

Experiment: TIA Z1 ZL

Filter 1

Invalid filter
 $Z(s)$: $(R_1, \infty, \infty, \infty, \infty, \infty, R_L)$

Filter 2

Invalid filter
 $Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s}\right)$

Filter 3

Invalid filter
 $Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1}\right)$

Filter 4

Invalid filter
 $Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s}\right)$

Filter 5

Invalid filter
 $Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s}\right)$

Filter 6

Invalid filter
 $Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$

Filter 7

Invalid filter
 $Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$

Filter 8

Filter Type: BP

$Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{C_L s}}}\right)$
 $H(s)$: $\frac{L_L R_L R_L g_m s}{(R_L g_m + 1)(C_L L_L R_L s^2 + L_L s + R_L)}$
Q: $C_L R_L \sqrt{\frac{1}{C_L L_L}}$
 ω_0 : $\sqrt{\frac{1}{C_L L_L}}$
Bandwidth: $\frac{1}{C_L R_L}$

Filter 9

Invalid filter
 $Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L\right)$

Filter 10

Filter Type: BS

$Z(s)$: $\left(R_1, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s}\right)}{L_L s + R_L + \frac{1}{C_L s}}\right)$
 $H(s)$: $\frac{R_L R_L g_m (C_L L_L s^2 + 1)}{(R_L g_m + 1)(C_L L_L s^2 + C_L R_L s + 1)}$
Q: $\frac{L_L \sqrt{\frac{1}{C_L L_L}}}{R_L}$
 ω_0 : $\sqrt{\frac{1}{C_L L_L}}$
Bandwidth: $\frac{R_L}{L_L}$

Filter 11

Invalid filter
 $Z(s)$: $(L_1 s, \infty, \infty, \infty, \infty, \infty, R_L)$

Filter 12

Invalid filter
 $Z(s)$: $\left(L_1 s, \infty, \infty, \infty, \infty, \frac{1}{C_L s}\right)$

Filter 13

Filter Type: BP

$Z(s)$: $\left(L_1 s, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1}\right)$
 $H(s)$: $\frac{L_1 R_L g_m s}{(C_L R_L s + 1)(L_1 g_m s + 1)}$
Q: $\frac{C_L L_1 R_L g_m \sqrt{\frac{1}{C_L L_1 R_L g_m}}}{C_L R_L + L_1 g_m}$
 ω_0 : $\sqrt{\frac{1}{C_L L_1 R_L g_m}}$
Bandwidth: $\frac{C_L R_L + L_1 g_m}{C_L L_1 R_L g_m}$

Filter 14

Invalid filter
 $Z(s)$: $\left(L_1 s, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s}\right)$

Filter 15

Invalid filter
 $Z(s)$: $\left(L_1 s, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s}\right)$

Filter 16

Filter Type: HP

$Z(s)$: $\left(L_1 s, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1}\right)$
 $H(s)$: $\frac{L_L L_L g_m s^2}{(C_L L_L s^2 + 1)(L_1 g_m s + 1)}$
Q: $\frac{C_L L_L \sqrt{\frac{1}{C_L L_L}}}{L_1 g_m}$
 ω_0 : $\sqrt{\frac{1}{C_L L_L}}$
Bandwidth: $\frac{L_L g_m}{C_L L_L}$

Filter 17

Invalid filter
 $Z(s)$: $\left(L_1 s, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s}\right)$

Filter 18

Filter Type: HP

$$Z(s)\colon \left(L_1s, \infty, \infty, \infty, \infty, \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}} \right)$$

$$H(s)\colon \frac{L_L L_L R_L g_m s^2}{(L_1 g_m s+1)(C_L L_L R_L s^2+L_L s+R_L)}$$

$$\mathbf{Q}\colon \frac{L_L \sqrt{\frac{R_L}{L_L(C_L R_L+L_1 g_m)}}(C_L R_L+L_1 g_m)}{L_L R_L g_m+L_L}$$

$$\omega_0\colon \sqrt{\frac{R_L}{L_L(C_L R_L+L_1 g_m)}}$$

$$\mathbf{Bandwidth}\colon \frac{L_L R_L g_m+L_L}{L_L(C_L R_L+L_1 g_m)}$$

Filter 19

Invalid filter

$$Z(s)\colon \left(L_1s, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2+1}+R_L \right)$$

Filter 20

Invalid filter

$$Z(s)\colon \left(L_1s, \infty, \infty, \infty, \infty, \frac{R_L\left(L_L s+\frac{1}{C_L^2} \right)}{L_L s+R_L+\frac{1}{C_L^2}} \right)$$

Filter 21

Invalid filter

$$Z(s)\colon \left(\frac{1}{C_L^2 s}, \infty, \infty, \infty, \infty, R_L \right)$$

Filter 22

Invalid filter

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

Filter 23

Filter Type: LP

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

$$H(s)\colon \frac{R_L g_m}{(C_L s+g_m)(C_L R_L s+1)}$$

$$\mathbf{Q}\colon -\frac{C_L C_L R_L \sqrt{C_L^2 R_L}}{C_L+C_L R_L g_m}$$

$$\omega_0\colon \sqrt{\frac{g_m}{C_L C_L R_L}}$$

$$\mathbf{Bandwidth}\colon \frac{C_L+C_L R_L g_m}{C_L C_L R_L}$$

Filter 24

Invalid filter

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

Filter 25

Invalid filter

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

Filter 26

Filter Type: BP

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

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

$$\mathbf{Q}\colon \frac{C_L L_L g_m \sqrt{C_L^2 L_L}}{C_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{C_L}{C_L L_L g_m}$$

Filter 27

Invalid filter

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

Filter 28

Filter Type: BP

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

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

$$\mathbf{Q}\colon \frac{L_L \sqrt{\frac{R_L g_m}{L_L(C_L+C_L R_L g_m)}}(C_L+C_L R_L g_m)}{C_L R_L+L_L g_m}$$

$$\omega_0\colon \sqrt{\frac{R_L g_m}{L_L(C_L+C_L R_L g_m)}}$$

$$\mathbf{Bandwidth}\colon \frac{C_L R_L+L_L g_m}{L_L(C_L+C_L R_L g_m)}$$

Filter 29

Filter Type: GE

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

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

$$\mathbf{Q}\colon \frac{C_L L_L g_m \sqrt{C_L^2 L_L}}{C_L}$$

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

$$\mathbf{Bandwidth}\colon \frac{C_L}{C_L L_L g_m}$$

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

Filter 30

Invalid filter

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

Filter 31

Invalid filter

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

Filter 32

Invalid filter

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

Filter 33**Filter Type:** LP

$$Z(s): \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_1 R_L g_m}{(C_L R_L s + 1)(C_1 R_1 s + R_1 g_m + 1)}$$

$$\mathbf{Q}: \frac{C_1 C_L R_1 R_L \sqrt{\frac{R_1 g_m + 1}{C_1^2 R_1^2 R_L^2 R_L^2}}}{C_1 R_1 + C_L R_1 R_L g_m + C_L R_L}$$

$$\omega_0: \sqrt{\frac{R_1 g_m + 1}{C_1 C_L R_1 R_L^2}}$$

$$\text{Bandwidth: } \frac{C_1 R_1 + C_L R_1 R_L g_m + C_L R_L}{C_1 C_L R_1 R_L}$$

Filter 34

Invalid filter

$$Z(s): \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 35

Invalid filter

$$Z(s): \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 36**Filter Type:** BP

$$Z(s): \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L R_1 g_m s}{(C_1 L_L s^2 + 1)(C_1 R_1 s + R_1 g_m + 1)}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_1^2 L_L^2}} (R_1 g_m + 1)}{C_1 R_1}$$

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

$$\text{Bandwidth: } \frac{C_1 R_1}{C_L L_L (R_1 g_m + 1)}$$

Filter 37

Invalid filter

$$Z(s): \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 38**Filter Type:** BP

$$Z(s): \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{C_L s}} \right)$$

$$H(s): \frac{L_L R_1 R_L g_m s}{(C_1 R_1 s + R_1 g_m + 1)(C_L L_L R_L s^2 + L_L s + R_L)}$$

$$\mathbf{Q}: \frac{L_L \sqrt{\frac{R_1 (R_1 g_m + 1)}{L_L (C_1 R_1 + C_L R_1 R_L g_m + C_L R_L)}} (C_1 R_1 + C_L R_1 R_L g_m + C_L R_L)}{C_1 R_1 R_L + L_L R_1 g_m + L_L}$$

$$\omega_0: \sqrt{\frac{R_1 (R_1 g_m + 1)}{L_L (C_1 R_1 + C_L R_1 R_L g_m + C_L R_L)}}$$

$$\text{Bandwidth: } \frac{C_1 R_1 R_L + L_L R_1 g_m + L_L}{L_L (C_1 R_1 + C_L R_1 R_L g_m + C_L R_L)}$$

Filter 39**Filter Type:** GE

$$Z(s): \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

$$H(s): \frac{R_1 g_m (C_L L_L R_L s^2 + L_L s + R_L)}{(C_1 L_L s^2 + 1)(C_1 R_1 s + R_1 g_m + 1)}$$

$$\mathbf{Q}: \frac{C_L L_L \sqrt{\frac{1}{C_1^2 L_L^2}} (R_1 g_m + 1)}{C_1 R_1}$$

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

$$\text{Bandwidth: } \frac{C_1 R_1}{C_L L_L (R_1 g_m + 1)}$$

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

Filter 40

Invalid filter

$$Z(s): \left(\frac{R_1}{C_1 R_1 s + 1}, \infty, \infty, \infty, \infty, \frac{R_L (L_L s + \frac{1}{C_L s})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

Filter 41

Invalid filter

$$Z(s): \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L \right)$$

Filter 42

Invalid filter

$$Z(s): \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

Filter 43**Filter Type:** Invalid011

$$Z(s): \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{R_1 g_m (C_1 R_1 s + 1)}{(C_L R_L s + 1)(C_1 R_1 g_m + C_1 s + g_m)}$$

$$\mathbf{Q}: \frac{C_1 C_L R_L \sqrt{\frac{1}{C_1^2 C_L^2 R_L^2 (R_1 g_m + 1)}} (R_1 g_m + 1)}{C_1 R_1 g_m + C_1 s + C_L R_L g_m}$$

$$\omega_0: \sqrt{\frac{R_1 g_m}{C_1 C_L R_L (R_1 g_m + 1)}}$$

$$\text{Bandwidth: } \frac{C_1 R_1 g_m + C_1 + C_L R_L g_m}{C_1 C_L R_L (R_1 g_m + 1)}$$

Filter 44

Invalid filter

$$Z(s): \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 45

Invalid filter

$$Z(s): \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 46**Filter Type:** Invalid110

$$Z(s): \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_L g_m s (C_1 R_1 s + 1)}{(C_1 L_L s^2 + 1)(C_1 R_1 g_m s + C_1 s + g_m)}$$

$$\mathbf{Q}: \frac{C_L L_L g_m \sqrt{\frac{1}{C_1^2 L_L^2}}}{C_1 (R_1 g_m + 1)}$$

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

$$\text{Bandwidth: } \frac{C_1 (R_1 g_m + 1)}{C_L L_L g_m}$$

Filter 47

Invalid filter

$$Z(s): \left(R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 48

Filter Type: Invalid110

$$Z(s)\colon \left(R_1+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$$
$$H(s)\colon \frac{L_LR_Lg_m s(C_1R_1s+1)}{(C_1R_1g_ms^2+C_1s+g_m)(C_LL_LR_Ls^2+L_Ls+R_L)}$$
$$Q\colon \frac{L_L\sqrt{\frac{R_Lg_m}{L_L(C_1R_1g_ms+C_1+C_LR_Lg_m)}}(C_1R_1g_m+C_1+C_LR_Lg_m)}{C_1R_LR_Lg_m+C_1R_L+L_Lg_m}$$
$$\omega_0\colon \sqrt{\frac{R_Lg_m}{L_L(C_1R_1g_m+C_1+C_LR_Lg_m)}}$$

Bandwidth: $\frac{C_1R_LR_Lg_m+C_1R_L+L_Lg_m}{L_L(C_1R_1g_m+C_1+C_LR_Lg_m)}$

Filter 49

Invalid filter

$$Z(s)\colon \left(R_1+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

Filter 50

Invalid filter

$$Z(s)\colon \left(R_1+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{R_L\left(L_Ls+\frac{1}{C_LL_L}\right)}{L_Ls+R_L+\frac{1}{C_LL_L}}\right)$$

Filter 51

Filter Type: BS

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ R_L\right)$$

$$H(s)\colon \frac{R_Lg_m(C_1L_1s^2+1)}{C_1L_1g_ms^2+C_1s+g_m}$$

$$Q\colon L_1g_m\sqrt{\frac{1}{C_1^2L_1^2}}$$

$$\omega_0\colon \sqrt{\frac{1}{C_1L_1}}$$

Bandwidth: $\frac{1}{L_1g_m}$

Filter 52

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_Ls}\right)$$

Filter 53

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{R_L}{C_LR_Ls+1}\right)$$

Filter 54

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ R_L+\frac{1}{C_Ls}\right)$$

Filter 55

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ L_Ls+\frac{1}{C_Ls}\right)$$

Filter 56

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{L_Ls}{C_LL_Ls^2+1}\right)$$

Filter 57

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ L_Ls+R_L+\frac{1}{C_Ls}\right)$$

Filter 58

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_Ls+\frac{1}{R_L}+\frac{1}{L_Ls}}\right)$$

Filter 59

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{L_Ls}{C_LL_Ls^2+1}+R_L\right)$$

Filter 60

Invalid filter

$$Z(s)\colon \left(L_1s+\frac{1}{C_1s},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{R_L\left(L_Ls+\frac{1}{C_LL_L}\right)}{L_Ls+R_L+\frac{1}{C_LL_L}}\right)$$

Filter 61

Filter Type: BP

$$Z(s)\colon \left(\frac{L_Ls}{C_1L_1s^2+1},\ \infty,\ \infty,\ \infty,\ \infty,\ R_L\right)$$

$$H(s)\colon \frac{L_LR_Lg_ms}{C_1L_1s^2+L_1g_ms+1}$$

$$Q\colon \frac{C_1\sqrt{C_1^2L_1^2}}{g_m}$$

$$\omega_0\colon \sqrt{\frac{1}{C_1L_1}}$$

Bandwidth: $\frac{g_m}{C_1}$

Filter 62

Filter Type: LP

$$Z(s)\colon \left(\frac{L_Ls}{C_1L_1s^2+1},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{1}{C_Ls}\right)$$

$$H(s)\colon \frac{L_Lg_m}{C_1(C_1C_1L_1s^2+L_1g_ms+1)}$$

$$Q\colon \frac{C_1\sqrt{C_1^2L_1^2}}{g_m}$$

$$\omega_0\colon \sqrt{\frac{1}{C_1L_1}}$$

Bandwidth: $\frac{g_m}{C_1}$

Filter 63

Filter Type: BP

$$Z(s)\colon \left(\frac{L_Ls}{C_1L_1s^2+1},\ \infty,\ \infty,\ \infty,\ \infty,\ \frac{R_L}{C_LR_Ls+1}\right)$$

$$H(s)\colon \frac{L_LR_Lg_ms}{(C_1R_Ls+1)(C_1L_1s^2+L_1g_ms+1)}$$

$$Q\colon \frac{L_L\sqrt{\frac{1}{L_1(C_1+C_LR_Lg_m)}}(C_1+C_LR_Lg_m)}{C_LR_L+L_1g_m}$$

$$\omega_0\colon \sqrt{\frac{1}{L_1(C_1+C_LR_Lg_m)}}$$

Bandwidth: $\frac{C_LR_L+L_1g_m}{L_1(C_1+C_LR_Lg_m)}$

Filter 64

Filter Type: Invalid011
$$Z(s): \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$
$$H(s): \frac{L_1 g_m (C_L R_L s + 1)}{C_L (C_1 L_1 s^2 + L_1 g_m s + 1)}$$
$$\mathbf{Q}: \frac{C_1 \sqrt{\frac{1}{C_1^2 L_1^2}}}{g_m}$$
$$\omega_0: \sqrt{\frac{1}{C_1^2 L_1}}$$
Bandwidth: $\frac{g_m}{C_1}$

Filter 65

Invalid filter
$$Z(s): \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 66

Filter Type: HP
$$Z(s): \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$
$$H(s): \frac{L_1 L_L g_m s^2}{(C_1 L_1 s^2 + 1)(C_1 L_1 s^2 + L_1 g_m s + 1)}$$
$$\mathbf{Q}: \frac{C_1 L_1 + C_L L_L \sqrt{\frac{1}{C_1^2 L_1^2 + C_L^2 L_L^2}}}{L_1 g_m}$$
$$\omega_0: \sqrt{\frac{1}{C_1 L_1 + C_L L_L}}$$
Bandwidth: $\frac{L_1 g_m}{C_1 L_1 + C_L L_L}$

Filter 67

Invalid filter
$$Z(s): \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 68

Filter Type: HP
$$Z(s): \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$
$$H(s): \frac{L_1 L_L R_L g_m s^2}{(C_1 L_1 s^2 + L_1 g_m s + 1)(C_L L_L R_L s^2 + L_L s + R_L)}$$
$$\mathbf{Q}: \sqrt{\frac{C_1 L_1 R_L + C_L L_L R_L + L_1 L_L g_m}{C_1 L_1 R_L + C_L L_L R_L + L_1 L_L g_m} \frac{R_L}{L_1 R_L g_m + L_L}}$$
$$\omega_0: \sqrt{\frac{R_L}{C_1 L_1 R_L + C_L L_L R_L + L_1 L_L g_m}}$$
Bandwidth: $\frac{L_1 R_L g_m + L_L}{C_1 L_1 R_L + C_L L_L R_L + L_1 L_L g_m}$

Filter 69

Invalid filter
$$Z(s): \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 70

Invalid filter
$$Z(s): \left(\frac{L_1 s}{C_1 L_1 s^2 + 1}, \infty, \infty, \infty, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

Filter 71

Filter Type: GE
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L \right)$$
$$H(s): \frac{R_L g_m (C_1 L_1 s^2 + C_1 R_1 s + 1)}{C_1 L_1 g_m s^2 + C_1 R_1 g_m s + C_1 s + g_m}$$
$$\mathbf{Q}: \frac{L_1 g_m \sqrt{\frac{1}{C_1^2 L_1^2}}}{R_1 g_m + 1}$$
$$\omega_0: \sqrt{\frac{1}{C_1 L_1}}$$
Bandwidth: $\frac{R_1 g_m + 1}{L_1 g_m}$
$$\mathbf{Qz}: \frac{L_1 \sqrt{\frac{1}{C_1^2 L_1^2}}}{R_1}$$

Filter 72

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

Filter 73

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

Filter 74

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

Filter 75

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 76

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

Filter 77

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 78

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L} + \frac{1}{L_L s}} \right)$$

Filter 79

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 80

Invalid filter
$$Z(s): \left(L_1 s + R_1 + \frac{1}{C_1 s}, \infty, \infty, \infty, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

Filter 81

Filter Type: BP

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, R_L \right)$$

$$H(s): \frac{L_1 R_1 R_L g_m s}{C_1 L_1 R_1 s^2 + L_1 R_1 g_m s + L_1 s + R_1}$$

$$\mathbf{Q:} \frac{C_1 R_1 \sqrt{\frac{C_1 L_1}{C_1 L_1}}}{R_1 g_m + 1}$$

$$\omega_0: \sqrt{\frac{1}{C_1 L_1}}$$

$$\mathbf{Bandwidth:} \frac{R_1 g_m + 1}{C_1 R_1}$$

Filter 82

Filter Type: LP

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_1 R_1 R_L g_m s}{C_L (C_1 L_1 R_1 s^2 + L_1 R_1 g_m s + L_1 s + R_1)}$$

$$\mathbf{Q:} \frac{C_1 R_1 \sqrt{\frac{C_1 L_1}{C_1 L_1}}}{R_1 g_m + 1}$$

$$\omega_0: \sqrt{\frac{1}{C_1 L_1}}$$

$$\mathbf{Bandwidth:} \frac{R_1 g_m + 1}{C_1 R_1}$$

Filter 83

Filter Type: BP

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

$$H(s): \frac{L_1 R_1 R_L g_m s}{(C_1 R_L s + 1)(C_1 L_1 R_1 s^2 + L_1 R_1 g_m s + L_1 s + R_1)}$$

$$\mathbf{Q:} \frac{L_1 \sqrt{\frac{R_1}{L_1 (C_1 R_1 + C_L R_1 R_L g_m + C_L R_L)}} (C_1 R_1 + C_L R_1 R_L g_m + C_L R_L)}{C_L R_L R_L + L_1 R_1 g_m + L_1}$$

$$\omega_0: \sqrt{\frac{R_1}{L_1 (C_1 R_1 + C_L R_1 R_L g_m + C_L R_L)}}$$

$$\mathbf{Bandwidth:} \frac{C_L R_L R_L + L_1 R_1 g_m + L_1}{L_1 (C_1 R_1 + C_L R_1 R_L g_m + C_L R_L)}$$

Filter 84

Filter Type: Invalid011

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$$

$$H(s): \frac{L_1 R_1 g_m (C_L R_L s + 1)}{C_1 (C_1 L_1 R_1 s^2 + L_1 R_1 g_m s + L_1 s + R_1)}$$

$$\mathbf{Q:} \frac{C_1 R_1 \sqrt{\frac{C_1 L_1}{C_1 L_1}}}{R_1 g_m + 1}$$

$$\omega_0: \sqrt{\frac{1}{C_1 L_1}}$$

$$\mathbf{Bandwidth:} \frac{R_1 g_m + 1}{C_1 R_1}$$

Filter 85

Invalid filter

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$$

Filter 86

Filter Type: HP

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$$

$$H(s): \frac{L_1 L_L R_1 g_m s^2}{(C_1 L_L s^2 + 1)(C_1 L_1 R_1 s^2 + L_1 R_1 g_m s + L_1 s + R_1)}$$

$$\mathbf{Q:} \frac{R_1 (C_1 L_1 + C_L L_L) \sqrt{\frac{C_1 L_1 + C_L L_L}{C_1 L_1 + C_L L_L}}}{L_1 (R_1 g_m + 1)}$$

$$\omega_0: \sqrt{\frac{1}{C_1 L_1 + C_L L_L}}$$

$$\mathbf{Bandwidth:} \frac{L_1 (R_1 g_m + 1)}{R_1 (C_1 L_1 + C_L L_L)}$$

Filter 87

Invalid filter

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$$

Filter 88

Filter Type: HP

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + \frac{1}{R_L + \frac{1}{L_L s}}} \right)$$

$$H(s): \frac{L_1 L_L R_1 R_L g_m s^2}{(C_1 L_L R_L s^2 + L_L s + R_L)(C_1 L_1 R_1 s^2 + L_1 R_1 g_m s + L_1 s + R_1)}$$

$$\mathbf{Q:} \frac{R_1 g_m \sqrt{\frac{C_1 L_1 R_1 R_L + C_L L_L R_1 R_L g_m + L_1 R_1 g_m + L_1 L_L}{L_1 R_1 R_L g_m + L_1 L_L}}} {L_1 R_1 R_L g_m + L_1 L_L}$$

$$\omega_0: \sqrt{\frac{R_1 R_L}{C_1 L_1 R_1 R_L + C_L L_L R_1 R_L g_m + L_1 R_1 g_m + L_1 L_L}}$$

$$\mathbf{Bandwidth:} \frac{L_1 R_1 R_L g_m + L_1 R_L + L_L R_1}{C_1 L_1 R_1 R_L + C_L L_L R_1 R_L g_m + L_1 L_L R_1 g_m + L_1 L_L}$$

Filter 89

Invalid filter

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$$

Filter 90

Invalid filter

$$Z(s): \left(\frac{1}{C_1 s + \frac{1}{R_1 + \frac{1}{L_1 s}}}, \infty, \infty, \infty, \infty, \frac{R_L (L_L s + \frac{1}{C_L})}{L_L s + R_L + \frac{1}{C_L s}} \right)$$

Filter 91

Filter Type: GE

$$Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, R_L \right)$$

$$H(s): \frac{R_L g_m (C_1 L_1 R_1 s^2 + L_1 s + R_1)}{C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + L_1 g_m s + R_1 g_m + 1}$$

$$\mathbf{Q:} \frac{C_1 \sqrt{\frac{C_1 L_1}{C_1 L_1}} (R_1 g_m + 1)}{g_m}$$

$$\omega_0: \sqrt{\frac{1}{C_1 L_1}}$$

$$\mathbf{Bandwidth:} \frac{g_m}{C_1 (R_1 g_m + 1)}$$

$$\mathbf{Qz:} C_1 R_1 \sqrt{\frac{1}{C_1 L_1}}$$

Filter 92

Invalid filter

$$Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$$

Filter 93

Invalid filter

$$Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$$

Filter 94

Invalid filter
 $Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$

Filter 95

Invalid filter
 $Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$

Filter 96

Invalid filter
 $Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$

Filter 97

Invalid filter
 $Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$

Filter 98

Invalid filter
 $Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{1}{\frac{1}{R_L} + \frac{1}{L_L s}} \right)$

Filter 99

Invalid filter
 $Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$

Filter 100

Invalid filter
 $Z(s): \left(\frac{L_L s}{C_1 L_1 s^2 + 1} + R_1, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$

Filter 101

Filter Type: BS
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, R_L \right)$

$H(s): \frac{R_1 R_L g_m (C_1 L_1 s^2 + 1)}{C_1 L_1 R_1 g_m s^2 + C_1 L_1 s^2 + C_1 R_1 s + R_1 g_m + 1}$

Q: $\frac{L_1 \sqrt{\frac{1}{C_1 L_1}} (R_1 g_m + 1)}{R_1}$

$\omega_0: \sqrt{\frac{1}{C_1 L_1}}$
Bandwidth: $\frac{R_1}{L_1 (R_1 g_m + 1)}$

Filter 102

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{1}{C_L s} \right)$

Filter 103

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{R_L}{C_L R_L s + 1} \right)$

Filter 104

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, R_L + \frac{1}{C_L s} \right)$

Filter 105

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, L_L s + \frac{1}{C_L s} \right)$

Filter 106

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} \right)$

Filter 107

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, L_L s + R_L + \frac{1}{C_L s} \right)$

Filter 108

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{1}{C_L s + R_L + \frac{1}{L_L s}} \right)$

Filter 109

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{L_L s}{C_L L_L s^2 + 1} + R_L \right)$

Filter 110

Invalid filter
 $Z(s): \left(\frac{R_1 \left(L_1 s + \frac{1}{C_1 s} \right)}{L_1 s + R_1 + \frac{1}{C_1 s}}, \infty, \infty, \infty, \infty, \frac{R_L \left(L_L s + \frac{1}{C_L s} \right)}{L_L s + R_L + \frac{1}{C_L s}} \right)$