

MAX17606 Synchronous Flyback Evaluation Kit

Evaluates: MAX17606

General Description

The MAX17606 evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates an isolated 15W synchronous flyback DC-DC converter. The circuit uses the MAX17606 secondary synchronous rectifier driver in a 6-pin SOT23 package, as well as the MAX17597 peak current mode flyback controller in a 16-pin TQFN package.

The EV kit circuit is configured to deliver an isolated +5V output voltage and provides up to 3A of output current. The EV kit is programmed to operate at a 200kHz switching frequency. An optocoupler, along with the transformer, provides the galvanic isolation between input and output, up to 1875V_{RMS}.

Features

- 18V to 36V DC Input Range
- Isolated Output: +5V DC, 3A
- Compact Design with High (200kHz) Switching Frequency
- 90% Peak Efficiency
- Low-Cost Flyback Design
- Galvanic Isolation up to 1875V_{RMS}
- Proven PCB Layout
- Fully Assembled and Tested

Ordering Information appears at end of data sheet.

Quick Start

Recommended Equipment

- One 18V–36V DC, 2A power supply
- Load capable of sinking 3A
- Four digital multimeters (DMM)
- MAX17606_SYNC_FB EVKITA#

Warning:

- 1) Do not turn on the power supply until all connections are completed.
- 2) Wear protective eye gear at all times.
- 3) Do not touch any part of the circuit with bare hands or conductive materials when powered up.
- 4) Make sure all high-voltage capacitors are fully discharged before handling. Allow 5 minutes after disconnecting input power source before touching circuit parts.

Equipment Setup and Test Procedure

- 1) Set the power supply to +24VDC. Disable the power supply output.
- 2) Connect the positive terminal of the power supply to the V_{IN} PCB pad and the negative terminal to the nearest PGND PCB pad. Connect the positive terminal of the 3A load to the V_{OUT} PCB pad and the negative terminal to the nearest GND0 PCB pad.
- 3) Connect two DMMs, configured in voltmeter mode, across the input and output terminals to measure the input and output voltage, respectively.
- 4) Connect two DMMs configured in ammeter mode at the input and output to measure the input current and output current.
- 5) Enable the power supply.
- 6) Verify that the output voltmeter displays 5V and the output load current is 3A.
- 7) If required, vary the input voltage from 18V to 36V, the load current from 0mA to 3A, and verify that the output voltage is 5V.

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Detailed Description

The MAX17606 EV kit provides a proven design to evaluate the MAX17606. The device is a secondary-side synchronous driver and controller specifically designed for the isolated flyback topology. By replacing the secondary diode with a MOSFET, the MAX17606 improves efficiency and makes thermal management easier. The device EV kit is configured for a 5V output voltage, supplying up to 3A of current.

This EV kit uses the peak current mode, pulse-width modulating (PWM) controller IC MAX17597 in a 16-pin TQFN package with an exposed pad as the primary-side flyback controller. This PWM controller varies the duty cycle to compensate for the variation in input voltage (V_{IN}) and the output load to maintain a constant output voltage.

The detailed description of flyback design calculations are described in Application Note 5504, "Designing Flyback Converters Using Peak Current-Mode Controllers." The details of soft-start time programming, programming output voltage, peak-current limit setting, switching frequency setting and the EN/UVLO, OVI settings are described in the MAX17595/6/7 data sheet.

The MAX17606 has a wide range of input voltage from 4.5V to 36V. The input range makes it simple to drive using one of the following two methods. When the output voltage is 5V and greater, V_{OUT} can be used to directly drive V_{IN} . When the output voltage is less than 5V, use the rectified drain voltage of the secondary synchronous MOSFET to drive V_{IN} . The EV kit circuit has an option for both of these configurations. By default, the EV kit is programmed to run from the rectified drain voltage of the synchronous MOSFET. When running the MAX17606 from the output voltage is required, remove R1 and set R31 to 10 Ω .

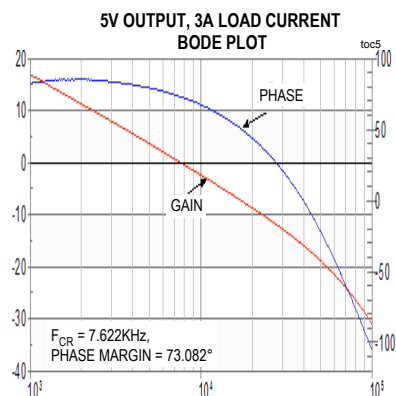
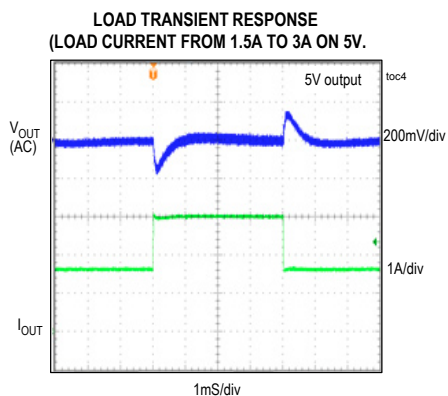
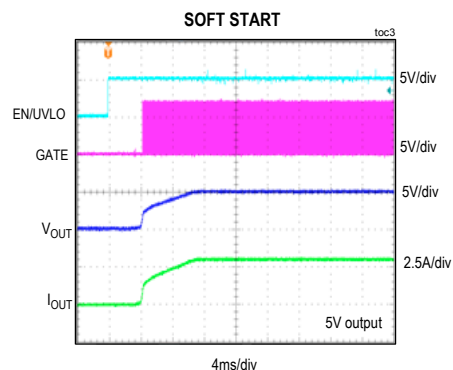
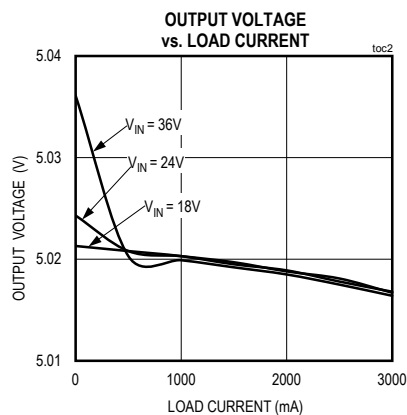
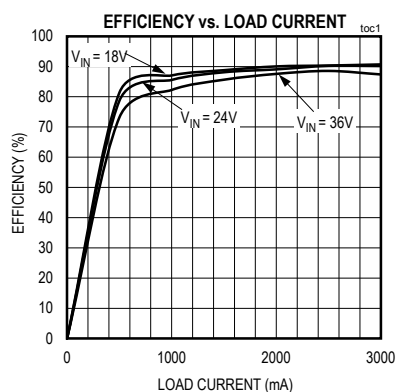
The device has a provision to program the turn-off trip point of the secondary synchronous rectifier. An external resistor (R25) connects the drain of the external MOSFET to the IC's DRN pin. This resistor sets the turn-off trip point with a precise internal current source. Once the synchronous rectifier is turned off, the MAX17606 uses resistor R26 (connected between the T_{OFF} pin and GND0) to program the turn-off time in order to provide immunity from DCM ringing. For the selection of R25 and R26 resistors, refer to the MAX17606 data sheet.

Note: The EV kit is shipped with frequency dithering disabled and the DITHER/SYNC pin shorted to SGND by a 0 Ω resistor. To set the desired frequency dither, replace R23 with a capacitor of appropriate value, as detailed in the MAX17595/6/7 data sheet. The DITHER /SYNC PCB pad is available for monitoring the signal at the DITHER/ SYNC pin.

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EV Kit Performance Report



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Component Suppliers

SUPPLIER	WEBSITE
Würth Elektronik	www.we-online.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com

Note: Indicate that you are using the MAX17606SFBEVKIT when contacting these component suppliers.

Ordering Information

PART	TYPE
MAX17606SFBEVKIT#	EV Kit

#Denotes RoHS compliant.

Component List, PCB Layout, and Schematics

See the following links for component information, PCB layout, and schematic.

- [MAX17606 EV BOM](#)
- [MAX17606 EV PCB Layout](#)
- [MAX17606 EV Schematic](#)

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Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/15	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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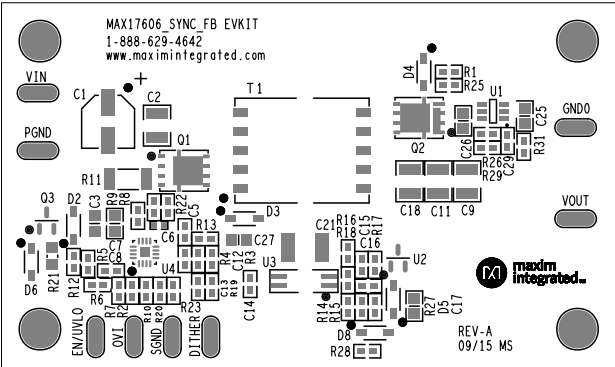
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HARDWARE NUMBER:

ENGINEER:DESIGNER:

DATE: 09/03/2015

ODB++/GERBER: SILK_TOP

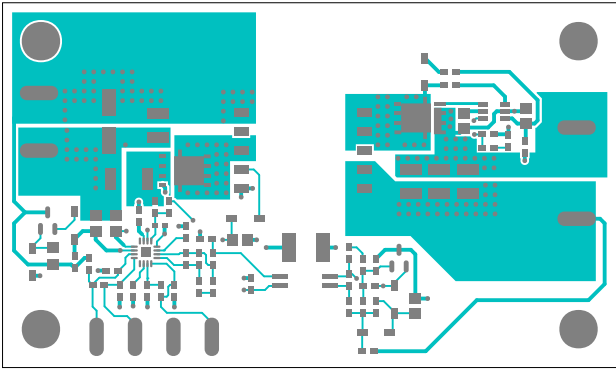




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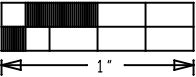
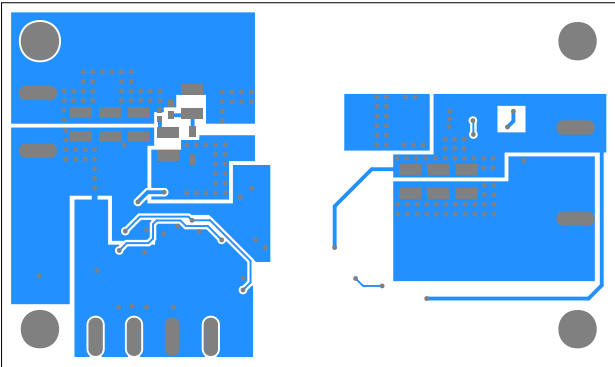




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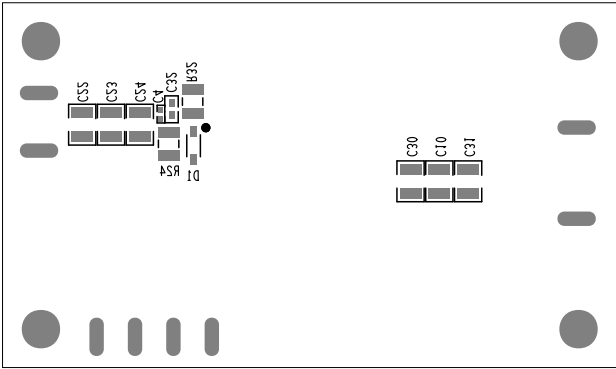
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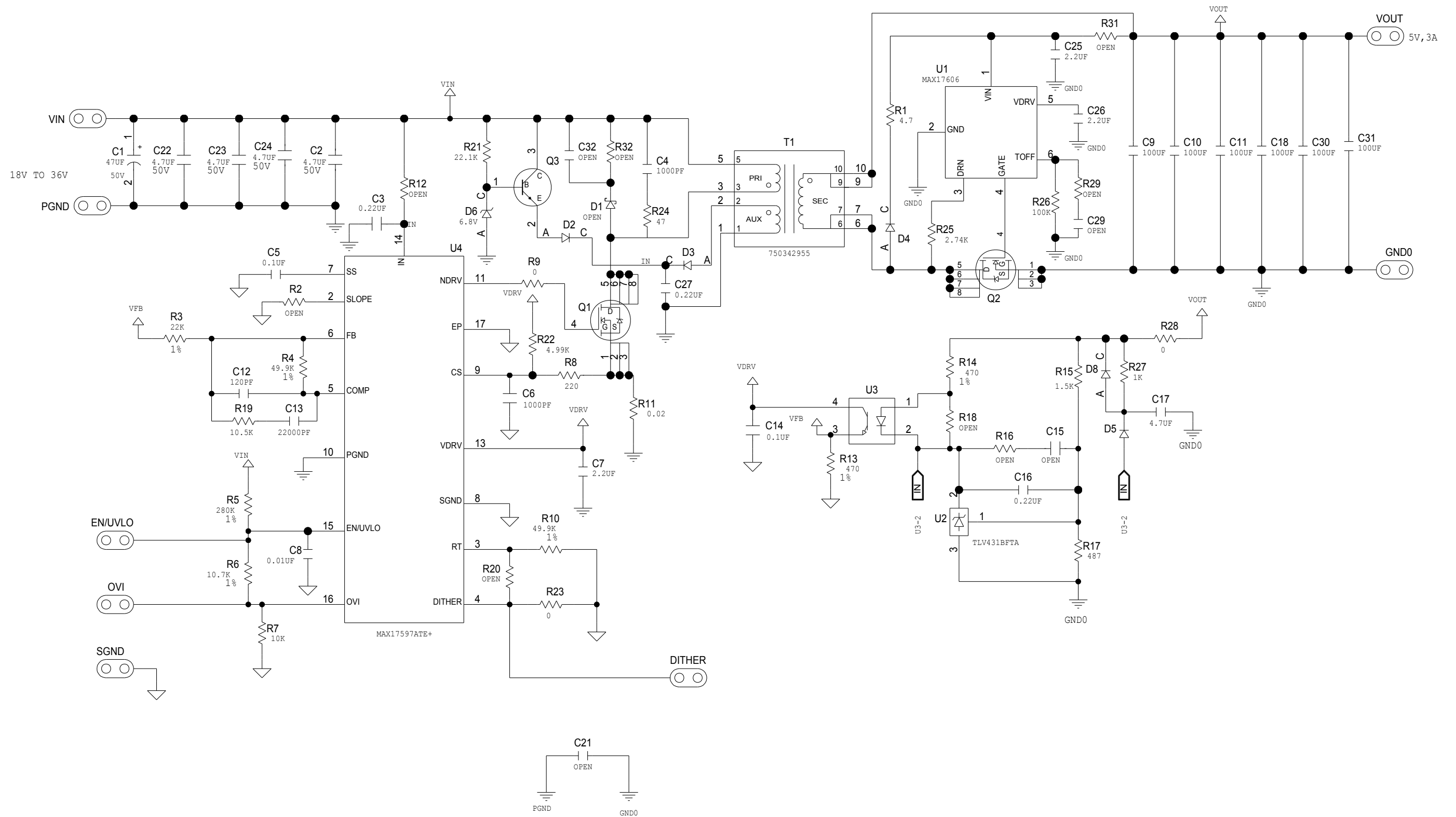
DATE: 09/03/2015

ODB++/GERBER: SILK_BOT



S NO	Designation	Qty	Description	Manufacturer Partnumber-1	Manufacturer Partnumber-2	Manufacturer Partnumber-3
1	C1	1	47μF±20%, 50V,ALUMINUM-ELECTROLYTIC SMT(CASE_D8)	PANASONIC EEEFK1H470XP		
2	C2, C22-C24	4	4.7μF±10% 50V X7R Ceramic capacitor (1210)	Murata GRM32ER71H475KA88K	KEMET C1210C475K5RAC	
3	C3, C27	2	0.22μF±10%,50V, X7R ceramic capacitor (0805)	Murata GRM21BR71H224KA	KEMET C0805C224K5RAC	TDK CGJ4J2X7R1H224K125AA
4	C4	1	1000pF±10%,100V,X7R ceramic capacitor (0402)	Murata GRM155R72A102KA01		
5	C5,C14	2	0.1μF±10%, 25V, X7R ceramic capacitor(0603)	TDK C1608X7R1E104K080AA		
6	C6	1	1000pF±5%,50V, X7R ceramic capacitor (0402)	Murata GRM155R71H102JA01D		
7	C7, C25, C26	3	2.2μF ±10%,50V, X7R ceramic capacitor (0805)	TDK C2012X7R1H225K		
8	C8	1	0.01μF±5%, 50V, X7R ceramic capacitor(0603)	KEMET C0603X7R500103JNP	KEMET C0603C103J5	
9	C9-C11, C18, C30, C31	6	100μF±20%, 6.3V, X5R ceramic capacitor (1210)	Murata GRM32ER60J107ME20	KEMET C1210C107M9PAC	VENKEL LTD C1210X5R6R3-107MNE
10	C12	1	120pF, 1%, 50V, COG ceramic capacitor (0603)	KEMET C0603C121K5GAC		
11	C13	1	22000pF, 10%, 25V, X7R ceramic capacitor (0603)	KEMET C0603C223K3RAC		
12	C15,C29,C32	3	OPEN (0603)			
13	C16	1	0.22uF±10%, 25V, X7R ceramic capacitor(0603)	KEMET C0603C224K3RAC	Murata GRM188R71E224KA8	KEMET C1608X7R1E224K08
14	C17	1	4.7μF ±10%,16V, X7R ceramic capacitor (0805)	Murata GRM21BR71C475KA73		
15	C21	1	OPEN (1812)			
16	D1	1	OPEN (SOD-123FL)			
17	D2-D5,D8	5	100V/0.3A, (SOD123), DIODE	DIODES INCORPORATED 1N4148W-7-F		
18	D6	1	6.8V/3UA, (SOD123), DIODE, ZENER	ON SEMICONDUCTOR MMSZ5235BT1G		
19	Q1	1	100V/22A/69W, POWER-56(8-PQFN),POWER- TRANSISTOR	FAIRCHILD SEMICONDUCTOR FDMS86102LZ		
20	Q2	1	40V/73A/5W, TSDFON-8 PACKAGE ,POWER-TRANSISTOR	INFINEON BSZ040N04LSG		
21	Q3	1	60V/0.5A/0.35W, SOT-23 ,HIGH VOLTAGE AMPLIFIER	FAIRCHILD SEMICONDUCTOR MMBTA05		
22	R1	1	4.7Ω ±5% resistor (0603)	VISHAY DALE CRCW06034R70JN		
23	R2,R12,R16,R18, R20,R29,R31	7	OPEN (0603)			
24	R3	1	22kΩ ±1% resistor (0603)	VISHAY DALE CRCW060322K0FK		
25	R4, R10	2	49.9kΩ ±1% resistor (0603)	VISHAY DALE CRCW060349K9FK	PANASONIC ERJ-3EKF4992V	

26	R5	1	280k Ω $\pm$ 1% resistor (0603)	VISHAY CRCW0603280KFK		
27	R6	1	10.7k Ω $\pm$ 5% resistor (0603)	VISHAY CRCW060310K7FK	PANASONIC ERJ-3EKF1072V	
28	R7	1	10k Ω $\pm$ 1% resistor (0603)	VISHAY DALE CHPHT0603K1002FGT		
29	R8	1	220 Ω $\pm$ 1% resistor (0603)	VISHAY DALE CRCW0603220RFK		
30	R9, R23, R28	3	0 Ω $\pm$ 0% resistor (0603)	VISHAY DALE CRCW06030000ZS	ROHM MCR03EZPJ000	PANASONIC ERJ-3GEY0R00
31	R11	1	0.02 Ω $\pm$ 1% resistor (2010)	TT ELECTRONICS LRC-LRF2010LF-01-R020F		
32	R13, R14	2	470 Ω $\pm$ 1% resistor (0603)	VISHAY DALE CRCW0603470RFK	PANASONIC ERJ-3EKF4700	
33	R15	1	1.5k Ω $\pm$ 1% resistor (0603)	VISHAY DALE CRCW06031K50FK		
34	R17	1	487 Ω $\pm$ 1% resistor (0603)	PANASONIC ERA-3AEB4870		
35	R19	1	10.5k Ω $\pm$ 1% resistor (0603)	VENKEL LTD CR0603-16W-1052FT		
36	R21	1	22.1k Ω $\pm$ 1% resistor (0805)	VISHAY DALE CRCW080522K1FK		
37	R22	1	4.99k Ω $\pm$ 1% resistor (0603)	VISHAY DALE CRCW06034K99FK	PANASONIC ERJ-ERJ-3EKF4991V	
38	R24	1	47 Ω $\pm$ 1% resistor (1210)	VISHAY DRALORIC CRCW121047R0JNEAHP		
39	R25	1	2.74k Ω $\pm$ 1% resistor (0603)	VISHAY DALE CRCW06032K74FK		
40	R26	1	100k Ω $\pm$ 1% resistor (0603)	VISHAY DALE CRCW06031003FK	PANASONIC ERJ-3EKF1003	
41	R27	1	1k Ω $\pm$ 1% resistor (0603)	VISHAY DALE CRCW06031001FK	PANASONIC ERJ-3EKF1001V	
42	R32	1	OPEN (1210)			
43	T1	1	EP13,10-pin SMT, 9 μ H,5A, (3-5):(10-6):(2-1) = 1:0.33:0.55	WURTH ELECTRONICS INC. 750342955		
44	U1	1	MAX17606, 6L THIN SOT23, Flyback converters	MAX17606AZT+		
45	U2	1	Shunt regulator ,SOT23	DIODES INCORPORATED TLV431BFTA		
46	U3	1	PHOTOTRANSISTOR OPTOCOUPLER	AVAGO TECHNOLOGIES ACPL-217-56AE		
47	U4	1	MAX17597 TQFN16-EP,PEAK-CURRENT-MODE CONTROLLERFOR FLYBACK	MAX17597ATE+		



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