June 2007

DM74ALS5245
Octal 3-STATE Transceiver

Features

- Input Hysteresis
- Low output noise generation
- High input noise immunity
- Advanced oxide-isolated, ion implanted Schottky TTL process
- Switching specification guaranteed over the full temperature and V_{CC} range
- PNP inputs to reduce input loading

General Description

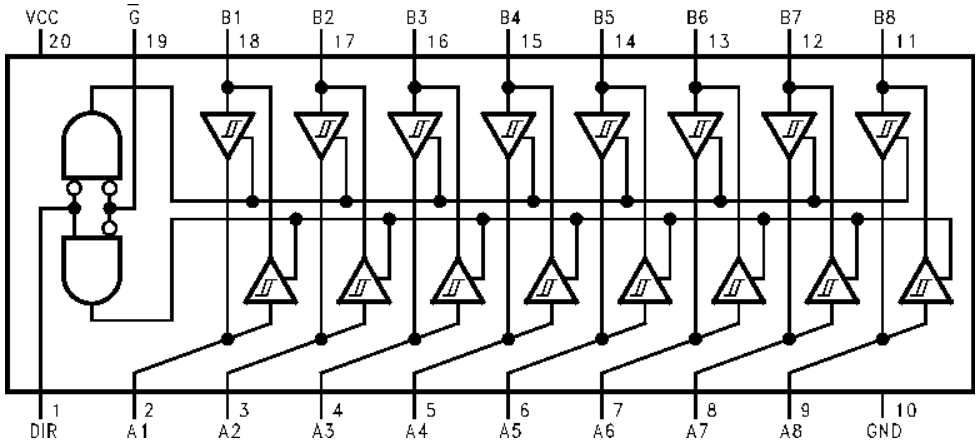
This octal bus transceiver is designed for asynchronous two-way communication between data buses. The inputs include hysteresis which provides improved noise rejection. Data is transmitted either from the A bus to the B bus or from the B bus to the A bus depending on the logic level of the direction control (DIR) input. The device can be disabled via the enable input ($\overline{G}$) which causes the outputs to enter the high impedance mode so the buses are effectively isolated.

Ordering Information

Order Number	Package Number	Package Description
DM74ALS5245WM	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
DM74ALS5245SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter “X” to the ordering number.

Connection Diagram



Function Table

Control Inputs		Operation
$\overline{G}$	DIR	
L	L	B Data to A Bus
L	H	A Data to B Bus
H	X	High Impedance

L = LOW Logic Level H = HIGH Logic Level X = Don't Care (Either LOW or HIGH Logic Level)

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating
V_{CC}	Supply Voltage	7V
V_I	Input Voltage	
	Control Inputs	7V
	I/O Ports	5.5V
T_A	Operating Free Air Temperature Range	0°C to +70°C
T_{STG}	Storage Temperature Range	–65°C to +150°C
θ_{JA}	Typical Thermal Resistance	74.0°C/W

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Min.	Max.	Units
V_{CC}	Supply Voltage	4.5	5.5	V
V_{IH}	HIGH Level Input Voltage	2		V
V_{IL}	LOW Level Input Voltage		0.8	V
I_{OH}	HIGH Level Output Current		–15	mA
I_{OL}	LOW Level Output Current		24	mA
T_A	Free Air Operating Temperature Range	0	70	°C

Electrical Characteristics

Over recommended free air temperature range. All typical values are measured at V_{CC} = 5V, T_A = 25°C.

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
V_{IK}	Input Clamp Voltage	V_{CC} = Min, I_I = –18mA				–1.5	V
H_{YS}	Hysteresis ($V_{T+} – V_{T–}$)	V_{CC} = Min		0.2	0.32		V
V_{OH}	HIGH Level Output Voltage	V_{CC} = 4.5V to 5.5V, I_{OH} = –0.4mA		V_{CC} – 2			V
		V_{CC} = Min.	I_{OH} = –3mA	2.4	3.2		
			I_{OH} = Max	2			
V_{OL}	LOW Level Output Voltage	V_{CC} = Min.	I_{OL} = 12mA		0.25	0.4	V
			I_{OL} = 24mA		0.35	0.5	
I_I	Input Current at Maximum Input Voltage	V_{CC} = Max.	I/O Ports, V_I = 5.5V			100	µA
			Control Inputs, V_I = 7V			100	
I_{IH}	HIGH Level Input Current	V_{CC} = Max., V_I = 2.7V				20	µA
I_{IL}	LOW Level Input Current	V_{CC} = Max., V_I = 0.4V				–100	µA
I_O	Output Drive Current	V_{CC} = Max., V_O = 2.25V		–30		–112	mA
I_{CC}	Supply Current	V_{CC} = Max.	Outputs HIGH		30	45	mA
			Outputs LOW		36	55	
			Outputs Disabled		38	58	
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}	V_{CC} = 5.0V, T_A = 25°C[1] (Fig. 1, Fig. 2)			0.5		V
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}	V_{CC} = 5.0V, T_A = 25°C[1] (Fig. 1, Fig. 2)			–0.2		V
V_{IHD}	Minimum High Level Dynamic Input Voltage	V_{CC} = 5.0V, T_A = 25°C[2]			1.6		V
V_{ILD}	Maximum Low Level Dynamic Input Voltage	V_{CC} = 5.0V, T_A = 25°C[2]			1.0		V

Notes:

1. n = number of device outputs; n–1 outputs switching, each driven 0V to 3V one output @ GND.
2. n = number of device outputs; n outputs switching, n–1 inputs switching 0V to 3V. Input under test switching 3V to threshold (V_{ILD}); 0V to threshold (V_{IHD}); f = 1 MHz.

Switching Characteristics

Over recommended operating free air temperature range.

Symbol	Parameter	Conditions	From (Input) To (Output)	Min.	Max.	Units
t_{PLH}	Propagation Delay Time, LOW-to-HIGH Level Output	V_{CC} = 4.5V to 5.5V, $R_1 = R_2$ = 500Ω, C_L = 50 pF	A or B to B or A	3	10	ns
t_{PHL}	Propagation Delay Time, HIGH-to-LOW Level Output		A or B to B or A	3	10	ns
t_{PZH}	Output Enable Time to HIGH Level Output		$\overline{G}$ to A or B	5	20	ns
t_{PZL}	Output Enable Time to LOW Level Output		$\overline{G}$ to A or B	5	20	ns
t_{PHZ}	Output Disable Time from HIGH Level Output		$\overline{G}$ to A or B	2	10	ns
t_{PLZ}	Output Disable Time from LOW Level Output		$\overline{G}$ to A or B	4	15	ns

ALS Noise Characteristics

The setup of a noise characteristics measurement is critical to the accuracy and repeatability of the tests. The following is a brief description of the setup used to measure the noise characteristics of ALS.

Equipment:

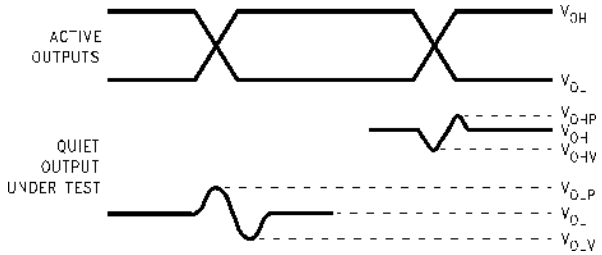
Word Generator

Printed Circuit Board Test Fixture

Dual Trace Oscilloscope

Procedure:

1. Verify Test Fixture Loading: Standard Load 50pF, 500Ω.
2. Deskew the word generator so that no two channels have greater than 150ps skew between them. This requires that the oscilloscope be deskewed first. Swap out the channels that have more than 150ps of skew until all channels being used are within 150ps. It is important to deskew the word generator channels before testing. This will ensure that the outputs switch simultaneously.
3. Terminate all inputs and outputs to ensure proper loading of the outputs and that the input levels are at the correct voltage.
4. Set V_{CC} to 5.0V.
5. Set the word generator to toggle all but one output at a frequency of 1 MHz. Greater frequencies will increase DUT heating and affect the results of the measurement.
6. Set the word generator input levels at 0V LOW and 3V HIGH. Verify levels with a digital volt meter.



Notes:

3. V_{OHV} and V_{OHP} are measured with respect to V_{OH} reference. V_{OLV} and V_{OLP} are measured with respect to ground reference.
4. Input pulses have the following characteristics: f = 1MHz, t_r = 3ns, t_f = 3ns, skew < 150ps.

Figure 1. Quiet Output Noise Voltage Waveforms

V_{OLP}/V_{OLV} and V_{OHP}/V_{OHV}:

- Determine the quiet output pin that demonstrates the greatest noise levels. The worst case pin will usually be the furthest from the ground pin. Monitor the output voltages using a 50Ω coaxial cable plugged into a standard SMB type connector on the test fixture. Do not use an active FET probe.
- Measure V_{OLP} and V_{OLV} on the quiet output during the HL transition. Measure V_{OHP} and V_{OHV} on the quiet output during the LH transition.
- Verify that the GND reference recorded on the oscilloscope has not drifted to ensure the accuracy and repeatability of the measurements.

V_{ILD} and V_{IHD}:

- Monitor one of the switching outputs using a 50Ω coaxial cable plugged into a standard SMB type connector on the test fixture. Do not use an active FET probe.
- First increase the input LOW voltage level, V_{IL}, until the output begins to oscillate. Oscillation is defined as noise on the output LOW level that exceeds V_{IL} limits, or on output HIGH levels that exceed V_{IH} limits. The input LOW voltage level at which oscillation occurs is defined as V_{ILD}.
- Next decrease the input HIGH voltage level on the word generator, V_{IH} until the output begins to oscillate. Oscillation is defined as noise on the output LOW level that exceeds V_{IL} limits, or on output HIGH levels that exceed V_{IH} limits. The input HIGH voltage level at which oscillation occurs is defined as V_{IHD}.
- Verify that the GND reference recorded on the oscilloscope has not drifted to ensure the accuracy and repeatability of the measurements.

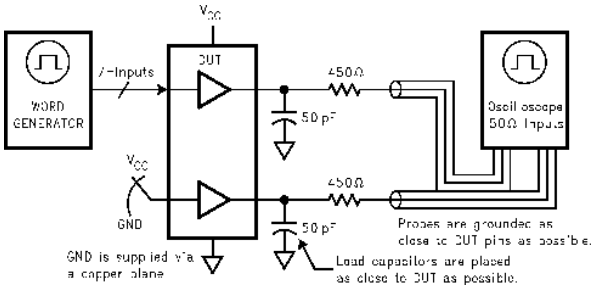


Figure 2. Simultaneous Switching Test Circuit

Physical Dimensions

Dimensions are in millimeters unless otherwise noted.

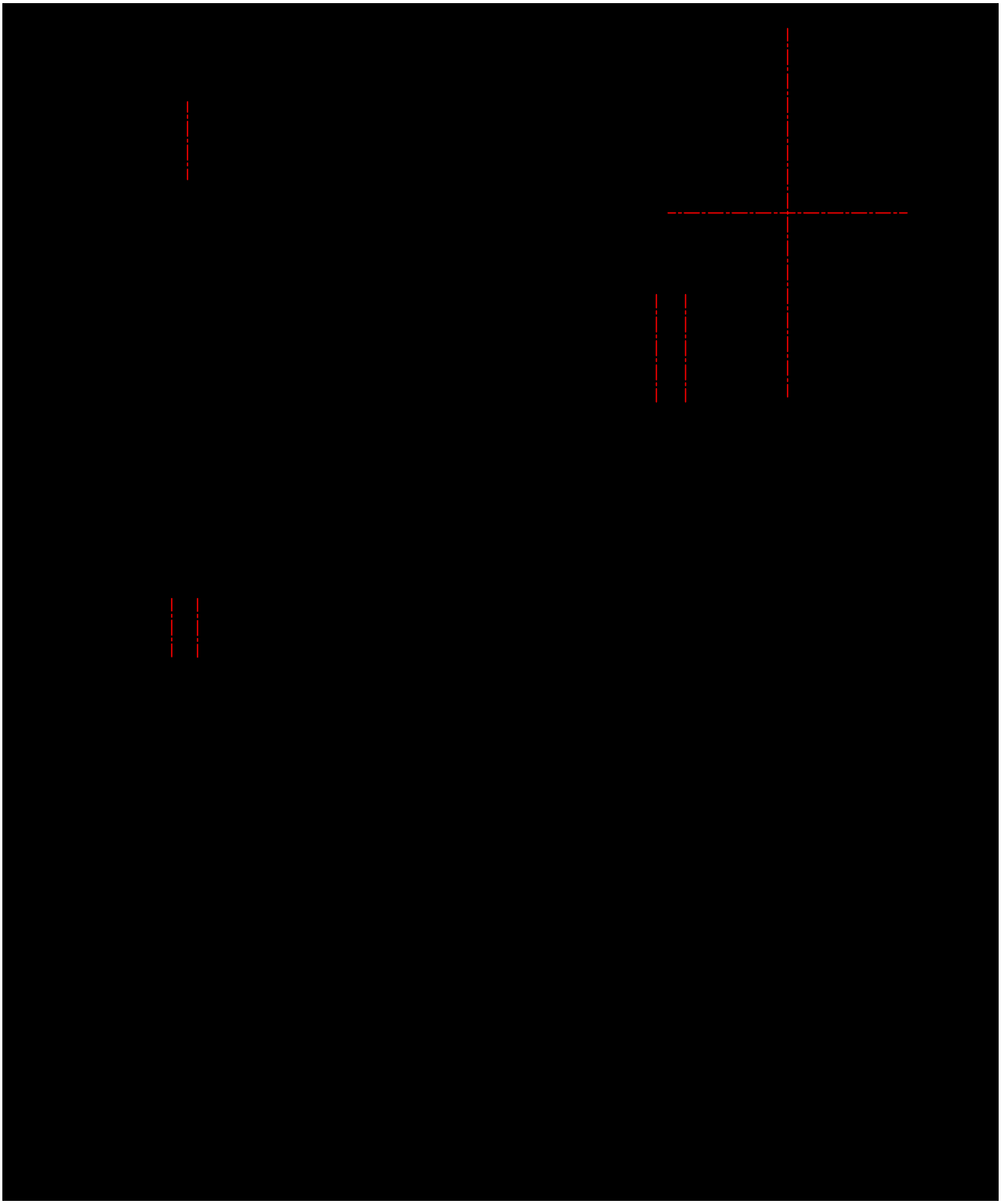


Figure 3. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
Package Number M20B

Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.

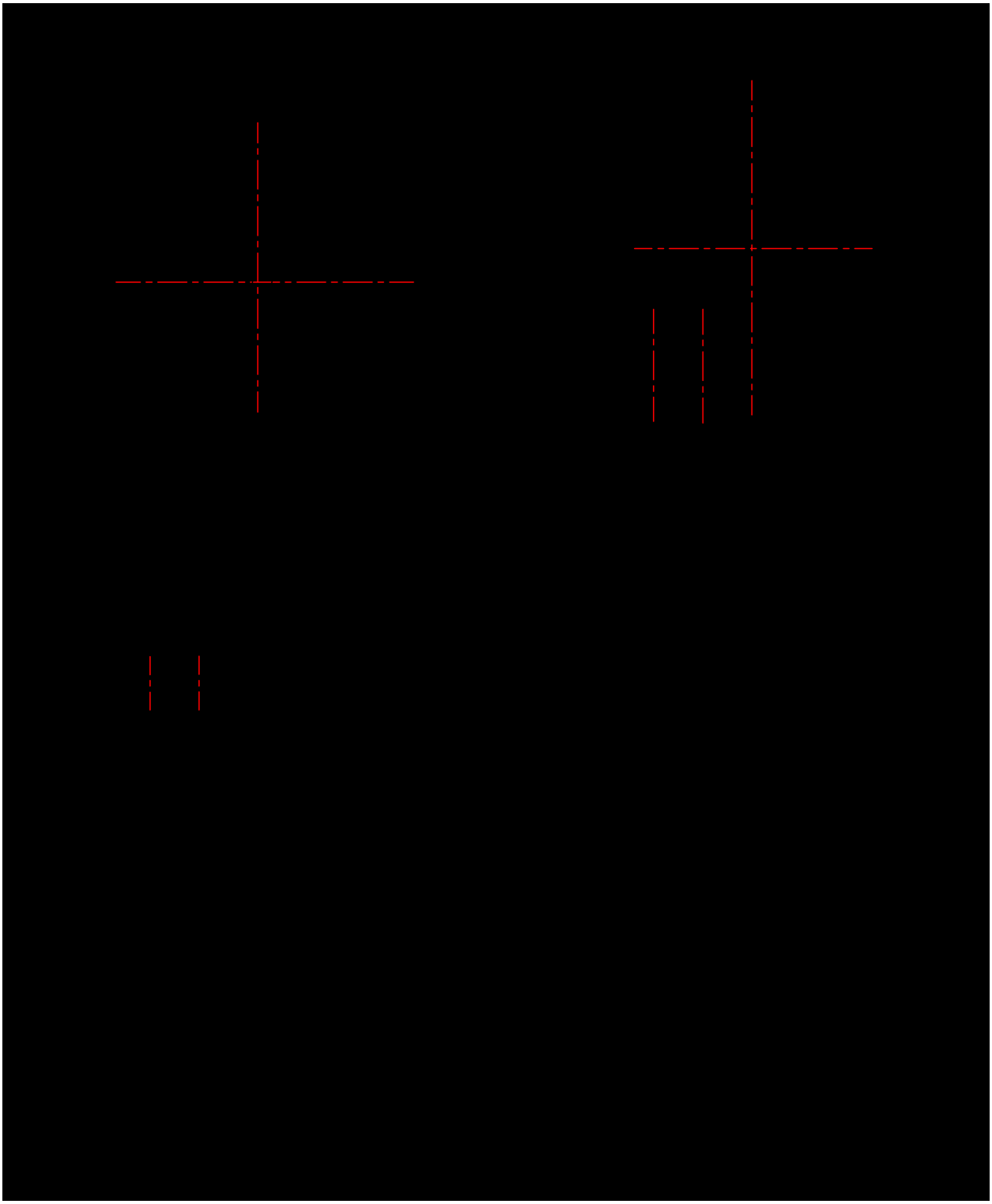


Figure 4. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M20D