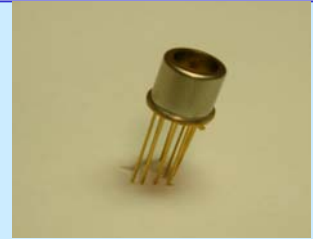


# Single Mode VCSEL 763nm TO5 & TEC

- ◆ Vertical Cavity Surface-Emitting Laser
- ◆ internal TEC and Thermistor
- ◆ Narrow linewidth
- ◆ > 2nm tunability with TEC
- ◆ High performance and reliability



INVISIBLE LASER RADIATION  
AVOID BEAM EXPOSURE  
CLASS 3B LASER PRODUCT

## ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	UNITS	MIN	TYP	MAX	TEST CONDITIONS
Emission wavelength	$\lambda_R$	nm	762,5		763,7	T=25°C, I <sub>TEC</sub> =0, P <sub>OP</sub> =0.3mW
Threshold current	I <sub>TH</sub>	mA		0,3		T=20°C
Output power	P <sub>opt</sub>	mW	0,25			T=25°C
Threshold voltage	U <sub>TH</sub>	V		1,8		
Laser current	I <sub>OP</sub>	mA			2,0	P <sub>opt</sub> =0.3 mW
Laser voltage	U <sub>OP</sub>	V		2,0		P <sub>opt</sub> =0.3 mW
Wallplug efficiency	$\eta_{WP}$	%		12		P <sub>opt</sub> =0.3mW
Slope efficiency	$\eta_S$	W/A		0,3		T= 20°C
Differential series resistance	R <sub>S</sub>	$\Omega$		250		P <sub>opt</sub> =0.3 mW
3dB modulation bandwidth	$\nu_{3dB}$	GHz	0.1			P <sub>opt</sub> =0.3 mW (due to ESD protection diode)
Rise and fall time	t <sub>R</sub> /t <sub>F</sub>	ps				10%..90%; P <sub>off/on</sub> =0.1/1.0mW
Relative intensity noise	RIN	dB/Hz		-130	-120	P <sub>opt</sub> = 0.3 mW @ 1 GHz
Wavelength tuning over current		nm/mA		0,6		
Wavelength tuning over temperature		nm/K		0,06		
Thermal resistance	R <sub>thermal</sub>	K/mW		5		
Side mode supression		dB	30			
Beam divergence	$\theta$	°	5		20	P <sub>opt</sub> =0.3 mW, full width 1/e <sup>2</sup>
Spectral bandwidth	$\Delta\lambda$	MHZ		100		P <sub>opt</sub> =0.3 mW
TEC current		mA			500	
NTC Thermistor Resistance		K $\Omega$		10,0		T=25°C
NTC Temperature Dependence		K $\Omega$		10/exp[3892*(1/298K-1/T <sub>op</sub> )]		
Wavelength tuning over TEC current		nm/mA		0,008		TEC current < 200 mA
ESD damage treshold		V	2.000			Human body model

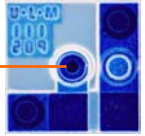
## ABSOLUTE MAXIMUM RATINGS

Storage temperature	-40 .. 125°C
Operating temperature	-20 .. 80°C
Electrical power dissipation	5 mW
Continous forward current	2 mA
Reverse voltage	8V
Soldering temperature*:	270°C
(*TEC temperature must be below 150°C)	

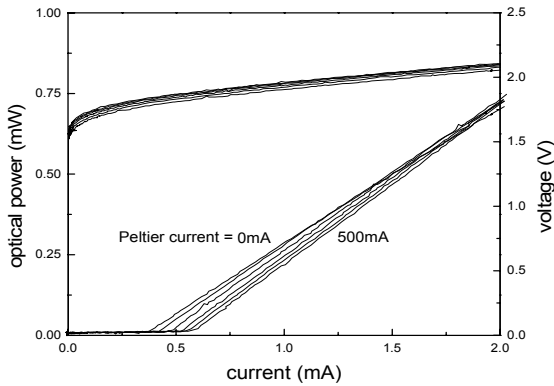
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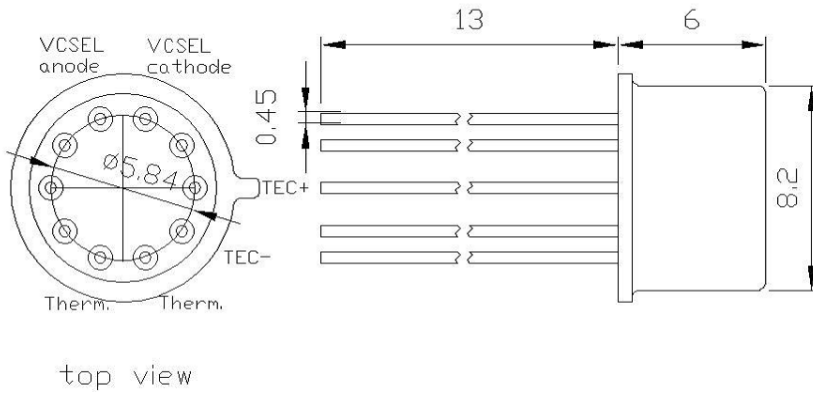
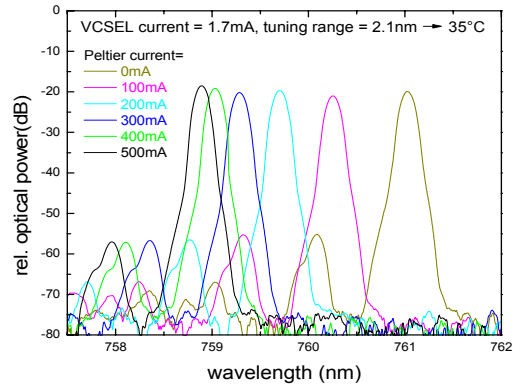
**ATTENTION:** Electrostatic Sensitive Devices  
Observe Precautions for Handling



**LIV**



**Spectral Characteristics**

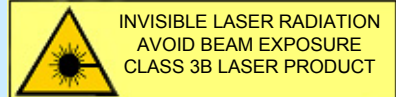


For order please use:  
**ULM763-01-TN-S05FTT**



# Single Mode VCSEL 763nm TO46 & TEC

- ◆ Vertical Cavity Surface-Emitting Laser
- ◆ internal TEC and Thermistor
- ◆ Narrow linewidth
- ◆ 2nm tunability with TEC
- ◆ ESD protection diode



## ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	UNITS	MIN	TYP	MAX	TEST CONDITIONS
Emission wavelength	$\lambda_R$	nm	760	763	766	$T=20^\circ\text{C}$ , $I_{\text{TEC}}=0$ , $P_{\text{OP}}=0.3\text{mW}$
Threshold current	$I_{\text{TH}}$	mA		0,5		$T=20^\circ\text{C}$
Output power	$P_{\text{opt}}$	mW	0,25			$T=25^\circ\text{C}$
Threshold voltage	$U_{\text{TH}}$	V		1,8		
Laser current	$I_{\text{OP}}$	mA			2,0	$P_{\text{opt}}=0.3\text{ mW}$
Laser voltage	$U_{\text{OP}}$	V		2,0		$P_{\text{opt}}=0.3\text{ mW}$
Wallplug efficiency	$\eta_{\text{WP}}$	%		12		$P_{\text{opt}}=0.3\text{mW}$
Slope efficiency	$\eta_s$	W/A		0,3		$T= 20^\circ\text{C}$
Differential series resistance	$R_s$	$\Omega$		250		$P_{\text{opt}}=0.3\text{ mW}$
3dB modulation bandwidth	$\nu_{3\text{dB}}$	GHz	0,1			$P_{\text{opt}}=0.3\text{ mW}$ (due to ESD protection diode)
Relative intensity noise	RIN	dB/Hz		-130,0	-120,0	$P_{\text{opt}} = 0.3\text{ mW @ } 1\text{ GHz}$
Wavelength tuning over current		nm/mA		0,60		
Wavelength tuning over temperature		nm/K		0,06		
Thermal resistance (VCSEL chip)	$R_{\text{thermal}}$	K/mW	3		5	
Side mode supression		dB	30			
Beam divergence	$\theta$	$^\circ$	10		25	$P_{\text{opt}}=0.3\text{ mW}$ , full width $1/e^2$
Spectral bandwidth	$\Delta\lambda$	MHZ		100,0		$P_{\text{opt}}=0.3\text{ mW}$
TEC current		mA			500,0	
NTC Thermistor Resistance		K $\Omega$	9,5	10	11	$T=25^\circ\text{C}$
NTC Temperature Dependence		K $\Omega$	10/exp[3892*(1/298K-1/T <sub>op</sub> )]			
Wavelength tuning over TEC current		nm/mA		0,008		TEC current < 200 mA
ESD damage treshold		V	2.000			Human body model

## ABSOLUTE MAXIMUM RATINGS

Storage temperature	-40 .. 125°C
Operating temperature	-20 .. 80°C
Electrical power dissipation	5 mW
Continous forward laser current	2 mA
Continous reverse current	10mA
Soldering temperature*:	270°C
(*TEC temperature must be below 150°C)	

**NOTICE:** Stresses greater than those listed under „Absolute Maximum Ratings“ may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated for extended periods of time may effect device reliability.

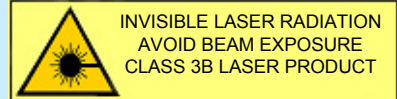


**ATTENTION:** Electrostatic Sensitive Devices  
Observe Precautions for Handling



# Single Mode VCSEL 763 $\pm$ 3 nm TEC & E2000

- ◆ Vertical Cavity Surface-Emitting Laser
- ◆ internal TEC and Thermistor
- ◆ E2000 receptical, 760 nm single-mode fiber
- ◆ 2nm tunability with TEC
- ◆ High performance and reliability



## ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	UNITS	MIN	TYP	MAX	TEST CONDITIONS
Emission wavelength	$\lambda_R$	nm	760	763	766	T=20°C, I <sub>TEC</sub> =0, P <sub>OP</sub> =0.1mW
Threshold current	I <sub>TH</sub>	mA		0,5		T=20°C
Output power	P <sub>opt</sub>	mW	0,1			T=0 .. 50°C, coupled into SM fiber
Threshold voltage	U <sub>TH</sub>	V		1,8		
Laser current	I <sub>OP</sub>	mA			2,0	P <sub>opt</sub> =0.1 mW
Laser voltage	U <sub>OP</sub>	V		2,0		P <sub>opt</sub> =0.1 mW
Wallplug efficiency	$\eta_{WP}$	%		12		P <sub>opt</sub> =0.1mW
Slope efficiency	$\eta_S$	W/A		0,1		T= 20°C
Differential series resistance	R <sub>S</sub>	$\Omega$		250		P <sub>opt</sub> =0.1 mW
3dB modulation bandwidth	$\nu_{3dB}$	GHz	0.1			P <sub>opt</sub> =0.1 mW (due to ESD protection diode)
Relative intensity noise	RIN	dB/Hz		-130,0	-120,0	P <sub>opt</sub> = 0.1 mW @ 1 GHz
Wavelength tuning over current		nm/mA		0,60		
Wavelength tuning over temperature		nm/K		0,06		
Thermal resistance (VCSEL chip)	R <sub>thermal</sub>	K/mW	3		5	
Side mode supression		dB	30			
Spectral bandwidth	$\Delta\lambda$	MHZ		100,0		P <sub>opt</sub> =0.1 mW
TEC current		mA			500,0	
NTC Thermistor Resistance		K $\Omega$	9,5	10	11	T=25°C
NTC Temperature Dependence		K $\Omega$				10/exp[3892*(1/298K-1/T <sub>op</sub> )]
Wavelength tuning over TEC current		nm/mA		0,008		TEC current < 200 mA
ESD damage treshold		V	2.000			Human body modul

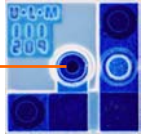
## ABSOLUTE MAXIMUM RATINGS

Storage temperature	-40 .. 125°C
Operating temperature	-20 .. 80°C
Electrical power dissipation	7.5 mW
Continuous forward laser current	3 mA
Laser reverse voltage	8V
Soldering temperature*:	270°C
(*TEC temperature must be below 150°C)	

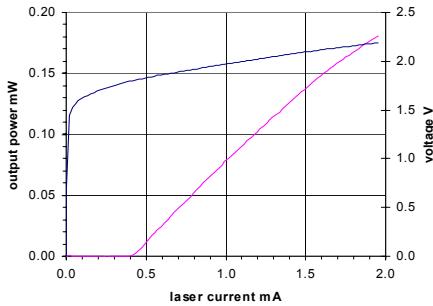
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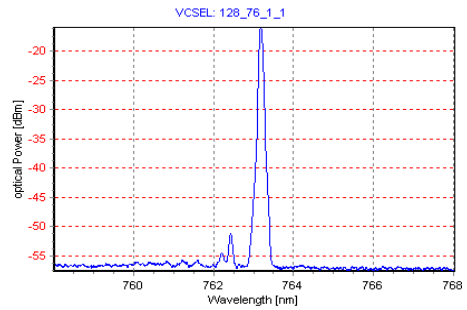
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Observe Precautions for Handling



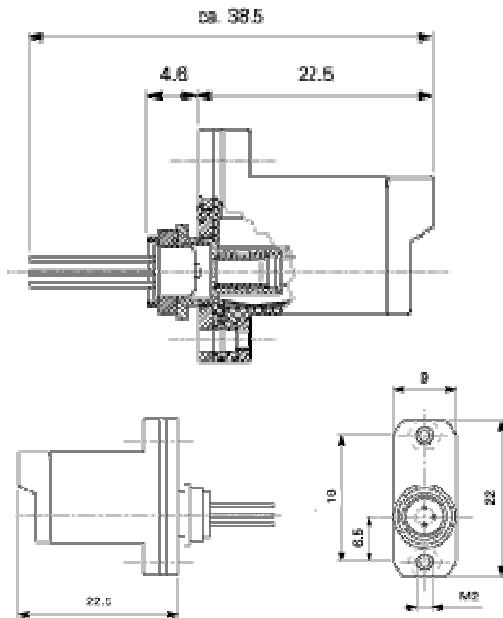
## LIV



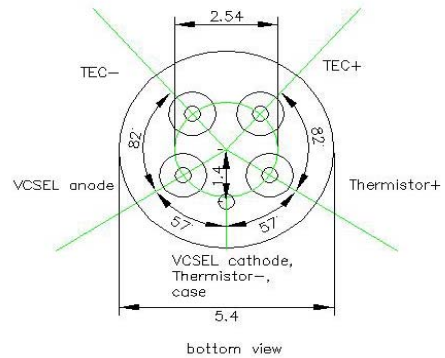
## Spectral Characteristics



## E2000 receptacle



## PIN layout



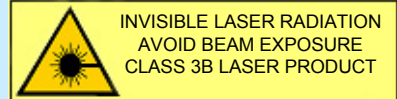
For order please use:

ULM763-03-TN-SE2BTT

**OPTION: Customer specific wavelength selection on request**

# Single Mode VCSEL 947 $\pm$ 3 nm TO46 & TEC

- ◆ Vertical Cavity Surface-Emitting Laser
- ◆ internal TEC and Thermistor
- ◆ Narrow linewidth
- ◆ 2nm tunability with TEC
- ◆ High performance and reliability



## ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	UNITS	MIN	TYP	MAX	TEST CONDITIONS
Emission wavelength	$\lambda_R$	nm	944	947	950	T=20°C, I <sub>TEC</sub> =0, P <sub>OP</sub> =0.5 mW
Threshold current	I <sub>TH</sub>	mA		0,3		T=20°C
Output power	P <sub>opt</sub>	mW	0,5			T=0 .. 50°C
Threshold voltage	U <sub>TH</sub>	V		1,6		
Laser current	I <sub>OP</sub>	mA			2,0	P <sub>opt</sub> =0.5 mW
Laser voltage	U <sub>OP</sub>	V		2,0		P <sub>opt</sub> =0.5 mW
Wallplug efficiency	$\eta_{WP}$	%		12		P <sub>opt</sub> =0.5 mW
Slope efficiency	$\eta_S$	W/A		0,3		T= 20°C
Differential series resistance	R <sub>S</sub>	$\Omega$		250		P <sub>opt</sub> =0.5 mW
3dB modulation bandwidth	V <sub>3dB</sub>	GHz	0.1			P <sub>opt</sub> =0.5 mW (due to ESD protection diode)
Relative intensity noise	RIN	dB/Hz		-130,0	-120,0	P <sub>opt</sub> = 0.5 mW @ 1 GHz
Wavelength tuning over current		nm/mA		0,60		
Wavelength tuning over temperature		nm/K		0,06		
Thermal resistance (VCSEL chip)	R <sub>thermal</sub>	K/mW	3		5	
Side mode suppression		dB	30			
Beam divergence	$\theta$	°	10		25	P <sub>opt</sub> =0.5 mW, full width 1/e <sup>2</sup>
Spectral bandwidth	$\Delta\lambda$	MHZ		100,0		P <sub>opt</sub> =0.5 mW
TEC current		mA			500,0	appropriate heatsink required
NTC Thermistor Resistance		K $\Omega$	9,5	10,0	10,5	T=25°C
NTC Temperature Dependence		K $\Omega$				10/exp[3892*(1/298K-1/T <sub>op</sub> )]
Wavelength tuning over TEC current		nm/mA		0,008		TEC current < 200 mA
ESD damage treshold		V	2.000			Human body model

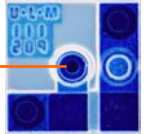
## ABSOLUTE MAXIMUM RATINGS

Storage temperature	-40 .. 125°C
Operating temperature	-20 .. 80°C
Electrical power dissipation	5 mW
Continuous forward laser current	2 mA
Laser reverse voltage	8V
Soldering temperature*:	270°C
(*TEC temperature must be below 150°C)	

**NOTICE:** Stresses greater than those listed under „Absolute Maximum Ratings“ may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated for extended periods of time may effect device reliability.

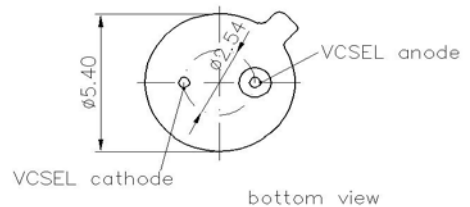
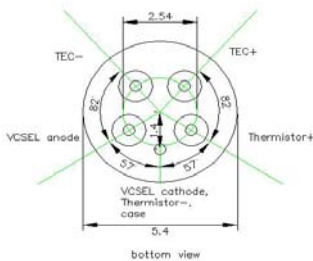
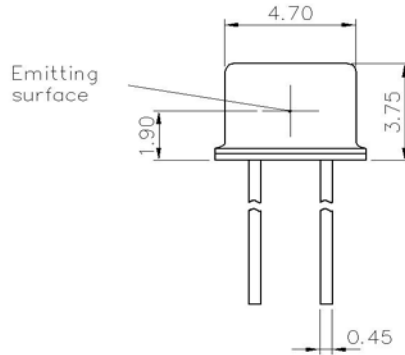
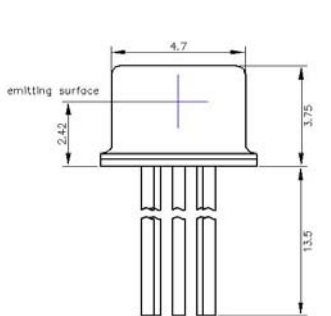
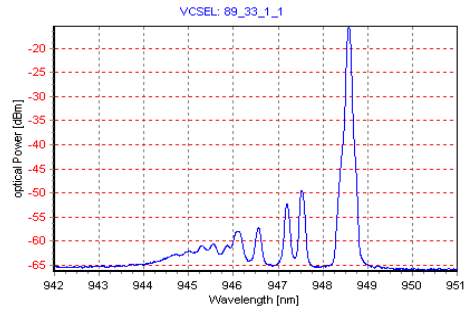
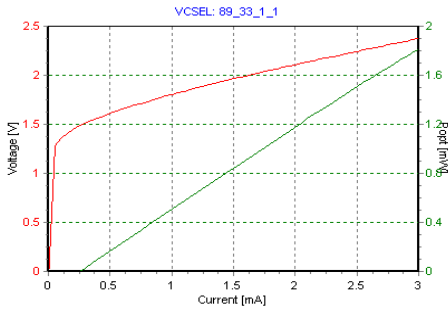


**ATTENTION:** Electrostatic Sensitive Devices  
Observe Precautions for Handling



**LIV**

**Spectral Characteristics**



For order please use:

with TEC/Thermistor: ULM947-03-TN-S46FTT

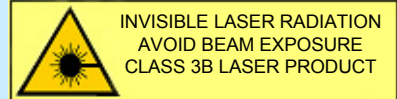
without TEC/Thermistor: ULM947-03-TN-S46FOP

**OPTION: Wide range of TO headers & caps (flat, tilted, ball)  
Customer specific wavelength selection on request**



# Single Mode VCSEL 948 $\pm$ 1 nm TO46 & TEC

- ◆ Vertical Cavity Surface-Emitting Laser
- ◆ internal TEC and Thermistor
- ◆ Narrow linewidth
- ◆ 2nm tunability with TEC
- ◆ High performance and reliability



## ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	UNITS	MIN	TYP	MAX	TEST CONDITIONS
Emission wavelength	$\lambda_R$	nm	947	948	949	T=20°C, I <sub>TEC</sub> =0, P <sub>OP</sub> =0.5mW
Threshold current	I <sub>TH</sub>	mA		0,5		T=20°C
Output power	P <sub>opt</sub>	mW	0,5			T=0 .. 50°C
Threshold voltage	U <sub>TH</sub>	V		1,6		
Laser current	I <sub>OP</sub>	mA			2,0	P <sub>opt</sub> =0.5 mW
Laser voltage	U <sub>OP</sub>	V		2,0		P <sub>opt</sub> =0.5 mW
Wallplug efficiency	$\eta_{WP}$	%		12		P <sub>opt</sub> =0.5mW
Slope efficiency	$\eta_s$	W/A		0,3		T= 20°C
Differential series resistance	R <sub>S</sub>	$\Omega$		250		P <sub>opt</sub> =0.5 mW
3dB modulation bandwidth	V <sub>3dB</sub>	GHz	0.1			P <sub>opt</sub> =0.5 mW (due to ESD protection diode)
Relative intensity noise	RIN	dB/Hz		-130,0	-120,0	P <sub>opt</sub> = 0.5 mW @ 1 GHz
Wavelength tuning over current		nm/mA		0,60		
Wavelength tuning over temperature		nm/K		0,06		
Thermal resistance (VCSEL chip)	R <sub>thermal</sub>	K/mW	3		5	
Side mode supression		dB	30			
Beam divergence	$\theta$	°	10		25	P <sub>opt</sub> =0.5 mW, full width 1/e <sup>2</sup>
Spectral bandwidth	$\Delta\lambda$	MHZ		100,0		P <sub>opt</sub> =0.5 mW
TEC current		mA			500	appropriate heatsink required
NTC Thermistor Resistance		K $\Omega$	9,5	10,0	10,5	T=25°C
NTC Temperature Dependence		K $\Omega$	10/exp[3892*(1/298K-1/T <sub>op</sub> )]			
Wavelength tuning over TEC current		nm/mA		0,008		TEC cuurent < 200 mA
ESD damage treshold		V	2.000			Human body model

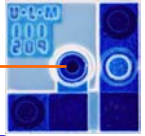
## ABSOLUTE MAXIMUM RATINGS

Storage temperature	-40 .. 125°C
Operating temperature	-20 .. 80°C
Electrical power dissipation	5 mW
Continuous forward laser current	2 mA
Laser reverse voltage	8V
Soldering temperature*:	270°C
(*TEC temperature must be below 150°C)	

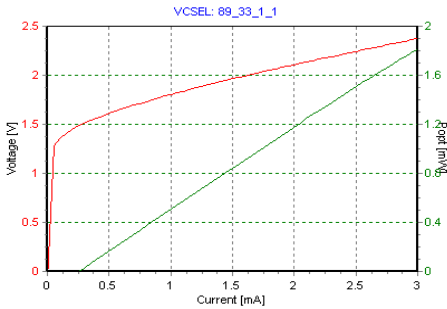
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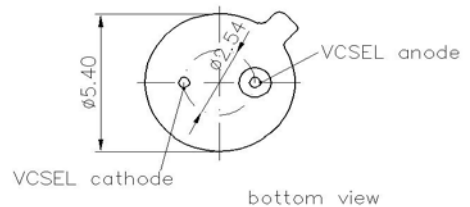
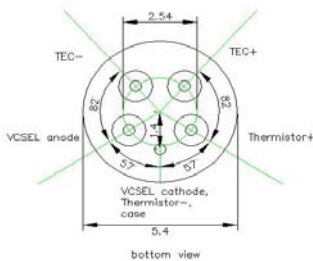
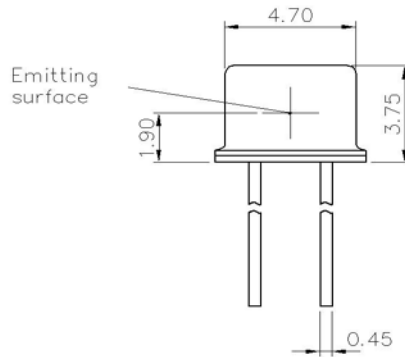
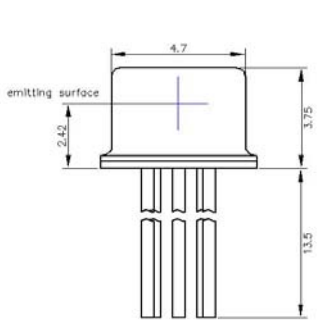
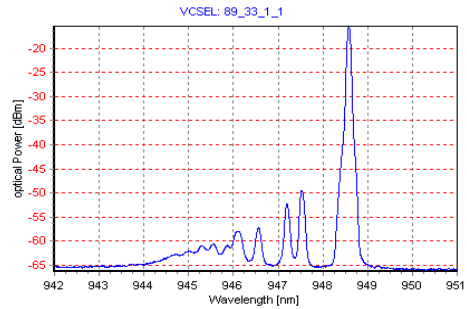
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Observe Precautions for Handling



**LIV**



**Spectral Characteristics**



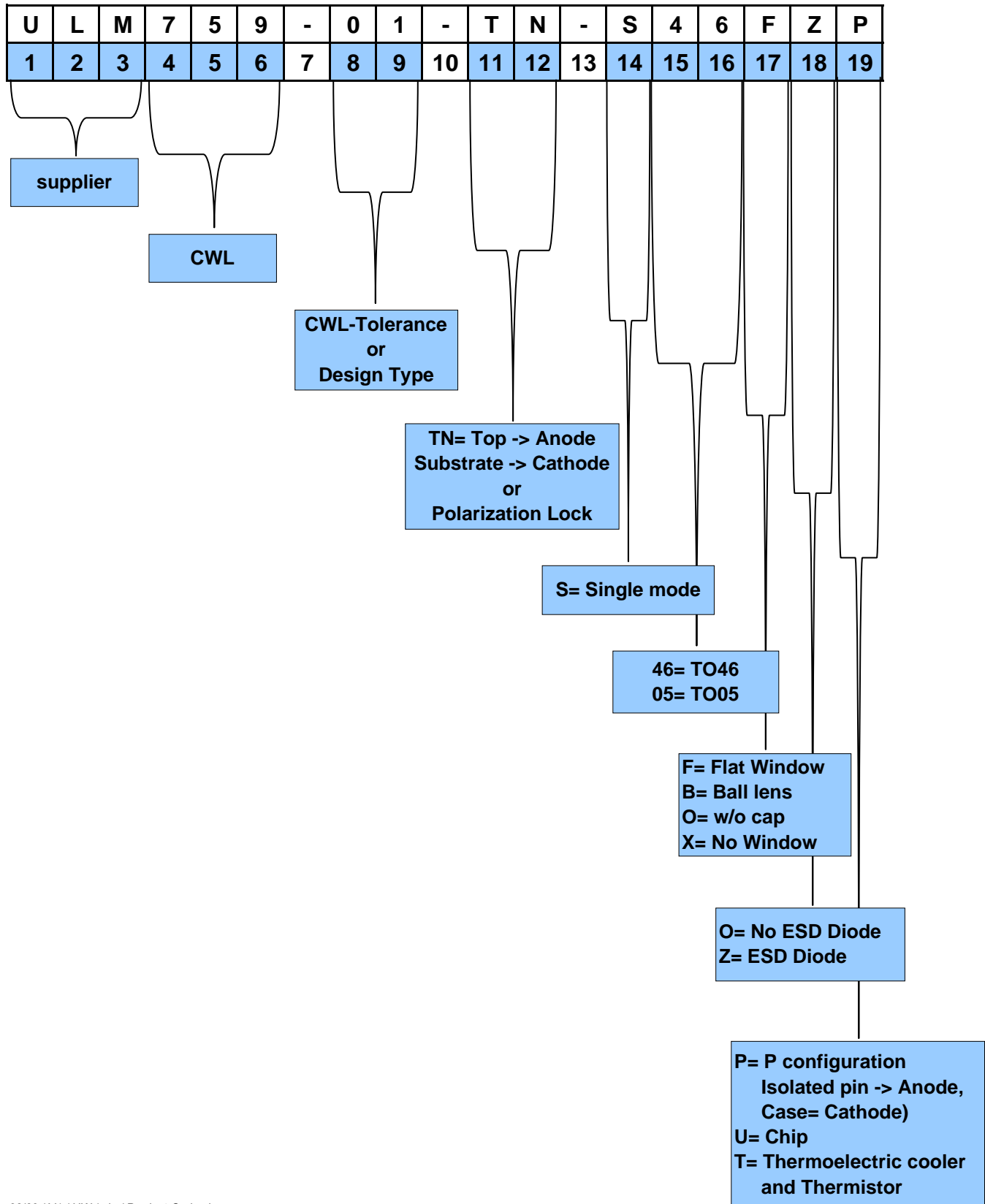
For order please use:

with TEC/Thermistor: ULM948-01-TN-S46FTT

without TEC/Thermistor: ULM948-01-TN-S46FOP

**OPTION: Wide range of TO headers & caps (flat, tilted, ball)  
Customer specific wavelength selection on request**

# Basic Product Code ULM Photonics



08/09 / V1 / HW / ulm/ Product-Code.xls