MC14106B

Hex Schmitt Trigger

The MC14106B hex Schmitt Trigger is constructed with MOS P−channel and N−channel enhancement mode devices in a single monolithic structure. These devices find primary use where low power dissipation and/or high noise immunity is desired. The MC14106B may be used in place of the MC14069UB hex inverter for enhanced noise immunity or to "square up" slowly changing waveforms.

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high−impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $V_{SS} \leq (V_{in}$ or $V_{out}) \leq V_{DD}$.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.

Features

- Increased Hysteresis Voltage Over the MC14584B
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low−power TTL Loads or One Low−power Schottky TTL Load Over the Rated Temperature Range
- Pin−for−Pin Replacement for CD40106B and MM74C14
- Can Be Used to Replace the MC14584B or MC14069UB
- 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 and are RoHS Compliant

MAXIMUM RATINGS (Voltages Referenced to V_{SS})

| Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage Range	−0.5 to +18.0	V
V_{in}, V_{out}	Input or Output Voltage Range (DC or Transient)	−0.5 to V_{DD} + 0.5	V
I_{in}, I_{out}	Input or Output Current (DC or Transient) per Pin	±10	mA
P_D	Power Dissipation, per Package (Note 1)	500	mW
T_A	Ambient Temperature Range	−55 to +125	°C
T_{stg}	Storage Temperature Range	−65 to +150	°C
T_L	Lead Temperature (8−Second Soldering)	260	°C

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.
1. Temperature Derating: "D/DW" Packages: −7.0 mW/°C From 65°C To 125°C

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http://onsemi.com
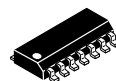
SOIC−14 NB
D SUFFIX
CASE 751A
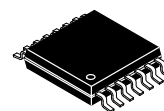
TSSOP−14
DT SUFFIX
CASE 948G

MARKING DIAGRAMS

14
14106BG
AWLYWW
1

SOIC−14 NB

14
14
106B
ALYW∎
1

TSSOP−14
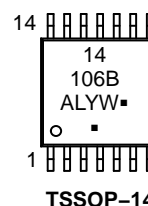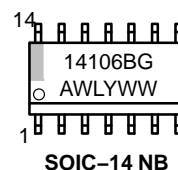
A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G or ∎ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

MC14106B

V_{DD} = PIN 14
V_{SS} = PIN 7
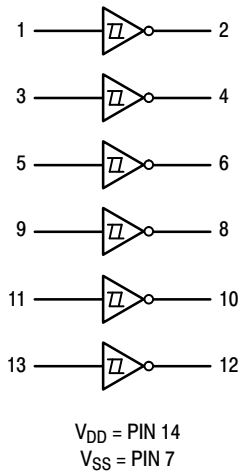
Figure 1. Logic Diagram
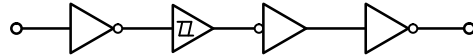
**Figure 2. Equivalent Circuit Schematic
(1/6 of Circuit Shown)**

ORDERING INFORMATION

Device	Package	Shipping†
MC14106BDG	SOIC−14 NB (Pb−Free)	55 Units / Rail
NLV14106BDG*	SOIC−14 NB (Pb−Free)	55 Units / Rail
MC14106BDR2G	SOIC−14 NB (Pb−Free)	2500 / Tape & Reel
NLV14106BDR2G*	SOIC−14 NB (Pb−Free)	2500 / Tape & Reel
MC14106BDTR2G	TSSOP−14 (Pb−Free)	2500 / Tape & Reel
NLV14106BDTR2G*	TSSOP−14 (Pb−Free)	2500 / Tape & Reel

†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.

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	−55°C Min	−55°C Max	25°C Min	25°C Typ (Note 2)	25°C Max	125°C Min	125°C Max	Unit
Output Voltage "0" Level $V_{in} = V_{DD}$	V_{OL}	5.0 10 15	– – –	0.05 0.05 0.05	– – –	0 0 0	0.05 0.05 0.05	– – –	0.05 0.05 0.05	Vdc
"1" Level $V_{in} = 0$	V_{OH}	5.0 10 15	4.95 9.95 14.95	– – –	4.95 9.95 14.95	5.0 10 15	– – –	4.95 9.95 14.95	– – –	Vdc
Hysteresis Voltage	V_H [5]	5.0 10 15	0.3 1.2 1.6	2.0 3.4 5.0	0.3 1.2 1.6	1.1 1.7 2.1	2.0 3.4 5.0	0.3 1.2 1.6	2.0 3.4 5.0	Vdc
Threshold Voltage Positive–Going	V_{T+}	5.0 10 15	2.2 4.6 6.8	3.6 7.1 10.8	2.2 4.6 6.8	2.9 5.9 8.8	3.6 7.1 10.8	2.2 4.6 6.8	3.6 7.1 10.8	Vdc
Negative–Going	V_{T-}	5.0 10 15	0.9 2.5 4.0	2.8 5.2 7.4	0.9 2.5 4.0	1.9 3.9 5.8	2.8 5.2 7.4	0.9 2.5 4.0	2.8 5.2 7.4	Vdc
Output Drive Current (V_{OH} = 2.5 Vdc) Source (V_{OH} = 4.6 Vdc) (V_{OH} = 9.5 Vdc) (V_{OH} = 13.5 Vdc)	I_{OH}	5.0 5.0 10 15	–3.0 –0.64 –1.6 –4.2	– – – –	–2.4 –0.51 –1.3 –3.4	–4.2 –0.88 –2.25 –8.8	– – – –	–1.7 –0.36 –0.9 –2.4	– – – –	mAdc
(V_{OL} = 0.4 Vdc) Sink (V_{OL} = 0.5 Vdc) (V_{OL} = 1.5 Vdc)	I_{OL}	5.0 10 15	0.64 1.6 4.2	– – –	0.51 1.3 3.4	0.88 2.25 8.8	– – –	0.36 0.9 2.4	– – –	mAdc
Input Current	I_{in}	15	–	±0.1	–	±0.00001	±0.1	–	±1.0	µAdc
Input Capacitance (V_{in} = 0)	C_{in}	–	–	–	–	5.0	7.5	–	–	pF
Quiescent Current (Per Package)	I_{DD}	5.0 10 15	– – –	0.25 0.5 1.0	– – –	0.0005 0.0010 0.0015	0.25 0.5 1.0	– – –	7.5 15 30	µAdc
Total Supply Current (Notes 3 & 4) (Dynamic plus Quiescent, Per Package) (C_L = 50 pF on all outputs, all buffers switching)	I_T	5.0 10 15		$I_T = (1.8\ \mu A/kHz)\ f + I_{DD}$ $I_T = (3.6\ \mu A/kHz)\ f + I_{DD}$ $I_T = (5.4\ \mu A/kHz)\ f + I_{DD}$					µAdc

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.
3. The formulas given are for the typical characteristics only at 25°C.
4. To calculate total supply current at loads other than 50 pF:
   $I_T(C_L) = I_T(50\ pF) + (C_L − 50)\ Vfk$ where I_T is in µA (per package), C_L in pF, V = ($V_{DD} − V_{SS}$) in volts, f in kHz is input frequency, and k = 0.001.
5. $V_H = V_{T+} − V_{T-}$ (But maximum variation of V_H is specified as less that $V_{T+\ max} − V_{T-\ min}$).

MC14106B

SWITCHING CHARACTERISTICS (C_L = 50 pF, T_A = 25°C)

Characteristic	Symbol	V_{DD} Vdc	Min	Typ (Note 6)	Max	Unit
Output Rise Time	t_{TLH}	5.0	–	100	200	ns
		10	–	50	100	
		15	–	40	80	
Output Fall Time	t_{THL}	5.0	–	100	200	ns
		10	–	50	100	
		15	–	40	80	
Propagation Delay Time	t_{PLH}, t_{PHL}	5.0	–	125	250	ns
		10	–	50	100	
		15	–	40	80	

6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.
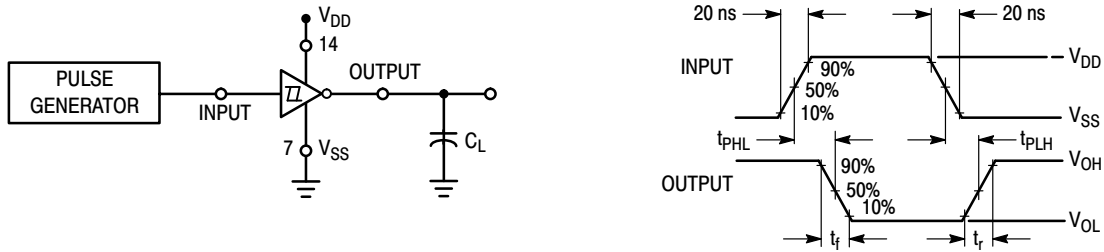
Figure 1. Switching Time Test Circuit and Waveforms
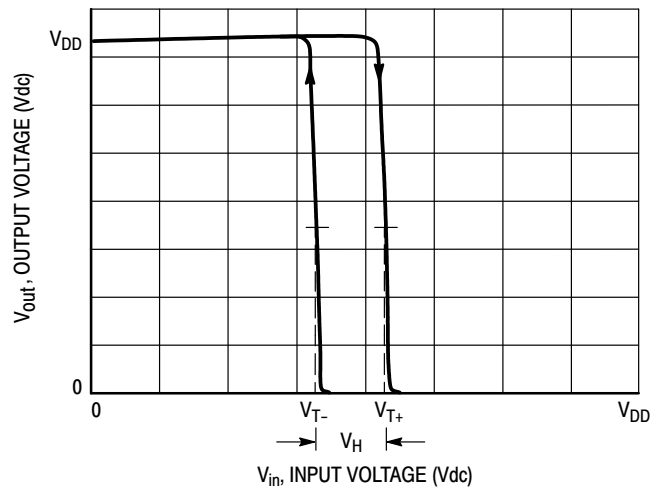
Figure 2. Typical Transfer Characteristics

MC14106B

APPLICATIONS

V_{in} o——▷○—— o V_{out}

**(a) Schmitt Triggers will square up
inputs with slow rise and fall times.**

**(b) A Schmitt trigger offers maximum
noise immunity in gate applications.**

Figure 3.

$$tw = RC\ IN\ \frac{V_{DD}}{V_{T+}}$$
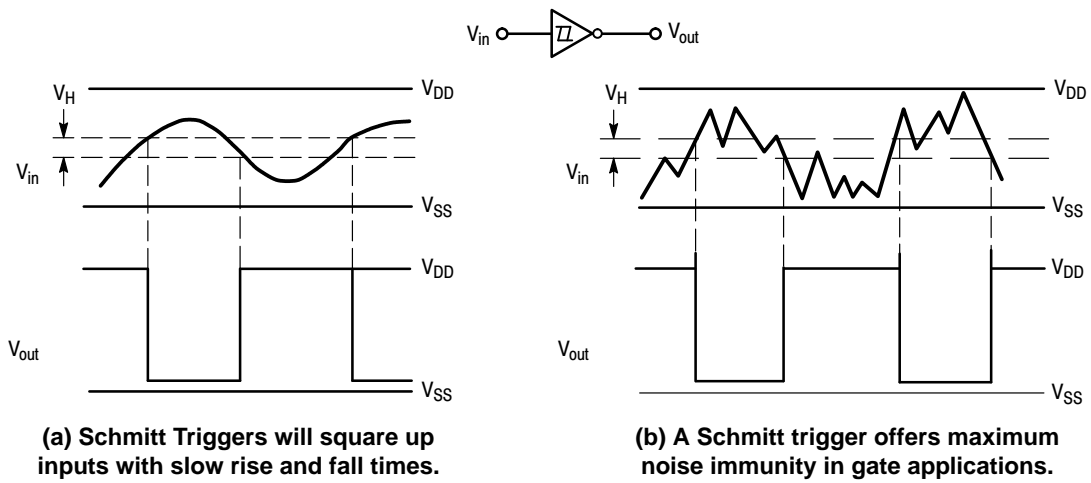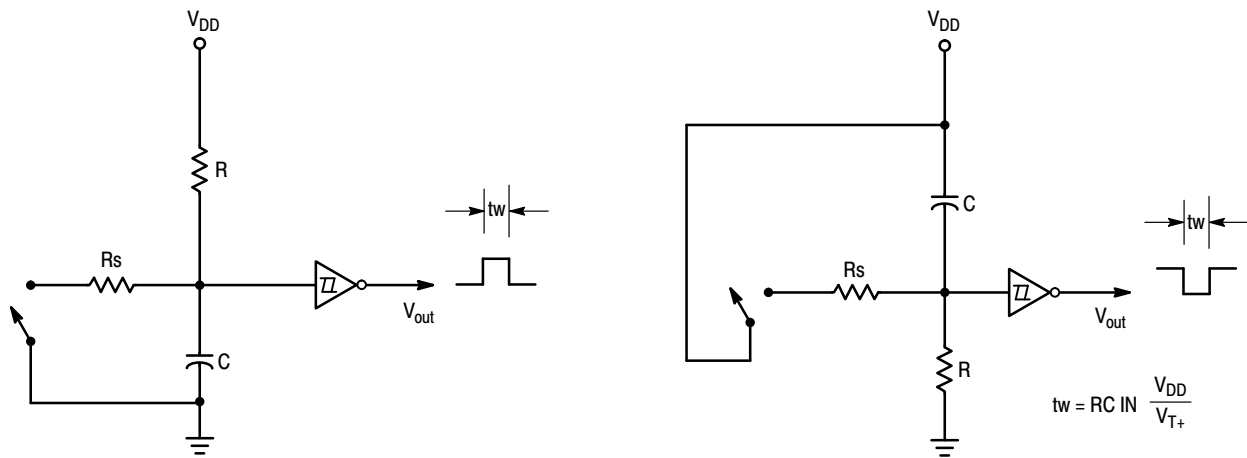
Useful as Pushbutton/Keyboard Debounce Circuit.

Figure 4. Monostable Multivibrator

$$*t_1 \approx RC \ln \frac{V_{T+}}{V_{T-}}$$

$$*t_2 \approx RC \ln \frac{V_{DD} - V_{T-}}{V_{DD} - V_{T+}}$$

$$\frac{1}{f} \approx RC \ln\left[\left(\frac{V_{DD} - V_{T-}}{V_{DD} - V_{T+}}\right)\left(\frac{V_{T+}}{V_{T-}}\right)\right]$$

$*t_1 + t_2 \gg t_{PHL} + t_{PLH}$
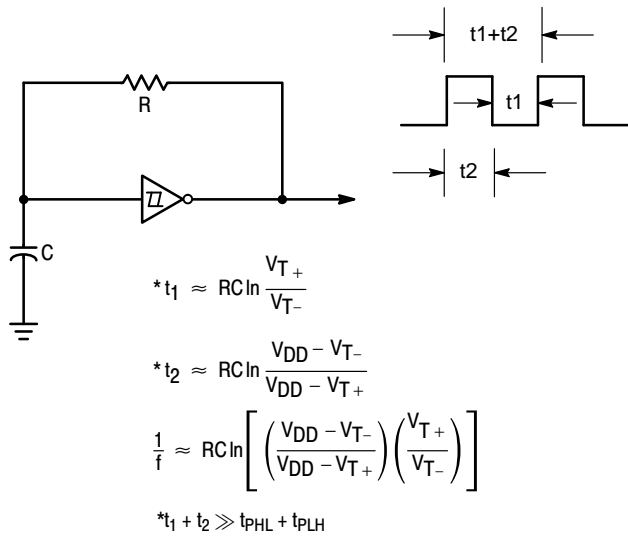
Figure 5. Astable Multivibrator
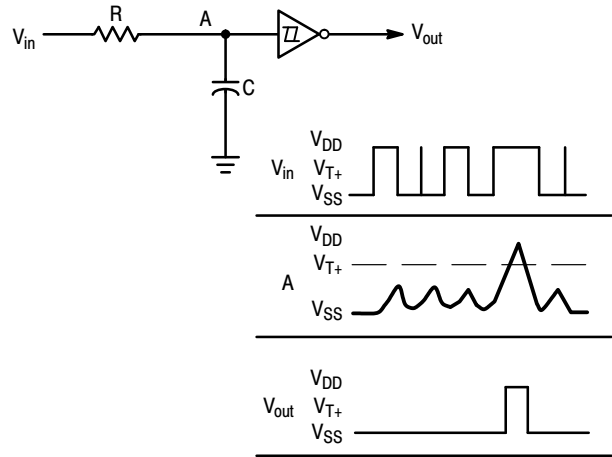
Useful in discriminating against short pulse durations.

Figure 6. Integrator

$$tw = RC \ln \frac{V_{DD}}{V_{T+}}$$
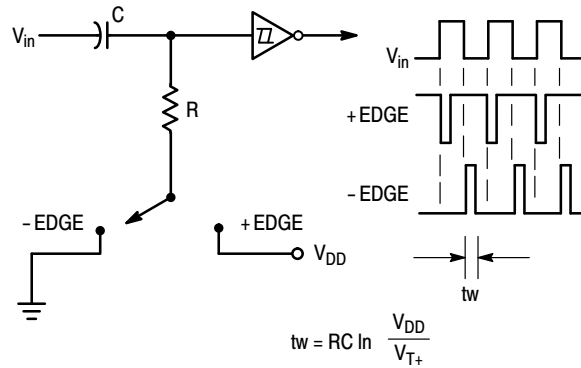
Useful as an edge detector circuit.

Figure 7. Differentiator
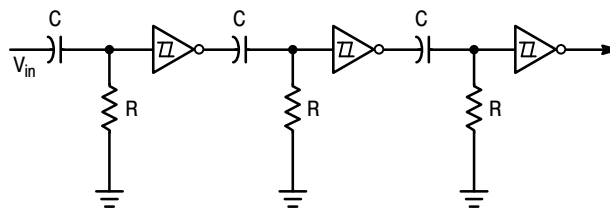
Figure 8. Positive Edge Time Delay Circuit

MC14106B

PACKAGE DIMENSIONS
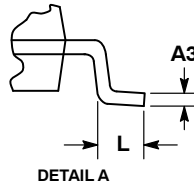
TSSOP−14
CASE 948G
ISSUE B

14X **K** REF

⊕ | 0.10 (0.004) Ⓜ | T | U Ⓢ | V Ⓢ

◻ | 0.15 (0.006) | T | U Ⓢ

2X **L/2**

L

PIN 1
IDENT.

◻ | 0.15 (0.006) | T | U Ⓢ

A

−V−

B
−U−

DETAIL E

0.25 (0.010)

M

N

N

F

K

K1

J   J1

SECTION N−N

C

◻ | 0.10 (0.004)

−T− SEATING
PLANE

D   **G**   **H**

DETAIL E

−W−

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		INCHES	
	MIN	MAX	MIN	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 °

SOLDERING FOOTPRINT*

7.06

1

0.65
PITCH

14X
0.36

14X
1.26

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.

ON Semiconductor®

SOIC−14 NB
CASE 751A−03
ISSUE L

DATE 03 FEB 2016

14

1

SCALE 1:1

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

X 45 °

SOLDERING FOOTPRINT*

6.50

14X
1.18

1

1.27
PITCH

14X
0.58

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.

GENERIC
MARKING DIAGRAM*

14

XXXXXXXXXG
AWLYWW

1

XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
G = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot " ▪", may or may not be present.

STYLES ON PAGE 2

DOCUMENT NUMBER:	98ASB42565B		
DESCRIPTION:	SOIC−14 NB		PAGE 1 OF 2

STYLE 1:
PIN 1. COMMON CATHODE
    2. ANODE/CATHODE
    3. ANODE/CATHODE
    4. NO CONNECTION
    5. ANODE/CATHODE
    6. NO CONNECTION
    7. ANODE/CATHODE
    8. ANODE/CATHODE
    9. ANODE/CATHODE
    10. NO CONNECTION
    11. ANODE/CATHODE
    12. ANODE/CATHODE
    13. NO CONNECTION
    14. COMMON ANODE

STYLE 2:
        CANCELLED

STYLE 3:
PIN 1. NO CONNECTION
    2. ANODE
    3. ANODE
    4. NO CONNECTION
    5. ANODE
    6. NO CONNECTION
    7. ANODE
    8. ANODE
    9. ANODE
    10. NO CONNECTION
    11. ANODE
    12. ANODE
    13. NO CONNECTION
    14. COMMON CATHODE

STYLE 4:
PIN 1. NO CONNECTION
    2. CATHODE
    3. CATHODE
    4. NO CONNECTION
    5. CATHODE
    6. NO CONNECTION
    7. CATHODE
    8. CATHODE
    9. CATHODE
    10. NO CONNECTION
    11. CATHODE
    12. CATHODE
    13. NO CONNECTION
    14. COMMON ANODE

STYLE 5:
PIN 1. COMMON CATHODE
    2. ANODE/CATHODE
    3. ANODE/CATHODE
    4. ANODE/CATHODE
    5. ANODE/CATHODE
    6. NO CONNECTION
    7. COMMON ANODE
    8. COMMON CATHODE
    9. ANODE/CATHODE
    10. ANODE/CATHODE
    11. ANODE/CATHODE
    12. ANODE/CATHODE
    13. NO CONNECTION
    14. COMMON ANODE

STYLE 6:
PIN 1. CATHODE
    2. CATHODE
    3. CATHODE
    4. CATHODE
    5. CATHODE
    6. CATHODE
    7. CATHODE
    8. ANODE
    9. ANODE
    10. ANODE
    11. ANODE
    12. ANODE
    13. ANODE
    14. ANODE

STYLE 7:
PIN 1. ANODE/CATHODE
    2. COMMON ANODE
    3. COMMON CATHODE
    4. ANODE/CATHODE
    5. ANODE/CATHODE
    6. ANODE/CATHODE
    7. ANODE/CATHODE
    8. ANODE/CATHODE
    9. ANODE/CATHODE
    10. ANODE/CATHODE
    11. COMMON CATHODE
    12. COMMON ANODE
    13. ANODE/CATHODE
    14. ANODE/CATHODE

STYLE 8:
PIN 1. COMMON CATHODE
    2. ANODE/CATHODE
    3. ANODE/CATHODE
    4. NO CONNECTION
    5. ANODE/CATHODE
    6. ANODE/CATHODE
    7. COMMON ANODE
    8. COMMON ANODE
    9. ANODE/CATHODE
    10. ANODE/CATHODE
    11. NO CONNECTION
    12. ANODE/CATHODE
    13. ANODE/CATHODE
    14. COMMON CATHODE

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DESCRIPTION:	SOIC−14 NB		PAGE 2 OF 2