

APDS-9120

Integrated Optical Proximity Sensors



Data Sheet



Description

Avago's APDS-9120 is an integrated optical proximity sensor that combines built-in signal conditioning and space-saving packaging technology.

This integrated sensor provides ease of use, as it eliminates design efforts required in implementing external LED drivers, signal filtering and amplification, sunlight and ambient light immunity and LED stuck high protection circuit.

APDS-9120 is designed to be a robust proximity sensor. It has artificial light immunity and operates in sunlight exposure. Both analog and/or digital output options are available.

To maximize power savings and battery life in applications such as portable or battery-operated devices, APDS-9120 has a shutdown mode feature. With an external limiting resistor, the LED current of the optical proximity sensors can be configured to various levels. The pulse width, burst rate, duty cycle and frequency can be controlled to minimize power consumption. These features make it ideal for low power mobile and handheld devices.

Application Support Information

The Application Engineering Group is available to assist you with the application design associated with APDS-9120 module. You can contact them through your local sales representatives for additional details.

Features

- Small form factor with conditioning IC, emitter and detector integrated into one single package
 - H1.1mm x W4.4mm x L4.4mm
- Low power consumption
 - LED pulse width control
 - Low shut down current
 - External LED drive-current control
- Shutdown current 1 μ A max
- Supply voltage : 2.4 V to 3.6 V
- Typical detection distance 30mm based on Kodak 18% grey card
- Artificial light immunity
- Operational in sunlight conditions
- Analog & Digital output available
 - Built in hysteresis comparator for digital output
- LED stuck Hi protection

Applications

- PDA and mobile phones
- Portable and Handheld devices
- Personal Computers/Notebooks
- Contactless Switches

Ordering Information

Part Number	Package Type	Shipping Option
APDS-9120-020	Tape & Reel	2500

Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Min.	Max.	Units	Conditions
Supply Voltage	V _{CC}	0	4.0	V	
Peak LED Current	I _{LEDpk}	0	500	mA	Pulsed at 12.5% Duty-cycle
Reflow Soldering Temperature			260	°C	
Input Logic Voltage	V _I	0	4.0	V	

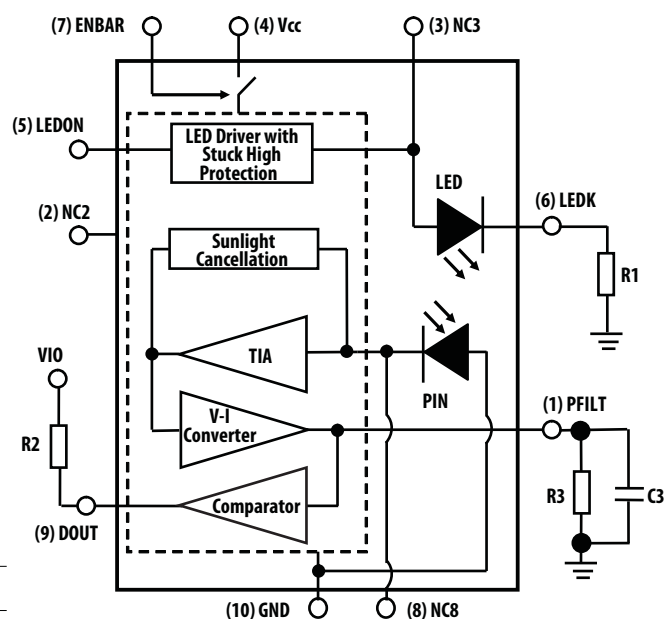
Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Units	Conditions
Operating Temperature	T _A	-40	85	°C	
Storage Temperature	T _S	-40	100	°C	
Supply Voltage	V _{CC}	2.4	3.6	V	

Electrical & Optical Specifications (Ta=25°C)

Parameters	Symbol	Min.	Typ.	Max.	Units	Conditions
Input						
Logic High Voltage, LEDON	V _{IH}	1.6	–	V _{CC}	V	
Logic High Voltage, ENB	V _{IH}	1.4	–	V _{CC}	V	For V _{CC} = 2.4V
		1.5	–	V _{CC}	V	For 2.4 < V _{CC} ≤ 3V
		1.7	–	V _{CC}	V	For 3 < V _{CC} ≤ 3.6V
Logic Low Voltage, LEDON	V _{IL}	0	–	0.3	V	
Logic Low Voltage, ENB	V _{IL}	0	–	0.3	V	
Logic High Input Current, LEDON	I _{IH}	–	0.1	1	μA	V _I ≥ V _{IH}
Logic High Input Current, ENB	I _{IH}	–	0.1	1	μA	V _I ≥ V _{IH}
Logic Low Input Current, LEDON	I _{IL}	–	0.1	1	μA	V _I ≤ V _{IL}
Logic Low Input Current, ENB	I _{IL}	–	0.1	1	μA	V _I ≤ V _{IL}
Shutdown Current	I _{SD}	–	0.3	1	μA	V _{CC} = 3V, ENB = 3V
Idle Current	I _{CC}	–	500	650	μA	V _{CC} = 3V, ENB = 0V
Output						
Analog Output	V _{PFILT}	1.25	1.9	2.55	V	V _{CC} = 3V, ENB = 0V, LEDON = 10 kHz, 50% DC, Continuous pulses; R3 = 1Mohm, C3 = 3.3nF; Kodak 18% grey card at detectable distance = 10mm from the APDS-9120
Digital Output	V _{OL}	0	–	0.3	V	I _{DOUT(Low)} = 2mA, V _{CC} = 3V
Rise Time(DOUT)	T _R	–	1	–	μs	V _{CC} = 3V, R2 = 10kΩ, Frequency = 10kHz
Fall Time(DOUT)	T _F	–	1	–	μs	V _{CC} = 3V, R2 = 10kΩ, Frequency = 10kHz
Transmitter						
Max I _{LED} Pulse Width	Max-PW	–	120	–	μs	V _{CC} = 3V, ENB = 0V
I _{LED} Peak Pulse Current	I _{LEDpk}	85	120	155	mA	V _{CC} = 3V, R1 = 10Ω
Hysterisis Comparator						
Hysterisis	V _{HYS}	–	40	–	mV	V _{CC} = 3V
Threshold Voltage	V _{TH}	–	655	–	mV	V _{CC} = 3V
Ambient light tolerance			100k	–	lux	Sun light
			10K	–		Incandescent
			5K	–		Fluorescent
			10K	–		Halogen

APDS-9120 Internal Block Diagram



Typical Characteristics

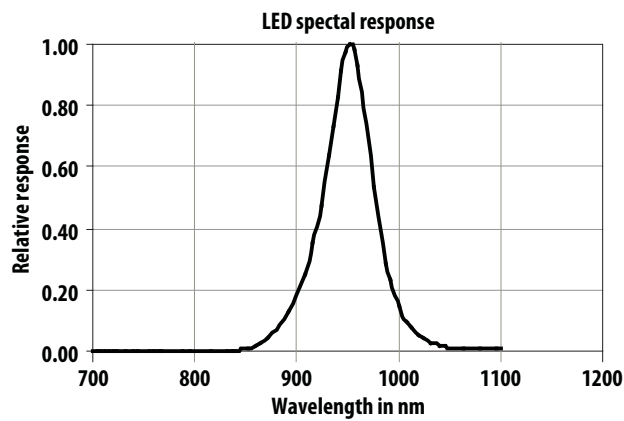


Figure 1. LED emitting spectrum

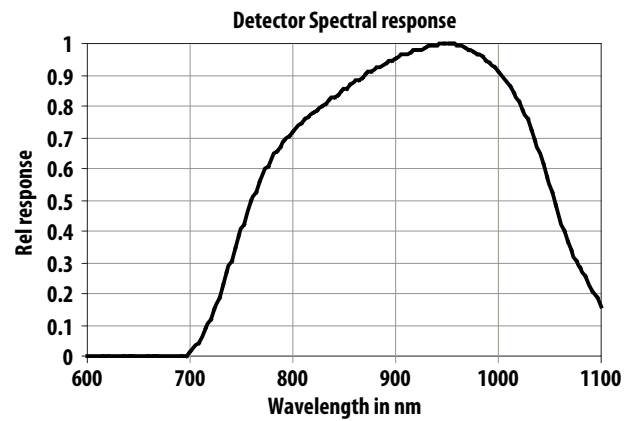


Figure 2. PIN spectral sensitivity

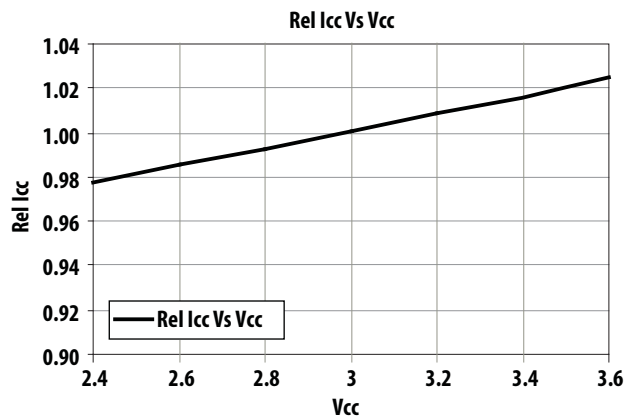


Figure 3. Relative supply current over supply voltage

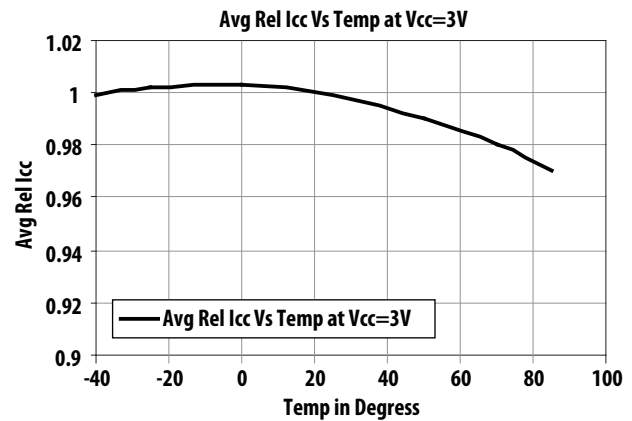


Figure 4. Average relative supply current over temperature

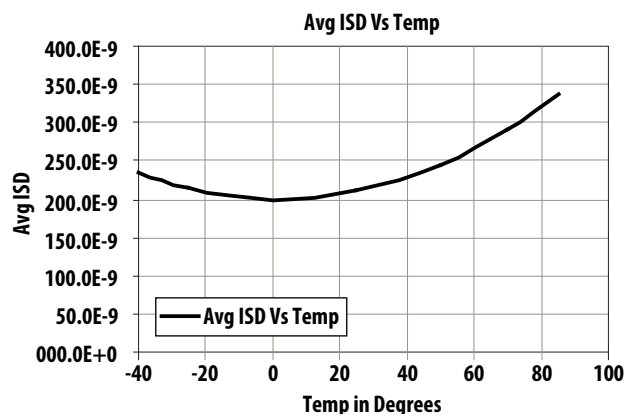


Figure 5. Average shutdown current over temperature

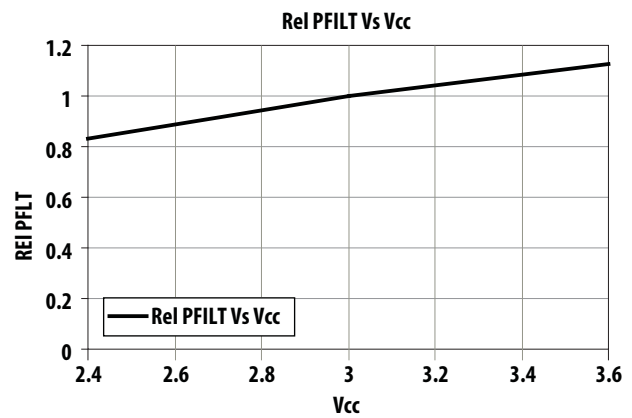


Figure 6. Relative output PFILT over supply voltage

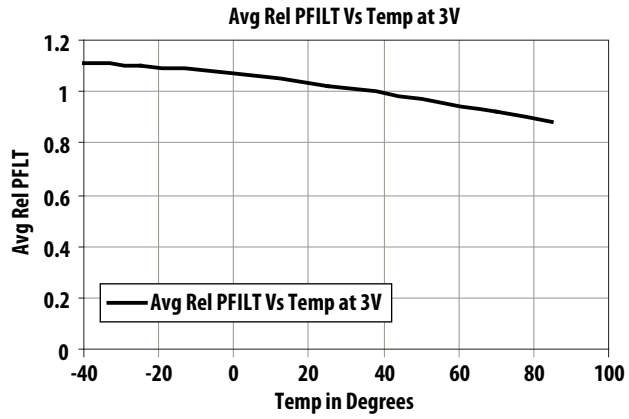


Figure 7. Average relative output PFILT over temperature

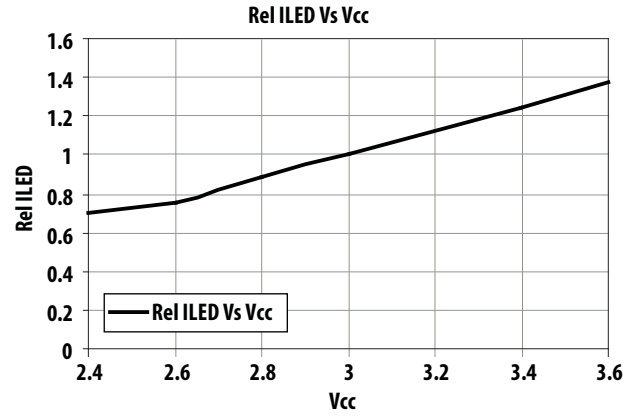


Figure 8. Relative ILED current over temperature

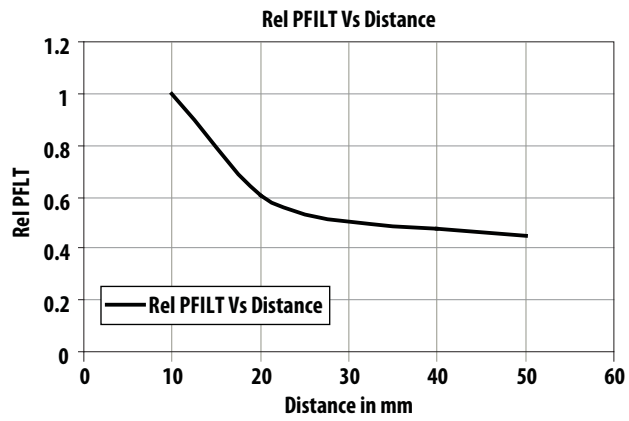


Figure 9. Relative output PFILT over detection distance

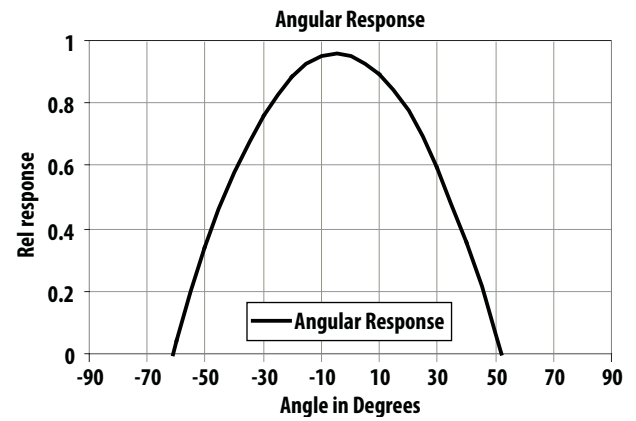
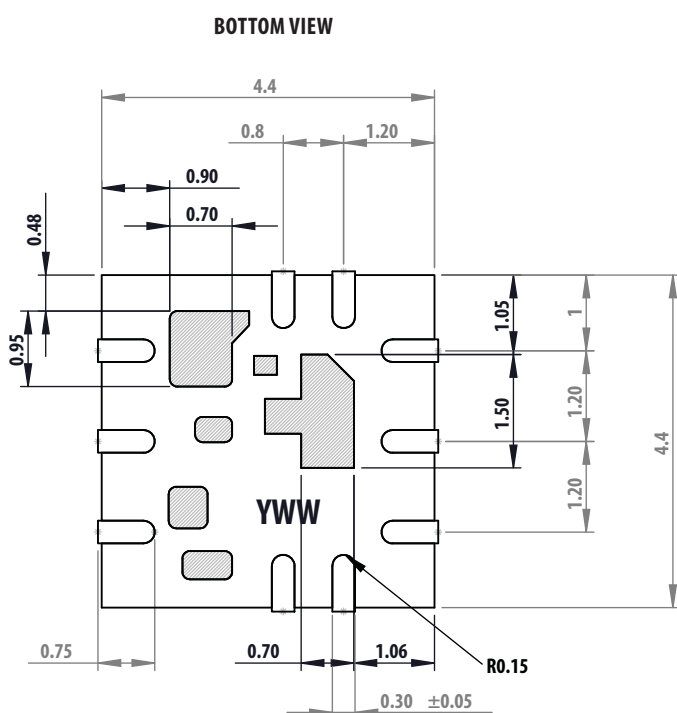
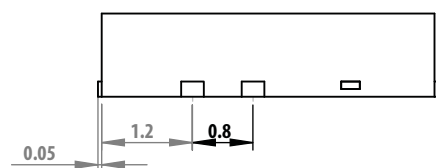
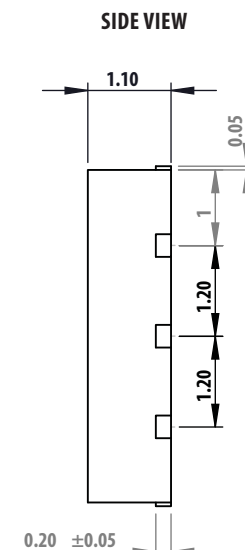
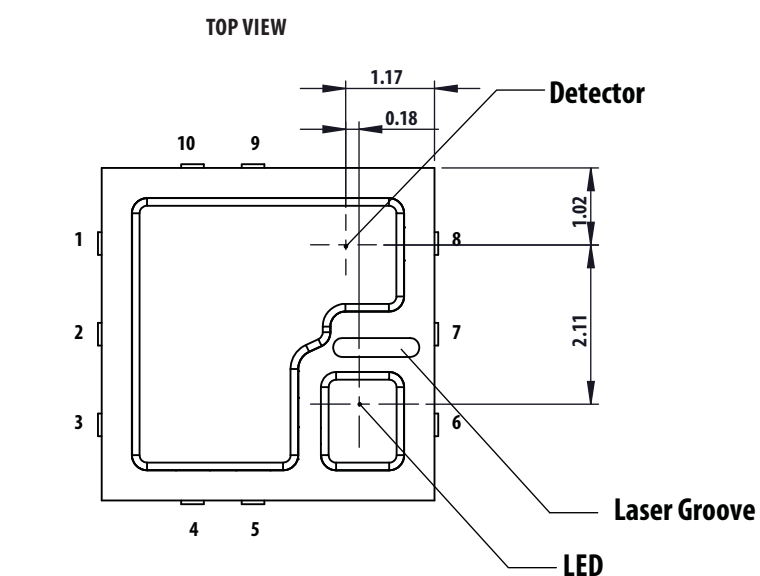
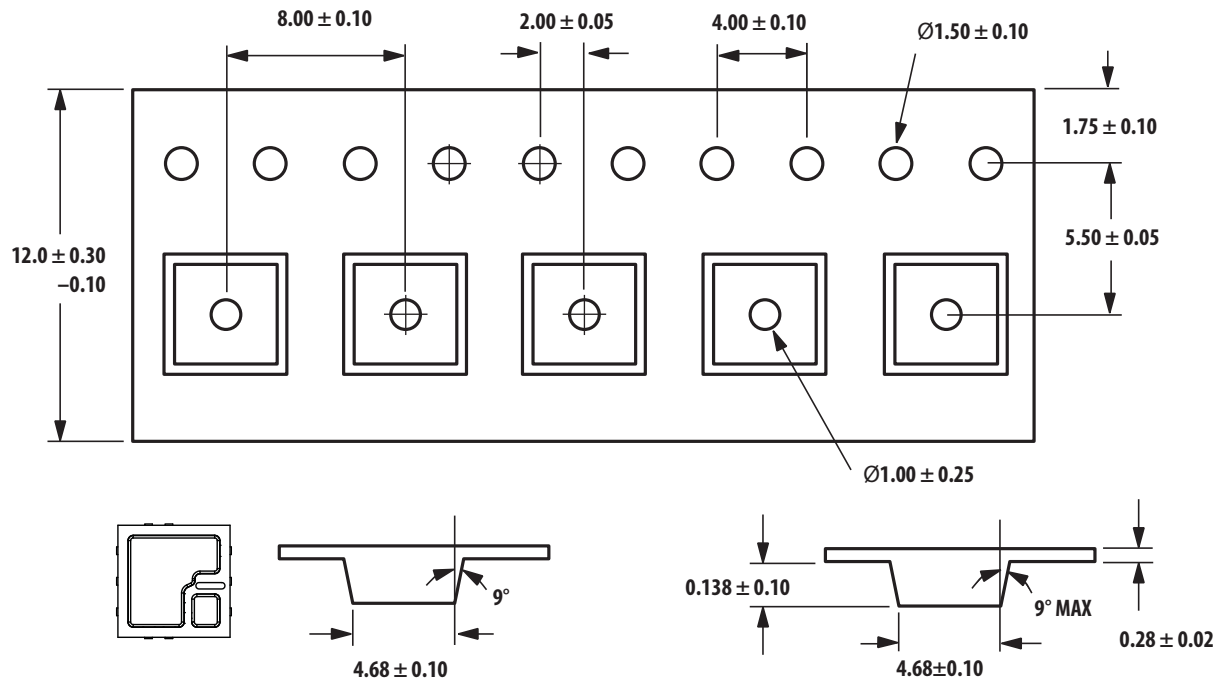


Figure 10. Angular response

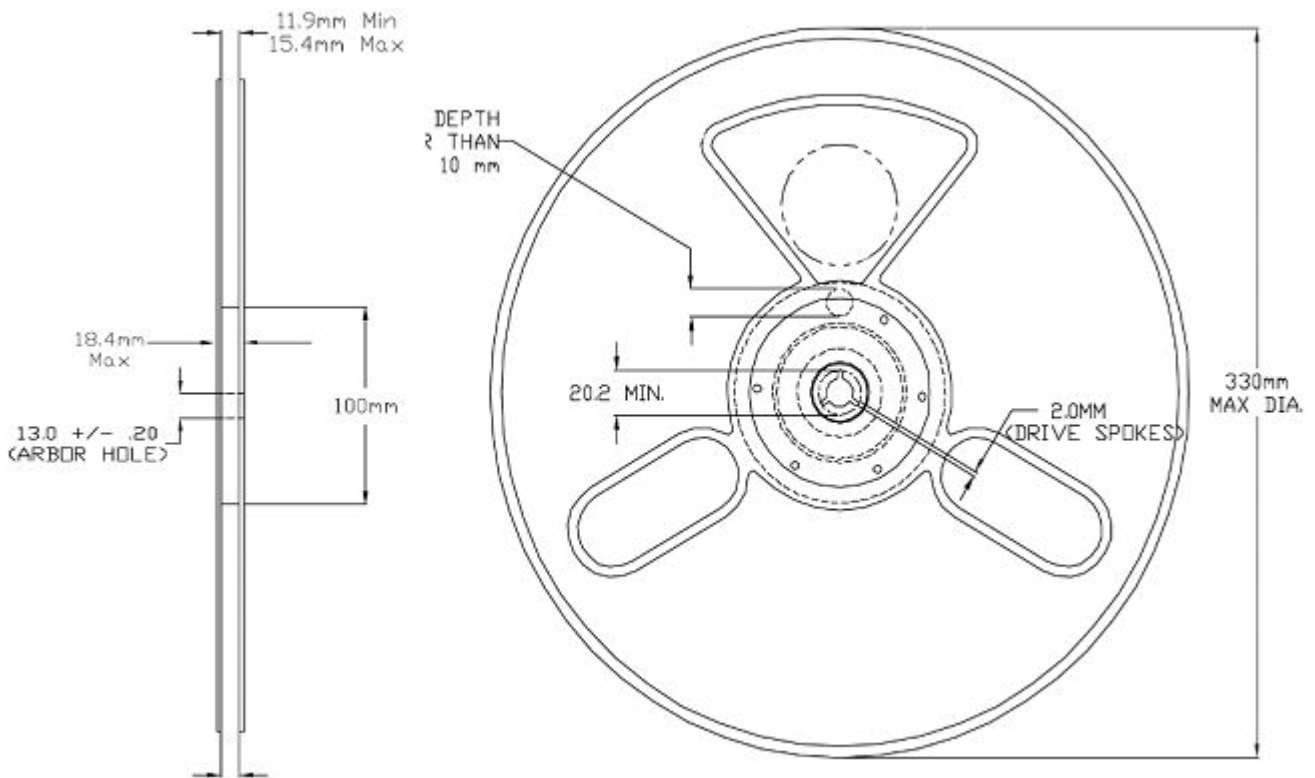


Tape and Reel Dimensions



Dimensions in mm

Reel Drawings



SMT Assembly Application Note

1.1 Solder Pad, Mask and Metal Stencil Aperture

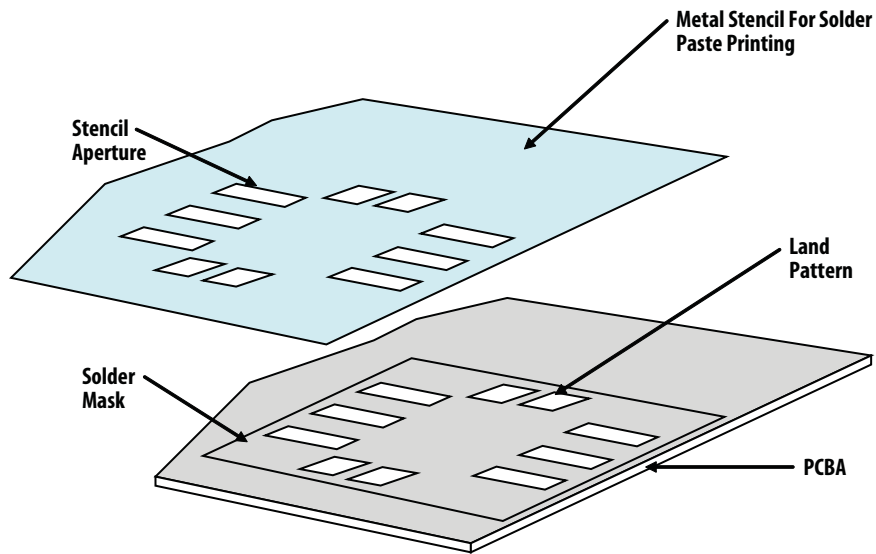
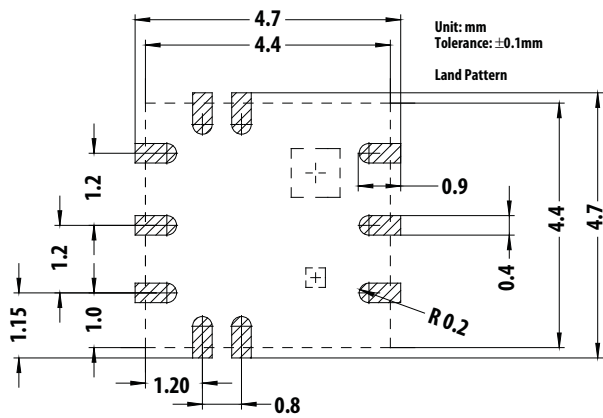


Figure 11. Stencil and PCBA

1.2 Recommended Land Pattern

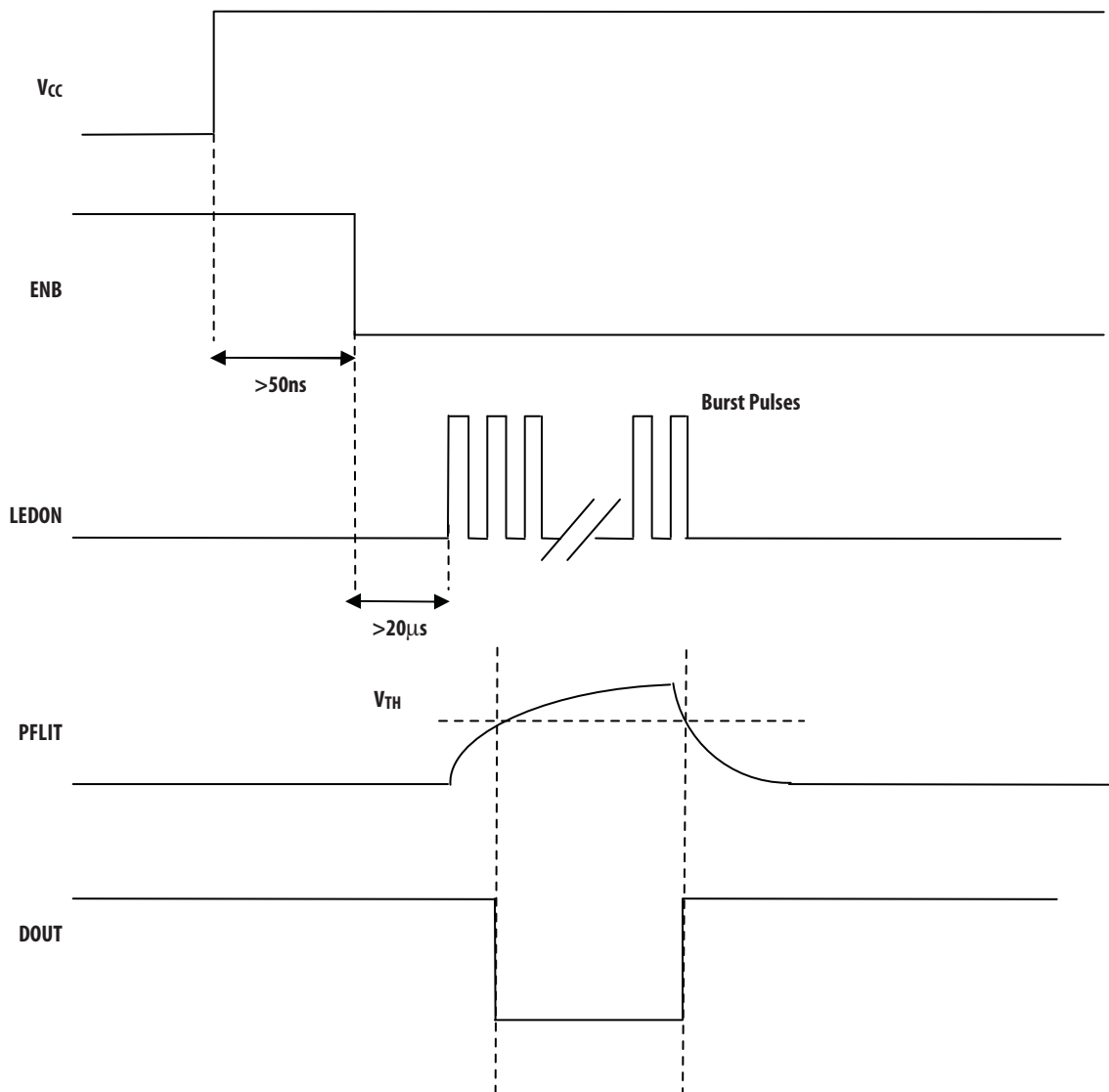


Notes:

1. Do NOT connect the NC (no connect) pins.
2. Manual soldering on APDS-9120 is not recommended.
Please refer to Recommended Reflow Profile for soldering.

Figure 12. Recommended Land Pattern

APDS-9120 Typical Timing Waveforms



Note:
Pulses at LEDON can only be activated at least 20us after ENB turn from high to low.

