MC74HC540A

Octal 3-State Inverting Buffer/Line Driver/Line Receiver

High–Performance Silicon–Gate CMOS

The MC74HC540A is identical in pinout to the LS540. The device inputs are compatible with Standard CMOS outputs. External pull–up resistors make them compatible with LSTTL outputs.

The HC540A is an octal inverting buffer/line driver/line receiver designed to be used with 3–state memory address drivers, clock drivers, and other bus–oriented systems. This device features inputs and outputs on opposite sides of the package and two ANDed active–low output enables.

The HC540A is similar in function to the HC541A, which has noninverting outputs.

- Output Drive Capability: 15 LSTTL Loads
- Outputs Directly Interface to CMOS, NMOS, and TTL
- Operating Voltage Range: 2 to 6 V
- Low Input Current: 1 μA
- High Noise Immunity Characteristic of CMOS Devices
- In Compliance With the JEDEC Standard No. 7A Requirements
- Chip Complexity: 124 FETs or 31 Equivalent Gates

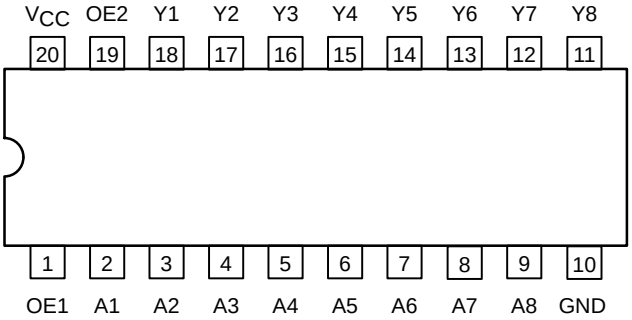


Figure 1. Pinout: 20–Lead Packages (Top View)

FUNCTION TABLE

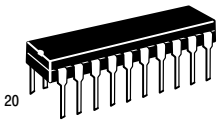
Inputs			Output Y
OE1	OE2	A	
L	L	L	H
L	L	H	L
H	X	X	Z
X	H	X	Z

Z = High Impedance
X = Don't Care

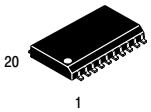
ON Semiconductor

http://onsemi.com

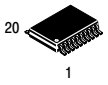
MARKING DIAGRAMS

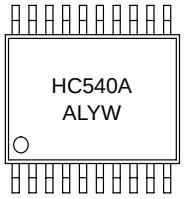


PDIP–20
N SUFFIX
CASE 783



SO–20
DW SUFFIX
CASE 751D





TSSOP–20
DT SUFFIX
CASE 948E

A = Assembly Location
L, WL = Wafer Lot
Y, YY = Year
W, WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
MC74HC540AN	PDIP–20	1440/Box
MC74HC540ADW	SOIC–WIDE	38/Rail
MC74HC540ADWR2	SOIC–WIDE	1000/Reel
MC74HC540ADT	TSSOP–20	75/Rail
MC74HC540ADTR2	TSSOP–20	2500/Reel

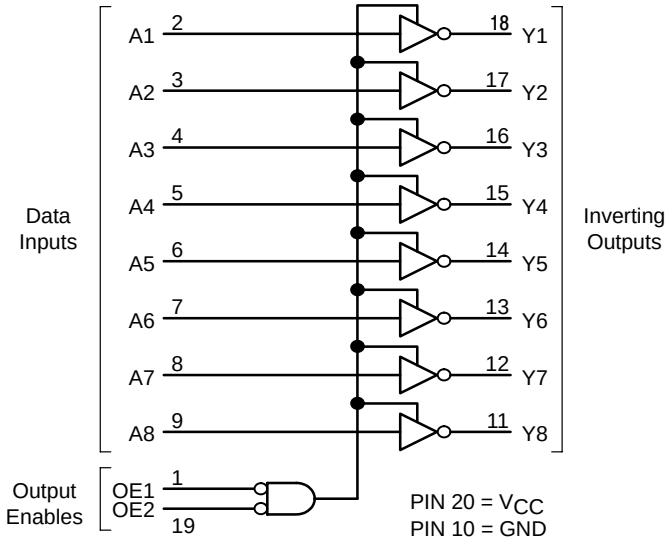


Figure 2. Logic Diagram

MAXIMUM RATINGS (Note 1.)

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +7.0	V
V_I	DC Input Voltage		−0.5 to V_{CC} +0.5	V
V_O	DC Output Voltage	(Note 2.)	−0.5 ≤ V_O ≤ V_{CC} +0.5	V
I_{IK}	DC Input Diode Current		±20	mA
I_{OK}	DC Output Diode Current		±35	mA
I_O	DC Output Sink Current		±35	mA
I_{CC}	DC Supply Current per Supply Pin		±75	mA
I_{GND}	DC Ground Current per Ground Pin		±75	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	Junction Temperature Under Bias		+150	°C
θ_{JA}	Thermal Resistance	PDIP SOIC TSSOP	67 96 128	°C/W
P_D	Power Dissipation in Still Air at 85°C	PDIP SOIC TSSOP	750 500 450	mW
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating	Oxygen Index: 30% – 35%	UL–94–VO (0.125 in)	
V_{ESD}	ESD Withstand Voltage	Human Body Model (Note 3.) Machine Model (Note 4.) Charged Device Model (Note 5.)	>2000 >200 >1000	V
$I_{LATCH-UP}$	Latch–Up Performance	Above V_{CC} and Below GND at 85°C (Note 6.)	±300	mA

1. Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Extended exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum–rated conditions is not implied.
2. I_O absolute maximum rating must be observed.
3. Tested to EIA/JESD22–A114–A.
4. Tested to EIA/JESD22–A115–A.
5. Tested to JESD22–C101–A.
6. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	DC Supply Voltage	(Referenced to GND)	2.0	6.0	V
V_{in}, V_{out}	DC Input Voltage, Output Voltage	(Referenced to GND)	0	V_{CC}	V
T_A	Operating Temperature, All Package Types		−55	+125	°C
t_r, t_f	Input Rise and Fall Time (Figure 3)	V_{CC} = 2.0 V V_{CC} = 4.5 V V_{CC} = 6.0 V	0 0 0	1000 500 400	ns

7. Unused inputs may not be left open. All inputs must be tied to a high– or low–logic input voltage level.

DC CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Condition	V_{CC} V	Guaranteed Limit –55 to 25°C	Guaranteed Limit ≤85°C	Guaranteed Limit ≤125°C	Unit
V_{IH}	Minimum High–Level Input Voltage	V_{out} = 0.1 V $\|I_{out}\| \le 20$ μA	2.0 3.0 4.5 6.0	1.50 2.10 3.15 4.20	1.50 2.10 3.15 4.20	1.50 2.10 3.15 4.20	V
V_{IL}	Maximum Low–Level Input Voltage	$V_{out} = V_{CC}$ – 0.1 V $\|I_{out}\| \le 20$ μA	2.0 3.0 4.5 6.0	0.50 0.90 1.35 1.80	0.50 0.90 1.35 1.80	0.50 0.90 1.35 1.80	V
V_{OH}	Minimum High–Level Output Voltage	$V_{in} = V_{IL}$ $\|I_{out}\| \le 20$ μA	2.0 4.5 6.0	1.9 4.4 5.9	1.9 4.4 5.9	1.9 4.4 5.9	V
		$V_{in} = V_{IL}$ $\|I_{out}\| \le 3.6$ mA $\|I_{out}\| \le 6.0$ mA $\|I_{out}\| \le 7.8$ mA	3.0 4.5 6.0	2.48 3.98 5.48	2.34 3.84 5.34	2.20 3.70 5.20	
V_{OL}	Maximum Low–Level Output Voltage	$V_{in} = V_{IH}$ $\|I_{out}\| \le 20$ μA	2.0 4.5 6.0	0.1 0.1 0.1	0.1 0.1 0.1	0.1 0.1 0.1	V
		$V_{in} = V_{IH}$ $\|I_{out}\| \le 3.6$ mA $\|I_{out}\| \le 6.0$ mA $\|I_{out}\| \le 7.8$ mA	3.0 4.5 6.0	0.26 0.26 0.26	0.33 0.33 0.33	0.40 0.40 0.40	
I_{in}	Maximum Input Leakage Current	$V_{in} = V_{CC}$ or GND	6.0	±0.1	±1.0	±1.0	μA
I_{OZ}	Maximum Three–State Leakage Current	Output in High Impedance State $V_{in} = V_{IL}$ or V_{IH} $V_{out} = V_{CC}$ or GND	6.0	±0.5	±5.0	±10.0	μA
I_{CC}	Maximum Quiescent Supply Current (per Package)	$V_{in} = V_{CC}$ or GND I_{out} = 0 μA	6.0	4	40	160	μA

8. Information on typical parametric values can be found in the ON Semiconductor High–Speed CMOS Data Book (DL129/D).

AC CHARACTERISTICS (C_L = 50 pF, Input $t_r = t_f$ = 6 ns)

Symbol	Parameter	V_{CC} V	Guaranteed Limit –55 to 25°C	Guaranteed Limit ≤85°C	Guaranteed Limit ≤125°C	Unit
t_{PLH}, t_{PHL}	Maximum Propagation Delay, Input A to Output Y (Figures 3 and 5)	2.0 3.0 4.5 6.0	80 30 18 15	100 40 23 20	120 55 28 25	ns
t_{PLZ}, t_{PHZ}	Maximum Propagation Delay, Output Enable to Output Y (Figures 4 and 6)	2.0 3.0 4.5 6.0	110 45 25 21	140 60 31 26	165 75 38 31	ns
t_{PZL}, t_{PZH}	Maximum Propagation Delay, Output Enable to Output Y (Figures 4 and 6)	2.0 3.0 4.5 6.0	110 45 25 21	140 60 31 26	165 75 38 31	ns
t_{TLH}, t_{THL}	Maximum Output Transition Time, Any Output (Figures 3 and 5)	2.0 3.0 4.5 6.0	60 22 12 10	75 28 15 13	90 34 18 15	ns
C_{in}	Maximum Input Capacitance		10	10	10	pF
C_{out}	Maximum Three–State Output Capacitance (Output in High Impedance State)		15	15	15	pF

9. For propagation delays with loads other than 50 pF, and information on typical parametric values, see the ON Semiconductor High–Speed CMOS Data Book (DL129/D).

		Typical @ 25°C, V_{CC} = 5.0 V, V_{EE} = 0 V	
C_{PD}	Power Dissipation Capacitance (Per Buffer) (Note 10.)	35	pF

10. Used to determine the no–load dynamic power consumption: $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$. For load considerations, see the ON Semiconductor High–Speed CMOS Data Book (DL129/D).

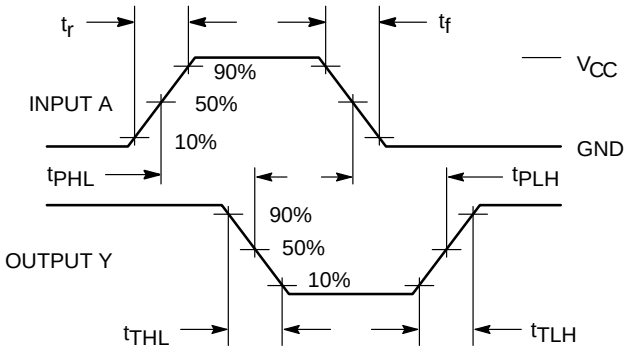


Figure 3. Switching Waveform

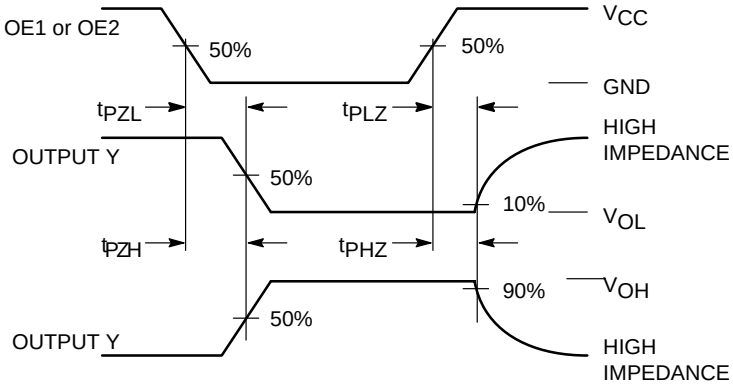
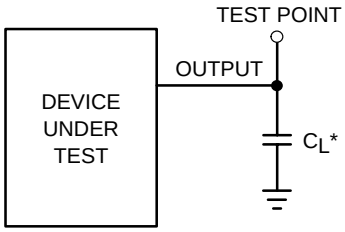
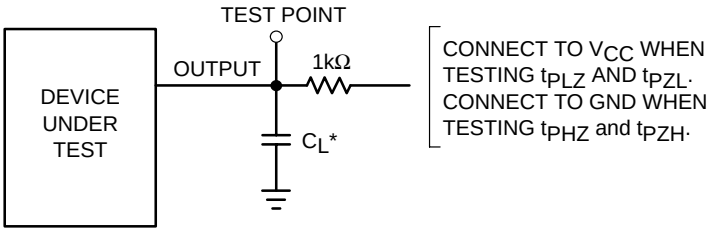


Figure 4. Switching Waveform



*Includes all probe and jig capacitance

Figure 5. Test Circuit



*Includes all probe and jig capacitance

Figure 6. Test Circuit

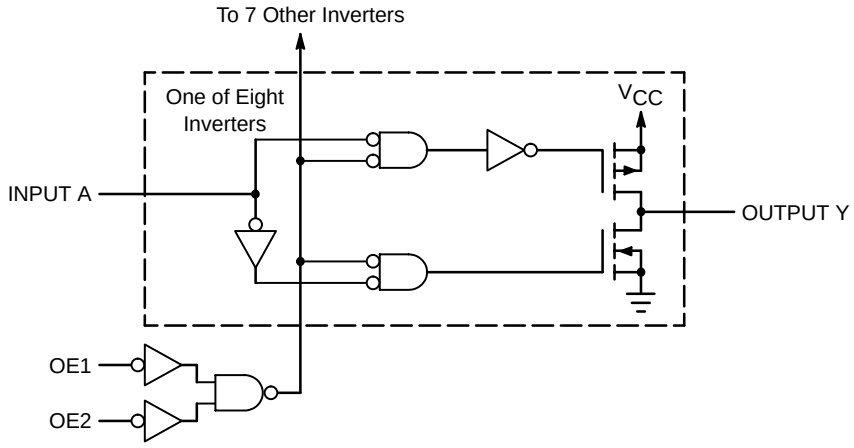


Figure 7. Logic Detail

PIN DESCRIPTIONS

INPUTS

A1, A2, A3, A4, A5, A6, A7, A8 (PINS 2, 3, 4, 5, 6, 7, 8, 9)

Data input pins. Data on these pins appear in inverted form on the corresponding Y outputs, when the outputs are enabled.

CONTROLS

OE1, OE2 (PINS 1, 19)

Output enables (active–low). When a low voltage is applied to both of these pins, the outputs are enabled and the device functions as an inverter. When a high voltage is applied to either input, the outputs assume the high impedance state.

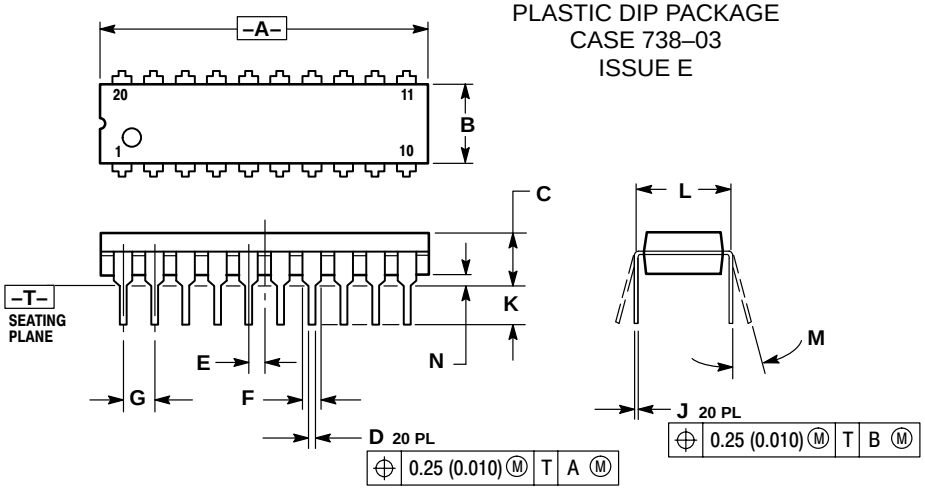
OUTPUTS

Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8 (PINS 18, 17, 16, 15, 14, 13, 12, 11)

Device outputs. Depending upon the state of the output enable pins, these outputs are either inverting outputs or high–impedance outputs.

PACKAGE DIMENSIONS

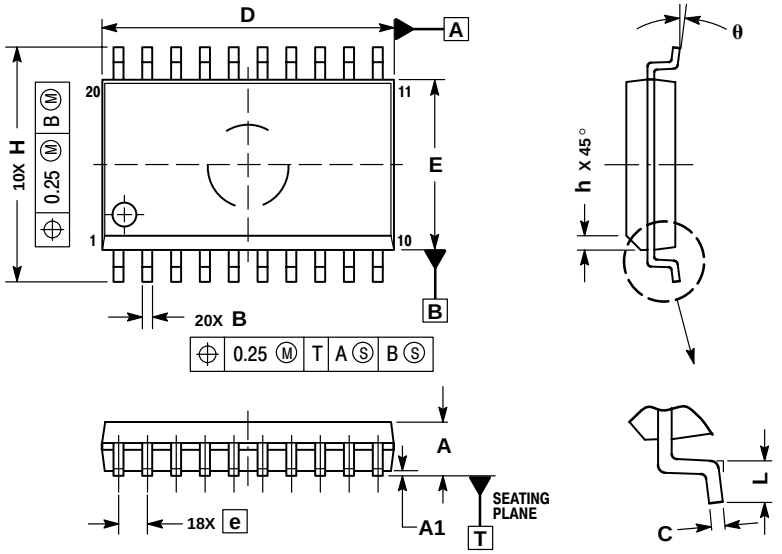
PDIP–20
N SUFFIX
PLASTIC DIP PACKAGE
CASE 738–03
ISSUE E



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.010	1.070	25.66	27.17
B	0.240	0.260	6.10	6.60
C	0.150	0.180	3.81	4.57
D	0.015	0.022	0.39	0.55
E	0.050 BSC		1.27 BSC	
F	0.050	0.070	1.27	1.77
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0 °	15 °	0 °	15 °
N	0.020	0.040	0.51	1.01

SO–20
DW SUFFIX
CASE 751D–05
ISSUE F

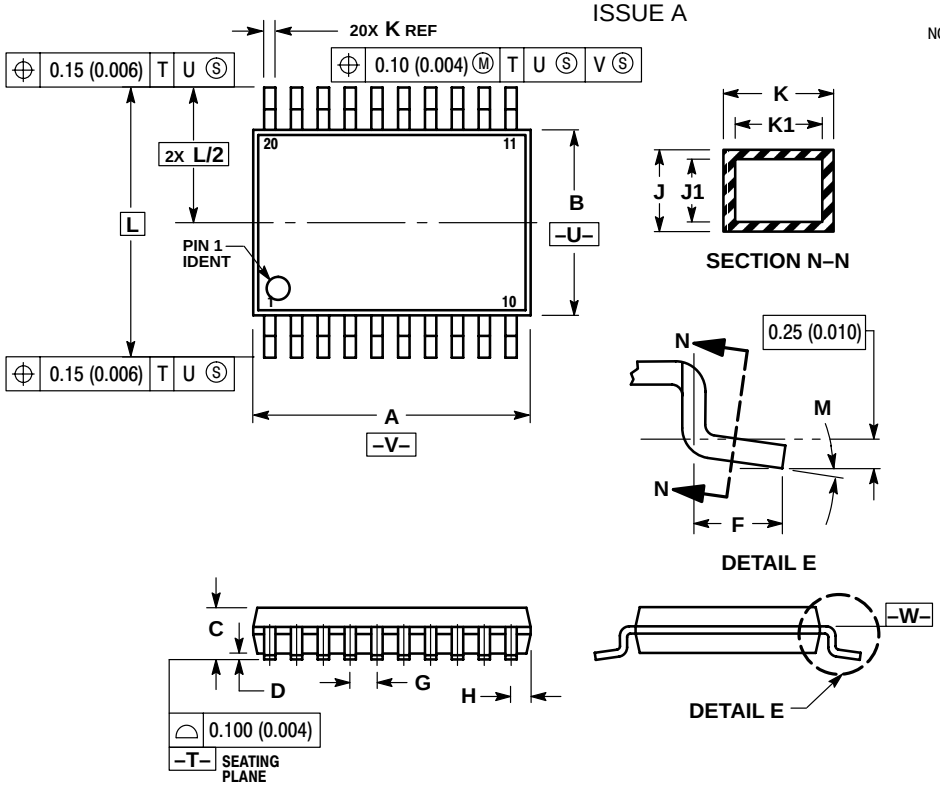


NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS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

	MILLIMETERS	
DIM	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
θ	0 °	7 °

PACKAGE DIMENSIONS

TSSOP–20
DT SUFFIX
CASE 948E–02
ISSUE A



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–.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	---	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	
H	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 BSC		0.252 BSC	
M	0°	8°	0°	8°

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
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