

SPECIFICATION FOR White LED Light Engine



CL-597XXL-C9W8XX

- CL-597XXL-C9W8XX
where CL is CL(Converterless power); 597(length in mm); XX (20 or 33 : Width in mm); L(Linear Bar); C(120V); 9(Watt); W(white); 8(CRI 80); XX(CCT)
- High brightness with long lifetime
- High power factor
- Low THD
- RoHS compliant

| Vendor | | Customer |
|---------|----------|----------|
| Written | Approval | Approval |
| | | |

Lumens CO., LTD.

456 Gomae-Dong, Giheung-Gu, Yongin-Si, Gyeonggi-Do 449-901 Korea

<http://www.lumens.co.kr>

1. Product description

* Description

- The CL series module is designed for the high power operation to get the high flux output applications.
- It incorporates the state of the art SMD LEDs with high reliability and semiconductor AC direct drive ICs.
- It is ideal for the indoor or down light applications.

* Features

- High performance, High brightness over 50,000 hours of life
- No emission of harmful short wavelength light(No UV radiation)
- High power conversion efficiency(>0.85)
- High power factor (0.99)
- Low THD
- Low EMI
- Thermal shutdown function embedded(150C)
- RoHS compliant

* Applications



LUMENS

2. Absolute maximum ratings

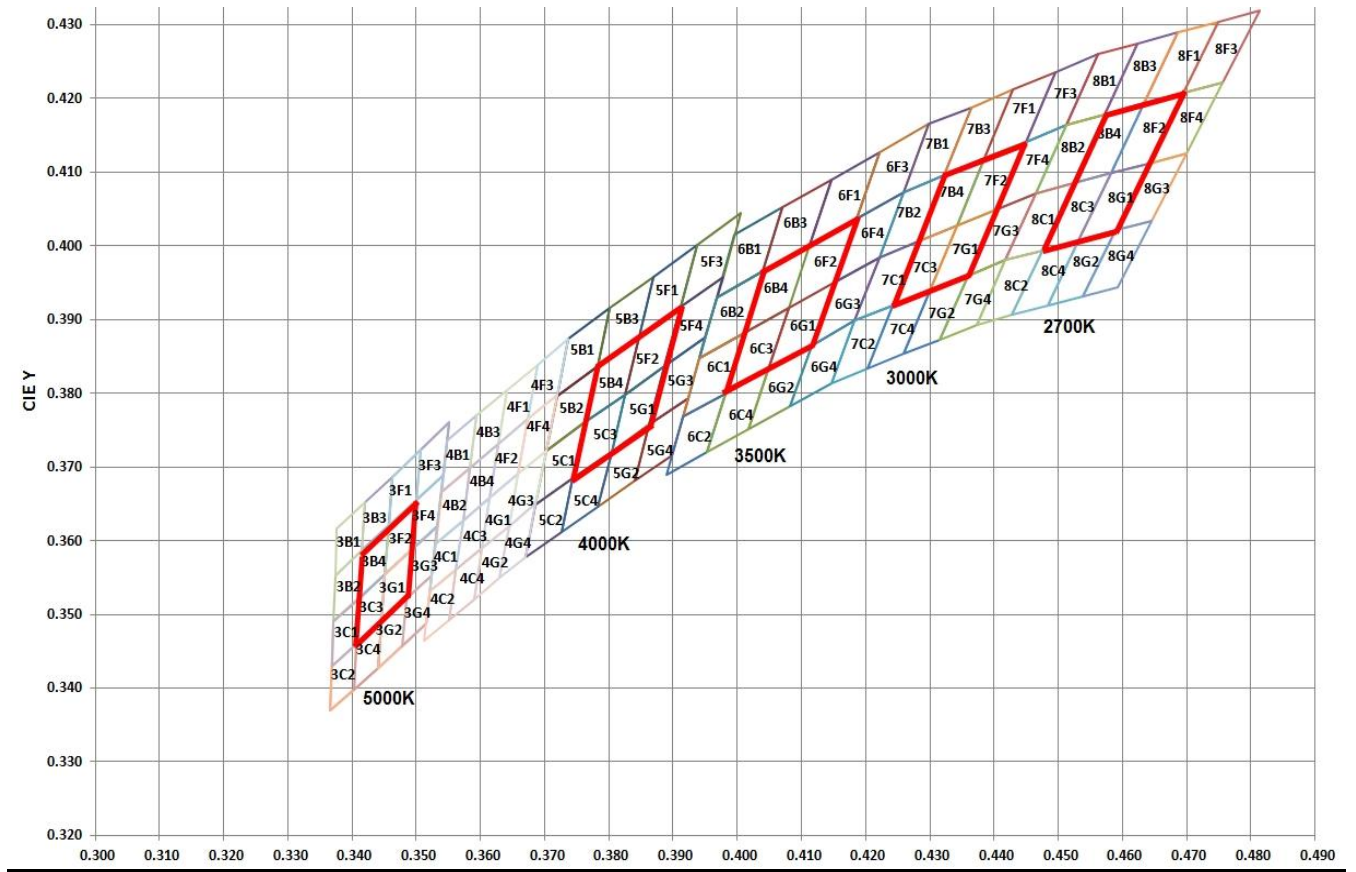
| Parameters | Symbol | Min Value | Max Value | Unit |
|---------------------------|--------|-----------|-----------|------|
| Maximum power dissipation | Pd | - | 10.5 | W |
| Maximum operation voltage | Vop | - | 130 | V |
| Operation temperature | Top | -40 | +125 | °C |
| Storage temperature | Tst | -40 | +125 | °C |

3. Electro-optical characteristics (Ta=25°C.)

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Condition |
|------------------------------|----------------|----------------------|-------|------|------|-------------------|
| Luminous Flux | Φ_v | 840 | 990 | | lm | Vop=120V 2700K |
| | | 890 | 1,050 | | lm | Vop=120V 3000K |
| | | 910 | 1,080 | | lm | Vop=120V 3500K |
| | | 930 | 1,100 | | lm | Vop=120V 4000K |
| | | 970 | 1,150 | | lm | Vop=120V 5000K |
| Efficiency | lm/W | 89.4 | 105.3 | | lm/W | Vop=120V 2700K |
| | | 94.7 | 111.7 | | lm/W | Vop=120V 3000K |
| | | 96.8 | 114.9 | | lm/W | Vop=120V 3500K |
| | | 98.9 | 117.0 | | lm/W | Vop=120V 4000K |
| | | 103.2 | 122.3 | | lm/W | Vop=120V 5000K |
| Correlated Color Temperature | CCT | 2700 (MacAdam 3Step) | | | K | Vop=120V |
| | | 3000 (MacAdam 3Step) | | | K | Vop=120V |
| | | 3500 (MacAdam 3Step) | | | K | Vop=120V |
| | | 4000 (MacAdam 3Step) | | | K | Vop=120V |
| | | 5000 (MacAdam 3Step) | | | K | Vop=120V |
| Color Rendering Index | CRI | 80 | - | - | - | Vop=120V |
| Viewing Angle FWHM | 2 θ 1/2 | 120 | 130 | 140 | deg | Vop=120V |
| Operation Voltage | Vop | 110 | 120 | 130 | V | |
| Power Dissipation | Pd | 8 | 9.0 | 10.5 | W | Vop=120V |
| Operation Frequency | Fop | 50 / 60 | | | Hz | Vop=120V |
| Power Factor | PF | Over 0.99 | | | V | Vop=120V |
| Current THD | ATHD | Less than 20% | | | | Vop=120V |

- (1) Parameters are measured by CAS-140 of Instrument System CO.,LTD.
- (2) Measurement accuracy : **CRI**(± 3), **Φ_v** ($\pm 10\%$), **Vf**($\pm 0.05V$), **Chromaticity coordinate**(± 0.01).
- (3) CRI : depends on Customer Requirements

4. CIE Chromaticity diagram



(1) Chromaticity coordinate groups are measured with an accuracy of ± 0.01

5. Chromaticity coordinates

5-1. 2700K

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 8B1 | 0.4513 | 0.4164 | 8B2 | 0.4465 | 0.4071 | 8B3 | 0.4573 | 0.4178 | 8B4 | 0.4523 | 0.4085 |
| | 0.4562 | 0.4260 | | 0.4513 | 0.4164 | | 0.4624 | 0.4274 | | 0.4573 | 0.4178 |
| | 0.4624 | 0.4274 | | 0.4573 | 0.4178 | | 0.4687 | 0.4289 | | 0.4634 | 0.4193 |
| | 0.4573 | 0.4178 | | 0.4523 | 0.4085 | | 0.4634 | 0.4193 | | 0.4582 | 0.4099 |
| | 0.4513 | 0.4164 | | 0.4465 | 0.4071 | | 0.4573 | 0.4178 | | 0.4523 | 0.4085 |
| 8C1 | 0.4418 | 0.3981 | 8C2 | 0.4373 | 0.3893 | 8C3 | 0.4475 | 0.3994 | 8C4 | 0.4428 | 0.3906 |
| | 0.4465 | 0.4071 | | 0.4418 | 0.3981 | | 0.4523 | 0.4085 | | 0.4475 | 0.3994 |
| | 0.4523 | 0.4085 | | 0.4475 | 0.3994 | | 0.4582 | 0.4099 | | 0.4532 | 0.4008 |
| | 0.4475 | 0.3994 | | 0.4428 | 0.3906 | | 0.4532 | 0.4008 | | 0.4483 | 0.3919 |
| | 0.4418 | 0.3981 | | 0.4373 | 0.3893 | | 0.4475 | 0.3994 | | 0.4428 | 0.3906 |
| 8F1 | 0.4634 | 0.4193 | 8F2 | 0.4582 | 0.4099 | 8F3 | 0.4695 | 0.4207 | 8F4 | 0.4641 | 0.4112 |
| | 0.4687 | 0.4289 | | 0.4634 | 0.4193 | | 0.4750 | 0.4304 | | 0.4695 | 0.4207 |
| | 0.4750 | 0.4304 | | 0.4695 | 0.4207 | | 0.4813 | 0.4319 | | 0.4756 | 0.4221 |
| | 0.4695 | 0.4207 | | 0.4641 | 0.4112 | | 0.4756 | 0.4221 | | 0.4700 | 0.4126 |
| | 0.4634 | 0.4193 | | 0.4582 | 0.4099 | | 0.4695 | 0.4207 | | 0.4641 | 0.4112 |
| 8G1 | 0.4532 | 0.4008 | 8G2 | 0.4483 | 0.3919 | 8G3 | 0.4589 | 0.4021 | 8G4 | 0.4538 | 0.3931 |
| | 0.4582 | 0.4099 | | 0.4532 | 0.4008 | | 0.4641 | 0.4112 | | 0.4589 | 0.4021 |
| | 0.4641 | 0.4112 | | 0.4589 | 0.4021 | | 0.4700 | 0.4126 | | 0.4646 | 0.4034 |
| | 0.4589 | 0.4021 | | 0.4538 | 0.3931 | | 0.4646 | 0.4034 | | 0.4593 | 0.3944 |
| | 0.4532 | 0.4008 | | 0.4483 | 0.3919 | | 0.4589 | 0.4021 | | 0.4538 | 0.3931 |

5-2. 3000K

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|
| 7B1 | 0.4259 | 0.4073 | 7B2 | 0.4221 | 0.3984 | 7B3 | 0.4322 | 0.4096 | 7B4 | 0.42810 | 0.40060 |
| | 0.4299 | 0.4165 | | 0.4259 | 0.4073 | | 0.4364 | 0.4188 | | 0.43220 | 0.40960 |
| | 0.4364 | 0.4188 | | 0.4322 | 0.4096 | | 0.4430 | 0.4212 | | 0.43850 | 0.41190 |
| | 0.4322 | 0.4096 | | 0.4281 | 0.4006 | | 0.4385 | 0.4119 | | 0.43420 | 0.40280 |
| | 0.4259 | 0.4073 | | 0.4221 | 0.3984 | | 0.4322 | 0.4096 | | 0.42810 | 0.40060 |
| 7C1 | 0.4183 | 0.3898 | 7C2 | 0.4147 | 0.3814 | 7C3 | 0.4242 | 0.3919 | 7C4 | 0.42030 | 0.38330 |
| | 0.4221 | 0.3984 | | 0.4183 | 0.3898 | | 0.4281 | 0.4006 | | 0.42420 | 0.39190 |
| | 0.4281 | 0.4006 | | 0.4242 | 0.3919 | | 0.4342 | 0.4028 | | 0.43000 | 0.39390 |
| | 0.4242 | 0.3919 | | 0.4203 | 0.3833 | | 0.4300 | 0.3939 | | 0.42590 | 0.38530 |
| | 0.4183 | 0.3898 | | 0.4147 | 0.3814 | | 0.4242 | 0.3919 | | 0.42030 | 0.38330 |
| 7F1 | 0.4385 | 0.4119 | 7F2 | 0.4342 | 0.4028 | 7F3 | 0.4449 | 0.4141 | 7F4 | 0.44030 | 0.40490 |
| | 0.4430 | 0.4212 | | 0.4385 | 0.4119 | | 0.4496 | 0.4236 | | 0.44490 | 0.41410 |
| | 0.4496 | 0.4236 | | 0.4449 | 0.4141 | | 0.4562 | 0.4260 | | 0.45130 | 0.41640 |
| | 0.4449 | 0.4141 | | 0.4403 | 0.4049 | | 0.4513 | 0.4164 | | 0.44650 | 0.40710 |
| | 0.4385 | 0.4119 | | 0.4342 | 0.4028 | | 0.4449 | 0.4141 | | 0.44030 | 0.40490 |
| 7G1 | 0.4300 | 0.3939 | 7G2 | 0.4259 | 0.3853 | 7G3 | 0.4359 | 0.3960 | 7G4 | 0.43160 | 0.38730 |
| | 0.4342 | 0.4028 | | 0.4300 | 0.3939 | | 0.4403 | 0.4049 | | 0.43590 | 0.39600 |
| | 0.4403 | 0.4049 | | 0.4359 | 0.3960 | | 0.4465 | 0.4071 | | 0.44180 | 0.39810 |
| | 0.4359 | 0.3960 | | 0.4316 | 0.3873 | | 0.4418 | 0.3981 | | 0.43730 | 0.38930 |
| | 0.4300 | 0.3939 | | 0.4259 | 0.3853 | | 0.4359 | 0.3960 | | 0.43160 | 0.38730 |

5-3. 3500K

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|
| 6B1 | 0.3968 | 0.3930 | 6B2 | 0.3941 | 0.3848 | 6B3 | 0.4040 | 0.3966 | 6B4 | 0.40100 | 0.38820 |
| | 0.3996 | 0.4015 | | 0.3968 | 0.3930 | | 0.4071 | 0.4052 | | 0.40400 | 0.39660 |
| | 0.4071 | 0.4052 | | 0.4040 | 0.3966 | | 0.4146 | 0.4089 | | 0.41130 | 0.40010 |
| | 0.4040 | 0.3966 | | 0.4010 | 0.3882 | | 0.4113 | 0.4001 | | 0.40800 | 0.39160 |
| | 0.3968 | 0.3930 | | 0.3941 | 0.3848 | | 0.4040 | 0.3966 | | 0.40100 | 0.38820 |
| 6C1 | 0.3915 | 0.3768 | 6C2 | 0.3889 | 0.3690 | 6C3 | 0.3981 | 0.3800 | 6C4 | 0.39810 | 0.38000 |
| | 0.3941 | 0.3848 | | 0.3915 | 0.3768 | | 0.4010 | 0.3882 | | 0.39530 | 0.37200 |
| | 0.4010 | 0.3882 | | 0.3981 | 0.3800 | | 0.4080 | 0.3916 | | 0.40170 | 0.37510 |
| | 0.3981 | 0.3800 | | 0.3953 | 0.3720 | | 0.4048 | 0.3832 | | 0.40480 | 0.38320 |
| | 0.3915 | 0.3768 | | 0.3889 | 0.3690 | | 0.3981 | 0.3800 | | 0.39810 | 0.38000 |
| 6F1 | 0.4113 | 0.4001 | 6F2 | 0.4080 | 0.3916 | 6F3 | 0.4186 | 0.4037 | 6F4 | 0.41500 | 0.39500 |
| | 0.4146 | 0.4089 | | 0.4113 | 0.4001 | | 0.4222 | 0.4127 | | 0.41860 | 0.40370 |
| | 0.4222 | 0.4127 | | 0.4186 | 0.4037 | | 0.4299 | 0.4165 | | 0.42590 | 0.40730 |
| | 0.4186 | 0.4037 | | 0.4150 | 0.3950 | | 0.4259 | 0.4073 | | 0.42210 | 0.39840 |
| | 0.4113 | 0.4001 | | 0.4080 | 0.3916 | | 0.4186 | 0.4037 | | 0.41500 | 0.39500 |
| 6G1 | 0.4048 | 0.3832 | 6G2 | 0.4017 | 0.3751 | 6G3 | 0.4116 | 0.3865 | 6G4 | 0.40820 | 0.37820 |
| | 0.4080 | 0.3916 | | 0.4048 | 0.3832 | | 0.4150 | 0.3950 | | 0.41160 | 0.38650 |
| | 0.4150 | 0.3950 | | 0.4116 | 0.3865 | | 0.4221 | 0.3984 | | 0.41830 | 0.38980 |
| | 0.4116 | 0.3865 | | 0.4082 | 0.3782 | | 0.4183 | 0.3898 | | 0.41470 | 0.38140 |
| | 0.4048 | 0.3832 | | 0.4017 | 0.3751 | | 0.4116 | 0.3865 | | 0.40820 | 0.37820 |

5-4. 4000K

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|
| 5B1 | 0.3719 | 0.3797 | 5B2 | 0.3702 | 0.3722 | 5B3 | 0.3782 | 0.3837 | 5B4 | 0.37630 | 0.37600 |
| | 0.3736 | 0.3874 | | 0.3719 | 0.3797 | | 0.3802 | 0.3916 | | 0.37820 | 0.38370 |
| | 0.3802 | 0.3916 | | 0.3782 | 0.3837 | | 0.3869 | 0.3958 | | 0.38470 | 0.38770 |
| | 0.3782 | 0.3837 | | 0.3763 | 0.3760 | | 0.3847 | 0.3877 | | 0.38250 | 0.37980 |
| | 0.3719 | 0.3797 | | 0.3702 | 0.3722 | | 0.3782 | 0.3837 | | 0.37630 | 0.37600 |
| 5C1 | 0.3686 | 0.3649 | 5C2 | 0.3670 | 0.3578 | 5C3 | 0.3744 | 0.3685 | 5C4 | 0.37260 | 0.36120 |
| | 0.3702 | 0.3722 | | 0.3686 | 0.3649 | | 0.3763 | 0.3760 | | 0.37440 | 0.36850 |
| | 0.3763 | 0.3760 | | 0.3744 | 0.3685 | | 0.3825 | 0.3798 | | 0.38040 | 0.37210 |
| | 0.3744 | 0.3685 | | 0.3726 | 0.3612 | | 0.3804 | 0.3721 | | 0.37830 | 0.36460 |
| | 0.3686 | 0.3649 | | 0.3670 | 0.3578 | | 0.3744 | 0.3685 | | 0.37260 | 0.36120 |
| 5F1 | 0.3847 | 0.3877 | 5F2 | 0.3825 | 0.3798 | 5F3 | 0.3912 | 0.3917 | 5F4 | 0.38870 | 0.38360 |
| | 0.3869 | 0.3958 | | 0.3847 | 0.3877 | | 0.3937 | 0.4001 | | 0.39120 | 0.39170 |
| | 0.3937 | 0.4001 | | 0.3912 | 0.3917 | | 0.4006 | 0.4044 | | 0.39780 | 0.39580 |
| | 0.3912 | 0.3917 | | 0.3887 | 0.3836 | | 0.3978 | 0.3958 | | 0.39500 | 0.38750 |
| | 0.3847 | 0.3877 | | 0.3825 | 0.3798 | | 0.3912 | 0.3917 | | 0.38870 | 0.38360 |
| 5G1 | 0.3804 | 0.3721 | 5G2 | 0.3783 | 0.3646 | 5G3 | 0.3863 | 0.3758 | 5G4 | 0.38400 | 0.36810 |
| | 0.3825 | 0.3798 | | 0.3804 | 0.3721 | | 0.3887 | 0.3836 | | 0.38630 | 0.37580 |
| | 0.3887 | 0.3836 | | 0.3863 | 0.3758 | | 0.3950 | 0.3875 | | 0.39240 | 0.37940 |
| | 0.3863 | 0.3758 | | 0.3840 | 0.3681 | | 0.3924 | 0.3794 | | 0.38980 | 0.37160 |
| | 0.3804 | 0.3721 | | 0.3783 | 0.3646 | | 0.3863 | 0.3758 | | 0.38400 | 0.36810 |

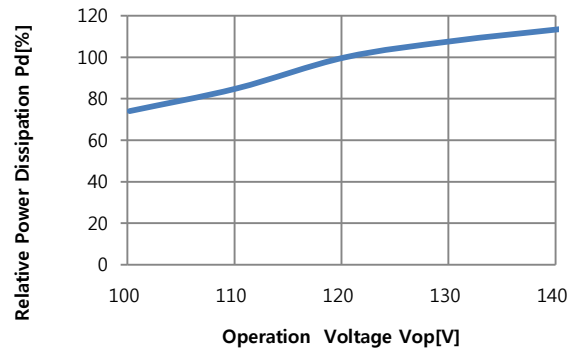
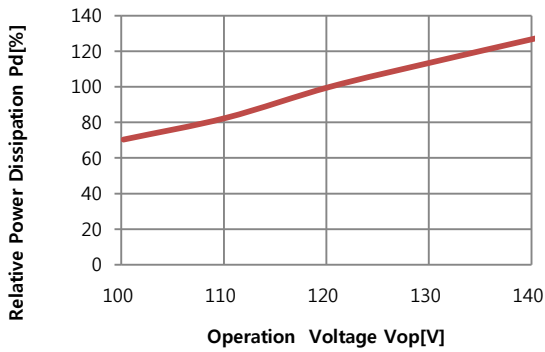
5-5. 5000K

| Region | x | y | Region | x | y | Region | x | y | Region | x | y |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|
| 3B1 | 0.3374 | 0.3553 | 3B2 | 0.3371 | 0.3490 | 3B3 | 0.3415 | 0.3587 | 3B4 | 0.34110 | 0.35220 |
| | 0.3376 | 0.3616 | | 0.3374 | 0.3553 | | 0.3420 | 0.3652 | | 0.34153 | 0.35868 |
| | 0.3420 | 0.3652 | | 0.3415 | 0.3587 | | 0.3463 | 0.3687 | | 0.34570 | 0.36205 |
| | 0.3415 | 0.3587 | | 0.3411 | 0.3522 | | 0.3457 | 0.3621 | | 0.34510 | 0.35540 |
| | 0.3374 | 0.3553 | | 0.3371 | 0.3490 | | 0.3415 | 0.3587 | | 0.34110 | 0.35220 |
| 3C1 | 0.3369 | 0.3430 | 3C2 | 0.3366 | 0.3369 | 3C3 | 0.3407 | 0.3460 | 3C4 | 0.34030 | 0.33980 |
| | 0.3371 | 0.3490 | | 0.3369 | 0.3430 | | 0.3411 | 0.3522 | | 0.34070 | 0.34600 |
| | 0.3411 | 0.3522 | | 0.3407 | 0.3460 | | 0.3451 | 0.3554 | | 0.34455 | 0.34905 |
| | 0.3407 | 0.3460 | | 0.3403 | 0.3398 | | 0.3446 | 0.3491 | | 0.34400 | 0.34270 |
| | 0.3369 | 0.3430 | | 0.3366 | 0.3369 | | 0.3407 | 0.3460 | | 0.34030 | 0.33980 |
| 3F1 | 0.3457 | 0.3621 | 3F2 | 0.3451 | 0.3554 | 3F3 | 0.3500 | 0.3655 | 3F4 | 0.34920 | 0.35870 |
| | 0.3463 | 0.3687 | | 0.3457 | 0.3621 | | 0.3507 | 0.3724 | | 0.34995 | 0.36553 |
| | 0.3507 | 0.3724 | | 0.3500 | 0.3655 | | 0.3551 | 0.3760 | | 0.35420 | 0.36900 |
| | 0.3500 | 0.3655 | | 0.3492 | 0.3587 | | 0.3542 | 0.3690 | | 0.35330 | 0.36200 |
| | 0.3457 | 0.3621 | | 0.3451 | 0.3554 | | 0.3500 | 0.3655 | | 0.34920 | 0.35870 |
| 3G1 | 0.3446 | 0.3491 | 3G2 | 0.3440 | 0.3427 | 3G3 | 0.3485 | 0.3522 | 3G4 | 0.34775 | 0.34570 |
| | 0.3451 | 0.3554 | | 0.3446 | 0.3491 | | 0.3492 | 0.3587 | | 0.34848 | 0.35220 |
| | 0.3492 | 0.3587 | | 0.3485 | 0.3522 | | 0.3533 | 0.3620 | | 0.35240 | 0.35535 |
| | 0.3485 | 0.3522 | | 0.3478 | 0.3457 | | 0.3524 | 0.3554 | | 0.35150 | 0.34870 |
| | 0.3446 | 0.3491 | | 0.3440 | 0.3427 | | 0.3485 | 0.3522 | | 0.34775 | 0.34570 |

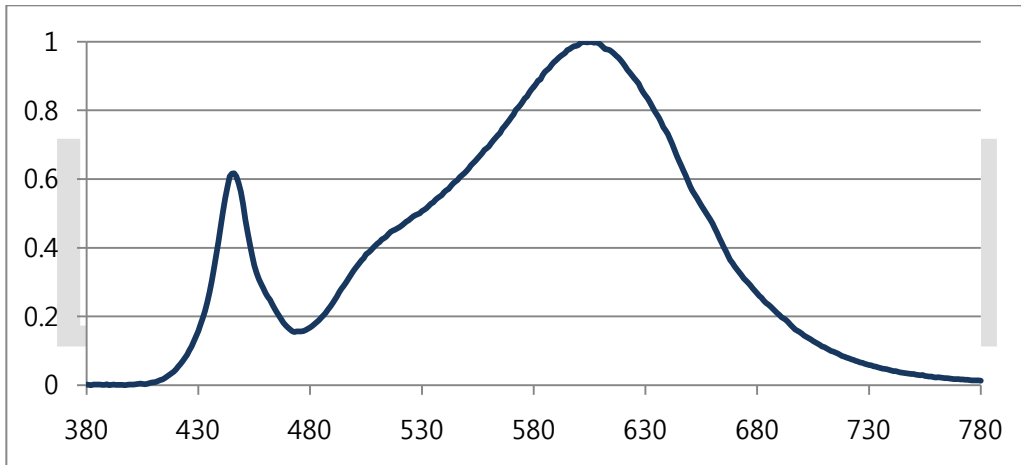


6. Characteristic Graphs

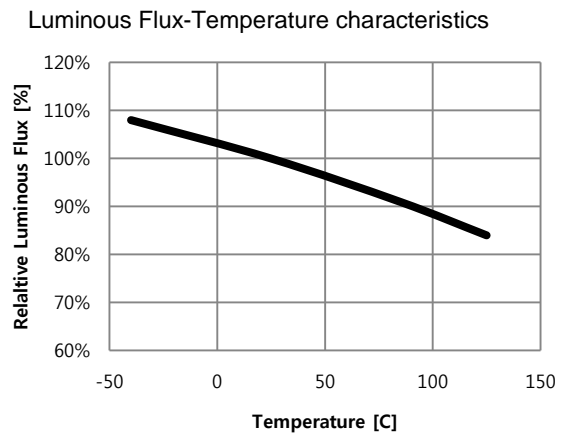
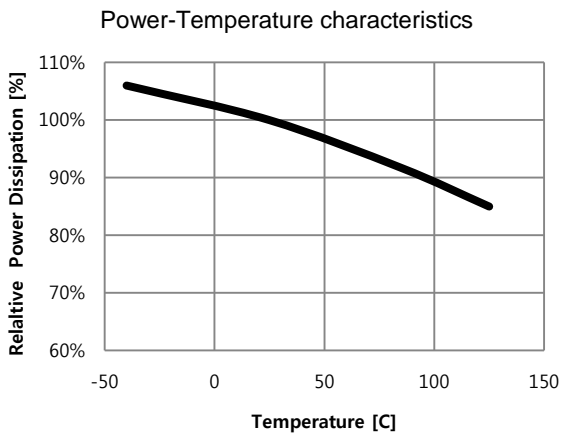
6-1 Voltage Characteristics(Ta=25°C)



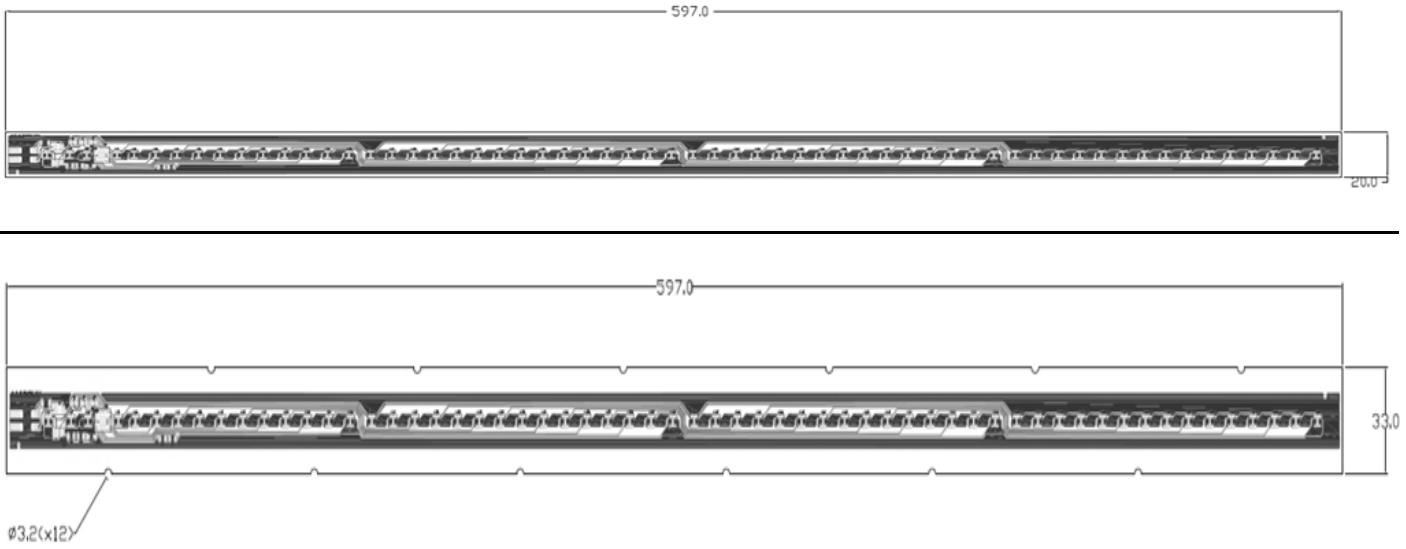
6-2 Spectrum Characteristics(Ta=25°C)



6-3 Temperature Characteristics



7. Outline Dimensions



Unit : mm

- 1) Outline diameter : 597 X 20 / 597X33
- 2) Tolerance - All measurements are ± 0.3 mm unless otherwise indicated.

LUMENS

9. Part List

| No. | Part | Location No. | Specification | Quantity |
|-----|--------------|--------------|-----------------------------------|----------|
| 1 | PCB | N/A | FR4 PCB 1.6T, 1 Copper Layer(1oz) | 1 |
| 2 | LED | LED 1~60 | 3535 Convex | 60 |
| 3 | IC | U1 | PT7030X 6x6 | 1 |
| 4 | Bridge Diode | D1 | MB6S | 1 |
| 5 | Connector | J1 | 1041880290 | 1 |
| 6 | Fuse | F1 | 2A AC 125V | 1 |
| 7 | Zener Diode | ZD1 | BZT52C7V5 | 1 |
| 8 | Resister | R1 | 3216 _ 47K Ohm | 1 |
| 9 | Resister | R3 | 3216 _ 10K Ohm | 1 |
| 10 | Resister | RS1 | 3216 _ 15 Ohm | 1 |
| 11 | Resister | RS2 | 3216 _ 15 Ohm | 1 |
| 12 | Resister | RT1 ~ RT2 | 3216 _ 150 Ohm | 2 |

LUMENS

10. Reliability test items and conditions

| Item | Reference | Test Conditions | Duration / Cycle | Number of Damaged |
|---|-----------------------|---|------------------|-------------------|
| Thermal Shock | EIAJ ED-4701 | Ta =-40°C (30min) ~ 100°C (30min) | 150 Cycle | 0/4 |
| Operating Endurance Test | Internal Reference | Ta =25°C, Vop = 120 V | 1000 Hours | 0/4 |
| High Temperature High Humidity Life Test | Internal Reference | Ta =60°C, RH=90%, Vop = 120 V | 500 Hours | 0/4 |
| High Temperature Life Test | Internal Reference | Ta = 60°C, Vop = 120 V | 500 Hours | 0/4 |
| ESD | | Air : 8kV Contact:4kV In the complete luminaire | 20 Time | 0/2 |

◆ CRITERIA FOR JUDGING THE DAMAGE

| Item | Symbol | Criteria for Judgment | | Condition |
|-------------------|----------|-----------------------|---------------|-------------|
| | | MIN | MAX | |
| Power Dissipation | Pd | - | USL (1) × 1.1 | Vop = 120 V |
| Luminous Flux | Φ_v | LSL (2) × 0.7 | - | Vop = 120 V |

(1) USL : Upper Standard Level

(2) LSL : Lower Standard Level

11. Cautions

- ◆ The LED Module itself and all its components may not be mechanically stressed.
- ◆ Make sure proper discharge prior to starting work.
- ◆ DO NOT touch any of the circuit board, components or terminals with body or metal while circuit is active.
- ◆ Installation of LED Module needs to be made with regard to all applicable electrical and safety standards. Only qualified personnel should be allowed to perform installation.
- ◆ DO NOT add or change wires while circuit is active.
- ◆ DO NOT make any modification on module.
- ◆ DO NOT use adhesives to attach the LED that outgas organic vapor.
- ◆ DO NOT use together with the materials containing Sulfur.
- ◆ The LED Module needs to be mounted on a heat sink providing adequate thermal dissipation.
- ◆ DO NOT exceed the values given in this specification
- ◆ Be cautious when soldering to board so as not to create a short between different trace patterns.
- ◆ Keep cautions not to apply higher voltage above the maximum rating. Otherwise damage may occur.
- ◆ Pay attention not to exceed the maximum operation temperature of 90 °C at the Tc Point when the modules are used in an enclosed environment.
- ◆ Maximum operating temperature for warranty coverage is 70 °C.
- ◆ DO NOT assemble in conditions of high moisture and/or oxidizing gas such as Cl, H₂S, NH₃, SO₂, NO_x, etc.
- ◆ The module should also not be installed in end equipment without ESD (Electrical Static Discharge) protection.
- ◆ Damage by corrosion will not be allowed as defect claim. Lumens LED Module is recommended for Indoor use only.
- ◆ Great care should be taken not to see directly the operated lighting LED. If not the intense light should cause the damage to eye. Use proper goggles to protect your eyes during operation.
- ◆ Long time exposure to sunlight or UV can cause the lens to discolor.
- ◆ Moisture-Proof package
 1. When moisture is absorbed into the LED light engine it may vaporize and expand products during manufacturing. There is a possibility that this may cause exfoliation of the contacts and damage to the optical characteristics of the LEDs. For this reason, the moisture-proof pack is used to keep moisture to a minimum in the package.
 2. A pack of a moisture-absorbent material (silica gel) is inserted into the shielding bag. The silica gel changes its color from blue to pink as it absorbs moisture.
- ◆ Storage Conditions
 1. Before opening the package: The LED light engines should be kept at 30 °C or less and 90% RH or less. The LED light engines should be used within a year. When storing the LED light engines, moisture-proof packaging with moisture-absorbent material (silica gel) is recommended.
 2. After opening the package: The LED light engines should be kept at 30 °C or less and 70% RH or less. The LEDs should be soldered within 168 hours (7 days) after opening the package. If unused LED light engines remain, they should be stored in moisture-proof packages, such as sealed containers with packages of moisture-absorbent material (silica gel). It is also recommended to return the LED light engines to the original moisture-proof bag and to reseal the moisture-proof bag again.
 3. Please avoid rapid transitions in ambient temperature, especially in high humidity environments where condensation can occur.

NOTE :

All the information published by Lumens is considered to be accurate and reliable. However Lumens does not warrant that product descriptions or other contents in this data sheet is accurate, complete, reliable, current, or error-free. Lumens disclaims any and all warranties and liabilities of an kind, including without limitation, warranties of non-infringement or implied warranty of merchantability of fitness for a particular purpose. The appearance and specifications of the product can be changed to improve quality, performance and/or design without advance notice. Lumens products are not authorized for use as critical components in life support devices or systems without the express written approval from the managing director of Lumens.