Quad 2-Channel Multiplexer with 3-State Outputs

MC74LVX257

The MC74LVX257 is an advanced high speed CMOS quad 2-channel multiplexer fabricated with silicon gate CMOS technology.

It consists of four 2-input digital multiplexers with common select (S) and enable ($\overline{OE}$) inputs. When ($\overline{OE}$) is held High, selection of data is inhibited and all the outputs go Low.
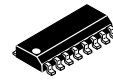
The select decoding determines whether the A or B inputs get routed to the corresponding Y outputs.

The inputs tolerate voltages up to 5.5 V, allowing the interface of 5.0 V systems to 3.0 V systems.

Features

- High Speed: t_{PD} = 4.5 ns (Typ) at V_{CC} = 3.3 V
- Low Power Dissipation: I_{CC} = 4 μA (Max) at T_A = 25 °C
- High Noise Immunity: V_{NIH} = V_{NIL} = 28% V_{CC}
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2.0 V to 5.5 V Operating Range
- Low Noise: V_{OLP} = 0.8 V (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 100 mA
- Chip Complexity: FETs = 100; Equivalent Gates = 25
- ESD Performance:
  Human Body Model > 2000 V;
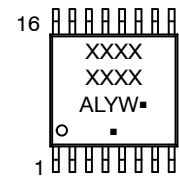- These Devices are Pb-Free and are RoHS Compliant

MARKING DIAGRAMS

SOIC-16
D SUFFIX
CASE 751B

```
16
┌──────────┐
│ XXXXXXX  │
│o AWLYWW  │
└──────────┘
1
```
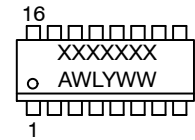
TSSOP-16
DT SUFFIX
CASE 948F

```
16
┌──────────┐
│  XXXX    │
│  XXXX    │
│o ALYW▪   │
└──────────┘
1
```

XXXXXXX = Specific Device Code
A = Assembly Location
WL, L = Wafer Lot
Y = Year
WW, W = Work Week
G or ▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

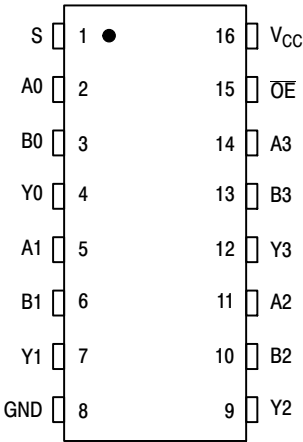See detailed ordering and shipping information on page 5 of this data sheet.
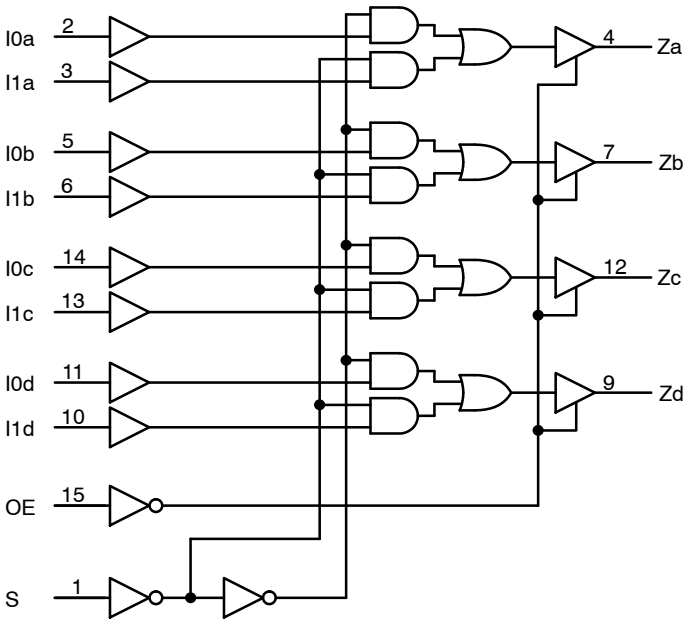
MC74LVX257

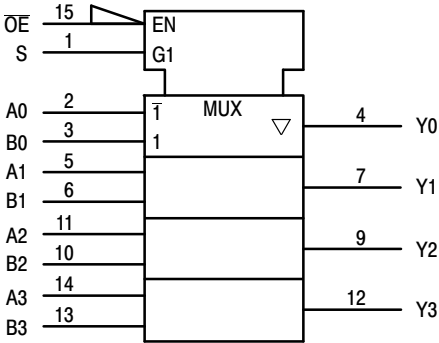**Figure 1. Pin Assignment**

Figure 2. Expanded Logic Diagram

Figure 3. IEC Logic Symbol

FUNCTION TABLE

Inputs		Outputs
$\overline{OE}$	S	Y0 – Y3
H	X	Z
L	L	A0 – A3
L	H	B0 – B3

A0 – A3, B0 – B3 = the levels of the respective Data-Word Inputs.

MC74LVX257

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +6.5	V
V_{IN}	DC Input Voltage		−0.5 to +6.5	V
V_{OUT}	DC Output Voltage		−0.5 to V_{CC}+0.5	V
I_{IN}	DC Input Current, per Pin		±20	mA
I_{OUT}	DC Output Current, Per Pin		±25	mA
I_{CC}	DC Supply Current, V_{CC} and GND Pins		±75	mA
I_{IK}	Input Clamp Current		−20	mA
I_{OK}	Output Clamp Current		±20	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 secs		260	°C
T_J	Junction Temperature Under Bias		+150	°C
θ_{JA}	Thermal Resistance (Note 1)	SOIC-16	126	°C/W
		TSSOP-16	159	
P_D	Power Dissipation in Still Air at 25 °C	SOIC-16	995	mW
		TSSOP-16	787	
MSL	Moisture Sensitivity		Level 1	–
F_R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	–
V_{ESD}	ESD Withstand Voltage (Note 2)	Human Body Model	2000	V
		Charged Device Model	N/A	

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. Measured with minimum pad spacing on an FR4 board, using 76 mm-by-114 mm, 2-ounce copper trace no air flow per JESD51-7.
2. HBM tested to EIA / JESD22-A114-A. CDM tested to JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115A (Machine Model) be discontinued.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics		Min	Max	Unit
V_{CC}	DC Supply Voltage		2.0	3.6	V
V_{IN}	DC Input Voltage		0	5.5	V
V_{OUT}	DC Output Voltage		0	V_{CC}	V
T_A	Operating Temperature Range, all Package Types		−40	85	°C
t_r, t_f	Input Rise or Fall Time	V_{CC} = 3.3 V ± 0.3 V	0	100	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

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DC CHARACTERISTICS (Voltages Referenced to GND)

Symbol	Parameter	Condition	V_CC (V)	T_A = 25 °C Min	T_A = 25 °C Typ	T_A = 25 °C Max	−40 °C ≤ T_A ≤ 85 °C Min	−40 °C ≤ T_A ≤ 85 °C Max	Unit
V_{IH}	Minimum High-Level Input Voltage		2.0 3.0 3.6	0.75 V_CC 0.7 V_CC 0.7 V_CC			0.75 V_CC 0.7 V_CC 0.7 V_CC		V
V_{IL}	Maximum Low-Level Input Voltage		2.0 3.0 3.6			0.25 V_CC 0.3 V_CC 0.3 V_CC		0.25 V_CC 0.3 V_CC 0.3 V_CC	V
V_{OH}	High-Level Output Voltage	I_{OH} = −50 μA I_{OH} = −50 μA I_{OH} = −4 mA	2.0 3.0 3.0	1.9 2.9 2.58	2.0 3.0		1.9 2.9 2.48		V
V_{OL}	Low-Level Output Voltage	I_{OL} = 50 μA I_{OL} = 50 μA I_{OL} = 4 mA	2.0 3.0 3.0		0.0 0.0	0.1 0.1 0.36		0.1 0.1 0.44	V
I_{OZ}	Maximum 3-State Leakage Current	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND	3.6			±0.1		±1.0	μA
I_{IN}	Input Leakage Current	V_{IN} = 5.5 V or GND	0 to 3.6			±0.1		±1.0	μA
I_{CC}	Maximum Quiescent Supply Current (per package)	V_{IN} = V_{CC} or GND	3.6	1.0	1.0	2.0		40	μA

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.

AC ELECTRICAL CHARACTERISTICS Input t_r = t_f = 3.0 ns

Symbol	Parameter	Test Conditions	T_A = 25 °C Min	T_A = 25 °C Typ	T_A = 25 °C Max	−40 °C ≤ T_A ≤ 85 °C Min	−40 °C ≤ T_A ≤ 85 °C Max	Unit
t_{PLH}, t_{PHL}	Maximum Propagation Delay, A or B to Y	V_{CC} = 2.7 V C_L = 15 pF C_L = 50 pF		6.5 9.5	10.0 14.0	1.0 1.0	15.0 18.5	ns
		V_{CC} = 3.3 V ± 0.3 V C_L = 15 pF C_L = 50 pF		4.5 7.5	8.0 12.0	1.0 1.0	10.0 13.5	
t_{PLH}, t_{PHL}	Maximum Propagation Delay, S to Y	V_{CC} = 2.7 V C_L = 15 pF C_L = 50 pF		8.0 10.5	12.0 15.5	1.0 1.0	17.0 20.0	ns
		V_{CC} = 3.3 V ± 0.3 V C_L = 15 pF C_L = 50 pF		6.0 8.5	10.0 13.5	1.0 1.0	12.0 15.5	
t_{PZL}, t_{PZH}	Maximum Output Enable, Time, $\overline{OE}$ to Y	V_{CC} = 2.7 V C_L = 15 pF R_L = 1 kΩ C_L = 50 pF		7.5 10.5	11.5 15.0	1.0 1.0	16.5 18.0	ns
		V_{CC} = 3.3 V ± 0.3 V C_L = 15 pF R_L = 1 kΩ C_L = 50 pF		5.5 8.5	9.5 13.0	1.0 1.0	11.5 15.0	
t_{PLZ}, t_{PHZ}	Maximum Output Disable, Time, $\overline{OE}$ to Y	V_{CC} = 2.7 C_L = 50 pF R_L = 1 kΩ		13.0	17.0	1.0	18.0	ns
		V_{CC} = 3.3 V ± 0.3 V C_L = 50 pF R_L = 1 kΩ		12	17.0	1.0	18.0	
C_{IN}	Maximum Input Capacitance			4	10		10	pF

		Typical @ 25°C, V_{CC} = 3.3 V	
C_{PD}	Power Dissipation Capacitance (Note 3)	20	pF

3. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$. C_{PD} is used to determine the no-load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

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NOISE CHARACTERISTICS Input $t_r = t_f$ = 3.0 ns, C_L = 50 pF, V_{CC} = 3.3 V

Symbol	Characteristic	T_A = 25 °C		Unit
		Typ	Max	
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	0.3	0.5	V
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	−0.3	−0.5	V
V_{IHD}	Minimum High Level Dynamic Input Voltage		2.0	V
V_{ILD}	Maximum Low Level Dynamic Input Voltage		0.8	V
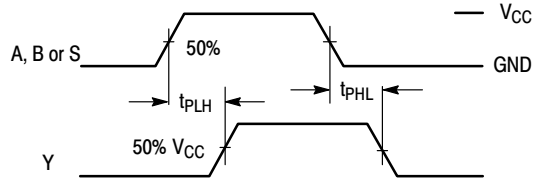
Figure 4. Switching Waveform
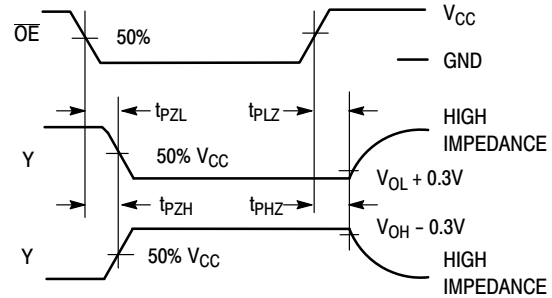
Figure 5. Switching Waveform
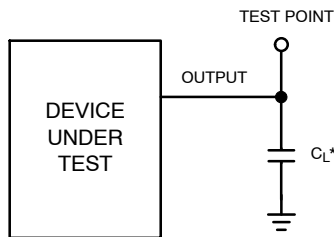
* Includes all probe and jig capacitance

Figure 6. Test Circuit

* Includes all probe and jig capacitance

CONNECT TO V_{CC} WHEN TESTING t_{PLZ} AND t_{PZL}. CONNECT TO GND WHEN TESTING t_{PHZ} AND t_{PZH}.

Figure 7. Test Circuit
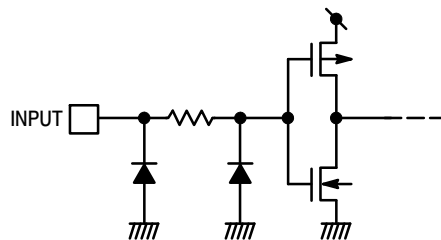
Figure 8. Input Equivalent Circuit

ORDERING INFORMATION

Device	Marking	Package	Shipping[†]
MC74LVX257DTR2G	LVX 257	TSSOP-16	2500 / Tape & Reel
MC74LVX257DR2G	LVX257G	SOIC-16	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.

MC74LVX257
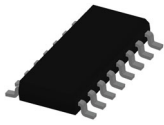
SOIC−16 9.90x3.90x1.37 1.27P
CASE 751B
ISSUE M

DATE 18 OCT 2024

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. DIMENSION IN MILLIMETERS. ANGLE IN DEGREES.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15mm PER SIDE.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127mm TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION.
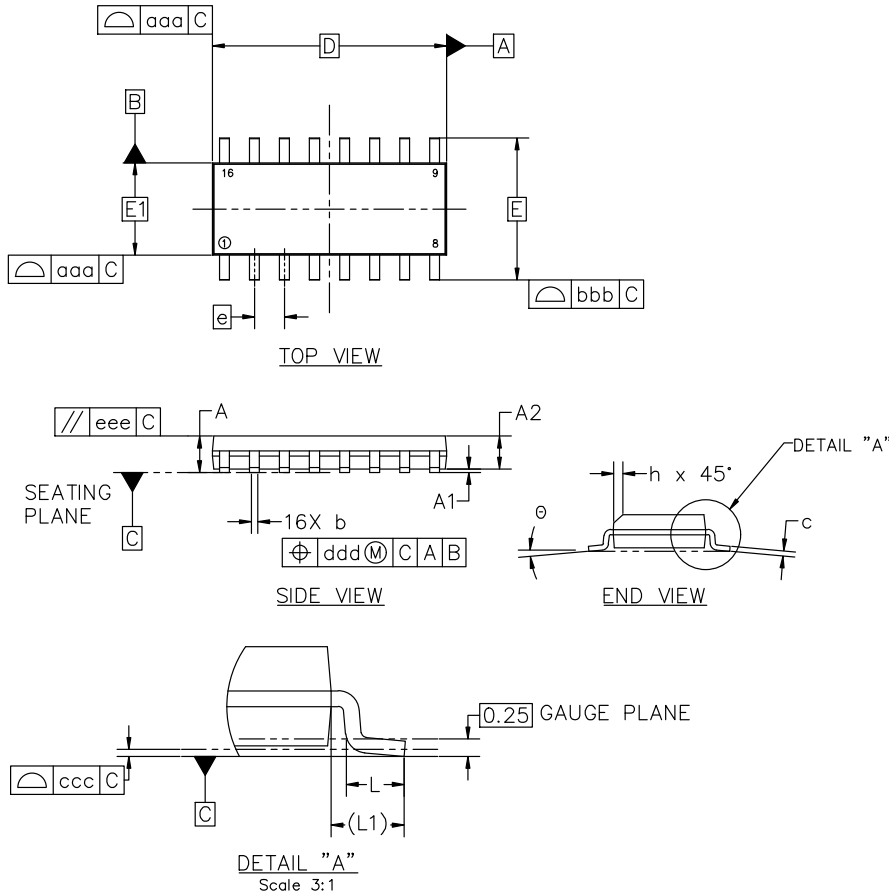
	MILLIMETERS		
DIM	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.10	0.18	0.25
A2	1.25	1.37	1.50
b	0.35	0.42	0.49
c	0.19	0.22	0.25
D	9.90 BSC		
E	6.00 BSC		
E1	3.90 BSC		
e	1.27 BSC		
h	0.25	---	0.50
L	0.40	0.83	1.25
L1	1.05 REF		
Θ	0°	---	7°
TOLERANCE OF FORM AND POSITION			
aaa	0.10		
bbb	0.20		
ccc	0.10		
ddd	0.25		
eee	0.10		

TOP VIEW

SIDE VIEW

END VIEW

SEATING PLANE

DETAIL "A"

DETAIL "A"
Scale 3:1

0.25 GAUGE PLANE

8X
6.40

1.270
PITCH

16X
0.58

1.120

RECOMMENDED MOUNTING FOOTPRINT

*FOR ADDITIONAL INFORMATION ON OUR PB−FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE onsemi SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D

DOCUMENT NUMBER:	98ASB42566B		
DESCRIPTION:	**SOIC−16 9.90X3.90X1.37 1.27P**		PAGE 1 OF 2

GENERIC
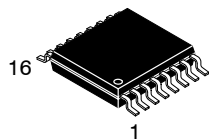**MARKING DIAGRAM***

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. Some products may not follow the Generic Marking.
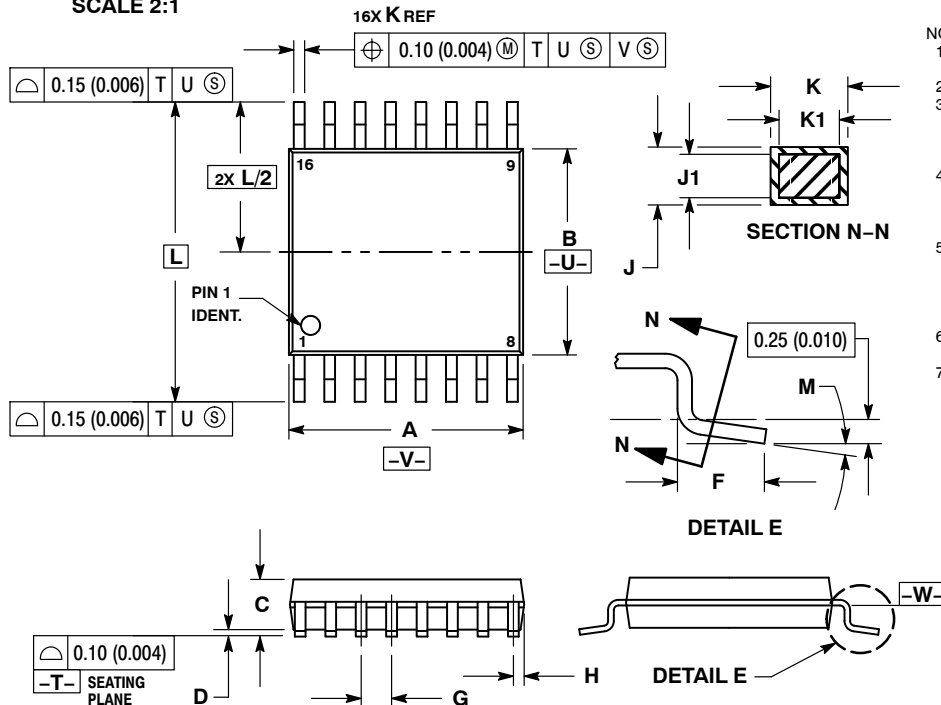
STYLE 1:		STYLE 2:		STYLE 3:		STYLE 4:	
PIN 1.	COLLECTOR	PIN 1.	CATHODE	PIN 1.	COLLECTOR, DYE #1	PIN 1.	COLLECTOR, DYE #1
2.	BASE	2.	ANODE	2.	BASE, #1	2.	COLLECTOR, #1
3.	EMITTER	3.	NO CONNECTION	3.	EMITTER, #1	3.	COLLECTOR, #2
4.	NO CONNECTION	4.	CATHODE	4.	COLLECTOR, #1	4.	COLLECTOR, #2
5.	EMITTER	5.	CATHODE	5.	COLLECTOR, #2	5.	COLLECTOR, #3
6.	BASE	6.	NO CONNECTION	6.	BASE, #2	6.	COLLECTOR, #3
7.	COLLECTOR	7.	ANODE	7.	EMITTER, #2	7.	COLLECTOR, #4
8.	COLLECTOR	8.	CATHODE	8.	COLLECTOR, #2	8.	COLLECTOR, #4
9.	BASE	9.	CATHODE	9.	COLLECTOR, #3	9.	BASE, #4
10.	EMITTER	10.	ANODE	10.	BASE, #3	10.	EMITTER, #4
11.	NO CONNECTION	11.	NO CONNECTION	11.	EMITTER, #3	11.	BASE, #3
12.	EMITTER	12.	CATHODE	12.	COLLECTOR, #3	12.	EMITTER, #3
13.	BASE	13.	CATHODE	13.	COLLECTOR, #4	13.	BASE, #2
14.	COLLECTOR	14.	NO CONNECTION	14.	BASE, #4	14.	EMITTER, #2
15.	EMITTER	15.	ANODE	15.	EMITTER, #4	15.	BASE, #1
16.	COLLECTOR	16.	CATHODE	16.	COLLECTOR, #4	16.	EMITTER, #1

STYLE 5:		STYLE 6:		STYLE 7:	
PIN 1.	DRAIN, DYE #1	PIN 1.	CATHODE	PIN 1.	SOURCE N-CH
2.	DRAIN, #1	2.	CATHODE	2.	COMMON DRAIN (OUTPUT)
3.	DRAIN, #2	3.	CATHODE	3.	COMMON DRAIN (OUTPUT)
4.	DRAIN, #2	4.	CATHODE	4.	GATE P-CH
5.	DRAIN, #3	5.	CATHODE	5.	COMMON DRAIN (OUTPUT)
6.	DRAIN, #3	6.	CATHODE	6.	COMMON DRAIN (OUTPUT)
7.	DRAIN, #4	7.	CATHODE	7.	COMMON DRAIN (OUTPUT)
8.	DRAIN, #4	8.	CATHODE	8.	SOURCE P-CH
9.	GATE, #4	9.	ANODE	9.	SOURCE P-CH
10.	SOURCE, #4	10.	ANODE	10.	COMMON DRAIN (OUTPUT)
11.	GATE, #3	11.	ANODE	11.	COMMON DRAIN (OUTPUT)
12.	SOURCE, #3	12.	ANODE	12.	COMMON DRAIN (OUTPUT)
13.	GATE, #2	13.	ANODE	13.	GATE N-CH
14.	SOURCE, #2	14.	ANODE	14.	COMMON DRAIN (OUTPUT)
15.	GATE, #1	15.	ANODE	15.	COMMON DRAIN (OUTPUT)
16.	SOURCE, #1	16.	ANODE	16.	SOURCE N-CH

DOCUMENT NUMBER:	**98ASB42566B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	**SOIC−16 9.90X3.90X1.37 1.27P**		**PAGE 2 OF 2**

TSSOP−16 WB
CASE 948F
ISSUE B

DATE 19 OCT 2006

16

1

SCALE 2:1

16X **K** REF

$\oplus$ | 0.10 (0.004) $\textcircled{M}$ | T U $\textcircled{S}$ V $\textcircled{S}$

$\bigtriangleup$ | 0.15 (0.006) | T U $\textcircled{S}$

2X **L/2**

16   9

L

B
−U−

PIN 1
IDENT.

1   8

$\bigtriangleup$ | 0.15 (0.006) | T U $\textcircled{S}$

A
−V−

C

$\bigtriangleup$ | 0.10 (0.004)
−T− SEATING
PLANE

D   **G**   **H**

K
K1

J1

SECTION N−N

N

0.25 (0.010)

M

N

F

DETAIL E

J

−W−

DETAIL E

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	0.18	0.28	0.007	0.011
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 °

RECOMMENDED
SOLDERING FOOTPRINT*

7.06

1

0.65
PITCH

16X
0.36

16X
1.26

DIMENSIONS: MILLIMETERS

GENERIC
MARKING DIAGRAM*

16

XXXX
XXXX
o ALYW

1
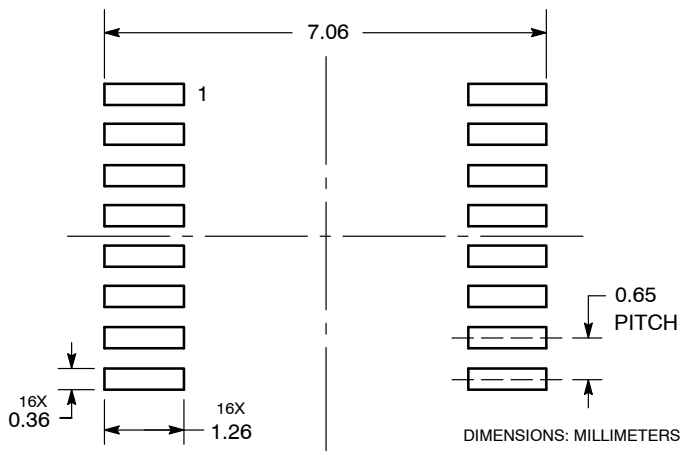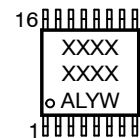
XXXX   = Specific Device Code
A   = Assembly Location
L   = Wafer Lot
Y   = Year
W   = Work Week
G or ▪   = Pb−Free Package

*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.

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

ADDITIONAL INFORMATION

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