ClearClock™ Oscillator Family | Low Jitter | 2.5x2.0mm XO

AK2

Request Samples | Check Inventory

ESD Sensitive | Pb

2.50 x 2.0 x 1.0 mm
RoHS/RoHS II Compliant
MSL Level = N/A

Features

- Based on 3rd Overtone, Quartz Crystal Technology
- Ultra-low rms jitter; < 120fs typical @ 156.25MHz
- Lowest in-class power consumption (15mA max with LVDS)
- ±25ppm max & ±30ppm max stability over -20°C to +70°C and -40°C to +85°C respectively
- 3.3V, 2.5V & 1.8V supply voltage options
- LVPECL, LVDS and HCSL differential output options
- Output enabled (Active High standard default)

Applications

- Optical Transceivers
- Optical Modules
- Networking and communications
- Gigabit Ethernet
- Fibre Channel
- SONET/SDH
- RF systems, base stations (BTS)
- Datacenter
- PCI Express

Key Electrical Specifications

Parameters		Min.	Typ.	Max.	Unit	Notes
Frequency Range		100		200	MHz	
Standard Available Frequencies		100.00, 125.00, 148.50, 156.25 & 200.00			MHz	Contact Abracon for availability of frequencies not listed
Supply Voltage (Vdd) [Note 1]		2.97	3.3	3.63	V	Option "A"
		2.37	2.5	2.62		Option "B"
		1.71	1.8	1.89		Option "C"
Supply Current (Idd)	LVPECL		30	50	mA	@ 200MHz; @ Vdd=3.3V
	LVDS		10	15		@ 200MHz; @ Vdd=3.3V
	HCSL		22	30		@ 200MHz; @ Vdd=3.3V
Operating Temperature Range		-20		70	°C	Option "D"
		-40		85		Option "F"
Storage Temperature		-55		150	°C	
Frequency Accuracy (Initial Set-Tolerance, as received stand-alone measured frequency) at time of shipment (Pre-Reflow) @ +25°C		-10	< ±5	+10	ppm	Relative to carrier frequency
Frequency Shift through Reflow		-2.00		+2.00	ppm	Relative to as received frequency
Frequency Stability over Operating Temperature Range [Note 2]		-25		25	ppm	Option "D" (-20°C to +70°C)
		-30		30		Option "F" (-40°C to +85°C)
First Year Aging		-3.00		+3.00	ppm	Maximum first year aging, ±2.00 ppm max. per year thereafter
Aging over 20 Year Product Life [Note 3]		-15		+15	ppm	
All-Inclusive Frequency Accuracy (Total Stability) over 20 Year Product Life [Notes 4]		-52		52	ppm	Option "D" (-20°C to +70°C)
		-57		57		Option "F" (-40°C to +85°C)
Rise (Tr) / Fall (Tf) Time 20% to 80% Vpeak to peak	LVPECL		0.3	0.6	ns	@ Vdd=3.3V, RL=50Ω
	LVDS		0.3	0.5		@ Vdd=3.3V, RL=100Ω
	HCSL		0.3	0.6		@ Vdd=3.3V, RL=50Ω to GND
Duty Cycle		45		55	%	
Start-up Time			< 2	5	ms	

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AK2

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2.50 x 2.0 x 1.0 mm
RoHS/RoHS II Compliant
MSL Level = N/A

Parameters			Min.	Typ.	Max.	Unit	Notes
Differential Output High Voltage (VOH) Output Low Voltage (VOL)	LVPECL	V_{OH}	V_{dd}-1.03		V_{dd}-0.88	V	R_L=50Ω to V_{dd}-2.0V
		V_{OL}	V_{dd}-1.85		V_{dd}-1.60		
	LVDS	V_{OH}		1.40	1.60		R_L=100Ω between both outputs
		V_{OL}	0.90	1.10			
	HCSL	V_{OH}	0.40	0.74	0.85		R_L=50Ω to ground on each output
		V_{OL}	-0.15	0.00	0.15		
Output Voltage Swing			0.50			V	LVPECL
			0.250	0.350	0.450		LVDS
			0.50				HCSL
Output Enable & Disable Control			0.7*(V_{dd})			V	Output Enable or No Connect
					0.3*(V_{dd})		Output Disable (High Impedance)
Output Enable Time				< 2.00	5.00	ms	
Output Disable Time					0.2	µs	
Output Disable Current Consumption					< 10	µA	OE ≤ 0.3V
rms phase jitter (12kHz to 20MHz from Carrier)				< 200	500	fs	Vdd, RF output type and Carrier frequency dependent
				<150	200	fs	@ 156.25MHz

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

Note 2: Relative to initial measured frequency @ +25°C, pre-reflow.

Note 3: Relative to post-reflow frequency.

Note 4: Includes post reflow frequency accuracy, temperature stability, load pulling, power supply variation, and 20-year aging.

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MSL Level = N/A

Phase Noise Test Setup

- Keysight E5052B Signal Source Analyzer
- Integration Bandwidth = 12kHz to 20MHz
- Spurious Activity (entire plot trace) = Not omitted (Normalized in dBc/Hz)
- Specifed Spur Omission Function = Not enabled
- IF Gain = 20dB
- Correlation = 5
- Average = 3

Typical Values measured at 25ºC ± 3º

Frequency (MHz)		100.00MHz								156.25MHz	
V_{DD}		1.8V		2.5V			3.3V			1.8V	2.5V
RF Output		LVDS	HCSL	LVDS	HCSL	LVPECL	LVDS	HCSL	LVPECL	LVDS	
rms Phase Jitter (fsec) 12kHz-20MHz		385.27	147.12	207.96	117.86	131.63	255.13	195.68	123.73	139.49	107.18
Phase Noise (dBc/Hz)	100Hz	-104.49	-86.91	-80.88	-75.50	-99.17	-87.89	-105.15	-102.40	-93.43	-93.21
	1KHz	-125.64	-120.54	-115.99	-115.89	-129.38	-120.80	-132.38	-132.55	-123.45	-125.31
	10KHz	-134.97	-144.63	-140.15	-147.34	-145.94	-143.61	-144.58	-146.61	-136.98	-139.61
	100KHz	-140.45	-152.42	-149.52	-457.05	-153.02	-146.87	-150.96	-152.79	-140.93	-149.12
	1MHz	-147.69	-155.94	-153.49	-153.53	-156.87	-148.30	-150.70	-156.98	-150.53	-154.70
	10MHz	-149.67	-157.06	-153.53	-159.42	-157.87	-153.04	-154.78	-158.59	-155.31	-156.40

Note 5: Guaranteed by characterization; rms Phase Jitter specifications are inclusive of any spurs

Note 6: Phase jitter measured with Keysight E5052B Signal Source Analyzer at 25ºC±3ºC

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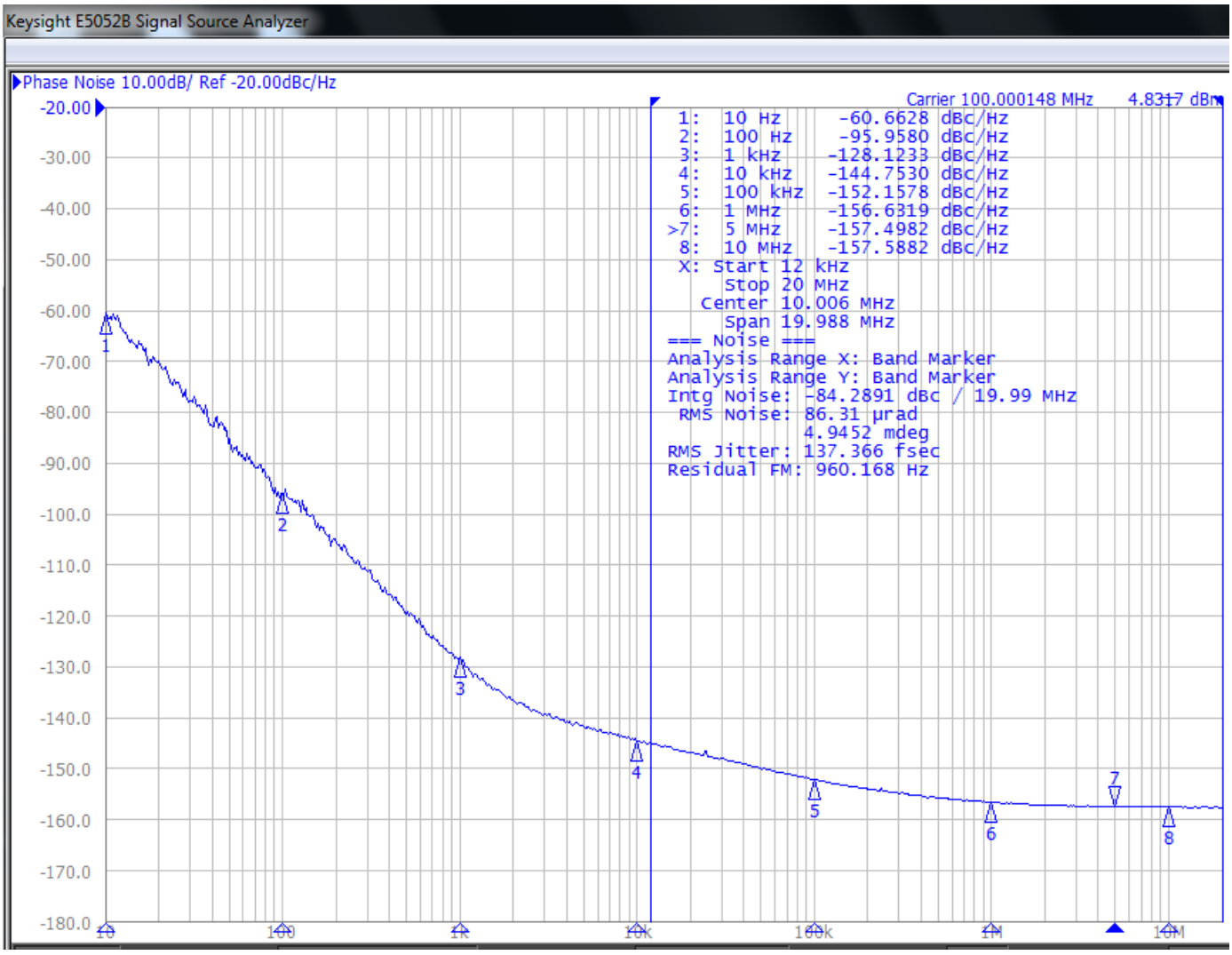
RoHS/RoHS II Compliant
MSL Level = N/A

Representative Phase Noise Plots @ +25°C [Note 7]

Frequency	**= 100.00MHz**
Vdd	**= 2.50V**
RF Output	**= LVPECL**
rms Phase Jitter	**= 137 fs**



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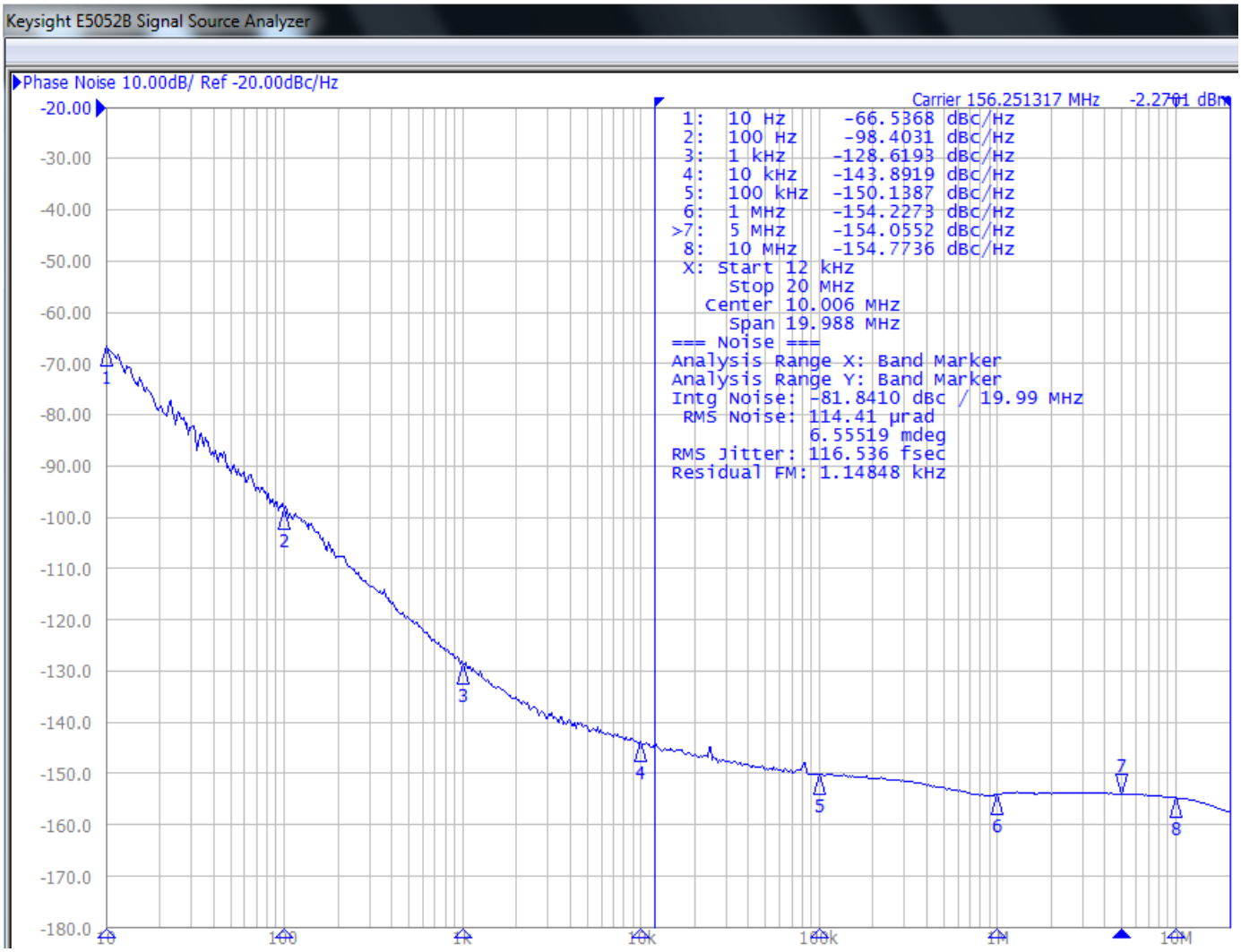
2.50 x 2.0 x 1.0 mm
RoHS/RoHS II Compliant
MSL Level = N/A

Frequency	**= 156.2500MHz**
Vdd	**= 2.50V**
RF Output	**= LVDS**
rms Phase Jitter	**= 117 fs**



Note 7: Contact Abracon for phase noise plots at alternative supply voltage (V_{dd}) & differential output formats

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2.50 x 2.0 x 1.0 mm
RoHS/RoHS II Compliant
MSL Level = N/A

Options and Part Identification [Note 8]

AK2 ☐ ☐ ☐ ☐ ☐ ☐

(1): Output
P: LVPECL
D: LVDS
H: HCSL

(3): Stability over OTR
D: ±25 ppm over -20°C to +70°C
F: ±30 ppm over -40°C to +85°C

(5): Output Frequency in MHz
Please specify the Frequency in units of MHz out to 4-**digit** accuracy after the decimal. *Example:* "156.2500"=156.25MHz

(2): Vdd(6): Packaging
Blank: Bulk (***)
T: Tape & Reel 1,000 units
T3: Tape & Reel 3,000 units

(***) MOQ: (100) units

(2): Vdd
A: 3.3V
B: 2.5V
C: 1.8V (*)

(*) Excluding LVPECL

(4): OE Function
1: OE Pin 1; Active High
2: OE Pin 2; Active High

Part Number Example

AK2PAF1-156.2500 [(100) units in Bulk]

AK2PAF1-156.2500T [(1k) units on Tape & Reel]

AK2PAF1-156.2500T3 [(3k) units on Tape & Reel]

Note 8: Contact Abracon for non-standard part number configurations and/or requests with carrier frequency callouts up to 5 & 6 digit accuracy after the decimal

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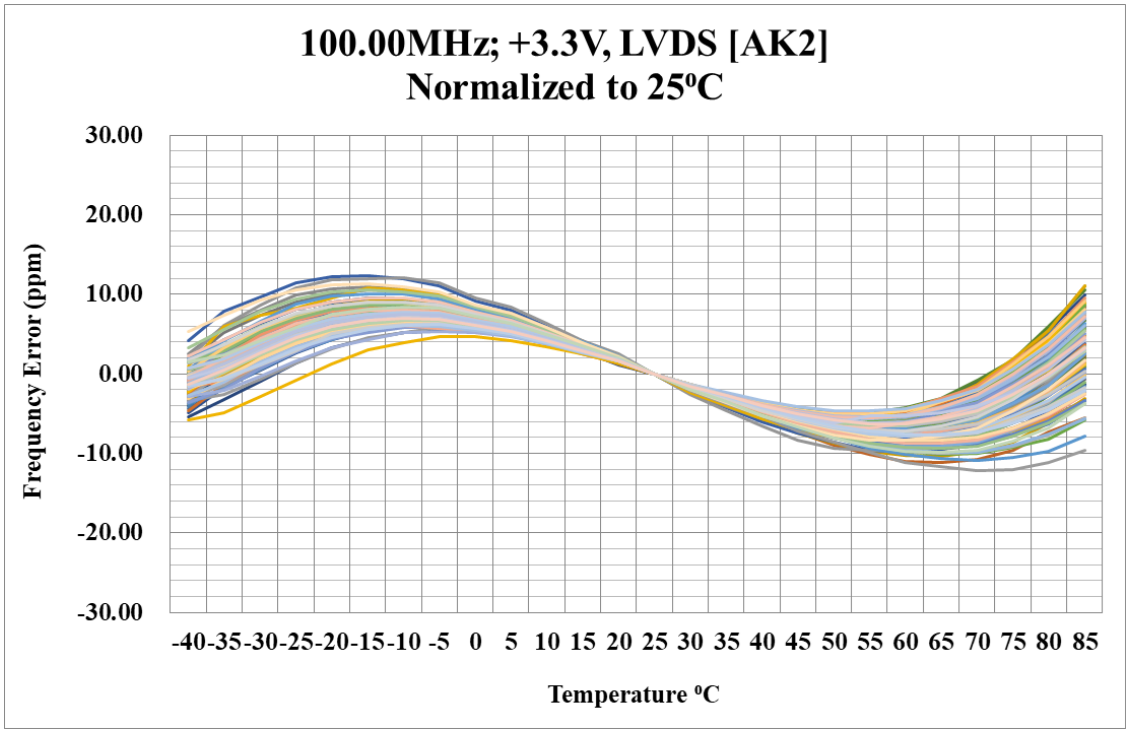
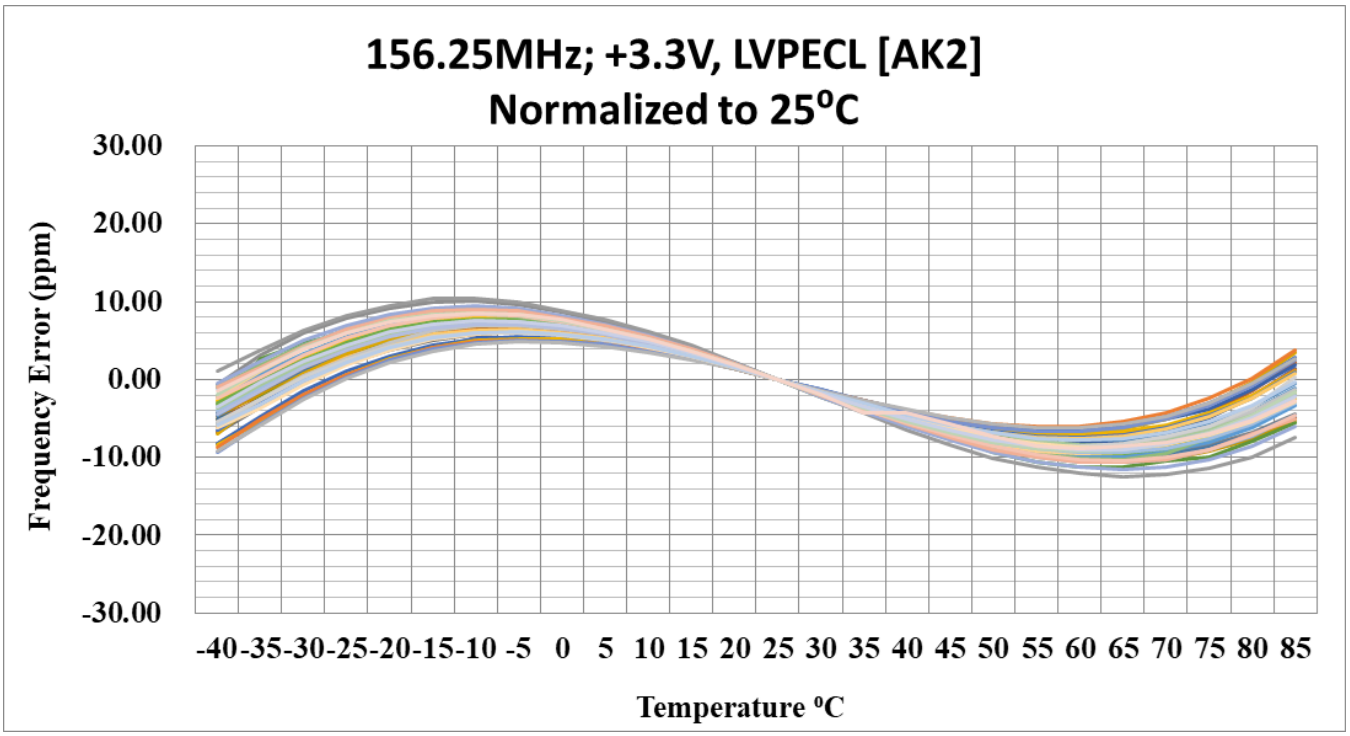
RoHS/RoHS II Compliant
MSL Level = N/A

Typical Frequency vs. Temperature Characteristics





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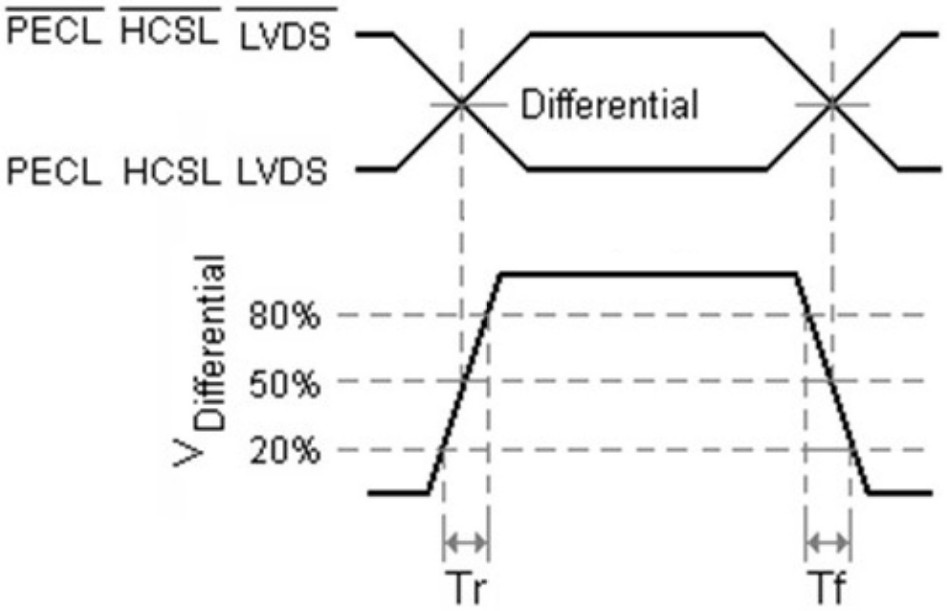
RoHS/RoHS II Compliant
MSL Level = N/A

Differential Output Waveform

LVPECL, LVDS and HCSL Output Waveforms



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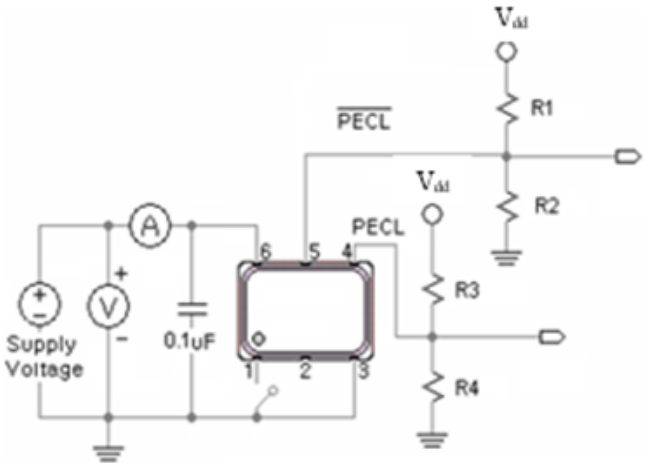
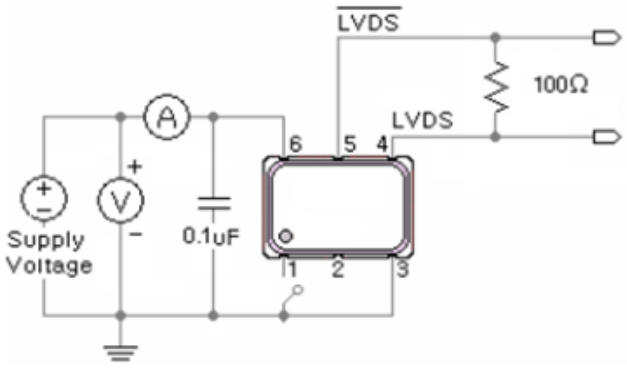
2.50 x 2.0 x 1.0 mm
RoHS/RoHS II Compliant
MSL Level = N/A

Recommended Test Circuit [Note 9]

LVPECL

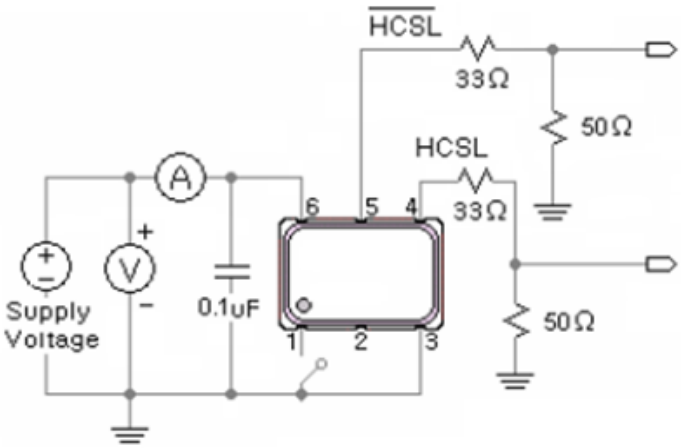


LVDS



Vdd= 3.3V: R1=R3=127Ω; R2=R4=82.5Ω
Vdd= 2.5V: R1=R3=250Ω; R2=R4=62.5Ω

HCSL



Note 9: Recommended test circuit images are representative of when the OE Function is located on Pin 1; when the OE Function is located on Pin 2, then Pin 1=No Connect & Pin 2=OE or No Connect.

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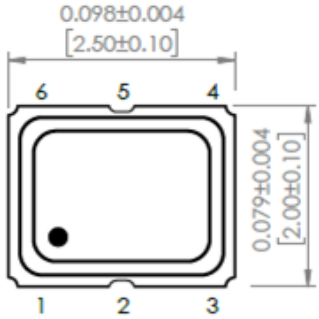
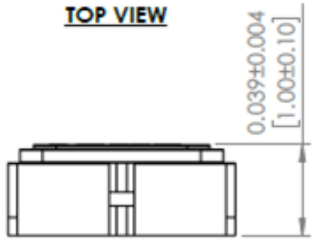
MSL Level = N/A

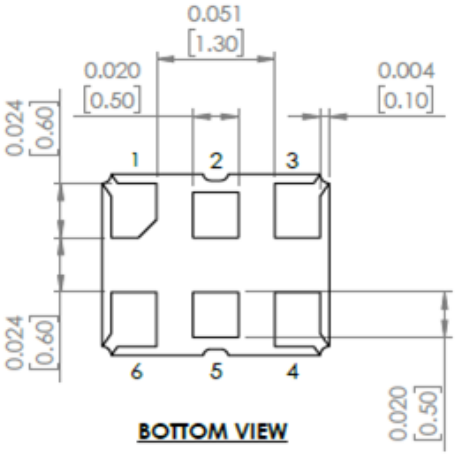
Mechanical Dimensions



TOP VIEW

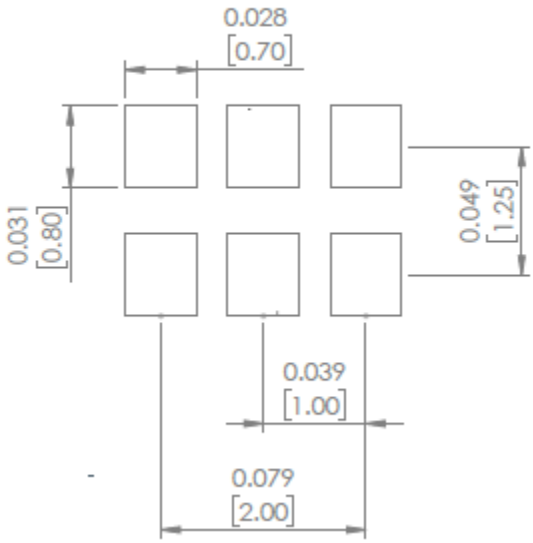


SIDE VIEW



BOTTOM VIEW

Recommended Land Pattern



Case 1 Pin #1=Output Enable/Disable Function *where* OE is Active HIGH		Case 2 Pin #2=Output Enable/Disable Function *where* OE is Active HIGH	
Pin	**Description**	**Pin**	**Description**
# 1	Output Enable = Logic High, "1", Vdd	**# 1**	No Connect
	Output Disable = Logic Low, "0", GND	**# 2**	Output Enable = Logic High, "1", Vdd
# 2	No Connect		Output Enable = Logic Low, "0", GND
# 3	GND	**# 3**	GND
# 4	Output	**# 4**	Output
# 5	Complementary output	**# 5**	Complementary output
# 6	Supply Voltage (Vdd)	**# 6**	Supply Voltage (Vdd)

Dimensions: inches [mm]

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MSL Level = N/A

Reflow Profile [JEDEC J-STD-020]

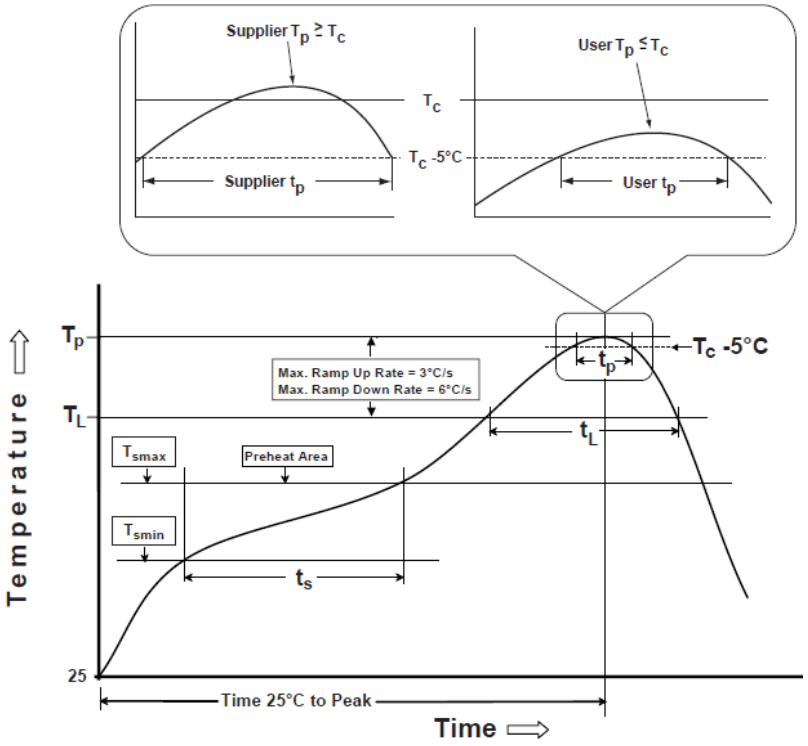

Table 1

SnPb Eutectic Process Classification Temperatures (T_c)		
Package Thickness	Volume mm³ <350	Volume mm³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2

Pb-Free Process Classification Temperatures (T_c)			
Package Thickness	Volume mm³ <350	Volume mm³ 350-2000	Volume mm³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm - 2.5 mm	260 °C	250 °C	245 °C
>2.5 mm	250 °C	245 °C	245 °C

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / soak		
Temperature minimum (T_{smin})	100°C	150°C
Temperature maximum (T_{smax})	150°C	200°C
Time (T_{smin} to T_{smax}) (t_s)	60 - 120 sec.	60 - 120 sec.
Average ramp-up rate (T_{smax} to T_P)	3°C/sec. max	3°C/sec. max
Liquidous temperature (T_L)	183°C	217°C
Time at liquidous (t_L)	60 - 150 sec.	60 - 150 sec.
Peak package body temperature (T_P)*	**see Table 1**	**see Table 2**
Time (t_p)** within 5°C of the specified classification temperature (T_C)	20 sec.	30 sec.
Ramp-down rate (T_p to T_{smax})	6°C/sec. max	6°C/sec. max
Time 25°C to peak temperature	6 min. max	8 min. max
Reflow cycles	2 max	2 max

*Tolerance for peak profile temperature (T_P) is defined as a supplier minimum and a user maximum.

**Tolerance for time at peak profile temperature (t_p) is defined as supplier minimum and a user maximum.

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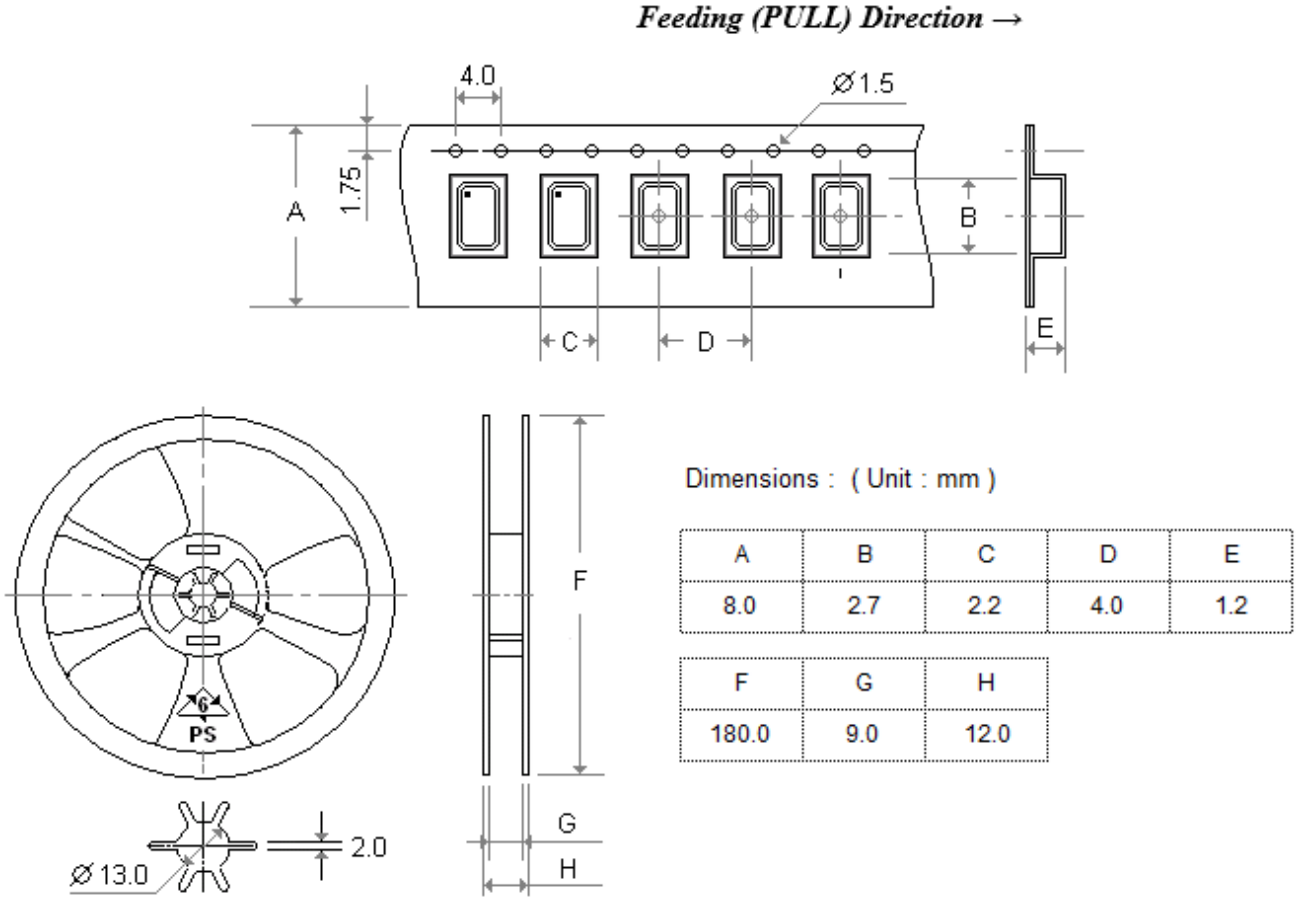
2.50 x 2.0 x 1.0 mm
RoHS/RoHS II Compliant
MSL Level = N/A

Packaging

Blank = Bulk (MOQ=100 units)
T = Tape & Reel 1,000 units/reel
T3= Tape & Reel 3,000 units/reel



Dimensions : (Unit : mm)

A	B	C	D	E
8.0	2.7	2.2	4.0	1.2

F	G	H
180.0	9.0	12.0

- (10) sprocket hold pitch cumulative tolerance is ±0.10 mm
- "E" measured from a place on the inside bottom of the pocket to the top surface of the carrier

Dimensions: mm

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