

### GENERAL DESCRIPTION

The EV1531DQ-002A Evaluation Board is designed to demonstrate the capabilities of MPS' MP1531 triple output step-up converter with charge-pumps.

The MP1531 includes a 250KHz fixed-frequency step-up converter and a positive and negative linear regulator. The linear regulators are powered via charge-pumps driven by the step-up converter switch node.

A single on/off control enables all 3 outputs. The outputs are internally sequenced at power-on for ease of use. An internal soft-start prevents overloading the input source at startup. Cycle-by-cycle current limit reduces component stress.

### ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	$V_{IN}$	2.7-5.5	V
Main Output Voltage	$V_{MAIN}$	5	V
Main Output Current	$I_{MAIN}$	100	mA
(+) Charge Pump Voltage	$V_{GH}$	15	V
(+) Charge Pump Current	$I_{GH}$	5	mA
(-) Charge Pump Voltage	$V_{GL}$	-10	V
(-) Charge Pump Current	$I_{GL}$	5	mA

### FEATURES

- 2.7V to 5.5V Operating Input Range
- 500mA Switch Current Limit
- 3 Outputs in Single Package
  - Step-Up Converter up to 22V
  - Positive 10mA Linear Regulator
  - Negative 10mA Linear Regulator
- 250mΩ Internal Power MOSFET Switch
- Up to 95% Efficiency
- 1μA Shutdown Mode
- Fixed 250KHz Frequency
- Positive Regulator up to 38V
- Negative Regulator down to -20V
- Internal Power-On Sequencing
- Adjustable Soft-Start/Fault Timer
- Thermal Shutdown
- Cycle-by-Cycle Over Current Protection
- Under Voltage Lockout
- Ready Flag

### APPLICATIONS

- TFT LCD Displays
- Portable DVD Players
- Tablet PCs
- Car Navigation Displays

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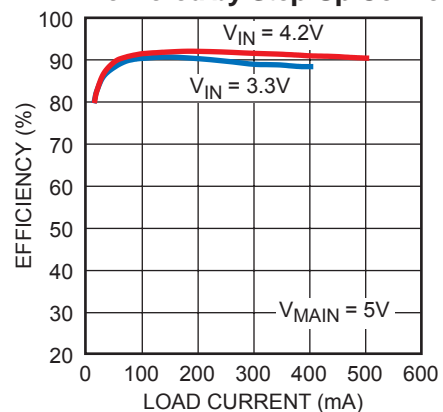
### EV1531DQ-002A EVALUATION BOARD



Dimensions (2.34"X x 2.25"Y x 0.50"Z)

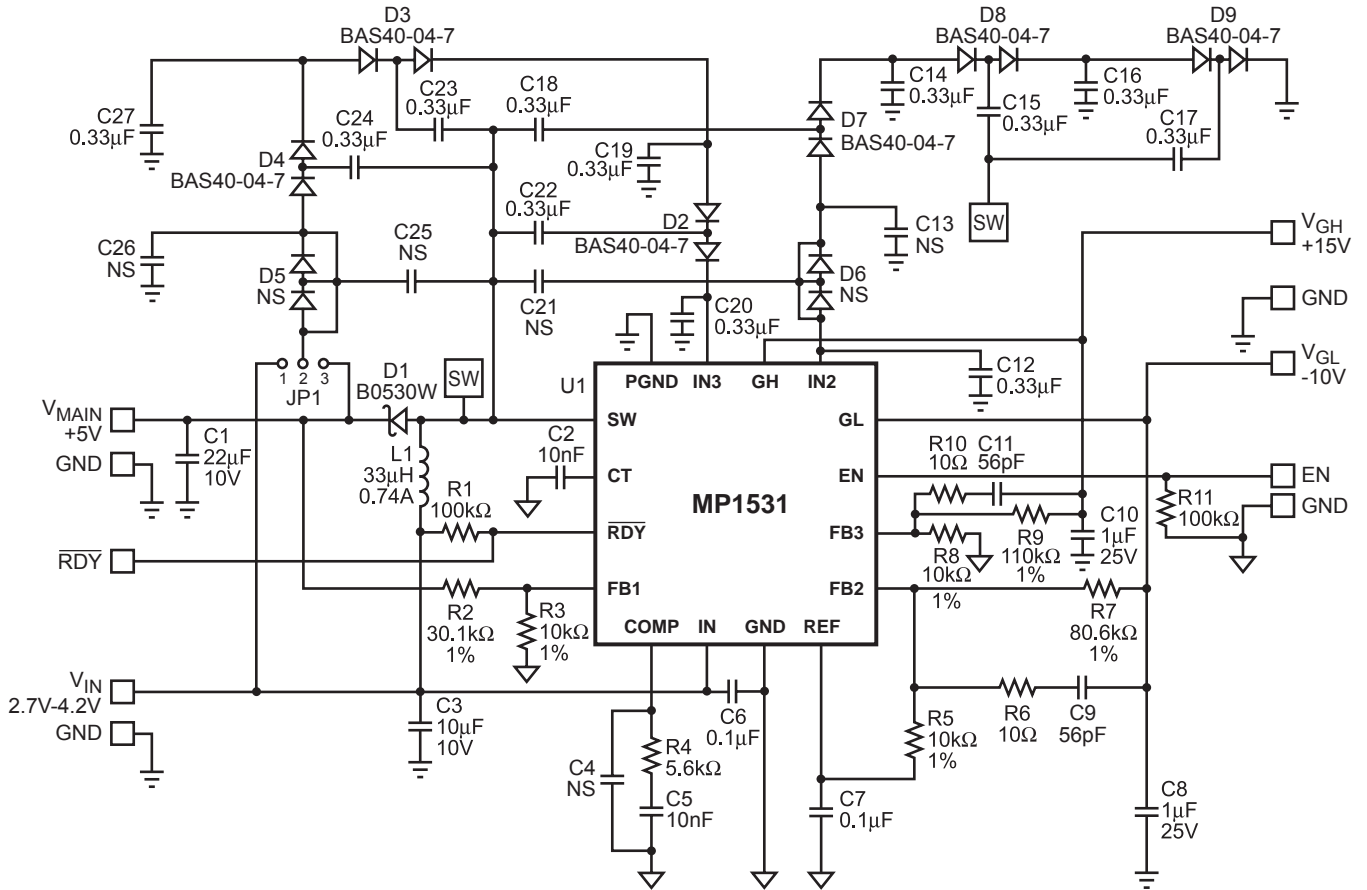
Board Number	MPS IC Number
EV1531DQ-002A	MP1531

Efficiency vs Load Current Delivered by Step-Up Converter



MP1531-EC01

**EVALUATION BOARD SCHEMATIC**



EV1531\_S01

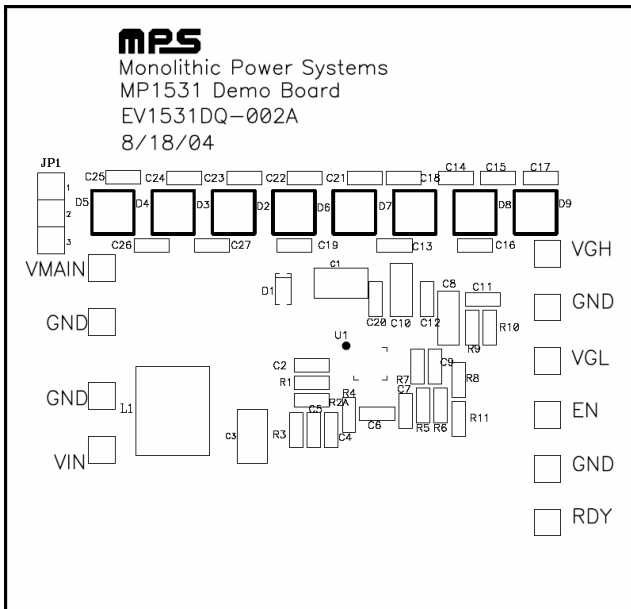
**EV1531DQ-002A BILL OF MATERIALS**

Qty	Ref	Description	Manufacturer P/N	Distributor P/N
6	D2, D3, D4, D7, D8, D9	Schottky Diodes, Dual, 40V, 200mA, SOT-23	Diodes Inc: BAS40-04-7	Digikey BAS40-04DICT-ND
1	D1	Schottky Diode, 30V, 0.5A, SOD-123	Diodes Inc: B0530W	Digikey: B0530WDICT-ND
2	D5, D6	NS		
5	C4, C13, C21, C25, C26	NS		
12	C12, C14, C15, C16, C17, C18, C19, C20, C22, C23, C24, C27	Ceramic Capacitor, 0.33µF, 50V, 0805, X7R	AVX: 08055C334KAT2A	Digikey: 478-1402-1-ND
1	C3	Ceramic Capacitor, 10µF, 10V, 1210, X5R	AVX:1210ZC106KAT2A	Digikey: 478-1625-1-ND

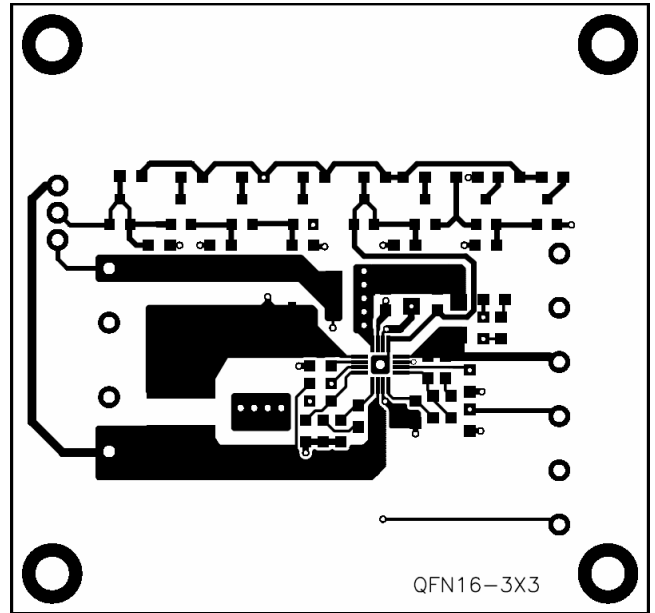
**EV1531DQ-002A BILL OF MATERIALS** (continued)

Qty	Ref	Description	Manufacturer P/N	Distributor P/N
1	C1	Ceramic Capacitor, 22 $\mu$ F, 10V, 1210, X5R	AVX:1210ZD226KAT2A	Digikey: 478-1632-1-ND
2	C8,C10	Ceramic Capacitor, 1 $\mu$ F, 25V, 1206, X7R	AVX:12063C105KAT2A	Digikey: 478-1567-1-ND
2	C2, C5	Ceramic Capacitor, 10nF, 50V, 0805, X7R	AVX:0805C103KAT2A	Digikey: 478-1383-1-ND
2	C6,C7	Ceramic Capacitor, 0.1 $\mu$ F, 50V, 0805, X7R	AVX:08055C104KAT2A	Digikey: 478-1395-1-ND
2	C9,C11	Ceramic Capacitor, 56pF, 50V, 0805, NPO	AVX:08055A560JAT2A	Digikey: 478-1313-1-ND
1	L1	Inductor, 33 $\mu$ H, 740mA	Coicraft:LP06013--333KX	
1	U1	MP1531DQ, QFN16	MPS: MP1531DQ	
2	R1,R11	Resistor, 100k $\Omega$ , 0805, 5%	Panasonic: ERJ-6GEYJ104V	Digikey: P100KACT-ND
1	R4	Resistor, 5.6k $\Omega$ , 0805, 5%	Panasonic: ERJ-6ENF562V	Digikey: P5.6KCCT-ND
1	R2	Resistor, 30.1k $\Omega$ , 0805, 1%	Panasonic: ERJ-6GEYJ303V	Digikey: P30KACT-ND
3	R3,R5,R8	Resistor, 10k $\Omega$ , 0805, 1%	Panasonic: ERJ-6GEYJ103V	Digikey: P10KACT-ND
1	R9	Resistor, 110k $\Omega$ , 0805, 1%	Panasonic: ERJ-6GEY114V	Digikey: P110KACT-ND
2	R6,R10	Resistor, 10 $\Omega$ , 0805, 5%	Panasonic: ERJ-6GEYJ100V	Digikey: P10ACT-ND
1	R7	Resistor, 80.6k $\Omega$ , 0805, 1%	Panasonic: ERJ-6ENF8062V	Digikey: P80.6KCCT-ND
1	JP1	Conn Jumper	Sullins: STC02SYAN	Digikey: S9000-ND

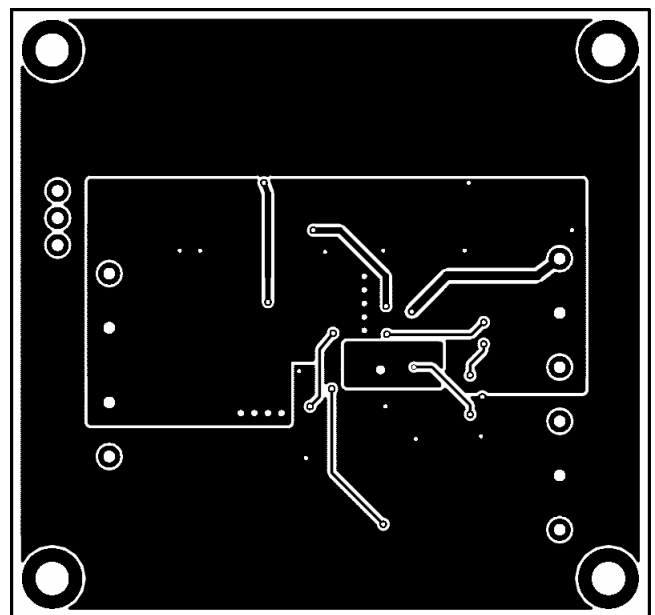
**PRINTED CIRCUIT BOARD LAYOUT**



**Figure 1—Top Silk Layer**

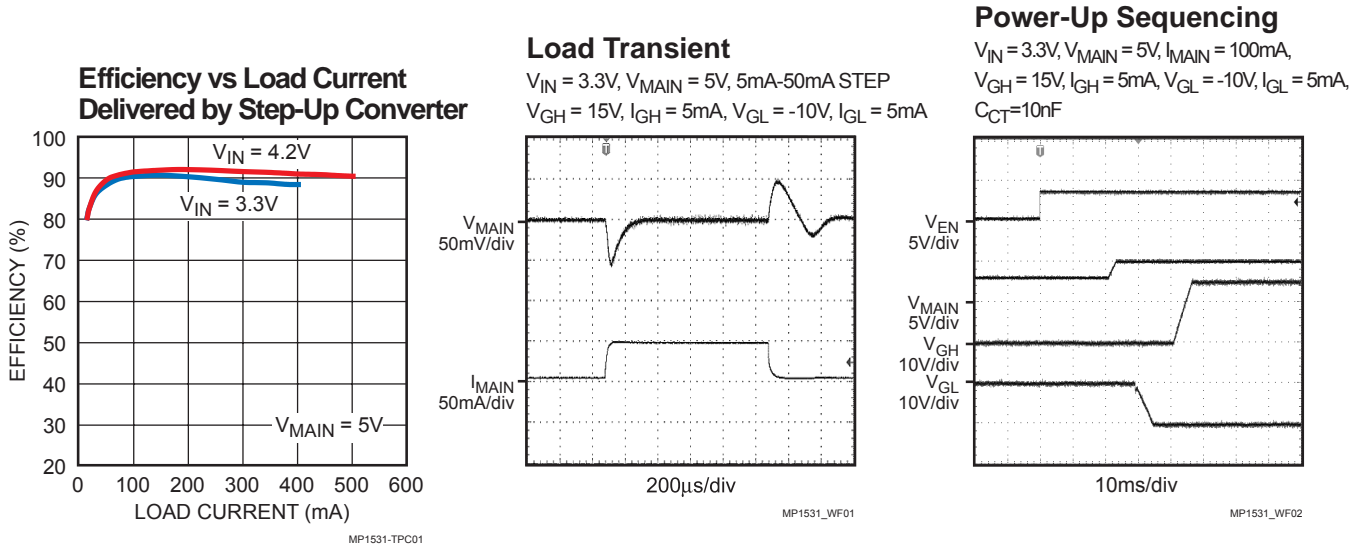


**Figure 2—Top Layer**



**Figure 3—Bottom Layer**

## TEST RESULTS



## QUICK START GUIDE

The three output voltages of this board are set to +5V, +15V, and -10V. The board layout accommodates most commonly used inductors and output capacitors.

1. Make sure Jumper JP1 is connected between 2 and 3.
2. Attach positive end of loads to VMAIN, VGH, and VGL pins respectively. Attach negative end of loads to GND pins.
3. Attach input voltage  $2.7V \leq V_{IN} \leq 5.5V$  and input ground to VIN and GND pins respectively.
4. During startup  $\overline{RDY}$  will be left HIGH. Once the turn-on sequence is complete, this pin will be pulled low if all regulators exceed 80% of their specified voltages. After all regulators are turned on, a fault in any regulator will cause  $\overline{RDY}$  to go LOW after approximately 15 $\mu$ s. If the fault persists for more than approximately 6ms (for  $C_{CT} = 10nF$ ), the entire chip will shut down.

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