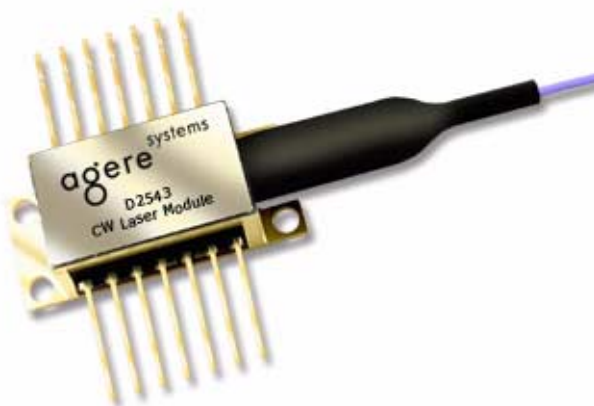


Wavelength-Selected Ultra High-Power D2543P-Type Isolated DFB Laser Modules



Featuring wavelength selection, the D2543P type Laser Module is ideally suited for use with external lithium niobate modulators, and in ultra high-power (40 mW) applications.

Features

- High-performance, multiquantum-well (MQW), distributed-feedback (DFB) laser
- D2543P-Type is offered on 100 GHz ITU grid wavelengths ranging from 1528.77 nm—1610.06 nm
- Polarization-maintaining fiber pigtail
- For use with lithium niobate modulators
- Ultra high optical power (40 mW, CW)
- Hermetic, 14-pin package

Applications

- Telecommunications:
 - Dense WDM
 - SONET/SDH OC-192/STM-64
 - Extended and ultralong reach
 - Undersea systems
- Digital video

Description

The D2543P-Type DFB laser module is designed for use with an external lithium niobate modulator and also in applications where ultra high power (40 mW) is required. The laser module features a polarization-maintaining fiber (PMF) pigtail, enabling it to be directly connected to a modulator without the need of a polarization controller. The PMF maintains the polarization of the output light to a consistent orientation. This allows the D2543P to be used as a CW light source for systems requiring extremely low chirp such as undersea, or 10 Gbits/s and 40 Gbits/s systems. The module contains a multiquantum-well (MQW), distributed feedback (DFB) laser. The wavelength of the laser can be temperature tuned for more precise wavelength selection by adjusting the temperature of the internal thermoelectric cooler.

Description (continued)

Controlled Feedback

The module contains an internal optical isolator that suppresses optical feedback in laser-based, fiber-optic systems. Light reflected back to the laser is attenuated a minimum of 30 dB.

Controlled Power

An internal, InGaAs, PIN photodiode functions as the back-facet monitor. The photodiode monitors emission from the rear facet of the laser and, when used in conjunction with control circuitry, can control optical power launched into the fiber. Normally, this configuration is used in a feedback arrangement to maintain consistent laser output power.

Standard Package

The laser module is fabricated in a 14-pin, hermetic, metal/ceramic butterfly package that incorporates a bias tee that separates the dc-bias path from the RF input. The RF input has a nominal $25\ \Omega$ impedance.

The laser module is equipped with *Fujikura*® polarization-maintaining fiber (PMF). The fiber is PANDA type and is the same fiber that is used on the Agere Systems Inc. lithium niobate modulators. It has a mode field diameter of $10.5\ \mu\text{m}$, a cladding diameter of $125\ \mu\text{m} \pm 3\ \mu\text{m}$, and a loose tube jacketed fiber $900\ \mu\text{m}$ in diameter. Figure 1 shows the orientation of polarization in the fiber.

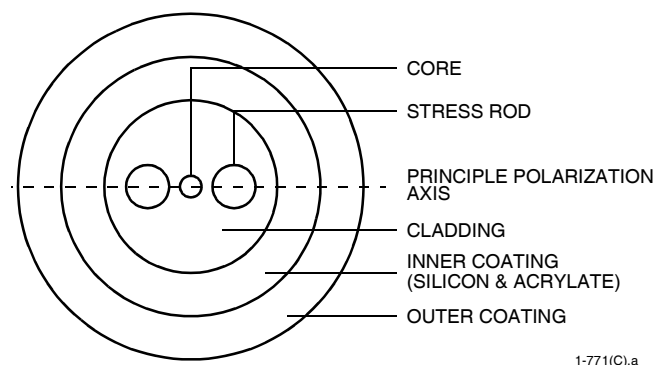


Figure 1. Polarization-Maintaining Fiber

Qualification Information

Agere Systems' optoelectronic components are being qualified to rigorous internal standards that are consistent with *Telcordia Technologies*™ TR-NWT-000468. All design and manufacturing operations are *ISO*® 9001 certified. The module is being fully qualified for central office applications.

Pin Information

Table 1. Pin Descriptions

Pin	D2543P-Type
1	Thermistor
2	Thermistor
3	Laser dc Bias (Cathode) (–)
4	Back-facet Monitor Anode (–)
5	Back-facet Monitor Cathode (+)
6	TEC (+)*
7	TEC (–)*
8	Case Ground
9	Case Ground
10	Case Ground
11	Laser Anode (+) †
12	RF Laser Input Cathode (–)
13	Laser Anode (+) †
14	Case Ground

* A positive current through the thermoelectric heat pump cools the laser.

† Both leads should be grounded for optimum performance.

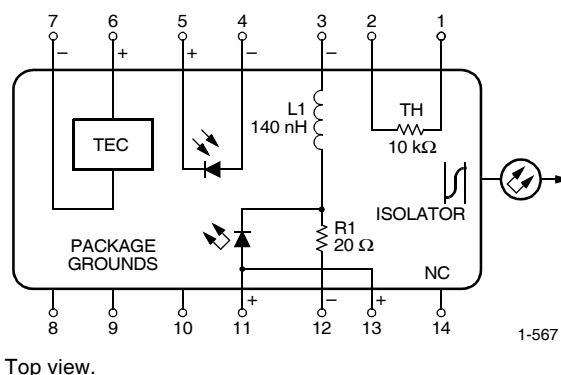


Figure 2. D2543P Circuit Schematic

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Laser Reverse Voltage	VRLMAX	—	2	V
dc Forward Current	IFLMAX	—	550	mA
Operating Case Temperature Range	T _C	–25	70	°C
Storage Case Temperature Range*	T _{stg}	–40	70	°C
Photodiode Reverse Voltage	VRPDMAX	—	10	V
Photodiode Forward Current	IFPDMAX	—	2	mA

* Does not apply to shipping container.

Handling Precautions

Power Sequencing

To avoid the possibility of damage to the laser module from power supply switching transients, follow this turn-on sequence:

1. All ground connections
2. Most negative supply
3. Most positive supply
4. All remaining connections

Reverse the order for the proper turn-off sequence.

Electrostatic Discharge

CAUTION: This device is susceptible to damage as a result of electrostatic discharge. Take proper precautions during both handling and testing. Follow guidelines such as JEDEC Publication No. 108-A (Dec. 1988).

Agere Systems employs a human-body model (HBM) for ESD-susceptibility testing and protection-design evaluation. ESD voltage thresholds are dependent on the critical parameters used to define the model. A standard HBM (resistance = 1.5 k Ω , capacitance = 100 pF) is widely used and, therefore, can be used for comparison purposes. The HBM ESD threshold presented here was obtained using these circuit parameters:

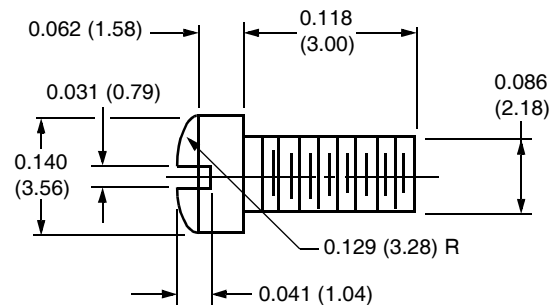
Parameter	Value	Unit
Human-body Model	>400	V

Mounting Instructions

The minimum fiber bend radius is 1.0 in. (25.4 mm)

To avoid degradation in performance, mount the module on the board as follows:

1. Place the bottom flange of the module on a flat heat sink at least 0.5 in. x 1.180 in. (12.7 mm x 30 mm) in size. The surface finish of the heat sink should be better than 32 μ in. (0.8 μ m), and the surface flatness must be better than 0.001 in. (25.4 μ m). Using thermal conductive grease is optional; however, thermal performance can be improved by up to 5% if conductive grease is applied between the bottom flange and the heat sink.
2. Mount four #2-56 screws with Fillister heads (M2-3 mm) at the four screw hole locations (see Outline Diagram). The Fillister head diameter must not exceed 0.140 in. (3.55 mm). Do not apply more than 1 in.-lb. of torque to the screws..



Note: Dimensions are in inches and (millimeters).

1-532(C)

Figure 3. Fillister Head Screw

Characteristics

Minimum and maximum values are testing requirements. Typical values are device characteristics and are results of engineering evaluations; they are for information purposes only and are not part of the testing requirements. All specifications in Tables 2 and 3 are tested at beginning of life (BOL) unless otherwise specified.

Table 2. D2543P-Type Electrical Characteristics (at 25 °C laser temperature)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Threshold Current	I_{TH}	—	—	20	50	mA
Drive Current	—	$L_F = 40$ mW	—	350	400	mA
Laser Forward Voltage	V_{LF}	$L_F = 40$ mW (CW)	—	1.5	2.0	V
Monitor Reverse-bias Voltage*	V_{RMON}	—	3	5	10	V
Back-facet Monitor Current:	I_{RMON}	$P_O = 40$ mW (CW)	0.15	2	3	mA
Monitor Dark Current	I_D	$I_F = 0$, $V_{RMON} = 5$ V	—	0.01	0.1	μ A
Input Impedance	Z_{IN}	—	—	25	—	Ω
Thermistor Current	I_{TC}	—	10	—	100	μ A
Resistance Ratio†	—	—	9.1	9.6	10.1	—
Thermistor Resistance	R_{TH}	$T_L = 25$ °C	9.5	—	10.5	k Ω
Laser Submount Temperature	T_{LASER}	—	20	—	35	°C
TEC Current	I_{TEC}	$T_L = 20$ °C, $T_C = 70$ °C	—	—	1.8	A
TEC Voltage	V_{TEC}	$T_L = 20$ °C, $T_C = 70$ °C	—	—	3.5	V
TEC Capacity	ΔT	$T_C = 70$ °C	50	—	—	°C

* Standard operating condition is 5.0 V reverse bias.

† Ratio of thermistor resistance at 0 °C to thermistor resistance at 50 °C..

Table 3. D2543P-Type Optical Characteristics (at 25 °C laser temperature)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Peak Optical Output Power	P_P	—	40.0	—	—	mW
Center Wavelength* (See Ordering Information, Tables 5 and 6.)	λ_C	$T_L = T_{SET}$ $\lambda_C = \lambda_{ITU} \pm 0.1$ nm	1528.77	—	1610.06	nm
Line Width (3 dB full width)	$\Delta\lambda$	CW, $P_F = 40.0$ mW	—	2	5	MHz
Side-mode Suppression Ratio	SMSR	CW	35	45	—	dB
Relative Intensity Noise	RIN	CW, $P_F = 40$ mW 200 MHz < f < 10 GHz	—	—	–140	dB/Hz
Optical Isolation	—	$T_C = 0$ °C to 75 °C	30	—	—	dB
Optical Polarization Extinction Ratio†	—	0 °C to 75 °C	20	—	—	dB
FM Efficiency	FM	$f_{MOD} = 30$ kHz, $P_F = 40$ mW	—	50	—	MHz/mA
Wavelength Drift (EOL)	$\Delta\lambda_C$	Tested over 25-year lifetime	—	—	± 0.1	nm

* Custom wavelengths available.

† The ST[®] ferrule key is not aligned to the slow axis of fiber. The connector is intended for testing purposes only.

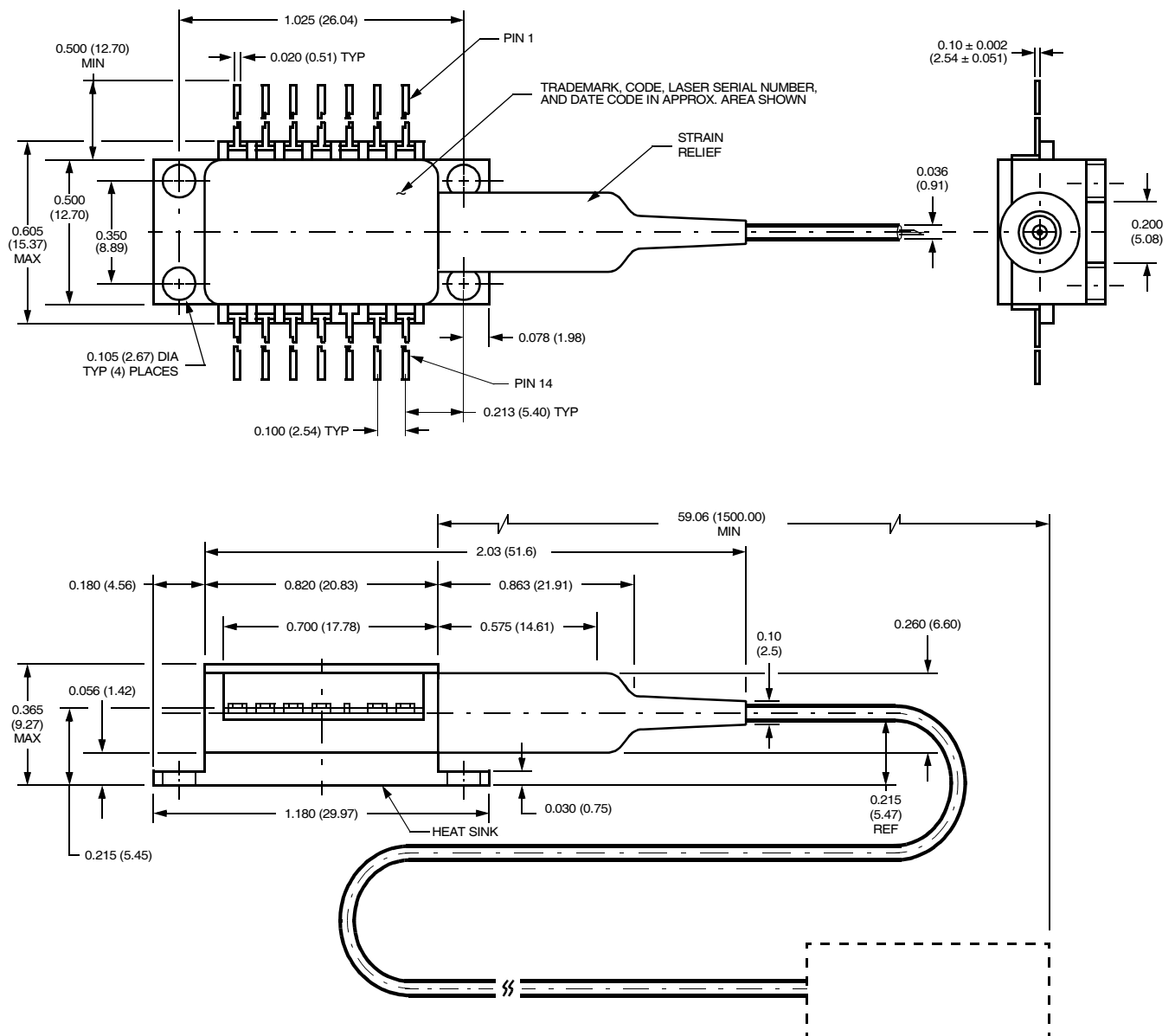
Characteristics (continued)

Table 4. D2543P Fiber Pigtail and Optical Connector Characteristics

Parameter	Symbol	Description	Min	Typ	Max	Unit
Pigtail Length	L	Fujikura PANDA or equivalent polarization-maintaining fiber	1.5	—	—	m
Connector Style	—	ST plug	—	—	—	—

Outline Diagram

Dimensions are in inches and (millimeters). Tolerances are ± 0.005 in. (± 0.127 mm).



1-520.h

High-Power Product

Class IIIb Laser Product

FDA/CDRH Class IIIb laser product per CDRH, 21 CFR 1040 Laser Safety requirements. The device will be classified with the FDA. Accession number is TBD.

This product complies with 21 CFR 1040.10 and 1040.11.

8 μm /125 $\mu\text{m} \pm 3 \mu\text{m}$ single-mode fiber with 900 μm diameter fiber with tight-buffered outer jacket and connector

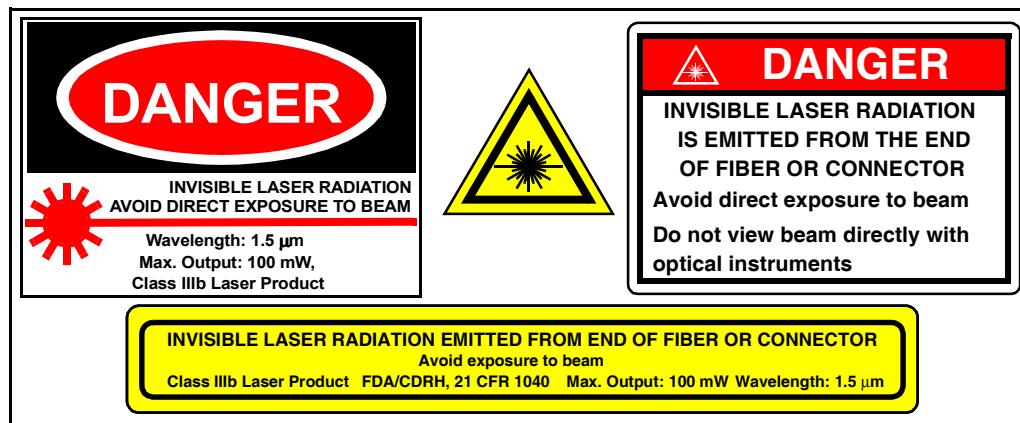
Wavelength range= 1528.77 nm—1610.06 nm

Maximum power = 100 mW

Because of size constraints, laser safety labeling (including an FDA Class IIIb label) is not affixed to the module but attached to the outside of the shipping carton.

Product is not shipped with power supply.

Caution: Use of controls, adjustments, and procedures other than those specified herein may result in hazardous laser radiation exposure.



Ordering Information

Table 5. D2543P 40 mW CW Laser D2543P (C-Band)

Device Code	ITU-T Frequency (THz)	Center Wavelength (nm)	Comcode	Device Code	ITU-T Frequency (THz)	Center Wavelength (nm)	Comcode
D2543P61	196.1	1528.77	109028738	D2543P38	193.8	1546.92	109028506
D2543P60	196.0	1529.55	109028720	D2543P37	193.7	1547.72	109028498
D2543P59	195.9	1530.33	109028712	D2543P36	193.6	1548.51	109028480
D2543P58	195.8	1531.12	109028704	D2543P35	193.5	1549.32	109028472
D2543P57	195.7	1531.90	109028696	D2543P34	193.4	1550.12	109028464
D2543P56	195.6	1532.68	109028688	D2543P33	193.3	1550.92	109028456
D2543P55	195.5	1533.47	109028670	D2543P32	193.2	1551.72	109028449
D2543P54	195.4	1534.25	109028662	D2543P31	193.1	1552.52	109028431
D2543P53	195.3	1535.04	109028654	D2543P30	193.0	1553.33	109028423
D2543P52	195.2	1535.82	109028647	D2543P29	192.9	1554.13	109028415
D2543P51	195.1	1536.61	109028639	D2543P28	192.8	1554.94	109028407
D2543P50	195.0	1537.40	109028621	D2543P27	192.7	1555.75	109028399
D2543P49	194.9	1538.19	109028613	D2543P26	192.6	1556.55	109028381
D2543P48	194.8	1538.98	109028605	D2543P25	192.5	1557.36	109028373
D2543P47	194.7	1539.77	109028597	D2543P24	192.4	1558.17	109028365
D2543P46	194.6	1540.56	109028589	D2543P23	192.3	1558.98	109028357
D2543P45	194.5	1541.35	109028571	D2543P22	192.2	1559.79	109028340
D2543P44	194.4	1542.14	109028563	D2543P21	192.1	1560.61	109028332
D2543P43	194.3	1542.94	109028555	D2543P20	192.0	1561.42	109028324
D2543P42	194.2	1543.73	109028548	D2543P19	191.9	1562.23	109028316
D2543P41	194.1	1544.53	109028530	D2543P18	191.8	1563.05	109028308
D2543P40	194.0	1545.32	109028522	D2543P17	191.7	1563.86	109028290
D2543P39	193.9	1546.12	109028514				

Ordering Information

Table 6. D2543P 40 mW CW Laser (L-Band)

Device Code	ITU Frequency (THz)	Center Wavelength (nm)	Comcode	Device Code	ITU Frequency (THz)	Center Wavelength (nm)	Comcode
D2543P916	191.6	1564.68	109029306	D2543P888	188.8	1587.88	109029025
D2543P915	191.5	1565.50	109029298	D2543P887	188.7	1588.73	109029017
D2543P914	191.4	1566.31	109029280	D2543P886	188.6	1589.57	109029009
D2543P913	191.3	1567.13	109029272	D2543P885	188.5	1590.41	109028993
D2543P912	191.2	1567.95	109029264	D2543P884	188.4	1591.26	109028985
D2543P911	191.1	1568.77	109029256	D2543P883	188.3	1592.10	109028977
D2543P910	191.0	1569.59	109029249	D2543P882	188.2	1592.95	109028969
D2543P909	190.9	1570.42	109029231	D2543P881	188.1	1593.79	109028951
D2543P908	190.8	1571.24	109029223	D2543P880	188.0	1594.64	109028944
D2543P907	190.7	1572.06	109029215	D2543P879	187.9	1595.49	109028936
D2543P906	190.6	1572.89	109029207	D2543P878	187.8	1596.34	109028928
D2543P905	190.5	1573.71	109029199	D2543P877	187.7	1597.19	109028910
D2543P904	190.4	1574.54	109029181	D2543P876	187.6	1598.04	109028902
D2543P903	190.3	1575.37	109029173	D2543P875	187.5	1598.89	109028894
D2543P902	190.2	1576.20	109029165	D2543P874	187.4	1599.75	109028886
D2543P901	190.1	1577.03	109029157	D2543P873	187.3	1600.60	109028878
D2543P900	190.0	1577.86	109029140	D2543P872	187.2	1601.46	109028860
D2543P899	189.9	1578.69	109029132	D2543P871	187.1	1602.31	109028852
D2543P898	189.8	1579.52	109029124	D2543P870	187.0	1603.17	109028845
D2543P897	189.7	1580.35	109029116	D2543P869	186.9	1604.03	109028837
D2543P896	189.6	1581.18	109029108	D2543P868	186.8	1604.88	109028829
D2543P895	189.5	1582.02	109029090	D2543P867	186.7	1605.74	109028811
D2543P894	189.4	1582.85	109029082	D2543P866	186.6	1606.60	109028803
D2543P893	189.3	1583.69	109029074	D2543P865	186.5	1607.47	109028795
D2543P892	189.2	1584.53	109029066	D2543P864	186.4	1608.33	109028787
D2543P891	189.1	1585.36	109029058	D2543P863	186.3	1609.19	109028779
D2543P890	189.0	1586.20	109029041	D2543P862	186.2	1610.06	109028746
D2543P889	188.9	1587.04	109029033				

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