

CLEARCLOCK™ | POWER OPTIMIZED 0.12ps 5x7mm XO



7.0 x 5.0 x 1.8 mm



RoHS/RoHS II Compliant

MSL = 1



ESD SENSITIVE

AX7

FEATURES

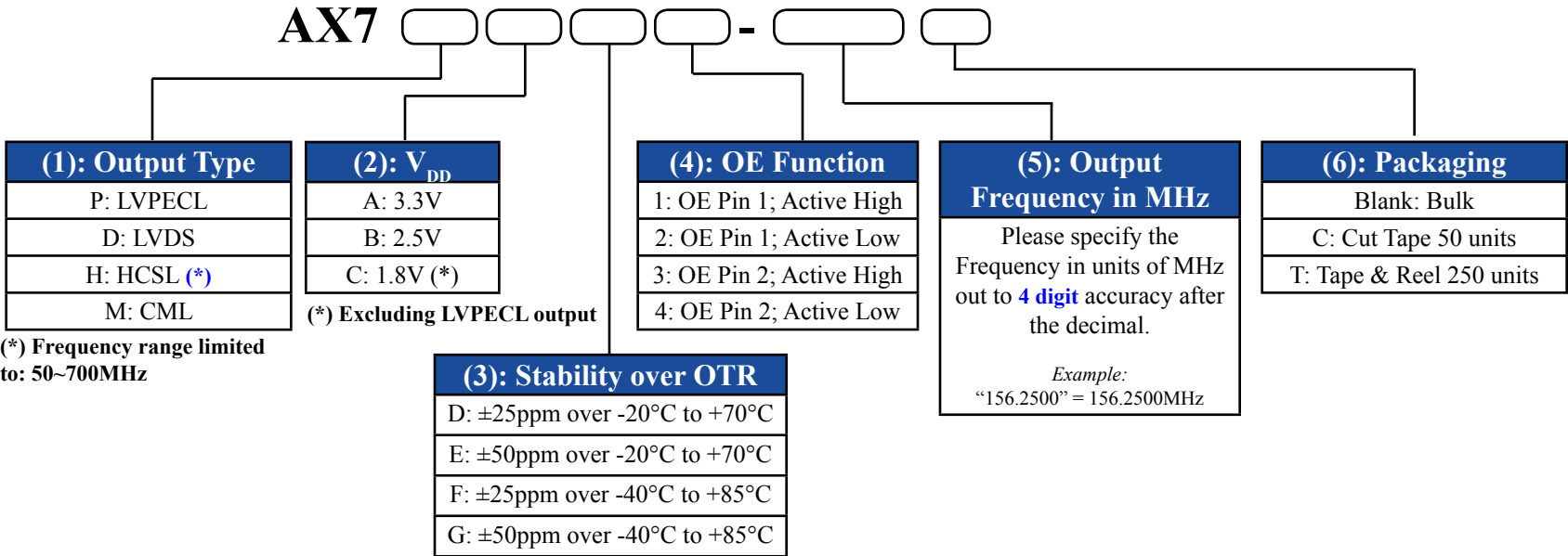
- 0.125ps typ jitter (150fs MAX $f > 200\text{MHz}$, 25°C)
- Highest in-class frequency range from 50 to 2100MHz
- Excellent spurious suppression
- 70mA MAX I_{DD} (LVDS, any V_{DD})
- Lowest in-class power consumption
- Supports LVPECL, HCSL, LVDS, CML
- Supports $\pm 50\text{ppm}$ or $\pm 100\text{ppm}$ all inclusive stability
- -40°C to 85°C or -20°C to 70°C operation
- Industry standard 5x7mm footprint

APPLICATIONS

- Networking and communications
- RF systems, base stations (BTS)
- Test and measurement
- Cloud, server and storage, Fibre Channel
- 100/400GbEthernet
- PCI Express

OPTIONS AND PART IDENTIFICATION [Note 1]

Note 1: Contact Abracon for part number requests with carrier frequency callouts up to 5 & 6 digit accuracy after the decimal.



Part Number Example:
AX7PAF1-644.53125C

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COMMON KEY ELECTRICAL SPECIFICATIONS

Parameters			Min.	Typ.	Max.	Unit	Notes
Frequency Range	LVPECL		50		2100	MHz	Option “P”
	LVDS		50		2100		Option “D”
	HCSL		50		700		Option “H”
	CML		50		2100		Option “M”
Power Supply Voltage (V _{DD}) ^[Note 1]			2.97	3.3	3.63	V	Option “A”
			2.25	2.5	2.75		Option “B”
			1.71	1.8	1.89		Option “C”
Current Consumption (I _{DD})	LVPECL			87	94	mA	@ V _{DD} =3.3V
	LVDS			64	70		
	HCSL			75	80		@ V _{DD} =1.8V
	CML			63	68		
Set Tolerance (as received) @ 25°C ±3°C			-5.00	<±3.00	+5.00	ppm	Relative to carrier
Operating Temperature Range (OTR)			-40		+85	°C	<i>See Options</i>
Storage Temperature			-55		+155	°C	
Frequency Stability over OTR			-25		+25	ppm	Option “D or F”
			-50		+50		Option “E or G”
Aging over 10-Year Product Life ^[Note 2]			-15		+15	ppm	
All Inclusive Frequency Accuracy over 10-Year Product Life ^[Note 2]			-50		+50	ppm	Specific to freq. stability option “D” or “F” (±25ppm)
			-100		+100		Specific to freq. stability option “E” or “G” (±50ppm)
Rise (Tr) / Fall Time (Tf)	LVPECL/LVDS/CML				0.35	nS	20% ↔ 80% waveform
	HCSL				0.40		
Duty Cycle			45		55	%	@ 50% V _{DD}
Start-up Time ^[Note 2]				< 5.0	10	ms	
Output High Voltage (V _{OH}) Output Low Voltage (V _{OL})	LVPECL	V _{OH}	V _{DD} -1.165		V _{DD} -0.8	V	50Ω into V _{DD} -2.0V or thevenin equivalent
		V _{OL}	V _{DD} -2.0		V _{DD} -1.55		
	LVDS	V _{OH}		1.4	1.6		100Ω between OUT and OUTN
		V _{OL}	0.9	1.1			
	HCSL	V _{OH}	0.66		1.15		50Ω to V _{DD}
		V _{OL}	0.0		0.15		
	CML	V _{OH}	V _{DD} -0.085		V _{DD} =Max		50Ω into GND
		V _{OL}	V _{DD} -0.6		V _{DD} -0.32		
Output Enable (OE) Control			0.8*(V _{DD})			V	
					0.2*(V _{DD})		

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PARAMETERS		MIN.	TYP.	MAX.	UNIT	NOTES
Output Enable Time				2.5	ms	
Output Disable Time				10	μs	
Output Disable Current Consumption	LVPECL		85	86	mA	@ V _{dd} =3.3V
	LVDS		63	65		
	HCSL		77	78		@ V _{dd} =1.8V
	CML		62	67		
RMS Phase Jitter (12kHz -20MHz BW)						
201.000MHz – 2100.000MHz			125	150	fsec	@ V _{dd} =3.3V
50.000MHz – 200.000MHz			200	300		

Note 1: Supply Voltage (Vdd) = 1.8V option not available with LVPECL output

Note 2: Relative to initial measured frequency @ 25°C ±3°C

TYPICAL PHASE NOISE AND JITTER CHARACTERISTICS (@25°C ± 3°C) [Note 2]

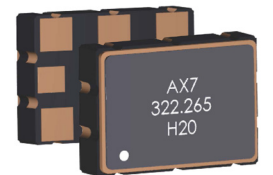
Frequency (MHz)		148.35	150	155.52	156.25	156.25	200	212.5	312.5
RF Output		LVDS	LVPECL	LVPECL	LVPECL	HCSL	LVPECL	LVDS	LVDS
RMS Phase Jitter (fsec) 12kHz-20MHz BW		125	137	124	123	129	122	127	114
Phase Noise (dBc/Hz)	100Hz	-96	-98	-98	-98	-99	-90	-83	-94
	1kHz	-120	-120	-120	-121	-121	-114	-114	-115
	10kHz	-132	-132	-132	-132	-132	-129	-129	-126
	100kHz	-140	-139	-141	-141	-140	-138	-137	-134
	1MHz	-149	-150	-151	-150	-151	-148	-147	-144
	10MHz	-157	-159	-159	-159	-160	-159	-157	-156
	20MHz	-157	-159	-159	-159	-160	-159	-157	-157

Frequency (MHz)		322.265625		491.52	644.53125	1000	1244.16	1500	2100
RF Output		LVPECL	HCSL	LVPECL	LVPECL	LVDS	LVDS	LVDS	LVPECL
RMS Phase Jitter (fsec) 12kHz-20MHz BW		121	121	123	127	114	127	112	138
Phase Noise (dBc/Hz)	100Hz	-91	-92	-91	-77	-76	-78	-79	-77
	1kHz	-113	-114	-111	-107	-102	-102	-101	-98
	10kHz	-125	-125	-122	-119	-115	-113	-112	-108
	100kHz	-133	-133	-131	-127	-124	-122	-120	-117
	1MHz	-144	-144	-138	-138	-134	-131	-130	-124
	10MHz	-157	-157	-154	-154	-150	-149	-145	-145
	20MHz	-159	-159	-154	-155	-152	-150	-145	-148

Note 2: Refer to following Section for selected Phase Noise Plots

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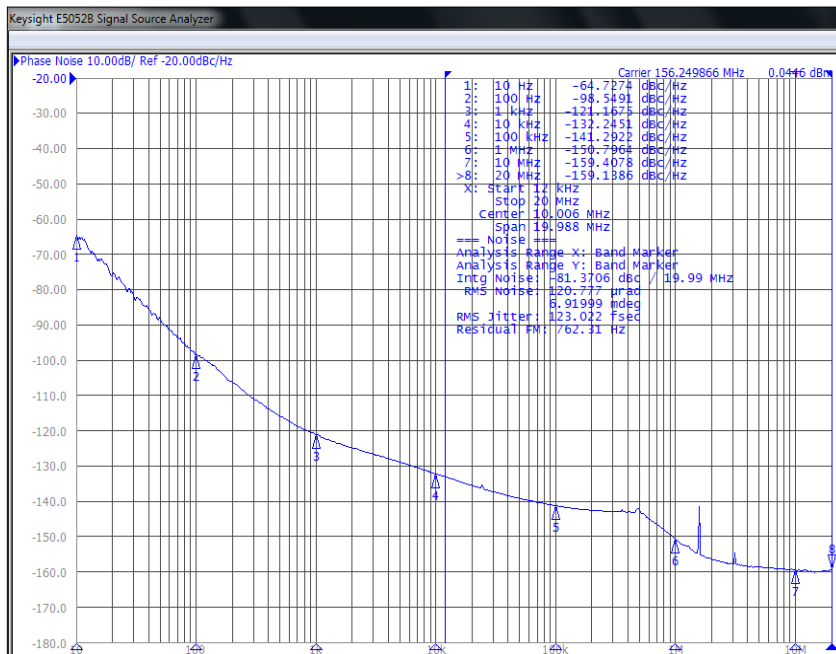
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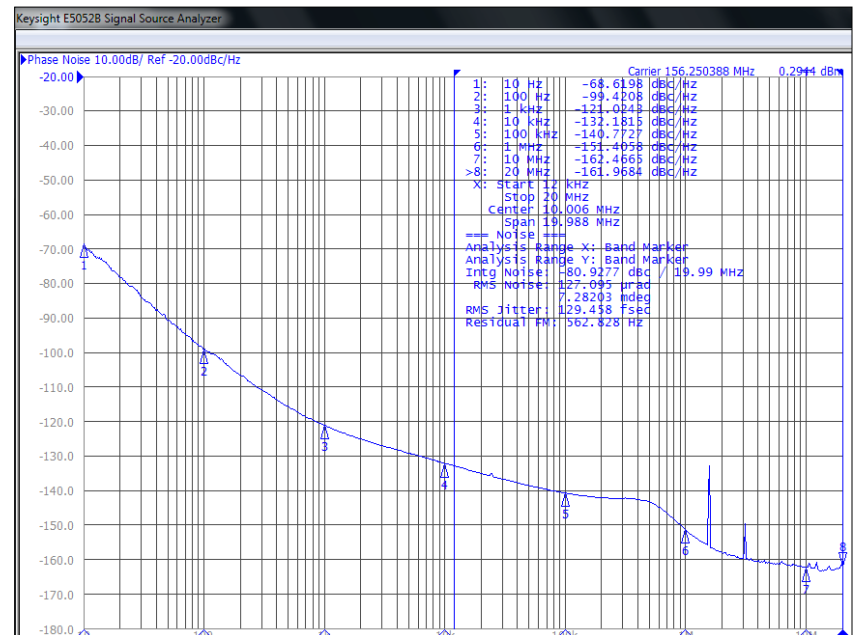
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SELECTED PHASE NOISE PLOTS (@25°C ± 3°C)

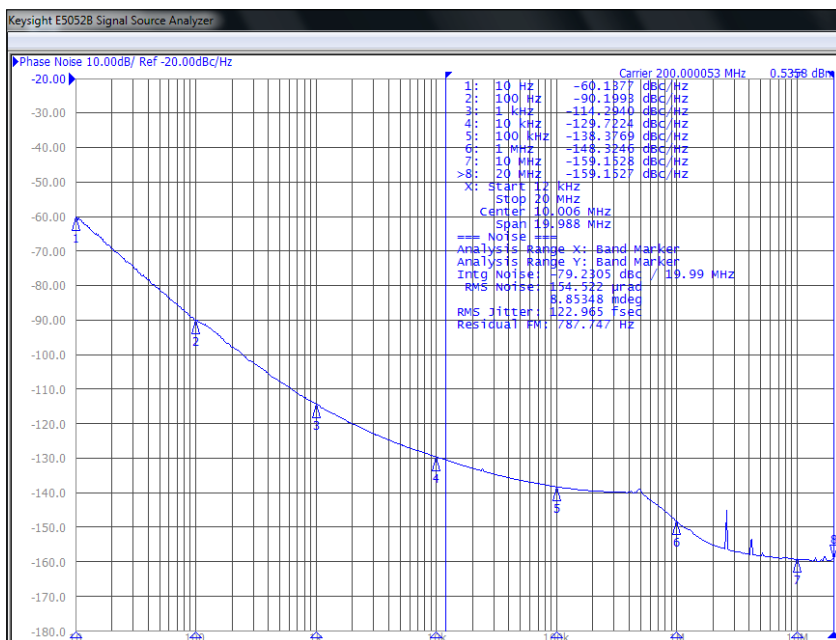
156.25MHz | LVPECL | $V_{DD}=3.3V$



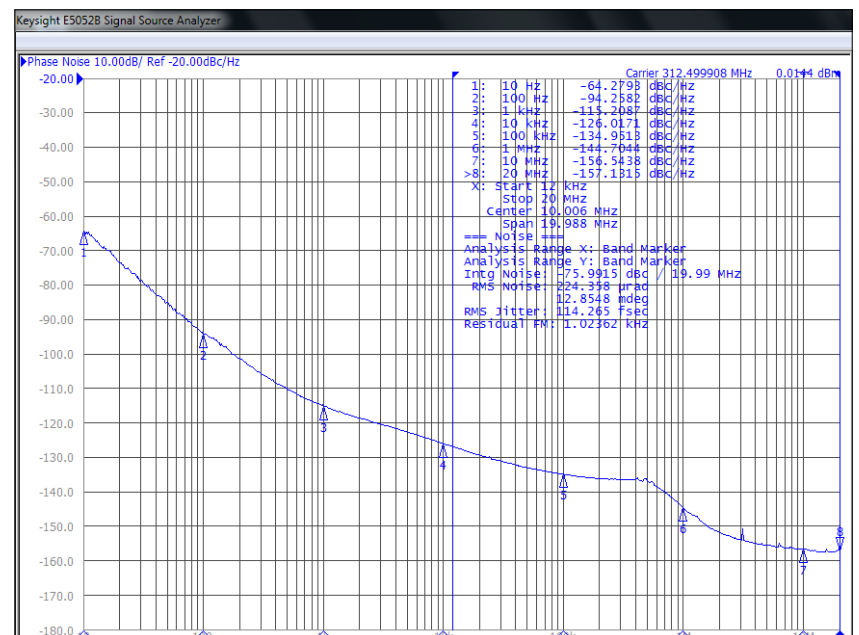
156.25MHz | HCSL | $V_{DD}=1.8V$



200MHz | LVPECL | $V_{DD}=3.3V$

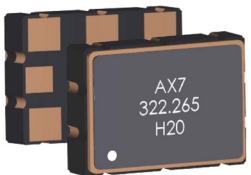


312.5MHz | LVDS | $V_{DD}=3.3V$



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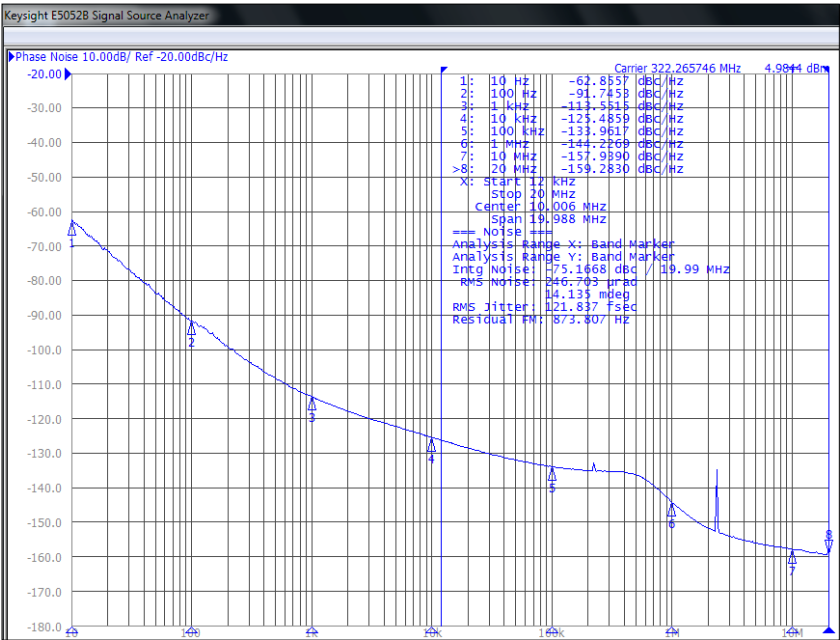
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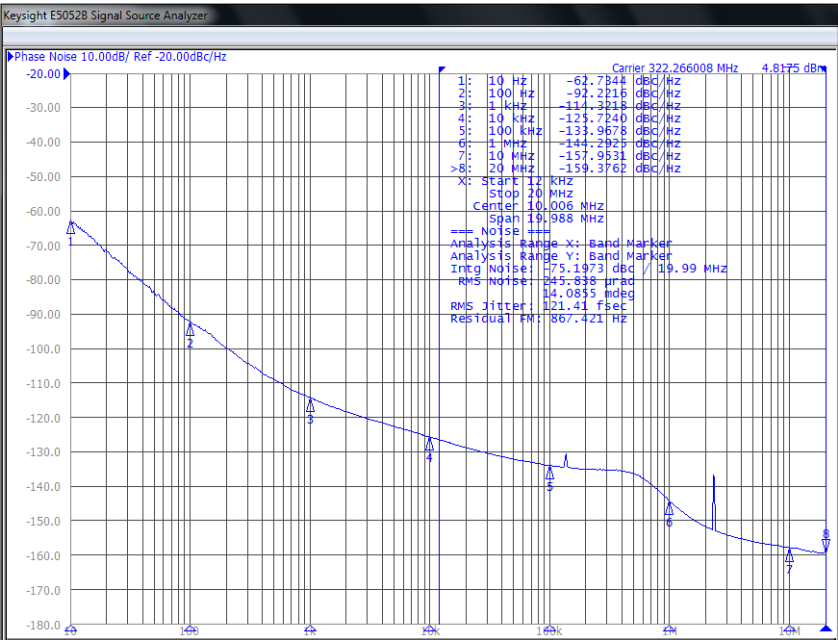
ESD SENSITIVE

SELECTED PHASE NOISE PLOTS (@25°C ± 3°C)

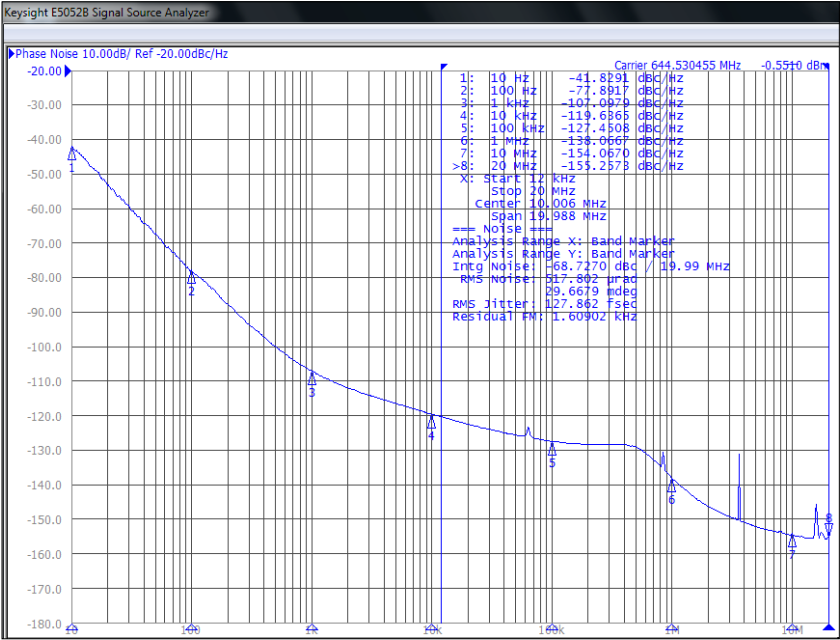
322.265625MHz | LVPECL | $V_{DD}=3.3V$



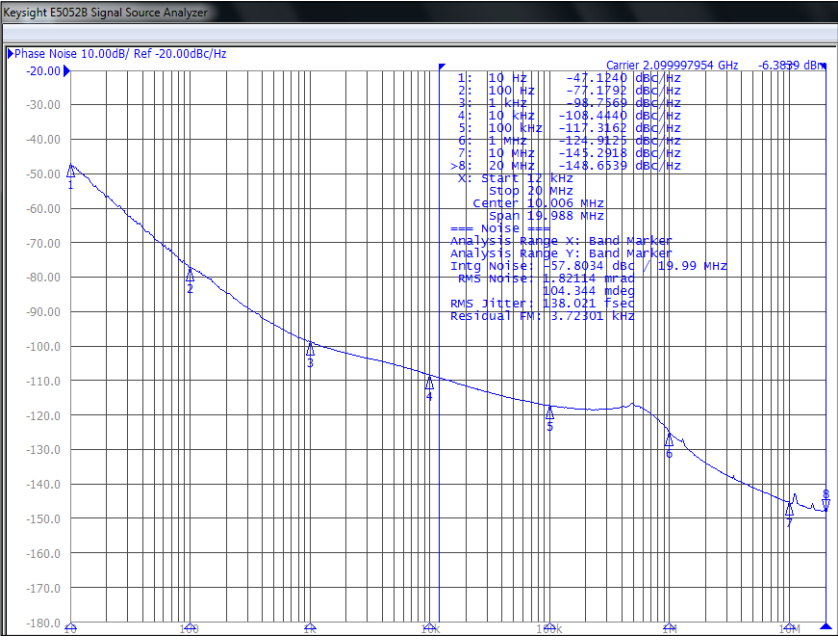
322.265625MHz | HCSL | $V_{DD}=3.3V$



644.53125MHz | LVPECL | $V_{DD}=3.3V$



2100MHz | LVPECL | $V_{DD}=3.3V$



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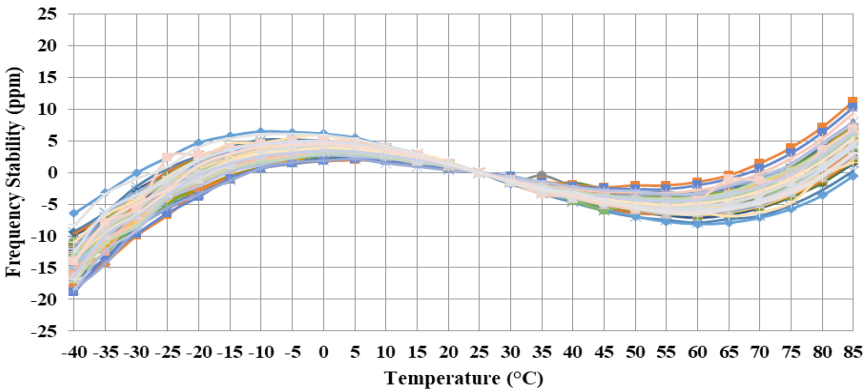
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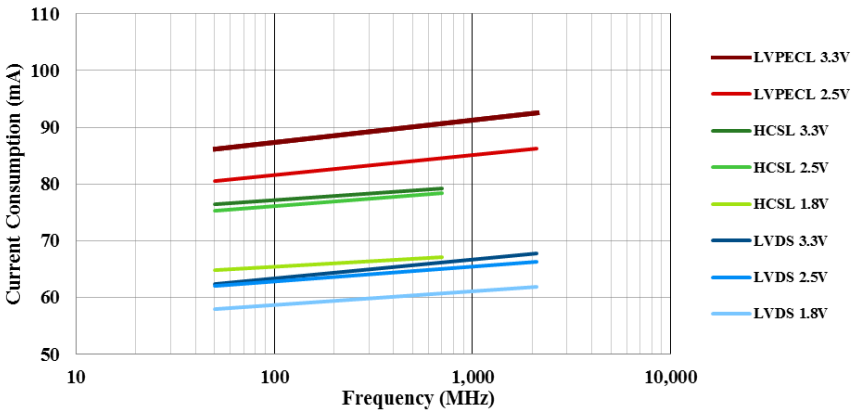
TYPICAL FREQUENCY V_s. TEMPERATURE CHARACTERISTICS

TYPICAL CURRENT CONSUMPTION (I_{DD}) V_s. FREQUENCY CHARACTERISTICS (@ 25°C ± 3°C)

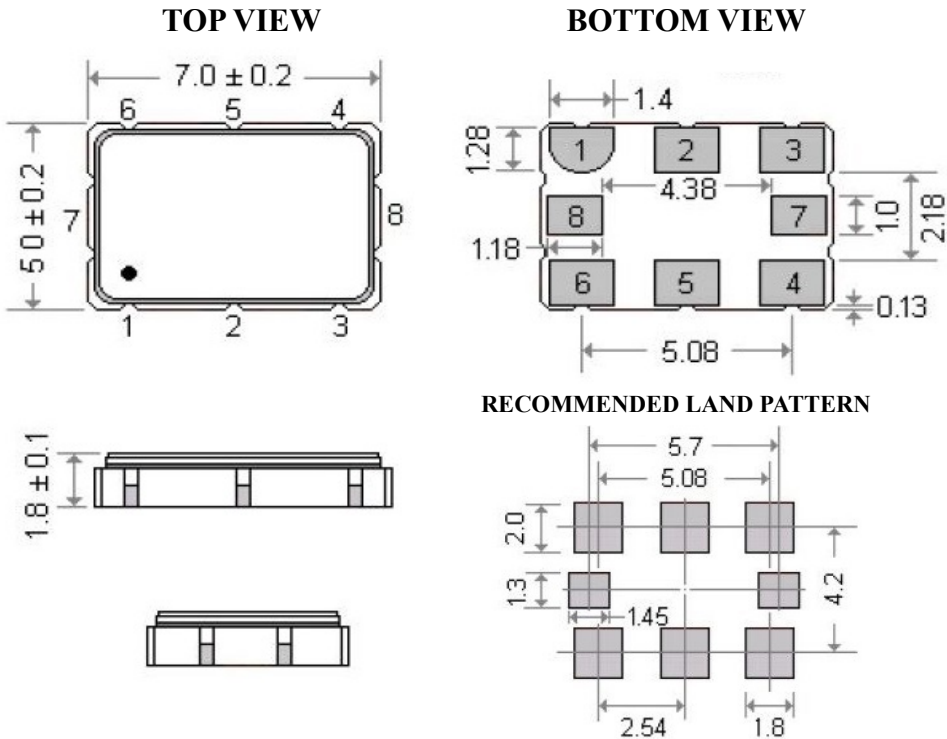
Frequency Stability vs. Temperature
AX7PAF1-122.8800 (50 units)



Current Consumption (I_{DD}) vs. Frequency
AX7



MECHANICAL DIMENSIONS



Dimensions: mm

PIN #	FUNCTION
# 1	Option 1 & 2: Output Enable/ Disable Option 3 & 4: No Connect
# 2	Option 1 & 2: No Connect Option 3 & 4: Output Enable/ Disable
# 3	GND
# 4	Output
# 5	Complementary output
# 6	Supply Voltage (V _{DD})
# 7	No connect
# 8	No connect

*Compatible with industry standard 5x7mm footprint. Pin 7 and 8 are no connect solder pads, not required.

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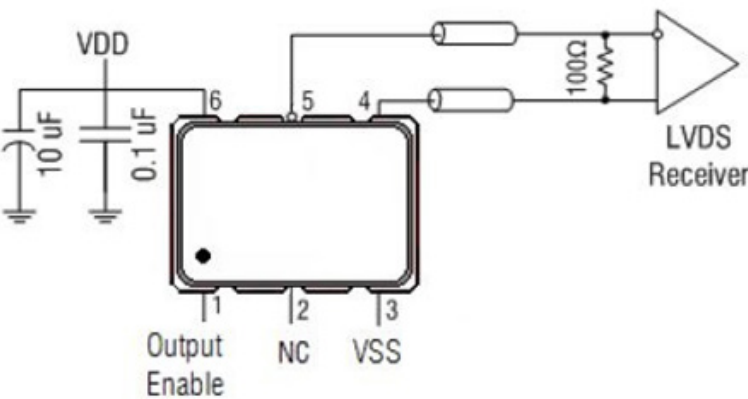
MSL = 1



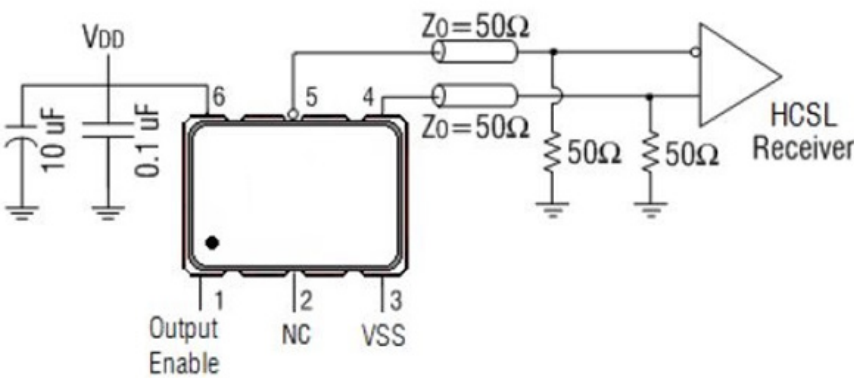
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RECOMMENDED TEST CIRCUIT

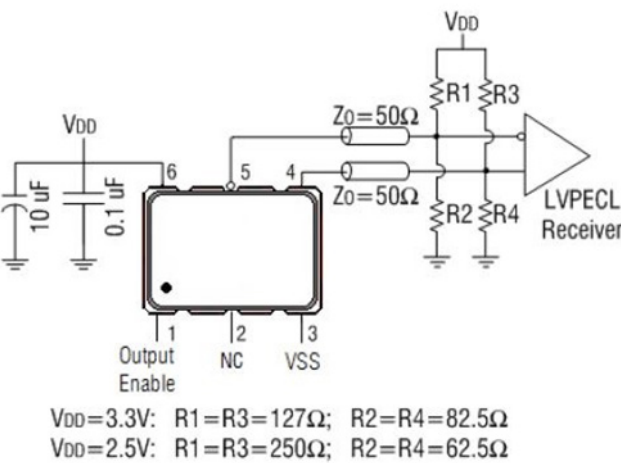
LVDS



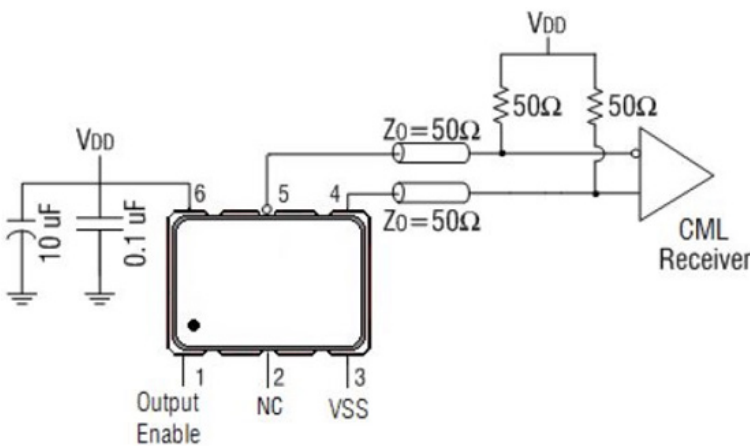
HCSL



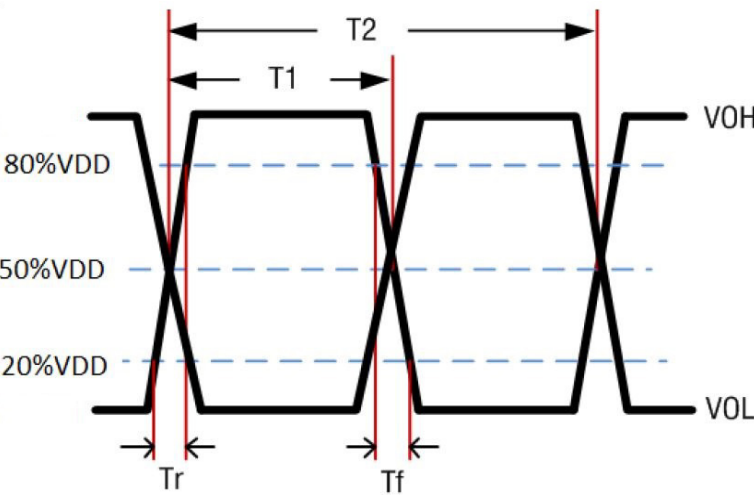
LVPECL



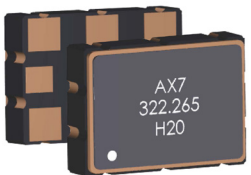
CML



DIFFERENTIAL OUTPUT WAVEFORM



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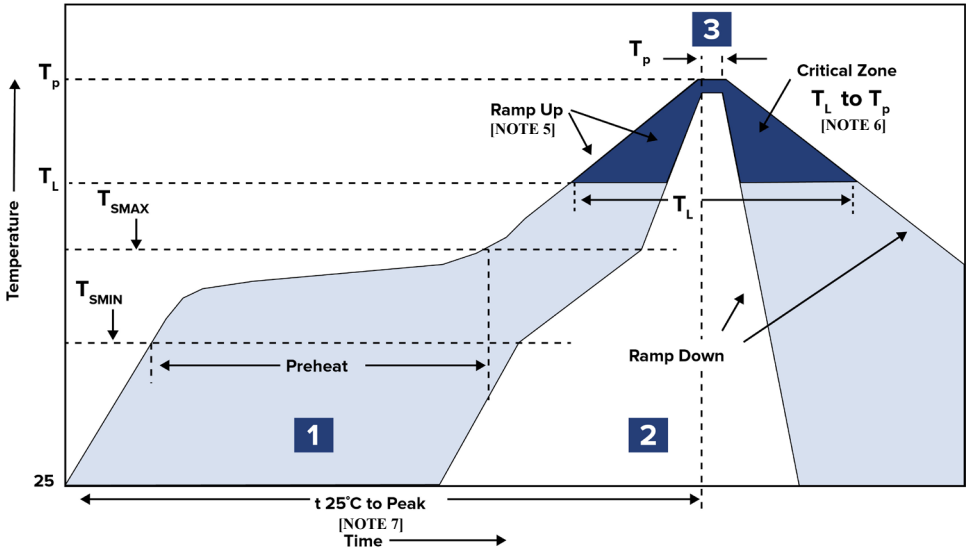
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REFLOW PROFILE



ZONE	DESCRIPTION	TEMPERATURE	TIME
1	Preheat / Soak	$T_{SMIN} \sim T_{SMAX}$ $150^{\circ}\text{C} \sim 200^{\circ}\text{C}$	60 ~ 180 sec.
2	Reflow	T_L 217°C	60 ~ 150 sec.
3	Peak heat	T_P $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$	20 ~ 40 sec.

Note 5: Ramp Up Rate ($T_L \rightarrow T_P$) = $3^{\circ}\text{C} / \text{sec. MAX}$

Note 6: Ramp Down Rate ($T_P \rightarrow T_L$) = $6^{\circ}\text{C} / \text{sec. MAX}$

Note 7: Time 25°C to Peak Temperature ($25^{\circ}\text{C} \rightarrow T_P$) = 8 minutes MAX

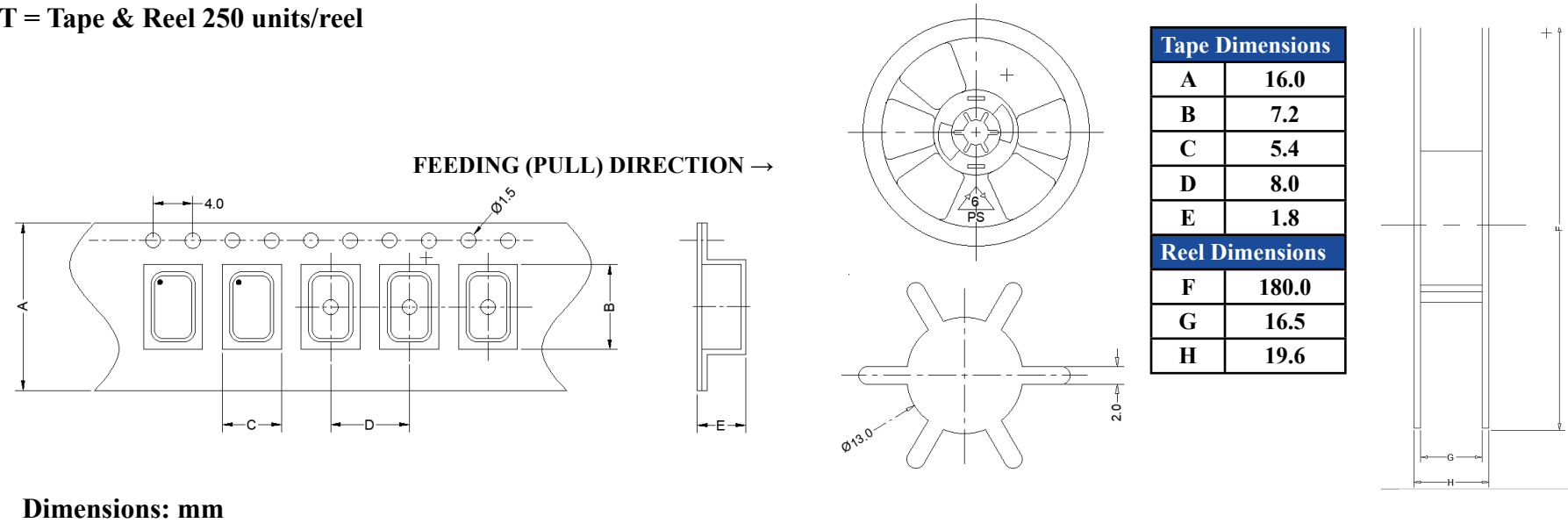
*Can withstand 2 times reflow

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

PACKAGING

C = Cut Tape 50 units

T = Tape & Reel 250 units/reel



Dimensions: mm



5101 Hidden Creek Ln Spicewood TX 78669
Phone: 512-371-6159 | Fax: 512-351-8858
For terms and conditions of sale, please visit:
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REVISED: 10.31.2017

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