4-Bit Configurable Dual-Supply Transceiver with 3-State Outputs

Product Preview

T30LMXT3V4T245, T30LMXT3V4T774

The T30LMXT3V4T245 and T30LMXT3V4T774 are 4-bit configurable dual-supply translating bidirectional transceivers with 3-state outputs. The A- and B-ports are designed to track two different power supply rails, V_{CCA} and V_{CCB} respectively. Both supply rails are configurable from 0.9 V to 3.6 V allowing universal bidirectional voltage translation between the A- and B-ports.

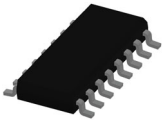
The T30LMXT3V4T245 transceiver consists of two groups of 2-bit transceivers, each of which may be independently controlled by its own direction (1DIR, 2DIR) and output enable pins ($\overline{1OE}$, $\overline{2OE}$). The Direction inputs, 1DIR and 2DIR, determine the direction of data flow for each group. When nDIR is High, data flows from nA to nB. When nDIR is Low, data flows from nB to nA. The Output Enable inputs, $\overline{1OE}$ and $\overline{2OE}$, when High, disables both A- and B-ports of group 1 and 2 respectively, by putting them in 3-state. The 1DIR, 2DIR, $\overline{1OE}$ and $\overline{2OE}$ signals are designed to track V_{CCA}.

The T30LMXT3V4T774 is a 4-bit transceiver, each bit of which has its own independent direction (DIR1, DIR2, DIR3, DIR4) pin. All 4-bits are controlled by a single output enable ($\overline{OE}$) pin. The Direction inputs, DIR1, DIR2, DIR3 and DIR4, determine the direction of data flow for each bit. When DIRn is High, data flows from An to Bn. When DIRn is Low, data flows from Bn to An. The Output Enable input, $\overline{OE}$, when High, disables all A- and B-ports by putting them in 3-state. The DIR1, DIR2, DIR3, DIR4 and $\overline{OE}$ signals are designed to track V_{CCA}.

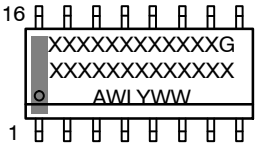
Features

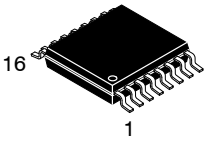
- Wide V_{CCA} and V_{CCB} Operating Range: 0.9 V to 3.6 V
- Balanced Output Drive: ±24 mA @ 3.0 V
- High-Speed w/ Balanced Propagation Delay:
  2.3 ns max at 3.0 to 3.6 V
- Input Pins OVT to 3.6 V
- Non-preferential V_{CC} Sequencing
- Outputs at 3-State until Active V_{CC} is reached
- Partial Power-Off Protection
- Outputs Switch to 3-State with either V_{CC} at GND
- Typical Max Data Rates
  400 Mbps (≥ 1.8 V to 3.3 V Translation)
  200 Mbps (≥ 1.1 V to [1.8 V, 2.5 V, 3.3 V] Translation)
  150 Mbps (≥ 1.1 V to 1.5 V Translation)
  100 Mbps (≥ 1.1 V to 1.2 V Translation)

MARKING DIAGRAMS

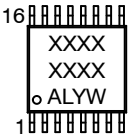


SOIC-16
D SUFFIX
CASE 751B

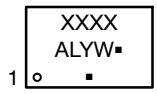


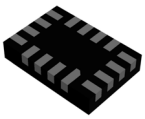


TSSOP-16
DT SUFFIX
CASE 948F

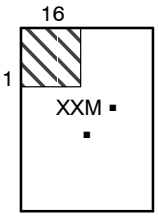


QFN16
MN SUFFIX
CASE 485AW





UQFN16
MU SUFFIX
CASE 523BF



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

(Note: Microdot may be in either location)

- Small Pb-Free Packaging:
  TSSOP16 (5.0 mm x 6.4 mm)
  SOIC16 (6.0 mm x 9.9 mm)
  UQFN16 (1.8 mm x 2.6 mm)
  QFN16 (2.5 mm x 3.5 mm)

Typical Applications

- Mobile Phones, PDAs, Other Portable Devices
- Automotive

ORDERING INFORMATION

See detailed ordering and shipping information on page 10 of this data sheet.

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

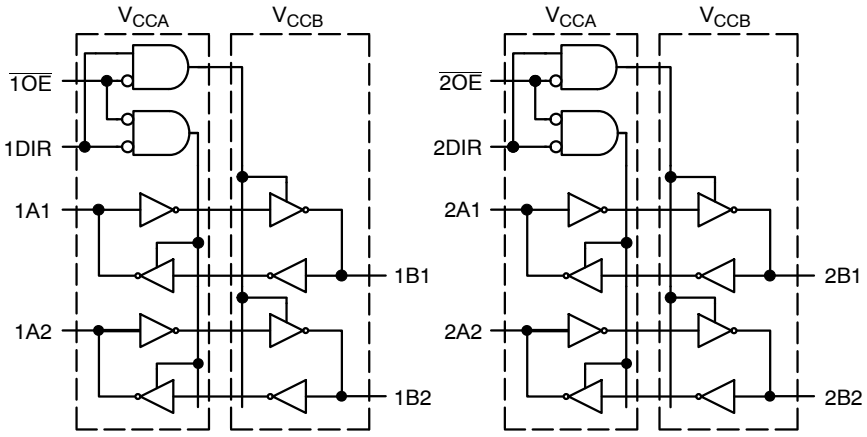
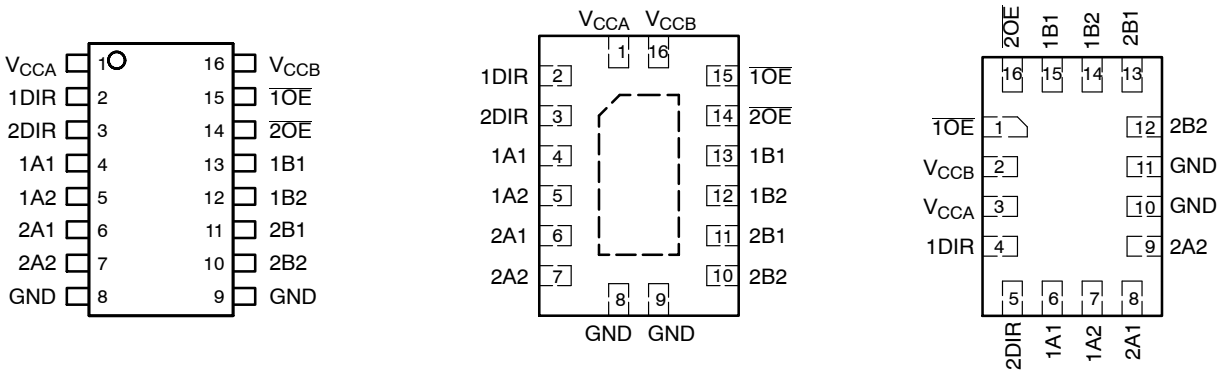


Figure 1. Logic Diagrams (T30LMXT3V4T245)



TSSOP16 / SOIC-16 **QFN16 (2.5 x 3.5)** **UQFN16 (1.8 x 2.6)**

Figure 2. Pin Assignments (T30LMXT3V4T245, Top View)

PIN NAMES

Pins	Description
V_{CCA}	A-Port DC Power Supply
V_{CCB}	B-Port DC Power Supply
GND	Ground
$\overline{1OE}$, $\overline{2OE}$	Output Enable
1DIR, 2DIR	Direction Selects
1A1, 1A2, 2A1, 2A2	A-Port I/O
1B1, 1B2, 2B1, 2B2	B-Port I/O

FUNCTION TABLE

$\overline{nOE}$	nDIR	Operating Mode
L	L	nB to nA
L	H	nA to nB
H	X	n Ports at Hi-Z

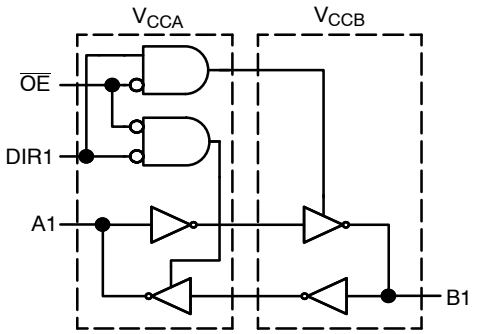
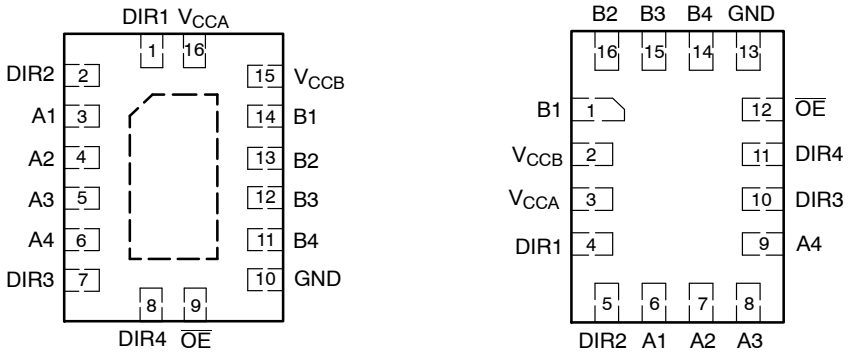


Figure 3. Logic Diagrams (T30LMXT3V4T774, 1-bit Shown)



QFN16 (2.5 x 3.5) **UQFN16 (1.8 x 2.6)**

Figure 4. Pin Assignments (T30LMXT3V4T774, Top View)

PIN NAMES

Pins	Description
V_{CCA}	A-Port DC Power Supply
V_{CCB}	B-Port DC Power Supply
GND	Ground
$\overline{OE}$	Output Enable
DIR1, DIR2, DIR3, DIR4	Direction Selects
A1, A2, A3, A4	A-Port I/O
B1, B2, B3, B4	B-Port I/O

FUNCTION TABLE

$\overline{OE}$	DIRn	Operating Mode
L	L	Bn to An
L	H	An to Bn
H	X	All Ports at Hi-Z

Application Recommendations

During power-up and power-down, it is recommended that the $\overline{OE}$ pins be connected to V_{CC} through pull-up resistors to ensure high impedance at the I/O ports. During normal operation, it is also recommended that the ports be disabled before changing the DIR state. Then, the ports may be enabled again. These should prevent contention and data errors.

MAXIMUM RATINGS

Symbol	Parameter		Value	Condition	Unit
V_{CCA}, V_{CCB}	DC Supply Voltage		−0.5 to +4.3		V
V_I	Input Voltage	$\overline{OE}$, DIR	−0.5 to +4.3		V
		A	−0.5 to +4.3		
		B	−0.5 to +4.3		
V_O	Output Voltage	(Power Down Mode) A, B	−0.5 to +4.3	V_{CCA} = V_{CCB} = 0	V
		(3-State Mode) A, B	−0.5 to +4.3		
		(Active Mode) A	−0.5 to V_{CCA}+0.5		
		(Active Mode) B	−0.5 to V_{CCB}+0.5		
I_{IK}	DC Input Diode Current		−50	V_I < GND	mA
I_{OK}	DC Output Diode Current		−50	V_O < GND	mA
I_O	DC Output Source/Sink Current		±50		mA
I_{CC}	DC Supply Current Per Supply Pin		±100		mA
I_{GND}	DC Ground Current per Ground Pin		±100		mA
T_{STG}	Storage Temperature Range		−65 to +150		°C
θ_{JA}	Thermal Resistance (Note 1)	SOIC-16 TSSOP-16 QFN16 UQFN16		126 159 118 TBD	°C/W
P_D	Power Dissipation in Still Air	SOIC-16 TSSOP-16 QFN16 UQFN16		995 787 1062 TBD	mW
MSL	Moisture Sensitivity Level			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 Charged Device Model		2 1	kV
$I_{LATCHUP}$	Latchup Performance Above V_{CC} and Below GND at 25°C (Note 3)			±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. 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 ANSI/ESDA/JEDEC JS-001-2017. CDM tested to EIA/JESD22-C101-A. JEDEC recommends that ESD qualification to EIA/JESD22-A115-A (Machine Model) be discontinued per JEDEC/JEP172A.
3. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CCA}, V_{CCB}	Positive DC Supply Voltage		0.9	3.6	V
V_I	Input Voltage		GND	3.6	V
V_O	Output Voltage	(Power Down) A, B	GND	3.6	V
		(3-State Mode) A, B	GND	3.6	
		(Active Mode) A	GND	V_{CCA}	
		(Active Mode) B	GND	V_{CCB}	
T_A	Operating Temperature Range		−40	+125	°C
$\Delta t / \Delta V$	Input Transition Rise or Fall Rate		0	5	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 – INPUT VOLTAGES

Symbol	Parameter	Test Conditions	Port	V_{CCA} (V)	V_{CCB} (V)	T_A = −40°C to +85°C			T_A = −40°C to +125°C		Unit
						Min	Typ (Note 4)	Max	Min	Max	
V_{IH}	Input HIGH Voltage		$\overline{OE}$, DIR, A	2.7 – 3.6	0.9 – 3.6	2.0	–	–	2.0	–	V
				2.3 – 2.7		1.6	–	–	1.6	–	
				0.9 – 1.95		0.65 V_{CCA}	–	–	0.65 V_{CCA}	–	
			B	0.9 – 3.6	2.7 – 3.6	2.0	–	–	2.0	–	
					2.3 – 2.7	1.6	–	–	1.6	–	
					0.9 – 1.95	0.65 V_{CCB}	–	–	0.65 V_{CCB}	–	
V_{IL}	Input LOW Voltage		$\overline{OE}$, DIR, A	2.7 – 3.6	0.9 – 3.6	–	–	0.8	–	0.8	V
				2.3 – 2.7		–	–	0.7	–	0.7	
				0.9 – 1.95		–	–	0.35 V_{CCA}	–	0.35 V_{CCA}	
			B	0.9 – 3.6	2.7 – 3.6	–	–	0.8	–	0.8	
					2.3 – 2.7	–	–	0.7	–	0.7	
					0.9 – 1.95	–	–	0.35 V_{CCB}	–	0.35 V_{CCB}	

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.

4. All typical values are at T_A = 25°C.

DC ELECTRICAL CHARACTERISTICS – OUTPUT VOLTAGES

Symbol	Parameter	Test Conditions	V_{CCA} (V)	V_{CCB} (V)	T_A = –40°C to +85°C			T_A = –40°C to +125°C		Unit
					Min	Typ (Note 4)	Max	Min	Max	
V_{OH}	Output HIGH Voltage	V_I = V_{IH} or V_{IL}:								V
		I_{OH} = –100 μA A	0.9 – 3.6	0.9 – 3.6	V_{CCA} – 0.1	–	–	V_{CCA} – 0.1	–	
		B	0.9 – 3.6	0.9 – 3.6	V_{CCB} – 0.1	–	–	V_{CCB} – 0.1	–	
		I_{OH} = –0.5 mA	0.9	0.9	0.7	–	–	0.7	–	
		I_{OH} = –3 mA	1.1	1.1	0.85	–	–	0.85	–	
		I_{OH} = –6 mA	1.4	1.4	1.05	–	–	1.05	–	
		I_{OH} = –8 mA	1.65	1.65	1.2	–	–	1.2	–	
		I_{OH} = –12 mA	2.3	2.3	1.8	–	–	1.8	–	
			2.7	2.7	2.2	–	–	2.2	–	
		I_{OH} = –18 mA	2.3	2.3	1.7	–	–	1.7	–	
			3.0	3.0	2.4	–	–	2.4	–	
		I_{OH} = –24 mA	3.0	3.0	2.2	–	–	2.2	–	
V_{OL}	Output LOW Voltage	V_I = V_{IH} or V_{IL}:								V
		I_{OL} = 100 μA	0.9 – 3.6	0.9 – 3.6	–	–	0.1	–	0.1	
		I_{OL} = 0.5 mA	0.9	0.9	–	–	0.2	–	0.2	
		I_{OL} = 3 mA	1.1	1.1	–	–	0.25	–	0.25	
		I_{OL} = 6 mA	1.4	1.4	–	–	0.35	–	0.35	
		I_{OL} = 8 mA	1.65	1.65	–	–	0.3	–	0.3	
		I_{OL} = 12 mA	2.3	2.3	–	–	0.4	–	0.4	
			2.7	2.7	–	–	0.4	–	0.4	
		I_{OL} = 18 mA	2.3	2.3	–	–	0.4	–	0.4	
			3.0	3.0	–	–	0.4	–	0.4	
		I_{OL} = 24 mA	3.0	3.0	–	–	0.55	–	0.55	

DC ELECTRICAL CHARACTERISTICS – LEAKAGE AND SUPPLY CURRENTS

Symbol	Parameter	Test Conditions	V_{CCA} (V)	V_{CCB} (V)	T_A = –40°C to +85°C		T_A = –40°C to +125°C		Unit
					Min	Max	Min	Max	
I_I	Input Leakage Current	V_I = 3.6 V or GND	0.9 – 3.6	0.9 – 3.6	–	±0.1	–	±1.0	μA
I_{OZ}	3-State Output Leakage	$\overline{OE}$ = V_{IH}; V_I = 3.6 V or GND, V_O = GND to 3.6 V	3.6	3.6	–	±0.1	–	±1.0	μA
I_{OFF}	Power-Off Leakage Current	V_I or V_O = 0 to 3.6 V A	0	0.9 – 3.6	–	±0.1	–	±1.0	μA
		B	0.9 – 3.6	0	–	±0.1	–	±1.0	

DC ELECTRICAL CHARACTERISTICS – LEAKAGE AND SUPPLY CURRENTS

Symbol	Parameter	Test Conditions	V_{CCA} (V)	V_{CCB} (V)	T_A = −40°C to +85°C		T_A = −40°C to +125°C		Unit
					Min	Max	Min	Max	
I_{CCA}	Quiescent Supply Current	V_I = V_{CCA} or GND; I_O = 0	0.9 – 3.6	0.9 – 3.6	–	0.5	–	1.0	μA
			0	0.9 – 3.6	–	−0.1	–	−1	
			0.9 – 3.6	0	–	0.1	–	1.0	
I_{CCB}	Quiescent Supply Current	V_I = V_{CCB} or GND; I_O = 0	0.9 – 3.6	0.9 – 3.6	–	0.5	–	1.0	μA
			0	0.9 – 3.6	–	0.1	–	1.0	
			0.9 – 3.6	0	–	−0.1	–	−1.0	

NOTE: Connect ground before applying supply voltage V_{CCA} or V_{CCB}. This device is designed with the feature that the power-up sequence of V_{CCA} and V_{CCB} will not damage the IC.

AC ELECTRICAL CHARACTERISTICS (Note 5)

Symbol	Parameter	V_{CCA} (V)	T_A = −40°C to +85°C					T_A = −40°C to +125°C					Unit
			V_{CCB} (V)					V_{CCB} (V)					
			3.3	2.5	1.8	1.5	1.2	3.3	2.5	1.8	1.5	1.2	
			Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	
t_{PLH}, t_{PHL}	Propagation Delay, A to B	3.3	2.3	2.8	3.5	4.2	8.0	2.6	3.3	3.9	4.7	8.3	ns
		2.5	2.7	3.1	3.8	4.4	8.2	2.9	3.5	4.2	4.9	8.5	
		1.8	3.2	3.6	4.0	4.6	8.4	3.5	3.9	4.5	5.0	8.7	
		1.5	3.9	4.0	4.4	5.1	8.7	4.1	4.3	4.8	5.5	9.0	
		1.2	4.9	5.0	5.2	6.1	9.0	5.3	5.4	5.9	6.9	9.3	
	Propagation Delay, B to A	3.3	2.3	2.7	3.2	3.9	4.9	2.6	2.9	3.5	4.1	5.3	
		2.5	2.8	3.1	3.6	4.0	5.0	3.3	3.5	3.9	4.3	5.4	
		1.8	3.5	3.8	4.0	4.4	5.2	3.9	4.2	4.5	4.8	5.9	
		1.5	4.2	4.4	4.6	5.1	6.1	4.7	4.9	5.0	5.5	6.9	
		1.2	8.0	8.2	8.4	8.7	9.0	8.3	8.5	8.7	9.0	9.3	
t_{PZH}, t_{PZL}	Output Enable, $\overline{OE}$ to A	3.3	2.8	3.2	3.5	4.0	5.4	3.1	3.4	3.7	4.2	5.7	ns
		2.5	4.2	4.4	4.6	4.8	5.7	4.7	4.9	5.1	5.3	6.0	
		1.8	6.7	6.7	6.7	6.7	6.7	7.5	7.5	7.5	7.5	7.5	
		1.5	9.1	9.1	9.1	9.1	9.1	10	10	10	10	10	
		1.2	12.8	12.8	12.8	12.8	12.8	13.3	13.3	13.3	13.3	13.3	
	Output Enable, $\overline{OE}$ to B	3.3	3.5	4.2	5.8	8.0	11.3	4.2	4.9	6.7	8.4	11.9	
		2.5	4	4.8	6.3	8.3	11.3	4.4	5.3	7.0	8.7	11.9	
		1.8	4.6	5.3	7.0	8.6	11.3	5.1	5.9	7.5	9.0	11.9	
		1.5	5.6	5.8	7.5	8.9	11.3	6.2	6.4	8.0	9.3	11.9	
		1.2	8.7	8.8	9.1	9.8	12.3	8.9	9.0	9.3	10.0	12.5	

AC ELECTRICAL CHARACTERISTICS (Note 5)

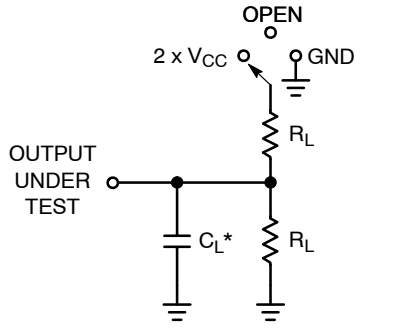
Symbol	Parameter	V_{CCA} (V)	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Unit
t_{PHZ}, t_{PLZ}	Output Disable $\overline{OE}$ to A	3.3	5.6	5.6	5.6	5.6	5.6	6.1	6.1	6.1	6.1	6.1	ns
		2.5	6.2	6.2	6.2	6.2	6.2	6.7	6.7	6.7	6.7	6.7	
		1.8	6.9	6.9	6.9	6.9	6.9	7.4	7.4	7.4	7.4	7.4	
		1.5	7.6	7.6	7.6	7.6	7.6	8.2	8.2	8.2	8.2	8.2	
		1.2	9.5	9.5	9.5	9.5	9.5	10.5	10.5	10.5	10.5	10.5	
	Output Disable, $\overline{OE}$ to B	3.3	5.6	5.6	5.6	5.6	5.6	6.1	6.1	6.1	6.1	6.1	
		2.5	6.2	6.2	6.2	6.2	6.2	6.7	6.7	6.7	6.7	6.7	
		1.8	6.9	6.9	6.9	6.9	6.9	7.4	7.4	7.4	7.4	7.4	
		1.5	7.6	7.6	7.6	7.6	7.6	8.2	8.2	8.2	8.2	8.2	
		1.2	9.5	9.5	9.5	9.5	9.5	10.5	10.5	10.5	10.5	10.5	

5. Propagation delays defined per Figure 5.

CAPACITANCE

Symbol	Parameter	Test Conditions	Typ (Note 4)	Unit
C_{IN}	Control Pin Input Capacitance	$V_{CCA} = V_{CCB} = 3.3$ V, $V_I = 0$ V or $V_{CCA/B}$	2.5	pF
$C_{I/O}$	I/O Pin Input Capacitance	$V_{CCA} = V_{CCB} = 3.3$ V, $V_I = 0$ V or $V_{CCA/B}$	5.0	pF
C_{PD} (Note 6)	Power Dissipation Capacitance	$V_{CCA} = V_{CCB} = 3.3$ V, $V_I = 0$ V or $V_{CCA/B}$, f = 10 MHz		pF
	A Port	A to B with output enabled or disabled	0.4	
		B to A with output disabled	0.7	
		B to A with output enabled	12	
	B Port	B to A with output enabled or disabled	0.4	
		A to B with output disabled	0.7	
		A to B with output enabled	12	

6. C_{PD} is defined as the value of the IC's equivalent capacitance from which the operating current can be calculated from: $I_{CC(operating)} \cong C_{PD} \times V_{CC} \times f_{IN} \times N_{SW}$ where $I_{CC} = I_{CCA} + I_{CCB}$ and N_{SW} = total number of outputs switching.



* C_L Includes load and jig capacitance

Figure 5. AC Test Circuit

Test	Switch Position	C_L	R_L
t_{PLH}, t_{PHL}	OPEN	15 pF	2 kΩ
t_{PLZ}, t_{PZL}	2 x V_{CC}		
t_{PHZ}, t_{PZH}	GND		
C_L includes load and jig capacitance Pulse generator Z_O = 50 Ω Input f = 1.0 MHz; t_W = 500 ns			

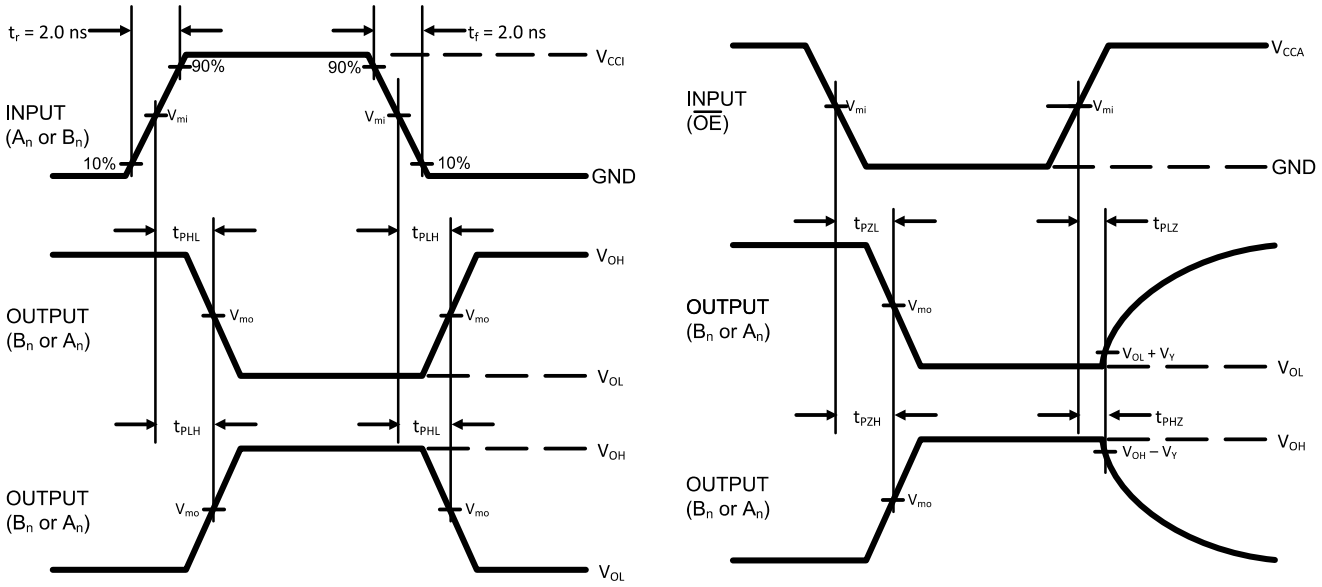


Figure 6. AC Waveforms

Symbol	V_{CC}				
	3.0 V – 3.6 V	2.3 V – 2.7 V	1.65 V – 1.95 V	1.4 V – 1.6 V	1.1 V – 1.3 V
V_{mi}	V_{CCI}/2	V_{CCI}/2	V_{CCI}/2	V_{CCI}/2	V_{CCI}/2
V_{mo}	V_{CCO}/2	V_{CCO}/2	V_{CCO}/2	V_{CCO}/2	V_{CCO}/2
V_Y	0.3 V	0.15 V	0.15 V	0.1 V	0.1 V

7. V_{CCI} is the V_{CC} associated with the input port.
8. V_{CCO} is the V_{CC} associated with the output port.

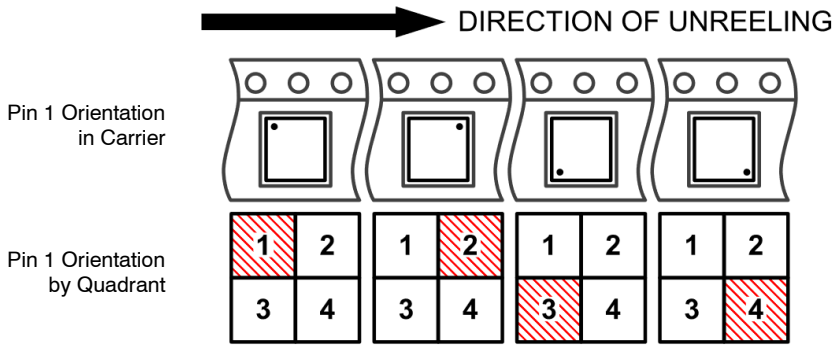
ORDERING INFORMATION

Order Number	Marking	Package	Pin 1 Quadrant	Shipping†
T30LMXT3V4T245DR2G	TBD	SOIC-16	TBD	2500 / Tape & Reel
T30LAXT3V4T245DR2G*	TBD	SOIC-16	TBD	2500 / Tape & Reel
T30LMXT3V4T245DTR2G	TBD	TSSOP-16	TBD	2500 / Tape & Reel
T30LAXT3V4T245DTR2G”	TBD	TSSOP-16	TBD	2500 / Tape & Reel
T30LMXT3V4T245MN1TWG	TBD	QFN16	TBD	3000 / Tape & Reel
T30LAXT3V4T245MN1TWG*	TBD	QFN16	TBD	3000 / Tape & Reel
T30LMXT3V4T245MU2TAG	TBD	UQFN16	TBD	3000 / Tape & Reel
T30LAXT3V4T245MU2TAG*	TBD	UQFN16	TBD	3000 / Tape & Reel
T30LMXT3V4T774MN1TWG	TBD	QFN16	TBD	3000 / Tape & Reel
T30LAXT3V4T774MN1TWG*	TBD	QFN16	TBD	3000 / Tape & Reel
T30LMXT3V4T774MU2TAG	TBD	UQFN16	TBD	3000 / Tape & Reel
T30LAXT3V4T774MU2TAG*	TBD	UQFN16	TBD	3000 / 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.

* For Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

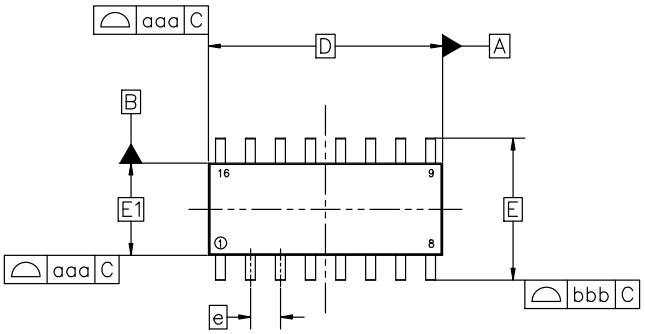
Pin 1 Orientation in Tape and Reel



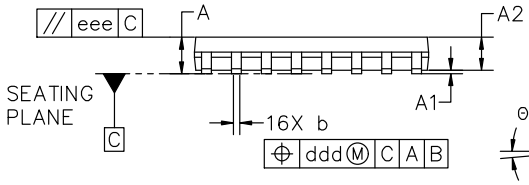
PACKAGE DIMENSIONS

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

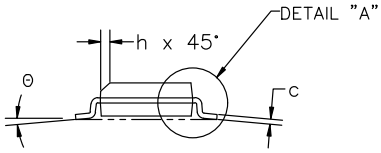
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. DIMENSION IN MILLIMETERS. ANGLE IN DEGREES.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15mm PER SIDE.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127mm TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION.



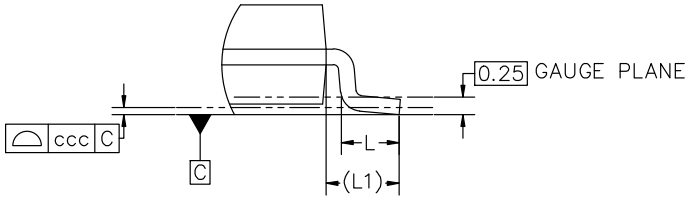
TOP VIEW



SIDE VIEW

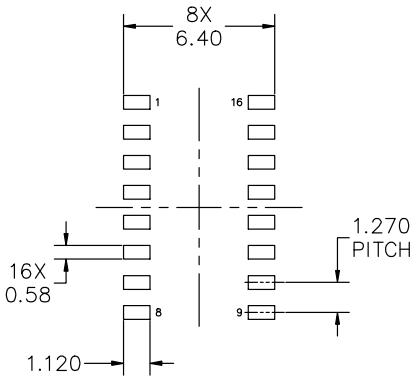


END VIEW



DETAIL "A"
Scale 3:1

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		

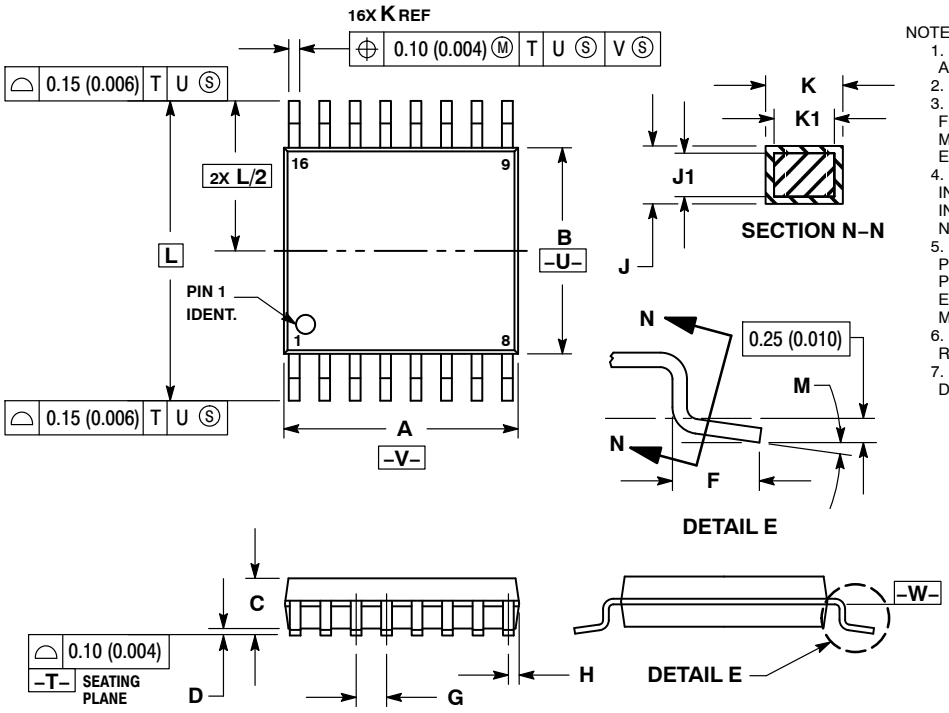


RECOMMENDED MOUNTING FOOTPRINT

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

PACKAGE DIMENSIONS

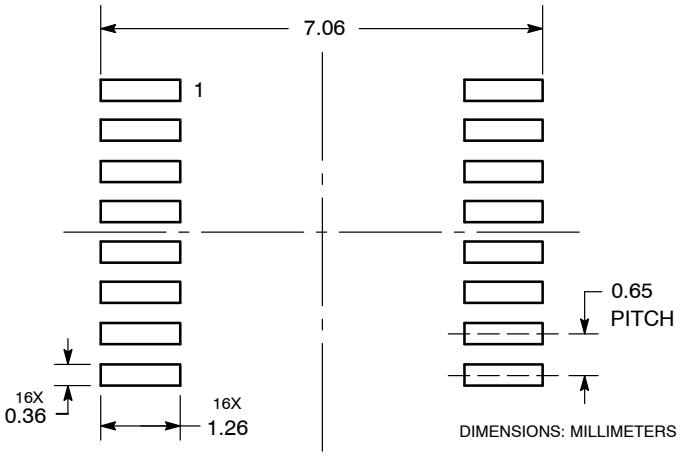
TSSOP−16 WB
CASE 948F
ISSUE B



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−.

	MILLIMETERS		INCHES	
DIM	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 °

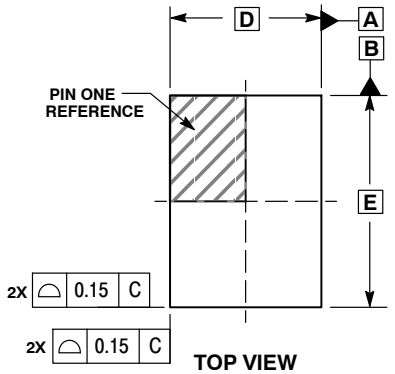
RECOMMENDED SOLDERING FOOTPRINT*

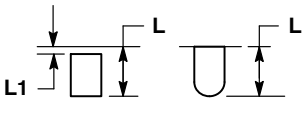


* For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

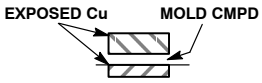
PACKAGE DIMENSIONS

QFN16, 2.5x3.5, 0.5P
CASE 485AW
ISSUE O





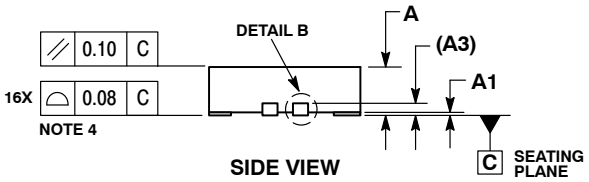
DETAIL A
ALTERNATE TERMINAL CONSTRUCTIONS

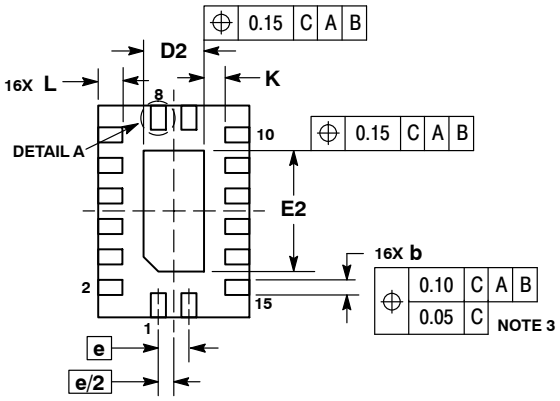


DETAIL B
ALTERNATE CONSTRUCTIONS

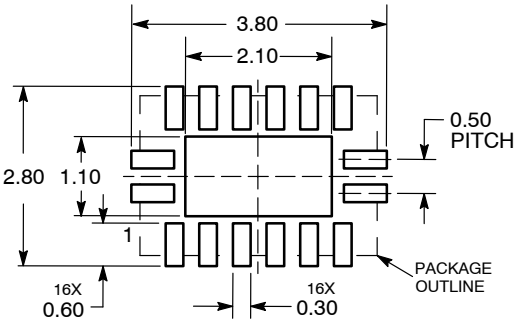
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.20	0.30
D	2.50 BSC	
D2	0.85	1.15
E	3.50 BSC	
E2	1.85	2.15
e	0.50 BSC	
K	0.20	---
L	0.35	0.45
L1	---	0.15





RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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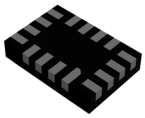
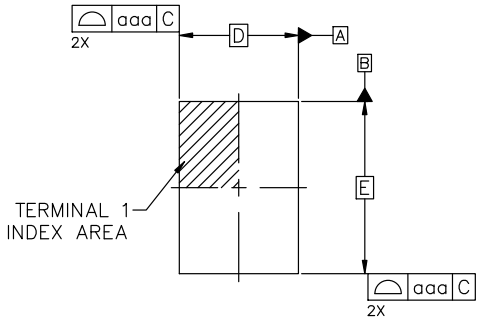
PACKAGE DIMENSIONS

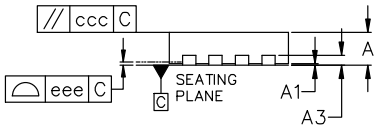


UQFN16 1.80x2.60x0.50, 0.40P
CASE 523BF
ISSUE A

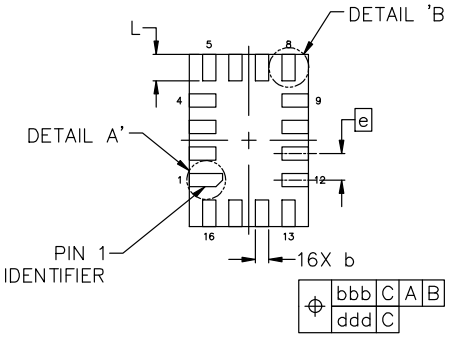
DATE 06 MAY 2024



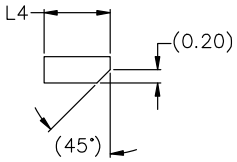
TOP VIEW



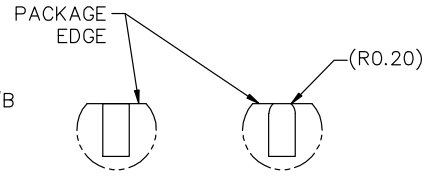
SIDE VIEW



BOTTOM VIEW



DETAIL 'A
SCALE 2:1



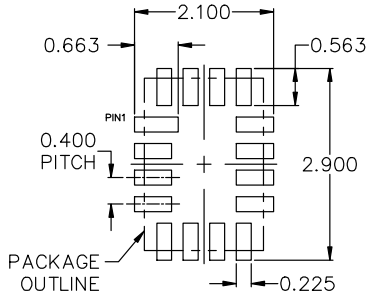
DETAIL 'B
SCALE 2:1

ALTERNATE
CONSTRUCTION

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M−2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS, DEGREES IN ANGLE.
3. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
4. TERMINAL SHAPE MAY VARY ACCORDING TO PACKAGE SUPPLIER, SEE TERMINAL SHAPE VARIANTS.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.45	0.50	0.55
A1	0.00	−−−	0.05
A3	0.10	0.15	0.20
b	0.15	0.20	0.25
D		1.80 BSC	
E		2.60 BSC	
e		0.40 BSC	
L	0.35	0.40	0.45
L4	0.45	0.50	0.55
TOLERANCES FOR FEATURE CONTROL FRAME			
aaa		0.05	
bbb		0.10	
ccc		0.10	
ddd		0.05	
eee		0.05	



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