# SPECIFICATION

## L2273

### Current Mode PWM Controller

### VERSION 1.0

# Description

L2273 is highly integrated current mode PWM control IC optimized for high performance, low standby power and cost effective offline flyblack converter applications in sub 60W range.

Fixed 65kHz PWM switching frequency at normal operation . At no load or light load condition, the IC operates in extended 'burst mode' to minimize switching loss.Lower standby power and higher conversion efficiency in thus achieved.

VDD low startup current and low operating current contribute to a reliable power on startup design with L2273. A large value resistor could thus be used in the startup circuit to minimize the standby power.

L2273 offers complete protection cov-erage with automatic self- recovery feature including Cycle-by-Cycle current limiting (OCP), over temperature protection(OTP), VDD over voltage clamp and under voltage lockout (UVLO).The Gate output is clamped to maximum 18V to protect the power MOSFET.

## Features

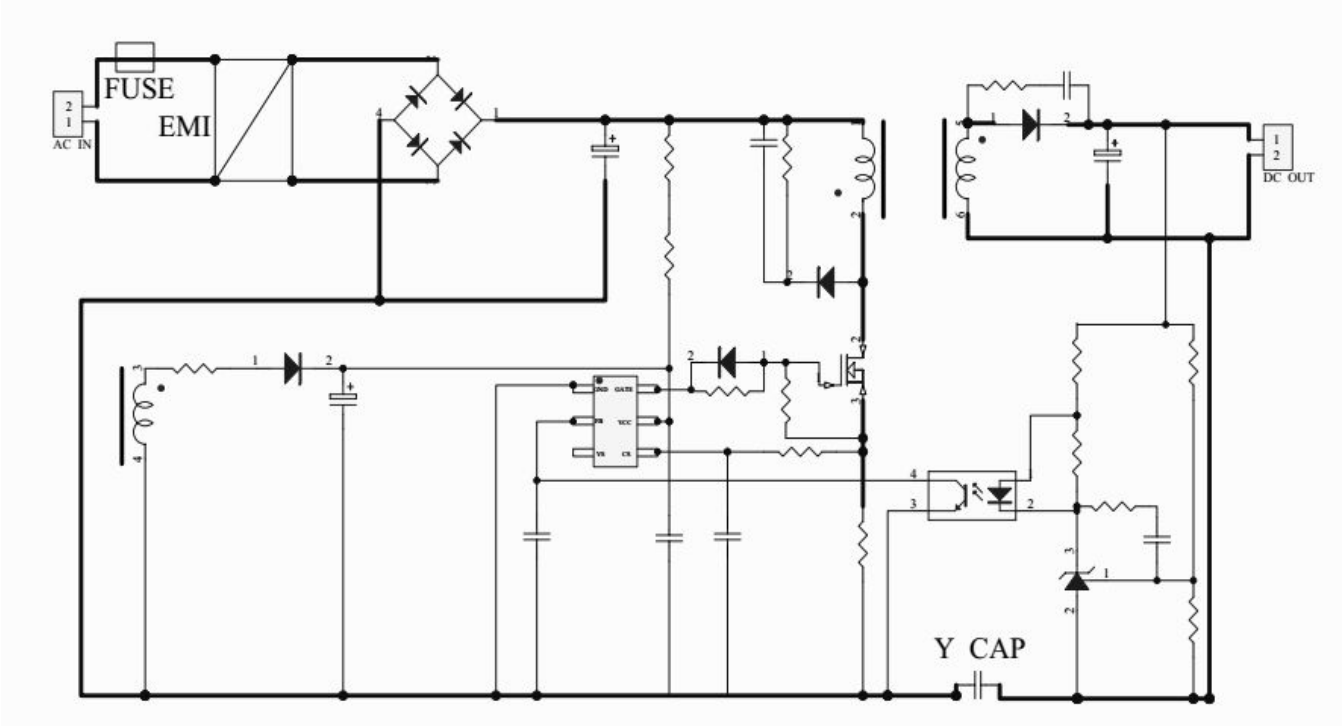
- Proprietary frequency shuffling technology for improved EMI performance.
- Fixed 65kHz PWM switching frequency.
- Leading edge Blanking on current sense input.
- Internal synchronized slope compensation .
- Extended burst mode control for improved efficiency and minimum standby power design(75mW)
- Low VDD startup current and low operating current.
- Gate output maximum voltage clamp
- Cycle-by-Cycle Current Limiting, Built-in Adaptive Current Peak Regulat-ion
- Power on Soft-start, Programmable CV and CC Regulation
- VDD Under Voltage Lockout with Hysteresis (UVLO),VDD OVP, OLP， OTP,OCP,VDD Clamp
- Internal over temperature protection (OTP)
-

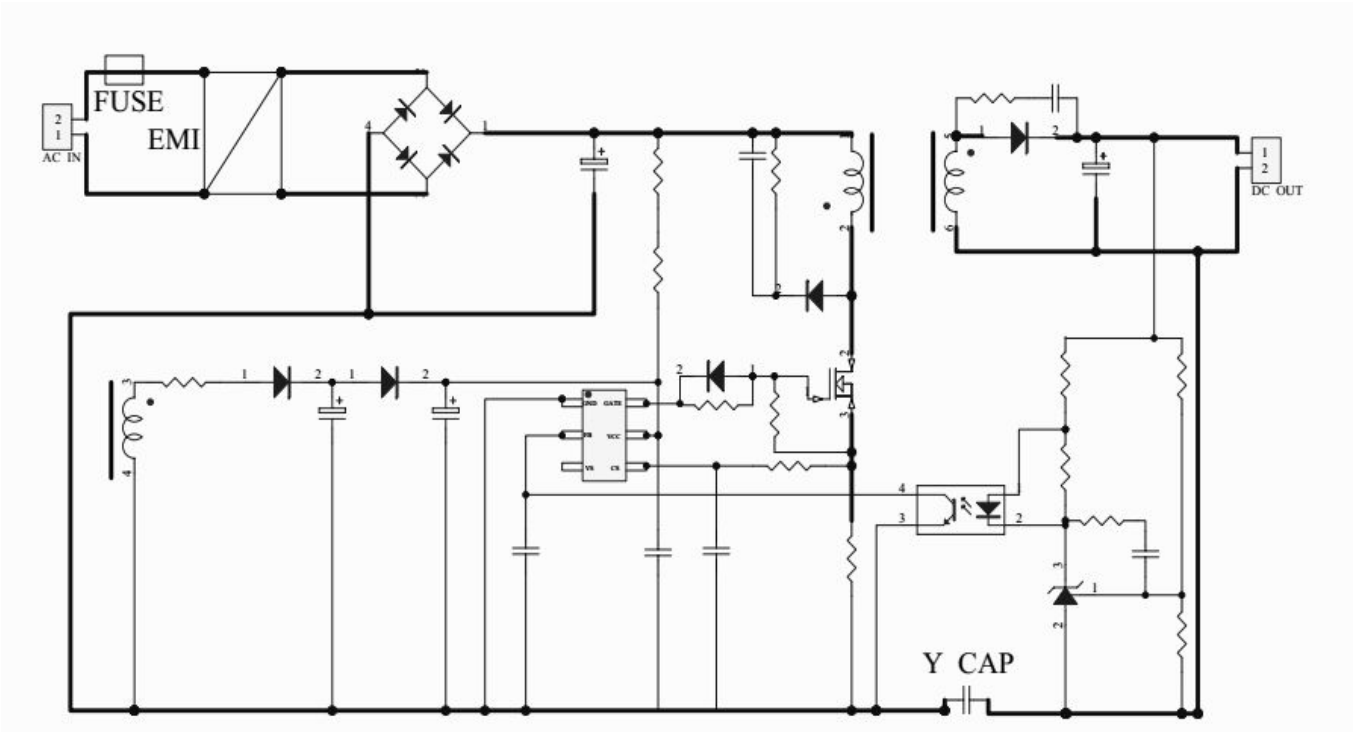
## Applications

- Cell Phone Charger
- Digital Cameras Charger
- Power adptor
- Set_top box power supplies
- Open_frame SMPS
- Battery charger

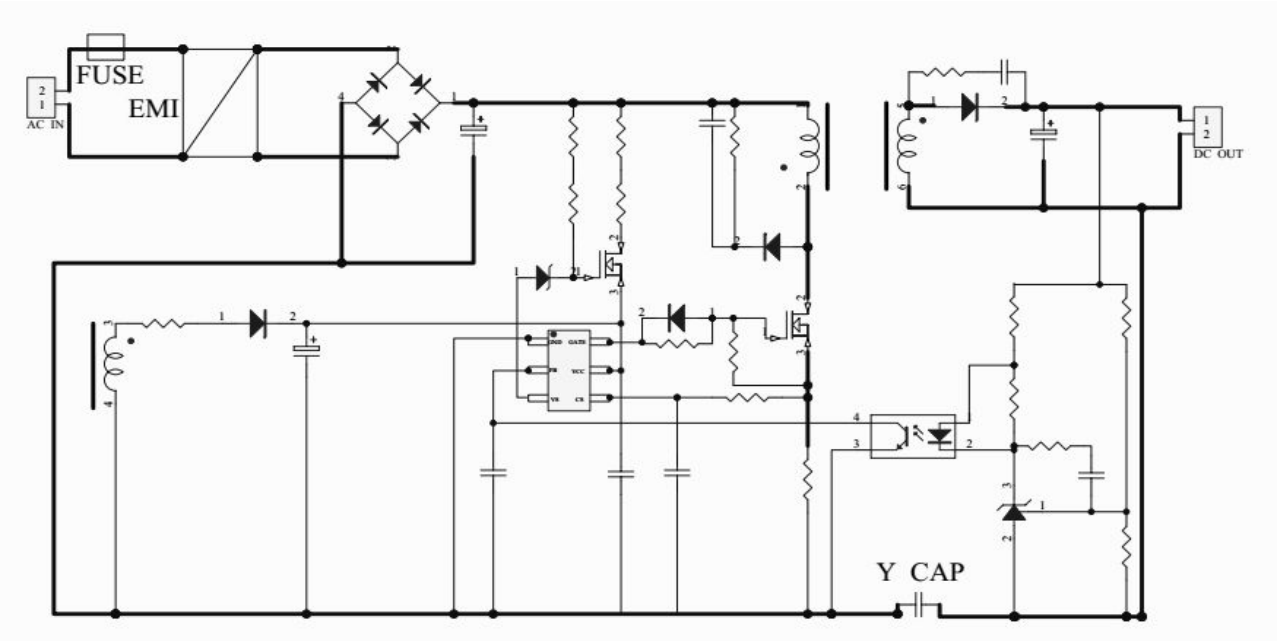
## Application Ciruit

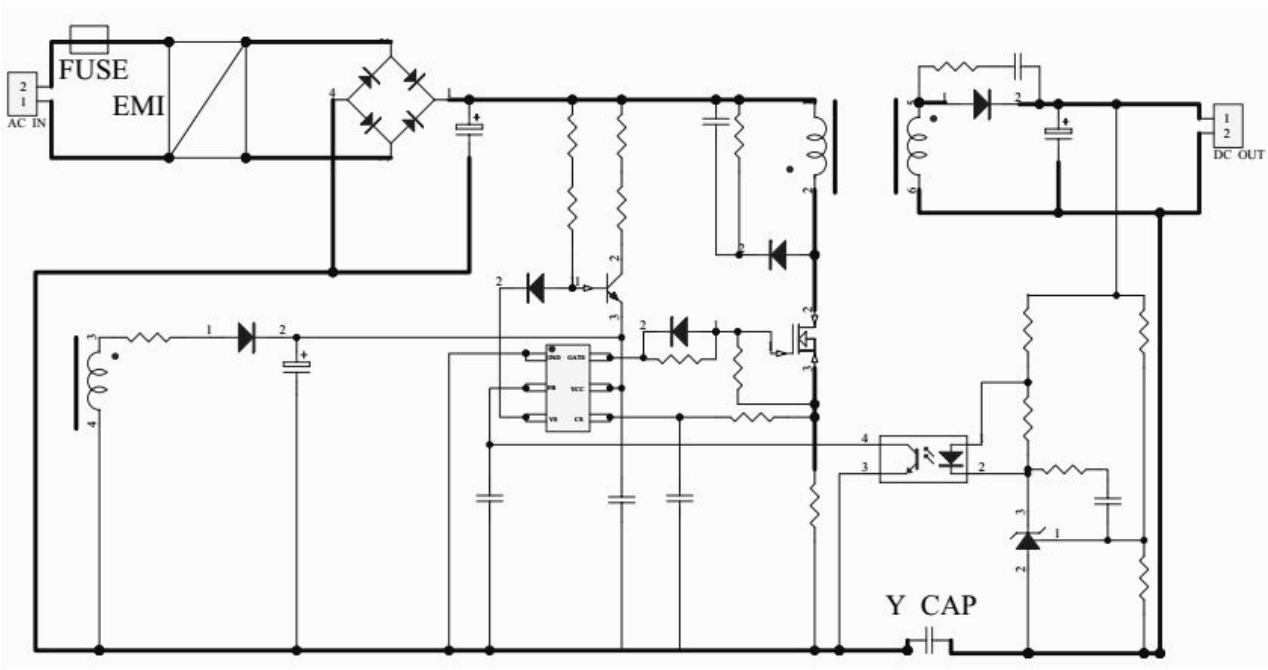
1: Two large value resistors are connected with VCC as startup circiut and Pin3 is inpending .Standby-power (<100mW)



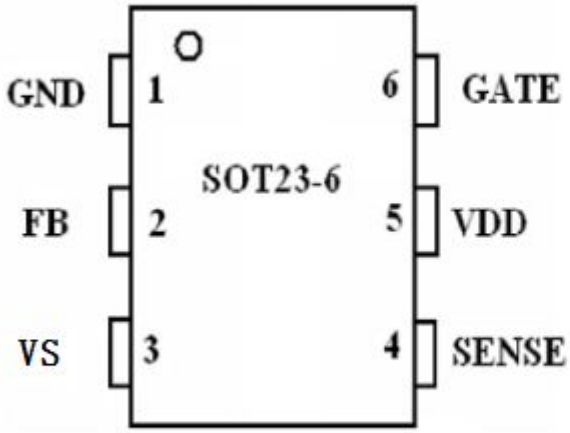



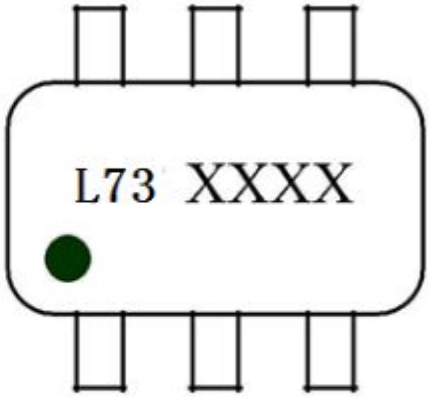
2: L2273 Pin3 provide start-up circiut especially.Standby-power(<75mW)



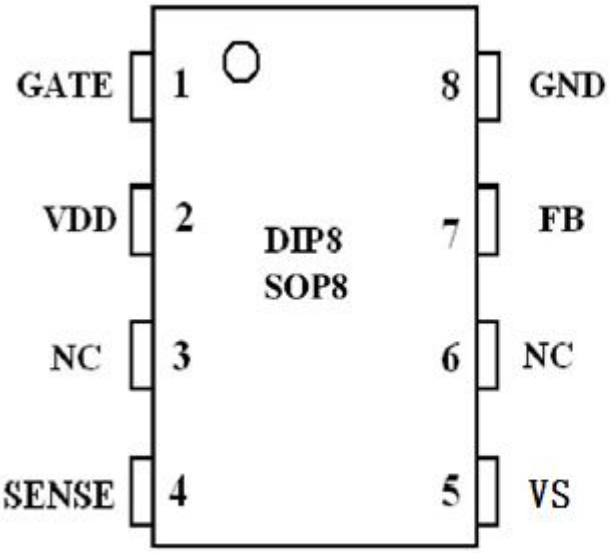



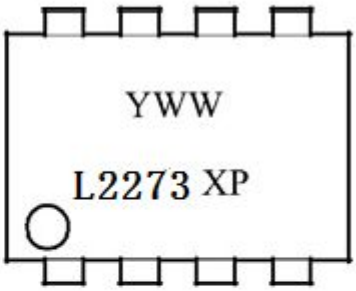
## Pin Assignment & Marking Information




XX:Year Code
XX:WeekCode(1-52)




X:T for SOT23-6
S for SOP-8
D for DIP-8
P:Pb-free Package
Y:Year Code(0-9)
WW:Week Code(01-52)

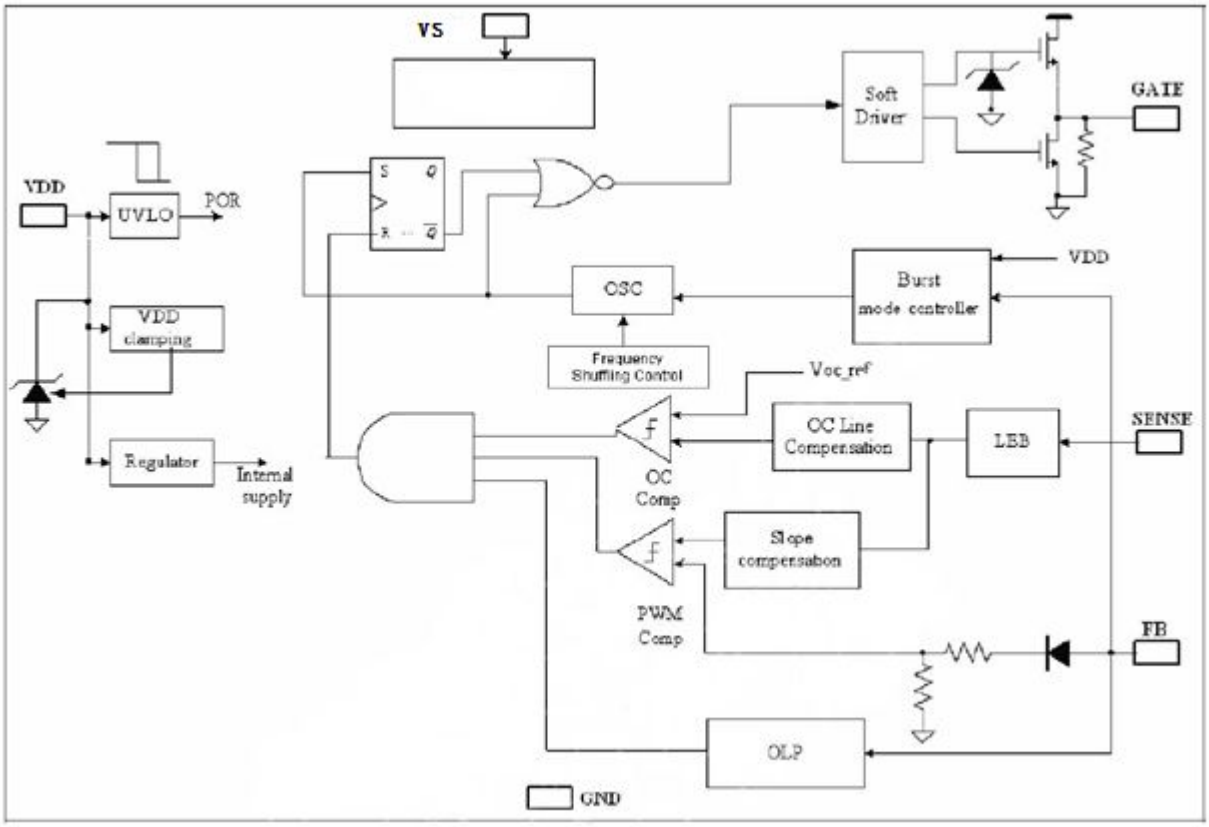
## Ordering Information

| Part number | Package | version number |
|---|---|---|
| L2273TP | SOT23-6 | |
| L2273SP | SOP-8 | |
| L2273DP | DIP-8 | |

## Pin Description

| **Symbol** | **Type** | **Description** |
|---|---|---|
| GATE | O | Totem-pole gate diver output for the power MOSFET |
| VDD | P | Chip DC power supply pin |
| SENSE | I | Current sense intput pin. Connected to MOSFET current resistor node. |
| VS | Z | Active Start-Up Pin |
| FB | I | Feedback input pin. The PWM duty cycle is determined by voltage level into this pin and SENSE pin input. |
| Gnd | P | Ground. |

## Block Diagram




## Absolute Maximum Rating

| Parameter | Value | Unit |
|---|---|---|
| VDD supply voltage | 30 | V |
| VDD clamp voltage | 29 | V |
| VDD clamp current | 10 | mA |
| VFB input voltage | -0.3 to7 | V |
| VSENSE input voltage to SENSE pin | -0.3 to7 | V |
| Vvs input voltage to VS Pin | -0.3 to7 | V |
| Min/Max operating junction temperature | -55 to 150 | ℃ |
| Operating ambient temperature | -20 to 85 | ℃ |

## Recommended Operating Conditions

| Symbol | Parameter | Min. Max. | Unit |
|---|---|---|---|
| VDD | Supply Voltage Vcc | 8 to 25 | V |
| $T_{OA}$ | Operating Ambient Tmperature | -20 to 85 | ℃ |

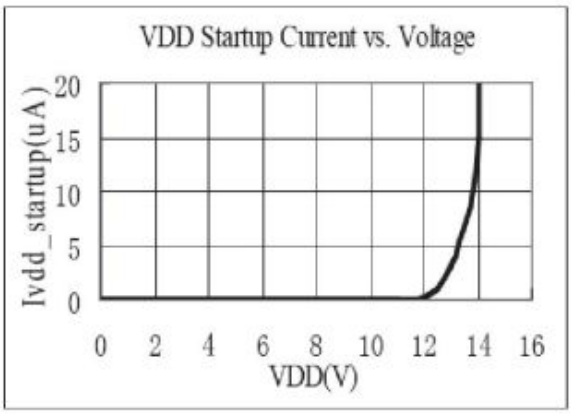
## Electrical Characteristics($T_A$ = 25 ℃, if not otherwise noted)

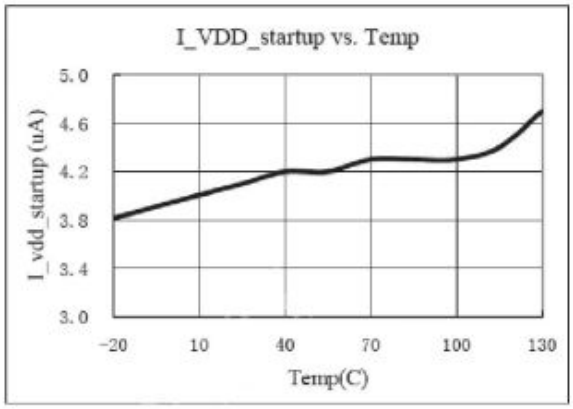
| Symbol | Parameter | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| **Supply Voltage($V_{dd}$ Pin)** | | | | | | |
| Idd_startup | VDD start up current | VDD=12.5V,RI=100K | | 3 | 10 | uA |
| Idd | VDD Operatio current | VDD=16V RT=100KΩ, FB=3V | | 1.5 | | mA |
| UVLO(ON) | VDD under voltage lockout enter | | 7.0 | 8.0 | 10.2 | V |
| UVLO(OFF) | VDD under voltage lockout exit | | 13 | 14 | 16.5 | V |
| VDD_clamp | VDD zener clamp voltage | Idd=10mA | 27 | 29 | 31 | V |
| **Voltage Feedback (FB Pin)** | | | | | | |
| AVCS | PWM input gain | VFB/ VSENSE | | 2 | | V/V |
| VFB_open | VFB open loop voltage | | | 5.7 | | V |
| IFB_short | FB pin short current | Short FB pin to GND and measure current | 0.05 | 0.1 | 0.15 | mA |
| VFB_burst | Burst mode voltage | | | 1.1 | | V |
| VTH_PL | Power limiting FB threshold voltage | Iout=－10mA | | 3.7 | | V |
| TD_PL | Power limiting debounce time | | | 65 | | mS |
| DC_MAX | Maximum duty cycl | VDD=18V,SENSE=0V RI=100KΩ,FB=3V | | 75 | | % |

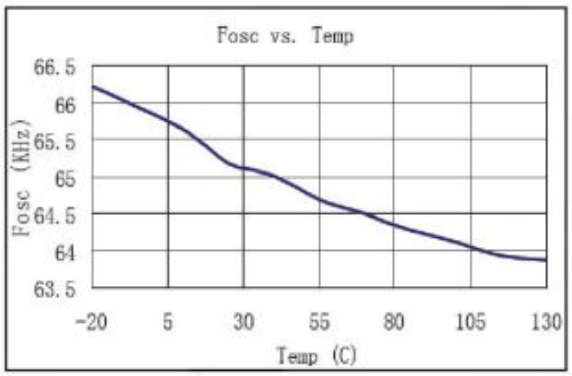
| | | | | | | |
|---|---|---|---|---|---|---|
| **Current Sensing (SEN Pin)** | | | | | | |
| T_blanking | Leading edge blanking time | | | 400 | | nS |
| ZSENSE_IN | Input impedance | | | 40 | | KΩ |
| VTH_sense | Over current thresholdvoltage | | | 0.67 | | V |
| **Oscillator** | | | | | | |
| Fosc | Normal oscillation frequency | | 50 | 64 | 80 | Khz |
| Δf_temp | Frequency temperature stability | TA= -20℃ to 100℃ | | 5 | | % |
| f_VDD | Frequency voltage stability | VDD=12V to 25V | | 1 | | % |
| Fosc_BM | Burst mode base frequency | | | 25 | | Khz |
| Δf_OSC | Frequency modulation range Base frequency | | -7 | | +7 | % |
| **Gate Drive Output** | | | | | | |
| VOL | Output low level | VDD=16V,IO=-20mA | | | 0.8 | V |
| VOH | Output high level | VDD=16V,IO=20mA | 10 | | | V |
| V_Clamp | output clamp voltage level | | | 18 | | V |
| T_r | Output rising time | VDD=16V,CL=1nF | | 220 | | nS |
| T_f | Output falling time | VDD=16V,CL=1nF | | 70 | | nS |
| **Active Start-Up (VS Pin)** | | | | | | |
| VS-High | Voltage of VS | | VDD+0.7 | | | V |
| VS-Low | Voltage of VS | | | | 1 | V |

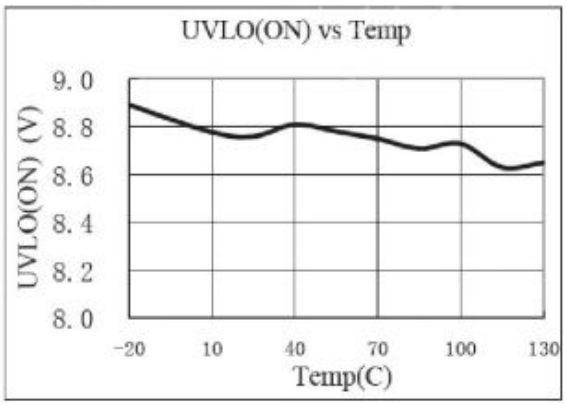
## Characterization Plots

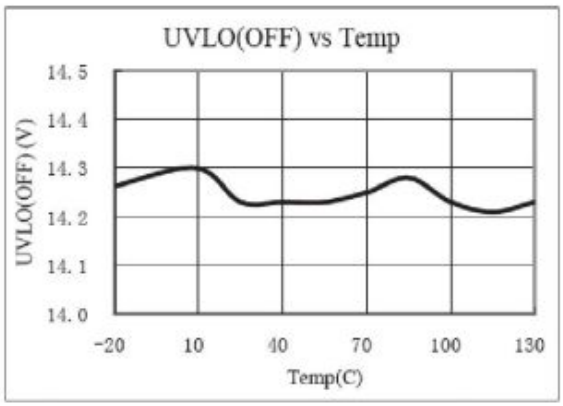
VDD = 16V, TA = 25oC condition applies if not otherwise noted.



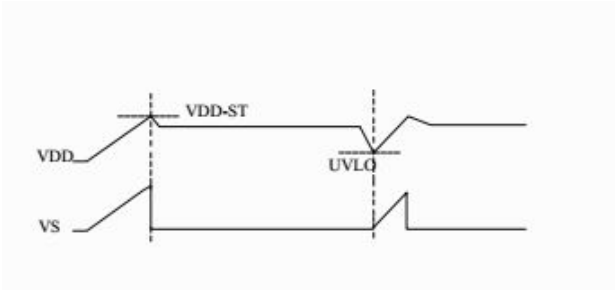



## Application Information

The L2273 is a highly integrated PWM controller IC optimized for offline flyback converter applications in sub 60W power range. The extended burst mode control greatly reduces the standby power consumption and helps the design easily meet the international power conservation requirements.

## Start up Control

L2273 has especially Start-up circuit .As application circuit,Vdd active Start-up circuits using external N-mos and BJT respectively Prior to start-up, the N-mos or the BJT is turned on, allowing the start-up current to charge the VDD bypass capacitor.r. When the VDD bypass capacitor is charged to a voltage higher than the start-up threshold VDD(ST),the N-mos and BJT will be turned off .The N-mos and BJT will be turned off all the time until the voltage of VDD bypass capacitor lower than UVLO.The voltage of VS will control the N-mos and BJT can low Standby power .




## Operating Current

The Operating current of L2273 is low at 1.5mA.Good efficiency is achieved with L2273 low operating current together with extended burst mode control features.

## Frequency shuffling for EMI improvement

The frequency Shuffling (switching frequency modulation) is implemented in L2273. The oscillation frequency is modulated with a random source so that the tone energy is spread out. The spread spectrum minimizes the conduction band EMI and therefore reduces system design challenge.

## ended Burst Mode Operation

At zero load or light load condition, majority of the power dissipation in a switching mode power supply is from switching loss on the MOSFET transistor, the core loss of transformer and the loss on the snubber circuit. The magnitude of power loss is in proportion to the number of switching events within a fixed period of time. Reducing switching events leads to the reduction on the power loss and thus conserves the energy.L2273 self adjusts the switching mode according to the loading condition. At from no load to light/medium load condition, the FB input drops below burst mode threshold level. Device enters Burst Mode control. The Gate drive output switches only when VDD voltage drops below a preset level and FB input is active to output an on state. Otherwise the gate drive remains at off state to minimize the switching loss and reduces the standby power consumption to the greatest extend.The frequency control also eliminates the audio noise at any loading conditions.

## Oscillator Operation

The switching frequency of briard is internally fixed at 65kHz.No external frequence setting components are required for PCB desigh simplifecation .

## Current Sensing and Leading Edge Blanking

Cycle-by-Cycle current limiting is offered in L2273 current mode PWM control. The switch current is detected by a sense resistor into the sense pin. An internal leading edge blanking circuit chops off the sense voltage spike at initial MOSFET on state due to Snubber diode reverse recovery so that the external RC filtering on sense input is no longer required. The current limit comparator is disabled and thus cannot turn off the external MOSFET during the blanking period. PWM duty cycle is determined by the current sense input voltage and the FB input voltage.

## Internal Synchronized Slope Compensation

Built-in slope compensation circuit adds voltage ramp onto the current sense input voltage for PWM generation. This greatly improves the close loop stability at CCM and prevents the sub-harmonic oscillation and thus reduces the output ripple voltage.

## Gate Drive

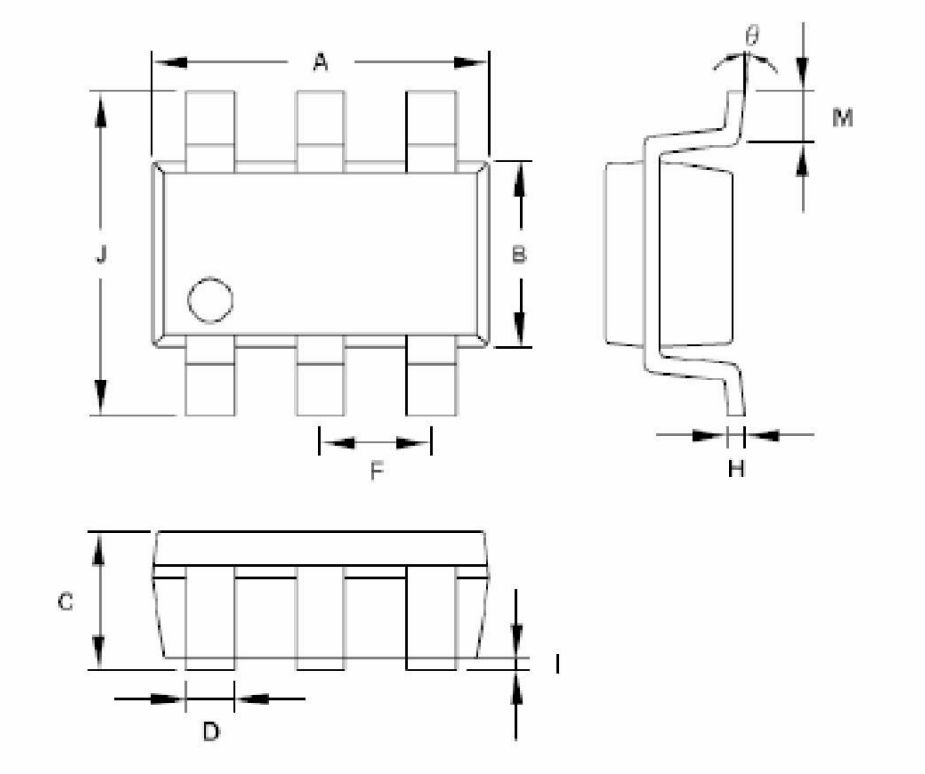
L2273 Gate is connected to an external MOSFET gate for power switch control. Too weak the gate drive strength results in higher conduction and switch loss of MOSFET while too strong gate drive output compromises the EMI.A good tradeoff is achieved through the built-in totem pole gate design with right output strength and dead time control. The low idle loss and good EMI system design is easier to achieve with this dedicated control scheme. An internal 18V clamp is added for MOSFET gate protection at higher than expected VDD input.

## Protection Controls

Good power supply system reliability is achieved with its rich protection features including Cycle-by- Cycle current limiting (OCP), Over Load Protection (OLP) and over voltage clamp, Under Voltage Lockout on VDD (UVLO). With On-Bright Proprietary technology, the OCP threshold tracks PWM Duty cycles and is line voltage compensated to achieve constant output power limit over the universal input voltage range with recommended reference design. At overload condition when FB input voltage exceeds power limit threshold value for more than TD_PL, control circuit reacts to shut down the output power MOSFET. Device restarts when VDD voltage drops below UVLO limit. VDD is supplied by transformer auxiliary winding output. It is clamped when VDD is higher than threshold value. The power MOSFET is shut down when VDD drops below UVLO limit and deviceenters power on start-up sequence thereafter.

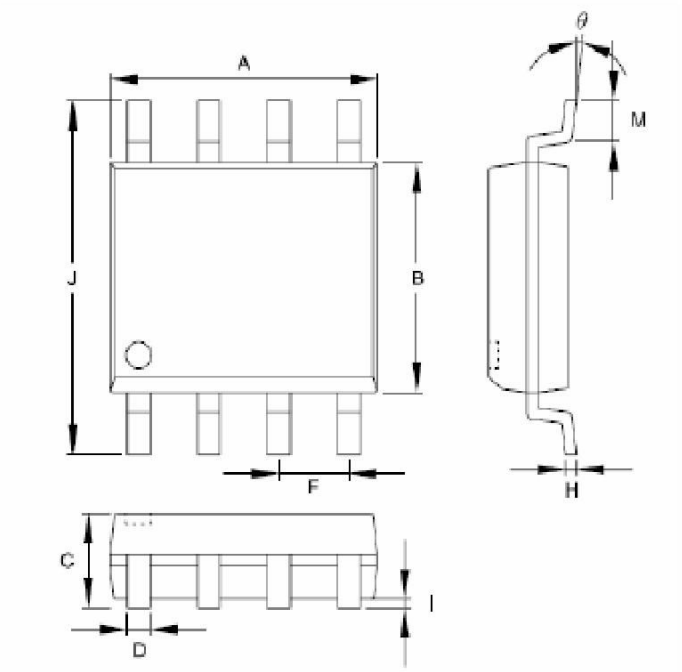
## Package Information

### SOT-23-6



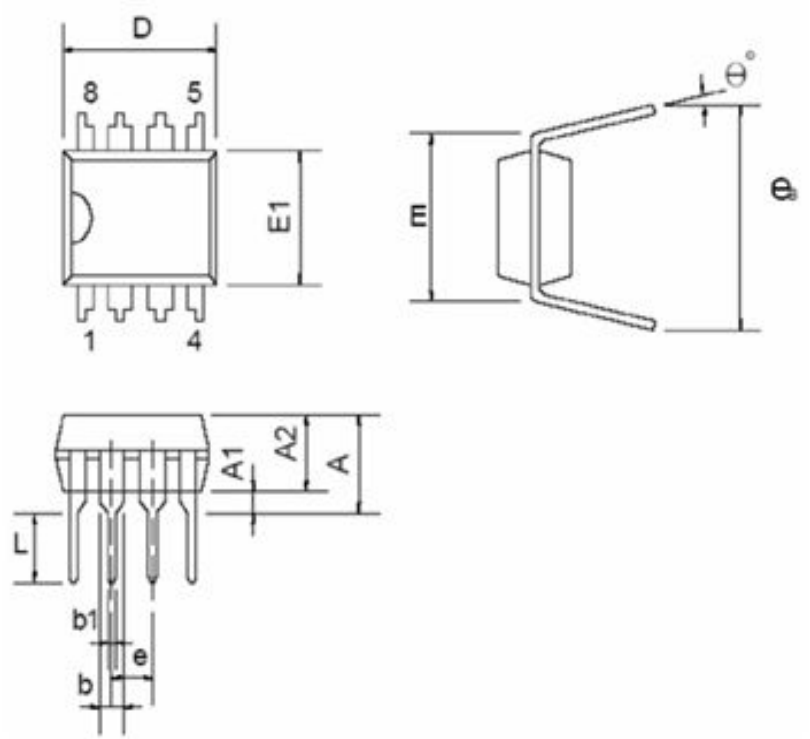

| Symbol | Dimension in Millimeters | | Dimensions in Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 2.692 | 3.099 | 0.106 | 0.122 |
| B | 1.397 | 1.803 | 0.055 | 0.071 |
| C | ------- | 1.450 | ------- | 0.058 |
| D | 0.300 | 0.550 | 0.012 | 0.022 |
| F | 0.838 | 1.041 | 0.033 | 0.041 |
| H | 0.080 | 0.254 | 0.003 | 0.010 |
| I | 0.050 | 0.150 | 0.002 | 0.006 |
| J | 2.600 | 3.000 | 0.102 | 0.118 |
| M | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 10° | 0° | 10° |

**SOP-8**




| Symbols | Dimensions in Millimeters | | Dimensions in Inch | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 4.801 | 5.004 | 0.189 | 0.197 |
| B | 3.810 | 3.988 | 0.150 | 0.157 |
| C | 1.346 | 1.753 | 0.053 | 0.069 |
| D | 0.330 | 0.508 | 0.013 | 0.020 |
| F | 1.194 | 1.346 | 0.047 | 0.053 |
| H | 0.178 | 0.229 | 0.007 | 0.009 |
| I | 0.102 | 0.254 | 0.004 | 0.010 |
| J | 5.791 | 6.198 | 0.228 | 0.244 |
| M | 0.406 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

**DIP-8**




| Symbol | Millimeters | | | Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | | | 5.334 | | | 0.210 |
| A1 | 0.381 | | | 0.015 | | |
| A2 | 3.175 | 3.302 | 3.429 | 0.125 | 0.130 | 0.135 |
| b | | 1.524 | | | 0.060 | |
| b1 | | 0.457 | | | 0.018 | |
| D | 9.017 | 9.271 | 10.160 | 0.355 | 0.365 | 0.400 |
| E | | 7.620 | | | 0.300 | |
| E1 | 6.223 | 6.350 | 6.477 | 0.245 | 0.250 | 0.255 |
| e | | 2.540 | | | 0.100 | |
| L | 2.921 | 3.302 | 3.810 | 0.115 | 0.130 | 0.150 |
| eB | 8.509 | 9.017 | 9.525 | 0.335 | 0.355 | 0.375 |
| θ° | 0° | 7° | 15° | 0° | 7° | 15° |