# Surface Mount LED Indicator

## Technical Data

**HSMD-TX00**
**HSME-TX00**
**HSMG-TX00**
**HSMH-TX00**
**HSMS-TX00**
**HSMY-TX00**

### Features

- **Compatible with Automatic Placement Equipment**
- **Compatible with Infrared and Vapor Phase Reflow Solder Processes**
- **Packaged in 12 mm or 8 mm tape on 7" or 13" Diameter Reels**
- **EIA Standard Package**
- **Low Package Profile**
- **Nondiffused Package Excellent for Backlighting and Coupling to Light Pipes**

### Description

These solid state surface mount indicators are designed with a flat top and sides to be easily handled by automatic placement equipment. A glue pad is provided for adhesive mounting processes. They are compatible with convective IR and vapor phase reflow soldering and conductive epoxy attachment processes.

The package size and configuration conform to the EIA-535 BAAC standard specification for case size 3528 tantalum capacitors. The folded leads permit dense placement and provide an external solder joint for ease of inspection.

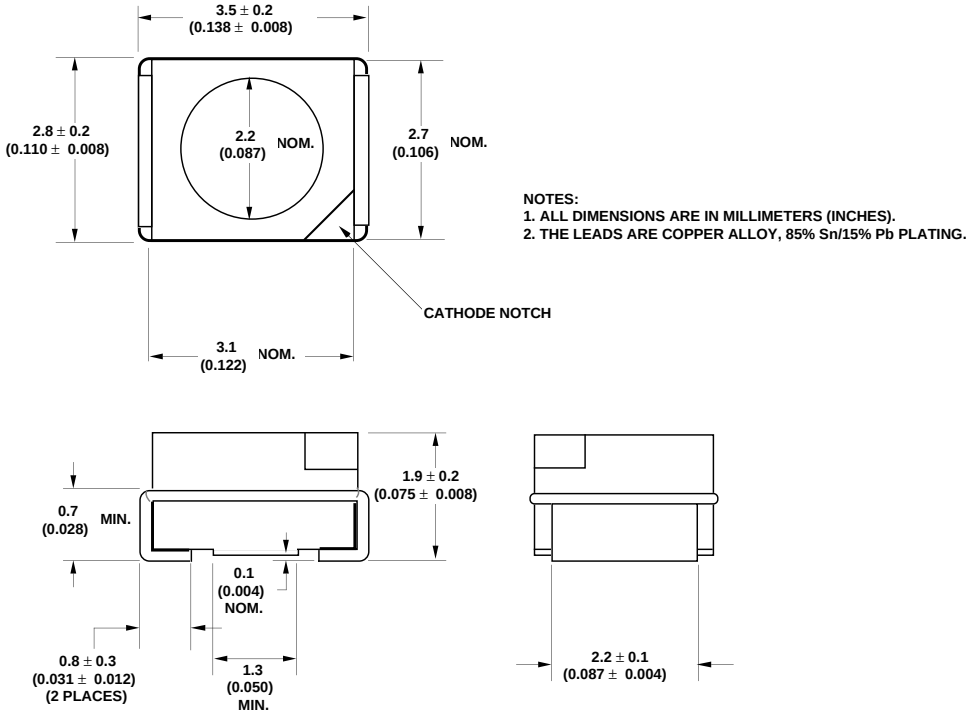
These devices are nondiffused, providing high intensity for applications such as backlighting, light pipe illumination, and front panel indication.

### Device Selection Guide

| DH AS AlGaAs Red HSMH- | High Efficiency Red HSMS- | Orange HSMD- | Yellow HSMY- | High Performance Green HSMG- | Emerald Green HSME- | Description |
|---|---|---|---|---|---|---|
| T400 | T400 | T400 | T400 | T400 | T400 | 12 mm Tape, 7" Reel, 2000 Devices |
| T500 | T500 | T500 | T500 | T500 | T500 | 12 mm Tape, 13" Reel, 8000 Devices |
| T600 | T600 | T600 | T600 | T600 | T600 | 8 mm Tape, 7" Reel, 2000 Devices |
| T700 | T700 | T700 | T700 | T700 | T700 | 8 mm Tape, 13" Reel, 8000 Devices |

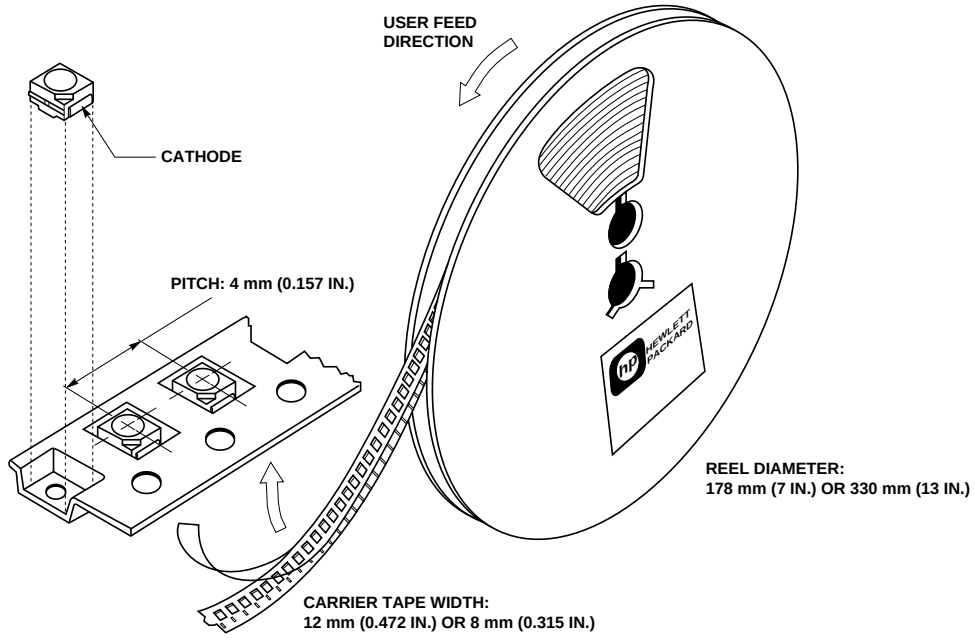

5964-9359E

## Package Dimensions




## Tape and Reel Specifications

Hewlett Packard surface mount LEDs are packaged tape and reel in accordance with EIA-481A, *Taping of Surface Mount Components for Automatic Placement*. This packaging system is compatible with tape-fed automatic pick and place systems. Each reel is sealed in a vapor barrier bag for added protection. Bulk packaging in vapor barrier bags is available upon special request.



## Absolute Maximum Ratings at $T_A$ = 25°C

| Parameter | DH AS AlGaAs Red | High Efficiency Red | Orange | Yellow | High Perf. Green | Emerald Green | Units |
|---|---|---|---|---|---|---|---|
| DC Forward Current[1] | 30 | 30 | 30 | 30 | 30 | 30 | mA |
| Peak Forward Current[2] | 300 | 90 | 90 | 60 | 90 | 90 | mA |
| Average Forward Current[2] | 20 | 25 | 25 | 20 | 25 | 25 | mA |
| LED Junction Temperature | 95 | | | | | | °C |
| Transient Forward Current[3] (10 μs Pulse) | 500 | | | | | | mA |
| Reverse Voltage ($I_R$ = 100 mA) | 5 | | | | | | V |
| Operating Temperature Range | -40 to +85 | | | | | -20 to +85 | °C |
| Storage Temperature Range | -40 to +85 | | | | | | °C |
| Reflow Soldering Temperature Convective IR Vapor Phase | 235°C Peak, above 185°C for 90 seconds.<br>215°C for 3 minutes. | | | | | | |

**Notes**:
1. Derate dc current linearly from 50°C: For AlGaAs red, high efficiency red, and green devices at 0.67 mA/°C. For yellow devices at 0.44 mA/°C.
2. Refer to Figure 5 showing Maximum Tolerable Peak Current vs. Pulse duration to establish pulsed operating conditions.
3. The transient peak current is the maximum non-recurring peak current the device can withstand without damaging the LED die and wire bond. The device should not be operated at peak currents above the Absolute Maximum Peak Forward Current.

## Electrical/Optical Characteristics at $T_A$ = 25°C

### DH AS AlGaAs Red HSMH-TX00

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Luminous Intensity | $I_v$ | 9.0 | 17.0 | | mcd | $I_F$ = 10 mA |
| Forward Voltage | $V_F$ | | 1.8 | 2.2 | V | $I_F$ = 10 mA |
| Reverse Breakdown Voltage | $V_R$ | 5.0 | 15.0 | | V | $I_R$ = 100 µA |
| Included Angle Between Half Intensity Points[1] | $2\theta_{1/2}$ | | 120 | | deg. | |
| Peak Wavelength | $\lambda_{PEAK}$ | | 645 | | nm | |
| Dominant Wavelength[2] | $\lambda_d$ | | 637 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 20 | | nm | |
| Speed of Response | $\tau_s$ | | 30 | | ns | Time Constant, $e^{-t/\tau_s}$ |
| Capacitance | C | | 30 | | pF | $V_F$ = 0, f = 1 MHz |
| Thermal Resistance | $R\theta_{J\text{-}pin}$ | | 180 | | °C/W | Junction-to-Cathode |
| Luminous Efficacy[3] | $\eta_v$ | | 80 | | lm/W | |

### High Efficiency Red HSMS-TX00

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Luminous Intensity | $I_v$ | 2.0 | 6.0 | | mcd | $I_F$ = 10 mA |
| Forward Voltage | $V_F$ | | 1.9 | 2.5 | V | $I_F$ = 10 mA |
| Reverse Breakdown Voltage | $V_R$ | 5.0 | 30.0 | | V | $I_R$ = 100 µA |
| Included Angle Between Half Intensity Points[1] | $2\theta_{1/2}$ | | 120 | | deg. | |
| Peak Wavelength | $\lambda_{PEAK}$ | | 635 | | nm | |
| Dominant Wavelength[2] | $\lambda_d$ | | 626 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 40 | | nm | |
| Speed of Response | $\tau_s$ | | 90 | | ns | Time Constant, $e^{-t/\tau_s}$ |
| Capacitance | C | | 11 | | pF | $V_F$ = 0, f = 1 MHz |
| Thermal Resistance | $R\theta_{J\text{-}pin}$ | | 160 | | °C/W | Junction-to-Cathode |
| Luminous Efficacy[3] | $\eta_v$ | | 145 | | lm/W | |

**Notes:**

1. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is half the on-axis value.
2. The dominant wavelength, $\lambda_d$, is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. The radiant intensity, $I_e$, in watts per steradian, may be found from the equation $I_e = I_v/\eta_v$, where $I_v$ is the luminous intensity in candelas and $\eta_v$ is luminous efficacy in lumens/watt.

**Orange HSMD-TX00**

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Luminous Intensity | $I_v$ | 1.5 | 5.0 | | mcd | $I_F$ = 10 mA |
| Forward Voltage | $V_F$ | | 1.9 | 2.5 | V | $I_F$ = 10 mA |
| Reverse Breakdown Voltage | $V_R$ | 5.0 | 30.0 | | V | $I_R$ = 100 µA |
| Included Angle Between Half Intensity Points[1] | $2\theta 1/2$ | | 120 | | deg. | |
| Peak Wavelength | $\lambda_{PEAK}$ | | 600 | | nm | |
| Dominant Wavelength[2] | $\lambda_d$ | | 602 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 40 | | nm | |
| Speed of Response | $\tau_s$ | | 260 | | ns | Time Constant, $e^{-t/\tau_s}$ |
| Capacitance | C | | 4 | | pF | $V_F$ = 0, f = 1 MHz |
| Thermal Resistance | $R\theta_{J\text{-}pin}$ | | 160 | | °C/W | Junction-to-Cathode |
| Luminous Efficacy[3] | $\eta_v$ | | 380 | | lm/W | |

**Yellow HSMY-TX00**

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Luminous Intensity | $I_v$ | 2.0 | 5.0 | | mcd | $I_F$ = 10 mA |
| Forward Voltage | $V_F$ | | 2.0 | 2.5 | V | $I_F$ = 10 mA |
| Reverse Breakdown Voltage | $V_R$ | 5.0 | 50.0 | | V | $I_R$ = 100 µA |
| Included Angle Between Half Intensity Points[1] | $2\theta 1/2$ | | 120 | | deg. | |
| Peak Wavelength | $\lambda_{PEAK}$ | | 583 | | nm | |
| Dominant Wavelength[2] | $\lambda_d$ | | 585 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 36 | | nm | |
| Speed of Response | $\tau_s$ | | 90 | | ns | Time Constant, $e^{-t/\tau_s}$ |
| Capacitance | C | | 15 | | pF | $V_F$ = 0, f = 1 MHz |
| Thermal Resistance | $R\theta_{J\text{-}pin}$ | | 160 | | °C/W | Junction-to-Cathode |
| Luminous Efficacy[3] | $\eta_v$ | | 500 | | lm/W | |

**Notes:**
1. $\theta 1/2$ is the off-axis angle where the luminous intensity is half the on-axis value.
2. The dominant wavelength, $\lambda_d$, is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. The radiant intensity, $I_e$, in watts per steradian, may be found from the equation $I_e = I_v/\eta_v$, where $I_v$ is the luminous intensity in candelas and $\eta_v$ is luminous efficacy in lumens/watt.

**High Performance Green HSMG-TX00**

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Luminous Intensity | $I_v$ | 4.0 | 10.0 | | mcd | $I_F$ = 10 mA |
| Forward Voltage | $V_F$ | | 2.0 | 2.5 | V | $I_F$ = 10 mA |
| Reverse Breakdown Voltage | $V_R$ | 5.0 | 50.0 | | V | $I_R$ = 100 μA |
| Included Angle Between Half Intensity Points[1] | $2\theta_{1/2}$ | | 120 | | deg. | |
| Peak Wavelength | $\lambda_{PEAK}$ | | 570 | | nm | |
| Dominant Wavelength[2] | $\lambda_d$ | | 572 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 28 | | nm | |
| Speed of Response | $\tau_s$ | | 500 | | ns | Time Constant, $e^{-t/\tau_s}$ |
| Capacitance | C | | 18 | | pF | $V_F$ = 0, f = 1 MHz |
| Thermal Resistance | $R\theta_{J\text{-}pin}$ | | 160 | | °C/W | Junction-to-Cathode |
| Luminous Efficacy[3] | $\eta_v$ | | 595 | | lm/W | |

**Notes:**
1. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is half the on-axis value.
2. The dominant wavelength, $\lambda_d$, is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. The radiant intensity, $I_e$, in watts per steradian, may be found from the equation $I_e = I_v/\eta_v$, where $I_v$ is the luminous intensity in candelas and $\eta_v$ is luminous efficacy in lumens/watt.

**Emerald Green HSME-TX00**

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Luminous Intensity | $I_v$ | 1.0 | 1.5 | | mcd | $I_F$ = 10 mA |
| Forward Voltage | $V_F$ | | 2.2 | 2.27 | V | $I_F$ = 10 mA |
| Reverse Breakdown Voltage | $V_R$ | 5.0 | 50.0 | | V | $I_R$ = 100 μA |
| Included Angle Between Half Intensity Points[1] | $2\theta_{1/2}$ | | 120 | | deg. | |
| Peak Wavelength | $\lambda_{PEAK}$ | | 558 | | nm | |
| Dominant Wavelength[2] | $\lambda_d$ | | 560 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 28 | | nm | |
| Speed of Response | $\tau_s$ | | 500 | | ns | Time Constant, $e^{-t/\tau_s}$ |
| Capacitance | C | | 52 | | pF | $V_F$ = 0, f = 1 MHz |
| Thermal Resistance | $R\theta_{J\text{-}pin}$ | | 120 | | °C/W | Junction-to-Cathode |
| Luminous Efficacy[3] | $\eta_v$ | | 680 | | lm/W | |

**Notes:**
1. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is half the on-axis value.
2. The dominant wavelength, $\lambda_d$, is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. The radiant intensity, $I_e$, in watts per steradian, may be found from the equation $I_e = I_v/\eta_v$, where $I_v$ is the luminous intensity in candelas and $\eta_v$ is luminous efficacy in lumens/watt.
4. Refer to Application Note 1061 for information comparing high performance green with emerald green light output degradation.

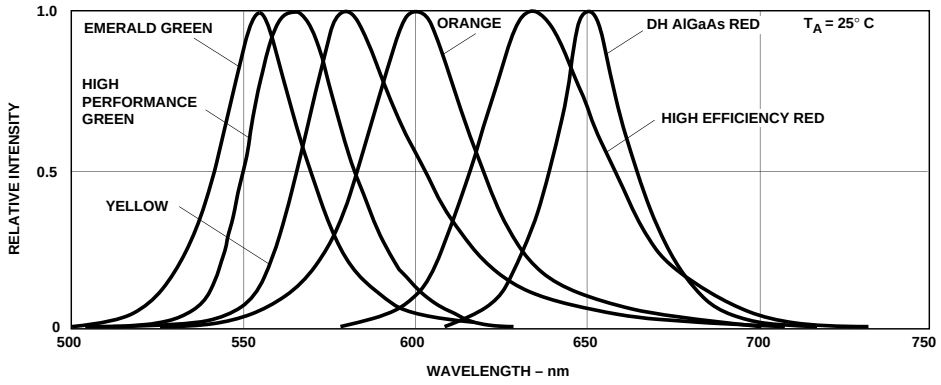



**Figure 1. Relative Intensity vs. Wavelength.**

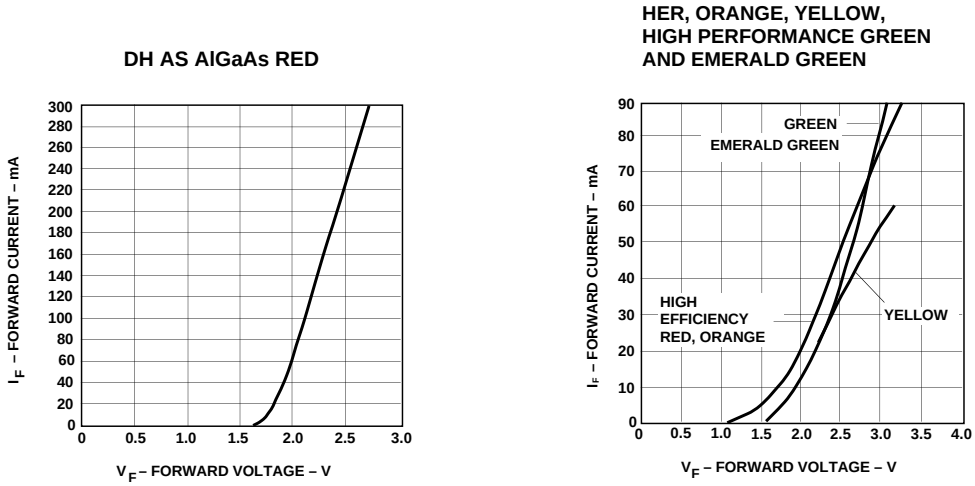



**Figure 2. Forward Current vs. Forward Voltage.**

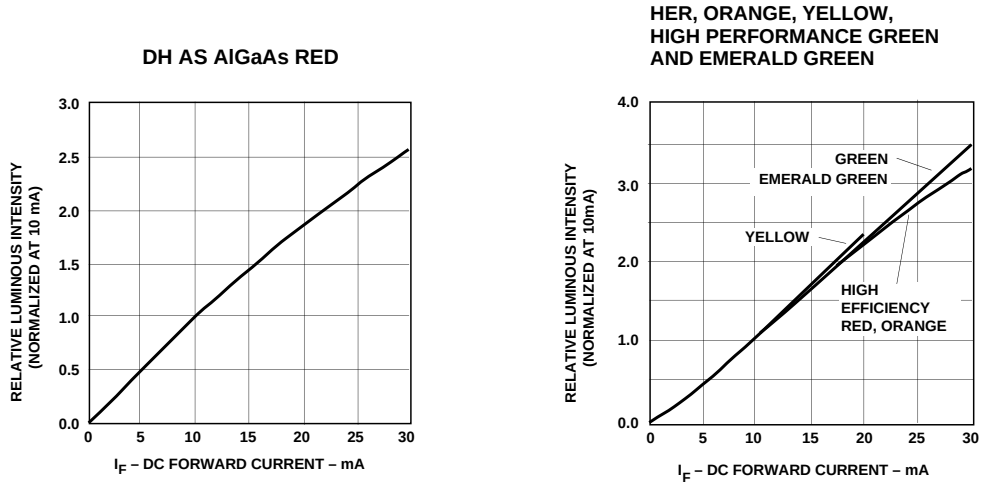



**Figure 3. Relative Luminous Intensity vs. Forward Current.**

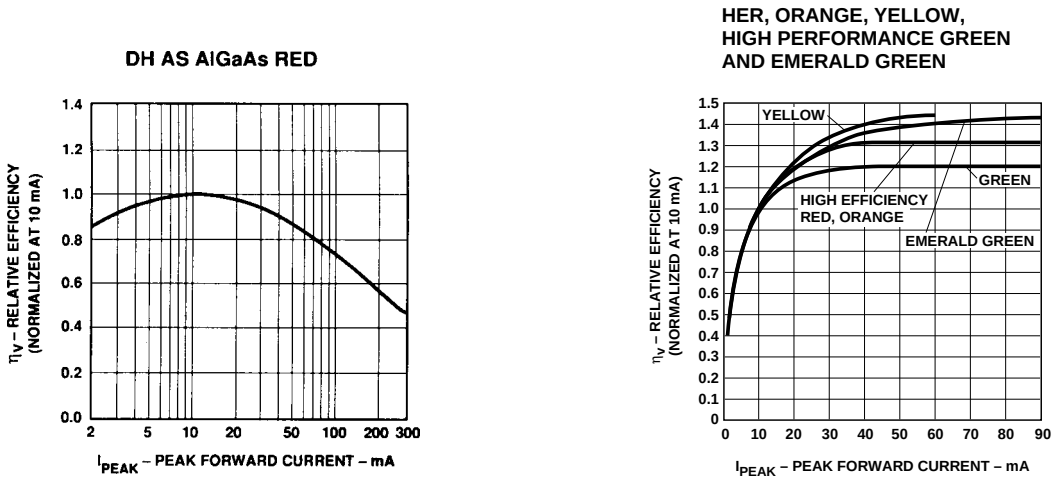



**Figure 4. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.**

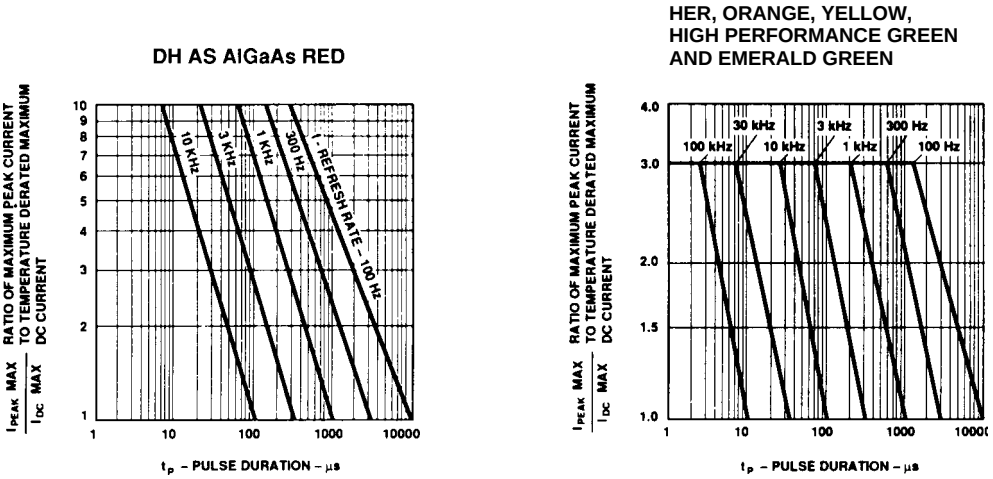



**Figure 5. Maximum Tolerable Peak Current vs. Pulse Duration ($I_{DC}$ MAX per MAX Ratings).**

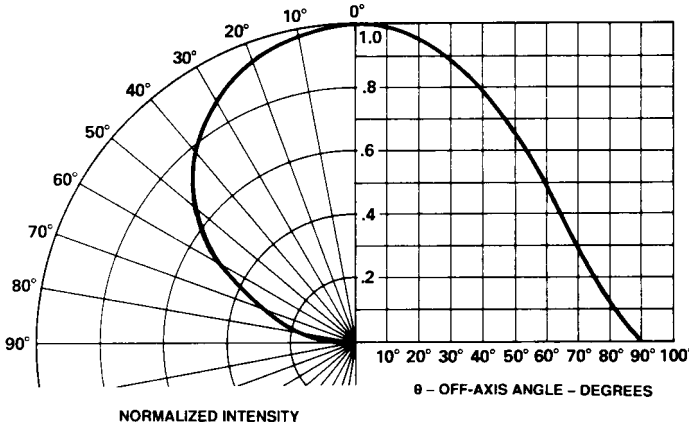



**Figure 6. Relative Intensity vs. Angular Displacement.**