Low-Voltage Multiplexer/Demultiplexer, Bus Switch

Product Preview

T30LMSW3B3257 / T30LMSW3B3253 / T30LMSW3B3125 / T30LMSW3B3126

The T30LMSW3B3257 device is a 4-bit 1-of-2 highspeed FET multiplexer/demultiplexer. The select (S) input controls the data flow. The FET multiplexers/demultiplexers are disabled when the output-enable ($\overline{\text{OE}}$) input is high.

The T30LMSW3B3253 device is a dual 1-of-4 highspeed FET multiplexer and demultiplexer. The select (S0, S1) inputs control the data flow. The FET multiplexers/demultiplexers are disabled when the output-enable ($\overline{\text{OE}}$) input is high.

The T30LMSW3B3125 and T30LMSW3B3126 devices are quadruple FET bus switches featuring independent line switches. Each switch of the T30LMSW3B3125 is disabled when the associated output-enable ($\overline{\text{OE}}$) input is high. Each switch of the T30LMSW3B3126 is disabled when the associated output-enable (OE) input is low.

These devices are fully specified for partial-power-down applications using I_{off}. The I_{off} feature ensures that damaging current will not backflow through the devices when the devices are powered down. The devices have isolation during power off.

To ensure the high-impedance state during power up or power down, $\overline{\text{OE}}$ should be tied to V_{CC} through a pullup resistor while OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

Features

- 5 Ω Switch Connection Between 2 Ports
- Rail to Rail Switching on Data Ports
- I_{off} Supports Partial Power Down Mode Operation
- Break-Before-Make circuitry for 3257 and 3253
- 2000 V HBM ESD Protection (JESD22)

Typical Applications

- Internet of Things
- Wireless Headphones
- Muxing/Demuxing
- Datacenters and Enterprise Computing
- Building Automation

This document contains information on a product under development. **onsemi** reserves the right to change or discontinue this product without notice.

MARKING DIAGRAMS
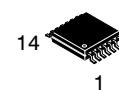
TSSOP-14
DT SUFFIX
CASE 948G

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XXXX
XXXX
ALYW■
```
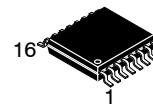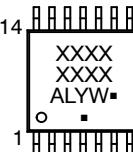
TSSOP-16
DT SUFFIX
CASE 948F

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XXXX
ALYW■
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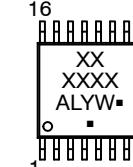
XXXXXX	= Specific Device Code
A	= Assembly Location
L, WL	= Wafer Lot
Y, YY	= Year
W, WW	= Work Week
G or ■	= Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

T30LMSW3B3257 / T30LMSW3B3253 / T30LMSW3B3125 / T30LMSW3B3126
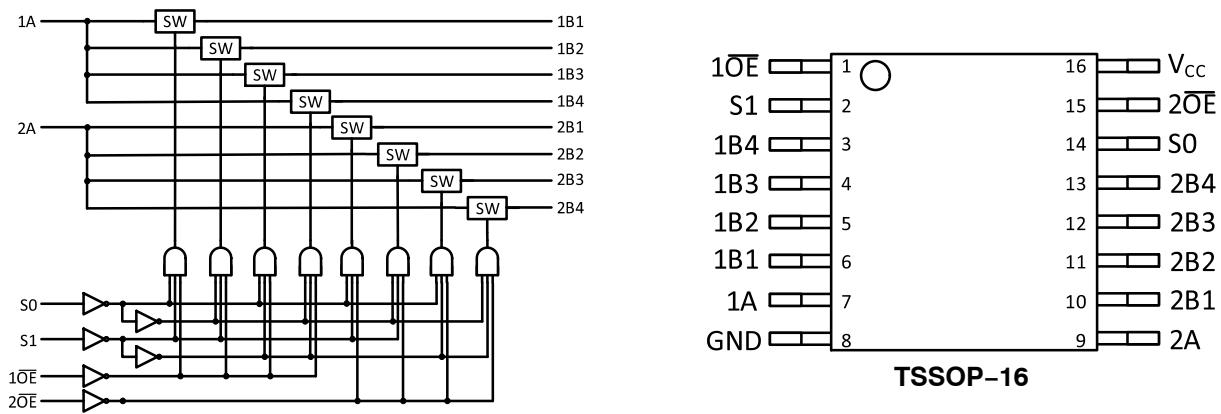
Figure 1. T30LMSW3B3253 Logic Diagram and Pin Assignment

T30LMSW3B3253 FUNCTION TABLE

Inputs			
$\overline{OE}$	S1	S0	Function
L	L	L	A = B1
L	L	H	A = B2
L	H	L	A = B3
L	H	H	A = B4
H	X	X	Disconnect
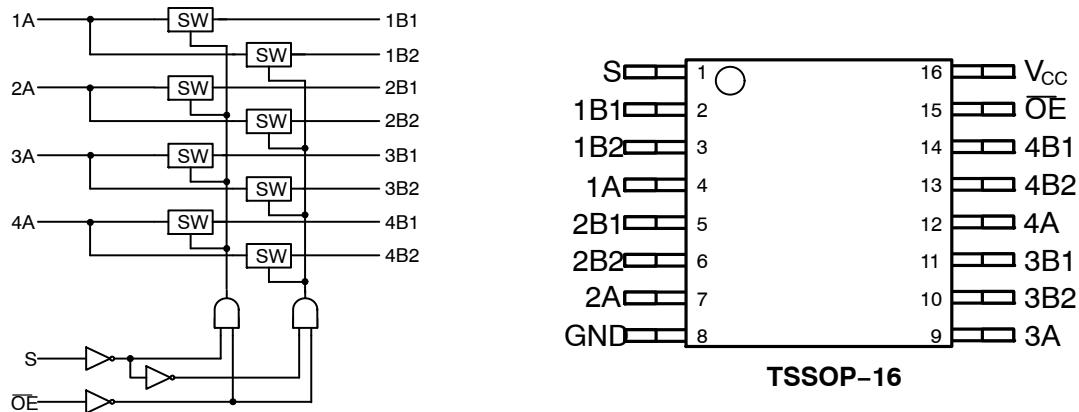
Figure 2. T30LMSW3B3257 Logic Diagram and Pin Assignment

T30LMSW3B3257 FUNCTION TABLE

Inputs		
$\overline{OE}$	S	Function
L	L	A = B1
L	H	A = B2
H	X	Disconnect

T30LMSW3B3257 / T30LMSW3B3253 / T30LMSW3B3125 / T30LMSW3B3126

Figure 3. T30LMSW3B3125 Logic Diagram and Pin Assignment

T30LMSW3B3125 FUNCTION TABLE

| $\overline{OE}$	Function
L	A = B
H	Disconnect
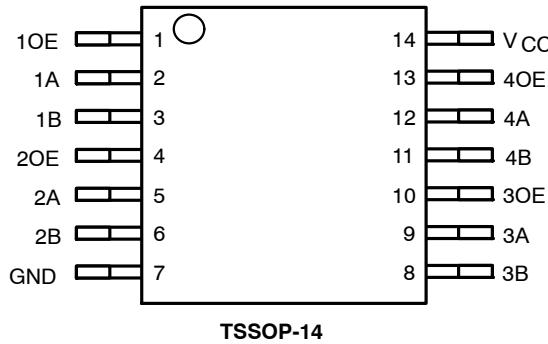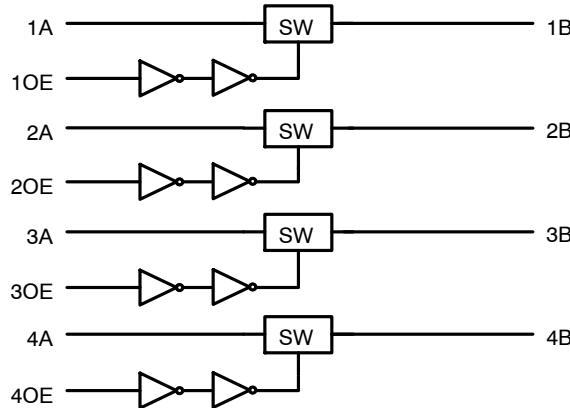
Figure 4. T30LMSW3B3126 Logic Diagram and Pin Assignment

T30LMSW3B3126 FUNCTION TABLE

OE	Function
L	Disconnect
H	A = B
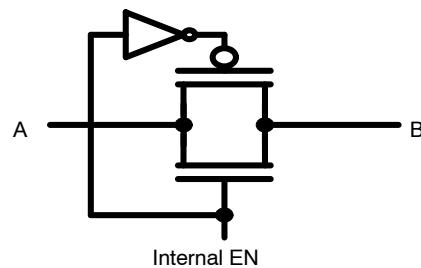
Figure 5. Individual FET Switch Simplified Schematic

MAXIMUM RATINGS

Symbol	Parameter		Condition	Value	Unit
V_{CCA}, V_{CCB}	Supply Voltage			−0.5 to +4.3	V
V_I	Input Voltage (Note 1)			−0.5 to +4.3	V
	Continuous Channel Current			128	mA
I_{IK}	Input Clamp Current		$V_{I/O}$ < GND	−50	mA
I_{CC}	DC Supply Current Per Supply Pin			±100	mA
I_{GND}	DC Ground Current per Ground Pin			±100	mA
T_J	Junction Temperature			+150	°C
T_{STG}	Storage Temperature			−65 to +150	°C
θ_{JA}	Thermal Resistance (Note 2)	TSSOP-16 TSSOP-14		159 150	°C/W
P_D	Power Dissipation in Still Air	TSSOP−16 TSSOP-14		787 833	mW
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 3) Human Body Model Charged Device Model			 2 TBD	kV
$I_{LATCHUP}$	Latchup Performance Above V_{CC} and Below GND at 25 °C (Note 4)			±100	mA

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. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. 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.
3. HBM tested to ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-F. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
4. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{CCA}, V_{CCB}	Positive DC Supply Voltage	1.65	3.6	V
V_I	Control Pin Input Voltage	GND	3.6	V
$V_{I/O}$	I/O Pin Voltage	GND	V_{CCA}	V
T_A	Operating Temperature Range	−40	+125	°C
Δt/ΔV	Control Input Transition Rise or Fall Rate	0	200	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.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V_{CCA} (V)	T_A = −40 °C to +85 °C			T_A = −40 °C to +125 °C		Unit
				Min	Typ (Note 5)	Max	Min	Max	
V_{IH}	Input HIGH Voltage		1.65–1.95	$0.7 * V_{CC}$	–	–	$0.7 * V_{CC}$	–	V
			2.3–2.7	1.7	–	–	1.7	–	
			2.7–3.6	2.0	–	–	2.0	–	
V_{IL}	Input LOW Voltage		1.65–1.95	–	–	$0.3 * V_{CC}$	–	$0.3 * V_{CC}$	V
			2.3–2.7	–	–	0.7	–	0.7	
			2.7–3.6	–	–	0.8	–	0.8	
V_{IK}	Clamp Diode Voltage	I_I = −18 mA	3.0	–	–	−1.2	–	−1.2	V
I_I	Input Leakage	$V_I = V_{CC}$ or GND	3.6	–	–	±0.5	–	±0.5	μA
I_{off}	Power Off Leakage	V_I or V_O = GND to 3.6 V	0	–	–	1.0	–	1.0	μA
I_{CC}	Supply Current	$V_I = V_{CC}$ or GND, I_O = 0	3.6	–	–	1.0	–	1.0	μA
ΔI_{CC}	Additional Supply Current	Control Pins; One input at 3 V, Other inputs at V_{CC} or GND	3.6	–	–	100	–	100	μA
C_I	Control Input Capacitance	V_I = 3 V or GND		–	3	–	–	–	pF
$C_{IO(off)}$	Switch Off Capacitance (T30LMSW3B3257)	$\overline{OE} = V_{CC}$; A		–	10.5	–	–	–	pF
		V_I = 3 V or GND B		–	5.5	–	–	–	
	Switch Off Capacitance (T30LMSW3B3253)	$\overline{OE} = V_{CC}$; A		–	20.5	–	–	–	
		V_I = 3 V or GND B		–	5.5	–	–	–	
	Switch Off Capacitance (T30LMSW3B3125 / T30LMSW3B3126)	$\overline{OE} = V_{CC}$ or OE = GND;		–	7.0	–	–	–	
		V_I = 3 V or GND							
R_{ON}	ON Resistance	V_I = 0 V; I_I = 24 mA	1.65–1.95	–	6	10	–	10	Ω
		V_I = 1.05 V; I_I = 15 mA		–	26	50	–	50	
		V_I = 0 V; I_I = 64 mA	2.3–2.7	–	4	7	–	7	
		I_I = 24 mA		–	4	7	–	7	
		V_I = 1.7 V; I_I = 15 mA		–	10	20	–	20	
		V_I = 0 V; I_I = 64 mA	3.0–3.6	–	4	6	–	6	
		I_I = 24 mA		–	4	6	–	6	
		V_I = 2.4 V; I_I = 15 mA		–	8	12	–	12	

5. All typical values are at nominal value of V_{CC} range and T_A = 25 °C.

AC ELECTRICAL CHARACTERISTICS (T30LMSW3B3257/T30LMSW3B3253)

Symbol	Parameter	Test Conditions	V_{CCA} (V)	T_A = −40 °C to +85 °C			T_A = −40 °C to +125 °C		Unit
				Min	Typ	Max	Min	Max	
t_{PD}	Propagation Delay (Note 6) A to B or B to A		1.65–1.95	–	–	0.15	–	0.15	ns
			2.3–2.7	–	–	0.15	–	0.15	
			2.7–3.6	–	–	0.25	–	0.25	
t_{EN}	Enable Time S to A or B		1.65–1.95	–	–	8.8	–	8.8	ns
			2.3–2.7	–	–	6.1	–	6.1	
			2.7–3.6	–	–	5.3	–	5.3	
	Enable Time $\overline{OE}$ to A or B		1.65–1.95	–	–	8.6	–	8.6	
			2.3–2.7	–	–	5.6	–	5.6	
			2.7–3.6	–	–	5	–	5	
t_{DIS}	Disable Time S to A or B		1.65–1.95	–	–	5.5	–	5.5	ns
			2.3–2.7	–	–	4.8	–	4.8	
			2.7–3.6	–	–	4.5	–	4.5	
	Disable Time $\overline{OE}$ to A or B		1.65–1.95	–	–	6.5	–	6.5	
			2.3–2.7	–	–	5.5	–	5.5	
			2.7–3.6	–	–	5.5	–	5.5	

AC ELECTRICAL CHARACTERISTICS (T30LMSW3B3125 / T30LMSW3B3126)

Symbol	Parameter	Test Conditions	V_{CCA} (V)	T_A = −40 °C to +85 °C			T_A = −40 °C to +125 °C		Unit
				Min	Typ	Max	Min	Max	
t_{PD}	Propagation Delay (Note 6) A to B or B to A		1.65–1.95	–	–	0.15	–	0.15	ns
			2.3–2.7	–	–	0.15	–	0.15	
			2.7–3.6	–	–	0.25	–	0.25	
t_{EN}	Enable Time $\overline{OE}$ to A or B		1.65–1.95	–	–	8.6	–	8.6	ns
			2.3–2.7	–	–	5.6	–	5.6	
			2.7–3.6	–	–	5	–	5	
t_{DIS}	Disable Time $\overline{OE}$ to A or B		1.65–1.95	–	–	6.5	–	6.5	ns
			2.3–2.7	–	–	5.5	–	5.5	
			2.7–3.6	–	–	5.5	–	5	

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.

6. The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).
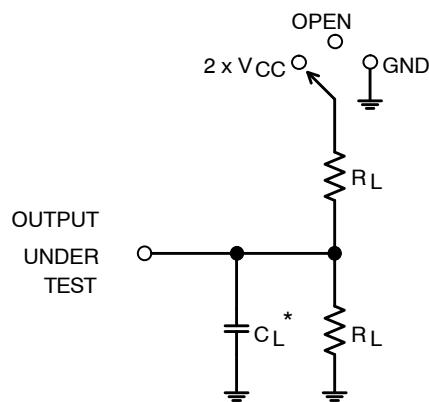
Test	Switch Position
t_{PLH} / t_{PHL}	Open
t_{PLZ} / t_{PZL}	2 x VCC
t_{PHZ} / t_{PZH}	GND

C_L includes load and jig capacitance
Pulse generator Z_O = 50 Ω
Input f = 10 MHz; t_W = 500 ns

Figure 6. AC Test Circuit
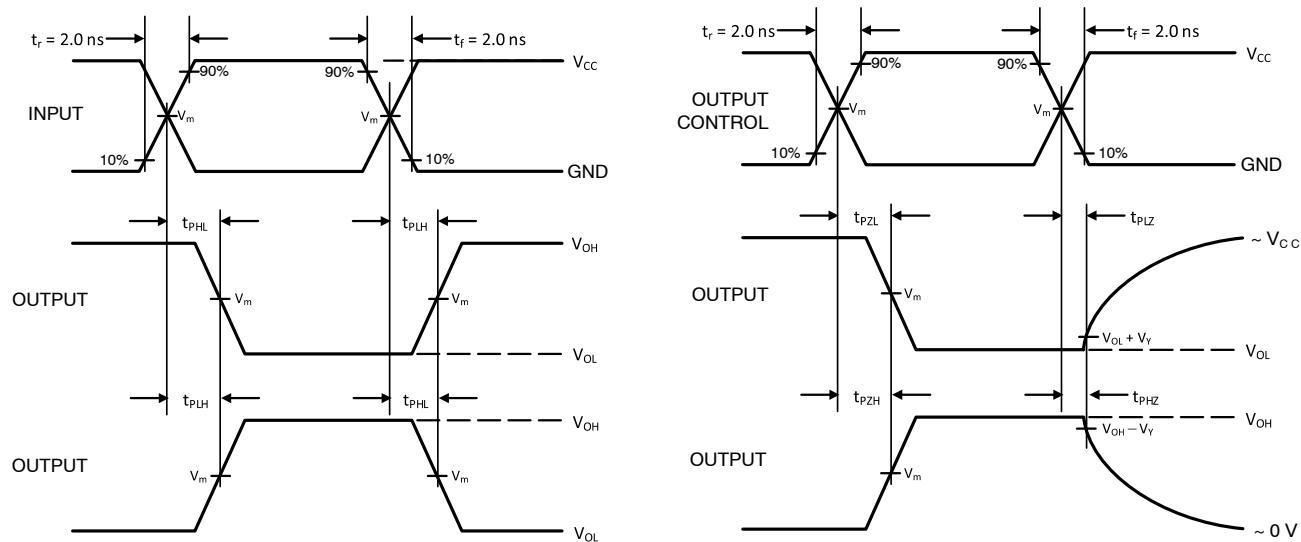
V_{CC}, V	C_L, pF	R_L, Ω	V_m, V	V_Y, V
1.65 V to 1.95 V	15	500	$V_{CC}/2$	0.1
2.3 V to 2.7 V	30	500	$V_{CC}/2$	0.15
3.0 V to 3.6 V	50	500	$V_{CC}/2$	0.3

Figure 7. AC Waveforms

T30LMSW3B3257 / T30LMSW3B3253 / T30LMSW3B3125 / T30LMSW3B3126

ORDERING INFORMATION

Device	Marking	Pin 1 Quadrant	Package	Shipping†
T30LMSW3B3257DTR2G	TBD	1	TSSOP-16	2500 / Tape & Reel
T30LMSW3B3253DTR2G	TBD	1	TSSOP-16	2500 / Tape & Reel
T30LMSW3B3125DTR2G	TBD	1	TSSOP-14	2500 / Tape & Reel
T30LMSW3B3126DTR2G	TBD	1	TSSOP-14	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.

Pin 1 Orientation in Tape and Reel
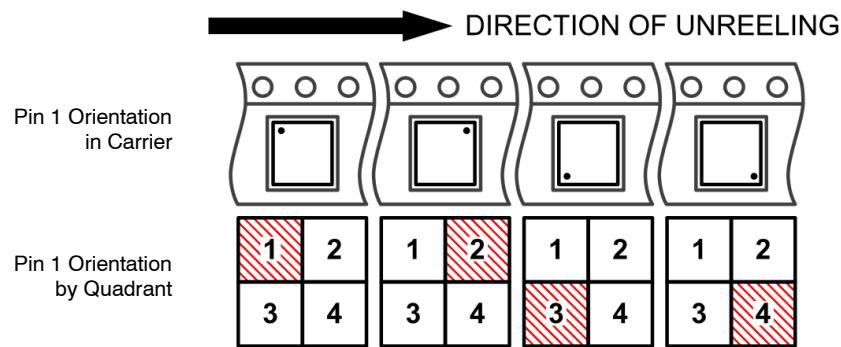
Figure 8.

PACKAGE DIMENSIONS
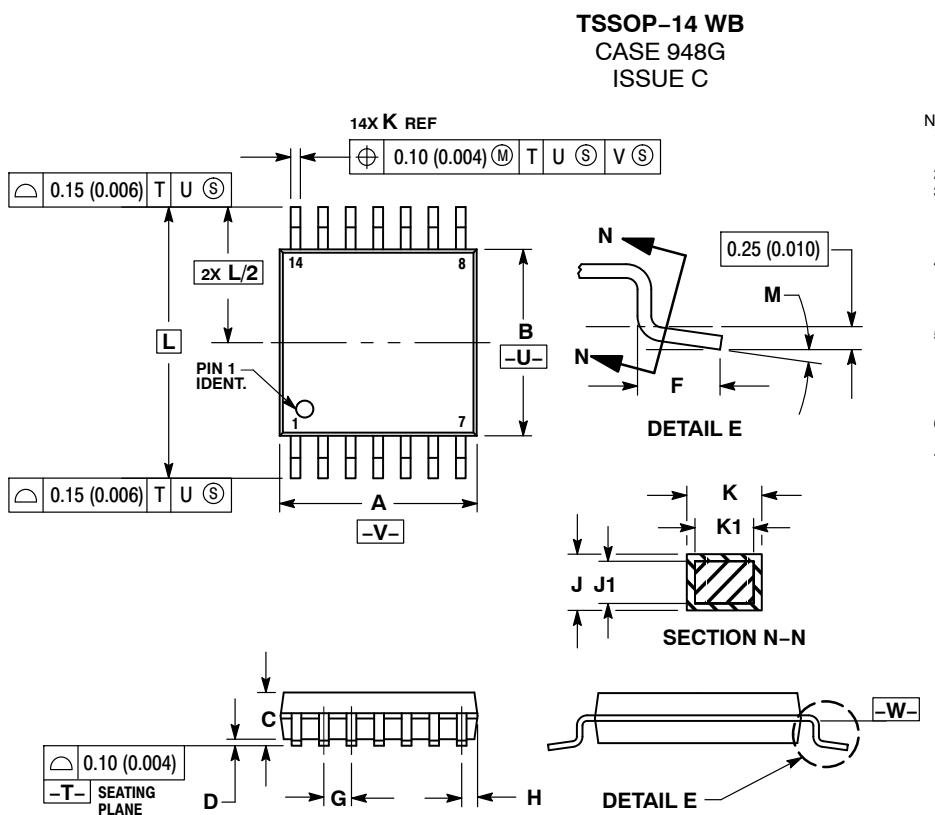
TSSOP−14 WB
CASE 948G
ISSUE C

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 °

RECOMMENDED SOLDERING FOOTPRINT*

7.06

14X 0.36

14X 1.26

0.65 PITCH

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.

T30LMSW3B3257 / T30LMSW3B3253 / T30LMSW3B3125 / T30LMSW3B3126

PACKAGE DIMENSIONS

TSSOP−16 WB
CASE 948F
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	MAX	INCHES 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*

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.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical–documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales

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