

# Microwave DFB Laser Transmitters



1540A, 1541A  
1541B, 1541C  
1740A, 1741A

3540A, 3541A  
3541B, 3541C  
3740A, 3741A

10340A, 10341A  
10341B, 10341C  
10370A, 10371A

## DATA SHEET

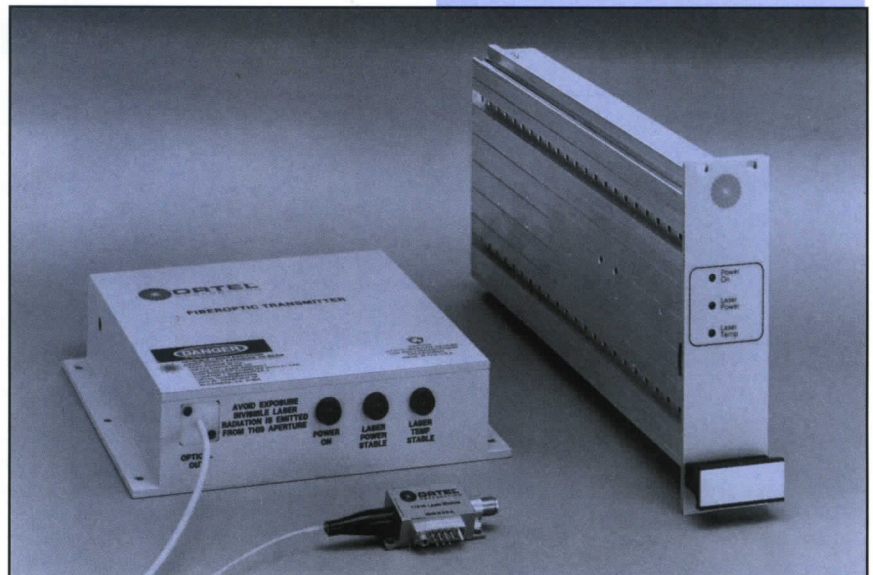
Ortel distributed feedback (DFB) laser transmitters provide exceptional performance for linear fiberoptic communications. By transmitting signals directly at microwave frequencies, these devices simplify and improve a wide array of applications, including antenna remoting, timing and reference signal distribution, telemetry, measurement, and delay lines.

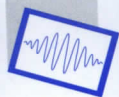
The single optical wavelength characteristic of DFB lasers greatly reduces the dispersive effects of fiber optics commonly observed with Fabry-Perot lasers. As a result, higher quality signals can be transmitted over much longer distances.

Several packaging styles are available for these microwave DFB lasers. The most basic package, the laser module, contains the laser chip, optical fiber, and impedance matched electrical connections in a hermetically sealed unit. Modules also contain a photodiode for monitoring the laser power, and a thermistor and thermoelectric cooler for monitoring and controlling the laser temperature. Additionally, all the microwave DFB lasers in this data sheet include integrated optical isolators, which improve noise performance and allow for fiber coupling efficiencies roughly 10 dB higher than can be achieved with non-isolated lasers.

In most cases, the basic laser module is integrated into a complete transmitter, packaged either as a flange-mount for extreme environments, or as a plug-in for integration with Ortel's System 10000 rack-mountable chassis and power supplies. Electronics within flange-mount and plug-in transmitters control the laser temperature and DC bias current and provide warnings should the temperature or power deviate from their intended levels, thus providing a self-regulating, fully integrated microwave product.

- High dynamic range
- Long distance communication
- Up to 15 GHz bandwidth
- Built-in optical isolator
- 1310 nm or 1550 nm





# Microwave DFB Laser Transmitters

## 3540A, 3541A/B/C, 3740A, 3741A

### Front Panel LEDs

- Power On • Laser Power Stable • Laser Temp Stable

### DC Monitor Voltages

Photodiode Current - Pin 6: 1 V/mA,  $\pm 2\%$  accuracy (into 1M $\Omega$  load).

Proportional to laser output power.

Laser DC Current - Pin 8: 1 V/mA,  $\pm 2\%$  accuracy (into 1M $\Omega$  load).

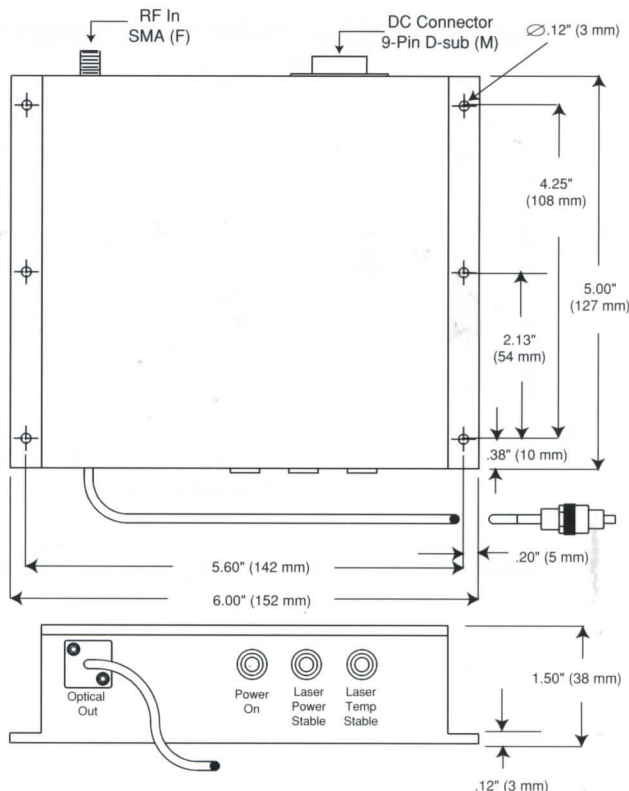
### Alarm Circuits

The alarms are open collector outputs capable of sinking 20 mA when active and withstanding 15 V when off.

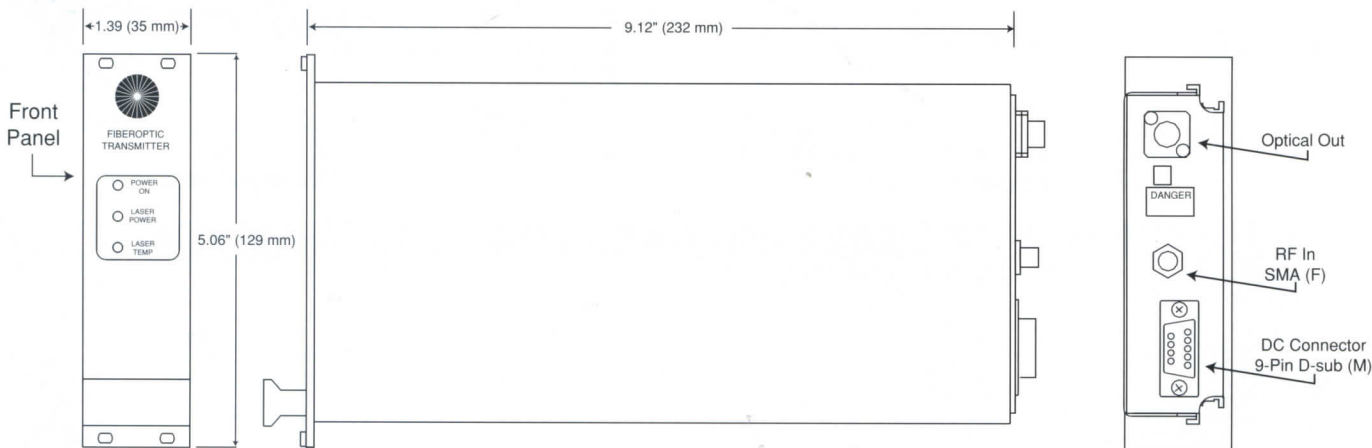
Low Optical Power - Pin 7: sinks current when power is below 90% of setpoint.

Laser Temperature - Pin 9: sinks current when laser internal temperature exceeds 2°C of setpoint (nominally 20°C).

9 Pin D-sub Connector			
Pin	Function	Pin	Function
1	+15 VDC	6	photodiode current monitor
2	+5 VDC	7	low optical power alarm*
3	NC	8	laser current monitor
4	power ground	9	over-temperature alarm*
5	ref. ground	*Open collector outputs.	



## 10340A, 10341A/B/C, 10370A, 10371A



Information contained herein is deemed to be reliable and accurate as of issue date. No responsibility is assumed for its use, nor for any infringements on the rights of others. Ortel Corporation reserves the right to change the design or specifications of the product at any time without notice. Ortel Corporation offers the products described herein with a one year warranty on material and workmanship. Ortel Corporation will repair or replace any product or part thereof which proves defective within one year of shipment. For a complete copy of our warranty policy, please contact Ortel Corporation.

**Safety Considerations** – The light emitted from this laser diode is invisible and may be harmful to the human eye. Avoid looking directly into the fiber pigtail or into the collimated beam along its axis when the device is in operation. Operating the laser diode outside of its maximum ratings may cause device failure or a safety hazard.

**DANGER**

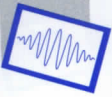
INVISIBLE LASER RADIATION  
AVOID DIRECT EXPOSURE TO BEAM

PEAK POWER 30 mW  
WAVELENGTH 1300/1550 nm  
CLASS IIIb LASER PRODUCT  
THIS PRODUCT COMPLIES WITH 21 CFR  
CHAPTER I SUBCHAPTER J

Making Light Work For You

**ORTEL**  
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# Microwave DFB Laser Transmitters

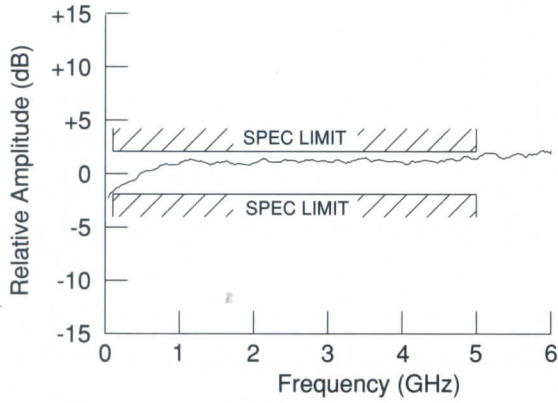
Package Styles	Model Numbers					
Module	1540A	1541A	1541B	1541C	1740A	1741A
Flange-mount Transmitter	3540A	3541A	3541B	3541C	3740A	3741A
Plug-in Transmitter	10340A	10341A	10341B	10341C	10370A	10371A
RF Parameters <sup>1</sup>						
Maximum Frequency	5 GHz	10 GHz	13 GHz	15 GHz	4 GHz	10 GHz
Minimum Frequency	0.1 GHz	0.1 GHz	0.1 GHz	0.1 GHz	0.1 GHz	0.1 GHz
Option -001	0.01 GHz	0.01 GHz	0.01 GHz	0.01 GHz	0.01 GHz	0.01 GHz
Amplitude Flatness <sup>2</sup>	± 2.0 dB	± 2.5 dB	± 3.0 dB	± 3.0 dB	± 2.5 dB	± 2.5 dB
Option -001	± 3.0 dB	± 3.0 dB	± 3.5 dB	± 3.5 dB	± 3.0 dB	± 3.0 dB
Input Impedance	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms
Input VSWR	1.8 : 1	1.8 : 1	3.0 : 1	3.0 : 1	1.8 : 1	1.8 : 1
Input 1 dB Compression, typ. min.	+13 dBm	+13 dBm	+20 dBm	+20 dBm	+13 dBm	+13 dBm
Input Third Order Intercept <sup>3</sup> , min (dBm)						
0.01 to 2.5 GHz	30	35	35	35	28	23
2.5 to 4 GHz	22	30	30	30	28	23
4 to 5 GHz	22	25	25	25		23
5 to 10 GHz		25	25	25		23
10 to 13 GHz			25	25		
13 to 15 GHz				25		
Equivalent Input Noise <sup>4</sup> , max. (dBm/Hz)						
0.01 to 1 GHz	-130	-130	-130	-130	-118	-118
1 to 2.5 GHz	-126	-130	-130	-130	-118	-118
2.5 to 3 GHz	-115	-130	-130	-130	-118	-118
3 to 4 GHz	-115	-125	-125	-125	-118	-118
4 to 5 GHz	-115	-125	-125	-125		-118
5 to 6 GHz		-125	-125	-125		-113
6 to 10 GHz		-120	-120	-120		-113
10 to 13 GHz			-115	-115		
13 to 15 GHz				-115		
Signal to Noise Ratio <sup>5</sup> , min. (dB)						
0.01 to 1 GHz	80	80	80	80	68	68
1 to 2.5 GHz	76	80	80	80	68	68
2.5 to 3 GHz	65	80	80	80	68	68
3 to 4 GHz	65	75	75	75	68	68
4 to 5 GHz	65	75	75	75		68
5 to 6 GHz		75	75	75		63
6 to 10 GHz		70	70	70		63
10 to 13 GHz			65	65		
13 to 15 GHz				65		
RF connector for laser module	SMA (f)	K-conn. <sup>TM6</sup> (f)	K-conn. <sup>TM6</sup> (f)	K-conn. <sup>TM6</sup> (f)	SMA (f)	K-conn. <sup>TM6</sup> (f)
for flange-mount and plug-in	SMA (f)	SMA (f)	SMA (f)	SMA (f)	SMA (f)	SMA (f)

Specifications describe warranted performance. Typical values, indicated by "typ.", provide expected levels of performance, but are not guaranteed.

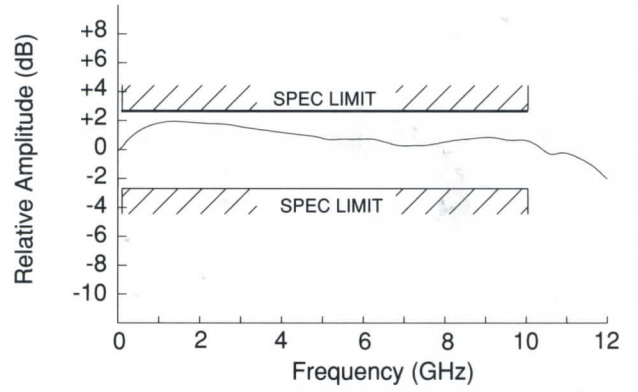


The following operating characteristics are intended for estimating the performance of a typical unit. For more detailed calculations, see the *Linear Fiberoptic Products Selection Guide* and *A System Designer's Guide to RF and Microwave Fiber Optics*, both published by Ortel, or contact Ortel.

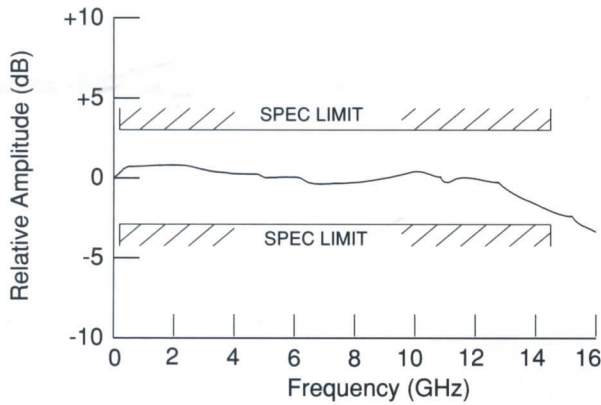
**Amplitude Response - 1540A, 3540A, 10340A**



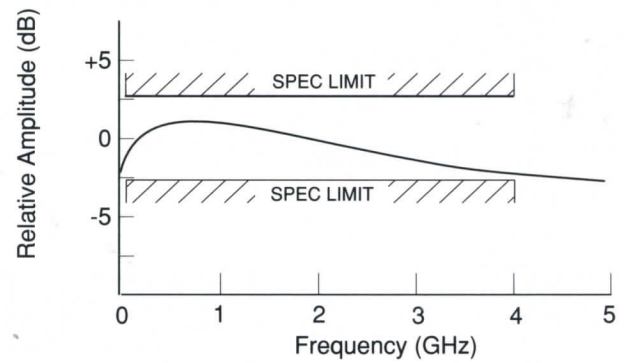
**Amplitude Response - 1541A, 3541A, 10341A**



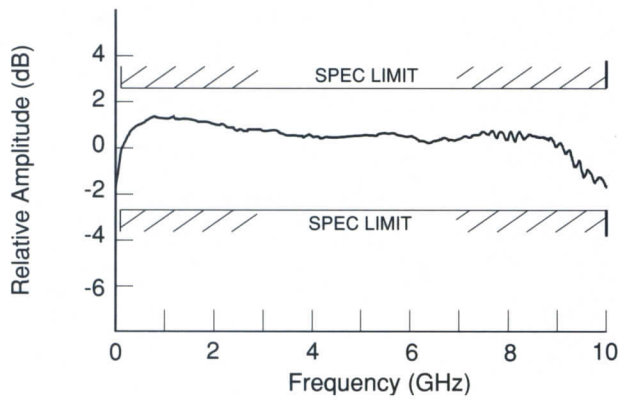
**Amplitude Response - 1541B/C, 3541B/C, 10341B/C**



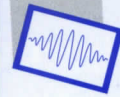
**Amplitude Response - 1740A, 3740A, 10370A**



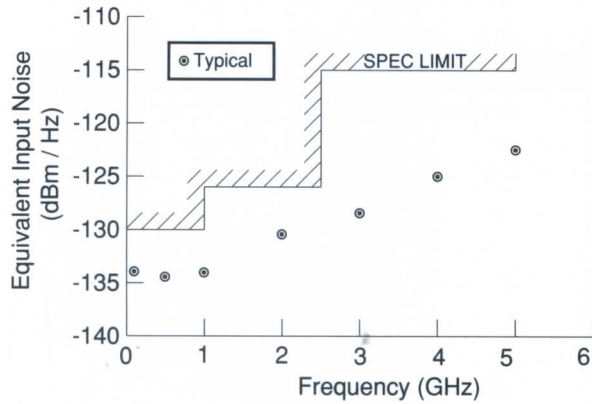
**Amplitude Response - 1741A, 3741A, 10371A**



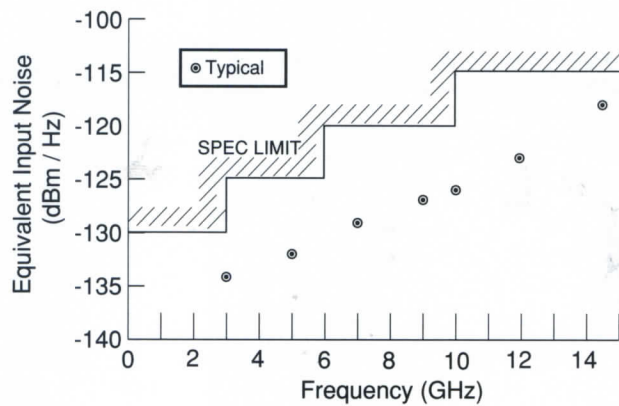
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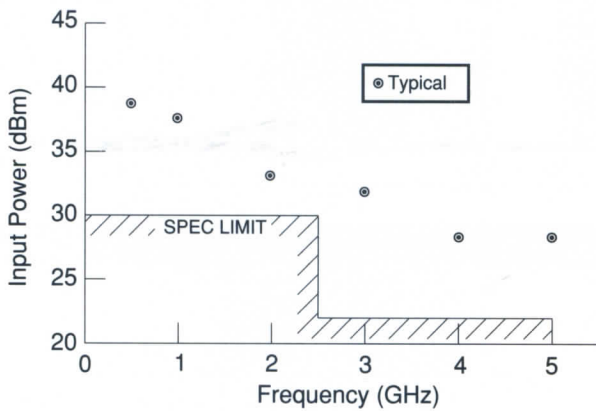
Equivalent Input Noise - 1540A, 3540A, 10340A



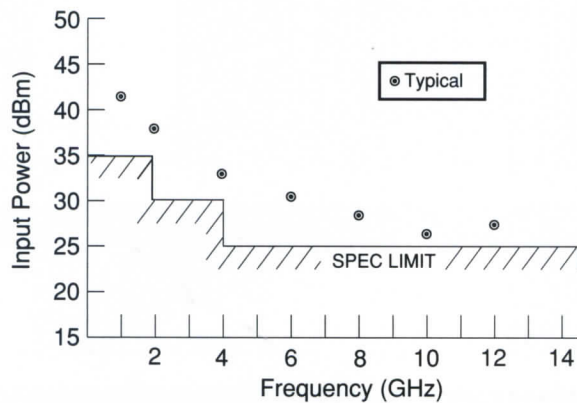
Equivalent Input Noise - 1541A/B/C, 3541A/B/C, 10341A/B/C



Input Third Order Intercept - 1540A, 3540A, 10340A



Input Third Order Intercept - 1541A/B/C, 3541A/B/C, 10341A/B/C



## Transmitter Options

		module	flange	plug-in
-001	DC coupled <sup>9</sup>	x	x	x
-005	1.5 stage optical isolator	x	x	x
-020	FC/APC bulkhead optical connector		x	x
-021	FC/SPC bulkhead optical connector		x	x
-022	FC/APC optical connector, 3 mm fiber cable pigtail		x	
-023	FC/SPC optical connector, 3 mm fiber cable pigtail		x	
-026	FC/PC bulkhead optical connector		x	x
-028	FC/PC optical connector, 3 mm fiber cable pigtail		x	
-030	no optical connector, 900 μm buffered fiber pigtail	x		
-031	FC/PC optical connector, 900 μm buffered fiber pigtail	x		
-032	FC/APC optical connector, 900 μm buffered fiber pigtail	x		

9. VSWR spec. not applicable for option -001.



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Package Styles		Model Numbers					
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Plug-in Transmitter		10340A	10341A	10341B	10341C	10370A	10371A
Optical Parameters <sup>1</sup>							
Wavelength		1310 ± 30nm	1310 ± 30nm	1310 ± 30nm	1310 ± 30nm	1550 ± 30nm	1550 ± 30nm
Spectral Width, FWHM <sup>4</sup> , typ. max.		10 MHz	10 MHz	10 MHz	10 MHz	10 MHz	10 MHz
Optical Power, min.		4 mW	2.4 mW	3 mW	3 mW	3 mW	3 mW
typ.		7 mW	5 mW	6 mW	6 mW		
Optical power stability vs. temperature		± 15%	± 15%	± 15%	± 15%	± 15%	± 15%
DC Modulation Gain, min. (mW/mA)		0.10	0.06	0.06	0.06	0.05	0.05
typ.		0.16	0.12	0.10	0.10		
Relative Intensity Noise <sup>4</sup> , max. (dB/Hz)							
0.01 to 1 GHz		-149	-149	-149	-149	-137	-137
1 to 2.5 GHz		-145	-149	-149	-149	-137	-137
2.5 to 3 GHz		-134	-149	-149	-149	-137	-137
3 to 4 GHz		-134	-144	-144	-144	-137	-137
4 to 5 GHz		-134	-144	-144	-144		-137
5 to 6 GHz			-144	-144	-144		-132
6 to 10 GHz			-139	-139	-139		-132
10 to 13 GHz				-134	-134		
13 to 15 GHz					-134		
Fiber		Singlemode (9/125)				Singlemode (9/125)	

DC Power Requirements for Flange-mounts & Plug-ins <sup>7,8</sup>					
Pin	Min.	Nom.	Max.	Max. Ripple	Current
1	+14 V	+15 V	+16 V	100 mV p-p	0.3 A max.
2	+4.75 V	+5 V	+5.5 V	200 mV p-p	1.5 A max.

Maximum Ratings		
	Modules & Flange-mounts	Plug-ins
Operating Temperature of Baseplate	-40 to +65°C	0 to +50°C
Storage Temperature	-40 to +85°C	-20 to +65°C
RF Input Power	+20 dBm/60 sec.	

- Specifications guaranteed when unit is connected to an optical path with return loss > 35 dB.
- Peak to peak.
- Two carrier test.
- No RF input.
- 1 MHz bandwidth, +10 dBm RF input.
- K-connector™ is a Wiltron Company trademark. K-connectors are SMA compatible.
- Plug-in products are powered with the 10990A rack mount chassis and 10901A/B power supply.
- For laser module DC requirements, contact Ortel for an OEM data sheet.

