HV825

High-Voltage EL Lamp Driver IC

Features

- Processed with HVCMOS® Technology
- 1.0 to 1.6V Operating Supply Voltage
- DC to AC Conversion
- Output Load of Typically up to 6.0 nF
- Adjustable Output Lamp Frequency
- Adjustable Converter Frequency
- Enable Function

Applications

- Pagers
- Portable Transceivers
- Cellular Phones
- Remote Control Units
- Calculators

General Description

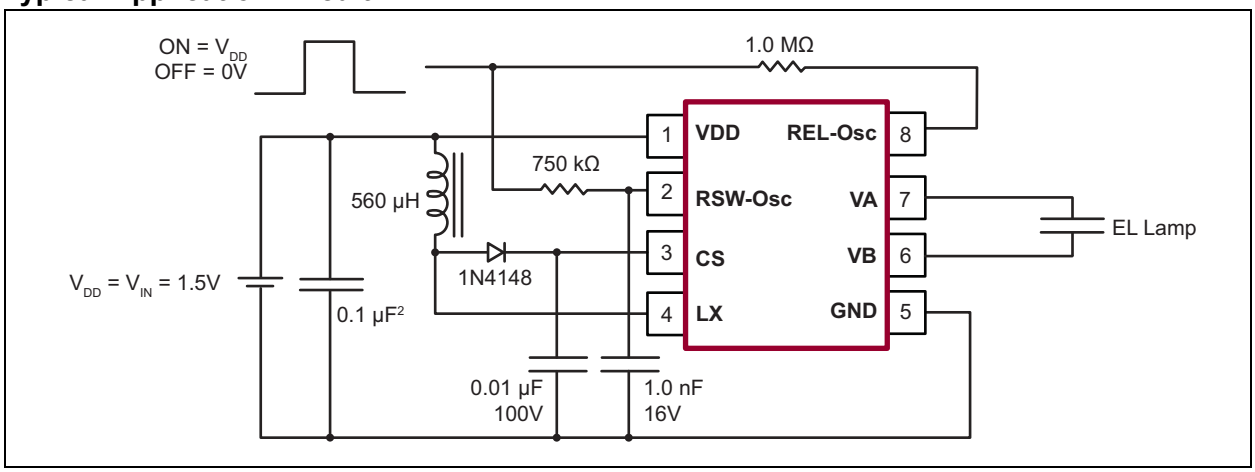
The HV825 is a high-voltage driver designed for driving EL lamps typically up to 6.0 nF. The input supply voltage range is from 1.0V to 1.6V. The device uses a single inductor and a minimum number of passive components. The typical output voltage that can be applied to the EL lamp is ±56V.

The HV825 can be enabled/disabled by connecting the R_{SW-Osc} resistor to V_{DD}/GND.

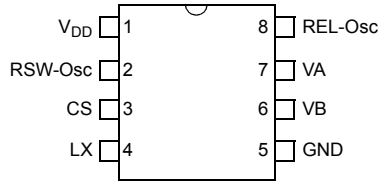
The HV825 has two internal oscillators to drive a switching bipolar junction transistor (BJT), and a high-voltage EL lamp driver. The frequency for the switching BJT is set by an external resistor connected between the R_{SW-Osc} pin and the V_{DD} supply pin. The EL lamp driver frequency is set by an external resistor connected between the R_{EL-Osc} pin and the V_{DD} pin. An external inductor is connected between the L_X and V_{DD} pins. A 0.01 to 0.1 µF, 100V capacitor is connected between the C_S pin and the GND pin. The EL lamp is connected between the V_A pin and the V_B pin.

The switching BJT charges the external inductor and discharges it into the 0.01 to 0.1 µF, 100V capacitor at the C_S pin. The voltage at the C_S pin will start to increase. The outputs V_A and V_B are configured as an H-bridge, and are switching in opposite states to achieve a peak-to-peak voltage of two times the V_{CS} voltage across the EL lamp.

Typical Application Circuit

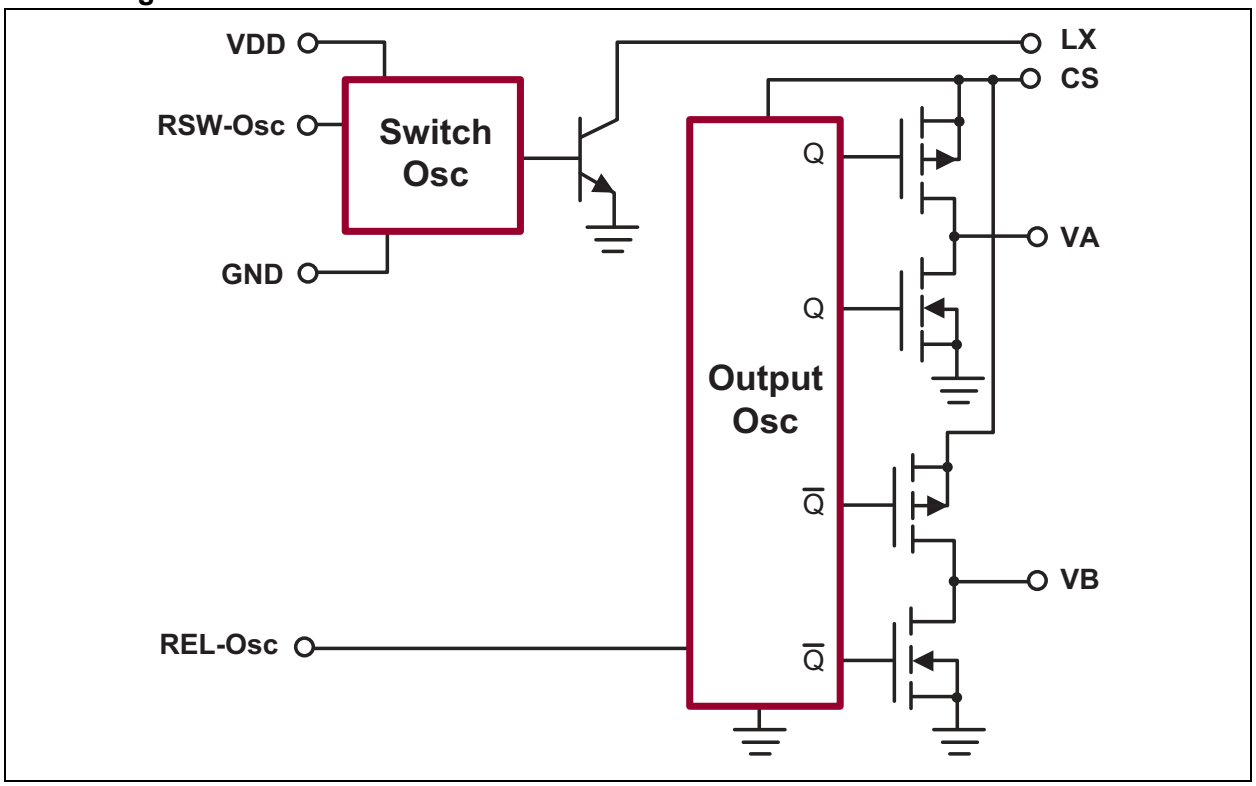


Package Types

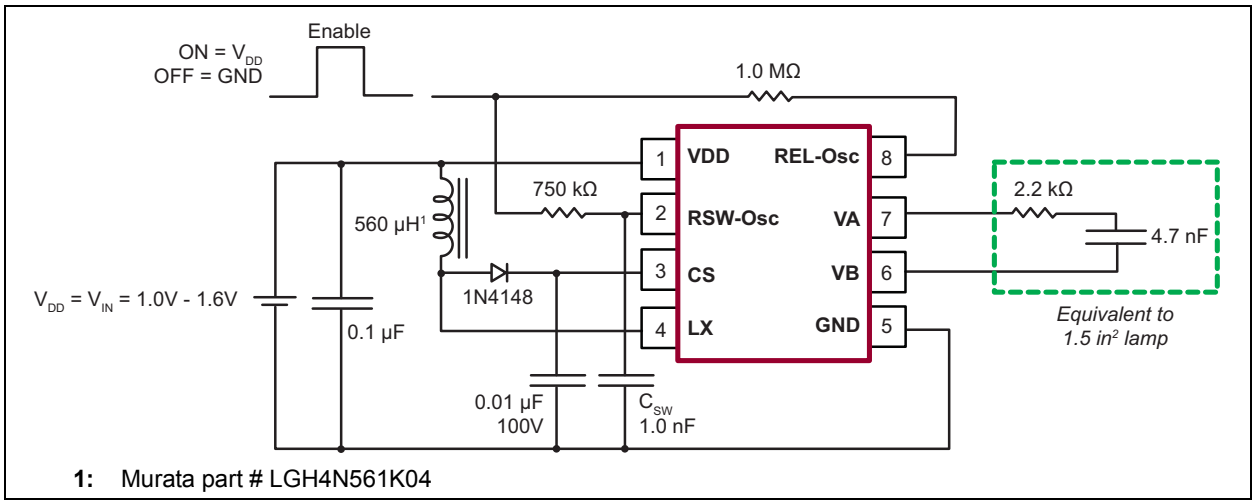


8-Lead SOIC / 8-Lead MSOP

Block Diagram



Test Circuit



1: Murata part # LGH4N561K04

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings(†)

V_{DD} pin ..... 0.5 to 2.5V

Package Power Dissipation (MSOP-8) ..... 300 mW

Package Power Dissipation (SO-8) ..... 400 mW

Operating Ambient Temperature Range ..... -25°C to +85°C

Storage Temperature Range ..... -65°C to +150°C

† 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 operation listings of this specification is not implied. Exposure above maximum rating conditions for extended periods may affect device reliability

DC CHARACTERISTICS

Electrical Specifications: Unless otherwise specified, all specifications apply at T_A = 25°C over recommended operating conditions.

Parameters	Sym.	Min.	Typ.	Max.	Unit	Conditions
On-resistance of switching transistor	R_{ON}	—	—	15	Ω	I = 50 mA
V_{DD} supply current (including inductor current)	I_{IN}	—	30	38	mA	V_{DD} = 1.5V. See test circuit.
Quiescent V_{DD} supply current	I_{DDQ}	—	—	1.0	µA	R_{SW-OSC} = GND
Output voltage on V_{CS}	V_{CS}	52	56	62	V	V_{DD} = 1.5V. See test circuit.
Differential output voltage across lamp	V_{A-B}	104	112	124	V	V_{DD} = 1.5V. See test circuit.
V_{A-B} output drive frequency	f_{EL}	400	—	—	Hz	V_{DD} = 1.5V. See test circuit.
Switching transistor frequency	f_{SW}	—	30	—	KHz	V_{DD} = 1.5V. See test circuit.
Switching transistor duty cycle	D	—	88	—	%	
Recommended Operating Conditions						
Supply voltage	V_{DD}	1.0	—	1.6	V	
Load capacitance	C_L	0	6	—	nF	
Operating temperature	T_A	-25	—	+85	°C	
Enable/Disable Table						
Low-level input voltage to R_{SW-OSC} resistor	V_{IL}	0	—	0.2	V	V_{DD} = 1.0–1.6V
High-level input voltage to R_{SW-OSC} resistor	V_{IH}	V_{DD}–0.5	—	V_{DD}	V	V_{DD} = 1.0–1.6V

Typical Thermal Resistance

Package	Θ_{ja}
8-Lead SOIC	101°C/W
8-Lead MSOP	216°C/W

2.0 APPLICATION INFORMATION

2.1 Typical Performance

Table 2-1 shows the performance of the typical application circuit.

TABLE 2-1: TYPICAL PERFORMANCE

Lamp Size	V_{IN}	I_{DD}	V_{CS}	f_{EL}	Brightness
1.5 in²	1.5V	30 mA	56V	450 Hz	3.65 ft-lm
Note: Results use Murata part # LQH4N561K04, max DC resistance = 14.5Ω					

2.2 Diode

A fast reverse recovery diode is used (1N4148 or equivalent).

2.3 C_S Capacitor

A 0.01 to 0.1 µF, 100V capacitor to GND is used to store the energy transferred from the inductor.

2.4 R_{EL-Osc} Resistor

The lamp frequency is controlled via the R_{EL-Osc} pin. The lamp frequency increases as R_{EL-Osc} decreases. As the lamp frequency increases, the amount of current drawn from the battery will increase and the output voltage V_{CS} will decrease. This is because the lamp will draw more current from V_{CS} when driven at higher frequencies.

In general, as the lamp size increases, a larger R_{EL-Osc} is recommended to provide higher V_{CS}. However, the color of the lamp is dependent upon its frequency and the shade of the color will change slightly with different frequencies.

2.5 R_{SW-Osc} Resistor

The switching frequency of the inductor is controlled via the R_{SW-Osc}. The switching frequency increases as the R_{SW-Osc} decreases. As the switching frequency increases, the amount of current drawn from the battery will decrease and the output voltage V_{CS} will also decrease.

2.6 L_X Inductor

The inductor L_X is used to boost the low input voltage. When the internal switch is on, the inductor is being charged. When the internal switch is off, the charge 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 lamp. In general, smaller value inductors, which can handle more current, are more suitable to drive larger lamps. As the inductor value decreases, the switching frequency of the inductor (controlled by R_{SW-Osc}) should be increased to avoid saturation.

The test circuit uses a Murata (LQH4N561) 560 µH inductor. Using different inductor values or inductors from different manufacturers will affect the performance.

As the inductor value decreases, smaller R_{SW-Osc} values should be used. This will prevent inductor saturation. An inductor with the same inductance value (560 µH) but lower series resistance will charge faster.

The R_{SW-Osc} resistor value needs to be decreased to prevent inductor saturation and high current consumption.

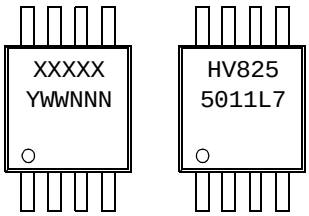
2.7 C_{SW} Capacitor

A 1 nF capacitor is recommended from the R_{SW-Osc} pin to GND. This capacitor is used to shunt any switching noise that may couple into the R_{SW-Osc} pin. A C_{SW} larger than 1 nF is not recommended.

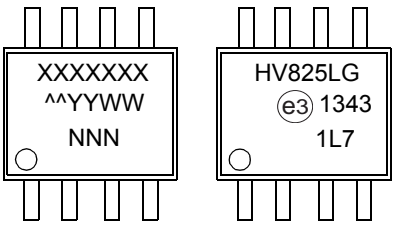
3.0 PACKAGING INFORMATION

3.1 Package Marking Information

8-Lead MSOP* Example:



8-Lead SOIC* Example:

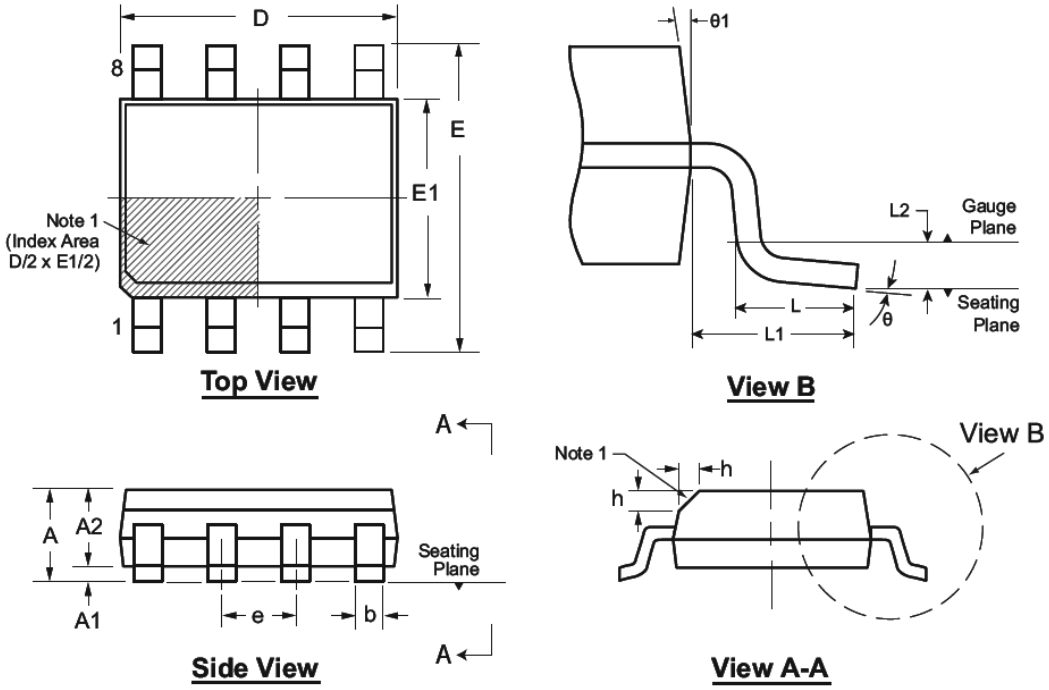


Legend:	XX...X	Product Code or Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package 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 SOIC (Narrow Body) Package Outline (LG/TG)

4.90x3.90mm body, 1.75mm height (max), 1.27mm pitch



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

Note:

1. *This chamfer feature is optional. A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.*

Symbol		A	A1	A2	b	D	E	E1	e	h	L	L1	L2	θ	θ1
Dimension (mm)	MIN	1.35*	0.10	1.25	0.31	4.80*	5.80*	3.80*	1.27 BSC	0.25	0.40	1.04 REF	0.25 BSC	0°	5°
	NOM	-	-	-	-	4.90	6.00	3.90		-	-			-	-
	MAX	1.75	0.25	1.65*	0.51	5.00*	6.20*	4.00*		0.50	1.27			8°	15°

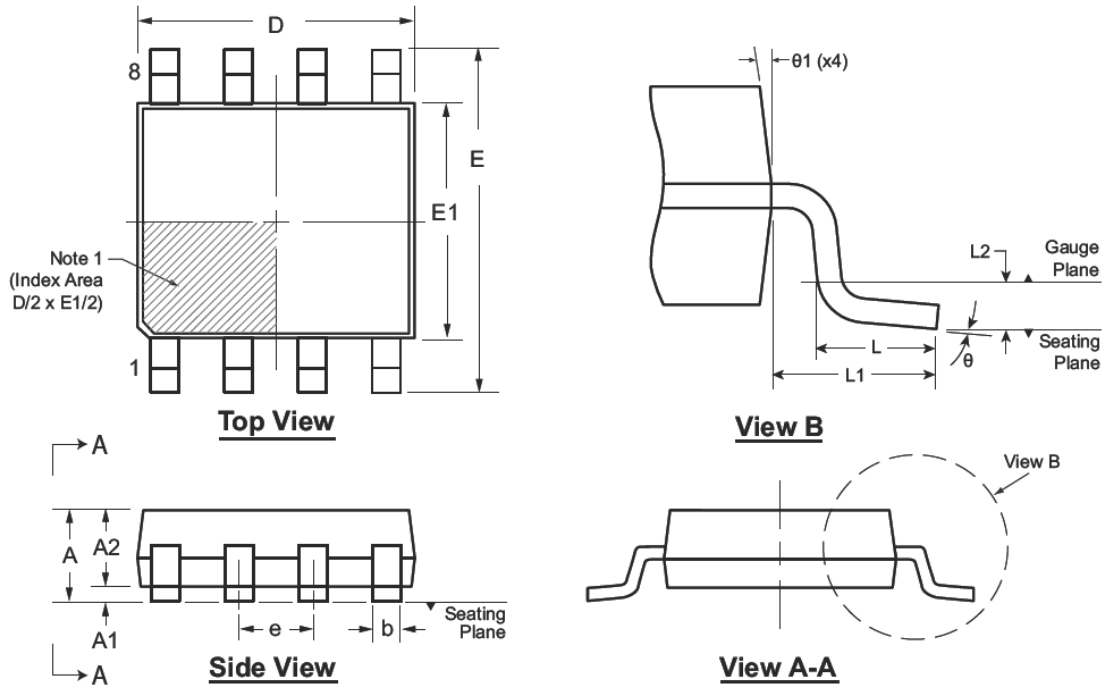
JEDEC Registration MS-012, Variation AA, Issue E, Sept. 2005.

** This dimension is not specified in the JEDEC drawing.*

Drawings are not to scale.

8-Lead MSOP Package Outline (MG)

3.00x3.00mm body, 1.10mm height (max), 0.65mm pitch



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

Note:

1. *A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.*

Symbol		A	A1	A2	b	D	E	E1	e	L	L1	L2	θ	θ1
Dimension (mm)	MIN	0.75*	0.00	0.75	0.22	2.80*	4.65*	2.80*	0.65 BSC	0.40	0.95 REF	0.25 BSC	0°	5°
	NOM	-	-	0.85	-	3.00	4.90	3.00		0.60			-	-
	MAX	1.10	0.15	0.95	0.38	3.20*	5.15*	3.20*		0.80			8°	15°

JEDEC Registration MO-187, Variation AA, Issue E, Dec. 2004.
** This dimension is not specified in the JEDEC drawing.*
Drawings are not to scale.

APPENDIX A: REVISION HISTORY

Revision A (November 2015)

- Initial release of this document in the Microchip format. This replaces version CO72913.

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

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

Device:	HV825	=	High Voltage EL Lamp Driver IC
Package:	LG MG	= =	8-lead SOIC 8-lead MSOP
Environmental:	G	=	Lead (Pb)-free/ROHS-compliant Package
Media Type:	(blank)	=	2500/Reel for LG and MG packages

Examples:

a) HV825LG-G: High Voltage EL Lamp Driver IC 8-lead SOIC package, 2500/reel

b) HV825MG-G: High Voltage EL Lamp Driver IC 8-lead MSOP package, 2500/reel

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