



## L6925D

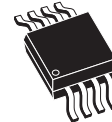
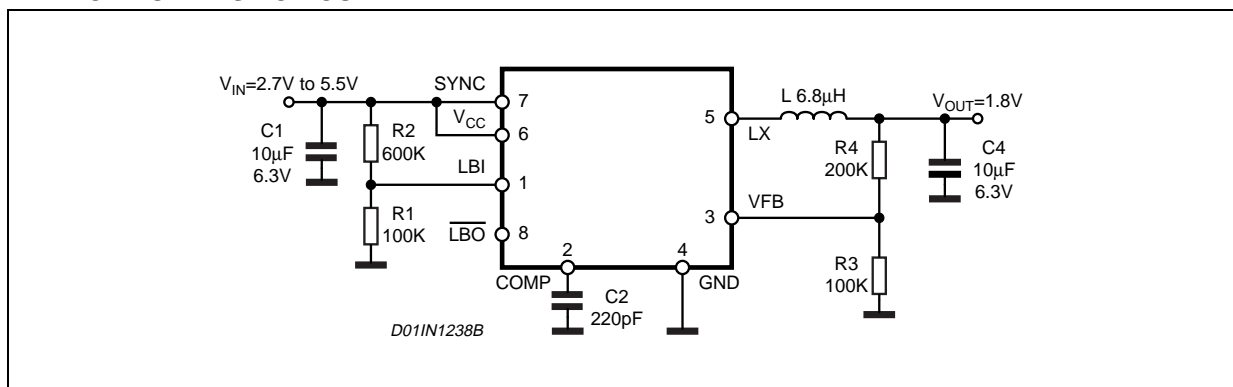
# HIGH EFFICIENCY MONOLITHIC SYNCHRONOUS STEP DOWN REGULATOR

- 2.7V TO 5.5V BATTERY INPUT RANGE
- HIGH EFFICIENCY: UP TO 95%
- INTERNAL SYNCHRONOUS SWITCH
- NO EXTERNAL SCHOTTKY REQUIRED
- EXTREMELY LOW QUIESCENT CURRENT
- 800mA MAX OUTPUT CURRENT
- ADJUSTABLE OUTPUT VOLTAGE FROM 0.6V
- LOW DROP-OUT OPERATION: UP TO 100% DUTY CYCLE
- SELECTABLE LOW NOISE/LOW CONSUMPTION MODE AT LIGHT LOAD
- LOW BATTERY INPUT
- LOW BATTERY OUTPUT
- $\pm 1\%$  OUTPUT VOLTAGE ACCURACY
- CURRENT-MODE CONTROL
- 600kHz SWITCHING FREQUENCY
- EXTERNALLY SYNCHRONIZABLE FROM 500kHz TO 1.4MHz
- OVP
- SHORT CIRCUIT PROTECTION

### APPLICATIONS

- BATTERY-POWERED EQUIPMENTS
- PORTABLE INSTRUMENTS
- CELLULAR PHONES
- PDAs AND HAND HELD TERMINALS
- DSC
- GPS

### APPLICATION TEST CIRCUIT



MSOP8

**ORDERING NUMBERS:** L6925D (Tube)  
L6925013TR (Tape & Reel)

### DESCRIPTION

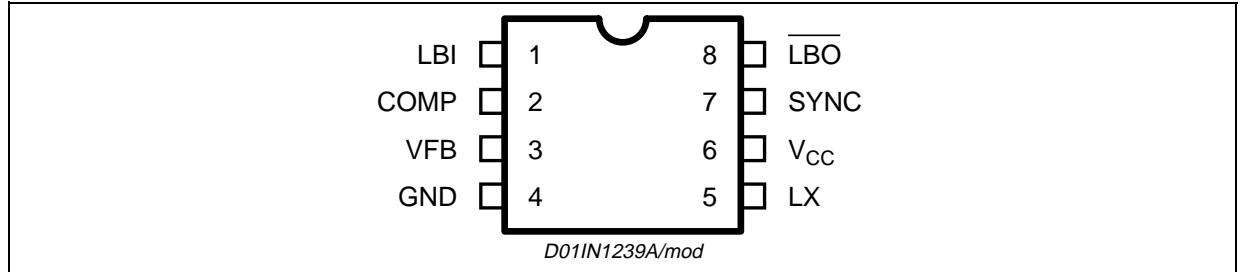
The device is dc-dc monolithic regulator specifically designed to provide extremely high efficiency. The device has an UVLO set at 2.7V cause it is particularly thought for single Li-ion cell applications. Output voltage can be selected by an external divider down to 0.6V. Duty Cycle can saturate to 100% allowing low drop-out operation. The device is based on a 600kHz fixed-frequency, current mode-architecture. Low Consumption Mode operation can be selected at light load conditions, allowing switching losses to be reduced. L6925D is externally synchronizable with a clock which makes it useful in noise-sensitive applications. LBI pin can be used to have a LBO signal when the Battery voltage is lower than a preset value. Other features like, Overvoltage protection, Shortcircuit protection and Thermal Shutdown (150°C) are also present.

# L6925D

## ABSOLUTE MAXIMUM RATINGS

| Symbol           | Parameter   | Value                   | Unit |
|------------------|---|-------------------------|------|
| V <sub>6</sub>   | Input voltage   | -0.3 to 6               | V    |
| V <sub>5</sub>   | Output switching voltage  | -1 to V <sub>CC</sub>   | V    |
| V <sub>1</sub>   | Shutdown  | -0.3 to V <sub>CC</sub> | V    |
| V <sub>3</sub>   | Feedback voltage  | -0.3 to V <sub>CC</sub> | V    |
| V <sub>2</sub>   | Analog input voltage  | -0.3 to V <sub>CC</sub> | V    |
| P <sub>tot</sub> | Power dissipation at Tamb=70°C  | 0.45                    | W    |
| T <sub>j</sub>   | Junction operating temperature range  | -40 to 150              | °C   |
| T <sub>stg</sub> | Storage temperature range   | -65 to 150              | °C   |
| LX Pin           | Maximum Withstanding Voltage Range Test Condition: CDF-AEC-Q100-002- "Human Body Model" Acceptance Criteria: "Normal Performance" | ±1000                   | V    |
| Other pins       |   | ±2000                   | V    |

## PIN CONNECTION



## THERMAL DATA

| Symbol                | Parameter                              | Value | Unit |
|-----------------------|--|-------|------|
| R <sub>th j-amb</sub> | Thermal Resistance Junction to Ambient | 180   | °C/W |

## PIN FUNCTIONS

| N | Name                    | Description   |
|---|-------------------------|---|
| 1 | LBI                     | Battery low voltage detector input. The internal threshold is set to 0.6V. The external threshold can be adjusted by using an external resistor divider.  |
| 2 | COMP                    | Error amplifier output. Compensate it with a 220pF capacitor  |
| 3 | VFB                     | Error amplifier input. The output voltage can be adjusted by using an external resistor divider connected to this pin (V <sub>FB</sub> = 0.6V).   |
| 4 | GND                     | Ground.   |
| 5 | LX                      | Switch node connection to the inductor.   |
| 6 | VCC                     | Input voltage.  |
| 7 | SYNC                    | This pin allows to select Low Noise/ Low Consumption Mode or to synchronize the device.   |
| 8 | $\overline{\text{LBO}}$ | Battery low voltage detector output. If the voltage at the LBI pin drops below the internal threshold, $\overline{\text{LBO}}$ goes low. The $\overline{\text{LBO}}$ is an open drain output. A pull_up resistor should be connected between the pin and the output voltage |

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$ ,  $V_{CC} = 3.6\text{V}$  unless otherwise specified)

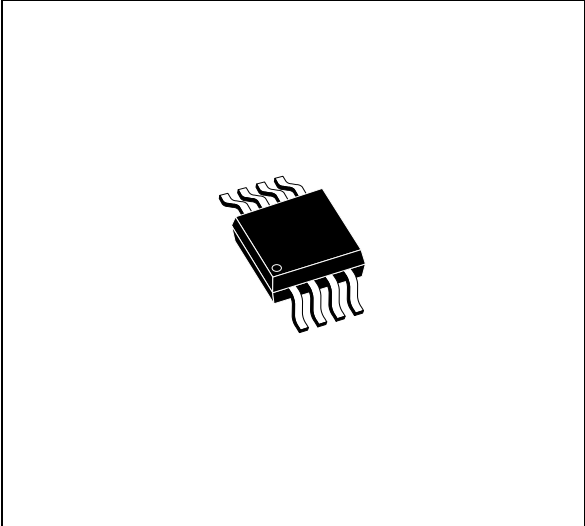
| Symbol                                 | Parameter                                | Test Condition  | Min   | Typ  | Max      | Unit             |
|--|--|---|-------|------|----------|------------------|
| $V_{CC}$                               | Operating input voltage                  | After Turn On   | 2.7   |      | 5.5      | V                |
| $V_{CC\ ON}$                           | Turn On threshold                        |   |       | 2.8  |          | V                |
| $V_{CC\ OFF}$                          | Turn Off threshold                       |   |       | 2.65 |          | V                |
| $V_{CC\ hys}$                          | Hysteresis                               |   |       | 150  |          | mV               |
| $R_p$                                  | High side $R_{on}$                       | $V_{CC} = 3.6\text{V}$ , $I_{LX} = 100\text{mA}$                                      |       | 240  |          | $\text{m}\Omega$ |
| $R_n$                                  | Low side $R_{on}$                        | $V_{CC} = 3.6\text{V}$ , $I_{LX} = 100\text{mA}$                                      |       | 215  |          | $\text{m}\Omega$ |
| $I_{lim}$                              | Peak current limit                       | $V_{CC} = 3.6\text{V}$  |       | 1.2  |          | A                |
|  | Valley current limit                     | $V_{CC} = 3.6\text{V}$  |       | 1.4  |          | A                |
| $V_{out}$                              | Output voltage range                     |   | 0.6   |      | $V_{CC}$ | V                |
| $f_{osc}$                              | Oscillator frequency                     |   |       | 600  |          | KHz              |
| $f_{sync}$                             | Sync mode clock (*)                      |   | 500   |      | 1400     | KHz              |
| <b>DC CHARACTERISTICS</b>              |  |   |       |      |          |                  |
| $I_q$                                  | Quiescent current (low noise mode)       | $V_{sync} = 0\text{V}$ , no load, $V_{FB} > 0.6\text{V}$                              |       | 230  |          | $\mu\text{A}$    |
|  | Quiescent current (low consumption mode) | $V_{sync} = V_{CC}$ , no load, $V_{FB} > 0.6\text{V}$                                 |       | 25   |          | $\mu\text{A}$    |
| $I_{sh}$                               | Shutdown current                         | $V_{CC} < 2.7\text{V}$ , $V_{FB} > 0.6\text{V}$                                       |       | 0.2  |          | $\mu\text{A}$    |
| $I_{LX}$                               | LX leakage current (*)                   | $V_{CC} < 2.7\text{V}$ , $V_{LX} = V_{CC}$  |       | 1    |          | $\mu\text{A}$    |
|  |  | $V_{CC} < 2.7\text{V}$ , $V_{LX} = 0\text{V}$   |       | 1    |          | $\mu\text{A}$    |
| <b>ERROR AMPLIFIER CHARACTERISTICS</b> |  |   |       |      |          |                  |
| $V_{fb}$                               | Voltage feedback                         |   | 0.593 | 0.6  | 0.607    | V                |
| $I_{fb}$                               | Feedback input current (*)               | $V_{FB} = 0.6\text{V}$  |       | 25   |          | nA               |
| <b>SYNC/MODE FUNCTION</b>              |  |   |       |      |          |                  |
| $V_{sync\_H}$                          | Sync mode threshold high                 |   |       |      | 1.3      | V                |
| $V_{sync\_L}$                          | Sync mode threshold low                  |   | 0.5   |      |          | V                |
| <b>LB SECTION</b>                      |  |   |       |      |          |                  |
| $V_{LBI}$                              | LBI Threshold                            |   |       | 0.6  |          | V                |
| $V_{\overline{LBO}}$                   | $\overline{LBO}$ Logic Low               | $I_{sink} = 1\text{mA}$ , $V_{CC} = 3.6\text{V}$ , $V_{LBI} < 0.6\text{V}$            |       | 0.2  | 0.4      | V                |
| $I_{LK-\overline{LBO}}$                | $\overline{LBO}$ Leakage Current (*)     | $V_{\overline{LBO}} = 3.6\text{V}$ , $V_{CC} = 3.6\text{V}$ , $V_{LBI} > 0.6\text{V}$ |       |      | 50       | nA               |
| <b>PROTECTIONS</b>                     |  |   |       |      |          |                  |
| HOVP                                   | Hard overvoltage threshold               |   |       | 10   |          | % $V_{out}$      |

(\*) Guaranteed by design

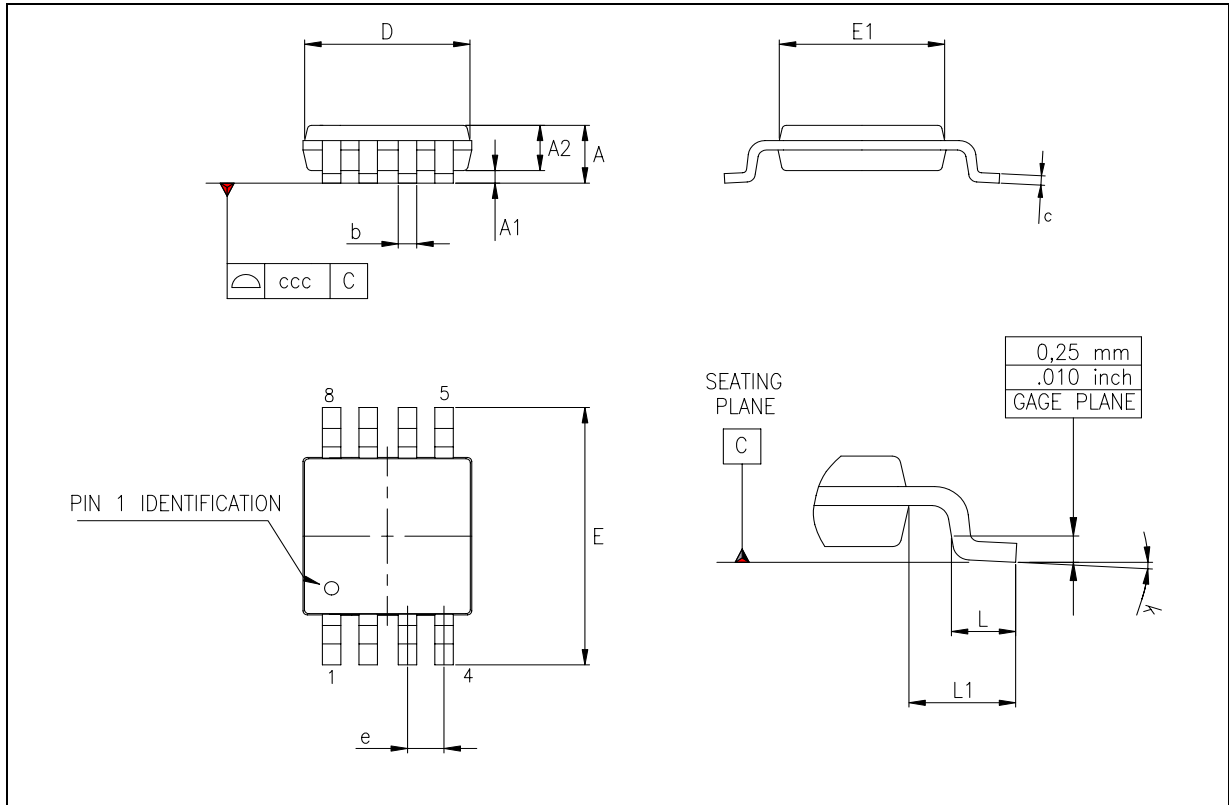
| DIM.   | mm                  |       |       | inch  |       |       |
|--------|---------------------|-------|-------|-------|-------|-------|
|        | MIN.                | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| A      |                     |       | 1.10  |       |       | 0.043 |
| A1     | 0.050               |       | 0.150 | 0.002 |       | 0.006 |
| A2     | 0.750               | 0.850 | 0.950 | 0.03  | 0.033 | 0.037 |
| b      | 0.250               |       | 0.400 | 0.010 |       | 0.016 |
| c      | 0.130               |       | 0.230 | 0.005 |       | 0.009 |
| D (1)  | 2.900               | 3.000 | 3.100 | 0.114 | 0.118 | 0.122 |
| E      | 4.650               | 4.900 | 5.150 | 0.183 | 0.193 | 0.20  |
| E1 (1) | 2.900               | 3.000 | 3.100 | 0.114 | 0.118 | 0.122 |
| e      |                     | 0.650 |       |       | 0.026 |       |
| L      | 0.400               | 0.550 | 0.700 | 0.016 | 0.022 | 0.028 |
| L1     |                     | 0.950 |       |       | 0.037 |       |
| k      | 0° (min.) 6° (max.) |       |       |       |       |       |
| aaa    |                     |       | 0.100 |       |       | 0.004 |

Note: 1. D and F does not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm (.006inch) per side.

**OUTLINE AND MECHANICAL DATA**



**MSOP8 (Body 3mm)**



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