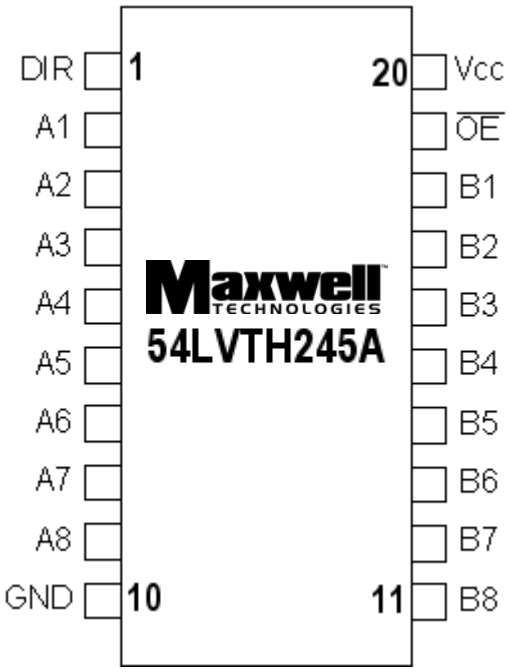
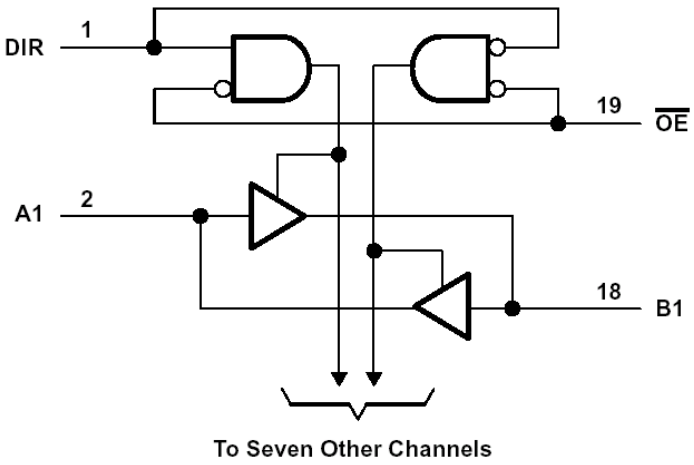
PRELIMINARY

54LVTH245A
3.3V ABT Octal Bus Transceiver with 3-State Output





Logic Diagram (Positive Logic)

FEATURES:

- 3.3V ABT octal bus transceiver with 3-state outputs
- RAD-PAK® radiation hardened against natural space radiation
- Total dose hardness:
  - >100 krad (Si), depending upon space misssion
- Package:
  - 20 pin RAD-PAK® flat package
  - 20 pin RAD-PAK® DIP
- Operating temperature range:
  -55 to 125˚C
- Supports mixed-mode signal operation
  - 5V input and output voltages with 3.3V V_{CC}
- Supports unregulated battery operation down to 2.7V.
- Typical VOLP (output ground bounce) < 0.8V at V_{CC}=3.3V, T_A= 25˚C
- Latch-up performance exceeds 500mA per JEDEC standard
- Supports live insertion
- Bus-hold data inputs eliminate the need for external pullup resistors

DESCRIPTION:

Maxwell Technologies' 54LVTH245A 8-bit octal transceiver micro-circuit features a greater than 100 krad (Si) total dose tolerance, depending upon space mission. The 54LVTH245A is designed specifically for low voltage (3.3V) V_{CC} operation, but with the capability to provide a TTL interface to a 5V system environment. It is designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus depending upon the logic level at the direction control (DIR) input. The output enable ($\overline{OE}$) input can be used to disable the device so the buses are effectively isolated. The 54LVTH245A active bus-hold circuitry is provided to prevent floating data inputs at a valid logic level and to eliminate the need for external pullup resistors.

Maxwell Technologies' patented RAD-PAK® packaging technology incorporates radiation shielding in the microcircuit package. It eliminates the need for box shielding while providing the required radiation shielding for a lifetime in orbit or space mission. In a GEO orbit, RAD-PAK provides greater than 100 krad (Si) radiation dose tolerance. This product is available with screening up to Class S.

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TABLE 1. PINOUT DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	DIR	DirectionControl
2-9	A1-A8	Inputs
10	GND	Ground
11-18	B8-B1	Outputs
19	$\overline{OE}$	Output Enable
20	V_{CC}	Supply Voltage

TABLE 2. 54LVT245 ABSOLUTE MAXIMUM RATINGS [1]

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage Range	V_{CC}	-0.5	4.6	V
Input Voltage Range [2]	V_I	-0.5	7.0	V
Voltage Range Applied to Any Output in the High State or Power-Off State	V_O	-0.5	7.0	V
Current Into Any Output in the High State [3]	I_O	--	48	mA
Input Clamp Current ($V_I < 0$)	I_{IK}	--	-50	mA
Output Clamp Current ($V_O < 0$)	I_{OK}	--	-50	mA
Maximum Power Dissipation at $T_A = 55^{\circ}C$	P_D	--	1.6	mW
Operating Temperature	T_A	-55	125	°C
Storage Temperature Range	T_S	-65	150	˚C

1. Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
3. This current flows only when the output is in the high state and $V_O > V_{CC}$.

TABLE 3. DELTA LIMITS

PARAMETER	VARIATION
$I_{CC(OL)}$	±10% of specified value in Table 5
$I_{CC(OH)}$	±10% of specified value in Table 5
$I_{CC(OD)}$	±10% of specified value in Table 5

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TABLE 4. 54LVTH245A RECOMMENDED OPERATING CONDITIONS [1]

PARAMETER		SYMBOL	MIN	MAX	UNIT
Supply Voltage		V_{CC}	2.7	3.6	V
High-level Input Voltage		V_{IH}	2.0	--	V
Low-level Input Voltage		V_{IL}	--	0.8	V
Input Voltage		V_I	--	5.5	V
High-level Output Current		I_{OH}	--	-24	mA
Low-level Output Current		I_{OL}	--	48	mA
Input Transition Rise or Fall Rate	Outputs enabled	$\Delta t/\Delta v$	--	10	ns/V
Operating Temperature		T_A	-55	125	˚C

1. Unused control inputs must be held high or low to prevent them from floating.

TABLE 5. 54LVTH245A ELECTRICAL CHARACTERISTICS

(V_{CC} = 3.3V ±10%, T_A = -55 to +125°C, UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	TEST CONDITIONS			MIN	MAX	UNIT
Input Clamp Voltage	V_{IK}	V_{CC} = 2.7	I_I = -18mA		--	-1.2	V
High-Level Output Voltage	V_{OH}	V_{CC} = 2.7V to 3.6V	I_{OH} = -100µA		V_{CC} -0.2	--	V
		V_{CC} = 2.7V	I_{OH} = -8mA		2.4	--	
		V_{CC} = 3V,	I_{OH} = -24mA		2.0	--	
Low-Level Output Voltage	V_{OL}	V_{CC} = 2.7V	I_{OL} = 100µA		--	0.2	V
			I_{OL} = 24mA		--	0.5	
		V_{CC} = 3V	I_{OL} = 16mA		--	0.4	
			I_{OL} = 32mA		--	0.5	
			I_{OL} = 48mA		--	0.55	
Input Current	I_I	V_{CC} = 3.6V	$V_I = V_{CC}$ or GND	Control inputs	--	±1	µA
		V_{CC} = 0 or 3.6V	V_I = 5.5V		--	10	
		V_{CC} = 3.6V	V_I = 5.5V	A or B Ports	--	20	
			$V_I = V_{CC}$			1	
			V_I = 0		--	-5	
Hold Current	$I_{I(HOLD)}$	V_{CC} = 3V	V_I = 0.8V	A or B Ports	75	--	µA
			V_I = 2V		-75	--	
Power Up Current	I_{OZPU} [2]	V_{CC} = 0 to 1.5V, V_O = 0.5V to 3V, $\overline{OE}$ = don't care			--	±100	µA
Power Down Current	I_{OZPD} [2]	V_{CC} = 1.5V to 0, V_O = 0.5V to 3V, $\overline{OE}$ = don't care			--	±100	µA

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TABLE 5. 54LVTH245A ELECTRICAL CHARACTERISTICS

(V_{CC} = 3.3V ±10%, T_A = -55 to +125°C, UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	MAX	UNIT
Supply Current	I_{CC}	V_{CC} = 3.6V	Outputs high	--	0.39	mA
		I_O = 0	Outputs low	--	14	
		V_I = V_{CC} or GND	Outputs disabled	--	0.39	
Delta Supply Current	ΔI_{CC} [1]	V_{CC} = 3V to 3.6V, One input at V_{CC} -0.6V, Other inputs at V_{CC} or GND		--	0.2	mA
Input Capacitance	C_I [2]	V_I = 3V or 0		--	8	pF
Input Output Capacitance	C_O [2]	V_O = 3V or 0		--	15	pF

1. This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.
2. Guaranteed by design.

TABLE 6. 54LVTH245A AC ELECTRICAL CHARACTERISTICS

(V_{CC} = 3.3V ±10%, T_A = -55 RO 125°C, UNLESS OTHERWISE NOTED)

PARAMETER	SYMBOL	V_{CC} = 3.3V ± 0.3V		V_{CC} = 2.7V		UNIT
		MIN	MAX	MIN	MAX	
Propagation Delay Time A orB to B or A	t_{PLH}	0.7	3.7	--	4.2	ns
	t_{PHL}	0.7	3.7	--	4.2	
Output Enable Time $\overline{OE}$ to A or B	t_{PZH}	1.2	5.7	--	7.4	ns
	t_{PZL}	1.6	5.7	--	6.8	
Output Disable Time $\overline{OE}$ to A or B	t_{PHZ}	1.8	6.2	--	6.8	ns
	t_{PLZ}	1.8	5.3	--	5.5	

TABLE 7. FUNCTION TABLE

INPUTS		OPERATION
$\overline{OE}$	DIR	
L	L	B data to A bus
I	H	A data to B bus
H	X	Isolation

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FIGURE 1. LOAD CIRCUIT

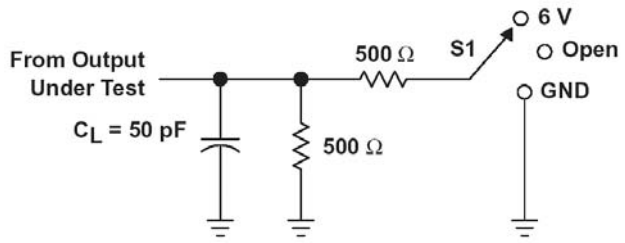

Figure Note:

1. C_L includes probe and jig capacitance.

PARAMETER MEASUREMENT INFORMATION

TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	6V
t_{PHZ}/t_{PZH}	GND

FIGURE 2. PULSE DURATION

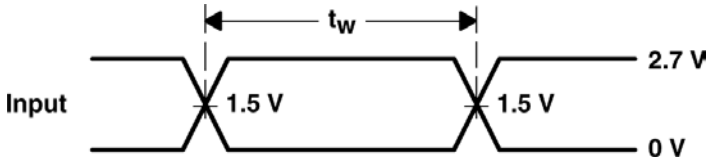

FIGURE 3. SETUP AND HOLD TIMES

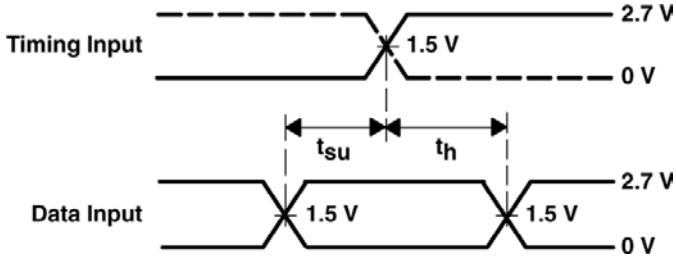

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FIGURE 4. PROPAGATION DELAY TIMES INVERTING AND NONINVERTING OUTPUTS

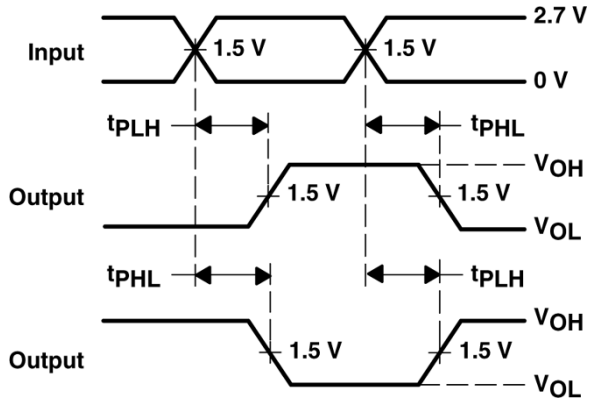

FIGURE 5. ENABLE AND DISABLE TIMES LOW- AND HIGH-LEVEL ENABLING

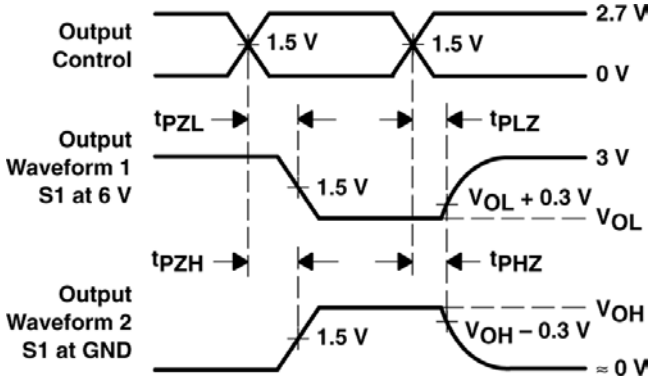

Figure Note:

2. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by The output control.
   Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

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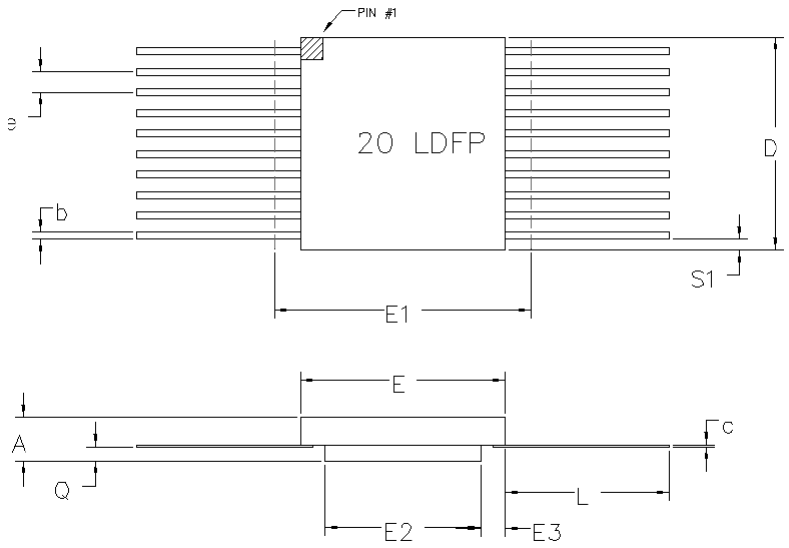

20 PIN RAD-PAK® FLAT PACKAGE

SYMBOL	DIMENSION		
	MIN	NOM	MAX
A	0.128	0.141	0.154
b	0.015	0.017	0.022
c	0.003	0.005	0.009
D	0.470	0.480	0.490
E	0.287	0.295	0.303
E1	--	--	0.333
E2	0.155	0.160	--
E3	0.030	0.068	--
e	0.050 BSC		
L	0.370	0.380	0.390
Q	0.035	0.039	0.042
S1	0.005	0.007	--
N	20		

F20-01
Note: All dimensions in inches

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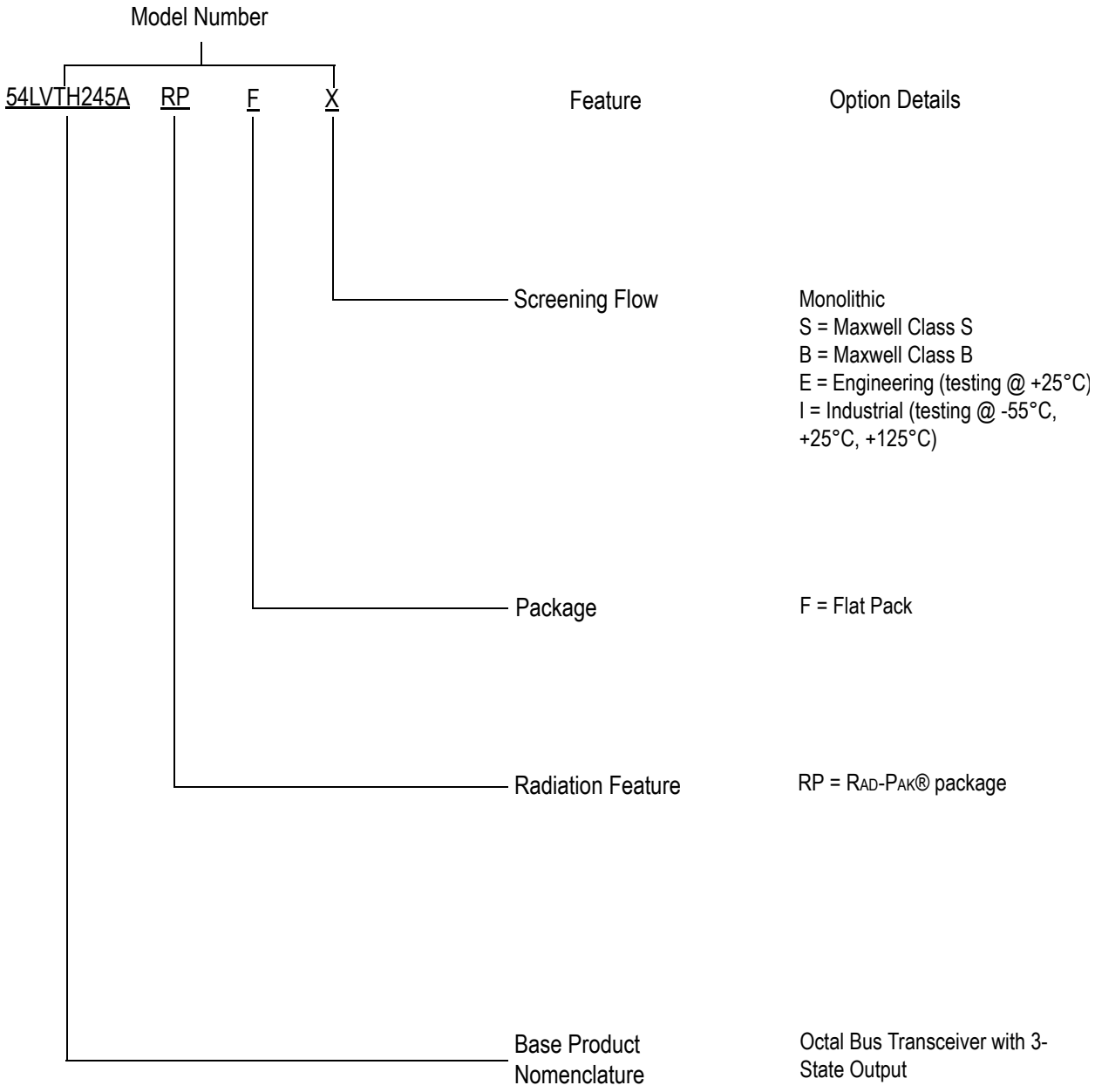
3.3V ABT Octal Bus Transceiver with 3-State Output

54LVTH245A

Product Ordering Options



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