

HLMP-Pxxx Series, HLMP-Qxxx Series, HLMP-6xxx Series, HLMP-70xx Series Subminiature LED Lamps

Description

Flat Top Package

The Broadcom[®] HLMP-Pxxx Series flat top lamps use an untinted, nondiffused, truncated lens to provide a wide radiation pattern that is necessary for use in backlighting applications. The flat top lamps are also ideal for use as emitters in light pipe applications.

Dome Packages

The Broadcom HLMP-6xxx Series dome lamps for use as indicators use a tinted, diffused lens to provide a wide viewing angle with a high on-off contrast ratio. High brightness lamps use an untinted, nondiffused lens to provide a high luminous intensity within a narrow radiation pattern.

Resistor Lamps

The Broadcom HLMP-6xxx Series 5 volt subminiature lamps with built-in current limiting resistors are for use in applications where space is at a premium.

Lead Configurations

All of these devices are made by encapsulating LED chips on axial lead frames to form molded epoxy subminiature lamp packages. A variety of package configuration options is available. These include special surface mount lead configurations, gull wing, yoke lead, or Z-bend. Right angle lead bends at 2.54 mm (0.100 inch) and 5.08mm (0.200 inch) center spacing are available for through hole mounting. For more information, refer to the Standard SMT and Through Hole Lead Bend Options for Subminiature LED Lamps data sheet.

Features

- Subminiature flat top package
 - Ideal for backlighting and light piping applications
- Subminiature dome package
 - Diffused dome for wide viewing angle
 - Nondiffused dome for high brightness
- TTL and LSTTL compatible 5V resistor lamps
- Available in six colors
- Ideal for space limited applications
- Axial leads
- Available with lead configurations for surface mount and through hole PCB mounting

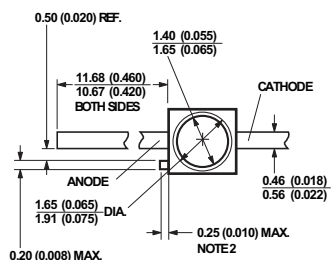
Device Selection Guide

Part Number: HLMP-xxxx

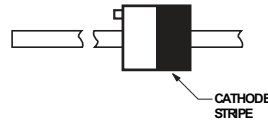
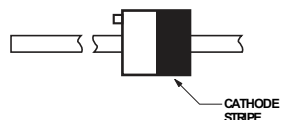
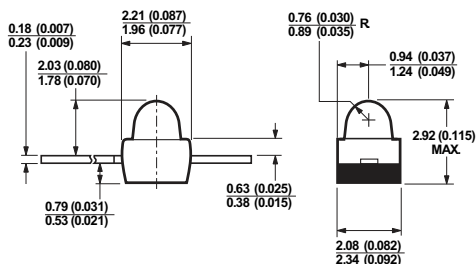
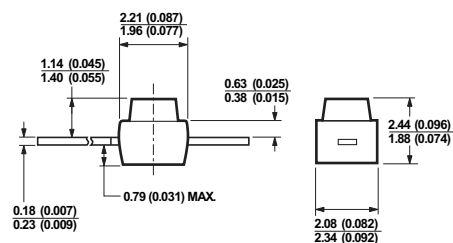
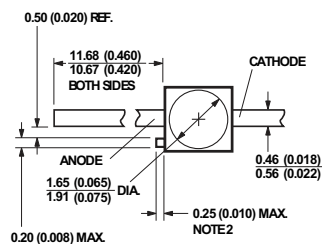
Standard Red	DH AS AlGaAs Red	High Efficiency Red	Orange	Yellow	High Perf. Green	Emerald Green	Device Description	Device Outline Drawing
P005	P105	P205	P405	P305	P505	P605	Untinted, Nondiffused, Flat Top	A
	P102	P202	P402	P302	P502		Untinted, Diffused, Flat Top	A
6000	Q100	6300	Q400	6400	6500	Q600	Tinted, Diffused	B
	Q105	6305	Q405	6405	6505	Q605	Untinted, Nondiffused, High Brightness	B
	Q150	7000		7019	7040		Tinted, Diffused, Low Current	B
	Q155						Nondiffused, Low Current	B
		6600			6800		Tinted, Diffused, Resistor, 5V, 10 mA	B
		6620		6720	6820		Diffused, Resistor, 5V, 4 mA	B

Package Dimensions

A. Flat Top Lamps



B. Diffused and Nondiffused



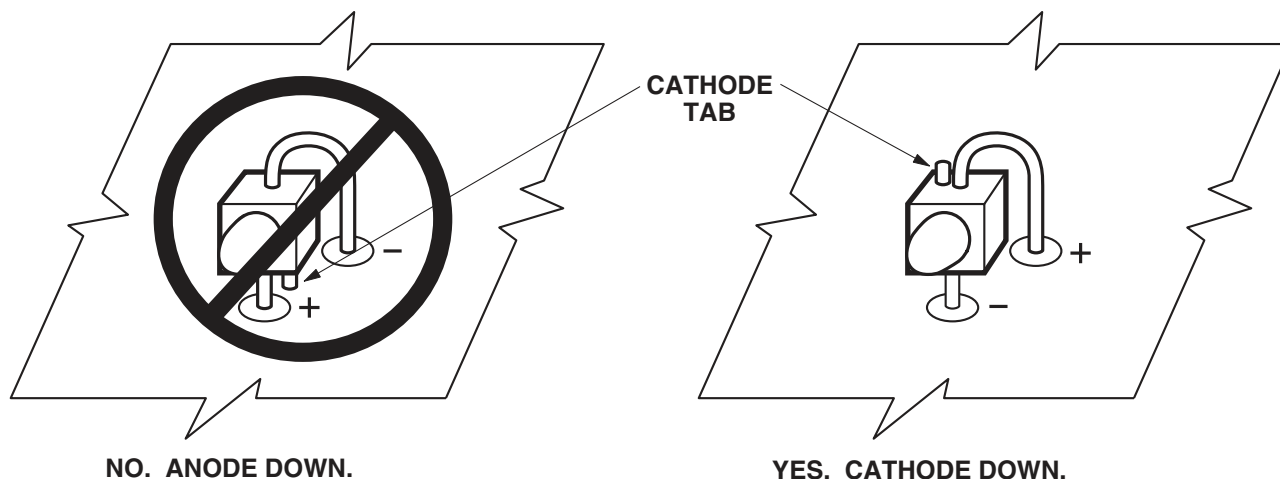
Notes:

All dimensions are in millimeters (inches).

Protruding support tab is connected to cathode lead.

Lead polarity for ALGaAs lamps is opposite to the lead polarity of subminiature lamps using other technologies.

Figure 1: Proper Right Angle Mounting to a PCB to Prevent Protruding Cathode Tab from Shorting to Anode Connection



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$)

Parameter	Standard Red	DH AS AlGaAs Red	High Eff. Red	Orange	Yellow	High Perf. Green	Emerald Green	Unit
DC Forward Current ^a	50	30	30	30	20	30	30	mA
Peak Forward Current ^b	1000	300	90	90	60	90	90	mA
DC Forward Voltage (Resistor Lamps Only)	—	—	6	—	6	6	6	V
Reverse Voltage ($I_R = 100 \mu\text{A}$)	5	5	5	5	5	5	5	V
Transient Forward Current ^c (10 μs Pulse)	2000	500	500	500	500	500	500	mA
Operating Temperature Range								$^\circ\text{C}$
Nonresistor Lamps	-55 to +100	-40 to +100	-55 to +100	-55 to +100	-55 to +100	-40 to +100	-20 to +100	
Resistor Lamps	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-20 to +85	-20 to +85	
Storage Temperature Range	-55 to +100							
For Through Hole Devices: Wave Soldering Temperature [1.6 mm (0.063 in.) from body]	260 $^\circ\text{C}$ for 5 seconds							
For Surface Mount Devices: Reflow Soldering Temperature	260 $^\circ\text{C}$ for 20 seconds							

- See Figure 6 for current derating vs. ambient temperature. Derating is not applicable to resistor lamps.
- Refer to Figure 7 showing Maximum Tolerable Peak Current vs. Pulse Duration to establish pulsed operating conditions.
- The transient peak current is the maximum nonrecurring peak current the device can withstand without failure. Do not operate these lamps at this high current.

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

Standard Red

Device HLMP-	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
6000-E00xx	Luminous Intensity	I_V	0.63	1.2	—	mcd	$I_F = 10\text{ mA}$
6000-G00xx			1.60	3.2	—		
P005-F00xx			1.0	2.5	—		
All	Forward Voltage	V_F	1.4	1.6	2.0	V	$I_F = 10\text{ mA}$
	Reverse Breakdown Voltage	V_R	5.0	12.0	—	V	$I_R = 100\text{ }\mu\text{A}$
6000	Included Angle Between Half Intensity Points	$2\theta_{1/2}$	—	90	—	Deg.	
P005			—	125	—		
All	Peak Wavelength	λ_{PEAK}	—	655	—	nm	
	Dominant Wavelength	λ_d	—	640	—	nm	
	Spectral Line Half Width	$\Delta\lambda_{1/2}$	—	24	—	nm	
	Speed of Response	τ_s	—	15	—	ns	
	Capacitance	C	—	100	—	pF	$V_F = 0$; $f = 1\text{ MHz}$
	Thermal Resistance	$R\theta_{J-PIN}$	—	170	—	$^\circ\text{C/W}$	Junction-to-Cathode Lead
	Luminous Efficacy	η_V	—	65	—	lm/W	

DH AS AlGaAs Red

Device HLMP-	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
P102-F00xx	Luminous Intensity	I_V	1.0	20.0	—	mcd	$I_F = 20 \text{ mA}$
P105-L00xx			10.0	30.0	—		
P105-NP000			25	—	80		
Q100-M00xx			16	45	—		
Q100-N00xx			25.0	45.0	—		
Q100-PQ000			40	—	125		
Q105-P00xx			40	200	—		
Q105-ST000			160	—	500		$I_F = 1 \text{ mA}$
Q150-F00xx			1.0	1.8	—		
Q155-F00xx			1.0	4.0	—		
Q100			Forward Voltage	V_F	—		
Q150/Q155	—	1.6			1.8	$I_F = 1 \text{ mA}$	
All	Reverse Breakdown Voltage	V_R	5.0	15.0	—	V	$I_R = 100 \mu\text{A}$
P105	Included Angle Between Half Intensity Points	$2\theta_{1/2}$	—	125	—	Deg.	
Q100/Q150			—	90	—		
Q105/Q155			—	28	—		
All	Peak Wavelength	λ_{PEAK}	—	645	—	nm	Measured at Peak
	Dominant Wavelength	λ_d	—	637	—	nm	
	Spectral Line Half Width	$\Delta\lambda_{1/2}$	—	20	—	nm	
	Speed of Response	τ_s	—	30	—	ns	Exponential Time Constant; e^{-t/τ_s}
	Capacitance	C	—	30	—	pF	$V_F = 0$; $f = 1 \text{ MHz}$
	Thermal Resistance	$R\theta_{J-PIN}$	—	170	—	$^{\circ}\text{C/W}$	Junction-to-Cathode Lead
	Luminous Efficacy	η_V	—	80	—	lm/W	

High Efficiency Red

Device HLMP-	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
P202-F00xx	Luminous Intensity	I_V	1.0	5.0	—	mcd	$I_F = 10 \text{ mA}$
P205-F00xx			1.0	8.0	—		
6300-F00xx			1.0	10.0	—		
6300-KL000			6.3	—	20.0		
6305-L00xx			10.0	40.0	—		$I_F = 2 \text{ mA}$
7000-D00xx			0.4	1.0	—		
6600-G00xx			1.6	5.0	—		$V_F = 5.0\text{V}$
6620-F00xx			1.0	2.0	—		
All	Forward Voltage (Nonresistor Lamps)	V_F	1.5	1.8	3.0	V	$I_F = 10 \text{ mA}$
6600	Forward Current (Resistor Lamps)	I_F	—	9.6	13.0	mA	$V_F = 5.0\text{V}$
5620			—	3.5	5.0		
All	Reverse Breakdown Voltage	V_R	5.0	30.0	—	V	$I_R = 100 \mu\text{A}$
P205	Included Angle Between Half Intensity Points	$2\theta_{1/2}$	—	125	—	Deg.	
6305			—	28	—		
All Diffused			—	90	—		
All	Peak Wavelength	λ_{PEAK}	—	635	—	nm	Measured at Peak
	Dominant Wavelength	λ_d	—	626	—	nm	
	Spectral Line Half Width	$\Delta\lambda_{1/2}$	—	40	—	nm	
	Speed of Response	τ_s	—	90	—	ns	
	Capacitance	C	—	11	—	pF	$V_F = 0; f = 1 \text{ MHz}$
	Thermal Resistance	$R\theta_{\text{J-PIN}}$	—	170	—	°C/W	Junction-to-Cathode Lead
	Luminous Efficacy	η_V	—	145	—	lm/W	

Orange

Device HLMP-	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
P402-F00xx	Luminous Intensity	I_V	1.0	4.0	—	mcd	$I_F = 10 \text{ mA}$
P405-F00xx			1.0	6	—		
P405-JK000			4.0		12.5		
Q400-F00xx			1.0	8	—		
Q405-H00xx			2.5	14	—		
All	Forward Voltage	V_F	1.5	1.9	3.0	V	$I_F = 10 \text{ mA}$
	Reverse Breakdown Voltage	V_R	5.0	30.0	—	V	$I_R = 100 \mu\text{A}$
P40x	Included Angle Between Half Intensity Points	$2\theta_{1/2}$	—	125	—	Deg.	
Q40x			—	90	—		
All	Peak Wavelength	λ_{PEAK}	—	600	—	nm	
	Dominant Wavelength	λ_d	—	602	—	nm	Measured at Peak
	Spectral Line Half Width	$\Delta\lambda_{1/2}$	—	40	—	nm	
	Speed of Response	τ_s	—	260	—	ns	
	Capacitance	C	—	4	—	pF	$V_F = 0; f = 1 \text{ MHz}$
	Thermal Resistance	$R\theta_{J-PIN}$	—	170	—	$^{\circ}\text{C/W}$	Junction-to-Cathode Lead
	Luminous Efficacy	η_V	—	380	—	lm/W	

Yellow

Device HLMP-	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
P302-F00xx	Luminous Intensity	I_V	1.0	3.0	—	mcd	$I_F = 10 \text{ mA}$
P305-F00xx			1.0	4.0	—		
6400-F00xx			1.0	9.0	12.5		
6400-JK000			4.0	—	—		
6405-J00xx			3.6	20	—		
6405-MN0xx			16	—	50		
7019-D00xx			0.4	0.6	—		$I_F = 2 \text{ mA}$
6720-F00xx			0.9	2.0	—		
All	Forward Voltage (Nonresistor Lamps)	V_F	—	2.0	2.4	V	$I_F = 10 \text{ mA}$
6720	Forward Current (Resistor Lamps)	I_F	—	3.5	5.0	mA	$V_F = 5V$
All	Reverse Breakdown Voltage	V_R	5.0	50.0	—	V	
P305	Included Angle Between Half Intensity Points	$2\theta_{1/2}$	—	125	—	Deg.	
6405			—	28	—		
All Diffused			—	90	—		
All	Peak Wavelength	λ_{PEAK}	—	583	—	nm	Measured at Peak
	Dominant Wavelength	λ_d	—	585	—	nm	
	Spectral Line Half Width	$\Delta\lambda_{1/2}$	—	36	—	nm	
	Speed of Response	τ_s	—	90	—	ns	
	Capacitance	C	—	15	—	pF	$V_F = 0; f = 1 \text{ MHz}$
	Thermal Resistance	$R\theta_{J-PIN}$	—	170	—	$^{\circ}\text{C/W}$	Junction-to-Cathode Lead
	Luminous Efficacy	η_V	—	500	—	lm/W	

High Performance Green

Device HLMP-	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
P502-F00xx	Luminous Intensity	I_V	1.0	3.0	—	mcd	$I_F = 10 \text{ mA}$
P505-F00xx			1.6	6.3	—		
6500-F00xx			1.0	7.0	—		
6505-L00xx			10.0	40.0	—		$I_F = 2 \text{ mA}$
7040-D00xx			0.4	0.6	—		
6800-G00xx			1.6	5.0	—		
6820-F00xx			1.0	2.0	—		
All	Forward Voltage (Nonresistor Lamps)	V_F	—	2.1	2.7	V	$I_F = 10 \text{ mA}$
6800	Forward Current (Resistor Lamps)	I_F	—	9.6	13.0	mA	$V_F = 5V$
6820			—	3.5	5.0		
All	Reverse Breakdown Voltage	V_R	5.0	50.0	—	V	$I_R = 100 \mu\text{A}$
P505	Included Angle Between Half Intensity Points	$2\theta_{1/2}$	—	125	—	Deg.	
6505			—	28	—		
All Diffused			—	90	—		
All	Peak Wavelength	λ_{PEAK}	—	565	—	nm	
	Dominant Wavelength	λ_d	—	569	—	nm	
	Spectral Line Half Width	$\Delta\lambda_{1/2}$	—	28	—	nm	
	Speed of Response	τ_s	—	500	—	ns	
	Capacitance	C	—	18	—	pF	$V_F = 0; f = 1 \text{ MHz}$
	Thermal Resistance	$R\theta_{J-PIN}$	—	170	—	°C/W	Junction-to-Cathode Lead
	Luminous Efficacy	η_V	—	595	—	lm/W	

High Performance Green¹

Device HLMP-	Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
P605-F00xx	Luminous Intensity	I_V	1.0	1.5	—	mcd	$I_F = 10 \text{ mA}$
Q600-F00xx			1.0	1.5	—		
Q605-F00xx			1.0	7.5	—		
All	Forward Voltage	V_F	—	2.2	3.0	V	$I_F = 10 \text{ mA}$
	Reverse Breakdown Voltage	V_R	5.0	—	—	V	$I_R = 100 \mu\text{A}$
P605	Included Angle Between Half Intensity Points	$2\theta_{1/2}$	—	125	—	Deg.	
Q60x			—	90	—		
All	Peak Wavelength	λ_{PEAK}	—	558	—	nm	
	Dominant Wavelength	λ_d	—	560	—	nm	Measured at Peak
	Spectral Line Half Width	$\Delta\lambda_{1/2}$	—	24	—	nm	
	Speed of Response	τ_s	—	3100	—	ns	
	Capacitance	C	—	35	—	pF	$V_F = 0; f = 1 \text{ MHz}$
	Thermal Resistance	$R\theta_{J-PIN}$	—	170	—	$^{\circ}\text{C/W}$	Junction-to-Cathode Lead
	Luminous Efficacy	η_V	—	656	—	lm/W	

- For information comparing standard green and emerald green light output degradation, refer to the *Luminous Intensity Degradation Data for Emerald Green LEDs (560 nm) vs. Degradation Data for Standard Green LEDs (569 nm) Application Note*.

Figure 2: Relative Intensity vs. Wavelength

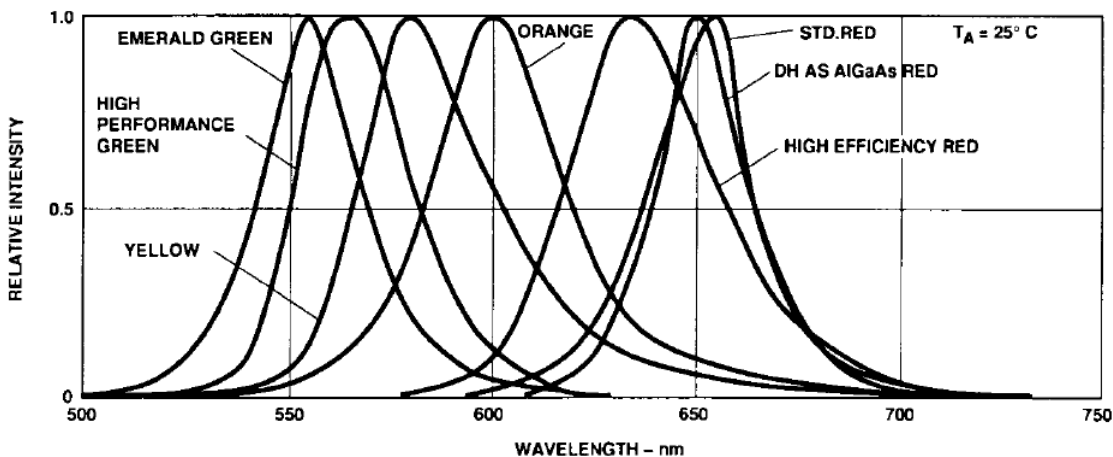


Figure 3: Forward Current vs. Forward Voltage (Nonresistor Lamp)

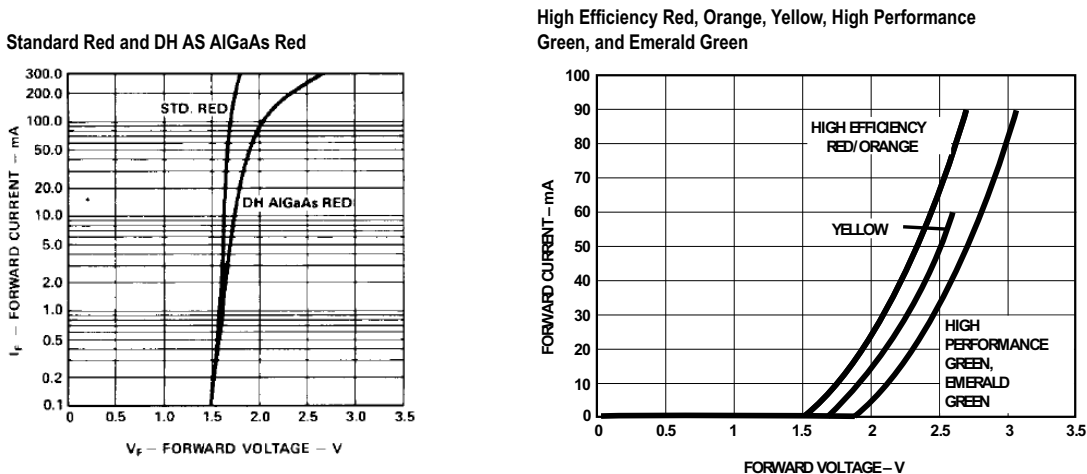


Figure 4: Relative Luminous Intensity vs. Forward Current (Nonresistor Lamp)

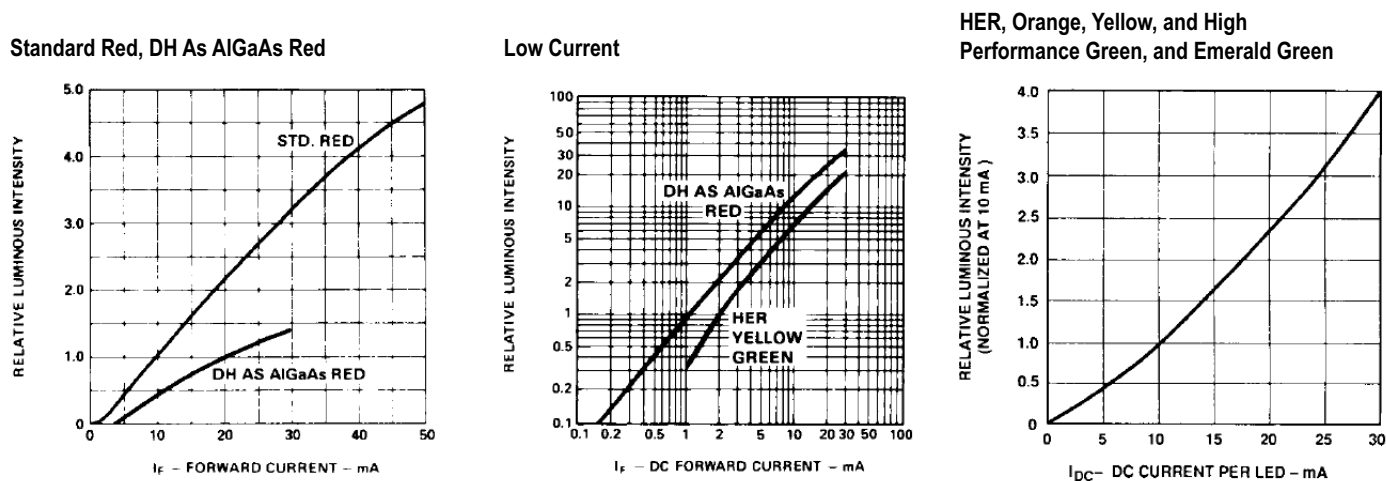


Figure 5: Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current (Nonresistor Lamps)

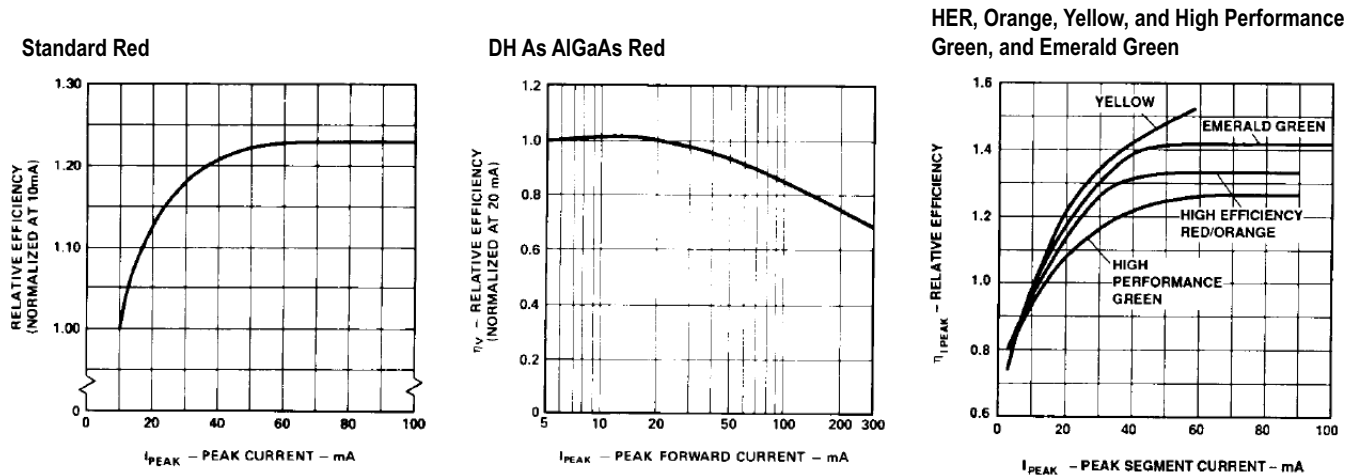


Figure 6: Maximum Forward DC Current vs. Ambient Temperature (Derating Based on T_J Max. = 110°C [Nonresistor Lamps])

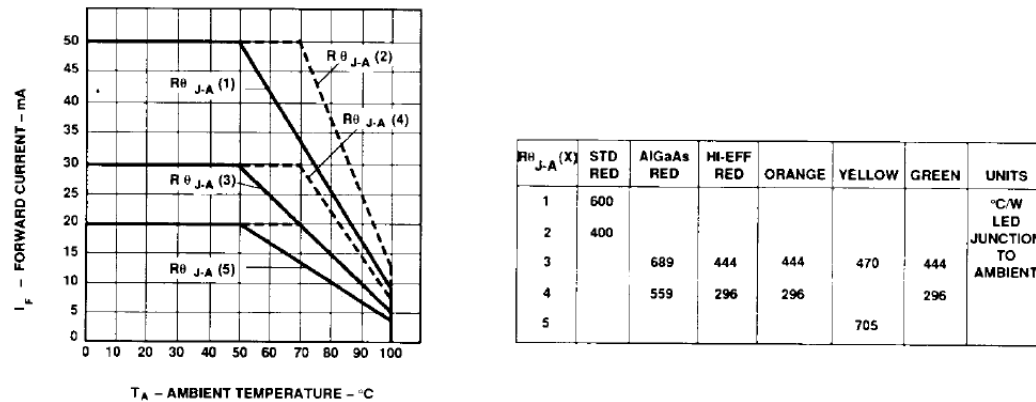


Figure 7: Maximum Tolerable Peak Current vs. Pulse Duration (I_{DC} Max. as per Max. Ratings) (Nonresistor Lamps)

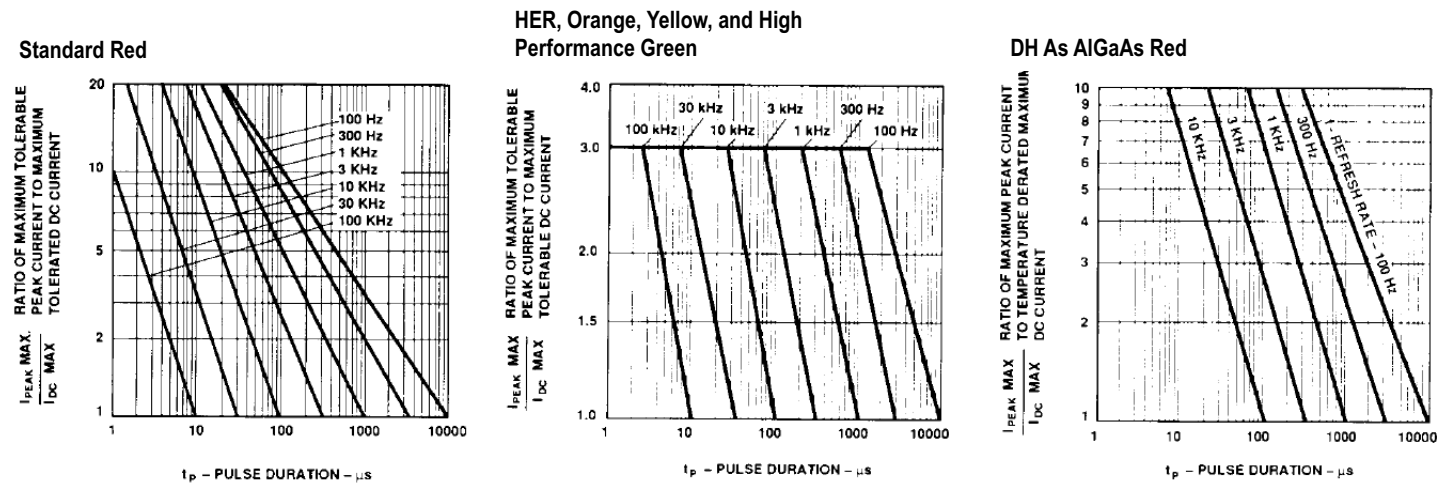


Figure 8: Resistor Lamp Forward Current vs. Forward Voltage

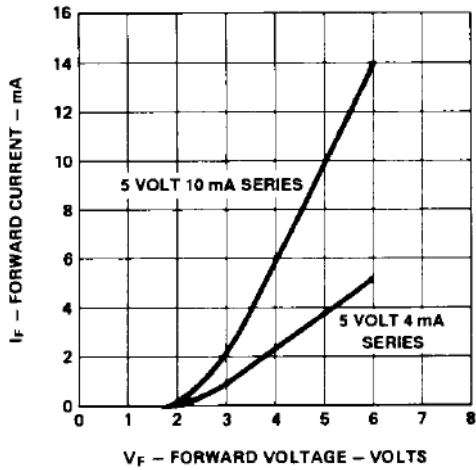


Figure 9: Resistor Lamp Luminous Intensity vs. Forward Voltage

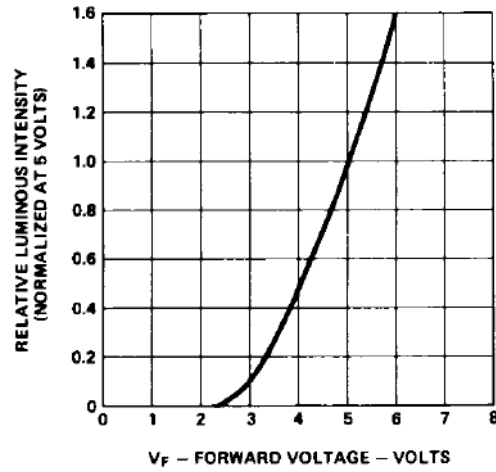
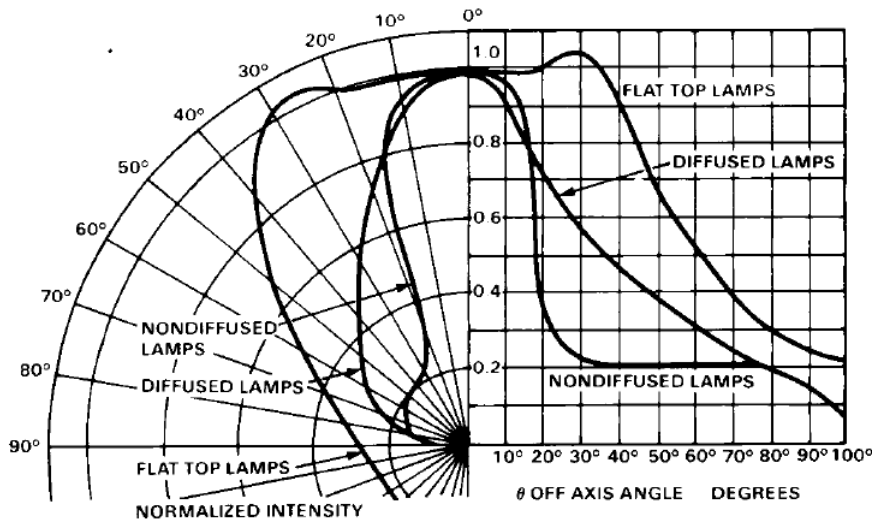


Figure 10: Relative Intensity vs. Angular Displacement



Part Numbering System

H L M x - X X X X -

X ₁	X ₂	X ₃	X ₄	X ₅
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Number	Description
HLMx-XXXX	4 x 4 Product Part Number
X ₁	Minimum I _V Bin Options
X ₂	Maximum I _V Bin Options
X ₃	Color Bin Selection
X ₄ , X ₅	Packaging Option

Intensity Bin Limits

Bin	Min.	Max.
A	0.10	0.20
B	0.16	0.32
C	0.25	0.50
D	0.40	0.80
E	0.63	1.25
F	1.00	2.00
G	1.60	3.20
H	2.50	5.00
J	4.00	8.00
K	6.30	12.50
L	10.00	20.00
M	16.00	32.00
N	25.00	50.00
P	40.00	80.00
Q	63.00	125.00
R	100.00	200.00
S	160.00	320.00
T	250.00	500.00
U	400.00	800.00
V	630.00	1250.00
W	1000.00	2000.00
X	1600.00	3200.00
Y	2500.00	5000.00

Color Bin Limits

Package	Bin	Min.	Max.
Emerald Green	0	Full Distribution	
	9	552	556
	8	555	559
	7	558	562
	6	561	565
Green	0	Full Distribution	
	6	561	565
	5	564	568
	4	567	571
	3	570	574
Yellow	2	573	577
	0	Full Distribution	
	1	581.5	585.0
	2	584.0	587.5
	3	586.5	590.0
	4	589.0	592.5
	5	591.5	593.5
	6	591.5	595.0
7	594.0	597.5	
Orange	0	Full Distribution	
	1	596.5	600.0
	2	599.0	602.5
	3	601.5	604.0
	4	603.8	608.2
	5	606.8	611.2
	6	609.8	614.2
	7	612.8	617.2
	8	615.8	620.2

Mechanical Option

00	Straight Leads, Bulk Packaging, Quantity of 500 Parts
10	Right Angle Housing, Bulk Packaging, Quantity of 500 Parts
11	Gull Wing Leads, 12 mm Tape on 7 in. Dia. Reel, 1500 Parts per Reel
12	Gull Wing Lead, Bulk Packaging, Quantity of 500 Parts
14	Gull Wing Leads, 12 mm Tape on 13 in. Dia. Reel, 6000 Parts per Reel
21	Yoke Leads, 12 mm Tape on 7 in. Dia. Reel, 1500 Parts per Reel
22	Yoke Leads, Bulk Packaging, Quantity of 500 Parts
24	Yoke Leads, 12 mm Tape on 13 in. Dia. Reel, 6000 Parts per Reel
31	Z-Bend Leads, 12 mm Tape on 7 in. Dia. Reel, 1500 Parts per Reel
32	Z-Bend Leads, Bulk Packaging, Quantity of 500 Parts
34	Z-Bend Leads, 12 mm Tape on 13 in. Dia. Reel, 6000 Parts per Reel
1L	2.54 mm (0.100 inch) Center Lead Spacing, Long Leads; 10.4 mm (0.410 in.)
1S	2.54 mm (0.100 inch) Center Lead Spacing, Short Leads; 3.7 mm (0.145 in.)
2L	5.08 mm (0.200 inch) Center Lead Spacing, Long Leads; 10.4 mm (0.410 in.)
2S	5.08 mm (0.200 inch) Center Lead Spacing, Short Leads; 3.7 mm (0.145 in.)

NOTE: All categories are established for classification of products. Products might not be available in all categories. Contact your Broadcom representative for further clarification/information.

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