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ABSTRACT

Traditionally, routers require manual intervention for power cycling and rebooting by physically accessing the power supply or using smart plugs with Wi-Fi control. Some advanced routers provide remote reboot options via software interfaces which depends on an active network connection, that may not always be available during network failures. For users with routers placed in hard-to-reach locations, such as mounted high on walls, inside cabinets, or in secured enclosures, manual intervention becomes inconvenient. The primary limitation of existing solutions is the lack of simple, hardware-based method to control the router's power when network access is unavailable. The smart plugs and network-based solutions rely on internet connectivity, which can be disrupted during power failures or software malfunctions. Additionally, physically accessing the router in difficult-to-reach locations increase the maintenance challenges in the system. Hence, the users require a more reliable, direct-control mechanism that does not depend on Wi-Fi or cloud-based services.

To address the challenge in router an IR-based remote power control system for routers is proposed. The proposed system integrates an IR sensor on the router's power supply and an IR transmitter in a handheld remote control. The user can send IR signals to turn the router on/off or reboot it without direct physical access. Unlike smart plugs or network-based solutions, the system provides a standalone, independent power control without relying on an active internet connection. The infrared communication ensures a simple and cost-effective implementation, requiring minimal modifications to existing hardware. The proposed system will be beneficial for home users, office environments, and industrial setups where router placement is non-optimal for manual access. The router with IR sensor system improves convenience, reduces downtime, and enhances network maintenance efficiency without complex networking dependencies. Future enhancements may include integrating RF based remote control for extended operational flexibility.

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS

Abbreviation	Full Form
IR	Infrared
PCB	Printed Circuit Board
IC	Integrated Circuit
DC	Direct Current
AC	Alternating Current
IPR	Intellectual Property Rights
OEM	Original Equipment Manufacturer
Wi-Fi	Wireless Fidelity
LED	Light Emitting Diode
IoT	Internet of Things

CHAPTER 1

INTRODUCTION

1.1 Background of the Existing Product

Routers are vital devices in any network, providing data routing, connectivity, and communication across multiple devices. They are designed to remain powered on continuously to ensure uninterrupted internet access. However, like all electronic devices, routers may occasionally encounter malfunctions, overheating, or require reboots to restore optimal performance. In most households and enterprises, rebooting a router involves manually disconnecting and reconnecting the power cable, which can be inconvenient, especially when the router is installed in hard-to-reach places or used in smart home environments where automation is preferred.

Currently, the majority of commercially available routers lack any integrated system for remote power cycling. While smart plugs and IOT devices offer some degree of control, they introduce extra cost, require internet access to function, or rely on third-party ecosystems. In scenarios where minimal cost, offline control, and simplicity are desired, these solutions may not be suitable. Hence, there is a gap in the market for a simple, cost-effective, and user-friendly method to manually control the power state of a router from a distance.

1.2 Problem Statement

Manual rebooting of routers is a frequent requirement for troubleshooting connectivity issues, resolving latency problems, or applying certain configuration changes. However, having to physically access the router every time to power cycle it becomes impractical in several cases:

- When routers are mounted on walls, ceilings, or placed in enclosed spaces.
- When users are not technically equipped to handle power connections.
- In office or lab environments where router access is restricted or shared.

There is no built-in method in most routers for remote on/off control, which leads to inefficiency, especially during minor troubleshooting or controlled resets. Moreover, dependence on internet-based smart devices for power control becomes a paradox when the router itself is offline. Therefore, a locally controllable, low-cost remote power control system is necessary.

1.3 Need for Improvement

The demand for convenient and localized power control for networking devices is growing with the rise in home automation and remote device management. Current solutions are either:

- Too costly for small or personal setups.
- Dependent on the internet (which may not be available if the router is down).
- Lacking the simplicity required for a plug-and-play setup.

To bridge this gap, there is a need for an integrated, offline, and non-internet dependent mechanism to control the router's power state. An Infrared (IR) based remote switching system is a promising and low-complexity solution that uses easily available components and can be added to existing router hardware without major redesign.

This approach improves accessibility, offers independence from internet-based ecosystems, and reduces the time and effort required to reboot routers. Moreover, it provides a budget-friendly solution for home users, educational labs, and embedded systems enthusiasts.

1.4 Objectives of the Project

- To design and implement an IR-based remote switching mechanism for powering a router on and off.
- To integrate an IR sensor and control circuit with the router's power supply system without altering its core networking functions.
- To ensure safe and reliable power switching through electronic components like relays, transistors, or opto-isolators.
- To design the system in a way that is non-intrusive, low-cost, and easy to deploy on existing routers.
- To demonstrate a proof-of-concept prototype that operates reliably through IR commands within an acceptable range and angle.

1.5 Expected Outcomes

- A working IR remote-controlled power switch module integrated into a router's power supply line.
- A user-friendly mechanism to power on/off the router using a standard or custom IR remote.
- Demonstrated improvement in convenience for users during network troubleshooting, especially in inaccessible or mounted environments.
- A low-cost, scalable hardware solution that can be adapted for other electronic devices with similar needs.
- A design that does not rely on Wi-Fi or internet connectivity, making it usable even when the router is offline.
- Schematics, simulation results, and hardware implementation supporting the feasibility of integrating such a feature into future consumer routers or DIY retrofit kits.

CHAPTER 2

REVERSE ENGINEERING STUDY

2.1 Selection of Existing Product

The selected product for reverse engineering is the Tenda N301 Wireless N300 Router, a budget-friendly wireless networking device commonly used in residential and small office environments. It supports wireless speeds of up to 300 Mbps on the 2.4 GHz band, and includes three Fast Ethernet ports one WAN and two LAN for wired connectivity.

This router was selected due to its:

- Wide market availability
- Compact and accessible internal design
- Simple hardware layout, ideal for analysis and potential hardware-based improvements

Figure 1: (Tenda N301 Wifi router)

2.2 Functional Analysis

The Tenda N301 router is primarily responsible for:

- Wireless Access Point functionality, enabling client devices to connect to the network.

- Routing and Network Address Translation (NAT) to allow multiple devices to share one public IP address.
- DHCP services to automatically assign IP addresses to connected clients.
- Web-based configuration interface for adjusting settings like SSID, password, DHCP scope, and firewall.

Internally, the router includes essential components that handle:

- Wireless signal processing and management
- Packet routing and switching logic
- Memory storage for configuration and firmware
- Voltage regulation and basic power filtering

2.3 Engineering and Material Study

System-on-Chip (SoC): QCA9535

At the heart of the router lies the Qualcomm Atheros QCA9535 SoC, which integrates:

- A 32-bit MIPS 24Kc CPU core
- Wireless radio (802.11b/g/n, 2.4 GHz)
- Five-port Fast Ethernet switch
- PCIe and GPIO interfaces

This SoC handles the majority of router operations, including wireless and wired networking, and is optimized for low-cost consumer routers.

Flash Memory

The router includes NOR flash memory, typically an 8 MB SPI chip (often from manufacturers like Winbond or Macronix). This component stores the firmware, bootloader (u-boot), and configuration files. It is non-volatile and retains data even when the router is powered off.

RAM

The onboard SDRAM (usually 32MB or 64MB) provides temporary memory for the running operating system and processes. It is volatile and clears on power-off. This is typically a single-chip solution (e.g., Nanya or EtronTech).

Oscillator: ECCE 25000JOGO

The 25.000 MHz crystal oscillator (ECCE 25000JOGO) provides the system clock required for synchronous digital logic operations. It ensures the timing accuracy for data transmission and processing within the router's SoC and wireless modules.

Power Transistor: D20601 G

This SMD transistor is part of the router's power regulation and switching section. It is likely used for voltage switching or protection in the DC input section.

Voltage Regulation

Internally, the router uses Low Drop-Out (LDO) regulators and step-down buck converters to provide stable 3.3V and 1.2V power rails to the SoC, RAM, and other components from the 9V external adapter.

Figure 2: (Internal Structure of Tenda N301)

Antennas and RF Front-End

The router includes:

- Two 5dBi detachable/non-detachable antennas.

- Internal RF filters, baluns, and power amplifiers matched to the 2.4 GHz frequency band.

PCB and Materials

- FR4 substrate PCB: Used due to its strength, flame resistance, and good dielectric properties.
- Solder mask and silk screen for labeling and insulation.
- Copper traces for signal and power distribution

2.4 Performance Study

The Tenda N301, in its unmodified state, provides:

- Stable wireless speeds up to 300 Mbps (actual throughput typically ~80–100 Mbps).
- Strong indoor range due to its dual 5dBi antennas.
- Fast boot-up time (~20–30 seconds).
- Reliable DHCP and NAT performance for small LANs (up to 5–10 active devices).

Limitations noted during testing:

- Slight heating after prolonged use, especially in poorly ventilated areas.
- Requires manual restart during firmware hangs or connectivity drops.
- No hardware reset options beyond physical button and power removal.

2.5 User Experience Analysis

User feedback and surveys indicate:

- Satisfaction with basic performance, setup simplicity, and coverage.
- However, frustrations arise during connectivity issues, where users must physically unplug and replug the router to reset it.
- A significant portion of users have routers mounted on walls or placed in enclosed cabinets, making access inconvenient.
- Many users desire a manual remote reset method without relying on smartphone apps or internet access which becomes unusable during an outage.

2.6 Issues and Limitations in the Existing System

Through reverse engineering and user analysis, several limitations in the Tenda N301 router were identified:

- No support for remote or automated power control.
- Requires manual intervention during resets or configuration reboots.
- Lacks GPIO or expansion ports for direct hardware extensions or automation.
- No smart integration (e.g., with Alexa, Google Home) without third-party devices.
- Power regulation components are tuned only for internal needs and offer no interface for additional modules.
- Closed firmware, limiting software-level customization or development of user-defined behaviors.

These limitations demonstrate that while the Tenda N301 functions well as a standalone router, it lacks modern conveniences in power management and external control, especially for users aiming to simplify troubleshooting or enable automation. These findings form the technical and functional basis for developing the enhancements in the next stage of the project.

CHAPTER 3

FORWARD ENGINEERING PROCESS

3.1 Problem Identification and Concept Selection

Problem Understanding

While the Tenda N301 router provides reliable wireless performance for home and small office users, it lacks any means for hardware-level remote power control. This limitation becomes significant during:

- Network drops, where the router must be rebooted physically.
- Firmware hangs, which prevent web interface access.
- Scenarios where the router is placed in hard-to-reach locations like ceilings, closets, or behind furniture.

Most users resort to manually unplugging and replugging the adapter, which is inconvenient and can be problematic for elderly users, non-tech-savvy individuals, or in shared/public installations.

Identifying Users & Stakeholders

The following stakeholders were identified during the initial survey:

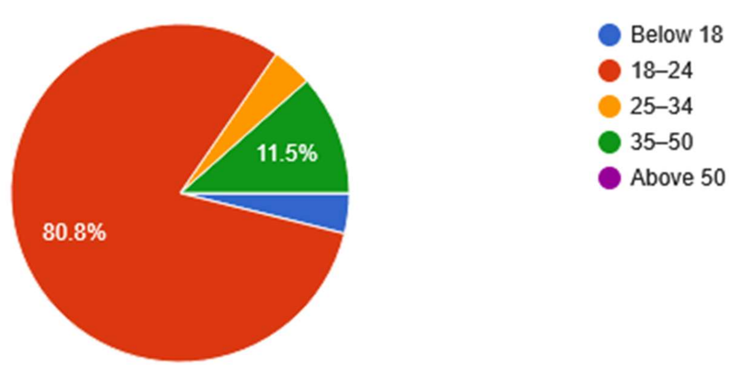
Stakeholder	**Role/Concern**
Home Users	Need quick and easy way to reset routers without moving furniture or accessing power sockets.
Office Admins	Seek minimal downtime and simple recovery methods for router malfunctions.
Service Technicians	Require better diagnostic and control options when troubleshooting on-site.
Product Developers	Interested in integrating low-cost hardware control for legacy routers.

Table 1: (Stakeholder and their roles)

Empathizing with Users

Questionnaire and its analysis,

Your age group



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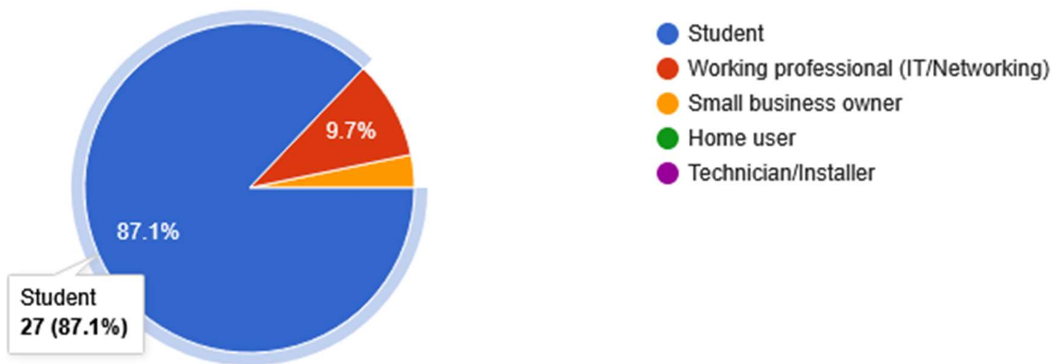
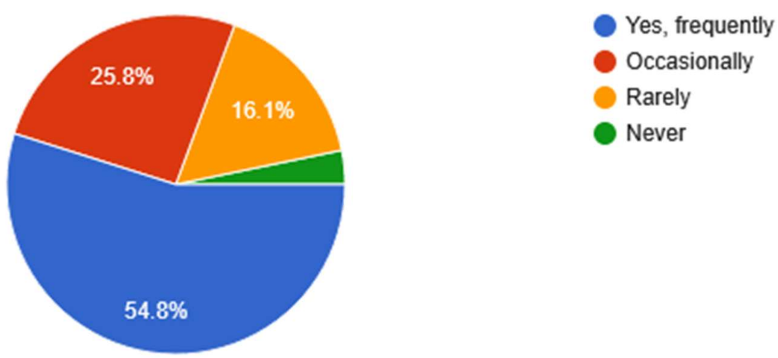
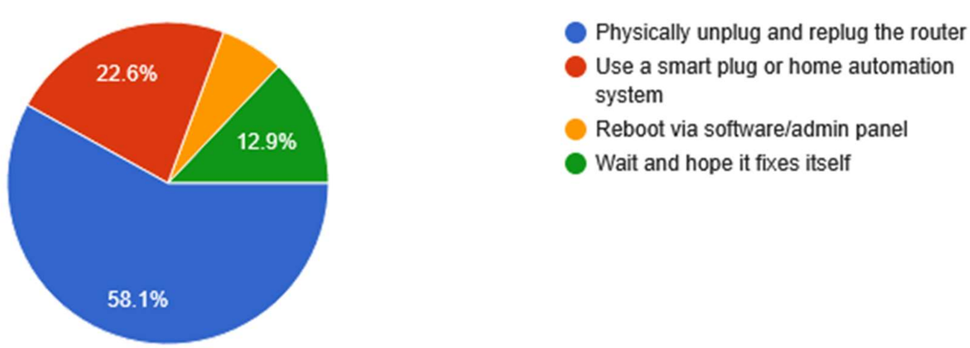
What best describes you?



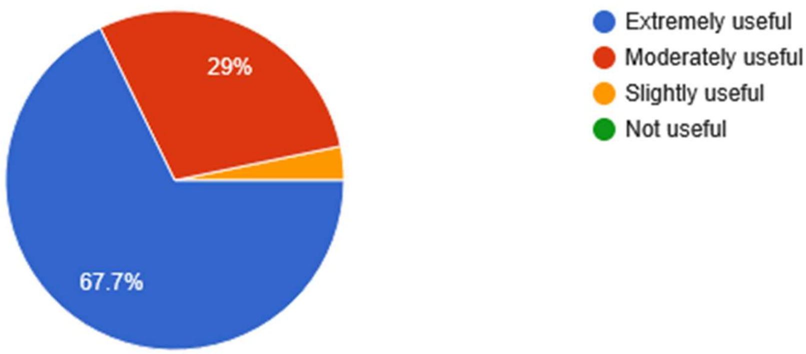
Have you ever faced issues restarting your router when it's placed in a hard-to-reach location (e.g., wall-mounted, inside a cabinet)?



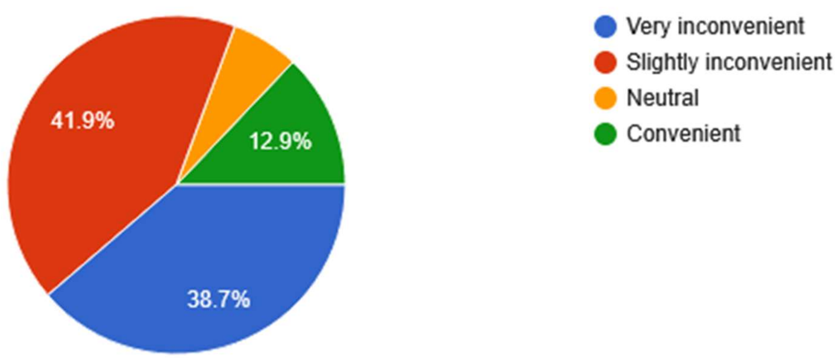
What do you currently do when your router stops responding or the internet goes down?



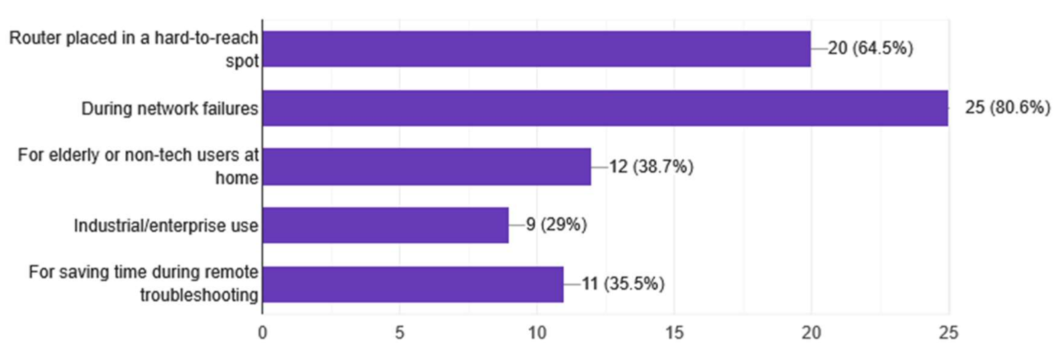
Would you find it useful if your router could be restarted using a remote control without internet access?



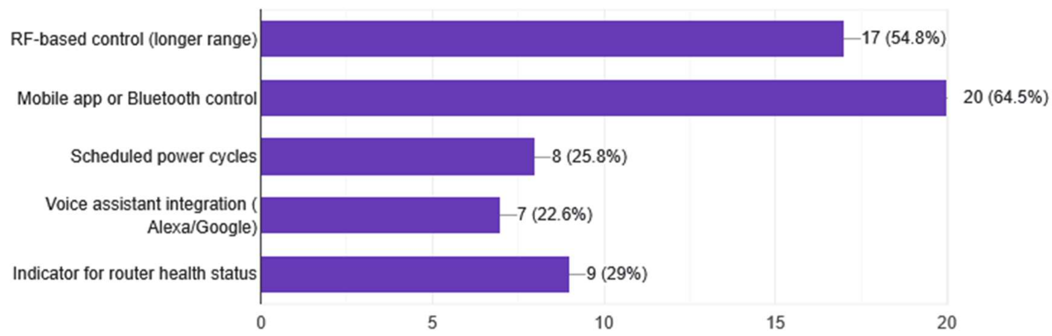
How convenient do you find your current method of restarting or accessing your router?



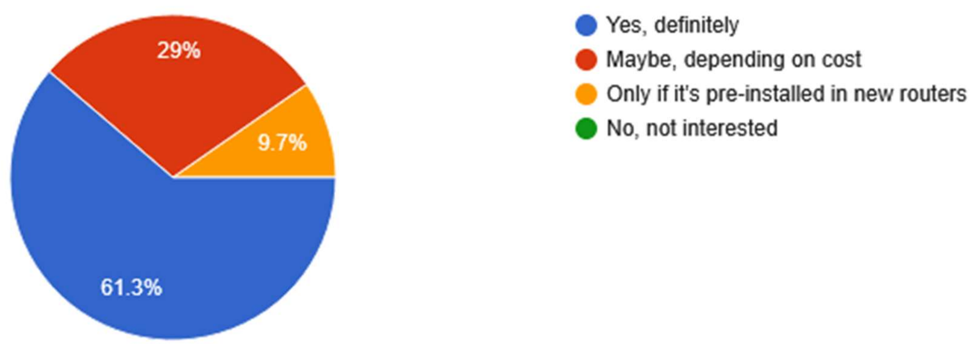
In which situations would an IR-based power control feature be most useful for you? (Choose all that apply)



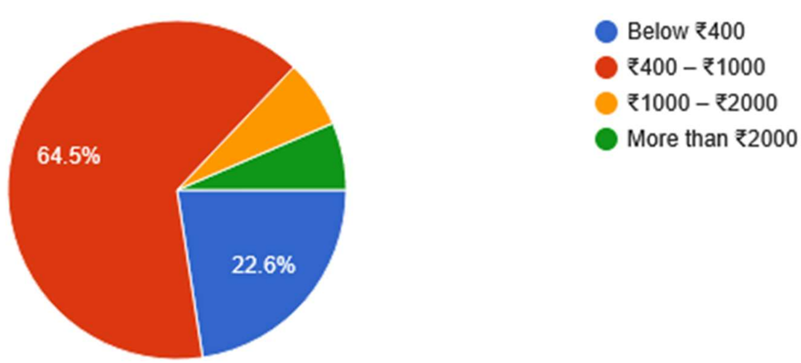
What additional features would you like in such a system?



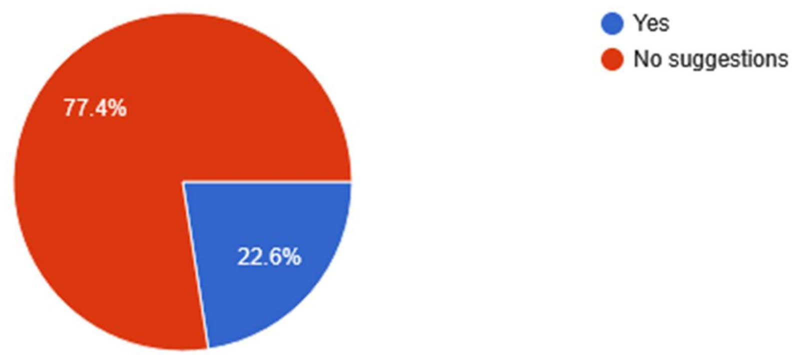
If this product were available as a small DIY kit, would you be interested in using or buying it?



What price range would you consider reasonable for such a solution?



Do you have any additional suggestions or ideas to improve the project?



Through direct interviews, user surveys, and observation of common networking issues, it was found that:

- 54.8% of users keep routers in inconvenient locations, often for aesthetic or range optimization reasons.
- 58.1% of users reported having to restart their router at when there is a problem occurred.
- A significant percentage had no knowledge of smart plugs or mobile-based control, and preferred offline, remote-free solutions.
- Many users preferred handheld, simple tools like a remote control over mobile apps or browser interfaces.
- 67.7% of people found our solution to be useful in times of troubleshooting.
- 64.5% of people expecting the product cost to be in the range of 400 to 1000(without routers actual cost).

Defining the Problem

There is no existing feature in the Tenda N301 router that allows users to power cycle the device remotely. During technical glitches, firmware issues, or ISP interruptions, users must physically interrupt the power supply to restore functionality.

Therefore, the core problem is:

"How can users power cycle the Tenda N301 router remotely without relying on internet connectivity or complicated smart systems?"

This problem definition emphasizes:

- Offline functionality
- Hardware-level control
- Simplicity and accessibility

Concept Screening & Selection

Several concepts were brainstormed and evaluated based on feasibility, cost, reliability, and user accessibility:

Concept	Description	Feasibility	Cost	Offline Capability	Simplicity	Score
1. Smart Plug with Wi-Fi	Use a third-party smart plug to control router power via mobile app	Medium	High	+	Moderate	5
2. IoT Module with App	Integrate ESP8266 to control relay via Wi-Fi app	Medium	Medium	+	Low	6
3. Manual Switch Extension	Add physical switch to power line	High	Low	✓	Low	6
4. **IR Remote-Controlled Relay Module**	Add a relay circuit controlled by IR remote	**High**	**Low**	✓	**High**	**9**

Table 2: (concept screening and selection)

Concept 4: IR Remote-Controlled Relay Module scored the highest due to its:

- Simplicity of use: Most users are already familiar with IR remote controls.
- Offline operation: Works without internet, mobile apps, or Bluetooth.
- Low cost: Components like IR modules and relay switches are very affordable.
- Ease of implementation: Minimal circuitry and soldering required

Justification for Concept Selection

The IR-based relay switching concept was selected based on the following justifications:

- User-Centric Design: Aligns with the needs of non-technical users seeking simple router control solutions.
- Hardware Compatibility: Can be externally added without modifying the router's internal logic board.
- Non-invasive Integration: Power line interruption via relay module doesn’t affect the router’s firmware or software configuration.
- Offline Operation: Works independently of internet status or smartphone access, making it ideal for ISP-related outages.
- Cost Efficiency: Uses widely available components (relay module, IR receiver, 7805 regulator), keeping the total cost under budget for a student or hobbyist project.
- Safety and Reliability: Electrical isolation from the router’s core circuitry ensures minimal risk of hardware damage.

This forward engineering approach addresses the core problem while providing a practical, user-friendly, and low-cost solution.

3.2 PRODUCT/PROCESS DESIGN

System Architecture and Circuit Design

The goal of the design was to create a simple and reliable hardware mechanism that could enable users to remotely power ON/OFF the router using an IR remote, independent of internet access or router firmware. The main architecture involved redirecting the 9V router power supply through a relay controlled by an IR receiver module.

The overall hardware setup includes:

- IR Receiver: Detects signals from a standard IR remote (38 kHz).
- Relay Driver Circuit: Activates or deactivates the relay based on IR input.
- Relay Switch (5V): Interrupts the 9V DC line to the router.
- Voltage Regulator (IC 7805): Steps down 9V from the router adapter to 5V for the relay module.

The power flow is controlled such that the router receives or loses power depending on the state of the relay, effectively serving as a remote-controlled power switch.

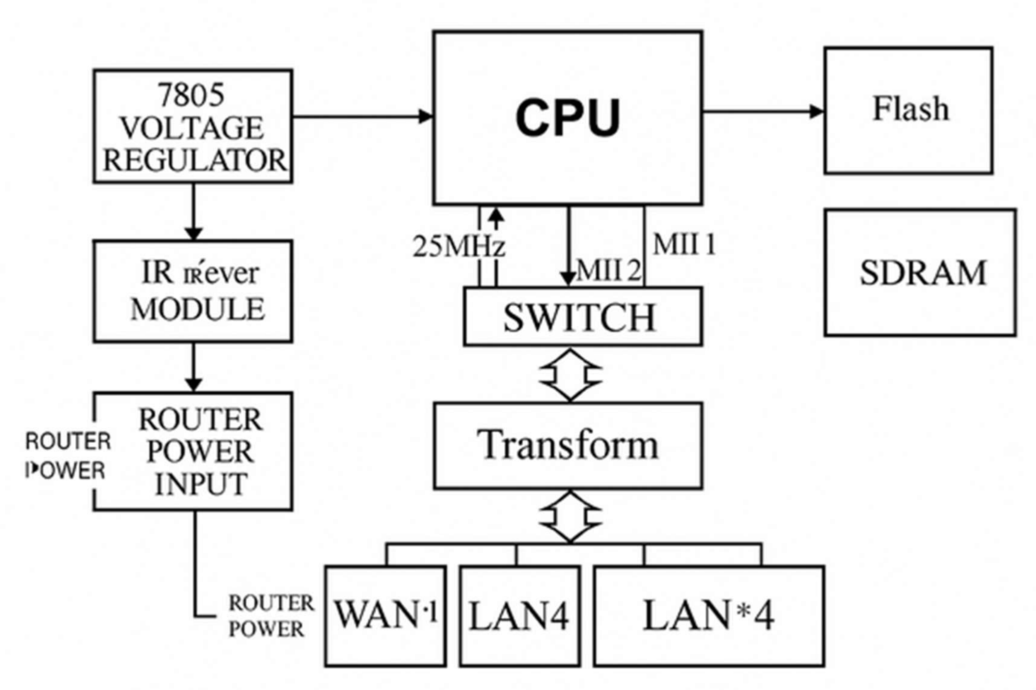


Figure 3: (Block diagram of proposed model)

Virtual Simulation and Design Verification

To validate the logic and flow of the system before physical prototyping, simulation was carried out using the Wowki (Wow!Kit) online electronics simulator. The circuit diagram was digitally replicated and tested for the following:

- Proper switching of the relay on IR signal reception.
- Stable 5V output from the IC 7805 when fed with 9V input.
- Isolation between the control and power side of the relay.
- Quick and reliable switching without overheating or signal delay.

Simulation allowed safe debugging of logical errors and component behavior, especially relay bounce and voltage drops during switching, which are critical for continuous router operation.

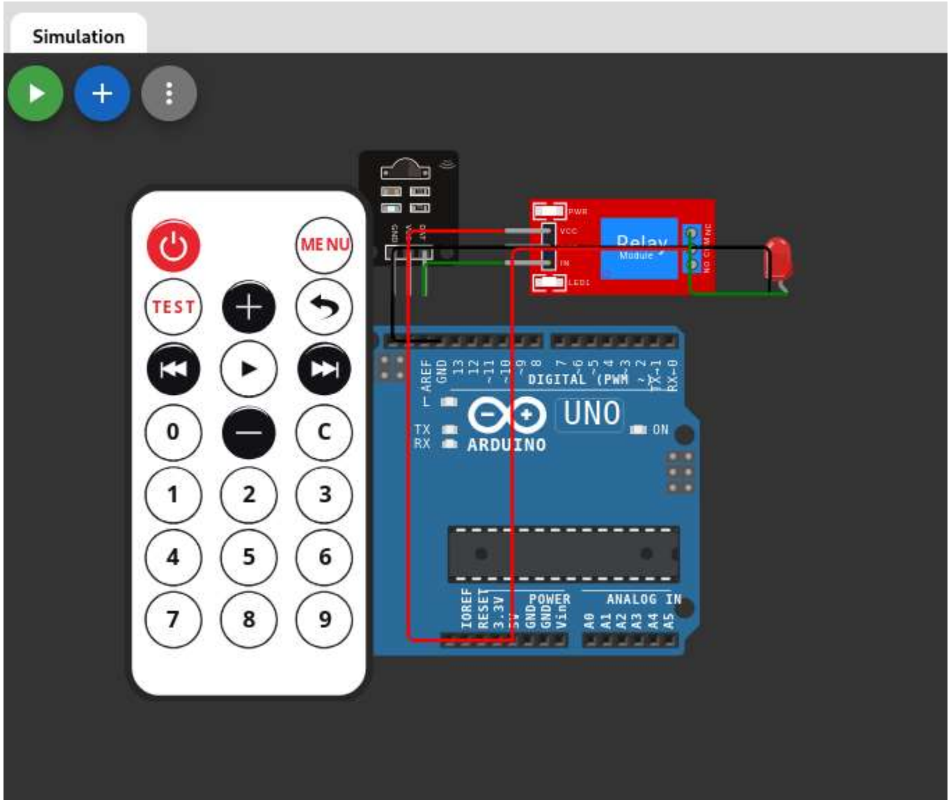


Figure 4: (Simulation in wowki)

Material and Component Selection

The material selection focused on cost efficiency, availability, and compatibility with router input power:

Component	Purpose	Reason for Selection
IC 7805 Voltage Regulator	Convert 9V DC to 5V DC	Reliable linear regulator for simple step-down, requires minimal external components
IR Controlled Relay Module (EmbedTronicX)	Switch the power supply to router	Built-in IR decoder, compact, plug-and-play, compatible with standard remotes

Table 3: (Component and its purpose)

Figure 5: (IR Relay module) **Figure 6: (IC 7805)**

All selected components are compact and easy to integrate externally to the router, avoiding invasive changes to the internal circuitry.

Structural Integration and Assembly

Since the router operates at 9V and the relay works at 5V, a 7805 voltage regulator was soldered between the input adapter and the relay module. The power supply is split such that:

- 9V is passed through the relay's common (COM) and normally-open (NO) terminals to the router.
- A secondary line is tapped before the relay and passed through the IC 7805 to power the relay board.

The relay and IR receiver were mounted externally on a small custom PCB which is connected in series with the router's power line using DC barrel connectors for easy attachment/removal.

The entire prototype was then housed inside a plastic casing with openings for:

- IR sensor exposure
- Input/output DC jacks
- Indicator LED to show relay status

This structure ensures the design is modular and can be easily connected/disconnected from any compatible router.

Prototype Development

After simulation and design, a physical prototype was developed using soldering techniques and standard perf boards. The IR-controlled relay module was tested with different remote keys to ensure compatibility. Proper insulation and heat sinks were added to the voltage regulator to avoid overheating during continuous operation.

All parts were assembled in a non-conductive enclosure to ensure safety and prevent short circuits, especially when used in households with limited technical oversight.

Testing and Validation

The final prototype was tested under real-world usage conditions for:

Test	Result
Relay Response to IR Signal	Consistent switching with no lag or misfire
Voltage Output Stability from 7805	Maintained 5.03V output with no noticeable drop
Router Boot Time Post-Activation	Normal (~20–30s), indicating proper power cycling
Thermal Stability	Regulator and relay remained within safe temperature range
User Distance Test	IR worked up to 8–10 meters in line-of-sight
Safety Check	No short circuits, sparks, or over-voltage during extended testing

Table 4: (Test and result)

This validation proved the solution was both functional and practical, meeting the design objectives without modifying the internal router circuitry.

CHAPTER 4

CONCLUSIONS AND FUTURE SCOPE

The project successfully demonstrated a cost-effective and practical solution to remotely control the power supply of a wireless router using an IR-based relay module. By incorporating an external IR-controlled relay circuit and a 7805 voltage regulator, the system enables users to turn the router ON or OFF remotely, eliminating the need for physical access to the power supply. This retrofit approach ensures that no internal circuit modifications are needed, preserving the integrity of the original hardware while enhancing its functionality.

The prototype was tested with the Tenda N301 Wireless N300 Router, and it worked effectively under various use-case conditions, validating the feasibility of the proposed solution. This solution is especially beneficial in home, office, and educational environments where network uptime and convenience are essential.

Future Scope:

- Mobile App Development: A dedicated app could be developed to provide additional functionalities such as scheduled power cycling, status indication, or alerts.
- Energy Efficiency Monitoring: The system can be extended with current sensors to monitor and log power usage of the router for energy optimization.
- Universal Compatibility**:** Enhancing the module to be compatible with various voltage levels and plug types will allow integration with a wider range of networking devices, not just routers.
- Patent Filing and Productization: Given its simplicity and broad application, there is potential for commercialization through patent filing and bulk production for direct-to-consumer sales or OEM partnerships

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APPENDIX

RoHS COMPLIANT

ECS-L2 (2.5V) and ECS-L3 (3.3V) low jitter, low current Frequency Configurable SMD crystal controlled oscillators.

ECSpressCON™

ECX-L LVDS Oscillator

Request a Sample

ECS INC INTERNATIONAL®

OPERATING CONDITIONS / ELECTRICAL CHARACTERISTICS

Parameters	Conditions	ECS-L2 (+2.5V)			ECS-L3 (+3.3V)			Units
		MIN	TYP	MAX	MIN	TYP	MAX	
Frequency Range		10.000		1500.0	10.000		1500.0	MHz
Operating Temperature	Standard	0		+70	0		+70	°C
	Extended (N Option)	-40		+85	-40		+85	°C
Storage Temperature		-55		+125	-55		+125	°C
Supply Voltage	V_{DD}	+2.375	+2.5	+2.625	+3.135	+3.3	+3.465	VDC
Frequency Stability *	Option A			±100			±100	ppm
	Option B			±50			±50	ppm
	Option C			±25			±25	ppm
	Option D			±20			±20	ppm
Input Current	10.0 ~ 100.0 MHz			16			18	mA
	100.1 ~ 250.0 MHz			18			20	mA
	250.1 ~ 500 MHz			21			22	mA
	500.1 ~ 1500.0 MHz			26			28	mA
Output Symmetry	@ 50% V_{DD} level			45/55			45/55	%
Output Load	Load between each Output			100			100	Ω
Output Enable	Pin 1 **	0.7%			0.7%			Vdd
Output Disable	Pin 1			0.3%			0.3%	Vdd
Disable Current			16		16			mA
Output Enable Time				200			200	ns
Output Disable Time	Pin 1 = VIL			50			50	ns
Differential Output Voltage		175	350		175	350		mV
Offset Voltage			1.25			1.25		V
Rise and Fall Times	10% V_{DD} to 90% Level	150	350	500	150	350	500	pS
Aging	@ +25°C (first year)			±2			±2	PPM
Start-up Time	@ +25°C (first year)			10			10	ms
Absolute Voltage Range				+3.63			+3.63	VDC
Moisture Sensitivity Level		1						
Termination Finish		Au						
ESD Sensitivity	Human Body Model	3kV Max.						

**Note: Inclusive of 25℃ tolerance, operating temperature, input voltage change, load change, shock and vibration.*
***Note: Internal pull-up resistor active output if pin 1 is left open.*

Part Numbering Guide: Example ECX-L35BN-156.250						
Series	Voltage	Package Size (mm)	Stability	Operating Temperature	Frequency	Packaging
ECX-L (LVDS Output)	2 = +2.5V 3 = +3.3V	2 = 2.5 x 2 3 = 3.2 x 2.5 5 = 5 x 3.2 7 = 7 x 5	A = ± 100 ppm B = ± 50 ppm C = ± 25 ppm D = ± 20 ppm	L = -10 ~ +70°C M = -20 ~ +70°C N = -40 ~ +85°C P = -40 ~ +105°C	Customer Specified	Blank =(Bulk) -TR=Tape & Reel (1K Min/Mult)

15351 West 109th Street | Lenexa, KS 66219 | Phone: 913.782.7787 | Fax: 913.782.6991 | www.ecsxtal.com

RoHS COMPLIANT

ECSpressCON™

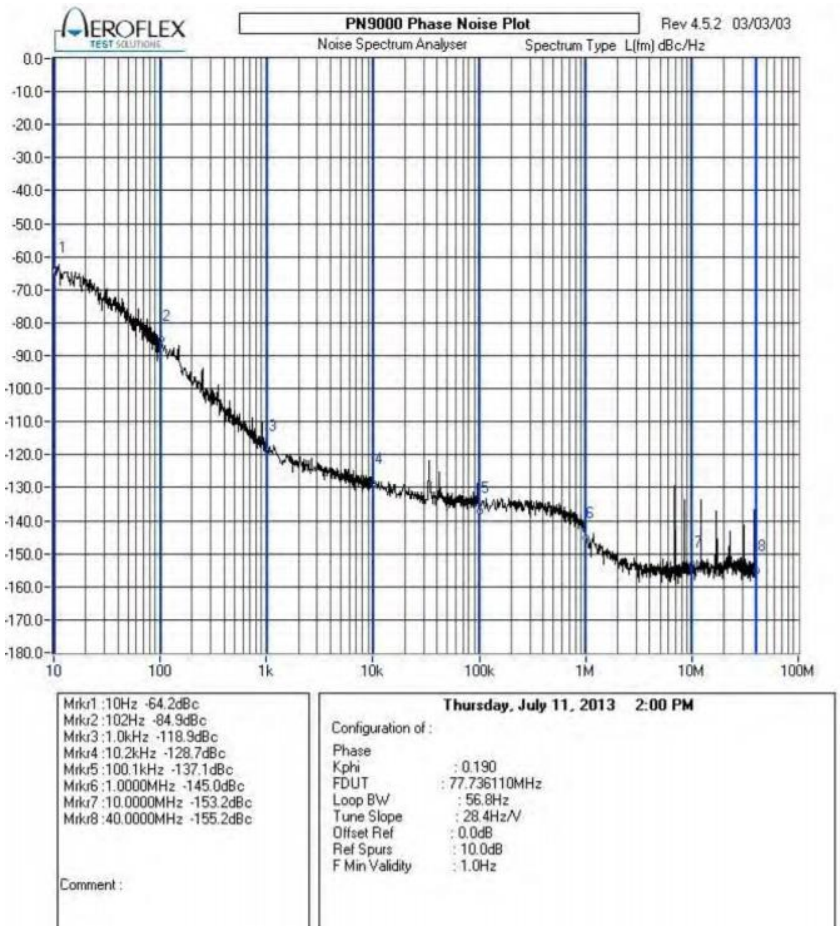
ECX-L LVDS Oscillator

ECS INC INTERNATIONAL®

Phase Noise and Jitter Data (typical)

	Frequency (offset)	77.760	122.880	125.000	156.250	212.5	491.520	622.080	1000	1250
SSB Phase Noise Data (dBc/Hz typical)	10 Hz	-64	-68	-63	-55	-62	-61	-48	-52	-42
	100 Hz	-84	-99	-94	-85	-93	-86	-85	-82	-81
	1 KHz	-118	-113	-113	-109	-105	-100	-101	-93	-93
	10 KHz	-128	-119	-118	-116	-113	-105	-102	-97	-96
	100 KHz	-137	-120	-119	-118	-115	-105	-103	-97	-97
	1 MHz	-145	-140	-137	-139	-135	-126	-124	-116	-119
	5 MHz	-152	-142	-146	-146	-143	-137	-133	-127	-129
Phase Jitter pS 12 KHz ~ 20 MHz, RMS		0.9	0.8	1.1	0.9	1.0	1.1	1.2	1.5	1.1

Phase Noise Plot of ECX-L35BN-77.760 (typical)



Package Data	
Item	Description
Lid	Metal
Base	Ceramic
Plating	Gold/Nickel Surface/Under

RoHS COMPLIANT

ECSpressCON^{TM}

ECX-L LVDS Oscillator

Dimensions (mm)

7 = 7x5 Package

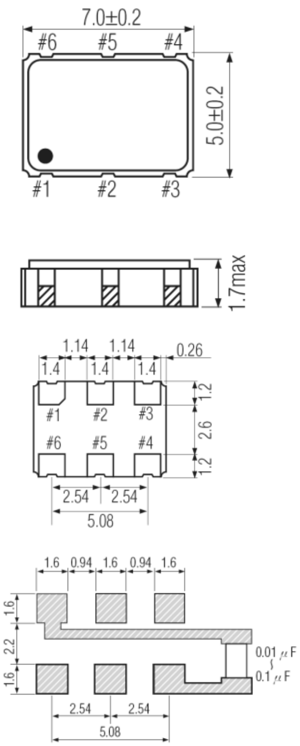


Figure 1) Top, Side, Bottom & Land

5 = 5x3.2 Package

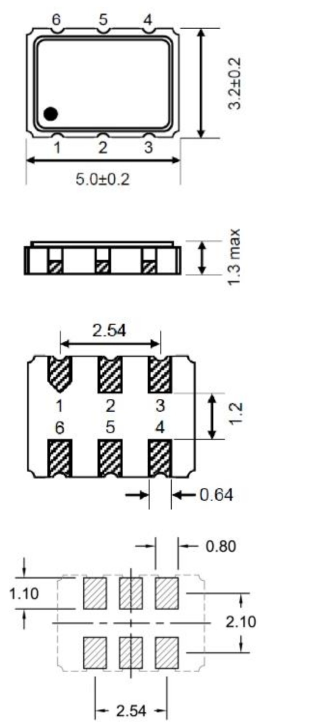


Figure 2) Top, Side, Bottom & Land

3 = 3.2x2.5 Package

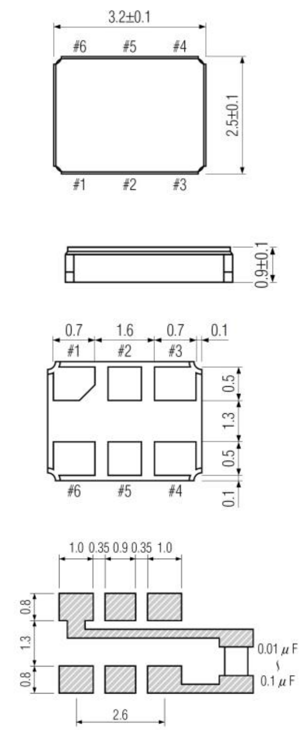


Figure 3) Top, Side, Bottom & Land

2 = 2.5x2 Package

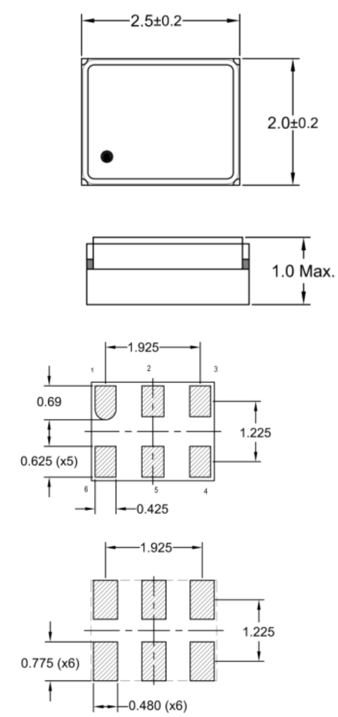
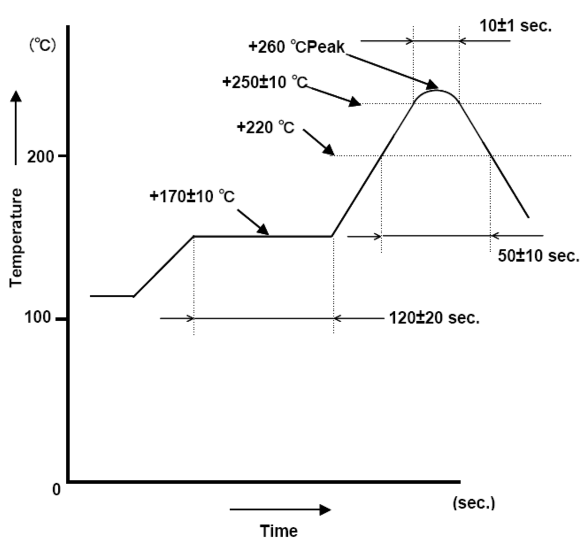


Figure 4) Top, Side, Bottom & Land

Suggested Reflow Profile



Pin Connections	
Pin #	Function
1	O/E or No Connect
2	No Connect
3	Ground
4	Differential Output
5	Complementary Output
6	Supply Voltage

10/100Base DIP Transformer

Part Number: D20601 G

- Compliant with IEEE 802.3 standard, Including 350 uH OCL with 8 mA bias.
- RoHS compliant.
- Operating temperature range : 0°C to +70°C.
- Storage temperature range: 0 °C to +85°C

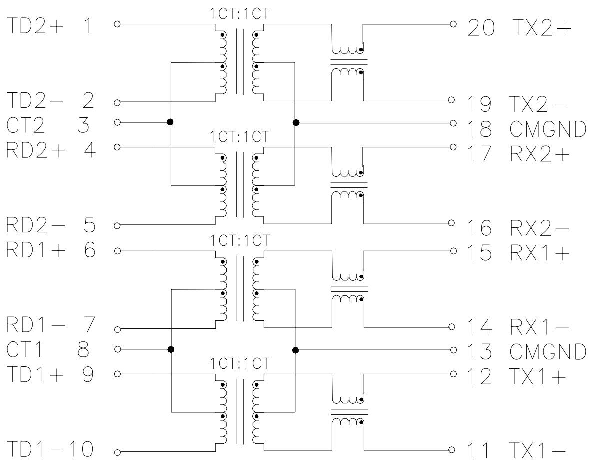
Electrical Specifications @ 25°C

Part Number	Turns Ratio (±5%)		OCL(uH Min) @100KHz/0.2V with 8.0mA DC	Insertion Loss (dB Max)	C w/w (pF Max) @100KHz/0.2V	HI-POT (Vrms)
	TX	RX		0.3-100MHz		
D20601 G	1CT:1CT	1CT:1CT	350	-1.10	50	1500

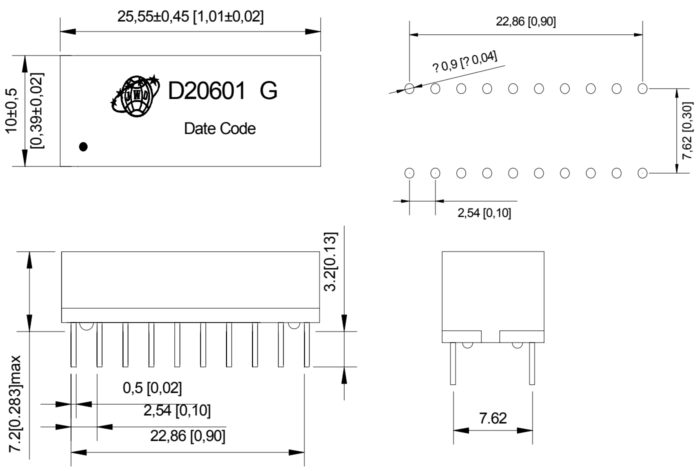
Continue

Part Number	Return Loss (dB Min)			Cross Talk (dB Min)	DCMR (dB Min)
	0.3-30MHz	30-60MHz	60-80MHz	0.3-100 MHz	0.3-100 MHz
D20601 G	-18	-14	-12	-35	-30

·Schematics:



Mechanicals:



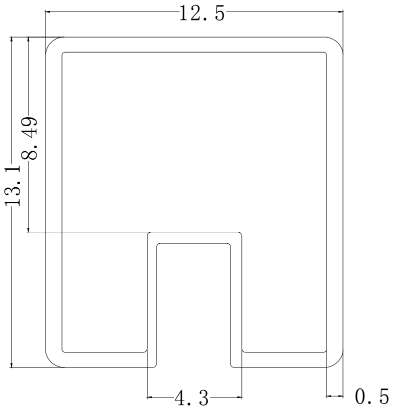
Unlessotherwise specified,tolerances:
xx.x0+/−0. 25mm 0.xx+/−0.05mm

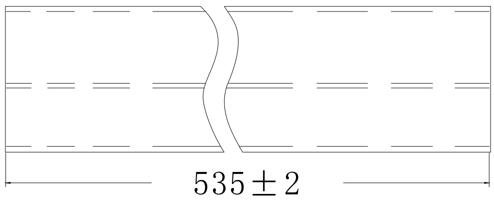
R0(04/13)

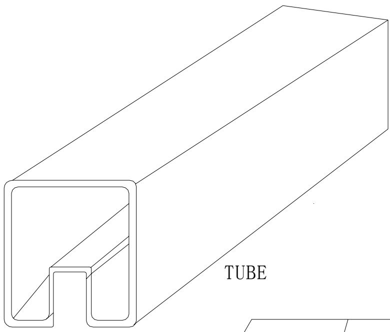
Tel：+86-816-2562292/2561202 Fax：+86-816-2562916
E-mail：myjwd@myjwd.com Website：www.myjwd.com

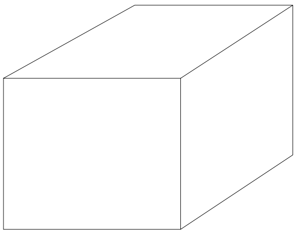
10/100Base DIP Transformer

Part Number: D20601 G

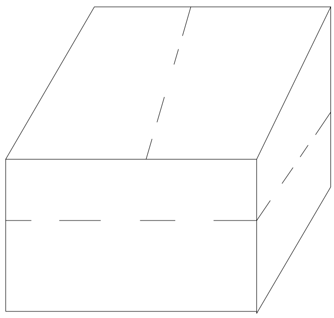








INNERCARTON:570(L)X180(W)X100(H)



EXPORTCARTON:580(L)X380(W)X240(H)

TUBE:20PCS
INNER BOX:70*20=1400PCS
OUTER CARTON:4*1400=5600PCS

R0(04/13)

Tel：+86-816-2562292/2561202 Fax：+86-816-2562916
E-mail：myjwd@myjwd.com Website：www.myjwd.com

New Design More Easily

Wireless N300 Easy Setup Router N301

The N301 Wireless N300 Easy Setup Router is designed to setup more easily for the home user. It complies with IEEE802.11n, delivers wireless speeds of up to 300Mbps, making it perfect for everyday web activities like email, chat, streaming videos, online gaming and more. The N301 can also work as a client router to connect ISP network wirelessly or uplink AP to share the Internet to every corner, eliminating the dead point.

Easy to Setup

With just three easy steps, get your secure wireless network up and running in minutes.

Secure WiFi at a push of WPS button

Compatible with WI-FI Protected Setup™ (WPS), N301 features WPS that allows users to almost instantly setup their security simply by pressing the "WPS" button automatically establishing a secure connection. Not only is this faster than normal security setups but more convenient in that you don't need to remember a password.

Advanced Wireless Security

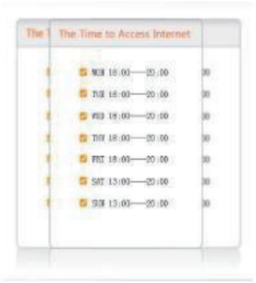
N301 offers multi-level wireless encryption options to prevent unauthorized access and protect your important data.

1.64/128bit WEP、WPA-PSK、WPA2-PSK

2. Wireless Access Control based on the mac address of wireless adapter

Wireless WAN

N301 can work as client mode to connect to ISP network or uplink AP wirelessly to share the Internet to every corner, eliminating the dead point.



Parental Control

Support parental control function like IP/MAC filter, you can limit the time to access the internet and block the websites.

How it Works

How to make wireless magic, start with Internet service and a modem then connect a Tenda router. The router broadcasts a wireless signal that lets you easily connect your devices and smart appliances.

Specifications

Hardware Features	
Compliant Standard	IEEE 802.3/3U IEEE 802.11n/g/b
Wired Interface	1 10/100Mbps WAN Port 3 10/100Mbps LAN Ports
Antennas	2 fixed 5dbi Omni Directional antennas
Button	1 Reset/WPS Button
Item dimensions(L*W*H)	127.4mm*90.5mm*26mm
Wireless Features	
Frequency Range (GHz)	2.400 – 2.4835 GHz
Wireless Link Rate	IEEE 802.11n: up to 300Mbps IEEE 802.11g: up to 54Mbps IEEE 802.11b: up to 11Mbps
Wireless Security	64/128bit WEP WPA-PSK WPA2-PSK WPS support
Working Mode	AP WISP WDS Bridge
Wireless Function	Enable/Disable Wireless Radio Wireless Access Control
Reception Sensitivity	b mode：1M -92dBm@8% 11M -87dBm@8% PER； g mode：54M -72dBm@8% PER； n mode：72.2M -68dBm@8% PER； 150M -68dBm@8% PER；

Software Features	
Internet Connection Type	Dynamic IP、PPPOE、Static IP、L2TP、PPTP
DHCP	Built-in DHCP server DHCP Client List Address Reservation
Virtual Server	Port Forwarding DMZ Host
Parental Control	Client Filter Mac Filter Websites Filter
Dynamic DNS	No-IP dyndns
VPN Pass-Through	PPTP L2TP
Other Advanced Function	Bandwidth Control Mac Address Clone Remote Web Management System Log
Others	
Package Contents	Wireless N300 Easy Setup Router N301 Quick Installation Guide Ethernet cable Power adapter Resources CD
Environment	Operating Temperature: 0℃~40℃ Storage Temperature: -40℃~70℃ Operating Humidity: 10%~90% non-condensing Storage Humidity: 5%~90% non-condensing
Certificates	FCC, CE, RoHs
EIRP Power (Max.)	2.400 – 2.4835 GHz： 19.89 dBm (EIRP)

Shenzhen Tenda Technology Co.,Ltd
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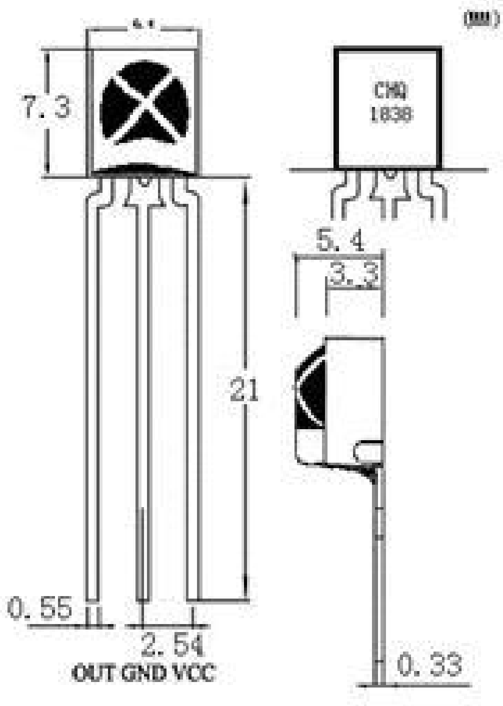
Shiyan Town, Baoan District
Shenzhen 518108,China
Phone: (86 755) 2765 7180
Fax: (86 755) 2765 7178
Email: sales@tenda.com.cn

http://www.openimpulse.com

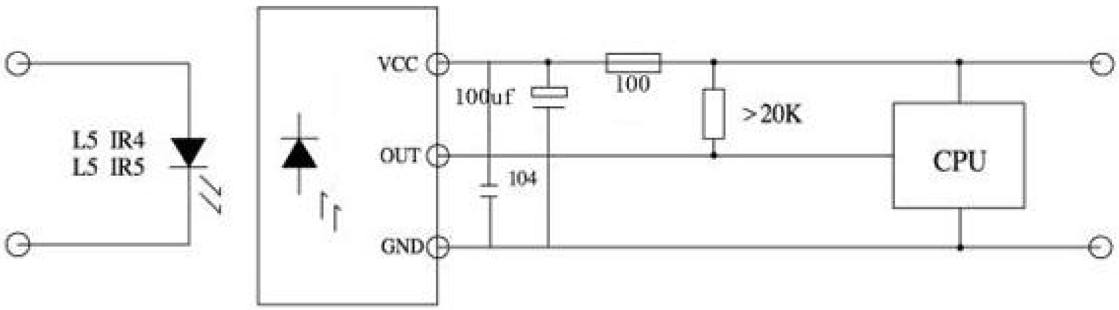
TL1838 Infrared Receiver Datasheet

1. **Features**
   * Compact design;
   * Built-in dedicated IC;
   * wide-angle and long distance reception;
   * anti-stem worries ability;
   * can more than offset the impact of ambient light;
   * Low voltage operation;

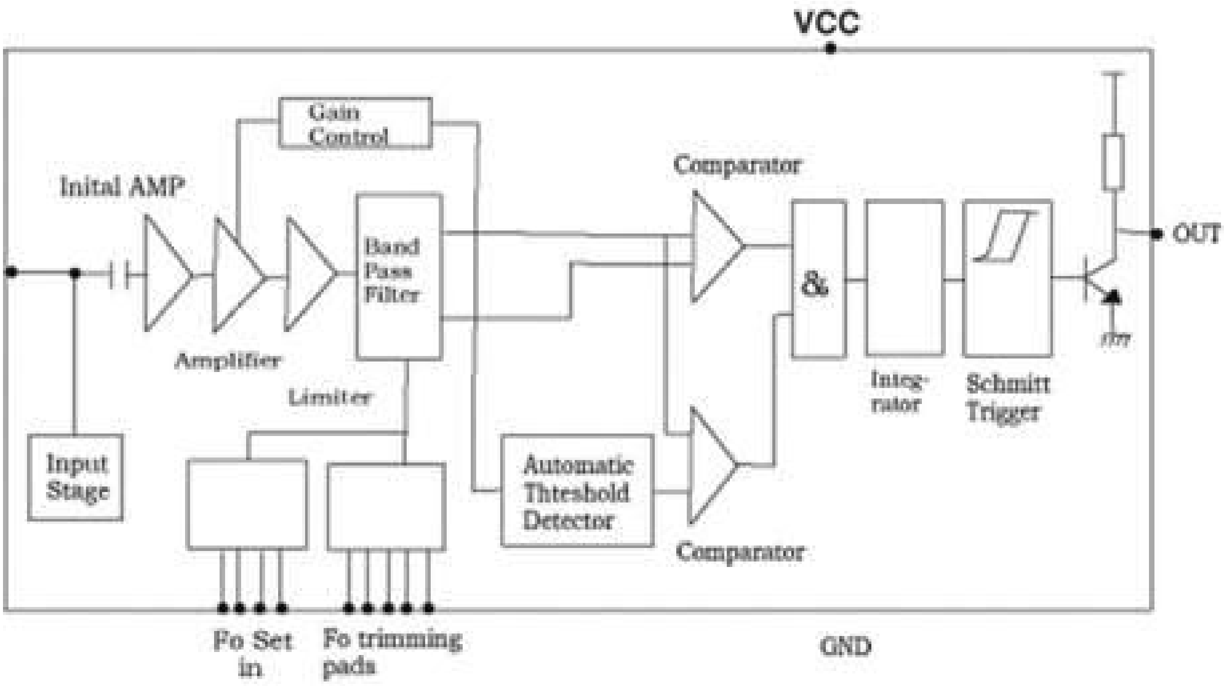
2. **Dimensions and Pin Assignment**



3. Application Circuit



4. Schematic Diagram

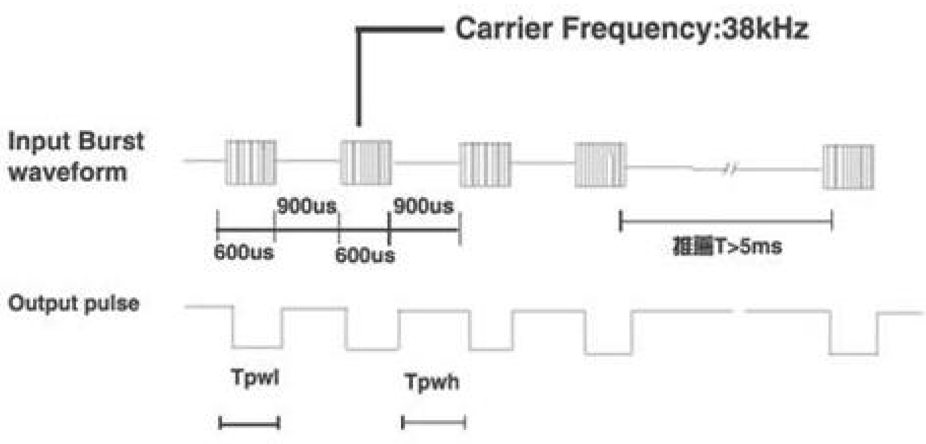


5. Optical Parameters (T = 25 ℃ Vcc = 5v f0 = 38KHZ)

Parameter	Symbol	Test Conditions	Min	Typ	Mnx	Unit
Operating Voltage	Vcc		2.7		5.5	V
Receiving distance	L	L5IR = 300MA (test signal)	10	15		M
Carrier Frequency	f0		38K			HZ
Acceptance angle	01/2	Distance attenuation 1/2		+ / -35		Deg
BMP width	FBW	-3Db andwidth	2	3.3	5	kHz
Quiescent Current	Icc	When there is no signal input	----	0.8	1.5	mA
Low output	VOL	Vin = 0V Vcc = 5V		0.2	0.4	V
High-level output	VOH	Vcc = 5V	4.5			V
The output pulse width	TPWL	Vin = 500μVp-p ※	500	600	700	μs
	TPWH	Vin = 50mVp-p ※	500	600	700	μs

※ testing on the optical axis to the transmit pulse width 600/900μs, 5CM within receiving range, the average value of the received pulse 50

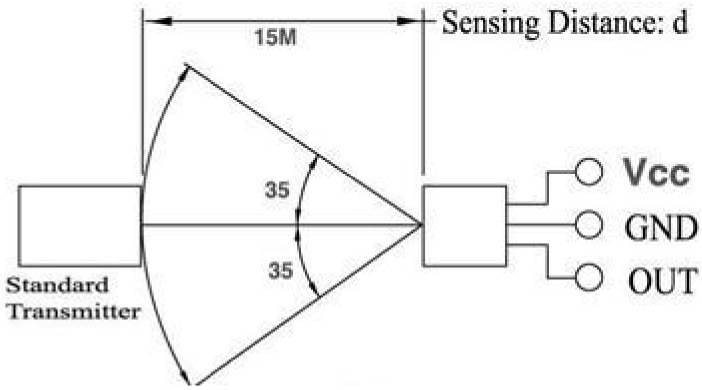
6. Test Wave



7. Limit Parameters

Project	Symbol	Specification	Unit
Supply Voltage	Vcc	6.0	v
Operating Temperature	Topr	-25-85	℃
Storage Temperature	Tstg	-40-125	℃
Soldering Temperature	Tsol	240	℃

8. Receiving Angle Diagram



9. Recommended Conditions of Use

Project	Symbol	Min	Typ	Mnx	Unit
Operating Voltage	Vcc	2.7	-----	5.5	V
Input Frequency	FM		38		kHz
Operating Temperature	Topr	-20			