Measurably better value

TG501xA/251xA Series

TGP31XX Series

TGF4XX2 Series

NUMBER OF CHANNELS	1 (TG5011AA, TG2511A)			1 (TGP3151, TGP3121)			2 (TGF4242, TGF4162, TGF4082, TGF4042)	
	2 (TG5012A, TG2512A)			2 (TGP3152, TGP3122)				
SINE FREQUENCY	1uHz – 50MHz (TG501xA)			1mHz – 50MHz (TGP315x)			1uHz – 240MHz (TGF4242)	
							1uHz – 160MHz (TGF4162)	
	1uHz – 25MHz (TG251xA)			1mHz – 25MHz (TGP312x)			1uHz – 80MHz (TGF4082)	
							1uHz – 40MHz (TGF4042)	
SINE FLATNESS	Relative to 1kHz			Relative to 1kHz			At 1Vpp. Relative to 10kHz	
	≤100kHz	±0.1dB		≤100kHz	±0.1dB		≤10MHz	±0.1dB
	≤5MHz	±0.15dB		≤5MHz	±0.5dB		≤100MHz	±0.2dB
	≤25MHz	±0.3dB		≤25MHz	±1.25dB		≤160MHz	±0.6dB
	≤50MHz	±0.5dB		≤50MHz	±1.75dB		≤240MHz	±1.0dB
SINE HARMONIC DISTORTION		<1Vpp	≥1Vpp		<1Vpp	≥1Vpp	At 1Vpp	
	≤20kHz	-65dBc	-65dBc	≤10MHz	-60dBc	-60dBc	≤10MHz	-65dBc
	≤100kHz	-60dBc	-60dBc	≤50MHz	-50dBc	-40dBc	≤50MHz	-50dBc
	≤1MHz	-45dBc	-45dBc	-	-	-	≤80MHz	-40dBc
	≤25MHz	-40dBc	-35dBc	-	-	-	≤160MHz	-35dBc
	≤50MHz	-40dBc	-65dBc	-	-	-	≤240MHz	-30dBc
SINE THD (<20kHz), TYPICAL	Not specified			Not specified			0.05%	
SINE NON-HARMONIC SPURIOUS	≤1MHz	-60dBc		-65dBc			-65dBc	
	≤50MHz	-60dBc + 6dB/octave						
SINE PHASE NOISE (10kHz OFFSET)	-115dBc/Hz (Typical)			-113dBc/Hz (Typical)			-113dBc/Hz (At 10MHz, 1Vpp)	
SQUARE FREQUENCY	1uHz – 50MHz (TG501xA)			1mHz – 50MHz (TGP315x)			1uHz – 100MHz (TGF4242)	
							1uHz – 100MHz (TGF4162)	
	1uHz – 25MHz (TG251xA)			1mHz – 25MHz (TGP312x)			1uHz – 25MHz (TGF4082)	
							1uHz – 25MHz (TGF4042)	
SQUARE RISE / FALL TIMES	<8ns (TG501xA)			5ns (TGP315x)			≤ 4Vpp	3ns (TGF4242, TGF4162)
							> 4Vpp	5ns (TGF4242, TGF4162)
	<13ns (TG251xA)			10ns (TGP312x)			10ns (TGF4042, TGF4082)	
SQUARE VARIABLE DUTY CYCLE	≤20MHz	20.0% to 80.0%		0.1% to 99.9%			0.001% to 99.999%	
	≤25MHz	40.0% to 60.0%		Width (positive, negative)	≥10ns (TGP315x) ≥20ns (TGP312x)		Width (positive, negative)	≥5ns (TGF4242, TGF4162) ≥20ns (TGF4082, TGF4042)
	≤50MHz	50.0% (Fixed)						
SQUARE JITTER (RMS)	500ps + 100ppm of period (Typical)			<30ps			<30ps	
SQUARE ASYMMETRY	5000ps + 1% of period (At 50% Duty Cycle)			±200ps ± 0.01% of period			±200ps ± 0.01% of period	
SQUARE OVERSHOOT / UNDERSHOOT	<5%			≤5% (TGP315x)			≤5%	
				≤3% (TGP312x)				
RAMP FREQUENCY	1uHz - 1MHz (TG501xA)			1mHz – 50MHz (TGP315x)			1uHz – 5MHz	
	1uHz – 500kHz (TG251xA)			1mHz – 25MHz (TGP312x)				
RAMP SYMMETRY	0.0% to 100.0%			0.0% to 100.0%			0.00% - 100.00%	
RAMP LINEARITY	<0.1% to 30kHz			<0.1% to 200kHz			<0.1% to 200kHz (TGF4242, TGF4162)	
							<0.1% to 100kHz (TGF4042, TGF4082)	
PULSE FREQUENCY	500uHz – 12.5MHz (TG501xA)			1mHz – 50MHz (TGP315x)			1mHz – 100MHz (TGF4242, TGF4162)	
	500uHz – 6.25MHz (TG251xA)			1mHz – 25MHz (TGP312x)			1mHz – 25MHz (TGF4082, TGF4042)	
PULSE OVERSHOOT / UNDERSHOOT	<5%			Edge time ≤5ns	5%		Edge time ≤5ns	5% (TGF4242, TGF4162)
				Edge time ≤10ns	3%		Edge time ≤10ns	3% (TGF4242, TGF4162) 5% (TGF4082, TGF4042)
				Edge time ≥20ns	2%		Edge time ≥20ns	2% (TGF4242, TGF4162) 3% (TGF4082, TGF4042)
PULSE JITTER	300ps + 0.01% of period (Typical)			<30ps RMS			<30ps RMS	

	TTi TG501xA/251xA Series		TTi TGP31XX Series	TTi TGF4XX2 Series	
PULSE WIDTH	Period ≤40s	20ns – 2000s	10ns – 1000s (TGP315x)	≤ 4Vpp	5ns – 1000s (TGF4242, TGF4162)
	Period ≤400s	200ns – 2000s	20ns – 1000s (TGP312x)	> 4Vpp	10ns – 1000s (TGF4242, TGF4162)
	Period ≤2000s	2us – 2000s		20ns – 1000s (TGF4082, TGF4042)	
PULSE WIDTH RESOLUTION	Period ≤40s	10ns	100ps	100ps	
	Period ≤400s	100ns			
	Period ≤2000s	1us			
PULSE WIDTH ACCURACY	Not specified		±200ps ± 0.01% of period	±200ps ± 0.01% of period	
PULSE WIDTH SETTING	Can be set as absolute width or duty cycle. Duty cycle resolution dependent on current period.		Can be set as absolute width, duty cycle or fall time delay. Duty cycle resolution 0.1%. Fall time delay resolution 100ps.	Can be set as absolute width, or duty cycle. Duty cycle resolution 0.001%.	
PULSE EDGE	8ns – 40us (TG501xA)		5ns – 800s (TGP315x)	≤ 4Vpp	3ns – 800s (TGF4242, TGF4162)
				> 4Vpp	5ns – 800s (TGF4242, TGF4162)
	13ns – 40us (TG251xA)		8ns – 800s (TGP312x)	8ns – 800s (TGF4082, TGF4042)	
PULSE EDGE RESOLUTION	Edge time ≤100ns	100ps	100ps	100ps	
	Edge time ≤2us	1ns			
	Edge time ≥40us	10ns			
PULSE EDGE ACCURACY	Not specified		±500ps ±0.01% of period	±500ps ±0.01% of period	
PULSE EDGE SETTING	Rise and fall times can be independently varied (only within a range, 3 ranges available) or can be varied together simultaneously.		Rise and fall times can be independently varied or can be varied together simultaneously and can be entered as absolute rise/fall time or as a % of width	Rise and fall times can be independently varied or can be varied together simultaneously and can be entered as absolute rise/fall time.	
PULSE DELAY	0ns – 2000s		0ns – 1000s	0ns – 1000s	
PULSE DELAY RESOLUTION	Period ≤40s	10ns	100ps	-	
	Period ≤400s	100ns			
	Period ≤2000s	1us			
PULSE DELAY ACCURACY	Not specified		±200ps ±0.01% of period	±200ps ±0.01% of period	
PULSE DELAY SETTING	Delay can only be entered as absolute delay.		Delay can be entered as absolute delay, phase or % of period	Delay can be entered as absolute delay or phase	
DOUBLE PULSE	Not offered		Offered extensively. See specification for more detail. The width of the two pulses can be varied independently.	Not offered	
ARB FREQUENCY	1uHz – 10MHz (TG501xA)		1mHz – 50MHz (TGP315x)	1uHz – 80MHz (TGF4242, TGF4162)	
	1uHz – 6MHz (TG251xA)		1mHz – 25MHz (TGP312x)	1uHz – 40MHz (TGF4082, TGF4042)	
ARB VERTICAL RESOLUTION	14 bits		16 bits	16 bits (TGF4242, TGF4162)	
				14 bits (TGF4082, TGF4042)	
ARB SAMPLING RATE	125Msps		800Msps	800Msps (TGF4242, TGF4162)	
				400Msps (TGF4082, TGF4042)	
MAXIMUM POINTS IN ARB	131072		4096	8192	
ARB MINIMUM RISE / FALL TIME	Not specified		Not specified	<5ns or <8ns, user selectable (TGF4242, TGF4162)	
				<8ns (TGF4082, TGF4042)	
EFFECTIVE ANALOGUE BANDWIDTH (-3dB)	Not specified		Not specified	62.5MHz, 100MHz, user selectable (TGF4242, TGF4162)	
				62.5MHz (TGF4082, TGF4042)	
ARB JITTER (POINT TO POINT)	8ns		1.25ns	1.25ns (TGF4242, TGF4162)	
				2.5ns (TGF4082, TGF4042)	
BUILT-IN ARB EDITING	Point edit, resize, interpolation, insert lines. Waveforms can also be downloaded via remote interfaces.		Point edit, resize, interpolation, insert lines. Waveforms can also be downloaded via remote interfaces.	Point edit, resize, interpolation, insert lines. Waveforms can also be downloaded via remote interfaces.	
ARB ARCHITECTURE	DDS		DDS	DDS	

	TTi TG501xA/251xA Series	TTi TGP31XX Series	TTi TGF4XX2 Series	
PRBS	1ubps – 50Mbps (TG501xA)	1mbps – 50Mbps (TGP315x)	1ubps – 100Mbps	
	1ubps – 25Mbps (TG251xA)	1mbps – 25Mbps (TGP312x)	Only available in TGF4242 and TGF4162.	
PRBS EDGE	8ns – 40us (TG501xA)	5ns – 800s (TGP315x)	≤ 4Vpp	3ns
	13ns – 40us (TG251xA)	8ns – 800s (TGP312x)	> 4Vpp	5ns
PRBS SEQUENCE LENGTH	7,9,11,15,20,23	7,9,11,15,20,23,29,31	7,9,11,15,20,23,29,31	
USER DEFINED PATTERN	Not offered	Offered. Maximum pattern length 65536. 4 patterns can be stored in the instrument. Built-in pattern editing provided. Patterns can also be downloaded via remote interfaces.	Not offered	
EXTERNAL PATTERN (EXTERNAL WIDTH)	Not offered	External 1: Pattern is applied at external modulation input. Indefinite pattern length. Up to 5Mbps. Pattern is sampled at 50Mbps with user defined pattern threshold level. Input to output jitter 20ns.	Not offered	
		External 2 (external width): Pattern is applied at external trigger input. Indefinite pattern length. Up to 50Mbps (TGP315x) or 25Mbps (TGP312x). Fixed latency. User defined threshold level. Input to output jitter 60ps RMS.		
NOISE BANDWIDTH (-3dB)	20MHz	1mHz – 25MHz (TGP315x)	100MHz (TGF4242, TGF4162)	
		1mHz – 12.5MHz (TGP315x)	62.5MHz (TGF4082, TGF4042)	
NOISE AMPLITUDE DISTRIBUTION	Gaussian (Crest Factor 5.27)	Gaussian (Crest Factor 3.3, 4.8, 6.0 or 7.0) or user defined. Built-in user defined distribution editing provided. User defined distribution can also be downloaded via remote interfaces.	Gaussian (Crest Factor 5.16) (TGF4242, TGF4162)	
			Gaussian (Crest Factor 6.4) (TGF4082, TGF4042)	
HARMONIC OUTPUT	Not offered (but possible using latest version of Waveform Manager Plus software).	Not offered (but possible using latest version of Waveform Manager Plus software).	1uHz – 80MHz Only available in TGF4242 and TGF4162. Order ≤50, Up to 16 different harmonics order can be defined. Amplitude and phase offset of each harmonics can be user defined. Harmonic waveform can also be created using Waveform Manager Plus software and downloaded via remote interfaces.	
AMPLITUDE	10mVp-p to 10Vp-p into 50Ω. Amplitude can be specified open circuit or into an assumed load of 1Ω to 10kΩ in Vpp, Vrms or dBm.	100mVp-p to 10Vp-p into 50Ω (50Ω source) or 200mVp-p to 20Vp-p into 50Ω (5Ω source). Amplitude can be specified open circuit or into an assumed load of 50Ω to 10kΩ in Vpp.	≤80MHz (TGF4242, TGF4162) ≤50MHz (TGF4082) ≤40MHz (TGF4042)	10mVp-p to 10Vp-p into 50Ω
			≤120MHz (TGF4242, TGF4162) ≤80MHz (TGF4082)	10mVp-p to 5Vp-p into 50Ω
			≤240MHz (TGF4242) ≤160MHz (TGF4162)	10mVp-p to 2.5Vp-p into 50Ω
			Amplitude can be specified open circuit or into an assumed load of 1Ω to 10kΩ in Vpp.	
AMPLITUDE RESOLUTION & ACCURACY	1mVpp, 2% ±1mV	1mVpp, 1.5% ±5mV	1mVpp, 1.5% ±5mV	
OFFSET	±5V into 50Ω	±5V into 50Ω (50Ω source) ±10V into 50Ω (5Ω source)	±5V into 50Ω	
OFFSET RESOLUTION & ACCURACY	1mV, 3% ± 10mV	1mV, 1% ± 50mV	1mV, 1% ± 50mV	
CHANNEL CROSSTALK (DUAL CHANNELS)	<-80dB	<-80dB	<-80dB	
CARRIER PHASE	-360.0 to +360.0	-360.000 to +360.000	-360.000 to +360.000	

	TTi TG501xA/251xA Series			TTi TGP31XX Series			TTi TGF4XX2 Series		
MODULATION	AM, FM, PM, FSK, BPSK, SUM, PWM			AM, AM –SC (suppressed carrier), FM, PM, FSK, BPSK, SUM, PWM, PDM, SPDM			AM, AM - SC, FM, PM, ASK, FSK, BPSK, SUM, PWM		
MODULATION FREQUENCY	AM, FM, PM, SUM, PWM	Internal	1uHz – 1MHz	AM, AM-SC, FM, PM, SUM, PWM, PDM, SPDM	Internal	1uHz – 10MHz	AM, AM-SC, FM, PM, SUM, PWM	Internal	1uHz – 10MHz
		External	DC – 20kHz		External	DC – 5MHz		External	DC – 5MHz
	FSK, BPSK	Internal	2mHz – 100kHz	FSK, BPSK	Internal	2mHz – 10MHz	ASK, FSK, BPSK	Internal	2mHz – 10MHz
		External	DC – 1MHz		External	DC – 50MHz (25MHz for TGP312x)		External	DC – 1MHz
MODULATION SOURCE	Internal / External			AM, AM-SC, FM, PM, SUM, PWM, PDM, SPDM	Internal / External / Other channel (which allows channel addition possible using SUM modulation in 2 channel models)		Internal / External		
				FSK, BPSK	Internal / External				
CARRIER WAVEFORM	AM, FM, PM, FSK, BPSK	Sine, Square, Ramp, Arb, PRBS		AM, AM-SC, SUM	Pulse, Double Pulse, Square, Pattern / PRBS, Function (Sine, Ramp, etcetera), Arb, Noise		AM,AM-SC, SUM, ASK	Sine, Square, Ramp, Pulse, Noise, Arb, PRBS	
	SUM (Only offered in TGF4242 and TGF4162)	Sine, Ramp, Arb		FM, PM, FSK, BPSK,	Pulse, Double Pulse, Square, Pattern / PRBS, Function (Sine, Ramp, etcetera), Arb		FM, PM,FSK, BPSK	Sine, Square, Ramp, Arb	
	PWM	Pulse		PWM, PDM	Pulse, Double Pulse		PWM	Pulse	
				SPDM	Double Pulse				
MODULATING WAVEFORM	AM, FM, PM, PWM, SUM	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Logarithmic Rise, PRBS (PN7 to PN23) and User Defined Arbs		AM, AM-SC, FM, PM, PWM, SUM, PDM, SPDM	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS (PN7 to PN31) and User Defined Arbs		AM, AM-SC, FM, PM, PWM, SUM	Sine, Square, Positive Ramp, Negative Ramp, Triangle, Gaussian Noise, DC, Sinc, Exponential Rise, Exponential Fall, Logarithmic Rise, Logarithmic Fall, Haversine, Gaussian, Lorentz, D-Lorentz, Cardiac, PRBS (PN7 to PN31, PRBS only available in TGF4242 and TGF4162) and User Defined Arbs	
	FSK, BPSK	Square		FSK, BPSK	Square		ASK, FSK, BPSK	Square	
AM DEPTH	0.0% to 120.0%			0.0% to 100.0%			0.00% to 100.00%		
SWEEP	Linear or Logarithmic, Up, Down, Up/Down or Down/Up, Triggered or Continuous			Linear or Logarithmic, Up or Down, Triggered or Continuous			Linear or Logarithmic, Up or Down, Triggered or Continuous		
SWEEP CARRIER WAVEFORM	Sine, Square, Ramp, Arb			Pulse, Double Pulse, Square, Pattern / PRBS, Function (Sine, Ramp, etcetera), Arb			Sine, Square, Ramp, Arb		
SWEEP TIME	1ms – 500s			100us – 500s			1us – 500s		
HOLD / RETURN TIME	Not offered			100us – 500s			Not offered		
SWEEP TRIGGER	Internal, External, Manual			Internal, External, Manual			Internal, External, Manual		
SWEEP MARKER	Variable Marker			Variable Marker			Not offered		
BURST	Cycle, Infinite, Gated			Cycle, Infinite, Gated			Cycle, Infinite, Gated		
BURST CARRIER WAVEFORM	Sine, Square, Ramp, Pulse, Noise (only Gated), Arb, PRBS			Pulse, Double Pulse, Square, Pattern / PRBS, Noise, Function (Sine, Ramp, etcetera), Arb			Sine, Square, Ramp, Pulse, Noise, Arb, PRBS		
CYCLE BURST COUNT	1 – 16777215			1 – 4294967295			1 - 2147483647		
INTERNAL PERIOD	1us – 500s			20ns – 500s			20ns – 500s (TGF4242, TGF4162) 40ns – 500s (TGF4082, TGF4042)		

	TTi TG501xA/251xA Series	TTi TGP31XX Series	TTi TGF4XX2 Series	
MAXIMUM CARRIER FREQUENCY FOR FINITE BURST	10MHz (subject to carrier waveform)	50MHz (subject to carrier waveform and model)	50MHz (subject to carrier waveform, TGF4242, TGF4162)	
			25MHz (subject to carrier waveform, TGF4082, TGF4042)	
GATED BURST SOURCE	Internal, External, Manual	Internal, External, Manual	Internal, External, Manual	
TRIGGER SOURCE	Internal , External, Manual	Internal , External, Manual	Internal , External, Manual	
TRIGGER TO OUTPUT JITTER	8ns	60ps RMS	5ns	
FREQUENCY COUNTER	Not offered	Not offered	Function	Freq, Period, Duty Cycle, Positive Width, Negative Width
			Range	100mHz – 125MHz (DC) 3Hz – 125MHz (AC)
			Coupling	AC, DC
DUAL CHANNEL FUNCTIONS	Tracking, Frequency coupling (fixed ratio or fixed offset), Amplitude / Offset coupling, Output coupling	Tracking, Frequency coupling (fixed ratio or fixed offset), Amplitude / Offset coupling, Output coupling, Channel Addition	Tracking, Frequency coupling (equal frequency), Amplitude / Offset coupling, Output coupling	
SYNC OUTPUT	Separate Sync for each channel.	Separate Sync for each channel.	Channel 2 can output channel 1Sync.	
PHASE LOCKING (BETWEEN CHANNELS OR GENERATORS)	Channels can be aligned and can have a phase offset (0° to 360°, 0.1° resolution). Two generators can be coupled.	Channels can be aligned and can have a phase offset (0° to 360°, 0.001° resolution). Two generators can be coupled.	Channels can be aligned and can have a phase offset (0° to 360°, 0.001° resolution). Two generators can be coupled.	
LAN INTERFACE	Standard, LXI	Standard, LXI	Standard, LXI	
USB HOST / DEVICE	Standard	Standard	Standard	
GPIB INTERFACE	Optional	Optional	Optional	
DISPLAY	3.7 inches, 256 by 112 monochrome graphics display	3.7 inches, 256 by 112 monochrome graphics display	4.3 inches (10.9cm), transflective backlit TFT LCD, 480 x 272 pixels, 262144 colours	