

**GTJF538 Series**  
**CMOS, Ultra-low Jitter Voltage Controlled Crystal Oscillators (VCXOs)**

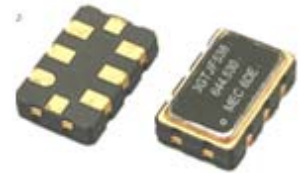
**200 fsec typical Phase Jitter**



**MERCURY**  
 Since 1973



**GTJF538** series (5.0x3.2x1.4 mm, 8 pads), a member of Mercury QuikXO™ quick-turn Voltage Controlled Crystal Oscillators (VCXOs), features CMOS output and femto-second (f. sec.) RMS phase jitter (163 f. sec. for 250 MHz at 3.3V, 12 KHz to 20 MHz). Operating voltages are 1.8V, 2.5V or 3.3V. Applications include networking, wireless infrastructure, high resolution audio and video, high-speed data converters and storage area networks. Differential outputs (LVPECL, LVDS, HCSL, CML) up to 2.1 GHz is also available.



**Related Products:** Click the product series ([underlined](#)) to open the spec. sheet link.

Package Size Output Logic Product Type	7.0 x 5.0 x 1.8 mm (8 pads) Package code: <b>578</b>		5.0 x 3.2 x 1.4 mm (8 pads) Package code: <b>538</b>	
	Output Logic code: <b>"T"</b>	Differential output code: <b>"x"</b> (1)	CMOS output code: <b>"T"</b>	Differential output code: <b>"x"</b> (1)
Clock Oscillators (XOs); <b>"H"</b>	<a href="#">HTJF578</a>	<a href="#">HxJF578</a>	<a href="#">HTJF538</a>	<a href="#">HxJF538</a>
Voltage Controlled Crystal Oscillators (VCXOs); <b>"G"</b>	<a href="#">GTJF578</a>	<a href="#">GxJF578</a>	This series	<a href="#">GxJF538</a>

(1) Differential output logics "x" include LVPECL ("P"), LVDS ("D"), HCSL ("C") or CML ("Q").

**General Specifications:** at Ta=+25°C, CL=15 pF

Product Type	Voltage Control Crystal Oscillator (VCXO)		
Power Supply Voltage (V <sub>DD</sub> )	1.8V±5%	2.5V±10%	3.3V±10%
Frequency Range	15-250MHz	15-250MHz	15-250MHz
Load	15pF max.	15pF max.	15pF max.
Output "High" Voltage; V <sub>OH</sub>	V <sub>DD</sub> - 0.4V min.	V <sub>DD</sub> - 0.4V min.	V <sub>DD</sub> - 0.4V min.
Output "Low" Voltage; V <sub>OL</sub>	50-200MHz: V <sub>DD</sub> x 0.1 max. 201-250MHz: 0.3V max.	V <sub>DD</sub> x 0.1 max.	V <sub>DD</sub> x 0.1 max.
Rise Time (Tr) / Fall Time (Tf) (10% ↔ 90% waveform)	1.0 nsec. typ. 5.0 nsec. max.	1.0 nsec. typ. 5.0 nsec. max.	1.0 nsec. typ. 5.0 nsec. max.
Duty Cycle	50%±10%	50%±5%	50%±5%
Current Consumption	50MHz : 62mA typ. 250MHz : 72mA typ.	50MHz : 65mA typ. 250MHz : 75mA typ.	50MHz : 70mA typ. 250MHz : 80mA typ.
Current with Output Disabled	61mA typ.	62mA typ.	63mA typ.
Start-up Time	5 msec. typ. 10 msec. max.	5 msec. typ. 10 msec. max.	5 msec. typ. 10 msec. max.
Phase Jitter, rms (12 KHz to 20 MHz)	350 fs typ. , 500 fs max.	200 fs typ. , 500 fs max.	170 fs typ. , 500 fs max.



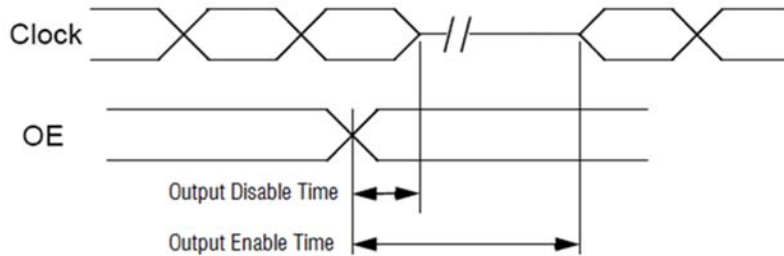
Frequency Stability Codes	Frequency stability over operating temp. range	± 25 ppm	± 50 ppm	± 100 ppm	if non-standard, please enter the desired stability after the "C" or "I" for example: "C20" ± 20ppm over -10 to +70°C
	Commercial (-10 to +70°C)	A	B	C	
	Industrial (-40 to +85°C)	D	E	F	
Aging at Ta = 25°C	+3ppm max. first year ; ±2ppm max. per year thereafter				
<b>Output Enable Function on Pad 2</b>					
OE Control	0.8% of V <sub>DD</sub> minimum to enable output.				
	0.2% of V <sub>DD</sub> maximum to disable output .				
Output Enable Time	2.5 ms max.				
Output Disable Time	10 us max.				
<b>Control Voltage Function on Pad 1</b>					
Control Voltage Center	+0.9 V for V <sub>DD</sub> =1.8 V	+1.25 V for V <sub>DD</sub> =2.5 V		+1.65 V for V <sub>DD</sub> =3.3 V	
Control Voltage Range	+0.18 V ~ +1.62 V	+0.25 V ~ +2.25 V		+0.3 V ~ +3.0 V	
Frequency Pulling Range	±80 ppm min. ; ± 200 ppm max.(available)				
Linearity	±1% typical. ±5% max.				
Transfer Function	Positive Transfer				
Absolute Voltage	3.8 V max.				
Input Impedance	5 MΩ min.				
Bandwidth	10KHz typ. Measured at -3 dB				
Harmonics	-5.0 dBc max				

**Product Related Information:**

Green Requirement	RoHS compliant, Pb (lead) free in accordance with EU Directive 2002/95/EC 6/6 (2002/95/EC) and WEEE (2002/96/EC). Free of halide, cadmium, hexavalent chromium, lead, mercury, PBB's and PBDE's.
Storage temp. range	-55 to +150°C
Humidity	85% RH, 85°C, 48 hours
Fine Leak / Gross Leak	MIL-Std-883, method 1014, condition A / MIL-Std-883, method 1014, condition C
Solderability	MIL-STD-202F method 208E
Reflow	260°C for 10 sec. Two times.
Vibration	MIL-STD-202F method 204, 35G, 50 to 2000 Hz
Shock	MIL-STD-202F method 213B, test condi. E, 1000GG ½ sine wave
Resistance to Solvent	MIL-STD-202, method 215
Temperature Cycling	MIL-STD-883, method 1010
ESD Rating	Human body model (HBM): 2000 V min.
Pad Surface Finish	Gold (0.3 um to 1.0 um) over nickel (1.27 um to 8.89 um)



Output OE Function



Part Number Format and Example:

Example: 3GTJF538-E-100N-200.000

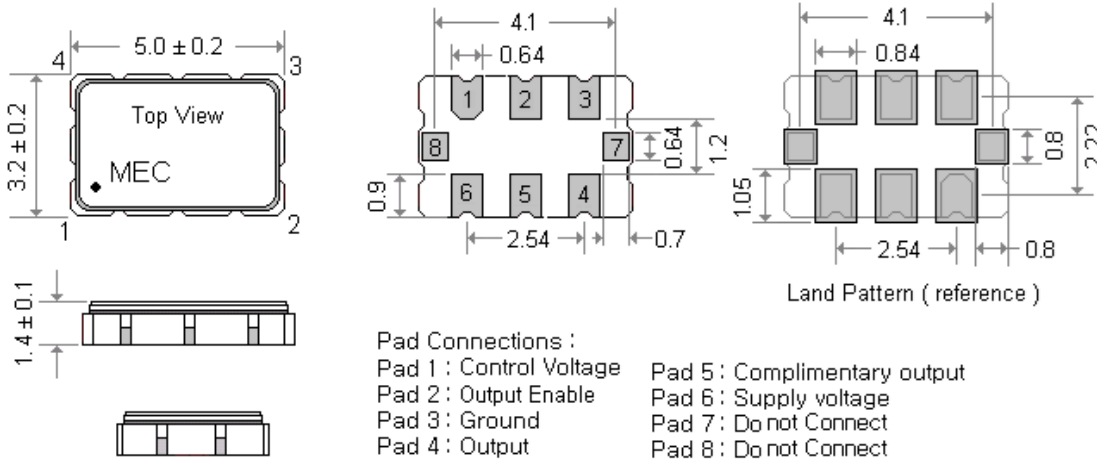
3	G	T	JF538	-	E	-	100N	-	200.000
Supply Voltage code "3" for 3.3V "25" for 2.5V "18" for 1.8V	"G" : for Voltage Control oscillators	Output Logic Code "T" : CMOS	"JF": Product Series. "538": Package size 5.0x3.2x1.4 mm 8 Pad		Frequency Stability Code : "A"-"F". See table above.		Frequency Pulling Range. 100: ± 100ppm (Example only) "M": Maximum "N": Minimum "T": Typical		Frequency (MHz)

GTJF538 Phase Noise Plot and Phase Jitter Data (typical),  $V_{DD}=+3.3V$ , Voltage Control = Ground

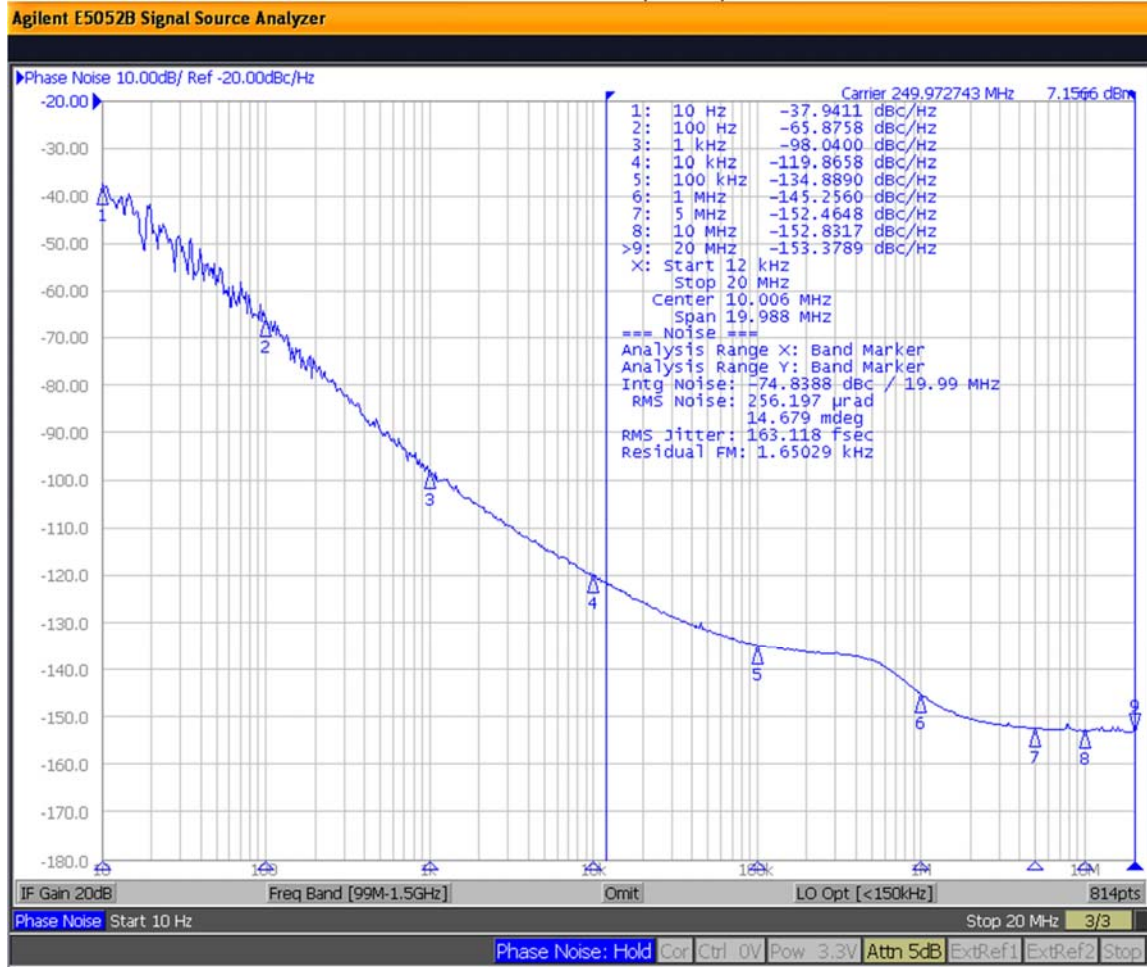
SSB Phase Noise Data (dBc/Hz Typical)	Frequency (MHz)	50	100	150	200	250
	100 Hz offset	-81	-75	-72	-70	-65
	1 KHz offset	-115	-107	-104	-102	-98
	10 KHz offset	-136	-127	-125	-124	-119
	100 KHz offset	-147	-141	-138	-136	-134
	1 MHz offset	-157	-151	-148	-146	-145
	5 MHz offset	-161	-157	-156	-153	-152
	10 MHz offset	-161	-158	-156	-154	-152
	20 MHz offset	-160	-158	-156	-154	-153
Phase Jitter fsec (12KHz ~ 20 MHz, RMS)	239	197	179	167	163	



**Package Dimensions and Recommended Solder Pad Layout** unit: (mm)

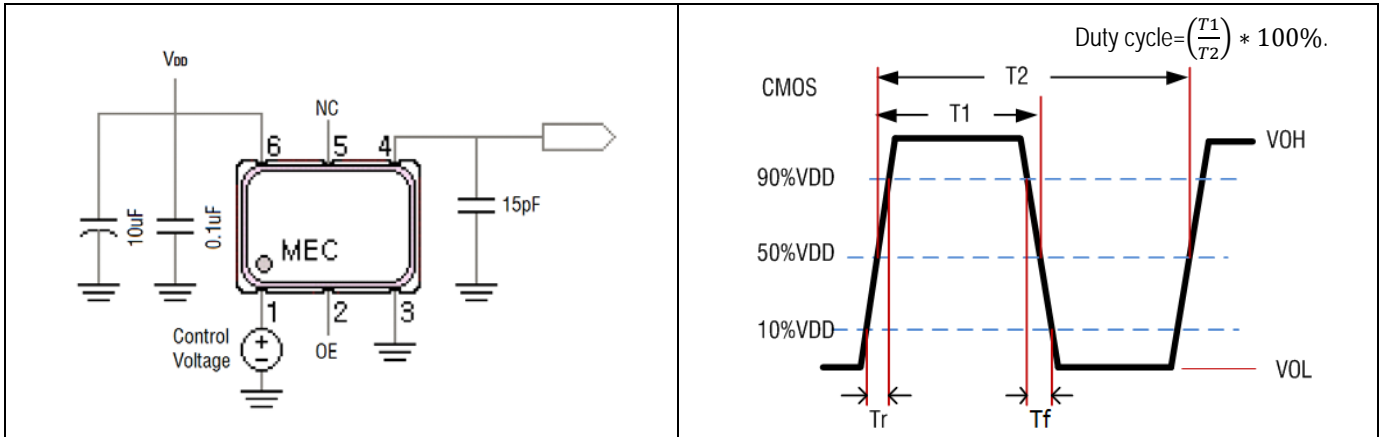


**Phase Noise Plot of 3GTJF538-E-100N-250.000 MHz (VCXO), V<sub>DD</sub>=+3.3V, Voltage Control = Ground**

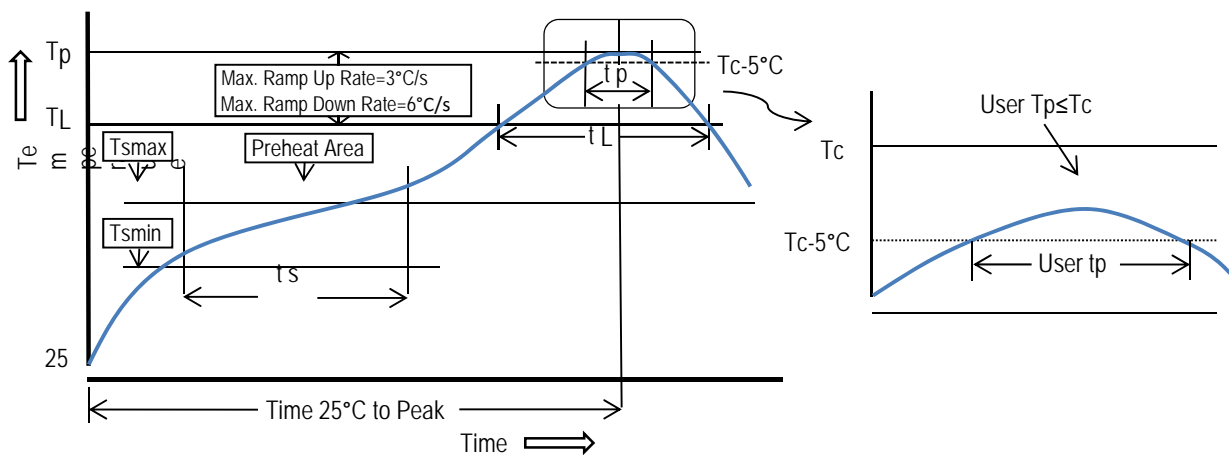




Test Circuit and Output Wave Form



Recommended Solder Reflow Profile (per IPC/JEDEC J-STD-020D.1)



Profile Feature	Sn-Pb Eutectic Assembly	Pb-free Assembly
Preheat/Soak		
- Temperature min. (Ts min.)	100°C	150°C
- Temperature max. (Ts max.)	150°C	200°C
- Time (ts) (Ts min. to Ts max.)	60 to 120 seconds	60 to 180 seconds
Ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )	3°C / sec. max.	3°C / sec. max.
Liquidous temperature (T <sub>L</sub> )	183°C	217°C
Time (t <sub>L</sub> ) maintained above T <sub>L</sub>	60 to 150 seconds	60 to 150 seconds
Peak package body temperature (T <sub>p</sub> )	235°C	260°C
Time (T <sub>p</sub> ) within 5°C of the classification temperature T <sub>c</sub>	10 to 30 seconds	20 to 40 seconds
Ramp-down rate (T <sub>p</sub> to T <sub>L</sub> )	6°C / second max.	6°C / second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.

All temperatures refer to topside of the package, measured on the package body surface.