

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

# **PIN NAMES**

Pins	Function
OEn	Output Enable Inputs
Dn	Data Inputs
On	3-State Outputs

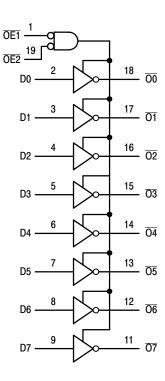


Figure 2. LOGIC DIAGRAM

### **TRUTH TABLE**

INPUTS			OUTPUTS
OE1	OE2	Dn	On
L	L	L	Н
L	L	Н	L
Х	Н	Х	Z
Н	Х	Х	Z

H = High Voltage Level

L = Low Voltage Level

Z = High Impedance State

X = High or Low Voltage Level and Transitions are AcceptableFor  $I_{CC}$  reasons, DO NOT FLOAT Inputs

#### **MAXIMUM RATINGS**

Symbol	Parameter	Value	Condition	Unit
V <sub>CC</sub>	DC Supply Voltage	-0.5 to +7.0		V
VI	DC Input Voltage	$-0.5 \le V_1 \le +7.0$		V
Vo	DC Output Voltage	$-0.5 \le V_O \le +7.0$	Output in 3–State	V
		$-0.5 \le V_{O} \le V_{CC} + 0.5$	Note 1	V
I <sub>IK</sub>	DC Input Diode Current	-50	V <sub>I</sub> < GND	mA
I <sub>OK</sub>	DC Output Diode Current	-50	V <sub>O</sub> < GND	mA
		+50	V <sub>O</sub> > V <sub>CC</sub>	mA
I <sub>O</sub>	DC Output Source/Sink Current	±50		mA
I <sub>CC</sub>	DC Supply Current Per Supply Pin	±100		mA
I <sub>GND</sub>	DC Ground Current Per Ground Pin	±100		mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150		°C

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<sub>O</sub> absolute maximum rating must be observed.

### **RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min	Тур	Max	Unit
V <sub>CC</sub>	Supply Voltage Operating Data Retention Only	2.0 1.5	3.3 3.3	3.6 3.6	V
VI	Input Voltage	0		5.5	V
Vo	Output Voltage (HIGH or LOW State) (3–State)	0		V <sub>CC</sub> 5.5	٧
I <sub>OH</sub>	HIGH Level Output Current, V <sub>CC</sub> = 3.0 V - 3.6 V			-24	mA
I <sub>OL</sub>	LOW Level Output Current, V <sub>CC</sub> = 3.0 V – 3.6 V			24	mA
I <sub>OH</sub>	HIGH Level Output Current, V <sub>CC</sub> = 2.7 V - 3.0 V			-12	mA
I <sub>OL</sub>	LOW Level Output Current, V <sub>CC</sub> = 2.7 V – 3.0 V			12	mA
T <sub>A</sub>	Operating Free–Air Temperature			+85	°C
Δt/ΔV	Input Transition Rise or Fall Rate, $V_{IN}$ from 0.8 V to 2.0 V, $V_{CC}$ = 3.0 V	0		10	ns/V

# **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
MC74LCX540DWR2	SOIC-20	1000 Tape & Reel
MC74LCX540DR2G	SOIC-20 (Pb-Free)	1000 Tape & Reel
MC74LCX540DT	TSSOP-20*	75 Units / Rail
MC74LCX540DTR2	TSSOP-20*	2000 Tape & Reel
MC74LCX540MEL	SOEIAJ-20	2000 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. \*This package is inherently Pb-Free.

### DC ELECTRICAL CHARACTERISTICS

			T <sub>A</sub> = −40°C	to +85°C	
Symbol	Characteristic	Condition	Min	Max	Unit
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	$2.7 \text{ V} \le \text{V}_{CC} \le 3.6 \text{ V}; \text{ I}_{OH} = -100 \mu\text{A}$	V <sub>CC</sub> – 0.2		V
		V <sub>CC</sub> = 2.7 V; I <sub>OH</sub> = -12 mA	2.2		1
		V <sub>CC</sub> = 3.0 V; I <sub>OH</sub> = −18 mA	2.4		1
		$V_{CC} = 3.0 \text{ V; } I_{OH} = -24 \text{ mA}$	2.2		1
V <sub>OL</sub>	LOW Level Output Voltage	$2.7 \text{ V} \le \text{V}_{CC} \le 3.6 \text{ V}; \text{I}_{OL} = 100 \mu\text{A}$		0.2	V
		V <sub>CC</sub> = 2.7 V; I <sub>OL</sub> = 12 mA		0.4	1
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 16 mA		0.4	1
		V <sub>CC</sub> = 3.0 V; I <sub>OL</sub> = 24 mA		0.55	
IĮ	Input Leakage Current	$2.7 \text{ V} \le \text{V}_{CC} \le 3.6 \text{ V}; 0 \text{ V} \le \text{V}_{I} \le 5.5 \text{ V}$		±5.0	μΑ
I <sub>OZ</sub>	3-State Output Current	$2.7 \le V_{CC} \le 3.6 \text{ V}; 0 \text{ V} \le V_{O} \le 5.5 \text{ V};$ $V_{I} = V_{IH} \text{ or V }_{IL}$		±5.0	μΑ
I <sub>OFF</sub>	Power-Off Leakage Current	$V_{CC} = 0 \text{ V}; V_{I} \text{ or } V_{O} = 5.5 \text{ V}$		10	μΑ
I <sub>CC</sub>	Quiescent Supply Current	$2.7 \le V_{CC} \le 3.6 \text{ V}; V_I = \text{GND or } V_{CC}$		10	μΑ
		$2.7 \le V_{CC} \le 3.6 \text{ V}; 3.6 \le V_{I} \text{ or } V_{O} \le 5.5 \text{ V}$		±10	μΑ
$\Delta I_{CC}$	Increase in I <sub>CC</sub> per Input	$2.7 \le V_{CC} \le 3.6 \text{ V}; V_{IH} = V_{CC} - 0.6 \text{ V}$		500	μΑ

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

# AC CHARACTERISTICS ( $t_R = t_F = 2.5 ns; C_L = 50 pF; R_L = 500 \Omega$ )

				Limits		
			T <sub>A</sub>	= -40°C to +8	35°C	
			V <sub>CC</sub> = 3.0	V to 3.6 V	V <sub>CC</sub> = 2.7 V	
Symbol	Parameter	Waveform	Min	Max	Max	Unit
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Input to Output	1	1.5 1.5	6.5 6.5	7.5 7.5	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time to High and Low Level	2	1.5 1.5	8.5 8.5	9.5 9.5	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time From High and Low Level	2	1.5 1.5	7.5 7.5	8.5 8.5	ns
t <sub>OSHL</sub>	Output-to-Output Skew (Note 3)			1.0 1.0		ns

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.

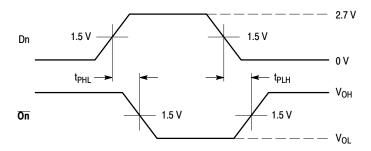
### **DYNAMIC SWITCHING CHARACTERISTICS**

			T,	<sub>A</sub> = +25°	С	
Symbol	Characteristic	Condition	Min	Тур	Max	Unit
V <sub>OLP</sub>	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
Volv	Dynamic LOW Valley Voltage (Note 4)	$V_{CC} = 3.3 \text{ V}, C_1 = 50 \text{ pF}, V_{IH} = 3.3 \text{ V}, V_{II} = 0 \text{ V}$		0.8		V

<sup>4.</sup> 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.

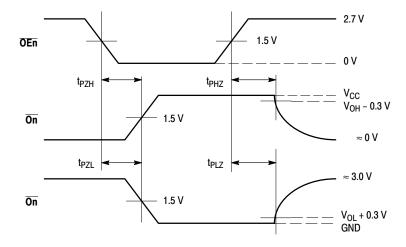
#### **CAPACITIVE CHARACTERISTICS**

Symbol	Parameter	Condition	Typical	Unit
C <sub>IN</sub>	Input Capacitance	$V_{CC} = 3.3 \text{ V}, V_{I} = 0 \text{ V or } V_{CC}$	7	pF
C <sub>OUT</sub>	Output Capacitance	$V_{CC} = 3.3 \text{ V}, V_I = 0 \text{ V or } V_{CC}$	8	pF
C <sub>PD</sub>	Power Dissipation Capacitance	10 MHz, $V_{CC} = 3.3V$ , $V_I = 0 V$ or $V_{CC}$	25	pF



#### **WAVEFORM 1 - PROPAGATION DELAYS**

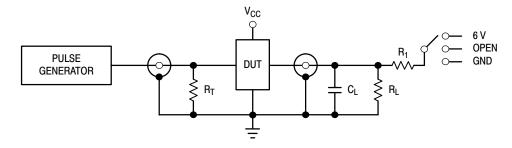
 $t_R = t_F = 2.5 \text{ ns}, 10\% \text{ to } 90\%; f = 1 \text{ MHz}; t_W = 500 \text{ ns}$ 



### WAVEFORM 2 - OUTPUT ENABLE AND DISABLE TIMES

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

Figure 3. AC Waveforms



TEST	SWITCH
t <sub>PLH</sub> , t <sub>PHL</sub>	Open
t <sub>PZL</sub> , t <sub>PLZ</sub>	6 V
Open Collector/Drain t <sub>PLH</sub> and t <sub>PHL</sub>	6 V
t <sub>PZH</sub> , t <sub>PHZ</sub>	GND

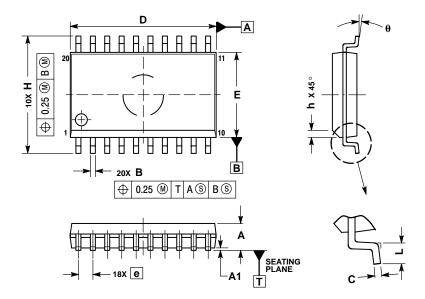
 $C_L$  = 50 pF or equivalent (Includes jig and probe capacitance)  $R_L$  =  $R_1$  = 500  $\Omega$  or equivalent

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

Figure 4. Test Circuit

#### PACKAGE DIMENSIONS

#### SOIC-20 **DW SUFFIX** CASE 751D-05 ISSUE G



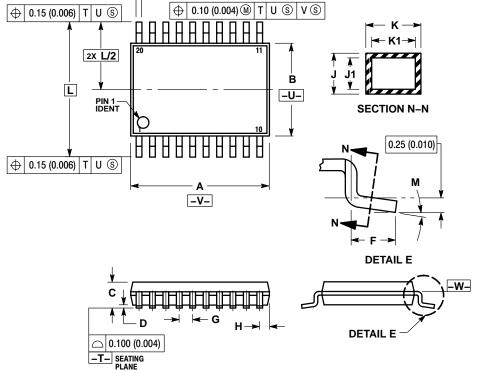
20X **K** REF

#### NOTES:

- DIMENSIONS ARE IN MILLIMETERS.
  INTERPRET DIMENSIONS AND TOLERANCES
  PER ASME Y14.5M, 1994.
- DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
- PROTRUSION: MAXIMUM MOLD PROTRUSION 0.15 PER SIDE. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		
DIM	MIN	MAX	
Α	2.35	2.65	
A1	0.10	0.25	
В	0.35 0.		
С	0.23	0.32	
D	12.65	12.95	
E	7.40	7.60	
е	1.27	BSC	
Н	10.05	10.55	
h	0.25	0.75	
L	0.50	0.90	
A	0 0	7 °	

#### TSSOP-20 **DT SUFFIX** CASE 948E-02 **ISSUE B**



#### NOTES:

- DTES:

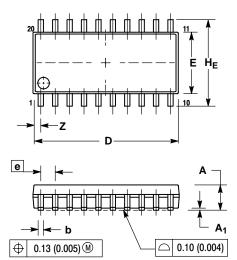
  1. DIMENSIONING AND TOLERANCING
  PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION:
  MILLIMETER.
  3. DIMENSION A DOES NOT INCLUDE
  MOLD FLASH, PROTRUSIONS OR GATE
  BURRS. MOLD FLASH OR GATE BURRS
  SHALL NOT EXCEED 0.15 (0.006) PER
  SIDE
- SIDE.
  4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH 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 DAMBAR FOR THOSING STALL BOOM (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION. 3. TERMINAL NUMBERS ARE SHOWN
- FOR REFERENCE ONLY.

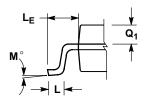
  7. DIMENSION A AND B ARE TO BE
  DETERMINED AT DATUM PLANE -W-.

	MILLIMETERS		INC	HES
DIM	MIN	MAX	MIN	MAX
Α	6.40	6.60	0.252	0.260
В	4.30	4.50	0.169	0.177
С		1.20		0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026	BSC
Н	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40		0.252 BSC	
M	0°	8°	0°	8°

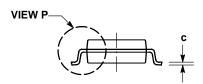
#### **PACKAGE DIMENSIONS**

#### SOEIAJ-20 **M SUFFIX** CASE 967-01 **ISSUE O**





**DETAIL P** 



- NOTES:
  1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTR

  - PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006)
    PER SIDE.
    TERMINAL NUMBERS ARE SHOWN FOR
    REFERENCE ONLY.
    THE LEAD WIDTH DIMENSION (b) DOES NOT
    INCLUDE DAMBAR PROTRUSION. ALLOWABLE
    DAMBAR PROTRUSION SHALL BE 0.08 (0.003)
    TOTAL IN EXCESS OF THE LEAD WIDTH
    DIMENSION AT MAXIMUM MATERIAL CONDITION.
    DAMBAR CANNOT BE LOCATED ON THE LOWER
    RADIUS OR THE FOOT. MINIMUM SPACE
    BETWEEN PROTRUSIONS AND ADJACENT LEAD
    TO BE 0.46 (0.018).

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
Α		2.05		0.081
A <sub>1</sub>	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
C	0.18	0.27	0.007	0.011
D	12.35	12.80	0.486	0.504
Е	5.10	5.45	0.201	0.215
е	1.27 BSC		0.050 BSC	
HE	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
LE	1.10	1.50	0.043	0.059
M	0 °	10 °	0 °	10°
Q <sub>1</sub>	0.70	0.90	0.028	0.035
Z		0.81		0.032

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