PART NUMBER

UC1635J-ROCV

Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All re-creations are done with the approval of the Original Component Manufacturer. (OCM)

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

Quality Overview

• ISO-9001

• AS9120 certification

• Qualified Manufacturers List (QML) MIL-PRF-38535
  • Class Q Military
  • Class V Space Level

Qualified Suppliers List of Distributors (QSLD)

  • Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OCM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

UNITRODE

Phase Locked Frequency Controller

FEATURES

- Precision Phase Locked Frequency Control System

- Crystal Oscillator

- Programmable Reference Frequency Dividers

- Phase Detector with Absolute Frequency Steering

- Separate Divider Outputs and Phase Detector Input Pins

- Double Edge Option on the Frequency Feedback Sensing Amplifier

- Two High Current Op Amps

- 5V Reference Output

DESCRIPTION

The UC1635 family of integrated circuits was designed for use in precision speed control of DC motors. An extension to the UC1633 line of phase locked controllers, these devices provide access to both of the digital phase detector's inputs, and include a reference frequency divider output pin. With this added flexibility, this family of controllers can be used to obtain phase synchronization of multiple motors.

A reference frequency can be generated using the device's crystal oscillator and programmable dividers. The oscillator operates using a broad range of crystals, or, can function as a buffer stage to an external frequency source.

The phase detector responds proportionally to the phase error between the detector's minus input pin and the sense amplifier output. This phase detector includes absolute frequency steering to provide maximum drive signals when any frequency error exists. This feature allows optimum start-up and lock times to be realized.

Two op-amps are included that can be configured to provide necessary loop filtering. The outputs of these op-amps will source or sink in excess of 16mA, so they can provide a low impedance control signal to driving circuits.

Additional features include a double edge option on the sense amplifier that can be used to double the loop reference frequency for increased loop bandwidths. A 5V reference output can be used to accurately set DC operating levels.
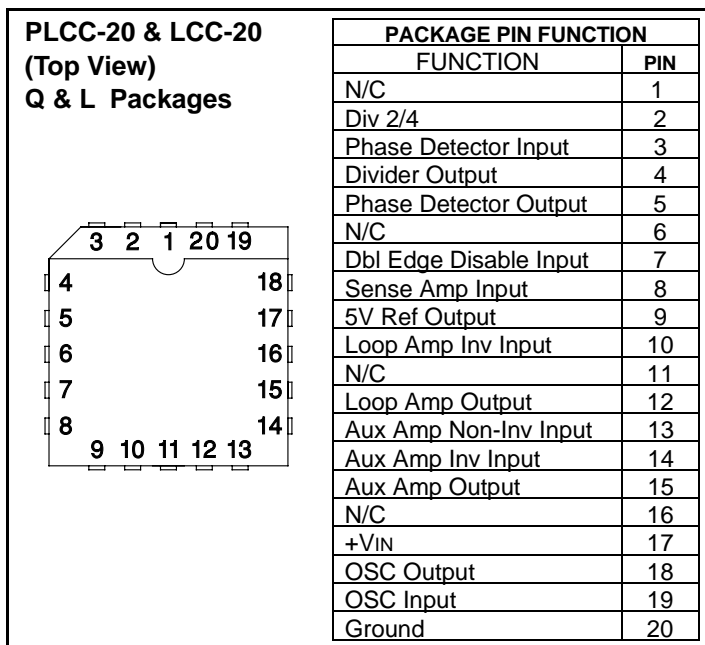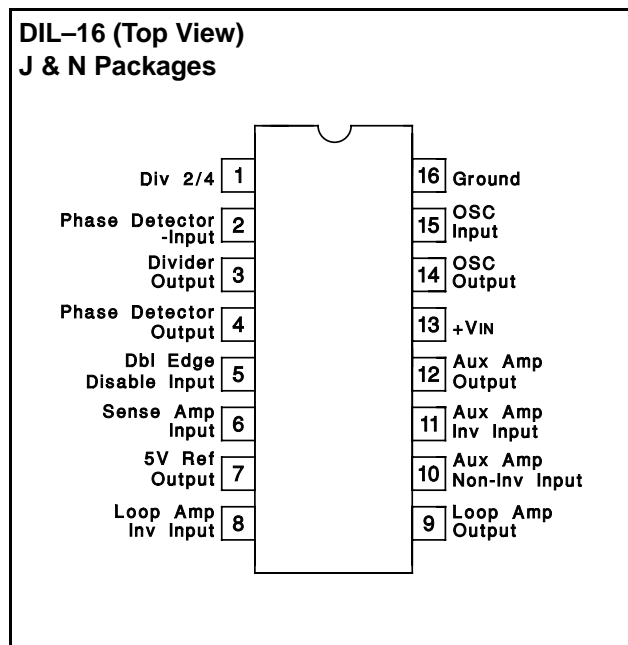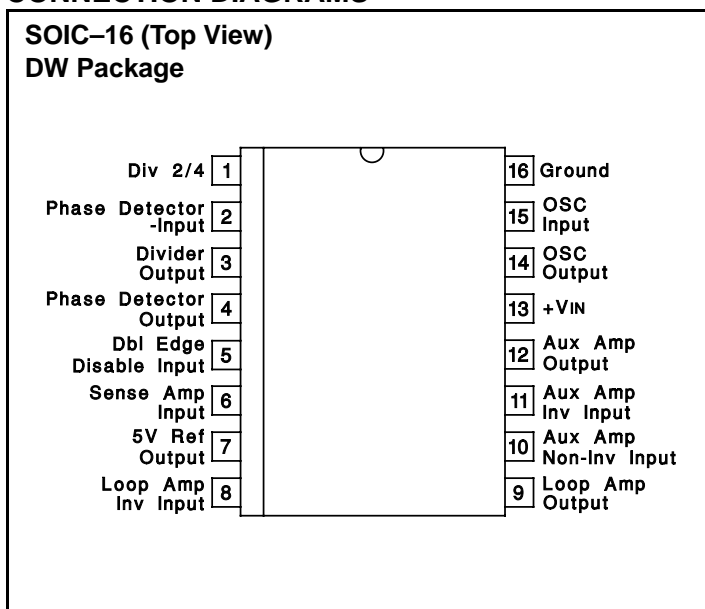
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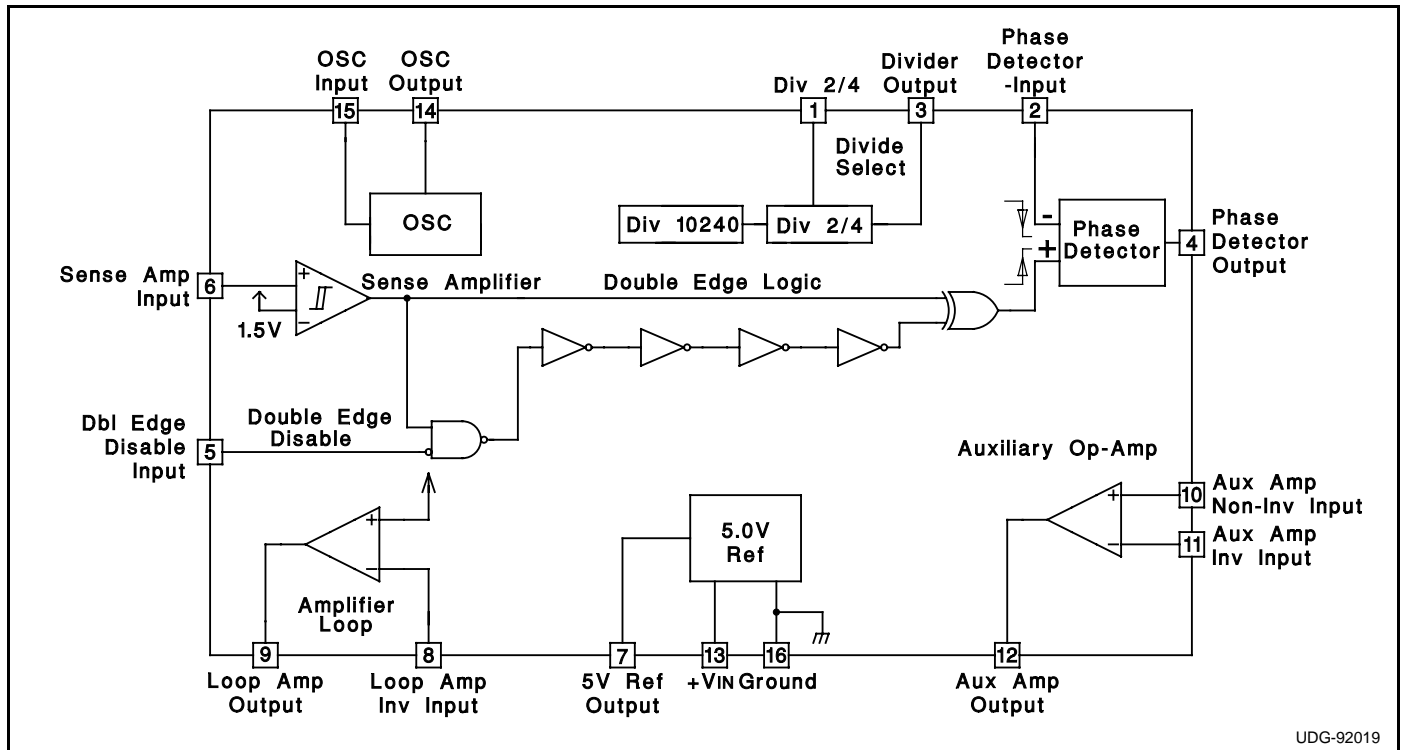
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ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage (+V_{IN}) . . . . +20V
Reference Output Current . . . . -30mA
Op-Amp Output Currents . . . . ±30mA
Op-Amp Input Voltages . . . . -0.3 to +20V
Phase Detector Input Voltage . . . . -0.3V to +5V
Phase Detector Output Current . . . . ±10mA
Lock Indicator Output Current . . . . +15mA
Lock Indicator Output Voltage . . . . +20V
Divide Select Input Voltages . . . . -0.3V to +10V
Double Edge Disable Input Voltage . . . . -0.3V to +10V
Oscillator Input Voltage . . . . -0.3V to +5V
Sense Amplifier Input Voltage . . . . -0.3V to +20V
Power Dissipation at T_A = 25°C, (Note 2) 1000mW
Power Dissipation at T_C = 25°C, (Note 2) 2000mW
Operating Junction Temperature . . . . -55° to 150°C
Storage Temperature . . . . -65° to +150°C
Lead Temperature (Soldering, 10 Seconds) . . . . 300°C

Note 1: Voltages are referenced to ground, (Pin 16). Currents are positive into, negative out of, the specified terminals.
Note 2: Consult Unitrode Integrated Circuits databook for information regarding thermal specifications and limitations of packages.

CONNECTION DIAGRAMS

SOIC–16 (Top View)
DW Package

Div 2/4	1	16 Ground
Phase Detector -Input	2	15 OSC Input
Divider Output	3	14 OSC Output
Phase Detector Output	4	13 +V_{IN}
Dbl Edge Disable Input	5	12 Aux Amp Output
Sense Amp Input	6	11 Aux Amp Inv Input
5V Ref Output	7	10 Aux Amp Non-Inv Input
Loop Amp Inv Input	8	9 Loop Amp Output

DIL–16 (Top View)
J & N Packages

Div 2/4	1	16 Ground
Phase Detector -Input	2	15 OSC Input
Divider Output	3	14 OSC Output
Phase Detector Output	4	13 +V_{IN}
Dbl Edge Disable Input	5	12 Aux Amp Output
Sense Amp Input	6	11 Aux Amp Inv Input
5V Ref Output	7	10 Aux Amp Non-Inv Input
Loop Amp Inv Input	8	9 Loop Amp Output

PLCC-20 & LCC-20
(Top View)
Q & L Packages

PACKAGE PIN FUNCTION	
FUNCTION	PIN
N/C	1
Div 2/4	2
Phase Detector Input	3
Divider Output	4
Phase Detector Output	5
N/C	6
Dbl Edge Disable Input	7
Sense Amp Input	8
5V Ref Output	9
Loop Amp Inv Input	10
N/C	11
Loop Amp Output	12
Aux Amp Non-Inv Input	13
Aux Amp Inv Input	14
Aux Amp Output	15
N/C	16
+V_{IN}	17
OSC Output	18
OSC Input	19
Ground	20

ELECTRICAL CHARACTERISTICS:

Unless otherwise stated, specifications hold for T_A = 0°C to +70°C for the UC3635, -25°C to +85°C for the UC2635 and -55°C to +125°C for the UC1635, +V_{IN} = 12V. T_A = T_J.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	+V_{IN} = 15V		20	28	mA
Reference					
Output Voltage (V_{REF})		4.75	5.0	5.25	V
Load Regulation	I_{OUT} = 0 to 7mA		5.0	20	mV
Line Regulation	+V_{IN} = 8 to 15V		2.0	20	mV
Short Circuit Current	V_{OUT} = 0V	15	35		mA

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, specifications hold for TA = 0°C to +70°C for the UC3635, -25°C to +85°C for the UC2635 and -55°C to +125°C for the UC1635, +Vin = 12V. TA = TJ.

| PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Oscillator					
DC Voltage Gain	Oscillator Input to Oscillator Output	12	16	20	dB
Input DC Level (VIB)	Oscillator Input Pin Open, TJ = 25°C	1.15	1.3	1.45	V
Input Impedance (Note 2)	VIN = VIB ±0.5V, TJ = 25°C	1.3	1.6	1.9	kΩ
Output DC Level	Oscillator Input Pin Open, TJ = 25°C	1.2	1.4	1.6	V
Maximum Operating Frequency		10			MHz
Dividers					
Maximum Input Frequency	Input = 1Vpp at Oscillator Input	10			MHz
Div 2/4 Input Current	Input = 5V (Div. by 2)		150	500	µA
	Input = 0V (Div. by 4)	-5.0	0.0	5.0	µA
Div 2/4 Threshold		0.5	1.6	2.2	V
Divider Output	High Level (w/6.8k Load to GND)	4.0	4.5		V
	Low Level (Open Collector Leakage)			10	µA
Sense Amplifier					
Threshold Voltage	Percent of VREF	27	30	33	%
Threshold Hysteresis			10		mV
Input Bias Current	Input = 1.5V	-1.0	-0.2		µA
Double Edge Disable Input					
Input Current	Input = 5V (Disabled)		150	500	µA
	Input = 0V (Enabled)	-5.0	0.0	5.0	µA
Threshold Voltage		0.5	1.6	2.2	V
Phase Detector					
-Input Threshold	Detector Responds to Falling Edge	0.5	1.6	2.2	V
-Input Current	Input = 2.2V		100	250	µA
High Output Level	Positive Phase/Freq. Error, Volts Below VREF		0.2	0.5	V
Low Output Level	Negative Phase/Freq. Error		0.2	0.5	V
Mid Output Level	Zero Phase/Freq. Error, Percent of VREF	47	50	53	%
High Level Maximum Source Current	VOUT = 4.3V	2.0	8.0		mA
Low Level Maximum Sink Current	VOUT 0.7V	2.0	5.0		mA
Mid Level Output Impedance (Note 3)	IOUT = -200 to +200µA, TJ = 25°C	4.5	6.0	7.5	kΩ
Loop Amplifier					
Non-Inv Reference Voltage	Percent of VREF	47	50	53	%
Input Bias Current	Input = 2.5V	-0.8	-0.2		µA
AVOL		60	75		dB
PSRR	+VIN = 8 to 15V	70	100		dB
Short Circuit Current	Source, VOUT = 0V	16	35		mA
	Sink, VOUT = 5V	16	30		mA

Note 3: These impedance levels will vary with TJ at about 1700ppm/°C.

ELECTRICAL CHARACTERISTICS (cont.):

Unless otherwise stated, specifications hold for T_A = 0°C to +70°C for the UC3635, -25°C to +85°C for the UC2635 and -55°C to +125°C for the UC1635, +Vin = 12V. $T_A = T_J$.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Auxiliary Op-Amp					
Input Offset Voltage	V_{CM} = 2.5V			8	mV
Input Bias Current	V_{CM} = 2.5V	-0.8	-0.2		µA
Input Offset Current	V_{CM} = 2.5V		.01	0.1	µA
AVOL		70	120		dB
PSRR	+V_{IN} = 8 to 15V	70	100		dB
CMRR	V_{CM} = 0 to 10V	70	100		dB
Short Circuit Current	Source, V_{OUT} = 0V	16	35		mA
	Sink, V_{OUT} = 5V	16	30		mA

Application and Operation Information
(For Additional Application Information see the UC1633 Data Sheet)
(Pin numbers refer to DIL and SOIC packages)

Phase Detector Input Detail

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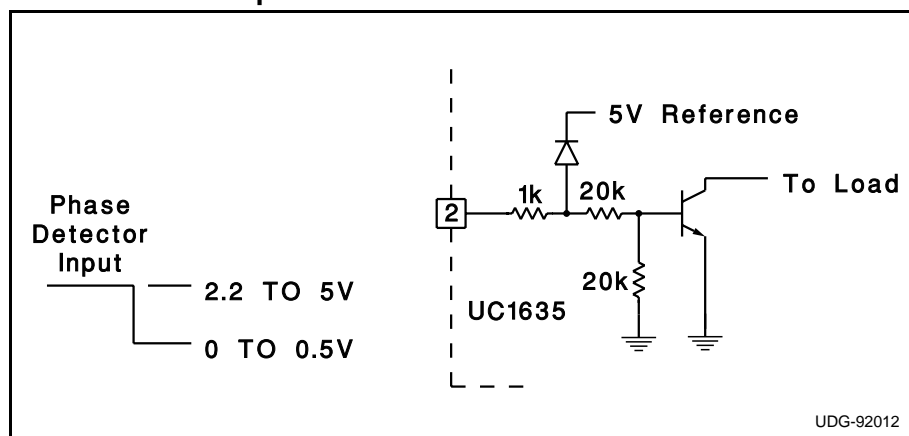
Reference Divider Output Detail

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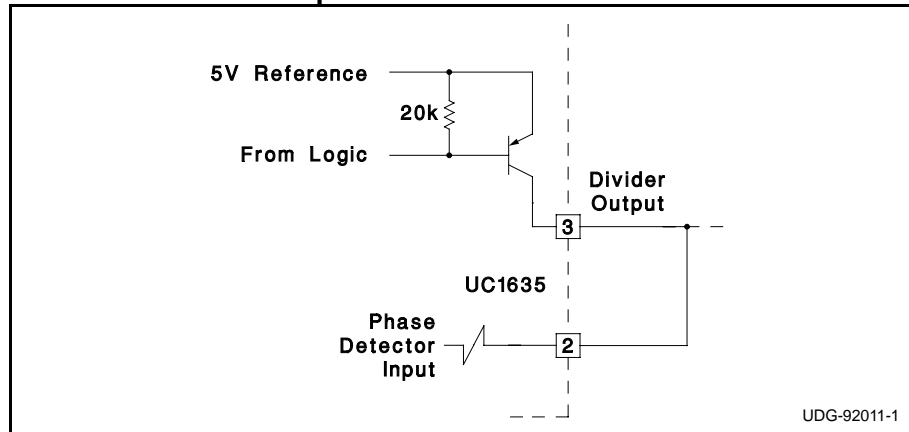
PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
UC1635J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
UC1635J883B	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
UC2635N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
UC3635DW	OBSOLETE	SOIC	DW	16		TBD	Call TI	Call TI
UC3635DWTR	OBSOLETE	SOIC	DW	16		TBD	Call TI	Call TI
UC3635N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI
UC3635Q	OBSOLETE	PLCC	FN	20		TBD	Call TI	Call TI
UC3635QTR	OBSOLETE	PLCC	FN	20		TBD	Call TI	Call TI

[1] The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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