CLEARCLOCK™ | POWER OPTIMIZED 175fs VCXO

AV7

7.0 x 5.0 x 1.8 mm

RoHS/RoHS II Compliant

MSL = 1

ESD SENSITIVE

FEATURES

- 175fs typ jitter (300fs MAX)
- Widest in-class frequency range from 50 to 2100MHz
- Excellent spurious suppresion
- 68mA MAX I_{DD} (CML)
- Lowest in-class power consumption
- Supports LVPECL, HCSL, LVDS, CML outputs
- ±100ppm pull range
- -40°C to 85°C or -20°C to 70°C operation
- Industry standard 5x7mm footprint
- Supports 3.3V, 2.5V or 1.8V operation

APPLICATIONS

- Networking and communications
- RF systems, base stations (BTS)
- Test and measurement
- 100/400GbEthernet
- Low noise phase locked loops
- Clean-up PLLs
- SONET/SDH
- Broadcast video
- Jitter cleaners

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.

AV7 ☐ ☐ ☐ ☐ - ☐ ☐

(1): Output Type
P: LVPECL
D: LVDS
H: HCSL (*)
M: CML

(*) Frequency range limited to: 50~700MHz

(2): V_{DD}
A: 3.3V
B: 2.5V
C: 1.8V (*)

(*) Excluding LVPECL output

(3): Stability over OTR
D: ±25ppm over -20°C to +70°C
E: ±50ppm over -20°C to +70°C (*)
F: ±25ppm over -40°C to +85°C
G: ±50ppm over -40°C to +85°C (*)

***Wider pull range option recommended. Contact Abracon for details.**

(4): OE Function
3: OE Pin 2; Active High
4: OE Pin 2; Active Low

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

(6): Packaging
Blank: Bulk
C: Cut Tape 50 units
T: Tape & Reel 250 units

Part Number Example:

AV7PAF3-644.53125C

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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 2]			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		
	CML			63	68		@ V_{DD}=1.8V
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	*See Options*
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 3]			-15		+15	ppm	
All Inclusive Frequency Accuracy over 10-Year Product Life [Note 3]			-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 3]				< 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})		

Note 2: Supply Voltage (Vdd) = 1.8V option not available with LVPECL output
Note 3: Relative to initial measured frequency @ 25°C ±3°C

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COMMON KEY ELECTRICAL SPECIFICATIONS

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		
	CML		62	67		@ V_{dd}=1.8V
Voltage Control Function						
Control Voltage (Vc)	Vdd=3.3V	0.3	1.65	3.0	V	
	Vdd=2.5V	0.25	1.25	2.25		
	Vdd=1.8V	0.18	0.9	1.62		
Frequency Pulling Range		±80	±100		ppm	
Linearity			±5	±10	%	
Transfer Function		Positive Transfer				
Input Impedance		5.0			MΩ	
Bandwidth			10.0		kHz	Measured @ -3dB
Harmonics				-5.0	dBc	
RMS Phase Jitter (12kHz -20MHz BW)			200	300	fsec	@ Vdd=3.3V

TYPICAL PHASE NOISE AND JITTER CHARACTERISTICS (@25°C ± 3°C) [Note 4]

Frequency (MHz)		148.35165	155.52	322.265625
RF Output		LVDS	LVPECL	LVPECL
Supply Voltage (Vdd)		1.8V	3.3V	3.3V
Control Voltage (Vc)		0.9V	1.65V	1.65V
RMS Phase Jitter (fsec) 12kHz-20MHz BW		169	129	136
Phase Noise (dBc/Hz)	100Hz	-74	-68	-66
	1kHz	-100	-93	-89
	10kHz	-122	-125	-117
	100kHz	-140	-140	-134
	1MHz	-150	-150	-143
	10MHz	-156	-159	-156
	20MHz	-157	-159	-157

Note 4: Refer to following Section for selected Phase Noise Plots

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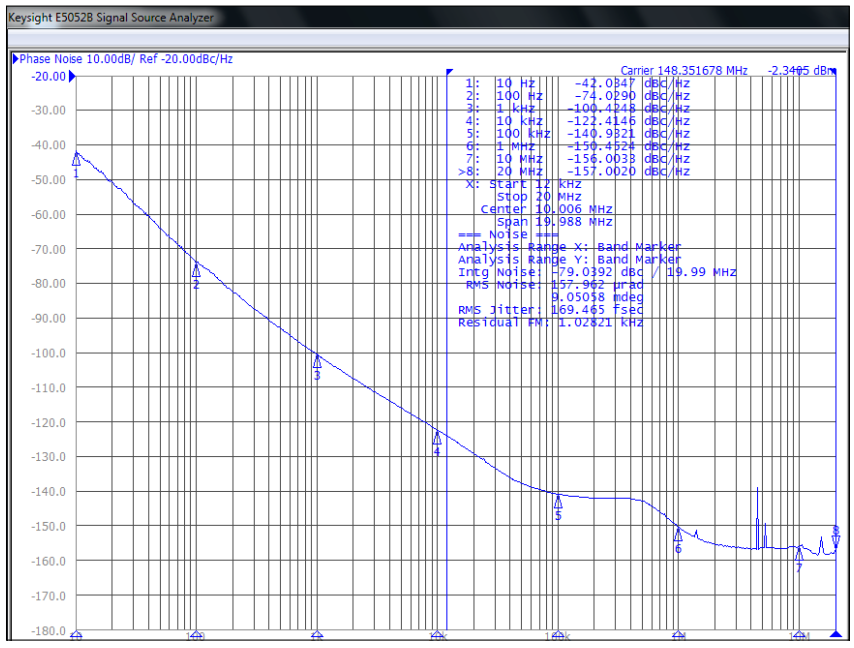
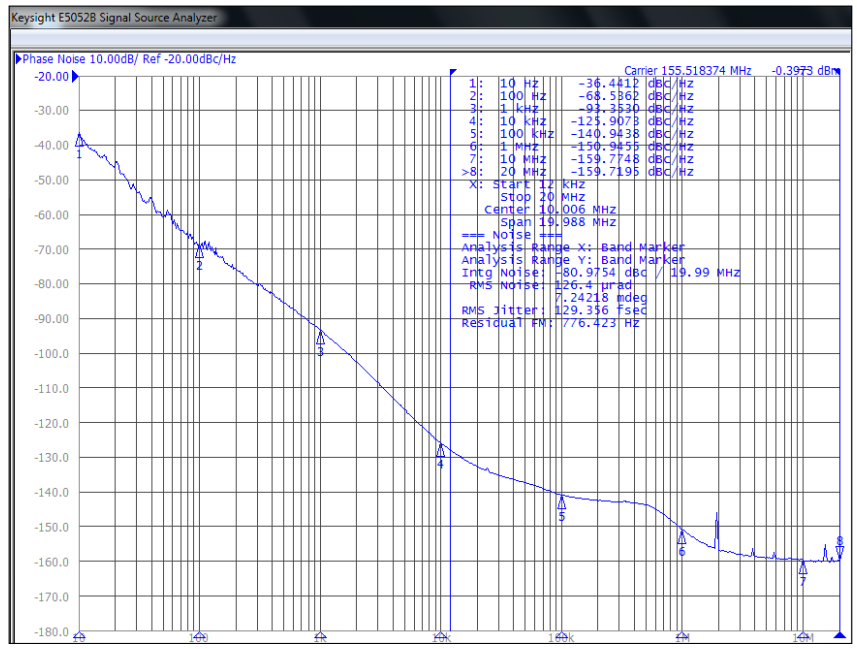
SELECTED PHASE NOISE PLOTS (@25°C ± 3°C)

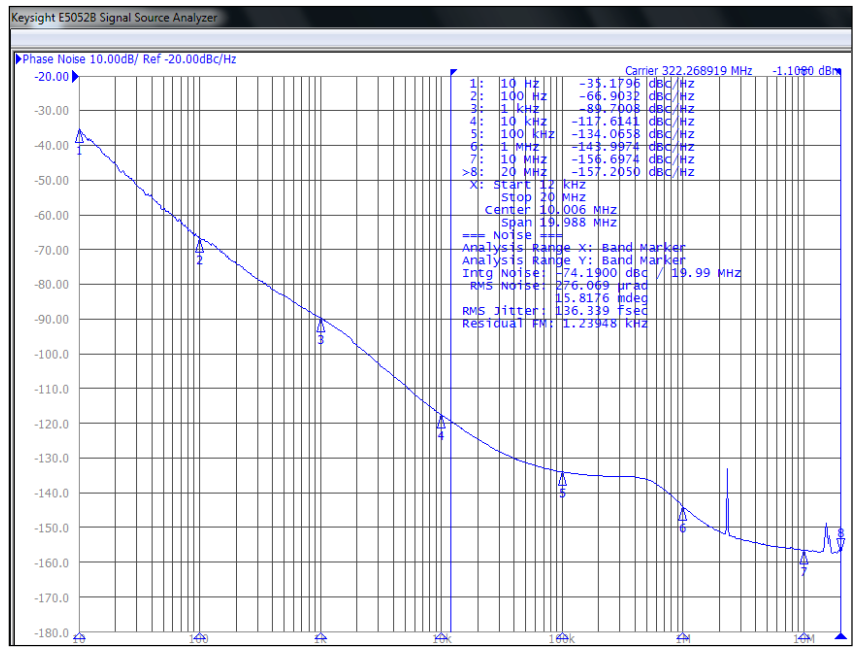
148.35165MHz – LVDS – Vdd=1.8V; Vc=0.9V



155.52MHz – LVPECL – Vdd=3.3V; Vc=1.65V



322.265625MHz – LVPECL – Vdd=3.3V; Vc=1.65V



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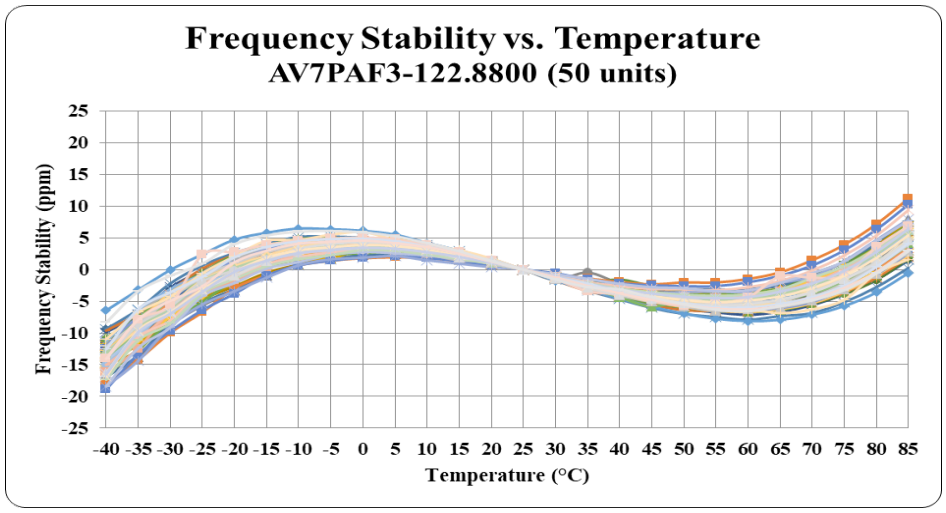
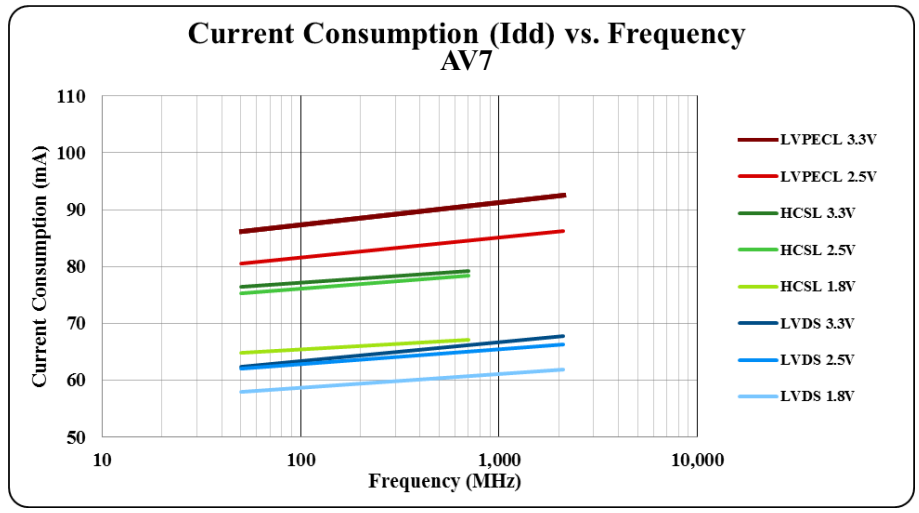
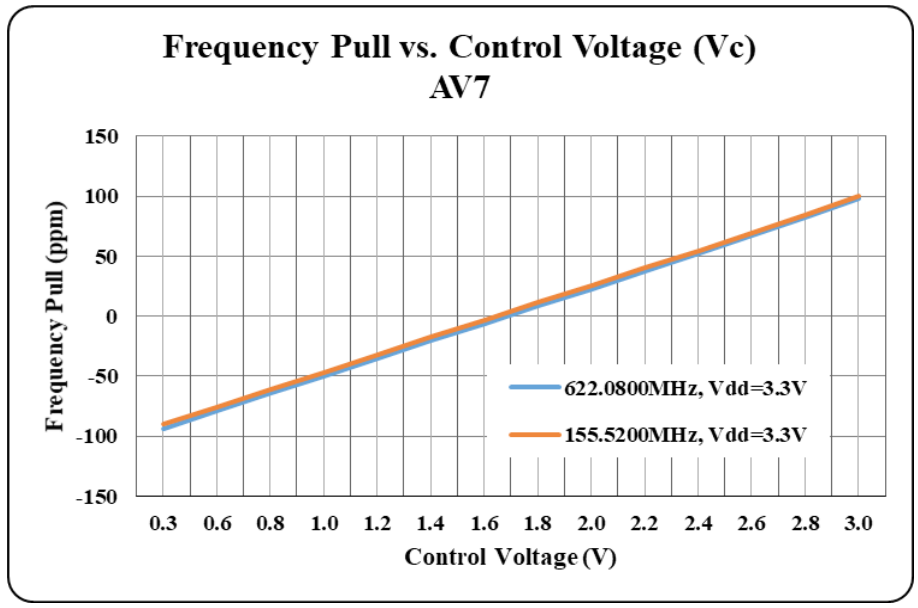
Typical Frequency Vs. Temperature Characteristics



Typical Current Consumption (I_{dd}) Vs. Frequency Characteristics (@ 25ºC ± 3ºC)



Typical Frequency Pull vs. Control Voltage (Vc) @ 25ºC ± 3ºC



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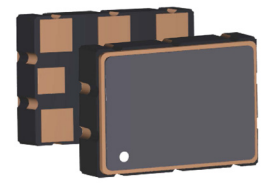

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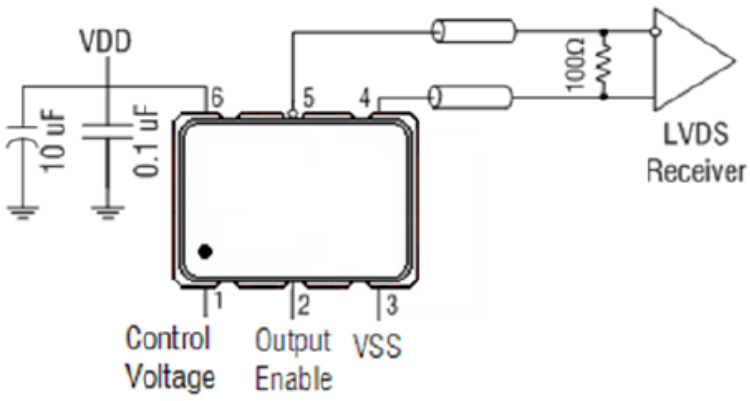
RoHS/RoHS II Compliant

MSL = 1

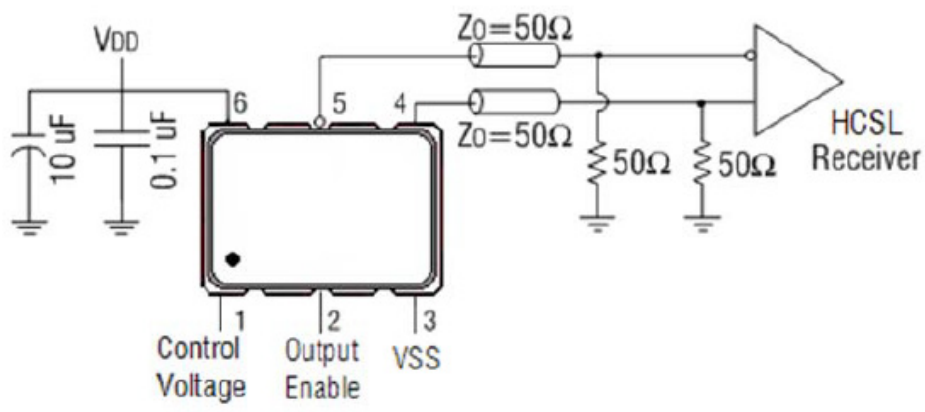
ESD SENSITIVE

RECOMMENDED TEST CIRCUIT

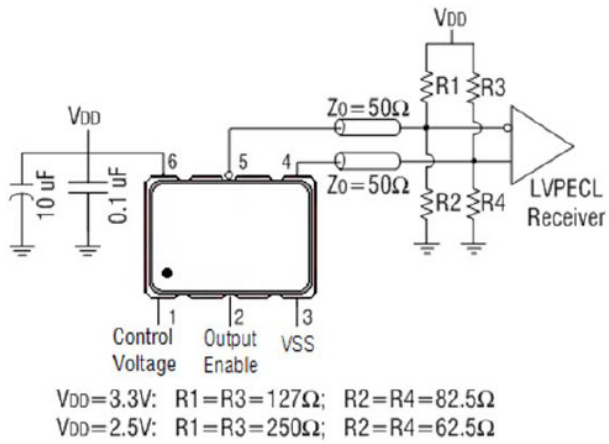
LVDS



HCSL

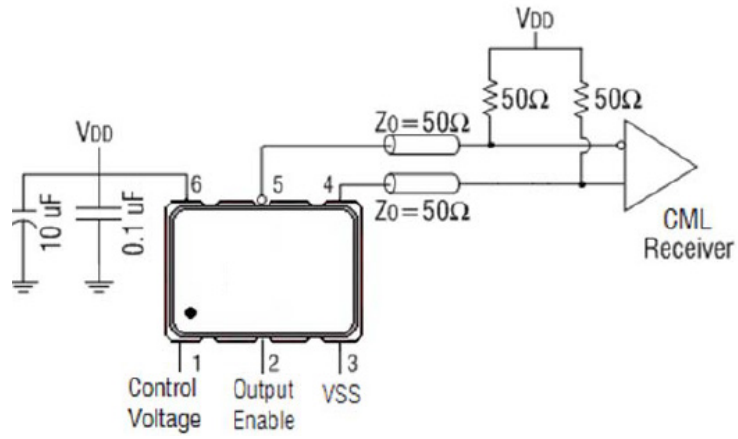


LVPECL

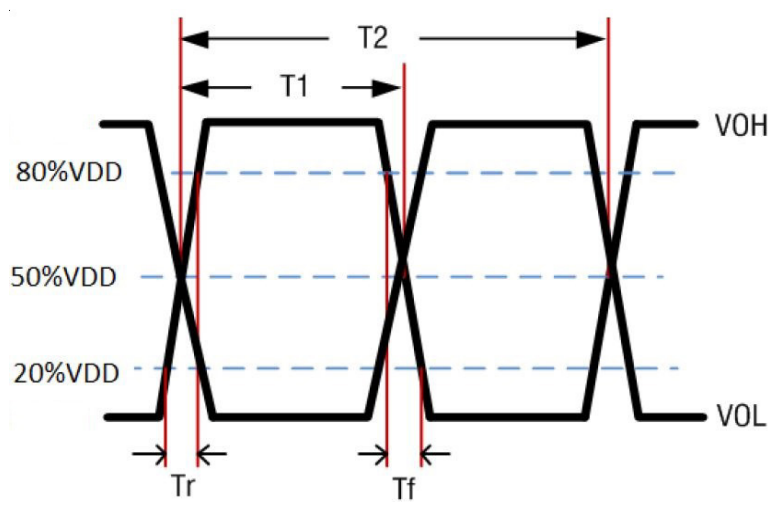


VDD=3.3V: R1=R3=127Ω; R2=R4=82.5Ω
VDD=2.5V: R1=R3=250Ω; R2=R4=62.5Ω

CML



DIFFERENTIAL OUTPUT WAVEFORM



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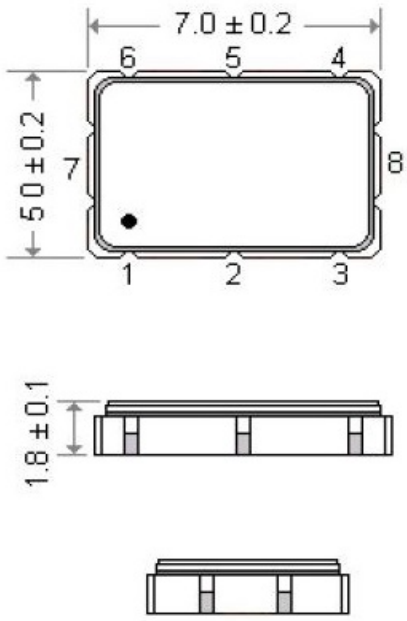
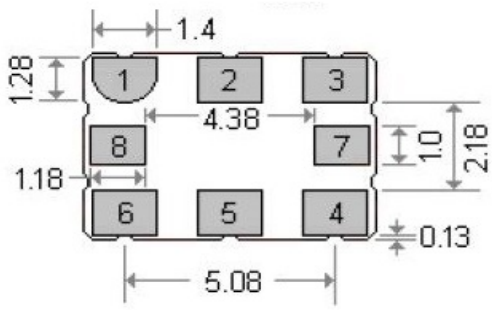
MECHANICAL DIMENSIONS

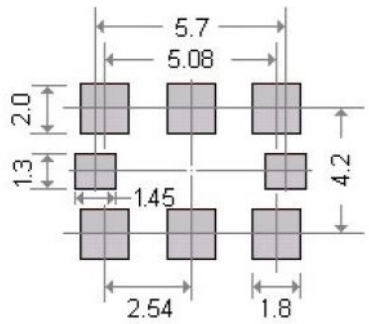
TOP VIEW



BOTTOM VIEW



RECOMMENDED LAND PATTERN

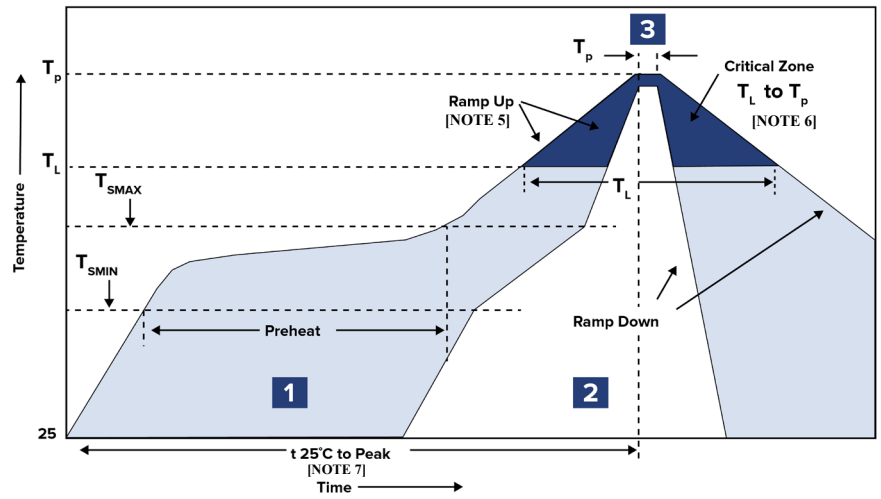


Dimensions: mm

PIN #	FUNCTION
# 1	Control Voltage (Vc)
# 2	**Option 3:** Enable: Active HIGH Disable: Active LOW **Option 4:** Enable: Active LOW Disable: Active HIGH
# 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.**

REFLOW PROFILE



Zone	Description	Temperature	Time
1	Preheat / Soak	T_{SMIN} ~ T_{SMAX} 150°C ~ 200°C	60 ~ 180 sec.
2	Reflow	T_L 217°C	60 ~ 150 sec.
3	Peak heat	T_P 260°C±5°C	20 ~ 40 sec.

Note 5: Ramp Up Rate ($T_L \rightarrow T_P$) = 3°C / sec. MAX
Note 6: Ramp Down Rate ($T_P \rightarrow T_L$) = 6°C / sec. MAX
Note 7: Time 25°C to Peak Temperature (25°C → T_P) = 8 minutes MAX

***Can withstand 2 times reflow**
***All temperatures refer to topside of the package, measured on the package body surface**

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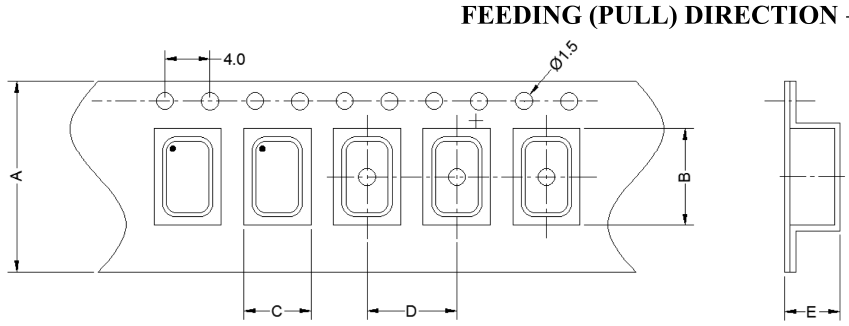
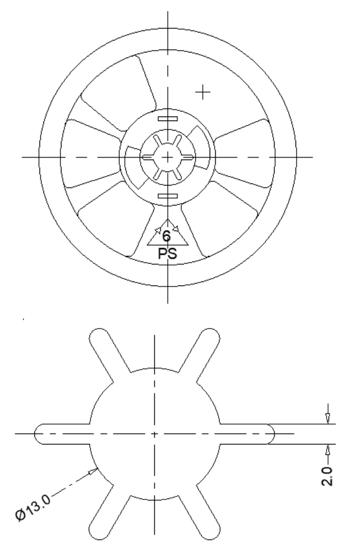
PACKAGING

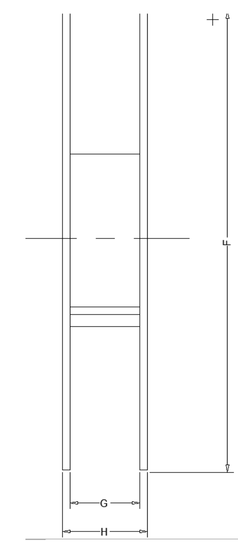
C = Cut Tape 50 units
T = Tape & Reel 250 units/reel

FEEDING (PULL) DIRECTION →





Tape Dimensions	
A	16.0
B	7.2
C	5.4
D	8.0
E	1.8
Reel Dimensions	
F	180.0
G	16.5
H	19.6



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