



SY100EL16VC/VD/VF

Enhanced Differential Receiver

Features

- 3.3V and 5V Power Supply Options
- 250 ps Propagation Delay
- Very High Voltage Gain vs. Standard EL16 or EL16V
- Ideal for Pulse Amplifier and Limiting Amplifier Applications
- Data Synchronous Enable/Disable (/EN) on QHG and /QHG Provides for Complete Glitchless Gating of the Outputs
- Ideal for Gating Timing Signals
- Complete Solution for High Quality, High Frequency Crystal Oscillator Applications
- Internal 75 k Ω Input Pull-Down Resistors
- Available in 8- and 10-Lead (3 mm) MSOP Packages

General Description

The SY100EL16VC, SY100EL16VD, and SY100EL16VF are differential receivers. The devices are equivalent to SY100EL16V, but with enhanced capabilities. The QHG, /QHG outputs have a DC gain several times larger than the DC gain of the Q output.

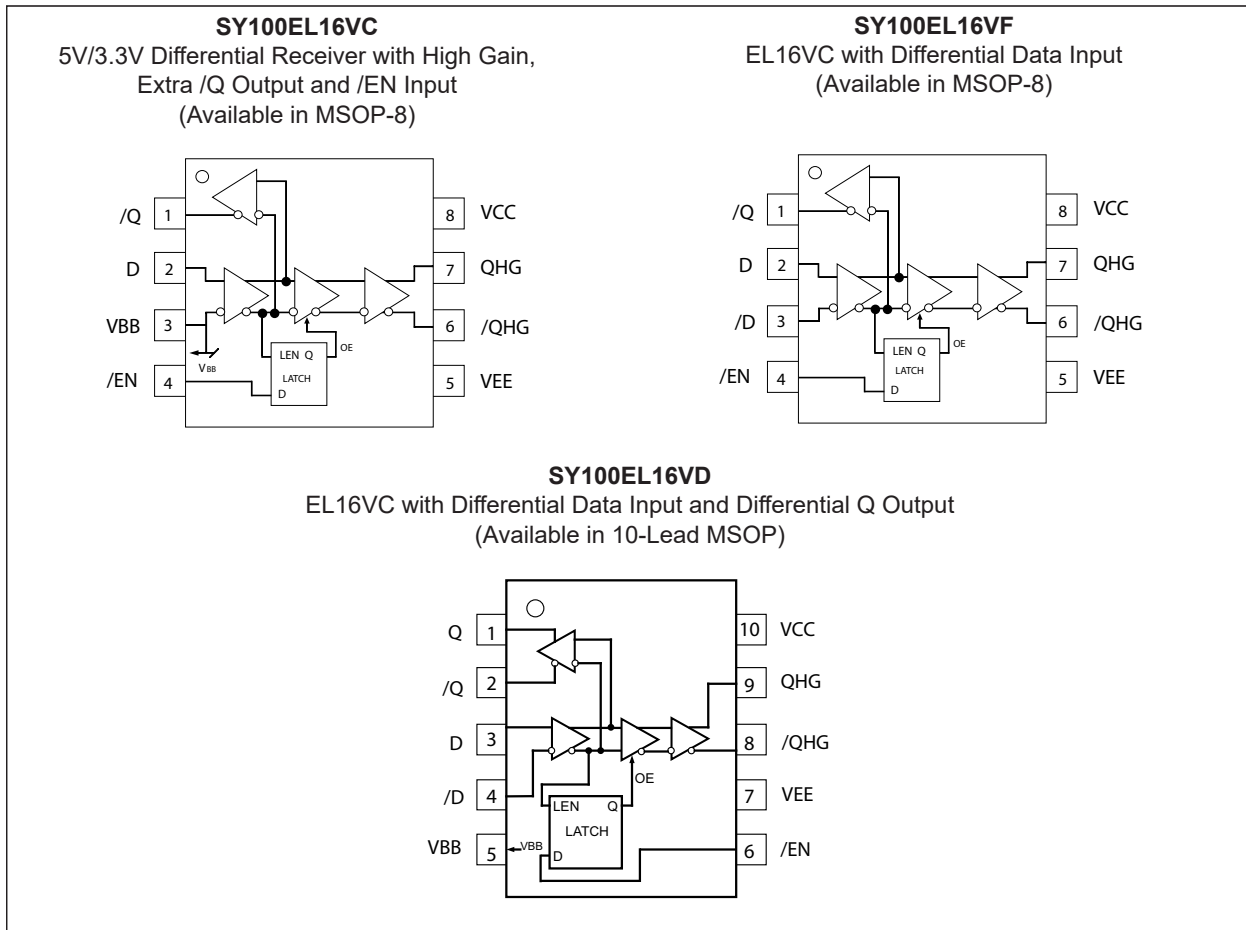
The SY100EL16VC provides an /EN input that is synchronized with the data input (D) signal in a way that provides glitchless gating of the QHG and /QHG outputs. When the /EN signal is low, the input is passed to the outputs and the data output equals the data input. When the data input is high and the /EN goes high, it forces the QHG low and the /QHG high on the next negative transition of the data input. If the data input is low when the /EN goes high, the next data transition to a high is ignored and QHG remains low and /QHG remains high. The next positive transition of the data input is not passed on to the data outputs under these conditions. The QHG and /QHG outputs remain in their disabled state as long as the /EN input is held high. The /EN input has no influence on the /Q output and the data input is passed on (inverted) to this output whether /EN is high or low. This configuration is ideal for crystal oscillator applications, where the oscillator can be free running and gated on and off synchronously without adding extra counts to the output.

The SY100EL16VD provides the flexibility of all the combinations in a 10-lead MSOP package.

The SY100EL16VF is similar to the SY100EL16VC, offering D, /D inputs rather than the VBB output.

SY100EL16VC/VD/VF

Package Types



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

PECL Power Supply Voltage (V_{CC}) (Note 1)	+8V
NECL Power Supply Voltage (V_{EE}) (Note 2)	-8V
PECL Mode Input Voltage (V_{IN}) (Note 3)	+6V
NECL Mode Input Voltage (V_{IN}) (Note 4)	-6V
Continuous Output Current (I_{OUT})	50 mA
Surge Output Current (I_{OUT})	100 mA
ESD Rating (Note 5)	>2 kV

† **Notice:** Permanent device damage can 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 rating conditions for extended periods may affect device reliability.

Note 1: $V_{EE} = 0V$.

2: $V_{CC} = 0V$.

3: $V_{EE} = 0V$, $V_{IN} \leq V_{CC}$.

4: $V_{CC} = 0V$, $V_{IN} \geq V_{EE}$.

5: Mil. Std. 883, Human Body Model, all pins.

DC ELECTRICAL CHARACTERISTICS

Electrical Characteristics: $V_{CC} = +3.0V$ to $+5.5V$; $V_{EE} = 0V$ or $V_{EE} = -5.5V$ to $-3.0V$; $V_{CC} = 0V$; $T_A = -40^\circ C$ to $85^\circ C$, unless otherwise stated, (Note 1).

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Power Supply Current	I_{EE}	—	—	40	mA	$T_A = -40^\circ C$ to $+25^\circ C$
		—	—	46		$T_A = +85^\circ C$
Output High Voltage (Note 2)	V_{OH}	$V_{CC} - 1.085$	$V_{CC} - 1.005$	$V_{CC} - 0.88$	V	$T_A = -40^\circ C$
		$V_{CC} - 1.025$	$V_{CC} - 0.955$	$V_{CC} - 0.88$		$T_A = 0^\circ C$ to $+85^\circ C$
Output Low Voltage (Note 2)	V_{OL}	$V_{CC} - 1.830$	$V_{CC} - 1.695$	$V_{CC} - 1.555$	V	$T_A = -40^\circ C$
		$V_{CC} - 1.810$	$V_{CC} - 1.705$	$V_{CC} - 1.620$		$T_A = 0^\circ C$ to $+85^\circ C$
Input High Voltage	V_{IH}	$V_{CC} - 1.165$	—	$V_{CC} - 0.880$	V	Single-Ended
Input Low Voltage	V_{IL}	$V_{CC} - 1.810$	—	$V_{CC} - 1.475$	V	Single-Ended
Output Reference Voltage	V_{BB}	$V_{CC} - 1.38$	—	$V_{CC} - 1.26$	V	—
Common Mode Range (Note 3)	V_{IHCMR}	$V_{EE} + 2.0$	—	$V_{CC} - 0.4$	V	$T_A = -40^\circ C$
		$V_{EE} + 1.9$	—	$V_{CC} - 0.4$		$T_A = 0^\circ C$ to $+85^\circ C$
Input High Current	I_{IH}	—	—	150	μA	—
Input Low Current	I_{IL}	0.5	—	—	μA	$V_{IN} = V_{IL(MIN)}$

Note 1: Devices are designed to meet the DC specifications shown in the table above after thermal equilibration 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.

2: Outputs are terminated through a 50Ω resistor to $V_{CC} - 2.0V$.

3: The CMR range is referenced to the most positive side of the differential input voltage. Normal operation is obtained if the high level falls within the specified range and the peak-to-peak voltage lies between 150 mV and 1V.

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AC ELECTRICAL CHARACTERISTICS

Electrical Characteristics: $V_{CC} = +3.0V$ to $+5.5V$; $V_{EE} = 0V$ or $V_{EE} = -5.5V$ to $-3.0V$; $V_{CC} = 0V$; $T_A = -40^\circ C$ to $+85^\circ C$, unless otherwise stated.

Parameter	Symbol	Min.	Typ.	Max.	Units	Condition
Propagation Delay D to Q, /Q (Differential)	t_{PLH} , t_{PHL}	—	—	350		$T_A = -40^\circ C$ to $+25^\circ C$
		—	—	380		$T_A = +85^\circ C$
Propagation Delay D to Q, /Q (Single-Ended)		—	—	400		$T_A = -40^\circ C$ to $+25^\circ C$
		—	—	430		$T_A = +85^\circ C$
Propagation Delay D to QHG, /QHG (Differential)		—	—	650		$T_A = -40^\circ C$ to $+25^\circ C$
		—	—	730		$T_A = +85^\circ C$
Propagation Delay D to QHG, /QHG (Single-Ended)	—	—	700		$T_A = -40^\circ C$ to $+25^\circ C$	
	—	—	780		$T_A = +85^\circ C$	
Setup Time /EN to D	t_S	150	—	—	ps	—
Hold Time D to /EN	t_H	150	—	—	ps	—
Duty Cycle Skew (Differential, Note 1)	t_{SKEW}	—	5	—	ps	$T_A = -40^\circ C$
		—	5	20		$T_A = 0^\circ C$ to $+85^\circ C$
Input Swing (Note 2)	V_{PP}	150	—	1000	mV	—
Output Rise/Fall Time Q (20% to 80%)	t_r/t_f	100	225	350	ps	—

Note 1: Duty cycle skew is the difference between a t_{PLH} and t_{PHL} propagation delay through a device.

2: Input swing for which AC parameters are ensured. The device has a DC gain of ≈ 40 mV to Q, /Q outputs and a DC gain of ≈ 200 mV or higher to QHG, /QHG outputs.

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Lead Temperature	T_{LEAD}	—	—	+260	$^\circ C$	Soldering, 20 sec.
Ambient Operating Temperature	T_A	-40	—	+85	$^\circ C$	—
Storage Temperature	T_S	-65	—	+150	$^\circ C$	—

TRUTH TABLE

/EN	QHG Output
0	Data
1	Logic Low

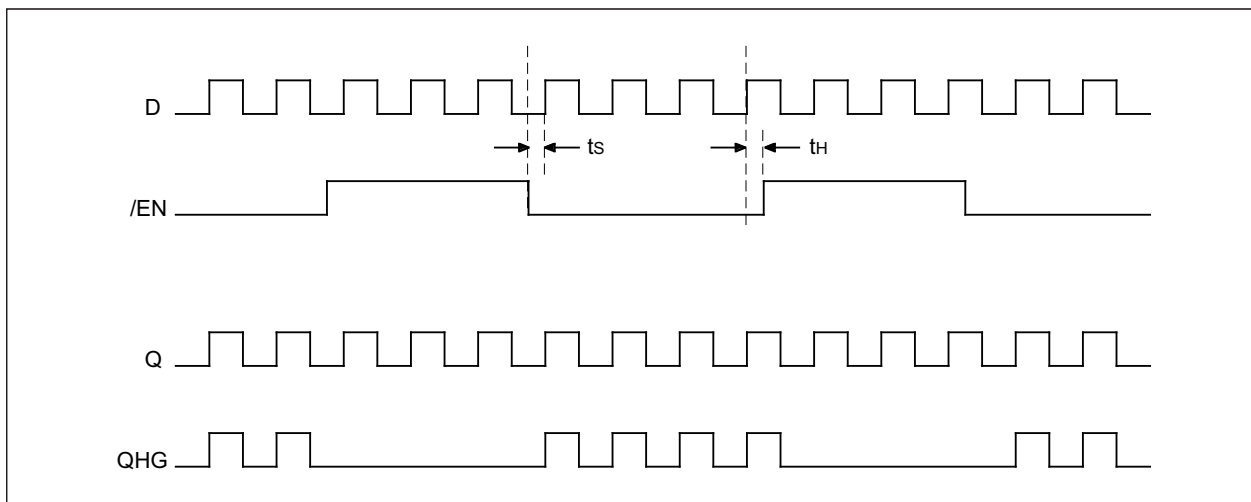
2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 2-1](#).

TABLE 2-1: PIN FUNCTION TABLE

Pin Name	Description
D	Data inputs.
Q	Data outputs.
QHG	Data outputs with high gain.
VBB	Reference voltage output.
/EN	Enable input.

Timing Diagram



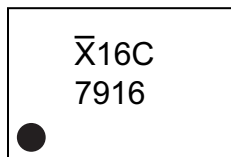
SY100EL16VC/VD/VF

3.0 PACKAGING INFORMATION

3.1 Package Marking Information

8- or 10-Lead MSOP*

Example



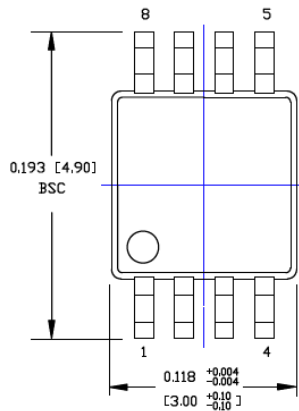
Legend:	XX...X	Product code or customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
	•, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle mark).
Note:	In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.	
	Underbar (̄) and/or Overbar (¯) symbol may not be to scale.	

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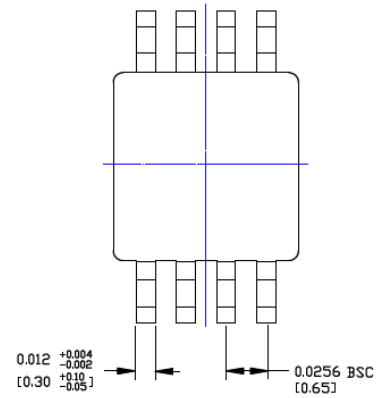
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8 LEAD MSOP PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

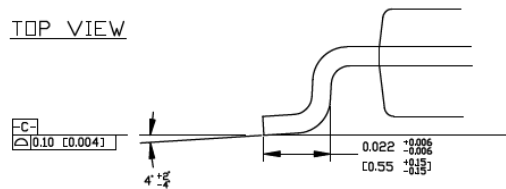
DRAWING #	MSOP-8LD-PL-1	UNIT	INCH [MM]
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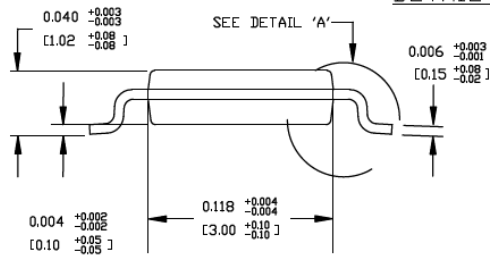
TOP VIEW



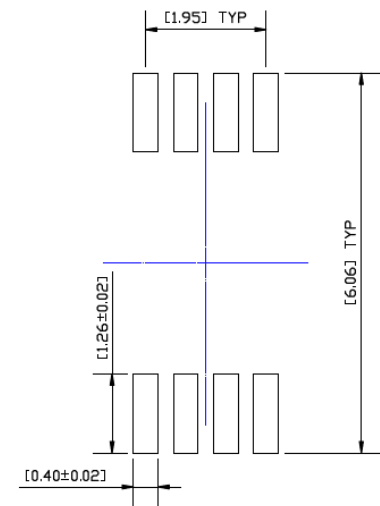
BOTTOM VIEW



DETAIL A



SIDE VIEW



RECOMMENDED LAND PATTERN

NOTES:

1. DIMENSIONS ARE IN INCHES [MM].
2. CONTROLLING DIMENSION: MM
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.008 [0.20] PER SIDE.

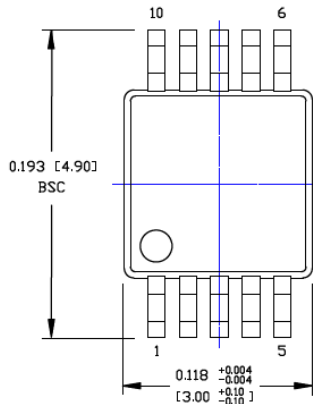
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>.

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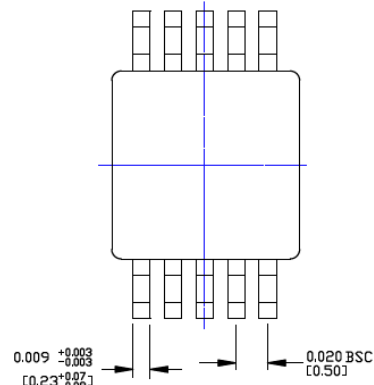
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10 LEAD MSOP PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

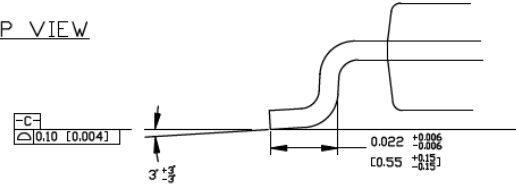
DRAWING #	MSOP-10LD-PL-1	UNIT	INCH [MM]
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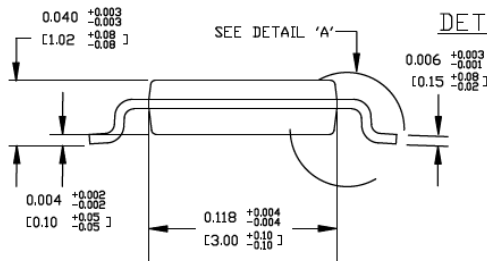
TOP VIEW



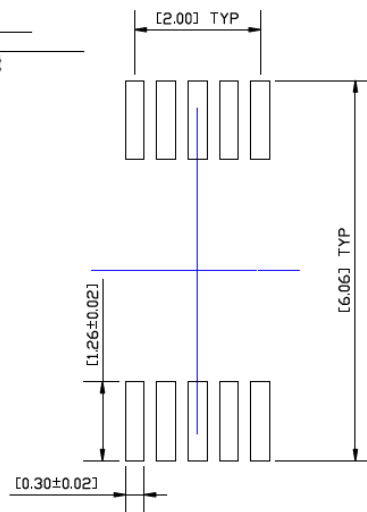
BOTTOM VIEW



DETAIL A



SIDE VIEW



RECOMMENDED LAND PATTERN

- NOTES:
1. DIMENSIONS ARE INCHES [MM].
 2. CONTROLLING DIMENSION: MM
 3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.008 [0.20] PER SIDE.

Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>.

APPENDIX A: REVISION HISTORY

Revision A (January 2020)

- Converted Micrel document SY100EL16VA-VF to Microchip data sheet DS20006239A.
- Minor text changes throughout.
- Removal of all reference to the discontinued VA, VB, and VE versions of this part.
- Removal of all reference to the discontinued SY10 versions of this part.
- Removal of both SOIC package options and wafer option from the original data sheet.

SY100EL16VC/VD/VF

NOTES:

SY100EL16VC/VD/VF

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

<u>Part No.</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>-XX</u>
Device	Supply Voltage	Product Version	Package	Temp. Range	Packing
Device:	SY100EL16: Enhanced Differential Receiver				
Supply Voltage:	V	=	3.3V/5V		
Product Version:	C	=	High Gain, Extra /Q Output, Single D Input,		
	D	=	High Gain, Extra Q Differential Output, Differential D Input		
	F	=	High Gain, Extra /Q Output, Differential D Input,		
Package:	K	=	8-Lead (C or F Product Version) or 10-Lead MSOP (D Product Version)		
Temperature Range:	G	=	-40°C to +85°C (NiPdAu Pb-Free)		
Packing:	<blank>	=	100/Tube		
	TR	=	1,000/Reel		
Examples:					
a) SY100EL16VCKG: SY100EL16, 3.3V/5V, High Gain, Extra /Q Output, Single D Input, 8-Lead MSOP, -40°C to +85°C Temperature Range, 100/Tube					
b) SY100EL16VCKG-TR: SY100EL16, 3.3V/5V, High Gain, Extra /Q Output, Single D Input, 8-Lead MSOP, -40°C to +85°C Temperature Range, 1,000/Reel					
c) SY100EL16VDKG: SY100EL16, 3.3V/5V, High Gain, Extra Q Differential Output, Differential D Input, 10-Lead MSOP, -40°C to +85°C Temperature Range, 100/Tube					
d) SY100EL16VDKG-TR: SY100EL16, 3.3V/5V, High Gain, Extra Q Differential Output, Differential D Input, 10-Lead MSOP, -40°C to +85°C Temperature Range, 1,000/Reel					
e) SY100EL16VFKG: SY100EL16, 3.3V/5V, High Gain, Extra /Q Output, Differential D Input, 8-Lead MSOP, -40°C to +85°C Temperature Range, 100/Tube					
f) SY100EL16VFKG-TR: SY100EL16, 3.3V/5V, High Gain, Extra /Q Output, Differential D Input, 8-Lead MSOP, -40°C to +85°C Temperature Range, 1,000/Reel					
Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.					

SY100EL16VC/VD/VF

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