

# FAN7315

## LCD Back Light Inverter Drive IC

### Features

- Wide Dimming Range
  - Analog dimming ( 2.5 : 1 )
  - Burst dimming ( >100 : 1 )
- High Efficiency Single Stage Power Conversion
- Wide Input Voltage Range 7.4V to 20V
- Back Light Lamp Ballast and Soft Dimming
- Few External Components
- Precision Voltage Reference Trimmed to 2%
- ZVS full-bridge topology
- Soft Start
- PWM Control at fixed frequency
- Analog, Burst Dimming Function
- Open Lamp Protection
- Open Lamp Regulation
- Short Lamp Protection
- Thermal Protection
- 20 Pin SSOP

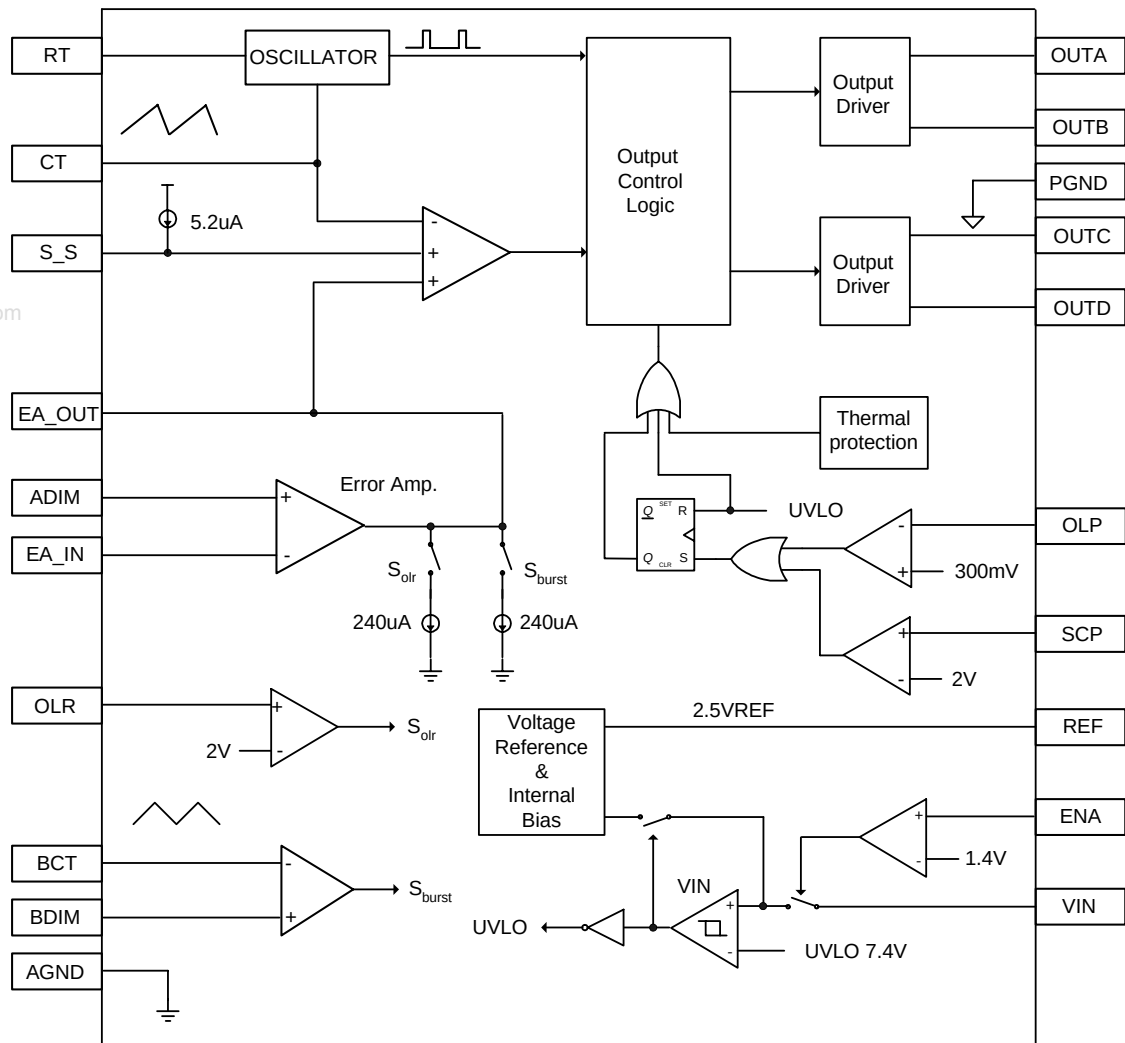
### Description

The FAN7315 provides all the control functions for a series parallel resonant converter and also contains a pulse width modulation (PWM) controller to develop a supply voltage. Typical operating frequency range is between 30kHz and 250kHz depending on the CCFL and the transformer's characteristics.

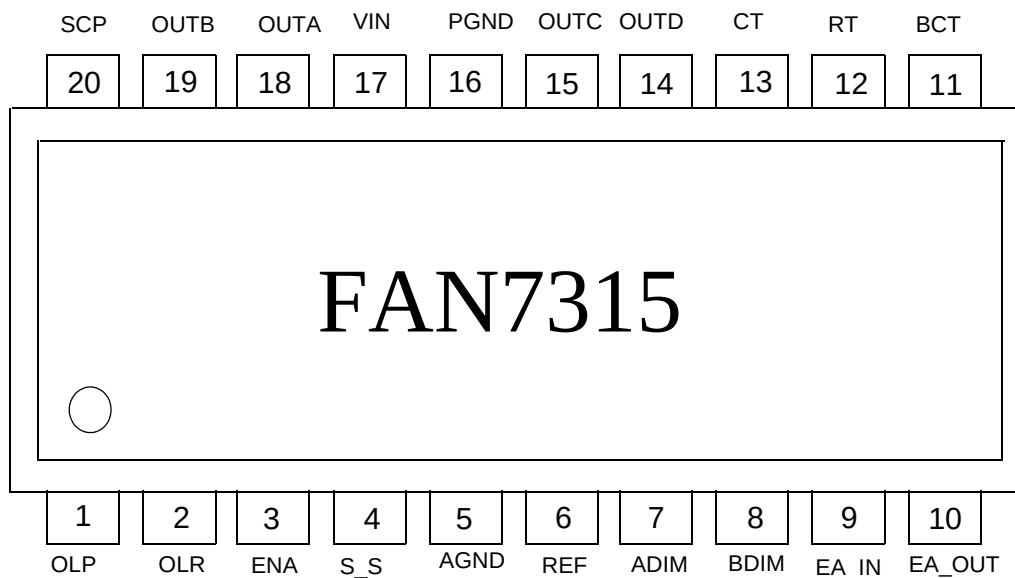
20-SSOP



## Internal Block Diagram



## Pin Assignments



## Pin Definitions

| No | Name   | Function Description   | No | Name | Function Description           |
|----|--------|------------------------|----|------|--------------------------------|
| 1  | OLP    | Open Lamp Protection   | 11 | BCT  | Burst Dimming Timing Capacitor |
| 2  | OLR    | Open Lamp Regulation   | 12 | RT   | Timing Resistor                |
| 3  | ENA    | Enable Input           | 13 | CT   | Timing Capacitor               |
| 4  | S/S    | Soft Start             | 14 | OUTD | NMOSFET Drive Output D         |
| 5  | AGND   | Analog Ground          | 15 | OUTC | PMOSFET Drive Output C         |
| 6  | V25    | 2.5V Reference Voltage | 16 | PGND | Power Ground                   |
| 7  | ADIM   | Analog Dimming Input   | 17 | VIN  | Supply Voltage                 |
| 8  | BDIM   | Burst Dimming Input    | 18 | OUTA | PMOSFET Drive Output A         |
| 9  | EA_IN  | Error Amplifier Input  | 19 | OUTB | NMOSFET Drive Output B         |
| 10 | EA_OUT | Error Amplifier Output | 20 | SCP  | Short Circuit Protection       |

## Absolute Maximum Ratings

V<sub>CC</sub>=12V, for typical values T<sub>a</sub>=25°C, for min/max values T<sub>a</sub> is the operating ambient temperature range with -40°C ≤ T<sub>a</sub> ≤ 85°C and 7.4V ≤ V<sub>CC</sub> ≤ 20V, unless otherwise specified.

| Characteristics                           | Symbol           | Value     | Unit |
|-------------------------------------------|------------------|-----------|------|
| Supply Voltage                            | V <sub>CC</sub>  | 7.4 ~ 20  | V    |
| Operating Temperature Range               | T <sub>opr</sub> | -40 ~ 85  | °C   |
| Storage Temperature Range                 | T <sub>stg</sub> | -65 ~ 150 | °C   |
| Thermal Resistance Junction-Air (Note1,2) | R <sub>θJA</sub> | 112       | °C/W |
| Power Dissipation                         | P <sub>d</sub>   | 1.1       | W    |

**Note:**

1. Thermal resistance test board  
Size: 76.2mm \* 114.3mm \* 1.6mm(1S0P)  
JEDEC standard: JESD51-3, JESD51-7
2. Assume no ambient airflow

## Electrical Characteristics

V<sub>CC</sub>=12V, for typical values T<sub>a</sub>=25°C, for min/max values T<sub>a</sub> is the operating ambient temperature range with -40°C ≤ T<sub>a</sub> ≤ 85°C and 7.4V ≤ V<sub>CC</sub> ≤ 20V, unless otherwise specified.

| Characteristics                       | Symbol               | Test Condition                                                     | Min. | Typ. | Max. | Unit |
|---------------------------------------|----------------------|--------------------------------------------------------------------|------|------|------|------|
| <b>REFERENCE SECTION</b>              |                      |                                                                    |      |      |      |      |
| Load Regulation                       | ΔV <sub>25load</sub> | 0 ≤ I <sub>25</sub> ≤ 3mA                                          | -    | 2    | 25   | mV   |
| Line Regulation                       | ΔV <sub>25line</sub> | 7.4V ≤ V <sub>CC</sub> ≤ 20V                                       | -    | 2    | 25   | mV   |
| 2.5V Regulation Voltage               | V <sub>25</sub>      | -                                                                  | 2.44 | 2.49 | 2.54 | V    |
| <b>OSCILLATOR SECTION(MAIN)</b>       |                      |                                                                    |      |      |      |      |
| Oscillation Frequency                 | fosc                 | T <sub>a</sub> =25°C, C <sub>t</sub> = 330pF, R <sub>t</sub> = 45k | 93   | 100  | 107  | kHz  |
|                                       |                      | C <sub>t</sub> = 330pF, R <sub>t</sub> = 45k                       | 89   | 100  | 111  | kHz  |
| CT High Voltage                       | V <sub>cth</sub>     | -                                                                  | -    | 1.95 | -    | V    |
| CT Low Voltage                        | V <sub>bctl</sub>    | -                                                                  | -    | 0.5  | -    | V    |
| <b>OSCILLATOR SECTION(BURST)</b>      |                      |                                                                    |      |      |      |      |
| Oscillation Frequency                 | fosc <sub>b</sub>    | C <sub>tb</sub> = 6.8nF, R <sub>t</sub> =45k                       | 150  | 191  | 232  | Hz   |
| BCT High Voltage                      | V <sub>bcth</sub>    | -                                                                  | -    | 2    | -    | V    |
| BCT Low Voltage                       | V <sub>bctl</sub>    | -                                                                  | -    | 0.5  | -    | V    |
| <b>ERROR AMP SECTION</b>              |                      |                                                                    |      |      |      |      |
| Error Amp Transconductance(Note1)     | G <sub>m</sub>       | V <sub>a</sub> = 1~2.5V                                            | 100  | 360  | 600  | umho |
| Output Sink Current                   | I <sub>sin</sub>     | EA_OUT = 1V                                                        | 44   | 73   | 100  | uA   |
| Output Source Current                 | I <sub>sur</sub>     | EA_OUT = 1V                                                        | 33   | 50   | 67   | uA   |
| Open Lamp Regulation Current          | I <sub>olr</sub>     | OLR=2.5V                                                           | 160  | 240  | 320  | uA   |
| EA_OUT High Volgate                   | V <sub>ea_outh</sub> |                                                                    | 2.2  | 2.5  | 2.8  | V    |
| <b>SOFT START SECTION</b>             |                      |                                                                    |      |      |      |      |
| Soft Start Current                    | I <sub>ss</sub>      | S <sub>S</sub> =0V                                                 | 3.5  | 5.2  | 6.9  | uA   |
| Soft Start Clamping Voltage           | V <sub>ssh</sub>     | -                                                                  | 2.2  | 2.55 | 2.9  | V    |
| <b>PROTECTION SECTION</b>             |                      |                                                                    |      |      |      |      |
| Open Lamp Protection Voltage          | V <sub>olp</sub>     | -                                                                  | 245  | 300  | 425  | mV   |
| Open Lamp Regulation Voltage          | V <sub>olr</sub>     | -                                                                  | 1.8  | 2    | 2.2  | V    |
| Short Circuit Protection Voltage      | V <sub>scp</sub>     | -                                                                  | 1.75 | 2    | 2.25 | V    |
| Thermal Shutdown On Temp.(Note1)      | TSD <sub>on</sub>    | -                                                                  | 130  | 150  | 170  | °C   |
| TSD Hysterisis(Note1)                 | TSD <sub>hy</sub>    | -                                                                  | -    | 30   | -    | °C   |
| <b>UNDER VOLTAGE LOCK OUT SECTION</b> |                      |                                                                    |      |      |      |      |
| Start Threshold Voltage On            | V <sub>thon</sub>    | -                                                                  | 5.2  | 6.3  | 7.4  | V    |
| UVLO Hysteresis                       | V <sub>hys</sub>     | -                                                                  | 100  | 300  | 500  | mV   |
| Start Up Current                      | I <sub>st</sub>      | V <sub>CC</sub> = V <sub>th</sub> -0.2V                            | 48   | 85   | 122  | uA   |
| Operating Supply Current              | I <sub>op</sub>      | V <sub>CC</sub> = 12V                                              | -    | -    | 2    | mA   |
| Stand-by Current                      | I <sub>sb</sub>      | V <sub>CC</sub> = 12V, ENA=0V                                      | 55   | 80   | 105  | uA   |

## Electrical Characteristics (Continued)

V<sub>CC</sub>=12V, for typical values T<sub>a</sub>=25°C, for min/max values T<sub>a</sub> is the operating ambient temperature range with -40°C ≤ T<sub>a</sub> ≤ 85°C and 7.4V ≤ V<sub>CC</sub> ≤ 20V, unless otherwise specified.

| Characteristics                               | Symbol            | Test Condition                                   | Min.                  | Typ.                 | Max.                  | Unit |
|-----------------------------------------------|-------------------|--------------------------------------------------|-----------------------|----------------------|-----------------------|------|
| <b>ON/OFF SECTION</b>                         |                   |                                                  |                       |                      |                       |      |
| Off State Input Voltage                       | V <sub>off</sub>  | -                                                | -                     | -                    | 0.7                   | V    |
| On State Input Voltage                        | V <sub>on</sub>   | -                                                | 2.1                   | -                    | -                     | V    |
| <b>OUTPUT SECTION</b>                         |                   |                                                  |                       |                      |                       |      |
| PMOS Gate High Voltage                        | V <sub>pdhv</sub> | V <sub>CC</sub> = 12V                            | -                     | V <sub>CC</sub>      | -                     | V    |
| PMOS Gate Low Voltage                         | V <sub>pdlv</sub> | V <sub>CC</sub> = 12V                            | V <sub>CC</sub> -7.25 | V <sub>CC</sub> -6.5 | V <sub>CC</sub> -5.55 |      |
| NMOS Gate High Voltage                        | V <sub>ndhv</sub> | V <sub>CC</sub> = 12V                            | 5.55                  | 6.5                  | 7.25                  | V    |
| NMOS Gate Low Voltage                         | V <sub>ndlv</sub> | V <sub>CC</sub> = 12V                            |                       |                      | 0.2                   |      |
| PMOS Gate Voltage With UVLO Activated         | V <sub>puv</sub>  | V <sub>CC</sub> = V <sub>th</sub> -0.5V          | V <sub>CC</sub> -0.2  | -                    | -                     | V    |
| NMOS Gate Voltage With UVLO Activated         | V <sub>nuv</sub>  | V <sub>CC</sub> = V <sub>th</sub> -0.5V          | -                     | -                    | 0.2                   |      |
| Rising Time(Note1)                            | T <sub>r</sub>    | V <sub>CC</sub> = 12V, C <sub>load</sub> =1700pF | -                     | 100                  | 300                   | ns   |
| Falling Time(Note1)                           | T <sub>f</sub>    | V <sub>CC</sub> = 12V, C <sub>load</sub> =1700pF | -                     | 100                  | 300                   | ns   |
| <b>Max./Min Overlap</b>                       |                   |                                                  |                       |                      |                       |      |
| Min. Overlap between diagonal switches(Note1) |                   | f <sub>osc</sub> =100KHz                         | -                     | 0                    | -                     | %    |
| Max. Overlap between diagonal switches(Note1) |                   | f <sub>osc</sub> =100KHz                         | -                     | 100                  | -                     | %    |
| <b>Delay Time</b>                             |                   |                                                  |                       |                      |                       |      |
| PDR_A/NDR_B(Note1)                            |                   | f <sub>osc</sub> =100KHz, R <sub>t</sub> =45k    | -                     | 325                  | -                     | ns   |
| PDR_C/NDR_D(Note1)                            |                   | f <sub>osc</sub> =100KHz, R <sub>t</sub> =45k    | -                     | 325                  | -                     | ns   |

### Note:

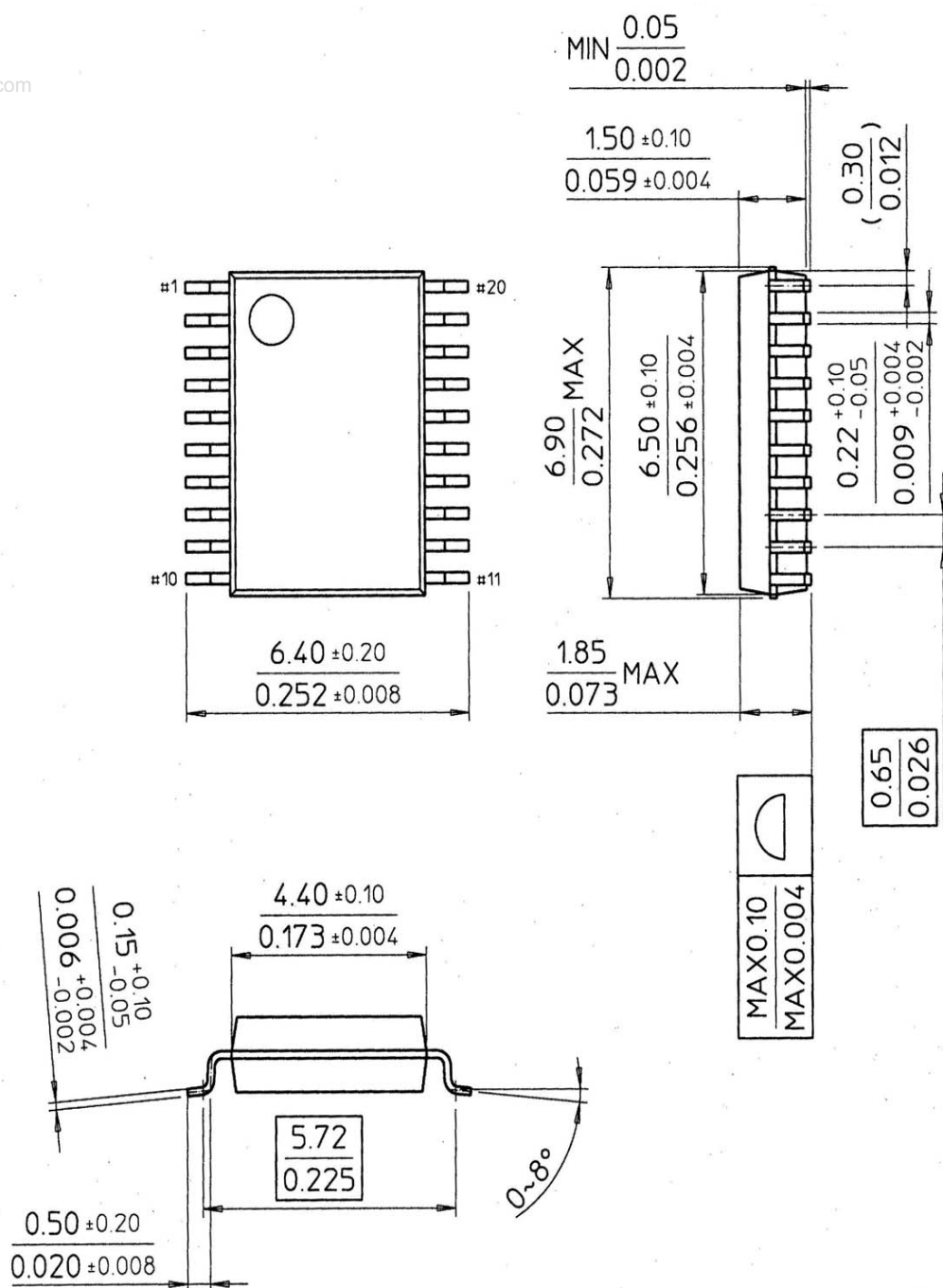
1. These parameters, although guaranteed, are not 100% tested in production.

# Mechanical Dimensions

Package

Dimensions in millimeters

## 20-SSOP



## Ordering Information

| Product number | Package | Operating Temperature |
|----------------|---------|-----------------------|
| FAN7315G       | 20-SSOP | -40°C ~ 85°C          |

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