



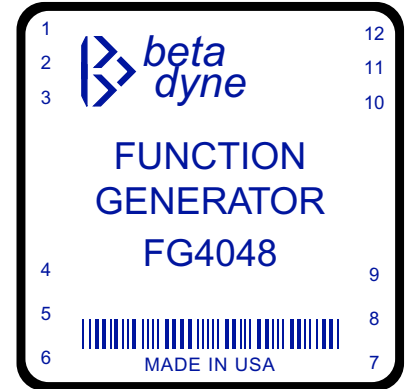
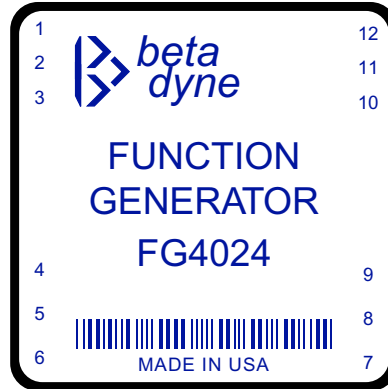
FG4024 & FG4048

FUNCTION GENERATORS

Programmable Frequency

Key Features

- Programmable sine, square and triangular wave outputs
- 3-port SPI compatible microprocessor
- Double-buffered data latch
- 1.2Hz resolution
- DC to 40kHz
- Internal DC/DC converter
- 60µA off state current
- Hot pluggable
- 5W of auxiliary output power



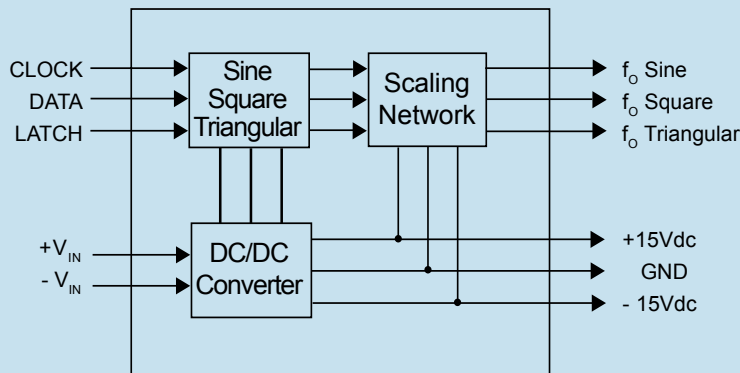
Beta Dyne is protected under various patents, including but not limited to U.S. Patent numbers: 5,777,519; 6,188,276; 6,262,901; 6,452,818; 6,473,3171.

Applications

- Telecom
- Test Pattern Generator
- Test and Measurement
- Uninterruptible Power Supply
- Automatic Test Equipment

Functional Description

The FG40 series of programmable function generators provide independent sine, square and triangular wave outputs at variable frequencies from 1.2Hz to 40kHz at a resolution of 1.2Hz increments. These triple output function generators include an internal DC/DC converter for auxiliary power needs. Two models are offered: the FG4024 offers an input voltage range from 18V_{IN} to 36V_{IN}; and the FG4048 offers an input range from 36V_{IN} to 75V_{IN}. Each model is capable of providing auxiliary output power of ±15V_{OUT} at up to 150mA.



$$f_o = \frac{f_{\text{CLOCK}} (D_{15} - D_0)_{\text{DEC}}}{2^{23}}$$

Serial Digital Interface

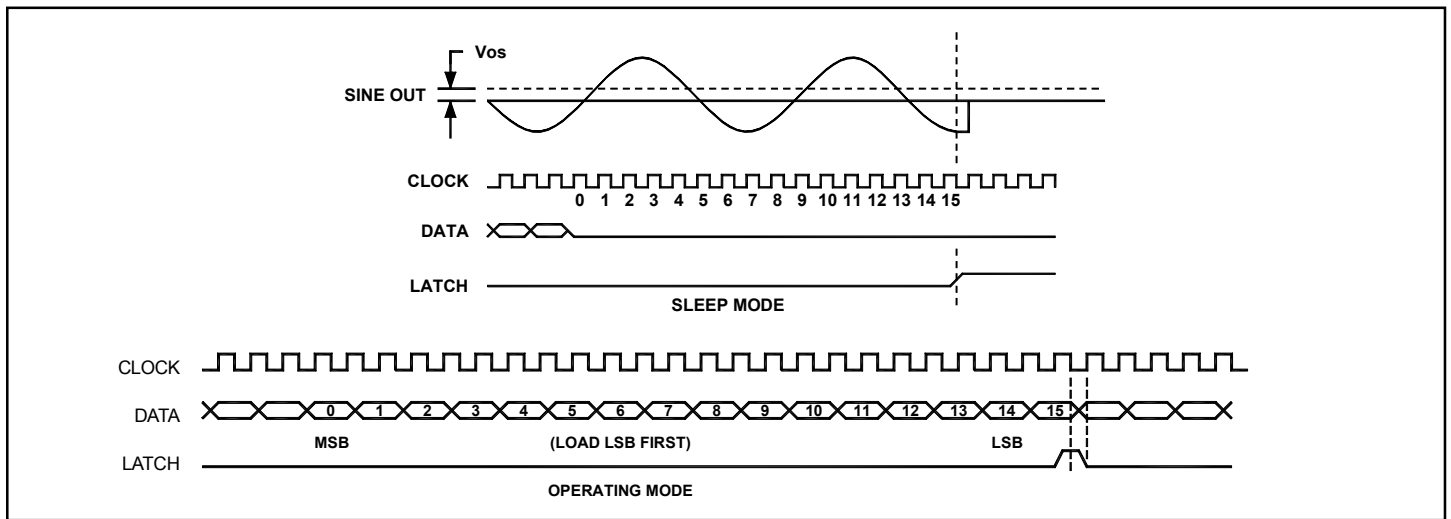
OSCILLATOR

Unless otherwise specified, all parameters are given under typical +25°C with nominal input voltage and under full output load conditions.

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Clock Input Low Voltage	(See App. Note FG-001)			1.5	Vdc
Clock Input High Voltage	(See App. Note FG-001)	3.5			Vdc
Clock Input Low Current	(See App. Note FG-001)	-250			μA
Clock Input High Current	(See App. Note FG-001)			250	μA
Clock Input Capacitance			12		pF
Clock On/Off Period, t_{CLOCK}	$t_r = t_f = 10\text{nS}@2.5\text{V}$ midpoint, See Serial Interface Timing	30			nS

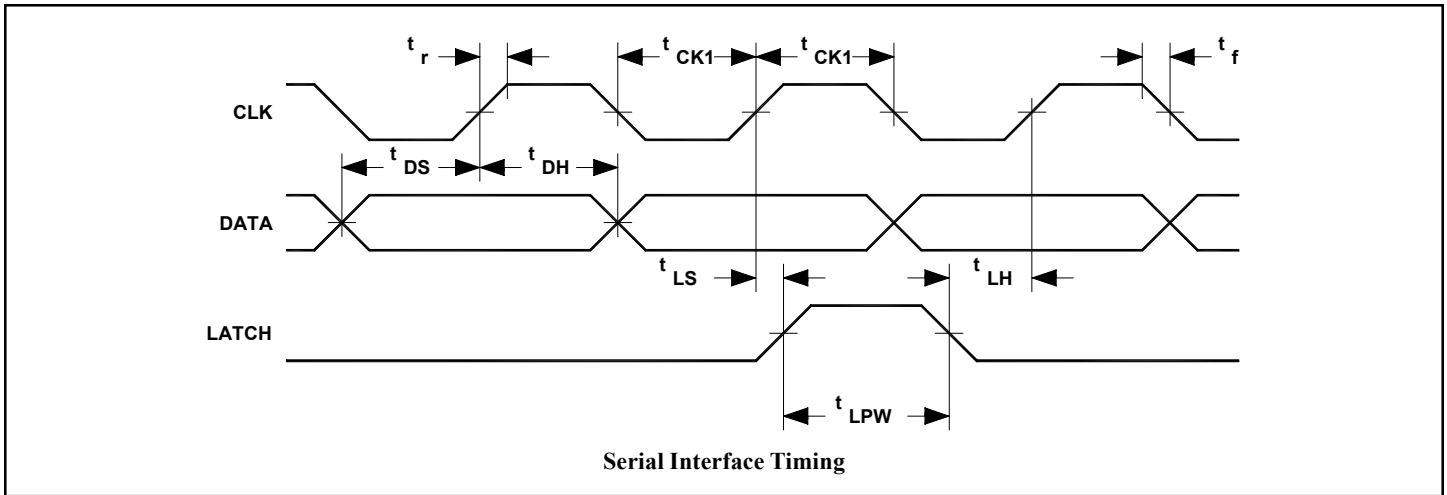
LOGIC INPUTS: CLOCK, DATA, LATCH

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Input Low Voltage				0.8	Vdc
Input High Voltage		2			Vdc
Input Low Current	$V_{\text{IN}} = 0\text{V}$	-1			μA
Output Low Current	$V_{\text{IN}} = V_{\text{CC}}$			1	μA
Output Low Voltage	$I_{\text{OL}} = -2\text{mA}$			0.4	Vdc
Output High Voltage	$I_{\text{OH}} = -2\text{mA}$	4			Vdc
Clock On/Off Period, t_{CLOCK}	See Serial Interface Timing	100			nS
Data Setup Time, t_{DS}		50			nS
Data Hold Time, t_{DH}		50			nS
Latch Pulse Width, t_{LPW}		50			nS
Latch Hold Time, t_{LH}		50			nS
Latch Setup Time, t_{LS}		50			nS



OUTPUT WAVEFORMS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Total Harmonic Distortion, 20Hz to 5kHz	(See App. Note FG-001)		0.14	0.17	%
Total Harmonic Distortion, 5kHz to 25kHz	(See App. Note FG-001)		0.30	0.70	%
Total Harmonic Distortion, 25kHz to 40kHz	(See App. Note FG-001)		0.80	1.00	%
Gain Error, 20Hz to 5kHz	(See App. Note FG-001)			±0.15	dB
Gain Error, 5kHz to 25kHz	(See App. Note FG-001)			±0.30	dB
Gain Error, 25kHz to 40kHz	(See App. Note FG-001)			±0.60	dB
Offset Voltage				6.6	mV
Output Voltage Swing, Sine wave		±10			Vdc
Output Voltage Swing, Triangle wave		±11			Vdc
Output Voltage Swing, Square wave		±15			Vdc
Slew Rate	$R_L = 2\text{k}, C_L = 500\text{pF}$		±13		V/μS
Output Frequency	User programmable	1.2	4000	80000	Hz
Output Current	Any waveform output		3		mA
Short Circuit Current	Any waveform output		10		mA



DC/DC Converter Section

INPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Supply Voltage Range, FG4024		18	24	36	Vdc
Supply Voltage Range, FG4048		36	48	75	Vdc
Input Current, No Load, FG4024			45		mA
Input Current, No Load, FG4048			30		mA
Input Current, Full Load, FG4024			290		mA
Input Current, Full Load, FG4048			142		mA
Short Circuit Current		10	20	30	mA
Input Reflected Ripple, FG4024			100		mA _{PP}
Input Reflected Ripple, FG4048			50		mA _{PP}
Start-up Threshold			10		Vdc
Under Voltage Shutdown			10		Vdc
Input Filter Type	LC Filter				
Off State Input Current, FG4024			60		μA
Off State Input Current, FG4048			60		μA
Remote On/Off Control, ON	Pin 5 open, 10Vdc@100μA, internal pullup				
Remote On/Off Control, OFF	Jumper Pin 5 to -V _{IN}				
Case Connection, FG4024	-V _{IN}				
Case Connection, FG4048	+V _{IN}				

OUTPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Voltage		±14.7	±15.0	±15.4	Vdc
Voltage Imbalance				3	%
Output Current		±10	±160	±160	mA
Short Circuit Protection	Indefinite				
Load Step Response	50% to FL, FL to 50%		100	200	μS
Turn On Delay			8		mS
Output Ripple & Noise	20MHz bandwidth (See App. Note FG-001)		100	150	mV _{PP}
Load Regulation	Minimum to FL			1	% of V _O
Line Regulation	Minimum to maximum input voltage			±0.5	%
Temperature Coefficient	Nominal line, FL		±0.01	±0.02	%/°C
Derating	No derating -40°C to +85°C				

NOTES

1. Converting THD from % to dB: THD in dB = (THD in %) / 100
2. To measure offset voltage, put the Function Generator in sleep mode and measure the sine and triangular wave output voltage. The square wave output will be between +V_{cc} and -V_{cc}.
3. Specifications are subject to change without notice.
4. All specifications are typical @ +25°C with nominal input voltage and under full power conditions, unless otherwise noted.

GENERAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Isolation Voltage		1000	1500		V _{RMS}
Isolation Resistance			10 ⁹		Ω
Thermal Resistance	Case to ambient		2		°C/W
MTBF	per MIL-HDBK-217F (Ground benign, +25°C)		1×10 ⁶		hours

ENVIRONMENTAL SPECIFICATIONS

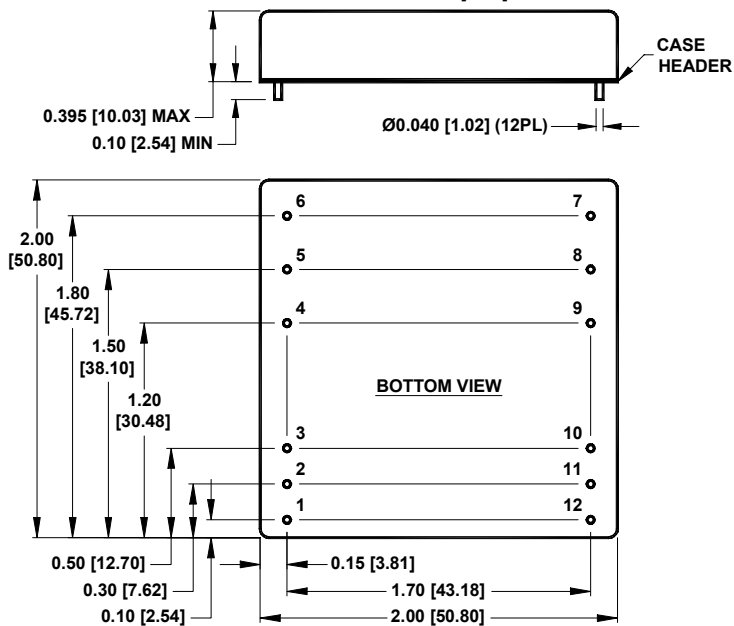
PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Humidity	Non-condensing			95	%
Storage Temperature		-60		+125	°C
Operating Temperature, Commercial		-40		+75	°C
Operating Temperature, Extended	Contact factory for price and availability	-55		+85	°C

PHYSICAL CHARACTERISTICS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Dimensions (L×W×H)	2.00×2.00×0.395 in. (50.80×50.80×10.03mm)				
Weight	2 oz. (58g)				
Case Material	Coated metal; Six-sided shielding				
Header	FR-4, non-conductive				
Potting	Thermally conductive				

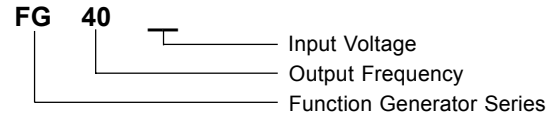
MECHANICAL SPECIFICATIONS

in inches [mm]



Pin	Function	Pin	Function
1	LATCH	7	+V _{OUT}
2	DATA	8	GND
3	CLOCK	9	-V _{OUT}
4	-V _{IN}	10	SINE
5	ON/OFF	11	SQUARE
6	+V _{IN}	12	TRIANGULAR

ORDERING GUIDE



MODEL CHART

Model	Output Frequency	Input Voltage	Output Voltage
FG4024	40kHz	24Vdc	±15Vdc
FG4048	40kHz	48Vdc	±15Vdc