TLK105/6 Customer EVM

This User Guide describes the design and operation of the evaluation module (EVM) for the TLK105 and TLK106.

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1 TLK105/6 EVM Purpose and Content

The Industrial Ethernet TLK105/6CUSEVM enables Texas Instruments customers to quickly design and market systems using the TLK105 and TLK106 devices. Customers are encouraged to use a design similar to the EVM circuit to expedite their product development.

The TLK105/6CUSEVM requires only a single-voltage power supply (5V from the MII). All other voltages are internally regulated.

The EVM kit contains:

- TLK105/6CUSEVM Unit
- Printed copy of this User's Guide
- TLK105/6CUSEVM schematic

2 Information and Specifications

This section provides the specifications of TLK105/6CUSEVM card and a description of the card's interfaces, connectors, jumpers and LEDs.

2.1 Usage Setup and Configuration

The TLK105/6 is powered via the MII connector.

- If 5V is supplied, the on-board voltage regulator, U1, converts 5V to 3.3V for the device.
- If 3.3V is supplied from the MII connector, populate R59 and remove R56.
- Make sure to install jumper J2 in order to supply 3.3V to CT_INPUT.
- Make sure that jumper J1 exists and is configured for MII or RMII.

2.2 Address Settings

The following jumpers set the PMD address of the TLK105/6CUSEVM Physical Layer device:

J7: PHY ID [0]
J6: PHY ID [1]
J5: PHY ID [2]

- **Default board setting for the PHY Address is 01h**
- The board may be set to any PHY Address 00h-07h by populating jumpers J5-J7.

2.3 TLK105/6 Connections

Table 1 describes the connections of the TLK105/6CUSEVM. Table 2 shows AN_0 mode selection.

Table 1. TLK105/6CUSEVM Connections

Ref. Des.	Name	Function
P1	MII Male Connector	MII interface
J1	MII or RMII selector	Select between MII mode to RMII mode
J14	RESET N	Reset the device
J2	Central Tap voltage selector	Enable 3.3V supply to the central tap.
U2	RJ45	RJ45 Ethernet connector
J5-J7	PHY ID[0:2]	Configure PHY ID address (default = addr 01h)
J10	RMII Enable	Enable RMII. (default = MII)
J8	CFG CROSSOVER	Disable AMDIX (default = AMDIX ON)
J4	CFG ANEG SPD 0	See description below

Table 2. TLK105/6CUSEVM ANEG Modes Connections

AN_0	Forced Mode
0	Half Duplex
1	Full Duplex

3 TLK105/6CUSEVM Specifications

3.1 Overview

Texas Instruments provides the TLK105/6CUSEVM platform for customer evaluation of TLK105/6 devices, demonstrating the advanced performance described in the TLK10x data sheet, . The EVM supports 10/100 Base-T and is compliant with IEEE 802.3 standard. The TLK105/6CUSEVM operates from a single power supply (5V or 3.3V) from the MII. All other voltages required for the TLK105/6 are internally generated in the device. The TLK105/6CUSEVM operates over the industrial temperature range.

3.2 Required Resources

Use any equipment that provides a standard IEEE 802.3, Clause 22 MII DTE interface; for example, a SmartBits® Netcom box.

3.3 Features

The TLK105/6CUSEVM features:

- Industrial temperature rating: –40°C ±105°C (the TLK105 maximum temperature is 85°C)
- Industrial-temperature external magnetics
- Control and status:
  - Configurable PHY Addresses – any address between 00h-07h (01h default) using jumpers as described in Table 1
  - 4 LEDs – 2 power and 2 status LEDs (Link)
- Strap options:
  - MII or RMII jumper (MII disable)
  - Resistor strapping options:
    - Configurable PHY Addresses 08h-31h
  - RESET_N ($\overline{\text{RESET}}$) jumper
- Connections for the following interfaces:
  - MII connector
  - RJ-45 connector
- Single-sided component placement
- On-board clock – Crystal or Oscillator Dual Footprint
- On-board power supplied by MII the connector only, resistors to configure 5V or 3.3V operation

3.4 RMII Configuration

To use the TLK105/6 with the RMII interface, change the following:

- Change J1 to PD (RMII)
- Connect J10 (RMII PU)
- Disconnect R71 and R72
- Populate R73 (0Ω)
- Remove XTAL1
- Populate a 50MHz oscillator at U5, such as VALPEY_FISHER, part number VF3AH1-50MHZ

Note: In RMII mode, the PHY shares a 50MHz clock with the MAC. Install a 50MHz OSC on the TLK105/6CUSEVM at U5, and remove the crystal. The MAC receives the shared CLK on the TX_CLK pin on the MII Connector (this pin is not used when working in RMII).

3.5 TLK105/6CUSEVM Block Diagram

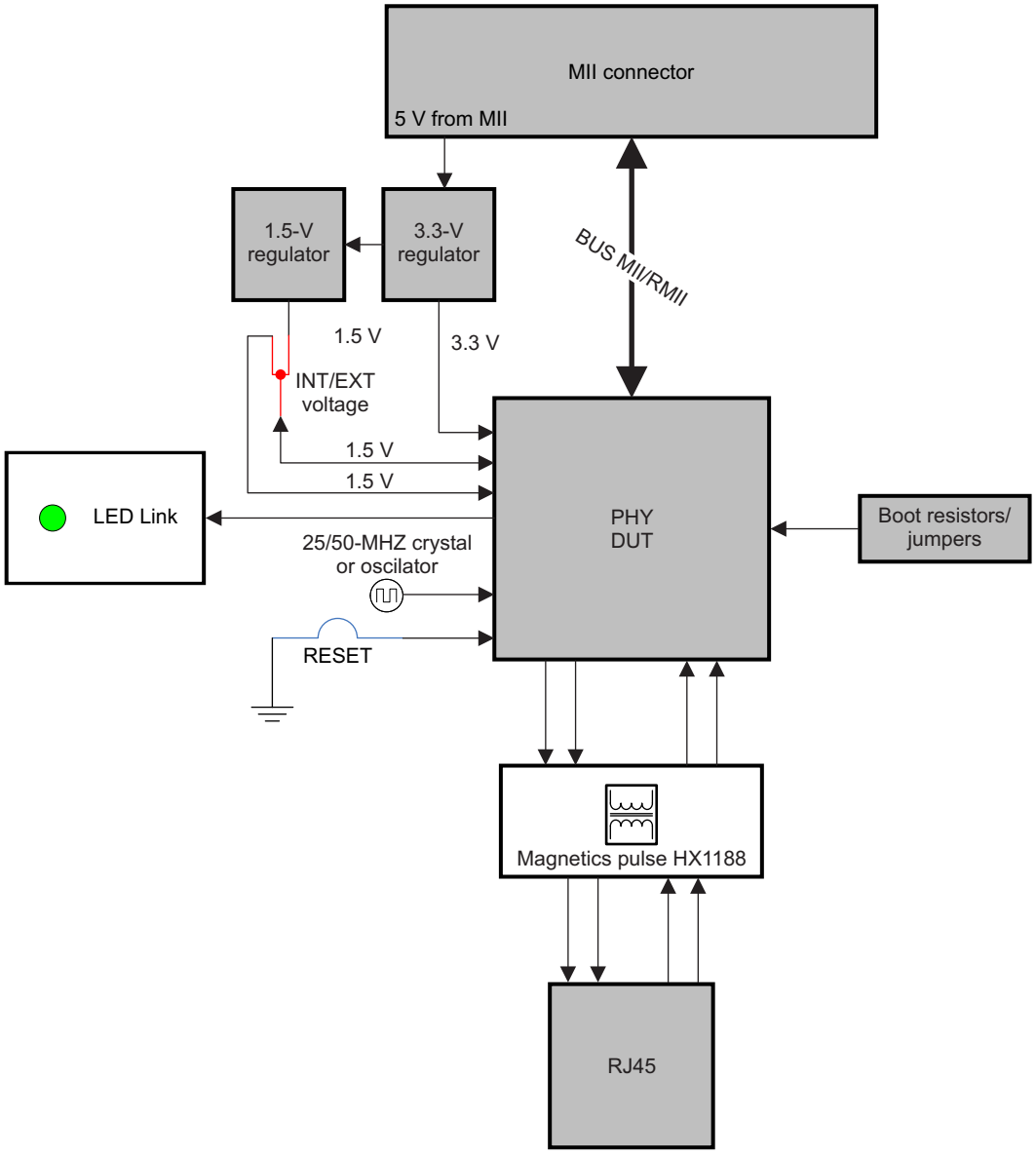

Figure 1. EVM Block Diagram

3.6 PCB Physical Layout

- FR4 material
- Trace impedance—Differential impedance 100 ohms, ±5%
- Uniform supply and ground planes
- 4-layer board
- Combination of through-hole and surface-mount technology

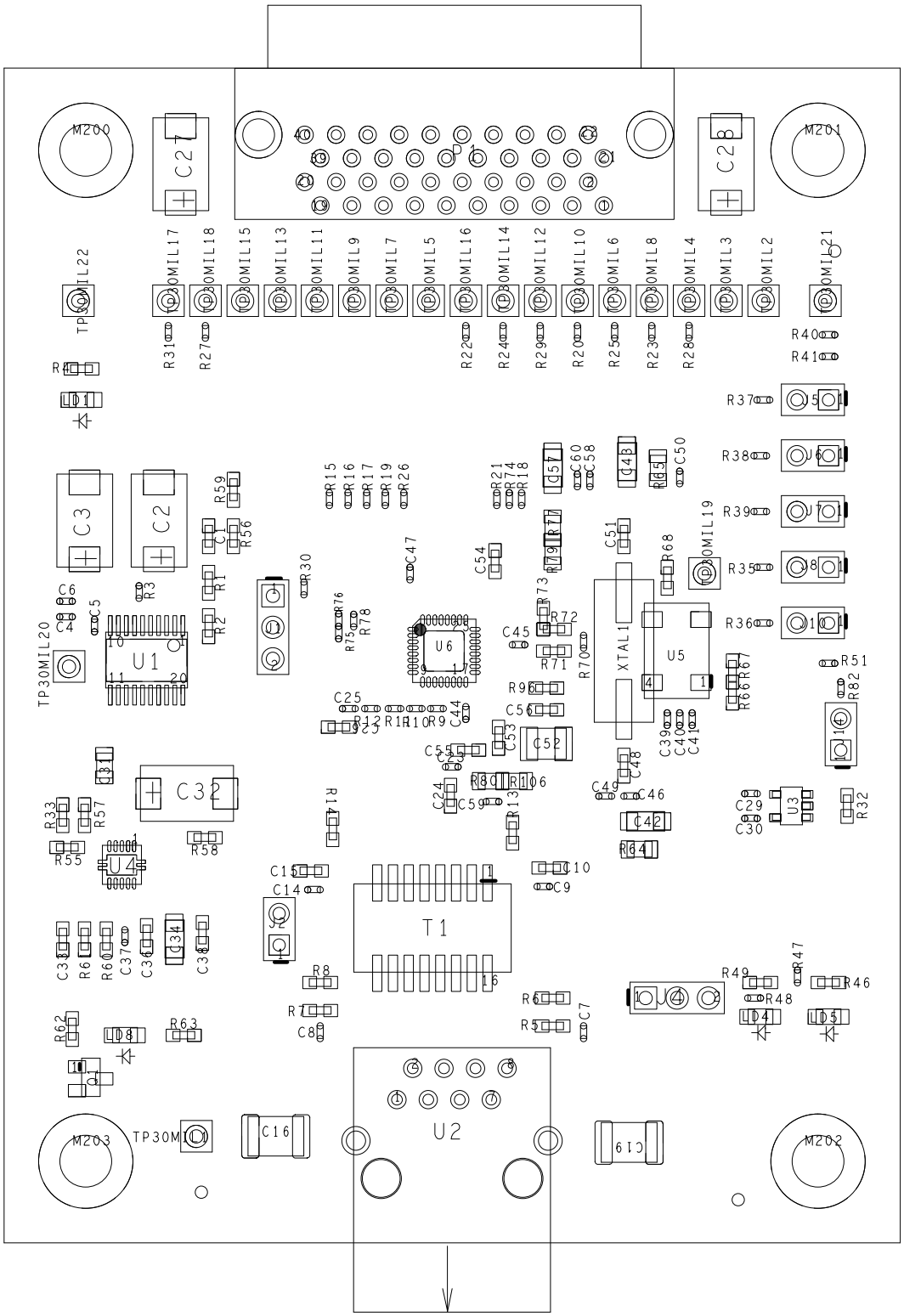

Figure 2. EVM Layout

3.7 EVM Schematics

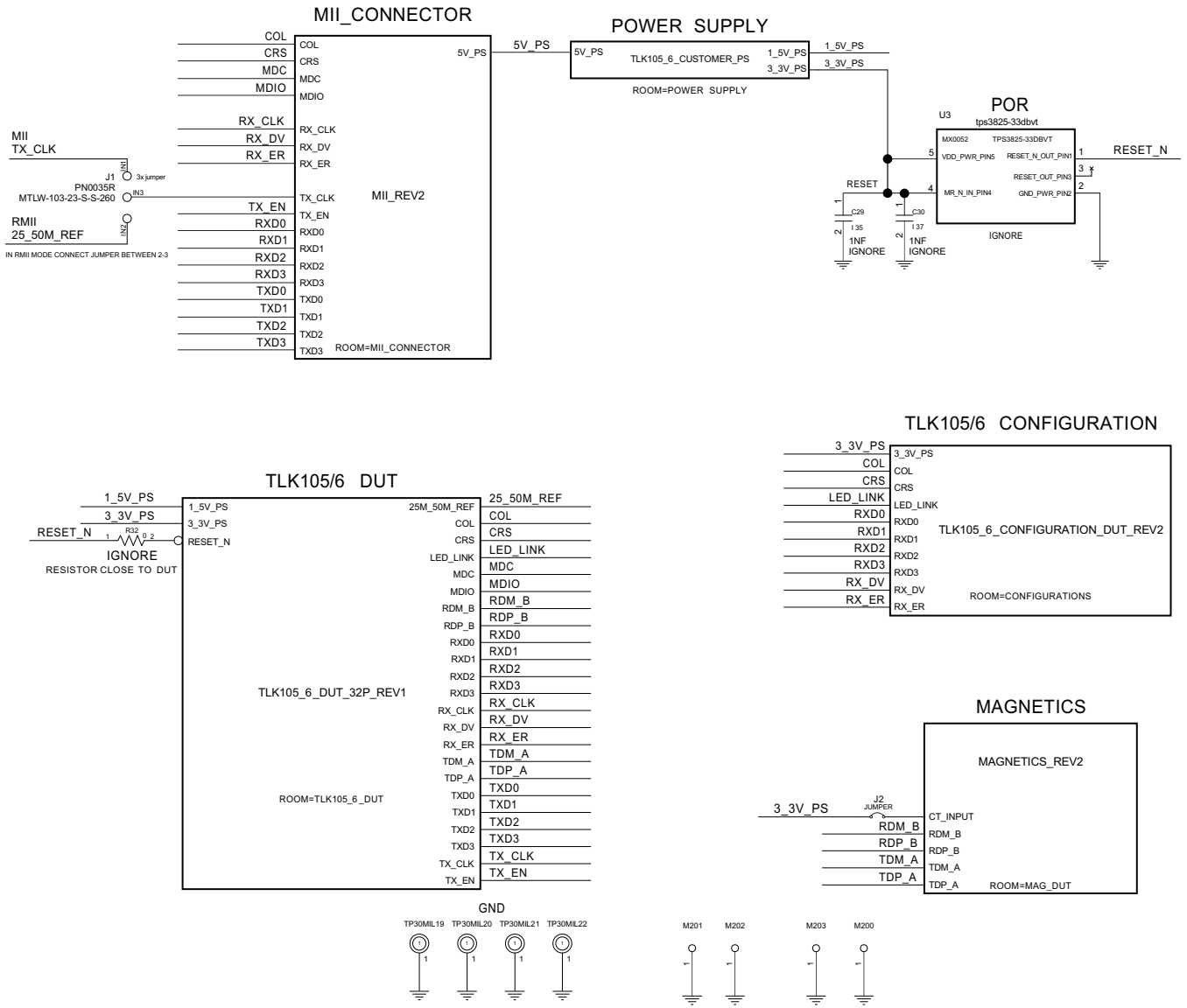

Figure 3. TLK105/6CUSEVM – Top Level Schematics

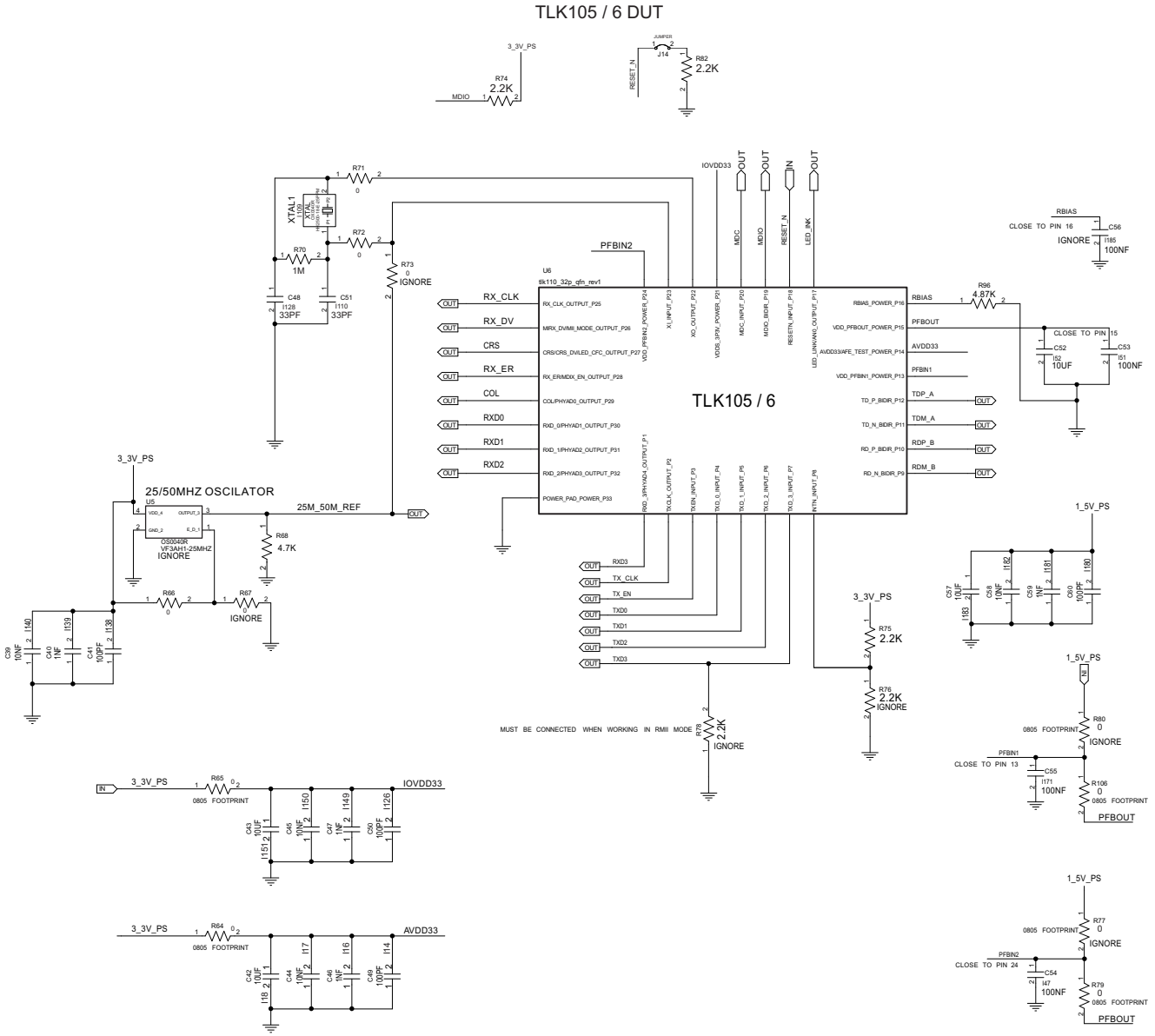

Figure 4. TLK105/6CUSEVM – PHY Schematics

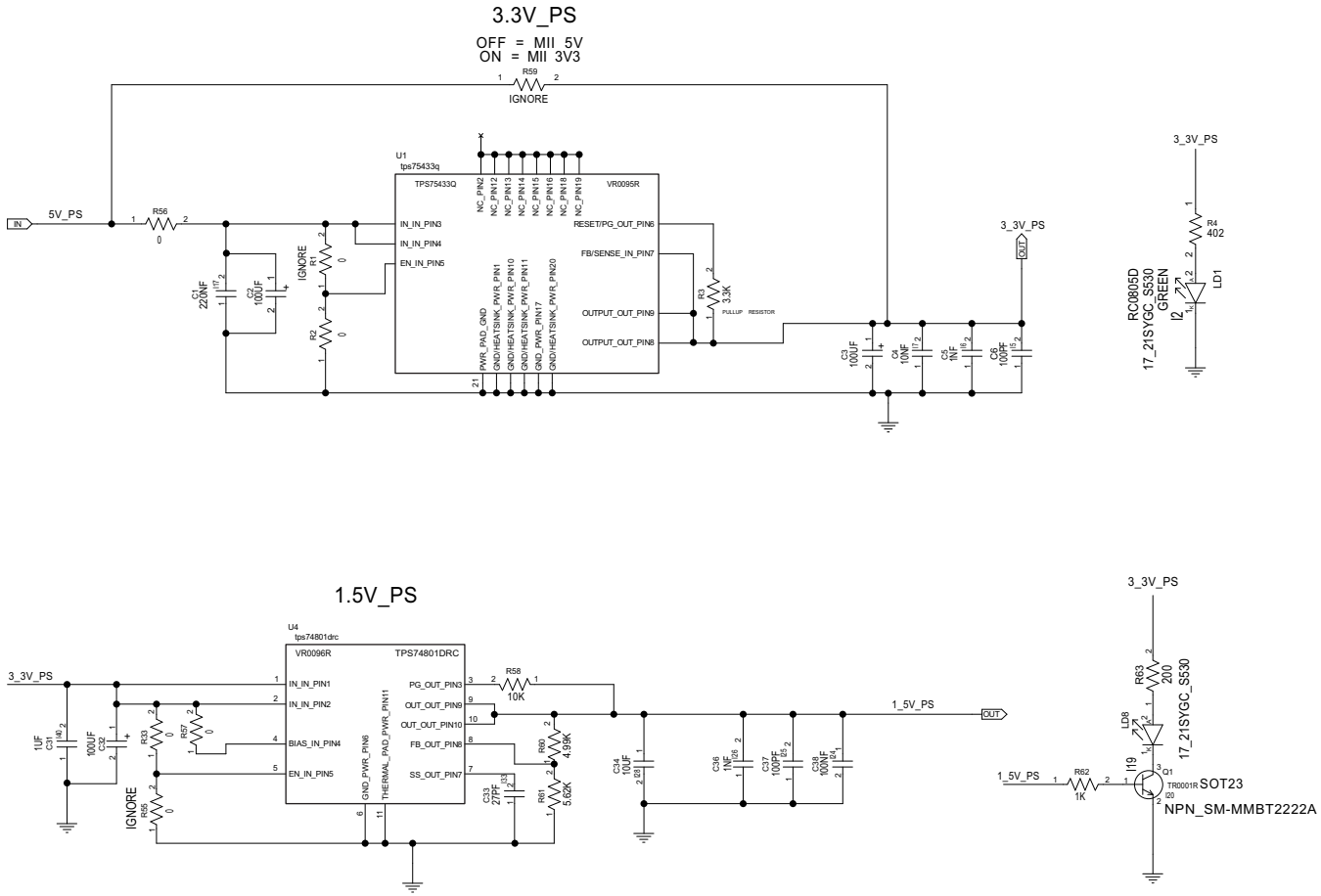

Figure 5. TLK105/6CUSEVM – 3.3V/1.5V LDO Schematics

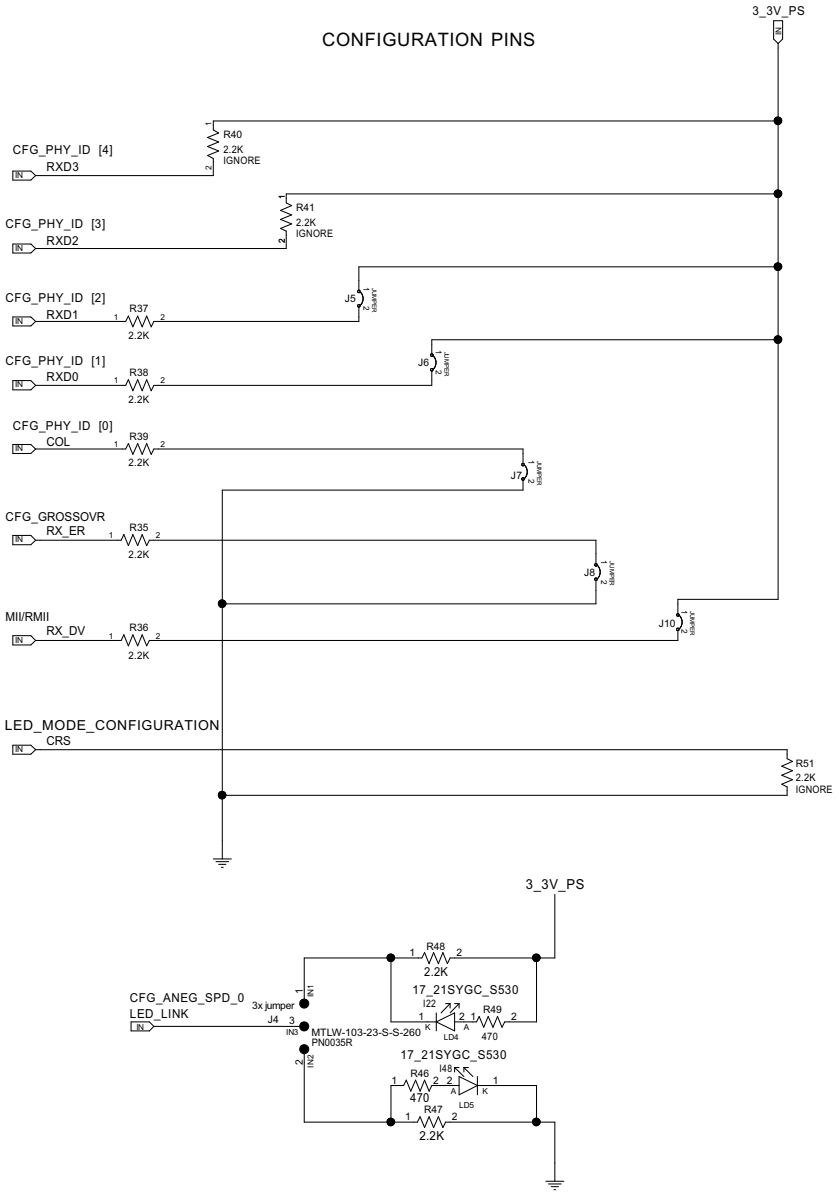

Figure 6. TLK105/6CUSEVM – SOR Schematics

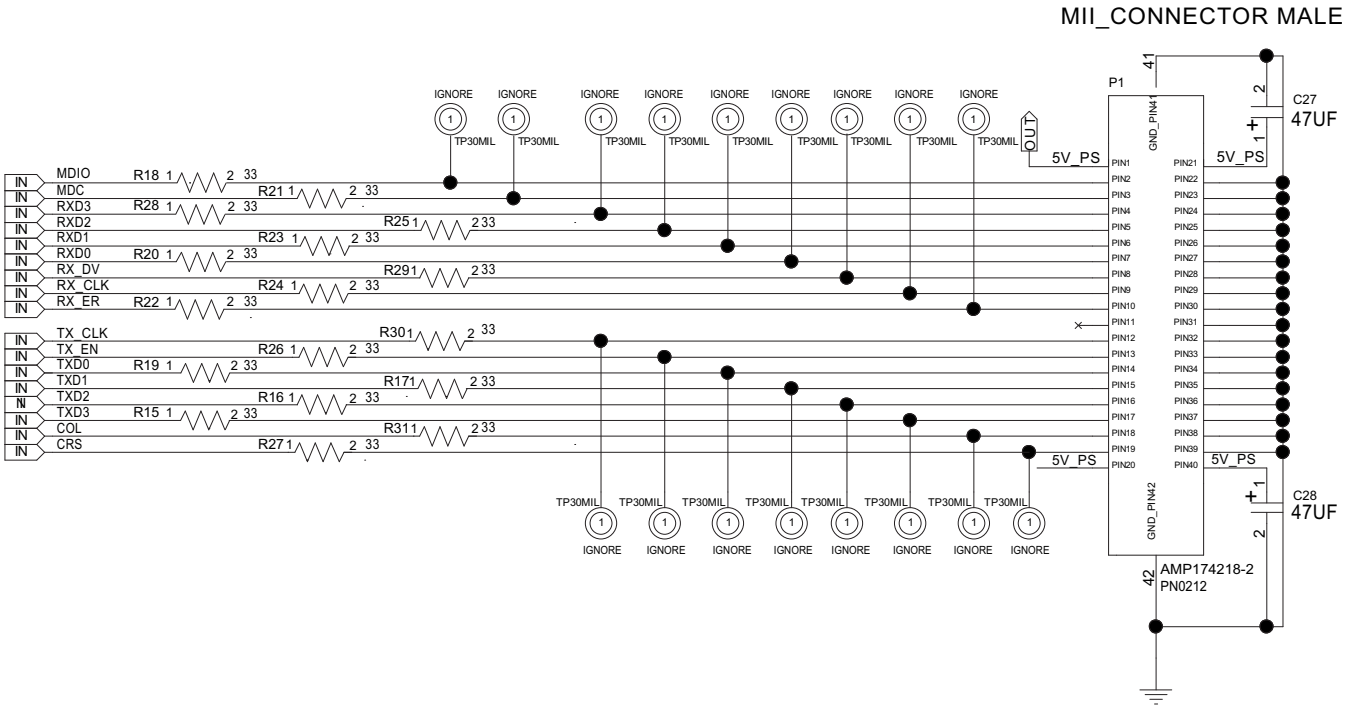

Figure 7. TLK105/6CUSEVM – MII Connector Schematics

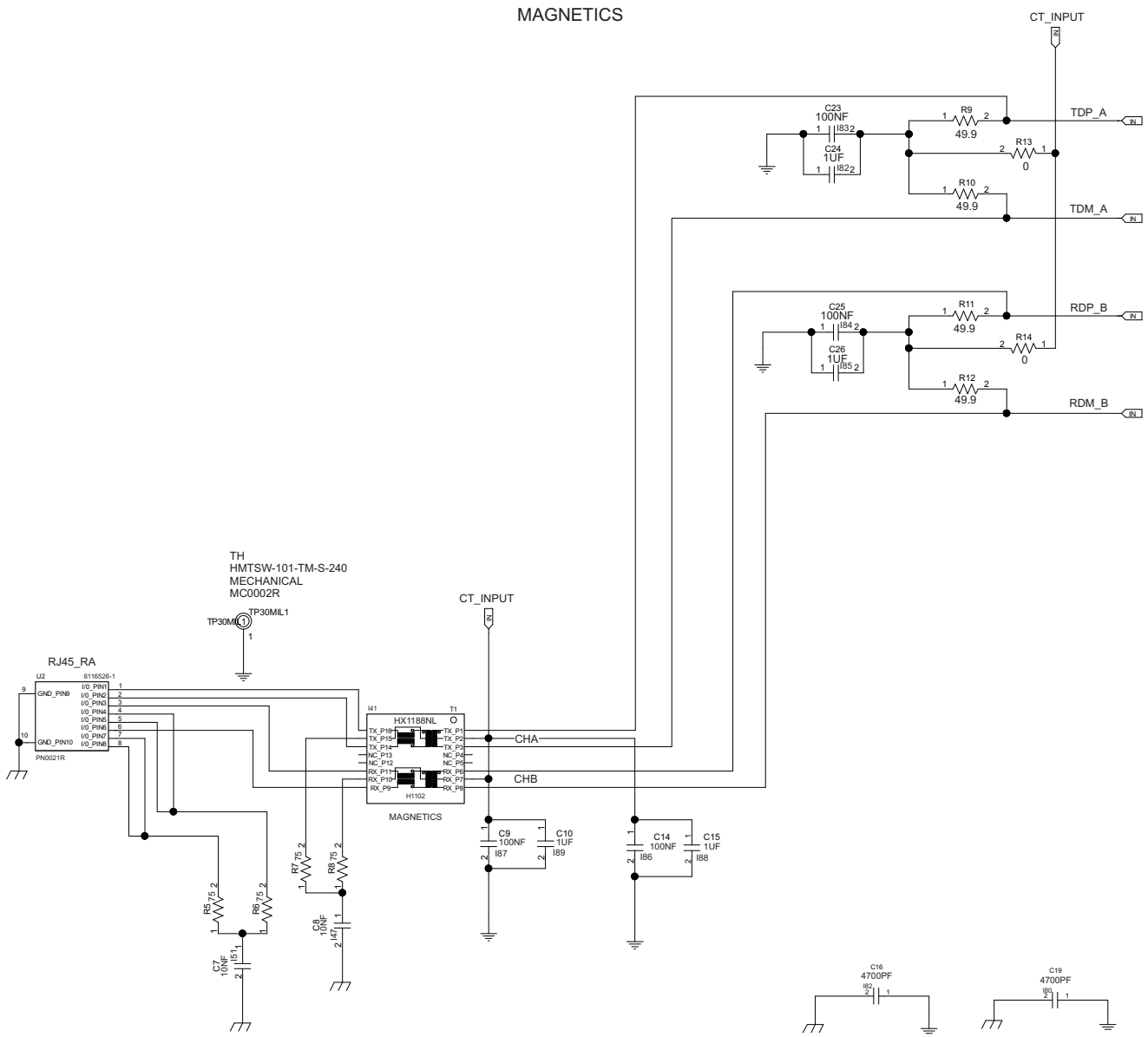

Figure 8. TLK105/6CUSEVM – Magnetics Schematics

4 Bill of Materials

4.1 Bill of Materials

Table 3. Bill of Materials

Part Name	Ref Des	Qty	JEDEC Type	Part No.	Vendor	Vendor Part No.	Value	BOM Ignore	Description	New Part No.
3XJUMPER_MECHANICAL-	J1, J4	2	JUMPERX3	PN0035R	SAMTEC	MTLW-103-23-S-S-260			JUMPERX3 MALE	CON-103260R
8_POS_TH_MEC-PN0021R, 8POS, 6116526-1	U2	1	8POS	PN0021R	AMP-TYCO	6116526-1			RJ45 CAT5 8 POS RA Female	CON-111333R
CAPACITOR_SINGLE-CP0042, 100NF, 10V, 10%, 10%, RC0402, GMC04X7R104K10NT	C9, C14, C23, C25	4	RC0402	CP0042	CALCHIP	GMC04X7R104K10NT	100NF		100NF_X7R_10V_10%_0402	CAT-400134R
CAPACITOR_SINGLE-CP0046, 1NF, 50V, 5%, 5%, RC0603, CL10B102JBNC	C36	1	RC0603	CP0046	SAMSUNG	CL10B102JBNC	1NF		1NF_X7R_50V_5%_0603	CAP-600106R
CAPACITOR_SINGLE-CP0067, 10UF, 35V, 20%, 20%, 1206, CE_GMK325_F106ZHT	C34, C42, C43, C57	4	1206	CP0067	TAIYO_YUDEN	CE_GMK325_F106ZHT	10UF		10UF_Y5V_35V_20%_1206	CAP-401010R
CAPACITOR_SINGLE-CP0105, 100NF, 16V, 10%, 10%, 0603, CL10B104KONC	C38, C53–C55	4	603	CP0105	SAMSUNG	CL10B104KONC	100NF		100NF_X7R_16V_10%_0603	CAP-400136R
CAPACITOR_SINGLE-CP0105, 100NF, 16V, 10%, 10%, 0603, CL10B104KONC	C56	1	603	CP0105	SAMSUNG	CL10B104KONC	100NF	IGNORE	100NF_X7R_16V_10%_0603	CAP-400136R
CAPACITOR_SINGLE-CP0120, 1UF, 16V, 80%, 20%, 0805, ECJ2VF1C105Z	C31	1	805	CP0120	PANASONIC	ECJ2VF1C105Z	1UF		1UF_Y5V_16V_+80%_-20%_0805	CAP-300108R
CAPACITOR_SINGLE-CP0135, 1NF, 25V, 5%, 5%, 0402, VJ0402Y102JXXA	C29, C30	2	402	CP0135	VITRAMON	VJ0402Y102JXXA	1NF	IGNORE	1NF_X7R_25V_5%_0402	CAS-600104R
CAPACITOR_SINGLE-CP0135, 1NF, 25V, 5%, 5%, 0402, VJ0402Y102JXXA	C5, C40, C46, C47, C59	5	402	CP0135	VITRAMON	VJ0402Y102JXXA	1NF		1NF_X7R_25V_5%_0402	CAS-600104R
CAPACITOR_SINGLE-CP0136, 27PF, 50V, 1%, 1%, 0603, 0603N270F500NT	C33	1	603	CP0136	HITANO	0603N270F500NT	27PF		27PF_NPO_50V_1%_0603	CAP-902716R
CAPACITOR_SINGLE-CP0146, 10NF, 50V, 5%, 5%, 0402, CL05B103JBNC	C4, C7, C8, C39, C44, C45, C58	7	402	CP0146	SAMSUNG	CL05B103JBNC	10NF		10NF_X7R_50V_5%_0402	CAS-601034R
CAPACITOR_SINGLE-CP0147R, 100PF, 50V, 5%, 5%, RC0402, VJ0402A101JXAT	C6, C37, C41, C49, C50, C60	6	RC0402	CP0147R	VITRAMON	VJ0402A101JXAT	100PF		100PF_NPO_50V_5%_0402	CAP-910004R
CAPACITOR_SINGLE-CP0221,1UF,6.3V,15%,15%,0603, ECJ1VB0J105K	C10, C15, C24, C26	4	603	CP0221	PANASONIC	ECJ1VB0J105K	1UF		1UF_X7R_6V3_15%_0603	CAS-300106R
CAPACITOR_SINGLE-CP0255, 220NF, 16V, 5%, 5%, 0603, 0603B224J160NT	C1	1	603	CP0255	HITANO	0603B224J160NT	220NF		220NF_16V_5%_0603	CAS-402236R
CAPACITOR_SINGLE-CP0259, 33PF, 50V, 1%, 1%, 0603, CL10C330FB8NNNC	C48, C51	2	603	CP0259	SAMSUNG	CL10C330FB8NNNC	33PF		33PF_NPO_50V_1%_0603	CAP-903316R
CAPACITOR_SINGLE-XXXX, 10UF, 10V, 10%, 10%, 1210, GRM32AR61C106KAB7L	C52	1	1210	XXXX	MURATA	GRM32AR61C106KAB7L	10UF		10UF_X5R_10V_10%_1210 LOW ESR	CAM-301005R
CAPACITOR_SINGLE-XXXX, 4700PF, 2000V, 10%, 10%, C1812, 1812GC472KATA1A	C16, C19	2	C1812	XXXX	SAMSUNG	1812GC472KAT1A	4700PF		4700PF_NPO_2000V_10%_1812	CAP-704735R
F4107R_SMT5X7-OS0040R, SMT5X7, VF3AH1-25MHZ	U5	1	SMT5X7	OS0040R	VALPEY_FISHER	VF3AH1-25MHZ		IGNORE	3.3V TIGHT STABILITY HCMOS SMD OSCILLATOR WITH STANDBY, 25MHz, 25ppm -40-+85 (INDUSTRIAL)	OSC-507025R
HC49SM_I-25M-INDUSTRIAL_OX0040R	XTAL1	1	HC49SM_I	OX0040R	HEC	HH2500-18-E-25PPM			XTAL HC49SM 25MHZ 100PPM 18PF INDUSTRIAL	CRS-250018R

Table 3. Bill of Materials (continued)

Part Name	Ref Des	Qty	JEDEC Type	Part No.	Vendor	Vendor Part No.	Value	BOM Ignore	Description	New Part No.
HX1188NL_SM16-TF0116R, SM16,	T1	1	SM16	TF0122R	PULSE	HX1188NL			10/100 BASE-T MAGNETICS	CON-118800R
JUMPER_TH-PN0019, JMP02, 90120-0762	J2, J5-J8, J10, J14	7	JMP02	PN0019	MOLEX	90120-0762			MOLEX JUMPER 0.1 INCH	CON-901202R
LED_SM-LD0021, 50V, RC0805D, 17_21SYGC_S530, GREEN	LD1, LD4, LD5, LD8	4	RC0805D	LD0021	EVERLIGHT	17_21SYGC_S530			GREEN_LED_SMD_0805	LED-215301R
MII-PN0212, , AMP174218-2	P1	1	MII-MALE	PN0212	AMP	AMP174218-2			MII_40PIN_SHILDED_THRA_MALE	CON-174218R
NPN_IC-MMBT222AA-TR0001R	Q1	1	SOT23	TR0001R	XXXX	NPN-SM-MMBT2222A			NPN SOT23 TRANSISTOR	TRS-104023R
PCAP_SINGLE-CT0024, 100UF, 10V, 20%, 20%, 7343, EEJL1AD107R	C2, C3, C32	3	7343	CT0024	PANASONIC	EEJL1AD107R	100UF		100UF_10V_20%_Tantalum_Low_ESR_D_Size	CAP-100343R
PCAP_SINGLE-CT0026R, 47UF, 20V, 10%, 10%, 7343, TCSVS1D476KDAR	C27, C28	2	7343	CT0026R	SAMSUNG	TCSVS1D476KDAR	47UF		47UF_TANT_20V_10%_7343	CAP-047343R
RESISTOR_2PIN-RE0004, 0, 0.06W, 5%, RC0603JW_000E	R1, R32, R55, R59, R67, R73	6	603	RE0004	BOURNS	RC0603JW_000E	0	IGNORE	0_0W06_5%_0603	RES-100006R
RESISTOR_2PIN-RE0004, 0, 0.06W, 5%, RC0603JW_000E	R2, R13, R14, R33, R56, R57, R66, R71, R72	9	603	RE0004	BOURNS	RC0603JW_000E	0		0_0W06_5%_0603	RES-100006R
RESISTOR_2PIN-RE0005, 0, 0.1W, 5%, RC0805JW_000E	R64, R65, R79, R106	4	805	RE0005	BOURNS	RC0805JW_000E	0		0R_0W1_5%_0805	RES-100008R
RESISTOR_2PIN-RE0005, 0, 0.1W, 5%, RC0805JW_000E	R77, R80	2	805	RE0005	BOURNS	RC0805JW_000E	0	IGNORE	0R_0W1_5%_0805	RES-100008R
RESISTOR_2PIN-RE0044, 4.7K, 0.06W, 5%, CR0603JW-472E	R68	1	603	RE0044	BOURNS	CR0603JW-472E	4.7K		4K7_0W06_5%_0603	RES-404706R
RESISTOR_2PIN-RE0085, 49.9, 0.06W, 1%, RC0402FR-0749R9	R9-R12	4	402	RE0085	YAGEO	RC0402FR-0749R9	49.9		49R9_0W06_1%_0402	RES-249914R
RESISTOR_2PIN-RE0125, 1K, 0.06W, 1%, CR0603FX_1001E	R62	1	603	RE0125	YAGEO	CR0603FX_1001E	1K		1K_0W06_1%_0603	RES-300106R
RESISTOR_2PIN-RE0152, 470, 0.1W, 1%, CR0603FX-470R	R46, R49	2	603	RE0152	YAGEO	CR0603FX-470R	470		470_0W1_1%_0603	RES-147006R
Part Name	Ref Des	Qty	JEDEC TYPE	PART No.	VENDOR	VENDOR PART No.	VALUE	BOM IGNORE	DESCRIPTION	NEW PART No.
RESISTOR_2PIN-RE0182, 10K, 0.06W, 1%, RC0603FR_0710K	R58	1	603	RE0182	YAGEO	RC0603FR_0710K	10K		10K_0W06_1%_0603	RES-301006R
RESISTOR_2PIN-RE0218, 200, 0.06W, 1%, RC0603FR-07200R	R63	1	603	RE0218	AVX	RC0603FR-07200R	200		200R_0W06_1%_0603	RES-320006R
RESISTOR_2PIN-RE0294, 75, 0.06W, 1%, CR0603FX_75R	R5-R8	4	603	RE0294	YAGEO	CR0605FX_75R	75		75R_0W06_1%_0603	RES-107506R
RESISTOR_2PIN-RE0343, 3.3K, 0.06W, 1%, CR0402FX-3301G	R3	1	402	RE0343	YAGEO	CR0402FX-3301G	3.3K		3K3_0W06_1%_0402	RES-403304R
RESISTOR_2PIN-RE0475, 5.62K, 0.06W, 1%, RC0603FR-075K62	R61	1	603	RE0475	YAGEO	RC0603FR-075K62	5.62K		5K62_0W06_1%_0603	RES-856216R
RESISTOR_2PIN-RE0518R, 402, 0.06W, 1%, CR0603-FX-402RELF	R4	1	603	RE0518R	BOURNS	CR0603-FX-402RELF	402		RESISTOR_402OHM_1%_0603	RES-140206R
RESISTOR_2PIN-RE0536R, 1M, 0.06W, 1%, RC0402FR-071M	R70	1	RC0402	RE0536R	YAGEO	RC0402FR-071M	1M		RESISTOR_1M_1%_0402	RES-600104R

Table 3. Bill of Materials (continued)

Part Name	Ref Des	Qty	JEDEC Type	Part No.	Vendor	Vendor Part No.	Value	BOM Ignore	Description	New Part No.
RESISTOR_2PIN-RE0661R, 2.2K, 0.06W, 1%, CR0402FR-072K2L	R35-R39, R47, R48, R74, R75, R82	10	402	RE0661R	YAGEO	CR0402FR-072K2L	2.2K		2.2K_0W06_1%_0402	RES-402204R
RESISTOR_2PIN-RE0661R, 2.2K, 0.06W, 1%, CR0402FR-072K2L	R40, R41, R51, R76, R78	5	402	RE0661R	YAGEO	CR0402FR-072K2L	2.2K	IGNORE	2.2K_0W06_1%_0402	RES-402204R
RESISTOR_2PIN-RE0662R, 33, 0.06W, 1%, CR0402FR-0733R	R15-R31	17	402	RE0662R	YAGEO	CR0402FR-0733R	33		33_0W06_1%_0402	RES-103304R
RESISTOR_2PIN-XXXX, 4.87K, 0.06W, 1%, CR0603-FX-4871ELF	R96	1	RC0603	XXXX	BOURNS	CR0603-FX-4871ELF	4.87K		RESISTOR_4.87K_1%_0603	RES-404876R
RESISTOR_2PIN-XXXX, 4.99K, 0.06W, 1%, CR0603-FX-4991ELF	R60	1	RC0603	XXXX	BOURNS	CR0603-FX-4991ELF	4.99K		RESISTOR_4.99K_1%_0603	RES-304996R
TLK110_32P_QFN_REV1_IC-	U6	1	QFN50P500X500 X100-33	XXXX	TI	TLK11032PQFN			10_100_PHY_32P_QFN	HPA-110320R
TP30MIL_MECHANICAL-MC0002R	TP30MIL1, TP30MIL19-TP30MIL22	5	TH	MC0002R	SAMTEC	HMTSW-101-07-TM-S-240			TESTPOINT_TH_0.9mm_pad _1.7MM	CON-101240R
TP30MIL_MECHANICAL-MC0002R	TP30MIL2-TP30MIL18	17	TH	MC0002R	SAMTEC	HMTSW-101-07-TM-S-240		IGNORE	TESTPOINT_TH_0.9mm_pad _1.7MM	CON-101240R
TPS3825-33DBVT_IC-MX0052, DBV, TPS3825-33DBVT	U3	1	DBV	MX0052	TI	TPS3825-33DBVT		IGNORE	PROCESSOR SUPERVISORY CIRCUITS WITH MR_N INPUT	REG-382533R
TPS74801DRC_IC-VR0096R, SON10, TPS74801DRC	U4	1	SON10	VR0096R	TI	TPS74801DRC			LDO 1.5A ADJ	REG-748010R
TPS75433Q_IC-VR0095R, TSSOP-20, TPS75433Q	U1	1	TSSOP-20	VR0095R	TI	TPS75433Q			LDO 3.3V 2A	REG-754330R

5 Software

The EVM requires no specific software, and can be controlled from networking equipment that supports the MII interface. However, for SmartBits users, TI can provide a proprietary GUI that simplifies the controllability of the TLK105/6CUSEVM through SmartBits and enables advanced features such as the cable diagnostic tool.

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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 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.

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EVM Warnings and Restrictions

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

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 . The EVM is designed to operate properly with certain components above 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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