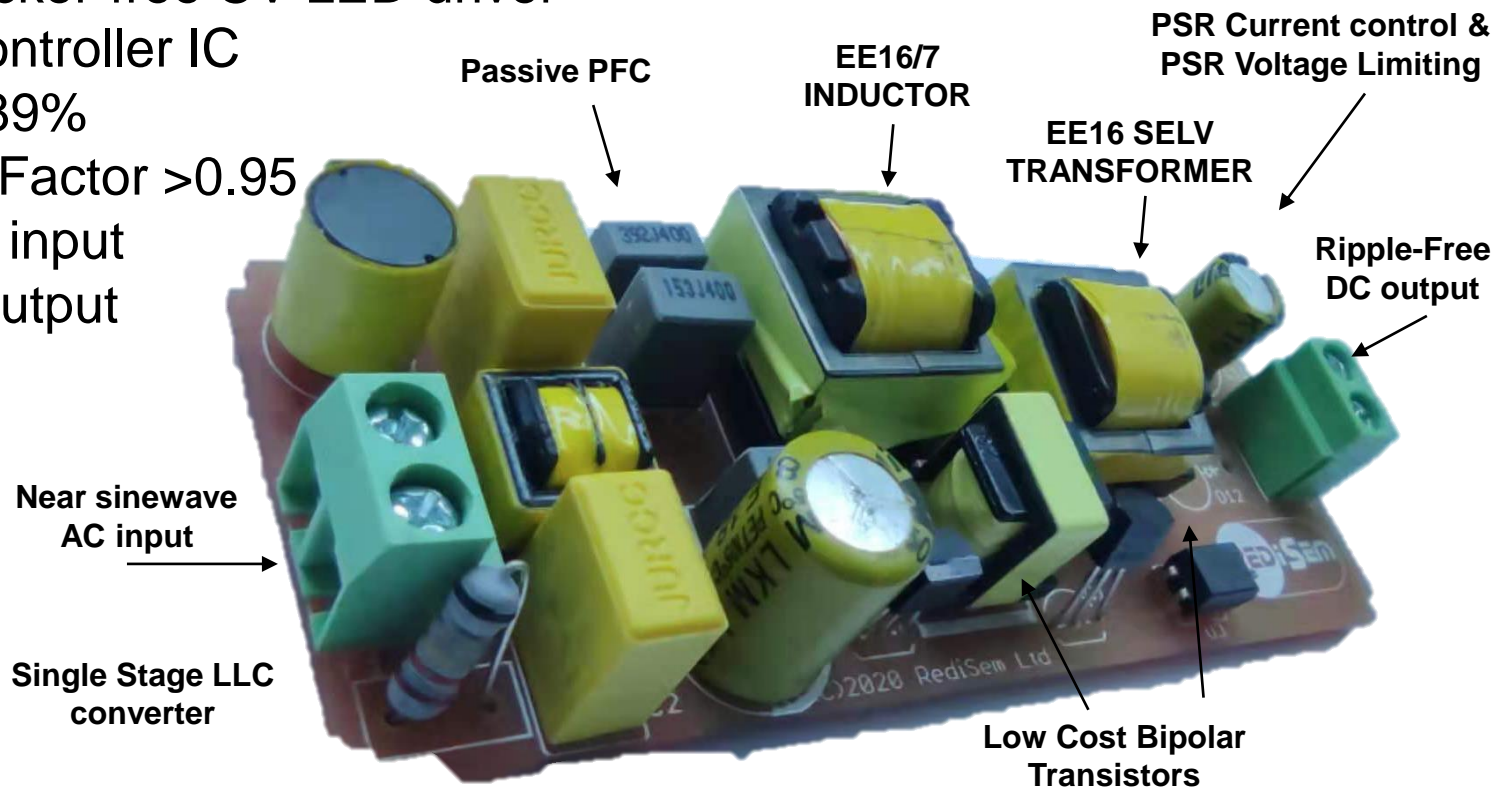




# RED2542 30W CV LED Driver Design Report

August 2021

- Low-cost Flicker-free CV LED driver
- RED2542 controller IC
- Efficiency >89%
- High Power Factor >0.95
- 198-264Vac input
- 24V 1.25A output
- Low EMI

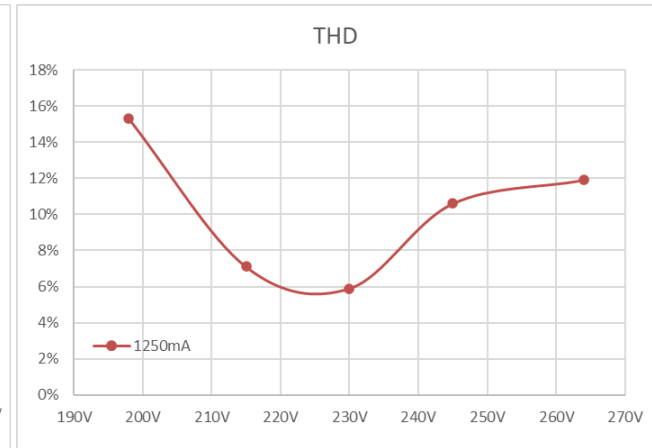
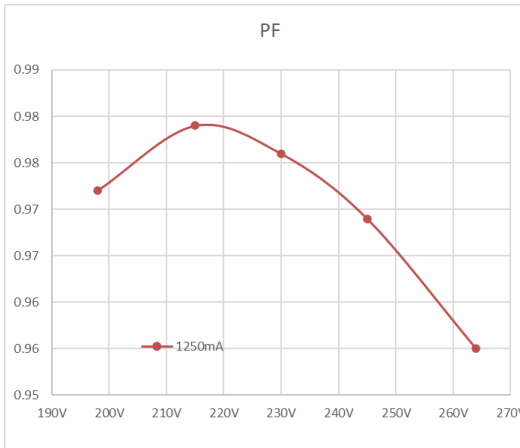
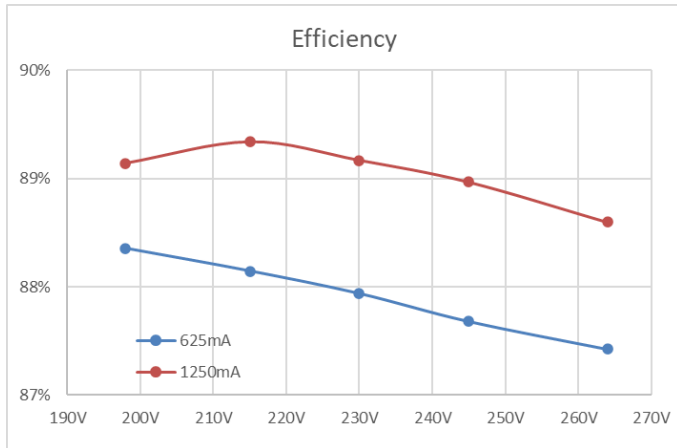


<b>RediSem IC</b>	RED2542 SOT23-6 LLC LED Driver IC
<b>Output Power</b>	30W
<b>Output Voltage</b>	24V constant voltage
<b>Line regulation</b>	0% (198 - 264VAC)
<b>Load Regulation</b>	0% (1.25A - 0A)
<b>Output Current range</b>	1.25A - 0A
<b>Low Freq. Ripple</b>	<0.1% @ 230V full load
<b>Efficiency</b>	89% @ 230V full load
<b>Magnetics</b>	EE16/7, EE16 SELV, EE10 basedriver
<b>Audio noise</b>	silent during PWM load, burst mode activates below 5% of output current
<b>Input</b>	198-264VAC, 50Hz
<b>Survive input range</b>	170 - 320VAC
<b>PF</b>	0.98 @ 230V full load
<b>THD</b>	6.4% @ 230V full load
<b>Size</b>	113mm x 40mm x 23mm
<b>Protection</b>	Short circuit, Over Load, Over temperature, SELV
<b>Converter</b>	1.5 boost PPFC CV LLC converter
<b>Component Count</b>	55

# Test Results



Output Current	625mA					1250mA				
Input voltage	198V	215V	230V	245V	264V	198V	215V	230V	245V	264V
Output Voltage	23.99V	23.99V	23.99V	23.99V	23.99V	23.99V	24.00V	23.99V	24.00V	24.00V
Input Power	16.97	17.01	17.05	17.10	17.15	33.64	33.58	33.63	33.72	33.86
Output Power	14.99	14.99	14.99	14.99	14.99	29.99	30.00	29.99	30.00	30.00
Efficiency	88.4%	88.1%	87.9%	87.7%	87.4%	89.1%	89.3%	89.2%	89.0%	88.6%
Power Factor	0.863	0.858	0.852	0.845	0.829	0.972	0.979	0.976	0.969	0.955
THD	47.0%	46.6%	46.2%	45.6%	46.0%	15.3%	7.1%	5.9%	10.6%	11.9%
LF Voltage Ripple (pk-pk) %	0.01%	0.01%	0.01%	0.01%	0.01%	1.37%	0.02%	0.02%	0.02%	0.02%



# Thermal Results

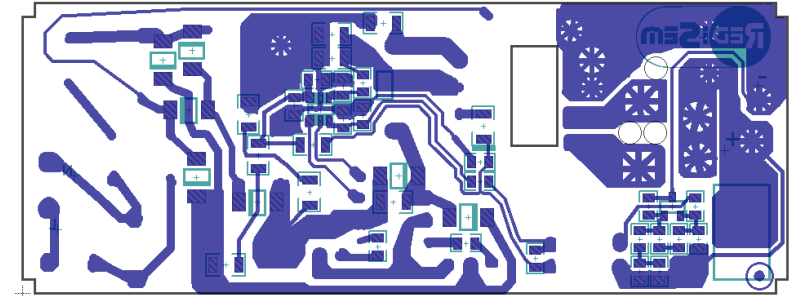
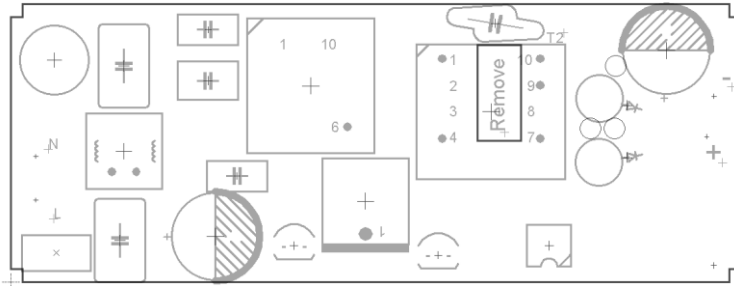


Thermal Results (cased)	198V 2.5A	264V 2.5A
Ta	36C	36C
Q1	108C	107C
Q2	110C	108C
L2 core	100C	117C
L2 winding	100C	117C
T2 core	109C	115C
T2 winding	101C	108C
TDIODE1	110C	114C
TDIODE2	107C	114C

# PCB layout

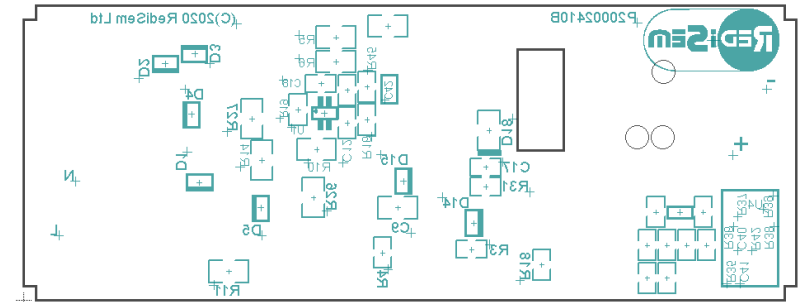
Top Side

Bottom Side

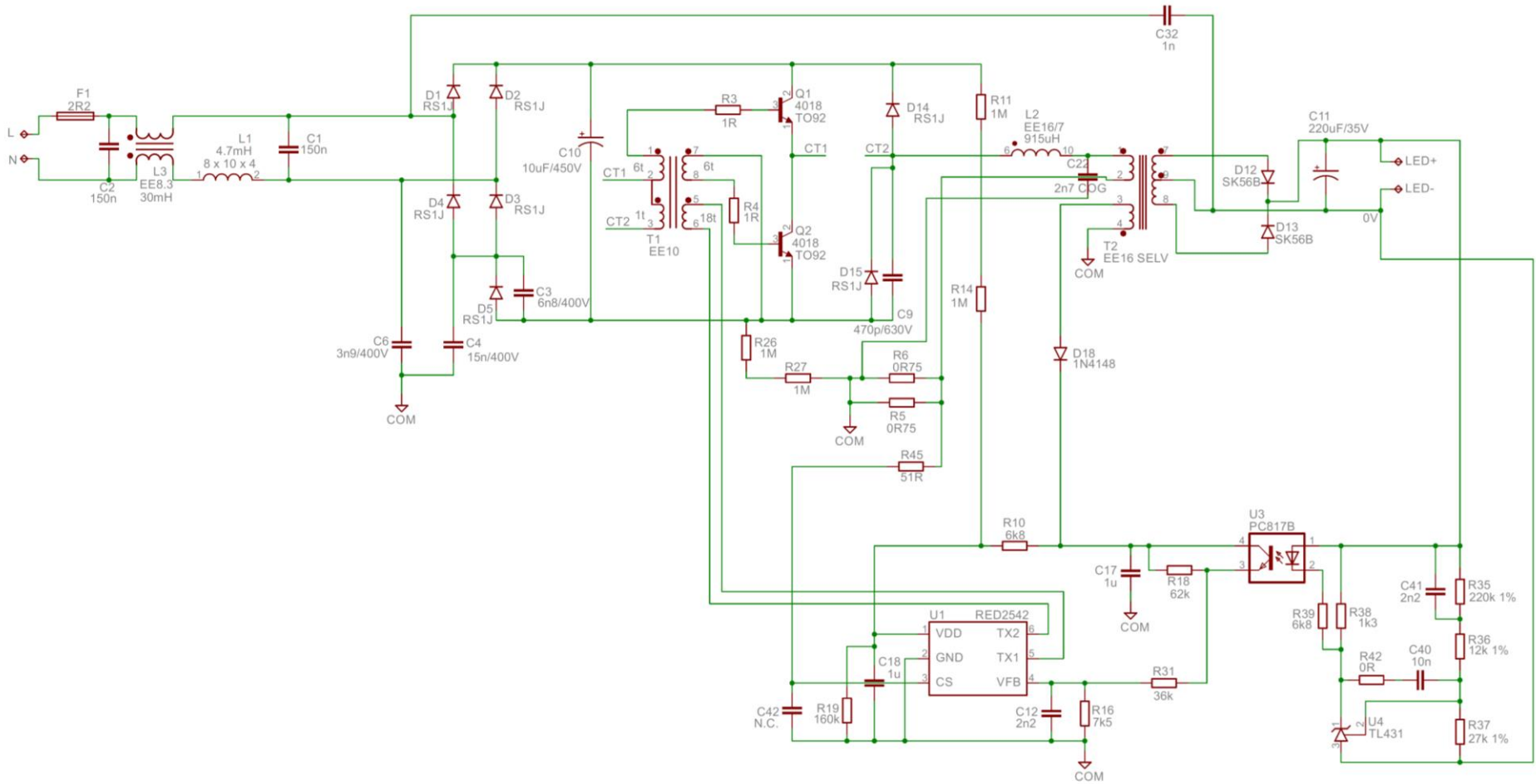


113mm

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



# Schematic



Code	Value	Description	Qty	Supplier
C1	150n	X2 MKP 20% 275VAC	1	Tenta
C2	150n	X2 MKP 20% 275VAC	1	Tenta
C3	6n8	MKP 5% 400VDC	1	Fara
C4	15n	MKP 5% 400VDC	1	Fara
C6	3n9	MKP 5% 400VDC	1	Fara
C9	470p	1206 NPO 5% 630VDC	1	Murata
C10	10u	ELEC 20% 450VDC	1	Ymin
C11	220u	ELEC 20% 35VDC	1	Aishi
C12	2n2	0805 COG 5% 50VDC	1	Samsung
C17	1u	0805 X7R 10% 50VDC	1	Samsung
C18	2u2	0805 X7R 10% 10VDC	1	Samsung
C32	1n	Y-CAP	1	
C40	10n	0805 X7R 10% 50VDC	1	
C41	1n	0805 X7R 10% 50VDC	1	
D12,13	SL56B		2	
D1,2,3,4,5,14,15	RS1J	Fast Diode 600VDC 1A	7	TSC/Vishay
D18	1N4148	MiniMELF	1	Vishay
F1	2R2	Resistor Fuse	1	
L1	4m7H	8x10x3 Drum Core	1	
L2	915uH	EE16/7 Main Inductor	1	
L3	30mH	EE8.3 Common mode	1	
R3,4	1R	0805 0.06W 1.0%	2	
R5,6	0R75	1206 0.25W 1.0%	2	
R11,14,27,28	1M	0805 0.06W 1.0%	4	
R10	6k8	0805 0.06W 1.0%	1	
R16	7k5	0805 0.06W 1.0%	1	
R18	62k	0805 0.06W 1.0%	1	
R19	160k	0805 0.06W 1.0%	1	
R31	36k	0805 0.06W 1.0%	1	
R35	220k	0805 0.06W 1.0%	1	
R36	12k	0805 0.06W 1.0%	1	
R37	27k	0805 0.06W 1.0%	1	
R38	1k3	0805 0.06W 1.0%	1	
R39	6k8	0805 0.06W 1.0%	1	
R42	0R	0805 0.06W 1.0%	1	
R45	51R	0805 0.06W 1.0%	1	
Q1,Q2	4018	TO-92 2A NPN Transistor (Ts=2-2.5us)	2	
T1	EE10	Base Drive , 18:6:6:1 turns	1	
T2	EE16 SELV	Output Transformer	1	
U1	RED2542	LLC LED controller IC	1	Redisem
U3	PC817B	Photocoupler	1	SHARP
U4	TL431B	Shunt Voltage Regulator	1	
<b>TOTAL</b>			<b>55</b>	



## RED2542

### 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 30W
- Active PFC CV LED drivers up to 75W

#### Order code

Part Number	Package	Packaging
RED2542AL-TR7	SOT23-6	Tape and reel

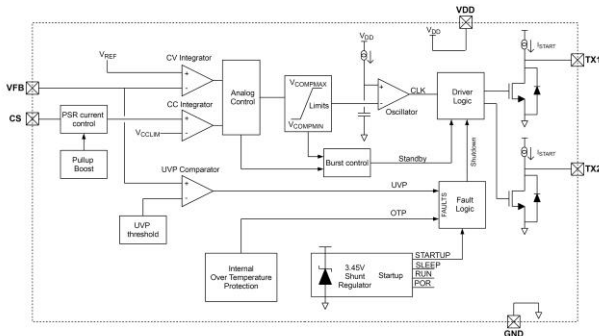


Figure 1: Block diagram



## RED2542 LED LLC Controller

#### Device Pins

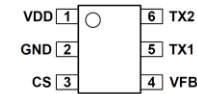


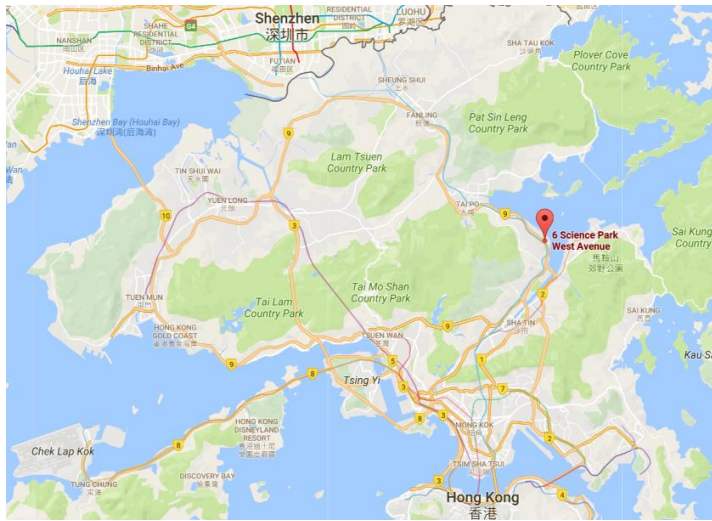
Figure 2: SOT23-6 pin connections (top view)

#### 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



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