

TPS23753AEVM-004: Evaluation Module for TPS23753A

This user's guide describes the TPS23753AEVM (TPS23753AEVM-004). The TPS23753AEVM-004 contains evaluation and reference circuitry for the TPS23753A. The TPS23753A is an IEEE 802.3-2005 compliant powered-device controller and power supply controller optimized for isolated converter topologies. The TPS23753AEVM-004 is targeted at general, efficient, synchronous rectifier, 10-W flyback converter applications.

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1 Description

TPS23753AEVM-004 allows users to evaluate the reference circuitry of the TPS23753A. It contains input and output power connectors and an array of onboard test points for circuit evaluation. TPS23753AEVM-003 (5-V output) and TPS23753AEVM-005 (12-V output) can be configured with simple bill of materials (BOM) changes.

1.1 Features

- Efficient, general market design
 - Simple gate drive, synchronous rectified secondary
 - 10-W output power from power over Ethernet (PoE), 48-V or 24-V adapter and 6-W output power from a 12-V adapter
 - 5-V or 12-V output voltage with simple BOM changes

1.2 Applications

- Voice over Internet protocol – IP telephones
- Wireless LAN – Wireless access points
- Security – Wired IP cameras

2 Electrical Specifications

Table 1. TPS23753AEVM-003, -004, and -005 Electrical and Performance Specifications at T = 25°C

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
POWER INTERFACE						
Input Voltage	Applied to the power pins of connectors J2, J4, or J6		0		57	V
Operating Voltage	After start up		30		57	V
Input UVLO	Rising input voltage				36	V
	Falling input voltage		30			
Detection voltage	At device terminals		3		10	mA
Classification voltage	At device terminals		10		23	mA
Classification current	Rclass = 1270 Ω		1.8		2.4	mA
Inrush current-limit			90		190	mA
Operating current-limit			405		495	mA
DC/DC CONVERTER						
Output voltage	20 V ≤ Vin ≤ 57 V, I _{LOAD} ≤ I _{LOAD} (max) 10.8 V ≤ Vin ≤ 13.2 V, I _{LOAD} ≤ I _{LOAD} (max)	3.3-V output (-004)	3.13	3.3	3.47	V
		5-V output (-003)	4.75	5.0	5.25	
		12-V output (-005)	11.4	12.0	12.6	
Output current	20 V ≤ Vin ≤ 57 V	3.3-V output			3	A
		5-V output			2	
		12-V output			0.9	
	10.8 V ≤ Vin ≤ 13.2 V	3.3-V output			1.8	A
		5-V output			1.2	
		12-V output			0.5	
Output ripple voltage, peak-to-peak	Vin = 44 V, I _{LOAD} = 3 A	3.3-V output		30		mV
	Vin = 44 V, I _{LOAD} = 2 A	5-V output		40		
	Vin = 44 V, I _{LOAD} = 0.9 A	12-V output		100		
Efficiency, end-to-end	Vin = 44 V, I _{LOAD} = 2 A	3.3-V output		83		%
	Vin = 44 V, I _{LOAD} = 1.4 A	5-V output		82		%
	Vin = 44 V, I _{LOAD} = 0.9 A	12-V output		83		%
Switching frequency			112		138	kHz

3 Schematic

The TPS23753AEVM-004 schematic follows.

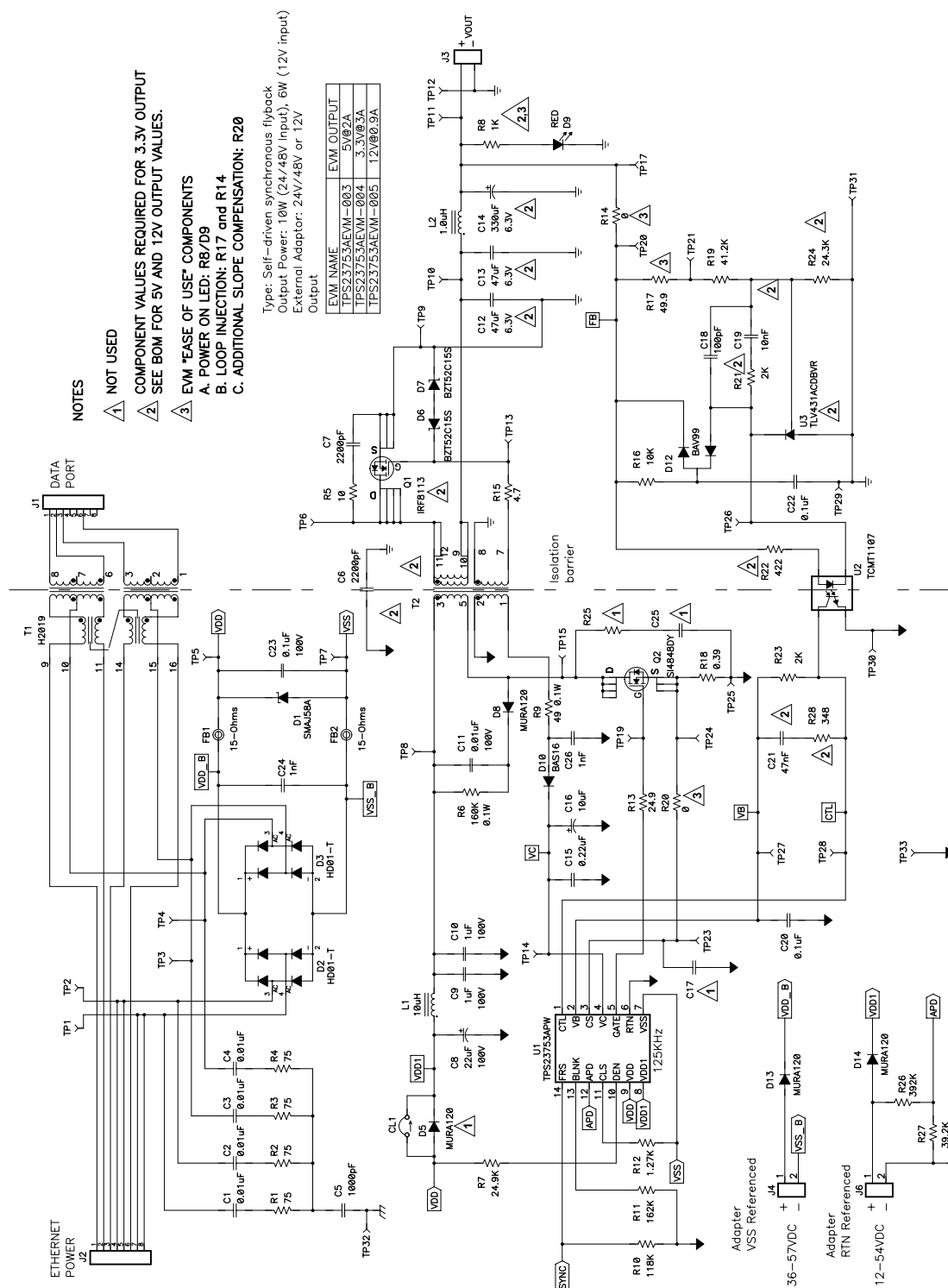


Figure 1. TPS23753AEVM-004 Schematic

4 General Configuration and Description

4.1 Physical Access

[Table 2](#) lists the TPS23753AEVM-004 connector functionality and [Table 3](#) describes the test point availability.

Table 2. Connector Functionality

Connector	Label	Description
J1	DATA PORT	Ethernet data port connector
J2	ETHERNET POWER	Ethernet power input connector. Contains Ethernet transformer and cable terminations
J3	VOUT	Output voltage connector
J4	ADP-VSS	VSS referenced external adapter input connector. J4-1/J4-1 are used with a powered-device adapter input (VSS)
J6	AP-RTN	RTN referenced external adapter input connector. J6-1/J6-2 are used with DC/DC converter adapter input (RTN) and

Table 3. Test Points

Test Point	Color	Label	Description
TP9, TP12, TP29, TP31	BLK	GND	Secondary-side (output) grounds (GND)
TP14	RED	VC	DC/DC converter bias supply
TP15	ORG	DR-P	Drain terminal of the primary-side switching MOSFET
TP7	BLK	VSS	POE input, low side
TP25, TP30, TP33	BLK	RTN	DC/DC converter return
TP20.	ORG	LOOP	Can be used with TP17 for overall feedback loop measurements.
TP21	WHT	I-LOOP	Can be used with TP17 for outer feedback loop measurements.
TP11, TP17	RED	VOUT	DC/DC converter output voltage.
TP10	RED	VOUT1	DC/DC converter output voltage (before LC filter).
TP13	WHT	GTS	Gate drive for the secondary-side synchronous rectifier MOSFET
TP6	WHT	DR-S	Drain terminal of the secondary-side synchronous rectifier MOSFET
TP28	WHT	CTL	Control loop input to the pulse width modulator
TP24	WHT	RCS	DC/DC converter primary-side switching MOSFET current sense (resistor side)
TP23	WHT	CS	DC/DC converter primary-side switching MOSFET current sense input (chip side)
TP27	RED	VB	Bias voltage regulator
TP19	WHT	GATE	Gate drive for the primary-side switching MOSFET
TP8	RED	VPRI	Transformer primary high side.
TP26	WHT	VKAT	Error amplifier (secondary-side) output drive for opto-isolator
TP1	RED	PR78	Pair 7,8
TP4	RED	PR12	Pair 1,2
TP2	ORG	PR45	Pair 4,5
TP3	ORG	PR36	Pair 3,6
D9	RED	POWER ON	Output power indicator

5 Test Setup

Figure 2 shows a typical test setup for TPS23753AEVM-004. Input voltage can be applied as described in Table 2.

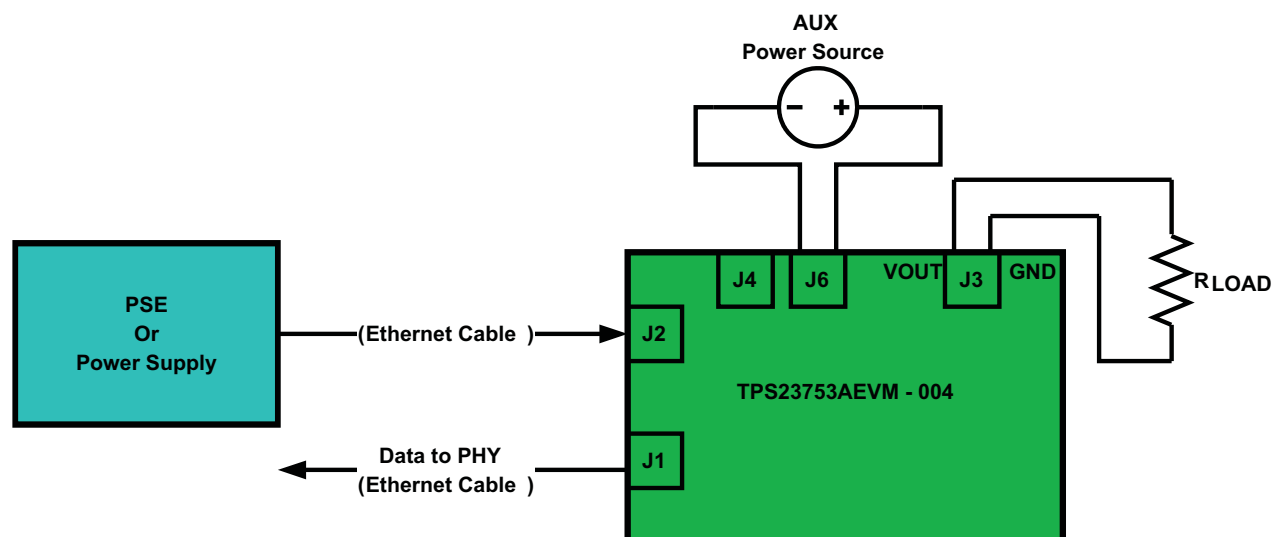


Figure 2. Typical TPS23753AEVM-004 Test Setup

6 TPS23753AEVM-004 Typical Performance Data

6.1 3.3-V Efficiency

Figure 3 illustrates the efficiency at three different input voltage levels: 1) PoE 48V from J2, 2) 48V RTN-based adapter, and 3) 24V RTN-based adapter.

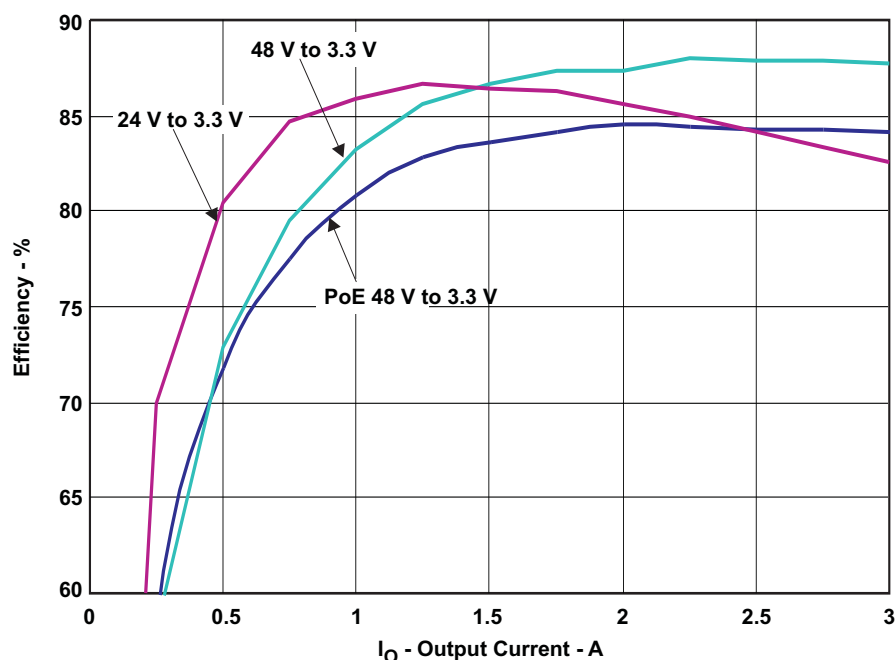


Figure 3. TPS23753AEVM-004 Efficiency With 3.3-V Output

6.2 5-V DC/DC Efficiency

Figure 4 illustrates the efficiency at three different input voltage levels: 1) PoE 48V from J2, 2) 48V RTN-based adapter, and 3) 24V RTN-based adapter.

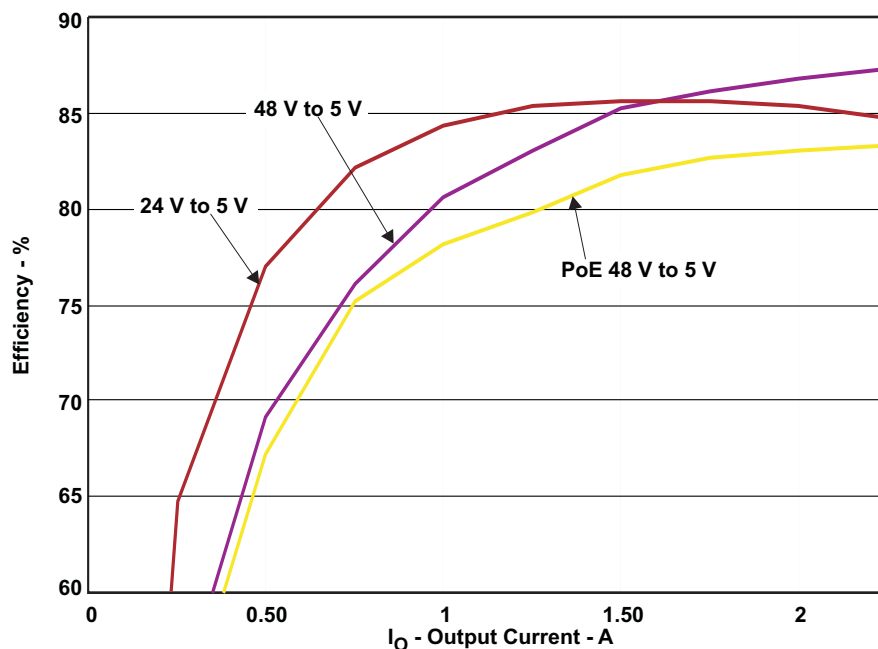


Figure 4. TPS23753AEVM-003 Efficiency With 5-V Output

6.3 12-V DC/DC Efficiency

Figure 5 illustrates the efficiency at three different input voltage levels: 1) PoE 48V from J2, 2) 48V RTN-based adapter, and 3) 24V RTN-based adapter.

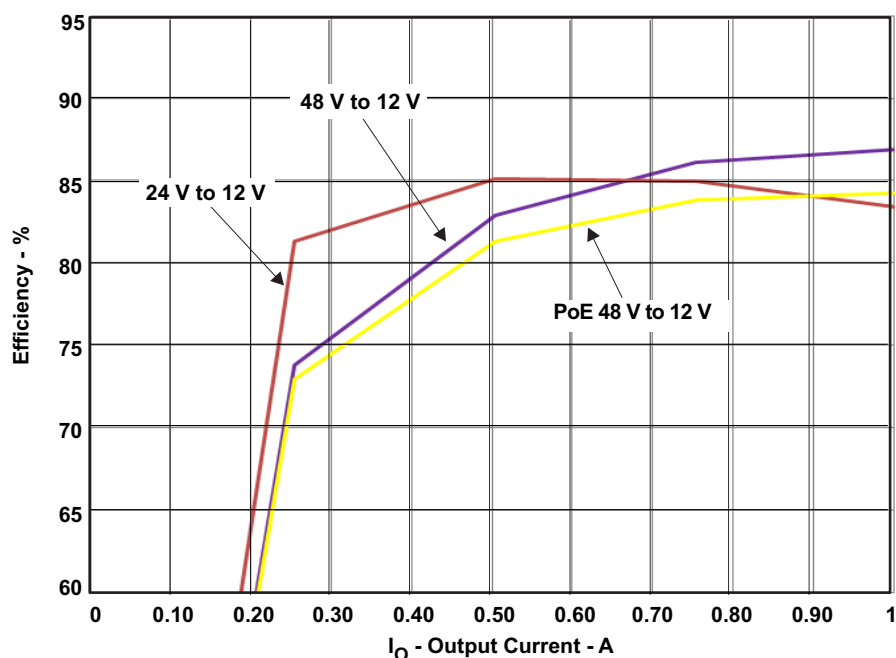


Figure 5. TPS23753AEVM-005 Efficiency With 12-V Output

6.4 TPS23753AEVM-004 Conducted Emissions

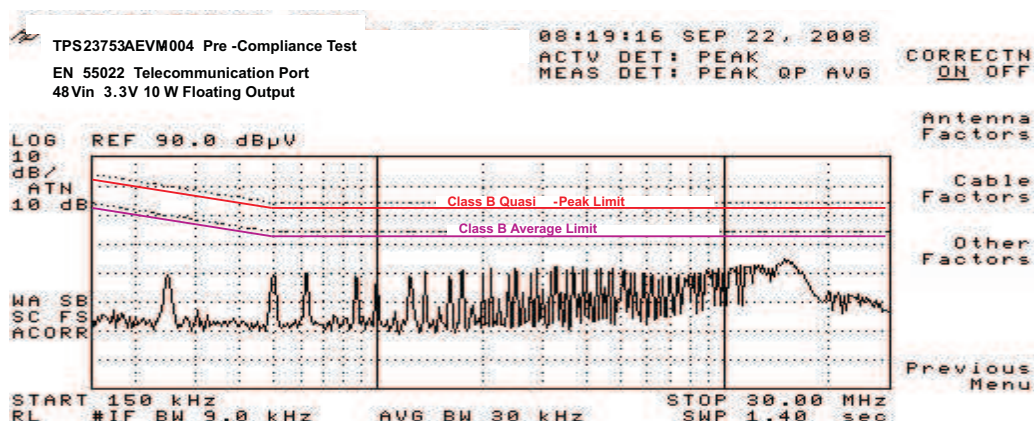


Figure 6. TPS23753AEVM-004 Conducted Emissions

7 EVM Assembly Drawings and Layout Guidelines

7.1 PCB Drawings

Figure 7 shows the component placement and layout.

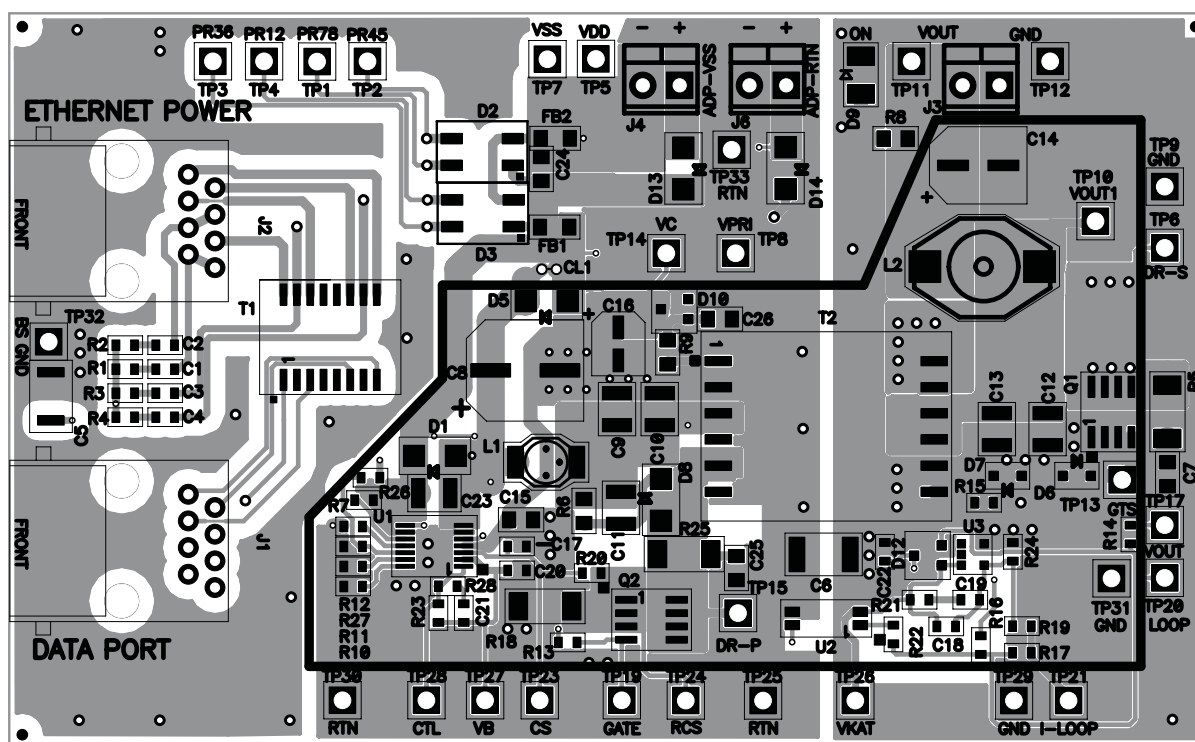


Figure 7. Top Side Placement

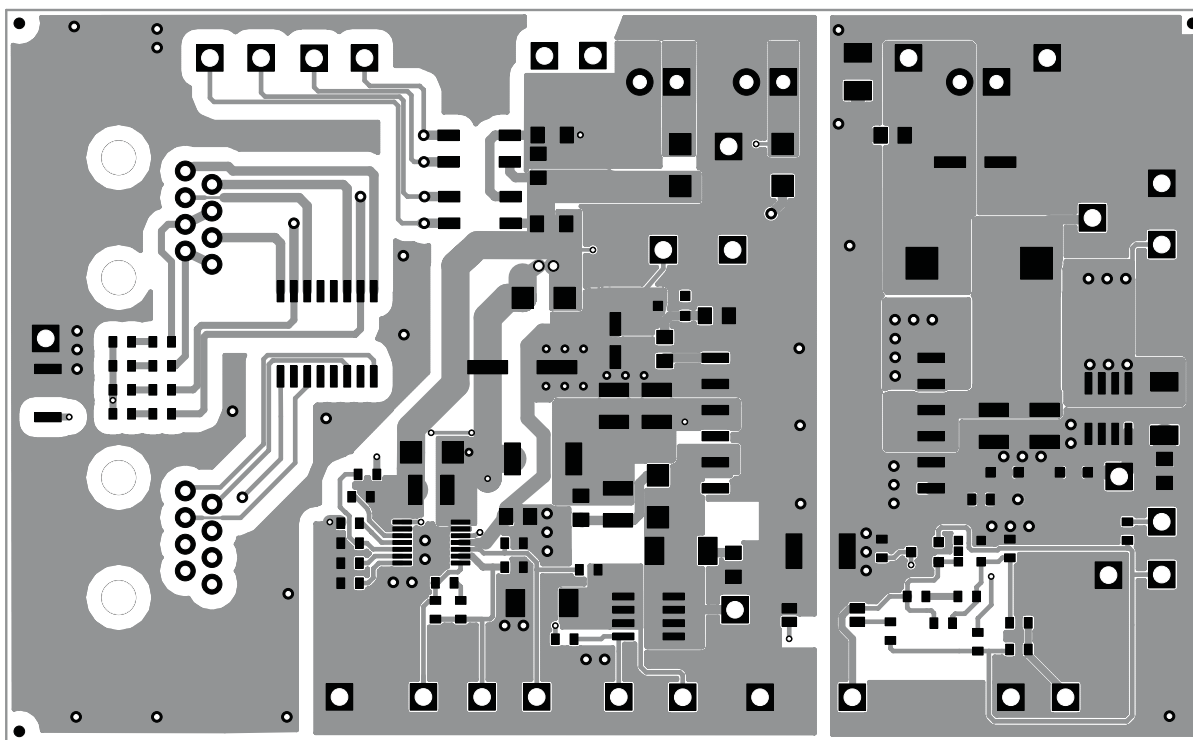


Figure 8. Top Side Routing

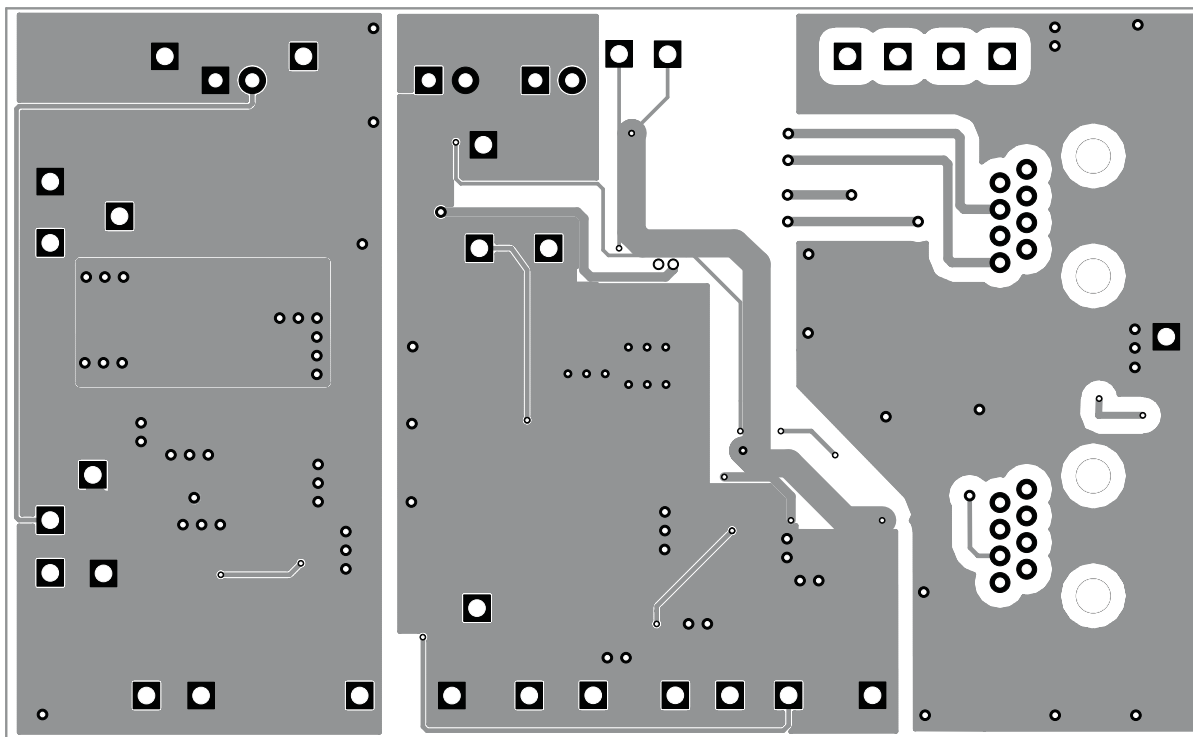


Figure 9. Bottom Side Routing

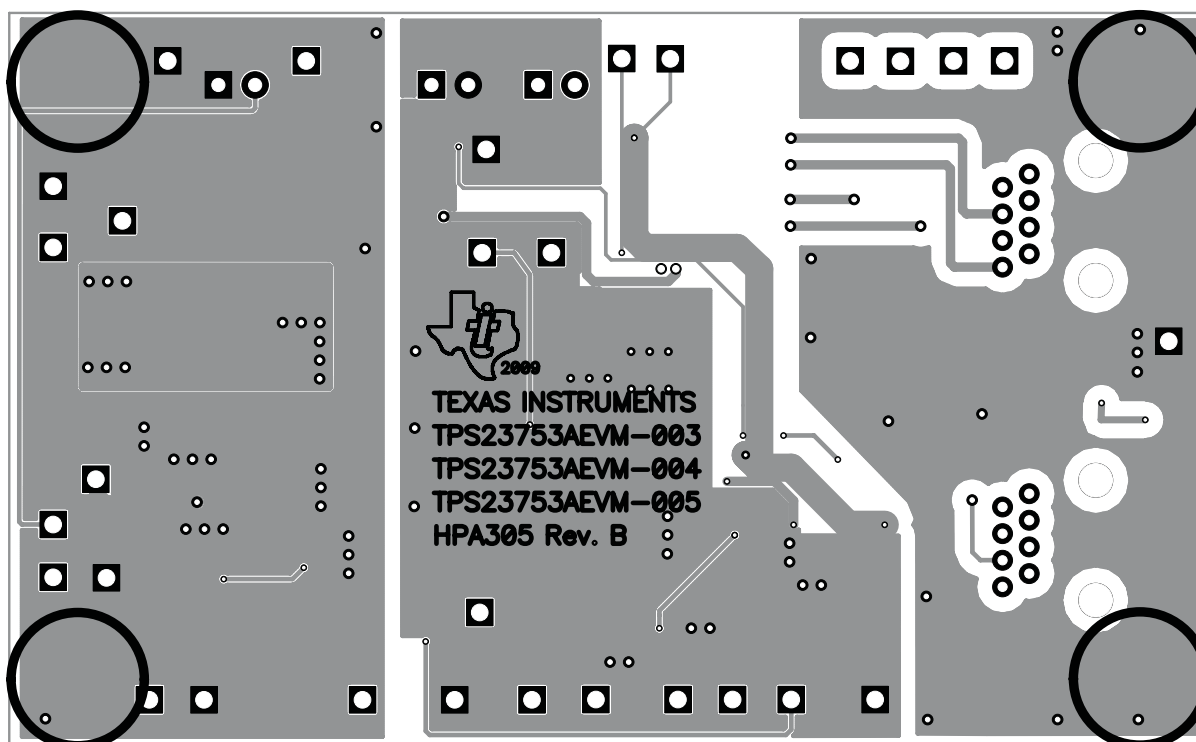


Figure 10. Bottom Side Placement

8 Bill of Materials

Table 4. TPS23753AEVM-003, -004, and -005 Bill of Materials

TPS23753AEVM-X			Ref Des	Value	Description	Size	Part Number	MFR
Outputs (V)								
12	3.3	5						
Count								
X=005	X=004	X=003						
4	4	4	C1, C2, C3, C4	0.01uF	Capacitor, Ceramic, 100V, X7R, 10%	0603	Std	Std
1	1	1	C11	0.01uF	Capacitor, Ceramic, 100V, X7R, 10%	1210	Std	Std
0	2	2	C12, C13	47uF	Capacitor, Ceramic, 6.3-V, X5R, 20%	1210	C3225X5R0J476M	TDK
2	0	0	C12, C13	10uF	Capacitor, Ceramic, 16-V, X5R, 20%	1210	C3225X5R1C106M	TDK
0	1	1	C14	330uF	Capacitor, Aluminum, 6.3V, 20%	0.260 x 0.276 inch	EEVFK0J331XP	Panasonic
1	0	0	C14	68uF	Capacitor, Aluminum, 16V, 20%	0.217 x 0.169	EEVFK1C680P	Panasonic
1	1	1	C15	0.22uF	Capacitor, Ceramic, 25V, X7R, 10%	0805	Std	Std
1	1	1	C16	10uF	Capacitor, Aluminum, 25V, ±20%	0.200 x 0.210 inch	EEVFK1E100R	Panasonic
0	0	0	C17	220pF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
0	1	1	C18	100pF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
1	0	0	C18	10pF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
0	0	1	C19	8.2nF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
0	1	0	C19	10nF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
1	0	0	C19	6.8nF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
2	2	2	C20, C22	0.1uF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
0	0	1	C21	22nF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
0	1	0	C21	47nF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
1	0	0	C21	15nF	Capacitor, Ceramic, 16V, X7R, 10%	0603	Std	Std
1	1	1	C23	0.1uF	Capacitor, Ceramic, 100V, X7R, 10%	1210	Std	Std
2	2	2	C24, C26	1nF	Capacitor, Ceramic, 100V, X7R, 10%	0805	Std	Std
0	0	0	C25	330pF	Capacitor, Ceramic, 200V, X7R, 10%	0805	Std	Std
1	1	1	C5	1000pF	Capacitor, Ceramic, 2kV, X7R 10%	1808	C4520X7R3D102K	TDK
1	1	1	C6	2200pF	Capacitor, Ceramic, 2kV, X7R, 20%	1812	C4532X7R3D222K	TDK
0	1	1	C7	2200pF	Capacitor, Ceramic, 100V, X7R, 10%	0805	Std	Std
1	0	0	C7	1000pF	Capacitor, Ceramic, 100V, X7R, 10%	0805	Std	Std
1	1	1	C8	22uF	Capacitor, Aluminum, 100V, 20%	8x10.2mm	EEVFK2A220P	Panasonic
2	2	2	C9, C10	1uF	Capacitor, Ceramic, 100V, X7R, 10%	1210	Std	Std
1	1	1	CL1	NA	Current Loop, AWG 28, 0.300 inch	0.300 X AWG 28	Std	Std
1	1	1	D1	SMAJ58A	Diode, TVS, 58-V, 1W	SMA	SMAJ58A	Diodes Inc.
1	1	1	D10	BAS16	Diode, Switching, 200mA, 75V, 225mW	SOT-23	BAS16LT1	On Semi
1	1	1	D12	BAV99	Diode, Dual Ultra Fast, Series, 200-mA, 70-V	SOT23	BAV99	Fairchild
2	2	2	D2, D3	HD01-T	Bridge Rectifier, 100V, 0.8A, Glass Passivated, SMD	MINI DIP4	HD01-T	Diodes, Inc
3	3	3	D8, D13, D14	MURA120	Diode, Rectifier, 1A, 200V	SMA	MURA120	On Semi
0	0	0	D5	MURA120	Diode, Rectifier, 1A, 200V	SMA	MURA120	On Semi
2	2	2	D6, D7	BZT52C15S	Diode, Zener, 200mW, 15V	SOD-323	BZT52C15S	Diodes, Inc
1	1	1	D9	RED	Diode, LED, RED, 2.0-V, 850-mcd,SM	1210	LTST-C930KRKT	LITE-ON INC
2	2	2	FB1, FB2	15-Ohms	Bead, Ferrite, SMT, 15-Ohms, 1500mA	0805	MMZ2012R150A	TDK
2	2	2	J1, J2	5520252-4	Connector, Jack, Modular, 8 POS	0.705 x 0.820	5520252-4	AMP
3	3	3	J3, J4, J6	ED1514	Terminal Block, 2-pin, 6-A, 3.5mm	0.27 x 0.25	ED1514	OST
1	1	1	L1	10uH	Inductor, SMT, 1.1A, 160milliohm	4.45x6.6mm	DO1608C-103ML_	Coilcraft
1	1	1	L2	1.0uH	Inductor, SMT, 1.0-uH, 6.8-A, 9-milliohm	0.51x0.37	DO3316P-102HCB	Coilcraft
0	1	1	Q1	IRF8113	MOSFET, N-ch, 30-V, 17.2-A, 5.6-milliOhms	SO8	IRF8113	IR
1	0	0	Q1	IRF7855	MOSFET, N-ch, 60-V, 12-A, 9.4-milliOhms	SO8	IRF7855	IR
1	1	1	Q2	SI4848DY	MOSFET, N-ch, 150-V, 3.7-A, 85-milliOhms	SO8	SI4848DY	Vishay Siliconix
4	4	4	R1, R2, R3, R4	75	Resistor, Chip, 1/16W, 5%	0603	Std	Std
1	1	1	R10	118K	Resistor, Chip, 1/16W,1%	0603	Std	Std
1	1	1	R11	162K	Resistor, Chip, 1/16W,1%	0603	Std	Std
1	1	1	R12	1.27K	Resistor, Chip, 1/16W,1%	0603	Std	Std

Table 4. TPS23753AEVM-003, -004, and -005 Bill of Materials (continued)

TPS23753AEVM-X			Ref Des	Value	Description	Size	Part Number	MFR
Outputs (V)								
12	3.3	5						
Count								
X=005	X=004	X=003						
1	1	1	R13	24.9	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	1	R15	4.7	Resistor, Chip, 1/16W, 5%	0603	Std	Std
1	1	1	R16	10K	Resistor, Chip, 1/16W,1%	0603	Std	Std
1	1	1	R17	49.9	Resistor, Chip, 1/16W,1%	0603	Std	Std
1	1	1	R18	0.39	Resistor, Chip, 1/2W, 1%	2010	Std	Std
0	1	1	R19	41.2K	Resistor, Chip, 1/16W,1%	0603	Std	Std
1	0	0	R19	12.4K	Resistor, Chip, 1/16W,1%	0603	Std	Std
2	2	2	R14, R20	0	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	0	1	R21	21K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	1	0	R21	2K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	0	0	R21	15K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	0	1	R22	1K	Resistor, Chip, 1/16W,1%	0603	Std	Std
0	1	0	R22	422	Resistor, Chip, 1/16W,1%	0603	Std	Std
1	0	0	R22	2.49K	Resistor, Chip, 1/16W,1%	0603	Std	Std
1	1	1	R23	2K	Resistor, Chip, 1/16W,1%	0603	Std	Std
0	0	1	R24	13.3K	Resistor, Chip, 1/16W,1%	0603	Std	Std
0	1	0	R24	24.3K	Resistor, Chip, 1/16W,1%	0603	Std	Std
1	0	0	R24	3.24K	Resistor, Chip, 1/16W,1%	0603	Std	Std
0	0	0	R25	79	Resistor, Chip, 1/2W, 5%	2010	Std	Std
1	1	1	R26	392K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	1	R27	39.2K	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	0	1	R28	249	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	1	0	R28	348	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	0	0	R28	301	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	1	R5	10	Resistor, Chip, 1/2W, 5%	2010	Std	Std
1	1	1	R6	160K	Resistor, Chip, 1/10W, 5%	0805	Std	Std
1	1	1	R7	24.9K	Resistor, Chip, 1/16W,1%	0603	Std	Std
0	1	1	R8	1K	Resistor, Chip, 1/10-W, 5%	0805	Std	Std
1	0	0	R8	2.87K				
1	1	1	R9	49.9	Resistor, Chip, 1/8W, 1%	0805	Std	Std
1	1	1	T1	H2019	Xfmr, Center-tapped, Voice Over IP	0.500 x 0.370	H2019	Pulse
0	0	1	T2	HA3802-BL or 835-01041FC	Transformer, PoE 13W, Triple Secondary, 150uH, 5V, 2A	0.875 x 0.675	HA3802-BL or 835-01041FC	Coilcraft or E&E Magnetic Products
0	1	0	T2	HA3801-BL or 835-01040FC	Transformer, PoE 13W, Triple Secondary, 165uH, 3.3V, 3A	0.875 x 0.675	HA3801-BL or 835-01040FC	Coilcraft or E&E Magnetic Products
1	0	0	T2	HA3803-BL or 835-01042FC	Transformer, PoE 13W, Triple Secondary, 150uH, 12V, 1A	0.875 x 0.675	HA3803-BL or 835-01042FC	Coilcraft or E&E Magnetic Products
1	1	1	U1	TPS23753APW	IC, IEEE 802.3-2005 Integrated Primary Side Controller	TSSOP14	TPS23753APW	TI
1	1	1	U2	TCMT1107	IC, Photocoupler, 3750VRMS, 80-160% CTR	MF4	TCMT1107	Vishay
0	1	1	U3	TLV431ACDBVR	IC, Shunt Regulator, 1.24-V ref, 6-V, 10-mA, 1%	SOT23-5	TLV431ACDBVR	TI
1	0	0	U3	TL431ACDBVR	IC, Shunt Regulator, 2.49-V ref, 36-V, 10-mA, 1%	SOT23-5	TL431ACDBVR	TI
1	1	1	—	—	PCB, 2.76 In x 4.50 In x 0.062 In	—	HPA305	Any

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

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Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

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For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

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

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.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

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

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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.

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.

【Important Notice for Users of EVMs for RF Products in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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