SEMEEE305

Evaluating and recommending circuit design options

Overview

This standard identifies the competences you need to evaluate circuit design options and to make recommendations on which option(s) should be implemented, in accordance with approved procedures. You will be required to evaluate and recommend design options for printed circuit board, semi-conductor layouts, thick, thin or flexible film circuitry. The design options could be for circuits such as power supplies, motor control systems, sensor/actuator circuits, digital control circuits, signal processing circuits, alarms and protection circuits, ADC and DAC hybrid circuits, communication device circuits or any other type of system that requires some form of circuit design.

Your responsibilities will require you to comply with organisational policy and procedures for evaluating and recommending circuit designs and to report any problems with these activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking full responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach to evaluating and recommending printed circuit design options. You will understand the design requirements and their application and will know about the circuit design process, in adequate depth to provide a sound basis for agreeing the design specifications at the required level of detail.

You will understand the safety requirements and any health or safety implications of the circuit design options. You will be required to demonstrate safe working practices throughout and will understand the responsibility you owe to yourself and others in the workplace.

Performance criteria

You must be able to:

P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

P2 follow the relevant instructions and any other design specifications

P3 evaluate, prioritise and recommend design options according to intended use

P4 present recommended options clearly and in the required format

P5 confirm that the design options are acceptable and note feedback for further design work

P6 check the impact of the design and that it meets relevant standards

P7 deal with problems within your control and report those that cannot be solved

P8 complete and store all relevant documentation in accordance with organisational requirements

P9 leave the work area in a safe condition on completion of the activities, as per organisational requirements

Knowledge and understanding

You need to know and understand:

K1 how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines

K2 the importance of wearing the appropriate personal protective equipment (PPE), and of keeping the work area clean and tidy

K3 what constitutes a hazardous voltage and how to reduce the risks of a phase to earth shock

K4 how to establish the detailed requirements for the circuit design

K5 the basic principles of how the electronic circuit functions, its operating sequence, the function/purpose of individual units/components and how they interact

K6 component and material characteristics relevant to the circuit design

K7 how to identify and obtain relevant sources of information about the circuit design options

K8 how to establish and compare the costs associated with given design options

K9 how to use methods to evaluate the various design options

K10 the level of detail needed to prepare a recommendation for given designs

K11 how to present circuit design recommendations (using drawings, Boolean algebra, truth tables, logic symbols, circuit diagrams, high level description language or other appropriate forms of presentation)

K12 the techniques that can be used for presenting technical information

K13 the types of drawing that can be used for circuit designs (component drawings, assembly drawings, schematic, circuit diagrams, block diagrams, wiring diagrams, circuit board designs)

K14 the extent of your own responsibility and to whom you should report if you have problems that you cannot resolve

K15 how to access, use and maintain information to comply with organisational requirements and legislation

Scope/range related to performance criteria

1. Take into account all of the following when evaluating circuit design options:
   1.1 the budget for the design
   1.2 the design function and operation
   1.3 any safety, legal or environmental considerations
   1.4 connections required to/from the circuit
   1.5 the target dimensions of the circuit
   1.6 any built-in test points (where applicable)
   1.7 substrate material to be used
   1.8 accessibility requirements for servicing
   1.9 quality standards to be achieved
   1.10 any special types of components to be used
   1.11 type of circuit (such as digital, analogue, hybrid)
   1.12 any design constraints
   1.13 the technology of the circuit design (such as single sided, double sided, multi-layer, flexible or rigid, wafers or dies)
   1.14 operating conditions (such as temperature, humidity, shock, EMC/EMI and vibration)
2. Obtain relevant instructions, specifications and information on the circuit design options from one of the following sources:
   2.1 the client
   2.2 industry standards
   2.3 technical journals
   2.4 technical manuals/handbooks
3. Evaluate circuit design options for one of the following:
   3.1 power supplies (such as switched mode, series regulation, shunt regulation)
   3.2 motor control systems (such as closed loop servo system, inverter control)
   3.3 sensor/actuator circuits (such as linear, rotational, temperature, photo-optic, flow, level, pressure)
   3.4 digital circuits (such as process control, microprocessor, logic devices, display devices)
   3.5 signal processing circuits (such as frequency modulating/demodulating, amplifiers, filters)
   3.6 alarms and protection circuits
   3.7 analogue to digital conversion/digital to analogue conversion hybrid circuits
   3.8 communication device circuits
   3.9 other circuit types (specify)
4. Evaluate and recommend design options for one of the following:
   4.1 printed circuit boards
   4.2 semi-conductor layouts
   4.3 thick film circuits
   4.4 flexible film circuits
   4.5 thin film circuits
5. Present the recommended design options using the following method:
   5.1 verbal report

5.2 Plus, one other method from the following:

6. Check that the recommended designs comply with one of the following standards:

6.1 organisational guidelines and codes of practice
6.2 client format and standards
6.3 current industry standards and codes of practice
6.4 other international standards

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