

---

# SY58627L

---



---

## DC-to-6.4Gbps Backplane Receive Buffer with Four Stage Programmable Equalization and DC-Offset Control

---

### General Description

The SY58627L high-speed, low jitter receive buffer is optimized for backplane and transmission line data-path management applications. The SY58627L is capable of receiving serial data up to 6.4Gbps across up to 36 inches of FR4.

The SY58627L differential input includes Micrel's unique, 3-pin input termination architecture that directly interfaces to any differential signal as small as 100mV<sub>pk</sub> (AC- or DC-coupled) without any termination resistor networks in the signal path. The outputs are 50Ω source-terminated CML optimized to drive 400mV<sub>pk</sub> into 50Ω (100Ω load across the output pair). The I/O termination is connected to a dedicated VTT pin for added bias flexibility.

The SY58627L receiver input provides four levels of equalization to compensate for degraded signals resulting from transmission losses. The equalization is programmed with a three-bit interface.

The SY58627L operates at 3.3V ±10% supply and is guaranteed over the full industrial temperature range of -40°C to +85°C. The SY58627L is part of Micrel's high-speed, Precision Edge<sup>®</sup> product line.

All data sheets and support documentation can be found on Micrel's web site at: [www.micrel.com](http://www.micrel.com).



Precision Edge<sup>®</sup>

### Features

- Selectable equalizing network to optimize incoming data eye pattern
- Four selectable equalization levels
- Receives up to 36" FR4 PCB trace, or longer combinations of FR4+cable+interconnect
- DC through 6.4Gbps data rate throughput
- Integrated loopback capability
- Unique, flexible I/O:
  - Patented, Internal termination to VTTIN pin interfaces to any differential AC- or DC-coupled signals
  - 50Ω source terminated CML outputs minimize round-trip reflections
  - Wide input voltage range: 100mV to 1.3V<sub>PK</sub>
  - Output disable
  - DC-offset control with VTT I/O
- Input loss-of-signal
  - Hysteresis included
- 3.3V ±10% supply voltage
- -40°C to +85°C temperature range
- Available in 32-pin (5mm x 5mm) QFN package

### Applications

- ATE, T&M backplane management
- Serial backplane management
- Combination FR4+cable+interconnect receiver
- Fibre Channel, GigE, SONET/SDH data transmission
- Electrical interface and interconnect applications that require DC-offset control

Precision Edge is a registered trademark of Micrel, Inc.

---

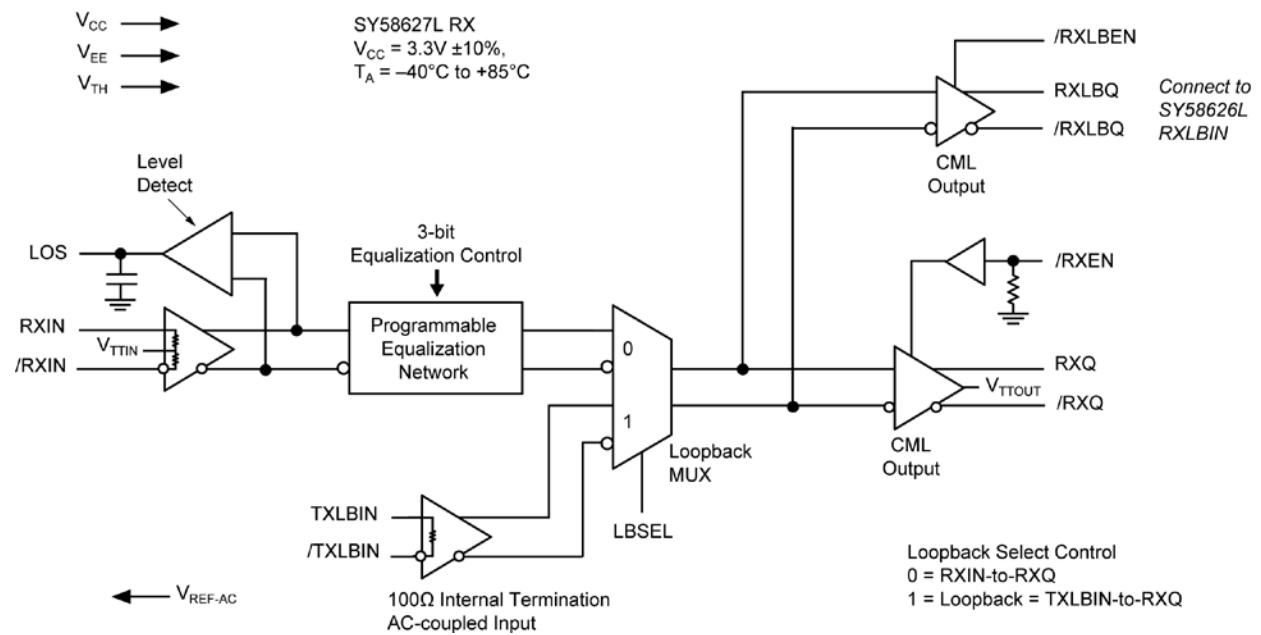
Micrel Inc. • 2180 Fortune Drive • San Jose, CA 95131 • USA • tel +1 (408) 944-0800 • fax + 1 (408) 474-1000 • <http://www.micrel.com>

---

January 2006

M9999-010606-A  
[hbwhelp@micrel.com](mailto:hbwhelp@micrel.com) or (408) 955-1690

## Functional Block Diagram

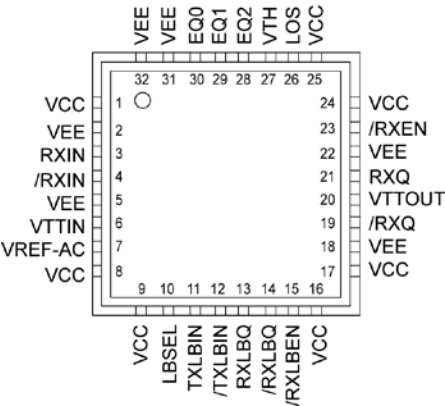


Ordering Information<sup>(1)</sup>

| Part Number                 | Package Type | Operating Range | Package Marking                             | Lead Finish       |
|-----------------------------|--------------|-----------------|---------------------------------------------|-------------------|
| SY58627LMG                  | QFN-32       | Industrial      | SY58627L with<br>Pb-Free bar-line indicator | NiPdAu<br>Pb-Free |
| SY58627LMGTR <sup>(2)</sup> | QFN-32       | Industrial      | SY58627L with<br>Pb-Free bar-line indicator | NiPdAu<br>Pb-Free |

Notes:  
Contact factory for die availability. Dice are guaranteed at T<sub>A</sub> = 25°C, DC Electricals only.  
Tape and Reel.

Pin Configuration



32-Pin QFN

## Pin Description

| Pin Number | Pin Name        | Pin Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3, 4       | RXIN, /RXIN     | Differential receiver input pair: This input pair is the differential signal input to the device. It accepts AC- or DC-coupled signals as small as 100mV (200mV <sub>PP</sub> ). The signal detect (SD Level) includes a small amount of hysteresis to prevent the signal detect output from oscillating when no signal is present. RXIN and /RXIN internally terminate to the VTTIN pin through 50Ω. Please refer to the "Input Interface Applications" section for more details. RXIN, /RXIN differential inputs recommended be $\geq 90\text{mV}_{\text{PK}}$ to ensure valid outputs. Consider disabling the outputs when the differential input is not present, or $< 90\text{mV}_{\text{PK}}$ (e.g.: Hot Swap Applications). |
| 6          | VTTIN           | Input termination center-tap: RXIN and /RXIN terminate to VTTIN. The VTTIN pin provides a center-tap to the internal termination network for maximum interface flexibility, and DC-offset capability. Please refer to the "Input Interface Applications" section for more details.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 7          | VREF-AC         | Reference voltage: This output biases to V <sub>CC</sub> -0.84V. It is used for AC-coupling the input pair (RXIN, /RXIN). Connect VREF-AC directly to the VTTIN pin. Bypass with 0.01μF low ESR capacitor to VCC. Maximum sink/source current is $\pm 1.5\text{mA}$ . Due to the limited drive capability, the VREF-AC pin is only intended to drive the VTTIN pin. Leave VREF-AC pin floating when not used. Please refer to the "Input Interface Applications" section for more details.                                                                                                                                                                                                                                         |
| 27         | VTH             | Input logic threshold control voltage for logic control threshold settings other than LVTTTL/CMOS. This input control pin can be externally biased to set the proper threshold for all the logic control pins, /RXEN, LBSEL, 3-bit equalization control, and /RXLBEN. For standard LVTTTL/CMOS control, simply leave the VTH pin floating and the threshold voltage defaults to V <sub>CC</sub> /2 (When V <sub>EE</sub> = 0V). For LVPECL thresholds, set VTH to V <sub>CC</sub> -1.3V.                                                                                                                                                                                                                                           |
| 23         | /RXEN           | TTL/CMOS (or VTH controlled) compatible control input for the RXQ output pair. When pulled HIGH, the RXQ output pair is disabled. This input is internally connected to a 25kΩ pull-down resistor and will default to a logic LOW state (Enable) if left open. When disabled, the RXQ output goes LOW, and /RXQ output goes HIGH. Default threshold is V <sub>CC</sub> /2 when VTH pin is floating.                                                                                                                                                                                                                                                                                                                                |
| 15         | /RXLBEN         | TTL/CMOS (or VTH controlled) compatible control input for RXLBQ output pair. When pulled HIGH, the RXLBQ output pair is disabled. This input is internally connected to a 25kΩ pull-down resistor and will default to a logic LOW state (Enable) if left open. When disabled, the RXLBQ output goes LOW, and /RXLBQ output goes HIGH. Default threshold is V <sub>CC</sub> /2 when VTH pin is floating. In normal operating mode when the RXLBQ output pair is not needed, disable the RXLBQ output pair (/RXLBEN = HIGH) to minimize noise.                                                                                                                                                                                       |
| 10         | LBSEL           | Loopback MUX select control: The TTL/CMOS (or VTH controlled) compatible input selects the input to the Loopback mode multiplexer. When LBSEL input is logic HIGH, Loopback mode is selected, and the TXLBIN input pair is selected to pass through the RXQ and RXLBQ output pairs. Note that the LBSEL pin is internally connected to a 25kΩ pull-down resistor and will default to a logic LOW state if left open (normal operation). The Loopback MUX includes internal input isolation to minimize crosstalk.                                                                                                                                                                                                                  |
| 11, 12     | TXLBIN, /TXLBIN | Loopback differential input pair: AC-coupled, CML-compatible input. This input pair includes internal termination connected to an internal VBB for an AC-coupled bias configuration. For local Loopback operation, the TXLBIN input pair receives a signal from the SY58626L transmitter TXLBQ output pair. The input signal from TXLBIN does not have any equalization. When the SY58627L Loopback mode is selected (LBSEL = HIGH), the signal at TXLBIN is directed to the RXQ and RXLBQ output pairs.                                                                                                                                                                                                                           |

**Pin Description** (Continued)

| Pin Number                 | Pin Name                | Pin Function                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13, 14                     | RXLBQ,<br>/RXLBQ        | Receiver loopback CML compatible output pair. When the SY58627L is in local Loopback mode (LBSEL = 1), RXLBQ output is directed from TXLBIN (no equalization). When the SY58627L is in normal mode (LBSEL = LOW) and the RXLBQ output is not required, disable the RXLBQ output (/RXLBEN = HIGH) to minimize switching noise. This differential output pair is optimized to drive 400mV <sub>PK</sub> swing into a 50Ω load (100Ω across the pair). The RXLBQ output pair includes 50Ω internal source termination resistors. |
| 21, 19                     | RXQ,<br>/RXQ            | Receiver differential CML compatible output pair: This CML-compatible output pair is the equalized signal seen at the RXIN input pair and is optimized to drive 400mV <sub>PK</sub> swing into a 50Ω load (100Ω across the pair). The RXQ output pair includes 50Ω internal source termination resistors. When the SY58627L is in Loopback mode (LBSEL = HIGH), the RXQ output signal is directed from the unequalized TXLBIN input.                                                                                          |
| 26                         | LOS                     | Loss-of-Signal output. This LVTTTL/CMOS output signal switches LOW when the signal is valid and switches HIGH when the signal is not valid. This open-collector output includes an internal 5kΩ pull-up resistor.<br>Input signal valid, LOS = LOW, RXIN swing is >110mV <sub>PK</sub> (220mV <sub>PP</sub> ).<br>Input signal not valid, LOS = HIGH, RXIN swing is <90mV <sub>PK</sub> (180mV <sub>PP</sub> )                                                                                                                |
| 20                         | VTOUT                   | Output termination center-tap: Each side of the RXQ differential output pair terminates to the VTOUT pin through 50Ω. The VTOUT pin provides a center-tap to the output termination network for maximum interface flexibility, and DC-offset capability. Please refer to the "CML Output Interface Applications" section for more details.                                                                                                                                                                                    |
| 28<br>29<br>30             | EQ2( MSB)<br>EQ1<br>EQ0 | TTL/CMOS (or VTH controlled) compatible, 3-bit control interface. There are four levels of equalization, as shown in the "Equalization Select Truth Table." When the MSB is logic HIGH, the RXQ output pair will not include any equalization.<br>000 = lowest equalization setting<br>001 = medium equalization setting<br>010 = medium-high equalization setting<br>011 = highest equalization setting<br>100 = equalization bypass                                                                                         |
| 1, 8, 9, 16, 17,<br>24, 25 | VCC                     | Positive Power Supply: Connect to +3.3V power supply. Bypass with 0.1μF//0.01μF low ESR capacitors as close to VCC pins as possible.                                                                                                                                                                                                                                                                                                                                                                                          |
| 2, 5, 18, 22, 31,<br>32    | VEE,<br>Exposed Pad     | Ground: Ground pins and exposed pad must be connected to the same ground plane.                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**Equalization Select Truth Table**

| Disable EQ<br>(MSB = EQ2) | Equalization<br>Select (EQ1) | Equalization<br>Select (EQ0) | Typical FR4 Length | Equalization |
|---------------------------|------------------------------|------------------------------|--------------------|--------------|
| 0                         | 0                            | 0                            | 9"                 | Low          |
| 0                         | 0                            | 1                            | 18"                | Medium Low   |
| 0                         | 1                            | 0                            | 24"                | Medium High  |
| 0                         | 1                            | 1                            | 36"                | High         |
| 1                         | X                            | X                            | NA                 | Disabled     |

**Absolute Maximum Ratings<sup>(1)</sup>**Supply Voltage (V<sub>CC</sub>) ..... -0.5V to +4.0V

Input Voltage ( $V_{IN}$ ) ..... -0.5V to  $V_{CC}$   
 Input Current ( $R_{XIN}$ ,  $/R_{XIN}$ ,  $\leq 120$ mins) ..... 67mA  
 CML Output Current ( $I_{OUT}$ )  
     Continuous ( $\leq 120$ mins) ..... 67mA  
     Surge ..... 100mA  
 Termination Current  
      $V_T$  .....  $\pm 100$ mA  
 $V_{REF-AC}$  Current  
     Source/sink current on  $V_{REF-AC}$  .....  $\pm 2$ mA  
 Lead Temperature (soldering, 20 sec.) .....  $+260^\circ\text{C}$   
 Storage Temperature ( $T_S$ ) .....  $-65^\circ\text{C}$  to  $150^\circ\text{C}$

## Operating Ratings<sup>(2)</sup>

Supply Voltage ( $V_{CC}$ ) .....  $+3.0\text{V}$  to  $+3.6\text{V}$   
 Ambient Temperature ( $T_A$ ) .....  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$   
 Package Thermal Resistance<sup>(3)</sup>  
     QFN ( $\theta_{JA}$ ) .....  $34^\circ\text{C/W}$   
     Still-Air .....  $34^\circ\text{C/W}$   
     QFN ( $\Psi_{JB}$ ) .....  $20^\circ\text{C/W}$   
     Junction-to-Board .....  $20^\circ\text{C/W}$

## DC Electrical Characteristics<sup>(4)</sup>

$T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ; unless otherwise stated.

| Symbol            | Parameter                                                        | Condition                                                                                      | Min           | Typ           | Max          | Units            |
|-------------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------|---------------|--------------|------------------|
| $V_{CC}$          | Power Supply                                                     |                                                                                                | 3.0           | 3.3           | 3.6          | V                |
| $I_{EE}$          | Power Supply Current                                             | Max $V_{CC}$ , includes $50\Omega$ internal source resistors, no external load current         |               | 210           | 260          | mA               |
| $R_{IN}$          | Input Resistance ( $R_{XIN}$ -to- $V_{TTIN}$ )                   |                                                                                                | 45            | 50            | 55           | $\Omega$         |
| $R_{DIFF\_IN}$    | Differential Input Resistance ( $R_{XIN}$ -to- $/R_{XIN}$ )      |                                                                                                | 90            | 100           | 110          | $\Omega$         |
| $V_{IN\_TRANS}$   | Transmission Line Input Voltage Swing ( $R_{XIN}$ , $/R_{XIN}$ ) | Input signal swing applied to transmission line input up to 36 in. (driver side of $R_{XIN}$ ) | 0.20          |               |              | $V_{PK}$         |
| $V_{IN}$          | Input Voltage Swing ( $R_{XIN}$ , $/R_{XIN}$ )                   | See Figure 4a.                                                                                 | 0.1           |               | 1.3          | $V_{PK}$         |
| $V_{DIFF\_IN}$    | Differential Input Voltage Swing $ R_{XIN}-/R_{XIN} $            | See Figure 4b.                                                                                 | 0.2           |               |              | $V_{PP}$         |
| $V_{IH}$          | Input High Voltage ( $R_{XIN}$ , $/R_{XIN}$ )                    |                                                                                                | $V_{EE}+1.6$  |               | $V_{CC}$     | V                |
| $V_{IL}$          | Input LOW Voltage ( $R_{XIN}$ , $/R_{XIN}$ )                     |                                                                                                | $V_{EE}+1.4$  |               | $V_{IH}-0.1$ | V                |
| $V_{TTIN}$        | $R_{XIN}$ -to- $V_{TTIN}$ ( $R_{XIN}$ , $/R_{XIN}$ )             |                                                                                                |               |               | 1.5          | V                |
| $V_{TTIN}$ Range  | $V_{TTIN}$ Voltage Range                                         | Voltage applied to $V_{TTIN}$ pin                                                              | $V_{CC}-1.5$  |               | $V_{CC}+1.5$ | V                |
| $V_{TTOUT}$ Range | $V_{TTOUT}$ Voltage Range                                        | Voltage applied to $V_{TTOUT}$ pin                                                             | $V_{CC}-0.4$  |               | $V_{CC}$     | V                |
| LOS               | Loss-of-Signal Input Levels                                      | Signal-detect Assert                                                                           |               | 110           |              | $\text{mV}_{PK}$ |
|                   |                                                                  | Signal-detect De-assert                                                                        |               | 90            |              |                  |
|                   | Input Return Loss                                                | 100MHz to 3.5GHz                                                                               |               | 10            |              | dB               |
| $V_{REF-AC}$      | Output Reference Voltage                                         |                                                                                                | $V_{CC}-0.95$ | $V_{CC}-0.84$ | $V_{CC}-0.7$ | V                |

### Notes:

- Permanent device damage may occur if absolute maximum ratings are exceeded. This is a stress rating only and functional operation is not implied at conditions other than those detailed in the operational sections of this data sheet. Exposure to absolute maximum ratings conditions for extended periods may affect device reliability.
- The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
- Package thermal resistance assumes exposed pad is soldered (or equivalent) to the devices most negative potential on the PCB.  $\theta_{JA}$  and  $\Psi_{JB}$  values are determined for a 4-layer board in still air unless otherwise stated.
- The circuit is designed to meet the DC specifications shown in the above table after thermal equilibrium has been established.  $T_J \leq 125^\circ\text{C}$ .

## RXQ and RXLBQ Output DC Electrical Characteristics<sup>(5)</sup>

$V_{CC} = 3.3V \pm 10\%$ ;  $V_{EE} = 0V$ ;  $T_A = -40^\circ C$  to  $+85^\circ C$ ;  $R_L = 100\Omega$  across output pair; unless otherwise stated.

| Symbol          | Parameter                                                              | Condition                    | Min            | Typ            | Max      | Units            |
|-----------------|------------------------------------------------------------------------|------------------------------|----------------|----------------|----------|------------------|
| $V_{OH}$        | RXQ & RXLBQ Output High Voltage                                        | $R_L = 50\Omega$ to $V_{CC}$ | $V_{CC}-0.040$ | $V_{CC}-0.010$ | $V_{CC}$ | V                |
| $V_{OUT}$       | Output Voltage Swing (RXQ, /RXQ) (RXLBQ, /RXLBQ)                       | See Figure 4a.               | 325            | 400            |          | mV <sub>PK</sub> |
| $V_{DIFF\_OUT}$ | RXQ & RXLBQ Differential Output Voltage Swing  RXQ-/RXQ   RXLBQ-/RXLBQ | See Figure 4b.               | 650            | 800            |          | mV <sub>PP</sub> |
| $R_{OUT}$       | Output Impedance                                                       |                              | 45             | 50             | 55       | $\Omega$         |

## Logic Control DC Electrical Characteristics<sup>(5)</sup>

$V_{CC} = 3.3V \pm 10\%$ ;  $V_{EE} = 0V$ ;  $T_A = -40^\circ C$  to  $+85^\circ C$ ; unless otherwise stated.

| Symbol   | Parameter               | Condition                                | Min          | Typ        | Max          | Units   |
|----------|-------------------------|------------------------------------------|--------------|------------|--------------|---------|
| $V_{IH}$ | Input HIGH Voltage      | All control input pins                   | $V_{TH}+0.2$ |            | $V_{CC}$     | V       |
| $V_{IL}$ | Input LOW Voltage       | All control input pins                   | $V_{EE}$     |            | $V_{TH}-0.2$ | V       |
| $I_{IH}$ | Input HIGH Current      |                                          |              |            | 300          | $\mu A$ |
| $I_{IL}$ | Input LOW Current       |                                          | -300         |            |              | $\mu A$ |
| $V_{TH}$ | Threshold Input Voltage | Voltage applied to pin ( $V_{EE} = 0V$ ) | 1.4          | $V_{CC}/2$ | 2.6          | V       |

## TXLBIN Input DC Electrical Characteristics<sup>(5)</sup>

$V_{CC} = 3.3V \pm 10\%$ ;  $V_{EE} = 0V$ ;  $T_A = -40^\circ C$  to  $+85^\circ C$ ;  $R_L = 100\Omega$  across output pair; unless otherwise stated.

| Symbol         | Parameter                                         | Condition      | Min | Typ | Max | Units           |
|----------------|---------------------------------------------------|----------------|-----|-----|-----|-----------------|
| $R_{DIFF\_IN}$ | Differential Input Resistance (TXLBIN-to-/TXLBIN) |                | 90  | 100 | 110 | $\Omega$        |
| $V_{IN}$       | Input Voltage Swing (TXLBIN, /TXLBIN)             | See Figure 4a. | 0.1 |     | 1.3 | V <sub>PK</sub> |
| $V_{DIFF\_IN}$ | Differential Input Voltage Swing  TXLBIN-/TXLBIN  | See Figure 4b. | 0.2 |     |     | V <sub>PP</sub> |

### Notes:

5. The circuit is designed to meet the DC specifications shown in the above table after thermal equilibrium has been established. 500fpm Airflow.  $T_J \leq 125^\circ C$ .

## AC Electrical Characteristics<sup>(6)</sup>

$V_{CC} = 3.3V \pm 10\%$ ;  $V_{EE} = 0V$ ;  $T_A = -40^\circ C$  to  $+85^\circ C$ ;  $R_L = 100\Omega$  across output pair; unless otherwise stated.

| Symbol          | Parameter                                              | Condition                                      | Min | Typ | Max     | Units             |
|-----------------|--------------------------------------------------------|------------------------------------------------|-----|-----|---------|-------------------|
| Freq            | Data Rate Throughput (RXQ & RXLBQ)                     | NRZ Data                                       | DC  |     | 6.4     | Gbps              |
| $t_{pd}$        | Differential Propagation Delay                         | RXIN-to-RXQ, no equalization                   | 150 | 250 | 450     | ps                |
|                 |                                                        | TXLBIN-to-RXQ                                  |     | 250 |         | ps                |
| $t_{EN}$        | TXQ Enable/Disable Time                                | /TXEN                                          |     | 425 | 650     | ps                |
| $t_{LB\_EN}$    | TXLBQ Enable/Disable Time                              | /TXLBEN                                        |     | 425 |         | ps                |
| $t_{LBSEL}$     | Loopback Select Time                                   | LBSEL                                          |     | 350 | 600     | ps                |
| $t_{PROG}$      | Programming Logic Control Time                         | 3-bit equalization control update-to-valid RXQ |     | 1   |         | ns                |
| $t_{pd}$ Tempco | Differential Propagation Delay Temperature Coefficient |                                                |     | 120 |         | fs/ $^\circ C$    |
| $t_{SKEW}$      | Part-to-Part Skew                                      | Note 7                                         |     |     | 200     | ps                |
| $t_{JITTER}$    | Random Jitter (RJ)                                     | Note 8                                         |     |     | Note 10 | ps <sub>RMS</sub> |
|                 | Deterministic Jitter (DJ)                              | Note 9                                         |     |     | Note 10 | ps <sub>PP</sub>  |
| $t_r, t_f$      | Output Rise/Fall Time (20% to 80%)                     | At full output swing                           | 20  | 50  | 80      | ps                |

### Notes:

- High-frequency AC-parameters are guaranteed by design and characterization.
- Part-to-part skew is defined for two parts with identical power supply voltages at the same temperature and with no skew of the edges at the respective inputs.
- Random jitter is measured with a K28.7 pattern, measured at  $\leq 6.4$ Gbps.
- Deterministic jitter is measured with both K28.5 and  $2^{23}-1$  PRBS pattern, at 4.25Gbps/6.4Gbps.
- Contact factory for updated random jitter and deterministic jitter limits.

## Detailed Description

The SY58627L is a high speed, low jitter receive buffer with integrated loopback capability. This buffer also provides input signal detect and output disable. Four selectable levels of equalization are included with the receiver. Equalization allows for faster data rates and longer distances by reducing the effects of intersymbol interference (ISI) caused by long cable and trace lengths. Input equalization supports data rates up to 6.4Gbps.

### DC-Offset Capability

The SY58627L transmitter includes the VTTIN and VTTOUT pin for maximum interface flexibility and DC-offset capability for the input and output, respectively. This feature allows for interfacing with different logic families without the use of AC-coupling. The output buffer has internal 50Ω source terminated CML outputs for minimizing round-trip reflections.

### Transmitter Disable and Shutdown

The SY58627L disable function is initiated by pulling /RXEN to logic HIGH. In disable mode, RXQ goes to a LOW state and /RXQ goes to a HIGH state. The threshold for /RXEN is set with the VTH pin. When the VTH pin is floating, the VTH levels are TTL/CMOS compatible with a threshold voltage at  $V_{CC}/2$  ( $V_{EE} = 0V$ ). For PECL compatible levels, apply a  $V_{CC}-1.3V$  voltage at the VTH pin. Please refer to the "Typical Operating Characteristics" for more details.

### Loss-of-Signal

The SY58627L RXIN input pair provides a TTL signal detect output. The LOS output de-asserts LOW when the swing at RXIN is greater than  $110mV_{PK}$  ( $220mV_{PP}$ ). SD output asserts HIGH when RXIN swing is less than  $90mV_{PK}$  ( $180mV_{PP}$ ). Hysteresis is included in the LOS output to prevent oscillation when no signal is present at the RXIN input. LOS can be tied to /RXEN and /RXLBEN to provide a valid output when input amplitude is  $<90mV_{PK}$  or disabled.

## Loopback

The SY58627L features a loopback test mode, activated by setting LBSEL to logic HIGH. Using the SY58627L with the SY58626L enables local loopback and link side loopback, shown in Figures 2b and 2c. This mode enables an external loopback path, bypassing circuitry on both local and link side. Please refer to Table 1 and Figure 3 for Loopback Control information.

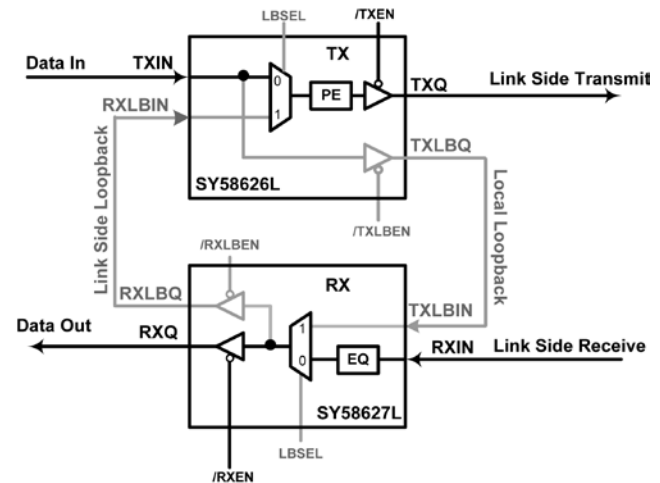


Figure 2a. Normal Operation

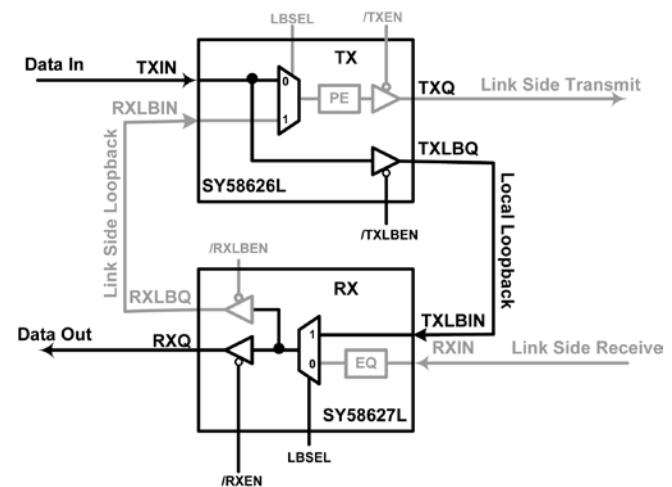


Figure 2b. Local Loopback Mode

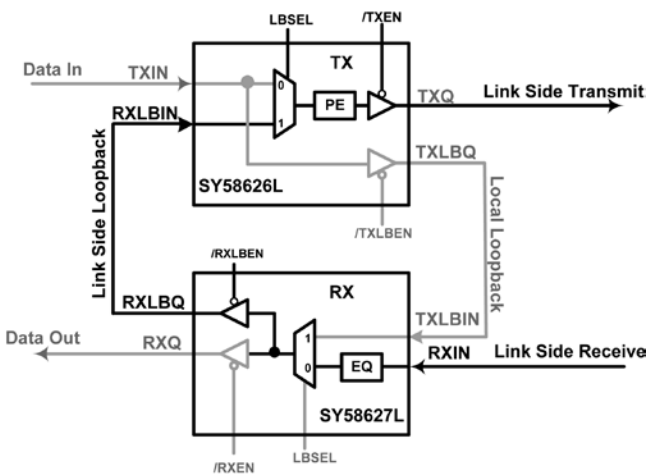


Figure 2c. Link Side Loopback Mode

|                         | LBSEL | /RXLBEN | /RXEN | RXQ    | RXLBQ |
|-------------------------|-------|---------|-------|--------|-------|
| Normal Mode             | 0     | 0       | 0     | RXIN   | RXIN  |
|                         | 0     | 0       | 1     | 0      | RXIN  |
|                         | 0     | 1       | 0     | RXIN   | 0     |
|                         | 0     | 1       | 1     | 0      | 0     |
| Link Side Loopback Mode | 1     | 0       | 0     | TXLBIN | TXBIN |
|                         | 1     | 0       | 1     | 0      | TXBIN |
|                         | 1     | 1       | 0     | TXLBIN | 0     |
|                         | 1     | 1       | 1     | 0      | 0     |

Table 1. Transmit Loopback Control Signal

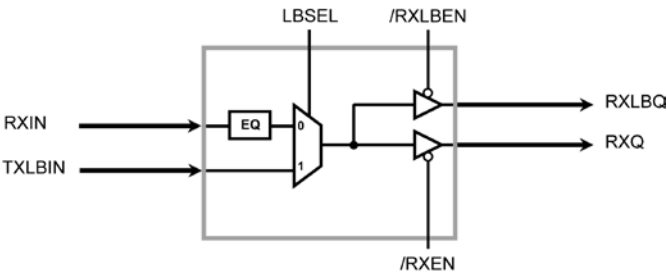
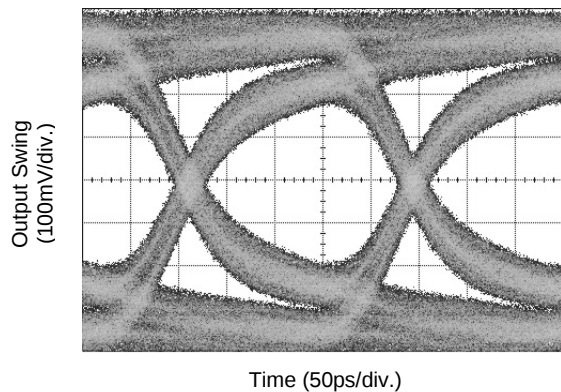


Figure 3. Loopback Control

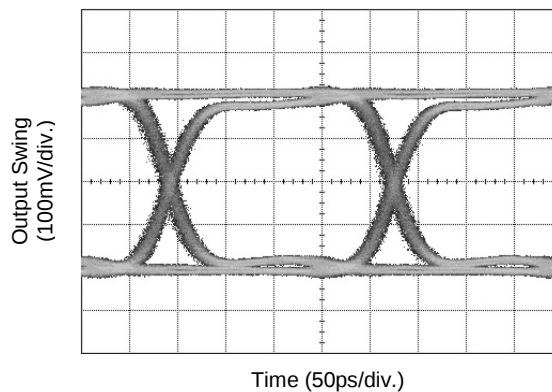
## Typical Operating Characteristics

$V_{CC} = 3.3V \pm 10\%$ ;  $V_{IN} > 400mV$ ;  $T_A = 25^\circ C$ ;  $R_L = 100\Omega$  across output pair; unless otherwise stated.

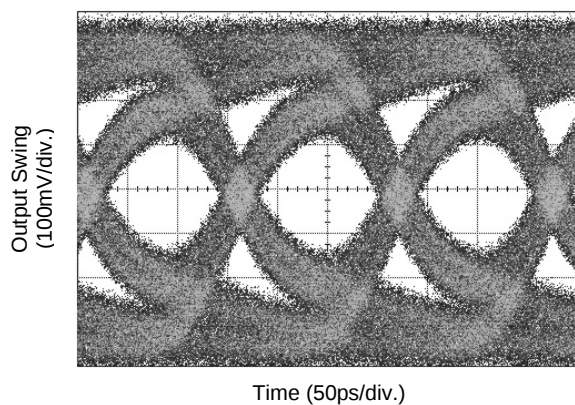
8in FR4 Output without SY58627L  
(4.25Gbps PRBS  $2^{23}$ )



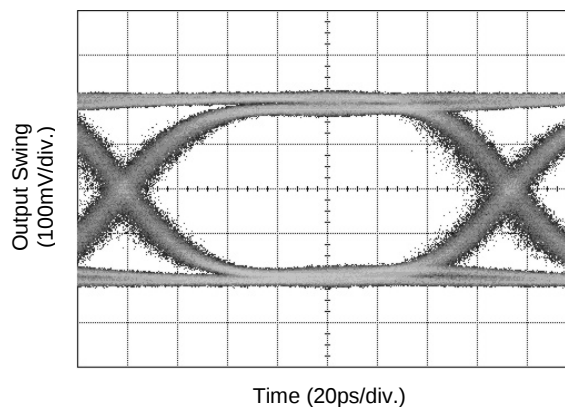
8in FR4 Output With SY58627L  
(4.25Gbps PRBS  $2^{23}$ )



8in FR4 Output without SY58627L  
(6.4Gbps PRBS  $2^{23}$ )



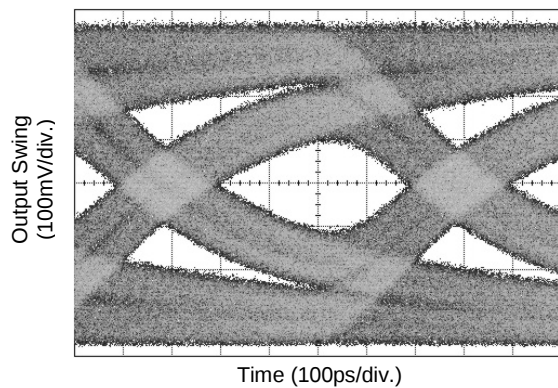
8in FR4 Output with SY58627L  
(6.4Gbps PRBS  $2^{23}$ )



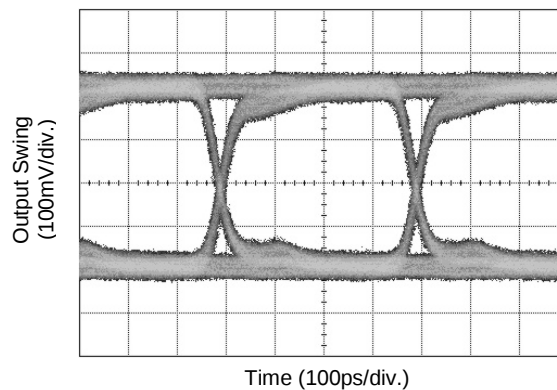
## Typical Operating Characteristics (Continued)

$V_{CC} = 3.3V \pm 10\%$ ;  $V_{IN} > 100mV$ ;  $T_A = 25^\circ C$ ;  $R_L = 100\Omega$  across output pair; unless otherwise stated.

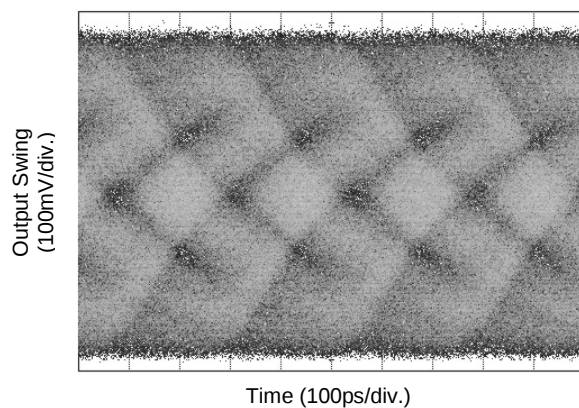
**1m FR4 Output without SY58627L  
(2.5Gbps PRBS  $2^{23}$ )**



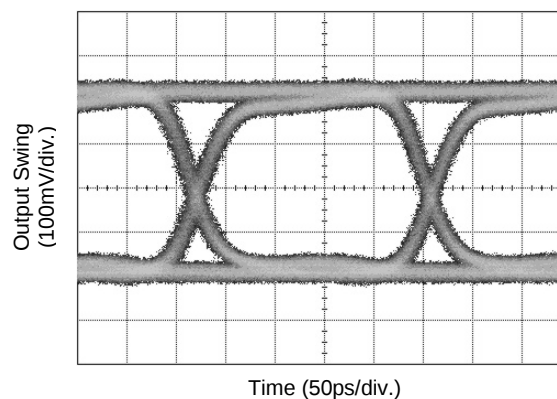
**1m FR4 Output with SY58627L  
(2.5Gbps PRBS  $2^{23}$ )**



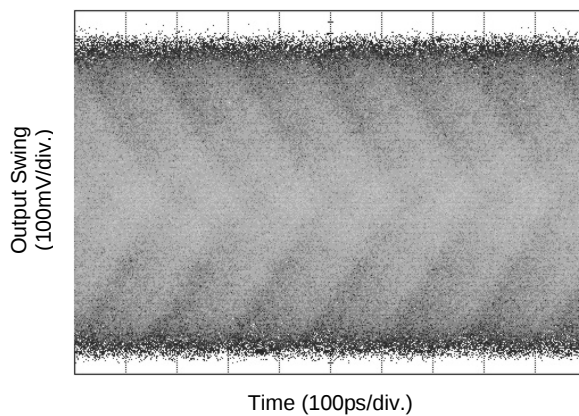
**1m FR4 Output without SY58627L  
(4.25Gbps PRBS  $2^{23}$ )**



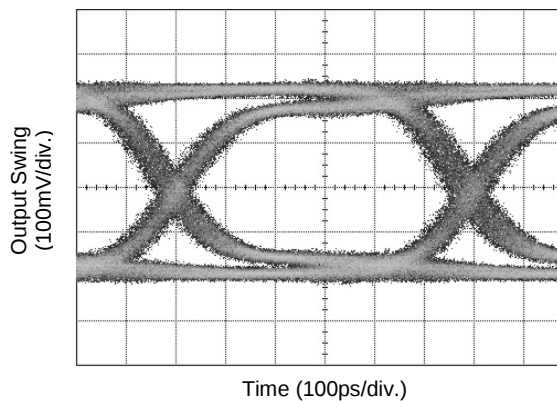
**1m FR4 Output with SY58627L  
(4.25Gbps PRBS  $2^{23}$ )**



**1m FR4 Output without SY58627L  
(6.4Gbps PRBS  $2^{23}$ )**



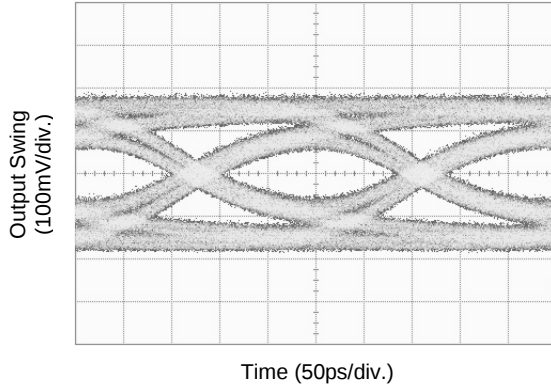
**1m FR4 Output without SY58627L  
(6.4Gbps PRBS  $2^{23}$ )**



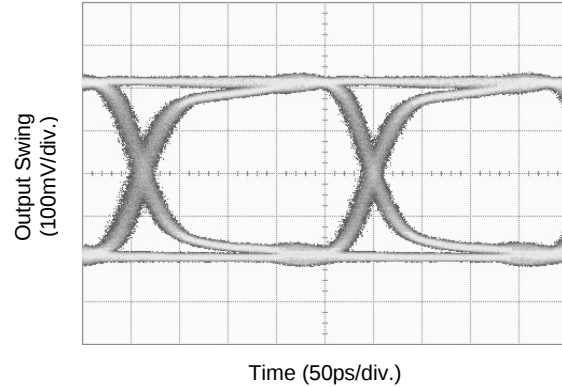
## Typical Operating Characteristics (Continued)

$V_{CC} = 3.3V \pm 10\%$ ;  $V_{IN} > 100mV$ ;  $T_A = 25^\circ C$ ,  $R_L = 100\Omega$  across output pair; unless otherwise stated.

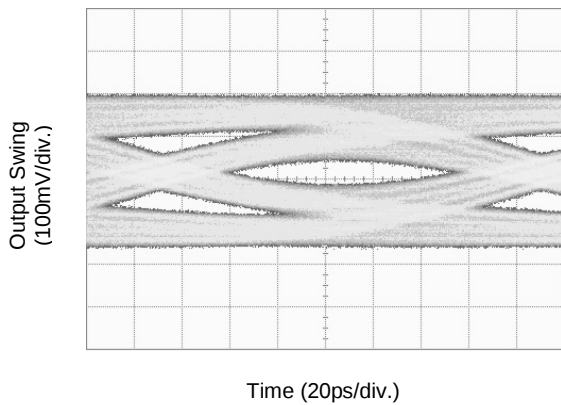
**5m Cable<sup>(1)</sup> Output without SY58627L  
(4.25Gbps PRBS 2<sup>23</sup>)**



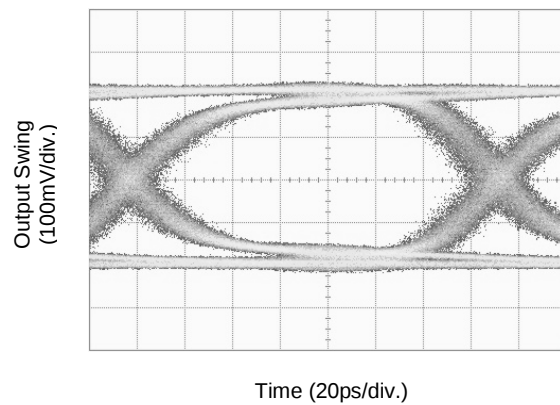
**5m Cable<sup>(1)</sup> Output with SY58627L  
(4.25Gbps PRBS 2<sup>23</sup>)**



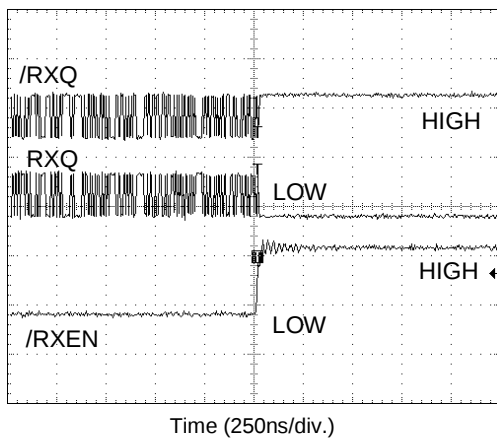
**5m Cable<sup>(1)</sup> Output without SY58627L  
(6.4Gbps PRBS 2<sup>23</sup>)**



**5m Cable<sup>(1)</sup> Output with SY58627L  
(6.4Gbps PRBS 2<sup>23</sup>)**



**Output Disable**



### Note:

1. Measurements made with 26AWG Amphenol Skew Clear Eye Opener Plus cable.

## Single-Ended and Differential Swings

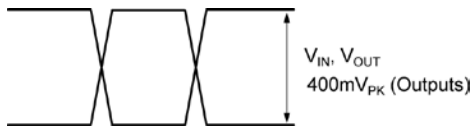


Figure 4a. Single-Ended Voltage Swing

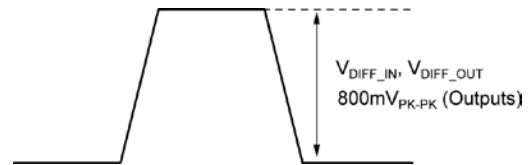


Figure 4b. Differential Voltage Swing

## Input and Output Stages

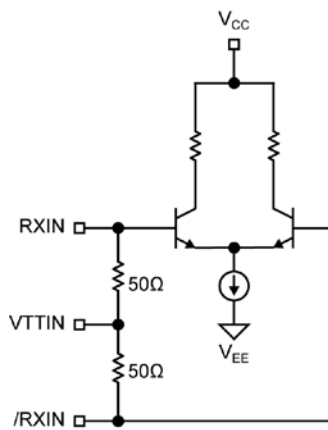


Figure 5a. Simplified RXIN Differential Input Stage

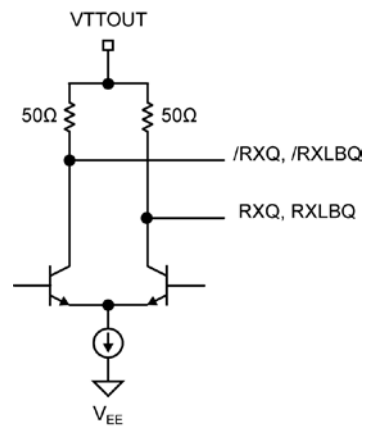


Figure 5b. Simplified RXIN Differential Output Stage

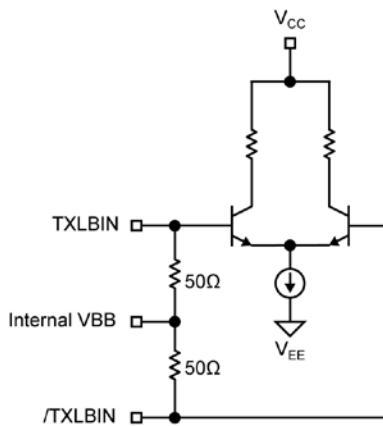


Figure 5c. Simplified RXIN Differential Input Stage

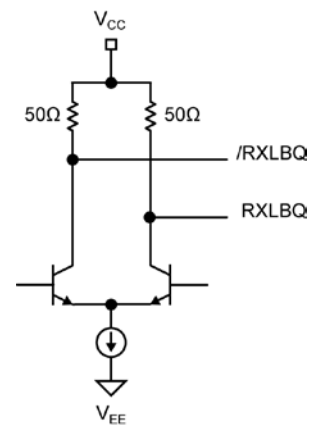
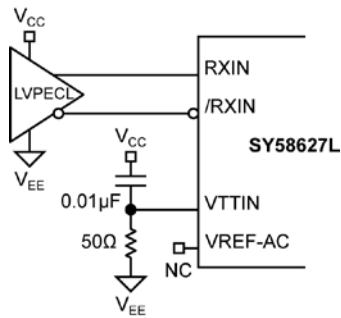
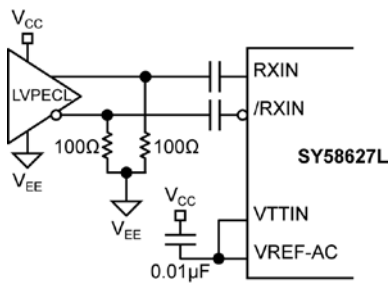


Figure 5d. Simplified RXIN Differential Output Stage

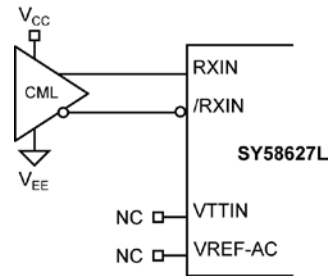
## Input Interface Applications



**Figure 6a. LVPECL Interface (DC-Coupled)**

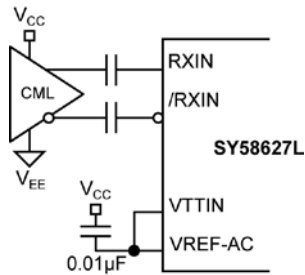


**Figure 6b. LVPECL Interface (AC-Coupled)**

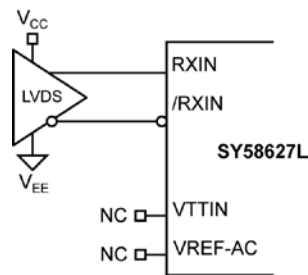


*option: may connect VTTIN to VCC*

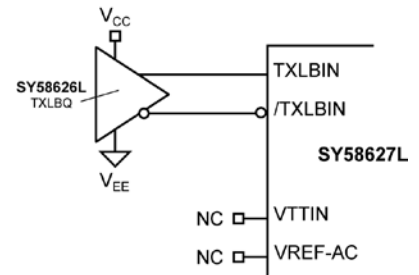
**Figure 6c. CML Interface (DC-Coupled)**



**Figure 6d. CML Interface (AC-Coupled)**



**Figure 6e. LVDS Interface (DC-Coupled)**



**Figure 6f. TXLBIN Interface (AC-Coupled)**

CML Output Interface Applications

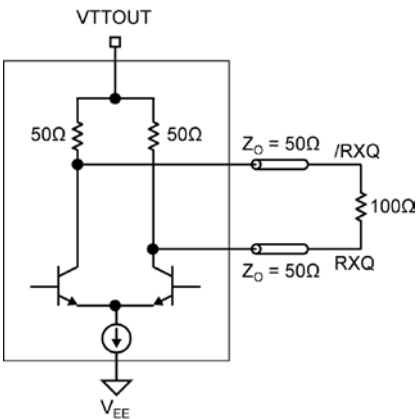


Figure 7a. CML DC-Coupled Termination

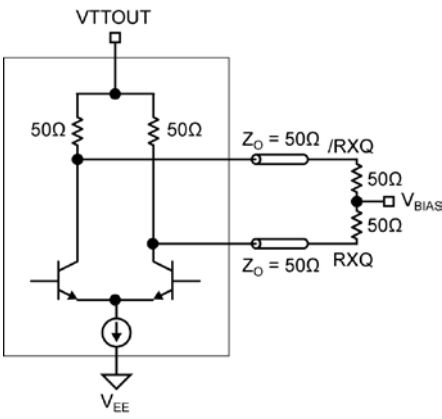


Figure 7b. CML DC-Coupled Termination

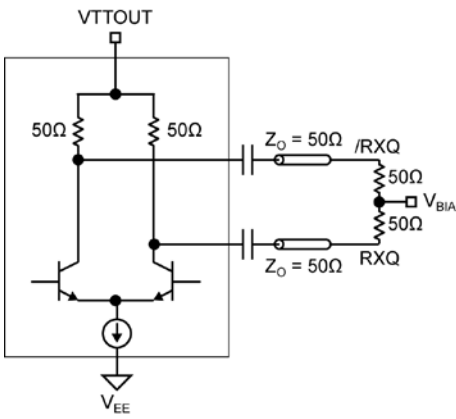


Figure 7c. CML AC-Coupled Termination

RXLBQ Output Interface Applications

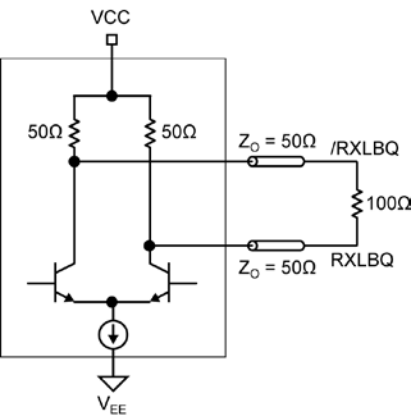


Figure 7a. CML DC-Coupled Termination

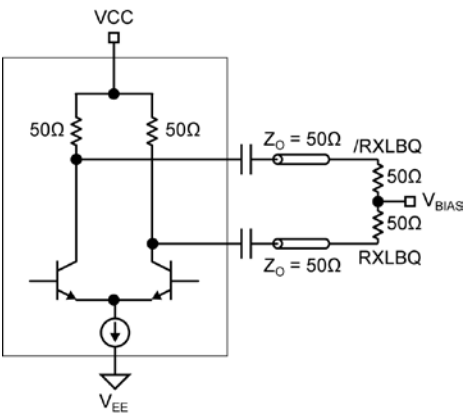


Figure 7b. CML DC-Coupled Termination

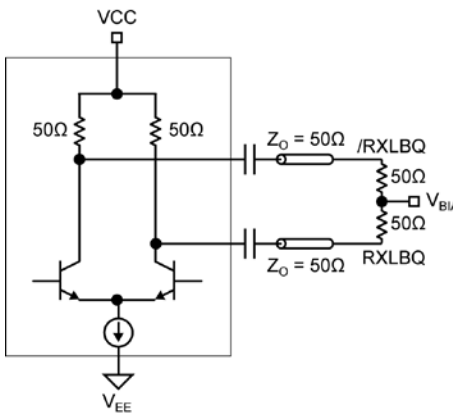
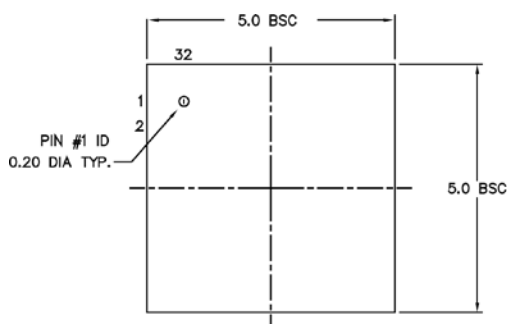


Figure 7c. CML AC-Coupled Termination

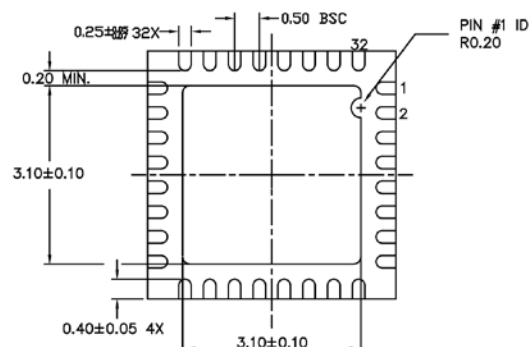
Related Product and Support Information

| Part Number   | Function                                                                                                                                    | Data Sheet Link                                                                                                                |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| SY58626L      | DC-to-6.4Gbps Backplane Transmit Buffer with Selectable Output Pre-emphasis, I/O DC-Offset Control, and 200mV-3V <sub>PP</sub> Output Swing | <a href="http://www.micrel.com/product-info/products/sy58626l.shtml">www.micrel.com/product-info/products/sy58626l.shtml</a>   |
| HBW Solutions | New Products and Applications                                                                                                               | <a href="http://www.micrel.com/product-info/products/solutions.shtml">www.micrel.com/product-info/products/solutions.shtml</a> |

## Package Information



TOP VIEW



BOTTOM VIEW



SIDE VIEW

### NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. MAX. PACKAGE WARPAGE IS 0.05 mm.
3. MAXIMUM ALLOWABLE BURRS IS 0.076 mm IN ALL DIRECTIONS.
4. PIN #1 ID ON TOP WILL BE LASER/INK MARKED.

### 32-Pin QFN

#### Package Notes:

1. Package meets Level 2 Moisture Sensitivity Classification.
2. All parts are dry-packed before shipment.
3. Exposed pad must be soldered to a ground for proper thermal management.

**MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA**  
 TEL +1 (408) 944-0800 FAX +1 (408) 474-1000 WEB <http://www.micrel.com>

The information furnished by Micrel in this data sheet is believed to be accurate and reliable. However, no responsibility is assumed by Micrel for its use. Micrel reserves the right to change circuitry and specifications at any time without notification to the customer.

Micrel Products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in personal injury. Life support devices or systems are devices or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform can be reasonably expected to result in a significant injury to the user. A Purchaser's use or sale of Micrel Products for use in life support appliances, devices or systems is a Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 2006 Micrel, Incorporated.