

Atmel MSL2010 Single String LED Driver Boost Demo Board

Atmel MSL2010

Key Features

- Fully assembled and tested
- DC to DC converter generates V_{LED}
- External 12V power supply included
- Built In PWM generator
- PWM input allows optional external brightness control
- Includes a single string of 10 white LEDs
- I²C interface

General Description

The Atmel® MSL2010 Boost Demo Board demonstrates a one-string LED driver with built-in boost regulator. The Demo Board is fully assembled and tested, and includes a potentiometer controlled Pulse Width (PWM) generator for LED brightness. Simply connect the included power supply and turn the knob to control the LED brightness. The circuit includes strategically placed jumpers, test points, a PWM input, I²C connections and un-installed component footprints to allow basic evaluation of the MSL2010.

Figure 1. Atmel MSL2010 Boost Demo Board.

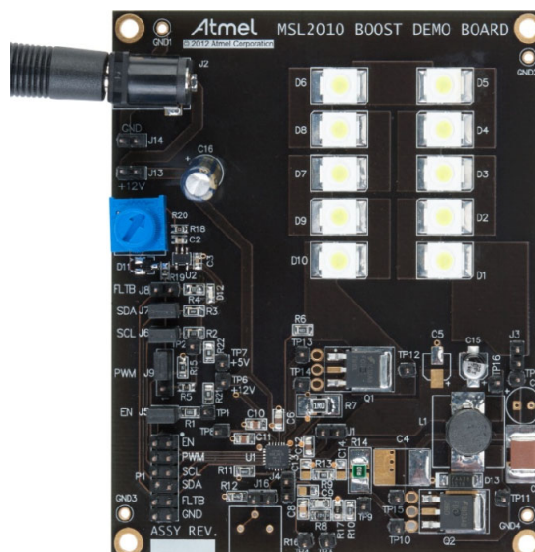


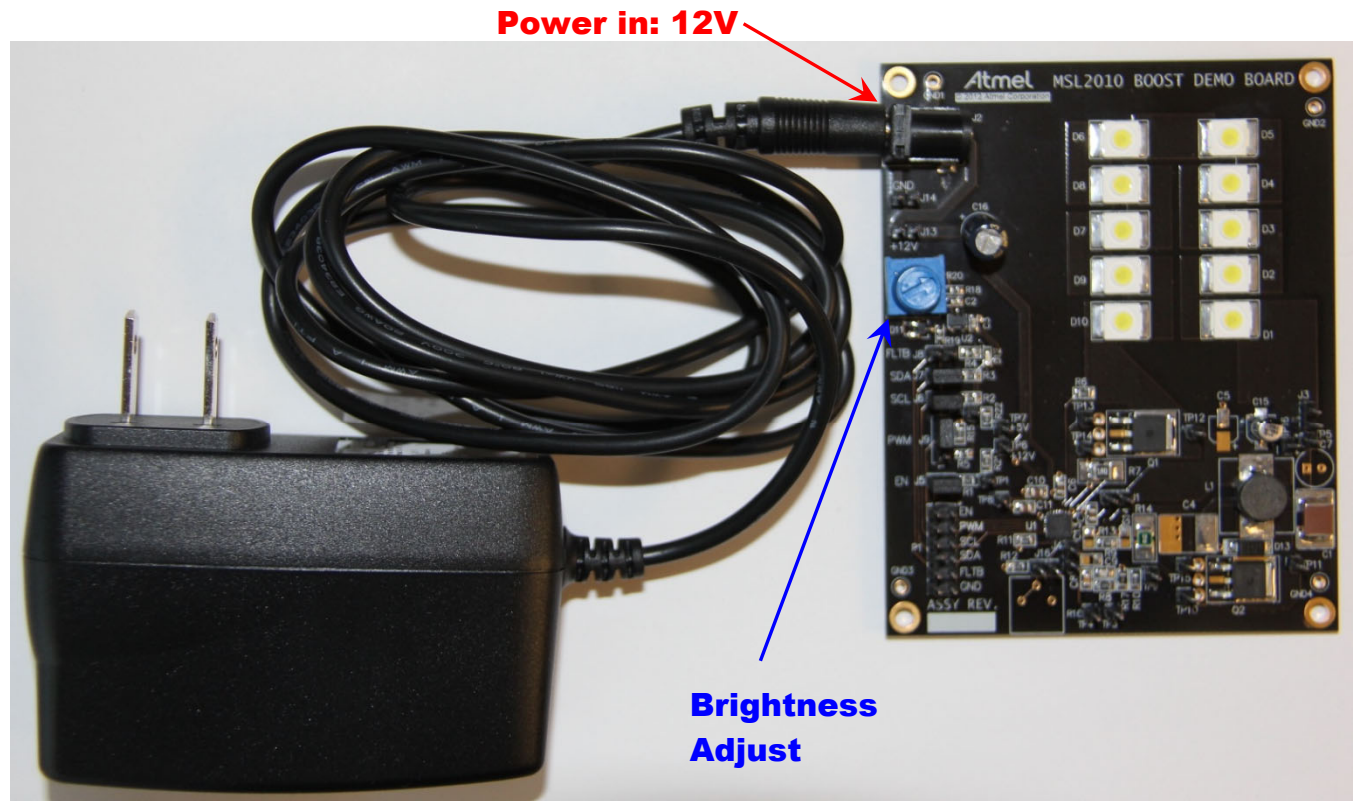
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1. Kit Contents

- **Atmel MSL2010 Boost Demo Board**
The demo board contains the MSL2010 LED driver/controller, LED drive MOSFET, boost regulator, I²C I/O and a PWM generator
- **External Power Supply**
The power supply provides the 12V input voltage required to power the Demo Board
- **LEDs**
The LEDs are configured as 10 series LEDs in a single string

Figure 1-1. MSL2010 Boost Demo Board



2. Operation of the Boost Demo Board

1. Connect the supplied 12V power supply to J2 and plug in the supply to 110VAC (90VAC to 255VAC):
 - a. Alternatively, apply 10V to 15V DC across jumpers J13(+)/J14(-).
2. Turn potentiometer R20 to adjust LED brightness.

3. Atmel MSL2010 Boost Demo Board Jumper Settings

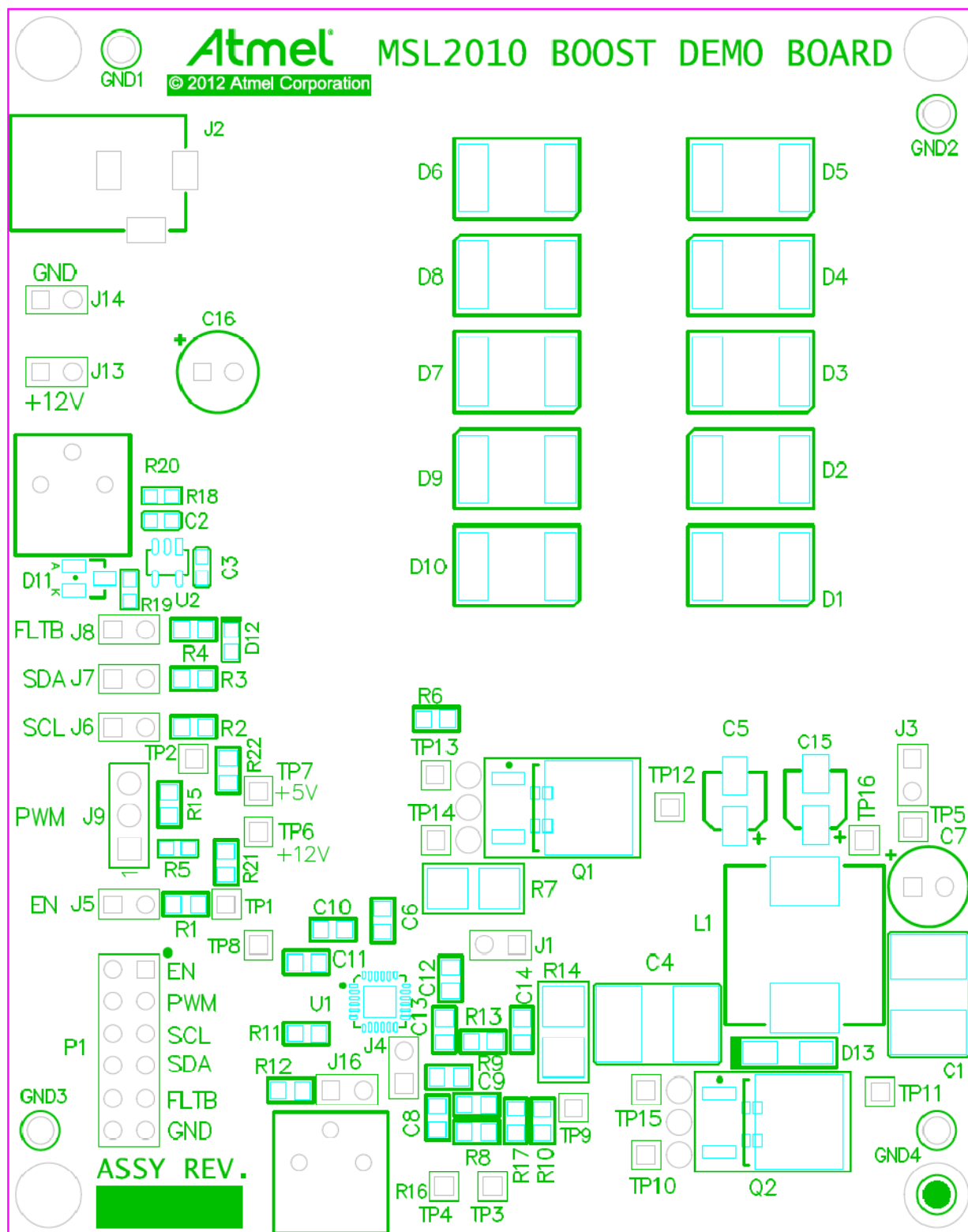
Table 3-1. Jumper Defaults

Jumper	Default	Function
J1	Shorted by circuit trace	Power for Boost
J3	Shorted by circuit trace	Connects LED string to V_{LED}
J4	Shorted by circuit trace	Connects FBO to FB
J5	Shorting bar installed	Connects pull-up for EN
J6	Shorting bar installed	Connects pull-up for SCL
J7	Shorting bar installed	Connects pull-up for SDA
J8	Shorted by circuit trace	Connects FLTB to fault indicator LED, D12
J9 (3-pin)	Shorting bar installed across pins 2 and 3	Connects PWM generator to MSL2010 PWM input
J13	Shorted by circuit trace	Power input to board; use as alternative to J2 when powering the board from a bench supply. Power distributes from J13 to J1, U1-16, U1-21 and R21.
J14	Shorted by circuit trace	Board ground
J16	Shorted by circuit trace	R_{TOFF} connection

3.1 Jumper Details

- **J1:** Passes the incoming 12V power to the boost converter. To supply the boost converter from an external supply, cut the trace below J1, on the bottom of the board, and apply external power to the boost via J1-1 or TP16
- **J3:** Connects the LED string to the output of the boost regulator. Cut the trace under J3 to monitor LED string current. Additionally an external LED load can be used by connecting the anode connection to J3 pin 2 and the LED cathode TP12
- **J4:** Connects FBO to FB. Allows the EO to optimize V_{LED}
- **J5, J6 and J7:** Connect the pull-up resistors for the Enable, SDA and SCL inputs
- **J8:** Connects indicator LED D12 to FLTB. FLTB pulls low for over-temperature condition, turning on D12
- **J9:** Shorting pins 1 and 2 (default) connects the MSL2010 PWM input to the output of the on-board PWM generator. Shorting pins 2 and 3 connects the PWM input to a pull-up resistor for permanent 100% duty cycle. To apply an external PWM signal remove the jumper from J9 and apply the PWM signal to J9-2, or to P1-3/4
- **J13(+), J14(-):** Allows connection of an external 10VDC to 15VDC power supply to drive the board, in place of the supplied 12V power supply
- **J16:** Connects the R_{TOFF} input to the external time resistor to set the off time of the boost converter. To use a potentiometer remove R12 and install the pot into position R16

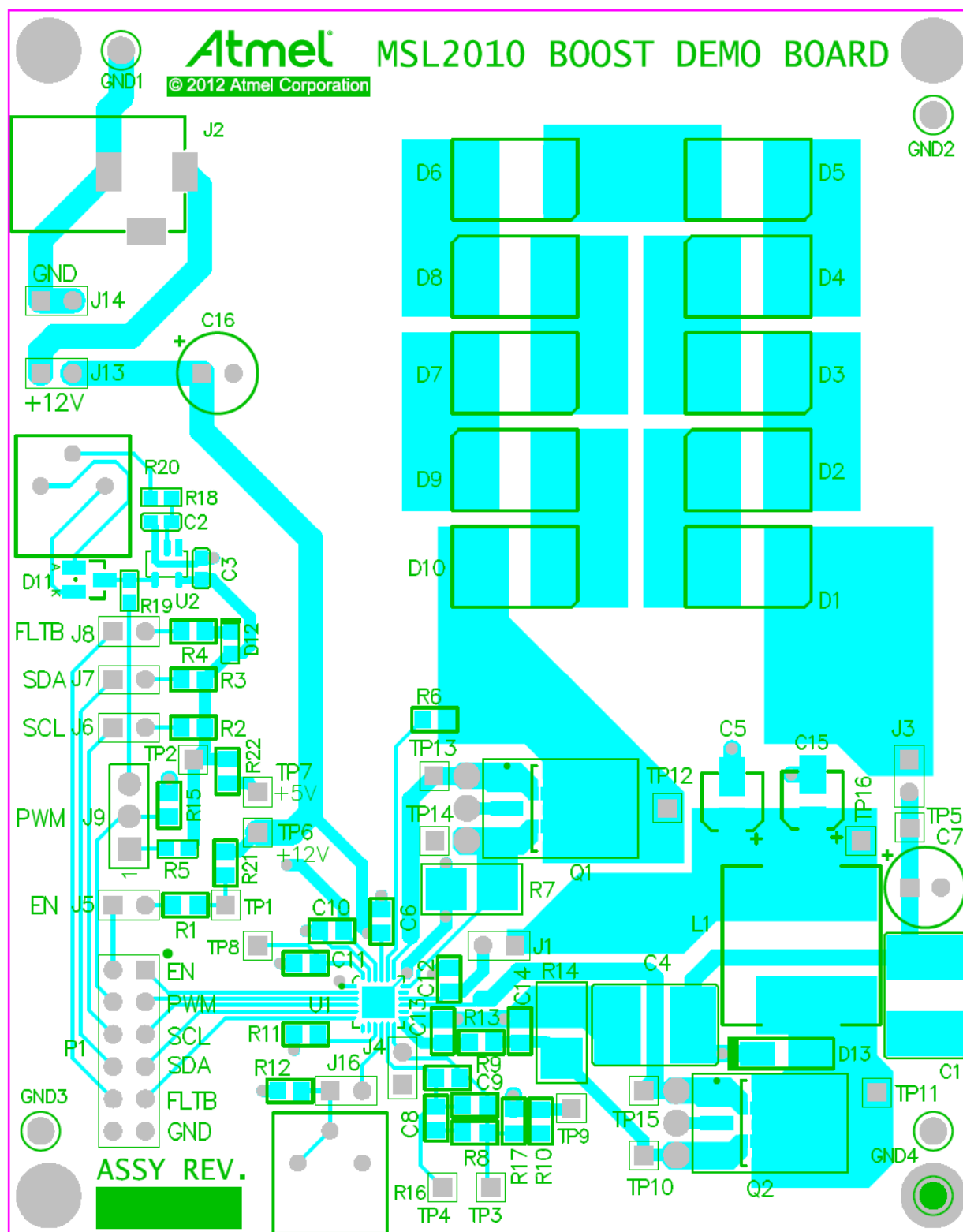
Figure 4-2. Atmel MSL2010 Boost Demo Board Component Layout



TOP LAYER

TOP SILKSCREEN

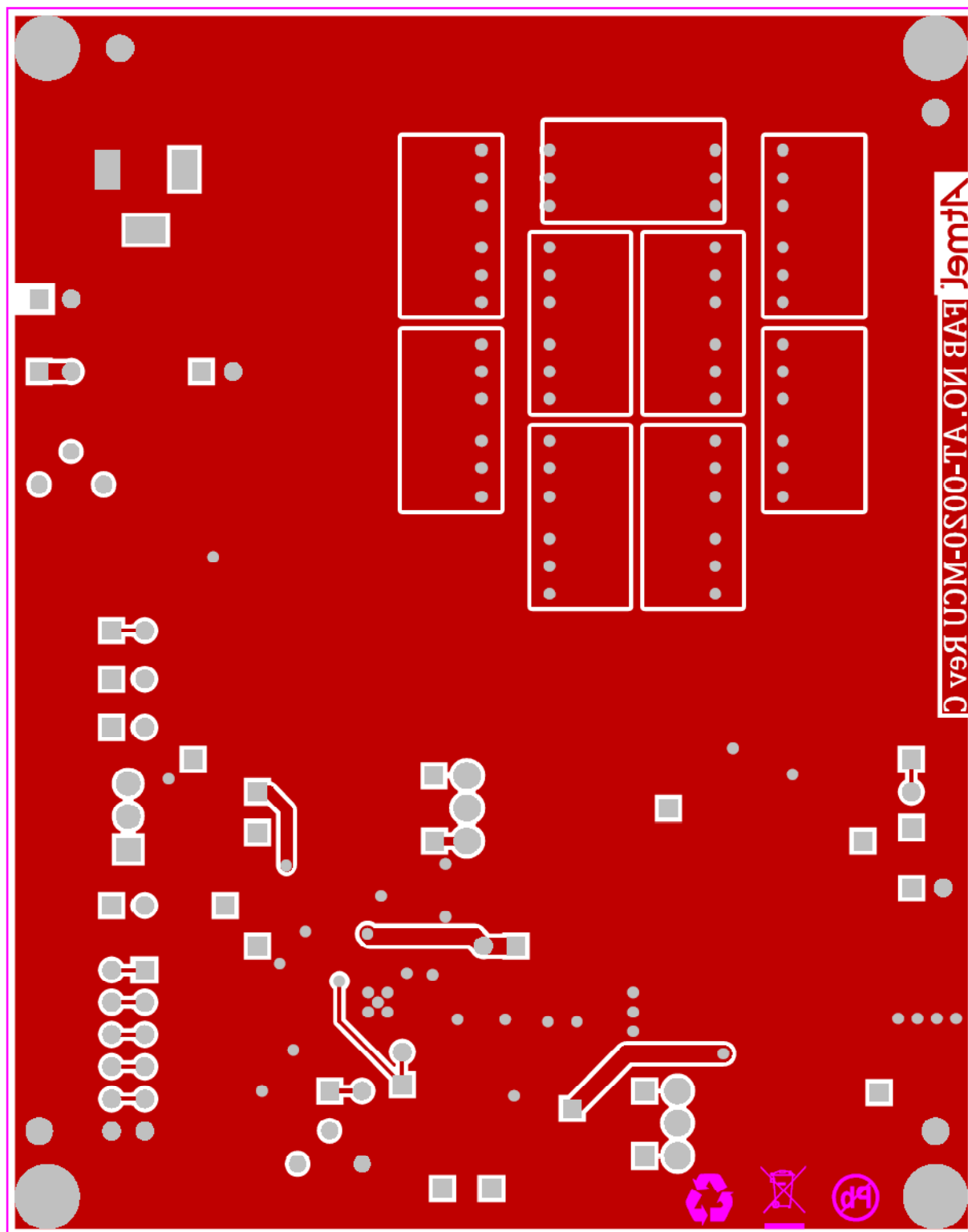
Figure 4-3. Atmel MSL2010 Boost Demo Board Component Side



TOP LAYER

TOP SILKSCREEN

Figure 4-4. Atmel MSL2010 Boost Demo Board Solder Side



BOTTOM LAYER

BOTTOM SILKSCREEN

Table 4-1. Atmel MSL2010 Boost Demo Board Bill of Materials

Reference Designator	Value	Description	Mfr PN
C1	10 μ F/100V	Cap cer 10 μ F 100V 20% X7S 2220	C5750X7S2A106M
C2	0.22 μ F/10V	Cap cer 0.22 μ F 10V 10% X7R 0603	CC0603KRX7R6BB224
C3	0.1 μ F/16V	Cap cer 0.1 μ F 16V 10% X7R 0603	GRM188R71C104KA01D
C6, C12	1 μ F/25V	Cap cer 1 μ F 25V Y5V 0805	C2012Y5V1E105Z/0.85
C8	10nF	Cap cer 10000pF 16V 10% X7R 0805	C0805C103K4RACTU
C9	8.2pF	Cap cer 8.2pF 50V NP0 0805	08055A8R2CAT2A
C10, C11	10 μ F/25V	Cap cer 10 μ F 25V 10% X5R 0805	C2012X5R1E106K
C15	22 μ F/25V	Cap alum 22 μ F 25V 20% SMD	EEE-FT1E220AR
C16	33 μ F/63V	Cap alum 33 μ F 63V 20% RADIAL	EEU-FC1J330
D1, D2, D3, D4, D5, D6, D7, D8, D9, D10	OVSPW1BCR4	LED white 6X6mm SMD 120deg	OVSPW1BCR4
D11	BAT54S	Diode Schottky 30V 200mW SOT23-3	BAT54S-7-F
D12	RED	LED super red clr thin 0603	LTST-C191KRKT
D13	SS16	Diode Schottky 1A 60V SOD123 SMA	SS16
GND1, GND2, GND3, GND4		Test point	
J1, J3, J4, J8, J16	DNI	Conn hdr brkway .100 2pos vert HDR1X2	4-103328-0
J2	PJ-102A	Conn jack power 2.1mm PCB TH	PJ-102A
J5, J6, J7, J13, J14	HDR1X2	Conn hdr brkway .100 2pos vert HDR1X2	4-103328-0
J9	HDR1X3	Conn hdr brkway .100 2pos vert HDR1X3	4-103328-0
L1	22 μ H	Inductor 22 μ H 2A shield SMD	CDRH8D38NP-220NC
P1	HDR2X6	Conn hdr brkway .100 2pos vert HDR2X6	4-103328-0
Q1	FQD7N10LTM	MOSFET N-ch 100V 5.8A DPAK TO252-3M	FQD7N10LTM
Q2	FDD3860	MOSFET N-ch 100V 6.2A DPAK TO252-3M	FDD3860
R1	10k Ω	Res 10.0k Ω 1/8W 1% 0805 SMD	ERJ-6ENF1002V
R2, R3	2.2k Ω	Res 2.2k Ω 1/8W 5% 0805 SMD	ERJ-6GEYJ222V
R4	1k Ω	Res 1.00k Ω 1/8W 1% 0805 SMD	ERJ-6ENF1001V
R5	100k Ω	Res 100k Ω 1/10W 1% 0603 SMD	RMCF0603FT100K
R6	100k Ω	Res 100k Ω 1/8W 1% 0805 SMD	ERJ-6ENF1003V
R7	1 Ω	Res 0.56 Ω 1/10W 1% 0603 SMD	ERJ-14YJ1R0U
R8	200k Ω	Res 200k Ω 1/8W 5% 0805 SMD	RMCF0805JT200K
R10, R12	47k Ω	Res 47.0k Ω 1/8W 1% 0805 SMD	ERJ-6ENF4702V
R11	46.4k Ω	Res 46.4k Ω 1/8W 1% 0805 SMD	ERJ-6ENF4642V
R13, R21, R22	0 Ω	Res 0.0 Ω 1/8W 0805 SMD	ERJ-6GEY0R00V
R14	0.1 Ω	Res .10 Ω 1/2W 5% 1210	73L5R10J
R15	1M Ω	Res 1.0M Ω 1/8W 5% 0805 SMD	ERJ-6GEYJ105V
R17	4.7k Ω	Res 4.7k Ω 1/8W 5% 0805 SMD	RMCF0805JT4K70
R18	470 Ω	Res 470 Ω 1/10W 1% 0603 SMD	RMCF0603FT470R
R19	10k Ω	Res 10k Ω 1/10W 1% 0603 SMD	RMCF0603FT10K0
R20	50k Ω	Trimmer 50k Ω 0.5W TH	3386P-1-503TLF

TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16		Test point HDR1X1	
U1	MSL2010	MSL2021 TQFN24	
U2	74AHC1G14	IC Schmitt-trg inv gate SOT23-5	SN74AHC1G14DBVR
X1	12V 2A power supply	Trans adapter wall 24W 12V	PSA24A-120(P)
C4	DNI	DNI	
C5	DNI	DNI	
C7	DNI	DNI	
C13, C14, R9	DNI	DNI	
R16	DNI	DNI	

5. Revision History

Doc. Rev.	Date	Comments
42100A	04/2014	Initial document release

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