{50\text{-}V_{IN(MAX)}}{(V_{OUT} + V_F)}$$

2. Select the transformer primary inductance for target switching frequency.

$$L_{MIN} = \frac{N_{PS}(V_{OUT} + V_F)}{I_{MIN}} \bullet t_{OFF(MIN)} \qquad f_{SW} = \frac{1}{t_{ON} + t_{OFF}} = \frac{1}{\frac{I_{PK}}{V_{IN}/L} + \frac{I_{PK}}{N_{PS}(V_{OUT} + V_F)/L}}$$

3. Select the output diodes and output capacitor.

$$V_D = V_{OUT} + \frac{V_{IN}}{N_{PS}} \qquad C_{OUT} = \frac{LI^2_{PK}}{2V_{OUT}\Delta V_{MAX}}$$

4. Select the snubber circuit to clamp the switch voltage spike. Good starting point: 2KΩ // 220nF

5. Select the feedback resistor for proper output voltage

1:1 Transformer

V_{OUT} (V)	N_{PS}	R_{FB} (kΩ)	R_{REF} (kΩ)	R_{TC} (kΩ)
3.3	1.00	18.7	6.04	19.1
5	1.00	27.4	6.04	28
12	1.00	64.9	6.04	66.5
15	1.00	80.6	6.04	80.6
20	1.00	107	6.04	105

2:1 Transformer

V_{OUT} (V)	N_{PS}	R_{FB} (kΩ)	R_{REF} (kΩ)	R_{TC} (kΩ)
3.3	2.00	37.4	6.04	18.7
5	2.00	56	6.04	28
12	2.00	130	6.04	66.5
15	2.00	162	6.04	80.6

3:1 Transformer

V_{OUT} (V)	N_{PS}	R_{FB} (kΩ)	R_{REF} (kΩ)	R_{TC} (kΩ)
3.3	3.00	56.2	6.04	20
5	3.00	80.6	6.04	28.7
10	3.00	165	6.04	54.9

4:1 Transformer

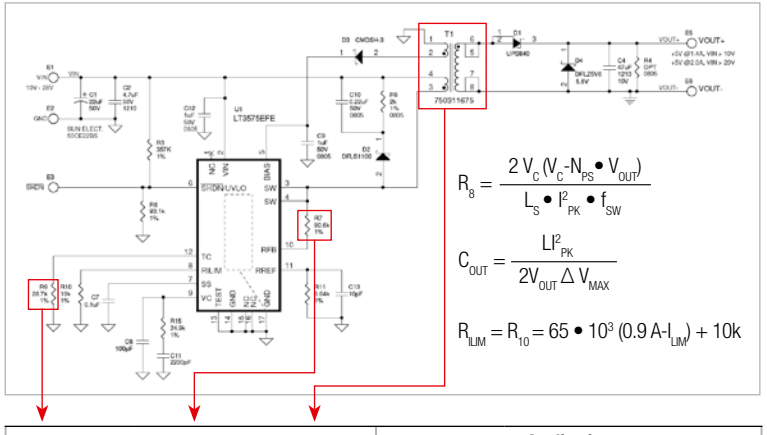
V_{OUT} (V)	N_{PS}	R_{FB} (kΩ)	R_{REF} (kΩ)	R_{TC} (kΩ)
3.3	4.00	76.8	6.04	19.1
5	4.00	113	6.04	28

LT3575 Design schematic –
different output voltages

6. Optimize the compensation network at pin VC to improve the transient performance. For best ripple performance, select a compensation capacitor not less than 1nF, and select a compensation resistor not greater than 50k.

7. Select the current limit resistor, using a 10k resistor for the full current capabilities of the switch. Select soft-start capacitor (good starting point 10nF) and UVLO resistor divider. (details see data sheet; here set for ON Mode @ Vin > 6.8V and OFF Mode @ Vin < 5.9V)

8. Fine tune the snubber with the final transformer in the application. Start with low load current and slowly increase load and at the same time check flyback spike on the scope. Make sure spike is <55V at maximum load.
Increase R8 ➔ higher spike at higher efficiency; lower R8 ➔ lower spike, but lower efficiency

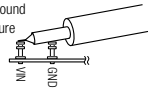


			Application		
R_{TC}	R_{FB}	Transformer	Input Voltage	Output Voltage	Output current
19.1 kΩ	76.8 kΩ	750 310 559	10-30	3.3 V	1.50 A
28.7 kΩ	80.6 kΩ	750 311 675	10-28 (20-28)	5.0 V	1.40 A (2 A)
54.9 kΩ	165 kΩ	750 310 564	12-24	12.0 V	0.50 A

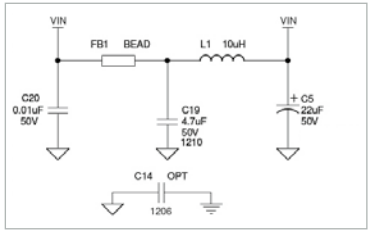
DEMOBOARD USAGE

1. With power off, connect the input power supply to VIN and GND
2. Turn on the power at the input.
   NOTE: Make sure that the input voltage does not exceed 30V
3. Check for the proper output voltages.
   NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
4. Once the proper output voltage is established, adjust the load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripplеby touching the probe tip directly across the VIN or VOUT and GND terminals.



OPTIONAL FILTER CIRCUIT



R_{TC}	Order Code*	I_{RMS}	size
FB1	742 792 15	3.0 A	1206
L1	744 052 100	1.1 A	5.8x5.8x1.8

* dependent on current other components maybe suitable

More design support notes to download
www.we-online.com/LT