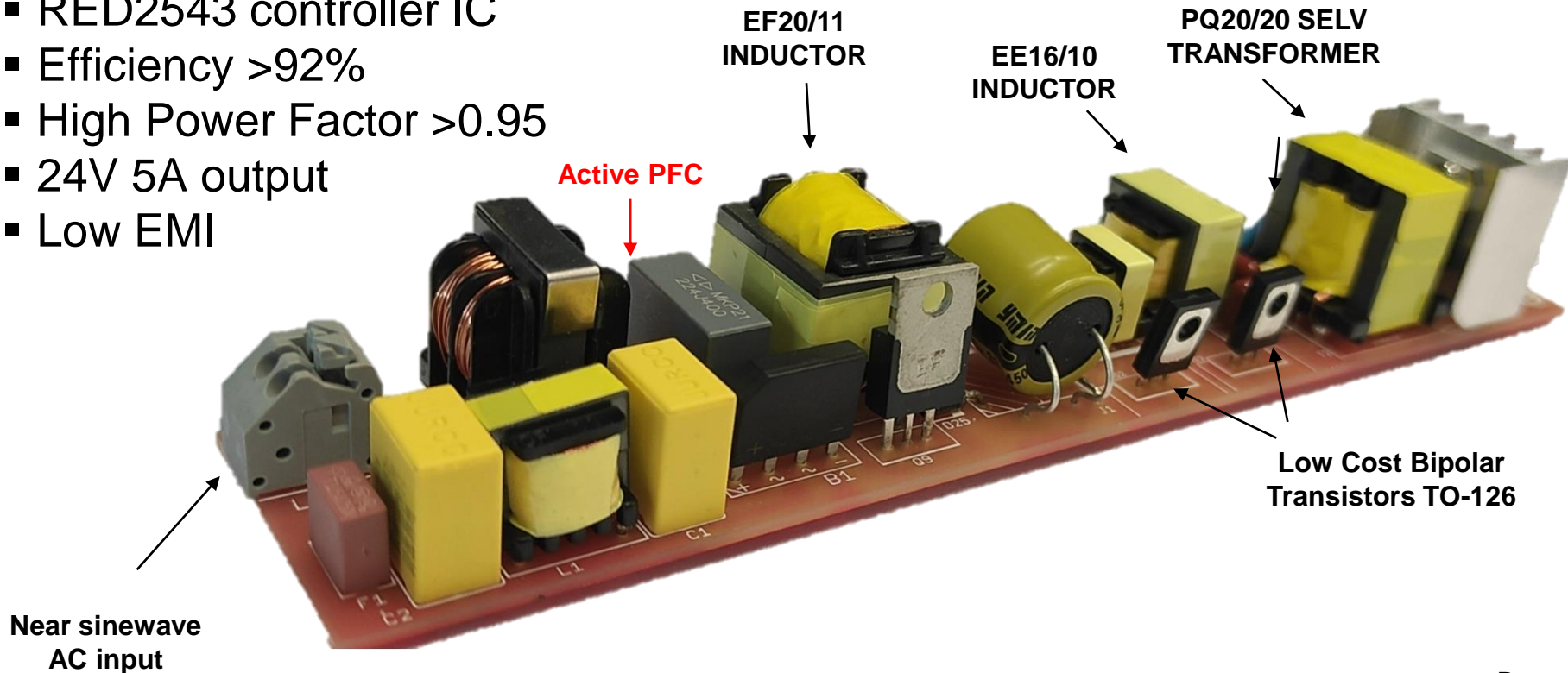




RED2543 120W CV LED Driver Design Report

August 2021

- Low-cost Flicker-free CV LED driver
- RED2543 controller IC
- Efficiency >92%
- High Power Factor >0.95
- 24V 5A output
- Low EMI



Overview

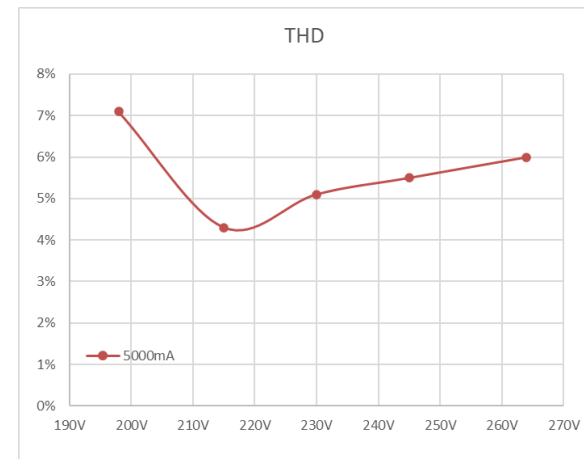
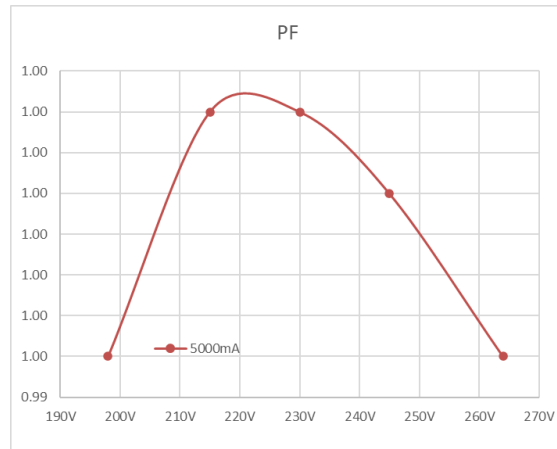
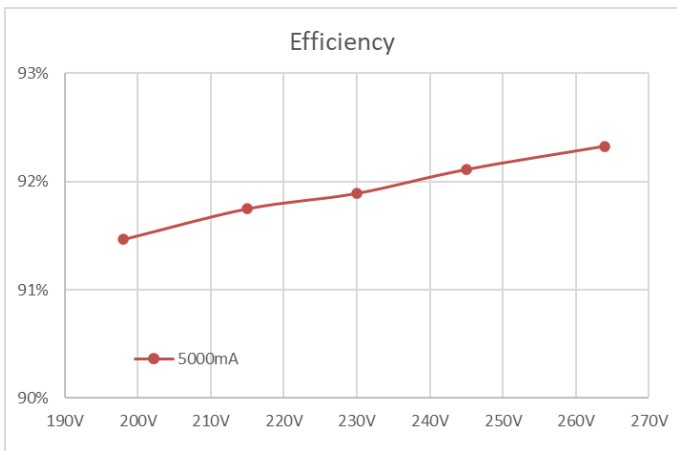


RediSem IC	RED2543 SOT23-6 LLC LED Driver IC
Output Power	120W
Output Voltage	24V constant voltage
Line regulation	0% (198 - 264VAC)
Load Regulation	0% (5A - 0A)
Output Current range	5A - 0A
Low Freq. Ripple	<0.3% @ 230V full load
Efficiency	>91.8% @ 230V full load
Magnetics	EF20/11, EE16/10, PQ20/20 SELV, EE10 base-driver
Audio noise	silent during PWM load, burst mode activates below 10% of output current
Input	198-264VAC, 50Hz
Survive input range	170 - 320VAC
PF	0.99 @ 230V full load
THD	5% @ 230V full load
CaseSize	210 x 36 x 30
Protection	Short circuit, Over Load, Over temperature, SELV
Converter	APFC LLC
Component Count	96

Test Results



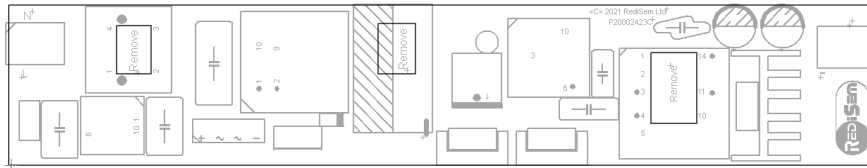
Output Current	2500mA					5000mA				
Input voltage	198V	215V	230V	245V	264V	198V	215V	230V	245V	264V
Output Voltage	23.80V	23.80V	23.80V	23.80V	23.80V	23.80V	23.80V	23.80V	23.82V	23.82V
Input Power	65.66	65.69	65.58	65.56	65.52	130.10	129.70	129.50	129.30	129.00
Output Power	59.50	59.50	59.50	59.50	59.50	119.00	119.00	119.00	119.10	119.10
Efficiency	90.6%	90.6%	90.7%	90.8%	90.8%	91.5%	91.8%	91.9%	92.1%	92.3%
Power Factor	0.994	0.990	0.985	0.969	0.968	0.995	0.998	0.998	0.997	0.995
THD	8.3%	8.8%	10.1%	10.0%	11.3%	7.1%	4.3%	5.1%	5.5%	6.0%



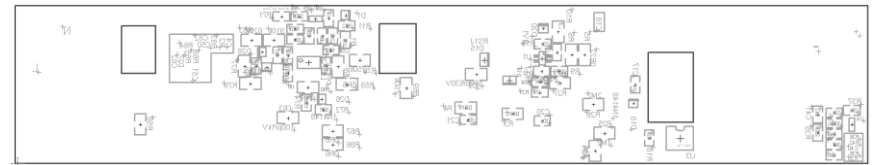
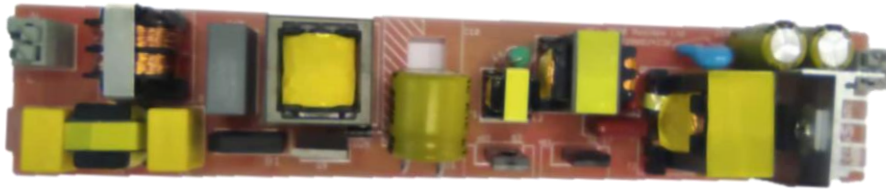
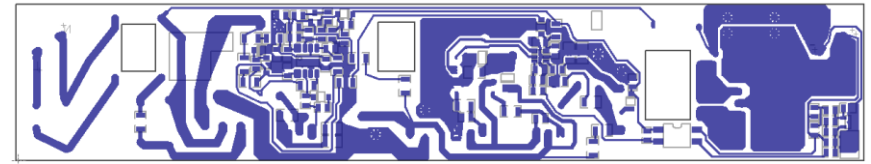
PCB layout



Top Side

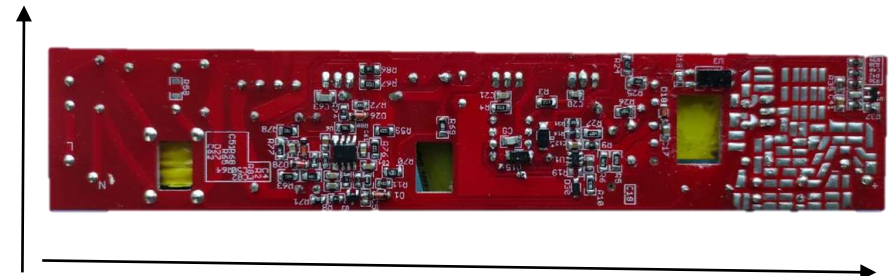


Bottom Side



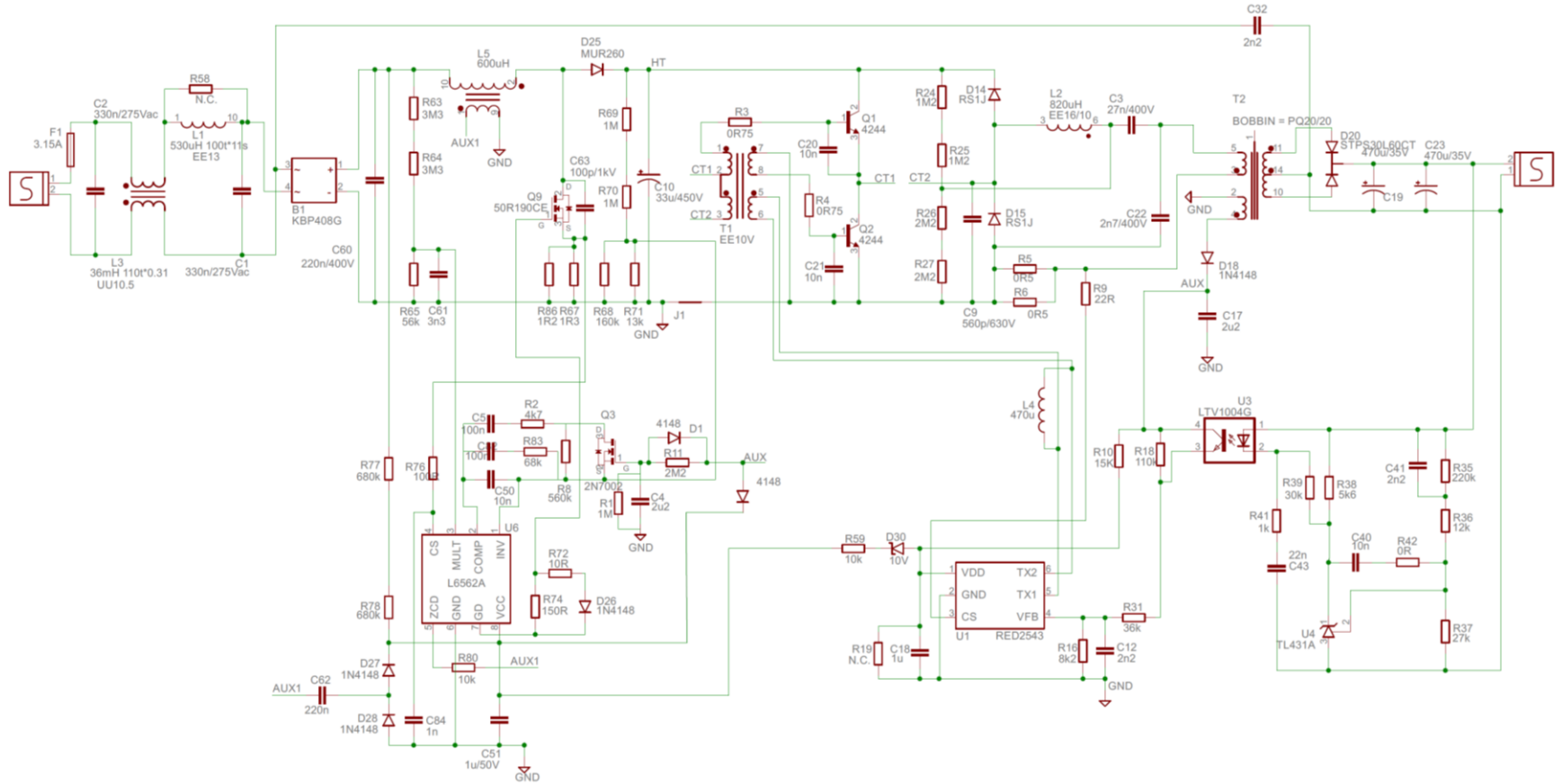
- Single sided PCB
- 1mm thick
- 1 Oz copper

34mm



183mm

Schematic



Code	Value	Description	Qty	Supplier
B1	DF6S	D4UB100	1	
C1, C2	330n	XCAP	2	
C4	2u2	0805 X7R 10% 50VDC	1	
C5	100n	0805 X7R 10% 50VDC	1	
C3	2n2	MKP 5% 630VDC	1	
C9	560p	1206 NPO 5% 630VDC	1	Murata
C10	56u	ELEC 20% 450VDC	1	Ymin
C12	2n2	0805 X7R 10% 25VDC	1	Murata
C17	2u2	0805 X7R 10% 50VDC	1	
C18	2u2	0805 X7R 10% 10VDC	1	
C19, 23	470uF	ECAP 20% 35VDC	2	
C20, 21	10n	0805 X7R 10% 50VDC	2	
C32	2n2	Y-CAP	1	
C40	2n2	0805 X7R 10% 50VDC	1	
C41	10n	0805 X7R 10% 50VDC	1	
C43	22n	0805 X7R 10% 50VDC	1	
C50	10n	0805 X7R 10% 50VDC	1	
C51	1uF	0805 X7R 10% 50VDC	1	
C60	220n	MKP 5% 400VDC	1	Fara
C61	3n3	0805 X7R 10% 50VDC	1	
C62	10n	0805 X7R 10% 50VDC	1	
C22	2n2	MKP 5% 630VDC	1	Fara
C82	100n	0805 X7R 10% 50VDC	1	
C84	10n	0805 X7R 10% 50VDC	1	
D14 15	RS1J	Fast Diode	2	TSC/Vishay
D1 D2 18 26 27 28	1N4148	small signal schottky diode	6	
D20	STPS30L60CT		1	
D25	MUR260		1	
D30	9V1	zener diode	1	
L1	530u	EE13	1	
L2	680uH	main inductor EE16/10	1	
L3	36mH	UU10.5	1	
L4	470uH	0410 inductor	1	
L5	600uH	APFC inductor EF20/11	1	
P1 P2		terminal	2	
Q1 Q2	4244	NPN transistor TO-126	2	Jilin
Q3	2N7000		1	
Q9	50R190CE	MOSFET DPAK	1	
R1	1M	1206 1% resistor	1	
R2	4k7	0805 1% resistor	2	
R3 4	0.75R	0805 1% resistor	2	

R5	0.5R	1206 1% resistor	1	
R6	0.5R	1206 1% resistor	1	
R8	220k	0805 1% resistor	1	
R9	22R	0805 1% resistor	1	
R10	15k	0805 1% resistor	1	
R11	2M2	1206 1% resistor	1	
R16	8k2	0805 1% resistor	1	
R18	110k	0805 1% resistor	1	
R24 25	1M2	1206 1% resistor	2	
R26 27	2M2	1206 1% resistor	2	
R31	36k	0805 1% resistor	1	
R35	220k	0805 1% resistor	1	
R36	12k	0805 1% resistor	1	
R37	24k	0805 1% resistor	1	
R38	5k6	0805 1% resistor	1	
R39	30k	0805 1% resistor	1	
R41	1k	0805 1% resistor	1	
R59	5k6	0805 1% resistor	1	
R63 64	3M3	1206 1% resistor	2	
R65	56k	0805 1% resistor	1	
R67	1R3	1206 1% resistor	1	
R68	270k	08051% resistor	1	
R69 70	680k	1206 1% resistor	2	
R71	13k	0805 1% resistor	1	
R72	10R	0805 1% resistor	1	
R74	150R	0805 1% resistor	1	
R76	100R	0805 1% resistor	1	
R77 78	680k	1206 1% resistor	2	
R80	10k	1206 1% resistor	1	
R83	68k	0805 1% resistor	1	
R86	1R2	0805 1% resistor	1	
T1	EE10	Base drive	1	
T2	PQ2020	output Transformer	1	
U1	RED2543	SOT23-6	1	RediSem
U3	LTV1004G		1	
U4	ATL431		1	
U6	L6562D	APFC SO8 IC	1	ST
Total			96	

RED2543 Datasheet



RED2543

Improved Resonant Controller for CV LED Drivers

Features

- Reduced pincount for smaller size & lower cost
- Reduced audio noise with improved burst-mode performance
- Reduced output ripple
- Improved transient response
- Reduced standby power
- Accurate primary side limiting of output current
- Boost current feature to ensure reliable startup with constant power loads
- Protection modes:
 - Overload output including short-circuit
 - No-Load output
 - Over-temperature
- Low standby power
- Smallest SOT23-6 IC package



SOT23-6

Applications

- Passive PFC CV LED drivers 80W
- Active PFC CV LED drivers up to 200W

Order code

Part Number	Package	Packaging
RED2543AL-TR7	SOT23-6	Tape and reel

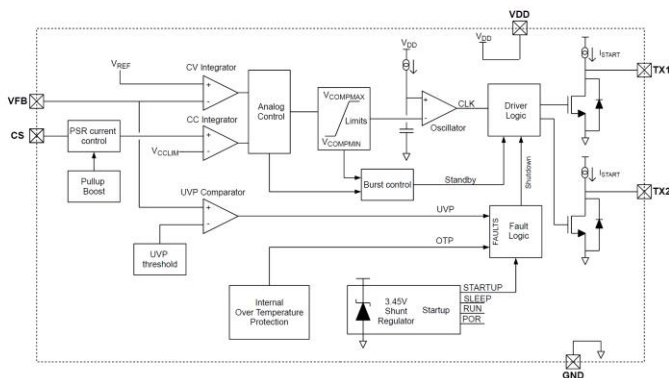


Figure 1: Block diagram



RED2543 LED LLC Controller

Device Pins

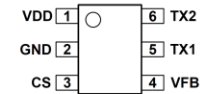
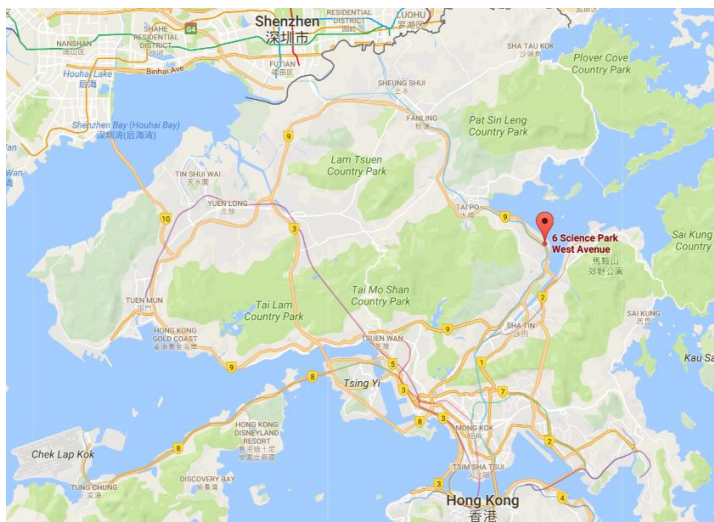


Figure 2: SOT23-6 pin connections (top view)

Pin Functions

Pin #	Name	Function
1	VDD	IC Power Supply pin
2	GND	Chip ground
3	CS	PSR Current Sense input provides output current regulation and cycle-by-cycle over-current protection. The CS pin is connected to the half-bridge current sense resistor
4	VFB	PSR Feedback input for output voltage regulation. Connect to primary sense winding
5	TX1	Output to control transformer
6	TX2	Output to control transformer

Contact details



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