INTEGRATED CIRCUITS
UNITRODE

UC1634
UC2634
UC3634

Phase Locked Frequency Controller

FEATURES

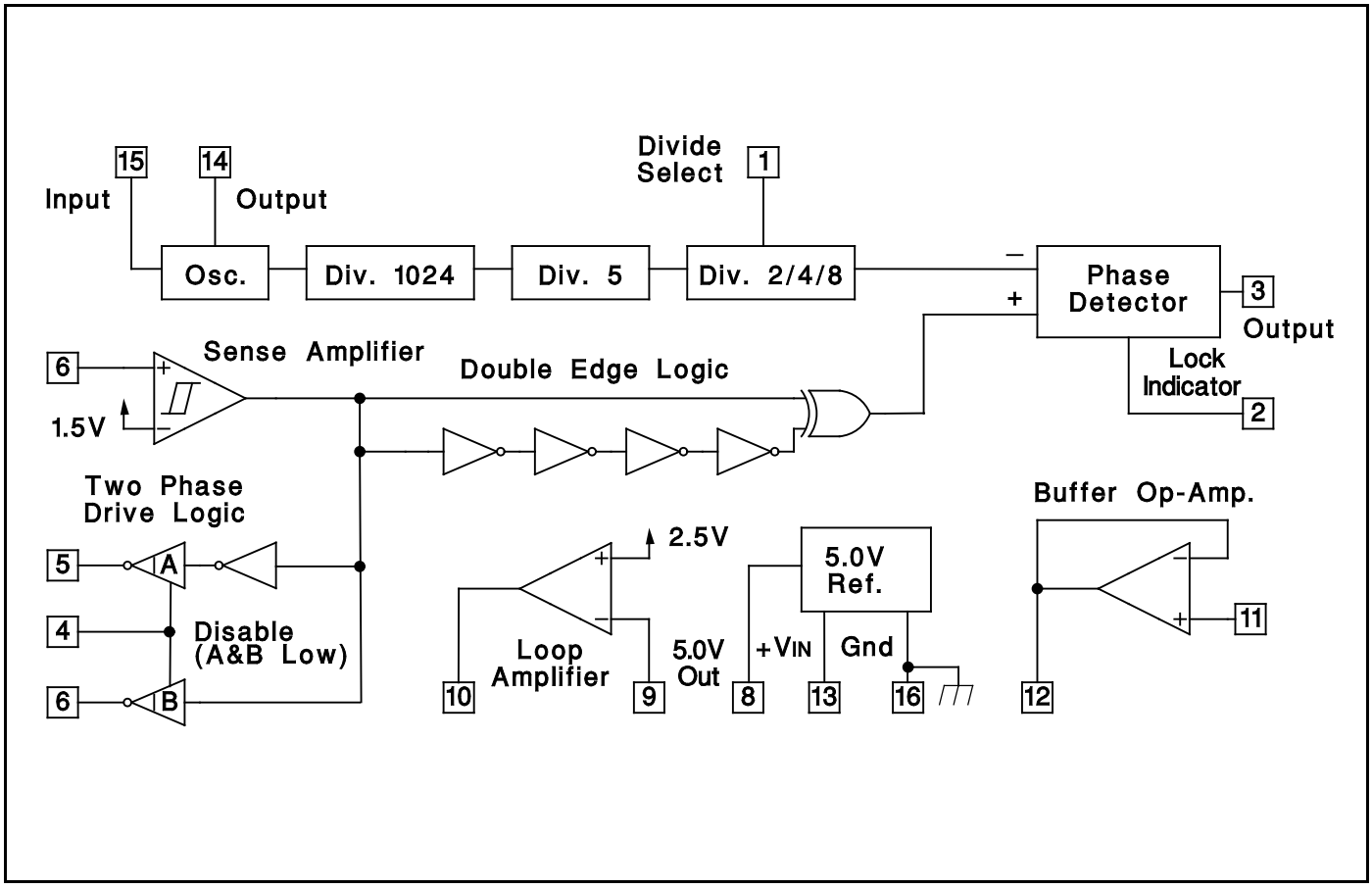
- Precision Phase Locked Frequency Control System
- Communication Logic for 2-Phase Motors
- Disable Input for Motor Inhibit
- Crystal Oscillator
- Programmable Reference Frequency Dividers
- Phase Detector with Absolute Frequency Steering
- Digital Lock Indicator
- Two High Current Op-Amps
- 5V Reference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

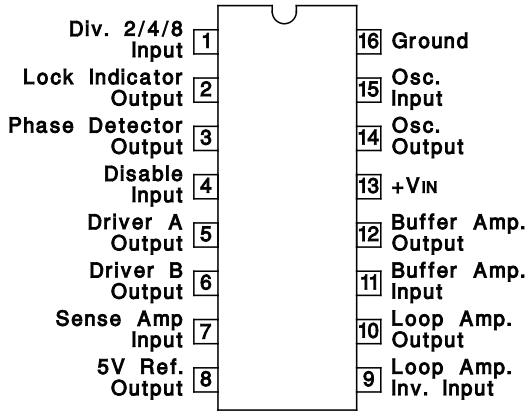


ABSOLUTE MAXIMUM RATINGS (Note 1, 2)

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 T_A = 25°C(Note 2) 1000mW
Power Dissipation at T_C = 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

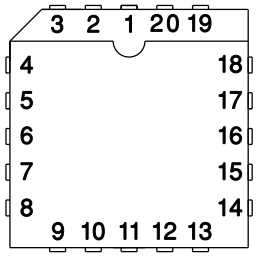
Note 1: Voltages are referenced to ground, (Pin 16, DIL Package). Currents are positive into, negative out of, the specified terminals.
Note 2: Consult Packaging Section of Databook for thermal limitations and considerations of package.

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

ELECTRICAL CHARACTERISTICS:

Unless otherwise stated, these specifications apply for T_A = 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, $+V_{IN}$ = 12V. T_A=T_J.

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	$+V_{IN}$ = 15V		20	29	mA
Reference					
Output Voltage (V_{REF})		4.75	5.0	5.25	V
Load Regulation	I_{OUT} = 0mA to 7mA		5.0	20	mV
Line Regulation	$+V_{IN}$ = 8V to 15V		2.0	20	mV
Short Circuit Current	V_{OUT} = 0V	12	30		mA
Oscillator					
DC Voltage Gain	Oscillator In to Oscillator Out	12	16	20	dB
Input DC Level (V_{IB})	Oscillator In Pin Open, T_J = 25°C	1.15	1.3	1.45	V
Input Impedance (Note 3)	V_{IN} = V_{IB} ± 0.5V, T_J = 25°C	1.3	1.6	1.9	kΩ
Output DC Level	Oscillator In Pin Open, T_J = 25°C	1.2	1.4	1.6	V
Maximum Operating Frequency		10			MHz
Dividers					
Maximum Input Frequency	Input = 1V_{PP} at Oscillator In	10			MHz
Div. 4/5 Input Current	Input = 5V (Div. by 4)		150	500	µA
(Q Package Only, Note 4)	Input = 0V (Div. by 5)	-5.0	0.0	5.0	µA

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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 = 0µA (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} = 16mA		0.3	0.6	V
Leakage Current	V_{OUT} = 15V		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} = 4.3V	2.0	8.0		mA
Low Level Maximum Sink Current	V_{OUT} = 0.7V	2.0	5.0		mA
Mid Level Output Impedance (Note 3)	I_{OUT} = -200 to +200µA, T_J = 25°C	4.5	6.0	7.5	kΩ
Lock Indicator Output					
Saturation Voltage	Freq. Error, I_{OUT} = 5mA		0.3	0.45	V
Leakage Current	Zero Freq. Error, V_{OUT} = 15V		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	$+V_{IN}$ = 8V to 15V	70	100		dB
Short Circuit Current	Source, V_{OUT} = 0V	16	35		mA
	Sink, V_{OUT} = 5V	16	30		mA
Buffer Op-Amp					
Input Offset Voltage	V_{CM} = 2.5V			8	mV
Input Bias Current	V_{CM} = 2.5V	-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} = 0V	16	35		mA
	Sink, V_{OUT} = 5V	16	30		mA

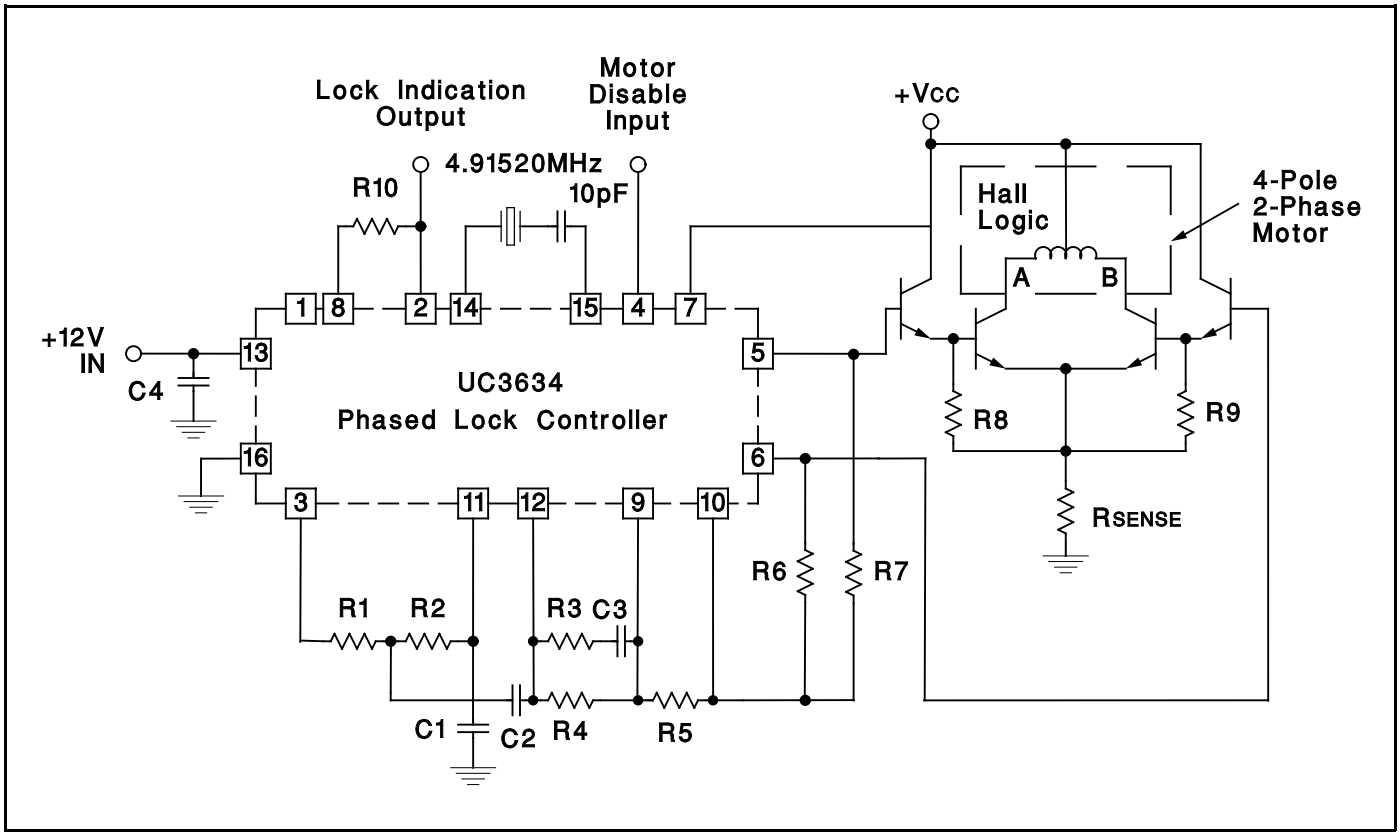
Note 3: These impedance levels will vary with T_J at about 1700ppm/°C.

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.

APPLICATION AND OPERATION INFORMATION (For additional information see UC1633 data sheet)

Design Example:

Precision phased locked frequency control of a 2-phase motor at 3600 RPM. Using the commutation logic on the UC3634, a simple discrete drive scheme is possible.



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