Waveformer™

DDS-1 FREQUENCY SYNTHESIZER

Most DDSs are used to augment either PLL or mix/filter circuitry, or as a modulator, and in such applications the DDS-1 is the industry's most powerful digital signal generator. Examples of such architectures appear below.

The Waveformer (DDS-1) permits fully synthesized and all-digital construction of the output, with fine control over frequency, phase and amplitude. It is an advanced **single-chip** synthesizer that includes accumulator, memory, digital-to-analog converter (DAC) and all other required circuit functions except the clock and the output filter, which are to be selected by the user.

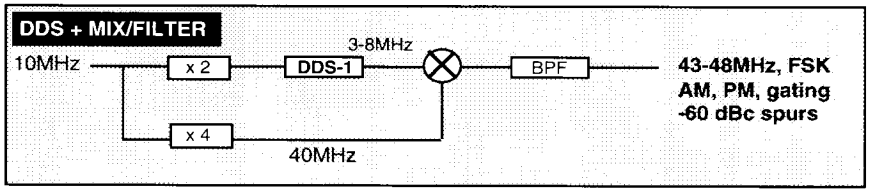
The DDS-1 is a versatile signal source, with true digital AM & PM, plus a unique built-in FSK function and one-bit >>100dB gating. It is a theoretically perfect FSK modulator, and is suited to all other modulation modes. **Quadrature output is also available - consult the factory.**

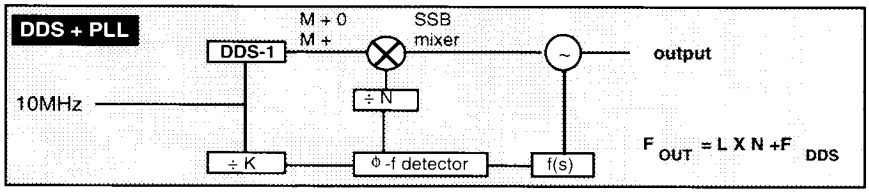
PERFORMANCE SPECIFICATIONS

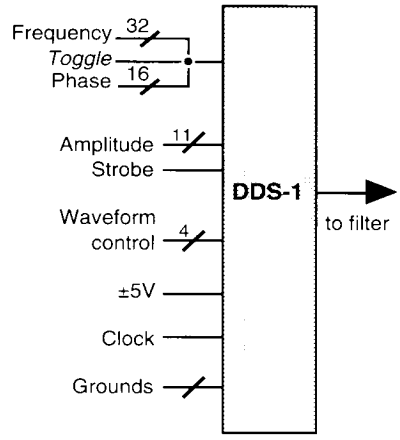
GENERAL OPERATING PERFORMANCE	
FREQUENCY RANGE	over 11 MHz
MAXIMUM CLOCK	up to 25 MHz
FREQUENCY STEPS	~5 mHz at 25 MHz clock
SWITCHING SPEED	< 1 µsec
SWITCHING MODE	phase-continuous
OUTPUT SIGNALS	SINE, 1V P-P into open circuit (complementary)
SPURS @20 MHz F_{CK}	<-60 dBc after the DAC (guaranteed)*
PHASE NOISE	per the clock, without degradation
WORK CONTROL	
AMPLITUDE	11 bits, binary weighting
FREQUENCY	auto-FSK, 1-bit toggle (user sets only F1 and F)
PHASE	16 bits, binary weighting (~.006°)
GATING	>>100 dB ON/OFF, 1-bit control
OPERATING CONDITIONS	
OPERATING TEMP	0° to +50°C (extended range avail)
NON-OP TEMP	-20° to +70° C
POWER (@10 MHz clock)	+5V @ 150 mA, -5.2V @ 100 mA, 1.25W total
THERMAL INTERFACE	no special requirements (see power)
ELECTRICAL INTERFACE	user/system supplies clock, control, power and output filter
MECHANICALS	
DIMENSIONS	1" x 1" ceramic package
INTERFACE/CONNECTOR	84-pin LCC - equivalent
WEIGHT	<20 grams
EVALUATION BOARD	
PERFORMANCE	exactly as above
SIZE	2.5 x 3.0 inches
CONNECTORS	IDC (power/control), SMA (RF)
CLOCK	External @ 25 MHz, TTL

*<5 MHz output

TYPICAL APPLICATIONS







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DDS-1 PINOUT

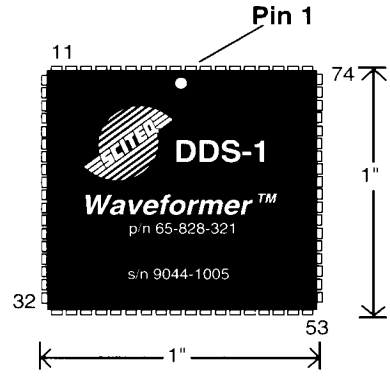
Pin	Function	Pin	Function	Pin	Function	Pin	Function
75 (J2)	OUTPUT RF	12 (3)	F2	33 (20)	F19/P3	54 (38)	A3 - N/U
76 (*)	analog gnd	13 (4)	F3	34 (21)	F20/P4	55 (39)	A4
77 (*)	digital gnd	14 (5)	F4	35 (23)	F22/P6	56 (40)	A5
78 (9,11)	V_{cc}	15 (6)	F5	36 (22)	F21/P5	57 (41)	A6
79 (9,11)	V_{cc}	16 (7)	F6	37 (24)	F23/P7	58 (42)	A7
80 (7)	clock (TTL)	17 (*)	digital gnd	38 (9,11)	V_{cc}	59 (43)	A8
81 (*)	analog gnd	18 (9,11)	V_{cc}	39 (*)	digital gnd	60 (44)	A9
82 (9,11)	V_{cc}	19 (9)	F8	40 (25)	F24/P8	61 (45)	A10
83 (*)	digital gnd	20 (8)	F7	41 (26)	F25/P9	62 (42)	A11
84 (9,11)	V_{cc}	21 (10)	F9	42 (28)	F27/P11	63 (47)	A12
1 (*)	digital gnd	22 (11)	F10	43 (27)	F26/P10	64 (49)	A14 (MSB)
2 (7)	clock (TTL)	23 (12)	F11	44 (29)	F28/P12	65 (9,11)	V_{cc}
3 (9,11)	V_{cc}	24 (13)	F12	45 (31)	F30/P14	66 (48)	A13
4 (8)	register command word	25 (15)	F14	46 (30)	F29/P13	67 (*)	digital gnd
5 (5)	register command word	26 (14)	F13	47 (32)	F31 (MSB)/P15	68 (*)	digital gnd
6 (6)	mode command word	27 (16)	F15	48 (4)	amplitude strobe	69 (*)	digital gnd
7 (3)	mode command word	28 (17)	F16/P0	49 (35)	AO (LSB) - N/U	70 (9,11)	V_{cc}
8 (9,11)	V_{cc}	29 (18)	F17/P1	50 (9,11)	V_{cc}	71 (10)	V_{EE}
9 (*)	digital gnd	30 (9,11)	Vcc	51 (*)	digital gnd	72 --	comp - DAC
10 (1)	FO (LSB) freq ctrl	31 (*)	digital gnd	52 (36)	A1- N/U	73 --	ref - DAC
11 (2)	F1	32 (19)	F18/P2	53 (37)	A2 - N/U	74	OUTPUT RF

EVALUATION BOARD NOTES:

1. Pin assignments are shown in parentheses.
2. V_{CC}(9,11), V_{EE}(10), clock input (7), amplitude strobe (4), and mode function (8,5,6,3) are located on 12-pin IDC header (J4) -all other pins are located on 50-pin IDC header (J1).

Pins 4/5 and 6/7 define 2-bit control words		
4(8)	**5(5)**	**Register Command Word**
0	0	Both registers held constant
0	1	Main register enabled only
1	0	Delta register enabled only
1	1	Delta output=0, main register enabled
6(6)	**7(3)**	**Mode Command Word**
0	0	Reset to DC
0	1	Frequency accumulation (FSK)
1	0	Phase accumulation
1	1	*not allowed*

CLCC - equivalent package



SOCKET : AMP P/N 821573-1 or equivalent

OTHER PINS	
DEVICE	**EVAL BOARD**
Digital ground: 1,9,17,etc.	Ground: 33,34, 12
Analog ground: 76,81	
V_{CC}: 3,8,18,etc.	V_{CC}: 9, 11
V_{EE}: 71	V_{EE}: 10

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