



FEATURES

Input voltage Range: 3V to 9V

Output Current: 1.6A

Output Voltage: 12V

Oscillator Frequency: 2MHz

High Efficiency: $>91\%$ at 1A from $6V_{IN}$ to $12V_{OUT}$

Full-featured evaluation board for AWT5157

- Shutdown Function
- OCP
- Thermal Shutdown

EQUIPMENT NEEDED

Power supply up to 9 V

Oscilloscope

Multimeter

GENERAL DESCRIPTION

The AWT5157 EVM (Shown in Fig.1) is designed for the evaluation of high-performance non-synchronous boost regulator AWT5157. The AWT5157 can operate over a wide input voltage range from 2.9V to 45V with low operating current.

Standard features, such as enable/shutdown control, UVLO, power good (PG) indicator, line and load regulation and over current protection can be demonstrated by this evaluation board.

For full details on the AWT5157 BOOST regulator, see the AWT5157 data sheets.

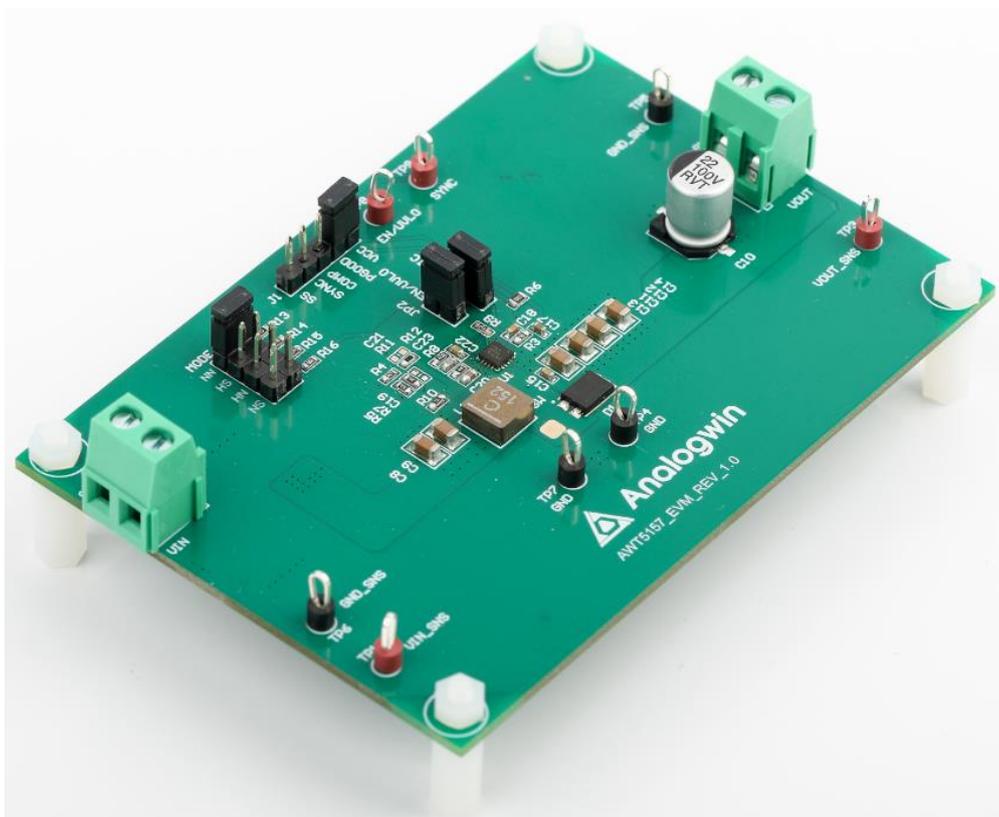


Fig.1 Evaluation Board Picture

ELECTRICAL SPECIFICATION

Table1. AWT5157 EVM Electrical Specifications

Name	Pin	Description	Test Conditions	Min.	Typ.	Max.	Unit
VIN	P1	Input voltage range V_{IN}	Operation	3		9	V
VOUT	P2	Output Voltage			12		V
EN	TP8	Enable Input		0		45	V

TEST POINTS and JUMPER DEFINITION

Table 2. Test Points Definition

Pin	Description
TP1	Input Voltage Sense Pin
SW	Probe point for the Switch node of the boost circuit
TP3	Output Voltage Sense Pin
TP4	GND Pin
TP5	GND Pin, Negative output voltage sense connection
TP6	GND Pin, Negative input voltage sense connection
TP7	GND Pin
TP8	Enable Voltage Pin
TP9	Input for external clock signal
JP1	Directly connect VIN to the BIAS pin
JP2	Directly connect EN/UVLO to the VIN
J1	SS Pin, Monitor the SS pin
	SYNC Pin, Monitor the SYNC pin
	COMP Pin, Monitor the COMP pin
	PGOOD Pin, Monitor the PGOOD pin
	VCC Pin, Monitor the VCC pin
J2	(NN), Hiccup mode disabled, spread spectrum disabled
	(HS), Hiccup mode enabled, spread spectrum enabled
	(HN), Hiccup mode enabled, spread spectrum disabled
	(NS), Hiccup mode disabled, spread spectrum enabled

BENCH SETUP

In order to prepare the evaluation board for operation, several steps should be completed before the initial use:

1. Connect power supply which is capable of 9V/1.6A to the input terminal P1, **DO NOT** turn on the power supply.
2. Connect an electronic load which is capable of sinking more than 1.6A to the output terminal P2, and set load current to 0A.

- It is highly recommended that an ammeter should be put in series with the input power supply and the electronic load to measure supply and load current, a voltmeter should be placed on the input and output voltage sense pins to get an accurate input and output voltage (See Fig.2).



Fig.2 Series with the power supply and the electronic Load

- Once a proper output voltage is established, gradually adjust the load current or the input voltage within operating range to observe regulation, efficiency and other parameters.

TEST PROCEDURE AND RESULT

Soft Start

- Follow the procedures in BENCH SETUP session.
- Set electronic load to 0A.
- Set $V_{EN}=3V$ and turn on enable power supply.
- Set $V_{IN}=3V$ and turn on input power supply, use oscilloscope to observe input voltage, output voltage, SS voltage and PGOOD voltage.
- Follow the steps above to verify the conditions for $V_{IN}=6V$ and $9V$.

The measured soft start waveforms at no load conditions are shown in Fig.3, Fig.4 and Fig.5. The measured soft start waveforms at load conditions are shown in Fig.6, Fig.7 and Fig.8.

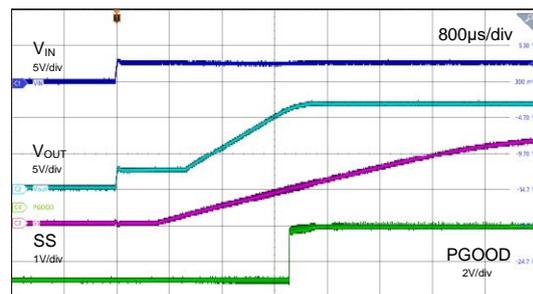


Fig.3 Soft Start by $V_{IN} = 3V$, $I_{OUT} = 0A$

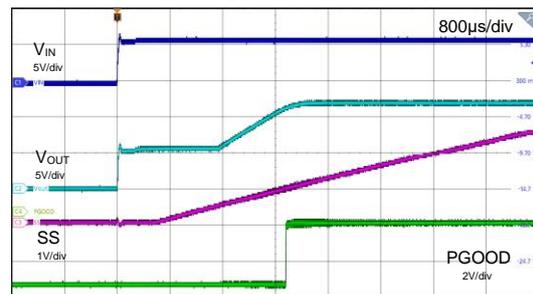


Fig.4 Soft Start by $V_{IN} = 6V$, $I_{OUT} = 0A$

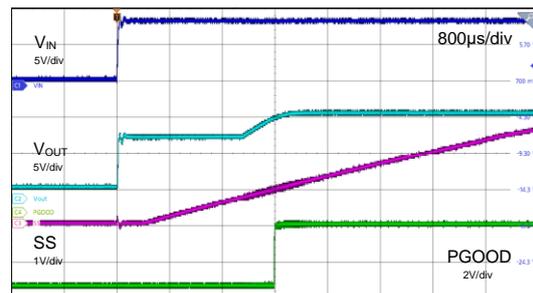


Fig.5 Soft Start by $V_{IN} = 9V$, $I_{OUT} = 0A$

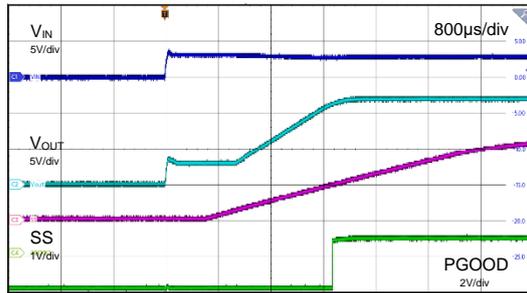


Fig.6 Soft Start by $V_{IN} = 3V$, $I_{OUT} = 0.5A$

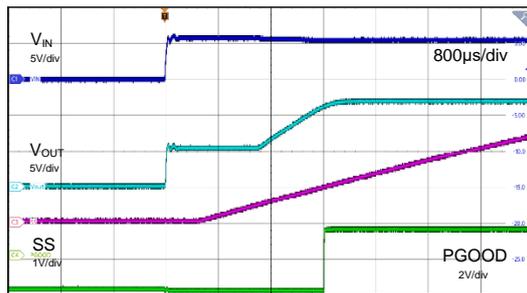


Fig.7 Soft Start by $V_{IN} = 6V$, $I_{OUT} = 1.6A$

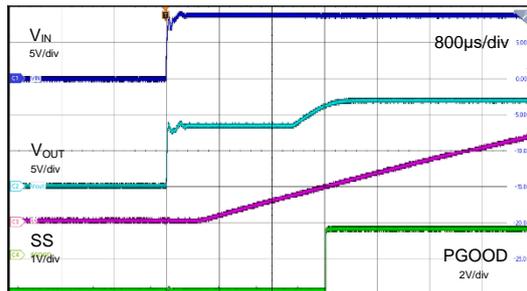


Fig.8 Soft Start by $V_{IN} = 9V$, $I_{OUT} = 1.6A$

Load Transient

1. Follow the procedures in BENCH SETUP session.
2. Set $V_{IN}=3V$ and turn on input power supply.
3. Set electronic load to dynamic mode and set load step from 0.3A to 0.6A with a slew rate of $1.2A/\mu s$, use oscilloscope to observe output voltage and load current (See Fig.9).
4. Set $V_{IN}=6V$ and turn on input power supply.
5. Set electronic load to dynamic mode and set load step from 0.8A to 1.6A with a slew rate of

$1.2A/\mu s$, use oscilloscope to observe output voltage and load current (See Fig.10).

6. Set $V_{IN}=9V$ and turn on input power supply.

7. Set electronic load to dynamic mode and set load step from 0.8A to 1.6A with a slew rate of $1.6A/\mu s$, use oscilloscope to observe output voltage and load current (See Fig.11).

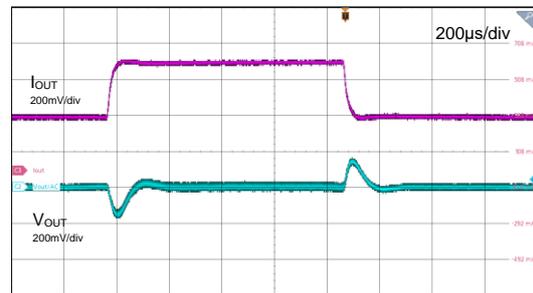


Fig.9 Load Transient, $V_{IN} = 3V$, $I_{OUT} = 0.3 A$ to $0.6 A$

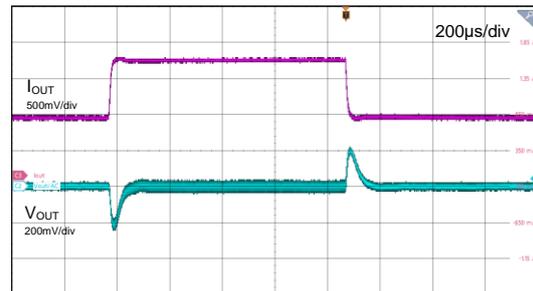


Fig.10 Load Transient, $V_{IN} = 6V$, $I_{OUT} = 0.8 A$ to $1.6 A$

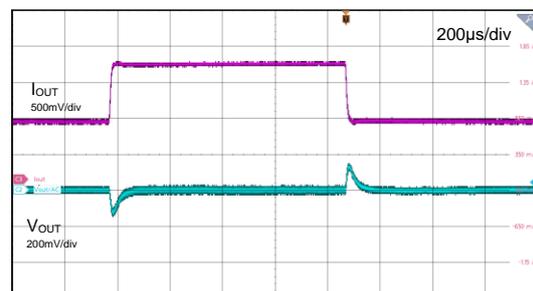


Fig.11 Load Transient, $V_{IN} = 9V$, $I_{OUT} = 0.8 A$ to $1.6 A$

It recommended to use minimized measurement loop (shown in Fig.12) to evaluate the load transient performance.

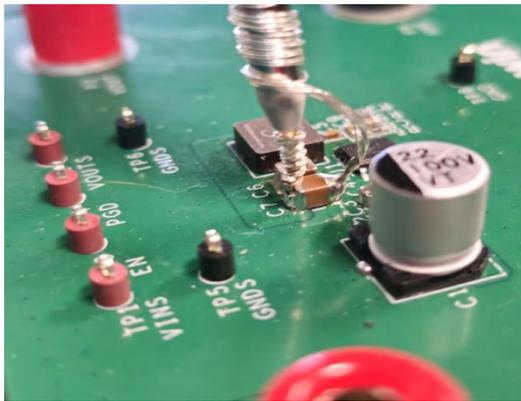


Fig.12 Measured Method

Efficiency Curve

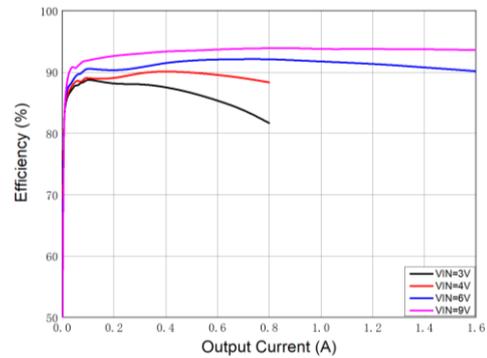


Fig.16 Efficiency vs Load

Steady State waveforms

The output voltage ripple is measured directly next to C14.

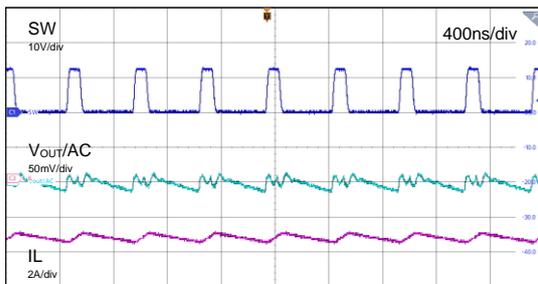


Fig.13 Steady State, $V_{IN} = 3V$, $I_{OUT} = 0.6A$

Load Regulation Curve

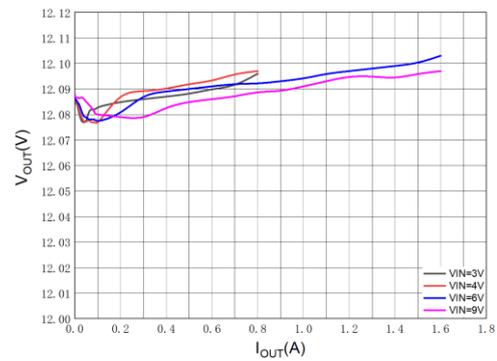


Fig.17 Load Regulation

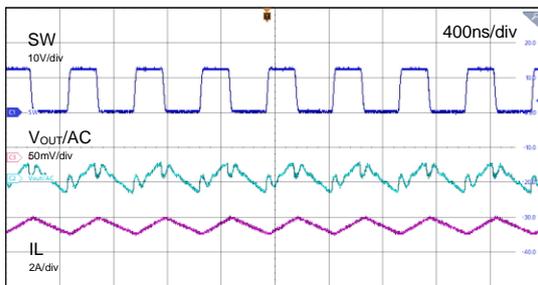


Fig.14 Steady State, $V_{IN} = 6V$, $I_{OUT} = 1.6A$

Thermal Performance

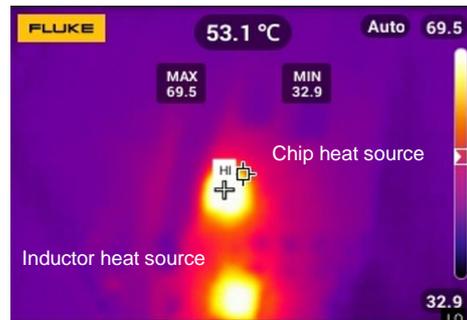


Fig.18 $V_{IN} = 3V$, $I_{OUT} = 0.6A$, $V_{BIAS} = V_{IN}$, no Forced Air Cooling

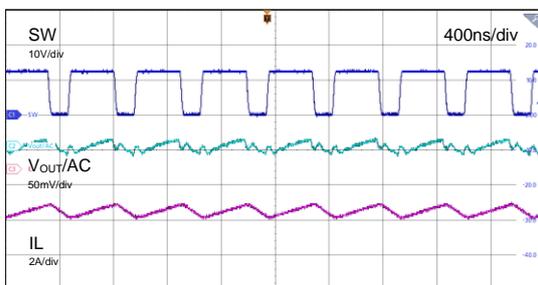


Fig.15 Steady State, $V_{IN} = 9V$, $I_{OUT} = 1.6A$

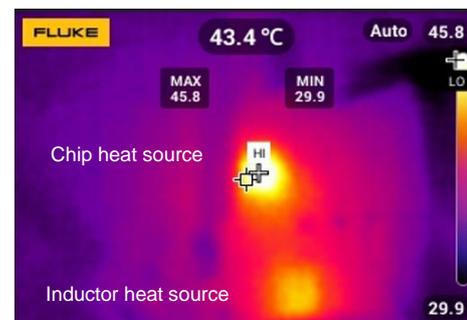


Fig.19 $V_{IN} = 3V$, $I_{OUT} = 0.6A$, $V_{BIAS} = 12V$, no Forced Air Cooling

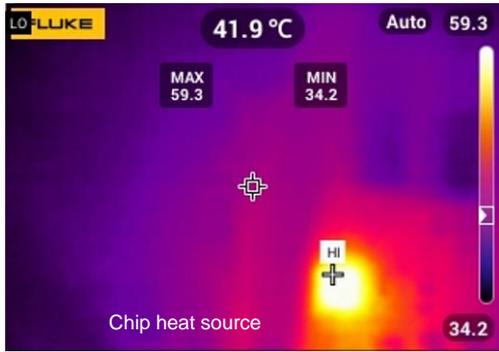


Fig.20 $V_{IN} = 6\text{ V}$, $I_{OUT} = 1.6\text{ A}$, $V_{BIAS} = V_{IN}$, no Forced
Air Cooling

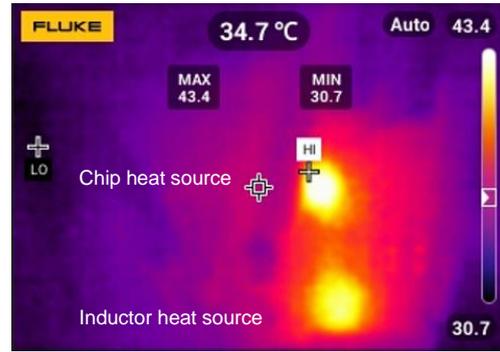


Fig.21 $V_{IN} = 9\text{ V}$, $I_{OUT} = 1.6\text{ A}$, $V_{BIAS} = V_{IN}$, no Forced
Air Cooling

AC Loop Response Curves

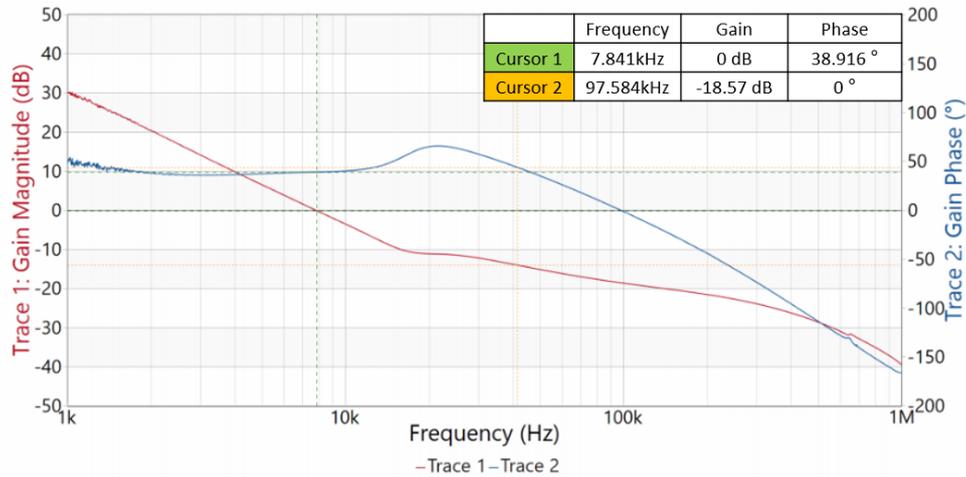


Fig.22 Control Loop Response, $V_{IN} = 3\text{ V}$, $I_{OUT} = 0.6\text{ A}$

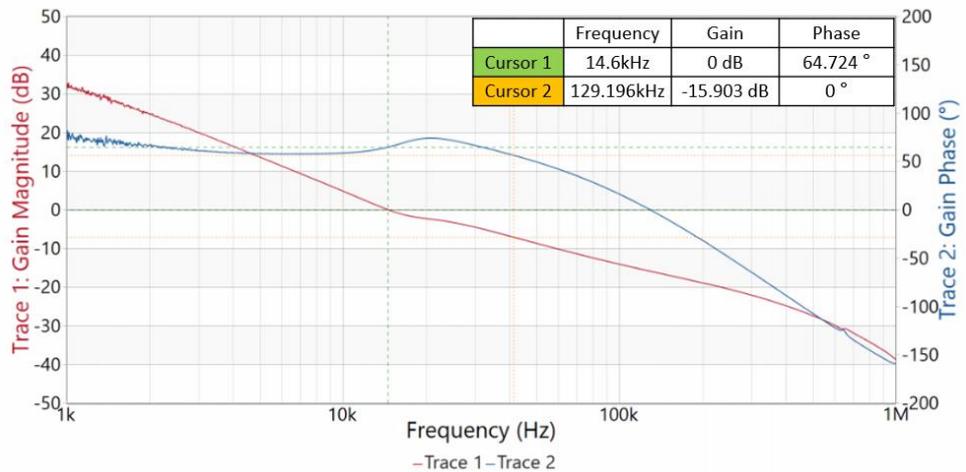


Fig.23 Control Loop Response, $V_{IN} = 6\text{ V}$, $I_{OUT} = 1.6\text{ A}$

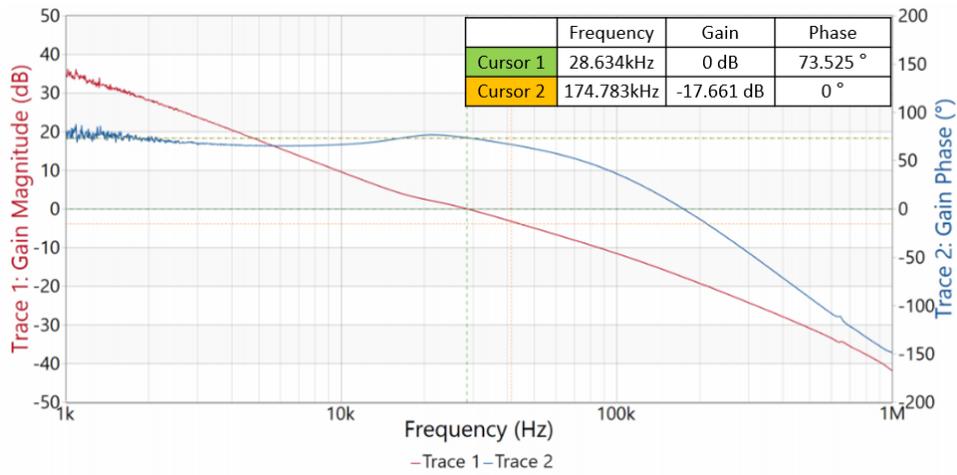


Fig.24 Control Loop Response, $V_{IN} = 9\text{ V}$, $I_{OUT} = 1.6\text{ A}$



LAYOUT DIAGRAMS

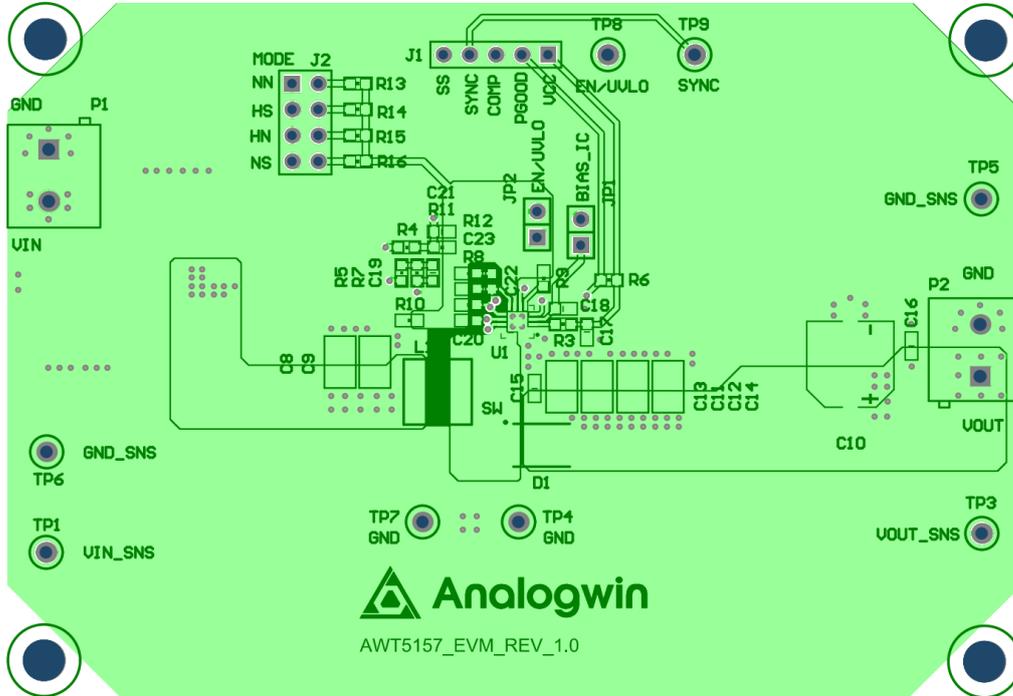


Fig.26 Top Layer

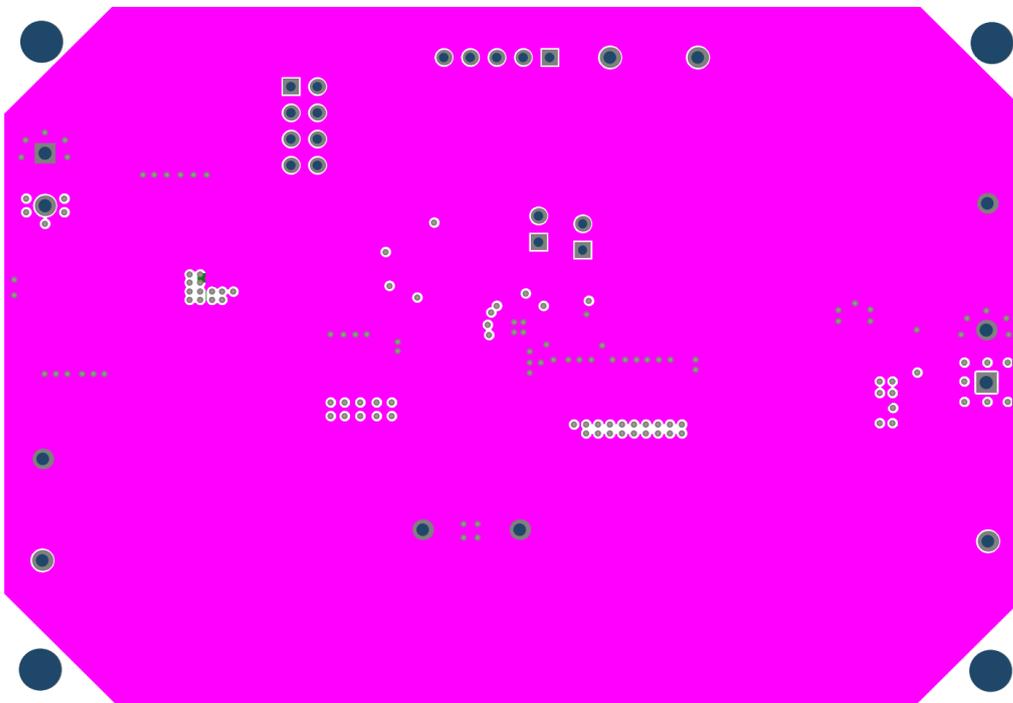


Fig.27 2nd Layer

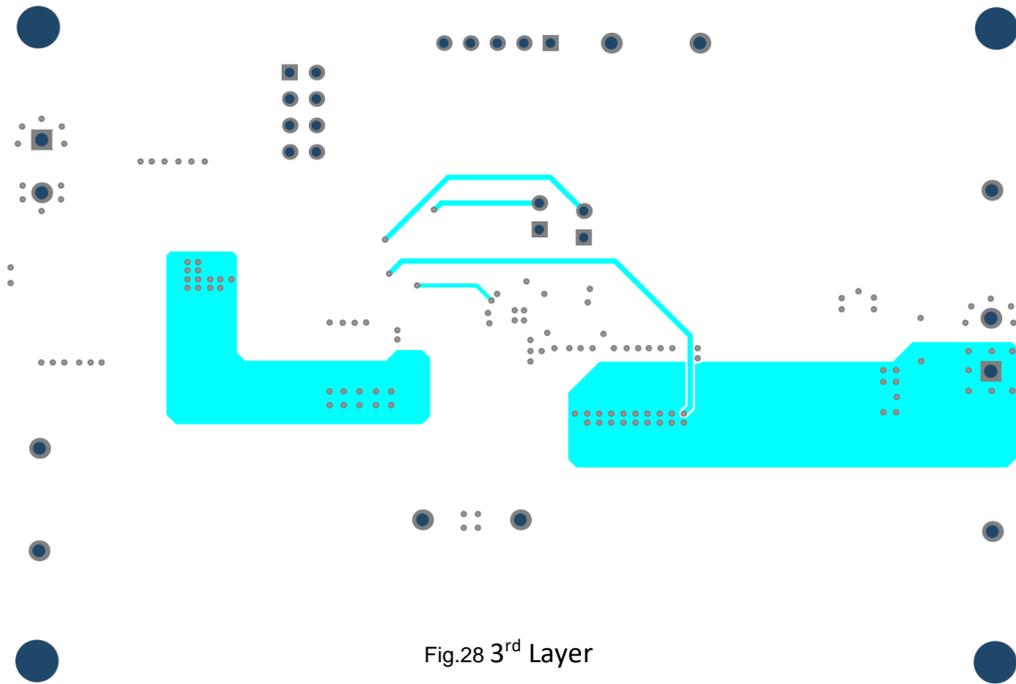


Fig.28 3rd Layer

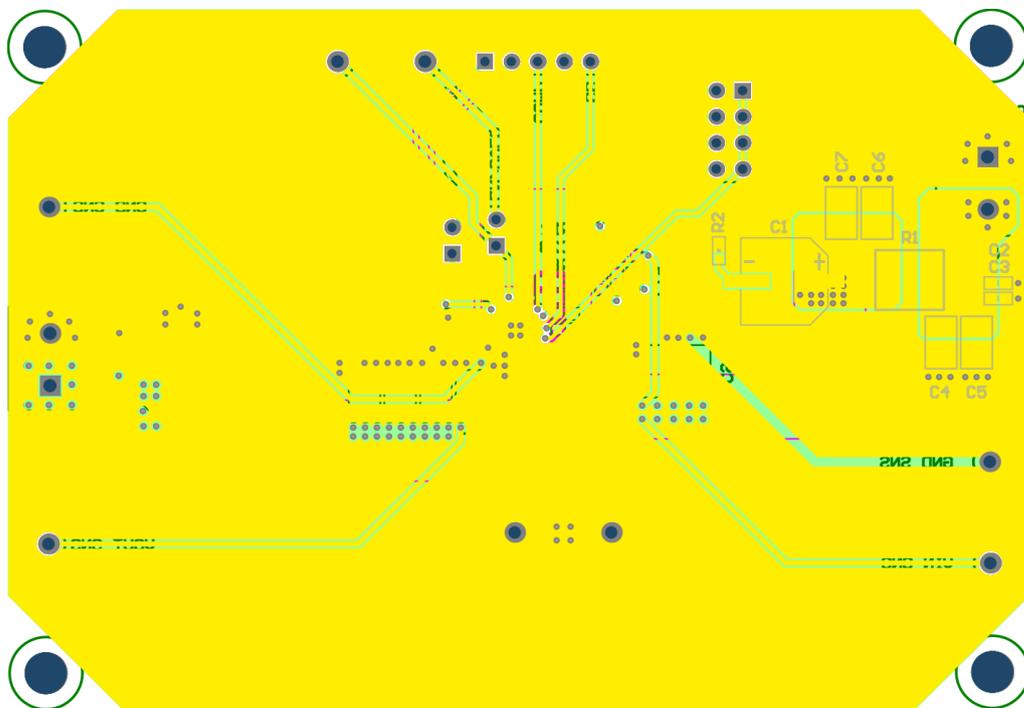


Fig.29 Bottom Layer



BILL OF MATERIALS

Table 3. BOM for AWT5157EVM

Designator	Description	Part Number	Quantity
C1, C10	CAP, AL, 22 μ F \pm 10% 100V, SMD, D8xL10.5mm	RVT2A220M0810	2
C2	CAP, MLCC, 100nF \pm 10% 50V, 0603	CGA0603X7R104K500JT	0
C15, C16	CAP, MLCC, 100nF \pm 10% 50V, 0603	CGA0603X7R104K500JT	2
C3	CAP, MLCC, 1 μ F \pm 10% 50V, 0603	CGA0603X5R105K500JT	0
C4, C5	CAP, MLCC, 10 μ F \pm 10% 50V, 1210	GRM32ER71H106KA12L	0
C6, C7, C8, C9	CAP, MLCC, 10 μ F \pm 10% 50V, 1210	GRM32ER71H106KA12L	4
C11, C12, C13, C14	CAP, MLCC, 4.7 μ F \pm 10% 50V, 1210	GRM32ER71H475KA88L	4
C17	CAP, MLCC, 1 μ F \pm 10% 16V, 0603	CGA0603X5R105K160JT	1
C18	CAP, MLCC, 100nF \pm 10% 100V, 0603	CL10B104KC8NNNC	1
C19, C21	CAP, 0603	Don't Need Install	0
C20	CAP, MLCC, 22nF \pm 10% 16V, 0603	CC0603KRX7R7BB223	1
C22	CAP, MLCC, 10nF \pm 10% 16V, 0603	CC0603KRX7R7BB103	1
C23	CAP, MLCC, 100pF \pm 10% 16V, 0603	CC0603KRX7R7BB101	1
D1	100V, 10A Schottky, TO-277B	SB10100	1
J1	Black direct insertion, 2.54mm-1x5P	C2337	1
J2	Black direct insertion, 2.54mm-2x4P	PZ254V-12-8P	1
JP1, JP2	Black direct insertion, 2.54mm-1x2P	C2337	2



Designator	Description	Part Number	Quantity
L1	Inductor 1.5 μ H, Coilcraft, SMD,6.3x6.5mm	XEL6030-152MEC	1
U1	Wide Input Voltage Range Boost/SEPIC/Flyback Converter, QFN3x3-16L	AWT5157BER	1
P1, P2	Power terminal block, green, 1x2P 5.08mm	WJ500V-5.08-2P	2
R1	RES, 0 Ω \pm 1%, 2W, 2512	FRP2512F0000TS	1
R2, R10, R13	RES, 0 Ω \pm 1%, 0603	0603WAF0000T5E	3
R3	RES, 4.99 Ω \pm 1%, 0603	SCR0603F4R99	1
R4	RES, 61.9k \pm 1%, 0603	RC0603FR-0761K9L	1
R5	RES, 20 Ω \pm 1%, 0603	0603WAF200JT5E	1
R6, R16	RES, 100k \pm 1%, 0603	0603WAF1003T5E	2
R7	RES, 49.9k \pm 1%, 0603	FRC0603F4992TS	1
R8	RES, 4.53k \pm 1%, 0603	RC0603FR-074K53L	1
R9	RES, 9.53k \pm 1%, 0603	0603WAF9531T5E	1
R11	RES, 71.5k \pm 1%, 0603	FRC0603F7152TS	1
R12	RES, 2.61k \pm 1%, 0603	FRC0603F2611TS	1
R14	RES, 26.7k \pm 1%, 0603	FRC0603F2672TS	1
R15	RES, 56.2k \pm 1%, 0603	FRC0603F5622TS	1
TP1	VINS, Test Point, Multipurpose, Red	RH-5010	1
TP3	VOUTS, Test Point, Multipurpose, Red	RH-5010	1
TP4	GND, Test Point, Multipurpose, Black	RH-5011	1



Designator	Description	Part Number	Quantity
TP5	GNDS, Test Point, Multipurpose, Black	RH-5011	1
TP6	GNDS, Test Point, Multipurpose, Black	RH-5011	1
TP7	GND, Test Point, Multipurpose, Black	RH-5011	1
TP8	EN/UVLO, Test Point, Multipurpose, Red	RH-5010	1
TP9	SYNC, Test Point, Multipurpose, Red	RH-5010	1



Table 4. Device and Package Configurations

EVM	DEVICE	Output Current
AWT5157EVM	AWT5157	1.6A