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Project Report For  
**“ARDUINO DAY 2021”**

<b>Problem Statement:</b>	IoT Based Digital Notice Board using Node MCU (ESP 8266)
<b>Probable Discipline:</b>	Electronics & Communication
<b>College Name:</b>	Sal Institute of Technology and Engineering Research
<b>College Code:</b>	067
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## CHAPTER 1. SYNOPSIS ABSTRACT

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Node MCU is an open-source IoT platform, it includes firmware which runs on the ESP8266 Wi-Fi soc which makes the Node MCU a good choice for the IoT Application. As most of the digital notice board prefer LED technology for display. We decided to use An LED Matrix, it is formed by Arrangement of LEDs in rows and columns to form a Matrix which is driven by 74HC595 shift register daisy chain and 4017-decade counter. Column scanning is done by 74HC595 Shift Registers, Shift Register has 8 bits serial-in, serial or parallel-out shift register with output latches. Row scanning is done by the 4017-decade counter. A decade counter is a circuit in which each of the chip outputs is turned on, one at a time, sequentially or in succession. The User will open the IP address using the Wi-Fi on his mobile or computer which will show An HTML website opens with an input text box, The LED Matrix will show the result as inserted into the text box.

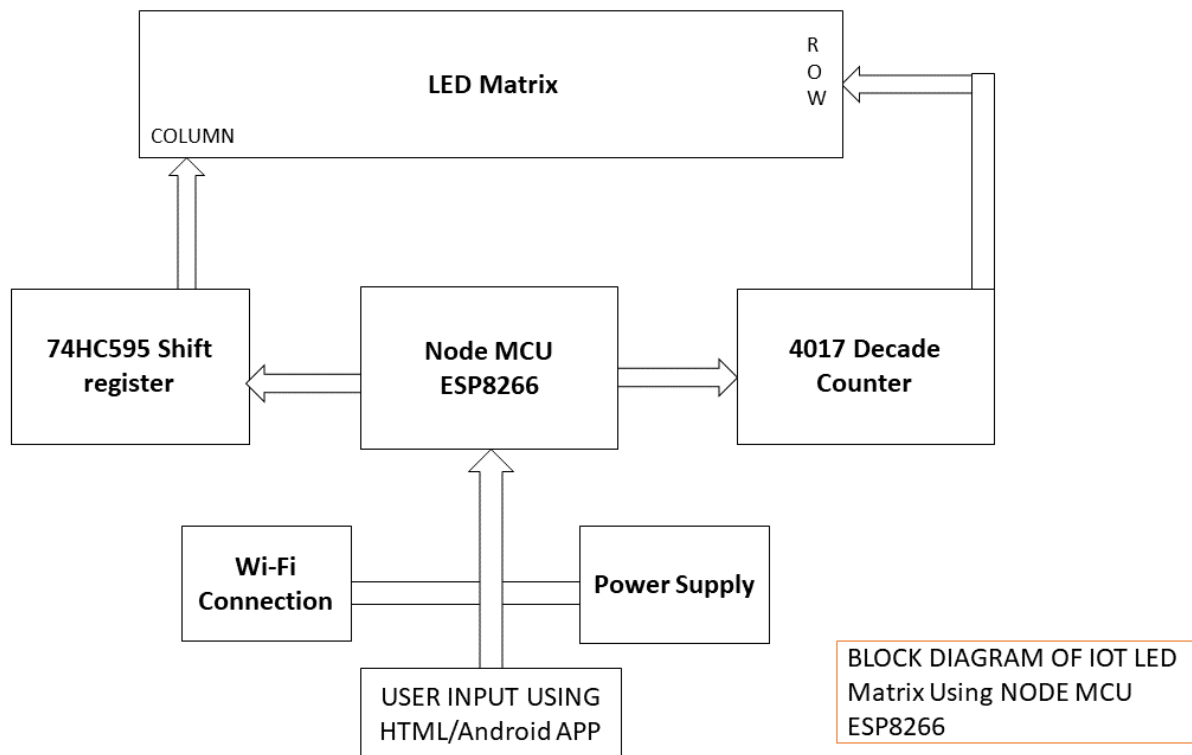
## CHAPTER 2. BLOCK DIAGRAM

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For Column using 74HC595 Shift Register.

For Row using the 4017 Decade Counter.

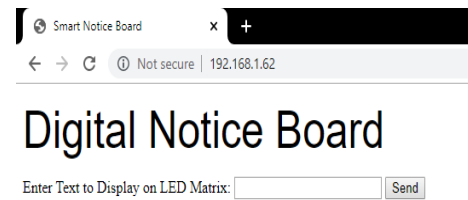
3.3/5 V Power Supply.



## CHAPTER 3. FLOW DIAGRAM



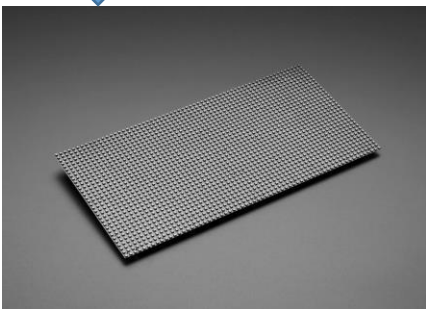
**COMPUTER/MOBILE**



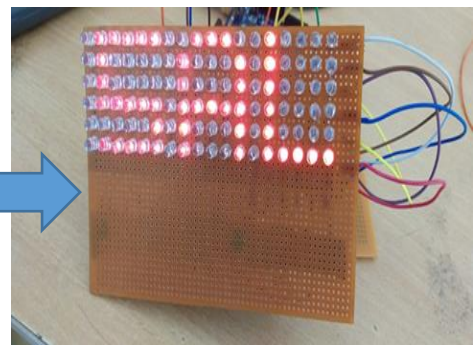
**HTML WEBPAGE**



**Wireless Communication (Wi-Fi)**



**LED Matrix**



**Message Display**

## CHAPTER 4. COMPONENTS LIST & DESCRIPTION

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### 1. LEDs

- A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it.

### 2. 4017 Decade Counter

- A decade counter is a circuit in which each of the chip outputs is turned on, one at a time, sequentially or in succession.

### 3. 74HC595 Shift Register

- 74HC595 is an "8-bit serial-in, serial or parallel-out shift register with output latches; 3-state." we can use it to control 8 outputs at a time while only taking up a few pins on the microcontroller.

### 4. 2N3904 Transistors

- The 2N3904 is a common NPN bipolar junction transistor used for general-purpose low-power amplifying or switching applications. It is designed for low current and power, medium voltage, and can operate at moderately high speeds.

### 5. Node MCU (8266)

- Node MCU is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes firmware, which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware, which is based on the ESP-12 module.

## 6. General Purpose Board

- General-purpose PCB's are widely used to embed circuits randomly for running of hardware. Its layer is coated with copper and allows proper soldering without any short circuit.

## 7. Resistors

- resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses

## 8. Female and Male Headers

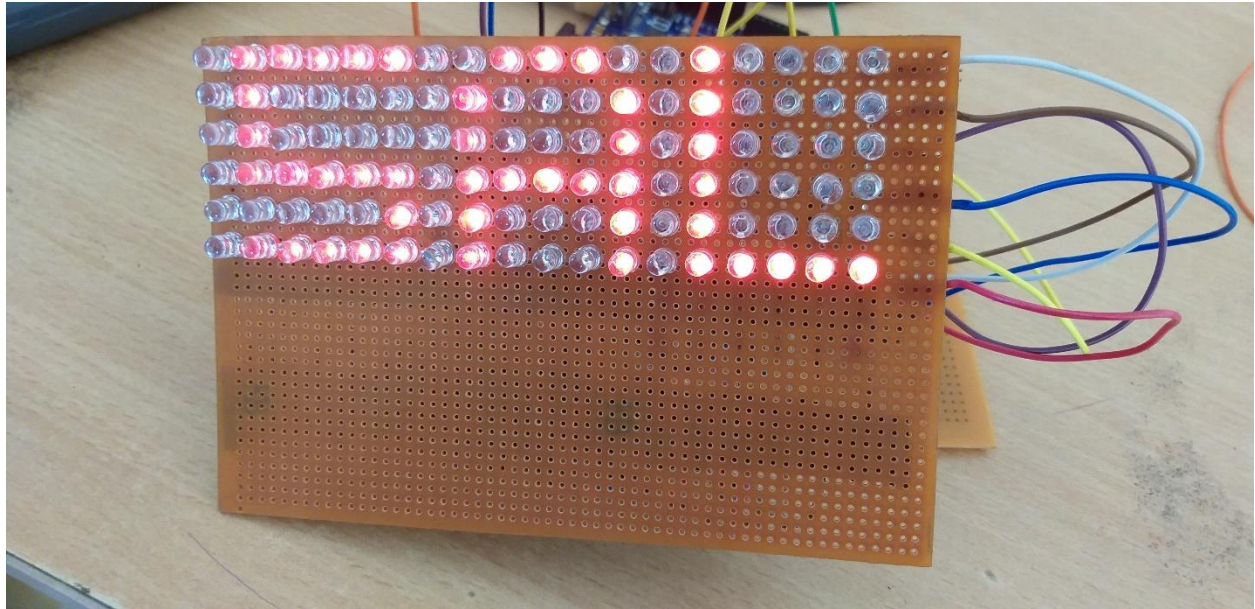
- A pin header is a form of electrical connector.

## 9. A Wi-Fi Connection



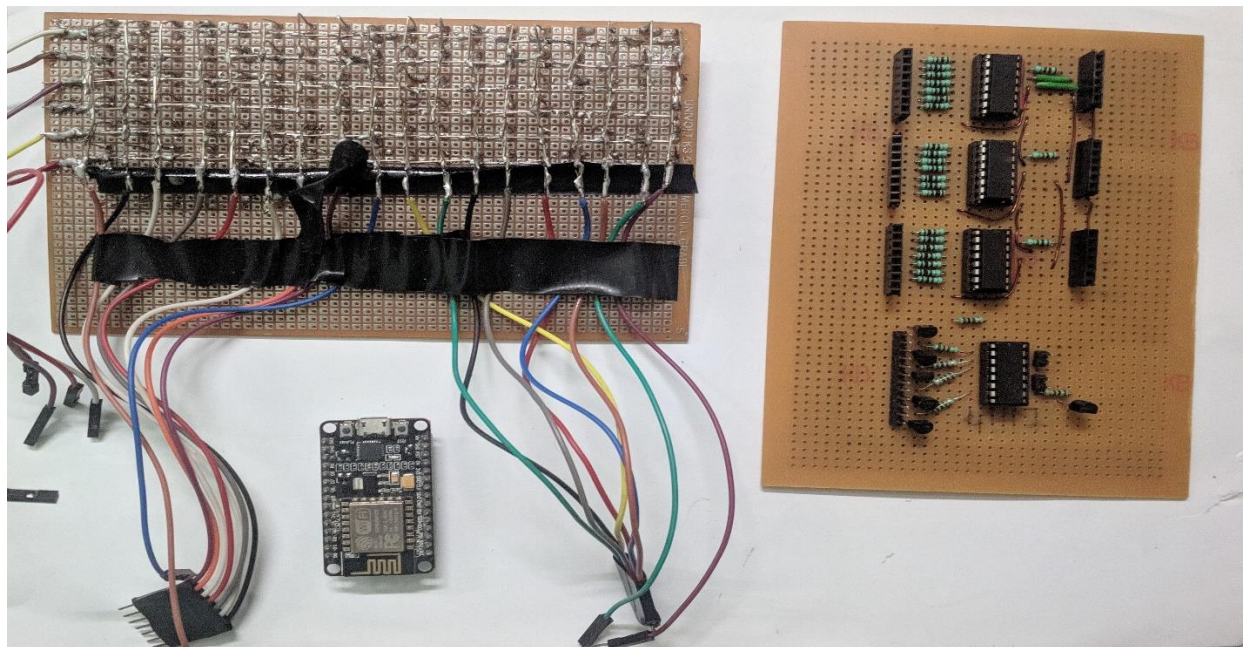
## CHAPTER 5. RESULTS

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(SAL)

**Front View**



**Back View**

## CHAPTER 6. ADVANTAGES & DISADVANTAGES

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### ❖ Advantages

1. We can update our signboard with the use of programming
2. Quick Updates or a Fix can be possible.
3. Economical Efficient for the larger Matrix.
4. Power Efficient.
5. Easy to Operate.
6. The number LED in the matrix can be expanded with the simple addition of Shift register & Decade Counter IC.
7. All Components are easily available.
8. Does not require any special components.
9. Easy to install & Does not require more space.
10. Updates can be made wirelessly.
11. Brightness can be adjusted.
12. Special Characters or Symbols can be coded manually.

### ❖ Disadvantages

1. Requires PC at the time of debugging.

## **CHAPTER 7. FUTURE SCOPE**

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- The LED matrix can be increased with Demands using 74HC595 Shift registers and 4017 Decade Counter.
- External Power Supply Can be used up to 12V.
- The RGB or Color Matrix can be made with the help of an RGB LED.
- The Brightness can be adjusted by the use of the PWM method or by the use of resistors.
- For More Robust Approach PCB layout can be made.
- Use of Sound or Vocal with the scrolling of text.

## APPENDIX (COMPONENT'S DATA SHEETS)

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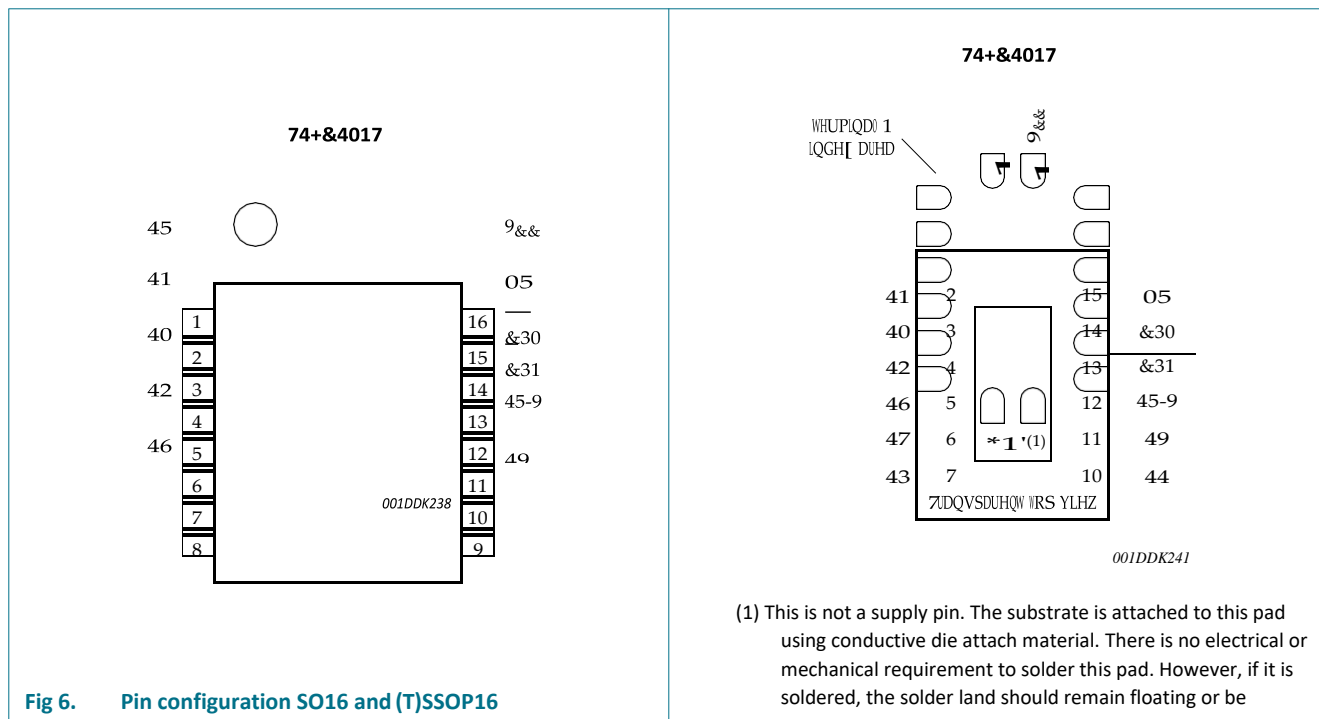
### 5 mm Round White LED

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#### Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Continuous Forward Current	I <sub>F</sub>	30	mA
Peak Forward Current (Duty /10 @ 1KHZ)	I <sub>FP</sub>	100	mA
Reverse Voltage	V <sub>R</sub>	5	V
Operating Temperature	T <sub>opr</sub>	-40 ~ +85	°C
Storage Temperature	T <sub>stg</sub>	-40 ~ +100	°C
Soldering Temperature (T=5 sec)	T <sub>sol</sub>	260 ± 5	°C
Power Dissipation	P <sub>d</sub>	100	mW
Zener Reverse Current	I <sub>z</sub>	100	mA
Electrostatic Discharge	ESD	4K	V

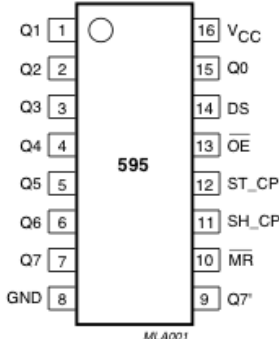
## 4017 Pin Information



## Pin description

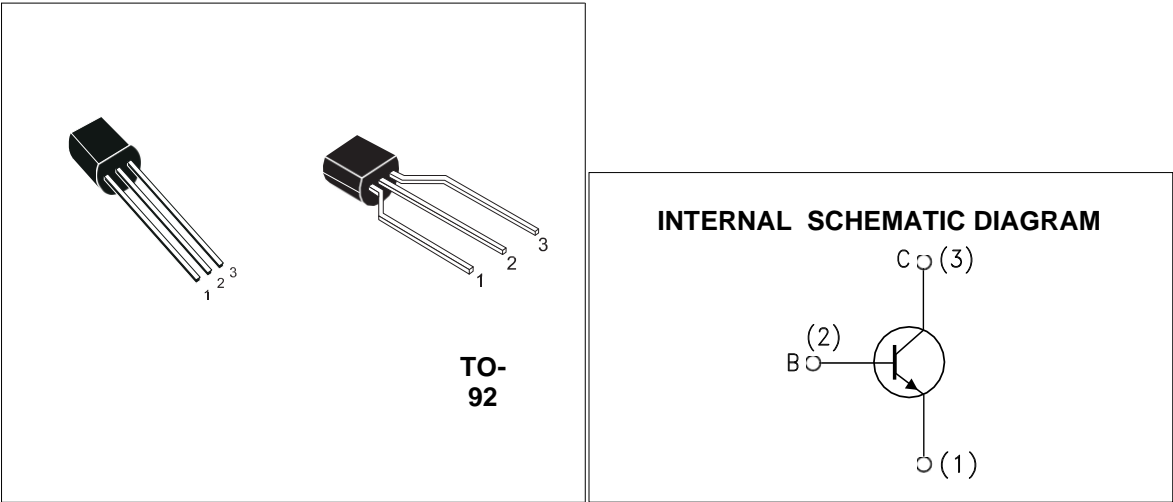
Symbol	Pin	Description
Q[0:9]	3, 2, 4, 7, 10, 1, 5, 6, 9, 11	Decoded output
GND	8	Ground (0 V)
Q5-9	12	Carry output (active LOW)
CP1	13	Clock input (HIGH-to-LOW edge-triggered)
CP0	14	Clock input (LOW-to-HIGH edge-triggered)
MR	15	Master reset input (active HIGH)
V <sub>CC</sub>	16	Supply voltage

## 74HC595 Shift Register

	PINS 1-7, 15	Q0 " Q7	Output Pins
	PIN 8	GND	Ground, Vss
	PIN 9	Q7"	Serial Out
	PIN 10	MR	Master Reclear, active low
	PIN 11	SH_CP	Shift register clock pin
	PIN 12	ST_CP	Storage register clock pin (latch pin)
	PIN 13	OE	Output enable, active low
	PIN 14	DS	Serial data input
	PIN 16	Vcc	Positive supply voltage

		MIN	NOM	MAX	UNIT
VCC	Supply voltage	2	5	6	V
VIH	High-level input voltage	VCC = 2 V		1.5	V
		VCC = 4.5 V		3.15	
		VCC = 6 V		4.2	
VIL	Low-level input voltage	VCC = 2 V		0.5	V
		VCC = 4.5 V		1.35	
		VCC = 6 V		1.8	
VI	Input voltage	0		VCC	V
VO	Output voltage	0		VCC	V
t <sub>tr</sub> /t <sub>tf</sub>	Input transition rise/fall time	VCC = 2 V		1000	ns
		VCC = 4.5 V		500	
		VCC = 6 V		400	
TA	Operating free-air temperature	-55		125	°C

# 2N3904 Transistors

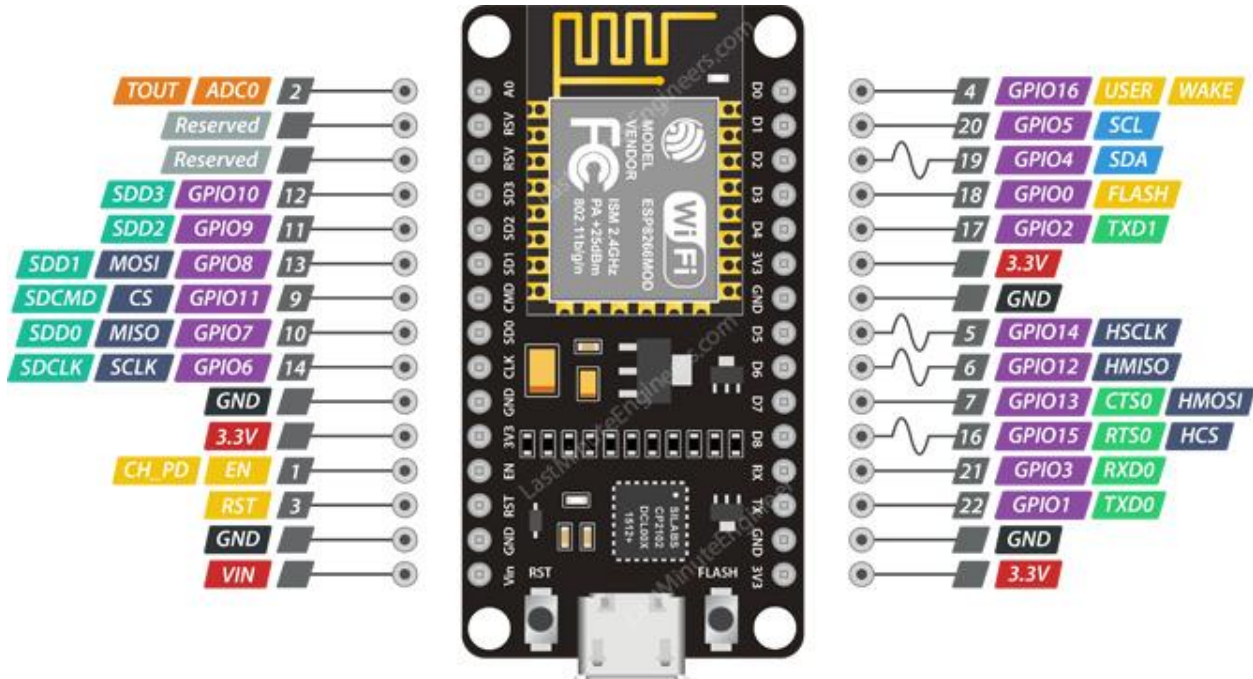


## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
VCBO	Collector-Base Voltage ( $I_E = 0$ )	60	V
VCEO	Collector-Emitter Voltage ( $I_B = 0$ )	40	V
VEBO	Emitter-Base Voltage ( $I_C = 0$ )	6	V
$I_C$	Collector Current	200	mA
$P_{tot}$	Total Dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	625	mW
$T_{stg}$	Storage Temperature	-65 to 150	$^{\circ}\text{C}$
$T_j$	Max. Operating Junction Temperature	150	$^{\circ}\text{C}$



## Node MCU ESP8266



- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 Mhz
- Wi-Fi: IEEE 802.11 b/g/n:
- Integrated TR switch, balun, LNA, power amplifier and matching network WEP or WPA/WPA2 authentication, or open networks