

EE504P-S03 Example Low Pass Filter

$$FS := 960 \quad fco := 60 \quad T := \frac{1}{FS} \quad \alpha := \frac{1}{2 \cdot \pi \cdot fco}$$

$$Kd := \frac{1}{1 + \alpha \cdot \frac{2}{T}} \quad Kd = 0.164$$

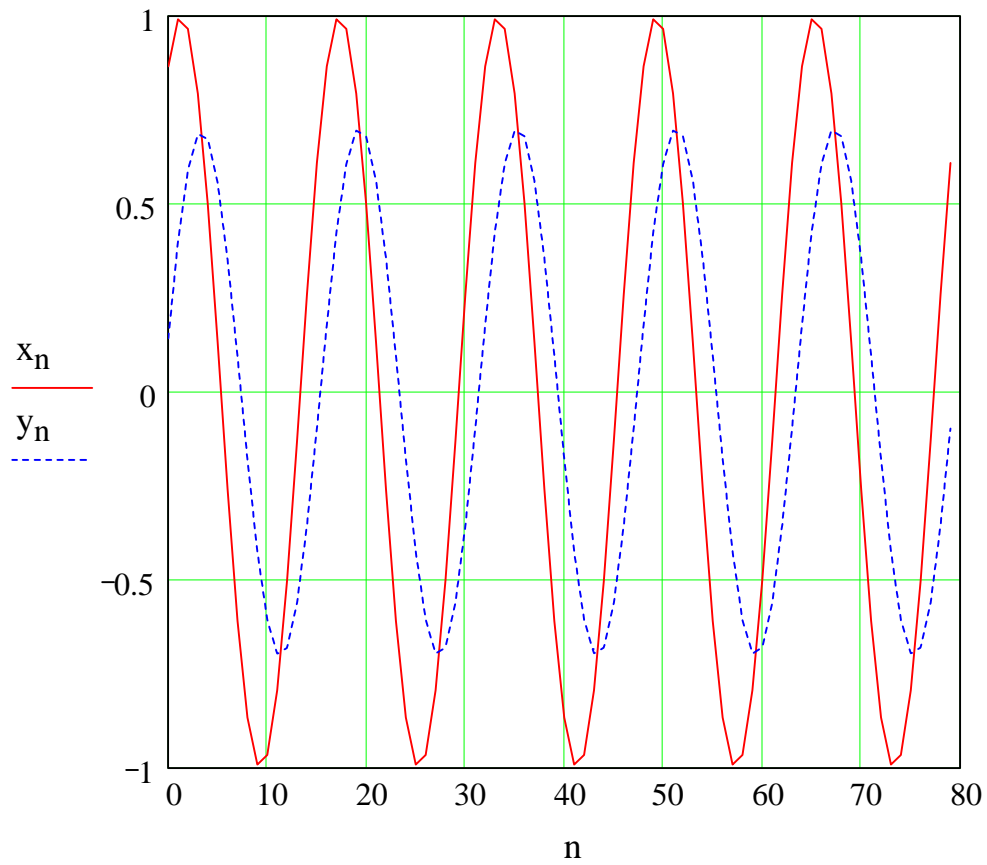
$$\alpha d := \frac{\left(1 - \alpha \cdot \frac{2}{T}\right)}{\left(1 + \alpha \cdot \frac{2}{T}\right)} \quad \alpha d = -0.672$$

$$f := 60 \quad N := \frac{FS}{f} \quad n := 0..(5 \cdot N) - 1$$

$$x_n := \sin\left(2 \cdot \pi \cdot n \cdot 60T + \frac{\pi}{3}\right)$$

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digitalfilter(x) :=
  Nx ← rows(x)
  for n ∈ 0..Nx
    yn ← 0
  for n ∈ 0..Nx - 1
    sum ← Kd · xn
    sum ← sum + Kd · xn-1 - αd · yn-1 if n >
    yn ← sum
  return y
```

$$y := \text{digitalfilter}(x)$$



$$N := 128 \quad k := 0..N-1$$

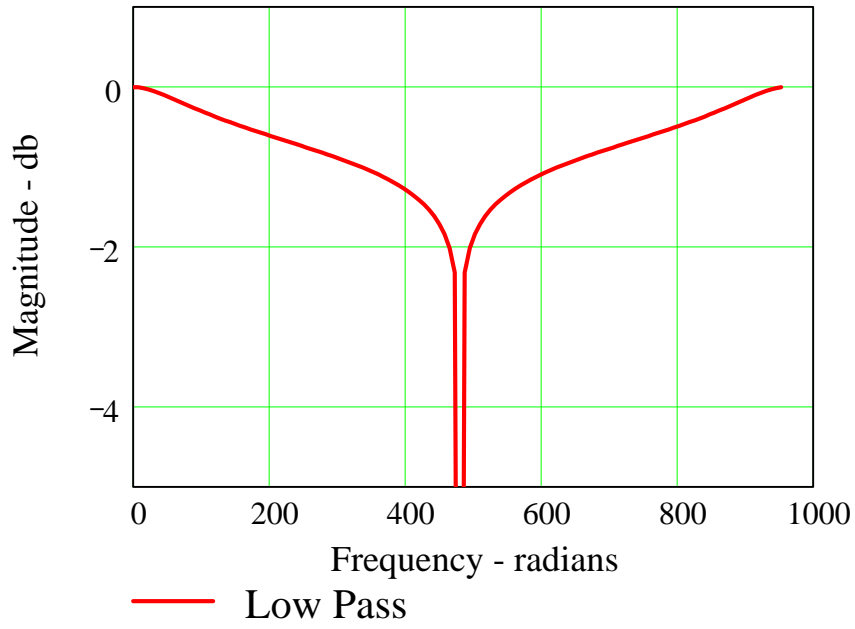
$$z_k := e^{-i \cdot (2 \cdot \pi) \cdot \frac{k}{N}} \quad w_k := \left(FS \cdot \frac{k + 0.0001}{N} \right)$$

$$Hz_k := Kd \cdot \frac{(1 + z_k)}{1 + \alpha d \cdot z_k}$$

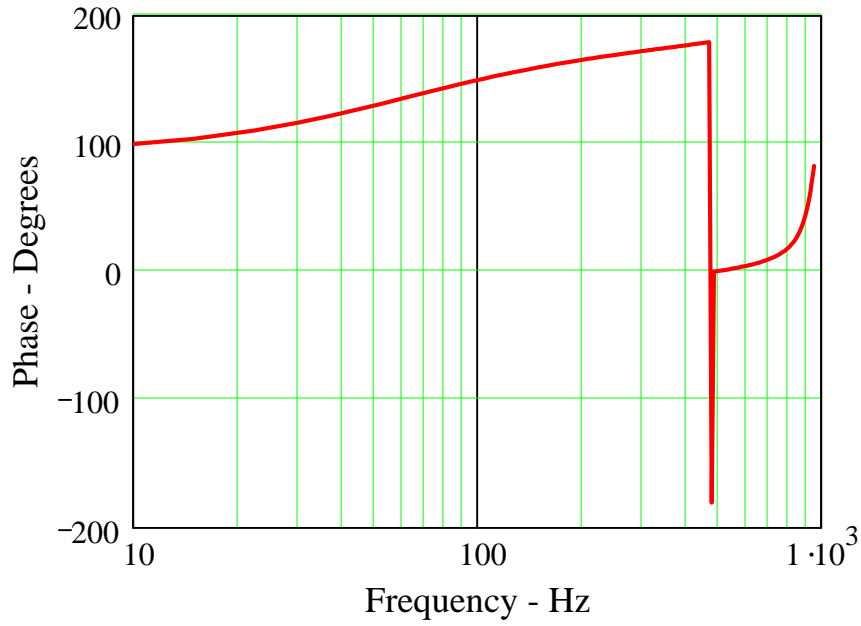
$$Hzm_k := \log(|Hz_k|)$$

$$Pz_k := \text{atan2}(\text{Im}(Hz_k), \text{Re}(Hz_k)) \cdot \frac{180}{\pi}$$

First Order Low Pass



Phase



0