EVM User's Guide:

DRV8432EVM Motor Drive Evaluation Board

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1 Introduction

1.1 Description

The DRV8432 is a dual full-bridge PWM motor driver. It has a maximum recommended supply voltage of 52.5 V. The DRV8432 is capable of delivering 2 x 7-A continuous output current and 2 x 12-A peak current per device. Furthermore, the outputs can be paralleled to drive 14-A continuous current or 24-A peak current. The DRV8432 has an advanced protection system consisting of short-circuit protection, overcurrent protection, undervoltage protection, and two-stage thermal protection.

The DRV8432EVM can be operated with either two full bridge outputs or 4 half bridge outputs. It can also be used in parallel mode to double the current capability. The unit can be operated with external PWM inputs using an MCU controller module or signal generator. The outputs and power supplies are connected using stripped wires by connecting them to the on-board terminal blocks. The EVM module also has hardware switches to control the modes and to allow a manual reset.

1.2 DRV8432EVM Features

- PWM input motor driver module
- Self-contained protection system (short-circuit and thermal)
- Double-side, plated-through PCB layout

1.3 DRV8432EVM Specifications

Table 1-1. Key Parameters

Output Stage Voltage	0 to 52.5 Volts
System Supply Voltage	12 Volts
Number of Output	4 × Half Bridge, 2 × Full Bridge, 1 × Paralleled Full Bridge
Output Current per Output Pin	Up to 12-A peak, 7 A continuous

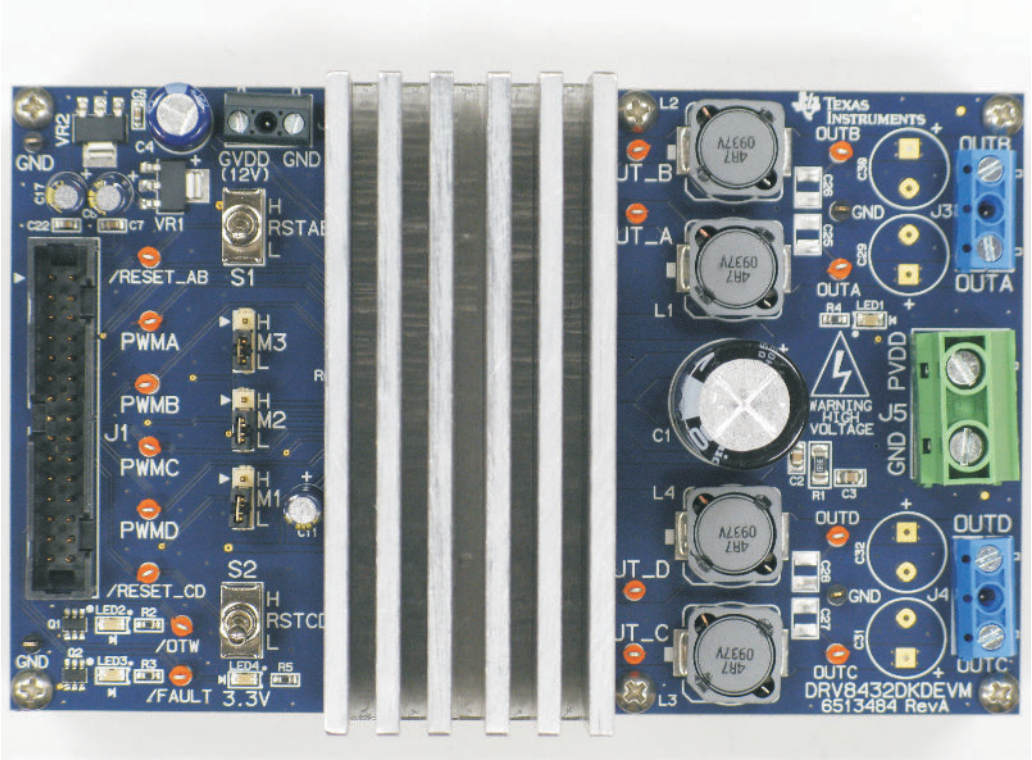

Figure 1-1. The TI DRV8432EVM Motor Drive Evaluation Board – Top View

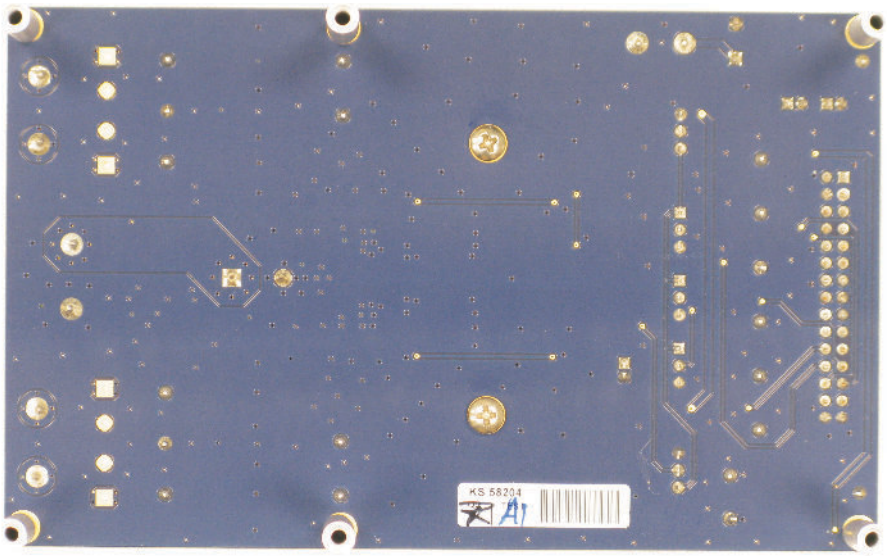

Figure 1-2. The TI DRV8432EVM Motor Drive Evaluation Board – Bottom View

2 Operation

2.1 Quick Start List for Stand-Alone Operation

Follow these steps to use the DRV8432EVM stand-alone or when connecting it into existing circuits or equipment. Connections to the EVM module can be made by inserting stripped wire for the power supplies and output connections.

2.1.1 Power Supply

Two power supplies are required to power up the EVM. One is needed for system power, logic and gate drive, while the second is for the output stage power supply. Use enough wire gauge such that the impedance is relatively low. The output stage supply should use at least AWG 19 wire.

Table 2-1. Power Supply Requirements

Description	Voltage Range	Current Requirements	Wire Size
System Power Supply	12 V	1 A	26 AWG
Output Stage Power Supply	0 – 52.5 V	14 A	19 AWG

2.1.2 Evaluation Module Preparation

Inputs and Outputs

1. Ensure that all external power sources are set to OFF.
2. Connect load(s) across the outputs (OUTX) or between the outputs and ground depending on the configuration requirement.
3. Connect an external 12-V power supply to the terminal block marked GVDD and GND (J2). Make sure the wires are connected with correct polarities.
4. Connect an external regulated power supply adjustable from 0 V–52.5 V to the terminal block marked PVDD and GND (J5). Make sure the wires are connected with correct polarities.

Control Signals

1. Install the mode jumpers on M3, M2, and M1 depending on the mode desired. See "Mode Pin Configurations" table for details.
2. Set RESET_AB (S1) and RESET_CD (S2) switches to low (RESET) position. If using an external MCU to control RESET, place the S1 and S2 switches in the middle position.
3. Prepare the PWM signals needed to control the power stage and make sure that PWM logic is 3.3 V not 5 V. 5 V will damage the device inputs.

2.1.3 Power Up

The DRV8432 device doesn't require a special power-up sequence, but the following sequence is recommended for the EVM.

1. Turn on GVDD (12 V) power supply.
2. Enable PWM signals.
3. Set RESET_AB (S1) and RESET_CD (S2) switches to high (NORMAL OPERATION) position.
4. Turn on the external PVDD power supply to the desired voltage gradually.
5. Adjust the duty cycle of PWM input signals to the desired value. The EVM should begin to operate normally.

2.1.4 Fault Conditions

When the device shuts down due to any fault conditions, flip RESET_AB and/or RESET_CD switches to low and back to HIGH to clear the fault and reset the device. If this doesn't work for any reason, turn 12-V GVDD power supply off and on again to clear the latch. Please inspect the board and test condition carefully to understand the problem before next operation.

Table 2-2. Mode Pin Configurations

MODE PINS			OUTPUT CONFIGURATION	DESCRIPTION
M3	M2	M1		
0	0	0	2 FB or 4 HB	Dual Full Bridges (two PWM inputs each full bridge) or four half bridges with cycle-by-cycle current limit

Table 2-2. Mode Pin Configurations (continued)

MODE PINS			OUTPUT CONFIGURATION	DESCRIPTION
M3	M2	M1		
0	0	1	2 FB or 4 HB	Dual full bridges (two PWM inputs each full bridge) or four half bridges with OC latching shutdown (no cycle-by-cycle current limit)
0	1	0	1 PFB	Parallel full bridge with cycle-by-cycle current limit
0	1	1	1 FB	Dual Full Bridges (one PWM input each full bridge with complementary PWM on second half bridge) with cycle-by-cycle current limit
1	x	x		Reserved

3 Schematics, PCB Layers, and Bill of Materials

3.1 DRV8432EVM Schematic

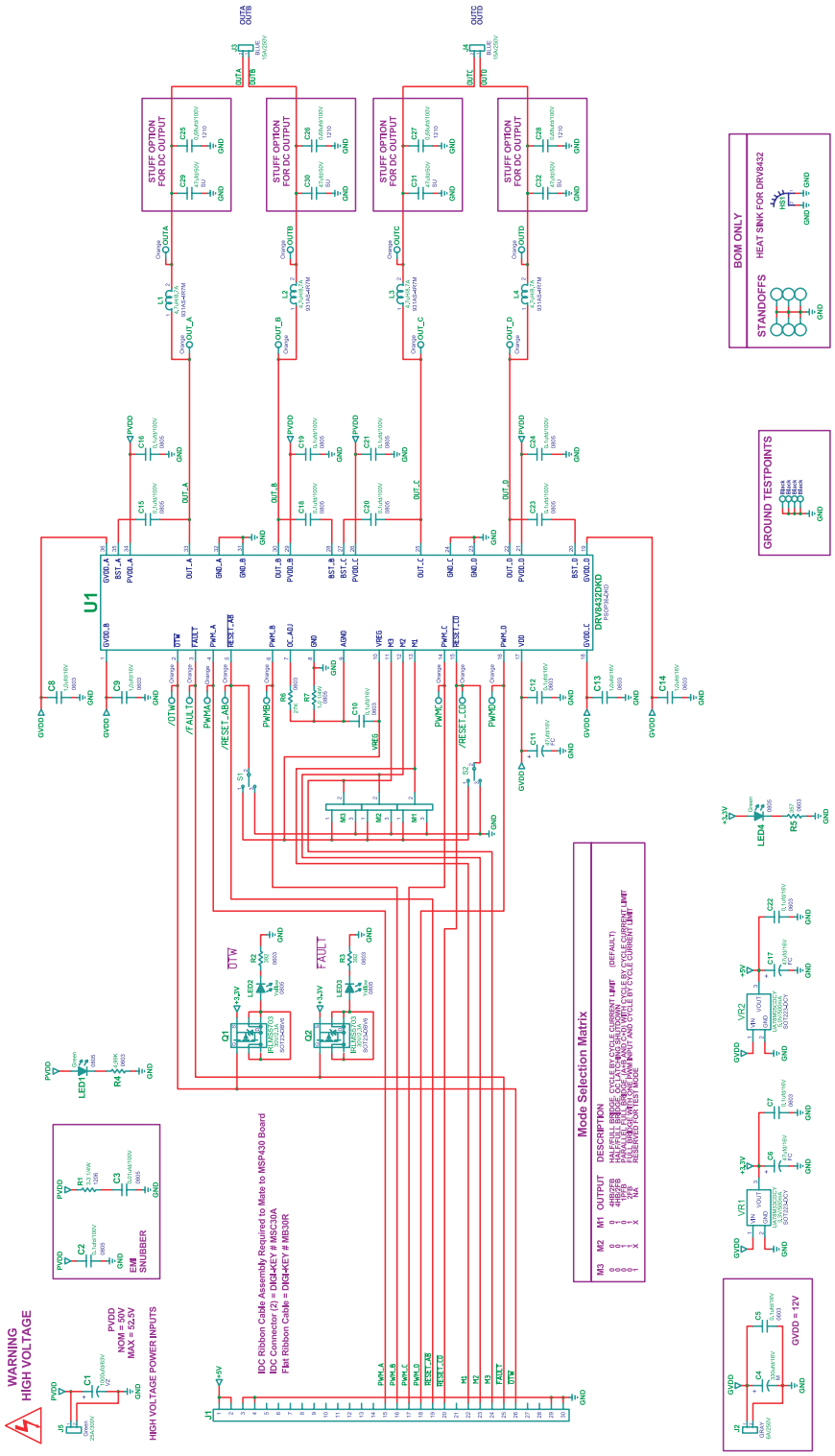

Figure 3-1. DRV8432EVM Schematic

3.2 DRV8432EVM PCB Layers

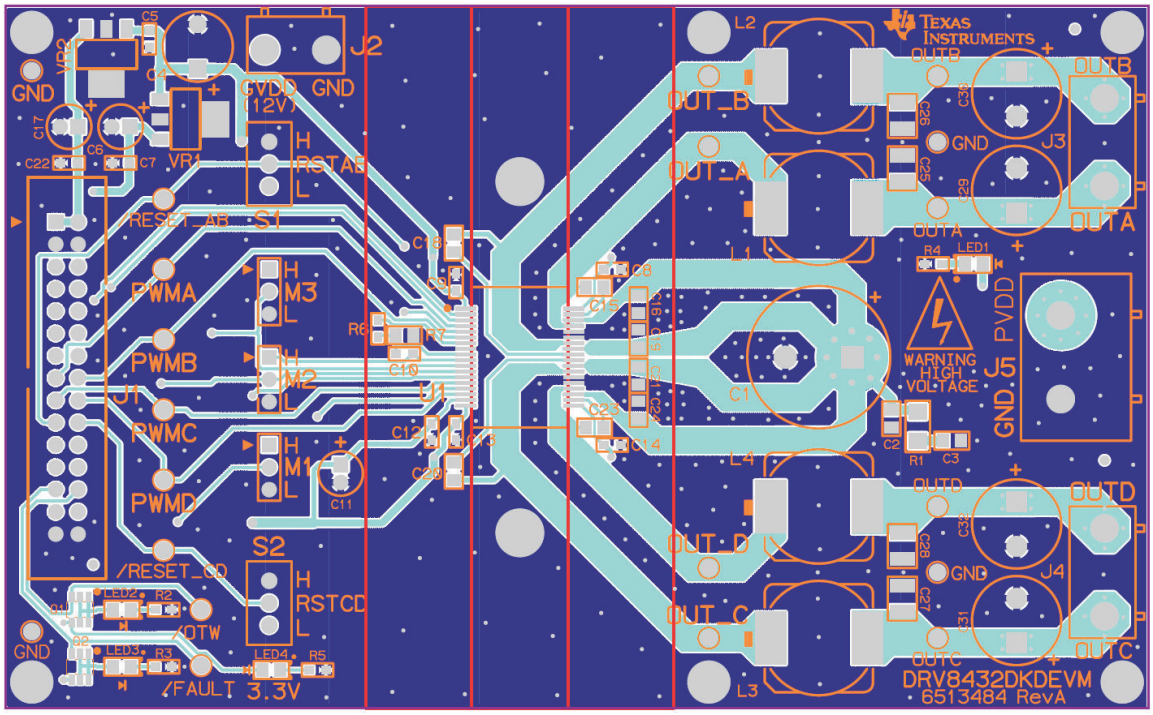

Figure 3-2. DRV8432EVM – Top Layer Composite

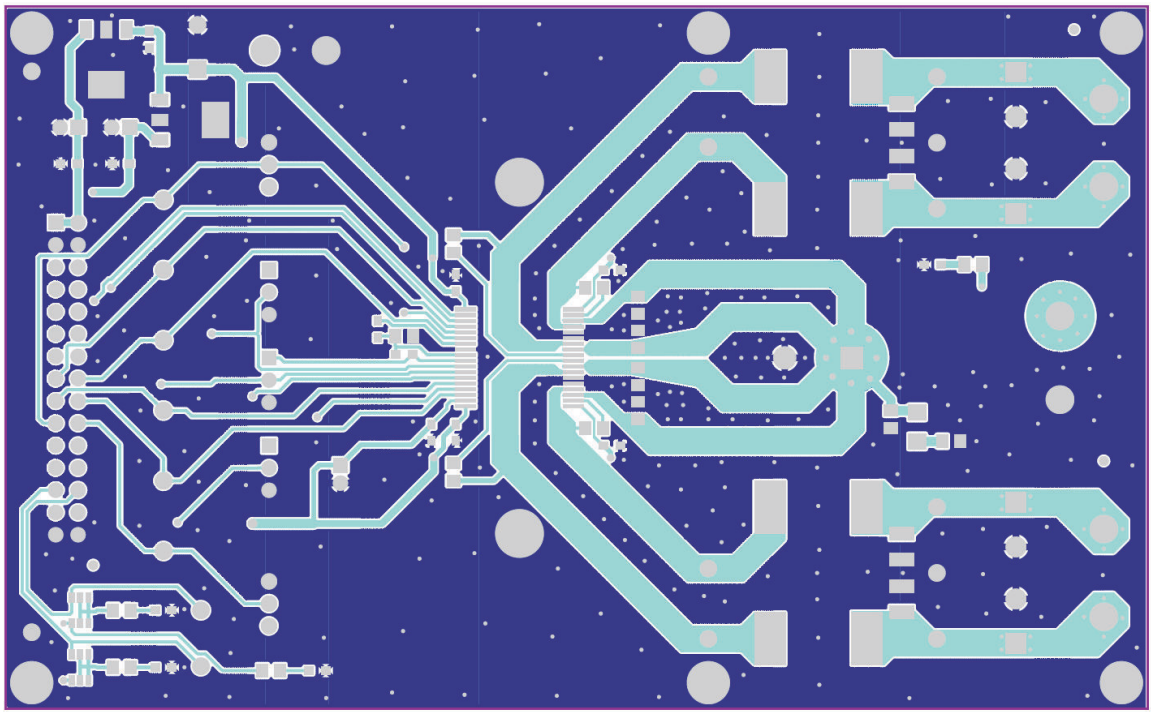

Figure 3-3. DRV8432EVM – Top Layer Copper

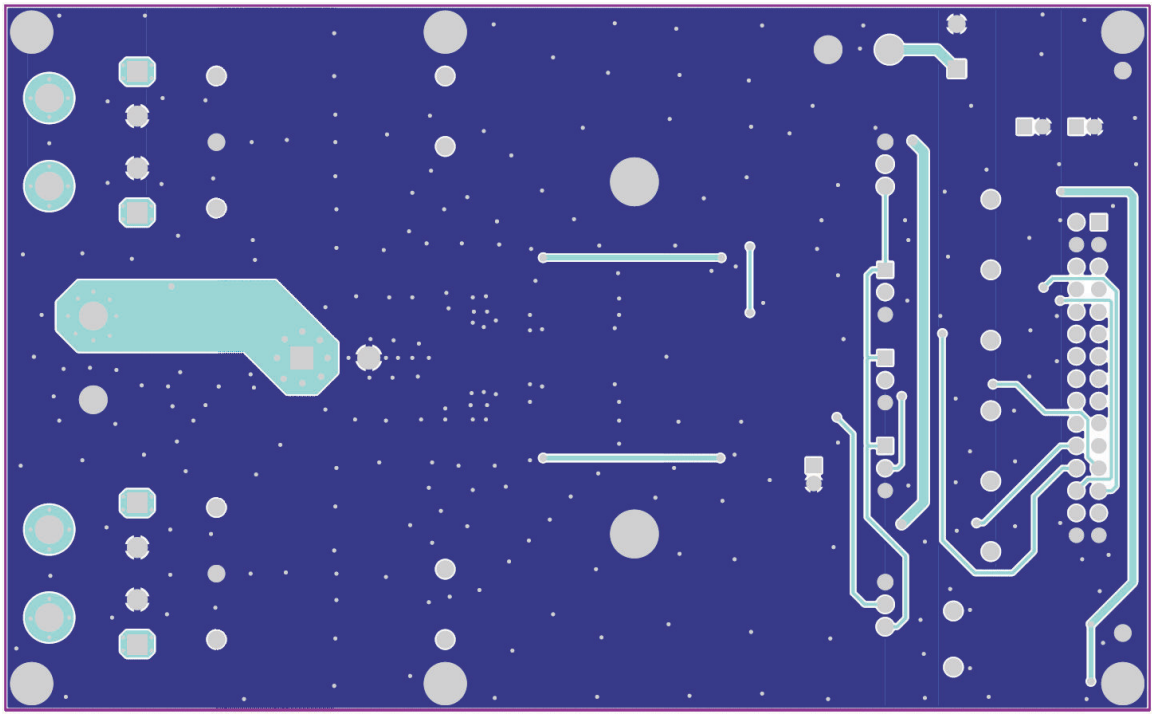

Figure 3-4. DRV8432EVM – Bottom Copper

3.3 Bill of Materials for DRV8432DKD_EVM

Table 3-1. Bill of Materials

QTY	REF DES	Description	Vendor	Vendor Part No.	MANU	MANU Part No.
1	U2	MOTOR DRIVE POWER AMP, PSOP3_36-DKD, RoHS	Texas Instruments	DRV8432DKD	Texas Instruments	DRV8432DKD
1	VR1	VOLT REG 3.3 V, 500 mA, SOT223-DCY, RoHS	Digi-Key	296-13424-1	Texas Instruments	UA78M33CDCYR
1	VR2	VOLT REG 5.0 V, 500 mA, SOT223-DCY, RoHS	Digi-Key	296-12290-1	Texas Instruments	UA78M05CDCYR
2	Q1, Q2	MOSFET, P-Chan 30 V, 2.4 A, SOT23-DBV6, RoHS	Digi-Key	IRLMS5703PBFCT	International Rectifier	IRLMS5703TRPBF
2	LED1, LED4	LED, GREEN 2.0 V, SMD0805, RoHS	Digi-Key	67-1553-1	Lumex Opto	SML-LXT0805GW-TR
2	LED2, LED3	LED, YELLOW 2.0 V, SMD0805, RoHS	Digi-Key	67-1554-1	Lumex Opto	SML-LXT0805YW-TR
1	C3	CAP SMD0805 CERM, 0.01 µF, 100 V, 10%, X7R, RoHS	Digi-Key	PCC1991CT	Panasonic	ECJ-2VB2A103K
5	C5, C7, C10, C12, C22	CAP SMD0603 CERM 0.1 µF, 16 V, 10%, X7R, RoHS	Digi-Key	PCC1762CT	Panasonic	ECJ-1VB1C104K
9	C2, C15, C16, C18, C19, C20, C21, C23, C24	CAP SMD0805 CERM 0.1 µF, 100V 10% X7R, RoHS	Digi-Key	445-1418-1	TDK	C2012X7R2A104K
4	C8, C9, C13, C14	CAP SMD0603 CERM 1.0 µF, 16V 10% X5R, RoHS	Digi-Key	PCC2224CT	Panasonic	ECJ-1VB1C105K
3	C6, C11, C17	CAP 47UFD 16-V RAD ALUM ELEC FC, RoHS	Digi-Key	P11196	Panasonic	EEU-FC1C470
1	C4	CAP 330UFD 16-V RAD ALUM ELEC M 20%, RoHS	Digi-Key	P10371TB	Panasonic	ECA-1CM331B
1	C1	CAP 1000UFD 63-V RAD ALUM ELEC VZ, RoHS	Digi-Key	493-1359	Nichicon	UVZ1J102MHD
1	R7	RESISTOR SMD0805 1.0 Ω, 1/4W, 1%, RoHS	Digi-Key	RHM1KCT	ROHM	ESR10EZPJ1R0
1	R1	RESISTOR SMD1206 3.3 Ω, 1/8W 5%, RoHS	Digi-Key	P3.3PCT	Panasonic	ERJ-8RQJ3R3V
1	R5	RESISTOR SMD0603 357 Ω, 1% THICK FILM 1/10W, RoHS	Digi-Key	P357HCT	Panasonic	ERJ-3EKF3570V

Table 3-1. Bill of Materials (continued)

QTY	REF DES	Description	Vendor	Vendor Part No.	MANU	MANU Part No.
2	R2, R3	RESISTOR SMD0603 392 Ω, 1%, THICK FILM 1/10W, RoHS	Digi-Key	P392HCT	Panasonic	ERJ-3EKF3920V
1	R4	RESISTOR SMD0603 4.99 kΩ, 1%, THICK FILM 1/10W, RoHS	Digi-Key	P4.99KHCT	Panasonic	ERJ-3EKF4991V
1	R6	RESISTOR SMD0603, THICK FILM, 27 kΩ, 5% 1/10W, RoHS	Yageo	311-27KGRCT	Panasonic	RC0603JR-0727KL
4	L1, L2, L3, L4	4.7 µH Shielded Inductor 8.5 A 10mOhm Max Nonstandard	Digi-Key	732-7447707047TR-ND	Wurth Elektronik	7447707047
3	M1, M2, M3	HEADER THRU MALE 3 PIN 100 LS GOLD, RoHS	Digi-Key	S1011E-03-ND	Sullins	PBC03SAAN
1	J1	HEADER SHROUDED 100 LS MALE GOLD 2 × 15 PINS, RoHS	Digi-Key	MHC30K	3M	N2530-6002-RB
1	J5	TERMINAL BLOCK 2PIN 25 A/300 V, GREEN 9.52 mm, PITCH 12-24AWG, RoHS	Digi-Key	ED2677	On Shore Technology	OSTT7022150
1	J2	TERMINAL BLOCK 2PIN 6 A/250 V, BLACK 7 mm PITCH 16-28AWG, RoHS	Digi-Key	ED1534	On Shore Technology	ED655/2DS
2	J3, J4	TERMINAL BLOCK 2PIN 15 A/250 V, BLUE 10 mm PITCH 14-22AWG, RoHS	Digi-Key	ED1627	On Shore Technology	ED600/2DS
16	$\overline{\text{OTW}}$, $\overline{\text{FAULT}}$ PWMA, PWMB, PWMC, PWMD, OUTA, OUT_A, OUTB, OUT_B, OUTC, OUT_C, OUTD, OUT_D, $\overline{\text{RESET\_AB}}$, $\overline{\text{RESET\_CD}}$	PC testpoint, orange, RoHS	Digi-Key	5003K	Keystone Electronics	5003
4	GNDx4	PC TESTPOINT, BLACK, RoHS	Digi-Key	5001	Keystone Electronics	5001K
2	S1, S2	SWITCH, SPST VERT-PCB ON-OFF-ON MINIATURE TOGGLE, RoHS	Digi-Key	ATE1E-2M3-10-Z	Copal Electronics	563-1159
3	M1(2-3), M2(2-3), M3(2-3)	SHUNT, BLACK AU FLASH 0.100 LS	Digi-Key	S9001	Sullins	SPC02SYAN
1	HS1	HEATSINK ALUMINUM, 35 × 80 × 38 mm 40 mm PITCH	Heavy Metal	HeatSink_DRV-EVM_35Wx80Lx38T-40P	Heavy Metal	HeatSink_DRV-EVM_35Wx80Lx38T-40P
6	N/A	4-40 SCREW, STEEL 0.250 in	Digi-Key	H342	Building Fasteners	PMS 440 0025 PH
6	N/A	STANDOFF, 4-40, 1.0 in × 1/4 in, ALUM RND F-F	Digi-Key	2030K	Keystone Electronics	2030
2	N/A	4-40 SPACER, ROUND, 0.125 in THICK, ALUMINUM	Digi-Key	2036	Keystone Electronics	2036K

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