

ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage 13.2V
 Analog Inputs (OHD, DCLIM, XTAL1, XTAL2)
 Maximum Forced Voltage -0.3 to 5V
 Logic Inputs
 Maximum Forced Voltage -0.3 to 7.5V
 Reference Output Current (VDD) Internally Limited
 Output Current (DRV1, DRV2, DRVS) Pulsed 1.5A
 Operating Junction Temperature -40°C to +125°C
 Storage Temperature -65°C to +150°C

Note: Unless otherwise indicated, voltages are referenced to ground and currents are positive into, negative out of, the specific terminals. Pulsed is defined as a less than 10% duty cycle with a maximum duration of 500 S.

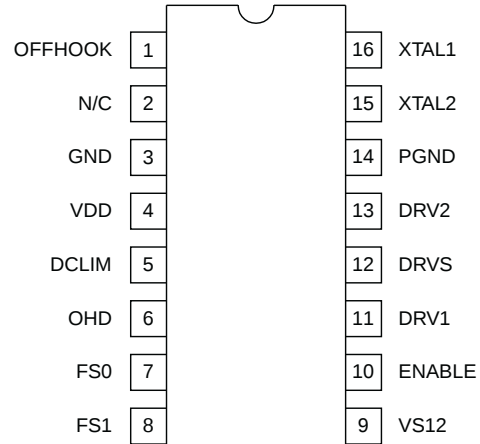
Table 1. Frequency selectability decoding.

FS1	FS0	MODE	Sine Wave Frequency (Hz)
0	0	1	20
0	1	1	25
1	0	1	50
1	1	3	0

FS1	FS0	FDRVS	FDRV – FDRVS
0	0	89.469kHz	20Hz
0	1	89.464kHz	25Hz
1	0	89.439kHz	50Hz

CONNECTION DIAGRAMS

**(TOP VIEW) DIL-16, SOIC-16
N or D Packages**



ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications hold for $T_A = 0^\circ\text{C}$ to 70°C for the UCC3752 and -40°C to $+85^\circ\text{C}$ for the UCC2752, $T_A = T_J$.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
V12 Supply Current Section					
Supply Current	ENABLE = 0V		0.5	3	mA
	ENABLE = 5V		0.5	3	mA
Internal Reference with External Bypass Section					
Output Voltage (VDD)		4.85	5	5.15	V
Load Regulation	$0\text{mA} \leq I_{VDD} \leq 2\text{mA}$		5	20	mV
Line Regulation	$10\text{V} < V_{S12} < 13\text{V}$, $I_{VDD} = 1\text{mA}$		3	20	mV
Short Circuit Current	VDD = 0	5	10		mA
Output Drivers Section (DRV1, DRV2)					
Pull Up Resistance	$I_{LOAD} = 10\text{mA}$ to 20mA		6	15	
Pull Down Resistance	$I_{LOAD} = 10\text{mA}$ to 20mA		6	15	
Rise Time	$C_{LOAD} = 1\text{nF}$		50	100	nS
Fall Time	$C_{LOAD} = 1\text{nF}$		50	100	nS
Output Drivers Section (DRVS)					
Pull Up Resistance	$I_{LOAD} = 10\text{mA}$ to 20mA		4	10	
Pull Down Resistance	$I_{LOAD} = 10\text{mA}$ to 20mA		4	10	
Sample Pulse-Width	Mode 1 (Table 1)	240	280	320	nS
Rise Time	$C_{LOAD} = 1\text{nF}$		50	100	nS
Fall Time	$C_{LOAD} = 1\text{nF}$		50	100	nS

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications hold for $T_A = 0^{\circ}\text{C}$ to 70°C for the UCC3752 and -40°C to $+85^{\circ}\text{C}$ for the UCC2752, $T_A = T_J$.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Current Limit Section					
DCLIM Threshold		250	300	350	mV
DCLIM Input Current	$V_{DCLIM} = 0\text{V}$	-900	-100		nA
OffHook Detect Section					
OHD Threshold		250	300	350	mV
OHD Input Current	$V_{OHD} = 0\text{V}$	-900	-100		nA
Offhook V_{OH}	$I_{OFFHOOK} = 1\text{mA}$	3.0	4.0		V
Offhook V_{OL}	$I_{OFFHOOK} = -1\text{mA}$		1.0	1.5	V
Offhook Pull-Up Impedance	$I_{LOAD} = 0\text{mA}$ to 1mA	100	400	900	
Offhook Pull-Down Impedance	$I_{LOAD} = 0\text{mA}$ to 1mA	100	250	900	
Frequency Section (Table 1)					
Primary Switching Frequency	All cases 3.579545 MHz Crystal		89489		Hz
Sampling Switching Frequency	$FS0 = 0$, $FS1 = 0$, Mode 1, (Table 1)		89469		Hz
	$FS0 = 1$, $FS1 = 0$, Mode 1		89464		Hz
	$FS0 = 0$, $FS1 = 1$, Mode 1		89439		Hz

PIN DESCRIPTIONS

DCLIM: Primary current sense input. Signal proportional to the primary switch current. All outputs are turned off when a threshold of 300mV is exceeded on this pin. This current-limit works on a cycle-by-cycle basis.

DRV1, DRV2: Low impedance driver outputs for the primary switches. DRV1 and DRV2 are complimentary and have 50% duty cycle.

DRVS: Low impedance driver output for the sampling switch(es). The pulse width of this output is 280ns. Typically, a pulse transformer is used to couple the short sampling pulses at DRVS to the floating sampling switch(es).

ENABLE: Logic input which turns off the outputs when low.

FS0, FS1: Frequency select pins for determining the difference frequency between primary and secondary pulses under normal operation. These pins can be hard-wired to GND or VDD to get one of the available output frequencies (20,25 and 50 Hz). See Table 1 in the spec table.

GND: Reference point for all the internal voltages and common return for the device.

OFFHOOK: Output indicating the off-hook condition. This signal can be used by an external circuit to switch to a line from the ring generator output to the DC voltage.

OHD: Off-Hook Detect. Voltage proportional to output current DC level is fed into this pin and compared to an internal threshold of 300mV. If the threshold is exceeded, the OFFHOOK output goes high.

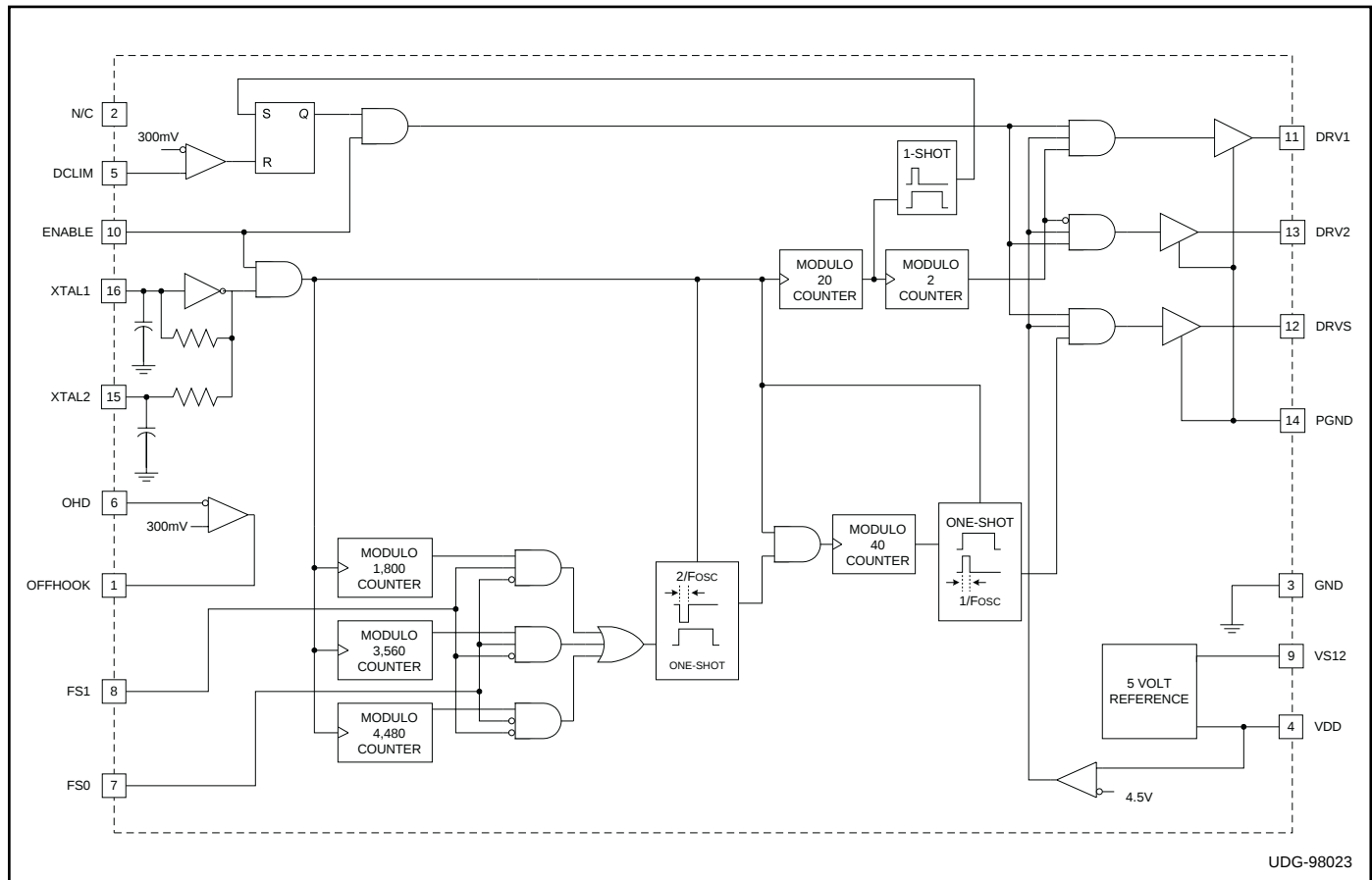
PGND: Return point for the output drivers. Connect to GND at a single point in the circuit.

VDD: Internal regulated 5V supply. This voltage is used to power all the internal precision circuits of the IC. This pin needs to be bypassed to GND with ceramic capacitor.

VS12: External 12V power supply for the IC. Powers VDD and provides voltage for the output drivers.

XTAL1, XTAL2: Pins for connecting precision Crystal to attain the accurate output frequencies. An external square-wave pulse can also be applied to XTAL2 if XTAL1 is tied to VDD/2.

BLOCK DIAGRAM



APPLICATION INFORMATION

Power Stage Operation

The power stage used for the UCC3752 application has two distinct switching circuits which together produce the required low frequency signal on the output. The primary side switching circuit consists of a current fed push-pull resonant circuit that generates the high frequency sinusoidal waveform across the transformer winding. The operation of this type of circuit is extensively covered in Unitrode Application notes U-141 and U-148. Resonant components C_{R1} , C_{R2} , L_R , N should be chosen so that the primary and secondary resonances are well matched. Also, for the UCC3752 operation, switching frequency is fixed by crystal selection. So, the resonant components must be selected to yield a resonant frequency close enough to the switching frequency to get a low distortion sine-wave. Practically, since it is impossible to get an exact match between the two frequencies, the switching frequency should always be higher than the resonant frequency to ensure low distortion and take advantage of ZVT operation. Switches Q1 and Q2 are pulsed at 50% duty cycle at the switching frequency (89.489 kHz) determined by a crystal (3.579545 MHz) connected to the UCC3752. The input voltage for the resonant stage (typically 12V) determines the voltage

stress of Q1 and Q2. Transformer turns ratio is determined by the output voltage requirements. On the secondary side, the high frequency waveform is sampled at a predetermined frequency (e.g. 89.469 kHz) which differs from the primary switching frequency by the desired output frequency (e.g. 20 Hz). The sampling is accomplished using a bi-directional switching circuit as shown in Figure 1 and Figure 2. Figure 1 shows the sampling mechanism consisting of two back-to-back FET switches allowing current flow in both directions. The sampling can also be done with a single active switch and a full-bridge rectifier as shown in Fig. 2. The DRVS pin of the UCC3752 provides the drive signal for the sampling switch(es) and this signal is coupled through a pulse transformer. Typical pulsewidth of the sampling signal is 280nS. As a result of sampling, the resultant output signal matches the secondary voltage in amplitude and has a low output frequency desired for ring generation.

The secondary winding of the power transformer also has a tap (or a separate winding) to generate a loosely regulated DC voltage. This DC voltage can be used to offset the ring generator output. It can also be used as a power supply for supplying talk battery voltage in some applications.

APPLICATION INFORMATION (cont.)

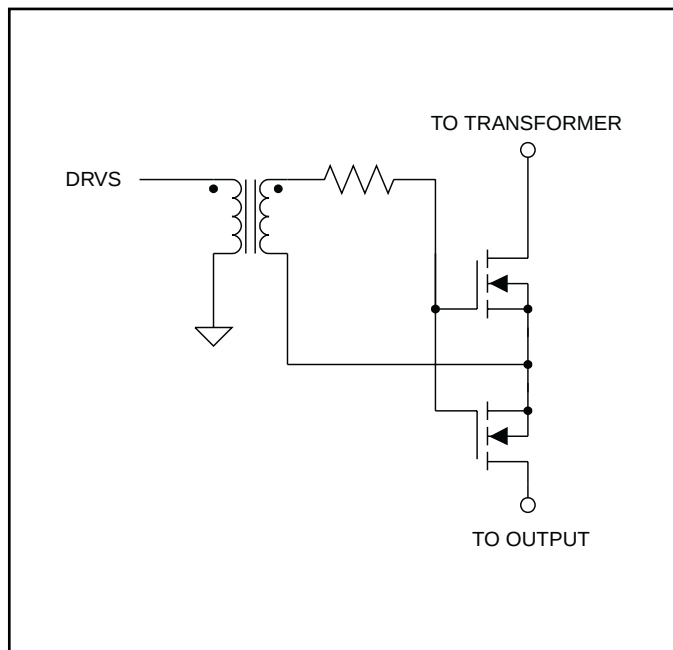


Figure 1. Sampling circuit with two FETs.

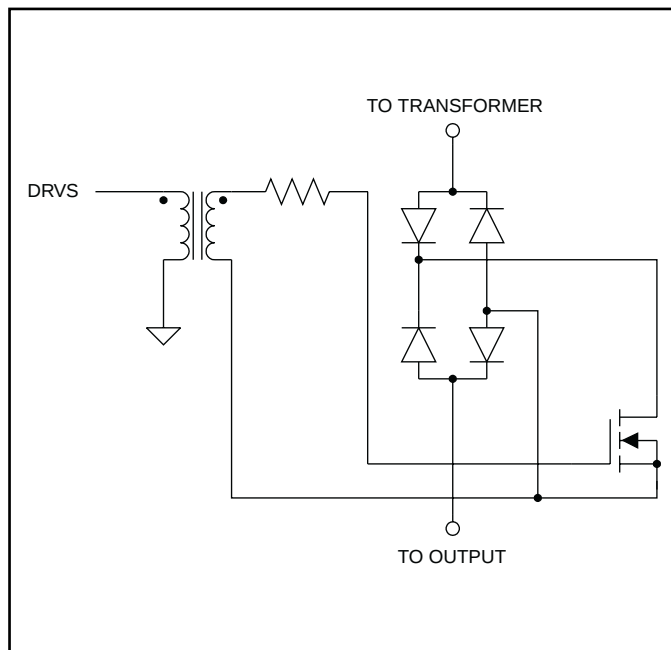


Figure 2. Sampling circuit with single FET and full-bridge rectifier.

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Customers are responsible for their applications using TI components.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, license, warranty or endorsement thereof.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations and notices. Representation or reproduction of this information with alteration voids all warranties provided for an associated TI product or service, is an unfair and deceptive business practice, and TI is not responsible nor liable for any such use.

Resale of TI's products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service, is an unfair and deceptive business practice, and TI is not responsible nor liable for any such use.

Also see: Standard Terms and Conditions of Sale for Semiconductor Products. www.ti.com/sc/docs/stdterms.htm

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
UCC2752D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UCC2752DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UCC2752DTR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UCC2752DTRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UCC2752N	ACTIVE	PDIP	N	16	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-NC-NC-NC
UCC2752NG4	ACTIVE	PDIP	N	16	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-NC-NC-NC
UCC3752D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UCC3752DTR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UCC3752DTRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UCC3752N	ACTIVE	PDIP	N	16	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-NC-NC-NC
UCC3752NG4	ACTIVE	PDIP	N	16	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-NC-NC-NC

⁽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) 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.

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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

Copyright © 2005, Texas Instruments Incorporated