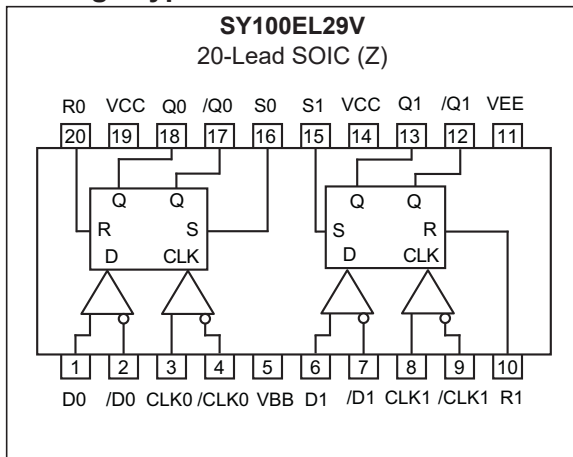


## 5V/3.3V Dual Differential Data and Clock D Flip-Flop with Set and Reset

### Features

- 3.3V and 5V Power Supply Option
- Differential D, CLK and Q
- Extended  $V_{EE}$  Range of  $-3.0V$  to  $-5.5V$
- VBB Output for Single-Ended Use
- 1100 MHz Min. Toggle Frequency
- Asynchronous Reset and Set
- Available in 20-Pin SOIC Package

### Package Type



### General Description

The SY100EL29V is a dual differential register with differential data (inputs and outputs) and clock. The registers are triggered by a positive transition of the positive clock (CLK) input. A HIGH on the Reset (Rx) asynchronously resets the appropriate register so that the Q outputs go LOW. A HIGH on the Set (Sx) asynchronously resets the appropriate register so that the Q outputs go HIGH. The Set and Reset inputs cannot both be HIGH simultaneously.

The differential input structures are clamped so that the inputs of unused registers can be left open without upsetting the bias network of the devices. The clamping action will assert the /D and the /CLK sides of the inputs. The non-inverting input will pull down to  $V_{EE}$  and the inverting input will be biased around  $V_{CC}/2$ . Because of the edge-triggered flip-flop nature of the devices, simultaneously opening both the clock and data inputs will result in an output which reaches an unidentified but valid state.

The fully differential design of the devices makes them ideal for very high frequency applications where a registered data path is necessary.

# SY100EL29V

## 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

† **Notice:** Stresses above those listed under “Absolute Maximum ratings” may cause permanent damage to the device. Exposure to 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:**  $V_{CC} = 0V$ ,  $V_{IN} \geq V_{EE}$ .

### 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	$I_{EE}$	—	30	50	mA	$T_A = +25^\circ C$
		—	—	50		$T_A = -40^\circ C, 0^\circ C, +85^\circ C$
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 (Single-Ended)	$V_{IH}$	$V_{CC} - 1.165$	—	$V_{CC} - 0.880$	V	—
Input Low Voltage (Single-Ended)	$V_{IL}$	$V_{CC} - 1.810$	—	$V_{CC} - 1.475$	V	—
Output Reference Voltage	$V_{BB}$	$V_{CC} - 1.38$	—	$V_{CC} - 1.26$	V	—
Common Mode Range (Note 3)	$V_{IHCMR}$	$V_{EE} + 1.3$	—	$V_{CC} - 0.4$	V	$T_A = -40^\circ C$ , $V_{PP} < 500$ mV
		$V_{EE} + 1.2$	—	$V_{CC} - 0.4$		$T_A = 0^\circ C$ to $85^\circ C$ , $V_{PP} < 500$ mV
		$V_{EE} + 1.5$	—	$V_{CC} - 0.4$		$T_A = -40^\circ C$ , $V_{PP} \geq 500$ mV
		$V_{EE} + 1.4$	—	$V_{CC} - 0.4$		$T_A = 0^\circ C$ to $85^\circ C$ , $V_{PP} \geq 500$ mV
Input High Current	$I_{IH}$	—	—	150	$\mu A$	—
Input Low Current	$I_{IL}$	0.5	—	—	$\mu A$	D, CLK, R, S
		-300	—	—	$\mu A$	/D, /CLK

**Note 1:** Devices are designed to meet the DC specifications shown in the above table 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 lpm is maintained.

**2:** Outputs are terminated through a  $50\Omega$  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.

## 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  $+85^{\circ}C$ ,  $R_L = 50\Omega$  to  $V_{CC} - 2V$ ; unless otherwise stated.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Maximum Toggle Frequency	$f_{MAX}$	1.1	—	—	GHz	—
Propagation Delay (CLK to Q)	$t_{PD}$	480	—	680	ps	$T_A = -40^{\circ}C$
		490	—	690		$T_A = 0^{\circ}C$
		500	—	700		$T_A = +25^{\circ}C$
		520	—	720		$T_A = +85^{\circ}C$
Propagation Delay (S, R to Q)		450	—	670		—
Set-Up Time (D-to-CLK)	$t_S$	200	—	—	ps	—
Hold Time (CLK-to-D)	$t_H$	150	—	—	ps	—
Reset Recovery Time	$t_{RR}$	300	—	—	ps	—
Minimum Pulse Width (CLK, R, S)	$t_{PW}$	400	—	—	ps	—
Input Swing (Note 1)	$V_{PP}$	150	—	1000	mV	—
Output Rise/Fall Time Q (20% to 80%)	$t_r/t_f$	280	330	550	ps	$T_A = +25^{\circ}C$
		280	—	550		$T_A = -40^{\circ}C, 0^{\circ}C, +85^{\circ}C$

**Note 1:** Input swing for which AC parameters are guaranteed.

# SY100EL29V

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## TEMPERATURE SPECIFICATIONS

Parameters	Symbol	Min.	Typ.	Max.	Units	Conditions
<b>Temperature Ranges</b>						
Operating Temperature Range	$T_A$	-40	—	+85	°C	—
Storage Temperature	$T_S$	-65	—	+150	°C	—
Lead Temperature	$T_{LEAD}$	—	—	+260	°C	Soldering, 20 sec.
<b>Package Thermal Resistance (SOIC)</b>						
Junction-to-Ambient	$\theta_{JA}$	—	90	—	°C/W	Still Air
		—	60	—		500 lfpm
Junction-to-Case	$\theta_{JC}$	—	35	—	°C/W	—

## 2.0 PIN DESCRIPTIONS

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

**TABLE 2-1: PIN FUNCTION TABLE**

Pin Name	Description
CLK, /CLK	Differential Clock Inputs.
D, /D	Differential Data Inputs.
/Q, Q	Differential Data Outputs.
R0, R1	Reset Inputs.
S0, S1	Set Inputs.
VBB	Reference Output.
VCC	Positive Supply Voltage.
VEE	Negative Supply Voltage.

## 2.1 Truth Table

**TABLE 2-2: TRUTH TABLE**

R	S	D	CLK	Q	/Q
L	L	L	Z	L	H
L	L	H	Z	H	L
H	L	X	X	L	H
L	H	X	X	H	L
L	H	X	X	Undef	Undef

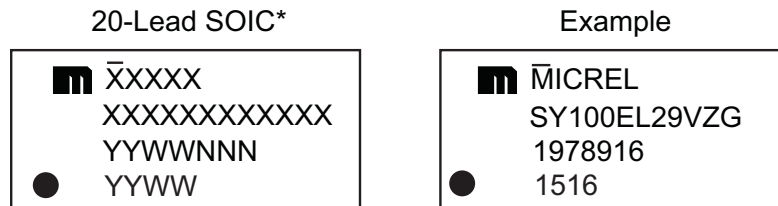
**Note:** Z = Low-to-high transition.



# SY100EL29V

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## 3.0 PACKAGING INFORMATION

### 3.1 Package Marking Information

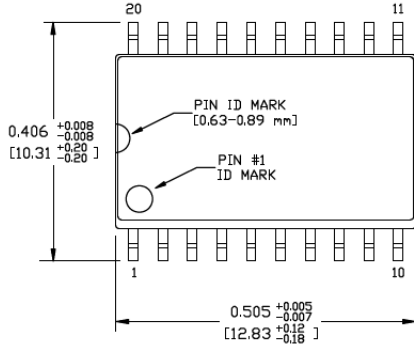


<p><b>Legend:</b> XX...X Product code or customer-specific information Y Year code (last digit of calendar year) YY Year code (last 2 digits of calendar year) WW Week code (week of January 1 is week '01') NNN Alphanumeric traceability code  Pb-free JEDEC® designator for Matte Tin (Sn) * This package is Pb-free. The Pb-free JEDEC designator () can be found on the outer packaging for this package.</p> <p>●, ▲, ▼ Pin one index is identified by a dot, delta up, or delta down (triangle mark).</p>
<p><b>Note:</b> 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.</p> <p>Underbar (<math>\bar{\quad}</math>) and/or Overbar (<math>\bar{\quad}</math>) symbol may not be to scale.</p>

**TITLE**

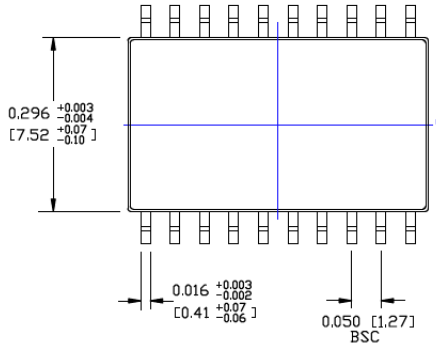
20 LEAD SOICW PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	SOICW-20LD-PL-1	UNIT	INCH [MM]
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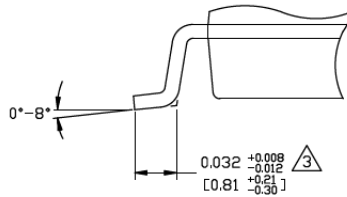
**TOP VIEW**

NOTE: 1, 2

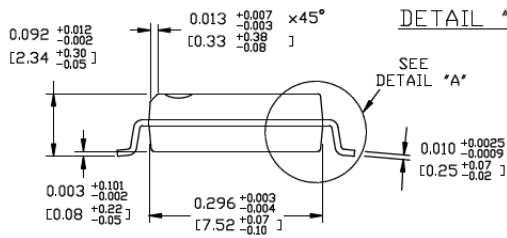


**BOTTOM VIEW**

NOTE: 1, 2

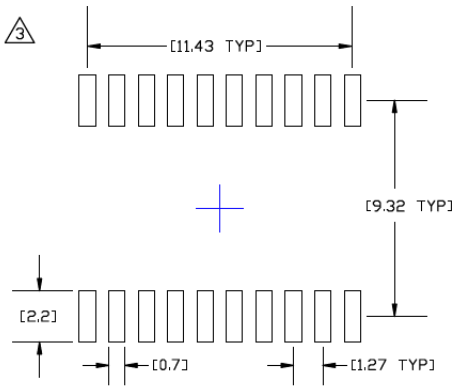


**DETAIL "A"**



**END VIEW**

NOTE: 1, 2, 3



**RECOMMENDED LAND PATTERN**

**NOTES:**

1. DIMENSIONS ARE IN INCHES[MM].
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.006[0.15] PER SIDE.

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

# SY100EL29V

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NOTES:



## APPENDIX A: REVISION HISTORY

### Revision A (August 2019)

- Converted Micrel document SY100EL29V to Microchip data sheet DS20006241A.
- Minor text changes throughout.

# SY100EL29V

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NOTES:

## 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>-XX</u>	<u>X</u>	<u>X</u>	<u>-XX</u>	<b>Examples:</b>
Device	Supply Voltage Range	Package	Temperature Range	Special Processing	
<b>Device:</b>	SY100EL29: Dual Differential Data and Clock D Flip-Flop with Set and Reset				a) SY100EL29VZG: SY100EL29, 3.3V/5V, -40°C to +85°C, 20-Lead SOIC, 38/Tube b) SY100EL29VZG-TR: SY100EL29, 3.3V/5V, -40°C to +85°C, 20-Lead SOIC, 1,000/Reel  <b>Note 1:</b> 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.
<b>Supply Voltage Range:</b>	V	=	3.3/5V		
<b>Package:</b>	Z	=	20-Lead SOIC (Pb-Free NiPdAu)		
<b>Temperature Range:</b>	G	=	-40°C to +85°C		
<b>Special Processing:</b>	<blank>	=	38/Tube		
	TR	=	1,000/Reel		

# SY100EL29V

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NOTES:

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