
COMPLIANCE TESTING AND VERIFICATION SERVICES
BACL

General product information:

Model	Input parameters	CCT
P2016W1H4-D01-8D1A01	150mA	2700K
P2016W2H4-D01-8D1A01		3000K
P2016W3H4-D01-8D1A01		4000K
P2016W4H4-D01-8D1A01		5000K
P2016W5H4-D01-8D1A01		6000K
P2016W6H4-D01-8D1A01		6500K

From above table, all models have same electrical parameters. They difference just in CCT.
6500K is the worse case,which could cover other CCT.Unless otherwise specified, the P2016W6H4-D01-8D1A01 was chosen as the representative models to perform the test.

Remarks:
The measured LED, part number P2016W6H4-D01-8D1A01, with ANSI bin 6500K, is part of the Hongli LED Package product family. The present classification is thus valid(worst case) for all Hongli LED Package P2016WxH4-D01-8D1A01 from ANSI bins equal to 6500K or lower CCT.

4	EXPOSURE LIMITS		P
4.1	General		P
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure		P
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds 10^4 cd·m^{-2}	>10^4 cd·m^{-2}	P
4.3	Hazard exposure limits		P
4.3.1	Actinic UV hazard exposure limit for the skin and eye		P
	The exposure limit for effective radiant exposure is 30 J.m^{-2} within any 8-hour period		P
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broadband source, the effective integrated spectral irradiance, Es, of the light source shall not exceed the levels defined by:	Es=7.8×10^{-6}W·m^{-2}	P
	$S \cdot \int_{200}^{400} \lambda \cdot \cdot\triangle \cdot\triangle$ 30 J·m^{-2}		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{max}=30/E_s$	$t_{max}=30/(7.8\times10^{-6})=3.85\times10^6$s	P
4.3.2	Near-UV hazard exposure limit for eye		P
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 J.m^{-2} for exposure times less than 1000s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, E_{UVA}, shall not exceed 10 W·m^{-2}	$E_{UVA}=4.3\times10^{-4}$W·m^{-2}	P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		N
	t_{max} 10000/E_{UVA} s		N
4.3.3	Retinal blue light hazard exposure limit		P
	To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, B(_), i.e., the blue-light weighted radiance , LB, shall not exceed the levels defined by:		P
	$\int_{300}^{700} t \cdot \cdot\triangle \cdot\triangle$ 10^6 J·m^{-2}·sr^{-1}		N

	700 λ· ·△ 100 W·m-2·sr-1 300	L_B=77 W·m-2·sr-1	P
4.3.4	Retinal blue light hazard exposure limit - small source	= 0.0030 rad	P
	Thus the spectral irradiance at the eye E_, weighted against the blue-light hazard function B(_) shall not exceed the levels defined by: see table 4.2		P
	700 B· λ · ·△ ·△ 100 J·m-2 300 t		N
	700 λ· ·△ 1 W·m-2 300	E_B=0.32W·m-2	P
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_, weighted by the burn hazard weighting function R(_) (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:		P
	$L_R = \sum^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{50000}{\alpha^{0.25}}$ W·m-2·sr-1	L_R=7.9x10^{4}W·m-2·sr -1	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		P
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, LIR, as viewed by the eye for exposure times greater than 10 s shall be limited to:		P
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{6000}{\alpha}$ W·m-2·sr-1	L_{IR}=1.4x10^{2}W·m-2·sr -1	P
4.3.7	Infrared radiation hazard exposure limits for the eye		P
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis),ocular exposure to infrared radiation, EIR,over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		N
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \le 18000 \cdot t^{-0,75}$ W·m-2		N
	For times greater than 1000 s the limit becomes:		P

	The measurement instrument is adequate calibrated.	See appendix B	P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		P
	The measurements made with an optical system.		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		P
5.2.2.2	Alternative method		N
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		N
5.2.3	Measurement of source size		P
	The determination of , the angle subtended by a source, requires the determination of the 50% emission points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		

[redacted]

6.1.3	Risk Group 2 (Moderate-Risk) This requirement is met by any lamp that exceeds the limits for Risk Group 0028 ra N		N	

[redacted]

Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye	-

Wavelength[1] λ, nm	UV hazard function $S_{uv}(\lambda)$	Wavelength λ, nm	UV hazard function $S_{uv}(\lambda)$
200	0,030	313*	0,006
205	0,051	315	0,003
210	0,075	316	0,0024
215	0,095	317	0,0020
220	0,120	318	0,0016
225	0,150	319	0,0012
230	0,190	320	0,0010
235	0,240	322	0,00067
240	0,300	323	0,00054
245	0,360	325	0,00050
250	0,430	328	0,00044
254*	0,500	330	0,00041
255	0,520	333*	0,00037
260	0,650	335	0,00034
265	0,810	340	0,00028
270	1,000	345	0,00024
275	0,960	350	0,00020
280*	0,880	355	0,00016
285	0,770	360	0,00013
290	0,640	365*	0,00011
295	0,540	370	0,000093
297*	0,460	375	0,000077
300	0,300	380	0,000064
303*	0,120	385	0,000053
305	0,060	390	0,000044
308	0,026	395	0,000036
310	0,015	400	0,000030

[1] Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
* Emission lines of a mercury discharge spectrum.

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	-

Wavelength nm	Blue-light hazard function B( )	Burn hazard function R( )
300	0,01	-
305	0,01	-
310	0,01	-
315	0,01	-
320	0,01	-
325	0,01	-
330	0,01	-
335	0,01	-
340	0,01	-
345	0,01	-
350	0,01	-
355	0,01	-
360	0,01	-
365	0,01	-
370	0,01	-
375	0,01	-
380	0,01	0,1
385	0,013	0,13
390	0,025	0,25
395	0,05	0,5
400	0,10	1,0
405	0,20	2,0
410	0,40	4,0
415	0,80	8,0
420	0,90	9,0
425	0,95	9,5
430	0,98	9,8
435	1,00	10,0
440	1,00	10,0
445	0,97	9,7
450	0,94	9,4
455	0,90	9,0
460	0,80	8,0
465	0,70	7,0

Table 5.4	Summary of the ELs for the surface of the skin or cornea (irradiance based values)				-
Hazard Name	**Relevant equation**	**Wavelength Range nm**	**Explosure aperture rad(deg)**	**Limiting aperture rad(deg)**	**EL in items of constant irradiance $W.m^{-2}$**
Actinic UV skin & eye	$E_S = E \bullet S(\ ) \bullet$	200 – 400	< 30000	1,4 (80)	30/t
Eye UV-A	$E_{UVA} = E \bullet$	315 – 400	1000 >1000	1,4 (80)	10000/t 10
Blue-light small source	$E_B = E \bullet B(\ ) \bullet$	300 – 700	100 >100	< 0,011	100/t 1,0

Appendix A - EUT Photos

1. General view of P2016W6H4-D01-8D1A01