Digital I/Q-Generator Chip for DAB

Description

The U2752M is an integrated circuit in CMOS technology for splitting a digital DAB signal into its quadrature components. The device is designed for DAB (ETS 300 401) applications.

Features

- U2752M splits a digital DAB input signal into its quadrature components
- Quadrature matching: 0 dB in magnitude, 1.6° in phase
- Clock frequency: 4.096 MHz
- Input signal
  - Center frequency: 3.072 MHz
  - Bandwidth: 1.536 MHz
  - Data format: 8 bit, 4.096 MHz, 2's complement
- Output signal
  - Select pin for baseband or 1.024 MHz center frequency
  - I-, Q- components in time multiplex
  - Data format: 8 bit, 4.096 MHz, 2's complement

Block Diagram

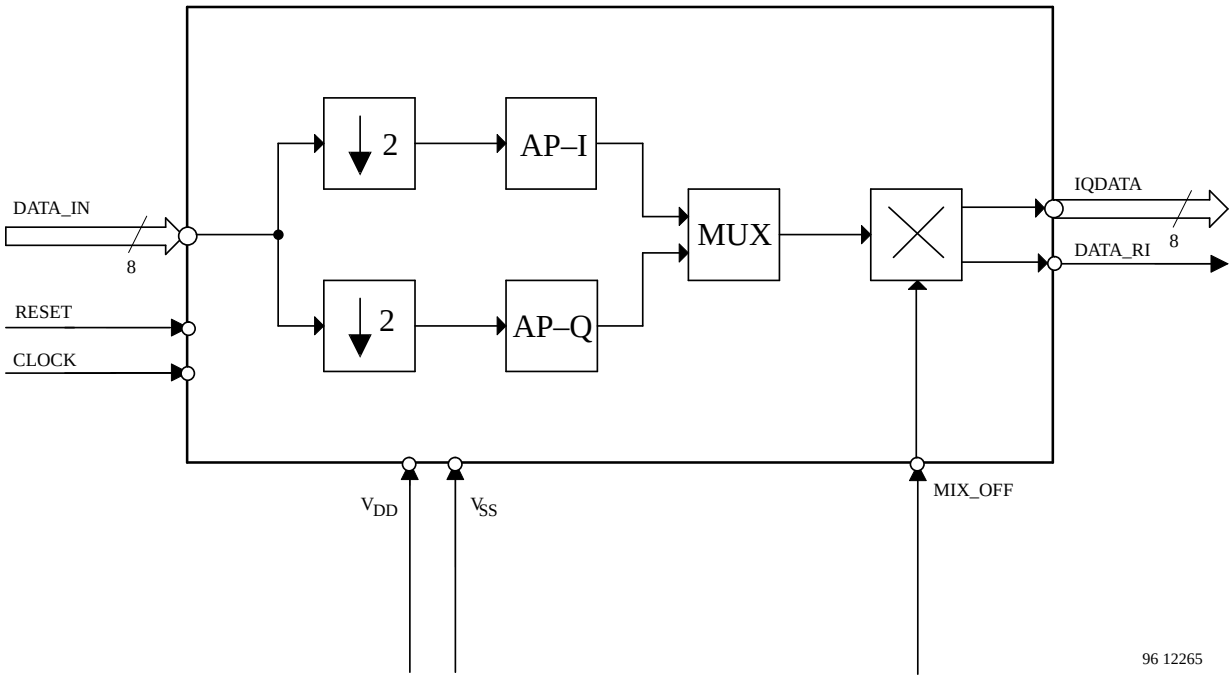


Figure 1.

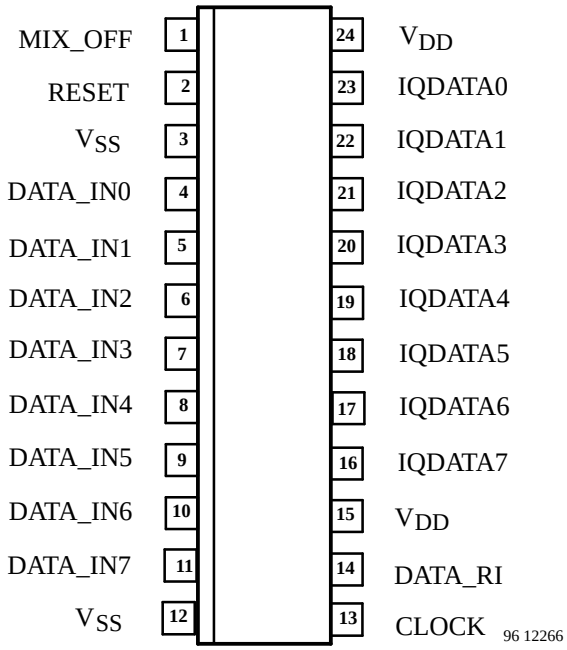
Functional Description

The U2752M performs the generation of the inphase and quadrature component of the DAB input signal with a quadrature matching of 0 dB in magnitude and a maximum value of 1.6° in phase. The clock of the device is 4.096 MHz.

The data format of the input signal DATA_IN is 8 bits, sampled with 4.096 MHz in 2's complement representation. Its center frequency is 3.072 MHz with a bandwidth of 1536 MHz. The U2752M uses decimation and common filter techniques to generate the quadrature components.

The output interface consists of the splitted signal IQ-DATA with a data format of 8 bits, 4.096 MHz in 2's complement representation. The inphase (I) and quadrature (Q) components are represented in time division multiplex format with a selection signal DATA_RI of 4.096 MHz. The output representation in baseband or 1.024 MHz center frequency is selected by the MIX_OFF signal. The baseband representation (MIX_OFF = '0') should be selected for the utilization together with the TEMIC U2757M device.

Pin Description



Pin	Signal	Description	PAD type	Direction
1	MIX_OFF	Low: I/Q in baseband representation High. I/Q in IF representation	bufincdn	IN
2	RESET	Reset signal, high active	bufincdn	IN
3	V_{SS}	Ground		GND
4	DATA_IN0	Data input (LSB)	bufinmos	IN
5	DATA_IN1	Data input	bufinmos	IN
6	DATA_IN2	Data input	bufinmos	IN
7	DATA_IN3	Data input	bufinmos	IN
8	DATA_IN4	Data input	bufinmos	IN
9	DATA_IN5	Data input	bufinmos	IN
10	DATA_IN6	Data input	bufinmos	IN
11	DATA_IN7	Data input (MSB)	bufinmos	IN
12	V_{SS}	Ground		GND
13	CLOCK	System clock 4.096 MHz	buftgmos	IN
14	DATA_RI	Internal data_ri signal	bu2out	OUT
15	V_{DD}	Power supply		PWR
16	IQDATA7	Data_output, I and Q multiplex (MSB)	bu2out	OUT
17	IQDATA6	Data_output, I and Q multiplex	bu2out	OUT
18	IQDATA5	Data_output, I and Q multiplex	bu2out	OUT
19	IQDATA4	Data_output, I and Q multiplex	bu2out	OUT
20	IQDATA3	Data_output, I and Q multiplex	bu2out	OUT
21	IQDATA2	Data_output, I and Q multiplex	bu2out	OUT
22	IQDATA1	Data_output, I and Q multiplex	bu2out	OUT
23	IQDATA0	Data_output, I and Q multiplex (LSB)	bu2out	OUT
24	V_{DD}	Power supply		PWR

Absolute Maximum Ratings

Parameters	Symbol	Min.	Typ.	Max.	Unit
DC supply voltage	V_{DD}	–0.5		7	V
Input/output voltage	V_{in}/V_{out}	–0.5		V_{DD} + 0.5	V
Storage temperature	T_{stg}	–65		150	°C
Ambient temperature	T_{amb}	–40		85	°C
Power dissipation	P_{stat}		0.25		mW
Power dissipation	P_{dyn}		15		mW
Electrostatic handling	$\pm V_{ESD}$			2000	V

Thermal Resistance

Parameters		Symbol	Value	Unit
Junction ambient	SO24	R_{thJA}	80	K/W

Electrical Characteristics

Test conditions: V_{DD} = 5 V, T_{amb} = 25°C

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
DC supply voltage		V_{DD}	4.5		5.5	V
Input/output voltage		V_{in}/V_{out}	0		V_{DD}	V
Input HIGH voltage bufinmos bufincdn		V_{IH}	3.5			V
Input LOW voltage bufinmos bufincdw		V_{IL}			1.5	V
Positive threshold Negative threshold buftgmos		VT+ VT–	1.61 2.47		2.60 3.52	V V
Input leakage bufinmos, buftgmos bufincdn	$V_{IN} = V_{DD}$ or V_{SS} $V_{IN} = V_{DD}$			1 40	5 +100	µA µA
Output HIGH voltage BU2OUT	I_{OH} = +6.4 mA	V_{OH}	2.4			V
Output LOW voltage BU2OUT	I_{OH} = –6.4 mA	V_{OL}			0.4	V

Input Interface Description

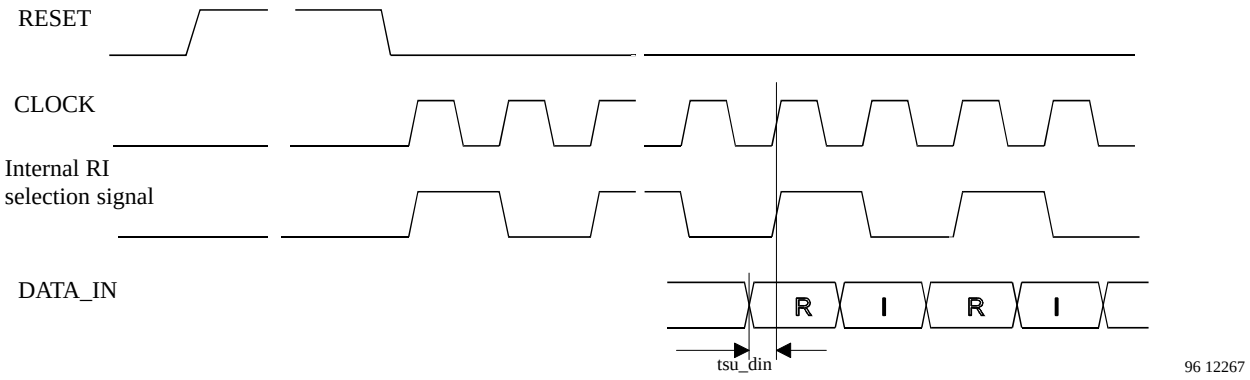


Figure 2. Input interface signals tsu_din 10 ns

For verification purposes, it can be helpful to know how the U2752M selects the input samples for real and imaginary data processing.

The U2752M generates an internal real and imaginary selection signal which depends on the first recognized rising CLOCK edge as shown in figure 2. Due to this selection signal, the data input DATA_IN will be used for the real or imaginary process path of the IC. The set-up time of DATA_IN tsu_din must be 10 ns.

Results

The phase deviation from 90° of the I- and Q- part over the normalized frequency is shown in figure 2.

The DAB relevant frequency range is from 1/8 to 7/8 on the normal frequency axis.

For the DAB frequency range the maximum phase mismath is 1.6° and the amplitde mismatch is 0 dB.

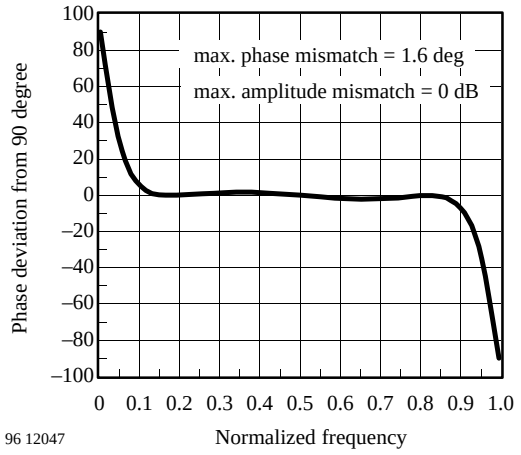


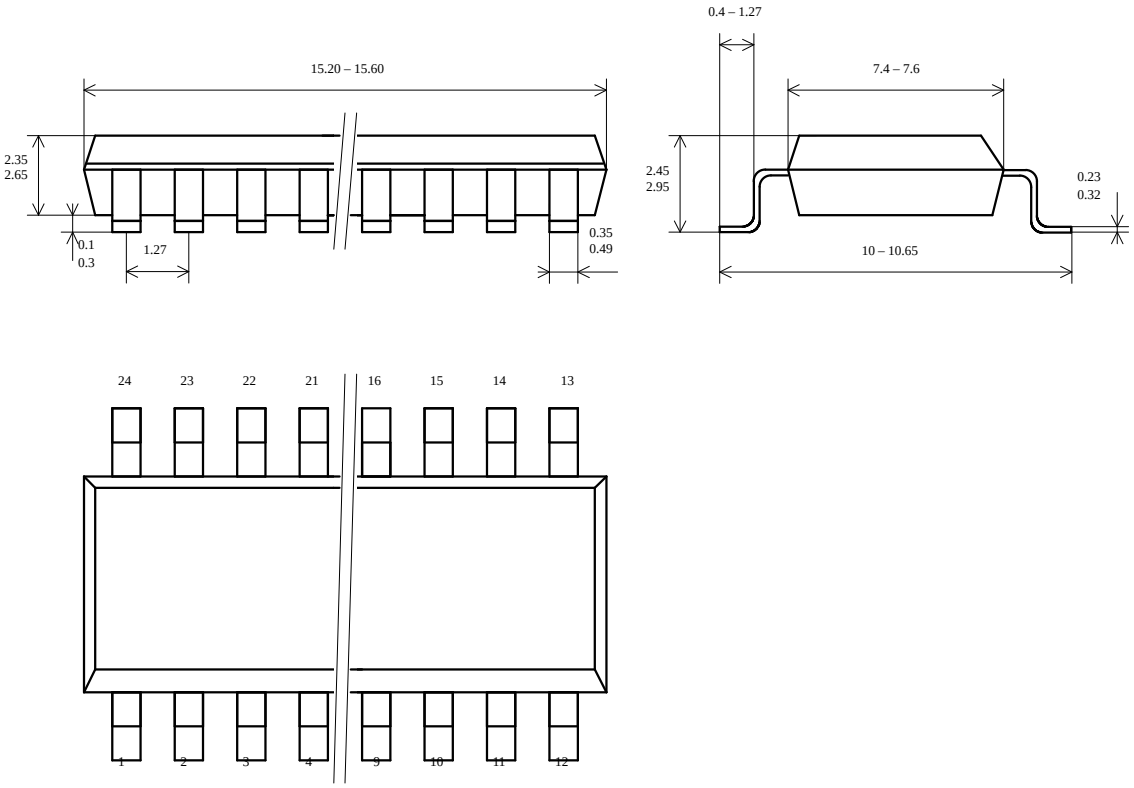
Figure 3.

Ordering and Packaging Information

Extended Type Number	Package	Remarks
U2752M-AFL	SO24	
U2752M-AFLG3	SO24	Taping according to IEC-286-3

Package

Dimensions in mm



Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

TEMIC can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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