WT – V2Q

8-Pin Voltage to Quadrature convertor SOCS (System On Chip Solution)

Description:

This system on a chip solution comprises a high speed analogue convertor and signal processor system with input / output protection and conditioning. A direct current voltage level presented to the input port is measured and the value converted to discrete phase A and phase B quadrature terms at the output port, the frequency and direction coding of which is proportional to the input value. The output polarity is pin selectable and can be changed according to the selected configuration mode.

Features:

- Complete SOCS (System On Chip Solution)
- Uses low cost additional components *
- Low-Power Brown-out Reset (BPR)
- Selectable voltage reference input
- Dual mode operation
- Buffered analogue input
- Buffered outputs

Functions:

- Conversion of an analogue voltage input level to discrete bidirectional quadrature signals.

Operating Characteristics:

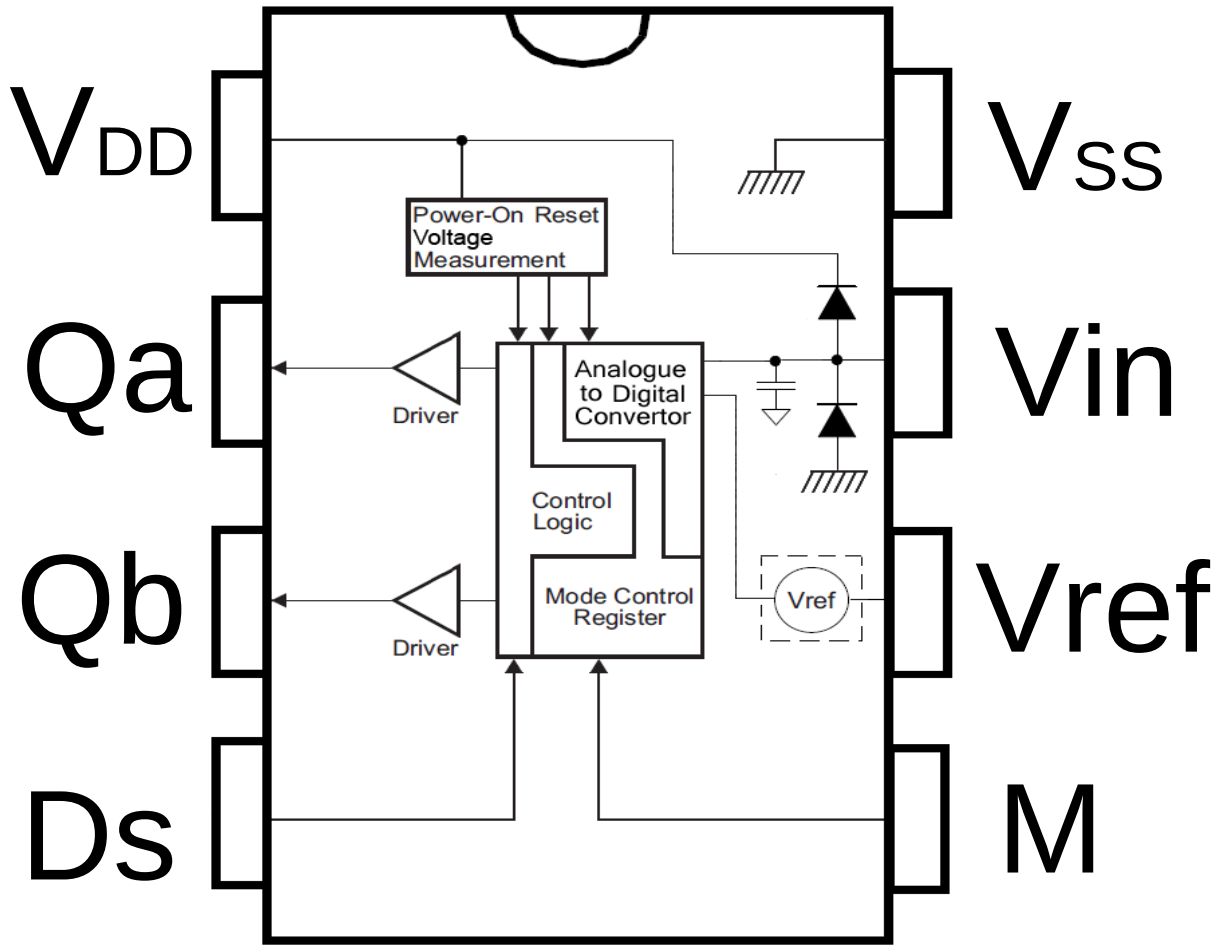
- Operating Speed :
  - Bidirectional mode 400 Hz to 13kHz +- 5%, center OFF
  - Unidirectional 200 Hz to 14 kHz +- 5%
- Input level switching :
  - High = $4.5V \leq V_{DD} \leq 5.5V$
  - Low = $1.8V \leq V_{DD} \leq 4.5V$
- Operating Voltage Range:
  - 2.3V to 5.5V (see specifications *)
- Temperature Range:
  - Industrial: -40°C to +85°C
- Internal input clamping
- Output source/sink capability 10ma

*Required - *Power supply must meet full specifications as per Electrical Specification page.*

PIN DIAGRAM

Pin Diagram – 8-Pin PDIP, SOIC

Fig 1

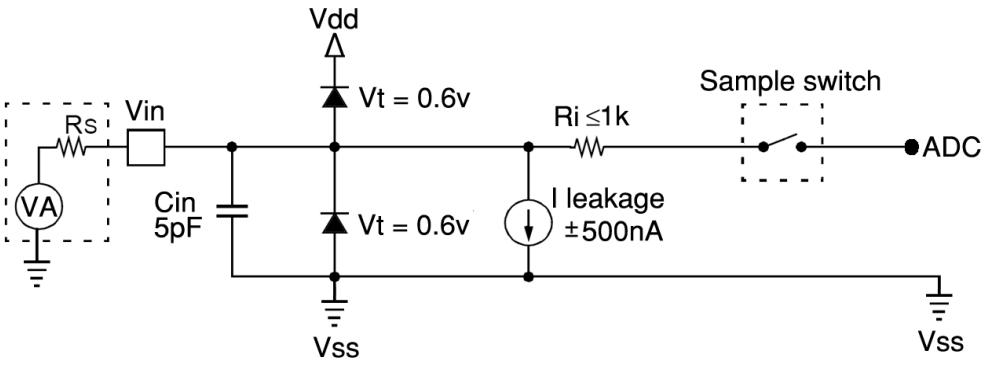


PIN	Direction	NAME	FUNCTION
1	input	V_{DD}	Vdd, supply input
2	output	Qa	Quadrature A pulse output
3	output	Qb	Quadrature B pulse output
4	input	Ds	Direction selection
5	input	M	Mode selection
6	input	Vref	Reference voltage input
7	input	Vin	Analogue voltage input
8	output	V_{SS}	Vss, 0 volt rail, return

Analogue input pin

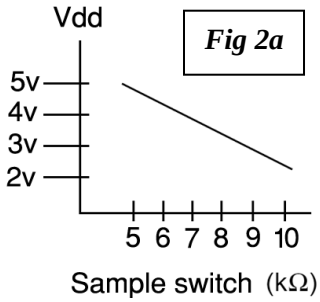
A model representing the analogue input pin is shown in figure 2 below. It illustrates the setup of the internal voltage path. The absolute maximum recommended impedance for analogue sources is 5 kΩ. This is required to meet the pin leakage specification as specified. Failure to observe this rule will result in erratic and inaccurate conversions in the convertor.

Fig 2



Cin = input capacitance
Vt = threshold voltage
Ri = internal resistance
Vin = control voltage

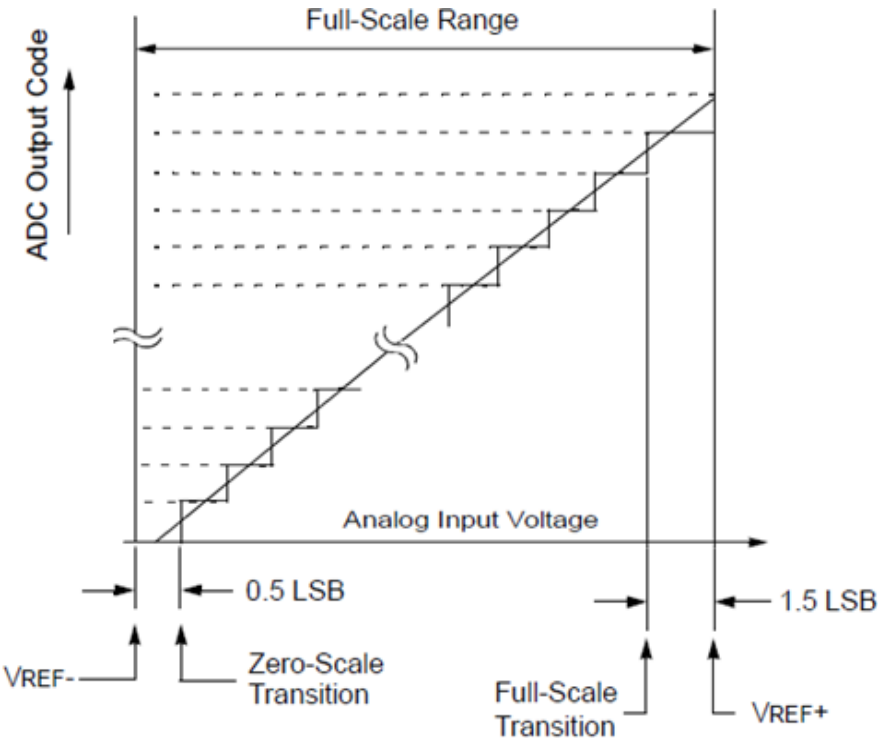
Fig 2a



Vref input

The ADC transfer function is shown in figure 2a above for interest only. Note that Vref+ sets the Full-Scale Range for the converter module, which in turn sets the span of the quadrature output. In normal use this Vref is connected directly to Vdd, however, if required, a different voltage can be applied instead. It is important to note that this will change the span (full scale) accordingly.

Fig 3



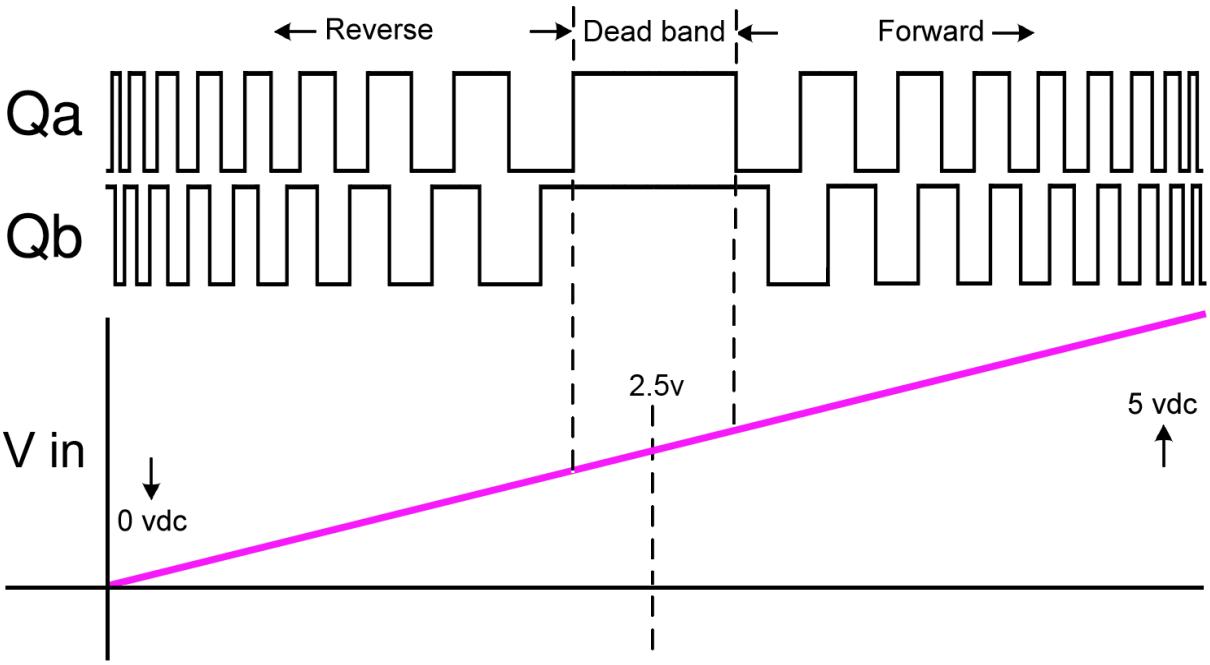
The relationship between Vin and the quadrature output

Figure 4 below depicts the relationship between the voltage going into the Vin pin (considered to be 5.0 v in this scenario) and the phase and speed of the quadrature data signals being generated. There is a small dead band at the centre point which is about 2.5vdc. At this centre band the quadrature pulses cease oscillating and become static, allowing a smooth transition between direction changes. There are no ambiguous signals presented at the output.

Notice that as the voltage increases, the quadrature pulses increase in speed and consequently their duration is reduced. The same effect happens as the voltage input moves closer to zero, except that the phase of the quadrature signals shifts and effectively changes direction.

The waveforms shown in figure 4 are merely to illustrate the relationship between the varying value of the voltage input and the quadrature frequency output. It is a pictorial representation of how the V2Q operates and is not to be used as a data reference.

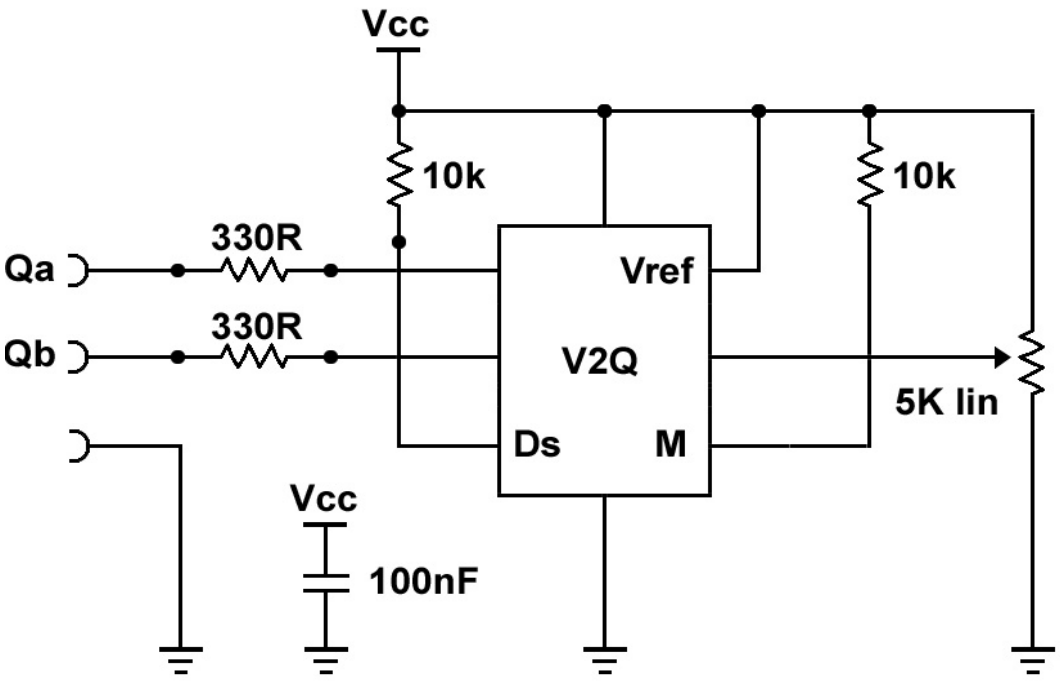
Fig 4



Application notes

The recommended minimum parts application schematic is shown below, note that a decoupling capacitor must be positioned close to the V_{SS} and V_{DD} pins. The schematic in figure 1 shows the recommended minimum configuration.

Fig 5



The analogue Vref input in this most basic implementation above is taken directly to Vcc, which for the purpose of this

If a variable resistor is used it *MUST* must be a linear type, NOT logarithmic which is used in audio equipment. This is to ensure there is a linear transfer ration between analogue input and quadrature frequency output. **(†)**

Generally speaking the inputs to most motor drivers with quadrature signal inputs will be TTL compatible, which in turn means that very little current is required to switch correctly. This means therefore that 330Ω resistors on the quadrature output pins is adequate. Should higher current drive capability be required simply lower the resistance as required, however, it is important that you ensure that the device is not forced to operate in conditions outside of the absolute maximums stipulated in the ELECTRICAL SPECIFICATIONS section within this document.

Note also that there are 10k pullup resistors connected to the Direction select and Mode pins.

IMPORTANT NOTE **(†)**

Use linear variable resistors only in this application unless logarithmic behaviour is specifically required for your application.

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings (†)

Ambient temperature under bias.....-40°C to +125°C
Storage temperature ..... -65°C to +150°C
Voltage on pins with respect to V_{SS}:
On V_{DD} pin..... -0.3V to +6.0V
On all other pins..... -0.3V to (V_{DD} + 0.3V)
Maximum current:
On V_{SS} pin **(1)**
$-40°C \le T_A \le +85°C$ ..... 100 mA
$+85°C \le T_A \le +125°C$ ..... 55 mA
On V_{DD} pin **(1)**
$-40°C \le T_A \le +85°C$..... 250 mA
$+85°C \le T_A \le +125°C$..... 85 mA

Sunk by any output pin..... 10 mA
Sourced by any output pin..... 10 mA
Clamp current, I_K ($V_{PIN} < 0$ or $V_{PIN} > V_{DD}$) ..... ±15 mA
Total power dissipation.....400 mW
Output low condition……0.6V
Output high condition…… V_{DD} - 0.7V
Capacitive loading on all digital pins……50pF
Analogue to digital conversion resolution……...10 bit
Analogue input pin capacitance……10pF
Maximum allowable analogue impedance……..5 kΩ
Output low condition……0.6V
Maximum quadrature frequency (bidirectional mode)……13 kHz
Minimum quadrature frequency (bidirectional mode)……..……400 Hz
Maximum quadrature frequency (unidirectional mode)……14 kHz
Minimum quadrature frequency (unidirectional mode)……..……200 Hz

Note 1: Maximum current rating requires even load distribution across I/O pins. Maximum current rating may be Limited by the device package power dissipation characterizations, see “Thermal Characteristics” to calculate device specifications.

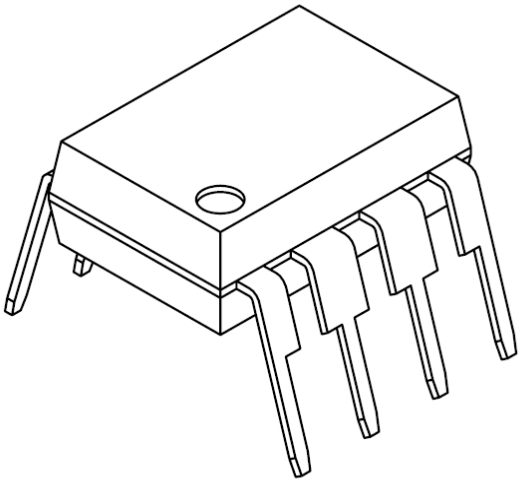
† IMPORTANT NOTICE: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure above maximum rating conditions for extended periods may affect device reliability.

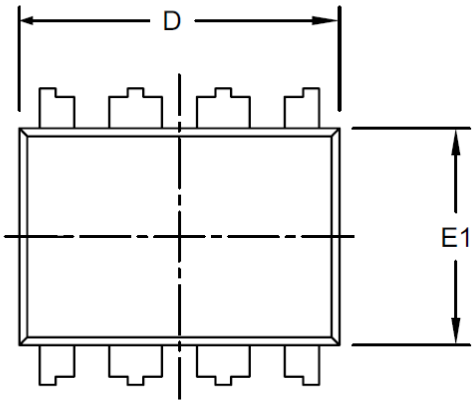
Document Revisions

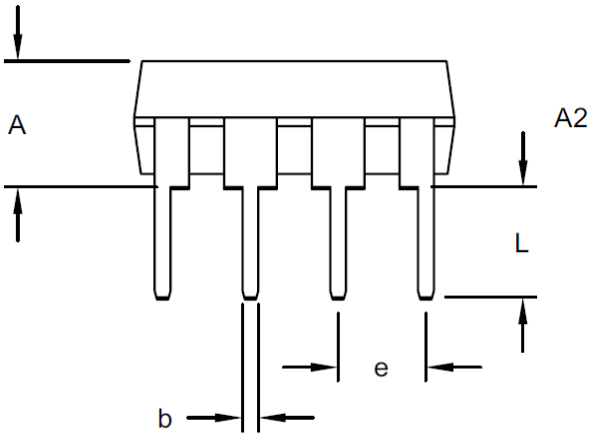
1.0 – First release

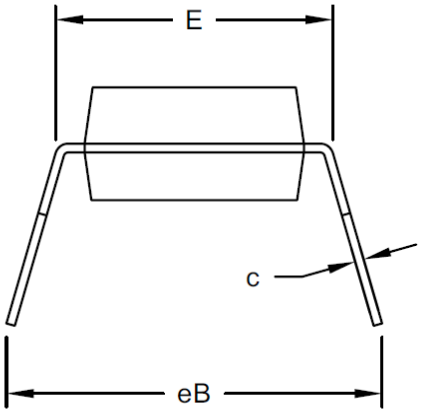
Package information

8 lead PDIP (300mil)









Datum	Dimension specifics	imperial inches		
Identifier		Min	Nom	Max
D	Overall Length	.348	.365	.400
E1	Package Width	.240	.250	.280
A	Top to Seating Plane	-	-	.220
A2	Package Thickness	.115	.130	.195
L	Tip to Seating Plane	.115	.130	.150
b	Lower Lead Width	.014	.018	.022
e	Pitch		.100	
E	Shoulder to Shoulder Width	.290	.310	.325
eB	Overall Row Spacing	-	-	.430
c	Lead Thickness	.008	.010	.015

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