

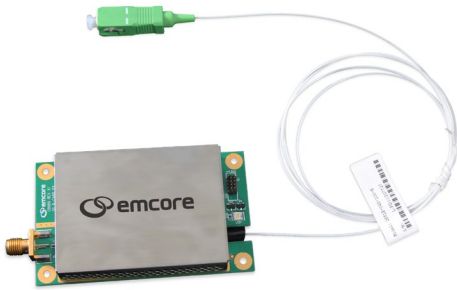
3 GHz RF Fiber Optic Links

PCB Modules for Wireless Applications



PRELIMINARY DATASHEET | JANUARY 2015

WIRELESS



EMCORE 3 GHz RF fiber optic link PCB module series is designed to accept single RF input and transport to single RF output over a fiber optic link. This cost-effective, high performance RF broadband transport link is ideal for integration into wireless or other wide-band RF transmission equipment.

The compact modules are equipped with local (LED indicator) and remote (12-pin onboard micro connector) alarms to monitor the module, laser, photodiode, RF and optical level status. RF gain can be adjusted locally with a push button, remotely with 12-pin micro connector, or automatically with automatic gain control (AGC).

Applications

- Distributed Antenna System (DAS)
- Cellular Backhaul and Distributions
- WiFi, WiMAX
- Public Services

Features

- 50 MHz - 3 GHz Operating Bandwidth
- Modulation Protocol Independent
- Low Noise Isolated DFB Laser
- Local, Remote Monitor and Control
- 30 dB RF Gain Control (1 dB Step)
- Automatic RF Gain Control
- Laser, Photodiode Monitoring
- RF and Optical Level Monitoring
- 50 Ohm SMA or SMB RF Connector
- SC/APC or LC/APC Optical Connector

Integration Features

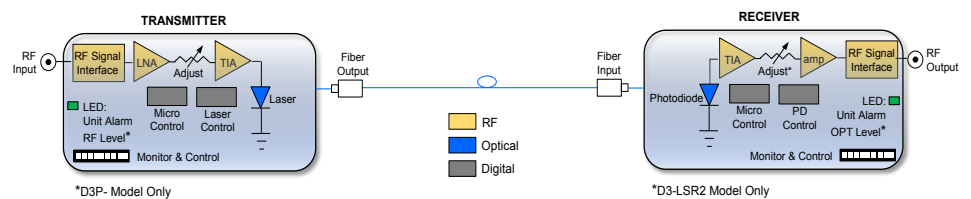
Each compact transmitter or receiver PCB module is designed with a miniature 50 Ohm SMA or SMB connector. A built-in RF shield minimizes EMI/RF interference and SC/APC or FC/APC fiber pigtail facilitates module assembly, interface, and integration to the RF transmission equipment.

EMCORE Advantage

EMCORE's vertically integrated, ISO-9001, RoHS compliant facility and its world-class GaAs InP wafer fab (Ortel heritage) has been successfully designing and manufacturing highly linear, wide-dynamic-range laser/photodiode die, modules, PCBAs, cards, and integrated systems for the CATV, satcom, and telecommunication RF fiber signal transport applications.

The 3 GHz PCB modules series are developed with selected laser and photodiode die and modules, then designed and integrated into a PCB module assembly specifically for the wireless and other wideband RF signal transport applications.

Block Diagram



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Module Specifications - Model D3S-LT, D3-LR, D3-LSR1

	Parameter	Min	Typical	Max	Units	
Link	Frequency Range	50	-	3000	MHz	
	Frequency Response	50-3000 MHz	-	-	+/- 2	dB
		Any 36 MHz	-	-	+/- 0.3	
	Noise Figure (at Max RF Gain)	-	21	-	dB	
	Input Third-Order Intercept	-	11	-	dBm	
	Spurs Free Dynamic Range ¹	-	110	-	dB/Hz ^{2/3}	
	RF Link Gain (at Max RF Gain) ²	-	-	20	dB	
Transmitter (D3S-LT)	RF Input (Composite)	-45 (max RF gain)	-	10 (min RF gain)	dBm	
	Tx Gain (TG) ² , Max	2	5	-	dB (W/A)	
	RF Gain Adjust (Manual, 1 dB Step)	0	-	30	dB	
	Automatic Gain Control	-	None	-		
	Optical Output	3	6	-	dBmo	
	Wavelength	1270	-	1610	nm	
	Input Impedance	-	50	-	Ohm	
	Input Return Loss	-	10	-	dB	
	DC Input @ 12 VDC	-	95	120	mA	
Receiver (D3-LR, D3-LSR1)	Optical Input	D3-LR	20 ³	-	8	dBmo
		D3-LSR1	-25 ³	-	8	
	Rx Gain (RG) ² , Max	12	15	-	dB (A/W)	
	RF Gain Adjust	-	None (Fixed Gain)	-		
	Automatic Gain Control	-	None	-		
	RF Output (Composite) ⁴	-40	-	6	dBm	
	Output Impedance	-	50	-	Ohm	
	Output Return Loss	-	10	-	dB	
DC Input @ 12 VDC	-	90	120	mA		

1. SFDR = 2/3 * (IIP3 + 174 - NF), measured at 1 GHz

2. Measured with 1 m of fiber. RF Link Gain dB = TG + RG - 2* Fiber Loss, dBo (Rin=Rout)

3. Minimum optical input to maintain 35 dB C/N on 36 MHz RF carrier over 1 m fiber link

4. Depending on RF input level, RF gain setting, and optical loss

Absolute Maximum Rating*

Parameter	Min	Max	Unit
Operating Temperature	-30	70	° C
DC Input Voltage	-	+16	V
Maximum Tx RF Input (at Min RF Gain)	-	+15	dBm
Maximum Rx Optical Input	-	+10	dBmo

*Damage may occur beyond these limits

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WIRELESS

Module Specifications - Model D3P-LT, D3-LSR2

	Parameter	Min	Typical	Max	Units	
Link	Frequency Range	50	-	3000	MHz	
	Frequency Response	50-3000 MHz	-	-	+/- 1.5	dB
		Any 36 MHz	-	-	+/- 0.25	
	Noise Figure (at Max RF Gain)	-	12	-	dB	
	Input Third-Order Intercept	-	10	-	dBm	
	Spurs Free Dynamic Range ¹	-	115	-	dB/Hz ^{2/3}	
	RF Link Gain (at Max RF Gain) ²	-	-	22	dB	
	RF Link Gain Variation Over Temperature (-20C to 65C)	-	+/- 2	-	dB	
Transmitter (D3P-LT)	RF Input (Composite)	-50 (max RF gain)	-	5 (min RF gain)	dBm	
	Tx Gain (TG) ² , Max	4	7	-	dB (W/A)	
	RF Gain Adjust (Manual, 1 dB Step)	0	-	30	dB	
	Automatic Gain Control (Hold Range)	-36 (max RF gain)	-	-6 (min RF gain)	dBm	
	Optical Output	3	6	-	dBmo	
	Wavelength	1270	-	1610	nm	
	Input Impedance	-	50	-	Ohm	
	Input Return Loss	-	11	-	dB	
	DC Input @ 12 VDC	-	200	230	mA	
Receiver (D3-LSR2)	Optical Input	-25 ³	-	8	dBmo	
	Rx Gain (RG) ² , Max	12	15	-	dB (A/W)	
	RF Gain Adjust (Manual, 1 dB Step)	0	-	30	Ohm	
	Automatic Gain Control (Hold Range)	-26 (min RF gain)	-	4 (max RF gain)	dBm	
	RF Output (Composite) ⁴	-40	-	6	dBm	
	Output Impedance	-	50	-	Ohm	
	Output Return Loss	-	11	-	dB	
	DC Input @ 12 VDC	-	150	180	mA	

1. SFDR = 2/3 * (IIP3 + 174 - NF), measured at 1 GHz

2. Measured with 1 m of fiber. RF Link Gain dB = TG + RG - 2* Fiber Loss, dBo (Rin=Rout)

3. Minimum optical input to maintain 35 dB C/N on 36 MHz RF carrier over 1 m fiber link

4. Depending on RF input level, RF gain setting, and optical loss

Absolute Maximum Rating*

Parameter	Min	Max	Unit
Operating Temperature	-30	70	° C
DC Input Voltage	-	+16	V
Maximum Tx RF Input (at Min RF Gain)	-	+15	dBm
Maximum Rx Optical Input	-	+10	dBmo

*Damage may occur beyond these limits

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Environmental, Physical Specifications

	Units	D3S-LT, D3-LR, D3-LSR1	D3P-LT, D3-LSR2
Operating Temperature	C°	-10 to 65	-20 to 65
Storage Temperature	C°	-40 to 85	-40 to 85
Humidity (Non-Condensing)	%	<95	<95
Physical Dimension	in (mm)	0.5 (12.7) x 1.8 (45.7) x 3.0 (76.2)	0.75 (19) x 2.0 (50.8) x 3.2 (81.3)
Weight	lbs (g)	0.25 (113)	0.3 (136)
Laser Safety	Class 1M Laser Product. Complies with: IEC-60825-1:2007/EN 60825-1:2007; CFR 1040.10/1040.11		21

Monitor and Control - Remote

Pin #	Tx Function	D3S-LT	D3P-LT
1	Laser OFF (0 VDC = OFF, Open = ON)	x	x
2	RS-232 Tx	x	x
3	RS-232 Rx	x	x
4	Unused		
5	+12 VDC (400 mA Max)	x	x
6	Ground	x	x
7	Laser Bias Monitor (1 V ~ 50 mA)	x	x
8	Tx Status Alarm (Open Collector ~ 25 mA)	x	x
9	Factory Use	x	x
10	Factory Use	x	x
11	Laser RF Level Monitor		x
12	RF Automatic Gain Control (3 VDC = ON, 0 VDC = OFF)		x

Pin #	Rx Function	D3-LR D3-LSR1	D3-LSR2
1	PD Optical Level Monitor	x	x
2	RS-232 Tx	x	x
3	RS-232 Rx	x	x
4	Unused		
5	+12 VDC (400 mA Max)	x	x
6	Ground	x	x
7	PD Receive Monitor (1 V ~ 1mW)	x	x
8	Rx Status Alarm (Open Collector ~ 25 mA)	x	x
9	Factory Use	x	x
10	Factory Use	x	x
11	RF Automatic Gain Control (3 VDC = ON, 0 VDC = OFF)		x
12	Unused		

Monitor and Control - Local

Tx LED	Module Alarm	RF Level Status	D3S-LT	D3P-LT
Off	No Power		x	x
Blink Green	Normal	High		x
Green	Normal	Normal	Module Alarm Only	x
Blink Red	Normal	Low		x
Red	Alarm		x	x

Tx RF Attenuation Adjustment	D3S-LT	D3P-LT
Onboard Push-Button	x	x

Rx LED	Module Alarm	Optical Level Status	D3-LR D3-LSR1	D3-LSR2
Off	No Power		x	x
Blink Green	Normal	High		x
Green	Normal	Normal	Module Alarm Only	x
Blink Red	Normal	Low		x
Red	Alarm		x	x

Rx RF Attenuation Adjustment	D3-LR D3-LSR1	D3-LSR2
Onboard Push-Button		x

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Ordering Information

Transmitter (T)				
D3w-LT/ xx-yy06-zz				
Model Series	Version "w"	RF Connector "xx"	Optical Wavelength "yy"	Optical Connector "zz"
D3w-LT 3 GHz Transmitter	S = Standard P = Premium	SA = 50 Ohm SMA SB = 50 Ohm SMB	13 = 1310 nm	SA = SC/APC FA = FC/APC
			CWDM: 27 = 1270 nm 47 = 1470 nm 29 = 1290 nm 49 = 1490 nm 31 = 1310 nm 51 = 1510 nm 33 = 1330 nm 53 = 1530 nm 39 = 1390 nm 55 = 1550 nm 41 = 1410 nm 57 = 1570 nm 43 = 1430 nm 59 = 1590 nm 45 = 1450 nm 61 = 1610 nm	

Receiver (R)						
D3-LR/xx-yy (Standard)			D3-LSRx/yy-zz (High-Sensitivity)			
Model Series	RF Connector "xx"	Optical Connector "yy"	Model Series	RF Gain "x"	RF Connector "yy"	Optical Connector "zz"
D3-LR 3 GHz Receiver	SA = 50 Ohm SMA SB = 50 Ohm SMB	SA = SC/APC FA = FC/APC	D3-LSR 3 GHz Hi-Sensitivity Receiver	1 = Fixed 2 = Adjustable	SA = 50 Ohm SMA SB = 50 Ohm SMB	SA = SC/APC FA = FC/APC