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

Preliminary Document

T30LMXT3V4T245

The T30LMXT3V4T245 is a 4-bit configurable dual-supply translating bidirectional transceiver 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}.

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 DIAGRAM
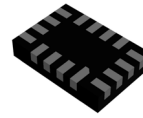
**UQFN16
MU SUFFIX
CASE 523BF**

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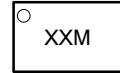
XXXX	= Specific Device Code
A	= Assembly Location
M	= Date Code/Assembly Location
L, WL	= Wafer Lot
Y	= Year
W, WW	= Work Week
G or ▪	= Pb-Free Package

(Note: Microdot may be in either location)

- Small Pb-Free Packaging:
    UQFN16 (1.8 mm x 2.6 mm)

Typical Applications

- Mobile Phones, PDAs, Other Portable Devices
- Automotive

ORDERING INFORMATION

See detailed ordering and shipping information on page 9 of this data sheet.

This Preliminary document is for informational purposes only. **onsemi** may update or withdraw it without notice. Content and referenced products are under development and subject to change.
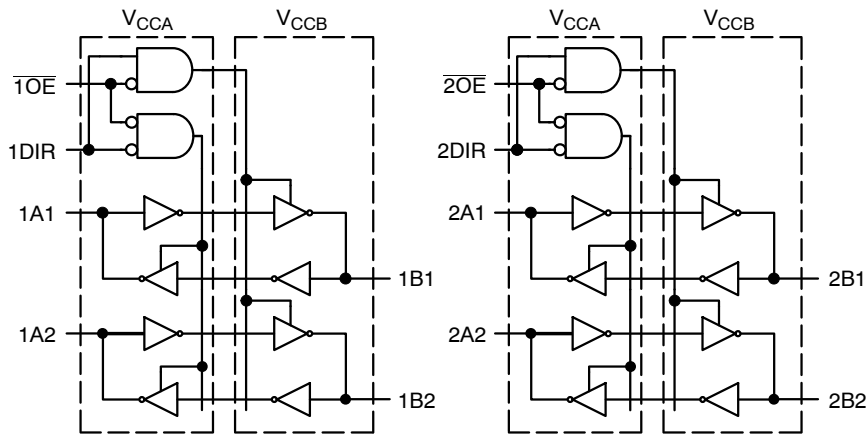
T30LMXT3V4T245

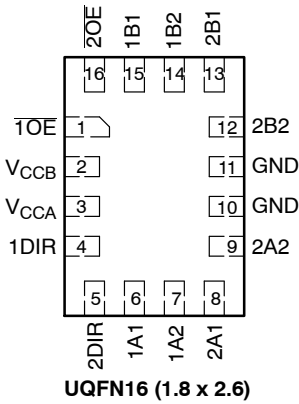**Figure 1. Logic Diagrams (T30LMXT3V4T245)**

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

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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 Condi-tions	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 Volt-age		$\overline{OE}$, 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.

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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} = −2 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} = 2 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 V$_{CCB}$ (V)					T$_A$ = −40 °C to +125 °C V$_{CCB}$ (V)					Unit
			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	2.9	3.3	4.5	5.6	9.3	3.3	3.8	5.0	6.2	9.5	ns
		2.5	3.3	3.7	4.6	5.7	9.4	4.0	4.0	5.1	6.3	9.6	
		1.8	3.9	4.0	4.9	6.0	9.6	4.3	4.3	5.4	6.6	9.8	
		1.5	4.2	4.3	5.2	6.3	9.8	4.7	4.7	5.8	7.0	10	
		1.2	5.1	5.2	6.2	7.1	11.0	5.7	5.8	6.9	7.9	11.2	
	Propagation Delay, B to A	3.3	2.8	3.0	3.4	4.2	5.1	3.3	3.4	4.3	4.7	5.7	
		2.5	3.3	3.4	3.9	4.2	5.2	3.8	3.9	4.3	4.7	5.8	
		1.8	4.5	4.6	4.9	5.3	6.2	5.0	5.1	5.4	5.9	6.9	
		1.5	5.6	5.7	6.0	6.3	7.1	6.2	6.3	6.6	7.0	7.9	
		1.2	9.3	9.4	9.6	9.8	11.0	9.5	9.6	9.8	10	11.2	
t$_{PZH}$, t$_{PZL}$	Output Enable, $\overline{OE}$ to A	3.3	3.8	3.8	3.8	4.0	5.3	4.2	4.2	4.2	4.2	5.4	ns
		2.5	4.8	4.8	4.8	4.8	5.7	5.3	5.3	5.3	5.3	5.9	
		1.8	7.2	7.2	7.2	7.2	7.2	8.0	8.0	8.0	8.0	8.0	
		1.5	9.4	9.4	9.4	9.4	9.4	10.4	10.4	10.4	10.4	10.4	
		1.2	12.8	12.8	12.8	12.8	13.3	14.1	14.1	14.1	14.1	14.1	
	Output Enable, $\overline{OE}$ to B	3.3	3.8	4.7	6.8	8.7	11.3	4.2	5.2	7.5	9.6	12.4	
		2.5	4.0	4.8	7.0	8.8	11.3	4.4	5.3	7.7	9.7	12.4	
		1.8	4.6	5.3	7.4	9.2	11.7	5.1	5.9	8.2	10.2	12.9	
		1.5	5.6	5.8	7.7	9.6	12.1	6.2	6.4	8.5	10.6	13.3	
		1.2	7.7	7.9	8.9	10.0	13.5	8.5	8.7	9.8	11.0	14.7	

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	6.7	6.7	6.7	6.7	6.7	8.5	8.5	8.5	8.5	8.5	ns
		2.5	6.2	6.2	6.2	6.2	6.2	6.9	6.9	6.9	6.9	6.9	
		1.8	8.6	8.6	8.6	8.6	8.6	9.5	9.5	9.5	9.5	9.5	
		1.5	10.2	10.2	10.2	10.2	10.2	11.3	11.3	11.3	11.3	11.3	
		1.2	11.0	11.0	11.0	11.0	11.0	12.0	12.0	12.0	12.0	12.0	
	Output Disable, $\overline{OE}$ to B	3.3	6.2	5.2	7.4	7.8	8.3	6.9	5.8	7.7	8.2	9.0	
		2.5	6.4	6.2	6.9	7.4	8.8	7.1	6.9	7.6	8.4	10.1	
		1.8	8.1	8.2	8.7	9.1	9.5	9.0	9.1	9.6	10.1	10.5	
		1.5	9.3	8.8	9.9	10.3	9.6	10.3	10.4	10.9	11.4	10.6	
		1.2	10.2	10.4	10.9	11.3	12.4	11.3	11.5	12.0	12.5	13.7	

5. Propagation delays defined per Figure 3.

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
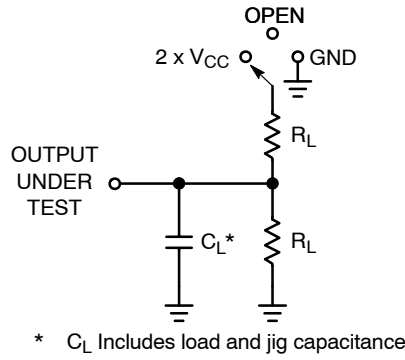
Figure 3. AC Test Circuit

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			
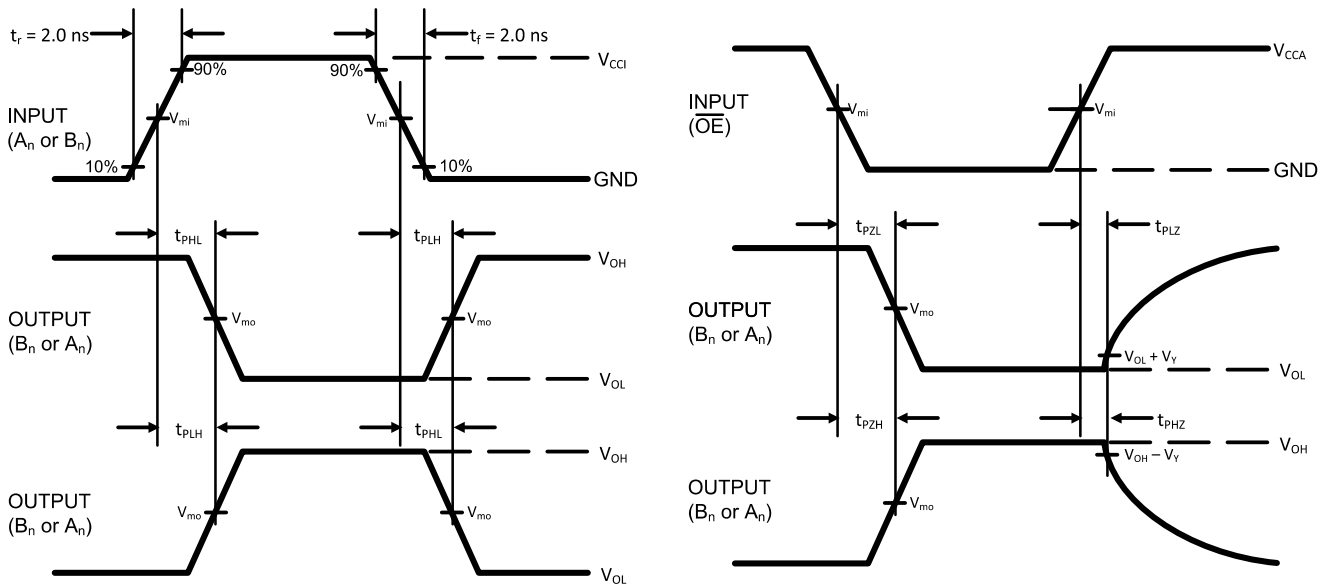
Figure 4. AC Waveforms

	V_{CC}				
Symbol	**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.

T30LMXT3V4T245

Order Number	Marking	Package	Pin 1 Quadrant	Shipping[†]
T30LMXT3V4T245MU2TAG	XA	UQFN16	1	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.

Pin 1 Orientation in Tape and Reel

DIRECTION OF UNREELING

Pin 1 Orientation in Carrier

Pin 1 Orientation by Quadrant
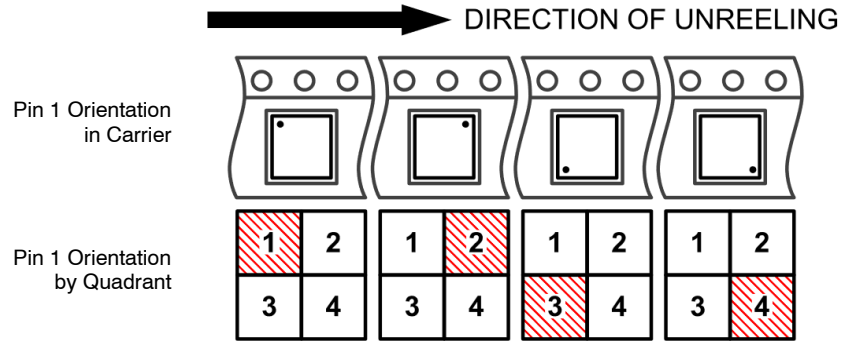
REVISION HISTORY

Revision	Description of Changes	Date
P5	UQFN16 Marking Diagram update (p.1), Ordering Information table update (p.10)	11/28/2025
P6	Removed all packages and OPNs except UQFN16 and updated values in AC Characteristics table.	12/16/2025

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

T30LMXT3V4T245

PACKAGE DIMENSIONS

UQFN16 1.80x2.60x0.50, 0.40P
CASE 523BF
ISSUE A
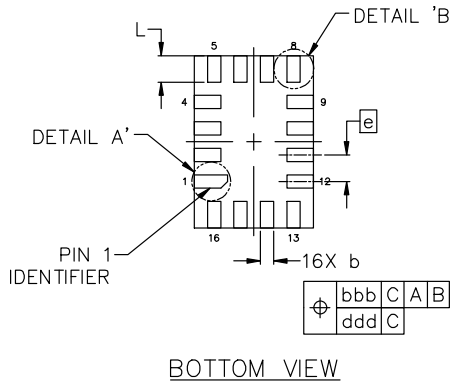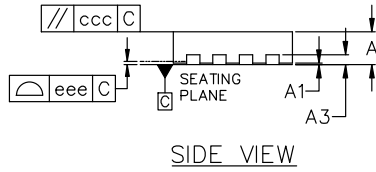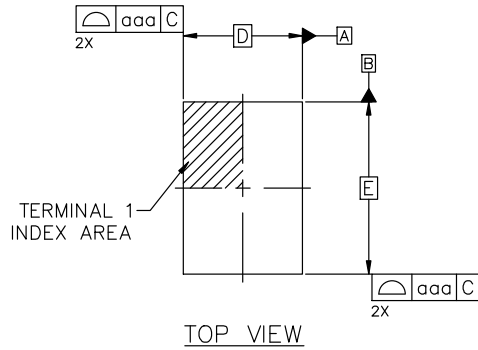
NOTES:
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M−2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS, DEGREES IN ANGLE.
3. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.
4. TERMINAL SHAPE MAY VARY ACCORDING TO PACKAGE SUPPLIER, SEE TERMINAL SHAPE VARIANTS.

TERMINAL 1 INDEX AREA

TOP VIEW

SEATING PLANE

SIDE VIEW

DETAIL 'A
SCALE 2:1

PACKAGE EDGE

DETAIL 'B
SCALE 2:1

ALTERNATE CONSTRUCTION

(R0.20)

DETAIL 'B

DETAIL A'

PIN 1 IDENTIFIER

16X b

BOTTOM VIEW
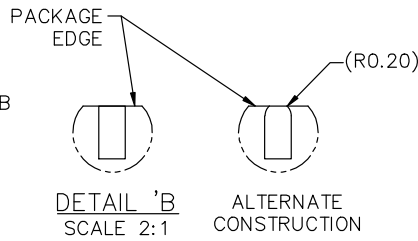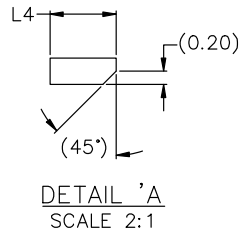
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.45	0.50	0.55
A1	0.00	―――	0.05
A3	0.10	0.15	0.20
b	0.15	0.20	0.25
D	1.80 BSC		
E	2.60 BSC		
e	0.40 BSC		
L	0.35	0.40	0.45
L4	0.45	0.50	0.55

TOLERANCES FOR FEATURE CONTROL FRAME	
aaa	0.05
bbb	0.10
ccc	0.10
ddd	0.05
eee	0.05

2.100
0.663
0.563
0.400 PITCH
2.900
0.225
PIN1
PACKAGE OUTLINE
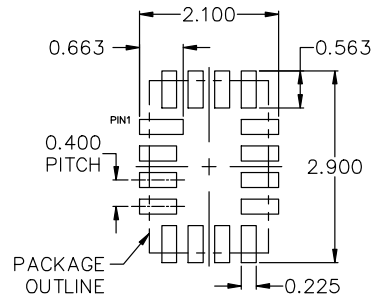
RECOMMENDED MOUNTING FOOTPRINT*
*FOR ADDITIONAL INFORMATION ON OUR Pb−FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

T30LMXT3V4T245

ADDITIONAL INFORMATION

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