钍地半导体
Tudi Semiconductor

Product Specification

TUDI-MAX3471CUA/MAX3471EUA

1.6μA, RS-485/RS-422, Half-Duplex, Differential Transceiver for Battery-Powered Systems

网址 www.sztdbdt.com

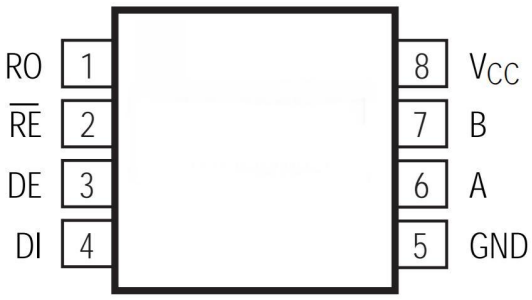
用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

Features

- 1.6μA Supply Current with Receiver Enabled
- +2.5V to +5.5V Single-Supply Operation
- True Fail-Safe Receiver Input
- Available in μMAX Package
- 1/8-Unit-Load Receiver Input
- -7V to +10V Common-Mode Input Voltage Range



MSOP8

Description

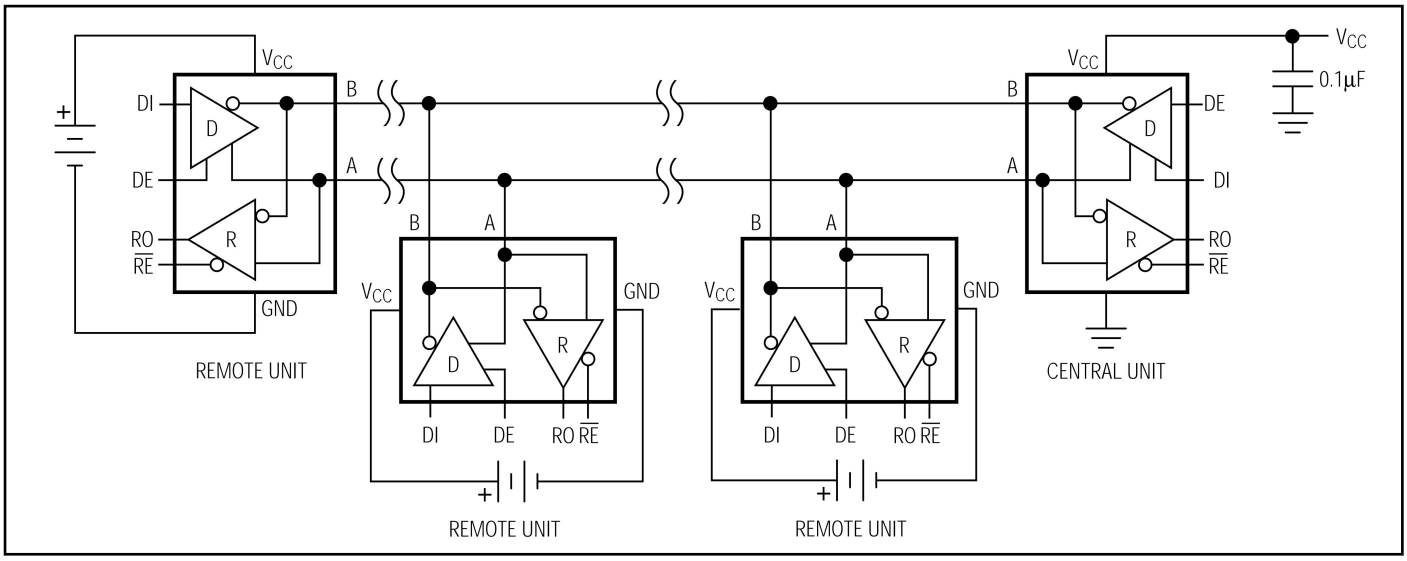
The MAX3471 half-duplex transceiver is intended for lithium battery-powered RS-485/RS-422 applications. It draws only 1.6μA (typical) supply current from a 3.6V supply with the receiver enabled and the driver dis-abled. Its wide 2.5V to 5.5V supply voltage guarantees operation over the lifetime of a lithium battery. This device features true fail-safe operation that guar-antees a logic-high receiver output when the receiver inputs are open or shorted. This means that the receiv-er output will be a logic high if all transmitters on a ter-minated bus are disabled (high impedance).

The MAX3471 has a 1/8-unit load input resistance. When driver outputs are enabled and pulled above V_{CC} or below GND, internal circuitry prevents battery back-charging. The MAX3471 is available in an 8-pin μMAX package.

Applications

- Remote Meter Reading
- Battery-Powered Differential
- Communications Level Translators

Typical Application Circuit



ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage (V_{CC}) 7V
Control Input Voltage (RE, DE).....-0.3V to (V_{CC}) + 0.3V)
Driver Input Voltage (DI).....-0.3V to (V_{CC}) + 0.3V)
Driver Output/Receiver Input Voltage (A, B).....±10.5V
Receiver Output Voltage (RO).....-0.3V to (V_{CC}) + 0.3V)
Continuous Power Dissipation
µMAX (derate 4.5mW/°C above +70°C) 362mW
Operating Temperature Ranges
MAX3471CUA.....0°C to +70°C
MAX3471EUA.....-40°C to +85°C
Storage Temperature Range .....-65°C to +160°C
Lead Temperature (soldering, 10sec) .....+300°C

Note 1: All currents into the device are positive; all currents out of the device are negative. All voltages are referred to device ground unless otherwise noted

DC ELECTRICAL CHARACTERISTICS

(V_{CC} = +2.5V to +5.5V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at V_{CC} = +3.6V and T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	V_{OD1}	Figure 1(R=open)				V_{cc}	V
Differential Driver Output (with load)	V_{OD2}	Figure 1	R=750Ω(RS-422)	1.5	3.28		V
			R=27Ω(RS-485)	0.2	0.83		
			R=27Ω(RS-485),V_{CC}=5V, T_A=+25℃		1.5		
Change in Magnitude of Differential Output Voltage(Note 2)	△V_{OD}	Figure 1,R=750Ω or 27Ω				0.2	V
Driver Common-Mode Output Voltage	V_{OC}	Figure 1,R=750Ω or 27Ω				0.6×V_{cc}	V
Change in Magnitude of Common-Mode Voltage(Note 2)	△V_{OC}	Figure 1,R=750Ω or 27Ω				0.2	V
Input High Voltage	V_{IH}	DE,DI,RE		0.7×V_{cc}			V
Input Low Voltage	V_{IL}	DE,DI,RE				0.3×V_{cc}	V
DI Input Hysteresis	V_{HYS}				100		mV
Input Current	I_{N1}	DE,DI,RE			±0.001	±1	μA
Input Current (A and B), Half Duplex	I_{N2}	DE=GND,V_{cc}= GND or 5.5V	V_{IN}=10V			0.105	mA
			V_{IN}=-7V			-0.075	

DC ELECTRICAL CHARACTERISTICS （Continued）

(V_{CC} = +2.5V to +5.5V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at V_{CC} = +3.6V and T_A = +25°C.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Driver Short-Circuit Output Current(Note 3)	I_{OSD}	-7V≤V_{OUT}≤10V	V_{cc}≤3.6V	-60		60	mA
			V_{cc}≤5.5V	-130		130	
Receiver Differential Threshold Voltage	V_{TH}	-7V≤V_{CM}≤10V		-450	-250	-50	mV
Receiver Input Hysteresis	△V_{TH}	V_{CM}=0			32		mV
Receiver Output High Voltage	V_{OH}	I_o=-0.8mA,V_{ID}=-50mV		V_{cc}-0.4			V
Receiver Output Low Voltage	V_{OL}	I_o=2.2mA,V_{ID}=-450mV				04	V
Three-State Current at Receiver Output	I_{OZR}	0≤V_o≤V_{cc}				± 1	μA
Receiver Input Resistance	R_{IN}	-7V≤V_{CM}≤10V		96			kΩ
Receiver Output Short-Circuit Current	I_{OSR}	0≤V_{RO}≤V_{cc}	V_{cc}≤3.6V	-20		50	mA
			V_{cc}≤5.5V	-40		110	
Supply Current	I_{cc}	V_{cc}≤3.6V,no load ,RE=DI=GND or V_{cc},V_A=V_B=0	DE=V_{cc}		50	60	μ A
			DE=GND		1.6	2	
		V_{cc}≤5.5V,no load ,RE=DI=GND or V_{cc},V_A=V_B=0	DE=V_{cc}		83	100	
			DE=GND		2.8	4	

SWITCHING CHARACTERISTICS

(V_{CC} = +2.5V to +5.5V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at V_{CC} = +3.6V and T_A = +25°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Input to Output Propagation Delay	t_{DPLH},t_{DPHL}	Figures 3 and 5,R_{DIFF}=1.5kΩ,C_{L1} = C_{L2}=100pF		1.4	2	μs
Driver Output Skew (t_{DPLH}-t_{DPHL})	t_{DSKEW}	Figures 3 and 5,R_{DIFF}=1.5kΩ,C_{L1} = C_{L2}=100pF		0.025		μs
Driver Rise or Fall Time	t_{DR},t_{DF}	Figures 3 and 5,R_{DIFF}=1.5kΩ,C_{L1} = C_{L2}=100pF	0.75	1.34	1.75	μs
Driver Enable Time to Output High	t_{DZH}	Figures 4 and 6,C_L=100pF,S2 closed,S1 open		1.5	6	μs
Driver Enable Time to Output Low	t_{DZL}	Figures 4 and 6,C_L=100pF,S1 closed,S2 open		0.86	4	μS
Driver Disable Time from Low	t_{DLZ}	Figures 4 and 6,C_L=15pF,S1 closed, S2 open		0.4	1.5	μ S
Driver Disable Time from High	t_{DHZ}	Figures 4 and 6,C_L=15pF,S2 closed, S1 open		0.6	1.5	μ s
Receiver Input to Output Propagation Delay	t_{RPLH}	Figures 7 and 9,C_L=15pF, $\|V_{ID}\|$=2V		5.2	12	μS
	t_{RPHL}			6.4	12	
Differential Receiver Skew (t_{DPLH}-t_{DPHL})	t_{RSKEW}	Figures 7 and 9, $\|V_{ID}\|$=2V		1.2		μs
Data Rate	f_{MAX}	Figure 9,C_L=100pF	64			kbps
Receiver Enable Time to Output Low	t_{RZL}	Figures 2 and 8,C_L=15pF,S1 closed, S2 open		70	500	ns
Receiver Enable Time to Output High	t_{RZH}	Figures 2 and 8,C_L=15pF,S2 closed, S1 open		85	500	ns
Receiver Disable Time from Low	t_{RLZ}	Figures 2 and 8,C_L=15pF,S1 closed, S2 open		50	200	ns
Receiver DisableTime from High	t_{RHZ}	Figures 2 and 8,C_L=15pF,S2 closed, S1 open		35	200	ns

Note 1: All currents into the device are positive; all currents out of the device are negative. All voltages are referred to device ground unless otherwise noted.
Note 2: ΔV_{OD} and ΔV_{OC} are the changes in magnitude of V_{OD} and V_{OC}, respectively, when the DI input changes state.
Note 3: Maximum and minimum current levels apply to peak current just prior to foldback-current limiting.

Pin Description

PIN	NAME	FUNCTION
1	RO	Receiver Output.When RE is low,if A-B≥-50mV,RO will be high;if A-B≤-450mV,RO will be low.
2	RE	Receiver Output Enable.Drive RE low to enable RO;RO is high impedance when RE is high.
3	DE	Driver Output Enable.Drive DE high to enable the driver outputs.These outputs are high impedance whenDE is low.
4	DI	Driver Input.With DE high,a low on DI forces the noninverting output low and the inverting output high.Similarly,a high on DI forces the noninverting output high and the inverting output low.
5	GND	Ground
6	A	Noninverting Driver Output and Noninverting Receiver Input
7	B	Inverting Driver Output and Inverting Receiver Input
8	V_{cc}	Positive Supply:+2.5V≤V_{cc}≤+5.5V

Detailed Description

The MAX3471 half-duplex transceiver consumes only 1.6μA from a single +3.6V supply. Its wide 2. 5V to 5.5V supply voltage guarantees operation over the lifetime of a lithium battery. This device contains one driver and one receiver. Its true fail-safe receiver input guarantees a logic-high receiver output when the receiver inputs are open or shorted, or when they are connected to a terminated transmission line with all drivers disabled. Reduced-slew-rate drivers minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 64kbps.

Receiver Input Filtering

The MAX3471 receiveroperates at up to 64kbps and incorporates input filtering in addition to input hystere-sis. This filtering enhances noise immunity when differ-ential signals have very slow rise and fall times. The MAX3471 guarantees a logic-high receiver output when the receiver inputs are shorted or open, or when they are connected to a terminated transmission line with all drivers disabled. This is accomplished by set-ting the receiver threshold between -50mV and -450mV. If the differential receiver input voltage (A-B) is greater than or equal to -50mV, RO is a logic high. If A-B is less than or equal to -450mV, RO is a logic low. In the case of a terminated bus with all transmitters dis-abled, the receiver ’ s differential input voltage is pulled to 0V by the termination. With the MAX3471 ’ s receiver thresholds, this results in a logic high with a 50mV mini-mum noise margin.

Table 1. Transmitting

INPUTS			OUTPUTS	
RE	DE	DI	B	A
X	1	1	0	1
X	1	0	1	0
0	0	X	Z_D	Z_D
1	0	X	Z_D	Z_D

Z_D = Driver output disabled

Table 2. Receiving

INPUTS			OUTPUT
RE	DE	A-B	RO
0	0	≥-0.05V	1
0	0	≤-0.45V	0
0	0	Open/Shorted	1
1	0	X	Z

X = Don ’ t care
Z = Receiver output high impedance

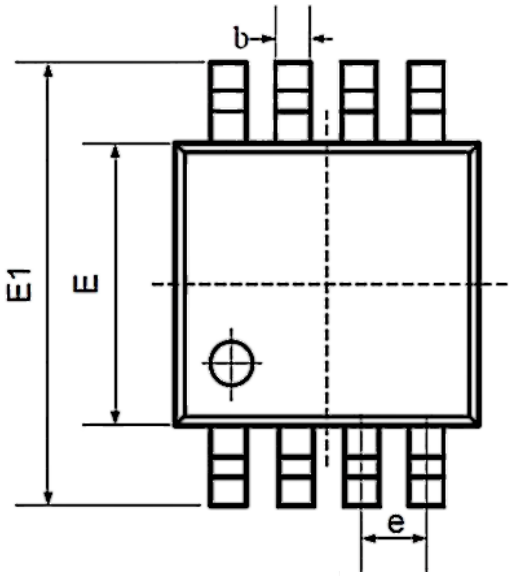
Order information

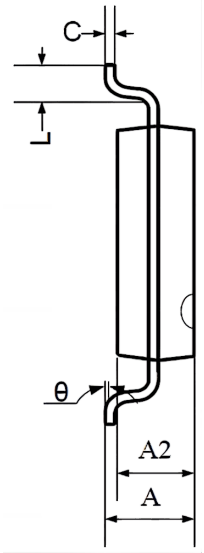
Order Number	Package	Package Quantity	Marking On The park	Temperature
MAX3471CUA-TUDI	MSOP8	Tape,Reel,4000	3471CUA	0°C to +70°C
MAX3471EUA-TUDI	MSOP8	Tape,Reel,4000	3471EUA	-40°C to +85°C

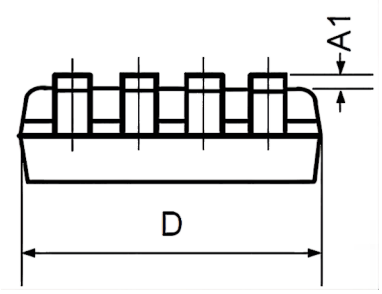
Revision history

	Date	Revision	Page
V1.0	2020/9	New	1-10
V1.1	2025-4	Update model and PDF template	1-11

Package MSOP8







Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
L	0.410	0.650	0.016	0.026
θ	0°	6°	0°	6°

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