74AVC8T245Q
8-Bit Dual-Supply Translating Transceiver with Configurable Voltage Translation and 3-State Outputs

GENERAL DESCRIPTION

The 74AVC8T245Q is an 8-bit, dual-supply bus transceiver with configurable voltage translation. The An and Bn are 8-bit data input-output ports. DIR is the direction control input and $\overline{OE}$ is the output enable input. V_{CCA} and V_{CCB} are dual supply pins. The supply voltage of V_{CCA} and V_{CCB} can range from 0.8V to 3.6V, making the device suitable for bidirectional translating among any of the 0.8V, 1.2V, 1.5V, 1.8V, 2.5V and 3.3V voltage nodes. The An, DIR and $\overline{OE}$ signals are referenced to V_{CCA} and Bn signals are referenced to V_{CCB}.

When DIR is set high, it allows transmission from An to Bn. When DIR is set low, it allows transmission from Bn to An. $\overline{OE}$ can be used to make the outputs disabled so that the buses are effectively isolated. In suspend mode, both An and Bn are in high-impedance state when either V_{CCA} or V_{CCB} input is at GND level.

This device is highly suitable for partial power-down applications by using power-off leakage current (I_{OFF}) circuit. When the device is powered down, the outputs are disabled, and the current backflow can be prevented from passing through the device.

This device is AEC-Q100 qualified (Automotive Electronics Council Standard Q100 Grade 1) and the use of this device is suitable for automotive applications.

FEATURES

- **AEC-Q100 Qualified for Automotive Applications**
  Device Temperature Grade 1
  T_A = -40℃ to +125℃
- **V_{CCA} Supply Voltage Range: 0.8V to 3.6V**
- **V_{CCB} Supply Voltage Range: 0.8V to 3.6V**
- **Inputs Accept Voltages up to 3.6V**
- **+12mA/-12mA Output Current**
- **Data Rates:**
  - **380Mbps (≥ 1.8V to 3.3V Translation)**
  - **260Mbps (≥ 1.1V to 3.3V Translation)**
  - **260Mbps (≥ 1.1V to 2.5V Translation)**
  - **210Mbps (≥ 1.1V to 1.8V Translation)**
  - **150Mbps (≥ 1.1V to 1.5V Translation)**
  - **100Mbps (≥ 1.1V to 1.2V Translation)**
- **Outputs in High-Impedance State when V_{CCA} or V_{CCB} = 0V**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green TQFN-3.5×5.5-24AL Package**

APPLICATIONS

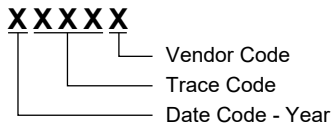
Automotive Applications
Personal Electronic Devices
Enterprise Infrastructures
Telecom Equipment

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
74AVC8T245Q	TQFN-3.5×5.5-24AL	-40℃ to +125℃	74AVC8T245QTSO24G/TR	06J TSO XXXXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor Code.



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS (1)

Supply Voltage Range, V_{CCA} ..... -0.5V to 4.6V
Supply Voltage Range, V_{CCB} ..... -0.5V to 4.6V
Input Voltage Range, V_I (2) ..... -0.5V to 4.6V
Output Voltage Range, V_O (2)
Suspend or 3-State Mode ..... -0.5V to 4.6V
Active Mode
A Ports .....-0.5V to MIN(4.6V, V_{CCA} + 0.5V)
B Ports .....-0.5V to MIN(4.6V, V_{CCB} + 0.5V)
Input Clamp Current, I_{IK} (V_I < 0V) .....-50mA
Output Clamp Current, I_{OK} (V_O < 0V) .....-50mA
Continuous Output Current, I_O .....±50mA
Continuous Current through $V_{CCA/B}$ or GND.....±100mA
Junction Temperature (3) .....+150℃
Storage Temperature Range .....-65℃ to +150℃
Lead Temperature (Soldering, 10s).....+260℃
ESD Susceptibility
HBM.....7000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range, V_{CCA}.....0.8V to 3.6V
Supply Voltage Range, V_{CCB}.....0.8V to 3.6V
Input Voltage Range, V_I.....0V to 3.6V
Output Voltage Range, V_O
Suspend or 3-State Mode .....0V to 3.6V
Active Mode
A Ports .....0V to V_{CCA}
B Ports .....0V to V_{CCB}
High-State or Low-State Output Current, I_O .....±12mA
Input Transition Rise or Fall Rate, Δt/ΔV
V_{CCI} = 0.8V to 3.6V.....5ns/V (MAX)
Operating Temperature Range .....-40℃ to +125℃

OVERSTRESS CAUTION

1. Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

2. The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.

3. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

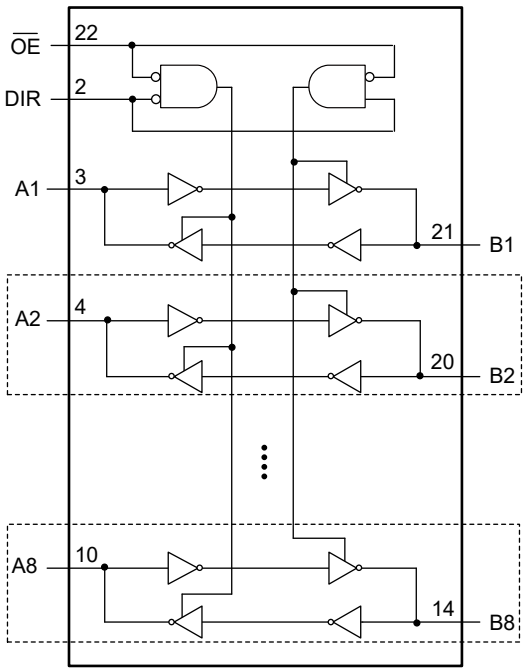
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

LOGIC DIAGRAM



FUNCTION TABLE

SUPPLY VOLTAGE	CONTROL INPUT		INPUT/OUTPUT	
V_{CCA}, V_{CCB} (1)	$\overline{OE}$	DIR	An	Bn
0.8V to 3.6V	L	L	An = Bn	Inputs
0.8V to 3.6V	L	H	Inputs	Bn = An
0.8V to 3.6V	H	*X*	Z	Z
GND (2)	*X*	*X*	Z	Z

H = High Voltage Level

L = Low Voltage Level

Z = High-Impedance State

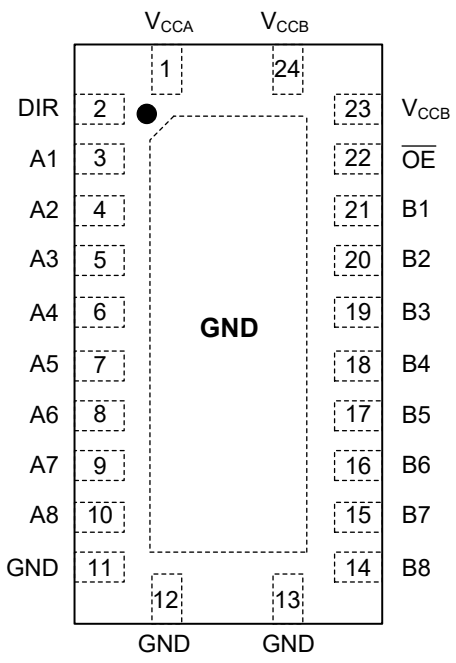
X = Don't Care

NOTES:

1. The An, DIR and $\overline{OE}$ signals are referenced to V_{CCA}. The Bn signals are referenced to V_{CCB}.
2. If at least one of V_{CCA} or V_{CCB} is at GND level, the device enters suspend mode.

PIN CONFIGURATION

(TOP VIEW)



TQFN-3.5×5.5-24AL

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	V_{CCA}	Supply Voltage V_{CCA}. The An, DIR and $\overline{OE}$ signals are referenced to V_{CCA}.
2	DIR	Direction Control Input.
3, 4, 5, 6, 7, 8, 9, 10	A1, A2, A3, A4, A5, A6, A7, A8	Data Inputs/Outputs.
11, 12, 13	GND	Ground.
14, 15, 16, 17, 18, 19, 20, 21	B8, B7, B6, B5, B4, B3, B2, B1	Data Inputs/Outputs.
22	$\overline{OE}$	Output Enable Input (Active Low).
23, 24	V_{CCB}	Supply Voltage V_{CCB}. The Bn signals are referenced to V_{CCB}.
Exposed Pad	GND	Connect it to GND internally. This pad is not an electrical connection point.

ELECTRICAL CHARACTERISTICS

(Full = -40℃ to +125℃, all typical values are measured at T_A = +25℃. V_{CCI} is the supply voltage associated with the data input ports. V_{CCO} is the supply voltage associated with the data output ports, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
High-Level Input Voltage	V_{IH}	Data inputs	V_{CCI} = 0.8V	Full	0.70 × V_{CCI}			V
			V_{CCI} = 1.1V to 1.95V	Full	0.65 × V_{CCI}			
			V_{CCI} = 2.3V to 2.7V	Full	1.6			
			V_{CCI} = 3.0V to 3.6V	Full	2.0			
		DIR, $\overline{OE}$ inputs	V_{CCA} = 0.8V	Full	0.70 × V_{CCA}			V
			V_{CCA} = 1.1V to 1.95V	Full	0.65 × V_{CCA}			
			V_{CCA} = 2.3V to 2.7V	Full	1.6			
			V_{CCA} = 3.0V to 3.6V	Full	2.0			
Low-Level Input Voltage	V_{IL}	Data inputs	V_{CCI} = 0.8V	Full			0.30 × V_{CCI}	V
			V_{CCI} = 1.1V to 1.95V	Full			0.35 × V_{CCI}	
			V_{CCI} = 2.3V to 2.7V	Full			0.7	
			V_{CCI} = 3.0V to 3.6V	Full			0.8	
		DIR, $\overline{OE}$ inputs	V_{CCA} = 0.8V	Full			0.30 × V_{CCA}	V
			V_{CCA} = 1.1V to 1.95V	Full			0.35 × V_{CCA}	
			V_{CCA} = 2.3V to 2.7V	Full			0.7	
			V_{CCA} = 3.0V to 3.6V	Full			0.8	
High-Level Output Voltage	V_{OH}	I_O = -100μA, V_{CCA} = V_{CCB} = 0.8V to 3.6V		Full	V_{CCO} - 0.1	V_{CCO} - 0.01		V
		I_O = -3mA, V_{CCA} = V_{CCB} = 1.1V		Full	0.85	0.97		
		I_O = -6mA, V_{CCA} = V_{CCB} = 1.4V		Full	1.05	1.20		
		I_O = -8mA, V_{CCA} = V_{CCB} = 1.65V		Full	1.20	1.41		
		I_O = -9mA, V_{CCA} = V_{CCB} = 2.3V		Full	1.75	2.07		
		I_O = -12mA, V_{CCA} = V_{CCB} = 3.0V		Full	2.30	2.71		
Low-Level Output Voltage	V_{OL}	I_O = 100μA, V_{CCA} = V_{CCB} = 0.8V to 3.6V		Full		0.01	0.10	V
		I_O = 3mA, V_{CCA} = V_{CCB} = 1.1V		Full		0.11	0.25	
		I_O = 6mA, V_{CCA} = V_{CCB} = 1.4V		Full		0.17	0.35	
		I_O = 8mA, V_{CCA} = V_{CCB} = 1.65V		Full		0.21	0.45	
		I_O = 9mA, V_{CCA} = V_{CCB} = 2.3V		Full		0.20	0.55	
		I_O = 12mA, V_{CCA} = V_{CCB} = 3.0V		Full		0.26	0.70	

ELECTRICAL CHARACTERISTICS (continued)

(Full = -40℃ to +125℃, all typical values are measured at T_A = +25℃. V_{CCI} is the supply voltage associated with the data input ports. V_{CCO} is the supply voltage associated with the data output ports, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Input Leakage Current	I_I	DIR, $\overline{OE}$ inputs, V_{CCA} = V_{CCB} = 0.8V to 3.6V, V_I = 0V or 3.6V		Full		±0.01	±5	μA
Off-State Output Current (1)	I_{OZ}	A or B ports, V_{CCA} = V_{CCB} = 3.6V, V_O = 0V or V_{CCO}		Full		±0.02	±5	μA
		Suspend mode A ports, V_{CCA} = 3.6V, V_{CCB} = 0V, V_O = 0V or V_{CCO}		Full		±0.02	±5	
		suspend mode B ports, V_{CCA} = 0V, V_{CCB} = 3.6V, V_O = 0V or V_{CCO}		Full		±0.02	±5	
Power-Off Leakage Current	I_{OFF}	A ports, V_{CCA} = 0V, V_{CCB} = 0.8V to 3.6V, V_I or V_O = 0V to 3.6V		Full		±0.05	±5	μA
		B ports, V_{CCB} = 0V, V_{CCA} = 0.8V to 3.6V, V_I or V_O = 0V to 3.6V		Full		±0.05	±5	
Supply Current	I_{CC}	A ports, V_I = 0V or V_{CCI}, I_O = 0A	V_{CCA} = 0.8V to 3.6V, V_{CCB} = 0.8V to 3.6V	Full		1.4	10	μA
			V_{CCA} = 1.1V to 3.6V, V_{CCB} = 1.1V to 3.6V	Full		1.3	10	
			V_{CCA} = 3.6V, V_{CCB} = 0V	Full		0.01	5	
			V_{CCA} = 0V, V_{CCB} = 3.6V	Full		0.01	5	
		B ports, V_I = 0V or V_{CCI}, I_O = 0A	V_{CCA} = 0.8V to 3.6V, V_{CCB} = 0.8V to 3.6V	Full		1.4	10	μA
			V_{CCA} = 1.1V to 3.6V, V_{CCB} = 1.1V to 3.6V	Full		0.7	10	
			V_{CCA} = 3.6V, V_{CCB} = 0V	Full		0.01	5	
			V_{CCA} = 0V, V_{CCB} = 3.6V	Full		0.01	5	
		A plus B ports (I_{CCA} + I_{CCB}), V_{CCA} = 0.8V to 3.6V, V_{CCB} = 0.8V to 3.6V, V_I = 0V or V_{CCI}, I_O = 0A		Full		1.4	15	μA
		A plus B ports (I_{CCA} + I_{CCB}), V_{CCA} = 1.1V to 3.6V, V_{CCB} = 1.1V to 3.6V, V_I = 0V or V_{CCI}, I_O = 0A		Full		1.3	15	μA
Input Capacitance	C_I	DIR, $\overline{OE}$ inputs, V_{CCA} = V_{CCB} = 3.3V, V_I = 0V or 3.3V		+25℃		3.2		pF
Input/Output Capacitance	$C_{I/O}$	A and B ports, V_{CCA} = V_{CCB} = 3.3V, V_O = V_{CCO} or GND		+25℃		4.5		pF

NOTE:

1. For I/O ports, the parameter I_{OZ} includes the input leakage current.

ELECTRICAL CHARACTERISTICS (continued)

Typical Total Supply Current (I_{CCA} + I_{CCB})

(T_A = +25℃, unless otherwise noted.)

V_{CCA}	V_{CCB}							UNITS
	0V	0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
0V	0	0.01	0.01	0.01	0.01	0.01	0.01	μA
0.8V	0.01	0.01	0.01	0.01	0.03	0.20	0.60	μA
1.2V	0.01	0.01	0.01	0.01	0.01	0.10	0.40	μA
1.5V	0.01	0.01	0.01	0.01	0.01	0.03	0.30	μA
1.8V	0.01	0.05	0.01	0.01	0.01	0.01	0.20	μA
2.5V	0.01	0.40	0.20	0.06	0.02	0.01	0.02	μA
3.3V	0.02	1.10	0.70	0.50	0.30	0.03	0.02	μA

Typical Power Dissipation Capacitance

(T_A = +25℃, V_{CCA} = V_{CCB}, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V_{CCA} = V_{CCB}						UNITS
			0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
Power Dissipation Capacitance (1) (2)	C_{PD}	A ports: (direction An to Bn), outputs enabled	2.1	2.0	2.1	2.2	2.6	3.2	pF
		A ports: (direction An to Bn), outputs disabled	0.7	0.7	0.7	0.7	0.9	1.0	
		A ports: (direction Bn to An), outputs enabled	25.5	25.4	25.4	25.6	26.1	26.4	
		A ports: (direction Bn to An), outputs disabled	1.4	1.3	1.4	1.4	1.6	1.8	
		B ports: (direction An to Bn), outputs enabled	27.6	27.5	27.6	27.7	28.0	28.4	
		B ports: (direction An to Bn), outputs disabled	1.4	1.3	1.4	1.4	1.6	1.8	
		B ports: (direction Bn to An), outputs enabled	2.1	2.0	2.1	2.2	2.6	3.2	
		B ports: (direction Bn to An), outputs disabled	0.7	0.7	0.7	0.7	0.9	1.1	

NOTES:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
   $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$
   where:
   f_i = Input frequency in MHz.
   f_o = Output frequency in MHz.
   C_L = Output load capacitance in pF.
   V_{CC} = Supply voltage in Volts.
   N = Number of inputs switching.
   $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = Sum of the outputs.
2. f_i = 10MHz, V_I = GND to V_{CC}, t_R = t_F = 1ns, C_L = 0pF, R_L = ∞.

DYNAMIC CHARACTERISTICS

Typical Dynamic Characteristics at V_{CCA} = 0.8V and T_A = +25℃

(See Figure 1 for test circuit. See Figure 2 and Figure 3 for waveforms, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V_{CCB}						UNITS
			0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
Propagation Delay (1)	t_{PD}	An to Bn	31.9	11.1	9.8	9.5	9.7	10.2	ns
		Bn to An	33.8	23.2	21.8	21.4	21.2	21.0	
Disable Time	t_{DIS}	$\overline{OE}$ to An	56.1	56.1	56.1	56.1	56.1	56.1	ns
		$\overline{OE}$ to Bn	35.1	20.2	19.3	19.4	18.8	19.8	
Enable Time	t_{EN}	$\overline{OE}$ to An	52.5	52.5	52.5	52.5	52.5	52.5	ns
		$\overline{OE}$ to Bn	38.4	18.2	16.9	16.6	16.8	17.8	

NOTE:

1. t_{PD} is the same as t_{PLH} and t_{PHL}. t_{DIS} is the same as t_{PLZ} and t_{PHZ}. t_{EN} is the same as t_{PZL} and t_{PZH}.

Typical Dynamic Characteristics at V_{CCB} = 0.8V and T_A = +25℃

(See Figure 1 for test circuit. See Figure 2 and Figure 3 for waveforms, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V_{CCA}						UNITS
			0.8V	1.2V	1.5V	1.8V	2.5V	3.3V	
Propagation Delay (1)	t_{PD}	An to Bn	30.2	26.6	25.9	24.6	24.1	24.0	ns
		Bn to An	32.0	11.1	9.8	9.4	9.4	9.9	
Disable Time	t_{DIS}	$\overline{OE}$ to An	56.1	12.7	7.9	6.2	4.3	4.0	ns
		$\overline{OE}$ to Bn	35.1	26.7	25.1	24.6	24.1	24.0	
Enable Time	t_{EN}	$\overline{OE}$ to An	52.4	13.2	8.2	6.7	4.8	4.4	ns
		$\overline{OE}$ to Bn	38.9	30.5	29.0	28.1	27.8	27.5	

NOTE:

1. t_{PD} is the same as t_{PLH} and t_{PHL}. t_{DIS} is the same as t_{PLZ} and t_{PHZ}. t_{EN} is the same as t_{PZL} and t_{PZH}.

DYNAMIC CHARACTERISTICS (continued)

(See Figure 1 for test circuit. See Figure 2 and Figure 3 for waveforms. Full = -40℃ to +125℃, all typical values are measured at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V_{CCB}									UNITS
			1.2V ± 0.1V			1.5V ± 0.1V			1.8V ± 0.15V			
			MIN (1)	TYP	MAX (1)	MIN (1)	TYP	MAX (1)	MIN (1)	TYP	MAX (1)	
V_{CCA} = 1.1V to 1.3V												
Propagation Delay (2)	t_{PD}	An to Bn	0.5	8.9	15.0	0.5	6.5	10.5	0.5	5.9	9.4	ns
		Bn to An	0.5	8.9	14.9	0.3	7.6	12.3	0.1	7.1	11.7	
Disable Time	t_{DIS}	$\overline{OE}$ to An	1.8	16.5	18.8	1.8	16.5	18.8	1.8	16.5	18.8	ns
		$\overline{OE}$ to Bn	1.9	10.0	15.2	1.9	8.4	12.3	1.9	8.0	11.7	
Enable Time	t_{EN}	$\overline{OE}$ to An	1.4	16.4	20.3	1.4	16.5	20.3	1.4	16.5	20.4	ns
		$\overline{OE}$ to Bn	1.1	11.1	17.5	1.1	8.9	13.2	1.1	8.3	12.0	
V_{CCA} = 1.4V to 1.6V												
Propagation Delay (2)	t_{PD}	An to Bn	0.3	7.4	12.1	0.3	5.4	8.4	0.3	4.7	7.4	ns
		Bn to An	0.5	6.4	10.4	0.3	5.3	8.4	0.1	4.8	7.6	
Disable Time	t_{DIS}	$\overline{OE}$ to An	1.8	9.4	11.3	1.8	9.4	11.3	1.5	9.4	11.3	ns
		$\overline{OE}$ to Bn	1.9	8.6	12.5	1.9	6.0	11.4	1.9	5.6	10.1	
Enable Time	t_{EN}	$\overline{OE}$ to An	1.1	9.0	10.6	1.1	9.0	11.0	0.7	9.0	11.0	ns
		$\overline{OE}$ to Bn	1.4	8.9	10.6	1.1	6.6	8.7	0.9	5.7	8.7	
V_{CCA} = 1.65V to 1.95V												
Propagation Delay (2)	t_{PD}	An to Bn	0.1	7.0	11.7	0.1	4.8	7.7	0.1	4.1	6.6	ns
		Bn to An	0.5	5.8	9.3	0.3	4.7	7.0	0.1	4.1	6.5	
Disable Time	t_{DIS}	$\overline{OE}$ to An	1.8	7.7	11.3	1.6	7.7	9.5	1.8	7.7	9.5	ns
		$\overline{OE}$ to Bn	1.7	8.2	12.0	1.7	5.9	10.9	1.6	5.7	9.6	
Enable Time	t_{EN}	$\overline{OE}$ to An	1.0	6.7	8.0	1.0	6.7	8.0	1.0	6.7	8.0	ns
		$\overline{OE}$ to Bn	1.2	8.1	13.1	1.2	5.6	10.2	1.0	5.1	8.2	
V_{CCA} = 2.3V to 2.7V												
Propagation Delay (2)	t_{PD}	An to Bn	0.1	6.6	11.1	0.1	4.4	7.1	0.1	3.7	5.9	ns
		Bn to An	0.5	5.2	8.4	0.3	4.1	6.2	0.1	3.5	5.5	
Disable Time	t_{DIS}	$\overline{OE}$ to An	4.3	5.5	6.9	1.0	5.5	6.9	1.0	5.5	6.9	ns
		$\overline{OE}$ to Bn	6.7	7.8	11.5	1.5	5.5	10.4	1.3	5.2	9.1	
Enable Time	t_{EN}	$\overline{OE}$ to An	0.7	4.4	5.3	0.7	4.5	5.3	0.7	4.4	5.3	ns
		$\overline{OE}$ to Bn	0.9	7.3	12.4	0.9	4.9	9.7	0.8	4.3	7.7	
V_{CCA} = 3.0V to 3.6V												
Propagation Delay (2)	t_{PD}	An to Bn	0.1	6.4	10.8	0.1	4.3	6.8	0.1	3.6	5.7	ns
		Bn to An	0.5	5.2	8.3	0.3	3.9	5.8	0.3	3.3	5.0	
Disable Time	t_{DIS}	$\overline{OE}$ to An	0.7	5.1	7.0	0.7	5.0	7.2	0.7	5.4	7.0	ns
		$\overline{OE}$ to Bn	1.4	7.6	11.3	1.4	5.2	10.3	1.2	5.0	9.0	
Enable Time	t_{EN}	$\overline{OE}$ to An	0.6	3.2	4.7	0.6	3.1	4.6	0.6	3.2	4.6	ns
		$\overline{OE}$ to Bn	0.8	7.2	12.4	0.8	4.6	9.6	0.6	4.0	7.5	

NOTES:

1. Specified by design and characterization, not production tested.
2. t_{PD} is the same as t_{PLH} and t_{PHL}. t_{DIS} is the same as t_{PLZ} and t_{PHZ}. t_{EN} is the same as t_{PZL} and t_{PZH}.

DYNAMIC CHARACTERISTICS (continued)

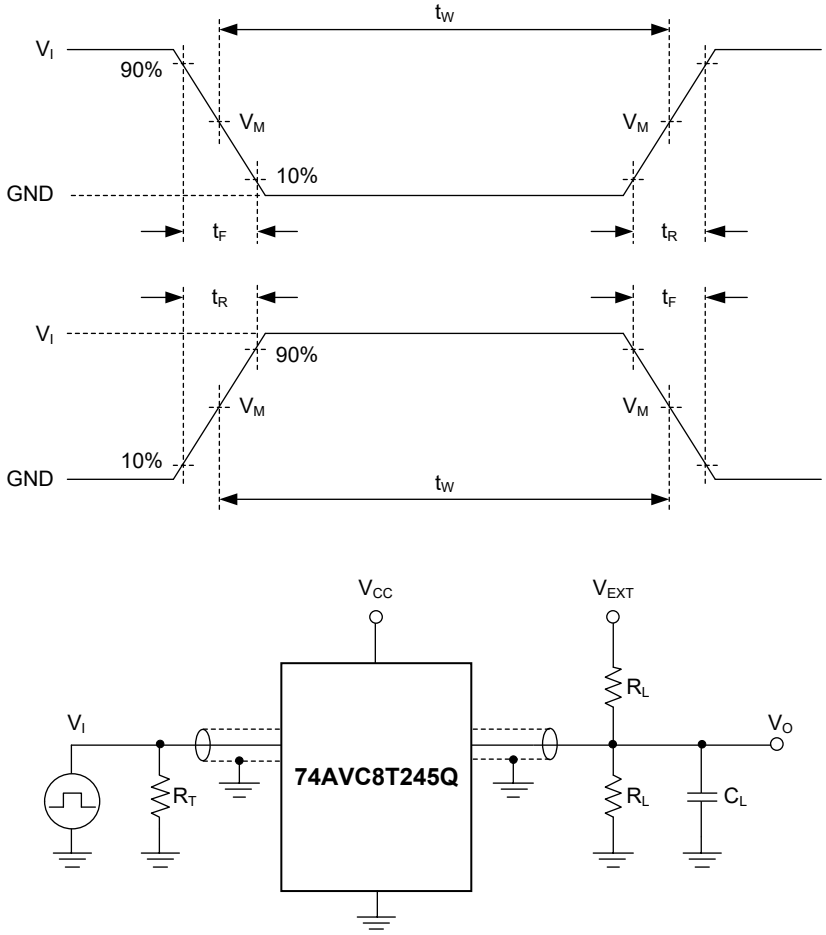
(See Figure 1 for test circuit. See Figure 2 and Figure 3 for waveforms. Full = -40℃ to +125℃, all typical values are measured at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	V_{CCB}						UNITS
			2.5V ± 0.2V			3.3V ± 0.3V			
			MIN (1)	TYP	MAX (1)	MIN (1)	TYP	MAX (1)	
V_{CCA} = 1.1V to 1.3V									
Propagation Delay (2)	t_{PD}	An to Bn	0.5	5.3	8.5	0.5	5.1	8.4	ns
		Bn to An	0.1	6.6	11.1	0.1	6.4	10.7	
Disable Time	t_{DIS}	$\overline{OE}$ to An	1.8	16.5	18.8	1.8	16.5	18.8	ns
		$\overline{OE}$ to Bn	1.4	7.4	10.8	1.2	8.7	12.4	
Enable Time	t_{EN}	$\overline{OE}$ to An	1.4	16.5	22.5	1.4	16.4	23.4	ns
		$\overline{OE}$ to Bn	1.0	7.7	11.2	1.0	7.6	11.1	
V_{CCA} = 1.4V to 1.6V									
Propagation Delay (2)	t_{PD}	An to Bn	0.3	4.1	6.2	0.3	3.9	5.8	ns
		Bn to An	0.1	4.3	6.9	0.1	4.2	6.7	
Disable Time	t_{DIS}	$\overline{OE}$ to An	1.3	9.4	11.3	1.6	9.4	11.6	ns
		$\overline{OE}$ to Bn	1.4	5.0	8.2	1.2	6.1	8.4	
Enable Time	t_{EN}	$\overline{OE}$ to An	0.7	9.0	11.1	0.4	9.0	11.9	ns
		$\overline{OE}$ to Bn	0.9	5.4	7.9	0.9	5.2	7.7	
V_{CCA} = 1.65V to 1.95V									
Propagation Delay (2)	t_{PD}	An to Bn	0.1	3.5	5.4	0.3	3.3	5.1	ns
		Bn to An	0.1	3.7	5.9	0.1	3.6	5.7	
Disable Time	t_{DIS}	$\overline{OE}$ to An	1.3	7.7	9.5	1.6	7.7	9.5	ns
		$\overline{OE}$ to Bn	1.2	4.4	7.6	1.0	5.6	7.6	
Enable Time	t_{EN}	$\overline{OE}$ to An	0.6	6.7	8.1	0.4	6.7	8.6	ns
		$\overline{OE}$ to Bn	0.8	5.8	7.7	0.8	5.5	7.3	
V_{CCA} = 2.3V to 2.7V									
Propagation Delay (2)	t_{PD}	An to Bn	0.2	3.1	4.7	0.1	2.8	4.4	ns
		Bn to An	0.2	3.1	4.8	0.1	3.0	4.6	
Disable Time	t_{DIS}	$\overline{OE}$ to An	1.0	5.5	6.9	1.0	5.5	7.1	ns
		$\overline{OE}$ to Bn	1.1	3.8	6.9	0.9	5.0	6.3	
Enable Time	t_{EN}	$\overline{OE}$ to An	0.6	4.5	5.4	0.4	4.5	5.4	ns
		$\overline{OE}$ to Bn	0.6	3.6	5.3	0.6	3.4	4.9	
V_{CCA} = 3.0V to 3.6V									
Propagation Delay (2)	t_{PD}	An to Bn	0.1	3.0	4.5	0.1	2.7	4.1	ns
		Bn to An	0.1	2.9	4.4	0.1	2.8	4.2	
Disable Time	t_{DIS}	$\overline{OE}$ to An	0.7	5.1	7.1	0.7	5.1	7.2	ns
		$\overline{OE}$ to Bn	1.0	3.8	7.1	0.8	4.9	6.9	
Enable Time	t_{EN}	$\overline{OE}$ to An	0.6	3.2	4.7	0.4	3.3	4.6	ns
		$\overline{OE}$ to Bn	0.5	3.3	5.2	0.5	3.1	4.6	

NOTES:

1. Specified by design and characterization, not production tested.
2. t_{PD} is the same as t_{PLH} and t_{PHL}. t_{DIS} is the same as t_{PLZ} and t_{PHZ}. t_{EN} is the same as t_{PZL} and t_{PZH}.

TEST CIRCUIT



Test conditions are given in Table 1.

Definitions for test circuit:

R_L: Load resistance.

C_L: Load capacitance (includes jig and probe).

R_T: Termination resistance (equals to output impedance Z_O of the pulse generator).

V_{EXT}: External voltage is used to measure switching time.

Figure 1. Test Circuit for Measuring Switching Times

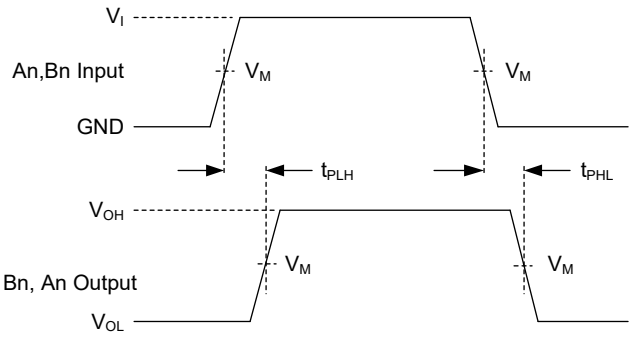
Table 1. Test Conditions

SUPPLY VOLTAGE	INPUT		LOAD		V_{EXT}		
V_{CCA}, V_{CCB}	V_I (1)	Δt/ΔV	C_L	R_L	t_{PLH}, t_{PHL}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ} (2)
0.8V to 1.6V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}
1.65V to 2.7V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}
3.0V to 3.6V	V_{CCI}	≤ 1.0ns/V	15pF	2kΩ	Open	GND	2 × V_{CCO}

NOTES:

1. V_{CCI} is the supply voltage associated with the data input ports.
2. V_{CCO} is the supply voltage associated with the data output ports.

WAVEFORMS

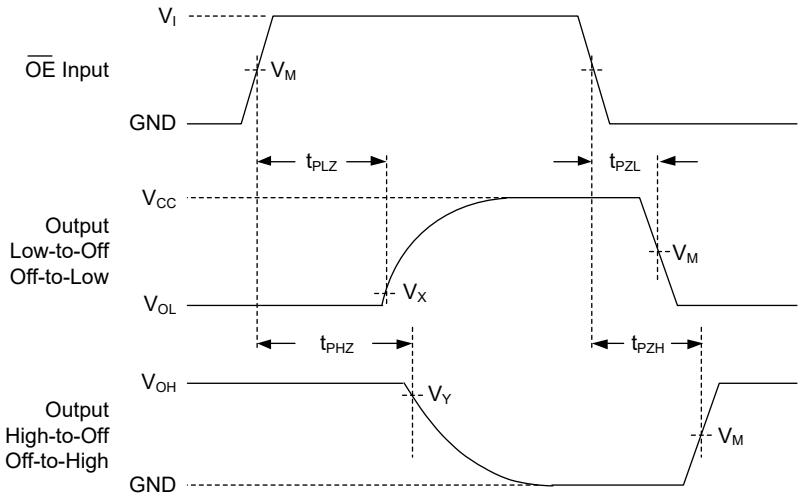


Test conditions are given in Table 1.

Measurement points are given in Table 2.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Figure 2. Input (An, Bn) to Output (Bn, An) Propagation Delay Times



Test conditions are given in Table 1.

Measurement points are given in Table 2.

Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Figure 3. Enable and Disable Times

Table 2. Measurement Points

SUPPLY VOLTAGE	INPUT (1)		OUTPUT		
V_{CCA}, V_{CCB}	V_I	V_M (2)	V_M (3)	V_X	V_Y
0.8V to 1.6V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.1V	V_{OH} - 0.1V
1.65V to 2.7V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.15V	V_{OH} - 0.15V
3.0V to 3.6V	V_{CCI}	0.5 × V_{CCI}	0.5 × V_{CCO}	V_{OL} + 0.3V	V_{OH} - 0.3V

NOTES:

1. V_{CCI} is the supply voltage associated with the data input ports.
2. The measurement points should be V_{IH} or V_{IL} when Δt/ΔV > 1.0ns/V.
3. V_{CCO} is the supply voltage associated with the data output ports.

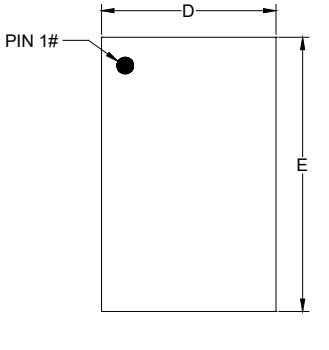
REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

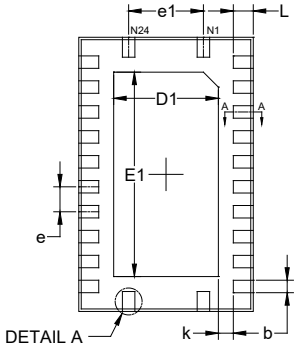
Changes from Original (SEPTEMBER 2023) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

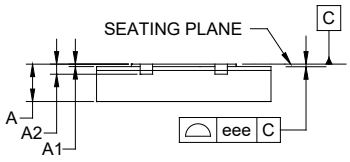
TQFN-3.5×5.5-24AL



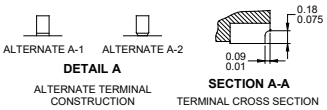
TOP VIEW

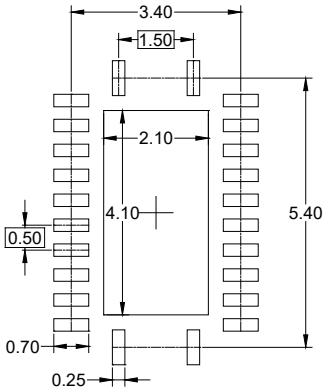


BOTTOM VIEW



SIDE VIEW





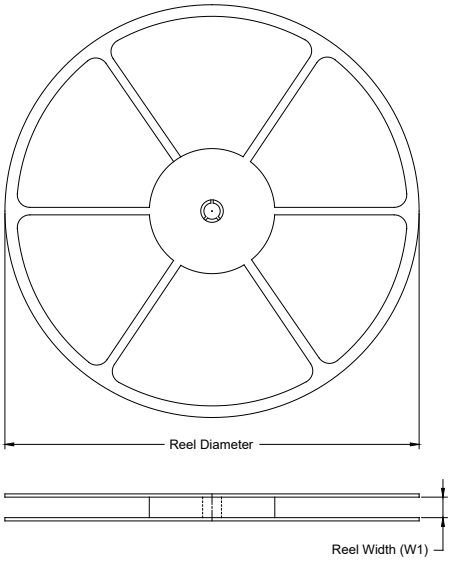
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.700	-	0.800
A1	0.000	-	0.050
A2	0.203 REF		
b	0.200	-	0.300
D	3.400	-	3.600
E	5.400	-	5.600
D1	2.000	-	2.200
E1	4.000	-	4.200
e	0.500 BSC		
e1	1.500 BSC		
L	0.300	-	0.500
k	0.300 REF		
eee	0.080		

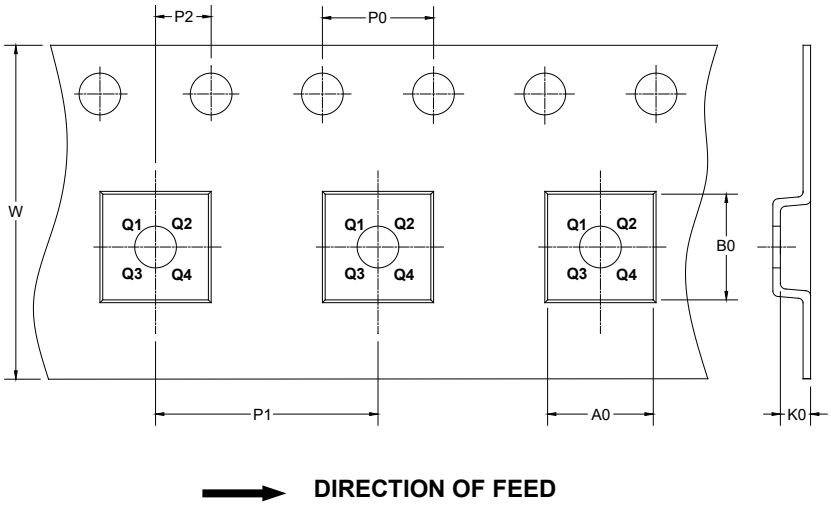
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

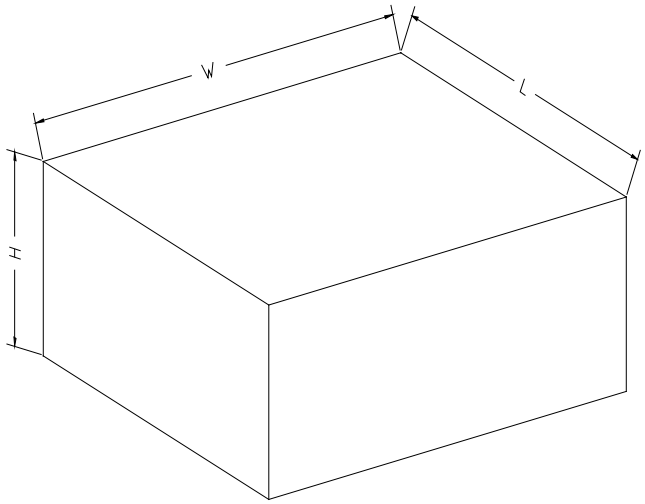
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TQFN-3.5×5.5-24AL	13"	12.4	3.80	5.80	1.00	4.0	8.0	2.0	12.0	Q1

DD0001

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13″	386	280	370	5

DD0002