FEATURES

- **Integrated synthesizer plus fan out buffer, clock generator (dividers), and translators in a 64-pin package**
- **3.3V ±10% power supply**
- **Low jitter: <50ps cycle-to-cycle jitter**
- **Low within-device skew: <50ps**
- **33MHz to 500MHz output frequency range**
- **Direct interface to crystal (SY89531/2/3L) from 14MHz to 18MHz (see SY89531/2/3L data sheet for recommended crystal)**
- **Reference (TTL/CML/LVPECL) input between 14MHz to 160MHz for the SY89534/5/6L**
- **TTL/CMOS control logic**
- **Three independently programmable output frequency banks:**
  - **Two differential output pairs @ Bank A**
  - **Nine differential output pairs @ Bank B**
  - **Two differential output pairs @ Bank C**

DESCRIPTION

The SY89531/2/3/4/5/6L are precision, high-speed clock synthesizers optimized for multi-frequency, multi-processor server, and synchronous computing applications. This document provides design and implementation information, and a detailed description of the SY89531/2/3/4/5/6L evaluation board. The evaluation board is intended to provide a convenient test and evaluation platform for the SY89531/2/3/4/5/6L Clock Synthesizer devices. One pair of outputs is taken from Bank A, and Bank C, and two pairs from Bank B for pin-to-pin skew measurements.

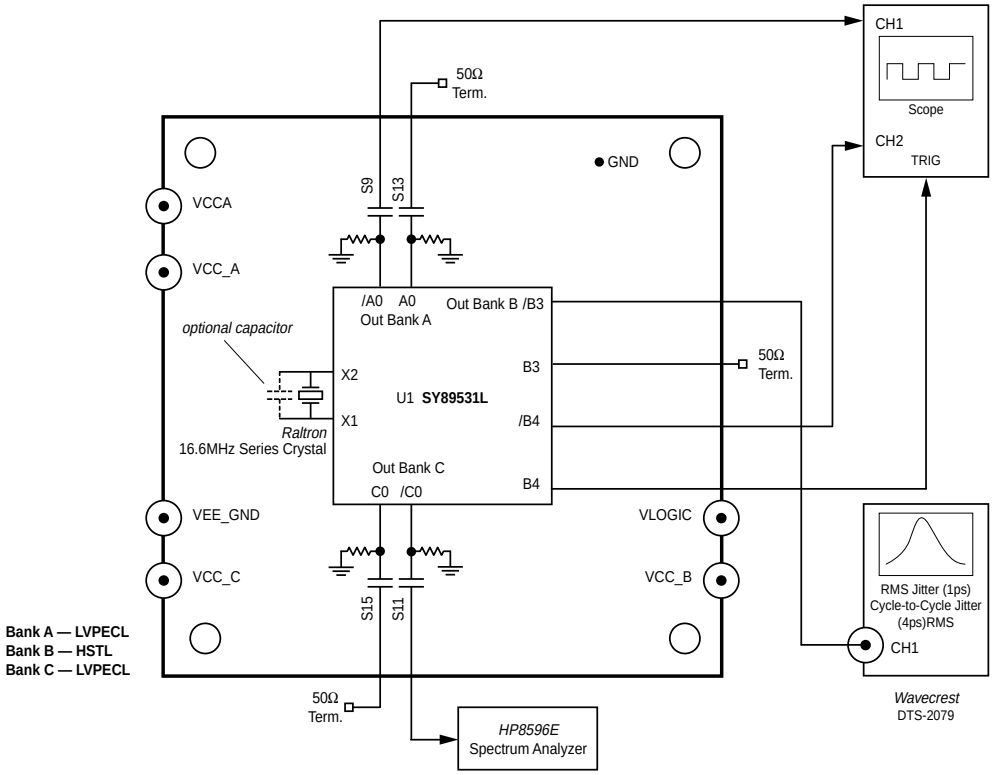


Figure 1. SY89531L Evaluation Board and Test Set-Up

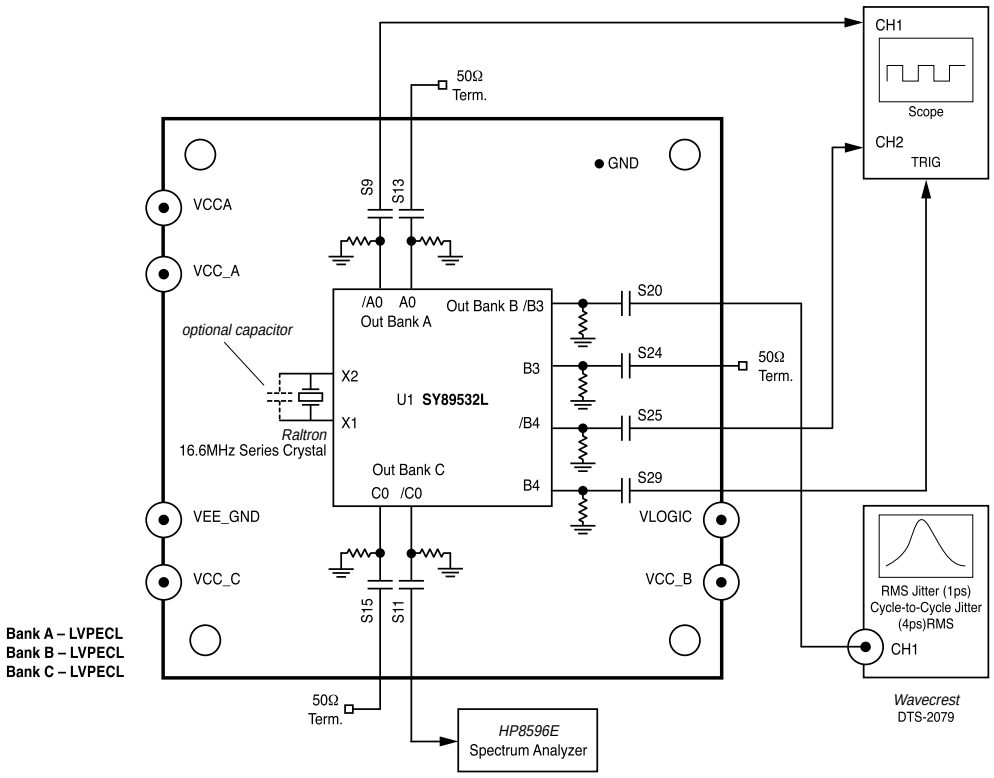
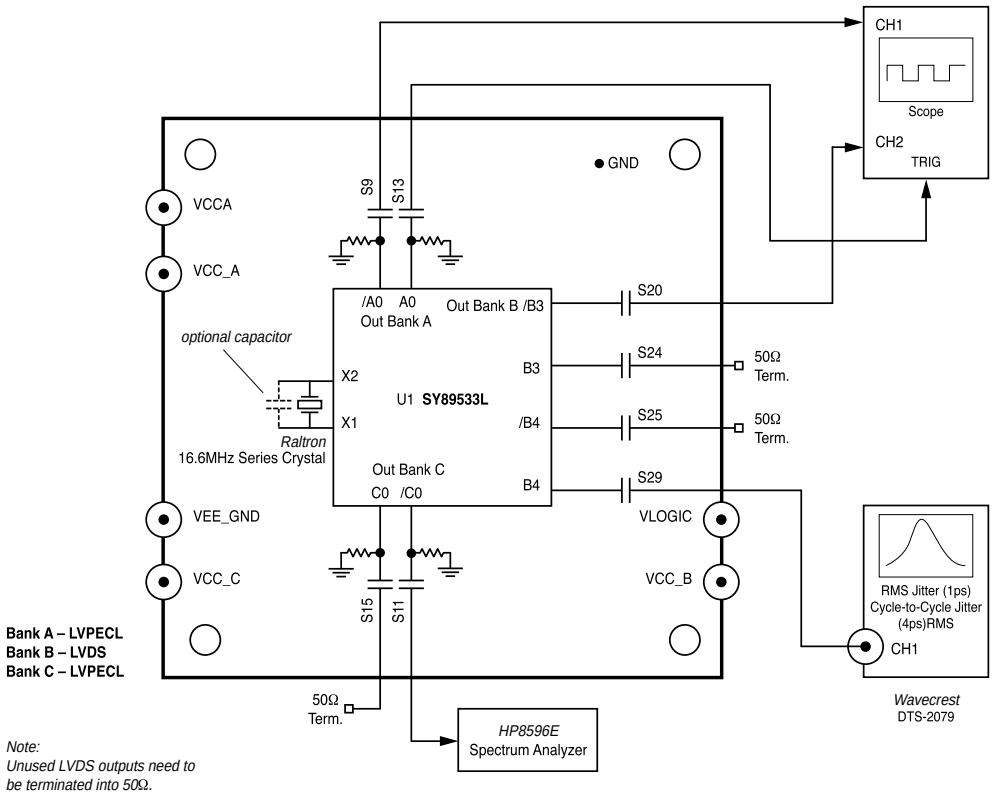


Figure 2. SY89532L Evaluation Board and Test Set-Up



Note:
Unused LVDS outputs need to be terminated into 50Ω.

Figure 3. SY89533L Evaluation Board and Test Set-Up

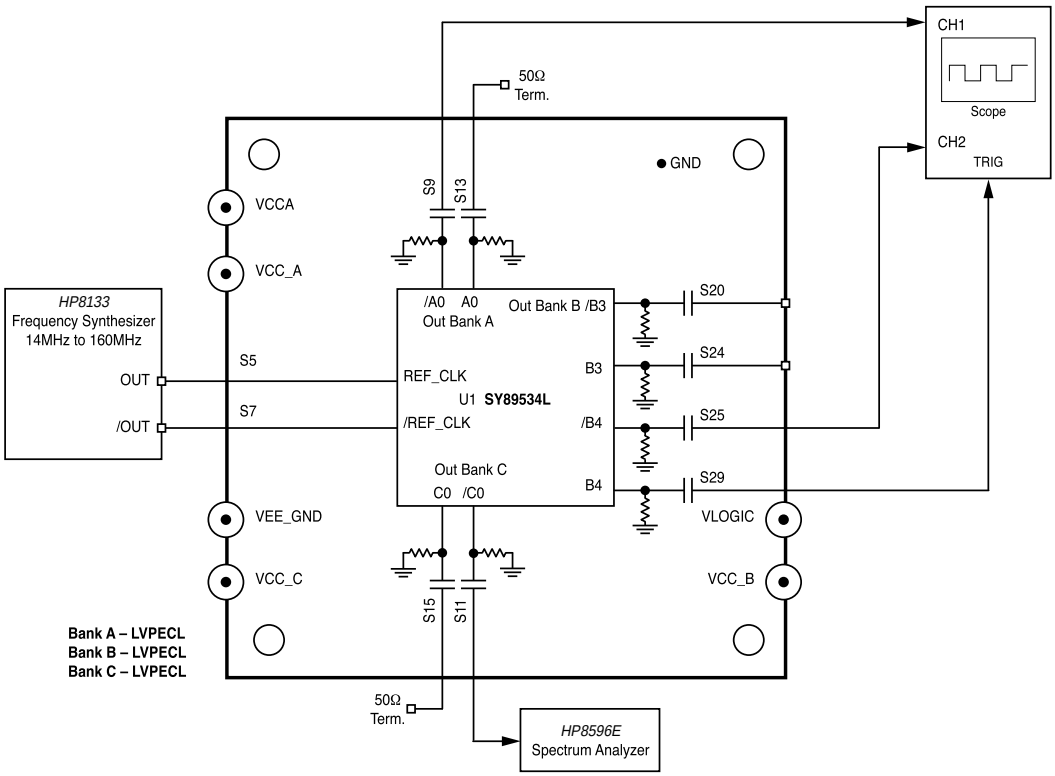


Figure 4. SY89534L Evaluation Board and Test Set-Up

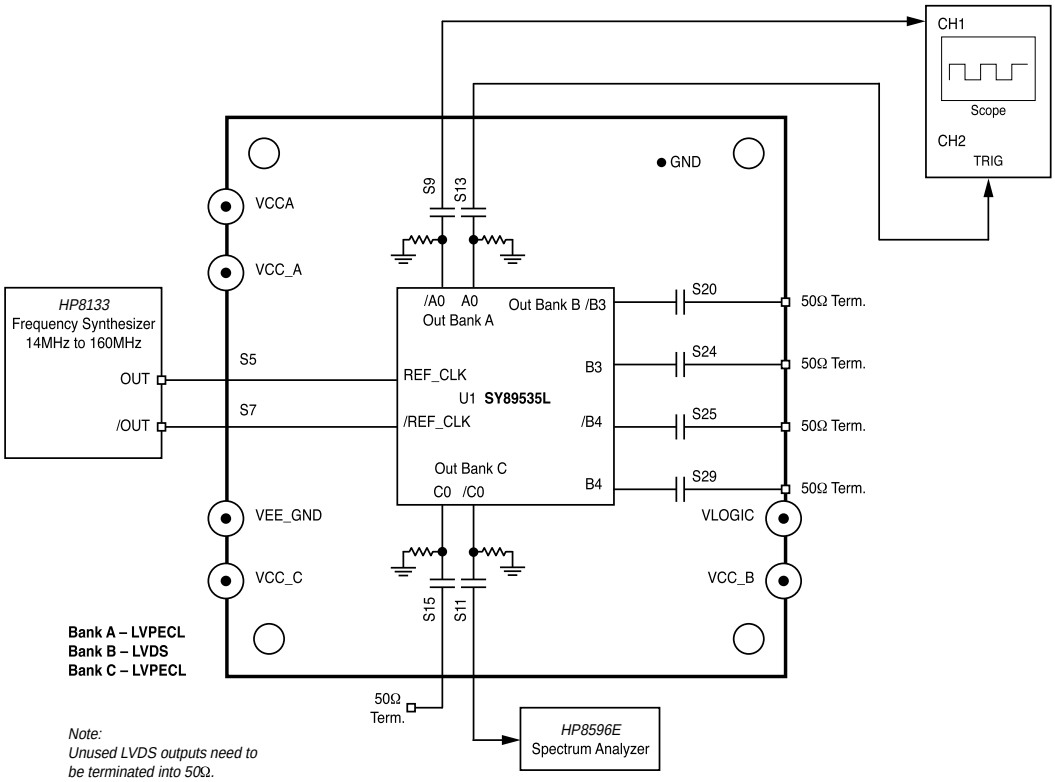


Figure 5. SY89535L Evaluation Board and Test Set-Up

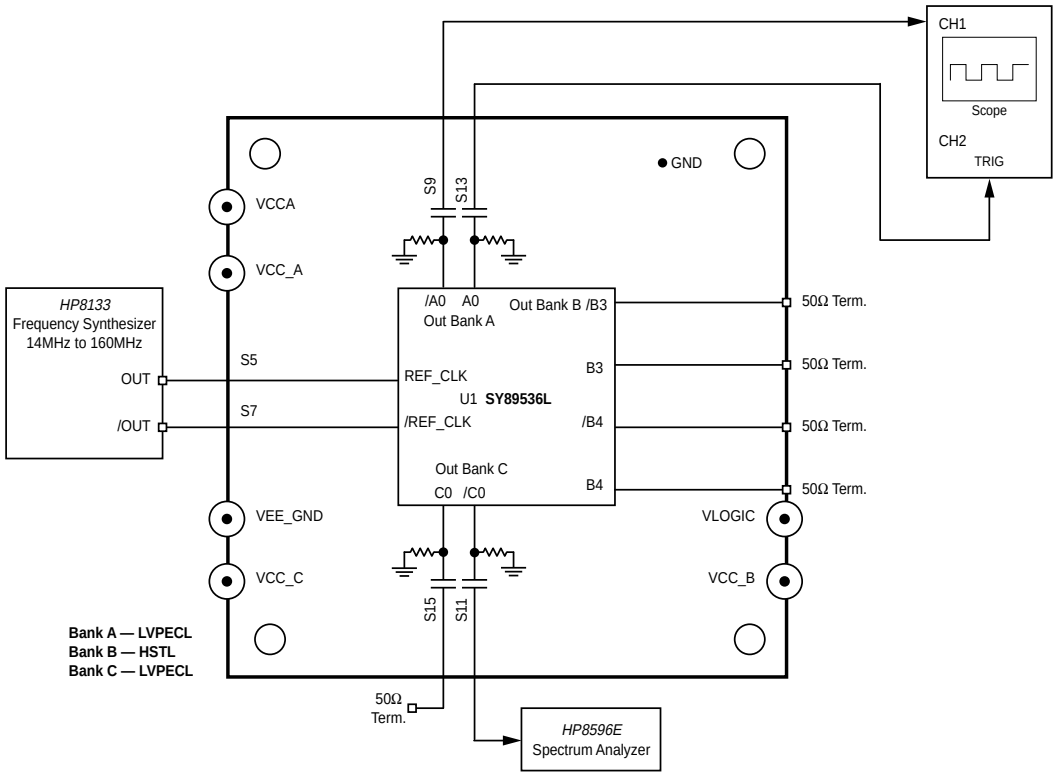


Figure 6. SY89536L Evaluation Board and Test Set-Up

FUNCTIONAL DESCRIPTION

At the core of the SY89531/2/3L clock synthesizer is a precision PLL driven by a 14MHz to 18MHz series resonant crystal. For users who wish to supply a TTL/CML or LVPECL, 14MHz to 160MHz clock input, use the Micrel SY89534L, SY89535L or SY89536L. The PLL output is sent to three banks of outputs. Each bank has its own programmable frequency divider, and the design is optimized to provide very low skew between banks, and very low jitter generation.

The evaluation boards simplify test and measurement by allowing easy setting of the M-Divider and post-dividers. The evaluation board, however, does not allow external VCOs to be evaluated. The VCO range is 600MHz to 1000MHz, and the feedback ratio is selectable via the M-Divider control dip switches. In addition, the M-Divider and post-dividers can be programmed on the fly and do not need powering down during programming.

Power Supply

The SY89531/2/3/4/5/6L are 3.3V devices. Therefore, VCCA, VCC_A, VCC_B, VCC_C, and Vlogic should be connected to +3.3VDC and VEE_GND and GND should be connected to 0VDC.

Board Layout

The evaluation board is constructed with FR-4 material and is co-planar designed to minimize noise, achieve high bandwidth, and minimize crosstalk.

Layer Stack

L1	Signal/GND
L2	Impedance GND
L3	VCCA/Vlogic
L4	VCC_A/VCC_B/VCC_C
L5	VEE/GND
L6	Signal

Signal Inputs/Outputs

The SY89531L, SY89532L and SY89533L evaluation boards have been designed with a 16.6MHz crystal input. The SY89534L, SY89535L and SY89536L have been designed to take a TTL/CML or LVPECL input between 14MHz and 160MHz. In addition, Bank A, Bank B, and Bank C have been pre-configured to illustrate the performance of the device. See Table 1, Device Input and Output Signals.

	Inputs		Outputs		
Device	**Crystal**	**Reference**	**BankA**	**BankB**	**BankC**
SY89531L	16.6MHz		LVPECL	HSTL	LVPECL
SY89532L	16.6MHz		LVPECL	LVPECL	LVPECL
SY89533L	16.6MHz		LVPECL	LVDS	LVPECL
SY89534L		14 to 160MHz	LVPECL	LVPECL	LVPECL
SY89535L		14 to 160MHz	LVPECL	LVDS	LVPECL
SY89536L		14 to 160MHz	LVPECL	HSTL	LVPECL

Table 1. Device Input and Output Signals

LVPECL operation is typically 750mV$_{PP}$ into 50Ω. Common mode is V_{CC}–1.3V. Unused pairs of outputs do not need to be terminated and do not add jitter. LVDS operation, on the other hand, has a typical voltage swing of 350mV into 50Ω. Common mode voltage is 1.25VDC. LVDS outputs are terminated with 100Ω across the pair. Unused outputs must be terminated with 100Ω.

Test Description

This section contains step-by-step instructions for evaluating the SY89531/2/3L in terms of spectral purity and measurement of cycle-to-cycle jitter.

1. Connect VCCA, VCC_A, VCC_B, VCC _C, and Vlogic to +3.3VDC.
2. Connect VEE_GND, and GND to 0VDC.
3. IMPORTANT (for SY89532L and SY89533L only)

   Set B_logic to 0

   Set XVCO to 0

   Set XVCOB to 1
4. Configure test setup as shown in Figures 1 to 4.
5. Example Configuration:

Fcrystal = 16.6MHz (Raltron AS-SIM Series Resonance Crystal)*

*NOTE: If a high frequency clock or pulse generator such as a Agilent 8133 is used to drive the device, a 250ps Transition Time Converter should be used before driving the device.

M = 60

Post divider banks A to C = 18

If the above configuration is used, the expected frequency will be 55.33MHz.

SW2	
1. B_logic	0
2. FSEL_B0	1
3. FSEL_B1	1
4. FSEL_B2	1
5. FSEL_C0	1
6. FSEL_C1	1
7. FSEL_C2	1

SW3	
1. XVCOB	1
2. XVCO	0
3. FSEL_A0	1
4. FSEL_A1	1
5. FSEL_A2	1

SW4	
1. M0	1
2. M1	1
3. M2	0
4. M3	1

Once dip switches SW2, SW3, and SW4 are set, check current consumption it should be as follows:

Device	I_{CC} (mA)
SY89531L	342
SY89532L	342
SY89533L	342
SY89534L	436
SY89535L	436
SY89536L	436

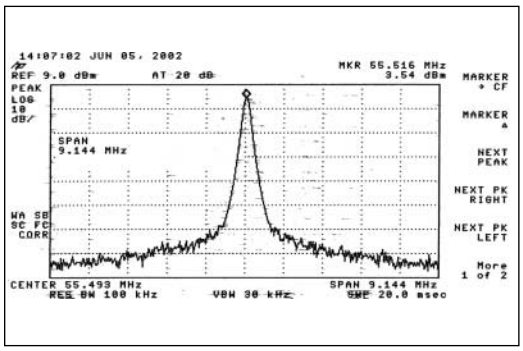


Figure 7. Spectral Plot Bank C

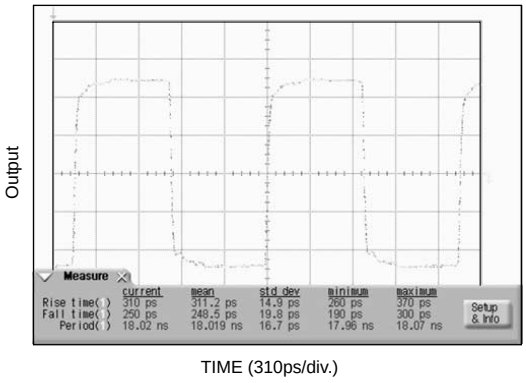


Figure 8. Output Waveform Bank C

6. To measure non-correlated random jitter using a Tektronix 11801B Digital Sampling Oscilloscope follow step 7 to 12.
7. On the Tektronix scope, set acquisition mode to run.
8. Then press the autoset button located on the front panel.
9. On the control panel, select the persist histogram button.
10. Then select the horizontal histogram and set the vertical and horizontal limits. Jitter information is then shown at the bottom of the screen.
11. As a reminder, to minimize accumulated jitter, always set the time delay to a minimum.
12. In addition, jitter is measured on the rising edge of a waveform.
13. Further, the evaluation boards provide ports to measure pin to pin skew using Bank B. Bank B has B3P, B3N, B4P, and B4N pins connected to SMA20, SMA24, SMA25, and SMA29.
14. To measure cycle-to-cycle jitter using a Wavecrest DTS-2079 follow steps 15 to 22.
15. Double click on the Wavecrest icon and select clock histogram.
16. Select CH1 input, refer to the test set-up figures.
17. To measure:
    a. $T_2 - T_1$ select stop edges to skip = 0
    b. $T_3 - T_1$ select stop edges to skip = 1
    c. $T_4 - T_1$ select stop edges to skip = 2
    d. $T_5 - T_1$ select stop edges to skip = 3
18. Set hits > 30,000.
19. Select “view accum hits.”
20. Set measure = period
21. Select pulse finds. Make sure min., and max. voltages are correct.
22. Hit “run and plot information to screen.”

Reference/Oscillator Frequency	M-Divider		Frequency of VCO (MHz)	
	Min.	Max.	Min.	Max.
Fmin = 14MHz	44	70	616	980
Ftyp = 16MHz	38	60	608	960
Fmax = 18MHz	34	54	612	972

Table 2. Valid M-Divider Settings vs. VCO Frequency for the SY89531/32/33L

Frequency	Predividers	M-Divider		Freq. of VCO (MHz)	
		Min.	Max.	Min.	Max.
Fmin = 14MHz	1	44	70	616	980
Fmax = 160MHz	8	30	50	600	1000

Table 3. Valid M-Divider and Prediviider Settings vs. VCO Frequency for the SY89534/35/36L

FEEDBACK DIVIDE SELECT TABLE (M-DIVIDER)

M3	M2	M1	M0	VCO Frequency (1)
0	0	0	0	Ref × 34
0	0	0	1	Ref × 36
0	0	1	0	Ref × 38
0	0	1	1	Ref × 40
0	1	0	0	Ref × 42
0	1	0	1	Ref × 44
0	1	1	0	Ref × 48
0	1	1	1	Ref × 50
1	0	0	0	Ref × 52
1	0	0	1	Ref × 54
1	0	1	0	Ref × 56
1	0	1	1	Ref × 60
1	1	1	0	Ref × 70
1	1	1	1	Ref × 72

Table 4. M-Divider Settings

Note 1. Ref = Crystal Frequency.

FREQUENCY ASKED QUESTIONS

What Do I Do with the Exposed Pad on the Bottom of the Package?

The purpose of the exposed pad at the bottom of the package is to conduct heat more efficiently out of the package. Solder or use thermal conductive epoxy. Although the pad is connected to GND, there has not been any degradation in either output generated jitter or input jitter tolerance performance. In addition, the exposed pad is directly connected to the chip ground internally. Make sure the exposed pad ground and the device ground are the same potential.

I Just Got my Evaluation Board and I Cannot Get Anything to Work.

First check the power supplies. This evaluation board uses one power supply. You should see a current draw of about 342mA for the SY89532/3L and 436mA for SY89534/5L when the part is running. After, check the voltage swing levels of REFCLK.

Next, make sure that B_logic is set to 0, since it is really used to ground the chip, and XVCO is set to 0 and XVCOb is set to 1.

Aside from setting the M-Divider, and Post dividers incorrectly, everything should operate as expected at this point.

What is the Time Domain Reflectometry Test?

TDR (Time Domain Reflectometry) is used to verify impedance continuity along a signal path. Many interconnects, such as SMA, if not launched correctly onto the PCB will exhibit inductive like resonance with an abrupt capacitive discontinuity. This discontinuity will subtract signal from the inputs and outputs and effectively close the resulting data eye.

What Should I Use to Generate REFCLK in my SY89534/5/6L Design?

This depends on data rate, jitter budget, and cost. However, REFCLK input jitter will affect the overall jitter performance of the system. A fundamental series tone crystal-based oscillator is ideal. Measure the jitter of the oscillator with a Wavecrest DTS2077 or a CSA803. A measurement above the 3ps noise floor of the instrument is too high. Remember that the REFCLK input is multiplied by the M-Divider selected value, so the resulting jitter increases by 20log (M-Divider). If you use a clock derived from an ASIC, verify the single cycle and accumulated cycle jitter.

Crystal based oscillators typically have poor AC power supply rejection ratio, and if you are providing board power via 400kHz switching supplies you may have to provide some level of filtering, not just bypassing, for the supplies. Also verify that the oscillator output has no “pedestals” in the response due to improper impedance matching and/or inadequate drive capability of the oscillator.

If the SY89531/2/3L experiences start-up problems, add a 10pF capacitor across XTAL1, and XTAL2. Start-up problems can be easily recognized. Start-up problems can be seen as the VCO oscillating at either its maximum or minimum frequency. Adding a capacitor across XTAL1 and XTAL2 lowers the gain of the crystal oscillator driver if electrical series resistance of the crystal is high, in addition to snapping out an parasitic that maybe present.

As a general guideline, do not use CMOS-based PLLs to drive the SY89534/5/6L. They almost always have too much high frequency deterministic jitter for this application. Also fanning out one oscillator to several locations on your board is not a good idea. Crosstalk and inadequate drive can adversely affect performance.

What Layout Tips Do You Have?

1. Establish controlled impedance stripline, microstrip, or co-planar construction techniques for high-speed signal paths.
2. All differential paths are critical timing paths, and skew should be matched to within ±10ps.
3. Signal trace impedance should not vary more than ±5%. If in doubt, perform TDR analysis of signal traces.
4. Maintain compact filter networks as close to filter pins as possible.
5. Provide ground plane relief under filter path to reduce stray capacitance and be careful of crosstalk coupling into the filter network.
6. Maintain low jitter on the REFCLK input by isolating the XTAL oscillator from power supply noise by adequately decoupling.
7. Keep XTAL oscillator close to SY89531/2/3/4/5/6L.
8. Isolate the input, output, and REFCLK signal traces from other clock and data signals on your board if these other traces are within 3x the trace width. Isolation can be achieved by putting ground traces in between.

Should I Adjust the Loop Filter?

The values found in the data sheets are the result of extensive modeling as well as lab testing. Therefore, we recommend starting with those values.

DESCRIPTION OF CONNECTORS

SY89531L

Connector	Name	Type	Connects to	Description
S9	A0p	LVPECL	Pin 54	AC-Coupled Output–Bank A
S11	C0p	LVPECL	Pin 20	AC-Coupled Output–Bank C
S13	A0n	LVPECL	Pin 53	AC-Coupled Output–Bank C
S15	C0n	LVPECL	Pin 19	AC-Coupled Output–Bank A
S20	B3p	HSTL	Pin 43	DC-Coupled Output–Bank C
S24	B3n	HSTL	Pin 42	DC-Coupled Output–Bank B
S25	B4p	HSTL	Pin 41	DC-Coupled Output–Bank B
S29	B4n	HSTL	Pin 40	DC-Coupled Output–Bank B

SY89532L

Connector	Name	Type	Connects to	Description
S9	A0p	LVPECL	Pin 54	AC-Coupled Output–Bank A
S11	C0p	LVPECL	Pin 20	AC-Coupled Output–Bank C
S13	A0n	LVPECL	Pin 53	AC-Coupled Output–Bank C
S15	C0n	LVPECL	Pin 19	AC-Coupled Output–Bank A
S20	B3p	LVPECL	Pin 43	AC-Coupled Output–Bank C
S24	B3n	LVPECL	Pin 42	AC-Coupled Output–Bank B
S25	B4p	LVPECL	Pin 41	AC-Coupled Output–Bank B
S29	B4n	LVPECL	Pin 40	AC-Coupled Output–Bank B

SY89533L

Connector	Name	Type	Connects to	Description
S9	A0p	LVPECL	Pin 54	AC-Coupled Output–Bank A
S11	C0p	LVPECL	Pin 20	AC-Coupled Output–Bank C
S13	A0n	LVPECL	Pin 53	AC-Coupled Output–Bank C
S15	C0n	LVPECL	Pin 19	AC-Coupled Output–Bank A
S20	B3p	LVDS	Pin 43	AC-Coupled Output–Bank B
S24	B3n	LVDS	Pin 42	AC-Coupled Output–Bank B
S25	B4p	LVDS	Pin 41	AC-Coupled Output–Bank B
S29	B4n	LVDS	Pin 40	AC-Coupled Output–Bank B

SY89534L

Connector	Name	Type	Connects to	Description
S5	X2	TTL/LVPECL	Pin 10	TTL or LVPECL Frequency Input
S7	X1	TTL/LVPECL	Pin 11	TTL or LVPECL Frequency Input
S9	A0p	LVPECL	Pin 54	AC-Coupled Output–Bank A
S11	C0p	LVPECL	Pin 20	AC-Coupled Output–Bank C
S13	A0n	LVPECL	Pin 53	AC-Coupled Output–Bank C
S15	C0n	LVPECL	Pin 19	AC-Coupled Output–Bank A
S20	B3p	LVPECL	Pin 43	AC-Coupled Output–Bank C
S24	B3n	LVPECL	Pin 42	AC-Coupled Output–Bank B
S25	B4p	LVPECL	Pin 41	AC-Coupled Output–Bank B
S29	B4n	LVPECL	Pin 40	AC-Coupled Output–Bank B

DESCRIPTION OF CONNECTORS

SY89535L

Connector	Name	Type	Connects to	Description
S5	X2	TTL/LVPECL	Pin 10	TTL or LVPECL Frequency Input
S7	X1	TTL/LVPECL	Pin 11	TTL or LVPECL Frequency Input
S11	C0p	LVPECL	Pin 20	AC-Coupled Output–Bank C
S13	A0n	LVPECL	Pin 53	AC-Coupled Output–Bank C
S15	C0n	LVPECL	Pin 19	AC-Coupled Output–Bank A
S20	B3p	LVDS	Pin 43	AC-Coupled Output–Bank B
S24	B3n	LVDS	Pin 42	AC-Coupled Output–Bank B
S25	B4p	LVDS	Pin 41	AC-Coupled Output–Bank B
S29	B4n	LVDS	Pin 40	AC-Coupled Output–Bank B

SY89536L

Connector	Name	Type	Connects to	Description
S5	X2	TTL/LVPECL	Pin 10	TTL or LVPECL Frequency Input
S7	X1	TTL/LVPECL	Pin 11	TTL or LVPECL Frequency Input
S11	C0p	LVPECL	Pin 20	AC-Coupled Output–Bank C
S13	A0n	LVPECL	Pin 53	AC-Coupled Output–Bank C
S15	C0n	LVPECL	Pin 19	AC-Coupled Output–Bank A
S20	B3p	HSTL	Pin 43	DC-Coupled Output–Bank B
S24	B3n	HSTL	Pin 42	DC-Coupled Output–Bank B
S25	B4p	HSTL	Pin 41	DC-Coupled Output–Bank B
S29	B4n	HSTL	Pin 40	DC-Coupled Output–Bank B

EVALUATION BOARD SCHEMATICS

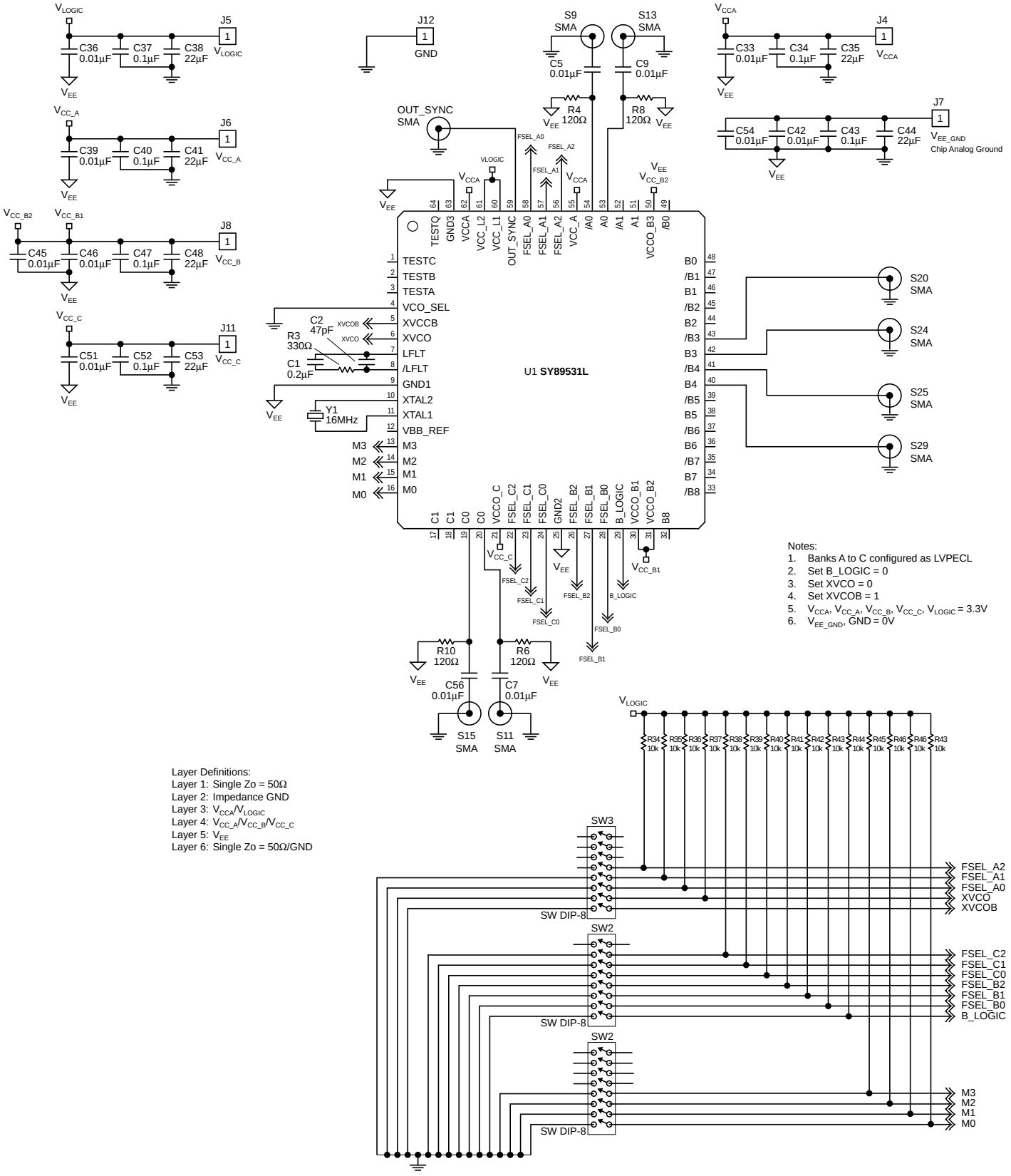


Figure 9. SY89531L Schematic

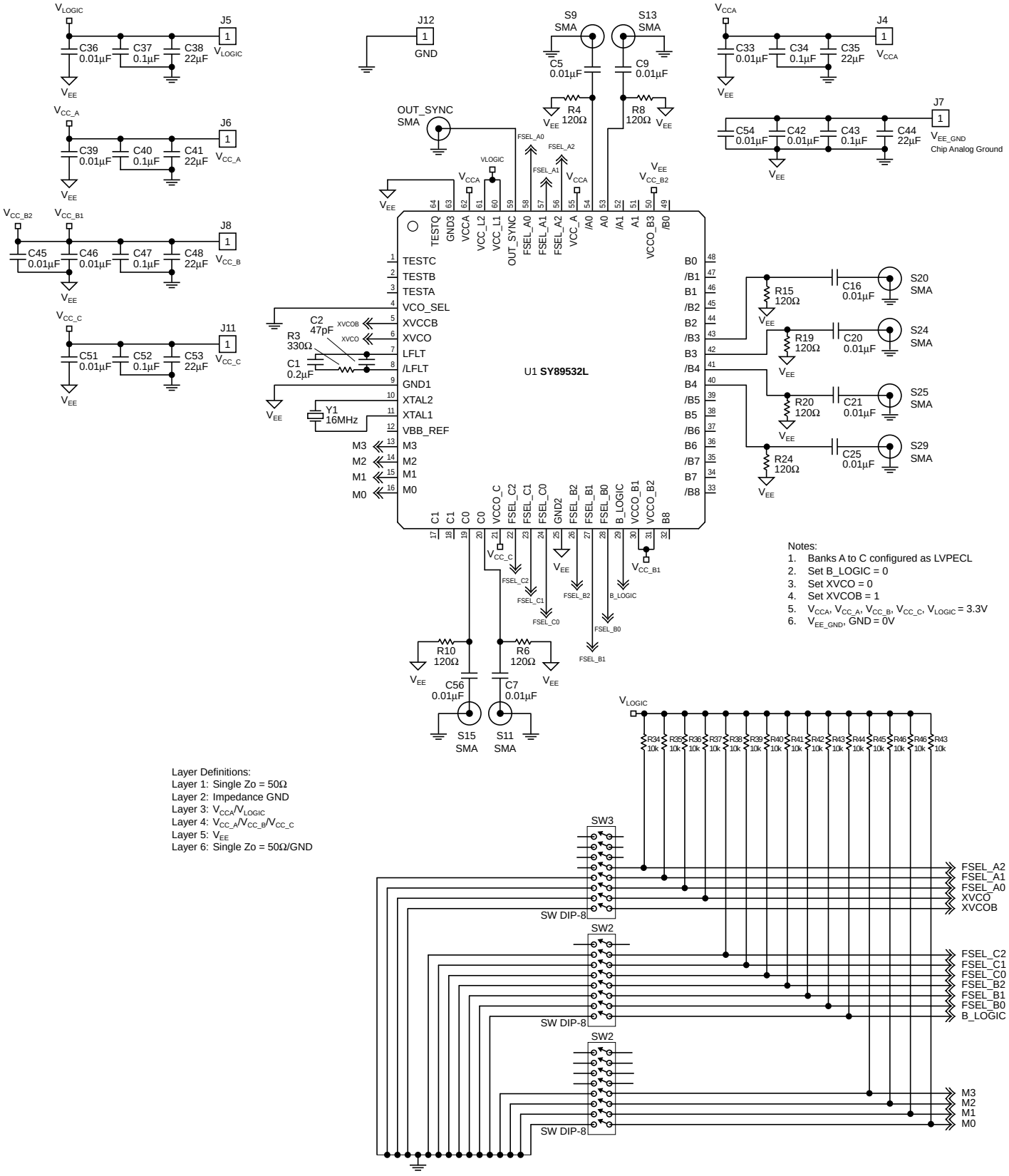


Figure 10. SY89532L Schematic

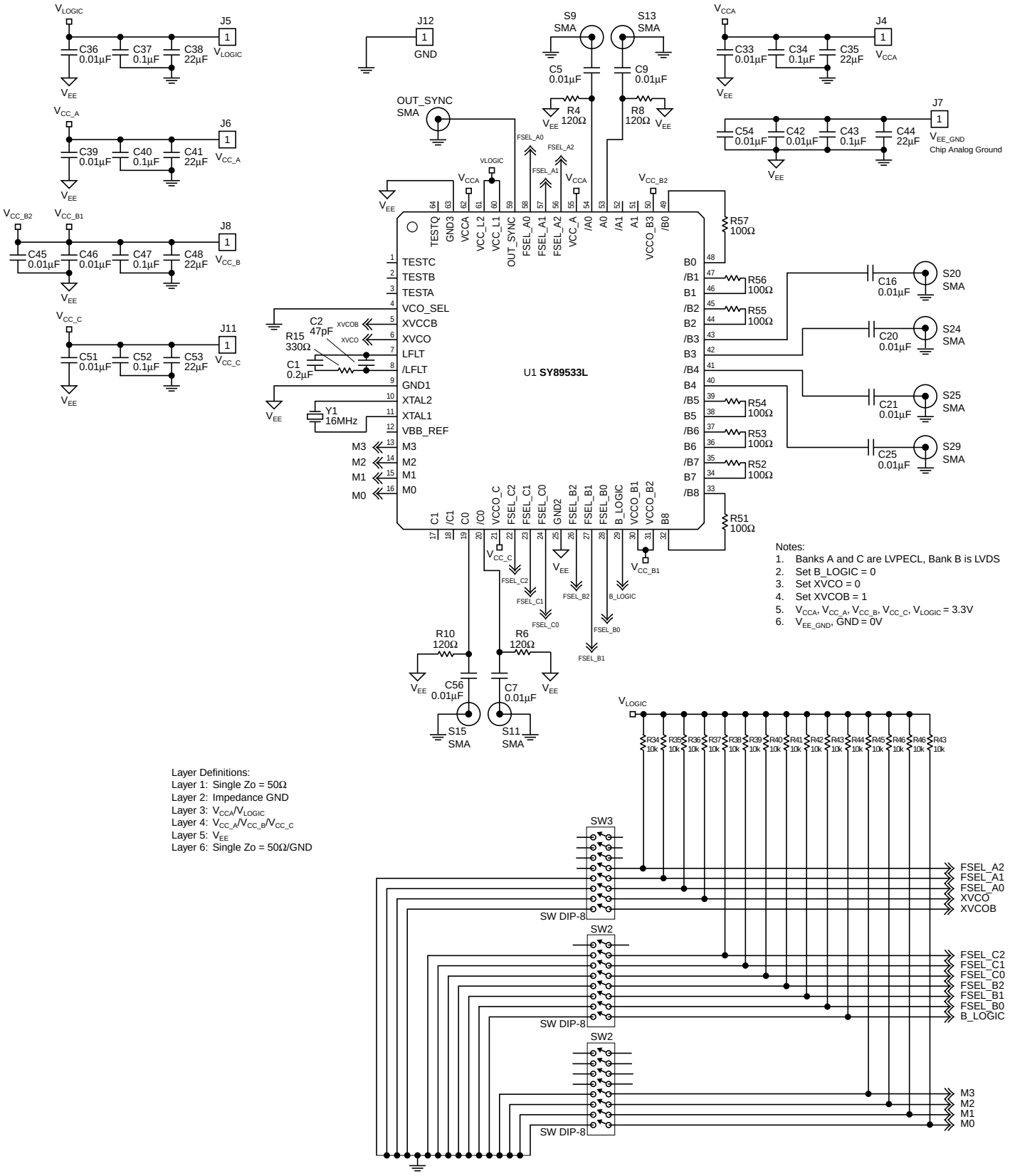


Figure 11. SY89533L Schematic

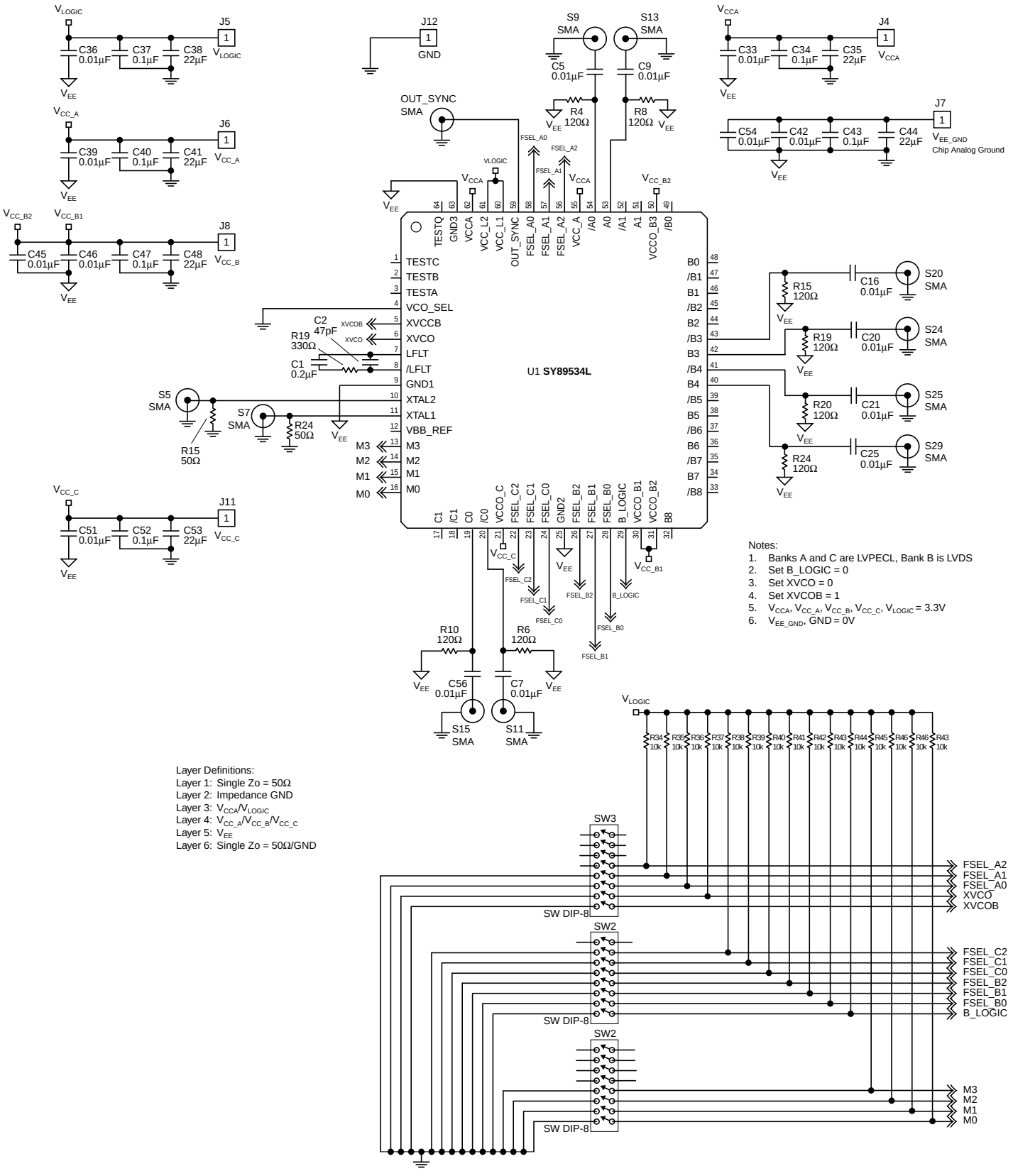


Figure 12. SY89534L Schematic

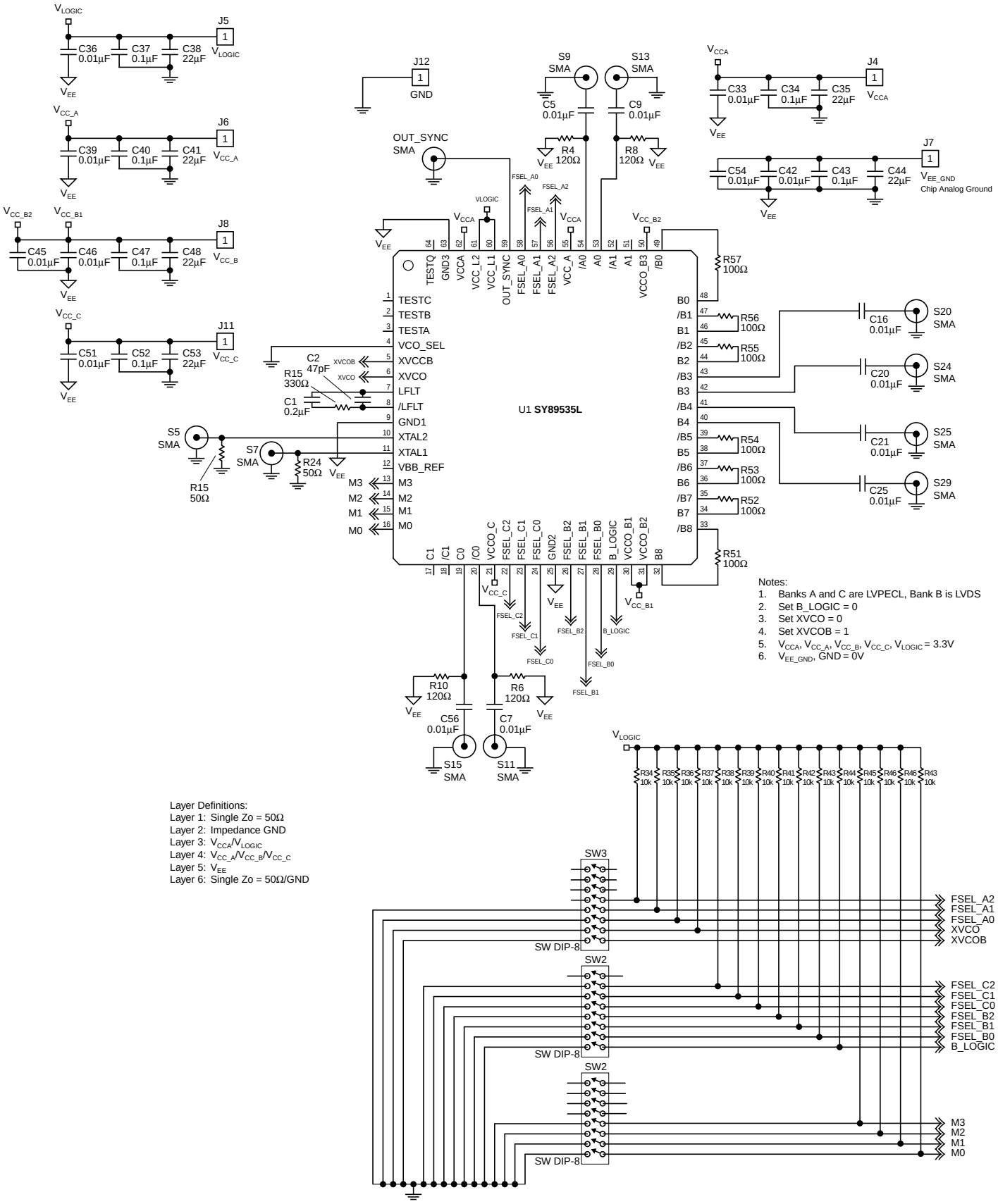


Figure 13. SY89535L Schematic

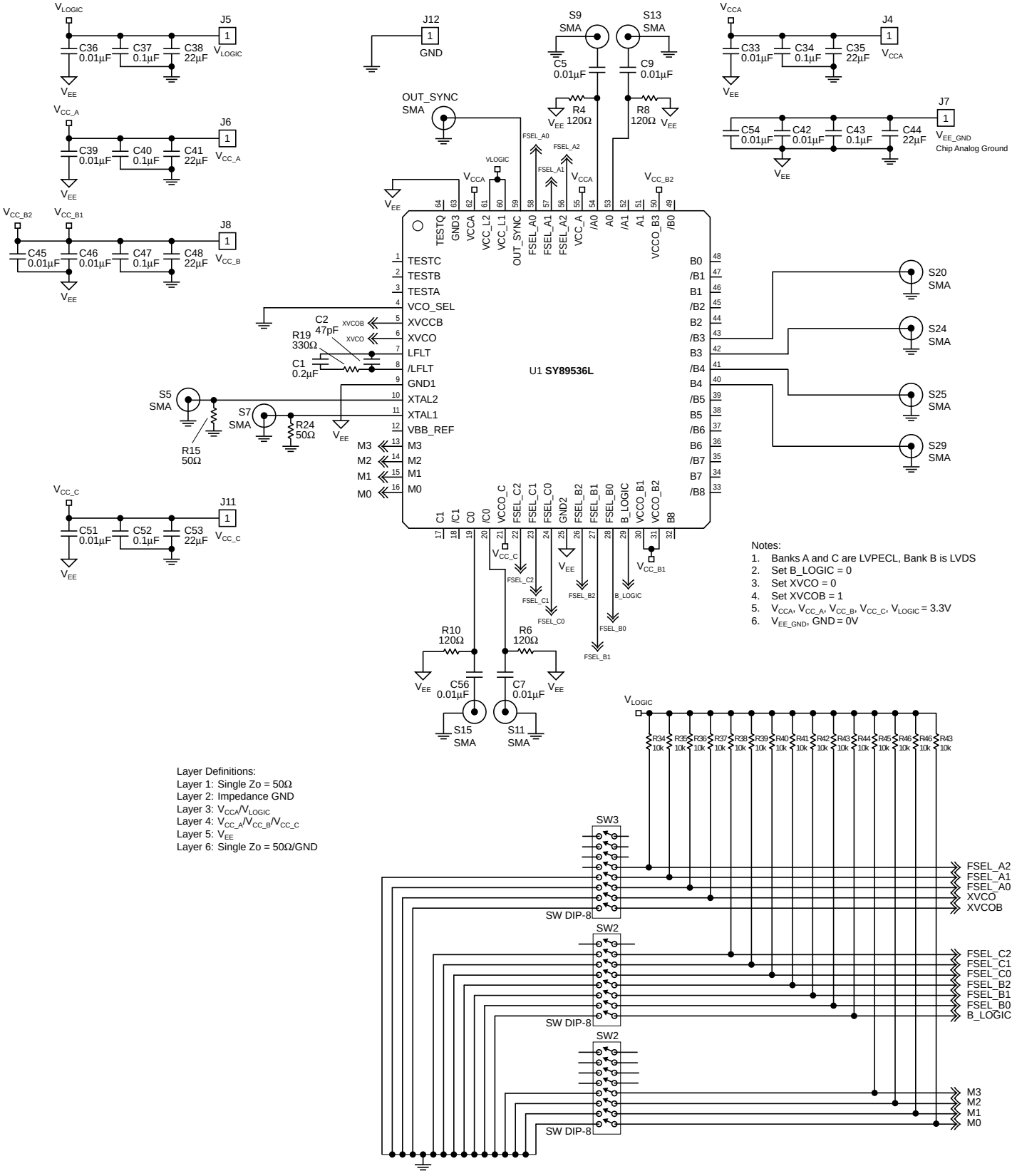


Figure 14. SY89536L Schematic

BILL OF MATERIALS

SY89531L

Item	Part Number	Manufacturer	Description	Qty.
C1	PCC1749CT-ND	Panasonic/Digi-Key(1)	0.2µF, 50V, Capacitor, Size 0603	1
C2	PCC470ACVCT-ND	Panasonic/Digi-Key(1)	47pF, 50V, Capacitor, Size 0603	1
C5, C7, C9, C33, C36, C39, C42, C45, C46, C51, C54, C56	PCCIC3CQCT-ND	Panasonic/Digi-Key(1)	0.01µF, 50V Capacitor, Size 0402	12
C34, C37, C40, C43, C47, C52	PCC104BCT-ND	Panasonic/Digi-Key(1)	0.1µF, 50V Capacitor, Size 1206	6
C35, C38, C41, C44, C48, C53	PCT3226CT-ND	Panasonic/Digi-Key(1)	22µF, 35V, Tantalum, D-Size	6
J4, J5, J6, J7 J8, J11, J12	111-0703-001-ND	Johnson/Digi-Key(2)	Banana Jack	7
R3	P332HCT-ND	Panasonic/Digi-Key(1)	330Ω Resistor, Size 0603	1
R4, R6, R8, R10	P121HCT-ND	Panasonic/Digi-Key(1)	120Ω Resistor, Size 0402	4
R33, R34, R35, R36 R37, R38, R39, R40, R41, R42, R43, R44, R45, R46	P100KHCT-ND	Panasonic/Digi-Key(1)	10k Resistor, Size 0602	14
S9, S11, S13, S15, S20, S24, S25, S29, OUT_SYNC	142-0701-851-ND	Johnson/Digi-Key(2)	SMA	9
SW2, SW3, SW4	CT2188LPST-ND	CTS/Digi-Key(3)	DIP-8	3
U1	**SY89531L**	**Micrel Semiconductor**(4)	3.3V Programmable LVPECL and HSTL Bus Clock Synthesizer	1
Y1	16.6 AS-SMD	Raltron(5)	16MHz	1

Note 1. Panasonic tel: 847-468-5624

Note 2. Johnson Components tel: 800-247-8256

Note 3. CTS tel: 574-293-7511

Note 4. Micrel Semiconductor tel: 408-944-0800

Note 5. Raltron tel: 305-593-6033

SY89532L

Item	Part Number	Manufacturer	Description	Qty.
C1	PCC1749CT-ND	Panasonic/Digi-Key(1)	0.2µF, 50V, Capacitor, Size 0603	1
C2	PCC470ACVCT-ND	Panasonic/Digi-Key(1)	47pF, 50V, Capacitor, Size 0603	1
C5, C7, C9, C16, C20, C21, C25, C33 C36, C39, C42, C45, C46, C51, C54, C56	PCCIC3CQCT-ND	Panasonic/Digi-Key(1)	0.01µF, 50V Capacitor, Size 0402	16
C34, C37, C40, C43, C47, C52	PCC104BCT-ND	Panasonic/Digi-Key(1)	0.1µF, 50V Capacitor, Size 1206	6
C35, C38, C41, C44, C48, C53	PCT3226CT-ND	Panasonic/Digi-Key(1)	22µF, 35V, Tantalum, D-Size	6
J4, J5, J6, J7 J8, J11, J12	111-0703-001-ND	Johnson/Digi-Key(2)	Banana Jack	7
R3	P332HCT-ND	Panasonic/Digi-Key(1)	330Ω Resistor, Size 0603	1
R4, R6, R8, R10 R15, R19, R20, R24	P121HCT-ND	Panasonic/Digi-Key(1)	120Ω Resistor, Size 0402	8
R33, R34, R35, R36 R37, R38, R39, R40, R41, R42, R43, R44, R45, R46	P100KHCT-ND	Panasonic/Digi-Key(1)	10k Resistor, Size 0602	14
S9, S11, S13, S15, S20, S24, S25, S29, OUT_SYNC	142-0701-851-ND	Johnson/Digi-Key(2)	SMA	9
SW2, SW3, SW4	CT2188LPST-ND	CTS/Digi-Key(3)	DIP-8	3
U1	**SY89532L**	**Micrel Semiconductor**(4)	3.3V Programmable LVPECL and LVDS Bus Clock Synthesizer	1
Y1	16.6 AS-SMD	Raltron(5)	16MHz	1

Note 1. Panasonic tel: 847-468-5624

Note 2. Johnson Components tel: 800-247-8256

Note 3. CTS tel: 574-293-7511

Note 4. Micrel Semiconductor tel: 408-944-0800

Note 5. Raltron tel: 305-593-6033

SY89533L

Item	Part Number	Manufacturer	Description	Qty.
C1	PCC1749CT-ND	Panasonic/Digi-Key(1)	0.2µF, 50V, Capacitor, Size 0603	1
C2	PCC470ACVCT-ND	Panasonic/Digi-Key(1)	47pF, 50V, Capacitor, Size 0603	1
C5, C7, C9, C16, C20, C21, C25, C33 C36, C39, C42, C45, C46, C51, C54, C56	PCCIC3CQCT-ND	Panasonic/Digi-Key(1)	0.01µF, 50V Capacitor, Size 0402	16
C34, C37, C40, C43, C47, C52	PCC104BCT-ND	Panasonic/Digi-Key(1)	0.1µF, 50V Capacitor, Size 1206	6
C35, C38, C41, C44, C48, C53	PCT3226CT-ND	Panasonic/Digi-Key(1)	22µF, 35V, Tantalum, D-Size	6
J4, J5, J6, J7 J8, J11, J12	111-0703-001-ND	Johnson/Digi-Key(2)	Banana Jack	7
R3	P332HCT-ND	Panasonic/Digi-Key(1)	330Ω Resistor, Size 0603	1
R4, R6, R8, R10, R15, R19, R20, R24	P121HCT-ND	Panasonic/Digi-Key(1)	120Ω Resistor, Size 0402	8
R33, R34, R35, R36 R37, R38, R39, R40, R41, R42, R43, R44, R45, R46	P10.0KHCT-ND	Panasonic/Digi-Key(1)	10k Resistor, Size 0602	14
R51, R52, R53, R54 R55, R56, R57	P100HCT-ND	Panasonic/Digi-Key(1)	100Ω Resistor, Size 0402	
S9, S11, S13, S15, S20, S24, S25, S29, OUT_SYNC	142-0701-851-ND	Johnson/Digi-Key(2)	SMA	9
SW2, SW3, SW4	CT2188LPST-ND	CTS/Digi-Key(3)	DIP-8	3
U1	**SY89533L**	**Micrel Semiconductor**(4)	3.3V Programmable LVPECL and LVDS Bus Clock Synthesizer	1
Y1	16.6 AS-SMD	Raltron(5)	16MHz	1

Note 1. Panasonic tel: 847-468-5624

Note 2. Johnson Components tel: 800-247-8256

Note 3. CTS tel: 574-293-7511

Note 4. Micrel Semiconductor tel: 408-944-0800

Note 5. Raltron tel: 305-593-6033

SY89534L

Item	Part Number	Manufacturer	Description	Qty.
C1	PCC1749CT-ND	Panasonic/Digi-Key(1)	0.2µF, 50V, Capacitor, Size 0603	1
C2	PCC470ACVCT-ND	Panasonic/Digi-Key(1)	47pF, 50V, Capacitor, Size 0603	1
C5, C7, C9, C16, C20, C21, C25, C33 C36, C39, C42, C45, C46, C51, C54, C56	PCCIC3CQCT-ND	Panasonic/Digi-Key(1)	0.01µF, 50V Capacitor, Size 0402	16
C34, C37, C40, C43, C47, C52	PCC104BCT-ND	Panasonic/Digi-Key(1)	0.1µF, 50V Capacitor, Size 1206	6
C35, C38, C41, C44, C48, C53	PCT3226CT-ND	Panasonic/Digi-Key(1)	22µF, 35V, Tantalum, D-Size	6
J4, J5, J6, J7 J8, J11, J12	111-0703-001-ND	Johnson/Digi-Key(2)	Banana Jack	7
R3	P332HCT-ND	Panasonic/Digi-Key(1)	330Ω Resistor, Size 0603	1
R4, R6, R8, R10, R15, R19, R20, R24	P121HCT-ND	Panasonic/Digi-Key(1)	120Ω Resistor, Size 0402	8
R15, R24	P51.1LCT-ND	Panasonic/Digi-Key(1)	50Ω Resistor, Size 0402	2
R33, R34, R35, R36 R37, R38, R39, R40, R41, R42, R43, R44, R45, R46	P10.0KHCT-ND	Panasonic/Digi-Key(1)	10k Resistor, Size 0602	14
R51, R52, R53, R54 R55, R56, R57	P100HCT-ND	Panasonic/Digi-Key(1)	100Ω Resistor, Size 0402	
S5, S9, S9, S11, S13, S15, S20, S24, S25, S29, OUT_SYNC	142-0701-851-ND	Johnson/Digi-Key(2)	SMA	11
SW2, SW3, SW4	CT2188LPST-ND	CTS/Digi-Key(3)	DIP-8	3
U1	**SY89534L**	**Micrel Semiconductor**(4)	3.3V Programmable LVPECL and LVDS Bus Clock Synthesizer	1
Y1	16.6 AS-SMD	Raltron(5)	16MHz	1

Note 1. Panasonic tel: 847-468-5624

Note 2. Johnson Components tel: 800-247-8256

Note 3. CTS tel: 574-293-7511

Note 4. Micrel Semiconductor tel: 408-944-0800

Note 5. Raltron tel: 305-593-6033

SY89535L

Item	Part Number	Manufacturer	Description	Qty.
C1	PCC1749CT-ND	Panasonic/Digi-Key(1)	0.2µF, 50V, Capacitor, Size 0603	1
C2	PCC470ACVCT-ND	Panasonic/Digi-Key(1)	47pF, 50V, Capacitor, Size 0603	1
C5, C7, C9, C16, C20, C21, C25, C33 C36, C39, C42, C45, C46, C51, C54, C56	PCCIC3CQCT-ND	Panasonic/Digi-Key(1)	0.01µF, 50V Capacitor, Size 0402	16
C34, C37, C40, C43, C47, C52	PCC104BCT-ND	Panasonic/Digi-Key(1)	0.1µF, 50V Capacitor, Size 1206	6
C35, C38, C41, C44, C48, C53	PCT3226CT-ND	Panasonic/Digi-Key(1)	22µF, 35V, Tantalum, D-Size	6
J4, J5, J6, J7 J8, J11, J12	111-0703-001-ND	Johnson/Digi-Key(2)	Banana Jack	7
R3	P332HCT-ND	Panasonic/Digi-Key(1)	330Ω Resistor, Size 0603	1
R4, R6, R8, R10,	P121HCT-ND	Panasonic/Digi-Key(1)	120Ω Resistor, Size 0402	4
R15, R24	P51.1LCT-ND	Panasonic/Digi-Key(1)	50Ω Resistor, Size 0402	2
R33, R34, R35, R36 R37, R38, R39, R40, R41, R42, R43, R44, R45, R46	P10.0HCT-ND	Panasonic/Digi-Key(1)	10k Resistor, Size 0602	14
R51, R52, R53, R54 R55, R56, R57	P100HCT-ND	Panasonic/Digi-Key(1)	100Ω Resistor, Size 0402	7
S5, S7, S9, S11, S13, S15, S20, S24, S25, S29, OUT_SYNC	142-0701-851-ND	Johnson/Digi-Key(2)	SMA	11
SW2, SW3, SW4	CT2188LPST-ND	CTS/Digi-Key(3)	DIP-8	3
U1	**SY89535L**	**Micrel Semiconductor**(4)	3.3V Programmable LVPECL and LVDS Bus Clock Synthesizer	1
Y1	16.6 AS-SMD	Raltron(5)	16MHz	1

Note 1. Panasonic tel: 847-468-5624

Note 2. Johnson Components tel: 800-247-8256

Note 3. CTS tel: 574-293-7511

Note 4. Micrel Semiconductor tel: 408-944-0800

Note 5. Raltron tel: 305-593-6033

SY89536L

Item	Part Number	Manufacturer	Description	Qty.
C1	PCC1749CT-ND	Panasonic/Digi-Key(1)	0.2µF, 50V, Capacitor, Size 0603	1
C2	PCC470ACVCT-ND	Panasonic/Digi-Key(1)	47pF, 50V, Capacitor, Size 0603	1
C5, C7, C9, C33, C36, C39, C42, C45, C46, C51, C54, C56	PCCIC3CQCT-ND	Panasonic/Digi-Key(1)	0.01µF, 50V Capacitor, Size 0402	12
C34, C37, C40, C43, C47, C52	PCC104BCT-ND	Panasonic/Digi-Key(1)	0.1µF, 50V Capacitor, Size 1206	6
C35, C38, C41, C44, C48, C53	PCT3226CT-ND	Panasonic/Digi-Key(1)	22µF, 35V, Tantalum, D-Size	6
J4, J5, J6, J7 J8, J11, J12	111-0703-001-ND	Johnson/Digi-Key(2)	Banana Jack	7
R3	P332HCT-ND	Panasonic/Digi-Key(1)	330Ω Resistor, Size 0603	1
R4, R6, R8, R10,	P121HCT-ND	Panasonic/Digi-Key(1)	120Ω Resistor, Size 0402	4
R33, R34, R35, R36 R37, R38, R39, R40, R41, R42, R43, R44, R45, R46	P10.0KHCT-ND	Panasonic/Digi-Key(1)	10k Resistor, Size 0602	14
R51, R52, R53, R54 R55, R56, R57	P100HCT-ND	Panasonic/Digi-Key(1)	100Ω Resistor, Size 0402	
S5, S9, S9, S11, S13, S15, S20, S24, S25, S29, OUT_SYNC	142-0701-851-ND	Johnson/Digi-Key(2)	SMA	11
SW2, SW3, SW4	CT2188LPST-ND	CTS/Digi-Key(3)	DIP-8	3
U1	**SY89536L**	**Micrel Semiconductor**(4)	3.3V Programmable LVPECL and HSTL Bus Clock Synthesizer	1
Y1	16.6 AS-SMD	Raltron(5)	16MHz	1

Note 1. Panasonic tel: 847-468-5624

Note 2. Johnson Components tel: 800-247-8256

Note 3. CTS tel: 574-293-7511

Note 4. Micrel Semiconductor tel: 408-944-0800

Note 5. Raltron tel: 305-593-6033

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