Hi-REL INFRARED EMITTING DIODES

FOR

SPACE AND MILITARY APPLICATIONS

HEL-REL INFRARED EMITTING DIODES

The recommended testing program for all hi-rel IRLEDs follows the general requirements of Mil-S-19500. The customer may specify the testing program outlined below, or supply us with a detailed specification. When specifying our program, indicate if screening alone or screening with a combination of Group A, B and C inspections is required.

SCREENING REQUIREMENTS

		MIL-STD-750		
STEPS	SCREEN	METHOD	CONDITIONS	LTPD
1	Internal visual (precap) inspection	–	Per our specification	100%
2	High temp life (stabilization bake)	1032	T_A = max storage temp t = 24 hours minimum	100%
3	Thermal shock (temp cycling)	1051	Min to max storage temp, 20 cycles, 10 minute dwell at each extreme	100%
4	Constant acceleration	2006	Y1 dir., 20,000 Gs min	100%
5	Fine leak test	1071H	Per specification	100%
6	Gross leak test	1071C or E	Per specification	100%
7	Interim electrical measurements	–	Read & record P_o	100%
8	Power burn-in	1038	I_F = max current T_C = 25°C (or T_A as applicable) t = 96 hours minimum	100%
9	End point measurements	–	Read & record P_o read V_F & V_R	100%
10	Delta endpoint of P_o	–	P_o = +30%/–15%	100%

GROUP A INSPECTION

		MIL-STD-750		
STEPS	TEST	METHOD	CONDITIONS	LTPD
	Subgroup 1			15
1	Visual and mechanical inspection	2071	Per mechanical drawing, I.D. damage, lens cracks, etc.	
	Subgroup 2			5
2	Radiant power output	–	T_A = 25°C, I_F per spec	
3	Forward voltage	4011	T_A = 25°C, I_F per spec	
4	Reverse breakdown	4016	T_A = 25°C, I_R per spec	

HEL-REL INFRARED EMITTING DIODES

GROUP B INSPECTION

STEPS	TEST	MIL-STD-750 METHOD	CONDITIONS	LTPD
	Subgroup 1			15
1	Solderability	2026		
	Subgroup 2			10
2	Thermal shock	1051	Min to max storage temp, 25 cycles, 10 minute dwell at each extreme	
3	Fine leak test	1071H	Per specification	
4	Gross leak test	1071 C or E		
5	End point measurements	–	Read & record P_o, V_F, V_R	
	Subgroup 3			5
6	Beginning point measurements	–	Read & record P_o	
7	Steady state life test	1038	I_F = max current T_C = 25°C (or T_A as applicable) t = 340 hours minimum	
8	End point measurements	–	Read & record P_o, V_F, V_R	
9	Delta endpoint of P_o	–	P_o = +30%/−15%	
	Subgroup 4**			20
10	Decap internal visual	2075	1 device/0 failures	
11	Bond strength	2037	As specified, 0 failures allowed	
	Subgroup 6			7
12	Beginning point measurements	–	Read & record P_o	
13	High temp life (non-operating)	1032	T_A = max storage temp t = 340 hours minimum	
14	End point measurements	–	Read & record P_o, V_F, V_R	

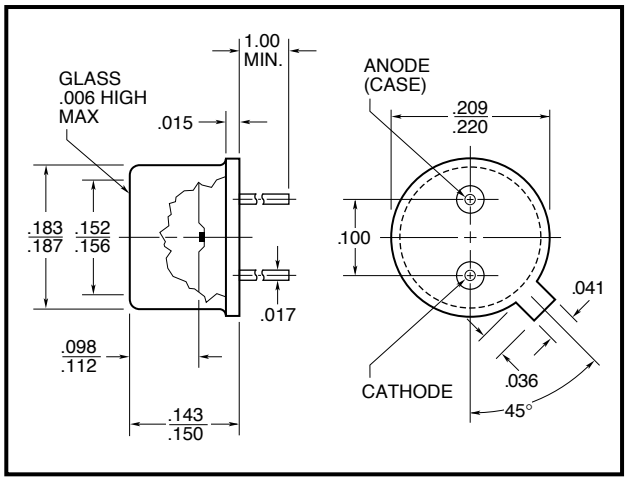
GROUP C INSPECTION

STEPS	TEST	MIL-STD-750 METHOD	CONDITIONS	LTPD
	Subgroup 1			15
1	Physical dimensions	2026	Per Mechanical drawing	
	Subgroup 2			10
2	Thermal shock (glass strain)	1056A		
3	Fine leak test	1071H	Per specification	
4	Gross leak test	1071 C or E		
5	Moisture resistance	1021	Omit initial conditioning	
6	External visual	1071	I.D. damage, lens cracks, etc.	
7	End point measurements	–	Read & record P_o, V_F, V_R	
	Subgroup 3			10
8	Shock	2016	Non-operating, 1500 Gs, 0.5ms, 5 blows ea. dir.	
9	Vibration, variable frequency	2056		
10	Constant acceleration	2006	One minute each X1, Y1, and Z1 axes, 20K Gs min.	
11	End point measurements	–	Read & record P_o, V_F, V_R	
	Subgroup 4**			15
12	Salt atmosphere	1041		
	Subgroup 6			10
13	Beginning point measurements	–	Read & record P_o	
14	Steady state life test	1026	I_F = max current T_C = 25°C (or T_A as applicable) t = 1000 hours minimum	
15	End point measurements	–	Read & record P_o, V_F, V_R	
16	Delta endpoint of P_o	–	P_o = +30%/−15%	

**Except for pill packages

HI-REL RAD HARD IR EMITTERS

OD-800W



FEATURES

- Designed for high radiation tolerance
- Excellent power degradation characteristics
- High power output
- Fast response
- Hermetically sealed metal package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified. Window caps are welded to the case.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_O	I_F = 100mA	2	3		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		810		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			50		nm
Half Intensity Beam Angle, θ			80		Deg
Forward Voltage, V_F	I_F = 100mA		1.45	1.8	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	3	4		Volts
Capacitance, C	V_R = 0V		150		pF
Rise Time			60		nsec
Fall Time			60		nsec

ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	180mW
Continuous Forward Current	100mA
Peak Forward Current (10µs, 150Hz)[2]	3A
Reverse Voltage	3V
Lead Soldering Temperature (1/16" from case for 10sec)	240°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

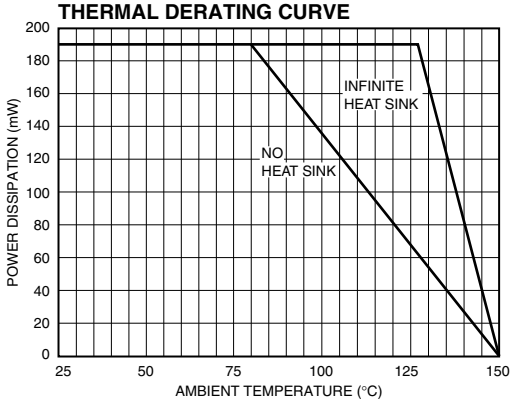
THERMAL PARAMETERS

Storage and Operating Temperature Range	-65°C TO 150°C
Maximum Junction Temperature	150°C
Thermal Resistance, R_{THJA}[1]	400°C/W Typical
Thermal Resistance, R_{THJA}[2]	135°C/W Typical

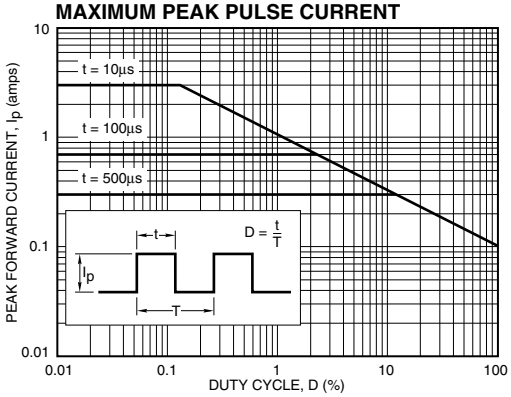
[1]Heat transfer minimized by measuring in still air with minimum heat conducting through leads
[2]Air circulating at a rapid rate to keep case temperature at 25°C

MAXIMUM RATINGS

THERMAL DERATING CURVE

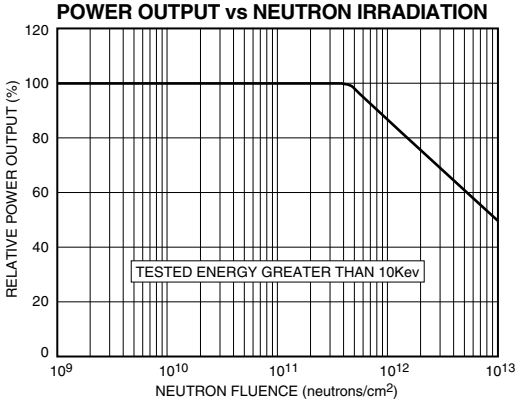


MAXIMUM PEAK PULSE CURRENT

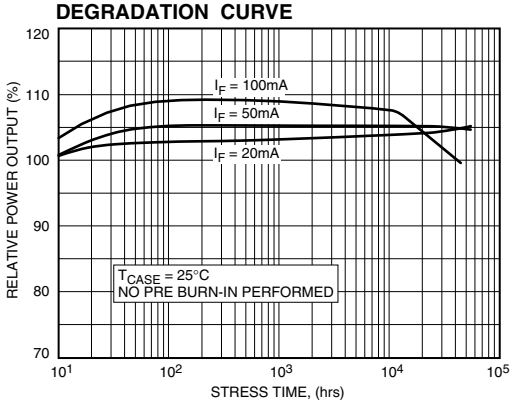


TYPICAL CHARACTERISTICS

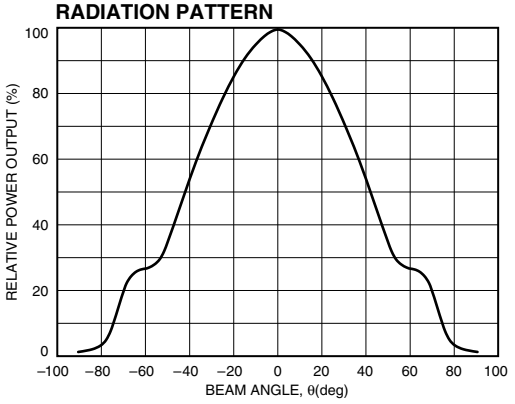
POWER OUTPUT vs NEUTRON IRRADIATION



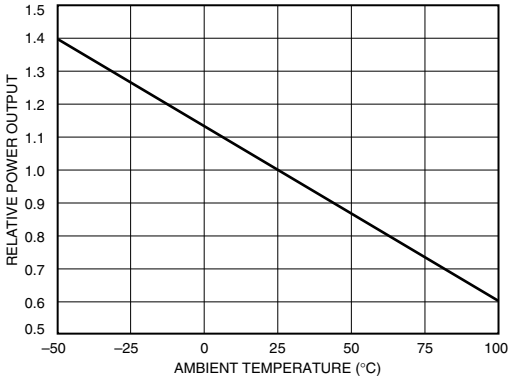
DEGRADATION CURVE



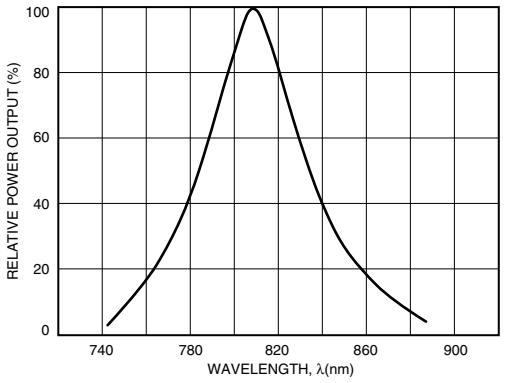
RADIATION PATTERN



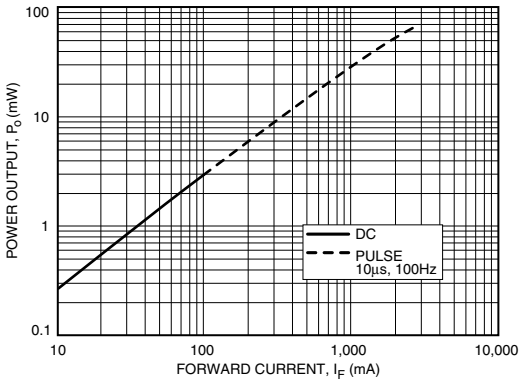
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

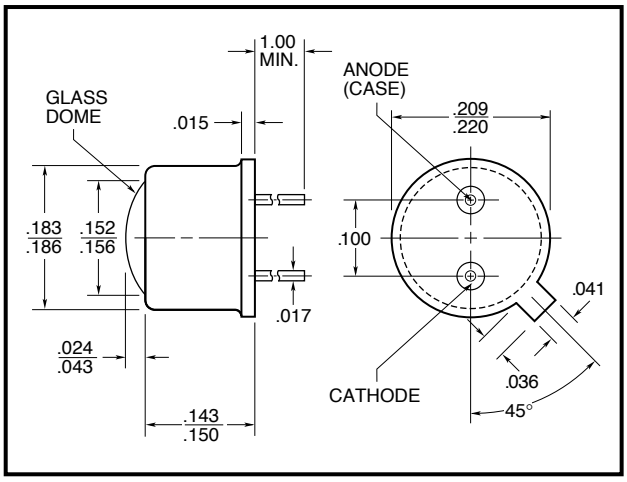


POWER OUTPUT vs FORWARD CURRENT



HI-REL RAD HARD IR EMITTERS

OD-800L



FEATURES

- Designed for high radiation tolerance
- Excellent power degradation characteristics
- High power output
- Fast response
- Hermetically sealed metal package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified. Window caps are welded to the case.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_O	I_F = 100mA	2	3		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		810		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			50		nm
Half Intensity Beam Angle, θ			35		Deg
Forward Voltage, V_F	I_F = 100mA		1.45	1.8	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	3	4		Volts
Capacitance, C	V_R = 0V		150		pF
Rise Time			60		nsec
Fall Time			60		nsec

ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	180mW
Continuous Forward Current	100mA
Peak Forward Current (10µs, 150Hz)[2]	3A
Reverse Voltage	3V
Lead Soldering Temperature (1/16" from case for 10sec)	240°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

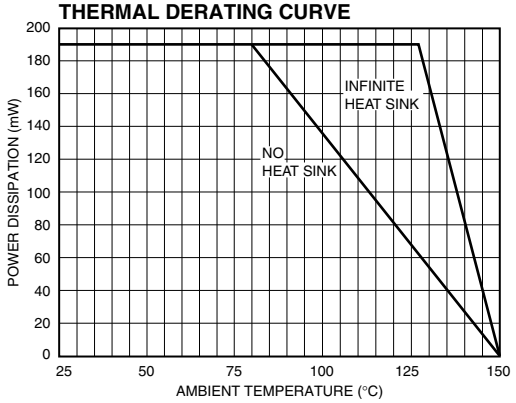
THERMAL PARAMETERS

Storage and Operating Temperature Range	-65°C TO 150°C
Maximum Junction Temperature	150°C
Thermal Resistance, R_{THJA}[1]	400°C/W Typical
Thermal Resistance, R_{THJA}[2]	135°C/W Typical

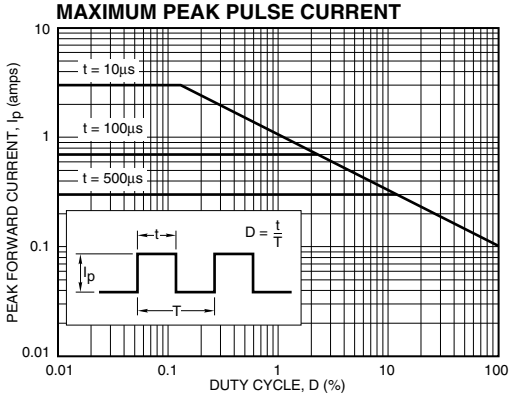
[1]Heat transfer minimized by measuring in still air with minimum heat conducting through leads
[2]Air circulating at a rapid rate to keep case temperature at 25°C

MAXIMUM RATINGS

THERMAL DERATING CURVE

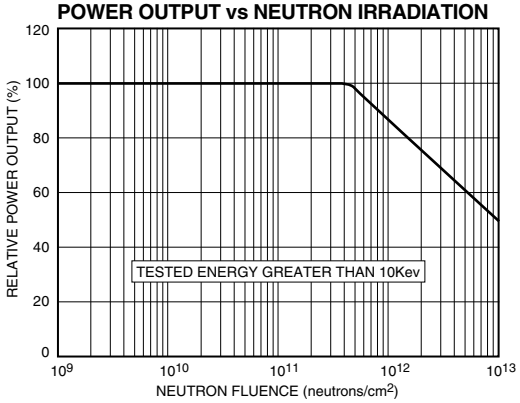


MAXIMUM PEAK PULSE CURRENT

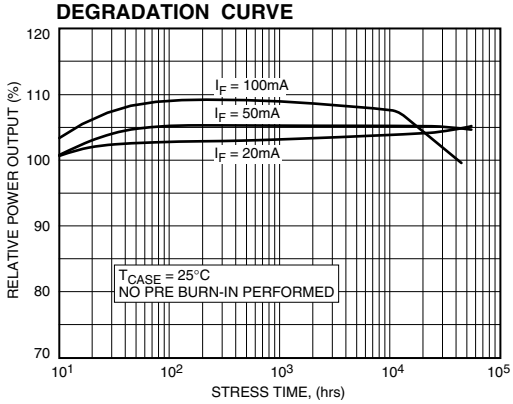


TYPICAL CHARACTERISTICS

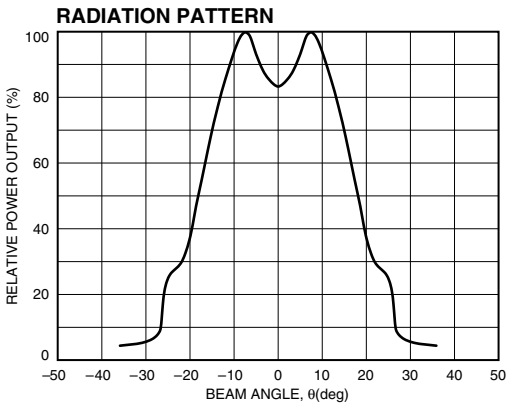
POWER OUTPUT vs NEUTRON IRRADIATION



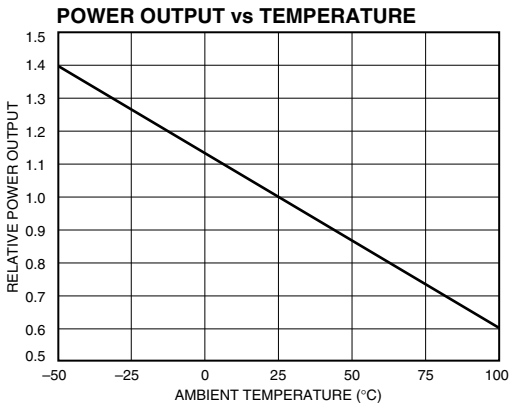
DEGRADATION CURVE



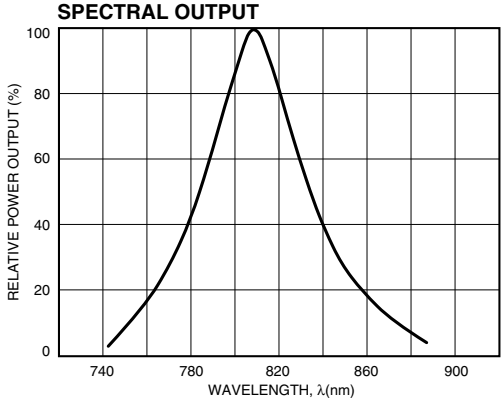
RADIATION PATTERN



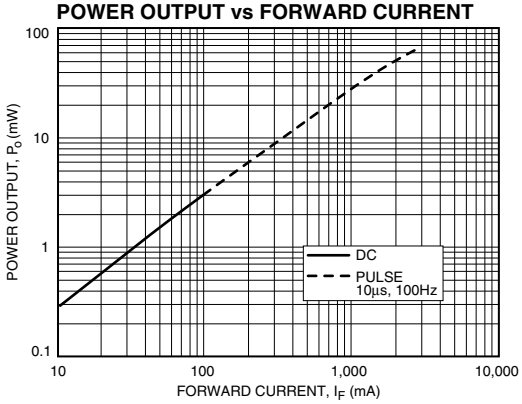
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

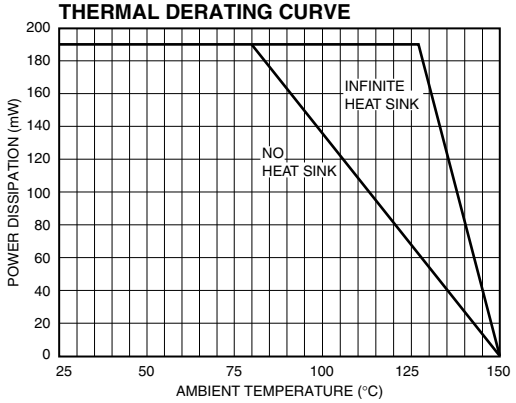


POWER OUTPUT vs FORWARD CURRENT

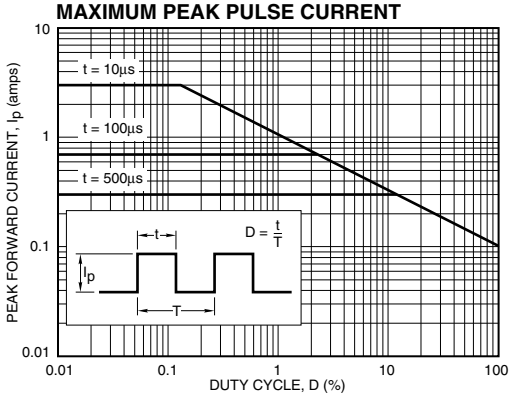


MAXIMUM RATINGS

THERMAL DERATING CURVE

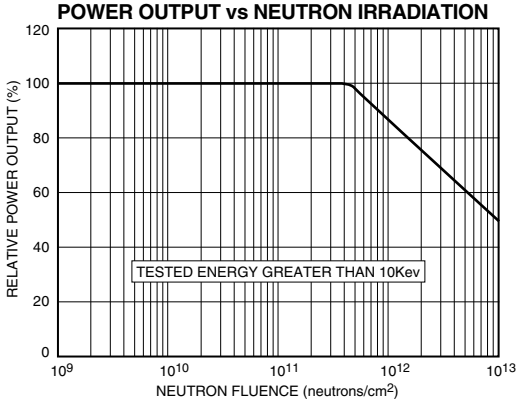


MAXIMUM PEAK PULSE CURRENT

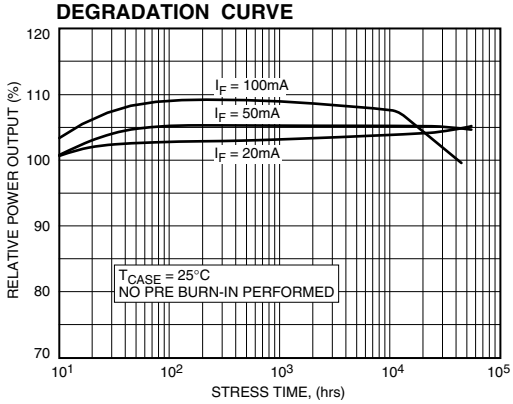


TYPICAL CHARACTERISTICS

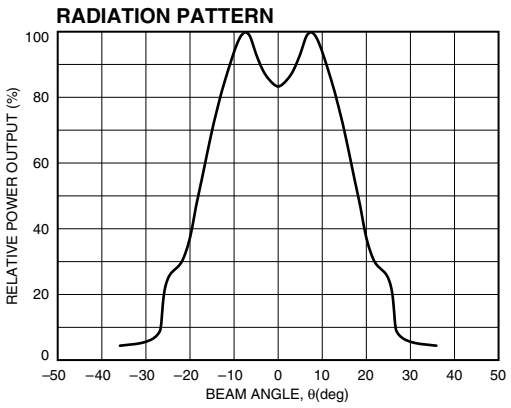
POWER OUTPUT vs NEUTRON IRRADIATION



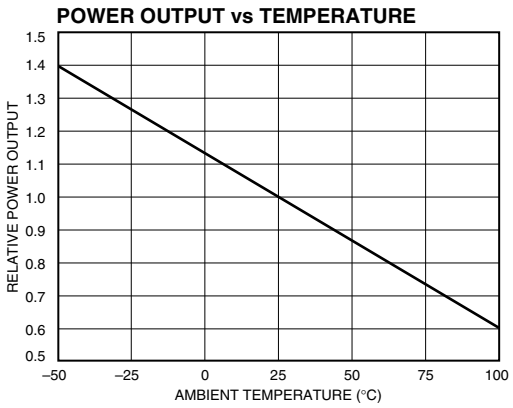
DEGRADATION CURVE



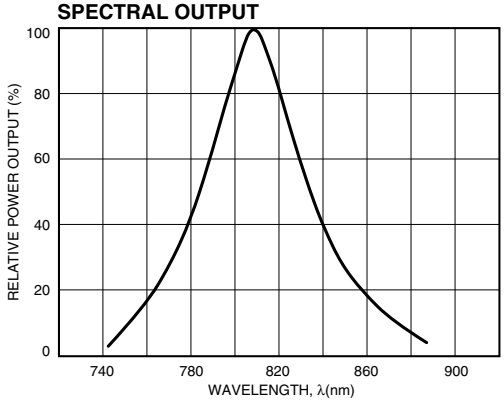
RADIATION PATTERN



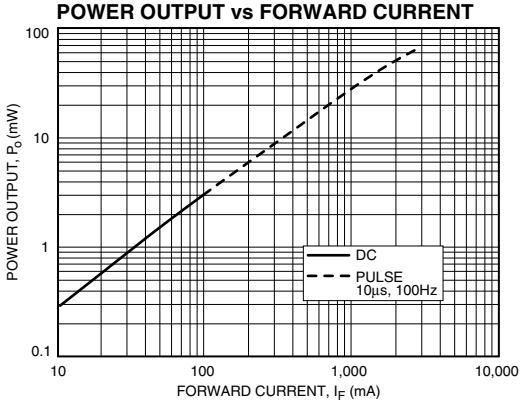
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

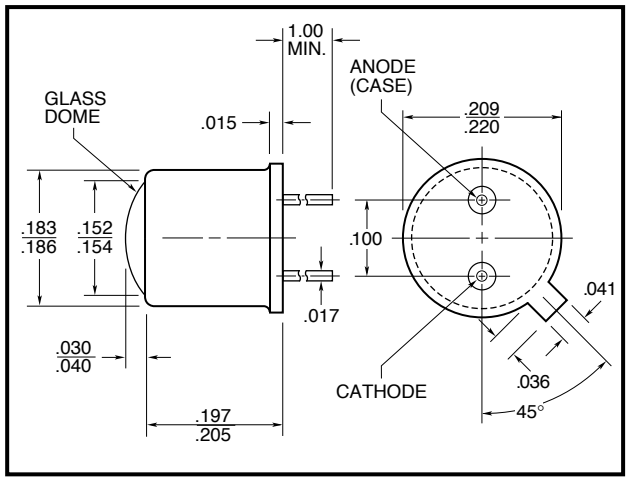


POWER OUTPUT vs FORWARD CURRENT



HI-REL RAD HARD IR EMITTERS

OD-800F



FEATURES

- Designed for high radiation tolerance
- Excellent power degradation characteristics
- High power output
- Fast response
- Hermetically sealed metal package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified. Window caps are welded to the case.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_O	I_F = 100mA	1.5	3		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		810		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			50		nm
Half Intensity Beam Angle, θ			8		Deg
Forward Voltage, V_F	I_F = 100mA		1.45	1.8	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	3	4		Volts
Capacitance, C	V_R = 0V		150		pF
Rise Time			60		nsec
Fall Time			60		nsec

ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	180mW
Continuous Forward Current	100mA
Peak Forward Current (10µs, 150Hz)[2]	3A
Reverse Voltage	3V
Lead Soldering Temperature (1/16" from case for 10sec)	240°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

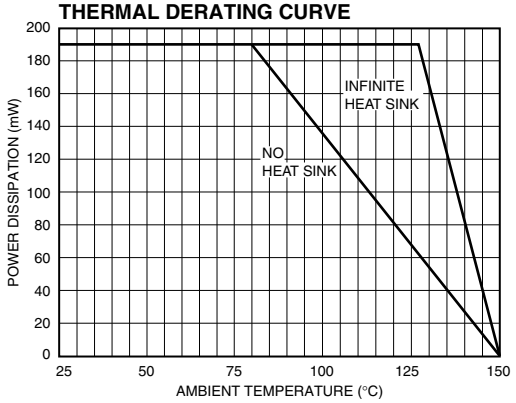
THERMAL PARAMETERS

Storage and Operating Temperature Range	-65°C TO 150°C
Maximum Junction Temperature	150°C
Thermal Resistance, R_{THJA}[1]	400°C/W Typical
Thermal Resistance, R_{THJA}[2]	135°C/W Typical

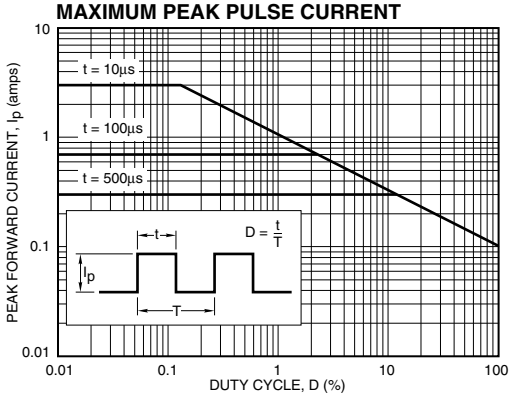
[1]Heat transfer minimized by measuring in still air with minimum heat conducting through leads
[2]Air circulating at a rapid rate to keep case temperature at 25°C

MAXIMUM RATINGS

THERMAL DERATING CURVE

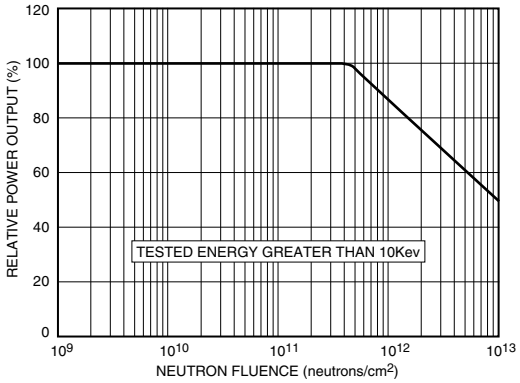


MAXIMUM PEAK PULSE CURRENT

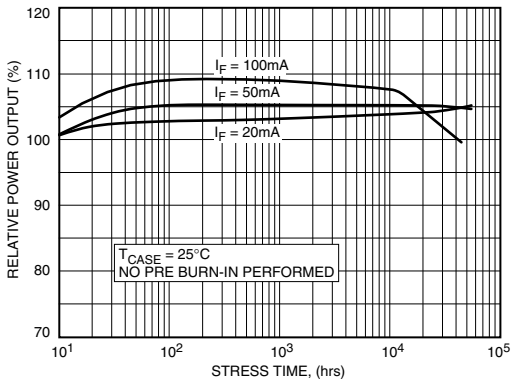


TYPICAL CHARACTERISTICS

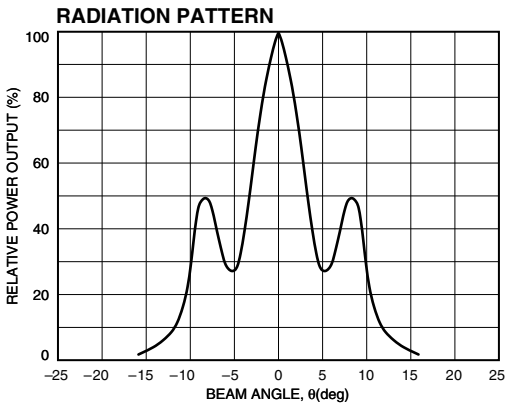
POWER OUTPUT vs NEUTRON IRRADIATION



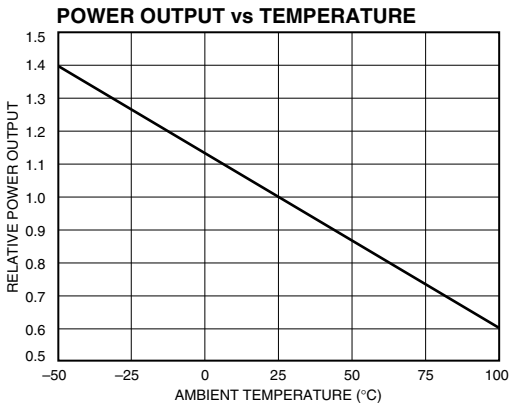
DEGRADATION CURVE



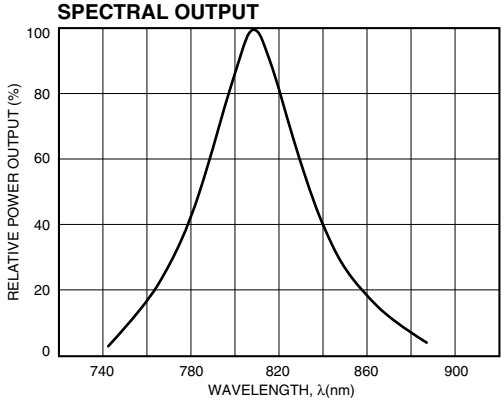
RADIATION PATTERN



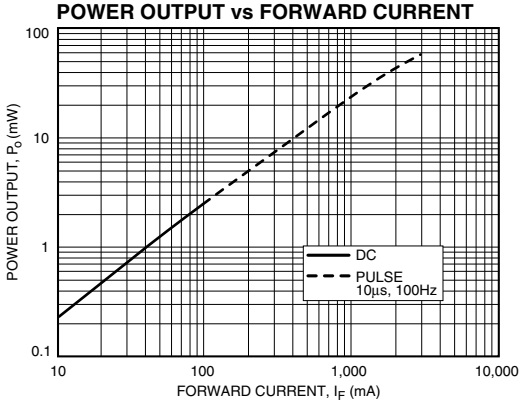
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

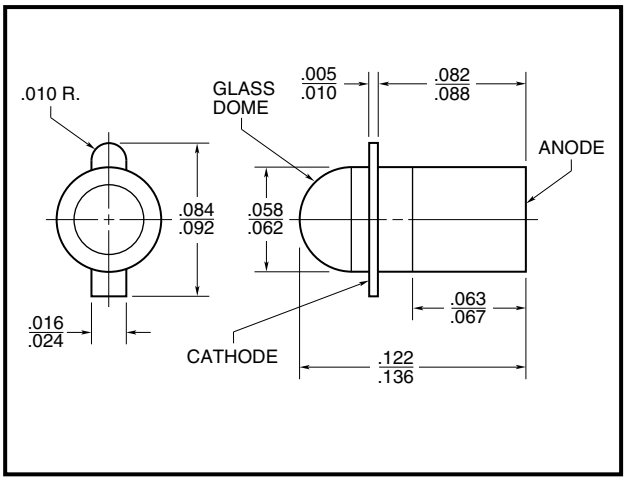


POWER OUTPUT vs FORWARD CURRENT



HI-REL RAD HARD IR EMITTERS

OD-800PP



FEATURES

- Designed for high radiation tolerance
- Super high reliability
- High power output
- Fast response
- Hermetically sealed miniature pill package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_o	I_F = 50mA	0.5	0.8		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		810		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			50		nm
Half Intensity Beam Angle, θ			25		Deg
Forward Voltage, V_F	I_F = 50mA		1.4	1.6	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	3	4		Volts
Capacitance, C	V_R = 0V		150		pF
Rise Time			60		nsec
Fall Time			60		nsec

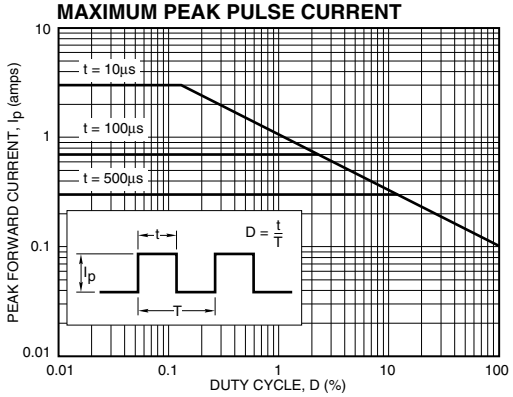
ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	180mW
Continuous Forward Current	100mA
Peak Forward Current (10µs, 150Hz)[2]	3A
Reverse Voltage	3V
Lead Soldering Temperature	240°C
Storage and Operating Temperature Range	-55°C to 125°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

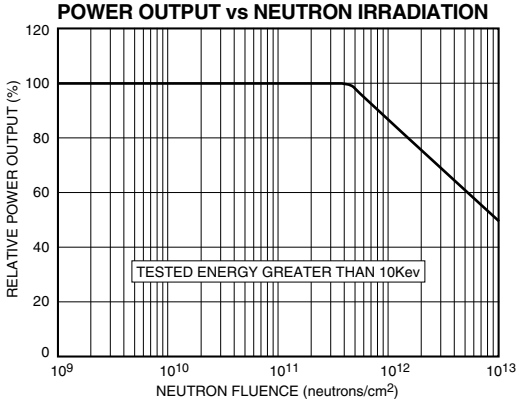
MAXIMUM RATINGS

MAXIMUM PEAK PULSE CURRENT

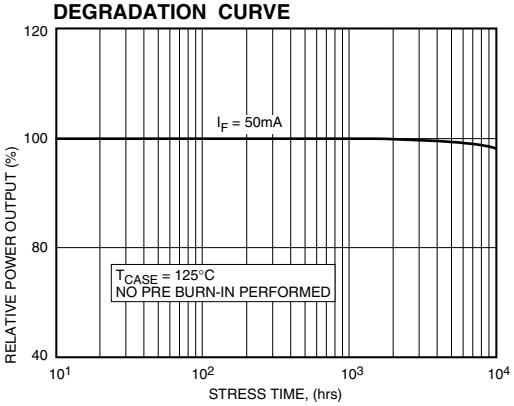


TYPICAL CHARACTERISTICS

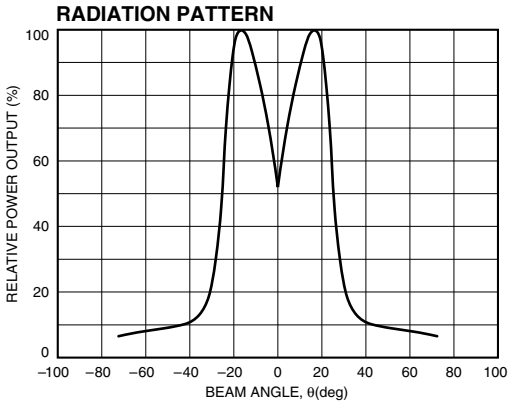
POWER OUTPUT vs NEUTRON IRRADIATION



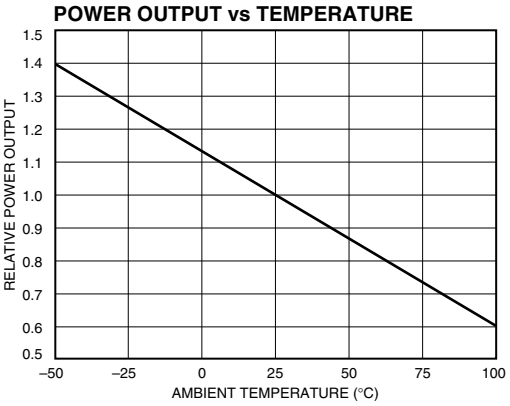
DEGRADATION CURVE



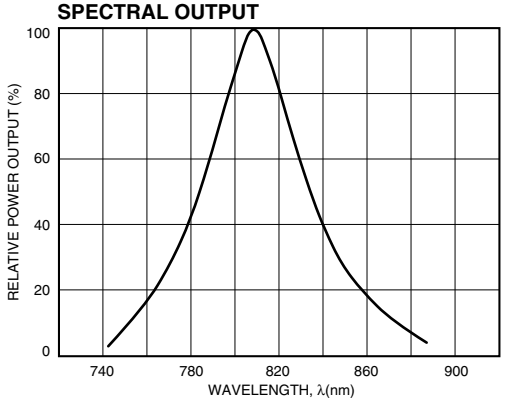
RADIATION PATTERN



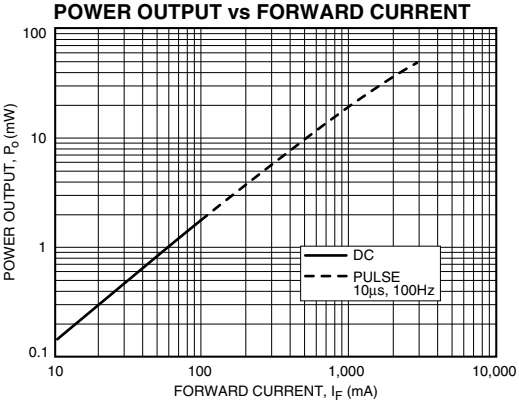
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

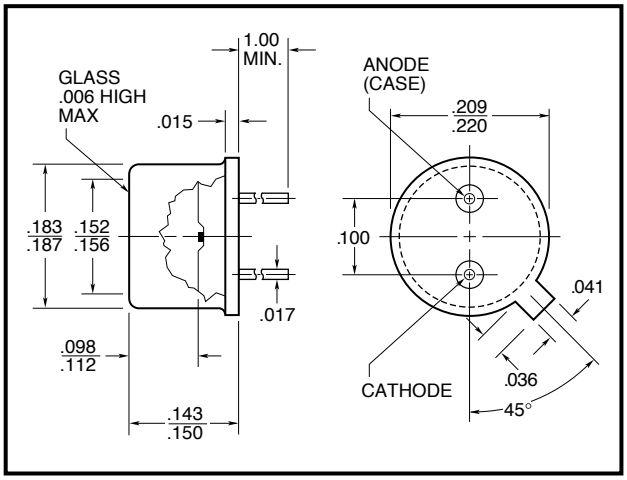


POWER OUTPUT vs FORWARD CURRENT



HI-REL GaAlAs IR EMITTERS

OD-880WJ



FEATURES

- High reliability LPE GaAlAs IRLEDs
- High power output
- 880nm peak emission
- Hermetically sealed TO-46 package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified. Window caps are welded to the case.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_o	I_F = 100mA	7	9		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		880		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			80		nm
Half Intensity Beam Angle, θ			80		Deg
Forward Voltage, V_F	I_F = 100mA		1.55	1.9	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	5	30		Volts
Capacitance, C	V_R = 0V		17		pF
Rise Time			0.5		µsec
Fall Time			0.5		µsec

ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	190mW
Continuous Forward Current	100mA
Peak Forward Current (10µs, 400Hz)[2]	3A
Reverse Voltage	5V
Lead Soldering Temperature (1/16" from case for 10sec)	240°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

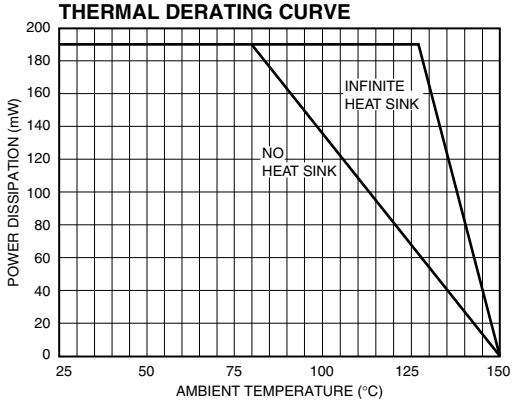
THERMAL PARAMETERS

Storage and Operating Temperature Range	-65°C TO 150°C
Maximum Junction Temperature	150°C
Thermal Resistance, R_{THJA}[1]	400°C/W Typical
Thermal Resistance, R_{THJA}[2]	160°C/W Typical

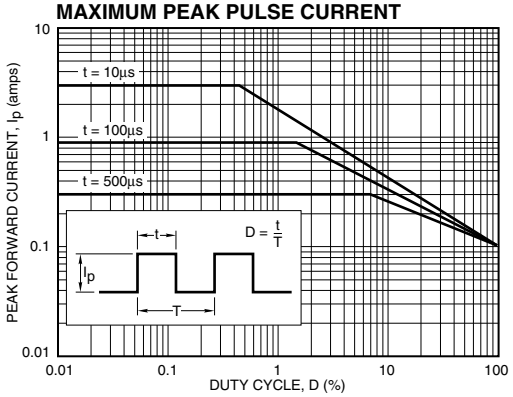
[1]Heat transfer minimized by measuring in still air with minimum heat conducting through leads
[2]Air circulating at a rapid rate to keep case temperature at 25°C

MAXIMUM RATINGS

THERMAL DERATING CURVE

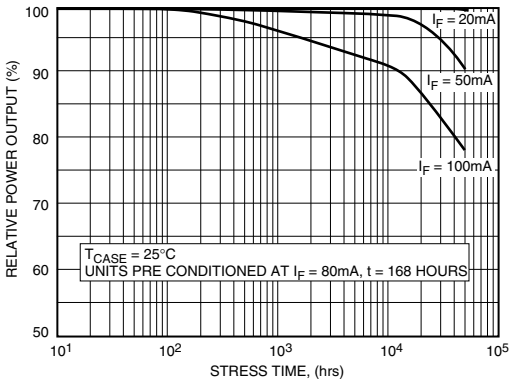


MAXIMUM PEAK PULSE CURRENT

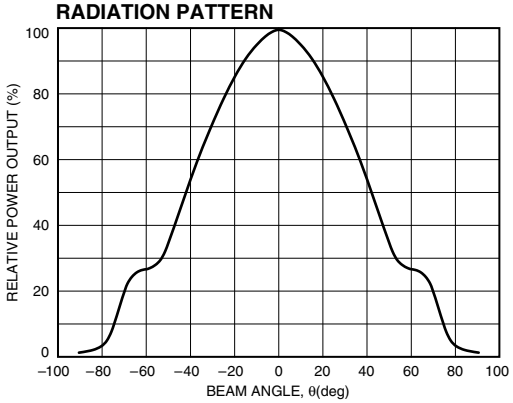


TYPICAL CHARACTERISTICS

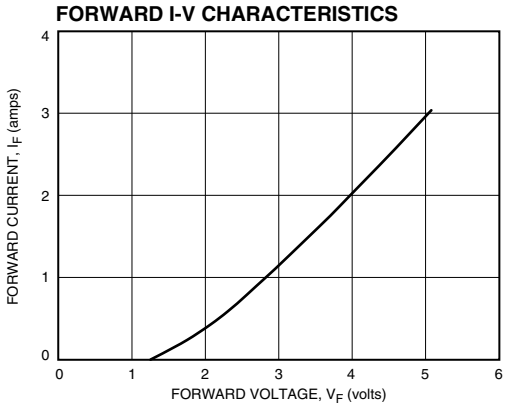
DEGRADATION CURVE



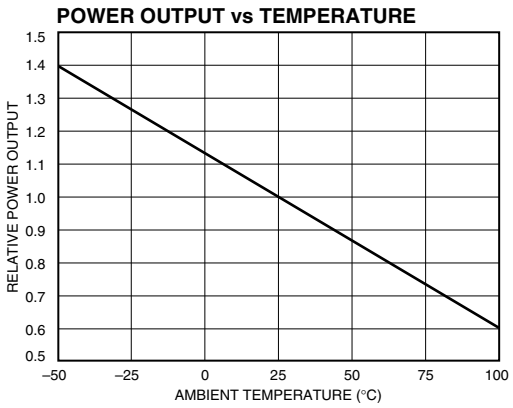
RADIATION PATTERN



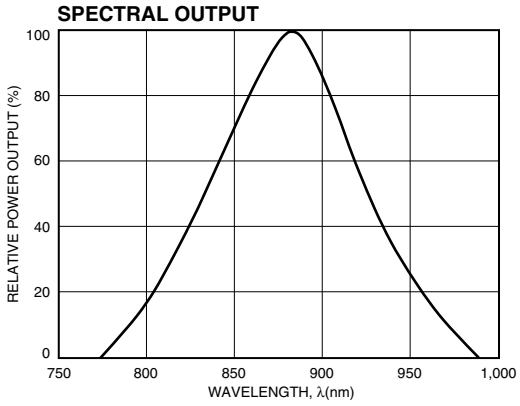
FORWARD I-V CHARACTERISTICS



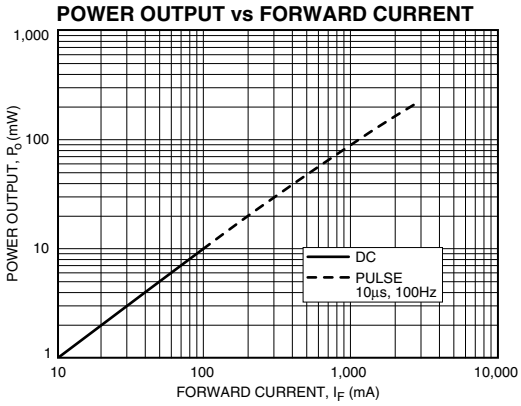
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

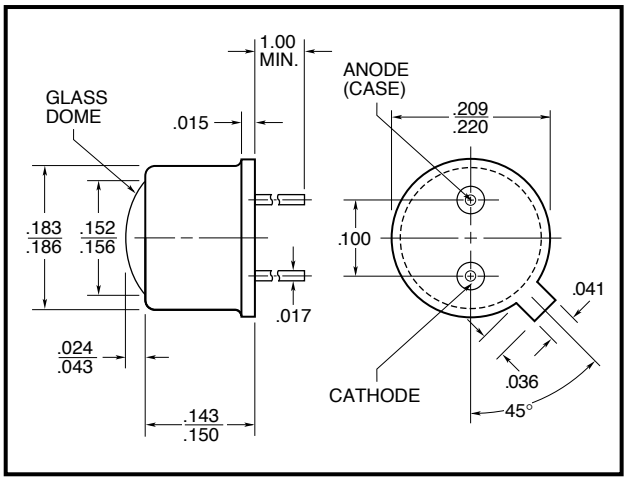


POWER OUTPUT vs FORWARD CURRENT



HI-REL GaAlAs IR EMITTERS

OD-880LJ



FEATURES

- High reliability LPE GaAlAs IRLEDs
- High power output
- 880nm peak emission
- Hermetically sealed TO-46 package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified. Window caps are welded to the case.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_o	I_F = 100mA	6	8.5		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		880		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			80		nm
Half Intensity Beam Angle, θ			35		Deg
Forward Voltage, V_F	I_F = 100mA		1.55	1.9	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	5	30		Volts
Capacitance, C	V_R = 0V		17		pF
Rise Time			0.5		µsec
Fall Time			0.5		µsec

ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	190mW
Continuous Forward Current	100mA
Peak Forward Current (10µs, 400Hz)[2]	3A
Reverse Voltage	5V
Lead Soldering Temperature (1/16" from case for 10sec)	240°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

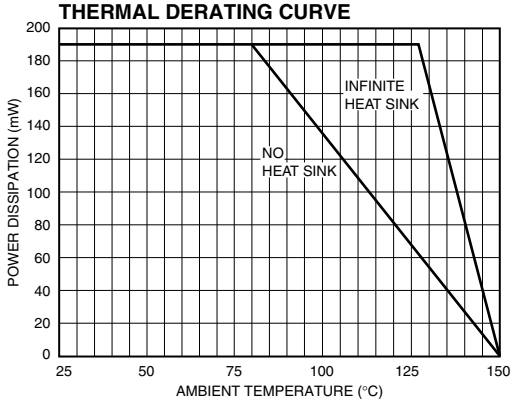
THERMAL PARAMETERS

Storage and Operating Temperature Range	-65°C TO 150°C
Maximum Junction Temperature	150°C
Thermal Resistance, R_{THJA}[1]	370°C/W Typical
Thermal Resistance, R_{THJA}[2]	120°C/W Typical

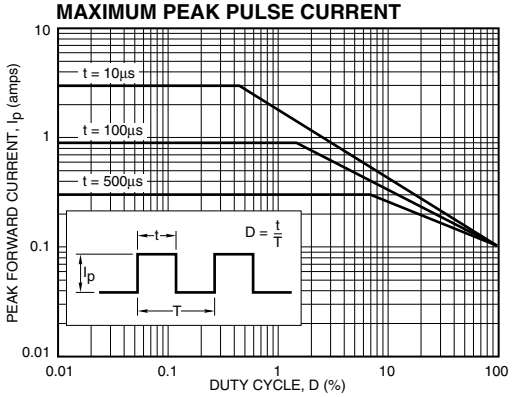
[1]Heat transfer minimized by measuring in still air with minimum heat conducting through leads
[2]Air circulating at a rapid rate to keep case temperature at 25°C

MAXIMUM RATINGS

THERMAL DERATING CURVE

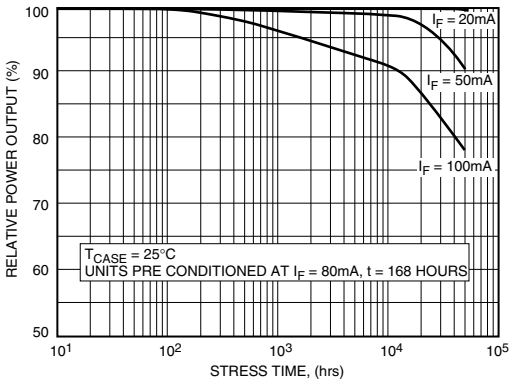


MAXIMUM PEAK PULSE CURRENT

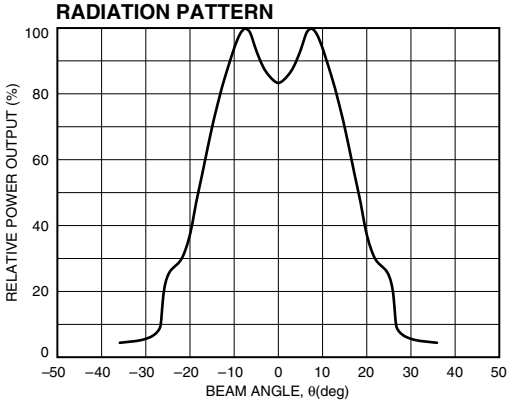


TYPICAL CHARACTERISTICS

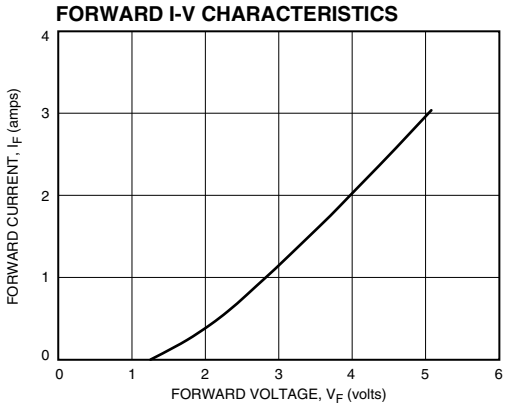
DEGRADATION CURVE



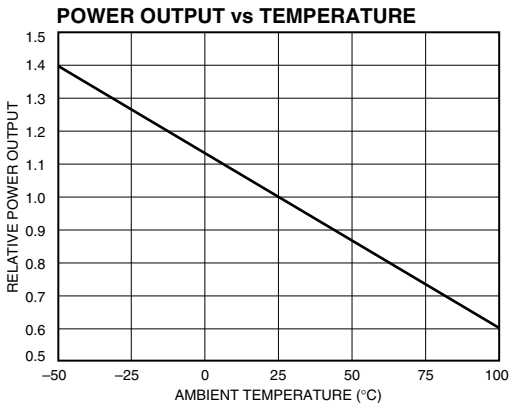
RADIATION PATTERN



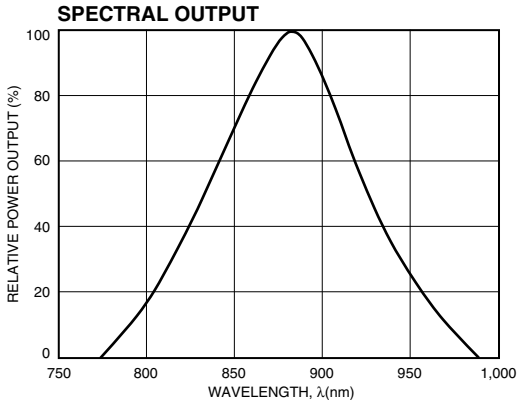
FORWARD I-V CHARACTERISTICS



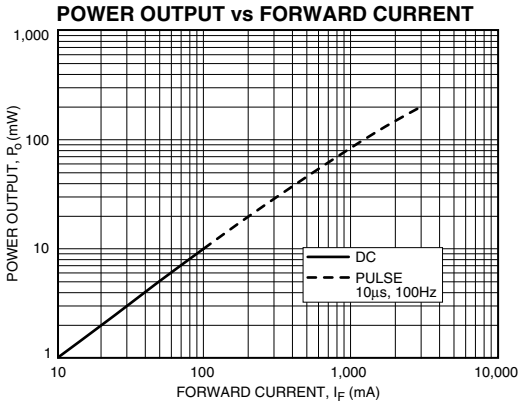
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

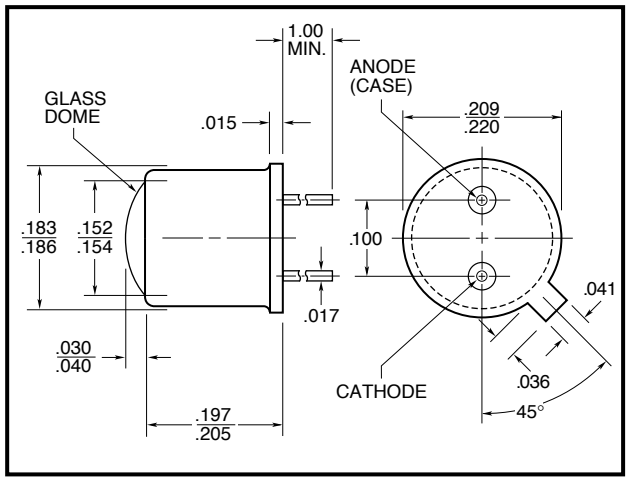


POWER OUTPUT vs FORWARD CURRENT



HI-REL GaAlAs IR EMITTERS

OD-880FJ



FEATURES

- High reliability LPE GaAlAs IRLEDs
- High power output
- 880nm peak emission
- Hermetically sealed TO-46 package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified. Window caps are welded to the case.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_o	I_F = 100mA	6	8		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		880		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			80		nm
Half Intensity Beam Angle, θ			8		Deg
Forward Voltage, V_F	I_F = 100mA		1.55	1.9	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	5	30		Volts
Capacitance, C	V_R = 0V		17		pF
Rise Time			0.5		µsec
Fall Time			0.5		µsec

ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	190mW
Continuous Forward Current	100mA
Peak Forward Current (10µs, 400Hz)[2]	3A
Reverse Voltage	5V
Lead Soldering Temperature (1/16" from case for 10sec)	240°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

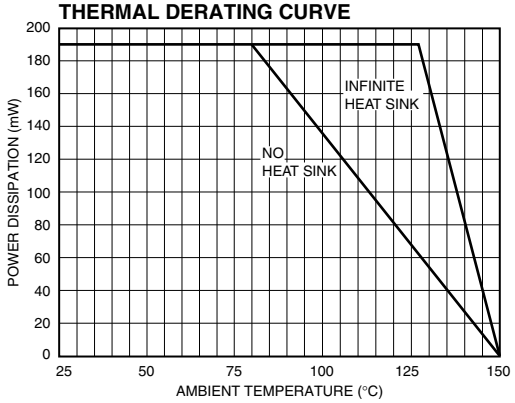
THERMAL PARAMETERS

Storage and Operating Temperature Range	-65°C TO 150°C
Maximum Junction Temperature	150°C
Thermal Resistance, R_{THJA}[1]	370°C/W Typical
Thermal Resistance, R_{THJA}[2]	120°C/W Typical

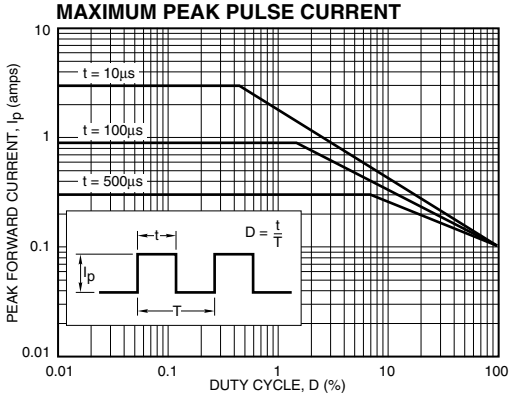
[1]Heat transfer minimized by measuring in still air with minimum heat conducting through leads
[2]Air circulating at a rapid rate to keep case temperature at 25°C

MAXIMUM RATINGS

THERMAL DERATING CURVE

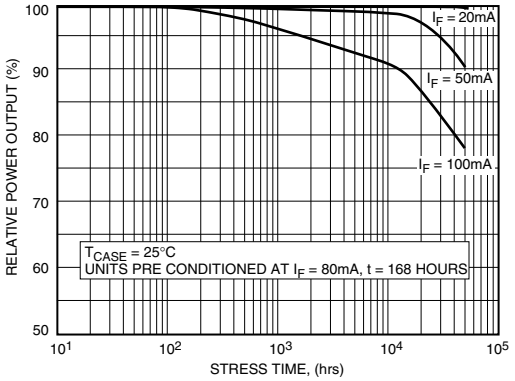


MAXIMUM PEAK PULSE CURRENT

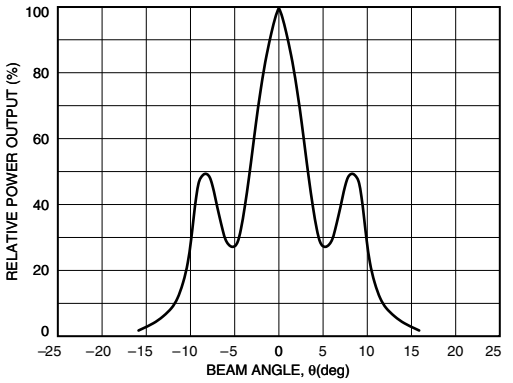


TYPICAL CHARACTERISTICS

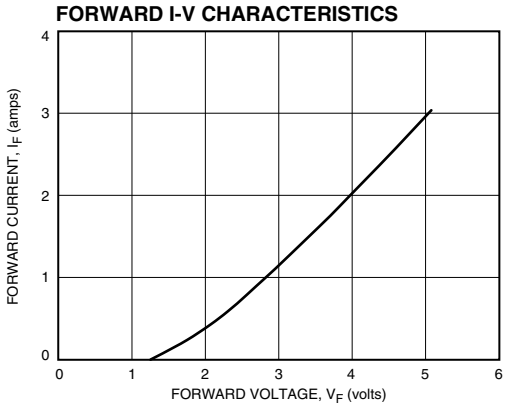
DEGRADATION CURVE



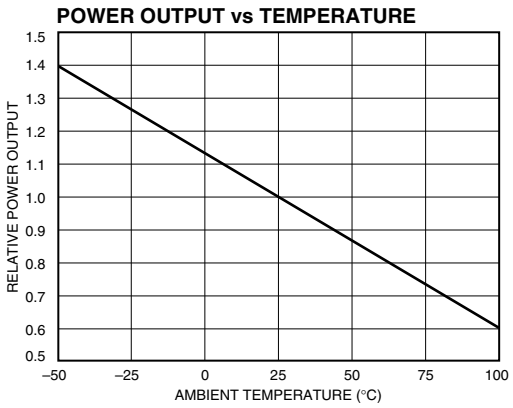
RADIATION PATTERN



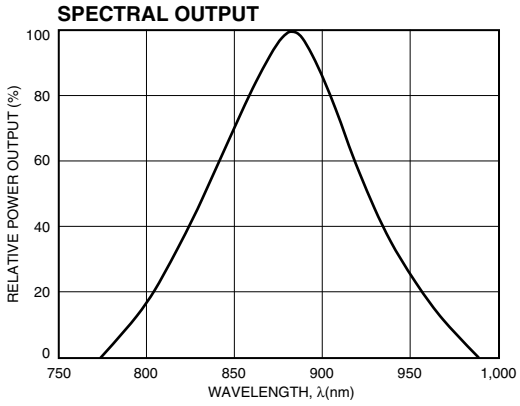
FORWARD I-V CHARACTERISTICS



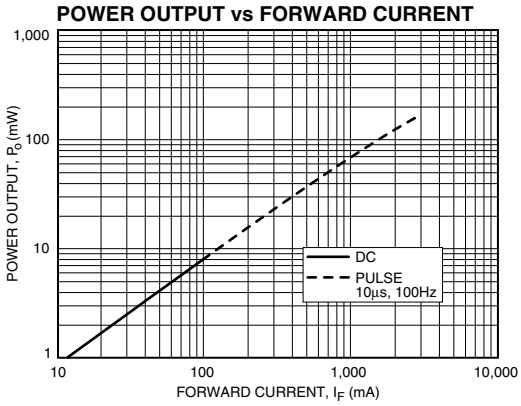
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

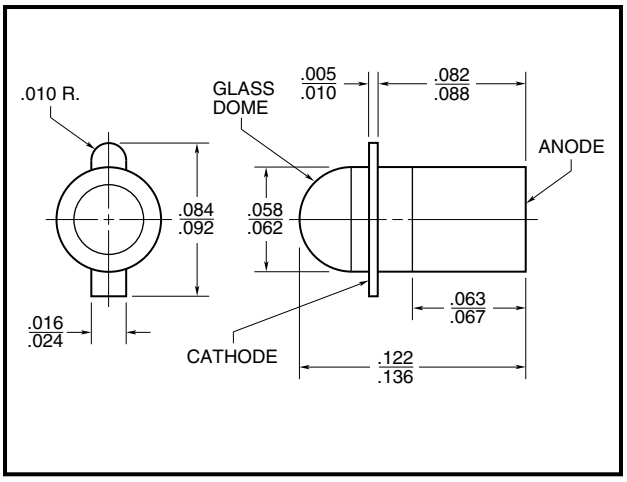


POWER OUTPUT vs FORWARD CURRENT



HI-REL GaAlAs IR EMITTERS

OD-880PP



FEATURES

- High reliability LPE GaAlAs IRLEDs
- High power output
- 880nm peak emission
- Hermetically sealed miniature pill package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified. Window caps are welded to the case.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_o	I_F = 50mA	2	2.2		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		880		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			80		nm
Half Intensity Beam Angle, θ			25		Deg
Forward Voltage, V_F	I_F = 50mA		1.4	1.6	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	5	30		Volts
Capacitance, C	V_R = 0V		17		pF
Rise Time			0.5		µsec
Fall Time			0.5		µsec

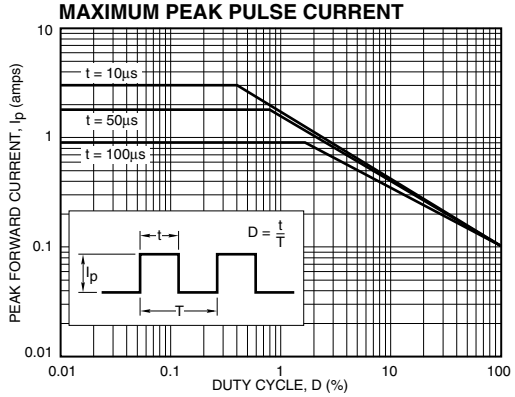
ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	190mW
Continuous Forward Current	100mA
Peak Forward Current (10µs, 400Hz)[2]	3A
Reverse Voltage	5V
Lead Soldering Temperature (10sec)	240°C
Storage and Operating Temperature Range	-55°C to 125°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

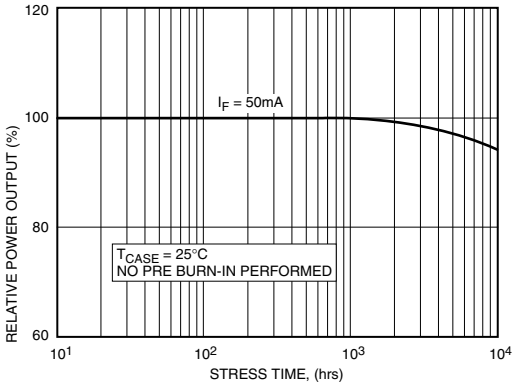
MAXIMUM RATINGS

MAXIMUM PEAK PULSE CURRENT

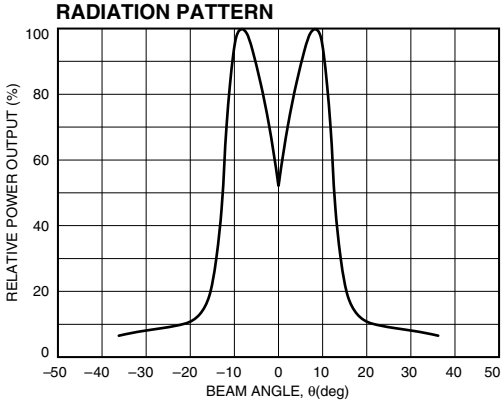


TYPICAL CHARACTERISTICS

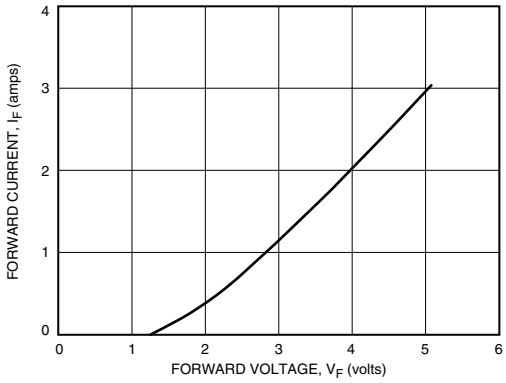
DEGRADATION CURVE



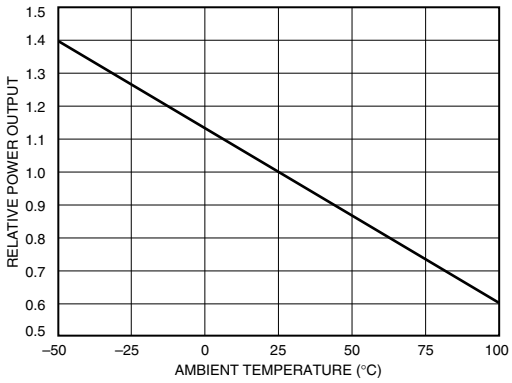
RADIATION PATTERN



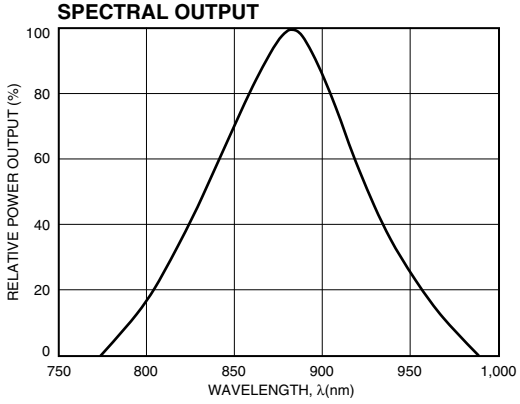
FORWARD I-V CHARACTERISTICS



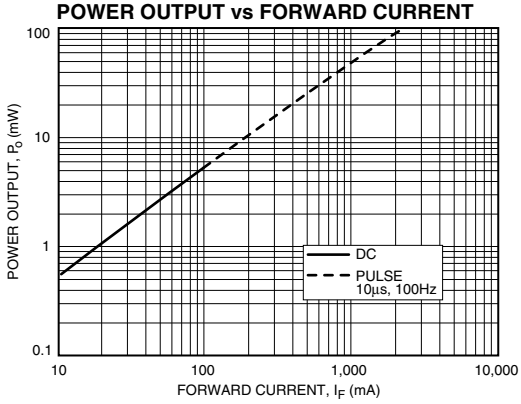
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT

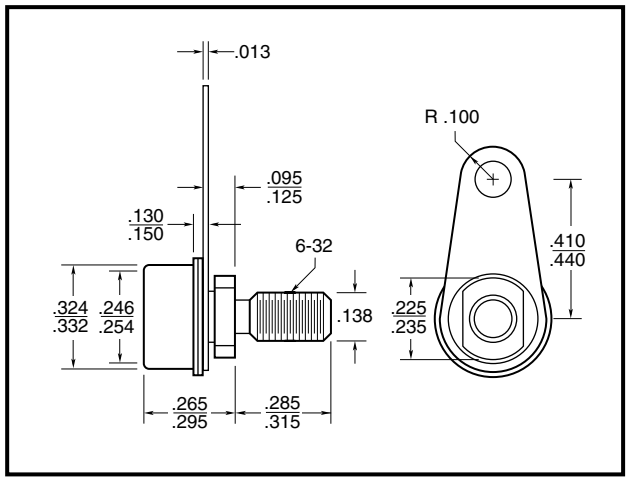


POWER OUTPUT vs FORWARD CURRENT



HI-REL GaAlAs IR EMITTERS

OD-50J



FEATURES

- High reliability LPE GaAlAs IRLEDs
- High power output
- 880nm peak emission
- Four wire bonds on chip corners
- Hermetically sealed stud package
- MIL-S-19500 screening available
- No internal coatings

All surfaces are gold plated. Dimensions are nominal values in inches unless otherwise specified. Window caps are welded to the case.

ELECTRO-OPTICAL CHARACTERISTICS AT 25°C

PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Total Power Output, P_o	I_F = 300mA	20	25		mW
Peak Emission Wavelength, λ_P	I_F = 50mA		880		nm
Spectral Bandwidth at 50%, $\Delta\lambda$			80		nm
Half Intensity Beam Angle, θ			115		Deg
Forward Voltage, V_F	I_F = 300mA		1.5	1.8	Volts
Reverse Breakdown Voltage, V_R	I_R = 10µA	5	40		Volts
Capacitance, C	V_R = 0V		90		pF
Rise Time			0.7		µsec
Fall Time			0.7		µsec

ABSOLUTE MAXIMUM RATINGS AT 25°C CASE

Power Dissipation[1]	900mW
Continuous Forward Current	450mA
Peak Forward Current (10µs, 700Hz)[2]	12A
Reverse Voltage	5V
Lead Soldering Temperature (1/16" from case for 10sec)	240°C

[1]Derate per Thermal Derating Curve above 25°C
[2]Derate linearly above 25°C

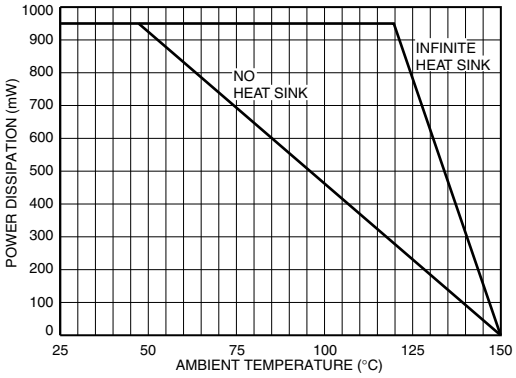
THERMAL PARAMETERS

Storage and Operating Temperature Range	-65°C TO 150°C
Maximum Junction Temperature	150°C
Thermal Resistance, R_{THJA}[1]	120°C/W Typical
Thermal Resistance, R_{THJA}[2]	35°C/W Typical

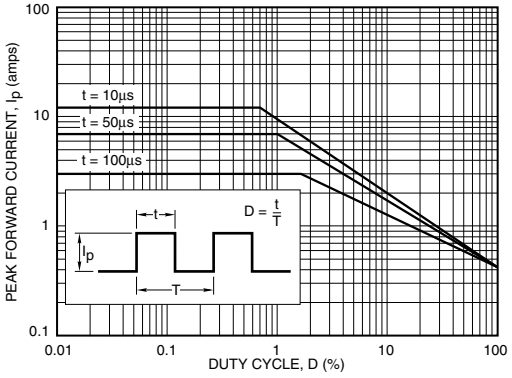
[1]Heat transfer minimized by measuring in still air with minimum heat conducting through leads
[2]Air circulating at a rapid rate to keep case temperature at 25°C

MAXIMUM RATINGS

THERMAL DERATING CURVE

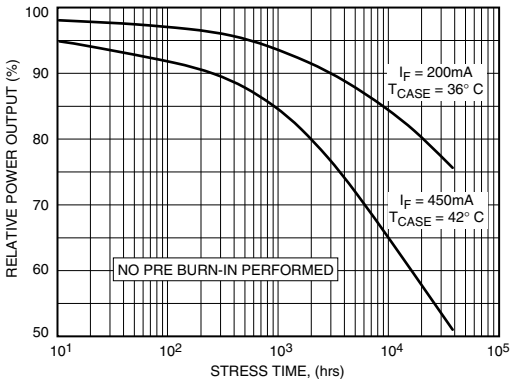


MAXIMUM PEAK PULSE CURRENT

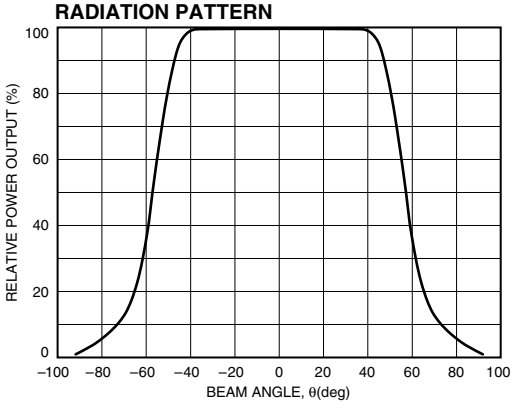


TYPICAL CHARACTERISTICS

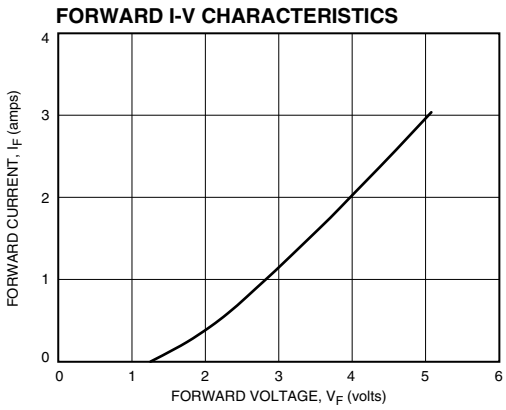
DEGRADATION CURVE



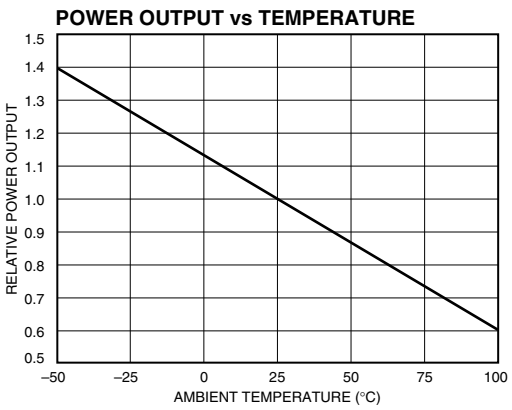
RADIATION PATTERN



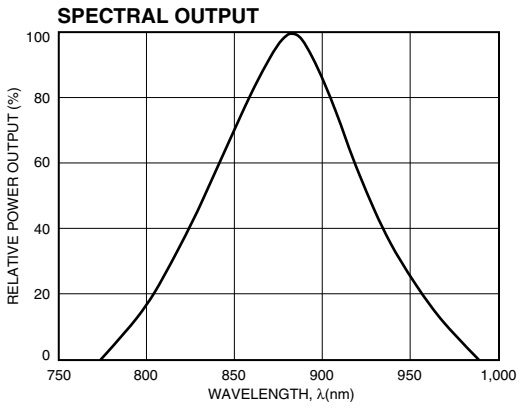
FORWARD I-V CHARACTERISTICS



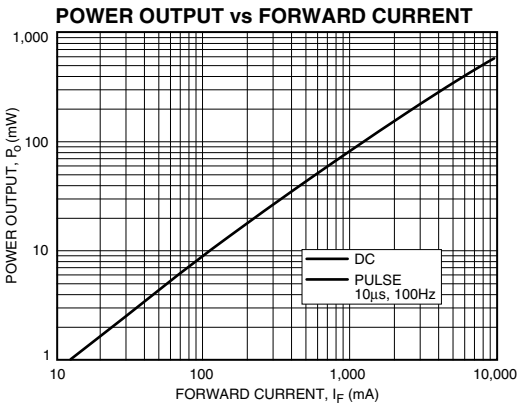
POWER OUTPUT vs TEMPERATURE



SPECTRAL OUTPUT



POWER OUTPUT vs FORWARD CURRENT



Park, California 91320