HEWLETT PACKARD

JAN Qualified Hermetic Solid State Lamps*

Technical Data

1N5765
JAN1N5765
JANTX1N5765
1N6092
JAN1N6092
JANTX1N6092
1N6093
JAN1N6093
JANTX1N6093
1N6094
JAN1N6094
JANTX1N6094

Features

- **Military Qualified**
- **Listed on MIL-S-19500 QPL**
- **Choice of Four Colors**
  Red
  High Efficiency Red
  Yellow
  Green
- **Designed for High-Reliability Applications**
- **Hermetically Sealed**
- **Wide Viewing Angle**
- **Low Power Operation**
- **IC Compatible**
- **Long Life**
- **Panel Mount Configuration**

Description

The 1N5765, 1N6092, 1N6093 and 1N6094 solid state LEDs are hermetically sealed in a TO-46 package with a tinted, diffused plastic lens over a glass window. These devices are designed for high reliability applications and provide excellent on-off contrast, high axial luminous intensity, and a wide viewing angle. The panel mount versions consist of an LED unit permanently mounted in an anodized aluminum sleeve.

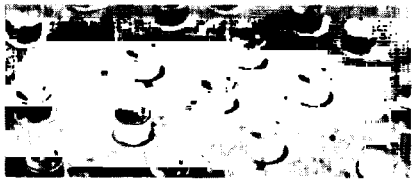
The 1N5765 utilizes a GaAsP LED chip with a red diffused lens over a glass window.

The 1N6092 has a high efficiency red GaAsP on GaP LED chip with a red diffused lens over a glass window. This device is comparable to the 1N5765 but its efficiency extends to higher currents and it provides greater luminous intensity.

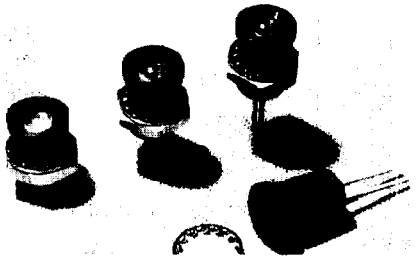
The 1N6093 provides a yellow GaAsP on GaP LED chip with a yellow, diffused lens over a glass window.

The 1N6094 utilizes a green GaP LED chip with a green, diffused lens over a glass window.

The plastic lens over glass window system is extremely durable and has exceptional temperature cycling capabilities.



HERMETIC TO-46 LAMP



PANEL MOUNT LAMP ASSEMBLY

*Panel mount versions of all of the above are available per the selection matrix on the next page.

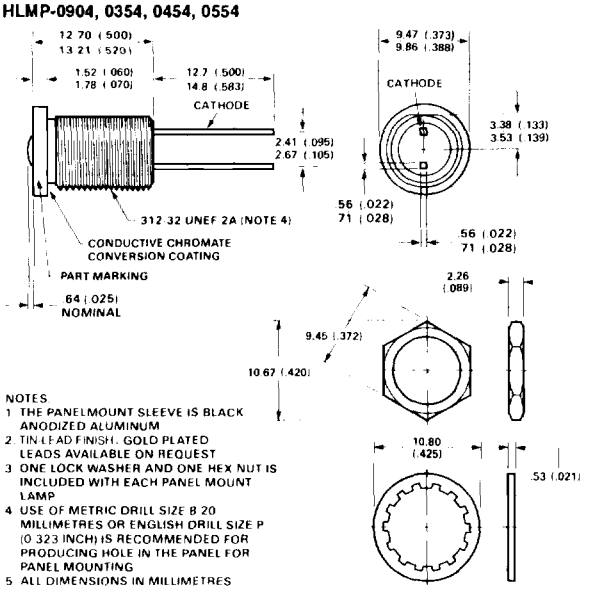
Selection Guide

COLOR – PART NUMBER – LAMP AND PANEL MOUNT MATRIX				
Description	**Standard Product**	**With JAN Qualification[1]**	**JAN Plus TX Testing[2]**	**Controlling MIL-S-19500 Document[4]**
TABLE A. Hermetic TO-46 Part Number System				
Standard Red	1N5765	JAN1N5765	JANTX1N5765	/467
High Efficiency Red	1N6092	JAN1N6092	JANTX1N6092	/519
Yellow	1N6093	JAN1N6093	JANTX1N6093	/520
Green	1N6094	JAN1N6094	JANTX1N6094	/521
TABLE B. Panel Mountable Part Number System[3]				
Standard Red	HLMP-0904	HLMP-0930	HLMP-0931	None
High Efficiency Red	HLMP-0354	HLMP-0380 (JANM19500/51901)	HLMP-0381 (JTXM19500/51902)	/519
Yellow	HLMP-0454	HLMP-0480 (JANM19500/52001)	HLMP-0481 (JTXM19500/52002)	/520
Green	HLMP-0554	HLMP-0580 (JANM19500/52101)	HLMP-0581 (JTXM19500/52102)	/521

Notes:
1. Parts are marked with the JAN part number.
2. Parts are marked with the JANTX part number.
3. Panel mountable packaging incorporates the Table A TO-46 part into a panel mount enclosure.
4. JAN and JANTX parts only.

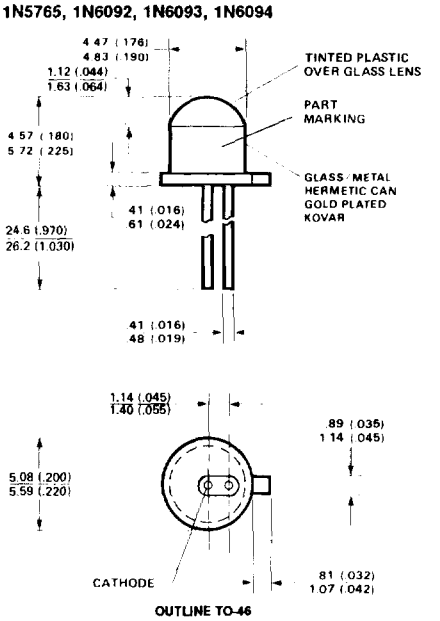
Package Dimensions

HLMP-0904, 0354, 0454, 0554



NOTES
1. THE PANELMOUNT SLEEVE IS BLACK ANODIZED ALUMINUM
2. TIN-LEAD FINISH. GOLD PLATED LEADS AVAILABLE ON REQUEST
3. ONE LOCK WASHER AND ONE HEX NUT IS INCLUDED WITH EACH PANEL MOUNT LAMP
4. USE OF METRIC DRILL SIZE 8.20 MILLIMETRES OR ENGLISH DRILL SIZE P (0.323 INCH) IS RECOMMENDED FOR PRODUCING HOLE IN THE PANEL FOR PANEL MOUNTING
5. ALL DIMENSIONS IN MILLIMETRES (INCHES)
6. PACKAGE WEIGHT INCLUDING LAMP AND PANEL MOUNT IS 1.2 1.8 GRAMS. NUT AND WASHER IS AN EXTRA 0.6 1.0 GRAM

1N5765, 1N6092, 1N6093, 1N6094



OUTLINE TO-46

NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES (INCHES)
2. GOLD PLATED KOVAR LEADS
3. PACKAGE WEIGHT OF LAMP ALONE IS .25 .40 GRAMS

Absolute Maximum Ratings at T_A = 25°C

Parameter	Red 1N5765 HLMP-0904	High Eff. Red 1N6092 HLMP-0354	Yellow 1N6093 HLMP-0454	Green 1N6094 HLMP-0554	Units
Power Dissipation (derate linearly from 50°C at 1.6 mW/°C)	100	120	120	120	mW
DC Forward Current	50[1]	35[2]	35[2]	35[2]	mA
Peak Forward Current	1000 See Fig. 5	60 See Fig. 10	60 See Fig. 15	60 See Fig. 20	mA
Operating and Storage Temperature Range	-65°C to +100°C				
Lead Soldering Temperature [1.6 mm (0.063 in.) from body]	260°C for 7 seconds				

Notes:
1. Derate from 50°C at 0.2 mA/°C.
2. Derate from 50°C at 0.5 mA/°C.

Electrical/Optical Characteristics at T_A = 25°C

Sym.	Description	1N5765/ HLMP-0904			1N6092/ HLMP-0354			1N6093/ HLMP-0454			1N6094/ HLMP-0554			Units	Test Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
I_{V1}	Axial Luminous Intensity	0.5	1.0		3.0	8.0		3.0	8.0		3.0	8.0		mcd	I_F = 20 mA Figs. 3, 8, 13, 18 θ = 0°
											At I_F = 25 mA				
I_{V2}	Luminous Intensity at θ = 30°	1.5			1.5			1.5			1.5			mcd	I_F = 20 mA θ = 30°
											At I_F = 25 mA				
$2\theta_{1/2}$	Included Angle Between Half Luminous Intensity Points[1]		60			70			70			70		deg	Figures 6, 11, 16, 21
λ_{PEAK}	Peak Wavelength	630	655	700	590	635	695	550	583	660	525	565	600	nm	Measurement at Peak
λ_d	Dominant Wavelength[2]		640			626			585			570		nm	
τ_s	Speed of Response		10			200			200			200		ns	
C	Capacitance		200	300		35	100		35	100		35	100	pF	V_F = 0; f = 1 MHz
$R\theta_{J\text{-}PIN}$	Thermal Resistance*[3]		425			425			425			425		°C/W	
$R\theta_{J\text{-}PIN}$	Thermal Resistance**[3]		550			550			550			550		°C/W	
V_F	Forward Voltage		1.6	2.0		2.0	3.0		2.0	3.0		2.1	3.0	V	I_F = 20 mA Figures 2, 7, 12, 17
												At I_F = 25 mA			
I_R	Reverse Current			1.0			1.0			1.0			1.0	µA	V_R = 3 V
BV_R	Reverse Breakdown Voltage	4.0	5.0		5.0			5.0			5.0			V	I_R = 100 µA
η_v	Luminous Efficacy[4]		56			140			455			600		lm/W	

Notes:

1. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
2. The dominant wavelength, λ_d, is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.
3. Junction to Cathode Lead with 3.18 mm (0.125 inch) of leads exposed between base of flange and heat sink.
4. Radiant intensity, I_e, in watts/steradian, may be found from the equation $I_e=I_v/\eta_v$, where I_v is the luminous intensity in candelas and η_v is the luminous efficacy in lumens/watt.

*Panel mount.
**T0-46.

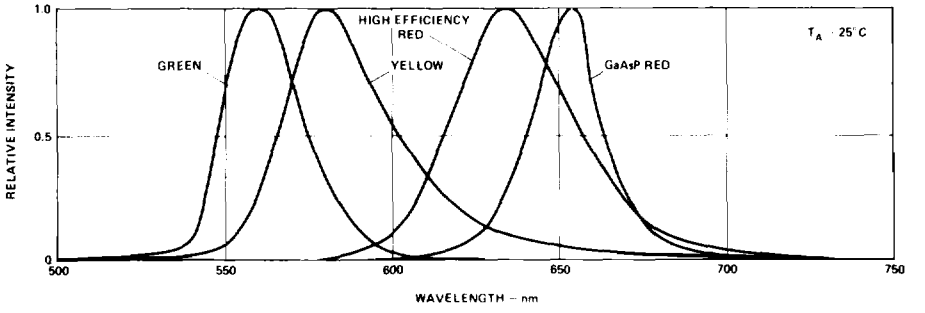


Figure 1. Relative Intensity vs. Wavelength.

Family of Red 1N5765/HLMP-0904

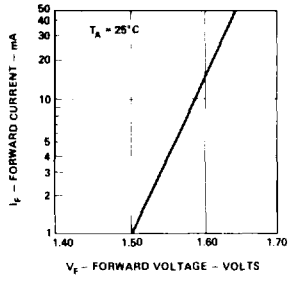


Figure 2. Forward Current vs. Forward Voltage.

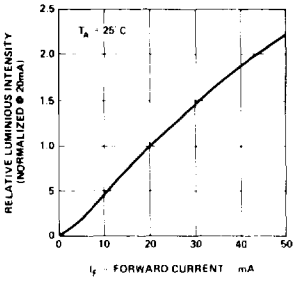


Figure 3. Relative Luminous Intensity vs. Forward Current.

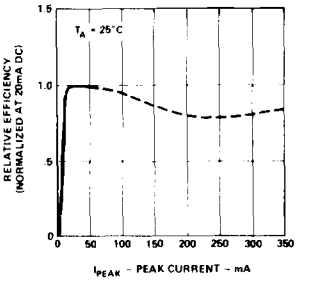


Figure 4. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

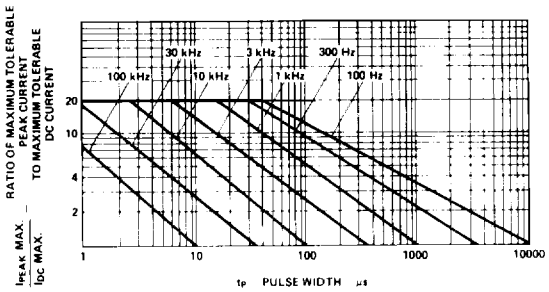


Figure 5. Maximum Tolerable Peak Current vs. Pulse Duration. (I_{DC} MAX as per MAX Ratings).

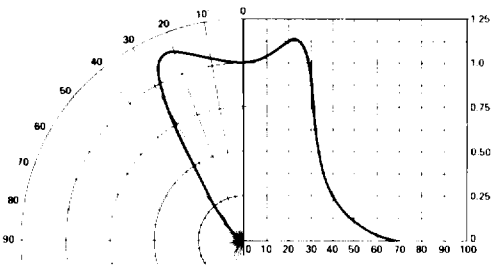


Figure 6. Relative Luminous Intensity vs. Angular Displacement.

Family of High Efficiency Red 1N6092/HLMP-0354

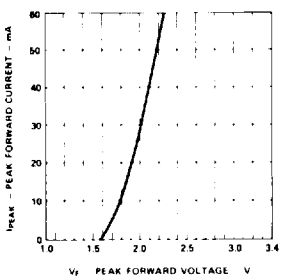


Figure 7. Forward Current vs. Forward Voltage.

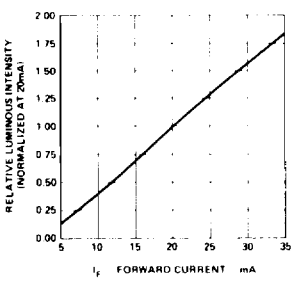


Figure 8. Relative Luminous Intensity vs. Forward Current.

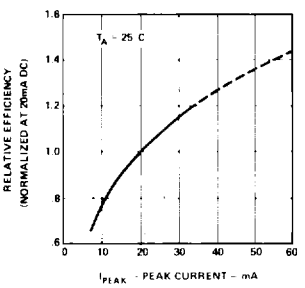


Figure 9. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

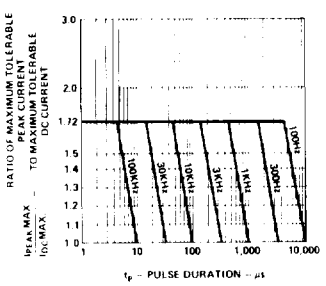


Figure 10. Maximum Tolerable Peak Current vs. Pulse Duration. (I_{DC} MAX as per MAX Ratings).

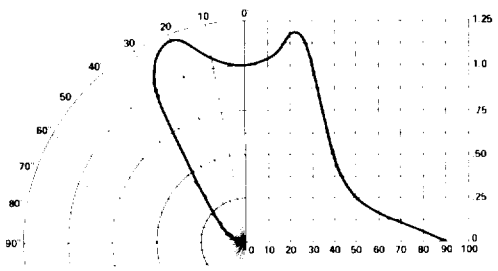


Figure 11. Relative Luminous Intensity vs. Angular Displacement.

Family of Yellow 1N6093/HLMP-0454

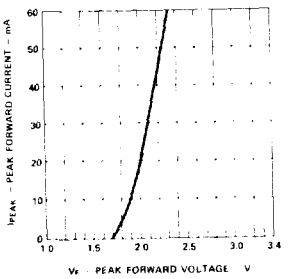


Figure 12. Forward Current vs. Forward Voltage.

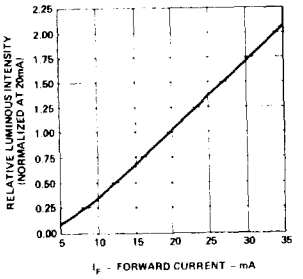


Figure 13. Relative Luminous Intensity vs. Forward Current.

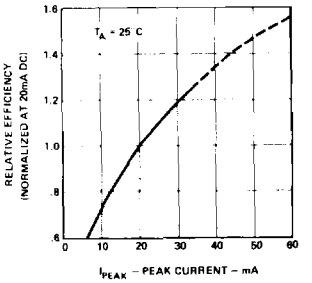


Figure 14. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

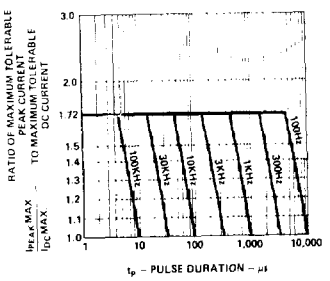


Figure 15. Maximum Tolerable Peak Current vs. Pulse Duration. (I_{DC} MAX as per MAX Ratings).

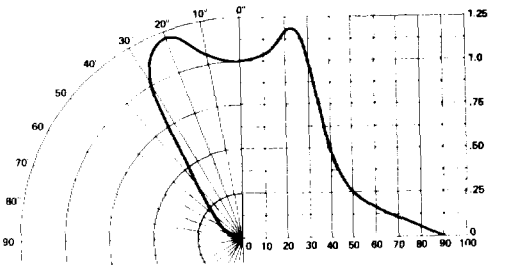


Figure 16. Relative Luminous Intensity vs. Angular Displacement.

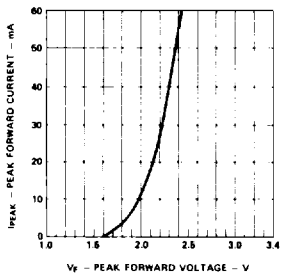


Figure 17. Forward Current vs. Forward Voltage.

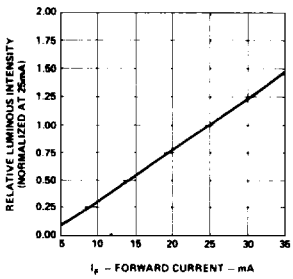


Figure 18. Relative Luminous Intensity vs. Forward Current.

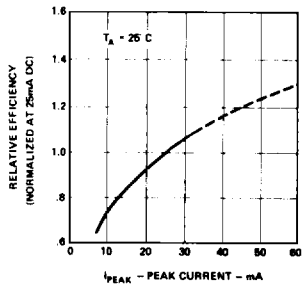


Figure 19. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

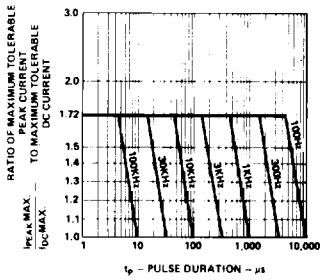


Figure 20. Maximum Tolerable Peak Current vs. Pulse Duration. (I_{DC} MAX as per MAX Ratings).

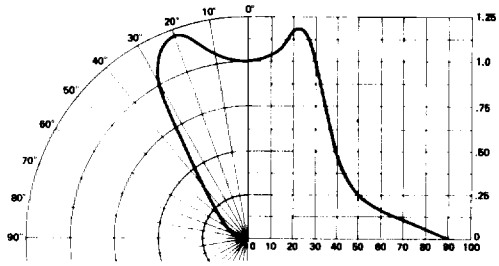


Figure 21. Relative Luminous Intensity vs. Angular Displacement.

JAN PART: Samples of each lot are subjected to Group A and B tests listed below. Every six months, samples from a single lot of each part type are subjected to Group C testing. All tests are to the conditions and limits specified by the appropriate MIL-S-19500 slash sheet specifications.

JANTX PART: These devices undergo 100% screening tests as listed below to the conditions and limits specified by the MIL-S-19500 slash sheet specification. The JANTX lot has also been subjected to Group A, B, and C sample tests as for the JAN PART above.

The following test tables apply to 1N6092, 1N6093 and 1N6094 devices. Refer to MIL-S-19500/467 slash sheet specifications for 1N5765 devices.

Table I. 100% Screening

Examination or Test	MIL-STD-750	
	Method	Conditions
1. High Temperature Life	1032	T_A = +100°C, Time = 24 hours
2. Temperature Cycling	1051	Condition A, T (high) = +100°C
3. Constant Acceleration	2006	20,000 g's. Y1 Axis
4. Fine Leak	1071	Condition H
5. Gross Leak	1071	Condition K, Test Temperature = +100°C
6. Electrical Test		I_V, V_F, and I_R, T_A = 25°C
7. Burn-In[1]	1015	I_F = 35 mA, T_A = 25°C, Time = 96 hours
8. Final Electrical Test		Same as Step 6
9. Deltas Determinations		ΔI_{V1} = -20%, V_F = ±50 mV
10. External Visual[1]	2071	

Note:
1. MIL-STD-883 Method applies.

Table II. Group A Inspection for TO-46 Lamps

Examination or Test	MIL-STD-750		LTPD	Symbol	Limits		Unit
	Method	Details			Min.	Max.	
Subgroup 1			5				
Visual and mechanical inspection	2071						
Subgroup 2			5				
Luminous intensity		I_F = 20 mA dc;[1] θ = 0°		I_{V1}	0.5[2] 3.0[3]		mcd mcd
Luminous intensity		I_F = 20 mA dc;[1] θ = 30°		I_{V2}	0.3[2] 1.5[3]		mcd mcd
Reverse current	4016	DC method; V_R = 3 V dc		I_R		1.0	μA dc
Forward current	4011	DC method; I_F = 20 mA[1]		V_F		3.0	V dc
Subgroup 3			10				
High temperature:		T_A = 100°C					
Reverse current	4016	DC method; V_R = 3 V dc		I_R		1.0	μA dc
Forward voltage	4011	DC method; I_F = 20 mA[1]		V_F		3.0	V dc
Low Temperature:		T_A = -55°C					
Reverse current	4016	DC method; V_R = 3 V dc		I_R		1.0	μA dc
Forward voltage	4011	DC method; I_F = 20 mA[1]		V_F		3.0	V dc
Subgroup 4			5				
Capacitance	4001	V_R = 0; f = 1 MHz		C		100	pF

Notes:
1. I_F = 25 mA for 1N6094.
2. For 1N5765.
3. For 1N6092, 1N6093, and 1N6094.

Table III. Group B Inspection

Examination or Test	MIL-STD-750		LTPD	Symbol	Limits		Unit
	Method	Details			Min.	Max.	
Subgroup 1			15				
Solderability	2026						
Resistance to solvents	1022						
Subgroup 2			10				
Thermal shock (temperature cycle)	1051	Test condition A T (high) = 100°C; 25 cycles					
Hermetic seal	1071	Test condition H					
Fine leak							
Gross Leak		Test condition C or K, indicator fluid/device maintained at 100°C ±5°C					
Electrical test:							
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°		I_{V1}	0.5[1] 3.0[2]		mcd mcd
Subgroup 3			5				
Steady-state-operation life	1027	I_F = 35 mA dc, 340 hours T_A = 25°C					
Electrical test:							
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°		I_{V1}	0.45[1] 2.7[2]		mcd mcd
Subgroup 4							
Decap internal design verification	2075	Test 1 device/0 failure					
Subgroup 5							
(Not applicable)							
Subgroup 6			7				
High temperature life (nonoperating)	1032	T_A = 100°C, 340 hours					
Electrical test:							
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°		I_{V1}	0.45[1] 2.7[2]		mcd mcd

Notes:
1. For 1N5765.
2. For 1N6092, 1N6093, and 1N6094.
3. 25 mA for 1N6094.

Table IV. Group C Inspection

Examination or Test	MIL-STD-750		LTPD	Symbol	Limits		Unit
	Method	Details			Min.	Max.	
Subgroup 1			15				
Physical dimensions	2066						
Subgroup 2			10				
Thermal shock (glass strain)	1056	Test condition A					
Terminal strength	2036	Test condition E					
Hermetic seal	1071						
Fine leak		Test condition H					
Gross leak		Test condition C or K, indicator fluid/device maintained at 100°C ± 5°C					
Moisture resistance	1021	Omit initial conditioning					
Electrical test:							
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°	I_{V1}		0.5[1] 3.0[2]		mcd mcd
Subgroup 3			10				
Shock	2016	Nonoperating, 1500 g's, 0.5 ms, 5 blows in X1, Y1, Z1 orientation					
Vibration, variable frequency	2056	Nonoperating					
Constant acceleration	2006	20,000 g's X1, Y1, Z1 orientation					
Electrical test:							
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°	I_{V1}		0.5[1] 3.0[2]		mcd mcd
Subgroup 4			15				
Salt atmosphere (corrosion)	1041						
Subgroup 5 (Not applicable)							
Subgroup 6							
Steady-state-operation life	1027	I_F = 35 mA dc, 1000 hours, T_A = 25°C					
Electrical test:							
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°	I_{V1}		0.45[1] 2.7[2]		mcd mcd

Table V. Group C Inspection (continued)

Examination or Test	MIL-STD-750 Method	MIL-STD-750 Details	LTPD	Symbol	Limits Min.	Limits Max.	Unit
Subgroup 7			10				
Peak forward pulse current (transient)		t_p = 1 µs, pps = 300, total test time = 5 s, I_{ptr} = 1.0 A(pk)					
Electrical test:							
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°		I_{V1}	0.45[1] 2.7[2]		mcd mcd
Subgroup 8			10				
Peak forward pulse current (operating)		t_p = 0.5 ms, P_{PM} ≤ 120 mW, T_A = 25°C, I_F = 60 mA, 500 hours					
Electrical test:							
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°		I_{V1}	0.45[1] 2.7[2]		mcd mcd

Notes:
1. For 1N5765.
2. For 1N6092, 1N6093, and 1N6094.
3. I_F = 25 mA for 1N6094.

Table VI. Group A Inspection for Panel Mount Lamps

Examination or Test	MIL-STD-750 Method	MIL-STD-750 Details	LTPD	Symbol	Limits Min.	Limits Max.	Unit
Subgroup 1			5				
External visual examination	2071						
Subgroup 2			5				
Luminous intensity		I_F = 20 mA dc,[3] θ = 0°		I_{V1}	0.5[1] 3.0[2]		mcd mcd
Forward voltage		DC method: I_F = 20 mA[3]		V_F		3.0	V dc
Reverse current		DC method: V_R = 3 V dc		I_R		1.0	µA dc
Subgroup 3			5				
Resistance to solvents	1022	Omit solution 2.1d					
Subgroup 4			5				
Physical dimensions	2066						

Notes:
1. For 1N5765.
2. For 1N6092, 1N6093, and 1N6094.
3. I_F = 25 mA for 1N6094.