

### DESCRIPTION

The NB685 provides a complete power supply for DDR3, DDR3L, LPDDR3, and DDR4 memory with the highest power density. It integrates a high frequency synchronous rectified step-down switch mode converter (VDDQ) with a 1A sink/source LDO (VTT) and buffered low noise reference (VTTREF).

The NB685 operates at high efficiency over a wide output current load range based on MPS proprietary switching loss reduction tech and internal low Ron power MOSFETs.

Adaptive Constant-On-Time (COT) control mode provides fast transient response and eases loop stabilization. The DC auto tune loop provides good load and line regulation.

The VTT LDO provides 1A sink/source current capability and requires only 22uF ceramic capacitance. The VTTREF tracks VDDQ/2 with an excellent 1% accuracy.

Full protection features include OC Limit, OVP, UVP and thermal shut down and Over temperature warning (OTW).

The converter requires minimum number of external components and is available in QFN 3x3 packages.

### FEATURES

- Wide 4.5V to 26V Operating Input Range
- Compatible for IMVP8
- 135uA low quiescent Current
- 12A Continuous Output Current
- Selectable Ultrasonic Mode
- Selectable 500k/700k Switching Frequency
- Built-in +/- 1A VTT LDO
- 1% Buffered VTTREF Output
- Adaptive COT for Fast transient
- DC Auto Tune Loop
- Stable with POSCAP and Ceramic Output Cap
- Over Temperature Warning
- Internal Soft Start
- Output Discharge
- OCL, OVP, UVP, OTP
- Latch off Reset via EN or Power Cycle

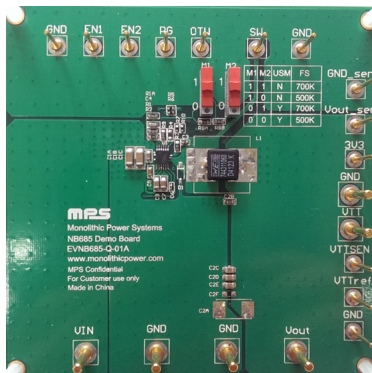
### APPLICATIONS

- Laptop Computer
- Networking Systems and Server
- Distributed Power Systems

All MPS parts are lead-free, halogen free, and adhere to the RoHS directive. For MPS green status, please visit MPS website under Quality Assurance.

"MPS" and "The Future of Analog IC Technology" are Registered Trademarks of Monolithic Power Systems, Inc.

## EVNB685-Q-01A EVALUATION BOARD

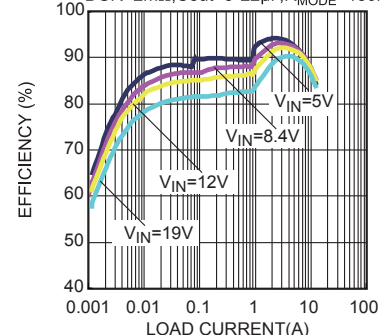


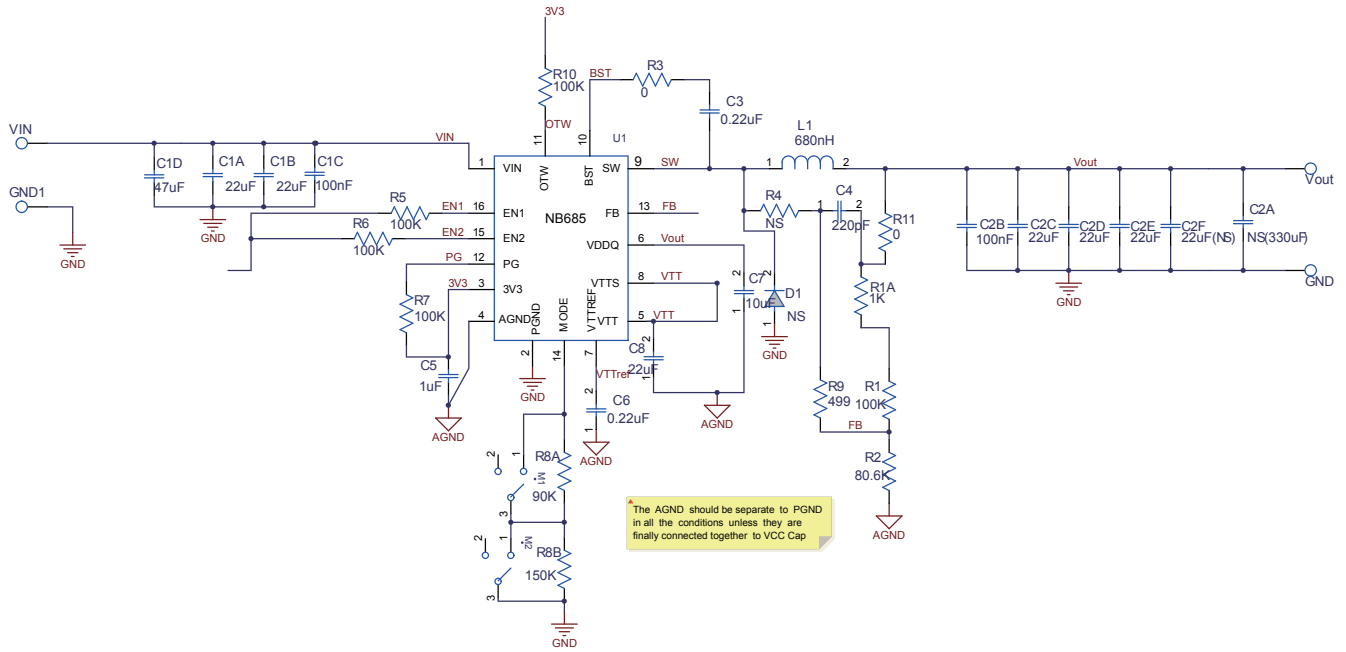
(L x W) 85mm x 85mm

Board Number	MPS IC Number
EVNB685-Q-01A	NB685

### Efficiency vs. Load Current

V<sub>OUT</sub>=1.35V, F<sub>S</sub>=500KHz, L=1.2uH, DCR=2mΩ, C<sub>out</sub>=3\*22uF, R<sub>MODE</sub>=150k



**EVALUATION BOARD SCHEMATIC**


**$V_{IN}=19V$ ,  $V_{OUT}=1.35V$ ,  $I_{O-MAX}=12A$**

**EVNB685-Q-01A BILL OF MATERIALS**

Qty	Designator	Value	Description	Package	Manufacture	Manufacture_PN
2	C1A, C1B	22µF	Ceramic Capacitor;25V;X5R;1206;	1206	muRata	GRM32ER61E226KE15L
2	C1C, C2B	100nF	Ceramic Capacitor;50V;X7R;0603;	0603	muRata	GRM188R71H104KA93D
1	C1D	47µF	Capacitor;35V	SMD	AVX	TAJE476K035RNJ
2	C2A,C2F	NS				
4	C2C,C2D,C2E,C8	22µF	Ceramic Capacitor;6.3V;X5R	0805	Murata	GRM21BR60J226ME39L
2	C3,C6	220nF	50V; X7R;0402	0402	Taiyo Yuden	UMK105BJ224KV-F
1	C4	220pF	Ceramic Capacitor;50V;C0G;0603	0603	muRata	GRM1885C1H221JA01D
1	C5	1µF	Ceramic Capacitor;6.3V;X5R;0603	0603	muRata	GRM188R60J105KA01D
1	C7	10µF	Ceramic Capacitor;6.3V;X5R;0805	0805	muRata	GRM21BR70J106KE76L
1	R1	100k	Film Resistor;1%	0603	Yageo	RC0603FR-07100KL
1	R2	80.6k	Film Resistor;1%	0603	Yageo	RC0603FR-0780K6L
1	R3,R11	0	Film Resistor;1%	0603	Yageo	RC0603FR-070RL
1	R4	NS				
4	R5,R6,R7,R10	100k	Film Resistor;1%	0402	Yageo	RC0402FR-07100KL
1	R8A	90k	Film Resistor;1%	0603	Yageo	RC0603FR-0790KL
1	R8B	150k	Film Resistor;1%	0603	Yageo	RC0603FR-07150KL
1	R9	499	Film Resistor;1%	0603	Yageo	RC0603FR-07499RL
1	R1A	1k	Film Resistor;1%	0603	Yageo	RC0603FR-071KL
1	L1	0.68µH	Inductor;680nH;3.1m;17A	SMD	Würth	744311068
2	M1,M2	450301014042	Button	DIP	Würth	450301014042
1	D1	NS				
1	U1	NB685	NB685	QFN3*3	MPS	NB685

PRINTED CIRCUIT BOARD LAYOUT

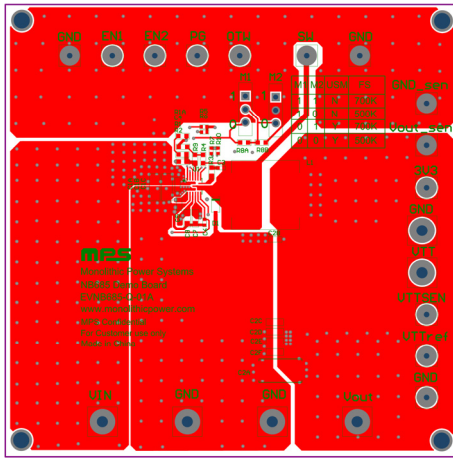


Figure 1—Top Layer

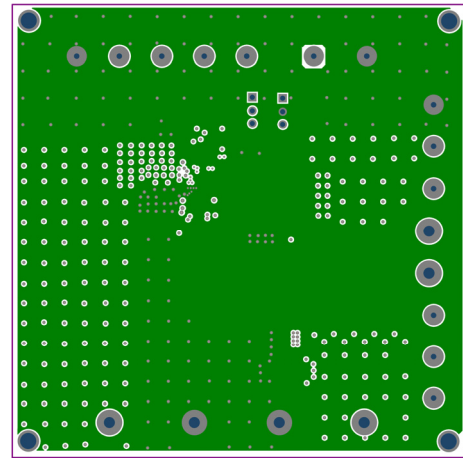


Figure 2—Inner Layer 1

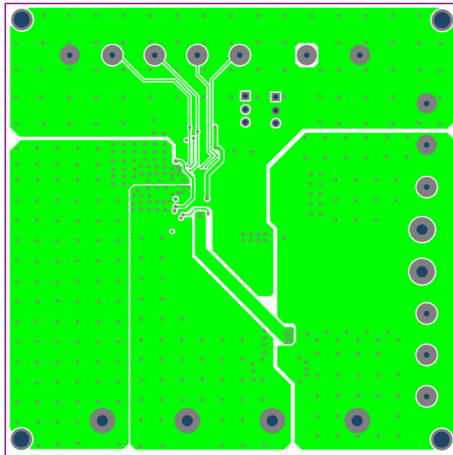


Figure 3—Inner Layer 2

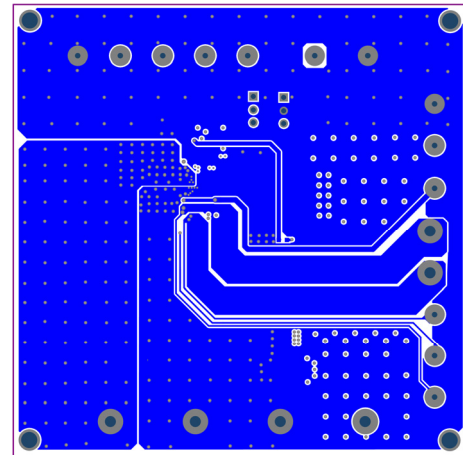


Figure 4— Bottom Layer

## QUICK START GUIDE

1. Connect the positive and negative terminals of the load to the VOUT and GND pins, respectively.
2. Preset the one power supply output between 4.5V and 24V as VIN, and another power supply to 3.3V as external 3.3V VCC, and then turn off the power supply.
3. Connect the positive and negative terminals of the VIN power supply output to the VIN and GND pins, respectively.
4. Connect the positive and negative terminals of the power 3.3V supply output to the 3V3 and AGND Pins, respectively.
5. Turn the VIN and 3V3 power supply on. The NB685 will automatically startup.
6. To use the Enable function, apply a digital input to the EN1/EN2 pin. Drive EN1/EN2 to 3.3V to turn on the regulator or less than 0.4V to turn it off.

**NOTICE:** The information in this document is subject to change without notice. Users should warrant and guarantee that third party Intellectual Property rights are not infringed upon when integrating MPS products into any application. MPS will not assume any legal responsibility for any said applications.