

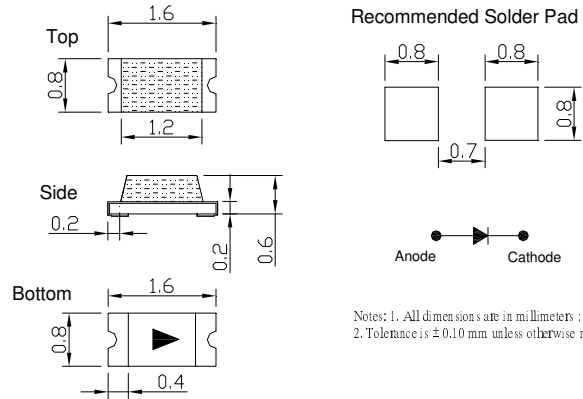
■Features

- Single chip
- Super high brightness of surface mount LED
- Sorting for I_v and V_f @ 5mA of I_f
- Compact package outline
(LxWxT) of 1.6mm x 0.8mm x 0.6mm
- Compatible to IR reflow soldering.

■Applications

- Backlighting (switches, keys, etc.)
- Marker lights (e.g. steps, exit ways, etc.)
-

■Outline Dimension



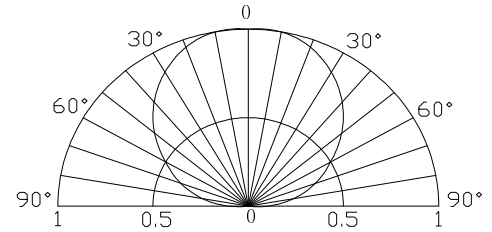
■Absolute Maximum Rating

($T_a=25^\circ\text{C}$)

Item	Symbol	Value		Unit
		WT/BL/TG/YG	YL/OR/HR	
DC Forward Current	I_F	20	20	mA
Pulse Forward Current*	I_{FP}	100	100	mA
Reverse Voltage	V_R	5	5	V
Power Dissipation	P_D	68	48	mW
Operating Temperature	T_{opr}	$-40 \sim +85$		$^\circ\text{C}$
Storage Temperature	T_{stg}	$-40 \sim +85$		$^\circ\text{C}$
Lead Soldering Temperature	T_{sol}	$260^\circ\text{C}/5\text{sec}$		-

*Pulse width Max 0.1ms, Duty ratio max 1/10

■Directivity



■Electrical -Optical Characteristics

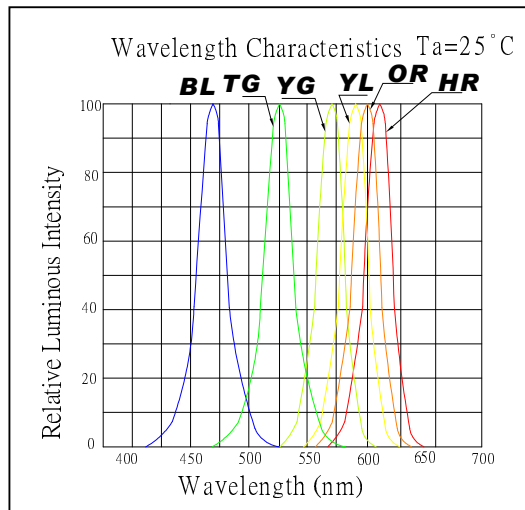
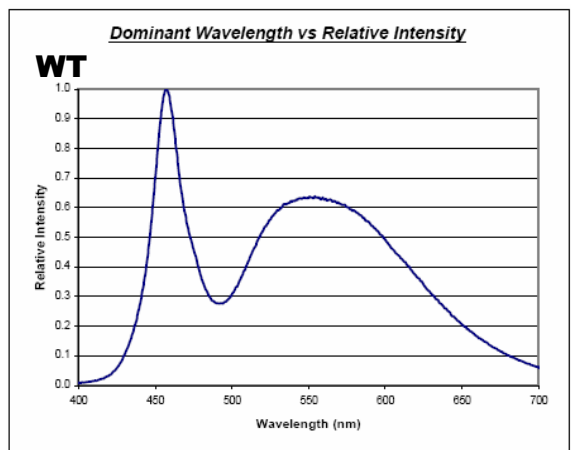
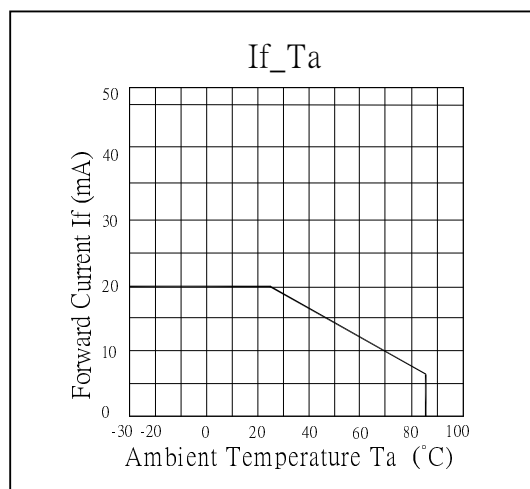
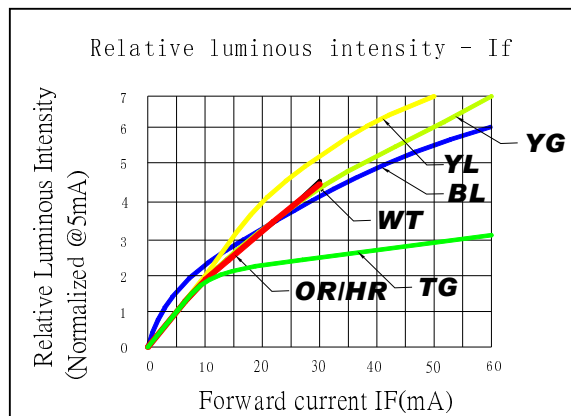
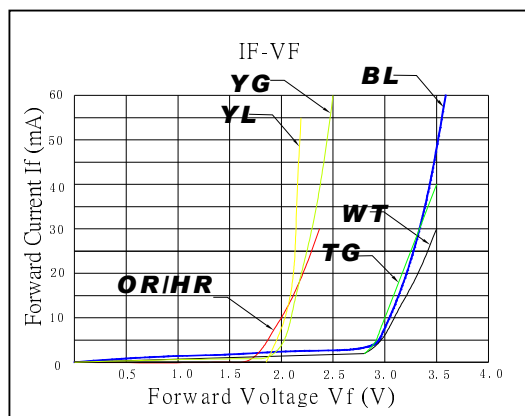
($T_a=25^\circ\text{C}$)

Part Number	Color			V_F (V)			I_R (μA)	I_v (mcd)			λ_D (nm)			$2\theta_{1/2}$ (deg)
				Min.	Typ.	Max.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Typ.
				$I_F=5\text{mA}$			$V_R=5\text{V}$	$I_F=5\text{mA}$			$I_F=5\text{mA}$			
OSM50603C1E	Warm white	M5		2.5	2.8	3.4	100	60	-	160	X=0.44, Y=0.41			120
OSW50603C1E	White	W5		2.5	2.8	3.4	100	100	-	200	X=0.27, Y=0.28			120
OSK40603C1E	Pink	K4		2.5	2.8	3.4	100	50	-	100	X=0.31, Y=0.20			120
OSVX0603C1E	Violet	VX		2.5	2.8	3.4	100	70	-	130	X=0.20, Y=0.09			120
OSB50603C1E	Blue	B5		2.5	2.8	3.4	100	14	-	40	455	470	475	120
OSG50603C1E	True Green	G5		2.5	2.8	3.4	100	120	-	220	520	525	530	120
OSG80603C1E	Yellow green	G8		1.6	1.8	2.4	100	5	-	15	565	570	575	120
OSY50603C1E	Yellow	Y5		1.6	1.8	2.4	100	15	-	50	585	590	595	120
OSO50603C1E	Orange	O5		1.6	1.8	2.4	100	15	-	50	600	605	610	120
OSR50603C1E	Red	R5		1.6	1.8	2.4	100	15	-	50	617	625	630	120

Note: * V_f tolerance: $\pm 0.05\text{V}$ * Dominant wavelength tolerance: $\pm 1\text{nm}$ * Luminous intensity is NIST reading. Luminous intensity tolerance: $\pm 10\%$

■ Optical and electrical characteristics

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES



■ OSG50603C1E Rank

1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	127	152
2	152	182
3	182	218

2. VF(IF=5mA)

Rank	Min (V)	Max (V)
1	2.5	2.6
2	2.6	2.7
3	2.7	2.8
4	2.8	2.9
5	2.9	3.0

3.WD(IF=5mA)

Rank	Min (nm)	Max (nm)
1	521	524
2	524	527
3	527	530

■ OSM50603C1E Rank

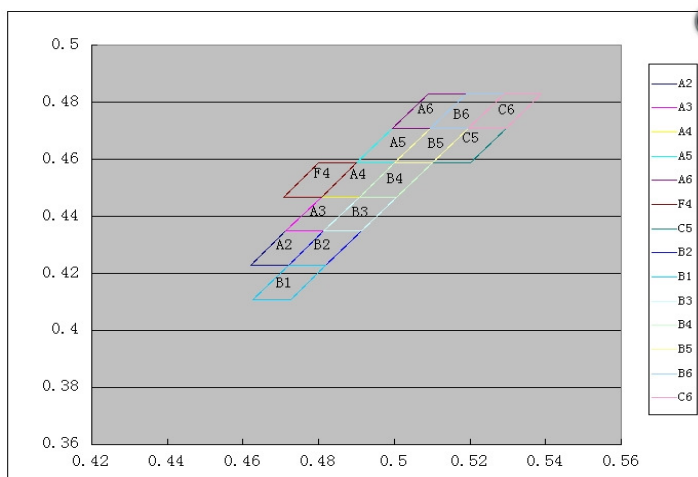
1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	73	88
2	88	106
3	106	127
4	127	152

2. VF(IF=5mA)

Rank	Min (V)	Max (V)
1	2.6	2.7
2	2.7	2.8
3	2.8	2.9
4	2.9	3.0
5	3.0	3.1

3. X, Y (IF=5mA)



Rank	X1	X2	X3	X4	Y1	Y2	Y3	Y4
A2	0.462	0.4714	0.4814	0.472	0.4227	0.4347	0.4347	0.4227
A3	0.4714	0.4807	0.4907	0.4814	0.4347	0.4467	0.4467	0.4347
A4	0.4807	0.4901	0.5001	0.4907	0.4467	0.4587	0.4587	0.4467
A5	0.4901	0.4995	0.5095	0.5001	0.4587	0.4707	0.4707	0.4587
A6	0.4995	0.5089	0.5189	0.5095	0.4707	0.4827	0.4827	0.4707
B1	0.4626	0.472	0.482	0.4726	0.4107	0.4227	0.4227	0.4107
B2	0.472	0.4814	0.4914	0.482	0.4227	0.4347	0.4347	0.4227
B3	0.4814	0.4907	0.5007	0.4914	0.4347	0.4467	0.4467	0.4347
B4	0.4907	0.5001	0.5101	0.5007	0.4467	0.4587	0.4587	0.4467
B5	0.5001	0.5095	0.5195	0.5101	0.4587	0.4707	0.4707	0.4587
B6	0.5095	0.5189	0.5289	0.5195	0.4707	0.4827	0.4827	0.4707
C5	0.5101	0.5195	0.5295	0.5201	0.4587	0.4707	0.4707	0.4587
C6	0.5195	0.5289	0.5389	0.5295	0.4707	0.4827	0.4827	0.4707
F4	0.4707	0.4801	0.4901	0.4807	0.4467	0.4587	0.4587	0.4467

■ OSW50603C1E Rank

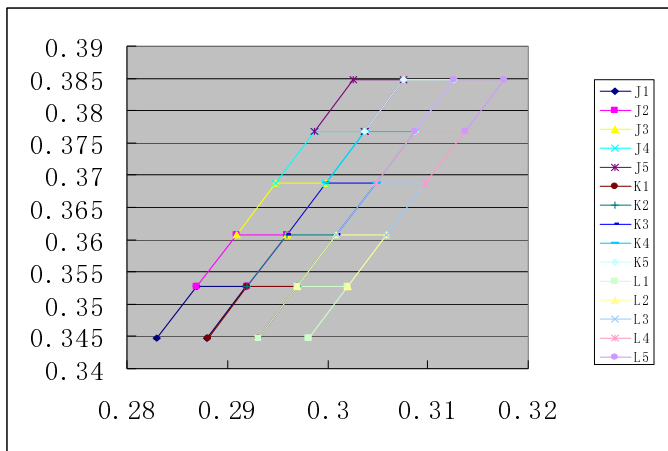
1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	100	120
2	120	144
3	144	170
4	170	200

2. VF(IF=5mA)

ank	Min (V)	Max (V)
1	2.6	2.7
2	2.7	2.8
3	2.8	2.9
4	2.9	3.0
5	3.0	3.1

3. X, Y (IF=5mA)



Rank	X1	X2	X3	X4	Y1	Y2	Y3	Y4
L1	0.2931	0.297	0.302	0.2981	0.3447	0.3527	0.3527	0.3447
L2	0.2970	0.3009	0.3059	0.302	0.3527	0.3607	0.3607	0.3527
L3	0.3009	0.3048	0.3098	0.3059	0.3607	0.3687	0.3687	0.3607
L4	0.3048	0.3087	0.3137	0.3098	0.3687	0.3767	0.3767	0.3687
L5	0.3087	0.3126	0.3176	0.3137	0.3767	0.3847	0.3847	0.3767
K1	0.2881	0.2920	0.2970	0.2931	0.3447	0.3527	0.3527	0.3447
K2	0.2920	0.2959	0.3009	0.297	0.3527	0.3607	0.3607	0.3527
K3	0.2959	0.2998	0.3048	0.3009	0.3607	0.3687	0.3687	0.3607
K4	0.2998	0.3037	0.3087	0.3048	0.3687	0.3767	0.3767	0.3687
K5	0.3037	0.3076	0.3126	0.3087	0.3767	0.3847	0.3847	0.3767
J1	0.2830	0.2869	0.2919	0.288	0.3447	0.3527	0.3527	0.3447
J2	0.2870	0.2909	0.2959	0.292	0.3527	0.3607	0.3607	0.3527
J3	0.2909	0.2948	0.2998	0.2959	0.3607	0.3687	0.3687	0.3607
J4	0.2948	0.2987	0.3037	0.2998	0.3687	0.3767	0.3767	0.3687
J5	0.2987	0.3026	0.3076	0.3037	0.3767	0.3847	0.3847	0.3767

■ OSK40603C1E Rank

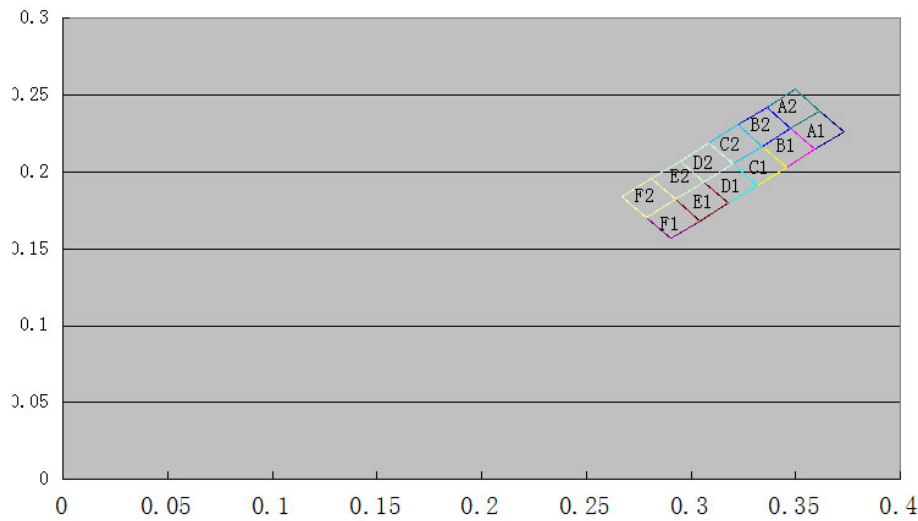
1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	50	60
2	60	72
3	72	85
4	85	100

2. VF(IF=5mA)

Rank	Min (V)	Max (V)
1	2.6	2.7
2	2.7	2.8
3	2.8	2.9
4	2.9	3.0
5	3.0	3.1

3. X, Y (IF=5mA)



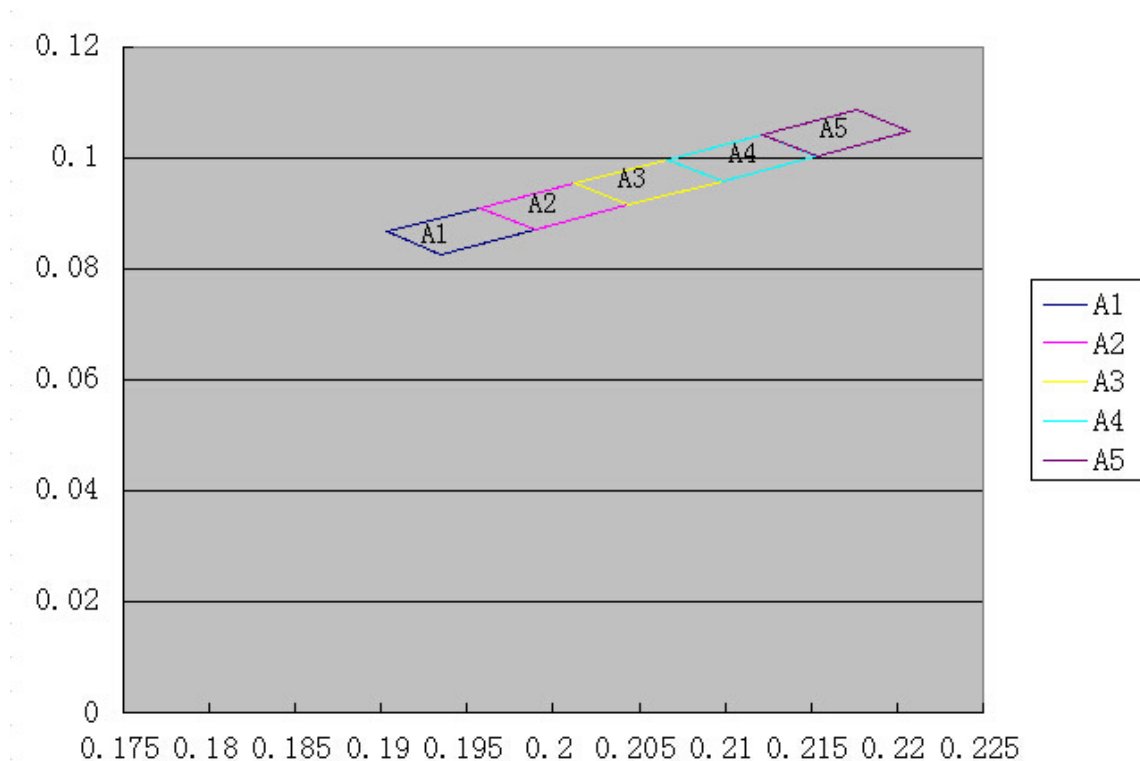
Rank	X1	X2	X3	X4	Y1	Y2	Y3	Y4
F2	0.2672	0.281	0.2926	0.2788	0.1845	0.1961	0.1823	0.1707
E2	0.281	0.2948	0.3063	0.2926	0.1961	0.2076	0.1939	0.1823
D2	0.2948	0.3086	0.3201	0.3063	0.2076	0.2192	0.2054	0.1939
C2	0.3086	0.3224	0.3339	0.3201	0.2192	0.2308	0.217	0.2054
B2	0.3224	0.3361	0.3477	0.3339	0.2308	0.2424	0.2286	0.217
A2	0.3361	0.3499	0.3615	0.3477	0.2424	0.2539	0.2401	0.2286
F1	0.2788	0.2926	0.3041	0.2903	0.1707	0.1823	0.1685	0.1569
E1	0.2926	0.3063	0.3179	0.3041	0.1823	0.1939	0.1801	0.1685
D1	0.3063	0.3201	0.3317	0.3179	0.1939	0.2054	0.1916	0.1801
C1	0.3201	0.3339	0.3455	0.3317	0.2054	0.217	0.2032	0.1916
B1	0.3339	0.3477	0.3593	0.3455	0.217	0.2286	0.2148	0.2032
A1	0.3477	0.3615	0.3731	0.3593	0.2286	0.2401	0.2263	0.2148

■ OSVX0603C1E Rank
1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	70	85
2	85	100
3	100	115
4	115	130

2. VF(IF=5mA)

ank	Min (V)	Max (V)
1	2.6	2.7
2	2.7	2.8
3	2.8	2.9
4	2.9	3.0
5	3.0	3.1

3. X, Y (IF=5mA)


Rank	X1	X2	X3	X4	Y1	Y2	Y3	Y4
A1	0.1904	0.1958	0.199	0.1935	0.0866	0.091	0.0871	0.0827
A2	0.1958	0.2013	0.2044	0.199	0.091	0.0954	0.0915	0.0871
A3	0.2013	0.2067	0.2099	0.2044	0.0954	0.0998	0.0959	0.0915
A4	0.2067	0.2122	0.2153	0.2099	0.0998	0.1042	0.1003	0.0959
A5	0.2122	0.2177	0.2208	0.2154	0.1043	0.1087	0.1048	0.1004

■ OSB50603C1E Rank

1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	17	21
2	21	25
3	25	30
4	30	36
5	36	40

2. VF(IF=5mA)

Rank	Min (V)	Max (V)
1	2.6	2.7
2	2.7	2.8
3	2.8	2.9
4	2.9	3.0
5	3.0	3.1

3.WD(IF=5mA)

Rank	Min (nm)	Max (nm)
1	457	460
2	460	463
3	463	466
4	466	469
5	469	472
6	472	475

■ OSO50603C1E Rank

1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	17	20
2	20	24
3	24	29
4	29	35
5	35	42

2. VF(IF=5mA)

Rank	Min (V)	Max (V)
1	1.7	1.8
2	1.8	1.9
3	1.9	2.0
4	2.0	2.1
5	2.1	2.2

3.WD(IF=5mA)

Rank	Min (nm)	Max (nm)
1	600	602
2	602	604
3	604	606
4	606	608
5	608	610

■ OSR50603C1E Rank

1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	17	20
2	20	24
3	24	29
4	29	35
5	35	42

2. VF(IF=5mA)

Rank	Min (V)	Max (V)
1	1.7	1.8
2	1.8	1.9
3	1.9	2.0
4	2.0	2.1
5	2.1	2.2

3.WD(IF=5mA)

Rank	Min (nm)	Max (nm)
1	617	620
2	620	623
3	623	626
4	626	629

■ OSY50603C1E Rank

1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	17	20
2	20	24
3	24	29
4	29	35
5	35	42

2. VF(IF=5mA)

Rank	Min (V)	Max (V)
1	1.7	1.8
2	1.8	1.9
3	1.9	2.0
4	2.0	2.1
5	2.1	2.2

3.WD(IF=5mA)

Rank	Min (nm)	Max (nm)
1	586	588
2	588	590
3	590	592
4	592	594

■ OSG80603C1E Rank

1. IV(IF=5mA)

Rank	Min (mcd)	Max (mcd)
1	5	7
2	7	9
3	9	11
4	11	13
5	13	15

2. VF(IF=5mA)

Rank	Min (V)	Max (V)
1	1.7	1.8
2	1.8	1.9
3	1.9	2.0
4	2.0	2.1
5	2.1	2.2

3.WD(IF=5mA)

Rank	Min (nm)	Max (nm)
1	565	566.5
2	566.5	568
3	568	569.5
4	569.5	571
5	571	572.5
6	572.5	574

■ Recommended Soldering Temperature – Time Profile (Reflow Soldering)

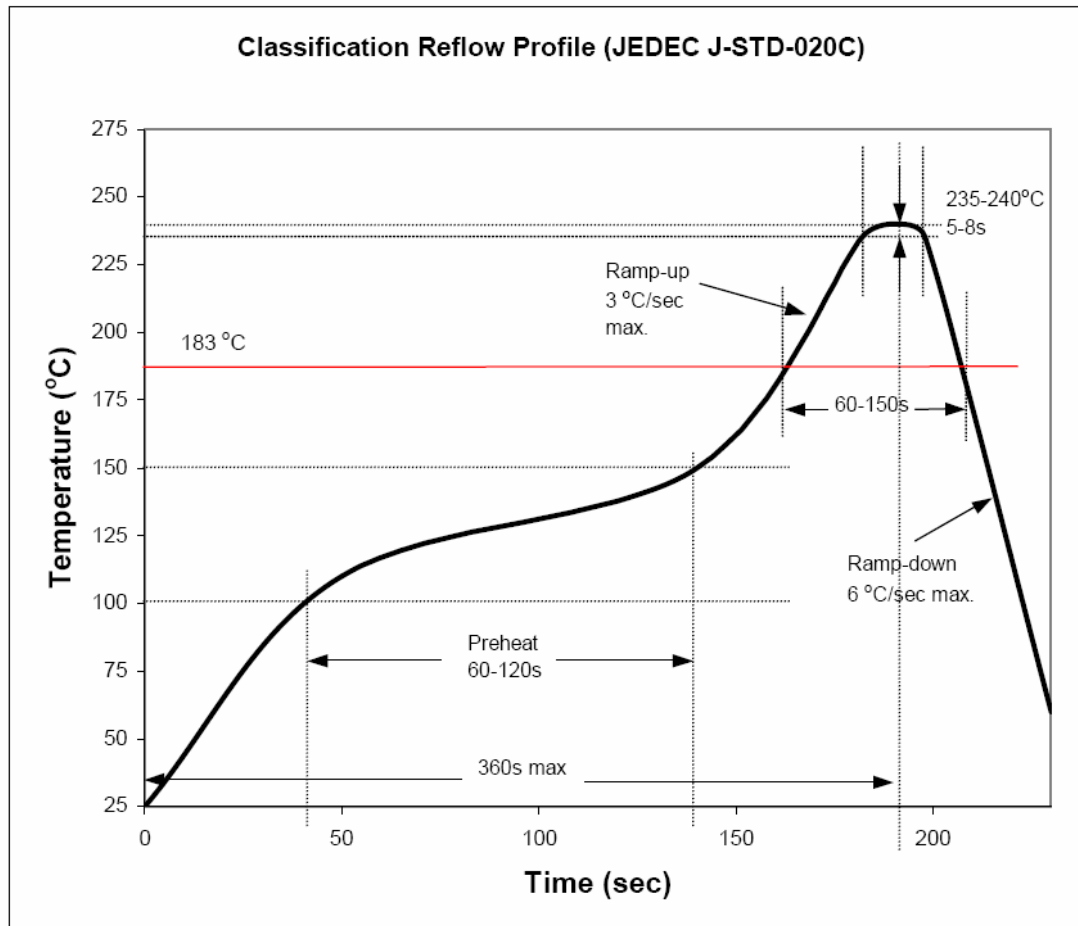
Surface Mounting Condition

In automatic mounting of the SMD LEDs on printed circuit boards, any bending, expanding and pulling forces or shock against the SMD LEDs should be kept min. to prevent them from electrical failures and mechanical damages of the devices.

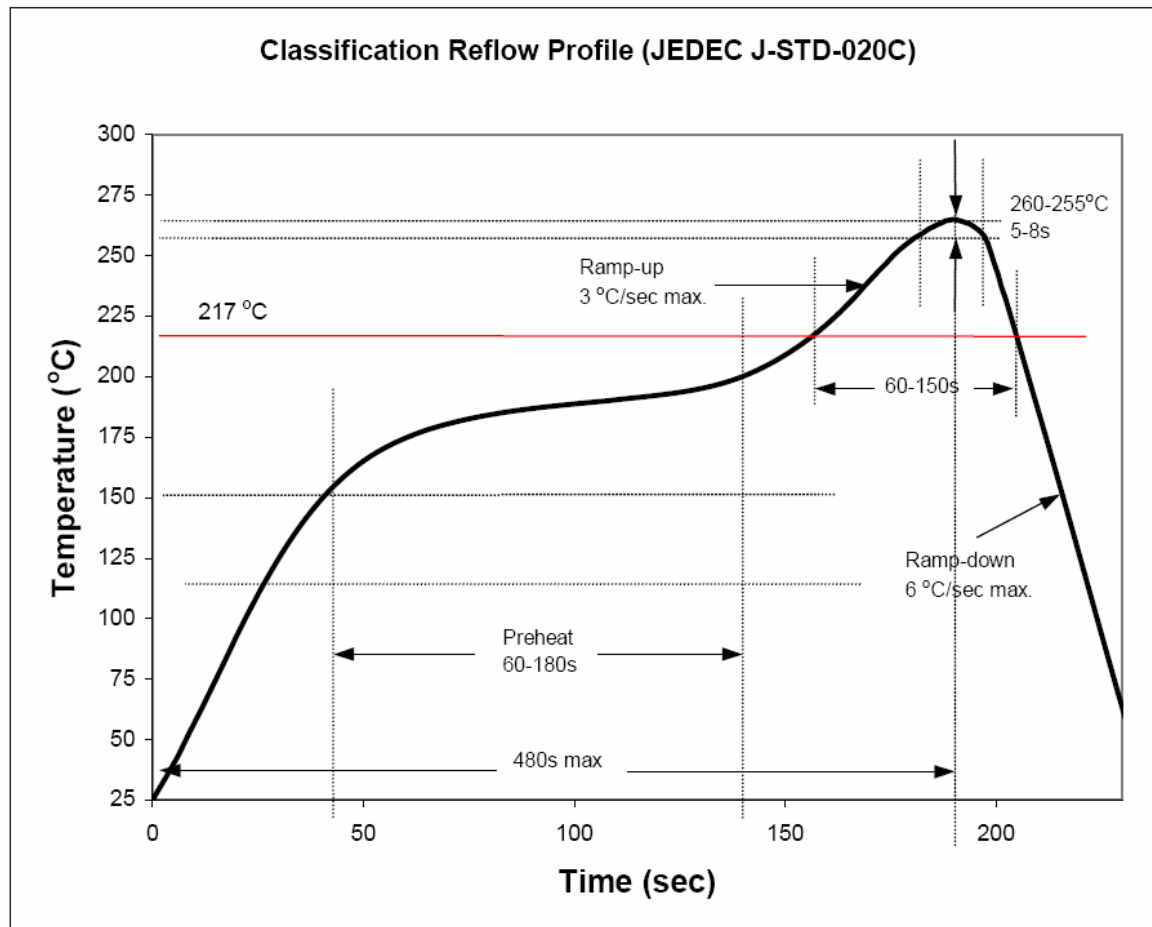
Soldering Reflow

- Soldering of the SMD LEDs should conform to the soldering condition in the individual specifications.
- SMD LEDs are designed for Reflow Soldering.
- In the reflow soldering, too high temperature and too large temperature gradient such as rapid heating/cooling may cause electrical & optical failures and damages of the devices.
- We cannot guarantee the LEDs after they have been assembled using the solder dipping method.

1) Lead Solder



2) Lead-Free Solder



3) Manual Soldering conditions.

- Lead Solder

Max. 300 for Max. 3sec, and only one time. °C

- Lead-free Solder

Max. 350 for Max. 3sec, and only one time. °C

- There is possibility that the brightness of LEDs is decreased, which is influenced by heat or ambient atmosphere during reflow. It is recommended to use the nitrogen reflow method.

- After LEDs have been soldered, repair should not be done. As repair is unavoidable, a double-head soldering iron should be used. It should be confirmed beforehand whether the characteristics of the LEDs will be damaged by repairing or not.

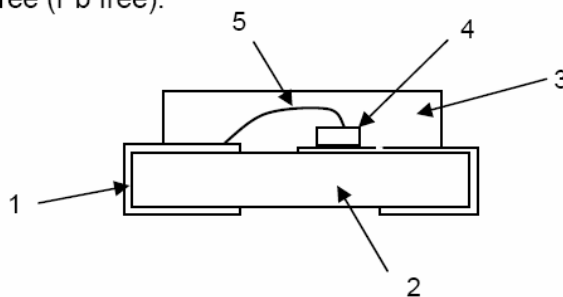
- Reflow soldering should not be done more than two times.

■ Material

White/ Blue/ Yellow green/ Yellow/ Orange/ Red :

	Material
1. Lead-frame. / Soldering Leads	Cu Alloy With Ni, Au Plating.
2. PCB	BT Resin.
3. Encapsulate	Epoxy Resin.
4. Die	AlInGaP based
5. Bonding wire	Au Chip : Ball Bonding / PCB : Ball Bonding

Note: Product is lead-free (Pb free).

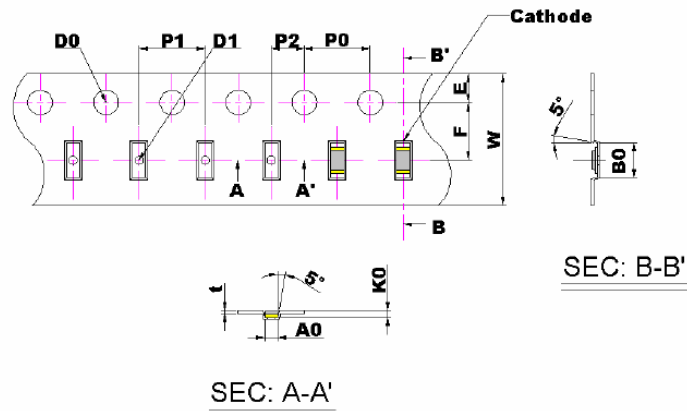


■ Taping and Orientation.

Quantity: 4,000 units/reel

Diameter: 178 mm

General Tolerance : ± 0.1



Item	Spec	Tol.(+/-)	Item	Spec	Tol.(+/-)
W	8.00	± 0.20	P2	2.00	± 0.05
E	1.75	± 0.10	t	0.20	± 0.05
F	3.50	± 0.05	A0	0.95	± 0.05
D0	1.50	+0.10/-0	B0	1.85	± 0.05
D1	0.50	± 0.08	K0	0.50	± 0.05
P0	4.00	± 0.1			
P1	4.00	± 0.1			

Unit : mm

■ Cautions:

1. After open the package, the LED should be kept at 30 °C, 30%RH or less. The LED should be soldered within 24 hours (1 day) after opening the package.
2. Heat generation must be taken into design consideration when using the LED.
3. Power must be applied resistors for protection, over current would be caused the optic damage to the devices and wavelength shift.
4. Manual tip solder may cause the damage to Chip devices, so advised that heat of iron should be lower than 15W with temperature control under 5 seconds at 230-260 deg. C. (The device would be got damage in re working process, recommended under 5 seconds at 230-260 deg. C)
5. All equipment and machinery must be properly grounded. It is recommended to use a wristband or anti-electrostatic glove when handing the LED.
6. Use IPA as a solvent for cleaning the LED. The other solvent may dissolve the LED package and the epoxy, Ultrasonic cleaning should not be done.
7. Damaged LED will show unusual characteristics such as leak current remarkably increase, turn-on voltage becomes lower and the LED get unlight at low current.

■ Reliability Test :

	Test Item	Test Conditions	Time	Test Q'ty	Fail Q'ty	O.K
1	Thermal Cycle Test (168 cycles)	H: +75°C 30 min ~ L: -35°C 30 min	168 Hrs	20	0	Pass
2	Thermal Shock Test (84 cycles, Rate= 5min)	H: +85°C (Holding 1 hr) ~ L: -40°C (Holding 1 hr)	168 Hrs	20	0	Pass
3	High Temp. Storage Test	Temp.: 100°C	168 Hrs	20	0	Pass
4	Low Temp. Storage Test	Temp.: -40°C	168 Hrs	20	0	Pass
5	High Temp. High Humidity Test	85°C/85%RH,	168 Hrs	20	0	Pass
6	Press Cook Test	T=121°C, P=2atms H=100%RH	168 Hrs	20	0	Pass
7	Operating Life Test	IF=20 mA, 25°C	168 Hrs	20	0	Pass
8	IR-Reflow Test	Max 260°C (Pb free condition)	2 Times	10	0	Pass

Conclusions:

The reliability tests were designed to evaluate both package integrity as well as workability of product performance over time.

All samples have done well by completed test requirement and passed all the qualification criteria with zero failure. From design standpoint, the package is robust enough to meet its datasheet conditions. Based on the good result shows on the above test, this product is qualified and released for market.