Rev 1; 12/05

DALLAS SEMICONDUCTOR MAXIM

77.76MHz VCXO

DS4077

General Description

The DS4077 is an integrated voltage-controlled crystal oscillator (VCXO) module designed to provide reference clock generation in base stations, telecom/datacom, and wireless applications. The DS4077 is developed using a fundamental quartz crystal plus a unique integrated circuit design. The internal fundamental quartz crystal determines the frequency of operation. Custom frequencies are available. Contact the factory for availability.

The DS4077 is designed for use with applications requiring low phase noise and jitter. Jitter performance of better than 1ps RMS is achieved over the 12kHz to 80MHz range. Phase noise performance of better than -130dBc/Hz at 1kHz is achieved with this design.

Applications

Clock-Data Recovery in Telecom/Datacom Applications

Data Retiming

Reference Clock Generation in Base Stations and Wireless Applications

Features

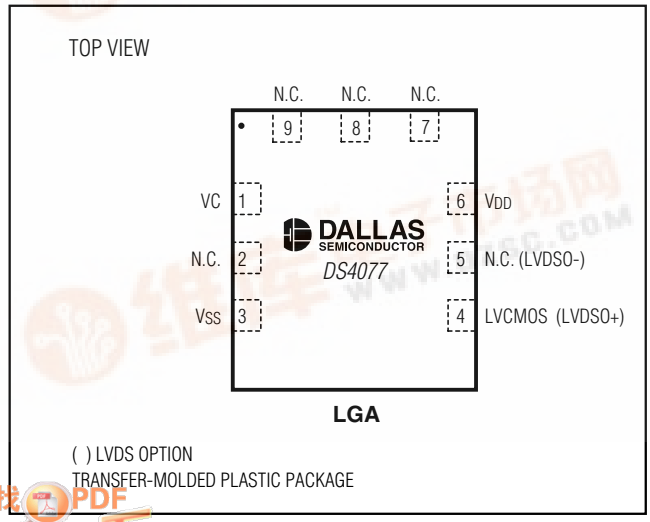
- ♦ 77.76MHz (f_{NOM}) Frequency
- ♦ 3.135V to 3.465V Operation
- ♦ Low Jitter: < 1ps RMS
- ♦ ±69ppm Absolute Pull Range (APR)
- ♦ Output Options:
  - LVCMOS Output Buffer
  - LVDS Complementary Output Buffer
- ♦ Minimum ±110ppm Tuning Range (+25°C)
- ♦ 14mm x 9mm x 3.06mm Plastic LGA Package

Ordering Information

PART	TEMP RANGE	OUTPUT TYPE	FREQUENCY (f_{NOM}) (MHz)	PIN-PACKAGE	TOP MARK*
DS4077L-0CN	-40°C to +85°C	LVCMOS	77.76	9 LGA	DS4077L-0CN
DS4077L-0DN	-40°C to +85°C	LVDS	77.76	9 LGA	DS4077L-0DN

**The top mark includes an "N" for industrial temperature grade devices.*

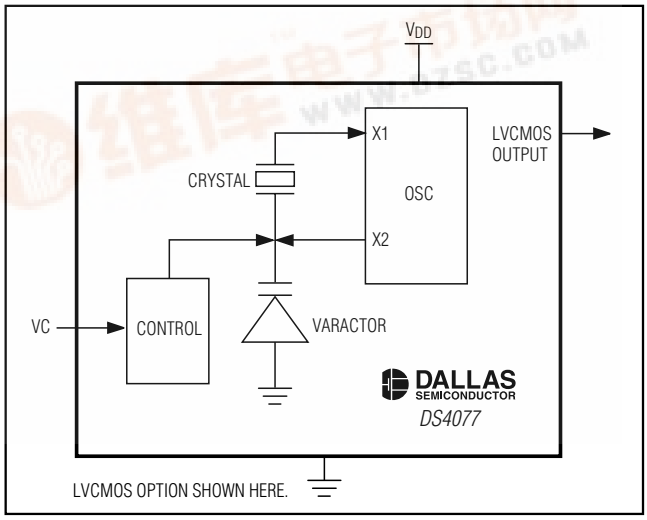
Pin Configuration



LGA

( ) LVDS OPTION
TRANSFER-MOLDED PLASTIC PACKAGE

Block Diagram



77.76MHz VCXO

ABSOLUTE MAXIMUM RATINGS

VC, V_{DD}, LVCMOS, LVDSO+, LVDSO- Output .....-0.3V, +3.6V
Operating Temperature Range
(noncondensing) .....-40°C to +85°C
Junction Temperature.....+150°C
Thermal Resistance
Junction to Ambient .....91.06°C/W
Junction to Case .....44.51°C/W

Storage Temperature Range .....-55°C to +125°C
Soldering Temperature
(reflow, 2 passes max)....See IPC/JEDEC STD-020 Specification

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V_{DD} = 3.135V to 3.465V, T_A = -40°C to +85°C, unless otherwise noted.) (Typical values at +25°C, V_{DD} = 3.3V, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
V_{DD} Operating Supply Range	V_{DD}		3.135	3.3	3.465	V
V_{DD} Supply Current	I_{DD}	Output open		20	30	mA
Frequency	f_{OUT}	VC = 1.6V, V_{DD} = 3.3V, T_A = +25°C (Note 2)	f_{NOM} –8ppm	f_{NOM}	f_{NOM} +8ppm	MHz
Frequency vs. V_{DD} Sensitivity	V_{DD}ppm	V_{DD} = 3.3V ±5%	-3.5		+11.5	ppm/pF
Frequency vs. Load Sensitivity	LOADpmm	10pF to 20pF (Note 3)		-1		ppm
Frequency vs. Temperature	TEMPppm	From +25°C	-20		+20	ppm
VC Voltage Range	VC_{RANGE}		0.3	1.60	2.8	V
Frequency Tuning Sensitivity	VC_{SEN}		41		164	ppm/V
Tuning Voltage Bandwidth	VC_{BW}	(Note 3)	10			kHz
Absolute Pull Range	f_{TUNE}	VC = 0.3V to 2.8V (Note 2)	-69		+69	ppm
VC Input Leakage	I_{LCV}	VC = 0V to V_{DD}	-500		+500	nA
Aging, First Year	AGEppm		-5		+5	ppm
Aging, Years 0–10	t_{AGE}	Total aging	-10		+10	ppm
LVDS OUTPUT						
Output High Voltage	$V_{OHLVDSO}$	(Note 4)			1.475	V
Output Low Voltage	$V_{OLLVDSO}$	(Note 4)	0.925			V
Differential Output Voltage	$V_{ODLVDSO}$	(Note 4)	250		400	mV
Output Common-Mode Variation	$V_{LVDSOCOM}$	(Note 4)			150	mV
Offset Output Voltage	$V_{OFFLVDSO}$	(Note 4)	1.125		1.275	V
Differential Output Impedeance	R_{OLVDSO}	(Note 3)	80		140	Ω
Output Current	$I_{VSSLVDSO}$	Short ground			40	mA
Output Current	I_{LVDSO}	Short together (Note 3)			12	mA
Output Rise Time (Differential)	t_{RLVDSO}	20% to 80% (Note 3)	150			ps
Output Fall Time (Differential)	t_{FLVDSO}	80% to 20% (Note 3)	150			ps

ELECTRICAL CHARACTERISTICS (continued)

(V_{DD} = 3.135V to 3.465V, T_A = -40°C to +85°C, unless otherwise noted.) (Typical values at +25°C, V_{DD} = 3.3V, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
LVCMOS OUTPUT						
Output Logic 0	V_{OL}	Output Current -450µA	0		0.4	V
Output Logic 1	V_{OH}	Output Current +450µA	V_{DD} - 0.8V		V_{DD}	V
Output Rise Time	t_R	Load condition: 10pF to ground; 10% to 90% V_{DD} (Note 3)			2	ns
Output Fall Time	t_F	Load condition: 10pF to ground; 90% to 10% V_{DD} (Note 3)			2	ns
Duty Cycle	D_{CYC}	Load condition: 10pF, V_{DD} / 2 (Note 3)	40		60	%
Harmonics	H	V_{DD} = 3.3V, T_A = +25°C (Note 3)		-18	-8	dBc/Hz
SSB PHASE NOISE AND JITTER, V_{DD} = 3.3, T_A = +25°C (Note 3)						
10Hz Offset		LVCMOS		-74		dBc/Hz
100Hz Offset				-105		
1kHz Offset				-130		
10kHz Offset				-147		
100kHz Offset				-150		
Jitter (12kHz to 80MHz)				1		ps_{RMS}

Note 1: Limits at -40°C are guaranteed by design and not production tested.
Note 2: 10pF, LVCMOS.
Note 3: Guaranteed by design and not production tested.
Note 4: 100Ω differential load.

Pin Description

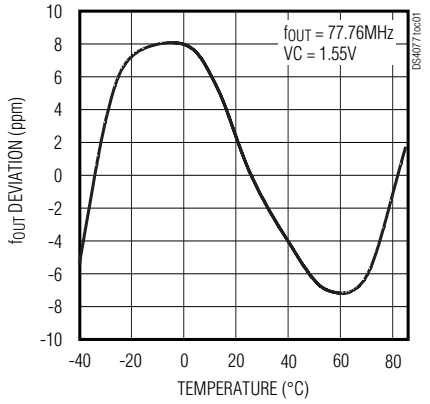
PIN		NAME	FUNCTION
LVCMOS	LVDS		
1	1	VC	VCXO Control Voltage
2, 5, 7, 8, 9	2, 7, 8, 9	N.C.	No Connection
3	3	V_{SS}	Ground
4	—	LVCMOS	LVCMOS Output
6	6	V_{DD}	DC Power
—	4, 5	LVDSO+/LVDSO-	LVDS Positive and Negative Outputs

77.76MHz VCXO

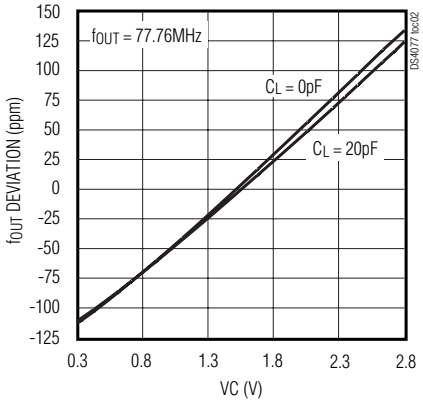
Typical Operating Characteristics

(V_{CC} = +3.3V, T_A = +25°C, unless otherwise noted.)

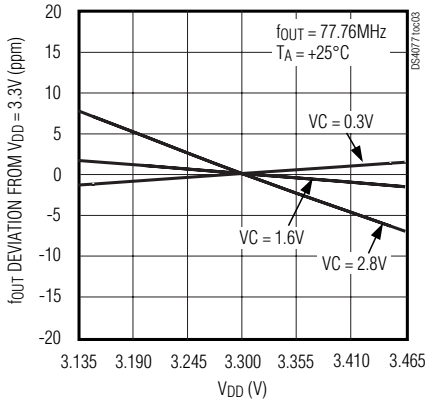
FREQUENCY vs. TEMPERATURE



LVCMOS OUTPUT FREQUENCY vs. LOAD CAPACITANCE vs. VC



OUTPUT FREQUENCY vs. SUPPLY VOLTAGE vs. VC



Package Information

(For the latest package information, go to **www.maxim-ic.com/DallasPackInfo** and click on package drawing 56-G6034-001.)