

SCOPE: Slew-Rate Limited, Low-Power RS-485 Tranceivers

<u>Device Type</u>	<u>Generic Number</u>	<u>Device Type</u>	<u>Generic Number</u>
01	MAX481M(x)/883B	05	MAX488M(x)/883B
02	MAX483M(x)/883B	06	MAX489M(x)/883B
03	MAX485M(x)/883B	07	MAX490M(x)/883B
04	MAX487M(x)/883B	08	MAX491M(x)/883B

Case Outline(s). The case outlines shall be designated in Mil-Std-1835 and as follows:

<u>Outline Letter</u>	<u>Mil-Std-1835</u>	<u>Case Outline</u>	<u>Package Code</u>
MAXIM SMD			
JA P	GDIP1-T8 or CDIP2-T8	8 LEAD CERDIP	J8
JD C	GDIP1-T14 or CDIP2-T14	14 LEAD CERDIP	J14

Absolute Maximum Ratings

Supply Voltage (V_{CC})	+12V
Control Input Voltage _____	
(RE, DE)	-0.5V to ($V_{CC} + 0.5V$)
Driver Input Voltage (DI)	-0.5V to ($V_{CC} + 0.5V$)
Driver Output Voltage (A,B)	-8V to 12.5V
Receiver Input Voltage (A,B)	-8V to 12.5V
Receiver Output Voltage (RO)	-0.5V to ($V_{CC} + 0.5V$)
Lead Temperature (soldering, 10 seconds)	+300°C
Storage Temperature	-65°C to +160°C
Continuous Power Dissipation	$T_A = +70^\circ C$
8 pin CERDIP (derate 8.0mW/°C above +70°C)	640mW
14 pin CERDIP (derate 9.1mW/°C above +70°C)	727mW
Junction Temperature T_J	+150°C
Thermal Resistance, Junction to Case, θ_{JC}	
8 pin CERDIP	55°C/W
14 pin CERDIP	55°C/W
Thermal Resistance, Junction to Ambient, θ_{JA} :	
8 pin CERDIP	125°C/W
14 pin CERDIP	110°C/W

Recommended Operating Conditions

Ambient Operating Range (T_A)	-55°C to +125°C
Receiver Input Voltage Operating Range	-7V to +12V

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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TABLE 1. ELECTRICAL TESTS:

TEST	Symbol	CONDITIONS		Group A Subgroup	Device type	Limits Min	Limits Max	Units
		-55 °C ≤ T _A ≤ +125 °C 1/ V _{CC} = 5V ± 5% Unless otherwise specified						
Differential Driver Output (no load)	V _{OD1}			1,2,3	All		5	V
Differential Driver Output (with load)	V _{OD2}	R=50Ω (RS-422), Figure 4		1,2,3	All	2.0		V
		R=27Ω (RS-485), Figure 4				1.5	5.0	
Change in Magnitude of Driver Differential Output Voltage for complementary output states	ΔV _{OD}	R=27Ω or 50Ω, Figure 4		1,2,3	All		0.2	V
Driver Common-mode Output Voltage	V _{OC}	R=27Ω or 50Ω, Figure 4		1,2,3	All		3.0	V
Change in Magnitude of Driver Common Mode Output Voltage for complementary output states	ΔV _{OD}	R=27Ω or 50Ω, Figure 4		1,2,3	All		0.2	V
Input High Voltage	V _{IH}	DE, DI, RE		1,2,3	All	2.0		V
Input Low Voltage	V _{IL}	DE, DI, RE		1,2,3	All		0.8	V
Input Current	I _{IN1}	DE, DI, RE		1,2,3	All		±2.0	μA
Input Current (A, B)	I _{IN2}	DE=0V, V _{CC} =0V or 5.25V	V _{IN} =12V	1,2,3	01,02,03, 05,06,07, 08	1.0		mA
			V _{IN} =-7V			-0.8		
Input Current (A, B)	I _{IN2}	DE=0V, V _{CC} =0V or 5.25V	V _{IN} =12V	1,2,3	04	0.25		mA
			V _{IN} =-7V			-0.2		
Receiver Differential Threshold Voltage	V _{TH}	-7V ≤ V _{CM} ≤ 12V		1,2,3	All	-0.2	0.2	V
Receiver Output High Voltage	V _{OH}	I _O = -4mA, V _{ID} = 200mV		1,2,3	All	3.5		V
Receiver Output Low Voltage	V _{OL}	I _O = 4mA, V _{ID} = -200mV		1,2,3	All		0.4	V
Three-State (High Impedance) Output Current at Receiver	I _{OZR}	0.4V ≤ V _O ≤ 2.4V		1,2,3	All		±1.0	μA
Receiver Input Resistance	R _{IN}			4,5,6	01,02,03, 05,06,07, 08	12		kΩ
		-7V ≤ V _{CM} ≤ 12V				04		
Supply Current (See Note 2 for No Load)	I _{CC}	RE=0V or V _{CC}	DE=V _{CC}	1,2,3	01,03 01,03 02 04 02,04		900	μA
			DE=0V				500	
			DE=5V				650	
			DE=5V				400	
			DE=0V				250	
		DE, DI, RE=0V or V _{CC}		1,2,3	05,06 07,08		250	
							500	

TEST	Symbol	CONDITIONS	Group A Subgroup	Device type	Limits Min	Limits Max	Units
		-55 °C ≤ T _A ≤ +125 °C 1/ V _{CC} = 5V ± 5% Unless otherwise specified					
Supply Current in Shutdown	I _{SHDN}	DE=0V, RE=V _{CC}	1,2,3	01,02,04		10	μA
Driver Short-Circuit Current, VO=High	I _{OSD1}	-7V ≤ V _O ≤ 12V, NOTE 3	1,2,3	All	35	250	mA
Driver Short-Circuit Current, VO=Low	I _{OSD2}	-7V ≤ V _O ≤ 12V, NOTE 3	1,2,3	All	35	250	mA
Receiver Short-Circuit Current	I _{OSR}	0V ≤ V _O ≤ V _{CC}	1,2,3	All	7	95	mA
Driver Input to Output	t _{PLH} / t _{PHL}	R _{DIFF} =54Ω, C _{L1} =C _{L2} =100pF Figures 6 and 8	9,10,11	01,03,07, 08	10	60	ns
				02,04,05, 06	250	2000	
Driver Output Skew to Output	t _{SKEW}	R _{DIFF} =54Ω, C _{L1} =C _{L2} =100pF Figures 6 and 8	9,10,11	01,03,07, 08		10	ns
				02,04,05, 06		800	
Driver Rise or Fall Time	t _R , t _F	R _{DIFF} =54Ω, C _{L1} =C _{L2} =100pF Figures 6 and 8	9,10,11	01,03,07, 08	3	40	ns
				02,04,05, 06	250	2000	
Driver Enable to Output High	t _{ZH}	C _L =100pF, S2 closed Figures 7 and 9	9,10,11	01,03,07, 08		70	ns
				02,04,05, 06	250	2000	
Driver Enable to Output Low	t _{ZL}	C _L =100pF, S1 closed Figures 7 and 9	9,10,11	01,03,07, 08		70	ns
				02,04,05, 06	250	2000	
Driver Disable Time from Low	t _{LZ}	C _L =15pF, S1 closed Figures 7 and 9	9,10,11	01,03,07, 08		70	ns
				02,04,05, 06	300	3000	
Driver Disable Time from High	t _{HZ}	C _L =15pF, S2 closed Figures 7 and 9	9,10,11	01,03,07, 08		70	ns
				02,04,05, 06	300	3000	
Receiver Input to Output	t _{PLH} / t _{PHL}	R _{DIFF} =54Ω, C _{L1} =C _{L2} =100pF Figures 6 and 10	9,10,11	01,03,07, 08	20	200	ns
				02,04,05, 06	250	2000	
Receiver Enable to Output Low	t _{ZL}	C _{RL} =15pF, S1 closed Figures 5 and 11	9,10,11	All		50	ns
Receiver Enable to Output High	t _{ZH}	C _{RL} =15pF, S2 closed Figures 5 and 11	9,10,11	All		50	ns
Receiver Disable Time from Low	t _{LZ}	C _{RL} =15pF, S1 closed Figures 5 and 11	9,10,11	All		50	ns
Receiver Disable Time from High	t _{HZ}	C _{RL} =15pF, S2 closed Figures 5 and 11	9,10,11	All		50	ns

TEST	Symbol	CONDITIONS		Group A Subgroup	Device type	Limits Min	Limits Max	Units
		-55 °C ≤ T _A ≤ +125 °C 1/ V _{CC} = 5V ± 5% Unless otherwise specified						
Maximum Data Rate	f _{MAX}		t _{PLH} , t _{PHL} < 50% of data period	9,10,11	01,03,07,08	2.5		Mbps
					02,04,05,06	250		kbps
Time to Shutdown	t _{SHDN}	NOTE 4		9,10,11	01,02,04	50	600	ns
Driver Enable from Shutdown to Output High	t _{ZH(SHDN)}	CL=100pF, S2 closed Figure 7 and 9		9,10,11	01 02,04		100 2000	ns
Driver Enable from Shutdown to Output Low	t _{ZL(SHDN)}	CL=100pF, S1 closed Figure 7 and 9		9,10,11	01 02,04		100 2000	ns
Receiver Enable from Shutdown to Output High	t _{ZH(SHDN)}	CL=15pF, S2 closed Figure 5 and 11		9,10,11	01 02,04		1000 2500	ns
Receiver Enable from Shutdown to Output Low	t _{ZL(SHDN)}	CL=15pF, S1 closed Figure 5 and 11		9,10,11	01 02,04		1000 2500	ns

NOTE 1: All currents into device pins are positive; all currents out of device pins are negative.

All voltages are referenced to device ground unless otherwise specified.

NOTE 2: Supply current specification is valid for loaded transmitters when DE=0V.

NOTE 3: Applies to peak current.

NOTE 4: The device types 01, 02, 04 are put into shutdown by bringing RE high and DE low. If the inputs are in this state for less than 50ns, the parts are guaranteed not to enter shutdown. If the inputs are in this state for at least 600ns, the parts are guaranteed to have entered shutdown.

FIGURES 4 to 11: See Commercial Datasheet.

FIGURE 4: Driver DC Test Load

FIGURE 5: Receiver Timing Test Load

FIGURE 6: Driver/Receiver Timing Test Circuit

FIGURE 7: Driver Timing Test Load

FIGURE 8: Driver Propagation Delays

FIGURE 9: Driver Enable and Disable Times for 01, 02, 03, 04, 06, 08.

FIGURE 10: Receiver Propagation Delays

FIGURE 11: Receiver Enable and Disable Times for 01, 02, 03, 04, 06, 08.

TERMINAL CONNECTIONS FOR 01, 02, 03, 04, 05, 06, 07, 08

	01,02,03,04	05, 07	06, 08	DASH	ORDERING	PKG
	MAX481/83/85/87	MAX488/90	MAX489/91		INFORMATION	
1	RO	VCC	NC	01	MAX481MJA/883B	J8
2	— RE	RO	RO	02	MAX483MJA/883B	J8
3	DE	DI	— RE	03	MAX485MJA/883B	J8
4	DI	GND	DE	04	MAX487MJA/883B	J8
5	GND	Y	DI	05	MAX488MJA/883B	J8
6	A	Z	GND	06	MAX489MJD/883B	J14
7	B	B	GND	07	MAX490MJA/883B	J8
8	V _{CC}	A	NC	08	MAX491MJD/883B	J14
9			Y			
10			Z			
11			B			
12			A			
13			NC			
14			V _{CC}			

QUALITY ASSURANCE

Sampling and inspection procedures shall be in accordance with MIL-Prf-38535, Appendix A as specified in Mil-Std-883.

Screening shall be in accordance with Method 5004 of Mil-Std-883. Burn-in test Method 1015:

1. Test Condition, A, B, C, or D.
2. TA = +125°C minimum.
3. Interim and final electrical test requirements shall be specified in Table 2.

Quality conformance inspection shall be in accordance with Method 5005 of Mil-Std-883, including Groups A, B, C, and D inspection.

Group A inspection:

1. Tests as specified in Table 2.
2. Selected subgroups in Table 1, Method 5005 of Mil-Std-883 shall be omitted.

Group C and D inspections:

- a. End-point electrical parameters shall be specified in Table 1.
- b. Steady-state life test, Method 1005 of Mil-Std-883:
 1. Test condition A, B, C, D.
 2. TA = +125°C, minimum.
 3. Test duration, 1000 hours, except as permitted by Method 1005 of Mil-Std-883.

TABLE 2. ELECTRICAL TEST REQUIREMENTS

Mil-Std-883 Test Requirements	Subgroups per Method 5005, Table 1
Interim Electric Parameters Method 5004	1
Final Electrical Parameters Method 5005	1*, 2, 3, 9, 10, 11
Group A Test Requirements Method 5005	1, 2, 3, 9, 10, 11
Group C and D End-Point Electrical Parameters Method 5005	1

* PDA applies to Subgroup 1 only.