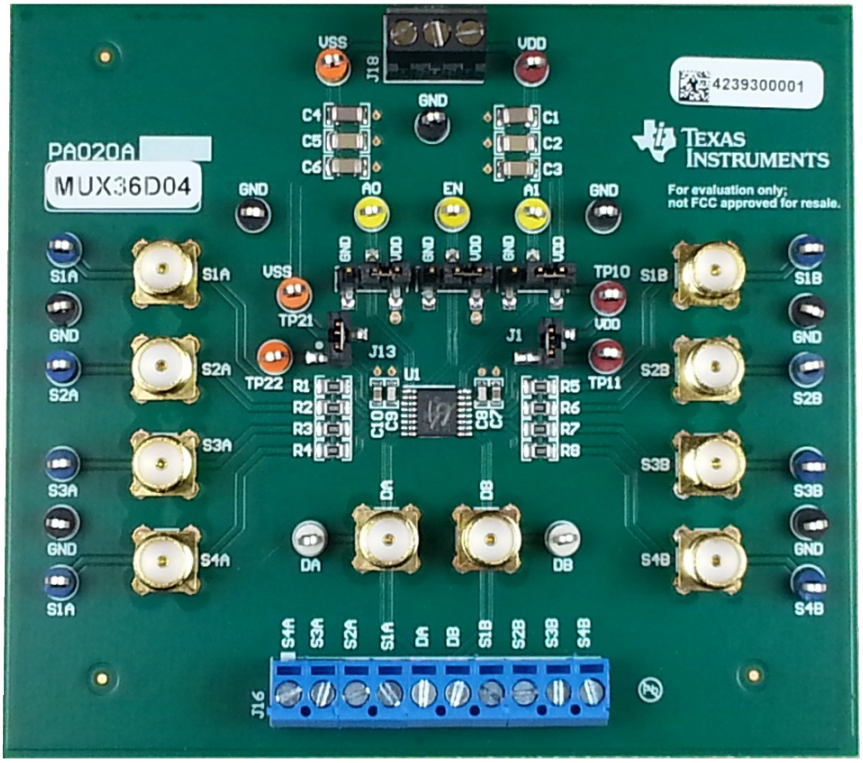
MUX36D04EVM-PDK



This user guide describes the characteristics, operation, and use of the MUX36D04 evaluation module (EVM) performance demonstration kit (PDK). This kit is an evaluation platform for MUX36D04, an analog multiplexer (mux) that offers 4:1 differential or 8:2 single-ended channels. This user guide includes setup and operating instructions, complete circuit descriptions, schematic diagrams, printed circuit board (PCB) layout, and a bill of materials (BOM).

NOTE: The MUX36D04EVM may also be used to evaluate the performance of the MUX509 as the two parts are pin compatible. The MUX509 would have to be separately ordered and manually soldered on the MUX36D04EVM.

Throughout this document, the terms MUX36D04EVM, demonstration kit, evaluation board, evaluation module, and EVM are synonymous with the MUX36D04EVM-PDK.

The following related documents are available through the Texas Instruments web site at www.ti.com.

Related Documentation

Device	Literature Number
MUX36D04	SBOS705

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1 Overview

The MUX36D04 is a CMOS analog multiplexer that offers 4:1 differential or 8:2 single-ended channels, operates with either dual supplies (±5 V to ±18 V) or a single supply (10 V to 36 V), and supports true rail-to-rail input and output. The MUX36D04 has very low on- and off-leakage currents and low quiescent current that make it ideally suited for portable applications.

1.1 MUX36D04EVM-PDK Features

The MUX36D04EVM-PDK includes the following features:

- Hardware required for evaluation of the with industry-standard TSSOP package MUX36D04.
- Multiple connectors on input and output pins for ease of evaluation.
- Layout as per the reference layout in data sheet.
- In addition to basic switching operations, the EVM can be used to test the crosstalk and off-isolation, as per the data sheet.

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2 EVM Setup

This section describes the power supply and jumper configuration options available on the MUX36D04EVM-PDK.

2.1 Powering Up the EVM

The MUX36D04 can operate with either dual supplies (±5 V to ±18 V) or a single supply (10 V to 36 V). It can operate with both symmetric supplies (such as V_{DD} = 12 V, V_{SS} = –12 V), and unsymmetric supplies (such as V_{DD} = 12 V, V_{SS} = –5 V).

The MUX36D04EVM-PDK provides connections for the power supply pins with either a single or dual power supply, from a minimum $V_{DD} – V_{SS}$ range of 10 V to maximum of 36 V. The V_{DD} supply must be connected at pin 1 and V_{SS} at pin 2 of J18 from a tabletop power-supply unit (PSU) as shown in Figure 1. For single-supply operation, connect V_{SS} to GND through a wire-bridge between pin 2 and pin 3 of J18. V_{DD} and V_{SS} can be monitored using TP10 and TP22, respectively.

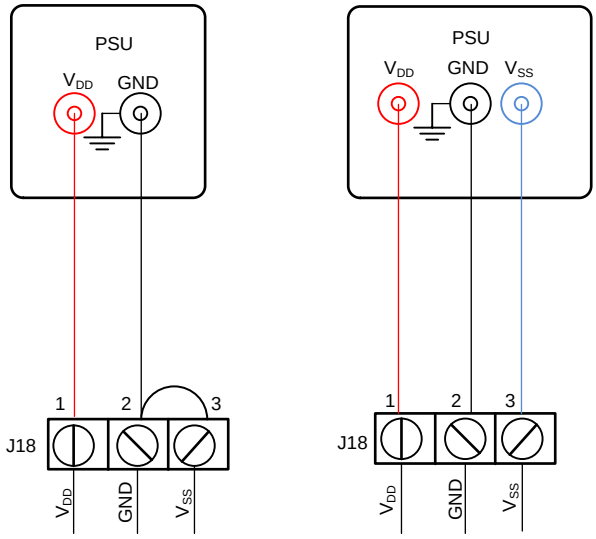


Figure 1. Power Connections for Single Supply (Left) and Dual Supply (Right) Operation

Jumpers J1 and J13 are provided to enable monitoring of the currents drawn from each of these supplies by the MUX36D04 using ammeters. In case ammeters are not used, headers J1 and J13 must be shorted using shunts for normal operation, as listed in Table 1. The EVM ships with these shunts inserted.

Table 1. J1 and J13 Header Description

Signal	Location	Description
V_{DD}	J1 pin 1 to pin 2	Positive power supply for the MUX36D04
V_{SS}	J13 pin 1 to pin 2	Negative power supply for the MUX36D04

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2.2 Digital Signal Connections

The digital signals of the MUX36D04 are brought out to headers. Each of these signals can be connected to V_{DD} or V_{SS} by using shunts as listed on Table 2.

Table 2. Digital Signal Locations

Signal	Location	Description
EN	J3 pin 2	Active high digital input. When this pin is low, all switches are turned off. When this pin is high, the A[2:0] inputs determine which switch is turned on.
A0	J4 pin 2	Address line A0
A1	J5 pin 2	Address line A1

Alternatively, these signals may be driven directly from a processor by removing the shunts, and wiring the processor general-purpose I/Os to pin 2 of J3, J4, and J5 jumpers.

2.3 Analog Signal Connections

The analog signals of MUX36D04 are accessible at multiple locations on the MUX36D04EVM-PDK. Table 3 lists all the locations. These signals may be used as input or output signals because the device acts as a switch between the input and output terminals.

Table 3. Analog Signal Locations

Signal	Header	SMA	Testpoint	Description
S1A	J16 pin4	J2	TP12	Source terminal 1A
S2A	J16 pin3	J6	TP14	Source terminal 2A
S3A	J16 pin2	J8	TP18	Source terminal 3A
S4A	J16 pin1	J10	TP20	Source terminal 4A
S1B	J16 pin7	J11	TP21	Source terminal 1B
S2B	J16 pin8	J12	TP24	Source terminal 2B
S3B	J16 pin9	J14	TP25	Source terminal 3B
S4B	J16 pin10	J15	TP26	Source terminal 4B
DA	NA	J7	TP17	Drain terminal A
DB	NA	J9	TP19	Drain terminal B

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3 Evaluation Using the MUX36D04EVM-PDK

All parameters listed in the specifications table of the MUX36D04 data sheet can be tested on the MUX36D04EVM-PDK.

3.1 Channel Selection Logic

Table 4 provides the truth table for the selection logic for the MUX36D04. This behavior of the device can be evaluated by driving the digital selection signal listed in Section 2.2 to the appropriate levels.

Table 4. Channel Selection Truth Table

EN	A1	A0	On channel
0	X(1)	X(1)	All channels are off
1	0	0	Channel 1
1	0	1	Channel 2
1	1	0	Channel 3
1	1	1	Channel 4

(1) X denotes *don't care.*.

3.2 Key Specifications

The MUX36D04 datasheet contains detailed information of the test setups for each of the mux parameters. The MUX36D04EVM-PDK can be used to validate these parameters as per the test procedures described in the data sheet.

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4 Bill of Materials, PCB Layout, and Schematics

This section contains the MUX36D04EVM-PDK bill of materials (BOM), PCB layout, and EVM schematics.

4.1 Bill of Materials

Table 5 lists the MUX36D04EVM-PDK BOM.

Table 5. Bill of Materials

Manufacturer Part Number	Qty	Reference Designators	Manufacturer	Description
PA020	1	PCB1	Any	Printed Circuit Board
C3216X5R1E476M160AC	2	C1, C4	TDK	CAP, CERM, 47 µF, 25 V, +/- 20%, X5R, 1206
GMK316AB7106KL	2	C2, C5	Taiyo Yuden	CAP, CERM, 10 µF, 35 V, +/- 10%, X7R, 1206
C3216X7R1H105K	2	C3, C6	TDK	CAP, CERM, 1 µF, 50 V, +/- 10%, X7R, 1206
GRM188R72A104KA35D	2	C7, C10	MuRata	CAP, CERM, 0.1 µF, 100 V, +/- 10%, X7R, 0603
C1608C0G2A101J	2	C8, C9	TDK	CAP, CERM, 100 pF, 100 V, +/- 5%, C0G/NP0, 0603
N/A	3	FID1, FID2, FID3	N/A	Fiducial mark. There is nothing to buy or mount.
SJ-5303 (CLEAR)	4	H1, H2, H3, H4	3M	Bumpon, Hemisphere, 0.44 X 0.20, Clear
TSM-102-01-L-SV	2	J1, J13	Samtec	Header, 100mil, 2x1, Gold with Tin Tail, SMT
5-1814832-1	10	J2, J6, J7, J8, J9, J10, J11, J12, J14, J15	TE Connectivity	SMA Straight PCB Socket Die Cast, 50 Ohm, TH
TSM-103-01-L-SV	3	J3, J4, J5	Samtec	Header, 100mil, 3x1, Gold, SMT
OSTTE100161	1	J16	On-Shore Technology	Terminal Block, 3.5mm, 10x1, Tin, Blue, TH
39357-0003	1	J18	Molex	Terminal Block, 3.5 mm, 3x1, Tin, TH
THT-14-423-10	1	LBL1	Brady	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll
ERJ-6GEY0R00V	8	R1, R2, R3, R4, R5, R6, R7, R8	Panasonic	RES, 0, 5%, 0.125 W, 0805
969102-0000-DA	5	SH-J1, SH-J3, SH-J4, SH-J5, SH-J13	3M	Shunt, 100mil, Gold plated, Black
5005	3	TP1, TP10, TP11	Keystone	Test Point, Compact, Red, TH
5006	7	TP2, TP3, TP4, TP5, TP6, TP7, TP8	Keystone	Test Point, Compact, Black, TH
5008	3	TP9, TP21, TP22	Keystone	Test Point, Compact, Orange, TH
5122	8	TP12, TP14, TP18, TP20, TP23, TP24, TP25, TP26	Keystone	Test Point, Compact, Blue, TH
5009	3	TP13, TP15, TP16	Keystone	Test Point, Compact, Yellow, TH
5007	2	TP17, TP19	Keystone	Test Point, Compact, White, TH
MUX36D04IPWR	1	U1	Texas Instruments	Fault-Protected, 8-Channel, Single-Ended and 4-Channel, Differential Multiplexer, PW0016A

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4.2 PCB Layout

Figure 2 and Figure 3 illustrate the EVM PCB layout.

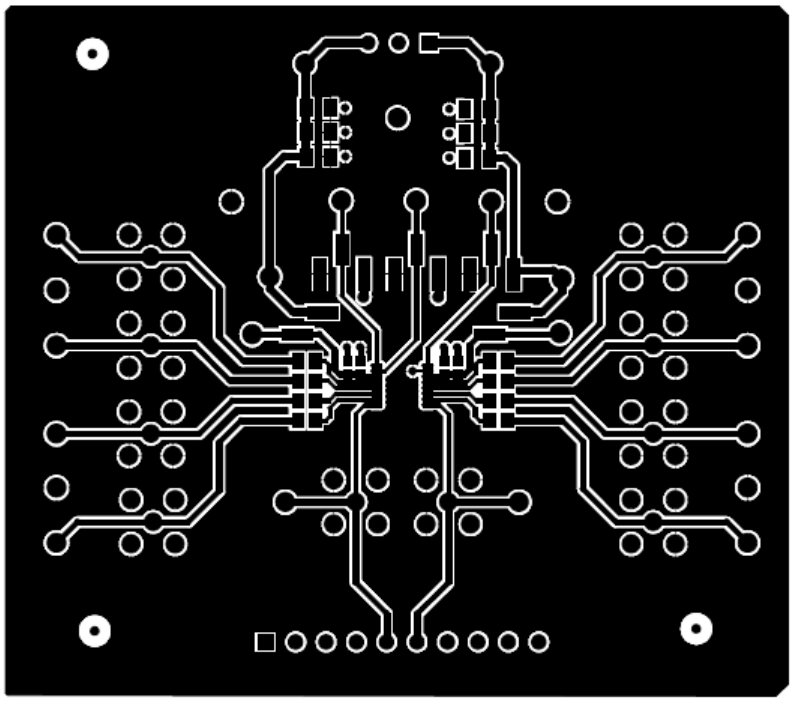


Figure 2. PCB Layer 1: Top Layer

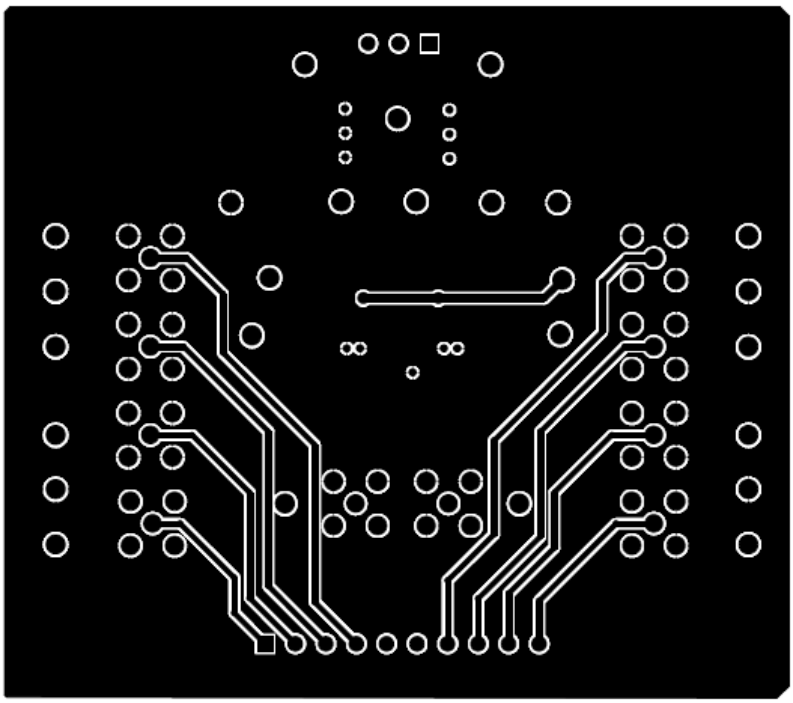


Figure 3. PCB Layer 2: GND Plane

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4.3 Schematic

Figure 4 and Figure 5 show the EVM electrical and mechanical schematics, respectively.

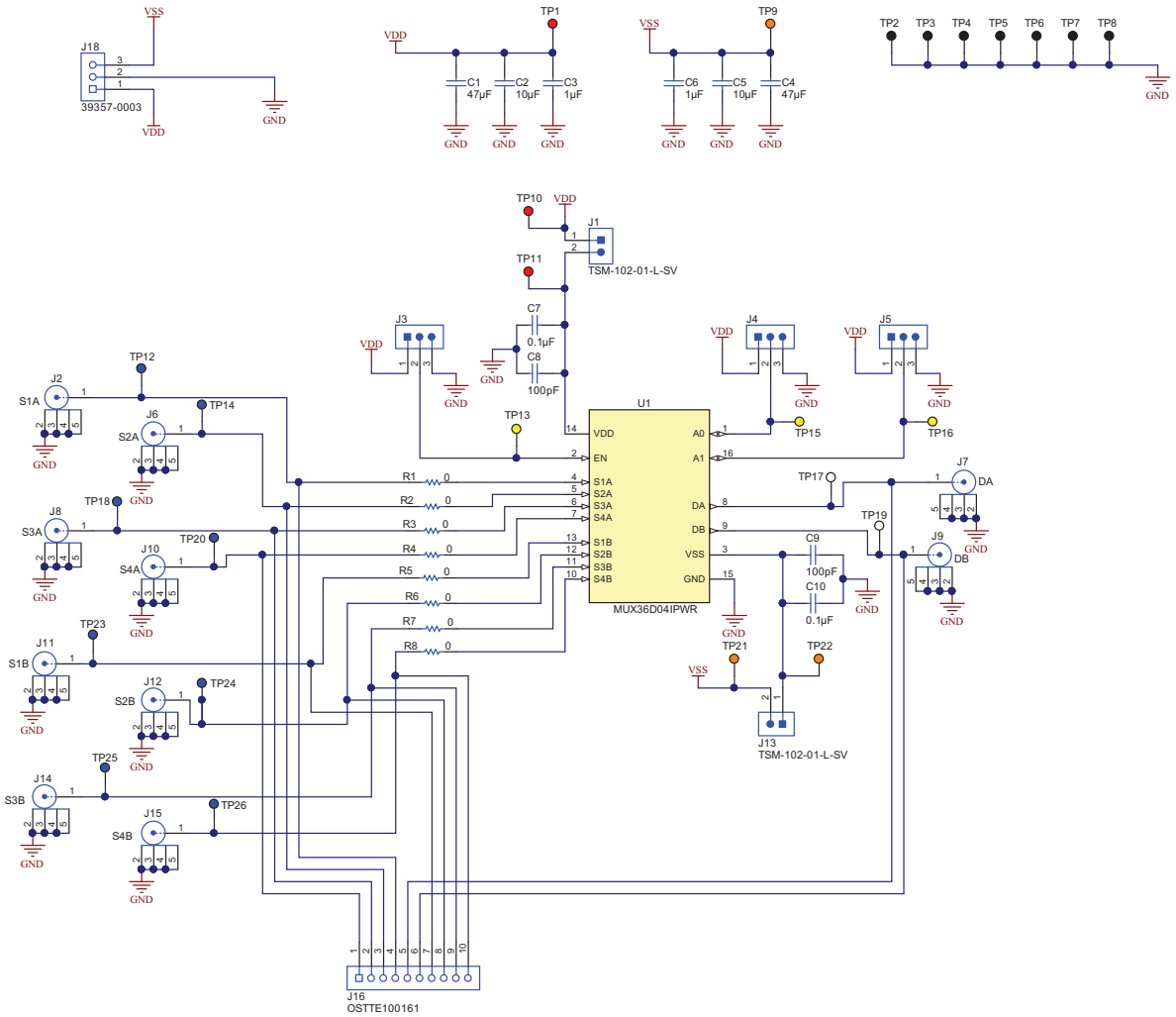


Figure 4. Schematic: Electrical



Figure 5. Schematic: Mechanical

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      CAUTION

      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

      Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

      FCC Interference Statement for Class A EVM devices

      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

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Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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