

**G\_JF538-Series**

150 fsec typical Phase Jitter

High Frequency Ultra-low jitter

Voltage Controlled Crystal Oscillators (VCXOs)

**MERCURY**

Since 1973



**G\_JF538** series (5.0x3.2x1.4 mm, 8 pads), a member of Mercury QuikXO™ quick-turn VCXOs, features LVPECL, LVDS, CML or HCSL output logics and femto-second (fsec) RMS phase jitter (151 fsec for LVPECL 644.530 MHz at 3.3V). Short lead time, for both standard and custom frequencies.



Other QuikXO™ products in this family: **H\_JF538** series(XOs).

**General Specifications<sup>(\*)</sup>**: at Ta=+25°C

Output Logic Type	LVPECL	LVDS	CML	HCSL	
Frequency Range	15 ~ 2100 MHz	15 ~ 2100 MHz	15 ~ 2100 MHz	15 ~ 700 MHz	
Load	50 ohms into V <sub>DD</sub> -2V or Thevenin equivalent	100 ohms between OUT and OUTN	50 ohms to V <sub>DD</sub>	50 ohms to GND	
Power Supply Voltage (V <sub>DD</sub> )	+2.5V ± 10% +3.3V ± 10%	+2.5V ± 10% +3.3V ± 10%	+1.8V ± 5% +2.5V ± 10% +3.3V ± 10%	+1.8V ± 5% +2.5V ± 10% +3.3V ± 10%	
Output "High" Voltage; V <sub>OH</sub>	V <sub>DD</sub> - 1.165V min. V <sub>DD</sub> - 0.8V max.	V <sub>DD</sub> : 1.4 V typical V <sub>DD</sub> : 1.6 V max.	V <sub>DD</sub> - 0.085V min V <sub>DD</sub> = max.	V <sub>DD</sub> : 0.66V min. V <sub>DD</sub> : 1.15V max.	
Output "Low" Voltage; V <sub>OL</sub>	V <sub>DD</sub> - 2.0V min. V <sub>DD</sub> - 1.55V max	V <sub>DD</sub> : 1.1 V typical V <sub>DD</sub> : 0.9 V min.	V <sub>DD</sub> - 0.6V min. V <sub>DD</sub> - 0.32V min.	V <sub>DD</sub> : 0.0V min. V <sub>DD</sub> : 0.15V 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				
Duty Cycle (at 50% V <sub>DD</sub> )	50% ±5%	50% ±5%	50% ±5%	50% ±5%	
Rise Time (Tr) / Fall Time (Tf) (20% ↔ 80% waveform )	0.4 nS. max.	0.4 nS. max.	0.4 nS. max.	0.4 nS. max.	
Current Consumption at V <sub>DD</sub> = 3.3V	100mA typ. 120mA max.	75mA typ. 90mA max.	70mA typ. 85mA max.	94mA typ. 115mA max.	
Current with Output Disabled	99mA typ.	74mA typ.	69mA typ.	93mA typ.	
Start-up Time	5ms typical ; 10 ms max.				
Phase Jitter, rms (12 KHz to 20 MHz)	150 fsec typical , 300 fsec Max.				



## Output Enable Function on Pad 2

OE Control	0.8% of $V_{DD}$ minimum to enable output.		
	0.2% of $V_{DD}$ maximum to disable output.		
Output Enable Time	2.5 ms max.		
Output Disable Time	10 us max.		
Control Voltage Function on Pad 1			
Control Voltage Center	+0.9 V for $V_{DD}=1.8$ V	+1.25 V for $V_{DD}=2.5$ V	+1.65 V for $V_{DD}=3.3$ 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	$\pm 80$ ppm min. ; $\pm 200$ ppm max.(available)		
Linearity	$\pm 1\%$ typical. $\pm 10\%$ max.		
Transfer Function	Positive Transfer		
Absolute Voltage	3.8 V max.		
Input Impedance	5 M $\Omega$ min.		
Bandwidth	10KHz typ. Measured at -3 dB		
Harmonics	-5.0 dBc max		

(\*If you want detailed specifications, please call for details.

### Environmental Performance Specifications

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.
Second Level Interconnect	e4
Moisture Sensitivity Level	Level 1 (infinite) according to IPC/JEDEC J-STD-020D.1
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)
Weight of the Device	0.045 grams typical

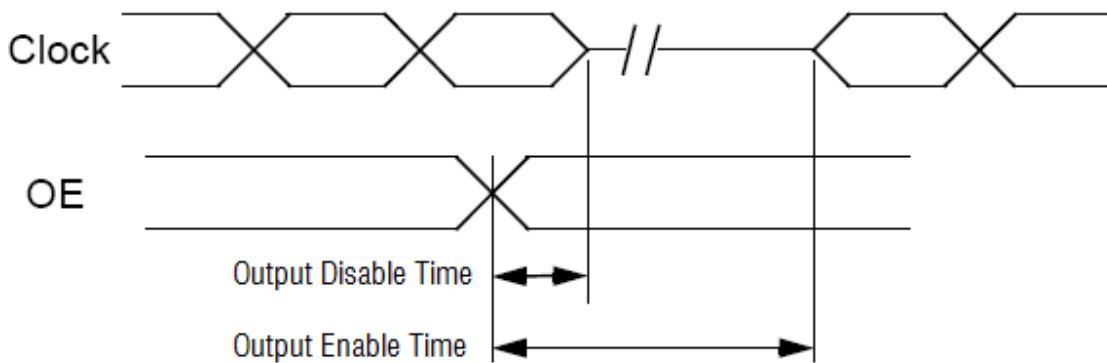


**Part Number Format and Example:**

Example: 3GPJF538-E-150N-644.530

3	G	P	JF538	-	E	-	150N	-	644.530
Supply Voltage code "3" for 3.3V "25" for 2.5V "18" for 1.8V	"G" : for Voltage Control oscillators	Output Logic Code "P" : PECL "D" : LVDS "C" : HCSL "Q" : CML	"JF": Product Series. "538": Package size 5.0x3.2x1.4 mm 8 Pad		Frequency stability code: "A"~"F". See table above.		Frequency Pulling Range. 150: ± 150ppm "M": Maximum "N": Minimum "T": Typical		Frequency (MHz)

**Output OE Function on Pad2**

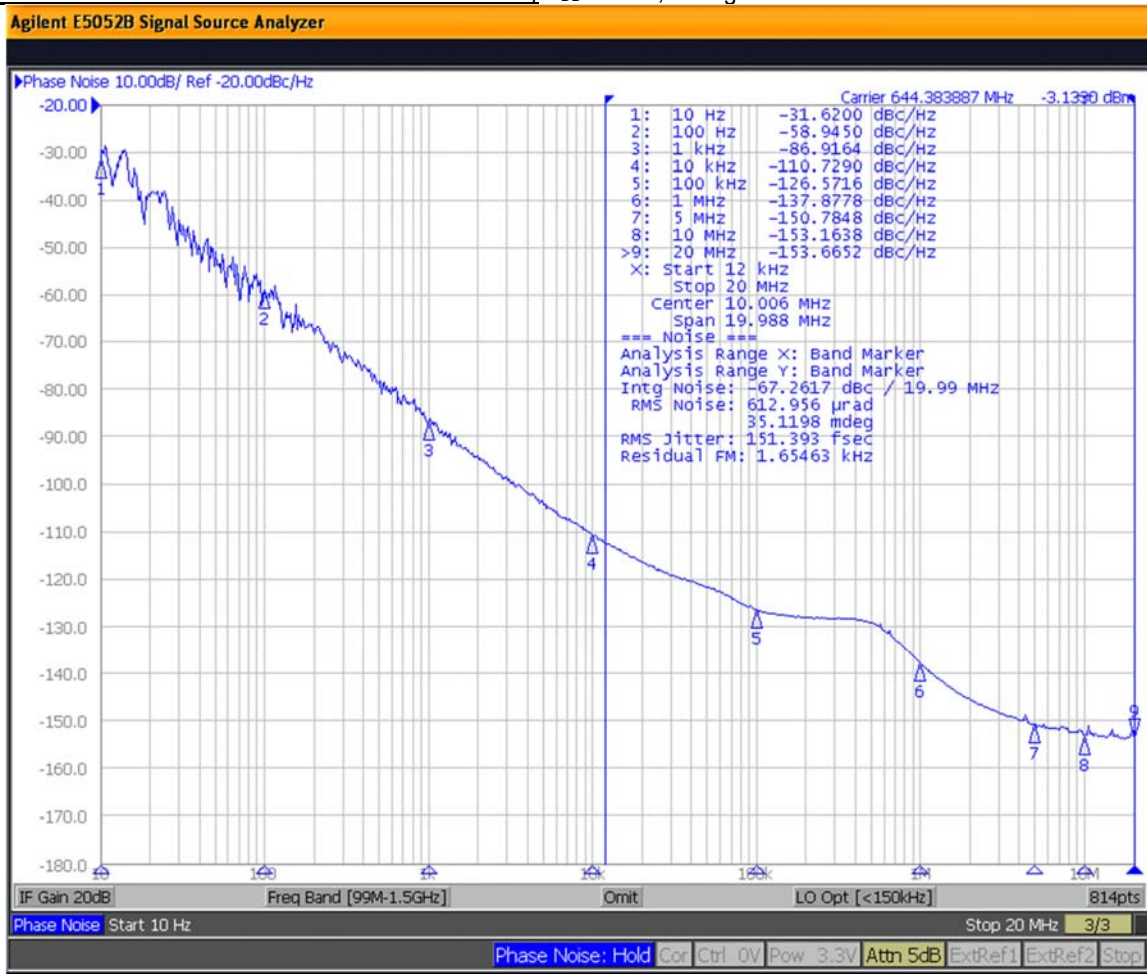


**3GPJF538 Phase Noise and Phase Jitter Data (typical), V<sub>DD</sub>=+3.3V, Voltage Control = Ground**

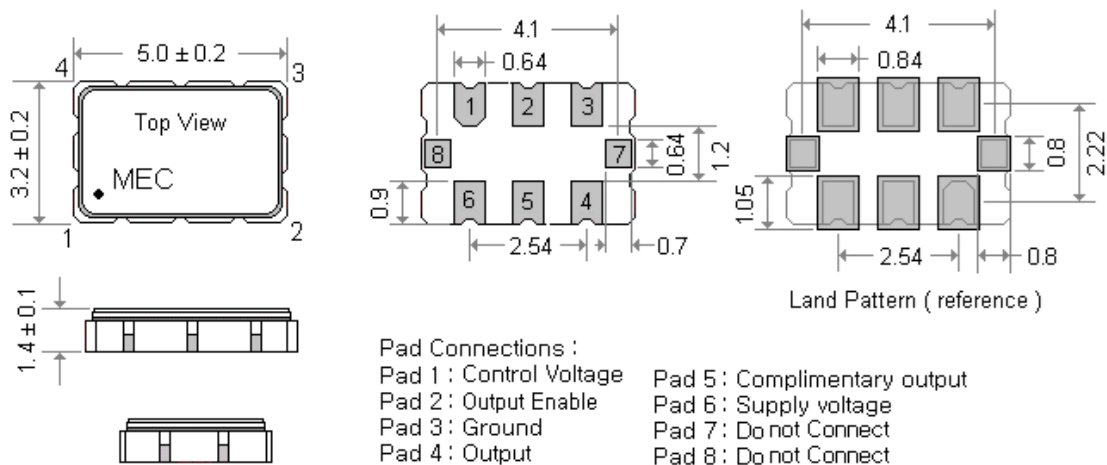
	Frequency (MHz)	156.250	491.52	644.530	1480	2100
SSB Phase Noise Data (dBc/Hz Typical)	10 Hz offset	-39	-16	-31	-12	-18
	100 Hz offset	-74	-48	-58	-54	-49
	1 KHz offset	-99	-83	-86	-80	-77
	10 KHz offset	-123	-112	-110	-104	-100
	100 KHz offset	-139	-128	-126	-119	-116
	1 MHz offset	-149	-140	-137	-130	-125
	5 MHz offset	-156	-151	-150	-145	-141
	10 MHz offset	-157	-153	-153	-148	-145
	20 MHz offset	-157	-154	-153	-150	-147
Phase Jitter fsec (12KHz ~ 20 MHz, RMS)		159	155	151	147	163



Phase Noise Plot of 3GPJF538-E-150N-644.530 MHz,  $V_{DD}=+3.3V$ , Voltage Control = Ground



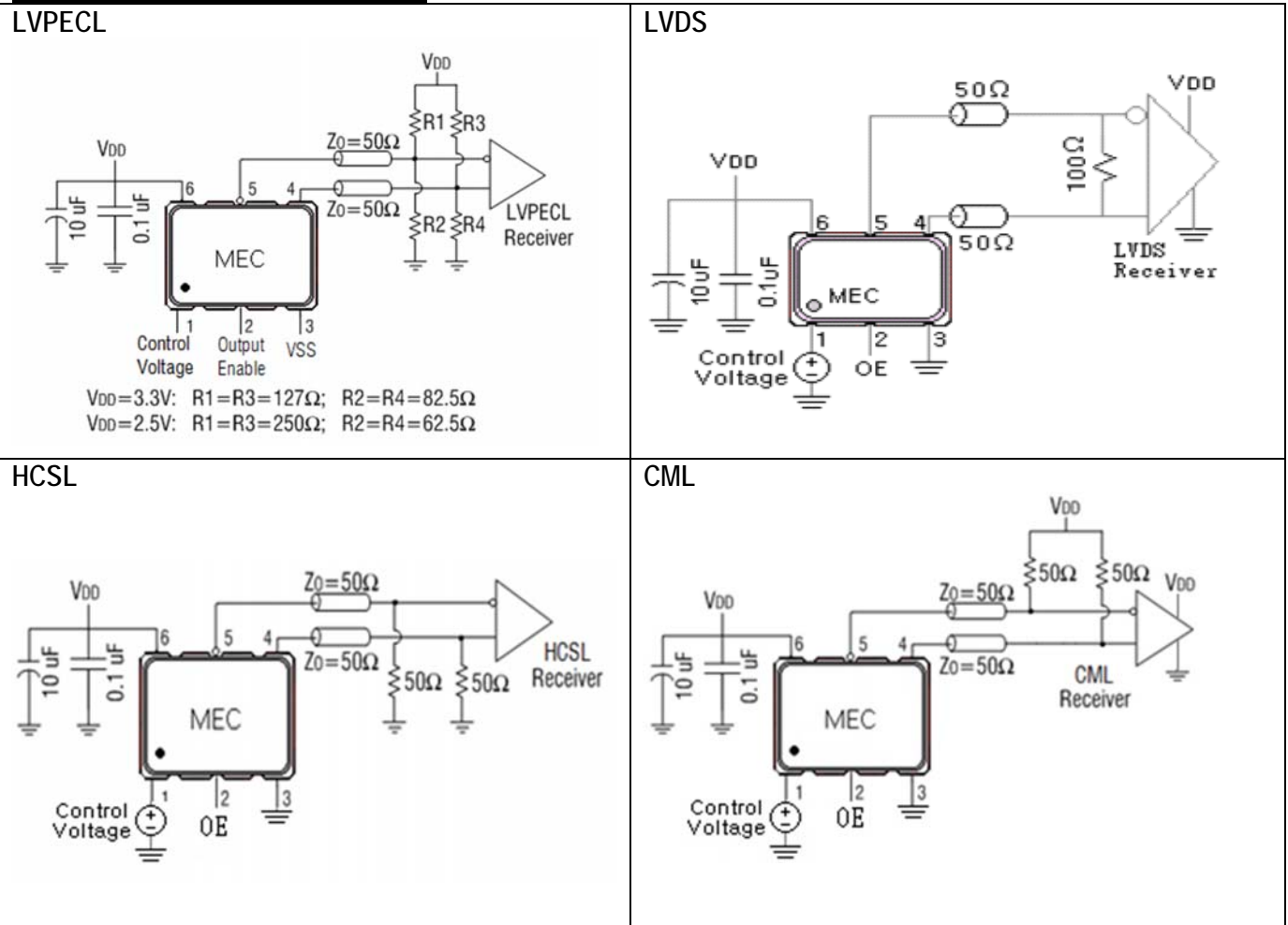
Package Dimensions and Recommended Solder Pad Layout unit: (mm)





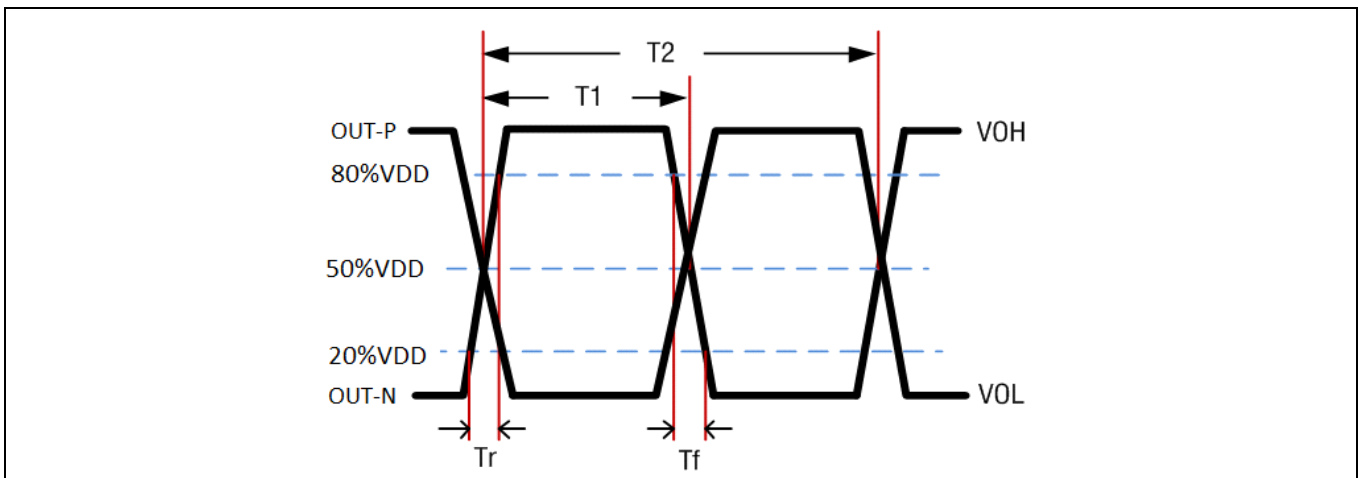
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Test Circuits and Output Waveforms



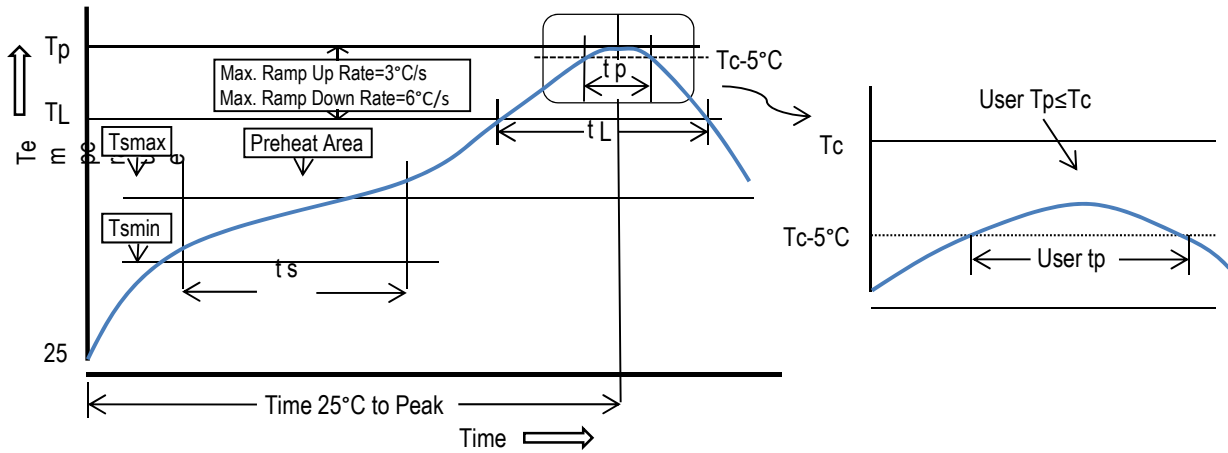
Differential Output Waveforms

Duty cycle =  $\left(\frac{T1}{T2}\right) * 100\%$ . Measured at 50% VDD





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



Profile Feature	Sn-Pb Eutectic Assembly	Pb-free Assembly
Preheat/Soak		
- Temperature min. ( $T_{smin}$ )	100°C	150°C
- Temperature max. ( $T_{smax}$ )	150°C	200°C
- Time ( $t_s$ ) ( $T_{smin}$ to $T_{smax}$ )	60 to 120 seconds	60 to 180 seconds
Ramp-up rate ( $T_L$ to $T_p$ )	3°C / sec. max.	3°C / sec. max.
Liquidous temperature ( $T_L$ )	183°C	217°C
Time ( $t_L$ ) maintained above $T_L$	60 to 150 seconds	60 to 150 seconds
Peak package body temperature ( $T_p$ )	235°C	260°C
Time ( $T_p$ ) within 5°C of the classification temperature $T_c$	10 to 30 seconds	20 to 40 seconds
Ramp-down rate ( $T_p$ to $T_L$ )	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.