

Experiment: TIA Z2 Z4 ZL

Filter 1

Invalid filter

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

Filter 2

Invalid filter

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

Filter 3

Invalid filter

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

Filter 4

Invalid filter

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

Filter 5

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 6

Filter Type: BP

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 7

Filter Type: GE

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

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

Filter 8

Filter Type: BP

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 9

Filter Type: GE

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

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

Filter 10

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 11

Invalid filter

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

Filter 12

Invalid filter

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

Filter 13

Invalid filter

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

Filter 14

Invalid filter

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

Filter 15

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

Filter 16

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

Filter 17

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

Filter 18

Filter Type: BP

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

$H(s)$: $\frac{L_LR_Ls}{2C_4L_LR_Ls^2+C_LL_LR_Ls^2+L_Ls+R_L}$

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

ω_0 : $\sqrt{\frac{1}{L_L(2C_4+C_L)}}$

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

Filter 19

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

Filter 20

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_LL_L}}$

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

Filter 21

Invalid filter
 $Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L\right)$

Filter 22

Invalid filter
 $Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls}\right)$

Filter 23

Invalid filter
 $Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$

Filter 24

Filter Type: Invalid011

$Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L + \frac{1}{C_Ls}\right)$

$H(s)$: $\frac{R_4(C_LR_Ls+1)}{2C_4C_LR_LR_Ls^2+2C_4L_Ls+C_LR_4s+2C_LR_Ls+2}$

Q: $\frac{2C_4C_LR_LR_L\sqrt{\frac{1}{C_4^2L_L}}}{2C_4R_4+C_LR_L+2C_LR_L}$

ω_0 : $\sqrt{\frac{1}{C_4C_LR_LR_L}}$

Bandwidth: $\frac{2C_4R_4+C_LR_4+2C_LR_L}{2C_4C_LR_4R_L}$

Filter 25

Filter Type: BS

$Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls + \frac{1}{C_Ls}\right)$

$H(s)$: $\frac{R_4(C_LL_Ls^2+1)}{2C_4C_LL_LR_Ls^2+2C_4R_4s+2C_LL_Ls^2+C_LR_4s+2}$

Q: $\frac{2C_4L_LL_L\sqrt{\frac{1}{C_4^2L_L}}}{R_4(2C_4+C_L)}$

ω_0 : $\sqrt{\frac{1}{C_LL_L}}$

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

Filter 26

Filter Type: BP

$Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$

$H(s)$: $\frac{L_LR_Ls}{2C_4L_LR_Ls^2+C_LL_LR_Ls^2+2L_Ls+R_4}$

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

ω_0 : $\sqrt{\frac{1}{L_L(2C_4+C_L)}}$

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

Filter 27

Invalid filter
 $Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 28

Filter Type: BP

$Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}}\right)$

$H(s)$: $\frac{L_LR_Ls}{2C_4L_LR_LR_Ls^2+C_LL_LR_Ls^2+L_LR_Ls+2L_LR_Ls+R_4R_L}$

Q: $\frac{R_4R_L\sqrt{\frac{1}{L_L(2C_4+C_L)}}(2C_4+C_L)}{R_L+2R_L}$

ω_0 : $\sqrt{\frac{1}{L_L(2C_4+C_L)}}$

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

Filter 29

Invalid filter
 $Z(s)$: $\left(\infty, R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$

Filter 30**Filter Type:** BS

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

Filter 31

Invalid filter

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

Filter 32

Invalid filter

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

Filter 33**Filter Type:** Invalid011

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

Filter 34

Invalid filter

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

Filter 35

Invalid filter

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

Filter 36**Filter Type:** Invalid110

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

Filter 37

Invalid filter

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

Filter 38**Filter Type:** Invalid110

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

Filter 39

Invalid filter

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

Filter 40

Invalid filter

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

Filter 41**Filter Type:** BS

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

$$H(s): \frac{R_L (C_L L_4 s^2 + 1)}{C_L C_L L_4 R_L s^3 + C_L L_4 s^2 + 2 C_L R_L s + C_L R_L s + 1}$$
$$\mathbf{Q}: \frac{L_4 \sqrt{C_L^2 L_4}}{2 R_L}$$
$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$
$$\mathbf{Bandwidth}: \frac{2 R_L}{L_4}$$

Filter 42

Invalid filter

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

Filter 43**Filter Type:** BS

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

$$H(s): \frac{R_L (C_L L_4 s^2 + 1)}{C_L C_L L_4 R_L s^3 + C_L L_4 s^2 + 2 C_L R_L s + C_L R_L s + 1}$$
$$\mathbf{Q}: \frac{C_L L_4 \sqrt{C_L^2 L_4}}{R_L (2 C_L + C_L)}$$
$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$
$$\mathbf{Bandwidth}: \frac{R_L (2 C_L + C_L)}{C_L L_4}$$

Filter 44

Invalid filter

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

Filter 45

Invalid filter

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

Filter 46

Invalid filter

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

Filter 47

Invalid filter

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

Filter 48

Invalid filter

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

Filter 49

Invalid filter

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

Filter 50

Invalid filter

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

Filter 51**Filter Type:** BP

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

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

$$\mathbf{Q}: 2 C_4 R_L \sqrt{\frac{1}{C_4 L_4}}$$

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

$$\mathbf{Bandwidth}: \frac{1}{2 C_4 R_L}$$

Filter 52

Invalid filter

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

Filter 53**Filter Type:** BP

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

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

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

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

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

Filter 54**Filter Type:** Invalid110

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

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

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

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

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

Filter 55

Invalid filter

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

Filter 56

Invalid filter

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

Filter 57

Invalid filter

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

Filter 58**Filter Type:** BP

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

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

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

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

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

Filter 59

Invalid filter

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

Filter 60

Invalid filter

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

Filter 61**Filter Type:** GE

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

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

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

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

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

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

Filter 62

Invalid filter

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

Filter 63

Invalid filter

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

Filter 64

Invalid filter

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

Filter 65

Invalid filter

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

Filter 66

Invalid filter

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

Filter 67

Invalid filter

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

Filter 68

Invalid filter

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

Filter 69

Invalid filter

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

Filter 70

Invalid filter

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

Filter 71**Filter Type:** BP

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

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

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

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

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

Filter 72**Filter Type:** BP

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

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

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

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

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

Filter 73**Filter Type:** BP

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

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

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

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

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

Filter 74**Filter Type:** Invalid110

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

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

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

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

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

Filter 75

Invalid filter

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

Filter 76**Filter Type:** BP

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

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

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

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

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

Filter 77

Invalid filter

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

Filter 78**Filter Type:** BP

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

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

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

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

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

Filter 79

Invalid filter

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

Filter 80

Invalid filter

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

Filter 81**Filter Type:** GE

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

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

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

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

$$\text{Bandwidth: } \frac{1}{C_4 (R_4 + 2R_L)}$$

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

Filter 82

Invalid filter

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

Filter 83

Invalid filter

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

Filter 84

Invalid filter

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

Filter 85

Invalid filter

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

Filter 86

Invalid filter

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

Filter 87

Invalid filter

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

Filter 88

Invalid filter

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

Filter 89

Invalid filter

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

Filter 90

Invalid filter

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

Filter 91**Filter Type:** BS

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

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

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

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

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

Filter 92**Filter Type:** BS

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

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

$$\mathbf{Q}: \frac{2 C_4 L_4 \sqrt{C_4^3 L_4}}{R_4 (2 C_4 + C_L)}$$

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

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

Filter 93**Filter Type:** BS

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

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

$$\mathbf{Q}: \frac{C_4 L_4 \sqrt{\frac{1}{C_4^3 L_4}} (R_4 + 2 R_L)}{R_4 R_L (2 C_4 + C_L)}$$

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

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

Filter 94

Invalid filter

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

Filter 95

Invalid filter

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

Filter 96

Invalid filter

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

Filter 97

Invalid filter

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

Filter 98

Invalid filter

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

Filter 99

Invalid filter

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

Filter 100

Invalid filter

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

Filter 101

Invalid filter

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

Filter 102

Invalid filter

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

Filter 103

Invalid filter

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

Filter 104

Invalid filter

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

Filter 105**Filter Type:** BS

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

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

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L^3 L_L}}{R_4}$$

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

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

Filter 106**Filter Type:** BP

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

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

$$\mathbf{Q}: \frac{C_L R_4 \sqrt{C_L^3 L_L}}{2}$$

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

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

Filter 107**Filter Type:** GE

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

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

$$\mathbf{Q}: \frac{2 L_L \sqrt{C_L^3 L_L}}{R_4 + 2 R_L}$$

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

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

$$\mathbf{Qz}:\frac{L_L\sqrt{\frac{1}{C_L^2L_L}}}{R_L}$$

Filter 108

Filter Type: BP

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

$$H(s): \frac{L_LR_LR_LR_Ls^4+L_LR_LR_Ls^2+2L_LR_LR_Ls+R_LR_L}{C_LL_LR_LR_Ls^4+2C_LL_LR_LR_Ls^2+2L_Ls+R_4R_L}$$

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

$$\omega_0:\sqrt{\frac{1}{R_4+2R_L}}$$

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

Filter 109

Filter Type: GE

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

$$H(s): \frac{R_4(C_LL_LR_Ls^2+L_Ls+R_L)}{C_LL_LR_Ls^4+2C_LL_LR_LR_Ls^2+2L_Ls+R_4+2R_L}$$

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

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

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

$$\mathbf{Qz:}\ C_LR_L\sqrt{\frac{1}{C_L^2L_L}}$$

Filter 110

Filter Type: BS

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

$$H(s): \frac{R_LR_L(C_LL_Ls^2+1)}{C_LL_LR_Ls^4+2C_LL_LR_LR_Ls^2+C_LR_LR_Ls+R_4+2R_L}$$

$$\mathbf{Q}:\frac{L_L\sqrt{\frac{1}{C_L^2L_L}}(R_4+2R_L)}{R_4R_L}$$

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

$$\mathbf{Bandwidth:}\frac{R_4R_L}{L_L(R_4+2R_L)}$$

Filter 111

Invalid filter

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

Filter 112

Invalid filter

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

Filter 113

Invalid filter

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

Filter 114

Invalid filter

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

Filter 115

Invalid filter

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

Filter 116

Invalid filter

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

Filter 117

Invalid filter

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

Filter 118

Filter Type: BP

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

$$H(s): \frac{L_LR_LR_Ls^4}{2C_LL_LR_LR_Ls^4+2C_LL_LR_LR_Ls^2+L_LR_LR_Ls+R_L}$$

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

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

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

Filter 119

Invalid filter

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

Filter 120

Filter Type: BS

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

$$H(s): \frac{R_L(C_LL_Ls^2+1)}{2C_LL_LR_LR_Ls^4+2C_LL_LR_LR_Ls^2+C_LR_LR_Ls+R_4R_Ls+1}$$

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

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

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

Filter 121

Invalid filter

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

Filter 122

Invalid filter

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

Filter 123

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

Filter 124

Filter Type: Invalid011

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

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

Q: $\frac{2C_LC_LR_LR_L\sqrt{\frac{C_LR_4R_L}{C_LC_LR_4R_L}}}{2C_LR_4+C_LR_4+2C_LR_L}$

ω_0 : $\sqrt{\frac{1}{C_LC_LR_4R_L}}$

Bandwidth: $\frac{2C_LR_4+C_LR_4+2C_LR_L}{2C_LR_4R_LR_L}$

Filter 125

Filter Type: BS

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

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

Q: $\frac{2C_LL_LL\sqrt{\frac{C_LR_4}{C_LL_L}}}{R_4(2C_L+C_L)}$

ω_0 : $\sqrt{\frac{1}{C_LL_L}}$

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

Filter 126

Filter Type: BP

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

$H(s)$: $\frac{L_LR_4}{2C_LL_LR_4s^2+C_LL_LR_4s^2+2L_LL_L+R_4}$

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

ω_0 : $\sqrt{\frac{1}{L_L(2C_L+C_L)}}$

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

Filter 127

Invalid filter

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

Filter 128

Filter Type: BP

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

$H(s)$: $\frac{L_LR_4R_Ls}{2C_LL_LR_4R_Ls^2+C_LL_LR_4R_Ls^2+L_LR_4s+2L_LR_Ls+R_4R_L}$

Q: $\frac{R_4R_L\sqrt{\frac{L_L(2C_L+C_L)}{2}}}{R_4+2R_L}$

ω_0 : $\sqrt{\frac{1}{L_L(2C_L+C_L)}}$

Bandwidth: $\frac{R_4+2R_L}{R_4R_L(2C_L+C_L)}$

Filter 129

Invalid filter

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

Filter 130

Filter Type: BS

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

$H(s)$: $\frac{R_LR_L(C_LL_Ls^2+1)}{2C_LC_LL_LR_LR_Ls^2+2C_LR_4s+C_LR_4s+2C_LL_LR_Ls^2+C_LR_4R_Ls+R_4+2R_L}$

Q: $\frac{C_LL_L\sqrt{\frac{C_LR_4}{C_LL_L}}(R_4+2R_L)}{R_LR_L(2C_L+C_L)}$

ω_0 : $\sqrt{\frac{1}{C_LL_L}}$

Bandwidth: $\frac{R_4R_L(2C_L+C_L)}{C_LL_LR_4+2R_L}$

Filter 131

Invalid filter

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

Filter 132

Invalid filter

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

Filter 133

Filter Type: Invalid011

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

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

Q: $\frac{C_LC_LR_LR_L\sqrt{\frac{C_LR_4R_L}{C_LC_LR_4R_L}}}{C_LR_4+2C_LR_L+C_LR_L}$

ω_0 : $\sqrt{\frac{1}{C_LC_LR_4R_L}}$

Bandwidth: $\frac{C_LR_4+2C_LR_4+C_LR_L}{C_LC_LR_4R_L}$

Filter 134

Invalid filter

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

Filter 135

Invalid filter

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

Filter 136

Filter Type: Invalid110

$Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$

$H(s)$: $\frac{L_Ls(C_LR_4s+1)}{C_LC_LL_LR_LR_Ls^2+2C_LL_LR_4s+C_LR_4s+C_LL_Ls^2+1}$

Q: $\frac{L_L\sqrt{\frac{C_LR_4}{C_LL_L}}(2C_L+C_L)}{C_LR_4}$

ω_0 : $\sqrt{\frac{1}{L_L(2C_L+C_L)}}$

Bandwidth: $\frac{C_LR_4}{L_L(2C_L+C_L)}$

Filter 137

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

Filter 138

Filter Type: Invalid110
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}}\right)$
 $H(s)$: $\frac{L_L R_L s(C_4 R_L s + 1)}{C_4 C_L L_L R_L R_L s^3 + C_4 L_L R_L R_L s^2 + 2C_4 L_L R_L R_L s + C_4 R_L R_L s + C_L L_L R_L s^2 + L_L s + R_L}$
Q: $\frac{L_L \sqrt{\frac{R_L}{L_L(C_4 R_L + 2C_4 R_L + C_L R_L)}}}{C_4 R_L R_L + L_L}$
 ω_0 : $\sqrt{\frac{R_L}{L_L(C_4 R_L + 2C_4 R_L + C_L R_L)}}$
Bandwidth: $\frac{C_4 R_L R_L + L_L}{L_L(C_4 R_L + 2C_4 R_L + C_L R_L)}$

Filter 139

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} + R_L\right)$

Filter 140

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

Filter 141

Filter Type: BS
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L\right)$
 $H(s)$: $\frac{R_L(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + 2C_4 R_L s + 1}$
Q: $\frac{L_4 \sqrt{\frac{C_4 L_4}{2R_L}}}{\frac{1}{C_4 L_4}}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{2R_L}{L_4}$

Filter 142

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$

Filter 143

Filter Type: BS
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L}{C_L R_L s + 1}\right)$
 $H(s)$: $\frac{R_L(C_4 L_4 s^2 + 1)}{C_4 C_L L_4 R_L s^3 + C_4 L_4 s^2 + 2C_4 R_L s + C_L R_L s + 1}$
Q: $\frac{C_4 L_4 \sqrt{\frac{C_4 L_4}{R_L(2C_4 L_4 + C_L)}}}{\frac{1}{C_4 L_4}}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{R_L(2C_4 + C_L)}{C_4 L_4}$

Filter 144

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls}\right)$

Filter 145

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls}\right)$

Filter 146

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1}\right)$

Filter 147

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 148

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{R_L + \frac{1}{L_Ls}}\right)$

Filter 149

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} + R_L\right)$

Filter 150

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}\right)$

Filter 151

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1}, \infty, R_L\right)$
 $H(s)$: $\frac{L_L R_L s}{2C_4 L_4 R_L s^2 + L_4 s + 2R_L}$
Q: $2C_4 R_L \sqrt{\frac{1}{C_4 L_4}}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{1}{2C_4 R_L}$

Filter 152

Invalid filter
 $Z(s)$: $\left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{C_Ls}\right)$

Filter 153

Filter Type: BP

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

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

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

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

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

Filter 154

Filter Type: Invalid110

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

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

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

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

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

Filter 155

Invalid filter

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

Filter 156

Invalid filter

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

Filter 157

Invalid filter

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

Filter 158

Filter Type: BP

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

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

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

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

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

Filter 159

Invalid filter

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

Filter 160

Invalid filter

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

Filter 161

Filter Type: GE

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

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

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

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

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

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

Filter 162

Invalid filter

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

Filter 163

Invalid filter

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

Filter 164

Invalid filter

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

Filter 165

Invalid filter

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

Filter 166

Invalid filter

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

Filter 167

Invalid filter

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

Filter 168

Invalid filter

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

Filter 169

Invalid filter

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

Filter 170

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L \left(L_Ls + \frac{1}{C_L^2s} \right)}{L_Ls + R_L + \frac{1}{C_L^2s}} \right)$$

Filter 171**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, R_L \right)$$

$$H(s): \frac{L_4R_LR_Ls}{2C_4L_4R_LR_Ls^2 + L_4R_4s + 2L_4R_L}$$

$$\mathbf{Q}: \frac{2C_4R_LR_L\sqrt{\frac{1}{C_4^2L_4}}}{R_4 + 2R_L}$$

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

$$\textbf{Bandwidth: } \frac{R_4 + 2R_L}{2C_4R_4R_L}$$

Filter 172**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4R_4s}{2C_4L_4R_4s^2 + C_LL_4R_4s + 2L_4s + 2R_4}$$

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

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

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

Filter 173**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, \frac{R_4}{C_LR_4s + 1} \right)$$

$$H(s): \frac{L_4R_4R_4s}{2C_4L_4R_4R_4s^2 + C_LL_4R_4R_4s + L_4R_4s + 2L_4R_Ls + 2R_4R_L}$$

$$\mathbf{Q}: \frac{\sqrt{2}R_4R_L\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)}{R_4 + 2R_L}$$

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

$$\textbf{Bandwidth: } \frac{R_4 + 2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 174**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4R_4s(C_LR_4s + 1)}{2C_4C_LL_4R_LR_Ls^3 + 2C_4L_4R_4s^2 + C_LL_4R_4s^2 + 2C_LL_4R_Ls^2 + 2C_LL_4R_Ls + 2L_4s + 2R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2}L + \sqrt{\frac{R_4}{L_4(2C_4R_4 + C_LR_4 + 2C_LR_L)}(2C_4R_4 + C_LR_4 + 2C_LR_L)}}{2(C_LR_4R_L + L_4)}$$

$$\omega_0: \sqrt{2}\sqrt{\frac{R_4}{L_4(2C_4R_4 + C_LR_4 + 2C_LR_L)}}$$

$$\textbf{Bandwidth: } \frac{2(C_LR_4R_L + L_4)}{L_4(2C_4R_4 + C_LR_4 + 2C_LR_L)}$$

Filter 175

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

Filter 176**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, \frac{L_Ls}{C_LL_Ls^2 + 1} \right)$$

$$H(s): \frac{L_4L_LR_4s}{2C_4L_LL_LR_4s^2 + C_LL_LR_4s^2 + C_LL_LR_4s^2 + 2L_4L_LR_4s + L_4R_4 + 2L_LR_4}$$

$$\mathbf{Q}: \frac{R_4\sqrt{\frac{L_4 + 2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)}{R_4 + 2R_L}$$

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

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

Filter 177

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

Filter 178**Filter Type:** BP

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_L^2}}} \right)$$

$$H(s): \frac{L_4L_LR_4R_Ls}{2C_4L_4L_LR_4R_Ls^2 + C_LL_LR_4R_Ls^2 + C_LL_LR_4R_Ls^2 + 2L_4L_LR_4s + L_4R_4R_L + 2L_LR_4R_L}$$

$$\mathbf{Q}: \frac{R_4R_L\sqrt{\frac{L_4 + 2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)}{R_4 + 2R_L}$$

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

$$\textbf{Bandwidth: } \frac{R_4 + 2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 179

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, \frac{L_Ls}{C_LL_Ls^2 + 1} + R_L \right)$$

Filter 180

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4^2}}}, \infty, \frac{R_L \left(L_Ls + \frac{1}{C_L^2s} \right)}{L_Ls + R_L + \frac{1}{C_L^2s}} \right)$$

Filter 181**Filter Type:** GE

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1} + R_4, \infty, R_L \right)$$

$$H(s): \frac{R_L(C_4L_4R_4s^2 + L_4s + R_4)}{C_4L_4R_4s^2 + 2C_4L_4R_4s^2 + L_4s + R_4 + 2R_L}$$

$$\mathbf{Q}: C_4\sqrt{\frac{1}{C_4L_4}}(R_4 + 2R_L)$$

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

$$\textbf{Bandwidth: } \frac{1}{C_4(R_4 + 2R_L)}$$

$$\mathbf{Q\!z}: C_4R_4\sqrt{\frac{1}{C_4L_4}}$$

Filter 182

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2 + 1} + R_4, \infty, \frac{1}{C_Ls} \right)$$

Filter 183

Invalid filter
 $Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L}{C_LR_Ls+1} \right)$

Filter 184

Invalid filter
 $Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, R_L + \frac{1}{C_Ls} \right)$

Filter 185

Invalid filter
 $Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, L_Ls + \frac{1}{C_Ls} \right)$

Filter 186

Invalid filter
 $Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$

Filter 187

Invalid filter
 $Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$

Filter 188

Invalid filter
 $Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$

Filter 189

Invalid filter
 $Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_4s}{C_LL_Ls^2+1} + R_L \right)$

Filter 190

Invalid filter
 $Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}} \right)$

Filter 191

Filter Type: BS

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

$$H(s): \frac{R_LR_L(C_4L_4s^2+1)}{C_4L_4R_Ls^3+2C_4L_4R_Ls^2+2C_4R_LR_Ls+R_L+2R_L}$$

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

$$\omega_0: \sqrt{\frac{1}{C_4^2L_4}}$$

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

Filter 192

Filter Type: BS

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

$$H(s): \frac{R_L(C_4L_4s^2+1)}{C_4C_4L_4R_Ls^3+2C_4L_4s^2+2C_4R_Ls+C_4R_Ls+2}$$

$$\mathbf{Q}: \frac{2C_4L_4\sqrt{\frac{1}{C_4^2L_4^2}}}{R_L(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4^2L_4}}$$

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

Filter 193

Filter Type: BS

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

$$H(s): \frac{R_LR_L(C_4L_4s^2+1)}{C_4C_4L_4R_LR_Ls^3+C_4L_4R_Ls^2+2C_4L_4R_Ls+2C_4R_LR_Ls+C_LR_LR_Ls+R_L+2R_L}$$

$$\mathbf{Q}: \frac{C_4L_4\sqrt{\frac{1}{C_4^2L_4^2}(R_L+2R_L)}}{R_LR_L(2C_4+C_L)}$$

$$\omega_0: \sqrt{\frac{1}{C_4^2L_4}}$$

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

Filter 194

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}, \infty, R_L + \frac{1}{C_Ls} \right)$$
Filter 195

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$
Filter 196

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$
Filter 197

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$
Filter 198

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$$
Filter 199

Invalid filter

$$Z(s): \left(\infty, \frac{1}{C_2s}, \infty, \frac{R_L(L_Ls + \frac{1}{C_Ls})}{L_Ls + R_L + \frac{1}{C_Ls}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$
Filter 200

Invalid filter

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

Filter 201

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

Filter 202

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

Filter 203

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

Filter 204

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

Filter 205

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 206

Filter Type: BP

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 207

Filter Type: GE

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

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

Filter 208

Filter Type: BP

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 209

Filter Type: GE

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

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

Filter 210

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 211

Invalid filter

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

Filter 212

Invalid filter

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

Filter 213

Invalid filter

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

Filter 214

Invalid filter

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

Filter 215

Invalid filter

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

Filter 216

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_Ls^2+1}\right)$

Filter 217

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

Filter 218

Filter Type: BP

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

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

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

ω_0 : $\sqrt{\frac{1}{L_L(2C_L + C_L)}}$

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

Filter 219

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_Ls^2+1} + R_L\right)$

Filter 220

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 221

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L\right)$

Filter 222

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls}\right)$

Filter 223

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L}{C_L R_L s + 1}\right)$

Filter 224

Filter Type: Invalid011

$Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L + \frac{1}{C_Ls}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{C_L C_L R_L R_L}}$

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

Filter 225

Filter Type: BS

$Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls + \frac{1}{C_Ls}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 226

Filter Type: BP

$Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{L_L(2C_L + C_L)}}$

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

Filter 227

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 228

Filter Type: BP

$Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{L_L(2C_L + C_L)}}$

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

Filter 229

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} + R_L\right)$

Filter 230**Filter Type:** BS

$$Z(s)\colon \left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4}{C_4R_4s+1},\infty,\frac{R_L\left(L_Ls+\frac{1}{C_L^2}\right)}{L_Ls+R_L+\frac{1}{C_L^2}}\right)$$

$$H(s)\colon \frac{R_4R_L\left(C_4L_Ls^2+1\right)}{2C_4C_LL_LR_LR_Ls^3+2C_4R_LR_Ls+C_LL_RR_4s^2+2C_LL_RL_RLs^2+C_LR_4R_LR_Ls+R_4+2R_L}$$

$$\mathbf{Q}\colon \frac{C_LL_L\sqrt{\frac{C_L^2}{C_L^2L_L^2}\left(R_4+2R_L\right)}}{R_LR_L\left(2C_4+C_L\right)}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4R_L\left(2C_4+C_L\right)}{C_LL_L\left(R_4+2R_L\right)}$$

Filter 231

Invalid filter

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

Filter 232

Invalid filter

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

Filter 233**Filter Type:** Invalid011

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

$$H(s)\colon \frac{R_L\left(C_4R_4s+1\right)}{C_4C_LR_LR_LR_4s^2+C_4R_4s+2C_LR_Ls+C_LR_Ls+1}$$

$$\mathbf{Q}\colon \frac{C_4C_LR_4R_L\sqrt{\frac{C_L^2C_L^2R_LR_L}{C_LR_4+2C_LR_L+C_LR_L}}}{C_LR_4+2C_LR_L+C_LR_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4C_LR_LR_L}}$$

$$\mathbf{Bandwidth}\colon \frac{C_4R_4+2C_4R_L+C_LR_L}{C_4C_LR_4R_L}$$

Filter 234

Invalid filter

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

Filter 235

Invalid filter

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

Filter 236**Filter Type:** Invalid110

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

$$H(s)\colon \frac{L_Ls\left(C_4R_4s+1\right)}{C_4C_LL_LR_4s^2+2C_4L_LL_Rs^2+C_4R_4s+C_LL_Ls^2+1}$$

$$\mathbf{Q}\colon \frac{L_L\sqrt{\frac{C_L^2\left(2C_4+C_L\right)}{C_LL_L}}}{C_4R_4}$$

$$\omega_0\colon \sqrt{\frac{1}{L_L\left(2C_4+C_L\right)}}$$

$$\mathbf{Bandwidth}\colon \frac{C_4R_4}{L_L\left(2C_4+C_L\right)}$$

Filter 237

Invalid filter

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

Filter 238**Filter Type:** Invalid110

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

$$H(s)\colon \frac{L_LR_Ls\left(C_4R_4s+1\right)}{C_4C_LL_LR_4R_Ls^3+C_4L_LR_R_2s^3+2C_4L_LR_Ls^3+C_4R_4R_Ls+C_LL_RL_Rs^3+L_Ls+R_L}$$

$$\mathbf{Q}\colon \frac{L_L\sqrt{\frac{R_2}{L_L\left(C_4R_4+2C_4R_L+C_LR_L\right)\left(C_4R_4+2C_4R_L+C_LR_L\right)}}}{C_4R_4R_L+L_L}$$

$$\omega_0\colon \sqrt{\frac{R_2}{L_L\left(C_4R_4+2C_4R_L+C_LR_L\right)}}$$

$$\mathbf{Bandwidth}\colon \frac{C_4R_4R_L+L_L}{L_L\left(C_4R_4+2C_4R_L+C_LR_L\right)}$$

Filter 239

Invalid filter

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

Filter 240

Invalid filter

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

Filter 241**Filter Type:** BS

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

$$H(s)\colon \frac{R_L\left(C_4L_4s^2+1\right)}{C_4C_LL_LR_Ls^3+C_4L_4s^2+2C_4R_Ls+C_LR_Ls+1}$$

$$\mathbf{Q}\colon \frac{L_4\sqrt{\frac{C_L^2C_L^2}{2R_L}}}{2R_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{2R_L}{L_4}$$

Filter 242

Invalid filter

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

Filter 243**Filter Type:** BS

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

$$H(s)\colon \frac{R_L\left(C_4L_4s^2+1\right)}{C_4C_LL_LR_Ls^3+C_4L_4s^2+2C_4R_Ls+C_LR_Ls+1}$$

$$\mathbf{Q}\colon \frac{C_4L_4\sqrt{\frac{C_L^2}{C_L^2L_4}}}{R_L\left(2C_4+C_L\right)}$$

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

$$\mathbf{Bandwidth}\colon \frac{R_L\left(2C_4+C_L\right)}{C_4L_4}$$

Filter 244

Invalid filter

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

Filter 245

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

Filter 246

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

Filter 247

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

Filter 248

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

Filter 249

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

Filter 250

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

Filter 251

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

$H(s)$: $\frac{L_LR_L}{2C_LL_LR_Ls^2+L_Ls+2R_L}$

Q: $2C_LR_L\sqrt{\frac{1}{C_LL_L}}$

ω_0 : $\sqrt{\frac{1}{C_LL_L}}$

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

Filter 252

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}, \infty, \frac{1}{C_Ls} \right)$

Filter 253

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$

$H(s)$: $\frac{L_LR_L}{2C_LL_LR_Ls^2+C_LL_LR_Ls^2+L_Ls+2R_L}$

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

ω_0 : $\sqrt{2}\sqrt{\frac{1}{L_L(2C_L+C_L)}}$

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

Filter 254

Filter Type: Invalid110
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}, \infty, R_L + \frac{1}{C_Ls} \right)$

$H(s)$: $\frac{L_LR_L}{2C_LL_LR_Ls^2+2C_LL_LR_Ls^2+C_LL_LR_Ls^2+2C_LR_Ls+2}$

Q: $\frac{\sqrt{2}L\sqrt{\frac{1}{L_L(2C_L+C_L)}}(2C_L+C_L)}{2C_LR_L}$

ω_0 : $\sqrt{2}\sqrt{\frac{1}{L_L(2C_L+C_L)}}$

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

Filter 255

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}, \infty, L_Ls + \frac{1}{C_Ls} \right)$

Filter 256

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

Filter 257

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

Filter 258

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{R_2}{C_2R_2s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}, \infty, \frac{1}{C_Ls + R_L + \frac{1}{C_Ls}} \right)$

$H(s)$: $\frac{L_LR_L}{2C_LL_LR_Ls^2+C_LL_LR_Ls^2+L_LL_LR_Ls+L_LR_L+2L_LR_L}$

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

ω_0 : $\sqrt{\frac{L_L+2L_L}{L_LL_L(2C_L+C_L)}}$

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

Filter 259

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

Filter 260

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

Filter 261**Filter Type:** GE

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

$$H(s): \frac{R_L (C_4 L_4 s^2 + C_4 R_4 s + 1)}{C_2 L_4 s^2 + C_4 R_4 s + 2 C_4 R_L s + 1}$$

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

$$\omega_0: \sqrt{\frac{1}{C_4^2 L_4}}$$

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

$$\mathbf{Qz:} \frac{L_4 \sqrt{C_4^2 L_4^2}}{R_4}$$

Filter 262

Invalid filter

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

Filter 263

Invalid filter

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

Filter 264

Invalid filter

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

Filter 265

Invalid filter

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

Filter 266

Invalid filter

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

Filter 267

Invalid filter

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

Filter 268

Invalid filter

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

Filter 269

Invalid filter

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

Filter 270

Invalid filter

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

Filter 271**Filter Type:** BP

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

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

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

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

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

Filter 272**Filter Type:** BP

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

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

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

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

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

Filter 273**Filter Type:** BP

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

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

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

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

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

Filter 274**Filter Type:** Invalid110

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

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

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

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

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

Filter 275

Invalid filter

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

Filter 276**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} \right)$$

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

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

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

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

Filter 277

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 278**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

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

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

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

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

Filter 279

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \frac{L_4 s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 280

Invalid filter

$$Z(s): \left(\infty, \frac{R_2}{C_2 R_2 s + 1}, \infty, \frac{1}{C_4 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

Filter 281**Filter Type:** GE

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

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

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

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

$$\text{Bandwidth: } \frac{1}{C_4 (R_4 + 2 R_L)}$$

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

Filter 282

Invalid filter

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

Filter 283

Invalid filter

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

Filter 284

Invalid filter

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

Filter 285

Invalid filter

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

Filter 286

Invalid filter

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

Filter 287

Invalid filter

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

Filter 288

Invalid filter

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

Filter 289

Invalid filter

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

Filter 290

Invalid filter

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

Filter 291**Filter Type:** BS

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

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

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

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

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

Filter 292**Filter Type:** BS

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,\frac{1}{C_Ls}\right)$$

$$H(s)\text{:}\frac{R_4\left(C_4L_4s^2+1\right)}{C_4C_7L_4R_4s^3+2C_4L_4s^2+2C_4R_4s+C_7R_4s+2}$$

$$\mathbf{Q}\text{:}\frac{2C_4L_4\sqrt{C_4^3L_4}}{R_4(2C_4+C_L)}$$

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

$$\textbf{Bandwidth:}\frac{R_4(2C_4+C_L)}{2C_4L_4}$$

Filter 293**Filter Type:** BS

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,\frac{R_L}{C_LR_4s+1}\right)$$

$$H(s)\text{:}\frac{R_4R_L\left(C_4L_4s^2+1\right)}{C_4C_7L_4R_4R_4s^3+C_4L_4R_4s^2+2C_4L_4R_4s^2+2C_4R_4R_4s+C_7R_4R_4s+R_4+2R_L}$$

$$\mathbf{Q}\text{:}\frac{C_4L_4\sqrt{C_4^3L_4}\left(R_4+2R_L\right)}{R_4R_L(2C_4+C_L)}$$

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

$$\textbf{Bandwidth:}\frac{R_4R_L(2C_4+C_L)}{C_4L_4\left(R_4+2R_L\right)}$$

Filter 294

Invalid filter

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,R_L+\frac{1}{C_Ls}\right)$$

Filter 295

Invalid filter

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,L_Ls+\frac{1}{C_Ls}\right)$$

Filter 296

Invalid filter

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,\frac{L_Ls}{C_LL_4s^2+1}\right)$$

Filter 297

Invalid filter

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 298

Invalid filter

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,\frac{1}{C_LR_4+\frac{1}{L_Ls}}\right)$$

Filter 299

Invalid filter

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,\frac{L_LR_4}{C_LL_4s^2+1}+R_L\right)$$

Filter 300

Invalid filter

$$Z(s)\text{:}\left(\infty,\frac{R_2}{C_2R_2s+1},\infty,\frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}},\infty,\frac{R_L\left(L_Ls+\frac{1}{C_L^2}\right)}{L_Ls+R_L+\frac{1}{C_L^2}}\right)$$

Filter 301

Invalid filter

$$Z(s)\text{:}\left(\infty,R_2+\frac{1}{C_2s},\infty,R_4,\infty,R_L\right)$$

Filter 302

Invalid filter

$$Z(s)\text{:}\left(\infty,R_2+\frac{1}{C_2s},\infty,R_4,\infty,\frac{1}{C_Ls}\right)$$

Filter 303

Invalid filter

$$Z(s)\text{:}\left(\infty,R_2+\frac{1}{C_2s},\infty,R_4,\infty,\frac{R_L}{C_LR_4s+1}\right)$$

Filter 304

Invalid filter

$$Z(s)\text{:}\left(\infty,R_2+\frac{1}{C_2s},\infty,R_4,\infty,R_L+\frac{1}{C_Ls}\right)$$

Filter 305**Filter Type:** BS

$$Z(s)\text{:}\left(\infty,R_2+\frac{1}{C_2s},\infty,R_4,\infty,L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\text{:}\frac{R_4\left(C_7L_4s^2+1\right)}{2C_7L_4s^2+C_7R_4s+2}$$

$$\mathbf{Q}\text{:}\frac{2L_4\sqrt{C_7^3L_4}}{R_4}$$

$$\omega_0\text{:}\sqrt{\frac{1}{C_7L_4}}$$

$$\textbf{Bandwidth:}\frac{R_4}{2L_4}$$

Filter 306**Filter Type:** BP

$$Z(s)\text{:}\left(\infty,R_2+\frac{1}{C_2s},\infty,R_4,\infty,\frac{L_4s}{C_7L_4s^2+1}\right)$$

$$H(s)\text{:}\frac{L_4R_4s}{C_7L_4R_4s^2+2L_4s+R_4}$$

$$\mathbf{Q}\text{:}\frac{C_7R_4\sqrt{C_7^3L_4}}{2}$$

$$\omega_0\text{:}\sqrt{\frac{1}{C_7L_4}}$$

$$\textbf{Bandwidth:}\frac{2}{C_7R_4}$$

Filter 307**Filter Type:** GE

$$Z(s)\text{:}\left(\infty,R_2+\frac{1}{C_2s},\infty,R_4,\infty,L_Ls+R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\text{:}\frac{R_4\left(C_7L_4s^2+C_7R_4s+1\right)}{2C_7L_4s^2+C_7R_4s+2C_7R_4s+2}$$

$$\mathbf{Q}\text{:}\frac{2L_4\sqrt{C_7^3L_4}}{R_4+2R_L}$$

$$\omega_0\text{:}\sqrt{\frac{1}{C_7L_4}}$$

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

$$\mathbf{Qz}:\frac{L_L\sqrt{\frac{1}{C_L^2L_L}}}{R_L}$$

Filter 308

Filter Type: BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$$

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

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

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

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

Filter 309

Filter Type: GE

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

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

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

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

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

$$\mathbf{Qz:} \ C_L R_L \sqrt{\frac{1}{C_L^2 L_L}}$$

Filter 310

Filter Type: BS

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

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

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

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

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

Filter 311

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L \right)$$

Filter 312

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_L s} \right)$$

Filter 313

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

Filter 314

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 315

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 316

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

Filter 317

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 318

Filter Type: BP

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

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

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

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

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

Filter 319

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 320

Filter Type: BS

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

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

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

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

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

Filter 321

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, R_L \right)$$

Filter 322

Invalid filter

$$Z(s): \left(\infty, R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_L R_4 s + 1}, \infty, \frac{1}{C_L s} \right)$$

Filter 323

Invalid filter

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

Filter 324**Filter Type:** Invalid011

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

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

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

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

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

Filter 325**Filter Type:** BS

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

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

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

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

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

Filter 326**Filter Type:** BP

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

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

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

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

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

Filter 327

Invalid filter

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

Filter 328**Filter Type:** BP

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

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

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

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

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

Filter 329

Invalid filter

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

Filter 330**Filter Type:** BS

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

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

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

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

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

Filter 331

Invalid filter

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

Filter 332

Invalid filter

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

Filter 333**Filter Type:** Invalid011

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

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

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

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

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

Filter 334

Invalid filter

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

Filter 335

Invalid filter

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

Filter 336**Filter Type:** Invalid110

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

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

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

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

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

Filter 337

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

Filter 338

Filter Type: Invalid110
 $Z(s)$: $\left(\infty, R_2 + \frac{1}{C_2 s}, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{C_L s}}}\right)$
 $H(s)$: $\frac{\frac{L_L R_L s (C_4 R_L s + 1)}{C_4 C_L L_L R_L R_L s^3 + C_4 L_L R_L R_L s^2 + 2 C_4 L_L R_L s^2 + C_4 R_L R_L s + C_L L_L R_L s^2 + L_L s + R_L}}{\frac{L_L \sqrt{\frac{R_L}{L_L (C_4 R_L + 2 C_4 R_L + C_L R_L)}} (C_4 R_L + 2 C_4 R_L + C_L R_L)}{C_4 R_L R_L + L_L}}$
Q: $\frac{L_L \sqrt{\frac{R_L}{L_L (C_4 R_L + 2 C_4 R_L + C_L R_L)}}}{C_4 R_L R_L + L_L}$
 ω_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 339

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

Filter 340

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

Filter 341

Filter Type: BS
 $Z(s)$: $\left(\infty, R_2 + \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L\right)$
 $H(s)$: $\frac{R_L (C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + 2 C_4 R_L s + 1}$
Q: $\frac{L_4 \sqrt{\frac{C_4 L_4}{C_4 L_4}}}{2 R_L}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{2 R_L}{L_4}$

Filter 342

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

Filter 343

Filter Type: BS
 $Z(s)$: $\left(\infty, R_2 + \frac{1}{C_2 s}, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1}\right)$
 $H(s)$: $\frac{R_L (C_4 L_4 s^2 + 1)}{C_4 C_L L_L R_L R_L s^3 + C_4 L_4 s^3 + 2 C_4 R_L s + C_L R_L s + 1}$
Q: $\frac{C_4 L_4 \sqrt{\frac{C_4 L_4}{C_4 L_4}}}{R_L (2 C_L + C_L)}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{R_L (2 C_L + C_L)}{C_4 L_4}$

Filter 344

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

Filter 345

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

Filter 346

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

Filter 347

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

Filter 348

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

Filter 349

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

Filter 350

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

Filter 351

Filter Type: BP
 $Z(s)$: $\left(\infty, R_2 + \frac{1}{C_2 s}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L\right)$
 $H(s)$: $\frac{L_4 R_L}{2 C_4 L_4 R_L s^2 + L_4 s + 2 R_L}$
Q: $2 C_4 R_L \sqrt{\frac{1}{C_4 L_4}}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{1}{2 C_4 R_L}$

Filter 352

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

Filter 353**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

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

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

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

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

Filter 354**Filter Type:** Invalid110

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{L_4s(C_4R_Ls+1)}{2C_4C_LL_4R_Ls^2+2C_4L_4s^2+C_LL_4s^2+2C_LR_Ls+2}$$

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

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

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

Filter 355

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

Filter 356

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_4s}{C_LR_Ls+1}\right)$$

Filter 357

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 358**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$$

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

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

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

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

Filter 359

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls+1}+R_L\right)$$

Filter 360

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$$

Filter 361**Filter Type:** GE

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, R_L\right)$$

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

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

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

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

$$\mathbf{Qz}\colon \frac{L_4\sqrt{\frac{1}{C_4^2R_4}}}{R_4}$$

Filter 362

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$$

Filter 363

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

Filter 364

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, R_L+\frac{1}{C_Ls}\right)$$

Filter 365

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

Filter 366

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{L_4s}{C_LL_Ls+1}\right)$$

Filter 367

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 368

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$$

Filter 369

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{L_4s}{C_LL_Ls+1}+R_L\right)$$

Filter 370

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2s}\right)}{L_Ls+R_L+\frac{1}{C_L^2s}}\right)$$

Filter 371**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, R_L\right)$$

$$H(s)\colon \frac{L_4R_4R_L}{2C_4L_4R_4R_Ls^2+L_4R_4s+2L_4R_Ls+2R_4R_L}$$

$$\mathbf{Q}\colon \frac{2C_4R_4R_L\sqrt{\frac{1}{C_4^2L_4}}}{R_4+2R_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{2C_4R_4R_L}$$

Filter 372**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{L_4R_4s}{2C_4L_4R_4s^2+C_LL_4R_4s+2L_4s+2R_4}$$

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

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

$$\mathbf{Bandwidth}\colon \frac{2}{R_4(2C_4+C_L)}$$

Filter 373**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{L_4R_4R_Ls}{2C_4L_4R_4R_Ls^2+C_LL_4R_4R_Ls+L_4R_4s+2L_4R_Ls+2R_4R_L}$$

$$\mathbf{Q}\colon \frac{\sqrt{2}R_4R_L\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)}{R_4+2R_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 374**Filter Type:** Invalid110

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{L_4R_4s(C_LR_Ls+1)}{2C_4C_LL_4R_4R_Ls^2+2C_4L_4R_4s^2+C_LL_4R_4s^2+2C_LL_4R_Ls^2+2C_LL_4R_4R_Ls+2L_4s+2R_4}$$

$$\mathbf{Q}\colon \frac{\sqrt{2}L+\sqrt{\frac{R_4}{L_4(2C_4R_4+C_LL_4R_4+2C_LL_4)}(2C_4R_4+C_LL_4R_4+2C_LL_4)}}{2(C_LL_4R_4R_L+L_4)}$$

$$\omega_0\colon \sqrt{2}\sqrt{\frac{R_4}{L_4(2C_4R_4+C_LL_4R_4+2C_LL_4R_L)}}$$

$$\mathbf{Bandwidth}\colon \frac{2(C_LL_4R_4R_L+L_4)}{L_4(2C_4R_4+C_LL_4R_4+2C_LL_4R_L)}$$

Filter 375

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

Filter 376**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_4L_LR_4s}{2C_4L_LL_4R_4s^2+C_LL_4R_4s^2+2L_4L_LR_4s+L_4R_4+2L_LR_4}$$

$$\mathbf{Q}\colon \frac{R_4\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)}{R_4+2R_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{2}{R_4(2C_4+C_L)}$$

Filter 377

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 378**Filter Type:** BP

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$

$$H(s)\colon \frac{L_4L_LR_4R_Ls}{2C_4L_LL_4R_4R_Ls^2+C_LL_4R_4R_Ls^2+2L_4L_LR_4s+L_4R_4R_L+2L_LR_L+2L_LR_4R_L}$$

$$\mathbf{Q}\colon \frac{R_4R_L\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)}{R_4+2R_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 379

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

Filter 380

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2s}\right)}{L_Ls+R_L+\frac{1}{C_L^2s}}\right)$$

Filter 381**Filter Type:** GE

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, R_L\right)$$

$$H(s)\colon \frac{R_L(C_4L_4R_4s^2+L_4s+R_4)}{C_4L_4R_4s^2+2C_4L_4R_4s^2+L_4s+R_4+2R_L}$$

$$\mathbf{Q}\colon C_4\sqrt{\frac{1}{C_4L_4}}(R_4+2R_L)$$

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

$$\mathbf{Bandwidth}\colon \frac{1}{C_4(R_4+2R_L)}$$

$$\mathbf{Qz}\colon C_4R_4\sqrt{\frac{1}{C_4L_4}}$$

Filter 382

Invalid filter

$$Z(s)\colon \left(\infty, R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, \frac{1}{C_Ls}\right)$$

Filter 383

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

Filter 384

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

Filter 385

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

Filter 386

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

Filter 387

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

Filter 388

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

Filter 389

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

Filter 390

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

Filter 391

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_4^2 L_4}}$

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

Filter 392

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_4^2 L_4}}$

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

Filter 393

Filter Type: BS

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

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

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

ω_0 : $\sqrt{\frac{1}{C_4^2 L_4}}$

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

Filter 394

Invalid filter

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

Filter 395

Invalid filter

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

Filter 396

Invalid filter

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

Filter 397

Invalid filter

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

Filter 398

Invalid filter

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

Filter 399

Invalid filter

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

Filter 400

Invalid filter

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

Filter 401

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, R_L \right)$$

Filter 402

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{1}{C_Ls} \right)$$

Filter 403

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_6}{C_LR_Ls+1} \right)$$

Filter 404

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, R_L + \frac{1}{C_Ls} \right)$$

Filter 405**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

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

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

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

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

Filter 406**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_LR_4}{C_LL_LR_4s^2+2L_Ls+R_4}$$

$$\mathbf{Q}: \frac{C_LR_4\sqrt{C_L^2L_L}}{2}$$

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

$$\textbf{Bandwidth: } \frac{2}{C_LR_4}$$

Filter 407**Filter Type:** GE

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

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

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

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

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

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

Filter 408**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{L_LR_4R_Ls}{C_LL_LR_LR_4s^2+L_LR_4s+2L_LR_Ls+R_4R_L}$$

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

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

$$\textbf{Bandwidth: } \frac{R_4+2R_L}{C_LR_4R_L}$$

Filter 409**Filter Type:** GE

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

$$H(s): \frac{R_4(C_LL_LR_Ls^2+L_Ls+R_L)}{C_LL_LR_4s^2+2C_LL_LR_Ls^2+2L_Ls+R_4+2R_L}$$

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

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

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

$$\mathbf{Qz: } C_LR_L\sqrt{\frac{1}{C_LL_L}}$$

Filter 410**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_L(L_Ls+\frac{1}{C_Ls})}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_4R_L(C_LL_Ls^2+1)}{C_LL_LR_4s^2+2C_LL_LR_Ls^2+C_LR_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}: \frac{L_L\sqrt{C_L^2L_L}(R_4+2R_L)}{R_4R_L}$$

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

$$\textbf{Bandwidth: } \frac{R_4R_L}{L_L(R_4+2R_L)}$$

Filter 411

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L \right)$$

Filter 412

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

Filter 413

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_6}{C_LR_Ls+1} \right)$$

Filter 414

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls} \right)$$

Filter 415

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

Filter 416

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

Filter 417

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 418**Filter Type:** BP

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

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

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

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

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

Filter 419

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 420**Filter Type:** BS

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

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

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

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

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

Filter 421

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, R_L \right)$$

Filter 422

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{1}{C_L s} \right)$$

Filter 423

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

Filter 424**Filter Type:** Invalid011

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, R_L + \frac{1}{C_L s} \right)$$

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

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

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

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

Filter 425**Filter Type:** BS

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, L_L s + \frac{1}{C_L s} \right)$$

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

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

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

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

Filter 426**Filter Type:** BP

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

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

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

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

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

Filter 427

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 428**Filter Type:** BP

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

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

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

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

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

Filter 429

Invalid filter

$$Z(s): \left(\infty, L_2 s + \frac{1}{C_2 s}, \infty, \frac{R_L}{C_L R_L s + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 430**Filter Type:** BS

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,\frac{R_4}{C_4R_4s+1},\,\infty,\,\frac{R_L\left(L_Ls+\frac{1}{C_L^2s}\right)}{L_Ls+R_L+\frac{1}{C_L^2s}}\right)$$
$$H(s)\colon \frac{R_4R_L\left(C_4L_Ls^2+1\right)}{2C_4C_LL_LR_LR_Ls^3+2C_4R_4R_Ls+C_LL_LR_Ls^2+2C_4L_LR_Ls^2+C_LR_LR_Ls+R_4+2R_L}$$
$$\mathbf{Q}\colon \frac{C_LL_L\sqrt{\frac{C_4^2L_L}{C_L^2R_L}}\left(R_4+2R_L\right)}{R_4R_L\left(2C_4+C_L\right)}$$
$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$
$$\mathbf{Bandwidth}\colon \frac{R_4R_L\left(2C_4+C_L\right)}{C_LL_L\left(R_4+2R_L\right)}$$

Filter 431

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,R_L\right)$$

Filter 432

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,\frac{1}{C_Ls}\right)$$

Filter 433**Filter Type:** Invalid011

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,\frac{R_4}{C_LR_Ls+1}\right)$$
$$H(s)\colon \frac{R_L\left(C_4R_4s+1\right)}{C_4C_LR_LR_Ls^2+C_4R_4+2C_4R_Ls+C_LR_Ls+1}$$
$$\mathbf{Q}\colon \frac{C_4C_LR_4R_L\sqrt{\frac{C_4^2R_4R_L}{C_L^2C_LR_L}}}{C_LR_4+2C_LR_L+C_LR_L}$$
$$\omega_0\colon \sqrt{\frac{1}{C_4C_LR_LR_L}}$$
$$\mathbf{Bandwidth}\colon \frac{C_4R_4+2C_4R_L+C_LR_L}{C_4C_LR_4R_L}$$

Filter 434

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,R_L+\frac{1}{C_Ls}\right)$$

Filter 435

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,L_Ls+\frac{1}{C_Ls}\right)$$

Filter 436**Filter Type:** Invalid110

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,\frac{L_Ls}{C_LL_Ls^2+1}\right)$$
$$H(s)\colon \frac{L_Ls\left(C_4R_4s+1\right)}{C_4C_LL_LR_4s^3+2C_4L_LR_Ls^2+C_4R_4s+C_LL_Ls^2+1}$$
$$\mathbf{Q}\colon \frac{L_L\sqrt{\frac{C_4^2L_L}{L_L\left(2C_4+C_L\right)}}\frac{C_4R_4}{C_4R_4}}{C_4R_4+2C_4R_L+C_LR_L}$$
$$\omega_0\colon \sqrt{\frac{1}{L_L\left(2C_4+C_L\right)}}\frac{C_4R_4}{C_4R_4}$$
$$\mathbf{Bandwidth}\colon \frac{C_4R_4}{L_L\left(2C_4+C_L\right)}$$

Filter 437

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 438**Filter Type:** Invalid110

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,\frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$
$$H(s)\colon \frac{L_LR_Ls\left(C_4R_4s+1\right)}{C_4C_LL_LR_4R_Ls^3+C_4L_LR_LR_Ls^2+2C_4L_LR_LR_Ls^2+C_4R_4R_Ls+C_LR_LR_Ls^2+L_Ls+R_L}$$
$$\mathbf{Q}\colon \frac{L_L\sqrt{\frac{R_4}{L_L\left(C_4R_4+2C_4R_L+C_LR_L\right)}}\left(C_4R_4+2C_4R_L+C_LR_L\right)}{C_4R_4R_L+L_L}$$
$$\omega_0\colon \sqrt{\frac{R_4}{L_L\left(C_4R_4+2C_4R_L+C_LR_L\right)}}$$
$$\mathbf{Bandwidth}\colon \frac{C_4R_4R_L+L_L}{L_L\left(C_4R_4+2C_4R_L+C_LR_L\right)}$$

Filter 439

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,\frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

Filter 440

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,R_4+\frac{1}{C_4s},\,\infty,\,\frac{R_L\left(L_Ls+\frac{1}{C_L^2s}\right)}{L_Ls+R_L+\frac{1}{C_L^2s}}\right)$$

Filter 441**Filter Type:** BS

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+\frac{1}{C_4s},\,\infty,\,R_L\right)$$
$$H(s)\colon \frac{R_L\left(C_4L_4s^2C_2s+1\right)}{C_4C_LL_LR_Ls^3+C_4L_4s^2+2C_4R_Ls+C_LR_Ls+1}$$
$$\mathbf{Q}\colon \frac{L_4\sqrt{\frac{C_2^2C_4}{2R_L}}}{2R_L}$$
$$\omega_0\colon \sqrt{\frac{1}{C_4^2L_4}}$$
$$\mathbf{Bandwidth}\colon \frac{2R_L}{L_4}$$

Filter 442

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+\frac{1}{C_4s},\,\infty,\,\frac{1}{C_Ls}\right)$$

Filter 443**Filter Type:** BS

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+\frac{1}{C_4s},\,\infty,\,\frac{R_L}{C_LR_Ls+1}\right)$$
$$H(s)\colon \frac{R_L\left(C_4L_4s^2+1\right)}{C_4C_LL_LR_Ls^3+C_4L_4s^2+2C_4R_Ls+C_LR_Ls+1}$$
$$\mathbf{Q}\colon \frac{C_4L_4\sqrt{\frac{C_4^2L_4}{C_L^2R_L}}}{R_L\left(2C_4+C_L\right)}$$
$$\omega_0\colon \sqrt{\frac{1}{C_LL_4}}$$
$$\mathbf{Bandwidth}\colon \frac{R_L\left(2C_4+C_L\right)}{C_4L_4}$$

Filter 444

Invalid filter

$$Z(s)\colon \left(\infty,\,L_2s+\frac{1}{C_2s},\,\infty,\,L_4s+\frac{1}{C_4s},\,\infty,\,R_L+\frac{1}{C_Ls}\right)$$

Filter 445

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls}\right)$

Filter 446

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_Ls^2+1}\right)$

Filter 447

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 448

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls + \frac{1}{R_L} + \frac{1}{L_Ls}}\right)$

Filter 449

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_L L_Ls^2+1} + R_L\right)$

Filter 450

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls + \frac{1}{C_L}\right)}{L_Ls + R_L + \frac{1}{C_Ls}}\right)$

Filter 451

Filter Type: BP
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L\right)$

$H(s)$: $\frac{L_4R_Ls}{2C_4L_4L_LR_Ls^2+C_4L_4R_LR_Ls^2+L_4s+2R_L}$

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
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls}\right)$

Filter 453

Filter Type: BP
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$

$H(s)$: $\frac{L_4R_Ls}{2C_4C_LL_4R_LR_Ls^2+C_4L_4R_LR_Ls^2+L_4s+2R_L}$

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

Filter 454

Filter Type: Invalid110
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L + \frac{1}{C_Ls}\right)$

$H(s)$: $\frac{L_4s(C_LR_Ls+1)}{2C_4C_LL_4R_LR_Ls^2+2C_4L_4s^2+C_4L_4s^2+2C_4L_4s^2+2C_4R_LR_Ls+2}$

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
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls + \frac{1}{C_Ls}\right)$

Filter 456

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$

Filter 457

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 458

Filter Type: BP
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls + \frac{1}{R_L} + \frac{1}{L_Ls}}\right)$

$H(s)$: $\frac{L_4L_LR_Ls}{2C_4L_4L_LR_LR_Ls^2+C_LL_4L_LR_Ls^2+L_4L_Ls+L_4R_L+2L_LR_L}$

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
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$

Filter 460

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L\left(L_Ls + \frac{1}{C_L}\right)}{L_Ls + R_L + \frac{1}{C_Ls}}\right)$

Filter 461

Filter Type: GE

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, R_L \right)$$

$$H(s): \frac{R_L(C_1L_4s^2+C_4R_4s+1)}{C_2L_4s^2+C_4R_4s+2C_4R_Ls+1}$$

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

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

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

$$\mathbf{Qz}: \frac{L_4\sqrt{\frac{C_1^2L_4}{R_4+2R_L}}}{R_4}$$

Filter 462

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls} \right)$$

Filter 463

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

Filter 464

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls} \right)$$

Filter 465

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

Filter 466

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

Filter 467

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

Filter 468

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}} \right)$$

Filter 469

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

Filter 470

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

Filter 471

Filter Type: BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_1s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, R_L \right)$$

$$H(s): \frac{L_4R_4R_Ls}{2C_1L_4R_4R_Ls^2+L_4R_4s+2L_4R_Ls+2R_4R_L}$$

$$\mathbf{Q}: \frac{2C_1R_4R_L\sqrt{\frac{C_1^2L_4}{R_4+2R_L}}}{R_4+2R_L}$$

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

Bandwidth: $\frac{R_4+2R_L}{2C_1R_4R_L}$

Filter 472

Filter Type: BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_1s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4R_4s}{2C_1L_4R_4s^2+C_LL_4R_4s^2+2L_4s+2R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2}R_4\sqrt{\frac{1}{L_4(2C_1^2+C_L)}}(2C_1+C_L)}{2}$$

$$\omega_0: \sqrt{2}\sqrt{\frac{1}{L_4(2C_1^2+C_L)}}$$

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

Filter 473

Filter Type: BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_1s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

$$H(s): \frac{L_4R_4R_Ls}{2C_1L_4R_4R_Ls^2+C_LL_4R_4s^2+L_4R_4s+2L_4R_Ls+2R_4R_L}$$

$$\mathbf{Q}: \frac{\sqrt{2}R_4R_L\sqrt{\frac{1}{L_4(2C_1^2+C_L)}}(2C_1+C_L)}{R_4+2R_L}$$

$$\omega_0: \sqrt{2}\sqrt{\frac{1}{L_4(2C_1^2+C_L)}}$$

Bandwidth: $\frac{R_4+2R_L}{R_4R_L(2C_1+C_L)}$

Filter 474

Filter Type: Invalid110

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_1s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{L_4R_4R_Ls(C_1R_4s+1)}{2C_1C_LL_4R_4R_Ls^2+2C_1L_4R_4s^2+C_LL_4R_4s^2+2C_LL_4R_4s+2C_LR_4R_Ls+2L_4s+2R_4}$$

$$\mathbf{Q}: \frac{\sqrt{2}L_4\sqrt{\frac{R_4}{L_4(2C_1R_4+C_LR_4+2C_LR_4)}}(2C_1R_4+C_LR_4+2C_LR_L)}{2(C_LR_4R_L+L_4)}$$

$$\omega_0: \sqrt{2}\sqrt{\frac{R_L}{L_4(2C_1R_4+C_LR_4+2C_LR_L)}}$$

Bandwidth: $\frac{2(C_LR_4R_L+L_4)}{L_4(2C_1R_4+C_LR_4+2C_LR_L)}$

Filter 475

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_1s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

Filter 476**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4s}}}, \infty, \frac{L_4s}{C_L L_L s^2 + 1} \right)$$

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

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

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

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

Filter 477

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4s}}}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

Filter 478**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4s}}}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$$

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

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

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

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

Filter 479

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4s}}}, \infty, \frac{L_4s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 480

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{1}{C_4s + \frac{1}{R_4 + \frac{1}{L_4s}}}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

Filter 481**Filter Type:** GE

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L \right)$$

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

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

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

$$\textbf{Bandwidth: } \frac{1}{C_4 (R_4 + 2R_L)}$$

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

Filter 482

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_Ls} \right)$$

Filter 483

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

Filter 484

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, R_L + \frac{1}{C_Ls} \right)$$

Filter 485

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

Filter 486

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} \right)$$

Filter 487

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

Filter 488

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}} \right)$$

Filter 489

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{L_Ls}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 490

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4 L_4 s^2 + 1} + R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

Filter 491**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}}, \infty, R_L \right)$$

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

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

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

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

Filter 492**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_4L_4s^2+1)}{C_4C_LL_4R_4s^3+2C_4L_4s^2+2C_4R_4s+C_LR_4s+2}$$

$$\mathbf{Q}: \frac{2C_4L_4\sqrt{\frac{1}{C_4^*L_4}}}{R_4(2C_4+C_L)}$$

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

$$\textbf{Bandwidth: } \frac{R_4(2C_4+C_L)}{2C_4L_4}$$

Filter 493**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, \frac{R_4}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_4R_L(C_4L_4s^2+1)}{C_4C_LL_4R_4R_Ls^3+C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+C_LR_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}: \frac{C_4L_4\sqrt{\frac{1}{C_4^*L_4}}(R_4+2R_L)}{R_LR_L(2C_4+C_L)}$$

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

$$\textbf{Bandwidth: } \frac{R_4R_L(2C_4+C_L)}{C_4L_4(R_4+2R_L)}$$

Filter 494

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, R_L + \frac{1}{C_Ls} \right)$$

Filter 495

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

Filter 496

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

Filter 497

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

Filter 498

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, \frac{1}{C_Ls + \frac{1}{R_L} + \frac{1}{C_Ls}} \right)$$

Filter 499

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

Filter 500

Invalid filter

$$Z(s): \left(\infty, L_2s + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_4s + \frac{1}{C_4^*s}\right)}{L_4s + R_4 + \frac{1}{C_4^*s}}, \infty, \frac{R_L\left(L_Ls + \frac{1}{C_L^*s}\right)}{L_Ls + R_L + \frac{1}{C_L^*s}} \right)$$

Filter 501

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, R_L \right)$$

Filter 502

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{1}{C_Ls} \right)$$

Filter 503

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_4}{C_LR_Ls+1} \right)$$

Filter 504

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, R_L + \frac{1}{C_Ls} \right)$$

Filter 505**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_LL_Ls^2+1)}{2C_LL_Ls^3+C_LR_4s+2}$$

$$\mathbf{Q}: \frac{2L_L\sqrt{\frac{1}{C_LL_L}}}{R_4}$$

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

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

Filter 506**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_LR_4}{C_LL_LR_4s^2+2L_Ls+R_4}$$

$$\mathbf{Q}: \frac{C_LR_4\sqrt{\frac{1}{C_LL_L}}}{2}$$

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

$$\textbf{Bandwidth: } \frac{2}{C_LR_4}$$

Filter 507**Filter Type:** GE

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_LL_Ls^2+C_LR_4s+1)}{2C_LL_Ls^3+C_LR_4s+2C_LR_Ls+2}$$

$$\mathbf{Q}: \frac{2L_L\sqrt{\frac{1}{C_LL_L}}}{R_4+2R_L}$$

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

$$\textbf{Bandwidth: } \frac{R_4+2R_4}{2L_L}$$

$$\mathbf{Qz}:\frac{L_L\sqrt{\frac{1}{C_L^2L_L}}}{R_L}$$

Filter 508

Filter Type: BP

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, R_4, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$

$$H(s):\frac{L_LR_LR_LR_Ls}{C_LL_LR_LR_Ls^2+L_LR_Ls+2L_LR_LR_Ls+R_LR_L}$$

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

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

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

Filter 509

Filter Type: GE

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

$$H(s):\frac{R_L(C_LL_LR_Ls^2+L_Ls+R_L)}{C_LL_LR_Ls^2+2C_LL_LR_Ls^2+2L_Ls+R_L+2R_L}$$

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

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

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

$$\mathbf{Qz:}\ C_LR_L\sqrt{\frac{1}{C_LL_L}}$$

Filter 510

Filter Type: BS

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, R_4, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$$

$$H(s):\frac{R_LR_L(C_LL_Ls^2+1)}{C_LL_LR_Ls^2+2C_LL_LR_Ls^2+C_LR_LR_Ls+R_L+2R_L}$$

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

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

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

Filter 511

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L\right)$$

Filter 512

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$$

Filter 513

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

Filter 514

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, R_L+\frac{1}{C_Ls}\right)$$

Filter 515

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

Filter 516

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

Filter 517

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 518

Filter Type: BP

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$

$$H(s):\frac{L_LR_Ls}{2C_LL_LR_Ls^2+C_LR_LR_Ls^2+L_LR_L+R_L}$$

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

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

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

Filter 519

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

Filter 520

Filter Type: BS

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$$

$$H(s):\frac{R_L(C_LL_Ls^2+1)}{2C_LL_LR_Ls^2+2C_LR_LR_Ls^2+C_LL_LR_Ls^2+C_LR_Ls+1}$$

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

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

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

Filter 521

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{R_L}{C_LR_Ls+1}, \infty, R_L\right)$$

Filter 522

Invalid filter

$$Z(s):\left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{R_L}{C_LR_Ls+1}, \infty, \frac{1}{C_Ls}\right)$$

Filter 523

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

Filter 524**Filter Type:** Invalid011

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_LR_Ls+1)}{2C_4C_LR_LR_Ls^2+2C_4R_4s+C_LR_4s+2C_LR_Ls+2}$$

$$\mathbf{Q}: \frac{2C_4C_LR_LR_L\sqrt{\frac{1}{C_LC_LR_LR_L}}}{2C_4R_4+C_LR_4+2C_LR_L}$$

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

$$\text{Bandwidth: } \frac{2C_4R_4+C_LR_4+2C_LR_L}{2C_4C_LR_LR_L}$$

Filter 525**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

$$H(s): \frac{R_4(C_LL_Ls^2+1)}{2C_4C_LL_LR_Ls^2+2C_4R_4s+2C_LL_Ls^2+C_LR_4s+2}$$

$$\mathbf{Q}: \frac{2C_4L_LL_L\sqrt{\frac{1}{C_LL_L}}}{R_4(2C_4+C_L)}$$

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

$$\text{Bandwidth: } \frac{R_4(2C_4+C_L)}{2C_4L_LL_L}$$

Filter 526**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_LL_LR_4}{2C_4L_LL_LR_4s^2+C_LL_R_4R_Ls^2+2L_LR_4}$$

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

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

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

Filter 527

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

Filter 528**Filter Type:** BP

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{L_LR_4R_Ls}{2C_4L_LR_LR_Ls^2+C_LR_4R_Ls^2+L_LR_4s+2L_LR_Ls+R_4R_L}$$

$$\mathbf{Q}: \frac{R_4R_L\sqrt{\frac{1}{L_L(2C_4+C_L)}}}{R_4+2R_L}$$

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

$$\text{Bandwidth: } \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 529

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

Filter 530**Filter Type:** BS

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

$$H(s): \frac{R_4R_L(C_LL_Ls^2+1)}{2C_4C_LL_LR_LR_Ls^2+2C_4R_4R_Ls+C_LR_4R_4s^2+2C_LL_LR_Ls^2+C_LR_Ls+R_4+2R_L}$$

$$\mathbf{Q}: \frac{C_LL_L\sqrt{\frac{1}{C_LL_L}}(R_4+2R_L)}{R_4R_L(2C_4+C_L)}$$

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

$$\text{Bandwidth: } \frac{R_4R_L(2C_4+C_L)}{C_LL_LR_4+2R_L}$$

Filter 531

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_Ls}, \infty, R_L \right)$$

Filter 532

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_Ls}, \infty, \frac{1}{C_Ls} \right)$$

Filter 533**Filter Type:** Invalid011

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_Ls}, \infty, \frac{R_4}{C_LR_Ls+1} \right)$$

$$H(s): \frac{R_4(C_LR_4s+1)}{C_4C_LR_LR_Ls^2+C_LR_4s+2C_LR_Ls+C_LR_Ls+1}$$

$$\mathbf{Q}: \frac{C_4C_LR_LR_L\sqrt{\frac{1}{C_4C_LR_LR_L}}}{C_LR_4+2C_LR_L+C_LR_L}$$

$$\omega_0: \sqrt{\frac{1}{C_4C_LR_LR_L}}$$

$$\text{Bandwidth: } \frac{C_4R_4+2C_LR_4+C_LR_L}{C_4C_LR_LR_L}$$

Filter 534

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_Ls}, \infty, R_L + \frac{1}{C_Ls} \right)$$

Filter 535

Invalid filter

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_Ls}, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

Filter 536**Filter Type:** Invalid110

$$Z(s): \left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_Ls}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{L_LL_LR_4(C_LR_4s+1)}{C_4C_LL_LR_4s^2+2C_4L_LR_4s^2+C_LR_4s+C_LL_Ls^2+1}$$

$$\mathbf{Q}: \frac{L_LL_L\sqrt{\frac{1}{L_L(2C_4+C_L)}}}{C_LR_4}$$

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

$$\text{Bandwidth: } \frac{C_LR_4}{L_L(2C_4+C_L)}$$

Filter 537

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 538

Filter Type: Invalid110
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls + \frac{1}{R_L + \frac{1}{L_Ls}}}\right)$
 $H(s)$: $\frac{L_L R_L s(C_4 R_L s + 1)}{C_4 C_L L_L R_L R_L s^3 + C_4 L_L R_L s^2 + 2C_4 L_L R_L s + C_4 R_L R_L s + C_L L_L R_L s^2 + L_L s + R_L}$
Q: $\frac{L_L \sqrt{\frac{R_L}{L_L(C_4 R_L + 2C_4 R_L + C_L R_L)}}(C_4 R_L + 2C_4 R_L + C_L R_L)}{C_4 R_L R_L + L_L}$
 ω_0 : $\sqrt{\frac{R_L}{L_L(C_4 R_L + 2C_4 R_L + C_L R_L)}}$
Bandwidth: $\frac{C_4 R_L R_L + L_L}{L_L(C_4 R_L + 2C_4 R_L + C_L R_L)}$

Filter 539

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$

Filter 540

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, R_4 + \frac{1}{C_4s}, \infty, \frac{R_L(L_L s + \frac{1}{C_L^2})}{L_L s + R_L + \frac{1}{C_L^2}}\right)$

Filter 541

Filter Type: BS
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L\right)$
 $H(s)$: $\frac{R_L(C_4 L_4 s^2 + 1)}{C_4 L_4 s^2 + 2C_4 R_L s + 1}$
Q: $\frac{L_4 \sqrt{\frac{C_4 L_4}{2R_L}}}{2R_L}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{2R_L}{L_4}$

Filter 542

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{C_L^2 s}\right)$

Filter 543

Filter Type: BS
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L}{C_L R_L s + 1}\right)$
 $H(s)$: $\frac{R_L(C_4 L_4 s^2 + 1)}{C_4 C_L L_L R_L s^3 + C_4 L_4 s^2 + 2C_4 R_L s + C_L R_L s + 1}$
Q: $\frac{C_4 L_4 \sqrt{\frac{C_4 L_4}{R_L(2C_4 + C_L)}}}{R_L(2C_4 + C_L)}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{R_L(2C_4 + C_L)}{C_4 L_4}$

Filter 544

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_L s}\right)$

Filter 545

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_L s + \frac{1}{C_L s}\right)$

Filter 546

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$

Filter 547

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$

Filter 548

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{1}{R_L + \frac{1}{L_L s}}\right)$

Filter 549

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$

Filter 550

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, L_4s + \frac{1}{C_4s}, \infty, \frac{R_L(L_L s + \frac{1}{C_L^2})}{L_L s + R_L + \frac{1}{C_L^2}}\right)$

Filter 551

Filter Type: BP
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L\right)$
 $H(s)$: $\frac{L_4 R_L}{2C_4 L_4 R_L s^2 + L_4 s + 2R_L}$
Q: $2C_4 R_L \sqrt{\frac{1}{C_4 L_4}}$
 ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$
Bandwidth: $\frac{1}{2C_4 R_L}$

Filter 552

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{C_L s}\right)$

Filter 570

Invalid filter

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2s}\right)}{L_Ls+R_L+\frac{1}{C_L^2s}}\right)$$

Filter 571**Filter Type:** BP

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, R_L\right)$$

$$H(s)\colon \frac{L_4R_4R_Ls}{2C_4L_4R_4R_Ls^2+L_4R_4s+2L_4R_Ls+2R_4R_L}$$

$$\mathbf{Q}\colon \frac{2C_4R_4R_L\sqrt{\frac{1}{C_4^2L_4}}}{R_4+2R_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{2C_4R_4R_L}$$

Filter 572**Filter Type:** BP

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{L_4R_4s}{2C_4L_4R_4R_Ls^2+C_LL_4R_4s+2L_4s+2R_4}$$

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

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

$$\mathbf{Bandwidth}\colon \frac{2}{R_4(2C_4+C_L)}$$

Filter 573**Filter Type:** BP

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{L_4R_4R_Ls}{2C_4L_4R_4R_Ls^2+C_LL_4R_4R_Ls+L_4R_4s+2L_4R_Ls+2R_4R_L}$$

$$\mathbf{Q}\colon \frac{\sqrt{2}R_4R_L\sqrt{\frac{1}{L_4(2C_4+C_L)}}(2C_4+C_L)}{R_4+2R_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 574**Filter Type:** Invalid110

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{L_4R_4s(C_LR_Ls+1)}{2C_4C_LL_4R_4R_Ls^3+2C_4L_4R_4s^2+C_LL_4R_4s^2+2C_LL_4R_Ls^2+2C_LL_4R_Ls+2L_4s+2R_4}$$

$$\mathbf{Q}\colon \frac{\sqrt{2}L+\sqrt{\frac{R_4}{L_4(2C_4R_4+C_LR_4+2C_LL_4)}}(2C_4R_4+C_LR_4+2C_LL_4)}{2(C_LR_4R_L+L_4)}$$

$$\omega_0\colon \sqrt{2}\sqrt{\frac{R_4}{L_4(2C_4R_4+C_LR_4+2C_LL_4)}}$$

$$\mathbf{Bandwidth}\colon \frac{2(C_LR_4R_L+L_4)}{L_4(2C_4R_4+C_LR_4+2C_LL_4)}$$

Filter 575

Invalid filter

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

Filter 576**Filter Type:** BP

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_4L_LL_4R_4s}{2C_4L_LL_4R_4s^2+C_LL_LL_4R_4s^2+2L_4L_LL_4s+L_4R_4+2L_LL_4}$$

$$\mathbf{Q}\colon \frac{R_4\sqrt{\frac{L_4+2L_L}{L_4L_LL_4(2C_4+C_L)}}(2C_4+C_L)}{R_4+2R_L}$$

$$\omega_0\colon \sqrt{\frac{L_4+2L_L}{L_4L_LL_4(2C_4+C_L)}}$$

$$\mathbf{Bandwidth}\colon \frac{2}{R_4(2C_4+C_L)}$$

Filter 577

Invalid filter

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 578**Filter Type:** BP

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{1}{C_LL_Ls+\frac{1}{R_L}+\frac{1}{L_L^2s}}\right)$$

$$H(s)\colon \frac{L_4L_LL_4R_4s}{2C_4L_4L_LL_4R_4s^2+C_LL_LL_4R_4R_Ls^2+L_4L_LL_4R_4s+2L_4L_LL_4R_Ls+L_4R_4R_L+2L_LL_4R_L}$$

$$\mathbf{Q}\colon \frac{R_4R_L\sqrt{\frac{L_4+2L_L}{L_4L_LL_4(2C_4+C_L)}}(2C_4+C_L)}{R_4+2R_L}$$

$$\omega_0\colon \sqrt{\frac{L_4+2L_L}{L_4L_LL_4(2C_4+C_L)}}$$

$$\mathbf{Bandwidth}\colon \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 579

Invalid filter

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

Filter 580

Invalid filter

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4s}}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2s}\right)}{L_Ls+R_L+\frac{1}{C_L^2s}}\right)$$

Filter 581**Filter Type:** GE

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, R_L\right)$$

$$H(s)\colon \frac{R_L(C_4L_4R_4s^2+L_4s+R_4)}{C_4L_4R_4s^2+2C_4L_4R_4s^2+L_4s+R_4+2R_4}$$

$$\mathbf{Q}\colon C_4\sqrt{\frac{1}{C_4L_4}}(R_4+2R_L)$$

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

$$\mathbf{Bandwidth}\colon \frac{1}{C_4(R_4+2R_L)}$$

$$\mathbf{Qz}\colon C_4R_4\sqrt{\frac{1}{C_4L_4}}$$

Filter 582

Invalid filter

$$Z(s)\colon \left(\infty, L_2s+R_2+\frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, \frac{1}{C_Ls}\right)$$

Filter 583

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L}{C_LR_Ls+1}\right)$

Filter 584

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, R_L + \frac{1}{C_Ls}\right)$

Filter 585

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, L_Ls + \frac{1}{C_Ls}\right)$

Filter 586

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$

Filter 587

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 588

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$

Filter 589

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_4s}{C_LL_Ls^2+1} + R_L\right)$

Filter 590

Invalid filter
 $Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$

Filter 591

Filter Type: BS

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, R_L\right)$

$H(s)$: $\frac{R_LR_L\left(C_4L_4s^2+1\right)}{C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+R_4+2R_L}$

Q: $\frac{L_4\sqrt{\frac{1}{C_4^2R_L}\left(R_4+2R_L\right)}}{2R_4R_L}$

ω_0 : $\sqrt{\frac{1}{C_4L_4}}$

Bandwidth: $\frac{2R_4R_L}{L_4\left(R_4+2R_L\right)}$

Filter 592

Filter Type: BS

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, \frac{1}{C_Ls}\right)$

$H(s)$: $\frac{R_4\left(C_4L_4s^2+1\right)}{C_4C_4L_4R_4s^2+2C_4L_4s^2+2C_4R_4s+C_4R_4s+2}$

Q: $\frac{2C_4L_4\sqrt{\frac{1}{C_4^2R_L}}}{R_4\left(2C_4+C_L\right)}$

ω_0 : $\sqrt{\frac{1}{C_4L_4}}$

Bandwidth: $\frac{R_4\left(2C_4+C_L\right)}{2C_4L_4}$

Filter 593

Filter Type: BS

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$

$H(s)$: $\frac{R_LR_L\left(C_4L_4s^2+1\right)}{C_4C_4L_4R_LR_Ls^2+C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+C_LR_4R_Ls+R_L+2R_L}$

Q: $\frac{C_4L_4\sqrt{\frac{1}{C_4^2R_L}\left(R_4+2R_L\right)}}{R_LR_L\left(2C_4+C_L\right)}$

ω_0 : $\sqrt{\frac{1}{C_4L_4}}$

Bandwidth: $\frac{R_LR_L\left(2C_4+C_L\right)}{C_4L_4\left(R_4+2R_L\right)}$

Filter 594

Invalid filter

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, R_L + \frac{1}{C_Ls}\right)$

Filter 595

Invalid filter

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, L_Ls + \frac{1}{C_Ls}\right)$

Filter 596

Invalid filter

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$

Filter 597

Invalid filter

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 598

Invalid filter

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$

Filter 599

Invalid filter

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$

Filter 600

Invalid filter

$Z(s)$: $\left(\infty, L_2s + R_2 + \frac{1}{C_2s}, \infty, \frac{R_4\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$

Filter 601

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, R_L\right)$

Filter 602

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, \frac{1}{C_L s}\right)$

Filter 603

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, \frac{R_L}{C_L R_L s + 1}\right)$

Filter 604

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, R_L + \frac{1}{C_L s}\right)$

Filter 605

Filter Type: BS

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, L_L s + \frac{1}{C_L s}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 606

Filter Type: BP

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 607

Filter Type: GE

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

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

Filter 608

Filter Type: BP

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{C_L s}}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 609

Filter Type: GE

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

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

Filter 610

Filter Type: BS

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}}\right)$

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

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

ω_0 : $\sqrt{\frac{1}{C_L L_L}}$

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

Filter 611

Invalid filter

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_L s}, \infty, R_L\right)$

Filter 612

Invalid filter

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_L s}, \infty, \frac{1}{C_L s}\right)$

Filter 613

Invalid filter

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_L s}, \infty, \frac{R_L}{C_L R_L s + 1}\right)$

Filter 614

Invalid filter

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_L s}, \infty, R_L + \frac{1}{C_L s}\right)$

Filter 615

Invalid filter

$Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{1}{C_L s}, \infty, L_L s + \frac{1}{C_L s}\right)$

Filter 616

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{1}{C_4s}, \infty, \frac{L_4s}{C_L L_Ls^2+1}\right)$$

Filter 617

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{1}{C_4s}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 618

Filter Type: BP

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$

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

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

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

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

Filter 619

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{1}{C_4s}, \infty, \frac{L_4s}{C_L L_Ls^2+1}+R_L\right)$$

Filter 620

Filter Type: BS

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$$

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

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

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

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

Filter 621

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L\right)$$

Filter 622

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls}\right)$$

Filter 623

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L}{C_L R_L s+1}\right)$$

Filter 624

Filter Type: Invalid011

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L+\frac{1}{C_Ls}\right)$$

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

$$\mathbf{Q}\colon \frac{2C_L C_L R_L R_L\sqrt{\frac{1}{C_L C_L R_L R_L}}}{2C_4 R_4s+C_L R_L+2C_L R_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_L C_L R_4 R_L}}$$

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

Filter 625

Filter Type: BS

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_4\left(C_L L_L s^2+1\right)}{2C_L C_L L_L R_L s^2+2C_4 R_L s+2C_L L_L s^2+C_L R_4s+2}$$

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

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

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

Filter 626

Filter Type: BP

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_4s}{C_L L_L s^2+1}\right)$$

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

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

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

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

Filter 627

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 628

Filter Type: BP

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$

$$H(s)\colon \frac{L_L R_4 R_L s}{2C_L L_L R_L R_L s^2+C_L L_L R_4 R_L s^2+L_L R_4s+2L_L R_L s+R_4 R_L}$$

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

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

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

Filter 629

Invalid filter

$$Z(s)\colon \left(\infty, \frac{L_2s}{C_2L_2s^2+1}+R_2, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_4s}{C_L L_L s^2+1}+R_L\right)$$

Filter 630**Filter Type:** BS

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4}{C_4 R_4 s + 1}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$
$$H(s): \frac{R_4 R_L (C_L L_L s^2 + 1)}{2 C_L C_L L_L R_L R_L s^3 + 2 C_L R_4 R_L s + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + C_L R_4 R_L s + R_4 + 2 R_L}$$
$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{C_L^2}{C_L^2 L_L^2} (R_4 + 2 R_L)}}{R_4 R_L (2 C_L + C_L)}$$
$$\omega_0: \sqrt{\frac{1}{C_L L_L}}$$
$$\textbf{Bandwidth: } \frac{R_4 R_L (2 C_L + C_L)}{C_L L_L (R_4 + 2 R_L)}$$

Filter 631

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, R_L \right)$$

Filter 632

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

Filter 633**Filter Type:** Invalid011

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$
$$H(s): \frac{R_L (C_L R_4 s + 1)}{C_L C_L R_L R_L s^3 + C_L R_4 s + 2 C_L R_L s + C_L R_L s + 1}$$
$$\mathbf{Q}: \frac{C_L C_L R_4 R_L \sqrt{\frac{C_L^2}{C_L^2 L_L^2} R_L R_L}}{C_L R_4 + 2 C_L R_L + C_L R_L}$$
$$\omega_0: \sqrt{\frac{1}{C_L C_L R_L R_L}}$$
$$\textbf{Bandwidth: } \frac{C_L R_4 + 2 C_L R_L + C_L R_L}{C_L C_L R_L R_L}$$

Filter 634

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 635

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 636**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_L s (C_L R_4 s + 1)}{C_L C_L L_L R_4 s^3 + 2 C_L L_L s^2 + C_L R_4 s + C_L L_L s^2 + 1}$$
$$\mathbf{Q}: \frac{L_L \sqrt{\frac{C_L^2}{L_L^2 (2 C_L + C_L)} (2 C_L + C_L)}}{C_L R_4}$$
$$\omega_0: \sqrt{\frac{1}{L_L (2 C_L + C_L)}}$$
$$\textbf{Bandwidth: } \frac{C_L R_4}{L_L (2 C_L + C_L)}$$

Filter 637

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 638**Filter Type:** Invalid110

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$
$$H(s): \frac{L_L R_L s (C_L R_4 s + 1)}{C_L C_L L_L R_4 R_L s^3 + C_L L_L R_4 s^2 + 2 C_L L_L R_L s^2 + C_L R_4 R_L s + C_L L_L R_L s^2 + L_L s + R_L}$$
$$\mathbf{Q}: \frac{L_L \sqrt{\frac{R_L}{L_L (C_L R_4 + 2 C_L R_L + C_L R_L)} (C_L R_4 + 2 C_L R_L + C_L R_L)}}{C_L R_4 R_L + L_L}$$
$$\omega_0: \sqrt{\frac{R_L}{L_L (C_L R_4 + 2 C_L R_L + C_L R_L)}}$$
$$\textbf{Bandwidth: } \frac{C_L R_4 R_L + L_L}{L_L (C_L R_4 + 2 C_L R_L + C_L R_L)}$$

Filter 639

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 640

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^2} \right)}{L_L s + R_L + \frac{1}{C_L^2}} \right)$$

Filter 641**Filter Type:** BS

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L \right)$$
$$H(s): \frac{R_L (C_L L_4 s^2 + 1)}{C_L C_L L_4 R_L s^3 + C_L L_4 s^2 + 2 C_L R_L s + C_L R_L s + 1}$$
$$\mathbf{Q}: \frac{L_4 \sqrt{\frac{C_L^2 L_4}{2 R_L}}}{2 R_L}$$
$$\omega_0: \sqrt{\frac{1}{C_L^2 L_4}}$$
$$\textbf{Bandwidth: } \frac{2 R_L}{L_4}$$

Filter 642

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

Filter 643**Filter Type:** BS

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$
$$H(s): \frac{R_L (C_L L_4 s^2 + 1)}{C_L C_L L_4 R_L s^3 + C_L L_4 s^2 + 2 C_L R_L s + C_L R_L s + 1}$$
$$\mathbf{Q}: \frac{C_L L_4 \sqrt{\frac{C_L^2 L_4}{2 R_L}}}{R_L (2 C_L + C_L)}$$
$$\omega_0: \sqrt{\frac{1}{C_L L_4}}$$
$$\textbf{Bandwidth: } \frac{R_L (2 C_L + C_L)}{C_L L_4}$$

Filter 644

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 645

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s}\right)$

Filter 646

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$

Filter 647

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$

Filter 648

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{1}{\frac{1}{C_L s} + \frac{1}{R_L}}\right)$

Filter 649

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$

Filter 650

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, L_4 s + \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$

Filter 651

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L\right)$

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

Q: $2 C_4 R_L \sqrt{\frac{1}{C_4 L_4}}$

ω_0 : $\sqrt{\frac{1}{C_4 L_4}}$

Bandwidth: $\frac{1}{2 C_4 R_L}$

Filter 652

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{C_L s}\right)$

Filter 653

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{R_L}{C_L R_L s + 1}\right)$

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

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

ω_0 : $\sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$

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

Filter 654

Filter Type: Invalid110
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, R_L + \frac{1}{C_L s}\right)$

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

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

ω_0 : $\sqrt{2} \sqrt{\frac{1}{L_4 (2 C_4 + C_L)}}$

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

Filter 655

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, L_L s + \frac{1}{C_L s}\right)$

Filter 656

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$

Filter 657

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$

Filter 658

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{1}{\frac{1}{C_L s} + \frac{1}{R_L} + \frac{1}{C_L s}}\right)$

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

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 659

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$

Filter 660

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{L_4 s}{C_4 L_4 s^2 + 1}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$

Filter 661

Filter Type: GE
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, R_L\right)$
 $H(s)$: $\frac{R_L(C_4L_4s^2+C_4R_4s+1)}{C_2L_4s^2+C_4R_4s+2C_4R_Ls+1}$
Q: $\frac{L_4\sqrt{C_4^2L_4}}{R_L+2R_L}$
 ω_0 : $\sqrt{\frac{1}{C_4L_4}}$
Bandwidth: $\frac{R_4+2R_L}{L_4}$
Qz: $\frac{L_4\sqrt{\frac{1}{C_4^2L_4}}}{R_L}$

Filter 662

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$

Filter 663

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$

Filter 664

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, R_L + \frac{1}{C_Ls}\right)$

Filter 665

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_Ls + \frac{1}{C_Ls}\right)$

Filter 666

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$

Filter 667

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, L_Ls + R_L + \frac{1}{C_Ls}\right)$

Filter 668

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_L^2s}}\right)$

Filter 669

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L\right)$

Filter 670

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, L_4s + R_4 + \frac{1}{C_4s}, \infty, \frac{R_L(L_Ls+C_L\frac{1}{C_L})}{L_Ls+R_L+\frac{C_L^2}{C_Ls}}\right)$

Filter 671

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4^2s}}, \infty, R_L\right)$
 $H(s)$: $\frac{L_4R_4R_Ls}{2C_4L_4R_4R_Ls^2+L_4R_4s+2L_4R_Ls+2R_4R_L}$
Q: $\frac{2C_4R_4R_L\sqrt{C_4^2L_4}}{R_4+2R_L}$
 ω_0 : $\sqrt{\frac{1}{C_4L_4}}$
Bandwidth: $\frac{R_4+2R_L}{2C_4R_4R_L}$

Filter 672

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4^2s}}, \infty, \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_4R_4s}{2C_4L_4R_4s^2+C_LL_4R_4s^2+2L_4s+2R_4}$
Q: $\frac{\sqrt{2}R_4\sqrt{L_4(2C_4^2+C_L)}(2C_4+C_L)}{2}$
 ω_0 : $\sqrt{2}\sqrt{L_4(2C_4^2+C_L)}$
Bandwidth: $\frac{2}{R_4(2C_4+C_L)}$

Filter 673

Filter Type: BP
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4^2s}}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$
 $H(s)$: $\frac{L_4R_4R_Ls}{2C_4C_LL_4R_LR_Ls^2+C_LL_4R_LR_Ls^2+L_4R_4s+2L_4R_Ls+2R_4R_L}$
Q: $\frac{\sqrt{2}R_4R_L\sqrt{L_4(2C_4^2+C_L)}(2C_4+C_L)}{R_4+2R_L}$
 ω_0 : $\sqrt{2}\sqrt{L_4(2C_4^2+C_L)}$
Bandwidth: $\frac{R_4+2R_L}{R_LR_L(2C_4+C_L)}$

Filter 674

Filter Type: Invalid110
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4^2s}}, \infty, R_L + \frac{1}{C_Ls}\right)$
 $H(s)$: $\frac{L_4R_4s(C_LR_Ls+1)}{2C_4C_LL_4R_LR_Ls^2+2C_4L_4R_4s^2+C_LL_4R_4s^2+2C_LR_4R_Ls^2+2C_LR_4R_Ls+2L_4s+2R_4}$
Q: $\frac{\sqrt{2}L\sqrt{L_4(2C_4^2+C_L)}\frac{R_4}{R_4+C_LR_4+2C_LR_L}}{2(C_LR_4R_L+L_4)}$
 ω_0 : $\sqrt{2}\sqrt{L_4(2C_4^2+C_L)}$
Bandwidth: $\frac{R_L}{L_4(2C_4R_4+C_LR_4+2C_LR_L)}$

Filter 675

Invalid filter
 $Z(s)$: $\left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4}+\frac{1}{L_4^2s}}, \infty, L_Ls + \frac{1}{C_Ls}\right)$

Filter 676**Filter Type:** BP

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

$$H(s): \frac{\frac{L_4L_LR_L}{2C_4L_4L_LR_LR_Ls^2+C_4L_4L_LR_LR_Ls^2+2L_4L_LR_Ls+L_4R_L+2L_LR_L}}{\frac{R_4R_L\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)}$$

$$\mathbf{Q:} \frac{R_4\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)}{2}$$

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

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

Filter 677

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{L_Ls}{C_LL_Ls} + R_L + \frac{1}{C_Ls} \right)$$

Filter 678**Filter Type:** BP

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{1}{C_LL_Ls+\frac{1}{R_Ls}} \right)$$

$$H(s): \frac{\frac{L_4L_LR_LR_L}{2C_4L_4L_LR_LR_Ls^2+C_4L_4L_LR_LR_Ls^2+2L_4L_LR_Ls+L_4R_L+2L_LR_L}}{\frac{R_4R_L\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)}$$

$$\mathbf{Q:} \frac{R_4\sqrt{\frac{L_4+2L_L}{L_4L_L(2C_4+C_L)}}(2C_4+C_L)}{2}$$

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

$$\mathbf{Bandwidth:} \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 679

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

Filter 680

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{1}{C_4s+\frac{1}{R_4+\frac{1}{L_4s}}}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

Filter 681**Filter Type:** GE

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, R_L \right)$$

$$H(s): \frac{R_L\left(C_4L_4R_Ls^2+L_4s+R_4\right)}{C_4L_4R_Ls^2+2C_4L_4R_LR_Ls^2+L_4s+R_4+2R_L}$$

$$\mathbf{Q:} C_4\sqrt{\frac{1}{C_4L_4}}\left(R_4+2R_L\right)$$

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

$$\mathbf{Bandwidth:} \frac{1}{C_4\left(R_4+2R_L\right)}$$

$$\mathbf{Qz:} C_4R_4\sqrt{\frac{1}{C_4L_4}}$$

Filter 682

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{1}{C_Ls} \right)$$

Filter 683

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L}{C_LR_Ls+1} \right)$$

Filter 684

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, R_L + \frac{1}{C_Ls} \right)$$

Filter 685

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, L_Ls + \frac{1}{C_Ls} \right)$$

Filter 686

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} \right)$$

Filter 687

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, L_Ls + R_L + \frac{1}{C_Ls} \right)$$

Filter 688

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}} \right)$$

Filter 689

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{L_Ls}{C_LL_Ls^2+1} + R_L \right)$$

Filter 690

Invalid filter

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{L_4s}{C_4L_4s^2+1} + R_4, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}} \right)$$

Filter 691**Filter Type:** BS

$$Z(s): \left(\infty, \frac{L_2s}{C_2L_2s^2+1} + R_2, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}, \infty, R_L \right)$$

$$H(s): \frac{R_LR_L\left(C_4L_4s^2+1\right)}{C_4L_4R_Ls^2+2C_4L_4R_LR_Ls^2+2C_4R_LR_Ls+R_4+2R_L}$$

$$\mathbf{Q:} \frac{L_4\sqrt{\frac{1}{C_4L_4}}\left(R_4+2R_L\right)}{2R_LR_L}$$

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

$$\mathbf{Bandwidth:} \frac{2R_LR_L}{L_4\left(R_4+2R_L\right)}$$

Filter 692**Filter Type:** BS

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, \frac{1}{C_L s} \right)$$

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

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

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

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

Filter 693**Filter Type:** BS

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

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

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

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

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

Filter 694

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 695

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 696

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

Filter 697

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 698

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

Filter 699

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 700

Invalid filter

$$Z(s): \left(\infty, \frac{L_2 s}{C_2 L_2 s^2 + 1} + R_2, \infty, \frac{R_4 (L_4 s + \frac{1}{C_4^+})}{L_4 s + R_4 + \frac{1}{C_4^+}}, \infty, \frac{R_L (L_L s + \frac{1}{C_L^+})}{L_L s + R_L + \frac{1}{C_L^+}} \right)$$

Filter 701

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 (L_2 s + \frac{1}{C_2^+})}{L_2 s + R_2 + \frac{1}{C_2^+}}, \infty, R_4, \infty, R_L \right)$$

Filter 702

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 (L_2 s + \frac{1}{C_2^+})}{L_2 s + R_2 + \frac{1}{C_2^+}}, \infty, R_4, \infty, \frac{1}{C_L s} \right)$$

Filter 703

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 (L_2 s + \frac{1}{C_2^+})}{L_2 s + R_2 + \frac{1}{C_2^+}}, \infty, R_4, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

Filter 704

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 (L_2 s + \frac{1}{C_2^+})}{L_2 s + R_2 + \frac{1}{C_2^+}}, \infty, R_4, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 705**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 (L_2 s + \frac{1}{C_2^+})}{L_2 s + R_2 + \frac{1}{C_2^+}}, \infty, R_4, \infty, L_L s + \frac{1}{C_L s} \right)$$

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

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

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

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

Filter 706**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 (L_2 s + \frac{1}{C_2^+})}{L_2 s + R_2 + \frac{1}{C_2^+}}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

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

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

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

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

Filter 707**Filter Type:** GE

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, R_4, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

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

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

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

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

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

Filter 708**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, R_4, \infty, \frac{1}{C_L s + \frac{1}{L_L s}} \right)$$

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

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

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

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

Filter 709**Filter Type:** GE

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, R_4, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

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

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

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

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

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

Filter 710**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, R_4, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

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

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

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

$$\textbf{Bandwidth: } \frac{R_4 R_L}{L_L \left(R_4 + 2 R_L \right)}$$

Filter 711

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, R_L \right)$$

Filter 712

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s} \right)$$

Filter 713

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

Filter 714

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 715

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 716

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

Filter 717

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 718**Filter Type:** BP

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{L_L s}} \right)$$

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

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

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

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

Filter 719

Invalid filter

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 720**Filter Type:** BS

$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2 s} \right)}{L_2 s + R_2 + \frac{1}{C_2 s}}, \infty, \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

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

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

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

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

Filter 721

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L\right)$$

Filter 722

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls}\right)$$

Filter 723

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L}{C_LR_4s+1}\right)$$

Filter 724**Filter Type:** Invalid011

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_L(C_LR_4s+1)}{2C_4C_LR_4R_LR_Ls^2+2C_4R_4s+C_LR_4s+2C_LR_4s+2}$$

$$\mathbf{Q}\colon \frac{2C_4C_LR_4R_L\sqrt{\frac{1}{c_L^2c_LR_4R_L}}}{2C_4R_4+C_LR_4+2C_LR_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4C_LR_4R_L}}$$

$$\textbf{Bandwidth}\colon \frac{2C_4R_4+C_LR_4+2C_LR_L}{2C_4C_LR_4R_L}$$

Filter 725**Filter Type:** BS

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{R_L(C_LL_Ls^2+1)}{2C_4C_LL_LR_4R_Ls^2+2C_4R_4s+2C_LL_Ls^2+C_LR_4s+2}$$

$$\mathbf{Q}\colon \frac{2C_4C_LL_LR_4\sqrt{\frac{1}{c_L^2L_L}}}{R_L(2C_4+C_L)}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\textbf{Bandwidth}\colon \frac{R_L(2C_4+C_L)}{2C_4L_L}$$

Filter 726**Filter Type:** BP

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

$$H(s)\colon \frac{L_LR_4R_4}{2C_4L_LR_4R_Ls^2+C_4L_LR_4R_4s^2+2L_LR_4}$$

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

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

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

Filter 727

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 728**Filter Type:** BP

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{1}{C_Ls+\frac{1}{L_Ls}}\right)$$

$$H(s)\colon \frac{L_LR_4R_4s}{2C_4L_LR_4R_Ls^2+C_4L_LR_4R_4s^2+L_LR_4s+2L_LR_4s+R_4R_L}$$

$$\mathbf{Q}\colon \frac{R_4R_L\sqrt{\frac{L_L(\overline{2C_4+C_L})}{2}}(2C_4+C_L)}{R_4+2R_L}$$

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

$$\textbf{Bandwidth}\colon \frac{R_4+2R_L}{R_4R_L(2C_4+C_L)}$$

Filter 729

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

Filter 730**Filter Type:** BS

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, \frac{R_4}{C_4R_4s+1}, \infty, \frac{R_L\left(L_Ls+\frac{1}{c_L^2}\right)}{L_Ls+R_L+\frac{1}{c_L^2}}\right)$$

$$H(s)\colon \frac{R_4R_L(C_LL_Ls^2+1)}{2C_4C_LR_4R_LR_Ls^2+2C_4R_4R_Ls+C_LL_LR_4s^2+2C_LL_LR_Ls^2+C_LR_4R_Ls+R_4+2R_L}$$

$$\mathbf{Q}\colon \frac{C_LL_LR_4\sqrt{\frac{1}{c_L^2L_L}}(R_4+2R_L)}{R_4R_L(2C_4+C_L)}$$

$$\omega_0\colon \sqrt{\frac{1}{C_LL_L}}$$

$$\textbf{Bandwidth}\colon \frac{R_4R_L(2C_4+C_L)}{C_LL_LR_4(2R_4+2R_L)}$$

Filter 731

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, R_L\right)$$

Filter 732

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$$

Filter 733**Filter Type:** Invalid011

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_4s+1}\right)$$

$$H(s)\colon \frac{R_L(C_LR_4s+1)}{C_4C_LR_4R_LR_Ls^2+C_4R_4s+2C_LR_4s+C_LR_4s+1}$$

$$\mathbf{Q}\colon \frac{C_4C_LR_4R_L\sqrt{\frac{1}{c_L^2c_LR_4R_L}}}{C_4R_4+2C_LR_4+C_LR_L}$$

$$\omega_0\colon \sqrt{\frac{1}{C_4C_LR_4R_L}}$$

$$\textbf{Bandwidth}\colon \frac{C_4R_4+2C_LR_4+C_LR_L}{C_4C_LR_4R_L}$$

Filter 734

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{c_L^2}\right)}{L_2s+R_2+\frac{1}{c_L^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, R_L+\frac{1}{C_Ls}\right)$$

Filter 735

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, L_Ls+\frac{1}{C_Ls}\right)$

Filter 736

Filter Type: Invalid110
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$
 $H(s)\colon \frac{L_Ls(C_4R_4s+1)}{C_2C_2L_LL_LR_4s^2+2C_4L_LLs^2+C_4R_4s+C_LLs^2+1}$
Q: $\frac{L_L\sqrt{L_L(\frac{C_4+1}{C_4}+C_4)}}{C_4R_4}$
 $\omega_0\colon \sqrt{\frac{1}{L_LL(2C_4+C_L)}}$
Bandwidth: $\frac{C_4R_4}{L_LL(2C_4+C_L)}$

Filter 737

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$

Filter 738

Filter Type: Invalid110
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_LL^2}}\right)$
 $H(s)\colon \frac{L_LL_Rs(C_4R_4s+1)}{C_2C_2L_LL_LR_4R_4s^3+C_2L_LL_R_4s^2+2C_4L_LL_R_4s^2+C_4R_4R_4s+C_LL_R_4s^2+L_LLs+R_L}$
Q: $\frac{L_LL\sqrt{L_LL(C_4R_4+\frac{1}{2C_4}R_4+C_LL)}}{C_4R_4R_4+L_LL}$
 $\omega_0\colon \sqrt{\frac{R_4}{L_LL(C_4R_4+2C_4R_4+C_LL)}}$
Bandwidth: $\frac{C_4R_4R_4+L_LL}{L_LL(C_4R_4+2C_4R_4+C_LL)}$

Filter 739

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$

Filter 740

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, R_4+\frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2}\right)}{L_Ls+R_L+\frac{1}{C_L^2}}\right)$

Filter 741

Filter Type: BS
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, R_L\right)$
 $H(s)\colon \frac{R_L\left(C_4L_4s^2+1\right)}{C_4L_4s^2+2C_4R_Ls+1}$
Q: $\frac{L_4\sqrt{\frac{C_4+1}{C_4}}}{2R_L}$
 $\omega_0\colon \sqrt{\frac{1}{C_4L_4}}$
Bandwidth: $\frac{2R_L}{L_4}$

Filter 742

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$

Filter 743

Filter Type: BS
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, \frac{R_L}{C_LL_Ls+1}\right)$
 $H(s)\colon \frac{R_L\left(C_4L_4s^2+1\right)}{C_2C_2L_LL_LR_4s^3+C_4L_4s^2+2C_4R_4s+C_LLs+1}$
Q: $\frac{C_4L_4\sqrt{\frac{C_4+1}{C_4}}}{R_L(2C_4+C_L)}$
 $\omega_0\colon \sqrt{\frac{1}{C_4L_4}}$
Bandwidth: $\frac{R_L(2C_4+C_L)}{C_4L_4}$

Filter 744

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, R_L+\frac{1}{C_Ls}\right)$

Filter 745

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, L_Ls+\frac{1}{C_Ls}\right)$

Filter 746

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$

Filter 747

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$

Filter 748

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$

Filter 749

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$

Filter 750

Invalid filter
 $Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+\frac{1}{C_4s}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2}\right)}{L_Ls+R_L+\frac{1}{C_L^2}}\right)$

Filter 751**Filter Type:** BP

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L\right)$$

$$H(s)\colon \frac{\frac{L_4R_Ls}{2C_4L_4R_Ls^2+C_4L_4R_Ls+2R_L}}{\frac{1}{2C_4L_4R_Ls^2+C_4L_4R_Ls+2R_L}}$$

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

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

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

Filter 752

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls}\right)$$

Filter 753**Filter Type:** BP

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{\frac{L_4R_Ls}{2C_4L_4R_Ls^2+C_4L_4R_Ls+2R_L}}{\frac{1}{2C_4L_4R_Ls^2+C_4L_4R_Ls+2R_L}}$$

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

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

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

Filter 754**Filter Type:** Invalid110

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, R_L+\frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{\frac{L_4s(C_LR_Ls+1)}{2C_4C_LL_1R_Ls^2+2C_4L_4s^2+C_LL_4s^2+3C_LR_Ls+2}}{\sqrt{2L_4\sqrt{\frac{L_4(2C_4+C_L)}{L_4(2C_4+C_L)}}}(2C_4+C_L)}$$

$$\mathbf{Q}\colon \frac{2C_4R_L}{\sqrt{2L_4\sqrt{\frac{L_4(2C_4+C_L)}{L_4(2C_4+C_L)}}}(2C_4+C_L)}$$

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

$$\mathbf{Bandwidth}\colon \frac{2C_4R_L}{L_4(2C_4+C_L)}$$

Filter 755

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

Filter 756

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

Filter 757

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 758**Filter Type:** BP

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{1}{C_Ls+\frac{1}{R_L+\frac{1}{L_Ls}}}\right)$$

$$H(s)\colon \frac{\frac{L_4L_LR_Ls}{2C_4L_4L_LR_Ls^2+C_4L_4R_Ls^2+L_4L_LR_Ls+L_4R_L+2L_LR_L}}{\frac{1}{2C_4L_4L_LR_Ls^2+C_4L_4R_Ls^2+L_4L_LR_Ls+L_4R_L+2L_LR_L}}$$

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

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

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

Filter 759

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

Filter 760

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_Ls}\right)}{L_Ls+R_L+\frac{1}{C_Ls}}\right)$$

Filter 761**Filter Type:** GE

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, R_L\right)$$

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

$$\mathbf{Q}\colon \frac{L_4\sqrt{\frac{1}{C_4+R_4}}}{R_4+2R_L}$$

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

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

$$\mathbf{Qz}\colon \frac{L_4\sqrt{\frac{1}{C_4+R_4}}}{R_4}$$

Filter 762

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{1}{C_Ls}\right)$$

Filter 763

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$$

Filter 764

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, R_L+\frac{1}{C_Ls}\right)$$

Filter 765

Invalid filter

$$Z(s)\colon \left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, L_4s+R_4+\frac{1}{C_4s}, \infty, L_Ls+\frac{1}{C_Ls}\right)$$

Filter 766

Invalid filter
 $Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$

Filter 767

Invalid filter
 $Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$

Filter 768

Invalid filter
 $Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{1}{C_L s + \frac{1}{R_L + L_L s}} \right)$

Filter 769

Invalid filter
 $Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$

Filter 770

Invalid filter
 $Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, L_4 s + R_4 + \frac{1}{C_4 s}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$

Filter 771**Filter Type:** BP

$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, R_L \right)$

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

Q: $\frac{2 C_4 R_4 R_L \sqrt{C_4 L_4}}{R_4 + 2 R_L}$

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

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

Filter 772**Filter Type:** BP

$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{1}{C_L s} \right)$

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

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

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

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

Filter 773**Filter Type:** BP

$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{R_L}{C_L R_L s + 1} \right)$

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

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

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

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

Filter 774**Filter Type:** Invalid110

$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, R_L + \frac{1}{C_L s} \right)$

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

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

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

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

Filter 775

Invalid filter
 $Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + \frac{1}{C_L s} \right)$

Filter 776**Filter Type:** BP

$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$

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

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

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

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

Filter 777

Invalid filter
 $Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$

Filter 778**Filter Type:** BP

$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{1}{C_L s + \frac{1}{R_L + L_L s}} \right)$

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

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

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

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

Filter 779

Invalid filter
 $Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2} \right)}{L_2 s + R_2 + \frac{1}{C_2^2}}, \infty, \frac{1}{C_4 s + \frac{1}{R_4} + \frac{1}{L_4 s}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$

Filter 780

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{1}{C_4s+\frac{1}{L_4^2}}, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2}\right)}{L_Ls+R_L+\frac{1}{C_L^2}}\right)$

Filter 781

Filter Type: GE

$Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, R_L\right)$

$H(s)$: $\frac{R_L\left(C_4L_4R_4s^2+L_4s+R_4\right)}{C_4L_4R_4s^2+2C_4L_4R_Ls^2+L_4s+R_4+2R_L}$

Q: $C_4\sqrt{\frac{1}{C_4L_4}}\left(R_4+2R_L\right)$

ω_0 : $\sqrt{\frac{1}{C_4L_4}}$

Bandwidth: $\frac{1}{C_4\left(R_4+2R_L\right)}$

Qz: $C_4R_4\sqrt{\frac{1}{C_4L_4}}$

Filter 782

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, \frac{1}{C_Ls}\right)$

Filter 783

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, \frac{R_L}{C_LR_Ls+1}\right)$

Filter 784

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, R_L+\frac{1}{C_Ls}\right)$

Filter 785

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, L_Ls+\frac{1}{C_Ls}\right)$

Filter 786

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, \frac{L_Ls}{C_LL_Ls+1}\right)$

Filter 787

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, L_Ls+R_L+\frac{1}{C_Ls}\right)$

Filter 788

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, \frac{1}{C_LL_L+\frac{1}{L_Ls}}\right)$

Filter 789

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, \frac{L_4s}{C_LL_Ls^2+1}+R_L\right)$

Filter 790

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{L_4s}{C_4L_4s^2+1}+R_4, \infty, \frac{R_L\left(L_Ls+\frac{1}{C_L^2}\right)}{L_Ls+R_L+\frac{1}{C_L^2}}\right)$

Filter 791

Filter Type: BS

$Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}}, \infty, R_L\right)$

$H(s)$: $\frac{R_4R_L\left(C_4L_4s^2+1\right)}{C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+R_4+2R_L}$

Q: $\frac{L_4\sqrt{\frac{1}{C_4^2R_4}}\left(R_4+2R_L\right)}{2R_LR_L}$

ω_0 : $\sqrt{\frac{1}{C_4L_4}}$

Bandwidth: $\frac{2R_LR_L}{L_4\left(R_4+2R_L\right)}$

Filter 792

Filter Type: BS

$Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}}, \infty, \frac{1}{C_Ls}\right)$

$H(s)$: $\frac{R_4\left(C_4L_4s^2+1\right)}{C_4C_LL_4R_4s^3+2C_4L_4s^2+2C_4R_4s+C_LR_4s+2}$

Q: $\frac{2C_4L_4\sqrt{\frac{1}{C_4^2L_4}}}{R_4\left(2C_4+C_L\right)}$

ω_0 : $\sqrt{\frac{1}{C_4L_4}}$

Bandwidth: $\frac{R_4\left(2C_4+C_L\right)}{2C_4L_4}$

Filter 793

Filter Type: BS

$Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}}, \infty, \frac{R_L}{C_LR_Ls+1}\right)$

$H(s)$: $\frac{R_4R_L\left(C_4L_4s^2+1\right)}{C_4C_LL_4R_4R_Ls^3+C_4L_4R_4s^2+2C_4L_4R_Ls^2+2C_4R_4R_Ls+C_LR_Ls+R_L+2R_L}$

Q: $\frac{C_4L_4\sqrt{\frac{1}{C_4^2L_4}}\left(R_4+2R_L\right)}{R_LR_L\left(2C_4+C_L\right)}$

ω_0 : $\sqrt{\frac{1}{C_4L_4}}$

Bandwidth: $\frac{R_4R_L\left(2C_4+C_L\right)}{C_4L_4\left(R_4+2R_L\right)}$

Filter 794

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}}, \infty, R_L+\frac{1}{C_Ls}\right)$

Filter 795

Invalid filter
 $Z(s)$: $\left(\infty, \frac{R_2\left(L_2s+\frac{1}{C_2^2}\right)}{L_2s+R_2+\frac{1}{C_2^2}}, \infty, \frac{R_4\left(L_4s+\frac{1}{C_4^2}\right)}{L_4s+R_4+\frac{1}{C_4^2}}, \infty, L_Ls+\frac{1}{C_Ls}\right)$

Filter 796

Invalid filter
$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^*} \right)}{L_4 s + R_4 + \frac{1}{C_4^*}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

Filter 797

Invalid filter
$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^*} \right)}{L_4 s + R_4 + \frac{1}{C_4^*}}, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 798

Invalid filter
$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^*} \right)}{L_4 s + R_4 + \frac{1}{C_4^*}}, \infty, \frac{1}{C_L s + \frac{1}{R_L + L_L s}} \right)$$

Filter 799

Invalid filter
$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^*} \right)}{L_4 s + R_4 + \frac{1}{C_4^*}}, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 800

Invalid filter
$$Z(s): \left(\infty, \frac{R_2 \left(L_2 s + \frac{1}{C_2^*} \right)}{L_2 s + R_2 + \frac{1}{C_2^*}}, \infty, \frac{R_4 \left(L_4 s + \frac{1}{C_4^*} \right)}{L_4 s + R_4 + \frac{1}{C_4^*}}, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L^*} \right)}{L_L s + R_L + \frac{1}{C_L^*}} \right)$$