



Eye Safety Risk Assessment of Infrared Emitting Diodes According IEC (EN DIN) 60825-1

LEDs are removed from IEC 60825-1 but are still covered by the **free air communication** safety standard **IEC 60825-12**. Therefore LEDs for free air communication are still to be assessed according IEC 60825-1. All other LEDs for lighting,

illumination, light barriers, and so on are moved to the eye safety standard for artificial non coherent sources IEC 62471 (identical with CIE S009).

COMPILATION OF INTENSITY/WAVELENGTH DATA FOR CLASS 1 ASSESSMENT ACCORDING IEC 60825-1

PART NUMBER	VIRTUAL SOURCE SIZE d (mm)	WAVELENGTH/MAXIMUM INTENSITY AT ABSOLUTE MAX. RATINGS HANDLED BY THE SIMPLIFIED METHOD	WAVELENGTH/MAXIMUM INTENSITY WHERE APPARENT SOURCE IS TO BE TAKEN INTO ACCOUNT; FOR CLASS 1 LIMIT REFER TO DIAGRAM
CQY36N	1.2	950 nm/7.5 mW/sr	
CQY37N	1.2	950 nm/11 mW/sr	
TSAL4400	1,9	940 nm/80 mW/sr	
TSAL5100	3.7	940 nm/80 mW/sr	
TSAL5300	2.3		940 nm/400 mW/sr
TSAL6100	3.7		940 nm/400 mW/sr
TSAL6100X01	3.7		940 nm/400 mW/sr
TSAL6200	2.4		940 nm/200 mW/sr
TSAL6400	2.2	940 nm/125 mW/sr	
TSAL7200	2.4		940 nm/200 mW/sr
TSAL7300	2.3	940 nm/150 mW/sr	
TSAL7400	2.2	940 nm/125 mW/sr	
TSAL7600	1.8	940 nm/75 mW/sr	
TSFF5210	2.7		870 nm/360 mW/sr
TSFF5410	2.2		870 nm/135 mW/sr
TSHA4400	1.8	875 nm/80 mW/sr	
TSHA4401	1.8	875 nm/80 mW/sr	
TSHA5200	3.7		875 nm/125 mW/sr
TSHA5201	3.7		875 nm/125 mW/sr
TSHA5202	3.7		875 nm/125 mW/sr
TSHA5203	3.7		875 nm/125 mW/sr
TSHA5500	2.2		875 nm/60 mW/sr
TSHA5501	2.2		875 nm/60 mW/sr
TSHA5502	2.2		875 nm/60 mW/sr
TSHA5503	2.2		875 nm/60 mW/sr
TSHA6200	3.7		875 nm/125 mW/sr
TSHA6201	3.7		875 nm/125 mW/sr
TSHA6202	3.7		875 nm/125 mW/sr
TSHA6203	3.7		875 nm/125 mW/sr
TSHA6500	2.2	875 nm/60 mW/sr	
TSHA6501	2.2	875 nm/60 mW/sr	
TSHA6502	2.2	875 nm/60 mW/sr	
TSHA6503	2.2	875 nm/60 mW/sr	
TSHF4410	1.8		880 nm/120 mW/sr
TSHF5210	3.7		880 nm/360 mW/sr
TSHF5410	2.1		880 nm/135 mW/sr
TSHF6210	2.1		880 nm/360 mW/sr
TSHF6410	2.1		880 nm/135 mW/sr
TSHG5210	3.7		850 nm/420 mW/sr
TSHG5410	2.1		850 nm/135 mW/sr
TSHG6210	3.7		850 nm/420 mW/sr



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Vishay Semiconductors

COMPILATION OF INTENSITY/WAVELENGTH DATA FOR CLASS 1 ASSESSMENT ACCORDING IEC 60825-1

PART NUMBER	VIRTUAL SOURCE SIZE d (mm)	WAVELENGTH/MAXIMUM INTENSITY AT ABSOLUTE MAX. RATINGS HANDLED BY THE SIMPLIFIED METHOD	WAVELENGTH/MAXIMUM INTENSITY WHERE APPARENT SOURCE IS TO BE TAKEN INTO ACCOUNT; FOR CLASS 1 LIMIT REFER TO DIAGRAM
TSHG6410	2.1		850 nm/135 mW/sr
TSHG8200	3.7		830 nm/360 mW/sr
TSHG8400	2.1		830 nm/135 mW/sr
TSKS5400	1.2	950 nm/7 mW/sr	
TSKS5400S	1.2	950 nm/7 mW/sr	
TSMF1000	1.2	890 nm/13 mW/sr	
TSMF1020	1.2	890 nm/13 mW/sr	
TSMF1030	1.2	890 nm/13 mW/sr	
TSML1000	1.2	940 nm/15 mW/sr	
TSML1000	1.2	940 nm/120 mW/sr	
TSML1020	1.2	940 nm/15 mW/sr	
TSML1020	1.2	940 nm/120 mW/sr	
TSML1030	1.2	940 nm/15 mW/sr	
TSML1030	1.2	940 nm/120 mW/sr	
TSML1040	1.2	940 nm/15 mW/sr	
TSML1040	1.2	940 nm/120 mW/sr	
TSML3700	0.5	940 nm/15 mW/sr	
TSPF5400	2.2		870 nm/150 mW/sr
TSSF4500	2.4	870 nm/50 mW/sr	
TSSS2600	2	950 nm/3 mW/sr	
TSTA7100	1.5	875 nm/100 mW/sr	
TSTA7300	1	875 nm/50 mW/sr	
TSTA7500	0.5	875 nm/16 mW/sr	
TSTS7100	1.5	950 nm/50 mW/sr	
TSTS7300	1	950 nm/20 mW/sr	
TSTS7500	0.5	950 nm/6.5 mW/sr	
TSUS4300	2.1	950 nm/35 mW/sr	
TSUS4400	2.1	950 nm/35 mW/sr	
TSUS5200	3.8	950 nm/50 mW/sr	
TSUS5201	3.8	950 nm/50 mW/sr	
TSUS5202	3.8	950 nm/50 mW/sr	
TSUS5400	2.9	950 nm/35 mW/sr	
TSUS5401	2.9	950 nm/35 mW/sr	
TSUS5402	2.9	950 nm/35 mW/sr	
VSLB3940X01	-	950 nm/110 mW/sr	
VSMB1940X01	-	950 nm/8 mW/sr	
VSMB2000X01	-	950 nm/12 mW/sr	
VSMB2020X01	-	950 nm/12 mW/sr	
VSMB3940X01	-	950 nm/11 mW/sr	
VSMF3710	-	870 nm/22 mW/sr	
VSMF4710	-	870 nm/22 mW/sr	
VSMF4720	-	870 nm/30 mW/sr	
VSMG2700	-	830 nm/22 mW/sr	
VSMG3700	-	830 nm/22 mW/sr	
VSML3710	0.36	940 nm/15 mW/sr	
VSMS3700	-	950 nm/8 mW/sr	

Note

All listed diode emitters are inside IEC 60825-1, class 1

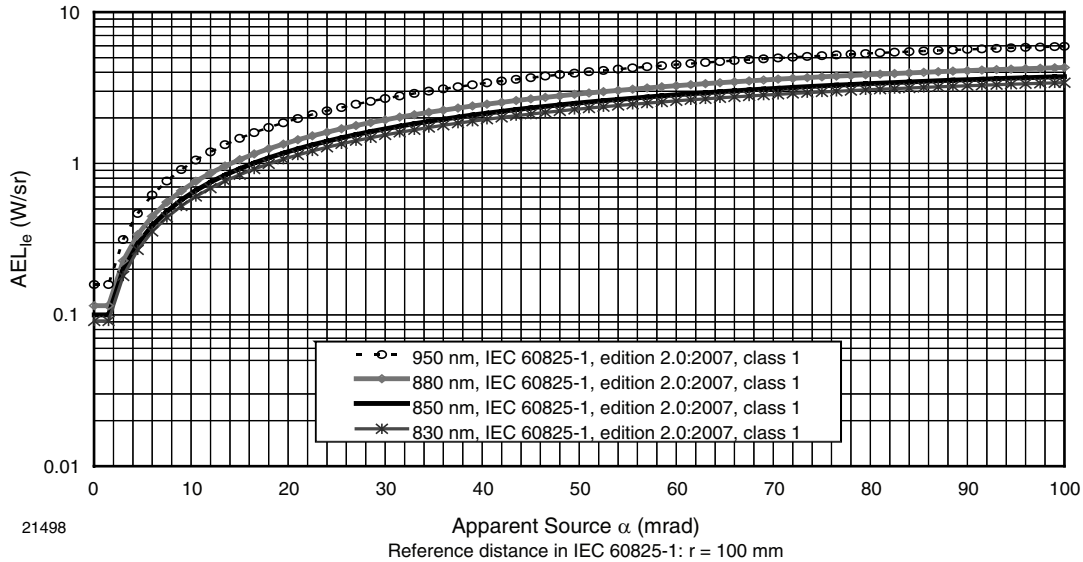


Fig. 1 - Accessible Emission Levels (AELs) vs. Apparent Source Size
($\alpha = d/r$, 1 mm source diameter is equivalent to an angular subtense of 10 mrad)

For the simplified method the apparent source size is not taken into account, the values for $\alpha = 0$ of this diagram are relevant.

IEC 62471 and EU DIRECTIVE 2006/25/EC

For all other applications beside free air communications (covered by IEC EN DIN 60825-12) the standard IEC 62471 is applicable.

This standard for incoherent sources replaces for LEDs the laser standard IEC DIN EN 60825-1.

In case of IR - Emitters the dominating limit is the cornea/lens risk in the wavelength range from 780 nm to 3000 nm. This limits the irradiance to $E_e = 100 \text{ W/m}^2$ which is expressed as intensity a value of $I_e = 4 \text{ W/sr}$ with the measurement condition of that standard with 0.2 m distance in mind ($I_e = E_e \times r^2$).

Evaluating the other limiting conditions as the thermal retinal risk and blue light hazard result in not limiting higher values for wavelengths $\lambda > 850 \text{ nm}$ and therefore are not to be taken into account. Only for $\lambda = 830 \text{ nm}$ a little reduction to $I_e = 3.77 \text{ W/sr}$ is given by the thermal risk.

This is still far above of the emitted intensities of IREDs covered by the Vishay datasheets.