MOSFET Integrated Smart Photoflash Capacitor Charger with IGBT Driver

General Description

The RT8805 is the most compact dual-phase synchronous buck controller in the industry specifically designed for high power density applications. This part is capable of delivering up to 60A output current due to its embedded bootstrapped drivers that support 12V + 12V driving capability.

The phase currents are sensed by innovative time sharing $R_{DS(ON)}$ current sensing technique for current balance and over current balance. Using one common GM amplifier to sense two phase currents eliminates offset and nonlinearity of the GM amplifier and yields good current balance. Other features include adjustable operation frequency from 50kHz to 1MHz, adjustable soft-start, PGOOD, external compensation, enable/shutdown for various application and performance consideration. The RT8805 comes to a tiny footprint package of VQFN-24L 4x4 packages.

Features

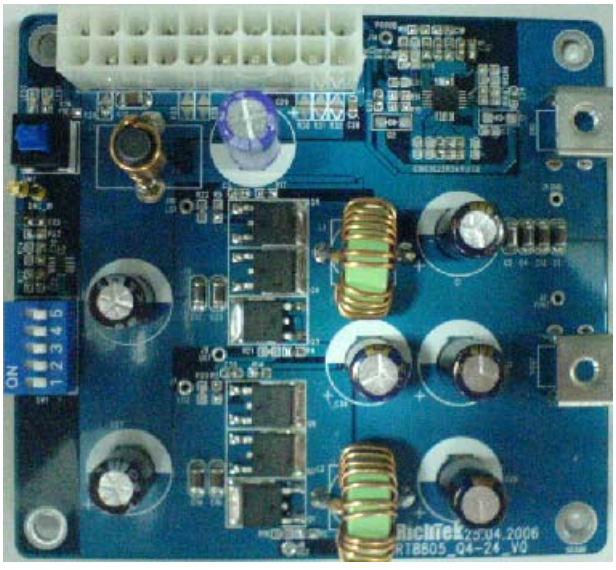
- **Embedded 12V Boot Strapped Driver**
- **Low Side MOSFET $R_{DS(ON)}$ Current Sensing for Power Stage Current Balance**
- **Adjustable Soft-Start**
- **Adjustable Frequency and Typical at 300kHz Per Phase**
- **External Compensation**
- **Adjustable Over Current Protection**
- **Power Good Indication**

Applications

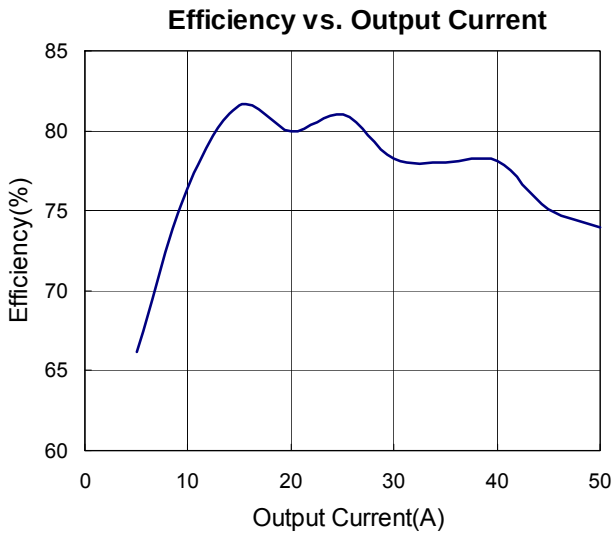
- Middle-High End GPU Core Power
- High End Desktop PC Memory Core Power
- Low Output Voltage, High Power Density DC-DC Converters
- Voltage Regulator Modules

IC Part Number	RT8805PQV
Board Number	RT8805_Q4-24_V0

Evaluation Board



RT8805_Q4-24_V0



Specification

Parameter	Symbol	Min	Typ	Max	Units
Input Voltage Range	V_{IN}	10.8	12	13.2	V
Output Voltage	V_{OUT}	1.23	1.29	1.35	V
Rated Output Current	I_{RATE}	--	50	--	A
Switching Frequency	f_{SW}	255	300	345	kHz
OCP Trip Point	I_{TRIP}	--	73	--	A

Schematic

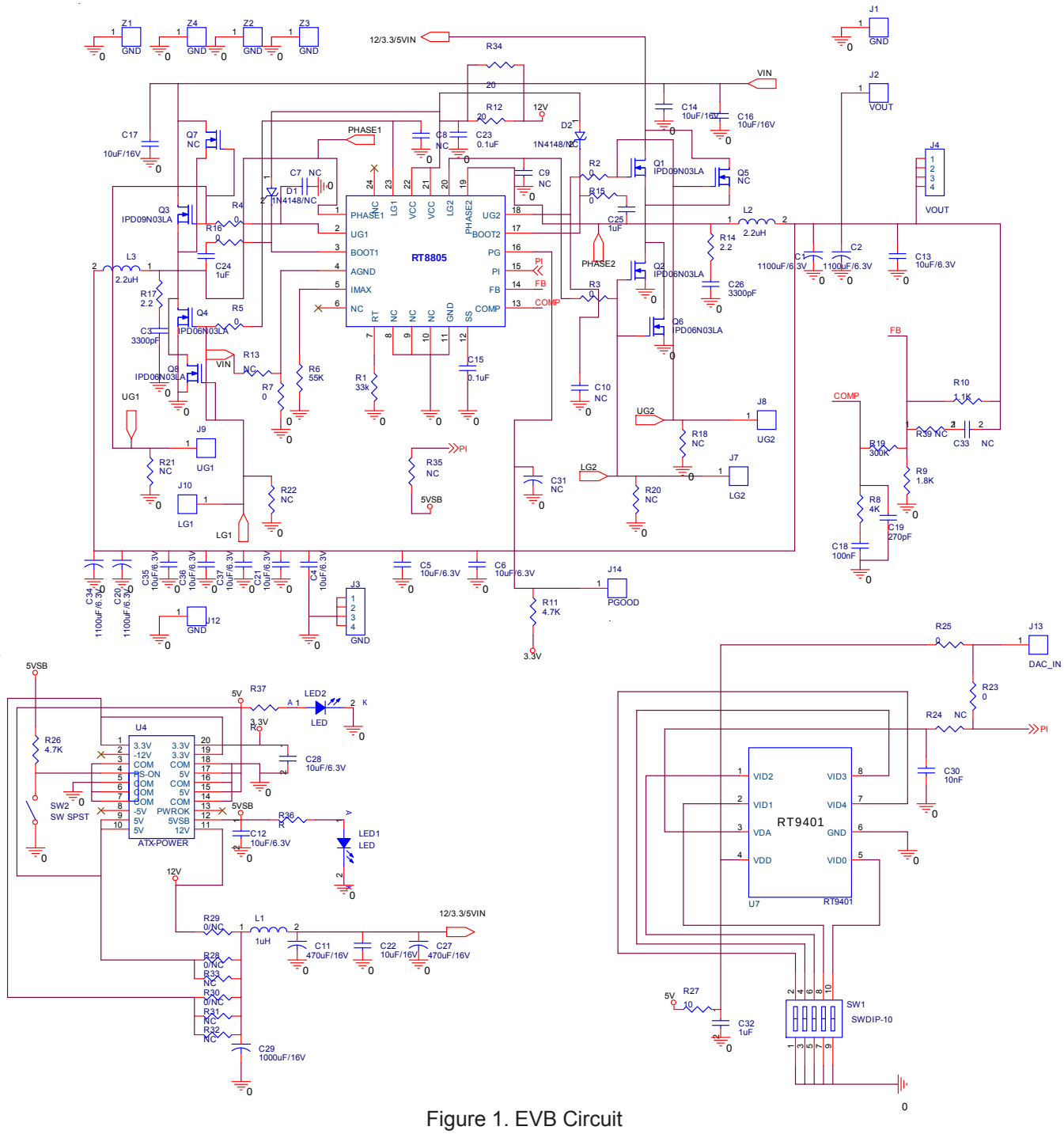


Figure 1. EVB Circuit

Bill of Materials

Reference	Qty	Part Number	Description	Package	Manufacture
U1	1	RT8805PQV	Dual-Phase PWM Controller	QFN-24L 4x4	RichTek
U7	1	RT9401APV8	DAC Generator	SOT-23-8	RichTek
C1,C2,C20,C34	4	ECME102M6R30814 VPB	1000uF,Electrolytic,6.3V	MH8X20	Evercon
C29	1	ECMH102M0160820 VUB	1000uF,Electrolytic,16V	MH8X20	Evercon
C11,C27	2	SE016M0470CTT	470uF,Electrolytic,16V	MH8X20	TEAPO
C4,C5,C6,C12,C13,C21, C28,C35,C36,C37	10	C2012X5R0J106K	10uF,Ceramic,10%,6.3V,X5R	0805	TDK
C14,C16,C17,C22	4	C3216X7R1C106K	10uF,Ceramic,±10%,16V,X7R	1206	TDK
C24,C25,C32	3	C1608X7R1C105KT	1uF,Ceramic,±10%,16V,X7R	0603	TDK
C15,C23,C18	3	0603B104K500CT	100nF,Ceramic,±10%,50V,NP0	0603	WTC
C3,C26	2	0603B332K500CT	3.3nF,Ceramic,±10%,50V,X7R	0603	WTC
C19	1	0603B271K500NT	270pF,Ceramic,±10%,50V,X7R	0603	WTC
C30	1	0603B103K500CT	10nF,Ceramic,±10%,50V,X7R	0603	WTC
R1,R6	2	WR06X3302PT	33KΩ,SMD,±1%	0603	WTC
R2,R3,R4,R5,R7,R15,R16, R23,R25,R28,R29,R30	12	WR06X0000PT	0Ω,SMD,±1%	0603	WTC
R8	1	WR06X3901FT	4KΩ,SMD,±1%	0603	WTC
R9	1	WR06X1801FT	1.8KΩ,SMD,±1%	0603	WTC
R10	1	WR06X1101FT	1.1KΩ,SMD,±1%	0603	WTC
R11,R26	2	WR06X4701FTL	4.7KΩ,SMD,±1%	0603	WTC
R12,R34	2	WR06X20R0FT	20Ω,SMD,±1%	0603	WTC
R14,R17	2	WR06W2R20FTL	2.2Ω,SMD,±1%	0603	WTC
R19	1	WR06X3003FT	300KΩ,SMD,±1%	0603	WTC
R27	1	WR06X10R0FTL	10Ω,SMD,±1%	0603	WTC
R36,R37	2	WR06X1001FTL	1KΩ,SMD,±1%	0603	WTC
LED1,LED2	2	TL-S190VCU	Red LED	0603	Full Color
L1	1	HM00-01800	1uH,Rod	DIP	Pulse
L2,L3	2	APS-11493	2.2uH/20A,Ring	DIP	Axis Power
Q1,Q3	2	IPD09N03LA	NMOS,25V,8.6mΩ,50A	D-pak	Infineon
Q2,Q4,Q6,Q8	4	IPD06N03LA	NMOS,25V,5.7mΩ,50A	D-pak	Infineon
SW1	1	SWDIP-10	Jumper Switch	DIP	
SW2	1	SW SPST	Button Switch	DIP	
U4	1	ATX-POWER	20pin connector	DIP	
Q5,Q7,C7,C8,C9,C10,R13, R18,R20,R21,R22,R24,R31, C31,R32,R33,C33,R35,R39, D2,D3	21		NC		

PCB Layout

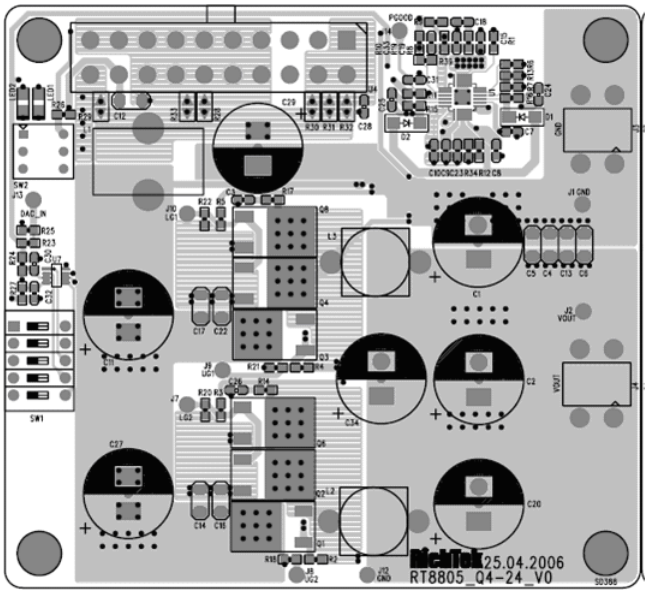


Figure 2. 1st Layer

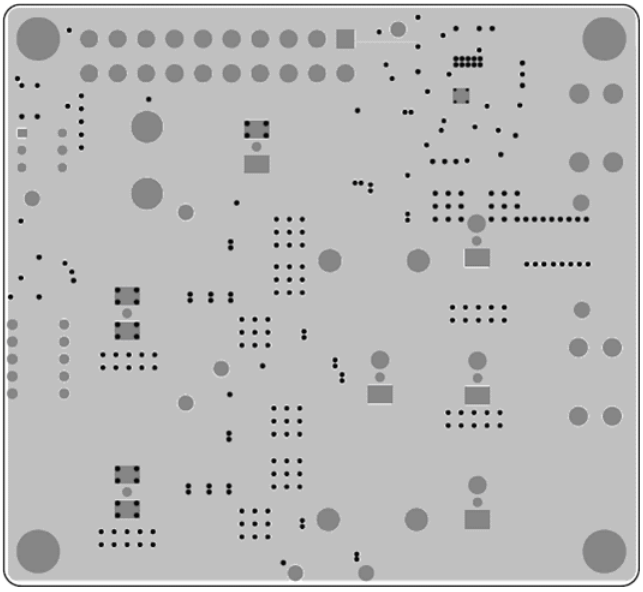


Figure 3. 2nd Layer

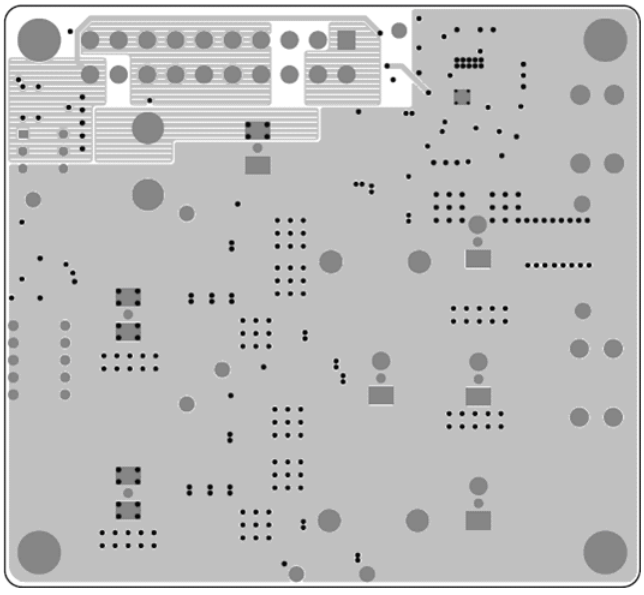


Figure 4. 3rd Layer

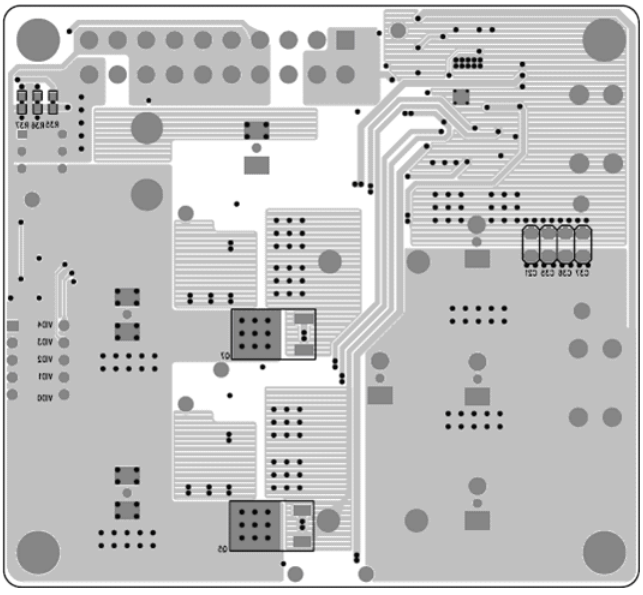


Figure 5. 4th Layer

Operating Guideline

1 Connect the 20 pins ATX power connector (U4) to a proper ATX power supply.

2 Connect positive end and negative end of load to connector J4 (VOUT) and connector J3 (GND), respectively.

3 SW2 is a PS_ON control switch. ON state means pull down the PS_ON and enable the RT8805.OFF state means pull high the PS_ON and disable the RT8805.

4 R24 and R25 are used for Vref setting:

(1) R24=NC & R25=0 is used for the EVB default setting to pull high the PI pin of RT8805 to 5VCC for RT8805 operating with internal Vref 0.8V.

(2) R24=0 & R25=NC is used for external Vref by DAC generator IC RT9401, and SW1 supports DAC generator setting, ON state of SW1 means pull down the corresponding VID (VIDX=0).

(3) R24=NC & R25= NC is used for external Vref by J13 connecting to an independent voltage source.

5 J1 and J2 are the output voltage measuring points.

More Information

For more information, please find the related datasheet or application notes from RichTek website :

http://www.richtek.com

Richtek Technology Corporation
Headquarter
5F, No. 20, Taiyuen Street, Chupei City
Hsinchu, Taiwan, R.O.C.
Tel: (8863)5526789 Fax: (8863)5526611

Richtek Technology Corporation
Taipei Office (Marketing)
8F, No. 137, Lane 235, Paochiao Road, Hsintien City
Taipei County, Taiwan, R.O.C.
Tel: (8862)89191466 Fax: (8862)89191465
Email: marketing@richtek.com