

OVAL PRECISION OPTICAL PERFORMANCE LED LAMPs

Technical Data

12/27/2002

Description

These Precision Optical Performance oval LEDs are specifically designed for Full Color / Video and Passenger Information signs.

High efficiency LED materials are used in these lamps: Aluminum Indium Gallium Phosphide (AlInGaP) for red, amber and green, and Indium Gallium Nitride (InGaN) for true green and blue.

Designers can select parallel (where the axis of the leads is parallel to the wide axis of the oval radiation pattern) or perpendicular orientation. Designers can also choose between lamps with or without standoffs.

Features

- Smooth, Consistent Spatial Radiation Patterns
- High Luminous Output
- Emitting Colors :
 - 632 nm Ultra Red
 - 625 nm Red
 - 605 nm Orange
 - 590 nm Amber
 - 573 nm Green
 - 525 nm True Green
 - 470 nm Blue
- Superior Resistance to Moisture
- Choice of Package Options

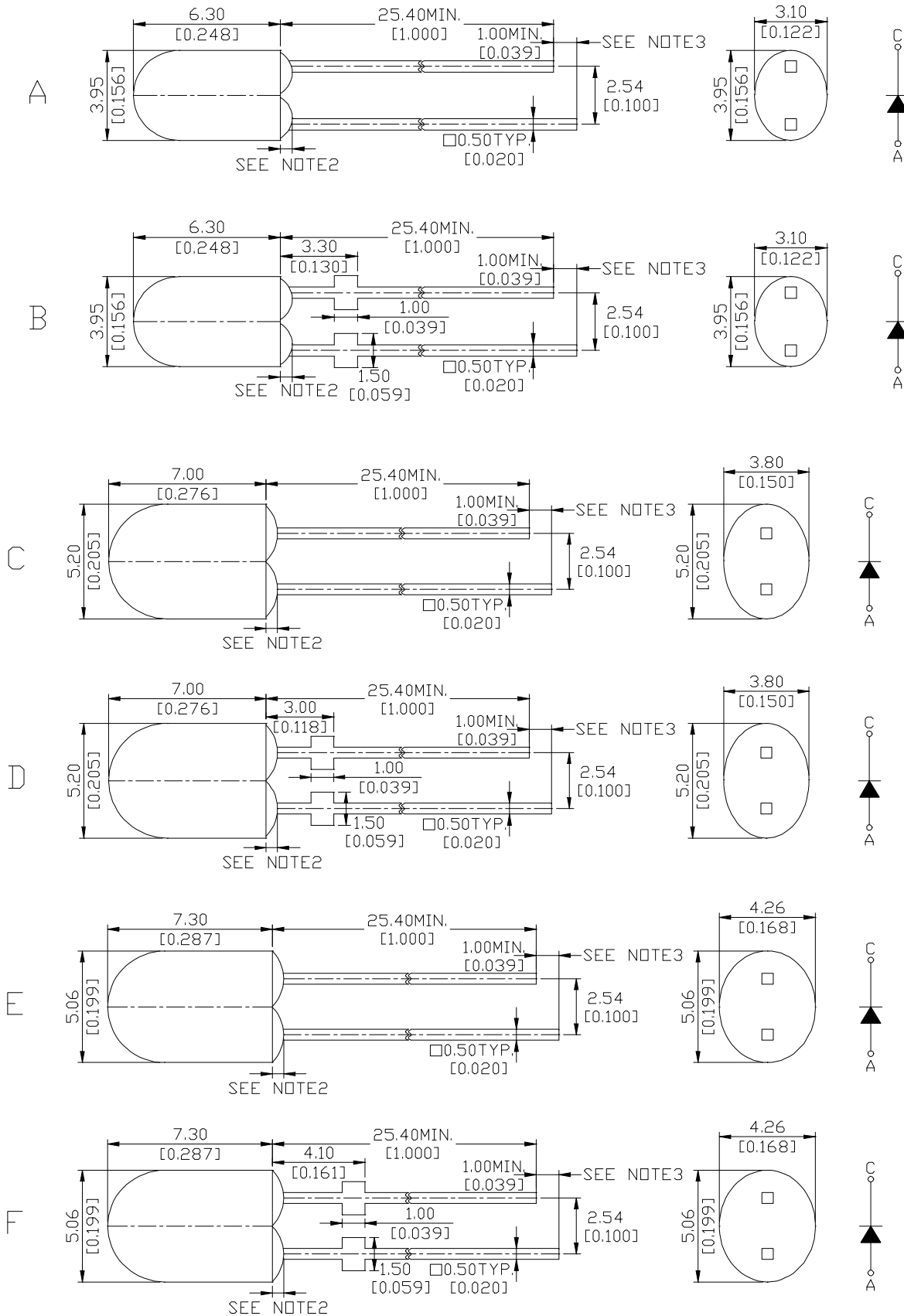
Benefits

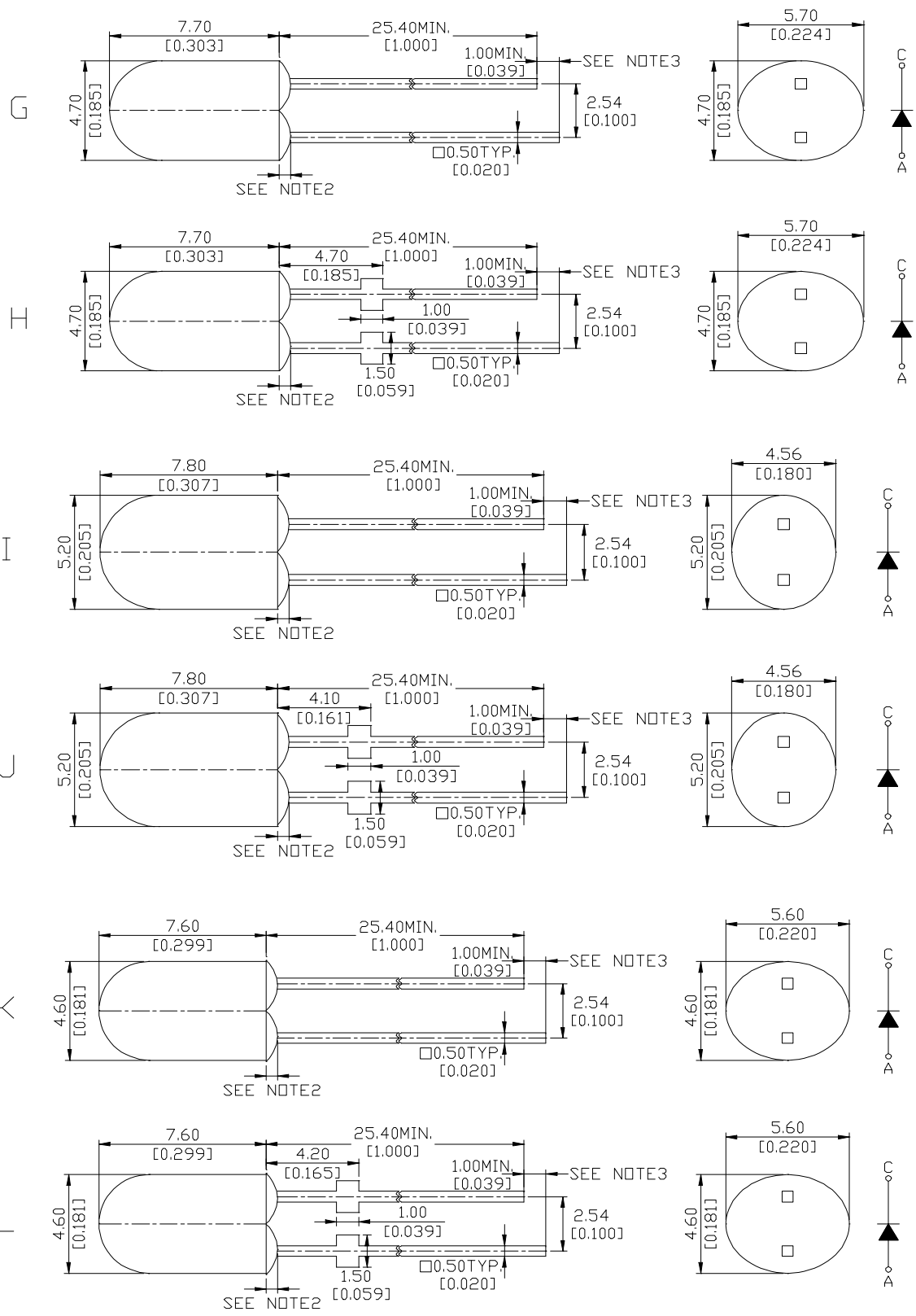
- Viewing Angle Designed for Wide Field of View Applications
- Red, True Green, and Blue Radiation Patterns Matched for Full Color Signs
- Superior Outdoor Environmental Performance

Applications

- Full Color / Video Signs
- Variable Message Signs
 - Passenger Information
 - Advertising
 - Time / Temperature

Package Dimension





- Notes :
1. Tolerance is ± 0.25 mm (.010") unless otherwise noted.
 2. Protruded resin under flange is 1.5 mm (.059") max.
 3. Lead spacing is measured where the leads emerge from the package.

Part Numbering Scheme

MVL-6 A B C D

where A = Leadframe Orientation
and Package Dimension

- "3" = Parallel Leadframe (3.10 X 3.95 mm)
- "5" = Parallel Leadframe (4.26 X 5.06 mm)
- "6" = Perpendicular Leadframe (4.70 X 5.70 mm)
- "7" = Parallel Leadframe (3.80 X 5.20 mm)
- "8" = Parallel Leadframe (4.56 X 5.20 mm)
- "9" = Perpendicular Leadframe (4.60 X 5.60 mm)

where C = Color Option

- "UROK" = 632 nm Ultra Red
- "NUOL" = 625 nm Red
- "UOL" = 625 nm Red
- "TUOL" = 625 nm Red
- "SO" = 605 nm Orange
- "UYL" = 590 nm Amber
- "TUYL" = 590 nm Amber
- "UG" = 573 nm Green
- "HTG / UTG" = 525 nm True Green
- "HB / UB" = 470 nm Blue

where B = Package Color

- "1" = color diffuse
- "2" = diffuse
- "3" = Matching Color
- "4" = Water Clear

where D = Standoff Option

- "N/A" = Without
- "-S" = With Stopper

Absolute Maximum Ratings at T_A=25°C

Parameter	AlInGaP "UROK" "UOL" "SO" "UYL" "TUOL" "TUYL" "UG"	AlInGaP "NUOL"	InGaN "HTG" "HB"	InGaN "UTG" "UB"	Units
DC Forward Current	50	30	30	30	mA
Power Dissipation	105	70	125	125	mW
Peak Forward Current(1/10 Duty Cycle 100 μs pulse width)	100	100	100	100	mA
Reverse Voltage (I _R =100μA)	5	5	5	5	V
Operating Temp Range	-20 to + 85	-20 to + 85	-20 to + 80	-20 to + 80	°C
Storage Temp	-40 to + 100	-40 to + 100	-30 to + 100	-30 to + 100	°C
Electrostatic Discharge Threshold	N/A	N/A	300 ^{NOTE1}	1000	V
Solder Temperature	260°C for 5 seconds [1.5mm (0.06 in.) below seating plane]				

Notes: 1. Product resistance to electrostatic discharge (ESD) is measured by simulating ESD using a rapid avalanche energy test (RAET). The RAET procedures are designed to approximate the maximum ESD ratings shown. Seller gives no other assurances regarding the ability of Products to withstand ESD.

MVL-63XXX

AllnGaP

Device Selection Guide (Red, Orange, Amber, Green)

Part Number	Color and Typical Dominant Wavelength λ_d (nm)	Luminous Intensity Iv(mcd) at $I_F=20mA$		Package Color	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing	Viewing Angle 2 θ 1/2 (Degrees) Typ	
		Min.	Typ.					Major	Minor
MVL-632UOL	Red 625	150	300	diffuse	No	Parallel	A	110	60
MVL-632UOL-S					Yes		B		
MVL-633UOL		150	300	Red	No		A		
MVL-633UOL-S					Yes		B		
MVL-634NUOL		150	300	Water Clear	No		A		
MVL-634NUOL-S					Yes		B		
MVL-634UOL		150	300	Water Clear	No		A		
MVL-634UOL-S					Yes		B		
MVL-633SO	Orange 605	150	300	Orange	No		A		
MVL-633SO-S					Yes		B		
MVL-634SO		150	300	Water Clear	No		A		
MVL-634SO-S					Yes		B		
MVL-633UYL	Amber 590	170	350	Amber	No		A		
MVL-633UYL-S					Yes		B		
MVL-634UYL		170	350	Water Clear	No		A		
MVL-634UYL-S					Yes		B		
MVL-631TUYL		400	450	Amber diffuse	No	A			
MVL-631TUYL-S					Yes	B			
MVL-632TUYL		400	450	diffuse	No	A			
MVL-632TUYL-S					Yes	B			
MVL-634UG	Green 573	100	150	Water Clear	No	A			
MVL-634UG-S					Yes	B			

InGaN

Device Selection Guide (True Green,Blue)

MVL-633HTG	True Green 525	350	650	Green	No	Parallel	A	110	60
MVL-633HTG-S					Yes		B		
MVL-634HTG		350	650	Water Clear	No		A		
MVL-634HTG-S					Yes		B		
MVL-633HB	Blue 470	100	200	Blue	No		A		
MVL-633HB-S					Yes		B		
MVL-634HB		100	200	Water Clear	No		A		
MVL-634HB-S					Yes		B		
MVL-633UTG	True Green 525	250	450	Green	No		A		
MVL-633UTG-S					Yes		B		
MVL-634UTG		250	450	Water Clear	No		A		
MVL-634UTG-S					Yes		B		
MVL-633UB	Blue 470	70	140	Blue	No		A		
MVL-633UB-S					Yes		B		
MVL-634UB		70	140	Water Clear	No		A		
MVL-634UB-S					Yes		B		

MVL-65XXX

AllnGaP

Device Selection Guide (Red, Orange, Amber, Green)

Part Number	Color and Typical Dominant Wavelength λ_d (nm)	Luminous Intensity Iv(mcd) at $I_F=20mA$		Package Color	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing	Viewing Angle $2\theta_{1/2}$ (Degrees)	
		Min.	Typ.					Typ	Major
MVL-653UOL	Red 625	400	600	Red	No	Parallel	E	50	30
MVL-653UOL-S					Yes		F		
MVL-654UOL		400	600	Water Clear	No		E		
MVL-654UOL-S					Yes		F		
MVL-653SO	Orange 605	400	700	Orange	No		E		
MVL-653SO-S					Yes		F		
MVL-654SO		400	700	Water Clear	No		E		
MVL-654SO-S					Yes		F		
MVL-653UYL	Amber 590	500	800	Amber	No		E		
MVL-653UYL-S					Yes		F		
MVL-654UYL		500	800	Water Clear	No		E		
MVL-654UYL-S					Yes		F		
MVL-653UG	Green 573	80	150	Green	No		E		
MVL-653UG-S					Yes		F		
MVL-654UG		80	150	Water Clear	No		E		
MVL-654UG-S					Yes		F		

InGaN

Device Selection Guide (True Green,Blue)

MVL-653HTG	True Green 525	750	1500	Green	No	Parallel	E	50	30
MVL-653HTG-S					Yes		F		
MVL-654HTG		750	1500	Water Clear	No		E		
MVL-654HTG-S					Yes		F		
MVL-653HB	Blue 470	200	400	Blue	No		E		
MVL-653HB-S					Yes		F		
MVL-654HB		200	400	Water Clear	No		E		
MVL-654HB-S					Yes		F		

MVL-66XXX

AllnGaP

Device Selection Guide (Red, Orange, Amber)

Part Number	Color and Typical Dominant Wavelength λ_d (nm)	Luminous Intensity Iv(mcd) at $I_F=20mA$		Package Color	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing	Viewing Angle 2 θ 1/2 (Degrees) Typ	
		Min.	Typ.					Major	Minor
MVL-663UOL	Red 625	200	400	Red	No	Perpendicular	G	80	40
MVL-663UOL-S					Yes		H		
MVL-664UOK		150	300	Ultra Red	No		G		
MVL-664UOK-S					Yes		H		
MVL-664UOL		200	400	Water Clear	No		G		
MVL-664UOL-S					Yes		H		
MVL-663TUOL		400	800	Red	No		G		
MVL-663TUOL-S					Yes		H		
MVL-664TUOL		400	800	Water Clear	No		G		
MVL-664TUOL-S					Yes		H		
MVL-663SO	Orange 605	250	500	Orange	No	G	80	40	
MVL-663SO-S					Yes	H			
MVL-664SO		250	500	Water Clear	No	G			
MVL-664SO-S					Yes	H			
MVL-663UYL	Amber 590	300	600	Amber	No	G	80	40	
MVL-663UYL-S					Yes	H			
MVL-664UYL		300	600	Water Clear	No	G			
MVL-664UYL-S					Yes	H			
MVL-663TUYL		400	800	Amber	No	G			
MVL-663TUYL-S					Yes	H			
MVL-664TUYL		400	800	Water Clear	No	G			
MVL-664TUYL-S					Yes	H			

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Device Selection Guide (True Green,Blue)

MVL-663HTG	True Green 525	600	1200	Green	No	Perpendicular	G	80	40
MVL-663HTG-S					Yes		H		
MVL-664HTG		600	1200	Water Clear	No		G		
MVL-664HTG-S					Yes		H		
MVL-663MTG	True Green 525	700	1300	Green	No	Perpendicular	G	80	40
MVL-663MTG-S					Yes		H		
MVL-664MTG		700	1300	Water Clear	No		G		
MVL-664MTG-S					Yes		H		
MVL-663HB	Blue 470	100	250	Blue	No	Perpendicular	G	80	40
MVL-663HB-S					Yes		H		
MVL-664HB		100	250	Water Clear	No		G		
MVL-664HB-S					Yes		H		
MVL-663MB	Blue 470	200	380	Blue	No	Perpendicular	G	80	40
MVL-663MB-S					Yes		H		
MVL-664MB		200	380	Water Clear	No		G		
MVL-664MB-S					Yes		H		

MVL-67XXX

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Device Selection Guide (Red)

Part Number	Color and Typical Dominant Wavelength λ_d (nm)	Luminous Intensity Iv(mcd) at $I_F=20mA$		Package Color	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing	Viewing Angle $2\theta_{1/2}$ (Degrees)		
		Min.	Typ.					Major	Minor	
MVL-671UOL	Red 625	250	500	Red diffuse	No	Parallel	C	70	30	
MVL-671UOL-S					Yes		D			
MVL-673UOL		250	500	Red	No		C			
MVL-673UOL-S					Yes		D			
MVL-674UOL		250	500	Water Clear	No		C			
MVL-674UOL-S					Yes		D			
MVL-671TUOL		500	900	Red diffuse	No		C	80	30	
MVL-671TUOL-S					Yes		D			
MVL-672TUOL		500	900	diffuse	No		C			
MVL-672TUOL-S					Yes		D			
MVL-673TUOL		800	1300	Red	No		C			
MVL-673TUOL-S					Yes		D			
MVL-674TUOL		800	1300	Water Clear	No		C			
MVL-674TUOL-S					Yes		D			
MVL-673UG		Green 573	70	150	Green		No	C	70	30
MVL-673UG-S							Yes	D		
MVL-674UG	70		150	Water Clear	No	C				
MVL-674UG-S					Yes	D				

InGaN

Device Selection Guide (True Green,Blue)

MVL-671HTG	True Green 525	600	1100	Green diffuse	No	Parallel	C	70	30
MVL-671HTG-S					Yes		D		
MVL-673HTG		700	1200	Green	No		C		
MVL-673HTG-S					Yes		D		
MVL-674HTG		700	1200	Water Clear	No		C		
MVL-674HTG-S					Yes		D		
MVL-671HB	Blue 470	100	200	Blue diffuse	No	C	70	30	
MVL-671HB-S					Yes	D			
MVL-673HB		100	250	Blue	No	C			
MVL-673HB-S					Yes	D			
MVL-674HB		100	250	Water Clear	No	C			
MVL-674HB-S					Yes	D			

MVL-68XXX

AlInGaP

Device Selection Guide (Red)

Part Number	Color and Typical Dominant Wavelength λ_d (nm)	Luminous Intensity Iv(mcd) at $I_F=20mA$		Package Color	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing	Viewing Angle $2\theta/2$ (Degrees)	
		Min.	Typ.					Major	Minor
MVL-681UOL	Red 625	300	600	Red diffuse	No	Parallel	I	60	30
MVL-681UOL-S					Yes		J		
MVL-682UOL		300	600	diffuse	No		I		
MVL-682UOL-S					Yes		J		
MVL-683UOL		400	800	Red	No		I		
MVL-683UOL-S					Yes		J		
MVL-684UOL		400	800	Water Clear	No		I		
MVL-684UOL-S					Yes		J		

InGaN

Device Selection Guide (True Green,Blue)

MVL-681HTG	True Green 525	600	1200	Green diffuse	No	Parallel	I	60	30
MVL-681HTG-S					Yes		J		
MVL-682HTG		600	1200	diffuse	No		I		
MVL-682HTG-S					Yes		J		
MVL-683HTG		650	1300	Green	No		I		
MVL-683HTG-S					Yes		J		
MVL-684HTG		650	1300	Water Clear	No		I		
MVL-684HTG-S					Yes		J		
MVL-681HB	Blue 470	100	200	Blue diffuse	No	Parallel	I	60	30
MVL-681HB-S					Yes		J		
MVL-682HB		100	200	diffuse	No		I		
MVL-682HB-S					Yes		J		
MVL-683HB		150	300	Blue	No		I		
MVL-683HB-S					Yes		J		
MVL-684HB		150	300	Water Clear	No		I		
MVL-684HB-S					Yes		J		

MVL-69XXX

AlInGaP

Device Selection Guide (Red)

Part Number	Color and Typical Dominant Wavelength λ_d (nm)	Luminous Intensity Iv(mcd) at $I_F=20mA$		Package Color	Leads with Stand-Offs	Lead Frame Orientation	Package Drawing	Viewing Angle $2\theta_{1/2}$ (Degrees)	
		Min.	Typ.					Major	Minor
MVL-693TUOL	Red 625	1000	2000	Red	No	Perpendicular	K	50	25
MVL-693TUOL-S					Yes		L		
MVL-694TUOL		1000	2000	Water Clear	No		K		
MVL-694TUOL-S					Yes		L		
MVL-693TUYL	Amber 590	1000	2000	Amber	No		K	50	25
MVL-693TUYL-S					Yes		L		
MVL-694TUYL		1000	2000	Water Clear	No		K		
MVL-694TUYL-S					Yes		L		

Electrical/Optical Characteristics at $T_A=25^\circ\text{C}$

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Typical Viewing Angle Major/Minor						
MVL-63XXX	$2\theta_{1/2}$		110/60		Degrees	$I_F = 20\text{mA}$
MVL-65XXX			50/30			
MVL-66XXX			80/40			
MVL-67XXX			70/30			
MVL-68XXX			60/30			
MVL-69XXX			50/25			
Peak/Dominant Wavelength						
MVL-6XXUROK(-S)	λ_p/λ_d		637/632		nm	Peak and Dominant of Wavelength of Spectral Distribution at $I_F = 20\text{ mA}$
MVL-6XXNUOL(-S)			630/625			
MVL-6XXUOL(-S)			630/625			
MVL-6XXTUOL(-S)			630/625			
MVL-6XXSO(-S)			610/605			
MVL-6XXUYL(-S)			592/590			
MVL-6XXTUYL(-S)			592/590			
MVL-6XXUG(-S)			575/573			
MVL-6XXUTG(-S)			523/525			
MVL-6XXHTG(-S)			523/525			
MVL-6XXUB(-S)			468/470			
MVL-6XXHB(-S)			468/470			
Spectral Halfwidth						
Ultra Red ($\lambda_d = 632\text{ nm}$)	$\Delta\lambda_{1/2}$		22		nm	Wavelength Width at Spectral Distribution 1/2 Power Point at $I_F = 20\text{mA}$
Red ($\lambda_d = 625\text{ nm}$)			17			
Orange ($\lambda_d = 605\text{ nm}$)			13			
Amber ($\lambda_d = 590\text{ nm}$)			17			
Yellow Green ($\lambda_d = 573\text{ nm}$)			20			
Ture Green ($\lambda_d = 525\text{ nm}$)			40			
Blue ($\lambda_d = 470\text{ nm}$)			26			
Forward Voltage						
AlInGaP	V_F	1.6	2.1	2.6	V	$I_F = 20\text{mA}$
InGaN		2.8	3.5	4.2		
Reverse Current						
AlInGaP	I_R			100	μA	$V_R = 5\text{V}$
InGaN "HTG" "HB"				100		
"UTG" "UB"				10		

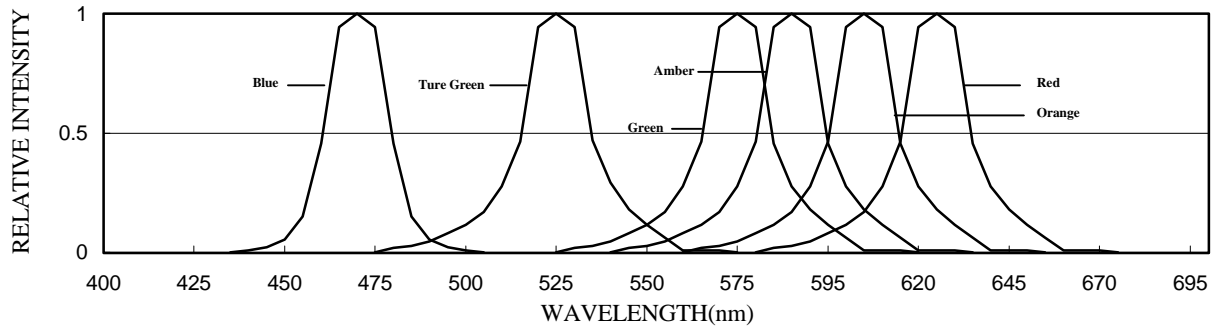
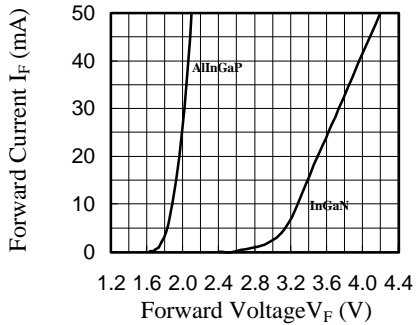
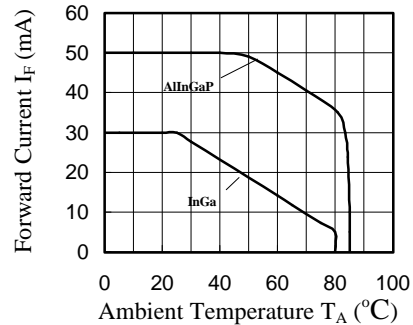


Figure 1. RELATIVE INTENSITY



1.2 1.6 2.0 2.4 2.8 3.2 3.6 4.0 4.4
Forward Voltage V_F (V)

FIG.2 FORWARD CURRENT VS. FORWARD VOLTAGE



0 20 40 60 80 100
Ambient Temperature T_A (°C)

FIG.3 FORWARD CURRENT VS. AMBIENT TEMPERATURE

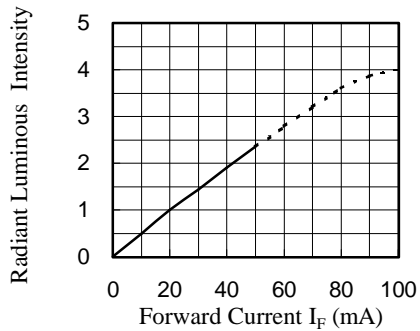


FIG.4 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

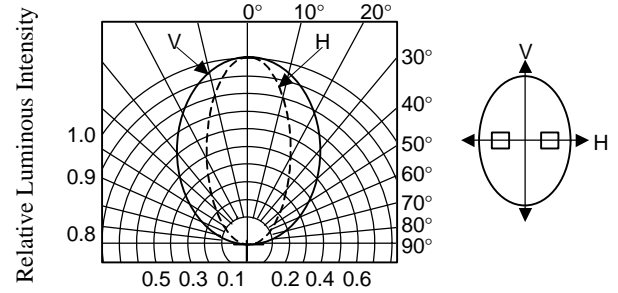


FIG.5 SPATIAL RADIATION PATTERN 80 X 40 DEGREE LAMPS

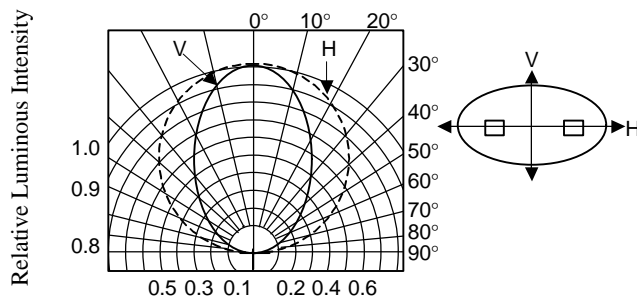


FIG.6 SPATIAL RADIATION PATTERN 110 X 60 DEGREE LAMPS

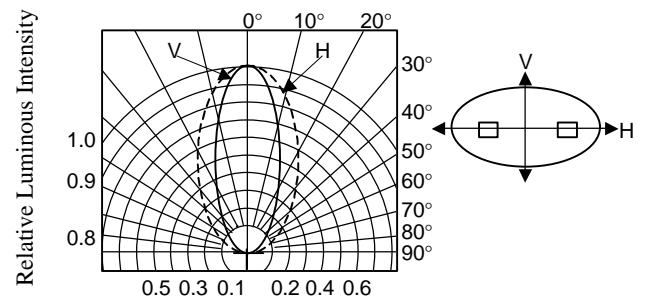


FIG.7 SPATIAL RADIATION PATTERN 50 X 30 DEGREE LAMPS

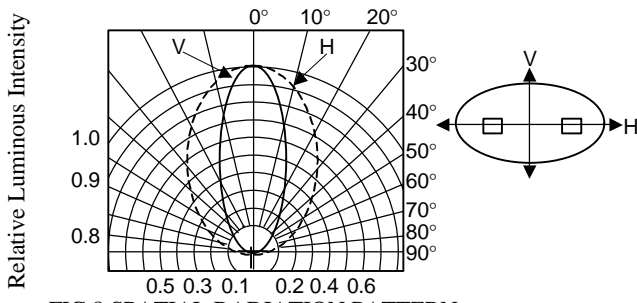


FIG.8 SPATIAL RADIATION PATTERN
70 X 30 DEGREE LAMPS

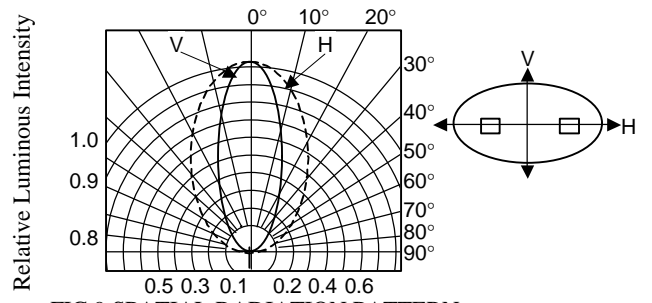


FIG.9 SPATIAL RADIATION PATTERN
60 X 30 DEGREE LAMPS

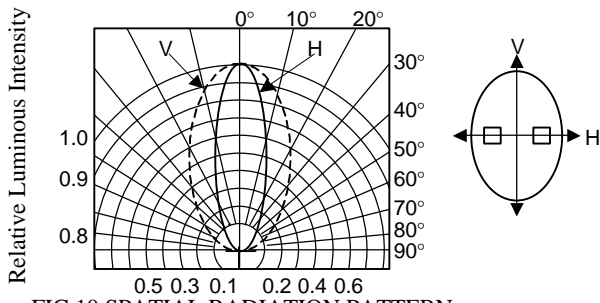


FIG.10 SPATIAL RADIATION PATTERN
50 X 25 DEGREE LAMPS

Unity Oval LEDs Bin Table

Luminous Intensity		
BIN RANGE	I_V (mcd) @ $I_F=20\text{mA}$	
	MIN	MAX
J	41	70
K	58	100
L	81	141
M	115	199
N	163	282
O	230	398
P	326	563
Q	461	796
R	652	1126
S	922	1593
T	1303	2253
U	1843	3185

Unity OVAL LED Bin Codes

Category code		
R	2	2

Luminous Intensity @ $I_f=20\text{mA}$ UNIT:mcd								
code	MIN	MAX	code	MIN	MAX	code	MIN	MAX
A	2	3	J	41	70	S	922	1593
B	3	4	K	58	100	T	1303	2253
C	4	6	L	81	141	U	1843	3185
D	5	9	M	115	199	V	2606	4506
E	7	12	N	163	282	W	3686	6371
F	10	18	O	230	398	X	5213	9011
G	14	25	P	326	563	Y	7373	12742
H	20	35	Q	461	796	Z	10425	18002
I	29	50	R	652	1126			

Dominant wavelength (Second code) @ $I_f=20\text{mA}$ UNIT:nm										
Material	BIN CODE		1		2		3		4	
	Wavelength(typ.)		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
AlInGaP	UOL	625	619	624	622	628	626	631		
	SOL	615	609	614	612	618	616	621		
	SO	605	599	604	602	608	606	611		
	UYL	590	584	589	587	591	589	593	591	596
	UG	572	568	573	571	576	574	579		
InGaN	TG	525	519	524	522	528	526	532	530	536
	SG	505	499	504	502	508	506	511		
	BG	490	484	489	487	493	491	496		
	B	470	464	469	467	473	471	476		

Forward Voltage @ $I_f=20\text{mA}$ UNIT:Voltage				
	AlInGaP		InGaN	
VF	MIN	MAX	MIN	MAX
1	1.35	1.65	2.55	2.85
2	1.55	1.85	2.75	3.05
3	1.75	2.05	2.95	3.25
4	1.95	2.25	3.15	3.45
5	2.15	2.45	3.34	3.65
6	2.35	2.65	3.55	3.85
7	2.55	2.85	3.75	4.05
8			3.95	4.25

Unity OVAL LED Bin Codes

Category code		
R	D	2

Luminous Intensity @ $I_F=20\text{mA}$ UNIT:mcd								
code	MIN	MAX	code	MIN	MAX	code	MIN	MAX
A	2	3	J	41	70	S	922	1593
B	3	4	K	58	100	T	1303	2253
C	4	6	L	81	141	U	1843	3185
D	5	9	M	115	199	V	2606	4506
E	7	12	N	163	282	W	3686	6371
F	10	18	O	230	398	X	5213	9011
G	14	25	P	326	563	Y	7373	12742
H	20	35	Q	461	796	Z	10425	18002
I	29	50	R	652	1126			

Color Ranks					
Blue	Rank A				
	x	0.151	0.127	0.151	0.171
	y	0.013	0.037	0.068	0.040
	Rank B				
	x	0.137	0.114	0.142	0.161
	y	0.027	0.058	0.091	0.058
Green	Rank C				
	x	0.122	0.100	0.135	0.152
	y	0.048	0.087	0.122	0.081
	Rank D				
	x	0.105	0.081	0.130	0.137
	y	0.077	0.133	0.171	0.112
Red	Rank E				
	x	0.144	0.059	0.131	0.203
	y	0.560	0.665	0.745	0.625
	Rank F				
	x	0.178	0.111	0.168	0.227
	y	0.610	0.730	0.755	0.630
Red	Rank G				
	x	0.202	0.143	0.216	0.252
	y	0.620	0.750	0.755	0.630
	Rank H				
	x	0.230	0.186	0.279	0.296
	y	0.628	0.760	0.734	0.619
Red	Rank I				
	x	0.663	0.630	0.685	0.721
	y	0.292	0.331	0.328	0.287
	Rank J				
	x	0.675	0.648	0.706	0.734
	y	0.280	0.312	0.307	0.274

Forward Voltage @ $I_F=20\text{mA}$ UNIT:Voltage				
VF	AlInGaP		InGaN	
	MIN	MAX	MIN	MAX
1	1.35	1.65	2.55	2.85
2	1.55	1.85	2.75	3.05
3	1.75	2.05	2.95	3.25
4	1.95	2.25	3.15	3.45
5	2.15	2.45	3.35	3.65
6	2.35	2.65	3.55	3.85
7	2.55	2.85	3.75	4.05
8			3.95	4.25