

## DESCRIPTION

The IF-E93 is a high-output, high-speed, green LED housed in a “connector-less” style plastic fiber optic package. The output spectrum of the green LED is produced by a Gallium Nitride die which peaks at a wavelength of 522 nm, ideally mapping to the lowest attenuation window of PMMA plastic core optical fiber. The device package features an internal LED micro-lens, and the PBT plastic housing ensures efficient optical coupling with standard 1000  $\mu\text{m}$  core plastic fiber cable.

## APPLICATION HIGHLIGHTS

The high output and fast transition times of the IF-E93 make it suitable for low-cost digital data links. When coupled to PMMA plastic optical fiber, attenuation is less than .1 dB/m, as compared to .16 dB/m with commonly used 650 nm LEDs. Using standard 1 mm core plastic fiber, the IF-E93 LED is capable of distances in excess of 150 meters at data rates of 5 Mbps. The drive circuit design is simpler than required for laser diodes, making the IF-E93 a good, low-cost alternative in a variety of analog and digital applications.

## APPLICATIONS

- Local Area Networks (LANs)
- Optical Sensors
- Medical Instruments
- Automotive Displays
- Audio Systems
- Electronic Games
- Robotics Communications
- Fiber Optic Modems
- Fluorescent Instruments
- Wavelength Multiplexing

- ◆ Ultra-Low Loss in Plastic Optical Fiber
- ◆ No Optical Design Required
- ◆ Mates with Standard 1000  $\mu\text{m}$  Core, 2.2 mm Jacketed Plastic Fiber Cable
- ◆ Internal Micro-Lens for Efficient Coupling
- ◆ Inexpensive Plastic Connector Housing
- ◆ Connector-Less Fiber Termination and Connection
- ◆ Interference-Free Transmission from Light-Tight Housing
- ◆ Visible Light Output
- ◆ Fast Rise and Fall Times
- ◆ RoHS Compliant

## MAXIMUM RATINGS

( $T_A=25^\circ\text{C}$ )

Operating and Storage Temperature Range ( $T_{OP}, T_{STG}$ ) ..... $-40^\circ$  to  $60^\circ\text{C}$   
 Junction Temperature ( $T_J$ ) ..... $85^\circ\text{C}$   
 Soldering Temperature (2 mm from case bottom) ( $T_S$ )  $t \leq 5s$  ..... $240^\circ\text{C}$   
 Reverse Voltage ( $V_R$ ).....5 V  
 Power Dissipation (PTOT)  $T_A=25^\circ\text{C}$ .....60 mW  
 De-rate Above  $25^\circ\text{C}$ ....1.1 mW/ $^\circ\text{C}$   
 Forward Current, DC ( $I_F$ ) ...35 mA  
 Surge Current ( $I_{FSM}$ )  $t \leq 10 \mu s$  .....150 mA

## CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit
Peak Wavelength	$\lambda_{PEAK}$	-	522	-	nm
Spectral Bandwidth (FWHM)	$\Delta\lambda$	-	40	-	nm
Output Power Coupled into Plastic Fiber (1 mm core diameter). Distance Lens to Fiber $\leq 0.1$ mm, 1 m SH4001 fiber, $I_F=20$ mA	$P_O$	600 -2.2	790 -1.0	950 -0.2	$\mu\text{W}$ dBm
Switching Times (10% to 90% and 90% to 10%) ( $F=1$ MHz) See Figure 3	$t_r, t_f$	-	145, 80	-	ns
Capacitance ( $V_F=0$ , $F=1$ MHz)	$C_0$	-	65	-	pF
Forward Voltage ( $I_F=20$ mA)	$V_f$	-	3.1	-	V

**CAUTION:** The IF E93 is ESD sensitive. To minimize risk of damage observe appropriate precautions during handling and processing.

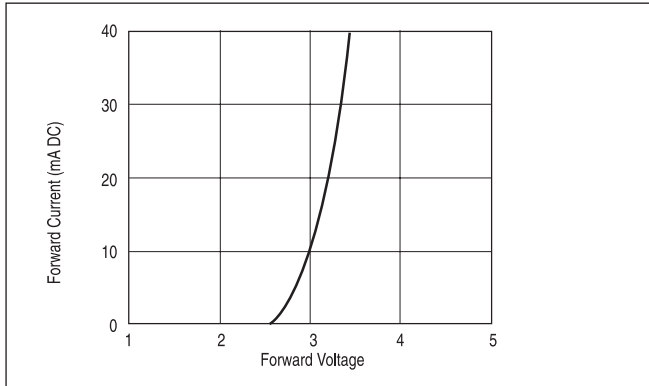


FIGURE 1. Forward current vs. forward voltage.

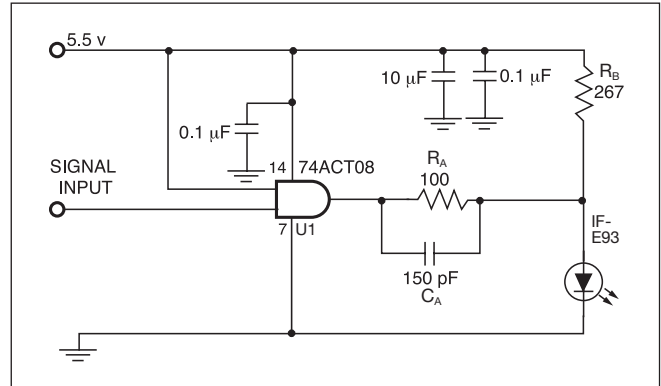


FIGURE 3. Test/Application circuit ( $I_F = 33\text{mA}$ ).

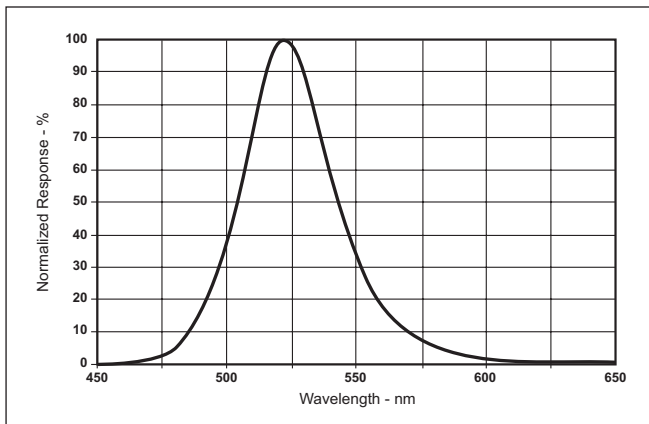


FIGURE 2. Typical spectral output vs. wavelength.

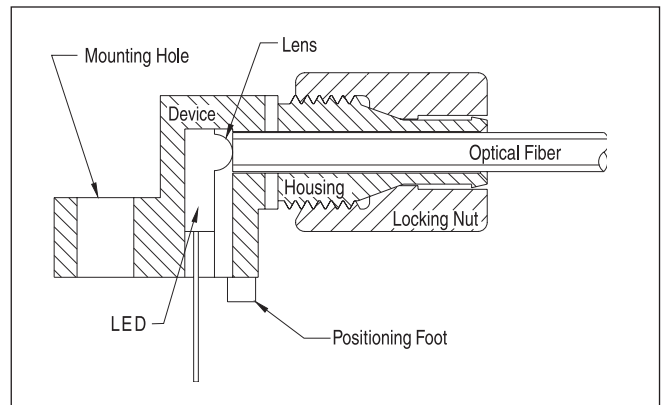


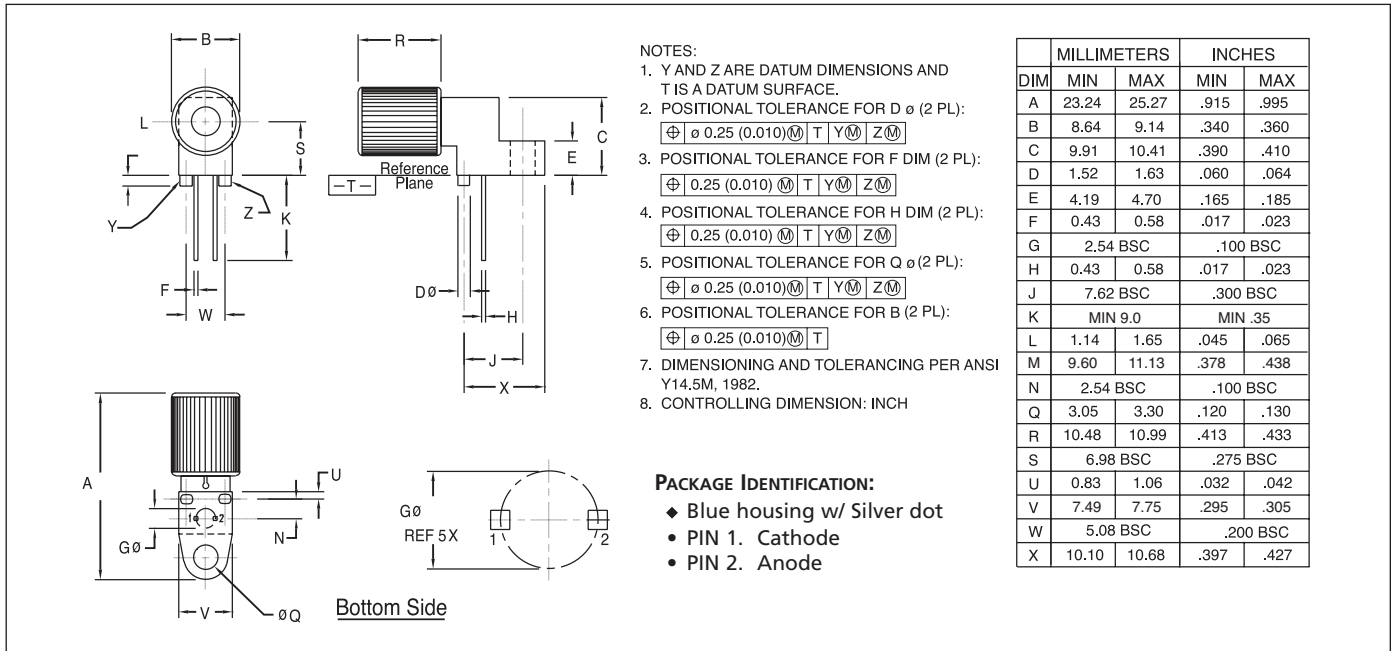
FIGURE 4. Cross-section of fiber optic device.

### APPLICATION NOTES

The application circuit given in Figure 3 can be used to drive the IF-E93 for fast applications. Gate U1 represents the circuit being used to drive the IF-E93. This must be able to supply the desired drive current at the output voltage. Resistor  $R_A$  supplies most of the drive current for the IF-E93. The amount of current supplied is  $I_A = (V_{U1} - V_f) / R_A$ , where  $V_f$  is the IF-E93 forward voltage and  $V_{U1}$  is the drive circuit's output voltage under load. Resistor  $R_B$  speeds up the switching time by keeping the voltage across the IF-E93 from going to zero during turn off. It also supplies some of the drive current. The drive current from  $R_B$  is  $I_B = (V_{CC} - V_f) / R_B$ , where  $V_{CC}$  is the supply voltage. The total drive current to the IF-E93 is  $I_A + I_B$ . Some power is wasted in  $R_B$  when the IF-E93 is off. Capacitor  $C_A$  is used to increase the drive current during switching and speed up the turn on and turn off times. It must not be so large as to overdrive the IF-E93 during turn on or drive the voltage negative during turn off. For lower speed applications, only  $R_A$  is needed and  $C_A$  and  $R_B$  can be omitted.

### FIBER TERMINATION INSTRUCTIONS

1. Cut off the ends of the optical fiber with a single-edge razor blade or sharp knife. Try to obtain a precise 90-degree angle (square).
2. Insert the fiber through the locking nut and into the connector until the core tip seats against the internal micro-lens.
3. Screw the connector locking nut down to a snug fit, locking the fiber in place.



**FIGURE 5.** Case outline. Specifications are believed to be accurate but are subject to change. Industrial Fiber Optics assumes no responsibility for the consequences of using the information provided beyond replacement warranty for products not meeting stated specifications. Industrial Fiber Optics products are not authorized for use in life support applications without written approval from the President of Industrial Fiber Optics Corporation.

**CAUTION:**

- To avoid degraded device life due to package stress, do not bend or form leads outside the orientation shown on drawing.
- Ensure that solder flux does not migrate into the device and block the optical path, degrading the performance.
- If washing the device, liquid may become trapped in the part cavity. Ensure that all potentially corrosive materials are flushed out of the device.