La lampe solaire de jardin

DOSSIER TECHNIQUE

Ne rien inscrire sur ce document

I Présentation

La borne solaire de jardin (encore appelée lampe solaire ou balise solaire) permet d'éclairer facilement et à faible coût les jardins. L'installation de celle-ci est très simple: (pas de câbles électriques à enfuir dans le sol). Il n'y a aucun coût de fonctionnement (l'énergie solaire est gratuite). De plus elle participe à la lutte contre le réchauffement climatique (baisse du CO^2 dans l'atmosphère). Son pied en forme de pointe facilite l'installation dans la terre. Son seul inconvénient, actuellement, est du à la faible intensité lumineuse émise par la balise mais les progrès technologiques de fabrication des diodes électroluminescentes « D.E.L » à haut rendement et forte puissance semble lui promettre un avenir radieux.

II Principe de la borne solaire

Le capteur photovoltaïque absorbe l'énergie solaire pendant la journée. Cette énergie est convertie par le capteur sous forme d'un courant électrique qui recharge la batterie intégrée à l'intérieur de la borne solaire. Quand l'obscurité arrive, la batterie fournie alors un courant électrique à une diode électroluminescente. Un interrupteur marche arrêt « M/A » permet l'arrêt ou la mise en service de la balise.

III Remarque importante

Pour des raisons de sécurité d'approvisionnement de composants électroniques, le fabriquant de la balise solaire a deux fournisseurs (sous-traitants) pour le circuit imprimé. Il en résulte donc deux circuits imprimés différents appelé dans ce dossier « Borne solaire avec un schéma structurel avec des transistors » ou « Borne solaire avec un schéma structurel avec un circuit intégré » .

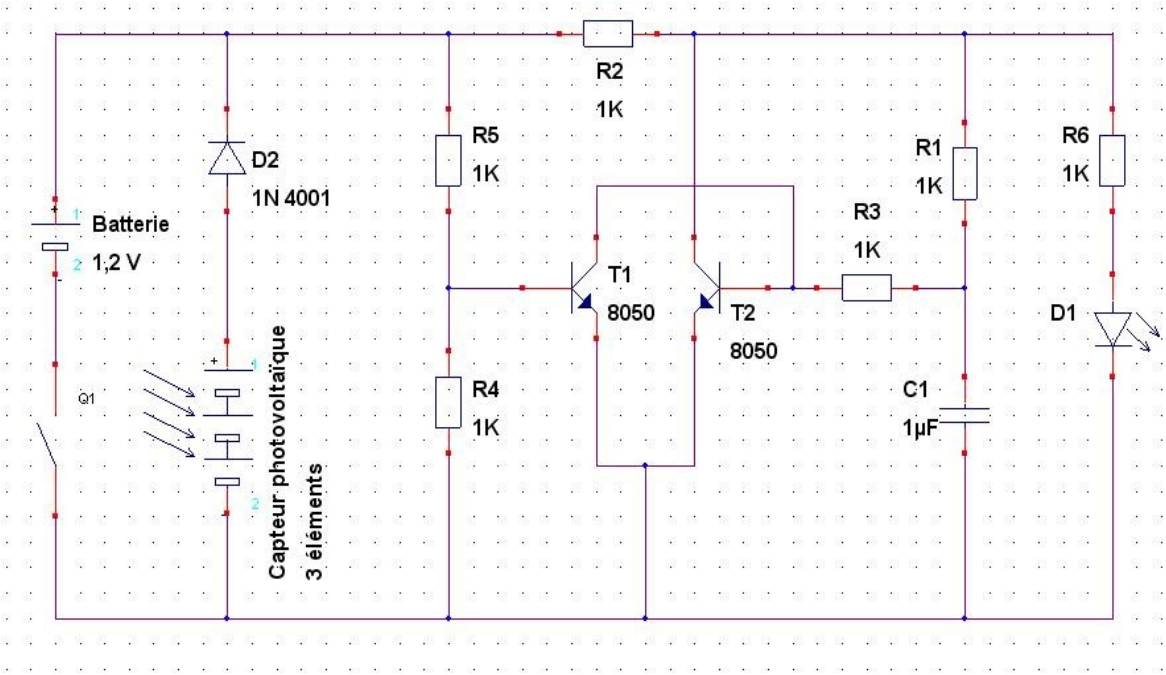
- L'étude théorique est réalisée avec la Borne solaire du type: Schéma structurel avec des transistors .

- L'étude pratique (montage démontage de la balise, mesures) peut être réalisée n'importe laquelle des deux balises.

10	1	Circuit imprimé	époxy	34 mm x 16 mm
9	1	Adaptateur pointu pour pied	PVC	Noir
8	2	manchon	PVC	Noir
7	2	Pied	PVC	Noir
6	1	Lentille optique cylindrique	Plastique	transparente
5	1	Capteur photovoltaïque	4 cellules	silicium
4	1	Couvercle	Plastique	noir
3	1	Châssis	Plastique	noir
2	1	batterie	Ni-MH AA	700mAh 1,2V
1	1	interrupteur	À glissière	Marche arrêt
Rep	Nb	Désignation	Valeur, référence	Observations

PIECES DETACHEES		A4	
LAMPE SOLAIRE	Nom:	le / /	

Borne solaire avec un schéma structurel à transistors



CIRCUIT IMPRIME

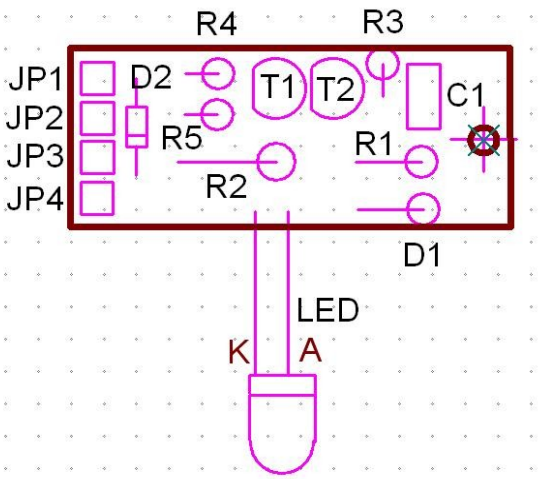


FIGURE 1

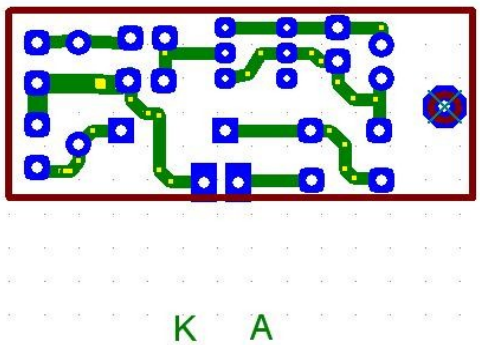


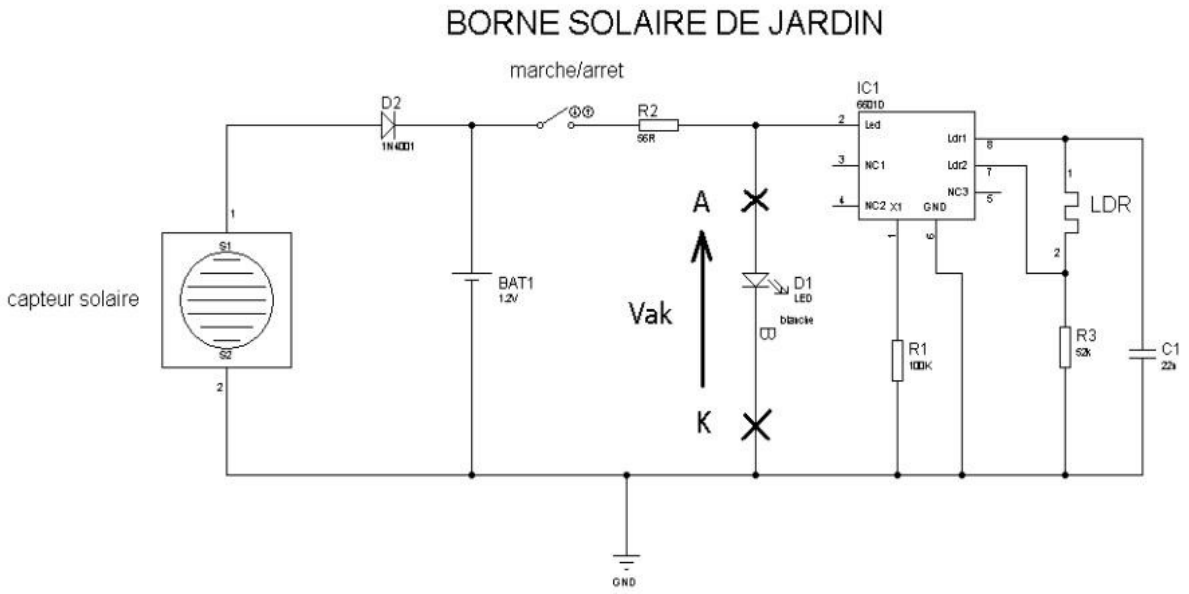
FIGURE 2

	2	Fils conducteurs jaunes	En cuivre	souple
	2	Fils conducteurs bleus	En cuivre	souple
	1	batterie	Ni-MH AA	700mAh 1,2V
	1	interrupteur	à glissière	Marche arret
Q2	1	transistor	8050	NPN
Q1	1	transistor	8050	NPN
D2	1	diode	1N4001	silicium
LED	1	Diode électroluminescente	HLMP-CW15	Blanche Ø 5mm
C1	1	condensateur	1µF	chimique
R5	3	résistor	1000 ohms	+/- 5%
R4	1	résistor	1500 ohms	+/- 5%
R3	1	résistor	1500 ohms	+/- 5%
R2	1	résistor	470 ohms	+/- 5%
R1	1	résistor	470 ohms	+/- 5%
Rep	Nb	Désignation	Valeur, référence	Observations

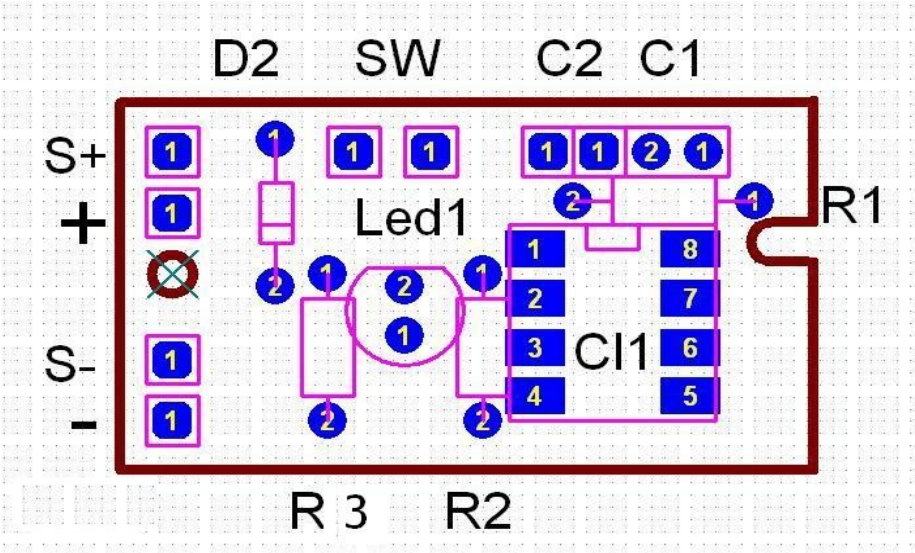
Nomenclature du circuit imprimé avec des transistors		A4	
MODULE ELECTRONIQUE	Nom:	le / /	

Nomenclature du circuit imprimé avec des transistors		A4	

Borne solaire avec un schéma structurel à base d'un circuit intégré



circuit imprimé



	1	Fils conducteurs jaunes	en cuivre	souple
	5	Fils conducteurs noirs	en cuivre	souple
	1	batterie	Ni-MH AA	600mAh 1,2V
SW	1	interrupteur	à glissière	Marche arret
CI1	1	circuit intégré	6601D	DIL
D2	1	diode	1N4001	silicium
Led1	1	Diode électroluminescente	HLMP-CW15	Blanche Ø 5mm
R3	1	résistor	56 Ω	+/- 1%
R2	1	résistor	100 k Ω	+/- 5%
R1	1	résistor	5100 Ω	+/- 1%
Rep	Nb	Désignation	Valeur, référence	Observations

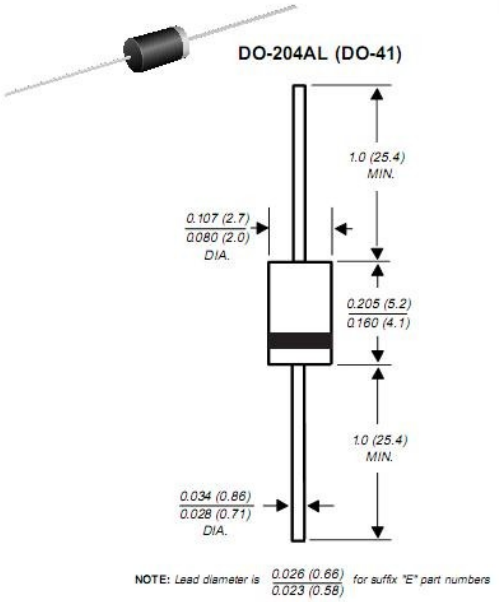
Nomenclature du circuit imprimé avec un circuit intégré		A4	
MODULE ELECTRONIQUE	Nom:	le / /	

GENERAL SEMICONDUCTOR®

1N4001 THRU 1N4007

General Purpose Plastic Rectifier

Reverse Voltage 50 to 1000 V
Forward Current 1.0 A



Dimensions in inches and (millimeters)

Features

- Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- Construction utilizes void-free molded plastic technique
- Low reverse leakage
- High forward surge capability
- High temperature soldering guaranteed: 250°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

Mechanical Data

Case: JEDEC DO-204AL, molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

Maximum Ratings & Thermal Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 4001	1N 4002	1N 4003	1N 4004	1N 4005	1N 4006	1N 4007	UNITS
*Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	V
*Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	V
*Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	V
*Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A=75°C	$I_{F(AV)}$	1.0							A
*Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=75°C	I_{FSM}	30							A
*Maximum full load reverse current full cycle average 0.375" (9.5mm) lead length at T_L=75°C	$I_{R(AV)}$	30							µA
Typical thermal resistance (NOTE 1)	$R_{\Theta JA}$ $R_{\Theta JL}$	50 25							°C/W
Maximum DC blocking voltage temperature	T_A	+150							°C
*Operating junction and storage temperature range	T_J, T_{STG}	-50 to +175							°C

Electrical Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	1N 4001	1N 4002	1N 4003	1N 4004	1N 4005	1N 4006	1N 4007	UNITS
*Maximum instantaneous forward voltage at 1.0A	V_F	1.1							V
*Maximum DC reverse current at rated DC blocking voltage T_A= 25°C T_A=100°C	I_R	5.0 50							µA
Typical reverse recovery time at I_{FM}=20mA, I_{RM}=1mA (NOTE 2)	t_{rr}	30							µs
Typical junction capacitance at 4.0V, 1MHz	C_J	15							pF

NOTES:
(1) Thermal resistance from junction to ambient, and from junction to lead at 0.375" (9.5mm) lead length, P.C.B. mounted
(2) Measured on Tektronix type "S" recovery plug-in. Tektronix 545 scope or equivalent.
*JEDEC registered values

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GENERAL SEMICONDUCTOR®

1N4001 THRU 1N4007

Ratings and Characteristic Curves (T_A = 25°C unless otherwise noted)

FIG.1 - FORWARD CURRENT DERATING CURVE

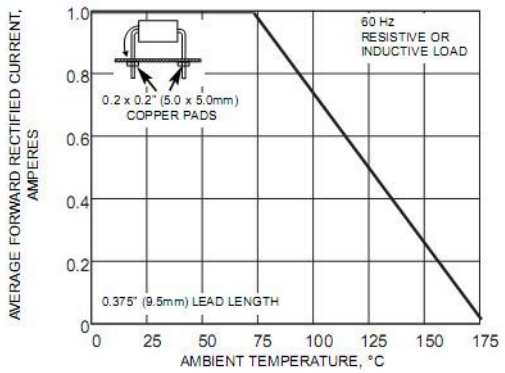


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

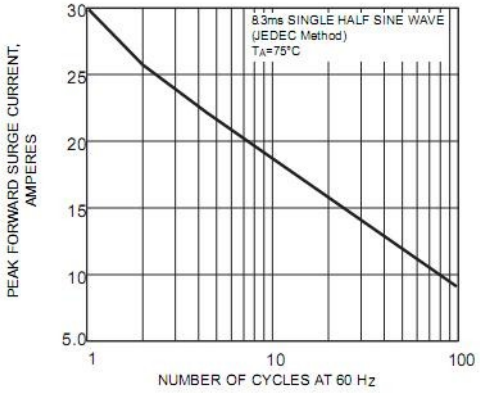


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

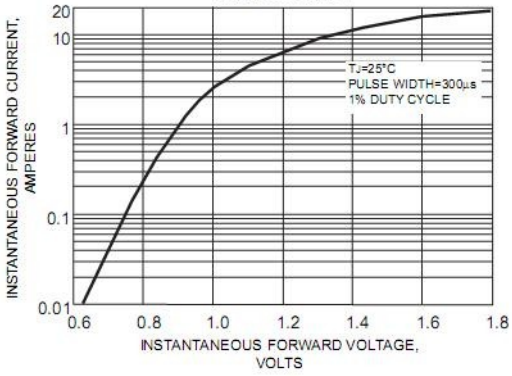


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

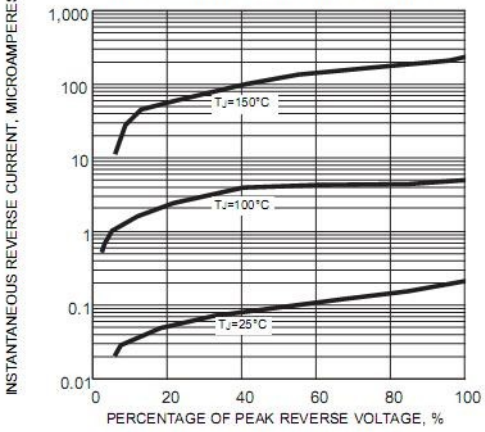


FIG. 5 - TYPICAL JUNCTION CAPACITANCE

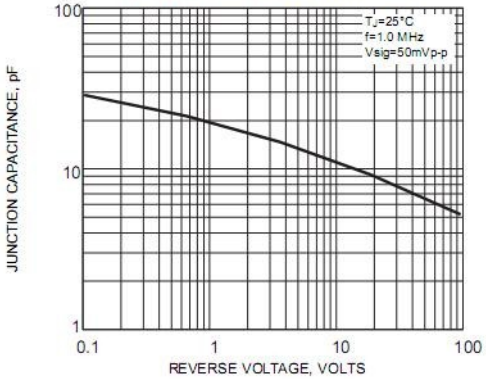
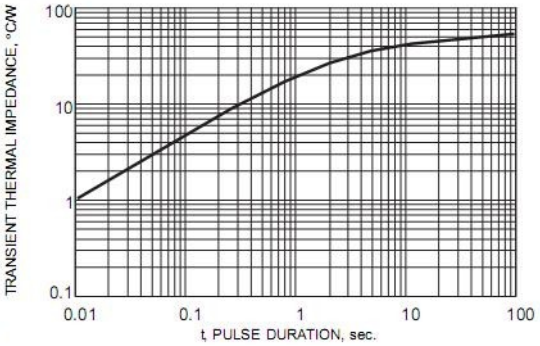
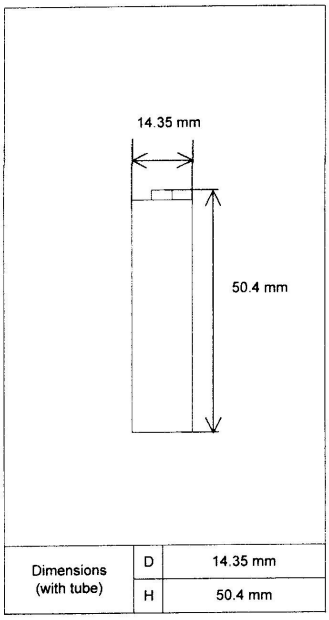


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



SANYO

Cell Type HR-3UTG



Dimensions (with tube)	D	14.35 mm
	H	50.4 mm

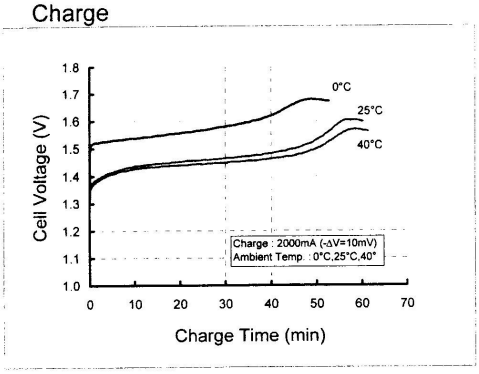
Specifications

Type : Nickel-Metal Hydride Battery			Size : AA Consumer Type
Capacity 1)	Typical		2000mAh
	Minimum		1900mAh
Nominal Voltage			1.2V
Charging Current x Time		Fast Charge 2)	2000mA × 1.1h
Ambient Temp.	Charge Condition	Fast Charge 2)	0°C - 40°C
	Discharge Condition		0°C - 50°C
	Storage Condition	Less than 90days	-20°C - 40°C
		Less than 1year	-20°C - 30°C
Internal Impedance 3) (after discharge to E.V.=1.0V)			Approx. 25mΩ (at 1000Hz)
Weight 4)			Approx.27g
Size 4) :(Diameter) x (Height)			14.35(D) x 50.4(H) mm

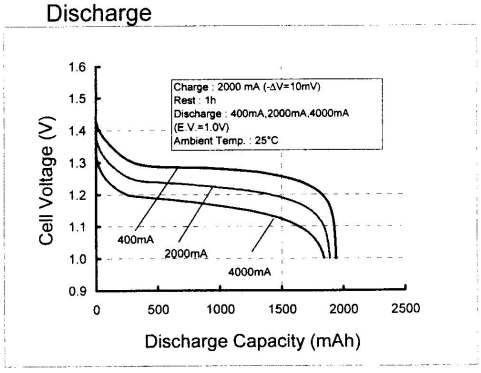
1)Single cell capacity under the following condition.
Charge : 200mA×16h, Discharge : 400mA(E.V.=1.0V) at 25°C
2)Use recommended charging system.
3)After a few charge and discharge cycles under the above 1) condition.
4)With tube.

Typical Characteristics

Charge



Discharge



NPN medium power 25 V transistor PSS8050

FEATURES

- High total power dissipation
- High current capability.

APPLICATIONS

- Medium power switching and muting
- Amplification
- Portable radio output amplifier (class-B, push-pull).

DESCRIPTION

NPN transistor in a SOT54 (TO-92) plastic package.
PNP complement: PSS8550.

MARKING

TYPE NUMBER	MARKING CODE
PSS8050C	S8050C
PSS8050D	S8050D

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{CEO}	collector-emitter voltage	25	V
I_C	collector current (DC)	1.5	A

PINNING

PIN	DESCRIPTION
1	collector
2	base
3	emitter

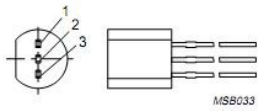


Fig.1 Simplified outline (SOT54).

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	25	V
V_{EBO}	emitter-base voltage	open collector	–	6	V
I_C	collector current (DC)		–	1.5	A
I_{CM}	peak collector current		–	2	A
I_B	base current (DC)		–	300	mA
I_{BM}	peak base current		–	1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C; note 1	–	850	mW
		$T_{amb} \leq 25$ °C; note 2	–	900	mW
		$T_{amb} \leq 25$ °C; note 3	–	1	W
T_{stg}	storage temperature		−65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		−65	+150	°C

Notes

1. Device mounted on a printed-circuit board; single sided copper; tinplated; standard footprint.
2. Device mounted on a printed-circuit board; single sided copper; tinplated; mounting pad for collector 1 cm^2.
3. Device mounted on a printed-circuit board; single sided copper; tinplated; standard footprint. Operated under pulsed conditions: pulse width $t_p \leq 1$ s; duty cycle $\delta \leq 0.75\%$.

HEWLETT PACKARD

T-1¾ (5 mm) Precision Optical Performance White LEDs

Technical Data

HP SunPower Series
HLMP-CW15
HLMP-CW16
HLMP-CW30
HLMP-CW31

Features

- **Highly Luminous White Emission**
- **Emission Color: 0.31, 0.32**
- **Viewing Angles: 15° & 30°**

Benefits

- **Reduced Power Consumption, Higher Reliability, and Increased Optical/Mechanical Design Flexibility, Compared to Incandescent Bulbs and Other Alternative White Light Sources**

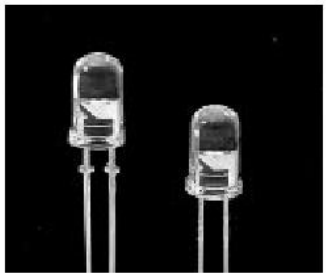
Applications

- **Electronic Signs and Signals**
- **Small Area Illumination**
- **Legend Backlighting**
- **General Purpose Indicators**

Description

These high intensity white LED lamps are based on InGaN material technology. A blue LED die is coated by a YAG phosphor to produce white. The typical resulting color is described by the coordinates x = 0.31, y = 0.32 using the 1931 CIE Chromaticity Diagram.

The T-1¾ lamps are untinted, nondiffused, and incorporate precise optics producing well defined spatial radiation patterns at specific viewing cone angles. The HLMP-CW15 and HLMP-CW16 offer a 15° viewing angle. The HLMP-CW30 and HLMP-CW31 offer a 30° viewing angle. The HLMP-CW16 and HLMP-CW31 have stand-offs on the leads.



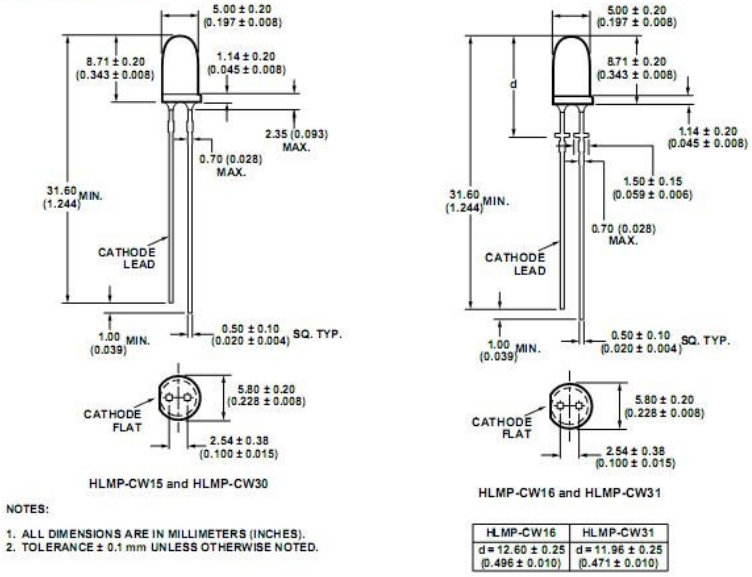
CAUTION: *HLMP-CWxx LEDs are Class 1 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Hewlett-Packard Application Note AN-1142 for additional details.*

Device Selection Guide

Part Number	Viewing Angle	Typical Intensity @ 20 mA (mcd)	Typical Luminous Flux @ 20 mA (mlm)[1]	Stand off
HLMP-CW15	15°	2000	160	No
HLMP-CW16	15°	2000	160	Yes
HLMP-CW30	30°	800	240	No
HLMP-CW31	30°	800	240	Yes

Note: 1. Values are based on approximate Flux/I_v conversion factors. Lamps are not tested for flux.

Package Dimensions



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).
2. TOLERANCE ± 0.1 mm UNLESS OTHERWISE NOTED.

HLMP-CW16	HLMP-CW31
d = 12.60 ± 0.25 (0.496 ± 0.010)	d = 11.96 ± 0.25 (0.471 ± 0.010)

Absolute Maximum Ratings at $T_A = 25°C$

Parameter	Value	Units
DC Forward Current[1]	30	mA
Peak Forward Current	100	mA
Average Forward Current	30	mA
Power Dissipation	120	mW
Reverse Voltage (I_R = 100 μA)	5	V
LED Junction Temperature	100	°C
Operating Temperature Range	−40 to +80	°C
Storage Temperature Range	−40 to +100	°C

Note: 1. Derate linearly as shown in Figure 4 for temperatures above 50°C.

Optical Characteristics at $T_A = 25°C$

Part Number	Luminous Intensity I_V (mcd) @ I_F = 20 mA Min.	Typ.	Typical Chromaticity Coordinates[1] x	y	Viewing Angle $2\theta_{1/2}$ Degrees[2] Typ.	Luminous Output η_V (lm/W)
HLMP-CW15/16	1300	2000	0.31	0.32	15	280
HLMP-CW30/31	450	800	0.31	0.32	30	280

Notes:
1. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represent the perceived color of the device.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
3. Luminous output is the ratio of luminous flux to radiant flux.

Electrical Characteristics at $T_A = 25°C$

Forward Voltage V_F (Volts) @ I_F = 20 mA Typ.	Max.	Reverse Breakdown V_R (Volts) @ I_R = 100 µA Min.	Capacitance C (pF), V_F = 0, f = 1 MHz Typ.	Thermal Resistance $R\theta_{J\text{-}PIN}$ (°C/W)
3.5	4.0	10	40	240

Intensity Bin Limits (mcd at 20 mA)

Bin Name	Min.	Max.
L	400	520
M	520	680
N	680	880
P	880	1150
Q	1150	1500
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500

Tolerance for each bin limit is ± 15%.

Color Bin Limits (at 20 mA)

Rank	Limits (Chromaticity Coordinates)					Approximate Color Temperature
1	x	0.44	0.39	0.35	0.38	3500-4500 K
	y	0.48	0.34	0.31	0.45	
2	x	0.35	0.38	0.33	0.33	4500-5500 K
	y	0.31	0.45	0.42	0.29	
3	x	0.33	0.33	0.32	0.30	5500-6500 K
	y	0.42	0.29	0.27	0.39	
4	x	0.32	0.30	0.25	0.30	6500-10,000 K
	y	0.27	0.39	0.34	0.24	
5	x	0.30	0.26	0.22	0.29	10,000-20,000 K
	y	0.24	0.33	0.29	0.22	

Notes:
1. Bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your Hewlett-Packard representative for information on currently available bins.

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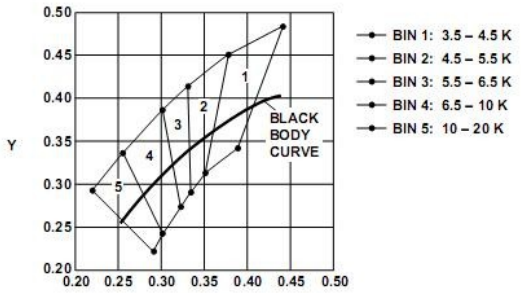
Color Bin Limits: CIE 1931 2' Chromaticity Diagram



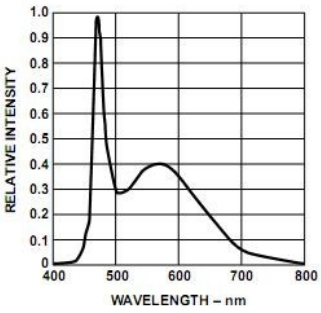


Figure 1. Relative Intensity vs. Wavelength.

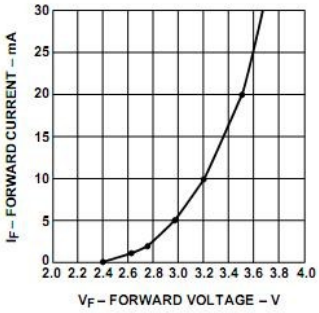


Figure 2. Forward Current vs. Forward Voltage.

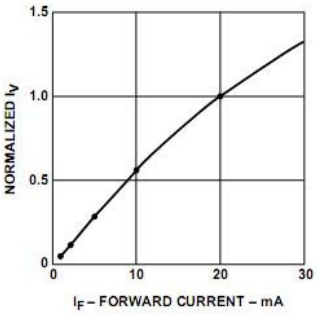


Figure 3. Relative Luminous Intensity vs. Forward Current.

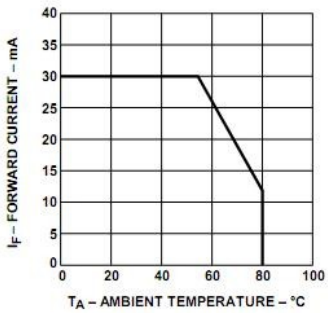


Figure 4. Maximum Forward Current vs. Ambient Temperature.

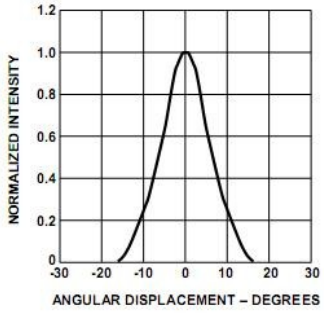


Figure 5. Representative Spatial Radiation Pattern for 15°.

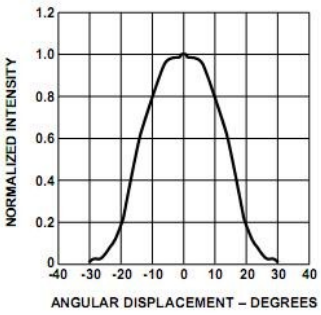


Figure 6. Representative Spatial Radiation Pattern for 30°.

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5968-4004E (4/99)