

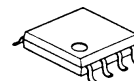
## PWM control Step-Down switching regulator IC

### ■GENERAL DESCRIPTION

**NJU7630** is a high speed low voltage operation switching regulator control IC. It features a totem pole driver that can directly drive an external MOS-FET.

Internal soft-start function, dead time control and timer latch function are included, requiring no external components. All parameters can be optimized by additional external components for design flexibility.

### ■PACKAGE OUTLINE



**NJU7630M**

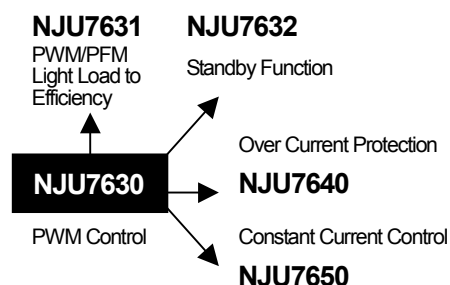


**NJU7630RB1**

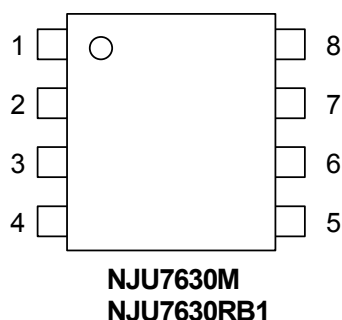
### ■FEATURES

- PWM switching control
- Operating Voltage           2.2V to 8V
- Wide Oscillator Range     300kHz to 1MHz
- Maximum Duty Cycle     100%
- Quiescent Current        800μA typ.
- Soft-Start Function       Internal : 16ms typ. or adjustable
- Dead Time Control
- Timer Latch for Short Circuit Protection
- C-MOS Technology
- Package Outline           NJU7630M     : DMP8  
                                  NJU7630RB1 : TVSP8

### ■PRODUCT VARIATION



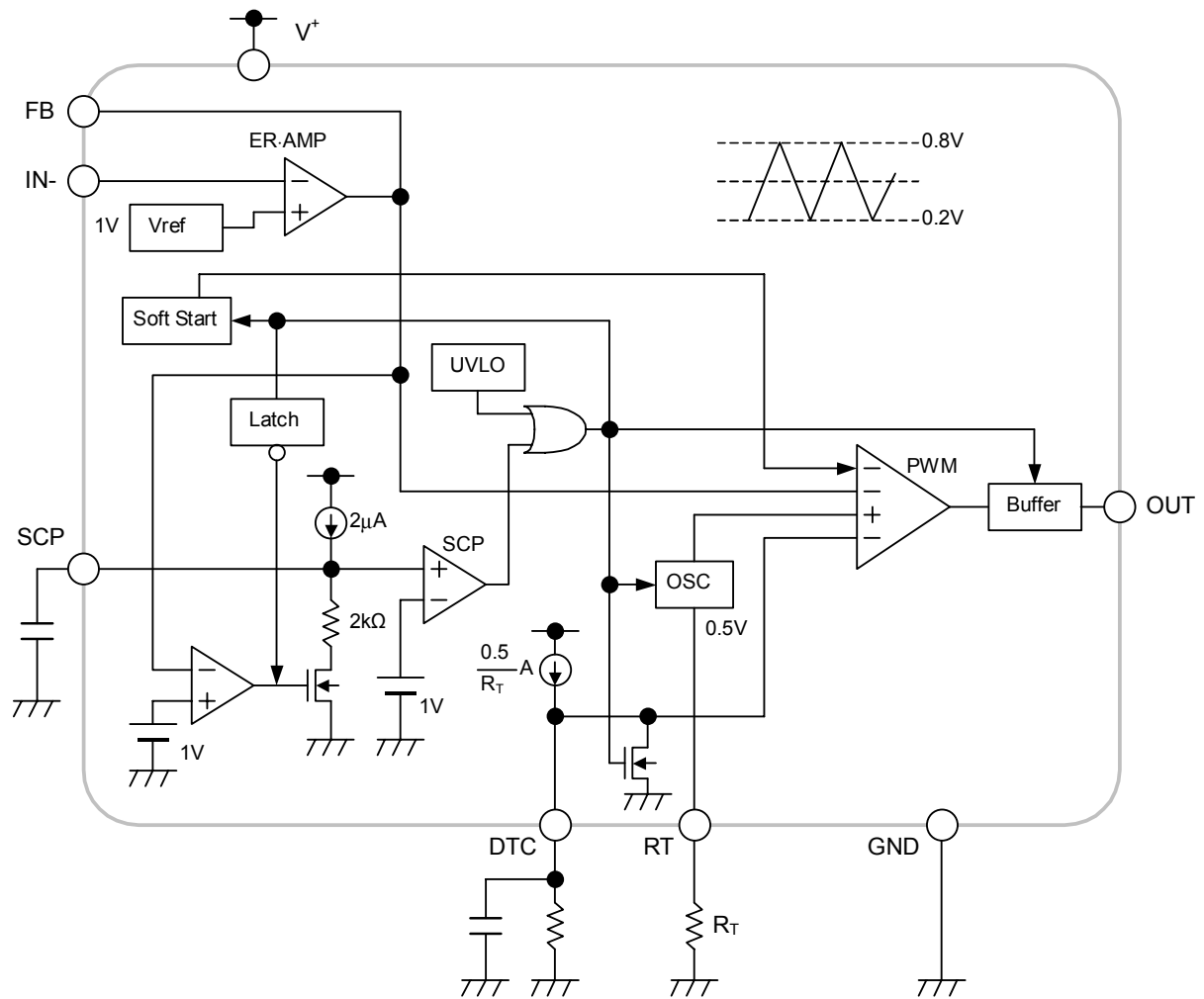
### ■PIN CONFIGURATION



#### PIN FUNCTION

1. OUT
2. V<sup>+</sup>
3. FB
4. IN-
5. SCP
6. DTC
7. RT
8. GND

## ■BLOCK DIAGRAM



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

| PARAMETER                   | SYMBOL    | MAXIMUM RATINGS         | UNIT |
|-----------------------------|-----------|-------------------------|------|
| Supply Voltage              | $V^+$     | +9                      | V    |
| Output Pin Current          | $I_O$     | $\pm 50$                | mA   |
| Power Dissipation           | $P_D$     | DMP8 :300<br>TVSP8 :320 | mW   |
| Operating Temperature Range | $T_{OPR}$ | -40 ~ +85               | °C   |
| Storage Temperature Range   | $T_{STG}$ | -40 ~ +125              | °C   |

## ■RECOMMENDED OPERATING CONDITIONS (Ta=25°C)

| PARAMETER                  | SYMBOL    | MIN. | TYP. | MAX.  | UNIT |
|----------------------------|-----------|------|------|-------|------|
| Operating Voltage          | $V^+$     | 2.2  | —    | 8     | V    |
| Oscillator Timing Resistor | $R_T$     | 30   | 47   | 120   | kΩ   |
| Oscillation Frequency      | $f_{OSC}$ | 300  | 700  | 1,000 | kHz  |

## ■ELECTRICAL CHARACTERISTICS ( $V^+=3.3V$ , $R_T=47k\Omega$ , Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-----------|--------|----------------|------|------|------|------|
|-----------|--------|----------------|------|------|------|------|

### Under Voltage Lockout Block

|                       |              |                         |     |     |     |    |
|-----------------------|--------------|-------------------------|-----|-----|-----|----|
| ON Threshold Voltage  | $V_{T\_ON}$  | $V^+ = L \rightarrow H$ | 1.9 | 2.0 | 2.1 | V  |
| OFF Threshold Voltage | $V_{T\_OFF}$ | $V^+ = H \rightarrow L$ | 1.8 | 1.9 | 2.0 | V  |
| Hysteresis Voltage    | $V_{HYS}$    |                         | 60  | 100 | —   | mV |

### Soft Start Block

|                 |          |                                  |   |    |    |    |
|-----------------|----------|----------------------------------|---|----|----|----|
| Soft Start Time | $T_{SS}$ | $V_{T\_ON} \rightarrow$ Duty=80% | 8 | 16 | 24 | ms |
|-----------------|----------|----------------------------------|---|----|----|----|

### Short Circuit Protection Block

|                                     |                |              |      |      |      |    |
|-------------------------------------|----------------|--------------|------|------|------|----|
| Input Threshold Voltage             | $V_{T\_PC}$    | FB Pin       | 0.95 | 1.00 | 1.05 | V  |
| Charge Current                      | $I_{CHG}$      | $V_{SCP}=0V$ | 1.5  | 2    | 2.5  | μA |
| Latch Mode<br>ON Threshold Voltage  | $V_{T\_LA}$    | SCP Pin      | 0.95 | 1.00 | 1.05 | V  |
| Latch Mode<br>OFF Threshold Voltage | $V_{T\_LAOFF}$ | SCP Pin      | 0.2  | 0.45 | 0.7  | V  |

### Oscillator Block

|                                          |           |                    |     |     |     |     |
|------------------------------------------|-----------|--------------------|-----|-----|-----|-----|
| RT Pin Voltage                           | $V_{RT}$  |                    | -5% | 0.5 | +5% | V   |
| Oscillation Frequency                    | $f_{OSC}$ |                    | 630 | 700 | 770 | kHz |
| Oscillate Supply Voltage<br>Fluctuations | $f_{DV}$  | $V^+=2.2V \sim 8V$ | —   | 1   | —   | %   |
| Oscillate Temperature<br>Fluctuations    | $f_{DT}$  | Ta=-40°C ~ +85°C   | —   | 3   | —   | %   |

## ■ELECTRICAL CHARACTERISTICS ( $V^+=3.3V$ , $R_T=47k\Omega$ , $T_a=25^\circ C$ )

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-----------|--------|----------------|------|------|------|------|
|-----------|--------|----------------|------|------|------|------|

### Error Amplifier Block

|                        |            |                                           |       |      |       |         |
|------------------------|------------|-------------------------------------------|-------|------|-------|---------|
| Reference Voltage      | $V_B$      |                                           | -1.0% | 1.00 | +1.0% | V       |
| Input Bias Current     | $I_B$      |                                           | -0.1  | —    | 0.1   | $\mu A$ |
| Open Loop Gain         | $A_V$      |                                           | —     | 80   | —     | dB      |
| Gain Bandwidth Product | $G_B$      |                                           | —     | 1    | —     | MHz     |
| Output Source Current  | $I_{OM+1}$ | $V_{FB}=1V$ , $V_{IN-}=0.9V$              | 25    | 55   | 95    | mA      |
|                        | $I_{OM+2}$ | $V_{FB}=1V$ , $V_{IN-}=0.9V$ , $V^+=2.2V$ | 4     | 9    | 16    | mA      |
| Output Sink Current    | $I_{OM-}$  | $V_{FB}=1V$ , $V_{IN-}=1.1V$              | 0.10  | 0.16 | 0.22  | mA      |

### PWM Compare Block

|                         |                    |                                     |      |      |      |   |
|-------------------------|--------------------|-------------------------------------|------|------|------|---|
| Input Threshold Voltage | $V_{T0}$           | Duty=0%                             | 0.16 | 0.22 | 0.28 | V |
|                         | $V_{T50}$          | Duty=50%                            | 0.44 | 0.5  | 0.56 | V |
| Maximum Duty Cycle      | $M_{AX}D_{UTY\_1}$ | $V_{FB}=0.9V$                       | 100  | —    | —    | % |
|                         | $M_{AX}D_{UTY\_2}$ | $V_{FB}=0.9V$ , $R_{DTC}=47k\Omega$ | 40   | 50   | 60   | % |

### Output Block

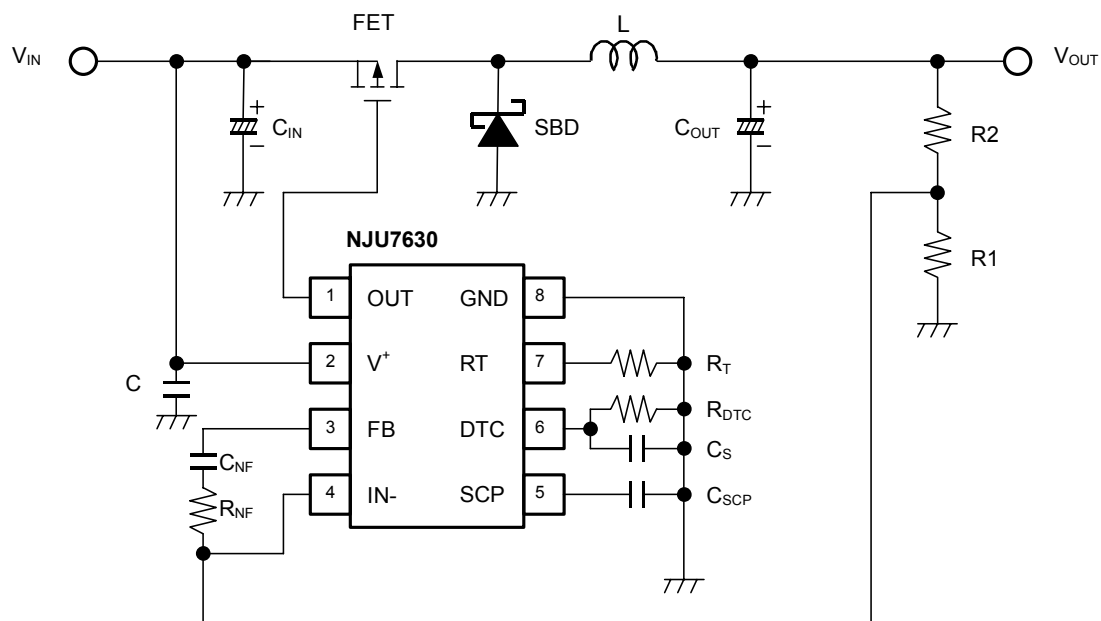
|                                 |          |             |   |    |    |          |
|---------------------------------|----------|-------------|---|----|----|----------|
| Output High Level ON Resistance | $R_{OH}$ | $I_O=-20mA$ | — | 10 | 20 | $\Omega$ |
| Output Low Level ON Resistance  | $R_{OL}$ | $I_O=+20mA$ | — | 5  | 10 | $\Omega$ |

### General Characteristics

|                   |          |                 |   |     |      |         |
|-------------------|----------|-----------------|---|-----|------|---------|
| Quiescent Current | $I_{DD}$ | $R_L=Non\ Load$ | — | 800 | 1200 | $\mu A$ |
|-------------------|----------|-----------------|---|-----|------|---------|

## ■ TYPICAL APPLICATIONS

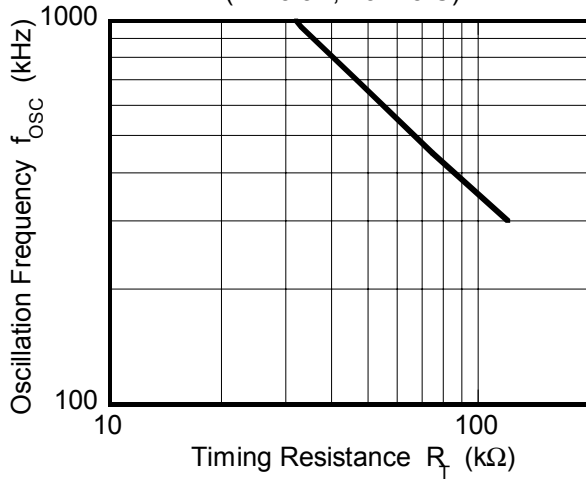
### Step-Down Converter



## ■ TYPICAL CHARACTERISTICS

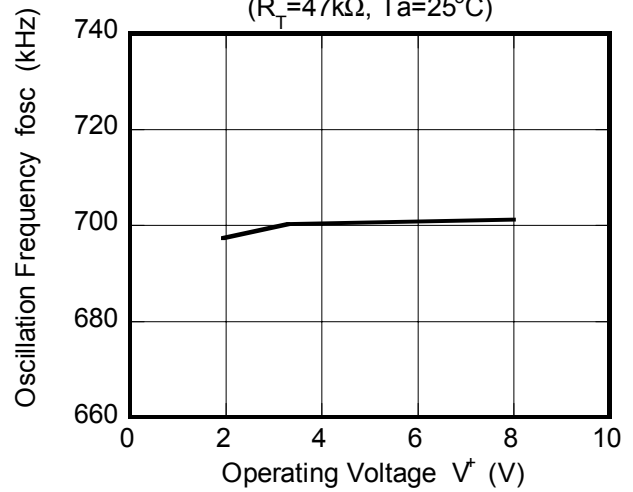
Oscillation Frequency vs. Timing Resistance

( $V^+ = 3.3\text{V}$ ,  $T_a = 25^\circ\text{C}$ )



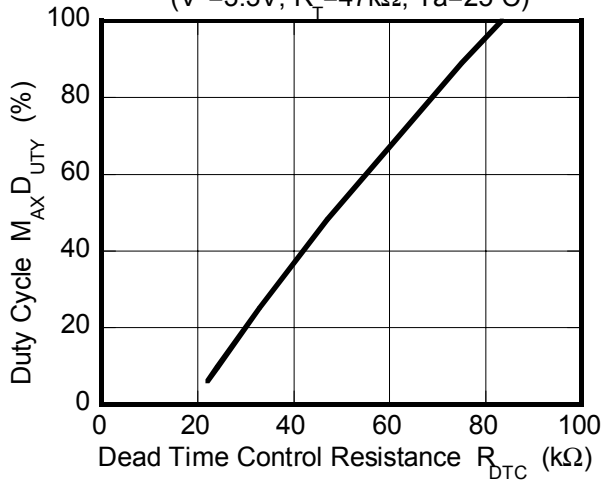
Oscillation Frequency vs. Operating Voltage

( $R_T = 47\text{k}\Omega$ ,  $T_a = 25^\circ\text{C}$ )



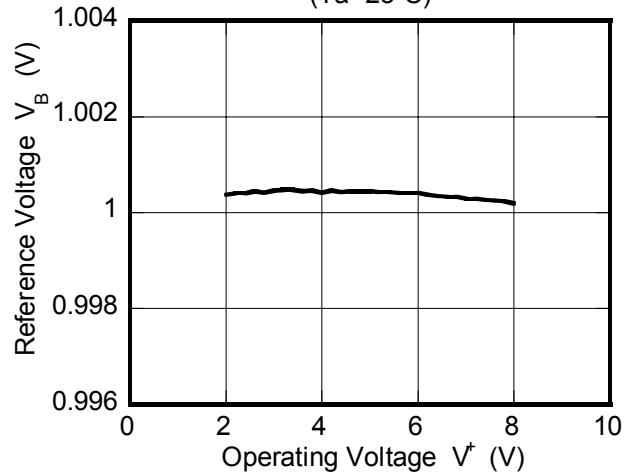
Duty Cycle vs.  $R_{DTC}$

( $V^+ = 3.3\text{V}$ ,  $R_T = 47\text{k}\Omega$ ,  $T_a = 25^\circ\text{C}$ )



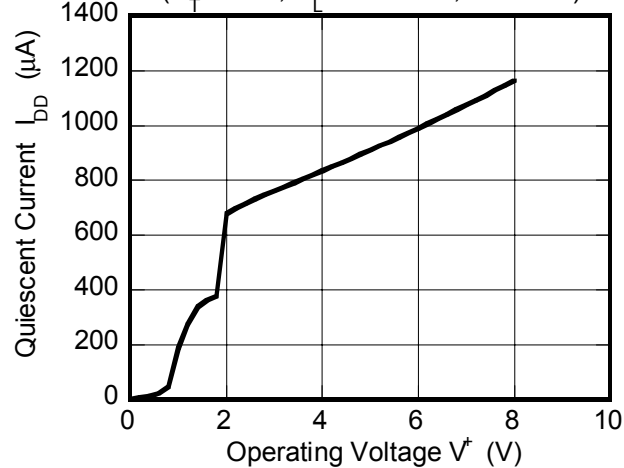
Reference Voltage vs. Operating Voltage

( $T_a = 25^\circ\text{C}$ )

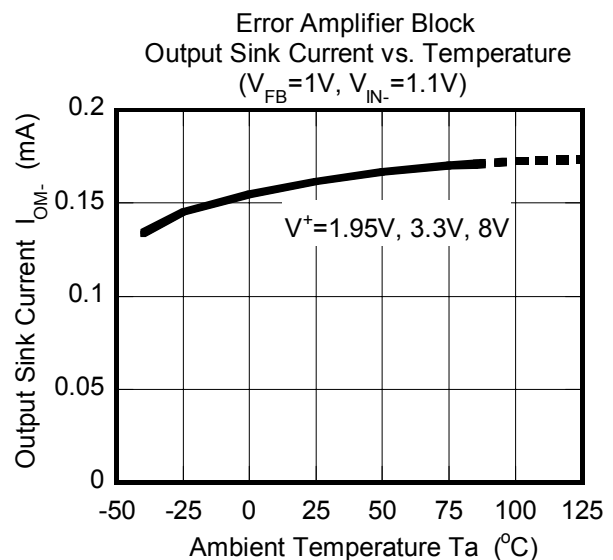
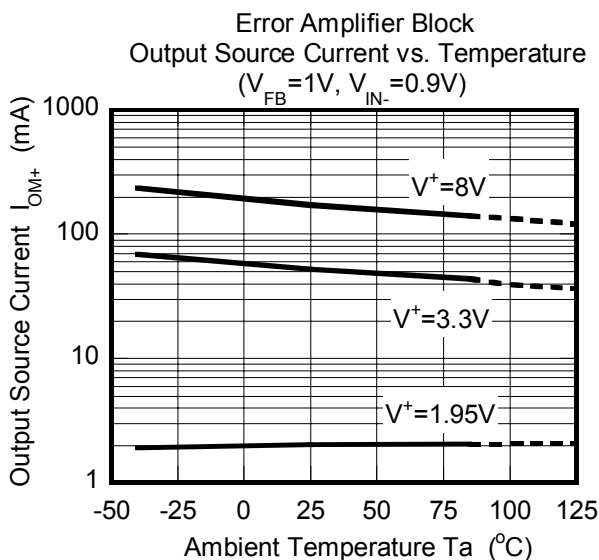
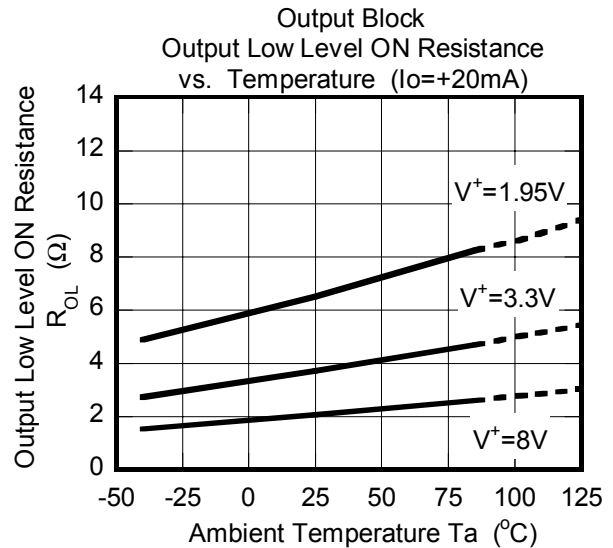
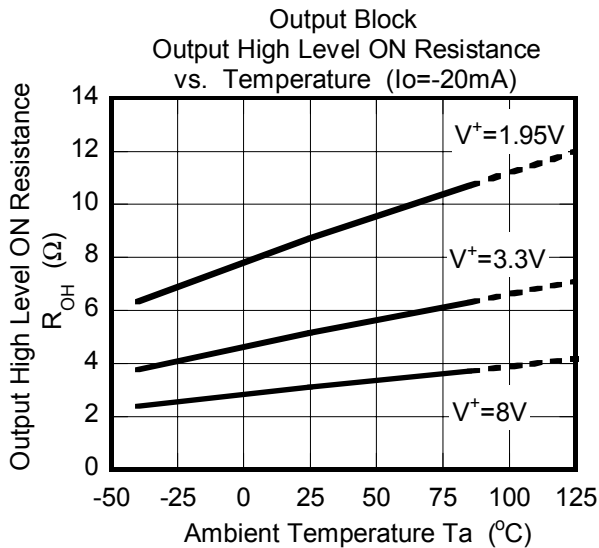
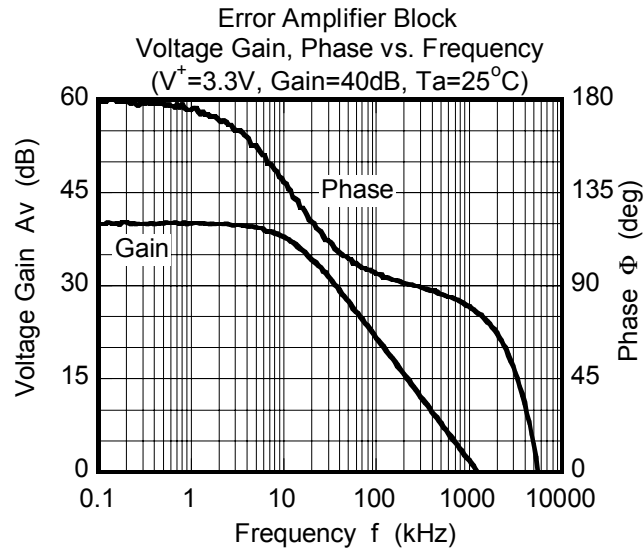


Quiescent Current vs. Operating Voltage

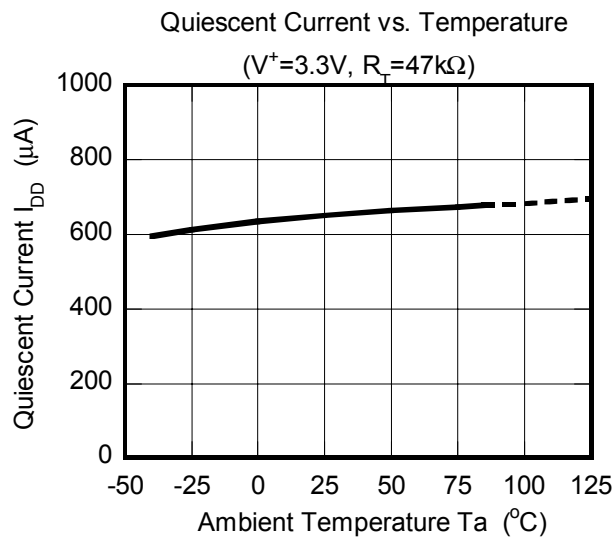
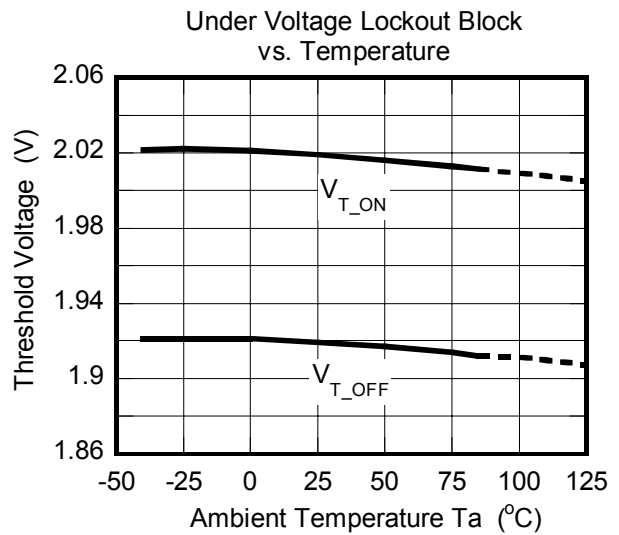
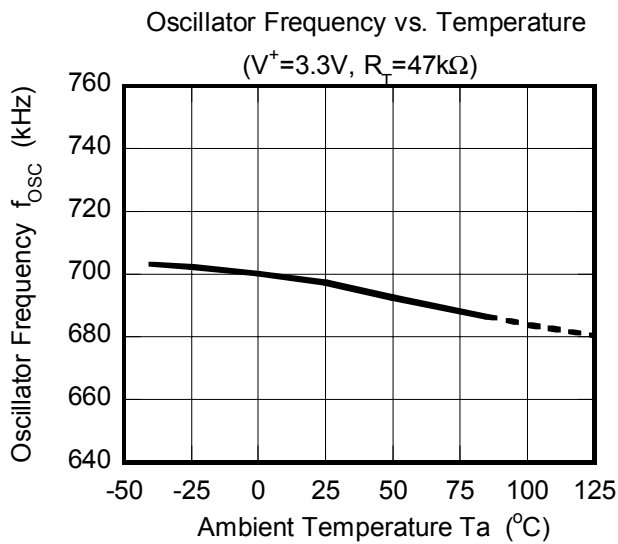
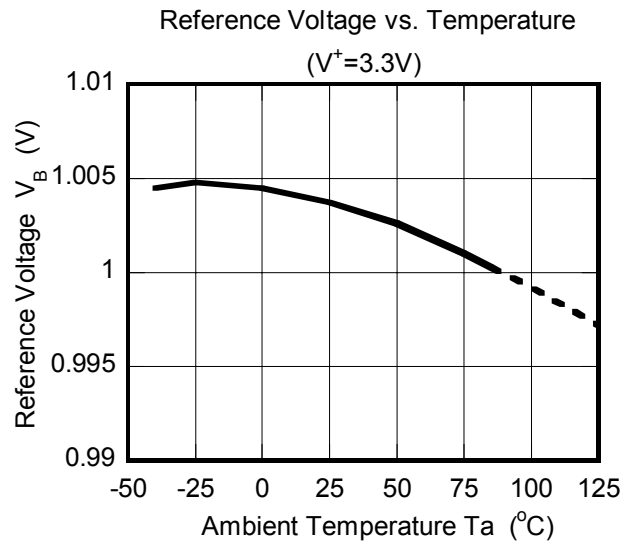
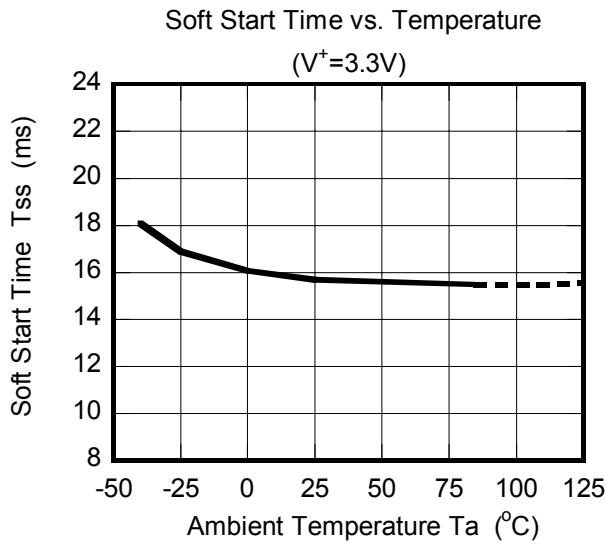
( $R_T = 47\text{k}\Omega$ ,  $R_L = \text{Non Load}$ ,  $T_a = 25^\circ\text{C}$ )



■ TYPICAL CHARACTERISTICS



## ■ TYPICAL CHARACTERISTICS





## MEMO

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