Interfacing Between ECL / LVECL / PECL / LVPECL - to - TTL / LVTTL / CMOS / LVCMOS

When going from ECL / LVECL / PECL / LVPECL environment to TTL / CMOS or LVTTL / LVCMOS and vise versa, signal integrity and duty cycle distortion can play an important role in the success of a design. To avoid running into such issues, use of integrated circuit translator chips is highly recommended because the I/O switching levels, propagation delay, and other parameters can be controlled over the full supply voltage and ambient temperature range. Controlling such parameters using discrete logic is extremely difficult since the voltage levels would shift with respect to supply voltage and temperature fluctuation. Semtech's high performance products are available to perform such signal translation from ECL / PECL to TTL / CMOS and vice versa while meeting the crucial design requirements mentioned earlier. These devices operate over an extended supply voltage range covering both 5.0V and 3.3V modes of operation. For ECL / PECL output termination refer to application note AN1003.

TTL / LVTTL / CMOS / LVCMOS to PECL / LVPECL Translators

Device	Function	Package Type	Operating Voltage
SK10/100ELT20W	LVTTL / LVCMOS to LVPECL and TTL / CMOS to PECL Translator	8 PIN SOIC/MSOP	3.0V to 5.5V
SK10/100ELT22W	Dual LVTTL / LVCMOS to LVPECL and TTL / CMOS to PECL Translator	8 PIN SOIC/MSOP	3.0V to 5.5V

PECL / LVPECL to TTL / LVTTL / CMOS / LVCMOS Translators

Device	Function	Package Type	Operating Voltage
SK10/100ELT21W	Differential PECL to CMOS / TTL and LVPECL to LVCMOS / LVTTL Translator	8 PIN SOIC	3.0V to 5.5V
SK100ELT23W	Dual Differential PECL to CMOS / TTL and LVPECL to LVCMOS / LVTTL Translator	8 PIN SOIC	3.0V to 5.5V

TTL / LVTTL / CMOS / LVCMOS to ECL / LVECL Translator

Device	Function	Package Type	Operating Voltage
SK10/100ELT24W	TTL / CMOS to ECL and LVTTL / LVCMOS to LVECL Translator	8 PIN SOIC/MSOP	+3.0V to +5.5V / -5.5V to -3.0V

ECL / LVECL to TTL / LVTTL / CMOS / LVCMOS Translator

Device	Function	Package Type	Operating Voltage
SK10/100ELT25W	Differential ECL to TTL / CMOS and LVECL to LVTTL / LVCMOS Translator	8 PIN SOIC	-5.5V to -3.0V / +.30V to +5.5V

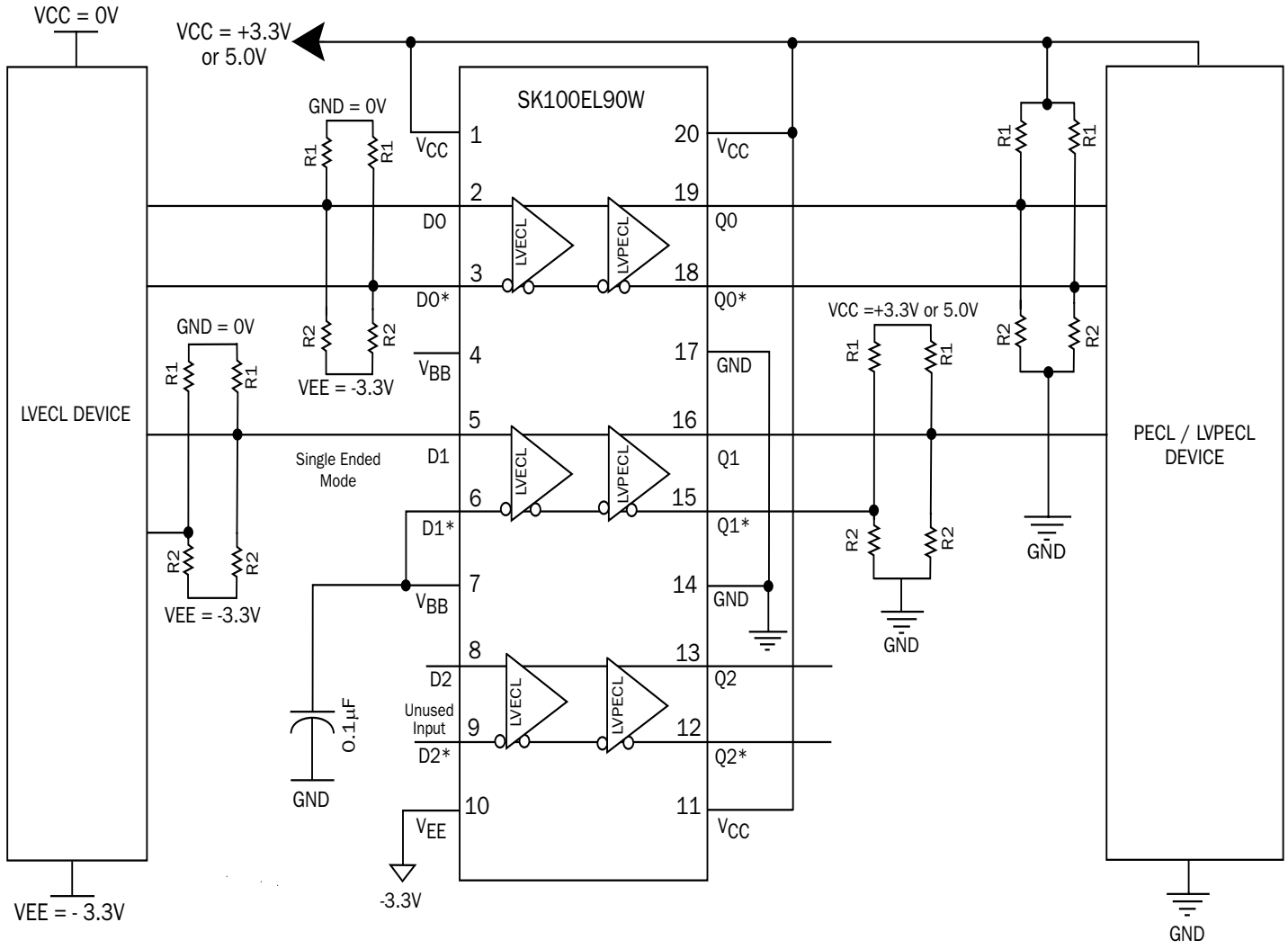
Translating ECL / LVECL to PECL / LVPECL or vice versa, proves to be a more challenging task compared to TTL / CMOS type signals. With ECL type signals being greater than 200 MHz and usually reaching into Giga Hertz range in speed, we have to use extreme care in board layout, noise filtering, signal integrity, proper output termination, and jitter, to name a few, when switching between positive and negative regions. Talking about the issues mentioned above is beyond the scope of this application note and we will concentrate only on providing a solution for ECL to PECL signal level translation and vice versa. Capacitive coupling method is one of the alternative solutions used by designers when interfacing ECL with PECL signals. As we mentioned before, using discrete logic can hinder the system performance; therefore, to avoid such problems use of translator devices is highly recommended. Semtech offer both ECL / LVECL to PECL / LVPECL and PECL / LVPECL to ECL / LVECL translators.

ECL / LVECL / PECL / LVPECL Translators

Device	Function	Package Type	Operating Voltage
SK10/100EL90W	Triple ECL to PECL/LVPECL and LVECL to PECL/LVPECL Translator	20 PIN SOIC	-5.5 to -3.0V / +3.0 to +5.5V
SK10/100EL91W	Triple PECL to ECL/LVECL and LVPECL to ECL/LVECL Translator	20 PIN SOIC	-5.5 to -3.0V / +3.0 to +5.5V

Using the two translators, SK10/100EL90W and SK10/100EL91W, we will show some examples of how these devices are used. Figures 1, 2, 3, and 4 show SK100EL90W and SK100EL91W in different ECL / LVECL / PECL / LVPECL translation schemes. What is important in these figures is that the inputs are used in three different ways and accordingly their corresponding outputs are properly terminated. The three modes are: inputs driven differentially, single-ended, or left open. Please note that only the Thevenin equivalent parallel termination scheme is shown here, for alternate termination schemes refer to application note AN1003. Furthermore, power supply noise filtering scheme is not shown in these examples.

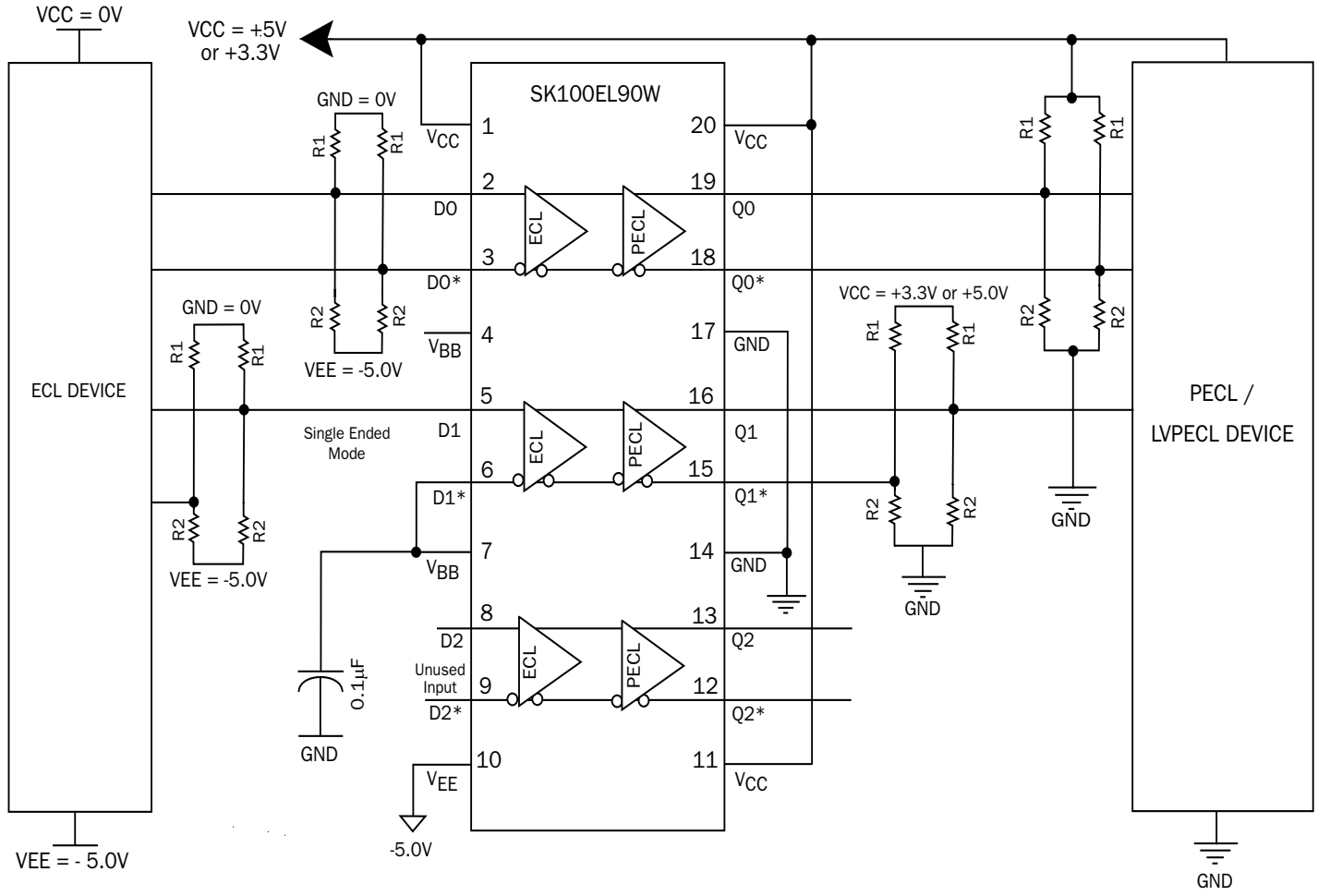
SK100EL90W in LVECL - to - PECL or LVPECL Mode Configuration



Assuming the impedance of transmission line is 50Ω the values of the termination resistors are:

Supply Voltage +3.3V or -3.3V		Supply Voltage +5.0V or -5.0V	
R1 (Ω)	R2 (Ω)	R1 (Ω)	R2 (Ω)
127	83	83	125

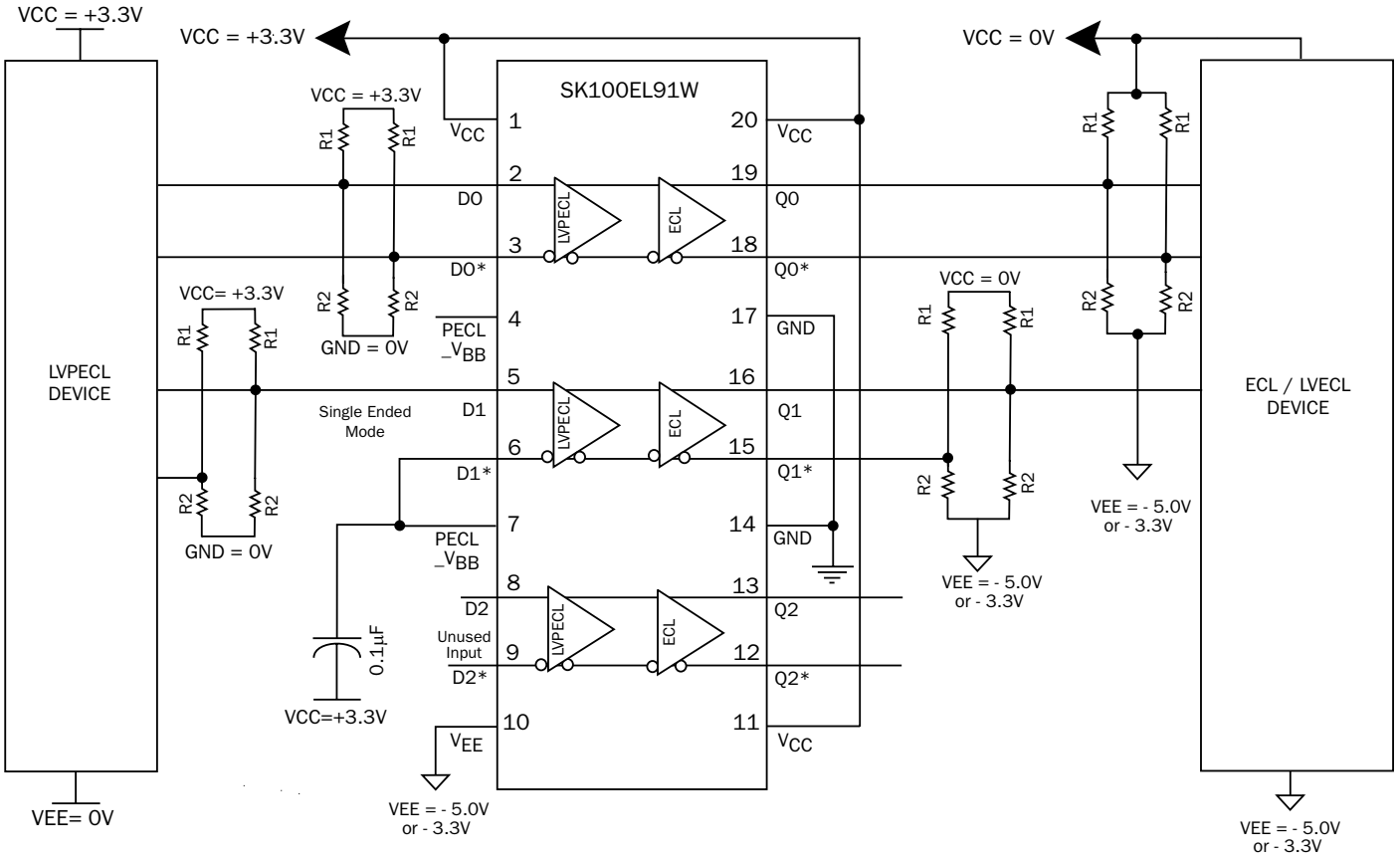
SK100EL90W in ECL-to-PECL or LVPECL Mode Configuration



Assuming the impedance of transmission line is 50Ω the values of the termination resistors are:

Supply Voltage +3.3V or -3.3V		Supply Voltage +5.0V or -5.0V	
R1 (Ω)	R2 (Ω)	R1 (Ω)	R2 (Ω)
127	83	83	125

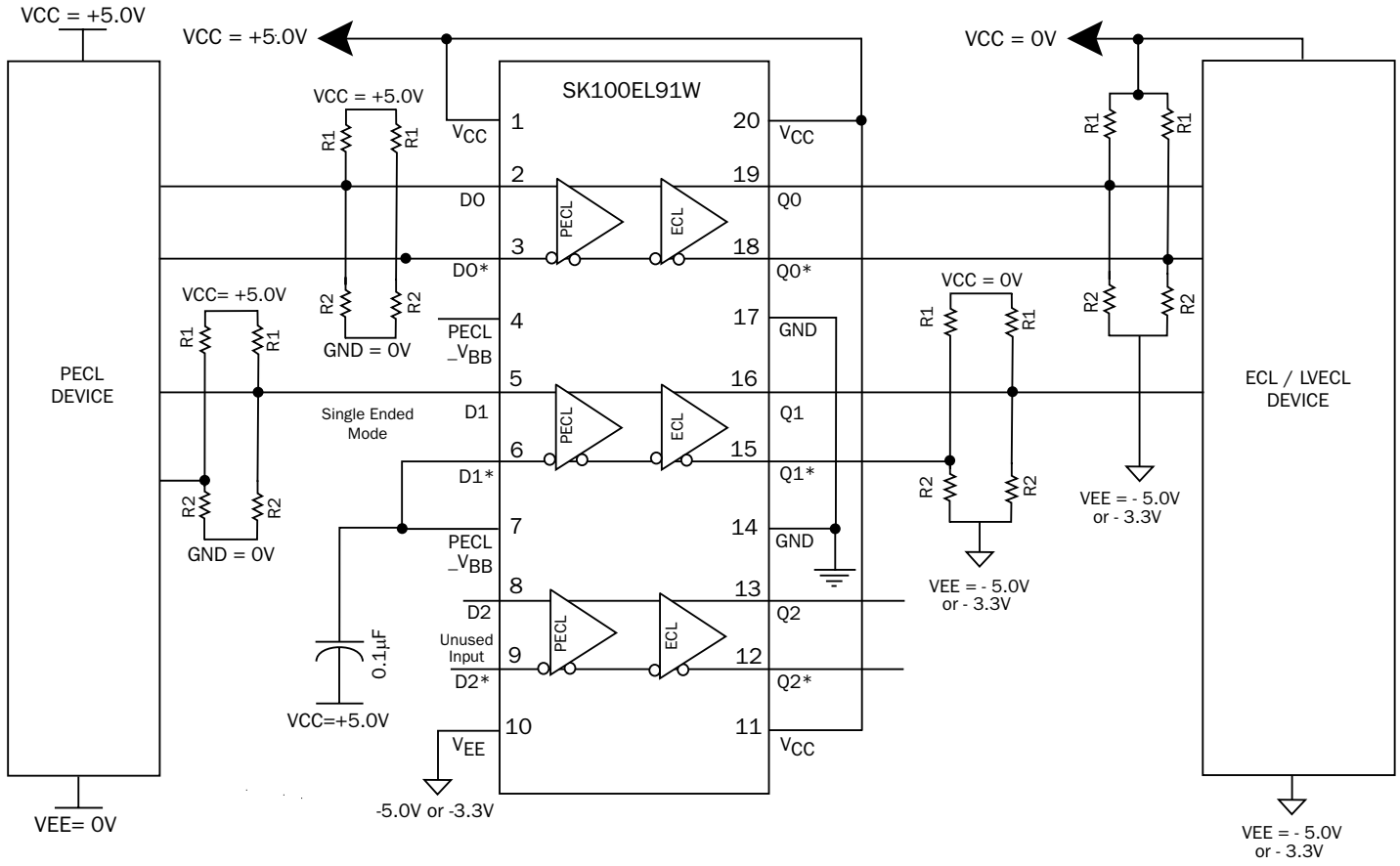
SK100EL91W in LVPECL - to - ECL or LVECL Mode Configuration



Assuming the impedance of transmission line is 50Ω the values of the termination resistors are:

Supply Voltage +3.3V or -3.3V		Supply Voltage +5.0V or -5.0V	
R1 (Ω)	R2 (Ω)	R1 (Ω)	R2 (Ω)
127	83	83	125

SK100EL91W in PECL - to - ECL or LVECL Mode Configuration



Assuming the impedance of transmission line is 50Ω the values of the termination resistors are:

Supply Voltage +3.3V or -3.3V		Supply Voltage +5.0V or -5.0V	
R1 (Ω)	R2 (Ω)	R1 (Ω)	R2 (Ω)
127	83	83	125

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