

Fiber Optic LAN Components LC SFF Duplex OFE 1.25 Gbps

HFT218x-521

FEATURES

- Prealigned Fixed LC Duplex Optical Front End (OFE)
- VCSEL packaged with a back monitor photodiode
- Common anode and common cathode polarities available
- TO-46 hermetic package for VCSEL and Pin + Preamp
- 5V or 3.3 V operation
- GaAs PIN detector and BiCMOS preamplifier
- Differential output for low noise
- High Speed >1GHz
- Laser signal is attenuated
- Unattenuated versions available as well (HFT2183-522 and HFT2184-522)



The HFT218x-52x is a single package transmitter and receiver designed to interface with the LC style optical connectors.

The transmitter is a high performance 850nm VCSEL (Vertical Cavity Surface Emitting Laser) packaged for high speed data communications. This product combines all the performance advantages of VCSEL with a custom designed power monitor diode. The power monitor diode can be used with an appropriate feedback control circuitry to set a maximum power level for each VCSEL. Attenuating coatings are available on the Laser transmitter to simplify design and assist in meeting eye safety requirements.

The PIN + preamp converts optical power into a differential output electrical signal. As the light increases, the differential output voltage increases, limiting at input powers above -10dBm. The differential output is designed to be AC coupled into a data amplifier.

The Honeywell HFT218x-521 is designed to interface with 50/125 and 62.5/125µm multimode fiber within an LC style interface.

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VCSEL PARAMETERS

ELECTRO-OPTICAL CHARACTERISTICS ($T_A=25^\circ\text{C}$ unless otherwise stated)

VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Peak Fiber Coupled Optical Power (See threshold current and slope efficiency which control power output)	$I_F=12$ mA Peak 50/125 μm fiber NA=0.20	P_{OC}		350 -4.5		μW dBm	1
Threshold Current		I_{TH}		3.5	6	mA	
Threshold Current Temperature Variation	$T_A = 0^\circ\text{C}$ to 70°C	ΔI_{TH}	-1.5		1.5	mA	2
Slope Efficiency	$P_{OC}=0.35$ mW	η	0.02	0.04	0.1	mW/mA	3
Slope Efficiency Temperature Variation	$T_A = 0^\circ\text{C}$ to 70°C	$\Delta\eta/\Delta T$		-0.5		%/ $^\circ\text{C}$	
Peak Wavelength	$I_F=12$ mA	λ_P	830	850	860	nm	
λ_P Temp Coefficient	$I_F=12$ mA	$\Delta\lambda_P/\Delta T$		0.06		nm/ $^\circ\text{C}$	
Spectral Bandwidth	$I_F=12$ mA, FWHM	$\Delta\lambda$			1.0	nm	
Laser Forward Voltage	$I_F=12$ mA	V_F	1.6	1.8	2.2	V	
Laser Reverse Voltage	$I_R=10$ μA	BVR_{LD}	5	10		V	
Rise and Fall Time	Bias Above Threshold (20%-80%)	t_R t_F		150 200	300 300	ps	4
Relative Intensity Noise	1 GHz BW	RIN		-128	-122	dB/Hz	
Series Resistance	$I_F=12$ mA	R_S	15	25	50	Ohms	

Photodiode Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Monitor Current	$P_{OC}=0.35$ mW	I_{PD}	0.09		0.58	mA	
Monitor Current Temperature Variation	$P_{OC}=0.35$ mW	$\Delta I_{PD}/\Delta T$		0.0		%/ $^\circ\text{C}$	
Dark Current	$P_O=0$ mW, $V_R=3$ V	I_D			20	nA	
PD Reverse Voltage	$P_O=0$ mW, $I_R=10$ μA	BVR_{PD}	30	115		V	5
PD Capacitance	$V_R=0$ V, Freq=1 MHz $V_R=3$ V, Freq=1 MHz	C		75 40	100 55	pF	

Notes:

- Operating power is set by the peak operating current $I_{PEAK}=I_{BIAS}+I_{MODULATION}$.
- Operation at temperatures outside the specified range may result in the threshold current exceeding the maximums defined in the electro-optical characteristics table.
- Slope efficiency is defined as $\Delta P_O/\Delta I_F$ at a total power output of 0.35 mW. Slope efficiency is intentionally lowered to the values shown by optical attenuation.
- Rise and fall times are sensitive to drive electronics. 200 ps rise and fall times are achievable for all Honeywell VCSELs.
- To safeguard the VCSEL from current spike damage, short the VCSEL anode and cathode to each other during photodiode BVR verification testing.

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RECEIVER PARAMETERS

ELECTRO-OPTICAL CHARACTERISTICS (V_{cc}=5V, 0°C<T<70°C unless otherwise specified)

Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Electrical Characteristics							
Supply Voltage	P _{in} = 0μW, R _{load} =50Ω	V _{cc}	3.0		5.5	Volts	1
Supply Current	P _{in} = 0μW, R _{load} =50Ω	I _{cc}		35	40	mA	1
Output Voltage	P _{in} = 100μW, R _{load} =50Ω	V _{out}		200	500	mV	1
Opto-Electronic Characteristics							
Responsivity	P _{in} = 20μW peak, R _{load} =50Ω	R	2500	3500	5000	μV/μW	2,3
Lower 3dB Bandwidth		BW _{lower}	0.1	0.3	1	MHz	4
Upper 3dB Bandwidth		BW _{upper}	850	1200	1500	MHz	4
RMS Output Referred Noise	P _{in} =0μW, R _{load} =50Ω 937.5MHz BT Filter			300		NW	5
Sensitivity	BER=10 ⁻¹² , SNR=7	S	-20	-24		dBm	
Power Supply Rejection Ratio	P _{in} =0μW, R _{load} =50Ω	PSRR	10	30		dB	6
Pulse Width Distortion	P _{in} =20μW peak, R _{load} =50Ω	PWD		35	60	ps	7
Rise/Fall Time	P _{in} =20μW peak, R _{load} =50Ω	T _R /T _F			400	ps	8
Wavelength Responsivity	P _{in} =20μW peak, R _{load} =50Ω	λ	760	850	860	nm	

Notes:

1. Pin refers to the total optical power at the face of the fiber optic cable input to the HFD3180-002.
2. Responsivity measured with source wavelength of 850nm, 125MHz square wave, P_{in}=20μW peak, R_{load}=50Ω.
3. The output voltage increases as received light power increases, up to approximately -15dBm. The preamplifier is designed to limit the electrical output signal above this optical input level, and does not introduce signal distortion until the average input power exceeds 0dBm.
4. Bandwidth is measured with a small signal sinusoidal light source with 50 μW average power, R_{load}=50Ω.
5. RMS input referred optical noise is obtained by measuring the RMS output referred noise, then dividing by the responsivity.
6. PSRR is measured from 300KHz to 1GHz by injecting a -20dB electrical signal on the V_{cc} pin. The nominal value at 100MHz is recorded. No external bypass components are assumed. An external V_{cc} filter network will greatly increase the PSRR.
7. Measured at the 50% level of output pulses using 0.5 GHz square wave with <200 ps rise time.
8. Rise and fall times are measured with source wavelength of 850nm, 125MHz square wave, with optical rise and fall times < 200ps, P_{in}=20μW peak, R_{load}=50Ω.

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Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-40 to +85°C
Operating Temperature	0 to +70°C
Lead Solder Temperature	260°C, 10 sec.
Continuous Optical Output Power (Any Current)	5 mW
Laser Diode Reverse Voltage ($I_R=10 \mu A$)	5 V
Laser Continuous Forward Current, Heat-Sinked	15 mA
PIN Photodiode Forward Current	10 mA
Power Supply Voltage (PIN + Preamp)	6 V
Incident Optical Power	0 dBm average, +4 dBm peak

NOTICE

Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

NOTICE

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation to equipment, take normal ESD precautions when handling this product

ORDER GUIDE

Catalog Listing	Description
HFT2180-521	Attenuated, Common Anode
HFT2181-521	Attenuated, Common Cathode

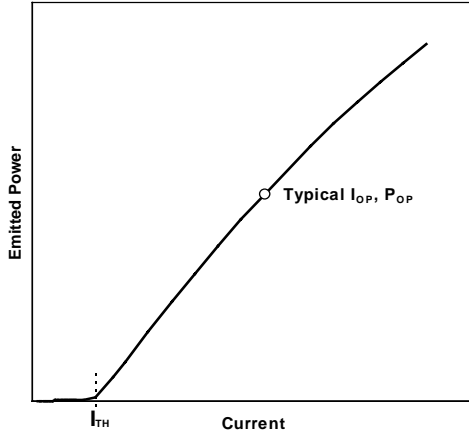
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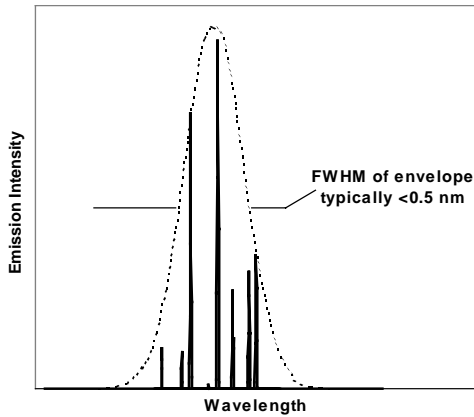
HFT218x-521

TYPICAL PERFORMANCE CURVES

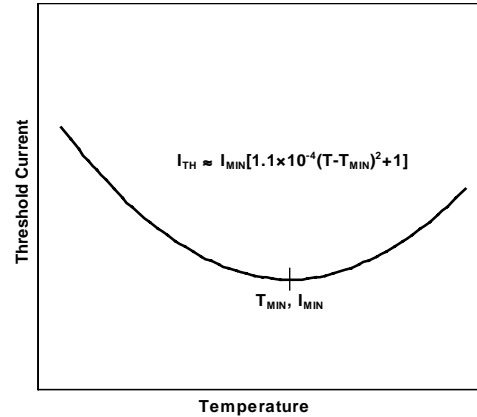
Emitted Power vs. Current: Power varies approximately linearly with current above threshold.



Emission Intensity vs. Wavelength: Typical 10 mA spectrum comprises multiple lines corresponding to multiple transverse modes.



Threshold Current vs. Temperature: Threshold current varies parabolically with temperature; thus it can be nearly constant for a limited temperature range.



NOTICE

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DANGER

The VCSEL is a class IIIb laser and should be treated as a potential eye hazard. Due to the size of the component, the applicable warning logotype, aperture label, and certification/identification label cannot be placed on the component itself. These labels can be found on the individual envelope in which the VCSEL unit is packaged, or attached to the shipping package.

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FIGURE 1: INTERNAL SCHEMATIC DIAGRAM OF THE HFD3180-002

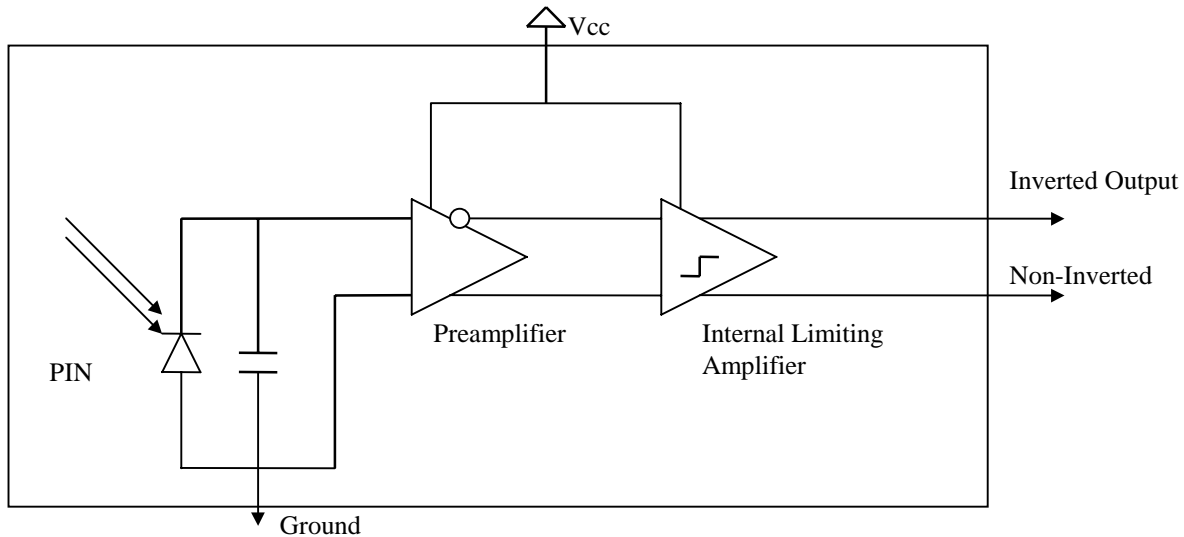
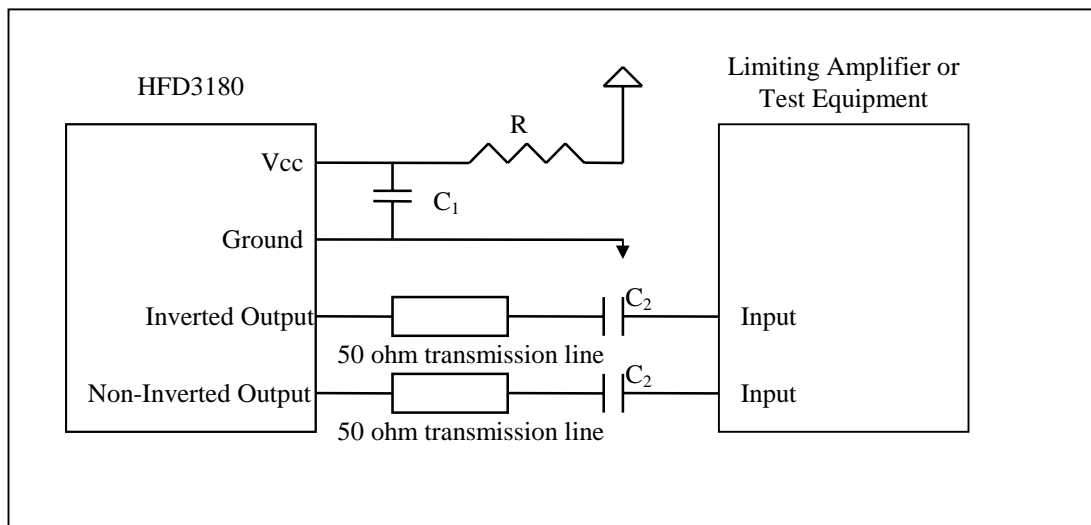


FIGURE 2: RECOMMENDED INTERFACE CIRCUIT FOR THE HFD3180-002



$R=10 \Omega$

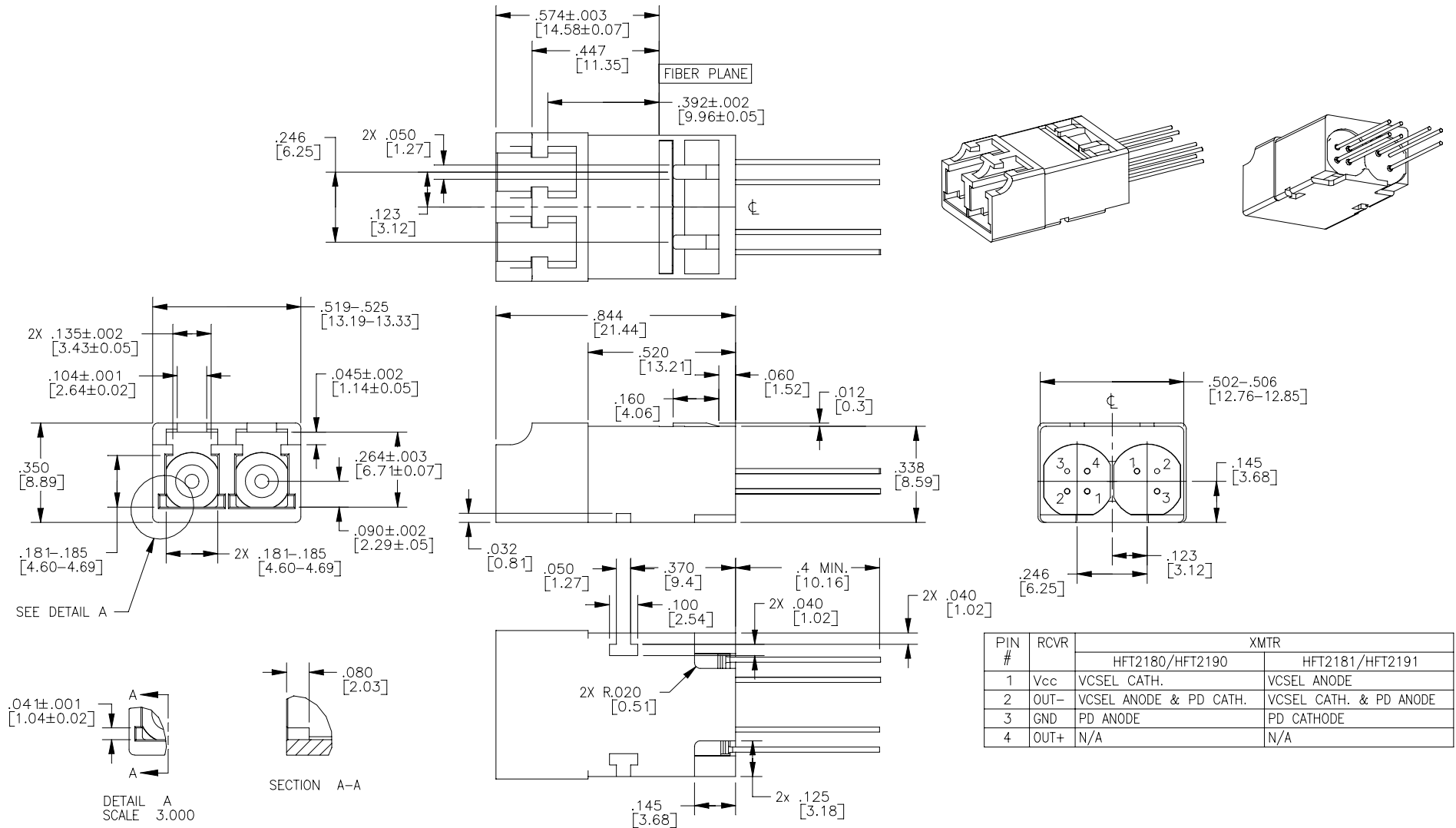
$C_1 = 10 \text{ nF}$

$C_2 = \text{DATA RATE DEPENDANT (22NF FOR RATES > 1GB)}$

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WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with the date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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