DRV8402DKD EVM Motor Drive Evaluation Board

The DRV8402DKD EVM customer evaluation module demonstrates the integrated circuit DRV8402DKD from Texas Instruments. The EVM can be used with an MSP430 control module or can be wired into an existing system.

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1 Introduction

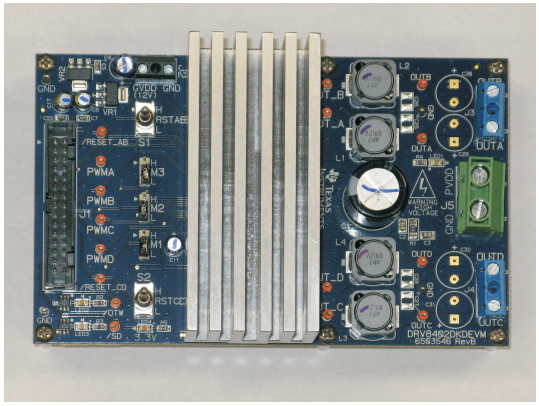


Figure 1. The TI DRV8402DKD EVM Motor Drive Evaluation Board – Top View

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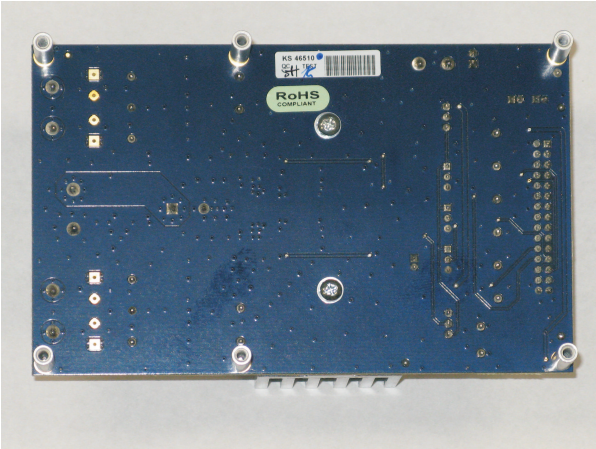


Figure 2. The TI DRV8402DKD EVM Motor Drive Evaluation Board – Bottom View

1.1 DRV8402DKD EVM Specifications

Table 1. Key Parameters

Output Stage Voltage	0 to 50 Volts
System Supply Voltage	12 Volts
Number of Output	4 × Half Bridge, 2 × Full Bridge
Output Current per Output Pin	12 A peak, 5 A continuous

2 Operation

2.1 Quick Start List for Stand-Alone Operation

Follow these steps to use the DRV8402DKD EVM 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 supply and output connections.

2.1.1 Power Supply

Two power supplies are required to power up the EVM. One is need for system power, logic and gate drive, while the second is the output stage supply. Please use enough wire gauge such that the impedance is relatively low. The output stage supply should use at least AWG 20 wire.

Table 2. Power Supply Requirements

Description	Voltage Range	Current Requirements	Wire Size
System Power Supply	12 V	0.3 A	26 AWG
Output Stage Power Supply	0 – 50 V	10 A	20 AWG

1. Ensure that all external power sources are set to OFF.
2. Connect an external regulated power supply adjusted from 10V–50V to the module VCC (**J7**) and GND (**J8**) banana jacks taking care to observe marked polarity.

2.1.2 Evaluation Module Preparations

Inputs and Outputs

1. Connect a Load(s) across the outputs (OUTX) or between the outputs and ground depending on the configuration required
2. Connect the GVDD supply (12V)

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3. Connect the PVDD supply (10–50V)

Control Inputs

1. Install the mode jumpers on M3, M2, and M1 depending on the mode desired. See Table 3.
2. Provide the PWM signals needed to control the power stage

2.1.3 Power Up

1. Verify correct voltage and input polarity and turn the external power supplies ON. Reset outputs AB and/or CD using switches S1 and S2 and return to active positions. The EVM should begin operation.
2. Adjust the input signal duty cycle for the desired output.

Table 3. Mode Selection Pins

MODE PINS			OUTPUT CONFIGURATION	DESCRIPTION
M3	M2	M1		
0	0	0	2FB	Dual Full Bridge with cycle-by-cycle current limit
0	0	1	2FB	Dual full bridge with OC latching shutdown (no cycle-by-cycle current limit)
0	1	0	1PFB	Parallel full bridge with cycle-by-cycle current limit
0	1	1	1 PFB	Parallel full bridge with OC latching shutdown
1	0	0	4 HB	Half Bridge with cycle-by-cycle current limit. Protection works similarly to full bridge mode. One difference in half bridge mode is that OUT X is Hi-Z instead of a pulldown through internal resistor when RESET pins is low
1	0	1	4 HB	Half Bridge with OC latching shutdown. Protection works similarly to full bridge mode. One difference in half bridge mode is that OUT X is Hi-Z instead of a pulldown through internal resistor when RESET pins is low
1	1	0	Reserved	
1	1	1		

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3 Schematics, PCB Layers, and Bill of Materials

3.1 DRV8402DKD EVM Schematic

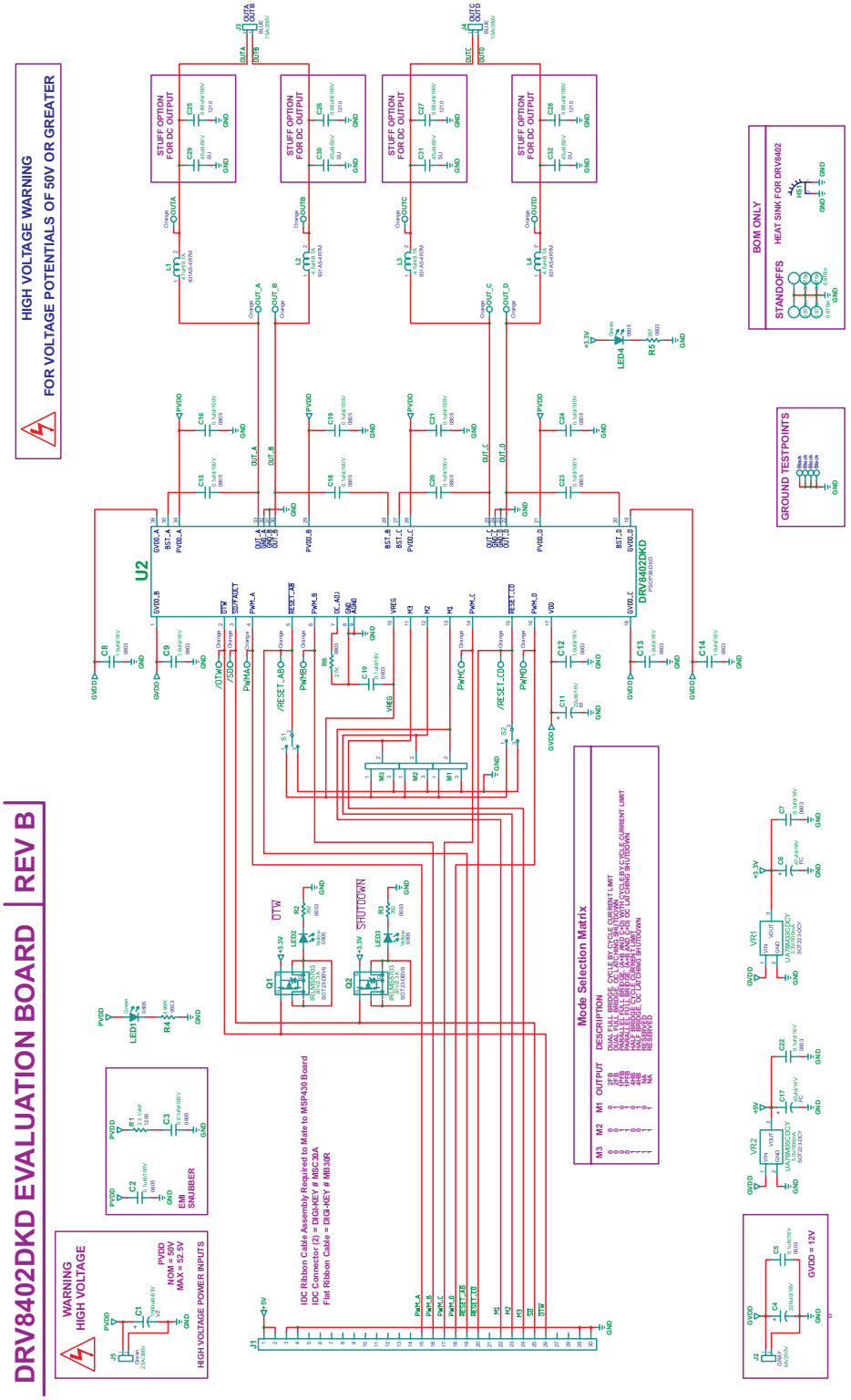


Figure 3. DRV8402DKD EVM Schematic

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3.2 DRV8402DKD EVM PCB Layers

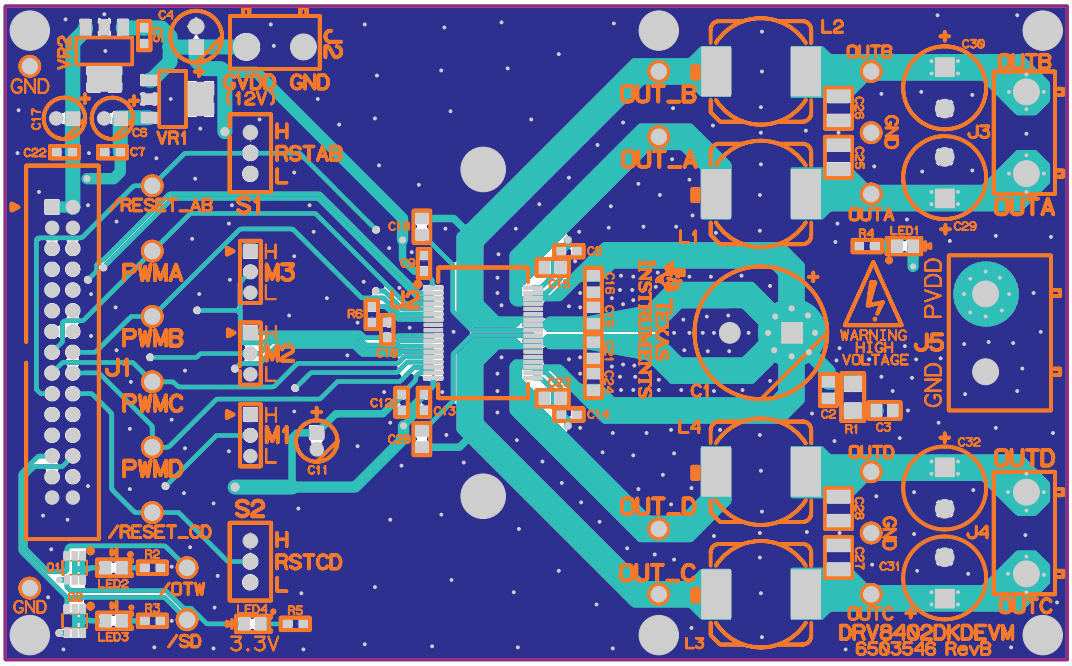


Figure 4. DRV8402DKD EVM – Top Layer Composite

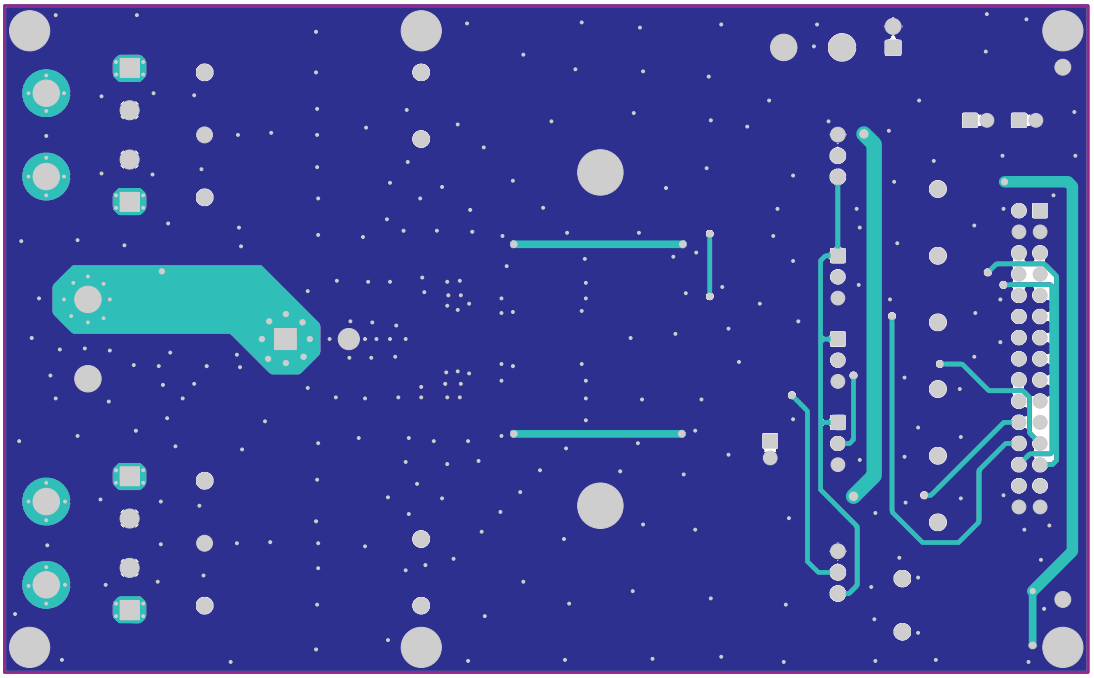


Figure 5. DRV8402DKD EVM – Bottom Copper

3.3 Bill of Materials for DRV8402DKD_EVM

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Table 4. 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	DRV8402DKD	Texas Instruments	DRV8402DKD
1	VR1	VOLT REG 3.3V 500mA SOT223-DCY ROHS	Digi-Key	296-13424-1	Texas Instruments	UA78M33CDCYR
1	VR2	VOLT REG 5.0V 500mA SOT223-DCY ROHS	Digi-Key	296-12290-1	Texas Instruments	UA78M05CDCYR
2	Q1,Q2	MOSFET, P-Chan 30V 2.3A, SOT23-DBV6 ROHS	Digi-Key	IRLMS5703PBFCT	International Rectifier	IRLMS5703TRPBF
2	LED1, LED4	LED, GREEN 2.0V SMD0805 ROHS	Digi-Key	67-1553-1	Lumex Opto	SML-LXT0805GW-TR
2	LED2, LED3	LED, YELLOW 2.0V SMD0805 ROHS	Digi-Key	67-1554-1	Lumex Opto	SML-LXT0805YW-TR
1	C3	CAP SMD0805 CERM 0.01UFD 100V 10% X7R ROHS	Digi-Key	PCC1991CT	Panasonic	ECJ-2VB2A103K
4	C5, C7, C10, C22	CAP SMD0603 CERM 0.1UFD 16V 10% X7R ROHS	Digi-Key	PCC1762CT	Panasonic	ECJ-1VB1C104K
9	C2, C15, C16, C18, C19, C20, C21, C23, C24	CAP SMD0805 CERM 0.1UFD 100V 10% X7R ROHS	Digi-Key	445-1418-1	TDK	C2012X7R2A104K
5	C8, C9, C12, C13, C14	CAP SMD0603 CERM 1.0UFD 16V 10% X5R ROHS	Digi-Key	PCC2224CT	Panasonic	ECJ-1VB1C105K
1	C11	CAP ALUM ELEC M RADIAL 22UFD 16V 20% ROHS	Digi-Key	P5135	Panasonic	ECA1CM220
2	C6, C17	CAP 47UFD 16V RAD ALUM ELEC FC ROHS	Digi-Key	P11196	Panasonic	EEU-FC1C470
1	C4	CAP ALUM ELEC M RADIAL 220UFD 16V 20% ROHS	Digi-Key	P5139	Panasonic	ECA-1CM221
1	C1	CAP 1000UFD 63V RAD ALUM ELEC VZ ROHS	Digi-Key	493-1359	Nichion	UVZ1J102MHD
1	R1	RESISTOR SMD1206 3.3 OHMS 5% 1/4W ROHS	Digi-Key	P3.3PCT	Panasonic	ERJ-8RQJ3R3V
1	R5	RESISTOR SMD0603 357 OHM 1% THICK FILM 1/10W ROHS	Digi-Key	P357HCT	Panasonic	ERJ-3EKF3570V
2	R2, R3	RESISTOR SMD0603 392 OHM 1% THICK FILM 1/10W ROHS	Digi-Key	P392HCT	Panasonic	ERJ-3EKF3920V
1	R4	RESISTOR SMD0603 4.99K OHM 1% THICK FILM 1/10W ROHS	Digi-Key	P4.99KHCT	Panasonic	ERJ-3EKF4991V
1	R6	RESISTOR SMD0603 THICK FILM 27K OHMS 5% 1/10W ROHS	Digi-Key	311-27KGRCT	Yageo	RC0603JR-0727KL
4	L1, L2, L3, L4	Inductor SMD 4.7UH 8.7A TYPE D128C ROHS	TOKO	931AS-4R7M	TOKO	931AS-4R7M
3	M1, M2, M3	HEADER THRU MALE 3 PIN 100LS GOLD ROHS	Digi-Key	S1011E-03-ND	Sullins	PBC03SAAN
1	J1	HEADER SHROUDED 100LS MALE GOLD 2X15 PINS ROHS	Digi-Key	MHC30K	3M	N2530-6002-RB
1	J5	TERMINAL BLOCK 2PIN 25A/300V GREEN 9.52mm PITCH 12-24AWG ROHS	Digi-Key	ED2677	On Shore Technology	OSTT7022150
1	J2	TERMINAL BLOCK 2PIN 6A/250V GRAY 7mm PITCH 16-28AWG ROHS	Digi-Key	ED1534	On Shore Technology	ED655/2DS
2	J3, J4	TERMINAL BLOCK 2PIN 15A/250V BLUE 10mm PITCH 14-22AWG ROHS	Digi-Key	ED1627	On Shore Technology	ED600/2DS
16	$\overline{SD}$, $\overline{OTW}$, PWMA, PWMB, PWMC, PWMD, OUTA, OUT_A, OUTB, OUT_B, OUTC, OUT_C, OUTD, OUT_D, $\overline{RESET_AB}$, $\overline{RESET_CD}$	PC testpoint, orange, ROHS	Digi-Key	5003K	Keystone Electronics	5003
4	GNDx4	PC testpoint, Black, ROHS	Digi-Key	5001K	Keystone Electronics	5001
2	S1, S2	SWITCH,SPST VERT-PCB ON-OFF-ON MINIATURE TOGGLE ROHS	Digi-Key	563-1159	Copal Electronics	ATE1E-2M3-10-Z

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Table 4. Bill of Materials (continued)

QTY	REF DES	Description	Vendor	Vendor Part No.	MANU	MANU Part No.
3	M1(2-3), M2(2-3), M3(2-3)	Shunt, Black AU Flash 0.100LS	Digi-Key	S9001	Sullins	SPC02SYAN
1	HS1	HEATSINK ALUMINUM 35x80x38mm 40mm PITCH	Heavy Metal	HeatSink_DRV-EVM_35Wx80Lx38T-40P	Heavy Metal	HeatSink_DRV-EVM_35Wx80Lx38T-40P
6		4-40 Screw, Steel 0.250 in	Digi-Key	H342	Building Fasteners	PMS 440 0025 PH
6		Standoff, 4-40, 0.875INx3/16IN, ALUM RND F-F	Digi-Key	2030K	Keystone Electronics	2030

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