

LM3642 Evaluation Board

1 Introduction

The LM3642 is a 4MHz fixed-frequency synchronous boost converter plus 1.5A constant current driver for a high-current white LED. The high-side current source allows for grounded cathode LED operation providing Flash current up to 1.5A. An adaptive regulation method ensures the current source remains in regulation and maximizes efficiency.

The LM3642 is controlled via an I²C-compatible interface. Features include: a hardware flash enable (STROBE) allowing a logic input to trigger the flash pulse and a TX input which forces the flash pulse into a low-current Torch Mode allowing for synchronization to RF power amplifier events or other high-current conditions.

The 4MHz switching frequency, over-voltage protection and adjustable current limit settings allows the use of tiny, low-profile inductors and (10 μ F) ceramic capacitors. The device is available in a small 9-bump (1.615 mm \times 1.665 mm \times 0.6 mm) DSBGA package and operates over the -40°C to $+85^{\circ}\text{C}$ temperature range.

The schematic for LM3642 is shown in [Figure 1](#).

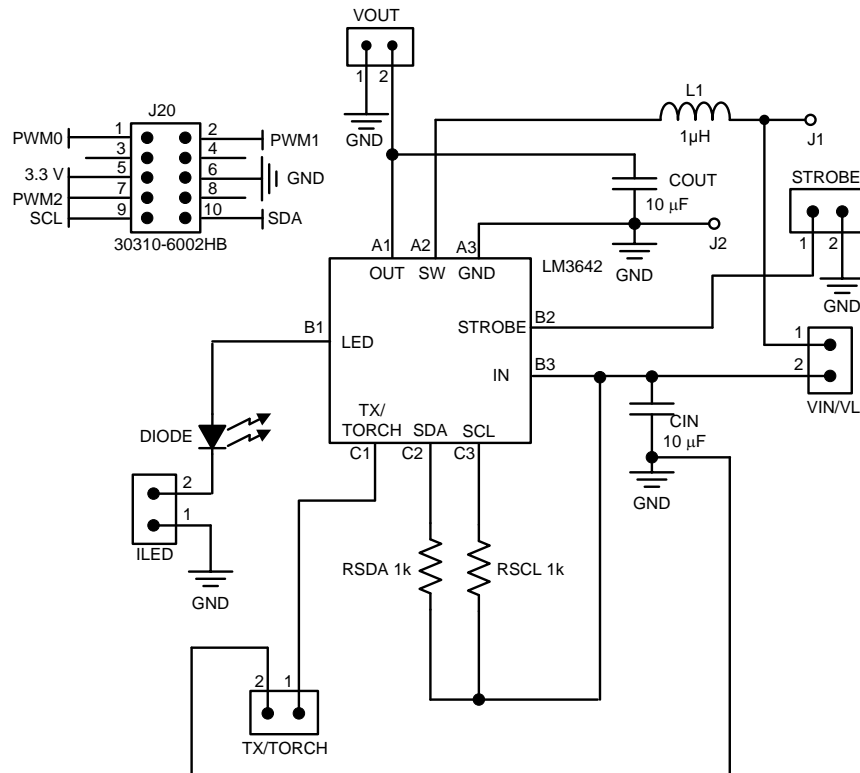


Figure 1. LM3642 Evaluation Board Schematic

2 Evaluation Board Bill of Materials

Table 1. Bill of Materials

Component	Manufacturer	Value	Part Number	Size (mm)	Description
L1	TOKO	1.0 μ H	DFE201610C-1R0N	2 x 1.6 x 1.2	Inductor, Metal Alloy, 1 μ H, 2.7A, 0.063 Ω , SMT
COU1	Murata	10 μ F	GRM155R60J106ME44D	0603 (1.6 x 0.8)	CAP, CERM, 10 μ F, 6.3V, X5R 20%, 0402
CIN	Murata	10 μ F	GRM155R60J106ME44D	0603 (1.6 x 0.8)	CAP, CERM, 10 μ F, 6.3V, X5R 20%, 0402
DIODE	Lumiled	Flash LED	LXCL-EYW4	(2.04 x 1.64 x 0.7)	145 lm (1A), VF = 3.6V, @1A
ILED,STROBE, TX/TORCH, VIN/VL,VOU1	Header		TSW-102-07-G-S	2 x 1	Header, TH, 100mil, 2x1, Gold plated, 230 mil above insulator
J1,J2	Keystone		6091,6092		Standard Banana Jack, Insulated, Red and Black
J20	3M		30310-6002HB		CONN HEADER 10POS DL STR GOLD
RSCL,RSDA	Vishay	1k Ω	CRCW0402100KJNED	0603 (1.6 x 0.8)	Resistor, 100k Ω , 5%, 0.063W, 0402

3 Operation

To operate the LM3642 board, the following jumpers will have to be connected:

SI No	Jumper Between	Function
1	VIN and VL	This connects the inductor to the Input. If a triangular waveform of the input is needed, please disconnect this jumper and supply Vin separately.
2	ILED1 and ILED2	This completes the loop, where the cathode of the LED Diode is connected to ground.

4 LM3642 Graphical User Interface

The LM3642 graphical user interface, [Figure 2](#), features all the register options that are programmable within the LM3642. When the LM3642.exe program is executed and any button is pressed or drop down box is selected, the program will automatically update the LM3642 with the settings of the appropriate register.

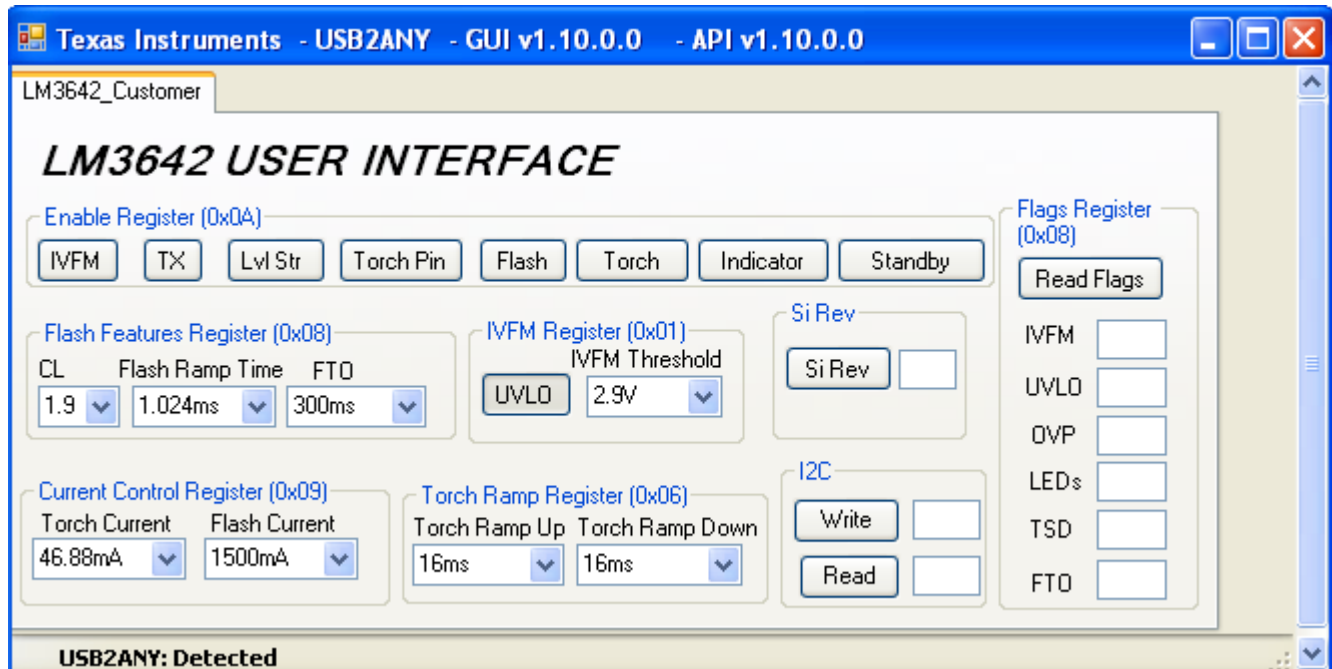


Figure 2. LM3642 Graphical User Interface

4.1 Register Descriptions

Register Name	Internal Hex Address	Power On/RESET Value
Enable Register	0x0A	00
Flags Register	0x0B	00
Flash Features Register	0x08	52
Current Control Register	0x09	0F
IVFM Mode Register	0x01	80
Torch Ramp Time Register	0x06	00
Silicon Revision Register	0x00	00

4.1.1 Enable Register (0x0A)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IVFM 0 = Disabled (default) 1 = Stop and Hold Mode	TX Pin Enable 0 = Disabled (default) 1 = Enabled	Strobe Pin Enable 0 = Disabled (default) 1 = Enabled	Torch Pin Enable 0 = Disabled (default) 1 = Enabled	RFU	RFU	Mode Bits: M1, M0 00 = Standby (default) 01 = Indicator 10 = Torch 11 = Flash	

4.1.2 Flags Register (0x0B)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	RFU	IVFM	UVLO Flag	OVP Flag	LED or Vout Short Flag	Thermal Shutdown Fault	Timeout Flag

IVFM— IVFM down threshold crossed.

UVLO Fault—UVLO Threshold crossed.

OVP Flag—Over-voltage Protection tripped. Open Output cap or open LED.

LED Short Fault—LED Short detected.

Thermal Shutdown Fault—LM3642 die temperature reached thermal shutdown value.

Time-Out Flag—Flash Timer tripped.

Note: Faults require a read-back of the Flags Register to resume operation. Flags report an event occurred, but do not inhibit future functionality. A read-back of the Flags Register will only get updated again if the fault or flags is still present upon a restart.

4.1.3 Flash Features Register (0x08)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	Inductor Current Limit 0 = 1.6A 1 = 1.88A (default)	Flash Ramp Time 000 = 256 μ s 001 = 512 μ s 010 = 1.024 ms (default) 011 = 2.048 ms 100 = 4.096 ms 101 = 8.192 ms 110 = 16.384 ms 111 = 32.768 ms			Flash Time-Out Time 000 = 100 ms 001 = 200 ms 010 = 300 ms (default) 011 = 400 ms 100 = 500 ms 101 = 600 ms 110 = 700 ms 111 = 800 ms		

4.1.4 Current Control Register (0x09)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	Torch Current 000 = 48.4 mA (default) 001 = 93.74 mA 010 = 140.63 mA 011 = 187.5 mA 100 = 234.38 mA 101 = 281.25 mA 110 = 328.13 mA 111 = 375 mA			Flash Current 0000 = 93.75 mA 0001 = 187.5 mA 0010 = 281.25 mA 0011 = 375 mA 0100 = 468.75 mA 0101 = 562.5 mA 0110 = 656.25 mA 0111 = 750 mA 1000 = 843.75 mA 1001 = 937.5 mA 1010 = 1031.25 mA 1011 = 1125 mA 1100 = 1218.75 mA 1101 = 1312.5 mA 1110 = 1406.25 mA 1111 = 1500 mA (default)			

4.1.5 Input Voltage Flash Monitor (IVFM) Mode Register (0x01)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
UVLO 0 = Disabled 1 = Enabled (default)	RFU		IVM-D (Down) Threshold 000 = 2.9V (default) 001 = 3.0V 010 = 3.1V 011 = 3.2V 100 = 3.3V 101 = 3.4V 110 = 3.5V 111 = 3.6V			RFU	

UVLO EN—If enabled and V_{IN} drops below 2.8V, the LM3642 will enter standby and set the UVLO flag in the Flags Register. Enabled = 1, Disabled = 0

Stop and Hold Mode—Stops Current Ramp and Holds the level for the remaining flash if V_{IN} crosses IVM-D Line. Sets IVFM Flag in Flags Register upon crossing IVM-D Line.

4.1.6 Torch Ramp Time Register (0x06)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU	RFU	Torch Ramp-Up Time 000 = 16 ms (default) 001 = 32 ms 010 = 64 ms 011 = 128 ms 100 = 256 ms 101 = 512 ms 110 = 1.024s 111 = 2.048s			Torch Ramp-Down Time 000 = 16 ms (default) 001 = 32 ms 010 = 64 ms 011 = 128 ms 100 = 256 ms 101 = 512 ms 110 = 1.024s 111 = 2.048s		

4.1.7 Silicon Revision Register (0x00)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RFU					000 = LM3642		

5 Board Layout

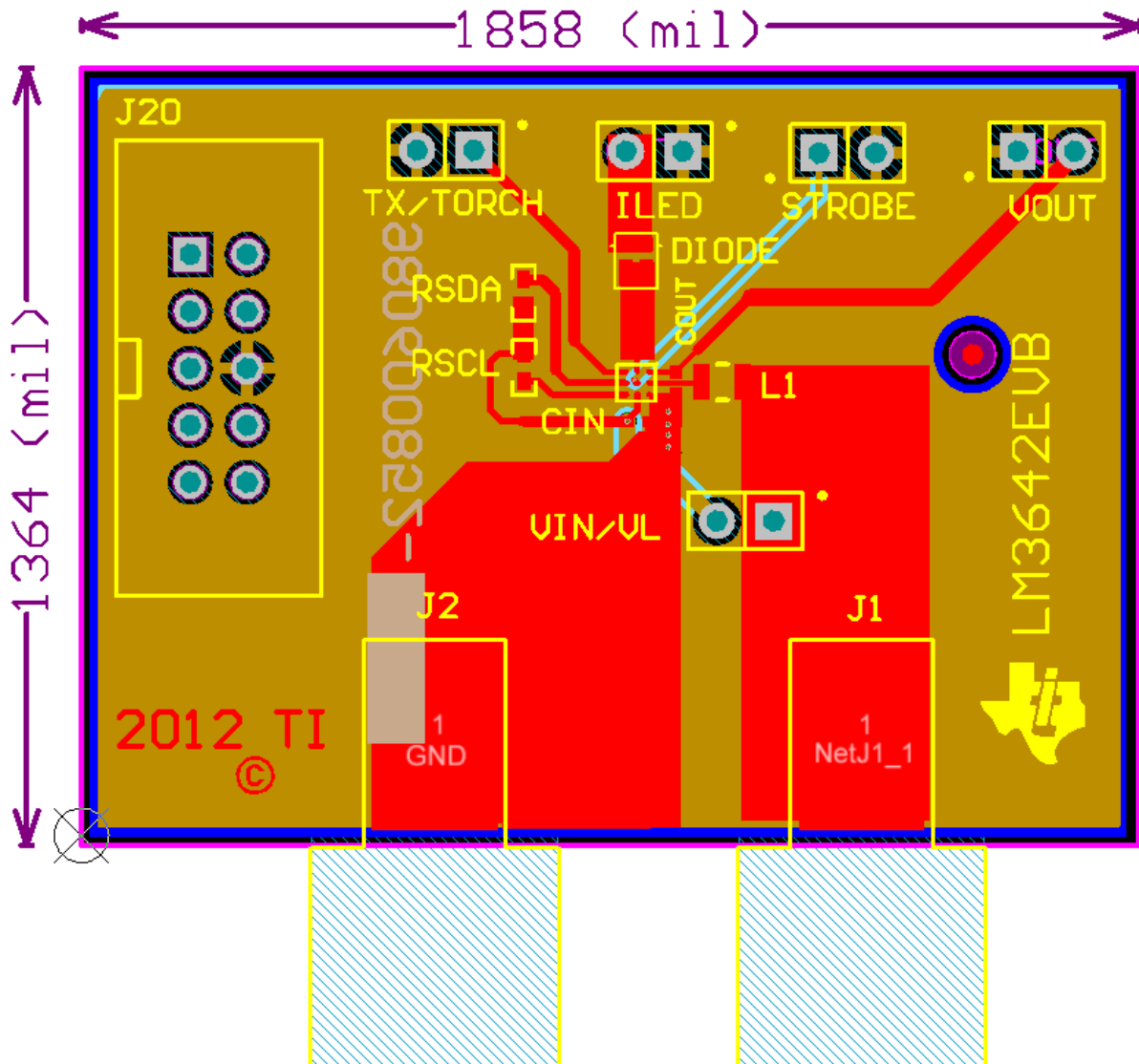


Figure 3. Board Layout (Top Layer)

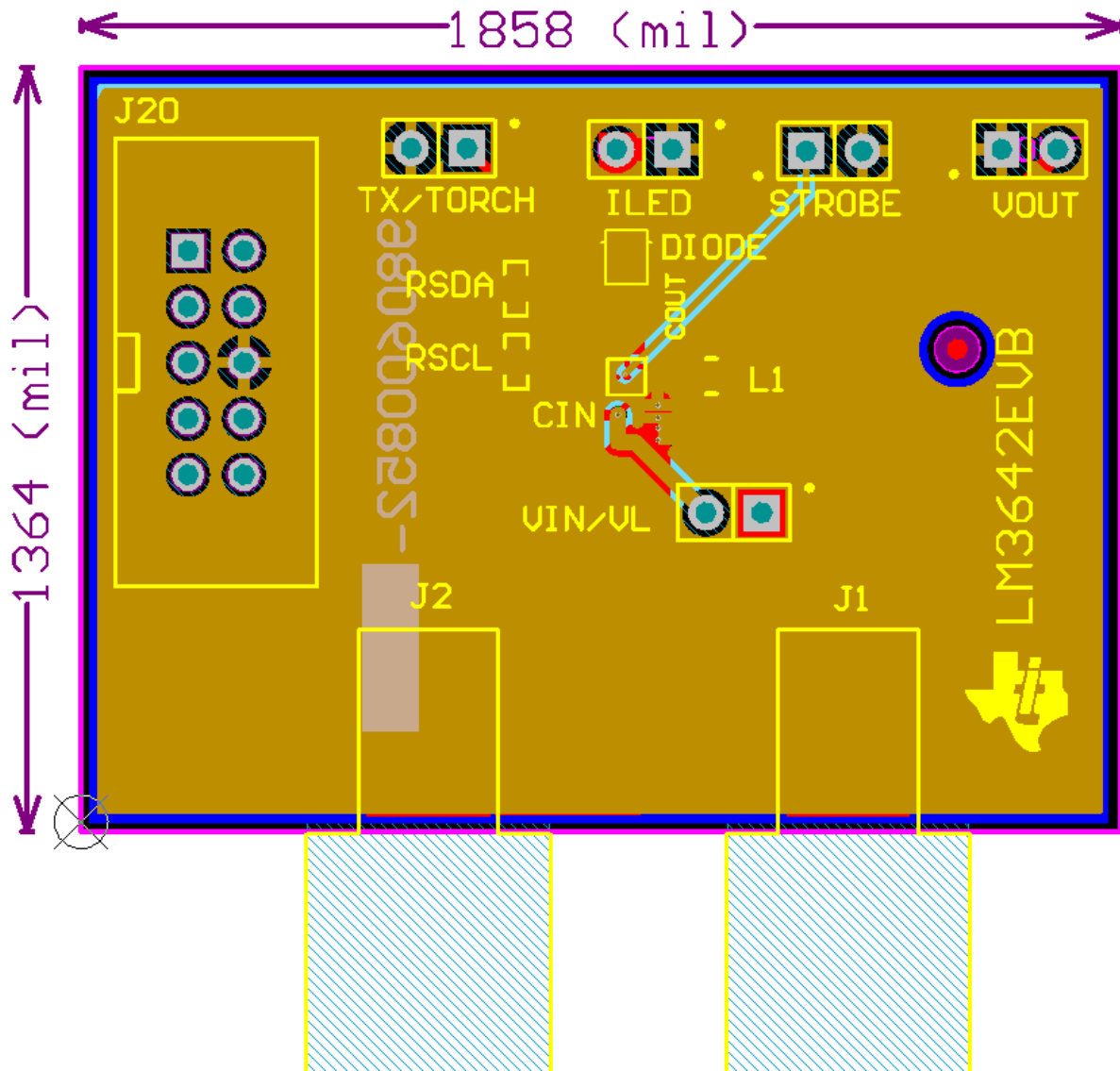


Figure 4. Board Layout (Mid Layer 1)

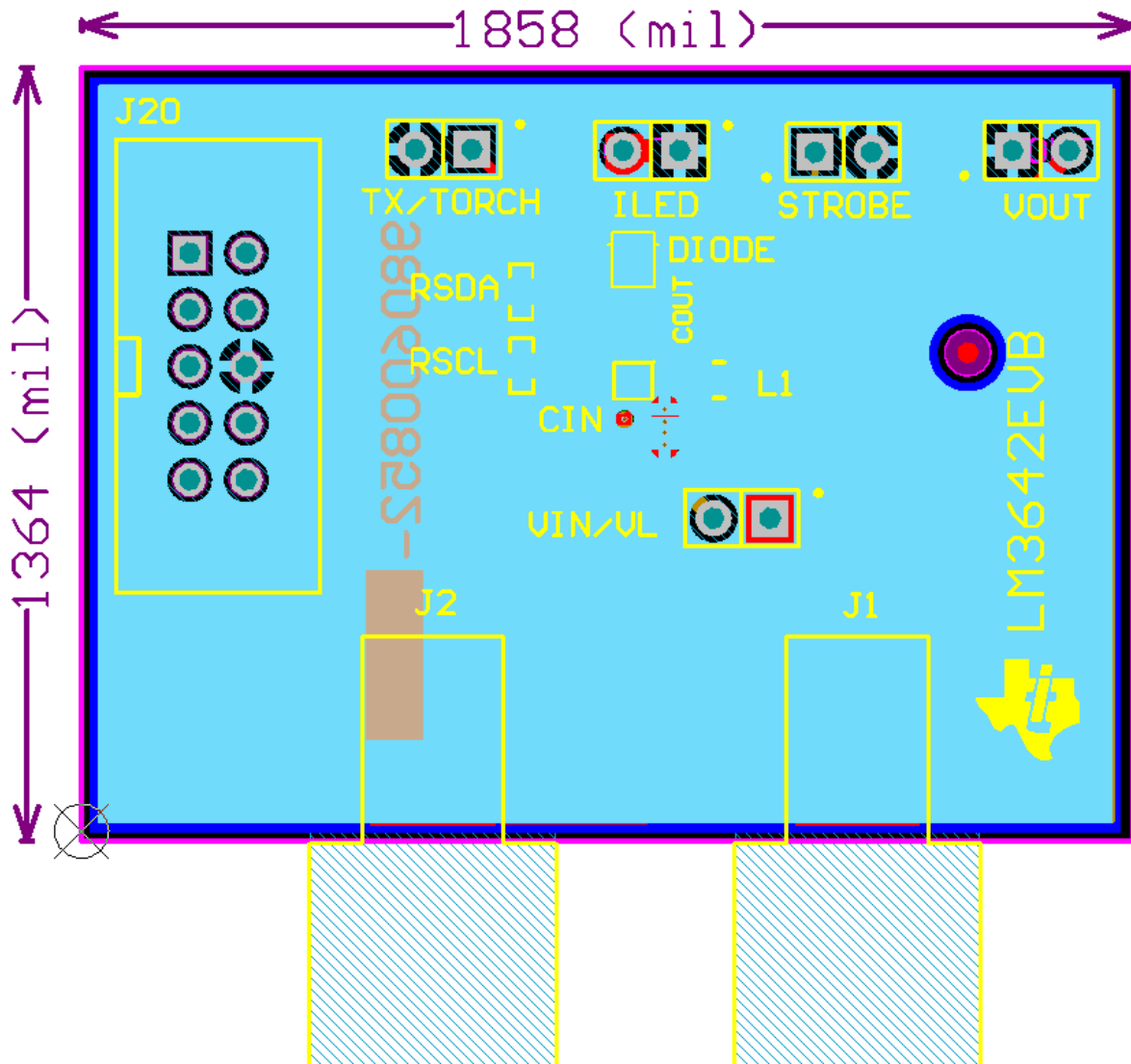


Figure 5. Board Layout (Mid Layer 2)

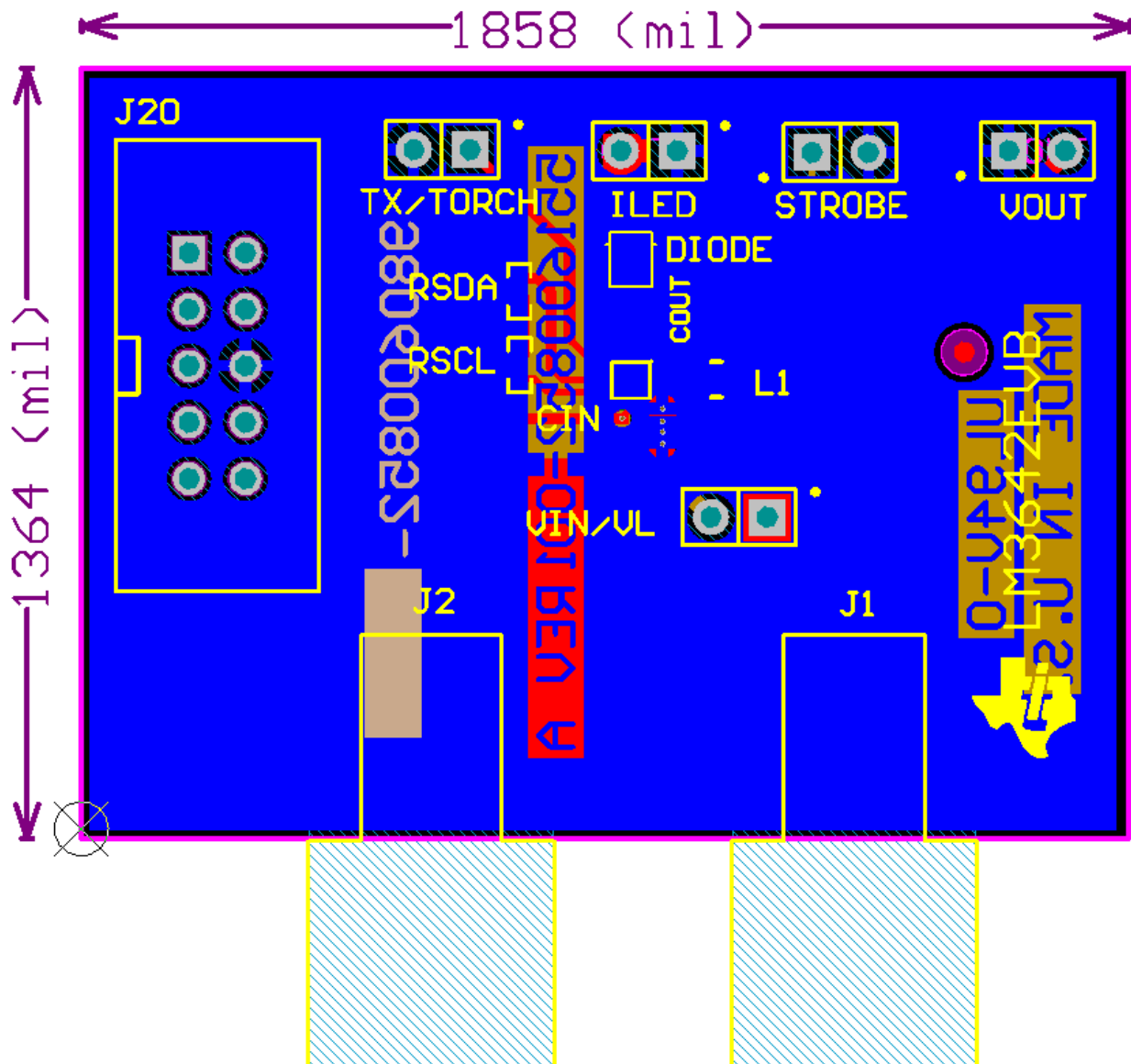


Figure 6. Board Layout (Bottom Layer)

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