

Sampling Phase Detectors

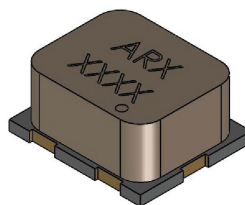
MSPD1011, MSPD1012, MSPD1013 Series

Data Sheet



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



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.

Environmental 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.



Electrical Specifications

$T_A = 25^\circ\text{C}$ (Unless otherwise noted)

Parameter	Conditions	MSPD1011			MSPD1012			MSPD1013			Unit
		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			Med.			High			
Forward voltage	$I_F = 1\text{ mA}$	270		350	370		550	600		700	mV
Junction capacitance	$V_R = 0\text{ V}, f = 1\text{ MHz}$			0.1			0.1			0.1	pF
Total resistance	$I_F = 5\text{ mA}$			24			24			24	Ω
Step Recovery Diode											
Breakdown voltage	$I_R = 10\text{ }\mu\text{A}$		20	30		20	30		20	30	V
Carrier lifetime	$I_F = 10\text{ mA}, I_R = 6\text{ mA}$		10			10			10		ns
Transition time	$I_F = 10\text{ mA}, V_R = 10\text{ V}$		70			70			70		ps
Junction capacitance	$V_R = 0\text{ V}, f = 1\text{ MHz}$			0.25			0.25			0.25	pF
DC Block Capacitor											
Capacitance	$f = 1\text{ MHz}$		0.5	1		0.5	1		0.5	1	pF

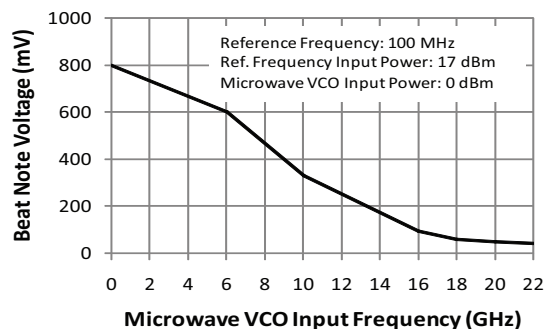
Absolute Maximum Ratings

$T_A = 25^\circ\text{C}$ (Unless otherwise noted)

Parameter	Conditions	Absolute Maximum Value
RF Incident Power	Applied to step recovery diode (pin 1 to pin 2)	27 dBm
	Applied to microwave input (pin 4)	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, $T_{\text{case}} = 25^\circ\text{C}$. Derate power linearly from 100 mW @ 85°C to 0 W @ 125°C	100 mW

Typical Performance

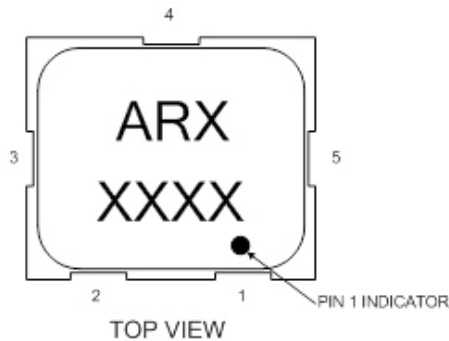
$Z_0 = 50\Omega$, $T_A = 25^\circ\text{C}$ (Unless otherwise noted)



MSPD1011, MSPD1012, MSPD1013 Sampling Phase Detectors



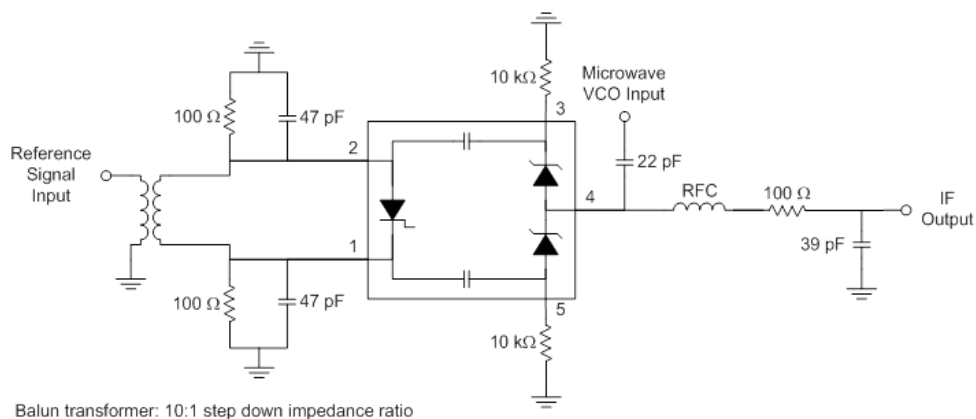
Pinout



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



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

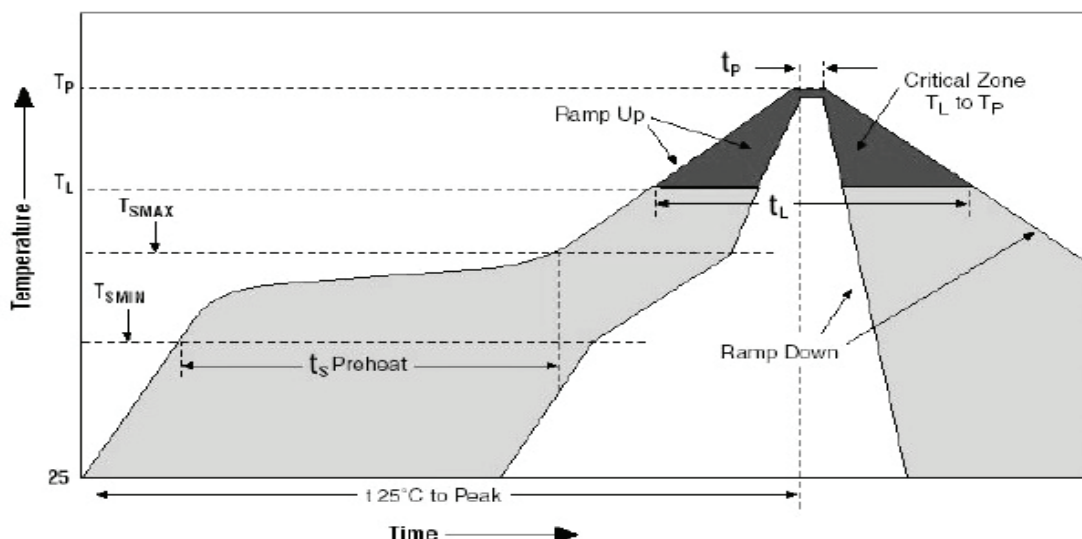


Figure 1: Dimensions and Views of the ARX-1000

Top View: Shows the package footprint. Dimensions include $.0250 \times .0035$ (5 PLCS) for the central area. The package is labeled "ARX XXXX". A black dot indicates "WHITE INDELIBLE INK LOCATED AT PORT 1".

Front View: Shows the package profile. The "CERAMIC COVER" is shown above the "CERAMIC SUBSTRATE". The total height is $.0500$ and the substrate thickness is $.0100$. Ports 1 and 2 are indicated.

Circuit Side View: Shows the internal structure with dimensions for the various layers and components. The central vertical axis is marked with dimensions: $.0125$, $.0305$, $.0485$, ϕ , $.0815$, $.0995$, $.1175$, and $.1300$. The bottom dimensions are $.0470$, $.0650$, and $.0830$. The side view also shows the "CERAMIC SUBSTRATE" and "CERAMIC COVER" labels.

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.

Aeroflex / Metelics, Inc.

54 Grenier Field Road, Londonderry, NH 03053
Tel: (603) 641-3800
Sales: (888) 641-SEMI (7364)
Fax: (603)-641-3500

975 Stewart Drive, Sunnyvale, CA 94085
Tel: (408) 737-8181
Fax: (408) 733-7645

www.aeroflex.com/metelics

metelics-sales@aeroflex.com

Aeroflex / Metelics, Inc. reserves the right to make changes to any products and services herein at any time without notice. Consult Aeroflex or an authorized sales representative to verify that the information in this data sheet is current before using this product. Aeroflex does not assume any responsibility or liability arising out of the application or use of any product or service described herein, except as expressly agreed to in writing by Aeroflex; nor does the purchase, lease, or use of a product or service from Aeroflex convey a license under any patent rights, copyrights, trademark rights, or any other of the intellectual rights of Aeroflex or of third parties.

Copyright 2012 Aeroflex / Metelics. All rights reserved.

ISO 9001:2008 certified companies



Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.