C30737PH and C30737LH Series

Silicon Avalanche Photodiodes (APDs) for range finding and laser meters – plastic and leadless ceramic carrier packages

Excelitas' C30737 Series APDs are ideally suited to laser meter, laser range finding and area scanning applications, providing high responsivity in the 500 – 1000 nm range.

The Excelitas C30737 series silicon avalanche photodiodes (APDs) provide high responsivity between 500 nm and 1000 nm, as well as extremely fast rise times at all wavelengths with a frequency response up to >1 GHz.

Standard versions of these APDs are available in two active area sizes: 0.23 mm and 0.5 mm diameter. They are offered in plastic through-hole T1-¾ (C30737PH) and leadless ceramic-carrier (LCC) surface mount (C30737LH) packages. The LCC package comes with clear glass or built-in 635 nm, 650 nm, or 905 nm filter window options. These package varieties are ideally suitable for high volume, cost-effective applications where a high gain APD is required.

The leadless, ceramic-carrier (LCC) SMD package parts (C30737LH series) are available in tape-and-reel pack for high volume shipments.

Customizations of these APDs are offered to meet your design challenges. Options for these APDs include breakdown voltage selection (binning).

Key Features

- High gain at low bias voltage
- Low breakdown voltage
- Fast response, tR ~ 300 ps
- Low noise ~ 0.2pA/√ Hz
- Surface mount – tape and reel
- Optimized versions for 900 and 800 nm sensitivity
- Two standard diameters: 230 µm and 500 µm
- Built-in filter windows
- RoHS compliant

Applications

- 905 nm range finding devices
- 635 nm and 650 nm laser meters
- Speed guns
- Area scanners for safety, surveillance, and automatic door openers
- Optical communication

Table 1. Electrical Characteristics at T_A = 22 °C; at operating voltage-Vop – unfiltered devices

Parameter	C30737PH-230-80 C30737LH-230-80			C30737PH-500-80 C30737LH-500-80			
	Min	Typical	Max	Min	Typical	Max	Unit
Active Area Diameter		230			500		µm
Peak Sensitivity Wavelength		800			800		nm
Breakdown Voltage, V_{BR}	120		200	120		200	V
Temperature Coefficient of V_R, for Constant M	-	0.5	-	-	0.5	-	V/°C
Gain (M) @ 800nm	-	100	-	-	100	-	
Responsivity @ 800 nm	-	50	-	-	50	-	A/W
Total Dark Current, I_d	-	2.5	10	-	5	20	nA
Noise Current, $i_{n,\ f=10kHz,\ \Delta f=1.0Hz}$	-	0.1	-	-	0.3	-	pA/√Hz
Capacitance, C_d	-	1	-	-	2	-	pF
Rise + Fall Time, R_L=50 Ω, 10%-90%-10% points	-	0.22	-	-	0.30	-	ns
Cut-off frequency (-3 dB)		1.6			1.2		GHz
Storage Temperature	-40		+100	-40		+100	°C
Operating Temperature	-20		+60	-20		+60	°C

Parameter	C30737PH-230-90 C30737LH-230-90			C30737PH-500-90 C30737LH-500-90			
	Min	Typical	Max	Min	Typical	Max	Unit
Active Area Diameter		230			500		µm
Peak Sensitivity Wavelength		900			900		nm
Breakdown Voltage, V_{BR}	180		260	180		260	V
Temperature Coefficient of V_R, for Constant M		1.3			1.3		V/°C
Gain (M) @ 900 nm	-	100	-		100		
Responsivity @ 900 nm	55	60	-	55	60		A/W
Total Dark Current, I_d	-	2.5	10		5	20	nA
Noise Current, $i_{n,\ f=10kHz,\ \Delta f=1.0Hz}$	-	0.2	-	-	0.4	-	pA/√Hz
Capacitance, C_d	-	0.6	-	-	1	-	pF
Rise & Fall Time, R_L=50 Ω, 10%-90%-10% points	-	0.5	-		0.6	-	ns
Cut-off frequency (-3 dB)		700			580		MHz
Storage Temperature	-40		+100	-40		+100	°C
Operating Temperature	-20		+60	-20		+60	°C

Table 2. Electrical Characteristics at T_A = 22 °C; at operating voltage-Vop – devices with optical bandpass filters

Parameter	C30737LH-230-81 (635 nm filter #1)			C30737LH-500-81 (635 nm filter #1)			
	Min	Typical	Max	Min	Typical	Max	Unit
Active Area Diameter		230			500		µm
Peak Sensitivity Wavelength		635			635		nm
Breakdown Voltage, V_{BR}	120		200	120		200	V
Temperature Coefficient of V_R, for Constant M	-	0.5	-	-	0.5	-	V/°C
Gain (M) @ 635 nm	-	100	-	-	100	-	
Responsivity @ 635 nm	-	35	-	-	35	-	A/W
Total Dark Current, I_d	-	2.5	10	-	5	20	nA
Noise Current, $i_{n,\ f=10kHz,\ \Delta f=1.0Hz}$	-	0.1	-	-	0.3	-	pA/√Hz
Capacitance, C_d	-	1	-	-	2	-	pF
Rise & Fall Time, R_L=50 Ω, 10%-90%-10% points	-	0.22	-	-	0.30	-	ns
Cut-off frequency (-3 dB)		1.6			1.2		GHz
Storage Temperature	-40		+100	-40		+100	°C
Operating Temperature	-20		+60	-20		+60	°C

Parameter	C30737LH-230-91 (905 nm filter #2)			C30737LH-500-92 (905 nm filter #2)			
	Min	Typical	Max	Min	Typical	Max	Unit
Active Area Diameter		230			500		µm
Peak Sensitivity Wavelength		905			905		nm
Breakdown Voltage, V_{BR}	180		260	180		260	V
Temperature Coefficient of V_R, for Constant M		1.3			1.3		V/°C
Gain (M) @ 900nm	-	100	-		100		
Responsivity @ 900 nm	55	60	-	55	60		A/W
Total Dark Current, I_d	-	2.5	10		5	20	nA
Noise Current, $i_{n,\ f=10kHz,\ \Delta f=1.0Hz}$	-	0.2	-	-	0.4	-	pA/√Hz
Capacitance, C_d	-	0.6	-	-	1	-	pF
Rise & Fall Time, R_L=50 Ω, 10%-90%-10% points	-	0.5	-		0.6	-	ns
Cut-off frequency (-3 dB)		700			580		MHz
Storage Temperature	-40		+100	-40		+100	°C
Operating Temperature	-20		+60	-20		+60	°C

Parameter	C30737LH-230-83 (650 nm filter #3)			C30737LH-500-83 (650 nm filter #3)			
	Min	Typical	Max	Min	Typical	Max	Unit
Active Area Diameter		230			500		µm
Peak Sensitivity Wavelength		650			650		nm
Breakdown Voltage, V_{BR}	120		200	120		200	V
Temperature Coefficient of V_R, for Constant M	-	0.5	-	-	0.5	-	V/°C
Gain (M) @ 650 nm	-	100	-	-	100	-	
Responsivity @ 650 nm	-	35	-	-	35	-	A/W
Total Dark Current, I_d	-	2.5	10	-	5	20	nA
Noise Current, $i_{n,\ f=10kHz,\ \Delta f=1.0Hz}$	-	0.1	-	-	0.3	-	pA/√Hz
Capacitance, C_d	-	1	-	-	2	-	pF
Rise & Fall Time, R_L=50 Ω, 10%-90%-10% points	-	0.22	-	-	0.30	-	ns
Cut-off frequency (-3 dB)		1.6			1.2		GHz
Storage Temperature	-40		+100	-40		+100	°C
Operating Temperature	-20		+60	-20		+60	°C

Table 3. Filter Transmission Characteristics

Filter #	1	2	3	
Nominal center wavelength	635 nm [note 1]	905 nm [note 2]	650 nm [note 3]	Transmission ≥ 85%
Transmission window	623…652 nm		638…669 nm	Transmission ≥ 85%
50% cut-on wavelength	606…617 nm	870…890 nm	622…634 nm	
50% cut-off wavelength	657…669 nm	929…949 nm	673…685 nm	
Average transmission from 300 nm to bandpass region	<1% @ <593 nm	<1% @ <850 nm	<1% @ <608 nm	
Average transmission from bandpass region to 1100 nm	<1% @ >682 nm	<1% @ >979 nm	<1% @ >699 nm	
Wavelength drift	<+0.5 nm/°C	<+0.5 nm/°C	<+0.5 nm/°C	for range -10°C…+50°C
Typical filter thickness	0.3 mm	0.3 mm	0.3 mm	Material: Borosilicate glass

Notes:
1. The 635 nm filter is designed to work optimally with the 635 nm red laser commonly used in laser meters or laser pointers.
2. The 905 nm filter is designed to work optimally with the Excelitas 950 nm Pulse Laser Diodes PGEW and PGA series.
3. The 650 nm filter is designed to work optimally with the 650 nm red laser commonly used in laser meters or laser pointers.

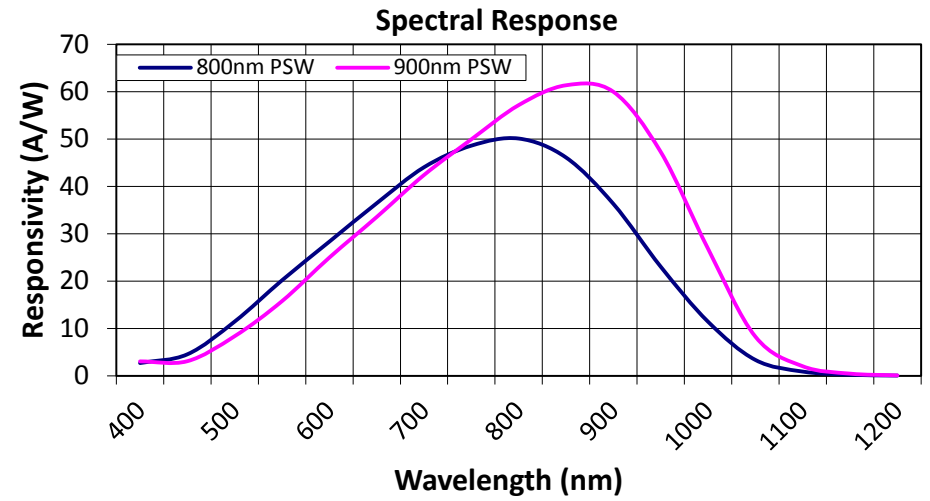

Figure 1
Typical Responsivity vs. wavelength.

800 nm PSW = APD with 800 nm peak sensitivity wavelength

900 nm PSW = APD with 900 nm peak sensitivity wavelength

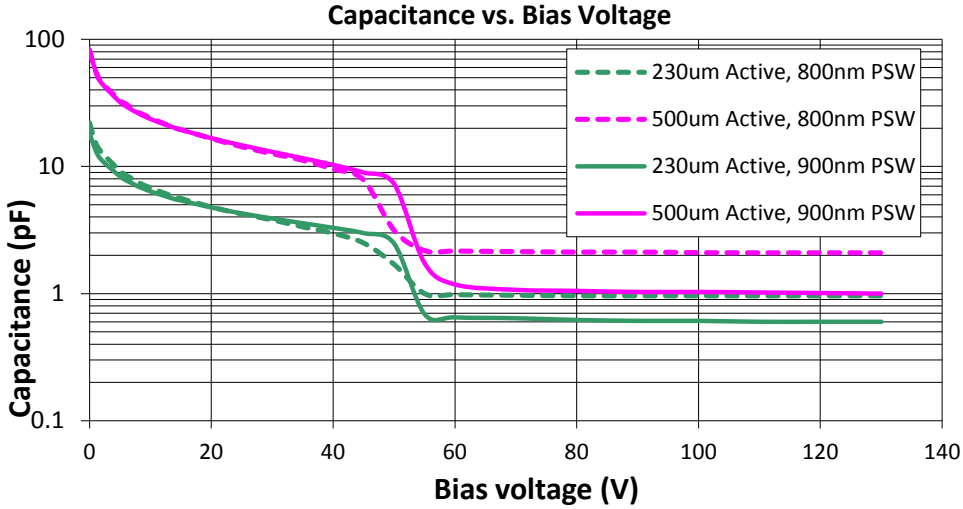

Figure 2
Typical capacitance vs. bias voltage

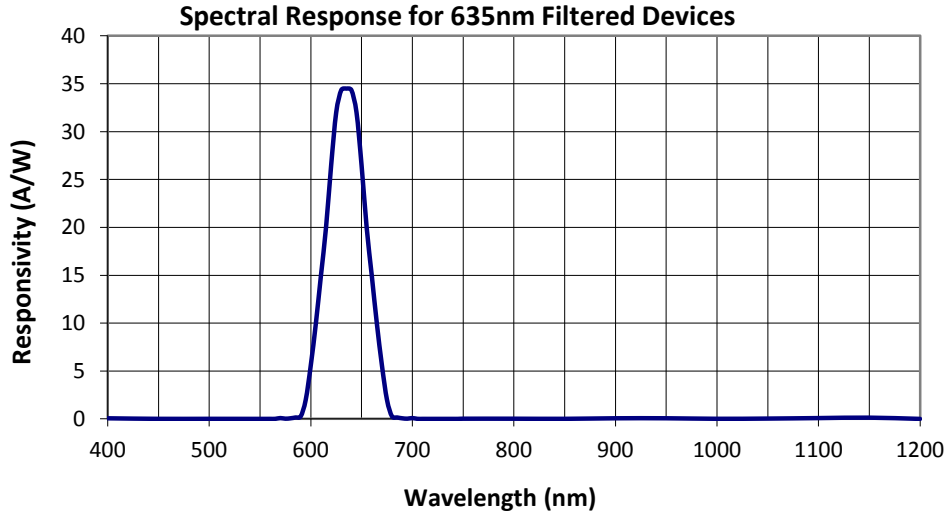

Figure 3
Typical response vs. wavelength for a 635 nm filtered APD – here C30737LH-500-81

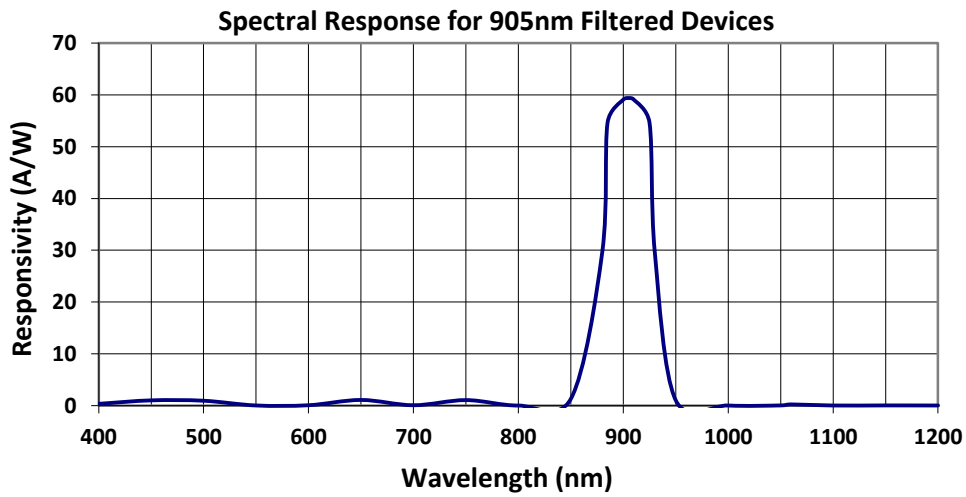

Figure 4
Typical response vs. wavelength for a 905 nm filtered APD – here C30737LH-500-92

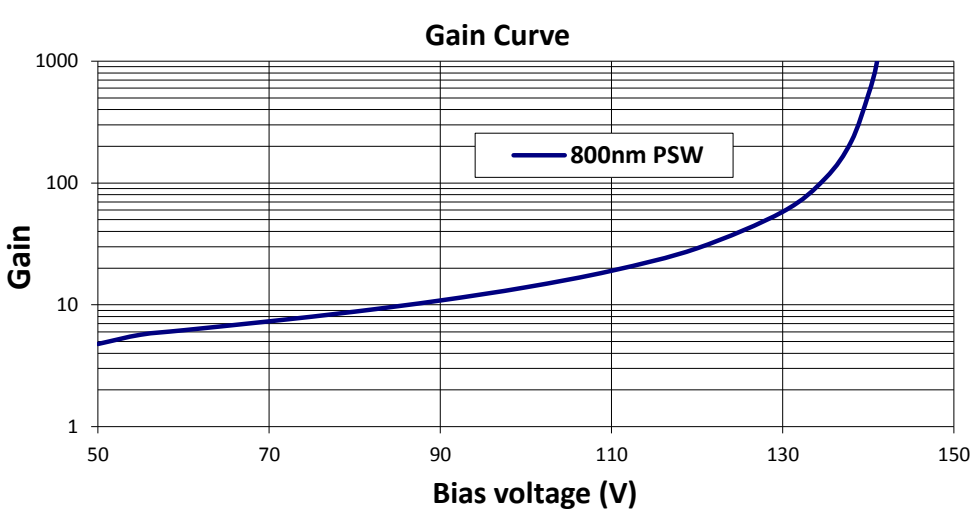

Figure 5
Typical gain vs. bias voltage for 800 nm peak sensitivity wavelength types

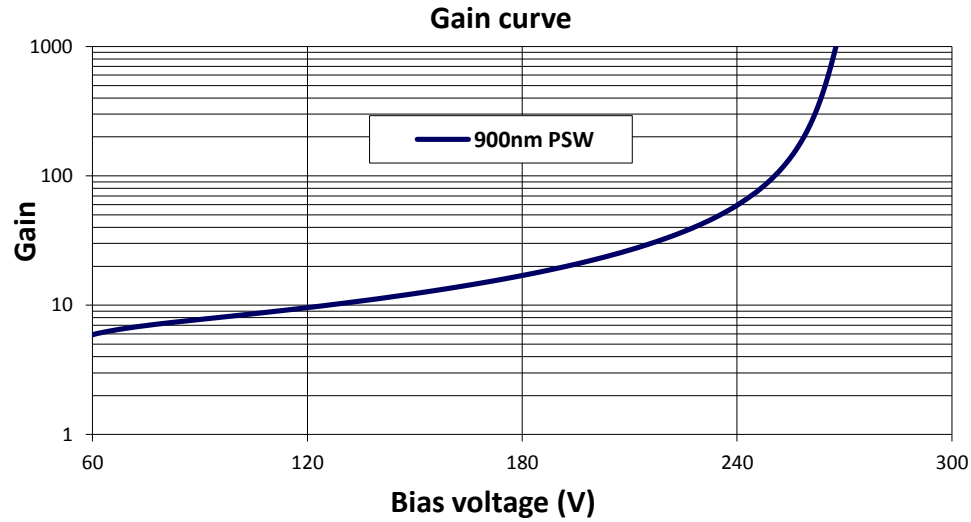

Figure 6
Typical gain vs. bias voltage for 900 nm peak sensitivity wavelength types

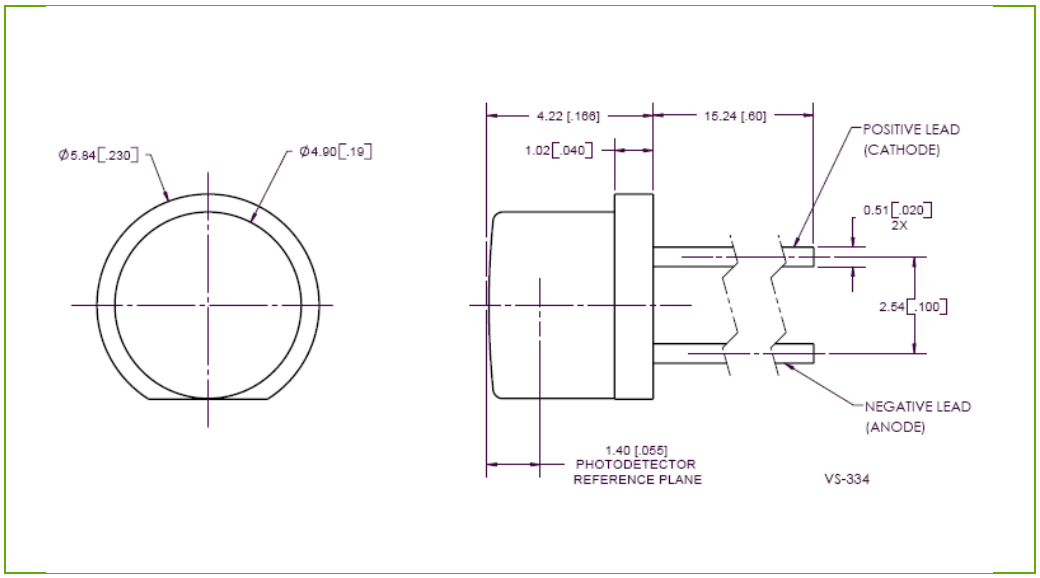

Figure 7

Plastic T 1 ¾ through-hole package. Dimensions in mm [inches].

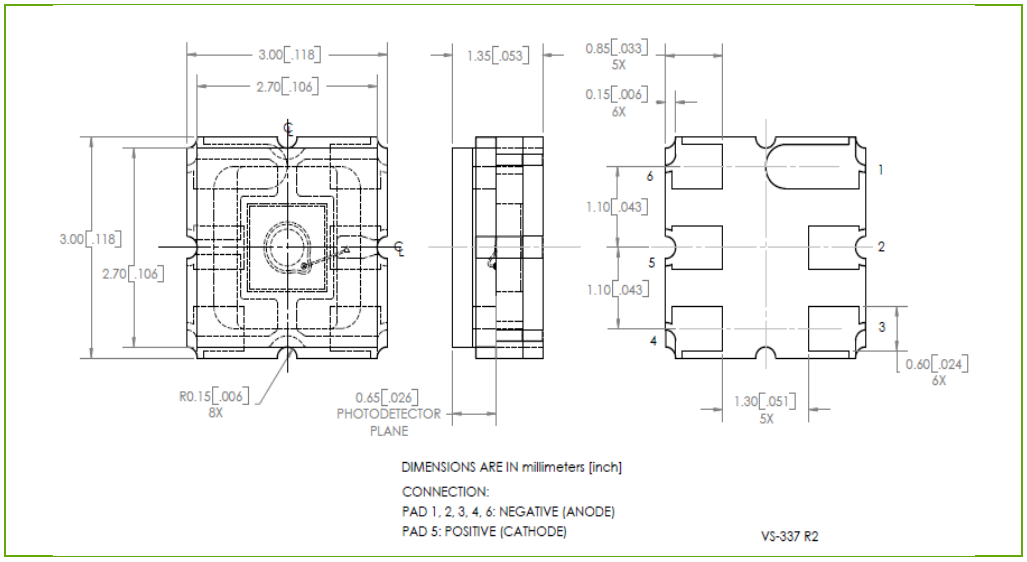

Figure 8

Leadless ceramic carrier (LCC) package. Dimensions in mm [inches]

Table 4. Ordering Guide

	C30737	AA -	BBB -	C	D(1)	E(2)(3)
Epitaxial structure Si APD	C30737					
Plastic TO-18 can (P-package)		PH -				
Leadless ceramic carrier (3 x 3 mm^2 LCC)		LH -				
Active area diameter = 230 µm			230 -			
Active area diameter = 500 µm			500 -			
Optimum chip response λ @ 800 nm				8		
Optimum chip response λ @ 900 nm				9		
No filter					0	
With 635 nm filter					1	
With 905 nm filter					2	
With 650 nm filter					3	
V_{bd} = 120 - 150 V						A
V_{bd} = 150 - 180 V						B
V_{bd} = 180 - 210 V						C
V_{bd} = 210 - 260 V						D
V_{bd} = whole V_{bd} range (no V_{bd} binning)						N

(1) Filter option is only available for the LCC (LH) package option.
(2) V_{bd} binning /screening is available in these options:
A, B and C are available for APD with optimum response λ @ 800 nm
C and D are available for APD with optimum response λ @ 900 nm
N is available for all types
(3) For binning please allow 2 V overlap between bins for the 800 nm versions and 5 V for the 900 nm versions.

Example: C30737LH-230-92C: A C30737 in the 3 x 3 mm ceramic carrier package, with optimum 900 nm response wavelength, with 905 nm filter and selected for V_{bd} of 180V - 210V.

Tape-and-Reel Shipping Pack Option

All the C30737LH (leadless ceramic carrier SMD package) series are offered in the tape-and-reel shipping pack option for quantities of 3000 units per reel; as shown in Figure 9 and 10. This packing option should be indicated at the time of order placement.

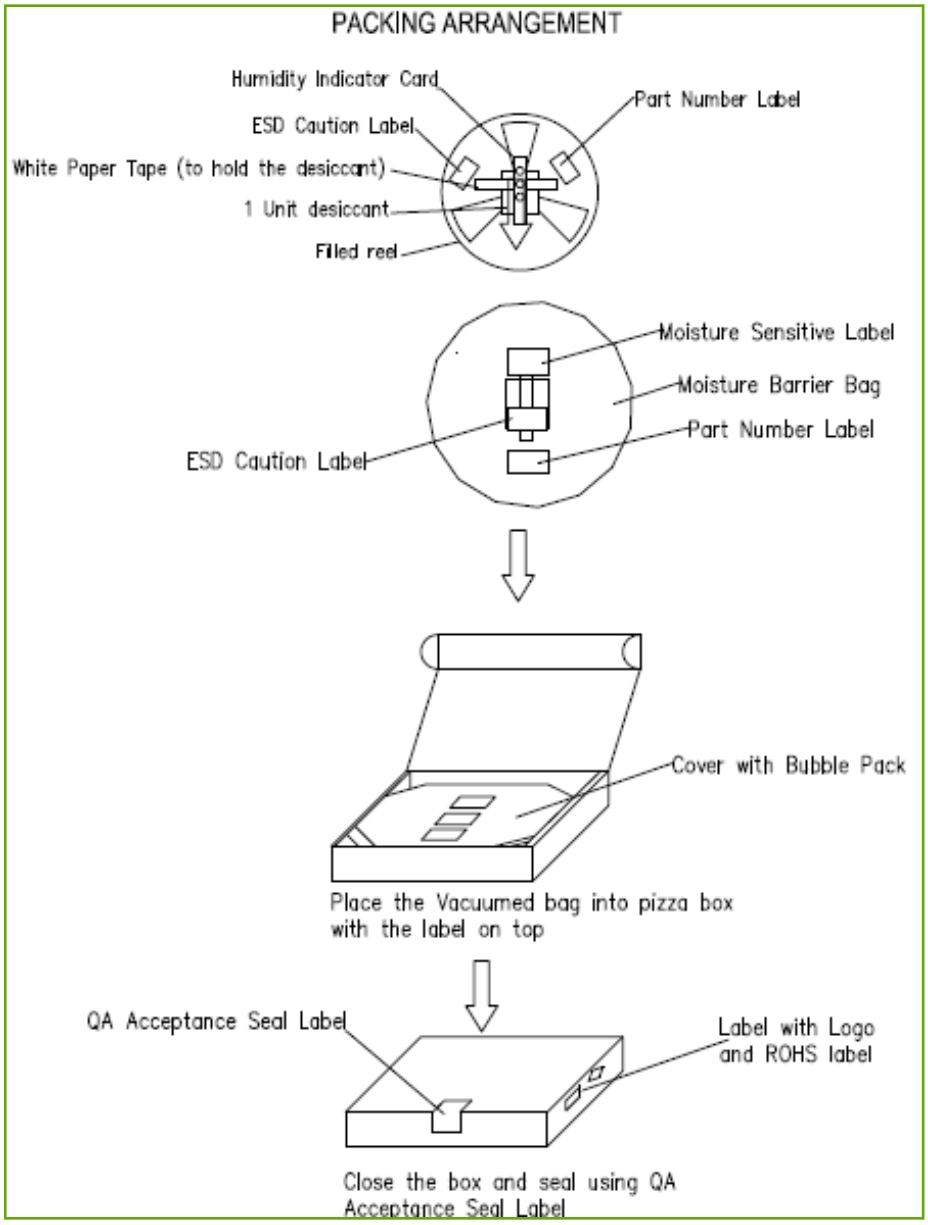

Figure 9 Tape-and-reel packing specification

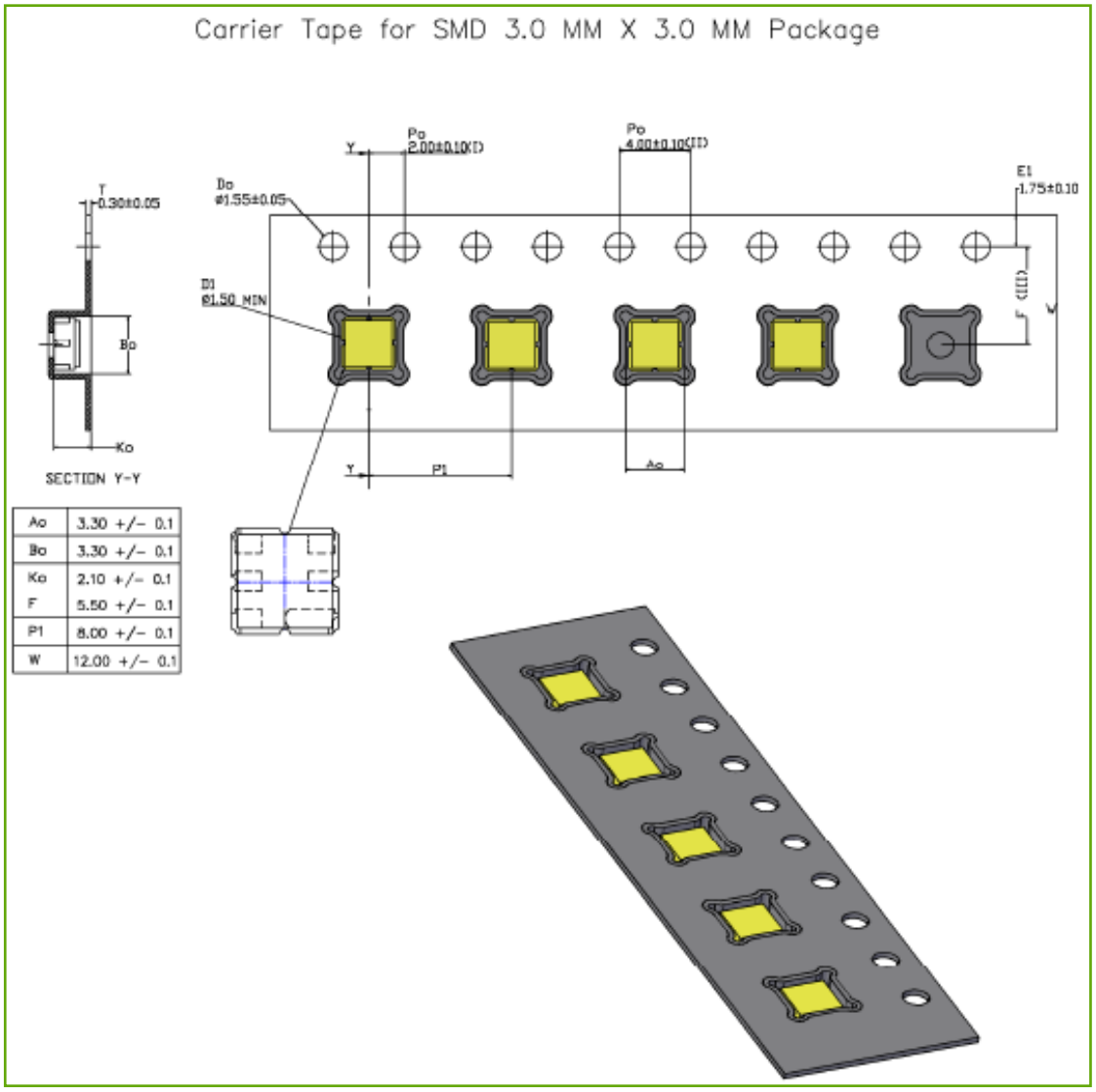

Figure 10 Tape-and-reel device carrier specification

RoHS Compliance

This series of APDs are designed and built to be fully compliant with the European Union Directive 2002/95EEC – Restriction of the use of certain Hazardous Substances in Electrical and Electronic equipment.

Warranty

A standard 12-month warranty following shipment applies.

About Excelitas Technologies

Excelitas Technologies is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection and other high-performance technology needs of OEM customers.

From analytical instrumentation to clinical diagnostics, medical, industrial, safety and security, and aerospace and defense applications, Excelitas Technologies is committed to enabling our customers' success in their specialty end-markets. Excelitas Technologies has approximately 3,000 employees in North America, Europe and Asia, serving customers across the world.

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