

Convertor CC BUCK

Convertorul cc-cc coborâtător (buck)

- Acest convertor cc-cc produce la ieșire o tensiune mai mică decât tensiunea de intrare.

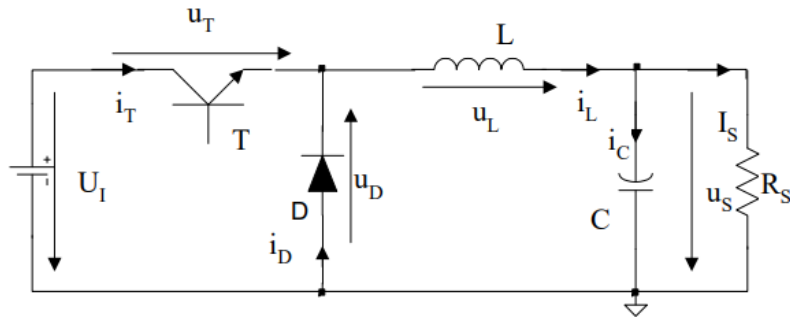


Figura 1. Schema unui convertor Buck

```

(%%199) /* 1. Definirea Variabilelor de Intrare */
Us_target: 3.3$
Ui_max: 15.449$
f: 200e3$
T: 1/f$
Is_max: 2.0$
Delta_IL: 0.6$
Delta_US: 25e-3$
U_pierderi_estimate: 0.7$

/* Tensiunea de iesire corectata pe baza pierderilor estimate */
Us_star: Us_target + U_pierderi_estimate$

/* Factorul de umplere ideal necesar */
delta: Us_star / Ui_max$

/* 2. Dimensionarea Bobinei (L) pe baza delta_ideal */
L_initial: ((Ui_max - Us_star) * (T * delta)) / Delta_IL$

/* 3. Dimensionarea Condensatorului (C) */
C_initial: (1/8) * ((1 - delta) * Ui_max * T^2) / (L_initial * Delta_US)$

/* 4. Verificarea Curentului Maxim de Varf (IL_max) */
IL_max: Is_max + Delta_IL/2$

/* 5. Verificarea Curentului Mediu Maxim Dioda (IDmed_max) */
IDmed_max_initial: Is_max * (1 - delta)$

/* Afisarea Rezultatelor Clave */
print("--- Rezultate Dimensionare Initiala (Fara Compensare Dinamica) ---")$
print("Tensiunea de iesire Corectata Us* (V):", float(Us_star));
print("Factorul de Umplere Ideal Delta (-):", float(delta));
print("-----");
print("Bobina L (uH):", float(L_initial * 1e6));
print("Condensator C (uF):", float(C_initial * 1e6));
print("Curentul Max de Varf ILmax (A):", float(IL_max));
print("Curentul Mediu Max Dioda IDmed,max (A):", float(IDmed_max_initial));
print("-----");

```

Figura1. Foaie de calcul dimensionare componente pasive

--- Rezultate Dimensionare Initiala (Fara Compensare Dinamica) ---
Tensiunea de iesire Corectata U_s^* (V): 4.0
(%o92) 4.0
Factorul de Umplere Ideal Delta (-): 0.2589164347206939
(%o93) 0.2589164347206939

(%o94) -----
Bobina L (uH): 24.70278550931021
(%o95) 24.70278550931021
Condensator C (uF): 57.9337499999999996
(%o96) 57.9337499999999996
Curentul Max de Varf I_{Lmax} (A): 2.3
(%o97) 2.3
Curentul Mediu Max Dioda $I_{Dmed,max}$ (A): 1.4821671305586122
(%o98) 1.4821671305586122

(%o99) -----

Figura 2. Rezultate dimensionare componente pasive

Absolute maximum ratings($T_a=25^\circ\text{C}$)			
Parameter	Symbol	Limits	Unit
Reverse voltage (repetitive)	V_{RM}	20	V
Reverse voltage (DC)	V_R	20	V
Average rectified forward current(*1)	I_o	3	A
Forward current surge peak (60Hz · 1cyc)	I_{FSM}	30	A
Junction temperature	T_j	125	$^\circ\text{C}$
Storage temperature	T_{stg}	-40 to +125	$^\circ\text{C}$

(*1)Mounting on alumina board. $T_c=95^\circ\text{C}$ Max.

Figura 2. Datasheet Dioda aleasa, **RB051M-2Y**

Absolute maximum ratings ($T_a=25^\circ\text{C}$)				
Parameter		Symbol	Limits	Unit
Drain-source voltage		V_{DSS}	20	V
Gate-source voltage		V_{GSS}	± 10	V
Drain current	Continuous	I_D	± 2.5	A
	Pulsed	I_{DP}^{*1}	± 5	A
Source current (Body diode)	Continuous	I_S	0.6	A
	Pulsed	I_{SP}^{*1}	5	A
Total power dissipation		P_D^{*2}	0.8	W
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Range of storage temperature		T_{stg}	-55 to +150	$^\circ\text{C}$

*1 $P_w \leq 10\text{W}$, Duty cycles $\leq 1\%$
*2 Mounted on a ceramic board

Figura 3 . Datasheet Tranzistor ales , **RUF025N02FRATL**

Static drain-source on-state resistance	R _{DS(on)} *	–	39	54	m Ω	I _D = 2.5A, V _{GS} = 4.5V
		–	49	68	m Ω	I _D = 2.5A, V _{GS} = 2.5V
		–	65	91	m Ω	I _D = 1.3A, V _{GS} = 1.8V
		–	80	160	m Ω	I _D = 0.5A, V _{GS} = 1.5V

Figura 4. Rezistenta drena sursa tranzistor mica

```

(%i97) /* 1. Definirea Variabilelor de Intrare */
Us_target: 3.3$
Ui_max: 15.449$
f: 200e3$
T: 1/f$
U_pierderi_estimate: 0.7$ /* Pierderi estimate static (dioda + bobina) */

/* 2. Calculele pentru Factorul de Umplere Idealizat */

/* Tensiunea de iesire corectata (Us*) */
Us_star: Us_target + U_pierderi_estimate$

/* Factorul de umplere ideal (delta_ideal) */
delta_ideal: Us_star / Ui_max$
delta: delta_ideal$

/* 3. Calculele Timpilor Necesari pentru Sursa PULSE */

/* Perioada (PER) */
PER: 1/f$

/* Latimea Pulsului (PW sau Ton) */
PW: delta * PER$

/* 4. Afisarea Parametrilor Sursa PULSE (V2) */
print("--- Parametrii Sursa PULSE (V2)")$
print("Factor de Umplere Ideal Delta (-):", float(delta));
print("PER (Perioada, T):", float(PER * 1e6), "uS");
print("PW (Latimea Pulsului, Ton):", float(PW * 1e6), "uS");
--- Parametrii Sursa PULSE (V2)
Factor de Umplere Ideal Delta (-): 0.2589164347206939
(%o95) 0.2589164347206939
PER (Perioada, T): 5.0 uS
(%o96) uS
PW (Latimea Pulsului, Ton): 1.2945821736034697 uS
(%o97) uS

```

Figura5 Parametrii sursei de tensiune

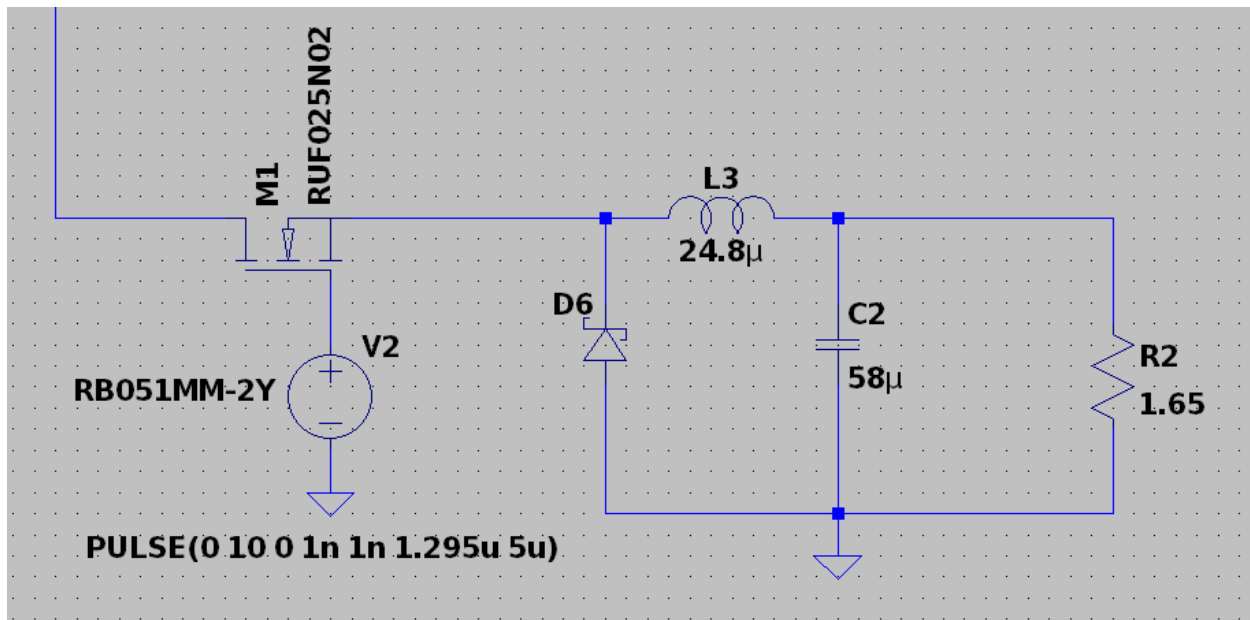
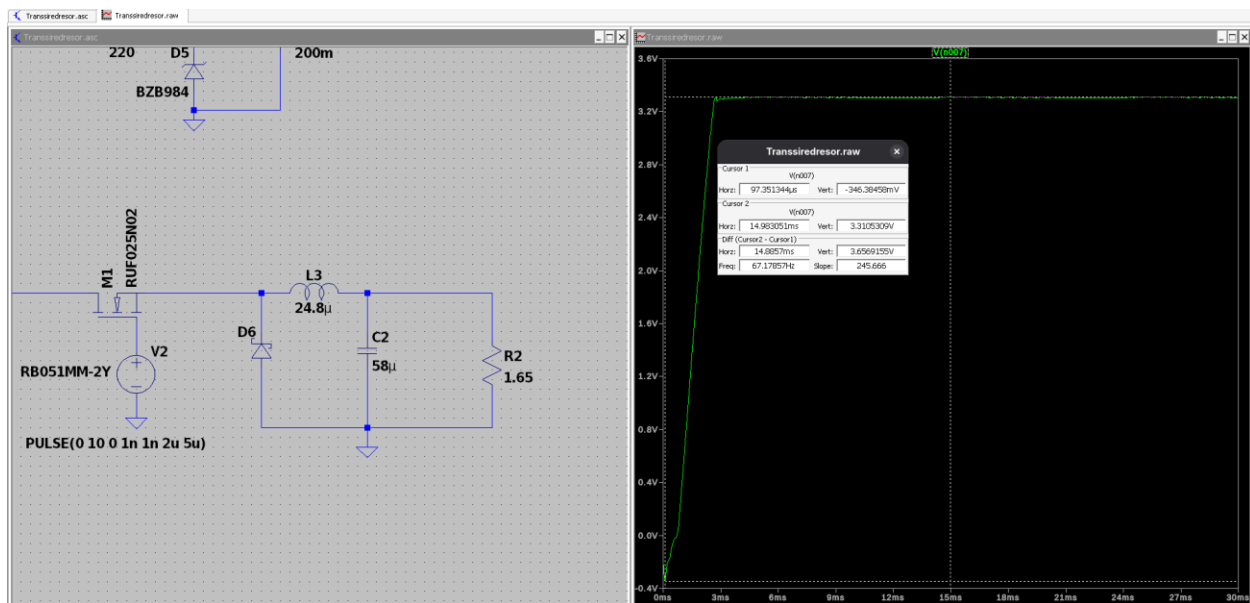


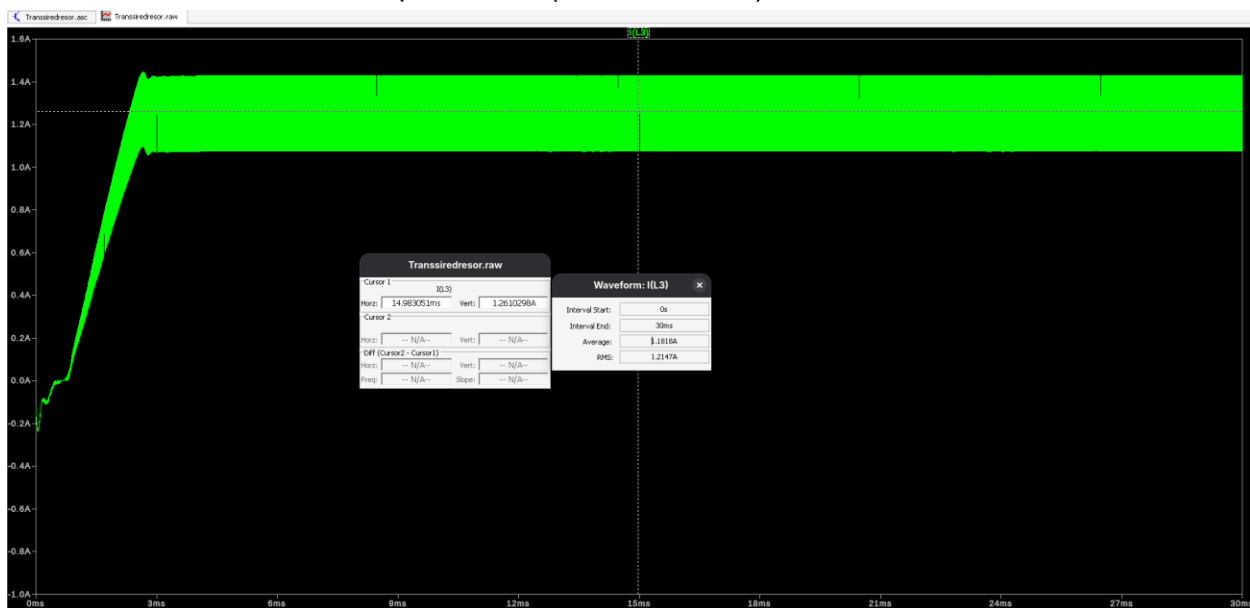
Figura6 schema electrica in ltspice

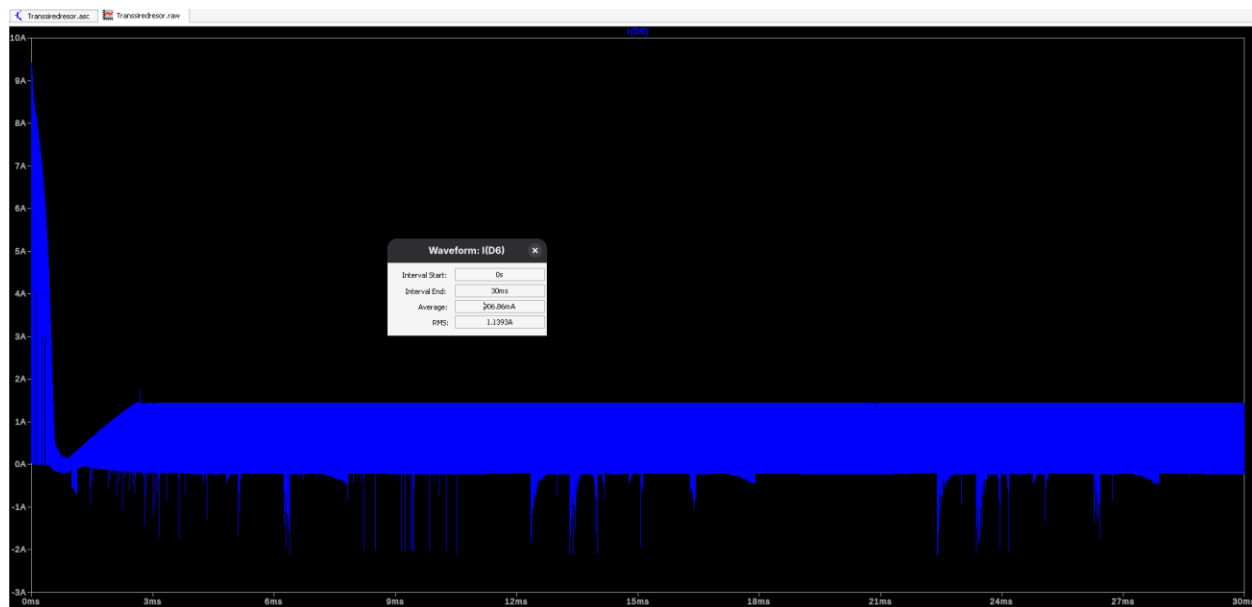


figura 7. tensiunea de la iesirea convertorului (trebuia la 3.3v si imi da la 2v)

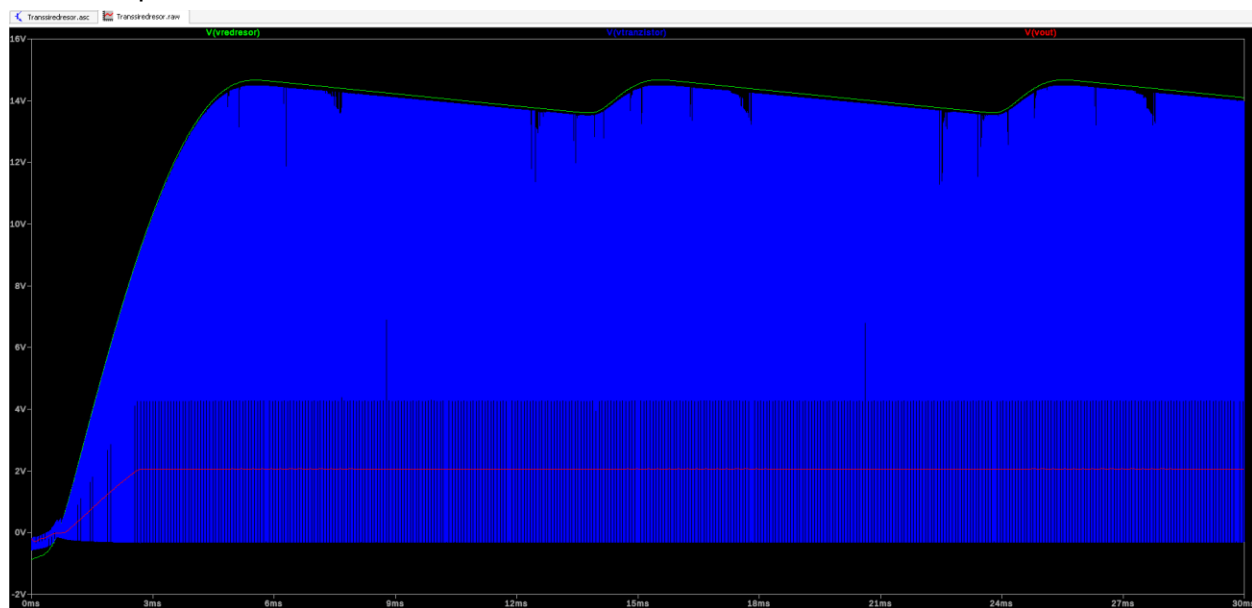


Daca modific factorul de umplere la 2u (fata de 1.295u) ne da 3.3v la iesire





Curentul prin dioda



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