MC74AC14, MC74ACT14

Hex Inverter Schmitt Trigger

The MC74AC14/74ACT14 contains six logic inverters which accept standard CMOS Input signals (TTL levels for MC74ACT14) and provide standard CMOS output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter−free output signals. In addition, they have a greater noise margin then conventional inverters.

The MC74AC14/74ACT14 has hysteresis between the positive−going and negative−going input thresholds (typically 1.0 V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

Features

- Schmitt Trigger Inputs
- Outputs Source/Sink 24 mA
- MC74ACT14 Has TTL Compatible Inputs
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
DC Supply Voltage (Referenced to GND)	V_{CC}	−0.5 to +7.0	V
DC Input Voltage (Referenced to GND)	V_{in}	−0.5 to V_{CC} +0.5	V
DC Output Voltage (Referenced to GND)	V_{out}	−0.5 to V_{CC} +0.5	V
DC Input Current, per Pin	I_{in}	±20	mA
DC Output Sink/Source Current, per Pin	I_{out}	±50	mA
DC V_{CC} or GND Current per Output Pin	I_{CC}	±50	°C
Storage Temperature	T_{stg}	−65 to +150	mJ

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
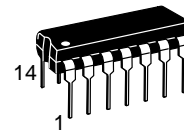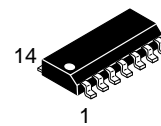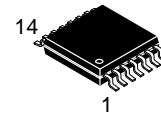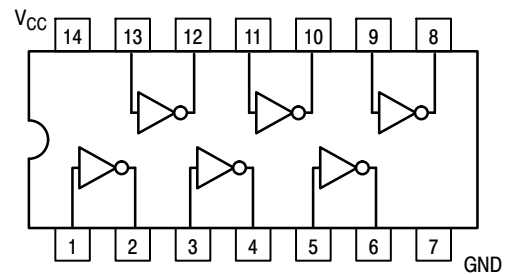
PDIP−14
SUFFIX N
CASE 646

SOIC−14
SUFFIX D
CASE 751A

TSSOP−14
SUFFIX DT
CASE 948G

(Top View)

Figure 1. Pinout: 14−Lead Packages Conductors

FUNCTION TABLE

Input	Output
A	**O**
L	H
H	L

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 4 of this data sheet.

MC74AC14, MC74ACT14

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	'AC	2.0	5.0	6.0	V
		'ACT	4.5	5.0	5.5	
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Ref. to GND)		0	–	V_{CC}	V
t_r, t_f	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V_{CC} @ 3.0 V	–	150	–	ns/V
		V_{CC} @ 4.5 V	–	40	–	
		V_{CC} @ 5.5 V	–	25	–	
t_r, t_f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V_{CC} @ 4.5 V	–	10	–	ns/V
		V_{CC} @ 5.5 V	–	8.0	–	
T_J	Junction Temperature (PDIP)		–	–	140	°C
T_A	Operating Ambient Temperature Range		–40	25	85	°C
I_{OH}	Output Current – High		–	–	–24	mA
I_{OL}	Output Current – Low		–	–	24	mA

1. V_{in} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.
2. V_{in} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	74AC T_A = +25°C	74AC T_A = –40°C to +85°C	Unit	Conditions
			Typ	Guaranteed Limits		
V_{OH}	Minimum High Level Output Voltage	3.0 4.5 5.5	2.99 4.49 5.49	2.9 / 2.9 4.4 / 4.4 5.4 / 5.4	V	I_{OUT} = –50 µA
		3.0 4.5 5.5	– – –	2.56 / 2.46 3.86 / 3.76 4.86 / 4.76	V	*V_{IN} = V_{IL} or V_{IH} –12 mA I_{OH} –24 mA –24 mA
V_{OL}	Maximum Low Level Output Voltage	3.0 4.5 5.5	0.002 0.001 0.001	0.1 / 0.1 0.1 / 0.1 0.1 / 0.1	V	I_{OUT} = 50 µA
		3.0 4.5 5.5	– – –	0.36 / 0.44 0.36 / 0.44 0.36 / 0.44	V	*V_{IN} = V_{IL} or V_{IH} 12 mA I_{OL} 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	–	±0.1 / ±1.0	µA	V_I = V_{CC}, GND
I_{OLD}	†Minimum Dynamic Output Current	5.5	–	– / 75	mA	V_{OLD} = 1.65 V Max
I_{OHD}		5.5	–	– / –75	mA	V_{OHD} = 3.85 V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	–	4.0 / 40	µA	V_{IN} = V_{CC} or GND

*All outputs loaded; thresholds on input associated with output under test.
†Maximum test duration 2.0 ms, one output loaded at a time.
NOTE: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

AC CHARACTERISTICS (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

Symbol	Parameter	V_{CC}* (V)	74AC T_A = +25°C C_L = 50 pF			74AC T_A = –40°C to +85°C C_L = 50 pF		Unit	Figure No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay	3.3 5.0	1.5 1.5	9.5 7.0	13.5 10.0	1.5 1.5	15.0 11.0	ns	3–5
t_{PHL}	Propagation Delay	3.3 5.0	1.5 1.5	7.5 6.0	11.5 8.5	1.5 1.5	13.0 9.5	ns	3–5

*Voltage Range 3.3 V is 3.3 V ±0.3 V.   Voltage Range 5.0 V is 5.0 V ±0.5 V.

MC74AC14, MC74ACT14

INPUT CHARACTERISTICS (unless otherwise specified)

Symbol	Parameter	V_CC (V)	74AC	74ACT		Test Conditions
V_{t+}	Maximum Positive Threshold	3.0 4.5 5.5	2.2 3.2 3.9	– 2.0 2.0	V	T_A = Worst Case
V_{t-}	Minimum Negative Threshold	3.0 4.5 5.5	0.5 0.9 1.1	– 0.8 0.8	V	T_A = Worst Case
$V_{h(max)}$	Maximum Hysteresis	3.0 4.5 5.5	1.2 1.4 1.6	– 1.2 1.2	V	T_A = Worst Case
$V_{h(min)}$	Minimum Hysteresis	3.0 4.5 5.5	0.3 0.4 0.5	– 0.4 0.4	V	T_A = Worst Case

DC CHARACTERISTICS

Symbol	Parameter	V_CC (V)	74ACT T_A = +25°C Typ	74ACT T_A = –40°C to +85°C Guaranteed Limits	Unit	Conditions
V_{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 4.4 5.4 5.4	V	I_{OUT} = –50 μA
		4.5 5.5	– –	3.86 3.76 4.86 4.76	V	*V_{IN} = V_{IL} or V_{IH} I_{OH} –24 mA –24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1 0.1 0.1	V	I_{OUT} = 50 μA
		4.5 5.5	– –	0.36 0.44 0.36 0.44	V	*V_{IN} = V_{IL} or V_{IH} 24 mA I_{OL} 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	–	±0.1 ±1.0	μA	V_I = V_{CC}, GND
ΔI_{CCT}	Additional Max. I_{CC}/Input	5.5	0.6	– 1.5	mA	V_I = V_{CC} – 2.1 V
I_{OLD}	†Minimum Dynamic Output Current	5.5	–	– 75	mA	V_{OLD} = 1.65 V Max
I_{OHD}		5.5	–	– –75	mA	V_{OHD} = 3.85 V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	–	4.0 40	μA	V_{IN} = V_{CC} or GND

*All outputs loaded; thresholds on input associated with output under test.
†Maximum test duration 2.0 ms, one output loaded at a time.

AC CHARACTERISTICS (For Figures and Waveforms – See Section 3 of the ON Semiconductor FACT Data Book, DL138/D)

Symbol	Parameter	V_CC* (V)	74ACT T_A = +25°C C_L = 50 pF			74ACT T_A = –40°C to +85°C C_L = 50 pF		Unit	Figure No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay	5.0	1.5	–	11.5	1.0	12.5	ns	3–5
t_{PHL}	Propagation Delay	5.0	1.5	–	10.0	1.0	11.0	ns	3–5

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = 5.0 V
C_{PD}	Power Dissipation Capacitance	25	pF	V_{CC} = 5.0 V

MC74AC14, MC74ACT14

ORDERING INFORMATION

Device	Package	Shipping†
MC74AC14NG	PDIP–14 (Pb–Free)	25 Units / Rail
MC74ACT14NG	PDIP–14 (Pb–Free)	
MC74AC14DG	SOIC–14 (Pb–Free)	55 Units / Rail
MC74AC14DR2G	SOIC–14 (Pb–Free)	2500 / Tape & Reel
NLV74AC14DR2G*	SOIC–14 (Pb–Free)	2500 / Tape & Reel
MC74ACT14DG	SOIC–14 (Pb–Free)	55 Units / Rail
MC74ACT14DR2G	SOIC–14 (Pb–Free)	2500 / Tape & Reel
MC74AC14DTR2G	TSSOP–14 (Pb–Free)	
MC74ACT14DTR2G	TSSOP–14 (Pb–Free)	

†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.
*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q100 Qualified and PPAP Capable.

MARKING DIAGRAMS

PDIP–14


```
14
MC74AC14N
○ AWLYYWWG
1
```

```
14
MC74ACT14N
○ AWLYYWWG
1
```

SOIC–14


```
14
AC14G
○ AWLYWW
1
```

```
14
ACT14G
○ AWLYWW
1
```

TSSOP–14


```
14
AC
14
ALYW■
1
```

```
14
ACT
14
ALYW■
1
```
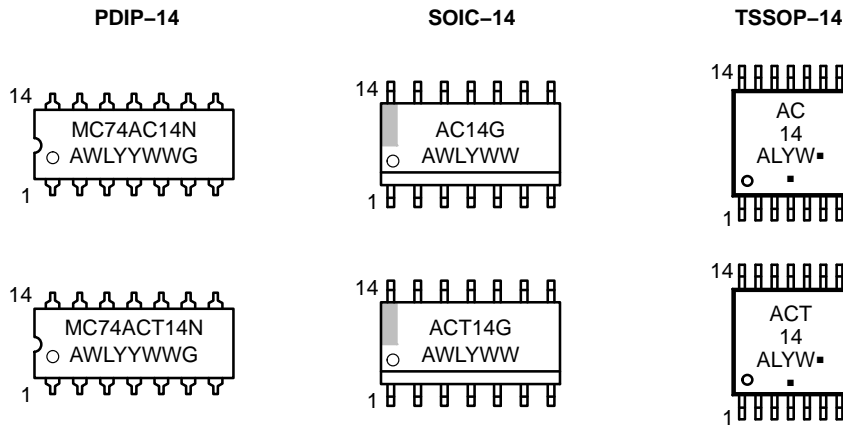
A   = Assembly Location
WL, L   = Wafer Lot
YY, Y   = Year
WW, W   = Work Week
G or ■ = Pb–Free Package
(Note: Microdot may be in either location)

MC74AC14, MC74ACT14

PACKAGE DIMENSIONS

PDIP−14
CASE 646−06
ISSUE R

TOP VIEW

END VIEW
WITH LEADS CONSTRAINED
NOTE 5

SIDE VIEW

⊕ | 0.010 Ⓜ | C | A Ⓜ | B Ⓜ

END VIEW
NOTE 6
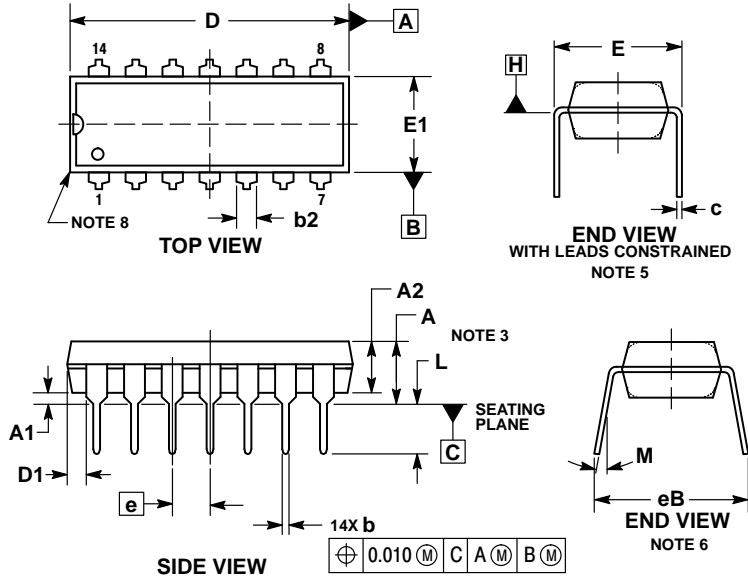
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSIONS A, A1 AND L ARE MEASURED WITH THE PACK-AGE SEATED IN JEDEC SEATING PLANE GAUGE GS−3.
4. DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 0.10 INCH.
5. DIMENSION E IS MEASURED AT A POINT 0.015 BELOW DATUM PLANE H WITH THE LEADS CONSTRAINED PERPENDICULAR TO DATUM C.
6. DIMENSION E3 IS MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED.
7. DATUM PLANE H IS COINCIDENT WITH THE BOTTOM OF THE LEADS, WHERE THE LEADS EXIT THE BODY.
8. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	–––––	0.210	–––	5.33
A1	0.015	–––––	0.38	–––
A2	0.115	0.195	2.92	4.95
b	0.014	0.022	0.35	0.56
b2	0.060 TYP		1.52 TYP	
C	0.008	0.014	0.20	0.36
D	0.735	0.775	18.67	19.69
D1	0.005	–––––	0.13	–––
E	0.300	0.325	7.62	8.26
E1	0.240	0.280	6.10	7.11
e	0.100 BSC		2.54 BSC	
eB	–––––	0.430	–––	10.92
L	0.115	0.150	2.92	3.81
M	–––––	10°	–––	10°

MC74AC14, MC74ACT14
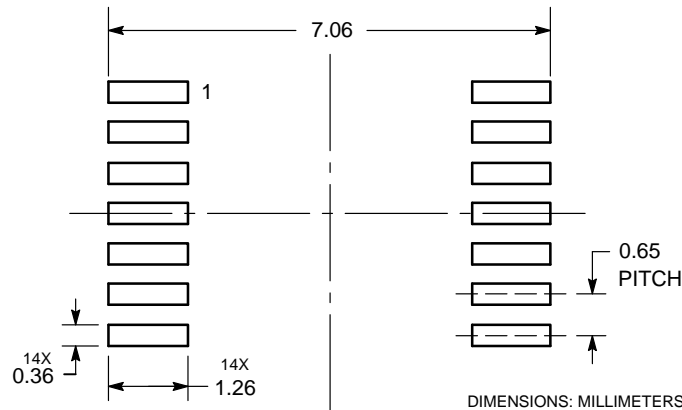
PACKAGE DIMENSIONS

SOIC−14 NB
CASE 751A−03
ISSUE K
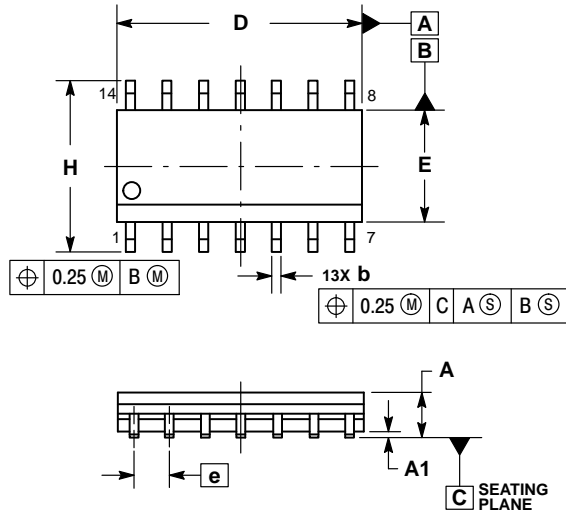
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0 °	7 °	0 °	7 °

DETAIL A

SEATING PLANE

DETAIL A

SOLDERING FOOTPRINT*

14X
1.18

1.27 PITCH

6.50

14X
0.58

1

DIMENSIONS: MILLIMETERS
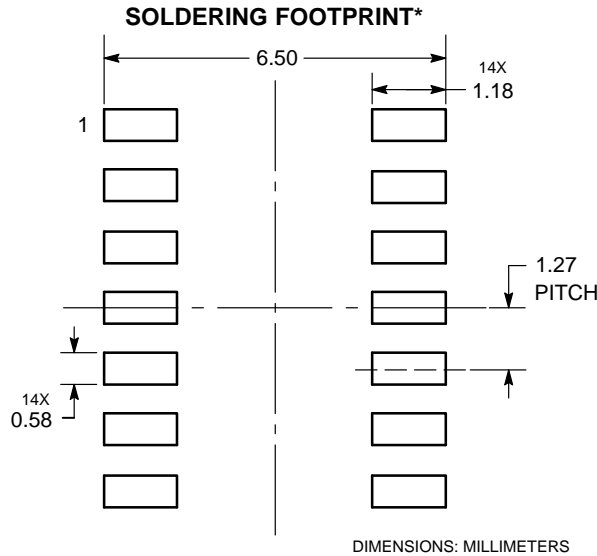
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

TSSOP–14
CASE 948G
ISSUE B
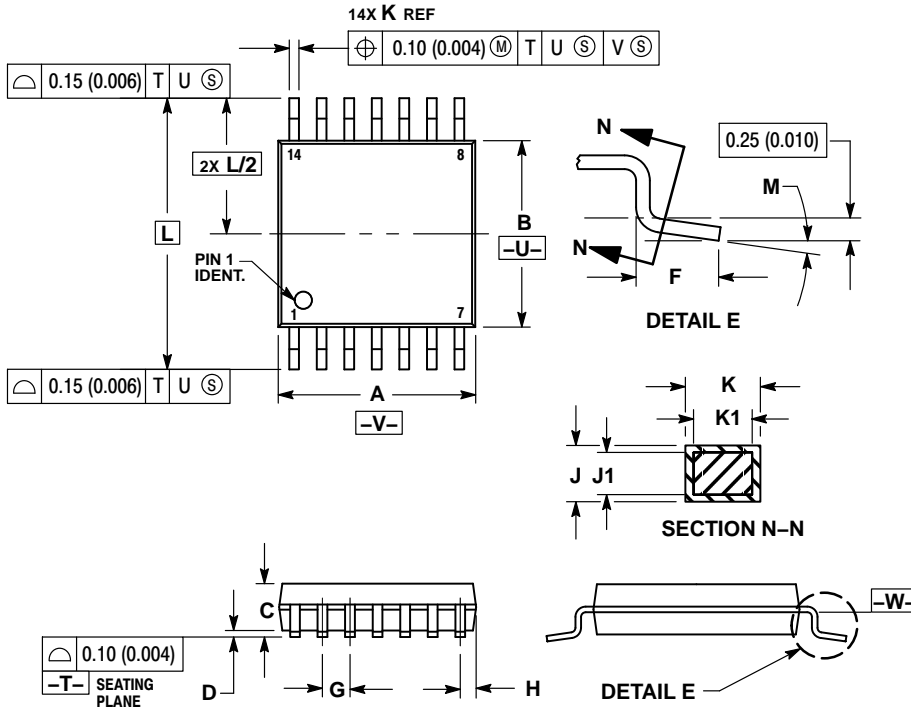
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD 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–.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	4.90	5.10	0.193	0.200
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	0.50	0.60	0.020	0.024
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 °

DETAIL E

SECTION N–N

SOLDERING FOOTPRINT*

DIMENSIONS: MILLIMETERS