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# HEMT-3301/HEMT-1001

## 940 nm High Radiant Emitters



### Data Sheet

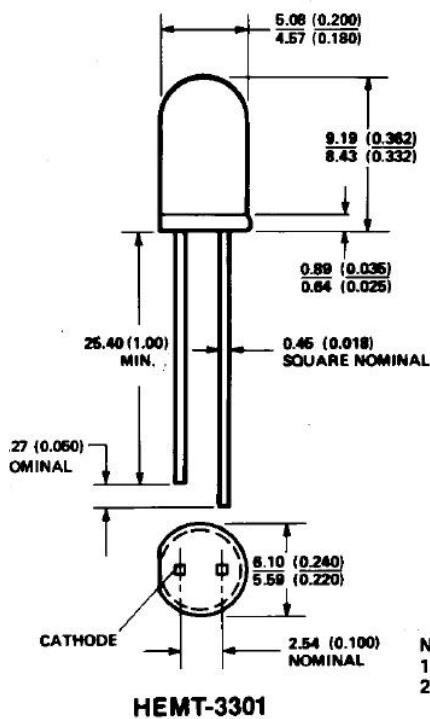
#### Description

The HEMT-3301 and HEMT-1001 are infrared emitters, using mesa structure GaAs on GaAs infrared diode, IRED, optimized for maximum quantum efficiency at a peak wavelength of 940 nm. The HEMT-3301 and HEMT-1001 emitters are untinted, undiffused plastic packages with medium wide radiation patterns. These medium-wide and wide radiation patterns eliminate the beam focusing problems that are encountered with emitters that have narrow radiation patterns. Applications include optical transducers, optical part counters, smoke detectors, covert identification, paper tape and card readers, and optical encoders.

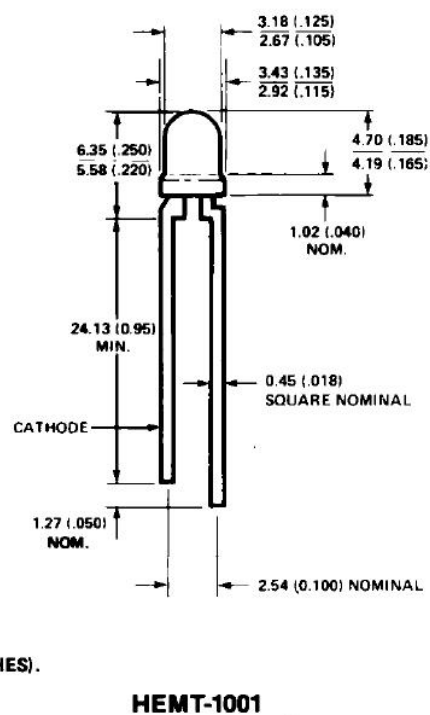
#### Features

- Nonsaturating, High Radiant Flux Output
- Efficient at Low Currents, Combined with High Current Capability
- Three Package Styles
- Operating Temperature Range -40°C to +100°C
- Medium-Wide Radiation Patterns
- Radiated Spectrum Matches Response of Silicon Photodetectors

#### Package Dimensions



NOTES:  
 1. ALL DIMENSIONS ARE IN MILLIMETRES (INCHES).  
 2. AN EPOXY MENISCUS MAY EXTEND ABOUT 1 mm (0.040") DOWN THE LEADS.



### Absolute Maximum Ratings at $T_A = 25^\circ\text{C}$

Description	Min.	Typ.	Max.	Units	Notes
Power Dissipation		150		mW	
DC Forward Current		100		mA	Derate as specified in Figure 6
Peak Forward Current		1000		mA	Time average current as determined from Figure 7
IRED Junction Temperature		110		$^\circ\text{C}$	
Operating Temperature	-40		+100	$^\circ\text{C}$	
Storage Temperature	-40		+100	$^\circ\text{C}$	
Lead Soldering Temperature		260		$^\circ\text{C}$ for 5 seconds	1.6 mm (0.063 in.) from emitter body

### Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$

Symbol	Description	Min.	Typ.	Max.	Units	Test Conditions	Fig.
$I_e$	Radiant Intensity HEMT-3301 HEMT-1001	2.5 1.0	4.0 2.0		mW/sr	$I_F = 20\text{ mA}$	4, 5
$\Delta I_e/\Delta T$	Temperature Coefficient for Radiant Intensity <sup>[1]</sup>		-0.58		$\%/^\circ\text{C}$	Measured at $\lambda_{\text{PEAK}}$	1
$\Delta I/\Delta T$	Temperature Coefficient for Peak Wavelength <sup>[2]</sup>		0.3		nm/ $^\circ\text{C}$	Measured at $\lambda_{\text{PEAK}}$	1
$\lambda_{\text{PEAK}}$	Peak Wavelength		940		nm	Measured at $\lambda_{\text{PEAK}}$	1
$2\theta_{1/2}$	Half Intensity <sup>[3]</sup> Total Angle HEMT-3301 HEMT-1001		50 60		deg.	$I_F = 20\text{ mA}$	8 9
$t_r$	Output Rise Time (10% to 90%)		1700		ns	$\lambda_{\text{PEAK}} = 20\text{ mA}$	
$t_f$	Output Fall Time (90% to 10%)		700		ns	$\lambda_{\text{PEAK}} = 20\text{ mA}$	
C	Capacitance		30		pf	$V_F = 0$ ; $f = 1\text{ MHz}$	
$V_R$	Reverse Breakdown Voltage	5.0			V	$I_R = 10\text{ mA}$	
$V_F$	Forward Voltage		1.30 1.15	1.50	V	$I_F = 100\text{ mA}$ $I_F = 20\text{ mA}$	2
$R\theta_{\text{J-PIN}}$	Thermal Resistance HEMT-3301 HEMT-1001		260 290		$^\circ\text{C/W}$	IRED Junction to Cathode Lead	

Notes:

1. Radiant intensity at ambient temperature  $I_e(T_A) = I_e(25^\circ\text{C}) + (\Delta I_e/\Delta T) (T_A - 25^\circ\text{C})/100$ .
2. Peak wavelength at ambient temperature:  $\lambda_{\text{PEAK}}(T_A) = \lambda_{\text{PEAK}}(25^\circ\text{C}) + (\Delta I/\Delta T) (T_A - 25^\circ\text{C})$ .
3.  $\theta_{1/2}$  is the off-axis angle from emitter centerline where the radiant intensity is half the on-axis value.
4. Approximate radiant flux output within a cone angle of  $2\theta$ :  $\phi_e(2\theta) = [\phi_e(\theta)/I_e(0)] I_e(T_A)$ ;  $\phi_e(\theta)/I_e(0)$  obtained from Figure 8 or 9.

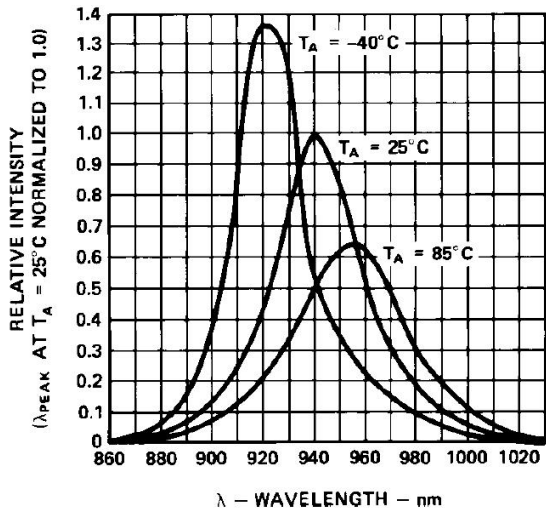


Figure 1. Radiated Spectrum.

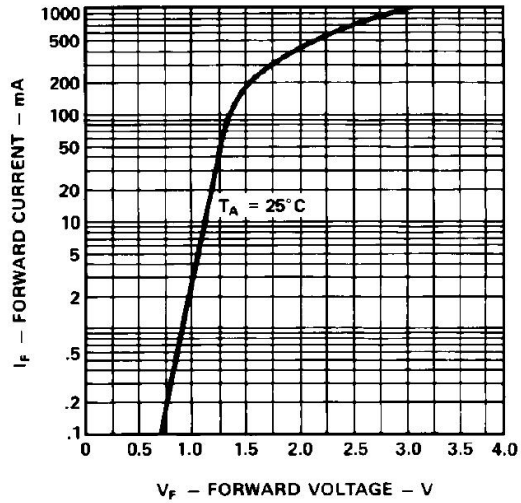


Figure 2. Forward Current vs. Forward Voltage.

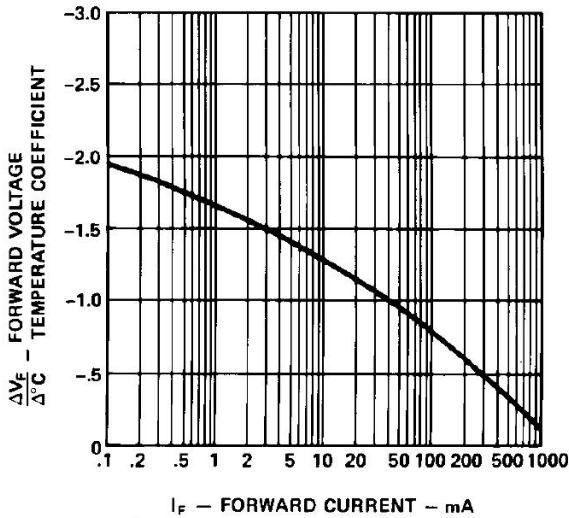


Figure 3. Forward Voltage Temperature Coefficient vs. Forward Current.

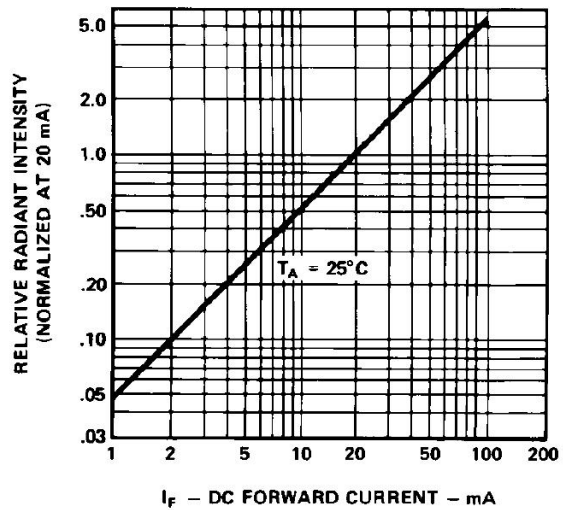


Figure 4. Relative Radiant Intensity vs. DC Forward Current.

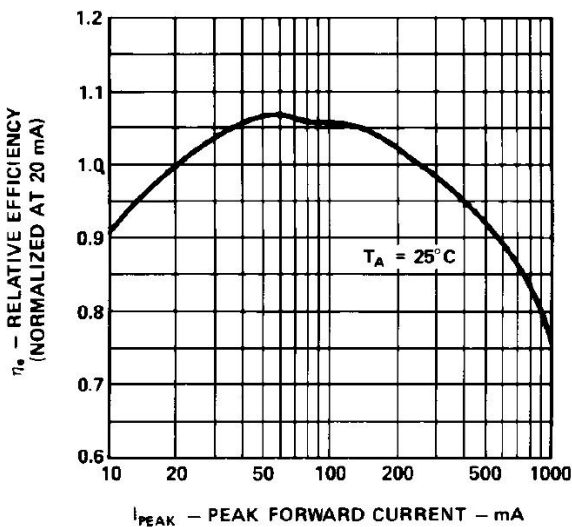


Figure 5. Relative Efficiency vs. Peak Forward Current.

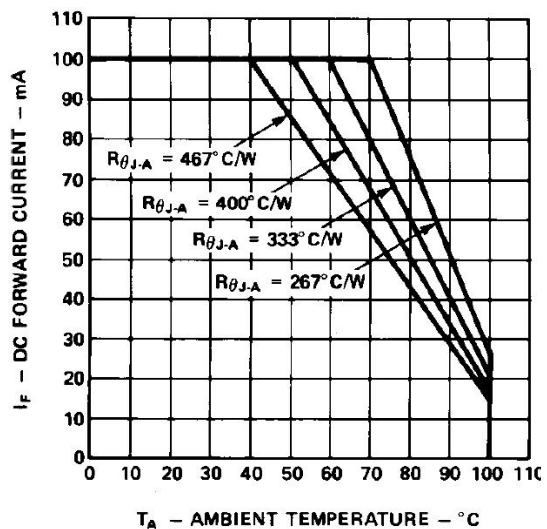


Figure 6. Maximum DC Forward Current vs. Ambient Temperature. Derating Based on T<sub>JMAX</sub> = 110°C.

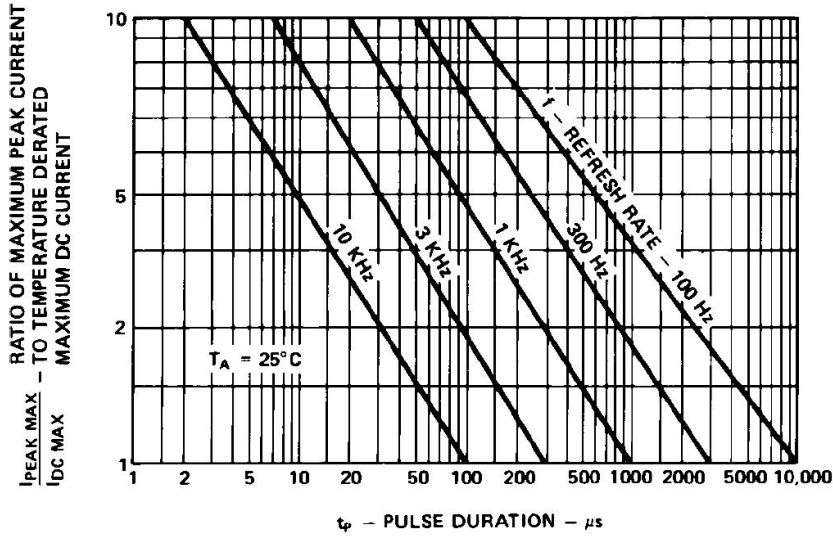


Figure 7. Maximum Tolerable Peak Current vs. Peak Determined from Temperature Derated IDC MAX).

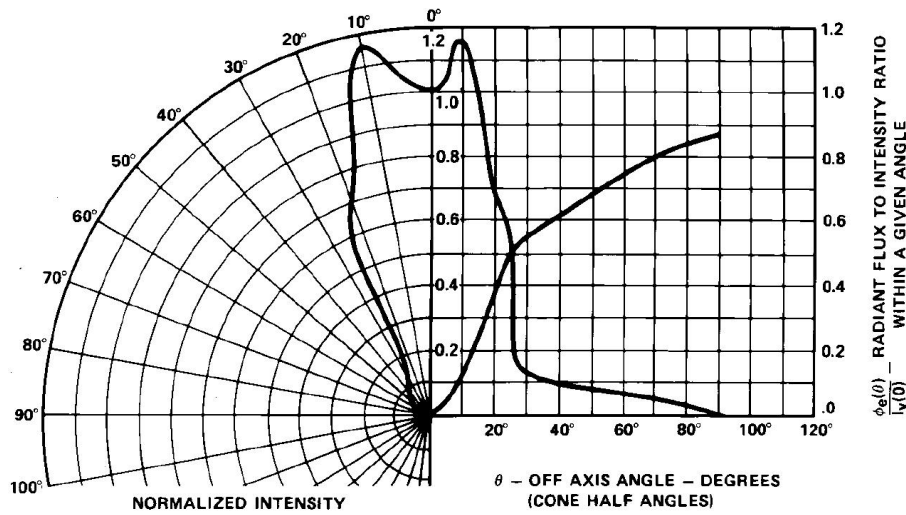


Figure 8. Far Field Radiation Pattern, HEMT-3301.

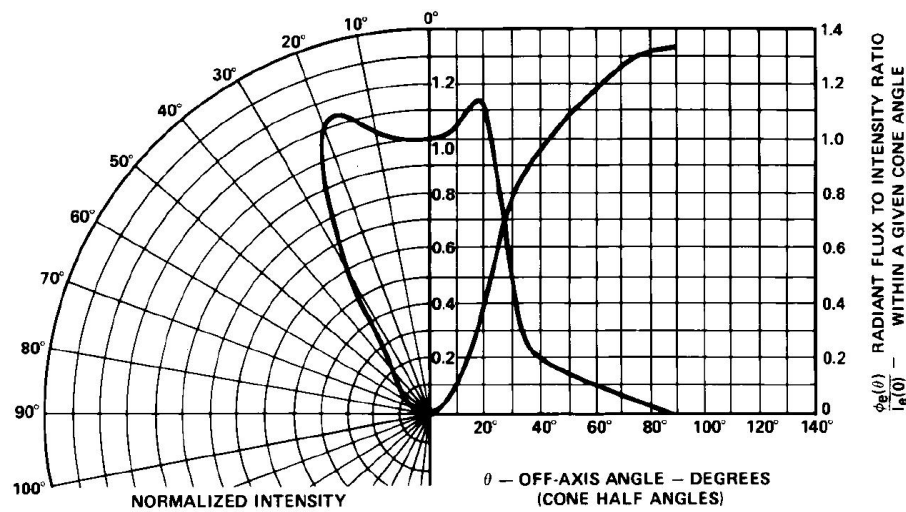


Figure 9. Far Field Radiation Pattern, HEMT-1001.

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AV02-0912EN - October 13, 2008

