

LEADTEK GPS MODULE LR9548S Specifications Sheet

Features:

- ▶ *SiRF StarIII low power chipset*
- ▶ *Compact module size for easy integration : 24 x 20 x 2.9 mm*
- ▶ *Multiple I/O pins reserved for customizing special user applications*
- ▶ *RoHS compliance (lead-free)*



Revision History:			
Revision	Release Date	Issuer	Change Description
1.7	2008/05/15	M. Huang	Modify operation temperature range and product dimension tolerance
1.8	2008/08/07	J. Lee	Chip spec revision
1.81	2008/09/17	J. Lee	Add recommendation for the external antenna
1.9	2008/12/30	J. Lee	Revise Power consumption & pin settings in red
2.0	2009/03/17	J. Lee	Upgrade to FW3.5 and add RoHS soldering profile
2.1	2009/09/29	S. Liao	Modification of pin definition, introduction rewording



Introduction

The Leadtek LR9548S GPS module is a high sensitivity, low power consumption, Surface Mount Device (SMD) module. This 20-channel global positioning system (GPS) receiver is designed for a wide range of OEM applications and is based on the SiRF's newest chipset technology, SiRFstarIII™. The LR9548S is also pin-to-pin compatible with the LR9805-III (LR9548) for easier and faster transition.

The LR9548S is designed to allow quick and easy integration into GPS-related applications such as:

- ▶ PDA, Pocket PC, and other computing devices
- ▶ Car and Marine Navigation
- ▶ Fleet Management /Asset Tracking
- ▶ AVL and Location-Based Services
- ▶ Hand-Held Device for Personal Positioning and Navigation

Features

Hardware and Software

- ▶ Based on the high performance features of the SiRFstarIII low power single chipset
- ▶ Compact module size for easy integration: 24x20x2.9 mm (0.94x0.79x0.11 in)
- ▶ Fully automatic assembly: reflow solder assembly ready
- ▶ Hardware compatible with SiRF GSW3 v3.5 software
- ▶ Multiple I/O pins reserved for customizing special user applications
- ▶ RoHS compliance

Performance

- ▶ Cold/Warm/Hot Start Time: 35/35/1 sec. at open sky and stationary environments.
- ▶ Reacquisition Time: 0.1 second
- ▶ RF Metal Shield for best performance in noisy environments
- ▶ Multi-path Mitigation Hardware

Interface

- ▶ TTL level serial port for GPS communications interface
- ▶ Protocol: NMEA-0183/SiRF Binary (default NMEA)
- ▶ Baud Rate: 4800 bps

Advantages

- ▶ Ideal for high volume mass production(Taping reel package)
- ▶ Cost saving through elimination of RF and board to board digital connectors
- ▶ Flexible and cost effective hardware design for different application needs
- ▶ Secure SMD PCB mounting method

Specifications

Technical Specifications

Feature	Item	Description
Chipset	GSC3f	SiRFstarIII low power single chipset
General	Frequency	L1, 1575.42 MHz
	C/A code	1.023 MHz chip rate
	Channels	20
Accuracy	Position	10 meters, 2D RMS < 5 meters 2D RMS, WAAS corrected
	Velocity	0.1 meters/second
	Time	1 microsecond synchronized to GPS time
Datum	Default	WGS-84
	Other	selectable for other Datum
Time to First Fix (TTFF) (Open Sky & Stationary Requirements)	Reacquisition	0.1 sec., average
	Snap start	1 sec., average
	Hot start	1 sec., average typical TTFF
	Warm start	35 sec., average typical TTFF
Dynamic Conditions	Cold start	35 sec., average typical TTFF
	Altitude	18,000 meters (60,000 feet) max.
	Velocity	515 meters/second (1000 knots) max.
	Acceleration	4g, max.
Power	Jerk	20 meters/second ³ , max.
	Main power input	3.3 ~ 5.0 VDC input
	Power consumption	≈ 119 mW (continuous mode)
	Supply Current	≈ 36 mA
Serial Port	Backup Power	1.65 ~ 5.0 VDC input.
	Electrical interface	Two full duplex serial TTL interface.
Time-1PPS Pulse	Protocol messages	NMEA-0183@4800 bps (Default)
	Level	TTL
Time-1PPS Pulse	Pulse duration	The 1PPS pulse width is 1 μs, this 1PPS is NOT suited to steer various oscillators (timing receivers, telecommunications system, etc).
	Time reference Measurement	At the pulse positive edge. Aligned to GPS second, ±1 microsecond

Environmental Characteristics

Items	Description
Operating temperature range	-30 deg. C to +85 deg. C
Storage temperature range	-55 deg. C to +100 deg. C

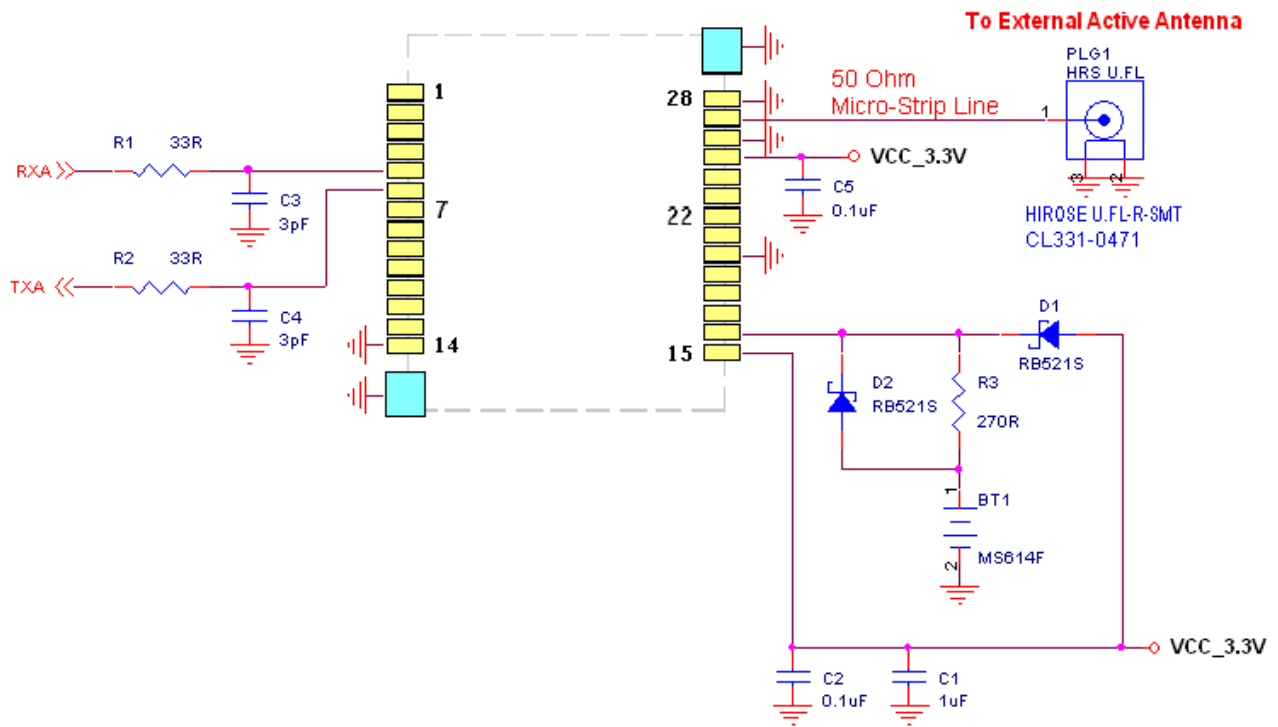
Physical Characteristics

Items	Description
Length	24 mm \pm 0.3mm (0.94in)
Width	20 mm \pm 0.3mm (0.79 in)
Height	2.9 mm \pm 0.3mm (0.11 in)
Weight	2.5g

Interface Specifications

Items	Description
I/O	28 pin SMD micro package

Reference Design



- All ground pads attach directly to ground plane by way of via.
- All components are reference only.
- Recommendation for the external antenna: antennas over 16dB.

Software

The Leadtek LR9548S module includes GSW3.5, the SiRF standard GPS software for SiRFstarIII low power single chipset receivers. Features include:

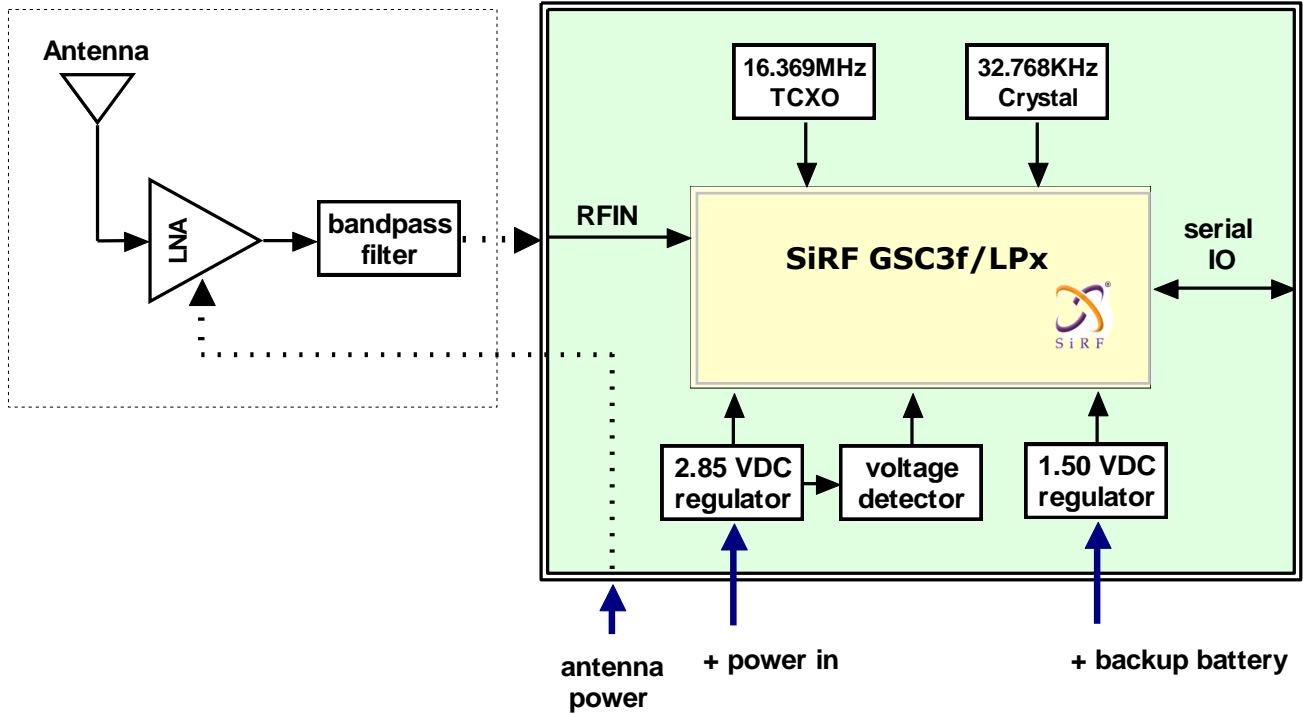
- ▶ Excellent sensitivity
- ▶ High configurability
- ▶ 1 Hz position update rate
- ▶ Supports use of satellite-based augmentation systems like the US WAAS or European EGNOS system
- ▶ Real-time Operating System (RTOS) friendly
- ▶ Capable of outputting either NMEA(default) or SiRF proprietary binary protocols
- ▶ Designed to accept custom user tasks executed on the integrated ARM7TDM1 processor
- ▶ Runs in full power operation (default) or optional power saving modes
- ▶ Enhanced Navigation Performance
- ▶ Improved Jamming Mitigation
- ▶ Improved Ephemeris Availability
- ▶ Default configuration is as follows:

Item	Description
Core of firmware	SiRF GSW3.5
Baud rate	4800 bps
Code type	NMEA-0183 ASCII
Datum	WGS-84
Protocol message	GGA(1sec), GSA(5sec), GSV(5sec), RMC(1sec),VTG(1sec)
Output frequency	1 Hz

Electrical Specifications

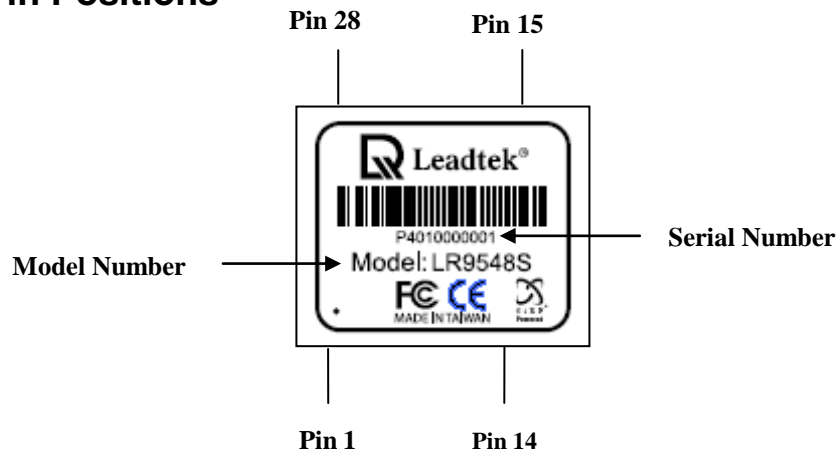
Block Diagram

9548S Block Diagram



Interface Specification

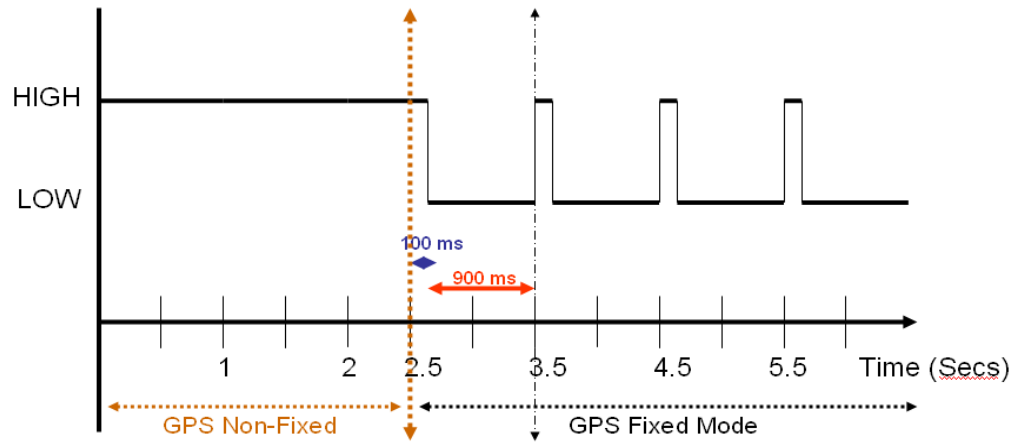
Photos and Pin Positions



Pin Settings

PIN	Name	Type	Description
1	NC		Not connected, keep floating
2	NC		Not connected, keep floating
3	NC		Not connected, keep floating
4	RXDB	I	TTL UART Port B input. If not used, keep floating
5	RXDA	I	TTL UART Port A input
6	TXDA	O	TTL UART Port A output
7	NC		Not connected, keep floating
8	TIMEMARK	O	1 PPS timemark output. If not used, keep floating.
9	NC		Not connected, keep floating
10	NC		Not connected, keep floating
11	NC		Not connected, keep floating
12	NC		Not connected, keep floating
13	NC		Not connected, keep floating
14	GND	PWR	Ground
15	VCC_IN	PWR	3.2~5.0V DC supply input
16	VSTBY	PWR	Apply 1.65~5.0V DC for backup RTC & SRAM.
17	BOOTSEL	I	Pull high for programming mode. If not used, keep floating
18	RESETN	I	Reset pin, active low, If not used, keep floating
19	GPS Status	O	*Please refer to the diagram below. If not used, keep floating
20	GND	PWR	Ground
21		N/C	Not connected, keep floating
22		N/C	Not connected, keep floating
23	TXDB	O	TTL UART Port B output. If not used, keep floating
24		N/C	Not connected, keep floating
25	ANTPWR	PWR	Antenna power input
26	GND	PWR	Ground
27	RFIN	I	RF Signal input
28	GND	PWR	Ground

*GPS Status: when GPS is fixed, the cycle will be shown as below:

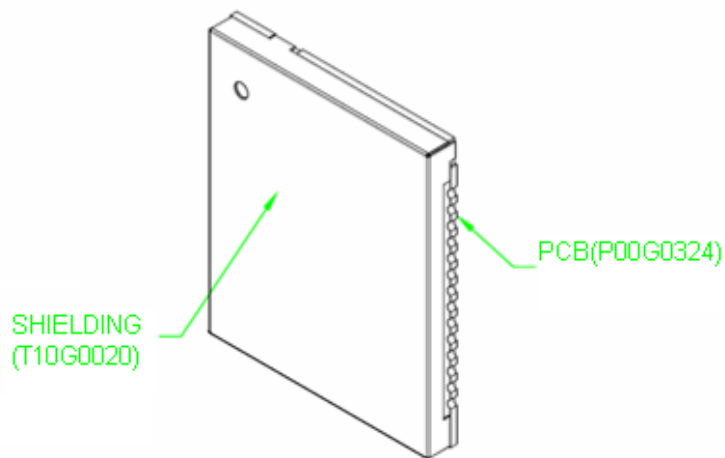
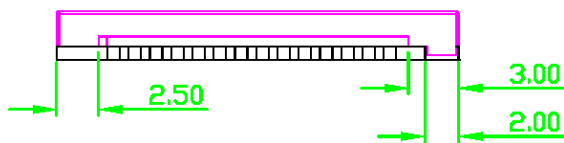
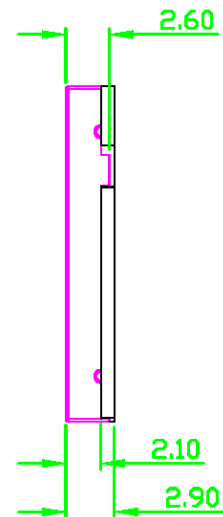
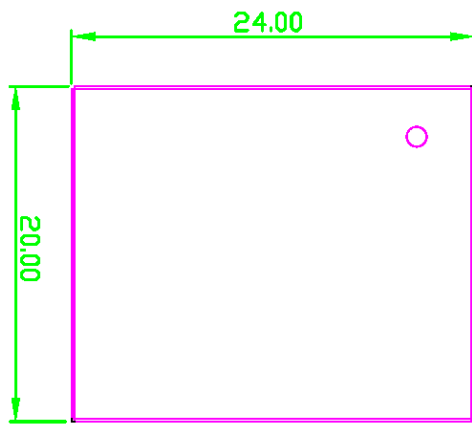


Mechanical Dimensions

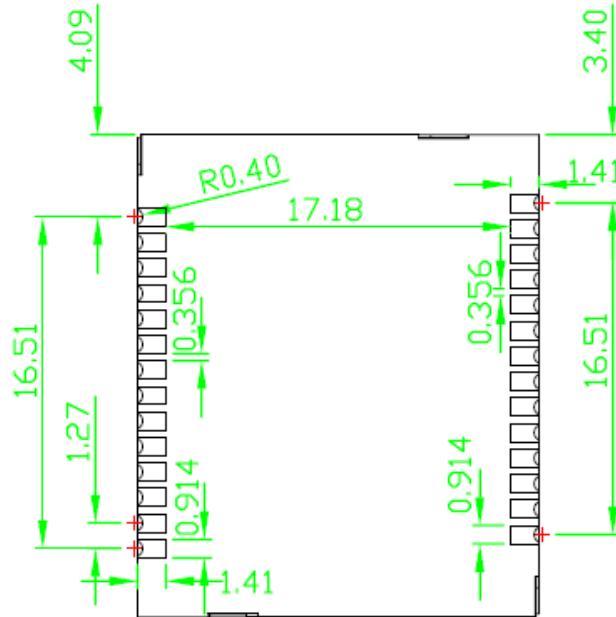
Outline Drawing

Tolerance:

Length	24.0 ± 0.3 mm
Width	20.0 ± 0.3 mm
Height	2.90 ± 0.3 mm



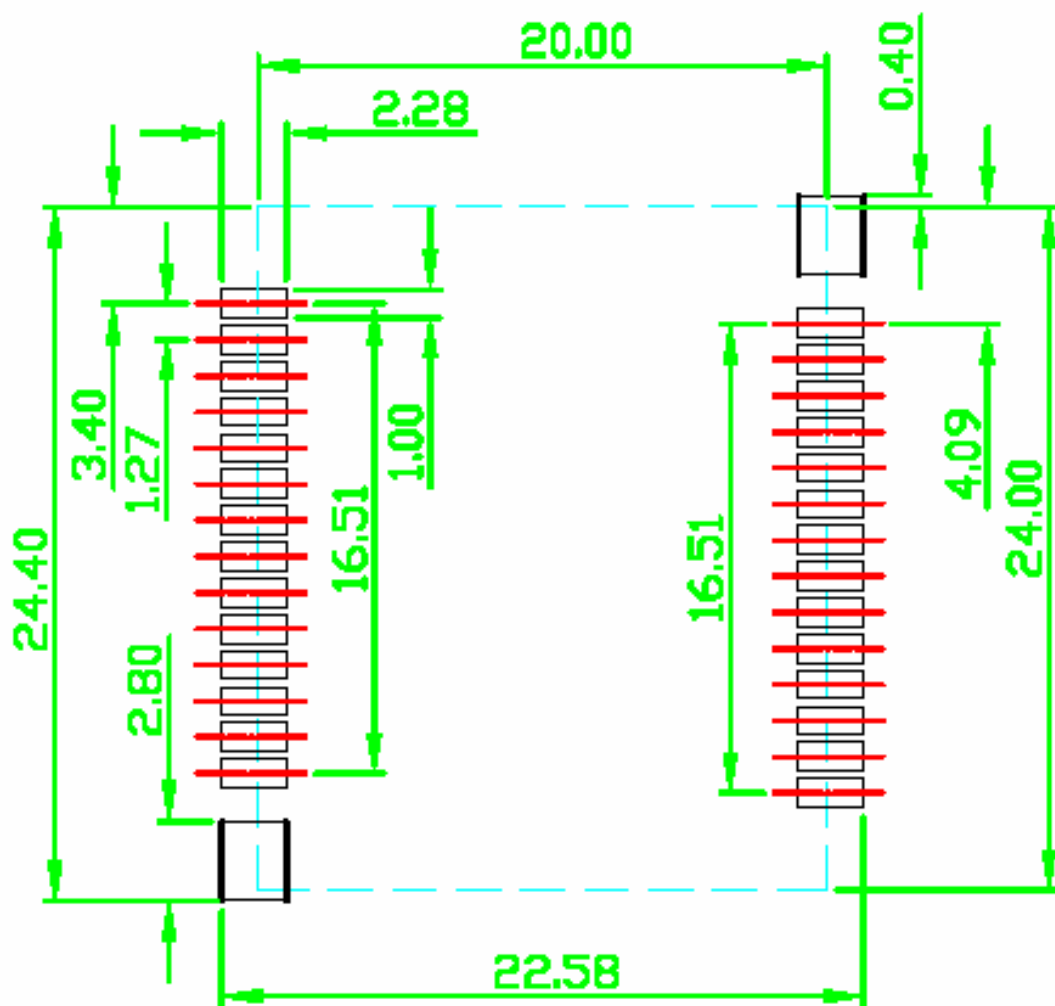
(Bottom view)



PCB PAD

Recommended Footprint

(Unit : mm)



PCB LAYOUT

Package Specification

(Unit : mm)

LR9548S modules are shipped in the plastic carrier tape on the reel. Each 13" reel can hold maximum 500 pcs of modules. The tape and reel dimensions are shown in the following figures.

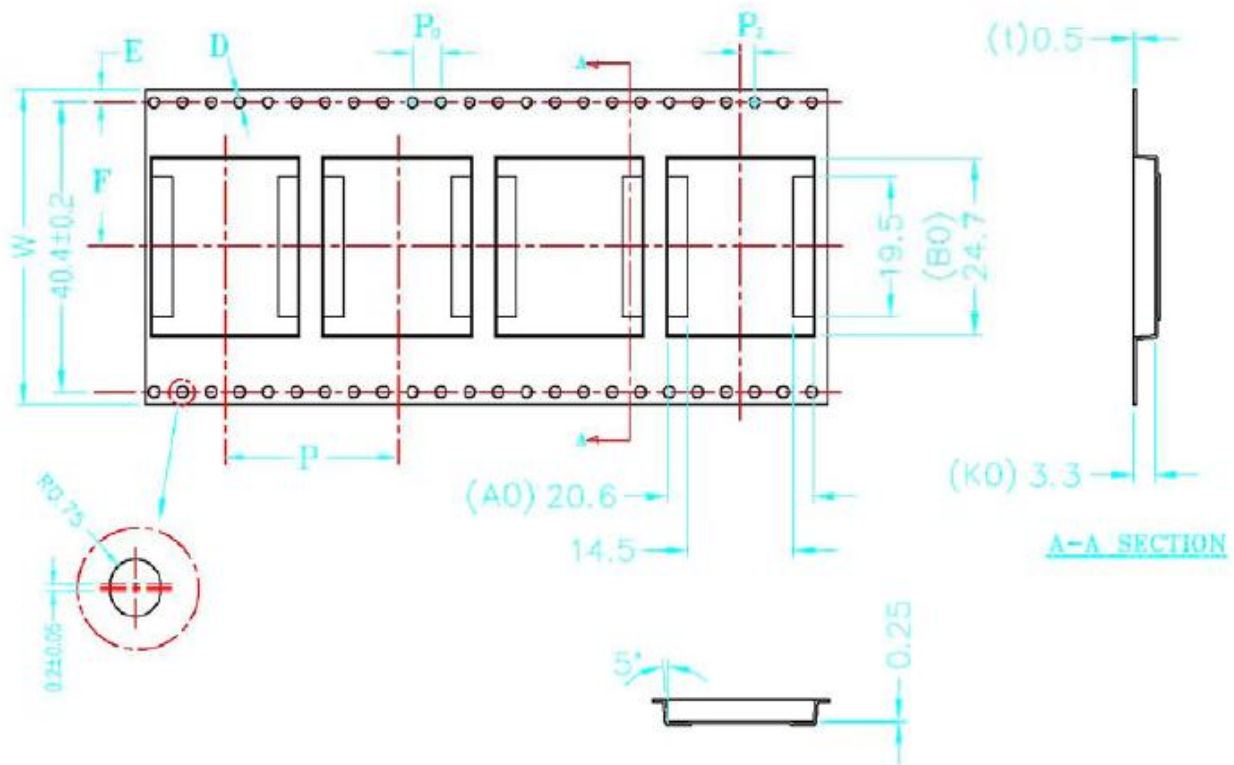


Figure1: Carrier tape dimensions

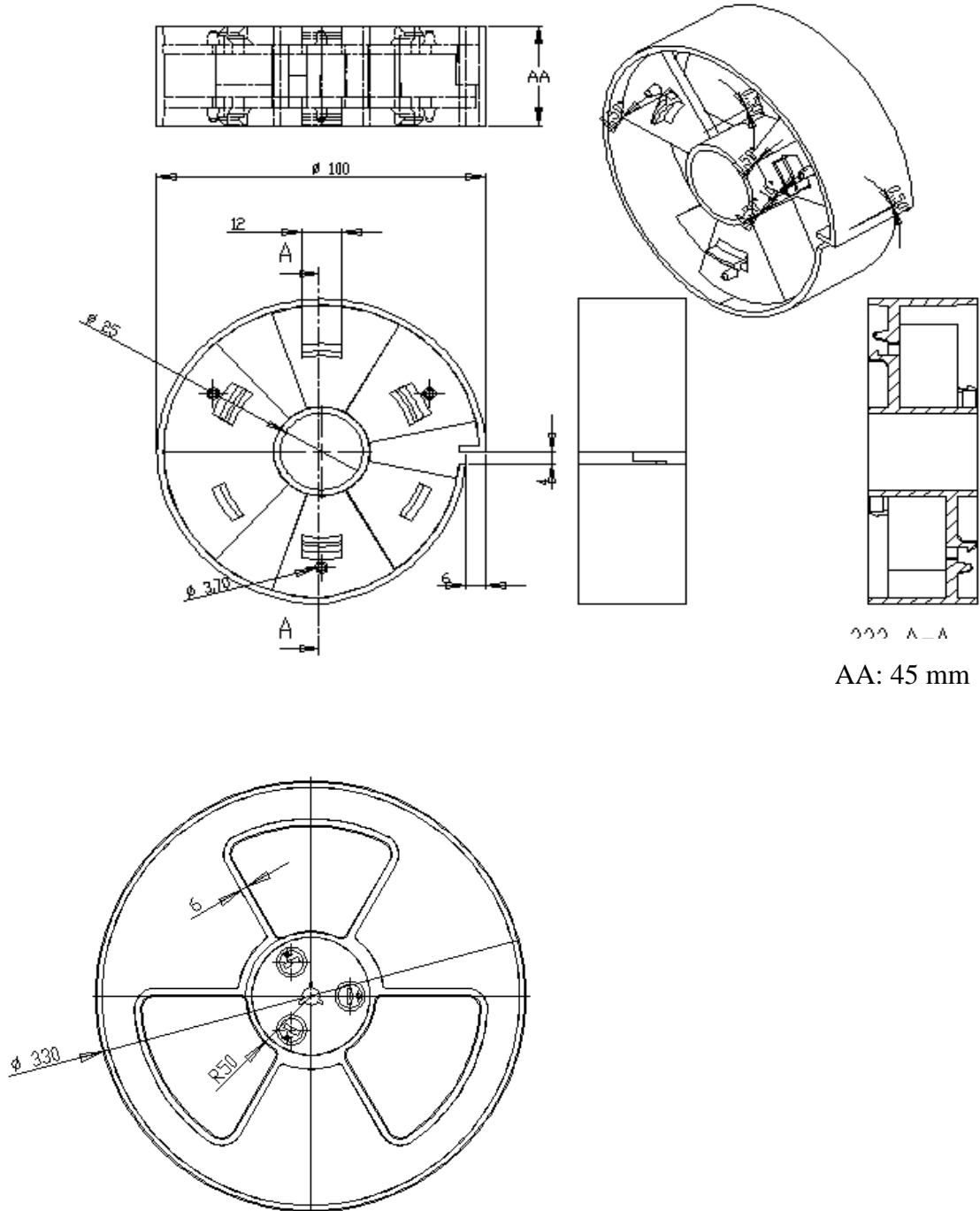
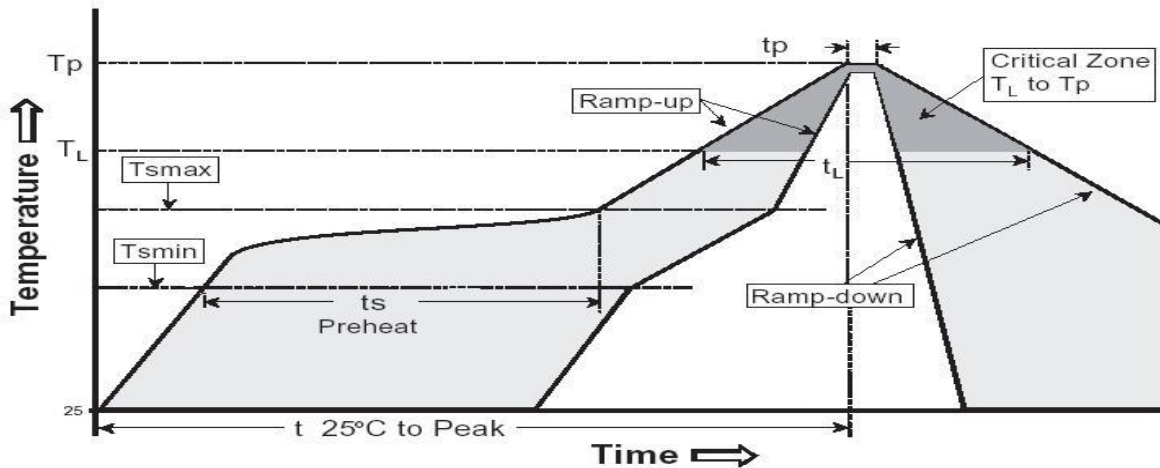


Figure 2: Reel dimensions

RoHS soldering profile

Reflow profile

High quality, low defect soldering requires identifying the optimum temperature profile for reflowing the solder paste. To have the correct profile assures components, boards, and solder joints are not damaged and reliable solder connection is achievable. Profiles are essential for establishing and maintaining processes. You must be able to repeat the profile to achieve process consistency. The heating and cooling rise rates must be compatible with the solder paste and components. The amount of time that the assembly is exposed to certain temperatures must first be defined and then maintained.



Average ramp-up rate	3°C/second max.
Preheat (T _{max} – T _{min} , t _s)	150~200°C ; 60~180seconds
Time maintained above (T _L , t _L)	217°C ; 60~150seconds
Peak Temperature (T _p)	255~260°C ; 10~20seconds
Ramp-down rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.
Maximum number of reflow cycles	≤3

Storage & baking condition

1. Calculated shelf life in sealed bag: 6 months at $<40^{\circ}\text{C}$ and $<90\%$ relative humidity(RH).
2. After bag is opened, devices that will be subjected to reflow soldering or other high temperature process must be:
 - a. Mounted within: 24 hours of factory conditions $\leq 30^{\circ}\text{C}$ /60% RH, or
 - b. Stored at $<10\%$ RH under the protection against humidity and static electricity
3. Devices require bake before mounting, if:
 - a. Humidity indicator Card is $>60\%$ when read at $23\pm 5^{\circ}\text{C}$
 - b. 2a or 2b not met
4. If baking is required, devices may be baked for 24 hours at $125\pm 5^{\circ}\text{C}$

Note: if device containers cannot be subjected to high temperature or if shorter bake times are desired, reference IPC/JEDEC J-STD-020 for bake procedure