HV830

High-Voltage EL Lamp Driver IC

Features

- 2V to 9.5V Operating Supply Voltage
- DC to AC Conversion
- 200V Peak-to-Peak Typical Output Voltage
- Large Output Load Capability, typically 50 nF
- Permits the use of High-resistance Elastomeric Lamp Components
- Adjustable Output Lamp Frequency to Control Lamp Color, Lamp Life and Power Consumption
- Adjustable Converter Frequency to Eliminate Harmonics and Optimize Power Consumption
- Enable/Disable Function
- Low Current Draw under No-load Condition

Applications

- Handheld Personal Computers
- Electronic Personal Organizers
- GPS Units
- Pagers
- Cellular Phones
- Portable Instrumentation

General Description

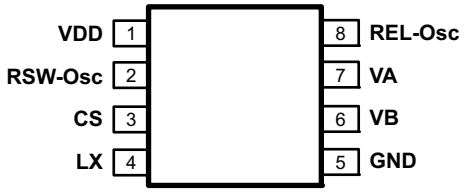
The HV830 is a high-voltage driver designed for driving EL lamps of up to 50 nF. EL lamps greater than 50 nF can be driven for applications not requiring high brightness. The input supply voltage range is from 2V to 9.5V. The device uses a single inductor and a minimum number of passive components. The nominal regulated output voltage that is applied to the EL lamp is ±100V. The chip can be enabled by connecting the resistors on the RSW-Osc and REL-Osc pins to the VDD pin. The chip can be disabled by connecting the resistors on RSW-Osc and REL-Osc to Ground.

The HV830 has two internal oscillators, a switching MOSFET, and a high-voltage EL lamp driver. The frequency of the switching converter MOSFET is set by an external resistor connected between the RSW-Osc and the VDD pins. The EL lamp driver frequency is set by an external resistor connected between the REL-Osc and the VDD pins. An external inductor is connected between the LX and VDD pins. A 0.01 µF to 0.1 µF capacitor is connected between the C_S pin and the GND. The EL lamp is connected between the VA and VB pins.

The switching MOSFET charges the external inductor and discharges it into the C_S capacitor. The voltage at C_S will start to increase. Once the voltage at C_S reaches a nominal value of 100V, the switching MOSFET is turned OFF to conserve power. The output pins, VA and VB, are configured as an H-bridge and are switched in opposite states to achieve 200V peak-to-peak across the EL lamp.

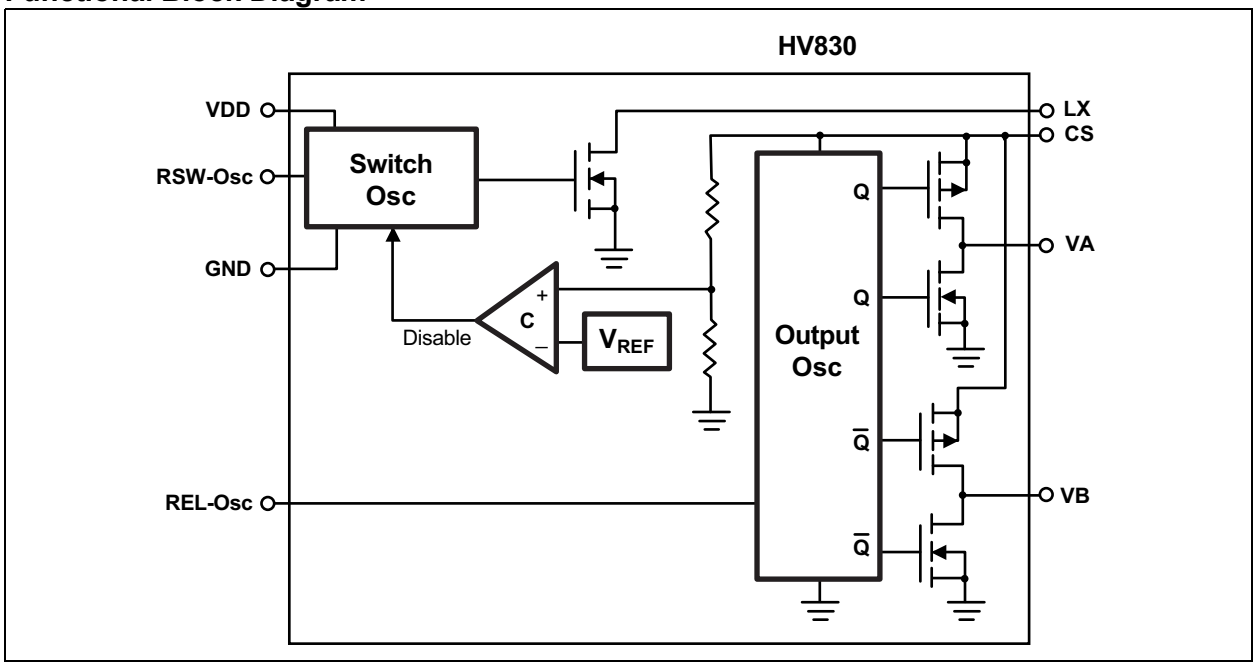
Package Type

8-lead SOIC
(Top view)



See Table 2-1 for pin information.

Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings(†)

Supply Voltage, V_{DD} ..... –0.5V to 10V
Output Voltage, V_{CS} ..... –0.5V to 120V
Operating Temperature, T_A ..... –25°C to +85°C
Storage Temperature, T_S ..... –65°C to +150°C
Power Dissipation:
8-lead SOIC ..... 400 mW

† **Notice:** Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	V_{DD}	2	—	9.5	V	
V_{A-B} Output Drive Frequency	f_{EL}	—	—	1.5	KHz	
Operating Temperature	T_A	–25	—	+85	°C	

DC ELECTRICAL CHARACTERISTICS

Electrical Specifications: V_{IN} = 3V, R_{SW} = 1 MΩ, R_{EL} = 3.3 MΩ, T_A = 25°C unless otherwise specified.

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
On Resistance of Switching Transistor	$R_{DS(ON)}$	—	2	4	Ω	I = 100 mA
Output Voltage V_{CS}, Regulation	V_{CS}	90	100	110	V	V_{DD} = 2V to 9.5V
Output Peak-to-Peak Voltage	V_A–V_B	180	200	220	V	V_{DD} = 2V to 9.5V
Quiescent V_{DD} Supply Current, Disabled	I_{DDQ}	—	30	—	nA	R_{SW-Osc} = Low
V_{DD} Supply Current	I_{DD}	—	100	150	µA	V_{DD} = 3V (See Figure 3-1.)
Input Current Including Inductor Current	I_{IN}	—	35	40	mA	
Output Voltage on V_{CS}	V_{CS}	—	95	—	V	
V_A–V_B Output Drive Frequency	f_{EL}	220	250	280	Hz	
Inductor Switching Frequency	f_{SW}	55	65	75	KHz	
Switching Transistor Duty Cycle	D	—	88	—	%	

TEMPERATURE SPECIFICATIONS

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
TEMPERATURE RANGE						
Operating Temperature	T_A	–25	—	+85	°C	
Storage Temperature	T_S	–65	—	+150	°C	
PACKAGE THERMAL RESISTANCE						
8-lead SOIC	θ_{JA}	—	101	—	°C/W	

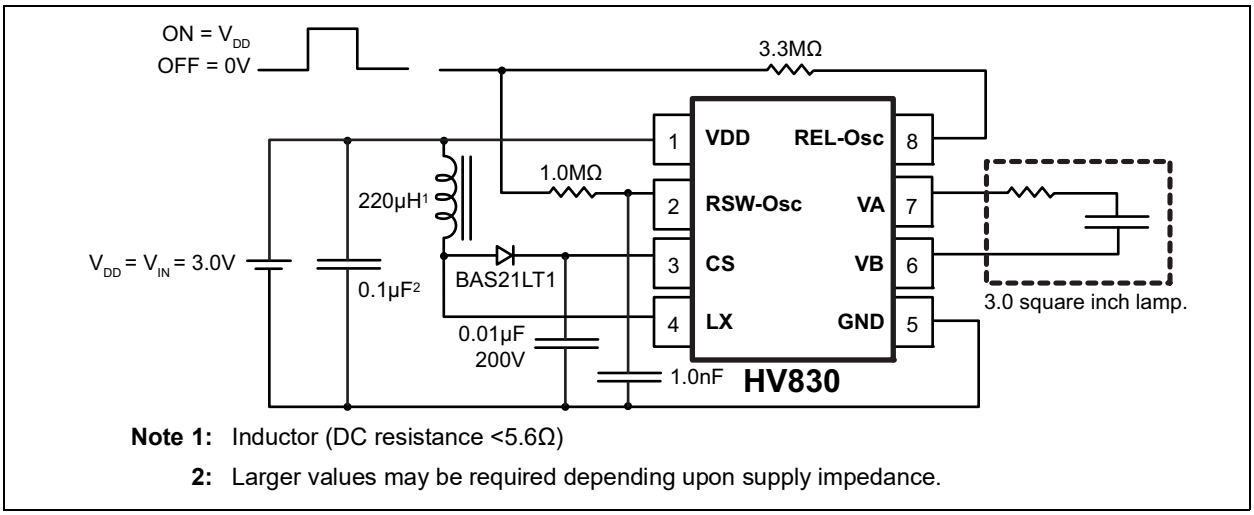
2.0 PIN DESCRIPTION

The details on the pins of HV830 are listed in Table 2-1.
See location of pins in **Functional Block Diagram**.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	VDD	VDD supply input pin of the IC
2	RSW-Osc	The switching frequency of the converter is controlled via an external resistor, R_{SW}, between the R_{SW-Osc} and V_{DD} pins of the device. The switching frequency increases as R_{SW} decreases. With a given inductor, as the switching frequency increases, the amount of current drawn from the battery will decrease and the output voltage V_{CS} will also decrease.
		A 1 nF capacitor is recommended between the R_{SW-Osc} pin and GND when a 0.01 µF C_S capacitor is used. This capacitor is used to shunt any switching noise that may couple into the R_{SW-Osc} pin. The C_{SW} capacitor may also be needed when driving large EL lamp due to an increase in switching noise. A C_{SW} larger than 1 nF is not recommended.
3	CS	A fast recovery diode (BAS21LT1 or equivalent) should be used here, and a 0.01 µF to 0.1 µF 200V capacitor to GND needs to be used to store the energy transferred from the inductor as indicated in the Typical Application Diagram in Figure 3-1.
4	LX	The inductor L_X is used to boost the low input voltage by inductive flyback. When the internal switch is on, the inductor is being charged. When the internal switch is off, the charge stored in the inductor will be transferred to the high-voltage capacitor C_S. The energy stored in the capacitor is connected to the internal H-bridge and therefore to the EL lamp. In general, smaller value inductors, which can handle more current, are more suitable to drive larger-sized lamps. As the inductor value decreases, the switching frequency of the inductor (controlled by R_{SW}) should be increased to avoid saturation. 220 µH inductors with 5.4Ω series DC resistance are typically recommended. For inductors with the same inductance value but with lower series DC resistance, a lower R_{SW} value is needed to prevent high current draw and inductor saturation.
5	GND	Ground pin
6,7	VA, VB	The EL lamp terminals are connected to the VA and VB pins. As the EL lamp size increases, more current will be drawn from the battery to maintain high voltage across the EL lamp. The input power, (V_{IN} x I_{IN}), will also increase. If the input power is greater than the power dissipation of the package (400 mW), an external resistor in series with one side of the lamp is recommended to help reduce the package power dissipation.
8	REL-Osc	The EL lamp frequency is controlled via an external R_{EL} resistor connected between R_{EL-Osc} and V_{DD} pins of the device. The lamp frequency increases as R_{EL} decreases. As the EL lamp frequency increases, the amount of current drawn from the battery will increase and the output voltage V_{CS} will decrease. The color of the EL lamp is dependent upon its frequency. A 3.3 MΩ resistor would provide a lamp frequency of 220 Hz to 280 Hz. Decreasing the R_{EL-Osc} by a factor of two will increase the lamp frequency by a factor of two.

3.0 APPLICATION INFORMATION



Note 1: Inductor (DC resistance <5.6Ω)

2: Larger values may be required depending upon supply impedance.

FIGURE 3-1: *Test Circuit, V_{IN} = 3V.*

3.1 Enable/Disable Configuration

The HV830 can be easily enabled and disabled by using a logic control signal on the R_{SW} and R_{EL} resistors as shown in Figure 3-2. The control signal can be from a microprocessor. R_{SW} and R_{EL} are typically very high values. Therefore, only tens of microamperes will be drawn from the logic signal when it is at a logic high (enable) state. When the microprocessor signal is high, the device is enabled, but when the signal is low, it is disabled.

TABLE 3-1: ENABLE/DISABLE

R_{SW} Resistor	HV830
V_{DD}	Enable
0V	Disable

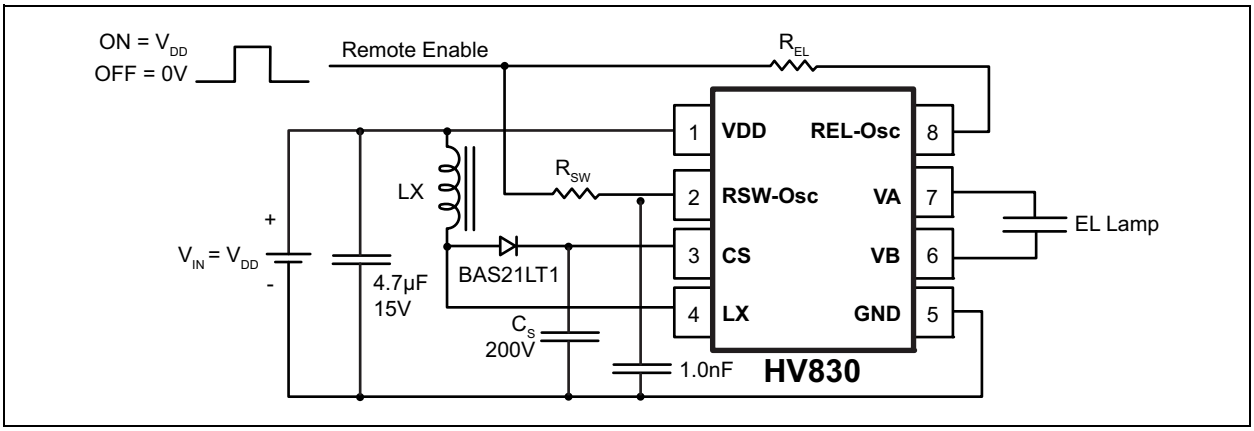
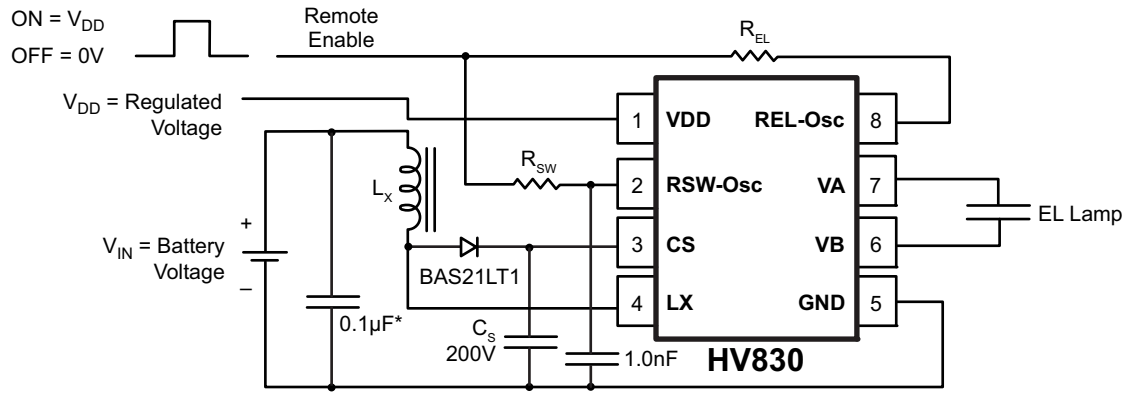


FIGURE 3-2: *Enable/Disable Configuration.*



Note 1: Larger values may be required depending upon supply impedance.

FIGURE 3-3: *Split Supply Configuration.*

3.2 Split Supply Configuration Using a Single Cell (1.5V) Battery

The HV830 can also be used for handheld devices operating from a single-cell 1.5V battery where a regulated voltage is available. This is shown in Figure 3-3. The regulated voltage can be used to run the internal logic of the HV830. The amount of current necessary to run the internal logic is typically 100 µA at a V_{DD} of 3V. Therefore, the regulated voltage could easily provide the current without being loaded down. The HV830 used in this configuration can also be enabled/disabled by applying a logic control signal on the R_{SW} and R_{EL} resistors as shown in Figure 3-2.

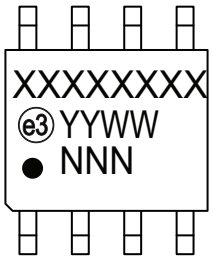
3.3 Split Supply Configuration for Battery Voltages of Higher than 9.5V

Figure 3-3 can also be used with high battery voltages, such as 12V, as long as the input voltage VDD of the HV830 is within the range of 2V to 9.5V.

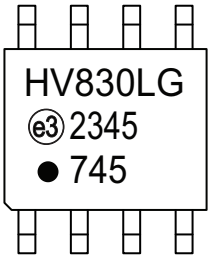
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

8-lead SOIC



Example

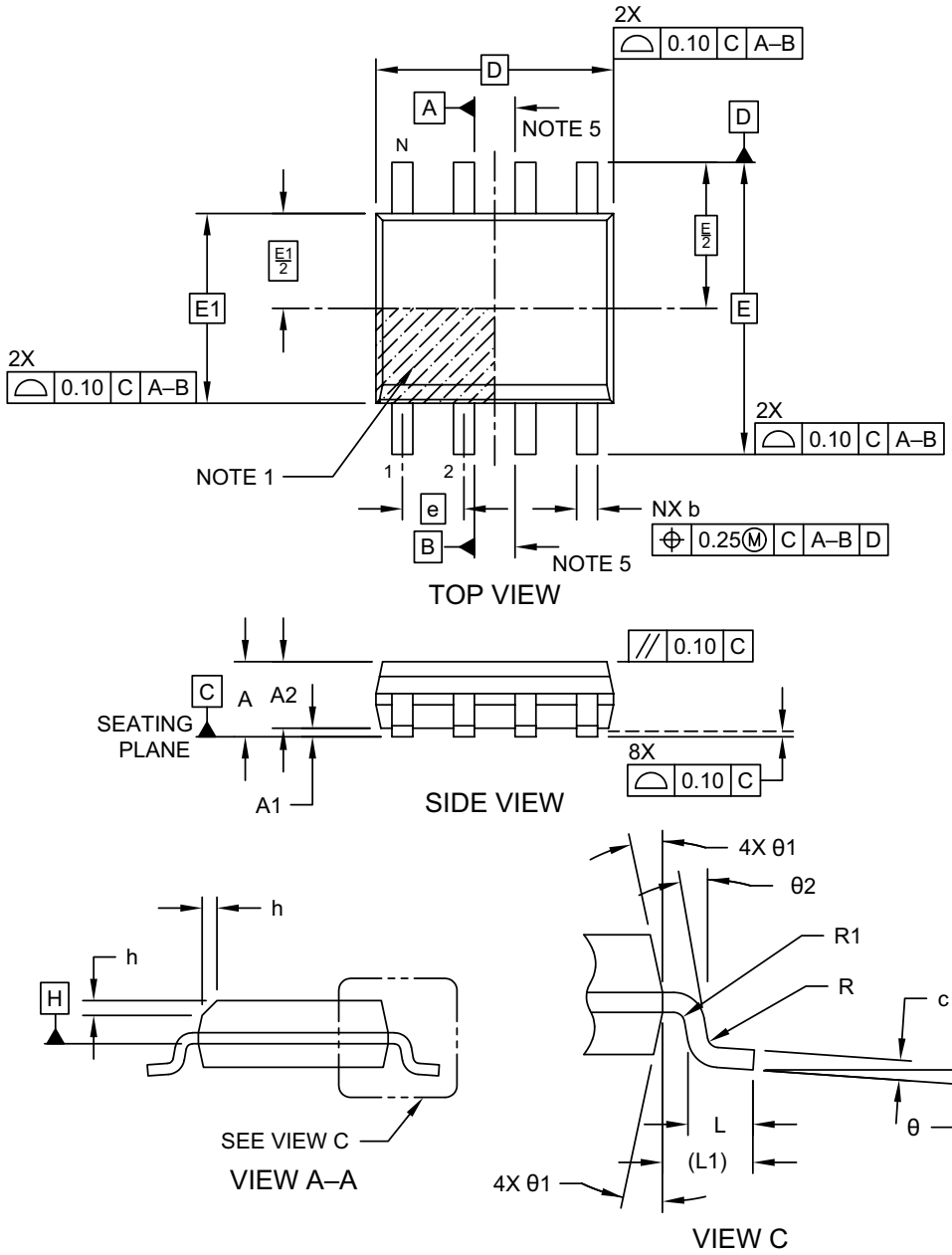


Legend:	XX...X	Product Code or Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for product code or customer-specific information. Package may or not include the corporate logo.

8-Lead Plastic Small Outline (C2X) - Narrow, 3.90 mm (.150 In.) Body [SOIC]
Atmel Legacy Global Package Code SWB

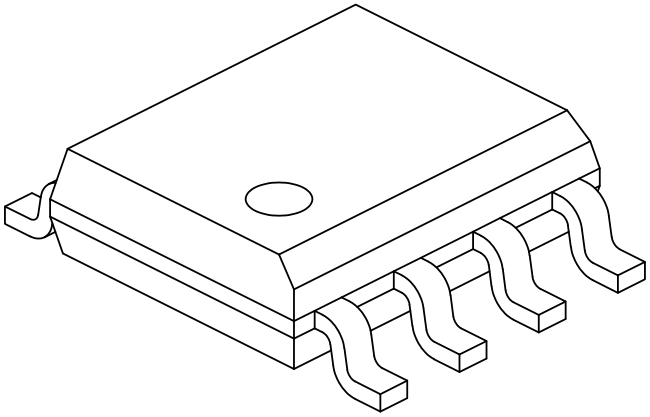
Note:	For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing No. C04-057-C2X Rev K Sheet 1 of 2

8-Lead Plastic Small Outline (C2X) - Narrow, 3.90 mm (.150 In.) Body [SOIC]
Atmel Legacy Global Package Code SWB

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		1.27 BSC	
Overall Height	A	–	–	1.75
Molded Package Thickness	A2	1.25	–	-
Standoff §	A1	0.10	–	0.25
Overall Width	E		6.00 BSC	
Molded Package Width	E1		3.90 BSC	
Overall Length	D		4.90 BSC	
Chamfer (Optional)	h	0.25	–	0.50
Foot Length	L	0.40	–	1.27
Footprint	L1		1.04 REF	
Lead Thickness	c	0.17	–	0.25
Lead Width	b	0.31	–	0.51
Lead Bend Radius	R	0.07	–	–
Lead Bend Radius	R1	0.07	–	–
Foot Angle	θ	0°	–	8°
Mold Draft Angle	θ1	5°	–	15°
Lead Angle	θ2	0°	–	–

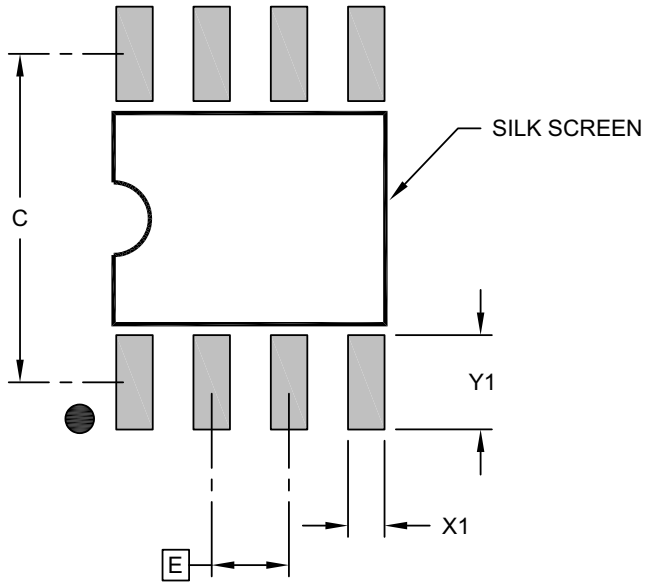
Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm per side.
4. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.
5. Datums A & B to be determined at Datum H.

Microchip Technology Drawing No. C04-057-C2X Rev K Sheet 2 of 2

8-Lead Plastic Small Outline (C2X) - Narrow, 3.90 mm (.150 In.) Body [SOIC]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	1.27 BSC		
Contact Pad Spacing	C		5.40	
Contact Pad Width (X8)	X1			0.60
Contact Pad Length (X8)	Y1			1.55

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-2057-C2X Rev K

APPENDIX A: REVISION HISTORY

Revision A (July 2023)

- Converted Supertex Doc# DSFP-HV830 to Microchip DS20005635A
- Changed the quantity of the LG package from 2500/Reel to 3300/Reel to align packaging specifications with the actual BQM
- Updated package outline drawings
- Made minor text changes throughout the document

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

PART NO.	XX	-	X	-	X
Device	Package Options		Environmental		Media Type

Device:	HV830	=	High-Voltage EL Lamp Driver IC
Packages:	LG	=	8-lead SOIC
Environmental:	G	=	Lead (Pb)-free/RoHS-compliant Package
Media Type:	(blank)	=	3300/Reel for an LG Package

Example:

a) HV830LG-G: High-Voltage EL Lamp Driver IC, 8-lead SOIC Package, 3300/Reel

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