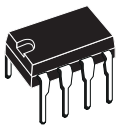
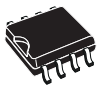
# ST730A

## 5V STEP-DOWN, CURRENT-MODE PWM DC-DC CONVERTERS

- UP TO 450mA LOAD CURRENTS
- 200kHz HIGH-FREQUENCY CURRENT-MODE PWM
- 85% TO 96% EFFICIENCIES
- 33µH OR 100µH PRE-SELECTED INDUCTOR VALUE, NO COMPONENT DESIGN REQUIRED
- 0.8mA QUIESCENT CURRENT
- 0.3µA SHUTDOWN SUPPLY CURRENT
- ADJUSTABLE OUTPUT VOLTAGE
- OVERCURRENT, SOFT-START AND UNDERVOLTAGE LOCKOUT PROTECTION
- CYCLE-BY-CYCLE CURRENT LIMITING
- PACKAGE AVAILABLE: DIP-8 AND SO-8



**DIP-8**



**SO-8**

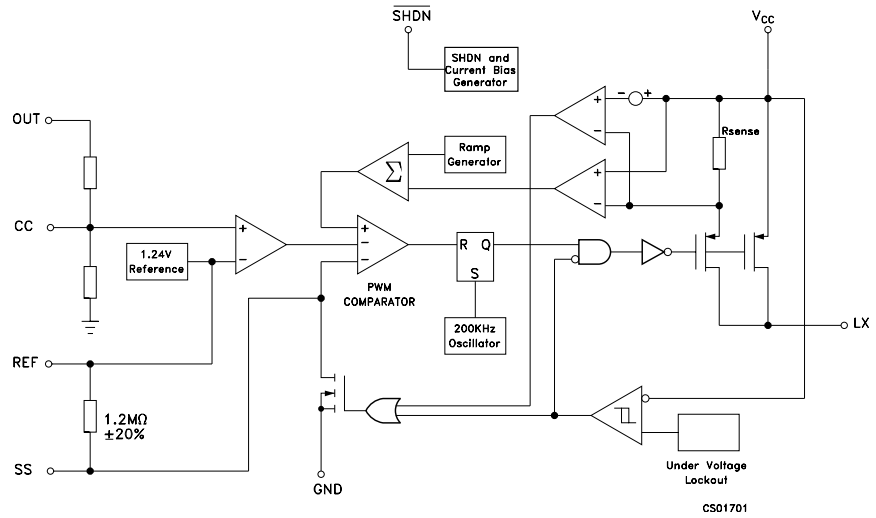
### DESCRIPTION

The ST730A is a 5V output CMOS, step-down switching regulator. The ST730A accepts inputs between 5.2V and 11V and delivers 450mA. Typical efficiencies are 85% to 96%.

Quiescent supply current is 0.8mA and only 0.3µA in shutdown mode. The output does not exhibit frequency over this specified range. Pulse-width modulation (PWM) current-mode control provides precise output regulation and excellent transient responses. Output voltage accuracy is guaranteed to be ±5% over line, load, and temperature varations.

Fixed-frequency switching and absence of subharmonic ruipple allows easy filtering of output ripple and noise, as well as the use of small external components. This regulators require only a single inductor value to work in most applications, so no inductor design is necessary. Typical applications are: Cellular phones & radios, portable Instruments, Portable Communications Equipments and Computer Peripherals.

### SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter[2] | Value | Unit |
|---|---|---|---|
| $V_{CC}$ | DC Input Voltage | -0.3 to 12 | V |
| $V_{LX}$ | Switch Pin Voltage | -0.3 to ($V_{CC}$ + 0.3) | V |
| $V_{SHDN}$ | Shutdown Voltage (SHDN) | -0.3 to ($V_{CC}$ + 0.3) | V |
| $V_S$,$V_C$ | Soft Start (SS) and Compensation Capacitor (CC) Pins Voltage | -0.3 to ($V_{CC}$ + 0.3) | V |
| $I_{LX}$ | Switching Peak Current | 2 | A |
| $I_{REF}$ | Reference Current | 2.5 | mA |
| $P_{TOT}$ | Continuous Power Dissipation at $T_A$=70°C (DIP-8)<br>(SO-8) | 550<br>344 | mW<br>mW |
| $T_{stg}$ | Storage Temperature Range | -40 to +150 | °C |
| $T_{op}$ | Operating Junction Temperature Range (AC series)<br>(AB series) | 0 to +70<br>-40 to +85 | °C<br>°C |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

## THERMAL DATA

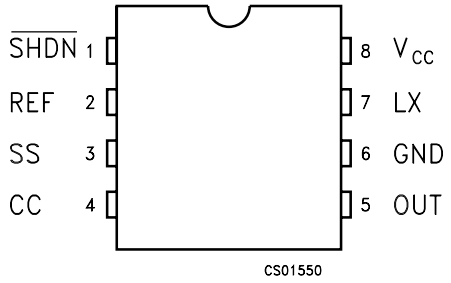
| Symbol | Parameter | SO-8 | DIP-8 | Unit |
|---|---|---|---|---|
| $R_{thj\text{-}amb}$ | Thermal Resistance Junction-ambient (*) | 160 | 100 | °C/W |

(*) This value depends from thermal design of PCB on which the device is mounted.

## ORDERING CODES

| TYPE | DIP8 | SO-8 | SO-8 (T&R) |
|---|---|---|---|
| ST730AB | ST730ABN | ST730ABD | ST730ABD-TR |
| ST730AC | ST730ACN | ST730ACD | ST730ACD-TR |

**CONNECTION DIAGRAM** (top view)



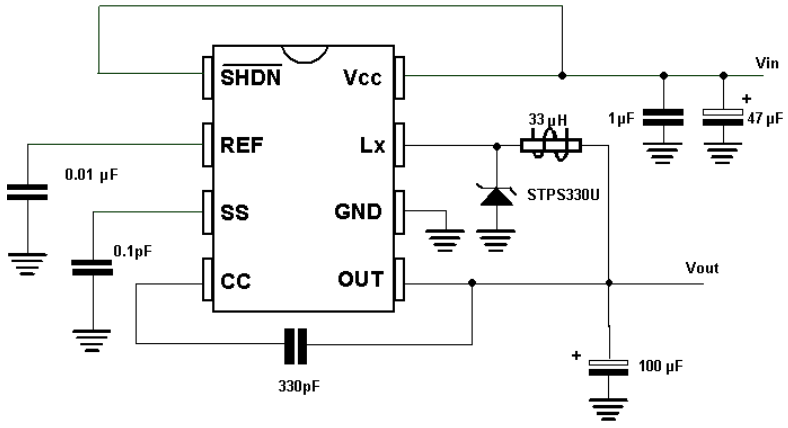

**PIN DESCRIPTION**

| Pin N° | Symbol | Name and Function |
|---|---|---|
| 1 | $\overline{SHDN}$ | Shutdown control (active low): If connected to GND the IC is in shutdown. Connect to $V_{CC}$ for normal operation (ON MODE) |
| 2 | REF | Reference Output Voltage: (1.25V): Bypass to GND with a capacitor that does not exceed 47nF |
| 3 | SS | Soft Start: a capacitor between SS and GND provides soft-start and short-circuit protections. |
| 4 | CC | Compensation Capacitor Input: externally compensates the outer (voltage) feedback loop. Connect to OUT with 330pF capacitor |
| 5 | OUT | Output Voltage Sense Input: provides regulation of feedback sensing. Connect to 5V output. |
| 6 | GND | Ground |
| 7 | LX | Switch Output. Drain of internal P-Channel Power MOSFET |
| 8 | $V_{CC}$ | Supply Voltage Input. Bypass to GND with 1µF ceramic capacitance and large value electrolytic capacitor in parallel. The 1µF capacitor must be as close as possible to the GND and $V_{CC}$ pins |

**ELECTRICAL CHARACTERISTICS** ($V_{CC}$=5V, $I_O$ = 0mA, $T_A$ = $T_{MIN}$ to $T_{MAX}$, unless otherwise specified.)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | Input Voltage | | 4 | | 11 | V |
| $V_O$ | Output Voltage | $V_{CC}$ = 6 to 11V $I_O$ =0 to 450mA | 4.75 | 5 | 5.25 | V |
| $\Delta V_O$ | Line Regulation | $V_{CC}$ = 5.2 to 11V | | 0.15 | | %/V |
| $\Delta V_O$ | Load Regulatio | $I_O$ = 0 to 450mA | | 0.005 | | %/mA |
| $\eta$ | Power Efficency | $I_O$ =300mA | | 92 | | % |
| $I_{SUPPLY}$ | Supply Current | ON Mode<br>OFF Mode, $\overline{SHDN}$=0 | | 0.8<br>0.3 | 2.5<br>100 | mA<br>µA |
| $V_{IH}$ | SHDN Input High Threshold | | 2 | | | V |
| $V_{IL}$ | SHDN Input Low Threshold | | | | 0.25 | V |
| $I_{SHDN}$ | Shutdown Input Leakage Current | | | | 1 | µA |
| $V_{LOCK}$ | Under Voltage Lockout | $V_{CC}$ Falling | | 2.7 | 3 | V |
| $R_{DS(on)}$ | LX On Resistance | $I_{LX}$=500mA | | 0.5 | | Ω |
| $I_{LX}$ | LX Leakage Current | $V_{CC}$ = 12V $V_{LX}$ = 0V | | 1 | | µA |
| $V_{REF}$ | Reference Voltage | $T_A$ = 25°C | 1.17 | 1.24 | 1.31 | V |
| $\Delta V_{REF}$ | Temperature Reference Drift | | | 50 | | ppm/°C |
| $f_{OSC}$ | Switching Frequency | C series<br>B series | 180<br>160 | 200 | 220<br>280 | KHz |
| $R_C$ | Compensation Pin Impedance | | | 7500 | | Ω |

**TYPICAL APPLICATION CIRCUIT**



**TYPICAL PERFORMANCE CHARACTERISTICS** (unless otherwise specified $T_j$ = 25°C

**Figure 1 :** Efficency vs Output Current

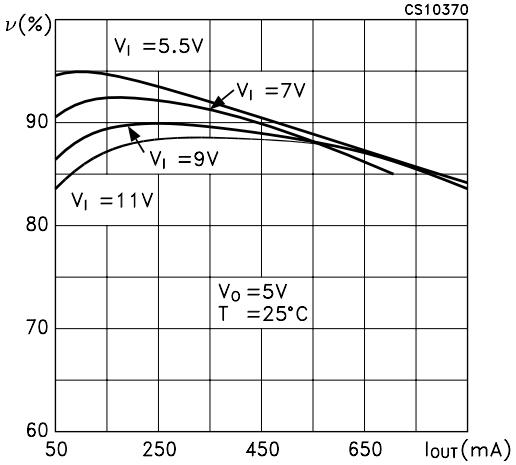



**Figure 2 :** Supply Current vs Temperature

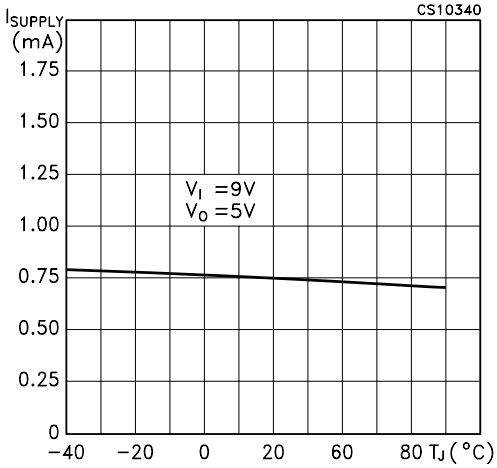



**Figure 3 :** Oscillator Frequency vs Temperature

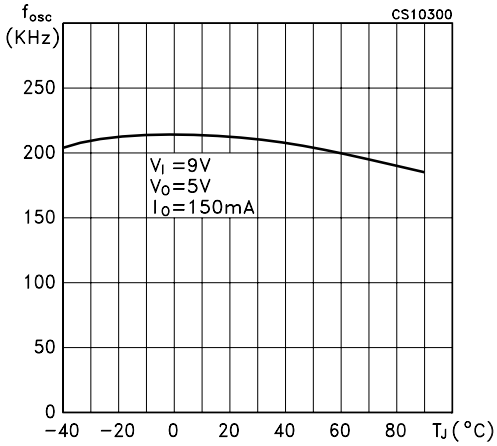



**Figure 4 :** Oscillator Frequency vs Input Voltage

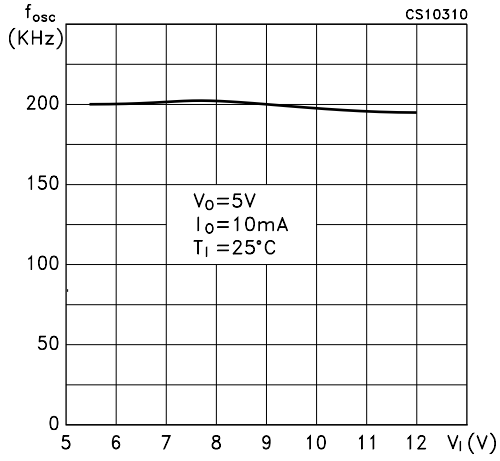



**Figure 5 :** Peak Inductor Current vs Output Current

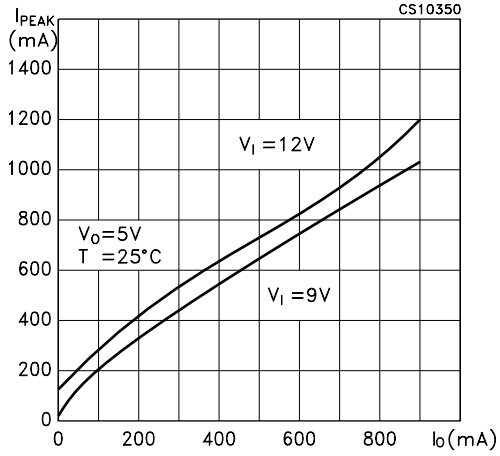



**Figure 6 :** Output Voltage vs Output Current

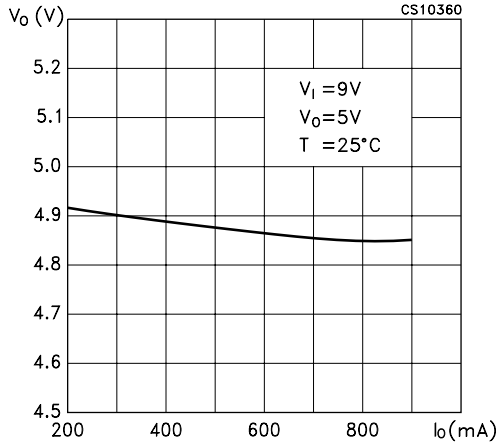
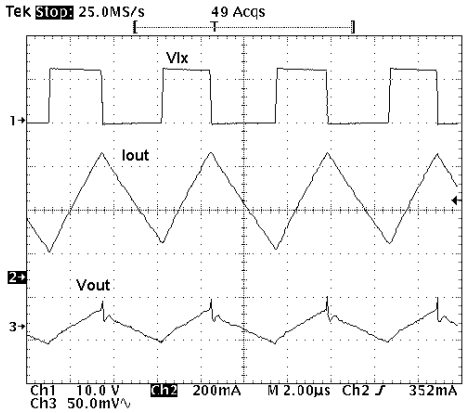
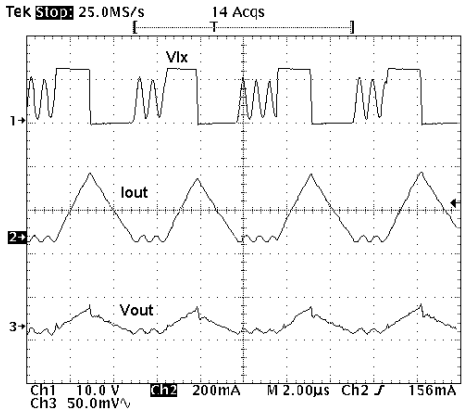


**Figure 7 :** Switching Waveforms, Continuous Conduction




$V_I$=6V to 11V, $I_O$=300mA

**Figure 8 :** Switching Waveforms, Discontinuous Conduction




$V_I$=6V to 11V, $I_O$=300mA

**Figure 9 :** Line Transient

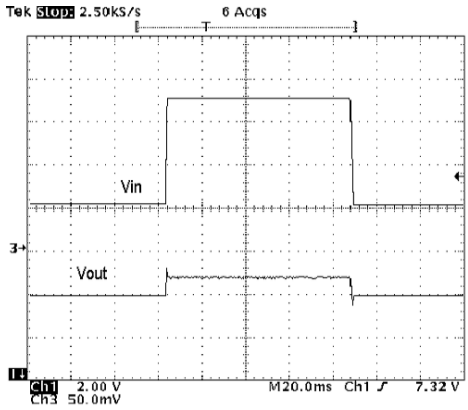
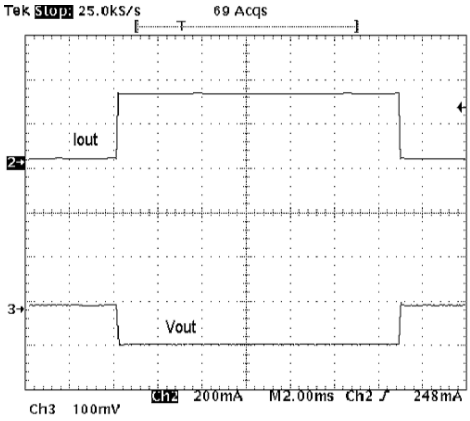
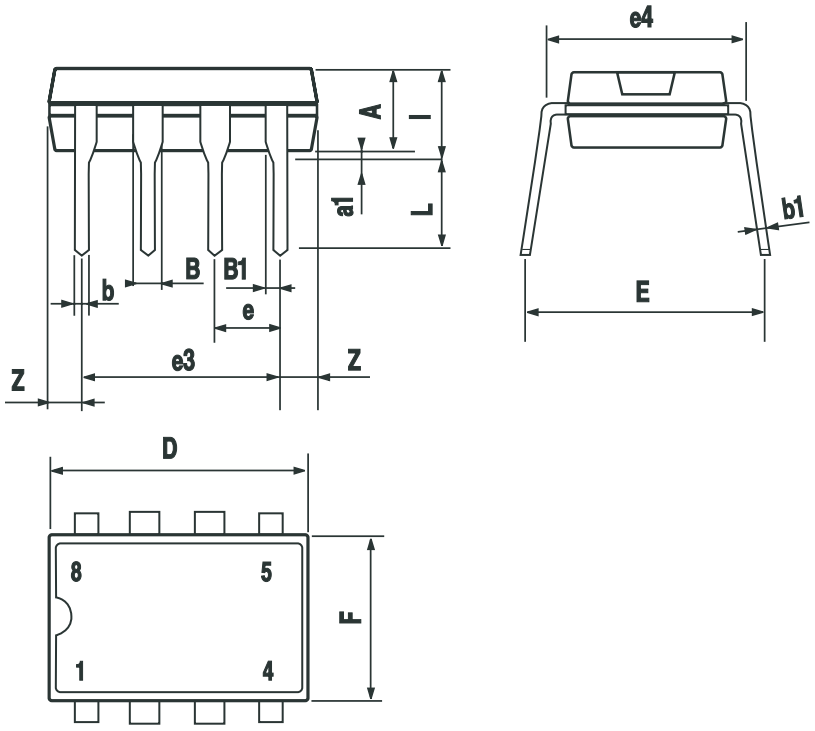



**Figure 10 :** Load Transient



## Plastic DIP-8 MECHANICAL DATA

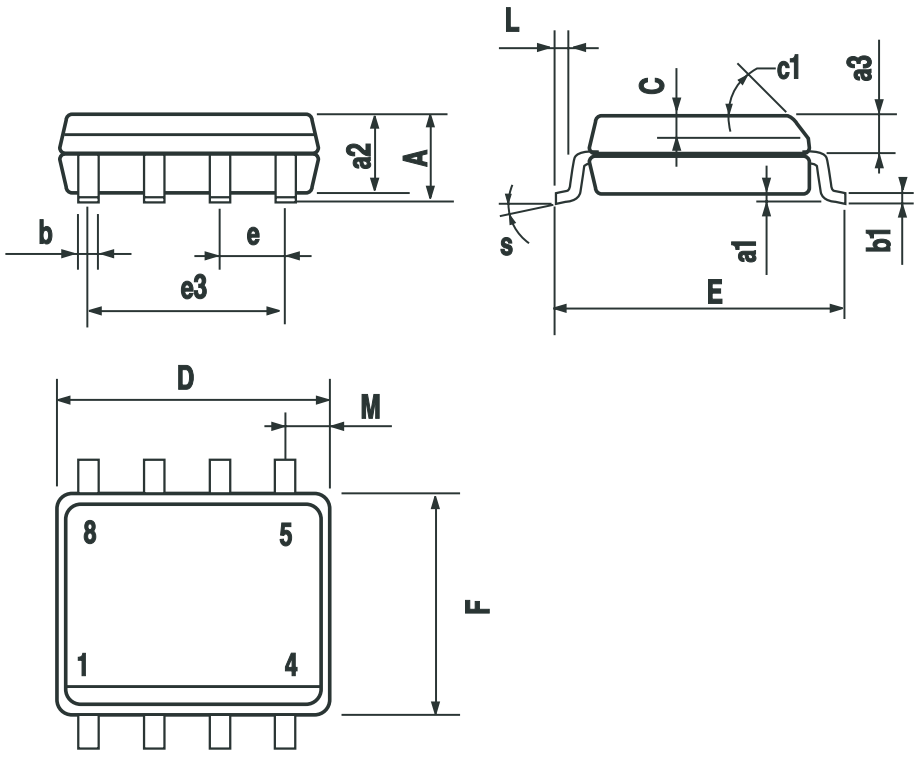
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | 3.3 | | | 0.130 | |
| a1 | 0.7 | | | 0.028 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| B1 | 0.91 | | 1.04 | 0.036 | | 0.041 |
| b | | 0.5 | | | 0.020 | |
| b1 | 0.38 | | 0.5 | 0.015 | | 0.020 |
| D | | | 9.8 | | | 0.386 |
| E | | 8.8 | | | 0.346 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 7.62 | | | 0.300 | |
| e4 | | 7.62 | | | 0.300 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 4.8 | | | 0.189 |
| L | | 3.3 | | | 0.130 | |
| Z | 0.44 | | 1.6 | 0.017 | | 0.063 |




P001F

## SO-8 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.25 | 0.003 | | 0.009 |
| a2 | | | 1.65 | | | 0.064 |
| a3 | 0.65 | | 0.85 | 0.025 | | 0.033 |
| b | 0.35 | | 0.48 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | 0.25 | | 0.5 | 0.010 | | 0.019 |
| c1 | 45° (typ.) | | | | | |
| D | 4.8 | | 5.0 | 0.189 | | 0.196 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 3.81 | | | 0.150 | |
| F | 3.8 | | 4.0 | 0.149 | | 0.157 |
| L | 0.4 | | 1.27 | 0.015 | | 0.050 |
| M | | | 0.6 | | | 0.023 |
| S | 8° (max.) | | | | | |

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