

## 5V ECL Differential Data and Clock D Flip-Flop

### Features

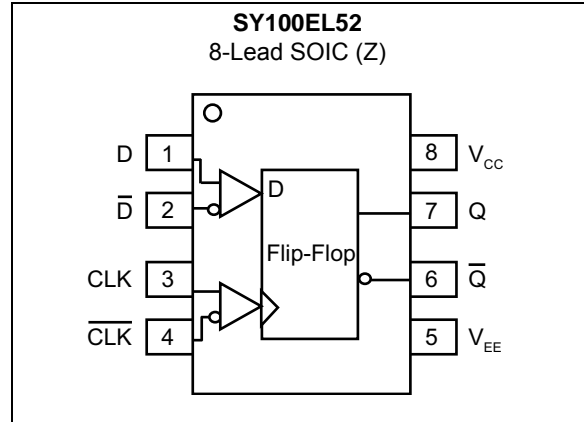
- 365 ps Propagation Delay (typical)
- 2.8 GHz Toggle Frequency (typical)
- Internal 75 k $\Omega$  Input Pull-Down Resistors
- Available in 8-Lead SOIC Package

### General Description

The SY100EL52 is a differential data, differential clock D flip-flop. Data enters the master portion of the flip-flop when the clock is low and is transferred to the slave, then the outputs, upon a positive transition of the clock. The differential clock inputs also allow the EL52 to be used as a negative edge triggered device.

The EL52 employs input clamping circuitry so that, under open input conditions (pulled down to  $V_{EE}$ ), the outputs of the device will remain stable.

### Package Type



# SY100EL52

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

**TABLE 1-1: DC ELECTRICAL CHARACTERISTICS**

**Electrical Characteristics PECL:**  $V_{CC} = 4.2V$  to  $5.5V$ ;  $V_{EE} = 0V$ ;  $T_A = -40^\circ C$  to  $+85^\circ C$ , unless otherwise stated. (Note 1)

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Power Supply Voltage	$V_{CC}$	4.2	5.0	5.5	V	—
Power Supply Current	$I_{EE}$	—	21	25	mA	$T_A = -40^\circ C$ to $+25^\circ C$
		—	24	29		$T_A = +85^\circ C$
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 (Single-Ended)	$V_{IH}$	$V_{CC} - 1.165$	—	$V_{CC} - 0.88$	V	—
Input Low Voltage (Single-Ended)	$V_{IL}$	$V_{CC} - 1.810$	—	$V_{CC} - 1.475$	V	—
Common Mode Range (Note 3)	$V_{IHCMR}$	$V_{CC} - 1.2$	—	$V_{CC} - 0.4$	V	D, /D
		3.0	—	$V_{CC} - 0.8$		CLK, /CLK
Input High Current	$I_{IH}$	—	—	150	$\mu A$	—
Input Low Current	$I_{IL}$	0.5	—	—	$\mu A$	$V_{IN} = V_{IL(MIN)}$

**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 lfpm 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.

**TABLE 1-2: DC ELECTRICAL CHARACTERISTICS**

**Electrical Characteristics NECL:**  $V_{EE} = -5.5V$  to  $-4.2V$ ;  $V_{CC} = 0V$ ;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , unless otherwise stated. (Note 1)

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Power Supply Voltage	$V_{EE}$	-5.5	-5.0	-4.2	V	—
Power Supply Current	$I_{EE}$	—	21	25	mA	$T_A = -40^{\circ}C$ to $+25^{\circ}C$
		—	24	29		$T_A = +85^{\circ}C$
Output High Voltage (Note 2)	$V_{OH}$	-1.085	-1.005	-0.88	V	$T_A = -40^{\circ}C$
		-1.025	-0.955	-0.88		$T_A = 0^{\circ}C$ to $+85^{\circ}C$
Output Low Voltage (Note 2)	$V_{OL}$	-1.830	-1.695	-1.555	V	$T_A = -40^{\circ}C$
		-1.810	-1.705	-1.620		$T_A = 0^{\circ}C$ to $+85^{\circ}C$
Input High Voltage (Single-Ended)	$V_{IH}$	-1.165	—	-0.88	V	—
Output High Voltage (Single-Ended)	$V_{IL}$	-1.810	—	-1.475	V	—
Common Mode Range (Note 3)	$V_{IHCMR}$	-1.2	—	-0.4	V	D, /D
		$V_{EE} + 3.0$	—	-0.8		CLK, /CLK
Input High Current	$I_{IH}$	—	—	150	$\mu A$	—
Input Low Current	$I_{IL}$	0.5	—	—	$\mu A$	$V_{IN} = V_{IL(MIN)}$

**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 lfpm 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.

**TABLE 1-3: AC ELECTRICAL CHARACTERISTICS**

**Electrical Characteristics:**  $V_{CC} = +4.2V$  to  $+5.5V$ ,  $V_{EE} = 0V$  or  $V_{EE} = -5.5V$  to  $-4.2V$ ,  $V_{CC} = 0V$ ;  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , unless otherwise stated.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Maximum Toggle Frequency	$f_{MAX}$	1.8	2.5	—	GHz	$T_A = -40^{\circ}C$
		2.2	2.8	—		$T_A = 0^{\circ}C$ to $+85^{\circ}C$
Propagation Delay to Output CLK	$t_{PD}$	235	335	515	ps	$T_A = -40^{\circ}C$
		275	365	465		$T_A = 0^{\circ}C$ to $+25^{\circ}C$
		320	410	510		$T_A = +85^{\circ}C$
Set-Up Time	$t_S$	125	0	—	ps	—
Hold Time	$t_H$	150	50	—	ps	—
Minimum Pulse Width	$t_{PW}$	400	—	—	ps	—
Input Swing (Note 1)	$V_{PP}$	150	—	1000	mV	—
Output Rise/Fall Time Q (20% to 80%)	$t_r/t_f$	100	225	350	ps	—

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

# SY100EL52

---

---

## TEMPERATURE SPECIFICATIONS

Parameters	Sym.	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.

## 2.0 PIN DESCRIPTIONS

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

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

Pin Number	Pin Name	Description
D, /D	1, 2	Data input.
CLK, /CLK	3, 4	Clock input.
V <sub>EE</sub>	5	Negative Power Supply.
/Q, Q	6, 7	Data output.
V <sub>CC</sub>	8	Positive Power Supply.

## 2.1 Truth Table

**TABLE 2-2: TRUTH TABLE**

D	CLK	Q
L	Z	L
H	Z	H

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

# SY100EL52

---

## 3.0 PACKAGING INFORMATION

### 3.1 Package Marking Information

8-Lead SOIC\*

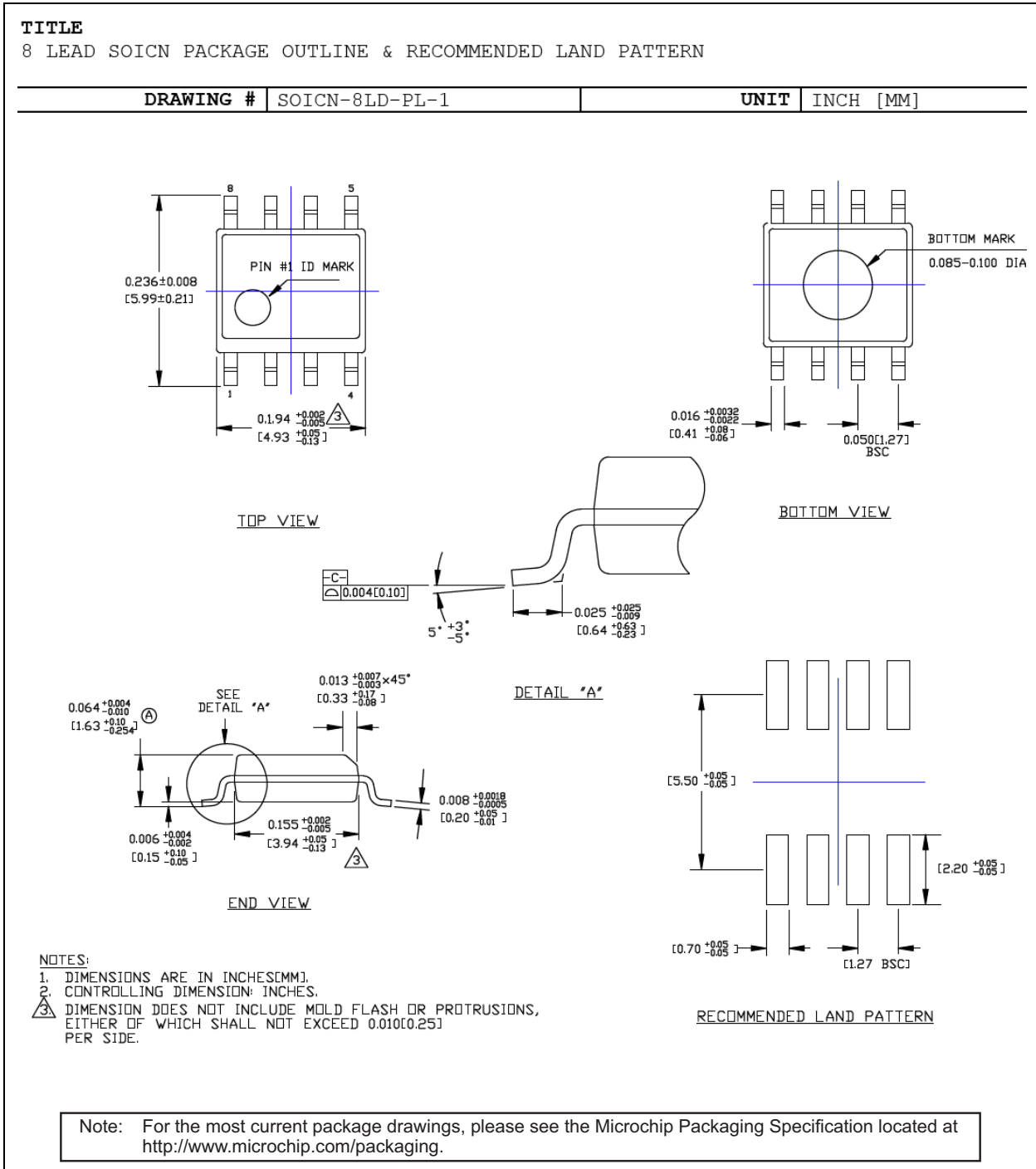


Example



<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
	(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).
<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.	
	Underbar (̄) and/or Overbar (¯) symbol may not be to scale.	

## 8-Lead SOIC Package Outline and Recommended Land Pattern



# SY100EL52

---

NOTES:

## APPENDIX A: REVISION HISTORY

### Revision A (September 2018)

- Converted Micrel document SY100EL52 to Microchip data sheet DS20006066A.
- Minor text changes throughout.
- Removed all reference to the EOL SY10EL52 version.

# SY100EL52

---

NOTES:

## PRODUCT IDENTIFICATION SYSTEM

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

<b>PART NO.</b>		<b>X</b>	<b>X</b>	<b>-XX</b>
<b>Device</b>		<b>Package</b>	<b>Temperature Range</b>	<b>Special Processing</b>
<b>Device:</b>	SY100EL52: Differential Data and Clock D Flip-Flop			
<b>Package:</b>	Z	=	8-Lead SOIC	
<b>Temperature Range:</b>	G	=	-40°C to +85°C (Pb-Free NiPdAu)	
<b>Special Processing:</b>	<blank>	=	95/Tube	
	TR	=	1,000/Reel	

<b>Examples:</b>	
a) SY100EL52ZG:	SY100EL52, 8-Lead SOIC, -40°C to +85°C (Pb-Free NiPdAu), 95/Tube
b) SY100EL52ZG-TR:	SY100EL52, 8-Lead SOIC, -40°C to +85°C (Pb-Free NiPdAu), 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.

# SY100EL52

---

NOTES:

---

---

**Note the following details of the code protection feature on Microchip devices:**

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as “unbreakable.”

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

---

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

*Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELoc® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.*

**QUALITY MANAGEMENT SYSTEM  
CERTIFIED BY DNV  
= ISO/TS 16949 =**

### **Trademarks**

The Microchip name and logo, the Microchip logo, AnyRate, AVR, AVR logo, AVR Freaks, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, Heldo, JukeBlox, KeeLoq, Klear, LANCheck, LINK MD, maXStylus, maXTouch, MediaLB, megaAVR, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, Prochip Designer, QTouch, SAM-BA, SpyNIC, SST, SST Logo, SuperFlash, tinyAVR, UNI/O, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

ClockWorks, The Embedded Control Solutions Company, EtherSynch, Hyper Speed Control, HyperLight Load, IntellIMOS, mTouch, Precision Edge, and Quiet-Wire are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KlearNet, KlearNet logo, memBrain, Mindi, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICKit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2018, Microchip Technology Incorporated, All Rights Reserved.  
ISBN: 978-1-5224-3505-1



# MICROCHIP

## Worldwide Sales and Service

### AMERICAS

**Corporate Office**  
2355 West Chandler Blvd.  
Chandler, AZ 85224-6199  
Tel: 480-792-7200  
Fax: 480-792-7277  
Technical Support:  
<http://www.microchip.com/support>  
Web Address:  
[www.microchip.com](http://www.microchip.com)

**Atlanta**  
Duluth, GA  
Tel: 678-957-9614  
Fax: 678-957-1455

**Austin, TX**  
Tel: 512-257-3370

**Boston**  
Westborough, MA  
Tel: 774-760-0087  
Fax: 774-760-0088

**Chicago**  
Itasca, IL  
Tel: 630-285-0071  
Fax: 630-285-0075

**Dallas**  
Addison, TX  
Tel: 972-818-7423  
Fax: 972-818-2924

**Detroit**  
Novi, MI  
Tel: 248-848-4000

**Houston, TX**  
Tel: 281-894-5983

**Indianapolis**  
Noblesville, IN  
Tel: 317-773-8323  
Fax: 317-773-5453  
Tel: 317-536-2380

**Los Angeles**  
Mission Viejo, CA  
Tel: 949-462-9523  
Fax: 949-462-9608  
Tel: 951-273-7800

**Raleigh, NC**  
Tel: 919-844-7510

**New York, NY**  
Tel: 631-435-6000

**San Jose, CA**  
Tel: 408-735-9110  
Tel: 408-436-4270

**Canada - Toronto**  
Tel: 905-695-1980  
Fax: 905-695-2078

### ASIA/PACIFIC

**Australia - Sydney**  
Tel: 61-2-9868-6733

**China - Beijing**  
Tel: 86-10-8569-7000

**China - Chengdu**  
Tel: 86-28-8665-5511

**China - Chongqing**  
Tel: 86-23-8980-9588

**China - Dongguan**  
Tel: 86-769-8702-9880

**China - Guangzhou**  
Tel: 86-20-8755-8029

**China - Hangzhou**  
Tel: 86-571-8792-8115

**China - Hong Kong SAR**  
Tel: 852-2943-5100

**China - Nanjing**  
Tel: 86-25-8473-2460

**China - Qingdao**  
Tel: 86-532-8502-7355

**China - Shanghai**  
Tel: 86-21-3326-8000

**China - Shenyang**  
Tel: 86-24-2334-2829

**China - Shenzhen**  
Tel: 86-755-8864-2200

**China - Suzhou**  
Tel: 86-186-6233-1526

**China - Wuhan**  
Tel: 86-27-5980-5300

**China - Xian**  
Tel: 86-29-8833-7252

**China - Xiamen**  
Tel: 86-592-2388138

**China - Zhuhai**  
Tel: 86-756-3210040

### ASIA/PACIFIC

**India - Bangalore**  
Tel: 91-80-3090-4444

**India - New Delhi**  
Tel: 91-11-4160-8631

**India - Pune**  
Tel: 91-20-4121-0141

**Japan - Osaka**  
Tel: 81-6-6152-7160

**Japan - Tokyo**  
Tel: 81-3-6880-3770

**Korea - Daegu**  
Tel: 82-53-744-4301

**Korea - Seoul**  
Tel: 82-2-554-7200

**Malaysia - Kuala Lumpur**  
Tel: 60-3-7651-7906

**Malaysia - Penang**  
Tel: 60-4-227-8870

**Philippines - Manila**  
Tel: 63-2-634-9065

**Singapore**  
Tel: 65-6334-8870

**Taiwan - Hsin Chu**  
Tel: 886-3-577-8366

**Taiwan - Kaohsiung**  
Tel: 886-7-213-7830

**Taiwan - Taipei**  
Tel: 886-2-2508-8600

**Thailand - Bangkok**  
Tel: 66-2-694-1351

**Vietnam - Ho Chi Minh**  
Tel: 84-28-5448-2100

### EUROPE

**Austria - Wels**  
Tel: 43-7242-2244-39  
Fax: 43-7242-2244-393

**Denmark - Copenhagen**  
Tel: 45-4450-2828  
Fax: 45-4485-2829

**Finland - Espoo**  
Tel: 358-9-4520-820

**France - Paris**  
Tel: 33-1-69-53-63-20  
Fax: 33-1-69-30-90-79

**Germany - Garching**  
Tel: 49-8931-9700

**Germany - Haan**  
Tel: 49-2129-3766400

**Germany - Heilbronn**  
Tel: 49-7131-67-3636

**Germany - Karlsruhe**  
Tel: 49-721-625370

**Germany - Munich**  
Tel: 49-89-627-144-0  
Fax: 49-89-627-144-44

**Germany - Rosenheim**  
Tel: 49-8031-354-560

**Israel - Ra'anana**  
Tel: 972-9-744-7705

**Italy - Milan**  
Tel: 39-0331-742611  
Fax: 39-0331-466781

**Italy - Padova**  
Tel: 39-049-7625286

**Netherlands - Drunen**  
Tel: 31-416-690399  
Fax: 31-416-690340

**Norway - Trondheim**  
Tel: 47-7288-4388

**Poland - Warsaw**  
Tel: 48-22-3325737

**Romania - Bucharest**  
Tel: 40-21-407-87-50

**Spain - Madrid**  
Tel: 34-91-708-08-90  
Fax: 34-91-708-08-91

**Sweden - Gothenberg**  
Tel: 46-31-704-60-40

**Sweden - Stockholm**  
Tel: 46-8-5090-4654

**UK - Wokingham**  
Tel: 44-118-921-5800  
Fax: 44-118-921-5820

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- ⊖ [View SY10EL52ZG TR on WIN SOURCE](#)
- ⊖ [Microchip Technology Information](#)

## Optimize Your Supply Chain with WIN SOURCE Solutions

- ✓ Global Sourcing Solution
- ✓ Obsolete Management
- ✓ Cost Control Management
- ✓ Shortage Management
- ✓ Alternative Solution
- ✓ Excess Inventory Management