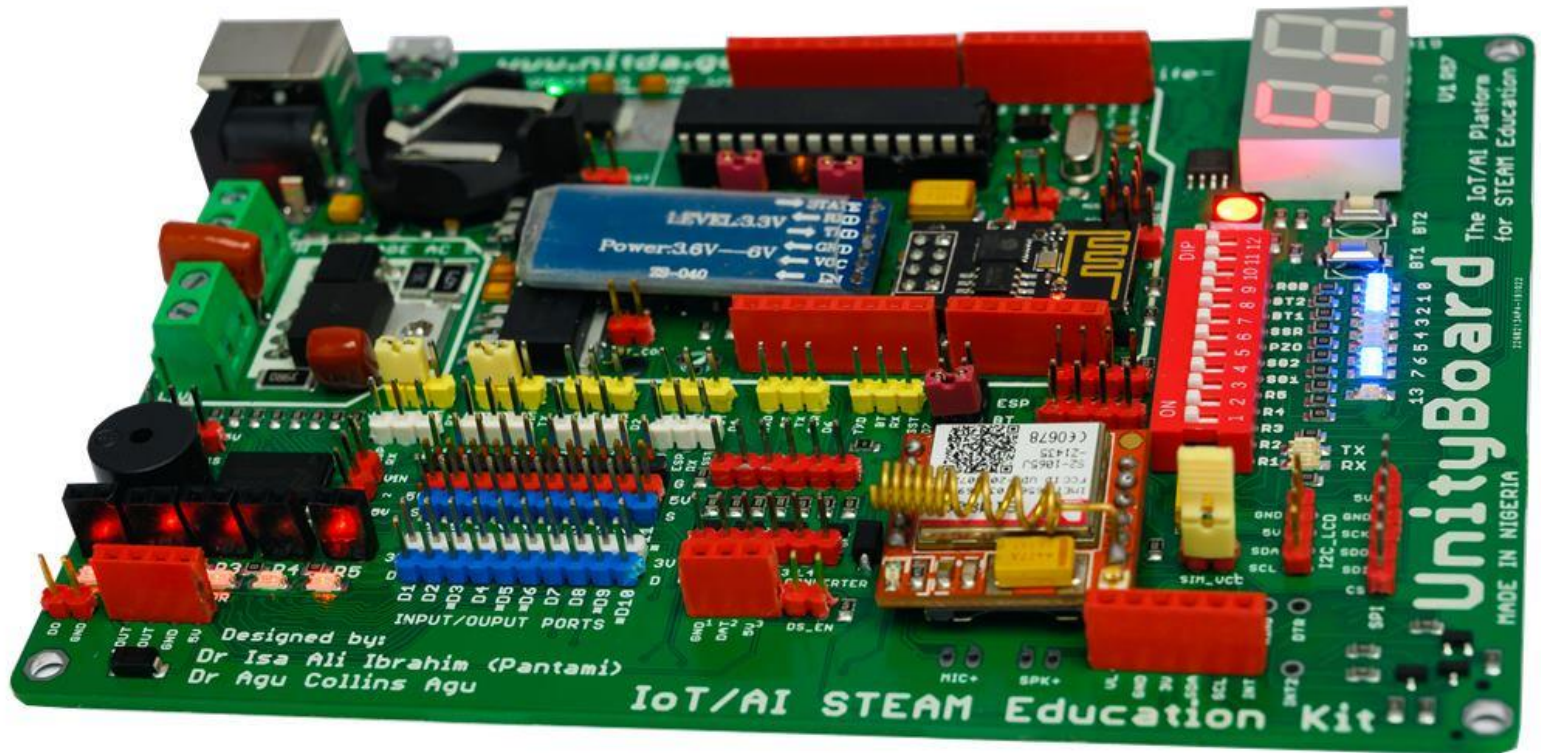


Specifications and Features of Unity Board

-A NITDA Research and Innovation Product for developing world class IT research and educational solutions to meet the unique IT needs of Nigeria-



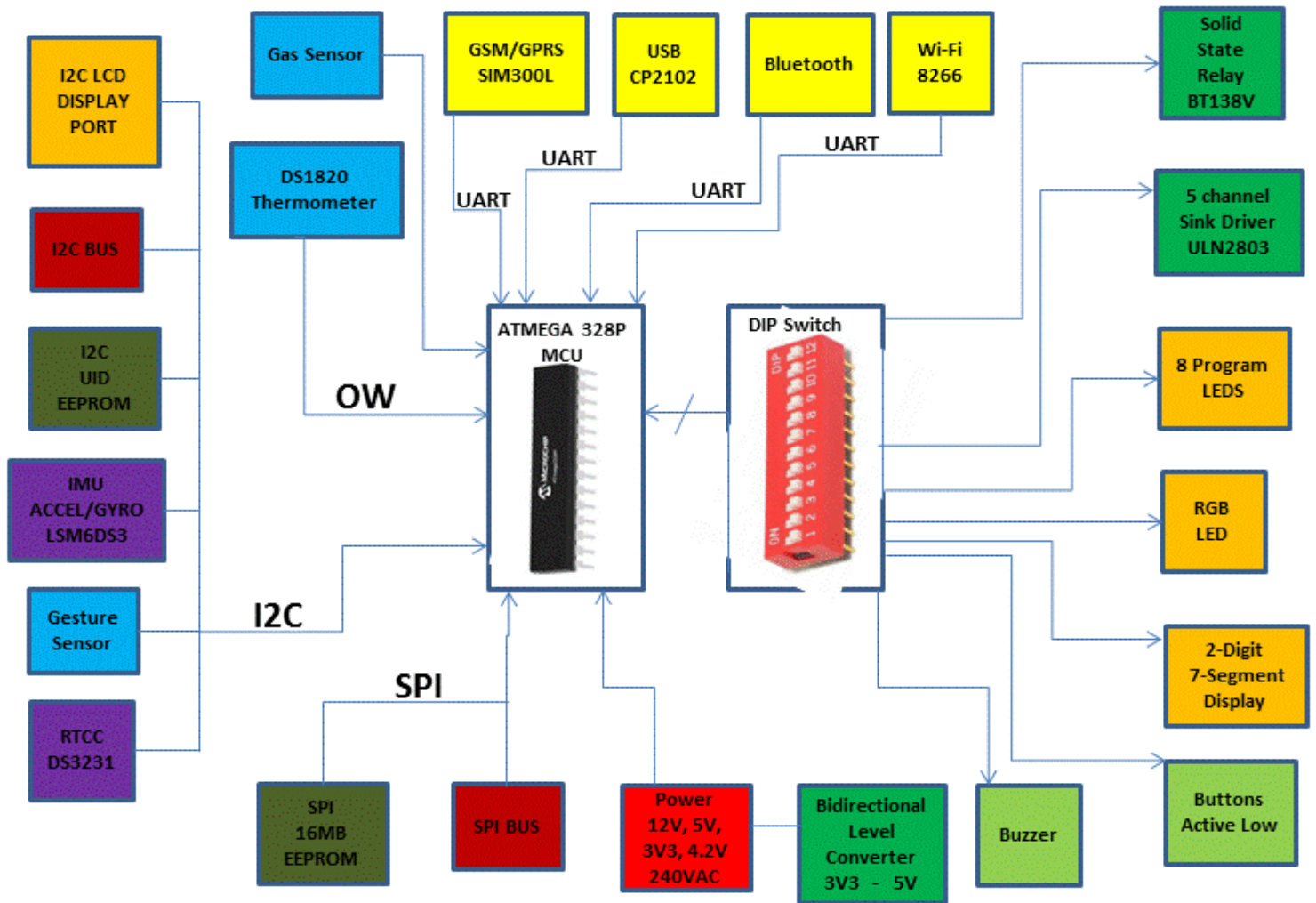
Applications:

Learning embedded programming, developing and testing firmware
Security Systems
Early Warning System for flooding & oil spillage
Pipeline Protection
SCADA
Tracking Systems & Fleet Management
Data Acquisition Systems
Grid/Infrastructure Monitoring, Environment Monitoring, etc)
Smart Cities

Manufacturer: td4pai IoT Hub, Kuje, FCT. NIGERIA

UNITY BOARD - IoT/AI Steam Education kit

BLOCK DIAGRAM OF UNITY BOARD

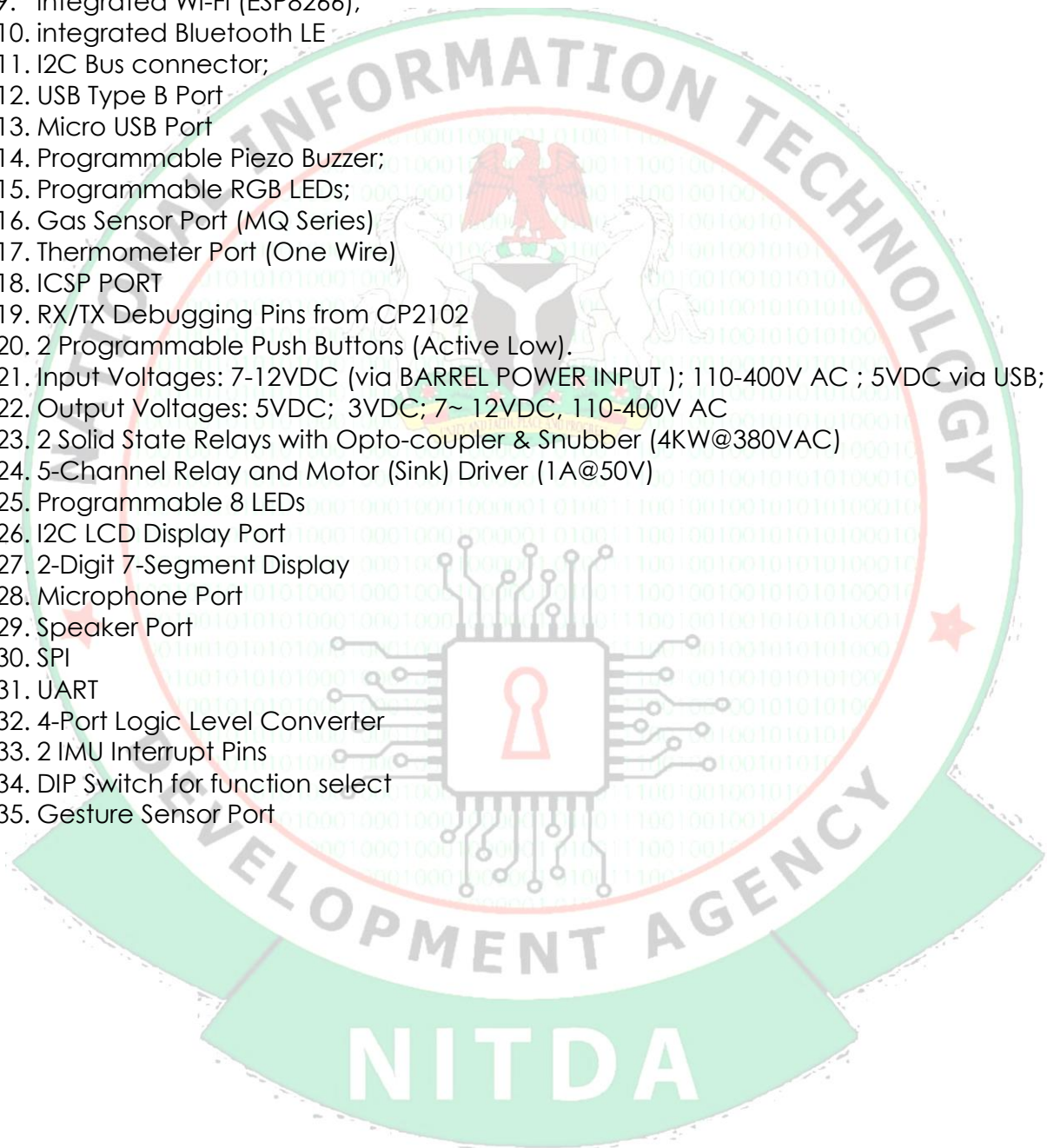


Specifications

PCB layers: 2
 Dimensions: 150mm x 113mm x 1.6mm
 Copper Weight: 1 oz
 Material Details: FR4-Standard Tg 130-140C
 Surface Finish: HASL
 PCB Colour: Green
 Flying Probe Test: Fully Tested
 PCBA (mix): SMT & THT

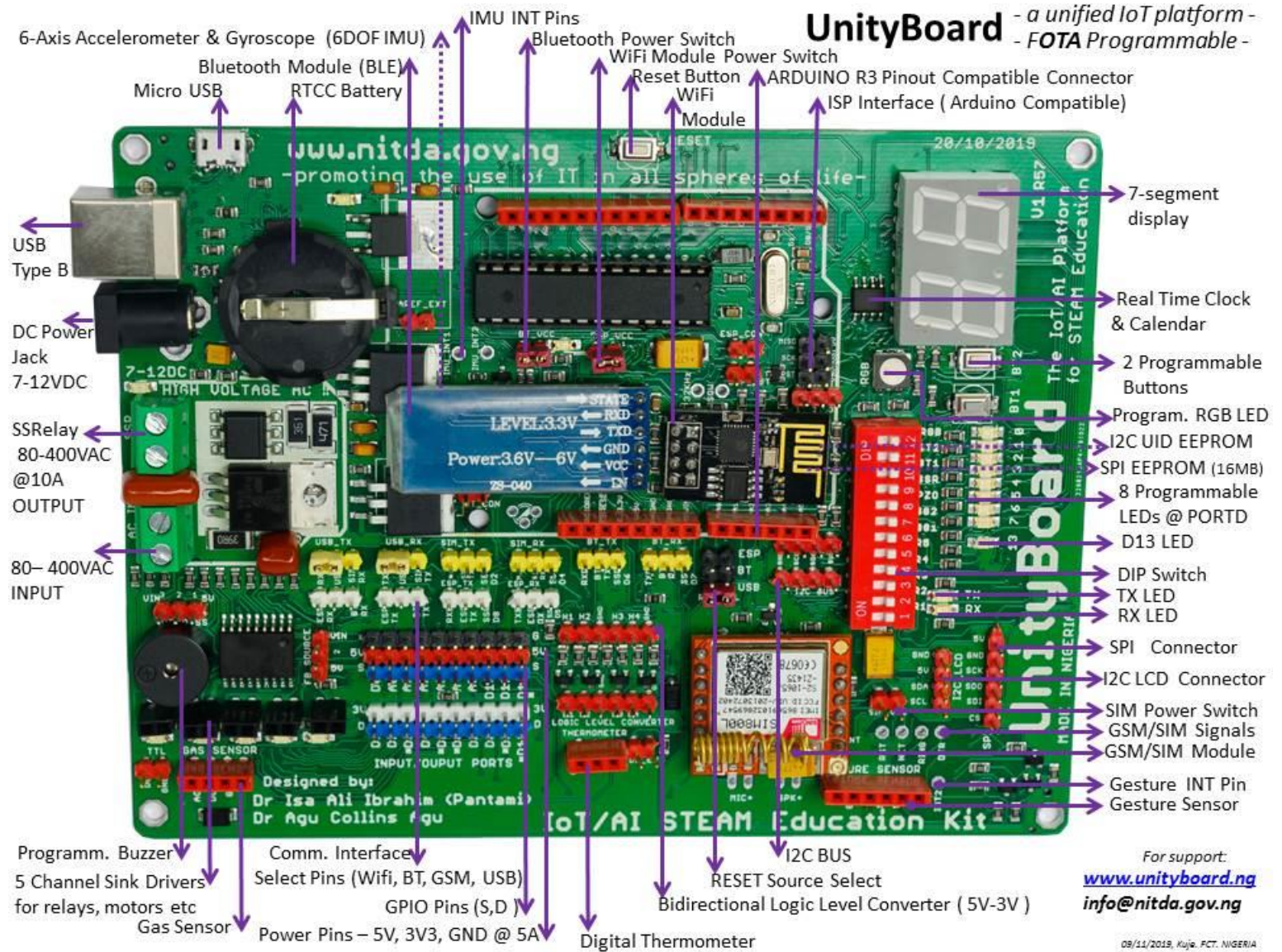
1. Microcontroller: ATmega328P
 Operating Voltage: 5V
 Input Voltage: 7-12V
 Digital I/O Pins: 14
 PWM Digital I/O Pins: 6
 Analog Input Pins: 6
 DC Current per I/O Pin: 20 mA
 DC Current for 3.3V Pin: 3A
 DC Current for 5V Pin: 3A
 Flash Memory: 32 KB (ATmega328P)
 SRAM: 2 KB (ATmega328P)
 EEPROM: 1 KB (ATmega328P)
 Clock Speed: 16 MHz

2. 2Mbit EEPROM (OFF-CHIP MEMORY COULD BE USED AS ANTI-COUNTERFEIT MEASURE TO PROTECT THE BOARD)
3. 128MBit SPI Serial EEPROM – Can store 32 000 fingerprints
4. Real-time Clock & Calendar (RTCC) with backup battery holder
5. 6-DOF Inertia measurement Unit (IMU)
6. OTA capability
7. Arduino compatible pins (R3 Shield Compatible)
8. integrated GSM/GPRS Module;
9. integrated Wi-Fi (ESP8266);
10. integrated Bluetooth LE
11. I2C Bus connector;
12. USB Type B Port
13. Micro USB Port
14. Programmable Piezo Buzzer;
15. Programmable RGB LEDs;
16. Gas Sensor Port (MQ Series)
17. Thermometer Port (One Wire)
18. ICSP PORT
19. RX/TX Debugging Pins from CP2102
20. 2 Programmable Push Buttons (Active Low).
21. Input Voltages: 7-12VDC (via BARREL POWER INPUT); 110-400V AC ; 5VDC via USB;
22. Output Voltages: 5VDC; 3VDC; 7~ 12VDC, 110-400V AC
23. 2 Solid State Relays with Opto-coupler & Snubber (4KW@380VAC)
24. 5-Channel Relay and Motor (Sink) Driver (1A@50V)
25. Programmable 8 LEDs
26. I2C LCD Display Port
27. 2-Digit 7-Segment Display
28. Microphone Port
29. Speaker Port
30. SPI
31. UART
32. 4-Port Logic Level Converter
33. 2 IMU Interrupt Pins
34. DIP Switch for function select
35. Gesture Sensor Port



BOARD LAYOUT

UnityBoard - a unified IoT platform -
- FOTA Programmable -



For support:
www.unityboard.ng
info@nitda.gov.ng

09/11/2019, Kufu, FCT, NIGERIA

COMPETITIVE MATRIX

	FEATURES	UnityBoard	Libelium WASPMOTE	FlyportPRO	Ublox C027	ARDUINO YUN	Raspberry Pi
1	Microcontroller	Atmel ATmega328P @16MHz	ATmega1281	PIC 24FJ256GB206	ARM Cortex M3	ATmega32u4	BROADCOM SoC
2	SPI EEPROM 32MB	YES	TBD	TBD	TBD	NO	NO
3	I2C UID EEPROM	YES	YES	YES	YES	NO	NO
4	Realtime Clock & Calendar (RTCC)	YES	YES	YES	NO	NO	NO
5	6-Axis Accelerometer & Gyroscope 6-DOF Inertia	YES	NO	NO	NO	NO	NO

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	measurement Unit (IMU)							
6	Bi-directional 3V3 to 5V Logic Level Converter	YES	NO	NO	NO	NO	NO	NO
7	Arduino Compatible pins (R3 Shield Compatible)	YES	NO	NO	YES	YES	NO	NO
8	integrated GSM/GPRS Module;	YES	NO	NO	YES	NO	NO	NO
9	integrated WiFi (ESP8266);	YES	NO	YES	YES	NO	YES	NO
10	integrated BlueTooth LE	YES	NO	NO	NO	NO	NO	NO
11	I2C Bus;	YES	NO	NO	NO	NO	NO	NO
12	USB Type B Connector	YES	NO	NO	NO	YES	NO	NO
13	Programmable Buzzer;	YES	NO	NO	NO	NO	NO	NO
14	Programmable RGB LED;	YES	NO	NO	NO	NO	NO	NO
15	Programmable 8x LEDs	YES	NO	NO	NO	NO	NO	NO
16	I2C LCD Display CONNECTOR	YES	NO	NO	NO	NO	NO	NO
17	Programmable 2-Digit 7-Segment Display	YES	NO	NO	NO	NO	NO	NO
18	Microphone input;	YES	NO	NO	NO	NO	NO	NO
19	Speaker output;	YES	NO	NO	NO	NO	NO	NO
20	2 Programmable Push Buttons (Active Low).	YES	NO	NO	NO	NO	NO	NO
21	INPUT VOLTAGES: 12V DC (via BARREL POWER INPUT); 80-400V AC	YES	NO	NO	NO	NO	NO	NO
22	Output Voltages: ~ 12V, 110-400V AC	YES	NO	NO	NO	NO	NO	NO
23	Gas Sensor Connector	YES	NO	NO	NO	NO	NO	NO
24	Digital Thermometer connector	YES	NO	NO	NO	NO	NO	NO
25	Gesture Sensor Connector	YES	NO	NO	NO	NO	NO	NO
26	1 Solid State Relays with Opto-coupler & Snubber (4KW@380VAC)	YES	NO	NO	NO	NO	NO	NO
27	Driver for Soft Relay (7KW@380VAC)	YES	NO	NO	NO	NO	NO	NO
28	5-Channel Relay and Motor (Sink) Driver	YES	NO	NO	NO	NO	NO	NO

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29	DIP Switches for activating/de-activating on-board peripherals.	YES	NO	NO	NO	NO	NO
30	Micro USB Connector	YES	YES	TBD	TBD	TBD	YES
31	SPI Pinout	YES	YES	YES	YES	YES	YES
32	UART	YES	YES	YES	YES	YES	YES

UNITY BOARD PERIPHERAL MAPPING

s/N	Peripherals/Functions	ARDUINO Equivalent Pins	Comm. Protocol	DIP Switch Position	Jumper Position	Remarks
1	Realtime Clock & Calendar (DS3231)	SDA = A4 ; SCL = A5	I2C	NONE	NONE	Device Address:
2	Serial Memory (24AA256UID)	SDA = A4 ; SCL = A5	I2C	NONE	NONE	Device Address:
3	16MB MEMORY (MX25L12845GM2I-08G)	D8 (CS); D11 (MOSI); D12(MISO); D13 (SCK)	SPI	NONE	WP = OPEN	
4	IMU _ Accelerometer & Gyroscope (LSM6DS3)	SDA = A4 ; SCL = A5	I2C	NONE	NONE	Device Address:
5	Gesture Sensor (APDS-9960) The APDS-9960 is a multipurpose sensor that can be used for Ambient Light, RGB Sensing, Proximity Sensing, and Gesture Detection	SDA = A4 ; SCL = A5	I2C	NONE	NONE	Device Address:
6	Thermometer (DS1820)	D9	OW	NONE	DS_EN= Closed	Device Address:
7	Gas Sensor (MQ series)	A1	Analog	NONE	TTL=OPEN	Device Address:
8	Buttons (BT1) Active Low	D2	Digital	DIP.10=ON	None	None
9	Buttons (BT2) Active Low	D3	Digital	DIP.11=ON	None	None
10	Buzzer (Passive)	D5	Digital	DIP.8=ON	PIEZO_SS = Middle & 5V Pins CLOSED ; FB_SOURCE = Middle & 5V Pins CLOSED	None

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11	RGB LED	RED = D9 ; GREEN = D10 ; BLUE = D11	Digital (PWM)	DIP.12=ON	
12	8 LEDs	LED0 =D0; LED1 = D1; LED2 = D2; LED3 = D3; LED4 = D4; LED5 = D5; LED6 =D6; LED7 = D7	Digital	DIP.12=ON	
13	2-Digit 7-Segment Display (Segment 1)	G = D0; F = D1; E = D2; D = D3; C = D4; B = D5; A = D6; DP = D8 ; Seg1 = A2	Digital	DIP.6=ON	
14	2-Digit 7-Segment Display (Segment 2)	G = D0; F = D1; E = D2; D = D3; C = D4; B = D5; A = D6; DP = D8 ; Seg2 = A3	Digital	DIP.7=ON	
15	Solid State Relay-BT138V (240VAC)	A0	Digital (PWM)	DIP.9=ON	
16	Sink Drivers (ULN2803)	R1=D6; R2=D9; R3=D10; R4=D11; R5=A1	Digital	R1=DIP.1=ON ; R2=DIP.2=ON; R3=DIP.3=ON; R4=DIP.4=ON; R5=DIP.5=ON	
17	WiFi (ESP8266)	Connections to the MCU Software Serial Receive (SSR D8) = D8 ; Software Serial Transmit (SST D5) = D5	UART (9600)	ESP_TX = ESP_TX & SSR D8=CLOSED : ESP_RX = ESP_RX & SST D5=CLOSED ; ESP_VCC=CLOSED	DIP Switch =ALL OFF
18	Bluetooth	Connections to the MCU Software Serial Receive (SSR D6) = D6 ; Software Serial Transmit (SST D7) = D7	UART (115200)	BT_TX = BT_TX & SSR D8=CLOSED : BT_RX = BT_RX & SST D7=CLOSED ; BT_VCC=CLOSED	DIP Switch =ALL OFF
19	GSM/GPRS	Connections to the MCU Software Serial Receive (SSR D2) = D2 ; Software Serial Transmit (SST D4) = D4	UART (9600)	SIM_TX = SIM_TX & SSR D2 Pins=CLOSED : SIM_RX = SIM_RX & SST D4 Pins=CLOSED ; VCC_SIM=CLOSED	DIP Switch =ALL OFF

20	Programming using the USB interface		UART (115200)	USB_TX=RXD & USB Pins = CLOSED : USB_RX=TXD & USB Pins=CLOSED : RST_SEL= USB Pins=CLOSED	DIP Switch =ALL OFF
21	OTA Programming via BLE		UART (115200)	BT_TX=RXD & BT_TX Pins = CLOSED : BT_RX=TXD & BT_RX Pins=CLOSED : RST_SEL= BT Pins=CLOSED	DIP Switch =ALL OFF

Endorsement and Award of Honour to NITDA by Federal Ministry of Education

The National Information Technology Development Agency (NITDA) won the Education Technology Development Agency of 2020 award for developing the Unity Board, an Indigenous Education Technology Platform for STEAM Education at EdTech Summit organised by the Federal Ministry of Education in collaboration with AFRITEX on March, 2020 at the International Conference Centre in Abuja. Nigeria.

