Derived Transfer Functions

Transfer Function 1

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ R_4,\ LLs + RL + \frac{1}{CLs}\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{K\_HP} : R_4gm-1,\ \text{K\_LP} : R_4gm-1,\ \text{Q} : \frac{LL\sqrt{\frac{1}{CLLL}}}{R_4+RL},\ \text{Qz} : \frac{LL\sqrt{\frac{1}{CLLL}}}{RL},\ \text{bandwidth} : \frac{R_4+RL}{LL},\ \text{wo} : \sqrt{\frac{1}{CLLL}},\ \text{wz} : \sqrt{\frac{1}{CLLL}} \right\},\ \text{tf} : \frac{\left(R_4gm-1\right)\left(CLLLs^2+CLRLs+1\right)}{CLLLs^2+CLR_4s+CLRLs+1} \right\}$$

Transfer Function 2

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ R_3,\ \frac{LLs}{CLLLs^2+1} + RL\right),\ \text{parameters} : \left\{ \text{K\_BP} : R_4gm-1,\ \text{K\_HP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{K\_LP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{Q} : CL\sqrt{\frac{1}{CLLL}}\left(R_4+RL\right),\ \text{Qz} : CLRL\sqrt{\frac{1}{CLLL}},\ \text{bandwidth} : \frac{1}{CL\left(R_4+RL\right)},\ \text{wo} : \sqrt{\frac{1}{CLLL}},\ \text{wz} : \sqrt{\frac{1}{CLLL}} \right\},\ \text{tf} : \frac{\left(R_4gm-1\right)\left(CLLLRLs^2+LLs+RL\right)}{CLLLR_4s^2+CLLLRLs^2+LLs+R_4+RL} \right\}$$

Transfer Function 3

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ L_4s,\ RL + \frac{1}{CLs}\right),\ \text{parameters} : \left\{ \text{K\_BP} : -1 + \frac{L_4gm}{CLRL},\ \text{K\_HP} : RLgm,\ \text{K\_LP} : -1,\ \text{Q} : \frac{L_4\sqrt{\frac{1}{CLL_4}}}{RL},\ \text{Qz} : -\frac{CLL_4RLgm\sqrt{\frac{1}{CLL_4}}}{CLRL-L_4gm},\ \text{bandwidth} : \frac{RL}{L_4},\ \text{wo} : \sqrt{\frac{1}{CLL_4}},\ \text{wz} : \sqrt{-\frac{1}{CLL_4RLgm}} \right\},\ \text{tf} : \frac{\left(CLRLs+1\right)\left(L_4gms-1\right)}{CLL_4s^2+CLRLs+1} \right\}$$

Transfer Function 4

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_4}{C_4R_4s+1},\ RL + \frac{1}{CLs}\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{-C_4R_4+CLR_4RLgm-CLRL}{C_4R_4+CLR_4+CLRL},\ \text{K\_HP} : -1,\ \text{K\_LP} : R_4gm-1,\ \text{Q} : \frac{C_4CLR_4RL\sqrt{\frac{1}{C_4CLR_4RL}}}{C_4R_4+CLR_4+CLRL},\ \text{Qz} : \frac{C_4CLR_4RL\sqrt{\frac{1}{C_4CLR_4RL}}}{C_4R_4-CLR_4RLgm+CLRL},\ \text{bandwidth} : \frac{C_4R_4+CLR_4+CLRL}{C_4CLR_4RL},\ \text{wo} : \sqrt{\frac{1}{C_4CLR_4RL}},\ \text{wz} : \sqrt{\frac{-R_4gm+1}{C_4CLR_4RL}} \right\},\ \text{tf} : -\frac{\left(CLRLs+1\right)\left(C_4R_4s-R_4gm+1\right)}{C_4CLR_4RLs^2+C_4R_4s+CLR_4s+CLRLs+1} \right\}$$

Transfer Function 5

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ L_4s + \frac{1}{C_4s},\ RL\right),\ \text{parameters} : \left\{ \text{K\_BP} : -1,\ \text{K\_HP} : RLgm,\ \text{K\_LP} : RLgm,\ \text{Q} : \frac{L_4\sqrt{\frac{1}{C_4L_4}}}{RL},\ \text{Qz} : -L_4gm\sqrt{\frac{1}{C_4L_4}},\ \text{bandwidth} : \frac{RL}{L_4},\ \text{wo} : \sqrt{\frac{1}{C_4L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(C_4L_4gms^2-C_4s+gm\right)}{C_4L_4s^2+C_4RLs+1} \right\}$$

Transfer Function 6

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ L_4s + \frac{1}{C_4s},\ \frac{RL}{CLRLs+1}\right),\ \text{parameters} : \left\{ \text{K\_BP} : -\frac{C_4}{C_4+CL},\ \text{K\_HP} : RLgm,\ \text{K\_LP} : RLgm,\ \text{Q} : \frac{C_4L_4\sqrt{\frac{1}{C_4L_4}}}{RL\left(C_4+CL\right)},\ \text{Qz} : -L_4gm\sqrt{\frac{1}{C_4L_4}},\ \text{bandwidth} : \frac{RL\left(C_4+CL\right)}{C_4L_4},\ \text{wo} : \sqrt{\frac{1}{C_4L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(C_4L_4gms^2-C_4s+gm\right)}{C_4CLL_4RLs^3+C_4L_4s^2+C_4RLs+CLRLs+1} \right\}$$

Transfer Function 7

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_4s}{C_4L_4s^2+1},\ RL\right),\ \text{parameters} : \left\{ \text{K\_BP} : RLgm,\ \text{K\_HP} : -1,\ \text{K\_LP} : -1,\ \text{Q} : C_4RL\sqrt{\frac{1}{C_4L_4}},\ \text{Qz} : -\frac{C_4\sqrt{\frac{1}{C_4L_4}}}{gm},\ \text{bandwidth} : \frac{1}{C_4RL},\ \text{wo} : \sqrt{\frac{1}{C_4L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(-C_4L_4s^2+L_4gms-1\right)}{C_4L_4RLs^2+L_4s+RL} \right\}$$

Transfer Function 8

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_4s}{C_4L_4s^2+1},\ \frac{RL}{CLRLs+1}\right),\ \text{parameters} : \left\{ \text{K\_BP} : RLgm,\ \text{K\_HP} : -\frac{C_4}{C_4+CL},\ \text{K\_LP} : -1,\ \text{Q} : RL\sqrt{\frac{1}{L_4\left(C_4+CL\right)}}\left(C_4+CL\right),\ \text{Qz} : -\frac{C_4\sqrt{\frac{1}{L_4(C_4+CL)}}}{gm},\ \text{bandwidth} : \frac{1}{RL\left(C_4+CL\right)},\ \text{wo} : \sqrt{\frac{1}{L_4\left(C_4+CL\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(-C_4L_4s^2+L_4gms-1\right)}{C_4L_4RLs^2+CLL_4RLs^2+L_4s+RL} \right\}$$

Transfer Function 9

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_4s}{C_4L_4s^2+1},\ \frac{1}{CLs + \frac{1}{RL} + \frac{1}{LLs}}\right),\ \text{parameters} : \left\{ \text{K\_BP} : RLgm,\ \text{K\_HP} : -\frac{C_4}{C_4+CL},\ \text{K\_LP} : -\frac{LL}{L_4+LL},\ \text{Q} : RL\sqrt{\frac{L_4+LL}{L_4LL\left(C_4+CL\right)}}\left(C_4+CL\right),\ \text{Qz} : -\frac{C_4\sqrt{\frac{L_4+LL}{L_4LL(C_4+CL)}}}{gm},\ \text{bandwidth} : \frac{1}{RL\left(C_4+CL\right)},\ \text{wo} : \sqrt{\frac{L_4+LL}{L_4LL\left(C_4+CL\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{LLRL\left(-C_4L_4s^2+L_4gms-1\right)}{C_4L_4LLRLs^2+CLL_4LLRLs^2+L_4LLs+L_4RL+LLRL} \right\}$$

Transfer Function 10

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ L_4s + R_4 + \frac{1}{C_4s},\ RL\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{K\_HP} : RLgm,\ \text{K\_LP} : RLgm,\ \text{Q} : \frac{L_4\sqrt{\frac{1}{C_4L_4}}}{R_4+RL},\ \text{Qz} : \frac{L_4gm\sqrt{\frac{1}{C_4L_4}}}{R_4gm-1},\ \text{bandwidth} : \frac{R_4+RL}{L_4},\ \text{wo} : \sqrt{\frac{1}{C_4L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(C_4L_4gms^2+C_4R_4gms-C_4s+gm\right)}{C_4L_4s^2+C_4R_4s+C_4RLs+1} \right\}$$

Transfer Function 11

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ L_4s + R_4 + \frac{1}{C_4s},\ \frac{RL}{CLRLs+1}\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{C_4RL\left(R_4gm-1\right)}{C_4R_4+C_4RL+CLRL},\ \text{K\_HP} : \frac{L_4RLgm}{CLR_4RL+L_4},\ \text{K\_LP} : RLgm,\ \text{Q} : \frac{C_4\sqrt{\frac{1}{C_4(CLR_4RL+L_4)}}}{C_4R_4+C_4RL+CLRL}\left(CLR_4RL+L_4\right),\ \text{Qz} : \frac{L_4gm\sqrt{\frac{1}{C_4(CLR_4RL+L_4)}}}{R_4gm-1},\ \text{bandwidth} : \frac{C_4R_4+C_4RL+CLRL}{C_4\left(CLR_4RL+L_4\right)},\ \text{wo} : \sqrt{\frac{1}{C_4\left(CLR_4RL+L_4\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(C_4L_4gms^2+C_4R_4gms-C_4s+gm\right)}{C_4CLL_4RLs^3+C_4CLR_4RLs^2+C_4L_4s^2+C_4R_4s+C_4RLs+CLRLs+1} \right\}$$

Transfer Function 12

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}},\ RL\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{K\_HP} : -1,\ \text{K\_LP} : -1,\ \text{Q} : \frac{C_4R_4RL\sqrt{\frac{1}{C_4L_4}}}{R_4+RL},\ \text{Qz} : -\frac{C_4R_4\sqrt{\frac{1}{C_4L_4}}}{R_4gm-1},\ \text{bandwidth} : \frac{R_4+RL}{C_4R_4RL},\ \text{wo} : \sqrt{\frac{1}{C_4L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(-C_4L_4R_4s^2+L_4R_4gms-L_4s-R_4\right)}{C_4L_4R_4RLs^2+L_4R_4s+L_4RLs+R_4RL} \right\}$$

Transfer Function 13

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}},\ LLs\right),\ \text{parameters} : \left\{ \text{K\_BP} : R_4gm-1,\ \text{K\_HP} : -1,\ \text{K\_LP} : -\frac{LL}{L_4+LL},\ \text{Q} : C_4R_4\sqrt{\frac{L_4+LL}{C_4L_4LL}},\ \text{Qz} : -\frac{C_4R_4\sqrt{\frac{L_4+LL}{C_4L_4LL}}}{R_4gm-1},\ \text{bandwidth} : \frac{1}{C_4R_4},\ \text{wo} : \sqrt{\frac{L_4+LL}{C_4L_4LL}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{LL\left(-C_4L_4R_4s^2+L_4R_4gms-L_4s-R_4\right)}{C_4L_4LLR_4s^2+L_4LLs+L_4R_4+LLR_4} \right\}$$

Transfer Function 14

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}},\ \frac{1}{CLs}\right),\ \text{parameters} : \left\{ \text{K\_BP} : R_4gm-1,\ \text{K\_HP} : -\frac{C_4}{C_4+CL},\ \text{K\_LP} : -1,\ \text{Q} : R_4\sqrt{\frac{1}{L_4\left(C_4+CL\right)}}\left(C_4+CL\right),\ \text{Qz} : -\frac{C_4R_4\sqrt{\frac{1}{L_4(C_4+CL)}}}{R_4gm-1},\ \text{bandwidth} : \frac{1}{R_4\left(C_4+CL\right)},\ \text{wo} : \sqrt{\frac{1}{L_4\left(C_4+CL\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{-C_4L_4R_4s^2+L_4R_4gms-L_4s-R_4}{C_4L_4R_4s^2+CLL_4R_4s^2+L_4s+R_4} \right\}$$

Transfer Function 15

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}},\ \frac{RL}{CLRLs+1}\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{K\_HP} : -\frac{C_4}{C_4+CL},\ \text{K\_LP} : -1,\ \text{Q} : \frac{R_4RL\sqrt{\frac{1}{L_4(C_4+CL)}}\left(C_4+CL\right)}{R_4+RL},\ \text{Qz} : -\frac{C_4R_4\sqrt{\frac{1}{L_4(C_4+CL)}}}{R_4gm-1},\ \text{bandwidth} : \frac{R_4+RL}{R_4RL\left(C_4+CL\right)},\ \text{wo} : \sqrt{\frac{1}{L_4\left(C_4+CL\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(-C_4L_4R_4s^2+L_4R_4gms-L_4s-R_4\right)}{C_4L_4R_4RLs^2+CLL_4R_4RLs^2+L_4R_4s+L_4RLs+R_4RL} \right\}$$

Transfer Function 16

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}},\ \frac{LLs}{CLLLs^2+1}\right),\ \text{parameters} : \left\{ \text{K\_BP} : R_4gm-1,\ \text{K\_HP} : -\frac{C_4}{C_4+CL},\ \text{K\_LP} : -\frac{LL}{L_4+LL},\ \text{Q} : R_4\sqrt{\frac{L_4+LL}{L_4LL\left(C_4+CL\right)}}\left(C_4+CL\right),\ \text{Qz} : -\frac{C_4R_4\sqrt{\frac{L_4+LL}{L_4LL(C_4+CL)}}}{R_4gm-1},\ \text{bandwidth} : \frac{1}{R_4\left(C_4+CL\right)},\ \text{wo} : \sqrt{\frac{L_4+LL}{L_4LL\left(C_4+CL\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{LL\left(-C_4L_4R_4s^2+L_4R_4gms-L_4s-R_4\right)}{C_4L_4LLR_4s^2+CLL_4LLR_4s^2+L_4LLs+L_4R_4+LLR_4} \right\}$$

Transfer Function 17

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}},\ \frac{1}{CLs + \frac{1}{RL} + \frac{1}{LLs}}\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{K\_HP} : -\frac{C_4}{C_4+CL},\ \text{K\_LP} : -\frac{LL}{L_4+LL},\ \text{Q} : \frac{R_4RL\sqrt{\frac{L_4+LL}{L_4LL(C_4+CL)}}\left(C_4+CL\right)}{R_4+RL},\ \text{Qz} : -\frac{C_4R_4\sqrt{\frac{L_4+LL}{L_4LL(C_4+CL)}}}{R_4gm-1},\ \text{bandwidth} : \frac{R_4+RL}{R_4RL\left(C_4+CL\right)},\ \text{wo} : \sqrt{\frac{L_4+LL}{L_4LL\left(C_4+CL\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{LLRL\left(-C_4L_4R_4s^2+L_4R_4gms-L_4s-R_4\right)}{C_4L_4LLR_4RLs^2+CLL_4LLR_4RLs^2+L_4LLR_4s+L_4LLRLs+L_4R_4RL+LLR_4RL} \right\}$$

Transfer Function 18

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_4s}{C_4L_4s^2+1} + R_4,\ RL\right),\ \text{parameters} : \left\{ \text{K\_BP} : RLgm,\ \text{K\_HP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{K\_LP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{Q} : C_4\sqrt{\frac{1}{C_4L_4}}\left(R_4+RL\right),\ \text{Qz} : \frac{C_4\sqrt{\frac{1}{C_4L_4}}\left(R_4gm-1\right)}{gm},\ \text{bandwidth} : \frac{1}{C_4\left(R_4+RL\right)},\ \text{wo} : \sqrt{\frac{1}{C_4L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(C_4L_4R_4gms^2-C_4L_4s^2+L_4gms+R_4gm-1\right)}{C_4L_4R_4s^2+C_4L_4RLs^2+L_4s+R_4+RL} \right\}$$

Transfer Function 19

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_4s}{C_4L_4s^2+1} + R_4,\ \frac{1}{CLs}\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{L_4gm}{CLR_4},\ \text{K\_HP} : \frac{C_4\left(R_4gm-1\right)}{C_4+CL},\ \text{K\_LP} : R_4gm-1,\ \text{Q} : \frac{L_4\sqrt{\frac{1}{L_4(C_4+CL)}}\left(C_4+CL\right)}{CLR_4},\ \text{Qz} : \frac{C_4\sqrt{\frac{1}{L_4(C_4+CL)}}\left(R_4gm-1\right)}{gm},\ \text{bandwidth} : \frac{CLR_4}{L_4\left(C_4+CL\right)},\ \text{wo} : \sqrt{\frac{1}{L_4\left(C_4+CL\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{C_4L_4R_4gms^2-C_4L_4s^2+L_4gms+R_4gm-1}{C_4CLL_4R_4s^3+C_4L_4s^2+CLL_4s^2+CLR_4s+1} \right\}$$

Transfer Function 20

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{L_4s}{C_4L_4s^2+1} + R_4,\ \frac{RL}{CLRLs+1}\right),\ \text{parameters} : \left\{ \text{K\_BP} : \frac{L_4RLgm}{CLR_4RL+L_4},\ \text{K\_HP} : \frac{C_4RL\left(R_4gm-1\right)}{C_4R_4+C_4RL+CLRL},\ \text{K\_LP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{Q} : \frac{L_4\sqrt{\frac{R_4+RL}{L_4(C_4R_4+C_4RL+CLRL)}}}{CLR_4RL+L_4}\left(C_4R_4+C_4RL+CLRL\right),\ \text{Qz} : \frac{C_4\sqrt{\frac{R_4+RL}{L_4(C_4R_4+C_4RL+CLRL)}}\left(R_4gm-1\right)}{gm},\ \text{bandwidth} : \frac{CLR_4RL+L_4}{L_4\left(C_4R_4+C_4RL+CLRL\right)},\ \text{wo} : \sqrt{\frac{R_4+RL}{L_4\left(C_4R_4+C_4RL+CLRL\right)}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(C_4L_4R_4gms^2-C_4L_4s^2+L_4gms+R_4gm-1\right)}{C_4CLL_4R_4RLs^3+C_4L_4R_4s^2+C_4L_4RLs^2+CLL_4RLs^2+CLR_4RLs+L_4s+R_4+RL} \right\}$$

Transfer Function 21

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_4\left(L_4s + \frac{1}{C_4s}\right)}{L_4s + R_4 + \frac{1}{C_4s}},\ RL\right),\ \text{parameters} : \left\{ \text{K\_BP} : -1,\ \text{K\_HP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{K\_LP} : \frac{RL\left(R_4gm-1\right)}{R_4+RL},\ \text{Q} : \frac{L_4\sqrt{\frac{1}{C_4L_4}}\left(R_4+RL\right)}{R_4RL},\ \text{Qz} : \frac{L_4\sqrt{\frac{1}{C_4L_4}}\left(-R_4gm+1\right)}{R_4},\ \text{bandwidth} : \frac{R_4RL}{L_4\left(R_4+RL\right)},\ \text{wo} : \sqrt{\frac{1}{C_4L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{RL\left(C_4L_4R_4gms^2-C_4L_4s^2-C_4R_4s+R_4gm-1\right)}{C_4L_4R_4s^2+C_4L_4RLs^2+C_4R_4RLs+R_4+RL} \right\}$$

Transfer Function 22

$$H(s) = \left\{ \text{fType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_4\left(L_4s + \frac{1}{C_4s}\right)}{L_4s + R_4 + \frac{1}{C_4s}},\ \frac{1}{CLs}\right),\ \text{parameters} : \left\{ \text{K\_BP} : -\frac{C_4}{C_4+CL},\ \text{K\_HP} : R_4gm-1,\ \text{K\_LP} : R_4gm-1,\ \text{Q} : \frac{C_4L_4\sqrt{\frac{1}{C_4L_4}}}{R_4\left(C_4+CL\right)},\ \text{Qz} : \frac{L_4\sqrt{\frac{1}{C_4L_4}}\left(-R_4gm+1\right)}{R_4},\ \text{bandwidth} : \frac{R_4\left(C_4+CL\right)}{C_4L_4},\ \text{wo} : \sqrt{\frac{1}{C_4L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4L_4}} \right\},\ \text{tf} : \frac{C_4L_4R_4gms^2-C_4L_4s^2-C_4R_4s+R_4gm-1}{C_4CLL_4R_4s^3+C_4L_4s^2+C_4R_4s+CLR_4s+1} \right\}$$

Transfer Function 23

$$H(s) = \left\{ \text{tType} : \text{GE},\ \text{impedance} : \left(\infty,\ \infty,\ \infty,\ \infty,\ \frac{R_4\left(L_4 s + \frac{1}{C_4 s}\right)}{L_4 s + R_4 + \frac{1}{C_4 s}},\ \frac{RL}{CLRLs + 1} \right),\ \text{parameters} : \left\{ \text{K\_BP} : -\frac{C_4}{C_4 + CL},\ \text{K\_HP} : \frac{RL\left(R_4 gm - 1\right)}{R_4 + RL},\ \text{K\_LP} : \frac{RL\left(R_4 gm - 1\right)}{R_4 + RL},\ \text{Q} : \frac{C_4 L_4 \sqrt{\frac{1}{C_4 L_4}}\left(R_4 + RL\right)}{R_4 RL\left(C_4 + CL\right)},\ \text{Qz} : \frac{L_4 \sqrt{\frac{1}{C_4 L_4}}\left(-R_4 gm + 1\right)}{R_4},\ \text{bandwidth} : \frac{R_4 RL\left(C_4 + CL\right)}{C_4 L_4\left(R_4 + RL\right)},\ \text{wo} : \sqrt{\frac{1}{C_4 L_4}},\ \text{wz} : \sqrt{\frac{1}{C_4 L_4}} \right\},\ \text{tf} : \frac{RL\left(C_4 L_4 R_4 gms^2 - C_4 L_4 s^2 - C_4 R_4 s + R_4 gm - 1\right)}{C_4 CLL_4 R_4 RLs^3 + C_4 L_4 R_4 s^2 + C_4 L_4 RLs^2 + C_4 R_4 RLs + CLR_4 RLs + R_4 + RL} \right\}$$