# Transition Mode PFC controller ADT6011

## DESCRIPTION

The ADT6011 is a transition mode PFC controller IC and it is very high power factor controller for Pre regulator and LED Lighting applications.
It can operate with wide input voltage range from 90V to 270VAC.
It supports flyback topology and achieves very high power factor.
The internal linear multiplier is able to reduce AC input current distortion, and operates with very low THD.

SOP-8

The output voltage is controlled by feedback with 1% precise internal voltage reference.
It provides very accuracy overvoltage protection .

## FEATURES

- Transition Mode operation
- Low startup current ( 10uA )
- Trimmed 1% Internal reference voltage
- Internal startup timer
- Internal Leading edge blanking
- Cycle-by-Cycle current limit
- Under Voltage Lockout
- Very accurate output overvoltage protection
- Totem pole gate driver with voltage clamp
- High Power factor ( >0.95 ) and Low THD ( < 20% )
  * Base TM PFC mode

## APPLICATIONS

- PFC pre-regulator
- LED lighting
  -. Single stage high PF Flyback AC/DC SMPS
  -. Single stage offline LED driver
  -. LED lighting power

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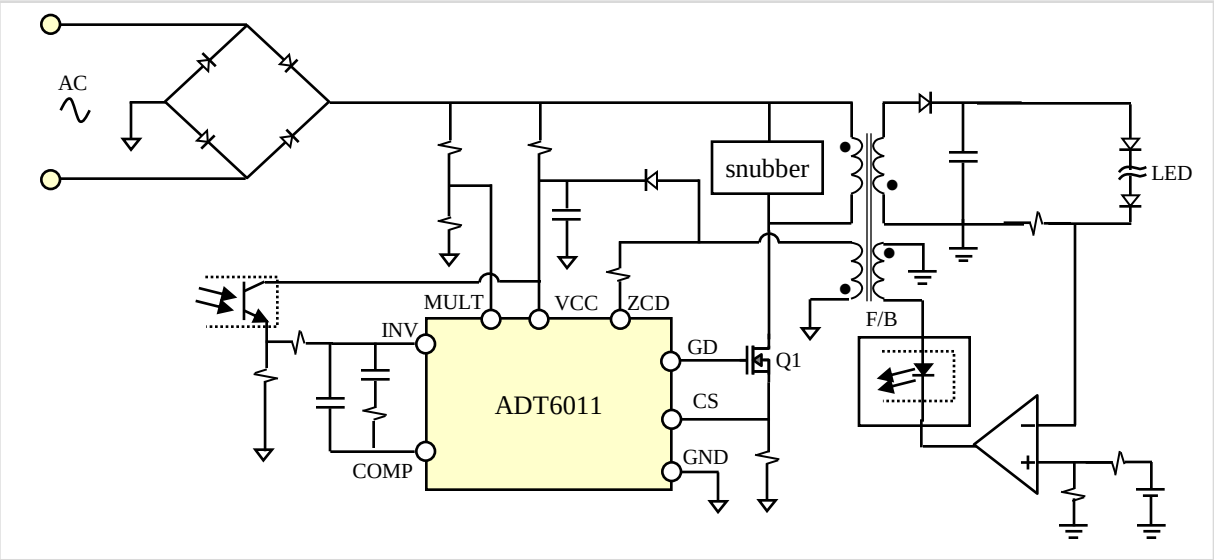
## TYPICAL APPLICATION




## ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Ground Voltage | GND | -0.3 | V |
| Power Voltage | VCC | 40 | V |
| Gate Driver Output | OUT | 18 | V |
| All other pins | INV,COMP,MULTI,ZCD | 6 | V |
| Power Dissipation | $P_D$ | 0.64 | W |
| Junction Temperature | $T_j$ | -40 ~ 150 | ℃ |
| Storage Temperature | $T_{stg}$ | -65 ~ 150 | ℃ |
| Thermal Resistance | $\theta_{JA}$ | 150 | ℃/W |

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## ELECTRICAL CHARACTERISTICS

(VCC = 20V, Ta=25°C, Co = 1nF; unless otherwise specified)

| Items | Symbol | Parameter | Condition | Unit | Spec ADT6011 | | |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Typ | Max |
| supply current | Istartup | start up | Before turn on, VCC=11V | uA | - | 10 | 40 |
| | Iq | quiescent | After turn on, no switching | mA | - | 1.2 | 4.5 |
| | Icc | Switching | @ 70khz | mA | - | 3.5 | 6 |
| supply voltage | VCC | Operating voltage | | V | 11 | - | 37 |
| | UVLO(IC ON) | Start up threshold | | V | - | 16 | - |
| | UVLO(IC OFF) | UVLO | | V | 9 | 10 | 11 |
| | Hys | UVLO hysteresis | | V | 5 | 6 | 7 |
| | OVP | Over voltage protection | | V | 37 | 38.5 | 40 |
| Error Amp | Vref | EA reference | $T_a$=25°C | V | 2.475 | 2.5 | 2.525 |
| | Gv(*) | Voltage gain | Open loop | dB | - | 80 | - |
| | Gb(*) | Gain bandwidth | | Mhz | - | 1 | - |
| | Icomp | Source current | V(COMP)=3.6V, V(INV)=2.4V | mA | -3 | -10 | -17 |
| | | Sink current | V(COMP)=3.6V, V(INV)=2.6V | mA | 3 | 10 | 17 |
| | Vcomp | Upper clamp voltage | Isource=0.5mA | V | 5.3 | 5.8 | 6.3 |
| | | Low clamp voltage | Isink=0.5mA | V | 1.3 | 1.6 | 1.9 |
| Static OVP | SOVP | Static OVP threshold voltage | | V | 2.1 | 2.25 | 2.4 |
| Multiplier | Vmulti | Linear operating range | | V | 0~3 | - | - |
| | ΔVcs/Δvmulti | Output max. slope | V(MULT)=0 to 0.5V, V(COMP)=Upper clamp | V/V | 1.0 | 1.1 | - |
| | K | Gain | V(MULT)=1 to 2V, V(COMP)=3.5V | 1/V | 0.27 | 0.35 | 0.49 |
| CS Comp | Vcs | CS reference clamp | V(COMP)=4V, V(MULT)=4V | V | 0.92 | 1 | 1.08 |
| | Tleb | LEB | | ns | - | 200 | - |
| Zero Current Detector | Vzcd_upper | Upper clamp voltage | I(ZCD)=2.5mA | V | 5.1 | 5.8 | 6.6 |
| | Vzcd_lower | Lower clamp voltage | I(ZCD)=-2.5mA | V | - | 0 | - |
| | Vzcda(*) | Arming voltage(posedge) | | V | - | 1.4 | - |
| | Vzcdt(*) | Triggering voltage(negedge) | | V | - | 0.7 | - |
| Startup Timer | Tstart | Re-start timer period | | us | 60 | 120 | 200 |
| Gate Drive | Vol | Low output voltage | Io=100mA | V | - | 0.6 | 1.2 |
| | Voh | High output voltage | Io=-50mA | V | 12 | 14 | - |
| | Tr | Rising time | Cl=1nF | ns | - | 60 | 110 |
| | Tf | Falling time | Cl=1nF | ns | - | 30 | 70 |

Note 1 : The parameter is guaranteed by design. It is not tested in production.

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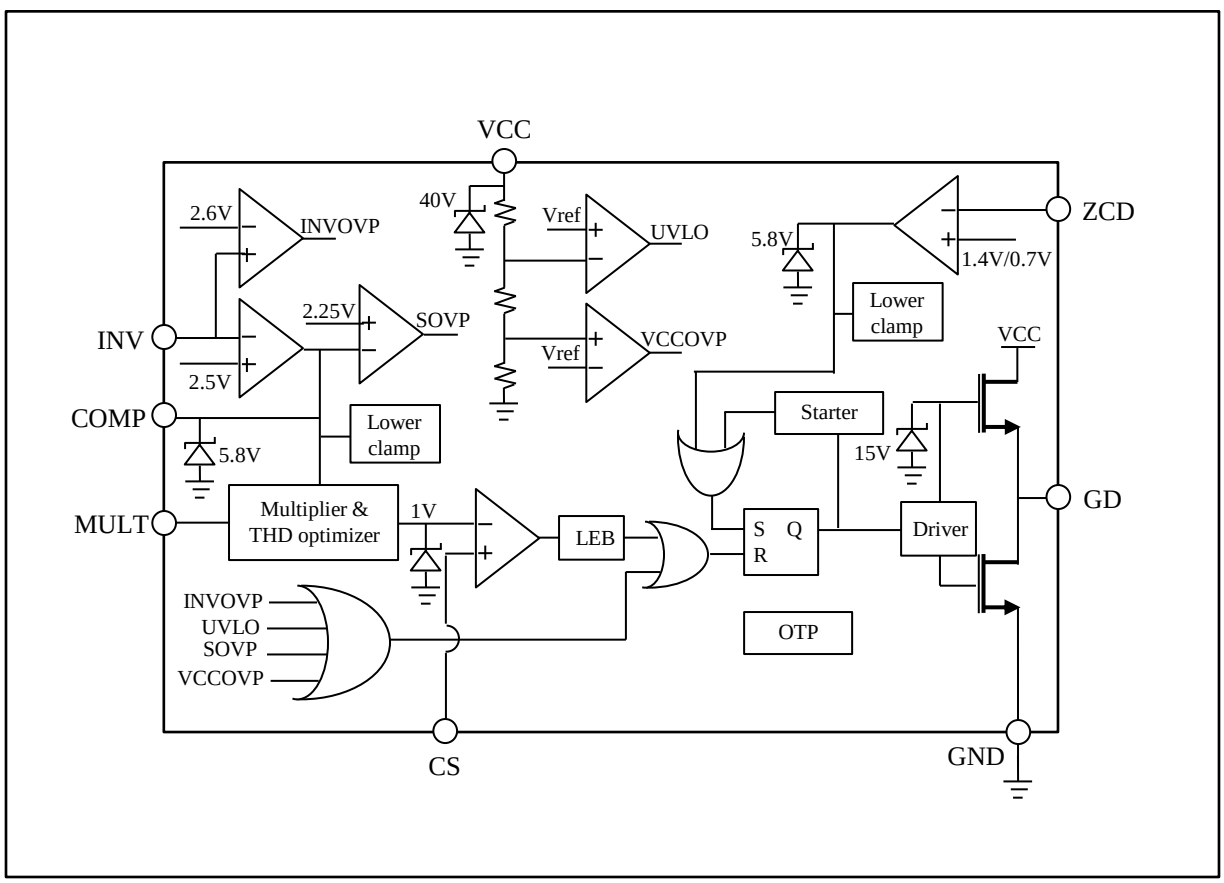
## PIN DESCRIPTION

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | INV | Inverting input of the error amplifier. |
| 2 | COMP | Output of Error amplifier. The compensation network is placed between INV and COMP pin. |
| 3 | MULT | Main input of the multiplier. Connected to the rectified main voltage via a resistor divider and provides the sinusoidal reference to the current loop. |
| 4 | CS | Current sense input and one input of internal PWM comparator. |
| 5 | ZCD | Zero Current Detection input. A negative edge triggers MOSFET' turn on. |
| 6 | GND | Ground. |
| 7 | GD | Gate driver output. |
| 8 | VCC | Supply voltage input. |

## BLOCK DIAGRAM

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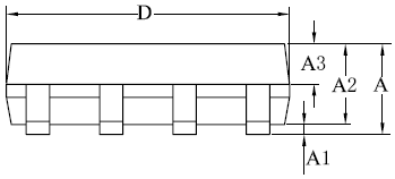
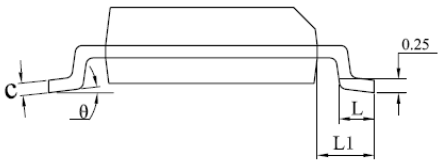
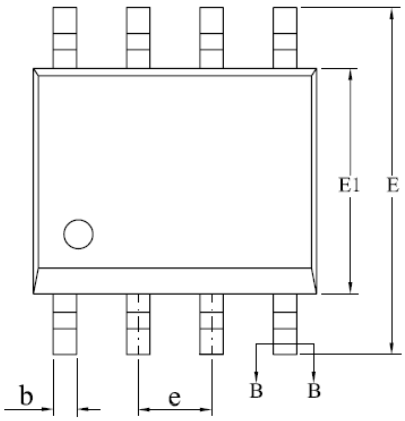
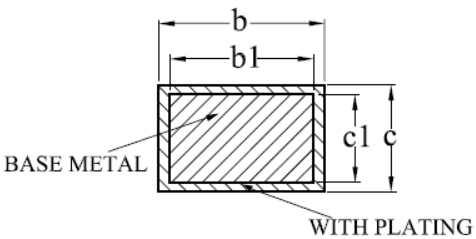
## PACKAGE DIMENSTION




SECTION B-B

| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | — | — | 1.77 |
| A1 | 0.08 | 0.18 | 0.28 |
| A2 | 1.20 | 1.40 | 1.60 |
| A3 | 0.55 | 0.65 | 0.75 |
| b | 0.39 | — | 0.48 |
| b1 | 0.38 | 0.41 | 0.43 |
| c | 0.21 | — | 0.26 |
| c1 | 0.19 | 0.20 | 0.21 |
| D | 4.70 | 4.90 | 5.10 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.70 | 3.90 | 4.10 |
| e | 1.27BSC | | |
| L | 0.50 | 0.65 | 0.80 |
| L1 | 1.05BSC | | |
| θ | 0 | — | 8° |

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