Atx smps circuit diagram

Understanding the ATX SMPS Circuit Diagram: A Comprehensive Guide **atx smps circuit diagram** is a fundamental topic for anyone interested in power electronics, computer hardware, or DIY electronics projects. The ATX SMPS (Switched-Mode Power Supply) is the backbone of modern computer power systems, providing regulated and efficient power conversion from AC mains to the various DC voltages required by computer components. Understanding its circuit diagram not only offers insights into how your PC gets the juice it needs but also equips you to troubleshoot, repair, or even design your own power supplies.

What is an ATX SMPS?

Before diving deep into the atx smps circuit diagram, it helps to grasp what an ATX SMPS actually is. ATX stands for Advanced Technology eXtended, a motherboard and power supply configuration standard developed by Intel. The SMPS, or Switched-Mode Power Supply, is a type of power supply that efficiently converts AC (Alternating Current) supply from your wall outlet into various DC (Direct Current) voltages. Unlike traditional linear power supplies, SMPS units switch the input power on and off rapidly, regulating voltage and current through high-frequency transformers and switching transistors. This switching technique reduces energy wastage, allowing the power

supply to be compact, lightweight, and more efficient.

Key Components in an ATX SMPS Circuit Diagram

Understanding the atx smps circuit diagram means getting familiar with its essential components. Each part plays a critical role in ensuring stable, reliable power delivery.

1. Input Stage

The input stage typically includes: - **EMI Filter:** This filters out any electromagnetic interference to prevent noise from entering or leaving the power supply. - **Rectifier and Filter Capacitor:** Converts the AC mains voltage into a DC voltage. The rectifier usually consists of diodes arranged in a bridge configuration, and capacitors smooth out the ripples.

2. Switching Stage

This is the heart of the SMPS, where high-frequency switching takes place. - **Switching Transistor/MOSFET:** This rapidly switches the input voltage on and off. - **Pulse Width Modulation (PWM) Controller:** Regulates the duty cycle of the switching transistor to control output voltage. - **High-Frequency Transformer:** Steps the voltage up or down as required and provides galvanic isolation between the input and output.

3. Output Stage

- **Rectification and Filtering:** Converts the transformer's AC output back into DC using fast-recovery diodes and smoothing inductors or capacitors. - **Voltage Regulation and Feedback:** Monitors the output voltage and sends feedback to the PWM controller to maintain stable output voltages.

Decoding the ATX SMPS Circuit Diagram Step by Step

An atx smps circuit diagram might seem complicated at first glance, but breaking it down into smaller functional blocks simplifies the understanding process.

AC Input and EMI Filtering

The AC mains input enters the power supply, passing first through an EMI (Electromagnetic Interference) filter. This filter usually consists of inductors and capacitors arranged to block high-frequency noise that could interfere with other electronic devices or cause the power supply to malfunction.

Rectification and Bulk Filtering

After filtering, the AC voltage is rectified by a bridge rectifier composed of diodes. This converts the sinusoidal AC voltage into pulsating DC. A large electrolytic capacitor then smooths out the voltage to provide a stable DC bus voltage for the switching

stage.

Switching and Transformer Action

The PWM controller generates pulses that drive the switching transistor or MOSFET. This transistor chops the DC bus voltage into high-frequency AC, which passes through the transformer. The high-frequency operation allows the transformer to be much smaller and lighter than conventional 50/60 Hz transformers.

Secondary Rectification and Filtering

On the transformer’s secondary side, the high-frequency AC is rectified using Schottky or fast-recovery diodes to minimize losses. The output is then filtered with inductors and capacitors to produce clean, stable DC voltages such as +12V, +5V, and +3.3V, which are standard in ATX power supplies.

Feedback and Regulation Loop

To maintain precise voltage levels, the output voltages are monitored by a feedback circuit, often involving an optocoupler for isolation between primary and secondary sides. This feedback adjusts the PWM duty cycle dynamically to compensate for load changes, ensuring the output remains stable.

Common LSI Keywords Related to

ATX SMPS Circuit Diagram

When exploring the topic of atx smps circuit diagram, certain related terms frequently appear. Understanding these can deepen your knowledge and help in further research: - **PWM controller IC (e.g., UC3842, TL494)** - **Switching transistor/MOSFET** - **Optocoupler feedback** - **Flyback transformer** - **EMI filter design** - **Overvoltage and overcurrent protection** - **Power factor correction (PFC)** - **Rectifier diodes and smoothing capacitors** - **Load regulation and line regulation** - **Heat dissipation and cooling mechanisms**

Tips for Reading and Using an ATX SMPS Circuit Diagram

Reading complex circuit diagrams can be challenging without a systematic approach. Here are some helpful tips:

1. **Start with the big picture:** Identify the input, switching, and output sections before zooming into details.
2. **Trace power flow:** Follow the path from the AC input to the DC output to understand how energy converts step-by-step.
3. **Identify control signals:** Look for the PWM controller and feedback loop, as these govern the regulation of voltages.
4. **Note component values:** Capacitors, resistors, and inductors all influence the performance and stability of the power supply.

5. **Check safety features:** Components like fuses, thermistors, and protection ICs are crucial for reliable operation.

Practical Applications and Troubleshooting Using ATX SMPS Circuit Diagrams

Whether you're repairing a faulty computer power supply or designing your own, the atx smps circuit diagram is an invaluable tool.

Troubleshooting Common Issues

- **No Power Output:** Check the fuse, bridge rectifier, and primary switching transistor components. - **Overvoltage or Undervoltage:** Investigate the feedback circuit and PWM controller. - **Excessive Noise or Ripple:** Inspect the filter capacitors and EMI filter components. - **Overheating Components:** Verify if heat sinks and cooling fans are functioning properly and that the switching transistor is not damaged.

Modifications and Enhancements

Advanced users might want to modify the ATX SMPS to include: - **Improved Power Factor Correction** for better efficiency. - **Additional voltage rails** for custom hardware. - **Enhanced protection circuits** to safeguard sensitive devices.

Understanding the circuit diagram is essential before attempting any modifications to avoid damaging the power supply or connected devices.

Why Learning the ATX SMPS Circuit Diagram Matters

In a world where electronic devices dominate, knowing how power supplies work is a valuable skill. The atx smps circuit diagram is not just a schematic; it's a roadmap to understanding efficient power conversion, safety, and reliability in electronics. From hobbyists building custom PCs to engineers designing robust power systems, this knowledge bridges theory and practical application. By mastering the intricacies of the ATX SMPS circuit, you open doors to troubleshooting skills, design innovation, and a deeper appreciation of the technology powering your everyday devices.

ATX SMPS Circuit Diagram: An In-Depth Technical Exploration **atx smps circuit diagram** serves as a foundational blueprint for understanding the intricate workings of one of the most widely used power supply units in modern computing systems. ATX (Advanced Technology eXtended) SMPS (Switched Mode Power Supply) designs have become the industry standard in providing regulated DC power from AC mains to internal PC components. This article delves into the detailed analysis of the ATX SMPS circuit diagram, highlighting its core components, operational principles, and the significance of its design features within the broader context of power electronics.

Understanding the Basics of ATX SMPS Circuit Diagram

The ATX SMPS circuit diagram represents a schematic that illustrates how alternating current (AC) from the mains is converted into multiple regulated direct current (DC) voltages suitable for powering a computer's motherboard, drives, and peripherals. Unlike traditional linear power supplies, the switched-mode architecture enhances efficiency by rapidly switching current on and off and regulating output through pulse-width modulation (PWM). Central to the ATX SMPS circuit is the conversion of mains voltage (typically 110V or 220V AC) into standardized DC outputs: +3.3V, +5V, and +12V, along with negative voltages like -12V and a 5V standby line. The circuit diagram typically includes components such as rectifiers, filters, transformers, PWM controllers, transistors, and feedback loops, each playing a critical role in ensuring stable and reliable power delivery.

Key Components in an ATX SMPS Circuit Diagram

Dissecting the ATX SMPS circuit diagram reveals several integral elements:

1. **Input Rectifier and EMI Filter:** The AC input first passes through an EMI (Electromagnetic Interference) filter to reduce noise and interference, followed by a bridge rectifier that

converts AC to pulsating DC.

2. **Smoothing Capacitors:** Large electrolytic capacitors smooth out the rectified DC voltage, providing a more consistent input to the switching stage.
3. **Switching Transistors (MOSFETs or BJTs):** These semiconductor devices rapidly switch the DC input on and off, controlled by the PWM controller to regulate output voltage.
4. **High-Frequency Transformer:** This isolates the output from the input and steps voltage levels up or down as necessary while operating at high frequencies (typically 50-100 kHz), allowing for smaller transformer size.
5. **Output Rectifiers and Filters:** Secondary-side rectifiers convert the transformer's AC output back to DC, which is then filtered to reduce ripple and noise.
6. **Feedback Circuitry:** Using optocouplers or other isolation methods, the output voltage is monitored and fed back to the PWM controller to maintain voltage stability under varying load conditions.

Operational Dynamics Illustrated by the ATX SMPS Circuit Diagram

The functionality of an ATX SMPS circuit revolves around efficient power conversion and regulation. Initially, the AC mains voltage enters the circuit and is filtered through the EMI filter, which helps the power supply meet regulatory standards for conducted and radiated emissions. This is crucial for minimizing interference with other electronic devices. Post EMI filtering, the

AC is rectified to DC by a bridge rectifier. At this stage, the voltage is unregulated and contains ripples. Large smoothing capacitors help to level out these fluctuations, but the voltage is still too high and inconsistent to power sensitive electronic components directly. The heart of the system, the PWM controller, drives the switching transistors. By adjusting the duty cycle—the ratio of on-time to off-time—the PWM controller regulates the energy transferred through the high-frequency transformer. This regulation ensures that the output voltages remain within strict tolerance limits despite changes in input voltage or load. On the secondary side, the transformer's output is rectified again and filtered to provide clean DC voltages. The feedback loop continuously monitors output voltages and sends signals back to the PWM controller to fine-tune the switching behavior, maintaining voltage stability.

Comparison with Other Power Supply Designs

Compared to linear power supplies, the ATX SMPS circuit diagram reveals significant advantages:

1. **Efficiency:** SMPS units typically achieve 70-90% efficiency, far surpassing linear regulators that dissipate excess voltage as heat.
2. **Size and Weight:** The use of high-frequency transformers allows for compact and lightweight designs, essential for modern PC cases.
3. **Multiple Output Voltages:** ATX SMPS designs inherently

support multiple voltage rails, essential for diverse component requirements.

However, SMPS circuits are more complex, require careful electromagnetic compatibility (EMC) design, and can introduce electrical noise if not properly filtered.

Reading and Interpreting the ATX SMPS Circuit Diagram

For engineers, hobbyists, and technicians, understanding the ATX SMPS circuit diagram is crucial for troubleshooting, repair, or custom design. The schematic provides a map of electrical connectivity and component functionality.

Step-by-Step Approach to Analyze the Diagram

1. **Identify Input Stage:** Locate the EMI filter and rectifier components on the left side of the diagram, marking the transition from AC to DC.
2. **Trace the Switching Section:** Follow the connections from the PWM controller IC to the switching transistors and transformer primary winding.
3. **Examine Output Stage:** Identify secondary transformer windings, rectifiers, smoothing capacitors, and output connectors.
4. **Locate Feedback Path:** Look for optocouplers or isolated

feedback lines from output to control IC.

5. **Analyze Protection Components:** Check for fuses, thermistors, snubber circuits, and other safety devices integrated into the schematic.

This systematic approach facilitates a comprehensive understanding of how each section contributes to the overall power supply operation.

Practical Applications and Design Considerations

ATX SMPS circuit diagrams are not only theoretical representations but also practical guidelines for manufacturing and repair. Designers must consider:

1. **Thermal Management:** Efficient heat dissipation for switching transistors and transformers to ensure longevity.
2. **Component Ratings:** Selecting capacitors and semiconductors with appropriate voltage and current ratings to handle transient spikes.
3. **EMI Compliance:** Designing the EMI filter and PCB layout to minimize electromagnetic interference and radio frequency interference (RFI).
4. **Safety Standards:** Incorporating isolation barriers, fuses, and earth grounding to meet regulatory requirements.

Moreover, the modularity of ATX SMPS designs allows for scalability and adaptability in different computer configurations,

from desktops to servers.

Emerging Trends in ATX SMPS Circuit Design

Recent advancements in semiconductor technology and digital control have influenced ATX SMPS circuit diagrams:

1. **Use of GaN and SiC Transistors:** Gallium Nitride (GaN) and Silicon Carbide (SiC) devices offer higher switching frequencies and efficiency.
2. **Digital PWM Controllers:** Microcontroller-based control enables adaptive voltage regulation and enhanced monitoring capabilities.
3. **Improved Power Factor Correction (PFC):** Active PFC circuits integrated within the ATX SMPS improve energy efficiency and reduce harmonic distortion.

These innovations reflect a shift towards smarter, more efficient, and environmentally friendly power supply solutions. Exploring the ATX SMPS circuit diagram reveals the complexity and precision engineering behind modern computer power supplies. Each component and connection plays a vital role in delivering stable, efficient power to sensitive electronics, underscoring the importance of detailed schematics in both educational and professional contexts.

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Students also benefit from digital access in meaningful ways. Academic success often depends on the ability to review material repeatedly and study efficiently. Downloadable PDFs allow offline access, easy note-taking, and organized revision. Digital books reduce physical strain and support more comfortable study habits.

Digital formats also accommodate different learning preferences. Some readers prefer linear reading, while others focus on specific sections or themes. Digital access allows both approaches. Readers can skim, search, annotate, or read deeply depending on their objectives, making ***Atx Smps Circuit Diagram*** adaptable rather than restrictive.

Accessibility features further expand the reach of digital books. Adjustable text size, text-to-speech options, screen reader compatibility, and night modes help ensure that content is usable by readers with diverse needs. These features promote inclusive access to knowledge and align with modern educational values.

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Global access is one of the most powerful outcomes of digital books. Readers from different countries and cultural backgrounds can access the same materials simultaneously. This shared access fosters collaboration, dialogue, and mutual understanding. Downloading ***Atx Smps Circuit Diagram*** connects individuals to a worldwide learning community.

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Questions & Answers About atx smps circuit diagram

No	Question	Answer
1	What is an ATX SMPS circuit diagram?	An ATX SMPS circuit diagram is a schematic representation of the components and connections inside an ATX (Advanced Technology eXtended) Switch Mode Power Supply, which is commonly used to power desktop computers.

2	What are the main components shown in an ATX SMPS circuit diagram?	The main components typically include the input rectifier, EMI filter, power factor correction circuit, switching transistors or MOSFETs, transformer, feedback control circuit, voltage regulators, and output connectors.
3	How does the feedback mechanism work in an ATX SMPS circuit diagram?	The feedback mechanism senses the output voltage and sends a signal back to the PWM controller to regulate the switching transistors, maintaining stable output voltages despite load variations.
4	Where can I find a detailed ATX SMPS circuit diagram for study?	Detailed ATX SMPS circuit diagrams can be found in electronics textbooks, online electronics forums, technical websites like Electronics Hub, or datasheets and application notes from power supply IC manufacturers.
5	What role does the transformer play in the ATX SMPS circuit diagram?	The transformer in an ATX SMPS isolates the input from the output, steps down the voltage to required levels, and provides multiple output rails such as +12V, +5V, and +3.3V.
6	Can I repair an ATX SMPS using its circuit diagram?	Yes, understanding the circuit diagram helps diagnose faults by identifying components, their connections, and expected signals, which aids in troubleshooting and repair.

7	What safety precautions should be taken when working with an ATX SMPS circuit?	Always unplug the power supply before working on it, discharge capacitors to avoid electric shock, use insulated tools, and be aware of high voltage sections in the circuit.
8	How does the ATX SMPS circuit diagram ensure multiple output voltages?	The circuit uses a multi-winding transformer and separate voltage regulation circuits for each output rail (+12V, +5V, +3.3V) to supply different voltages simultaneously.
9	What is the function of the PWM controller in the ATX SMPS circuit diagram?	The PWM (Pulse Width Modulation) controller regulates the switching frequency and duty cycle of the power transistors to control output voltage and maintain efficiency.
10	Why is an EMI filter included in the ATX SMPS circuit diagram?	The EMI (Electromagnetic Interference) filter reduces electrical noise generated by the switching operation, preventing interference with other electronic devices and ensuring compliance with regulatory standards.

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Atx Smps Circuit Diagram eBooks provide a structured and reliable way to consume knowledge in an increasingly digital world.

Accessible knowledge encourages lifelong learning.

The digital format of Atx Smps Circuit Diagram eBooks allows rapid revision, correction, and content expansion.

Atx Smps Circuit Diagram eBooks allow rapid content revision and correction.

Digital libraries replace bulky collections while preserving accessibility.

Atx Smps Circuit Diagram eBooks are frequently referenced during planning and execution phases.

For long-term projects, Atx Smps Circuit Diagram eBooks serve as stable reference materials that can be revisited repeatedly.

Digital formats ensure identical learning materials for all participants.

By offering instant access, Atx Smps Circuit Diagram eBooks eliminate delays often associated with traditional publishing and physical distribution.

Repetition strengthens understanding.

Atx Smps Circuit Diagram eBooks remain relevant as digital learning expands.

Atx Smps Circuit Diagram eBooks support intentional learning by

encouraging focused reading.

Centralized content improves trust and reliability.

Atx Smps Circuit Diagram eBooks support self-paced learning by allowing readers to control reading speed and progression.

Ultimately, Atx Smps Circuit Diagram eBooks offer an efficient, scalable, and flexible approach to continuous learning.

Atx Smps Circuit Diagram eBooks align with documentation-driven workflows.

Many readers prefer Atx Smps Circuit Diagram eBooks due to their flexibility and ability to adapt to individual reading habits. Adjustable fonts, searchable text, and portable access significantly improve comprehension and engagement.

Digital reading makes Atx Smps Circuit Diagram knowledge easier to access by reducing barriers related to location, cost, and physical storage requirements.

Atx Smps Circuit Diagram eBooks enable learning across multiple contexts, including work, travel, and home environments.

Benefits of eBooks

eBooks like Atx Smps Circuit Diagram have become an essential part of modern reading and learning due to their flexibility, efficiency, and accessibility. Compared to printed books, eBooks offer a range of advantages that support diverse reading habits, learning styles, and lifestyle needs. These benefits make eBooks

a preferred choice for students, professionals, and casual readers alike.

One of the most significant benefits of eBooks is portability. A single device can store hundreds or even thousands of titles, including Atx Smps Circuit Diagram, allowing readers to carry an entire library wherever they go. This convenience is particularly valuable for travelers, students, and professionals who need access to reference materials without carrying physical books.

Searchable text is another powerful advantage. Instead of flipping through pages manually, readers can instantly locate specific terms, phrases, or references within Atx Smps Circuit Diagram. This feature saves time and improves efficiency, especially when studying, researching, or revising key concepts. Search functionality transforms eBooks into dynamic reference tools rather than static reading materials.

Offline access further enhances usability. Once downloaded, Atx Smps Circuit Diagram can be read without an internet connection. This allows uninterrupted reading during travel, in remote areas, or whenever connectivity is limited. Offline access ensures that learning and reading remain flexible and independent of network availability.

Customization options significantly improve reading comfort. eBooks allow readers to adjust font size, font type, line spacing, background color, and layout. These adjustments reduce eye

strain and accommodate individual preferences or visual needs. Night mode, sepia backgrounds, and brightness controls make long reading sessions more comfortable and sustainable.

Digital copies also reduce physical storage requirements. Instead of shelves filled with books, eBooks are stored digitally, freeing up space at home or in the office. This minimal footprint is particularly beneficial for users with limited space or those who prefer a clutter-free environment.

From an environmental perspective, eBooks are eco-friendly. By reducing the need for paper, printing, and physical transportation, digital reading contributes to lower resource consumption. Choosing eBooks like Atx Smps Circuit Diagram supports sustainable reading habits without sacrificing access to knowledge.

Cost efficiency and accessibility

eBooks are often more affordable than printed editions, and many free or open-access titles are available legally. This accessibility lowers barriers to education and knowledge, enabling more people to benefit from resources like Atx Smps Circuit Diagram. Digital distribution also allows faster updates and revisions, ensuring access to current information.

Highlighting and Notes

Highlighting and note-taking tools are among the most valuable features of eBooks. Built-in annotation tools allow readers to

interact directly with Atx Smps Circuit Diagram, turning reading into an active and engaging process. Highlighting important sections helps identify key ideas, definitions, or arguments that require further review.

Digital notes can be added alongside highlighted text, enabling readers to record thoughts, questions, or summaries in context. These annotations remain linked to the original content, making it easier to revisit and understand notes later. Unlike handwritten notes, digital annotations are searchable and editable, enhancing long-term usability.

Many eBook platforms allow users to export notes and highlights. Exported annotations can be used for revision, research, presentations, or collaborative study. This feature is particularly useful for students and professionals who rely on organized summaries and references.

Color-coded highlights add another layer of organization. Different colors can represent themes, importance levels, or types of information. For example, one color may be used for definitions, another for examples, and another for questions. This visual system improves clarity and speeds up review sessions.

Annotations can also evolve over time. As understanding deepens, notes can be edited, expanded, or refined. This flexibility supports iterative learning and continuous improvement, allowing Atx Smps Circuit Diagram to grow

alongside the reader’s knowledge.

Advanced annotation workflows

Power users often combine eBook annotations with external note-taking systems. Linking highlights from Atx Smps Circuit Diagram to structured notes creates a comprehensive learning framework. This workflow supports deeper analysis, synthesis of ideas, and long-term knowledge retention.

Regular review of highlights and notes reinforces learning. Scheduling periodic review sessions helps transfer information from short-term to long-term memory. Digital tools make these reviews efficient by consolidating all annotations in one place.

Cross-device Sync

Cross-device synchronization is a key advantage of modern eBooks. Cloud services allow readers to access Atx Smps Circuit Diagram seamlessly across multiple devices, including smartphones, tablets, laptops, and eReaders. This flexibility supports reading anytime and anywhere without losing progress.

When cross-device sync is enabled, reading position, bookmarks, highlights, and notes are automatically updated across all connected devices. A reader can start reading Atx Smps Circuit Diagram on a phone, continue on a tablet, and finish on a computer without manually tracking progress. This seamless experience enhances convenience and productivity.

Cloud synchronization also provides an added layer of data protection. Notes and annotations stored in the cloud are less likely to be lost due to device failure or accidental deletion. Automatic backups ensure continuity and peace of mind for long-term users.

Cross-device access supports flexible learning environments. Students can study on different devices depending on location or time of day. Professionals can reference Atx Smps Circuit Diagram during meetings, travel, or remote work without carrying physical materials. This adaptability aligns with modern, mobile lifestyles.

Choosing reliable sync solutions

Selecting reliable cloud services and reading platforms is essential for effective synchronization. Reputable services offer stable performance, security features, and privacy controls. Keeping applications updated ensures compatibility and smooth syncing across devices.

Users should also manage storage settings carefully. Syncing large libraries may require sufficient cloud storage space. Regularly reviewing stored files and removing unused items helps maintain efficiency without sacrificing access to important materials.

Integrating eBooks into daily workflows

eBooks like Atx Smps Circuit Diagram integrate easily into daily

workflows. Digital calendars, task managers, and note-taking apps can be used alongside reading platforms to schedule study sessions, track progress, and set goals. This integration supports structured learning and consistent reading habits.

Combining eBooks with other digital resources such as videos, lectures, and discussion forums enhances understanding. Cross-referencing Atx Smps Circuit Diagram with complementary materials creates a rich and interconnected learning environment.

Long-term advantages of eBooks

Over time, the benefits of eBooks extend beyond convenience. Digital libraries are easier to update, organize, and maintain. Annotations and highlights accumulate into a personalized knowledge base that can be revisited and refined. Cross-device access ensures that learning remains continuous and adaptable to changing needs.

eBooks also support lifelong learning. As interests evolve and new goals emerge, readers can quickly acquire and integrate new resources. Atx Smps Circuit Diagram becomes part of a dynamic system rather than a static book on a shelf.

Final thoughts on the benefits of eBooks like Atx Smps Circuit Diagram

eBooks like Atx Smps Circuit Diagram offer unmatched portability, customization, efficiency, and accessibility. Through

searchable text, offline access, advanced highlighting and note-taking, and seamless cross-device synchronization, digital reading transforms how knowledge is consumed and retained. By embracing these features, readers can enhance comfort, improve productivity, and build sustainable learning habits that extend far beyond traditional reading experiences.