



TGS8787, TGS8788

16-Bit Parallel Data to ARINC 429 & 561

Data sheet

1. Features and Benefits

- Automatically converts 16-bit parallel data to ARINC 429 or 561 serial data
- High speed data bus interface
- On-chip line driver
- Available in small TQFP package
- Industrial and extended temperature ranges

2. General Description

The TGS8787 and TGS8788 are system components for interfacing 16-bit parallel data to an ARINC 429 bus. They combine logic and line driver on one chip. The TGS8787 has an output resistance of 37.5 Ohms, and the TGS8788 has output resistance of 10 Ohms to facilitate external lightning protection circuitry. The technology is analog/digital CMOS.

Both products offer high speed data bus transactions into a buffer register. After loading 2 each 16-bit words, data is automatically transferred and transmitted. The data rate is equal to the clock rate. Parity can be enabled in the 32nd bit. Reset is used to initialize the logic upon startup. Word gaps are sent automatically.

The part requires +/- 10 Volt supplies in addition to a 5 Volt supply.

3. Pin Configurations

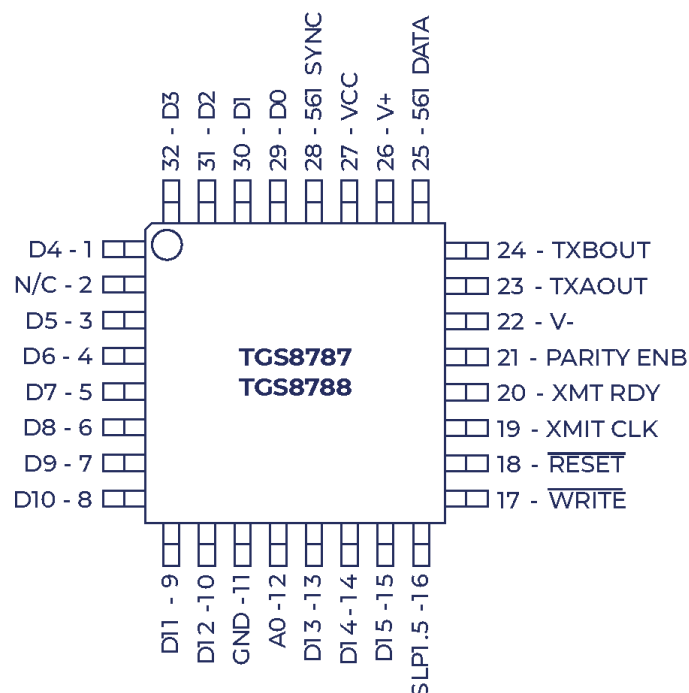


Fig.1 32-Pin Plastic PQFP package

4. Pin Description

Pin	Symbol	Function	Description
2	N/C	N/C	
1, 3-10, 13-15, 29-32	DIN	digital input	Parallel 16-bit bus input
11	GND	power supply	Ground
12	A0	digital input	Load address, A0 = 1 for 1st data load, A0 = 0 for 2-nd data load
16	SLP1.5	digital input	Selects the slope of the line driver. High = 1.5 us
17	$\overline{\text{WRITE}}$	digital input	Write strobe. Loads data on rising edge
18	$\overline{\text{RESET}}$	digital input	Registers and sequencing logic initialized when low
19	XMIT CLK	digital input	Clock input for the transmitter
20	XMT RDY	digital output	Goes high if the buffer register is empty
21	PARITY ENB	digital input	When high the 32 nd bit output is odd parity
22	V-	power supply	-10 Volt rail
23	TXAOUT	analog output	Line driver output - A side
24	TXBOUT	analog output	Line driver output - B side
25	561 DATA	digital output	Serial output for ARINC 561 data
26	V+	power supply	+10 Volt rail
27	VCC	power supply	+5 Volt rail, “one” level out of line driver, inverted for “zero”
28	561 SYNC	digital output	ARINC 561 Sync signal

5. Ordering Information

Type Number	Package Name	Package Quantity	Operating Temperature
TGS8787-PQ	PQFP-32	100	–40°C to +125°C
TGS8788-PQ	PQFP-32	100	–40°C to +125°C

6. Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
Supply voltage (VDD)	-12.5	12.5	V
Logic input voltage range	-10	10	V
Operating Voltage (VCC)	4.75	7	V
DC current per input pin	+10		mA
Operating Temperature Range	-40°C	125	°C
Solder Reflow Temperature		260	°C
Junction Temperature		175	°C
Storage Temperature	-65°C	150	°C

7. DC Electrical Characteristics

VCC = 5.0 V, V = 0 V, V+ = 10 V, V- = -10 V, T_A = Operating Temperature Range (unless otherwise specified).

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units
Operating Voltage	V _{CC}		4.75	5	5.25	V
Operating Voltage	V+		9.5	10	10.5	V
Operating Voltage	V-		-9.5	-10	10.5	V
Min. Input Voltage (HI)	V _{IH}		2.0	1.4		V
Max. Input Voltage (LO)	V _{IL}			1.4	0.7	V
Min. Input Current (HI)	I _{IH}	V _{IH} = 4.9 V			280	μA
Max. Input Current (LO)	I _{IL}	V _{IL} = 0.1 V	-1			μA
Min. Output Voltage (HI)	V _{OH}	I _{OUT} = -1.6 mA	2.7			V
Max. Output Voltage (LO)	V _{IH}	I _{OUT} = 1.6 mA			0.4	V
Line Driver Output Levels (Ref. To GND)	ONE	No load, VCC = 5.0 V	4.5	5	5.5	V
	NULL		-0.25	0	0.25	V
	ZERO		-5.5	-5	-4.5	V
Line Driver Output Levels (Differential TXAOUT - TXBOUT)	ONE	No load, VCC = 5.0 V	9.0	10.0	11.0	V
	NULL		-0.5	0	0.5	V
	ZERO		-11	-10	-9	V
Minimum Short Circuit Sink or Source Current	I _{OUT}	Momentary magnitude	80			mA
Operating Current Drain	I _{CC}	f = 100 kHz		0.8	2.8	mA
Operating Current Drain (V+)	I _{DD}	f = 100 kHz		6	20	mA
Operating Current Drain (V-)	I _{EE}	f = 100 kHz	-20	-6		mA
Input Capacitance	C _{IN}	Not tested			20	pF

AC Electrical Characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Data Bus Timing						
Setup Data Bus to $\overline{\text{WRITE}}$	t_{SET}		20			ns
Hold $\overline{\text{WRITE}}$ to Data Bus	t_{HLD}		30			ns
Hold A0 to $\overline{\text{WRITE}}$	t_{AH}		0			ns
Pulse width $\overline{\text{WRITE}}$	t_{WPW}		40		1 CLK	ns
Delay between $\overline{\text{WRITE}}$	t_{WPD}		40			ns
Setup A0 to $\overline{\text{WRITE}}$	t_{ASW}		20			ns
Delay last $\overline{\text{WRITE}}$ to XMT RDY	t_{XD}		80			ns
Line Driver Timing						
Line Driver propagation delay		No load				
Output high to low	t_{phlx}		-	500	-	ns
Output low to high	t_{plhx}		-	500	-	ns
Line Driver transition times						
Output high to low	t_{fx}	SLP1.5 = logic 1	1.0	1.5	2.0	μs
Output low to high	t_{rx}	SLP1.5 = logic 1	1.0	1.5	2.0	μs
Output high to low	t_{fx}	SLP1.5 = logic 0	5	10	15	μs
Output low to high	t_{rx}	SLP1.5 = logic 0	5	10	15	μs

8. Functional Description

The TGS8787 is a parallel to serial converter, which when loaded with two 16-bit parallel words, outputs the data as a 32-bit serial word. Timing circuitry inserts a 4-bit gap at the end of each 32-bit word. An input buffer register allows load operations to take place while the previously loaded word is being transmitted.

If the PARITY ENB pin is high, the 32nd bit will be a parity bit, inserted so as to make the 32-bit word have odd parity. If the PARITY ENB pin is low, the 32nd bit will be the D15 bit of the 2nd word loaded. Outputs are provided for both ARINC 429 (TXAOUT and TXBOUT pins) and ARINC 561 (561 DATA and 561 SYNC pins) type data.

A low signal applied to the pin $\overline{\text{RESETS}}$ the TGS8787's internal logic so that spurious transmission does not take place during power-up. The registers are cleared so that a continuous gap will be transmitted until the first word is loaded into the transmitter.

The XMIT CLK frequency is the same as the data rate. Input data can be loaded when the XMT RDY signal is high, which indicates the input buffer register is empty. The first 16-bit word is loaded with the A0 input high. The second word is loaded with A0 in the low state. Once A0 is set low, it must not go high until after the second byte is loaded. Each data word is loaded into the input buffer register by a low pulse on the WRITE input. After the second word has been loaded, the XMT RDY output goes low.

The contents of the input buffer register are transferred to the output register during the fourth bit period of the gap. If the fourth gap bit period of the previous work has already been transmitted, the contents of the input buffer register will be transferred to the output shift register during the first bit period after the second data load, and the XMT RDY output goes high.

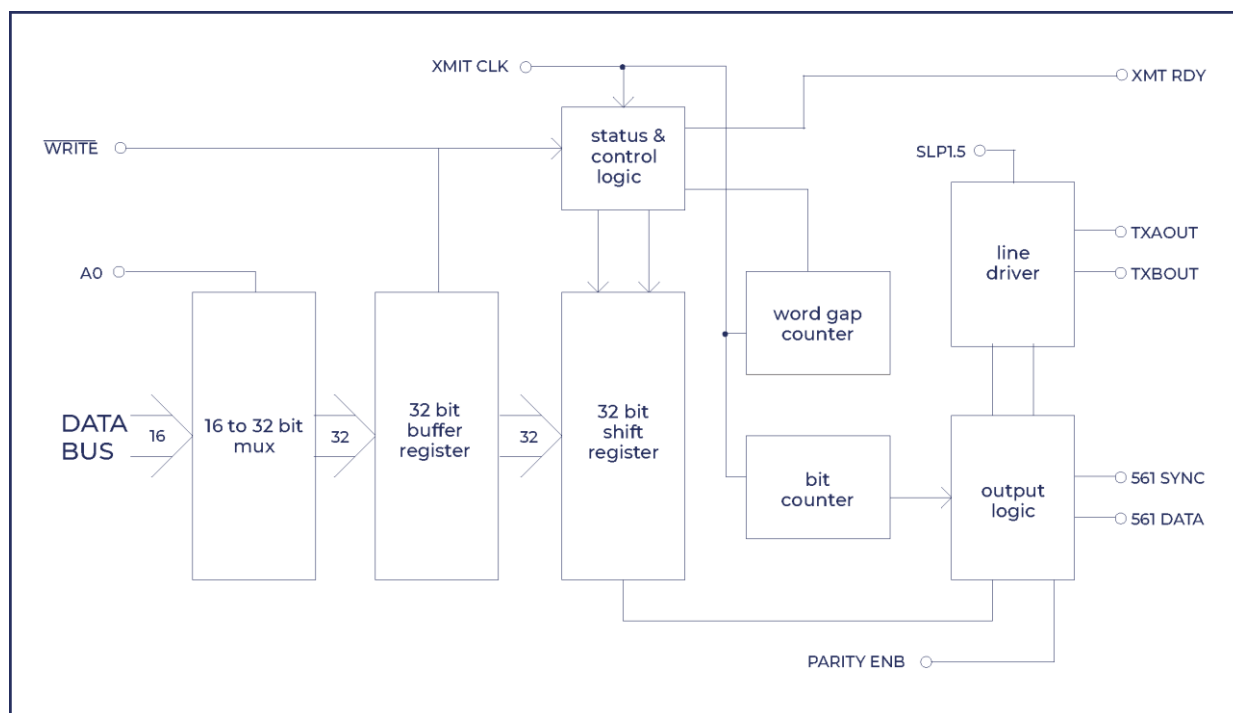


Fig. 2 Block Diagram

After the output shift register is loaded, the data is shifted out to the output logic in the order shown in figure 2.

Table 1. Order of transmitted data

A0	Load	Data Bus	ARINC Bits
1	Word 1	D0 - D15	ARINC 1 - ARINC 16
0	Word 2	D0 - D15	ARINC 17 - ARINC 32

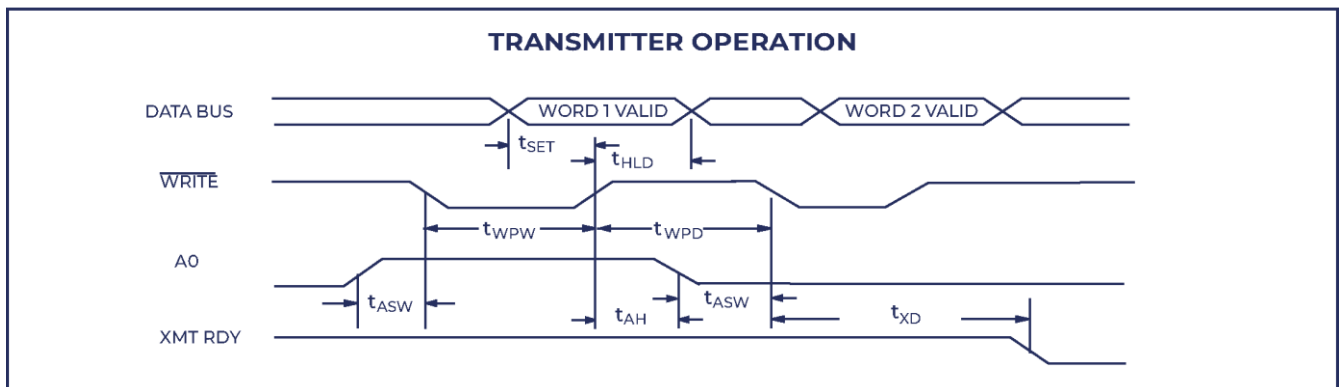
The 561 SYNC output pulses low when the XMIT CLK is low during the 8th bit of the ARINC transmission.

The TGS8787 and TGS8788 have an on-chip line driver designed to directly drive the ARINC 429 bus. The two ARINC outputs (TXAOUT and TXBOUT) provide a differential voltage to produce a +10 Volt One, a -10 Volt Zero, and a 0 Volt Null. The slope of the ARINC outputs is controlled by the SLP1.5 pin. If SLP1.5 is high, the output rise and fall time is nominally 1.5 μ s. If SLP1.5 is set low, the rise and fall times are 10 μ s.

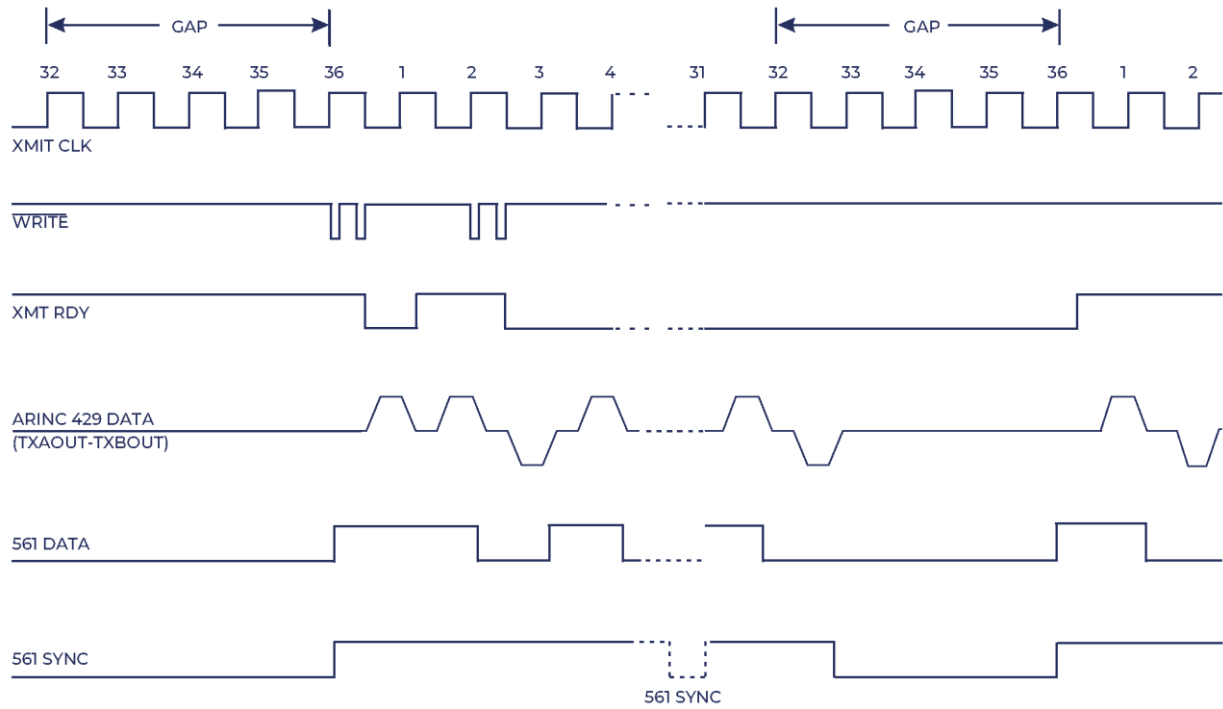
The TGS8787 has 37.5 Ohms in series with each line driver output. The TGS8788 has 10.0 Ohms in series. The TGS8788 is for applications where external series resistance is needed, typically for lightning protection devices.

Power supply sequencing

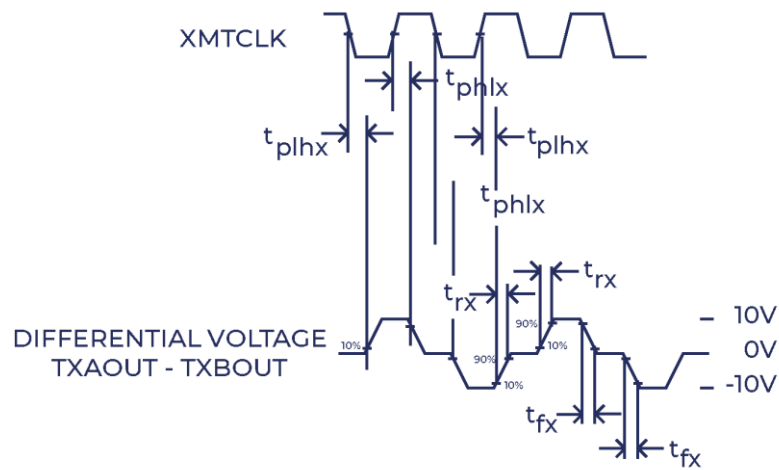
The power supplies must be controlled to prevent large currents during supply turn-on and turn-off. The required sequence is V+ followed by VCC, always ensuring that V+ is the most positive supply. The V- supply is not critical and can be asserted at any time.



DATA TRANSMISSION-EXAMPLE PATTERN



LINE DRIVER OUTPUTS



9. Package Information

32 PIN PLASTIC QUAD FLAT PACK (PQFP)

inches (millimeters)

