

High-Speed Dual-Differential Comparator/Sense Amp

NE521

Features

- TTL-Compatible Strokes and Outputs
- Large Common-Mode Input Voltage Range
- Operates from Standard Supply Voltages
- Pb-Free Packages are Available

Applications

- MOS Memory Sense Amp
- A-to-D Conversion
- High-Speed Line Receiver

MAXIMUM RATINGS

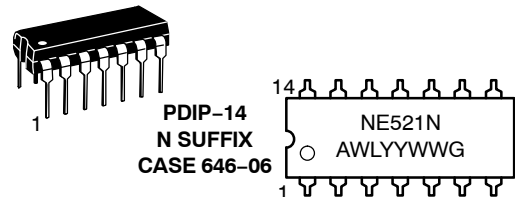
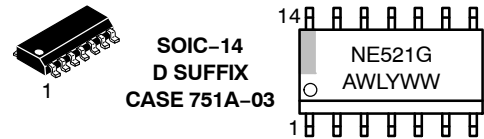
Rating	Symbol	Value	Unit
Supply Voltage			V
Positive	V_+	+7.0	
Negative	V_-	-7.0	
Differential Input Voltage	V_{IDR}	± 6.0	V
Input Voltage	V_{IN}		V
Common Mode		± 5.0	
Stroke/Gate		+5.25	
Maximum Power Dissipation (Note 1)	P_D		mW
$T_A = 25^\circ\text{C}$ (Still-Air)			
N Package		1420	
D Package		1040	
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$		$^\circ\text{C/W}$
N Package		100	
D Package		145	
Operating Temperature Range	T_A	0 to 70	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_J	150	$^\circ\text{C}$
Lead Soldering Temperature (10 sec max)	T_{sld}	+230	$^\circ\text{C}$

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. Derate above 25°C at the following rates:

- N package at 10 mW/ $^\circ\text{C}$
- D package at 6.9 mW/ $^\circ\text{C}$.

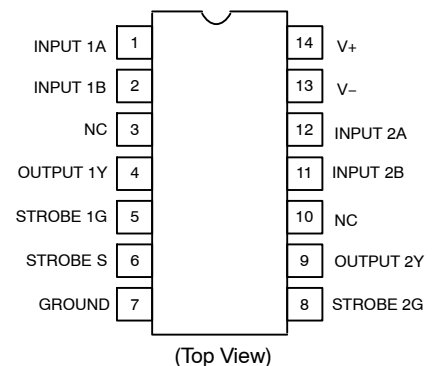
MARKING DIAGRAMS



A = Assembly Location
 WL = Wafer Lot
 Y, YY = Year
 WW = Work Week
 G = Pb-Free Package

PIN CONNECTIONS

D, N Packages



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 5.

LOGIC FUNCTION TABLE

$V_{ID} (A^+, B)$	Strobe S	Strobe G	Output (Y)
$V_{ID} \leq -V_{OS}$	H	H	L
$-V_{OS} < V_{ID} < V_{OS}$	H	H	Undefined
$V_{ID} \geq V_{OS}$	H	H	H
X	L	X	H
X	X	L	H

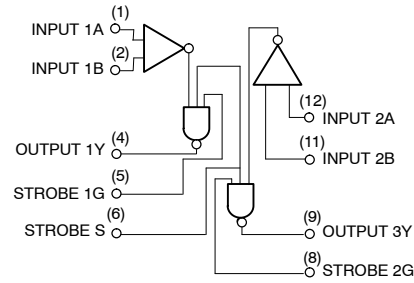


Figure 1. Block Diagram

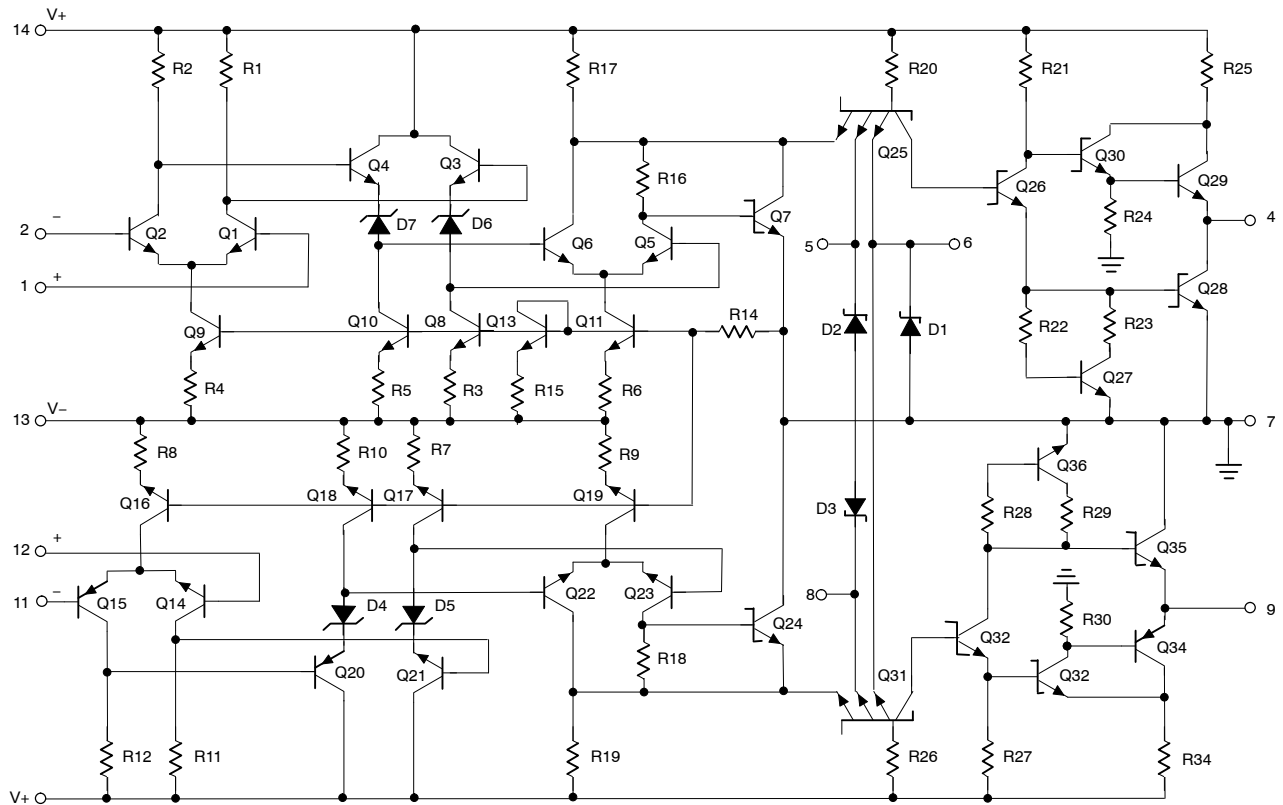


Figure 2. Equivalent Schematic

NE521

DC ELECTRICAL CHARACTERISTICS ($V_+ = +5.0\text{ V}$; $V_- = -5.0\text{ V}$, $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$, unless otherwise noted.)

Characteristic	Test Conditions	Symbol	Limits			Unit
			Min	Typ	Max	
Input Offset Voltage At 25°C Overtemperature Range	$V_+ = +4.75\text{ V}$; $V_- = -4.75\text{ V}$	V_{OS}	– –	6.0 –	7.5 10	mV
Input Bias Current At 25°C Overtemperature Range	$V_+ = +5.25\text{ V}$; $V_- = -5.25\text{ V}$	I_{BIAS}	– –	7.5 –	20 40	μA
Input Offset Current At 25°C Overtemperature Range	$V_+ = +5.25\text{ V}$; $V_- = -5.25\text{ V}$	I_{OS}	– –	1.0 –	5.0 12	μA
Common-Mode Voltage Range	$V_+ = +4.75\text{ V}$; $V_- = -4.75\text{ V}$	V_{CM}	–3.0	–	+3.0	V
Input Current High	$V_+ = +5.25\text{ V}$; $V_- = -5.25\text{ V}$ $V_{IH} = 2.7\text{ V}$ 1G or 2G Strobe Common Strobe S	I_{IH}	– –	– –	50 100	μA
Input Current Low	$V_{IL} = 0.5\text{ V}$ 1G or 2G Strobe Common Strobe S	I_{IL}	– –	– –	–2.0 –4.0	mA
Output Voltage High Low	$V_{I(S)} = 2.0\text{ V}$ $V_+ = +4.75\text{ V}$; $V_- = -4.75\text{ V}$; $I_{LOAD} = -1.0\text{ mA}$ $V_+ = +5.25\text{ V}$; $V_- = -5.25\text{ V}$; $I_{LOAD} = 20\text{ mA}$	V_{OH} V_{OL}	2.7	3.4	0.5	V
Supply Voltage Positive Negative	–	V_+ V_-	4.75 –4.75	5.0 –5.0	5.25 –5.25	V
Supply Current Positive Negative	$V_+ = +5.25\text{ V}$; $V_- = -5.25\text{ V}$; $T_A = 25^\circ\text{C}$	I_{CC+} I_{CC-}	– –	27 –15	35 –28	mA
Short-Circuit Output Current	–	I_{SC}	–40	–	–100	mA

AC ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$; $R_L = 280\ \Omega$; $C_L = 15\text{ pF}$, $V_+ = 5.0\text{ V}$; $V_- = 5.0\text{ V}$, guaranteed by characterization)

Characteristic	From Input	To Output	Symbol	Limits			Unit
				Min	Typ	Max	
Large-Signal Switching Speed							
Propagation Delay Low to High (Note 2)	Amp	Output	t _{PLH(D)}	–	9.6	12	ns
High to Low (Note 2)	Amp	Output	t _{PHL(D)}	–	8.2	9.0	
Low to High (Note 3)	Strobe	Output	t _{PLH(S)}	–	4.8	10	
High to Low (Note 3)	Strobe	Output	t _{PHL(S)}	–	3.9	6.0	
Max. Operating Frequency	–	–	f _{MAX}	40	55	–	MHz

2. Response time measured from 0 V point of $\pm 100\text{ mV}_{P-P}$ 10 MHz square wave to the 1.5 V point of the output.

3. Response time measured from 1.5 V point of input to 1.5 V point of the output.

TYPICAL PERFORMANCE CHARACTERISTICS

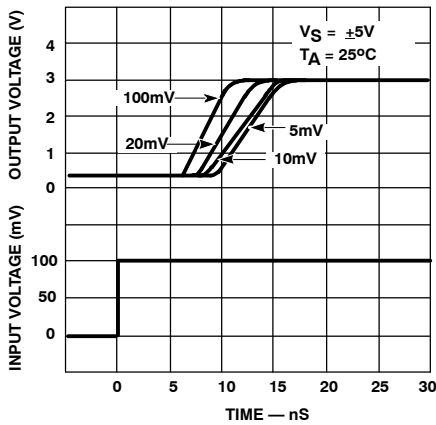


Figure 3. Response Time for Various Input Overdrives

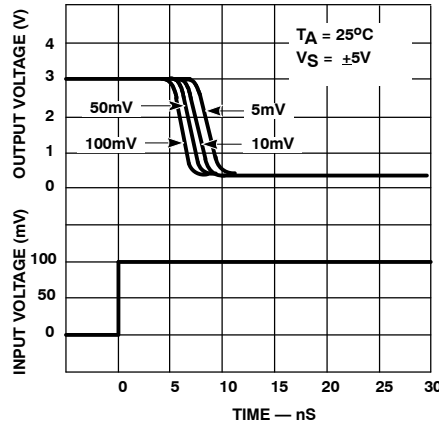


Figure 4. Response Time for Various Input Overdrives

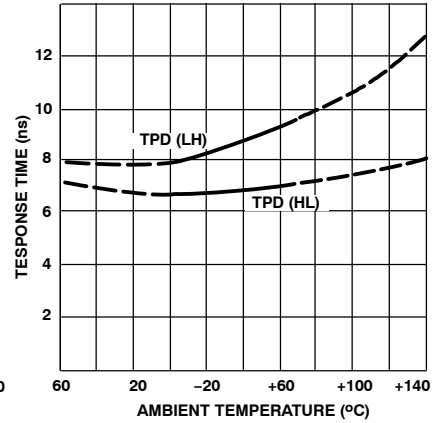


Figure 5. Response Time vs. Temperature

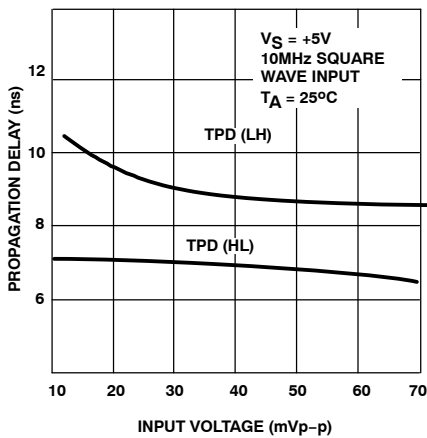


Figure 6. Propagation Delay for Various Input Voltages

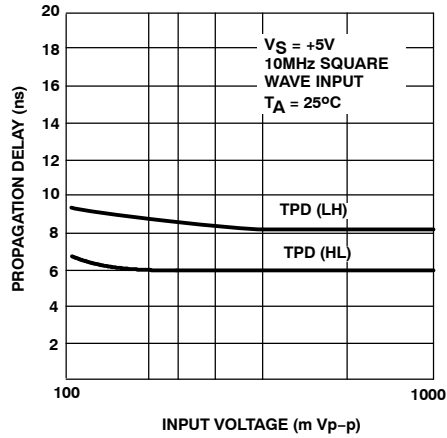


Figure 7. Propagation Delay for Various Input Voltages

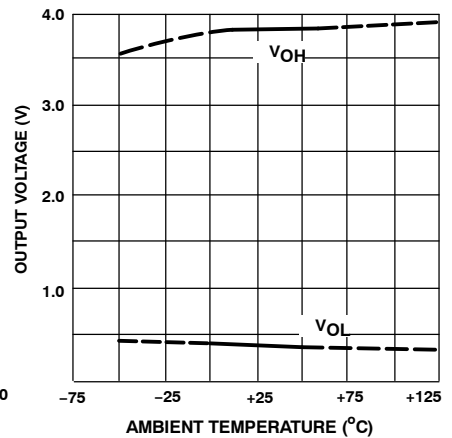


Figure 8. Output Voltage vs. Ambient Temperature

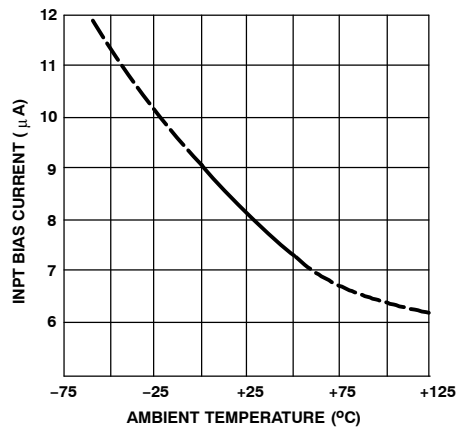


Figure 9. Input Bias Current vs. Ambient Temperature

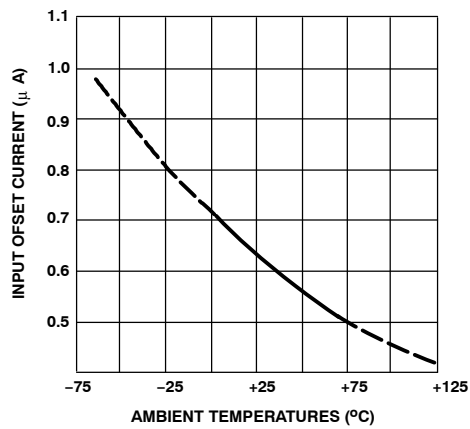


Figure 10. Input Offset Current vs. Ambient Temperature

NE521

ORDERING INFORMATION

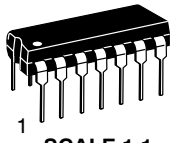
Device	Temperature Range	Package	Shipping†
NE521DR2G	0 to +70°C	SOIC-14 (Pb-Free)	2500/Tape & Reel

DISCONTINUED (Note 4)

NE521D	0 to +70°C	SOIC-14	55 Units/Rail
NE521DG		SOIC-14 (Pb-Free)	
NE521DR2		SOIC-14	2500/Tape & Reel
NE521N	0 to +70°C	PDIP-14	25 Units/Rail
NE521NG		PDIP-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](#).

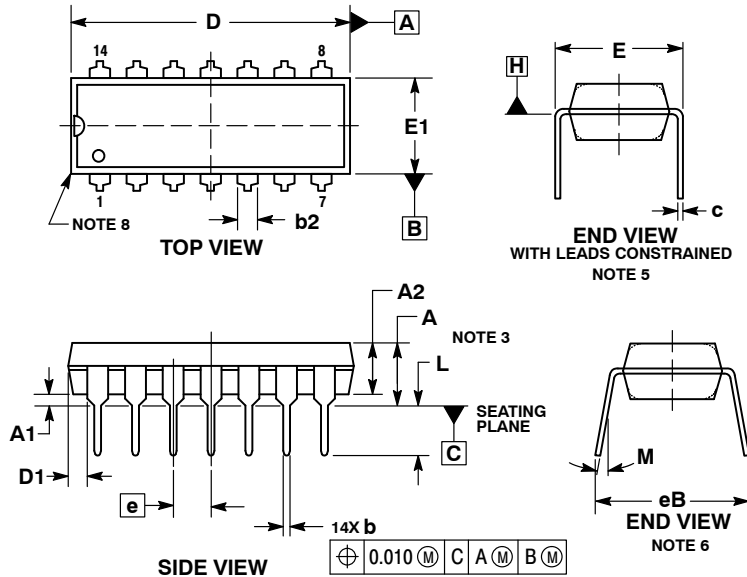
4. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.



SCALE 1:1

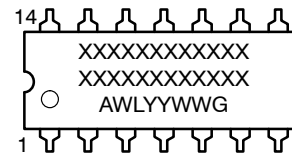
PDIP-14
CASE 646-06
ISSUE 5

DATE 22 APR 2015


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSIONS A, A1 AND L ARE MEASURED WITH THE PACKAGE 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 eB 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°

GENERIC
MARKING DIAGRAM*


XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
YY = 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. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

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PDIP-14
CASE 646-06
ISSUE S

DATE 22 APR 2015

STYLE 1: PIN 1. COLLECTOR 2. BASE 3. EMITTER 4. NO CONNECTION 5. EMITTER 6. BASE 7. COLLECTOR 8. COLLECTOR 9. BASE 10. EMITTER 11. NO CONNECTION 12. EMITTER 13. BASE 14. COLLECTOR	STYLE 2: CANCELLED	STYLE 3: CANCELLED	STYLE 4: PIN 1. DRAIN 2. SOURCE 3. GATE 4. NO CONNECTION 5. GATE 6. SOURCE 7. DRAIN 8. DRAIN 9. SOURCE 10. GATE 11. NO CONNECTION 12. GATE 13. SOURCE 14. DRAIN
STYLE 5: PIN 1. GATE 2. DRAIN 3. SOURCE 4. NO CONNECTION 5. SOURCE 6. DRAIN 7. GATE 8. GATE 9. DRAIN 10. SOURCE 11. NO CONNECTION 12. SOURCE 13. DRAIN 14. GATE	STYLE 6: 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 7: 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 8: 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
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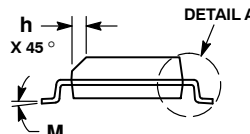
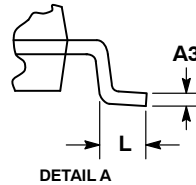
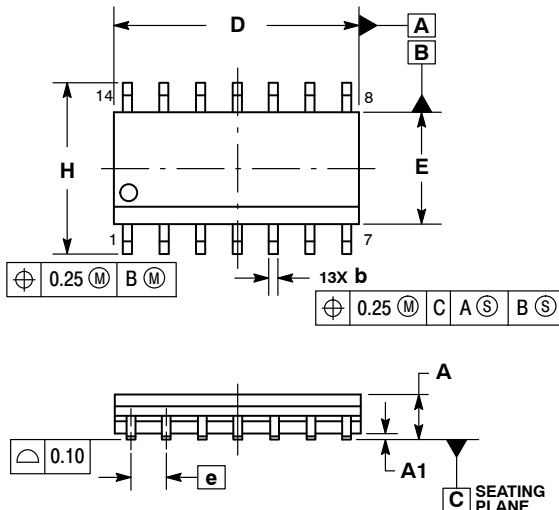
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SCALE 1:1

SOIC-14 NB
CASE 751A-03
ISSUE L

DATE 03 FEB 2016

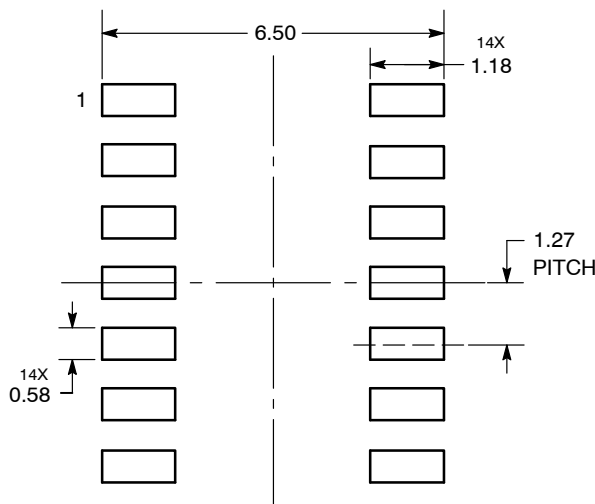


NOTES:

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°

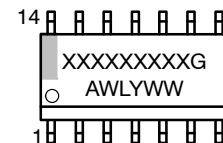
SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC
MARKING DIAGRAM*



XXXXXX = 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. Some products may not follow the Generic Marking.

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SOIC-14
CASE 751A-03
ISSUE L

DATE 03 FEB 2016

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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