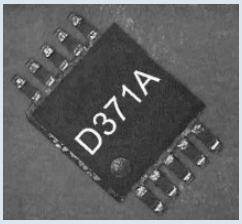
DUREL CORPORATION
AN AFFILIATE OF 3M AND ROGERS CORPORATION

Data Sheet D371A Electroluminescent Lamp Driver IC



MSOP-10

General Description:

The Durel® D371A Lamp Driver is part of a family of switch-mode IC drivers intended to reduce EL system cost, improve performance and to simplify the design, specification, and manufacture of EL backlighting systems. This driver is optimized for cellular phone and databank backlighting applications.

Features

- Flexible Wave shaping Capability
- High Efficiency
- Small Package Size
- Adjustable Output Frequency
- High AC Voltage Output
- External Clock Compatible

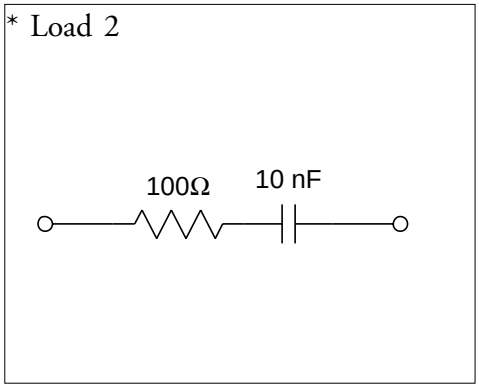
Applications

- Cellular / PHS Phones
- Data Banks
- LCD Backlighting

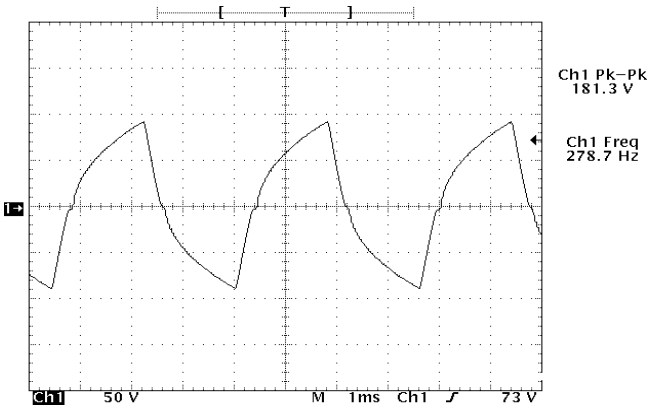
Lamp Driver Specifications:

(V+=3.0V, CLF=3.9nF, CHF=68pF, L=2.2mH/4Ω, E=V+, Renable=0Ω, DCH open, Load 2*, T_a=25°C, unless otherwise specified)

Parameter	*Symbol*	*Minimum*	*Typical*	*Maximum*	*Unit*	*Conditions*
Supply Current	I		15	18	mA	
Standby Current			5	1000	nA	E = GND
Enable Current			15		µA	E = 3.0V
Enable Voltage						
On	E	2.6			V	
Off				0.4	V	
Inductor Frequency	HF		23		kHz	CHF=68pF
Lamp Frequency	LF	190	260	330	Hz	CLF=3.9nF
Output Voltage	VOUT	160	188	215	Vpp	



Typical Waveform



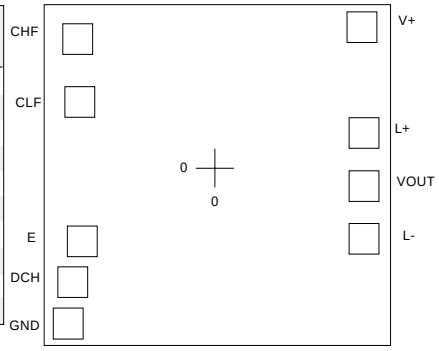
Absolute Maximum Ratings:

Parameter	*Symbol*	*Minimum*	*Maximum*	*Unit*	*Comments*
Supply voltage				V	
Operating range	V+	2.0	6.5		
Withstand range		-0.5	9.0		
Output Voltage	Vout		220	Vpp	Peak to peak voltage
Enable voltage	E	-0.5	(V+) +0.5	V	
Operating temperature	T_a	-40	85	℃	
Storage temperature	T_s	-65	150	℃	
Solder temperature		245	300	℃	5 second soak
CHF (Pin 1) Voltage	V_{CHF}	GND	(V+)+0.3V	V	
CLF (Pin 2) Voltage	V_{CLF}	GND	(V+)+0.3V	V	

Note: The absolute maximum ratings are stress ratings only. Functional operation of the device at these ratings or any other conditions above those indicated in the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect life of lamp or driver.

Physical Data:

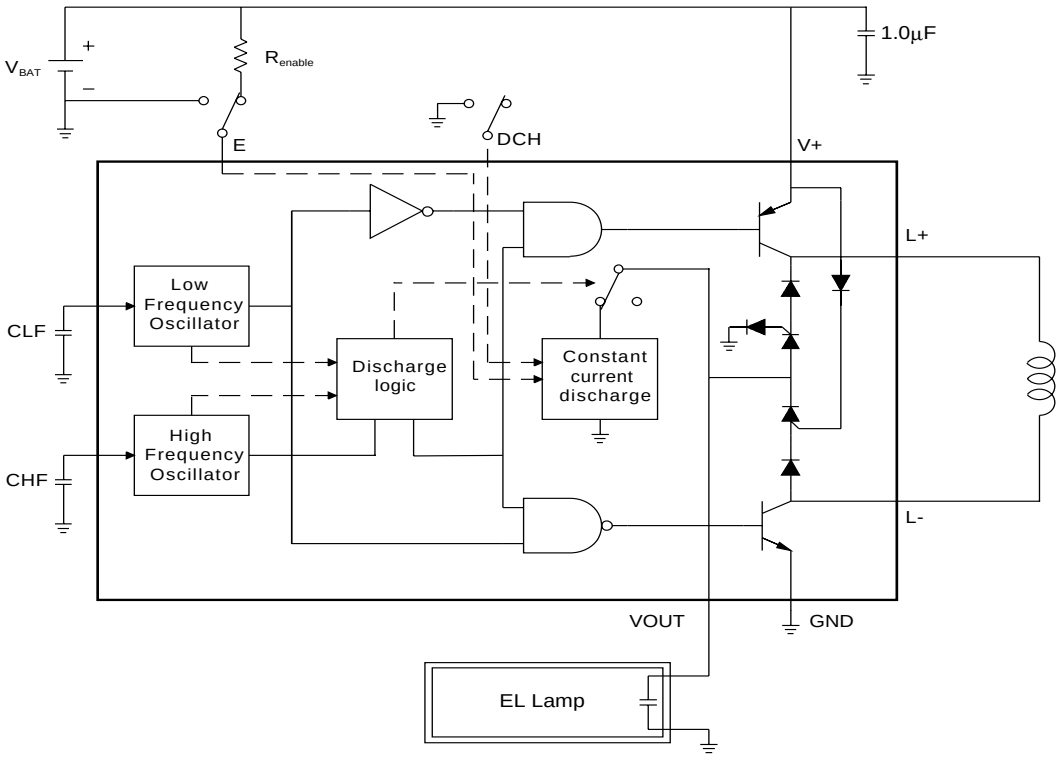
Pad Center Locations			*MSOP*	*Function*
Name	*Xμm*	*Yμm*	*Pin-outs*	
CHF	-427	728	1	Capacitor input to high frequency oscillator
CLF	-427	463	2	Capacitor input to low frequency oscillator
E	-426	-413	3	System Enable
DCH	-445	-583	4	Wave shaping input
GND	-459	-776	5	Power ground
N/C			6	Not connected
L-	467	-345	7	Negative power connection to inductor
V-out	473	-78	8	Output voltage to EL lamp
L+	473	190	9	Positive power connection to inductor
V+	475	786	10	System power input



Notes:

1. Dimensions are in microns, unless otherwise noted.
2. Bond pads are typically 100 x 100.
3. Die thickness is 330 +/- 25 (13 +/- 1 mil).
4. Pad center coordinates are relative to origin on center of die.
5. Die size is 1170 x 1760.
6. Base of die should be grounded.

Block Diagram of the Inverter Circuitry:

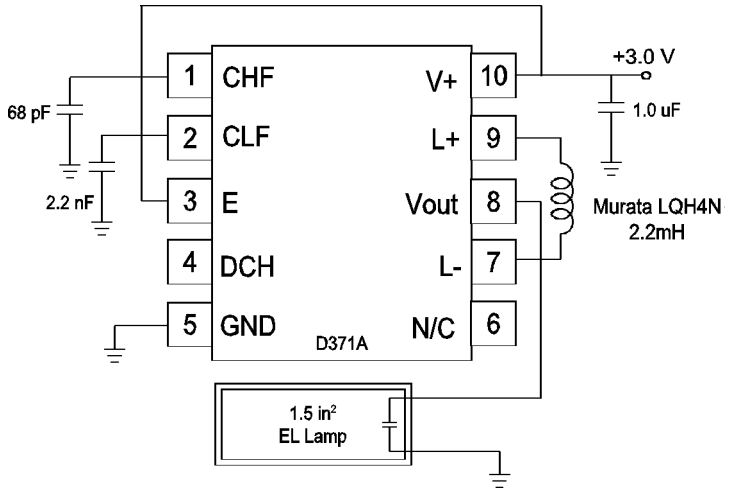


Typical D371A EL Driver Configuration:

3.0V Cellular LCD

Typical Output

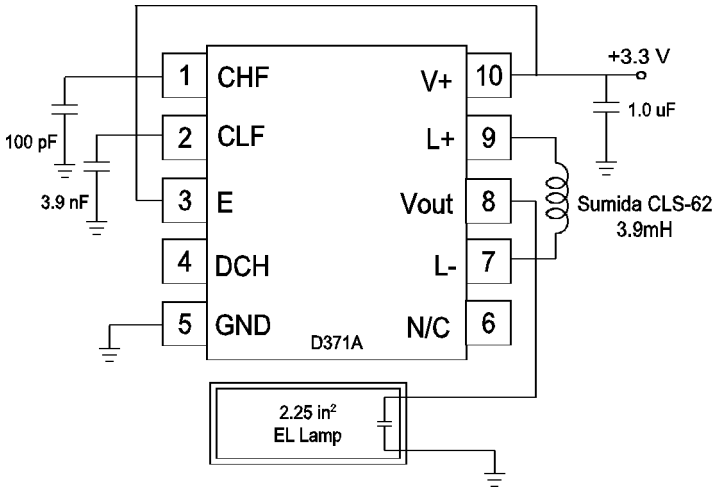
Brightness = 6.75 fL (23.1 Cd/m^2)
Lamp Frequency = 460 Hz
Supply Current = 16mA
Vpp = 190
Load = 1.5in^2



3.3 V Cellular Display and Keypad

Typical Output

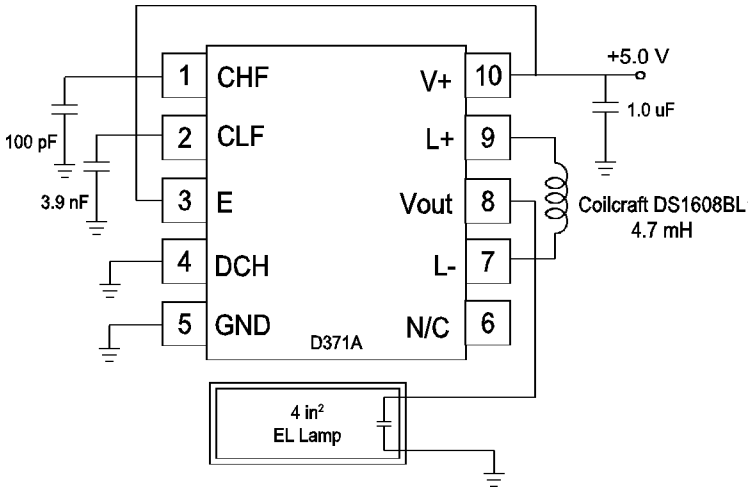
Brightness = 4.45 fL (15.2 Cd/m^2)
Lamp Frequency = 275 Hz
Supply Current = 12mA
Vpp = 185
Load = 2.25in^2



5.0 V PDA

Typical Output

Brightness = 5.5fL (18.8 Cd/m^2)
Lamp Frequency = 285 Hz
Supply Current = 15mA
Vpp = 200
Load = 4in^2



DESIGNING WITH D371

The Durel® D371A Lamp Driver is part of a family of switch-mode IC drivers intended to reduce EL system cost, improve performance and to simplify the design, specification, and manufacture of EL backlighting systems. This driver is optimized for cellular phone and databank backlighting applications.

A typical D371 circuit is represented in Figure 1. This application guideline is furnished to help you optimize your EL driver circuit design. It provides typical system outputs, such as lamp luminance and supply current draw, for various circuit configurations. Durel also provides a Designer's Kit, which includes a printed circuit board to aid you in developing an EL lamp driver configuration that meets your requirements.

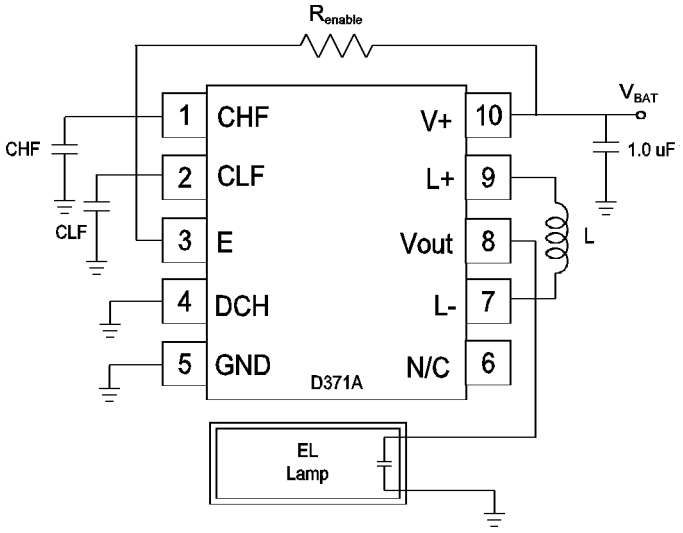


Figure 1: Typical D371 Circuit Design

I. Lamp Frequency

Selecting the appropriate value of capacitor (CLF) for the low frequency oscillator will set the output frequency of the D371 inverter. Figure 2 graphically represents the effect of the CLF capacitor value on the oscillator frequency at V+ = 3.0V.

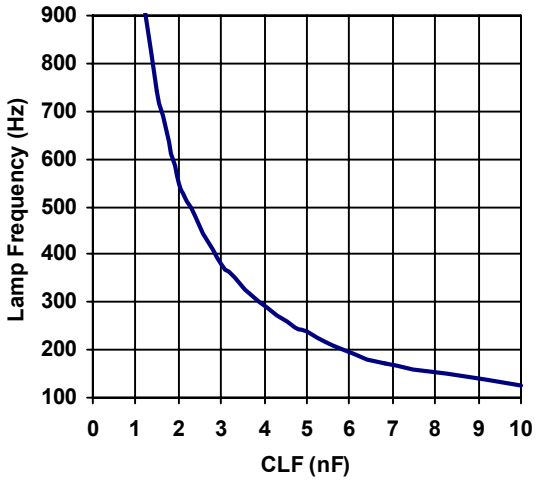


Figure 2: Typical Lamp frequency vs. CLF capacitor

The lamp frequency may also be controlled with an external clock signal. The resulting lamp frequency will be half of the clock signal frequency. The output voltage (pin 8) will increase in magnitude during the low portion of the clock signal and linearly decrease during the high portion of the clock signal.

Lamp frequencies of 200-500Hz are typically used. The lamp frequency should always be set so that the output voltage does not exceed 200Vpp.

II. Inductor Switching Frequency

Selecting the appropriate value of capacitor (CHF) for the high frequency oscillator will set the inductor switching frequency of the D371 inverter. Figure 2 graphically represents the effect of the CHF capacitor value on the oscillator frequency at V+ = 3.0V.

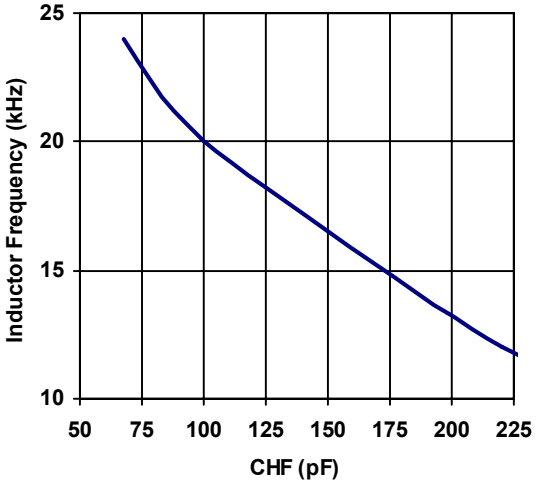


Figure 3: Typical inductor frequency vs. CHF capacitor

The inductor switching frequency may also be controlled with an external clock signal. The inductor will charge during the low portion of the clock signal and discharge into the EL lamp during the high portion of the clock signal.

III. Inductor Selection

The inductor value and inductor switching frequency have the greatest impact on the output brightness and current consumption of the driver. Figures 4 and 5 show typical brightness and current draw of a D371 circuit with several different inductor and CHF values. The CLF value was modified in each case such that the output voltage was approximately 190Vpp. Please note that the DC resistance (DCR) and current rating of inductors with the same inductance value may vary with manufacturer and inductor type. Thus, inductors made by a different manufacturer may yield different outputs, but the trend of the different curves should be similar.

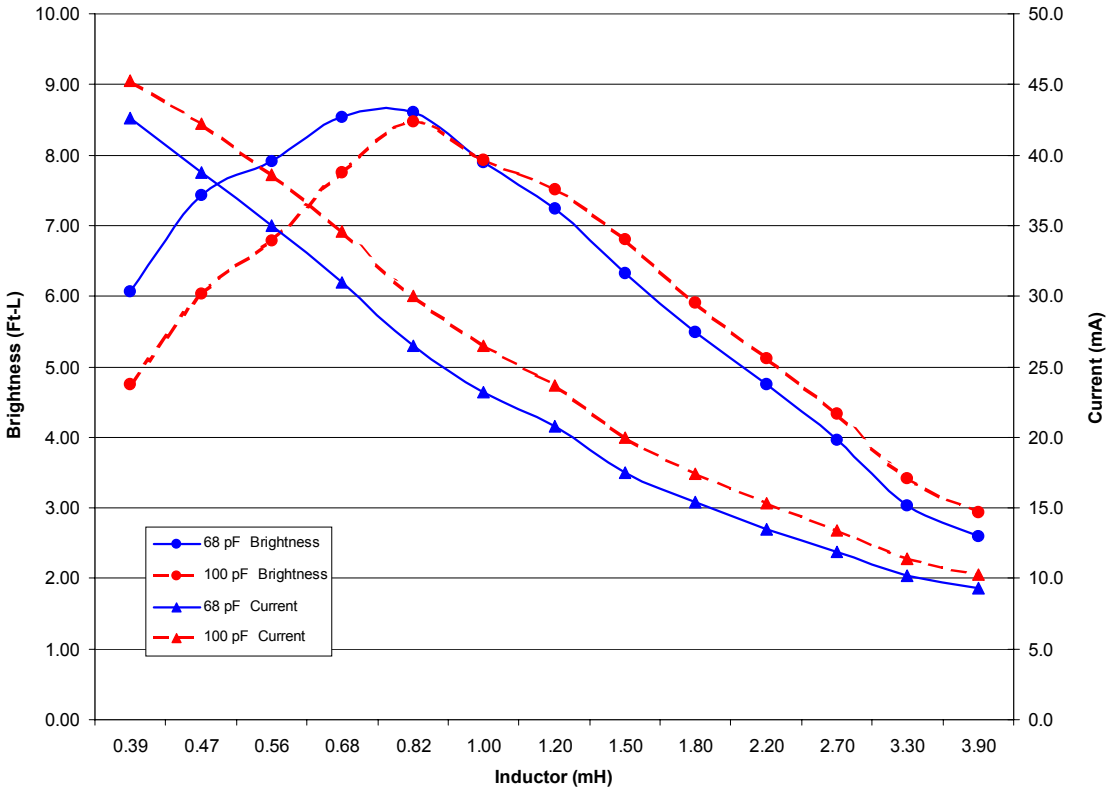


Figure 4: Brightness and current vs. inductor and CHF value.
Conditions: V+=3.0V, Lamp=2.0in^2

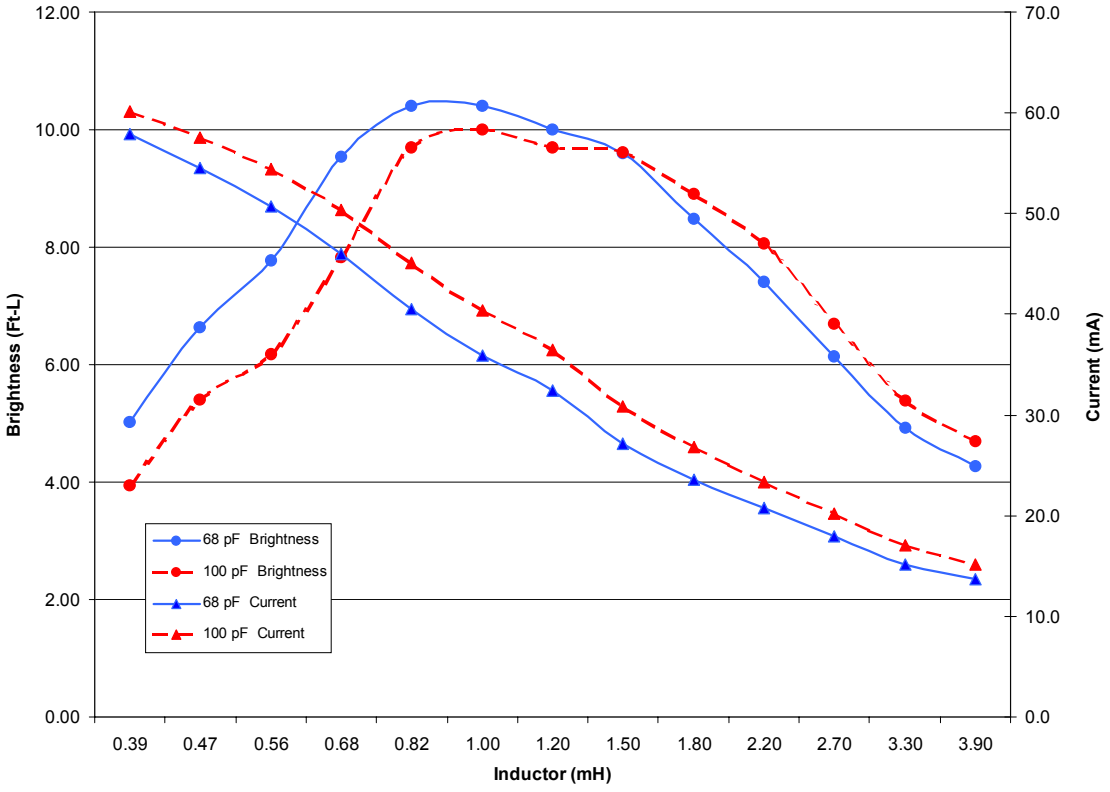


Figure 5: Brightness and current vs. inductor and CHF value.
Conditions: V+=5.0V, Lamp=4.0in^2

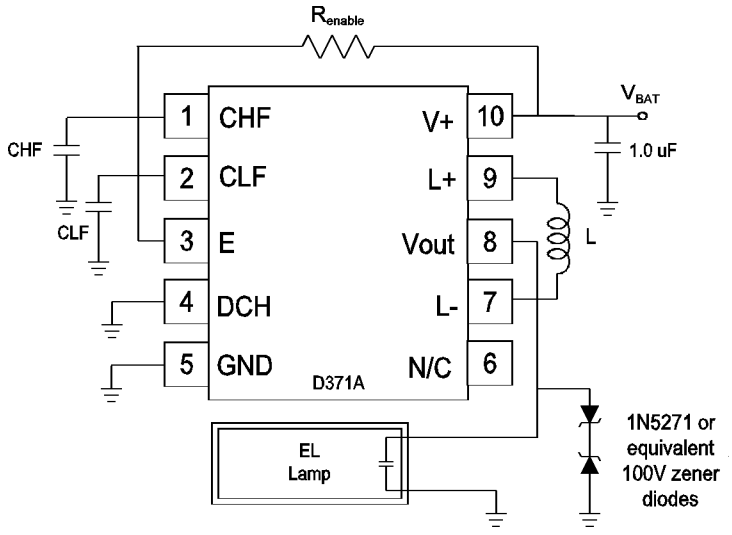
IV. Wave-Shaping

The D371 inverter uses a patented wave-shaping technique for reducing audible noise from an EL lamp. The linear discharge of the output waveform may be adjusted by selecting one of 4 lamp discharge levels. The optimal discharge level for an application depends on the lamp size, lamp brightness, etc. To ensure that the D371 is configured optimally, each level should be evaluated. In many cases, the lower discharge levels result in lower audible noise from the EL lamp.

Discharge level	Renable	DCH pin	Typical Lamp Size
1 (slowest)	80kΩ	Open	0.5-1.5 in^2
2	0Ω	Open	1.0-2.5 in^2
3	80kΩ	GND	1.5-3.5 in^2
4 (fastest)	0Ω	GND	>3.5 in^2

V. Output Voltage

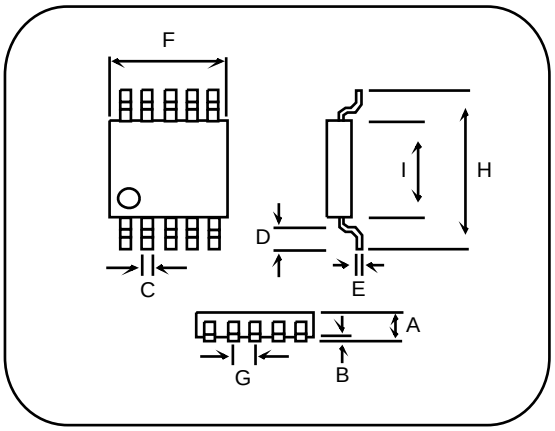
The inductor and CLF capacitor should be set such that the output voltage of the D371A inverter does not exceed 200Vpp. In some cases, a pair of zener diodes connected to the output (as shown below) is recommended to prevent over-voltage on pin 8. Durel can provide assistance in optimizing circuit components for your application.



Ordering Information:

The D371A inverter is available as bare die in probed wafer form or in die trays, and in a standard MSOP-10 plastic package per tube or per tape and reel. A Durel D371A Designer's Kit is available for evaluating and identifying the optimum component values for your application.

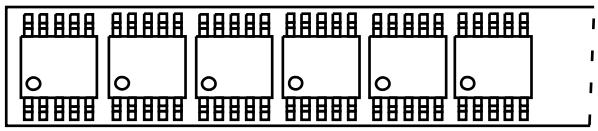
	MSOP-10					
	Min.		Typical		Max.	
Description	mm.	in.	mm.	in.	mm.	in.
A	0.92	0.036	1.00	0.039	1.08	0.043
B	0.05	0.002	0.10	0.004	0.15	0.006
C	0.15	0.006	0.23	0.009	0.31	0.012
D	0.40	0.016	0.55	0.022	0.70	0.028
E	0.13	0.005	0.18	0.007	0.23	0.009
F	2.90	0.114	3.00	0.118	3.10	0.122
G	0.35	0.014	0.50	0.020	0.65	0.026
H	4.75	0.187	4.90	0.193	5.05	0.199
J	2.90	0.114	3.00	0.118	3.10	0.122



MSOPs are marked with direct logo part number (371A) and wafer lot number. Marking orientation is bottom closest to pin 1 side.

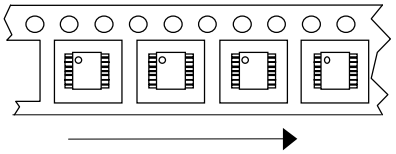
MSOPs in Tubes: 1DDD371AA-M03

Tube-length = 320 mm (12.6 in). 100 units per tube.

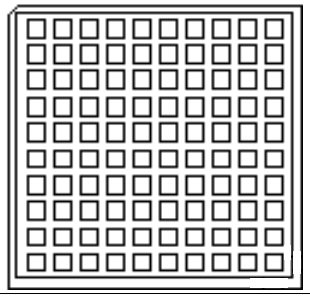


MSOPs in Tape & Reel: 1DDD371AA-M04

Embossed tape on 360 mm diameter reel per EIA-481-2. 2500 units per reel. Quantity marked on reel label.



Die in Trays: 1DDD371AA-B02



- Die tray size is 2 inches square
- Total number of pockets is 100
- Pocket depth is 890µm (0.035")
- Pocket area is 2030µm x 2030µm (0.080" x 0.080")

ISO 9001 Certified

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