

### HIGH PERFORMANCE PRODUCTS

#### Description

The SK10/100EL16V is a differential receiver with variable output swing. Its VCTRL input controls the amplitude of the Q and Q\* outputs. The operating range of the EL16V control input, VCTRL, is from VBB (large swing) to VCC (min swing), see Figure 2. 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 1a, 1b, and 2.

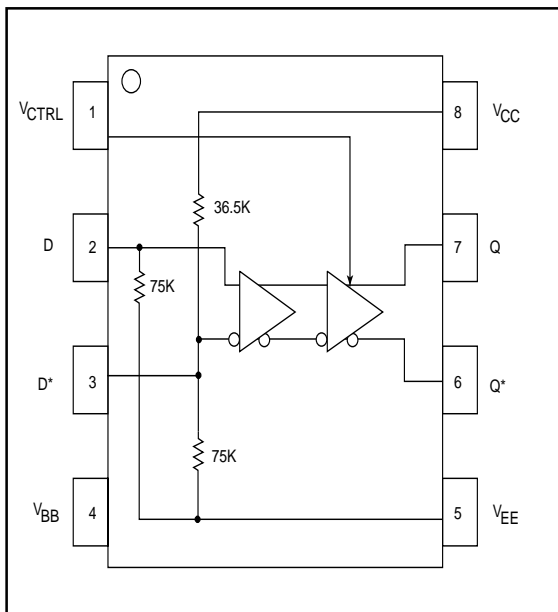
The SK10/100EL16V provides a VBB output for either single-ended use or as a DC bias for AC coupling to the device. The VBB pin should be used only as a bias for the EL16V as its current sink/source capability is limited. Whenever used, the VBB pin should be bypassed to VCC via a 0.01  $\mu$ F capacitor.

Under open input conditions, the pulldown resistor on D, pulldown and pullup resistors on D\* will force the Q output LOW and Q\* output HIGH. The VCTRL pin should be bypassed to VCC via a 0.01  $\mu$ F capacitor when the pin is used.

#### Features

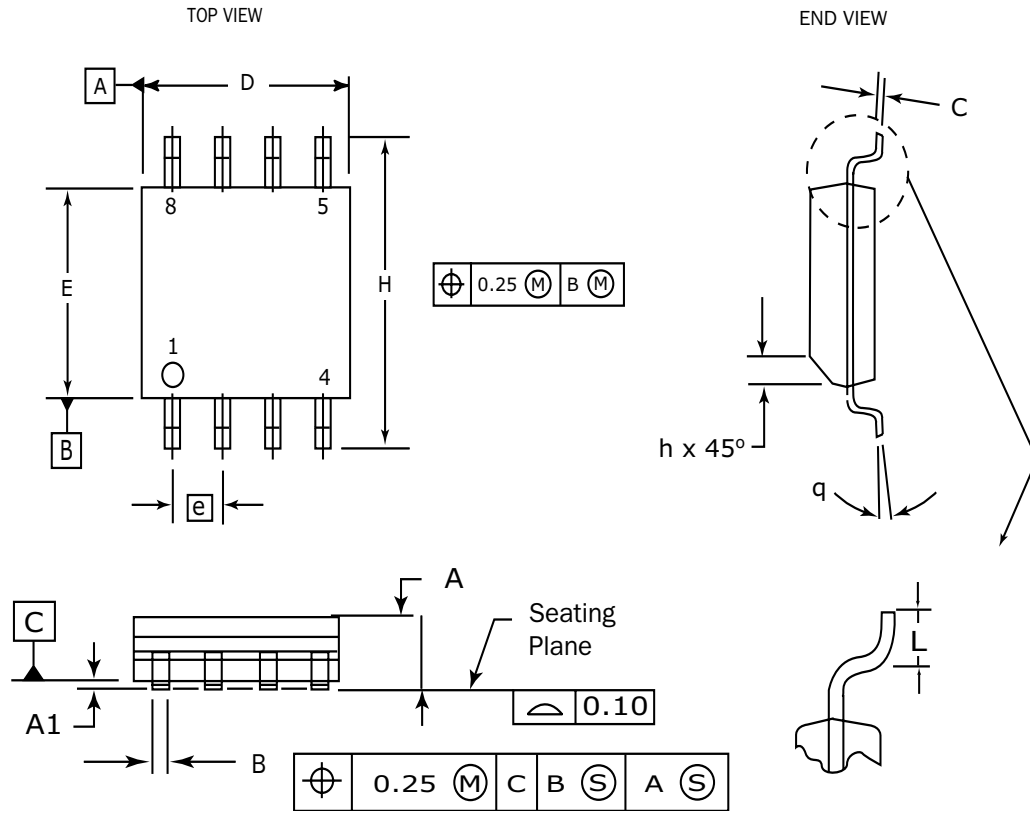
- Extended Supply Voltage Range: (VEE = -5.5V to -3.0V, VCC = 0V) or (VCC = +3.0V to +5.5V, VEE = 0V)
- High Bandwidth Output Transitions
- 240 ps typical Propagation Delay
- VBB Output
- Internal Input Resistors: Pulldown on D, Pulldown and Pullup on D\*
- Q Output will Default Low with Inputs Open or at VEE
- New Differential Input Common Mode Range
- ESD Protection of >4000V
- Specified Over Industrial Temperature Range: -40°C to 85°C
- Available in both 8 Pin SOIC (150 mil) and MSOP (3mm x 3mm) Packages
- Flammability Rate: UL-94 code V-0.
- Moisture Sensitivity: Level 1.

#### Functional Block Diagram



#### PIN Description

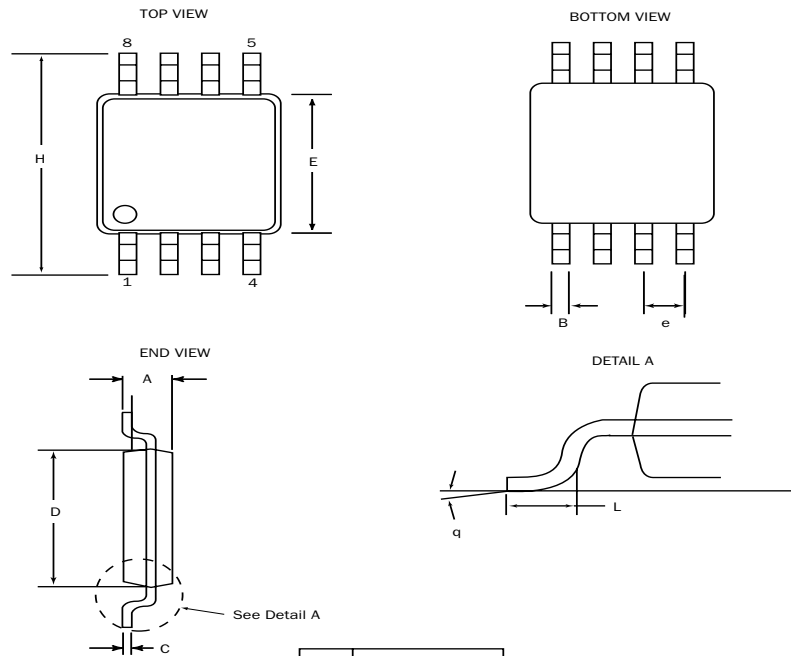
Pin	Function
D, D*	Differential Data Inputs
Q, Q*	Differential Data Outputs
VBB	Reference Output Voltage
VCTRL	Output Swing Control

**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
$\theta$	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**
**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

DIM	Millimeters	
	MIN	MAX
A	0.94	1.1
B	0.21	0.45
C	0.13	0.22
D	2.90	3.10
E	2.90	3.10
e	0.65	BSC
H	4.7	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.

**HIGH-PERFORMANCE PRODUCTS**
**DC Characteristics**
**SK10EL16V 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 <sub>OH</sub>	Output HIGH Voltage <sup>9</sup>	-1080	-890	-1020	-840	-980	-810	-910	-720	mV
V <sub>OL</sub>	Output LOW Voltage <sup>9</sup>	-1950	-1650	-1950	-1630	-1950	-1630	-1950	-1595	mV
V <sub>IH</sub>	Input HIGH Voltage	-1230	-890	-1170	-840	-1130	-810	-1060	-720	mV
V <sub>IL</sub>	Input LOW Voltage	-1950	-1500	-1950	-1480	-1950	-1480	-1950	-1445	mV
V <sub>PP</sub>	Differential Input Swing <sup>8</sup>	150	1000	150	1000	150	1000	150	1000	mV
V <sub>BB</sub>	Reference Output Voltage	-1430	-1300	-1380	-1270	-1350	-1250	-1310	-1190	mV
I <sub>EE</sub>	Power Supply Current	14	27	14	27	14	27	14	27	mA
I <sub>IN</sub>	Input Current: D, D*, (Diff) D, D*; VCTRL (SE)	-150	150 150	-150	150 150	-150	150 150	-150	150 150	μA μA

**SK100EL16V DC Electrical Characteristics (Note 2)**
 $(V_{EE} = -3.0V \text{ to } -5.5V; V_{CC} = 0V; V_{OUT} \text{ loaded } 50\Omega \text{ to } V_{CC} - 2.0V)$ 

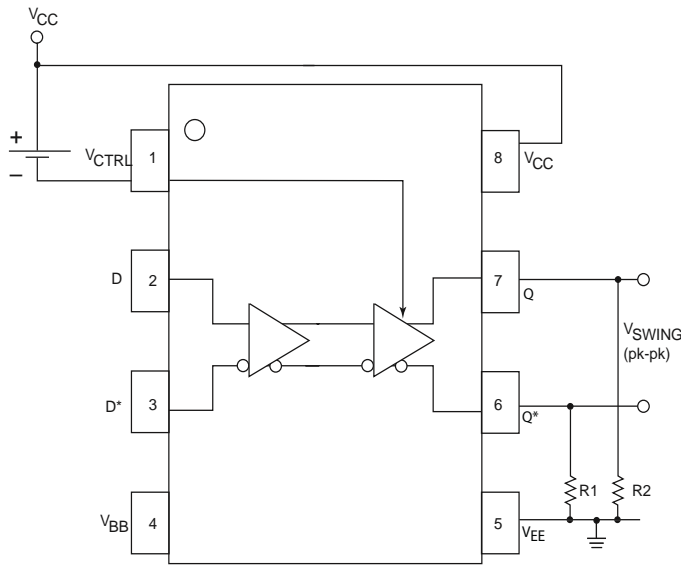
Symbol	Characteristic	TA = -40°C		TA = 0°C to +85°C		Unit	Condition
		Min	Max	Min	Max		
V <sub>OH</sub>	Output HIGH Voltage <sup>9</sup>	-1085	-880	-1035	-880	mV	V <sub>IN</sub> = V <sub>IHmax</sub> or V <sub>ILmin</sub>
V <sub>OL</sub>	Output LOW Voltage <sup>9</sup>	-1950	-1555	-1950	-1620	mV	V <sub>IN</sub> = V <sub>IHmax</sub> or V <sub>ILmin</sub>
V <sub>IH</sub>	Input HIGH Voltage	-1165	-880	-1165	-880	mV	Guaranteed HIGH signal for all inputs
V <sub>IL</sub>	Input LOW Voltage	-1810	-1475	-1810	-1475	mV	Guaranteed LOW signal for all inputs
V <sub>PP</sub>	Differential Input Swing <sup>8</sup>	150	1000	150	1000	mV	
V <sub>BB</sub>	Reference Output Voltage	-1380	-1260	-1380	-1260	mV	
I <sub>EE</sub>	Power Supply Current	16	32	16	32	mA	
I <sub>IN</sub>	Input Current: D, D*, (Diff) D, D*; VCTRL (SE)	-150	150 150	-150	150 150	μA μA	

**HIGH-PERFORMANCE PRODUCTS**
**AC Characteristics**
**SK10/100EL16V AC Electrical Characteristics**
 $(V_{CC} - V_{EE} = 3.0V \text{ to } 5.5V; V_{OUT} \text{ loaded } 50\Omega \text{ to } V_{CC} - 2.0V)$ 

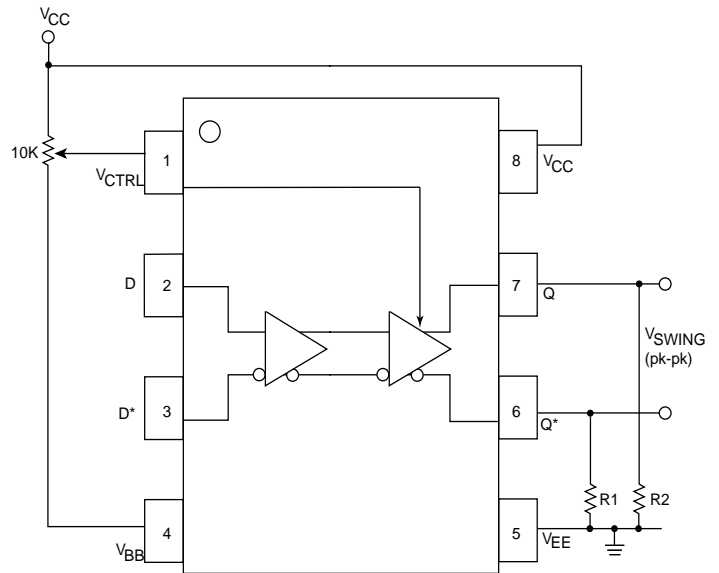
Symbol	Characteristic	TA = -40°C			TA = 0°C			TA = +25°C			TA = +85°C			Unit	Condition
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
$f_{max}$	Max. Toggle Frequency <sup>4</sup>	2.0			2.0			2.0			2.0			GHz	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay to Output D (Diff) D (SE)	190 150	230 225	270 300	190 150	230 225	270 300	200 150	240 230	280 310	210 150	255 235	300 320	ps ps	
A <sub>v</sub>	Small Signal Gain <sup>5</sup>								32					dB	
tskew	Duty Cycle Skew <sup>3</sup> (Diff)		5	20		5	20		5	20		5	20	ps	
t <sub>r</sub> , t <sub>f</sub>	Output Rise/Fall Times Q (20% to 80%)	110	140	175	125	155	185	125	160	200	130	180	230	ps	
V <sub>CMR</sub>	Common Mode Range <sup>6</sup>	V <sub>EE</sub> +1.7		V <sub>CC</sub> -0.4	V <sub>EE</sub> +1.7		V <sub>CC</sub> -0.4	V <sub>EE</sub> +1.7		V <sub>CC</sub> -0.4	V <sub>EE</sub> +1.7		V <sub>CC</sub> -0.4	V	
VO <sub>p.p</sub>	Output Voltage <sup>7</sup>			200			200			200			200	mV	V <sub>CTRL</sub> =V <sub>CC</sub>

**Notes:**

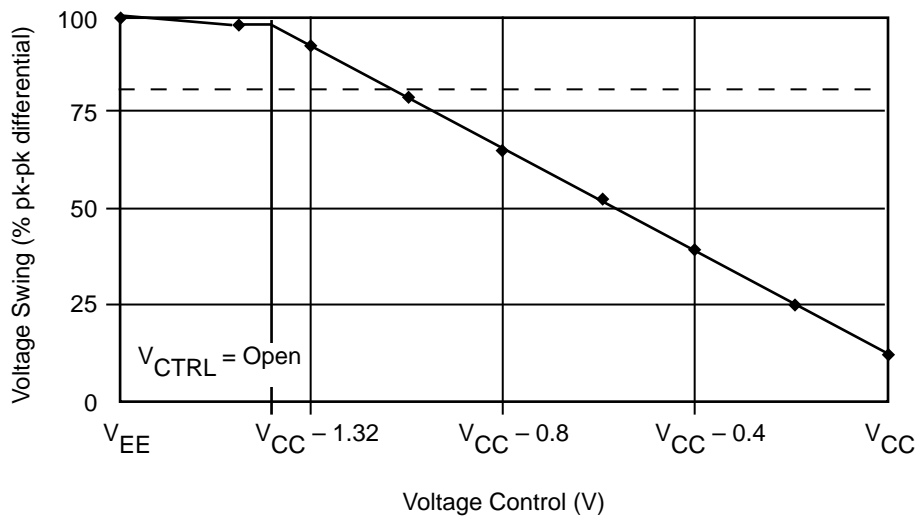
- 10EL circuits are designed to meet the DC specifications shown in the table after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse airflow greater than 500 lfm is maintained. Outputs are terminated through a 50Ω resistor to V<sub>CC</sub>-2.0V.
- 100K circuits are designed to meet the DC specification shown in the table where transverse airflow greater than 500 lfm is maintained.
- Duty cycle skew is the difference between T<sub>PLH</sub> and T<sub>PHL</sub> propagation delay through a device.
- F<sub>max</sub> guaranteed for functionality only. See Figure 3 for typical output swing. VO<sub>p.p</sub> levels are guaranteed at DC only.
- The device has a DC gain of ~40.
- 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<sub>PP(min)</sub> and 1V. The lower end of the CMR range varies 1:1 with V<sub>EE</sub> and is equal to V<sub>EE</sub> + 1.7V.
- VO<sub>p.p</sub> is obtained as follows: Voltages of Q and Q\* outputs with respect to V<sub>CC</sub> are measured. The absolute difference between a high and a low state is equal to VO<sub>p.p</sub>.
- Minimum input swing for which parameters are guaranteed.
- The VO<sub>H</sub> and VO<sub>L</sub> limits apply when the V<sub>CTRL</sub> pin is left open. Otherwise, see figure 2.
- For part ordering information, see HPP Part Ordering Information Data Sheet.

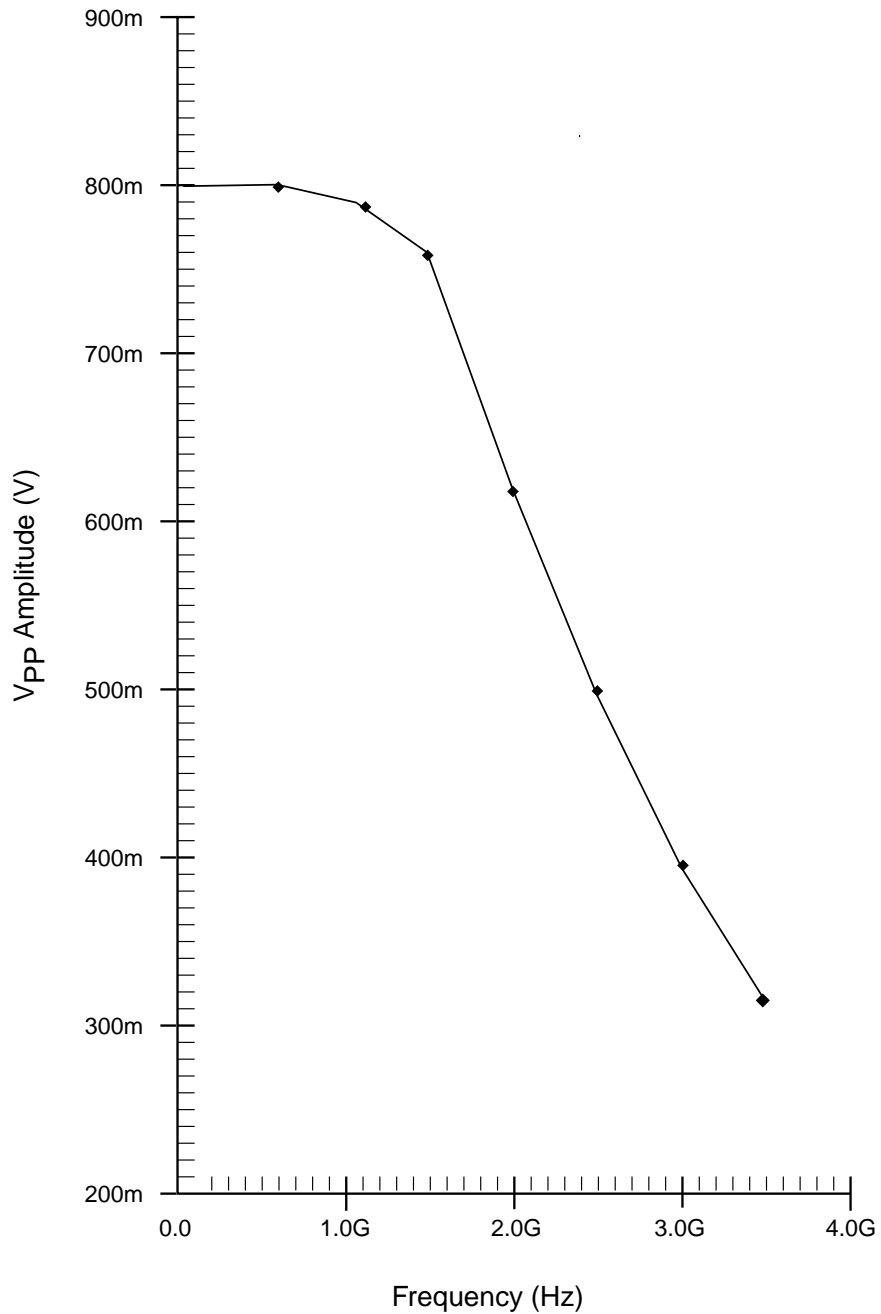
**HIGH-PERFORMANCE PRODUCTS**
**AC Characteristics (continued)**

**Figure 1A**

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


**Figure 1B**

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

**Implementation of Voltage Source**

**Figure 2. Typical Voltage Output Swing at 25°C**



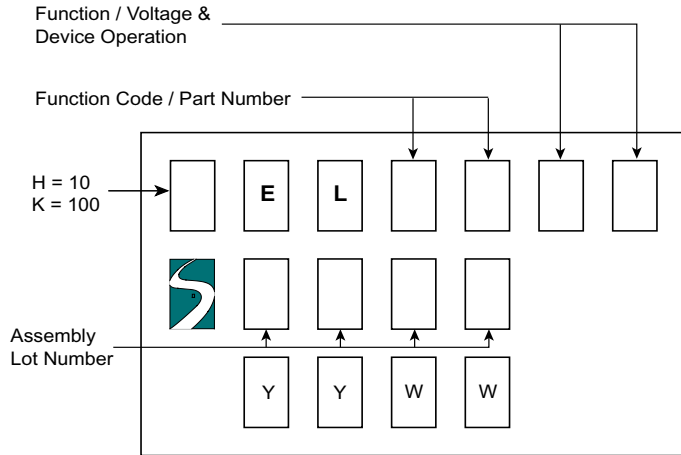
Input Conditions: 800 mV Peak-to-Peak

Figure 3. Typical Output V<sub>PP</sub> vs. Frequency

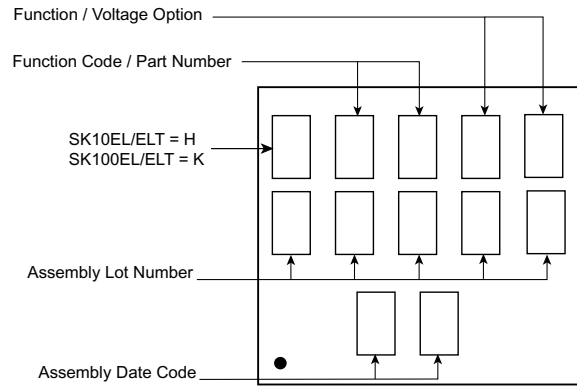
**HIGH-PERFORMANCE PRODUCTS****Ordering Information**

<b>Ordering Code</b>	<b>Package ID</b>
SK10EL16VD	8-SOIC
SK10EL16VDT	8-SOIC
SK100EL16VD	8-SOIC
SK100EL16VDT	8-SOIC
SK10EL16VMS	8-MSOP
SK10EL16VMST	8-MSOP
SK100EL16VMS	8-MSOP
SK100EL16VMST	8-MSOP
SK10EL16VU	Die
SK100EL16VU	Die



**HIGH-PERFORMANCE PRODUCTS**
**Marking Information**
**8 PIN SOIC PACKAGE**


YY: Last two digits of the Year  
WW: Working Week

**8/10 PIN MSOP PACKAGES**

**Application Notes**

- AN1002** - Interfacing Between ECL / LVECL / PECL / LVPECL - to - TTL / LVTTTL / CMOS / LVCMOS
- AN1003** - Termination Techniques for ECL / LVECL / PECL / LVPECL Devices
- AN1005** - Using ECL / LVECL Devices as PECL / LVPECL
- AN1006** - Designing with 10K and 100K ECL / PECL Devices

**Contact Information**

Division Headquarters 10021 Willow Creek Road San Diego, CA 92131 Phone: (858) 695-1808 FAX: (858) 695-2633	<b>Semtech Corporation</b> <b>High-Performance Products Division</b>	Marketing Group 1111 Comstock Street Santa Clara, CA 95054 Phone: (408) 566-8776 FAX: (408) 566-8759
---	---	--