

HIGH-PERFORMANCE PRODUCTS

Description

The SK10/100EL16XWA-XWG devices are high gain differential receivers with higher performance capabilities. These devices have a DC gain of approximately 200. SK10/100EL16XWA-XWG devices are functionally compatible with SK10/100EL16W and MC10/100EL16 and MC10/100LVEL16 as well.

SK10/100EL16XWA is pin to pin compatible with SK10/100EL16W with the exception of its high gain differential outputs.

SK10/100EL16XWB is pin to pin compatible with SK10/100EL16B with the exception of its differential high gain outputs.

SK10/100EL16XWC is for single ended mode of operation since its D* input is internally connected to the reference voltage VBB; therefore, pin 3 should be bypassed to VCC via 0.01 uF capacitor. This device has differential high gain outputs, an added feature of the enable input pin, and the single ended monitor output Q* similar to SK10/100EL16XWB.

SK10/100EL16XWD has all the options: the differential monitor outputs and the high gain outputs, enable-input pin, and the VBB reference voltage.

SK10/100EL16XWE has only the differential monitor outputs and the high gain outputs.

SK10/100EL16XWF had the enable option, the single ended monitor output and the differential high gain outputs.

SK10/100EL16XWG is pin to pin compatible with SK10/100EL16V with the exception of its differential high gain outputs. Its VCTRL input controls the amplitude of the QHG and QHG* outputs. The operating range of the EL16XWG control input, VCTRL, is from VBB (large swing) to VCC (min swing), see Figure 3. Simple control of

the output swing can be obtained by a variable resistor between the VBB and VCC pins, with wiper driving CTRL. Typical application circuits and results are described in Figures 3, 4a, and 4b. If provided, VBB reference voltage is an output pin for single-ended use or DC bias for AC coupling to the device. Whenever used, VBB output pin should be bypassed to VCC via a 0.01 uF capacitor.

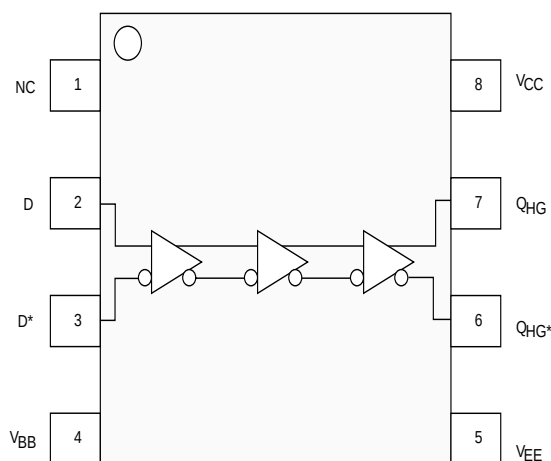
Under open input conditions, the pull-down resistor on D, pull-down and pull-up on D* will force the high gain outputs QHG to a low state and QHG* to a high state.

Features

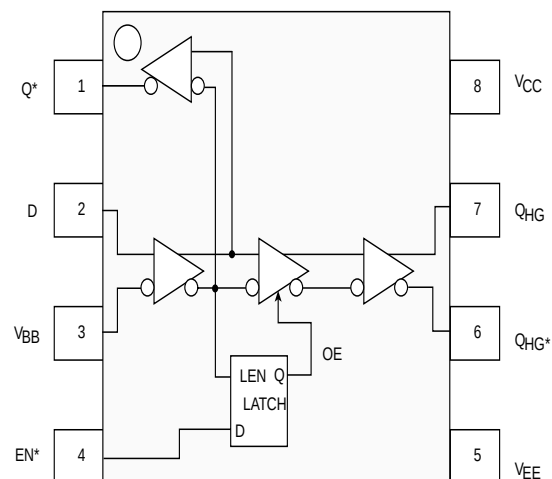
- Extended Supply Voltage Range: (VEE = -5.5V to -3.0V, VCC = 0V) or (VCC = +3.0V to +5.5V, VEE = 0V)
- High Bandwidth Output Transitions
- 300 ps Propagation Delay
- VBB Output
- Internal Input Resistors: Pulldown on D, Pulldown and Pullup on D*
- QHG Output will Default Low with Inputs Open or at VEE
- New Differential Input Common Mode Range
- Functionally Equivalent to MC10/100EL16 and MC100LVEL16
- ESD Protection of >4000V
- Specified Over Industrial Temperature Range: -40°C to 85°C
- Available in Both 8 Pin SOIC Package, and 8 / 10 Pin MSOP Packages
- Flammability Rate: UL-94 code V-0.
- Moisture Sensitivity: Level 1.

Pin Names

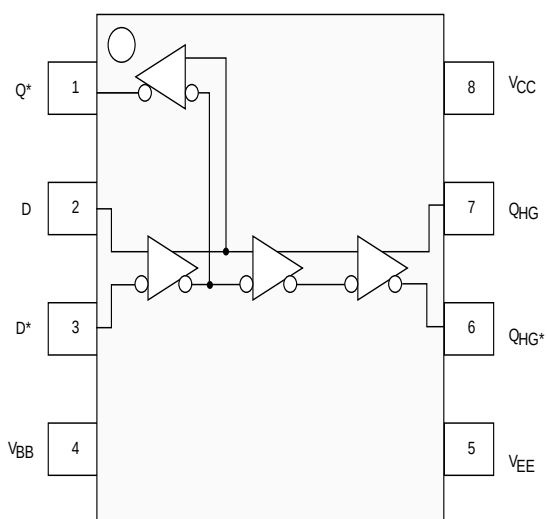
Pin	Function
D, D*	Differential Data Inputs
Q, Q*	Differential Data Outputs
QHG, QHG*	Differential High Gain Data Outputs
VBB	Reference Output Voltage
EN*	Enable Input



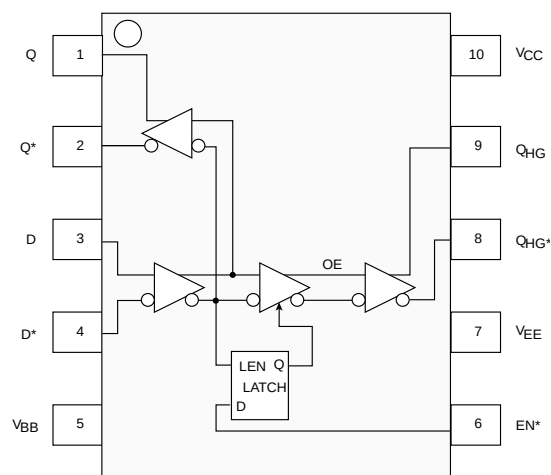
SK10/100EL16XWA
(Available in 8-Pin SOIC & MSOP Packages)



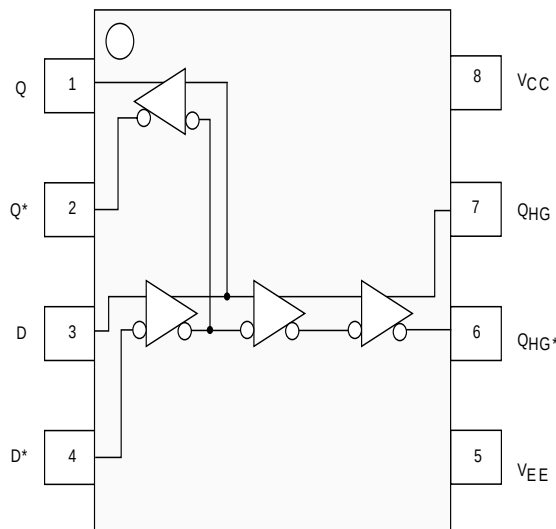
SK10/100EL16XWC
(Available in 8-Pin SOIC & MSOP Packages)



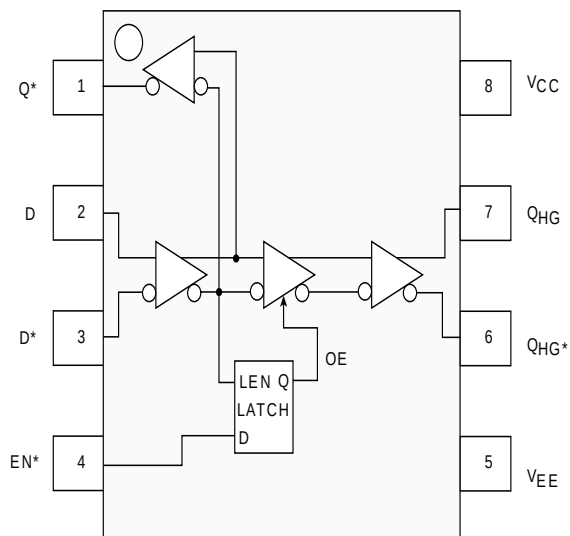
SK10/100EL16XWB
(Available in 8-Pin SOIC & MSOP Packages)



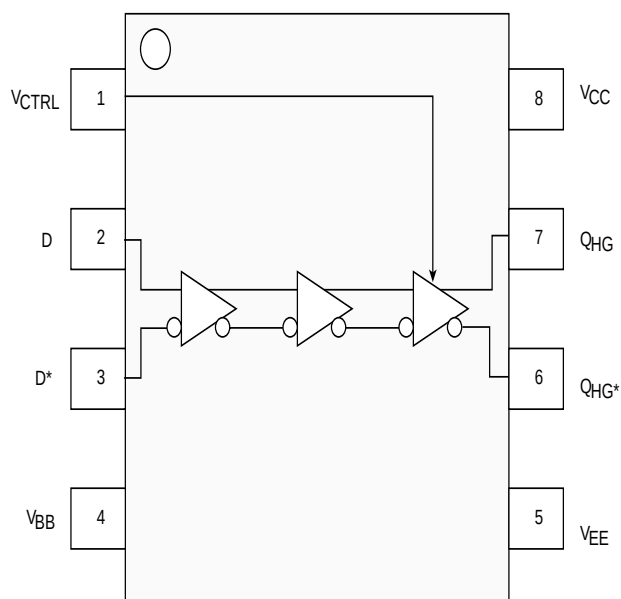
SK10/100EL16XWD
(Available in 10-Pin MSOP Package)



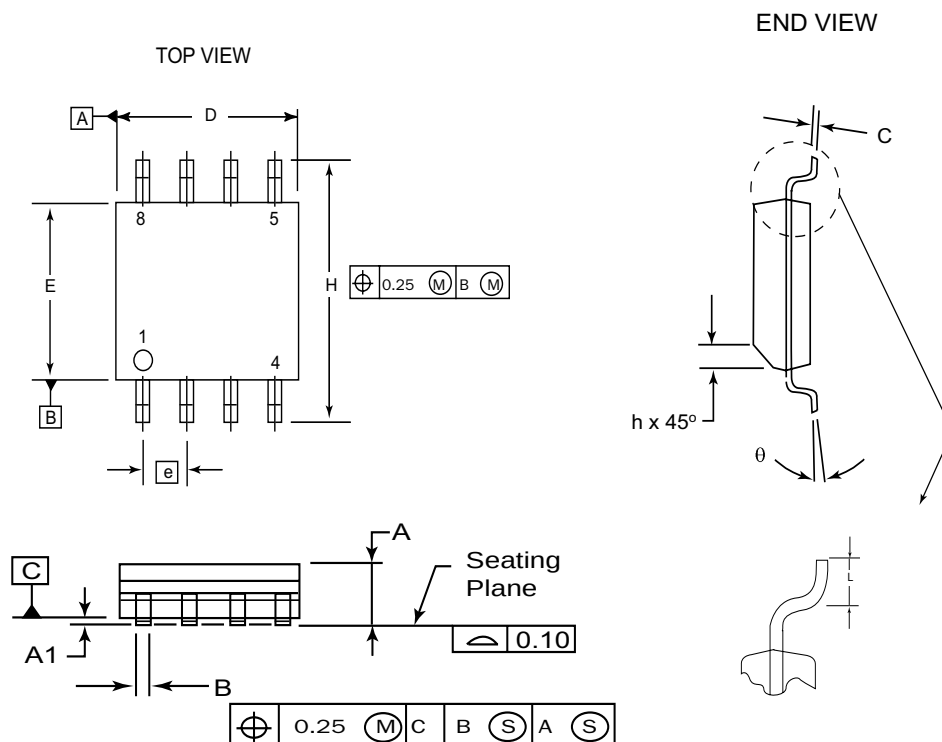
SK10/100EL16XWE
(Available in 8-Pin SOIC & MSOP Packages)



SK10/100EL16XWF
(Available in 8-Pin SOIC & MSOP Packages)



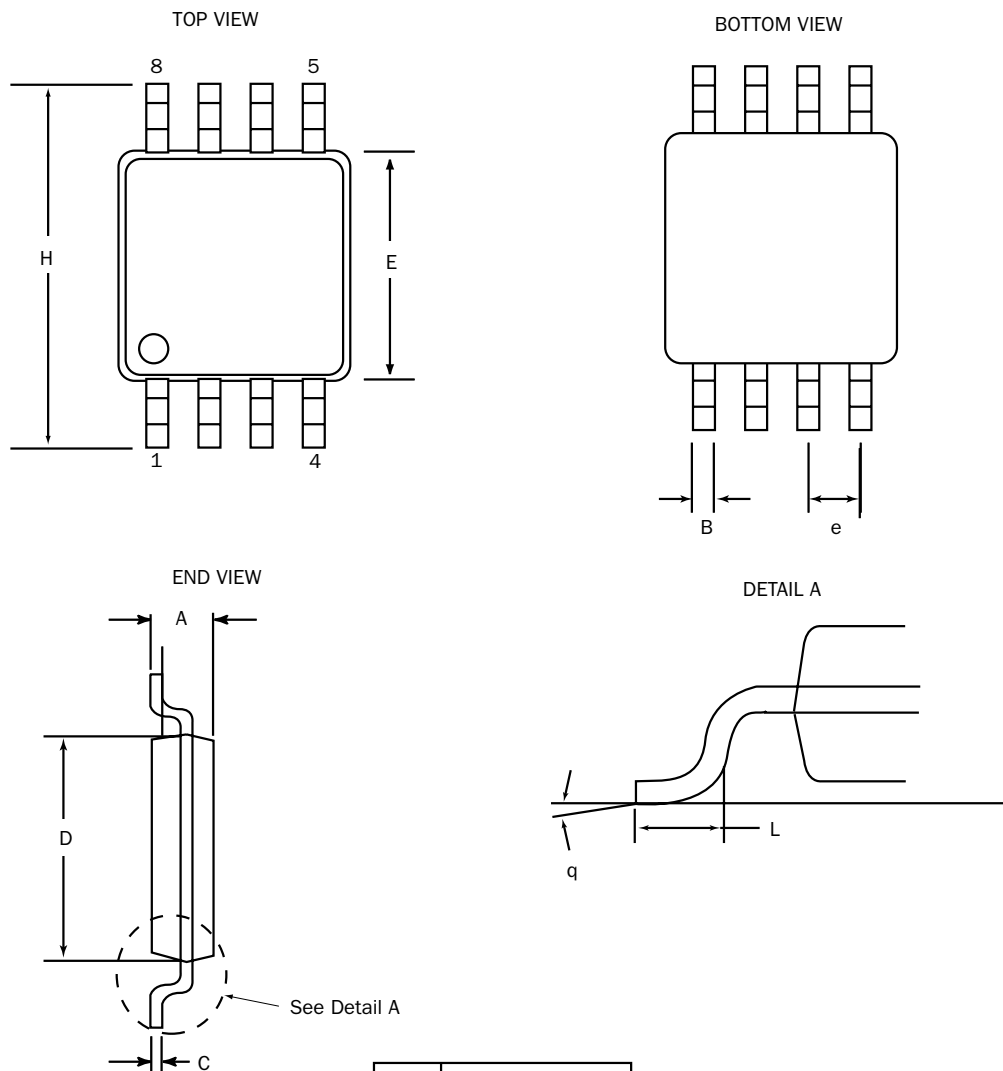
SK10/100EL16XWG
(Available in 8-Pin SOIC & MSOP Packages)

8 Pin SOIC Package


DIM	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.33	0.51
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.27
θ	0°	8°

NOTES:

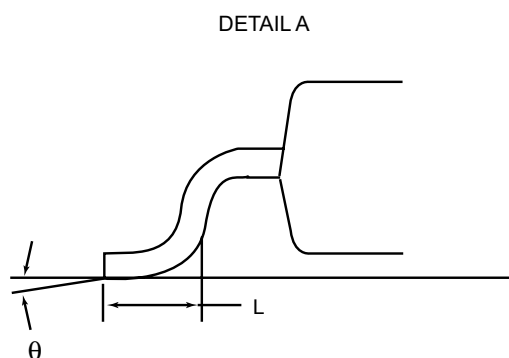
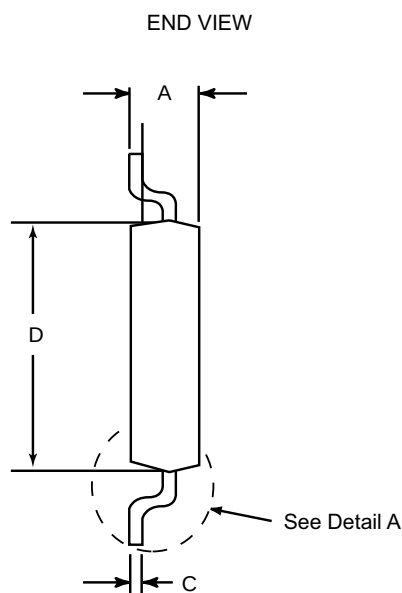
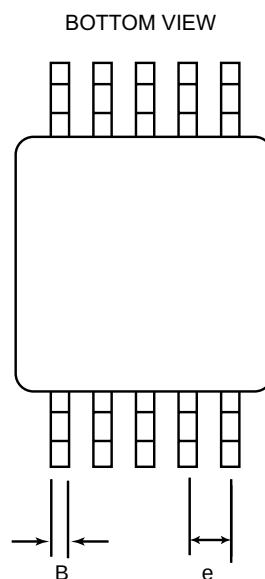
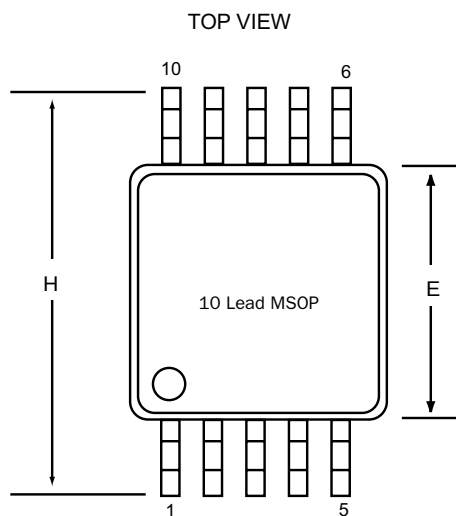
1. Dimensions are in millimeters.
2. Dimensions D and E do not include mold protrusion.
3. Maximum mold protrusion 0.15 per side.
4. Dimension B does not include Dambar protrusion. Allowable Dambar protrusion shall be 0.127 total in excess of the B dimension at maximum material condition.

8 Pin MSOP Package


DIM	MILLIMETERS	
	MIN	MAX
A	0.94	1.1
B	0.25	0.40
C	0.13	0.23
D	2.90	3.10
E	2.90	3.10
e	0.65	BSC
H	4.75	5.1
L	0.4	0.7
θ	0°	6°

NOTES:

1. Dimensions are in mm
2. Controlling dimension: mm
3. Dimension does not include mold flash or protrusions, either of which shall not exceed 0.20

10 Pin MSOP Packaging


DIM	MILLIMETERS	
	MIN	MAX
A	0.94	1.1
B	0.15	0.3
C	0.13	0.23
D	2.9	3.1
E	2.9	3.1
e	0.5	BSC
H	4.75	5.1
L	0.40	0.7
θ	0°	6°

NOTES:

1. Dimensions are in mm
2. Controlling dimensions: mm
3. Dimension does not include mold flash or protrusions, either of which shall not exceed 0.20

HIGH-PERFORMANCE PRODUCTS
DC Characteristics
SK10EL16XWA-WXG DC Electrical Characteristics (Note 1)
 $(V_{EE} = -3.0V \text{ to } -5.5V; V_{CC} = 0V; V_{OUT} \text{ loaded } 50\Omega \text{ to } V_{CC} - 2.0V)$

Symbol	Characteristic	TA = - 40°C		TA= 0°C		TA = + 25°C		TA= + 85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
V _{OH}	Output HIGH Voltage ⁹	- 1080	- 890	- 1020	- 840	-980	- 810	- 910	- 720	mV
V _{OL}	Output LOW Voltage ⁹	- 1950	- 1650	- 1950	- 1630	- 1950	- 1630	- 1950	- 1595	mV
V _{IH}	Input HIGH Voltage	- 1230	- 890	- 1170	- 840	- 1130	- 810	- 1060	- 720	mV
V _{IL}	Input LOW Voltage	- 1950	- 1500	- 1950	- 1480	- 1950	- 1480	- 1950	- 1445	mV
V _{BB}	Reference Output Voltage	-1430	-1300	-1380	-1270	-1350	-1250	-1310	-1190	mV

SK100EL16XWA-XWG DC Electrical Characteristics (Note 2)
 $(V_{EE} = -3.0V \text{ to } -5.5V; V_{CC} = 0V; V_{OUT} \text{ loaded } 50\Omega \text{ to } V_{CC} - 2.0V)$

Symbol	Characteristic	TA = -40°C		TA = 0°C to +85°C		Unit	Condition
		Min	Max	Min	Max		
V _{OH} V _{OL}	Output HIGH Voltage ⁹ Output LOW Voltage ⁹	- 1085 - 1950	- 880 - 1555	- 1025 - 1950	- 880 - 1620	mV mV	V _{IN} = V _{IHmax} or V _{ILmin}
V _{IH}	Input HIGH Voltage	- 1165	- 880	- 1165	- 880	mV	Guaranteed HIGH signal for all inputs
V _{IL}	Input LOW Voltage	- 1810	- 1475	- 1810	- 1475	mV	Guaranteed LOW signal for all inputs
V _{BB}	Reference Output Voltage	-1430	-1260	-1430	-1260	mV	

SK10/100EL16XWA-XWG DC Electrical Characteristics (Notes 1, 2)
 $(V_{CC} - V_{EE} = 3.0V \text{ to } 5.5V; V_{OUT} \text{ loaded } 50\Omega \text{ to } V_{CC} - 2.0V)$

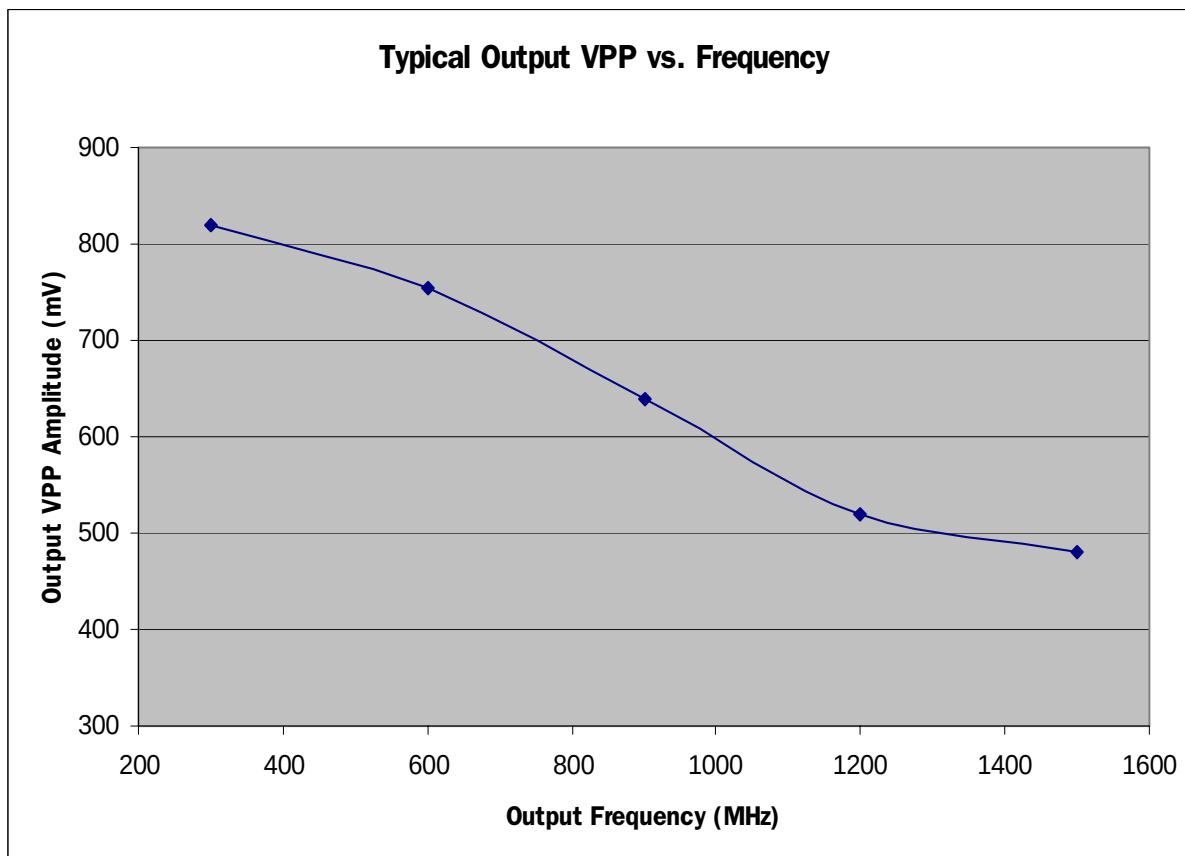
Symbol	Characteristic	TA = -40°C		TA = 0°C		TA = + 25°C		TA = +85°C		Unit
		Min	Max	Min	Max	Min	Max	Min	Max	
I _{EE}	Power Supply Current 10EL 100EL		40 47		40 47		40 47		40 47	mA mA
I _{IN}	Input Current (Diff) (SE)	-150	150 150	-150	150 150	-150	150 150	-150	150 150	μA μA

HIGH-PERFORMANCE PRODUCTS
AC Characteristics
SK10/100EL16XWA-XWG AC Electrical Characteristics
 $(V_{CC} - V_{EE} = 3.0V \text{ to } 5.5V; V_{OUT} \text{ loaded } 50\Omega \text{ to } V_{CC} - 2.0V)$

		TA = -40°C			TA = 0°C			TA = + 25°C			TA = +85°C			
Symbol	Characteristic	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
f _{max}	Max. Toggle Frequency ⁴ NRZ Data CLK	2.5 1.25			2.5 1.25			2.5 1.25			2.5 1.25			Gbps GHz
t _{PLH} t _{PHL}	Input to Output Delay Q, Q* Output (DIFF)	285		365	300		370	305		375	310		405	ps
t _{PLH} t _{PHL}	Input to Output Delay Q _{HG} , Q _{HG} * Output (DIFF)	280		335	290		345	295		355	310		370	ps
t _S	Setup Time, EN*		150			150			150			150		ps
t _H	Hold Time, EN*		150			150			150			150		ps
t _{SK}	Duty Cycle Skew ³ (DIFF)		5			5	20		5	20		5	20	ps
t _r , t _f	Output Rise/Fall Times Q, Q* (20% to 80%) Q _{HG} , Q _{HG} * (20% - 80%)	170 120		285 190	175 130		290 190	180 130		295 195	190 130		310 205	ps ps
V _{CMR}	Common Mode Range ⁶	V _{EE} + 1.7		V _{CC}	V _{EE} + 1.7		V _{CC}	V _{EE} + 1.7		V _{CC}	V _{EE} + 1.7		V _{CC}	V
V _{PP}	Differential Input Swing ⁵	150	1000	150	1000	150	1000	150	1000	150	1000	150	1000	mV
V _{OP-P}	Output Voltage ^{7, 8}			200			200			200			200	mV

Notes:

- 10K circuits are designed to meet the DC specification shown in the table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board, and transverse airflow greater than 500 lfpm is maintained.
- 100K circuits are designed to meet the DC specification shown in the table where transverse airflow greater than 500 lfpm is maintained.
- Duty cycle skew is the difference between T_{PLH} and T_{PHL} propagation delay through a device.
- F_{MAX} guaranteed for functionality only. (See Figure 1 for typical output swing.)
- Minimum input swing for which AC parameters are guaranteed. The device has a DC gain of $\cong 40$ to Q/Q* outputs and a DC gain of $\cong 200$ or higher to Q_{HG}/Q_{HG}* outputs.
- CMR range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the high level falls within the specified range and the peak-to-peak voltage lies between V_{PP(min)} and 1V. The lower end of the CMR range varies 1:1 with V_{EE} and is equal to V_{EE} + 1.7V.
- V_{OP-P} is obtained as follows: Voltages of Q and Q* outputs with respect to V_{CC} are measured. The absolute difference between a high and a low state is equal to V_{OP-P}.
- The output voltage applies to EL16XWG only. V_{CTRL} = V_{CC}.
- The VO_H and VO_L limits apply to EL16XWA-XWG and when the V_{CTRL} input of EL16XWG is left open. Otherwise refer to figure 3 for EL16XWG.
- For part ordering description, see HPP Part Ordering Information Data Sheet.



Input Conditions: 20mV
Output VPP: 700 mV @ 700 MHz
550 mV @ 1.25 GHz - 2.5 Gbps NRZ Data

Figure 1. Typical Output VPP vs. Frequency

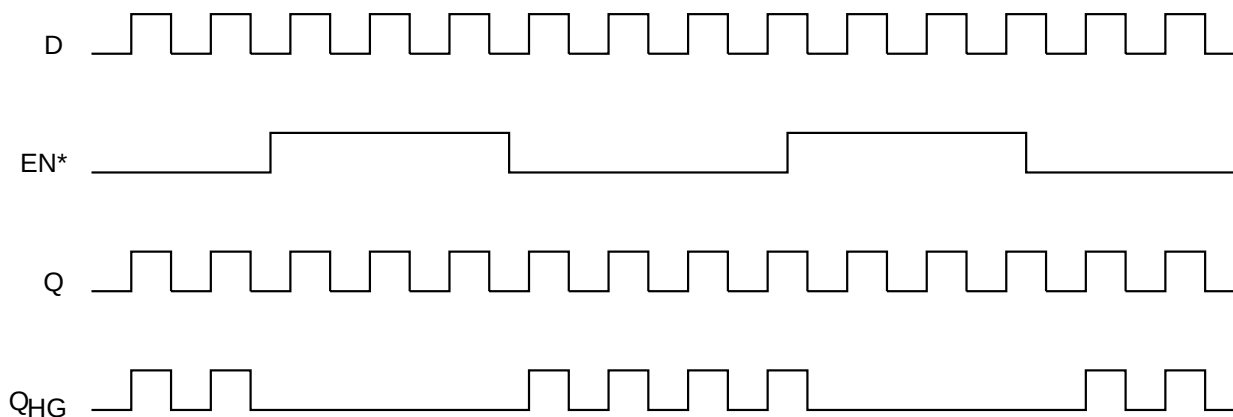


Figure 2. Timing Diagram

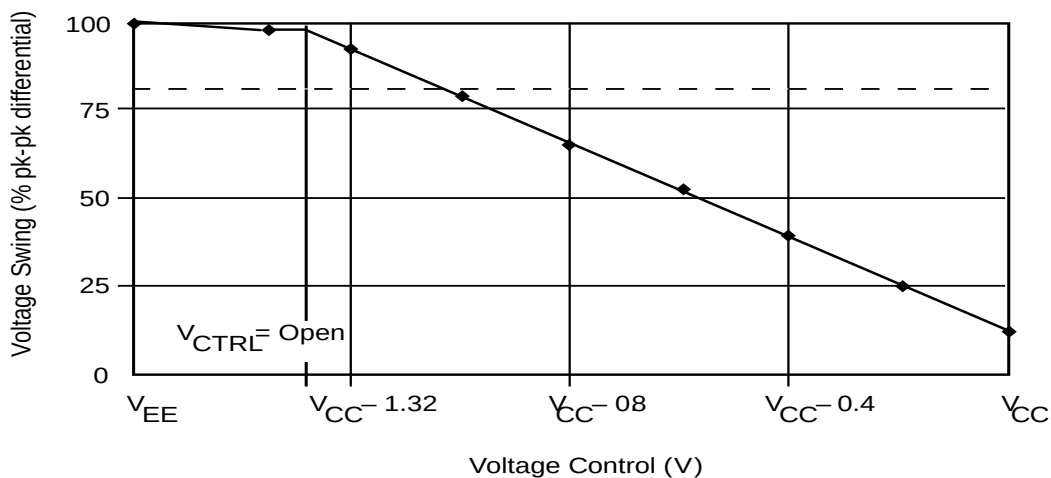


Figure 3. Typical Voltage Output Swing at 25°C

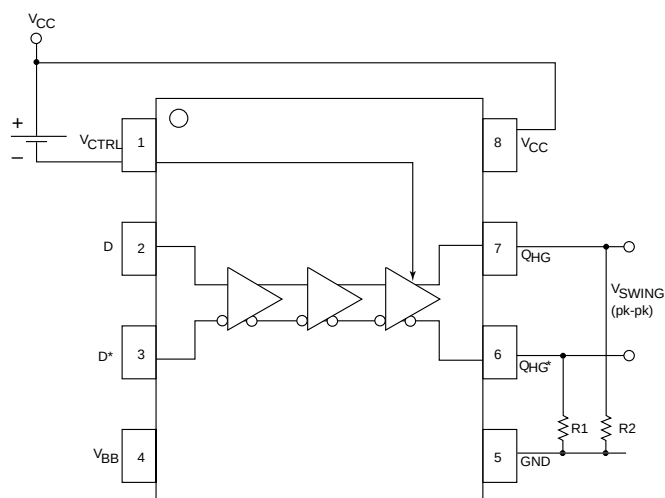


Figure 4A

**Note: $R1 = R2 = 150\Omega$ for $V_{CC} = 3.3V$
 $R1 = R2 = 330\Omega$ for $V_{CC} = 5.0V$**

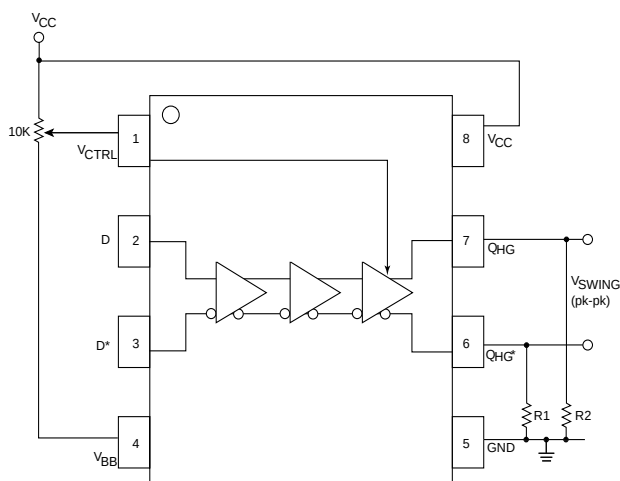


Figure 4B

**Note: $R1 = R2 = 150\Omega$ for $V_{CC} = 3.3V$
 $R1 = R2 = 330\Omega$ for $V_{CC} = 5.0V$**

Implementation of Voltage Source

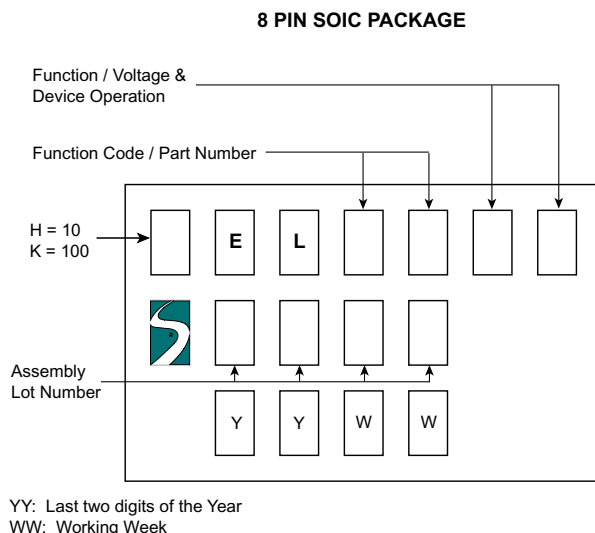
Ordering Code	Package ID	Temperature Range
SK10EL16XWAD	8-SOIC	Industrial
SK10EL16XWBD	8-SOIC	Industrial
SK10EL16XWCD	8-SOIC	Industrial
SK10EL16XWED	8-SOIC	Industrial
SK10EL16XWFD	8-SOIC	Industrial
SK10EL16XWGD	8-SOIC	Industrial
SK10EL16XWADT	8-SOIC	Industrial
SK10EL16XWBDT	8-SOIC	Industrial
SK10EL16XWCDT	8-SOIC	Industrial
SK10EL16XWEDT	8-SOIC	Industrial
SK10EL16XWFDT	8-SOIC	Industrial
SK10EL16XWGDT	8-SOIC	Industrial
SK10EL16XWAMS	8-MSOP	Industrial
SK10EL16XWBMS	8-MSOP	Industrial
SK10EL16XWCMS	8-MSOP	Industrial
SK10EL16XWDMS	10-MSOP	Industrial
SK10EL16XWEMS	8-MSOP	Industrial
SK10EL16XWFMS	8-MSOP	Industrial
SK10EL16XWGMS	8-MSOP	Industrial
SK10EL16XWAMST	8-MSOP	Industrial
SK10EL16XWBMST	8-MSOP	Industrial
SK10EL16XWCMST	8-MSOP	Industrial
SK10EL16XWDMST	10-MSOP	Industrial
SK10EL16XWEMST	8-MSOP	Industrial
SK10EL16XWFMST	8-MSOP	Industrial
SK10EL16XWGMST	8-MSOP	Industrial

HIGH-PERFORMANCE PRODUCTS
Ordering Information (continued)

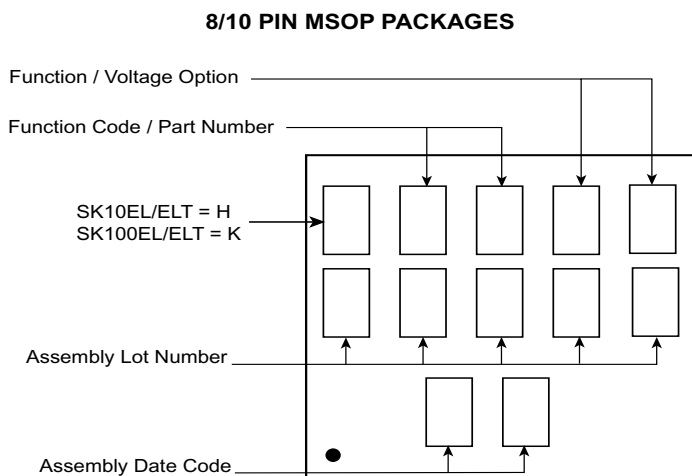
Ordering Code	Package ID	Temperature Range
SK100EL16XWAD	8-SOIC	Industrial
SK100EL16XWBD	8-SOIC	Industrial
SK100EL16XWCD	8-SOIC	Industrial
SK100EL16XWED	8-SOIC	Industrial
SK100EL16XWFD	8-SOIC	Industrial
SK100EL16XWGD	8-SOIC	Industrial
SK100EL16XWADT	8-SOIC	Industrial
SK100EL16XWBDT	8-SOIC	Industrial
SK100EL16XWCDT	8-SOIC	Industrial
SK100EL16XWEDT	8-SOIC	Industrial
SK100EL16XWFDT	8-SOIC	Industrial
SK100EL16XWGDT	8-SOIC	Industrial
SK100EL16XWAMS	8-MSOP	Industrial
SK100EL16XWBMS	8-MSOP	Industrial
SK100EL16XWCMS	8-MSOP	Industrial
SK100EL16XWDMS	10-MSOP	Industrial
SK100EL16XWEMS	8-MSOP	Industrial
SK100EL16XWFMS	8-MSOP	Industrial
SK100EL16XWGMS	8-MSOP	Industrial
SK100EL16XWAMST	8-MSOP	Industrial
SK100EL16XWBMST	8-MSOP	Industrial
SK100EL16XWCMST	8-MSOP	Industrial
SK100EL16XWDMST	10-MSOP	Industrial
SK100EL16XWEMST	8-MSOP	Industrial
SK100EL16XWFMST	8-MSOP	Industrial
SK100EL16XWGMST	8-MSOP	Industrial
SK10EL16XWU	Die	Options A - G
SK100EL16XWU	Die	Options A - G

HIGH-PERFORMANCE PRODUCTS

Marking Information



Marking Example for MSOP Package



Because there are too many characters in the ordering code, and the fact that the MSOP Package can only accommodate five characters per row, the example below depicts the naming convention adopted for these parts only:

- 1: H16XA —>SK10EL16XWAMS
- 2: K16XA —>SK100EL16XWAMS

Contact Information

Division Headquarters
10021 Willow Creek Road
San Diego, CA 92131
Phone: (858) 695-1808
FAX: (858) 695-2633

Semtech Corporation
High-Performance Products Division

Marketing Group
1111 Comstock Street
Santa Clara, CA 95054
Phone: (408) 566-8776
FAX: (408) 727-8994