HV508

High-Voltage Liquid Crystal Shutter Driver

Features

- Logic-selectable Output Voltage
- 100 nF Drive Capability
- 90 V_{P-P} Maximum Output Voltage
- 25 µs Response Time

Applications

- Liquid Crystal Shutter

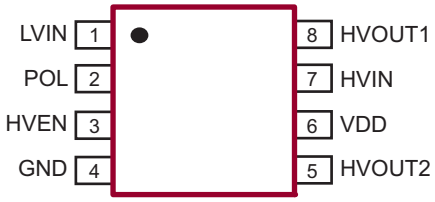
General Description

The HV508 is a 45V liquid crystal shutter driver in an 8-lead SOIC surface-mount package. It is composed of two outputs that provide square waves of opposite phases. The liquid crystal shutter is connected between the two outputs. Its equivalent load can be modeled as a minimum of 1 MΩ resistor in parallel with a maximum of 0.1 uF capacitor.

The HV508 has three input supply voltages—HV_{IN}, LV_{IN} and V_{DD}. The output amplitude is either LV_{IN} or HV_{IN}. A logic high on the HV_{EN} input sets the output to operate from the HV_{IN} supply. On the other hand, a logic low on the HV_{EN} input sets the output to operate from the LV_{IN} supply. The output frequency is determined by the logic input frequency applied to the POL input.

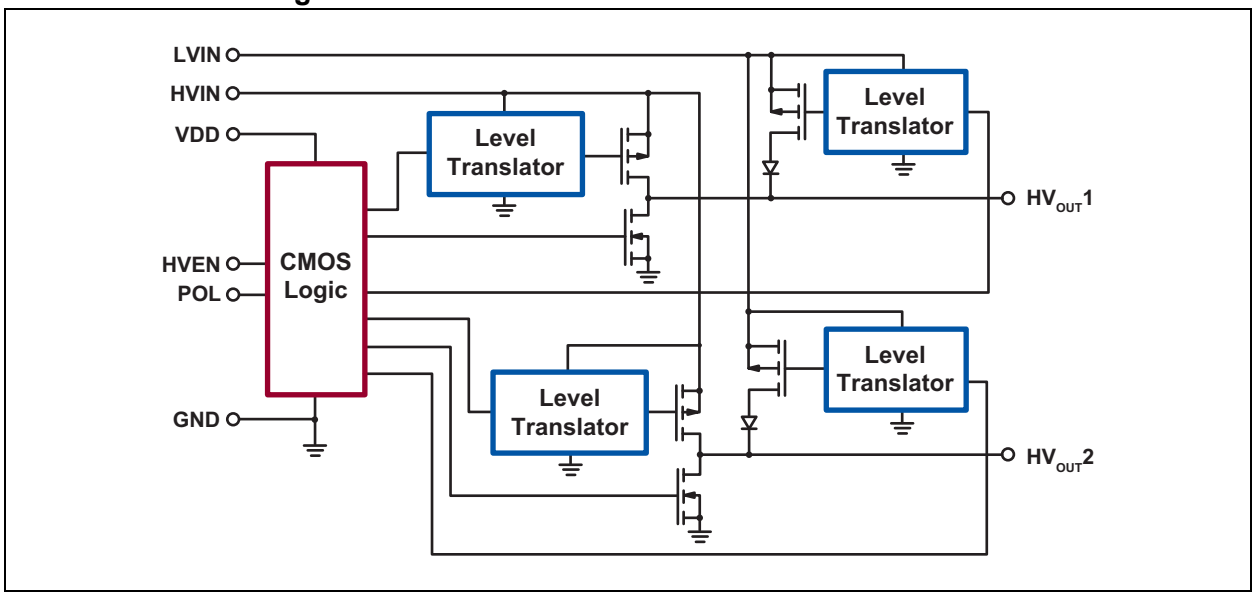
Package Type

8-lead SOIC
(Top view)

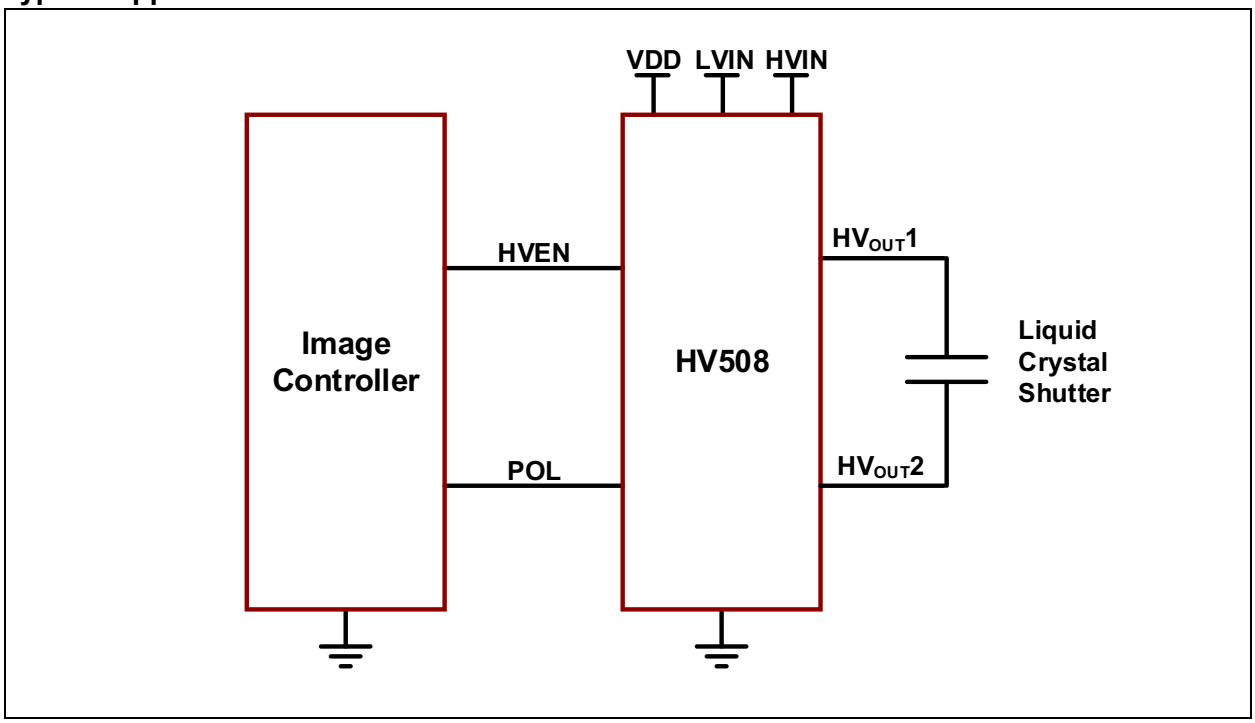


See Table 2-1 for pin information.

Functional Block Diagram



Typical Application Circuit



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

High-voltage Input, HV_{IN} ..... +60V
Low-voltage Input, LV_{IN} ..... +7.5V
Logic Supply voltage, V_{DD} ..... +12V
Operating Ambient Temperature, T_A ..... –5°C to +60°C
Storage Temperature, T_S ..... –65°C to +150°C
Power Dissipation (**Note 1**):
8-lead SOIC ..... 700 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.

Note 1: For operation above 25°C ambient, derate linearly at 6 mW/°C.

RECOMMENDED OPERATING CONDITIONS

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
Logic Supply Voltage	V_{DD}	5	—	10	V	
Low-output Supply Voltage	LV_{IN}	3	—	6	V	
High-output Supply Voltage	H_{VIN}	5	—	45	V	
Logic Input Voltage Low	V_{IL}	0	—	0.3 V_{DD}	V	
Logic Input Voltage High	V_{IH}	0.7 V_{DD}	—	V_{DD}	V	
Ambient Temperature	T_A	–5	—	+60	°C	

DC ELECTRICAL CHARACTERISTICS

Electrical Specifications: Over operating supply voltages; T_A = –5°C to +60°C unless otherwise indicated.

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
HV_{IN} Quiescent Current	I_{HVQ}	—	—	10	µA	
LV_{IN} Quiescent Current	I_{LVQ}	—	—	10	µA	
V_{DD} Quiescent Current	I_{DDQ}	—	—	10	µA	
HV_{IN} Operating Current	I_{HV}	—	—	2.8	mA	POL = 100 Hz, HV_{EN} = high, T_A = 25°C, Load = 1 MΩ in parallel with 0.1 µF between $HV_{OUT}1$ and $HV_{OUT}2$
LV_{IN} Operating Current	I_{LV}	—	—	380	µA	POL = 100 Hz, HV_{EN} = low, T_A = 25°C, Load = 1 MΩ in parallel with 0.1 µF between $HV_{OUT}1$ and $HV_{OUT}2$
Logic Input Current Low	I_{IL}	–5	—	—	µA	
Logic Input Current High	I_{IH}	—	—	5	µA	
Output Capacitive Load	C_{LOAD}	0	—	0.25	µF	C_{LOAD} in parallel with a 1 MΩ resistor (**Note 1**)

Note 1: The device can operate continuously in this range without damage. AC limits are not implemented.

AC ELECTRICAL CHARACTERISTICS

Electrical Specifications: HV_{IN} = 45V, LV_{IN} = 6V, V_{DD} = 5V, and T_A = –5°C to +60°C.						
Parameter	**Sym.**	**Min.**	**Typ.**	**Max.**	**Unit**	**Conditions**
POL Input Frequency	f_{POL}	0	—	100	Hz	
Turn-on Time when High-voltage is Enabled	$t_{HV(ON)}$	—	—	16	µs	Load = 1 MΩ in parallel with 0.1 µF between $HV_{OUT}1$ and $HV_{OUT}2$, HV_{EN} = high, outputs rise to HV_{IN} (See Fig.1 in **Timing Waveforms**.)
Turn-off Time when high-voltage is Enabled	$t_{HV(OFF)}$	—	—	16	µs	
Turn-on time when High-voltage is Disabled	$t_{LV(ON)}$	—	—	40	µs	Load = 1 MΩ in parallel with 0.1 µF between $HV_{OUT}1$ and $HV_{OUT}2$, HV_{EN} = low, outputs rise to HV_{IN} (See Fig.1 in **Timing Waveforms**.)
Turn-off time when High-voltage is Disabled	$t_{LV(OFF)}$	—	—	6	µs	
Turn-on time from HV_{EN} to HV_{OUT}	$t_{EN(ON)}$	—	—	25	µs	Load = 1 MΩ in parallel with 0.1 µF between $HV_{OUT}1$ and $HV_{OUT}2$ (See Fig.2 in **Timing Waveforms**.)

TEMPERATURE SPECIFICATIONS

Parameter	**Sym.**	**Min.**	**Typ.**	**Max.**	**Unit**	**Conditions**
TEMPERATURE RANGE						
Operating Ambient Temperature	T_A	–5	—	+60	°C	
Storage Temperature	T_S	–65	—	+150	°C	
PACKAGE THERMAL RESISTANCE						
8-lead SOIC	θ_{JA}	—	101	—	°C/W	

Timing Waveforms

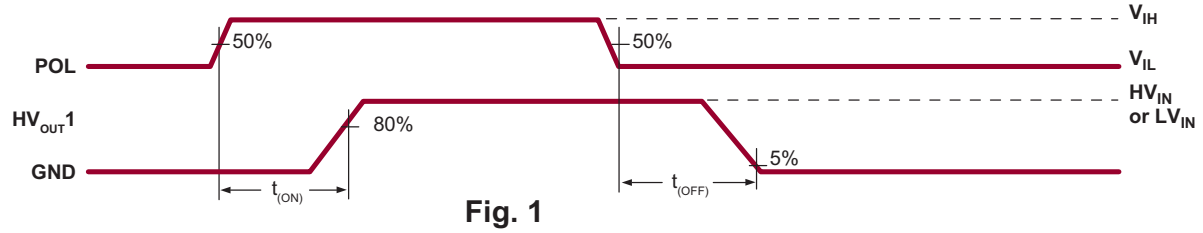


Fig. 1

Fig. 2

2.0 PIN DESCRIPTION

The details on the pins of HV508 are listed on Table 2-1. Refer to **Package Type** for the location of pins.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	LVIN	Low Voltage Supply
2	POL	Polarity
3	HVEN	High Voltage Enable
4	GND	Ground
5	HVOUT2	High Voltage Output Channel 2
6	VDD	Logic Voltage Supply
7	HVIN	High Voltage Supply
8	HVOUT1	High Voltage Output Channel 1

3.0 FUNCTIONAL DESCRIPTION

Follow the steps in Table 3-1 to power up and power down the HV508.

TABLE 3-1: POWER-UP AND POWER-DOWN SEQUENCE

Power-up		Power-down	
Step	**Description**	**Step**	**Description**
1	Connect ground.	1	Remove $LV_{IN.}$
2	Apply V_{DD}.	2	Remove H_{VIN}.
3	Connect logic Inputs.	2	Remove all logic inputs.
4	Connect $HV_{IN.}$	3	Remove V_{DD}.
5	Connect $LV_{IN.}$	4	Disconnect ground.

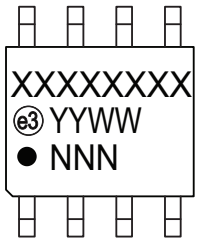
TABLE 3-2: TRUTH FUNCTION TABLE

HV_{EN}	POL	$HV_{OUT}1$	$HV_{OUT}2$
H	H	HV_{IN}	GND
H	L	GND	HV_{IN}
L	H	LV_{IN}	GND
L	L	GND	LV_{IN}

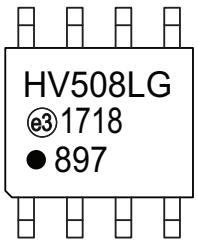
4.0 PACKAGE MARKING INFORMATION

4.1 Packaging Information

8-lead SOIC



Example

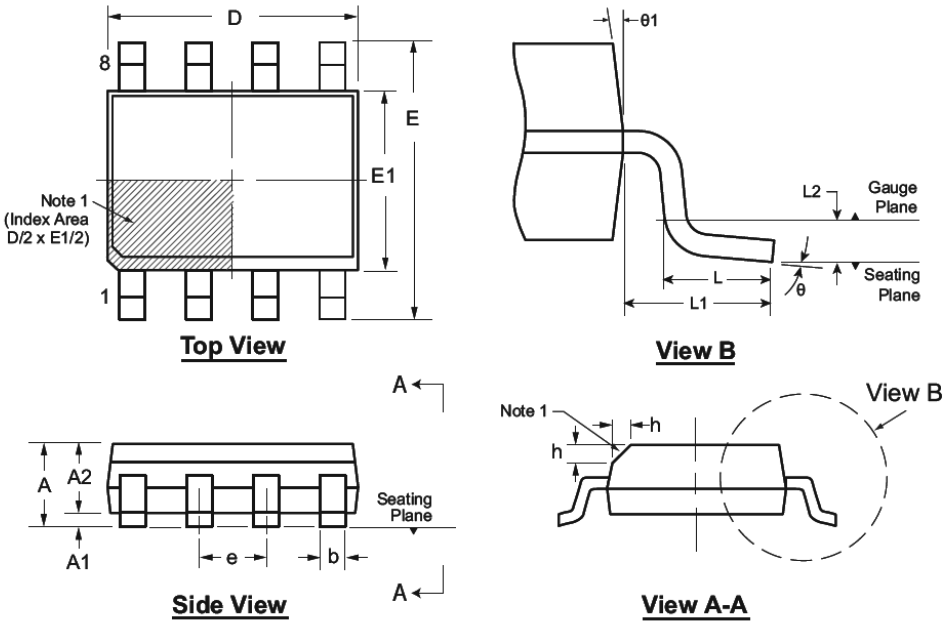


Legend:	XX...X	Product Code or Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package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

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (March 2017)

- Converted Supertex Doc# DSFP-HV508 to Microchip DS20005728A
- Removed “HVCMOS® Technology” throughout the data sheet
- Changed part marking format
- Changed the quantity of the 8-lead SOIC LG package from 2500/Reel to 3300/Reel
- 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:	HV508	=	High-Voltage Liquid Crystal Shutter Driver
Package:	LG	=	8-lead SOIC
Environmental:	G	=	Lead (Pb)-free/RoHS-compliant Package
Media Type:	(blank)	=	3300/Reel for an LG Package

Example:

a) HV508LG-G: High-Voltage Liquid Crystal Shutter Driver, 8-lead SOIC, 3300/Reel

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