

TYPE  
NAME

**ME1013**

**DESCRIPTION**

ME1XX3 are AlGaAs double heterostructure light emitting diodes (LED) emitting light beams around 850nm wavelength. A spherical micro-lens is mounted on the light emitting area to provide a highly optical coupling efficiency from LED to fiber.

ME1XX3 is suitable for such applications as the light sources for data links and optical communication systems.

**FEATURES**

- Low operating current (50mA)
  - \* Easy drive with conventional transistors and IC's
- With  $\phi$  100  $\mu$ m spherical lens
- High radiance and narrow beam angle
  - \* High optical coupling efficiency from LED to fiber
- High speed response and high modulation frequency (30MHz, -1.5dB)
- High linearity in light output vs. current characteristic

**APPLICATION**

Optical data link, optical communication systems, and other optical information systems

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter		Conditions	Ratings	Unit
I <sub>F</sub>	Forward current (Note 1)	DC	T <sub>c</sub> ≤ 50°C	75	mA
		Pulse (Note 2)	T <sub>c</sub> ≤ 50°C	120	
V <sub>R</sub>	Reverse voltage		-	3	V
T <sub>c</sub>	Case temperature		-	-40~+100	°C
T <sub>stg</sub>	Storage temperature		-	-55~+125	°C

Note 1 : Forward current derating (T<sub>c</sub> > 50°C) : I<sub>F</sub> (T<sub>c</sub>) = I<sub>Fmax</sub>  $\left( \frac{T_{cmax} - T_c}{T_{cmax} - 50} \right)$

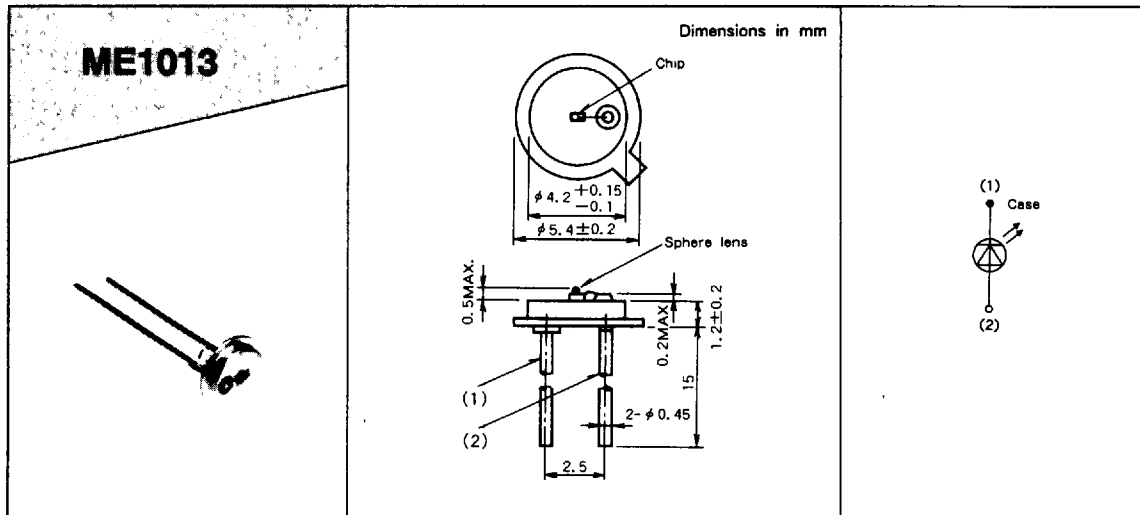
2 : Duty ratio ≤ 50 %, repetition ≥ 100kHz

**ELECTRICAL/OPTICAL CHARACTERISTICS (T<sub>c</sub> = 25°C)**

Symbol	Parameter	Test conditions	Limits			Unit	
			Min.	Typ.	Max.		
$\lambda_p$	Peak wavelength	I <sub>F</sub> = 50mA	820	850	880	nm	
$\Delta \lambda$	Spectral half width	I <sub>F</sub> = 50mA	-	45	-	nm	
P <sub>o</sub>	Light output	DC	I <sub>F</sub> = 50mA	1.0	1.5	-	mW
		Pulse (Note 3)	I <sub>F</sub> = 100mA	2.0	3.0	-	
$\theta$	Beam diverging angle	I <sub>F</sub> = 50mA	-	40	-	deg.	
f <sub>c</sub>	Cut-off frequency	I <sub>F</sub> = 25mA, I <sub>RF</sub> = 4mA <sub>P-P</sub> , -1.5dB (optical signal)	15	30	-	MHz	
V <sub>F</sub>	Forward voltage	I <sub>F</sub> = 50mA	-	1.6	2.2	V	
I <sub>R</sub>	Reverse current	V <sub>R</sub> = 3V	-	-	10	$\mu$ A	

Note 3 : Duty ratio = 50 %, repetition = 100kHz.

OUTLINE DRAWINGS

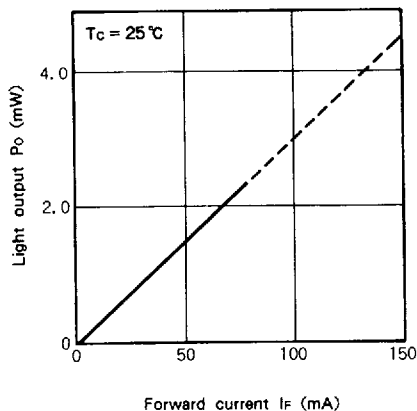


**SAMPLE CHARACTERISTICS**

**1 Light output vs. forward current**

Typical current dependence of the light output is shown in Fig.1. Light power of typical 1.5mW is obtained at 50mA. Over the forward current of 10mA, excellent linearity in light output vs. current is obtained and enables the LED to be applicable in analog systems.

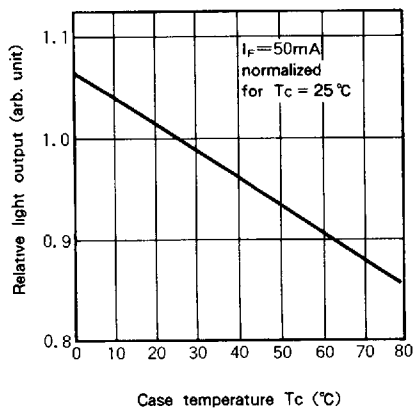
Fig. 1 Light output vs. forward current



**2 Temperature dependence of light output**

Fig.2 shows typical relative light output vs. case temperature characteristics when the light output is normalized for  $T_c = 25^\circ\text{C}$ . As the case temperature rises, the relative light output decreases at a rate of  $-0.015\text{dB}/^\circ\text{C}$ .

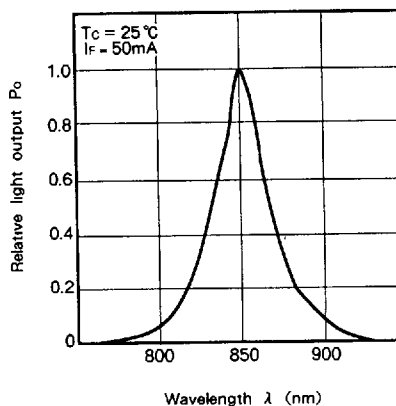
Fig. 2 Temperature dependence of light output



**3 Emission spectra**

Typical emission spectra is shown in Fig.3. The spectral half width is typically 45nm. Peak wavelength are in a range from 820 to 880nm depending on production lots at room temperature.

Fig. 3 Typical emission spectra



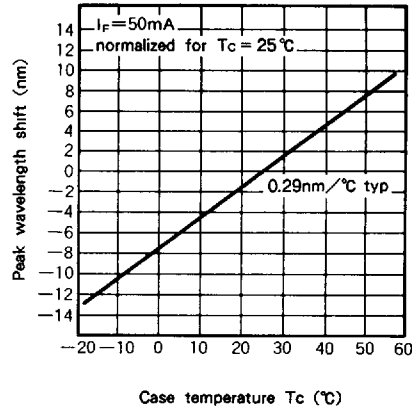
FOR OPTICAL COMMUNICATION

**4 Case temperature dependence of the peak wavelength shift**

Fig. 4. shows typical case temperature dependence of the peak wavelength shift with the light emitting peak wavelength being 0 at forward current of 50mA and case temperature of 25°C.

As the case temperature rises, the peak wavelength shift to the long wavelength side at a rate of about 0.29nm/°C.

Fig. 4 Temperature dependence of peak wavelength shift

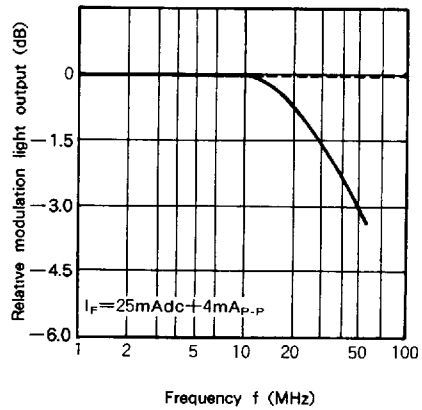


**5 Modulation characteristics**

Typical frequency modulation characteristics are shown in Fig.5. A bandwidth of 30MHz is typically obtained when it is defined as the frequency range with in which the modulated light output does not drop to the -1.5dB level.

In pulsed operation, response time of the light output is typically 12ns.

Fig. 5 Typical frequency modulation characteristics

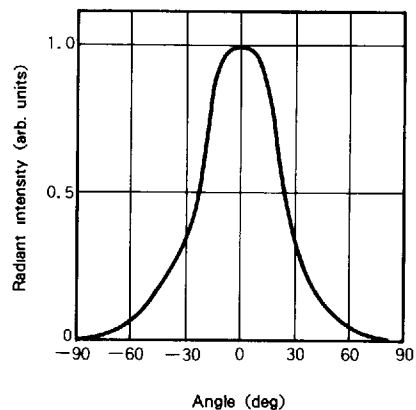


**6 Far-field pattern**

Typical far-field pattern is shown in Fig.6. Full angle of the beam at half maximum intensity is typically 40 deg.

Diameters of the light emitting region and the lens are 35  $\mu$ m and 100  $\mu$ m respectively.

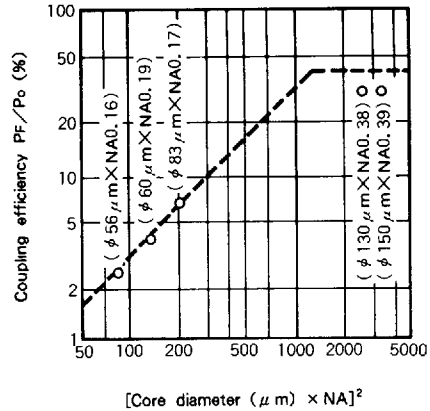
Fig. 6 Typical far-field radiation pattern



**7 Coupling efficiency**

The coupling efficiency depends on the product of core diameter and numerical aperture (NA) of a fiber. Typical efficiency and light power coupled into various step index fibers are plotted in Fig.7. The dashed line shows the theoretical limit. For example, with a fiber having a core diameter of 150 μm and NA = 0.39, the coupling efficiency is about 30%. At a low operating current of 50mA, about 500 μW is obtained.

Fig. 7 Coupling characteristics of the LED to various step index optical fibers.



**8 Allowance in fiber aligning**

The ME1013 release you from difficult and troublesome aligning of fibers because of their excellent radiation patterns. Fig.8. shows variation of coupling loss due to offset of the optical axis. Fig.9. shows the coupling loss due to distance d between the top of the lens and the fiber end.

The allowable range by fiber couple has been enhanced, making handling much easier.

Fig. 8 Coupling loss due to offset of the fiber axis. This data is for step index fibers.

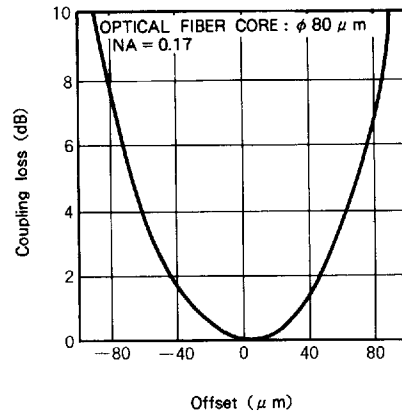


Fig. 9 Coupling loss due to the distance between top of the lens and the fiber end.

