



INHOUSE
SEMINAR TOPICS
2024

Pick Your Choice

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

FREE INHOUSE SEMINARS ADDED VALUE FOR OUR CUSTOMERS!



Our inhouse seminars are tailored specifically to your needs. Just let us know your requirements, e.g. regarding duration and setting, and we will make a proposal for your individual seminar. The topics cover all our product areas:

- Passive Components
- Active Components
- Electromechanical Components
- Wireless Connectivity & Sensors
- Standard & Custom Transformers
- Some topics can even be offered in a digital setting in case we don't have local support

For inhouse seminars hosted directly at customer facilities, customers are encouraged to provide the following items:

- Conference room and beverages during the seminar
- White board or flip chart
- Projector for a big TV supporting a HDMI, VGA or display port with minimum HD ready resolution (Full HD resolution will be preferred to display our tools properly) and a power cable near the display stand
- Würth Elektronik can provide a projector (please let us know at least one week in advance if necessary)

TECHNICAL MODULES FOR

INHOUSE SEMINARS

1. Passive Components	04
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**The purpose of the seminar is to share technical knowledge with our customers.
Please contact your local support to adjust timelines and discuss the schedule.**

PASSIVE COMPONENTS

EMC

1. EMC Physics

The laws of electromagnetism, material science and construction techniques are explored to understand and explain the behavior of ferrites, inductors and capacitors.



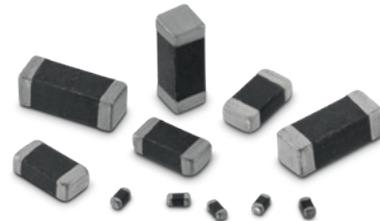
2. EMC Basics

EMC standards and tests can be tricky to understand and pass. Which standards apply to different devices and what measures can be taken to ensure the device passes the tests?



3. Ferrites for PCB Assembly

Thousands of ferrite varieties are available. How is the right chip bead ferrite for your design selected taking into account impedance, frequency range and peak currents?



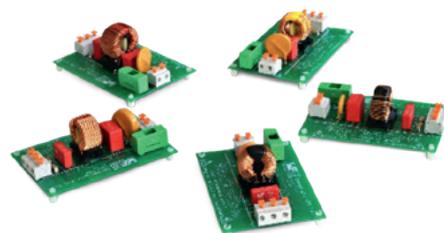
4. Ferrites for Cable Assembly

Different materials, different impedance values and different mechanical solutions. Quickly select your snap ferrite and solve your EMC issues, without any change on the PCB.



5. Common Mode Chokes

How do common mode chokes work? What's their purpose? And what needs to be considered when selecting one?



6. Shielding Materials

Understand wave propagation and the implications when selecting a shielding solution.



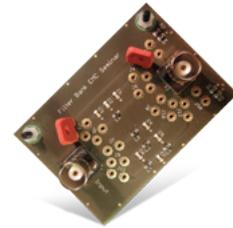
7. Overvoltage Protection

ESD and overvoltage can damage your device. Overvoltage protection must be implemented to meet the correct standard and operating environment. Learn how to select them easily and safely in your application.



8. Filter Topologies

An introduction to passive filter topologies and how to calculate their parameters. Learn how LTspice can be used to simulate and optimize filter behavior.



PASSIVE COMPONENTS

POWER NON-ISOLATED DC/DC CONVERTERS

1. Inductor Selection

Understand how the materials and construction of inductors result in different characteristics and the calculation steps to select the best inductor for your SMPS.



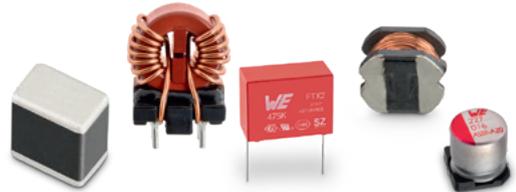
2. Capacitor Selection

Understand how the materials and construction of capacitors result in different characteristics and the calculation steps to select the best capacitors for your SMPS.



3. Filtering DC/DC Converters

Design filters for your discrete and module based power supply. The focus will be differential mode filtering on both the input and output of SMPS.



4. Resistors

Take a look behind the scenes of current sense resistors (technologies and parameters) and how to use them in your application. Understand what current sense is and why we use it.



PASSIVE COMPONENTS

INTERFACES

1. Interfaces and Communication

Learn about interface standards and how specific common mode chokes, ferrites and ESD protection can be used to solve EMI issues which apply to interfaces like USB, HDMI and RS-485.



2. LAN and Single Pair Ethernet

An introduction to Ethernet and Power over Ethernet solutions. We explain the standards, LAN and LAN PoE components needed in PoE systems.



3. RF Inductors and Antennas

What are the special considerations that need to be taken into account for RF applications? Here we show what makes LTCC components and RF inductor technologies suitable for high frequency applications.

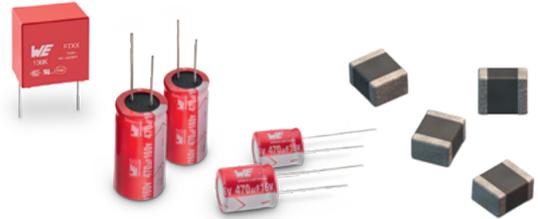


PASSIVE COMPONENTS

CAPACITORS

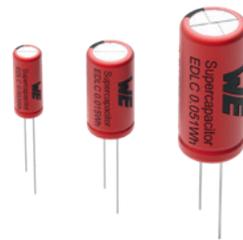
1. Capacitor Technologies and Selection

Learn about capacitor construction and materials and how electrolytic, polymer, MLCC and film technologies are used in different application scenarios.



2. Supercapacitors

Learn about the differences to other technologies and where the supercapacitors can be used. Learn how to design-in supercapacitors in a real backup solution and about the different possibilities on how to balance the supercapacitors.



QUARTZ CRYSTALS

1. Quartz Crystals and Oscillators

Learn about how to design your crystal oscillation circuit correctly, the most important components around the crystal and the consequences of mismatching.

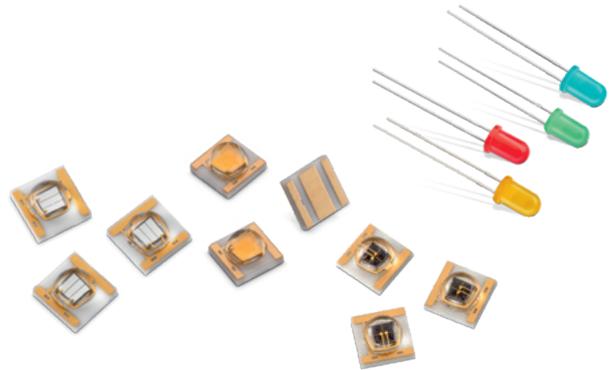


ACTIVE COMPONENTS

OPTOELECTRONIC COMPONENTS

1. Visible LEDs

An introduction to LED terminology and performance parameters. We give an overview of the different solutions available for different applications.



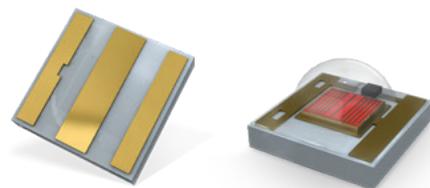
2. IR Products

Explanation of IR illumination. Important measurements and electro-optical characteristics. Connection with Photodiodes and Phototransistors. Difference between laser and LED. Application and why pulsing is important and not CW (continuous wave).



3. UV Products

An introduction to ultraviolet radiation and our UV LEDs. We explain what UV radiation can be used for and how you can achieve disinfection with UV-C LEDs. For this we also offer ray files for optical simulations.



ACTIVE COMPONENTS

OPTOELECTRONIC COMPONENTS

4. Horticulture LEDs

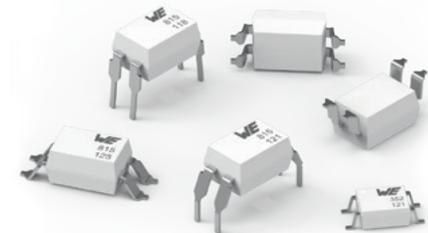
Sustainable food production with Horticulture LEDs. We show the optical, electrical and biological basics of Horticulture LEDs. We give you an overview about the benefits and explain, which LEDs are suitable for different applications.



5. Optocoupler

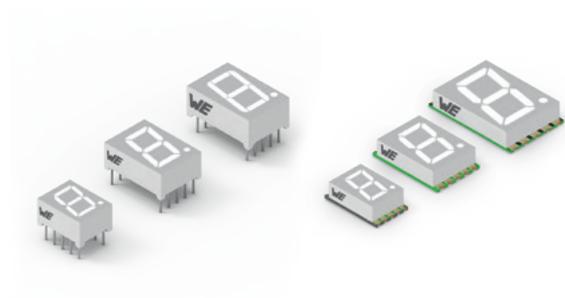
Overvoltages can damage your device. To protect your application, optocouplers can be used.

Learn about the products and benefits of optocouplers. We explain how to find the right products with the most important parameters.



6. 7 Segment Displays

7 segment displays can be seen everywhere from outdoor to indoor applications, and become very popular in consumer electronics. This module shows you their advantages, what products can be offered and how they are unbeatable compared to other display technology.



ACTIVE COMPONENTS

MAGIC MODULES & TOOLS

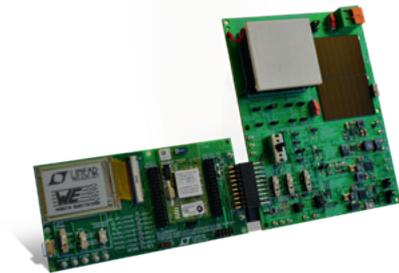
1. Magic Modules

The benefit of using Power Modules. This session goes into detail where and how to implement Power Modules. Make designing non-isolated and isolated converters with functional isolation for data acquisition, interface, microcontroller supply and industrial control applications easy.



2. Energy Harvesting

How can Energy Harvesting be used in very low power applications? We explain how our energy harvesting coils are tailored to power harvesting applications through insightful examples using our demonstration kits.



3. REDEXPERT

We demonstrate the use of our innovative **REDEXPERT** online design platform and how you can use it to quickly select and compare products that are suitable for your applications.



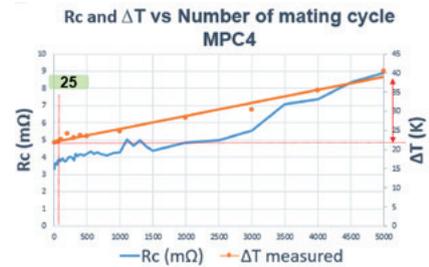
Go to REDEXPERT:
www.we-online.com/redexpert



ELECTROMECHANICAL COMPONENTS

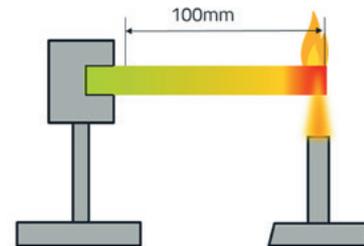
1. Electrical Contact

- Definition of contact resistance and elements included
- All resistances around contact
- Contact zone parameters (plating...)
- High power and high frequency
- Manufacturing process



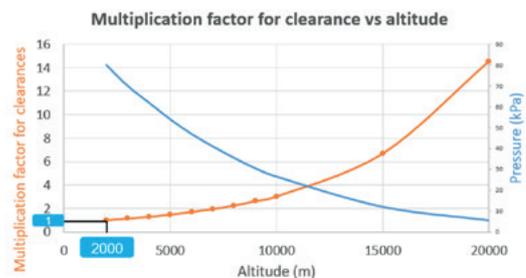
2. Plastic and Electricity

- How and why plastic is made
- Mechanical (strength, thermal) and electrical (resistive, dielectric) behavior of plastics
- Know everything on flammability:
 - Yellow card
 - UL94
 - Glow wire
- REACH, RoHS, halogen-free rules



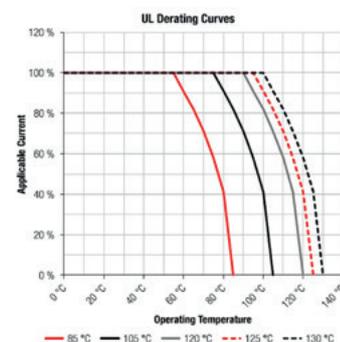
3. Creepage and Clearances

- Calculation parameters (pollution degree, overvoltage category, CTI...)
- Main rules and standards (product and PCB)
- Limitations by standards



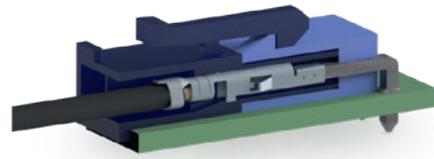
4. Connector Temperature Rise and Derating

- Consequences of too high temperatures
- Basic temperature rise – current rules
- Heat dissipation
- How to keep your system in a safe temperature



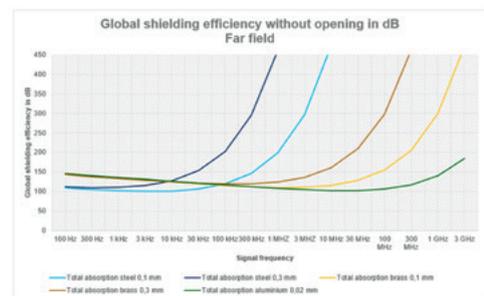
5. Crimping

- AWG and mm² cable definition
- What is a real good crimp?
- Crimp tools
- Manufacturing best practices



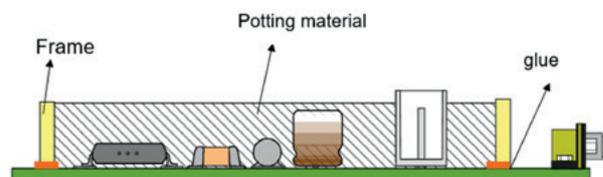
6. Electromagnetic Compatibility for Electromechanical Connectors

- Ground connection
- Shielding efficiency
- Shielding interconnections optimizing
- Data connectors impedance matching



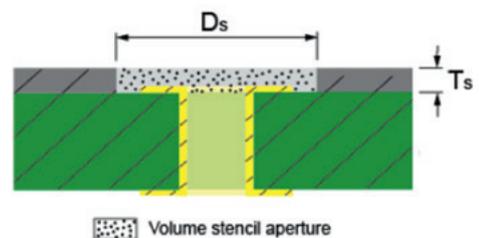
7. Basics for Potting

- Best choice of base material
- Process technologies
- Parameters to control
- Applications



8. THR – Through Hole Reflow

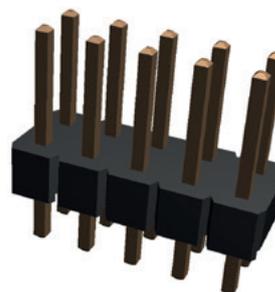
- Basic requirements for products
- Layout and stencil suggestions
- Process
- Quality requirements



ELECTROMECHANICAL COMPONENTS

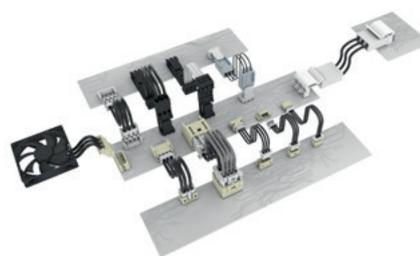
9. Tips and Tricks

- Connector plastic and retention force
- Switch debounce circuits
- AWG and mm² cables
- High temperature plastic material
- And more ...



10. Technical Training for Purchasers

- Electromechanics parameters
- Plastic, metal and plating
- Soldering process
- Electromechanical components
- Certifications



11. REDCUBE

- Secure high power connectors without soldering
- Mechanical and electrical tests
- High current PCB design tips
- Concrete assembly process and tool definition
- SMT and THR versions



12. USB-C Connector

- USB-C main features
- Power delivery
- Connector certification tests
- Possibilities and limits
- Temperature rise
- Soldering process



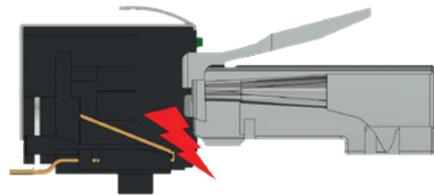
13. Function and Design of Coax Connectors

- Coax cable and connector parameters that make it work (or not)
- Fit your connector to your application
- RF signal integrity PCB layout optimization



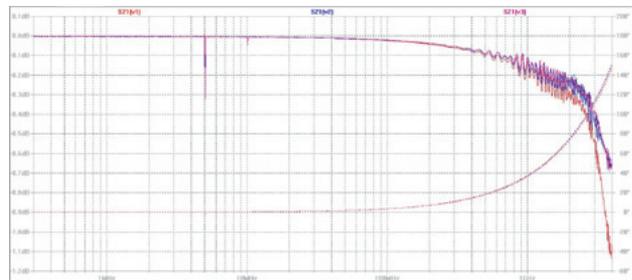
14. PoE – Power over Ethernet and Connectors

- PoE principles reminders
- Which connector category for which PoE type?
- Temperature rise concrete experiences
- Mechanical resistance



15. RF Behaviour of Pin Headers

- Parameters – insertion loss, crosstalk
- Parameters measurement set-up
- LTspice integration



16. Switch for Experts

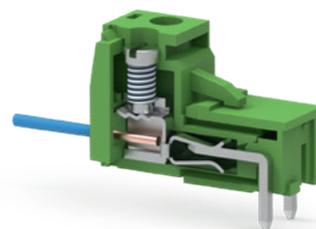
- How to choose a switch
- What you need to know on technical parameters
- Switch AC and DC load
- Washability: how to ensure good quality
- Bounce / chattering
- IPxx rating



ELECTROMECHANICAL COMPONENTS

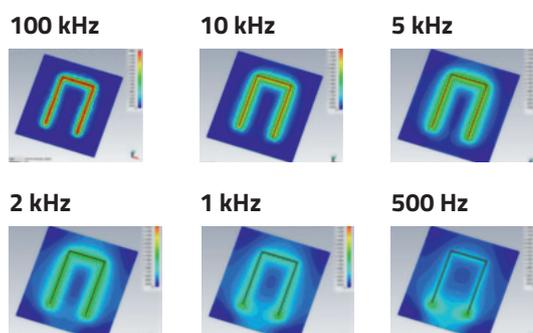
17. Terminal Blocks: What You Think You Know and What You Don't Know

- Mating cycles – hot and cold swap
- Harsh conditions resistance
- High voltage strength and limits
- How to master temperature increase
- UL and VDE differences
- How to apply inrush currents



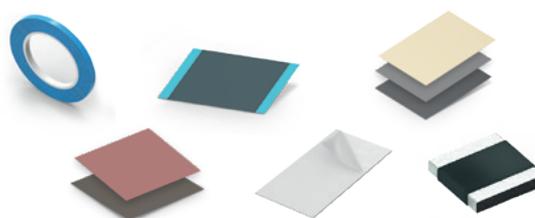
18. Design Considerations for Shielding

- Legal requirements
- How to reduce the coupling effect
- Current return path
- Improving shielding layout for connectors



19. Thermal Management

More compact and faster devices mean hotter working environments. Find out how to pick the right Thermal Interface Material for your design and help enhance the reliability of your designs.



WIRELESS CONNECTIVITY & SENSORS

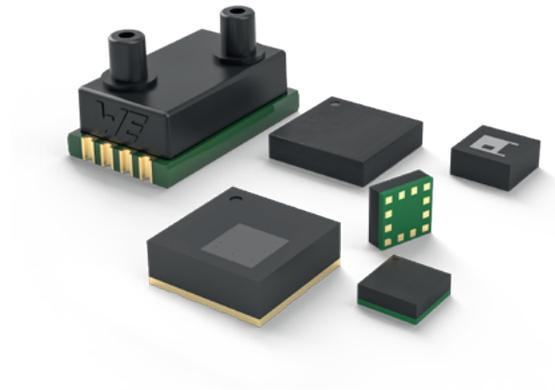
1. Radio Connection and Sensor Technology

- Basics of radio transmission
- Frequency bands
- Network topologies
- Radio protocols
- Design-In HW/SW
- Certifications



2. Introduction MEMS Sensor Technology

- Fundamentals of MEMS Sensor Technology
- Sensors over time
- Measurement technology: interaction of mechanics and electronics
- Sensor cell versus sensor system
- Smart Sensors
- Design tips



POWER TRANSFORMERS AND CUSTOM MAGNETICS

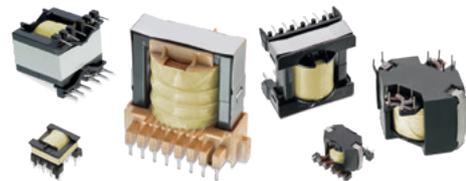
1. Transformer Selection

- What do you need to take into consideration when designing an isolated DC/DC converter?
- Can I use a standard transformer in my design?



2. PFC

- What is Power Factor Correction?
- Which passive components do I need for an active PFC?



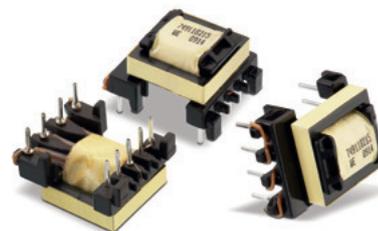
3. Wireless Power Transfer

- Go fully wireless! Wireless power transfer! Almost all applications can benefit from wireless power transfer.
- But how do you implement this easily?
- Should you use proprietary or standard solutions such as Qi?



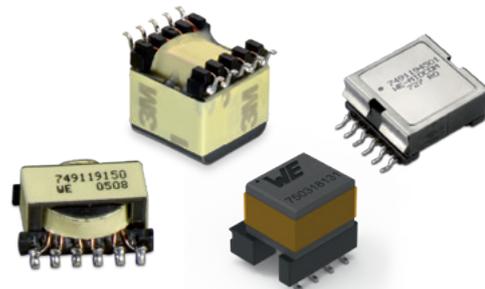
4. Power Line Transformers

- Offline SMPS designs require special specifications!
- Which transformer can I use for my application?



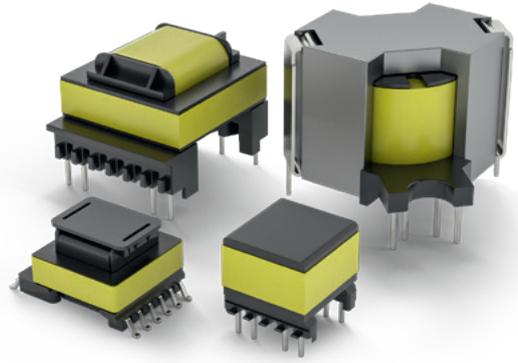
5. PoE Transformers

- Which standard transformer can be used in PoE applications?
- What are the minimum requirements?



6. Custom Transformer Design Considerations

How to determine which core and bobbin to use based on customer requirements, and what can be done to optimize construction to minimise parasitic effects (e.g. leakage inductance).



7. Transformer Design for Safety

Overview of common safety standards and what is required to determine safety distances. How the required distances are achieved using standard transformer components.

8. Transformer Design for EMC

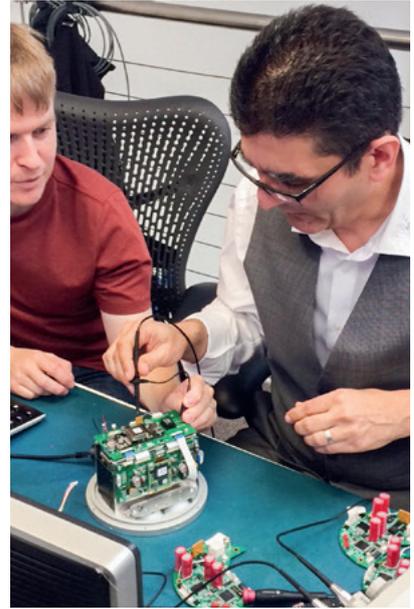
Various techniques for minimizing conducted and radiated emissions using different types of internal and external shielding. We describe the advantages and disadvantages of these techniques.

9. Transformer Design for Manufacturing

Material selection and construction techniques that ensure your transformer is optimized to our factory automation capabilities (e.g. pin-out, winding, soldering).

GALLERY





NOTES

MORE THAN YOU EXPECT

Würth Elektronik eiSos differs from all other component manufacturers in several aspects:

- We guarantee all catalog products are available ex stock
- Samples free of charge
- Orders below MOQ
- Design kits with lifelong free refill
- Design Guide Trilogy of Magnetics, Trilogy of Connectors, Trilogy of Wireless Power Transfer, Abc of Capacitors, Abc of Power Modules & Application Handbook LTspice IV Simulator Design
- Seminars and webinars free of charge
- Reference designs of leading IC manufacturers
- Worldwide technical sales force and field application engineers on site

Please contact your local Würth Elektronik sales representative for more information or to book an inhouse seminar.

