

Experiment: TIA simple Z2 Z4 ZL

Filter 1

Invalid filter

$$Z(s): (\infty, R_2, \infty, R_4, \infty, \infty, R_L)$$

$$H(s): \frac{R_4 R_L}{R_4 + 2 R_L}$$

Filter 2

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4}{C_L R_4 s + 2}$$

Filter 3

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_4 R_L}{C_L R_4 R_L s + R_4 + 2 R_L}$$

Filter 4

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_L R_L s + 1)}{C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 5

Filter Type: BS

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_L L_L s^2 + 1)}{2 C_L L_L s^2 + C_L R_4 s + 2}$$

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L L_L}}{R_4}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_4}{2 L_L}$$

Filter 6

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_4}{C_L L_L R_4 s^2 + C_L R_4 s + R_4}$$

$$\mathbf{Q}: \frac{C_L R_4 \sqrt{C_L L_L}}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{2}{C_L R_4}$$

Filter 7

Filter Type: GE

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_L L_L s^2 + C_L R_L s + 1)}{2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L L_L}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_4 + 2 R_L}{2 L_L}$$

$$\mathbf{Qz}: \frac{L_L \sqrt{C_L L_L}}{R_L}$$

Filter 8

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_L R_L R_4}{C_L L_L R_4 R_L s^2 + L_L R_4 s^2 + 2 L_L R_L s + R_4 R_L}$$

$$\mathbf{Q}: \frac{C_L R_4 R_L \sqrt{C_L L_L}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_4 + 2 R_L}{C_L R_4 R_L}$$

Filter 9

Filter Type: GE

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4 (C_L L_L R_L s^2 + L_L s + R_L)}{C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{C_L \sqrt{C_L L_L} (R_4 + 2 R_L)}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{2}{C_L (R_4 + 2 R_L)}$$

$$\mathbf{Qz}: C_L R_L \sqrt{\frac{1}{C_L L_L}}$$

Filter 10

Filter Type: BS

$$Z(s): \left(\infty, R_2, \infty, R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L R_L (C_L L_L s^2 + 1)}{C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + C_L R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{C_L L_L} (R_4 + 2 R_L)}{R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_4 R_L}{L_L (R_4 + 2 R_L)}$$

Filter 11

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, R_L \right)$$

$$H(s): \frac{R_4}{2 C_L R_L s + 1}$$

Filter 12

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{1}{s (2 C_L + C_L)}$$

Filter 13

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L}{2 C_L R_L s + C_L R_L s + 1}$$

Filter 14

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L R_L s + 1}{s(2C_L C_L R_L s^2 + 2C_L + C_L)}$$

Filter 15

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + 1}{s(2C_L C_L L_L s^2 + 2C_L + C_L)}$$

Filter 16

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s}{2C_L L_L s^2 + C_L L_L s^2 + 1}$$

Filter 17

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + C_L R_L s + 1}{s(2C_L C_L L_L s^2 + 2C_L R_L s + 2C_L + C_L)}$$

Filter 18**Filter Type:** BP

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{C_L s}}} \right)$$

$$H(s): \frac{L_L R_L s}{2C_L L_L R_L s^2 + C_L L_L R_L s^2 + L_L s + R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L(2C_L + C_L)}} (2C_L + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_L + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{1}{R_L(2C_L + C_L)}$$

Filter 19

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{C_L L_L R_L s^2 + L_L s + R_L}{2C_L C_L L_L L_L s^2 + 2C_L R_L s^2 + 2C_L R_L s + C_L L_L s^2 + 1}$$

Filter 20**Filter Type:** BS

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_L s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_L C_L L_L R_L s^2 + 2C_L R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_L L_L}}}{R_L(2C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L(2C_L + C_L)}{C_L L_L}$$

Filter 21

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, R_L \right)$$

$$H(s): \frac{R_L R_L}{2C_L R_L R_L s + R_L + 2R_L}$$

Filter 22

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L}{2C_L R_L s + C_L R_L s + 2}$$

Filter 23

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L R_L}{2C_L R_L R_L s + C_L R_L R_L s + R_L + 2R_L}$$

Filter 24**Filter Type:** Invalid011

$$Z(s): \left(\infty, R_2, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L R_L s + 1)}{2C_L C_L R_L R_L s^2 + 2C_L R_L s + C_L R_L s + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_L C_L R_L R_L \sqrt{\frac{1}{C_L R_L s + 1}}}{2C_L R_L + C_L R_L + 2C_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L C_L R_L R_L}}$$

$$\mathbf{Bandwidth}: \frac{2C_L R_L + C_L R_L + 2C_L R_L}{2C_L C_L R_L R_L}$$

Filter 25**Filter Type:** BS

$$Z(s): \left(\infty, R_2, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_L C_L L_L R_L s^2 + 2C_L R_L s + 2C_L L_L s^2 + C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_L L_L \sqrt{\frac{1}{C_L L_L}}}{R_L(2C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L(2C_L + C_L)}{2C_L L_L}$$

Filter 26**Filter Type:** BP

$$Z(s): \left(\infty, R_2, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_L s}{2C_L L_L R_L s^2 + C_L L_L R_L s^2 + 2L_L s + R_L}$$

$$\mathbf{Q}: \frac{R_L \sqrt{\frac{1}{L_L(2C_L + C_L)}}}{2}$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_L + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{2}{R_L(2C_L + C_L)}$$

Filter 27

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + C_L R_L s + 1)}{2C_L C_L L_L R_L s^2 + 2C_L C_L R_L R_L s^2 + 2C_L R_L s + 2C_L L_L s^2 + C_L R_L s + 2C_L R_L s + 2}$$

Filter 28

Filter Type: BP

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{1}{C_L s + \frac{1}{L_L s}} \right) \\ H(s): & \frac{L_L R_4 R_L s}{2 C_L L_L R_L R_L s^2 + C_L L_L R_4 R_L s^2 + L_L R_4 s + 2 L_L R_L s + R_4 R_L} \\ \mathbf{Q}: & \frac{R_4 R_L \sqrt{L_L (2 C_L + C_L)}}{R_4 + 2 R_L} \\ \omega_0: & \sqrt{\frac{1}{L_L (2 C_L + C_L)}} \\ \mathbf{Bandwidth}: & \frac{R_4 + 2 R_L}{R_4 R_L (2 C_L + C_L)} \end{aligned}$$

Filter 29

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right) \\ H(s): & \frac{R_4 (C_L L_L R_L s^2 + L_L s + R_L)}{2 C_L C_L L_L R_L R_L s^3 + 2 C_L L_L R_4 R_L s^2 + 2 C_L R_4 R_L s + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L} \end{aligned}$$

Filter 30

Filter Type: BS

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right) \\ H(s): & \frac{R_4 R_L (C_L L_L s^2 + 1)}{2 C_L C_L L_L R_L R_L s^3 + 2 C_L R_4 R_L s + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + C_L R_4 R_L s + R_4 + 2 R_L} \\ \mathbf{Q}: & \frac{C_L L_L \sqrt{C_L L_L (R_4 + 2 R_L)}}{R_4 R_L (2 C_L + C_L)} \\ \omega_0: & \sqrt{\frac{1}{C_L L_L}} \\ \mathbf{Bandwidth}: & \frac{R_4 + R_L (2 C_L + C_L)}{C_L L_L (R_4 + 2 R_L)} \end{aligned}$$

Filter 31

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, R_L \right) \\ H(s): & \frac{R_L (C_L R_4 s + 1)}{C_L R_4 s + 2 C_L R_L s + 1} \end{aligned}$$

Filter 32

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, \frac{1}{C_L s} \right) \\ H(s): & \frac{C_L R_4 s + 1}{s (C_L C_L R_4 s + 2 C_L + C_L)} \end{aligned}$$

Filter 33

Filter Type: Invalid011

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, \frac{R_L}{C_L R_L s + 1} \right) \\ H(s): & \frac{R_L (C_L R_4 s + 1)}{C_L C_L R_L R_L s^2 + C_L R_4 s^2 + 2 C_L R_L s + C_L R_L s + 1} \\ \mathbf{Q}: & \frac{C_L C_L R_4 R_L \sqrt{C_L C_L R_L R_L}}{C_L R_4 + 2 C_L R_L + C_L R_L} \\ \omega_0: & \sqrt{\frac{1}{C_L R_4 + 2 C_L R_L + C_L R_L}} \\ \mathbf{Bandwidth}: & \frac{C_L R_4 + 2 C_L R_L + C_L R_L}{C_L C_L R_4 R_L} \end{aligned}$$

Filter 34

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, R_L + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_L R_4 s + 1) (C_L R_L s + 1)}{s (C_L C_L R_4 s + 2 C_L C_L R_L s + 2 C_L + C_L)} \end{aligned}$$

Filter 35

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, L_L s + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_L R_4 s + 1) (C_L L_L s^2 + 1)}{s (2 C_L C_L L_L L_L s^2 + C_L C_L R_4 s^2 + 2 C_L + C_L)} \end{aligned}$$

Filter 36

Filter Type: Invalid110

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right) \\ H(s): & \frac{L_L s (C_L R_4 s + 1)}{C_L C_L L_L R_4 R_L s^3 + 2 C_L L_L R_4 s^2 + C_L R_4 s + C_L L_L s^2 + 1} \\ \mathbf{Q}: & \frac{L_L \sqrt{L_L (2 C_L + C_L)}}{C_L R_4} \\ \omega_0: & \sqrt{\frac{1}{L_L (2 C_L + C_L)}} \\ \mathbf{Bandwidth}: & \frac{C_L R_4}{L_L (2 C_L + C_L)} \end{aligned}$$

Filter 37

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_L R_4 s + 1) (C_L L_L s^2 + C_L R_L s + 1)}{s (2 C_L C_L L_L L_L s^2 + C_L C_L R_4 s^2 + 2 C_L C_L R_L s + 2 C_L + C_L)} \end{aligned}$$

Filter 38

Filter Type: Invalid110

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right) \\ H(s): & \frac{L_L R_L s (C_L R_4 s + 1)}{C_L C_L L_L R_4 R_L s^3 + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + C_L R_4 R_L s + C_L L_L R_L s^2 + L_L s + R_L} \\ \mathbf{Q}: & \frac{L_L \sqrt{L_L (C_L R_4 + 2 C_L R_L + C_L R_L)}}{C_L R_4 R_L + L_L} \\ \omega_0: & \sqrt{\frac{R_L}{L_L (C_L R_4 + 2 C_L R_L + C_L R_L)}} \\ \mathbf{Bandwidth}: & \frac{C_L R_4 R_L + L_L}{L_L (C_L R_4 + 2 C_L R_L + C_L R_L)} \end{aligned}$$

Filter 39

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right) \\ H(s): & \frac{(C_L R_4 s + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_L C_L L_L R_L R_L s^3 + 2 C_L C_L L_L R_L s^2 + 2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + C_L L_L s^2 + 1} \end{aligned}$$

Filter 40

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2, \infty, R_4 + \frac{1}{C_L s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right) \\ H(s): & \frac{R_L (C_L R_4 s + 1) (C_L L_L s^2 + 1)}{C_L C_L L_L R_L R_L s^3 + 2 C_L C_L L_L L_L R_L s^2 + C_L C_L R_4 R_L s^2 + C_L R_4 s + 2 C_L R_L s + C_L L_L s^2 + C_L R_L s + 1} \end{aligned}$$

Filter 41

Filter Type: BS

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+1)}{C_4L_4s^2+2C_4R_LR_Ls+1}$$

$$\mathbf{Q}: \frac{L_4\sqrt{\frac{C_4L_4}{C_LL_L}}}{2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

Bandwidth: $\frac{2R_L}{L_4}$

Filter 42

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_4L_4s^2+1}{s(C_4C_LL_4s^2+2C_4+C_L)}$$

Filter 43

Filter Type: BS

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+1)}{C_4C_LL_LR_Ls^2+C_4L_4s^2+2C_4R_Ls+C_LR_Ls+1}$$

$$\mathbf{Q}: \frac{C_4L_4\sqrt{\frac{C_4L_4}{C_LL_L}}}{R_L(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

Bandwidth: $\frac{R_L(2C_4+C_L)}{C_4L_4}$

Filter 44

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4L_4s^2+1)(C_LR_Ls+1)}{s(C_4C_LL_4s^2+2C_4C_LR_LR_Ls+2C_4+C_L)}$$

Filter 45

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4L_4s^2+1)(C_LL_Ls^2+1)}{s(C_4C_LL_4s^2+2C_4C_LL_Ls^2+2C_4+C_L)}$$

Filter 46

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_Ls(C_4L_4s^2+1)}{C_4C_LL_LL_Ls^4+C_4L_4s^2+2C_4L_Ls^2+C_LL_Ls^2+1}$$

Filter 47

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4L_4s^2+1)(C_LL_Ls^2+C_LR_Ls+1)}{s(C_4C_LL_4s^2+2C_4C_LL_Ls^2+2C_4C_LR_LR_Ls+2C_4+C_L)}$$

Filter 48

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{C_Ls+\frac{1}{R_L}+\frac{1}{C_Ls}}{C_Ls+\frac{1}{R_L}+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{L_LR_Ls(C_4L_4s^2+1)}{C_4C_LL_LR_LR_Ls^4+C_4L_4L_Ls^2+C_4L_LR_LR_Ls^2+2C_4L_LR_LR_Ls^2+C_LL_LR_LR_Ls^2+L_Ls+R_L}$$

Filter 49

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

$$H(s): \frac{(C_4L_4s^2+1)(C_LL_LR_Ls^2+L_Ls+R_L)}{C_4C_LL_LL_Ls^4+2C_4C_LL_LR_LR_Ls^2+C_4L_4s^2+C_4L_LR_LR_Ls^2+2C_4R_Ls+C_LL_LR_LR_Ls^2+1}$$

Filter 50

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L(L_Ls+\frac{1}{C_Ls})}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+1)(C_LL_Ls^2+1)}{C_4C_LL_LL_Ls^4+C_4C_LL_LR_LR_Ls^2+2C_4C_LL_LR_LR_Ls^2+2C_4L_LR_LR_Ls^2+C_4L_4s^2+2C_4R_Ls+C_LL_LR_LR_Ls^2+1}$$

Filter 51

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L \right)$$

$$H(s): \frac{L_4R_L}{2C_4L_4R_Ls^2+L_4s+2R_L}$$

$$\mathbf{Q}: 2C_4R_L\sqrt{\frac{1}{C_4L_4}}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

Bandwidth: $\frac{1}{2C_4R_L}$

Filter 52

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4s}{2C_4L_4s^2+C_LL_4s^2+2}$$

Filter 53

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{L_4R_L}{2C_4L_4R_Ls^2+C_LL_LR_Ls^2+L_4s+2R_L}$$

$$\mathbf{Q}: \sqrt{2}R_L\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)$$

$$\omega_0: \sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$$

Bandwidth: $\frac{1}{R_L(2C_4+C_L)}$

Filter 54

Filter Type: Invalid110

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4s(C_4R_Ls+1)}{2C_4C_LL_LR_Ls^2+2C_4L_4s^2+C_LL_LR_Ls^2+2C_LR_Ls+2}$$

$$\mathbf{Q}: \frac{\sqrt{2}L_4\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)}{2C_LR_L}$$

$$\omega_0: \sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$$

Bandwidth: $\frac{2C_LR_L}{L_4(2C_4+C_L)}$

Filter 55

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s (C_L L_L L_L s^2 + 1)}{2C_4 C_L L_4 L_L s^4 + 2C_4 L_4 s^3 + C_L L_4 s^2 + 2C_L L_L s^2 + 2}$$

Filter 56

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_4 L_L s}{2C_4 L_4 L_L s^3 + C_L L_4 L_L s^2 + L_4 + 2L_L}$$

Filter 57

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s (C_L L_L s^2 + C_L R_L s + 1)}{2C_4 C_L L_4 L_L s^4 + 2C_4 C_L L_4 R_L s^3 + 2C_4 L_4 s^2 + C_L L_4 s^2 + 2C_L L_L s^2 + 2C_L R_L s + 2}$$

Filter 58**Filter Type:** BP

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_4 L_L R_L s}{2C_4 C_L L_L R_L s^2 + C_L L_4 R_L s^2 + L_4 L_L s^2 + L_4 L_L s + L_4 R_L + 2L_L R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_4 + C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_4 + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{1}{R_L (2C_4 + C_L)}$$

Filter 59

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{L_4 s (C_L L_L R_L s^2 + L_L s + R_L)}{2C_4 C_L L_4 L_L R_L s^4 + 2C_4 L_4 L_L s^3 + 2C_4 L_4 R_L s^2 + C_L L_4 L_L s^2 + 2C_L L_L R_L s^2 + L_4 s + 2L_L s + 2R_L}$$

Filter 60

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_4 R_L s (C_L L_L s^2 + 1)}{2C_4 C_L L_4 L_L R_L s^4 + 2C_4 L_4 R_L s^3 + C_L L_4 L_L s^2 + C_L L_4 R_L s^2 + 2C_L L_L R_L s^2 + L_4 s + 2R_L}$$

Filter 61**Filter Type:** GE

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_L L_4 s^2 + C_L R_4 s + 1)}{C_L L_4 s^2 + C_L R_4 s + 2C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{L_4}{R_L + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\mathbf{Bandwidth}: \frac{R_4 + 2R_L}{L_4}$$

$$\mathbf{Qz}: \frac{L_4}{R_4} \sqrt{\frac{1}{C_L L_4}}$$

Filter 62

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_4 s^2 + C_L R_4 s + 1}{s(C_L C_L L_4 s^2 + C_L C_L R_4 s + 2C_L + C_L)}$$

Filter 63

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_L L_4 s^2 + C_L R_4 s + 1)}{C_L C_L L_4 R_L s^3 + C_L C_L R_L R_L s^2 + C_L L_4 s^2 + C_L R_4 s + 2C_L R_L s + C_L R_L s + 1}$$

Filter 64

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L R_L s + 1)(C_L L_4 s^2 + C_L R_4 s + 1)}{s(C_L C_L L_4 s^2 + C_L C_L R_4 s + 2C_L C_L R_L s + 2C_L + C_L)}$$

Filter 65

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_L s^2 + 1)(C_L L_4 s^2 + C_L R_4 s + 1)}{s(C_L C_L L_4 s^2 + 2C_L C_L L_L s^2 + C_L C_L R_4 s + 2C_L + C_L)}$$

Filter 66

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_L L_4 s^2 + C_L R_4 s + 1)}{C_L C_L L_4 L_L s^4 + C_L C_L L_L R_4 s^3 + C_L L_4 s^2 + 2C_L L_L s^2 + C_L R_4 s + C_L L_L s^2 + 1}$$

Filter 67

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_L L_4 s^2 + C_L R_4 s + 1)(C_L L_L s^2 + C_L R_L s + 1)}{s(C_L C_L L_4 s^2 + 2C_L C_L L_L s^2 + C_L C_L R_4 s + 2C_L C_L R_L s + 2C_L + C_L)}$$

Filter 68

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_L (C_L L_4 s^2 + C_L R_4 s + 1)}{C_L C_L L_4 L_L R_L s^4 + C_L C_L L_L R_L R_L s^3 + C_L L_4 L_L s^3 + C_L L_4 R_L s^2 + C_L L_L R_4 s^2 + 2C_L L_L R_L s^2 + C_L R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$

Filter 69

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_L s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_L L_4 s^2 + C_L R_4 s + 1)(C_L L_L R_L s^2 + L_L s + R_L)}{C_L C_L L_4 L_L s^4 + C_L C_L L_L R_L s^3 + 2C_L C_L L_L R_L s^2 + C_L L_4 s^2 + C_L L_L s^2 + C_L R_4 s + 2C_L R_L s + C_L L_L s^2 + 1}$$

Filter 70

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1) (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_L s^3 + C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^3 + C_4 C_L R_4 R_L s^3 + C_4 L_4 s^3 + C_4 R_4 s + 2 C_4 R_4 s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 71

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{R_L}{L_L} \right)$$

$$H(s): \frac{L_4 R_4 R_L}{2 C_4 L_4 R_L R_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_4 R_L}$$

$$\mathbf{Q}: \frac{2 C_4 R_4 R_L \sqrt{\frac{1}{C_L^2 L_4}}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\text{Bandwidth: } \frac{R_4 + 2 R_L}{2 C_4 R_4 R_L}$$

Filter 72

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s}{3 C_4 L_4 R_4 s^2 + C_L L_4 R_4 s^2 + 2 L_4 s + 2 R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2} R_4 \sqrt{L_4 (2 C_4 + C_L)} (2 C_4 + C_L)}{2}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$$

$$\text{Bandwidth: } \frac{2}{R_4 (2 C_4 + C_L)}$$

Filter 73

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{L_4 R_4 R_L s}{3 C_4 L_4 R_L R_L s^2 + C_L L_4 R_L R_L s^2 + L_4 R_4 s^2 + C_L L_4 R_4 s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_L R_L}$$

$$\mathbf{Q}: \frac{\sqrt{2} R_4 R_L \sqrt{L_4 (2 C_4 + C_L)} (2 C_4 + C_L)}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$$

$$\text{Bandwidth: } \frac{R_4 + 2 R_L}{R_4 R_L (2 C_4 + C_L)}$$

Filter 74

Filter Type: Invalid110

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s (C_L R_L s^2 + 1)}{2 C_4 C_L L_4 L_L R_L R_L s^4 + 2 C_4 L_4 R_L s^4 + C_L L_4 R_L s^4 + 2 C_L L_4 R_L s^4 + 2 C_L R_4 R_L s + 2 L_4 s + 2 R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2} L_4 \sqrt{L_4 (2 C_4 R_4 s^2 + 2 C_L R_4)} (2 C_4 + C_L)}{2 (C_L R_4 R_L + L_4)}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{R_4}{L_4 (2 C_4 + C_L)}}$$

$$\text{Bandwidth: } \frac{2 (C_L R_4 R_L + L_4)}{L_4 (2 C_4 R_4 + C_L R_4 + 2 C_L R_L)}$$

Filter 75

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s (C_L L_L s^2 + 1)}{2 C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 L_4 R_4 s^4 + 2 C_L L_4 R_4 s^4 + C_L L_4 R_4 s^4 + C_L L_4 R_4 s^4 + 2 C_L L_L R_4 s^2 + 2 L_4 s + 2 R_4}$$

Filter 76

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_L s}{C_L L_L s + 1} \right)$$

$$H(s): \frac{L_4 L_L R_4 s}{2 C_4 L_4 L_L R_L R_L s^2 + C_L L_L R_L R_L s^2 + L_4 L_L R_L s^2 + 2 L_4 L_L s + L_4 R_L s + 2 L_L R_L}$$

$$\mathbf{Q}: \frac{R_4 \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}} (2 C_4 + C_L)}{2}$$

$$\omega_0: \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$$

$$\text{Bandwidth: } \frac{R_4 + 2 R_L}{R_4 (2 C_4 + C_L)}$$

Filter 77

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s (C_L L_L s^2 + C_L R_L s + 1)}{2 C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 C_L L_4 R_L R_4 s^4 + 2 C_L L_4 R_L s^4 + 2 C_L L_4 R_L s^4 + 2 C_L L_4 R_L s^4 + 2 C_L L_L R_4 s^2 + 2 C_L L_L R_4 s^2 + 2 L_4 s + 2 R_4}$$

Filter 78

Filter Type: BP

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{1}{C_L s + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_4 L_L R_4 R_L s}{2 C_4 L_4 L_L R_L R_L s^2 + C_L L_4 L_L R_L R_L s^2 + L_4 L_L R_L s^2 + 2 L_4 L_L s + L_4 R_L s + 2 L_L R_L}$$

$$\mathbf{Q}: \frac{R_4 R_L \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}} (2 C_4 + C_L)}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$$

$$\text{Bandwidth: } \frac{R_4 + 2 R_L}{R_4 R_L (2 C_4 + C_L)}$$

Filter 79

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{L_4 R_4 s (C_L L_L R_L s^2 + L_L s + R_L)}{2 C_4 C_L L_4 L_L R_4 R_L s^4 + 2 C_4 L_4 L_L R_4 s^4 + 2 C_L L_4 R_4 s^4 + C_L L_4 R_4 s^4 + C_L L_4 R_4 s^4 + 2 C_L L_L R_4 s^2 + 2 L_4 L_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 L_L R_L}$$

Filter 80

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_4 R_4 R_L s (C_L L_L s^2 + 1)}{2 C_4 C_L L_4 L_L R_4 R_L s^4 + 2 C_4 L_4 R_4 R_L s^4 + 2 C_L L_4 R_4 s^4 + C_L L_4 R_4 s^4 + C_L L_4 R_4 s^4 + 2 C_L L_L R_4 s^2 + 2 L_4 L_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_L R_L}$$

Filter 81

Filter Type: GE

$$Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_4 L_4 R_L s^2 + L_4 s + R_4)}{C_4 L_4 R_4 s^2 + 3 C_4 L_4 R_L s^2 + L_4 s + R_4 + 2 R_L}$$

$$\mathbf{Q}: C_4 \sqrt{\frac{1}{C_L L_4}} (R_4 + 2 R_L)$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\text{Bandwidth: } \frac{1}{C_L (R_4 + 2 R_L)}$$

$$\mathbf{Qz}: C_4 R_4 \sqrt{\frac{1}{C_L L_4}}$$

Filter 82

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s} \right)$
 $H(s): \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 C_L L_4 R_4 s^3 + 2 C_4 L_4 s^2 + C_L L_4 s^2 + C_L R_4 s + 2}$

Filter 83

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$
 $H(s): \frac{R_L (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_4 C_L L_4 R_4 R_L s^3 + C_4 L_4 R_4 s^2 + 2 C_4 L_4 R_L s^2 + C_L L_4 R_L s^2 + C_L R_4 R_L s + L_4 s + R_4 + 2 R_L}$

Filter 84

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L + \frac{1}{C_L s} \right)$
 $H(s): \frac{(C_L R_L s + 1) (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_4 R_L s^3 + 2 C_4 C_L L_4 R_L s^2 + C_L L_4 s^2 + C_L R_4 s + 2 C_L R_L s + 2}$

Filter 85

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_L s + \frac{1}{C_L s} \right)$
 $H(s): \frac{(C_L L_L s^2 + 1) (C_4 L_4 R_L s^2 + L_4 s + R_4)}{2 C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_4 s^3 + C_4 L_4 R_4 s^2 + 2 C_4 L_4 s^2 + 2 C_L L_L s^2 + C_L R_4 s + 2}$

Filter 86

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$
 $H(s): \frac{L_L s (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 L_L R_L s^4 + 2 C_L L_4 L_L s^3 + C_4 L_4 R_L s^2 + C_L L_4 L_L s^2 + C_L L_L R_L s^2 + L_4 s + 2 L_L s + R_L}$

Filter 87

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$
 $H(s): \frac{(C_L L_L s^2 + C_L R_L s + 1) (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{2 C_4 C_L L_L L_L s^4 + C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_4 R_L s^3 + 2 C_4 L_4 s^2 + 2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2}$

Filter 88

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s + \frac{1}{L_L s}} \right)$
 $H(s): \frac{L_L R_L s (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_4 C_L L_4 L_L R_L R_L s^4 + C_4 L_4 L_L R_L s^3 + 2 C_4 L_4 L_L R_L s^2 + C_4 L_4 R_L s^2 + C_L L_4 L_L R_L s^3 + C_L L_L R_L s^2 + L_4 L_L s^2 + L_4 R_L s + L_L R_4 s + 2 L_L R_L s + R_L R_L}$

Filter 89

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$
 $H(s): \frac{(C_4 L_4 R_4 s^2 + L_4 s + R_4) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_4 L_L R_L s^4 + C_4 C_L L_4 L_L R_L s^3 + 2 C_4 L_4 L_L s^3 + C_4 L_4 R_L s^2 + 2 C_4 L_4 R_L s^2 + C_L L_4 L_L s^3 + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + L_4 s + 2 L_L s + R_4 + 2 R_L}$

Filter 90

Invalid filter
 $Z(s): \left(\infty, R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$
 $H(s): \frac{R_L (C_L L_L s^2 + 1) (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_4 C_L L_4 L_L R_L s^4 + 2 C_4 C_L L_4 L_L R_L s^3 + C_4 C_L L_4 R_4 R_L s^3 + C_4 L_4 R_4 R_L s^2 + C_L L_4 R_4 s^2 + 2 C_4 L_4 R_L s^2 + C_L L_4 R_L s^2 + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + L_4 s + 2 L_L s + R_4 + 2 R_L}$

Filter 91

Filter Type: BS

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_L s})}{L_4 s + R_4 + \frac{1}{C_L s}}, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L (C_4 L_4 s^2 + 1)}{C_4 L_4 R_4 s^2 + 2 C_4 L_4 R_L s^2 + 2 C_4 R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{1}{C_L L_L} (R_4 + 2 R_L)}}{2 R_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\text{Bandwidth: } \frac{2 R_L R_L}{L_4 (R_4 + 2 R_L)}$$

Filter 92

Filter Type: BS

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_L s})}{L_4 s + R_4 + \frac{1}{C_L s}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 R_L s^3 + 2 C_4 L_4 s^2 + 2 C_L R_4 s + C_L R_4 s + 2}$$

$$\mathbf{Q}: \frac{2 C_L L_4 \sqrt{\frac{1}{C_L L_L} (R_4 + 2 R_L)}}{R_L R_L (2 C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\text{Bandwidth: } \frac{R_4 R_L (2 C_L + C_L)}{2 C_4 L_4}$$

Filter 93

Filter Type: BS

$$Z(s): \left(\infty, R_2, \infty, \frac{R_L (L_4 s + \frac{1}{C_L s})}{L_4 s + R_4 + \frac{1}{C_L s}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L R_L (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 R_L R_L s^3 + C_4 L_4 R_4 s^2 + 2 C_4 L_4 R_L s^2 + 2 C_4 R_4 R_L s + C_L R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{C_4 L_4 \sqrt{\frac{1}{C_L L_L} (R_4 + 2 R_L)}}{R_L R_L (2 C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\text{Bandwidth: } \frac{R_4 R_L (2 C_L + C_L)}{C_4 L_4 (R_4 + 2 R_L)}$$

Filter 94

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_L s})}{L_4 s + R_4 + \frac{1}{C_L s}}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2 + 1) (C_L R_L s + 1)}{C_L C_L L_4 R_4 s^3 + 2 C_L C_L L_4 R_L s^3 + 2 C_4 C_L R_4 R_L s^2 + 2 C_4 L_4 s^2 + 2 C_L R_4 s + C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 95

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_L s})}{L_4 s + R_4 + \frac{1}{C_L s}}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2 + 1) (C_L L_L s^2 + 1)}{2 C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_L R_4 s^3 + 2 C_4 L_4 s^2 + 2 C_L R_4 s + 2 C_L L_L s^2 + C_L R_4 s + 2}$$

Filter 96

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2 s} \right)}{L_4 s + R_4 + \frac{1}{C_4^2 s}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_4 s (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 L_L R_4 s^4 + 2 C_4^2 L_4 L_L s^3 + C_4 L_4 R_4 s^2 + 2 C_4^2 L_L R_4 s^2 + 2 C_4 L_L R_4 s^2 + 2 L_L s + R_4}$$

Filter 97

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2 s} \right)}{L_4 s + R_4 + \frac{1}{C_4^2 s}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 \left(C_4 L_4 s^2 + 1 \right) \left(C_L L_L s^2 + C_L R_L s + 1 \right)}{2 C_L^2 C_L L_4 L_L s^4 + C_4 C_L L_4 R_L s^3 + 2 C_L^2 C_L L_4 R_L s^3 + 2 C_4 C_L L_L R_4 s^3 + 2 C_4^2 C_L R_L R_L s^3 + 2 C_4^2 L_4 s^2 + 2 C_4 R_L s + 2 C_L L_L s^2 + C_L R_L s + 2 C_L^2 R_L s + 2}$$

Filter 98

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2 s} \right)}{L_4 s + R_4 + \frac{1}{C_4^2 s}}, \infty, \frac{\frac{1}{C_L s} + \frac{1}{R_L + \frac{1}{C_L s}}}{\frac{L_L R_4 R_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 L_L R_4 R_L s^4 + C_4 C_L L_L R_4 s^3 + 2 C_4 L_4 L_L R_L s^3 + C_4 L_4 R_4 R_L s^3 + 2 C_4 L_L R_4 R_L s^3 + C_L L_L R_4 R_L s^3 + L_L R_4 s + 2 L_L R_L s + R_4 R_L}} \right)$$

$$H(s): \frac{L_L R_4 R_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 L_L R_4 R_L s^4 + C_4 C_L L_L R_4 s^3 + 2 C_4 L_4 L_L R_L s^3 + C_4 L_4 R_4 R_L s^3 + 2 C_4 L_L R_4 R_L s^3 + C_L L_L R_4 R_L s^3 + L_L R_4 s + 2 L_L R_L s + R_4 R_L}$$

Filter 99

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2 s} \right)}{L_4 s + R_4 + \frac{1}{C_4^2 s}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4 \left(C_4 L_4 s^2 + 1 \right) \left(C_L L_L R_L s^2 + L_L s + R_L \right)}{C_4 C_L L_4 L_L R_4 s^4 + 2 C_4^2 C_L L_L R_L s^3 + 2 C_4 C_L L_L R_4 R_L s^3 + 2 C_4 L_4 L_L s^3 + C_4 L_4 R_4 s^3 + 2 C_4 L_L R_4 s^3 + 2 C_4^2 L_4 s^2 + 2 C_4 R_L s + 2 C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$

Filter 100

Invalid filter

$$Z(s): \left(\infty, R_2, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2 s} \right)}{L_4 s + R_4 + \frac{1}{C_4^2 s}}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_4 R_L \left(C_4 L_4 s^2 + 1 \right) \left(C_L L_L s^2 + 1 \right)}{C_4^2 C_L L_4 L_L R_4 s^4 + 2 C_4^2 C_L L_L R_L s^3 + C_4 C_L L_4 R_4 R_L s^3 + 2 C_4 C_L L_L R_4 R_L s^3 + C_4 L_4 R_4 s^3 + 2 C_4 L_L R_4 s^3 + 2 C_4^2 L_4 s^2 + 2 C_4 R_L s + 2 C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$

Filter 101

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L}{R_4 + 2 R_L}$$

Filter 102

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4}{C_L R_4 s + 2}$$

Filter 103

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_4 R_L}{C_L R_L s + R_4 + 2 R_L}$$

Filter 104

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_L R_L s + 1)}{C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 105**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 \left(C_L L_L s^2 + 1 \right)}{2 C_L^2 L_L s^2 + C_L R_4 s + C_L R_4 s + 2}$$

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L^2 L_L}}{R_4}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_4}{2 L_L}$$

Filter 106**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_4 s}{C_L L_L R_4 s^2 + 2 L_L s + R_4}$$

$$\mathbf{Q}: \frac{C_L R_4 \sqrt{C_L^2 L_L}}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{2}{C_L R_4}$$

Filter 107**Filter Type:** GE

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 \left(C_L L_L s^2 + C_L R_L s + 1 \right)}{2 C_L^2 L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L^2 L_L}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_4 + 2 R_L}{2 L_L}$$

$$\mathbf{Qz}: \frac{L_L \sqrt{C_L^2 L_L}}{R_L}$$

Filter 108**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{C_L s}}} \right)$$

$$H(s): \frac{L_L R_4 R_L s}{C_L L_L R_4 R_L s^2 + L_L R_4 s + 2 L_L R_L s + R_4 R_L}$$

$$\mathbf{Q}: \frac{C_L R_4 R_L \sqrt{C_L^2 L_L}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_4 + 2 R_L}{C_L R_4 R_L}$$

Filter 109**Filter Type:** GE

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4(C_L L_L R_L s^2 + L_L s + R_L)}{C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + 2L_L s + R_4 + 2R_L}$$

$$\mathbf{Q}: \frac{C_L \sqrt{\frac{1}{C_L^2 L_L^2}} (R_4 + 2R_L)}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{2}{C_L (R_4 + 2R_L)}$$

$$\mathbf{Qz}: C_L R_L \sqrt{\frac{1}{C_L L_L}}$$

Filter 110**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L}} \right)$$

$$H(s): \frac{R_4 R_L (C_L L_L s^2 + 1)}{C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + C_L R_L R_L s + R_4 + 2R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{\frac{1}{C_L^2 L_L^2}} (R_4 + 2R_L)}{R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4 R_L}{L_L (R_4 + 2R_L)}$$

Filter 111

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L}{2C_4 R_L s + 1}$$

Filter 112

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{1}{s(2C_4 + C_L)}$$

Filter 113

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L}{2C_4 R_L s + C_L R_L s + 1}$$

Filter 114

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L R_L s + 1}{s(2C_4 C_L R_L s + 2C_4 + C_L)}$$

Filter 115

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + 1}{s(2C_4 C_L L_L s^2 + 2C_4 + C_L)}$$

Filter 116

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s}{2C_4 L_L s^2 + C_L L_L s^2 + 1}$$

Filter 117

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + C_L R_L s + 1}{s(2C_4 C_L L_L s^2 + 2C_4 C_L R_L s + 2C_4 + C_L)}$$

Filter 118**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_L s + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{\frac{L_L R_L}{2C_4 C_L R_L s^2 + C_L L_L R_L s^2 + L_L s + R_L}}{2C_4 C_L R_L s^2 + 2C_4 L_L R_L s^2 + 2C_4 + C_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L (2C_4 + C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_4 + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{1}{R_L (2C_4 + C_L)}$$

Filter 119

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{C_L L_L R_L s^2 + L_L s + R_L}{2C_4 C_L L_L R_L s^2 + 2C_4 L_L s^2 + 2C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 120**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_4 C_L L_L R_L s^2 + 2C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_L^2 L_L^2}}}{R_L (2C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L (2C_4 + C_L)}{C_L L_L}$$

Filter 121

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, R_L \right)$$

$$H(s): \frac{R_L R_L}{2C_4 R_L R_L s + R_L + 2R_L}$$

Filter 122

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L}{2C_4 R_L s + C_L R_L s + 2}$$

Filter 123

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4}{C_LR_4s+1}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_4R_L}{2C_LR_LR_Ls+C_LR_LR_Ls+R_4+2R_L}$$

Filter 124**Filter Type:** Invalid011

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4}{C_LR_4s+1}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_LR_Ls+1)}{2C_LR_LR_LR_Ls^2+2C_LR_4s+C_LR_4s+2C_LR_Ls+2}$$

$$\mathbf{Q}: \frac{2C_LR_LR_L\sqrt{C_LR_LR_L}}{2C_LR_4s+C_LR_4s+2C_LR_L}$$

$$\omega_0: \sqrt{\frac{1}{C_LR_LR_L}}$$

$$\textbf{Bandwidth: } \frac{2C_LR_4R_L+2C_LR_L}{2C_LR_LR_L}$$

Filter 125**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4}{C_LR_4s+1}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_LR_Ls^2+1)}{2C_LR_LR_LR_4s^2+2C_LR_4s+2C_LR_Ls^2+C_LR_4s+2}$$

$$\mathbf{Q}: \frac{2C_LR_LR_L\sqrt{\frac{C_LR_L}{C_LR_L}}}{R_4(2C_L+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_LR_L}}$$

$$\textbf{Bandwidth: } \frac{R_4(2C_L+C_L)}{2C_LR_LR_L}$$

Filter 126**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4}{C_LR_4s+1}, \infty, \frac{L_Ls}{C_LR_Ls^2+1} \right)$$

$$H(s): \frac{L_LR_4s}{2C_LR_LR_LR_4s^2+C_LR_4s^2+2L_LR_Ls+R_4}$$

$$\mathbf{Q}: \frac{R_4\sqrt{\frac{1}{L_L(2C_L+C_L)}}(2C_L+C_L)}{2}$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_L+C_L)}}$$

$$\textbf{Bandwidth: } \frac{2}{R_4(2C_L+C_L)}$$

Filter 127

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4}{C_LR_4s+1}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_LR_Ls^2+C_LR_4s+1)}{2C_LR_LR_LR_4s^2+2C_LR_LR_4s^2+2C_LR_4s+2C_LR_LR_4s^2+2C_LR_LR_4s+2C_LR_LR_4s+2}$$

Filter 128**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4}{C_LR_4s+1}, \infty, \frac{1}{C_Ls+\frac{1}{L_Ls}} \right)$$

$$H(s): \frac{L_LR_4s}{2C_LR_LR_LR_4s^2+C_LR_LR_4s^2+L_LR_4s+2L_LR_LR_Ls+R_4R_L}$$

$$\mathbf{Q}: \frac{R_4R_L\sqrt{\frac{L_L(C_L+C_L)}{L_L(2C_L+C_L)}}(2C_L+C_L)}{R_L+2R_L}$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_L+C_L)}}$$

$$\textbf{Bandwidth: } \frac{R_4+2R_L}{R_LR_L(2C_L+C_L)}$$

Filter 129

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4}{C_LR_4s+1}, \infty, \frac{L_Ls}{C_LR_Ls^2+1} + R_L \right)$$

$$H(s): \frac{R_4(C_LR_LR_Ls^2+L_Ls+R_L)}{2C_LR_LR_LR_LR_4s^2+2C_LR_LR_4s^2+2C_LR_LR_4s^2+2C_LR_LR_4s^2+2C_LR_LR_4s^2+2L_LR_LR_4s+2R_L+2R_L}$$

Filter 130**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_4}{C_LR_4s+1}, \infty, \frac{R_L(L_Ls+\frac{1}{C_Ls})}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_LR_L(C_LR_Ls^2+1)}{2C_LR_LR_LR_LR_4s^2+2C_LR_LR_4s^2+C_LR_LR_4s^2+2C_LR_LR_4s^2+C_LR_LR_4s^2+R_L+2R_L}$$

$$\mathbf{Q}: \frac{C_LR_LR_L\sqrt{\frac{C_LR_L}{C_LR_L}}(R_L+2R_L)}{R_LR_L(2C_L+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_LR_LR_L}}$$

$$\textbf{Bandwidth: } \frac{R_LR_L(2C_L+C_L)}{C_LR_LR_L(R_L+2R_L)}$$

Filter 131

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L(C_LR_4s+1)}{C_LR_4s+2C_LR_4s+1}$$

Filter 132

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_LR_4+1}{s(C_LR_LR_4s+2C_L+C_L)}$$

Filter 133**Filter Type:** Invalid011

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_L(C_LR_4s+1)}{C_LR_LR_LR_4s^2+C_LR_4s^2+2C_LR_4s+C_LR_LR_4s+1}$$

$$\mathbf{Q}: \frac{C_LR_LR_L\sqrt{C_LR_LR_L}}{C_LR_4s+2C_LR_4s+C_LR_L}$$

$$\omega_0: \sqrt{\frac{1}{C_LR_LR_L}}$$

$$\textbf{Bandwidth: } \frac{C_LR_4+2C_LR_4+C_LR_L}{C_LR_LR_LR_L}$$

Filter 134

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_LR_4s+1)(C_LR_Ls+1)}{s(C_LR_LR_4s+2C_LR_4s+2C_L+C_L)}$$

Filter 135

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_LR_4s+1)(C_LR_Ls^2+1)}{s(2C_LR_LR_4s^2+C_LR_LR_4s+2C_L+C_L)}$$

Filter 136**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_4 R_4 s + 1)}{C_4 C_L L_L R_4 s^3 + 2 C_4 L_L s^2 + C_4 R_4 s + C_L L_L s^2 + 1}$$

$$\mathbf{Q}: \frac{L_L \sqrt{\frac{1}{L_L (2 C_4 + C_L)}} (2 C_4 + C_L)}{C_4 R_4}$$

$$\omega_0: \sqrt{\frac{1}{L_L (2 C_4 + C_L)}}$$

$$\textbf{Bandwidth: } \frac{C_4 R_4}{L_L (2 C_4 + C_L)}$$

Filter 137

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 R_4 s + 1) (C_L L_L s^2 + C_L R_L s + 1)}{s (2 C_4 C_L L_L s^3 + C_4 C_L R_L s^2 + 2 C_4 C_L R_4 s + 2 C_4 + C_L)}$$

Filter 138**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_L s (C_4 R_4 s + 1)}{C_4 C_L L_L R_4 R_L s^3 + C_4 L_L R_L s^2 + 2 C_4 L_L R_L s^2 + C_4 R_4 R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{\frac{R_L}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}} (C_4 R_4 + 2 C_4 R_L + C_L R_L)}{C_4 R_4 R_L + L_L}$$

$$\omega_0: \sqrt{\frac{R_L}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}}$$

$$\textbf{Bandwidth: } \frac{C_4 R_4 R_L + L_L}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}$$

Filter 139

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_L R_4 s + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^2 + 2 C_4 C_L R_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 140

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L (C_L R_4 s + 1) (C_L L_L s^2 + 1)}{C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^2 + C_4 C_L R_L R_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 141**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + 2 C_4 R_L s + 1}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{C_4^2 L_4}{2 R_L}}}{2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\textbf{Bandwidth: } \frac{2 R_L}{L_4}$$

Filter 142

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_4 s^2 + 1}{s (C_4 C_L L_4 s^2 + 2 C_4 + C_L)}$$

Filter 143**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 R_L s^3 + C_4 L_4 s^2 + 2 C_4 R_L s + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_4 L_4 \sqrt{\frac{1}{C_L^2 L_4}}}{R_L (2 C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L^2 L_4}}$$

$$\textbf{Bandwidth: } \frac{R_L (2 C_4 + C_L)}{C_4 L_4}$$

Filter 144

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + 1) (C_L R_L s + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 145

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + 1) (C_L L_L s^2 + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L L_L s^2 + 2 C_4 + C_L)}$$

Filter 146

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_L L_L s^4 + C_4 L_4 s^2 + 2 C_4 L_L s^2 + C_L L_L s^2 + 1}$$

Filter 147

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_4 s^2 + 1) (C_L L_L s^2 + C_L R_L s + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L L_L s^2 + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 148

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 L_L R_L s^4 + C_4 L_4 L_L s^3 + C_4 L_4 R_L s^2 + 2 C_4 L_L R_L s^2 + C_L L_L R_L s^2 + L_L s + R_L}$$

Filter 149

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_4 L_L s^4 + 2 C_4 C_L L_L R_L s^3 + C_4 L_4 s^2 + 2 C_4 L_L s^2 + 2 C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 150

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L \left(L_Ls + \frac{1}{C_L^2s} \right)}{L_Ls + R_L + \frac{1}{C_L^2s}} \right)$$
$$H(s): \frac{R_L \left(C_4L_4s^2 + 1 \right) \left(C_LL_Ls^2 + 1 \right)}{C_4C_LL_4L_Ls^4 + C_4C_LL_4R_LR_Ls^3 + 2C_4C_LL_LR_Ls^2 + C_4L_4s^3 + C_4L_4s^2 + 2C_4R_Ls + C_LL_Ls^2 + C_LR_Ls + 1}$$

Filter 151**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, R_L \right)$$

$$H(s): \frac{L_4R_Ls}{2C_4L_4R_Ls^2 + C_4^2R_Ls^2 + L_4s + 2R_L}$$

$$\mathbf{Q}: 2C_4R_L\sqrt{\frac{1}{C_4L_4}}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth:} \frac{1}{2C_4R_L}$$

Filter 152

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4s}{2C_4L_4s^2 + C_LL_4s^2 + 2}$$

Filter 153**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, \frac{R_L}{C_LR_Ls + 1} \right)$$

$$H(s): \frac{L_4R_Ls}{2C_4L_4R_Ls^2 + C_4^2R_Ls^2 + L_4s + 2R_L}$$

$$\mathbf{Q}: \sqrt{2}R_L\sqrt{\frac{1}{L_4(2C_4 + C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{2}\sqrt{\frac{1}{L_4(2C_4 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{1}{R_L(2C_4 + C_L)}$$

Filter 154**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4s \left(C_LR_Ls^2 + 1 \right)}{2C_4C_LL_4R_Ls^2 + 2C_4L_4s^2 + 2C_4L_4s^2 + C_LL_4s^2 + 2C_LR_Ls + 2}$$

$$\mathbf{Q}: \frac{\sqrt{2}L_4\sqrt{\frac{1}{L_4(2C_4 + C_L)}} (2C_4 + C_L)}{2C_LR_L}$$

$$\omega_0: \sqrt{2}\sqrt{\frac{1}{L_4(2C_4 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{2C_LR_L}{L_4(2C_4 + C_L)}$$

Filter 155

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4s \left(C_LL_Ls^2 + 1 \right)}{2C_4C_LL_4L_Ls^4 + 2C_4L_4s^2 + C_LL_4s^2 + 2C_LL_4s^2 + 2C_LL_Ls^2 + 2}$$

Filter 156

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, \frac{L_4s}{C_LL_Ls^2 + 1} \right)$$

$$H(s): \frac{L_4L_Ls}{2C_4L_4L_Ls^2 + C_LL_4L_Ls^2 + L_4 + 2L_L}$$

Filter 157

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4s \left(C_LL_Ls^2 + C_LR_Ls + 1 \right)}{2C_4C_LL_4L_Ls^4 + 2C_4C_LL_4R_LR_Ls^3 + 2C_4L_4s^2 + C_LL_4s^2 + 2C_LL_Ls^2 + 2C_LR_Ls + 2}$$

Filter 158**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, \frac{1}{C_Ls + \frac{1}{R_L}} \right)$$

$$H(s): \frac{L_4L_LR_Ls}{2C_4L_4L_LR_Ls^2 + C_LL_4R_Ls^2 + L_4L_Ls + L_4R_L + 2L_LR_L}$$

$$\mathbf{Q}: R_L\sqrt{\frac{L_4 + 2L_L}{L_4L_L(2C_4 + C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{\frac{L_4 + 2L_L}{L_4L_L(2C_4 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{1}{R_L(2C_4 + C_L)}$$

Filter 159

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, \frac{L_4s}{C_LL_Ls^2 + 1} + R_L \right)$$

$$H(s): \frac{L_4s \left(C_LL_LR_Ls^2 + 2C_4L_4R_Ls^2 + 2C_4L_4R_Ls^2 + C_LL_LR_Ls^2 + 2C_LL_LR_Ls^2 + L_4s + 2L_Ls + 2R_L \right)}{2C_4C_LL_4L_LR_Ls^4 + 2C_4L_4L_Ls^2 + 2C_4L_4R_Ls^2 + C_LL_LR_Ls^2 + 2C_LL_LR_Ls^2 + L_4s + 2L_Ls + 2R_L}$$

Filter 160

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1}, \infty, \frac{R_L \left(L_Ls + \frac{1}{C_L^2s} \right)}{L_Ls + R_L + \frac{1}{C_L^2s}} \right)$$

$$H(s): \frac{L_4R_Ls \left(C_LL_Ls^2 + 1 \right)}{2C_4C_LL_4L_LR_Ls^4 + 2C_4L_4R_Ls^2 + C_LL_LR_Ls^2 + C_LL_LR_Ls^2 + 2C_LL_LR_Ls^2 + L_4s + 2R_L}$$

Filter 161**Filter Type:** GE

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L \left(C_LL_Ls^2 + C_LR_4s + 1 \right)}{C_4L_4s^2 + C_4R_4s + 2C_4R_Ls + 1}$$

$$\mathbf{Q}: \frac{L_4\sqrt{\frac{C_4R_4}{R_4 + 2R_L}}}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth:} \frac{R_4 + 2R_L}{L_4}$$

$$\mathbf{Qz:} \frac{L_4\sqrt{\frac{1}{R_4 + 2R_L}}}{R_4}$$

Filter 162

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_4L_4s^2 + C_4R_4s + 1}{s \left(C_4C_LL_4s^2 + C_4C_LR_4s + 2C_4 + C_L \right)}$$

Filter 163

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2^2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls + 1} \right)$$

$$H(s): \frac{R_L \left(C_LL_4s^2 + C_4R_4s + 1 \right)}{C_4C_LL_4R_Ls^2 + C_4C_LR_4R_Ls^2 + C_4L_4s^2 + C_4R_4s + 2C_LR_Ls + C_LR_Ls + 1}$$

Filter 164

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{(C_4R_Ls+1)(C_4L_4s^2+C_4R_4s+1)}{s(C_4C_LL_4s^3+C_4C_LR_4s+2C_4C_LR_Ls+2C_4+C_L)}$

Filter 165

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{(C_4L_Ls^2+1)(C_4L_4s^2+C_4R_4s+1)}{s(C_4C_LL_4s^3+2C_4C_LL_Ls^2+C_4C_LR_4s+2C_4+C_L)}$

Filter 166

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$
 $H(s)$: $\frac{L_Ls(C_4L_4s^2+C_4R_4s+1)}{C_4C_LL_4L_Ls^3+C_4C_LL_LR_4s^2+C_4L_4s^2+2C_4L_Ls^2+C_4R_4s+C_LL_Ls^2+1}$

Filter 167

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{(C_4L_4s^2+C_4R_4s+1)(C_4L_Ls^2+C_4R_Ls+1)}{s(C_4C_LL_4s^3+2C_4C_LL_Ls^2+C_4C_LR_4s+2C_4C_LR_Ls+2C_4+C_L)}$

Filter 168

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{C_Ls}}}\right)$
 $H(s)$: $\frac{L_LR_Ls(C_4L_4s^2+C_4R_4s+1)}{C_4C_LL_4L_LR_Ls^3+C_4C_LL_LR_4R_Ls^2+C_4L_4L_Ls^3+C_4L_4R_Ls^2+C_4L_LR_Ls^2+2C_4L_LR_Ls^2+C_4R_4R_Ls+C_LL_LR_Ls^2+L_Ls+R_L}$

Filter 169

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$
 $H(s)$: $\frac{(C_4L_4s^2+C_4R_4s+1)(C_4L_LR_Ls^2+L_Ls+R_L)}{C_4C_LL_4L_Ls^3+C_4C_LL_LR_4s^2+2C_4C_LL_LR_Ls^2+C_4L_4s^2+2C_4L_Ls^2+C_4R_4s+2C_4R_Ls+C_LL_Ls^2+1}$

Filter 170

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}\right)$
 $H(s)$: $\frac{R_L(C_LL_Ls^2+1)(C_4L_4s^2+C_4R_4s+1)}{C_4C_LL_4L_Ls^3+C_4C_LL_LR_4R_Ls^2+C_4C_LL_LR_Ls^3+2C_4C_LL_LR_Ls^2+C_4C_LR_4R_Ls^2+C_4L_4s^2+C_4R_4s+2C_4R_Ls+C_LL_Ls^2+C_LR_Ls+1}$

Filter 171

Filter Type: BP

$Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{C_4s}}}, \infty, R_L\right)$
 $H(s)$: $\frac{L_LR_LR_Ls}{2C_4L_4R_LR_Ls^2+L_4R_4s+2L_4R_Ls+2R_LR_L}$
Q: $\frac{2C_4R_4R_L\sqrt{C_4^2L_4^2}}{R_4+2R_L}$
 ω_0 : $\sqrt{\frac{1}{C_4L_4}}$
Bandwidth: $\frac{R_4+2R_L}{2C_4R_4R_L}$

Filter 172

Filter Type: BP

$Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{C_4s}}}, \infty, \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_LR_Ls}{2C_4L_4R_LR_Ls^2+C_LR_4R_Ls^2+2L_4s+2R_4}$
Q: $\frac{\sqrt{2}R_4\sqrt{L_4(2C_4+C_L)}}{(2C_4+C_L)}$
 ω_0 : $\sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$
Bandwidth: $\frac{2}{R_4(2C_4+C_L)}$

Filter 173

Filter Type: BP

$Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{C_4s}}}, \infty, \frac{R_Ls}{C_LR_Ls+1}\right)$
 $H(s)$: $\frac{L_LR_Ls}{2C_4L_4R_LR_Ls^2+C_LR_4R_Ls^2+L_4R_4s+2L_4R_Ls+2R_4R_L}$
Q: $\frac{\sqrt{2}R_4R_L\sqrt{L_4(2C_4+C_L)}}{R_4+2R_L}(2C_4+C_L)$
 ω_0 : $\sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$
Bandwidth: $\frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$

Filter 174

Filter Type: Invalid110

$Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{C_4s}}}, \infty, R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_4R_Ls(C_LR_4s+1)}{2C_4C_LL_LR_LR_Ls^3+2C_4L_4R_4s^2+C_LR_LR_4s^2+2C_4L_LR_Ls^2+2C_LR_4R_Ls+2L_4s+2R_4}$
Q: $\frac{R_4\sqrt{L_4(2C_4R_4+C_LR_4+2C_LR_L)}}{2(C_LR_4R_L+L_4)}$
 ω_0 : $\sqrt{2}\sqrt{\frac{R_4}{L_4(2C_4R_4+C_LR_4+2C_LR_L)}}$
Bandwidth: $\frac{2(C_LR_4R_L+L_4)}{L_4(2C_4R_4+C_LR_4+2C_LR_L)}$

Filter 175

Invalid filter

$Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{C_4s}}}, \infty, L_Ls + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_4R_Ls(C_LL_Ls^2+1)}{2C_4C_LL_LR_LR_Ls^3+2C_4L_4R_4s^2+2C_4L_LR_Ls^3+C_LR_4R_Ls^2+2C_LL_R_4s^2+2L_4s+2R_4}$

Filter 176

Filter Type: BP

$Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{C_4s}}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$
 $H(s)$: $\frac{L_LR_LR_Ls}{2C_4L_4R_LR_Ls^2+C_LR_4R_4s^2+2L_4L_Ls+L_4R_4+2L_LR_4}$
Q: $\frac{R_4\sqrt{L_4+2L_L}}{L_4L_L(2C_4+C_L)}(2C_4+C_L)$
 ω_0 : $\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}$
Bandwidth: $\frac{2}{R_4(2C_4+C_L)}$

Filter 177

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, L_Ls+R_L+\frac{1}{C_Ls} \right)$$
$$H(s): \frac{L_4R_4s(C_LL_4s^2+C_LR_Ls+1)}{2C_LC_LL_LL_R4s^4+2C_LC_LL_R4R_Ls^3+2C_LL_4R_4R_Ls^2+2C_LL_4L_4R_4s^2+C_LL_4L_4s^3+C_LL_4R_4s^3+2C_LL_4R_Ls^2+2C_LL_R4s^2+2L_4s+2R_4}$$

Filter 178**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{1}{C_LR_L+\frac{1}{R_L}+\frac{1}{L_Ls}} \right)$$
$$H(s): \frac{L_4L_4R_4R_LR_Ls^2+C_LL_4R_4R_LR_Ls^2+L_4L_LR_4R_Ls^2+2L_4L_LR_Ls+L_4R_4R_L+2L_LR_LR_L}{2C_LL_4R_4R_LR_Ls^2+C_LL_4L_LR_4R_LR_Ls^2+L_4L_LR_4R_Ls^2+2L_4L_LR_Ls+L_4R_4R_L+2L_LR_LR_L}$$
$$\mathbf{Q:} \frac{R_4R_L\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_L+C_L)}}(2C_L+C_L)}{R_4+2R_L}$$
$$\omega_0: \sqrt{\frac{L_4+2L_L}{L_LL_L(2C_L+C_L)}}$$
$$\mathbf{Bandwidth:} \frac{R_4+2R_L}{R_4R_L(2C_L+C_L)}$$

Filter 179

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{L_4s}{C_LR_Ls^2+L_Ls+R_L} + R_L \right)$$
$$H(s): \frac{L_4R_4s(C_LL_4R_Ls^2+L_Ls+R_L)}{2C_LC_LL_4R_4R_Ls^4+2C_LL_4L_LR_4R_Ls^3+2C_LL_4R_4R_Ls^2+C_LL_4L_LR_4s^3+2C_LL_4L_LR_Ls^2+2C_LL_4R_4R_Ls^2+L_4R_4s^2+2L_4R_Ls+2L_LR_4R_L}$$

Filter 180

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_LR_L}\right)}{L_Ls+R_L+\frac{1}{C_LR_L}} \right)$$
$$H(s): \frac{L_4R_4R_Ls(C_LL_Ls^2+1)}{2C_LC_LL_4R_4R_LR_Ls^4+2C_LL_4L_LR_4R_Ls^3+C_LL_4L_LR_4s^3+2C_LL_4L_LR_Ls^2+C_LL_4R_4R_Ls^2+2C_LL_4R_4R_Ls^2+L_4R_4s^2+2L_4R_Ls+2L_LR_4R_L}$$

Filter 181**Filter Type:** GE

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, R_L \right)$$
$$H(s): \frac{R_L(C_LL_4R_4s^2+L_4s+R_4)}{C_LL_4R_4s^2+2C_LL_4R_Ls^2+L_4s+R_4+2R_L}$$
$$\mathbf{Q:} C_4\sqrt{\frac{1}{C_LL_4}}\left(R_4+2R_L\right)$$
$$\omega_0: \sqrt{\frac{1}{C_LL_4}}$$
$$\mathbf{Bandwidth:} \frac{1}{C_4(R_4+2R_L)}$$
$$\mathbf{Q\#}: C_4R_4\sqrt{\frac{1}{C_LL_4}}$$

Filter 182

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, \frac{1}{C_Ls} \right)$$
$$H(s): \frac{C_4L_4R_4s^2+L_4s+R_4}{C_LC_LL_4R_4s^3+2C_LL_4s^2+C_LL_4s^2+C_LR_4s+2}$$

Filter 183

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$
$$H(s): \frac{R_L(C_LL_4R_4s^2+L_4s+R_4)}{C_LC_LL_4R_LR_Ls^3+C_LL_4R_4s^2+2C_LL_4R_Ls^2+2C_LL_4R_Ls^2+C_LR_4R_Ls+L_4s+R_4+2R_L}$$

Filter 184

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, R_L + \frac{1}{C_Ls} \right)$$
$$H(s): \frac{(C_LR_Ls+1)(C_LL_4R_4s^2+L_4s+R_4)}{C_LC_LL_4R_4R_Ls^3+2C_LL_4C_LL_4R_Ls^3+2C_LL_4s^2+C_LL_4s^2+C_LR_4s+2C_LR_Ls+2}$$

Filter 185

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, L_Ls + \frac{1}{C_Ls} \right)$$
$$H(s): \frac{(C_LL_Ls^2+1)(C_LL_4R_4s^2+L_4s+R_4)}{2C_LC_LL_4L_LLs^4+C_LC_LL_4R_4s^3+2C_LL_4s^2+2C_LL_4s^2+2C_LL_Ls^2+C_LR_4s+2}$$

Filter 186

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, \frac{L_4s}{C_LL_4s^2+1} \right)$$
$$H(s): \frac{L_LL_Ls(C_LL_4R_4s^2+L_4s+R_4)}{C_LC_LL_4L_LL_R4s^4+2C_LL_4L_LLs^3+C_LL_4R_4s^2+C_LL_4L_LLs^2+C_LL_4R_4s^2+L_4s+2L_Ls+R_4}$$

Filter 187

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$
$$H(s): \frac{(C_LL_Ls^2+C_LR_Ls+1)(C_LL_4R_4s^2+L_4s+R_4)}{2C_LC_LL_4L_LLs^4+C_LC_LL_4R_4s^3+2C_LC_LL_4R_Ls^3+2C_LL_4s^2+2C_LL_4s^2+2C_LL_Ls^2+C_LR_4s+2C_LR_Ls+2}$$

Filter 188

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, \frac{1}{C_LR_L+\frac{1}{R_L}+\frac{1}{L_Ls}} \right)$$
$$H(s): \frac{L_LR_Ls(C_LL_4R_4s^2+L_4s+R_4)}{C_LC_LL_4L_LL_R4s^4+C_LL_4L_LL_R4s^3+2C_LL_4L_LL_R_Ls^3+C_LL_4L_LL_R_Ls^2+C_LL_4L_LL_R_Ls^2+L_4R_Ls+L_LR_4s+2L_LR_Ls+R_4R_L}$$

Filter 189

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, \frac{L_4s}{C_LR_Ls^2+1} + R_L \right)$$
$$H(s): \frac{(C_LL_4R_4s^2+L_4s+R_4)(C_LL_4R_Ls^2+L_Ls+R_L)}{C_LC_LL_4L_LL_R4s^4+2C_LC_LL_4L_LL_R_Ls^3+2C_LL_4L_LLs^3+C_LL_4R_4s^2+2C_LL_4R_Ls^2+C_LL_4L_LLs^3+C_LL_R_4s^2+2C_LL_Ls^2+L_4s+2L_Ls+R_4+2R_L}$$

Filter 190

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_LL_4s^2+1} + R_4, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_LR_L}\right)}{L_Ls+R_L+\frac{1}{C_LR_L}} \right)$$
$$H(s): \frac{R_L(C_LL_Ls^2+1)(C_LL_4R_4s^2+L_4s+R_4)}{C_LC_LL_4L_LL_R4s^4+2C_LC_LL_4L_LL_R_Ls^3+C_LC_LL_4R_4R_Ls^3+C_LL_4R_4s^2+2C_LL_4R_Ls^2+C_LL_4L_LLs^2+C_LL_4R_Ls^2+C_LR_4R_Ls+L_4s+R_4+2R_L}$$

Filter 191**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L (C_1 L_4 s^2 + 1)}{C_1 L_4 R_4 s^2 + 2 C_1 L_4 R_L s^2 + 2 C_1 R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{C_1^2 R_4}{C_1^2 R_4} (R_4 + 2 R_L)}}{2 R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_1 L_4}}$$

$$\textbf{Bandwidth: } \frac{2 R_4 R_L}{L_4 (R_4 + 2 R_L)}$$

Filter 192**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, \frac{1}{C_1 s} \right)$$

$$H(s): \frac{R_4 (C_1 L_4 s^2 + 1)}{C_1 C_2 L_4 R_4 s^3 + 2 C_1 L_4 s^2 + 2 C_1 R_4 s + C_1 R_4 s + 2}$$

$$\mathbf{Q}: \frac{2 C_1 L_4 \sqrt{\frac{C_1^2 R_4}{C_1^2 R_4} (R_4 + 2 R_L)}}{R_4 (2 C_1 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_1 L_4}}$$

$$\textbf{Bandwidth: } \frac{R_4 (2 C_1 + C_L)}{2 C_1 L_4}$$

Filter 193**Filter Type:** BS

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, \frac{R_L}{C_2 R_L s + 1} \right)$$

$$H(s): \frac{R_4 R_L (C_1 L_4 s^2 + 1)}{C_1 C_2 L_4 R_4 R_L s^3 + C_1 L_4 R_4 s^2 + 2 C_1 L_4 R_L s^2 + 2 C_1 R_4 R_L s + C_1 R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{C_1 L_4 \sqrt{\frac{C_1^2 R_4}{C_1^2 R_4} (R_4 + 2 R_L)}}{R_4 R_L (2 C_1 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_1 L_4}}$$

$$\textbf{Bandwidth: } \frac{R_4 R_L (2 C_1 + C_L)}{C_1 L_4 (R_4 + 2 R_L)}$$

Filter 194

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, R_L + \frac{1}{C_1 s} \right)$$

$$H(s): \frac{R_4 (C_1 L_4 s^2 + 1) (C_1 R_L s + 1)}{C_1 C_2 L_4 R_4 s^3 + 2 C_1 C_2 L_4 R_L s^3 + 2 C_1 C_2 L_4 R_4 s^2 + 2 C_1 C_2 L_4 s^2 + 2 C_1 R_4 s + C_1 R_4 s + 2 C_1 R_L s + 2}$$

Filter 195

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, L_L s + \frac{1}{C_1 s} \right)$$

$$H(s): \frac{R_4 (C_1 L_4 s^2 + 1) (C_1 L_L s^2 + 1)}{2 C_1 C_2 L_4 L_L s^4 + C_1 C_2 L_4 R_4 s^3 + C_1 C_2 L_4 R_4 s^3 + 2 C_1 C_2 L_L R_4 s^3 + 2 C_1 L_4 s^2 + 2 C_1 R_4 s + 2 C_1 L_L s + 2}$$

Filter 196

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, \frac{L_4 s}{C_1 L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_4 s (C_1 L_4 s^2 + 1)}{C_1 C_2 L_4 L_L R_4 s^4 + 2 C_1 C_2 L_4 L_L s^3 + C_1 L_4 R_4 s^3 + 2 C_1 C_2 L_L R_4 s^3 + C_1 L_L R_4 s^2 + 2 L_L s + R_4}$$

Filter 197

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_1 L_4 s^2 + 1) (C_1 L_L s^2 + C_1 R_L s + 1)}{2 C_1 C_2 L_4 L_L s^4 + C_1 C_2 L_4 R_4 s^3 + 2 C_1 C_2 L_4 R_4 s^3 + 2 C_1 C_2 L_L R_4 s^3 + 2 C_1 C_2 L_L R_4 s^2 + 2 C_1 L_4 s^2 + 2 C_1 R_4 s + 2 C_1 L_L s + 2}$$

Filter 198

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, \frac{1}{C_1 s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_4 R_L s (C_1 L_4 s^2 + 1)}{C_1 C_2 L_4 L_L R_L R_L s^4 + C_1 C_2 L_4 L_L R_4 s^3 + 2 C_1 C_2 L_L R_L s^3 + C_1 L_4 R_4 R_L s^2 + 2 C_1 C_2 L_L R_4 R_L s^2 + C_1 L_L R_4 R_L s^2 + L_L R_4 s + 2 L_L R_L s + R_L R_L}$$

Filter 199

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, \frac{L_4 s}{C_1 L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4 (C_1 L_4 s^2 + 1) (C_1 L_L R_L s^2 + L_L s + R_L)}{C_1 C_2 L_4 L_L R_4 s^4 + 2 C_1 C_2 L_4 L_L R_L s^3 + 2 C_1 C_2 L_4 R_4 R_L s^3 + 2 C_1 C_2 L_L R_4 R_L s^3 + C_1 L_4 R_4 R_L s^2 + 2 C_1 C_2 L_L R_4 R_L s^2 + C_1 L_L R_4 R_L s^2 + L_L R_4 s + 2 L_L R_L s + R_4 + 2 R_L}$$

Filter 200

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2 s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_1^2} \right)}{L_4 s + R_4 + \frac{1}{C_1^2}}, \infty, \frac{R_L (L_L s + \frac{1}{C_1^2})}{L_L s + R_L + \frac{1}{C_1^2}} \right)$$

$$H(s): \frac{R_4 R_L (C_1 L_4 s^2 + 1) (C_1 L_L s^2 + 1)}{C_1 C_2 L_4 L_L R_4 s^4 + 2 C_1 C_2 L_L R_L s^3 + C_1 C_2 L_4 R_4 R_L s^3 + 2 C_1 C_2 L_L R_4 R_L s^3 + C_1 L_4 R_4 R_L s^2 + 2 C_1 C_2 L_L R_4 R_L s^2 + 2 C_1 L_L R_4 R_L s^2 + C_1 L_L R_4 R_L s + R_4 + 2 R_L}$$

Filter 201

Invalid filter

$$Z(s): \left(\infty, \frac{R_L}{C_2 R_L s + 1}, \infty, R_4, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L}{R_4 + 2 R_L}$$

Filter 202

Invalid filter

$$Z(s): \left(\infty, \frac{R_4}{C_2 R_L s + 1}, \infty, R_4, \infty, \frac{1}{C_1 s} \right)$$

$$H(s): \frac{R_4}{C_1 R_L s + 2}$$

Filter 203

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_L s + 1}, \infty, R_4, \infty, \frac{R_L}{C_1 R_L s + 1} \right)$$

$$H(s): \frac{R_4 R_L}{C_1 R_L R_L s + R_4 + 2 R_L}$$

Filter 204

Invalid filter

$$Z(s): \left(\infty, \frac{R_4}{C_2 R_L s + 1}, \infty, R_4, \infty, R_L + \frac{1}{C_1 s} \right)$$

$$H(s): \frac{R_4 (C_1 R_L s + 1)}{C_1 R_L s + 2 C_1 R_L s + 2}$$

Filter 205**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4(C_L L_L s^2 + 1)}{2C_L L_L s^2 + C_L R_4 s + 2}$$

$$\mathbf{Q}: \frac{2L_L \sqrt{C_L L_L}}{R_4}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4}{2L_L}$$

Filter 206**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_4}{C_L L_L R_4 s^2 + 2L_L s + R_4}$$

$$\mathbf{Q}: \frac{C_L R_4 \sqrt{C_L L_L}}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{2}{C_L R_4}$$

Filter 207**Filter Type:** GE

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4(C_L L_L s^2 + C_L R_L s + 1)}{2C_L L_L s^2 + C_L R_4 s + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2L_L \sqrt{C_L L_L}}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4 + 2R_L}{2L_L}$$

$$\mathbf{Qz}: \frac{L_L \sqrt{C_L L_L}}{R_L}$$

Filter 208**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4, \infty, \frac{1}{C_L s + \frac{1}{R_L + L_L s}} \right)$$

$$H(s): \frac{L_L R_4 R_L s}{C_L L_L R_L R_L s^2 + L_L R_4 s + 2L_L R_L s + R_4 R_L}$$

$$\mathbf{Q}: \frac{C_L R_4 R_L \sqrt{C_L L_L}}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4 + 2R_L}{C_L R_4 R_L}$$

Filter 209**Filter Type:** GE

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4(C_L L_L R_L s^2 + L_L s + R_L)}{C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + 2L_L s + R_4 + 2R_L}$$

$$\mathbf{Q}: \frac{C_L \sqrt{C_L L_L} (R_4 + 2R_L)}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{2}{C_L (R_4 + 2R_L)}$$

$$\mathbf{Qz}: C_L R_L \sqrt{\frac{1}{C_L L_L}}$$

Filter 210**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_4 R_L (C_L L_L s^2 + 1)}{C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + C_L R_4 R_L s + R_4 + 2R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{C_L L_L} (R_4 + 2R_L)}{R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4 R_L}{L_L (R_4 + 2R_L)}$$

Filter 211

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_L s}, \infty, R_L \right)$$

$$H(s): \frac{R_L}{2C_L R_L s + 1}$$

Filter 212

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_L s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{1}{s(2C_L + C_L)}$$

Filter 213

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_L s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L}{2C_L R_L s + C_L R_L s + 1}$$

Filter 214

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_L s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L R_L s + 1}{s(2C_L R_L R_L s + 2C_L + C_L)}$$

Filter 215

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_L s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + 1}{s(2C_L R_L L_L s^2 + 2C_L + C_L)}$$

Filter 216

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_L s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s}{2C_L L_L s^2 + C_L L_L s^2 + 1}$$

Filter 217

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_L s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + C_L R_L s + 1}{s(2C_L R_L L_L s^2 + 2C_L R_L s + 2C_L + C_L)}$$

Filter 218**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_1 s}, \infty, \frac{1}{C_L s + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{R_2}{2C_1 L_L R_L s^2 + C_1^2 L_L R_L s^2 + L_L s + R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L (2C_1 + C_L)}} (2C_1 + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_1 + C_L)}}$$

$$\text{Bandwidth: } \frac{1}{R_L (2C_1 + C_L)}$$

Filter 219

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_1 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{C_L L_L R_L s^2 + C_1^2 L_L R_L s^2 + L_L s + R_L}{2C_1 C_L L_L R_L s^3 + 2C_1 L_L s^2 + 2C_1 R_L s + C_L L_L s^2 + 1}$$

Filter 220**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_1 s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L L})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_1 C_L L_L R_L R_L s^3 + 2C_1 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_L^2 L_L}}}{R_L (2C_1 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_L (2C_1 + C_L)}{C_L L_L}$$

Filter 221

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, R_L \right)$$

$$H(s): \frac{R_L R_L}{2C_1 R_L R_L s + R_L + 2R_L}$$

Filter 222

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L}{2C_1 R_L s + C_L R_L s + 2}$$

Filter 223

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L R_L}{2C_1 R_L R_L s + C_L R_L R_L s + R_L + 2R_L}$$

Filter 224**Filter Type:** Invalid011

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L R_L s + 1)}{2C_1 C_L R_L R_L s^3 + 2C_1 R_L s + C_L R_L s^2 + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_1 C_L R_L \sqrt{\frac{1}{C_L^2 R_L R_L}}}{2C_1 R_L s + C_L R_L s + 2C_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L R_L}}$$

$$\text{Bandwidth: } \frac{2C_1 R_L + C_L R_L + 2C_L R_L}{2C_1 C_L R_L R_L}$$

Filter 225**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_1 C_L L_L R_L s^3 + 2C_1 R_L s + 2C_L L_L s^2 + C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_1 L_L \sqrt{\frac{1}{C_L^2 L_L}}}{R_L (2C_1 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\text{Bandwidth: } \frac{R_L (2C_1 + C_L)}{2C_L L_L}$$

Filter 226**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_L}{2C_1 L_L R_L s^2 + C_1^2 L_L R_L s^2 + 2L_L s + R_L}$$

$$\mathbf{Q}: \frac{R_L \sqrt{\frac{1}{L_L (2C_1 + C_L)}}}{2}$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_1 + C_L)}}$$

$$\text{Bandwidth: } \frac{2}{R_L (2C_1 + C_L)}$$

Filter 227

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + C_L R_L s + 1)}{2C_1 C_L L_L R_L s^3 + 2C_1 C_L R_L s^2 + 2C_1 R_L s + 2C_L L_L s^2 + C_L R_L s + 2C_L R_L s + 2}$$

Filter 228**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, \frac{1}{C_L s + R_L + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_L R_L s}{2C_1 L_L R_L R_L s^2 + C_L R_L R_L s^2 + L_L R_L s + 2L_L R_L s + R_L R_L}$$

$$\mathbf{Q}: \frac{R_L R_L \sqrt{\frac{1}{L_L (2C_1 + C_L)}}}{R_L + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_1 + C_L)}}$$

$$\text{Bandwidth: } \frac{R_L + 2R_L}{R_L R_L (2C_1 + C_L)}$$

Filter 229

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_L (C_L L_L R_L s^2 + L_L s + R_L)}{2C_1 C_L L_L R_L R_L s^3 + 2C_1 L_L R_L s^2 + 2C_1 R_L s + C_L L_L R_L s^2 + 2C_L L_L R_L s + 2L_L s + R_L + 2R_L}$$

Filter 230**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_L}{C_1 R_L s + 1}, \infty, \frac{R_L (L_L s + \frac{1}{C_L L})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L R_L (C_L L_L s^2 + 1)}{2C_1 C_L L_L R_L R_L s^3 + 2C_1 R_L R_L s + C_L L_L R_L s^2 + 2C_L L_L R_L s + C_L R_L R_L s + R_L + 2R_L}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_L^2 L_L}} (R_L + 2R_L)}{R_L R_L (2C_1 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

Bandwidth: $\frac{R_4 R_L (2 C_4 + C_L)}{C_L L_L (R_4 + 2 R_L)}$

Filter 231

Invalid filter
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, R_L \right)$
 $H(s): \frac{R_L (C_4 R_4 s + 1)}{C_4 R_4 s + 2 C_4 R_L s + 1}$

Filter 232

Invalid filter
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$
 $H(s): \frac{C_4 R_4 s + 1}{s (C_4 C_L R_4 s + 2 C_4 + C_L)}$

Filter 233

Filter Type: Invalid011
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$
 $H(s): \frac{R_L (C_4 R_4 s + 1)}{C_4 C_L R_4 R_L R_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L R_L s + 1}$
Q: $\frac{C_4 C_L R_4 R_L \sqrt{C_4 C_L R_4 R_L}}{C_4 R_4 + 2 C_4 R_L + C_L R_L}$
 $\omega_0: \sqrt{\frac{1}{C_4 C_L R_4 R_L}}$
Bandwidth: $\frac{C_4 R_4 + 2 C_4 R_L + C_L R_L}{C_4 C_L R_4 R_L}$

Filter 234

Invalid filter
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$
 $H(s): \frac{(C_4 R_4 s + 1) (C_L R_L s + 1)}{s (C_4 C_L R_4 s + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$

Filter 235

Invalid filter
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$
 $H(s): \frac{(C_4 R_4 s + 1) (C_L L_L s^2 + 1)}{s (2 C_4 C_L L_L s^2 + C_4 C_L R_4 s + 2 C_4 + C_L)}$

Filter 236

Filter Type: Invalid110
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$
 $H(s): \frac{L_L s (C_4 R_4 s + 1)}{C_4 C_L L_L R_4 s^3 + 2 C_4 L_L s^2 + C_4 R_4 s + C_L R_4 s + 1}$
Q: $\frac{L_L \sqrt{\frac{1}{L_L (2 C_4 + C_L)}}}{C_4 R_4}$
 $\omega_0: \sqrt{\frac{1}{L_L (2 C_4 + C_L)}}$
Bandwidth: $\frac{C_4 R_4}{L_L (2 C_4 + C_L)}$

Filter 237

Invalid filter
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$
 $H(s): \frac{(C_4 R_4 s + 1) (C_L L_L s^2 + C_L R_L s + 1)}{s (2 C_4 C_L L_L s^2 + C_4 C_L R_4 s + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$

Filter 238

Filter Type: Invalid110
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} + \frac{1}{R_L + L_L s} \right)$
 $H(s): \frac{L_L R_L s (C_4 R_4 s + 1)}{C_4 C_L L_L R_4 R_L s^3 + C_4 L_L R_4 s^2 + 2 C_4 L_L R_L s^2 + C_4 R_4 R_L s + C_L L_L s^2 + L_L s + R_L}$
Q: $\frac{R_L \sqrt{\frac{1}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}} (C_4 R_4 + 2 C_4 R_L + C_L R_L)}{C_4 R_4 R_L + L_L}$
 $\omega_0: \sqrt{\frac{1}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}}$
Bandwidth: $\frac{C_4 R_4 R_L + L_L}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}$

Filter 239

Invalid filter
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$
 $H(s): \frac{(C_4 R_4 s + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^2 + 2 C_4 L_L R_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + 1}$

Filter 240

Invalid filter
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$
 $H(s): \frac{R_L (C_4 R_4 s + 1) (C_L L_L s^2 + 1)}{C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^2 + C_4 C_L R_4 R_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$

Filter 241

Filter Type: BS
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L \right)$
 $H(s): \frac{R_L (C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + 2 C_4 R_L s + 1}$
Q: $\frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{2 R_L}$
 $\omega_0: \sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{2 R_L}{L_4}$

Filter 242

Invalid filter
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$
 $H(s): \frac{C_4 R_4 s + 1}{s (C_4 C_L L_4 s^2 + 2 C_4 + C_L)}$

Filter 243

Filter Type: BS
 $Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$
 $H(s): \frac{R_L (C_4 L_4 s^2 + 1)}{C_4 C_L L_L R_L s^3 + C_4 L_4 s^2 + 2 C_4 R_L s + C_L R_L s + 1}$
Q: $\frac{C_4 L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_L (2 C_4 + C_L)}$
 $\omega_0: \sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{R_L (2 C_4 + C_L)}{C_4 L_4}$

Filter 244

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls} \right) \\ H(s): & \frac{(C_4L_4s^2+1)(C_LR_Ls+1)}{s(C_4C_LL_4s^3+2C_4C_LR_Ls+2C_4+C_L)} \end{aligned}$$

Filter 245

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right) \\ H(s): & \frac{(C_4L_4s^2+1)(C_LL_Ls^2+1)}{s(C_4C_LL_4s^3+2C_4C_LL_Ls^2+2C_4+C_L)} \end{aligned}$$

Filter 246

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right) \\ H(s): & \frac{L_Ls(C_4L_4s^2+1)}{C_4C_LL_4L_Ls^3+C_4L_4s^2+2C_4C_LL_Ls^2+C_LL_Ls^2+1} \end{aligned}$$

Filter 247

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right) \\ H(s): & \frac{(C_4L_4s^2+1)(C_LL_Ls^2+C_LR_Ls+1)}{s(C_4C_LL_4s^3+2C_4C_LL_Ls^2+2C_4C_LR_Ls+2C_4+C_L)} \end{aligned}$$

Filter 248

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}} \right) \\ H(s): & \frac{L_LR_Ls(C_4L_4s^2+1)}{C_4C_LL_4L_LR_Ls^3+C_4L_4L_LR_Ls^3+C_4L_4R_Ls^2+2C_4L_LR_Ls^2+C_LL_LR_Ls^2+L_LR_Ls+R_L} \end{aligned}$$

Filter 249

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right) \\ H(s): & \frac{(C_4L_4s^2+1)(C_LL_LR_Ls^2+L_Ls+R_L)}{C_4C_LL_4L_Ls^3+2C_4C_LL_LR_Ls^3+C_4L_4s^2+2C_4L_Ls^2+2C_4R_Ls+C_LL_Ls^2+1} \end{aligned}$$

Filter 250

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L(L_Ls+C_L^2)}{L_Ls+R_L+\frac{C_L^2}{C_L^2}} \right) \\ H(s): & \frac{R_L(C_4L_4s^2+1)(C_LL_Ls^2+1)}{C_4C_LL_4L_Ls^3+C_4C_LL_LR_Ls^3+2C_4C_LL_LR_Ls^3+C_4L_4s^2+2C_4R_Ls+C_LL_Ls^2+C_LL_LR_Ls+1} \end{aligned}$$

Filter 251**Filter Type:** BP

$$\begin{aligned} Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L \right) \\ H(s): & \frac{L_4R_Ls}{2C_4L_4R_Ls^2+L_4s+2R_L} \\ \mathbf{Q}: & 2C_4R_L\sqrt{\frac{1}{C_4L_4}} \\ \omega_0: & \sqrt{\frac{1}{C_4L_4}} \\ \mathbf{Bandwidth}: & \frac{1}{2C_4R_L} \end{aligned}$$

Filter 252

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls} \right) \\ H(s): & \frac{L_4s}{2C_4L_4s^2+C_LL_4s^2+2} \end{aligned}$$

Filter 253**Filter Type:** BP

$$\begin{aligned} Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L}{C_LR_Ls+1} \right) \\ H(s): & \frac{L_4R_Ls}{2C_4L_4R_Ls^2+C_LL_4R_Ls^2+L_4s+2R_L} \\ \mathbf{Q}: & \sqrt{2}R_L\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L) \\ \omega_0: & \sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}} \\ \mathbf{Bandwidth}: & \frac{1}{R_L(2C_4+C_L)} \end{aligned}$$

Filter 254**Filter Type:** Invalid110

$$\begin{aligned} Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L + \frac{1}{C_Ls} \right) \\ H(s): & \frac{L_4s(C_LR_Ls+1)}{2C_4C_LL_4R_Ls^3+2C_4L_4s^2+C_LL_4s^2+2C_LR_Ls+2} \\ \mathbf{Q}: & \frac{\sqrt{2}L+\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)}{2C_LR_L} \\ \omega_0: & \sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}} \\ \mathbf{Bandwidth}: & \frac{2C_LR_L}{L_4(2C_4+C_L)} \end{aligned}$$

Filter 255

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls + \frac{1}{C_Ls} \right) \\ H(s): & \frac{L_Ls(C_LL_Ls^2+1)}{2C_4C_LL_4L_Ls^3+2C_4L_4s^2+C_LL_4s^2+2C_LL_Ls^2+2} \end{aligned}$$

Filter 256

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right) \\ H(s): & \frac{L_LL_Ls}{2C_4L_4L_Ls^2+C_LL_4L_Ls^2+L_4+2L_L} \end{aligned}$$

Filter 257

$$\begin{aligned} \text{Invalid filter} \\ Z(s): & \left(\infty, \frac{R_2}{C_2R_{2s}+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right) \\ H(s): & \frac{L_Ls(C_LL_Ls^2+C_LR_Ls+1)}{2C_4C_LL_4L_Ls^3+2C_4C_LL_LR_Ls^3+2C_4L_4s^2+C_LL_4s^2+2C_LL_Ls^2+2C_LR_Ls+2} \end{aligned}$$

Filter 258**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}} \right)$$

$$H(s): \frac{L_4L_LL_LR_LR_Ls^2+C_LL_4L_LR_Ls^2+L_4L_Ls+L_4R_L+2L_LR_L}{2C_4L_4L_LR_LR_Ls^2+2C_4L_4L_Ls^2+2C_4L_4R_Ls^2+C_LL_4L_Ls^2+2C_LL_LR_Ls^2+L_4s+2L_Ls+2R_L}$$

$$\mathbf{Q}: R_L\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)$$

$$\omega_0: \sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}$$

$$\mathbf{Bandwidth:} \frac{1}{R_L(2C_4+C_L)}$$

Filter 259

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L \right)$$

$$H(s): \frac{L_4s(C_LL_LL_LR_Ls^2+L_Ls+R_L)}{2C_4C_LL_LL_R_Ls^4+2C_4L_4L_Ls^3+2C_4L_4R_Ls^2+C_LL_4L_Ls^2+2C_LL_LR_Ls^2+L_4s+2L_Ls+2R_L}$$

Filter 260

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L(L_Ls+\frac{1}{C_L})}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{L_LR_Ls(C_LL_Ls^2+1)}{2C_4C_LL_LL_R_Ls^4+2C_4L_4R_Ls^3+C_LL_4L_Ls^2+2C_LL_LR_Ls^2+2C_LL_LR_Ls^2+L_4s+2R_L}$$

Filter 261**Filter Type:** GE

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+C_4R_4s+1)}{C_4L_4s^2+C_4R_4s+2C_4R_Ls+1}$$

$$\mathbf{Q}: \frac{L_4}{R_L+2R_L}\sqrt{\frac{C_L}{C_4}}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth:} \frac{R_4+2R_L}{L_4}$$

$$\mathbf{Qz:} \frac{L_4\sqrt{\frac{1}{C_4L_4}}}{R_4}$$

Filter 262

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_4L_4s^2+C_4R_4s+1}{s(C_4C_LL_4s^2+C_4C_LR_4s+2C_4+C_L)}$$

Filter 263

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+C_4R_4s+1)}{C_4C_LL_LR_Ls^3+C_4C_LR_LR_Ls^2+C_4L_4R_Ls^2+C_4R_4s+2C_4R_Ls+C_LR_Ls+1}$$

Filter 264

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, R_L+\frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_LL_Ls+1)(C_4L_4s^2+C_4R_4s+1)}{s(C_4C_LL_4s^2+C_4C_LR_4s+2C_4C_LR_Ls+2C_4+C_L)}$$

Filter 265

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, L_Ls+\frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_LL_Ls^2+1)(C_4L_4s^2+C_4R_4s+1)}{s(C_4C_LL_4s^2+2C_4C_LL_Ls^2+C_4C_LR_4s+2C_4+C_L)}$$

Filter 266

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_Ls(C_4L_4s^2+C_4R_4s+1)}{C_4C_LL_LL_Ls^4+C_4C_LL_LR_Ls^3+C_4L_4R_Ls^2+2C_4L_4s^2+C_LR_Ls+C_LL_Ls^2+1}$$

Filter 267

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, L_Ls+R_L+\frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4L_4s^2+C_4R_4s+1)(C_LL_Ls^2+C_LR_Ls+1)}{s(C_4C_LL_4s^2+2C_4C_LL_Ls^2+2C_4C_LR_4s+2C_4C_LR_Ls+2C_4+C_L)}$$

Filter 268

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}} \right)$$

$$H(s): \frac{L_LR_Ls(C_4L_4s^2+C_4R_4s+1)}{C_4C_LL_LL_R_Ls^4+C_4C_LL_LR_LR_Ls^3+C_4L_4R_Ls^2+C_4L_4R_Ls^2+C_4L_LR_Ls^2+2C_4L_LR_Ls^2+C_4R_4s+C_LL_LR_Ls^2+L_Ls+R_L}$$

Filter 269

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L \right)$$

$$H(s): \frac{(C_4L_4s^2+C_4R_4s+1)(C_LL_LR_Ls^2+L_Ls+R_L)}{C_4C_LL_LL_Ls^4+C_4C_LL_LR_Ls^3+2C_4C_LR_LR_Ls^2+C_4L_4R_Ls^2+2C_4L_Ls^2+C_4R_4s+2C_4R_Ls+C_LL_Ls^2+1}$$

Filter 270

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{R_L(L_Ls+\frac{1}{C_L})}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_L(C_LL_Ls^2+1)(C_4L_4s^2+C_4R_4s+1)}{C_4C_LL_LL_Ls^4+C_4C_LL_LR_LR_Ls^3+2C_4C_LL_LR_Ls^2+2C_4C_LR_LR_Ls^2+C_4C_LR_LR_Ls^2+C_4L_4R_Ls^2+C_4L_LR_Ls^2+2C_4R_Ls+C_LL_Ls^2+C_LR_Ls+1}$$

Filter 271**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, R_L \right)$$

$$H(s): \frac{L_4R_LR_Ls}{2C_4L_4R_LR_LR_Ls^2+L_4R_4s+2L_4R_Ls+2R_LR_L}$$

$$\mathbf{Q}: \frac{2C_4R_LR_L\sqrt{\frac{1}{C_4L_4}}}{R_4+2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth:} \frac{R_4+2R_L}{2C_4R_LR_L}$$

Filter 272**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{L_4^s}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_2}{2C_L L_4 R_4 R_L s^2 + C_L L_4 R_4 s^2 + 2L_4 s + 2R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2} R_4 \sqrt{\frac{R_4}{L_4 (2C_L^2 + C_L)}} (2C_L + C_L)}{2}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2C_L + C_L)}}$$

$$\text{Bandwidth: } \frac{2}{R_4 (2C_L + C_L)}$$

Filter 273**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4^s}}}, \infty, \frac{R_4}{C_L R_L s + 1} \right)$$

$$H(s): \frac{L_4 R_4 R_L}{2C_L L_4 R_4 R_L s^2 + C_L L_4 R_4 s^2 + L_4 R_4 s + 2L_4 R_L s + 2R_4 R_L}$$

$$\mathbf{Q}: \frac{\sqrt{2} R_4 R_L \sqrt{\frac{R_4}{L_4 (2C_L^2 + C_L)}} (2C_L + C_L)}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2C_L + C_L)}}$$

$$\text{Bandwidth: } \frac{R_4 + 2R_L}{R_4 R_L (2C_L + C_L)}$$

Filter 274**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4^s}}}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s (C_L R_L s + 1)}{2C_L C_L L_4 R_4 R_L s^2 + 2C_L L_4 R_4 s^2 + C_L L_4 R_4 s^2 + 2C_L L_4 R_4 s^2 + 2C_L R_4 R_L s + 2L_4 s + 2R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2} L_4 \sqrt{\frac{R_4}{L_4 (2C_L^2 R_4 + C_L R_4 + 2C_L R_L)}} (2C_L R_4 + C_L R_4 + 2C_L R_L)}{2(C_L R_4 R_L + L_4)}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{R_4}{L_4 (2C_L R_4 + C_L R_4 + 2C_L R_L)}}$$

$$\text{Bandwidth: } \frac{2(C_L R_4 R_L + L_4)}{L_4 (2C_L R_4 + C_L R_4 + 2C_L R_L)}$$

Filter 275

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4^s}}}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s (C_L L_L s^2 + 1)}{2C_L C_L L_4 L_L R_4 s^2 + 2C_L L_4 R_4 s^2 + 2C_L L_4 L_L s^2 + C_L L_4 R_4 s^2 + 2C_L L_L R_4 s^2 + 2L_4 s + 2R_4}$$

Filter 276**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4^s}}}, \infty, \frac{L_L s}{C_L L_L s + 1} \right)$$

$$H(s): \frac{L_4 L_L R_4 s}{2C_L L_4 L_L R_4 s^2 + C_L L_4 L_L R_4 s^2 + 2L_4 L_L s + L_4 R_4 + 2L_L R_4}$$

$$\mathbf{Q}: \frac{R_4 \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_L^2 + C_L)}} (2C_L + C_L)}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_L + C_L)}}$$

$$\text{Bandwidth: } \frac{2}{R_4 (2C_L + C_L)}$$

Filter 277

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4^s}}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s (C_L L_L s^2 + C_L R_L s + 1)}{2C_L C_L L_4 L_L R_4 s^2 + 2C_L C_L L_4 R_4 s^2 + 2C_L L_4 R_4 s^2 + 2C_L L_4 L_L s^2 + C_L L_4 R_4 s^2 + 2C_L L_4 R_4 s^2 + 2C_L L_L R_4 s^2 + 2L_4 L_L s + L_4 R_4 + 2L_L R_4 + 2R_4}$$

Filter 278**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4^s}}}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L^s}}} \right)$$

$$H(s): \frac{L_4 L_L R_4 R_L s}{2C_L L_4 L_L R_4 R_L s^2 + C_L L_4 L_L R_4 R_L s^2 + L_4 L_L R_4 s + 2L_4 R_L R_L}$$

$$\mathbf{Q}: \frac{R_4 R_L \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_L^2 + C_L)}} (2C_L + C_L)}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_L + C_L)}}$$

$$\text{Bandwidth: } \frac{R_4 + 2R_L}{R_4 R_L (2C_L + C_L)}$$

Filter 279

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4^s}}}, \infty, \frac{L_L s}{C_L L_L s + 1} + R_L \right)$$

$$H(s): \frac{L_4 R_4 s (C_L L_L R_L s^2 + L_L s + R_L)}{2C_L C_L L_4 L_L R_4 R_L s^2 + 2C_L C_L L_4 R_4 s^2 + 2C_L L_4 R_4 s^2 + C_L L_4 L_L R_4 s^2 + 2C_L L_4 L_L R_4 s^2 + 2C_L L_L R_4 s^2 + 2L_4 L_L s + L_4 R_4 + 2L_L R_L s + 2R_4 R_L}$$

Filter 280

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4^s}}}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_4 R_4 R_L s (C_L L_L s^2 + 1)}{2C_L C_L L_4 L_L R_4 R_L s^2 + 2C_L L_4 R_4 s^2 + C_L L_4 L_L R_4 s^2 + 2C_L L_4 L_L R_4 s^2 + C_L L_4 R_4 s^2 + 2C_L L_L R_4 s^2 + 2L_4 L_L s + L_4 R_4 + 2L_L R_L s + 2R_4 R_L}$$

Filter 281**Filter Type:** CE

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_L L_4 R_L s^2 + L_4 s + R_4)}{C_L L_4 R_L s^2 + 2C_L L_4 R_L s^2 + L_4 s + R_4 + 2R_L}$$

$$\mathbf{Q}: C_4 \sqrt{\frac{1}{C_L L_4}} (R_4 + 2R_L)$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\text{Bandwidth: } \frac{1}{C_L (R_4 + 2R_L)}$$

$$\mathbf{Qz}: C_4 R_4 \sqrt{\frac{1}{C_L L_4}}$$

Filter 282

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_4 R_L s^2 + L_4 s + R_4}{C_L C_L L_4 R_L s^2 + 2C_L L_4 s^2 + C_L L_4 s^2 + C_L R_4 s^2 + 2}$$

Filter 283

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_L L_4 R_L s^2 + L_4 s + R_4)}{C_L C_L L_4 R_L R_L s^2 + C_L L_4 R_L s^2 + 2C_L L_4 R_L s^2 + C_L L_4 R_L s^2 + C_L R_L R_L s^2 + L_4 s + R_4 + 2R_L}$$

Filter 284

Invalid filter
$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{L_4 s}{C_4 L_4 s^2+1} + R_4, \infty, R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_4 R_L s+1)(C_4 L_4 R_4 s^2+L_4 s+R_4)}{C_4 C_L L_4 R_4 s^3+2C_4 C_L L_4 R_4 s^2+2C_4 L_4 s^3+C_L L_4 s^2+C_L R_4 s+2C_L R_L s+2}$$

Filter 285

Invalid filter
$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{L_4 s}{C_4 L_4 s^2+1} + R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_L s^2+1)(C_L L_4 R_L s^2+L_4 s+R_4)}{2C_4 C_L L_4 L_L s^4+C_4 C_L L_4 R_4 s^3+2C_4 L_4 s^3+C_L L_4 s^2+2C_L L_L s^2+C_L R_4 s+2}$$

Filter 286

Invalid filter
$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{L_4 s}{C_4 L_4 s^2+1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2+1} \right)$$
$$H(s): \frac{L_L s(C_L L_4 R_4 s^2+L_4 s+R_4)}{C_4 C_L L_4 L_L R_4 s^4+2C_4 L_4 L_L s^3+C_4 L_4 R_4 s^2+C_L L_4 L_L s^2+C_L L_L R_4 s^2+L_4 s+2L_L s+R_4}$$

Filter 287

Invalid filter
$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{L_4 s}{C_4 L_4 s^2+1} + R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_L s^2+C_L R_L s+1)(C_L L_4 R_4 s^2+L_4 s+R_4)}{2C_4 C_L L_4 L_L s^4+C_4 C_L L_4 R_4 s^3+2C_4 C_L L_4 R_4 s^2+2C_4 L_4 s^3+C_L L_4 s^2+2C_L L_L s^2+C_L R_4 s+2C_L R_L s+2}$$

Filter 288

Invalid filter
$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{L_4 s}{C_4 L_4 s^2+1} + R_4, \infty, \frac{1}{\frac{1}{R_L} + \frac{1}{C_L s}} \right)$$
$$H(s): \frac{L_L R_L s(C_4 L_4 R_4 s^2+L_4 s+R_4)}{C_4 C_L L_4 L_L R_4 R_L s^4+C_4 L_4 L_L R_4 s^3+2C_4 L_4 L_L R_L s^2+C_4 L_4 R_4 R_L s^2+C_L L_4 L_L R_L s^2+L_4 L_L s^2+L_4 R_4 s+L_L R_4 s+2L_L R_L s+R_4 R_L}$$

Filter 289

Invalid filter
$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{L_4 s}{C_4 L_4 s^2+1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2+1} + R_L \right)$$
$$H(s): \frac{(C_4 L_4 R_4 s^2+L_4 s+R_4)(C_L L_L R_L s^2+L_L s+R_L)}{C_4 C_L L_4 L_L R_4 s^4+2C_4 C_L L_4 L_L R_L s^3+2C_4 L_4 L_L s^3+C_4 L_4 R_4 s^2+2C_4 L_4 R_L s^2+C_L L_4 L_L R_4 s^2+2C_L L_L R_L s^2+L_4 s+2L_L s+R_L}$$

Filter 290

Invalid filter
$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{L_4 s}{C_4 L_4 s^2+1} + R_4, \infty, \frac{R_L \left(L_L s + \frac{C_L^2+1}{C_L^2} \right)}{L_L s+R_L + \frac{C_L^2+1}{C_L^2}} \right)$$
$$H(s): \frac{R_L (C_L L_L s^2+1)(C_4 L_4 R_4 s^2+L_4 s+R_4)}{C_4 C_L L_4 L_L R_4 s^4+2C_4 C_L L_4 L_L R_L s^3+C_4 C_L L_4 R_4 R_L s^3+C_4 L_4 R_4 s^2+2C_4 L_4 R_L s^2+C_L L_4 L_L s^2+C_L L_L R_4 s^2+2C_L L_L R_L s^2+L_4 s+R_L+2R_L}$$

Filter 291

Filter Type: BS

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_L^2} \right)}{L_4 s+R_4 + \frac{1}{C_L^2}}, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L (C_4 L_4 s^2+1)}{C_4 L_4 R_4 s^3+2C_4 L_4 R_L s^2+2C_4 R_4 R_L s+R_4+2R_L}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{1}{C_L^2 L_L} (R_4+2R_L)}}{2R_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\text{Bandwidth: } \frac{2R_L R_L}{L_4 (R_4+2R_L)}$$

Filter 292

Filter Type: BS

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_L^2} \right)}{L_4 s+R_4 + \frac{1}{C_L^2}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2+1)}{C_4 C_L L_4 R_4 s^3+2C_4 L_4 R_L s^2+2C_4 R_4 s+R_4+2R_L}$$

$$\mathbf{Q}: \frac{2C_4 L_4 \sqrt{\frac{1}{C_L^2 L_4}}}{R_4 (2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\text{Bandwidth: } \frac{R_4 (2C_4+C_L)}{2C_4 L_4}$$

Filter 293

Filter Type: BS

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_L^2} \right)}{L_4 s+R_4 + \frac{1}{C_L^2}}, \infty, \frac{R_L}{C_L R_{Ls}+1} \right)$$

$$H(s): \frac{R_4 R_L (C_4 L_4 s^2+1)}{C_4 C_L L_4 R_4 R_L s^3+C_4 L_4 R_4 s^2+2C_4 L_4 R_L s^2+2C_4 R_4 R_L s+C_L R_4 R_L s+R_4+2R_L}$$

$$\mathbf{Q}: \frac{C_4 L_4 \sqrt{\frac{1}{C_L^2 L_L} (R_4+2R_L)}}{R_4 R_L (2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\text{Bandwidth: } \frac{R_4 R_L (2C_4+C_L)}{C_4 L_4 (R_4+2R_L)}$$

Filter 294

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_L^2} \right)}{L_4 s+R_4 + \frac{1}{C_L^2}}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2+1)(C_L R_L s+1)}{C_4 C_L L_4 R_4 s^3+2C_4 C_L L_4 R_L s^2+2C_4 C_L R_4 R_L s^2+2C_4 L_4 s^2+2C_4 R_4 s+C_L R_4 s+2C_L R_L s+2}$$

Filter 295

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_L^2} \right)}{L_4 s+R_4 + \frac{1}{C_L^2}}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2+1)(C_L L_L s^2+1)}{2C_4 C_L L_4 L_L s^4+C_4 C_L L_4 R_4 s^3+2C_4 C_L L_4 R_4 s^2+2C_4 L_4 s^3+2C_4 R_4 s+2C_L L_L s^2+C_L R_4 s+2}$$

Filter 296

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_L^2} \right)}{L_4 s+R_4 + \frac{1}{C_L^2}}, \infty, \frac{L_L s}{C_L L_L s^2+1} \right)$$

$$H(s): \frac{L_L R_4 (C_4 L_4 s^2+1)}{C_4 C_L L_4 L_L R_4 s^4+2C_4 L_4 L_L s^3+C_4 L_4 R_4 s^2+2C_4 L_L R_4 s^2+C_L L_L R_4 s^2+2L_L s+R_4}$$

Filter 297

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_{2s}+1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_L^2} \right)}{L_4 s+R_4 + \frac{1}{C_L^2}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2+1)(C_L L_L s^2+C_L R_L s+1)}{2C_4 C_L L_4 L_L s^4+C_4 C_L L_4 R_4 s^3+2C_4 C_L L_4 R_L s^2+2C_4 C_L L_L R_4 s^2+2C_4 L_4 s^3+2C_4 R_4 s+2C_L L_L s^2+C_L R_4 s+2C_L R_L s+2}$$

Filter 298

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_4 R_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 L_L R_4 R_L s^4 + C_4 L_4 L_L R_4 s^3 + 2 C_4 L_4 L_L R_L s^2 + C_4 L_4 R_4 R_L s^2 + 2 C_4 L_L R_4 R_L s^2 + C_L L_L R_4 R_L s^3 + L_L R_4 s + 2 L_L R_L s + R_4 R_L}$$

Filter 299

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2 + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_L C_L L_4 L_L R_4 s^4 + 2 C_L C_L L_L R_L s^3 + C_4 C_L L_L R_4 R_L s^3 + 2 C_4 L_L R_4 s^3 + C_4 L_4 R_4 s^2 + 2 C_4 L_L R_L s^2 + 2 C_4 L_L R_4 R_L s + C_L L_L R_4 s^3 + 2 C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$

Filter 300

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$

$$H(s): \frac{R_4 R_L (C_4 L_4 s^2 + 1) (C_L L_L s^2 + 1)}{C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 C_L L_L R_L s^3 + C_4 C_L L_4 R_4 R_L s^3 + 2 C_L L_L R_4 R_L s^3 + 2 C_4 L_L R_L s^3 + C_4 L_4 R_4 s^2 + 2 C_4 L_L R_L s^2 + 2 C_4 L_L R_4 R_L s + C_L L_L R_4 s^3 + 2 C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$

Filter 301

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L}{R_4 + 2 R_L}$$

Filter 302

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4}{C_L R_4 s + 2}$$

Filter 303

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_4 R_L}{C_L R_L R_L s + R_L + 2 R_L}$$

Filter 304

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_L R_L s + 1)}{C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 305**Filter Type:** BS

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_L L_L s^2 + 1)}{2 C_L L_L s^2 + C_L R_4 s + 2}$$

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L L_L}}{R_4}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4}{2 L_L}$$

Filter 306**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_4}{C_L L_L R_L s^2 + 2 L_L s + R_4}$$

$$\mathbf{Q}: \frac{C_L R_4 \sqrt{C_L L_L}}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{2}{C_L R_4}$$

Filter 307**Filter Type:** GE

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_L L_L s^2 + C_L R_L s + 1)}{2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L L_L}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4 + 2 R_L}{2 L_L}$$

$$\mathbf{Qz}: \frac{L_L \sqrt{C_L L_L}}{R_4}$$

Filter 308**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_4 R_L s}{C_L L_L R_4 R_L s^2 + L_L R_4 s + 2 L_L R_L s + R_4 R_L}$$

$$\mathbf{Q}: \frac{C_L R_4 R_L \sqrt{C_L L_L}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4 + 2 R_L}{C_L R_4 R_L}$$

Filter 309**Filter Type:** GE

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4 (C_L L_L R_L s^2 + L_L s + R_L)}{C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + 2 L_L R_L s + 2 R_L}$$

$$\mathbf{Q}: \frac{C_L \sqrt{C_L L_L} (R_4 + 2 R_L)}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{2}{C_L (R_4 + 2 R_L)}$$

$$\mathbf{Qz}: C_L R_L \sqrt{\frac{1}{C_L L_L}}$$

Filter 310**Filter Type:** BS

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$

$$H(s): \frac{R_4 R_L (C_L L_L s^2 + 1)}{C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + C_L R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{C_L L_L} (R_4 + 2 R_L)}{R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

Bandwidth: $\frac{R_s R_L}{L_L(R_L+2R_L)}$

Filter 311

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, R_L \right)$$

$$H(s): \frac{R_L}{2C_4 R_L s + 1}$$

Filter 312

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{1}{s(2C_4+C_L)}$$

Filter 313

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L}{2C_4 R_L s + C_L R_L s + 1}$$

Filter 314

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L R_L s + 1}{s(2C_4 C_L R_L s + 2C_4 + C_L)}$$

Filter 315

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + 1}{s(2C_4 C_L L_L s^2 + 2C_4 + C_L)}$$

Filter 316

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s}{2C_4 L_L s^2 + C_L L_L s^2 + 1}$$

Filter 317

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + C_L R_L s + 1}{s(2C_4 C_L L_L s^2 + 2C_4 C_L R_L s + 2C_4 + C_L)}$$

Filter 318

Filter Type: BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

$$H(s): \frac{L_L R_L}{2C_4 C_L R_L R_L s^2 + C_L^2 L_L R_L s^2 + L_L s + R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L(2C_4+C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_4+C_L)}}$$

$$\mathbf{Bandwidth}: \frac{1}{R_L(2C_4+C_L)}$$

Filter 319

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{C_L L_L R_L s^2 + L_L s + R_L}{2C_4 C_L L_L R_L s^2 + 2C_4 L_L s^2 + 2C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 320

Filter Type: BS

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_4 C_L L_L R_L s^2 + 2C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_L^2 L_L}}}{R_L(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L^2 L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L(2C_4+C_L)}{C_L L_L}$$

Filter 321

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, R_L \right)$$

$$H(s): \frac{R_L R_L}{2C_4 R_L R_L s + R_L + 2R_L}$$

Filter 322

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L}{2C_4 R_L s + C_L R_L s + 2}$$

Filter 323

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L R_L}{2C_4 R_L R_L s + C_L R_L R_L s + R_L + 2R_L}$$

Filter 324

Filter Type: Invalid011

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L R_L s + 1)}{2C_4 C_L R_L R_L s^2 + 2C_4 R_L s + C_L R_L s + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_4 C_L R_L R_L \sqrt{\frac{1}{C_L^2 C_L^2 R_L R_L}}}{2C_4 R_L s + C_L R_L + 2C_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L^2 C_L R_L R_L}}$$

$$\mathbf{Bandwidth}: \frac{2C_4 R_L + C_L R_L + 2C_L R_L}{2C_4 C_L R_L R_L}$$

Filter 325**Filter Type:** BS

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4(C_LL_Ls^2+1)}{2C_1C_2L_LR_4R_4s^3+2C_2R_4s+2C_2L_Ls^2+C_LR_4s+2}$$

$$\mathbf{Q}\colon \frac{2C_1L_LL_L\sqrt{\frac{1}{C_2C_2L_L}}}{R_4(2C_1+C_L)}$$

$$\omega_0\colon \sqrt{\frac{1}{C_1L_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4(2C_1+C_L)}{2C_1L_L}$$

Filter 326**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_LR_4s}{2C_1L_LR_4R_4s^2+C_1L_LR_4s^2+2L_Ls+R_4}$$

$$\mathbf{Q}\colon \frac{R_4\sqrt{L_L(2C_1+C_L)}}{2(2C_1+C_L)}$$

$$\omega_0\colon \sqrt{\frac{1}{L_L(2C_1+C_L)}}$$

$$\mathbf{Bandwidth}\colon \frac{2}{R_4(2C_1+C_L)}$$

Filter 327

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4(C_LL_Ls^2+C_LR_Ls+1)}{2C_1C_2L_LR_4R_4s^3+2C_1C_LR_4R_4s^2+2C_1R_4s+2C_1L_LR_4s^2+C_LR_4s+2C_LR_Ls+2}$$

Filter 328**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls+\frac{1}{R_L+L_Ls}}\right)$$

$$H(s)\colon \frac{L_LR_4s}{2C_1C_2L_LR_4R_4s^2+C_1L_LR_4s^2+L_LR_4s+2L_LR_Ls+R_4R_L}$$

$$\mathbf{Q}\colon \frac{R_4R_L\sqrt{L_L(\frac{1}{C_2C_2+C_L})}}{R_4+2R_L(2C_1+C_L)}$$

$$\omega_0\colon \sqrt{\frac{1}{L_L(2C_1+C_L)}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{R_4R_L(2C_1+C_L)}$$

Filter 329

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

$$H(s)\colon \frac{R_4(C_LL_LR_Ls^2+L_Ls+R_L)}{2C_1C_2L_LR_4R_4R_Ls^3+2C_1L_LR_4s^2+2C_1R_4s+C_2L_LR_4s^2+2C_2L_LR_Ls^2+2L_Ls+R_4+2R_L}$$

Filter 330**Filter Type:** BS

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L(L_Ls+\frac{1}{C_Ls})}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$$

$$H(s)\colon \frac{R_4R_L(C_LL_Ls^2+1)}{2C_1C_2L_LR_4R_4R_Ls^3+2C_1R_4R_Ls+C_2L_LR_4s^2+2C_2L_LR_Ls^2+C_LR_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}\colon \frac{C_2L_LL_L\sqrt{\frac{1}{C_2C_2L_L}}(R_4+2R_L)}{R_4R_L(2C_1+C_L)}$$

$$\omega_0\colon \sqrt{\frac{1}{C_2L_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4R_L(2C_1+C_L)}{C_2L_L(R_4+2R_L)}$$

Filter 331

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, R_4+\frac{1}{C_4s}, \infty, R_L\right)$$

$$H(s)\colon \frac{R_L(C_4R_4s+1)}{C_4R_4s+2C_4R_Ls+1}$$

Filter 332

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{C_4R_4s+1}{s(C_1C_2R_4s+2C_1+C_L)}$$

Filter 333**Filter Type:** Invalid011

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{R_4}{C_LR_4s+1}\right)$$

$$H(s)\colon \frac{R_4(C_4R_4s+1)}{C_1C_2R_4R_4R_Ls^2+C_4R_4s+2C_1R_Ls+C_LR_Ls+1}$$

$$\mathbf{Q}\colon \frac{C_1C_2R_4R_L\sqrt{\frac{1}{C_1C_2R_4R_L}}}{C_4R_4+2C_4R_L+C_LR_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_1C_2R_4R_L}}$$

$$\mathbf{Bandwidth}\colon \frac{C_4R_4+2C_4R_L+C_LR_L}{C_4C_2R_4R_L}$$

Filter 334

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, R_4+\frac{1}{C_4s}, \infty, R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{(C_4R_4s+1)(C_LR_Ls+1)}{s(C_1C_2R_4s+2C_1C_2R_LR_Ls+2C_1+C_L)}$$

Filter 335

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, R_4+\frac{1}{C_4s}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{(C_4R_4s+1)(C_2L_Ls^2+1)}{s(2C_1C_2L_LL_Ls^2+C_1C_2R_4s+2C_1+C_L)}$$

Filter 336**Filter Type:** Invalid110

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_Ls(C_4R_4s+1)}{C_2C_2L_LR_4R_4s^3+2C_2L_LR_4s^2+C_4R_4s+C_2L_Ls^2+1}$$

$$\mathbf{Q}\colon \frac{L_L\sqrt{L_L(2C_1+C_L)}}{C_4R_4(2C_1+C_L)}$$

$$\omega_0\colon \sqrt{\frac{1}{L_L(2C_1+C_L)}}$$

$$\mathbf{Bandwidth}\colon \frac{C_4R_4}{L_L(2C_1+C_L)}$$

Filter 337

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, R_4+\frac{1}{C_4s}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{(C_4R_4s+1)(C_LL_Ls^2+C_LR_Ls+1)}{s(2C_1C_2L_LL_Ls^2+C_1C_2R_4s+2C_1C_2R_Ls+2C_1+C_L)}$$

Filter 338

Filter Type: Invalid110

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{C_Ls}}} \right) \\ H(s): & \frac{L_L R_L s (C_4 R_4 s + 1)}{C_2 C_L L_L R_4 R_L s^3 + C_4 L_L R_4 s^2 + 2 C_2 L_L R_4 s + C_4 R_4 R_L s + C_L L_L R_L s^2 + L_L s + R_L} \\ \mathbf{Q}: & \frac{L_L \sqrt{\frac{R_L}{L_L (C_4 R_4 + 2 C_4 R_4 + C_L R_L)}} (C_4 R_4 + 2 C_4 R_4 + C_L R_L)}{C_4 R_4 R_L + L_L} \\ \omega_0: & \sqrt{\frac{R_L}{L_L (C_4 R_4 + 2 C_4 R_4 + C_L R_L)}} \\ \textbf{Bandwidth:} & \frac{C_4 R_4 R_L + L_L}{L_L (C_4 R_4 + 2 C_4 R_4 + C_L R_L)} \end{aligned}$$

Filter 339

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s + 1} + R_L \right) \\ H(s): & \frac{(C_4 R_4 s + 1) (C_L L_L R_L s^2 + C_L R_L)}{C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^2 + 2 C_4 C_L R_L s + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + 1} \end{aligned}$$

Filter 340

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{R_L (L_L s + C_L^2)}{L_L s + R_L + \frac{1}{C_L^2}} \right) \\ H(s): & \frac{R_L (C_4 R_4 s + 1) (C_L L_L s^2 + 1)}{C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^2 + C_4 C_L R_L R_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1} \end{aligned}$$

Filter 341

Filter Type: BS

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, R_L \right) \\ H(s): & \frac{R_L (C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + 2 C_4 R_L s + 1} \\ \mathbf{Q}: & \frac{L_4 \sqrt{\frac{C_4^2 L_4}{2 R_L}}}{\frac{1}{C_4 L_4}} \\ \omega_0: & \sqrt{\frac{1}{C_4 L_4}} \\ \textbf{Bandwidth:} & \frac{2 R_L}{L_4} \end{aligned}$$

Filter 342

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_4 L_4 s^2 + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L)} \end{aligned}$$

Filter 343

Filter Type: BS

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, \frac{R_L}{C_L R_L s + 1} \right) \\ H(s): & \frac{R_L (C_4 L_4 s^2 + 1)}{C_4 C_L L_L R_L s^3 + C_4 L_4 s^2 + 2 C_4 R_L s + C_L R_L s + 1} \\ \mathbf{Q}: & \frac{C_L L_4 \sqrt{\frac{C_4^2 L_4}{2 R_L}}}{\frac{1}{R_L (2 C_4 + C_L)}} \\ \omega_0: & \sqrt{\frac{1}{C_4 L_4}} \\ \textbf{Bandwidth:} & \frac{R_L (2 C_4 + C_L)}{C_4 L_4} \end{aligned}$$

Filter 344

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_4 L_4 s^2 + 1) (C_L R_L s + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L R_L s + 2 C_4 C_L)} \end{aligned}$$

Filter 345

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, L_L s + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_4 L_4 s^2 + 1) (C_L L_L s^2 + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L L_L s^2 + 2 C_4 C_L)} \end{aligned}$$

Filter 346

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right) \\ H(s): & \frac{L_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_L L_L s^4 + C_4 L_4 s^2 + 2 C_4 L_L s^2 + C_L L_L s^2 + 1} \end{aligned}$$

Filter 347

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_4 L_4 s^2 + 1) (C_L L_L s^2 + C_L R_L s + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L L_L s^2 + 2 C_4 C_L R_L s + 2 C_4 C_L)} \end{aligned}$$

Filter 348

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{C_L s}}} \right) \\ H(s): & \frac{L_L R_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_L L_L R_L s^4 + C_4 L_L s^2 + C_4 L_L R_L s^2 + 2 C_4 L_L R_L s + C_L L_L R_L s^2 + L_L s + R_L} \end{aligned}$$

Filter 349

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right) \\ H(s): & \frac{(C_4 L_4 s^2 + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_L L_L s^4 + 2 C_4 C_L L_L R_L s^2 + C_4 L_L s^2 + 2 C_4 L_L s^2 + 2 C_4 R_L s + C_L L_L s^2 + 1} \end{aligned}$$

Filter 350

Invalid filter

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4 s + \frac{1}{C_4s}, \infty, \frac{R_L (L_L s + \frac{C_L^2}{C_L^2})}{L_L s + R_L + \frac{1}{C_L^2}} \right) \\ H(s): & \frac{R_L (C_4 L_4 s^2 + 1) (C_L L_L s^2 + 1)}{C_4 C_L L_L L_L s^4 + C_4 C_L L_L R_L s^2 + 2 C_4 C_L L_L R_L s^2 + C_4 L_4 s^2 + 2 C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1} \end{aligned}$$

Filter 351

Filter Type: BP

$$\begin{aligned} Z(s): & \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L \right) \\ H(s): & \frac{L_L R_L}{2 C_4 L_4 R_L s^2 + L_L s + 2 R_L} \\ \mathbf{Q}: & 2 C_4 R_L \sqrt{\frac{1}{C_4 L_4}} \\ \omega_0: & \sqrt{\frac{1}{C_4 L_4}} \\ \textbf{Bandwidth:} & \frac{1}{2 C_4 R_L} \end{aligned}$$

Filter 352

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_2 L_4 s^2 + 1}, \infty, \frac{1}{C_2 s} \right)$$

$$H(s): \frac{L_4 s}{2C_2 L_4 s^2 + C_L L_4 s^2 + 2}$$

Filter 353**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_2 L_4 s^2 + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{L_4 R_L s}{2C_2 L_4 R_L s^2 + C_L L_4 R_L s^2 + L_4 s + 2R_L}$$

$$\mathbf{Q}: \sqrt{2} R_L \sqrt{\frac{1}{L_4 (2C_2 + C_L)}} (2C_2 + C_L)$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2C_2 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{1}{R_L (2C_2 + C_L)}$$

Filter 354**Filter Type:** Invalid110

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_2 L_4 s^2 + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s (C_2 R_L s + 1)}{2C_2 C_L L_4 R_L s^2 + 2C_2 L_4 s^2 + C_L L_4 s^2 + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \sqrt{2} L_4 \sqrt{\frac{L_4 (2C_2 + C_L)}{L_4 (2C_2 + C_L)}} (2C_2 + C_L)$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2C_2 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{2C_2 R_L}{L_4 (2C_2 + C_L)}$$

Filter 355

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_2 L_4 s^2 + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_L s (C_L L_L s^2 + 1)}{2C_2 C_L L_L L_L s^2 + 2C_2 L_L s^2 + C_L L_4 s^2 + 2C_L L_L s^2 + 2}$$

Filter 356

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_2 L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_4 L_L s}{2C_2 L_4 L_L s^2 + C_L L_4 L_L s^2 + L_4 + 2L_L}$$

Filter 357

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_2 L_4 s^2 + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s (C_2 L_L s^2 + C_L R_L s + 1)}{2C_2 C_L L_4 L_L s^2 + 2C_2 C_L L_4 R_L s^2 + 2C_2 L_4 s^2 + C_L L_4 s^2 + 2C_L L_L s^2 + 2C_L R_L s + 2}$$

Filter 358**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L}} \right)$$

$$H(s): \frac{L_4 L_L R_L s}{2C_2 L_4 L_L R_L s^2 + C_L L_4 L_L R_L s^2 + L_4 L_L s + L_4 R_L + 2L_L R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_2 + C_L)}} (2C_2 + C_L)$$

$$\omega_0: \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_2 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{1}{R_L (2C_2 + C_L)}$$

Filter 359

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_2 L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{L_4 s (C_L L_L R_L s^2 + L_L s + R_L)}{2C_2 C_L L_4 L_L R_L s^2 + 2C_2 L_4 L_L s^2 + 2C_2 L_4 R_L s^2 + C_L L_4 L_L s^2 + 2C_L L_L R_L s^2 + L_4 s + 2L_L s + 2R_L}$$

Filter 360

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_4 R_L s (C_L L_L s^2 + 1)}{2C_2 C_L L_4 L_L R_L s^2 + 2C_2 L_4 L_L R_L s^2 + C_L L_4 L_L s^2 + C_L L_4 R_L s^2 + 2C_L L_L R_L s^2 + L_4 s + 2R_L}$$

Filter 361**Filter Type:** GE

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_L L_4 s^2 + C_4 R_4 s + 2C_2 R_L s + 1}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{C_4 + 1}{C_L L_4}}}{R_L + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\mathbf{Bandwidth:} \frac{R_4 + 2R_L}{L_4}$$

$$\mathbf{Qz:} \frac{L_4 \sqrt{\frac{C_4 + 1}{C_L L_4}}}{R_4}$$

Filter 362

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_4 s^2 + C_4 R_4 s + 1}{s (C_L C_L L_4 s^2 + C_4 C_L R_4 s + 2C_2 + C_L)}$$

Filter 363

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_L L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 R_L s^2 + C_4 C_L R_L s^2 + C_L L_4 s^2 + C_4 R_4 s + 2C_2 R_L s + C_L R_L s + 1}$$

Filter 364

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L R_L s + 1) (C_L L_4 s^2 + C_4 R_4 s + 1)}{s (C_L C_L L_4 s^2 + C_4 C_L R_4 s + 2C_2 C_L R_L s + 2C_2 + C_L)}$$

Filter 365

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2 s}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_L s^2 + 1) (C_L L_4 s^2 + C_4 R_4 s + 1)}{s (C_L C_L L_4 s^2 + 2C_2 C_L L_L s^2 + C_2 C_L R_4 s + 2C_2 + C_L)}$$

Filter 366

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_4s}{C_L L_4 s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_L R_4 s^3 + C_4 L_4 R_4 s^2 + 2C_4 L_L s^2 + C_4 R_4 s + C_L L_L s^2 + 1}$$

Filter 367

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + C_4 R_4 s + 1)(C_L L_L s^2 + C_L R_L s + 1)}{s(C_4 C_L L_4 s^3 + 2C_4 C_L L_L s^2 + C_2 C_L R_4 s + 2C_4 C_L R_L s + 2C_4 + C_L)}$$

Filter 368

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

$$H(s): \frac{L_L R_L s (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L R_L s^4 + C_4 C_L L_L R_4 R_L s^3 + C_4 L_4 L_L s^3 + C_4 L_4 R_L s^2 + C_4 L_L R_4 s^2 + 2C_4 L_L R_L s^2 + C_4 R_4 R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$

Filter 369

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_4 s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + C_4 R_4 s + 1)(C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_L R_L s^3 + 2C_2 C_L L_L R_L s^2 + C_4 L_4 s^2 + 2C_4 L_L s^2 + C_4 R_4 s + 2C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 370

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)(C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_L L_L s^4 + C_4 C_L L_L R_L s^3 + C_4 C_L L_L R_4 s^2 + C_4 C_L L_L R_4 s^2 + 2C_4 C_L L_L R_L s^2 + C_4 C_L R_4 s^2 + C_4 L_L s^2 + C_4 R_4 s + 2C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 371**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4 s}}}, \infty, R_L \right)$$

$$H(s): \frac{L_4 R_L R_4 s}{2C_4 L_4 R_L R_L s^2 + L_4 R_4 s + 2L_4 R_L s + 2R_L R_L}$$

$$\mathbf{Q}: \frac{2C_4 R_L R_L \sqrt{\frac{1}{C_4 L_4}}}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\textbf{Bandwidth: } \frac{R_4 + 2R_L}{2C_4 R_L R_L}$$

Filter 372**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4 s}}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s}{2C_4 L_4 R_L R_L s^2 + C_L L_4 R_4 s^2 + 2L_4 s + 2R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2} R_4 \sqrt{\frac{1}{L_4 (2C_4 + C_L)}} (2C_4 + C_L)}{2}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2C_4 + C_L)}}$$

$$\textbf{Bandwidth: } \frac{2}{R_4 (2C_4 + C_L)}$$

Filter 373**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4 s}}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{L_4 R_L R_L s}{2C_4 C_L L_L R_L R_L s^2 + C_L L_4 R_L R_L s^2 + L_4 R_4 s + 2L_4 R_L s + 2R_L R_L}$$

$$\mathbf{Q}: \frac{\sqrt{2} R_L R_L \sqrt{\frac{1}{L_4 (2C_4 + C_L)}} (2C_4 + C_L)}{R_L + 2R_L}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2C_4 + C_L)}}$$

$$\textbf{Bandwidth: } \frac{R_4 + 2R_L}{R_L R_L (2C_4 + C_L)}$$

Filter 374**Filter Type:** Invalid110

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4 s}}}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_L R_L s (C_L R_L s + 1)}{2C_4 C_L L_L R_L R_L s^3 + 2C_4 L_4 R_L s^2 + C_L L_4 R_L s^2 + 2C_4 L_4 R_4 s^2 + 2C_4 L_4 R_L s^2 + 2C_L R_4 R_L s + 2L_4 s + 2R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2} L_4 \sqrt{\frac{R_L}{L_4 (2C_4 R_4 + 2C_L R_L)}} (2C_4 R_4 + C_L R_4 + 2C_L R_L)}{2(C_L R_L R_L + L_4)}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{R_L}{L_4 (2C_4 R_4 + C_L R_4 + 2C_L R_L)}}$$

$$\textbf{Bandwidth: } \frac{2(C_L R_L R_L + L_4)}{L_4 (2C_4 R_4 + C_L R_4 + 2C_L R_L)}$$

Filter 375

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4 s}}}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_L s (C_L L_L s^2 + 1)}{2C_4 C_L L_4 L_L R_L s^4 + 2C_4 L_4 R_L s^3 + 2C_4 L_4 L_L s^3 + C_L L_4 R_L s^2 + C_L L_4 R_4 s^2 + 2C_L L_L R_L s^2 + 2C_L L_L R_4 s^2 + 2L_4 s + 2R_4}$$

Filter 376**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4 s}}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_4 L_L R_L R_L s}{2C_4 C_L L_L R_L R_L s^2 + C_L L_4 L_L R_L R_L s^2 + 2L_4 L_L s + L_4 R_4 s + 2L_L R_4}$$

$$\mathbf{Q}: \frac{R_4 \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_4 + C_L)}} (2C_4 + C_L)}{2}$$

$$\omega_0: \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_4 + C_L)}}$$

$$\textbf{Bandwidth: } \frac{2}{R_4 (2C_4 + C_L)}$$

Filter 377

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4 s}}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_L R_L s (C_L L_L s^2 + C_L R_L s + 1)}{2C_4 C_L L_L L_L R_L s^4 + 2C_4 C_L L_L R_L s^3 + 2C_4 L_4 R_L s^2 + 2C_L L_4 L_L s^2 + C_L L_4 R_L s^2 + 2C_L L_4 R_4 s^2 + 2C_L L_L R_L s^2 + 2L_4 s + 2R_4}$$

Filter 378**Filter Type:** BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{L_4 s}}}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

$$H(s): \frac{L_4 L_L R_L R_L s}{2C_4 C_L L_L R_L R_L s^2 + C_L L_4 L_L R_L R_L s^2 + L_4 L_L R_4 s + 2L_4 L_L R_L s + L_4 R_4 R_L + 2L_L R_L}$$

$$\mathbf{Q}: \frac{R_4 R_L \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_4 + C_L)}} (2C_4 + C_L)}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{L_4 + 2L_L}{L_4 L_L (2C_4 + C_L)}}$$

Bandwidth: $\frac{R_4+2R_L}{R_4R_L(2C_2s+C_L)}$

Filter 379

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4s}}}, \infty, \frac{L_4s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{L_4 R_4 s (C_L L_L R_L s^2 + L_L s + R_L)}{2C_2 C_L L_4 L_L R_4 R_L s^4 + 2C_4 L_4 L_L R_4 s^3 + 2C_4 L_4 R_4 R_L s^2 + C_L L_4 L_L R_4 s^3 + 2C_2 L_4 L_L R_L s^2 + 2C_L L_L R_4 R_L s^2 + 2L_4 L_L s^3 + L_4 R_4 s + 2L_4 R_L s + 2L_L R_4 s + 2R_4 R_L}$$

Filter 380

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4s}}}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_4 R_4 R_L s (C_L L_L s^2 + 1)}{2C_2 C_L L_4 L_L R_4 R_L s^4 + 2C_4 L_4 R_4 R_L s^2 + C_L L_4 L_L R_4 s^3 + 2C_2 L_4 L_L R_L s^2 + 2C_L L_4 L_L R_L s^2 + L_4 R_4 s + 2L_4 R_L s + 2R_4 R_L}$$

Filter 381

Filter Type: GE

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_4 L_4 R_4 s^2 + 2C_4 L_4 R_L s^2 + L_4 s + R_4 + 2R_L}$$

$$\mathbf{Q}: C_4 \sqrt{\frac{1}{C_L L_4}} (R_4 + 2R_L)$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\mathbf{Bandwidth}: \frac{1}{C_4 (R_4 + 2R_L)}$$

$$\mathbf{Qz}: C_4 R_4 \sqrt{\frac{1}{C_4 L_4}}$$

Filter 382

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 C_L L_4 R_4 s^3 + 2C_4 L_4 R_L s^2 + C_L L_4 s^3 + C_L L_4 s^3 + C_L R_4 s + 2}$$

Filter 383

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_4 C_L L_4 R_L R_L s^3 + C_4 L_4 R_4 s^2 + 2C_4 L_4 R_L s^2 + C_L L_4 R_4 s^2 + L_4 s + R_4 + 2R_L}$$

Filter 384

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L R_L s + 1) (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 R_4 s^3 + 2C_4 C_L L_4 R_L s^2 + 2C_4 L_4 s^2 + C_L L_4 s^2 + C_L R_4 s + 2C_L R_L s + 2}$$

Filter 385

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_L s^2 + 1) (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{2C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_4 s^3 + 2C_4 L_4 s^3 + 2C_4 L_4 s^3 + C_L L_4 s^3 + C_L R_4 s + 2}$$

Filter 386

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_4s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 L_L R_4 s^4 + 2C_4 L_4 L_L s^3 + C_4 L_4 R_4 s^2 + C_L L_4 L_L s^3 + C_L L_4 R_4 s^2 + L_4 s + 2L_L s + R_4}$$

Filter 387

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_L s^2 + C_L R_L s + 1) (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{2C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_4 s^3 + 2C_4 C_L L_4 R_L s^2 + 2C_4 L_4 s^2 + C_L L_4 s^2 + C_L R_4 s + 2C_L R_L s + 2}$$

Filter 388

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_4s}{C_L s + \frac{1}{R_L + \frac{1}{C_L s}}} \right)$$

$$H(s): \frac{L_L R_L s (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 L_L R_L R_L s^4 + C_4 L_4 L_L R_L s^3 + 2C_4 L_4 L_L R_L s^2 + C_4 L_4 R_L R_L s^2 + C_L L_4 L_L R_L s^2 + C_L L_4 R_L s^2 + L_4 L_L s^2 + L_4 R_L s + L_L R_4 s + 2L_L R_L s + R_4 R_L}$$

Filter 389

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_4 L_4 R_4 s^2 + L_4 s + R_4) (C_L L_L R_L s^2 + L_L s + R_L)}{C_L C_L L_4 L_L R_L s^4 + 2C_4 C_L L_4 L_L R_L s^3 + 2C_4 L_4 L_L s^3 + C_4 L_4 R_L s^2 + 2C_2 L_4 L_L R_L s^2 + 2C_L L_4 L_L R_L s^2 + L_4 s + 2L_L s + R_4 + 2R_L}$$

Filter 390

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1) (C_4 L_4 R_4 s^2 + L_4 s + R_4)}{C_4 C_L L_4 L_L R_4 s^4 + 2C_4 C_L L_4 L_L R_L s^3 + C_4 C_L L_4 R_4 R_L s^3 + C_4 L_4 R_4 s^2 + 2C_4 L_4 R_L s^2 + 2C_4 L_4 R_L s^2 + C_L L_4 L_L s^3 + C_L L_4 R_L s^2 + C_L L_4 R_4 s^2 + 2C_L L_L R_L s^2 + L_4 s + R_4 + 2R_L}$$

Filter 391

Filter Type: BS

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_L s} \right)}{L_4 s + R_4 + \frac{1}{C_L s}}, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L (C_4 L_4 s^2 + 1)}{C_4 L_4 R_4 s^2 + 2C_4 L_4 R_L s^2 + 2C_4 R_4 R_L s + R_4 + 2R_L}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{1}{C_L R_4}} (R_4 + 2R_L)}{2R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\mathbf{Bandwidth}: \frac{2R_4 R_L}{L_4 (R_4 + 2R_L)}$$

Filter 392

Filter Type: BS

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{R_L \left(L_4 s + \frac{1}{C_L s} \right)}{L_4 s + R_4 + \frac{1}{C_L s}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 R_4 s^3 + 2C_4 L_4 s^2 + 2C_4 R_4 s + C_L R_4 s + 2}$$

$$\mathbf{Q}: \frac{2C_4 L_4 \sqrt{\frac{1}{C_L L_4}}}{R_L (2C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\mathbf{Bandwidth}: \frac{R_L (2C_4 + C_L)}{2C_4 L_4}$$

Filter 393**Filter Type:** BS

$$Z(s)\colon \left(\infty,\,R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\,\infty,\,\frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{R_4R_L\left(C_4L_4s^2+1\right)}{C_4C_LL_4R_4R_Ls^3+C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+C_LL_4R_4s+R_4+2R_L}$$

$$\mathbf{Q}\colon \frac{C_4L_4\sqrt{\frac{1}{C_4^2C_L}}\left(R_4+2R_L\right)}{R_4R_L\left(2C_4+C_L\right)}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4L_4}}$$

$$\textbf{Bandwidth}\colon \frac{R_4R_L\left(2C_4+C_L\right)}{C_4L_4\left(R_4+2R_L\right)}$$

Filter 394

Invalid filter

$$Z(s)\colon \left(\infty,\,R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\,\infty,\,R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LR_Ls+1\right)}{C_4C_LL_4R_4s^4+2C_4C_LL_4R_Ls^3+2C_4C_LL_4R_4s^2+2C_4L_4s^2+2C_4R_4s+C_LL_4s+2C_LL_R_Ls+2}$$

Filter 395

Invalid filter

$$Z(s)\colon \left(\infty,\,R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\,\infty,\,L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LL_Ls^2+1\right)}{2C_4C_LL_4L_Ls^4+C_4C_LL_4R_4s^3+2C_4C_LL_4R_4s^2+2C_4L_4s^2+2C_4R_4s+2C_LL_R_Ls^2+C_LL_R_4s+2}$$

Filter 396

Invalid filter

$$Z(s)\colon \left(\infty,\,R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\,\infty,\,\frac{L_Ls}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_LR_4s\left(C_4L_4s^2+1\right)}{C_4C_LL_4L_LR_4s^4+2C_4L_4L_LR_4s^3+C_4L_4L_LR_4s^2+2C_4L_4R_4s^2+C_LL_R_4s^2+2L_Ls+R_4}$$

Filter 397

Invalid filter

$$Z(s)\colon \left(\infty,\,R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\,\infty,\,L_Ls+R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LL_Ls^2+C_LR_Ls+1\right)}{2C_4C_LL_4L_Ls^4+C_4C_LL_4R_4s^3+2C_4C_LL_4R_Ls^2+2C_4C_LL_4R_4s^2+2C_4L_4s^2+2C_4R_4s+2C_LL_Ls^2+C_LR_Ls+2C_LR_Ls+2}$$

Filter 398

Invalid filter

$$Z(s)\colon \left(\infty,\,R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\,\infty,\,\frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$$

$$H(s)\colon \frac{L_LR_4R_Ls\left(C_4L_4s^2+1\right)}{C_4C_LL_4L_4R_4R_Ls^4+C_4L_4L_LR_4s^3+2C_4L_4L_LR_Ls^2+2C_4L_4R_4s^2+C_4L_4R_4R_Ls^2+2C_4L_LR_4R_Ls^2+L_LR_4s+2L_LR_Ls+R_4R_L}$$

Filter 399

Invalid filter

$$Z(s)\colon \left(\infty,\,R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\,\infty,\,\frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LL_LR_Ls^2+L_Ls+R_L\right)}{C_4C_LL_4L_LR_4s^4+2C_4C_LL_4L_LR_Ls^3+2C_4C_LL_4R_4R_Ls^2+2C_4L_4L_LR_Ls^2+C_4L_4R_4s^2+2C_4L_LR_4s^2+2C_4L_LR_Ls^2+2C_4L_LR_Ls^2+2L_Ls+R_4+2R_L}$$

Filter 400

Invalid filter

$$Z(s)\colon \left(\infty,\,R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\,\infty,\,\frac{R_L\left(L_Ls+\frac{1}{C_LR}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$$

$$H(s)\colon \frac{R_4R_L\left(C_4L_4s^2+1\right)\left(C_LL_Ls^2+1\right)}{C_4C_LL_4L_4R_4R_Ls^4+2C_4C_LL_4L_LR_Ls^3+C_4C_LL_4R_4R_Ls^2+2C_4C_LL_4R_4R_Ls^2+2C_4L_4R_4s^2+2C_4L_LR_4s^2+2C_4L_LR_Ls^2+2C_4L_LR_Ls^2+C_LL_R_4s^2+2C_LL_R_Ls+R_4+2R_L}$$

Filter 401

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4,\,\infty,\,R_L\right)$$

$$H(s)\colon \frac{R_4R_L}{R_4+2R_L}$$

Filter 402

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4,\,\infty,\,\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4}{C_LR_4s+2}$$

Filter 403

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4,\,\infty,\,\frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{R_4R_L}{C_LR_LR_Ls+R_4+2R_L}$$

Filter 404

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4,\,\infty,\,R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_LR_Ls+1\right)}{C_LR_4s+2C_LR_Ls+2}$$

Filter 405**Filter Type:** BS

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4,\,\infty,\,L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_LL_Ls^2+1\right)}{2C_LL_Ls^2+C_LR_4s+2}$$

$$\mathbf{Q}\colon \frac{2L_L\sqrt{\frac{1}{C_LL_L}}}{R_4}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\textbf{Bandwidth}\colon \frac{R_4}{2L_L}$$

Filter 406**Filter Type:** BP

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4,\,\infty,\,\frac{L_Ls}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_LR_4}{C_LL_LR_4s^2+2L_Ls+R_4}$$

$$\mathbf{Q}\colon \frac{C_LR_4\sqrt{\frac{1}{C_LL_L}}}{2}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\textbf{Bandwidth}\colon \frac{2}{C_LR_4}$$

Filter 407**Filter Type:** GE

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_L L_L s^2 + C_L R_4s + 1)}{2C_L L_L s^2 + C_L R_4s + 2C_L R_Ls + 2}$$

$$\mathbf{Q}: \frac{2L_L \sqrt{C_L^2 L_L}}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_4 + 2R_L}{2L_L}$$

$$\mathbf{Qz: } \frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L}$$

Filter 408**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{1}{C_Ls + \frac{1}{R_L} + \frac{1}{L_Ls}} \right)$$

$$H(s): \frac{C_L L_L R_4 R_L s^2 + L_L R_4s + 2L_L R_Ls + R_4 R_L}{C_L R_4 R_L \sqrt{C_L L_L}}$$

$$\mathbf{Q}: \frac{C_L R_4 R_L \sqrt{C_L L_L}}{R_4 + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_4 + 2R_L}{C_L R_4 R_L}$$

Filter 409**Filter Type:** GE

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4(C_L L_L R_L s^2 + L_L R_Ls + R_L)}{C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + 2L_Ls + R_4 + 2R_L}$$

$$\mathbf{Q}: \frac{C_L \sqrt{\frac{1}{C_L^2 L_L}} (R_4 + 2R_L)}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{2}{C_L (R_4 + 2R_L)}$$

$$\mathbf{Qz: } C_L R_L \sqrt{\frac{1}{C_L L_L}}$$

Filter 410**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_L \left(L_Ls + \frac{1}{C_Ls} \right)}{L_Ls + R_L + \frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_4 R_L (C_L L_L s^2 + 1)}{C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + C_L R_L R_Ls + R_4 + 2R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{\frac{1}{C_L^2 L_L}} (R_4 + 2R_L)}{R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_4 R_L}{L_L (R_4 + 2R_L)}$$

Filter 411

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L}{2C_4 R_Ls + 1}$$

Filter 412

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{1}{s(2C_4 + C_L)}$$

Filter 413

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L}{C_L R_Ls + 1} \right)$$

$$H(s): \frac{R_L}{2C_4 R_Ls + C_L R_Ls + 1}$$

Filter 414

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_L R_L s + 1}{s(2C_4 C_L R_Ls + 2C_4 + C_L)}$$

Filter 415

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_L L_L s^2 + 1}{s(2C_4 C_L L_L s^2 + 2C_4 + C_L)}$$

Filter 416

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_Ls}{2C_4 L_L s^2 + C_L L_L s^2 + 1}$$

Filter 417

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_L L_L s^2 + C_L R_Ls + 1}{s(2C_4 C_L L_L s^2 + 2C_4 C_L R_Ls + 2C_4 + C_L)}$$

Filter 418**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_Ls}, \infty, \frac{1}{C_Ls + \frac{1}{R_L} + \frac{1}{L_Ls}} \right)$$

$$H(s): \frac{L_L R_L s}{2C_L L_L R_L s^2 + C_L L_L R_L s^2 + L_Ls + R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L (2C_4 + C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_4 + C_L)}}$$

$$\textbf{Bandwidth: } \frac{1}{R_L (2C_4 + C_L)}$$

Filter 419

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{C_L C_L R_L s^2 + L_Ls + R_L}{2C_4 C_L L_L R_L s^2 + 2C_4 L_L s^2 + 2C_4 R_Ls + C_L L_L s^2 + 1}$$

Filter 420**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L \left(L_Ls + \frac{1}{C_L^2s} \right)}{L_Ls + R_L + \frac{1}{C_L^2s}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_L C_L L_L R_L R_L s^3 + 2C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{C_L^2 L_L}}{R_L (2C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_L (2C_L + C_L)}{C_L L_L}$$

Filter 421

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L}{2C_4 R_4 R_L s + R_4 + 2R_L}$$

Filter 422

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4}{2C_4 R_4 s + C_L R_4 s + 2}$$

Filter 423

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_4 R_L}{2C_4 R_4 R_L s + C_L R_4 R_L s + R_4 + 2R_L}$$

Filter 424**Filter Type:** Invalid011

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L R_L s + 1)}{2C_L C_L R_4 R_L R_L s^2 + 2C_4 R_4 s + C_L R_4 s + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_L C_L R_4 R_L \sqrt{C_L^2 L_L R_4 R_L}}{2C_4 R_4 s + C_L R_4 s + 2C_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 C_L R_4 R_L}}$$

$$\textbf{Bandwidth: } \frac{2C_L R_4 + C_L R_4 + 2C_L R_L}{2C_4 C_L R_4 R_L}$$

Filter 425**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, L_Ls + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_L C_L L_L R_L R_L s^3 + 2C_4 R_4 s + 2C_L L_L s^2 + C_L R_4 s + 2}$$

$$\mathbf{Q}: \frac{2C_L L_L \sqrt{C_L^2 L_L}}{R_L (2C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_L (2C_L + C_L)}{2C_L L_L}$$

Filter 426**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{L_L s}{C_L L_L s + 1} \right)$$

$$H(s): \frac{L_L R_4 s}{2C_L L_L R_L s^2 + C_L L_L R_4 s^2 + 2L_L s + R_4}$$

$$\mathbf{Q}: \frac{R_4 \sqrt{\frac{1}{L_L (2C_L + C_L)}}}{2}$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_L + C_L)}}$$

$$\textbf{Bandwidth: } \frac{2}{R_4 (2C_L + C_L)}$$

Filter 427

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, L_Ls + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_L L_L s^2 + C_L R_L s + 1)}{2C_L C_L L_L R_L R_L s^3 + 2C_L C_L R_L R_L s^2 + 2C_4 R_4 s + 2C_L L_L s^2 + C_L R_4 s + 2C_L R_L s + 2}$$

Filter 428**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{1}{\frac{1}{C_L s} + \frac{1}{R_L s}} \right)$$

$$H(s): \frac{L_L R_4 R_L s}{2C_L L_L R_L R_L s^2 + C_L L_L R_4 R_L s^2 + L_L R_4 s + 2L_L R_L s + R_4 R_L}$$

$$\mathbf{Q}: \frac{R_4 R_L \sqrt{\frac{1}{L_L (2C_L + C_L)}}}{R_4 + 2R_L} (2C_L + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_L + C_L)}}$$

$$\textbf{Bandwidth: } \frac{R_4 + 2R_L}{R_4 R_L (2C_L + C_L)}$$

Filter 429

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{L_L s}{C_L L_L s + 1} + R_L \right)$$

$$H(s): \frac{R_4 (C_L L_L R_L s^2 + L_L s + R_L)}{2C_L C_L L_L R_L R_L s^3 + 2C_L L_L R_4 R_L s^2 + 2C_4 R_4 s + 2C_L L_L s^2 + C_L R_4 s + 2C_L R_L s^2 + 2L_L s + R_4 + 2R_L}$$

Filter 430**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2s} \right)}{L_L s + R_L + \frac{1}{C_L^2s}} \right)$$

$$H(s): \frac{R_L R_L (C_L L_L s^2 + 1)}{2C_L C_L L_L R_L R_L s^3 + 2C_L R_4 R_L s + C_L L_L R_4 s^2 + 2C_L L_L R_L s^2 + C_L R_4 R_L s + R_4 + 2R_L}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{C_L^2 L_L}}{R_L R_L (R_4 + 2R_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_4 R_L (2C_L + C_L)}{C_L L_L (R_4 + 2R_L)}$$

Filter 431

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_L R_4 s + 1)}{C_L R_4 s + 2C_L R_L s + 1}$$

Filter 432

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{1}{s(C_L C_L R_4 s + 2C_L + C_L)}$$

Filter 433

Filter Type: Invalid011

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_4 R_L s + 1)}{C_4 C_L R_L R_L s^2 + C_4 R_L s + 2 C_L R_L s + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_4 C_L R_L R_L \sqrt{C_4 C_L R_L R_L}}{C_4 R_L + 2 C_4 R_L + C_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 C_L R_L R_L}}$$

$$\textbf{Bandwidth: } \frac{C_4 R_L + 2 C_4 R_L + C_L R_L}{C_4 C_L R_L R_L}$$

Filter 434

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L R_L s + 1) (C_L R_L s + 1)}{s (C_L C_L R_L s + 2 C_L C_L R_L s + 2 C_L + C_L)}$$

Filter 435

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L R_L s + 1) (C_L L_L s^2 + 1)}{s (2 C_L C_L L_L s^2 + C_L C_L R_L s + 2 C_L + C_L)}$$

Filter 436

Filter Type: Invalid110

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_4 R_L s + 1)}{C_4 C_L L_L R_L s^3 + 2 C_4 L_L s^2 + C_4 R_L s + C_L L_L s^2 + 1}$$

$$\mathbf{Q}: \frac{L_L \sqrt{\frac{L_L (2 C_L + C_L)}{C_L R_L}} (2 C_L + C_L)}{C_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{L_L (2 C_L + C_L)}}$$

$$\textbf{Bandwidth: } \frac{C_4 R_L}{L_L (2 C_L + C_L)}$$

Filter 437

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 R_L s + 1) (C_L L_L s^2 + C_L R_L s + 1)}{s (2 C_L C_L L_L s^2 + C_L C_L R_L s + 2 C_L C_L R_L s + 2 C_L + C_L)}$$

Filter 438

Filter Type: Invalid110

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L s + \frac{1}{C_L s}}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_L s (C_4 R_L s + 1)}{C_4 C_L L_L R_L R_L s^3 + C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + C_L R_L R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{\frac{R_L (C_4 R_L + 2 C_L R_L)}{C_L R_L R_L}} (C_4 R_L + 2 C_L R_L + C_L R_L)}{C_L R_L R_L + L_L}$$

$$\omega_0: \sqrt{\frac{R_L}{L_L (C_L R_L + 2 C_L R_L + C_L R_L)}}$$

$$\textbf{Bandwidth: } \frac{C_4 R_L R_L + L_L}{L_L (C_4 R_L + 2 C_L R_L + C_L R_L)}$$

Filter 439

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_4 R_L s + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_L R_L s^3 + 2 C_4 C_L L_L R_L s^2 + 2 C_4 L_L s^2 + C_L R_L s + 2 C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 440

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L (C_4 R_L s + 1) (C_L L_L s^2 + 1)}{C_4 C_L L_L R_L s^3 + 2 C_L C_L L_L R_L s^2 + C_L C_L R_L s^2 + C_L R_L R_L s^2 + C_L R_L s + 2 C_L R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 441

Filter Type: BS

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + 2 C_4 R_L s + 1}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{C_4 R_L}{C_L R_L}}}{2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\textbf{Bandwidth: } \frac{2 R_L}{L_4}$$

Filter 442

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_4 s^2 + 1}{s (C_L C_L L_4 s^2 + 2 C_L + C_L)}$$

Filter 443

Filter Type: BS

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2 + 1)}{C_L C_L L_L R_L s^3 + C_L L_4 s^2 + 2 C_L R_L s + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_4 L_4 \sqrt{\frac{C_L R_L}{C_L R_L}}}{R_L (2 C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\textbf{Bandwidth: } \frac{R_L (2 C_L + C_L)}{C_4 L_4}$$

Filter 444

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_4 s^2 + 1) (C_L R_L s + 1)}{s (C_L C_L L_4 s^2 + 2 C_L C_L R_L s + 2 C_L + C_L)}$$

Filter 445

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + 1) (C_L L_L s^2 + 1)}{s (C_L C_L L_4 s^2 + 2 C_L C_L L_L s^2 + 2 C_L + C_L)}$$

Filter 446

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_L L_L s^4 + C_4 L_4 s^2 + 2 C_L L_L s^2 + C_L L_L s^2 + 1}$$

Filter 447

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{(C_4L_4s^2+1)(C_LL_Ls^2+C_LR_Ls+1)}{s(C_4C_LL_4s^3+2C_4C_LL_Ls^2+2C_4C_LR_Ls+2C_4+C_L)}$

Filter 448

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls + \frac{1}{R_L} + \frac{1}{L_Ls}}\right)$
 $H(s)$: $\frac{L_LR_Ls(C_4L_4s^2+1)}{C_4C_LL_4L_LR_Ls^4+C_4L_4L_LR_Ls^3+C_4L_4R_LR_Ls^2+2C_4L_LR_Ls^2+C_LL_LR_Ls^2+L_Ls+R_L}$

Filter 449

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$
 $H(s)$: $\frac{(C_4L_4s^2+1)(C_LL_LR_Ls^2+L_Ls+R_L)}{C_4C_LL_4L_LR_Ls^4+2C_4C_LL_LR_Ls^3+C_4L_4s^2+2C_4L_LR_Ls+C_LL_Ls^2+1}$

Filter 450

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}\right)$
 $H(s)$: $\frac{R_L(C_4L_4s^2+1)(C_LL_Ls^2+1)}{C_4C_LL_4L_LR_Ls^4+C_4C_LL_LR_Ls^3+2C_4C_LL_LR_Ls^2+C_4L_4s^2+2C_4R_Ls+C_LL_Ls^2+C_LR_Ls+1}$

Filter 451

Filter Type: BP
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L\right)$
 $H(s)$: $\frac{L_4R_Ls}{2C_4L_LR_Ls^2+C_4L_4R_Ls^2+L_4s+2R_L}$
Q: $2C_4R_L\sqrt{\frac{1}{C_4L_4}}$
 ω_0 : $\sqrt{\frac{1}{C_4L_4}}$
Bandwidth: $\frac{1}{2C_4R_L}$

Filter 452

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_4s}{2C_4L_4s^2+C_LL_4s^2+2}$

Filter 453

Filter Type: BP
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$
 $H(s)$: $\frac{L_4R_Ls}{2C_4L_LR_Ls^2+C_4L_4R_Ls^2+L_4s+2R_L}$
Q: $\sqrt{2}R_L\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)$
 ω_0 : $\sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$
Bandwidth: $\frac{2C_4R_L}{R_L(2C_4+C_L)}$

Filter 454

Filter Type: Invalid110
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_4s(C_LR_Ls+1)}{2C_4C_LL_LR_Ls^3+2C_4L_4s^2+C_LL_Ls^2+2C_LR_Ls+2}$
Q: $\frac{\sqrt{2}L_4\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)}{2C_4R_L}$
 ω_0 : $\sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$
Bandwidth: $\frac{2C_4R_L}{L_4(2C_4+C_L)}$

Filter 455

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_4s(C_LL_Ls^2+1)}{2C_4C_LL_4L_LR_Ls^4+2C_4L_4s^2+C_LL_Ls^2+2C_LL_LR_Ls^2+2}$

Filter 456

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$
 $H(s)$: $\frac{L_4L_Ls}{2C_4L_4L_Ls^2+C_LL_4L_LR_Ls^2+L_4+2L_L}$

Filter 457

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_4s(C_LL_Ls^2+C_LR_Ls+1)}{2C_4C_LL_4L_LR_Ls^4+2C_4C_LL_LR_Ls^3+2C_4L_4s^2+C_LL_Ls^2+2C_LL_LR_Ls^2+2C_LR_Ls+2}$

Filter 458

Filter Type: BP
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls + \frac{1}{R_L} + \frac{1}{L_Ls}}\right)$
 $H(s)$: $\frac{L_4L_LR_Ls}{2C_4L_4L_LR_Ls^3+C_LL_4L_LR_Ls^2+C_LL_LR_Ls^2+L_4L_Ls+L_LR_Ls+2L_LR_L}$
Q: $R_L\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)$
 ω_0 : $\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}$
Bandwidth: $\frac{1}{R_L(2C_4+C_L)}$

Filter 459

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$
 $H(s)$: $\frac{L_4s(C_LL_LR_Ls^2+L_Ls+R_L)}{2C_4C_LL_4L_LR_Ls^4+2C_4L_4L_LR_Ls^3+2C_4L_4R_Ls^2+C_LL_Ls^2+2C_LL_LR_Ls^2+L_4s+2L_Ls+2R_L}$

Filter 460

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}\right)$
 $H(s)$: $\frac{L_4R_Ls(C_LL_Ls^2+1)}{2C_4C_LL_4L_LR_Ls^4+2C_4L_4R_Ls^2+C_LL_Ls^2+C_LL_LR_Ls^2+2C_LL_LR_Ls^2+L_4s+2R_L}$

Filter 461

Filter Type: GE

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,R_L\right)$$

$$H(s)\colon \frac{R_L\left(C_4L_4s^2+C_4R_4s+1\right)}{C_4L_4s^2+C_4R_4s+2C_4R_Ls+1}$$

$$\mathbf{Q}\colon \frac{L_4\sqrt{\frac{C_4L_4}{R_L+2R_L}}}{R_L+2R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{L_4}$$

$$\mathbf{Qz}\colon \frac{L_4\sqrt{\frac{C_4L_4}{R_L}}}{R_4}$$

Filter 462

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{C_4L_Ls^2+C_4R_4s+1}{s(C_4C_LL_4s^2+C_4C_LR_4s+2C_4+C_L)}$$

Filter 463

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,\frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{R_L\left(C_4L_4s^2+C_LR_4s+1\right)}{C_4C_LL_4R_Ls^3+C_4C_LR_4R_Ls^2+C_4L_4s^2+C_4R_4s+2C_4R_Ls+C_LR_Ls+1}$$

Filter 464

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{(C_LR_Ls+1)(C_4L_4s^2+C_LR_4s+1)}{s(C_4C_LL_4s^2+C_4C_LR_4s+2C_4+C_L)}$$

Filter 465

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{(C_LL_Ls^2+1)(C_4L_4s^2+C_LR_4s+1)}{s(C_4C_LL_4s^2+2C_4C_LL_Ls^2+C_4C_LR_4s+2C_4+C_L)}$$

Filter 466

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,\frac{L_4s}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_Ls(C_4L_4s^2+C_LR_4s+1)}{C_4C_LL_LL_Ls^4+C_4C_LL_LR_4s^3+C_4L_4s^2+2C_4L_Ls^2+C_4R_4s+C_LL_Ls^2+1}$$

Filter 467

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,L_Ls+R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{(C_4L_4s^2+C_LR_4s+1)(C_LL_Ls^2+C_LR_Ls+1)}{s(C_4C_LL_4s^2+2C_4C_LL_Ls^2+C_4C_LR_4s+2C_4C_LR_Ls+2C_4+C_L)}$$

Filter 468

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,\frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$

$$H(s)\colon \frac{L_LR_Ls(C_4L_4s^2+C_LR_4s+1)}{C_4C_LL_4L_LR_Ls^4+C_4C_LL_LR_4R_Ls^3+C_4L_4L_Ls^3+C_4L_4R_Ls^2+C_4L_LR_4s^2+2C_4L_LR_Ls^2+C_4R_4R_Ls+C_LL_LR_Ls^2+L_Ls+R_L}$$

Filter 469

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,\frac{L_4s}{C_LL_Ls^2+1}+R_L\right)$$

$$H(s)\colon \frac{(C_4L_4s^2+C_LR_4s+1)(C_LL_LR_Ls^2+L_Ls+R_L)}{C_4C_LL_4L_LL_Ls^4+C_4C_LL_LR_4R_Ls^3+2C_4C_LL_LR_Ls^2+C_4L_4s^2+2C_4L_4s^2+C_4R_4s+2C_4R_Ls+C_LL_Ls^2+1}$$

Filter 470

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+R_4+\frac{1}{C_4s},\,\infty,\,\frac{R_L\left(L_Ls+\frac{1}{C_L}\right)}{L_4s+R_L+\frac{1}{C_Ls}}\right)$$

$$H(s)\colon \frac{R_L(C_LL_Ls^2+1)(C_4L_4s^2+C_LR_4s+1)}{C_4C_LL_4L_LL_Ls^4+C_4C_LL_LR_LR_Ls^3+C_4C_LL_LR_4R_Ls^2+2C_4C_LL_LR_Ls^2+C_4C_LR_4R_Ls^2+C_4L_4s^2+C_4R_4s+2C_4R_Ls+C_LL_Ls^2+C_LR_Ls+1}$$

Filter 471

Filter Type: BP

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,\frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}},\,\infty,\,R_L\right)$$

$$H(s)\colon \frac{L_4R_4R_Ls}{2C_4L_LR_LR_Ls^2+L_4R_4s+2L_4R_LR_L}$$

$$\mathbf{Q}\colon \frac{2C_4R_LR_L\sqrt{\frac{C_4L_4}{C_LR_L}}}{R_4+2R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{2C_4R_4R_L}$$

Filter 472

Filter Type: BP

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,\frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}},\,\infty,\,\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{L_4R_4s}{2C_4L_LR_LR_Ls^2+C_4L_4R_4s^2+L_4R_4s+2L_4s+2R_4}$$

$$\mathbf{Q}\colon \frac{\sqrt{2}R_4\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)}{2}$$

$$\omega_0\colon \sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$$

$$\mathbf{Bandwidth}\colon \frac{2}{R_4(2C_4+C_L)}$$

Filter 473

Filter Type: BP

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,\frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}},\,\infty,\,\frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{L_4R_4R_Ls}{2C_4L_LR_LR_Ls^2+C_LR_4R_Ls^2+L_4R_4s+2L_4R_LR_L}$$

$$\mathbf{Q}\colon \frac{\sqrt{2}R_4\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)}{R_4+2R_L}$$

$$\omega_0\colon \sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 474**Filter Type:** Invalid110

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, R_L + \frac{1}{C_L s} \right) \\ H(s): & \frac{L_4 R_4 s (C_L R_L s + 1)}{2 C_L C_L L_L R_4 R_L s^3 + 2 C_L L_4 R_4 s^2 + C_L L_4 R_4 s^2 + 2 C_L L_4 R_4 s^2 + 2 C_L R_4 R_L s + 2 L_4 s + 2 R_4} \\ Q: & \frac{\sqrt{2} L + \sqrt{L_4 (2 C_L R_4 + C_L R_4 + 2 C_L R_L)}}{2 (C_L R_4 R_L + L_4)} \\ \omega_0: & \sqrt{2} \sqrt{\frac{R_4}{L_4 (2 C_L R_4 + C_L R_4 + 2 C_L R_L)}} \\ \text{Bandwidth:} & \frac{2 (C_L R_4 R_L + L_4)}{L_4 (2 C_L R_4 + C_L R_4 + 2 C_L R_L)} \end{aligned}$$

Filter 475**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + \frac{1}{C_L s} \right) \\ H(s): & \frac{L_4 R_4 s (C_L L_L s^2 + 1)}{2 C_L C_L L_L R_4 R_L s^4 + 2 C_L L_4 R_4 s^3 + 2 C_L L_4 R_4 s^3 + C_L L_4 R_4 s^3 + 2 C_L L_L R_4 s^2 + 2 L_4 s + 2 R_4} \end{aligned}$$

Filter 476**Filter Type:** BP

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} \right) \\ H(s): & \frac{L_4 L_L R_4 s}{2 C_L L_L L_L R_4 R_L s^2 + C_L L_4 L_L R_4 s^2 + 2 L_4 L_L R_4 s + L_4 R_4 + 2 L_L R_4} \\ Q: & \frac{R_4 \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_L + C_L)}} (2 C_L + C_L)}{2} \\ \omega_0: & \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_L + C_L)}} \\ \text{Bandwidth:} & \frac{2}{R_4 (2 C_L + C_L)} \end{aligned}$$

Filter 477**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right) \\ H(s): & \frac{L_4 R_4 s (C_L L_L s^2 + C_L R_L s + 1)}{2 C_L C_L L_L R_4 R_L s^4 + 2 C_L L_4 R_4 s^3 + 2 C_L L_4 R_4 s^3 + C_L L_4 R_4 s^3 + 2 C_L L_L R_4 s^2 + 2 C_L L_L R_4 s^2 + 2 L_4 s + 2 R_4} \end{aligned}$$

Filter 478**Filter Type:** BP

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right) \\ H(s): & \frac{L_4 L_L R_4 R_L s}{2 C_L L_L L_L R_4 R_L s^2 + C_L L_4 L_L R_4 R_L s^2 + L_4 L_L R_4 s + 2 L_4 L_L R_L s + L_4 R_4 R_L + 2 L_L R_L R_L} \\ Q: & \frac{R_4 R_L \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_L + C_L)}} (2 C_L + C_L)}{2} \\ \omega_0: & \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_L + C_L)}} \\ \text{Bandwidth:} & \frac{R_4 + 2 R_L}{R_4 R_L (2 C_L + C_L)} \end{aligned}$$

Filter 479**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} + R_L \right) \\ H(s): & \frac{L_4 R_4 s (C_L L_L R_L s^2 + L_L s + R_L)}{2 C_L C_L L_L R_4 R_L s^4 + 2 C_L L_4 R_4 s^3 + 2 C_L L_4 R_4 s^3 + C_L L_4 R_4 s^3 + 2 C_L L_L R_4 s^2 + 2 C_L L_L R_4 s^2 + 2 L_4 L_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_4 R_L} \end{aligned}$$

Filter 480**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right) \\ H(s): & \frac{L_4 R_4 R_L s (C_L L_L s^2 + 1)}{2 C_L C_L L_L R_4 R_L s^4 + 2 C_L L_4 R_4 s^3 + 2 C_L L_4 R_4 s^3 + C_L L_4 R_4 s^3 + 2 C_L L_L R_4 s^2 + 2 C_L L_L R_4 s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_4 R_L} \end{aligned}$$

Filter 481**Filter Type:** GE

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, R_L \right) \\ H(s): & \frac{R_L (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L R_4 s^2 + 2 C_L L_4 R_4 s^2 + L_4 s + R_4 + 2 R_L} \\ Q: & C_4 \sqrt{\frac{1}{C_L L_4}} (R_4 + 2 R_L) \\ \omega_0: & \sqrt{\frac{1}{C_L L_4}} \\ \text{Bandwidth:} & \frac{1}{C_L (R_4 + 2 R_L)} \\ Q: & C_4 R_4 \sqrt{\frac{1}{C_L L_4}} \end{aligned}$$

Filter 482**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s} \right) \\ H(s): & \frac{C_L L_4 R_4 s^2 + L_4 s + R_4}{C_L C_L L_4 R_4 s^2 + 2 C_L L_4 s^2 + C_L L_4 s^2 + C_L L_4 s^2} \end{aligned}$$

Filter 483**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right) \\ H(s): & \frac{R_L (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 R_4 R_L s^3 + C_L L_4 R_4 s^3 + 2 C_L L_4 R_4 s^3 + C_L L_4 R_4 s^3 + C_L R_4 R_L s + L_4 s + R_4 + 2 R_L} \end{aligned}$$

Filter 484**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, R_L + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_L R_L s + 1) (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 R_4 s^3 + 2 C_L C_L L_4 R_4 s^3 + 2 C_L L_4 s^3 + C_L L_4 s^3 + C_L R_4 s + 2 C_L R_L s + 2} \end{aligned}$$

Filter 485**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, L_L s + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_L L_L s^2 + 1) (C_L L_4 R_4 s^2 + L_4 s + R_4)}{2 C_L C_L L_L L_L s^4 + C_L C_L L_4 R_4 s^3 + 2 C_L L_4 s^3 + C_L L_4 s^3 + 2 C_L L_L s^2 + 2 C_L L_L s^2 + C_L R_4 s + 2} \end{aligned}$$

Filter 486**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right) \\ H(s): & \frac{L_L s (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_L L_L R_4 s^4 + 2 C_L L_4 L_L s^3 + C_L L_4 R_4 s^3 + C_L L_4 L_L s^3 + C_L L_L R_4 s^2 + L_4 s + 2 L_L s + R_4} \end{aligned}$$

Filter 487**Invalid filter**

$$\begin{aligned} Z(s): & \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right) \\ H(s): & \frac{(C_L L_L s^2 + C_L R_L s + 1) (C_L L_4 R_4 s^2 + L_4 s + R_4)}{2 C_L C_L L_L L_L s^4 + C_L C_L L_4 R_4 s^3 + 2 C_L C_L L_4 R_4 s^3 + 2 C_L L_4 s^3 + 2 C_L L_4 s^3 + 2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2} \end{aligned}$$

Filter 488

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$$

$$H(s): \frac{L_LR_Ls(C_4L_4R_4s^2+L_4s+R_4)}{C_4C_7L_4L_LR_4R_Ls^4+C_4L_4L_LR_4s^3+2C_4L_4L_LR_Ls^2+C_4L_4R_4R_Ls^2+C_4L_4L_LR_Ls^2+C_4L_4L_LR_Ls^2+C_4L_4R_4s^2+L_4L_Ls^2+L_4R_4s+2L_LR_Ls+R_LR_L}$$

Filter 489

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

$$H(s): \frac{(C_4L_4R_4s^2+L_4s+R_4)(C_7L_LR_Ls^2+L_Ls+R_L)}{C_4C_7L_4L_LR_4s^4+2C_4C_7L_4L_LR_Ls^3+2C_4L_4L_LR_Ls^2+C_4L_4R_4s^2+2C_4L_4R_Ls^2+C_7L_LR_4R_Ls^2+2C_7L_LR_Ls^2+L_4s+2L_Ls+R_4+2R_L}$$

Filter 490

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_LR_L(C_4L_4s^2+1)(C_7L_LR_Ls^2+1)(C_4L_4R_4s^2+L_4s+R_4)}{C_4C_7L_4L_LR_4s^4+2C_4C_7L_4L_LR_Ls^3+2C_4L_4L_LR_Ls^2+C_4L_4R_4s^2+2C_4L_4R_Ls^2+C_7L_LR_4R_Ls^2+2C_7L_LR_Ls^2+L_4s+2L_Ls+R_4+2R_L}$$

Filter 491

Filter Type: BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, R_L \right)$$

$$H(s): \frac{R_LR_L(C_4L_4s^2+1)}{C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}: \frac{L_4\sqrt{\frac{1}{C_4^2L_4^2}(R_4+2R_L)}}{2R_4R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4^2L_4}}$$

$$\text{Bandwidth: } \frac{2R_4R_L}{L_4(R_4+2R_L)}$$

Filter 492

Filter Type: BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_4L_4s^2+1)}{C_4C_7L_4R_4s^3+2C_4L_4R_Ls^2+2C_4R_4R_Ls+C_LR_4s+2}$$

$$\mathbf{Q}: \frac{2C_4L_4\sqrt{\frac{1}{C_4^2L_4^2}}}{R_4(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4^2L_4}}$$

$$\text{Bandwidth: } \frac{R_4(2C_4+C_L)}{2C_4L_4}$$

Filter 493

Filter Type: BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_4R_L(C_4L_4s^2+1)}{C_4C_7L_4L_LR_4R_Ls^3+C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+C_LR_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}: \frac{C_4L_4\sqrt{\frac{1}{C_4^2L_4^2}(R_4+2R_L)}}{R_4R_L(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4^2L_4}}$$

$$\text{Bandwidth: } \frac{R_4R_L(2C_4+C_L)}{C_4L_4(R_4+2R_L)}$$

Filter 494

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_4L_4s^2+1)(C_LR_Ls+1)}{C_4C_7L_4R_4s^3+2C_4C_7L_4R_Ls^2+2C_4C_7L_4R_4s^2+2C_4L_4s^2+2C_4R_4s+C_LR_4s+2C_LR_Ls+2}$$

Filter 495

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_4L_4s^2+1)(C_LR_Ls^2+1)}{2C_4C_7L_4L_LR_Ls^4+C_4C_7L_4R_4s^3+2C_4C_7L_4R_Ls^2+2C_4C_7L_4R_4s^2+2C_4L_4s^2+2C_4R_4s+2C_7L_LR_Ls^2+C_LR_4s+2}$$

Filter 496

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, \frac{L_Ls}{C_LR_Ls^2+1} \right)$$

$$H(s): \frac{L_LR_L(C_4L_4s^2+1)}{C_7C_7L_4L_LR_4s^4+2C_7L_4L_LR_Ls^3+C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4L_4R_4s^2+C_LR_4s^2+2L_Ls+R_4}$$

Filter 497

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_4L_4s^2+1)(C_LR_Ls^2+C_LR_Ls+1)}{2C_4C_7L_4L_LR_Ls^4+C_4C_7L_4R_4s^3+2C_4C_7L_4R_Ls^2+2C_4C_7L_4R_4s^2+2C_4L_4s^2+2C_4R_4s+2C_7L_LR_Ls^2+C_LR_4s+2C_LR_Ls+2}$$

Filter 498

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$$

$$H(s): \frac{L_LR_LR_Ls(C_4L_4s^2+1)}{C_4C_7L_4L_LR_4R_Ls^4+C_4L_4L_LR_4s^3+2C_4L_4L_LR_Ls^2+2C_4L_4R_4R_Ls^2+C_4L_4L_LR_Ls^2+2C_4L_4R_4R_Ls^2+C_7L_LR_4R_Ls^2+L_LR_4s+2L_LR_Ls+R_4R_L}$$

Filter 499

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, \frac{L_Ls}{C_LR_Ls^2+1} + R_L \right)$$

$$H(s): \frac{R_4(C_4L_4s^2+1)(C_LR_Ls^2+L_Ls+R_L)}{C_4C_7L_4L_LR_4s^4+2C_4C_7L_4R_4s^3+2C_4C_7L_4R_Ls^2+2C_4C_7L_4R_4s^2+2C_4L_4s^2+2C_4R_4s+2C_7L_LR_Ls^2+2C_7L_LR_Ls^2+2L_Ls+R_4+2R_L}$$

Filter 500

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s + \frac{1}{C_4s})}{L_4s + R_4 + \frac{1}{C_4s}}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_4R_L(C_4L_4s^2+1)(C_LR_Ls^2+1)}{C_4C_7L_4L_LR_4s^4+2C_4C_7L_4R_4s^3+2C_4C_7L_4R_Ls^2+2C_4C_7L_4R_4s^2+2C_4L_4s^2+2C_4R_4s+2C_7L_LR_Ls^2+2C_7L_LR_Ls^2+2L_Ls+R_4+2R_L}$$

Filter 501

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, R_L \right)$$

$$H(s): \frac{R_4R_L}{R_4+2R_L}$$

Filter 502

Invalid filter

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4}{C_LR_4s+2}$$

Filter 503

Invalid filter

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{R_4R_L}{C_LR_LR_Ls+R_L+2R_L}$$

Filter 504

Invalid filter

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, R_L + \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4(C_LR_Ls+1)}{C_LR_Ls+2C_LR_Ls+2}$$

Filter 505**Filter Type:** BS

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, L_Ls + \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4(C_LR_Ls^2+1)}{2C_LR_Ls^2+C_LR_Ls+2}$$

$$\mathbf{Q}\colon \frac{2L_L\sqrt{C_LR_L}}{R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_L}{2L_L}$$

Filter 506**Filter Type:** BP

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_LR_4s}{C_LL_LR_Ls^2+2L_Ls+R_4}$$

$$\mathbf{Q}\colon \frac{C_LR_4\sqrt{C_LR_L}}{2}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{2}{C_LR_4}$$

Filter 507**Filter Type:** GE

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4(C_LL_Ls^2+C_LR_Ls+1)}{2C_LR_Ls^2+C_LR_Ls+2C_LR_Ls+2}$$

$$\mathbf{Q}\colon \frac{2L_L\sqrt{C_LR_L}}{R_L+2R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4\pm 2R_L}{2L_L}$$

$$\mathbf{Qz}\colon \frac{L_L\sqrt{C_LR_L}}{R_L}$$

Filter 508**Filter Type:** BP

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{C_Ls}}\right)$$

$$H(s)\colon \frac{L_LR_4R_Ls}{C_LL_LR_LR_Ls^2+L_LR_4s+2L_LR_Ls+R_LR_L}$$

$$\mathbf{Q}\colon \frac{C_LR_4R_L\sqrt{C_LR_L}}{R_L+2R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4\pm 2R_L}{C_LR_4R_L}$$

Filter 509**Filter Type:** GE

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$$

$$H(s)\colon \frac{R_4(C_LL_LR_Ls^2+L_Ls+R_L)}{C_LL_LR_Ls^2+2C_LL_LR_Ls+2L_Ls+R_4+2R_L}$$

$$\mathbf{Q}\colon \frac{C_L\sqrt{\frac{1}{C_LR_L}}(R_4+2R_L)}{2}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{2}{C_L(R_4+2R_L)}$$

$$\mathbf{Qz}\colon C_LR_L\sqrt{\frac{1}{C_LL_L}}$$

Filter 510**Filter Type:** BS

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_L(L_Ls+\frac{1}{C_Ls})}{L_Ls+R_L+\frac{R_L}{C_Ls}}\right)$$

$$H(s)\colon \frac{R_4R_L(C_LL_Ls^2+1)}{C_LL_LR_Ls^2+2C_LL_LR_Ls+2C_LR_Ls+R_L+2R_L}$$

$$\mathbf{Q}\colon \frac{L_L\sqrt{\frac{1}{C_LR_L}}(R_4+2R_L)}{R_4R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4R_L}{L_L(R_4+2R_L)}$$

Filter 511

Invalid filter

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L\right)$$

$$H(s)\colon \frac{R_L}{2C_LR_Ls+1}$$

Filter 512

Invalid filter

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{1}{s(2C_L+C_L)}$$

Filter 513

Invalid filter

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{R_L}{2C_LR_Ls+C_LR_Ls+1}$$

Filter 514

Invalid filter

$$Z(s)\colon \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{C_LR_Ls+1}{s(2C_LR_Ls+2C_L+C_L)}$$

Filter 515

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_L L_L s^2 + 1}{s(2C_4C_L L_L s^2 + 2C_4 + C_L)}$$

Filter 516

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s}{2C_4 L_L s^2 + C_L L_L s^2 + 1}$$

Filter 517

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_L L_L s^2 + C_L R_L s + 1}{s(2C_4C_L L_L s^2 + 2C_4C_L R_L s + 2C_4 + C_L)}$$

Filter 518**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{C_Ls}}} \right)$$

$$H(s): \frac{L_L R_L s}{2C_4 L_L R_L s^2 + C_L L_L R_L s^2 + L_L s + R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L(2C_4 + C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_4 + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{1}{R_L(2C_4 + C_L)}$$

Filter 519

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{C_L L_L R_L s^2 + L_L s + R_L}{2C_4C_L L_L R_L s^2 + 2C_4 L_L s^2 + 2C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 520**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_L(C_L L_L s^2 + 1)}{2C_4C_L L_L R_L s^2 + 2C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_L L_L}}}{R_L(2C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L(2C_4 + C_L)}{C_L L_L}$$

Filter 521

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, R_L \right)$$

$$H(s): \frac{R_L R_L}{2C_4 R_L R_L s + R_L + 2R_L}$$

Filter 522

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_L}{2C_4 R_L s + C_L R_L s + 2}$$

Filter 523

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L R_L}{2C_4 R_L R_L s + C_L R_L R_L s + R_L + 2R_L}$$

Filter 524**Filter Type:** Invalid011

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_L(C_L R_L s + 1)}{2C_4C_L R_L R_L s^2 + 2C_4 R_L s + C_L R_L s + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_4C_L R_L \sqrt{\frac{1}{C_L R_L R_L}}}{2C_4 R_L s + C_L R_L s + 2C_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4C_L R_L R_L}}$$

$$\mathbf{Bandwidth}: \frac{2C_4 R_L + C_L R_L + 2C_4 R_L}{2C_4C_L R_L R_L}$$

Filter 525**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_L(C_L L_L s^2 + 1)}{2C_4C_L L_L R_L s^2 + 2C_L R_L s + 2C_L L_L s^2 + C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_4 L_L \sqrt{\frac{1}{C_L L_L}}}{R_L(2C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L(2C_4 + C_L)}{2C_4 L_L}$$

Filter 526**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_L s}{2C_4 L_L R_L s^2 + C_L L_L R_L s^2 + 2L_L s + R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L(2C_4 + C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_4 + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{2}{R_L(2C_4 + C_L)}$$

Filter 527

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_L}{C_4 R_L s + 1}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_L(C_L L_L s^2 + C_L R_L s + 1)}{2C_4C_L L_L R_L s^2 + 2C_4C_L R_L s^2 + 2C_4 R_L s + 2C_L L_L s^2 + C_L R_L s + 2C_L R_L s + 2}$$

Filter 528

Filter Type: BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$$

$$H(s): \frac{\frac{L_LR_4R_Ls}{2C_4C_LL_LR_LR_Ls^2+C_4C_LR_4R_Ls^2+L_LR_4s+2L_LR_Ls+R_4R_L}}{R_4R_L\sqrt{\frac{L_L(2C_4+C_L)}{C_4R_4}}(2C_4+C_L)}$$

$$\mathbf{Q}: \frac{R_4+2R_L}{R_4+2R_L}$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_4+C_L)}}$$

$$\mathbf{Bandwidth}: \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 529

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LR_Ls^2+1} + R_L \right)$$

$$H(s): \frac{R_4(C_L L_L R_L s^2 + L_L s + R_L)}{2C_4C_LL_LR_LR_Ls^3+2C_4C_LR_4R_Ls^2+2C_4R_4R_Ls+C_4C_LR_4R_Ls^2+2C_LL_LR_Ls^2+2L_Ls+R_4+2R_L}$$

Filter 530

Filter Type: BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_4R_L\left(C_LL_Ls^2+1\right)}{2C_4C_LL_LR_LR_Ls^3+2C_4R_4R_Ls+C_LL_LR_4R_Ls^2+2C_LL_LR_Ls^2+C_LR_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}: \frac{C_LL_L\sqrt{\frac{C_L}{C_4R_4}}(R_4+2R_L)}{R_4R_L(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4R_L(2C_4+C_L)}{C_LL_L(R_4+2R_L)}$$

Filter 531

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L(C_4R_4s+1)}{C_4R_4s+2C_4R_Ls+1}$$

Filter 532

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_4R_4s+1}{s(C_4C_LR_4s+2C_4+C_L)}$$

Filter 533

Filter Type: Invalid011

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_4s+1} \right)$$

$$H(s): \frac{R_L(C_4R_4s+1)}{C_4C_LR_4R_Ls^2+C_4R_4s+2C_4R_Ls+C_LR_4s+1}$$

$$\mathbf{Q}: \frac{C_4C_LR_4R_L\sqrt{\frac{1}{C_4C_LR_4R_L}}}{C_4R_4+2C_4R_L+C_LR_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4C_LR_4R_L}}$$

$$\mathbf{Bandwidth}: \frac{C_4R_4+2C_4R_L+C_LR_L}{C_4C_LR_4R_L}$$

Filter 534

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4R_4s+1)(C_LR_4s+1)}{s(C_4C_LR_4s+2C_4C_LR_Ls+2C_4+C_L)}$$

Filter 535

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4R_4s+1)(C_LL_Ls^2+1)}{s(2C_4C_LL_Ls^2+C_4C_LR_4R_Ls+2C_4+C_L)}$$

Filter 536

Filter Type: Invalid110

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_Ls(C_LR_4s+1)}{C_4C_LL_LR_4R_Ls^3+C_4C_LR_4R_Ls^2+2C_4C_LR_LR_Ls^2+C_4R_4s+C_LL_LR_Ls^2+L_Ls+R_L}$$

$$\mathbf{Q}: \frac{L_L\sqrt{\frac{C_LR_4}{L_L(2C_4+C_L)}}(2C_4+C_L)}{C_4R_4}$$

$$\omega_0: \sqrt{\frac{1}{L_L(2C_4+C_L)}}$$

$$\mathbf{Bandwidth}: \frac{C_4R_4}{L_L(2C_4+C_L)}$$

Filter 537

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4R_4s+1)(C_LL_LR_Ls^2+C_LR_Ls+1)}{s(2C_4C_LL_LR_Ls^2+C_4C_LR_4R_Ls+2C_4C_LR_Ls+2C_4+C_L)}$$

Filter 538

Filter Type: Invalid110

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$$

$$H(s): \frac{L_LR_Ls(C_LR_4s+1)}{C_4C_LL_LR_4R_Ls^3+C_4C_LR_4R_Ls^2+2C_4C_LR_LR_Ls^2+C_4R_4s+C_LR_LR_Ls^2+L_Ls+R_L}$$

$$\mathbf{Q}: \frac{\frac{R_L}{L_L\sqrt{\frac{C_LR_4}{C_4R_4+2C_4R_L+C_LR_L}}}(C_4R_4+2C_4R_L+C_LR_L)}{C_4R_4R_L+L_L}$$

$$\omega_0: \sqrt{\frac{R_L}{L_L(C_4R_4+2C_4R_L+C_LR_L)}}$$

$$\mathbf{Bandwidth}: \frac{C_4R_4R_L+L_L}{L_L(C_4R_4+2C_4R_L+C_LR_L)}$$

Filter 539

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

$$H(s): \frac{(C_4R_4s+1)(C_LL_LR_Ls^2+L_Ls+R_L)}{C_4C_LL_LR_4R_Ls^3+2C_4C_LL_LR_Ls^2+2C_4R_4s+2C_4R_Ls+C_LR_Ls^2+2C_LL_LR_Ls^2+L_Ls+R_Ls+1}$$

Filter 540

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_L(C_4R_4s+1)(C_LL_Ls^2+1)}{C_4C_LL_LR_4R_Ls^3+2C_4C_LL_LR_Ls^2+C_4C_LR_4R_Ls^2+C_4R_4s+2C_4R_Ls+C_LR_Ls^2+C_LR_Ls+1}$$

Filter 541

Filter Type: BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+1)}{C_4L_4s^2+2C_4R_Ls+1}$$

$$\mathbf{Q}: \frac{L_4\sqrt{\frac{1}{C_4L_4}}}{2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

Bandwidth: $\frac{2R_L}{L_4}$

Filter 542

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_4L_4s^2+1}{s(C_4C_LL_4s^2+2C_4+C_L)}$$

Filter 543

Filter Type: BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+1)}{C_4C_LL_4R_Ls^2+C_4L_4s^2+2C_4R_Ls+C_LR_Ls+1}$$

$$\mathbf{Q}: \frac{C_4L_4\sqrt{\frac{1}{C_4L_4}}}{R_L(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

Bandwidth: $\frac{R_L(2C_4+C_L)}{C_4L_4}$

Filter 544

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4L_4s^2+1)(C_LR_Ls+1)}{s(C_4C_LL_4s^2+2C_4C_LR_Ls+2C_4+C_L)}$$

Filter 545

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4L_4s^2+1)(C_LL_Ls^2+1)}{s(C_4C_LL_4s^2+2C_4C_LL_Ls^2+2C_4+C_L)}$$

Filter 546

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_4s}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_Ls(C_4L_4s^2+1)}{C_4C_LL_Ls^4+C_4L_4s^2+2C_4L_Ls^2+C_LL_Ls^2+1}$$

Filter 547

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4L_4s^2+1)(C_LL_Ls^2+C_LR_Ls+1)}{s(C_4C_LL_4s^2+2C_4C_LL_Ls^2+2C_4C_LR_Ls+2C_4+C_L)}$$

Filter 548

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}} \right)$$

$$H(s): \frac{L_LR_Ls(C_4L_4s^2+1)}{C_4C_LL_LL_R_Ls^4+C_4L_4L_Ls^2+C_4L_LR_Ls^2+2C_4L_LR_Ls^2+C_LR_LR_Ls^2+L_Ls+R_L}$$

Filter 549

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_4s}{C_LL_Ls^2+1} + R_L \right)$$

$$H(s): \frac{(C_4L_4s^2+1)(C_LL_LR_Ls^2+L_Ls+R_L)}{C_4C_LL_LL_Ls^4+2C_4C_LL_LR_Ls^2+C_4L_4s^2+2C_4L_LR_Ls^2+2C_4R_Ls+C_LL_Ls^2+1}$$

Filter 550

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2}\right)}{L_Ls+R_L+\frac{1}{C_L^2}} \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+1)(C_LL_Ls^2+1)}{C_4C_LL_LL_Ls^4+C_4C_LL_LR_Ls^2+2C_4C_LL_LR_Ls^2+C_4L_4s^2+2C_4R_Ls+C_LL_Ls^2+C_LR_Ls+1}$$

Filter 551

Filter Type: BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L \right)$$

$$H(s): \frac{L_4R_L}{2C_4L_4R_Ls^2+L_Ls+2R_L}$$

$$\mathbf{Q}: 2C_4R_L\sqrt{\frac{1}{C_4L_4}}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

Bandwidth: $\frac{1}{2C_4R_L}$

Filter 552

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4s}{2C_4L_4s^2+C_LL_4s^2+2}$$

Filter 553

Filter Type: BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{L_4R_L}{2C_4L_4R_Ls^2+C_LR_LR_Ls^2+L_4s+2R_L}$$

$$\mathbf{Q}: \sqrt{2}R_L\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)$$

$$\omega_0: \sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$$

Bandwidth: $\frac{1}{R_L(2C_4+C_L)}$

Filter 554

Filter Type: Invalid110

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4s(C_LR_Ls+1)}{2C_4C_LL_LR_Ls^2+2C_4L_4s^2+C_LR_Ls^2+2C_LR_Ls+2}$$

$$\mathbf{Q}: \frac{\sqrt{2}L_4\sqrt{\frac{1}{L_4(2C_4+C_L)}}}{2C_LR_L}$$

$$\omega_0: \sqrt{2}\sqrt{\frac{1}{L_4(2C_4+C_L)}}$$

Bandwidth: $\frac{2C_LR_L}{L_4(2C_4+C_L)}$

Filter 555

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_L L_4 s^2 + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s (C_L L_L L_L s^2 + 1)}{2C_L C_L L_L L_L s^4 + 2C_L L_L s^3 + C_L L_L s^2 + 2C_L L_L s^2 + 2C_L L_L s^2 + 2}$$

Filter 556

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_L L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L L_L s}{2C_L L_L L_L s^3 + C_L L_L L_L s^2 + L_L + 2L_L}$$

Filter 557

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_L L_4 s^2 + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s (C_L L_L L_L s^2 + C_L R_L s^2 + C_L R_L s + 1)}{2C_L C_L L_L L_L s^4 + 2C_L L_L R_L s^3 + 2C_L L_L s^2 + C_L L_L s^2 + 2C_L L_L s^2 + 2C_L R_L s + 2}$$

Filter 558**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_L L_4 s^2 + 1}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

$$H(s): \frac{L_4 L_L R_L s}{2C_L L_L L_L R_L s^2 + C_L L_L R_L s^2 + L_L L_L s^2 + L_L L_L s^2 + L_L R_L + 2L_L R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{L_4 + 2L_L}{L_L L_L (2C_L + C_L)}} (2C_L + C_L)$$

$$\omega_0: \sqrt{\frac{L_4 + 2L_L}{L_L L_L (2C_L + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{1}{R_L (2C_L + C_L)}$$

Filter 559

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_L L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{L_4 s (C_L L_L L_L R_L s^2 + 2C_L L_L L_L s^2 + 2C_L L_L R_L s^2 + C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + L_L s + R_L)}{2C_L C_L L_L L_L R_L s^4 + 2C_L L_L L_L R_L s^3 + 2C_L L_L R_L s^2 + C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + L_L s + 2L_L s + 2R_L}$$

Filter 560

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_L L_4 s^2 + 1}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_L R_L s (C_L L_L s^2 + 1)}{2C_L C_L L_L L_L R_L s^4 + 2C_L L_L R_L s^3 + C_L L_L s^2 + C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + L_L s + 2R_L}$$

Filter 561**Filter Type:** GE

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L (C_L L_4 s^2 + C_L R_4 s + 1)}{C_L L_4 s^2 + C_L R_4 s + 2C_L R_4 s + 1}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{C_L L_4}}{R_L + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\mathbf{Bandwidth}: \frac{R_4 + 2R_L}{L_4}$$

$$\mathbf{Qz}: \frac{L_4 \sqrt{C_L L_4}}{R_4}$$

Filter 562

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_4 s^2 + C_L R_4 s + 1}{s(C_L C_L L_4 s^2 + C_L C_L R_4 s + 2C_L + C_L)}$$

Filter 563

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_L L_4 s^2 + C_L R_4 s + 1)}{C_L C_L L_L R_L s^3 + C_L C_L R_L R_L s^2 + C_L L_L s^2 + C_L R_L s + 2C_L R_L s + C_L R_L s + 1}$$

Filter 564

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L R_L s + 1)(C_L L_4 s^2 + C_L R_4 s + 1)}{s(C_L C_L L_4 s^2 + C_L C_L R_4 s + 2C_L C_L R_L s + 2C_L + C_L)}$$

Filter 565

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_L s^2 + 1)(C_L L_4 s^2 + C_L R_4 s + 1)}{s(C_L C_L L_4 s^2 + 2C_L C_L L_L s^2 + C_L C_L R_4 s + 2C_L + C_L)}$$

Filter 566

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_L L_4 s^2 + C_L R_4 s + 1)}{C_L C_L L_L L_L s^4 + C_L C_L L_L R_L s^3 + C_L L_L s^2 + 2C_L L_L s^2 + C_L R_L s + C_L L_L s^2 + 1}$$

Filter 567

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_4 s^2 + C_L R_4 s + 1)(C_L L_L s^2 + C_L R_L s + 1)}{s(C_L C_L L_4 s^2 + 2C_L C_L L_L s^2 + C_L C_L R_4 s + 2C_L C_L R_L s + 2C_L + C_L)}$$

Filter 568

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

$$H(s): \frac{L_L R_L s (C_L L_4 s^2 + C_L R_4 s + 1)}{C_L C_L L_L L_L R_L s^4 + C_L C_L L_L R_L R_L s^3 + C_L L_L L_L s^3 + C_L L_L R_L s^2 + C_L L_L R_L s^2 + 2C_L L_L R_L s^2 + C_L R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$

Filter 569

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_L L_4 s^2 + C_L R_4 s + 1)(C_L L_L R_L s^2 + L_L s + R_L)}{C_L C_L L_L L_L s^4 + C_L C_L L_L R_L s^3 + 2C_L C_L L_L R_L s^2 + C_L L_L s^2 + 2C_L L_L s^2 + C_L R_L s + 2C_L R_L s + C_L L_L s^2 + 1}$$

Filter 570

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L \left(L_Ls + \frac{1}{C_L^2s} \right)}{L_Ls + R_L + \frac{1}{C_L^2s}} \right)$$
$$H(s): \frac{R_L \left(C_L L_L s^2 + 1 \right) \left(C_4 L_4 s^2 + C_4 R_4 s + 1 \right)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_L s^3 + C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^3 + C_4 C_L R_4 R_L s^3 + C_4 L_4 s^3 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 571**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, R_L \right)$$

$$H(s): \frac{L_4 R_L R_4 s}{2 C_4 L_4 R_L R_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_4 R_L}$$

$$\mathbf{Q:} \frac{2 C_4 R_4 R_L \sqrt{\frac{1}{C_L^2 L_4}}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\mathbf{Bandwidth:} \frac{R_4 + 2 R_L}{2 C_4 R_4 R_L}$$

Filter 572**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s}{3 C_4 L_4 R_4 s^2 + C_L L_4 R_4 s^2 + 2 L_4 s + 2 R_4}$$

$$\mathbf{Q:} \frac{\sqrt{2} R_4 \sqrt{L_4 (2 C_4 + C_L)}}{2 (2 C_4 + C_L)}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{2}{R_4 (2 C_4 + C_L)}$$

Filter 573**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{L_4 R_L R_4 s}{3 C_4 L_4 R_L R_L s^2 + C_L L_4 R_L R_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_4 R_L}$$

$$\mathbf{Q:} \frac{L_4 R_L R_4 s}{\sqrt{2} R_L \sqrt{L_4 (2 C_4 + C_L)} (2 C_4 + C_L)}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{R_4 + 2 R_L}{R_4 R_L (2 C_4 + C_L)}$$

Filter 574**Filter Type:** Invalid110

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s \left(C_L L_L s^2 + 1 \right)}{2 C_4 C_L L_4 R_L R_L s^4 + 2 C_4 L_4 R_L s^2 + C_L L_4 R_L s^2 + 2 C_L L_4 R_L s^2 + 2 C_L R_4 R_L s + 2 L_4 s + 2 R_4}$$

$$\mathbf{Q:} \frac{\sqrt{2} L_4 \sqrt{L_4 (2 C_4 R_4 + C_L R_4)}}{2 (C_L R_4 R_L + L_4)} (2 C_4 + C_L)$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 R_4 + C_L R_4)}}$$

$$\mathbf{Bandwidth:} \frac{2 (C_L R_4 R_L + L_4)}{L_4 (2 C_4 R_4 + C_L R_4 + 2 C_L R_L)}$$

Filter 575

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s \left(C_L L_L s^2 + 1 \right)}{2 C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 L_4 R_4 s^2 + 2 C_L L_4 L_L s^3 + C_L L_4 R_4 s^2 + 2 C_L L_L R_4 s^2 + 2 C_L L_L R_4 s^2 + 2 L_4 s + 2 R_4}$$

Filter 576**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, \frac{L_L s}{C_L L_L s + 1} \right)$$

$$H(s): \frac{L_4 L_L R_4 s}{2 C_4 L_4 L_L R_L R_L s^2 + C_L L_L R_L R_L s^2 + L_L L_L R_L s^2 + 2 L_4 L_L s + L_4 R_L s + 2 L_L R_L}$$

$$\mathbf{Q:} \frac{R_4 \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}}{2 (2 C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{2}{R_4 (2 C_4 + C_L)}$$

Filter 577

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 R_4 s \left(C_L L_L s^2 + C_L R_L s + 1 \right)}{2 C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 C_L L_4 R_L R_4 s^3 + 2 C_4 L_4 R_L R_4 s^3 + 2 C_L L_4 L_L s^3 + C_L L_4 R_L s^2 + 2 C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 L_4 L_L s + L_4 R_4 s + 2 L_4 R_L s + 2 L_L R_4 R_L}$$

Filter 578**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_4 L_L R_L R_L s}{2 C_4 L_4 L_L R_L R_L s^2 + C_L L_L R_L R_L s^2 + L_4 L_L R_L R_L s^2 + 2 L_4 L_L R_L s + L_4 R_L R_L s + 2 L_L R_L R_L}$$

$$\mathbf{Q:} \frac{R_4 R_L \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}}{2 (2 C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$$

$$\mathbf{Bandwidth:} \frac{R_4 + 2 R_L}{R_4 R_L (2 C_4 + C_L)}$$

Filter 579

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{L_4 R_4 s \left(C_L L_L R_L s^2 + L_L s + R_L \right)}{2 C_4 C_L L_4 L_L R_L R_L s^4 + 2 C_4 L_4 L_L R_L R_L s^3 + 2 C_4 L_4 R_L R_L s^3 + C_L L_4 L_L R_L s^3 + 2 C_L L_4 L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 L_4 L_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 L_L R_4 R_L}$$

Filter 580

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4} + \frac{1}{L_4s}}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2s} \right)}{L_L s + R_L + \frac{1}{C_L^2s}} \right)$$

$$H(s): \frac{L_4 R_L R_4 s \left(C_L L_L s^2 + 1 \right)}{2 C_4 C_L L_4 L_L R_L R_L s^4 + 2 C_4 L_4 R_L R_L s^3 + C_L L_4 L_L R_L R_L s^3 + 2 C_L L_4 L_L R_L s^3 + C_L L_4 R_L R_L s^2 + 2 C_L L_L R_L R_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_4 R_L}$$

Filter 581**Filter Type:** GE

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_L s}{C_4 L_4 s + 1} + R_4, \infty, R_L \right)$$

$$H(s): \frac{R_L \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{C_L L_4 R_4 s^2 + 3 C_L L_L R_L s^2 + L_4 s + R_4 + 2 R_L}$$

$$\mathbf{Q:} C_4 \sqrt{\frac{1}{C_L L_4}} \left(R_4 + 2 R_L \right)$$

$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$

$$\mathbf{Bandwidth:} \frac{R_4 + 2 R_L}{C_L (R_4 + 2 R_L)}$$

$$\mathbf{Qz:} C_4 R_4 \sqrt{\frac{1}{C_L L_4}}$$

Filter 582

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{C_4L_4R_4s^2+L_4s+R_4}{C_4C_2L_4R_4s^3+2C_4L_4s^2+C_4L_4s^2+C_LR_4s+2}$$

Filter 583

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_L(C_4L_4R_4s^2+L_4s+R_4)}{C_4C_2L_4R_4R_Ls^3+C_4L_4R_4s^2+2C_4L_4R_4s^2+C_LR_4R_Ls+L_4s+R_L+2R_L}$$

Filter 584

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_4L_4s+1)(C_4L_4R_4s^2+L_4s+R_4)}{C_4C_2L_4R_4s^3+2C_4C_2L_4R_4s^3+2C_4L_4s^2+C_LL_4s^2+C_LR_4s+2C_LR_Ls+2}$$

Filter 585

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_LL_Ls^2+1)(C_4L_4R_4s^2+L_4s+R_4)}{2C_4C_2L_4L_LL_Ls^4+C_4C_2L_4R_4s^3+2C_4L_4s^2+C_LL_4s^2+2C_LL_Ls^2+C_LR_4s+2}$$

Filter 586

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_Ls(C_4L_4R_4s^2+L_4s+R_4)}{C_4C_2L_4L_LL_LR_4s^3+2C_4L_4L_LL_Ls^3+C_4L_4R_4s^2+C_LL_LL_Ls^3+C_LL_LR_4s^2+L_4s+2L_Ls+R_4}$$

Filter 587

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{(C_LL_Ls^2+C_LR_Ls+1)(C_4L_4R_4s^2+L_4s+R_4)}{2C_4C_2L_4L_LL_Ls^4+C_4C_2L_4R_4s^3+2C_4C_2L_4R_4s^3+2C_4L_4s^2+C_LL_Ls^2+2C_LL_Ls^2+C_LR_4s+2C_LR_Ls+2}$$

Filter 588

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{1}{C_Ls+\frac{1}{L_L}+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{L_LR_Ls(C_4L_4R_4s^2+L_4s+R_4)}{C_4C_2L_4L_LL_LR_4R_Ls^4+C_4L_4L_LL_LR_4s^3+2C_4L_4L_LL_Ls^3+C_4L_4R_4R_Ls^2+C_4L_4L_LL_LR_4s^2+C_LL_LL_LLs^2+L_4L_Ls^2+L_4R_Ls+L_LL_LR_4s+2L_LL_LR_4s+R_4R_L}$$

Filter 589

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

$$H(s): \frac{(C_4L_4R_4s^2+L_4s+R_4)(C_LL_LR_Ls^2+L_Ls+R_L)}{C_4C_2L_4L_LL_R_4s^4+2C_4C_2L_4L_LL_R_Ls^3+2C_4L_4L_LL_R_Ls^3+C_4L_4R_4s^2+2C_4L_4R_Ls^2+C_LL_LR_4s^2+C_LL_LR_Ls^2+L_4s+2L_Ls+R_L+2R_L}$$

Filter 590

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L(L_Ls+\frac{1}{C_Ls})}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_L(C_LL_Ls^2+1)(C_4L_4R_4s^2+L_4s+R_4)}{C_4C_2L_4L_LL_R_4s^4+2C_4C_2L_4L_LL_R_Ls^3+C_4C_2L_4R_4R_Ls^3+C_4L_4R_4R_Ls^2+C_4L_4R_4s^2+2C_4L_4R_Ls^2+C_LL_LL_LLs^2+C_LL_LR_4s^2+2C_LL_LR_Ls^2+C_LR_4R_Ls+L_4s+R_L+2R_L}$$

Filter 591

Filter Type: BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s+\frac{1}{C_Ls})}{L_4s+R_4+\frac{1}{C_Ls}}, \infty, R_L \right)$$

$$H(s): \frac{R_4R_L(C_4L_4s^2+1)}{C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}: \frac{L_4\sqrt{\frac{1}{C_4L_4}}(R_4+2R_L)}{2R_4R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

$$\text{Bandwidth: } \frac{2R_4R_L}{L_4(R_4+2R_L)}$$

Filter 592

Filter Type: BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s+\frac{1}{C_Ls})}{L_4s+R_4+\frac{1}{C_Ls}}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_4L_4s^2+1)}{C_4C_2L_4R_4R_Ls^3+2C_4L_4s^2+2C_4R_4s+C_LR_4s+R_4+2R_L}$$

$$\mathbf{Q}: \frac{2C_4L_4\sqrt{\frac{1}{C_4L_4}}}{R_4(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

$$\text{Bandwidth: } \frac{R_4R_L(2C_4+C_L)}{2C_4L_4}$$

Filter 593

Filter Type: BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s+\frac{1}{C_Ls})}{L_4s+R_4+\frac{1}{C_Ls}}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_4R_L(C_4L_4s^2+1)}{C_4C_2L_4R_4R_LR_Ls^3+C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+C_LR_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}: \frac{C_4L_4\sqrt{\frac{1}{C_4L_4}}(R_4+2R_L)}{R_4R_L(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4L_4}}$$

$$\text{Bandwidth: } \frac{R_4R_L(2C_4+C_L)}{C_4L_4(R_4+2R_L)}$$

Filter 594

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s+\frac{1}{C_Ls})}{L_4s+R_4+\frac{1}{C_Ls}}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_L(C_4L_4s^2+1)(C_LR_Ls+1)}{C_4C_2L_4R_4s^3+2C_4C_2L_4R_Ls^3+2C_4C_2L_4R_Ls^3+2C_4L_4s^2+2C_4R_4s+C_LR_4s+2C_LR_Ls+2}$$

Filter 595

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4(L_4s+\frac{1}{C_Ls})}{L_4s+R_4+\frac{1}{C_Ls}}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_4L_4s^2+1)(C_LL_Ls^2+1)}{2C_4C_2L_4L_LL_Ls^4+C_4C_2L_4R_4s^3+2C_4C_2L_4R_4s^3+2C_4L_4s^2+2C_4R_4s+2C_LL_Ls^2+C_LR_4s+2}$$

Filter 596

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4s}\right)}{L_4s+R_4+\frac{1}{C_4s}},\,\infty,\,\frac{L_6s}{C_LL_6s^2+1}\right)$$

$$H(s)\colon \frac{L_LR_4(C_4L_4s^2+1)}{C_4C_LL_4L_LR_4s^4+2C_4L_4L_6s^3+2C_4L_4L_6s^3+C_4L_4R_4s^3+2C_4L_LR_4s^3+C_LL_6R_4s^3+2L_6s+R_4}$$

Filter 597

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4s}\right)}{L_4s+R_4+\frac{1}{C_4s}},\,\infty,\,L_Ls+R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LL_6s^2+C_LR_4s+1\right)}{2C_4C_LL_4L_6s^4+C_4C_LL_4R_4s^3+2C_4C_LL_4R_4s^3+2C_4C_LL_6R_4s^3+2C_4C_LL_6R_4s^3+2C_4R_4s^3+2C_LL_6s^2+C_LR_4s+2C_LR_4s+2}$$

Filter 598

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4s}\right)}{L_4s+R_4+\frac{1}{C_4s}},\,\infty,\,\frac{1}{C_Ls+\frac{1}{\frac{1}{R_L}+\frac{1}{L_Ls}}}\right)$$

$$H(s)\colon \frac{L_LR_4R_Ls\left(C_4L_4s^2+1\right)}{C_4C_LL_4L_LR_4R_4s^4+C_4C_LL_4R_4R_4s^3+C_4L_4L_LR_4s^3+2C_4L_4L_LR_4s^3+C_4L_4R_4R_4s^3+2C_4L_LR_4R_4s^3+C_LL_4R_4R_4s^3+L_LR_4s+2L_LR_4s+R_4R_L}$$

Filter 599

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4s}\right)}{L_4s+R_4+\frac{1}{C_4s}},\,\infty,\,\frac{L_6s}{C_LL_6s^2+1}+R_L\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LL_6R_4s^2+L_Ls+R_L\right)}{C_4C_LL_4L_LR_4s^4+2C_4C_LL_4L_LR_4s^3+2C_4C_LL_4R_4R_4s^3+2C_4L_4L_LR_4s^3+2C_4L_4R_4R_4s^3+2C_4L_6R_4s^3+2C_4R_4R_4s^3+C_LL_6R_4s^2+2C_LL_6R_4s^2+2L_6s+R_4+2R_L}$$

Filter 600

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+R_2+\frac{1}{C_2s},\,\infty,\,\frac{R_4\left(L_4s+\frac{1}{C_4s}\right)}{L_4s+R_4+\frac{1}{C_4s}},\,\infty,\,\frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$$

$$H(s)\colon \frac{R_4R_L\left(C_4L_4s^2+1\right)\left(C_LL_6s^2+1\right)}{C_4C_LL_4L_LR_4s^4+2C_4C_LL_4R_4R_4s^3+C_4C_LL_4L_LR_4R_4s^3+2C_4C_LL_4R_4R_4s^3+2C_4L_4L_LR_4s^3+2C_4L_4R_4R_4s^3+2C_4L_6R_4s^3+2C_4R_4R_4s^3+C_LL_6R_4s^2+2C_LL_6R_4s^2+2L_6s+R_4+2R_L}$$

Filter 601

Invalid filter

$$Z(s)\colon \left(\infty,\,\frac{L_2s}{C_2L_2s^2+1}+R_2,\,\infty,\,R_4,\,\infty,\,R_L\right)$$

$$H(s)\colon \frac{R_4R_L}{R_4+2R_L}$$

Filter 602

Invalid filter

$$Z(s)\colon \left(\infty,\,\frac{L_2s}{C_2L_2s^2+1}+R_2,\,\infty,\,R_4,\,\infty,\,\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4}{C_LR_4s+2}$$

Filter 603

Invalid filter

$$Z(s)\colon \left(\infty,\,\frac{L_2s}{C_2L_2s^2+1}+R_2,\,\infty,\,R_4,\,\infty,\,\frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{R_4R_L}{C_LR_4R_Ls+R_4+2R_L}$$

Filter 604

Invalid filter

$$Z(s)\colon \left(\infty,\,\frac{L_2s}{C_2L_2s^2+1}+R_2,\,\infty,\,R_4,\,\infty,\,R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_LR_Ls+1\right)}{C_LR_4s+2C_LR_Ls+2}$$

Filter 605

Filter Type: BS

$$Z(s)\colon \left(\infty,\,\frac{L_2s}{C_2L_2s^2+1}+R_2,\,\infty,\,R_4,\,\infty,\,L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_LL_6s^2+1\right)}{2C_LL_6s^2+C_LR_4s+2}$$

$$\mathbf{Q}\colon \frac{2L_L\sqrt{C_LL_L}}{R_4}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4}{2L_L}$$

Filter 606

Filter Type: BP

$$Z(s)\colon \left(\infty,\,\frac{L_2s}{C_2L_2s^2+1}+R_2,\,\infty,\,R_4,\,\infty,\,\frac{L_6s}{C_LL_6s^2+1}\right)$$

$$H(s)\colon \frac{L_6R_4}{C_LL_6R_4s^2+2L_6s+R_4}$$

$$\mathbf{Q}\colon \frac{C_LR_4\sqrt{C_LL_L}}{2}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{2}{C_LR_4}$$

Filter 607

Filter Type: GE

$$Z(s)\colon \left(\infty,\,\frac{L_2s}{C_2L_2s^2+1}+R_2,\,\infty,\,R_4,\,\infty,\,L_Ls+R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_LL_6s^2+C_LR_4s+1\right)}{2C_LL_6s^2+C_LR_4s+2C_LR_4s+2}$$

$$\mathbf{Q}\colon \frac{2L_L\sqrt{C_LL_L}}{R_4+2R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{2L_L}$$

$$\mathbf{Qz}\colon \frac{L_L\sqrt{C_LL_L}}{R_L}$$

Filter 608

Filter Type: BP

$$Z(s)\colon \left(\infty,\,\frac{L_2s}{C_2L_2s^2+1}+R_2,\,\infty,\,R_4,\,\infty,\,\frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$

$$H(s)\colon \frac{L_LR_4R_L}{C_LL_LR_4R_4s^4+L_LR_4s^3+2L_LR_4s+R_4R_L}$$

$$\mathbf{Q}\colon \frac{C_LR_4R_L\sqrt{C_LL_L}}{R_4+2R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{C_LR_4R_L}$$

Filter 609**Filter Type:** GE

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, \frac{R_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4 (C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + L_L s + R_L)}{C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{C_L \sqrt{\frac{1}{C_L^2 L_L^2}} (R_4 + 2 R_L)}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{2}{C_L (R_4 + 2 R_L)}$$

$$\mathbf{Qz}: C_L R_L \sqrt{\frac{1}{C_L L_L}}$$

Filter 610**Filter Type:** BS

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L}} \right)$$

$$H(s): \frac{R_4 R_L (C_L L_L s^2 + 1)}{C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + C_L R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{\frac{1}{C_L^2 L_L^2}} (R_4 + 2 R_L)}{R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_4 R_L}{L_L (R_4 + 2 R_L)}$$

Filter 611

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, R_L \right)$$

$$H(s): \frac{R_L}{2 C_4 R_L s + 1}$$

Filter 612

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{1}{s (2 C_L + C_L)}$$

Filter 613

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L}{2 C_L R_L s + C_L R_L s + 1}$$

Filter 614

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L R_L s + 1}{s (2 C_L C_L R_L s + 2 C_L + C_L)}$$

Filter 615

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + 1}{s (2 C_L C_L L_L s^2 + 2 C_L + C_L)}$$

Filter 616

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s}{2 C_L L_L s^2 + C_L L_L s^2 + 1}$$

Filter 617

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + C_L R_L s + 1}{s (2 C_L C_L L_L s^2 + 2 C_L C_L R_L s + 2 C_L + C_L)}$$

Filter 618**Filter Type:** BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_L s}{2 C_L L_L R_L s^2 + C_L L_L R_L s^2 + L_L s + R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L (2 C_4 + C_L)}} (2 C_4 + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L (2 C_4 + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{1}{R_L (2 C_4 + C_L)}$$

Filter 619

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{C_L L_L R_L s^2 + 2 C_L L_L s^2 + 2 C_L R_L s + C_L L_L s^2 + 1}{2 C_4 C_L L_L R_L s^2 + 2 C_4 L_L s^2 + 2 C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 620**Filter Type:** BS

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2 C_L C_L L_L R_L s^2 + 2 C_L R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_L^2 L_L^2}}}{R_L (2 C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L (2 C_4 + C_L)}{C_L L_L}$$

Filter 621

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, R_L \right)$$

$$H(s): \frac{R_4 R_L}{2 C_4 R_4 R_L s + R_4 + 2 R_L}$$

Filter 622

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4}{2 C_4 R_4 s + C_L R_4 s + 2}$$

Filter 623

Invalid filter
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_6}{C_6R_6s+1}\right)$
 $H(s)$: $\frac{R_4R_6}{2C_4R_4R_4s+C_4R_4R_4s+R_4+2R_6}$

Filter 624

Filter Type: Invalid011
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{R_4(C_LR_Ls+1)}{2C_4C_LR_4R_Ls^2+2C_4R_4s+C_LR_4s+2C_LR_Ls+2}$
Q: $\frac{2C_4C_LR_4R_L\sqrt{C_LC_LR_4R_L}}{2C_4R_4s+C_LR_4+2C_LR_L}$
 ω_0 : $\sqrt{\frac{1}{C_4R_4R_4R_L}}$
Bandwidth: $\frac{2C_4R_4+C_LR_4+2C_LR_L}{2C_4C_LR_4R_L}$

Filter 625

Filter Type: BS
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{R_4(C_4L_Ls^2+1)}{2C_4C_LR_4R_LR_4s^2+2C_4R_4s+2C_LR_4s^2+C_LR_4s+2}$
Q: $\frac{2C_4L_LL_L\sqrt{\frac{C_L}{C_L}L_L}}{R_4(2C_4+C_L)}$
 ω_0 : $\sqrt{\frac{1}{C_2L_2}}$
Bandwidth: $\frac{R_4(2C_4+C_L)}{2C_4L_LL_L}$

Filter 626

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{Ls^s}{C_LL_Ls^2+1}\right)$
 $H(s)$: $\frac{L_LL_4s}{2C_4L_LL_4R_4s^2+C_LR_4R_4s^2+2L_Ls+R_4}$
Q: $\frac{R_4\sqrt{\frac{1}{L_LL_L(2C_4+C_L)}(2C_4+C_L)}}{2}$
 ω_0 : $\sqrt{\frac{1}{L_LL_L(2C_4+C_L)}}$
Bandwidth: $\frac{2}{R_4(2C_4+C_L)}$

Filter 627

Invalid filter
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{R_4(C_LL_Ls^2+C_LR_4s+1)}{2C_4C_LL_LR_4R_4s^2+2C_4C_LR_4R_4s^2+2C_4R_4s+2C_LL_LR_4s^2+C_LR_4s+2C_LR_4s+2}$

Filter 628

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls+\frac{1}{L_Ls}}\right)$
 $H(s)$: $\frac{L_LR_4R_4s}{2C_4C_LL_LR_4R_4s^2+C_LR_4R_4s^2+L_LR_4s+2L_LR_Ls+R_4R_L}$
Q: $\frac{R_4R_L\sqrt{\frac{L_LL_L(C_4+C_L)}{L_LL_L(2C_4+C_L)}}}{R_4+2R_L}$
 ω_0 : $\sqrt{\frac{1}{L_LL_L(2C_4+C_L)}}$
Bandwidth: $\frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$

Filter 629

Invalid filter
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{Ls^s}{C_LL_Ls^2+1} + R_L\right)$
 $H(s)$: $\frac{R_4(C_LL_LR_4s^2+L_Ls+R_L)}{2C_4C_LL_LR_4R_4s^2+2C_4C_LR_4R_4s^2+2C_4R_4s+C_LR_4s^2+2C_LL_LR_4s^2+2L_Ls+R_4+2R_L}$

Filter 630

Filter Type: BS
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$
 $H(s)$: $\frac{R_4R_L\left(C_LL_Ls^2+1\right)}{2C_4C_LL_LR_4R_4s^2+2C_4R_4R_4s+C_LL_LR_4s^2+2C_LL_LR_Ls^2+C_LR_4R_4s+R_4+2R_L}$
Q: $\frac{C_LL_LL_L\sqrt{\frac{C_LL_L}{C_LL_L}R_L}\left(R_4+2R_L\right)}{R_4R_L\left(2C_4+C_L\right)}$
 ω_0 : $\sqrt{\frac{1}{C_LL_LL_L}}$
Bandwidth: $\frac{R_4R_L(2C_4+C_L)}{C_LL_LL_L(R_4+2R_L)}$

Filter 631

Invalid filter
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, R_4 + \frac{1}{C_4s}, \infty, R_L\right)$
 $H(s)$: $\frac{R_4(C_4R_4s+1)}{C_4R_4s+2C_4R_4s+1}$

Filter 632

Invalid filter
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{C_4R_4s+1}{s(C_4C_LR_4s+2C_4+C_L)}$

Filter 633

Filter Type: Invalid011
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$
 $H(s)$: $\frac{R_L(C_LR_Ls+1)}{C_4C_LR_4R_4s^2+C_4R_4s+2C_LR_Ls+C_LR_Ls+1}$
Q: $\frac{C_4C_LR_4R_L\sqrt{C_LC_LR_4R_L}}{C_4R_4s+2C_4R_4+C_LR_L}$
 ω_0 : $\sqrt{\frac{1}{C_4C_LR_4R_L}}$
Bandwidth: $\frac{C_4R_4+2C_4R_4+C_LR_L}{C_4C_LR_4R_L}$

Filter 634

Invalid filter
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, R_4 + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{(C_LR_4s+1)(C_LR_Ls^2+1)}{s(C_4C_LR_4s+2C_4C_LR_4s+2C_4+C_L)}$

Filter 635

Invalid filter
 $Z(s)$: $\left(\infty, \frac{Ls^s}{C_2L_2s^2+1} + R_2, \infty, R_4 + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{(C_2R_4s+1)(C_2L_Ls^2+1)}{s(2C_4C_LL_Ls^2+C_4C_LR_4s+2C_4+C_L)}$

Filter 636

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_L s(C_4 R_L s + 1)}{C_4 C_L L_L R_L s^3 + 2 C_4 L_L s^2 + C_4 R_L s + C_L L_L s^2 + 1}$$
$$\mathbf{Q}: \frac{L_L \sqrt{\frac{L_L (2 C_4 + C_L)}{C_4 R_L}}}{C_4 R_L}$$
$$\omega_0: \sqrt{\frac{1}{L_L (2 C_4 + C_L)}}$$
Bandwidth: $\frac{C_4 R_L}{L_L (2 C_4 + C_L)}$

Filter 637

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_4 R_L s + 1)(C_L L_L s^2 + C_L R_L s + 1)}{s(2 C_4 C_L L_L s^3 + C_4 C_L R_L s^2 + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 638

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$
$$H(s): \frac{L_L R_L s(C_4 R_L s + 1)}{C_4 C_L L_L R_L R_L s^3 + C_4 L_L R_L s^2 + 2 C_4 L_L R_L s + C_4 R_L R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$
$$\mathbf{Q}: \frac{L_L \sqrt{\frac{R_L}{L_L (C_4 R_L + 2 C_4 R_L + C_L R_L)}}}{C_4 R_L R_L + L_L}$$
$$\omega_0: \sqrt{\frac{R_L}{L_L (C_4 R_L + 2 C_4 R_L + C_L R_L)}}$$
Bandwidth: $\frac{C_4 R_L R_L + L_L}{L_L (C_4 R_L + 2 C_4 R_L + C_L R_L)}$

Filter 639

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} + R_L \right)$$
$$H(s): \frac{(C_L R_L s + 1)(C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_L R_L s^3 + 2 C_4 C_L L_L R_L s^2 + 2 C_4 C_L R_L s^2 + C_4 R_L s + 2 C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 640

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$
$$H(s): \frac{R_L (C_L R_L s + 1)(C_L L_L s^2 + 1)}{C_4 C_L L_L R_L s^3 + 2 C_4 C_L L_L R_L s^2 + C_4 C_L R_L R_L s^2 + C_4 R_L s + 2 C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 641

Filter Type: BS
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L \right)$$
$$H(s): \frac{R_L (C_L L_4 s^2 + 1)}{C_L L_4 s^2 + 2 C_L R_L s + 1}$$
$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{C_L^2 L_4}{2 R_L}}}{C_L L_4}$$
$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$
Bandwidth: $\frac{2 R_L}{C_L L_4}$

Filter 642

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$
$$H(s): \frac{C_L L_4 s^2 + 1}{s(C_L C_L L_4 s^2 + 2 C_L R_L s + 2 C_L + C_L)}$$

Filter 643

Filter Type: BS
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$
$$H(s): \frac{R_L (C_L L_4 s^2 + 1)}{C_4 C_L L_L R_L s^3 + C_L L_4 s^2 + 2 C_4 R_L s + C_L R_L s + 1}$$
$$\mathbf{Q}: \frac{C_L L_4 \sqrt{\frac{C_L^2 L_4}{C_L R_L}}}{R_L (2 C_L + C_L)}$$
$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$
Bandwidth: $\frac{R_L (2 C_L + C_L)}{C_L L_4}$

Filter 644

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_4 s^2 + 1)(C_L R_L s + 1)}{s(C_L C_L L_4 s^2 + 2 C_L C_L R_L s + 2 C_L + C_L)}$$

Filter 645

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_4 s^2 + 1)(C_L L_L s^2 + 1)}{s(C_L C_L L_4 s^2 + 2 C_L C_L L_L s^2 + 2 C_L + C_L)}$$

Filter 646

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_L s(C_4 L_4 s^2 + 1)}{C_4 C_L L_L L_L s^3 + C_4 L_4 s^2 + 2 C_4 L_L s^2 + C_L L_L s^2 + 1}$$

Filter 647

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_4 s^2 + 1)(C_L L_L s^2 + C_L R_L s + 1)}{s(C_L C_L L_4 s^2 + 2 C_L C_L L_L s^2 + 2 C_L C_L R_L s + 2 C_L + C_L)}$$

Filter 648

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$
$$H(s): \frac{L_L R_L s(C_L L_4 s^2 + 1)}{C_4 C_L L_L L_L R_L s^3 + C_4 L_L L_L s^2 + C_4 L_L R_L s^2 + 2 C_4 L_L R_L s^2 + C_L L_L R_L s^2 + L_L s + R_L}$$

Filter 649

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$
$$H(s): \frac{(C_L L_4 s^2 + 1)(C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_L L_L s^3 + 2 C_4 C_L L_L R_L s^2 + C_4 L_L s^2 + 2 C_4 L_L s^2 + 2 C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 650

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$
$$H(s): \frac{R_L \left(C_4 L_4 s^2 + 1 \right) \left(C_L L_L s^2 + 1 \right)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_L s^3 + 2 C_4 C_L L_L R_L s^3 + C_4 L_4 s^3 + 2 C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 651**Filter Type:** BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L \right)$$

$$H(s): \frac{L_4 R_L}{2 C_4 L_4 R_L s^2 + C_4 L_4 R_L s^2 + L_4 s + 2 R_L}$$

$$\mathbf{Q}: 2 C_4 R_L \sqrt{\frac{1}{C_4 L_4}}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\mathbf{Bandwidth:} \frac{1}{2 C_4 R_L}$$

Filter 652

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{C_L s} \right)$$
$$H(s): \frac{L_4 s}{2 C_4 L_4 s^2 + C_L L_4 s^2 + 2}$$

Filter 653**Filter Type:** BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{L_4 R_L}{2 C_4 L_4 R_L s^2 + C_4 L_4 R_L s^2 + L_4 s + 2 R_L}$$

$$\mathbf{Q}: \sqrt{2} R_L \sqrt{\frac{1}{L_4 \left(2 C_4 + C_L \right)}} \left(2 C_4 + C_L \right)$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 \left(2 C_4 + C_L \right)}}$$

$$\mathbf{Bandwidth:} \frac{1}{R_L \left(2 C_4 + C_L \right)}$$

Filter 654**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s \left(C_L R_L s + 1 \right)}{2 C_4 C_L L_4 R_L s^2 + 2 C_4 L_4 s^2 + C_L L_4 s^2 + 2 C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{\sqrt{2 L_4} \sqrt{\frac{1}{L_4 \left(2 C_4 + C_L \right)}} \left(2 C_4 + C_L \right)}{2 C_L R_L}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 \left(2 C_4 + C_L \right)}}$$

$$\mathbf{Bandwidth:} \frac{2 C_L R_L}{L_4 \left(2 C_4 + C_L \right)}$$

Filter 655

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s \left(C_L L_L s^2 + 1 \right)}{2 C_4 C_L L_4 L_L s^4 + 2 C_4 L_4 s^2 + C_L L_4 s^2 + 2 C_L L_L s^2 + 2}$$

Filter 656

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_4 L_L s}{2 C_4 L_4 L_L s^2 + C_L L_4 L_L s^2 + L_4 + 2 L_L}$$

Filter 657

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s \left(C_L L_L s^2 + C_L R_L s + 1 \right)}{2 C_4 C_L L_4 L_L s^4 + 2 C_4 C_L L_4 R_L s^2 + 2 C_4 L_4 s^2 + C_L L_4 s^2 + 2 C_L L_L s^2 + 2 C_L R_L s + 2}$$

Filter 658**Filter Type:** BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{C_L s} + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 L_L R_L s}{2 C_4 L_4 L_L R_L s^2 + C_L L_4 L_L R_L s^2 + L_4 L_L s + L_4 R_L + 2 L_L R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L \left(2 C_4 + C_L \right)}} \left(2 C_4 + C_L \right)$$

$$\omega_0: \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L \left(2 C_4 + C_L \right)}}$$

$$\mathbf{Bandwidth:} \frac{1}{R_L \left(2 C_4 + C_L \right)}$$

Filter 659

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{L_4 s \left(C_L L_L s^2 + L_L s + R_L \right)}{2 C_4 C_L L_4 L_L R_L s^4 + 2 C_4 L_4 L_L s^2 + 2 C_4 L_4 R_L s^2 + C_L L_4 L_L s^2 + 2 C_L L_L R_L s^2 + L_4 s + 2 L_L s + 2 R_L}$$

Filter 660

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_4 R_L s \left(C_L L_L s^2 + 1 \right)}{2 C_4 C_L L_4 L_L R_L s^4 + 2 C_4 L_4 R_L s^2 + C_L L_4 L_L s^2 + C_L L_4 R_L s^2 + 2 C_L L_L R_L s^2 + L_4 s + 2 L_L s + 2 R_L}$$

Filter 661**Filter Type:** GE

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, R_L \right)$$

$$H(s): \frac{R_L \left(C_L L_L s^2 + C_L R_L s + 1 \right)}{C_4 L_4 s^2 + C_4 R_L s + 2 C_4 R_L s + 1}$$

$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_L + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\mathbf{Bandwidth:} \frac{R_4 + 2 R_L}{L_4}$$

$$\mathbf{Qz:} \frac{L_4 \sqrt{\frac{1}{C_4 L_4}}}{R_L}$$

Filter 662

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L s^2 + C_L R_L s + 1}{s \left(C_4 C_L L_4 s^2 + C_4 C_L R_L s + 2 C_4 + C_L \right)}$$

Filter 663

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L \left(C_L L_4 s^2 + C_L R_L s + 1 \right)}{C_4 C_L L_4 R_L s^2 + C_4 C_L R_L R_L s^2 + C_4 L_4 s^2 + C_4 R_L s + 2 C_L R_L s + C_L R_L s + 1}$$

Filter 664

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L R_L s + 1)(C_4 L_4 s^2 + C_4 R_4 s + 1)}{s(C_4 C_L L_4 s^3 + C_4 C_L R_4 s + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 665

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_L s^2 + 1)(C_4 L_4 s^2 + C_4 R_4 s + 1)}{s(C_4 C_L L_4 s^3 + 2 C_4 C_L L_L s^2 + C_4 C_L R_4 s + 2 C_4 + C_L)}$$

Filter 666

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_L s (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_L R_4 s^3 + C_4 L_4 s^2 + 2 C_4 L_L s^2 + C_4 R_4 s + C_L L_L s^2 + 1}$$

Filter 667

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_L s^2 + C_4 R_4 s + 1)(C_L L_L s^2 + C_L R_L s + 1)}{s(C_4 C_L L_4 s^3 + 2 C_4 C_L L_L s^2 + C_4 C_L R_4 s + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 668

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{\frac{1}{R_L} + \frac{1}{C_L s}}} \right)$$
$$H(s): \frac{L_L R_L s (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L R_L s^4 + C_4 C_L L_L R_L R_L s^3 + C_4 L_4 L_L s^2 + C_4 L_L R_L s^2 + C_4 L_L R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$

Filter 669

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$
$$H(s): \frac{(C_4 L_4 s^2 + C_4 R_4 s + 1)(C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_L R_L s^3 + 2 C_4 C_L L_L R_L s^2 + C_4 L_4 s^2 + C_4 R_4 s + 2 C_L R_L s + C_L L_L s^2 + 1}$$

Filter 670

Invalid filter
$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L (L_L s + C_L^2)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$
$$H(s): \frac{R_L (C_L L_L s^2 + 1)(C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_L R_L s^3 + C_4 C_L L_L R_L s^2 + 2 C_4 C_L L_L R_L s^2 + C_4 C_L R_L s^2 + C_4 L_4 s^2 + C_4 R_4 s + 2 C_L R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 671

Filter Type: BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{C_4 s}}}, \infty, R_L \right)$$
$$H(s): \frac{L_L R_L R_L s}{2 C_4 L_4 R_L R_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_L R_L}$$
$$\mathbf{Q}: \frac{2 C_4 R_4 R_L \sqrt{C_4^2 L_4}}{R_4 + 2 R_L}$$
$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

Bandwidth: $\frac{R_4 + 2 R_L}{2 C_4 R_4 R_L}$

Filter 672

Filter Type: BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{C_4 s}}}, \infty, \frac{1}{C_L s} \right)$$
$$H(s): \frac{L_L R_L s}{2 C_4 L_4 R_L s^2 + C_L L_4 R_L s^2 + 2 L_4 s + 2 R_L}$$
$$\mathbf{Q}: \frac{\sqrt{2} R_L \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}} (2 C_4 + C_L)}{2}$$
$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$$

Bandwidth: $\frac{2}{R_4 (2 C_4 + C_L)}$

Filter 673

Filter Type: BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{C_4 s}}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$
$$H(s): \frac{L_L R_L R_L s}{2 C_4 L_4 R_L R_L s^2 + C_L L_4 R_L R_L s^2 + C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 C_L R_L R_L s + 2 L_4 s + 2 R_L}$$
$$\mathbf{Q}: \frac{\sqrt{2} R_L R_L \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}} (2 C_4 + C_L)}{R_4 + 2 R_L}$$
$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$$

Bandwidth: $\frac{R_4 + 2 R_L}{R_L R_L (2 C_4 + C_L)}$

Filter 674

Filter Type: Invalid110

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{C_4 s}}}, \infty, R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{L_L R_L s (C_L R_L s + 1)}{2 C_4 C_L L_L R_L R_L s^3 + 2 C_4 L_4 R_L s^2 + C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 C_L R_L R_L s + 2 L_4 s + 2 R_L}$$
$$\mathbf{Q}: \frac{\sqrt{2} L + \sqrt{\frac{R_L}{L_4 (2 C_4 R_4 + C_L R_4 + 2 C_L R_L)}} (2 C_4 R_4 + C_L R_4 + 2 C_L R_L)}{2 (C_L R_L R_L + L_4)}$$
$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 R_4 + C_L R_4 + 2 C_L R_L)}}$$

Bandwidth: $\frac{2 (C_L R_L R_L + L_4)}{L_4 (2 C_4 R_4 + C_L R_4 + 2 C_L R_L)}$

Filter 675

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{C_4 s}}}, \infty, L_L s + \frac{1}{C_L s} \right)$$
$$H(s): \frac{L_4 R_L s (C_L L_L s^2 + 1)}{2 C_4 C_L L_L L_L R_L s^3 + 2 C_4 L_4 R_L s^2 + 2 C_L L_4 R_L s^2 + 2 C_L L_L R_L s^2 + 2 C_L L_L R_L s + 2 L_4 s + 2 R_L}$$

Filter 676

Filter Type: BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4 + \frac{1}{C_4 s}}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_L L_L R_L s}{2 C_4 C_L L_L R_L s^2 + C_L L_4 L_L R_L s^2 + 2 L_4 L_L s + L_4 R_L s + 2 L_L R_L}$$
$$\mathbf{Q}: \frac{R_L \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}} (2 C_4 + C_L)}{2}$$
$$\omega_0: \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$$

Bandwidth: $\frac{2}{R_L (2 C_4 + C_L)}$

Filter 677

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{L_4 R_4 s (C_L L_4 s^2 + C_L R_L s + 1)}{2 C_L C_L L_4 L_L R_4 s^4 + 2 C_L C_L L_4 R_4 R_L s^3 + 2 C_L L_4 R_4 s^2 + 2 C_L L_4 L_L s^2 + C_L L_4 R_4 s^2 + 2 C_L L_L R_4 s^2 + 2 C_L R_4 R_L s + 2 L_4 s + 2 R_4}$$

Filter 678

Filter Type: BP

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$
$$H(s): \frac{L_4 L_L R_4 R_L s}{2 C_L L_4 L_L R_4 R_L s^2 + C_L L_4 L_L R_4 R_L s^2 + L_4 L_L R_4 s + 2 L_4 L_L R_L s + L_4 R_4 R_L s + 2 L_L R_L R_L}$$
$$\mathbf{Q:} \frac{R_4 R_L \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_L + C_L)}} (2 C_L + C_L)}{R_4 + 2 R_L}$$
$$\omega_0: \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_L + C_L)}}$$
$$\mathbf{Bandwidth:} \frac{R_4 + 2 R_L}{R_4 R_L (2 C_L + C_L)}$$

Filter 679

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} + R_L \right)$$
$$H(s): \frac{L_4 R_4 s (C_L L_4 R_L s^2 + L_L s + R_L)}{2 C_L C_L L_4 L_L R_4 R_L s^4 + 2 C_L C_L L_4 R_4 R_L s^3 + 2 C_L L_4 R_4 R_L s^2 + C_L L_4 L_L R_4 s^2 + 2 C_L L_L R_4 s^2 + 2 C_L L_L R_4 s + 2 L_4 R_4 s + 2 L_L R_4 R_L}$$

Filter 680

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$
$$H(s): \frac{L_4 R_4 R_L s (C_L L_L s^2 + 1)}{2 C_L C_L L_4 L_L R_4 R_L s^4 + 2 C_L C_L L_4 R_4 R_L s^3 + C_L L_4 L_L R_4 s^3 + 2 C_L L_4 L_L R_L s^2 + C_L L_L R_4 R_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_4 R_L}$$

Filter 681

Filter Type: GE

$$Z(s): \left(\infty, \frac{L_4 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L \right)$$
$$H(s): \frac{R_L (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L L_4 R_4 s^2 + 2 C_L L_4 R_L s^2 + L_4 s + R_4 + 2 R_L}$$
$$\mathbf{Q:} C_4 \sqrt{\frac{1}{C_L L_4}} (R_4 + 2 R_L)$$
$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$
$$\mathbf{Bandwidth:} \frac{1}{C_L (R_4 + 2 R_L)}$$
$$\mathbf{Q\omega:} C_4 R_4 \sqrt{\frac{1}{C_L L_4}}$$

Filter 682

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s} \right)$$
$$H(s): \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_L C_L L_4 R_4 s^3 + 2 C_L L_4 s^2 + C_L L_4 s^2 + C_L L_4 s^2 + C_L R_4 s + L_4 s + R_4 + 2 R_L}$$

Filter 683

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_4}{C_L R_L s + 1} \right)$$
$$H(s): \frac{R_L (C_L L_4 R_L s^2 + L_4 s + R_4)}{C_L C_L L_4 R_L R_L s^3 + C_L L_4 R_4 s^2 + 2 C_L L_4 R_L s^2 + C_L L_4 R_L s^2 + C_L R_4 R_L s + L_4 s + R_4 + 2 R_L}$$

Filter 684

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L R_L s + 1) (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 R_4 R_L s^3 + 2 C_L C_L L_4 R_L s^3 + 2 C_L L_4 s^2 + C_L L_4 s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 685

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_L s^2 + 1) (C_L L_4 R_4 s^2 + L_4 s + R_4)}{2 C_L C_L L_4 L_L s^4 + C_L C_L L_4 R_4 s^3 + 2 C_L L_4 s^2 + C_L L_4 s^2 + 2 C_L L_L s^2 + C_L R_4 s + 2}$$

Filter 686

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$
$$H(s): \frac{L_L s (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 L_L R_4 s^4 + 2 C_L C_L L_4 R_4 s^3 + C_L L_4 R_4 s^2 + C_L L_4 L_L s^2 + C_L L_L R_4 s^2 + L_4 s + 2 L_L s + R_4}$$

Filter 687

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_L s^2 + C_L R_L s + 1) (C_L L_4 R_4 s^2 + L_4 s + R_4)}{2 C_L C_L L_4 L_L s^4 + C_L C_L L_4 R_4 s^3 + 2 C_L C_L L_4 R_4 s^2 + 2 C_L L_4 s^2 + 2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 688

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$
$$H(s): \frac{L_L R_L s (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 L_L R_4 R_L s^4 + C_L C_L L_4 L_L R_4 s^3 + 2 C_L C_L L_4 R_4 s^2 + 2 C_L L_4 L_L R_L s^2 + C_L L_4 R_4 R_L s^2 + C_L L_4 L_L R_L s^2 + L_4 R_4 s + L_L R_4 s + 2 L_L R_L s + R_4 R_L}$$

Filter 689

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$
$$H(s): \frac{(C_L L_4 R_4 s^2 + L_4 s + R_4) (C_L L_L R_L s^2 + L_L s + R_L)}{C_L C_L L_4 L_L R_4 s^4 + 2 C_L C_L L_4 R_L s^3 + 2 C_L C_L L_4 R_L s^2 + 2 C_L L_4 R_4 s^2 + 2 C_L L_L R_L s^2 + C_L L_L R_4 s^2 + L_4 s + 2 L_L s + R_4 + 2 R_L}$$

Filter 690

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$
$$H(s): \frac{R_L (C_L L_L s^2 + 1) (C_L L_4 R_4 s^2 + L_4 s + R_4)}{C_L C_L L_4 L_L R_4 s^4 + 2 C_L C_L L_4 L_L R_L s^3 + C_L C_L L_4 R_4 R_L s^3 + C_L L_4 R_4 s^2 + 2 C_L L_4 R_L s^2 + C_L L_4 L_L s^2 + C_L L_L R_4 s^2 + C_L R_4 R_L s + L_4 s + R_4 + 2 R_L}$$

Filter 691**Filter Type:** BS

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, R_L\right)$$

$$H(s)\colon \frac{R_4R_L\left(C_4L_4s^2+1\right)}{C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}\colon \frac{L_4\sqrt{\frac{C_4^2L_4}{C_4^2L_4}\left(R_4+2R_L\right)}}{2R_LR_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth}\colon \frac{2R_LR_L}{L_4\left(R_4+2R_L\right)}$$

Filter 692**Filter Type:** BS

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)}{C_4C_LL_4R_4s^3+2C_4L_4R_4s^2+2C_4R_4s+C_LR_4s+2}$$

$$\mathbf{Q}\colon \frac{2C_4L_4\sqrt{\frac{C_4^2L_4}{C_4^2L_4}\left(R_4+2R_L\right)}}{R_4\left(2C_4+C_L\right)}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4\left(2C_4+C_L\right)}{2C_4L_4}$$

Filter 693**Filter Type:** BS

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{R_LR_L\left(C_4L_4s^2+1\right)}{C_4C_LL_4R_4R_Ls^3+C_4L_4R_4s^2+2C_4L_4R_LR_Ls^2+2C_4R_4R_Ls+C_LR_4R_Ls+R_L+2R_L}$$

$$\mathbf{Q}\colon \frac{C_4L_4\sqrt{\frac{C_4^2L_4}{C_4^2L_4}\left(R_4+2R_L\right)}}{R_4R_L\left(2C_4+C_L\right)}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4L_4}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4R_L\left(2C_4+C_L\right)}{C_4L_4\left(R_4+2R_L\right)}$$

Filter 694

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LR_Ls+1\right)}{C_4C_LL_4R_4s^3+2C_4C_LL_4R_Ls^2+2C_4C_LL_4R_LR_Ls^2+2C_4L_4R_4s^2+2C_4L_4s+C_LR_4s+2C_LR_Ls+2}$$

Filter 695

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LL_Ls^2+1\right)}{2C_4C_LL_4L_Ls^3+C_4C_LL_4R_4s^2+2C_4C_LL_4R_4s^2+2C_4L_4R_4s^2+2C_4L_4s+2C_4R_4s+2C_LL_Ls^2+C_LR_4s+2}$$

Filter 696

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, \frac{L_Ls}{C_LL_Ls+1}\right)$$

$$H(s)\colon \frac{L_LR_4s\left(C_4L_4s^2+1\right)}{C_4C_LL_4L_LR_4s^3+2C_4L_4L_LR_4s^2+C_4L_4L_LR_4s^2+2C_4L_4R_4s^2+2C_4L_LR_4s^2+2L_Ls+R_L}$$

Filter 697

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LL_Ls^2+C_LR_Ls+1\right)}{2C_4C_LL_4L_LL_Ls^3+C_4C_LL_4R_4s^2+2C_4C_LL_4R_4s^2+2C_4C_LL_4R_4s^2+2C_4L_LL_4s^2+2C_4R_4s+2C_LL_Ls^2+C_LR_4s+2C_LR_Ls+2}$$

Filter 698

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, \frac{1}{C_Ls+\frac{1}{L_LL_Ls}}\right)$$

$$H(s)\colon \frac{L_LR_4R_Ls\left(C_4L_4s^2+1\right)}{C_4C_LL_4L_LR_LR_Ls^3+C_4C_LL_4L_LR_4s^2+2C_4L_LL_4R_Ls^2+C_4L_LR_4R_Ls^2+2C_4L_LR_4R_Ls^2+C_LL_4R_4s^2+L_LR_4s+2L_LR_Ls+R_LR_L}$$

Filter 699

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, \frac{L_LR_4}{C_LL_4s^2+1}+R_L\right)$$

$$H(s)\colon \frac{R_4\left(C_4L_4s^2+1\right)\left(C_LL_LR_Ls^2+L_Ls+R_L\right)}{C_4C_LL_4L_LR_4s^3+2C_4C_LL_4L_LR_Ls^2+2C_4C_LL_4R_4R_Ls^2+2C_4L_LR_4R_Ls^2+C_4L_LR_4R_Ls^2+2C_4L_LR_4R_Ls^2+C_LL_4R_4s^2+C_LR_4s^2+2C_LL_LR_Ls^2+2L_Ls+R_L+2R_L}$$

Filter 700

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2L_4}\right)}{L_4s+R_4+\frac{1}{C_4^2L_4}}, \infty, \frac{R_L\left(L_4s+\frac{1}{C_L^2L_4}\right)}{L_Ls+R_L+\frac{1}{C_L^2L_4}}\right)$$

$$H(s)\colon \frac{R_4R_L\left(C_4L_4s^2+1\right)\left(C_LL_Ls^2+1\right)}{C_4C_LL_4L_LR_4s^3+2C_4C_LL_4L_LR_Ls^2+C_4C_LL_4R_4R_Ls^2+2C_4C_LL_4R_4R_Ls^2+C_4L_LR_4R_Ls^2+2C_4L_LR_4R_Ls^2+2C_4L_LR_4R_Ls^2+C_LL_4R_4s^2+C_LR_4s^2+2C_LL_LR_Ls^2+C_LR_4R_Ls+R_4+2R_L}$$

Filter 701

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2L_2}\right)}{L_2s+R_2+\frac{1}{C_2^2L_2}}, \infty, R_4, \infty, R_L\right)$$

$$H(s)\colon \frac{R_LR_L}{R_4+2R_L}$$

Filter 702

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2L_2}\right)}{L_2s+R_2+\frac{1}{C_2^2L_2}}, \infty, R_4, \infty, \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4}{C_LR_4s+2}$$

Filter 703

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2L_2}\right)}{L_2s+R_2+\frac{1}{C_2^2L_2}}, \infty, R_4, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{R_4R_L}{C_LR_LR_Ls+R_4+2R_L}$$

Filter 704

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2L_2}\right)}{L_2s+R_2+\frac{1}{C_2^2L_2}}, \infty, R_4, \infty, R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_LR_Ls+1\right)}{C_LR_4s+2C_LR_Ls+2}$$

Filter 705**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 \left(C_L L_L s^2 + 1 \right)}{2 C_L L_L s^2 + C_L R_4 s + 2}$$

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L^2 L_L^2}}{R_4}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_4}{2 L_L}$$

Filter 706**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_4 s}{C_L L_L R_4 s^2 + 2 L_L s + R_4}$$

$$\mathbf{Q}: \frac{C_L R_4 \sqrt{C_L^2 L_L^2}}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{2}{C_L R_4}$$

Filter 707**Filter Type:** GE

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 \left(C_L L_L s^2 + C_L R_L s + 1 \right)}{2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L^2 L_L^2}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_4 + 2 R_L}{2 L_L}$$

$$\mathbf{Qz: } \frac{L_L \sqrt{C_L^2 L_L^2}}{R_L}$$

Filter 708**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, R_4, \infty, \frac{1}{C_L s + \frac{1}{L_L^2 s}} \right)$$

$$H(s): \frac{L_L R_4 R_L s}{C_L L_L R_4 R_L s^2 + L_L R_4 s + 2 L_L R_L s + R_4 R_L}$$

$$\mathbf{Q}: \frac{C_L R_4 R_L \sqrt{C_L^2 L_L^2}}{R_4 + 2 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_4 + 2 R_L}{C_L R_4 R_L}$$

Filter 709**Filter Type:** GE

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4 \left(C_L L_L R_L s^2 + L_L s + R_L \right)}{C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + 2 L_L R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{C_L \sqrt{C_L^2 L_L^2} \left(R_4 + 2 R_L \right)}{2}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{2}{C_L \left(R_4 + 2 R_L \right)}$$

$$\mathbf{Qz: } C_L R_L \sqrt{\frac{1}{C_L^2 L_L}}$$

Filter 710**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, R_4, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2 s} \right)}{L_L s + R_L + \frac{1}{C_L^2 s}} \right)$$

$$H(s): \frac{R_4 R_L \left(C_L L_L s^2 + 1 \right)}{C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + C_L R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q}: \frac{L_L \sqrt{C_L^2 L_L^2} \left(R_4 + 2 R_L \right)}{R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\textbf{Bandwidth: } \frac{R_4 R_L}{L_L \left(R_4 + 2 R_L \right)}$$

Filter 711

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, \frac{1}{C_4 s}, \infty, R_L \right)$$

$$H(s): \frac{R_L}{2 C_4 R_L s + 1}$$

Filter 712

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{1}{s \left(2 C_4 + C_L \right)}$$

Filter 713

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{R_k}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_k}{2 C_4 R_L s + C_L R_L s + 1}$$

Filter 714

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L R_k s + 1}{s \left(2 C_4 C_L R_L s + 2 C_4 + C_L \right)}$$

Filter 715

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L \left(L_L s^2 + 1 \right)}{s \left(2 C_4 C_L L_L s^2 + 2 C_4 + C_L \right)}$$

Filter 716

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2^2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s}{2 C_4 L_L s^2 + C_L L_L s^2 + 1}$$

Filter 717

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_L L_L R_L s^2 + C_L R_L s + 1}{s(2C_L C_L L_L L_L s^3 + 2C_L C_L R_L R_L s + 2C_L + C_L)}$$

Filter 718**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + R_L + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_L}{2C_L L_L R_L R_L s^2 + C_L L_L R_L s^2 + L_L s + R_L}$$

$$\mathbf{Q}: R_L \sqrt{\frac{1}{L_L (2C_L + C_L)}} (2C_L + C_L)$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_L + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{1}{R_L (2C_L + C_L)}$$

Filter 719

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{C_L L_L R_L s^2 + L_L s + R_L}{2C_L C_L L_L L_L s^3 + 2C_L R_L s^2 + 2C_L R_L s + C_L L_L s^2 + 1}$$

Filter 720**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_L C_L L_L R_L s^2 + 2C_L R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_L^2 C_L}}}{R_L (2C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L (2C_L + C_L)}{C_L L_L}$$

Filter 721

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, R_L \right)$$

$$H(s): \frac{R_L R_L}{2C_L R_L R_L s + R_L + 2R_L}$$

Filter 722

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L}{2C_L R_L s + C_L R_L s + 2}$$

Filter 723

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L R_L}{2C_L R_L R_L s + C_L R_L R_L s + R_L + 2R_L}$$

Filter 724**Filter Type:** Invalid011

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L R_L s + 1)}{2C_L C_L R_L R_L s^2 + 2C_L R_L s + C_L R_L s + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_L C_L R_L \sqrt{\frac{1}{C_L^2 C_L R_L R_L}}}{2C_L R_L s + C_L R_L s + 2C_L R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_L C_L R_L R_L}}$$

$$\mathbf{Bandwidth}: \frac{2C_L R_L + C_L R_L + 2C_L R_L}{2C_L C_L R_L R_L}$$

Filter 725**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{2C_L C_L L_L R_L s^2 + 2C_L R_L s + 2C_L L_L s^2 + C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{2C_L L_L \sqrt{\frac{1}{C_L^2 L_L}}}{R_L (2C_L + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

$$\mathbf{Bandwidth}: \frac{R_L (2C_L + C_L)}{2C_L L_L}$$

Filter 726**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_L s}{2C_L L_L R_L R_L s^2 + C_L L_L R_L s^2 + 2L_L s + R_L}$$

$$\mathbf{Q}: \frac{R_L \sqrt{\frac{1}{L_L (2C_L + C_L)}} (2C_L + C_L)}{R_L + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_L + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{2}{R_L (2C_L + C_L)}$$

Filter 727

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_L (C_L L_L s^2 + C_L R_L s + 1)}{2C_L C_L L_L R_L s^3 + 2C_L C_L R_L R_L s^2 + 2C_L R_L s + 2C_L R_L s + C_L R_L s + 2C_L R_L s + 2}$$

Filter 728**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{1}{C_L s + R_L + \frac{1}{L_L s}} \right)$$

$$H(s): \frac{L_L R_L R_L s}{2C_L L_L R_L R_L s^2 + C_L L_L R_L R_L s^2 + L_L R_L s + 2L_L R_L s + R_L R_L}$$

$$\mathbf{Q}: \frac{R_L R_L \sqrt{\frac{1}{L_L (2C_L + C_L)}} (2C_L + C_L)}{R_L + 2R_L}$$

$$\omega_0: \sqrt{\frac{1}{L_L (2C_L + C_L)}}$$

$$\mathbf{Bandwidth}: \frac{R_L + 2R_L}{R_L R_L (2C_L + C_L)}$$

Filter 729

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$
$$H(s): \frac{R_4 (C_L L_L R_L s^2 + L_L s + R_L)}{2 C_4 C_L L_L R_4 R_L s^3 + 2 C_4 L_L R_4 s^2 + 2 C_4 R_4 R_L s + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$

Filter 730

Filter Type: BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$
$$H(s): \frac{R_4 R_L (C_L L_L s^2 + 1)}{2 C_4 C_L L_L R_4 R_L s^3 + 2 C_4 R_4 R_L s + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + C_L R_4 R_L s + R_4 + 2 R_L}$$
$$Q: \frac{C_L L_L \sqrt{\frac{1}{C_L^2 L_L^2}} (R_4 + 2 R_L)}{R_4 R_L (2 C_L + C_L)}$$
$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

Bandwidth: $\frac{R_4 R_L (2 C_L + C_L)}{C_L L_L (R_4 + 2 R_L)}$

Filter 731

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, R_L \right)$$
$$H(s): \frac{R_L (C_4 R_4 s + 1)}{C_4 R_4 s + 2 C_4 R_L s + 1}$$

Filter 732

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$
$$H(s): \frac{C_L R_4 s + 1}{s (C_L C_L R_4 s + 2 C_4 + C_L)}$$

Filter 733

Filter Type: Invalid011

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$
$$H(s): \frac{R_L (C_4 R_4 s + 1)}{C_4 C_L R_4 R_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L R_L s + 1}$$
$$Q: \frac{C_4 C_L R_4 R_L \sqrt{\frac{1}{C_L^2 C_L^2 R_L R_L}}}{C_L R_4 + 2 C_L R_L + C_L R_L}$$
$$\omega_0: \sqrt{\frac{1}{C_L^2 C_L R_L R_L}}$$

Bandwidth: $\frac{C_4 R_4 + 2 C_4 R_L + C_L R_L}{C_4 C_L R_4 R_L}$

Filter 734

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L R_4 s + 1) (C_L R_L s + 1)}{s (C_4 C_L R_4 s + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 735

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_4 R_4 s + 1) (C_L L_L s^2 + 1)}{s (2 C_4 C_L L_L s^3 + C_L C_L R_4 s + 2 C_L s + C_L)}$$

Filter 736

Filter Type: Invalid110

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_L s (C_4 R_4 s + 1)}{C_4 C_L L_L R_4 s^3 + 2 C_4 L_L R_4 s^2 + C_4 R_4 s + C_L L_L s^2 + 1}$$
$$Q: \frac{L_L \sqrt{\frac{1}{L_L (2 C_4 + C_L)}}}{C_4 R_4}$$
$$\omega_0: \sqrt{\frac{1}{L_L (2 C_4 + C_L)}}$$

Bandwidth: $\frac{C_4 R_4}{L_L (2 C_4 + C_L)}$

Filter 737

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_4 R_4 s + 1) (C_L L_L s^2 + C_L R_L s + 1)}{s (2 C_4 C_L L_L R_L s^3 + C_4 C_L R_4 s + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 738

Filter Type: Invalid110

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{L_L s}} \right)$$
$$H(s): \frac{L_L R_L s (C_4 R_4 s + 1)}{C_4 C_L L_L R_4 R_L s^3 + C_L L_L R_4 s^2 + 2 C_4 L_L R_L s^2 + C_4 R_4 R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$
$$Q: \frac{L_L \sqrt{\frac{1}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}}}{C_4 R_4 R_L + L_L}$$
$$\omega_0: \sqrt{\frac{1}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}}$$

Bandwidth: $\frac{C_4 R_4}{L_L (C_4 R_4 + 2 C_4 R_L + C_L R_L)}$

Filter 739

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$
$$H(s): \frac{(C_L R_4 s + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_L R_4 s^3 + 2 C_4 C_L L_L R_L s^2 + 2 C_4 L_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 740

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$
$$H(s): \frac{R_L (C_L R_L s + 1) (C_L L_L s^2 + 1)}{C_L C_L R_4 R_L s^3 + 2 C_4 C_L L_L R_L s^2 + C_L C_L R_L s^2 + C_L R_4 s + 2 C_L R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 741

Filter Type: BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L \right)$$
$$H(s): \frac{R_L (C_L L_L s^2 + 1)}{C_L C_L R_4 s^3 + 2 C_L L_L R_L s^2 + 2 C_L R_L s + 1}$$
$$Q: \frac{L_4 \sqrt{\frac{1}{C_L^2 L_L^2}}}{2 R_L}$$
$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$

Bandwidth: $\frac{2 R_L}{L_4}$

Filter 742

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_4 L_4 s^2 + 1}{s(C_4 C_L L_4 s^2 + 2C_4 + C_L)}$$

Filter 743**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L (C_L L_4 s^2 + 1)}{C_L C_L L_4 R_L s^3 + C_L L_4 s^2 + 2C_4 R_L s + C_L R_L s + 1}$$

$$\mathbf{Q}: \frac{C_4 L_4 \sqrt{\frac{1}{C_4^* L_4}}}{R_L (2C_4 + C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4^* L_4}}$$

$$\text{Bandwidth: } \frac{R_L (2C_4 + C_L)}{C_4 L_4}$$

Filter 744

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + 1)(C_L R_L s + 1)}{s(C_4 C_L L_4 s^2 + 2C_4 C_L R_L s + 2C_4 + C_L)}$$

Filter 745

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + 1)(C_L L_L s^2 + 1)}{s(C_4 C_L L_4 s^2 + 2C_4 C_L L_L s^2 + 2C_4 + C_L)}$$

Filter 746

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 L_L s^4 + C_4 L_4 s^2 + 2C_4 L_L s^2 + C_L L_L s^2 + 1}$$

Filter 747

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + 1)(C_L L_L s^2 + C_L R_L s + 1)}{s(C_4 C_L L_4 s^2 + 2C_4 C_L L_L s^2 + 2C_4 C_L R_L s + 2C_4 + C_L)}$$

Filter 748

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

$$H(s): \frac{L_L R_L s (C_4 L_4 s^2 + 1)}{C_L C_L L_4 L_L s^4 + C_4 C_L L_4 R_L s^3 + C_4 L_4 L_L s^3 + C_4 R_L s^3 + 2C_4 L_L R_L s^2 + C_L R_L s^2 + L_L s + R_L}$$

Filter 749

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_4 L_4 s^2 + 1)(C_L L_L R_L s^2 + L_L s + R_L)}{C_L C_L L_4 L_L s^4 + 2C_4 C_L L_L R_L s^3 + C_L L_4 s^3 + 2C_4 L_L s^2 + 2C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 750

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^*} \right)}{L_L s + R_L + \frac{1}{C_L^*}} \right)$$

$$H(s): \frac{R_L (C_4 L_4 s^2 + 1)(C_L L_L s^2 + 1)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_L s^3 + 2C_4 C_L L_L R_L s^3 + C_4 L_4 s^3 + C_4 L_4 s^2 + 2C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 751**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L \right)$$

$$H(s): \frac{L_4 R_L s}{2C_4 L_4 R_L s^2 + C_4 L_4 R_L s^2 + L_4 s^2 + 2R_L}$$

$$\mathbf{Q}: 2C_4 R_L \sqrt{\frac{1}{C_4 L_4}}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\text{Bandwidth: } \frac{1}{2C_4 R_L}$$

Filter 752

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s}{2C_4 L_4 s^2 + C_L L_4 s^2 + 2}$$

Filter 753**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{L_4 R_L s}{2C_4 L_4 R_L s^2 + C_4 L_4 R_L s^2 + L_4 s^2 + L_L s + 2R_L}$$

$$\mathbf{Q}: \sqrt{2} R_L \sqrt{\frac{1}{L_4 (2C_4 + C_L)}} (2C_4 + C_L)$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2C_4 + C_L)}}$$

$$\text{Bandwidth: } \frac{1}{R_L (2C_4 + C_L)}$$

Filter 754**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_4 s (C_L R_L s + 1)}{2C_4 C_L L_4 R_L s^3 + 2C_4 L_4 s^2 + C_L L_4 s^2 + 2C_L R_L s + 2}$$

$$\mathbf{Q}: \frac{\sqrt{2} L_4 \sqrt{\frac{1}{L_4 (2C_4 + C_L)}}}{2C_L R_L}$$

$$\omega_0: \sqrt{2} \sqrt{\frac{1}{L_4 (2C_4 + C_L)}}$$

$$\text{Bandwidth: } \frac{2C_L R_L}{L_4 (2C_4 + C_L)}$$

Filter 755

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$
$$H(s): \frac{L_4 s (C_L L_L L_L s^2 + 1)}{2 C_4 C_L L_4 L_L s^4 + 2 C_4 L_4 L_L s^3 + C_L L_4 s^2 + 2 C_L L_L s^2 + 2}$$

Filter 756

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_4 L_4 s}{2 C_4 L_4 L_L s^3 + C_L L_4 L_L s^2 + L_4 + 2 L_L}$$

Filter 757

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{L_4 s (C_L L_L L_L s^2 + C_L R_L s + 1)}{2 C_4 C_L L_4 L_L s^4 + 2 C_4 C_L L_4 R_L s^3 + 2 C_4 L_4 s^2 + C_L L_4 s^2 + 2 C_L L_L s^2 + 2 C_L R_L s + 2}$$

Filter 758

Filter Type: BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$
$$H(s): \frac{L_4 L_L R_L s}{2 C_4 L_4 L_L R_L s^2 + C_L L_4 L_L s^2 + L_4 L_L s + L_4 R_L + 2 L_L R_L}$$

Q: $R_L \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$ $(2 C_4 + C_L)$

ω_0 : $\sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$

Bandwidth: $\frac{1}{R_L (2 C_4 + C_L)}$

Filter 759

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{L_4 s}{C_L L_4 s^2 + 1} + R_L \right)$$
$$H(s): \frac{L_4 s (C_L L_L R_L s^2 + L_L s + R_L)}{2 C_4 C_L L_4 L_L R_L s^3 + 2 C_4 L_4 R_L s^2 + 2 C_4 L_4 L_L s^2 + C_L L_4 R_L s^2 + C_L L_L s^2 + 2 C_L L_L R_L s^2 + L_4 s + 2 L_L s + 2 R_L}$$

Filter 760

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$
$$H(s): \frac{L_4 R_L s (C_L L_L s^2 + 1)}{2 C_4 C_L L_4 L_L R_L s^3 + 2 C_4 L_4 R_L s^2 + C_L L_4 L_L s^2 + 2 C_L L_L R_L s^2 + 2 C_L L_L L_L s^2 + L_4 s + 2 R_L}$$

Filter 761

Filter Type: GE

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_{L4}}, \infty, R_L \right)$$
$$H(s): \frac{R_L (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 L_4 s^2 + C_4 R_4 s + 2 C_4 R_L s + 1}$$

Q: $\frac{L_4 \sqrt{C_4 L_4}}{R_L + 2 R_L}$

ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$

Bandwidth: $\frac{B_4 + 2 B_L}{L_4}$

Qz: $\frac{L_4 \sqrt{C_4 L_4}}{R_4}$

Filter 762

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_{L4}}, \infty, \frac{1}{C_L s} \right)$$
$$H(s): \frac{C_4 L_4 s^2 + C_4 R_4 s + 1}{s (C_4 C_L L_4 s^2 + C_4 C_L R_4 s + 2 C_4 + C_L)}$$

Filter 763

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_{L4}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$
$$H(s): \frac{R_L (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 R_L s^3 + C_4 C_L R_L R_L s^2 + C_4 L_4 s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L R_L s + 1}$$

Filter 764

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_{L4}}, \infty, R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L R_L s + 1) (C_4 L_4 s^2 + C_4 R_4 s + 1)}{s (C_4 C_L L_4 s^2 + C_4 C_L R_4 s + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 765

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_{L4}}, \infty, L_L s + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_L L_L s^2 + 1) (C_4 L_4 s^2 + C_4 R_4 s + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L L_L s^2 + C_4 C_L R_4 s + C_L R_4 s + 2 C_4 + C_L)}$$

Filter 766

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_{L4}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_L s (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_L R_4 s^3 + C_4 L_4 L_L s^2 + 2 C_4 L_L s^2 + C_L R_4 s + C_L L_L s^2 + 1}$$

Filter 767

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_{L4}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{(C_4 L_4 s^2 + C_4 R_4 s + 1) (C_L L_L s^2 + C_L R_L s + 1)}{s (C_4 C_L L_4 s^2 + 2 C_4 C_L L_L s^2 + C_4 C_L R_4 s + 2 C_4 C_L R_L s + 2 C_4 + C_L)}$$

Filter 768

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_{L4}}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$
$$H(s): \frac{L_L R_L s (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L R_L s^4 + C_4 C_L L_L R_L R_L s^3 + C_4 L_4 L_L s^2 + C_4 L_4 R_L s^2 + C_4 L_L R_L s^2 + 2 C_L L_L R_L s^2 + C_4 R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$

Filter 769

Invalid filter

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{L_6 s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) \colon \frac{(C_4 L_4 s^2 + C_4 R_4 s + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_L R_L s^3 + 2 C_4 C_L L_L R_L s^2 + C_4 L_4 s^3 + 2 C_4 L_4 s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + 1}$$

Filter 770

Invalid filter

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s^2}} \right)$$

$$H(s) \colon \frac{R_L (C_L L_2 s^2 + 1) (C_L L_4 s^2 + C_4 R_4 s + 1)}{C_4 C_L L_4 L_L s^4 + C_4 C_L L_L R_L s^3 + C_4 C_L L_L R_L s^2 + 2 C_4 C_L L_L R_L s^2 + 2 C_4 C_L L_L R_L s^2 + C_4 R_4 s + 2 C_4 R_L s + C_L L_L s^2 + C_L R_L s + 1}$$

Filter 771

Filter Type: BP

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, R_L \right)$$

$$H(s) \colon \frac{L_4 R_4 R_L s}{2 C_4 L_4 R_L R_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_4 R_L}$$

$$\mathbf{Q} \colon \frac{2 C_4 R_4 R_L \sqrt{C_4 L_4}}{R_4 + 2 R_L}$$

$$\omega_0 \colon \sqrt{\frac{1}{C_4 L_4}}$$

$$\textbf{Bandwidth} \colon \frac{R_4 + 2 R_L}{2 C_4 R_4 R_L}$$

Filter 772

Filter Type: BP

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s) \colon \frac{L_4 R_4 s}{2 C_4 L_4 R_4 s^2 + C_L L_4 R_4 s^2 + L_4 R_4 s + 2 L_4 s + 2 R_4}$$

$$\mathbf{Q} \colon \frac{2}{\sqrt{2} R_4 \sqrt{L_4 (2 C_4 + C_L)} (2 C_4 + C_L)}$$

$$\omega_0 \colon \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$$

$$\textbf{Bandwidth} \colon \frac{2}{R_4 (2 C_4 + C_L)}$$

Filter 773

Filter Type: BP

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s) \colon \frac{L_4 R_4 R_L s}{2 C_4 C_L L_L R_L s^2 + C_L L_4 R_L s^2 + C_L L_4 R_L s^2 + 2 C_L L_4 R_L s^2 + 2 C_L L_4 R_L s + 2 L_4 R_L s + 2 R_4 R_L}$$

$$\mathbf{Q} \colon \frac{\sqrt{2} R_4 \sqrt{\frac{1}{L_4 (2 C_4 + C_L)} (2 C_4 + C_L)}}{R_4 + 2 R_L}$$

$$\omega_0 \colon \sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$$

$$\textbf{Bandwidth} \colon \frac{R_4 + 2 R_L}{R_4 R_L (2 C_4 + C_L)}$$

Filter 774

Filter Type: Invalid110

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s) \colon \frac{L_4 R_4 s (C_L R_L s + 1)}{2 C_4 C_L L_L R_L s^3 + 2 C_4 L_4 R_L s^2 + C_L L_4 R_L s^2 + 2 C_L L_4 R_L s^2 + 2 C_L R_L R_L s + 2 L_4 s + 2 R_4}$$

$$\mathbf{Q} \colon \frac{\sqrt{2} L_4 \sqrt{\frac{R_4}{L_4 (2 C_4 R_4 + C_L R_L R_L + 2 C_L R_L R_L)}} (2 C_4 R_4 + C_L R_4 + 2 C_L R_L)}{2 C_L R_4 R_L + L_4}$$

$$\omega_0 \colon \sqrt{2} \sqrt{\frac{R_4}{L_4 (2 C_4 R_4 + C_L R_L R_L + 2 C_L R_L R_L)}}$$

$$\textbf{Bandwidth} \colon \frac{2 (C_L R_4 R_L + L_4)}{L_4 (2 C_4 R_4 + C_L R_L R_L + 2 C_L R_L R_L)}$$

Filter 775

Invalid filter

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s) \colon \frac{L_4 R_4 s (C_L L_L s^2 + 1)}{2 C_4 C_L L_L R_L s^4 + 2 C_4 L_4 R_L s^3 + 2 C_L L_4 R_L s^3 + C_L L_4 R_L s^3 + 2 C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 L_4 s + 2 R_4}$$

Filter 776

Filter Type: BP

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} \right)$$

$$H(s) \colon \frac{L_4 L_L R_4 s}{2 C_4 C_L L_L R_L s^2 + C_L L_4 L_L R_L s^2 + 2 L_4 L_L R_L s + L_4 R_4 s + 2 L_L R_4}$$

$$\mathbf{Q} \colon \frac{R_4 \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}} (2 C_4 + C_L)}{2}$$

$$\omega_0 \colon \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$$

$$\textbf{Bandwidth} \colon \frac{2}{R_4 (2 C_4 + C_L)}$$

Filter 777

Invalid filter

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s) \colon \frac{L_4 R_4 s (C_L L_L s^2 + C_L R_L s + 1)}{2 C_4 C_L L_4 L_L R_L s^4 + 2 C_4 C_L L_4 R_L s^3 + 2 C_4 L_4 R_L s^3 + 2 C_L L_4 R_L s^3 + C_L L_4 R_L s^3 + 2 C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 L_4 s + 2 R_4 + 2 R_L}$$

Filter 778

Filter Type: BP

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

$$H(s) \colon \frac{L_4 L_L R_4 R_L s}{2 C_4 C_L L_L R_L s^2 + C_L L_4 L_L R_L s^2 + L_4 L_L R_L s^2 + 2 L_4 L_L R_L s + L_4 R_L s + 2 L_L R_L R_L}$$

$$\mathbf{Q} \colon \frac{R_4 R_L \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}} (2 C_4 + C_L)}{R_4 + 2 R_L}$$

$$\omega_0 \colon \sqrt{\frac{L_4 + 2 L_L}{L_4 L_L (2 C_4 + C_L)}}$$

$$\textbf{Bandwidth} \colon \frac{R_4 + 2 R_L}{R_4 R_L (2 C_4 + C_L)}$$

Filter 779

Invalid filter

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s) \colon \frac{L_4 R_4 s (C_L L_L R_L s^2 + L_L s + R_L)}{2 C_4 C_L L_4 L_L R_L R_L s^4 + 2 C_4 C_L L_4 L_L R_L s^3 + 2 C_4 L_4 R_L s^3 + 2 C_L L_4 R_L s^3 + C_L L_4 R_L s^3 + 2 C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + 2 L_4 s + 2 L_4 R_L s + 2 L_L R_L s + 2 R_4 R_L}$$

Filter 780

Invalid filter

$$Z(s) \colon \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s^2}} \right)$$

$$H(s) \colon \frac{L_4 R_L s (C_L L_L s^2 + 1)}{2 C_4 C_L L_4 L_L R_L R_L s^4 + 2 C_4 L_4 R_L s^3 + C_L L_4 L_L R_L s^3 + 2 C_L L_4 R_L s^3 + C_L L_4 R_L s^3 + 2 C_L L_L R_L s^2 + 2 C_L L_L R_L s^2 + L_4 R_4 s + 2 L_4 R_L s + 2 R_L R_L}$$

Filter 781**Filter Type:** GE

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L \right)$$

$$H(s): \frac{R_L \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{C_4 L_4 R_4 s^2 + 2 C_4 L_4 R_4 s^2 + L_4 s + R_4 + 2 R_L}$$

$$\mathbf{Q:} \ C_4 \sqrt{\frac{1}{C_4 L_4}} \left(R_4 + 2 R_L \right)$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\mathbf{Bandwidth:} \ \frac{1}{C_4 \left(R_4 + 2 R_L \right)}$$

$$\mathbf{Qz:} \ C_4 R_4 \sqrt{\frac{1}{C_4 L_4}}$$

Filter 782

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{C_4 L_4 R_4 s^2 + L_4 s + R_4}{C_4 C_L L_4 R_4 s^3 + 2 C_4 L_4 s^2 + C_L L_4 s^2 + C_L L_4 s^2 + C_L R_4 s + 2}$$

Filter 783

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_L \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{C_4 C_L L_4 R_4 R_L s^3 + C_4 L_4 R_4 s^3 + 2 C_4 L_4 R_L s^2 + 2 C_4 L_4 s^2 + C_L L_4 R_L s^2 + C_L R_4 R_L s + L_4 s + R_4 + 2 R_L}$$

Filter 784

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L R_L s + 1) \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_4 R_L s^3 + 2 C_4 L_4 s^2 + 2 C_4 L_4 s^2 + C_L L_4 s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 785

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_L s^2 + 1) \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{2 C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_4 R_L s^3 + 2 C_4 L_4 s^2 + C_L L_4 s^2 + 2 C_L L_L s^2 + C_L R_4 s + 2}$$

Filter 786

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L s \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 C_L L_4 L_L s^3 + C_4 L_4 L_L s^3 + C_4 L_4 R_4 s^2 + C_L L_4 L_L s^2 + C_L L_L R_4 s^2 + L_4 s + 2 L_L s + R_4}$$

Filter 787

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{(C_L L_L s^2 + C_L R_L s + 1) \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{2 C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_4 R_L s^3 + 2 C_4 L_4 s^2 + 2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 788

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_L s + \frac{1}{L_L + \frac{1}{C_L}}} \right)$$

$$H(s): \frac{L_L R_L s \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{C_4 C_L L_4 L_L R_4 R_L s^4 + C_L L_4 L_L R_4 s^3 + 2 C_4 L_L L_L R_L s^3 + C_4 L_4 R_4 R_L s^2 + C_L L_4 L_L R_L s^2 + C_L L_L R_L s^2 + L_4 s + L_L R_L s + L_L R_L s + 2 L_L R_L s + R_L}$$

Filter 789

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{(C_4 L_4 R_4 s^2 + L_4 s + R_4) \left(C_L L_L R_L s^2 + L_L s + R_L \right)}{C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 C_L L_L R_L s^3 + 2 C_4 L_4 L_L s^3 + C_4 L_4 R_4 R_L s^2 + C_L L_4 L_L R_L s^2 + C_L L_L R_L s^2 + L_4 s + 2 C_L L_L R_L s^2 + L_4 s + 2 L_L s + R_4 + 2 R_L}$$

Filter 790

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$

$$H(s): \frac{R_L \left(C_L L_L s^2 + 1 \right) \left(C_4 L_4 R_4 s^2 + L_4 s + R_4 \right)}{C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 C_L L_L R_L s^3 + C_4 C_L L_4 R_4 R_L s^3 + C_4 L_4 R_4 s^2 + 2 C_4 L_L R_L s^2 + C_L L_4 L_L s^2 + C_L L_L R_L s^2 + C_L R_4 R_L s^2 + 2 C_L L_L R_L s^2 + L_4 s + R_4 + 2 R_L}$$

Filter 791**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, R_L \right)$$

$$H(s): \frac{R_L R_4 \left(C_4 L_4 s^2 + 1 \right)}{C_4 C_L L_4 R_4 s^2 + 2 C_4 L_4 R_L s^2 + 2 C_4 R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q:} \ \frac{L_4 \sqrt{\frac{1}{C_4^2 C_L}} \left(R_4 + 2 R_L \right)}{2 R_4 R_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\mathbf{Bandwidth:} \ \frac{2 R_4 R_L}{L_4 \left(R_4 + 2 R_L \right)}$$

Filter 792**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 \left(C_4 L_4 s^2 + 1 \right)}{C_4 C_L L_4 R_4 s^2 + 2 C_4 L_4 R_L s^2 + 2 C_4 R_4 s + C_L R_4 s + R_4 + 2 R_L}$$

$$\mathbf{Q:} \ \frac{2 C_4 L_4 \sqrt{\frac{1}{C_4^2 C_L}}}{R_4 \left(2 C_4 + C_L \right)}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\mathbf{Bandwidth:} \ \frac{R_4 \left(2 C_4 + C_L \right)}{2 C_4 L_4}$$

Filter 793**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_4 R_L \left(C_4 L_4 s^2 + 1 \right)}{C_4 C_L L_4 R_4 R_L s^3 + C_4 L_4 R_4 s^2 + 2 C_4 L_4 R_L s^2 + 2 C_4 R_4 R_L s + C_L R_4 R_L s + R_4 + 2 R_L}$$

$$\mathbf{Q:} \ \frac{C_4 L_4 \sqrt{\frac{1}{C_4^2 C_L}} \left(R_4 + 2 R_L \right)}{R_4 R_L \left(2 C_4 + C_L \right)}$$

$$\omega_0: \sqrt{\frac{1}{C_4 L_4}}$$

$$\mathbf{Bandwidth:} \ \frac{R_4 R_L \left(2 C_4 + C_L \right)}{C_4 L_4 \left(R_4 + 2 R_L \right)}$$

Filter 794

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2 + 1) (C_L R_L s + 1)}{C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_4 R_L s^2 + 2 C_4 C_L R_4 R_L s^2 + 2 C_4 L_4 s^2 + 2 C_4 R_4 s + C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 795

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, L_L s + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2 + 1) (C_L L_L s^2 + 1)}{2 C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_L s^3 + C_4 C_L L_4 R_L s^3 + 2 C_4 C_L L_L R_4 s^3 + 2 C_4 L_4 s^2 + 2 C_4 R_4 s + C_L R_4 s + 2 C_L L_L s^2 + C_L R_L s + 2}$$

Filter 796

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_4 s (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 L_L R_L s^4 + 2 C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_L R_L s^3 + C_4 L_4 R_4 s^3 + 2 C_4 L_L R_4 s^2 + C_L L_L R_4 s^2 + 2 L_L s + R_4}$$

Filter 797

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2 + 1) (C_L L_L s^2 + C_L R_L s + 1)}{2 C_4 C_L L_4 L_L s^4 + C_4 C_L L_4 R_4 s^3 + 2 C_4 C_L L_4 R_L s^3 + 2 C_4 C_L L_L R_4 s^3 + 2 C_4 L_4 s^2 + 2 C_4 R_4 s + 2 C_L L_L s^2 + C_L R_4 s + 2 C_L R_L s + 2}$$

Filter 798

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, \frac{1}{C_L s + \frac{1}{L_L s} + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_L R_4 R_L s (C_4 L_4 s^2 + 1)}{C_4 C_L L_4 L_L R_L R_L s^4 + C_4 L_4 L_L R_L s^3 + C_4 L_4 L_L R_L s^3 + 2 C_4 L_L R_L s^3 + C_4 L_4 R_L s^2 + 2 C_4 L_L R_L R_L s^2 + C_L L_L R_L s^2 + L_L R_4 s + 2 L_L R_L s + R_4 R_L}$$

Filter 799

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_4 (C_4 L_4 s^2 + 1) (C_L L_L R_L s^2 + L_L s + R_L)}{C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 C_L L_4 R_L R_L s^3 + 2 C_4 C_L L_L R_L R_L s^3 + 2 C_4 L_4 L_L s^3 + C_4 L_4 R_4 s^2 + 2 C_4 L_L R_4 s^2 + 2 C_4 L_L R_L s^2 + 2 C_4 R_4 s + C_L L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$

Filter 800

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^2} \right)}{L_4 s + R_4 + \frac{1}{C_4^2}}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$

$$H(s): \frac{R_4 R_L (C_4 L_4 s^2 + 1) (C_L L_L s^2 + 1)}{C_4 C_L L_4 L_L R_4 s^4 + 2 C_4 C_L L_4 R_L s^3 + C_4 C_L L_4 R_L s^3 + 2 C_4 C_L L_L R_4 s^3 + 2 C_4 L_4 R_4 s^2 + 2 C_4 L_L R_4 s^2 + 2 C_4 L_L R_L s^2 + 2 L_L s + R_4 + 2 R_L}$$