TRANSYSTEM INC.
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GPS Engine Board

EB-250/ EB-250L

EB-250 is an ultra miniature 13 x 15 mm^2 GPS engine board. It provides superior navigation performance under dynamic conditions in areas with limited sky view like urban canyons. High sensitivity up to **-158dBm** for weak signal operation without compromising accuracy. EB-250 series are your best choice for embedded applications.

Key Features :
• Small form factor: 13 x 15 x 2.2 mm
• Lead-Free – RoHS/WEEE compliant
• High sensitivity -158dBm
• Tracks 51-Channel of satellites
• Fast Position Fix
• Low power consumption
• Max. GPS signal input level :
  EB-250 -120dBm
  EB-250L -117dBm

Applications :
• Handheld devices
• Automotive and Marine Navigation
• Automotive Navigator Tracking
• Emergency Locator
• Geographic Surveying
• Personal Positioning
• Sporting and Recreation
• Embedded applications : PDA, DSC, Smart phone, UMPC, PND, MP4

ELECTROSTATIC SENSITIVE DEVICES

PIN Definition :

```
1   RX1              GND   22
    TX1         RF_INPUT
    PPS              GND
    TX0             V285A
    RX0               NC
    GND              GND
    GPIO[8]      GPIO[5]
    GPIO[0]      GPIO[7]
    GPIO[4]      GPIO[6]
    V285D        VIN_3V3
11  ON/OFF     V_RTC_3V3  12
```

PIN Coordinates   Unit:mm

Pin #	X	Y	Pin #	X	Y
1	0.00	0.00	12	13.0	12.7
2	0.00	1.27	13	13.0	11.43
3	0.00	2.54	14	13.0	10.16
4	0.00	3.81	15	13.0	8.89
5	0.00	5.08	16	13.0	7.62
6	0.00	6.35	17	13.0	6.35
7	0.00	7.62	18	13.0	5.08
8	0.00	8.89	19	13.0	3.81
9	0.00	10.16	20	13.0	2.54
10	0.00	11.43	21	13.0	1.27
11	0.00	12.7	22	13.0	0.00

Ultimate

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EB

EB-250 Specifications

Specification	Description
General	L1 frequcney, C/A code (SPS) 51 independent tracking channels
Sensitivity	-158dBm /Tracking; -146dBm /Acquisition
Update Rate	Up to 5Hz
Accuracy	Without aid: 3.0m 2D-RMS <3m CEP (50%) without SA (horizontal) DGPS (WAAS, EGNOS, MSAS, RTCM): 2.5m
Acquisition (open sky)	Cold Start: 36 sec Warm Start: 33 sec Hot Start: 1 sec
Reacquisition	< 1sec
Dynamics	Altitude: 18000m (max.) Velocity: 515m/sec (max.) Vibration: 4G (max.)
Supply Voltage	DC 3.0~6 V
Power Consumption	EB-250: < 30mA @ 2.85V (w/o Active ANT) / Tracking EB-250L: < 27.5mA @ 2.85V (w/o Active ANT) / Tracking
Backup Battery	DC 1.5~6V (RTC Vcc)
NMEA Message	NMEA0183 v3.1 baud rate 4800/9600/…/57600, default 9600 Selectable Output: GGA, GLL, GSA, GSV, RMC, and VTG
Datum	Default WGS-84 (total 219 Datum)
Antenna	External Antenna / External Active Antenna Output Voltage: 2.85 VDC
Serial Interface	TTL
Operating Temperature	-30℃ to 85℃
Storage Temperature	-40℃ to 125℃
Operating Humidity	≦95%, non condensing
Mounting	SMT Type, 22 Pin
Dimension	13 x 15 x 2.2(H) mm

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1 Introduction

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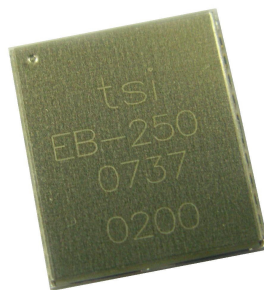
1.1 Key Features

- Small form factor: 13 x 15 x 2.2 mm
- Lead-Free – RoHS/WEEE compliant
- High sensitivity -158dBm
- Tracks 51-Channel of satellites
- Fast Position Fix, 36/ 33/ 1s for Cold/ Warm/ Hot start
- Low power consumption

1.2 Applications

- Handheld devices
- Automotive and Marine Navigation
- Automotive Navigator Tracking
- Emergency Locator
- Geographic Surveying
- Personal Positioning
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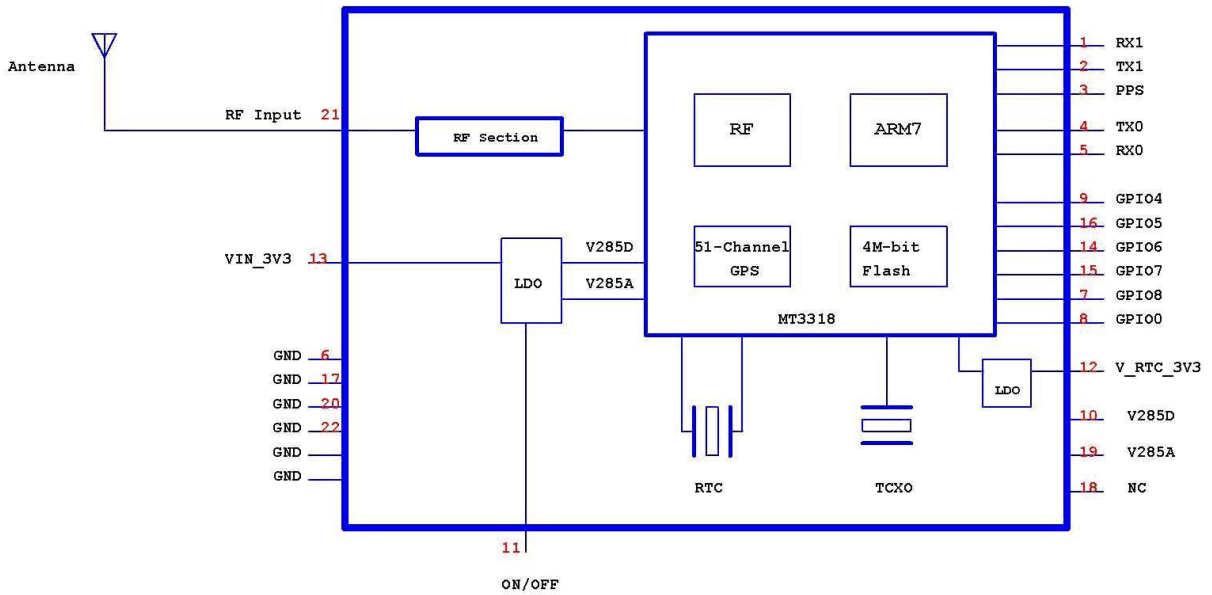- Embedded applications such as: PDA, DSC, Smart phone, UMPC, PND, MP4

1.3 Look & Feel

2 Technical Description

2.1 Block Diagram

EB-250 Series System Block Diagram

Antenna		
RF Input 21	RF Section	1 RX1
		2 TX1
	RF ARM7	3 PPS
		4 TX0
		5 RX0
		9 GPIO4
VIN_3V3 13	V285D	16 GPIO5
	LDO 51-Channel 4M-bit	14 GPIO6
	V285A GPS Flash	15 GPIO7
		7 GPIO8
	MT3318	8 GPIO0
GND 6		12 V_RTC_3V3
GND 17	LDO	
GND 20		10 V285D
GND 22		19 V285A
GND	RTC TCXO	18 NC
GND		
	11	
	ON/OFF	

2.2 Pin Definition

Pin#	Signal Name	Type	Description
1	RX1	I	Serial Data Input
2	TX1	O	Serial Data Output
3	PPS	O	1Hz pulse 10% duty cycle when GPS has position fix
4	TXD	O	Serial data Output (NMEA)
5	RXD	I	Serial Data Innput (NMEA)
6	GND	P	Ground
7	GPIO[8]	I/O*	General input/ output
8	GPIO[0]	O	GPS status, blink when GPS has position fix
9	GPIO[4]	I/O*	General input/ output
10	V285D	P	Digital power indicator, 2.85V±2%
11	On / Off	I	GPS Power On / Off control , Open if not used
12	V_RTC_3V3	P	RTC power 1.5~6V DC, 500uA max
13	VIN_3V3	P	Power Supply 3.0~6V DC
14	GPIO[6]	I/O*	General input / output
15	GPIO[7]	I/O*	General input / output
16	GPIO[5]	I/O*	General input / output
17	GND	P	Ground
18	NC	NC	NC
19	V285A	P	Analog power indicator, 2.85V±2%
20	GND	P	Ground
21	RF Input	I	Antenna port, L1, 1575.42MHz, 50 ohm
22	GND	P	Ground

P: Power   I: Input   O: Output   I/O*: Input or Output, Open if not used
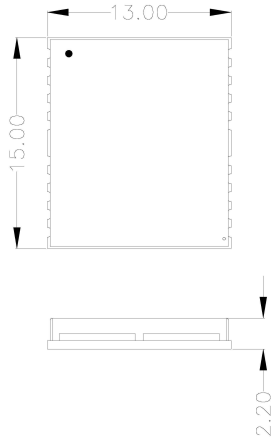
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2.3 Specification

EB-250 Specifications

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3 Dimension and Package

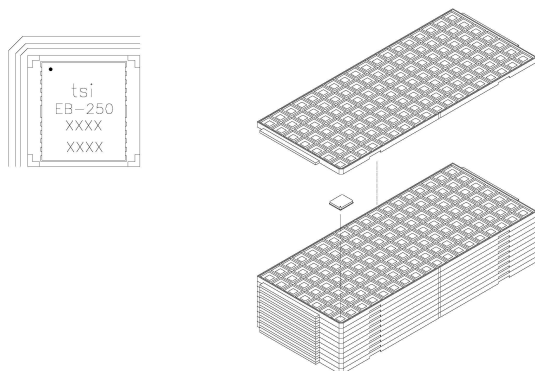### 3.1 Mechanical Dimension

3.2 Recommend Layout Pattern

3.3 Package

![TRANSYSTEM INC. logo](http://www.transystem.com.tw)
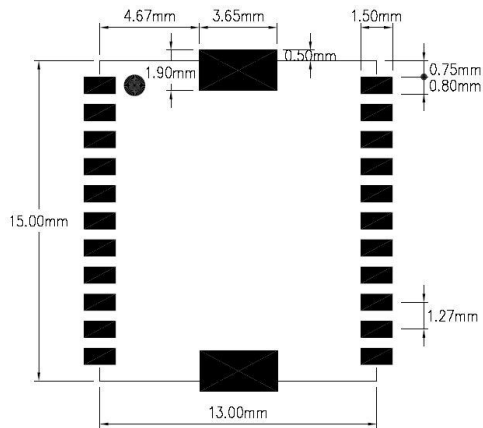
4 Application Information

4.1 GPS Antenna Recommendations

Follow below recommendations when choosing GPS antenna for EB-250 series for best system performance. Transystem also offers active antenna products for optimal performance with EB-250 series. For details, please contact your Transystem sales contact directly.

- Use active antenna that works with 3V power supply
- Receiving frequency 1575.42 ± 1.032MHz
- Polarization RHCP (right hand circular polarized)
- Output impedance = 50 Ohm
- 15dB ≦ LNA Gain ≦ 20dB
- Noise figure ≦ 2.0dB
- Connector: surface mounted on main PCB, Ipex or MMCX

4.2 Application Circuit
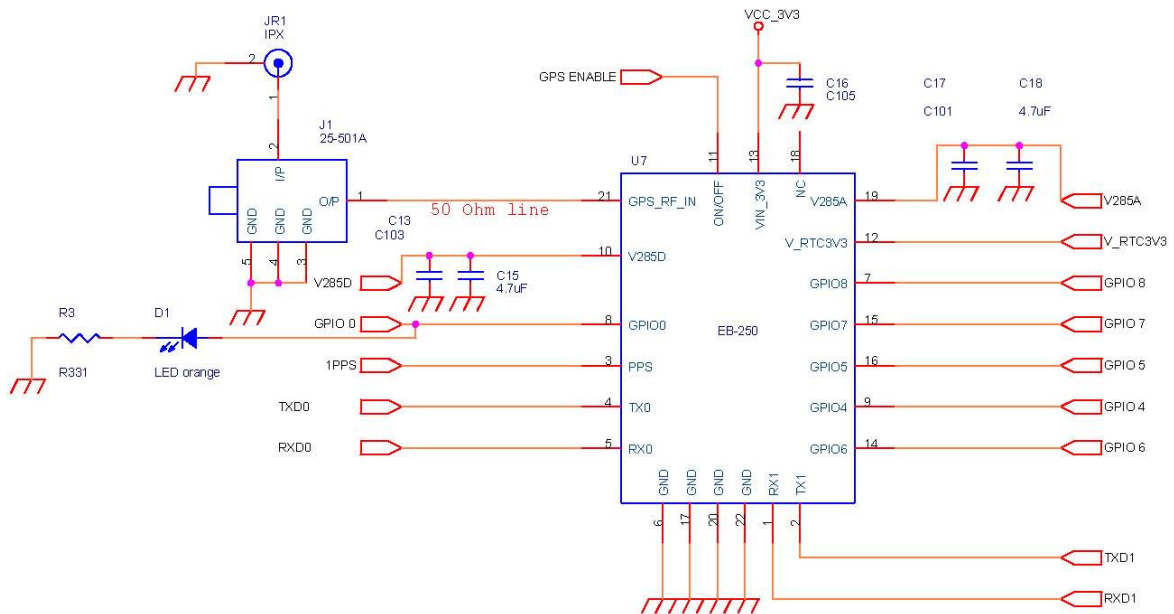
【Note1】: GPIO[0] (pin#8) can be used as GPS position fix indicator.
【Note2】: V_RTC_3V3 (pin#12) could connect to 1.5~6V DC power supply directly.

4.3 General GPS Receiver User's Tips

- If the satellite signals can not be locked or experiencing receiving problem (while in urban area), following steps are suggested:
    a) Please plug the external active antenna into GPS receiver and put the antenna outdoor or on the roof of the vehicle for better receiving performance.
    b) Move to another open space or reposition GPS receiver toward the direction with least blockage.
    c) Move the GPS receiver away from the interference sources.
    d) Wait until the weather condition is improved.
- Some vehicles having heavy metallic sun protecting coating on windshields may affect signal receptions
- Driving in and around high buildings may affect signal reception.
- Driving under tunnels or in buildings may affect signal reception.
- In general, GPS receiver performs best in open space where it can see clean sky. Weather will affect GPS reception – rain & snow contribute to worsen sensitivity.
- When GPS receiver is moving, it will take longer time to get position fix. Wait for satellite signals to be locked at a fixed point when first power-on the GPS receiver to ensure quick GPS position fix.

4.4 IR reflow profile

Ramp-down rate : 6 °C /sec. max.

Time 25 °C to peak temperature : 8 minutes max.

Cycle interval : 5 minus
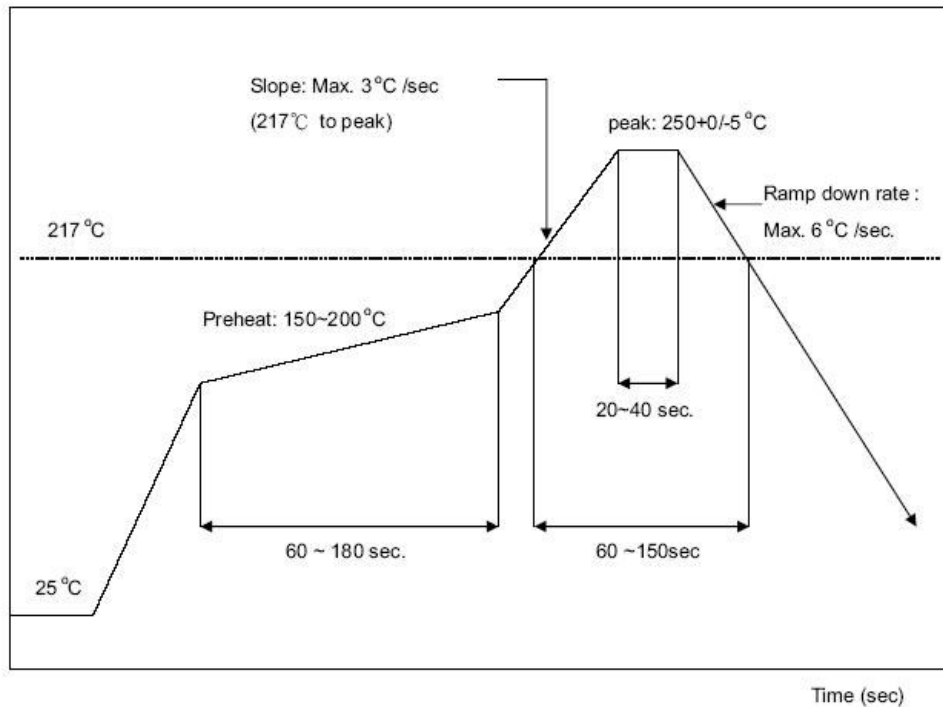
4.5 How to avoid ESD damage to ICs

- Any person handling the ICs should be grounded either with a wrist strap or ESD-protective footwear used in conjunction with a conductive or static-dissipative floor or floor mat.
- The work surface where devices are placed for handling, processing, testing, etc., must, be made of static-dissipative material and be grounded to ESD ground.
- All insulator materials must either be removed from the work area or must be neutralized with an ionizer. Static-generating clothing must be covered with an ESD-protective smock.
- When ICs are being stored, transferred between operations or workstations, or shipped, they must be kept in a Faraday shield container with inside surfaces (surfaces touching the ICs) that are static-dissipative.

Contact Information

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