



# HW-6467-CORE Video Processing Module

## Reference Guide

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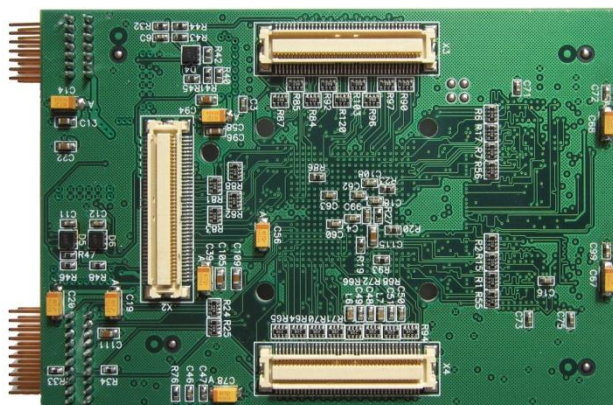
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## 2. INTRODUCTION



Top view



Bottom view

The SY6467 Core Module is a credit card sized CPU board based on the Digital Media System-on-Chip TMS320DM6467 from TI (Texas Instruments).

Core module could be supplied in two mass production configurations and is designed to operate within industrial temperature range (-40:+70 C).

**[HW-6467-CORE-Z594]** Equipped with TMS320DM6467ZUTA (297Mhz ARM core, 594Mhz DSP core) and 128MB of DDR2 RAM.

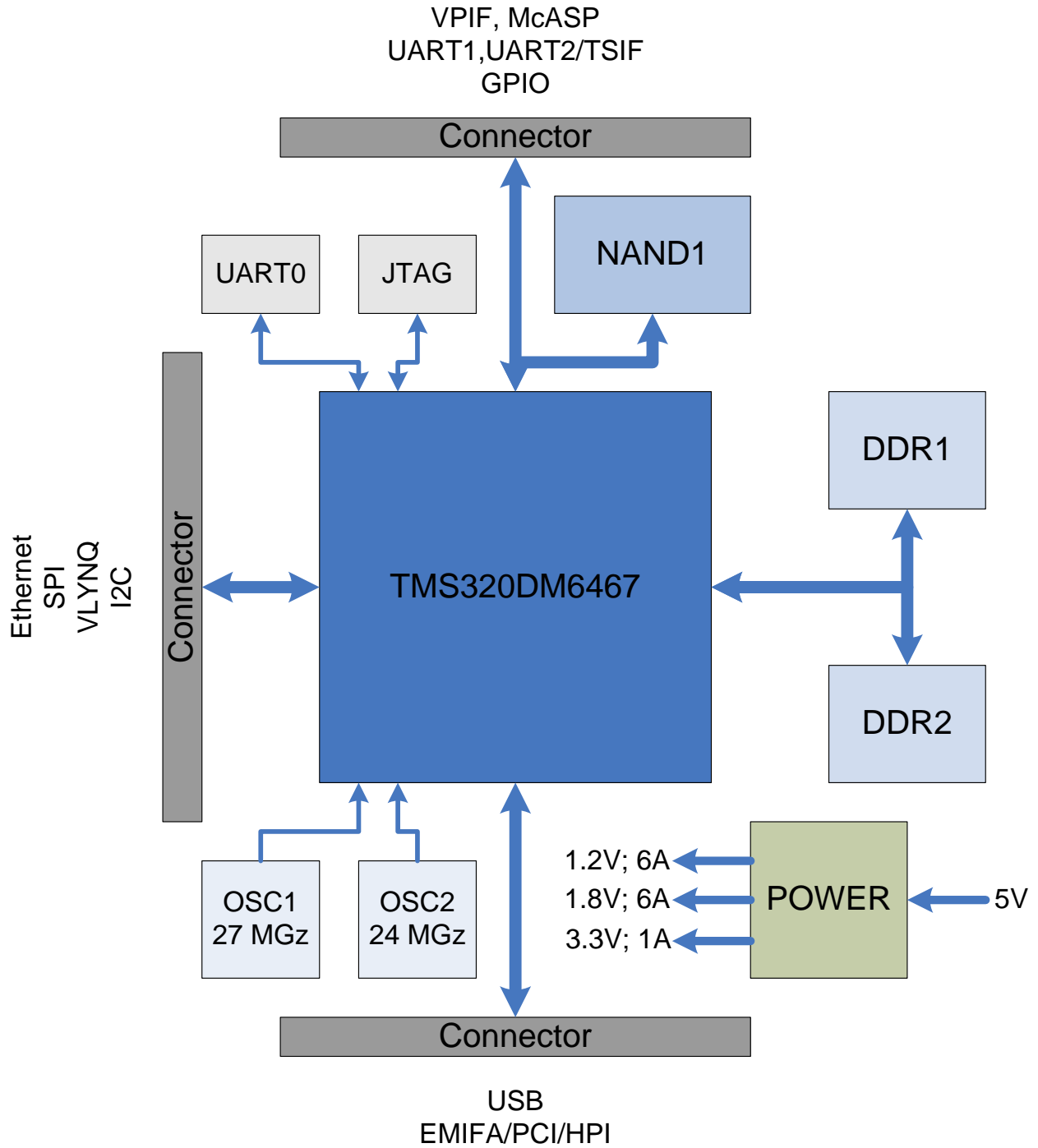
**[HW-6467-CORE-Z729]** Equipped with TMS320DM6467ZUTD7 (365Mhz ARM core, 729Mhz DSP core) and 256MB of DDR2 RAM.

All interfaces are accessible through the 3 board connectors. Connector is SlimStack 80 pins type by Molex.

The power consumption of the whole board is less than 5 W.

Please check <http://focus.ti.com/docs/prod/folders/print/tms320dm6467.html> for more detailed guides to TMS320DM6467 SoC.

### 3. BLOCK DIAGRAM



## **4. HANDLING PRECAUTIONS**

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Please read the following notes prior to installing the SY6467 module. They apply to all ESD (electrostatic discharge) sensitive components:

- 1) The SY6467 does not need any configurations before installation.
- 2) The module does not provide any on-board ESD protection circuitry – this must be provided by the product it is used in.
- 3) Before installing the module it is recommended that you discharge yourself by touching a grounded object.
- 4) Be sure all tools required for installation are electrostatic discharged as well.
- 5) Before installing (or removing) the module, unplug the power cable from your mains supply.

Handle the board with care and try to avoid touching its components or tracks.

## 5. FUNCTIONAL DESCRIPTION

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### 5.1 Processor

The SY6467 Core Module uses the TMS320DM6467 processor. It's a high-performance Digital Media System-on-Chip. This processor provides a lot of features such as:

- Advanced Very-Long-Instruction-Word (VLIW) TMS320C64x+™ DSP Core
- Dual Programmable High-Definition Video Image Co-Processor (HDVICP) Engines to support a range of encode, decode, transcode operations H.264, MPEG2, VC1, MPEG4
- 99-MHz Video Port Interface (VPIF) BT.656 or BT.1120 video capture and video display channels
- Video Data Conversion Engine (VDCE)
- Two Transport Stream Interface (TSIF) Modules
- External Memory Interfaces (EMIFs)
- Enhanced Direct-Memory-Access (EDMA) Controller (64 Independent Channels)
- 10/100/1000 Mb/s Ethernet MAC (EMAC)
- USB Port With Integrated 2.0 PHY
- 32-Bit, 33-MHz, 3.3 V Peripheral Component Interconnect (PCI) Master/Slave Interface
- Two 64-Bit General-Purpose Timers
- One 64-Bit Watch Dog Timer
- Three Configurable UART/IrDA/CIR Modules
- One Serial Peripheral Interface (SPI) With Two Chip-Selects
- Master/Slave Inter-Integrated Circuit (I<sup>2</sup>C Bus)
- Two Multichannel Audio Serial Ports (McASPs)
- 32-Bit Host Port Interface (HPI)
- VLYNQ™ Interface (FPGA Interface)
- Two Pulse Width Modulator (PWM) Outputs
- ATA/ATAPI I/F (ATA/ATAPI-6 Specification)
- Up to 33 General-Purpose I/O (GPIO) Pins

Further details of the processor can be found in the TMS320DM6467 hardware manual [1].

### 5.2 Flash

The SY6467 contains 64 MBytes NAND flash which serves as program and data storage memory. A flash memory NAND512W3A2CZA6 from ST is used and connected to the 8-bit wide data bus.

### 5.3 RAM

256 MByte SDRAM are available as main memory. The memory consists of two 1GBit DDR2 that are connected in parallel to a 64-bit wide data bus. They are clocked at up to 310 MHz. Type of DDR2 is recommended MT47H64M16HR-3IT by Micron.

## 5.4 Ethernet Controller

The Ethernet Media Access Controller (EMAC) provides an efficient interface between the DM6467 and the network. The SY6467 EMAC support both 10Base-T and 100Base-TX, or 10 Mbps/second (Mbps) and 100 Mbps in either half- or full-duplex mode; and 1000Base-TX (1 Gbps) in full-duplex mode with hardware flow control and quality of service (QoS) support.

The Management Data Input/Output (MDIO) module continuously polls all 32 MDIO addresses in order to enumerate all PHY devices in the system. Once a PHY candidate has been selected by the ARM, the MDIO module transparently monitors its link state by reading the PHY status register. Link change events are stored in the MDIO module and can optionally interrupt the ARM, allowing the ARM to poll the link status of the device without continuously performing costly MDIO accesses.

## 5.5 Video Output-Input

The SY6467 also includes a High-Definition Video/Imaging Co-processor (HDVICP) and Video Data Conversion Engine (VDCE) to offload many video and imaging processing tasks from the DSP core, making more DSP MIPS available for common video and imaging algorithms.

The video port interface (VPIF) is a receiver and transmitter of video data. The VPIF has two input channels that receive video byte stream data and two output channels that video byte stream data is asserted.

The functional features of the VPIF are:

- ITU-BT.656 format is supported.
- ITU-BT.1120 (1125/60/2:1, 1250/50/2:1, and 1080-30p) and SMTPE 296 formats are supported.
- Raw data capturing function (receiver only; 8/10/12-bit format) is supported.
- VBI data storage is supported on BT.656 (SDTV) mode.

## 5.6 Audio Interface

There is a multichannel audio serial port (McASP0) with 4 serializers and a secondary multichannel audio serial port (McASP1) with a single transmit serializer.

The multichannel audio serial port (McASP) functions as a general-purpose audio serial port optimized for the needs of multichannel audio applications. The McASP is useful for time-division multiplexed (TDM) stream, Inter-Integrated Sound (I2S) protocols, and intercomponent digital audio interface transmission (DIT). The McASP consists of transmit and receive sections that may operate synchronized, or completely independently with separate master clocks, bit clocks, and frame syncs, and using different transmit modes with different bit-stream formats.

## 5.7 Inter-Integrated Circuit (I2C) Peripheral

The I2C peripheral provides an interface between the SY6467 and other devices that are compliant with the I2C-bus specification and connected by way of an I2C-bus. External components that are attached to this 2-wire serial bus can transmit and receive data that is 2-bits to 8-bits wide to and from the SY6467 through the I2C peripheral.

The I2C peripheral is compliant with the Philips Semiconductors Inter-IC bus (I2C-bus) specification version 2.1.

## 5.8 USB 2.0

The USB controller provides a low-cost connectivity solution for consumer portable devices by providing a mechanism for data transfer between USB devices up to 480 Mbps. Its support for a dual-role feature allows or additional versatility supporting operation capability as a host or peripheral.

The USB has the following features:

- Operating as a host, it complies with the USB 2.0 standard for high-speed (480 Mbps), full-speed (12 Mbps), and low-speed (1.5 Mbps) operations with a peripheral
- Operating as a peripheral, it complies with the USB 2.0 standard for high-speed (480 Mbps) and full-speed (12 Mbps) operation with a host.
- Supports 4 simultaneous RX and TX endpoints, in addition to control endpoint, more devices can be supported by dynamically switching endpoints states
- Each endpoint (other than endpoint 0) can support all transfer types (control, bulk, interrupt, and isochronous)
- Includes a 4K endpoint FIFO RAM, and supports programmable FIFO sizes
- External 5V power supply for VBUS, when operating as host, enabled directly by the USB controller through a dedicated signal
- Includes a DMA controller that supports 4 TX and 4 RX DMA channels
- Includes RNDIS mode of DMA for accelerating RNDIS type protocols using short packet termination over USB

## 5.9 Reset

There are several ways for issuing a reset signal:

- Board voltage monitor checks the 5V input supply. When voltage is lower 4.5V it holds the board in Reset
- Via the active low signal EXT\_RESET# at board connector (see [5.Pins Table]). The duration of this signal min 100ms. This signal accessible via TP3, TP4 test points (see [6.Technical Characteristics])

All Resets are hardware resets of the whole board and issue a Power-on Reset of the processor.

## 5.10 Hardware configuration

There are two variants of hardware configuration are used to boot processor:

- 1) NAND Flash boot (default) – jumper between TP9 and TP5
- 2) UART0 boot – jumper between TP5 and TP6

## 5.11 Debugging Interfaces

To debug and boot there are two interfaces:

- UART0 is used mainly for ARM core (14 pins additional connector)
- JTAG is used mainly for DSP core (20 pins additional connector)

See [6.Technical Characteristics] drawing for connectors pins.

## **5.12 Power Supply**

A voltage of +5.0 volts, +/- 10%, @ max. 1 A should be supplied via the board connector or UART0 additional connector. Further voltages for the processor and the other parts are generated on board (1.2V, 1.8V and 3.3V).

## 6. PINS TABLE

### 6.1 Board connector X2

Connector Pin	Pin Name	Description
1	3.3V	pins 1...3 are power supply for extension board, 3.3V max 100mA
2	3.3V	
3	3.3V	
4	CORE_PWR_GD	output 3.3V signal, means good power on Core Module after cool restart or Power-up
5	CPU_RESET#	Cool Reset, active low
6	GND	
7	MDCLK	
8	MRCLK	
9	MTXEN	
10	MTCLK	
11	GMTCLK	
12	RFTCLK	
13	MTXD0	
14	MTXD1	
15	MTXD2	
16	MTXD3	
17	MTXD4	
18	MTXD5	
19	MTXD6	
20	MTXD7	
21	SPI_SCLK	
22	SPI_EN	
23	SPI_SCS0	
24	SPI_SCS1	
25	SPI_MISO	
26	SPI_MOSI	
27	ACLKX1	
28	AHCLKX1	
29	5V	pins 29...40 are power supply input +5V 1A
30	5V	
31	5V	
32	5V	
33	5V	
34	5V	
35	5V	
36	5V	
37	5V	
38	5V	
39	5V	
40	5V	

41	GND	
42	GND	
43	GND	
44	GND	
45	GND	
46	GND	
47	GND	
48	GND	
49	GP03	
50	GP02	
51	GP01	
52	GP00	
53	ACLKRO	
54	AHCLKRO	
55	ACLKX0	
56	AHCLKX0	
57	ASFRO	
58	AFSX0	
59	AMUTE0	
60	AMUTEINO	
61	AXR0[0]	
62	AXR0[1]	
63	AXR0[2]	
64	AXR0[3]	
65	MCRS	
66	MCOL	
67	MRXDV	
68	MDIO	
69	MRXER	
70	MRXD7	
71	MRXD6	
72	MRXD5	
73	MRXD4	
74	MRXD3	
75	MRXD2	
76	MRXD1	
77	MRXD0	
78	GND	
79	1.8V	pins 79, 80 are power supply for extension board, 1.8V max 100mA
80	1.8V	

## 6.2 Board connector X3

Connector Pin	Pin Name	Description
1	UART2_CTS	
2	UART2_RTS	
3	ST0_CLKIN	
4	ST1_CLKIN	
5	PWM1	
6	PWM0	
7	GND	
8	VP_DIN8	
9	VP_DIN9	
10	VP_DIN10	
11	VP_DIN11	
12	VP_DIN4	
13	VP_DIN5	
14	VP_DIN6	
15	VP_DIN7	
16	VP_CLKIN3	
17	VP_CLKIN2	
18	VP_CLKO3	
19	VP_CLKO2	
20	VP_CLKIN1	
21	VP_CLKIN0	
22	GND	
23	VLYNQ_SCRUN	
24	TOUT4	
25	TOUT3	
26	TOUT2	
27	TOUT1	
28	VLYNQ_RXD3	
29	VLYNQ_RXD2	
30	VLYNQ_RXD1	
31	VLYNQ_RXD0	
32	GND	
33	VLYNQ_TXD3	
34	VLYNQ_TXD2	
35	VLYNQ_TXD1	
36	VLYNQ_TXD0	
37	GND	
38	AXR1[0]	
39	SCL	
40	SDA	

41	GP04	
42	VP_DOUT3	
43	VP_DOUT2	
44	VP_DOUT1	
45	VP_DOUT0	
46	EXT_RESET	
47	VP_DOUT7	
48	VP_DOUT6	
49	VP_DOUT5	
50	VP_DOUT4	
51	VP_DOUT15	
52	VP_DOUT14	
53	VP_DOUT13	
54	GND	
55	VP_DOUT12	
56	TOUT0	
57	VLYNQ_CLOCK	
58	TIN2	
59	TIN1	
60	TIN0	
61	VP_DOUT11	
62	VP_DOUT10	
63	VP_DOUT9	
64	VP_DOUT8	
65	GND	
66	VP_DIN0	
67	VP_DIN1	
68	VP_DIN2	
69	VP_DIN3	
70	VP_DIN12	
71	VP_DIN13	
72	VP_DIN14	
73	VP_DIN15	
74	GND	
75	UART1_CTS	
76	UART1_RTS	
77	UART1_RXD	
78	UART1_TXD	
79	UART2_TXD	
80	UART2_RXD	

NOTE: Blank description corresponds to standard DM6467 pin set, please consult TMS320DM6467 hardware manual [1] for definition.

## 6.3 Board connector X4

Connector Pin	Pin Name	Description
1	EM_D15	
2	EM_D14	
3	EM_D13	
4	EM_D12	
5	GND	
6	EM_D11	
7	EM_D10	
8	EM_D9	
9	EM_D8	
10	GND	
11	EM_A7	
12	EM_A6	
13	EM_A5	
14	EM_A4	
15	GND	
16	EM_A11	
17	EM_A10	
18	EM_A9	
19	EM_A8	
20	GND	
21	EM_A22	
22	EM_CS5	
23	EM_A21	
24	EM_A23	
25	GND	
26	EM_A15	
27	EM_A14	
28	EM_A13	
29	EM_A12	
30	GND	
31	EM_CS4	
32	EM_A20	
33	EM_WAIT5	
34	EM_WAIT4	
35	GND	
36	CLKOUT0	
37	USB_DP	
38	USB_DN	
39	USB_DRWBUS	
40	GND	

41	GND	
42	GP07	
43	GP06	
44	GP05	
45	GND	
46	GND	
47	EM_DQM0	
48	EM_A16	
49	EM_A17	
50	GPIO10	
51	GND	
52	EM_WE#	
53	EM_BA0	
54	EM_OE#	
55	EM_DQM1	
56	GND	
57	EM_A3	
58	EM_A2	
59	EM_A1	
60	EM_A0	
61	GND	
62	EM_WAIT2	
63	EM_WAIT3	
64	EM_R~W	
65	EM_BA1	
66	GND	
67	EM_CS3	
68	EM_CS2	
69	EM_A19	
70	EM_A18	
71	GND	
72	EM_D3	
73	EM_D2	
74	EM_D1	
75	EM_D0	
76	GND	
77	EM_D7	
78	EM_D6	
79	EM_D5	
80	EM_D4	

## 7. TECHNICAL CHARACTERISTICS

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### 7.1 Electrical Specifications

Supply voltage	+5.0 volts, +/- 10%,
Current consumption	0,5A aver, 1A max.

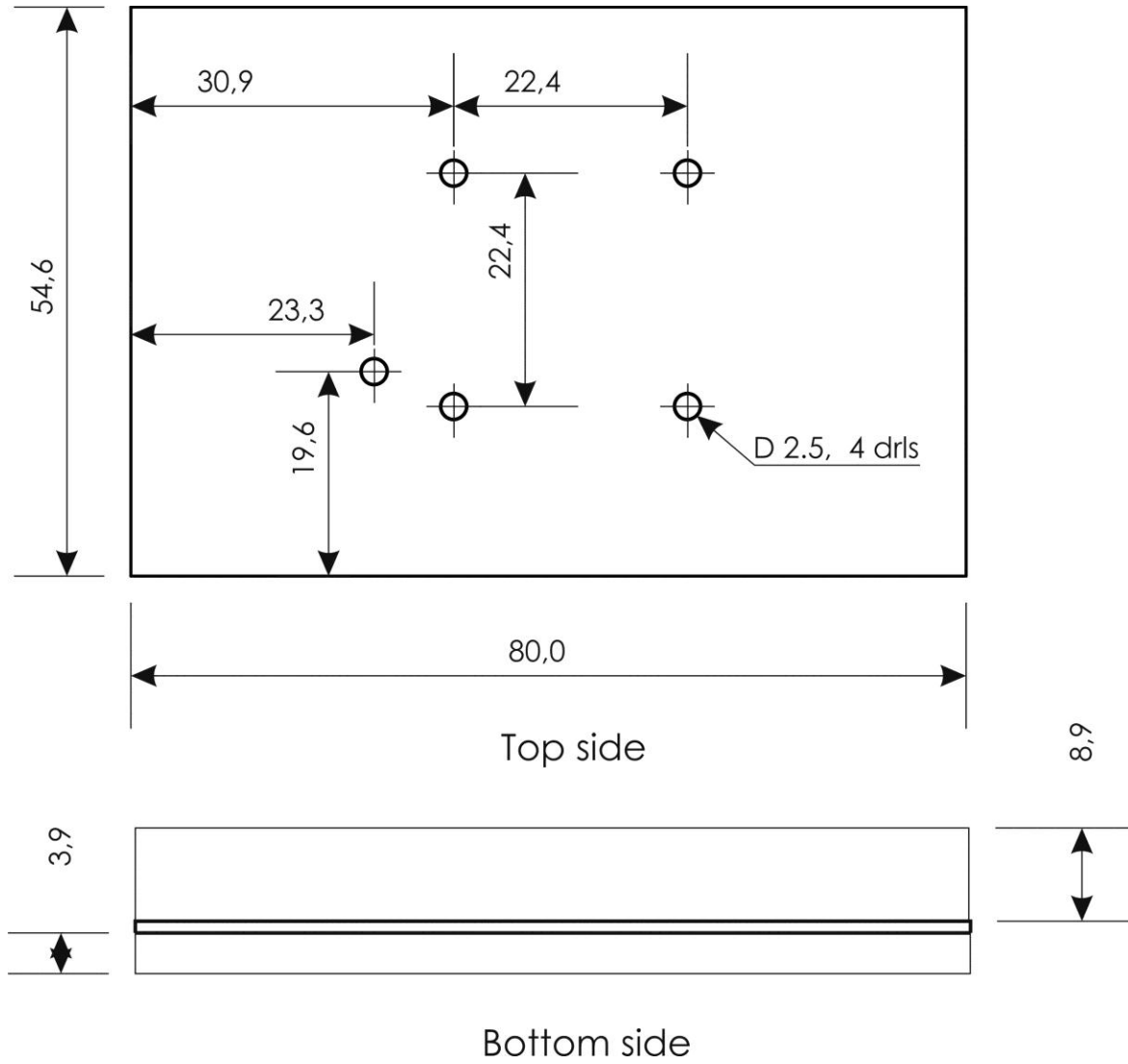
### 7.2 Environmental Specifications

Operating temperature	-40... +70°C
Storage temperature	-40... +85°C
Relative humidity	0...95%, non-condensing

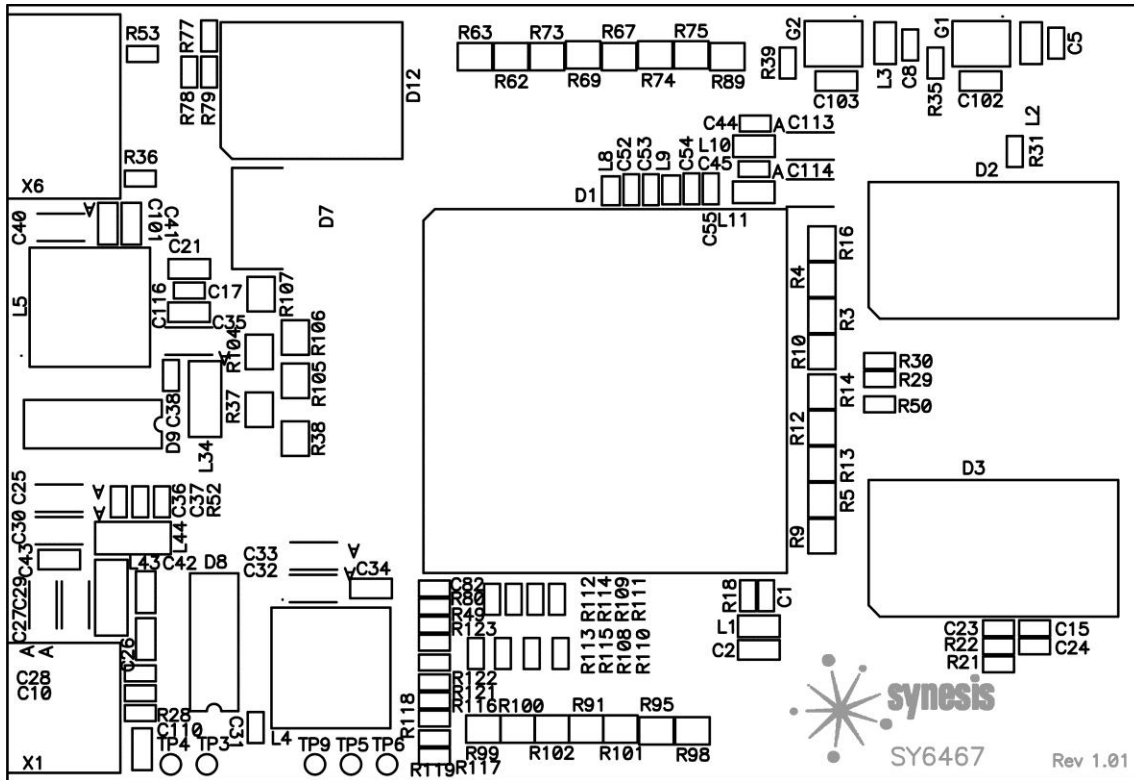
### 7.3 Mechanical Specifications

Weight	Approx. 30g
Board	FR4, 8 layers
Dimensions	80mm x 54.6mm x 1.5mm

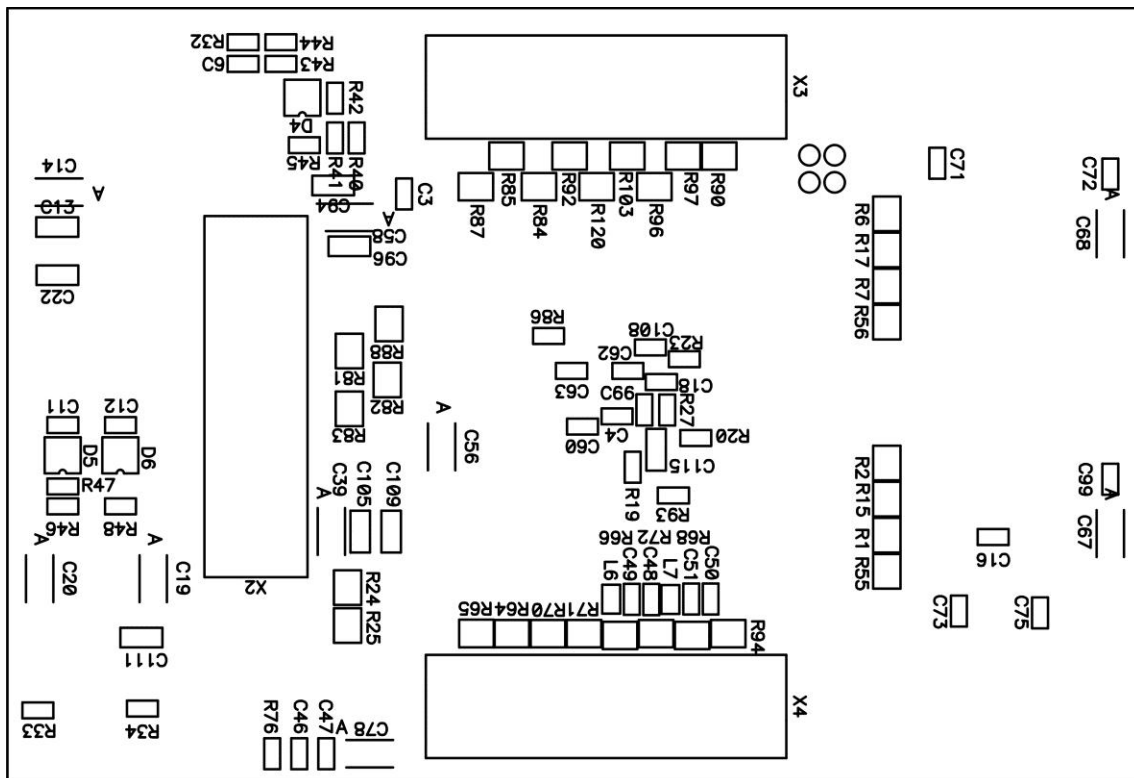
### 7.4 Dimensional Drawing



### 7.5 Top View



### 7.6 Bottom View



## 8. REFERENCES

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- [1] TMS320DM6467 Digital Media System-on-Chip, Hardware Manual , Texas Instruments  
<http://focus.ti.com/docs/prod/folders/print/tms320dm6467.html>