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1/3Φ 1KW MINI IPM BASED INVERTERS

We offer 4 types of Inverters, listed below, based on 15A, Mini IPM using IGBT & SiC and 2 types of PWM Controllers: i. ARDUINO Based FPGA CYCLONE 10 PWM Controller ii. DUAL CORE DELFINO BASED DEVELOPMENT BOARD (MICRO 28377D).

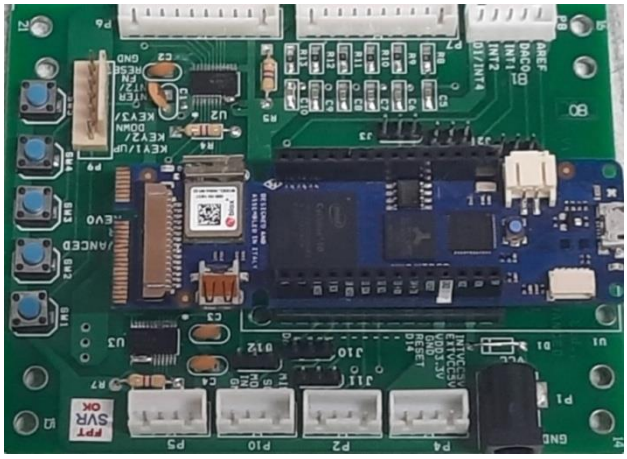
-1/3ϕ IGBT Mini IPM based Inverter with built in Controller (Vdr-inv01-igbt).
- 1/3ϕ SiC Mini IPM based Inverter with built in Controller (Vdr-inv01-SiC)
-1/3ϕ IGBT Mini IPM based Inverter with External Controller (Vdr-inv02-igbt)
-1/3ϕ SiC Mini IPM based Inverter with External Controller (Vdr-inv02-SiC)

1. 1/3ϕ Mini IPM based Inverter with built in Controller (Vdr-inv01-igbt) & (Vdr-inv01-SiC)

This Inverters trainer consists of a IGBT or SiC Based Mini Intelligent Power Module and a built in PWM Controller and can be used to build i. 1Ø Inverter ii. 3Ø Inverter iii. DC Chopper iii. Speed Control of AC Motor iv. Speed Control of DC Motor v. Speed Control of BLDC Motor vi. Speed Control of PMSM Motor.

i. ARDUINO Based FPGA CYCLONE 10 PWM Controller.

As Arduino based embedded Controller become more awareness among students, Vi Micro has designed another innovative PWM Controller based on Arduino Vidor 4000 Controller, which provide a Cortex M0+ Microcontroller and a Cyclone 10 FPGA to build many Power Electronics Applications.



The Arduino Vidor 4000 is used to build this PWM Controller, which consists of one Cortex M0+ Microcontroller and Intel Cyclone10 FPGA.

Features:

- Based on Arduino Vidor with FPGA & 32 bit Cortex M0+ Embedded Controller.
- FPGA: Intel Cyclone 10CL016
- Digital I/O Pins: 22 headers + 25 Mini PCI Express
- UART, SPI, I2C
- Memory: Flash :2 MB, SDRAM: 8MB
- Clock Speed: 48 MHz - up to 200 MHz
- Microcontroller: Cortex-M0+ 32bit ARM MCU
- Digital I/O Pins: 8 nos.
- PWM Pins: 6 no
- Memory: Flash: 256KB, SDRAM: 32KB
- Analog Inputs: 6 no, 12bit
- Analog Outputs: 1 no, 10bit
- Clock Speed: 48MHz – 200Mhz.

Carrier Board Features:

- 6-nos of Analog Inputs are terminated at P2 connector
- 12 bit, 350Ks/s
- 1-no of Digital to Analog is terminated at P5 connector
- 6 PWM Signals terminated at P3 Connector
- 3-nos of Capture are terminated at P4 connector for sensor interfacing.
- Buffer Provided for the PWM and Capture signals
- RS232 - Com Port interface with PC
- 20X4 Alphanumeric LCD Display fixed in the Front Panel.
- 4 Push Type Switches for user applications and fixed in the Front Panel.

ii. 3Φ IGBT Based Mini IPM Power Circuit. (Vmipm- Lcd01)

The Power Circuit of this Trainer consists of Six Numbers of IGBT with gate driver in a Single Chip Called Mini Intelligent Power Module. & pwm isolator IC'S. The PWM signals are given from the **ARDUINO Based FPGA CYCLONE 10 PWM Controller**. It can be used for high voltage single phase / Three phase inverter, chopper, motor control applications

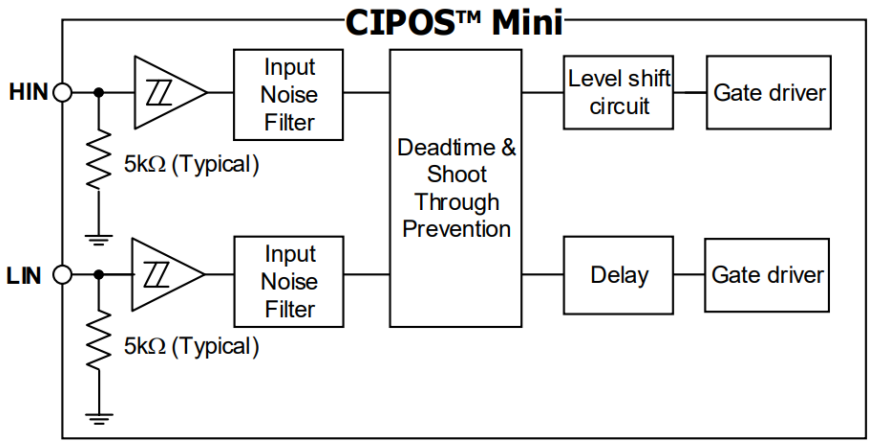
* Six Numbers of High speed opto - isolator provided for PWM isolation
* Power Circuit : One Number of IGBT based Mini IPM - IGCM15F60GA (6 IGBT- 3 Legs)-with suitable snubber circuit & Heat sink provided .
* Rating of device is 600V@ 15AMP
* Isolated +15 Vdc@1amp provided for control ic's
* One number of Single phase diode rectifier (600V, 35Amp) with filter capacitor provided for input ac rectification and for power circuit input with fuse protection
* One number of Analog voltmeter provided for DC-Link voltage measurement.
* Four Number of Hall Effect current sensors provided for output current & DC-Link Current Measurement & Protection
* Four number of op-amp signal conditioner circuit provided for all current sensors & output terminated in front panel for current wave form measurement.
* Over current Trip circuit provided for Over Load protection.
* One number of LED provided to indicate TRIP Status
* One number of Reset Switch provided to reset the Trip Function
* Six Numbers of banana connector termination provided in power circuit Input & external load interface
* 12 Numbers of test points provided in control section for wave form measurement in CRO

* All are mounted in attractive powder coated cabinet with front panel sticker with mimic diagram indication.
* 230V AC input, one number of power on / off switch with indication.

iii. 3Φ SiC Based Mini IPM Power Circuit. (Vmipm- Lcd02)

The Power Circuit of this Trainer consists of Six Numbers of SiC with gate driver in a Single Chip Called Mini Intelligent Power Module, fully isolated Dual In-Line molded module with 1200 V MOSFET & PWM isolator IC's . The PWM Signals are given from the **ARDUINO Based FPGA CYCLONE 10 PWM Controller**. It can be used for high voltage single phase / Three phase inverter, chopper, motor control applications

* Six Numbers of High speed opto - isolator provided for pwm isolation
* Power Circuit : One Number of SiC based Mini IPM (6 SiC MOSFET - 3 Legs) with suitable snubber circuit & Heat sink provided .
* Rating of device is 1200V@ 15AMP
* Isolated +15 Vdc@1amp provided for control ic's
* One number of Single phase diode rectifier (1200V, 35Amp) with filter capacitor provided for input ac rectification and for power circuit input with fuse protection
* One number of Analog voltmeter provided for DC-Link voltage measurement.
* Four Number of Hall Effect current sensors provided for output current & DC-Link Current Measurement & Protection
* Four number of op-amp signal conditioner circuit provided for all current sensors & output terminated in front panel for current wave form measurement.
* Over current Trip circuit provided for Over Load protection.
* Improved heat dissipation › Rugged 1200 V SOI gate driver technology , Integrated bootstrap functionality , Over current shutdown , Independent temperature thermistor , Under-voltage lockout at all channels, Low side pins accessible for all phase current monitoring
* One number of LED provided to indicate TRIP Status
* One number of Reset Switch provided to reset the Trip Function
* Six Numbers of banana connector termination provided in power circuit Input & external load interface
* 12 Numbers of test points provided in control section for wave form measurement in CRO
* All are mounted in attractive powder coated cabinet with front panel sticker with mimic diagram indication.
* 230V AC input, one number of power on / off switch with indication.



2. 1Φ/3Φ Mini IPM based Inverter with external controller (Vdr –inv02-igbt) & (Vdr-inv02-SiC)

This trainer consists of a IGBT or SiC Based Mini Intelligent Power Module with an External PWM Controller and can be used to build

I. 1Φ Inverter
II. 3Φ Inverter
III. DC Chopper
IV. Speed Control of AC Motor
V. Speed Control of DC Motor
VI. Speed Control of BLDC Motor
VII. Speed Control of PMSM Motor

a. 3Φ IGBT BASED Mini IPM POWER MODULE (Vmipm-106B)

This module consists of Six Numbers of IGBT with gate driver in A Single Chip Called Mini Intelligent Power Module. & PWM isolator IC'S. The PWM signals are given from an external **PWM Controller** :**DUAL CORE DELFINO BASED DEVELOPMENT BOARD (MICRO 28377D).** It can be used for high voltage single phase / three phase inverter, chopper, motor control applications.

Features

* Six Numbers of High speed opto - isolator provided for pwm isolation
* Power Circuit : One Number of IGBT based Mini IPM - IGCM15F60GA (6 IGBT- 3 Legs)-with suitable snubber circuit & Heat sink provided .
* Rating of device is 600V@ 15AMP
* Isolated +15vdc@1amp provided for control ic's
* One number of Single phase diode rectifier (600V, 35Amp) with filter capacitor provided for input ac rectification and for power circuit input with fuse protection
* One number of Analog voltmeter provided for DC-Link voltage measurement.
* Four Number of Hall Effect current sensors provided for output current & DC-Link Current Measurement & Protection
* Four number of op-amp signal conditioner circuit provided for all current sensors & output terminated in front panel for current wave form measurement.
* Over current Trip circuit provided for Over Load protection.
* One number of LED provided to indicate TRIP Status
* One number of Reset Switch provided to reset the Trip Function
* Six Numbers of banana connector termination provided in power circuit Input & external load interface
* One numbers of 34 pin & 1 no of 26 Pin FRC connectors provided for External PWM Controller Interface.
* 10 Numbers of test points provided in control section for wave form measurement in CRO
* All are mounted in attractive powder coated cabinet with front panel sticker with mimic diagram indication.
* 230V AC input, one number of power on / off switch with indication.

SPECIFICATION :

Power circuit input	:	230V AC / 300V DC@ 4amp (externally)
Power Circuit Output	:	Suitable for 1HP AC/DC/BLDC/PMSM motor
PWM input	:	6 Numbers of PWM – 5VDC level
Protection	:	5Amp.

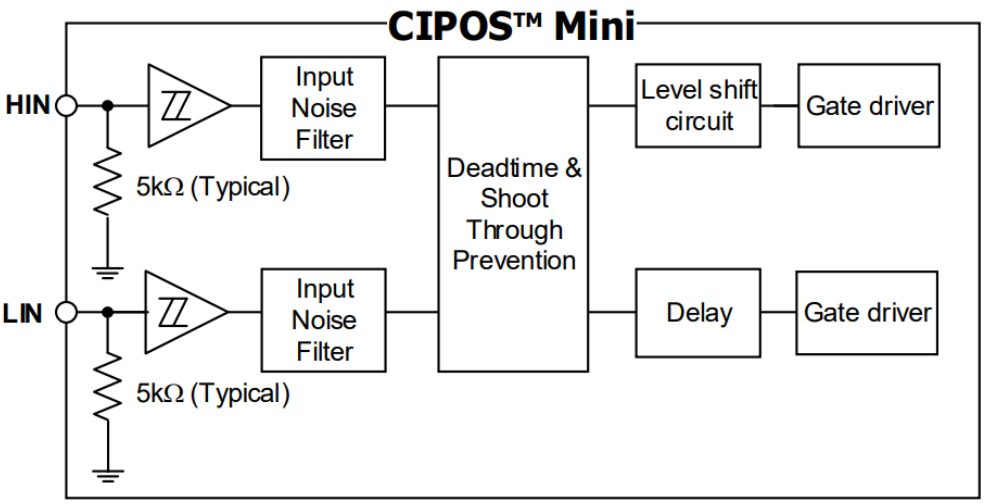
b. 3Φ SiC BASED Mini IPM POWER MODULE (Vmipm-106C)

This module consists of Six Numbers of SiC with gate driver in A Single Chip Called Mini Intelligent Power Module. & PWM isolator IC'S. Fully isolated Dual In-Line molded module with 1200 V CoolSiC MOSFET. The PWM signals are given from an external **PWM Controller** :**DUAL CORE DELFINO BASED DEVELOPMENT BOARD (MICRO 28377D).** It can be used for high voltage single phase / three phase inverter, chopper, motor control applications.

Features

* Six Numbers of High speed opto - isolator provided for pwm isolation
* Power Circuit : One Number of SiC based Mini IPM (6 SiC MOSFET- 3 Legs)- with suitable snubber circuit & Heat sink provided .
* Rating of device is 1200V@ 15AMP
* Isolated +15 Vdc@1amp provided for control IC's
* One number of Single phase diode rectifier (1200V, 35Amp) with filter capacitor provided for input ac rectification and for power circuit input with fuse protection
* One number of Analog voltmeter provided for DC-Link voltage measurement.
* Four Number of Hall Effect current sensors provided for output current & DC-Link Current Measurement & Protection
* Four number of op-amp signal conditioner circuit provided for all current sensors & output terminated in front panel for current wave form measurement.
* Over current Trip circuit provided for Over Load protection.
* Improved heat dissipation › Rugged 1200 V SOI gate driver technology , Integrated bootstrap functionality , Over current shutdown , Independent temperature thermistor , Under-voltage lockout at all channels, Low side pins accessible for all phase current monitoring
* One number of LED provided to indicate TRIP Status
* One number of Reset Switch provided to reset the Trip Function
* Six Numbers of banana connector termination provided in power circuit Input & external load interface
* One numbers of 34 pin & 1 no of 26 Pin FRC connectors provided for External PWM Controller Interface.
* 10 Numbers of test points provided in control section for wave form measurement in CRO
* All are mounted in attractive powder coated cabinet with front panel sticker with mimic diagram indication.

* 230V AC input, one number of power On / Off switch with indication.



SPECIFICATION :

Power circuit input	:	230V AC / 300V DC@ 4amp (externally)
Power Circuit Output	:	Suitable for 1HP AC/DC/BLDC/PMSM motor
PWM input	:	6 Numbers of PWM – 5VDC level
Protection	:	5Amp.

b. DUAL CORE DELFINO BASED DEVELOPMENT BOARD (MICRO 28377D)

The Micro-28377D Trainer kit is intended and developed for advanced closed-loop control applications for Power electronics, Smart grid etc.., It is also focused for students to learn the multi-processor architecture and the inter processor communication mechanisms. The inbuilt peripherals of the processor lead to uncomplicated design for the developers in the emerging technology.

Features:

Dual- Core 32-bit Delfino fixed point Processor
Operating Speed: 200MHz (For each core)
32-bit floating-point unit (FPU) which supports floating point operations
Trigonometric Math Unit (TMU) to speed up the execution of trigonometric operations
Viterbi, Complex Math, and CRC Unit II (VCU-II) to accelerate the performance of FFT's and communications-based algorithms
Two CLA real-time control co-processors that run at the same speed as the main CPU's
Parallel processing capability effectively doubles the computational performance
1MB (512KW) of onboard flash memory with error correction code (ECC)
204KB (102KW) of SRAM
16 Channels (16-bit/12-bit at 1.1 MSPS/3.5 MSPS) Successive Approximation ADCs
16 Enhanced PWM outputs, 6 Enhanced Capture Inputs
3 (12-bit) Buffered DACs
2 SDFM with 8 Input Channels and PWM synchronization
External memory interface 16/32 bit support
192 dedicated PIE vectors
MCU/DSP balancing code density & execution time
Single cycle read-modify-write instruction.

ON Board Features:

- 16 Numbers of user LEDs
- 2 Numbers of Limit Switches for user interface
- 4 Numbers of Push-Button Micro Switches
- 1 SPDT Switch for user interface
- 20 × 4 Alphanumeric LCD
- 256MB of SDRAM
- Quadrature Encoder Interface
- Opto-isolated USB Interface
- Opto-isolated USB to Serial Interface
- Opto-isolated on board USB to JTAG Emulator
- PWM Outputs and Capture Inputs are terminated at 34-pin FRC connector
- 16 Channel ADC inputs are terminated at 26-pin FRC connector with buffered and protection
- DAC outputs and sigma Delta ADC inputs are terminated in screw type connector.
- External Emulator facility.
- Compatible with MATLAB SIMULINK

3Φ Resistive and Motor Loads for the above 4 Types of Inverters.

1. One number of 3Φ, 500W Resistive load

THREE PHASE LOADING RHEOSTAT

MODEL : PEC HV AC- C1C

- ∗500W rating
- *Three phase input
- ∗Different selector switch provided for current Selection
- ∗Fuse provided for input protection
- ∗All are mounted on a moveable cabinet
- ∗Banana connector provided for load input

2a. 1 HP DC SHUNT MOTOR – SPRING BALANCE LOAD SET UP WITH PROXIMITY SENSOR

MAKE: Vi Microsystems
MODEL: PEC16MO-DC-P1-00

This set up consists of (1) DC Shunt Motor (2) mechanical spring balance load set-up (3) **PROXIMITY SENSOR**

DC MOTOR SPECIFICATIONS:

#	Power	:	1HP(.75KW)
#	Armature voltage	:	180VDC, 5.1Amp
#	Field voltage	:	220VDC, 0.3Amp
#	Speed	:	1500 rpm
#	Double side shaft extension.		
#	Make	:	BENN/ Equivalent

b. 1 HP THREE PHASE AC MOTOR – SPRING BALANCE LOAD SET UP WITH PROXIMITY SENSOR

MAKE : Vi Microsystems
MODEL : PEC16MO-SQ-P1-00

This set up consists of one number of (1) three phase AC Motor (2) mechanical spring balance load set-up (3) **PROXIMITY SENSOR**

AC MOTOR SPECIFICATIONS :

- # Three phase squirrel cage induction motor.
- # Power : 1hp(.75kw)

Current : 1.8A, star connection
Three phase 415VAC, 50Hz input
Speed : 1440 rpm
Make : Siemens/BENN
PROXIMITY SENSOR

c. 1HP BLDC MOTOR – SPRING BALANCE LOAD SETUP

MAKE : Vi Microsystems
MODEL : PEC16MO-BL-H1-8P

Rated Power - 940W
Phase - 3φ Input
Rated Voltage - 310 VDC
Rated current - 4A
Rated Torque - 3Nm
Rated Speed - 3000 RPM
No. of poles - 8 Poles
Position Sensor - Hall effect A, B, & C
Back EMF - Trapezoidal EMF
Supplied by - Vi Microsystems (Imported Motor)

d. 1HP PMSM MOTOR – SPRING BALANCE LOAD SET UP

MAKE : Vi Microsystems
MODEL : PEC16MO-PS-Q1-4P

Speed - 3000RPM (Max)
Rated Voltage - 200-230 VAC / 3 Phase
Rated current - 2.7 A
Rated Torque - 2.39 N-M

Power - 1 HP (750W)
Speed/Position Feedback – Rotary Encoder 512 PPR/Quadrature Encoder
Rotor pole - 4 Poles
Phase - 3φ
Back EMF - Sinusoidal
Spring balance load setup