

### GENERAL DESCRIPTION

The EVQ1531-M-00A 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	$V_{IN}$	2.7-5.0	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

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.

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### EVQ1531-M-00A EVALUATION BOARD

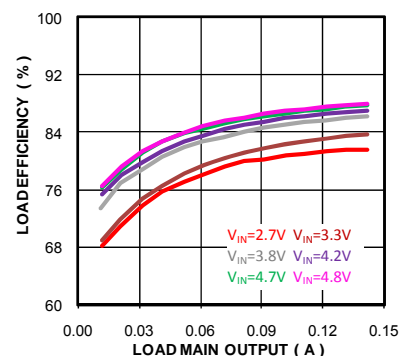


Dimensions (2.34"X x 2.25"Y x 0.50"Z)

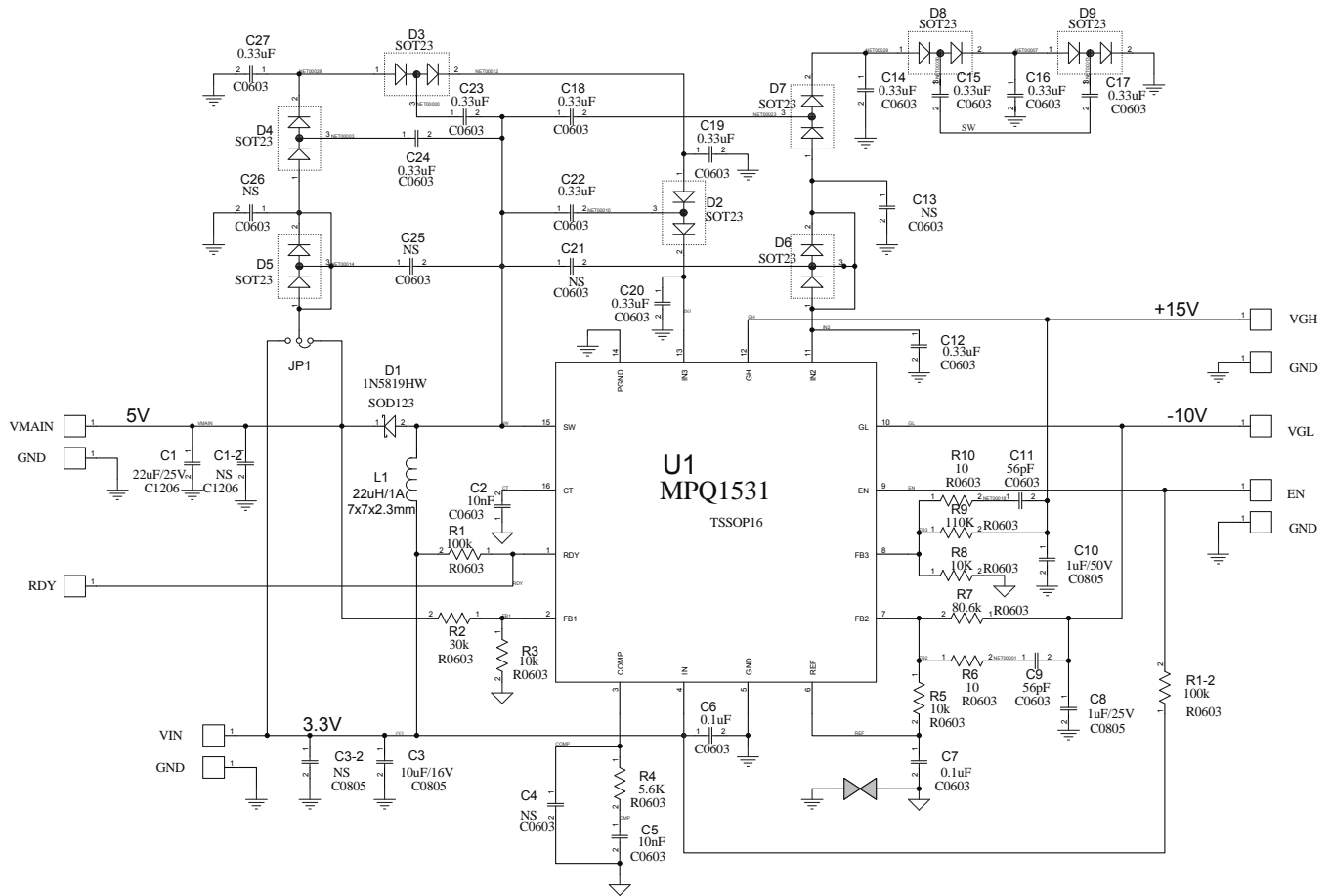
Board Number	MPS IC Number
EVQ1531-M-00A	MPQ1531DM

### Load Efficiency

$V_{MAIN}=5V$ ,  $V_{GH}=15V/5mA$ ,  $V_{GL}=-10V/5mA$



## EVALUATION BOARD SCHEMATIC



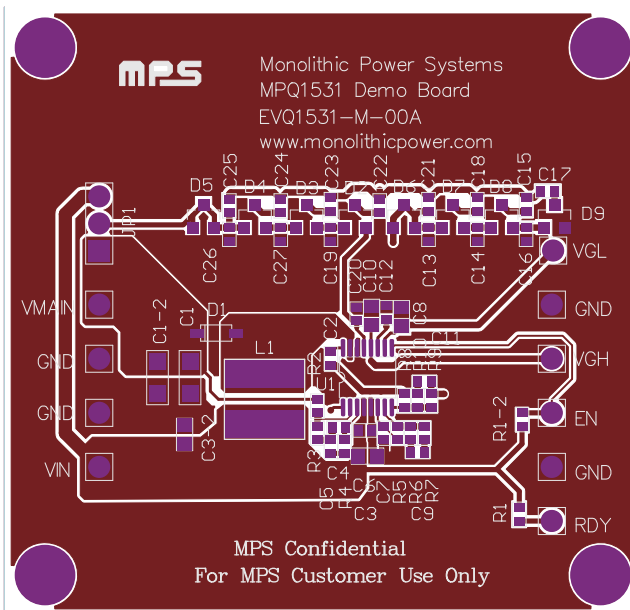
## EVQ1531-M-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
1	C1	22µF	22µF, Ceramic Capacitor, 25V, X5R	1206	Murata	GRM31CR61E226KE15L
7	C1-2, C3-2, C4, C13, C21, C25, C26	NS		0603	Murata	
2	C2, C5	10nF	10nF, Ceramic Capacitor, 50V, X7R	0603	Murata	GRM188R71H103KA01D
1	C3	10µF	10µF, Ceramic Capacitor, 16V, X5R	0805	Murata	GRM21BR61C106KE15L
2	C6, C7	0.1µF	0.1µF, Ceramic Capacitor, 50V, X7R	0603	Murata	GRM188R71H104KA93D
2	C8, C10	1µF	1µF, Ceramic Capacitor, 50V, X7R	0805	Murata	GRM21BR71H105KA12X
2	C9, C11	56pF	56pF, Ceramic Capacitor, 50V, NPO	0603	Murata	GRM1885C1H560JA01D

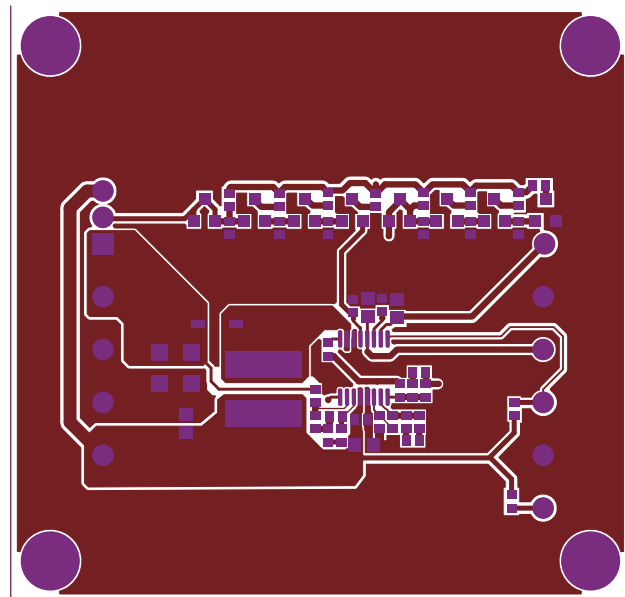
**EVQ1531-M-00A BILL OF MATERIALS** *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer P/N
12	C12, C14, C15, C16, C17, C18, C19, C20, C22, C23, C24, C27	0.33μF	0.33μF, Ceramic Capacitor, 50V, X7R	0603	TDK	C1608X5R1H334K080AB
1	D1	1A	Schottky Diode, 40V, 1A	SOD-123	Diodes	1N5819HW-7
6	D2, D3, D4, D7, D8, D9	BAS40-04	Schottky Diodes, Dual, 40V, 200mA	SOT23	Diodes	BAS40-04-7
2	D5, D6	NS		SOT23		
1	L1	22μH	22μH, 1.2A, 0.12Ω, SMD	WE-6823	Würth Elektronik	744 062 220
2	R1, R1-2	100K	Resistor, 5%, 1/10W	0603	GENERIC	GENERIC
1	R2	30K	Resistor, 5%, 1/10W	0603	GENERIC	GENERIC
3	R3, R5, R8	10K	Resistor, 5%, 1/10W	0603	GENERIC	GENERIC
1	R4	5.6K	Resistor, 1%, 1/10W	0603	GENERIC	GENERIC
2	R6, R10	10	Resistor, 5%, 1/10W	0603	GENERIC	GENERIC
1	R7	80.6K	Resistor, 1%, 1/10W	0603	GENERIC	GENERIC
1	R9	110K	Resistor, 1%, 1/10W	0603	GENERIC	GENERIC
1	U1		MPQ1531, TSSOP16	TSSOP16	MPS	MPQ1531DM

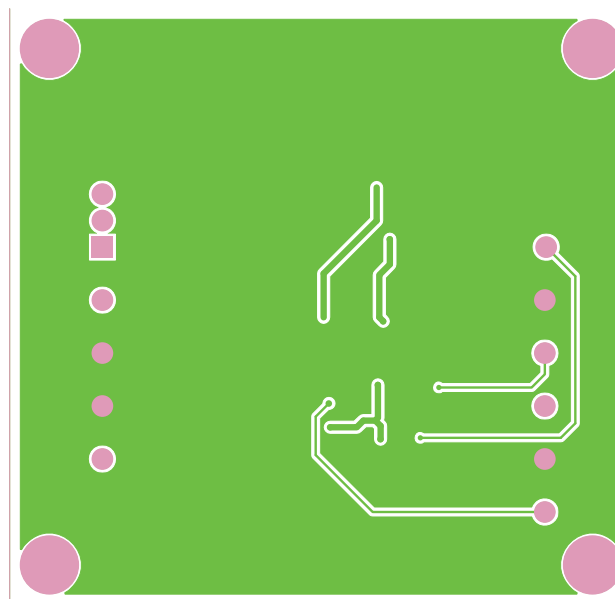
**PRINTED CIRCUIT BOARD LAYOUT**



**Figure 1—Top Silk Layer**



**Figure 2—Top Layer**

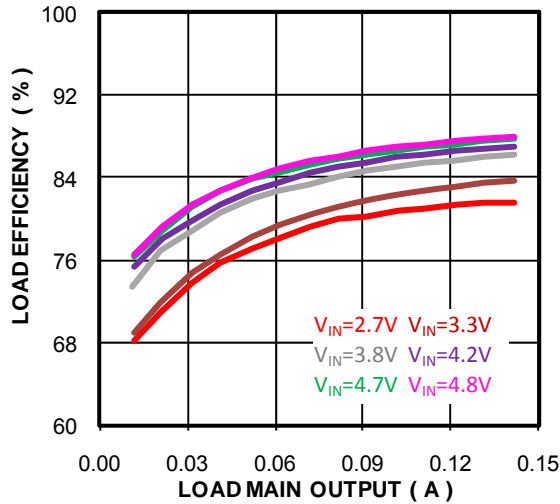


**Figure 3—Bottom Layer**

## TEST RESULTS

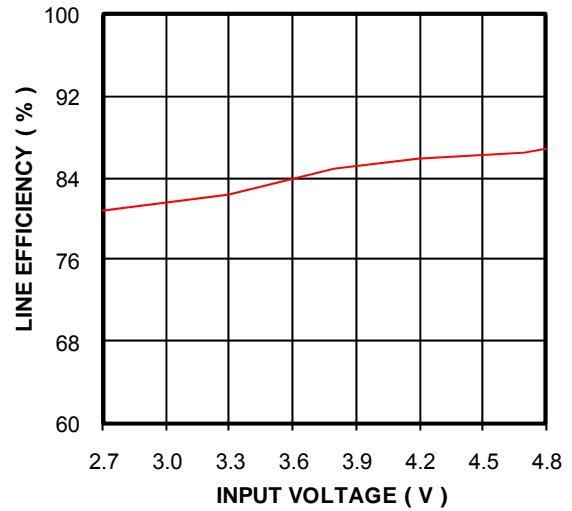
### Load Efficiency

$V_{MAIN}=5V, V_{GH}=15V/5mA, V_{GL}=-10V/5mA$



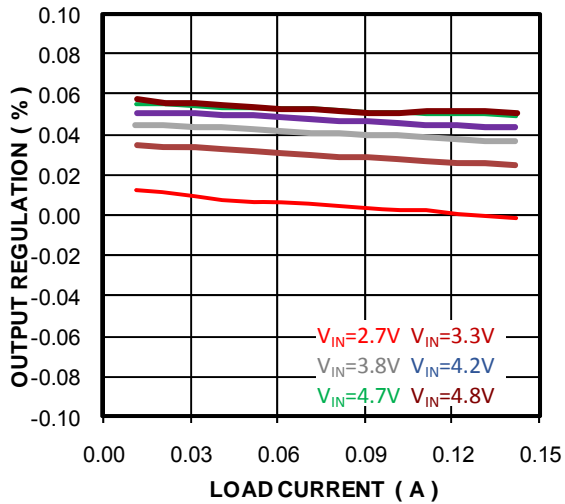
### Line Efficiency

$V_{MAIN}=5V$



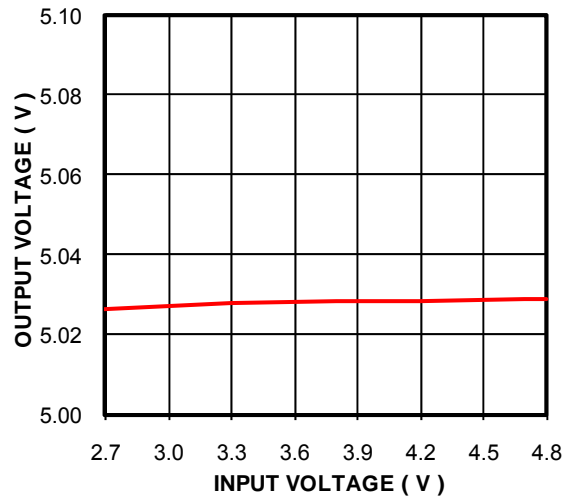
### Load Regulation

$V_{MAIN}=5V, V_{GH}=15V/5mA, V_{GL}=-10V/5mA$



### Lined Regulation

$V_{MAIN}=5V, I_{MAIN}=0.1A, V_{HG}=15V, I_{GH}=5mA, V_{GL}=-10V, I_{GL}=5mA$

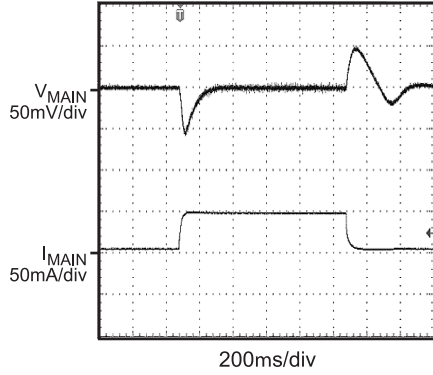


**TEST RESULTS (continued)**

**Load Transient**

$V_{IN} = 3.3V$ ,  $V_{MAIN} = 5V$ , 5mA-50mA STEP

$V_{GH} = 15V$ ,  $I_{GH} = 5mA$ ,  $V_{GL} = -10V$ ,  $I_{GL} = 5mA$

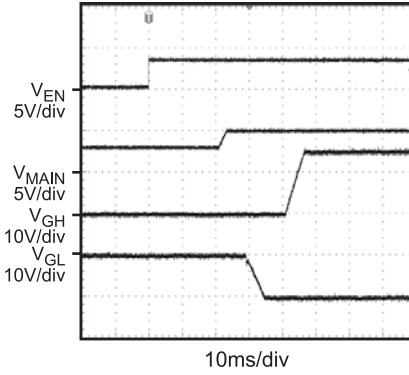


**Power-Up Sequencing**

$V_{IN} = 3.3V$ ,  $V_{MAIN} = 5V$ ,  $I_{MAIN} = 100mA$ ,

$V_{GH} = 15V$ ,  $I_{GH} = 5mA$ ,  $V_{GL} = -10V$ ,  $I_{GL} = 5mA$ ,

$C_{CT} = 10nF$



## 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  $2.7V \leq V_{IN} \leq 5.5V$  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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