

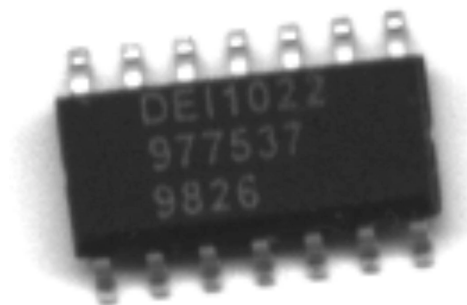
Device Engineering Incorporated

2102 E. Fifth St.
Tempe, AZ 85281
Phone: (480) 303-0822
Fax: (480) 303-0824
E-mail: admin@deiaz.com

DEI1022, DEI1023 DEI1024, DEI1025 ARINC 429 Line Driver Integrated Circuit

Features:

- ARINC 429 Line Driver for high speed (100KHz) and low speed (12.5KHz) data rates.
- Adjustable Slew rates via external capacitors.
- Small foot print (14L SOIC NB)
- Programmable output differential range via V_{REF} pin.
- Drives full ARINC load of 400Ω and $0.03\mu F$.
- $-40^{\circ}C$ to $+85^{\circ}C$ operating temperature range.
- 100% Final testing.



Functional Description:

The ARINC 429 Line Driver Circuit is a bipolar monolithic IC designed to meet the requirements of several general aviation serial data bus standards. These include the differential bipolar RZ types such as ARINC 429, ARINC 571, and ARINC 575.

The DEI1022, DEI1023, DEI1024, and DEI1025 are a family of ARINC Line Driver circuits with variations in driver output resistance and output fusing. See the Product Matrix definition table below to find the correct version for your application.

Serial data is presented on DATA(A) and DATA(B) inputs in the dual rail format of the HS-3182. The driver is enabled by the SYNC and CLOCK inputs. The output voltage level is programmed by the V_{REF} input and is normally tied to +5VDC along with V_1 to produce output levels of +5 volts, 0 volts, and -5 volts on each output for ± 10 volts differential outputs.

The driver output resistance of the DEI1022 and DEI1023 is $75\Omega \pm 20\%$ at room temperature; 37.5Ω on each output. The driver output resistance of the DEI1024 and the DEI1025 is zero. The output slew rate is controlled by external timing capacitors on C_A and C_B . Typical values are 75pF for 100KHz and 500pF for 12.5KHz data.

Product Matrix Definition		
Part Number	Output Fusing	Output Resistance (each output)
DEI 1022	NO	37.5Ω
DEI 1023	YES	37.5Ω
DEI 1024	NO	0Ω
DEI 1025	YES	0Ω

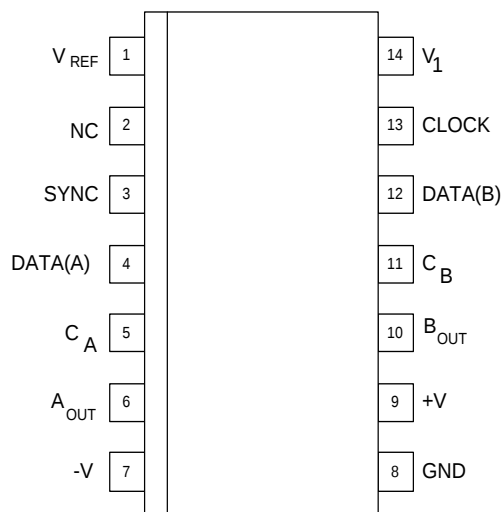


Figure 1: Pinout Diagram

Pin #	Pin Name	Description
1	V _{REF}	Analog Input. The voltage on V _{REF} sets the output voltage levels on A _{OUT} and B _{OUT} . The output logic levels swing between +V _{REF} , 0 volts, and -V _{REF} volts.
2	NC	No Connect
3	SYNC	Logic input. Logic 0 forces outputs to NULL state. Logic 1 enables data transmission.
13	CLOCK	Logic input. Logic 0 forces outputs to NULL state. Logic 1 enables data transmission.
4 12	DATA(A) DATA(B)	Logic inputs. These signals contain the Serial Data to be transmitted on the ARINC 429 data bus. Refer to Figure 3.
5 11	C _A C _B	Analog Nodes. External timing capacitors are tied from these points to ground to establish the output signal slew rate. Typical C _A = C _B = 75pF for 100 kHz data and C _A = C _B = 500pF for 12.5 kHz data. *
6 10	A _{OUT} B _{OUT}	Outputs. These are the line driver outputs which are connected to the aircraft serial data bus.
7	-V	Negative Supply Input. -15VDC nominal.
8	GND	Ground.
9	+V	Positive Supply Input. +15VDC nominal.
14	V _I	Logic Supply Input. +5VDC nominal.

*C_A and C_B pin voltages swing between ±5 volts. Any electronic switching of the capacitor on the pins must not inhibit the full voltage swings.

Figure 2: Pin Descriptions

INPUTS				OUTPUTS		COMMENTS
SYNC NOTE 1	CLOCK NOTE 1	DATA(A) NOTE 1	DATA(B) NOTE 1	A _{OUT}	B _{OUT}	
L	X	X	X	0	0	NULL
X	L	X	X	0	0	NULL
H	H	L	L	0	0	NULL
H	H	H	H	0	0	NULL
H	H	H	L	+V _{REF}	-V _{REF}	LOGIC 1
H	H	L	H	-V _{REF}	+V _{REF}	LOGIC 0

NOTES:
1. X = Don't care.

Figure 3: Truth Table

MAXIMUM RATINGS:

VOLTAGE BETWEEN PINS:

- a) +V and -V 40V
- b) V_1 and GND 7V
- c) V_{REF} and GND 6V
- d) LOGIC INPUTS (GND-0.3V) to ($V_1+0.3V$)

OUTPUT SHORT CIRCUIT DURATION.....Note A

OUTPUT OVERVOLTAGE PROTECTION.....Note B

STORAGE TEMPERATURE 65°C TO +150°C

LEAD TEMPERATURE (soldering, 10 sec.) 275°C

POWER DISSIPATION..... See POWER DISSIPATION TABLE

NOTES:

A. One output at a time can be shorted to ground indefinitely.

B. For the DEI1023 and the DEI1025 both outputs are fused at between 0.5 Amp DC and 1.0 Amp DC to prevent an overvoltage fault from coupling onto the system power bus. For the DEI1022 and the DEI1024 the outputs are not fused. For the DEI1022 and the DEI1024, external fusing must be provided to meet the Transmitter Fault Isolation of the ARINC 429 SPECIFICATION.

Operating Range:

Operating Voltage:

- a) +V +11.4VDC to +16.5VDC
- b) -V -11.4VDC to -16.5VDC
- c) V_1 +5VDC $\pm 5\%$
- d) V_{REF} (for ARINC 429) +5VDC $\pm 5\%$
- e) V_{REF} (for other applications) +3V to +6V

Operating Temperature (T_A) -40°C to +85°C

Max. Oper. Junction Temperature(T_J) 175°C

Full Load = 400Ω/30,000pF Half Load = 4,000Ω/10,000pF						
DATA RATE	LOAD	+V @ 15V	-V @ -15V	$V_1 + V_{REF}$ @5V	429 POWER	LOAD POWER
0 to 100kbps	NONE	2.0mA	-5.0mA	4mA	125mW	0.0mW
12.5kbps	FULL	16.0mA	19.0mA	4mA	485mW	60.0mW
100kbps	FULL	48.0mA	51.0mA	4mA	1194mW*	325.0mW
12.5kbps	HALF	6.0mA	8.0mA	4mA	196mW	30.0mW
100kbps	HALF	22.0mA	25.0mA	4mA	561mW	162.5mW

*May require heat sink @ $T_A = 85^\circ\text{C}$

Figure 4: Power Dissipation Table

Conditions: Temperature: -40°C to +85°C; +V = +11.4VDC to +16.5VDC, -V = -11.4VDC to -16.5VDC; V ₁ = V _{REF} = +5VDC ±5%						
SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	TEST CONDITIONS
IQ+V	Quiescent +V supply current	-	2	-	mA	No Load. 429 mode. DATA = CLOCK = SYNC = LOW
IQ-V	Quiescent -V supply current	-	5	-	mA	No Load. 429 mode. DATA = CLOCK = SYNC = LOW
IQV ₁	Quiescent V ₁ supply current	-	4	-	mA	No Load. 429 mode. DATA = CLOCK = SYNC = LOW
IQV _{REF}	Quiescent V _{REF} supply current	-	10	-	μA	No Load. 429 mode. DATA = CLOCK = SYNC = LOW
V _{IH}	Logic 1 In. V	2.0	-	-	V	No Load.
V _{IL}	Logic 0 In. V	-	-	0.6	V	No Load.
I _{IH}	Logic 1 In. I	-	-	10	μA	No Load.
I _{IL}	Logic 0 In. I	-	-	-20	μA	No Load.
I _{OHSC}	Output Short Circuit Current (Output High)	-80	-	-	mA	Short to Ground
I _{OLSC}	Output Short Circuit Current (Output Low)	80	-	-	mA	Short to Ground
V _{OH}	Output Voltage HIGH. (+1)	V _{REF} - 250mV	V _{REF}	V _{REF} + 250mV	V	No Load. 429 Mode.
V _{NULL}	Output Voltage NULL. (0)	-250	-	+250	mV	No Load. 429 Mode.
V _{OL}	Output Voltage LOW. (-1)	-V _{REF} - 250mV	-V _{REF}	-V _{REF} + 250mV	V	No Load. 429 Mode.
I _{CT} + -	Timing Capacitor Charge Current C _A (+1) C _B (-1) C _A (-1) C _B (+1)	-	+200 -200	-	μA	No Load. 429 Mode. SYNC = CLOCK = HIGH C _A and C _B held at zero volts.
ISC (+V)	+V Short Circuit Supply Current	-	-	+150	mA	Output short to ground
ISC (-V)	-V Short Circuit Supply Current	-	-	-150	mA	Output short to ground
R _{OUT}	Resistance on each output	-	See Note 1	-	Ohms	Room Temp Only
C _{IN}	Input Capacitor	-	-	15	pF	-
Notes: 1. For the DEI1022 and the DEI1023 the typical resistance on each output is 37.5 Ω. For the DEI1024 and the DEI1025 the resistance on each output is 0 Ω.						

Figure 5: DC Electrical Characteristics

AC ELECTRICAL CHARACTERISTICS

Figure 6 shows the output waveform for the ARINC 429.

The output slew rates are controlled by timing capacitors C_A and C_B . They are charged by $\pm 200\mu A$ (nom.). Slew rate (SR) measured as $V/\mu sec$, is calculated by:

$$SR = 200/C$$

where C is in pF.

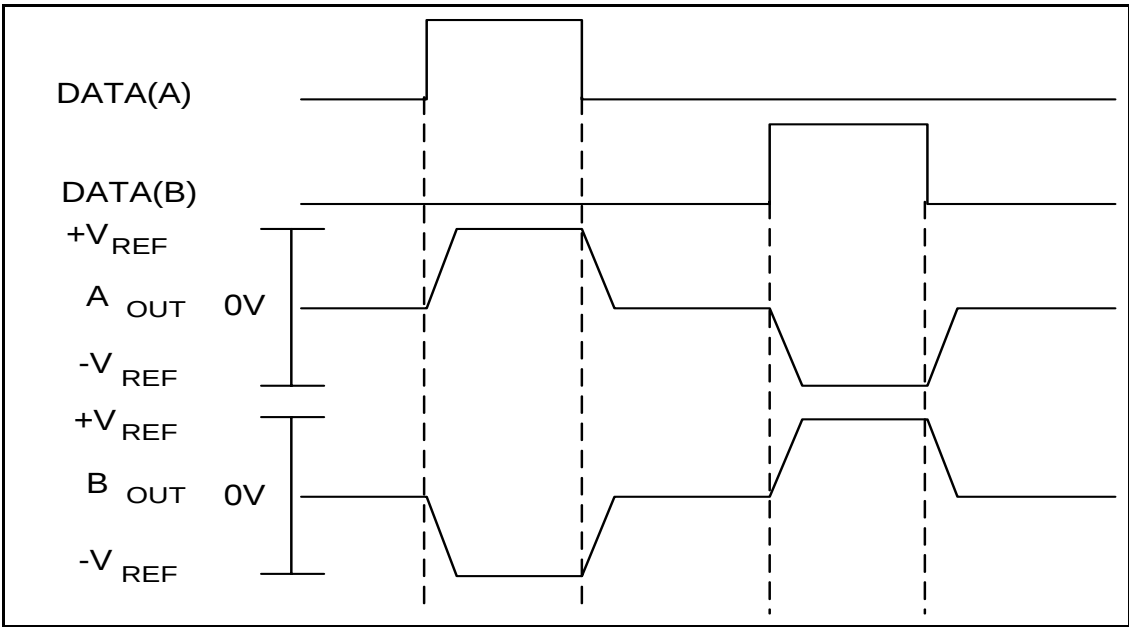


Figure 6: ARINC 429 Waveforms

AC Electrical Characteristics					
Parameter	Symbol	MIN	MAX	UNITS	NOTES
Output Rise Time A_{OUT} or B_{OUT} $C_A = C_B = 75pF$ $C_A = C_B = 500pF$	t_R t_R	1.0 5.0	2.0 15.0	μsec μsec	
Output Fall Time A_{OUT} or B_{OUT} $C_A = C_B = 75pF$ $C_A = C_B = 500pF$	t_F t_F	1.0 5.0	2.0 15.0	μsec μsec	
Input to Output Propagation Delay	t_{PNH} t_{PNL}	-	3.0	μsec	See Figure 7
A_{OUT} / B_{OUT} Skew Spec.	-	-	500	nsec	

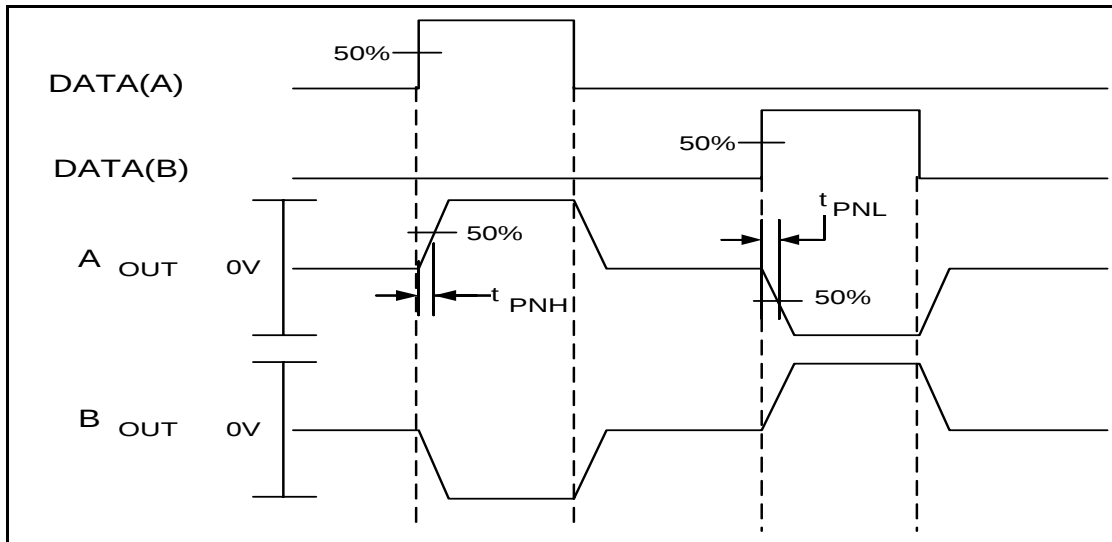


Figure 7: Propagation Delay

Component Screening:

The components shall be screened as follows:

I. DC parametric and functional test:

All components will be tested at room temperature per manufactures specification.

Part Marking:

The part will be marked with the following:

DEI 1022:

DEI1022
Lot Number
Date Code

DEI 1024:

DEI1024
Lot Number
Date Code

DEI 1023:

DEI1023
Lot Number
Date Code

DEI 1025:

DEI1025
Lot Number
Date Code

Package Description:

Package Type: Plastic

No. of Pins: 14

Package Dimensions: See drawing below.

Thermal Characteristics: $\theta_{JA} = 115^{\circ}\text{C/W}$

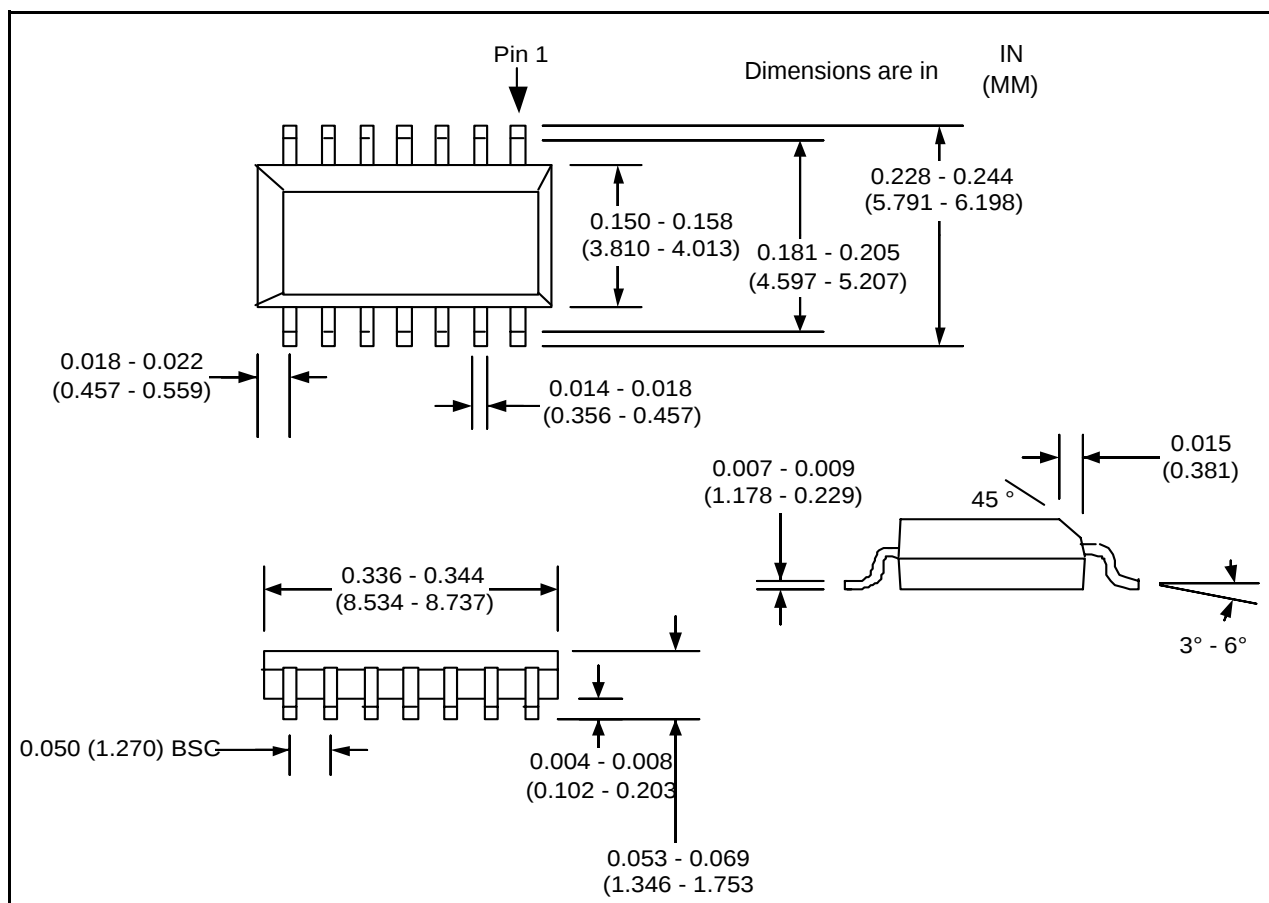


Figure 8: Package Dimensions (14L SOIC NB)