MSPD101x-xxx Series

Sampling Phase Detectors
10 MHz - 20 GHz

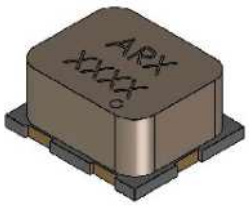
Rev. V1

Features

- Surface Mount Package:
  3.3 mm (L) x 2.8 mm (W) x 1.5 mm (H)
- RoHS* Compliant

Applications

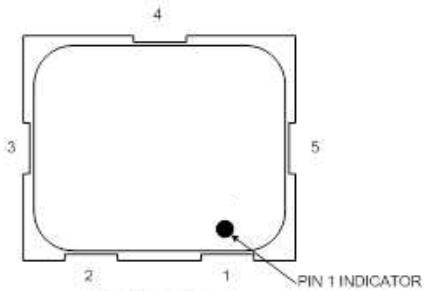
- Phase Lock Loops
- High Frequency Sampling



CS121



CS122



TOP VIEW

Description

The products of the MSPD101x-x series are fully-contained sampling phase detectors, each comprising a beam lead silicon step recovery diode, beam lead DC blocking capacitors and a beam lead series-tee pair of low-barrier silicon Schottky diodes mounted on a ceramic substrate. The semiconductors and chip capacitors are protected with an epoxy encapsulation on the top side of the ceramic substrate. These products are manufactured using a proven diode fabrication and assembly processes which optimize diode characteristics for optimal electrical performance and excellent reliability.

These low profile, compact surface mount components offer RF and microwave signal performance superior to comparable chip-and-wire discrete devices in leaded packages. These rugged devices are capable of reliable operation in all military, commercial and industrial applications.

Pin Configuration

Pin #	Description
1	Cathode terminal of step recovery diode
2	Anode terminal of step recovery diode
3	Cathode connection of Schottky diode series tee
4	Center node of Schottky diode series tee
5	Anode connection of Schottky diode series tee

Ordering Information

Part #	Description	Packaging
MSPD1011-xxx[1]-T	Low Barrier	Tube
MSPD1012-xxx[1]-T	Medium Barrier	
MSPD1013-xxx[1]-T	High Barrier	
MSPD1011-xxx[1]-R	Low Barrier	250 or 500 piece reel
MSPD1012-xxx[1]-R	Medium Barrier	
MSPD1013-xxx[1]-R	High Barrier	
MSPD1011-xxx[1]-W	Low Barrier	Waffle Pack
MSPD1012-xxx[1]-W	Medium Barrier	
MSPD1013-xxx[1]-W	High Barrier	

1. Insert 121 for ceramic or 122 for epoxy.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

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Electrical Specifications: T_A = +25°C

Parameter	Conditions	MSPD1011			MSPD1012			MSPD1013			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Microwave Signal Level	—		-3 to 0			0 to 3			0 to 13		dBm
Schottky Diode											
Barrier Height		Low			Medium			High			
Forward Voltage	I_F = 1 mA	270	—	350	370	—	550	600	—	700	mV
Junction Capacitance	V_R = 0 V, 1 MHz	—	—	0.1	—	—	0.1	—	—	0.1	pF
Total Resistance	I_F = 5 mA	—	—	24	—	—	24	—	—	24	Ω
Step Recovery Diode											
Breakdown Voltage	I_R = 10 µA	—	20	30	—	20	30	—	20	30	V
Carrier Lifetime	I_F = 10 mA, I_R = 6 mA	—	10	—	—	10	—	—	10		ns
Transition Time	I_F = 10 mA, V_R = 10V	—	70	—	—	70	—	—	70	—	ps
Junction Capacitance	V_R = 0 V, 1 MHz	—	—	0.25	—	—	0.25	—	—	0.25	pF
DC Block Capacitance											
Capacitance	1 MHz	—	0.5	1.0	—	0.5	1.0	—	0.5	1.0	pF

Absolute Maximum Ratings @ T_A = 25°C (Unless otherwise noted)

Parameter	Conditions	Absolute Maximum
RF Incident Power	Applied to step recovery diode (pin 1 to pin2) Applied to microwave input (pin 4)	27 dBm 20 dBm
Total Dissipated Power	Infinite heat sink, T_C = 25°C. Derate power linearty from 100 mW @ 85°C to 0 W @ 125°C	100 mW
Junction Temperature	—	150°C
Operating Temperature	—	-55°C to +125°C
Storage Temperature	—	-65°C to +150°C

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Handling Procedures

Please observe the following precautions to avoid damage:

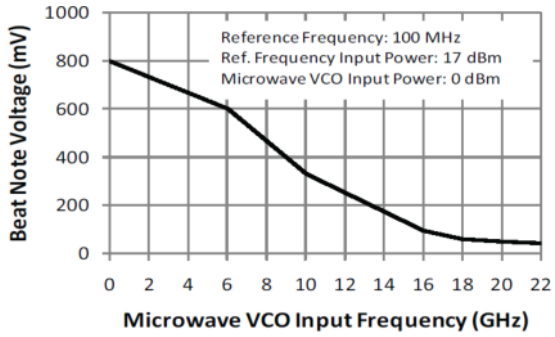
Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices. The moisture sensitivity level (MSL) rating is 1.

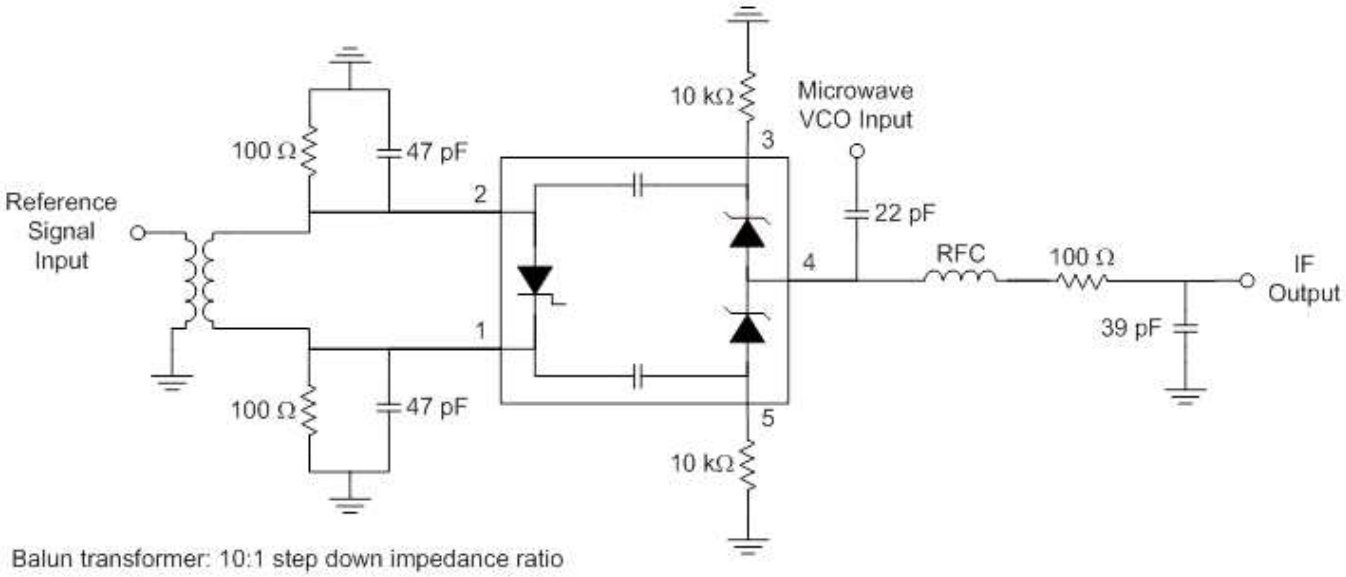
Environmental Capabilities

The MSPD101x-121 sampling phase detectors are capable of meeting the environmental requirements of MIL-STD-750 and MIL-STD-883.

Typical Performance:
T_A = +25°C, Z_0 = 50 Ω



Recommended Circuit



Balun transformer: 10:1 step down impedance ratio

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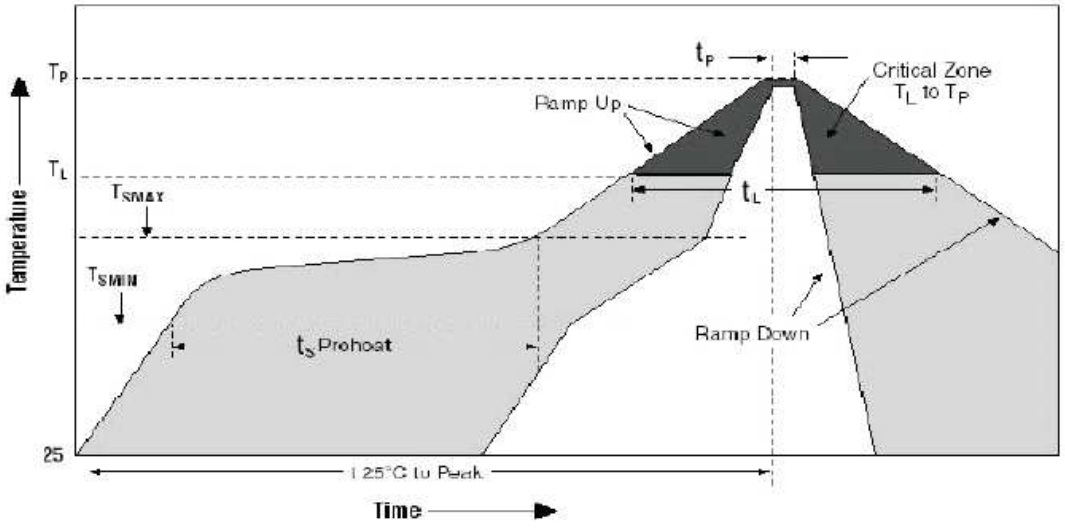
Assembly Instructions

The MSPD101x family of sampling phase detectors may be soldered to a printed circuit using conventional solder reflow or wave soldering procedures with RoHS type or Sn60/Pb40 type solders per the recommended time temperature profile described in Table I and Figure I.

Table 1. Time-Temperature Profile for Sn60/Pb40 or RoHS Type Solders

Profile Feature	SnPb Solder Assembly	Pb-Free Solder Assembly
Average Ramp-Up Rate (T_L to T_P)	3°C /second maximum	3°C /second maximum
Preheat: - Temperature Min (T_{SMIN}) - Temperature Max (T_{SMAX}) - Time (min to max)(t_S)	 100°C 150°C 60-120 s	 150°C 200°C 60-180 s
T_{SMAX} to T_L - Ramp-Up Rate		 3°C/s maximum
Time Maintained Above: - Temperature (T_L) - Time (t_L)	 183°C 60-150 s	 217°C 60-150 s
Peak temperature (T_P)	225 +0/-5°C	260 +0/-5°C
Time Within 5°C of Actual Peak Temperature (t_P)	10 – 30 s	20 – 40 s
Ramp-Down Rate	6°C /s maximum	6°C /s maximum
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum

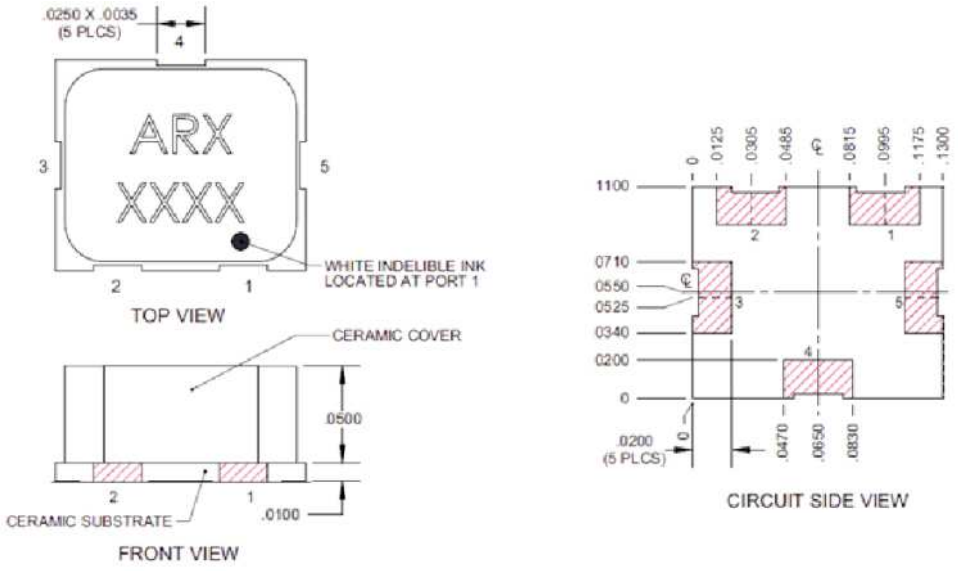
Figure 1. Solder Re-Flow Time-Temperature Profile



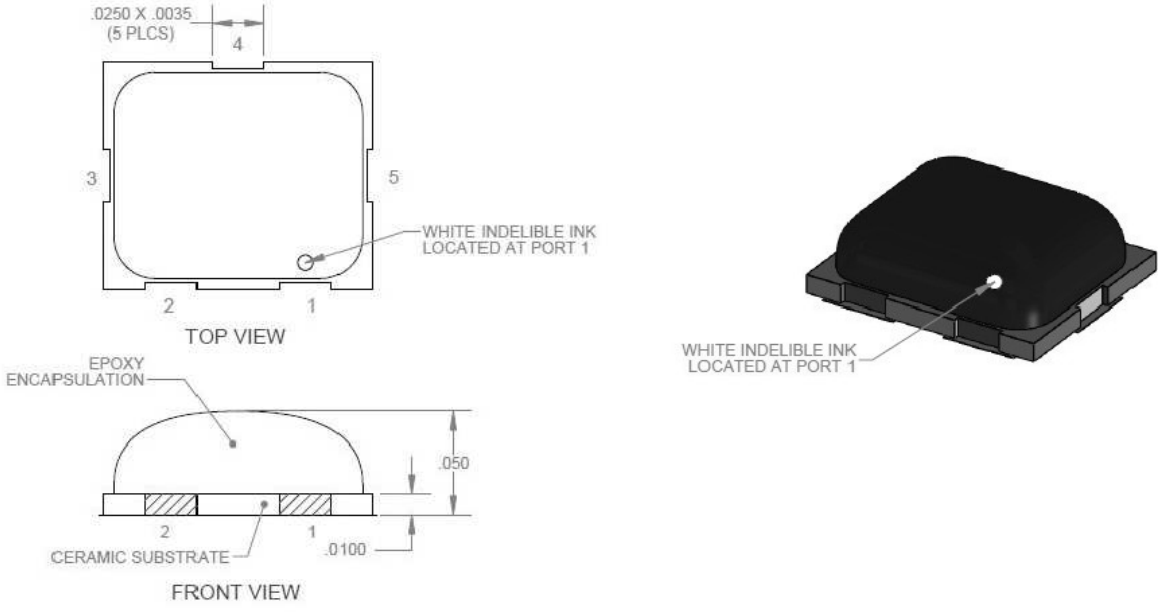
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Outline Drawing (CS121)



Outline Drawing (CS122)



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