

# FAN7601B

## Green Current Mode PWM Controller

### Features

- Green Current Mode PWM Control
- Low Operating Current: Maximum 4 mA
- Burst Mode Operation
- Internal High-Voltage Startup Switch
- Under-Voltage Lockout (UVLO): 12 V / 8 V
- Latch Protection and Soft-Start Function
- Over-Voltage Protection: 19 V
- Operating Frequency up to 300 kHz
- Maximum Duty Cycle: 95%

### Applications

- Offline Adapter Applications
- Auxiliary Power Supplies

### Related Resources

- [AN4129 — Green Current Mode PWM Controller FAN7601](#)

### Description

The FAN7601B is a programmable frequency green current mode PWM controller. It is specially designed for the offline adapter applications and the auxiliary power supplies that require high efficiency at light load and no load. The internal high-voltage startup switch and burst mode reduce the power loss.

FAN7601B includes protections, such as latch protection and over-voltage protection. The latch protection can be used for over-voltage protection, thermal protection, and others. The soft-start prevents the output voltage overshoot at startup.

### Ordering Information

| Part Number | Operating Junction Temperature | Top Mark | Package | Packing Method |
|-------------|--------------------------------|----------|---------|----------------|
| FAN7601BMX  | -40°C to +150°C                | 7601B    | 8-SOP   | Tape & Reel    |

## Block Diagram

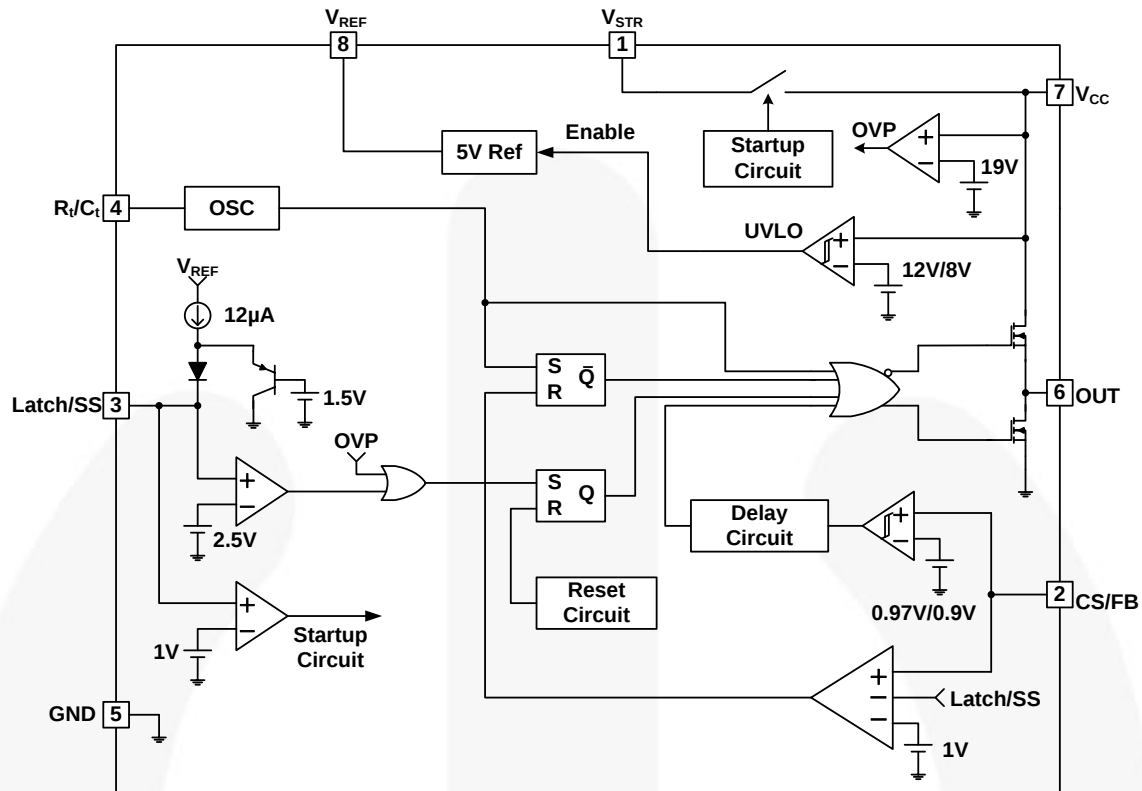


Figure 1. Internal Block Diagram

## Pin Configuration

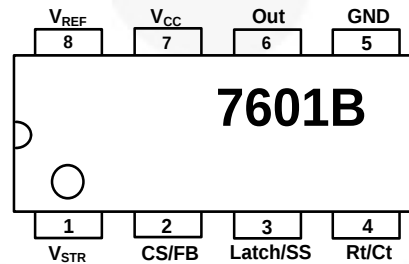


Figure 2. Pin Assignments (Top View)

## Pin Definitions

| Pin # (8-Pin) | Name      | Description                     |
|---------------|-----------|---------------------------------|
| 1             | $V_{STR}$ | Startup                         |
| 2             | CS/FB     | Current Sense and Feedback      |
| 3             | Latch/SS  | Latch Protection and Soft-Start |
| 4             | Rt/Ct     | Oscillator Timing               |
| 5             | GND       | Ground                          |
| 6             | Out       | Gate Drive Output               |
| 7             | $V_{CC}$  | IC Power Supply                 |
| 8             | $V_{REF}$ | Voltage Reference               |

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol      | Parameter                                  |                                   | Min. | Max. | Unit |
|-------------|--------------------------------------------|-----------------------------------|------|------|------|
| $V_{CC}$    | Supply Voltage                             |                                   |      | 20   | V    |
| $V_{CS/FB}$ | Input Voltage CS/FB                        |                                   | -0.3 | 20.0 | V    |
| $T_{STG}$   | Storage Temperature                        |                                   | -55  | +150 | °C   |
| $T_J$       | Recommended Operating Junction Temperature |                                   | -40  | +150 | °C   |
| $I_O$       | Output Current                             |                                   |      | 250  | mA   |
| $V_{STR}$   | $V_{STR}$ Input Voltage                    |                                   |      | 500  | V    |
| ESD         | Electrostatic Discharge Capability         | Human Body Model, JESD22-A114     |      | 2000 | V    |
|             |                                            | Charged Device Model, JESD22-C101 |      | 1500 |      |

## Thermal Impedance

| Symbol        | Parameter                               | Value | Unit |
|---------------|-----------------------------------------|-------|------|
| $\theta_{JA}$ | Thermal Resistance, Junction-to-Ambient | 180   | °C/W |

## Electrical Characteristics

$T_A = -25^{\circ}\text{C} \sim 125^{\circ}\text{C}$ ,  $V_{CC} = 14\text{ V}$ ,  $R_T = 9.5\text{ k}\Omega$ ,  $C_T = 2.2\text{ nF}$  unless otherwise specified.

| Symbol                       | Parameter                               | Conditions                                           | Min. | Typ. | Max. | Unit          |
|------------------------------|-----------------------------------------|------------------------------------------------------|------|------|------|---------------|
| <b>Reference Section</b>     |                                         |                                                      |      |      |      |               |
| $V_{REF}$                    | Reference Output Voltage                | $I_O = 1\text{ mA}$                                  | 4.85 | 5.00 | 5.15 | V             |
| $\Delta V_{REF1}$            | Line Regulation                         | $V_{CC} = 10\text{ V} \sim 18\text{ V}$              |      | 10   | 20   | mV            |
| $\Delta V_{REF2}$            | Load Regulation                         | $I_O = 1\text{ mA} \sim 10\text{ mA}$                |      | 20   | 30   | mV            |
| <b>Oscillator Section</b>    |                                         |                                                      |      |      |      |               |
| $f_{OSC}$                    | Initial Accuracy                        |                                                      | 90   | 100  | 110  | kHz           |
| $ST_V$                       | Voltage Stability                       | $V_{CC} = 10\text{ V} \sim 18\text{ V}$              |      | 1.0  | 1.5  | %             |
| $V_{OSC}$                    | Amplitude                               | $V_{pin4}$ peak-to-peak                              |      | 1.25 |      | V             |
| <b>PWM Section</b>           |                                         |                                                      |      |      |      |               |
| $V_{CS/FB1}$                 | CS/FB Threshold Voltage <sup>1</sup>    |                                                      | 0.9  | 1.0  | 1.1  | V             |
| $D_{MAX}$                    | Maximum Duty Cycle                      | $T_A = 25^{\circ}\text{C}$                           | 92   | 95   | 98   | %             |
| $D_{MIN}$                    | Minimum Duty Cycle                      |                                                      |      |      | 0    | %             |
| <b>Burst Mode Section</b>    |                                         |                                                      |      |      |      |               |
| $V_{CS/FB2}$                 | CS/FB Threshold Voltage <sup>2(1)</sup> |                                                      | 0.77 | 0.97 | 1.17 | V             |
| $V_{CS/FB3}$                 | CS/FB Threshold Voltage <sup>3(1)</sup> |                                                      | 0.7  | 0.9  | 1.1  | V             |
| <b>Soft-Start Section</b>    |                                         |                                                      |      |      |      |               |
| $I_{SS}$                     | Soft-Start Current                      | $V_{pin3} = \text{GND}$                              | 9    | 12   | 15   | $\mu\text{A}$ |
| $V_{SL}$                     | Soft-Start Limit Voltage <sup>(2)</sup> | $I_{SS} = 1\text{ }\mu\text{A}$                      | 1.2  | 1.5  | 1.8  | V             |
| <b>Protection Section</b>    |                                         |                                                      |      |      |      |               |
| $V_{LATCH}$                  | Latch Voltage                           |                                                      | 2.25 | 2.50 | 2.75 | V             |
| $V_{OVP}$                    | Over-Voltage Protection                 |                                                      | 18   | 19   | 20   | V             |
| <b>UVLO Section</b>          |                                         |                                                      |      |      |      |               |
| $V_{TH}$                     | Start Threshold Voltage                 |                                                      | 11   | 12   | 13   | V             |
| $V_{TL}$                     | Minimum Operating Voltage               |                                                      | 7    | 8    | 9    | V             |
| <b>Total Current Section</b> |                                         |                                                      |      |      |      |               |
| $I_{OP}$                     | Operating Supply Current                |                                                      |      | 3    | 4    | mA            |
| <b>Output Section</b>        |                                         |                                                      |      |      |      |               |
| $V_{OL}$                     | Low Output Voltage                      | $T_A = 25^{\circ}\text{C}$ , $I_O = 100\text{ mA}$   |      | 2.0  | 2.5  | V             |
| $V_{OH}$                     | High Output Voltage                     | $T_A = 25^{\circ}\text{C}$ , $I_O = -100\text{ mA}$  | 11.5 | 12.0 | 14.0 | V             |
| $t_r$                        | Rising Time <sup>(1)</sup>              | $T_A = 25^{\circ}\text{C}$ , $C_I = 1\text{ nF}$     |      | 45   | 150  | ns            |
| $t_f$                        | Falling Time <sup>(1)</sup>             | $T_A = 25^{\circ}\text{C}$ , $C_I = 1\text{ nF}$     |      | 35   | 150  | ns            |
| <b>Startup Section</b>       |                                         |                                                      |      |      |      |               |
| $I_{STR}$                    | $V_{STR}$ Startup Current               | $V_{STR} = 30\text{ V}$ , $T_A = 25^{\circ}\text{C}$ | 0.5  | 1.0  | 1.5  | mA            |

### Notes:

- These parameters, although guaranteed, are not 100% tested in production.
- It is recommended to connect a 1 M $\Omega$  resistor between the Latch/SS pin and GND to prevent abnormal operation of the latch protection by noise coupling.

## Typical Performance Characteristics

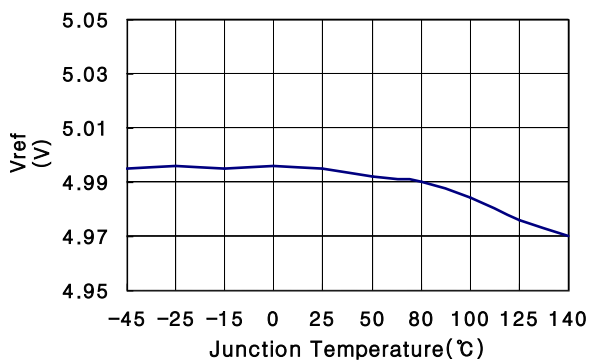


Figure 3. Trimmed Reference Voltage

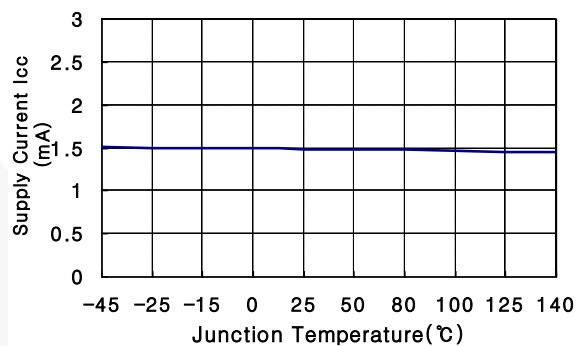


Figure 4. Supply Current

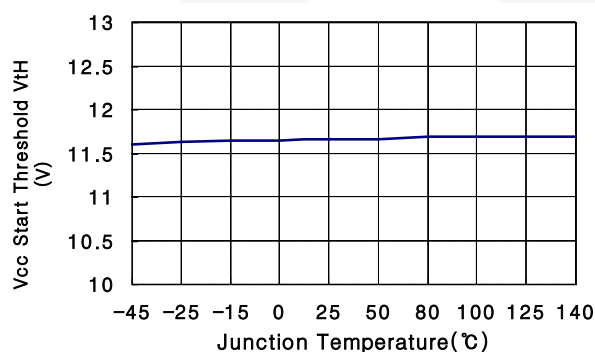


Figure 5. V<sub>CC</sub> Start Threshold Voltage

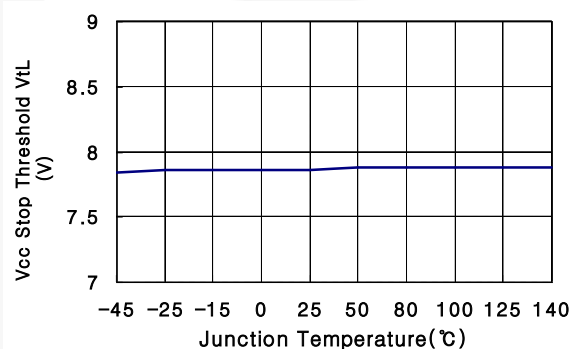


Figure 6. V<sub>CC</sub> Stop Threshold Voltage

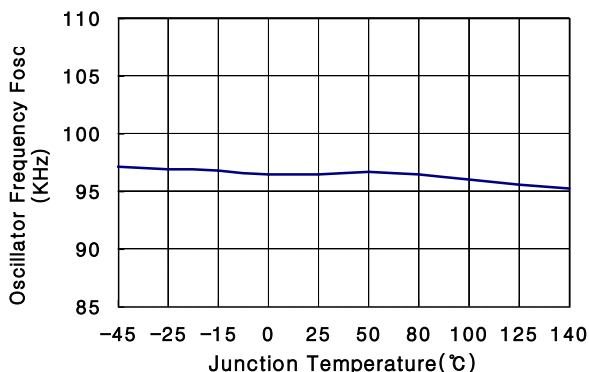


Figure 7. Oscillator Frequency

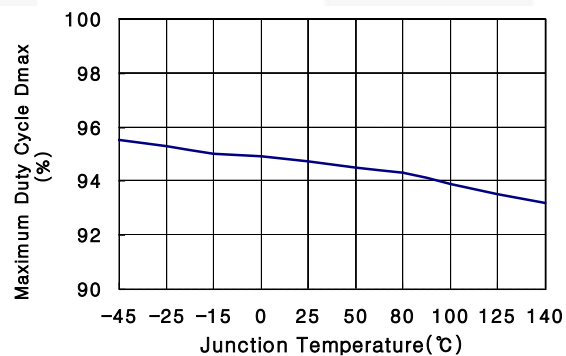


Figure 8. Maximum Duty Cycle

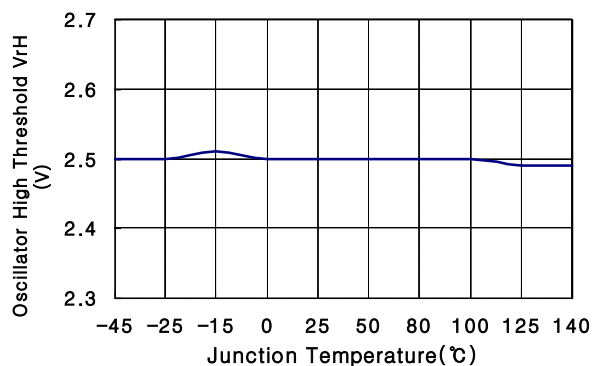


Figure 9. Oscillator High Threshold Voltage

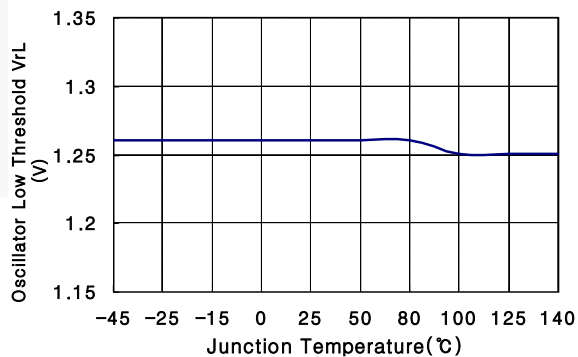


Figure 10. Oscillator Low Threshold Voltage

## Typical Performance Characteristics (Continued)

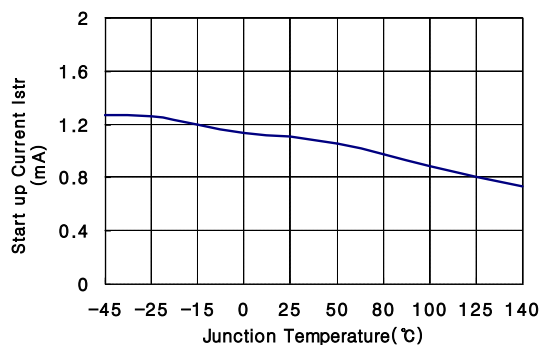


Figure 11. Startup Current

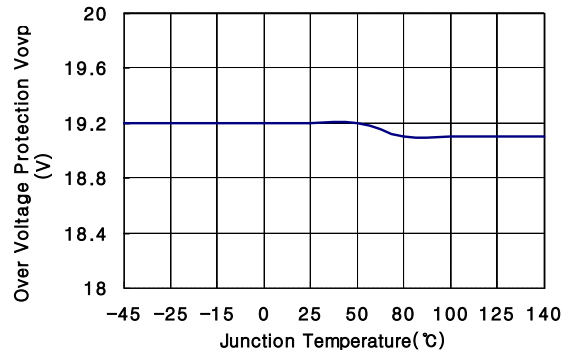


Figure 12. Over-Voltage Protection Level

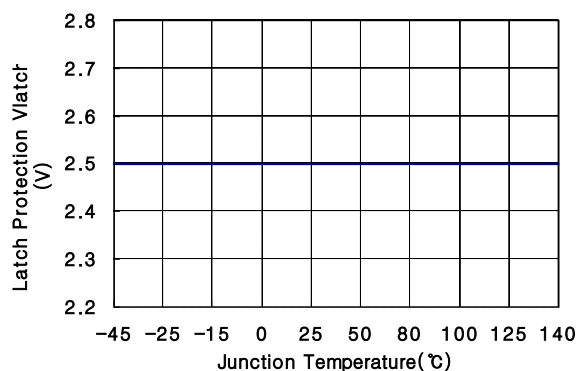


Figure 13. Latch Protection Voltage

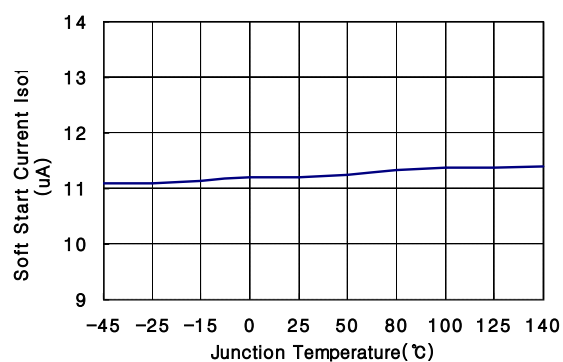


Figure 14. Soft-Start Current

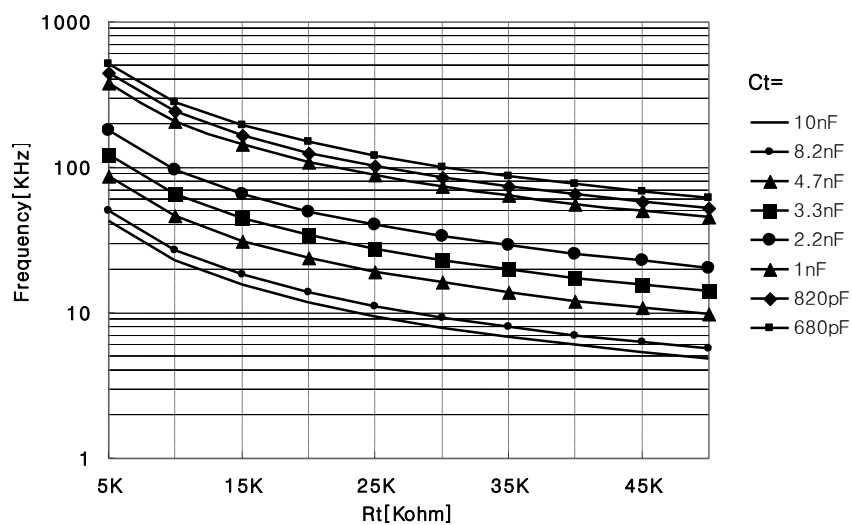
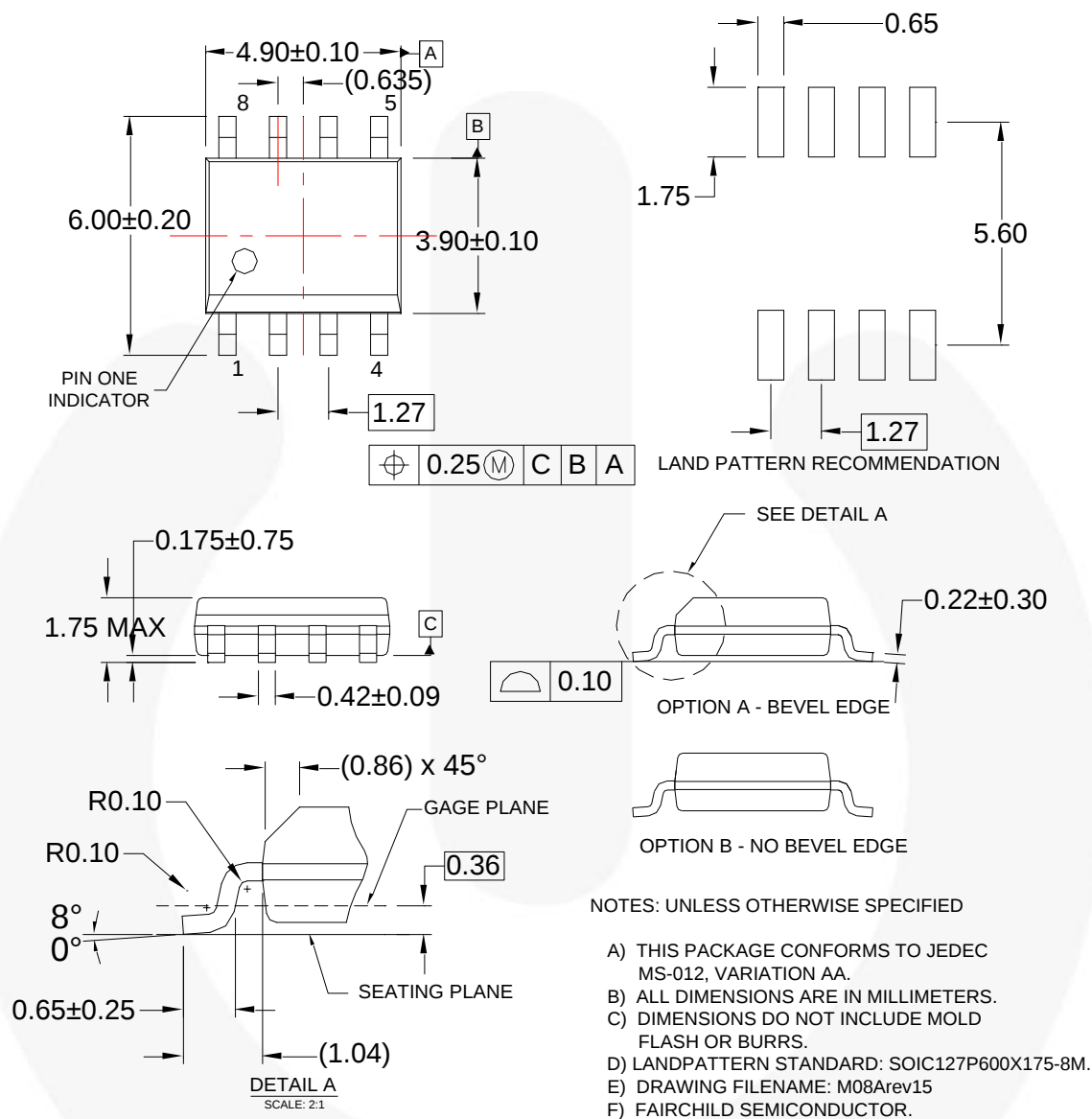


Figure 15. Oscillator Frequency Characteristic

## Physical Dimensions



**Figure 16. 8-Lead, Small Outline Package (SOP)**

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|  | MicroPak™                                      | SuperFET®                                                                         | UHC®             |
| Fairchild®                                                                        | MicroPak2™                                     | SuperSOT™-3                                                                       | Ultra FRFET™     |
| Fairchild Semiconductor®                                                          | MillerDrive™                                   | SuperSOT™-6                                                                       | UniFET™          |
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