Analog electronic teaching - a new approach for bipolar transistors

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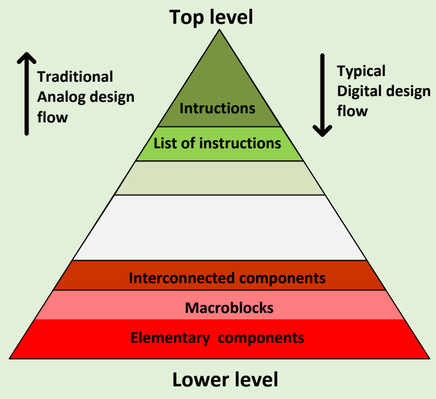
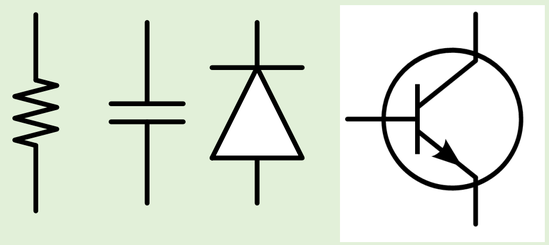
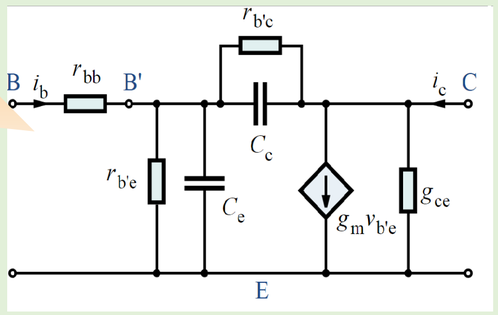
1- Electronic Design: Two opposite design flow methodologies;
the analog one is harder.





2 - Component: Transistor is considered an elemental component.

3 - Model: The traditional transistor equivalent model is too complex for beginners.



However it has :

- Three regions of operation (i)
- Collector-Emitter equivalent for each region (ii)
- Two boundaries of operation (iii)
- Two working regimes (iv)

4 - Proposed methodology

a) Team work: teacher + student

b) Student:

- Define acceptable definitions for (i, ii, iii, iv)
- Select type of Learning Support Means (LSM):
  - Internet sites
  - Internet slides
  - Internet movies
  - (Books – By teacher suggestion, for comparison)
- Mean criteria selection:
  - No suggestions where made
  - Should be as more realistic as possible
- LSM personal perceptions (not an evaluation!)

5 - Transistor working concepts perceptions for selected sites

Transistor Operation	Transistor Working Concepts	Site #						
		1	**2**	**3**	**4**	**5**	**6**	**7**
Transistor Regions	Regions identification	5	1	2	1	1	4	5
	Regions sequence	1	1	1	1	1	1	1
	Region characteristics	1	1	2	1	1	2	2
	Region boundaries	1	1	1	1	1	1	1
	Collector – Emitter equivalent	2	1	2	1	1	1	3
Transistor Regimes	Regimes identification	1	1	1	1	1	1	2
	Regions for Switching regime	1	1	1	1	1	1	1

6 - Transistor working concepts perceptions for slide sites

Transistor Operation	Transistor Working Concepts	Slide site #				
		1	**2**	**3**	**4**	**5**
Transistor Regions	Operation regions identification	2	5	3	5	4
	Regions sequence	2	4	1	1	3
	Region characteristics	1	3	4	2	3
	Region boundaries	1	1	1	2	3
	Collector – Emitter equivalent	1	1	5	2	1
Transistor Regimes	Regimes identification	1	1	2	2	1
	Regions for Switching regime	1	1	1	2	1

7 - TRANSISTOR WORKING CONCEPTS PERCEPTIONS FOR SELECTED FOR VIDEOS

Transistor Operation	Transistor Working Concepts	Video site #			
		1	**2**	**3**	**4**
Transistor Regions	Operation regions identification	5	1	2	1
	Regions sequence	1	1	1	1
	Region characteristics	1	1	2	1
	Region boundaries	1	1	1	1
	Collector – Emitter equivalent	2	1	2	1
Transistor Regimes	Regimes identification	1	1	1	1
	Regions for Switching regime	1	1	1	1

8 - TRANSISTOR WORKING CONCEPTS PERCEPTIONS FOR BOOKS

Transistor Operation	Transistor Working Concepts	Book #		
		1	**2**	**3**
Transistor Regions	Operation regions identification	3	4	3
	Regions sequence	3	3	3
	Region characteristics	3	4	3
	Region boundaries	3	3	3
	Collector – Emitter equivalent	3	3	3
Transistor Regimes	Regimes identification	3	3	3
	Regions for Switching regime	3	3	3

Conclusions

a) This work was based in a single individual sample;

b) Learning Support Means (LSM) received poor acceptance;

c) Other Alternative Support Means are under development;

d) For these, a broader test sample was used;

e) Preliminary results from this test are encouraging to further pursue this work