

**A Battery Supplied System composed of a uC and an Accelerometer sensor is part of an ECU.  
Elaborate a concept for the Power Management.**

The system has to generate the following supplies:

Vcore	1,5 V	Icore	500 mA
VI/O	3,3 V	I_I/O	220 mA
Vsensor low noise	3,3 V	Isensor	40 mA

Costs	Cost	Rth_ja[°K/W]	Drop	Model
Linear regulator VR1 LT	1,00 €	70	check datasheet MAX value	LTC1086-3.3
Linear regulator VR2	1,50 €	65	check datasheet MAX value	LTC1965-3.3
Switching regulator eff_typ=90%	3 €	70		LTC3310S
Cap (5V max)	0,03 €			
Cap (>5V max)	0,05 €			
Inductor (Isat≤300mA)	0,30 €			
Inductor (Isat>300mA)	0,50 €			

Application case: local battery	Battery voltage 5,5 V	Capacity [mA h] 1900
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Design Target Prio 1: Elaborate a concept with the combination of Linear and Switching regulators, in order to maximise the overall efficiency, justify your design choice with a short comment. What is the overall output Power? What is the overall input Power, and overall efficiency?

Design Target Prio 2: What is the cost of the designed Power Management System ? (follow the Cost in the table)

Put your concept in LTspice by using the above Models (are present in the "jigs" library). Set an indeal input voltage which emulate the battery. If necessary adapt resistor divider to accomodate the output voltage for the SMPS as you defined in your concept. Emulate the 3 Loads with Resistor. Simulate and check the Pin, Pout, Ploss , Eff, for all the regulators in steady state. For sure the results will be not equal to your concept, pls comment about the difference.

What is the dissipated power in the overal system and which is the junction temperature reached by the single regulators if T\_ambient is 85°C. Do you have risk?

When the car is in a park, the system is ON only 200 seconds every Hour. If the system OFF (quiescent) current is 1.5mA; What is the time to discharge by 30% the local battery?

The ADAS system is a safety critical system. The violation of the safet goal has a severe injury impact on the driver and it is classified as a driver difficult controllability case. The actual design has an Occurency >10%. What is the ASIL Level of this system?

The Sensor is built with micromachine technology, the sensor cavity has a recangular shape 2mmx1mm. The minimum metal width=2µm, the minimum distance 2µm the metal thicknes is 20µm. If the cavity would be only filled with the caps: What is the overall sensor capacitance tath could be realized (consider vacuum as dielectric)?

In the introduction chapter on pag 27 there are some inputs about CPSA applications. What could be a novel possible CPSA application? Highlight which application value would benefit from the CPSA. Be creative! Be innovative!

Your project has to by presented to Tesla System Engineer, put special care on the form.