

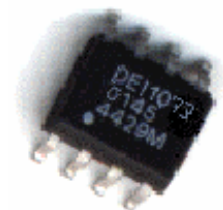
DEVICE ENGINEERING INCORPORATED

385 East Alamo Drive
Chandler, AZ 85225
Phone: (480) 303-0822
Fax: (480) 303-0824
E-mail: admin@deiaz.com

DEI1073, DEI1074, DEI1075 ARINC 429 LINE DRIVER WITH RATE SELECT AND TRI-STATE

FEATURES

- TTL/CMOS TO ARINC 429 Line Driver.
- Rate control input set Hi (100KBS) or Lo (12.5KBS) speed slew rates.
- Operates from $\pm 9.5V$ to $\pm 16.5V$ power supply.
- Drives full ARINC load.
- Output resistor options: 0, 10 or 37.5 Ohms.
- Tristate Outputs
- Thermally enhanced 8 lead SOIC package.
- Outputs Short Circuit Tolerant



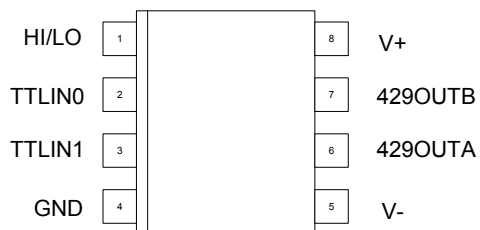
GENERAL DESCRIPTION

The DEI1073 family of 8 pin BiCMOS integrated circuits are line drivers designed to directly drive the ARINC 429 avionics serial digital data bus. The device converts TTL/CMOS serial input data to the tri-level RZ bipolar differential modulation format of the ARINC bus. The outputs are tri-state capable. A TTL/CMOS control input selects the output slew rate for HI (100KBS) and LOW (12.5KBS) speed operation. No external timing capacitors are required.

The DEI1073 has internal 37.5 Ohm output resistors, the DEI1074 has 10 Ohm resistors, and the DEI1075 has none. The 10 and 0 Ohm options require external series resistors which are typically used to implement a transient voltage protection network.

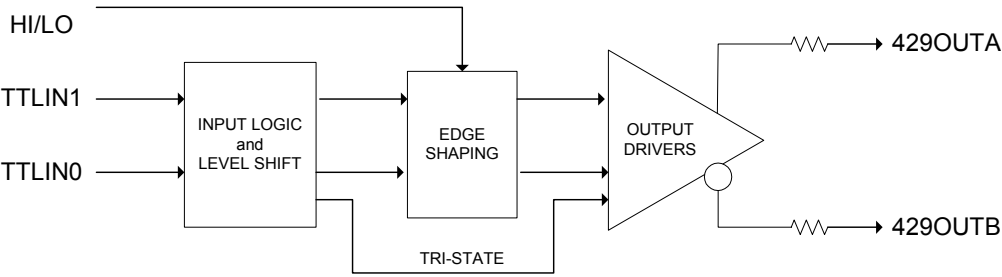
Table 1 PIN DESCRIPTION

PIN	NAME	DESCRIPTION
1	HI/LO	LOGIC INPUT. Slew rate control. 1 = Hi speed. 0 = Low speed.
2	TTLIN0	LOGIC INPUT. Serial digital data input 0.
3	TTLIN1	LOGIC INPUT. Serial digital data input 1.
4	GND	POWER INPUT. Ground.
5	V-	POWER INPUT. -9.5 to -16.5 VDC
6	429OUTA	429 OUTPUT. ARINC 429 format serial digital data output A.
7	429OUTB	429 OUTPUT. ARINC 429 format serial digital data output B.
8	V+	POWER INPUT. +9.5 to +16.5 VDC.



Note:
Heatsink pad is electrically Isolated.

FUNCTIONAL DESCRIPTION



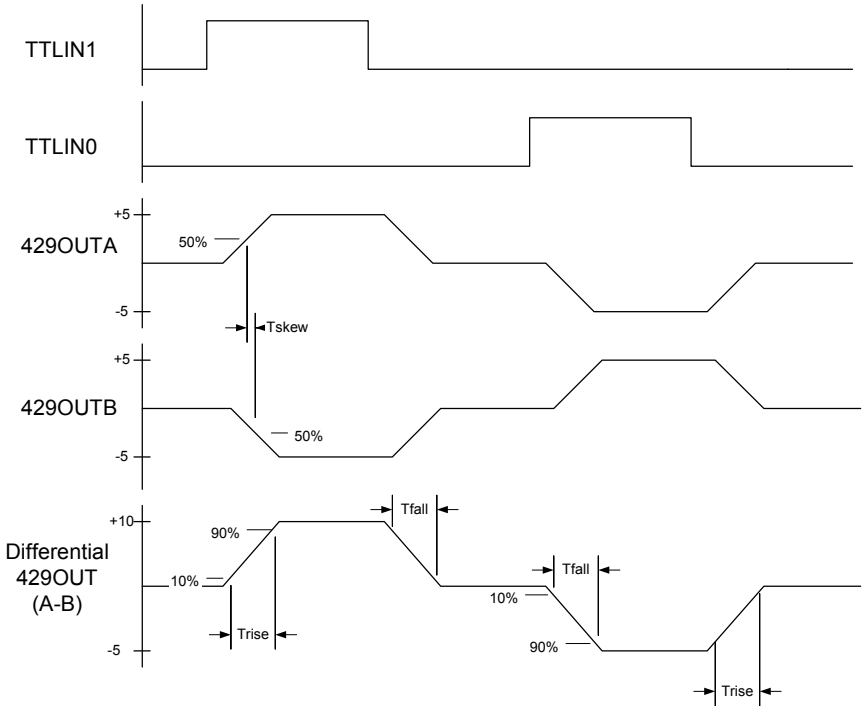
Block Diagram

Table 2 Speed Control Function Table

HI/LO	OUTPUT TRANSITION TIME
0	10uS (12.5 KBS data)
1	1.5uS (100KBS data)

Table 3 Transmit Data Function Table

TTLIN1	TTLIN0	429OUTA	429OUTB	NOTES
0	0	0V	0V	Null output
0	1	-5V	5V	Zero output
1	0	5V	-5V	One output
1	1	Hi-Z	Hi-Z	Tri-State output



LINE DRIVER WAVEFORMS

ELECTRICAL DESCRIPTION

Table 4 Absolute Maximum Ratings

PARAMETER	MIN	MAX	UNITS
Voltages referenced to Ground			
V+ Supply Voltage	-0.3	+20	V
V1- Supply Voltage	0.3	-20	V
V+, V- Supply Slew Rate		+/-100	V/uS
Storage Temperature	-65	+150	°C
Input Voltage TTLIN and HI/LO Inputs 429OUT Outputs	Gnd – 0.3 'V-' – 0.3	'V+' + 0.3 'V+' + 0.3	V V
Power Dissipation @ 85 °C: (> 10 Sec) 8 Lead EQ SOIC, thermal pad soldered to heat spreader land,		1.0	W
Junction Temperature: Tjmax, Plastic Packages (Limited by molding compound Tg) Tjmax, Ceramic Packages		145 160	°C °C
ESD per JEDEC A114-A Human Body Model		2000	V
Lead Soldering Temperature (10 sec duration)		280	°C
Notes:			
1. Stresses above absolute maximum ratings may cause permanent damage to the device.			
2. The device is tolerant of one or both outputs shorted to Ground and of both outputs shorted together.			

Table 5 Recommended Operating Conditions

PARAMETER	SYMBOL	CONDITIONS
Supply Voltage	V+ V-	9.5 to 16.5V -9.5 to -16.5V
Operating Temperature Plastic Package Ceramic Packages	T _{OP}	-55 to +85 °C or -55 to +125 °C

Table 6 Electrical Characteristics

Conditions: Tcase = rated operating temperature -55/+85°C or -55/+125°C V+/- = +/-9.5 to +/-16.5V Unless otherwise noted.						
PARAMETER	TEST CONDITION	SYMBOL	MIN	NOM	MAX	UNITS
LOGIC INPUTS						
Input Voltage, Logic 1		V _{IH}	2.0		V+	V
Input Voltage, Logic 0		V _{IL}	-0.3		0.8	V
Input Current, Logic 1	V _{IN} = 5.0V	I _{IH}	0		100	uA
Input Current, Logic 0	V _{IN} = 0.0V	I _{IL}	0		-100	uA
ARINC OUTPUTS						
ARINC Output Voltage (Differential) One Null Zero	Differential Output Voltage = 429OUTA – 429OUTB. No Load.	V _{DIF1} V _{DIFnull} V _{DIF0}	9.0 -0.5 -9.0	10.0 0 -10.0	11.0 +0.5 -11.0	V V V
ARINC Output Voltage (Single Ended) Hi Null Lo	Referenced to Ground No Load.	V _{OHI} V _{Onull} V _{OLO}	4.5 -0.25 -5.5	5.0 0 -5.0	5.5 +0.25 -4.5	V V V
Output Tristate Current	-5V to +5V	I _Z	-10		+10	uA
ARINC Output Short Circuit Current	Outputs shorted to Ground.	I _{SCLO} I _{SCH}		130 -130		mA mA
Output Resistance: DEI1073 DEI1074 DEI1075	Room Temperature	R _{out37} R _{out10} R _{out0}		37.5 10 0		Ohms Ohms Ohms
Output Slew Rate, Hi Speed Lo to Hi and Hi to Lo transitions	HI/LO = 1 No Load 10% to 90% voltage amplitude of differential output.	T _{HI}	1.0		2.0	uS
Output Slew Rate, Lo Speed Lo to Hi and Hi to Lo transitions	HI/LO = 0 No Load Measured from 10% to 90% voltage amplitude of differential output.	T _{LO}	5		15	uS
Output skew time between A and B outputs.	HI/LO = 1 Measured at 50% voltage amplitude of both outputs	T _{skew}			200	nS
SUPPLY CURRENT						
Quiescent Operating Supply Current: IV+ IV-	V+ = 15V, V- = -15V HI/LO = 0 or 1 TTLIN0=TTLIN1= 0V No Load	I _{V+} I _{V-}	- -14.0	6.0 -6.0	14.0 -	mA mA

DESIGN CONSIDERATIONS

Transient Voltage Protection

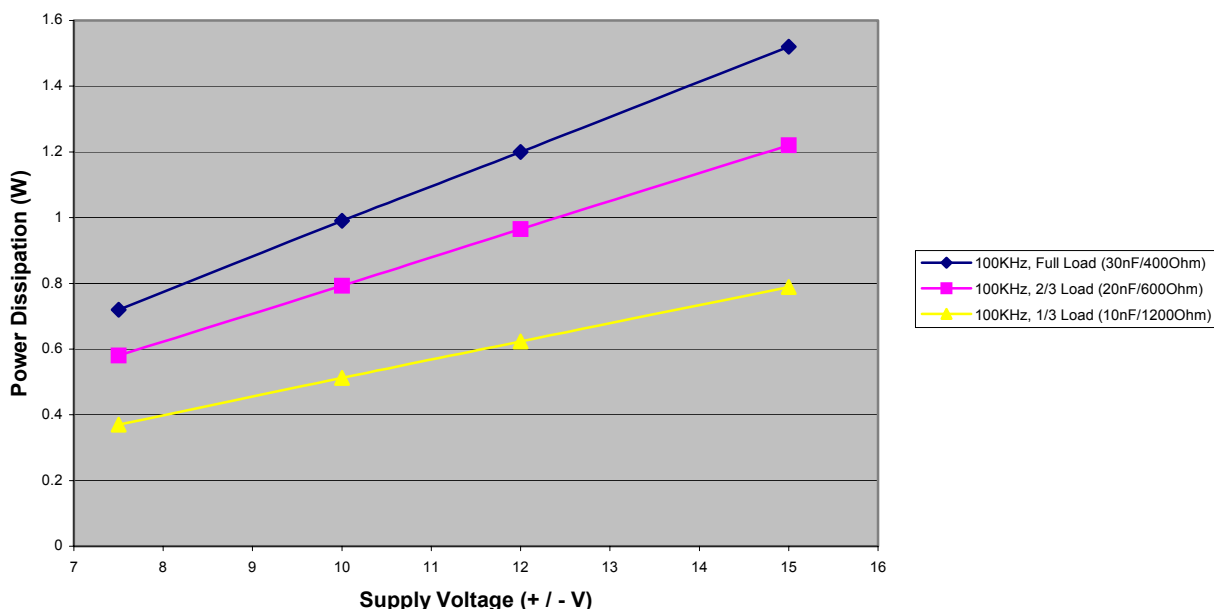
External transient voltage suppressing devices are required to protect the device from stress such as that defined by DO160D Section 22, Lightning Induced Transient Susceptibility. The output stage of the driver includes intrinsic clamp diodes to the V+ and V- power rails. Consider using the 0 Ohm output option to allow use of an external 36 Ohm current limiting resistor and transient voltage suppressor. Transients at the device must be limited to less than one diode drop beyond the power rails to prevent excessive current to the device.

Thermal Management

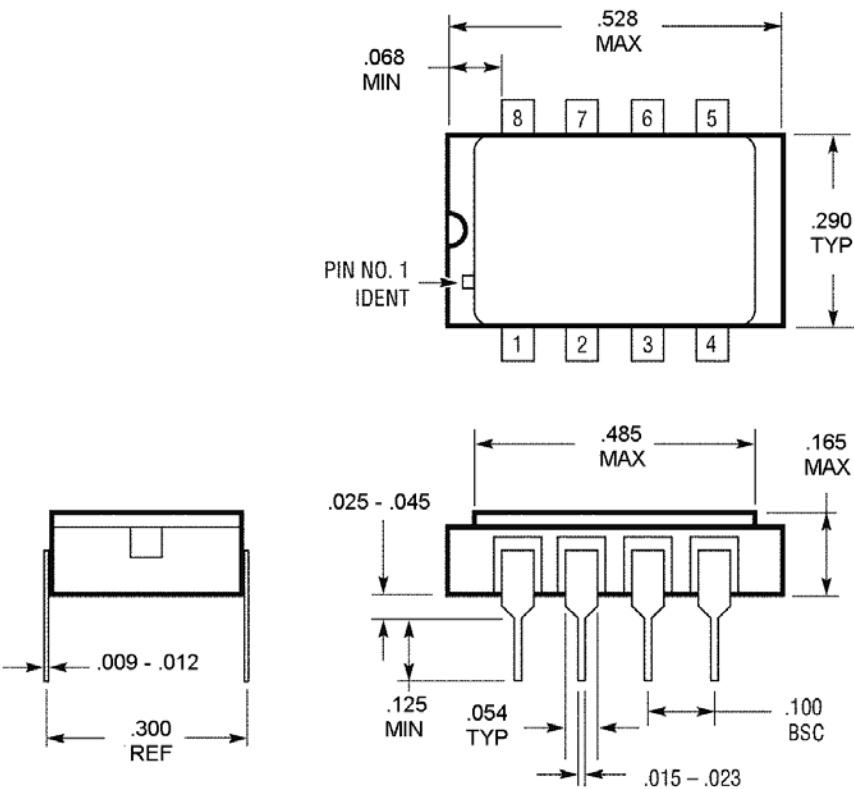
Device power dissipation varies greatly as a function of data rate, load capacitance, data duty cycle, and supply voltage. Proper thermal management is important in designs operating at the HI speed data rate (100KBS) with high capacitive loads and high data duty cycles. Dissipation may be estimated from the graph below which shows the approximate power dissipation for various loads and supply voltages. It is calculated for 100% data duty cycle at 100KBS with no word gap null times and must be reduced by the appropriate data duty cycle. Adjust for the application data duty cycle using a factor of (total bits transmitted in 10 sec period / 1,000,000) = (32 x total ARINC words transmitted in 10 sec period / 1,000,000).

Heat transfer from the IC package should be maximized. Use maximum trace width on all power and signal connections at the IC. The exposed heat sink pad of the SOIC package should be soldered to a heat spreader land on the PCB. The pad is electrically isolated. Maximize land size by extending beyond the IC outline if possible. Place vias on the signal/power traces close to the IC and on the heat spreader land to maximize heat flow to the internal power planes.

429 DRIVER DEVICE POWER DISSIPATION (100kbs, 100% DC)



8 Lead Ceramic Sidebrazed DIP



SYMBOL	DESCRIPTION	VALUE	UNITS
Theta _{jc}	Junction to Case	55	°C/W
Theta _{ja}	Junction to Ambient.	125	°C/W

Table 3 Process Flow

PROCESS STEP	STANDARD	BURN-IN
PRE-BURN-IN Electrical Test	N/A	YES
BURN IN (1)	N/A	96hrs @ +125 °C
FINAL ELECTRICAL TEST, Room Temperature	100%	100%
FINAL ELECTRICAL TEST, High Temperature	100% @ +85 or +125°C	100% @ +85 or +125°C
FINAL ELECTRICAL TEST, Low Temperature	0.65% AQL @ -55°C	0.65% AQL @ -55°C

NOTES:

1. Burn-in conditions: 125°C, 96 hrs, V+/V- = +/-15.0V Inputs = 0V, Outputs open.

ORDERING INFORMATION**Table 8 Ordering Information**

Part Number	Marking	Package	Output Resistor	Burn-In	Temperature
DEI1073-SES	DEI1073 / SES	8L EQ SOIC	37	No	-55 / +85 °C
DEI1074-SES	DEI1074 / SES	8L EQ SOIC	10	No	-55 / +85 °C
DEI1075-SES	DEI1075 / SES	8L EQ SOIC	0	No	-55 / +85 °C
DEI1073-SMB	DEI1073 / SMB	8L EQ SOIC	37	Yes	-55 / +125 °C
DEI1074-SMB	DEI1074 / SMB	8L EQ SOIC	10	Yes	-55 / +125 °C
DEI1075-SMB	DEI1075 / SMB	8L EQ SOIC	0	Yes	-55 / +125 °C
DEI1073-DMS	DEI1073 / DMS	8L SB DIP	37	No	-55 / +125 °C
DEI1074-DMS	DEI1074 / DMS	8L SB DIP	10	No	-55 / +125 °C
DEI1075-DMS	DEI1075 / DMS	8L SB DIP	0	No	-55 / +125 °C
DEI1073-DMB	DEI1073 / DMB	8L SB DIP	37	Yes	-55 / +125 °C
DEI1074-DMB	DEI1074 / DMB	8L SB DIP	10	Yes	-55 / +125 °C
DEI1075-DMB	DEI1075 / DMB	8L SB DIP	0	Yes	-55 / +125 °C
DEI1073-SMS	DEI1073 / SMS	8L EQ SOIC	37	No	-55 / +125 °C
DEI1074-SMS	DEI1074 / SMS	8L EQ SOIC	10	No	-55 / +125 °C
DEI1075-SMS	DEI1075 / SMS	8L EQ SOIC	0	No	-55 / +125 °C

DEI reserves the right to make changes to any products or specifications herein. DEI makes no warranty, representation, or guarantee regarding suitability of its products for any particular purpose.