

# MC74LCX374

## Low-Voltage CMOS Octal D-Type Flip-Flop

### With 5 V-Tolerant Inputs and Outputs (3-State, Non-Inverting)

The MC74LCX374 is a high performance, non-inverting octal D-type flip-flop operating from a 2.3 to 3.6 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A  $V_I$  specification of 5.5 V allows MC74LCX374 inputs to be safely driven from 5 V devices.

The MC74LCX374 consists of 8 edge-triggered flip-flops with individual D-type inputs and 3-state true outputs. The buffered clock and buffered Output Enable ( $\overline{OE}$ ) are common to all flip-flops. The eight flip-flops will store the state of individual D inputs that meet the setup and hold time requirements on the LOW-to-HIGH Clock (CP) transition. With the  $\overline{OE}$  LOW, the contents of the eight flip-flops are available at the outputs. When the  $\overline{OE}$  is HIGH, the outputs go to the high impedance state. The  $\overline{OE}$  input level does not affect the operation of the flip-flops.

#### Features

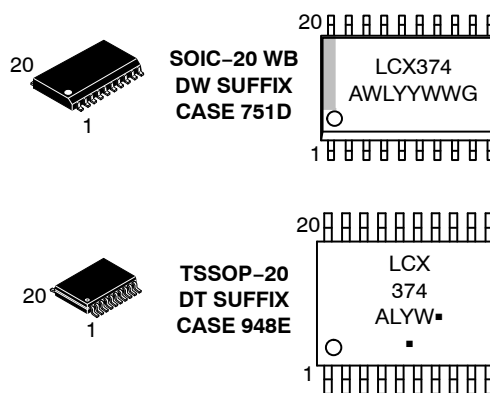
- Designed for 2.3 to 3.6 V  $V_{CC}$  Operation
- 5 V Tolerant – Interface Capability With 5 V TTL Logic
- Supports Live Insertion and Withdrawal
- $I_{OFF}$  Specification Guarantees High Impedance When  $V_{CC} = 0$  V
- LVTTTL Compatible
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current in All Three Logic States (10  $\mu$ A)  
Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- ESD Performance:
  - ◆ Human Body Model >2000 V
  - ◆ Machine Model >200 V
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant



ON Semiconductor®

<http://onsemi.com>

#### MARKING DIAGRAMS



#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

# MC74LCX374

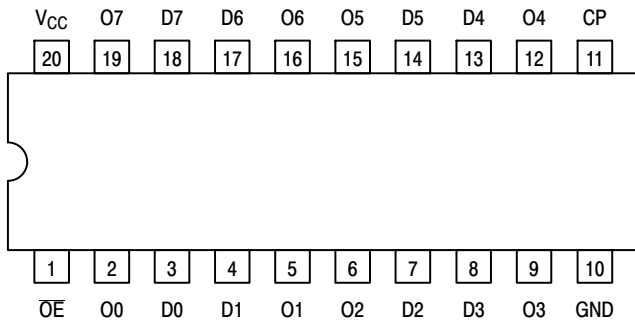


Figure 1. Pinout: 20-Lead (Top View)

## PIN NAMES

Pins	Function
OE	Output Enable Input
CP	Clock Pulse Input
D0-D7	Data Inputs
O0-O7	3-State Outputs

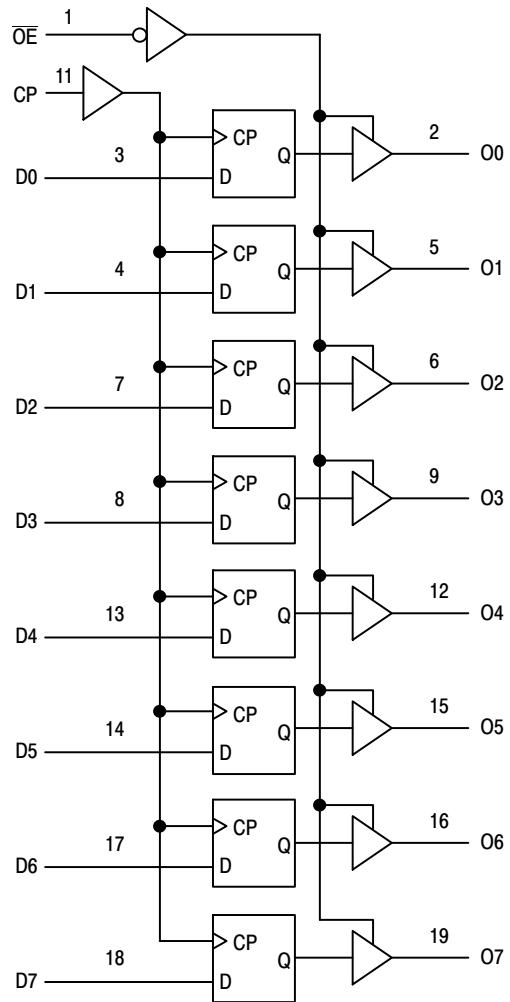


Figure 2. LOGIC DIAGRAM

## TRUTH TABLE

INPUTS			OUTPUTS	OPERATING MODE
OE	CP	Dn	On	
L	↑	l	L	Load and Read Register
L	↑	h	H	
L	↑	X	NC	Hold and Read Register
H	↑	X	Z	Hold and Disable Outputs
H	↑	l	Z	Load Internal Register and Disable Outputs
H	↑	h	Z	

H = High Voltage Level

h = High Voltage Level One Setup Time Prior to the Low-to-High Clock Transition

L = Low Voltage Level

l = Low Voltage Level One Setup Time Prior to the Low-to-High Clock Transition

NC = No Change, State Prior to Low-to-High Clock Transition

X = High or Low Voltage Level and Transitions are Acceptable

Z = High Impedance State

↑ = Low-to-High Transition

↑ = Not a Low-to-High Transition; For I<sub>CC</sub> Reasons, DO NOT FLOAT Inputs

# MC74LCX374

## MAXIMUM RATINGS

Symbol	Parameter	Value	Condition	Units
$V_{CC}$	DC Supply Voltage	-0.5 to +7.0		V
$V_I$	DC Input Voltage	$-0.5 \leq V_I \leq +7.0$		V
$V_O$	DC Output Voltage	$-0.5 \leq V_O \leq +7.0$	Output in 3-State	V
		$-0.5 \leq V_O \leq V_{CC} + 0.5$	(Note 1)	V
$I_{IK}$	DC Input Diode Current	-50	$V_I < GND$	mA
$I_{OK}$	DC Output Diode Current	-50	$V_O < GND$	mA
		+50	$V_O > V_{CC}$	mA
$I_O$	DC Output Source/Sink Current	$\pm 50$		mA
$I_{CC}$	DC Supply Current Per Supply Pin	$\pm 100$		mA
$I_{GND}$	DC Ground Current Per Ground Pin	$\pm 100$		mA
$T_{STG}$	Storage Temperature Range	-65 to +150		°C
MSL	Moisture Sensitivity		Level 1	

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Output in HIGH or LOW State.  $I_O$  absolute maximum rating must be observed.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Units
$V_{CC}$	Supply Voltage Operating Data Retention Only	2.0	3.3	3.6	V
		1.5	3.3	3.6	
$V_I$	Input Voltage	0		5.5	V
$V_O$	Output Voltage (HIGH or LOW State) (3-State)	0		$V_{CC}$	V
		0		5.5	
$I_{OH}$	HIGH Level Output Current, $V_{CC} = 3.0\text{ V} - 3.6\text{ V}$			-24	mA
$I_{OL}$	LOW Level Output Current, $V_{CC} = 3.0\text{ V} - 3.6\text{ V}$			24	mA
$I_{OH}$	HIGH Level Output Current, $V_{CC} = 2.7\text{ V} - 3.0\text{ V}$			-12	mA
$I_{OL}$	LOW Level Output Current, $V_{CC} = 2.7\text{ V} - 3.0\text{ V}$			12	mA
$T_A$	Operating Free-Air Temperature	-40		+85	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate, $V_{IN}$ from 0.8 V to 2.0 V, $V_{CC} = 3.0\text{ V}$	0		10	ns/V

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MC74LCX374DWR2G	SOIC-20 WB (Pb-Free)	1000 Tape & Reel
MC74LCX374DTR2G	TSSOP-20 (Pb-Free)	2500 Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MC74LCX374

## DC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic	Condition	T <sub>A</sub> = -40°C to +85°C		Units
			Min	Max	
V <sub>IH</sub>	HIGH Level Input Voltage (Note 2)	2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V	2.0		V
V <sub>IL</sub>	LOW Level Input Voltage (Note 2)	2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V		0.8	V
V <sub>OH</sub>	HIGH Level Output Voltage	2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OH</sub> = -100 μA	V <sub>CC</sub> - 0.2		V
		V <sub>CC</sub> = 2.7 V; I <sub>OH</sub> = -12 mA	2.2		
		V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -18 mA	2.4		
		V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = -24 mA	2.2		
V <sub>OL</sub>	LOW Level Output Voltage	2.7 V ≤ V <sub>CC</sub> ≤ 3.6 V; I <sub>OL</sub> = 100 μA		0.2	V
		V <sub>CC</sub> = 2.7 V; I <sub>OL</sub> = 12 mA		0.4	
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 16 mA		0.4	
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 24 mA		0.55	
I <sub>OZ</sub>	3-State Output Current	V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> = 0 to 5.5 V		±5	μA
I <sub>OFF</sub>	Power Off Leakage Current	V <sub>CC</sub> = 0, V <sub>IN</sub> = 5.5 V or V <sub>OUT</sub> = 5.5 V		10	μA
I <sub>IN</sub>	Input Leakage Current	V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = 5.5 V or GND		±5	μA
I <sub>CC</sub>	Quiescent Supply Current	V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> = 5.5 V or GND		10	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	2.3 ≤ V <sub>CC</sub> ≤ 3.6 V; V <sub>IH</sub> = V <sub>CC</sub> - 0.6 V		500	μA

2. These values of V<sub>I</sub> are used to test DC electrical characteristics only.

## AC CHARACTERISTICS (t<sub>R</sub> = t<sub>F</sub> = 2.5 ns; C<sub>L</sub> = 50 pF; R<sub>L</sub> = 500 Ω)

Symbol	Parameter	Waveform	Limits				Units
			T <sub>A</sub> = -40°C to +85°C				
			V <sub>CC</sub> = 3.0 V to 3.6 V		V <sub>CC</sub> = 2.7 V		
			Min	Max	Min	Max	
f <sub>max</sub>	Clock Pulse Frequency	1	150				MHz
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay CP to O <sub>n</sub>	1	1.5	8.5	1.5	9.5	ns
			1.5	8.5	1.5	9.5	
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time to HIGH and LOW Levels	2	1.5	8.5	1.5	9.5	ns
			1.5	8.5	1.5	9.5	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time from HIGH and LOW Levels	2	1.5	7.5	1.5	8.5	ns
			1.5	7.5	1.5	8.5	
t <sub>s</sub>	Setup Time, HIGH or LOW D <sub>n</sub> to CP	1	2.5		2.5		ns
t <sub>h</sub>	Hold Time, HIGH or LOW D <sub>n</sub> to CP	1	1.5		1.5		ns
t <sub>w</sub>	CP Pulse Width, HIGH or LOW	3	3.3		3.3		ns
t <sub>OSHL</sub> t <sub>OSLH</sub>	Output-to-Output Skew (Note 3)			1.0 1.0			ns

3. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t<sub>OSHL</sub>) or LOW-to-HIGH (t<sub>OSLH</sub>); parameter guaranteed by design.

# MC74LCX374

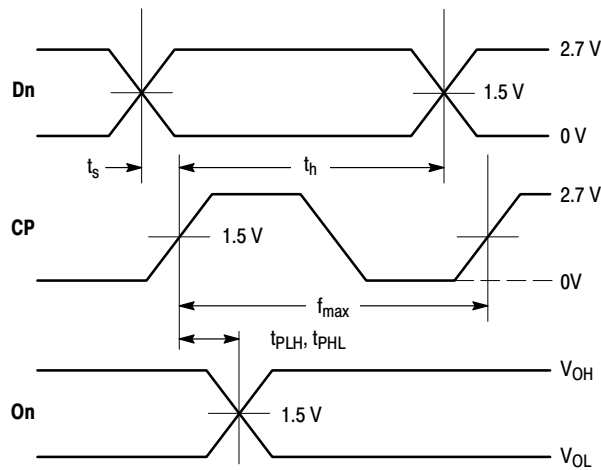
## DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Characteristic	Condition	$T_A = +25^\circ\text{C}$			Units
			Min	Typ	Max	
$V_{OLP}$	Dynamic LOW Peak Voltage (Note 4)	$V_{CC} = 3.3\text{ V}, C_L = 50\text{ pF}, V_{IH} = 3.3\text{ V}, V_{IL} = 0\text{ V}$		0.8		V
$V_{OLV}$	Dynamic LOW Valley Voltage (Note 4)	$V_{CC} = 3.3\text{ V}, C_L = 50\text{ pF}, V_{IH} = 3.3\text{ V}, V_{IL} = 0\text{ V}$		0.8		V

4. Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

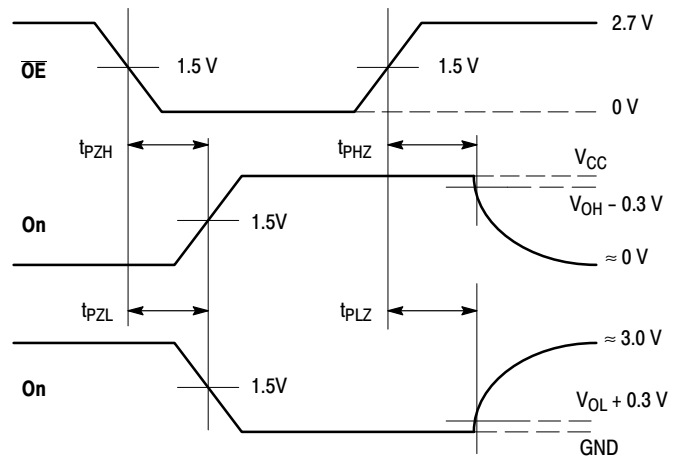
## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Units
$C_{IN}$	Input Capacitance	$V_{CC} = 3.3\text{ V}, V_I = 0\text{ V or } V_{CC}$	7	pF
$C_{OUT}$	Output Capacitance	$V_{CC} = 3.3\text{ V}, V_I = 0\text{ V or } V_{CC}$	8	pF
$C_{PD}$	Power Dissipation Capacitance	10 MHz, $V_{CC} = 3.3\text{ V}, V_I = 0\text{ V or } V_{CC}$	25	pF



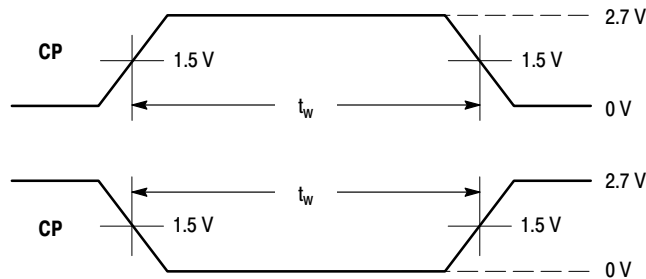
**WAVEFORM 1 - PROPAGATION DELAYS, SETUP AND HOLD TIMES**

$t_R = t_F = 2.5\text{ ns}$ , 10% to 90%;  $f = 1\text{ MHz}$ ;  $t_W = 500\text{ ns}$



**WAVEFORM 2 - OUTPUT ENABLE AND DISABLE TIMES**

$t_R = t_F = 2.5\text{ ns}$ , 10% to 90%;  $f = 1\text{ MHz}$ ;  $t_W = 500\text{ ns}$

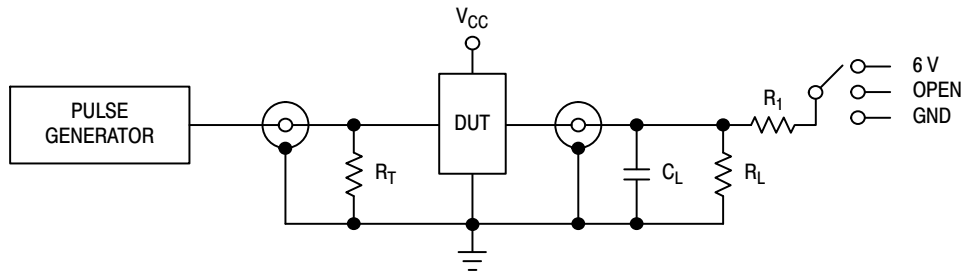


**WAVEFORM 3 - PULSE WIDTH**

$t_R = t_F = 2.5\text{ ns}$  (or fast as required) from 10% to 90%;  
Output requirements:  $V_{OL} \leq 0.8\text{ V}, V_{OH} \geq 2.0\text{ V}$

**Figure 3. AC Waveforms**

# MC74LCX374



TEST	SWITCH
$t_{PLH}$ , $t_{PHL}$	Open
$t_{PZL}$ , $t_{PLZ}$	6 V
Open Collector/Drain $t_{PLH}$ and $t_{PHL}$	6 V
$t_{PZH}$ , $t_{PHZ}$	GND

$C_L = 50 \text{ pF}$  or equivalent (Includes jig and probe capacitance)

$R_L = R_1 = 500 \text{ } \Omega$  or equivalent

$R_T = Z_{OUT}$  of pulse generator (typically  $50 \text{ } \Omega$ )

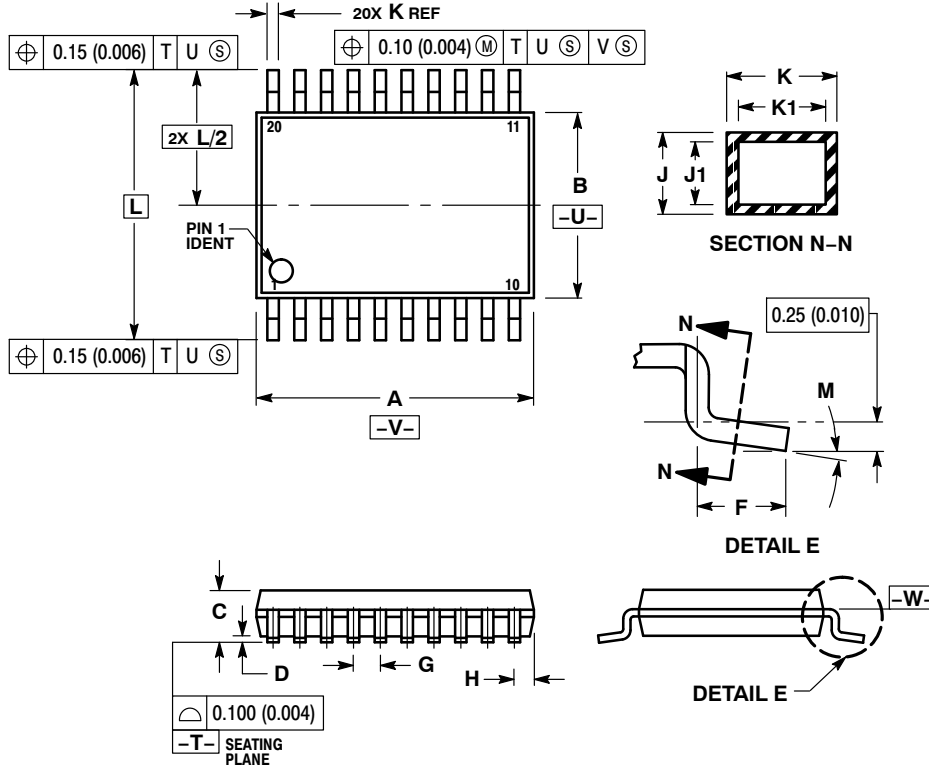
**Figure 4. Test Circuit**



# MC74LCX374

## PACKAGE DIMENSIONS

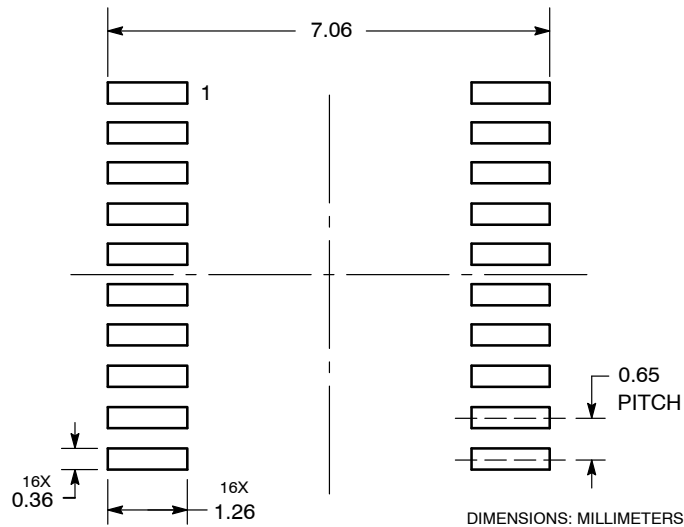
TSSOP-20  
DT SUFFIX  
CASE 948E-02  
ISSUE C



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

### SOLDERING FOOTPRINT





**ON Semiconductor** and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А