

DRV8374 and DRV8378 Evaluation Module



Description

The DRV8374 and DRV8378 evaluation modules (EVM) are integrated driver IC evaluation modules for three-phase motor driver applications and provide single-chip power stage design for customers driving 4.5V to 35V (DRV8374) and 4.5V to 65V (DRV8378) brushless DC motors.

Get Started

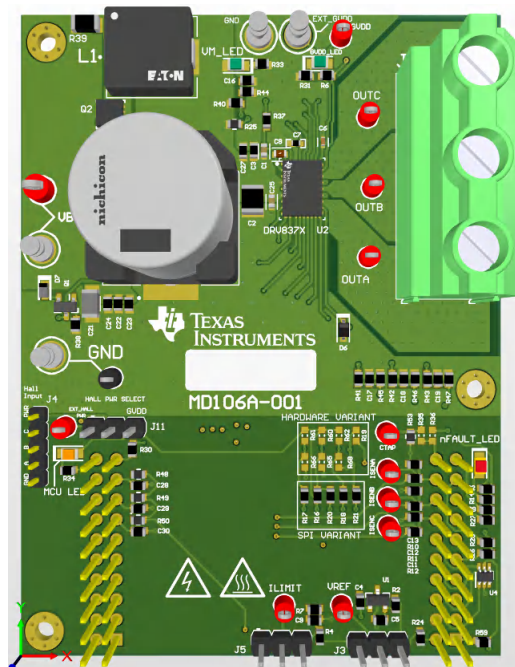
1. Order the applicable variant of DRV8374EVM or DRV8378EVM (see [Table 2-1](#)) and LAUNCHXL-F280049C
2. Download the comprehensive reference design files from the DRV8376EVM tool page
3. Refer to the DRV8374 and [DRV8378 Three-Phase Integrated FET Motor Driver](#) datasheet or refer to [E2E.ti.com](#) for questions and support

1 Features

- 4.5V to 65V operating voltage and 16A peak current capability (DRV8378EVM)
- 4.5V to 35V operating voltage and 40A peak current capability (DRV8374EVM)
- GVDD regulator
- Integrated CSAs for three-phase low-side current measurement
- Supply and fault LEDs
- C2000™ (LAUNCHXL-F280049C) sensed trapezoidal firmware available

Applications

- [Automotive HVAC control & HMI module](#)
- [Brushless-DC \(BLDC\) Motor Modules](#)
- [Home printer](#)
- [HVAC motor control](#)
- [Mobile robot motor control](#)
- [Multifunction printer](#)



Board Image

2 Evaluation Module Overview

2.1 Introduction

This document is designed to be used as a startup guide to the DRV8374EVM and DRV8378EVM and LAUNCHXL-F280049C designs and is provided with the DRV8374EVM and DRV8378EVM as a supplement to the DRV8374 and [DRV8378 Three-Phase Integrated FET Motor Driver](#) datasheet. This document is intended for the engineers involved in the design, implementation, and validation of DRV8374 and DRV8378 and TMS320F280049C reference software.

The scope of this document is to provide the user with a guide to evaluate the DRV8374 and DRV8378 device with a TMS320F280049C isolated board. This document explains the hardware connections required between boards and external motor and supplies. When the hardware connections are complete, the user is required to download the necessary tools and software to spin a motor.

The reference software is composed of GUIComposer software with sensored trapezoidal algorithm for BLDC motor control.

CAUTION

The DRV8374EVM and DRV8378EVM are designed to be evaluated only with the LAUNCHXL-F280049C MCU PCB, which must be ordered separately.

WARNING

Voltages exceeding the standard EVM ratings as specified on the datasheet can cause personal injury, electrical shock hazard, damage the EVM, or a combination.

Additionally, do not leave power connections to the EVM connected while not in operation.

WARNING



Hot surface

Contact can cause burns. Do not touch.

WARNING



High Voltage

For safety, use of isolated test equipment with overvoltage and overcurrent protection is highly recommended. Electric shock is possible when connecting board to live wire. The board must be handled with care by a professional.

2.2 Kit Contents

Item	Description	Quantity
DRV8374EVM or DRV8378EVM	PCB	1
Box	Cardboard box	1
Label	Standard label	1
Foam	Antistatic foam	2
Literature	EVM disclaimers	1

2.3 Specification

[Table 2-1](#) for the voltage a current capability of each EVM to prevent damage to both the IC and the EVM, confirm that these voltage and current specifications are not exceeded.

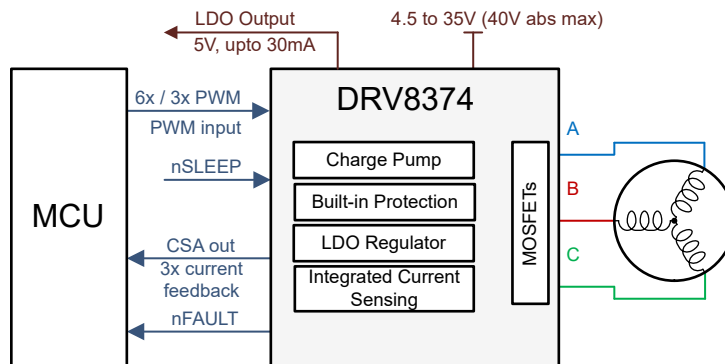


Figure 2-1. Simplified Schematic for DRV8374H/S

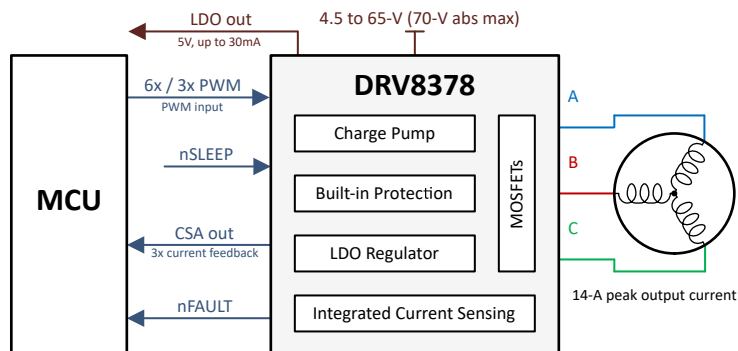


Figure 2-2. Simplified Schematic for DRV8378H/S

2.4 Device Information

The DRV8374 and DRV8378 integrates three half-H bridges, has a very low RDS(ON) to enable high power drive capability, and allows customers to drive 4.5V to 35V (DRV8374) and 4.5V to 65V (DRV8378) brushless-DC motors. [Table 2-1](#) shows the device variants and specifications.

Current is sensed using an integrated current sensing feature which eliminates the need for external sense resistors. Power management features with integrated LDO generate the necessary voltage rails for the device and can be used to power external circuits.

The DRV8374 and DRV8378 can drive a PWM frequency up to 200kHz. The control scheme is highly configurable through hardware pins or register settings ranging from motor current limiting behavior to fault response.

Table 2-1. EVM Variants

EVM	Device	Package	Voltage	Peak Current	RDSon (HS + LS)	Interface
DRV8374S-29EVM	DRV8374S	29-pin VQFN (7 × 5mm)	4.5V – 35V	40A	17mΩ	SPI
DRV8374H-29EVM	DRV8374H	29-pin VQFN (7 × 5mm)				Hardware
DRV8374H-23EVM	DRV8374H	23-pin VQFN (6 × 4mm)				Hardware
DRV8378S-29EVM	DRV8378S	29-pin VQFN (7 × 5mm)	4.5V – 60V	16A	58mΩ	SPI
DRV8378H-29EVM	DRV8378H	29-pin VQFN (7 × 5mm)				Hardware
DRV8378H-23EVM	DRV8378H	23-pin VQFN (6 × 4mm)				Hardware

3 Hardware

The following section describes the EVM hardware and connections to the external supply, hall sensors, PC through USB, and motor. Figure 2-1 shows device ratings for each EVM variant. Figure 2-1 and Figure 2-2 show the major blocks of the DRV8374 and DRV8378 devices

3.1 Hardware Connections Overview – DRV8363-Q1EVM and LAUNCHXL-F280049C

The following section describes the EVM hardware and connections to the external supply, hall sensors, PC through the USB, and motor.

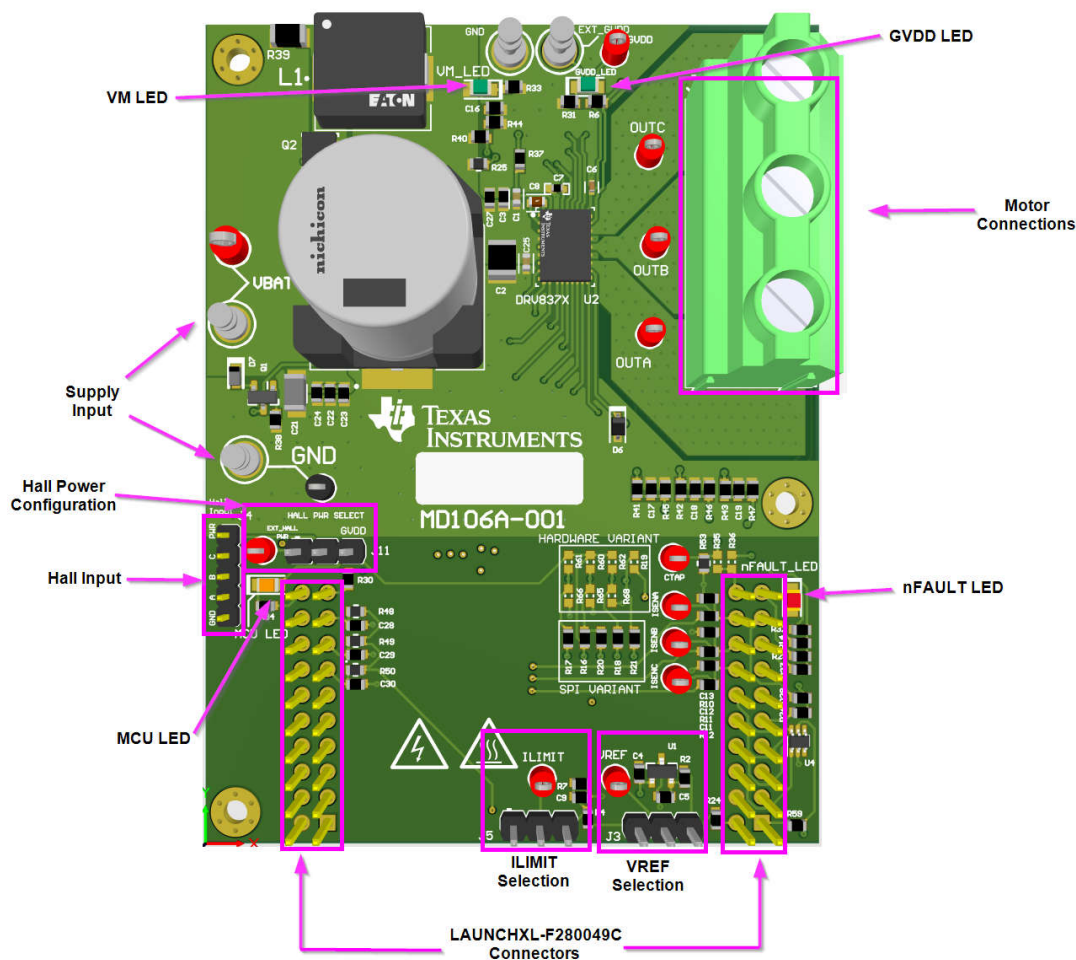


Figure 3-1. LAUNCHXL-F280049C Connection Overview on DRV837x EVM

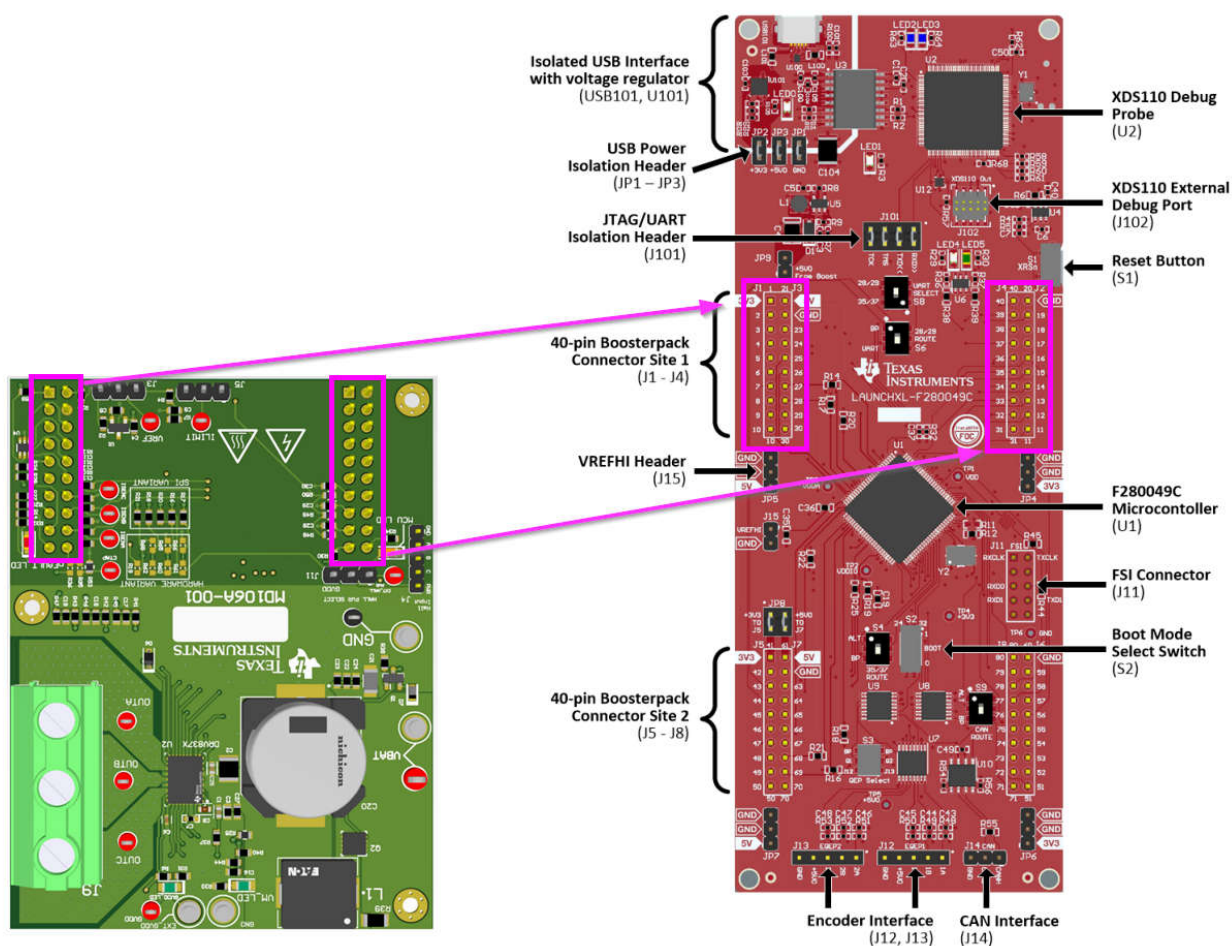


Figure 3-2. LAUNCHXL-F280049C Attachment

Attach the DRV837x EVM to the LAUNCHXL-F280049C as seen in [Figure 3-2](#) and [Figure 3-3](#)

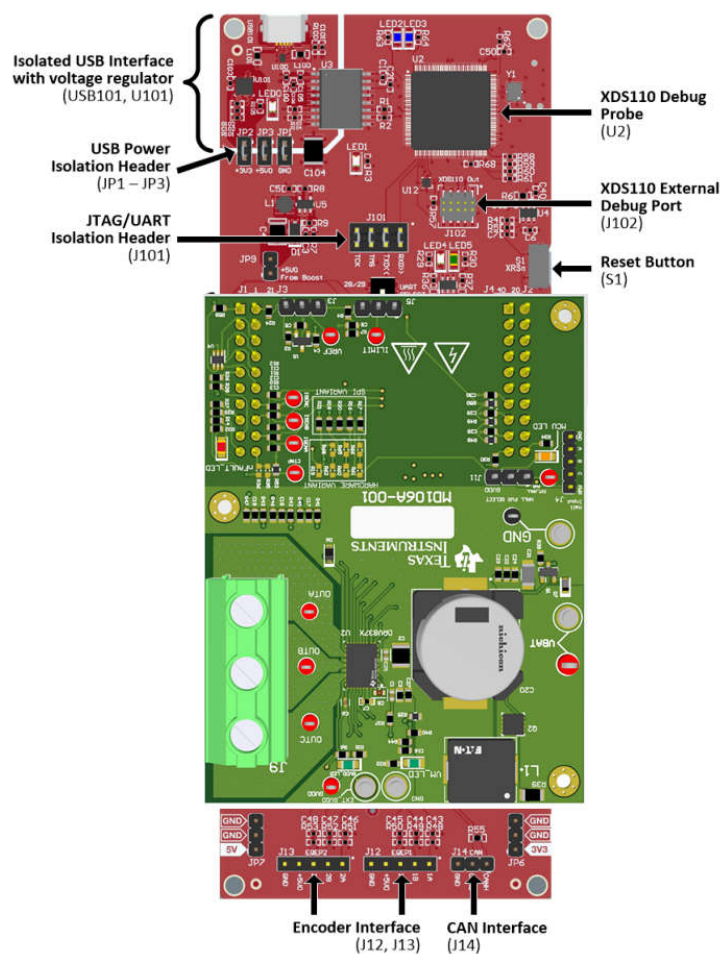


Figure 3-3. After Attaching LaunchPad

Supply power to the VBAT and GND terminals as seen in [Figure 3-4](#). [Table 2-1](#) lists the EVM variants to help select the correct supply voltage.

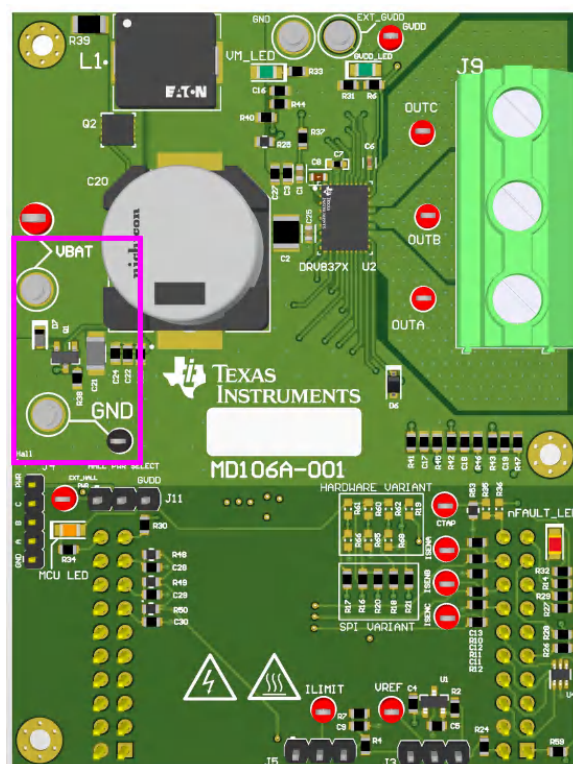


Figure 3-4. EVM Power Supply Input

WARNING

To minimize the risk of potential shock hazard and personal injury, remove all power connections and interfaces to the DRV837xEVM when not in use.

Once the EVM and LaunchPad™ are connected to each other and connected to a power supply open the EVM GUI found on dev.ti.com

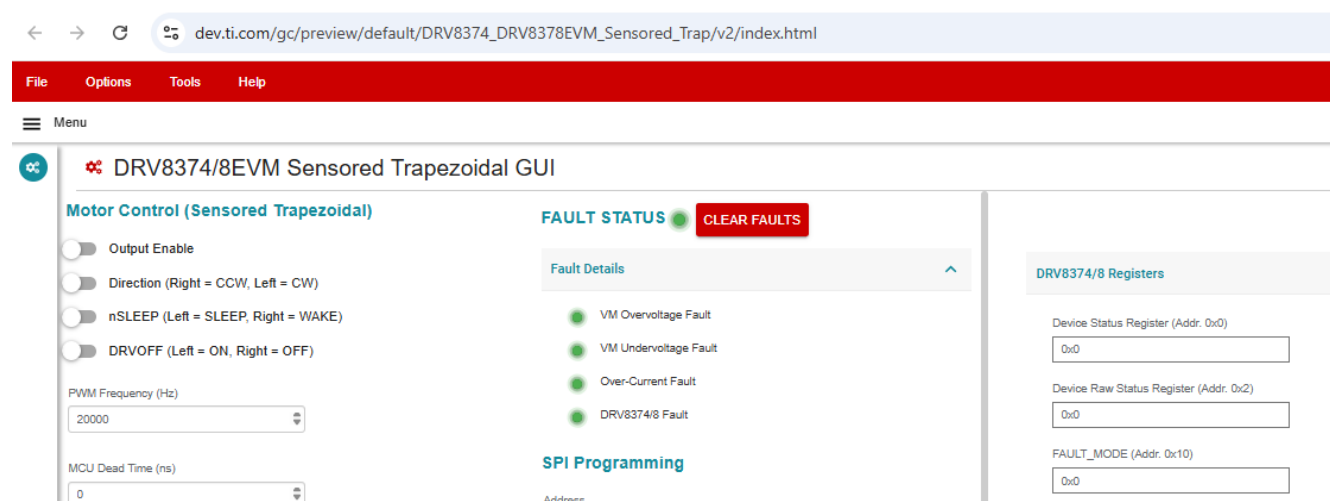


Figure 3-5. LaunchPad GUI

The GUI allows users to control the EVM, monitor faults, spin a motor, and configure SPI settings (for SPI variants).

4 Hardware Design Files

4.1 Schematics

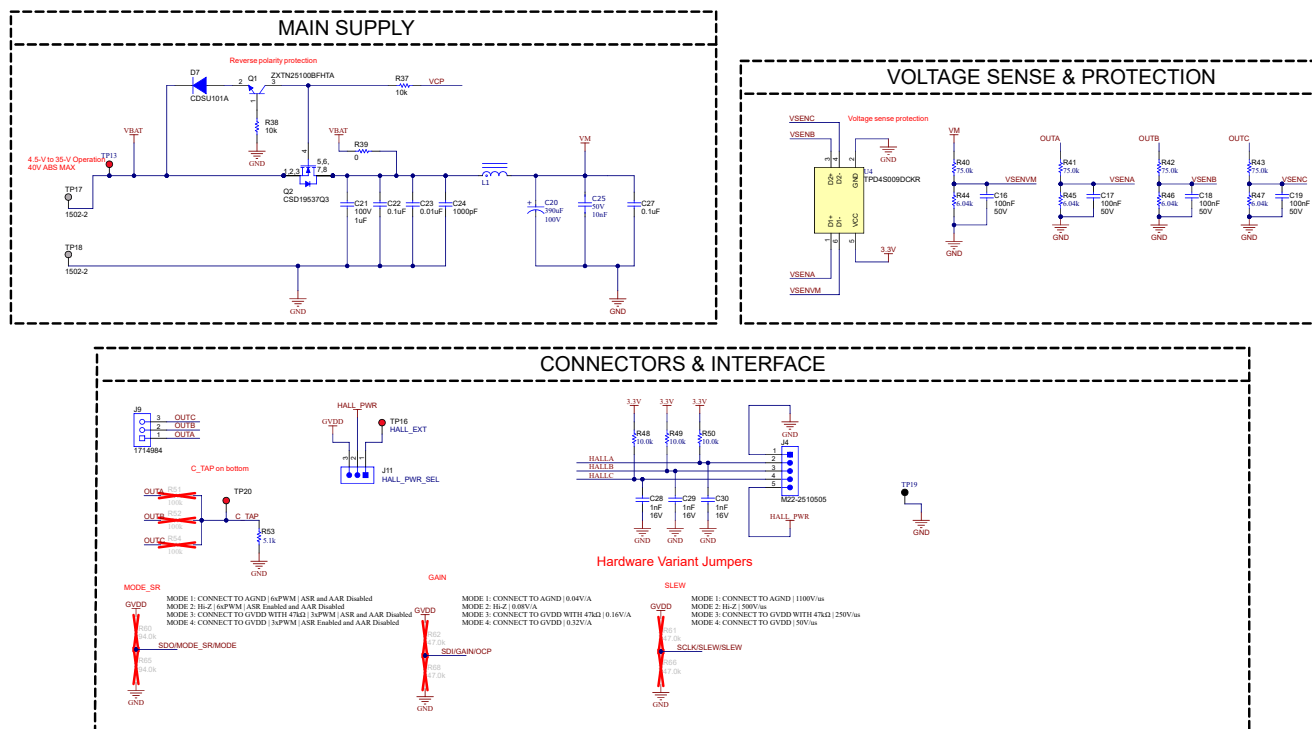


Figure 4-1. Main Supply, Voltage Sense and Protection, and Connectors and Interface

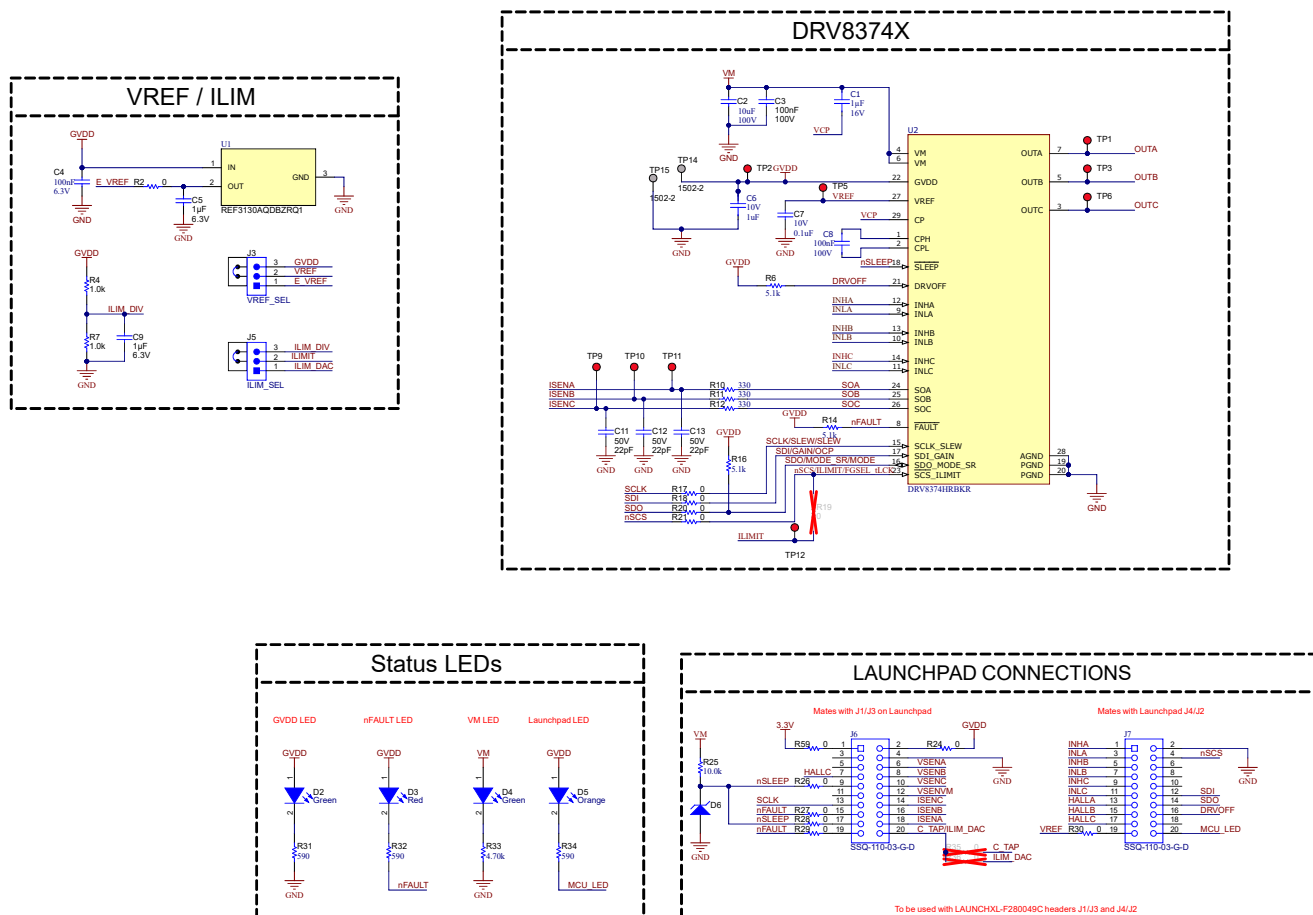


Figure 4-2. IC, VREF/ILIMT, Status LEDs, and LaunchPad™ Connections

4.2 PCB Layouts

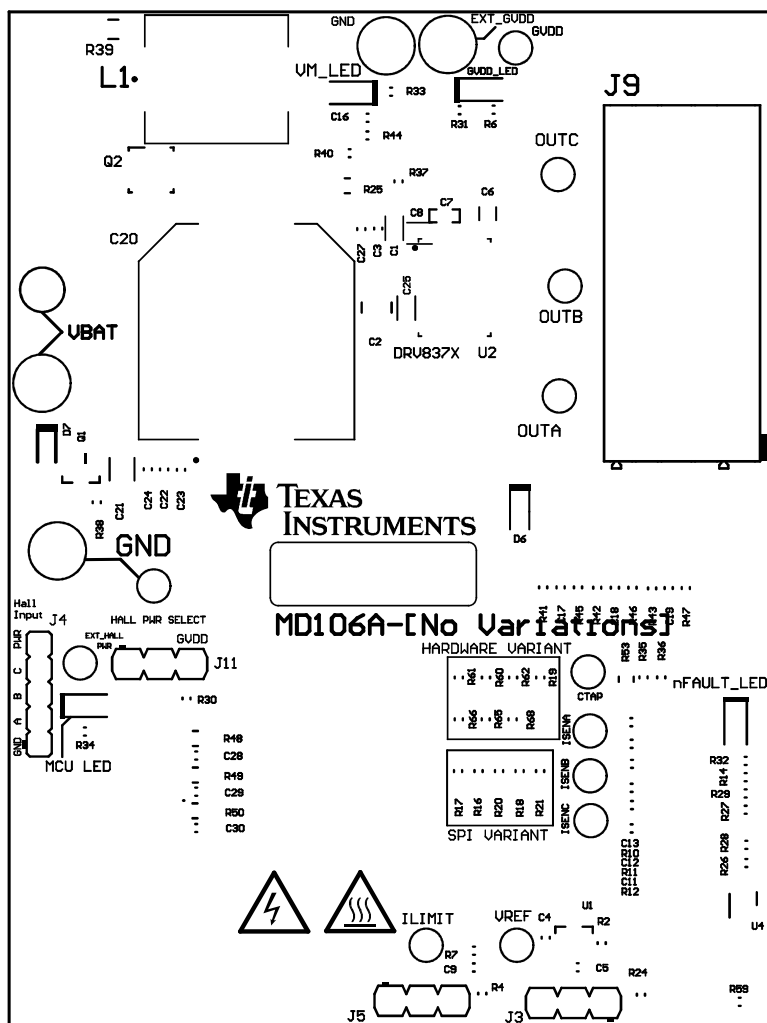


Figure 4-3. Top Overlay

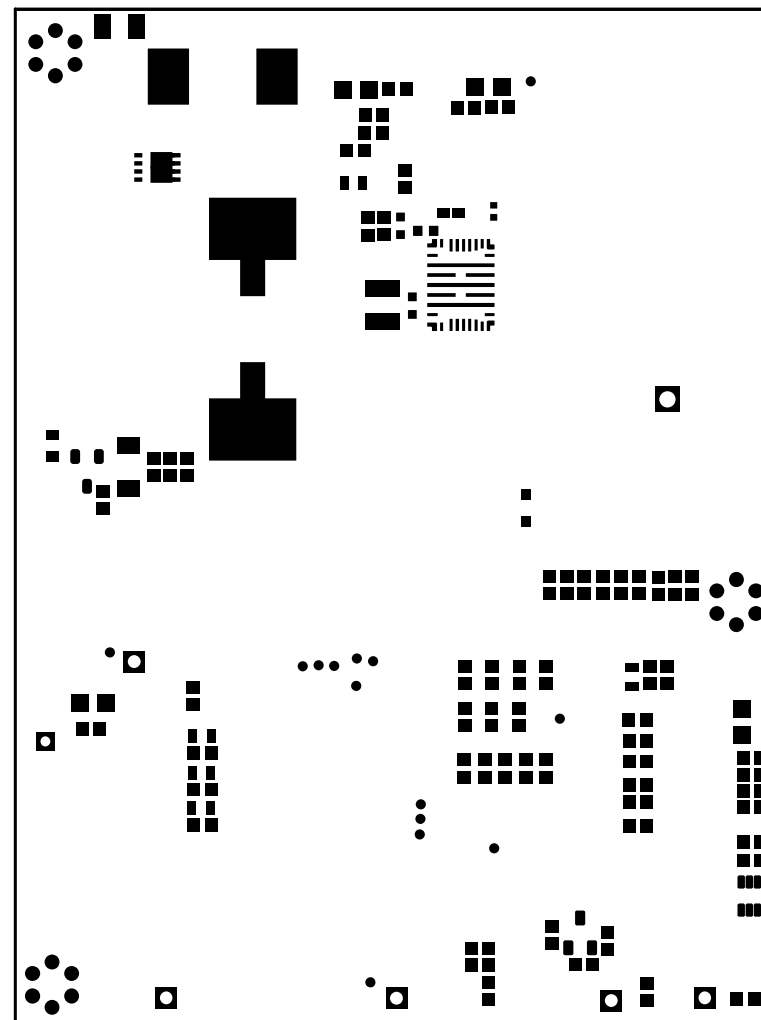


Figure 4-4. Top Paste

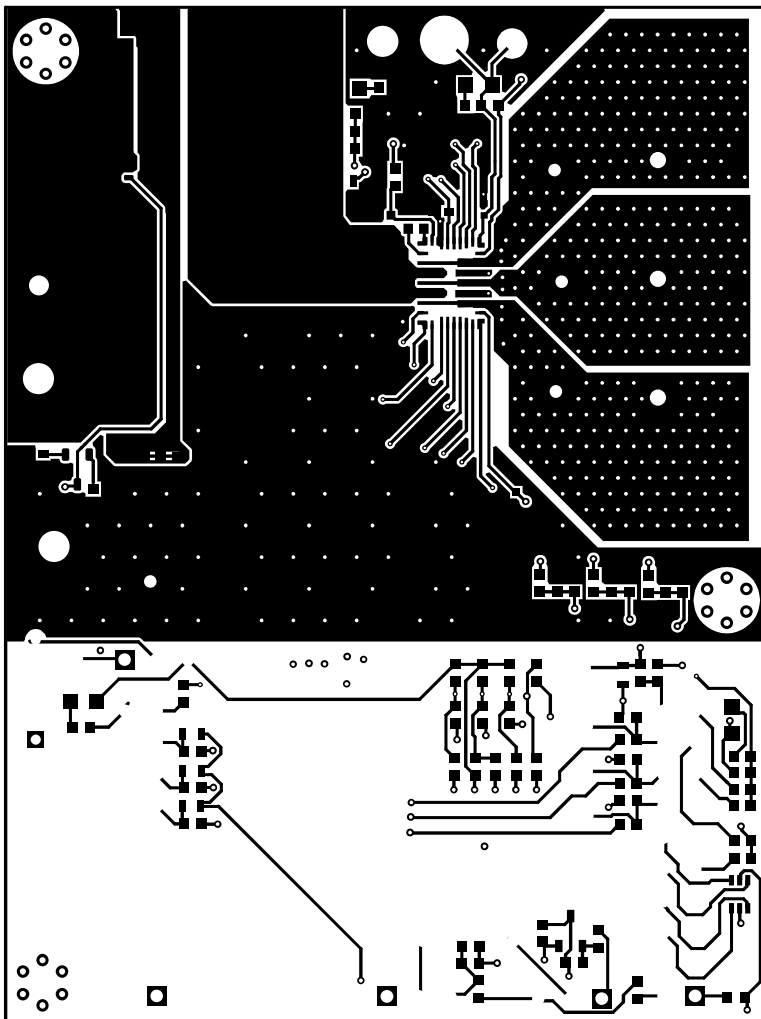


Figure 4-5. Top Layer

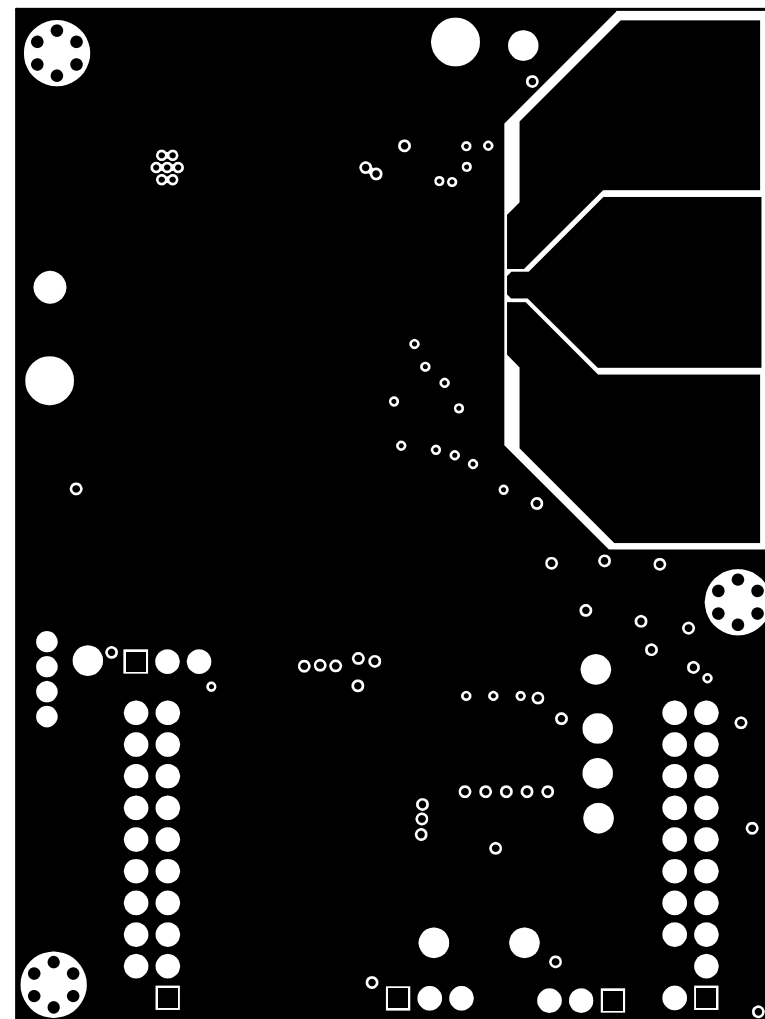


Figure 4-6. Ground Layer

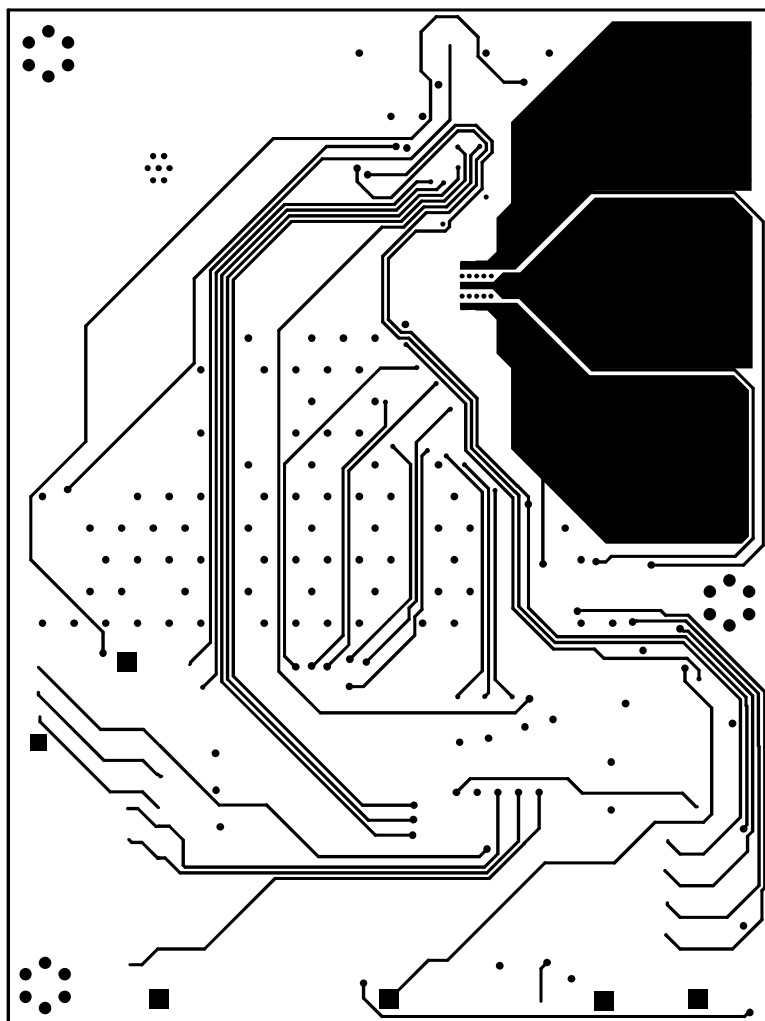


Figure 4-7. Power Layer

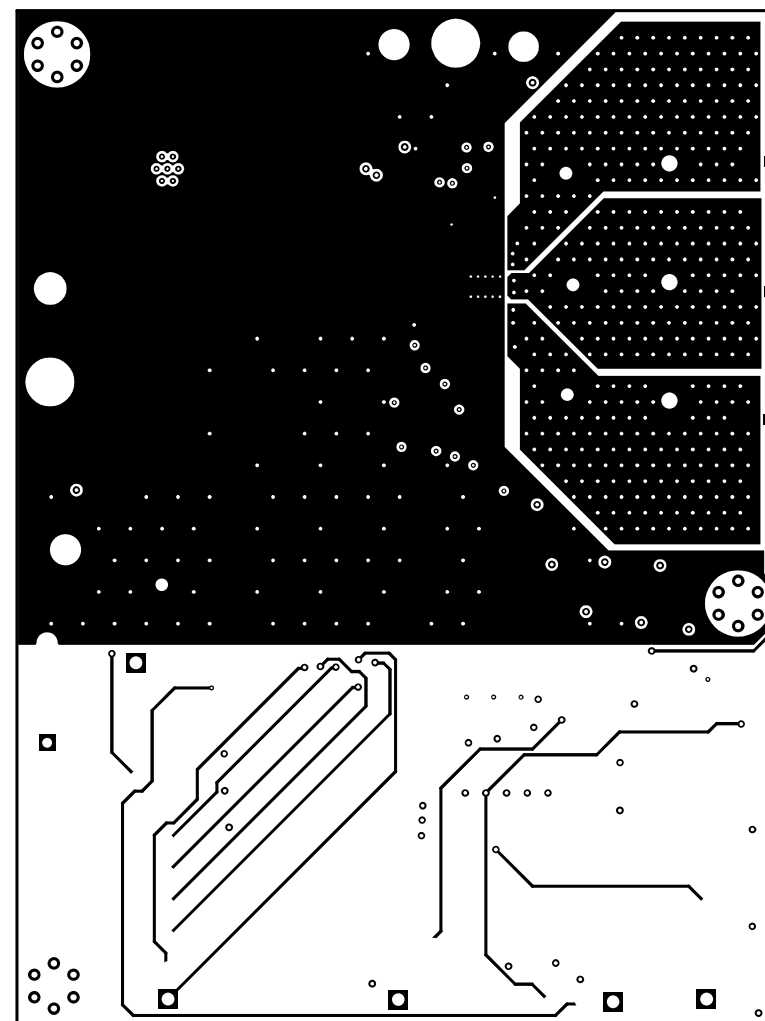


Figure 4-8. Bottom Layer

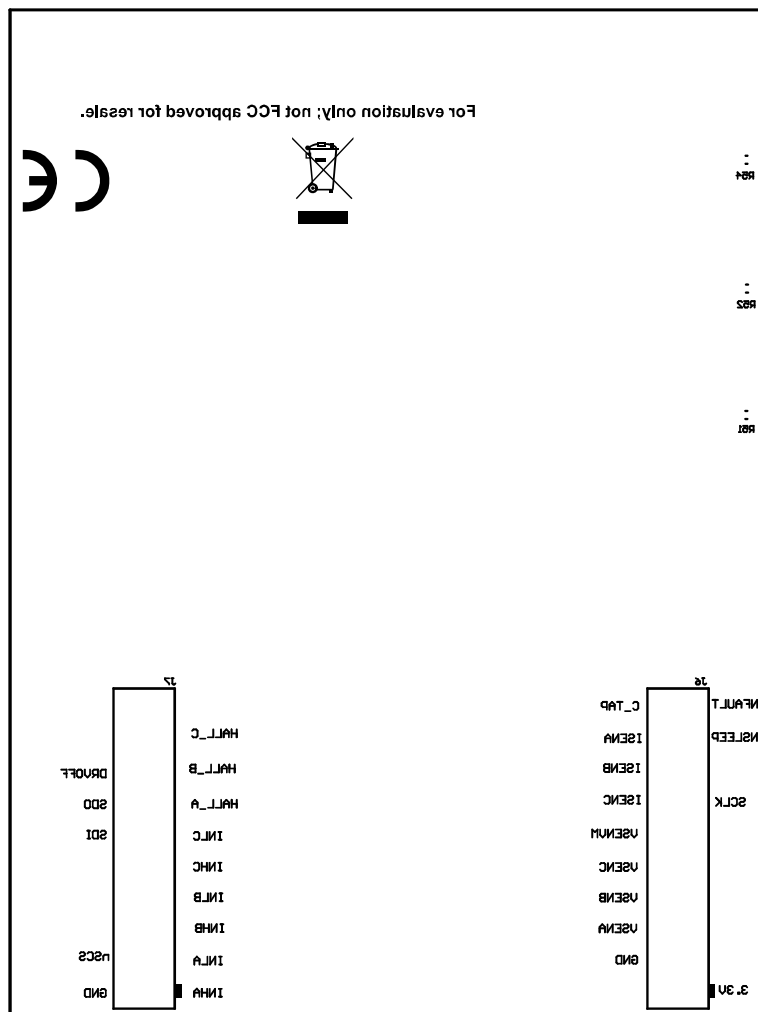


Figure 4-9. Bottom Overlay

4.3 Bill of Materials (BOM)

Item Number	Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
1	IPCB1	1	MD106	Any	-	Printed Circuit Board	-
2	C1	1	1μF	CGA3E1X7R1C105M080AC	TDK	Cap Ceramic 1μF 16V X7R 20% Pad SMD 0603 +125°C Automotive T/R	0603
3	C2	1	10uF	GRM32ER71J106KA12L	MuRata™	CAP, CERM, 10μF, 63V, ± 10%, X7R, 1210	1210
4	C3	1	0.1uF	0603BB104KW101	Passive Plus	CAP, CERM, 0.1μF, 100V, ± 10%, X7R, 0603	0603
5	C4	1	0.1uF	GRM188R70J104KA01D	MuRata	CAP, CERM, 0.1μF, 6.3V, ± 10%, X7R, 0603	0603
6	C5, C9	2	1uF	CL10B105KQ8NNNC	Samsung Electro-Mechanics	CAP, CERM, 1μF, 6.3V, ± 10%, X7R, 0603	0603
7	C6	1	1μF	GMC04X7R105K10NT	Cal-Chip Electronics	1μF ±10% 10V Ceramic Capacitor X7R 0402 (1005 Metric)	0402
8	C7	1	0.1uF	GRM155R71A104KA01D	MuRata	CAP, CERM, 0.1μF, 10V, ± 10%, X7R, 0402	0402
9	C8	1	100nF	CL10B104KC8NNNC	Samsung	Cap Ceramic 100nF 100V X7R ±10% Pad SMD 0603 +125°C T/R	0603
10	C11, C12, C13	3	22pF	CGA3E2C0G1H220J080AA	TDK	CAP, CERM, 22pF, 50V, ± 5%, C0G/NP0, AEC-Q200 Grade 1, 0603	0603
11	C16, C17, C18, C19	4	0.1uF	06035C104JAT2A	AVX	CAP, CERM, 0.1μF, 50V, ± 5%, X7R, 0603	0603
12	C20	1	390μF	UCM2A391MNS1MS	Nichicon	390μF 100V Aluminum Electrolytic Capacitors Radial, Can - SMD 5000hrs at 105°C	SMT_CAP_17MM1_17MM1
13	C21	1	1uF	C3216X7R2A105K160AA	TDK	CAP, CERM, 1μF, 100V, ± 10%, X7R, 1206	1206
14	C22, C27	2	0.1uF	CGA3E3X7S2A104K080AB	TDK	CAP, CERM, 0.1μF, 100V, ± 10%, X7S, AEC-Q200 Grade 1, 0603	0603
15	C23	1	0.01uF	CGA3E2X7R2A103K080AA	TDK	CAP, CERM, 0.01μF, 100V, ± 10%, X7R, AEC-Q200 Grade 1, 0603	0603
16	C24	1	1000pF	CGA3E2X7R2A102K080AA	TDK	CAP, CERM, 1000pF, 100V, ± 10%, X7R, AEC-Q200 Grade 1, 0603	0603
17	C25	1	10nF	CGA3E2X7R1H103K080AE	TDK	Cap Ceramic 10nF 50V X7R 10% Pad SMD 0603 +125°C Automotive T/R	0603
18	C28, C29, C30	3	1000pF	8.85012E+11	Würth Elektronik™	CAP, CERM, 1000pF, 16V, ± 10%, X7R, 0603	0603
19	D2, D4	2	Green	LTST-C170KGKT	Lite-On	LED, Green, SMD	LED_0805
20	D3	1	Red	LTST-C170KRKT	Lite-On	LED, Red, SMD	LED_0805
21	D5	1	Orange	LTST-C170KFKT	Lite-On	LED, Orange, SMD	LED_0805
22	D6	1	3.3V	SZMM3Z3V3ST1G	ON Semiconductor	Diode, Zener, 3.3V, 300mW, AEC-Q101, SOD-323	SOD-323
23	D7	1	90V	CDSU101A	Comchip Technology	Diode, Switching, 90V, 0.1A, SOD-523F	SOD-523F

Item Number	Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
24	J3, J5, J11	3	-	68001-403HLF	FCI	Header, 2.54mm, 3x1, Tin, TH	Header, 2.54mm, 3x1, TH
25	J4	1	-	M22-2510505	Harwin®	Header, 2mm, 5x1, Gold, TH	Header, 2mm, 5x1, TH
26	J6, J7	2	-	SSQ-110-03G-D	Samtec®	Receptacle, 2.54mm, 10x2, Gold, TH	Receptacle, 2.54mm, 10x2, TH
27	J9	1	-	1714984	Phoenix Contact	Terminal Block, 3x1, 9.52MM, TH	Terminal Block, 3x1, 9.52mm, TH
28	L1	1	1µH	HCMA1104-1R0-R	Eaton	1µH Shielded Drum Core, Wirewound Inductor 18A 3.3mΩ Max	Nonstandard SMD2
29	LBL1	1	-	THT-14-423-10	Brady®	Thermal Transfer Printable Labels, 0.650" W × 0.200" H - 10,000 per roll	PCB Label 0.650 × 0.200 inch
30	Q1	1	100V	ZXTN25100BFHTA	Diodes Inc.	Transistor, NPN, 100V, 3A, AEC-Q101, SOT-23	SOT-23
31	Q2	1	100V	CSD19537Q3	Texas Instruments	MOSFET, N-CH, 100V, 50A, DQG0008A (VSON- CLIP-8)	DQG0008A
32	R2, R17, R18, R20, R21, R24, R26, R27, R28, R29, R30, R59	12	0	ERJ-3GEY0R00V	Panasonic®	RES, 0, 5%, 0.1W, AEC-Q200 Grade 0, 0603	0603
33	R4, R7	2	1.0k	RCA06031K00JNEA	Vishay®-Dale	RES, 1.0k, 5%, 0.1W, AEC-Q200 Grade 0, 0603	0603
34	R6, R14, R16	3	5.1k	CRCW06035K10JNEA	Vishay-Dale	RES, 5.1k, 5%, 0.1W, 0603	0603
35	R10, R11, R12	3	330	RG1608P-331-B-T5	Susumu Co Ltd	RES, 330, 0.1%, 0.1W, 0603	0603
36	R25, R48, R49, R50, R53	5	10.0k	TNPW060310K0BEEA	Vishay-Dale	RES, 10.0k, 0.1%, 0.1W, AEC-Q200 Grade 1, 0603	0603
37	R31, R32, R34	3	590	RC0603FR-07590RL	Yageo®	RES, 590, 1%, 0.1W, 0603	0603
38	R33	1	4.70k	RT0603BRD074K7L	Yageo America	RES, 4.70k, 0.1%, 0.1W, 0603	0603
39	R37, R38	2	10k	CRCW060310K0JNEA	Vishay-Dale	RES, 10k, 5%, 0.1W, AEC-Q200 Grade 0, 0603	0603
40	R39	1	0	RCA12060000ZSEA	Vishay-Dale	RES, 0, 5%, 0.25W, AEC-Q200 Grade 0, 1206	1206
41	R40, R41, R42, R43	4	75.0k	CRCW060375K0FKEA	Vishay-Dale	RES, 75.0k, 1%, 0.1W, AEC-Q200 Grade 0, 0603	0603
42	R44, R45, R46, R47	4	6.04k	RT0603DRE076K04L	Yageo America	RES, 6.04k, 0.5%, 0.1W, 0603	0603
43	SH-J2, SH-J3	2	1x2	SNT-100-BK-G	Samtec®	Shunt, 100mil, Gold plated, Black	Shunt
44	TP1, TP2, TP3, TP5, TP6, TP9, TP10, TP11, TP12, TP16, TP20	11	5000	-	Keystone	Test Point, Miniature, Red, TH	Red Miniature Testpoint
45	TP13	1	5005	-	Keystone	Test Point, Compact, Red, TH	Red Compact Testpoint
46	TP14, TP15, TP17, TP18	4	1502-2	-	Keystone	Terminal, Turret, TH, Double	Keystone1502-2

Item Number	Designator	Quantity	Value	Part Number	Manufacturer	Description	Package Reference
47	TP19	1	5001	-	Keystone	Test Point, Miniature, Black, TH	Black Miniature Testpoint
48	U1	1	-	REF3130AQDBZRQ1	Texas Instruments	Automotive 20ppm/°C Max, 100µA, SOT23-3 Series Voltage Reference, DBZ0003A (SOT-23-3)	DBZ0003A
49	U2	1	-	DRV8374HRBKR	Texas Instruments	Three-Phase Integrated FET Motor Driver	VQFN29
50	U4	1	-	TPD4S009DCKR	Texas Instruments	4-Channel ESD Solution for High-Speed Differential Interface, DCK0006A (SOT-SC70-6)	DCK0006A
51	R19, R35, R36	0	0	ERJ-3GEY0R00V	Panasonic	RES, 0, 5%, 0.1W, AEC-Q200 Grade 0, 0603	0603
52	R51, R52, R54	0	100k	ERA-3AEB104V	Panasonic	RES, 100k, 0.1%, 0.1W, AEC-Q200 Grade 0, 0603	0603
53	R60, R61, R62, R65, R66, R68	0	47.0k	MCT0603MD4702DP500	Vishay/Beyschlag	RES, 47.0k, 0.5%, 0.15W, AEC-Q200 Grade 0, 0603	0603

5 Additional Information

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6 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
September 2026	*	Initial Release

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