Features

- Meet the Requirements of the EIA/TIA-485 Standards with 5V Power Supply
- Integrated Transient Voltage Suppressor (TVS)
- TVS Protection for Bus Terminals :
  ±30kV, IEC 61000-4-2, Contact/Air Discharge
  ±88A, IEC 61000-4-4, EFT (5/50ns)
  ±30A, IEC 61000-4-5, Surge (8/20μs)
- ***HBM ±15kV*** ESD Protection for all pins
- ***MM ±800V*** ESD Protection for all pins
- Latchup immunity up to ***±400mA***.
- High CDM protection up to ***±2kV***.
- True Fail-Safe Receiver While Maintaining EIA/TIA-485 Compatibility
- Hot-Swap Glitch Protection on Control Inputs
- Controlled Transmitter Slew-Rate
- 1nA Low Shutdown Current
- Up to 256 Transceivers on the Bus

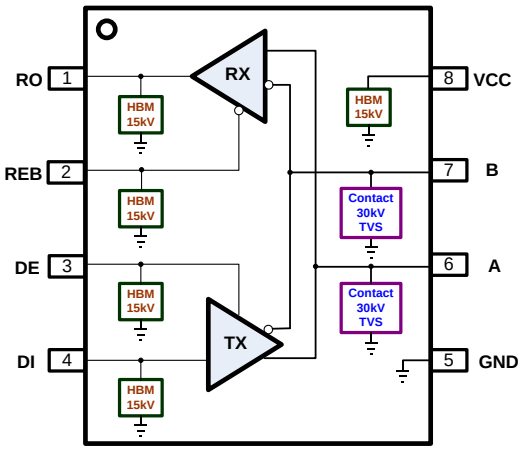
Applications

- Energy Meter Networks
- Motor Control
- Industrial Control
- Telecommunications Equipment
- Security System
- Building Automation Networks

Description

The AZRS8352P is a ±30 kV IEC 61000-4-2 Contact/Air Discharge protected, half-duplex transceiver which designed for RS-485 data bus network with one transmitter and one receiver. The AZRS8352P is fully compliant with the EIA/TIA-485 standard under 5V supply. The AZRS8352P features a fail-safe receiver, which guarantees the output of receiver to logic high when the receiver inputs are open, short or idle.

The AZRS8352P has a slew-rate-limited transmitter to minimize EMI and reflection caused by improperly cable terminated. The transmission speed of AZRS8352P is up to 118kbps with error-free operation. For the glitch free protection, hot-swap circuit of the AZRS8352P guarantees the outputs of both the transmitter and the receiver in a high impedance state during the power up period. Moreover, the transmitter of the AZRS8352P has the thermal shutdown and the current limited function to protect itself from damage of the system fault conditions during normal operation.



Functional Block of AZRS8352P

Part Number	Duplex	Tx/Rx	Data Rate (kbps)	Slew Rate Limit	Rx Input Filtering	Low Power Shutdown	Tx/ Rx Enable	ESD on A,B	Package Type
AZRS8352P	Half	1/1	118	Yes	Yes	Yes	Yes	± 30kV	SO-8

ABSOLUTE MAXIMUM RATINGS

PARAMETER	PARAMETER	RATING	UNITS
Power Supply Vcc	Vcc	-0.3 to 7.0	V
Control Input Voltage	REB, DE	-0.3 to (Vcc+ 0.3)	V
Receiver Input Voltage	A, B	±13	V
Receiver Output Voltage	RO	-0.3 to (Vcc+ 0.3)	V
Transmitter Output Voltage	A, B	±13	V
Transmitter Input	DI	-0.3 to (Vcc+ 0.3)	V
Operating Temperature	T_{OP}	-40 to +85	°C
Storage Temperature	T_{STO}	-65 to +150	°C

DC ELECTRICAL CHARACTERISTICS

(Vcc=5V ±5% with T_{AMB}= T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at Vcc=5V and T_{AMB}= 25 °C.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
TRANSMITTER							
Differential Transmitter Output	V_{OD1}	No load				5	V
Differential Transmitter Output	V_{OD2}	Fig.1, R_L= 27Ω		1.7			V
Change in Magnitude of Differential Output Voltage	ΔV_{OD}	Fig.1, R_L= 27Ω				0.2	V
Transmitter Common- Mode Output Voltage	V_{OC}	Fig.1, R_L= 27Ω				3	V
Change in Magnitude of Common- Mode Voltage	ΔV_{OC}	Fig.1, R_L= 27Ω				0.2	V
Input High Voltage	V_{IH}	DE, DI, REB		2.0			V
Input Low Voltage	V_{IL}	DE, DI, REB				0.8	V
Input Current	I_{IN1}	DI				±1	μA
Input Current	I_{IN2}	DE, REB				±50	μA
DI Input Hysteresis	V_{HYS}				100		mV
Input Current (A and B)	I_{IN3}	DE = GND, VCC = GND or 5.25V	V_{IN} = 12V			125	μA
			V_{IN} = -7V			-75	
Transmitter Short-Circuit Output Current	I_{OS}	-7V ≤ V_{OUT} ≤ Vcc		-250			mA
		0V ≤ V_{OUT} ≤ 12V				250	

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
RECEIVER							
Receiver Differential Threshold Voltage	V_{TH}	-7V ≤ V_{CM} ≤ +12V		-200	-125	-50	mV
Receiver Input Hysteresis	ΔV_{TH}				25		mV
Receiver Output High Voltage	V_{OH}	Io= -4mA, VID= -50mV		Vcc-1.5			V
Receiver Output Low Voltage	V_{OL}	Io= 4mA, VID= -200mV				0.4	V
Three- State Output Current at Receiver	I_{OZR}	0.4V ≤ V_{CM} ≤ 2.4V				±1	μA
Receiver Input Resistance	R_{IN}	-7V ≤ V_{CM} ≤ +12V		96			kΩ
Receiver Output Short-Circuit Current	I_{OSR}	Fig.6 , 0V ≤ V_{RO} ≤ Vcc		±7		±95	mA
SUPPLY CURRENT							
Supply Current	Icc	No load, REB= GND, DI= Vcc or GND.	DE= Vcc		270	600	μA
			DE= GND		220	300	μA
Supply Current in Shutdown Mode	I_{SHDN}	REB= Vcc, DE= GND			1n	10μ	A

SWITCHING CHARACTERISTICS

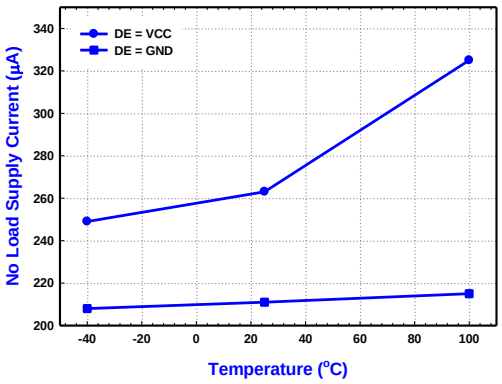
(Vcc=5V ±5% with T_{AMB}= T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at Vcc=5V and T_{AMB}= 25 °C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Transmitter Input to Output	t_{DPLH}, t_{DPHL}	Fig.2 and 7, R_{DIFF}=54Ω, C_{L1}=C_{L2}= 100pF	500	980	2600	ns
Transmitter Output Skew $\lvert t_{DPLH} - t_{DPHL} \rvert$	t_{DSKEW}	Fig.2 and 7, R_{DIFF}=54Ω, C_{L1}=C_{L2}= 100pF			±200	ns
Transmitter Rise or Fall Time	t_{DF}, t_{DR}	Fig.2 and 7, R_{DIFF}=54Ω, C_{L1}=C_{L2}= 100pF	667	1500	2500	ns
Maximum Data Rate	f_{MAX}		118			kbps
Transmitter Enable to Output Low	t_{DZL}	Fig.4 and 8, C_{DL}= 100pF, S1 closed			1000	ns
Transmitter Enable to Output High	t_{DZH}	Fig.4 and 8, C_{DL}= 100pF, S2 closed			1000	ns

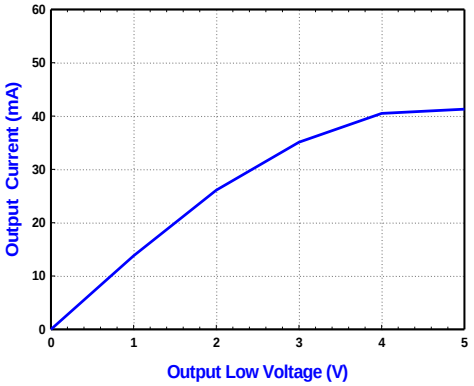
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Transmitter Disable Time from Low	t_{DLZ}	Fig.4 and 8, C_{DL}= 15pF, S1 closed			100	ns
Transmitter Disable Time from High	t_{DHZ}	Fig.4 and 8, C_{DL}= 15pF, S2 closed			100	ns
Receiver Input to Output	t_{RPLH}, t_{RPHL}	Fig.5 and 9 , $\lvert V_{ID}\rvert \geq$ 2.0V; rise and fall time of $V_{ID} \leq$ 15ns		127	200	ns
$\lvert t_{RPLH} - t_{RPHL}\rvert$ Different Receiver Skew	t_{RSKD}	Fig.5 and 9, $\lvert V_{ID}\rvert \geq$ 2.0V; rise and fall time of $V_{ID} \leq$ 15ns			±30	ns
Receiver Enable to Output Low	t_{RZL}	Fig.3 and 10, C_{RL}= 100pF, S1 closed		20	50	ns
Receiver Enable to Output High	t_{RZH}	Fig.3 and 10, C_{RL}= 100pF, S2 closed		20	50	ns
Receiver Disable Time from Low	t_{RLZ}	Fig.3 and 10, C_{RL}= 100pF, S1 closed		20	50	ns
Receiver Disable Time from High	t_{RHZ}	Fig.3 and 10, C_{RL}= 100pF, S2 closed		20	50	ns
Time to Shutdown	t_{SHDN}		50	200	600	ns
Transmitter Enable from Shutdown to Output Low	$t_{DZL(SHDN)}$	Fig.4 and 8, C_{DL}= 15pF, S1 closed			1000	ns
Transmitter Enable from Shutdown to Output High	$t_{DZH(SHDN)}$	Fig.4 and 8, C_{DL}= 15pF, S2 closed			1000	ns
Receiver Enable from Shutdown to Output Low	$t_{RZL(SHDN)}$	Fig.3 and 10, C_{RL}= 100pF, S1 closed			100	ns
Receiver Enable from Shutdown to Output High	$t_{RZH(SHDN)}$	Fig.3 and 10, C_{RL}= 100pF, S2 closed			2000	ns

(Vcc = +5V, T_{AMB}= 25 °C, unless otherwise noted.)

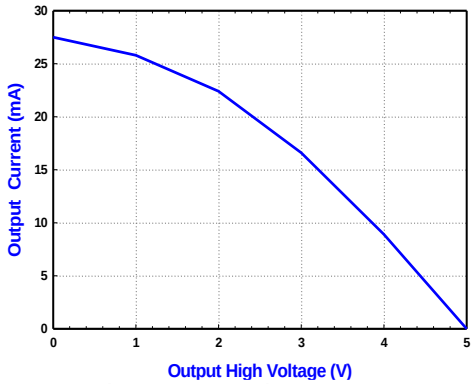
No Load Supply Current v.s. Temperature



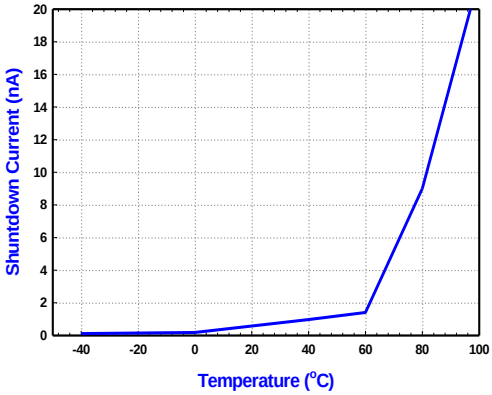
Output Current v.s. Receiver Output Low Voltage



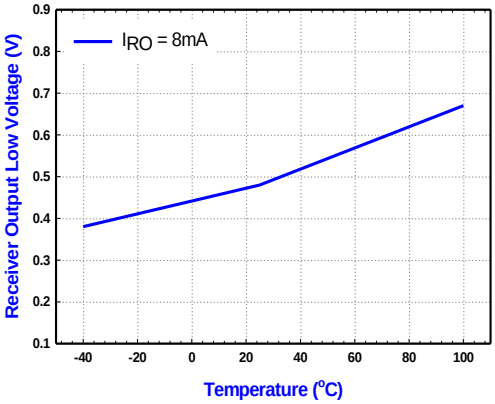
Output Current v.s. Receiver Output High Voltage



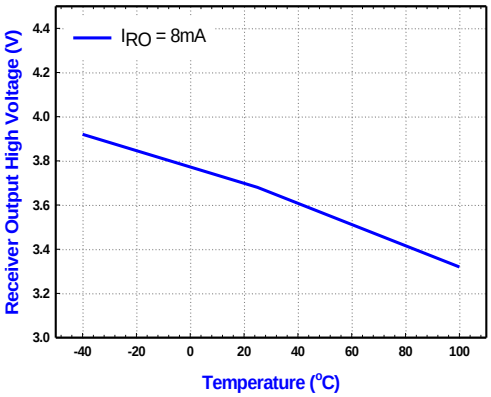
Shutdown Current v.s. Temperature



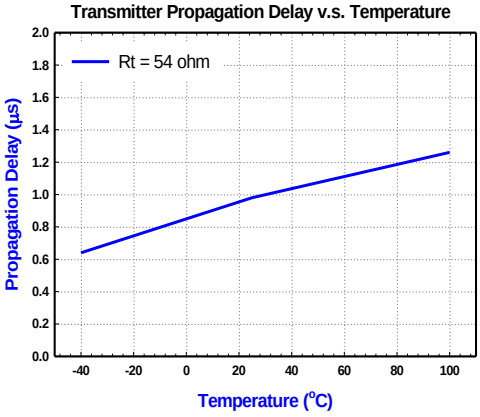
Receiver Output Low Voltage v.s. Temperature



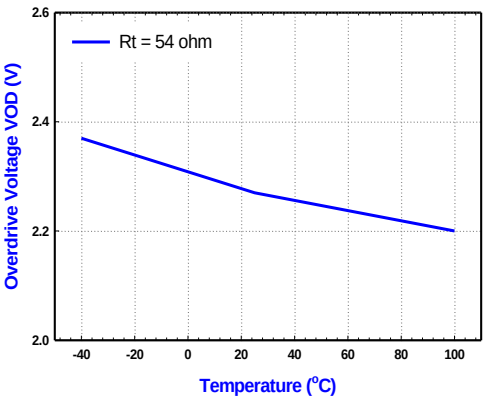
Receiver Output High Voltage v.s. Temperature



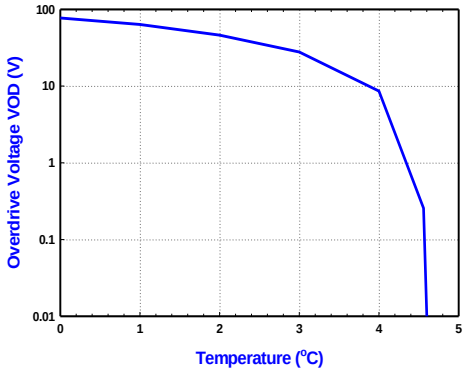
Transmitter Propagation Delay v.s. Temperature



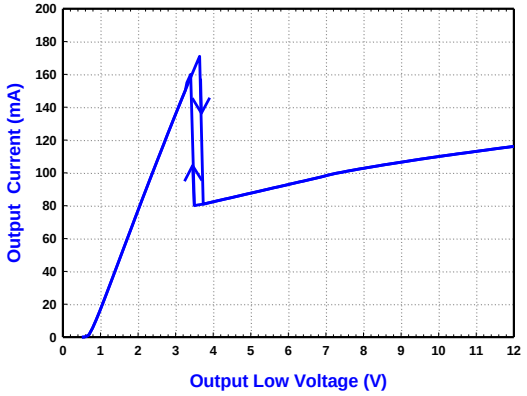
Transmitter Differential Output Voltage v.s. Temperature



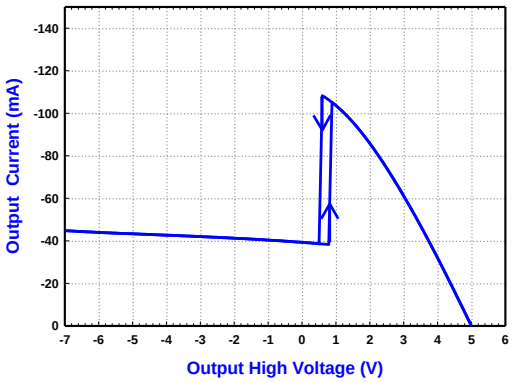
Transmitter Output Current v.s. Differential Output Voltage



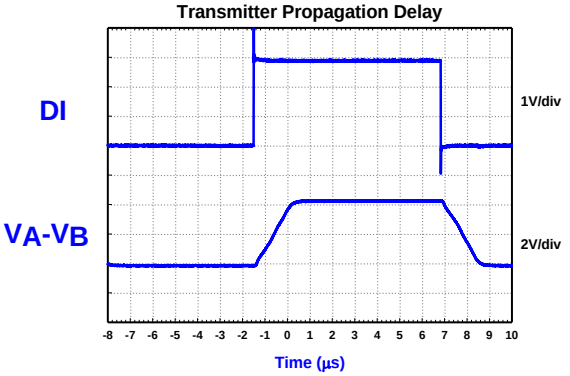
Output Current v.s. Transmitter Output Low Voltage



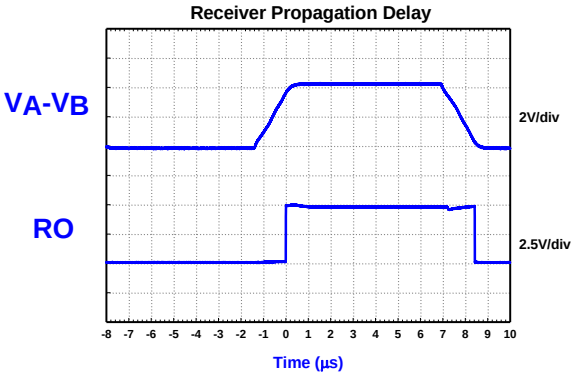
Output Current v.s. Transmitter Output High Voltage



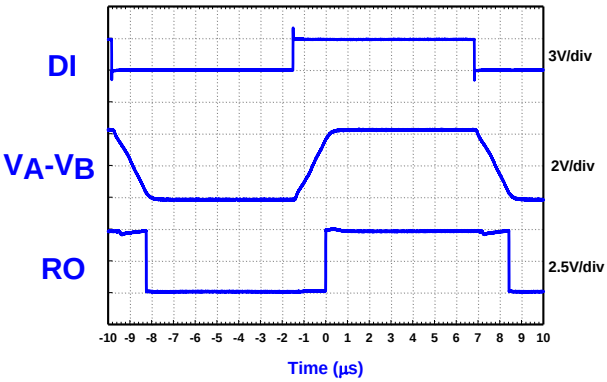
Transmitter Propagation Delay



Receiver Propagation Delay



LoopBack Testing Waveform



PIN FUNCTION DESCRIPTION

Pin Number	Mnemonic	Function
1	RO	Receiver outputs. When REB is low and if (A - B) ≥ -50mV, RO is high; if (A - B) ≤ -200mV, RO is low.
2	REB	Receiver Output Enable. Drive REB low to enable receiver; RO is high impedance when REB is high. Drive REB high and DE low to enter shutdown mode.
3	DE	Transmitter Output Enable. Drive DE high to enable transmitter outputs. The outputs of transmitter are high impedance when DE is low. Drive REB high and DE low to enter shutdown mode.
4	DI	Transmitter Input. With DE high, low state of DI forces pin6 (A) to be low and pin7 (B) to be high. Similarly, high state of DI forces pin6 (A) to be high and pin7 (B) to be low.
5	GND	Ground pin. Must be connected to 0V.
6	A	Non-inverting Receiver Input and Non-inverting Transmitter Output
7	B	Inverting Receiver Input and Inverting Transmitter Output
8	VCC	Power Supply 5V. Must adding a 100nF decoupling capacitor as close to the VCC pin as possible.

FUNCTION TABLE

TRANSMITTING				
INPUTS			OUTPUTS	
REB	DE	DI	B	A
X	1	1	0	1
X	1	0	1	0
0	0	X	HIGH- Z	HIGH- Z
1	0	X	SHUTDOWN	

RECEIVING			
INPUTS			OUTPUT
REB	DE	A - B	RO
0	0	≥ –0.05	1
0	0	≤ –0.2	0
0	0	OPEN/ SHORT	1
1	1	X	HIGH- Z
1	0	X	SHUTDOWN

X
= Don`t care

SHDNDOWN
= Receiver and Transmitter Output high impedance

High-Z
= High Impedance State

Detail Description

The AZRS8352P is a half-duplex RS-485 transceiver, which contains one transmitter and one receiver with 5V power supply. This device is fully compliant with the EIA/TIA-485 standard.

The AZRS8352P features a fail-safe receiver, which guarantees the receiver output high when the receiver inputs are open, short or idle. The AZRS8352P features the slew-rate-limited transmitter to minimize EMI and reflection by improperly cable terminated, which allowed error-free data transmission up to 118kbps. The hot- swap circuits guarantees the outputs of the transceiver in a high impedance state during the power up period. The thermal shutdown function and the transmitter current limited function protect the device from damage of system fault conditions.

Transmitter

The design of the transmitter is a non-inverted translator that converts the single-ended input signal to differential EIA/TIA-485 signal level. The transmitter of the AZRS8352P guarantees a 120kbps data rate communication with limited slew rate of output signal to minimize EMI and reduce improperly terminated cable reflection. When the transmitter is active (DE= HIGH), the single-end input signals of transmitter will be transported to differential output signals of the transmitter. Under the disable state (DE= LOW), the outputs of transmitter are stay at high impedance state.

Receiver

The receiver of the AZRS8352P converts the differential EIA/TIA-485 signals to single-end output TTL signal when receiver is in active state (REB=LOW), which incorporates input filtering in addition to input hysteresis, which enhances noise immunity with differential signals that have very slow rise and fall times.

Fail-Safe

The AZRS8352P guarantees a receiver output high when the receiver inputs are short, open, or idle. The threshold voltage of receiver input is between -50mV and -200mV. If the differential receiver input voltage (A - B) is greater than or equal to -50mV, receiver output (RO) is logic-high. If (A - B) is less than or equal to -200mV, RO is logic-low. In the case of a terminated bus with all transmitters disabled, the receiver's differential input voltage (A - B) is 0V; therefore, the RO is logic-high at that time.

Transmitter Output Protection

The AZRS8352P has the current limitation function and the thermal shutdown protection in the transmitter. Firstly, the function of current limitation provides immediate protection against short circuits over the whole common-mode voltage range (-7V to +12V). Secondly, the function of thermal shutdown protection will be active to force the transmitter outputs into a high impedance state if the operating temperature is over 150 ^{o}C.

1/8 Unit Load

The RS-485 standard defines both receiver inputs impedance are 12kΩ (1 unit load) and the maximum 32-unit loads on the bus. The AZRS8352P transceiver has a 96kΩ input impedance (1/8 unit load) of the receiver, allowing up to 256 devices to be connected in parallel on the RS485 bus.

Reduced EMI and Reflections

The AZRS8352P features the function of a slew-rate-limited transmitter that minimizes EMI and reduces reflections caused by improperly terminated cables, which allows the error-free data transmission up to 118kbps.

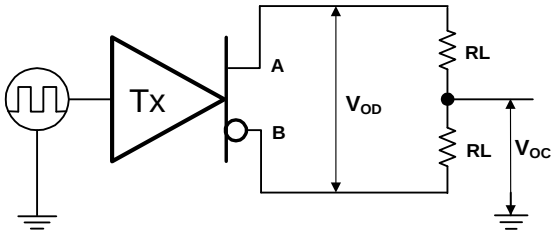


Fig.1 Transmitter DC test circuit

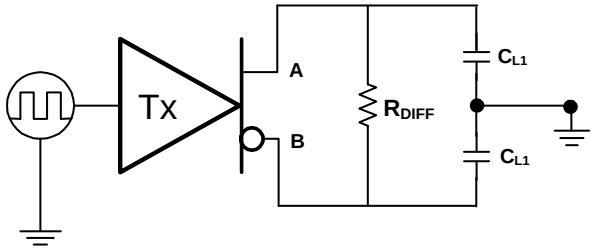


Fig.2 Transmitter timing test circuit

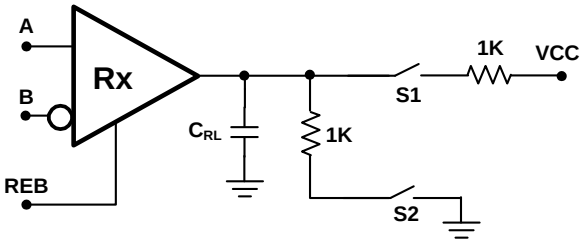


Fig.3 Receiver enable/disable timing test load

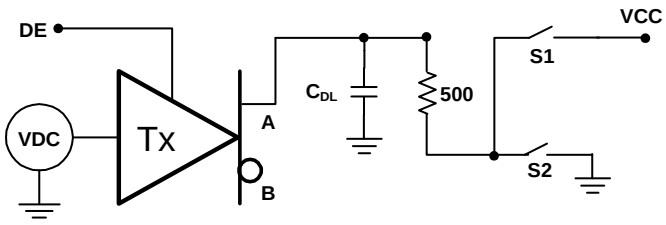


Fig.4 Transmitter enable/disable timing test load

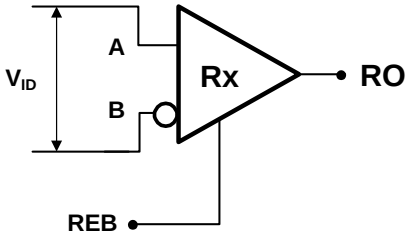


Fig.5 Receiver timing test circuit

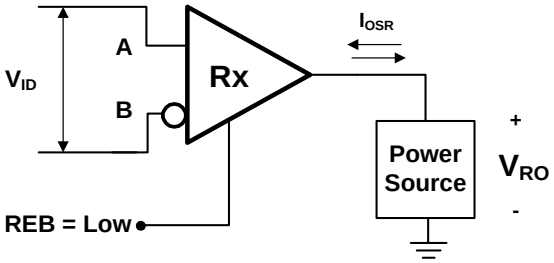


Fig.6 Receiver output short circuit

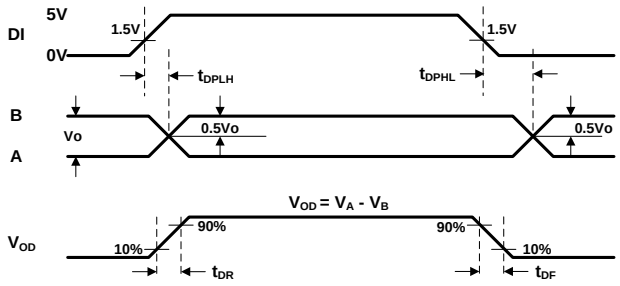


Fig.7 Transmitter Propagation Delays

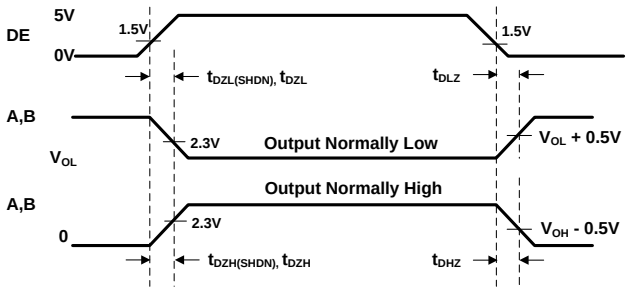


Fig.8 Transmitter Enable and Disable Times

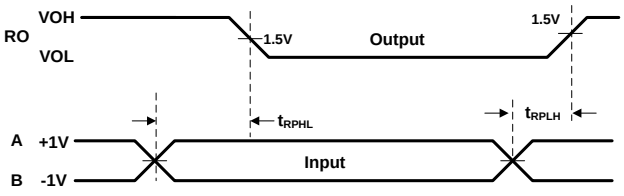


Fig.9 Receiver Propagation Delays

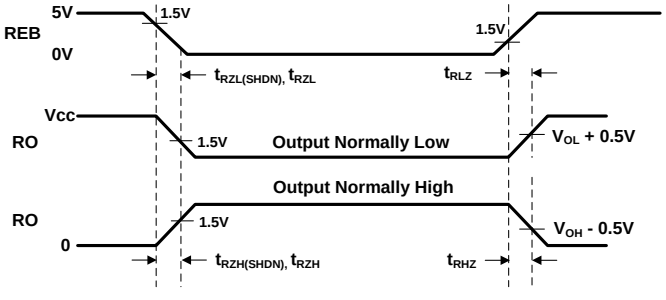


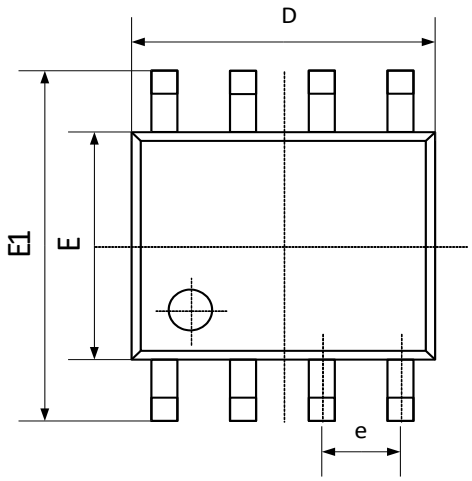
Fig.10 Receiver Enable and Disable Times

Mechanical Details

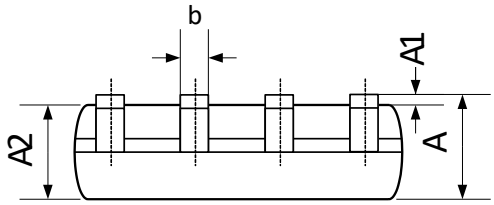
SO-8

PACKAGE DIAGRAMS

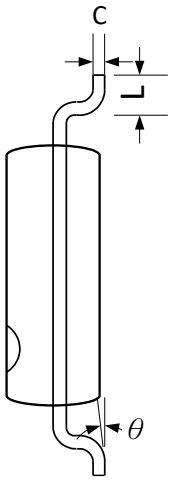
TOP VIEW



SIDE VIEW



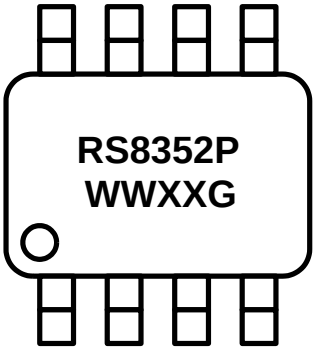
END VIEW



PACKAGE DIMENSIONS

Symbol	Millimeters		Inches	
	min	max	min	max
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
A2	1.25	1.55	0.049	0.061
b	0.33	0.51	0.013	0.020
C	0.17	0.26	0.007	0.010
D	4.70	5.10	0.185	0.201
E	3.70	4.10	0.146	0.161
E1	5.80	6.20	0.228	0.244
e	1.27 BSC		0.05BSC	
L	0.40	1.27	0.016	0.050
Θ	0	8	0	8

MARKING CODE



RS8352P = Device Code
WW = Date Code
XX = Control Code
G = Green Part Indication

Part Number	Marking Code
AZRS8352P.RDG	RS8352P WWXXG

Ordering Information

PN#	Material	Type	Reel size	MOQ	MOQ/internal box	MOQ/carton
AZRS8352P.RDG	Green	T/R	13 inch	2,500/reel	1 reel=2,500/box	5 box=12,500/carton

Revision History

Revision	Modification Description
Revision 2026/05/19	The Formal Release.