



LIGHTING FOREVER

ADJUSTABLE SHUNT REGULATOR

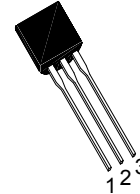
EL431 series

Feature

- Programmable output voltage
- Temperature coefficient is 50ppm/°C typical
- Temperature compensated for operation over full temperature range
- Low output noise voltage
- Fast turn on response
- Pb free



SOT-23
 Package Code: N
 Pin 1: Reference
 Pin 2: Cathode
 Pin 3: Anode

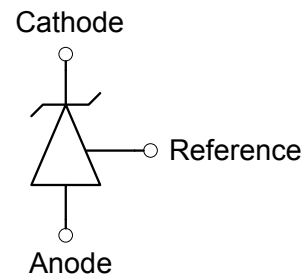
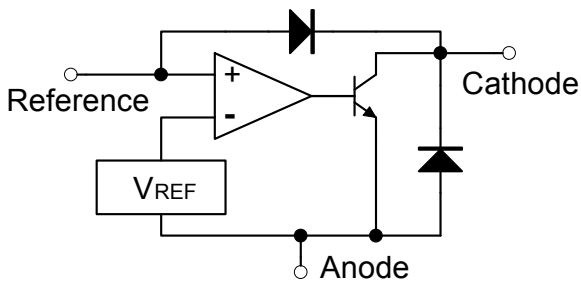


TO-92
 Package Code: A
 Pin 1: Reference
 Pin 2: Anode
 Pin 3: Cathode

Description

The EL431 series are three-terminal adjustable regulators with guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{REF} (approximately 2.495 volts) and 36 volts with two external resistors. These devices have a typical dynamic output impedance of 0.2Ω . Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacement for Zener diodes in many applications.

Functional Block Diagram & Symbol



Ordering Information

Package	$V_{REF}: 2.495\pm 2\%$	$V_{REF}: 2.495\pm 1\%$	$V_{REF}: 2.495\pm 0.5\%$
SOT-23	431AN	431BN	431CN
TO-92	431AA	431BA	431CA



LIGHTING FOREVER

ADJUSTABLE SHUNT REGULATOR

EL431 series

Absolute Maximum Ratings

(Operating temperature range applies unless otherwise specified)

Characteristics	Symbol	Value		Unit
Cathode Voltage	V_{KA}	36		V
Cathode Current Range (Continuous)	I_K	-100~+150		mA
Reference Input Current Range	I_{REF}	0.05~+10		mA
Power Dissipation	P_D	SOT-23	280	mW
		TO-92	770	
Operating Temperature Range	T_{opr}	-25~+120		°C
Storage Temperature Range	T_{stg}	-65~+150		°C

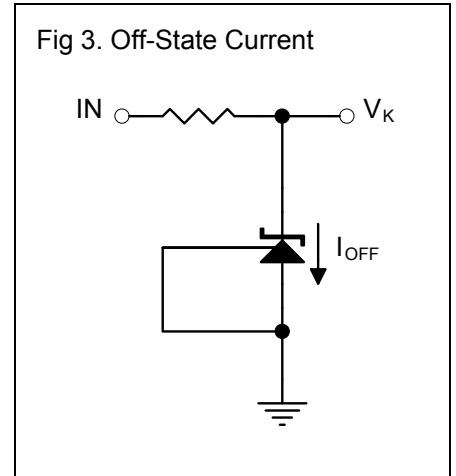
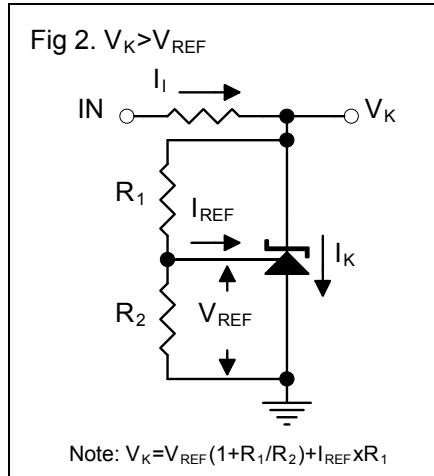
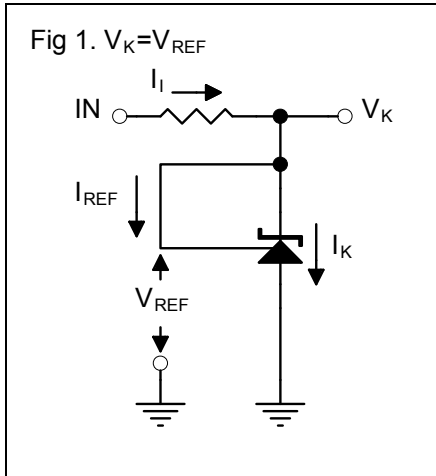
Operating Conditions

Characteristics	Symbol	Min.	Max.	Unit
Cathode Voltage	V_{KA}	V_{REF}	36	V
Cathode Current Range (Continuous)	I_K	1	100	mA

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise specified)

Characteristics		Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Input Voltage (Fig1)	431AN/AA	V_{REF}	$V_K=V_{REF}, I_K=10\text{mA}$	2.445	2.495	2.545	V
	431BN/BA			2.470	2.495	2.520	
	431CN/CA			2.483	2.495	2.507	
Deviation of Reference Input Voltage Over-Temperature (Fig1)		$V_{REF(dev)}$	$V_K=V_{REF}, I_K=10\text{mA}$ $T_{min} \leq T_a \leq T_{max}$	-	7	17	mV
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage (Fig2)		$\Delta V_{REF} / \Delta V_K$	$I_K=10\text{mA}, \Delta V_K=10\text{V to } V_{REF}$	-	-1.1	-2.7	mV/V
			$I_K=10\text{mA}, \Delta V_K=36\text{V to } 10\text{V}$	-	-0.85	-2.0	mV/V
Reference Input Current (Fig2)		I_{REF}	$I_K=10\text{mA}, R_1=10\text{k}\Omega, R_2=\infty$	-	2	4	μA
Deviation of Reference Input Current Over Full Temperature Range (Fig2)		$I_{REF(dev)}$	$I_K=10\text{mA}, R_1=10\text{k}\Omega, R_2=\infty, T_a=\text{Full Range}$	-	0.4	1.2	μA
Minimum Cathode Current for Regulation (Fig1)		$I_{K(min)}$	$V_K=V_{REF}$	-	0.3	1.0	mA
Off-State Cathode Current (Fig3)		$I_{K(off)}$	$V_K=36\text{V}, V_{REF}=0$	-	0.1	1.0	μA
Dynamic Output Impedance (Fig1)		Z_K	$V_K=V_{REF}, f \leq 1\text{kHz}$ $I_K=1 \text{ to } 100\text{mA}$	-	0.2	0.5	Ω

Test Circuits



Characteristics Curve

Figure 1. Cathod Current vs. Cathod Voltage

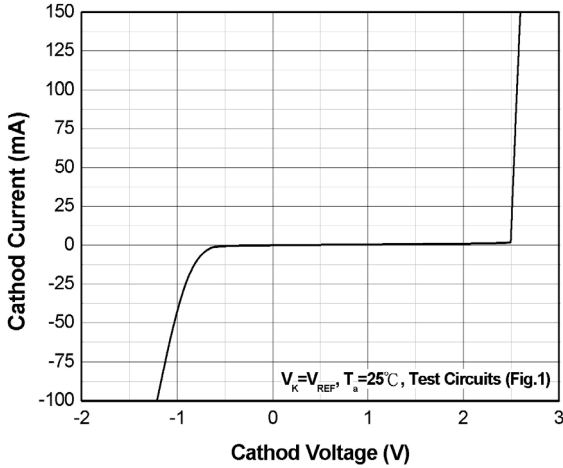


Figure 2. Change in Reference Input Voltage and Cathod Voltage

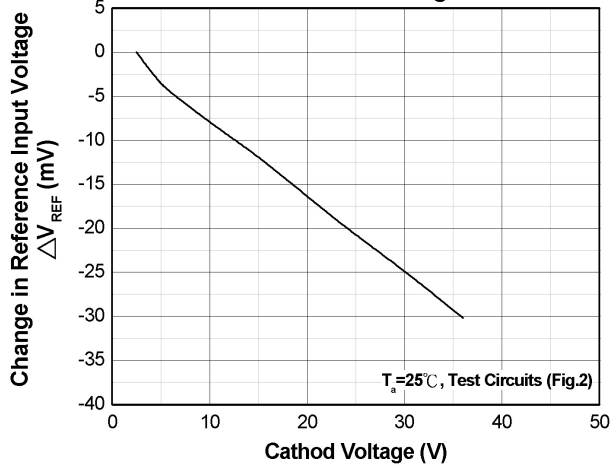


Figure 3. Reference Input Voltage vs. Temperature

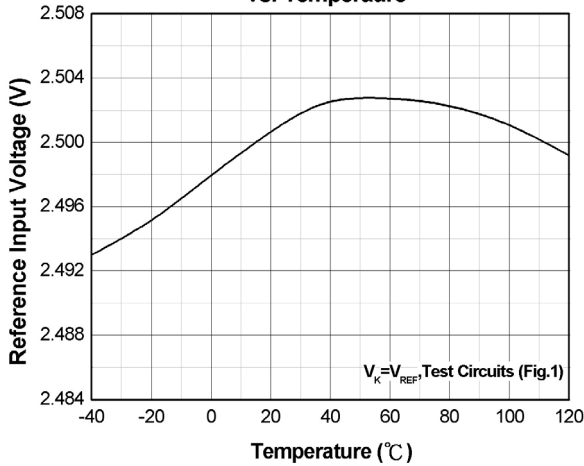


Figure 4. Cathod Current vs. Cathod Voltage

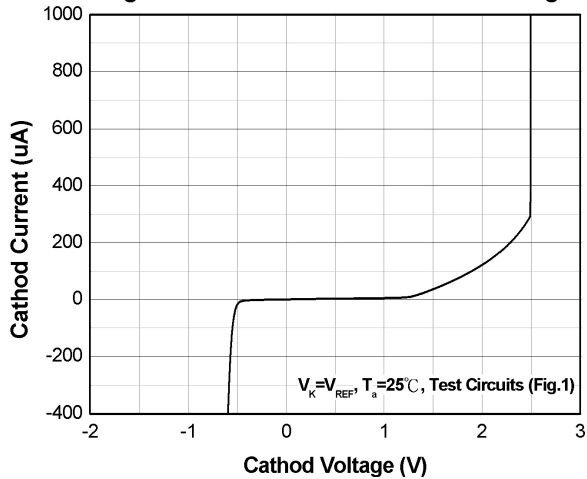


Figure 5. Small Signal Voltage Amplification vs. Frequency

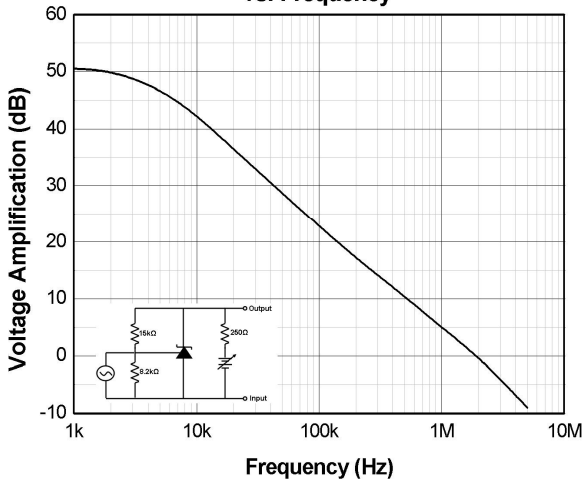


Figure 6. Leakage Current vs. Temperature

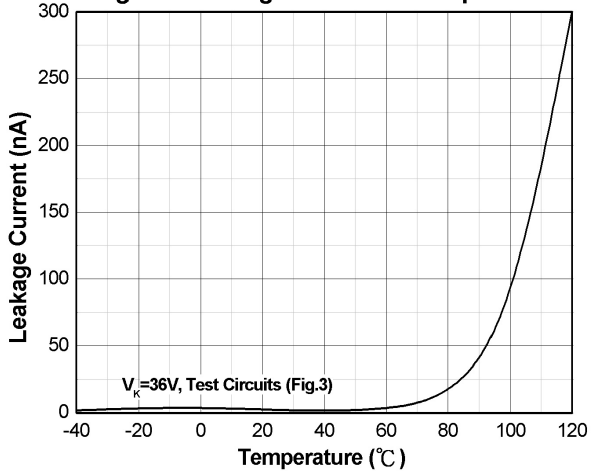


Figure 7. Leakage Current vs. Temperature

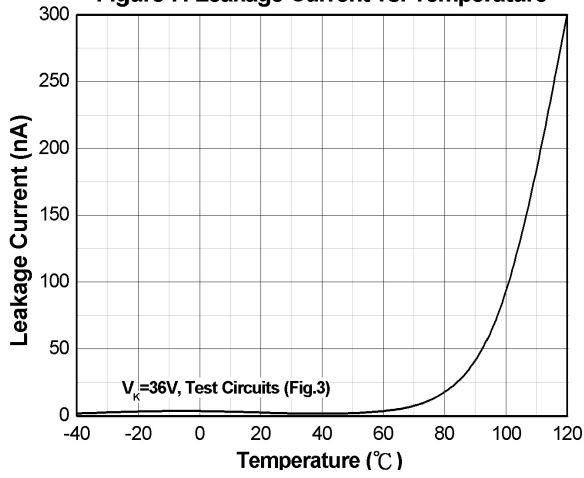
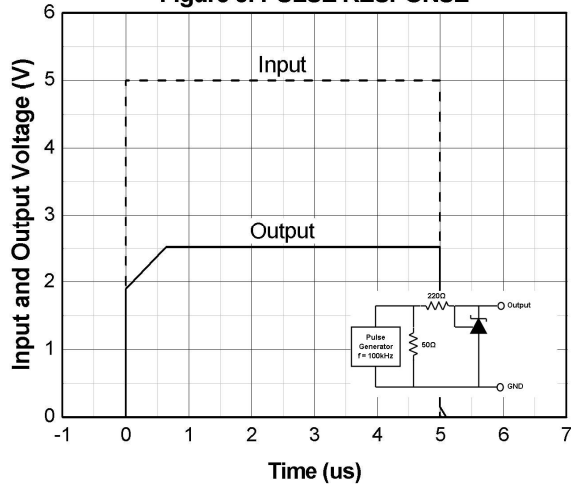
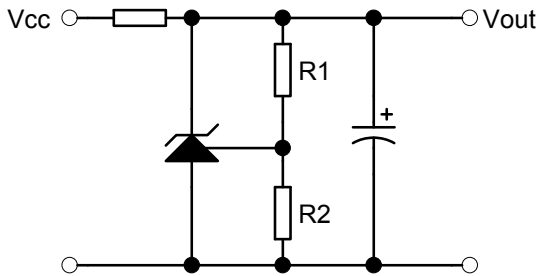


Figure 8. PULSE RESPONSE



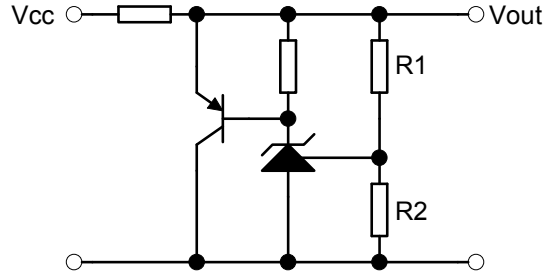
Typical Application

Fig 4. Shunt Regulator



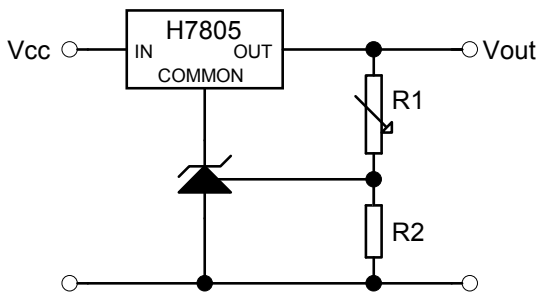
$$V_{out} = (1 + R_1/R_2)V_{REF}$$

Fig 5. High Current Shunt Regulator



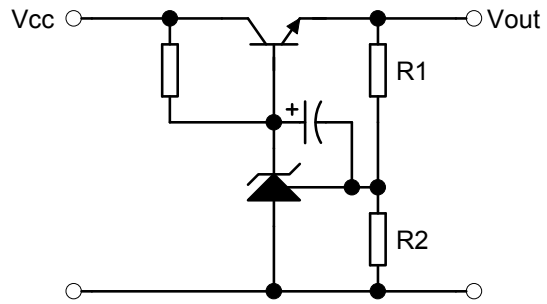
$$V_{out} = (1 + R_1/R_2)V_{REF}$$

Fig 6. Output Control of a Three-Terminal Fixed Regulator



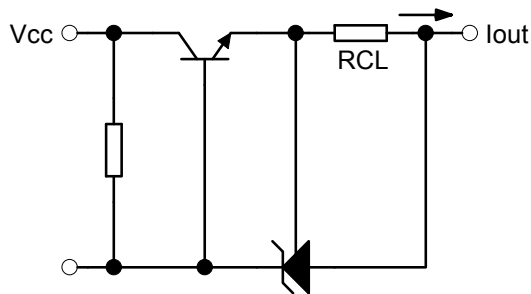
$$V_{out} = (1 + R_1/R_2)V_{REF}; V_{out(min)} = V_{REF} + 5V$$

Fig 7. Series Pass Regulator



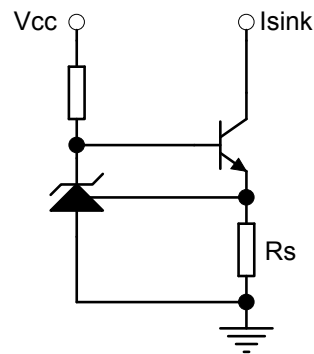
$$V_{out} = (1 + R_1/R_2)V_{REF}; V_{out(min)} = V_{REF} + V_{BE}$$

Fig 8. Current Limiter or Current Source



$$I_{out} = V_{REF}/R_{CL}$$

Fig 9. Constant Current Sink

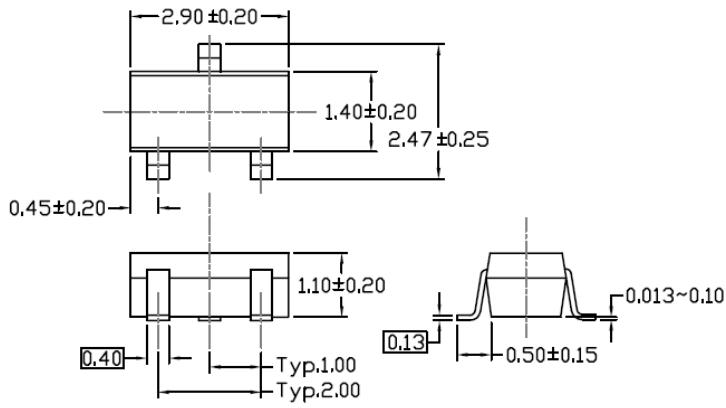


$$I_{sink} = V_{REF}/R_S$$

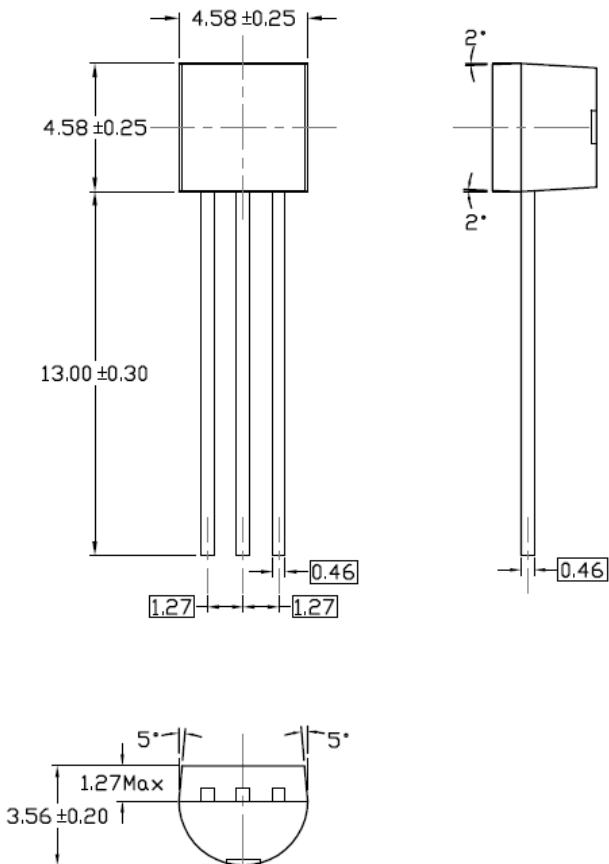
Package Drawings

(Dimensions in mm)

SOT-23

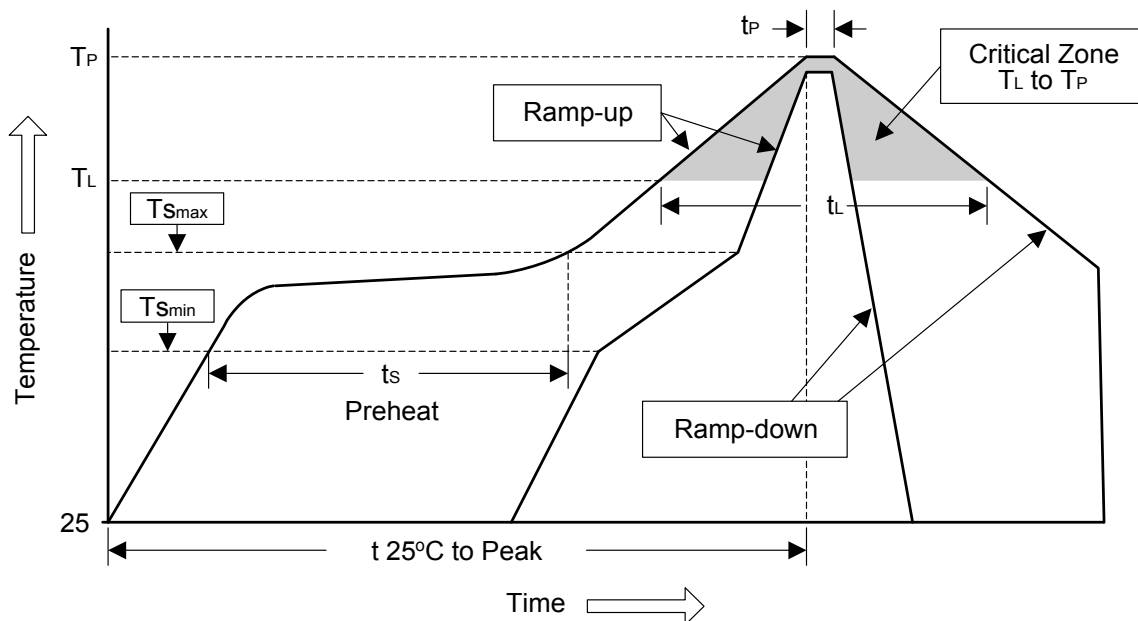


TO-92



Soldering Methods

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices



Average ramp-up rate (T_L to T_P)	<3°C/sec
Preheat	
- Temperature Min (T_{smin})	150°C
- Temperature Max (T_{smax})	200°C
- Time (min to max) (t_s)	60~180 sec
T_{smax} to T_L	
- Ramp-up Rate	<3°C/sec
Time maintained above:	
- Temperature (T_L)	217°C
- Time (t_L)	60~150 sec
Peak Temperature (T_P)	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_p)	20~40 sec
Ramp-down Rate	<6°C/sec
Time 25°C to Peak Temperature	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb-Free devices.	260°C ±5°C	10sec ±1sec



LIGHTING FOREVER

ADJUSTABLE SHUNT REGULATOR

EL431 series

DISCLAIMER

1. Above specification may be changed without notice. EVERLIGHT will reserve authority on material change for above specification.
2. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
3. These specification sheets include materials protected under copyright of EVERLIGHT. Reproduction in any form is prohibited without the specific consent of EVERLIGHT.