GIVEN DATA:

•
$$V_{in} = 12 \, \text{V}$$

$$ullet$$
 $V_{out}=5\,\mathrm{V}$

•
$$I_{out}=1\,\mathrm{A}$$

•
$$f_s = 50 \, \mathrm{kHz}$$

CALCULATIONS:

Puty cycle

$$D = rac{V_{out}}{V_{in}} = rac{5}{12} = 0.4167$$
 (41.67%)

Inductor selection

$$L = rac{(V_{out} - V_{in}) imes D}{F_s(\Delta I)} = rac{(12-5) imes 0.4167}{50k imes 0.2} = 29.17 ext{ mH}$$

| Output capacitor

$$C = rac{D imes \Delta I}{F_s imes \Delta V} = rac{0.4167 imes 0.2}{50k imes 0.1} = \boxed{f 16.66~\mu F}$$

🔼 Inductor current ripple

$$\Delta I_L = rac{(V_{in} - V_{out}) \cdot D}{L \cdot f_s} = rac{(12 - 5) \cdot 0.4167}{0.0291 \cdot 50{,}000} pprox 0.00200 ext{ A} \quad egin{bmatrix} ext{(2.00 mA p-p)} \end{bmatrix}$$

Output voltage ripple

$$\Delta V_{out} pprox rac{\Delta I_L}{8 \cdot f_s \cdot C} = rac{0.00200}{8 \cdot 50,000 \cdot 16.66 imes 10^{-6}} pprox 0.000300 ext{ V}$$

Parameter	Value
Duty cycle (D)	0.4167 (41.67 %)
Inductor (L)	29.1 mH
Capacitor (C)	16.66 μF
Inductor ripple (ΔI_L)	2.00 mA p-p
Output ripple (ΔV_{out})	0.300 mV p-p