



# Product Preview

## 2.0 GHz PLL Frequency Synthesizer

The MC145202-1 is pin-for-pin compatible with the previous generation MC145200, MC145201, and MC145202. Table 1 highlights the different features in these four devices. The MC145202-1 is recommended for new designs, and also offers improved suppression of reference sideband spurs.

The counters are programmed via a synchronous serial port which is SPI compatible. The serial port is byte-oriented to facilitate control via an MCU. Due to the innovative BitGrabber Plus™ registers, the MC145202-1 may be cascaded with other peripherals featuring BitGrabber Plus without requiring leading dummy bits or address bits in the serial data stream. In addition, BitGrabber Plus peripherals may be cascaded with existing BitGrabber™ peripherals.

The device features a single-ended current source/sink phase detector A output and a double-ended phase detector B output. Both phase detectors have linear transfer functions (no dead zones). The maximum current of the single-ended phase detector output is determined by an external resistor tied from the Rx pin to ground. This current can be varied via the serial port.

Slew-rate control is provided by a special driver designed for the REF<sub>Out</sub> pin. This minimizes interference caused by REF<sub>Out</sub>.

This part includes a differential RF input that may be operated in a single-ended mode. Also featured are on-board support of an external crystal and a programmable reference output. The R, A, and N counters are fully programmable. The C register (configuration register) allows the part to be configured to meet various applications. A patented feature allows the C register to shut off unused outputs, thereby minimizing system noise and interference.

In order to have consistent lock times and prevent erroneous data from being loaded into the counters, on-board circuitry synchronizes the update of the A register if the A or N counters are loading. Similarly, an update of the R register is synchronized if the R counter is loading.

The double-buffered R register allows new divide ratios to be presented to the three counters (R, A, and N) simultaneously.

- Maximum Operating Frequency: 2000 MHz @ -10 dBm
- Operating Supply Current: 4 mA Nominal at 3.0 V
- Operating Supply Voltage Range (V<sub>DD</sub>, V<sub>CC</sub>, V<sub>PD</sub> Pins): 2.7 to 5.5 V
- Current Source/Sink Phase Detector Output:  
1.7 mA @ 5.0 V or 1.0 mA @ 3.0 V
- Gain of Current Source/Sink Phase/Frequency Detector Controllable via Serial Port
- R Counter Division Range: 1 and 5 to 8191
- Dual-Modulus Capability Provides Total Division up to 262,143
- High-Speed Serial Interface: 4 Mbps
- Output A Pin, When Configured as Data Out, Permits Cascading of Devices
- Two General-Purpose Digital Outputs:  
Output A: Totem-Pole (Push-Pull) with Four Output Modes  
Output B: Open-Drain
- Patented Power-Saving Standby Feature with Orderly Recovery for Minimizing Lock Times, Standby Current: 30 μA
- See App Note AN1253/D for Low-Pass Filter Design, and AN1277/D for Offset Reference PLLs for Fine Resolution or Fast Hopping

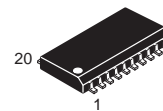
BitGrabber and BitGrabber Plus are trademarks of Motorola, Inc.

This document contains information on a product under development. Motorola reserves the right to change or discontinue this product without notice.

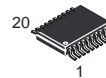
# MC145202-1

## PLL FREQUENCY SYNTHESIZER

### SEMICONDUCTOR TECHNICAL DATA

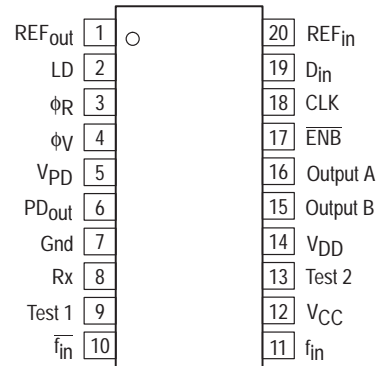


**F SUFFIX**  
PLASTIC PACKAGE  
CASE 751J  
(SO-20)



**DT SUFFIX**  
PLASTIC PACKAGE  
CASE 948D  
(TSSOP-20)

### PIN CONNECTIONS



(Top View)

### EVALUATION KIT

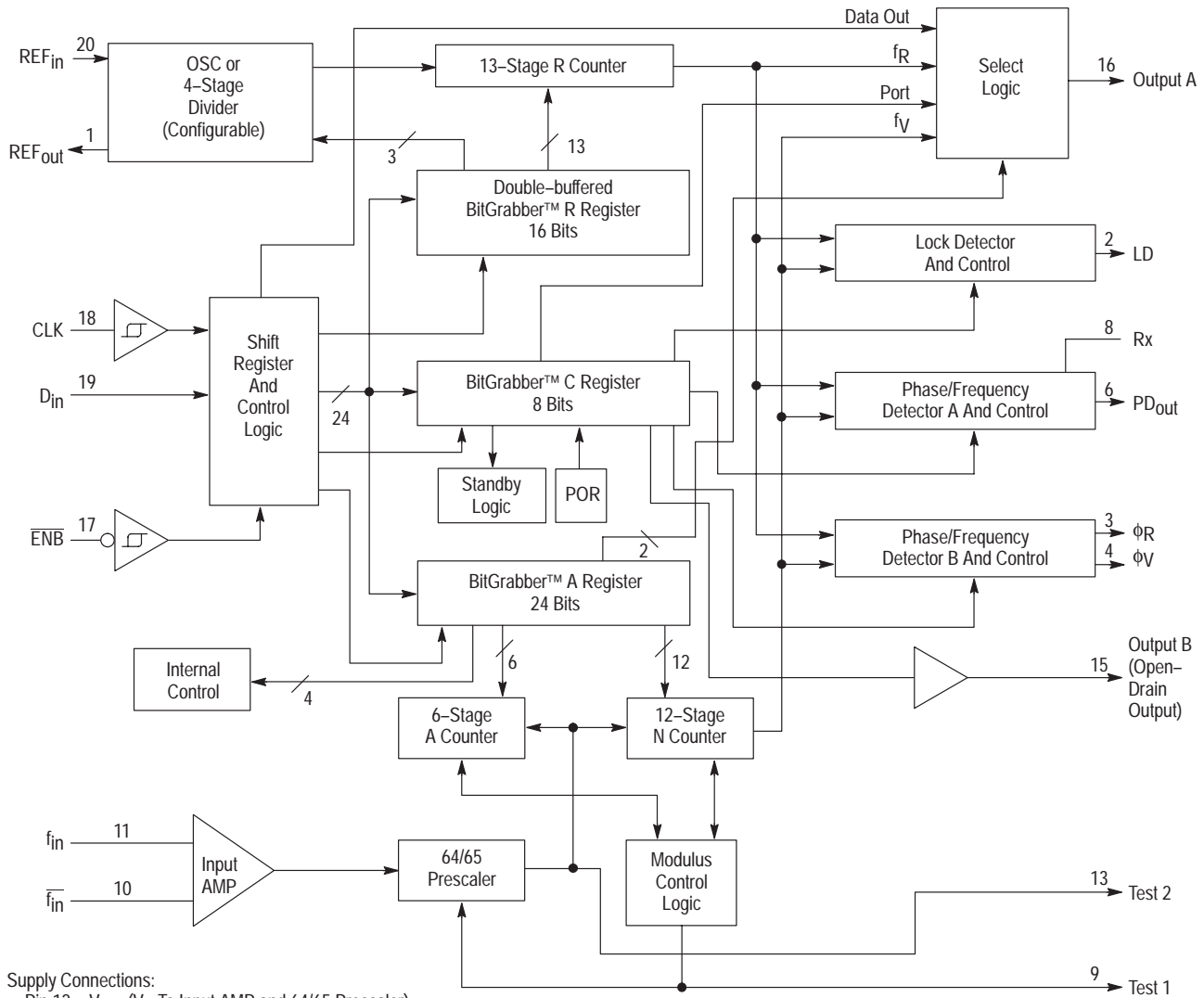
The P/N TBD, which contains hardware and software, will be available.

### ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC145202F1	T <sub>A</sub> = -40 to 85°C	SO-20
MC145202DT1		TSSOP-20

# MC145202-1

## BLOCK DIAGRAM



Supply Connections:  
 Pin 12 = V<sub>CC</sub> (V+ To Input AMP and 64/65 Prescaler)  
 Pin 5 = V<sub>PD</sub> (V+ To Phase/Frequency Detectors A and B)  
 Pin 14 = V<sub>DD</sub> (V+ To Balance Of Circuit)  
 Pin 7 = Gnd (Common Ground)

**Table 1. Differences in the PLL Frequency Synthesizers**

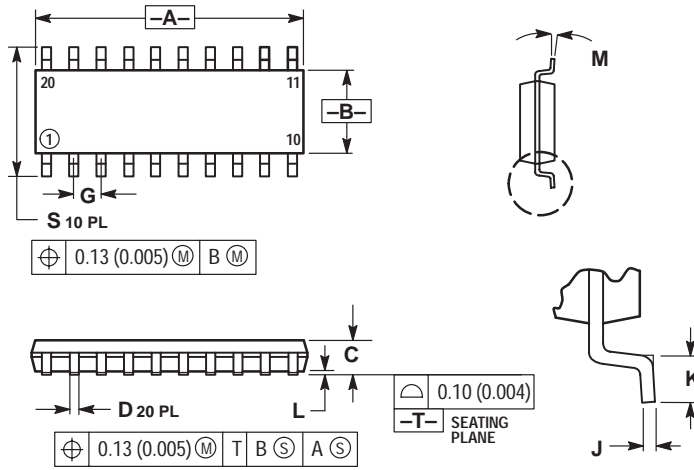
Parameter	Preferred	Not Recommended For New Designs		
	MC145202-1	MC145202	MC145201	MC145200
Supply Voltage, V <sub>DD</sub> and V <sub>CC</sub> (main supply)	2.7 to 5.5 V	2.7 to 5.5 V	4.5 to 5.5 V	4.5 to 5.5 V
Supply Voltage, V <sub>PD</sub> (charge pump supply)	2.7 to 5.5 V	2.7 to 5.5 V	4.5 to 5.5 V	8.0 to 9.5 V
Supply Current	4 mA	4 mA	12 mA	12 mA
Value of External Resistor Rx, typical	3.9 kΩ for 1.7 mA [Note]	3.9 kΩ for 1.7 mA	18 kΩ for 2.0 mA	47 kΩ for 2.0 mA
Serial Programming with only 1 PLL (not cascaded)	Same, No Change	Same	Same	Same
Serial Programming with 2 or more PLLS (cascaded)	No leading dummy bits	No leading dummy bits	Leading dummy bits	Leading dummy bits

**NOTE:** Preliminary value.

# MC145202-1

## OUTLINE DIMENSIONS

### F SUFFIX PLASTIC PACKAGE CASE 751J-02 (SO-20) ISSUE A

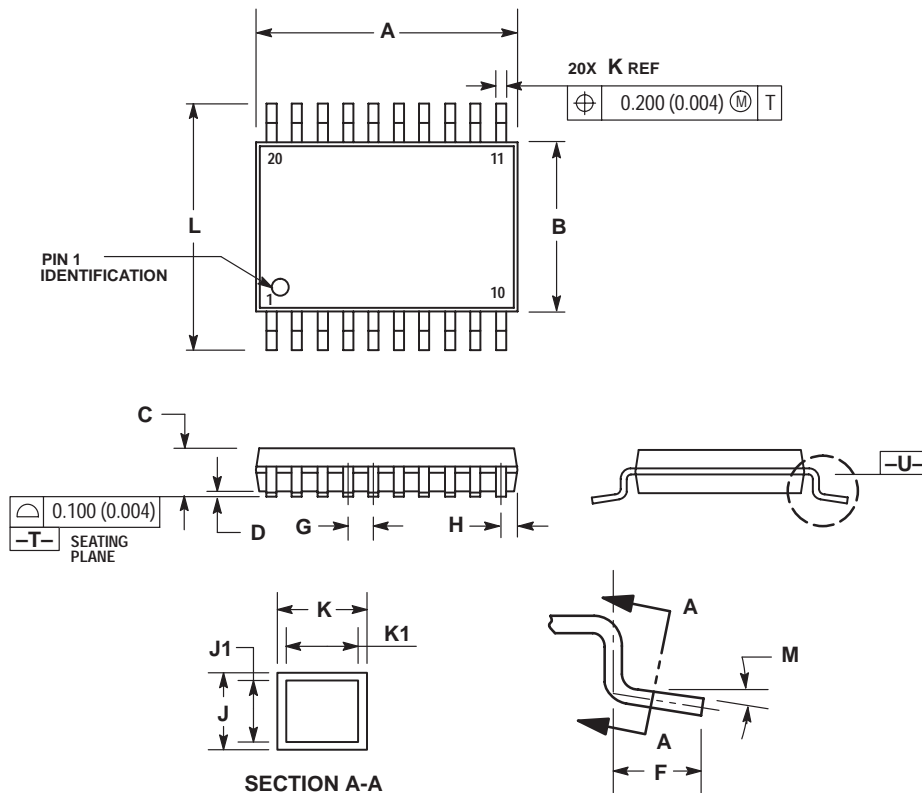


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.12 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.55	12.80	0.494	0.504
B	5.10	5.40	0.201	0.213
C	---	2.00	---	0.079
D	0.35	0.45	0.014	0.018
G	1.27 BSC		0.050 BSC	
J	0.18	0.23	0.007	0.009
K	0.55	0.85	0.022	0.033
L	0.05	0.20	0.002	0.008
M	0°	7°	0°	7°
S	7.40	8.20	0.291	0.323


### DT SUFFIX PLASTIC PACKAGE CASE 948D-03 (TSSOP-20) ISSUE B



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSIONS A AND B ARE TO BE DETERMINED AT DATUM PLANE -U-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	6.60	---	0.260
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.25	0.002	0.010
F	0.45	0.55	0.018	0.022
G	0.65 BSC		0.026 BSC	
H	0.275	0.375	0.011	0.015
J	0.09	0.24	0.004	0.009
J1	0.09	0.18	0.004	0.007
K	0.16	0.32	0.006	0.013
K1	0.16	0.26	0.006	0.010
L	6.30	6.50	0.248	0.256
M	0°	10°	0°	10°

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

**How to reach us:**

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution;  
P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

**JAPAN:** Motorola Japan Ltd.; SPD, Strategic Planning Office, 141,  
4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan. 81-3-5487-8488

**Customer Focus Center: 1-800-521-6274**

**Mfax™:** RMFAX0@email.sps.mot.com – TOUCHTONE 1-602-244-6609  
Motorola Fax Back System – US & Canada ONLY 1-800-774-1848  
– <http://sps.motorola.com/mfax/>

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre,  
2, Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.  
852-26668334

**HOME PAGE:** <http://motorola.com/sps/>

