>>Digital Signal Processing

Standard Digital Signal Processing Trainer

HBE-DSPLAB II

- **Mounted TI's TMS320F28335**
- **Code Composer Studio program Development Environment**
- **Various Signal Processing Experiments of Voice and Bio signal**
- **Built-in Function generator**
- **Built-in 2 Channel PC Based Oscilloscope for signal measurement**
- **Provide Sample program sources for experiments**
- **Available DSP application programming through Matlab simulink**
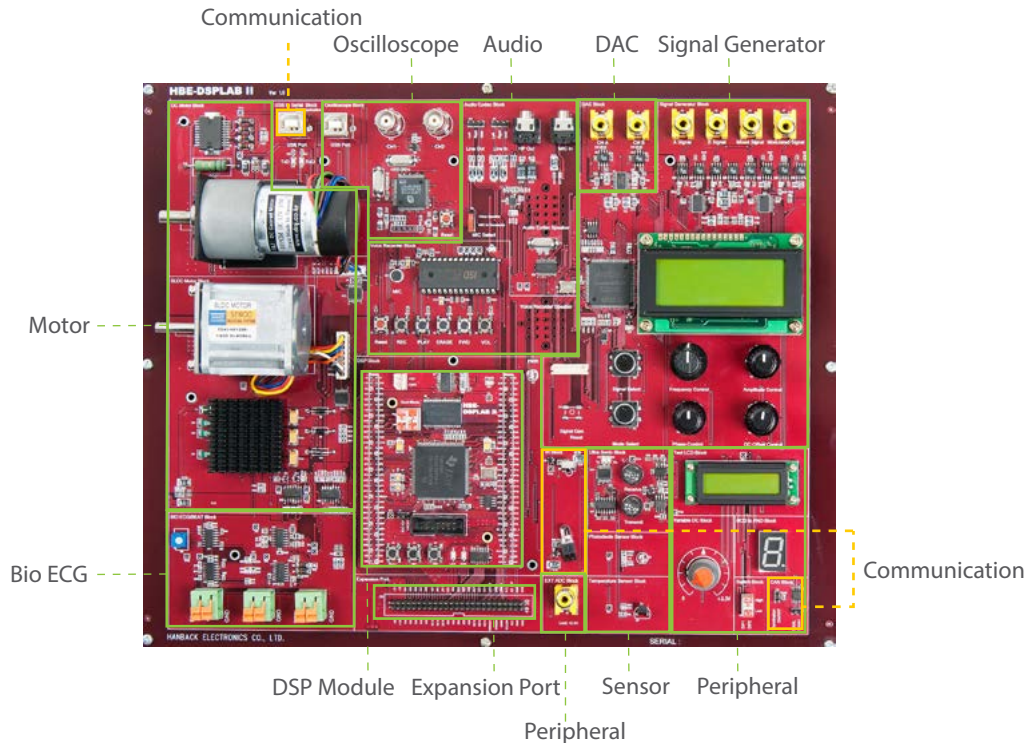- **Provide Emulator**

Features

- Using TMS320F28335 - 32bit Floating-point Operation type device of TI.
- For beginners, Peripheral block is designed to control a simple signal.
- Various control experiments using several type sensors of Photo Diode, Temperature and Ultra Sonic etc.
- Check ECG signal and Beat signal of body through Bio ECG Block.
- Provide internal Waveform Generator(1Hz ~ 100kHz) which outputs Sinusoidal/Triangle/Square wave. User can practice without the additional equipment.
- Provided Audio Codec Block to process external voice signal.
- Provided Mixer Block to output the signal by Mixing Audio signal with Waveform Generator signal.
- Provided Modulation Block to output the signal by Modulation of Waveform Generator signal with the set frequency.
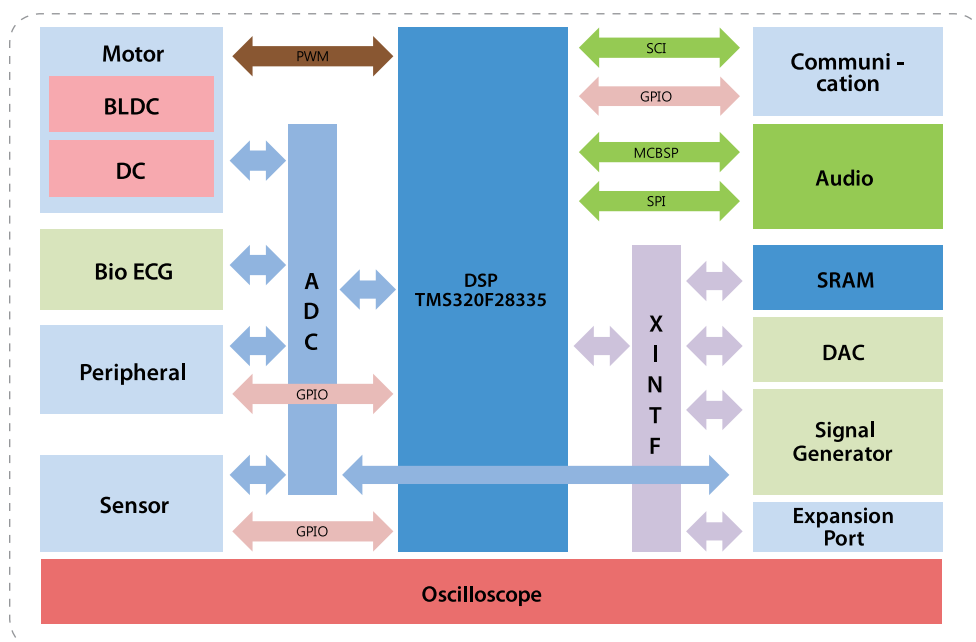- For Motor control study, Provided DC Motor Block and BLDC Motor Block.

Basic Experiment List

1. Program Development Experiment using Code Composer Studio IDE
2. Digital measurement and control Experiment with GPIO
3. Interrupt Experiment
4. ADC measurement control Experiment
5. Communication Experiment : SCI, CAN, I²C, McBSP, SPI
6. Standalone Flash programming
7. Measuring Analog and Digital signal
8. DC motor measurement control
9. BLDC motor measurement control
10. Bio ECG bio signal measurement control
11. FIR and IIR filter Design
12. Composite Signal Filtering
13. Noise Filtering
14. Frequency analysis by FFT
15. Voice Signal Measuring and Signal Processing

Configuration and Names

Communication
Oscilloscope   Audio   DAC   Signal Generator

Motor

Bio ECG

Communication

DSP Module   Expansion Port   Sensor   Peripheral

Peripheral

Block Diagram

Motor		PWM				SCI		Communi-cation
BLDC						GPIO		
DC						MCBSP		Audio
						SPI		
Bio ECG		A D C		DSP TMS320F28335		X I N T F		SRAM
Peripheral								DAC
			GPIO					Signal Generator
Sensor								Expansion Port
			GPIO					
Oscilloscope								

Digital Signal Processing
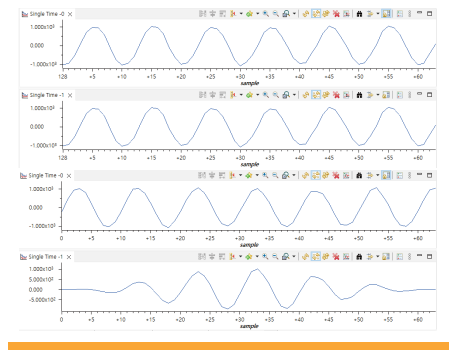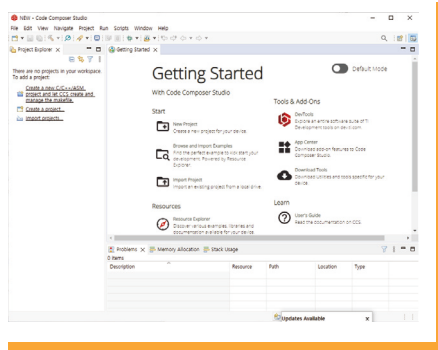## >>HBE-DSPLAB II

Hardware Specifications

Items	Description

DSP Module	DSP : TMS320F28335 Device
	    - High-Performance 32bit CPU
	    - 6 Channel DMA Controller
	    - On-Chip Memory : 256k x 16 Flash, 34k x 16 SARAM
	    - Boot ROM (8k x 16)
	    - 12 Bit ADC, 16 Channel
	SRAM : 1Mbit (64k x 16bit), Switch 2EA, LED 2EA, JTAG port

Peripheral	2pole DIP Switch 1EA BCD to FND 1EA : BCD value to 7-Segment display 16 x 2 Text LCD 1EA : E, RS, 4bit Data Variable DC : 0 ~ + 3.3V variable DC input Ext ADC RCA Port : External 0 ~ +3.3V range Signal input
DAC	2CH, 10MHz speed Digital to Analog Converter per a channel

Signal Generator	Sig A, Sig B, Mixer, Mod : Connected with each signal output RCA port and ADC block of DSP
	
	Text LCD : Set output signal value display
	
	Switch : Output signal set Switch and Initialization Switch
	Waveform Generator : Waveform output set to Sig A, Sig B port
	Waveform : Select of Sine, Triangle, Square waveform
	Frequency : Select of 1, 2, 5, 10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k, 20k, 50k, 100k output frequency
	Amplitude : Select from 0Vp-p to 10Vp-p by 0.5Vp-p unit
	Phase : Select to 345° at intervals of 15°
	Bias : Select of -5V ~ +5V by 0.5V level unit
	
	Mixing Signal : Signal Output from Audio Codec to Mixer port
	    - Audio signal output
	    - Mixing Signal Output of Sig A and Audio signal|
	    - Mixing Signal Output of Sig B and Audio signal
	    - Mixing Signal Output of Audio Signal, Sig A and Sig B
	
	Modulation Signal : Modulation signal output of Sig A or Sig B with Set Frequency to Mod port
	    - Modulation Signal Output of Sig A and Frequency
	    - Modulation Signal Output of Sig B and Frequency
	    - Modulation Signal Output of Mixing signal of Sig A and Sig B and Frequency

Sensor	Photo Diode 1EA, Temperature Sensor 1EA : LM35D, Ultrasonic Sensor 1set : Transmit / Receive Block
Bio ECG	ECG signal and Beat signal Measurement Block, Cable and Measuring Terminal included for Measurement
Communication	CAN Transfer Block, IR Transmit /Receive Block, USB to Serial Block : Serial Communication Block
Motor	DC Motor Block : +12V DC Geared/Encoder Motor, DC Motor Drive Block, PWM control, Encoder input BLDC Motor Block : +12V Brushless DC Motor, BLDC Motor Drive Block, 3 phase PWM control, Hall Sensor input, Sensorless control
Audio	Voice Recorder : SD1760P, 60 seconds recoding (8kHz Sampling), Reset, Record, Play, Erase, Forward, Volume Switch MIC. input speaker output (connected to MIC In of Audio Codec) Audio Codec : TLV320AIC23, MIC in, HP Out Connector, Line IN, Line Port, Can be used for input source
Oscilloscope	2 CH, ±16V measuring range, 500kHz Sampling Speed, PC monitor by USB communication
Expansion Port	Address, Data and Control signal of DSP module connected External expansion port
Power	+5V, +12V, -12V, +3.3V SMPS Power (50W)
Size	336 mm x 273 mm (except a bag)

* Specifications can be changed without notice

Software Specifications

•**Code Composer Studio 12.1 Program Test Environment**

Programming Environment using Code Composer Studio

Real Time Data Check using Code Composer Studio

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Components

HBE-DSPLAB II

User's Manual and Platform USB

ECG PAD

USB cable
(A to B Type)

AC Power cable

RCA cable

DSP JTAG and Cable

ECG Probe Cable

Oscilloscope Probe Cable