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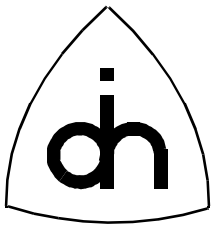

Technical Description for Vidar-5x4-ASM

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1. Abstract

This document provides technical description of the Odin TeleSystems' Vidar-5x4-ASM daughter card. This presentation is targeted to systems integrators and application developers who are developing telecommunications systems and/or software applications utilizing the Vidar-5x4-ASM modules together with Odin Telecom frameworX (OTX) Network Interface Cards (NICs). The purpose of this document is to provide the needed information about the hardware to allow software developers to efficiently integrate Vidar-5x4-ASM into their overall system under design.

For more information on how to develop host applications utilizing the OTX hardware device driver Application Programming Interface (API), please refer to the *"Programmer's Guide for OTX Hardware API"* document (Odin TeleSystems Inc. document number 1411-1-SAA-1006-1). For information on how to develop custom DSP applications, please refer to *"Programmer's Guide for OTX C54x DSP Software Development Kit"* (Odin document number 1412-1-SAA-1007-1).

2. Table of Content

3. Introduction to Vidar-5x4-ASM

Vidar-5x4-ASM is a Daughter Board Module providing DSP resources. The Vidar-5x4-ASM daughter board can be attached to an OTX Network Interface Card (such as Arni-16-PCI, Thor-2-PCI, Thor-8-PCI) to provide additional Digital Signal Processing Resources.

Vidar-5x4-ASM is a member of the Odin Telecom frameworX (OTX) product family and is supported by the following OTX Software Products:

- SDA-1012-1 : OTX Adapter Family WDM driver for Windows and Windows 2000
- SDA-1013-1 : OTX Adapter Family NT driver for Windows NT 4.0
- SAA-1006-1: OTX Hardware Driver Software Development Kit (SDK)
- SAA-1007-1: OTX DSP C54x Software Development Kit (SDK)

The Vidar-5x4-ASM contains 4 Texas Instruments TMS320C548 DSPs. The Vidar-5x4-ASM is also offered with partial population of 2 DSPs (Product name Vidar-5x2-ASM).

The DSPs on the Vidar daughter board can be used to run Odin provided standard DSP applications or they can be used to run user developed custom applications. Vidar-5x4-ASM is delivered with the Odin Signal Processing Module 1 (OtxSpm1) DSP application package that provides supports for many common telecom applications; such as tone detection and generation, FSK detection, and HDLC sending and receiving.

For custom application development, Vidar-5x4-ASM supports the standard Texas Instruments development tools. These tools can be purchased from Odin and are listed in the following:

- Odin Product # SAA-1004-1: Texas Instruments C Compiler/Assembler/Linker for TMS320C54x DSPs
- Odin Product # SAA-1005-1: Texas Instruments Code Composer Debugger with DSP Research Emulator Board

For more information on custom DSP application development, please refer to *"Programmer's Guide for OTX C54x DSP Software Development Kit"* (Odin document number 1412-1-SAA-1007-1)

4. Specifications

The physical dimensions of Vidar-5x4-ASM are shown in Figure 1.

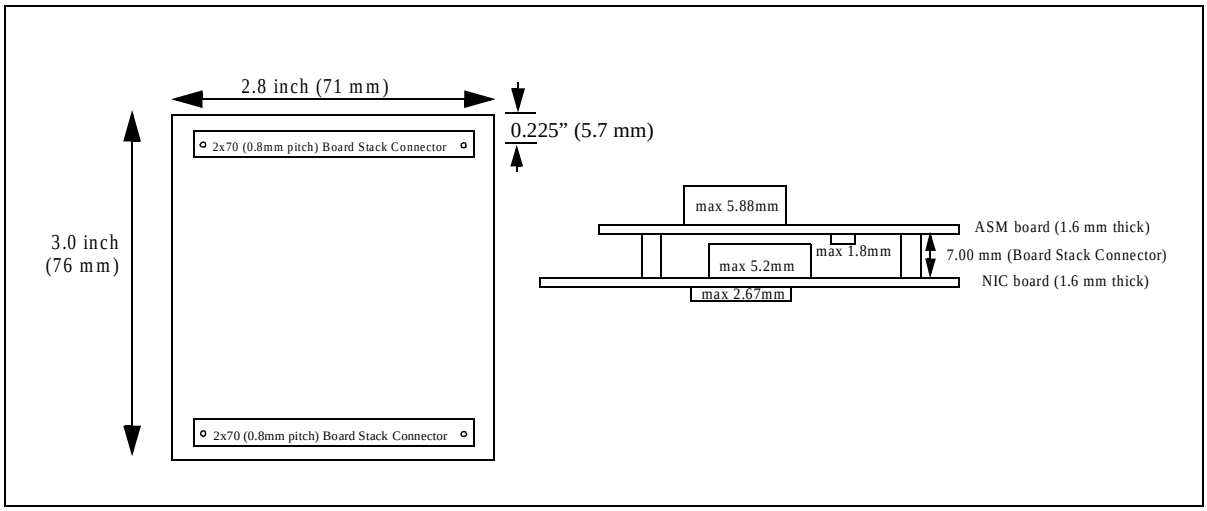

Figure 1. Vidar-5x4-ASM Physical Dimensions.

5. Installation

The Vidar-5x4-ASM board has been packaged in a sealed anti-static bag for protection during shipping and handling. Follow precautions regarding handling of electrical equipment while attaching Vidar-5x4-ASM into a OTX Network Interface Card. Be aware of the possibility of damage to the sensitive electrical devices on Vidar-5x4-ASM from static electricity discharge. Please wear anti-static protection devices such as a ground strap connected to a grounded equipment frame while handling the board.

To attached the board to a OTX NIC, remove it from the anti-static bag and place it together with the NIC board on to a flat and properly grounded anti-static mat. Place the Vidar-5x4-ASM on top of the NIC card and align the ASM connectors on the Vidar-5x4-ASM with connectors labeled BJ5 and BJ6 on the NIC card (See). Make sure that the Vidar-5x4-ASM board is oriented the right way. The tip of the Odin Logo needs to be point towards the NIC boards H.100 connector. Gently push the ASM board into the connector until you feel the connector is fully inserted.

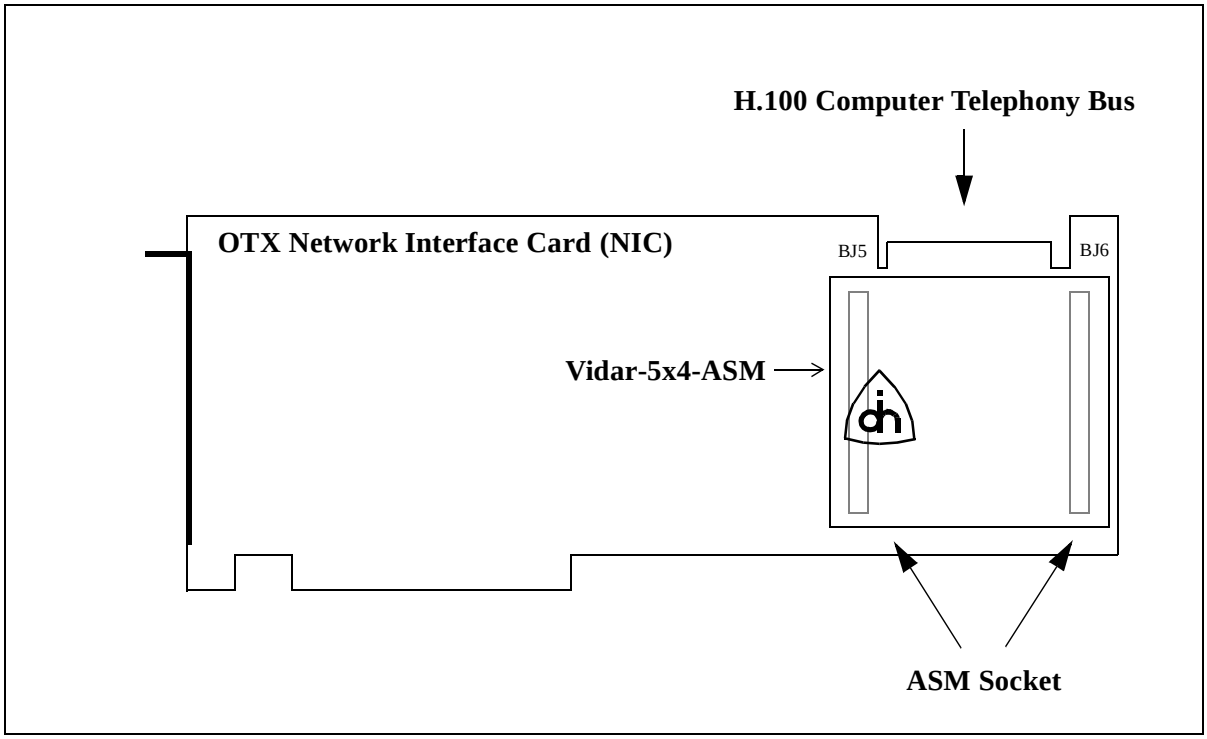

Figure 2. Installing Vidar-5x4-ASM to an OTX Network Interface Card.

6. Supported Driver Devices

6.1 Physical Devices

The Vidar-5x4-ASM supports the following physical API driver devices:

TABLE 1. OTX Physical Driver Devices supported by Vidar-5x4-ASM

Host Device	Device Type	Max #	Description
OTX_DEVICE_XXXXX	*OTX_DEVICE_DSP*	2 or 4	Digital Signal Processor

6.2 Logical Devices

The Vidar-5x4-ASM is delivered with OTX Signal Processing Module 1 (OtxSpm1) DSP application pack. The OtxSpm1 DSP application supports the following logical devices.

TABLE 2. OTX Logical Driver Devices supported by Vidar-5x4-ASM

Host Device	Device Type	Max #	Description
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_EFFECTS_GENERATOR*	8	Logical Device for Generating Tone Effects (such as saw tooth, sweeping sine wave, noise, etc.)
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_SINEWAVE_GENERATOR*	8	Logical Device for Generating Sine waves with variable frequencies.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DTMF_GENERATOR* *OTX_LDEVICE_TONE_MF_GENERATOR*	8	Logical Device for Generating single DTMF or MF tones.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DTMF_DIALER* *OTX_LDEVICE_TONE_MF_DIALER*	8	Logical Device for Dialling DTMF or MF tone sequences
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_SILENCE_DETECTOR*	8	Logical Device for Detecting Silence.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DTMF_DETECTOR* *OTX_LDEVICE_TONE_MF_DETECTOR*	8	Logical Device for Detecting DTMF or MF tones.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DIAL_DETECTOR*	8	Logical Device for Detecting Dial Tone
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_FSK_DETECTOR*	8	Logical Device for Detecting FSK.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_CONVERTER*	8	Logical Device for converting from one data format to another.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_RAW_SENDER*	8	Logical Device for sending raw (unstructured) used data.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_RAW_RECEIVER*	8	Logical Device for receiving raw (unstructured) used data.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_HDLC_SENDER*	4	Logical Device for sending HDLC frames.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_HDLC_RECEIVER*	4	Logical Device for receiving HDLC frames.

Additional OTX DSP packages will be offered in the future for:

- *OTX_LDEVICE_MODEM_V34_SENDER*
- *OTX_LDEVICE_MODEM_V34_RECEIVER*
- *OTX_LDEVICE_MODEM_V90_SENDER*
- *OTX_LDEVICE_MODEM_V90_RECEIVER*
- *OTX_LDEVICE_FAX_V17_SENDER*
- *OTX_LDEVICE_FAX_V17_RECEIVER*
- *OTX_LDEVICE_VOICE_ECHO_CANCELLER*

- *OTX_LDEVICE_VOICE_SILENCE_SUPRESSOR*
- *OTX_LDEVICE_VOICE_CODEC_G723_ENCODER*
- *OTX_LDEVICE_VOICE_CODEC_G723_DECODER*
- *OTX_LDEVICE_VOICE_CODEC_G729_ENCODER*
- *OTX_LDEVICE_VOICE_CODEC_G729_DECODER*

For mode information on how to use the physical and logical driver devices, please refer to the "*Programmer's Guide for OTX Hardware API"* (Odin document # 1412-1-SAA-1006-1).

7. System Architecture

The overall system architecture can be best described and understood through different architectural views or aspects. This document explores the systems architecture from the following angles:

1. **External Interface View:** The external interface view describes the external interfaces of the adapter board, and how they are connected to the various internal devices and modules.

2. **Data Architecture View:** The data architecture view illustrates how the Time - Division Multiplexed (TDM) serial data is connected and transferred through the board.

3. **Control Architecture View:** The control architecture view describes how the internal devices and modules can be controlled by the host processor.

4. **Clock Architecture View:** The clock architecture view specifies what clocking and synchronization options are available, how clocking is derived, and how it distributed to the various devices.

5. **Logical Subsystem View:** The logical subsystem view describes the logical design subsystems in the system. Each subsystem can comprise hardware, firmware and driver or on-board processor software.

It is important to note that one device within the board can be involved in several of these views, each view describing how one aspect of the device interfaces with other devices.

7.1 External Interfaces

7.1.1 OTX ASM Interface

The Vidar-5x4-ASM contains the OTX ASM socket, which is illustrated in Figure 3.

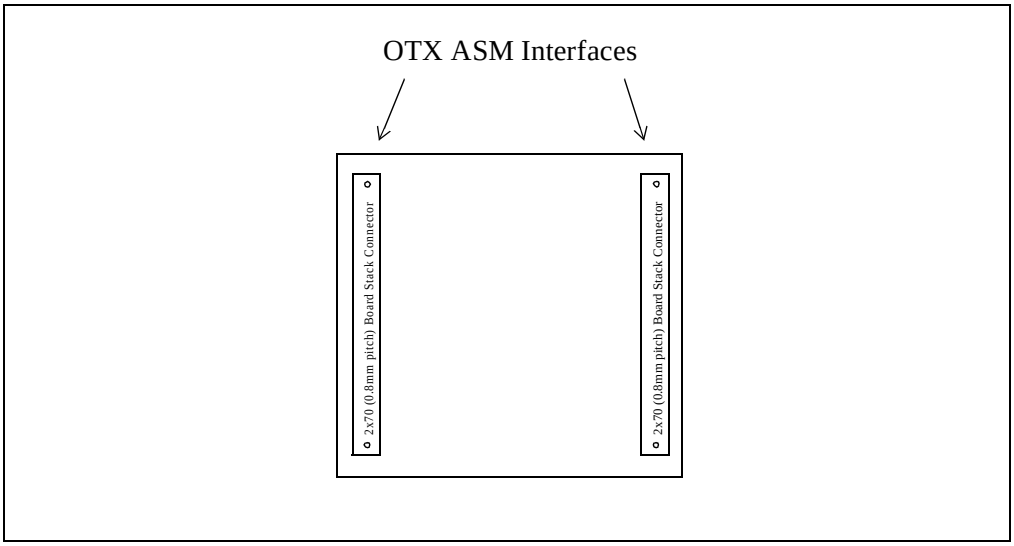

Figure 3. Vidar-5x4-ASM External Interfaces.

On OTX Network Interface Cards (NICs) the ASM socket connectors are market with reference designators BJ5 and BJ6.

7.2 Data Architecture

Internally, Vidar-5x4-ASM utilizes serial TDM (Time-Division Multiplexed) data streams for transfer of data or voice. These serial data streams are called “Highways.” The ASM interface includes 4 Highways transmitting data between a OTX NIC board and the Vidar-5x4-ASM Daughter board. The serial highways provide data paths between physical devices as shown in Figure 4.

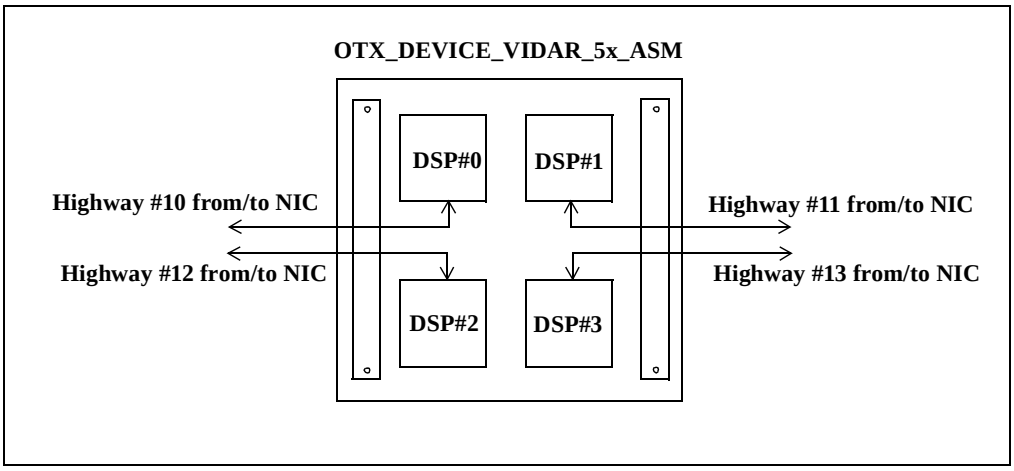

Figure 4. Vidar-5x4-ASM Highway Connections.

The Vidar-5x4-ASM internal highways are configured to operate at 2.048 Mbit/s, each containing 32 8-bit time-slots. The data rate of one time-slot is 64 kbit/s. Table 3 lists the internal highways used on Vidar-5x4-ASM boards.

TABLE 3. Vidar-5x4-ASM Highway Connections

NIC Highway #	Connecting Time-Space Switch to
10	Vidar-5x4-ASM DSP #0
11	Vidar-5x4-ASM DSP #1
12	Vidar-5x4-ASM DSP #2
13	Vidar-5x4-ASM DSP #3

The DSPs on Vidar-5x4-ASM are connected to the local highway through their buffered serial ports. However, in addition to the buffered serial port, each TMS320C548 DSP also provides a Time Division Multiplexed (TDM) serial port which is ideal for DSP to DSP communication. Up to 8 DSPs can be connected together using the TDM serial ports. On Vidar-5x4-ASM, all 4 DSPs are connected together as shown in Figure 5. The DSP to DSP communication channels can be used to transmit serial data between DSPs or to establish allow DSPs to control each other through a user defined control protocol.

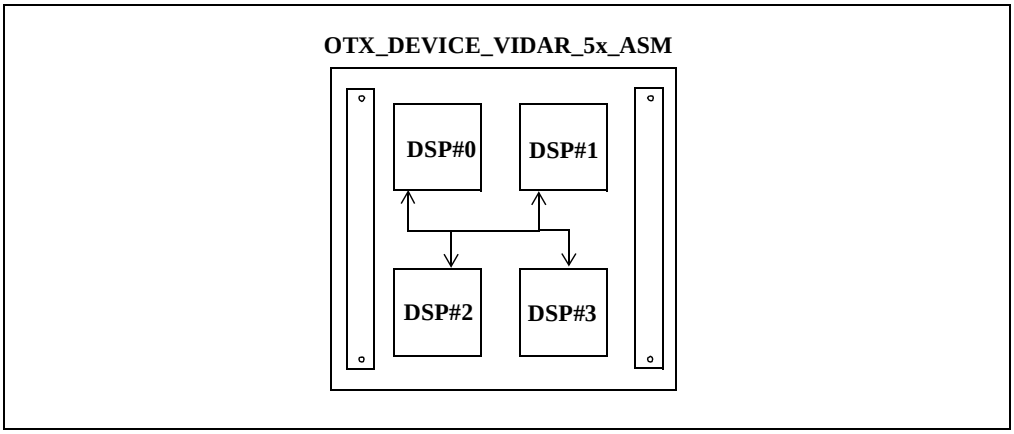

Figure 5. Vidar-5x4-ASM DSP-to-DSP TDM Serial Port Connections.

7.3 Control Architecture

The OTX ASM Interface includes a 16-bit processor bus, which is used by the host to control the physical and logical devices on the Vidar-5x4-ASM daughter board. The Vidar-5x4-ASM control architecture is illustrated in Figure 6.

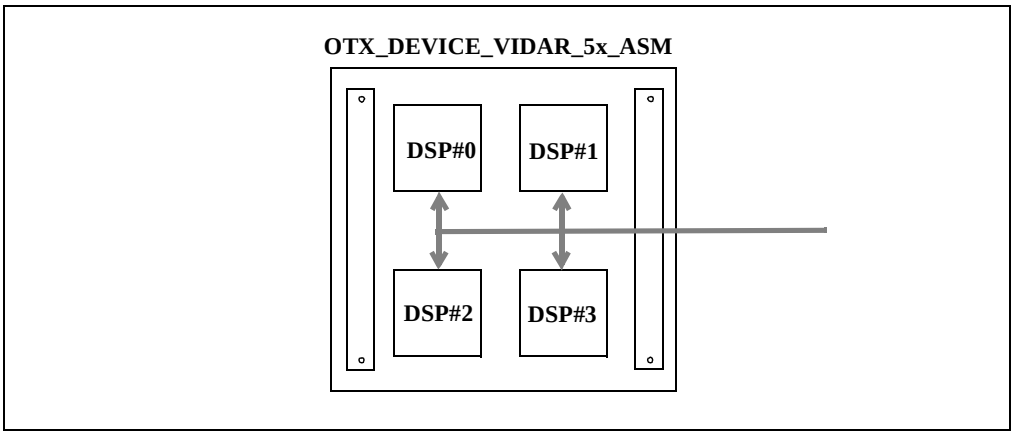

Figure 6. Vidar-5x4-ASM Control Architecture.

7.4 Clock Architecture

On the Vidar-5x4-ASM board all the internal TDM data highways and the all the devices processing TDM data are synchronized to one clock reference. The clock reference can be derived from multiple sources and then switched to all the devices. The Vidar-5x4-ASM board supports the same clock sources are the NIC card that it is used on.

7.5 Logical Subsystems

The logical subsystem view describes the logical design subsystems within the Vidar-5x4-ASM adapter. Each subsystem can comprise hardware, firmware, and driver or on-board processor software. The Vidar-5x4-ASM comprises of only one subsystems:

- Processor Subsystem

7.5.1 Processor Subsystem

The processor subsystem contains 16 Texas Instruments TMS320C548 Digital Signal Processors. Each DSP also contains 64 kWords (128 kBytes) of external Static Random Access Memory (SRAM). In addition, the processor subsystem provides 16 LEDs (one per DSP) which can be turned on and off under DSP software control. The LEDs are typically used as heart-beat indicators (blinked on and off by the DSP application) displaying to the user whether each DSP is up and running (LED blinking) or not (LED steady).

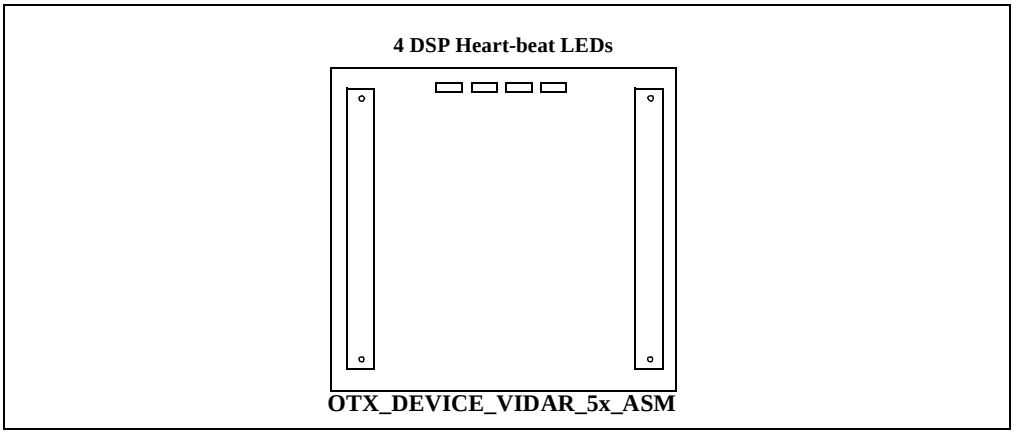

Figure 7. Vidar-5x4-ASM DSP Heart-beat LEDs.

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