Texas Instruments

TPS2375EVM

Power-Over-Ethernet Powered Device (PD) Evaluation Module

User's Guide

April 2004

PMP Systems Power

SLVU108

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0 V and 57 V and the output voltage range of 0 V and 57 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. 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 85°C. The EVM is designed to operate properly with certain components above 85°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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Preface

Read This First

About This Manual

This user's guide describes the TPS2375 HPA028 evaluation module (EVM). It contains the EVM schematic, bill of materials, assembly drawing, and top and bottom board layouts.

How to Use This Manual

This document contains the following chapters:

- ❏ Chapter 1 — Introduction
- ❏ Chapter 2 — Hardware Overview
- ❏ Chapter 3 — EVM Operation
- ❏ Chapter 4 — Bill of Materials
- ❏ Chapter 5 — EVM Schematic and Layout

Information About Cautions and Warnings

This book may contain cautions and warnings.

This is an example of a caution statement.

A caution statement describes a situation that could potentially damage your software or equipment.

CAUTION

This is an example of a warning statement.

A warning statement describes a situation that could potentially cause harm to you.

WARNING

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

Related Documentation From Texas Instruments

TPS2375 Power Over Ethernet Powered Device Power Switch − data sheet, (SLUSxxx).

Contents

Figures

Chapter 1

Introduction

This User's Guide describes the setup and operation of the TPS2375 HPA028 evaluation module (EVM). Information and instructions presented throughout this document assumes user familiarity with the IEEE 802.3af Specification for Power Over Ethernet.

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Chapter 2

Hardware Overview

The HPA028 EVM features the TPS2375 made by Texas Instruments Incorporated. The EVM is designed to look like the front end of any Power Over Ethernet (PoE) Powered Device (PD) module. An RJ-45 connector is provided to connect directly to an Ethernet cable having a Power Sourcing Equipment (PSE) driving it on the other end. The EVM also accepts power applied using a stand-alone power supply.

According to the IEEE 802.3af specification, the PD module must provide the circuitry needed to be detected by the PSE as it polls the Ethernet links. The IEEE 802.3af specification also allows the option for the PD to provide classification as to the amount of power needed by the PD Module. The HPA028 EVM with the TPS2375 provides all the necessary hardware to provide detection and classification.

The HPA028 EVM also has connections for connecting an external DC/DC converter to convert the 48 V down to the voltages needed for the Ethernet Module.

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Chapter 3

EVM Operation

This chapter discusses the EVM operation including setup, jumpers, test points and features.

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3.1 Setup

The HPA028 EVM is designed to allow evaluation of the TPS2375 device. Test points and jumpers are provided to facilitate testing and configuration. At the factory, JP0, JP5, JP6 (between pin 2 and pin 3), and JP7 will be installed.

3.2 Jumpers

JP0, JP1, JP2, JP3, JP4	Selects the Classification Resistor
JP5	Used to pass power from the input
JP6	Selects ground connection when applying an external power supply on J4 or J5
JP7	Used to connect a 4.7 kΩ resistor as the load of the PD, that may be used to maintain the power signature for the PD

3.3 Test Points

Test Points	Description
TP1	Test point for TPS2375 ILIM pin
TP2	Test point for TPS2375 CLASS pin
TP3	Test point for TPS2375 DET pin
TP4	Test point for TPS2375 VSS pin
TP5	Test point for TPS2375 RTN pin
TP6	Test point for TPS2375 PG pin
TP7	Test point for TPS2375 N/C pin (or the UVLO pin if the DUT is TPS2376)
TP8	Test point for TPS2375 VDD pin
TP9	Test point for the 48 volts after the diode-bridges (BRG1 and BRG2)
TP10	Test point for the 48-V return on the Power Sourcing Equipment side
TP11, TP12	Test point for probing the signal-pair 48-V inputs coming from the RJ-45 connector or for connecting an external 48-V power supply.
TP13, TP14	Test point for probing the spare pair 48-V inputs coming from the RJ-45 connector or for connecting an external 48V power supply
TP15, TP16, TP17	Test points (only TP17 installed) for probing the 48-V supply to the load (DC/DC Converter), or for connecting additional load resistors or capacitors
TP18, TP19, TP20	Test points (only TP20 installed) for probing the 48-V RTN or for connecting additional load resistors or capacitors

3.4 Features

The HPA028 EVM facilitates easy evaluation of the TPS2375 PD controller. The EVM features are described in this section.

3.4.1 Input and Output Capacitors

The input capacitor of the TPS2375 PD controller is specified by the IEEE802.3af standard. C1, a 0.1 μF ±10% ceramic capacitor, meets the IEEE specification, so no additional input capacitor can be added.

Two spare capacitor footprints (C2 and C4) on the EVM are provided for adding additional load capacitance on the output of the TPS2375. When adding any of the large aluminum electrolytic capacitors, care should be taken to select capacitors with an appropriate voltage rating, and to observe the polarity marking on the PCB silkscreen. The recommended voltage rating for these capacitors is 100 V.

3.4.2 Gigabit Ethernet Application

The EVM only allows 10/100BASE data rate transmission due to the magnetic limitation of T1 (H2019). To evaluate the EVM with a Gigabit Ethernet network, remove T1 (H2019), R13, R14, R15, and R16, and place a Gigabit transformer (H5007) on the T2 footprint.

3.4.3 Dual DUT Footprint

Since the TPS2375 is available in both SO-8 and TSSOP-8 packages, two footprints (U1 and U2) are provided to test either package. The EVM is supplied with the SO-8 package device (TPS2375D) on the U2 footprint. To evaluate the TSSOP package, remove the device from U2 and solder a TSSOP-8 package device (TPS2375PW) on the U1 footprint.

Warning

Do not have devices on both U1 and U2 at the same time.

3.4.4 Power-Good Indicator

The PG LED (D3) Indicator illuminates when the TPS2375 turns on.

3.4.5 Connect DC/DC Converter

A block connector (J2) is provided to connect downstream DC/DC converters if desired. Test points (such as TP17 and TPS20) are not recommended for connecting loads.

3.4.6 Available Spare Footprints

- TP15, TP16 – extra test points for 48-V positive rail (VDD)
- TP18, TP19 − extra test points for 48-V load-side return (RTN)
- J5 – Jack for connecting an external wall-mounted transformer power supply;
- R8, R9 – To set the UVLO threshold if a TPS2376 is under test;
- R12 – To reduce the load resistance (or increase the load current) on the TPS2375 output if desired.

Chapter 4

Bill of Materials

This chapter contains the bill of materials for the TPS2375EVM.

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4.1 Bill of Materials

Count	RefDes	Description	Size	Part Number	MFR
1	D1	Diode, 58-V TVS,	SMA	SMAJ58A	Vishay
1	D2	Diode, 5.6 V Zener	D0−219AB	BZD27C5V6P	Vishay
1	D3	LED, SMD, Green, PLCC2−Package	1210	TLMG3102	Vishay
3	D4, D5, D6	Bridge Rectifier, 100 V, 1A, SMD	DF−S	DF01S	Vishay
1	C1	Capacitor, 0.1 μF,100-V, X7R, 10%	1210	VJ1210Y104KXBXX	Vishay
1	C3	Capacitor33−μF, 100-V, 20%	TH	2222 038 59339	Vishay
0	C2, C4	Capacitor33−μF, 100-V, 20%	TH	2222 038 59339	Vishay
2	J1, J3	Connector, Jack, Modular, 8 POS	0.705 × 0.82	520252	AMP
1	J2	Terminal Block, 6 pin, 10-A, 200 mil space	1.225 × 0.401	999394	Weidmuller
1	J4	Header, 2−pin, 100 mil spacing		PTC36SAAN	Sullins
0	J5	Connector, 2.1 mm, DC Jack w/ Switch, SM	0.57 × 0.35	RASM 722	Switchcraft
7	JP0, JP1, JP2, JP3, JP4, JP5, JP7	Header, 2−pin, 100 mil spacing		PTC36SAAN	Sullins
1	JP6	Header, 3−pin, 100mil spacing		PTC36SAAN	Sullins
1	Q1	MOSFET, N−ch, 60−V, 115−mA, 1.2 Ω	SOT23	2N7002 E	Vishay
1	R0	Resistor, Chip, 4.42K Ω, 1/16−W, 1%	603	CRCW06034421F	Vishay
1	R1	Resistor, Chip, 95 Ω, 1/8W, 1%	1206	CRCW1206953F	Vishay
1	R2	Resistor, Chip, 549 Ω, 1/8W, 1%	1206	CRCW1206549F	Vishay
1	R3	Resistor, Chip, 357 Ω, ½ W, 1%	2010	CRCW20103570F	Vishay
1	R4	Resistor, Chip, 255 Ω, ½ W, 1%	2010	CRCW20102550F	Vishay
1	R5	Resistor, Chip, 24.9 KΩ, 1/10−W, 1%	805	CRCW08052492F	Vishay
1	R6	Resistor, Chip, 178 KΩ, 1/10−W, 1%	805	Std	Std
1	R7	Resistor, Chip, 100 KΩ, 1/10−W,5%	805	CRCW08051003J	Vishay
0	R8	Resistor, Chip, 138 KΩ, 1/10W, 5%	805	CRCW0805−xxx−J	Vishay
0	R9	Resistor, Chip, 10 KΩ, 1/10W, 5%	805	CRCW0805−xxx−J	Vishay
1	R10	Resistor, Chip, 20 KΩ, 1/8−W, 5%	1206	Std	Std
1	R11	Resistor, Chip, 4.7 KΩ, 1−W, 1%	2512	WSL−2512−4701 1%	Vishay
0	R12	Resistor, Chip, xx Ω, 1−W, 1%	2512	WSL−2512−xx 1%	Vishay
4	R13, R14, R15, R16	Resistor, Chip, 0 Ω, 1/16−W, x%	402	Std	Std
1	T1	16−PIN SOIC Xfmr, Center−tapped,	16−SOIC	H2019	Pulse
0	T2	24−pin SOIC Magnetics Modules, Ratio 1:1	SO24	H5007	Pulse
12	TP1, TP2, TP3, TP6, TP7, TP8, TP9, TP11, TP12, TP13, TP14, TP17	Test Point, Red, 1 mm	0.038	07WX9455	Farnell
0	TP15, TP16	Test Point, Red, 1 mm	0.038	07WX9455	Farnell
4	TP4,TP5, TP10, TP20	Test Point, Black, 1 mm	0.038	240−333	Farnell
0	TP18, TP19	Test Point, Black, 1 mm	0.038	240−333	Farnell

Count	RefDes	Description	Size	Part Number	MFR
0	U1	IC, TPS2375 Powered Device Controller	TSSOP−8	TPS2375PW	TI
1	U2	IC, TPS2375 Powered Device Controller	SO−8	TPS2375D	TI
4	Shunt	on JP0,JP5, JP6, & JP7, 2−pin, 0.100 cntr		STC02SYAN	Sullins
1	−−	PCB, 4.316 In × 2.890 In × 0.062 In		HPA028	Any
4		Rubber bumber		2566	SPC Tech.

Notes: 1) These assemblies are ESD sensitive, ESD precautions must be observed.

2) These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.

3) These assemblies must comply with workmanship standards IPC−A−610 Class 2.

4) Reference designators marked with an asterisk (**) cannot be substituted. All other components can be substituted-with equivalent MFG's components.

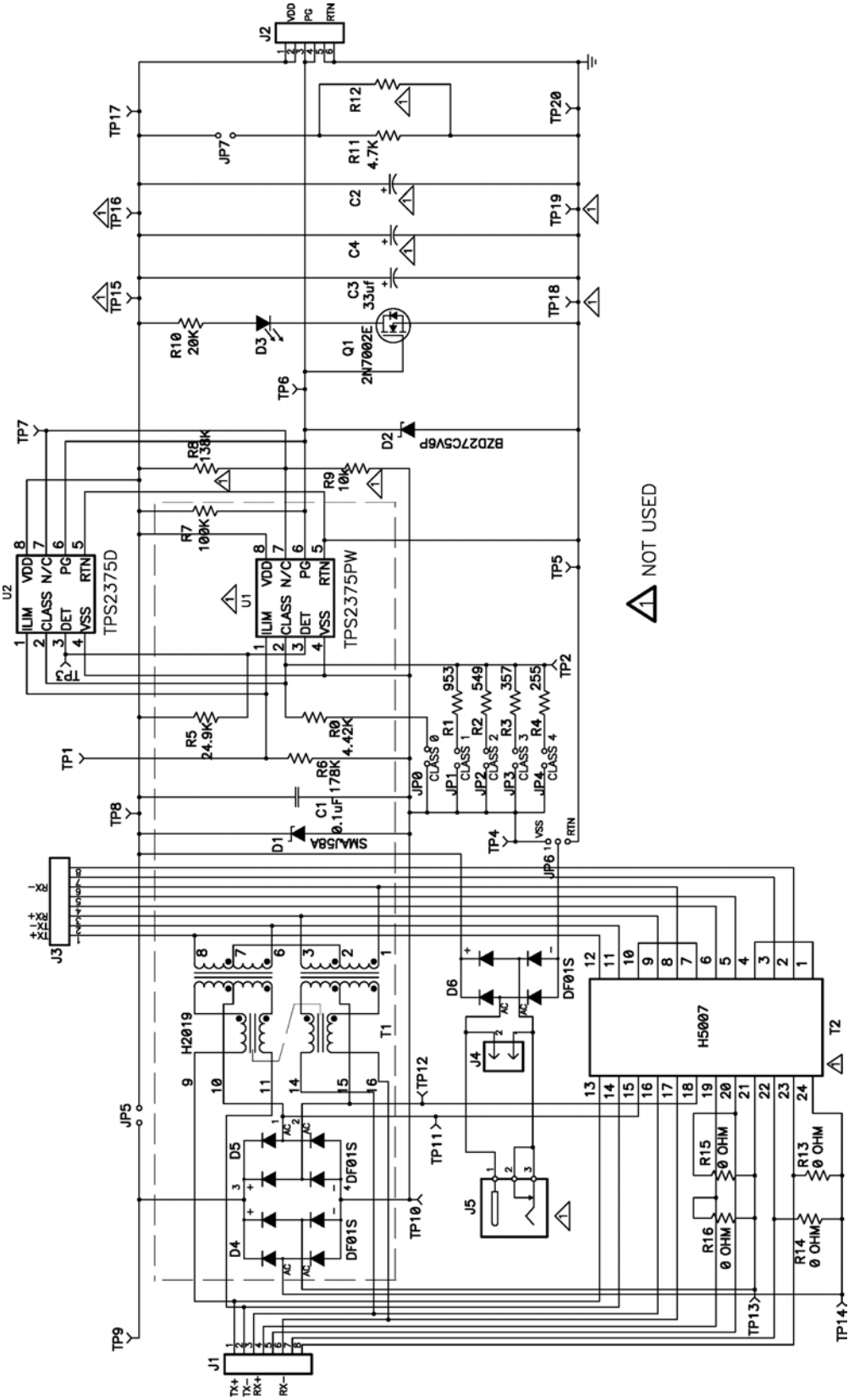
Chapter 5

Schematic and Layout

This chapter contains the schematic and layout for the TPS2375EVM.

Topic **Page**

5.1 TPS2375 EVM Schematic



5.2 Layouts

The board layout is shown on the following pages.

Figure 5−1. Top Assembly Layer

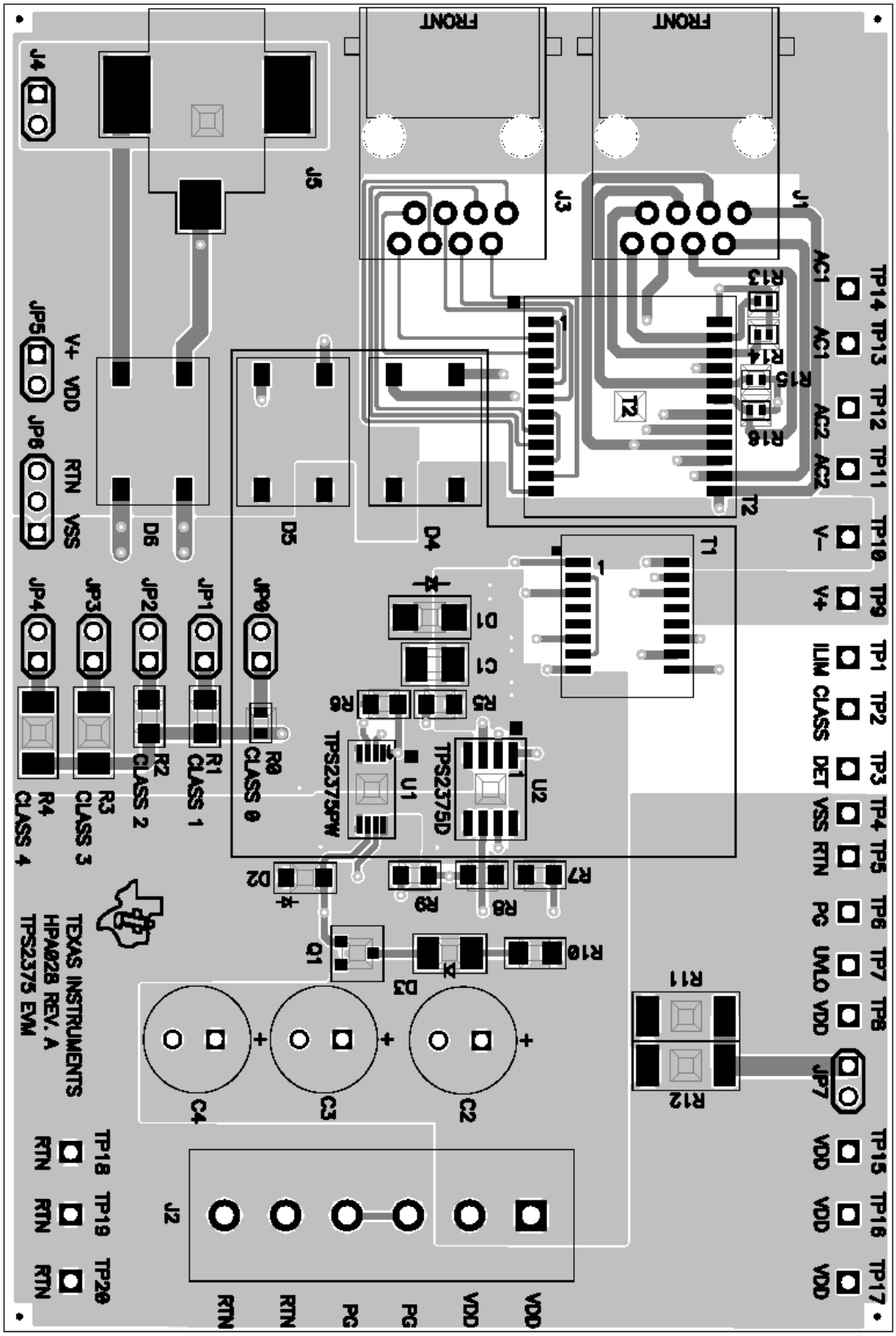


Figure 5−2. Bottom Assembly Layer