

**Each Place Has Its Own Purpose,
Complete It with the Right Light !**

Q&A





What's the biggest difference from LM302N compared to conventional lighting? What's special with it?

Compared to conventional LEDs, Samsung's LM302N utilizes precisely designed light spectra with optimized amounts of cyan to accommodate lighting needs to the extent desired at any given point in time: the LM302N DAY improves alertness and the LM302N NITE enhances relaxation. The LM302N DAY can suppress the body's melatonin level more than 18 percent below that of conventional LED lighting. Available in a variety of color temperatures from 3000K to 6500K, the DAY package can be used in a diverse range of indoor applications, such as schools, offices, libraries and industrial sites, to enhance an individual's sense of awakesness and energy level.

The LM302N NITE can provide a proper level of brightness without hindering the release of melatonin, helping people to maintain the hormone level as if they were in a calm natural atmosphere at night. The body releases about five percent more melatonin under lights with the LM302N NITE packages than conventional LED packages, increasing relaxation. By comparison, spending a lot of time under conventional nighttime lighting can cause excessive alertness that makes it harder to fall asleep. Additionally, the LM302N NITE is offered in color temperatures between 1800K and 4000K, providing design flexibility to bring the benefits of relaxing light to a variety of lighting spaces.



Elio Jin-ha Kim

Principal Engineer
Samsung Electronics



Have you planned an LED with 2 chips in one package in the future?
2700k and 6500k?

We don't have a plan as of today. Rather we're putting more effort into optimizing Day and Night LEDs separately. Usually, the color tuning can be implemented in the module level, where LEDs of different CCTs are mounted side by side. We understand, however, that there needs to be enough space for color mixing in such cases, which may become a pain point to some fixture designs with a very tight space allowance. We wish to address such needs in the future as well.



Elio Jin-ha Kim
Principal Engineer
Samsung Electronics



I'm interested in your products. Besides 3030 and 2835, any other LED platforms or modules available? If not, any plan in the future?

We believe the HCL will spread over many different LED platforms, although we offer only 3030 6V and 2835 9V as the HCL platform. Samsung has been also offering standard and customized LED module products.



Elio Jin-ha Kim
Principal Engineer
Samsung Electronics



Can I use the LM302N day to keep my colleagues/employees awake and working more efficiently for longer?

The LM302N DAY featuring a spectrum with intensified cyan wavelengths can help suppressing melatonin production in our body. It can be a help on increasing concentration level thus promote people be more alerted and focused while using lighting.

There are certain jobs requiring day and night switches, for example, night security or 24-hour factory workers. Using LM302N DAY may help preventing errors and accidents at work in such shift due to uncautionness. However, care must be taken when designing the lighting for night-time workplace due to the health concerns from chronic disturbances to the natural circadian rhythms of humans. Risk and benefit analysis must precede such lighting designs.



Elio Jin-ha Kim
Principal Engineer
Samsung Electronics



Which uncertainties are there on the linear scale on the melanopsin sensitivity curve? May this curve change in the near future its shape (even if perhaps the peak wavelength stays the same)?

The melanopic sensitivity curve is an approximation of non-visual spectral sensitivity, just as the $V(\lambda)$ is for apparent brightness, neither will be precisely accurate for every person, under all circumstances. For example, the melanopic function includes a correction for the lens yellowness that will vary between individuals and as we age. It is certainly possible that uncertainties in the standardized curve could be identified and refined. I personally doubt that these will amount to something that will make a material difference to our ability to predict non-visual responses to polychromatic light in real world conditions, but who knows what the future holds. In the meantime, the melanopic curve is a good compromise, it is a conceptually simple solution with very few assumption, and has been shown to work well enough to predict many published data so far.



Robert Lucas

Professor of Neuroscience
University of Manchester



Do you think researchers will find more hidden photoreceptors within humans at wavelength that have not yet been regarded as beneficial?

The circadian light responses we are interested in here originate in the eyes and are lost in animals that lack the known photoreceptors (rods, cones and melanopsin), so it is unlikely.



Robert Lucas

Professor of Neuroscience
University of Manchester



While we all understand that the skin of different races has, through evolution, changed to protect that race from sun exposure. Do we think ipRGCs performance could be similarly different in different races? Do we think their performance changes with age?

We know little about how much ipRGC performance varies from person to person. One important characteristic that is most unlikely to vary is the spectral sensitivity of melanopsin, which is the same in a mouse as it is in a monkey, as it is in a human, as it is in a rat. So the cyan part of the spectrum is likely to have a special importance for everyone. Beyond that, we really need more information about possible variations in non-visual light response between people. There's recently been an interesting paper from Andrew Phillips and colleagues reporting quite big differences in how much light it takes to suppress melatonin between individuals. Understanding the origin of the variability is a very important challenge. It could be down to inherited characteristics (genetic differences), it could be caused by differences in people's environment or lifestyle.



Robert Lucas

Professor of Neuroscience
University of Manchester



If we think about light as a dose for melatonin suppression, 2 minutes outside gives me the same dose as 12 hours indoors under enhanced spectrum that meets the Well standard. What does the research on doses per unit time suggest has the most benefit?

Your question is very thought-provoking given the fact that the daylight on a sunny day can be several hundred to a thousand times brighter than the indoor ambient light. However, the melatonin suppression is not a linearly increasing function of the light intensity. Once the light level exceeds certain threshold, enough melatonin suppression takes place. You cannot deposit the light surplus and withdraw it for later use during the rest of the day. That's why there are guidelines for the desirable daytime and night-time lighting by expert groups, which include the WELL building standard that defines both the minimum melanopic lux or melanopic-EDI and the minimum exposure hours for daytime lighting. The recommendation from an international expert review group in 2019, as introduced by Prof. Lucas, defines the minimum melanopic-EDI throughout the daytime and the maximum melanopic-EDI during evening and night-time, respectively. Similar recommendations are available from the Lighting Research Center at the Rensselaer polytechnic institute in CLA and CS metrics.



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