

Phase Locked Frequency Controller

FEATURES

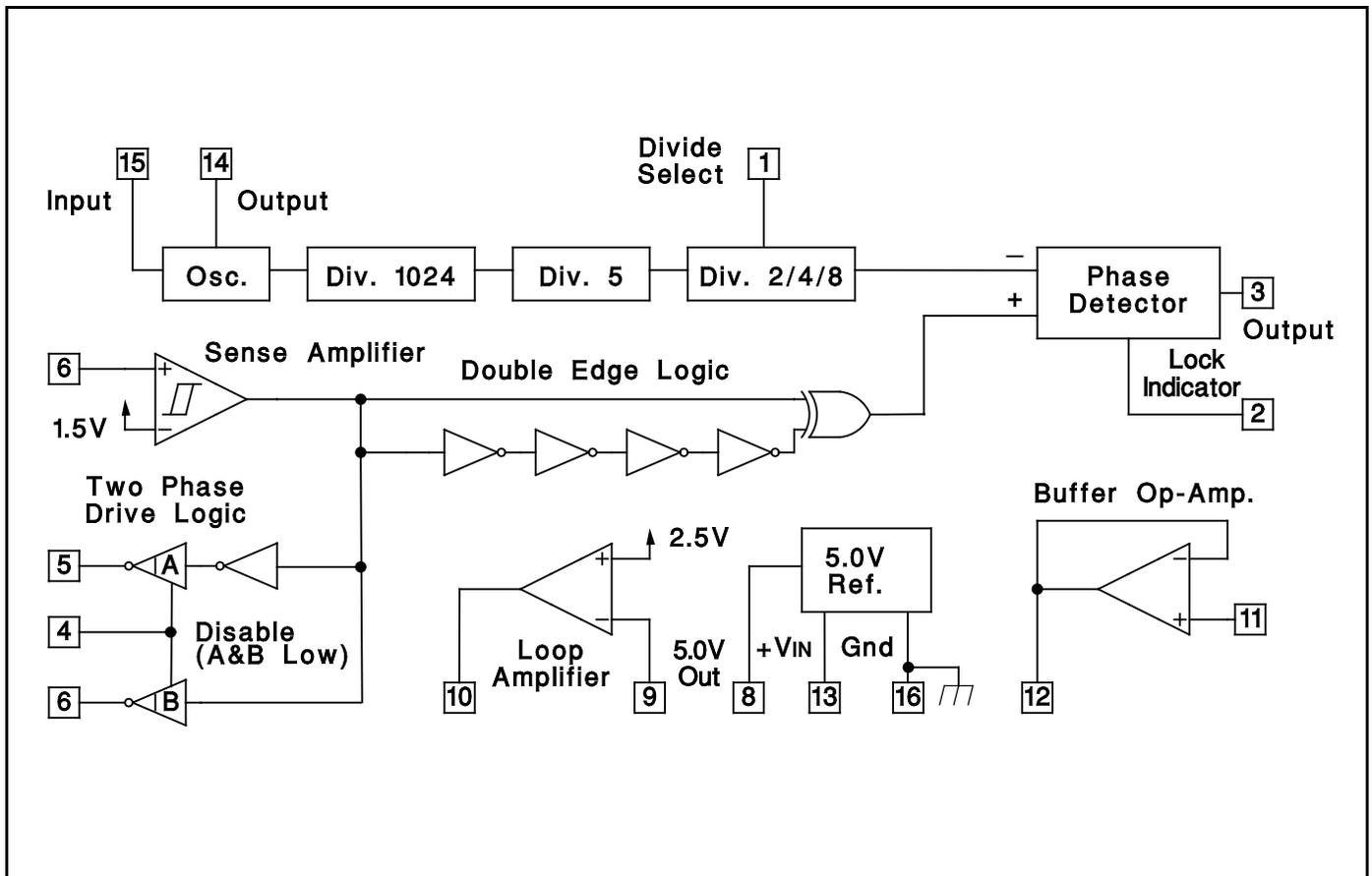
- Precision Phase Locked Frequency Control System
- Communication Logic for 2-Phase Motors
- Disable Input for Motor Inhibit
- Crystal Oscillator
- Programmable Reference Frequency Dividers
- Phase Detector with Absolute Frequency Steering
- Digital Lock Indicator
- Two High Current Op-Amps
- 5V Reference Output

DESCRIPTION

The UC1634 series of devices is optimized to provide precision phase locked frequency control for two phase DC brushless motors. These devices include most of the features of the general purpose UC1633 Phase Locked Control family and also provide the out-of-phase commutation signals required for driving two phase brushless motors. Only an external power booster stage is required for a complete drive and control system.

The two commutation outputs are open collector devices that can sink in excess of 16mA. A disable input allows the user to simultaneously force both of these outputs to an active low state. Double edge logic, following the sense amplifier, doubles the reference frequency at the phase detector by responding to both edges of the input signal at Pin 7.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Note 1, 2)

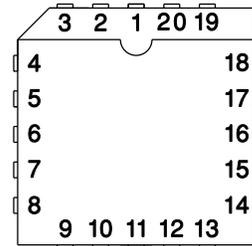
Input Supply Voltage (+VIN)	+20V
Reference Output Current	-30mA
Op-Amp Output Currents	±30mA
Op-Amp Input Voltages	-3V to +20V
Phase Detector Output Current	±10mA
Lock Indicator Output Current	+15mA
Lock Indicator Output Voltage	+20V
Divide Select Input Voltage	-3V to +10V
Disable Input Voltage	-3V to +10V
Oscillator Input Voltage	-3V to +5V
Sense Amplifier Input Voltage	-3V to +20V
Driver Output Currents	+30mA
Driver Output Voltages	+20V
Power Dissipation at TA = 25°C(Note 2)	1000mW
Power Dissipation at TC = 25°C (Note 2)	2000mW
Operating Junction Temperature	-55°C to +150°C
Storage Temperature	-65°C to +150°C
Lead Temperature (Soldering, 10 Seconds)	300°C

Note 1: Voltages are referenced to ground, (Pin 16, DIL Package). Currents are positive into, negative out of, the specified terminals.

Note 2: Consult Packaging Section of Databook for thermal limitations and considerations of package.

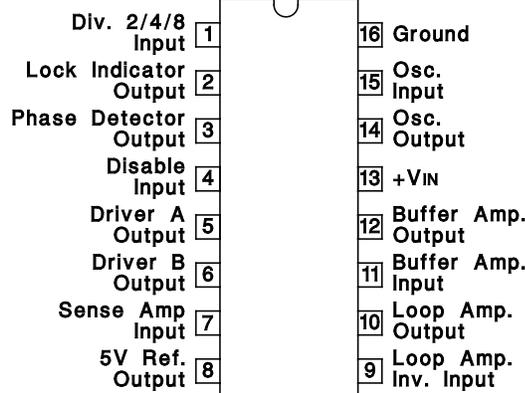
CONNECTION DIAGRAMS

**PLCC-20 (TOP VIEW)
Q Package**



PACKAGE PIN FUNCTION	
FUNCTION	PIN
N/C	1
DIV 2/4/8	2
Lock Indicator Output	3
Phase Detector Output	4
Disable Input	5
N/C	6
Driver A Output	7
Driver B Output	8
Sense Amp Output	9
5V Ref Output	10
Loop Amp Inv Input	11
Loop Amp Output	12
Buffer Amp Input	13
Buffer Amp Output	14
+VIN	15
N/C	16
OSC Output	17
OSC Input	18
Ground	19
DIV 4/5 Input	20

**DIL-16, SOIC-16 (TOP VIEW)
J or N Package, DW Package**



ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications apply for TA = 0°C to +70°C for the UC3634, -25°C to + 85°C for the UC2634 and -55°C to +125°C for the UC1634, +VIN = 12V. TA=TJ.

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	+VIN = 15V		20	29	mA
Reference					
Output Voltage (VREF)		4.75	5.0	5.25	V
Load Regulation	IOUT = 0mA to 7mA		5.0	20	mV
Line Regulation	+VIN = 8V to 15V		2.0	20	mV
Short Circuit Current	VOUT = 0V	12	30		mA
Oscillator					
DC Voltage Gain	Oscillator In to Oscillator Out	12	16	20	dB
Input DC Level (VIB)	Oscillator In Pin Open, TJ = 25°C	1.15	1.3	1.45	V
Input Impedance (Note 3)	VIN = VIB ± 0.5V, TJ = 25°C	1.3	1.6	1.9	kΩ
Output DC Level	Oscillator In 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 In	10			MHz
Div. 4/5 Input Current (Q Package Only, Note 4)	Input = 5V (Div. by 4)		150	500	μA
	Input = 0V (Div. by 5)	-5.0	0.0	5.0	μA

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications apply for $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ for the UC3634, -25°C to $+85^\circ\text{C}$ for the UC2634 and -55°C to $+125^\circ\text{C}$ for the UC1634, $+V_{IN} = 12\text{V}$. $T_A = T_J$

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Dividers (cont.)					
Div. 4/5 Input Threshold (Q Package Only, Note 4)		0.5	1.6	2.2	V
Div. 2/4/8 Input Current	Input = 5V (Div. by 8)		150	500	μA
	Input = 0V (Div. by 2)	-500	-150		μA
Div. 2/4/8 Open Current Voltage	Input Current = $0\mu\text{A}$ (Div. by 4)	1.5	2.5	3.5	V
Div. by 2 Threshold		0.20	0.8		V
Div. by 4 Threshold		1.5		3.5	V
Div. by 8 Threshold	Volts Below V_{REF}	0.20	0.8		V
Sense Amplifier					
Threshold Voltage	Percent of V_{REF}	27	30	33	%
Threshold Hysteresis			10		mV
Input Bias Current	Input = 1.5V	-1.0	-0.2		μA
Two Phase Drive Outputs, A and B					
Saturation Voltage	$I_{OUT} = 16\text{mA}$		0.3	0.6	V
Leakage Current	$V_{OUT} = 15\text{V}$		0.1	5.0	μA
Disable Input					
Input Current	Input = 5V (Disabled, A and B Outputs Active Low)		150	500	μA
	Input = 0V (Enabled)	-5.0	0.0	5.0	μA
Threshold Voltage		0.5	1.6	2.2	V
Phase Detector					
High Output Level	Positive Phase / Freq. Error, Volts Below V_{REF}		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 V_{REF}	47	50	53	%
High Level Maximum Source Current	$V_{OUT} = 4.3\text{V}$	2.0	8.0		mA
Low Level Maximum Sink Current	$V_{OUT} = 0.7\text{V}$	2.0	5.0		mA
Mid Level Output Impedance (Note 3)	$I_{OUT} = -200$ to $+200\mu\text{A}$, $T_J = 25^\circ\text{C}$	4.5	6.0	7.5	$\text{k}\Omega$
Lock Indicator Output					
Saturation Voltage	Freq. Error, $I_{OUT} = 5\text{mA}$		0.3	0.45	V
Leakage Current	Zero Freq. Error, $V_{OUT} = 15\text{V}$		0.1	1.0	μA
Loop Amplifier					
N INV. Reference Voltage	Percent of V_{REF}	47	50	53	%
Input Bias Current	Input = 2.5V	-0.8	-0.2		μA
AVOL		60	75		dB
PSRR	$+V_{IN} = 8\text{V}$ to 15V	70	100		dB
Short Circuit Current	Source, $V_{OUT} = 0\text{V}$	16	35		mA
	Sink, $V_{OUT} = 5\text{V}$	16	30		mA
Buffer Op-Amp					
Input Offset Voltage	$V_{CM} = 2.5\text{V}$			8	mV
Input Bias Current	$V_{CM} = 2.5\text{V}$	-0.8	-0.2		μA
PSRR	$+V_{IN} = 8$ to 15V	70	100		dB
CMRR	$V_{CM} = 0$ to 10V	70	100		dB
Short Circuit Current	Source, $V_{OUT} = 0\text{V}$	16	35		mA
	Sink, $V_{OUT} = 5\text{V}$	16	30		mA

Note 3: These impedance levels will vary with T_J at about $1700\text{ppm}/^\circ\text{C}$.

Note 4: This part is also available in a 20 pin plastic leadless chip carrier, Q designator, where a divide by 4/5 select pin is available. Consult factory for details.

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
UC3634N	OBSOLETE	PDIP	N	16		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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