EV1531DQ-002A

Low Power, Triple Output Step-Up Plus Charge Pump for TFT Bias

EVALUATION BOARD – INITIAL RELEASE

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

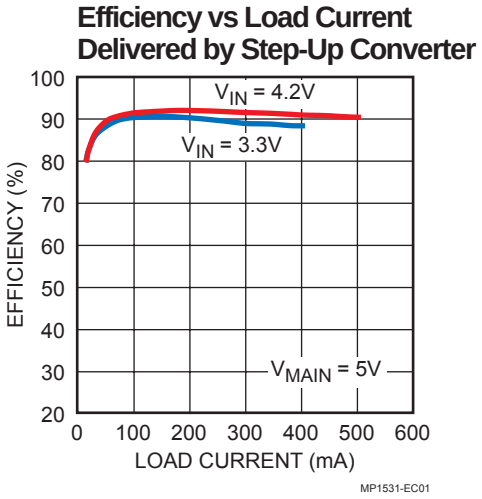
APPLICATIONS

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

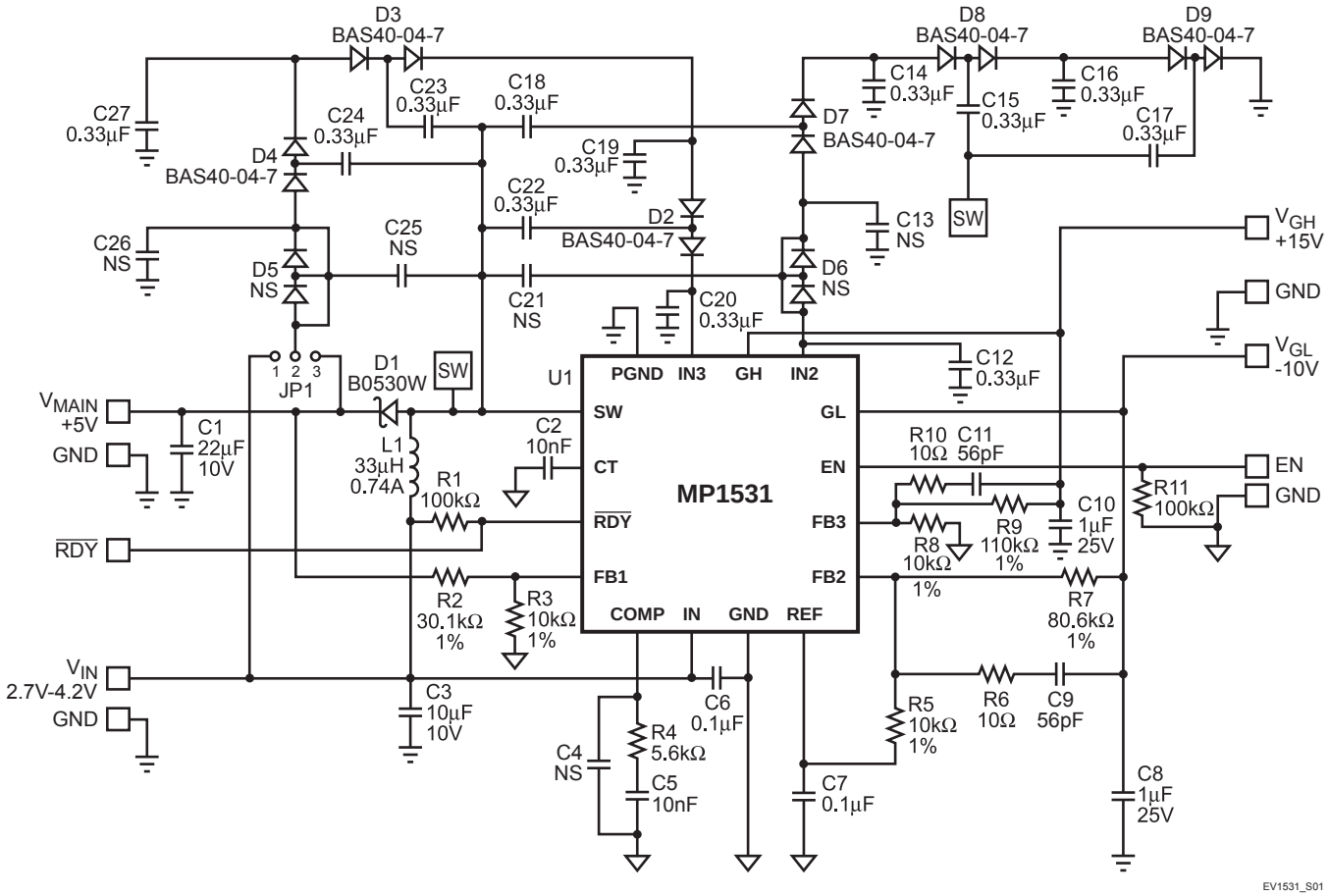
EV1531DQ-002A EVALUATION BOARD

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

Board Number	MPS IC Number
EV1531DQ-002A	MP1531



EVALUATION BOARD SCHEMATIC



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, 22µF, 10V, 1210, X5R	AVX:1210ZD226KAT2A	Digikey: 478-1632-1-ND
2	C8,C10	Ceramic Capacitor, 1µF, 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, 0.1µF, 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, 33µH, 740mA	Coicraft:LP06013--333KX	
1	U1	MP1531DQ, QFN16	MPS: MP1531DQ	
2	R1,R11	Resistor, 100kΩ, 0805, 5%	Panasonic: ERJ-6GEYJ104V	Digikey: P100KACT-ND
1	R4	Resistor, 5.6kΩ, 0805, 5%	Panasonic: ERJ-6ENF562V	Digikey: P5.6KCCT-ND
1	R2	Resistor, 30.1kΩ, 0805, 1%	Panasonic: ERJ-6GEYJ303V	Digikey: P30KACT-ND
3	R3,R5,R8	Resistor, 10kΩ, 0805, 1%	Panasonic: ERJ-6GEYJ103V	Digikey: P10KACT-ND
1	R9	Resistor, 110kΩ, 0805, 1%	Panasonic: ERJ-6GEY114V	Digikey: P110KACT-ND
2	R6,R10	Resistor, 10Ω, 0805, 5%	Panasonic: ERJ-6GEYJ100V	Digikey: P10ACT-ND
1	R7	Resistor, 80.6kΩ, 0805, 1%	Panasonic: ERJ-6ENF8062V	Digikey: P80.6KCCT-ND
1	JP1	Conn Jumper	Sullins: STC02SYAN	Digikey: S9000-ND

PRINTED CIRCUIT BOARD LAYOUT

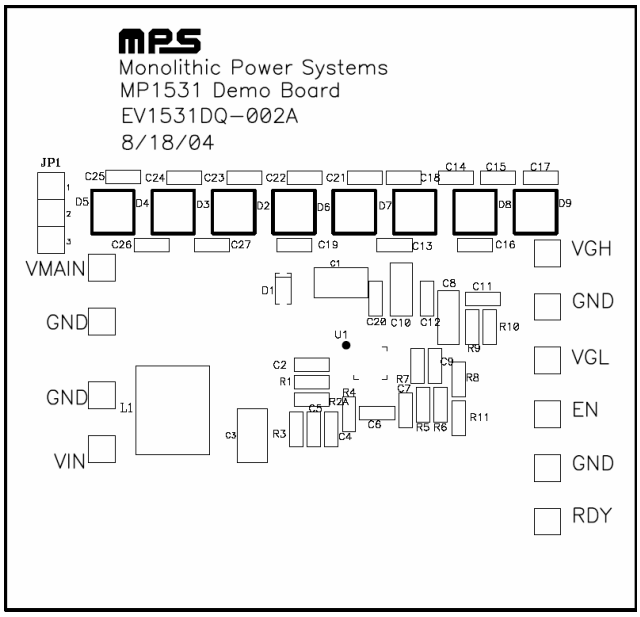


Figure 1—Top Silk Layer

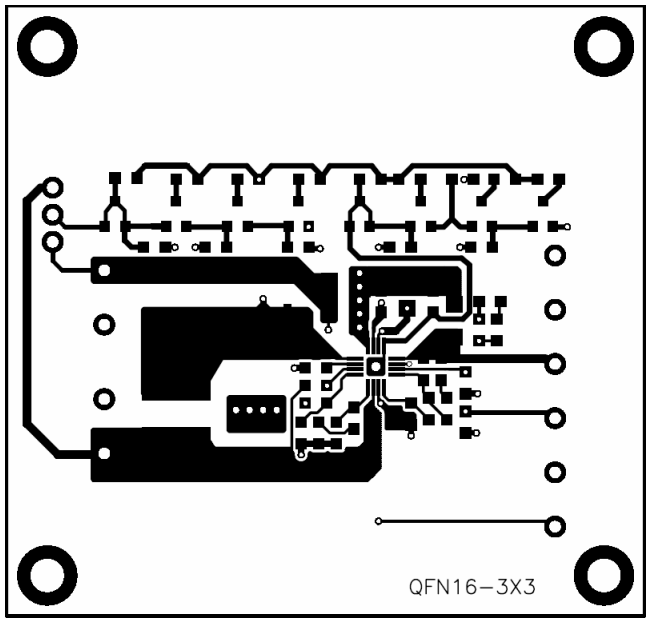


Figure 2—Top Layer

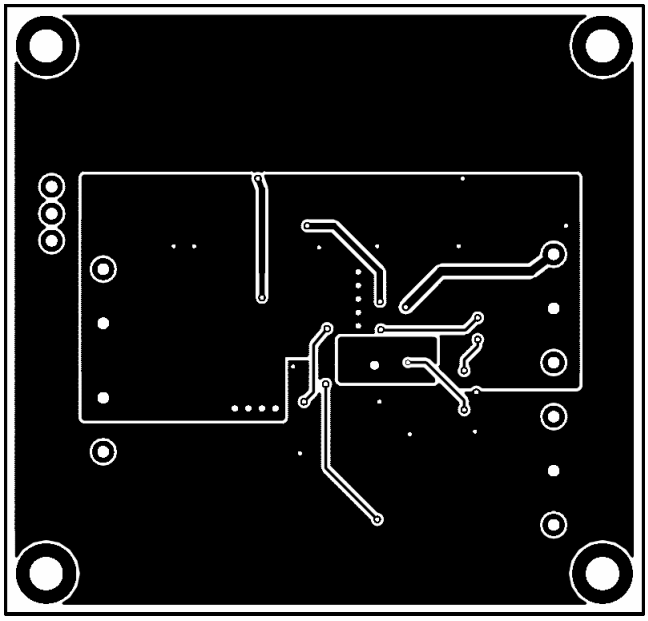
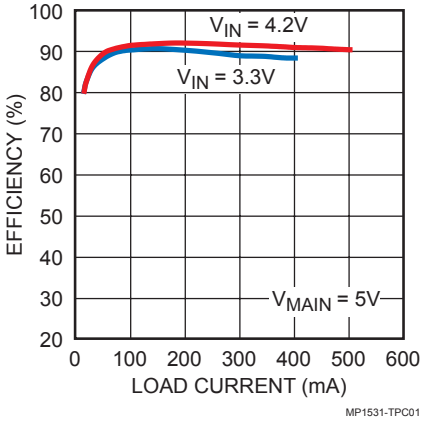


Figure 3—Bottom Layer

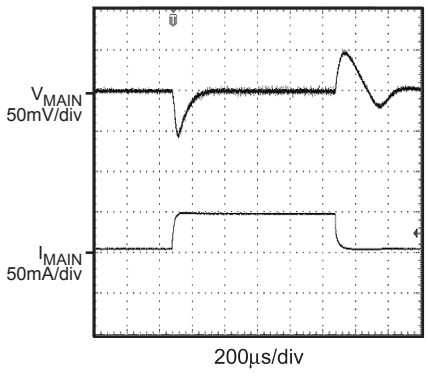
TEST RESULTS

Efficiency vs Load Current Delivered by Step-Up Converter



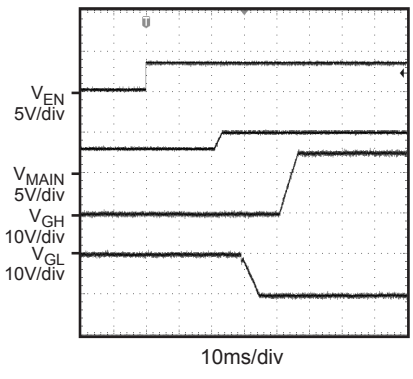
Load Transient

V_{IN} = 3.3V, V_{MAIN} = 5V, 5mA-50mA STEP
V_{GH} = 15V, I_{GH} = 5mA, V_{GL} = -10V, I_{GL} = 5mA



Power-Up Sequencing

V_{IN} = 3.3V, V_{MAIN} = 5V, I_{MAIN} = 100mA,
V_{GH} = 15V, I_{GH} = 5mA, V_{GL} = -10V, I_{GL} = 5mA,
C_{CT}=10nF



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 ≤ V_{IN} ≤ 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 15µs. If the fault persists for more than approximately 6ms (for C_{CT} = 10nF), the entire chip will shut down.