Sampling Phase Detectors
MSPD1011, MSPD1012, MSPD1013 Series
Data Sheet

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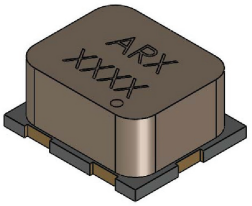

Features

- Operating Frequency: 10 MHz to 20 GHz
- Surface mount package:
  3.3 mm (L) x 2.8 mm (W) x 1.5 mm (H)
- RoHS Compliant

LEAD FREE
Pb
RoHS
COMPLIANT

Applications

- Phase locked loops
- High frequency sampling

Description

The products of the MSPD101x-121 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 Aeroflex/Metelics proven diode fabrication and assembly processes which optimize diode characteristics for optimal electrical performance and excellent reliability.

These low profile, compact (3.3 mm L x 2.8 mm W x 1.5 mm H) 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. The MSPD101x-121 family of devices is RoHS compliant.

Enviromental Capabilities

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

ESD Ratings

As are all semiconductors, the MSPD101x-121 sampling phase detectors are susceptible to damage from ESD events. Proper ESD prevention procedures should be followed. The ESD rating for these devices is Class 0 (HBM). The moisture sensitivity level rating is MSL 1.

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Electrical Specifications

T_A= 25ºC (Unless otherwise noted)

Parameter	Conditions	MSPD1011			MSPD1012			MSPD1013			
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
Microwave signal level			-3 to 0			0 to 3			0 to 13		dBm
Schottky Diode											
Barrier height			Low			Med.			High		
Forward voltage	I_F = 1 mA	270		350	370		550	600		700	mV
Junction capacitance	V_R = 0 V, f = 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 = 10 V		70			70			70		ps
Junction capacitance	V_R = 0 V, f = 1 MHz			0.25			0.25			0.25	pF
DC Block Capacitor											
Capacitance	f = 1 MHz		0.5	1		0.5	1		0.5	1	pF

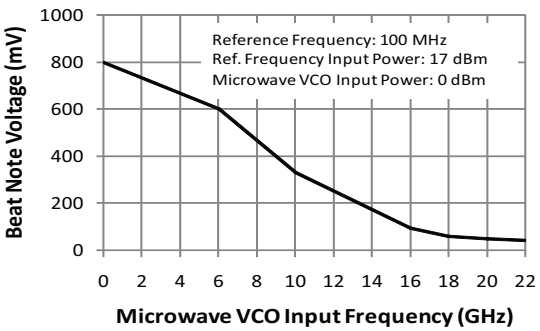
Absolute Maximum Ratings

T_A= 25°C (Unless otherwise noted)

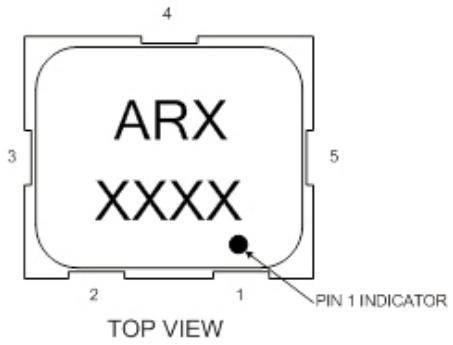
Parameter	Conditions	Absolute Maximum Value
RF Incident Power	Applied to step recovery diode (pin 1 to pin 2) Applied to microwave input (pin 4)	27 dBm 20 dBm
Operating Temperature		-55°C to 125°C
Storage Temperature		-65°C to 150°C
Junction Temperature		150°C
Total Dissipated Power	Infinite heat sink, T_{case} = 25°C. Derate power linearly from 100 mW @ 85°C to 0 W @ 125°C	100 mW

Typical Performance

Z_0 = 50Ω, T_A = 25°C (Unless otherwise noted)



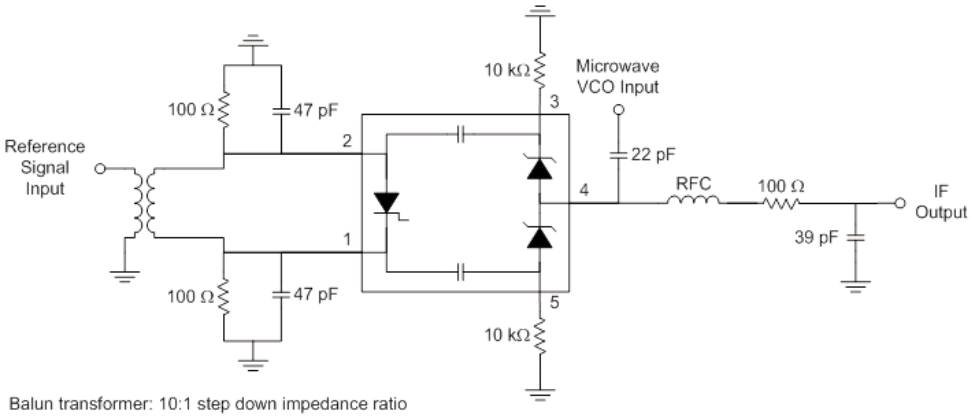
Pinout



Pin Description Table

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

Recommended Circuit



Balun transformer: 10:1 step down impedance ratio

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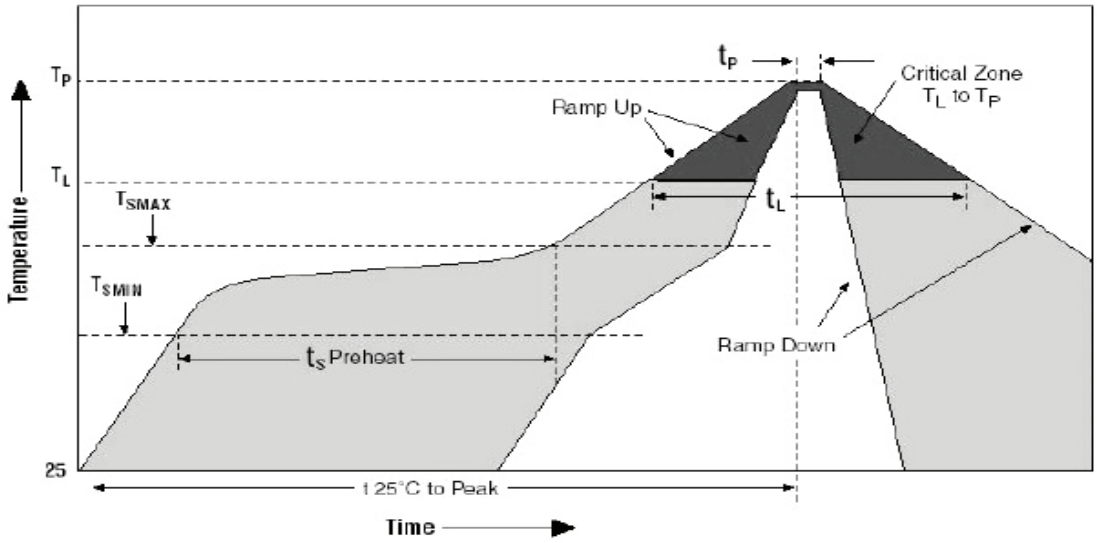
Assembly Instructions

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.

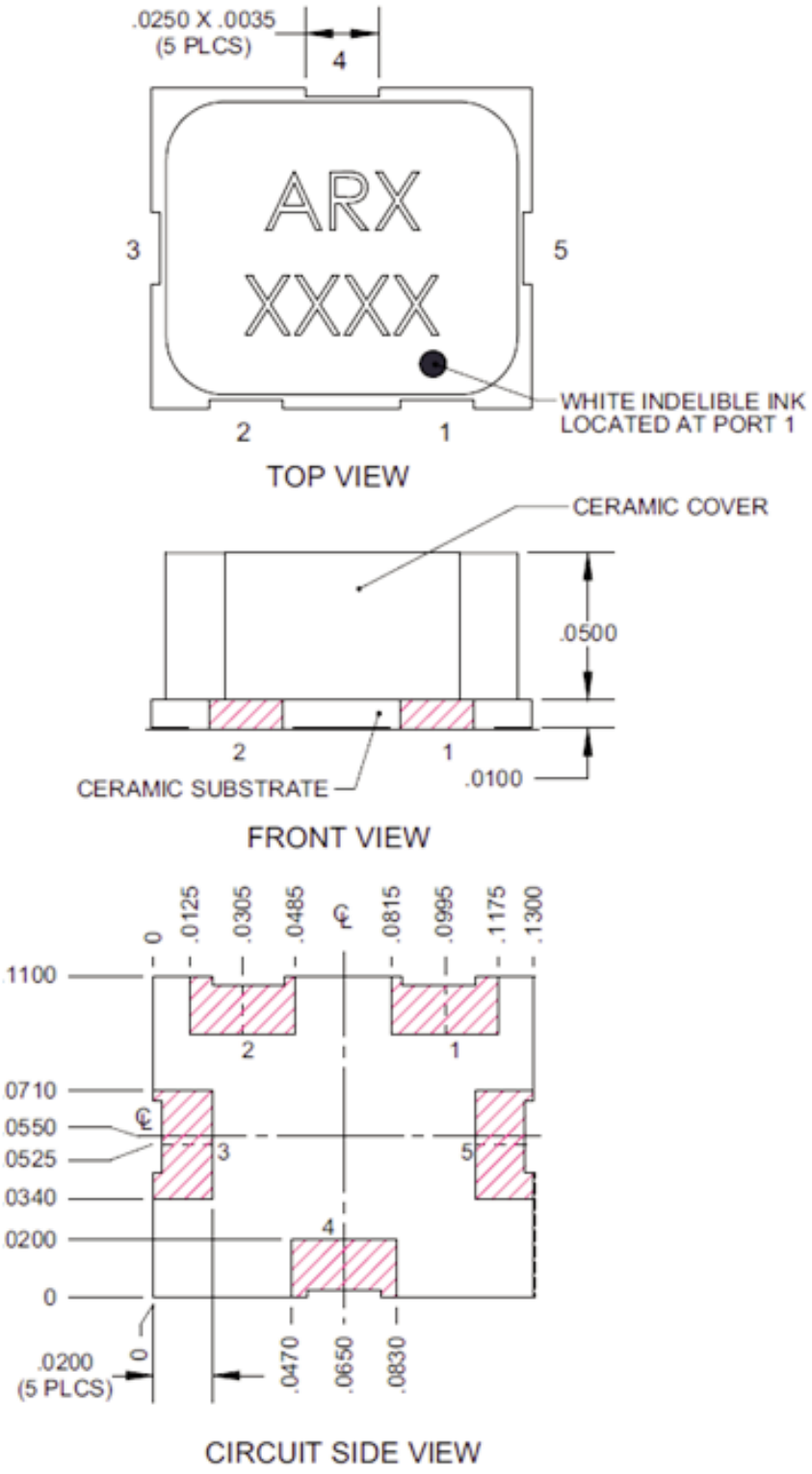
Table 1. Time-Temperature Profile for Sn60/Pb40 or RoHS Type Solders

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



Outline Drawing Case Style 121 (CS121)



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Part Number Ordering Information

Part Number	Description	Packaging
MSPD1011-121-T	Sampling Phase Detector, Low Barrier	Tube Packaging
MSPD1012-121-T	Sampling Phase Detector, Medium Barrier	
MSPD1013-121-T	Sampling Phase Detector, High Barrier	
MSPD1011-121-R	Sampling Phase Detector, Low Barrier	Tape & Reel Packaging (QTY: 250 or 500 per reel)
MSPD1012-121-R	Sampling Phase Detector, Medium Barrier	
MSPD1013-121-R	Sampling Phase Detector, High Barrier	
MSPD1011-121-W	Sampling Phase Detector, Low Barrier	Waffle Pack Packaging
MSPD1012-121-W	Sampling Phase Detector, Medium Barrier	
MSPD1013-121-W	Sampling Phase Detector, High Barrier	

Contact the factory for other packaging options.

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