

HIGH EFFICIENCY VFD POWER SUPPLY MODULE

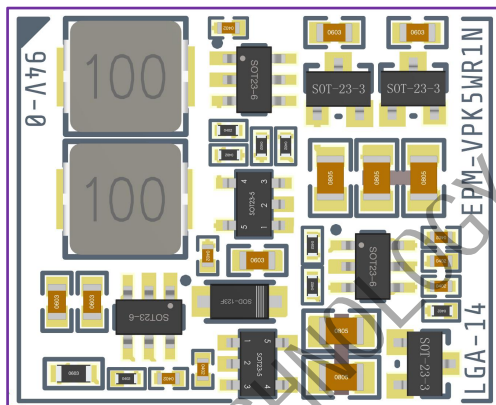
Features

- On board negative HV converter and filament driver.
- 22*18mm ultra small size LGA Package.
- High efficiency (Up to 95%).
- Wide-output voltage adjustable (-40V to -0.6V).
- Wide-voltage adjustable AC filament driver (VIN / 2 to 8V).
- Maximum output Current can reach 150mA(HV converter).
- Maximum output Current can reach 600mA(Filament driver).

Applications

- Audio product.
- Set top box product.
- Instrumentation.
- PT63XX Driver power.
- VFD Alarm clock.

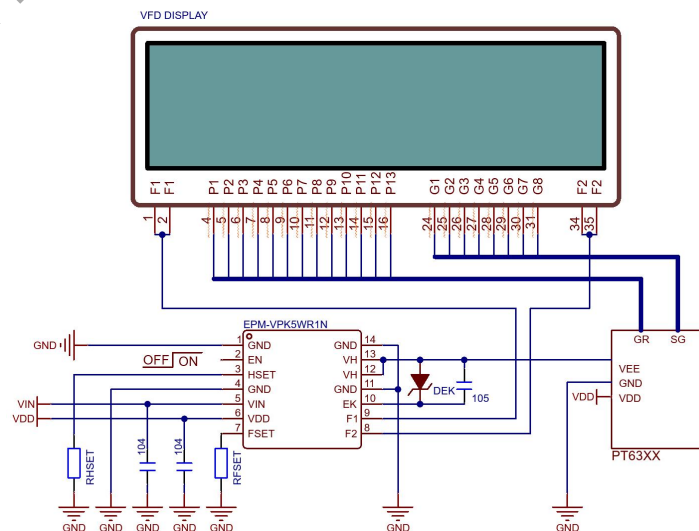
MODULE DIAGRAM (TOP)



(BOTTOM)

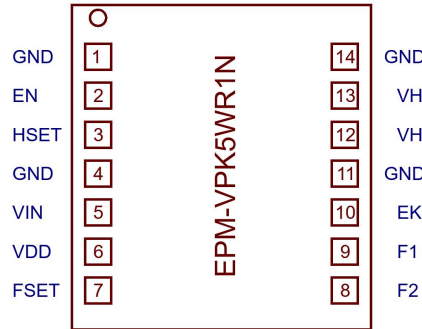


Typical Application



Pin Configuration and Functions

14-PIN LGA Package



Pin		I/O	Description
Name	NO.		
GND	1	G	Ground.
EN	2	I	Enable,high active.
HVA	3	I/O	HV Output Voltage setting,connect resistor to GND.
GND	4	G	Ground.
VIN	5	I	Power input
VDD	6	I	Logic Power input.
FVA	7	I/O	Filament Voltage output setting,connect resistor to GND.
F2	8	O	Filament Driver output.
F1	9	O	Filament Driver output.
EK	10	I/O	Cut-off Voltage setting,connect Zener diode to GND.
GND	11	G	Ground.
VH	12	O	Negative Voltage output.
VH	13	O	Negative Voltage output.
GND	14	G	Ground.

Absolute Maximum Ratings

*Exceeding absolute maximum ratings can cause permanent damage to the module

Item	Min	Max	Unit
VIN to GND	-0.3	14	V
VDD to GND	-0.3	5.5	V
EN to GND	-0.3	VIN	V
FVA to GND	-0.3	7	V
HVA to GND	-0.3	7	V
VH to GND	-50	50	V
Storage Temperature	-30	100	°C



Recommended Operating Conditions

Item	Min	Max	Unit
Power voltage input Range	4.5	5.5	Vdc
Logic power input Range	3.0	5.0	Vdc
HVA Resistor	1500	--	ohm
FVA Resistor	330	--	ohm
Cut-off voltage Adjustment Range	0.6	10	Vdc
VH Output Adjustment Range	-40	-0.6	Vdc
Filament driver Output Adjustment Range	VIN/2	6	Vac
VH Output Current	0	150	mA
Filament driver Output Current	0	600	mA

Electrical Characteristics

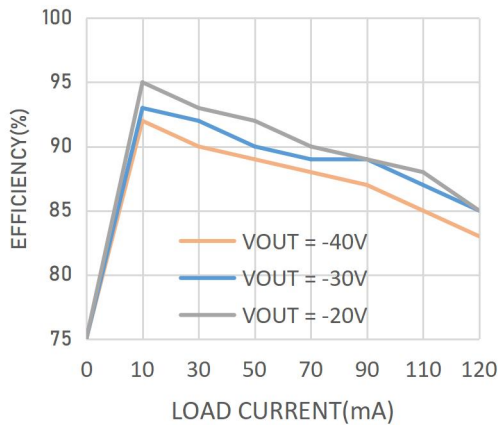
Parameter	Test Conditions	Min	Typ	Max	Unit
NEGATIVE OUTPUT					
I _{STDBY1} VIN Standby Current EN = 0V	VIN = 5V	--	3.5	5.0	mA
I _{STDBY2} VIN Standby Current EN = VIN	RHVA = 1500 ohm±1%	--	6.0	8.0	mA
I _{SC Δ} Short circuit current Limit(peak)		--	200	250	mA
F _{SW} Switch Frequency		--	1.2	--	MHz
V _{OUT} VH Output Voltage		-40.5	-40	-41	Vdc
I _{MAX} MAX Output Current		--	--	120	mA
FILAMENT DRIVER					
I _{STDBY1} VIN Standby Current EN = 0V	VIN = 5V RFVA = 680 ohm ±1%	--	3.5	5.0	mA
I _{STDBY2} VIN Standby Current EN = VIN		--	6.0	8.0	mA
I _{SC Δ} Short circuit current Limit(peak)		--	1000	1100	mA
V _{OUT} Output Voltage		--	VIN/2	6.0	Vac
I _{MAX} MAX Output Current		--	--	600	mA
F _{OUT} Output AC Frequency		190	200	205	KHz
V _{ADJ} Output Adjust Range	VIN = 5V	2.5	--	6	Vac
UVLO					
V _{UVP} UVLO Voltage		2.2	2.5	--	V
ENABLE CONTROL					
V _{IL max} EN Low Threshold		--	--	0.5	V
V _{IH min} EN High Threshold		1.2	--	--	V
R _{EN} EN Pull- down Resistance		--	10	--	KOhm



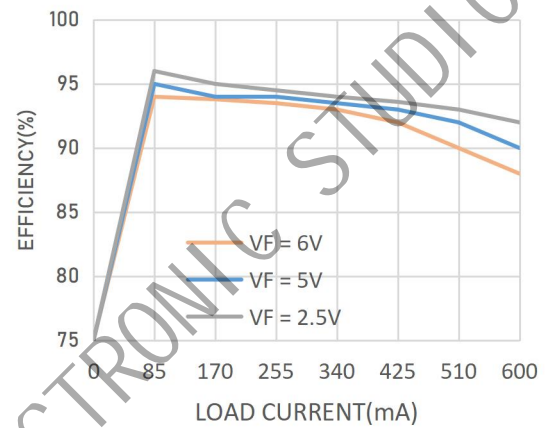
Typical Characteristics

VIN = 5V T = 25°C

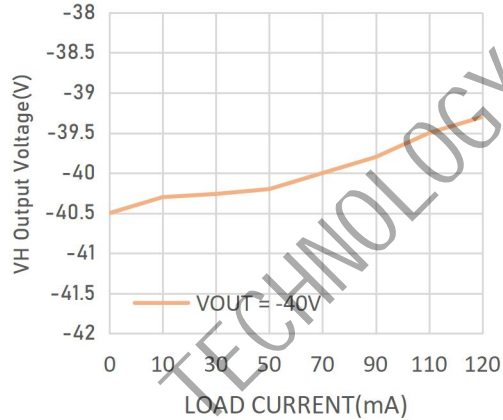
Efficiency VS VH Load Current



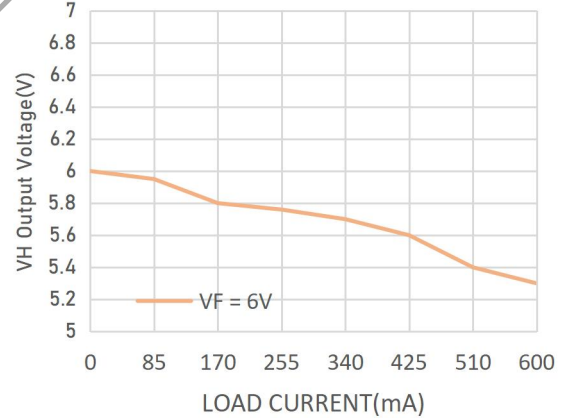
Efficiency VS Load Current



VH Load Regulation



Filament Driver Load Regulation

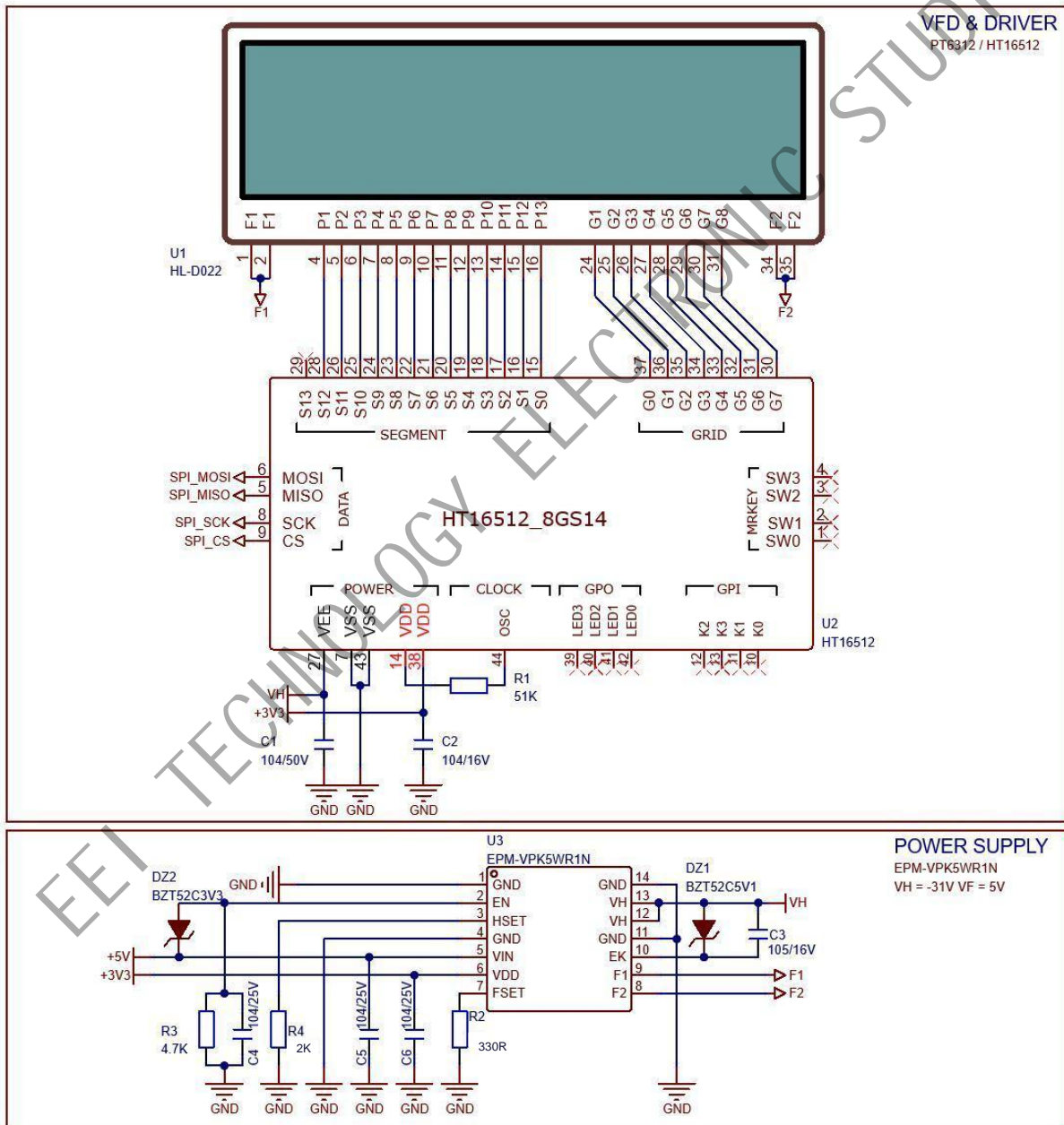


Parameter	Test Conditions	Min	Typ	Max	Unit
MODULE OUTPUT					
η Efficiency	VIN = 5V, VH = -20V	85	90	95	%
	VIN = 5V, VH = -30V	83	89	93	
	VIN = 5V, VH = -40V	82	88	90	
Δ VH Load Regulation	VIN = 5V, VH = -40V, ILoad = 0-100mA	-0.5	--	0.7	V
Δ Filament Load Regulation	VIN = 5V, VF = 6V, ILoad = 0-600mA	-0.75	--	--	V

PT6312 Applications Schematic

POWER VIN = 5V With 3.3V UVLO VH = -31V VF = 5V

LOGIC POWER = 3.3V Driver IC : PT6312/HT16512



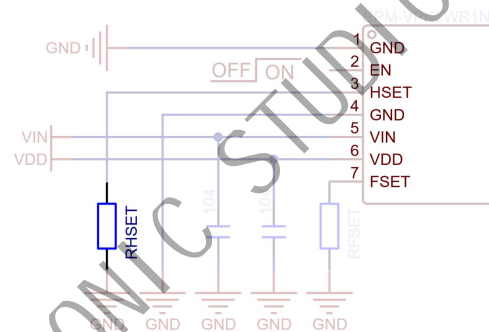
Detailed Design Procedure

VH Output Setting

The "VH" output voltage can be adjusted from -0.6V to -40V by changing "RHSET".

The resistance value of "RHSET" can be calculated by the following formula: $RHSET = (100000 / ((-VOUT / 0.6) - 1))$.

VOUT	RHSET
-20V	3K
-30V	2K
-35V	1.8K
-40V	1.5K

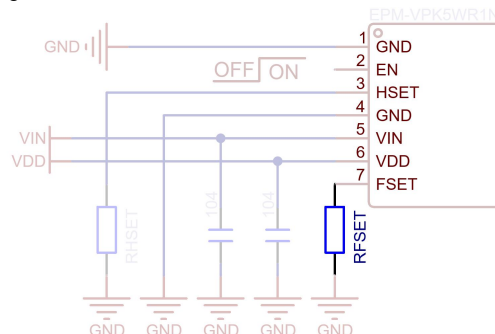


Filament Driver Output Setting

The "VF" output voltage can be adjusted from $VIN/2$ to 6V by changing "RFSET".

The resistance value of "RFSET" can be calculated by the following formula: $RFSET = (4700 / (((VOUT*2) / 0.6) - 1))$.

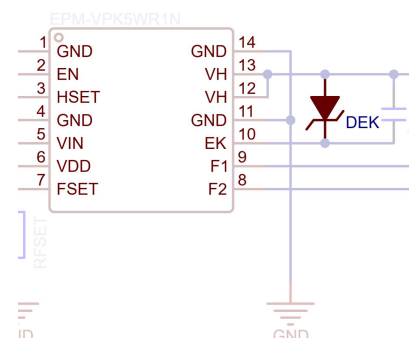
VF	RFSET
2.5V	680Ω
3.0V	510Ω
4.5V	380Ω
5.0V	300Ω



Cut-off Output Setting

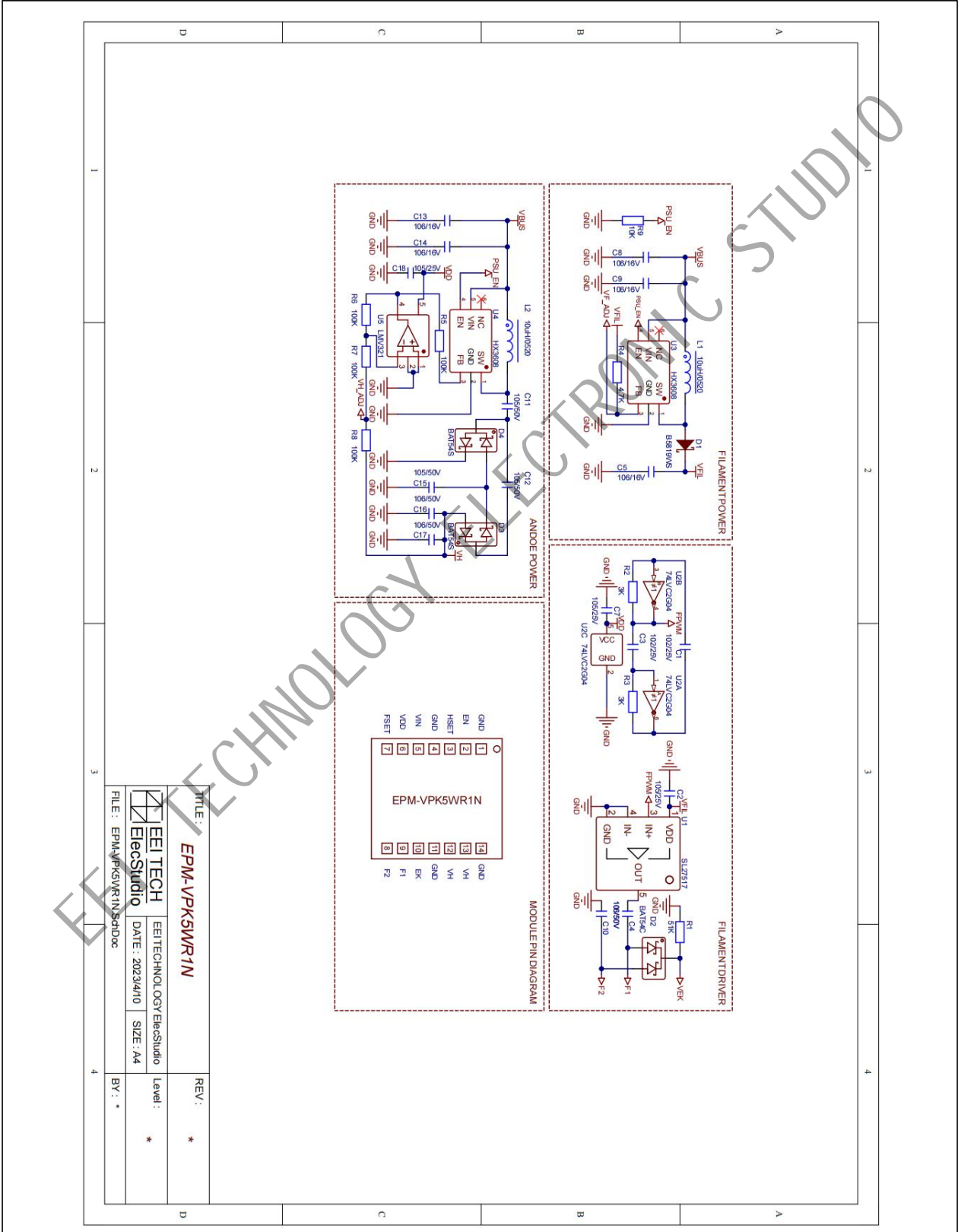
The "EK" voltage can be adjusted by changing "DEK" Zener Diode

The EK voltage can be calculated by the following formula: $EK = ((VF/2) - DEK)$



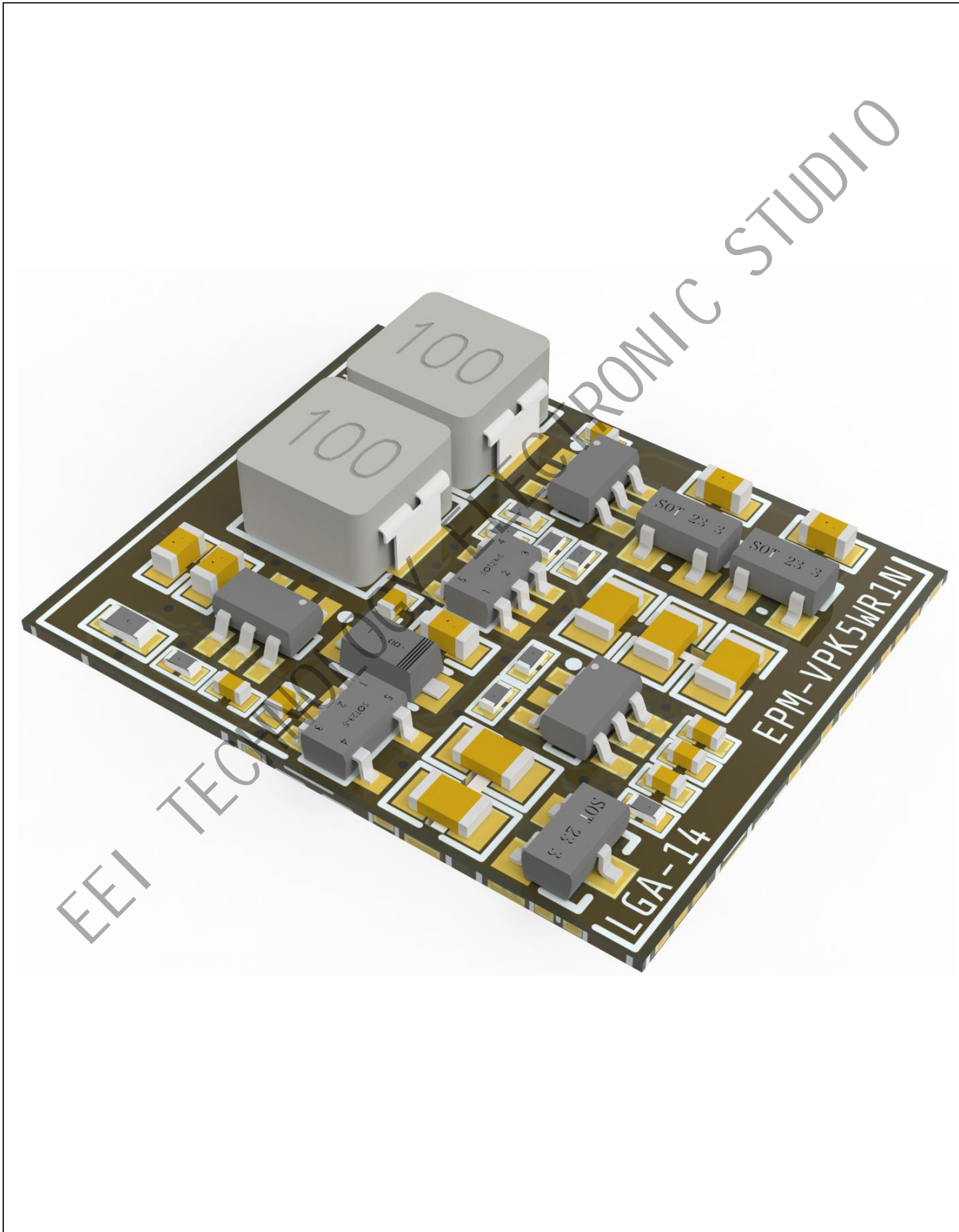


Module Schematic



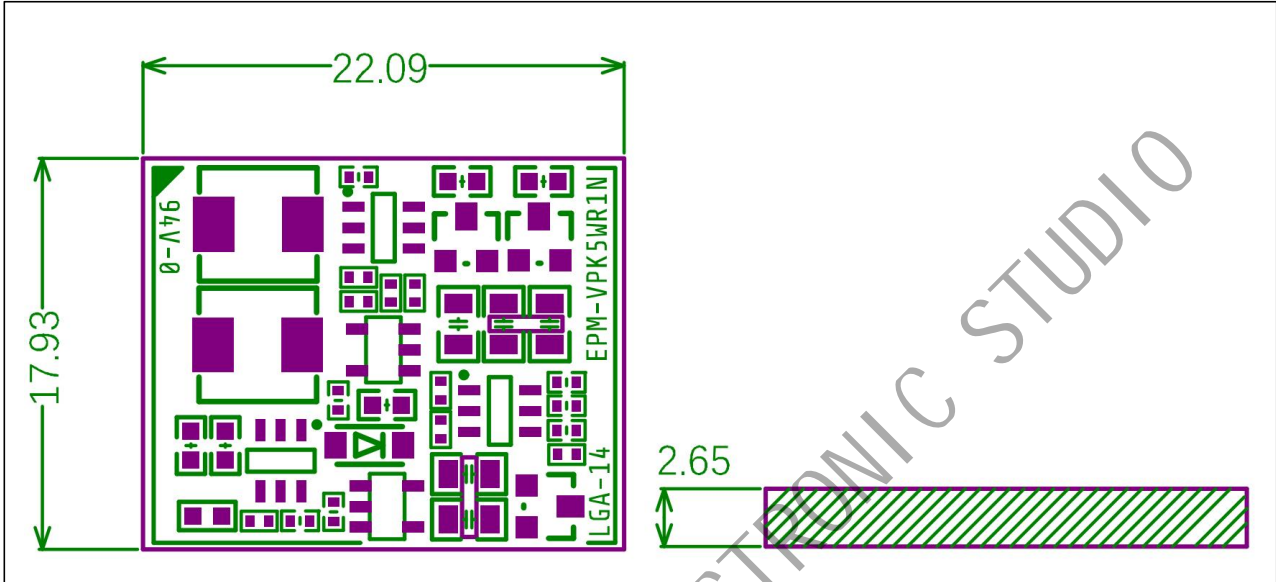
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Package View





Package Outline



Example P.C.B Layout

