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**User Guide for  
FEBFDMQ86530L  
Evaluation Board**

**GreenBridge™ of High-Efficiency  
Bridge Rectifiers Quad N-Channel  
PowerTrench® MOSFETS**

**Featured Fairchild Product:  
FDMQ86530L**

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This user guide supports the evaluation kit for the FDMQ86530L. It should be used in conjunction with the FDMQ86530L datasheet as well as Fairchild's application notes and technical support team. Please visit Fairchild's website at [www.fairchildsemi.com](http://www.fairchildsemi.com).

This document describes the evaluation kit for the GreenBridge™ FDMQ86530L integrated quad 60 V N-channel MOSFET in an MLP 4.5 x 5 package. The FDMQ86530L replaces a conventional diode bridge in AC 24 V rectifier applications by reducing the power dissipation and reducing thermal problems.

## 1. Evaluation Board Specifications

- Board laminate: FR-360HR
- Cu layer count: 4-layer
- Board thickness: 1.6 mm
- Inter layer Cu thickness: 2 oz.
- Via hole minimum plating: 20  $\mu$ m
- Outer layer Cu thickness: 2 oz.
- Solder mask is concentric with holes per standard specification
- Gold immersion
- Non-conductive ink silkscreen

**Table 1. Summary of Features and Performance**

Parameter	Value	Remark
GreenBridge™	FDMQ86530L	Quad 60 V N-channel PowerTrench® MOSFETs, Fairchild Semiconductor
Controller	Bridge Controller	
V <sub>IN</sub> Range	9 V <sub>AC</sub> ~ 42 V <sub>AC</sub>	
Switching Frequency	60 Hz	
Max. I <sub>OUT</sub>	5 A	Limited by Power component

**Table 2. MOSFET Parameters**

Part Number	Location	BV <sub>DSS</sub> (V)	I <sub>D</sub> T <sub>A</sub> =25°C	Typ. R <sub>DS(ON)</sub> at 10 V <sub>GS</sub>	Typ. Q <sub>g</sub> at 10 V <sub>GS</sub>
FDMQ86530L	Q1, Q2, Q3, Q4	60	8 A	12 m $\Omega$	23 nC

The board dimensions are 100 mm x 75 mm. Figure 1 shows the physical information of the individual layers.

		1.6T
Copper	1	0.07
Pre-preg		0.18
Copper	2	0.07
C.C.L		1.0
Copper	3	0.07
Pre-Preg		0.18
Copper	4	0.07
Total Thickness		1.64T

Figure 1. Board Construction

## 2. Photographs

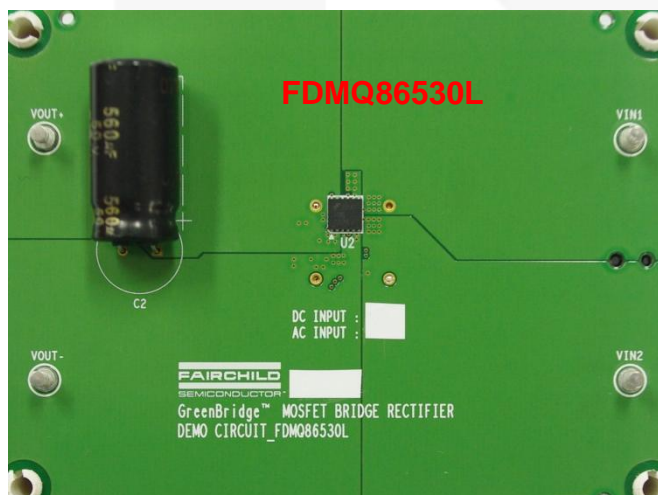


Figure 2. Top View

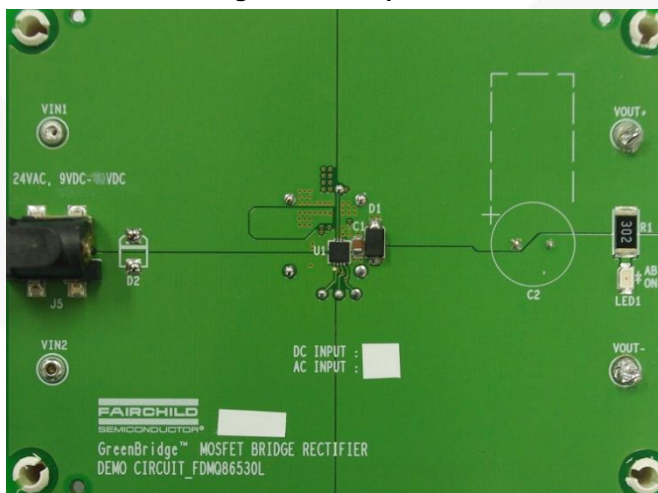


Figure 3. Bottom View

### 3. Printed Circuit Board

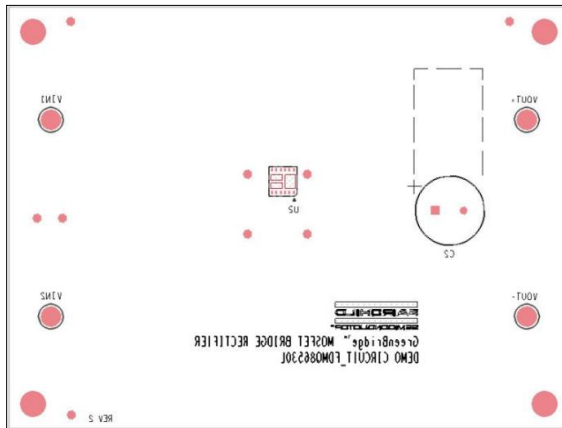


Figure 4. SST and SMT Top Side  
(Size = 100 X 75 mm, 4 Layer)

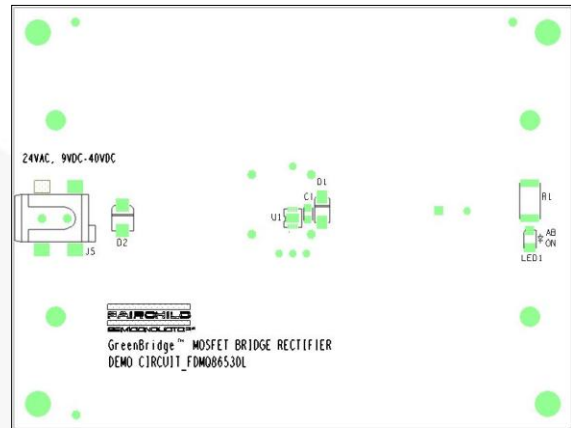


Figure 5. SSB and SMB Bottom Side

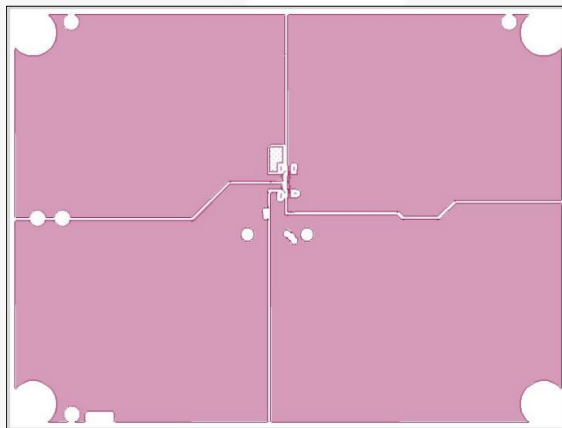


Figure 6. Top Layer

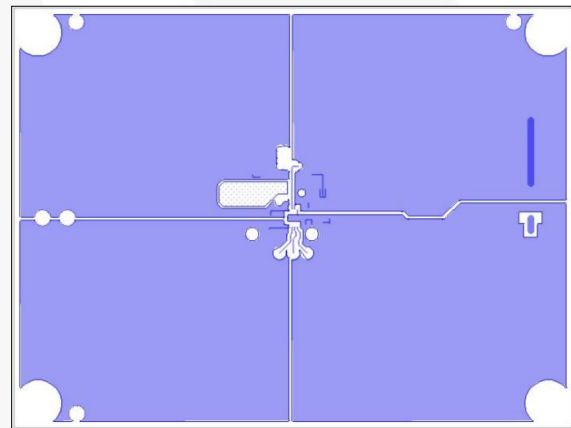


Figure 7. Bottom Layer

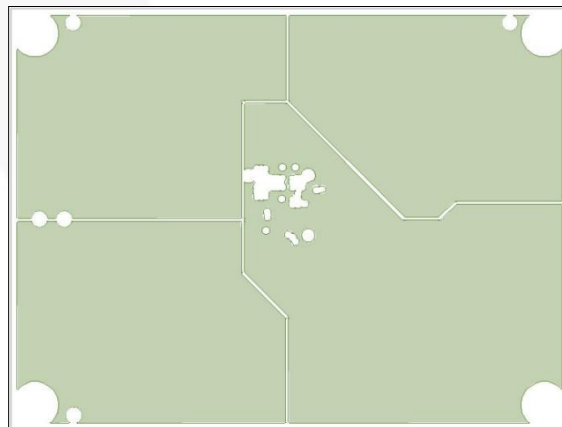


Figure 8. Power Layer

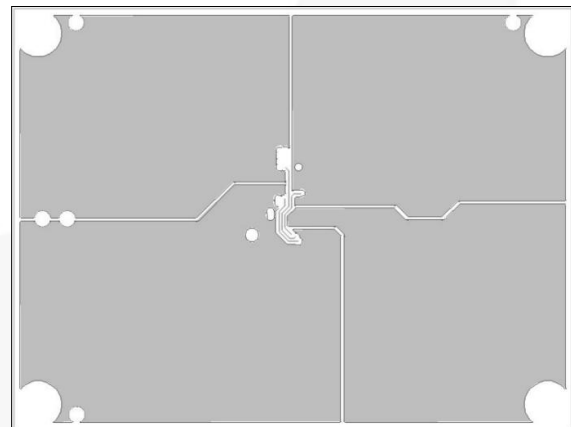
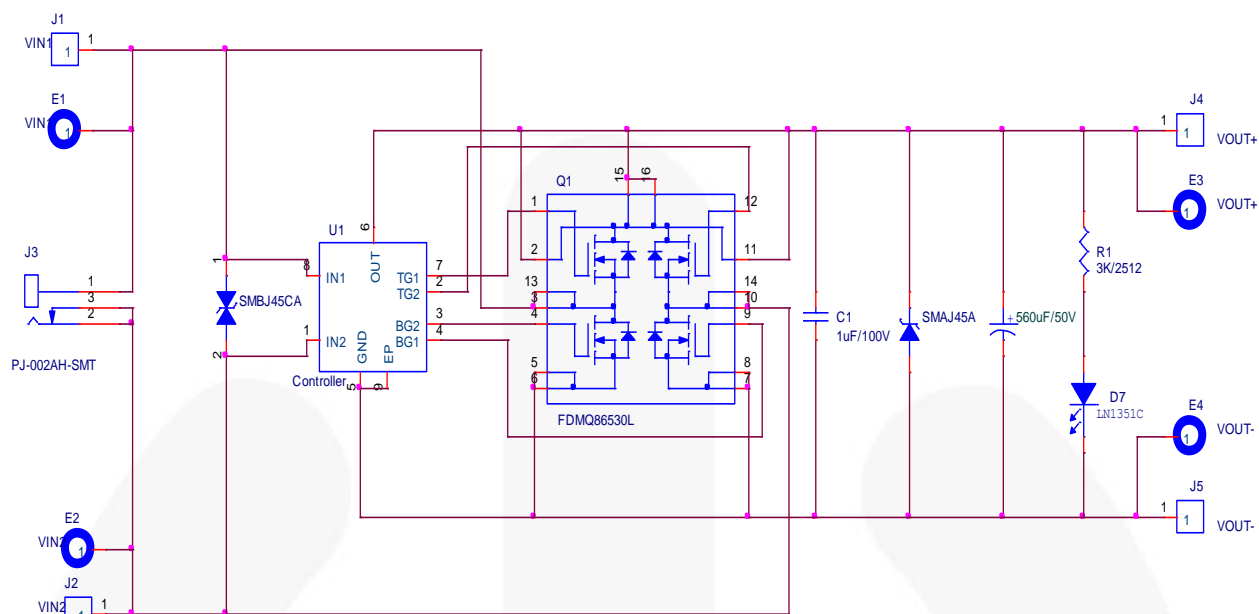


Figure 9. Ground Layer

## 4. Schematic



**Figure 10. Evaluation Board Schematic**

## 5. Bill of Materials

Item	Qty.	Reference	Part Name	Vendor	Comment
1	1	C1	C2012X7S2A105K	TDK	1 $\mu$ F / 100 V / 2012
2	1	C2	EEU-FM1H561	Panasonic	560 $\mu$ F / 50 V /ALU
3	1	D1	SMAJ45A-13-F	Diodes	TVS UNIDIRECT 400 W 45 V SMA
4	1	D2	SMBJ45CA-13-F	Diodes	TVS BIDIRECT 600 W 45 V SMB
5	4	E1-E4	2501-2-00-80-00-00-07-0	Mill-Max	Test Pin
6	1	J5	PJ-002A-SMT	CUI INC.	POWER JACK 2.1 x 5.5 mm
7	1	LED1	LN1351CTR	Panasonic	GREEN J-TYPE SMD
8	1	R1	CRCW25123K00JNEG	VISHAY	3 k $\Omega$ , 5% 2512
9	1	U1	LT4320IDDE	LINEAR TECH.	IC
10	1	U2	FDMQ86530L	Fairchild Semiconductor	60 V N-Channel MOSFET GreenBridge™
11	4	MH1-MH4	8833 (SNAP ON)	KEYSTONE	NYLON 0.50" Tall

## 6. Test Setup

### 6.1. Test Equipment

- 0 – 50V<sub>AC</sub> / 5 A AC power supply for input voltage
- Oscilloscope to view waveforms

### 6.2. Test Setup

- AC V<sub>IN</sub> power supply adjusted and connected to VIN1 (J1) and VIN2 (J2)



Figure 11. AC GreenBridge™ FDMQ86530L Test Setup

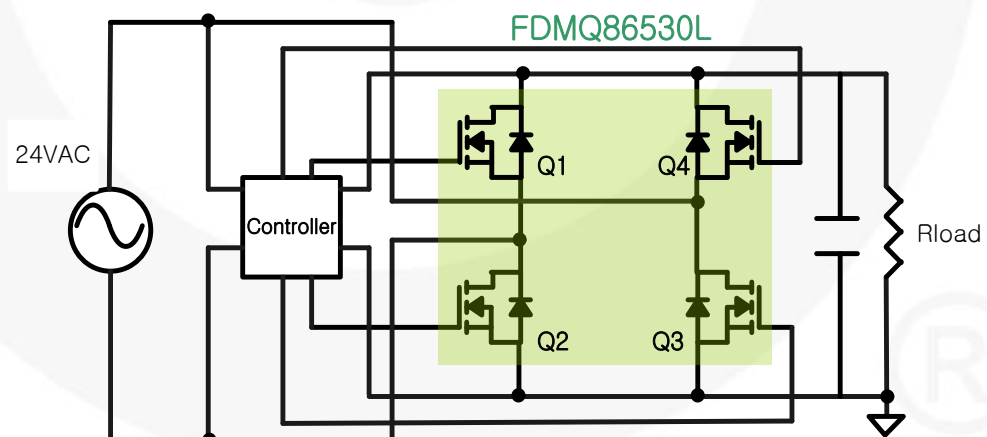


Figure 12. Test Diagram



## 7. Measured Data

Figure 13 - Figure 15 show the measured thermal performance of the GreenBridge™ FDMQ8650L compared with B360B diode bridge on the evaluation board. Figure 16 shows the thermal image at 5 A of output current.

**Table 3. Test Condition**

$V_{IN}$	$f_{SW}$	$I_{OUT}$	Cooling
24 V <sub>AC</sub>	60 Hz	0~5 A, 0.5 A Step, 5 min. Soak Time	No

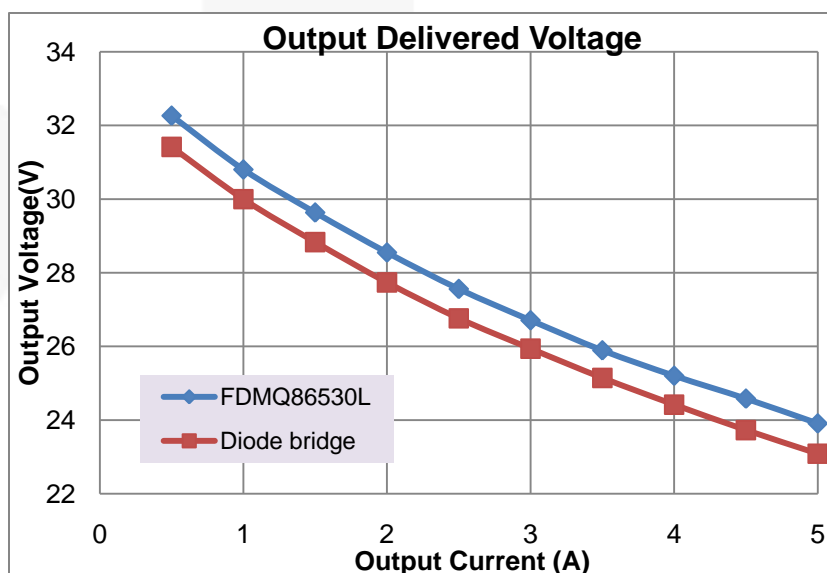


Figure 13. Output Delivered Voltage at  $T_A=25^{\circ}\text{C}$ , Natural Air Flow

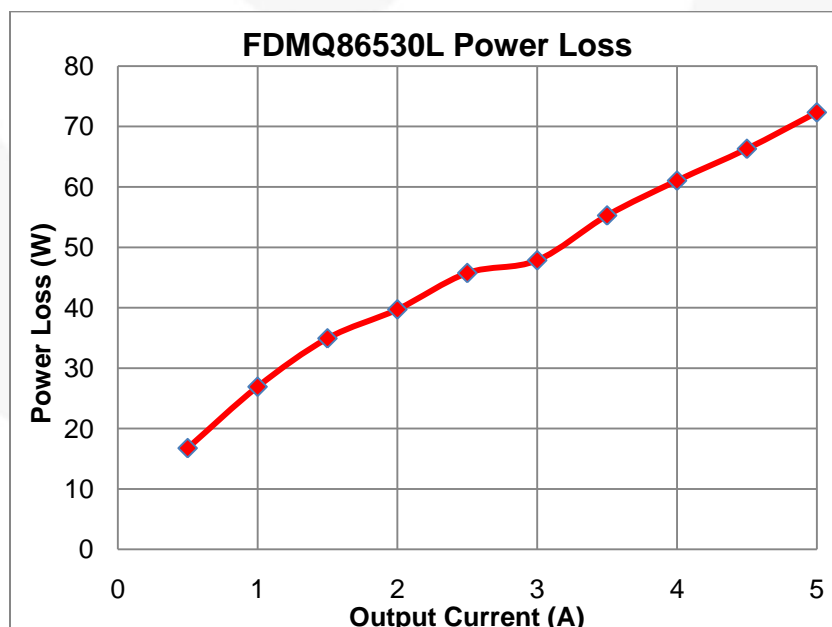


Figure 14. Power Dissipation at  $T_A=25^{\circ}\text{C}$ , Natural Air Flow

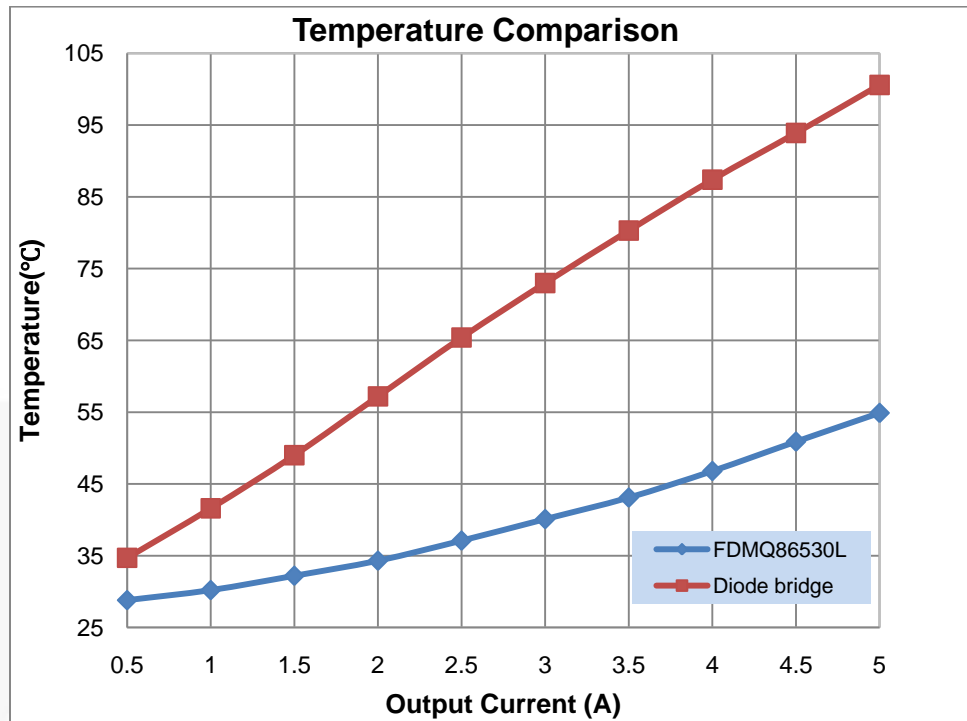
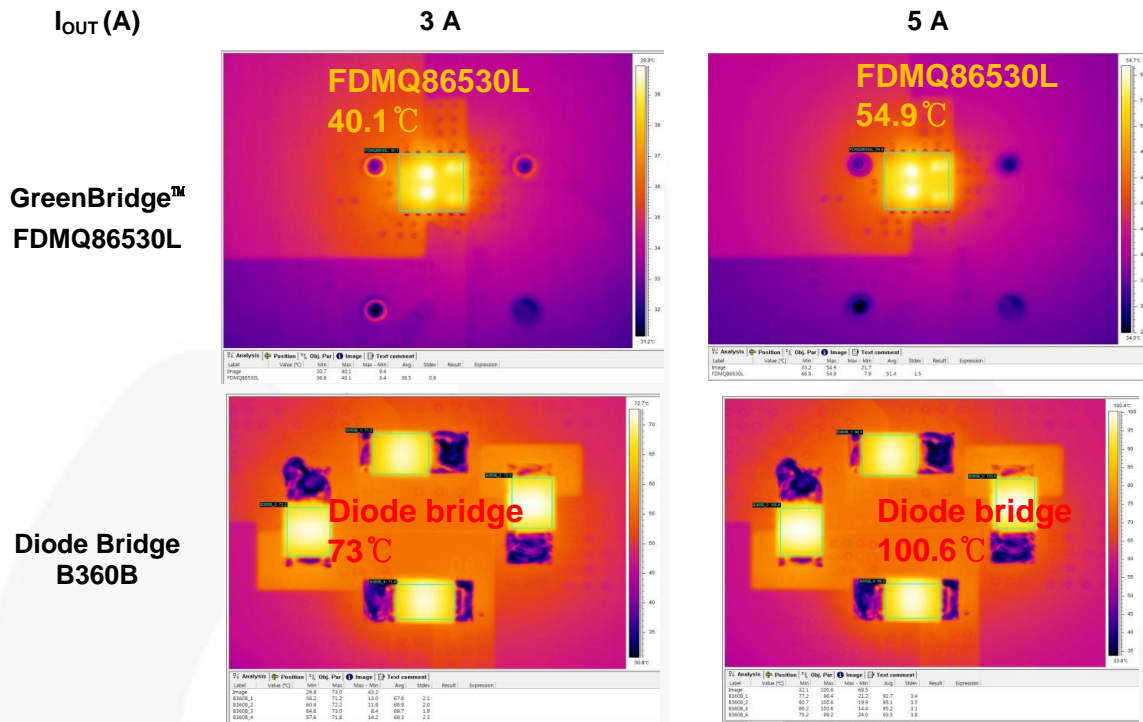


Figure 15. Thermal Performance at  $T_A=25^{\circ}\text{C}$ , Natural Air Flow

## 7.1. Thermal Images



## 7.2. Waveforms

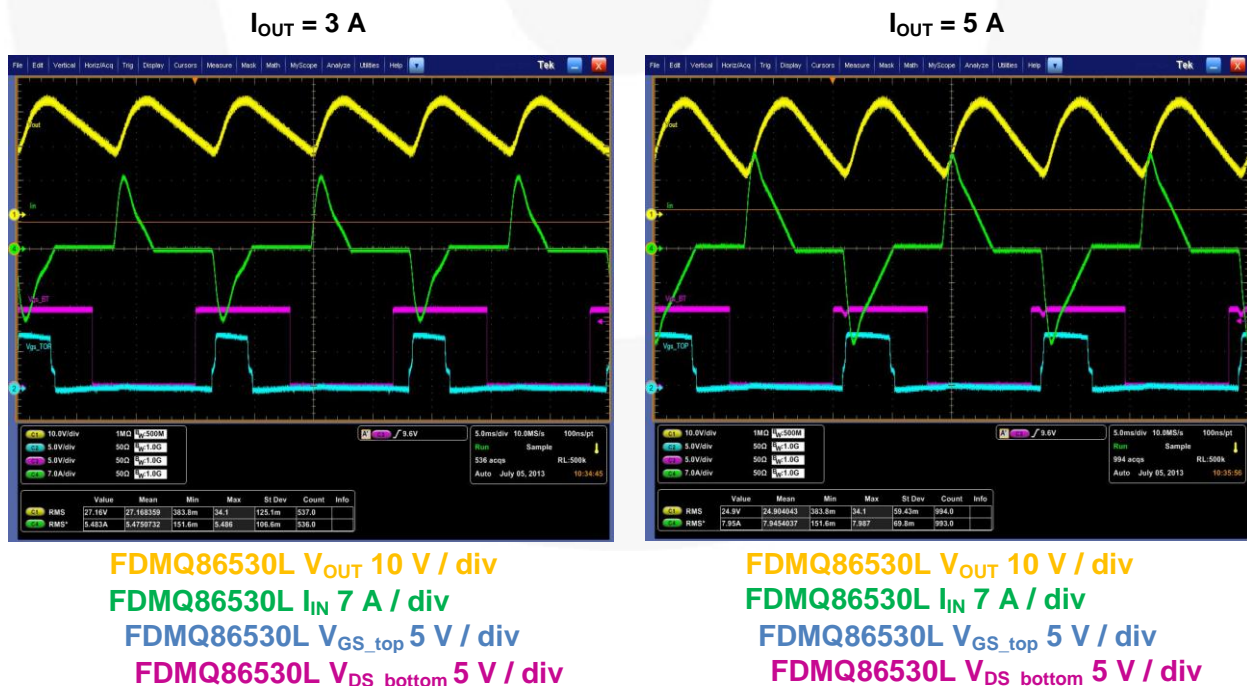


Figure 17. Switching Waveforms at  $V_{IN} = 24 V_{AC}$  / 60 Hz,  $T_A = 25^\circ C$ , Natural Air Flow

## 8. Revision History

Rev.	Date	Description
1.0.0	October 2013	Initial Release

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### WARNING AND DISCLAIMER

Replace components on the Evaluation Board only with those parts shown on the parts list (or Bill of Materials) in the Users' Guide. Contact an authorized Fairchild representative with any questions.

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