Application Notes:
PECL and LVDS Outputs
What are PECL and LVPECL?

- PECL stands for “Positive Emitter Coupled Logic”. PECL are differential logic outputs commonly used in high-speed clock distribution circuits. PECL requires a +5 V supply.

- Low Voltage PECL (LVPECL) denotes PECL circuits designed for use with 3.3V or 2.5V supply, the same supply voltage as for low voltage CMOS devices.

- Taitien offers LVPECL output crystal oscillators in both 3.3V and 2.5V supplies.
Pros/Cons of PECL Output

• Advantages:
  – Very good jitter performance due to large voltage swing
  – Ideal use in high-speed circuits
  – Capable of driving long transmission lines

• Drawbacks:
  – Larger power consumption due to differential output and external DC biasing compared to single-ended output
  – Incompatible with 1.8V supply
Each output is terminated with a 50Ω resistor to a termination voltage of (Vdd – 2V).
What is LVDS Output?

- LVDS stands for Low Voltage Differential Signaling, centered around operating voltage of 1.2V, regardless of power supply.

- LVDS technology is defined by the ANSI/TIA/EIA-644 industry standard.

- Taitien has many crystal oscillator product lines with LVDS output options at 3.3V and 2.5V supplies.
Pros/Cons of LVDS Output

• Advantages:
  – Lower power consumption compared to PECL outputs due to smaller voltage swings (typically ~350mV)
  – Less susceptible to noise
  – Lower EMI emissions compared to CMOS/TTL

• Drawbacks:
  – Reduced jitter performance compared to PECL
Where is LVDS used?

The LVDS standard was created to address applications in the data communications, telecommunications, server, peripheral and computer markets where high-speed data transfer is necessary.
A single 100Ω termination resistor is needed. Some receiver ICs may include the resistor internally.
Signal Level Comparison

<table>
<thead>
<tr>
<th>Voltage</th>
<th>TTL</th>
<th>CMOS (5V)</th>
<th>ECL</th>
<th>PECL</th>
<th>LVPECL (3.3V)</th>
<th>LVDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5V</td>
<td>4.10</td>
<td>3.20</td>
<td>2.35</td>
<td>1.60</td>
<td>1.42</td>
<td>1.07</td>
</tr>
<tr>
<td>4V</td>
<td>4.10</td>
<td>3.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3V</td>
<td>3.20</td>
<td>1.60</td>
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<tr>
<td>2V</td>
<td>2.40</td>
<td>1.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1V</td>
<td>0.4</td>
<td>1.07</td>
<td></td>
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</tr>
</tbody>
</table>

VOH_min: 2.4 V
VOH_max: 4.1 V
VOL_min: 0.4 V
VOL_max: 2.4 V

90% VDD: 3.2 V
10% VDD: 1.6 V