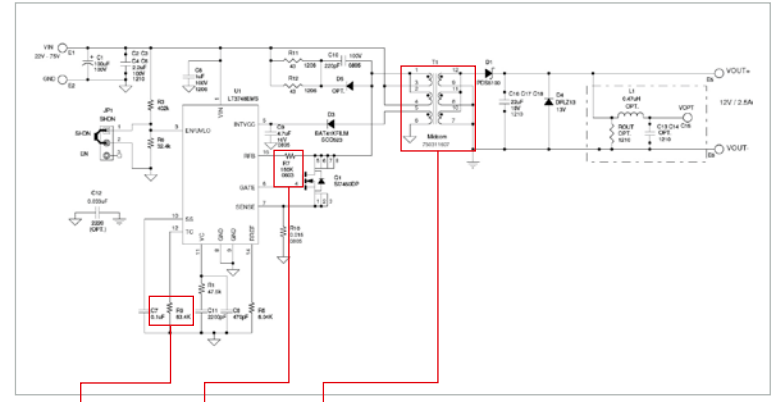




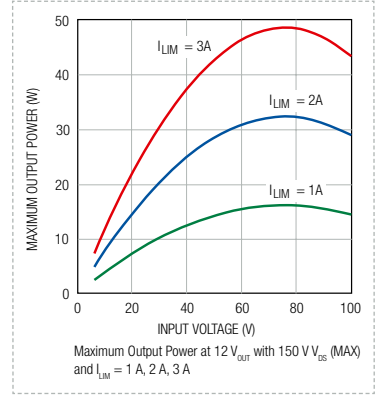
LT3748 Design schematic – different output voltages



Application					
R _{TC}	R _{FB}	Transformer	Input Voltage	Output Voltage	Output current
63.4 kΩ	158 kΩ	750 311 607	22-77	12 V	2.5 A
78.0 kΩ	118 kΩ	750 311 599	10-40	15 V	2.0 A
124 kΩ	187 kΩ	750 311 608	22-77	24 V	1.3 A

DEMOBOARD USAGE

- With power off, connect the input power supply to VIN and GND
- Turn on the power at the input.
NOTE: Make sure that the input voltage does not exceed 30V
- 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.
- 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 ripple by touching the probe tip directly across the VIN or VOUT and GND terminals.



6. Select the Feedback resistor

$$R_{FB} = \frac{6.04k\Omega \cdot N_{PS} \cdot ((V_{OUT} + V_{F(DIODE)}) + 0.55V)}{1.223V}$$

7. Select the Output Capacitor

$$C_{OUT} = \frac{L_{PRI} \cdot I_{LIM}^2}{2 \cdot \Delta V_{MAX} \cdot V_{OUT}}$$

8. Check if Snubber Circuitry is necessary. Select a capacitor 2-3 times of MOSFET output capacitance
- probe drain of the MOSFET switch (i.e. Si7738DP - 150V)
 - probe anode of the output diode, when MOSFET turns on (i.e.SBR 8U60P5 – 60V)
- a) $V_{PROBE} < V_{DS}$ b) $V_{PROBE} < V_{R(DIODE)}$

If above mentioned requirements are not given decrease R8 to lower the spike for a) and b)

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

High power up to 30 W

LT3748
100 V Isolated Flyback Controller with primary side sensing 12 V/2.5 A



Order Code 750 108
Version 1.0



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

Evaluation Board for LT3748

Input: 22-75 V
Output: 12 V up to 2.5 A

different setups possible:
Output: 15 V up to 2 A
Output: 24 V up to 1.3 A

LT3748 – 8 Design Tips

- Select the transformer turns ratio to accommodate the diode reverse voltage and maximize the efficiency

$$N_{PS} = \frac{N_P}{N_S} \quad V_{DS(MAX)} = \frac{V_{IN(MAX)}}{N_{PS}} + V_{OUT} \quad I_{OUT(MAX)} \approx 0.8 \cdot (1 - D) \cdot N_{PS} \cdot \frac{I_{LIM}}{2}$$

$$D = \frac{(V_{OUT} + V_{F(DIODE)}) \cdot N_{PS}}{[V_{IN} + ((V_{OUT} + V_{F(DIODE)}) \cdot N_{PS})]} \quad I_{DIODE(RMS)} = \sqrt{(I_{LIM} + N_{PS})^2 \cdot \frac{(1 - D)}{3}}$$
- Calculate the Sense Resistor Value

$$R_{SENSE} = \frac{100 \text{ mV}}{I_{LIM}}$$
- Select a transformer based on inductance and saturation current requirements (see table page 4 to 7). Dependent on size restrictions you may have to increase the switching frequency to choose a lower primary inductance and following a smaller transformer package. Verify if the inductance is large enough to satisfy the minimum on and off times of LT3748.

$$L_{PRI} \leq \frac{V_{IN} \cdot (V_{OUT} + V_{F(DIODE)}) \cdot N_{PS}}{f_{SW} \cdot I_{LIM} \cdot [(V_{OUT} + V_{F(DIODE)}) \cdot N_{PS} + V_{IN(MIN)}]}$$

Verification

$$L_{PRI} \geq \frac{(V_{OUT} + V_{F(DIODE)}) \cdot N_{PS} \cdot R_{SENSE} \cdot 400ns}{15mV} \quad L_{PRI} \geq \frac{V_{IN(MAX)} \cdot R_{SENSE} \cdot 250ns}{15mV}$$
- Select a MOSFET Switch by considering the leakage of the transformer which will cause the drain to ring. A verification in the final design has to be done, if a snubber circuit needs to be added to meet the voltage requirements.

$$V_{DS} = V_{IN} + ((V_{OUT} + V_{F(DIODE)}) \cdot N_{PS})$$
- Select the Output Diode, where maximizing the efficiency is the goal, minimizing the maximum voltage requirement V_{IN} may allow the use of a diode with a lower reverse bias rating and a lower forward drop which could further increase efficiency.

Available transformers for

simple isolated flyback converters with primary side sensing – ex stock

Reference to Linear Technology Specification				all possible OFF THE SHELF transformer*										
up to 3 W	up to 7 W	up to 14 W	external MOSFET	WE Order Code	Power (W)	Core	U _{in} (V)	U _{out} (V)	I _{out} (A)	Turns ratio N _p :N _s	L _{pri} (μH)	Leakage (nH)	Isolation (V)	I _{sat} (A)
			LT3748	750 311 691	< 10	EP5	8 - 15	150	0.001	5:1	60	1000	1500	0.25
	LT3573			750 310 799	< 10	EP7	18 - 30	15	0.4	1:1	25	125	1500	2
LT3574	LT3573			750 370 040	< 10	EP7	18 - 30	5	1	3:1	30	200	1500	1.7
LT3574	LT3573			750 370 041	< 10	EP7	18 - 30	5	1	3:1	50	450	1500	1.6
LT3574	LT3573			750 370 047	< 10	EP7	18 - 30	5	1	3:1	30	150	1500	1.7
	LT3573			750 370 058	< 10	EP7	18 - 30	15	0.4	1:1	25	185	1500	2
	LT3573			750 370 059	< 10	EP7	18 - 30	5	1	3:1	50	500	1500	1.6
			LT3748	750 311 692	< 10	EP7	8 - 15	± 150	0.001	5:1	80	2000	1500	1
	LT3573			750 370 042	< 10	ER9.5	5	5	0.2	1:1	15	250	1500	1.5
	LT3573	LT3575		750 310 471	< 10	EP10	9 - 30	5	1	3:1	25	430	1500	2.6
	LT3573	LT3575		750 310 559	< 10	EP10	12 - 30	3.3	1.3	4:1	24	500	1500	2.1
	LT3573	LT3575		750 310 562	< 10	EP10	18 - 30	12	0.5	2:1	25	500	1500	2.8
	LT3573	LT3575		750 310 563	< 10	EP10	18 - 30	12	0.4	2:1	25	500	1500	2.8
LT3574	LT3573	LT3575		750 310 564	< 10	EP10	12 - 30	± 5	1	3:1	63	600	1500	
			LT3748	750 311 486	< 10	EP13	12	± 200	0.002	1:10	100	4500	1500	2
			LT3748	750 811 048	< 10	EE16	100-400	30	0.3	4.387:1	1500	14000	IEC61558-2-17	0.65
			LT3748	750 311 889	< 10	EFD25	28	250	0.1	1:5	37	160	500	2.95
		LT3575		750 311 303	10 - 15	EP10	9 - 30	5	3	5:1	50	800	1500	2.25
LT3574		LT3575		750 311 304	10 - 15	EP10	9 - 30	5	3	4:1	50	850	1500	2.5
		LT3575		750 311 305	10 - 15	EP10	9 - 30	12	1	3:1	50	1200	1500	2.8
		LT3575		750 311 306	10 - 15	EP10	9 - 30	12	1	3:1	100	1750	1500	1.65
LT3574		LT3575		750 311 307	10 - 15	EP10	9 - 30	24	0.5	2:1	100	2000	1500	1.9
LT3574		LT3575		750 311 308	10 - 15	EP10	9 - 30	24	0.5	1:1	100	2100	1500	2.1
	LT3573	LT3575		750 311 675	10 - 15	EP10	9 - 30	5	2	3:1	25	130	1500	2.5
		LT3575	LT3748	750 311 567	10 - 15	EP10	10 - 40	5	3	2:1	7	800	1500	11.2
			LT3748	750 311 424	10 - 15	EP13	36	12	1	3:1	100	900	1500	2.4
			LT3748	750 311 456	10 - 15	EP13	36	12	1	3:1	100	900	2500	2.4
		LT3575	LT3748	750 311 458	10 - 15	EP13	36	3.3	4	3:1	36	175	2500	5
		LT3575	LT3748	750 311 564	10 - 15	EP13	10 - 40	5	3	3:1	9.07	120	1500	8
		LT3575	LT3748	750 311 624	10 - 15	EP13	10 - 40	15	1	1.5:1	9	180	1500	> 8
		LT3575		750 311 625	10 - 15	EP13	10 - 40	3.3	4	4:1	9	350	1500	> 8
		LT3575	LT3748	750 311 856	10 - 15	EP13	16 - 24	(4x) 15	(4x) 0.2	1:4:4:4	3.8	250	1000	>12
		LT3575		750 311 342	10 - 15	EFD20	36	5	3	2:1	15	650	1500	5.8
			LT3748	750 311 911	10 - 15	EE 20	16 - 24	(4x) 15	(4x) 0.2	1:3:3:3:3	6.8	100	1500	

*dependent on application transformer specification can differ slightly to datasheet

Reference to Linear Technology Specification				all possible OFF THE SHELF transformer*										
up to 3 W	up to 7 W	up to 14 W	external MOSFET	WE Order Code	Power (W)	Core	U _{in} (V)	U _{out} (V)	I _{out} (A)	Turns ratio N _p :N _s	L _{pri} (μH)	Leakage (nH)	Isolation (V)	I _{sat} (A)
			LT3575	750 311 422	15 - 25	EP13	36	5	4	5:1	50	600	1500	3.3
			LT3575	750 311 423	15 - 25	EP13	36	5	4	2:1	50	600	1500	3.85
			LT3575	750 311 439	15 - 25	EP13	37 - 57	12	2.1	2:1	37	750	1500	2.8
			LT3575	750 311 457	15 - 25	EP13	36	5	4	4:1	50	600	2500	3.7
			LT3575	750 311 688	15 - 25	EP13	36	5	4	5:1	50	600	1500	3.1
			LT3575	750 311 689	15 - 25	EP13	36	5	4	4:1	50	600	2500	3.7
				750 311 385	25 - 35	EP13	18 - 60	13	2.3	1.25:1	15	100	1500	6.75
				750 310 617	25 - 35	EFD20	9 - 36	12	3	1:1.16	4.5	150	1500	
				750 311 597	25 - 35	EFD20	20 - 48	5	6.0	3:1	6	300	1500	9.5
				750 311 598	25 - 35	EFD20	20 - 48	12	2.5	2:1	8.3	300	1500	9
			LT3748	750 311 599	25 - 35	EFD20	20 - 48	15	2	3:2	8	500	1500	12
			LT3748	750 311 600	25 - 35	EFD20	30 - 75	15	2	2:1	12	500	1500	11
			LT3748	750 311 604	25 - 35	EFD20	20 - 48	24	1.3	1:1	8	300	1500	9.5
				750 311 605	25 - 35	EFD20	30 - 75	5	6	7:2	15	500	1500	9.5
			LT3748	750 311 607	25 - 35	EFD20	30 - 75	12	2.5	5:2	14	500	1500	9.5
			LT3748	750 311 608	25 - 35	EFD20	30 - 75	24	1.3	3:2	12	500	1500	9
			LT3748	750 311 797	35 - 45	EFD20	18 - 100	12	2.5	2.5:1	14	210	4000	11.5
				750 311 589	35 - 45	EFD25	20 - 48	5	9	3:1	6	200	1500	18
			LT3748	750 311 590	35 - 45	EFD25	20 - 48	12	3.8	2:1	8	200	1500	18
			LT3748	750 311 591	35 - 45	EFD25	20 - 48	15	3	3:2	8	200	1500	20
			LT3748	750 311 592	35 - 45	EFD25	20 - 48	24	1.9	1:1	8	200	1500	18
				750 311 593	35 - 45	EFD25	30 - 75	5	9	7:2	15	300	1500	18
			LT3748	750 311 594	35 - 45	EFD25	30 - 75	12	3.8	5:2	15	400	1500	18
			LT3748	750 311 595	35 - 45	EFD25	30 - 75	15	3	2:1	12	200	1500	16
			LT3748	750 311 596	35 - 45	EFD25	30 - 75	24	1.9	3:2	12	200	1500	18
				750 311 771	35 - 45	EFD25	100 - 400	15	3	6:1	500	5000	2500	2.5
				750 310 988	35 - 45	EFD25	12	48	0.85	1:4.42	14	200	1500	> 15
			LT3748	750 311 783	> 45 W	EFD25	19 - 70	24	2.5	1.5:1	20	170	1500	16

*dependent on application transformer specification can differ slightly to datasheet

All transformers can be used for all listed ICs under certain conditions. Please review 8 Design Tips on page 02.