![TEXAS INSTRUMENTS]

DIR9001 Evaluation Board

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1 Description

The DEM-DIR9001 is an evaluation board for the low jitter, Digital Audio Interface Receiver DIR9001. It is operated by either a single +3.3 V power supply, or a +5 V power supply.

The DEM-DIR9001 has both an Optical Toslink input and an Coaxial input for the SPDIF interface which can achieve standard digital audio interface format IEC60958, AES/EBU, and JEIAT CPR-1205 (former EIAJ CP-1201, 340).

The DEM-DIR9001 recovers standard system clock and PCM audio interface clock from incoming biphase signals such as SPDIF, IEC60958, and AES/EBU. These signals are provided to the audio DAC/DSP, buffer output, and direct output.
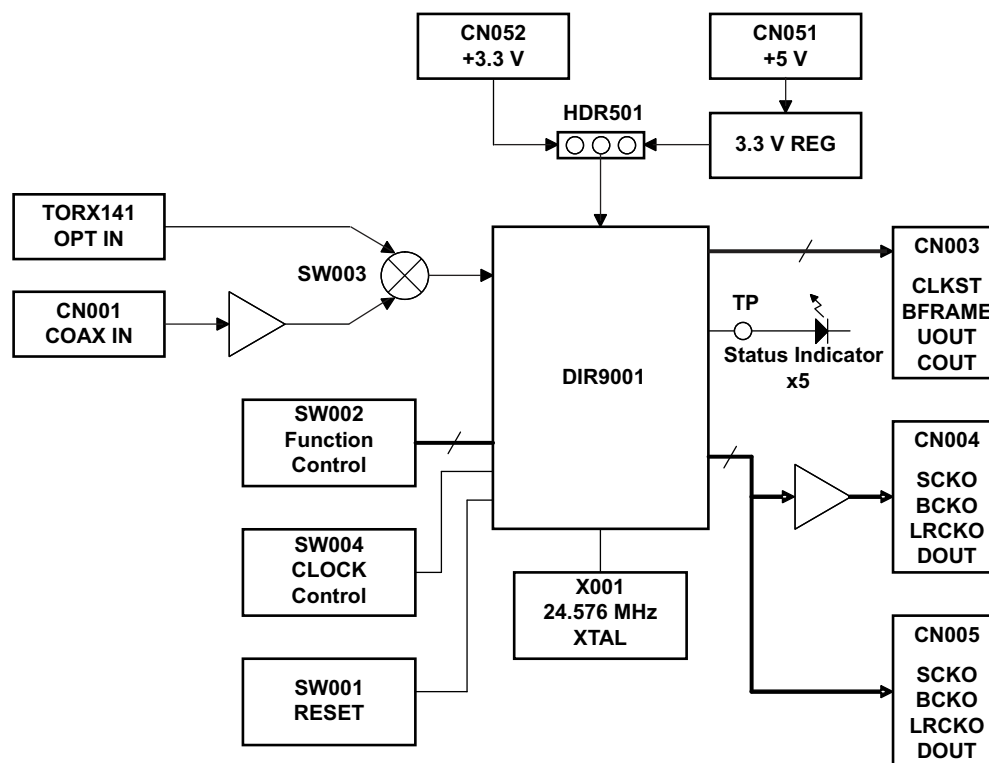
1.1 Block Diagram

Figure 1. DEM-DIR9001 Block Diagram

1.2 Operation and Setting

1.2.1 Power Supply

+5 V Power supply
Connect the +5 V power supply at CN051 with the 5V jumper connection at the HDR051 connector. For all internal operations, the +3.3 V power supply is generated by the mounted REG-IC. External +3.3 V is not required.

+3.3 V Power supply
Connect +3.3 V power supply at CN052 with 3.3 V jumper connection at the HDR051 connector. All +3.3 V power supply is provided from CN052.

1.2.2 Reset

SW001 is a reset switch for the DIR9001. External automatic power on the reset circuit is combined.

1.2.3 SPDIF Input and Selection

- Connect the Toslink optical fiber cable connector at U001.
- Connect the RCA Coaxial cable connector at CN001.
- Optical input or Coaxial input must be selected by SW003 as OPT or COAX.

1.2.4 Function Control

Table 1. SW002: FMT0, FMT1 PCM Audio Data Format Selection

FMT[1:0] SETTING		DOUT SERIAL AUDIO DATA OUTPUT FORMAT
FMT1	FMT0	
L	L	16-bit MSB first, right justified
L	H	24-bit MSB first, right justified
H	L	24-bit MSB first, left justified
H	H	24-bit MSB first, I^{2}S

Table 2. SW002: PSCK0, PSCK1 System Clock Frequency Selection

PSCK[1:0] SETTING		OUTPUT CLOCK AT PLL SOURCE		
PSCK1	PSCK0	SCKO	BCKO	LRCKO
L	L	128fs	64fs	fs
L	H	256fs	64fs	fs
H	L	384fs	64fs	fs
H	H	512fs	64fs	fs

1.2.5 Operation Mode Control

SW004 is the fundamental operation mode control for DIR9001.

XTAL: Outputs connected at the XTAL resonator clock and divided clock

AUTO: Outputs from either the PLL generated clock or the XTAL clock are automatically selected by the operation status of DIR9001.
DIR9001 is locked into SPDIF interface clock → PLL clock
DIR9001 is unlocked into SPDIF interface clock → XTAL clock

PLL: Outputs from the PLL generated clock
If in the PLL mode operation, XTAL clock is not required for all operations of the DIR9001.

1.2.6 CN003 Status Output

CN003 is the output for the Channel status (COUT), User bit (UOUT), Bit frame (BFRAME), and clock transition status (CLKST).

1.2.7 Status Indicator

The following status is shown with an LED indicator.
- ERROR : Unlock or Data parity error
- $\overline{\text{AUDIO}}$: non audio data
- EMPH : with pre-emphasis
- FSOUT1 : detected sampling rate
- FSOUT2 : detected sampling rate

Description

1.2.8 CN004, CN005 PCM Audio Interface Clock Output

CN004 and CN005 are PCM audio interface clock outputs (System Clock, LRCK, BCK, and DATA). CN004 is a buffered output with a mounted logic buffer IC. CN005 is a direct output from DIR9001.

Caution: Pins on the right side are GND.

- SCKO : System Clock (128/256/384/512fs)
- BCKO : PCM audio, BCK clock (64fs)
- LRCKO : PCM audio, LRCK clock (fs)
- DOUT : PCM audio, DATA clock
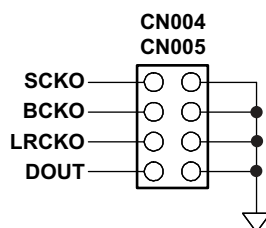
1.2.9 External Clock Input

The external clock can be connected at CN002 (not mounted) by removing the mounted XTAL. This alows the user to confirm operation of the DIR9001 by another clock source.

2   Schematic, Printed-Circuit Board and Bill of Materials

This section presents the DEM-DIR9001 printed-circuit boards, the DEM-DIR9001 schematic, and the bill of materials.
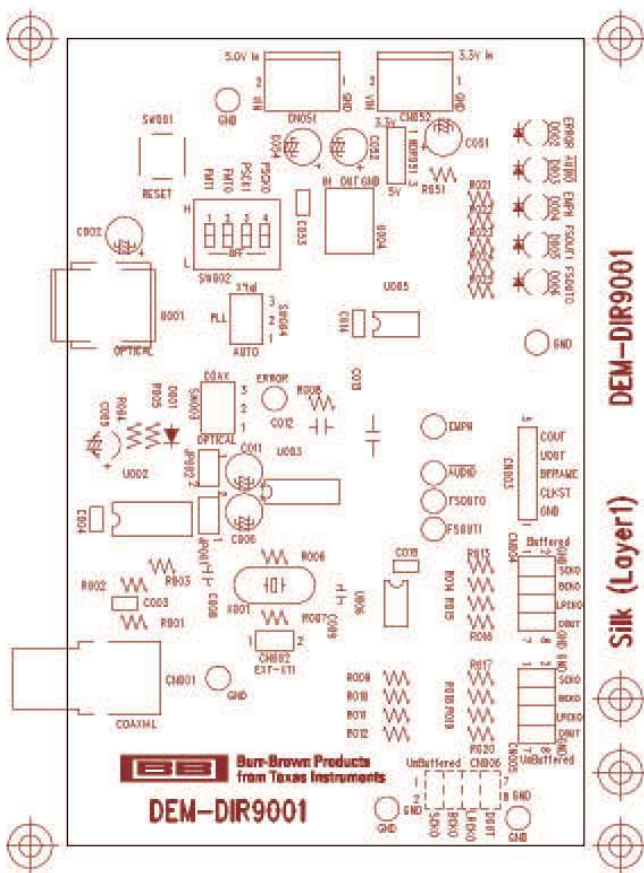
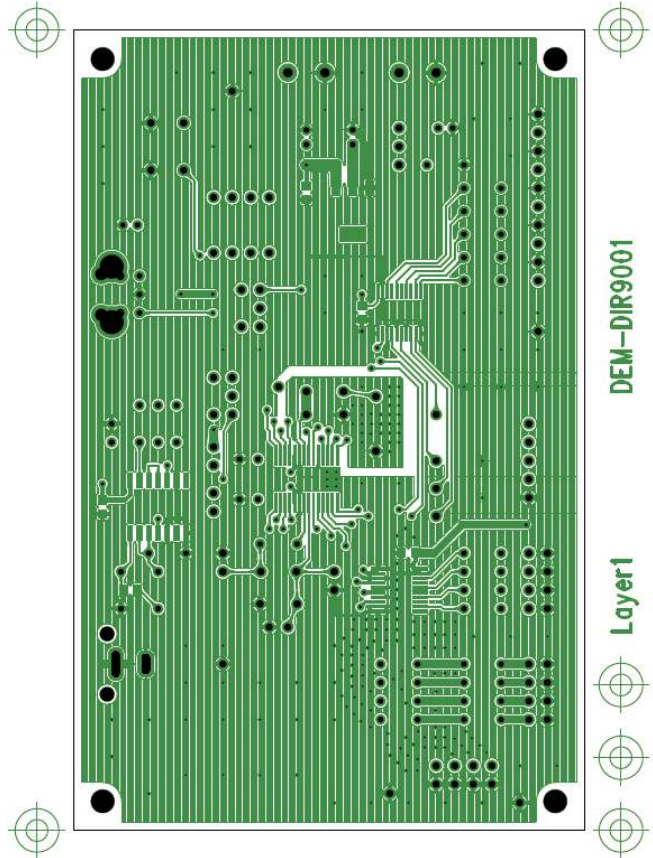### 2.1   *DEM-DIR9001 Printed-Circuit Board*

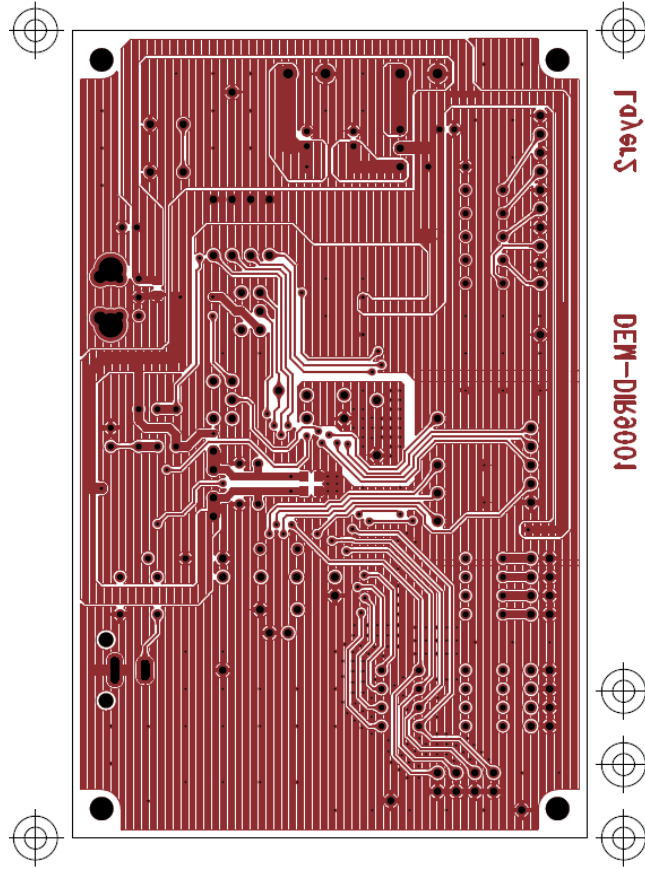**Figure 2. DEM-DIR9001 Silkscreen**

Figure 3. DEM-DIR9001 — Top View

Figure 4. DEM-DIR9001 — Bottom View

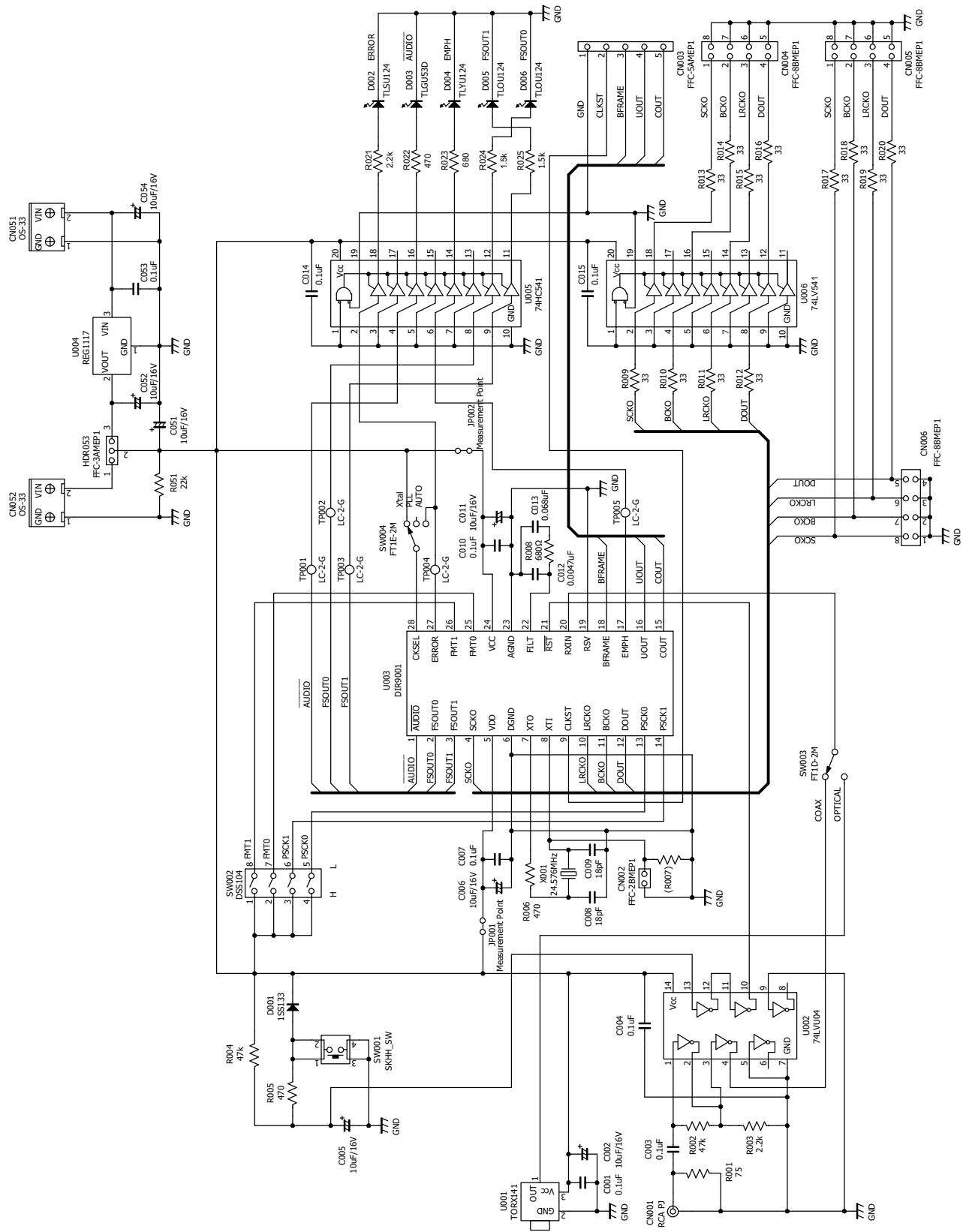## 2.2 DEM-DIR9001 Schematic Circuit Diagram

Figure 5. Schematic

2.3 Bill of Materials

Reference		Description	MFG.	Model	Value
Type	NO.				
C	1,3,4	Chip Ceramic Capacitor	Murata	GRM188B11E104KA01	0.1 μF, K, 25 V
C	2,6,11	OS Capacitor	SANYO	16SS10M	10 μF, M, 16 V
C	5	AL EL Capacitor	ELNA	RC3-16V100M	10 μF, M, 16 V
C	7	Chip Ceramic Capacitor	Murata	GRM188B11E104KA01	0.1 μF, K, 25 V
C	8,9	Ceramic Capacitor	Murata	RPE2C1H180J2P1Z01	18 pF, J, 50 V
C	10,14,15	Chip Ceramic Capacitor	Murata	GRM188B11E104KA01	0.1 μF, K, 25 V
C	12	Polypropylene Capacitor	NISSEI	APSF0100J472	0.0047 μF, J
C	13	Polypropylene Capacitor	NISSEI	APSF0100J683	0.068 μF, J
C	51,52	OS Capacitor	SANYO	16SS10M	10 μF, M, 16V
C	53	Chip Ceramic Capacitor	Murata	GRM188B11E104KA01	0.1 μF, K, 25V
C	54	OS Capacitor	SANYO	16SS10M	10 μF, M, 16V
CN	1	Pin Jack	SMK	LPR6520-0804	RCA PJ
CN	3	Header Pin	Honda Tsushin	FFC-5AMEP1	5 pin
CN	4,5	Header Pin	Honda Tsushin	FFC-8BMEP1	8 pin
CN	6	Connector	Honda Tsushin	Z-282-8FD	8 pin
CN	51,52	Terminal	Osada	OS-33	2 pin
CN	53	Header Pin	Honda Tsushin	FFC-3BMEP1	3 pin
D	1	Diode	ROHM	1SS133	
D	2	LED	TOSHIBA	TLGU53D	Green
D	3,4	LED	TOSHIBA	TLOU124	Orange
D	5	LED	TOSHIBA	TLSU124	Red
D	6	LED	TOSHIBA	TLYU124	Yellow
R	1	1/4W Resistor	KOA	MFS1/4CC750RF	75 Ω, F, 1/4 W
R	2	1/4W Resistor	KOA	MFS1/4CC470RF	47 Ω, F, 1/4 W
R	3	1/4W Resistor	KOA	MFS1/4CC2201F	2.2 kΩ, F, 1/4 W
R	4,5	1/4W Resistor	KOA	MFS1/4CC470RF	47 Ω, F, 1/4 W
R	8	1/4W Resistor	KOA	MFS1/4CC6800F	680 Ω, F, 1/4 W
R	9-20	1/4W Resistor	KOA	MFS1/4CC330RF	33 Ω, F, 1/4 W
R	21	1/4W Resistor	KOA	MFS1/4CC2201F	2.2 kΩ, F, 1/4 W
R	22	1/4W Resistor	KOA	MFS1/4CC4700F	470 Ω, F, 1/4 W
R	23	1/4W Resistor	KOA	MFS1/4CC6800F	680 Ω, F, 1/4 W
R	24,25	1/4W Resistor	KOA	MFS1/4CC1501F	1.5 kΩ, F, 1/4 W
R	51	1/4W Resistor	KOA	MFS1/4CC2202F	22 kΩ, F, 1/4 W
SW	1	Tact Switch	ALPS	SKHRAAA010	
SW	2	DIP Switch	Fujisoku	DSS104	
SW	3	Toglle Switch	Fujisoku	FT1D-2M	
SW	4	Toglle Switch	Fujisoku	FT1E-2M	
TP	1	Test Pin	Mac 8	LC-2-G	Green
TP	2,3	Test Pin	Mac 8	LC-2-G	Orange
TP	4	Test Pin	Mac 8	LC-2-G	Red
TP	5	Test Pin	Mac 8	LC-2-G	Yellow
U	1	TOSLINK	TOSHIBA	TORX141P	
U	2	Logic IC	TI	SN74LVU04ANSR	
U	3	DIR	TI	PCM9001PW	
U	4	Regulator	TI	REG1117-3.3	800 mA, 3.3 V
U	5	Logic IC	TI	SN74LV541APW	
U	6	Logic IC	TI	SN74LV541APW	
X	1	Crystal Resonator	Kinseki	HC-49/U-S	24.576 MHz

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It is important to operate this EVM within the input voltage range of 2.7 V to 3.6 V or 5 V and the output voltage range of 2.7 V to 3.6 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.

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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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