

ClearClock™ Oscillator Family | Clock Oscillator| 2.0x1.6mm XO

Description

Abracon's AK1B offers the latest high frequency fundamental crystal technology, with exceptional phase noise performance, with a noise floor of -166 dBc/Hz at 156.250MHz. The Abracon AK1B is available with a compact 2.0 x 1.6 x 0.75 mm package with a frequency stability of ± 50 ppm over an operating temperature range of -40°C to 105°C. Additional advantages include a various power supply options ranging from 1.8V, 2.5V, 3.3V and a continuous voltage range of 2.375V to 3.63V.



Features

- Available in industry standard frequencies: 100MHz and 156.25MHz
- ± 50 ppm stability over industrial operating temperature (-40°C to +105°C)
- 1.8V, 2.5V, 3.3V, 2.375 V to 3.63V Continuous supply voltage options
- Industry standard 2.0 x 1.6 x 0.75 mm footprint
- Available in Abracon's global distribution network

Typical Applications

- Optical Transceivers and Modules
- Data Centers, Storage, and Servers
- Networking switches and gateways
- 100G/200G/400G/800G Ethernet
- Fibre Channel/SONET/SDH/PCle
- Industrial and FPGA applications
- Test & measurement

Electrical Specifications

Parameters		Min.	Typ.	Max.	Unit	Notes
Frequency Range		100		156.25	MHz	
Standard Available Frequencies		100.000, 156.250			MHz	Contact Abracon for availability of frequencies not listed
Supply Voltage (V _{DD})		2.97	3.3	3.63	V	Option "A"
		2.375	2.5	2.625		Option "B"
		1.71	1.8	1.89		Option "C"
		2.375		3.63		Option "D"
Supply Current (I _{DD})	LVPECL			60	mA	At 156.2500MHz, 3.3V
	LVDS			20		
	HCSL			40		
Operating Temperature Range		-40		85	°C	Option "R"
		-40		105		Option "S"
Storage Temperature		-55		150	°C	
First Year Aging		-3		3	ppm	At 25°C
Frequency Stability [Note 1]		-50		50		Option "R" (-40°C to +85°C)
		-50		50		Option "S" (-40°C to +105°C)

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Electrical Specifications Cont.

Parameters			Min.	Typ.	Max.	Unit	Notes
Rise (Tr) / Fall (Tf) Time ^[Note 3]	LVPECL				0.5	ns	R _L =50Ω to V _{dd} −2.0V on each output
	LVDS				0.5		R _L = 100Ω (Between Outputs)
	HCSL				0.6		R _L = 50Ω to GND, R _S =0Ω
Duty Cycle			45		55	%	
Start-up Time ^[Note 2]					2.0	ms	
Differential Output High Voltage (VOH) Output Low Voltage (VOL)	LVPECL	V _{OH}	V _{DD} -1.105	V _{DD} -0.950	V _{DD} -0.860	V	R _L =50Ω into V _{dd} −2.0V on each output, Option “P”
		V _{OL}	V _{DD} -1.810	V _{DD} -1.700	V _{DD} -1.590		
	HCSL	V _{OH}	0.50		1.0		R _L = 50Ω to GND, R _S =0Ω, Option “H”
		V _{OL}	-0.150		0.150		
Differential Voltage	LVDS	V _{OD}	247	350	454	mV	R _L = 100Ω (Between Outputs), Option “D”.
		ΔV _{OD}			50	mV	
Offset Voltage		V _{OS}	1.125	1.250	1.375	V	
		ΔV _{OS}			50	mV	
Output Voltage Swing (V _{opp})		LVPECL	0.40			V	R _L =50Ω into V _{dd} −2.0V on each output
		LVDS	0.25				R _L = 100Ω (Between Outputs)
		HCSL	0.55				R _L = 50Ω to GND, R _S =0Ω
Tri-state Function		V _{IH}	“1” (V _{IH} ≥0.7*V _{dd}) or Open: Oscillation; “0” (V _{IL} <0.3*V _{dd}): No Oscillation/Hi Z			V	
		V _{IL}					
Output Enable Time					2.0	ms	
Output Disable Time					0.2	μs	
Output Disable Current Consumption					10	μA	OE (pad 1) ≤ 0.3*(V _{dd})
RMS Phase Jitter (12kHz to 20MHz from Carrier)			See Table 1 below				V _{dd} , output logic type and Carrier frequency dependent

Note 1: Includes post reflow frequency tolerance, temperature stability, load pulling, power supply variation and first year aging

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

Note 3: Measured over 20% to 80% of waveform

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Phase Noise Specifications

Table 1
RMS Phase Jitter 12kHz – 20MHz BW [Note 4,5]

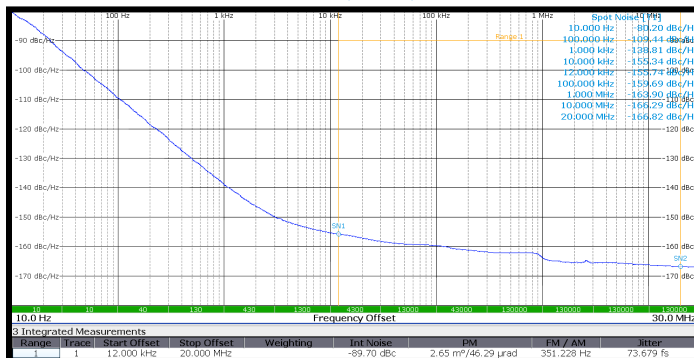
Carrier Frequency	Output Logic	Supply Voltage (1.8V)		Supply Voltage (2.5V)		Supply Voltage (3.3V)	
		RMS Jitter		RMS Jitter		RMS Jitter	
		Typ. (fs)	Max (fs)	Typ. (fs)	Max (fs)	Typ. (fs)	Max (fs)
100	LVDS	79.3	100	73.7	85	73.7	80
	LVPECL	NA	NA	75.9	85	75.9	85
	HCSL	68.6	80	54.4	80	54.4	80
156.25	LVDS	53.4	80	34.5	50	34.5	50
	LVPECL	NA	NA	41.8	60	41.8	50
	HCSL	47.2	60	34.2	50	34.2	50

Note 4: Guaranteed by characterization; RMS Phase Jitter specifications are inclusive of any spurs

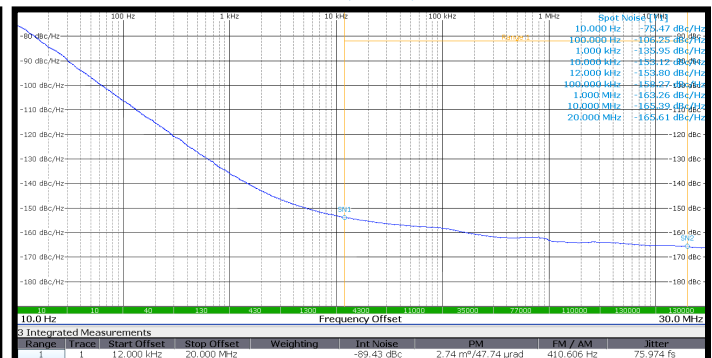
Note 5: Phase jitter measured with Rohde & Schwarz FSWP8

Phase Noise Plots [Note 5]

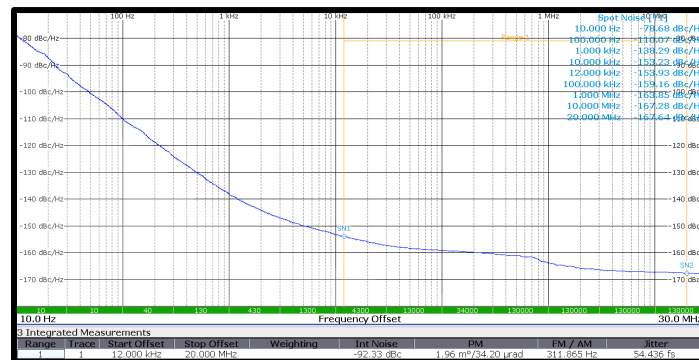
Plot #1: LVDS, 3.3V, 100MHz



Plot #2: LVPECL, 3.3V, 100MHz



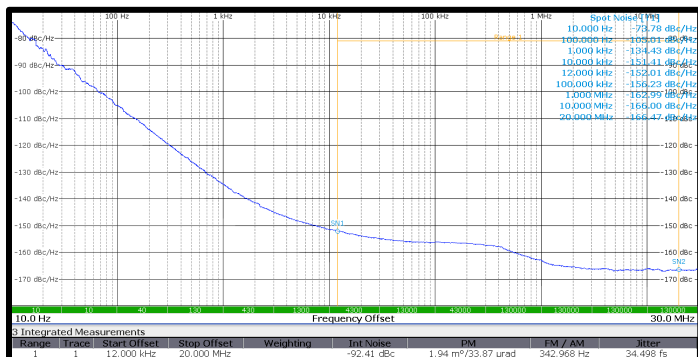
Plot #3: HCSL, 3.3V, 100MHz



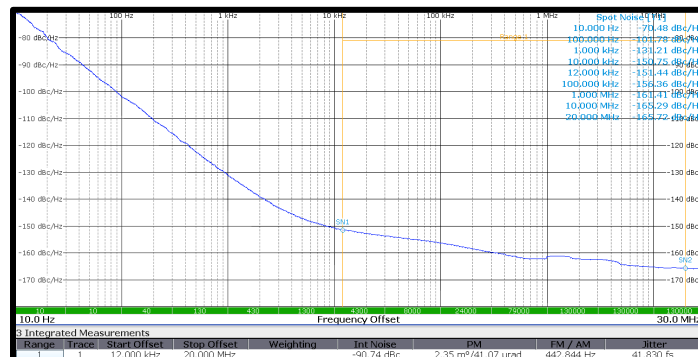
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Phase Noise Plots Cont. [Note 5]

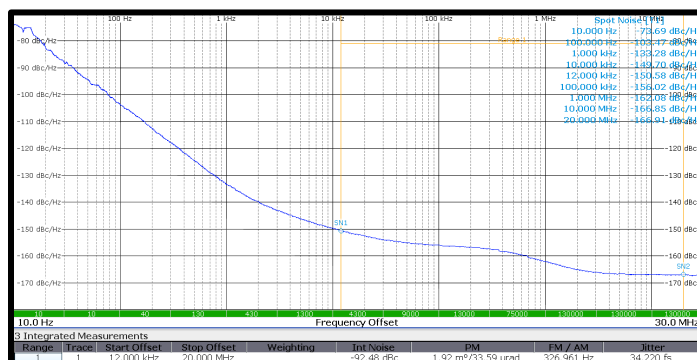
Plot #3: LVDS, 3.3V, 156.25MHz



Plot #5: LVPECL, 3.3V, 156.25MHz

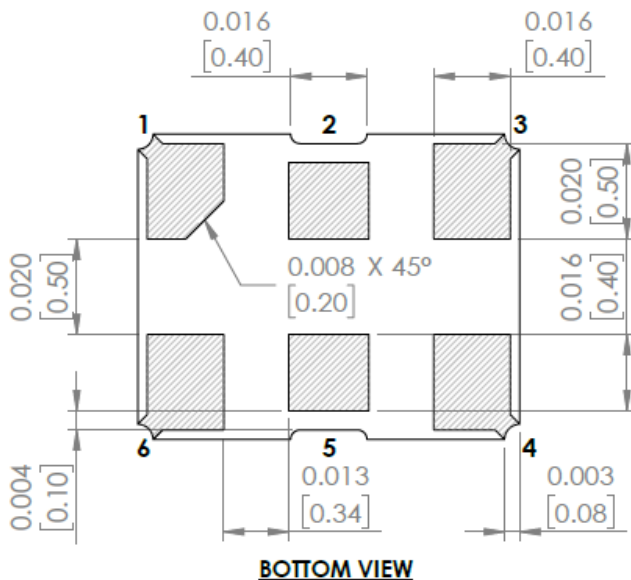
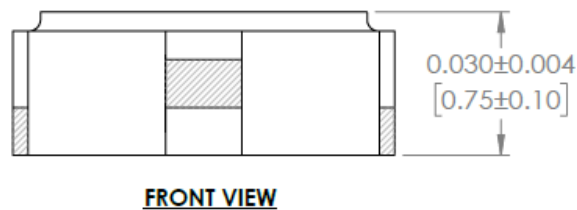
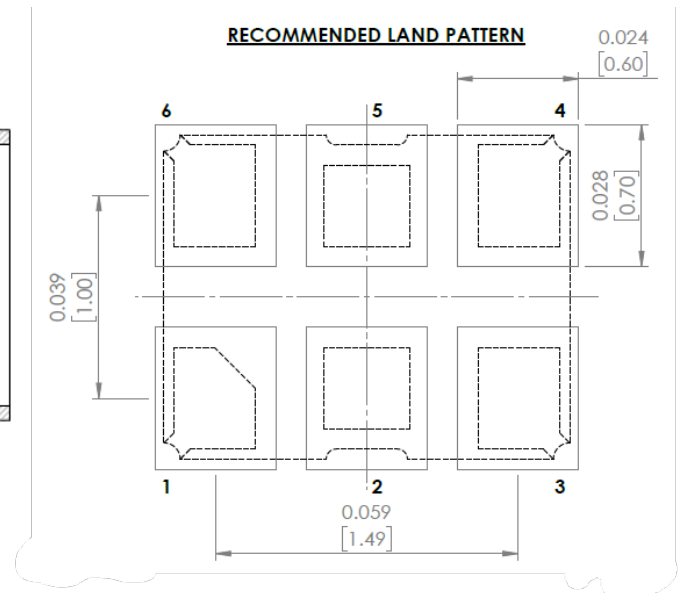
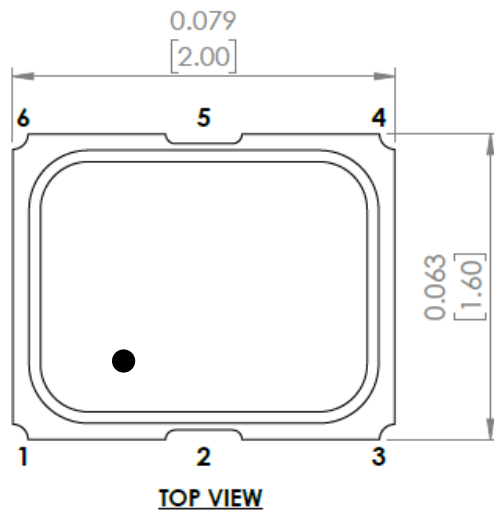


Plot #6: HCSL, 3.3V, 156.25MHz



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Mechanical Dimensions



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

Dimensions: Inches [mm]

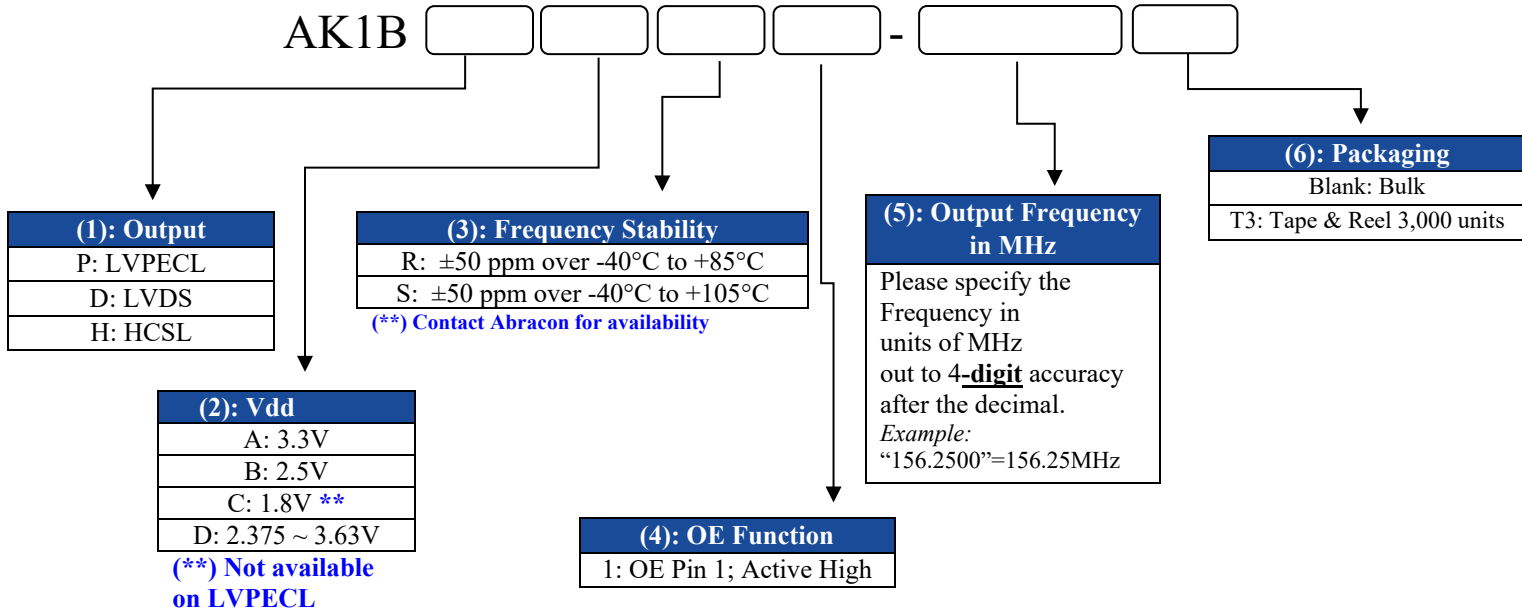
Revision: IR
Initial Release 5/20/2025

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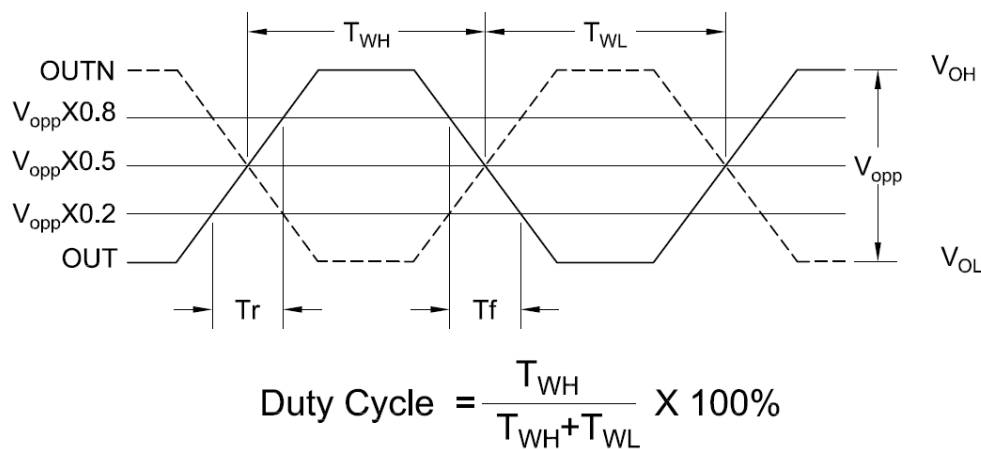
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Part Identification



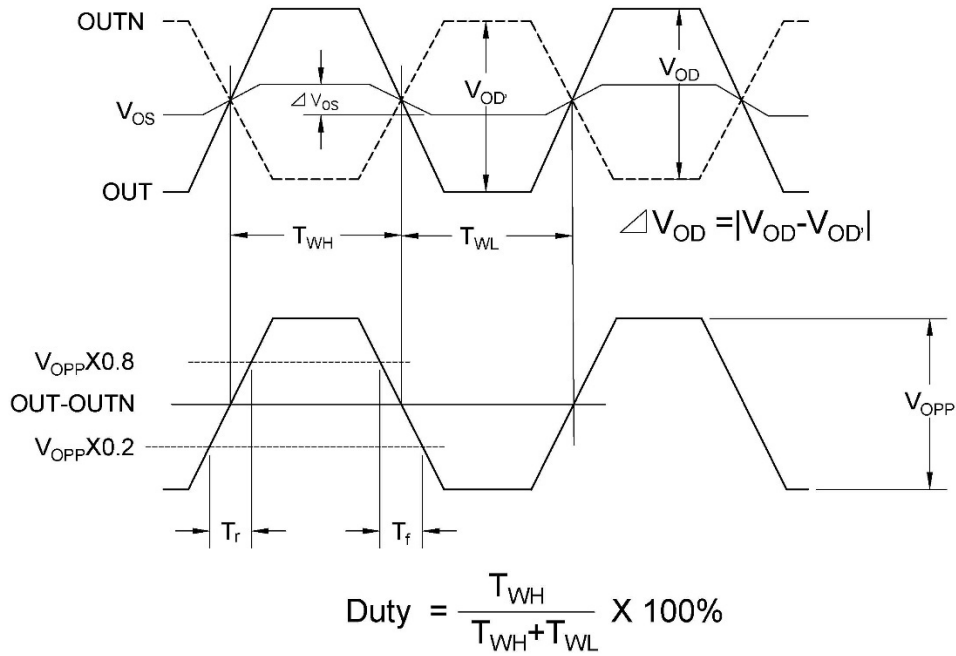
Output Waveform Diagram

LVPECL: Output Wave Form (Duty, Tr, Tf, Vopp)

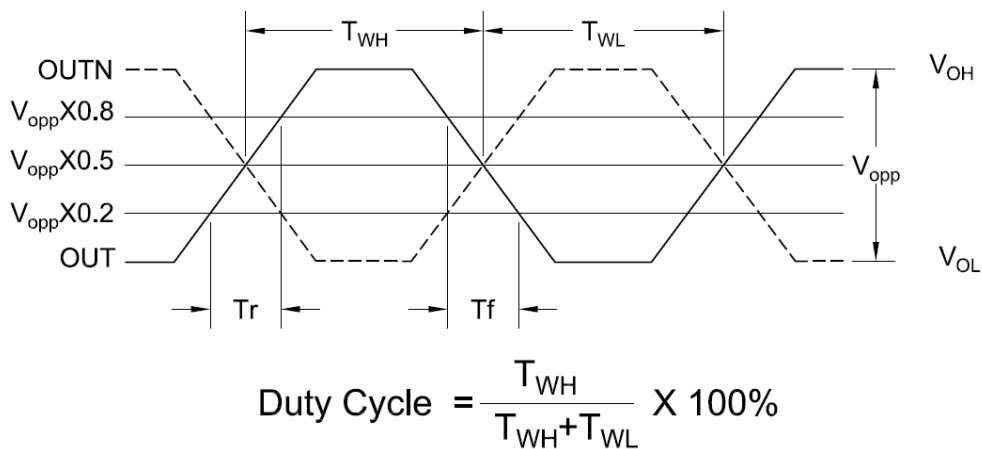


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LVDS: Output Wave Form (Duty, Tr, Tf, VOD, ΔVOD , VOS, ΔVOS , Vopp)

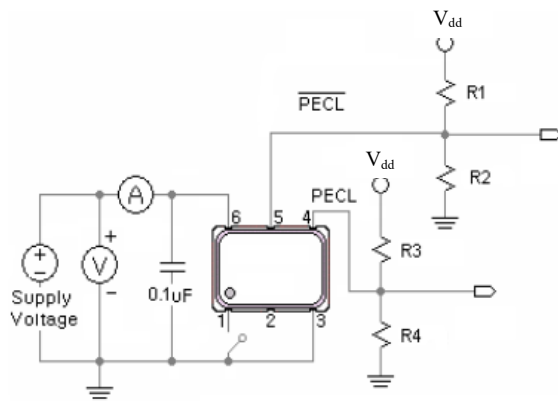


HCSL: Output Wave Form (Duty, Tr, Tf, VOH, VOL, Vopp)



Recommended Test Circuit [\[Note 6\]](#)

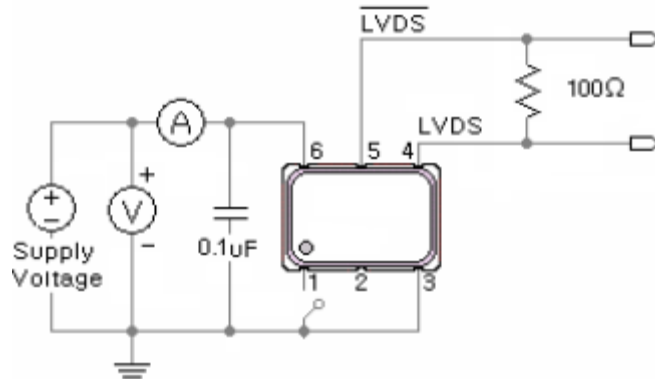
LVPECL



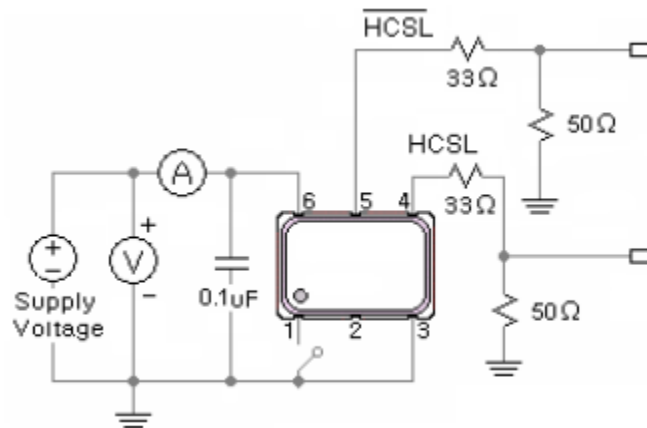
Vdd=3.3V: R1=R3=127Ω; R2=R4=82.5 Ω

Vdd=2.5V: R1=R3=250Ω; R2=R4=62.5 Ω

LVDS



HCSL



Note 6: 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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Absolute Maximum Ratings [\[Note 7\]](#)

Parameters	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	V _{SS} -0.5		4.5	V	
Input Voltage	V _{SS} -0.5		V _{DD} +0.5	V	
Output Voltage	V _{SS} -0.5		V _{DD} +0.5	V	
Maximum Junction Operating Temperature			150	°C	
Ambient Operating Temperature Range	-40		85	°C	Industrial
Ambient Operating Temperature Range	-40		105	°C	Extended Industrial
Reflow Temperature			260	°C	See Reflow Profile
ESD Protection	4kV HBM, 300V MM, 2kV CDM				

Note 7: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability. The data sheet limits are not guaranteed if the device is operated beyond the recommended operating conditions.

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Reflow Profile [JEDEC J-STD-020]

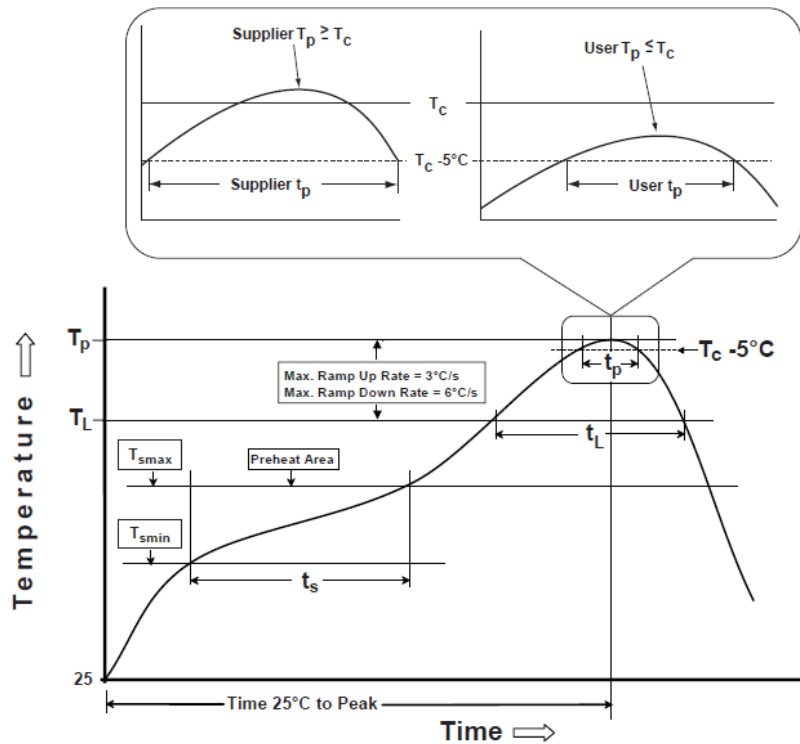


Table 1

SnPb Eutectic Process Classification Temperatures (T_C)		
Package Thickness	Volume mm ³ <350	Volume mm ³ ≥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 mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >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

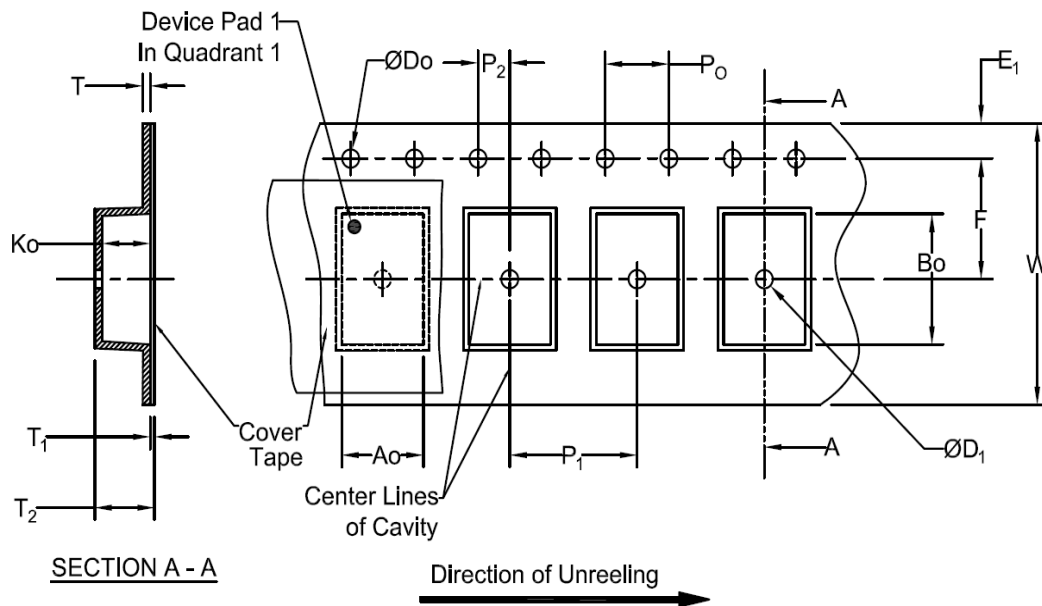
*Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.

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

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Packaging

T3: 3,000pcs/reel

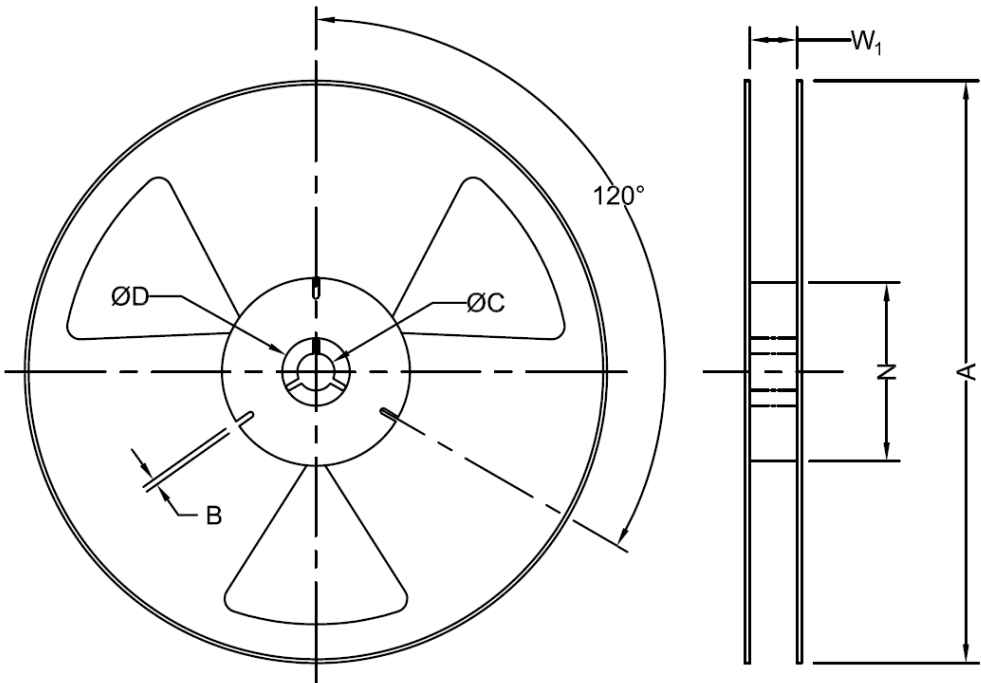


Tape Specifications (mm)							
Width	Ao	Bo	Do	D ₁ (Min)	E ₁	F	Ko
8mm	*	*	1.5+0.1/-0.0	1.0	1.75±0.1	3.5±0.05	*
Width	P ₁	P ₂	P ₀	T (Max)	T ₁ (Max)	T ₂ (Max)	W (Max)
8mm	4.0±0.1	2.0±0.05	4.0±0.1	0.6	0.1	2.5	8.3

***Note: Compliant to EIA-481**

Dimensions: mm

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Reel Specifications (mm)							
Width	Qty/Reel	A (Nom)	B (Min)	C (Min)	D (Min)	N (Min)	*W ₁
8mm	3000	178	1.5	13.0+0.5/-0.2	20.2	50	8.4+1.5/-0.0

***Note: Measured at Hub**

Dimensions: mm