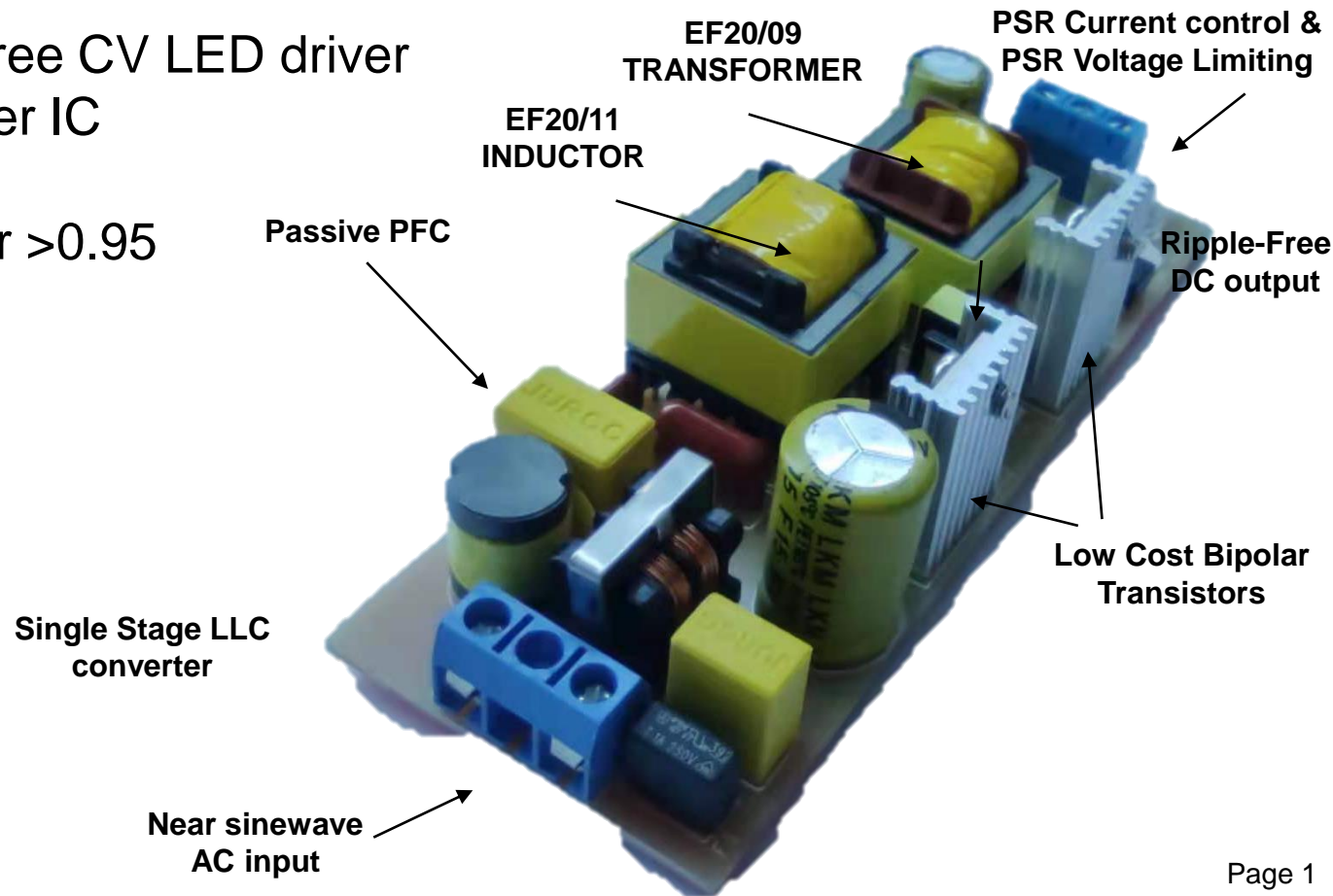




RED2543 60W CV LED Driver Design Report

August 2021

- Low-cost Flicker-free CV LED driver
- RED2543 controller IC
- Efficiency >90%
- High Power Factor >0.95
- 24V 2.5A output
- Low EMI



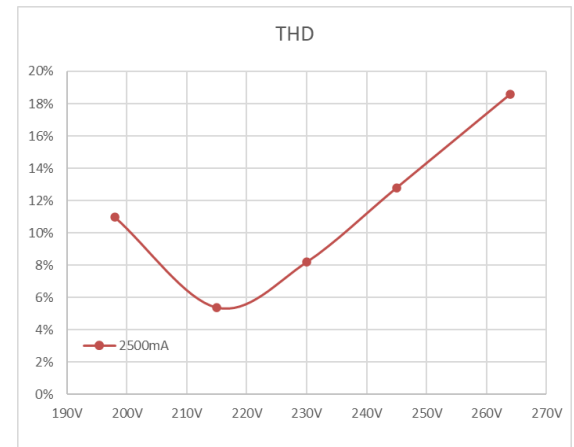
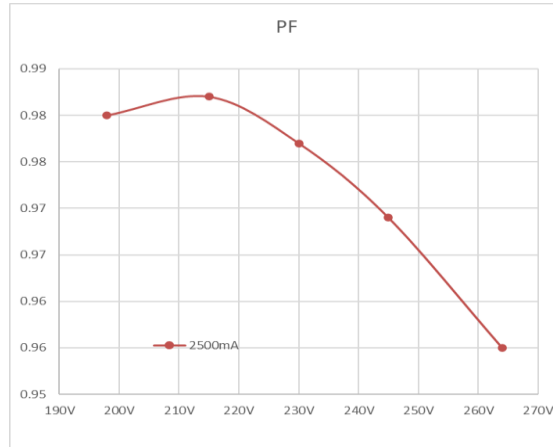
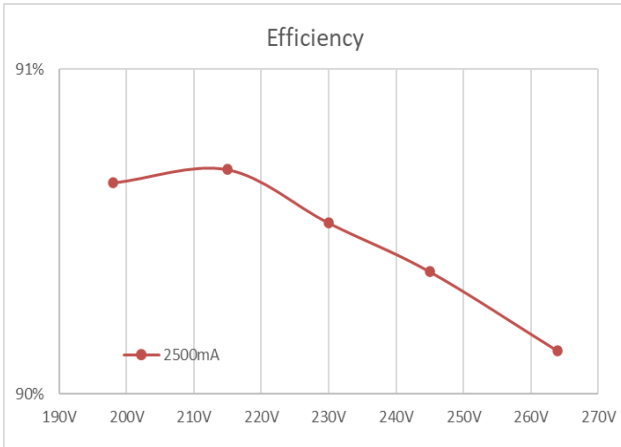
Overview

RediSem IC	RED2543 SOT23-6 LLC LED Driver IC
Output Power	60W
Output Voltage	24V constant voltage
Line regulation	0% (198 - 264VAC)
Load Regulation	0% (1.25A - 0A)
Output Current range	2.5A - 0A
Low Freq. Ripple	<0.3% @ 230V full load
Efficiency	>90% @ 230V full load
Magnetics	EF20/11, EF20/09 SELV, EE10 basedriver
Audio noise	silent during PWM load, burst mode activates below 6% of output current
Input	198-264VAC, 50Hz
Survive input range	170 - 320VAC
PF	0.98 @ 230V full load
THD	8.2% @ 230V full load
Size	140mm x 46mm x 30mm
Protection	Short circuit, Over Load, Over temperature, SELV
Converter	1.5 boost PFC CV LLC converter
Component Count	55

Test Results



Output Current	1250mA					2500mA				
Input voltage	198V	215V	230V	245V	264V	198V	215V	230V	245V	264V
Output Voltage	23.95V	23.95V	23.95V	23.95V	23.95V	23.95V	23.95V	23.95V	23.95V	23.95V
Input Power	33.23	33.27	33.32	33.39	33.47	66.05	66.02	66.14	66.25	66.43
Output Power	29.94	29.94	29.94	29.94	29.94	59.88	59.88	59.88	59.88	59.88
Efficiency	90.1%	90.0%	89.8%	89.7%	89.4%	90.7%	90.7%	90.5%	90.4%	90.1%
Power Factor	0.888	0.858	0.852	0.845	0.829	0.980	0.982	0.977	0.969	0.955
THD	41.6%	41.3%	41.5%	42.6%	46.4%	11%	5.40%	8.20%	12.80%	18.60%
LF Voltage Ripple (pk-pk) %	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.22%	0.22%	0.25%	0.28%



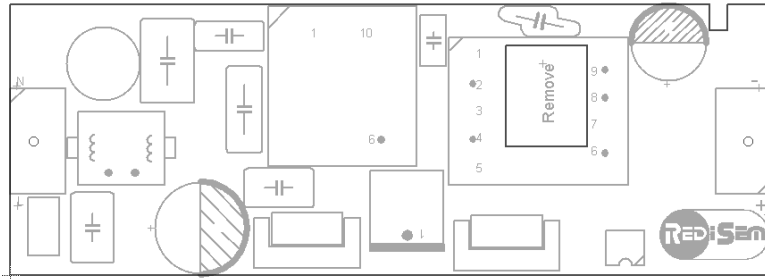
Thermal Results



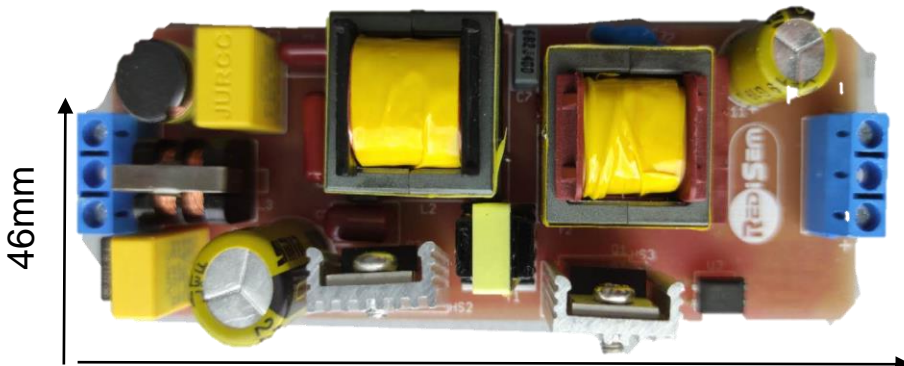
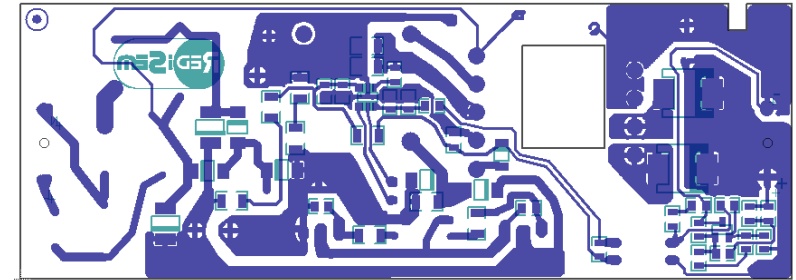
Thermal Results (cased and gap pad on both magnetics and output diodes)	198V 2.5A	264V 2.5A
Ta	35C	35C
Q1	85C	102C
Q2	90C	103C
L2 core	95C	111C
L2 winding	94C	107C
T2 core	90C	98C
T2 winding	95C	94C
TDIODE1	97C	98C
TDIODE2	100C	102C

PCB layout

Top Side

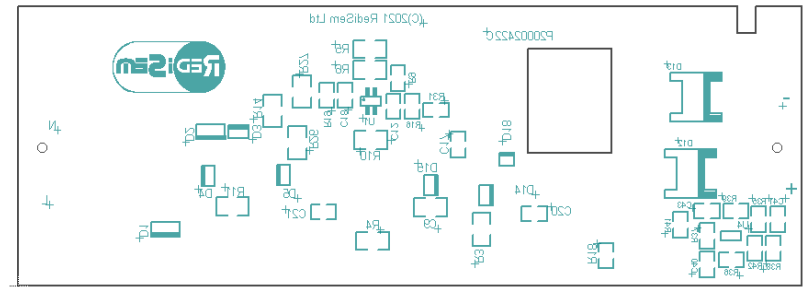


Bottom Side

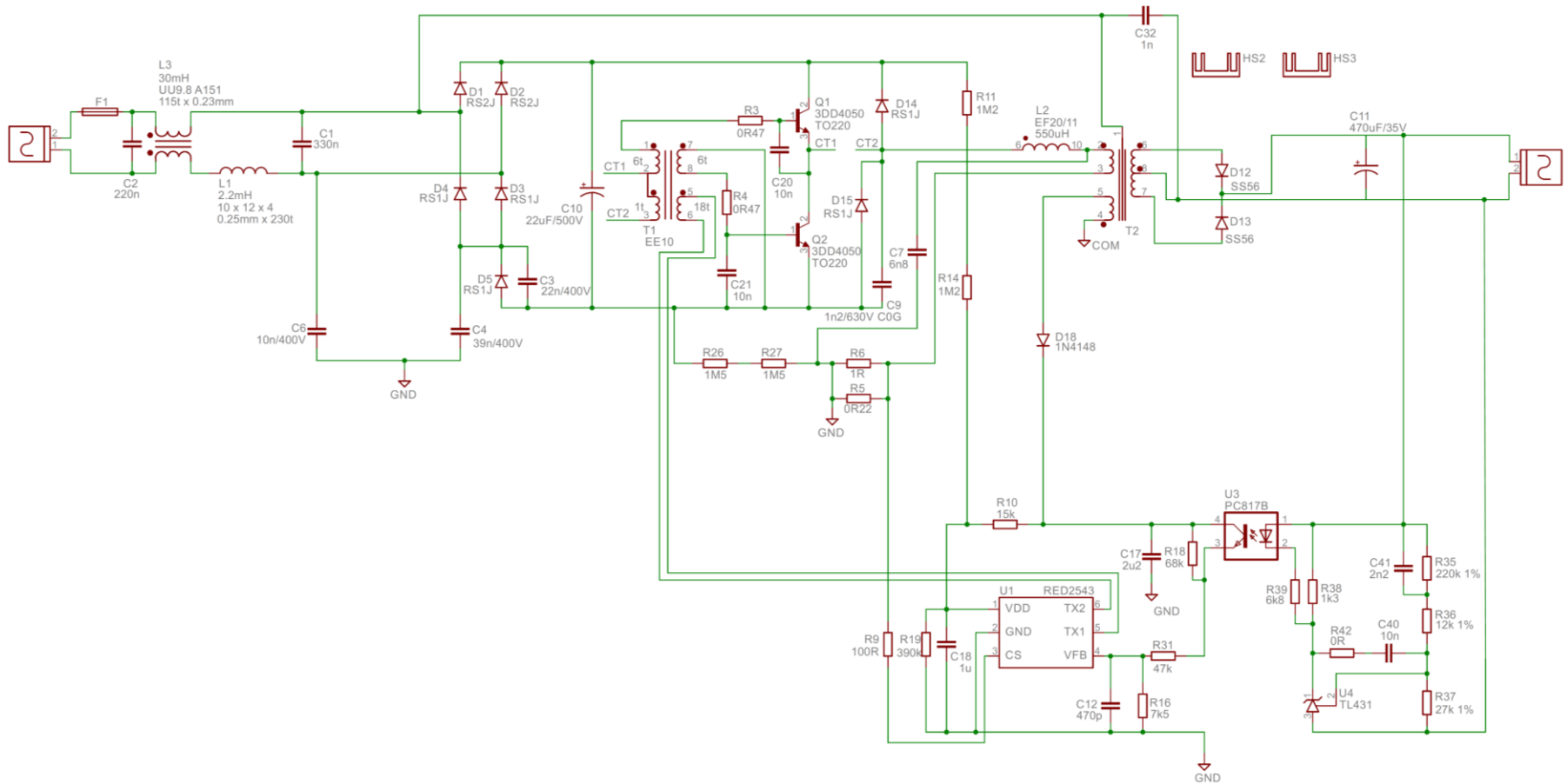


140mm

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



Schematic



Code	Value	Description	Qty	Supplier
C1	330n	X2 MKP 20% 275VAC	1	Tenta
C2	220n	X2 MKP 20% 275VAC	1	Tenta
C3	22n	MKP 5% 400VDC	1	Fara
C4	39n	MKP 5% 400VDC	1	Fara
C6	10n	MKP 5% 400VDC	1	Fara
C9	1n2	1206 NPO 5% 630VDC	1	Murata
C10	22u	ELEC 20% 450VDC	1	Ymin
C11	470u	ELEC 20% 35VDC	1	Aishi
C12	470p	0805 COG 5% 50VDC	1	Samsung
C17	2u2	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	2n2	0805 X7R 10% 50VDC	1	
D12,13	SS56	SMC 5A/60V	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	2m2	10x12x14 Drum Core	1	
L2	550uH	EF20/11 Main Inductor	1	
L3	30mH	EE8.3 Common mode	1	
R3,4	0R47	0805 0.06W 1.0%	2	
R5	1R	1206 0.25W 1.0%	1	
R6	0R22	1206 0.25W 1.0%	1	
R11,14	1M2	1206 0.25W 1.0%	2	
R26,27	1M5	1206 0.25W 1.0%	2	
R10	10k	0805 0.06W 1.0%	1	
R16	6k2	0805 0.06W 1.0%	1	
R18	110k	0805 0.06W 1.0%	1	
R19	390k	0805 0.06W 1.0%	1	
R31	30k	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	100R	0805 0.06W 1.0%	1	
Q1,Q2	3DD4050	TO-220 NPN Transistor	2	Hua Jing
T1	EE10	Base Drive , 18:6:6:1 turns	1	
T2	EF20/09 SELV	Output Transformer	1	
U1	RED2543	LLC LED controller IC	1	Redisem
U3	PC817B	Photocoupler	1	SHARP
U4	TL431B	Shunt Voltage Regulator	1	
TOTAL			55	

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

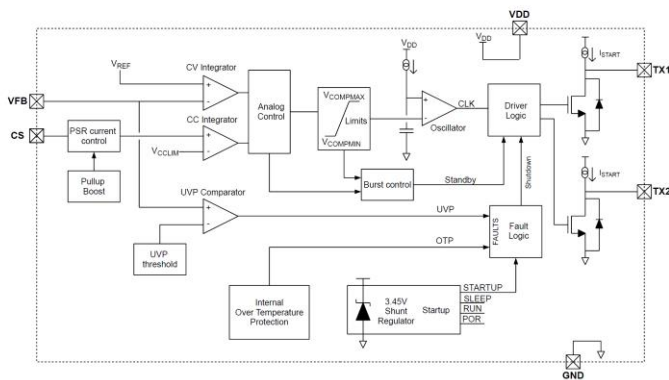


Figure 1: Block diagram



RED2543 LED LLC Controller

Device Pins

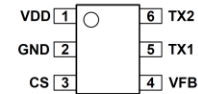
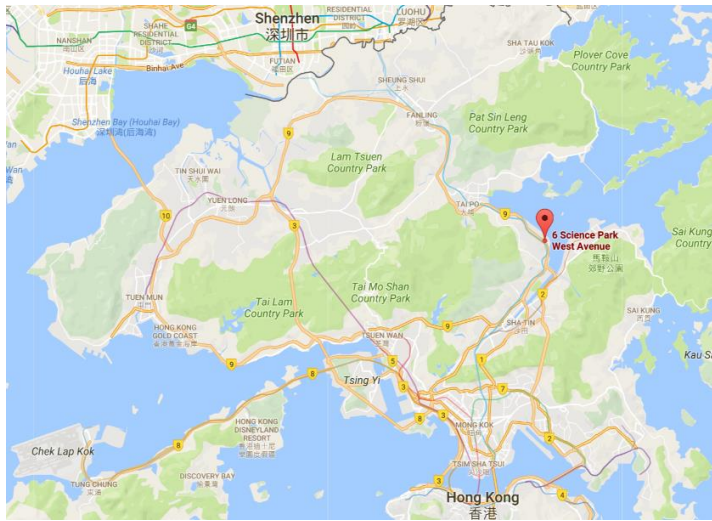


Figure 2: SOT23-6 pin connections (top view)

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



RediSem Hong Kong

218-219 Photonics Centre No 2,
Science Park East Avenue
H. K. Science & Technology Park Shatin,
New Territories, Hong Kong

info@redisem.com
tel. +852 2607 4141
fax. +852 2607 4140

RediSem Shenzhen

Room 1505, 15 Floor Caiwuwei
JinLong Building No. 139
Hongbao Road Guiyuan Street, Luohu
District Shenzhen City

eko.liu@redisem.com
tel. +86 755 8227 342

Approved Distributors

China

Mobicon Electronic Trading (Shenzen) Ltd.

17F, International Trade Bldg.
Renmin South Road
Luoho District, Shenzen P.R.C.
Tel. (86-755) 8221 1737
Fax. (86-755) 8221 1774
china@mobicon.com

Honestar Shenzen Headquarter

Rm.1502, East Tower, FIYTA Tech. Bldg.
Nanshan District
Shenzhen 518057 P.R. China
Tel. 86-755-86018818
Fax. 86-755-86018808
sales@honestar.com

India

Innovatech Switching Power India Private Ltd.

55, Ground Floor, 15th Cross, 9th Main
Vyalikaval
Bangalore, Karnataka 560003
Tel. 91-80-23560288
Tel. 91-9844088331
customer.service@ispipl.com

Korea

SOONAM Co., Ltd.

697 Pangyo-Ro,(A-905, Bundang Techno Park),
Bungang-Gu, Seongnam-Si,
Kyonggi-Do, 463-816, Korea
Contact Person: Mr. Seungjib Hong
Contact Number: +82 (0)10 9001 8248
seungjib.hong@redisem.com