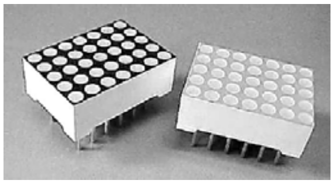
Data Sheet

HDSP-701x, HDSP-703x, HDSP-711x, and HDSP-713x Series

17.3-mm (0.68-inch) General-Purpose 5x7 Dot Matrix Alphanumeric Displays



Description

The Broadcom® HDSP-701x, HDSP-703x, HDSP-711x, and HDSP-713x Series displays have a 17.3-mm (0.68-inch) character height and use industry-standard size and pinout. The devices are available in either common row anode or common row cathode configurations. The displays come in either gray or black face paint and are available in a choice of AlInGaP Red, AlInGaP Green, or AlInGaP Deep Red.

Applications

- Suitable for indoor use
- Not recommended for industrial application
- Extreme temperature cycling not recommended

Features

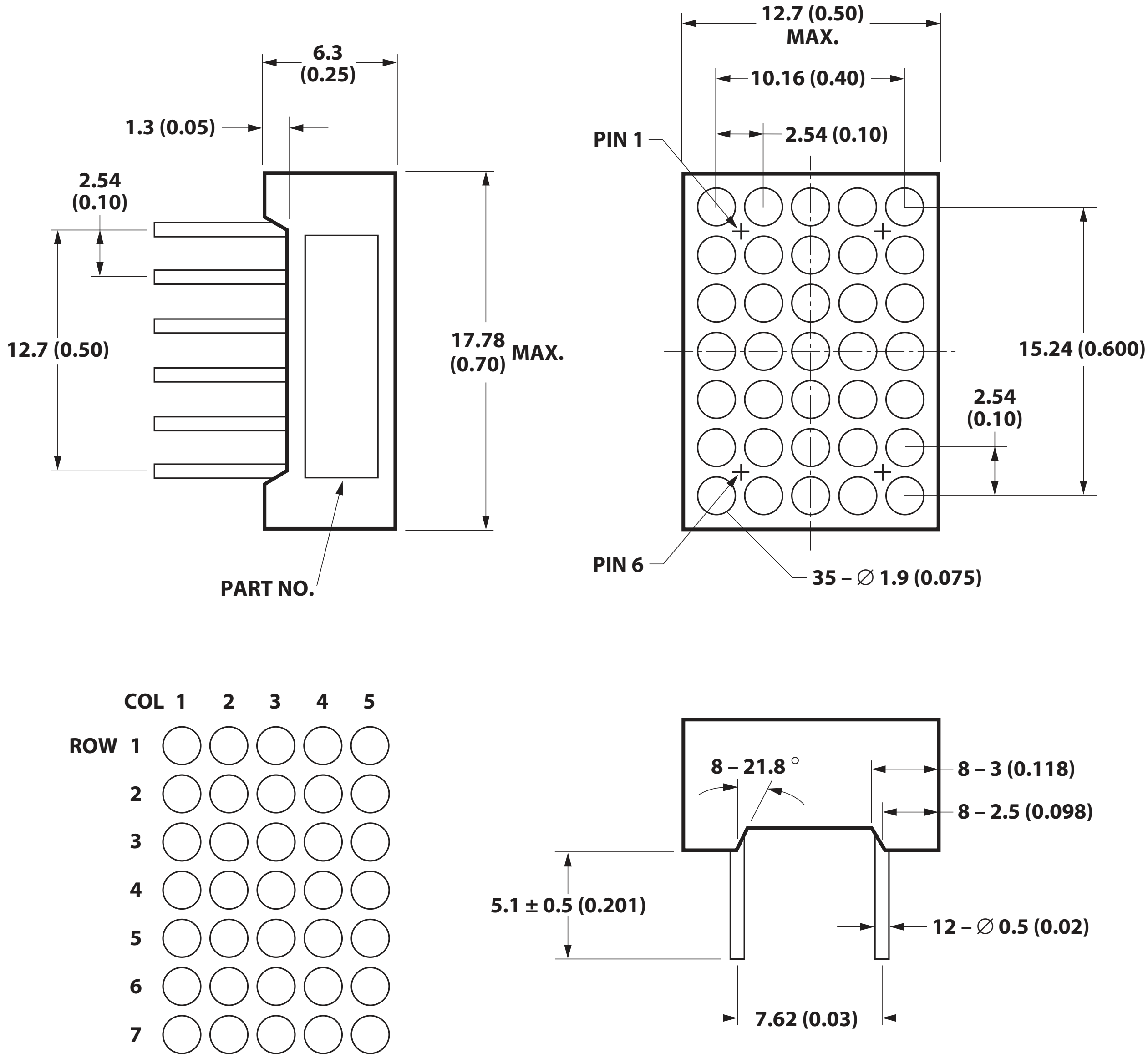
- 5 × 7 dot matrix font
- Viewable up to 12 meters
- X-Y stackable
- Industry-standard pinout
  - 7.6-mm (0.3 in.) Dual-in-Line (DIP) leads on 2.54 mm (0.1 in.) centers
- Choice of colors
  - AlInGaP Red, AlInGaP Green, AlInGaP Deep Red
- Choice of face paint colors
  - Gray or black
- Design flexibility
  - Common row anode or common row cathode
- Categorized for luminous intensity
- Green categorized for color

Ordering Information

AlInGaP Red	AlInGaP Green	AlInGaP Deep Red	Description
HDSP-701E	HDSP-701G	HDSP-701A	17.3 mm Gray Surface Common Row Anode
HDSP-703E	HDSP-703G	HDSP-703A	17.3 mm Gray Surface Common Row Cathode
HDSP-711E	HDSP-711G	HDSP-711A	17.3 mm Black Surface Common Row Anode
HDSP-713E	HDSP-713G	HDSP-713A	17.3 mm Black Surface Common Row Cathode

Package Dimensions

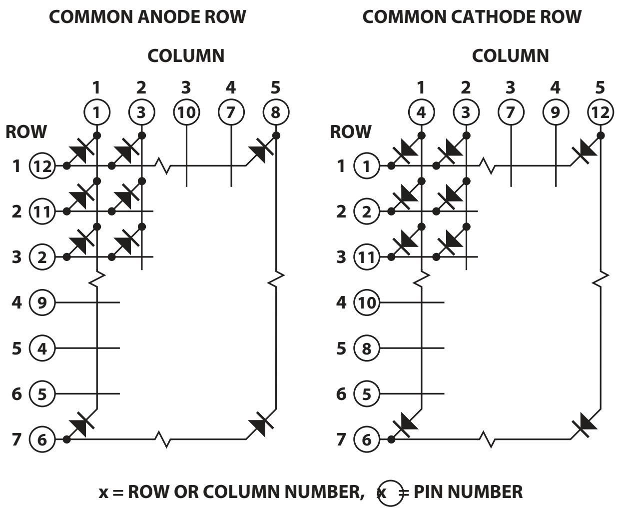
Figure 1: Package Drawing



NOTES:
1. ALL DIMENSIONS IN MILLIMETERS (INCHES).
2. UNLESS OTHERWISE STATED, TOLERANCE IS ± 0.25 mm (0.010).
3. FOR GREEN ONLY.

Internal Circuit Diagram

Figure 2: Common Anode and Cathode Rows



COMMON ROW ANODE		COMMON ROW CATHODE	
PIN	HDSP-701E/711E/ 701G/711G/701A/711A	PIN	HDSP-703E/713E/ 703G/713G/703A/713A
1	COLUMN 1 CATHODE	1	ROW 1 CATHODE
2	ROW 3 ANODE	2	ROW 2 CATHODE
3	COLUMN 2 CATHODE	3	COLUMN 2 ANODE
4	ROW 5 ANODE	4	COLUMN 1 ANODE
5	ROW 6 ANODE	5	ROW 6 CATHODE
6	ROW 7 ANODE	6	ROW 7 CATHODE
7	COLUMN 4 CATHODE	7	COLUMN 3 ANODE
8	COLUMN 5 CATHODE	8	ROW 5 CATHODE
9	ROW 4 ANODE	9	COLUMN 4 ANODE
10	COLUMN 3 CATHODE	10	ROW 4 CATHODE
11	ROW 2 ANODE	11	ROW 3 CATHODE
12	ROW 1 ANODE	12	COLUMN 5 ANODE

Absolute Maximum Ratings at T_A = 25°C

Description	Red HDSP-701E/ 711E/703E/ 713E	Deep Red HDSP-701A/ 703A/711A/ 713A	Green HDSP-701G/ 711G/703G/ 713G	Unit
Power Dissipation per Dot	62.5	52	62.5	mW
Peak Forward Current per Dot[a]	90	60	90	mA
DC Forward Current per Dot	25[b]	20[c]	25[d]	mA
Reverse Voltage per Dot[e]	5			V
Operating Temperature	–40 to +85	–40 to +85	–40 to +85	°C
Storage Temperature	–40 to +85	–40 to +85	–40 to +85	°C
Wave Soldering Temperature for 3 Seconds[f] (1.6-mm [0.063 in.] below body)	250	250	250	°C

a. Duty factor = 10%, frequency = 1 kHz, T_A = 25°C.
b. Derate linearly as shown in Figure 6.
c. Derate linearly as shown in Figure 10.
d. Derate linearly as shown in Figure 14.
e. Reverse Voltage is for LED testing purposes and is not recommended to be used as an application condition.
f. Not recommended to be soldered more than 2 times. Minimum interval between solderings is 15 minutes. Total soldering time not to exceed 5 seconds.

Optical/Electrical Characteristics at T_A = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Red Devices HDSP-701E/711E/703E/713E						
Luminous Intensity/Dot[a,b,c] (Digital Average)	I_V	2.90	6.80	—	mcd	I_F = 10 mA
Peak Wavelength	λ_P	—	633	—	nm	I_F = 20 mA
Dominant Wavelength[d]	λ_d	—	622	—	nm	I_F = 20 mA
Forward Voltage[e]	V_F	—	1.95	2.50	V	I_F = 20 mA
Reverse Voltage[f]	V_R	5	—	—	V	I_R = 100 mA
Luminous Intensity Matching Ratio	I_{V-M}	—	—	2:1		I_F = 10 mA
Green Devices HDSP-701G/711G/703G/713G						
Luminous Intensity/Dot[a,b,c] (Digital Average)	I_V	4.85	9.00	—	mcd	I_F = 10 mA
Peak Wavelength	λ_P	—	572	—	nm	I_F = 20 mA
Dominant Wavelength[d]	λ_d	—	570	—	nm	I_F = 20 mA
Forward Voltage[e]	V_F	1.80	2.10	2.50	V	I_F = 20 mA
Reverse Voltage[f]	V_R	5	—	—	V	I_R = 100 mA
Luminous Intensity Matching Ratio	I_{V-M}	—	—	2:1		I_F = 10 mA
Deep Red Devices HDSP-701A/711A/703A/713A						
Luminous Intensity/Dot[a,b,c] (Digital Average)	I_V	1.55	2.10	—	mcd	I_F = 2 mA
Peak Wavelength	λ_P	—	660	—	nm	I_F = 20 mA
Dominant Wavelength[d]	λ_d	—	640	—	nm	I_F = 20 mA
Forward Voltage[e]	V_F	—	2.00	2.60	V	I_F = 20 mA
Reverse Voltage[f]	V_R	5	—	—	V	I_R = 100 mA
Luminous Intensity Matching Ratio	I_{V-M}	—	—	2:1		I_F = 2 mA

a. The luminous intensity, I_V, is measured at the mechanical axis of the package.

b. The optical axis is closely aligned with the mechanical axis of the package.

c. Tolerance is ±15%.

d. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the perceived color of the device.

e. Forward voltage tolerance is ±0.1V.

f. Indicates product final test condition. Long-term reverse bias is not recommended.

Red

Figure 3: Relative Intensity vs. Wavelength

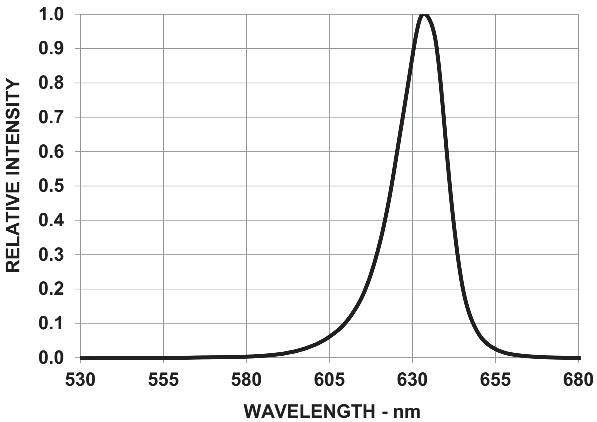


Figure 4: Forward Current vs. Forward Voltage

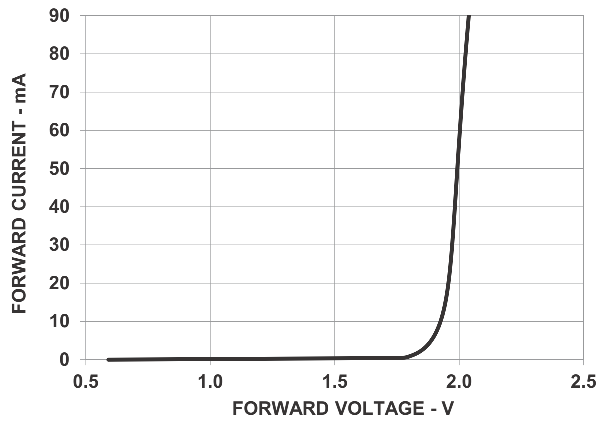


Figure 5: Relative Luminous Intensity vs. Forward Current

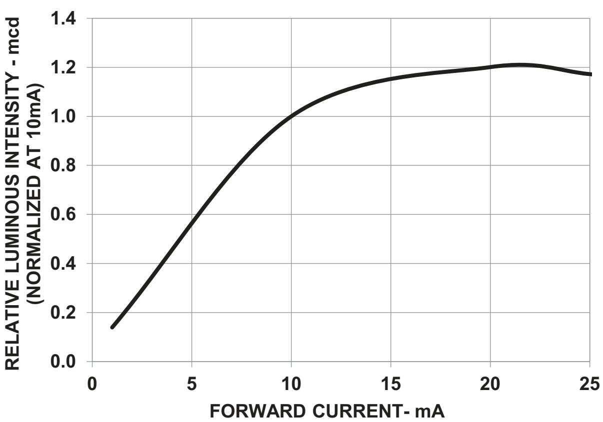
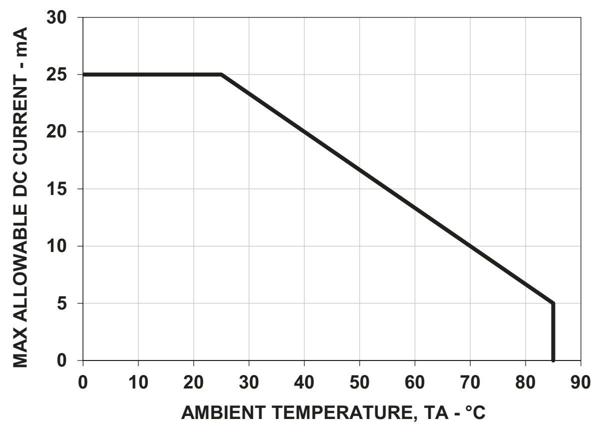


Figure 6: Maximum Forward Current vs. Ambient Temperature



Deep Red

Figure 7: Relative Intensity vs.Wavelength

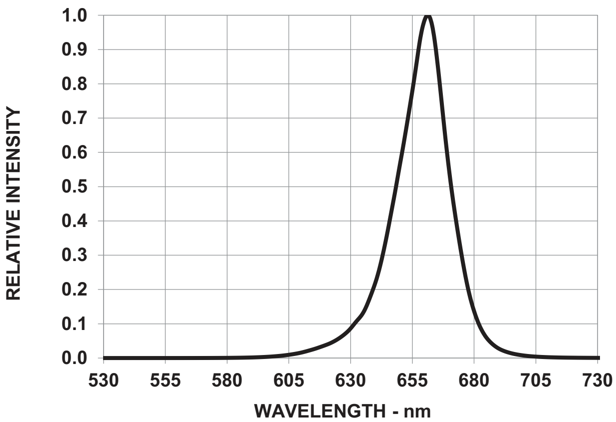


Figure 8: Forward Current vs. Forward Voltage

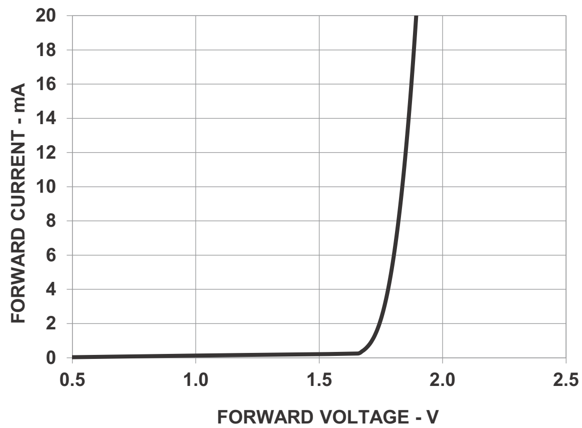


Figure 9: Relative Luminous Intensity vs. Forward Current

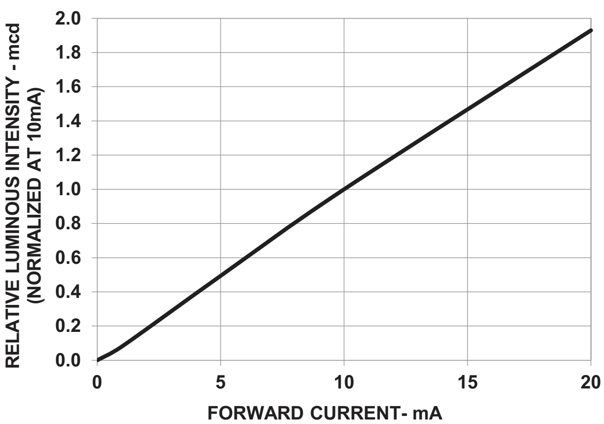
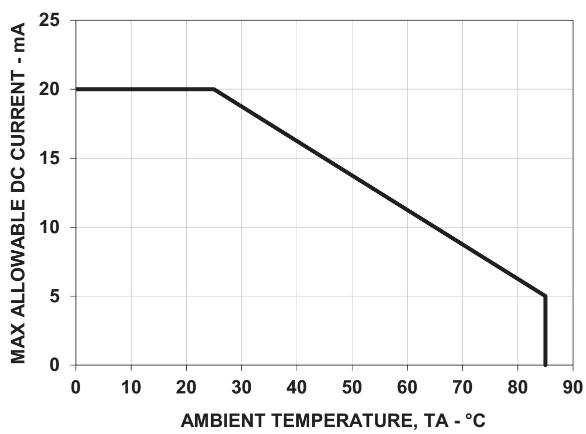


Figure 10: Maximum Forward Current vs. Ambient Temperature



Green

Figure 11: Relative Intensity vs. Wavelength

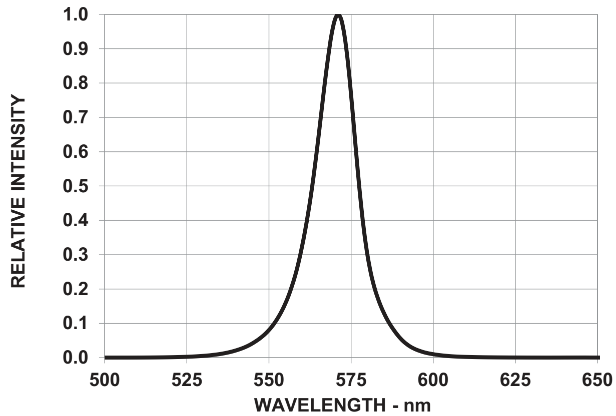


Figure 12: Forward Current vs. Forward Voltage

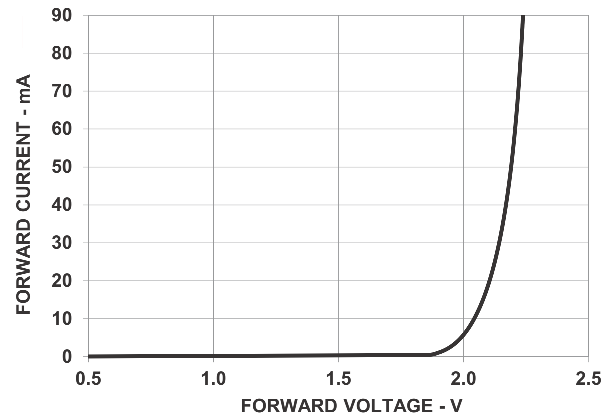


Figure 13: Relative Luminous Intensity vs. Forward Current

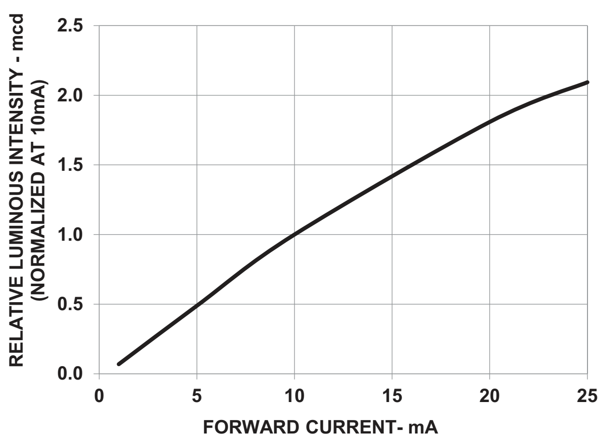
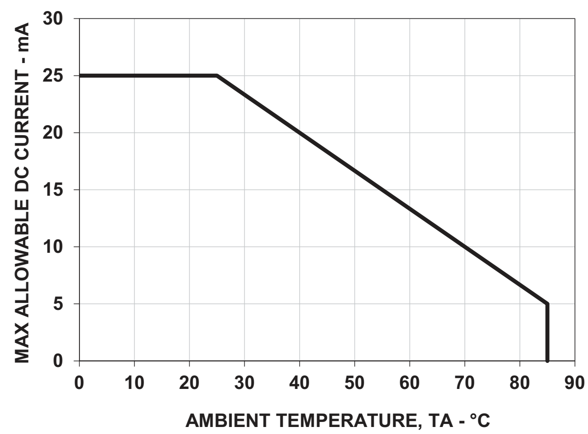


Figure 14: Maximum Forward Current vs. Ambient Temperature



Intensity Bin Limits

Red (mcd at 10 mA)

IV Bin Category	Min.	Max.
G	2.900	4.350
H	4.350	6.525
I	6.525	9.785
K	9.785	14.675

Tolerance for each bin limit is ±15%.

Green (mcd at 10 mA)

IV Bin Category	Min.	Max.
L	4.850	7.280
M	7.280	10.920
N	10.920	16.380
O	16.380	24.570

Tolerance for each bin limit is ±15%.

Deep Red (mcd at 2 mA)

IV Bin Category	Min.	Max.
I	1.550	2.330
J	2.330	3.490

Tolerance for each bin limit is ±15%.

Color Bin Limits[1] (Dominant Wavelength)

Color	Bin	Dominant Wavelength (nm)	
		Min.	Max.
Green	2	573.6	576.5
	3	570.6	573.5
	4	567.6	570.5
	5	564.5	567.5

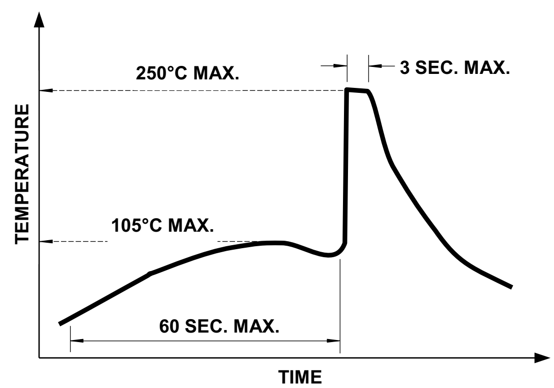
1. Bin categories are established for classification of products. Products might not be available in all bin categories.

Precautionary Notes

Soldering and Handling Precautions

- Set and maintain the wave soldering parameters according to the recommended temperature and dwell time. Perform daily checks on the profile to ensure that it is always conforming to the recommended conditions. Exceeding these conditions will over-stress the LEDs and cause premature failures.
- Use only bottom preheaters to reduce thermal stress experienced by the LEDs.
- Recalibrate the soldering profile before loading a new type of PCB. PCBs with different sizes and designs (component density) will have different heat capacities and might cause a change in temperature experienced by the PCB if the same wave soldering setting is used.
- Do not perform wave soldering more than once.
- Any alignment fixture used during wave soldering must be loosely fitted and must not apply stress on the LEDs. Use non-metal material because it will absorb less heat during the wave soldering process.
- At elevated temperatures, the LEDs are more susceptible to mechanical stress. Allow the PCB to be sufficiently cooled to room temperature before handling. Do not apply stress to the LED when it is hot.
- Use wave soldering to solder the LED. Use hand soldering only for rework or touch up if unavoidable, but it must be strictly controlled to following conditions:
  - Soldering iron tip temperature = 315°C maximum.
  - Soldering duration = 2 seconds maximum.
  - Number of cycle = 1 only.
  - Power of soldering iron = 50W maximum.
- For ESD-sensitive devices, apply proper ESD precautions at the soldering station. Use only an ESD-safe soldering iron.
- Do not touch the LED package body with the soldering iron except for the soldering terminals because it may cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED is affected by soldering with hand soldering.
- Keep the heat source at least 1.6 mm away from the LED body during soldering.
- Design an appropriate hole size to avoid problems during insertion.
- Cleaning agents from the ketone family (acetone, methyl ethylketone, and so on) and from the chlorinated hydrocarbon family (methylene chloride, trichloroethylene, carbon tetrachloride, and so on) are not recommended for cleaning the LED displays. All of these various solvents attack or dissolve the encapsulating epoxies used to form the package of plastic LED parts.
- For the purpose of cleaning, wash with DI water only. The cleaning process should take place at room temperature only. Clear any water or moisture from the LED display immediately after washing.
- Use of *No clean* solder paste is recommended for soldering.

Figure 15: Recommended Wave Soldering Profile



NOTE: Figure 15 refers to measurements with thermocouple mounted at the bottom of the PCB.

Application Precautions

- The drive current of the LED must not exceed the maximum allowable limit across temperatures as stated in the data sheet. Constant current driving is recommended to ensure consistent performance.
- Circuit design must cater to the whole range of forward voltage (V_F) of the LEDs to ensure the intended drive current can always be achieved.
- The LED exhibits slightly different characteristics at different drive currents, which may result in a larger variation of performance (such as intensity, wavelength, and forward voltage). Set the application current as close as possible to the test current to minimize these variations.
- The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving the LED in matrix form, ensure that the reverse bias voltage does not exceed the allowable limit of the LED.

- Avoid rapid change in ambient temperatures, especially in high-humidity environments, because they cause condensation on the LED.
- If the LED is intended to be used in a harsh or outdoor environment, protect the LED against damages caused by rain, water, dust, oil, corrosive gases, external mechanical stresses, and so on.

Eye Safety Precautions

LEDs may pose optical hazards when in operation. Do not look directly at operating LEDs because it might be harmful to the eyes. For safety reasons, use appropriate shielding or personal protective equipment.

Disclaimer

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