
640KHz/1.22MHz Boost Converter with a 2.4A Switch

General Description

The KI8811 is a high efficiency boost DC-DC converter which combines a current mode, fixed frequency (1.22MHz or 640KHz programmable with FSEL pin) PWM architecture for TFT LCD displays and other portable applications.

KI8811 operates over a wide range of input supply voltage ($2.5V < V_{IN} < 5.5V$) and provides a regulated boost voltage (from V_{IN} up to as high as 15V). The KI8811 also features a skip cycle mode operation for power saving at light loads.

The built-in soft-start circuitry (externally programmable through the CSS pin) provides the freedom for the control of input current ramp rate. Overall current consumption during the power down mode (by pull MPD~ pin to logic low) is typically less than 0.1uA. Under-voltage lockout (UVLO), Thermal Shutdown (TSD), Over Current detection/protection (OVI) and other protection features are also incorporated onto the KI8811 to ensure the reliable operation under different operating circumstances.

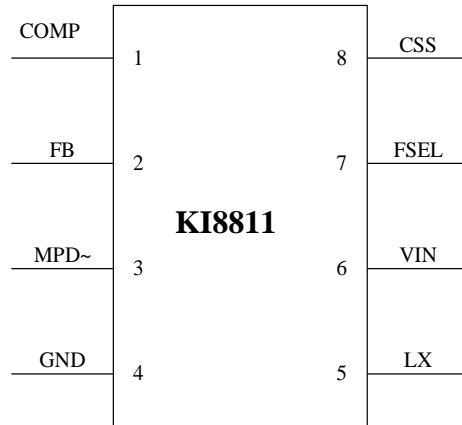
Features

- 90% efficiency
- Built-in 2.4A, 0.18 Ω , 20V power NMOS switch
- 640KHz/1.22MHz FSEL pin selectable fixed frequency PWM operation
- Built-in slope compensation circuitry to ensure system stability
- Adjustable output voltage from V_{IN} up to as high as 15V
- Programmable Soft-Start for optimizing control of input current ramp rate
- Built-in Skip Cycle mode to maintain high power efficiency at light loads
- Built-in Thermal Shutdown (TSD) and Over-current detection/protection (OVI)
- Built-in maximum duty cycle detection/protection
- Small 8-pin MSOP Package

Applications

- TFT LCD displays
- Portable Applications
- Handheld Devices

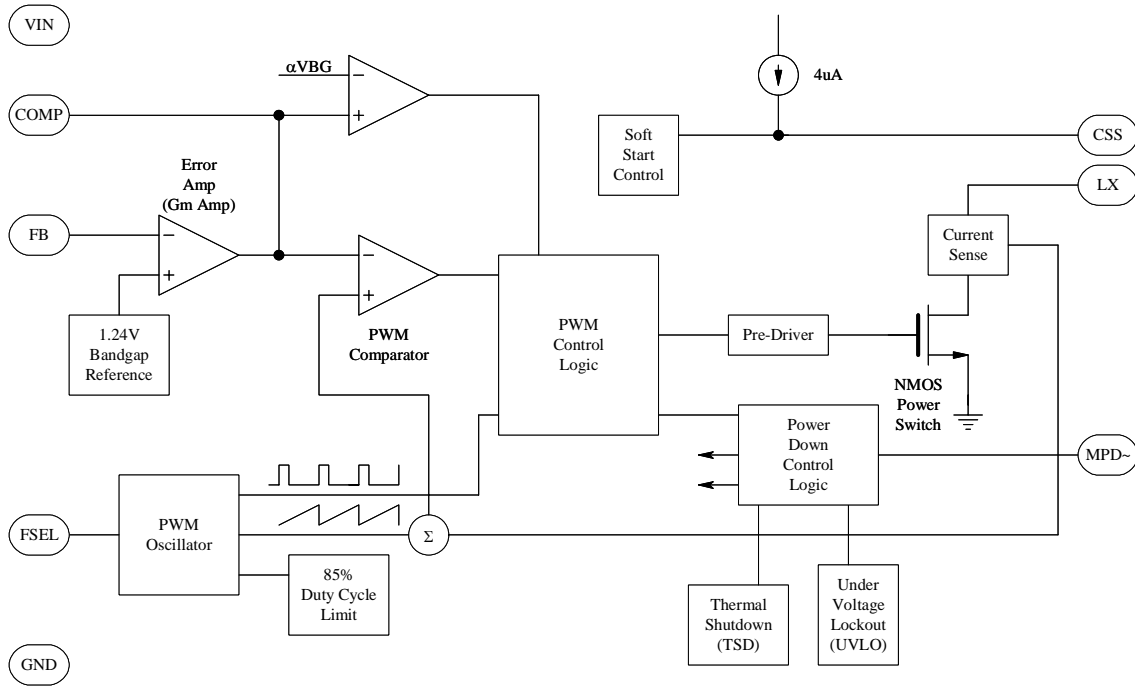
KI8811 Pin Assignment



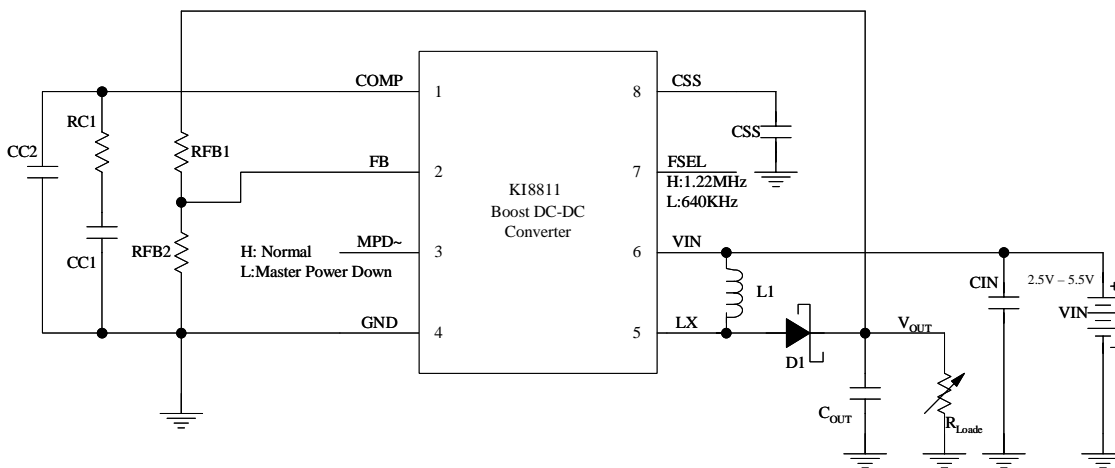
KI8811 Pin Description

| Pin Number | Pin Name | Pin description |
|------------|----------|--|
| 1 | COMP | Compensation pin for Error Amplifier. Connect RC1 and CC1 in series in-between COMP pin and ground (GND). Optional CC2 between COMP and GND pins will introduce the extra pole to cancel the unwanted zero due to the non-ideal ESR of the output capacitor. |
| 2 | FB | Output Voltage Feedback Loop pin. Connect an external precision resistor divider (RFB1 and RFB2) tap to FB pin (reference voltage is 1.18V nominal) will determine the nominal output voltage. i.e. $V_{OUT}=1.18 * (1+R_{FB1}/R_{FB2})$. |
| 3 | MPD~ | Master power down pin (active low). When MPD~ pin goes low, the KI8811 will enter the power down mode. |
| 4 | GND | Ground pin. |
| 5 | LX | Boost converter power switch pin. Connect the inductor (L1) and catch (Schottky) diode (D1) to LX pin with minimum trace area. |
| 6 | VIN | Supply voltage input pin (2.5V to 5.5V recommended). |
| 7 | FSEL | Frequency selection pin. When this pin is low, 640KHz PWM frequency is selected. When this pin is high, the PWM frequency is 1.22MHz. This pin is default low (640KHz) with internal 5uA pull down device. |
| 8 | CSS | Soft-Start current ramp rate control pin. Connect a soft start capacitor (C _{SS}) in-between this pin and ground (GND) to set the proper input current ramp rate. |

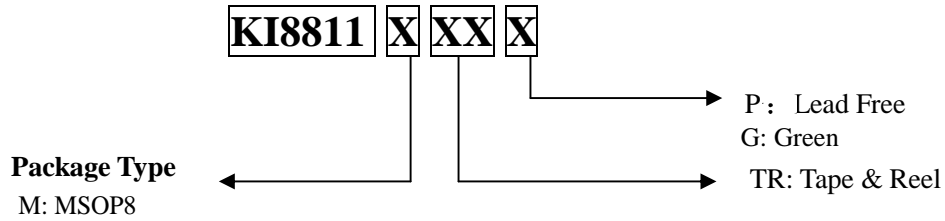
Functional Block Diagram



KT8811 Typical Application Circuit



Ordering Information



| Package | Temperature Range | Part Number | | Marking ID | | Packing Type |
|---------|-------------------|-------------|------------|------------|-------|--------------|
| | | Lead Free | Green | Lead Free | Green | |
| MSOP8 | -40 to 85°C | KI8811MTRP | KI8811MTRG | i8811 | i8811 | Tape & Reel |

KINETEIC's Pb-free products, as designated with "P" suffix in the part number, are RoHS compliant. Products with "G" suffix are available in green packages.

Absolute Maximum Ratings

| | |
|-----------------------------------|--|
| VIN | -0.3V to 5.5V |
| Lx to GND pin | -0.3V to +20V |
| MPD~, FSEL, FB to GND pin | -0.3V to (VIN+0.3V) |
| CSS, COMP to GND pin | -0.3V to (VIN+0.3V) |
| RMS LX pin Current | 1.2A |
| ESD Susceptibility | 2KV (Human Body Model) 200V (Machine Model) |
| Continuous Power Dissipation | Limited by internal Thermal Shutdown (TSD) |
| Operating Temperature Range | -40°C to 85°C |
| Junction Temperature | +150°C |
| Storage Temperature Range | -65°C to 150°C |
| Lead Temperature (Soldering, 10s) | +300°C |

Recommended Operating Conditions

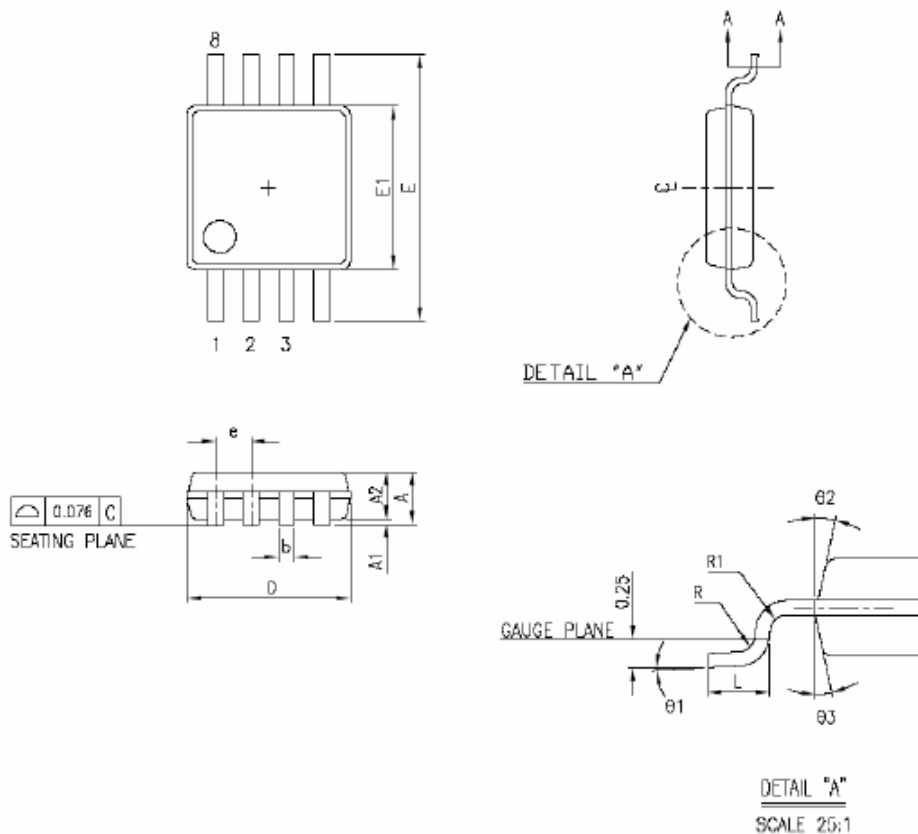
| | |
|------------------------------------|--------------------|
| VIN Supply Voltage Range | 2.5V to 5.5V |
| Operating Ambient Temperature (TA) | -40°C to 85°C |
| Output Voltage (VOUT) | VIN to 15V maximum |

Electrical Characteristics

Unless otherwise specified, $V_{IN} = MPD\sim = 3.0V$, $FSEL = GND$, $T_A = 0^\circ C$ to $85^\circ C$. Typical values are at $T_A = 25^\circ C$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-------------------------------|---|--|----------------|---------------|----------------|------------|
| V_{IN} | Input Supply Voltage | | 2.5 | | 5.5 | V |
| UVLO_H | Under Voltage Lockout_High | V_{IN} rising edge threshold | 2.15 | 2.28 | 2.42 | V |
| UVLO_L | Under Voltage Lockout_Low | V_{IN} falling edge threshold | 2.11 | 2.24 | 2.32 | V |
| I_{Q1_VIN} | Quiescent Current_PWM off | $V_{FB} = 1.3V$ (i.e. no PWM switching) | | 180 | 350 | μA |
| I_{Q2_VIN} | Quiescent Current_PWM on | $V_{FB} = 1.0V$ (i.e. with PWM switching) | | 2 | 5 | mA |
| I_{PD_VIN} | Power Down Current | MPD \sim pin = GND | | 0.1 | 10 | μA |
| V_{FB} | Feedback Voltage | V_{FB} Level in order to produce $V_{COMP} = 1.18V$ | 1.162 | 1.18 | 1.198 | V |
| I_{B_FB} | FB pin Bias current | $V_{FB} = 1.18V$ | | 0 | 40 | nA |
| G_m | Error Amp (E/A) Transconductance | $\Delta I = 5\mu A$ | 70 | 140 | 240 | $\mu mhos$ |
| A_v | E/A Voltage Gain | | | 700 | | V/V |
| $\Delta V_{FB}/\Delta V_{IN}$ | Feedback Voltage Line Regulation | Level to produce $V_{COMP} = 1.18V$ ($2.5V < V_{IN} < 5.5V$) | | 0.05 | 0.15 | % |
| F_{OSC_L} | Oscillator Frequency_Low | FSEL = GND | 540 | 640 | 740 | KHz |
| F_{OSC_H} | Oscillator Frequency_High | FSEL = VIN | 1.0 | 1.22 | 1.5 | MHz |
| D_{1_Max} | Maximum Duty Cycle | FSEL = GND | 79 | 85 | 92 | % |
| D_{2_Max} | Maximum Duty Cycle | FSEL = VIN | | 84 | | % |
| I_{SW_Max} | Switch Current Limit ² | $V_{FB} = 1V$ Duty Cycle = 65% | 1.8 | 2.4 | 3.4 | A |
| R_{DS_On} | ON Resistance | $I_{LX} = 1.2A$ | | 0.18 | 0.35 | Ω |
| I_{LX_Off} | Leakage Current | $V_{LX} = 12V$ | | 0.01 | 20 | μA |
| R_{CS} | Current Sense Transresistance | | 0.20 | 0.30 | 0.43 | Ω |
| $R_{SS-Reset}$ | Soft Start reset device maximum on resistance | | | | 300 | Ω |
| I_{CH_SS} | Soft Start Ramp Up Charge Current | $V_{CSS} = 1.2V$ | 1.5 | 4 | 7 | μA |
| V_{IL} | Digital input low voltage | MPD \sim and FSEL $2.5 < V_{IN} < 5.5V$ | | | 0.3 * V_{IN} | V |
| V_{IH} | Digital input high voltage | MPD \sim and FSEL $2.5V < V_{IN} < 5.5V$ | 0.7 * V_{IN} | | | V |
| V_{HYS} | Hysteresis | MPD \sim and FSEL | | 0.1* V_{IN} | | V |
| I_{FSEL} | FSEL pull down current | | 1.8 | 5 | 9 | μA |
| $I_{MPD\sim}$ | MPD \sim input current | | | 0.001 | 1 | μA |

8-pin MSOP Package Information



| SYMBOL | DIMENSION IN MM | | | DIMENSION IN INCH | | |
|--------|-----------------|------|-------|-------------------|--------|--------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | — | | 1.10 | — | | 0.043 |
| A1 | 0.05 | | 0.15 | 0.002 | | 0.006 |
| A2 | 0.81 | 0.86 | 0.91 | 0.032 | 0.034 | 0.036 |
| b | 0.25 | | 0.40 | 0.008 | | 0.012 |
| b1 | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 |
| c | 0.13 | | 0.23 | 0.005 | | 0.009 |
| c1 | 0.13 | 0.15 | 0.18 | 0.005 | 0.006 | 0.007 |
| D | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| E1 | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| E | 4.90 BSC | | | 0.193 BSC | | |
| L | 0.445 | 0.55 | 0.648 | 0.0175 | 0.0217 | 0.0255 |
| theta1 | 0° | | 6° | 0° | | 6° |
| theta2 | 12 REF. | | | 12 REF. | | |
| theta3 | 12 REF. | | | 12 REF. | | |
| R | 0.09 | | | 0.004 | | |
| R1 | 0.09 | | | 0.004 | | |
| JEDEC | MO-187AA | | | | | |