Innovation in power conversion

Solid-State Lighting Solutions
AC-DC LED Driver ICs

September 2011

About Power Integrations' Solid-State Lighting Solutions

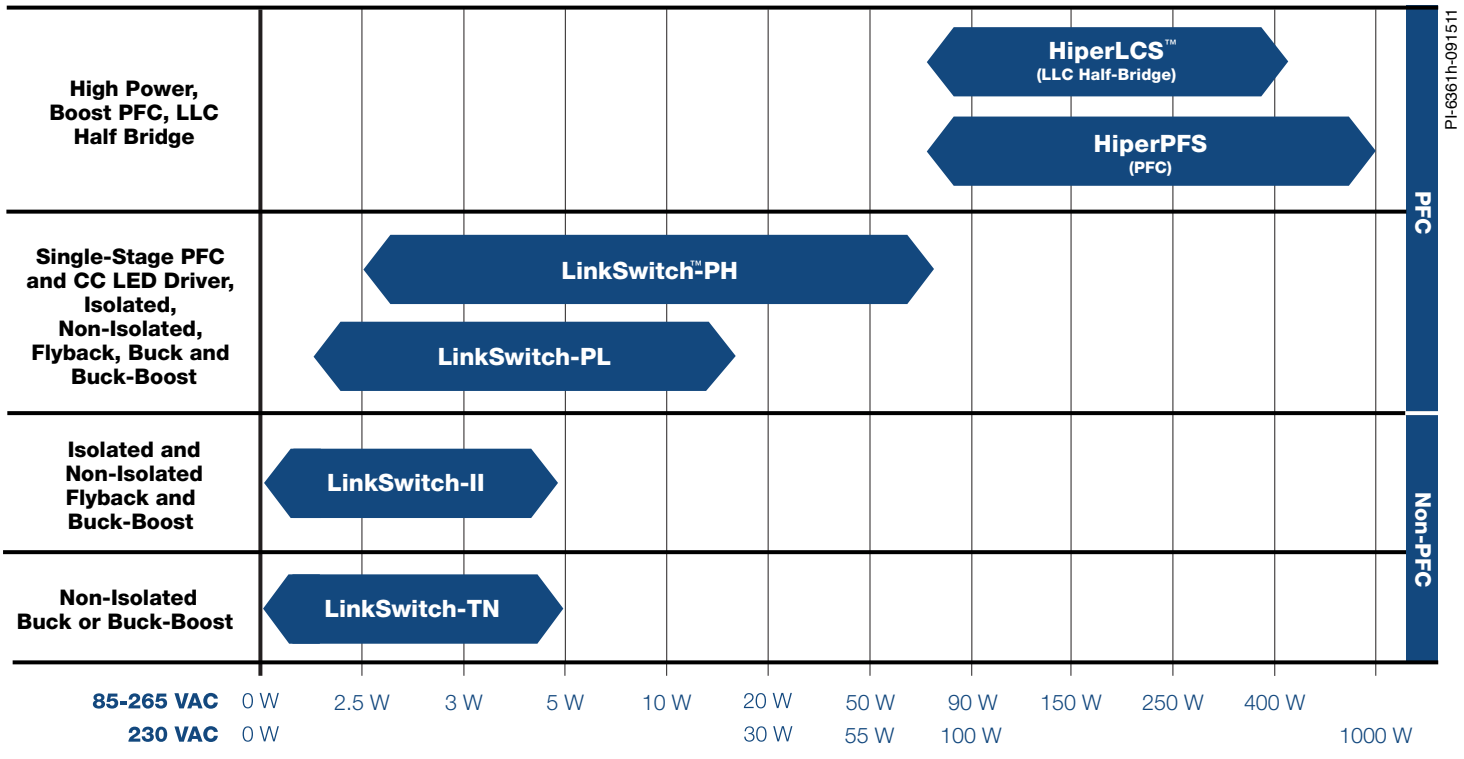
Power Integrations is the leading supplier of high-voltage analog integrated circuits used in energy-efficient power supplies. The company's innovative technology enables compact, energy-efficient power converters for a wide range of electronic products, LED lighting, AC-DC and DC-DC applications. With industry-leading product quality and delivery, the company has shipped billions of devices to customers around the world.

Power Integrations offers a broad range of highly integrated, high-power, constant current LED driver ICs for use in solid-state lighting LED applications where offline power supplies are required. Topologies include buck, buck-boost, resonant, and flyback.

– High efficiency single-stage conversion
– Long life time – no electrolytic bulk capacitors in the power train
– Phase-controlled TRIAC dimmability
– Single-stage power factor correction (PFC) plus accurate constant current (CC) output
– Small size
– Resistance to shock and vibration
– Highly integrated
– Design-in made easy with PI Expert™ design tools

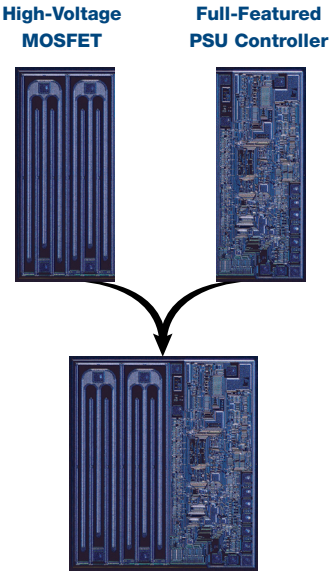
For more detailed information about Power Integrations' LED driver ICs, please visit our Solid-State Lighting microsite at http://www.powerint.com/led-drivers.

AC-DC Product Overview



Enabling Predictable Success

Power Integrations' highly integrated ICs enable the design and production of switch-mode power supplies that use up to 70% fewer components compared to discrete solutions. Switchers that incorporate our ICs are smaller, lighter, and more portable than comparable power supplies.

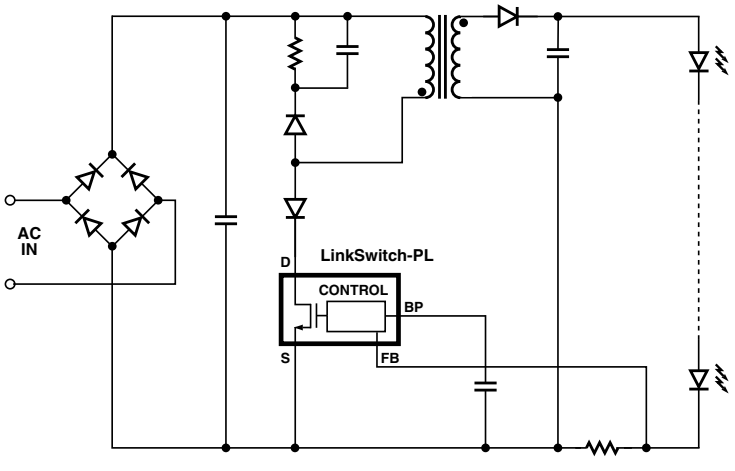


We combine a high-voltage power MOSFET switch with a controller on a single chip to provide key power supply functions, such as:

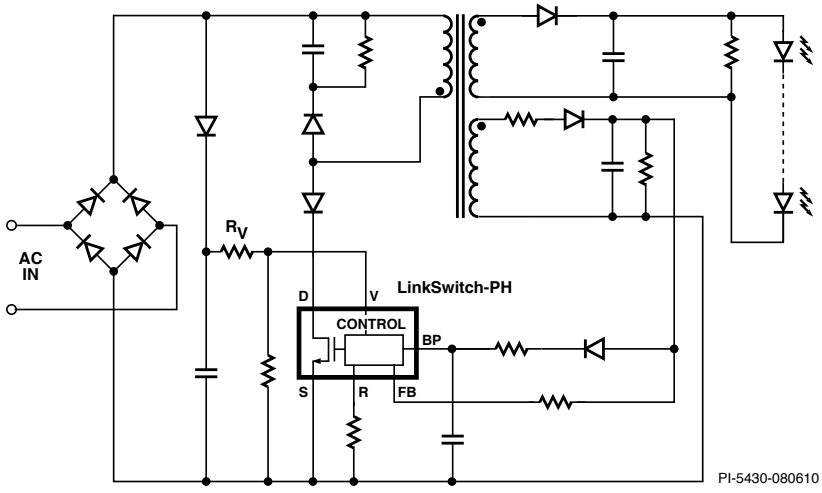
- High-voltage start-up
- Short-circuit and open-loop protection
- Programmable current limit
- Line undervoltage and overvoltage protection
- Output overvoltage protection
- Accurate over-temperature and over-power protection
- Soft-start
- Feedback compensation
- Remote ON/OFF

Reducing Component Count

LinkSwitch-PL and LinkSwitch-PH dramatically simplify isolated flyback LED driver designs by eliminating an optocoupler and secondary control circuitry. The devices introduce a revolutionary control technique to provide very tight output regulation, compensating for transformer and internal parameter tolerances, along with input voltage variations.



PI-5835-060710



PI-5430-080610

Design Tools

The Green Room

Power Integrations' Green Room web site (www.powerint.com/greenroom) offers the latest information in energy-efficient design, including:

– Energy-efficiency regulations: Search by application, regulatory agency or geographic location
– Mr. Green's blog: An informative blog about energy-efficiency standards and other green matters
– Energy FAQs: Answers to frequently asked questions about energy efficiency
– Energy-efficiency resources: Links to other helpful web sites addressing energy issues
– Introduction to green power: Tips for minimizing standby waste

PI Expert™ Design Software

This powerful, interactive software takes a designer's power supply specifications and automatically determines the critical components (including transformer specifications) needed to generate a working switch-mode power supply. Designs can be optimized for efficiency or cost using auto-design or manual control options. PI Expert simplifies the design of LED drivers, offline power supplies, and DC-DC converters, reducing design time from days to minutes.

To download PI Expert or request a CD, go to www.powerint.com/designsoftware.htm

Reference Designs

Reference Design Kits (RDKs) provide all of the essential materials needed to demonstrate the advanced features of Power Integrations' ICs. Kits include a fully assembled and tested reference design power supply board, engineering report, product samples, unpopulated PCB, data sheet and other related documentation.

For more information, go to www.powerint.com/dak.htm

PI Forums

Power Integrations provides several forums where designers can discuss technical questions with PI engineers and the extensive Power Integrations' design community:

– Power Supply Design Forum: For general technical questions
– PI Expert Support Forum: For discussing PI Expert Design Software
– Green Energy Forum: For discussing energy efficiency regulations, EcoSmart technology and improving the energy efficiency of electronic products

To participate in PI Forums, go to www.powerint.com/forum

Total Product Support

– Application notes
– Data sheets
– Design example reports
– Design ideas
– Engineering prototype reports
– PI Expert design software
– Reference design kits

Design Example Report (DER)

Design Example Reports contain a power supply design specification, schematic, bill of materials, transformer documentation, and PCB layout. This design has been built and bench-tested to provide performance data and typical operation characteristics.

LED Driver Reference Designs

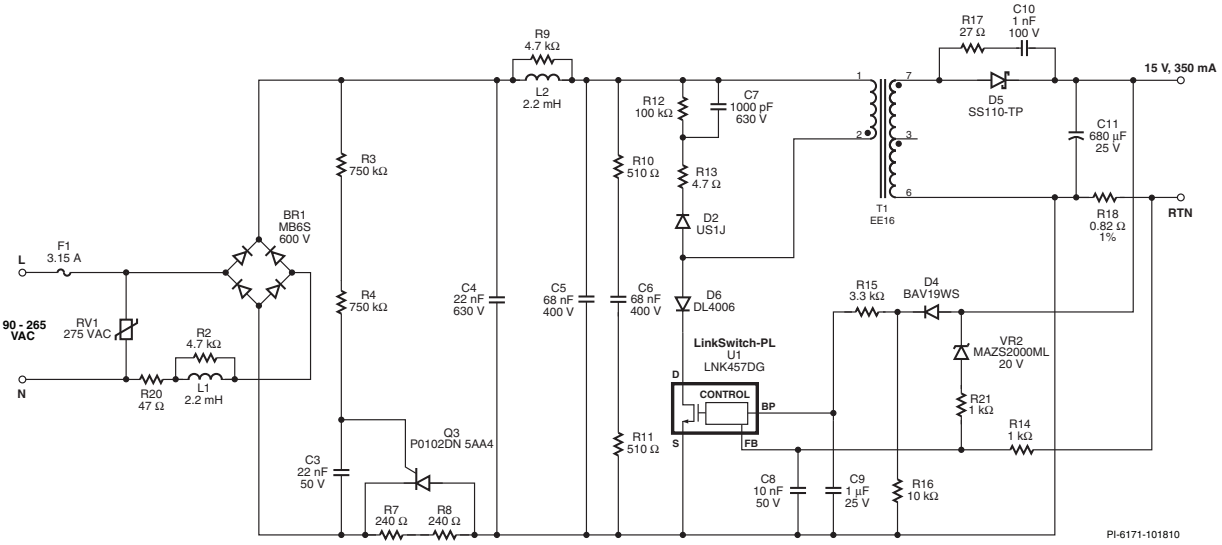
Product Family	AC Input Voltage (V)	Output Power (W)	Output Current (A)	TRIAC Dimming	Power Factor	Efficiency (%)	Topology	Document	RDK	Page Number
LinkSwitch-PL	90-265	5	0.35	✓	>0.90	78	Flyback	RDR-251	RDK-251	6
LinkSwitch-PH	185-264	6	0.26	✓	>0.90	78	Flyback	DER-269		6
LinkSwitch-PH	90-265	7	0.33	✓	>0.97	82	Flyback	RDR-193	RDK-193	7
LinkSwitch-PH	90-265	7	0.38	✓	>0.90	85	Flyback	DER-277		7
LinkSwitch-PH	198-265	8	0.38	✓	>0.86	74	Flyback	DER-264		8
LinkSwitch-PH	90-265	14	0.5	✓	>0.98	87	Flyback	RDR-195	RDK-195	8
LinkSwtich-PH	180-265	14	0.5	*	>0.97	85.5	Flyback	DER-263		9
LinkSwitch-PH	180-265	15	0.5	✓	>0.90	84	Flyback	DER-281		10
LinkSwitch-PL	85-265	1.2	0.366		>0.90	50	Flyback	RDR-268	RDK-268	11
LinkSwitch-PL	85-135	4.55	0.13		>0.95	85	Buck-Boost	RDR-271	RDK-271	11
LinkSwitch-PH	90-265	12	0.33		>0.99	88	Buck	RDR-257	RDK-257	12
LinkSwitch-PH	90-265	12	0.33		>0.97	85	Buck-Boost	DER-273		12
LinkSwitch-PH	90-265	15	0.3		>0.96	87	Flyback	DER-256		13
LinkSwitch-PH	90-265	15	0.5		>0.90	90.7	Flyback	DER-278		13
LinkSwitch-PH	90-265	15	0.5		>0.90	91.7	Flyback	DER-284		14
LinkSwitch-PH	90-265	15	0.5		>0.90	85	Flyback	DER-288		14
LinkSwitch-PH	90-265	15	0.5		>0.90	94	Flyback	DER-289		15
LinkSwitch-PH	180-265	25	0.25		>0.90	91.35	Buck-Boost	DER-287		16
LinkSwitch-PH	180-265	25	0.35		>0.90	90.55	Buck-Boost	DER-285		16
LinkSwitch-PH	90-308	30	1		>0.90	91	Flyback	DER-286		17
LinkSwitch-PH	180-300	75	2.1		>0.95	92	Flyback	RDR-290	RDK-290	18
LinkSwitch-PH	184-277	150	4.2		>0.95	92	Flyback	DER-291		19
HiperLCS	100-265	150	48		>0.90	93	LLC+Boost PFC	RDR-292	RDK-292	20
LinkSwitch-TN	85-265	0.5	0.04			70	Buck-Boost	DER-92, DI-92		23
LinkSwitch-TN	85-265	1.25	0.1			60	Buck-Boost	DI-74		23
LinkSwitch-TN	85-265	3	0.3			62	Buck	RDR-131, DI-131	RDK-131	24
LinkSwitch-II	90-265	3.6	0.3			75	Flyback	DER-261		24
LinkSwitch-II	90-265	3.6	0.35			75	Flyback	DI-206		25
LinkSwitch-II	85-265	4.2	0.35			82	Tapped Buck	DER-186, DI-186		25
LinkSwitch-II	85-265	4.2	0.35			75	Flyback	DER-185, DI-185		26
LinkSwitch-II	85-265	5.32	0.7			72	Flyback	DER-184, DI-184		26
LinkSwitch-II	85-265	8.4	0.7			80.1	Flyback	DER-215		27
LinkSwitch-TN	108-132	9	0.13		>0.90	85	Buck-Boost	DI-171		27
LinkSwitch-TN	90-132	9.1	0.13			92	Buck	DER-172, DI-172		28
LinkSwitch-TN	85-265	11	0.02			91	Boost	DI-210		28
TinySwitch-III	195-265	14	0.7			85	Flyback	DER-173, DI-173		29
TinySwitch-III	185-265	18	1.8	✓		84	Flyback	DI-130		21
TOPSwitch-GX	85-277	20	1.67		>0.95	80	Flyback	DER-168, DI-168		21
TOPSwitch-GX	208-277	75	3.1		>0.90	85	Flyback	DER-136, DI-136		22

*Analog dimming

TRIAC Dimmable, High Power Factor Design Examples

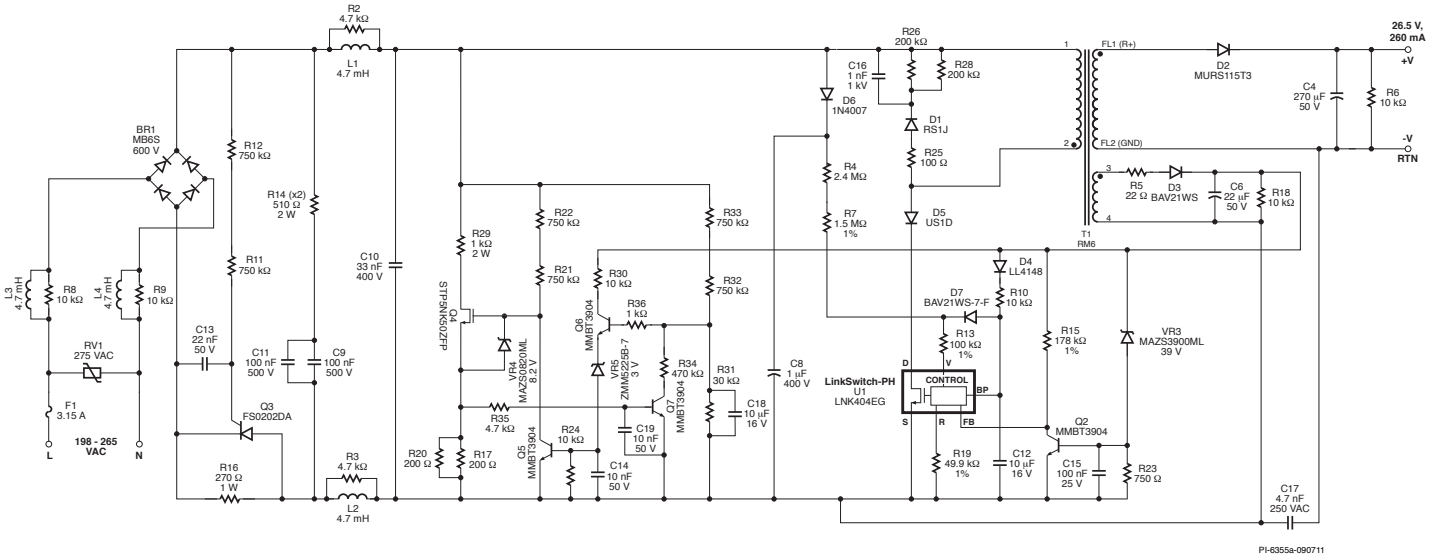
LinkSwitch-PL – Non-Isolated TRIAC Dimmable, Power Factor Corrected LED Driver (RDK-251)

5 W, 15 V, 350 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



LinkSwitch-PH – Isolated TRIAC Dimmable, Power Factor Corrected, LED Driver with Smart Active Load for Wide Dimming Range with High Power Dimmers (DER-269)

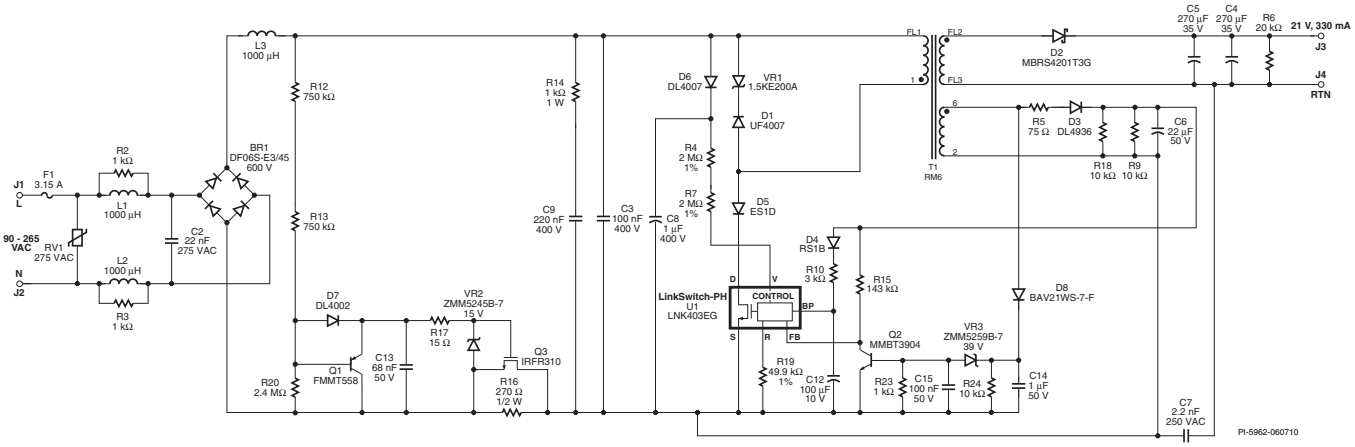
6 W, 26.5 V, 260 mA OUTPUT, 185 – 264 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



TRIAC Dimmable, High Power Factor Design Examples

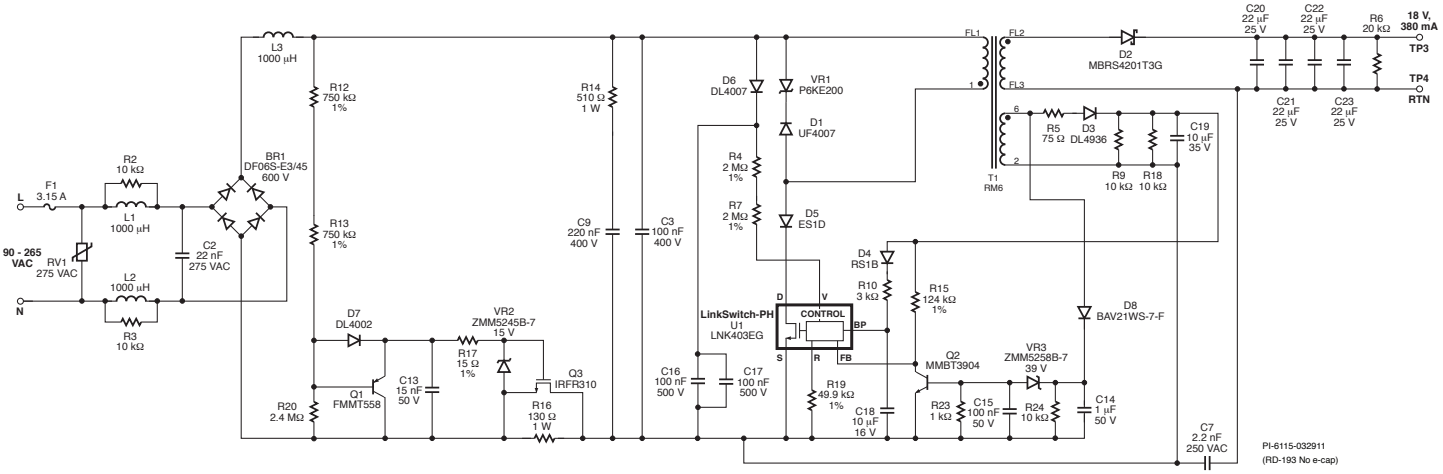
LinkSwitch-PH – High Efficiency, High Power Factor, TRIAC Dimmable LED Driver (RDK-193)

7 W, 21 V, 330 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



LinkSwitch-PH – High Efficiency, High Power Factor, TRIAC Dimmable LED Driver (DER-277)

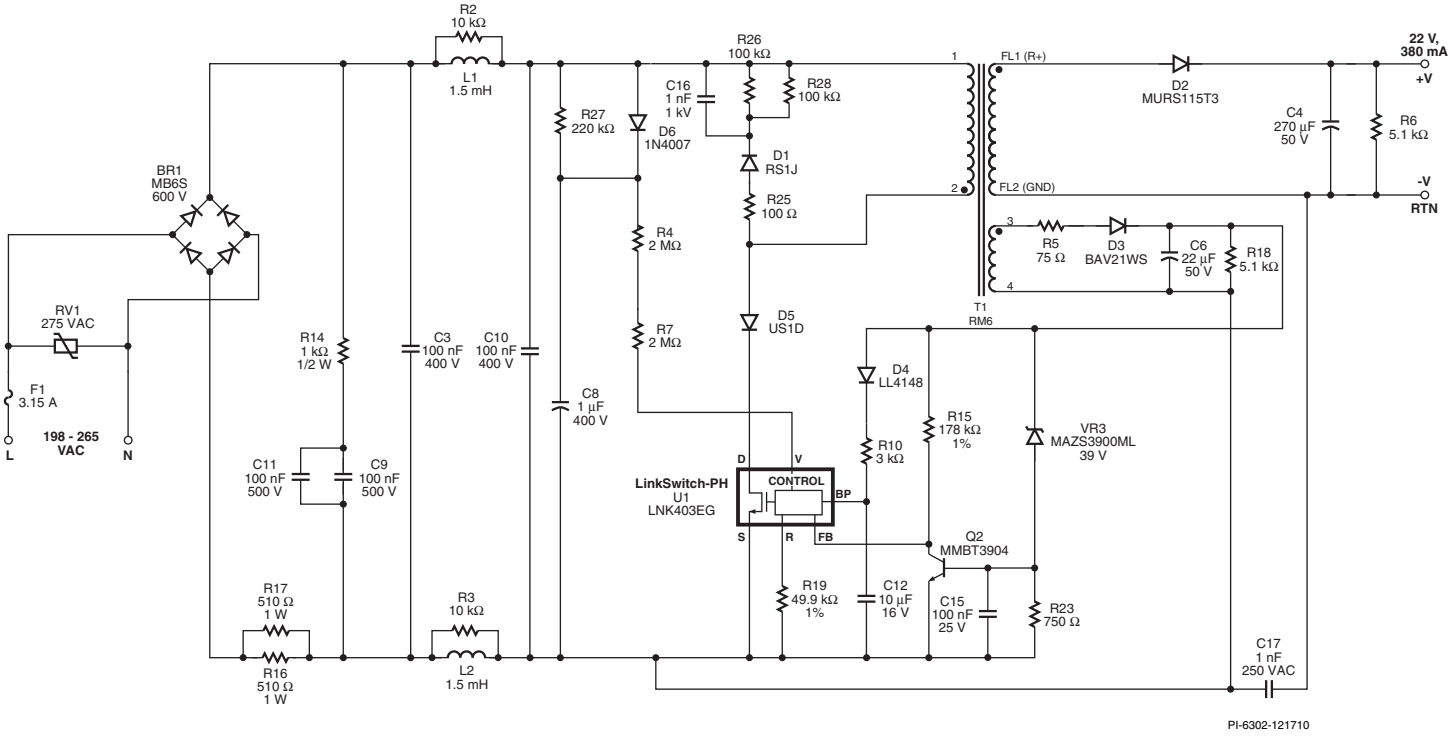
7 W, 18 V, 380 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



TRIAC Dimmable, High Power Factor Design Examples

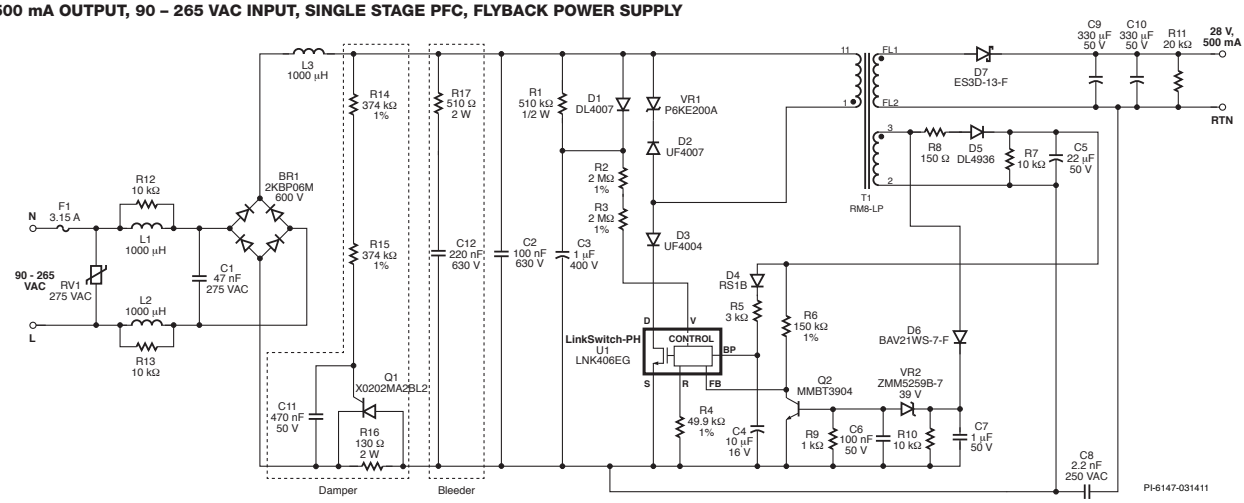
LinkSwitch-PH – High Efficiency, High Power Factor, High Power TRIAC Dimmable LED Driver (DER-264)

8 W, 22 V, 380 mA OUTPUT, 198 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



LinkSwitch-PH – High Efficiency, High Power Factor, TRIAC Dimmable LED Driver (RDK-195)

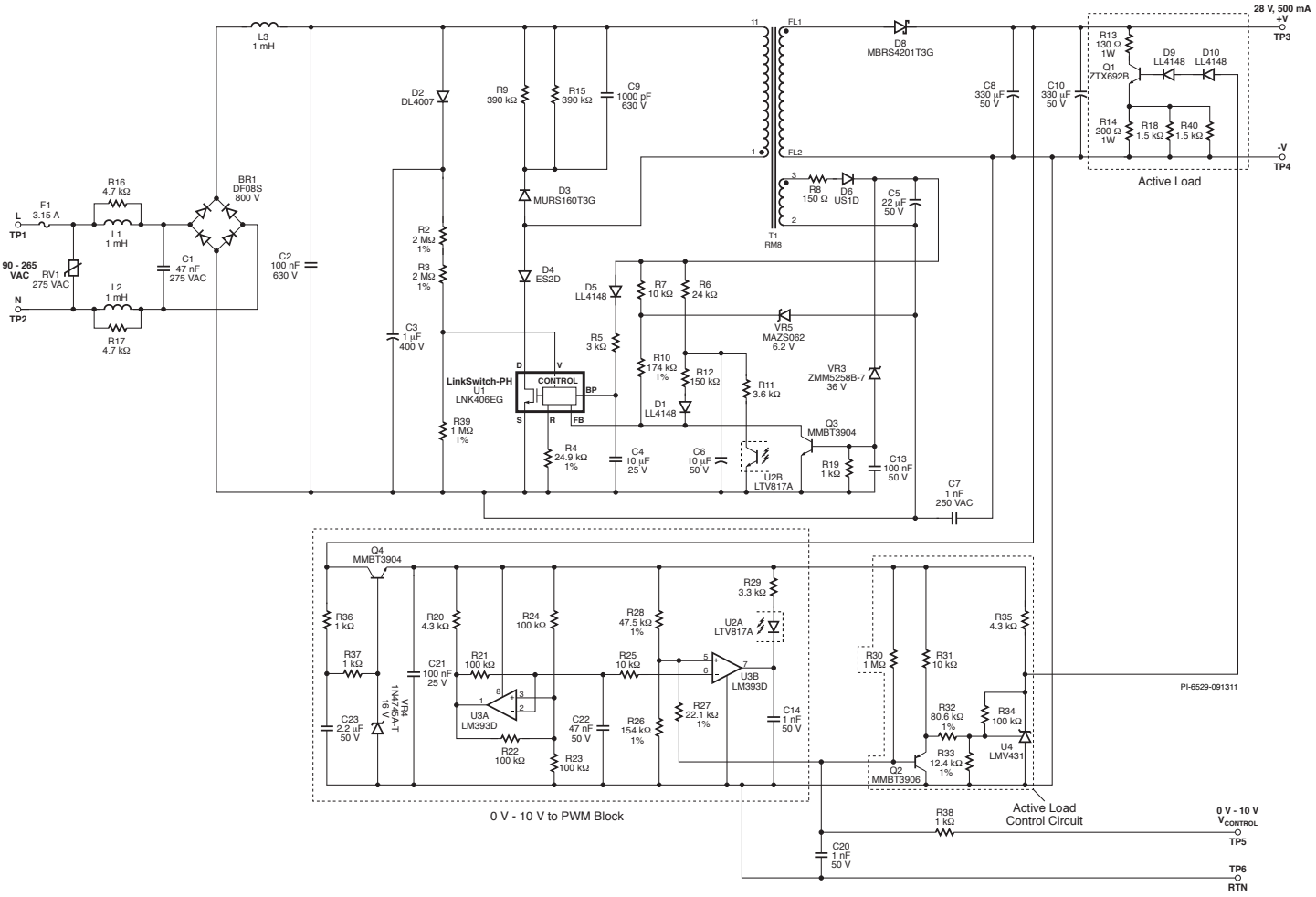
14 W, 28 V, 500 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY

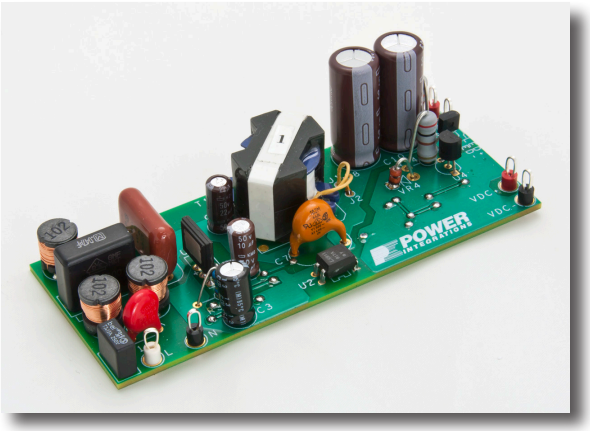


TRIAC Dimmable, High Power Factor Design Examples

LinkSwitch-PH – High Efficiency, High Power Factor, PWM Dimming LED Driver (DER-263)

14 W, 28 V, 500 mA OUTPUT, 180 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY

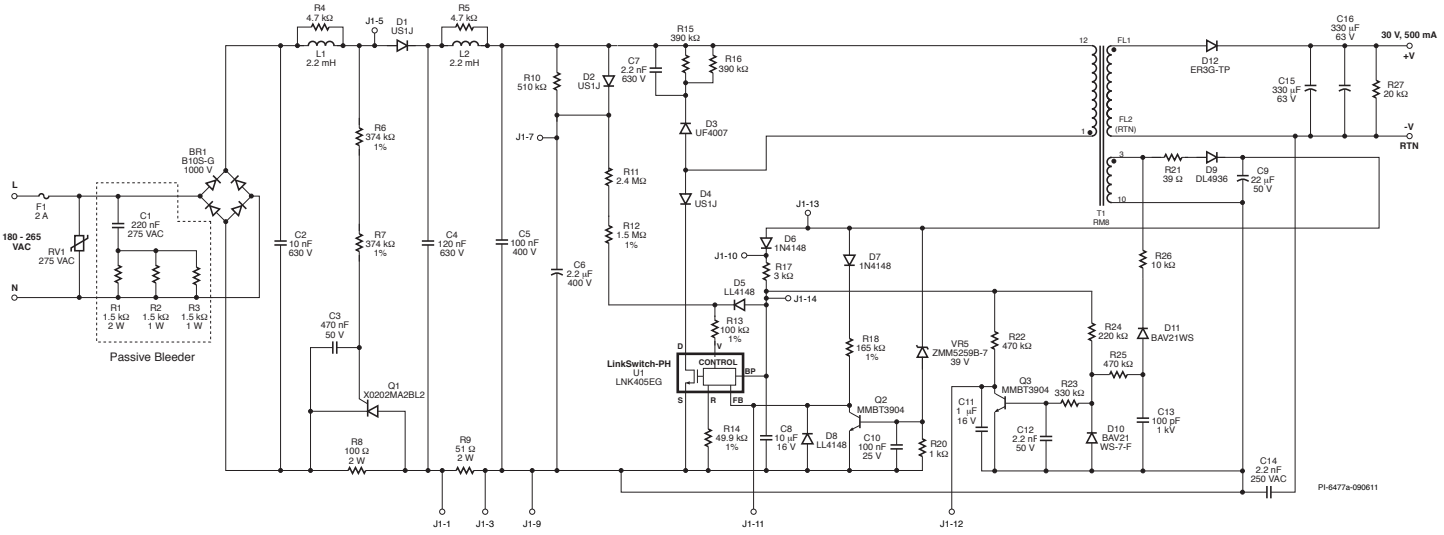


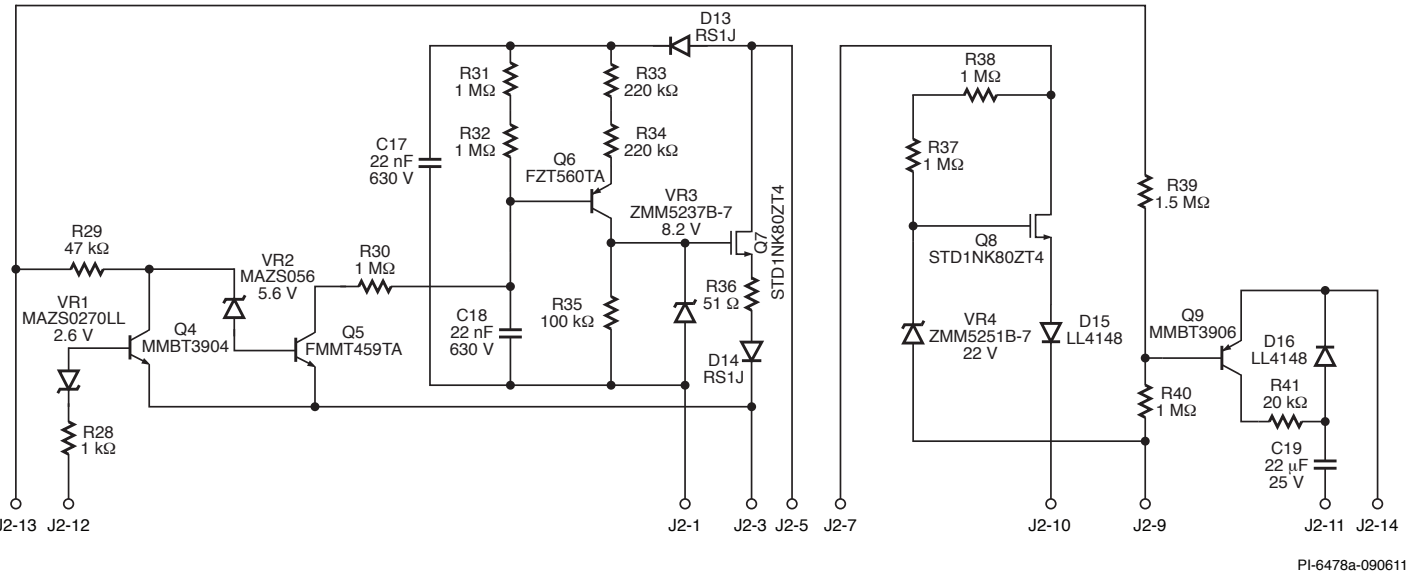


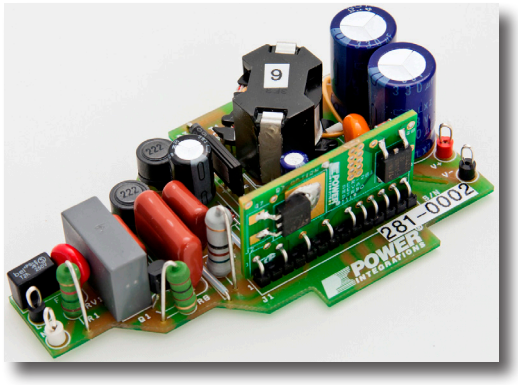
TRIAC Dimmable, High Power Factor Design Examples

LinkSwitch-PH – High Efficiency, High Power Factor, Wide TRIAC Compatibility Dimmable LED Driver (DER-281)

15 W, 30 V, 500 mA OUTPUT, 180 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY

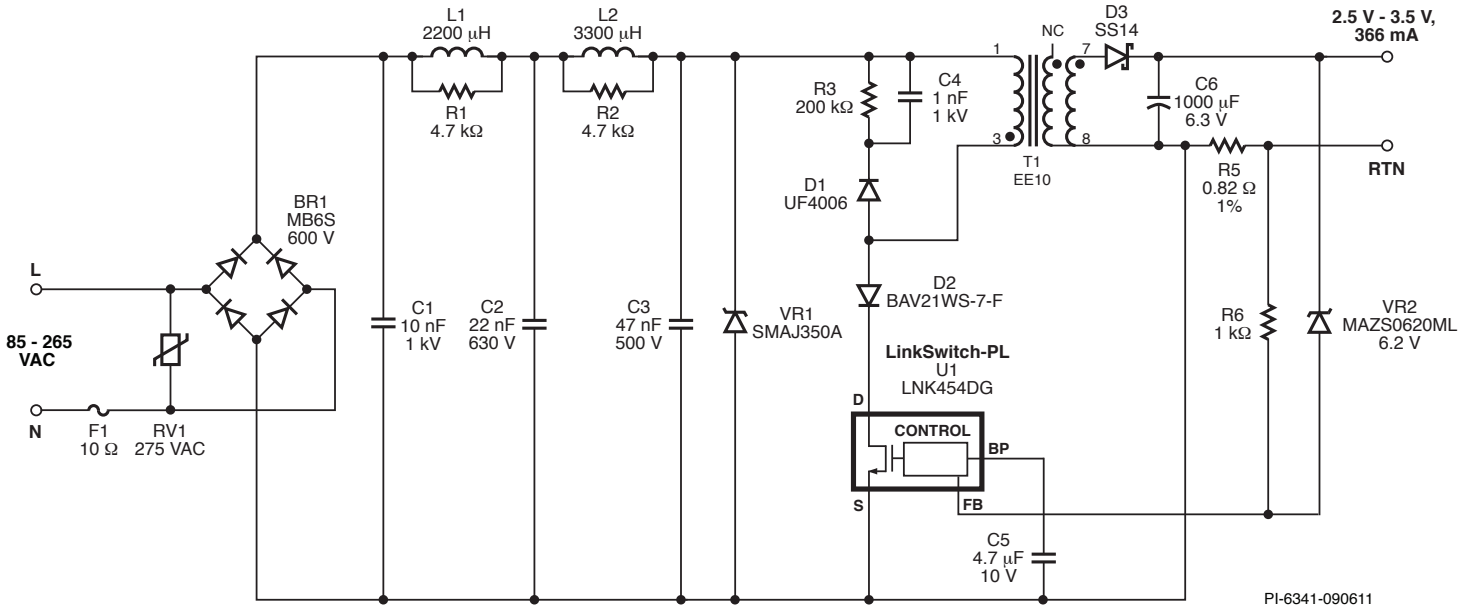


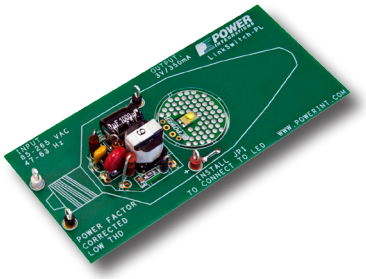




LinkSwitch-PL – High Efficiency, High Power Factor, LED Driver (RDK-268)

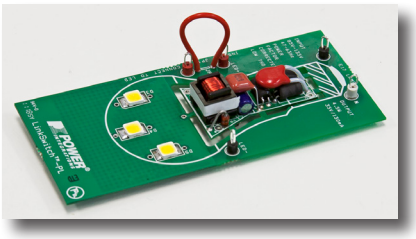
1.2 W, 2.5 V – 3.5 V, 366 mA OUTPUT, 85 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY

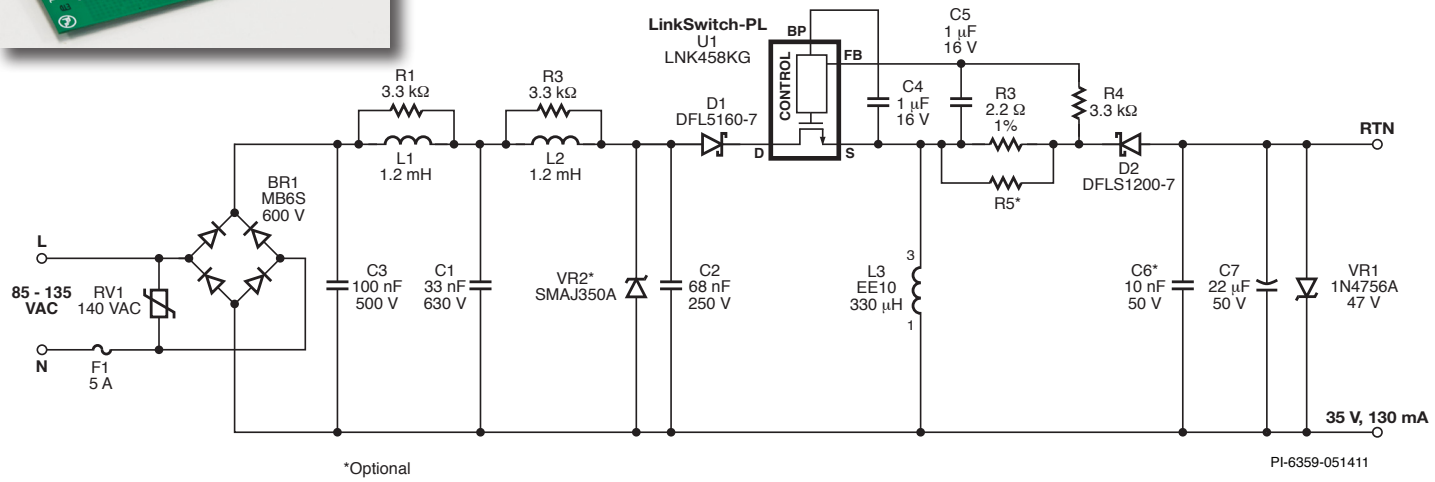




LinkSwitch-PL – High Efficiency, High Power Factor, LED Driver (RDK-271)

4.5 W, 35 V, 130 mA OUTPUT, 85 – 135 VAC INPUT, SINGLE STAGE PFC, BUCK-BOOST POWER SUPPLY

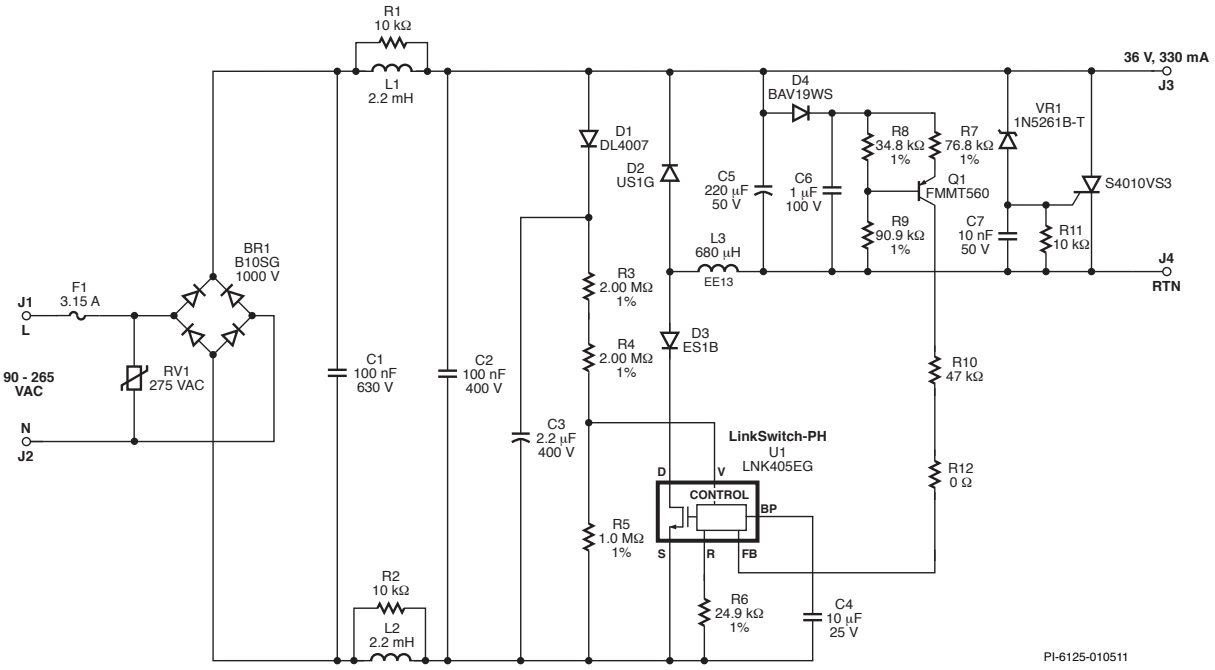




High Power Factor Design Examples

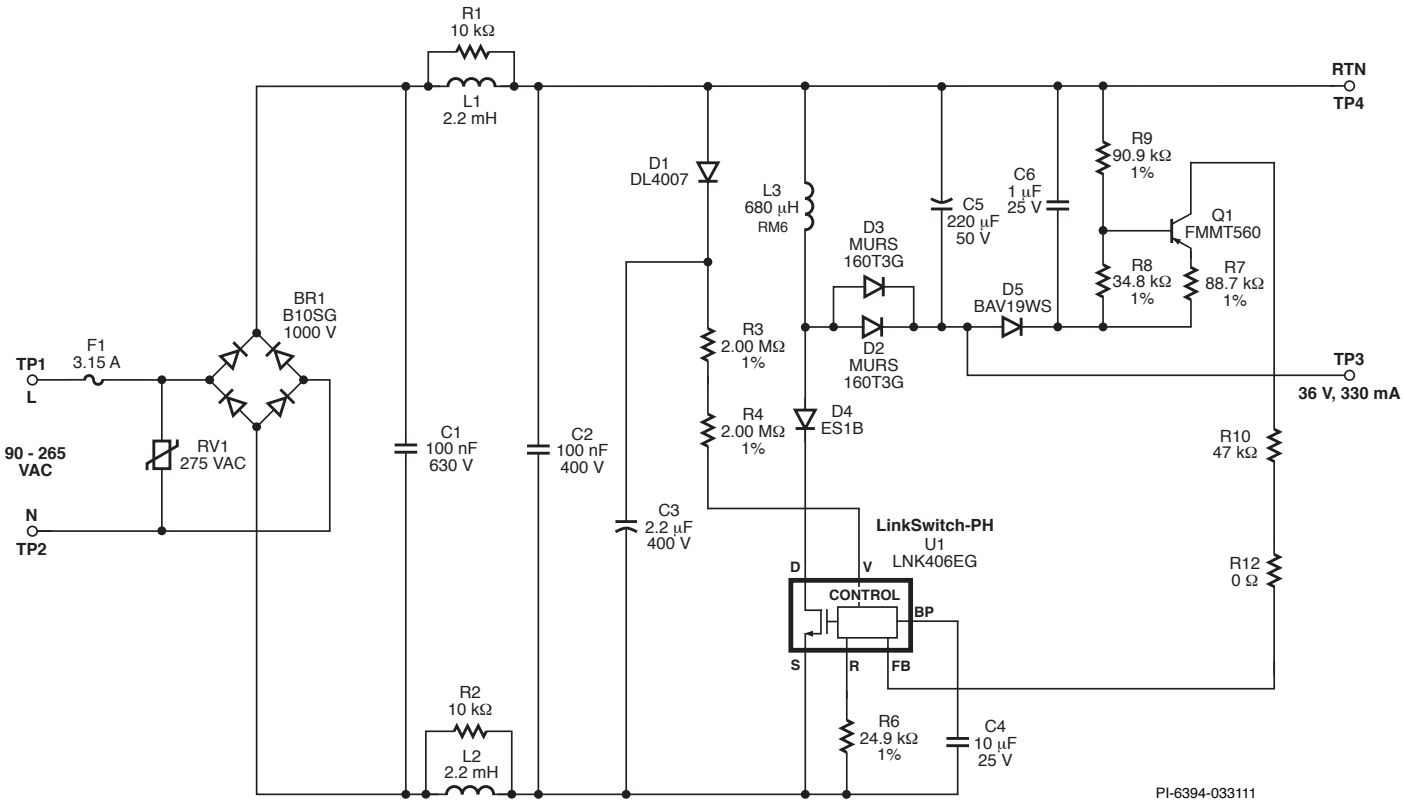
LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (RDK-257)

12 W, 36 V, 330 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, BUCK CONVERTER POWER SUPPLY



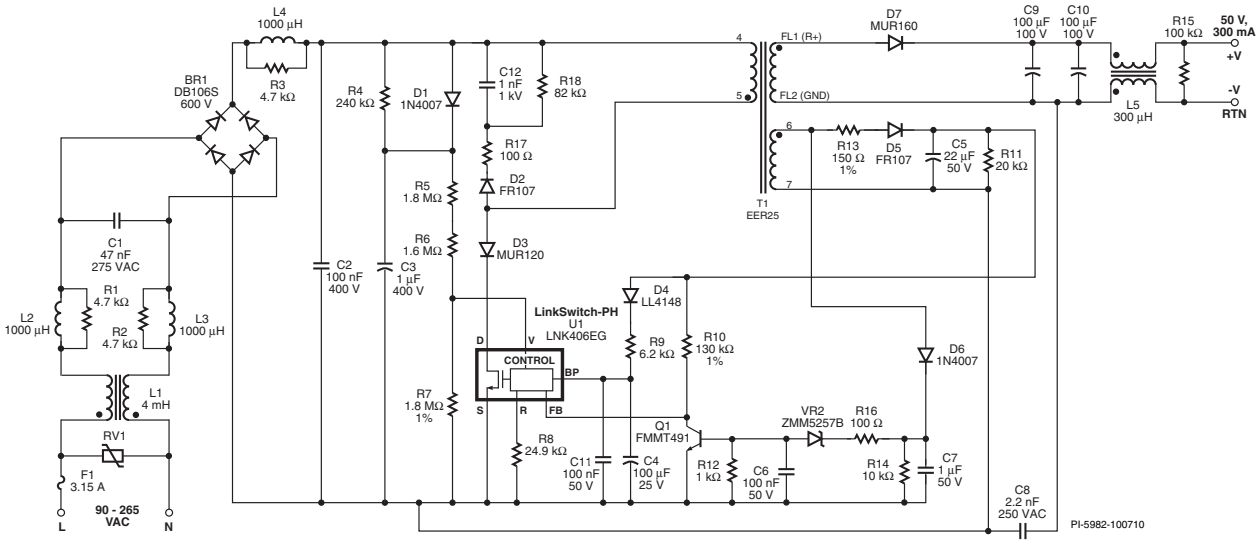
LinkSwitch-PH – Power Factor Corrected, LED Driver (DER-273)

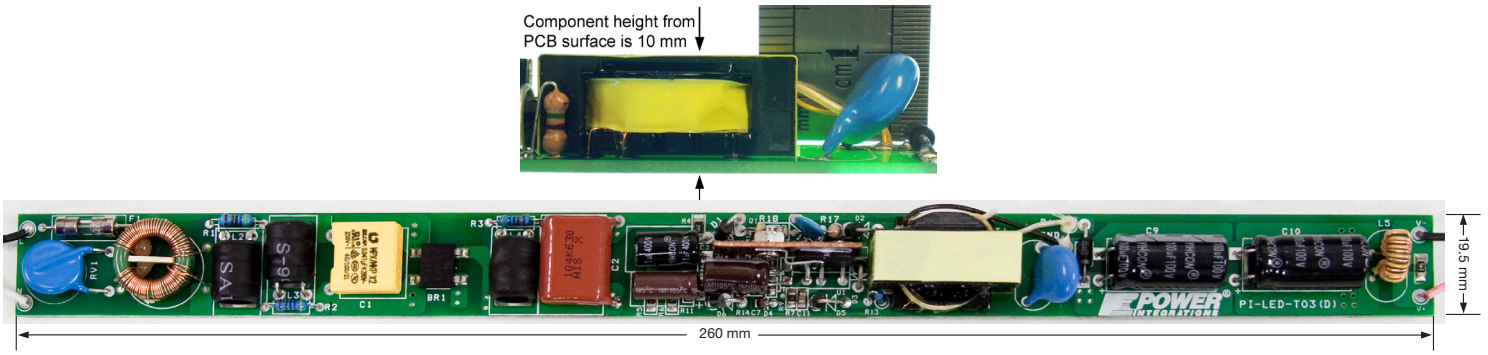
12 W, 36 V, 330 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, BUCK-BOOST CONVERTER POWER SUPPLY



LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-256)

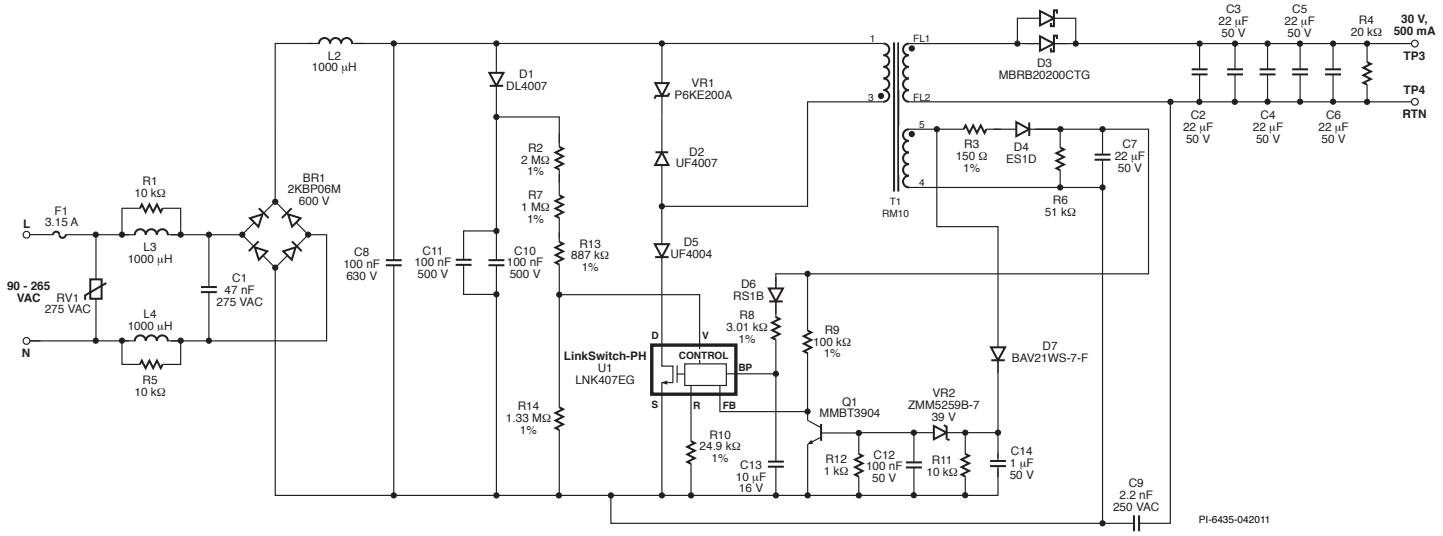
15 W, 50 V, 300 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY





LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-278)

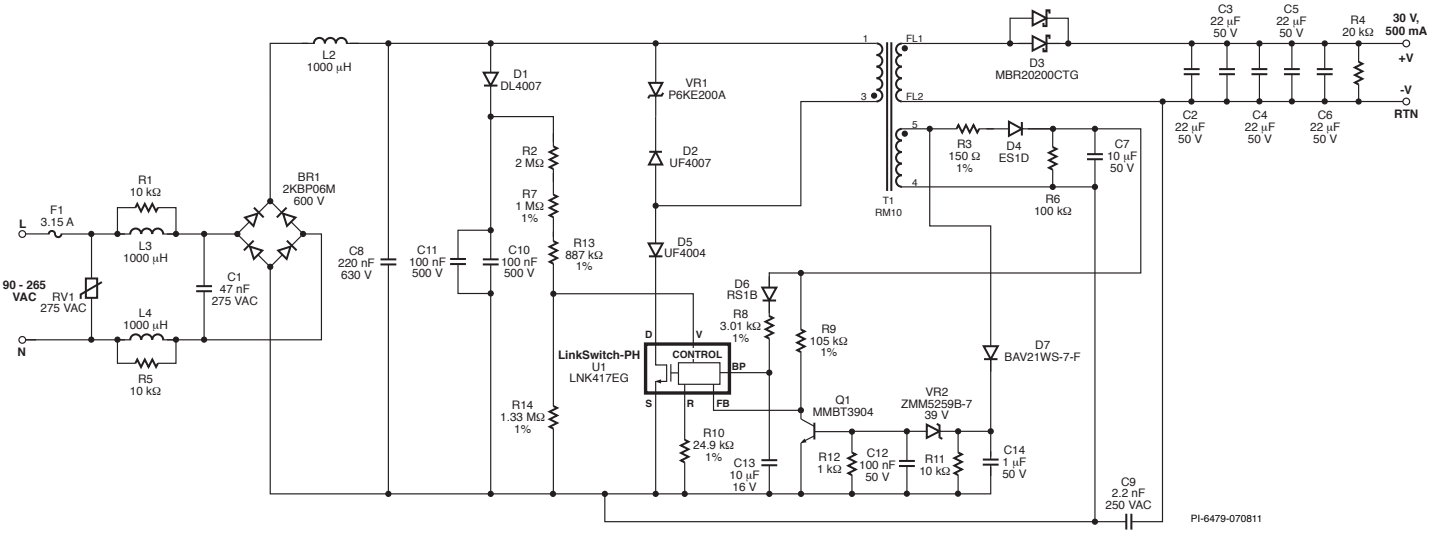
15 W, 30 V, 500 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



High Power Factor Design Examples

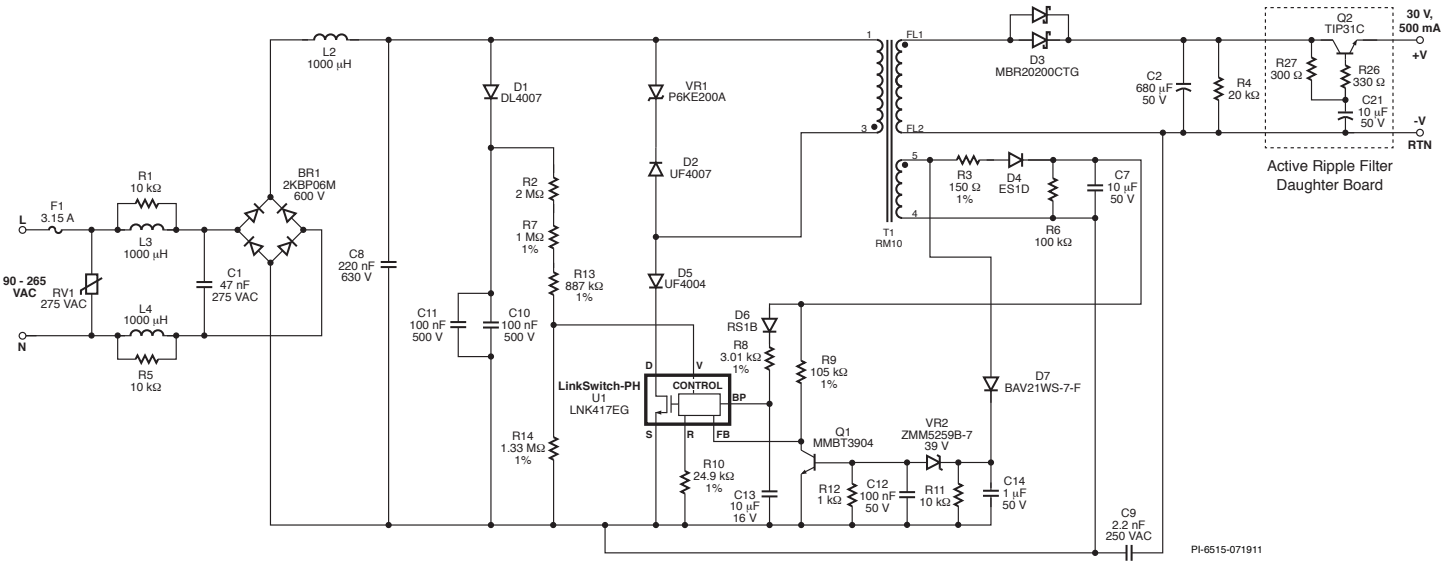
LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-284)

15 W, 30 V, 500 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



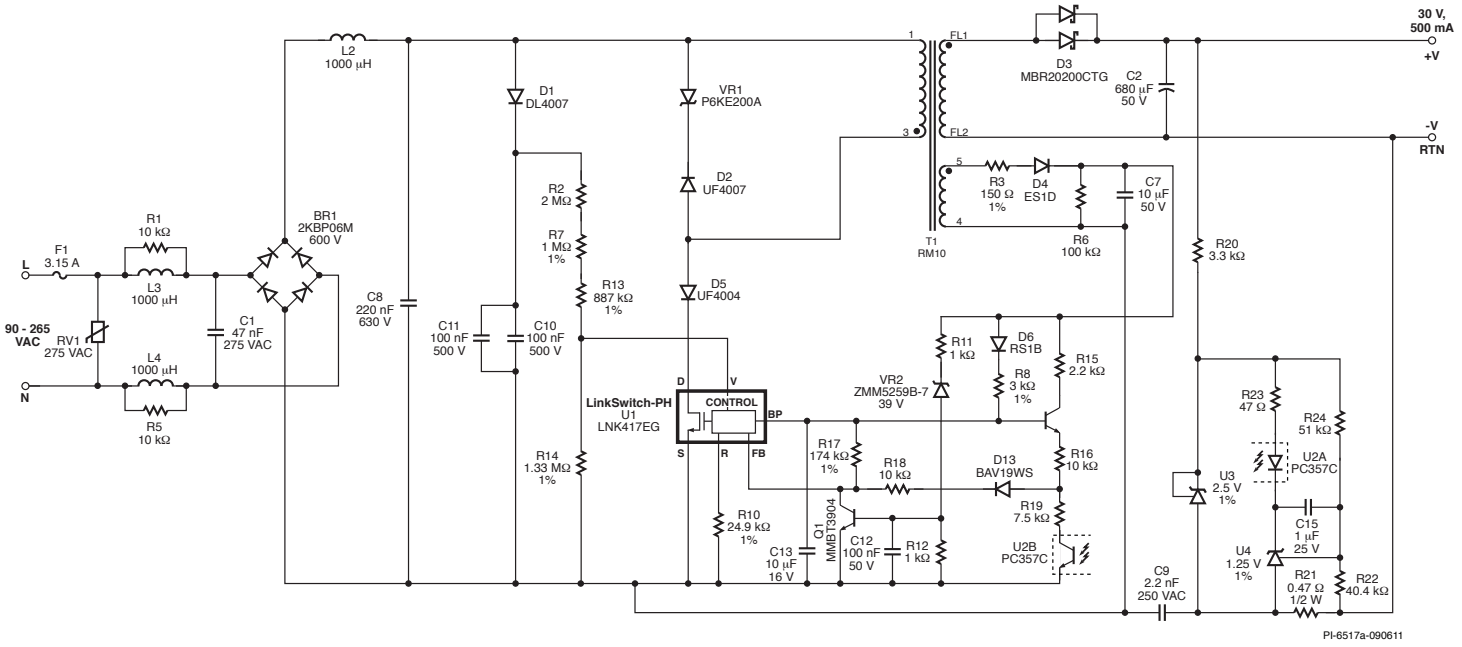
LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-288)

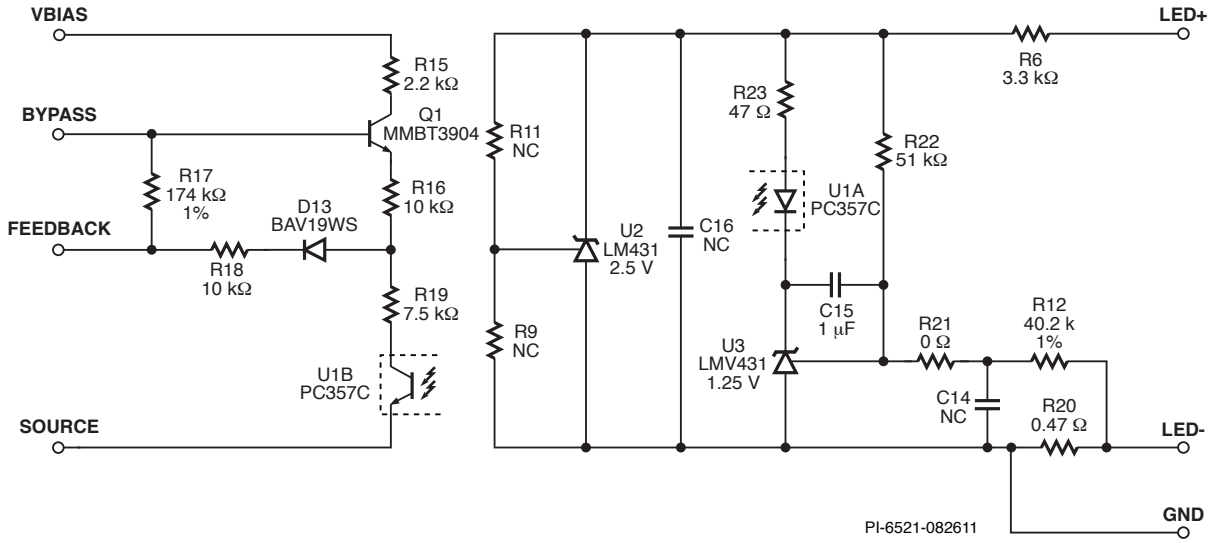
15 W, 30 V, 500 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-289)

15 W, 30 V, 500 mA OUTPUT, 90 – 265 VAC INPUT, FLYBACK POWER SUPPLY

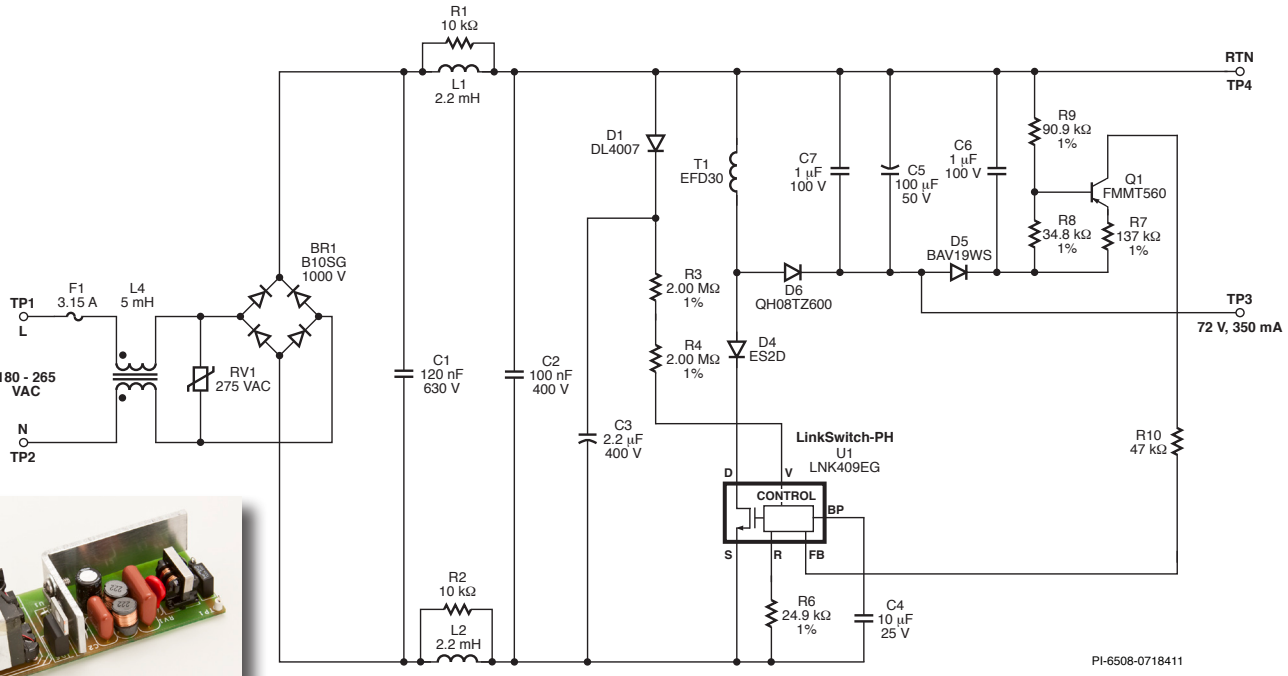




High Power Factor Design Examples

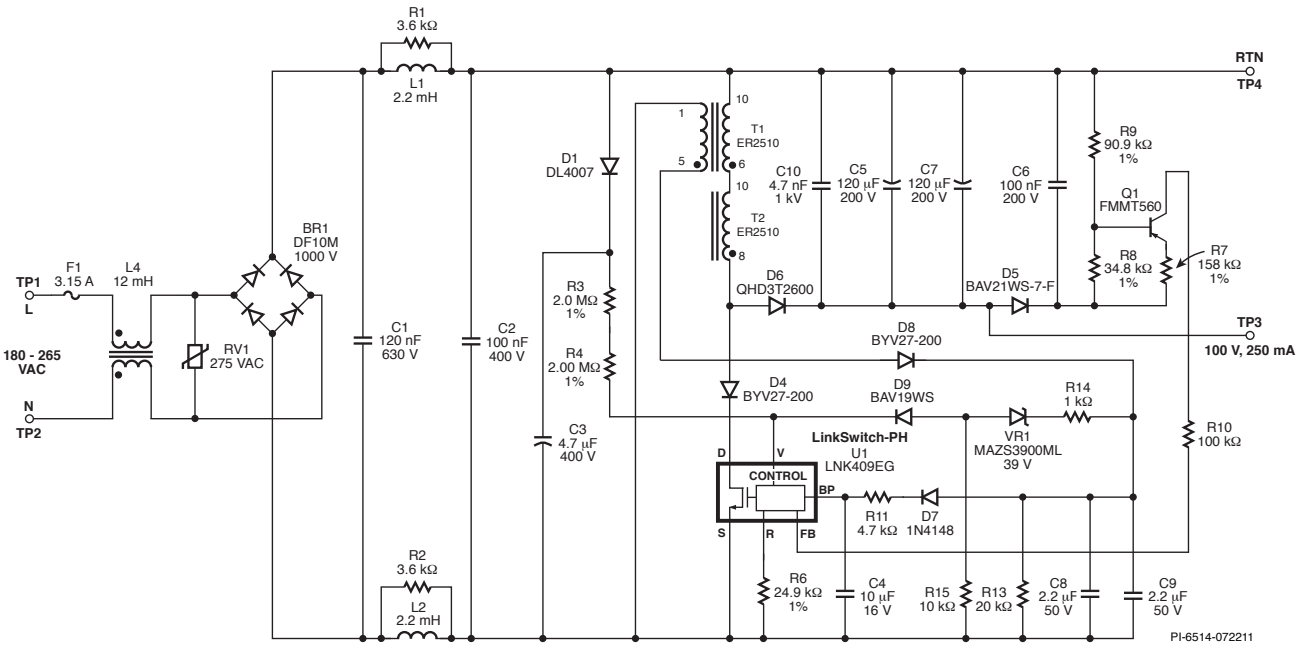
LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-285)

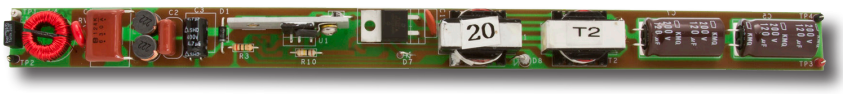
25 W, 72 V, 350 mA OUTPUT, 180 – 265 VAC INPUT, SINGLE STAGE PFC, NON-ISOLATED, BUCK-BOOST POWER SUPPLY



LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-287)

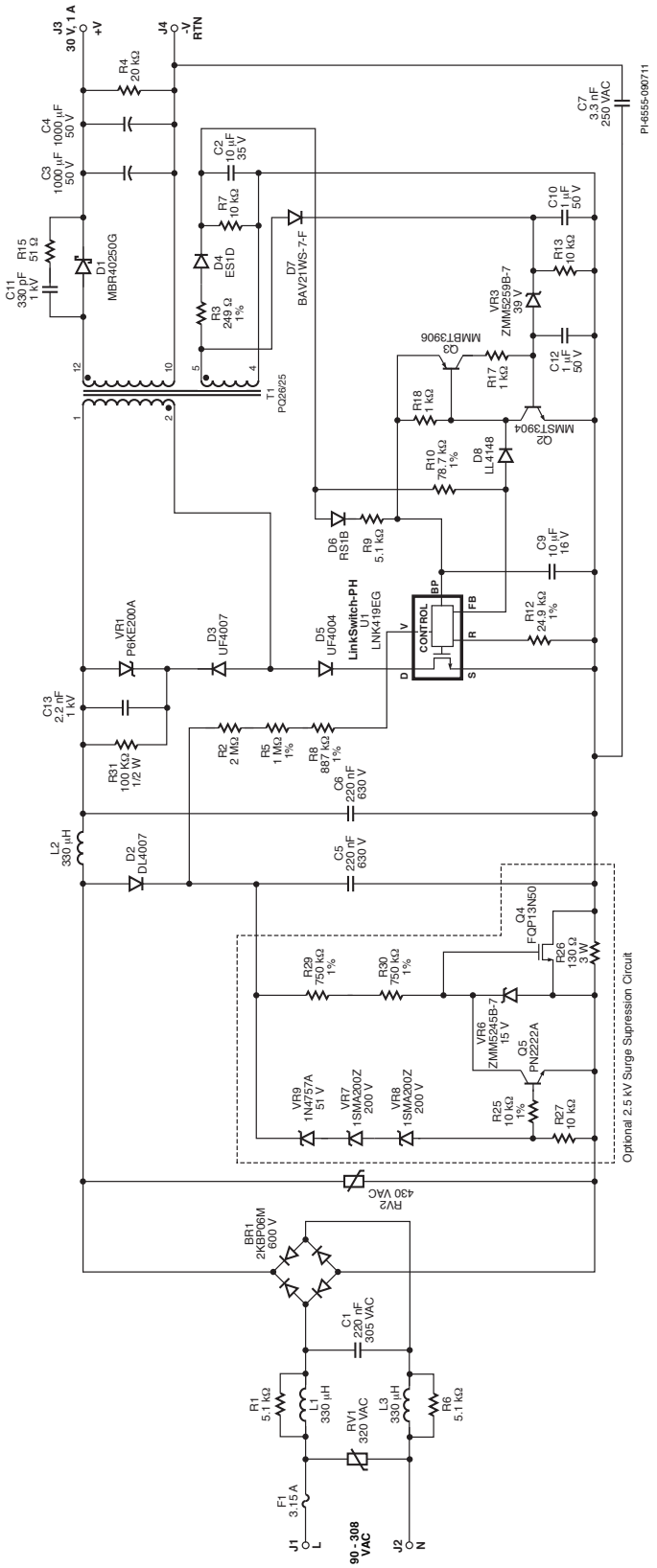
25 W, 100 V, 250 mA OUTPUT, 180 – 265 VAC INPUT, SINGLE STAGE PFC, NON-ISOLATED, BUCK-BOOST POWER SUPPLY





LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-286)

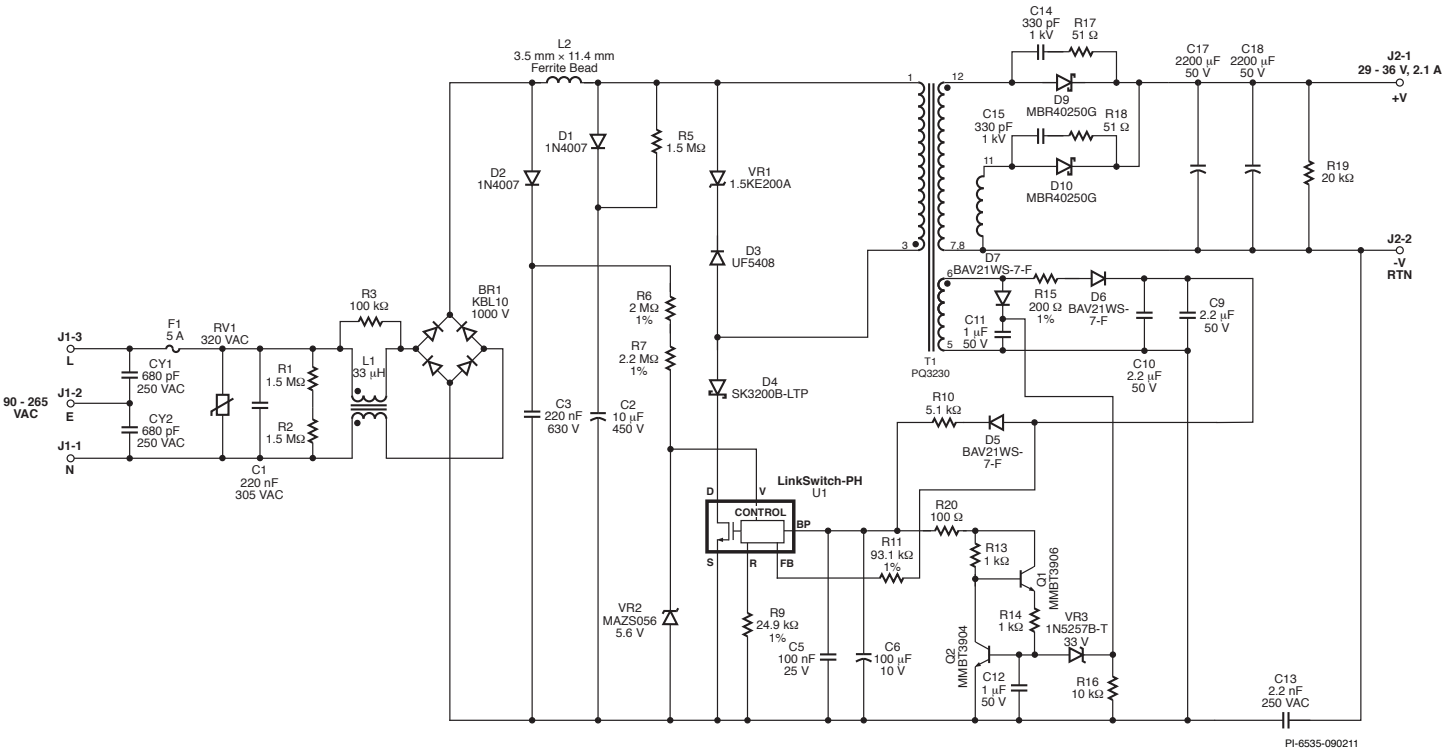
30 W, 30 V, 1 A OUTPUT, 90 – 308 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY

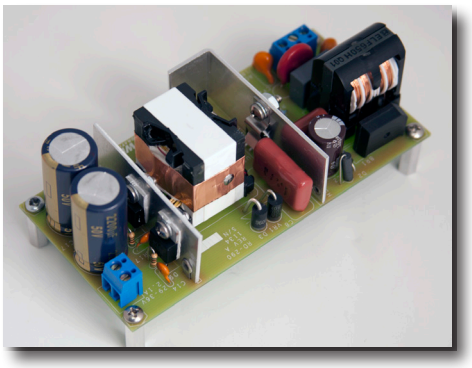


High Power Factor Design Examples

LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (RDK-290)

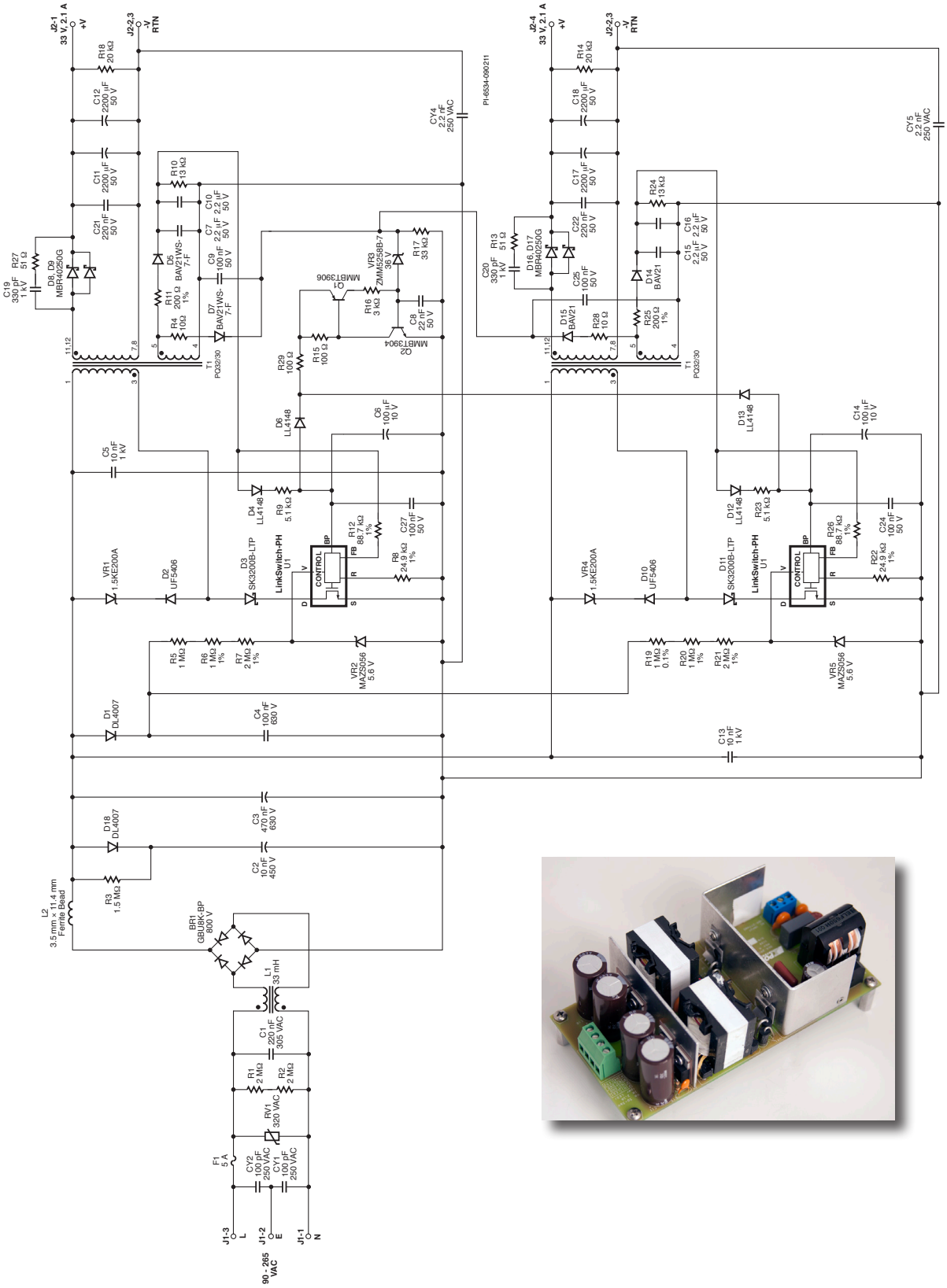
75 W, 29 – 36 V, 2.1 A, 180 – 300 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY





LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (DER-291)

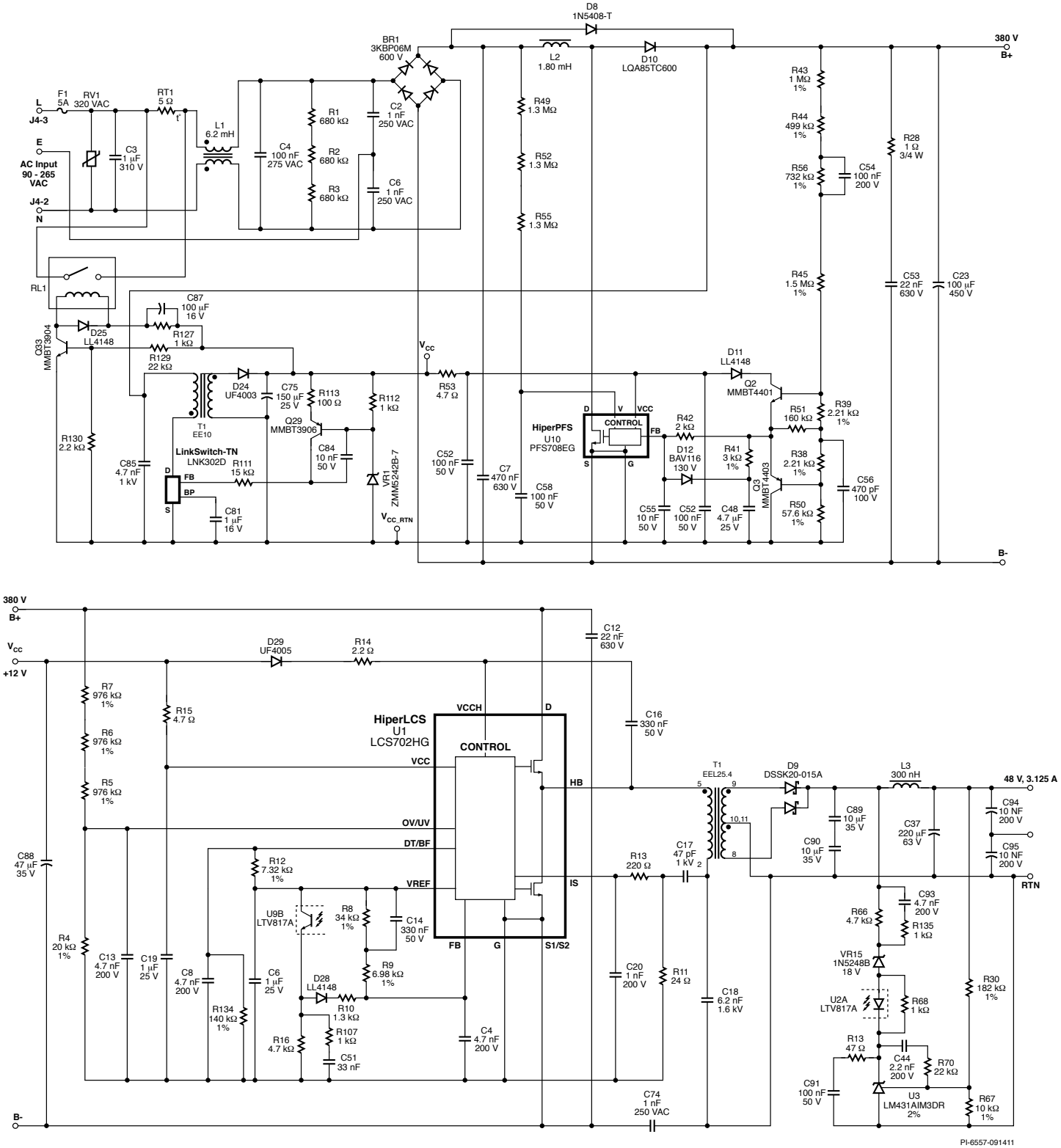
150 W, 30 – 36 V, 4.2 A, 184 – 277 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



High Power Factor Design Examples

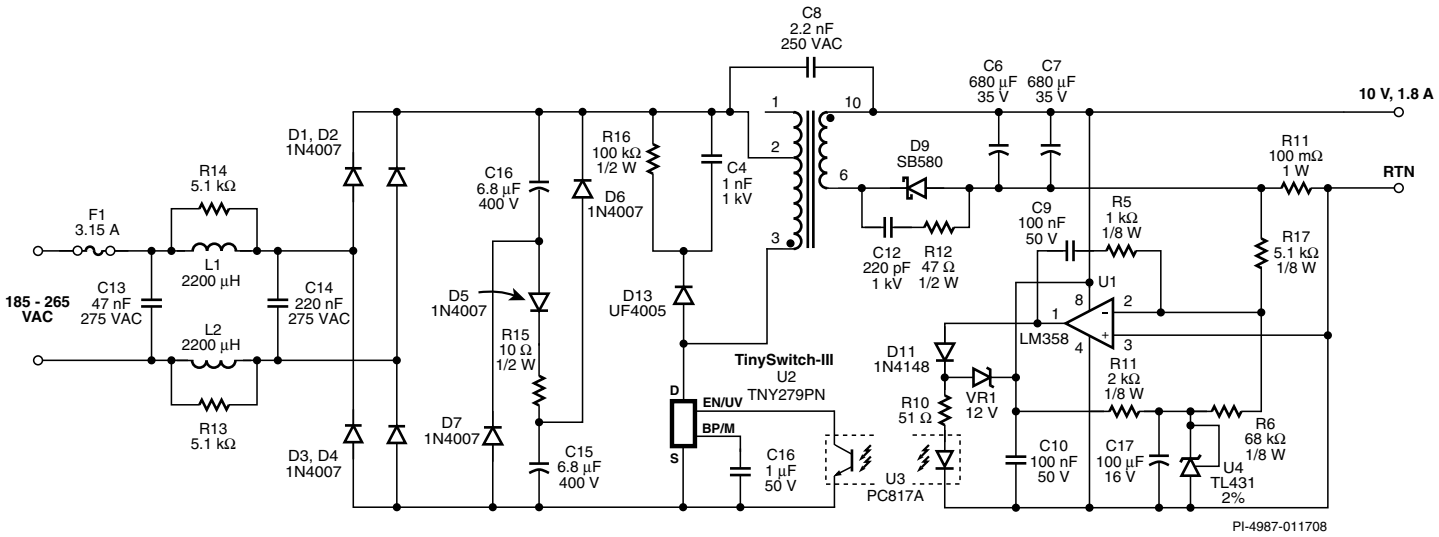
LinkSwitch-PH – High Efficiency, High Power Factor, Streetlight LED Driver (RDK-292)

150 W, 48 V, 3.125 A, 100 – 265 VAC INPUT, LLC AND BOOST PFC FLYBACK POWER SUPPLY



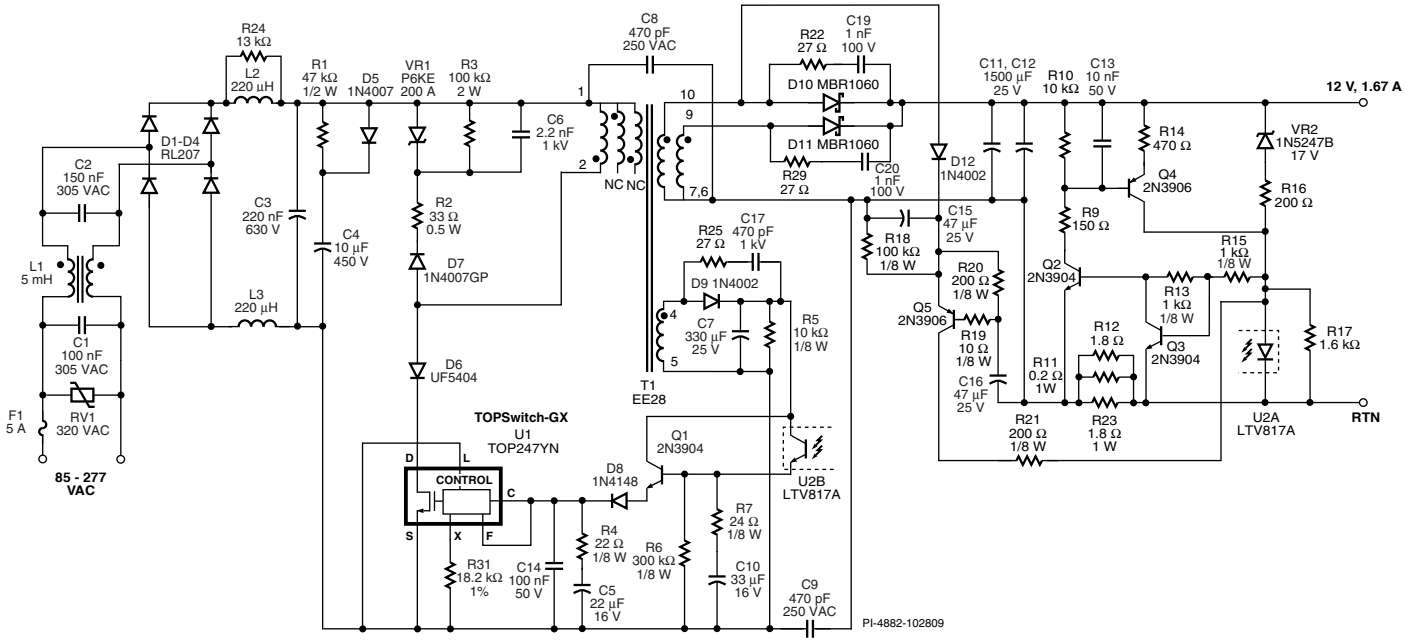
TinySwitch-III – Passive PFC, Constant Current LED Driver (DI-130)

18 W, 10 V, 1.8 A OUTPUT, 185 – 265 VAC INPUT, PASSIVE PFC FLYBACK POWER SUPPLY



TOPSwitch-GX – Power Factor Corrected, Constant Voltage, Constant Current LED Driver (DER-168)

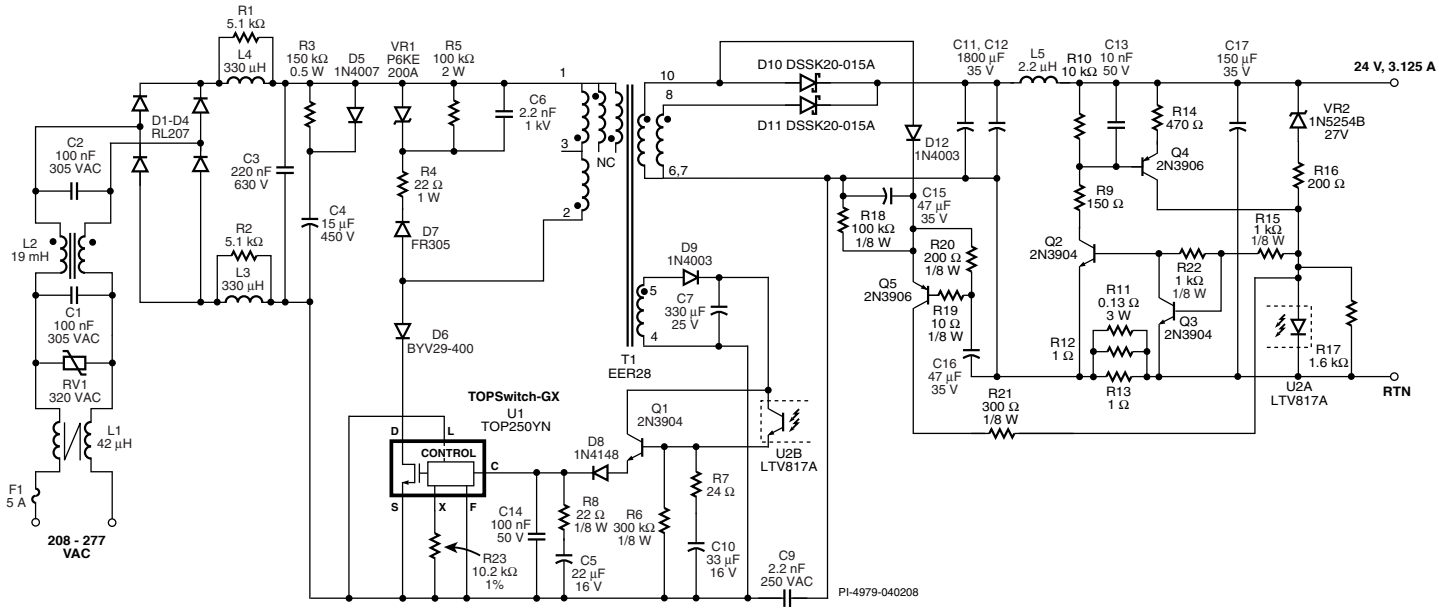
20 W, 12 V, 1.67 A OUTPUT, 85 – 277 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



High Power Factor Design Examples

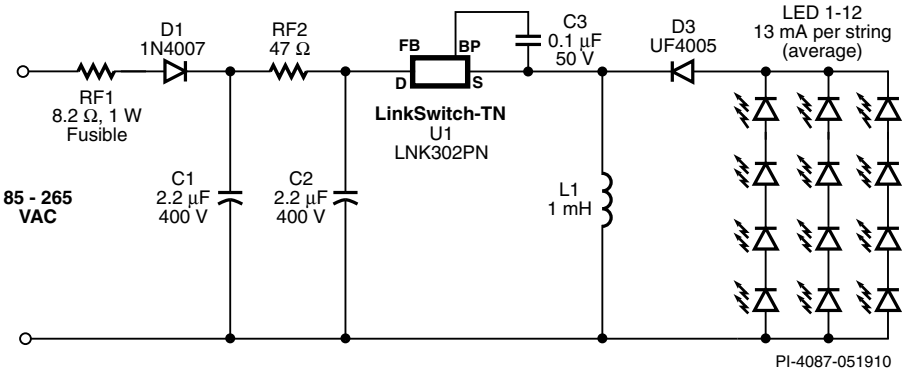
TOPSwitch-GX – Power Factor Corrected Constant Current LED Driver (DER-136)

75 W, 24 V, 3.1 A OUTPUT, 208 – 277 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



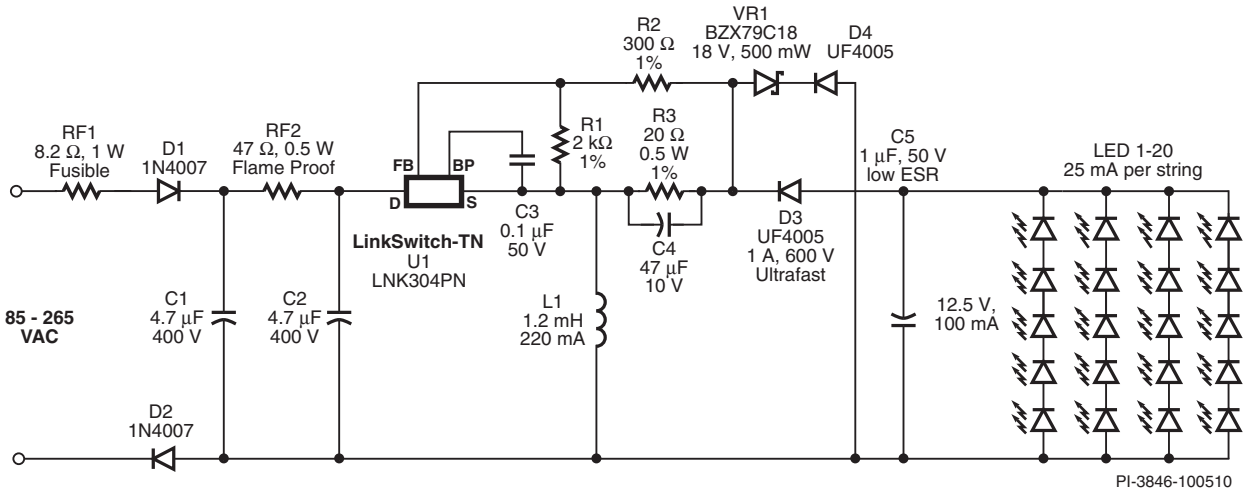
LinkSwitch-TN – Non-Isolated, Buck-Boost LED Driver (DER-92)

0.5 W, 13 V, 40 mA, 85 – 265 VAC INPUT, BUCK-BOOST POWER SUPPLY



LinkSwitch-TN – Non-Isolated, Constant Current LED Driver (DI-74)

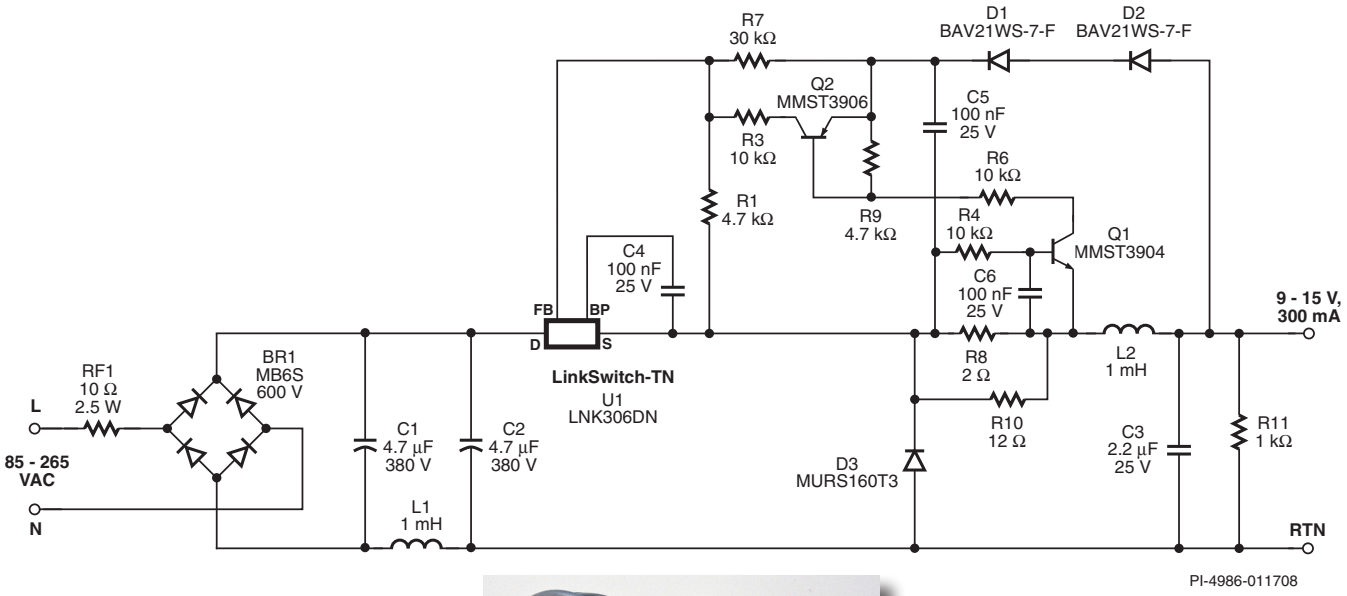
1.25 W, 12.5 V, 100 mA, 85 – 265 VAC INPUT, BUCK-BOOST POWER SUPPLY

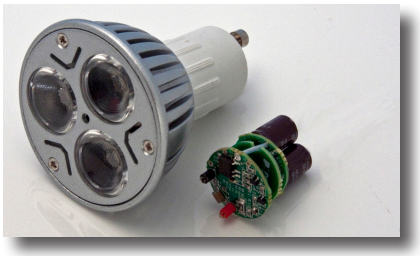


Design Examples

LinkSwitch-TN – Non-Isolated, Constant Current Light Bulb Replacement (RDK-131)

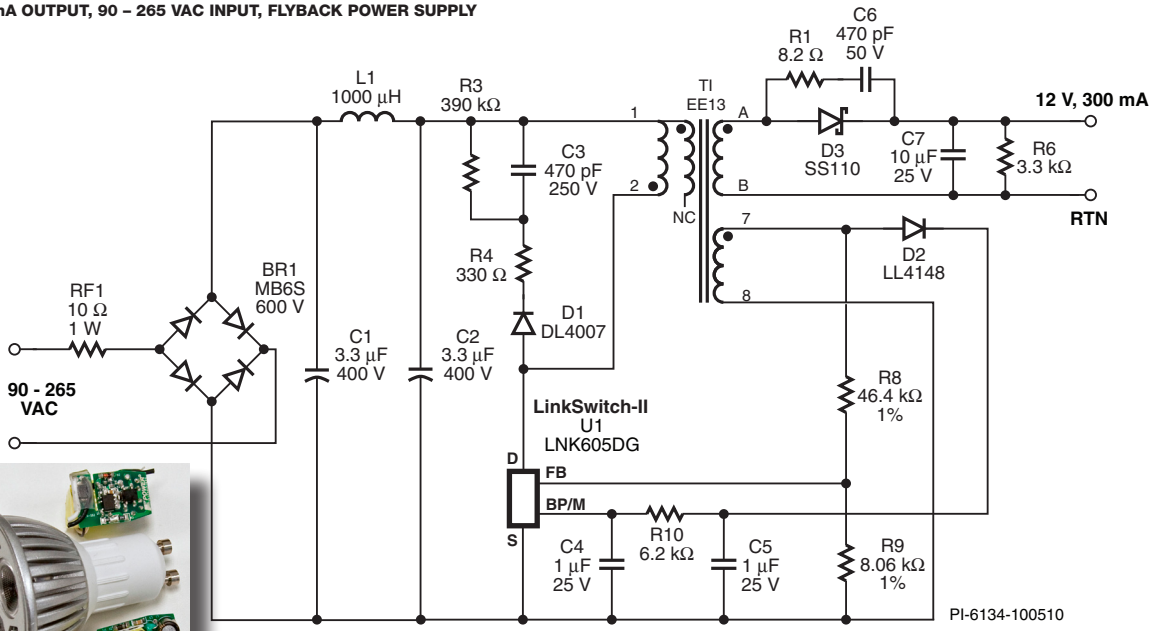
3 W, 9 V – 15 V, 300 mA OUTPUT, 85 – 265 VAC INPUT, BUCK CONVERTER POWER SUPPLY





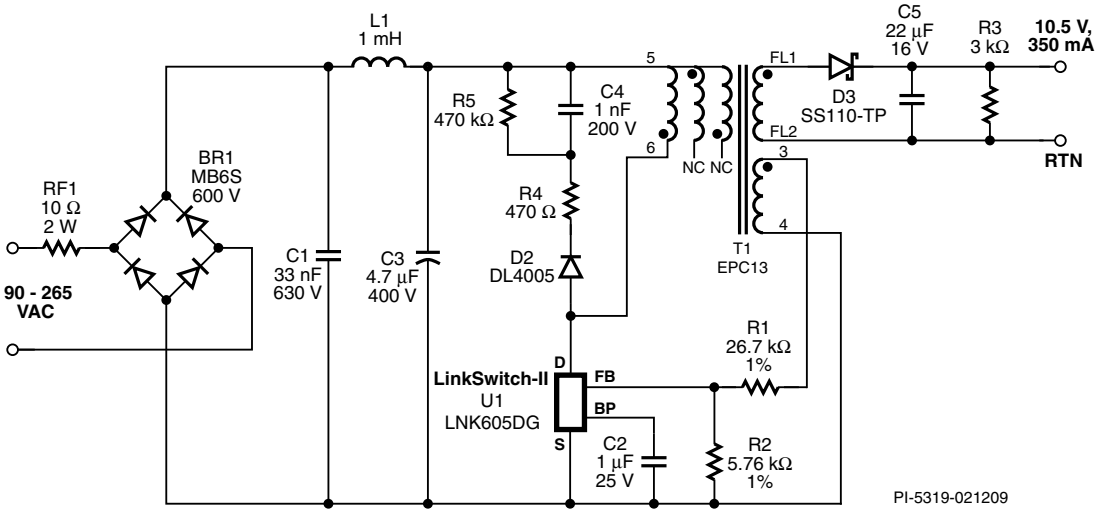
LinkSwitch-II – Constant Voltage, Constant Current LED Driver (DER-261)

3.6 W, 12 V, 300 mA OUTPUT, 90 – 265 VAC INPUT, FLYBACK POWER SUPPLY



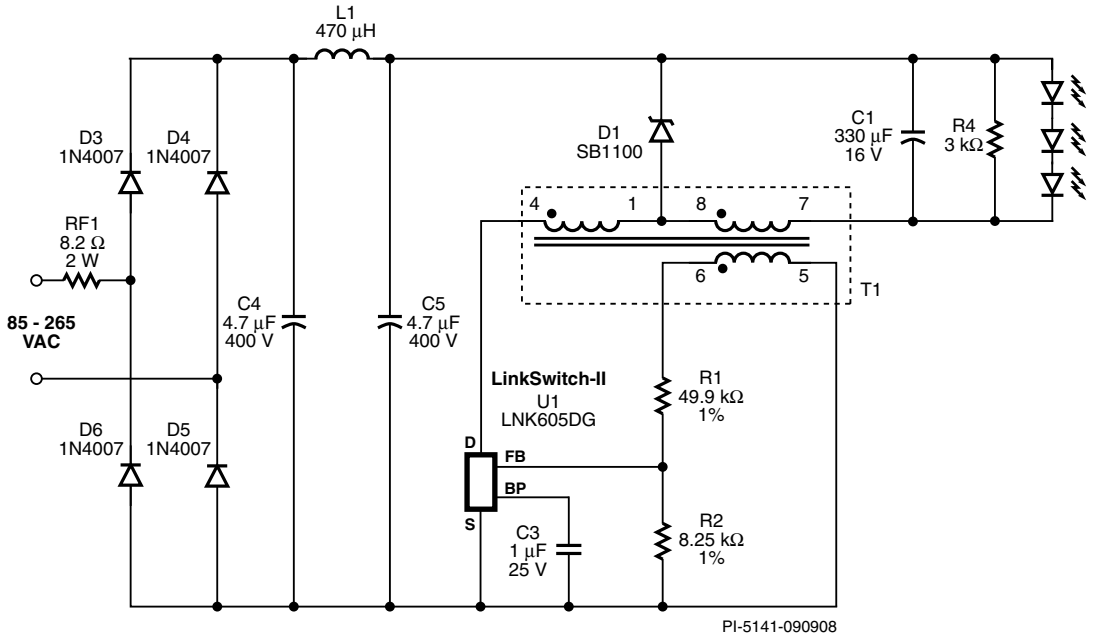
LinkSwitch-II – Isolated Constant Voltage, Constant Current LED Driver (DER-206)

3.67 W, 10.5 V, 350 mA OUTPUT, 90 – 265 VAC INPUT, FLYBACK POWER SUPPLY



LinkSwitch-II – Non-Isolated Constant Voltage, Constant Current, Tapped Buck LED Driver (DER-186)

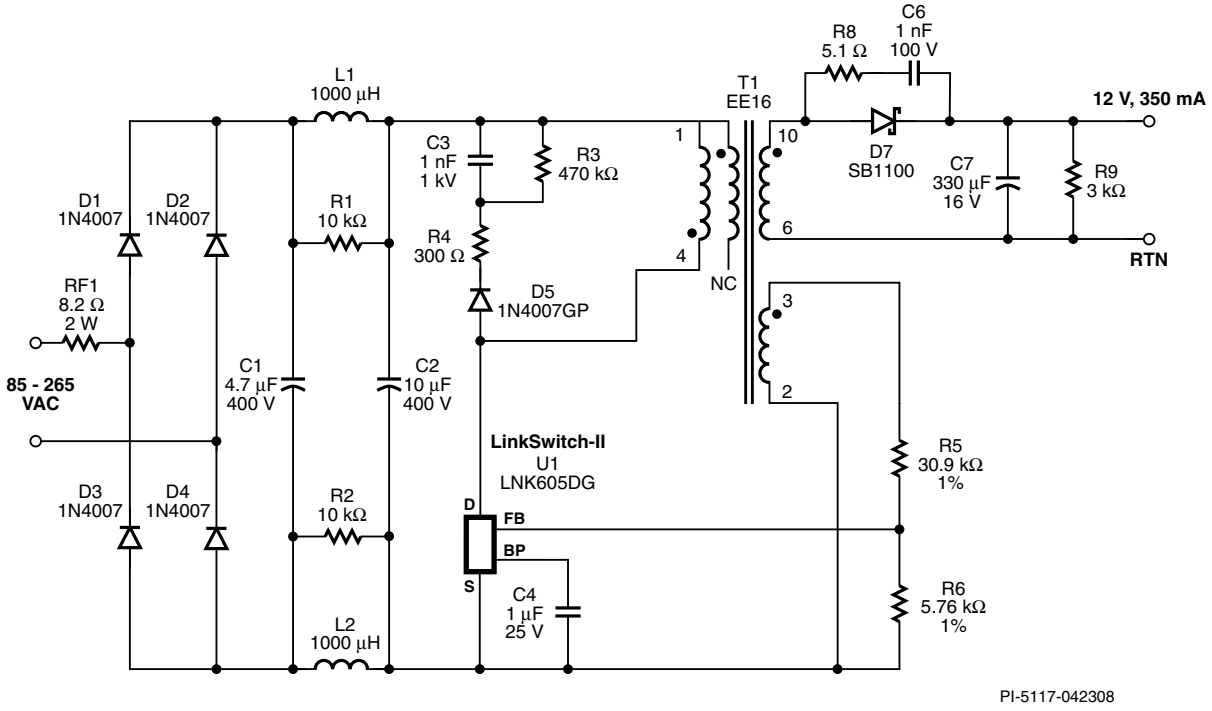
4.2 W, 12 V, 350 mA OUTPUT, 85 – 265 VAC INPUT, TAPPED BUCK CONVERTER POWER SUPPLY



Design Examples

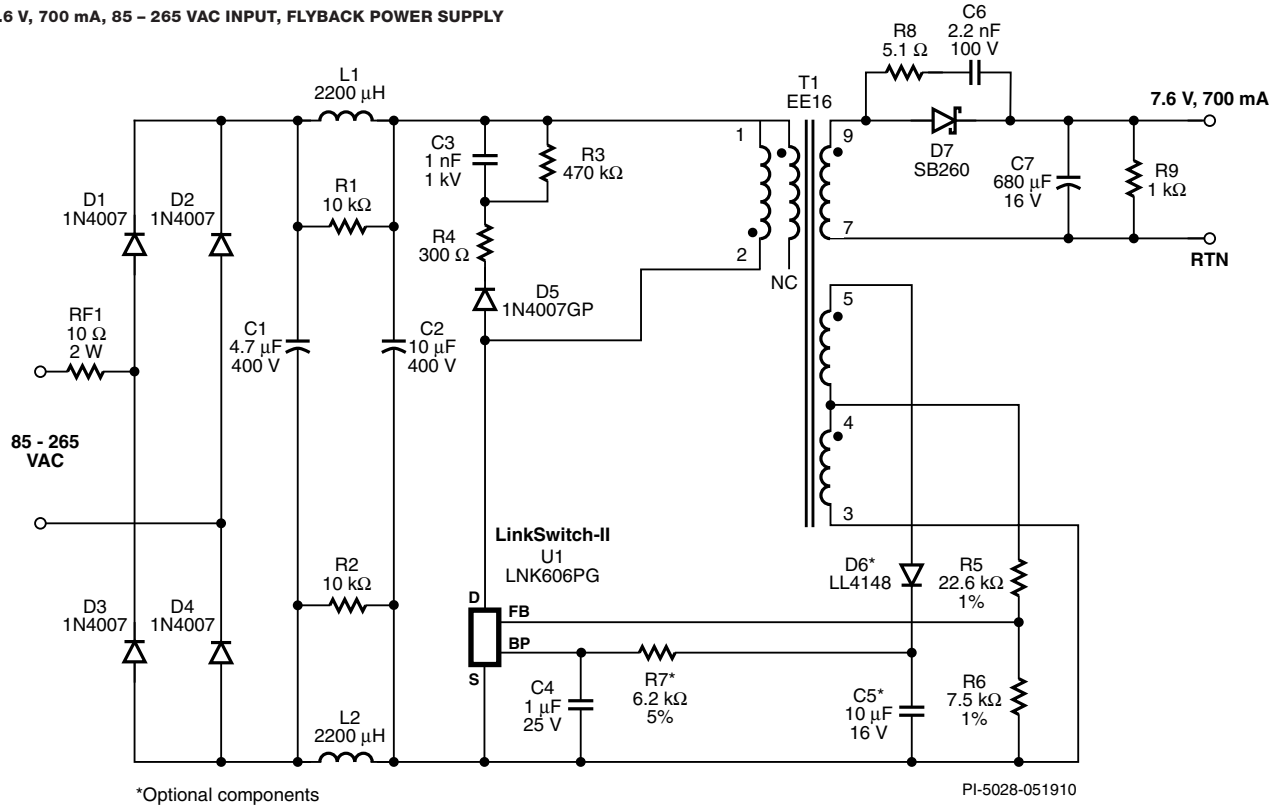
LinkSwitch-II – Constant Voltage, Constant Current LED Driver (DER-185)

4.2 W, 12 V, 350 mA OUTPUT, 85 – 265 VAC INPUT, FLYBACK POWER SUPPLY



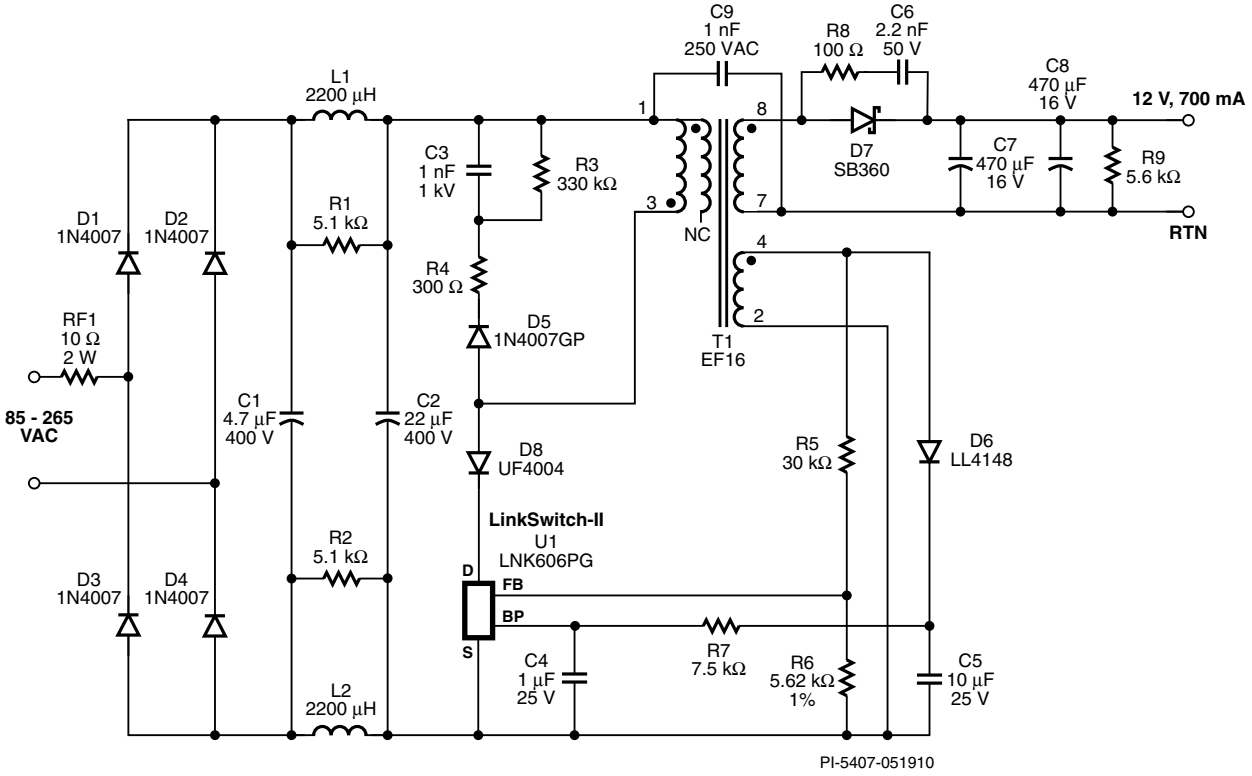
LinkSwitch-II – Constant Voltage, Constant Current LED Driver (DER-184)

5.32 W, 7.6 V, 700 mA, 85 – 265 VAC INPUT, FLYBACK POWER SUPPLY



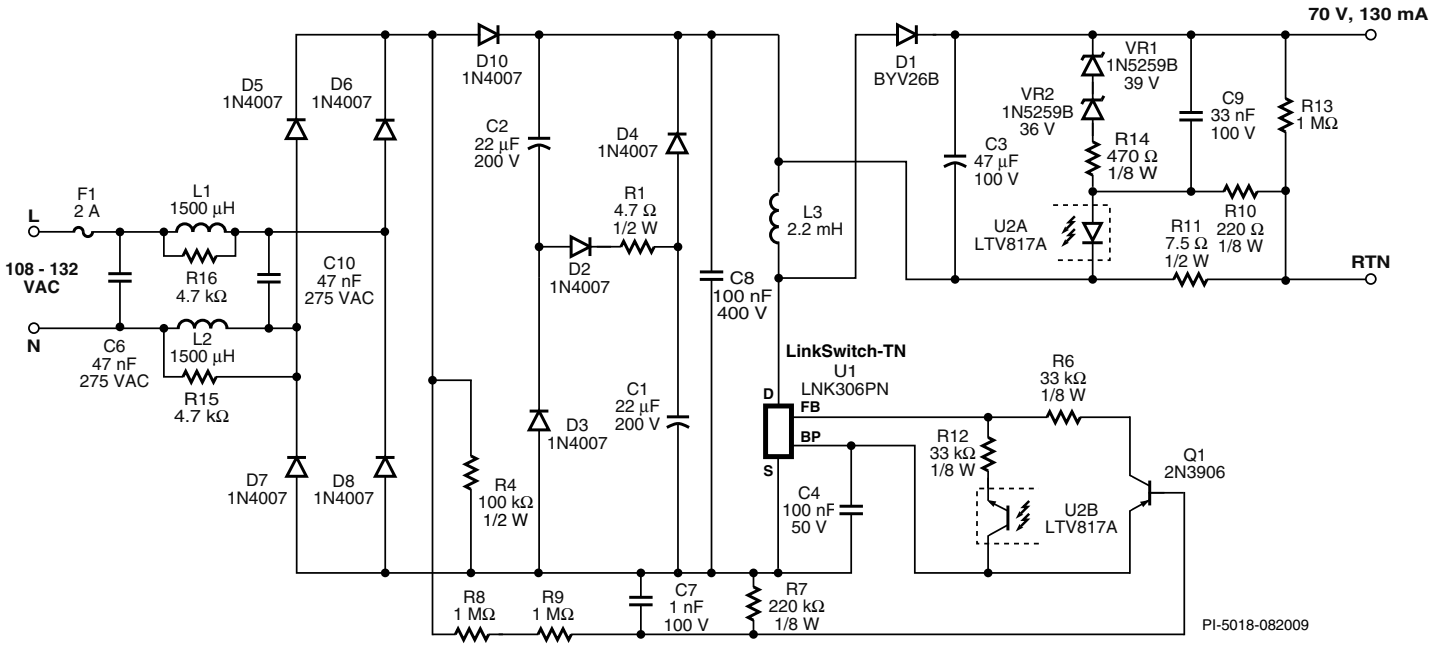
LinkSwitch-II – Constant Voltage, Constant Current LED Driver (DER-215)

8.4 W, 12 V, 700 mA, 85 – 265 VAC INPUT, FLYBACK POWER SUPPLY



LinkSwitch-TN – Low-Cost Dimmable LED Ballast (DI-171)

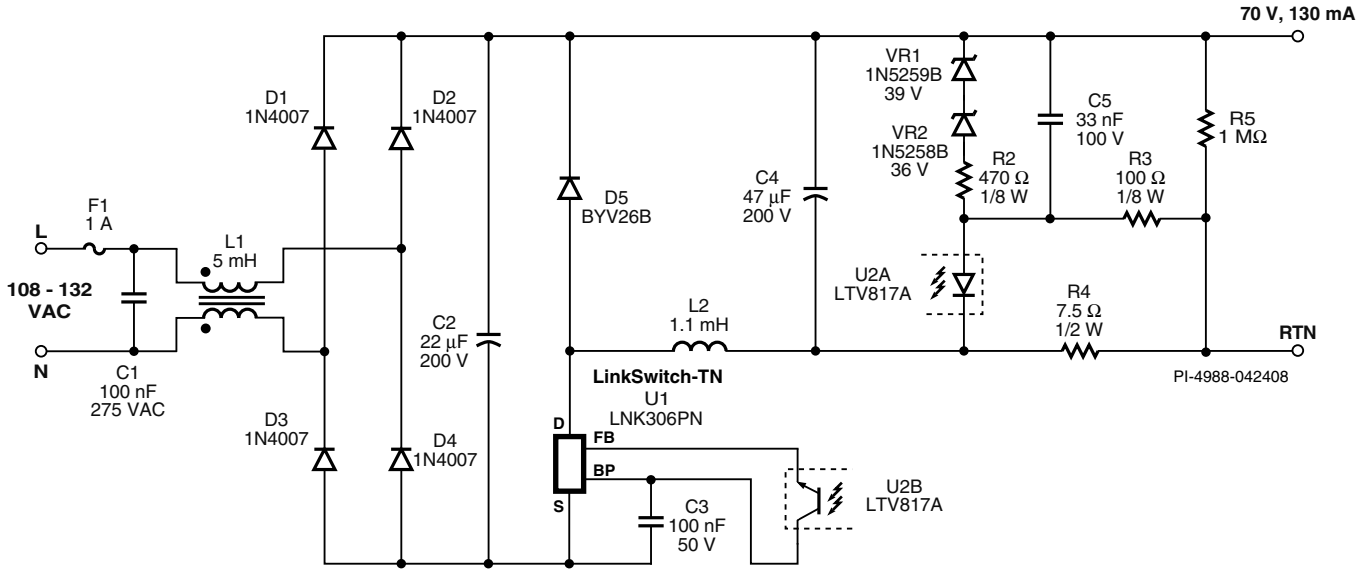
9 W, 70 V, 130 mA OUTPUT, 108 – 132 VAC INPUT, BUCK-BOOST POWER SUPPLY



Design Examples

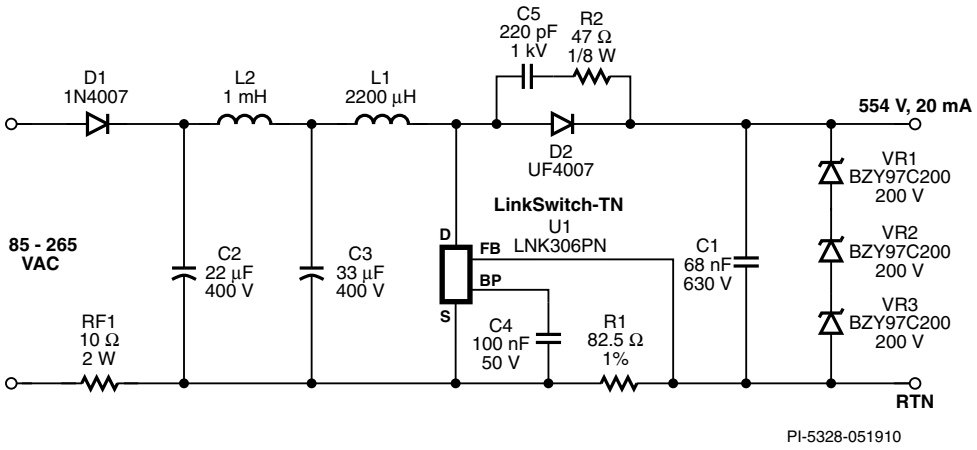
LinkSwitch-TN – Constant Current Buck Converter LED Driver (DER-172)

9.1 W, 70 V, 130 mA OUTPUT, 108 – 132 VAC INPUT, BUCK CONVERTER POWER SUPPLY



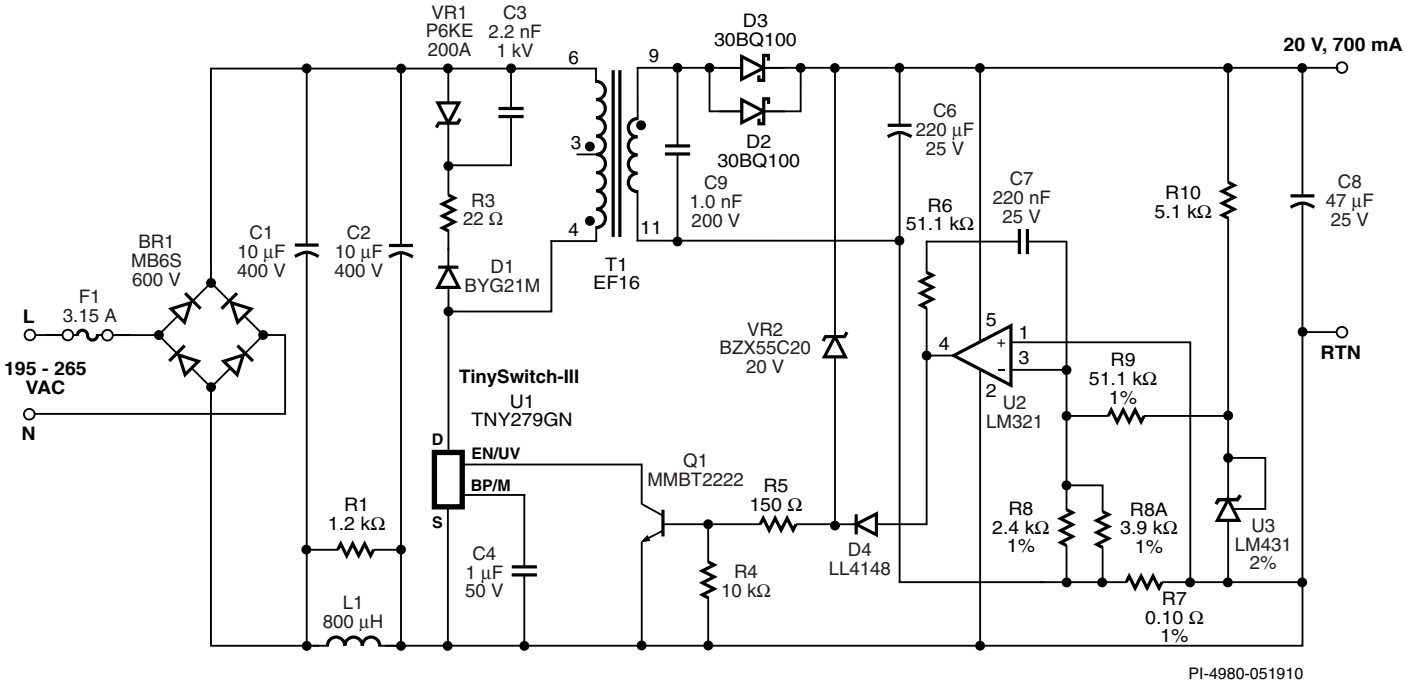
LinkSwitch-TN – Constant Current LED Driver (DI-210)

11 W, 554 V, 20 mA OUTPUT, 85 – 265 VAC INPUT, BOOST POWER SUPPLY



TinySwitch-III – Non-Isolated, Constant Current, High Efficiency LED Driver (DER-173)

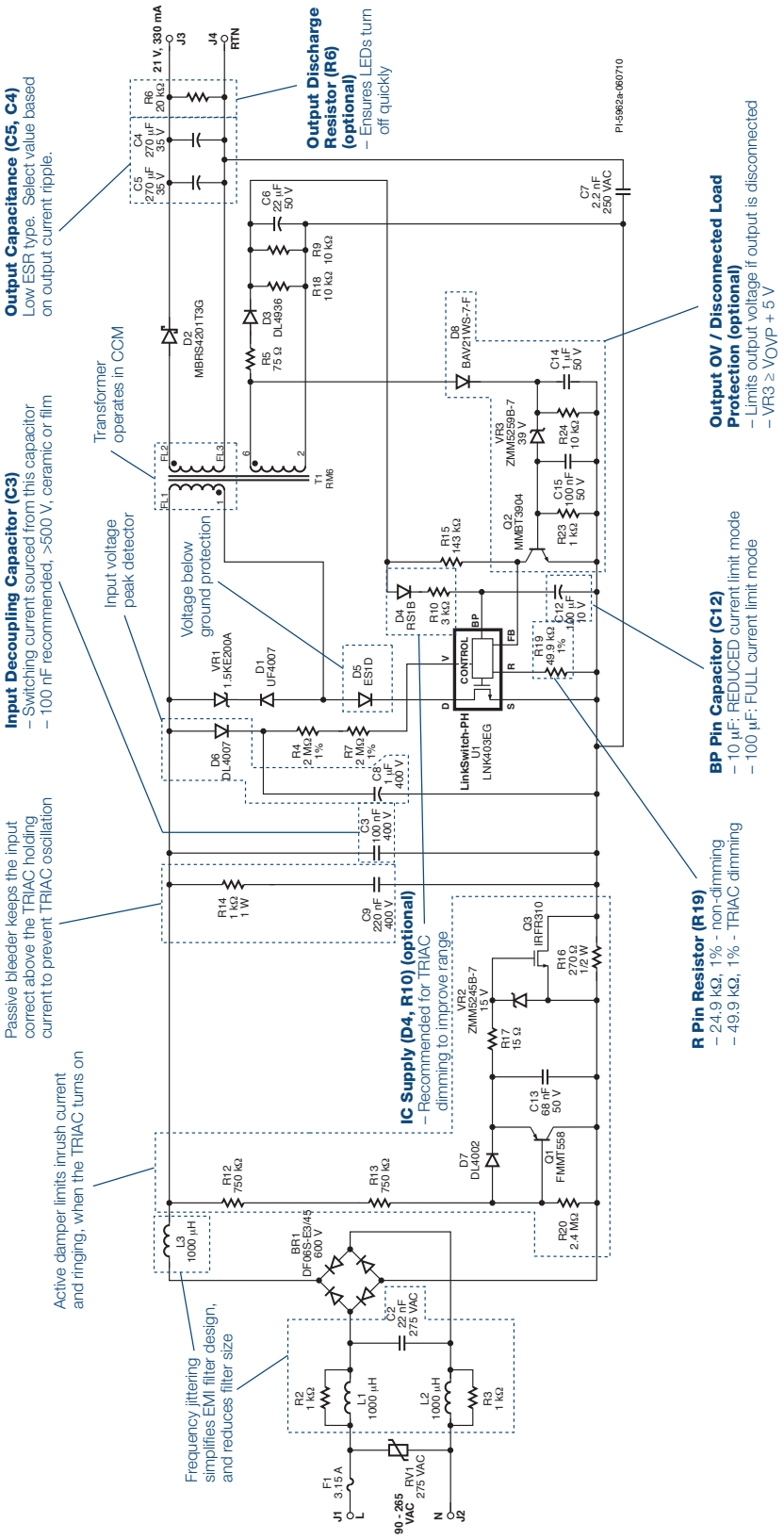
14 W, 20 V, 700 mA OUTPUT, 195 – 265 VAC INPUT FLYBACK POWER SUPPLY



LED Circuit Operations

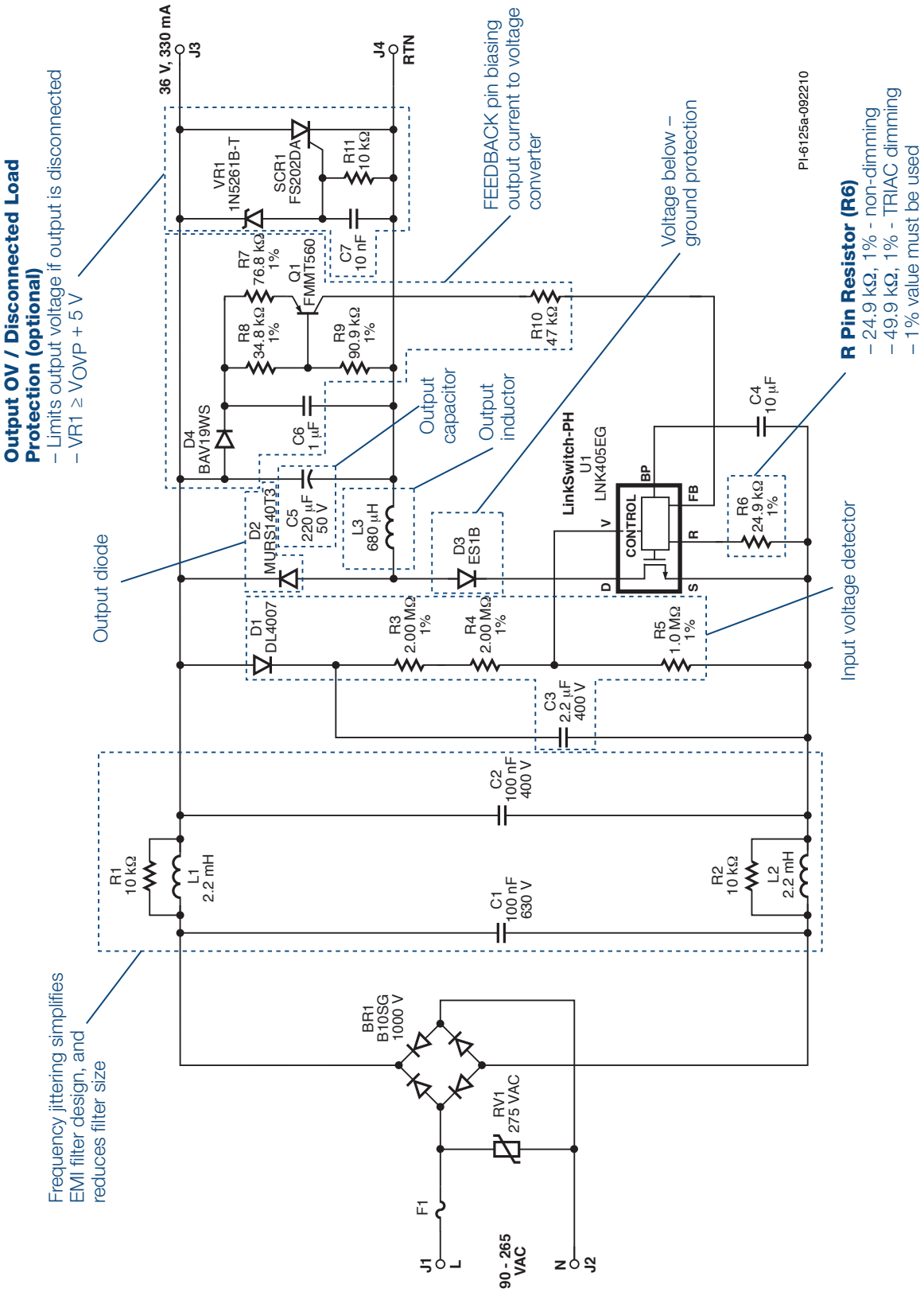
LinkSwitch-PH – High Efficiency, High Power Factor, TRIAC Dimmable LED Driver (RDK-193)

7 W, 21 V, 330 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



LinkSwitch-PH – High Efficiency, High Power Factor, LED Driver (RDK-257)

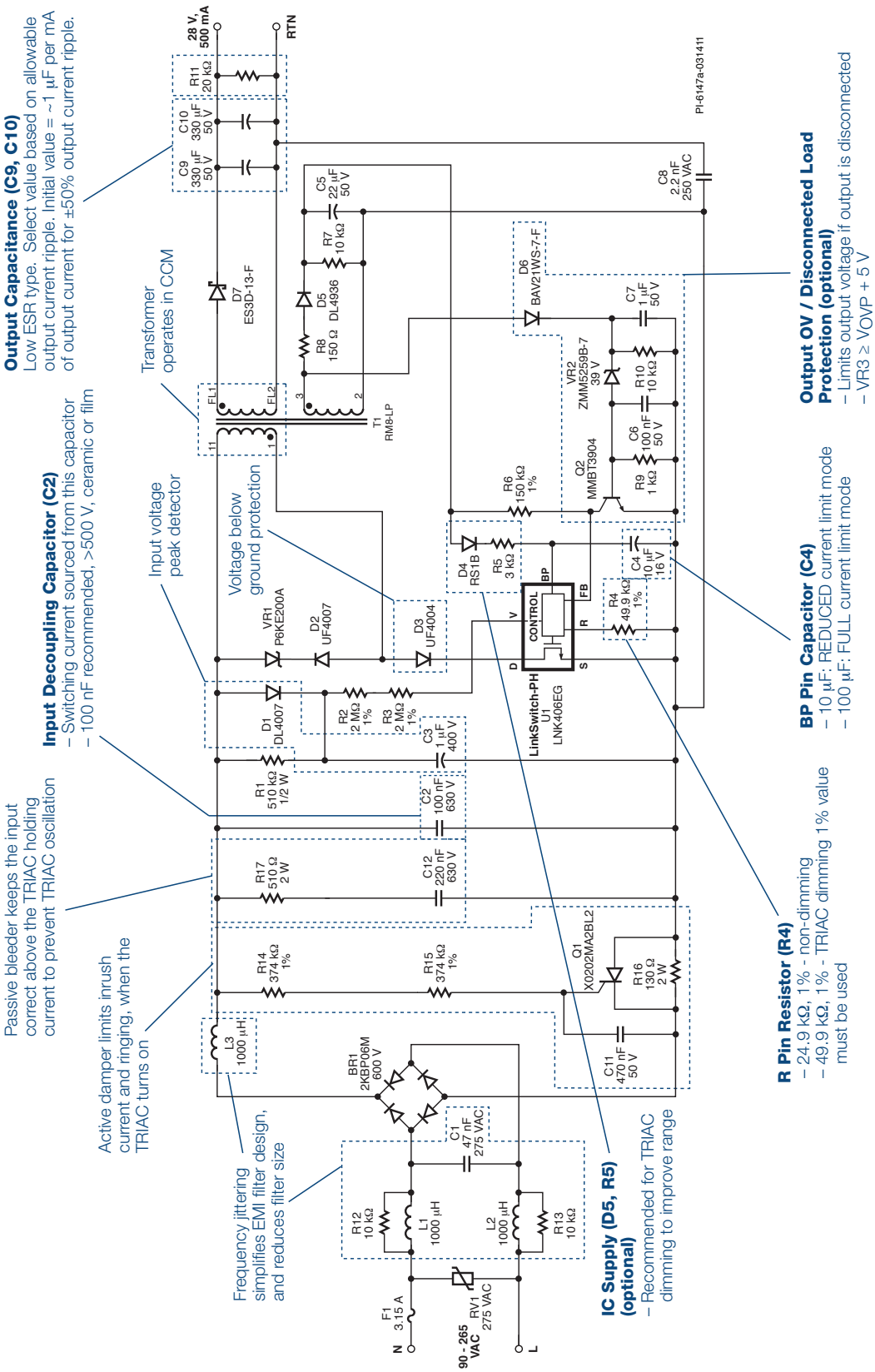
12 W, 36 V, 330 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, BUCK CONVERTER POWER SUPPLY



LED Circuit Operations

LinkSwitch-PH – High Efficiency, High Power Factor, TRIAC Dimmable LED Driver (RDK-195)

14 W, 28 V, 500 mA OUTPUT, 90 – 265 VAC INPUT, SINGLE STAGE PFC, FLYBACK POWER SUPPLY



TRIAC Dimmable, Single-Stage PFC, Medium-Power AC-DC Power Conversion[1,2]

Product[5]	Minimum Output Power[3] (W)	Maximum Output Power[4] (W)	Minimum Output Power[3] (W)	Maximum Output Power[4] (W)
	R_V = 2 MΩ		R_V = 4 MΩ	
LinkSwitch-PH	85-132 VAC		85-308 VAC	
LNK403/413E/L	2.5	4.5	6.5	12
LNK404/414E/L	2.5	5.5	6.5	15
LNK405/415E/L	3.8	7.0	8.5	18
LNK406/416E/L	4.5	8.0	10	22
LNK407/417E/L	5.5	10	12	25
LNK408/418E/L	6.8	13.5	16	35
LNK409/419E/L	8.0	20	18	50

Additional Features:
- Single-stage power factor correction and accurate constant current (CC) output
- Flicker-free phase-controlled TRIAC dimming
- Primary side control eliminates optocoupler and all secondary current control circuitry
- Eliminates electrolytic bulk capacitor
- Eliminates all control loop compensation circuitry
- Simple PWM dimming interface

Notes:
1. *Continuous power in an open frame with adequate heat sinking at device local ambient of 70 °C.*
2. *Power level calculated on typical LED string voltage with efficiency >80%.*
3. *Minimum output power with C_{BP} = 10 µF.*
4. *Maximum output power with C_{BP} = 100 µF. LNK4x3EG C_{BP} = 10 µF.*
5. *Package: eSIP-7C, eSIP-7L.*

TRIAC Dimmable, Single-Stage PFC, Low-Power AC-DC Power Conversion (Up to 16 W)

Product[1]	Minimum Output Power[2] (W)	Maximum Output Power[2] (W)
LinkSwitch-PL	85-265 VAC	
LNK454D	1.5	3
LNK456D	3	6
LNK457D/K/V	4	8
LNK458K/V	6	11.5
LNK460K/V	8	16

Additional Features:
- Single-stage power factor correction and accurate CC output
- Flicker-free phase-controlled TRIAC dimming
- Very low component count with small non-electrolytic bulk capacitor, for compact replacement lamp designs
- Compact SO-8C package
- Completely eliminates control loop compensation

Notes:
1. *Packages: D: SO-8C, K: eSOP™-12, V: eDIP™-12.*
2. *Maximum practical continuous power in an open frame design with adequate heat sinking, measured at +50 °C ambient .*

Low-Power AC-DC, Non-Isolated Power Conversion (≤360 mA)

Product[1]	Output Current[2] (mA)		Output Current[3] (mA)	
	MDCM[3]	CCM[4]	MDCM[3]	CCM[4]
LinkSwitch-TN	230 VAC ± 15%		85-265 VAC	
LNK302P/G/D	63	80	63	80
LNK304P/G/D	120	170	120	170
LNK305P/G/D	175	280	175	280
LNK306P/G/D	225	360	225	360

Additional Features:
- 700 V internal MOSFET rating
- Self-powered
- ON/OFF control
- Hysteretic thermal shutdown
- Power limiting
- Frequency jitter reduces EMI
- EcoSmart™ low standby/no-load power consumption

Notes:
1. *Packages: P: DIP-8B, G: SMD-8B, D: SO-8C.*
2. *Typical output current in a non-isolated buck converter. Output power capability depends on respective output voltage.*
3. *Mostly discontinuous conduction mode.*
4. *Continuous conduction mode.*

IC Product Tables

Low-Power AC-DC Power Conversion (Up to 6.1 W)

Product[1]	Continuous Output Power (W)		Continuous Output Power (W)	
	Adapter[2]	Open Frame[3]	Adapter[2]	Open Frame[3]
LinkSwitch-II	230 VAC ± 15%		85-265 VAC	
LNK603/613P/D	2.5	3.3	2.5	3.3
LNK604/614P/D	3.5	4.1	3.5	4.1
LNK605/615P/D	4.5	5.1	4.5	5.1
LNK606/616P/G/D	5.5	6.1	5.5	6.1
LNK632D	3.1	3.1	3.1	3.1

Additional Features:

- 700 V internal MOSFET rating
- Self-powered
- ON/OFF control
- Hysteretic overtemperature protection
- Power limiting
- Frequency jitter reduces EMI
- EcoSmart low standby/no-load power consumption

Notes:

1. *Packages: P: DIP-8C, G: SMD-8C, D: SO-8C.*
2. *Minimum continuous power in a typical non-ventilated enclosed adapter measured at 50 °C ambient.*
3. *Minimum practical continuous power in an open frame design with adequate heat sinking, measured at 50 °C ambient.*

Medium-Power AC-DC Power Conversion (Up to 36.5 W)

Product[1]	Continuous Output Power (W)		Continuous Output Power (W)	
	Adapter[2]	Open Frame[3]	Adapter[2]	Open Frame[3]
TinySwitch-III	230 VAC ± 15%		85-265 VAC	
TNY274P/G	6	11	5	8.5
TNY275P/G	8.5	15	6	11.5
TNY276P/G	10	19	7	15
TNY277P/G	13	23.5	8	18
TNY278P/G	16	28	10	21.5
TNY279P/G	18	32	12	25
TNY280P/G	20	36.5	14	28.5

Additional Features:

- 700 V internal MOSFET rating
- Self-powered
- Hysteretic overtemperature protection
- Frequency jitter reduces EMI
- EcoSmart low standby/no-load power consumption
- On-time extension
- Latching output overvoltage protection
- Line undervoltage lockout
- Selectable current limit

Notes:

1. *Packages: P: DIP-8C, G: SMD-8C.*
2. *Minimum continuous power in a typical non-ventilated encased adapter with minimal heat sinking, measured at a device ambient of 50 °C.*
3. *Minimum continuous power in an open frame with adequate heat sinking. TinySwitch-III operates without bias winding.*

High-Power AC-DC Power Conversion (Up to 290 W)

Product[3]	Continuous Output Power (W)		Continuous Output Power (W)	
	Adapter[1]	Open Frame[2]	Adapter[1]	Open Frame[2]
TOPSwitch-GX	230 VAC ± 15%[4]		85-265 VAC	
TOP242P/G	9	15	6.5	10
TOP242R	21	22	11	14
TOP242Y/F	10	22	7	14
TOP243P/G	13	25	9	15
TOP243R	29	45	17	23
TOP243Y/F	20	45	15	30
TOP244P/G	16	28	11	20
TOP244R	34	50	20	28
TOP244Y/F	30	65	20	45
TOP245P/G	19	30	13	22
TOP245R	37	57	23	33
TOP245Y/F	40	85	26	60
TOP246P/G	21	34	15	26
TOP246R	40	64	26	38
TOP246Y/F	60	125	40	90
TOP247R	42	70	28	43
TOP247Y/F	85	165	55	125
TOP248R	43	75	30	48
TOP248Y/F	105	205	70	155
TOP249R	44	79	31	53
TOP249Y/F	120	250	80	180
TOP250R	45	82	32	55
TOP250Y/F	135	290	90	210

Notes:
1. *Typical continuous power in a non-ventilated enclosed adapter measured at 50 °C ambient.*
2. *Maximum practical continuous power in an open frame design at 50 °C ambient.*
3. *Packages: P: DIP-8C, G: SMD-8C, R: TO-263-7C ,Y: TO-220-7C, F: TO-262C.*
4. *230 VAC or 100/115 VAC with doubler.*

Additional Features:

- 700 V internal MOSFET rating
- Hysteretic thermal shutdown
- Power limiting
- Frequency jitter reduces EMI
- Line undervoltage detection
- Line overvoltage detection
- EcoSmart low standby/no-load power consumption

IC Product Tables

High Efficiency AC-DC Power Conversion (Up to 333 W)

Product[5]	Continuous Output Power (W)			Continuous Output Power (W)		
	Adapter[1]	Open Frame[2]	Peak[3]	Adapter[1]	Open Frame[2]	Peak[3]
TOPSwitch-HX	230 VAC ± 15%[4]			85-265 VAC		
TOP252P/G	9	15	21	6	10	13
TOP252M						
TOP252E	10	21		6	13	
TOP253P/G	15	25	38	9	15	25
TOP253M			4			29
TOP253E	21	43		13	29	
TOP254P/G	16	28	47	11	20	30
TOP254M			62			40
TOP254E/Y	30	62		20	43	
TOP255P/G	19	30	54	13	22	35
TOP255M			81			52
TOP255E/Y	40	81		26	57	
TOP255L						
TOP256P/G	21	34	63	15	26	40
TOP256M			98			64
TOP256E[7]/Y	60	119		40	86	
TOP256L		88			64	
TOP257P/G	25	41	70	19	30	45
TOP257M			119			78
TOP257E/Y	85	157		55	119	
TOP257L		105			78	
TOP258P/G	29	48	77	22	35	50
TOP258M			140			92
TOP258E/Y	105	195		70	148	
TOP258L		122			92	
TOP259E/Y	128	238		80	171	
TOP259L		162			120	
TOP260E/Y	147	275		93	200	
TOP260L		190			140	
TOP261E/Y	177	333		118	254	
TOP261L		244			177	
TOP262L[6]	177	244		118	177	
TOP262E[6]		333			254	

Additional Features:

- Multi-mode operation maximizes efficiency at all loads
- eSIP™-7F and eSIP-7C packages
  - Low thermal impedance junction-to-case (2 °C per watt)
  - Low height is ideal for adapters where space is limited
  - Horizontal eSIP-7F package ideal for ultra low height adapter and monitor applications
- Output overvoltage protection is user programmable for latching/non-latching shutdown with fast AC reset
- Allows both primary and secondary sensing
- Line undervoltage detection prevents turn-off glitches
- Line overvoltage shutdown extends line surge limit
- Accurate programmable current limit
- Optimized line feed-forward for line ripple rejection
- 132 kHz frequency (254Y-258Y and all E/L packages) reduces transformer and power supply size
  - Half frequency option for video applications
- Frequency jittering reduces EMI filter cost
- Improved auto-restart delivers <3% of maximum power in short circuit and open loop fault conditions
- Accurate hysteretic thermal shutdown function automatically recovers
- Fully integrated soft-start for minimum start-up stress

Notes:

1. *Minimum continuous power in a typical non-ventilated enclosed adapter measured at 50 °C ambient. Use of an external heat sink will increase power capability.*
2. *Minimum continuous power in an open frame design at +50 °C ambient.*
3. *Peak power capability in any design at +50 °C ambient.*
4. *230 VAC or 110/115 VAC with doubler.*
5. *Packages - P: DIP-8C, G: SMD-8C, M: SDIP-10C, Y: TO-220-7C, E: eSIP-7C, L: eSIP-7F.*
6. *TOP261 and TOP262 have the same current limit set point. In some applications TOP262 may run cooler than TOP261.*
7. *Parts are available with Green (Halogen Free) mold compound. Parametrically green material encapsulated parts are identical to non-green parts.*

HiperPFS – High-Efficiency Integrated LLC Controller (75 W to 440 W)

Product	Maximum Continuous Output Power Ratings at 90 VAC (W)	Peak Output Power Rating at 90 VAC (W)
PFS704E	110	120
PFS706E	140	150
PFS708E	190	205
PFS710E	240	260
PFS712E	300	320
PFS714E	350	385
PFS716E	388	425
Product	**Maximum Continuous Output Power Ratings at 180 VAC (W)**	**Peak Output Power Rating at 180 VAC (W)**
PFS723E	255	280
PFS724E	315	350
PFS725E	435	480
PFS726E	540	600
PFS727E	675	750
PFS728E	810	900
PFS729E	900	1000

Notes:
1. *See Key Application considerations.*
2. *Maximum practical continuous power at 90 VAC in an open-frame design with adequate heat sinking, measured at 50 °C ambient.*
3. *Recommended lower range of maximum continuous power for best light load efficiency; HiperPFS will operate and perform below this level.*
4. *Maximum practical continuous power at 180 VAC in an open-frame design with adequate heat sinking, measured at 50 °C ambient.*
5. *Internal output power limit.*

Additional Features:

- Single chip solution for boost power factor correction (PFC)
  - EN61000-3-2 Class C and D compliant
- High light load efficiency at 10% and 20% load
  - >95% efficiency from 10% load to full load
  - <130 mW no-load consumption at 230 VAC with output in regulation
  - <50 mW no-load consumption at 230 VAC in remote off-state
- Frequency adjusted over line voltage, and line cycle
  - Spread-spectrum across >60 kHz window to simplify EMI filtering requirements
  - Lower boost inductance
- Provides up to 1 kW peak output power
  - >1 kW peak power delivery in power limit voltage regulation mode
- High integration allows smaller form factor, higher power density designs
  - Incorporates control, gate driver, and high-voltage power MOSFET
  - Internal current sense reduces component count and system losses
- Protection features include: UV, OV, OTP, brown-in/out, cycle- by-cycle current limit, and power limiting for overload protection
- Halogen free and RoHS compliant

HiperLCS – High-Efficiency Integrated LLC Controller (75 W to 440 W)

Product	Power[1] (W)
LCS700H	110
LCS701H	170
LCS702H	220
LCS703H	275
LCS705H	350
LCS708H	440

Notes:
1. *Maximum power delivered when mounted to a heat sink, maximum heat sink temperature of 90 °C.*

Additional Features:

- LLC half-bridge power stage incorporating controller, high and low-side gate drives, and high-voltage power MOSFETs
  - Highly integrated – eliminates external components
- High maximum operating frequency of 1 MHz
  - Nominal steady-state operation up to 500 kHz
  - Dramatically reduces magnetics size and allows use of SMD ceramic output capacitors
- Accurate programmable minimum and maximum frequency limits
- Precise duty symmetry balances output rectifier current, improving efficiency
  - 50% ±0.3% typical at 300 kHz
- Comprehensive fault handling and current limiting
  - Programmable brown-in/out thresholds and hysteresis
  - Undervoltage (UV) and overvoltage (OV) protection
  - Programmable over-current protection (OCP)
  - Short-circuit protection (SCP)
  - Over-temperature protection (OTP)
- Programmable dead-time
- Programmable burst mode maintains regulation at no-load and improves light load efficiency
- Programmable soft-start time and delay before soft-start
- Single package designed for high-power and high-frequency
  - Reduces assembly cost and reduces PCB layout loop areas
  - Simple single clip attachment to heat sink
  - Exposed thermal pad connected to ground potential – no insulators required between package and heat sink
  - Staggered pin arrangement for simple PC board routing and high-voltage creepage requirements
- Paired with HiperPFS PFC product gives complete, high efficiency, low part count LED driver

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