Subminiature Solid State Lamps

LTL-93BCK1/CA1	AlGaAs Red
LTL-93BGK1/GA1	Green
LTL-93BPK1/PA1	Bright Red
LTL-93BYK1/ YA1	Yellow
LTL-93BEK1/HRA1	Red Orange

Features

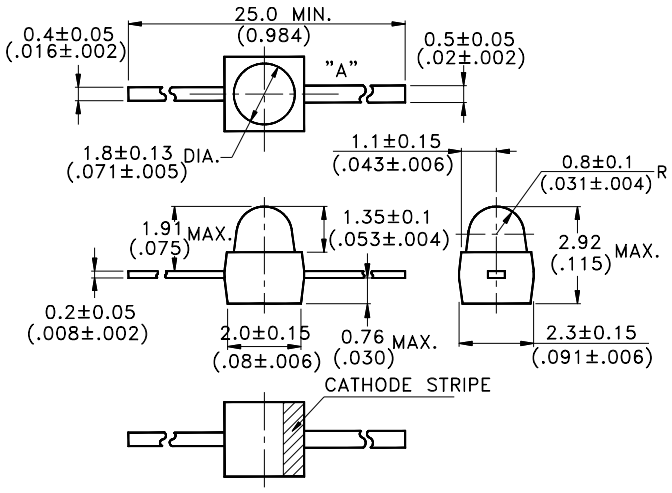
- Subminiature package style.
- Low package profile.
- Axial leads.
- Wide viewing Angle.
- Long life solid state reliability.

Description

The Bright Red source color devices are made with Gallium Phosphide on Gallium Phosphide Red Light Emitting Diode. The Orange source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Orange Light Emitting Diode. The Green source color devices are made with Gallium Phosphide on Gallium Phosphide Green Light Emitting Diode. The Yellow source color devices are made with Gallium Arsenide Phosphide on Gallium Phosphide Yellow Light Emitting Diode. The AlGaAs Red source color are Aluminum Gallium Arsenide Red Light Emitting Diode.

Lamps in this series of solid state indicators are molded in an axial lead subminiature package of molded epoxy. Size makes these lamp suitable for PC board mounting in space sensitive application.

Package Dimensions



Notes:

1. All dimensions are in millimeters (inches).
2. Tolerance is ± 0.25mm (.010") unless otherwise noted.
3. LTL-93BCK1, 93BCA1 "A" identify anode, other item "A" identify cathode.
4. Specifications are subject to change without notice.

Devices

Part No. LTL-	Lens	Source Color
93BCK1 93BCA1	Water Clear Red Diffused	AlGaAs Red
93BPK1 93BPA1	Water Clear Red Diffused	Bright Red
93BEK1 93BHRA1	Water Clear Red Diffused	Red Orange
93BGK1 93BGA1	Water Clear Green Diffused	Green
93BYK1 93BYA1	Water Clear Yellow Diffused	Yellow

Absolute Maximum Ratings at Ta=25℃

Parameter	AlGaAs Red	Bright Red	Red Orange	Green	Yellow	Unit
Power Dissipation	100	40	100	100	60	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	200	60	120	120	80	mA
Continuous Forward Current	40	15	30	30	20	mA
Derating Linear From 50℃	0.8	0.15	0.4	0.4	0.25	mA/℃
Reverse Voltage	5	5	5	5	5	V
Operating Temperature Range	-55℃ to +100℃					
Storage Temperature Range	-55℃ to +100℃					
Wave Soldering Condition	260℃ for 5 Seconds					
Infared Soldering Condition	260℃ for 5 Seconds					
Vapor phase Soldering Condition	215℃ for 3 minutes					

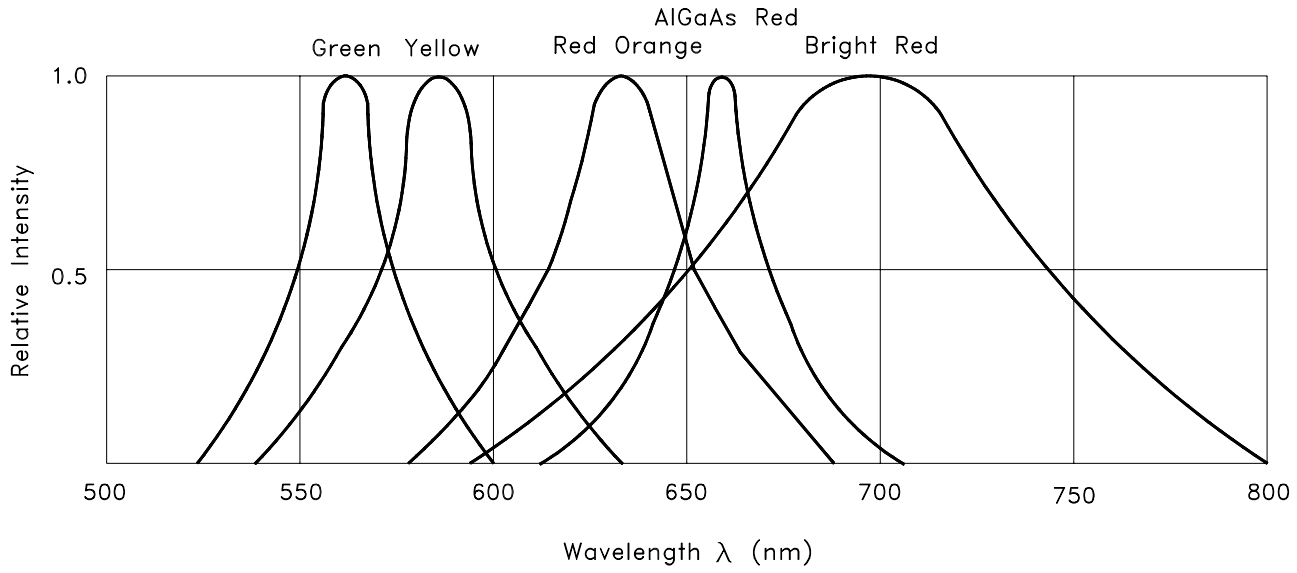


Fig.1 RELATIVE INTENSITY VS. WAVELENGTH

Electrical / Optical Characteristics at Ta=25℃

Parameter	Symbol	Part No. LTL-	Min.	Typ.	Max.	Unit.	Test Condition.
Luminous Intensity	Iv	93BCK1 93BCA1	40 25	200 60		mcd	IF=20 mA Note 1
Viewing Angle	$2\theta 1/2$	93BCK1 93BCA1		34 90		deg	Note 2 (FIG.22)
Peak Emission Wavelength	λ P			660		nm	Measurement @Peak (FIG.1)
Dominant Wavelength	λ d			638		nm	Note 3
Spectral Line Half Width	△λ			20		nm	
Forward Voltage	VF			1.8	2.4	V	IF=20mA
Reverse Current	IR				100	μA	VR=5V
Capacitance	C			30		PF	VF=0 f=1MHZ

Notes:1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
2. $2\theta 1/2$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
3. The dominant wavelength, λd is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.

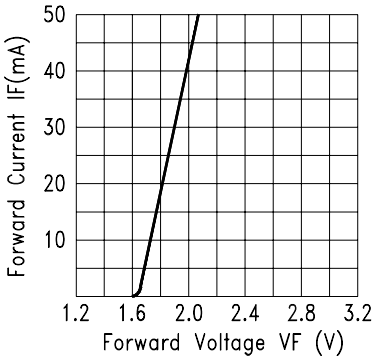


Fig.18 FORWARD CURRENT VS. FORWARD VOLTAGE

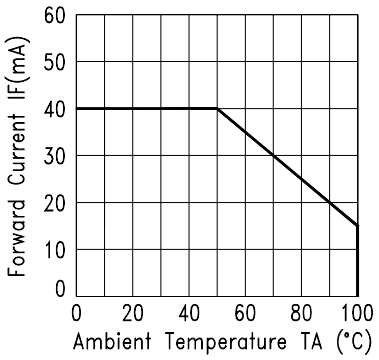


Fig.19 FORWARD CURRENT DERATING CURVE

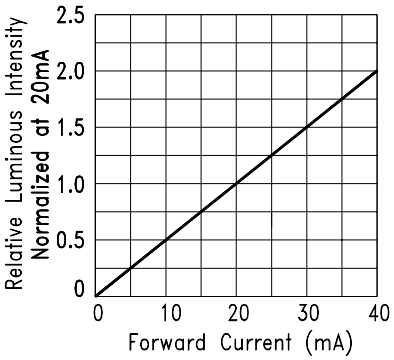


Fig.20 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

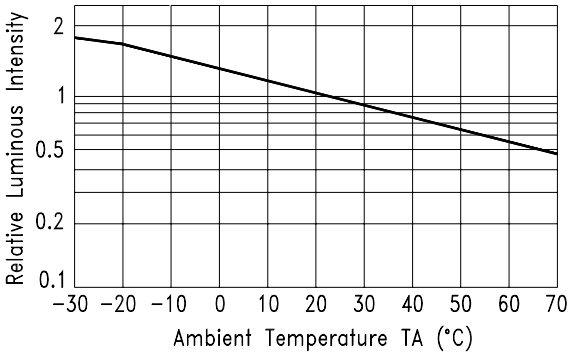


Fig.21 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

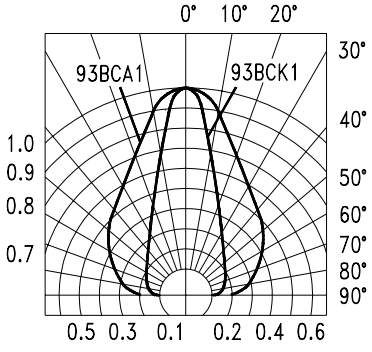


Fig.22 SPATIAL DISTRIBUTION

Electrical / Optical Characteristics and Curves at Ta = 25℃

Parameter	Symbol	Part No. LTL-	Min.	Typ.	Max.	Unit.	Test Condition.
Luminous Intensity	I_V	93BPK1 93BEK1 93BGK1 93BYK1	2.5 5.6 5.6 5.6	8.7 19.0 19.0 19.0		mcd	I_F=10 mA Note 1
Viewing Angle	$2\theta 1/2$	93BPK1 93BEK1 93BGK1 93BYK1		34		deg	Note 2 (Fig.6)
Peak Emission Wavelength	λ P	93BPK1 93BEK1 93BGK1 93BYK1		697 635 565 585		nm	Measurement @Peak (Fig.1)
Dominant Wavelength	λ d	93BPK1 93BEK1 93BGK1 93BYK1		657 621 569 588		nm	Note 3
Spectral Line Half Width	$\triangle\lambda$	93BPK1 93BEK1 93BGK1 93BYK1		90 40 30 35		nm	
Forward Voltage	V_F	93BPK1 93BEK1 93BGK1 93BYK1		2.1 2.0 2.1 2.1	2.8 2.8 2.8 2.8	V	I_F=20mA
Reverse Current	I_R	93BPK1 93BEK1 93BGK1 93BYK1			100	μ A	V_R=5V
Capacitance	C	93BPK1 93BEK1 93BGK1 93BYK1		55 20 35 15		PF	V_F=0 f=1MHZ

Notes:1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
2. $2\theta 1/2$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
3. The dominant wavelength, λd is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.

Electrical / Optical Characteristics and Curves at Ta= 25℃

Parameter	Symbol	Part No. LTL-	Min.	Typ.	Max.	Unit.	Test Condition.
Luminous Intensity	I_V	93BPA1 93BHRA1 93BGA1 93BYA1	0.5 2.5 1.1 1.7	1.7 3.7 3.7 3.1		mcd	I_F=10 mA Note 1
Viewing Angle	$2\theta_{1/2}$	93BPA1 93BHRA1 93BGA1 93BYA1		90		deg	Note 2 (Fig.7)
Peak Emission Wavelength	λ P	93BPA 1 93BHRA1 93BGA1 93BYA1		697 635 565 585		nm	Measurement @Peak (Fig.1)
Dominant Wavelength	λ d	93BPA1 93BHRA1 93BGA1 93BYA1		657 621 569 588		nm	Note 3
Spectral Line Half Width	$\triangle\lambda$	93BPA1 93BHRA1 93BGA1 93BYA1		90 40 30 35		nm	
Forward Voltage	V_F	93BPA1 93BHRA1 93BGA1 93BYA1		2.1 2.0 2.1 2.1	2.8 2.8 2.8 2.8	V	I_F=20mA
Reverse Current	I_R	93BPA1 93BHRA1 93BGA1 93BYA1			100	μ A	V_R=5V
Capacitance	C	93BPA1 93BHRA1 93BGA1 93BYA1		55 20 35 15		PF	V_F=0 f=1MHZ

Notes:1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
2. $2\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
3. The dominant wavelength, λd is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.

Typical Electrical / Optical Characteristic Curves (25℃ Ambient Temperature Unless Otherwise Noted)

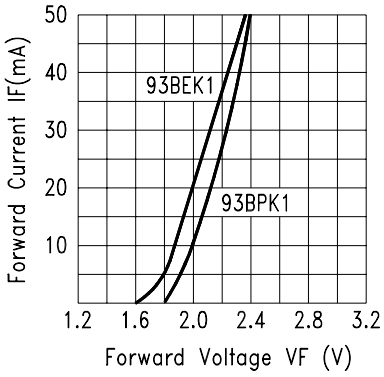


Fig.2 FORWARD CURRENT VS. FORWARD VOLTAGE

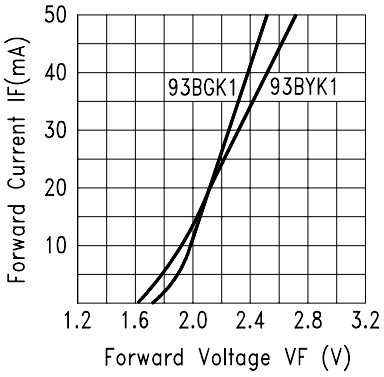


Fig.3 FORWARD CURRENT VS. FORWARD VOLTAGE

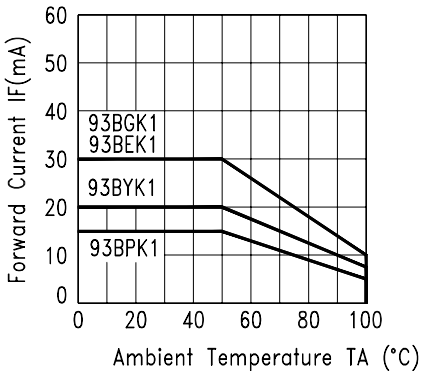


Fig.4 FORWARD CURRENT DERATING CURVE

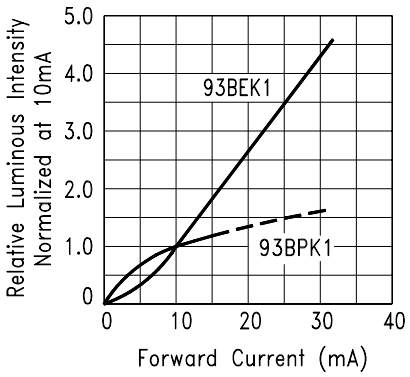


Fig.5 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

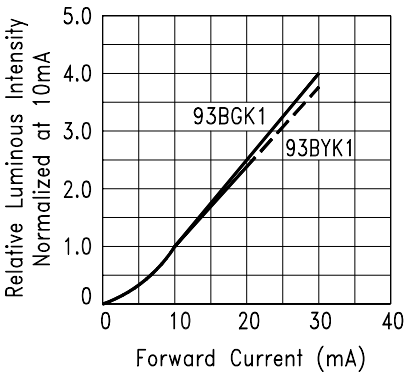


Fig.6 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

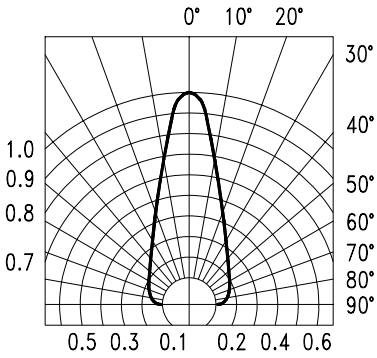


Fig.7 SPATIAL DISTRIBUTION

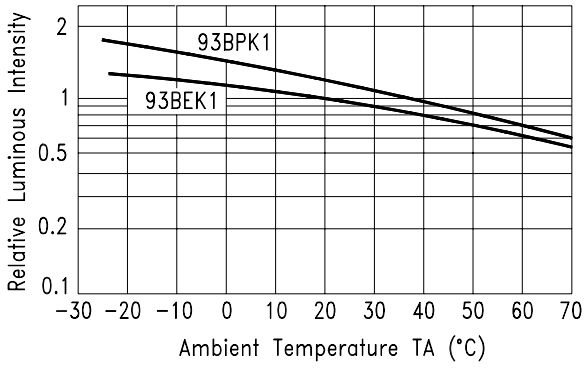


Fig.8 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

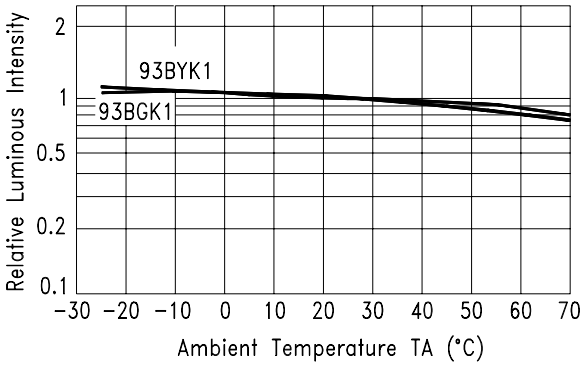


Fig.9 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

SMD LAMPS

Typical Electrical / Optical Characteristic Curves (25℃ Ambient Temperature Unless Otherwise Noted)

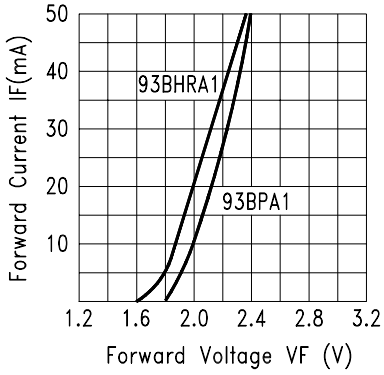


Fig.10 FORWARD CURRENT VS. FORWARD VOLTAGE

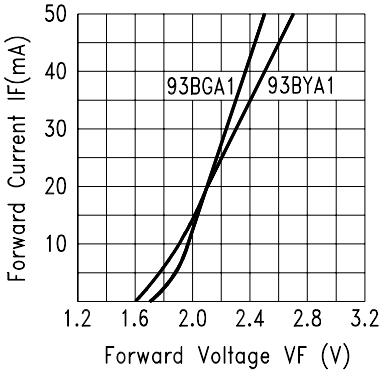


Fig.11 FORWARD CURRENT VS. FORWARD VOLTAGE

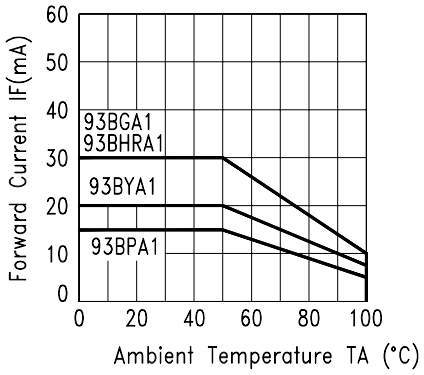


Fig.12 FORWARD CURRENT DERATING CURVE

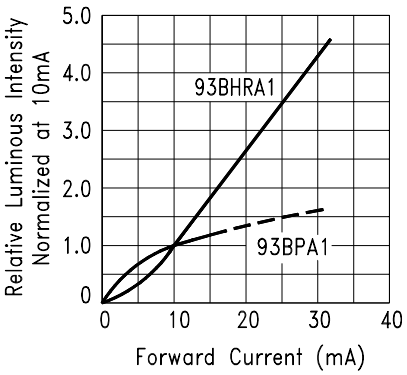


Fig.13 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

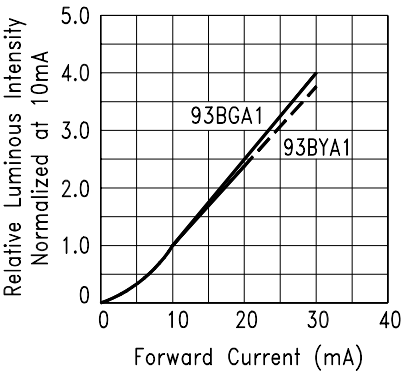


Fig.14 RELATIVE LUMINOUS INTENSITY VS. FORWARD CURRENT

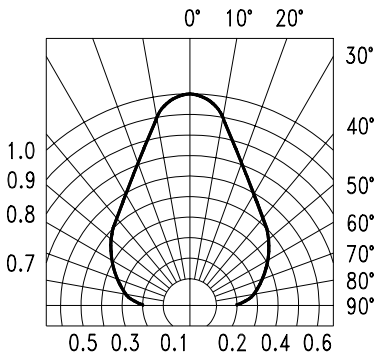


Fig.15 SPATIAL DISTRIBUTION

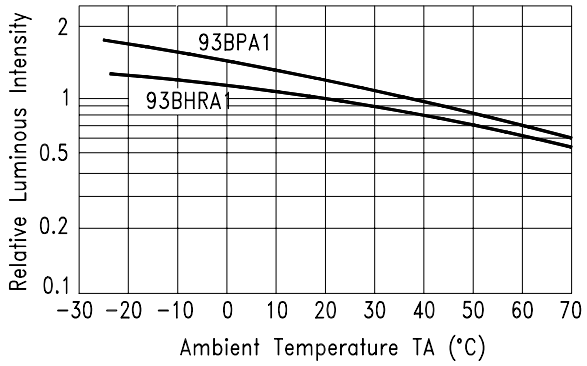


Fig.16 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE

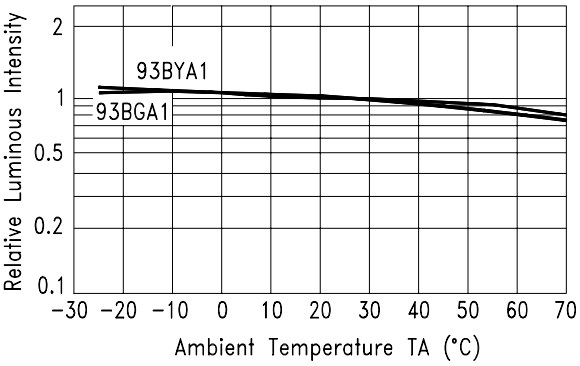


Fig.17 LUMINOUS INTENSITY VS. AMBIENT TEMPERATURE