

# QDFT Series

## High-Sensitivity Transimpedance pinFET Receiver



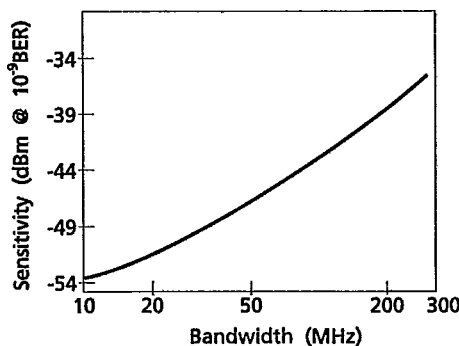
- Fixed transimpedance circuit configuration
- Hybrid construction
- Industry-standard 14-pin DIL package
- Multimode fiber

### Description

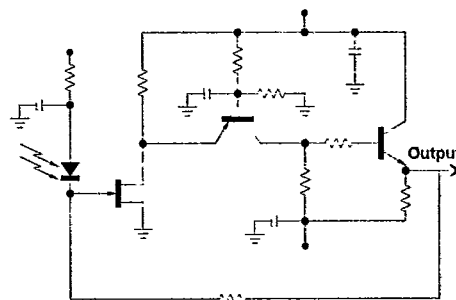
The Lasertron QDFT pinFET module is a high-sensitivity detector and hybrid preamplifier module designed for fiber-optic receivers operating at data rates up to and exceeding 168 Mb/s at 1300 and 1550 nm wavelengths. The transimpedance circuitry provides excellent sensitivity and superior dynamic range. The high sensitivity results from use of an advanced substrate-illuminated GaInAs detector element having <math><0.5\text{ pF}</math> capacitance, <math><20\text{ nA}</math> leakage, and a responsivity of >math>0.8\text{ A/W}</math> at 1300 and 1550 nm.

Sensitivities range from -53 dBm at 18 Mb/s, to -43 dBm at 140 Mb/s. Optical dynamic range exceeds 25 dB. Operation requires only 5 V power supplies at modest bias currents. The QDFT is packaged in a hermetically-sealed, low-profile, 14-pin DIL package and is pigtailed with multimode fiber.

TYPICAL VARIATION OF SENSITIVITY WITH BANDWIDTH

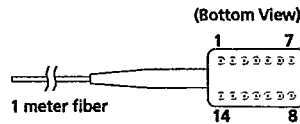


TRANSIMPEDANCE pinFET DESIGN

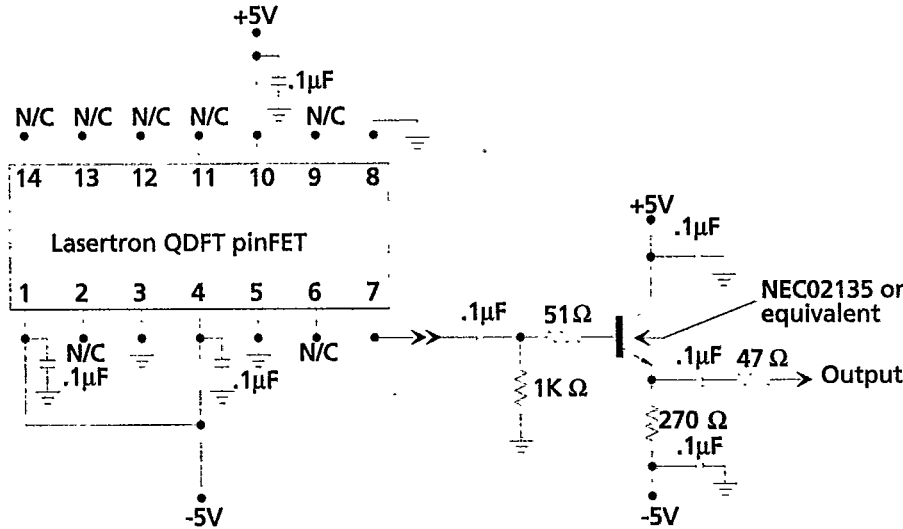


**Pin Connections**

1 Detector Bias (-5 V)	8 Case Ground
2 NC	9 NC
3 Case Ground	10 +5V
4 -5 V	11 NC
5 Case Ground	12 NC
6 NC	13 NC
7 Output	14 NC



**QDFT BIAS AND INTERFACE CIRCUIT**



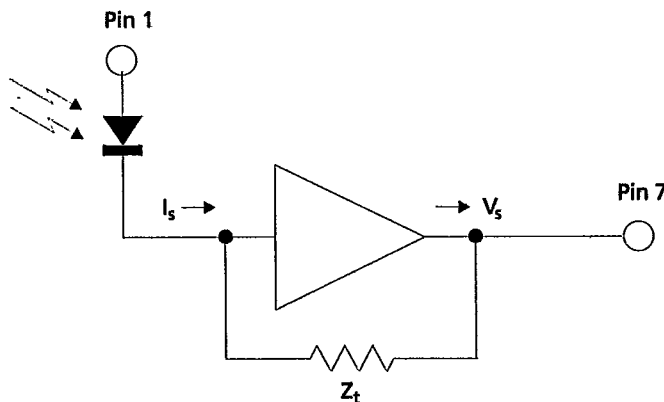
**Applications**

The Lasertron QDFT pinFET module consists of a low-capacitance, rear-illuminated detector element followed by a hybrid transimpedance amplifier. Benefits of the transimpedance design of the QDFT pinFET module include excellent dynamic range and ease of implementation. The QDFT pinFET requires no equalization and is self-biasing. Simply by applying +5 V and -5 V supplies to the amplifier circuit, and a -5 V supply to the detector element, the device is ready to receive an optical input through a multimode fiber-optic pigtail.

Figure 1 illustrates the fundamental operation of a QDFT pinFET. As incident light illuminates the detector, a small signal current is produced which is directly proportional to the amplitude of the incident light source ( $P_i$ ) and the responsivity ( $R$ ) of the detector.

This simple relationship of  $R \times P_i$  yields the output signal current ( $I_s$ ). This current is then stepped up to a voltage with the transimpedance resistor ( $Z_t$ ) and a gain block amplifier. The resulting signal voltage ( $V_s$ ) is simply derived from the quantities  $I_s \times Z_t$ .

**Figure 1**  
**Transimpedance Design Circuitry**



**specifications on following pages...**

Receivers & Detectors

**QDFT****Low-Bandwidth  
pinFET Receiver**■ *Telecom access and junction applications***Specifications**

QDFT -	005	010	015	020	025*	040	045
Min. pinFET bandwidth (MHz)	5	10	15	20	25	40	45
Min. noise filter bandwidth (MHz)	4	9	9	9	25	25	25
Sensitivity (dBm, Avg.): Min.	-53	-51	-51	-50	*	-45	-45
Typ.	-55	-53	-53	-51.5	*	-48	-48
Typ. transimpedance (K Ohm)	900	500	500	250	*	120	120
Max. input (dBm, Avg.)	-27.9	-25.4	-25.4	-22.4	*	-19.2	-19.2

\*Specifications for the QDFT-025 models are as follows:

	QDFT-025	-001	-004
Sensitivity (dBm, Avg.): Min.		-47	-50
Typ.		-49	-50.5
Typ. transimpedance (K Ohm)		250	360
Max. input (dBm, Avg.)		-22.4	-25.5

**Common Specifications (all models)**

	Min	Typ	Max
Sensitivity change 25 to 65°C (dB)		1.5	
Gain flatness 10 MHz to 3 dB bandwidth (measured into a 1K Ohm load, dB)			1
Detector dark current (nA)		5	20
Detector capacitance -5 V bias (pF)		0.3	1.5
Output voltage at Pmax (V, p-p)		2.3	
Measured output impedance (Ohms)			7
Responsivity 1300 nm and -5 V bias (A/W)		0.75	0.85
Responsivity change (25 to 65°C)		0.1	0.5
Power consumption: +5 V supply (mW)		90	
-5 V supply (mW)		40	
Operating temperature range (°C)		-20	70
Storage temperature range (°C)		-40	85

**Absolute Maximum Ratings**

Fiber coupled power (mW)	5
Reverse photocurrent (mA)	5
Reverse bias voltage (V)	15
Forward current (mA)	2
Lead soldering temperature (°C)	260
Lead soldering duration (sec)	10
Fiber yield strength (N, min)	10
Fiber bend radius (mm, min)	35

**Ordering Information**

Base Model	Suffix			
	No Connector	FC/PC	Biconic	ST
QDFT-005	-001	-050	-051	-052
QDFT-010	-001	-050	-051	-052
QDFT-015	-001	-050	-051	-052
QDFT-020	-001	-050	-051	-052
QDFT-025	-001	-050	-051	-052
QDFT-025	-004	-053	-054	-055
QDFT-040	-001	-050	-051	-052
QDFT-045	-001	-050	-051	-052

**QDFT****Moderate-Bandwidth  
pinFET Receiver**

- Telecom trunk, access and junction applications

**Specifications**

QDFT -	050	060	065	070	090	100
Min. pinFET bandwidth (MHz)	50	60	65	70	90	100
Min. noise filter bandwidth (MHz)	34	50	50	50	90	90
Sensitivity (dBm, Avg.): Min.	-42.5	-42	-44	-42	-42	-42
Typ.	-46.8	-45	-46	-44.5	-43	-43
Typ. transimpedance (K Ohm)	72	72	90	54	42	42
Max. input (dBm, Avg.)	-17	-17	-19	-15.8	-14.6	-14.6

Common Specifications	Min	Typ	Max
Sensitivity change 25 to 65°C (dB)		1.5	
Gain flatness 10 MHz to 3 dB bandwidth (measured into a 1K Ohm load, dB)			1
Detector dark current (nA)		5	20
Detector capacitance -5 V bias (pF)		0.3	0.5
Output voltage at Pmax (V)		2.3	
Measured output impedance (Ohms)		7	
Responsivity 1300 nm and -5 V bias (A/W)	0.75	0.85	
Responsivity change (25 to 65°C)		0.1	0.5
Power consumption: +5 V supply (mW)		90	
-5 V supply (mW)		40	
Operating temperature range (°C)	-20		70
Storage temperature range (°C)	-40		85

**Absolute Maximum Ratings**

Fiber coupled power (mW)	5
Reverse photocurrent (mA)	5
Reverse bias voltage (V)	15
Forward current (mA)	2
Lead soldering temperature (°C)	260
Lead soldering duration (sec)	10
Fiber yield strength (N, min)	10
Fiber bend radius (mm, min)	35

**Ordering Information**

Base Model	Suffix			
	No Connector	FC/PC	Biconic	ST
QDFT-050	-001	-050	-051	-052
QDFT-060	-001	-050	-051	-052
QDFT-065	-001	-050	-051	-052
QDFT-070	-001	-050	-051	-052
QDFT-090	-001	-050	-051	-052
QDFT-100	-001	-050	-051	-052

**QDFT****High-Bandwidth  
pinFET Receiver**■ *Telecom access and junction applications***Specifications**

QDFT	125	170	200	250	275	300
Min. pinFET bandwidth (MHz)	125	170	200	250	275	300
Min. noise filter bandwidth (MHz)	100	150	150	200	200	200
Sensitivity (dBm, Avg.): Min.	-39	-37	-37	-35	-35	-35
Typ.	-40.5	-38.5	-38.5	-36.5	-36.5	-36.5
Typ. transimpedance (K Ohm)	20	11	11	6.5	6.5	6.5
Max. input (dBm, Avg.)	-11.5	-8.9	-8.9	-6.6	-6.6	-6.6

**Min Typ Max****Common Specifications**

Sensitivity change 25 to 65°C (dB)	1.5
Gain flatness 10 MHz to 3 dB bandwidth (measured into a 1K Ohm load, dB)	1
Detector dark current (nA)	5
Detector capacitance -5 V bias (pF)	0.3
Output voltage at Pmax (V, p-p)	2.3
Measured output impedance (Ohms)	7
Responsivity 1300 nm and -5 V bias (A/W)	0.75
Responsivity change (25 to 65°C)	0.1
Power consumption: +5 V supply (mW)	135
-5 V supply (mW)	80
Operating temperature range (°C)	-20
Storage temperature range (°C)	-40

**Absolute Maximum Ratings**

Fiber coupled power (mW)	5
Reverse photocurrent (mA)	5
Reverse bias voltage (V)	15
Forward current (mA)	2
Lead soldering temperature (°C)	260
Lead soldering duration (sec)	10
Fiber yield strength (N, min)	10
Fiber bend radius (mm, min)	35

**Ordering Information**

Base Model	Suffix			
	No Connector	FC/PC	Biconic	ST
QDFT-125	-301	-350	-351	-352
QDFT-170	-301	-350	-351	-352
QDFT-200	-301	-350	-351	-352
QDFT-250	-301	-350	-351	-352
QDFT-275	-301	-350	-351	-352
QDFT-300	-301	-350	-351	-352

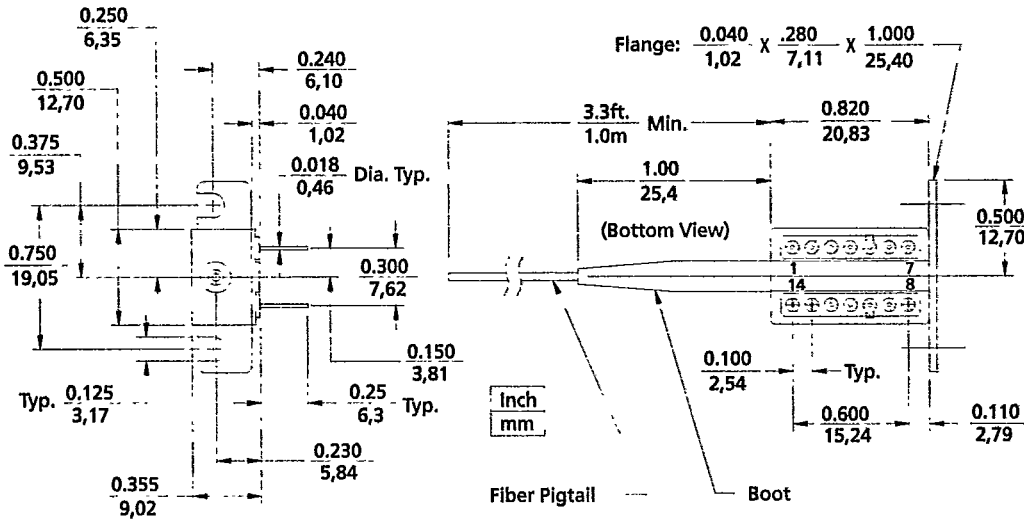
# Package Specifications

T-91-20

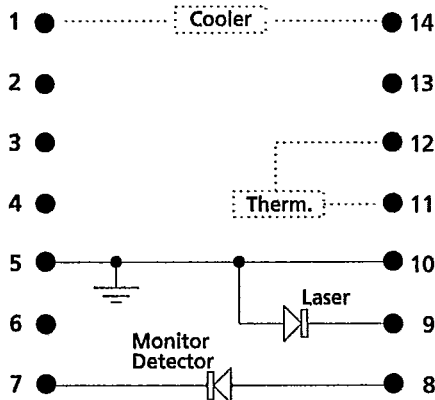
Lasertron uses a variety of industry-standard packages to house its products. The dimensions indicated here are common to all like packages; however, pin connections may differ between product families. Product-specific pin connections are provided in the individual data sheets in the Product Information section of this Product Guide.

## Source Packages

### 14-pin DIL "Longhorn" (Lasers, LEDs)



#### LONGHORN SCHEMATIC



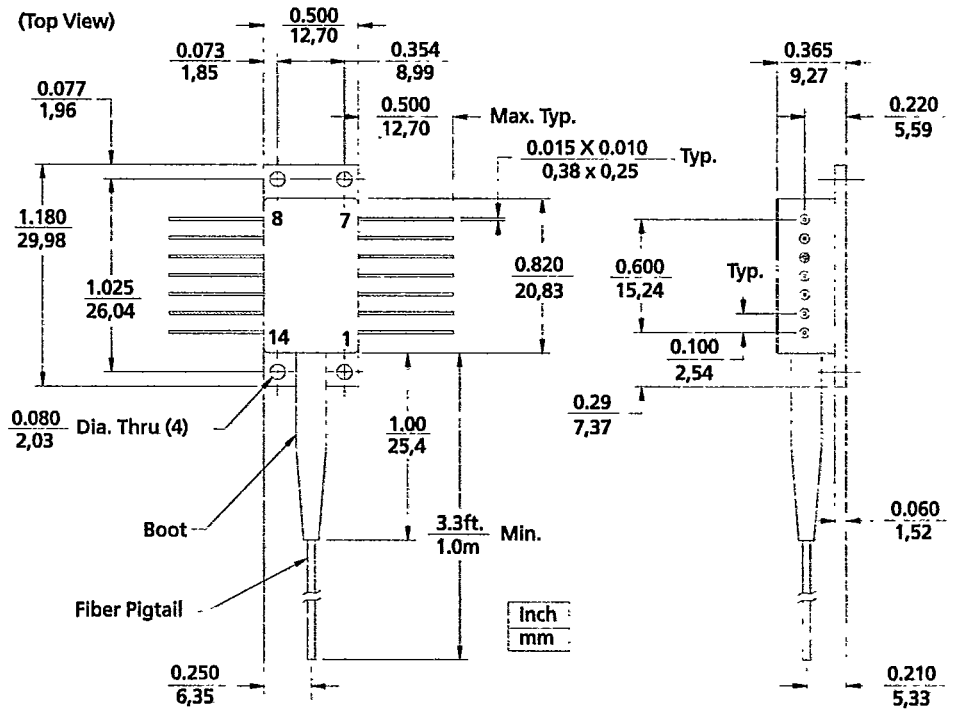
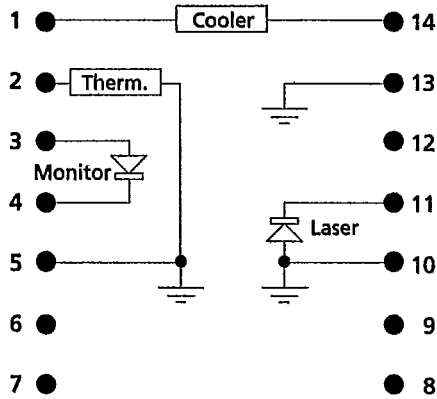
**Note:** Cooler and thermistor are not included in all modules.



**Source Packages  
(continued)**

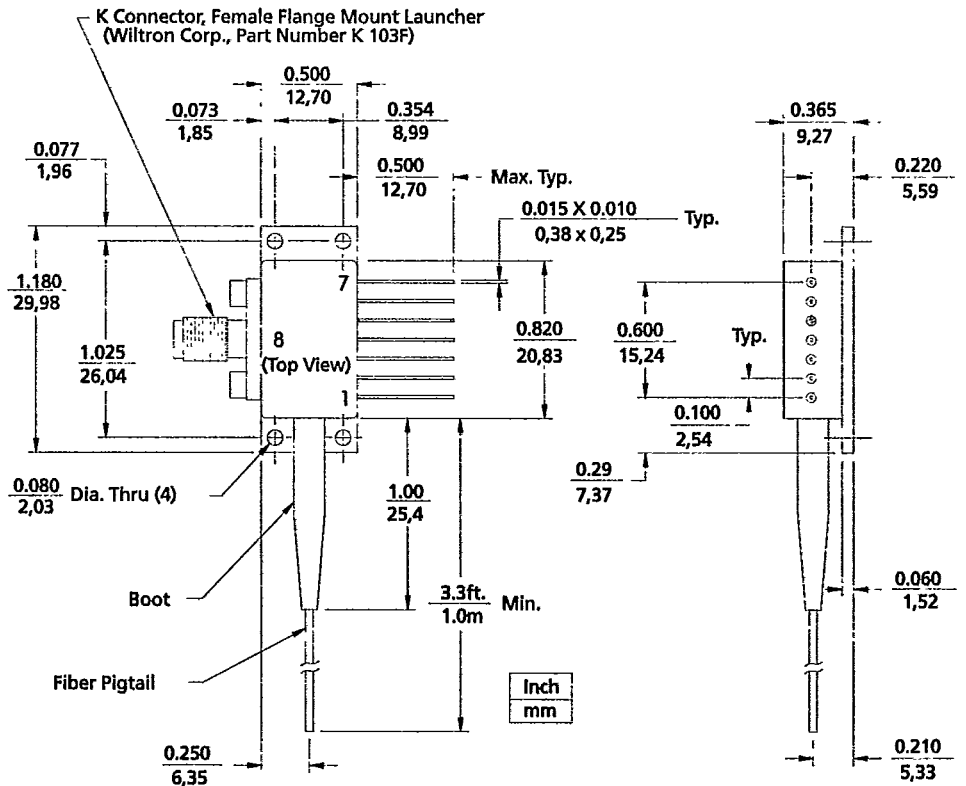
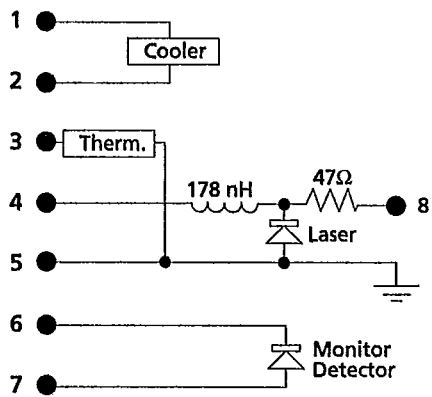
**14-pin "Butterfly"**

**BUTTERFLY SCHEMATIC**



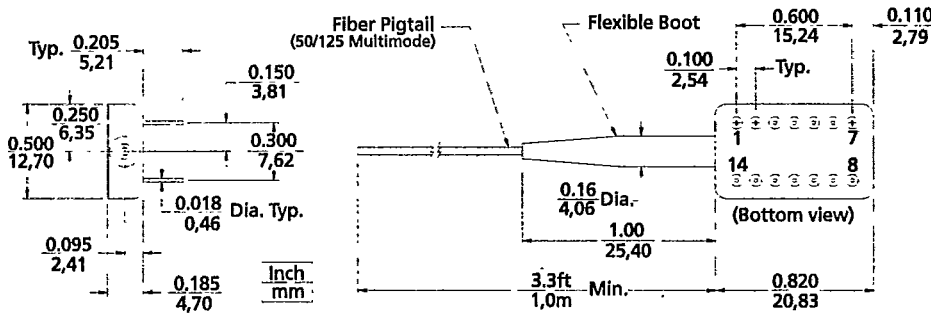
**Microwave Laser**

**MICROWAVE LASER SCHEMATIC**

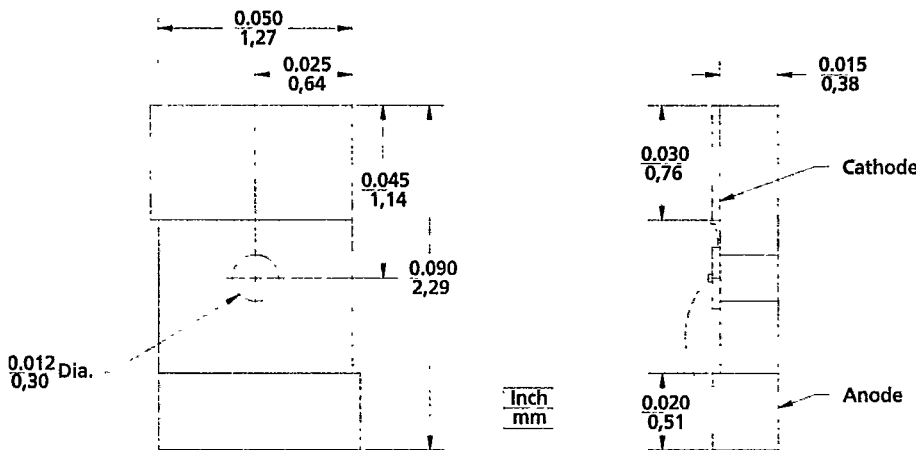


# Detector Packages

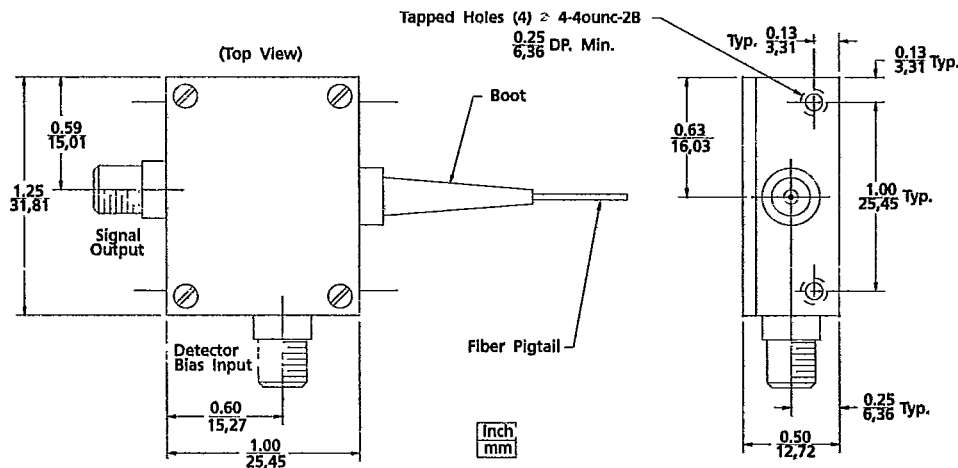
## 14-pin DIL PIN/pinFET



## QDE035, QDE075



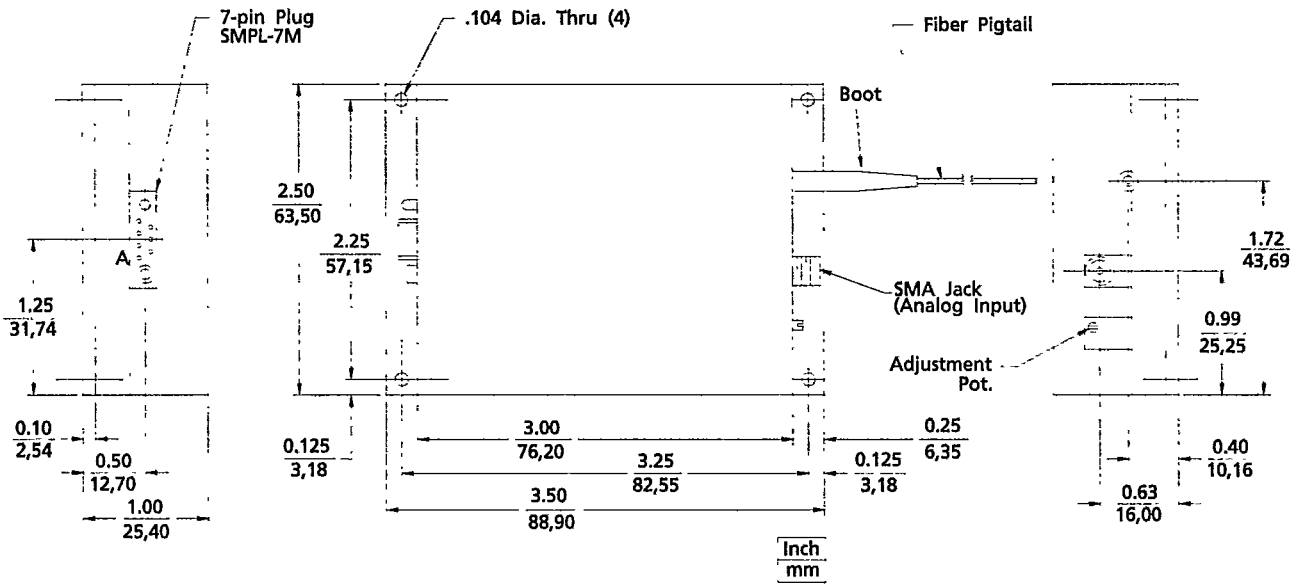
## QDEMW1, QDEMW3 Microwave Detector



Packaging



**QTX Transmitter**



**QLXSMW Microwave Transmitter**

