

Step-Up / Flyback Switching Regulator IC with Load Switch Function

■GENERAL DESCRIPTION

NJU7606/08 is a high speed low voltage operation switching regulator control IC with load switch function.

It features a which disconnects load from input during standby and also provides latch mode.

■PACKAGE OUTLINE



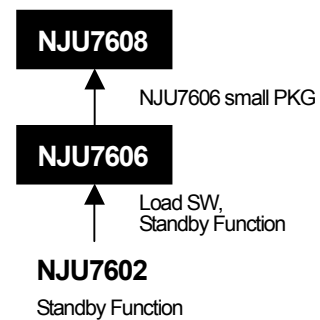
NJU7606RB2

NJU7608PB1

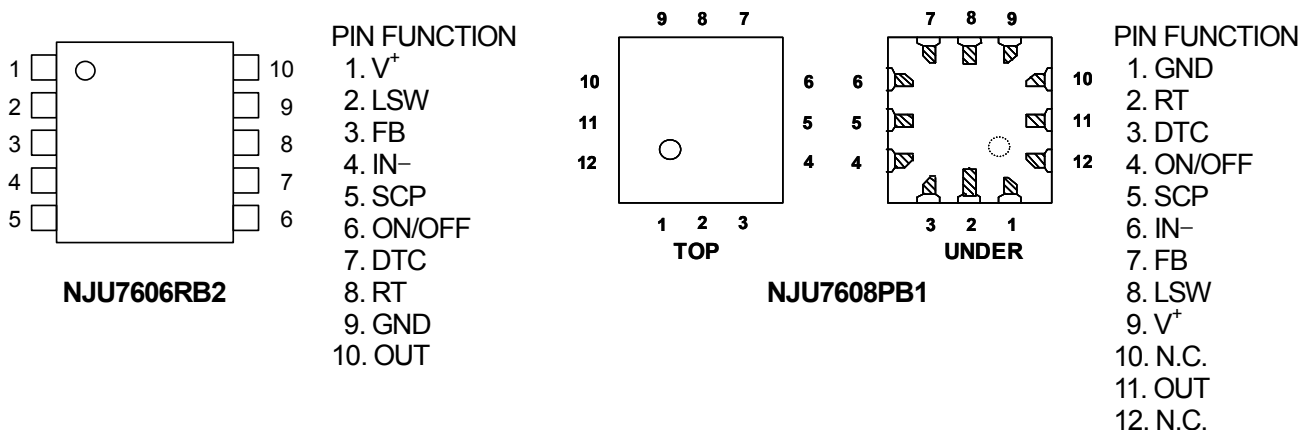
■FEATURES

- PWM switching control
- Load Switch Function
- Operating Voltage 2.2V to 8V
- Wide Oscillator Range 300kHz to 1MHz
- Maximum Duty Cycle 90% typ.
- Quiescent Current Operating: 800μA typ.
Standby: 1μA max.
- Soft-Start Function Internal : 16ms typ. or adjustable
- Dead Time Control
- Timer Latch for Short Circuit Protection
- C-MOS Technology
- Package Outline NJU7606RB2 : TVSP10
NJU7608PB1 : FFP12 -B1

■PRODUCT VARIATION



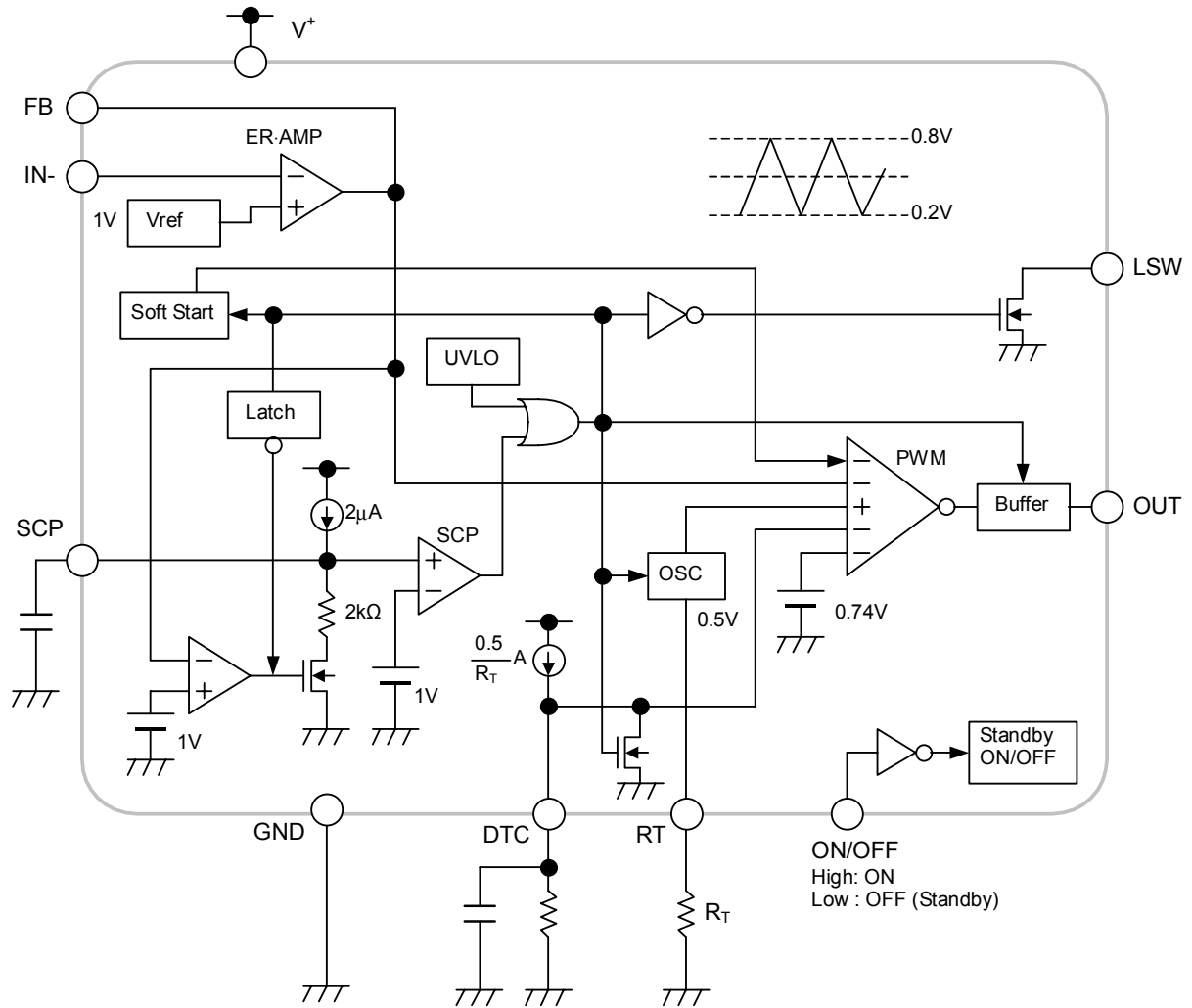
■PIN CONFIGURATION



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■BLOCK DIAGRAM



■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER | SYMBOL | MAXIMUM RATINGS | UNIT |
|-----------------------------|---------------------|-----------------------------------|------|
| Supply Voltage | V ⁺ | +9 | V |
| LSW Output Voltage | V _{LSW} | +9 | V |
| Output Pin Current | I _O | ±50 | mA |
| LSW Output Current | I _{LSW} | -10 | mA |
| ON/OFF Pin Voltage | V _{ON/OFF} | +9 (*1) | V |
| Power Dissipation | P _D | TVSP10 :320 FFP12-B1 :300 (*2) | mW |
| Operating Temperature Range | T _{OPR} | -40 ~ +85 | °C |
| Storage Temperature Range | T _{STG} | -40 ~ +125 | °C |

*1: When input voltage is less than 9V, the absolute maximum control voltage is equal to the input voltage.

*2: On board. 25mm×25mm×0.2mm

■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⁺=V_{ON/OFF}=3.3V, R_T=47kΩ, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------------|----------------------|------------------------------|------|------|------|------|
| Under Voltage Lockout Block | | | | | | |
| ON Threshold Voltage | V _{T_ON} | V ⁺ = L → H | 1.9 | 2.0 | 2.1 | V |
| OFF Threshold Voltage | V _{T_OFF} | V ⁺ = H → 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} → 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 ON Threshold Voltage | V _{T_LA} | SCP Pin | 0.95 | 1.00 | 1.05 | V |
| Latch Mode 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 Fluctuations | f _{DV} | V ⁺ =2.2V ~ 8V | — | 1 | — | % |
| Oscillate Temperature Fluctuations | f _{DT} | Ta=-40°C ~ +85°C | — | 3 | — | % |

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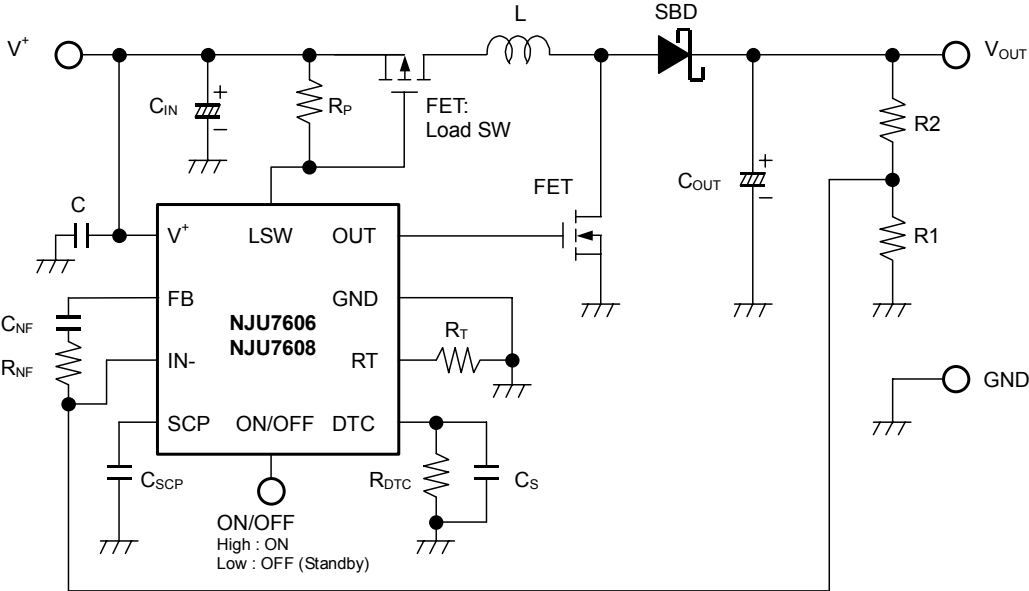
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■ ELECTRICAL CHARACTERISTICS ($V^+=V_{ON/OFF}=3.3V$, $R_T=47k\Omega$, $T_a=25^\circ C$)

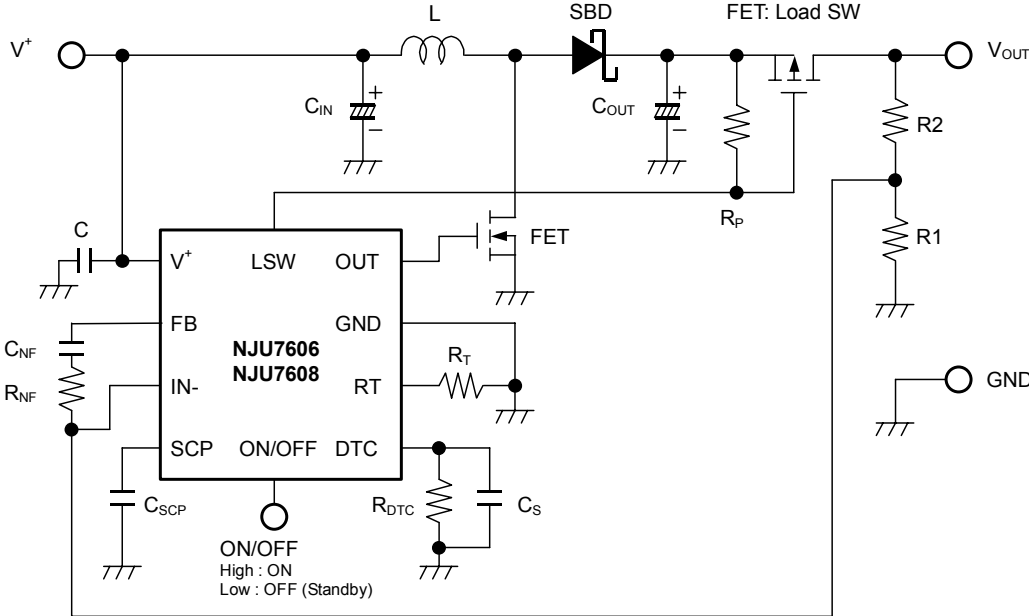
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|-----------------|---|-------|------|-------|----------|
| Error Amplifier Block | | | | | | |
| Reference Voltage | V_B | | -1.5% | 1.00 | +1.5% | V |
| Input Bias Current | I_B | | -0.1 | – | 0.1 | μA |
| Open Loop Gain | A_V | | – | 80 | – | dB |
| Gain Bandwidth Product | G_B | | – | 1 | – | MHz |
| Output Source Current | I_{OM+1} | $V_{FB}=1V$, $V_{IN-}=0.9V$ | 20 | 45 | 70 | 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 | $M_{AXDUTY1}$ | $V_{FB}=0.9V$ | 85 | 90 | 95 | % |
| | $M_{AXDUTY2}$ | $V_{FB}=0.9V$, $R_{DTC}=47k\Omega$ | 40 | 50 | 60 | % |
| Output Block | | | | | | |
| Output High Level ON Resistance | R_{OH} | $I_O=-20mA$ | – | 10 | 20 | Ω |
| Output Low Level ON Resistance | R_{OL} | $I_O=+20mA$ | – | 5 | 10 | Ω |
| Load SW Output Block | | | | | | |
| LSW Output ON Resistance | R_{LSW} | $I_{LSW}=1mA$ | – | 55 | 100 | Ω |
| LSW Output Leak Current | I_{LEAK_LSW} | $V_{LSW}=9V$, $V_{ON/OFF}=0V$ | – | – | 0.1 | μA |
| ON/OFF Block | | | | | | |
| ON Control Voltage | V_{ON} | $V_{ON/OFF}=L \rightarrow H$ | 1.6 | – | V^+ | V |
| OFF Control Voltage | V_{OFF} | $V_{ON/OFF}=H \rightarrow L$ | 0 | – | 0.3 | V |
| General Characteristics | | | | | | |
| Quiescent Current | I_{DD} | $R_L=Non\ Load$ | – | 800 | 1200 | μA |
| Standby Current | I_{DD_STB} | $V_{ON/OFF}=0V$ | – | – | 1.0 | μA |

■ TYPICAL APPLICATIONS

Step-Up Converter (Input Line Load SW)



Step-Up Converter (Output Line Load SW)

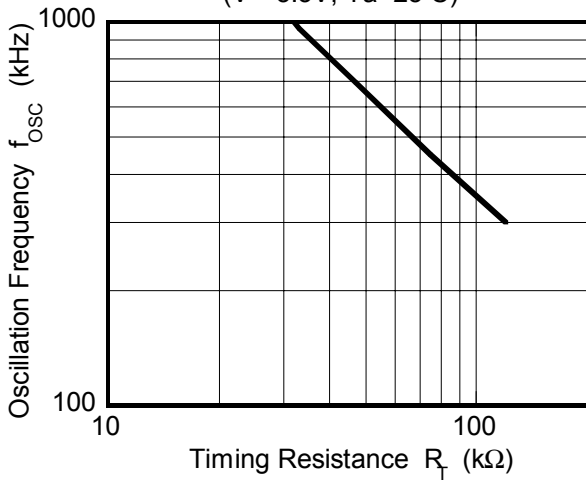


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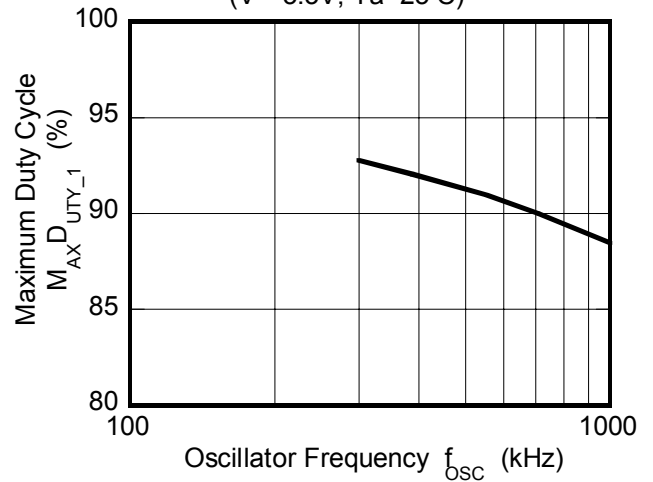
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■ TYPICAL CHARACTERISTICS

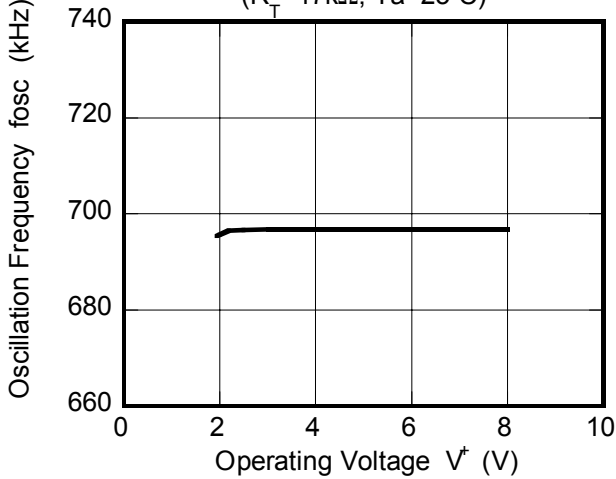
Oscillation Frequency vs. Timing Resistance
($V^+ = 3.3V, T_a = 25^\circ C$)



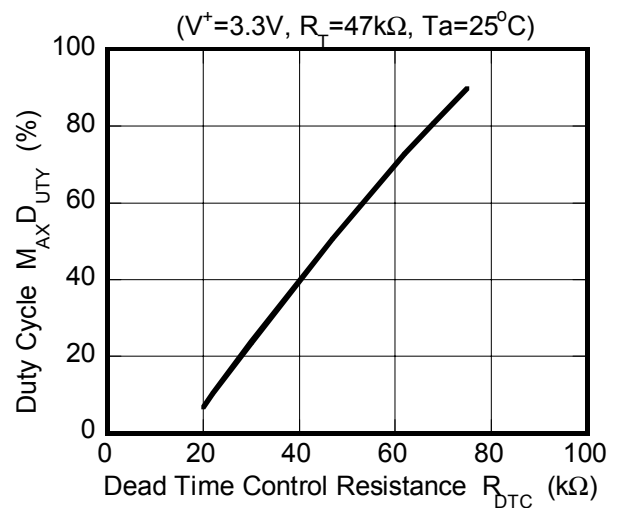
Maximum Duty Cycle vs. Oscillator Frequency
($V^+ = 3.3V, T_a = 25^\circ C$)



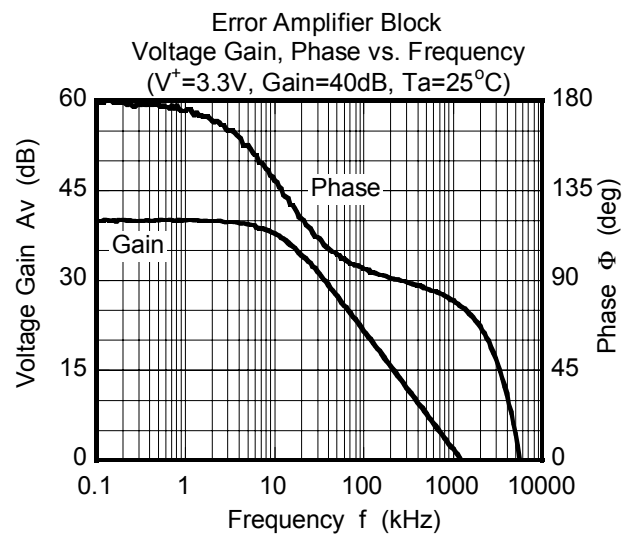
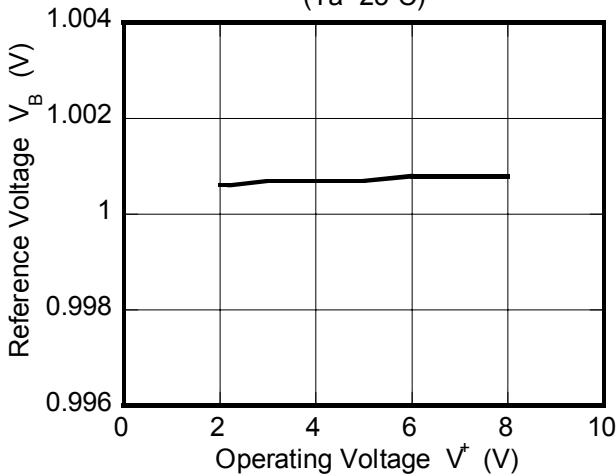
Oscillation Frequency vs. Operating Voltage
($R_T = 47k\Omega, T_a = 25^\circ C$)



Duty Cycle vs. R_{DTC}

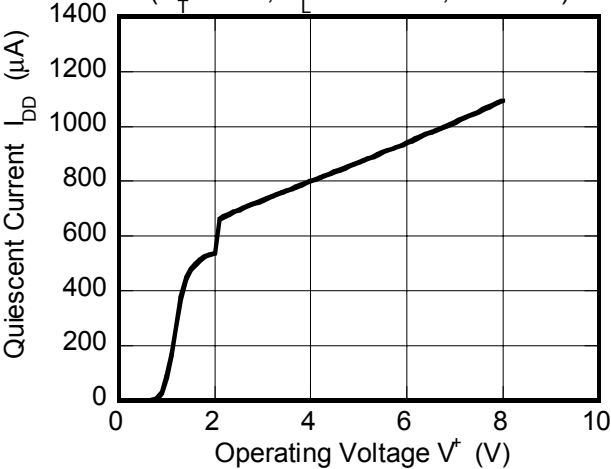


Reference Voltage vs. Operating Voltage
($T_a = 25^\circ C$)

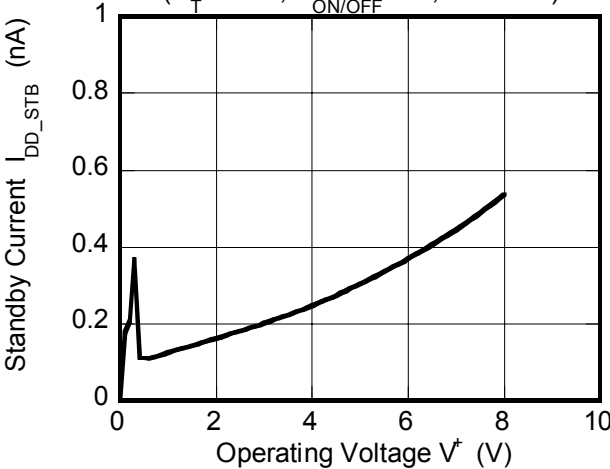


■ TYPICAL CHARACTERISTICS

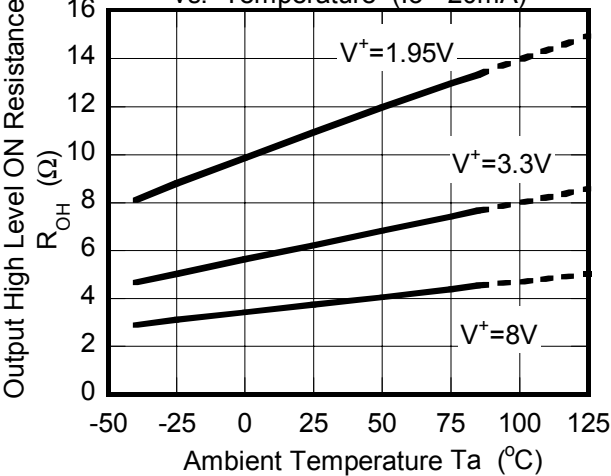
Quiescent Current vs. Operating Voltage
($R_T=47k\Omega$, $R_L=Non\ Load$, $T_a=25^\circ C$)



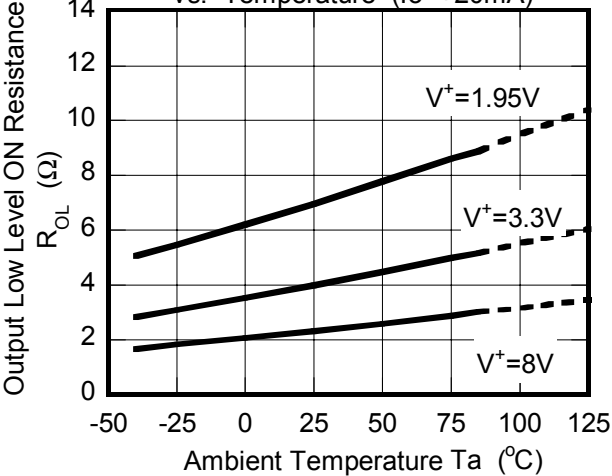
Standby Current vs. Operating Voltage
($R_T=47k\Omega$, $V_{ON/OFF}=0V$, $T_a=25^\circ C$)



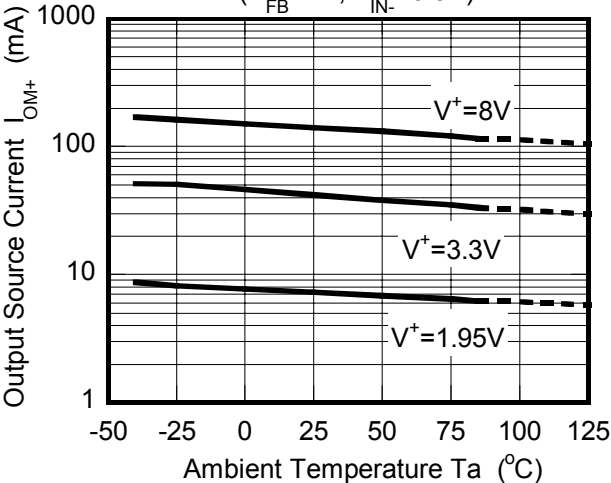
Output Block
Output High Level ON Resistance vs. Temperature ($I_o=-20mA$)



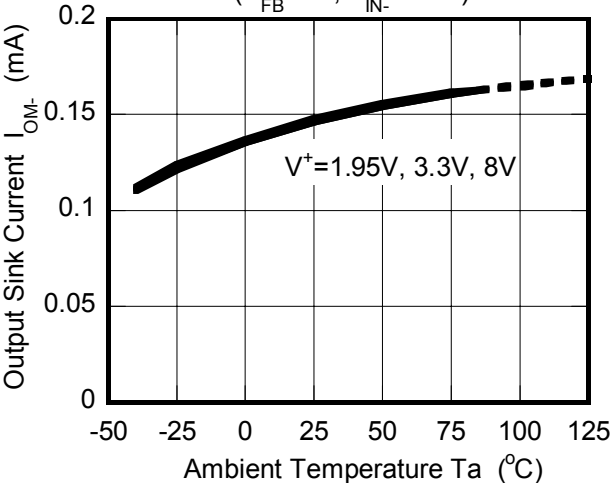
Output Block
Output Low Level ON Resistance vs. Temperature ($I_o=+20mA$)



Error Amplifier Block
Output Source Current vs. Temperature ($V_{FB}=1V$, $V_{IN-}=0.9V$)



Error Amplifier Block
Output Sink Current vs. Temperature ($V_{FB}=1V$, $V_{IN-}=1.1V$)

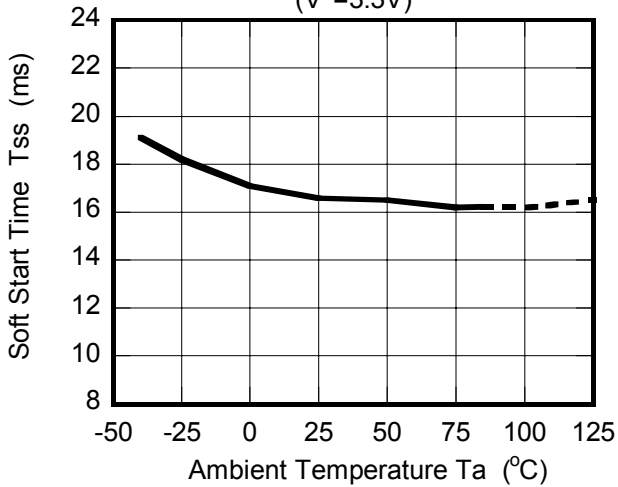


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TYPICAL CHARACTERISTICS

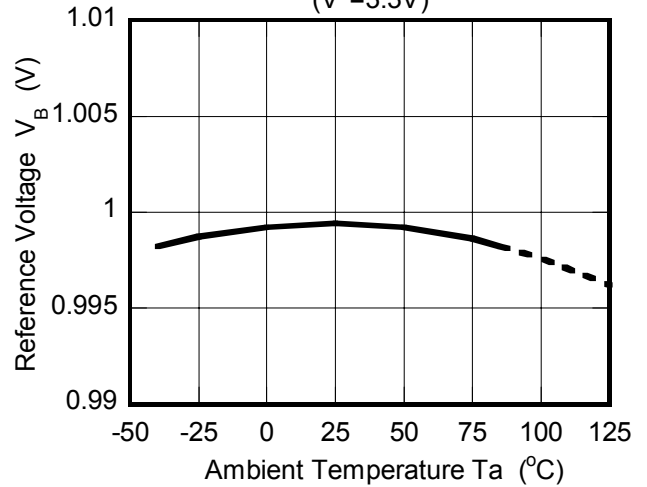
Soft Start Time vs. Temperature

($V^+ = 3.3V$)



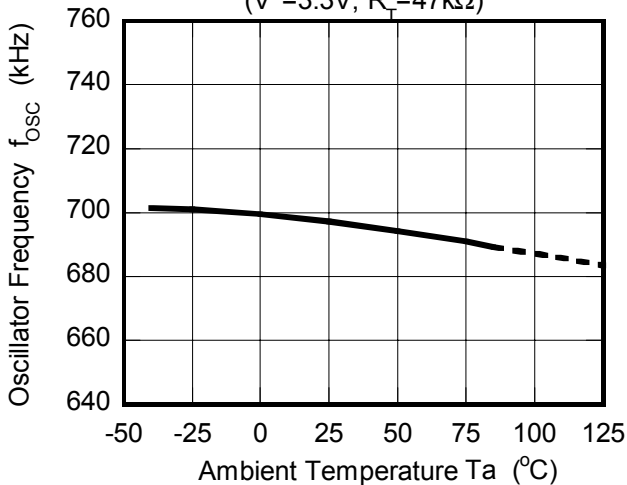
Reference Voltage vs. Temperature

($V^+ = 3.3V$)



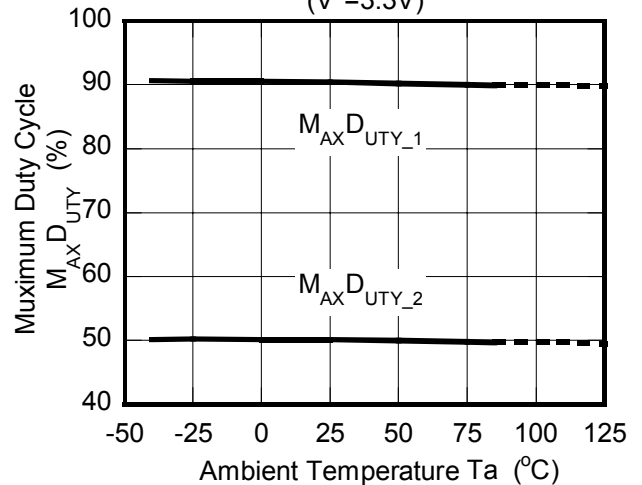
Oscillator Frequency vs. Temperature

($V^+ = 3.3V, R_T = 47k\Omega$)

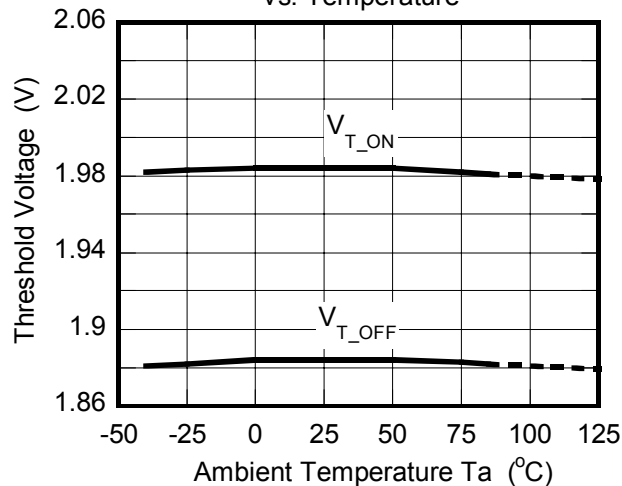


Maximum Duty Cycle vs. Temperature

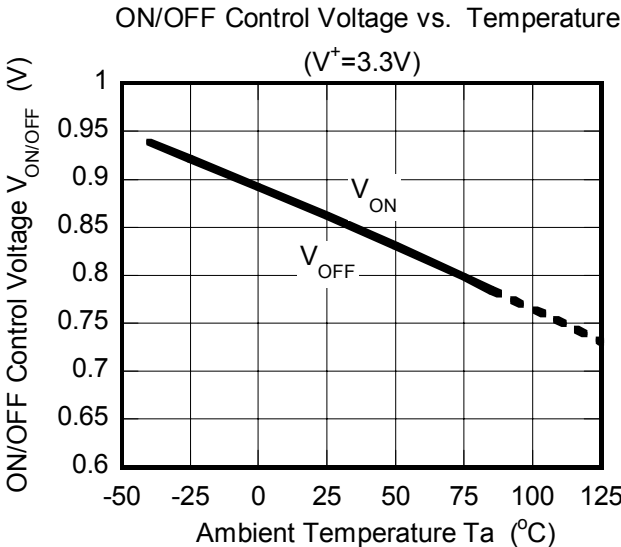
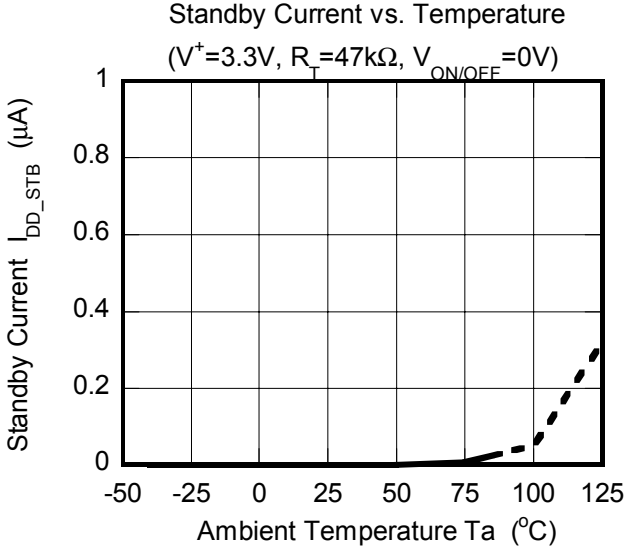
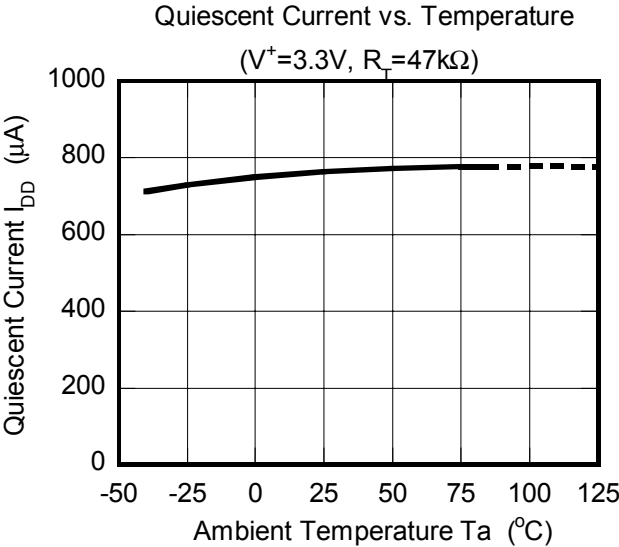
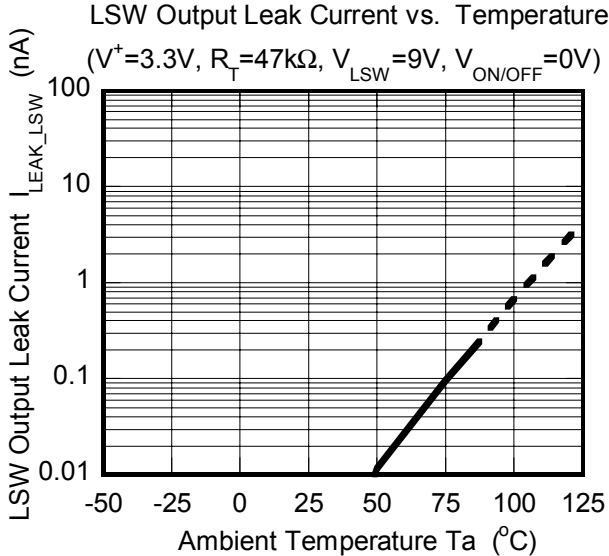
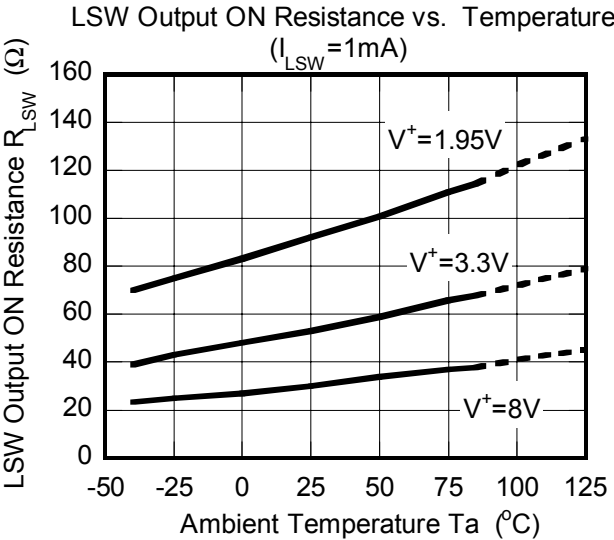
($V^+ = 3.3V$)



Under Voltage Lockout Block vs. Temperature



■ TYPICAL CHARACTERISTICS



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MEMO

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