

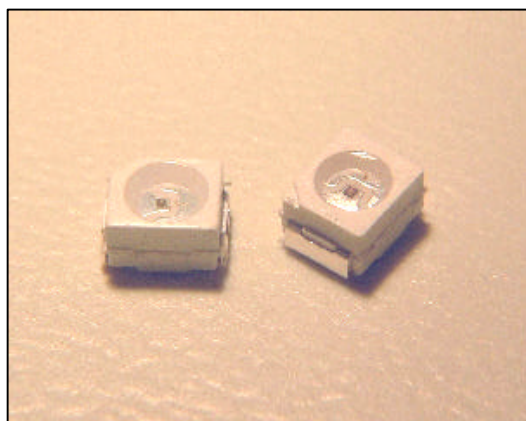
MSL-204B/UB/MB	MSL-204UG
MSL-204TG/UTG/MTG	MSL-204UYL
MSL-204W	MSL-204SO
MSL-204UW	MSL-204UOL
MSL-204MW	MSL-204DR
MSL-204HW	MSL-204TUOL
	MSL-204TUYL

Technical Data ALLEDs

01/07/2003

Features

- **Package** : white P-LCC-2 package with clear epoxy
- **Feature of the device** : extremely wide viewing angle; ideal for backlighting and coupling in light guides
- **Wavelength** : 640 nm (red), 625 nm (red), 605 nm (orange), 590 nm (amber), 573nm (green), 525 nm (true green), 470 nm (blue)
- **Viewing angle** : Lambertian Emitter (120°)
- **Technology** : AlGaAs (red)
AlInGaP (red, orange, amber, green)
InGaN (True green, blue)
- **Optical efficiency** : 1.5 lm/W (super-red, orange, yellow), 2.5 lm/W (green), 0.6 lm/W (pure green)
- **Grouping parameter** : luminous intensity
- **Assembly methods** : suitable for all SMT assembly methods
- **Soldering methods** : IR reflow soldering and TTW soldering
- **Preconditioning** : acc. to JEDEC Level 2
- **Taping** : 8-mm tape with 2000/reel, ϕ 180mm

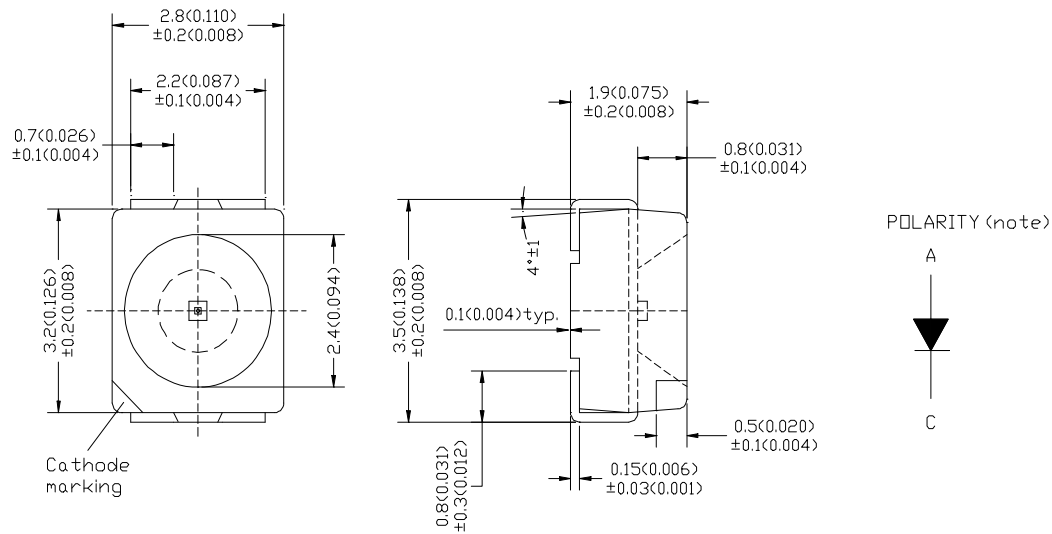


Applications

- **Automotive** : Dashboards , stop lamps , turn signals
- **Backlighting** : LCDs , Key pads , advertising
- **Lighting** : Signal & symbol luminare , marker lights
Substitution of micor incandescent lamps
- **Displays** : Indoor & outdoor signboards ,
Message boards
- **Status indicators** : Comsumer & industrial electronics

Package Dimensions

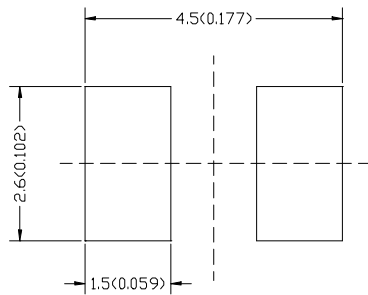
Unit : mm (inch)



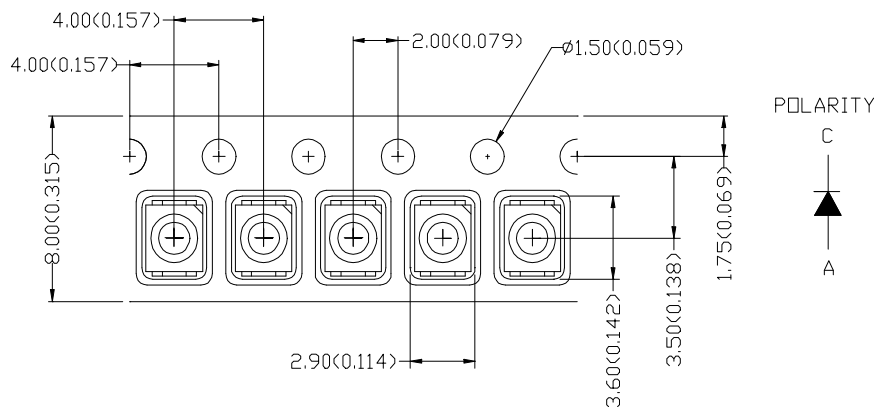
Notes :

1. All dimensions are in millimeters (inches)
2. Polarity of MSL-204DR is inverted

Recommended Solder Patterns



Method of Taping / Polarity and Orientation Packing unit 2000/reel



Notes :

1. All dimensions are in millimeters (inches)
2. Polarity of MSL-204DR is inverted

Selection Guide

Part Number	Color of Emission	Color of the Light Emitting Area	Luminous Intensity I_V (mcd) @ 20mA	Luminous Flux F_V (lm) @ 20mA
MSL-204B	Blue	Colorless clear	40	120
MSL-204UB	Blue		80	230
MSL-204MB	Blue		120	345
MSL-204TG	Green		140	410
MSL-204UTG	Green		280	810
MSL-204MTG	Green		500	1440
MSL-204UG	Yellow-Green		80	230
MSL-204UYL	Yellow		120	350
MSL-204SO	Orange		150	440
MSL-204UOL	Red		150	440
MSL-204DR	Red		50	150
MSL-204TUYL	Yellow		180	520
MSL-204TUOL	Red		300	870
MSL-204W	White		130	380
MSL-204UW	White		200	580
MSL-204MW	White		400	1160
MSL-204HW	White		200	580

Luminous Intensity Groups

C1 : 0.28 ~ 0.36	P1 : 45 ~ 56
C2 : 0.36 ~ 0.45	P2 : 56 ~ 71
D1 : 0.45 ~ 0.56	Q1 : 71 ~ 90
D2 : 0.56 ~ 0.71	Q2 : 90 ~ 112
E1 : 0.71 ~ 0.90	R1 : 112 ~ 140
E2 : 0.90 ~ 1.12	R2 : 140 ~ 180
F1 : 1.12 ~ 1.40	S1 : 180 ~ 224
F2 : 1.40 ~ 1.80	S2 : 224 ~ 280
G1 : 1.80 ~ 2.24	T1 : 280 ~ 355
G2 : 2.24 ~ 2.80	T2 : 355 ~ 450
H1 : 2.80 ~ 3.55	U1 : 450 ~ 560
H2 : 3.55 ~ 4.50	U2 : 560 ~ 710
J1 : 4.50 ~ 5.60	V1 : 710 ~ 900
J2 : 5.60 ~ 7.10	V2 : 900 ~ 1120
K1 : 7.10 ~ 9.00	AA : 1120 ~ 1400
K2 : 9.00 ~ 11.20	AB : 1400 ~ 1800
L1 : 11.20 ~ 14.00	BA : 1800 ~ 2240
L2 : 14.00 ~ 18.00	BB : 2240 ~ 2800
M1 : 18.00 ~ 22.40	CA : 2800 ~ 3550
M2 : 22.40 ~ 28.00	CB : 3550 ~ 4500
N1 : 28.00 ~ 35.50	DA : 4500 ~ 5600
N2 : 35.50 ~ 45.00	DB : 5600 ~ 7100

Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of +/- 11%

Maximum Ratings

Parameter	Symbol	Value		Unit
		UOL,SO UYL,UG TUYL,TUOL	B,UB,MB TG,UTG MTG	
Operating Temp. range	T_{OP}	-40 ~ +100		°C
Storage Temp. range	T_{stg}	-40 ~ +100		°C
Junction temperature	T_j	125	110	°C
Forward current	I_F	30		mA
Surge current $t \leq 10\text{ms}$, $D=0.005$	I_{FM}	0.5		A
Reverse Voltage	V_R	5		V
Power dissipation	P_{tot}	80	85	mW
Thermal resistance (Junction/ambient)	$R_{th JA}$	500	400	K/W
Thermal resistance (Junction/soldering point)	$R_{th JS}$	280	180	K/W

mounted on PC board FR4 (pad size 16 mm²)

Optical Characteristics at T_A=25°C

Part Number	Luminous Intensity I _V (mcd) @ 20mA		Peak Wavelength I _{peak} (nm)	Color, Dominant Wavelength I _d (nm)	Viewing Angle 2q 1/2 (Degrees)	Optical Efficiency @I _F =20mA (lm / W)	Temperature Coefficient of V _F @I _F =20mA, T _{cv} (mV / K)	Spectral Bandwidth at 50% I _{rel} max (nm)
	Min.	Typ.	Typ.	Typ.	Typ.			
MSL-204B	22.4	40	468	470	120	2	-2.6	26
MSL-204UB	35.5	80	468	470	120	3	-2.6	26
MSL-204MB	70	120	468	470	120	6	-1.6	27
MSL-204TG	71	140	523	525	120	6	-3.1	36
MSL-204UTG	140	280	518	525	120	11	-3.1	35
MSL-205MTG	280	500	518	525	121	18	-3.1	35
MSL-204UG	35.5	80	576	572	120	6	-2.6	16
MSL204UYL	56	120	592	590	120	9	-2.3	16
MSL-204SO	71	150	611	605	120	11	-2.3	20
MSL-204UOL	71	150	633	625	120	11	-2.3	20
MSL-204DR	28	50	657	640	120	4	-2.5	20
MSL-204TUYL	90	180	594	592	120	9	-2.3	16
MSL-204TUOL	140	300	633	625	120	11	-2.3	20

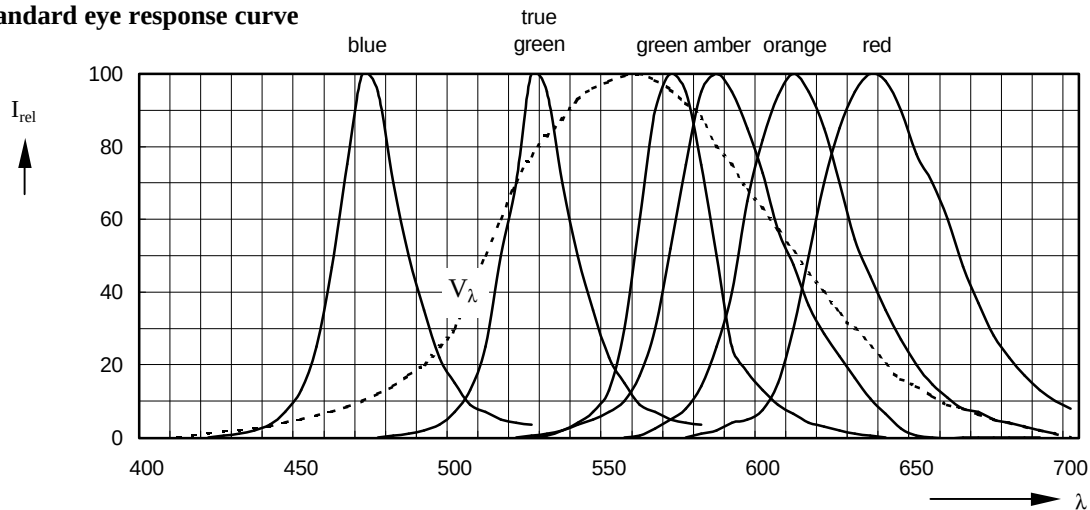
Part Number	Luminous Intensity I _V (mcd) @ 20mA	Chromaticity Coordinates (Typ.)		Viewing Angle 2q 1/2 (Degrees)	Optical Efficiency @I _F =20mA (lm / W)	Temperature Coefficient of V _F @I _F =20mA, T _{cv} (mV / K)
		x	y			
	Typ.	Typ.	Typ.	Typ.		
MSL-204W	130	0.33	0.33	120	4	-2.6
MSL-204UW	200	0.33	0.33	120	6	-2.6
MSL-204MW	400	0.33	0.33	120	6	-2.6
MSL-204HW	200	0.33	0.33	120	5	-2.6

Device Type	Forward Voltage V _F (Volts) @I _F = 20mA			Reverse Current I _R (uA) @ V _R = 5V		Thermal Resistance R _{qJ-S} (°C/W)	Thermal Resistance R _{qJ-A} (°C/W)
	Min.	Typ.	Max	Min.	Typ.	Typ.	Typ.
MSL-204B	-	3.5	4.0	0.01	10	180	400
MSL-204UB	-	3.5	4.0	0.01	10	180	400
MSL-204MB	-	3.5	4.0	0.01	10	180	400
MSL-204TG	-	3.5	4.0	0.01	10	180	400
MSL-204UTG	-	3.5	4.0	0.01	10	180	400
MSL-204MTG	-	3.5	4.0	0.01	10	180	400
MSL-204UG	-	2.0	2.5	0.01	10	280	500
MSL-204UYL	-	2.0	2.5	0.01	10	280	500
MSL-204SO	-	2.0	2.5	0.01	10	280	500
MSL-204UOL	-	2.0	2.5	0.01	10	280	500
MSL-204DR	-	1.8	2.4	0.01	10	280	500
MSL-204TUYL	-	2.0	2.7	0.01	10	280	500
MSL-204TUOL	-	2.0	2.7	0.01	10	280	500
MSL-204W		3.5	4.0	0.01	10	180	400
MSL-204UW		3.5	4.0	0.01	10	180	400
MSL-204MW		3.5	4.0	0.01	10	180	400
MSL-204HW		3.4	4.0	0.01	50	180	400

Voltages are tested at a current pulse dration of 1 ms and a accuracy of ±0.05V

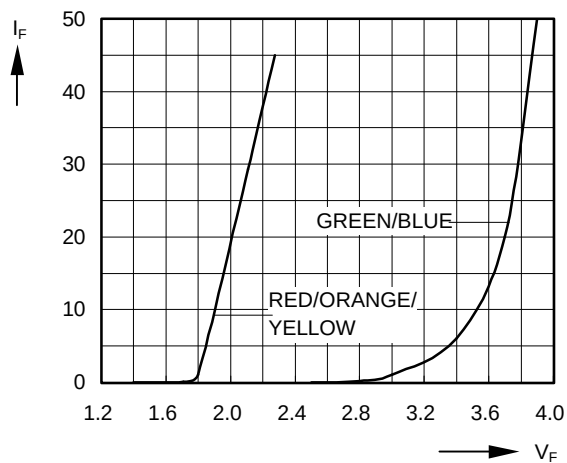
Relative spektrale Emission $I_{rel} = f(\lambda)$, $T_A = 25^\circ\text{C}$, $I_F = 20\text{mA}$

$V(\lambda)$ = Standard eye response curve



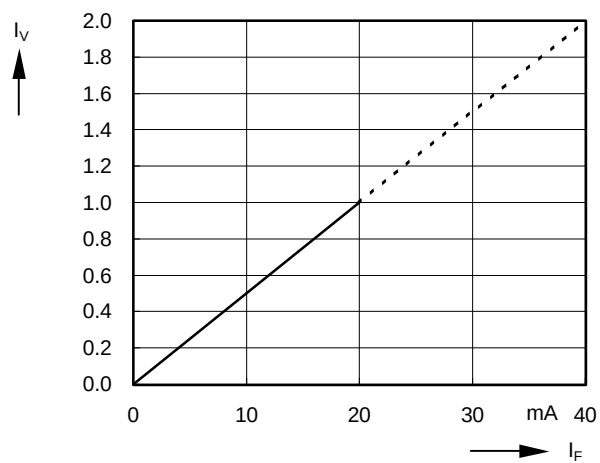
Forward Current $I_F = f(V_F)$

$T_A = 25^\circ\text{C}$

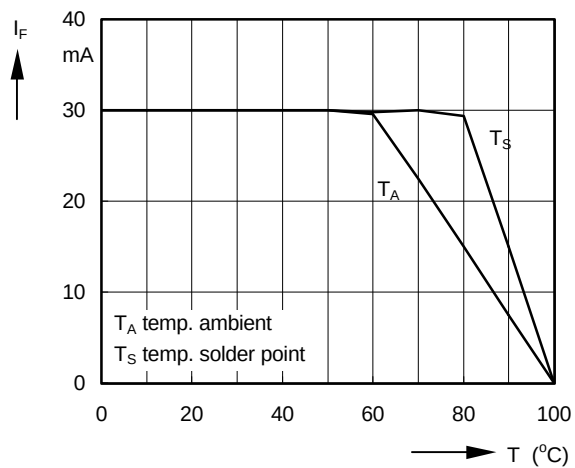


Relative Luminous Intensity $I_V/I_V(20\text{mA}) = f(I_F)$

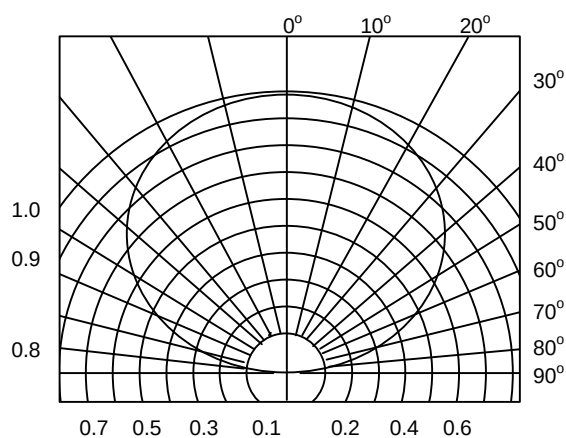
$T_A = 25^\circ\text{C}$



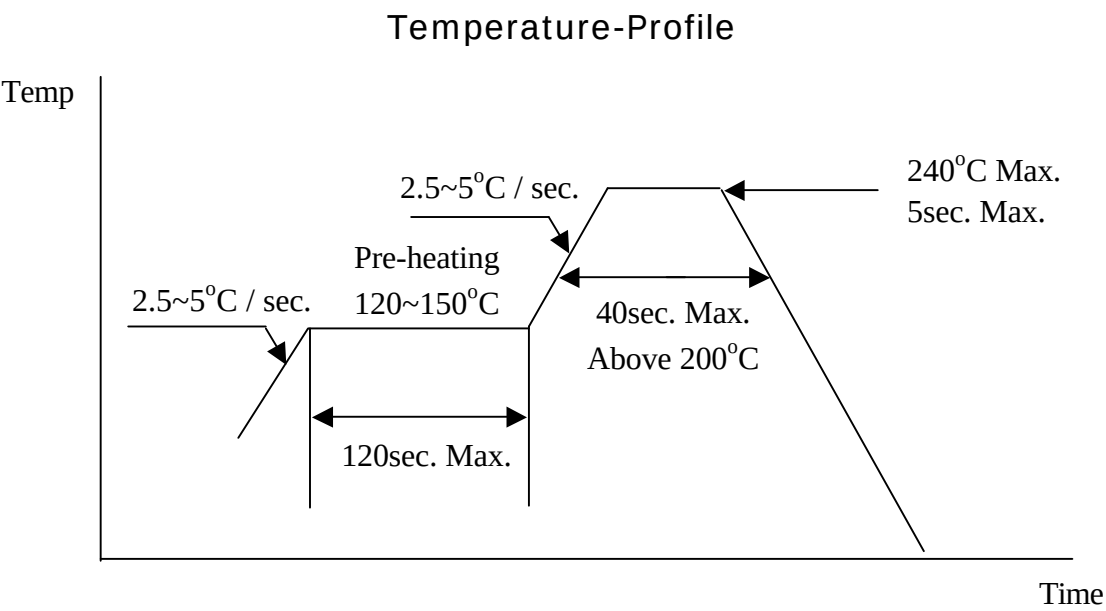
Max. Permissible Forward Current $I_F = f(T_A)$



Radiation Characteristic $I_{rel} = f(j)$



IR Reflow Soldering Profile



Unity ALLED Bin Codes

Category Code	
C	B

Luminous Intensity Group	
C1 : 0.28 ~ 0.36	P1 : 45 ~ 56
C2 : 0.36 ~ 0.45	P2 : 56 ~ 71
D1 : 0.45 ~ 0.56	Q1 : 71 ~ 90
D2 : 0.56 ~ 0.71	Q2 : 90 ~ 112
E1 : 0.71 ~ 0.90	R1 : 112 ~ 140
E2 : 0.90 ~ 1.12	R2 : 140 ~ 180
F1 : 2.12 ~ 1.40	S1 : 180 ~ 224
F2 : 1.40 ~ 1.80	S2 : 224 ~ 280
G1 : 1.80 ~ 2.24	T1 : 280 ~ 355
G2 : 2.24 ~ 2.80	T2 : 355 ~ 450
H1 : 2.80 ~ 3.55	U1 : 450 ~ 560
H2 : 3.55 ~ 4.50	U2 : 560 ~ 710
J1 : 4.50 ~ 5.60	V1 : 710 ~ 900
J2 : 5.60 ~ 7.10	V2 : 900 ~ 1120
K1 : 7.10 ~ 9.00	AA : 1120 ~ 1400
K2 : 9.00 ~ 11.20	AB : 1400 ~ 1800
L1 : 11.20 ~ 14.00	BA : 1800 ~ 2240
L2 : 14.00 ~ 18.00	BB : 2240 ~ 2800
M1 : 18.00 ~ 22.40	CA : 2800 ~ 3550
M2 : 22.40 ~ 28.00	CB : 3550 ~ 4500
N1 : 28.00 ~ 35.50	DA : 4500 ~ 5600
N2 : 35.50 ~ 45.00	DB : 5600 ~ 7100

Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of +/- 11%

Dominant Wavelength (in nanometers) @ I _F =20mA							
P/N \ BIN		A		B		C	
		minimum	maximum	minimum	maximum	minimum	maximum
UOL	Red	615	621	621	627	627	633
TG	Green	519	525	525	531	531	537
B	Blue	464	468	468	472	472	476

Wavelength groups are tested at a current pulse duration of 25 ms and an accuracy of +/- 1nm

Unity White ALLED Bin Codes

Category Code	
C	B

Luminous Intensity Group	
MSL-204W	MSL-204MW
MSL-204UW	MSL-204HW
C1 : 0.28 ~ 0.36	P1 : 45 ~ 56
C2 : 0.36 ~ 0.45	P2 : 56 ~ 71
D1 : 0.45 ~ 0.56	Q1 : 71 ~ 90
D2 : 0.56 ~ 0.71	Q2 : 90 ~ 112
E1 : 0.71 ~ 0.90	R1 : 112 ~ 140
E2 : 0.90 ~ 1.12	R2 : 140 ~ 180
F1 : 2.12 ~ 1.40	S1 : 180 ~ 224
F2 : 1.40 ~ 1.80	S2 : 224 ~ 280
G1 : 1.80 ~ 2.24	T1 : 280 ~ 355
G2 : 2.24 ~ 2.80	T2 : 355 ~ 450
H1 : 2.80 ~ 3.55	U1 : 450 ~ 560
H2 : 3.55 ~ 4.50	U2 : 560 ~ 710
J1 : 4.50 ~ 5.60	V1 : 710 ~ 900
J2 : 5.60 ~ 7.10	V2 : 900 ~ 1120
K1 : 7.10 ~ 9.00	AA : 1120 ~ 1400
K2 : 9.00 ~ 11.20	AB : 1400 ~ 1800
L1 : 11.20 ~ 14.00	BA : 1800 ~ 2240
L2 : 14.00 ~ 18.00	BB : 2240 ~ 2800
M1 : 18.00 ~ 22.40	CA : 2800 ~ 3550
M2 : 22.40 ~ 28.00	CB : 3550 ~ 4500
N1 : 28.00 ~ 35.50	DA : 4500 ~ 5600
N2 : 35.50 ~ 45.00	DB : 5600 ~ 7100

Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of $\pm 11\%$

Dominant Wavelength (in nanometers) @ $I_F=20\text{mA}$								
Bin Code	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
NA	0.264	0.317	0.283	0.353	0.283	0.305	0.264	0.267
NB	0.264	0.267	0.283	0.305	0.296	0.276	0.280	0.248
NC	0.283	0.353	0.330	0.400	0.330	0.380	0.283	0.325
ND	0.285	0.325	0.330	0.380	0.330	0.360	0.283	0.305
NE	0.283	0.305	0.330	0.360	0.330	0.339	0.287	0.295
NF	0.287	0.295	0.330	0.339	0.330	0.318	0.296	0.276
NG	0.296	0.276	0.330	0.318	0.33	0.298	0.296	0.256
NH	0.330	0.400	0.361	0.415	0.361	0.385	0.330	0.360
NI	0.330	0.360	0.361	0.385	0.361	0.351	0.330	0.318

Chromaticity coordinate groups are tested at a current pulse duration of 25 ms and a tolerance of ± 0.01

Surface Mount Moisture Sensitivity Specifications

1. Controlling Moisture

Unity Opto Technology, in its design of packing materials and packing methods, takes into consideration the susceptibility of some Unity packages to moisture induced damage. The risk of this damage is caused when the LED lens plastic encapsulation material is exposed to increases or decreases in the Relative Humidity of the surrounding environment.

Such damage may include delamination between the die and the LED lens plastic encapsulation material, which may result in open connections due to broken wire bonds. Moisture in the package having reached a critical level will fracture the package in order to escape when exposed to peak temperature conditions, typical in soldering practices.

Therefore, the control of moisture levels in the LED package is critical to reduce the risk of moisture-induced failures. Please follow JEDEC-STD-033A standards for handling moisture sensitive devices.

2. Packaging SMD devices:

Unity packages all SMD devices into dry pack bags (moisture barrier bags).

Unity includes a desiccant pouch in each bag. Testing confirms that the desiccant pouch greatly reduces the presence of moisture by maintaining the environment in the bag, thus protecting the devices during shipment and storage.

3. Handling Dry Packed Parts

Upon receipt, the bags should be inspected for damage to ensure that the bag's integrity has been maintained. Inspection should verify that there are no holes, gouges, tears, or punctures of any kind that may expose the contents of the bag.

To open the bag, simply cut across the top of the bag as close to the original seal as possible being careful not to damage the contents. Once open the desired quantity of units should be removed and the bag resealed. If the bag is left open longer than 2 hours, the desiccant pouch should be replaced with a dry desiccant and the bag should be sealed immediately to avoid moisture damage.