

Step-Up/Flyback Switching Regulator IC with Power Saving PWM/PFM control

■GENERAL DESCRIPTION

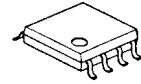
NJU7601 is a high speed low voltage operation switching regulator control IC with power saving PWM/PFM control. Automatic PWM/PFM control improves power efficiency at light load. It features a totem pole driver that can directly drive an external MOS-FET.

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.

■FEATURES

- Automatic PWM/PFM Control
- Operating Voltage 2.2V to 8V
- Wide Oscillator Range 300kHz to 1MHz
- Maximum Duty Cycle 90% typ.
- Quiescent Current 800 μ A typ.
- Soft-Start Function Internal : 16ms typ. or adjustable
- Dead Time Control
- Timer Latch for Short Circuit Protection
- C-MOS Technology
- Package Outline NJU7600M : DMP8
NJU7600RB1 : TVSP8

■PACKAGE OUTLINE

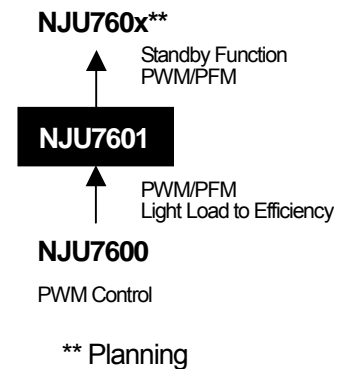


NJU7601M

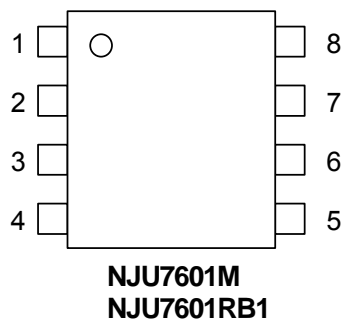


NJU7601RB1

■PRODUCT VARIATION



■PIN CONFIGURATION

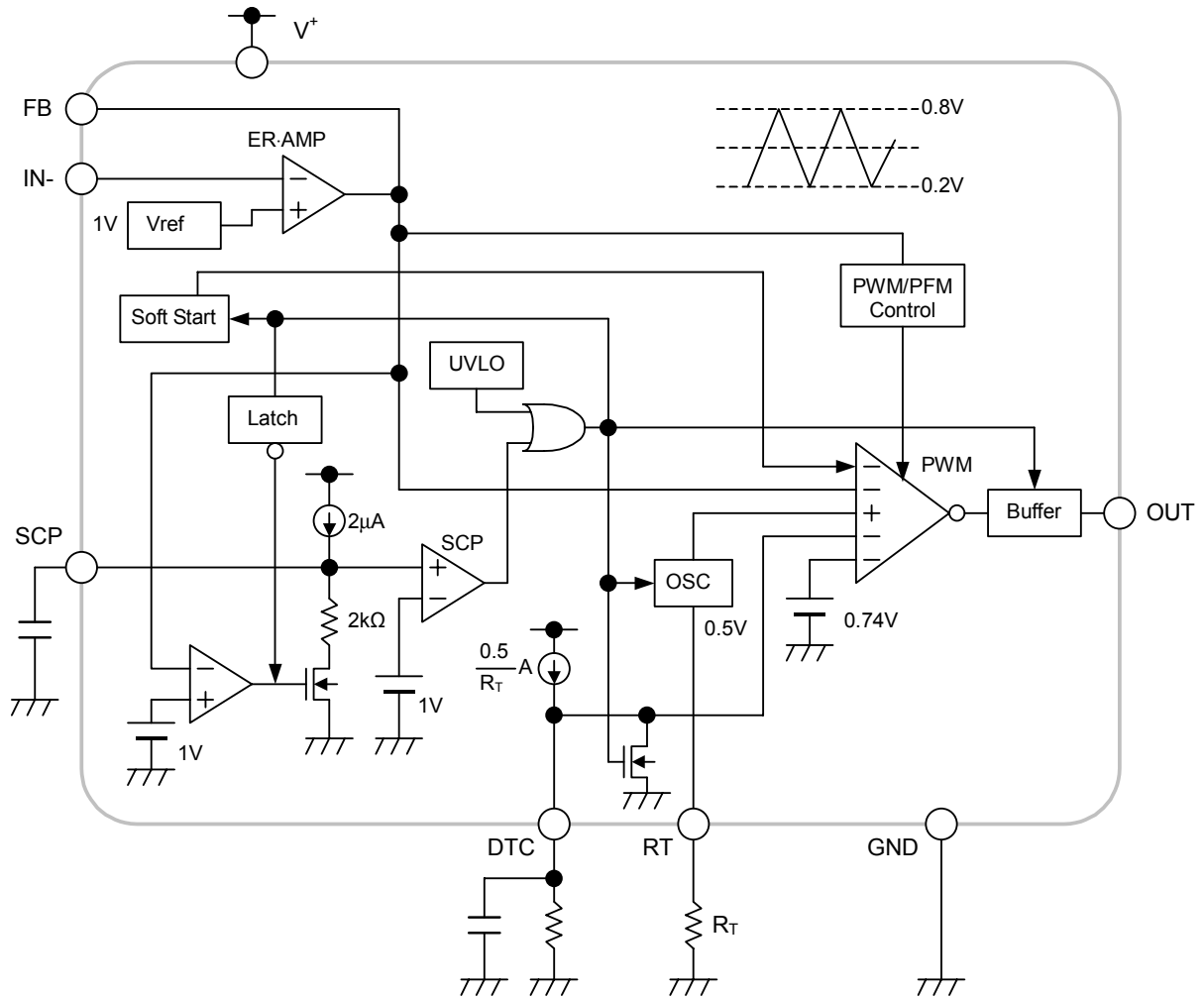


- PIN FUNCTION**
1. V⁺
 2. FB
 3. IN-
 4. SCP
 5. DTC
 6. RT
 7. GND
 8. OUT

NJU7601

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■BLOCK DIAGRAM



■ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Supply Voltage	V^+	+9	V
Output Pin Current	I_O	±50	mA
Power Dissipation	P_D	DMP8 :300 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 ($V^+=3.3V$, $R_T=47k\Omega$, $T_a=25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
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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
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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}	$V^+=2.2V \sim 8V$	—	1	—	%
Oscillate Temperature Fluctuations	f_{DT}	$T_a=-40^\circ C \sim +85^\circ C$	—	3	—	%

NJU7601

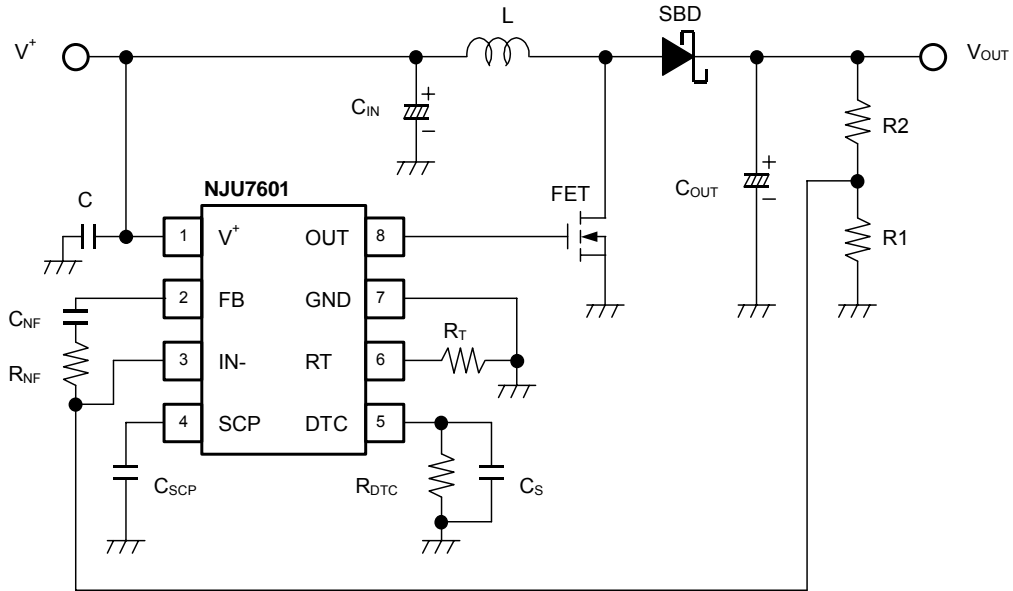
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■ELECTRICAL CHARACTERISTICS ($V^+=3.3V$, $R_T=47k\Omega$, $T_a=25^\circ C$)

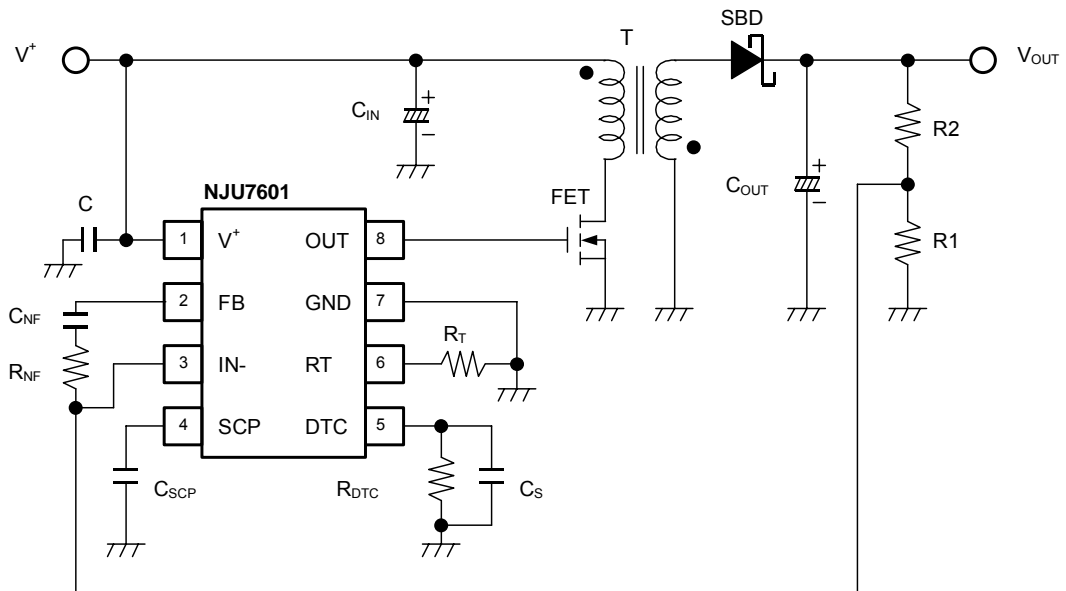
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Error Amplifier Block						
Reference Voltage	V_B		-1.5%	1.00	+1.5%	V
Input Bias Current	I_B		-0.1	–	0.1	μA
Open Loop Gain	A_V		–	80	–	dB
Gain Bandwidth Product	G_B		–	1	–	MHz
Output Source Current	I_{OM+1}	$V_{FB}=1V$, $V_{IN-}=0.9V$	25	55	95	mA
	I_{OM+2}	$V_{FB}=1V$, $V_{IN-}=0.9V$, $V^+=2.2V$	4	9	16	mA
Output Sink Current	I_{OM-}	$V_{FB}=1V$, $V_{IN-}=1.1V$	0.10	0.16	0.22	mA
PWM Complete Block						
Input Threshold Voltage	V_{T0}	Duty=PFMD _{UTY}	0.29	0.35	0.41	V
	V_{T50}	Duty=50%	0.44	0.5	0.56	V
Maximum Duty Cycle	$M_{AX}D_{UTY1}$	$V_{FB}=0.9V$	85	90	95	%
	$M_{AX}D_{UTY2}$	$V_{FB}=0.9V$, $R_{DTC}=47k\Omega$	40	50	60	%
PWM/PFM Change Duty Cycle	PFMD _{UTY}		17	25	33	%
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
General Characteristics						
Quiescent Current	I_{DD}	$R_L=Non\ Load$	–	800	1200	μA

■ TYPICAL APPLICATIONS

Step-Up Converter



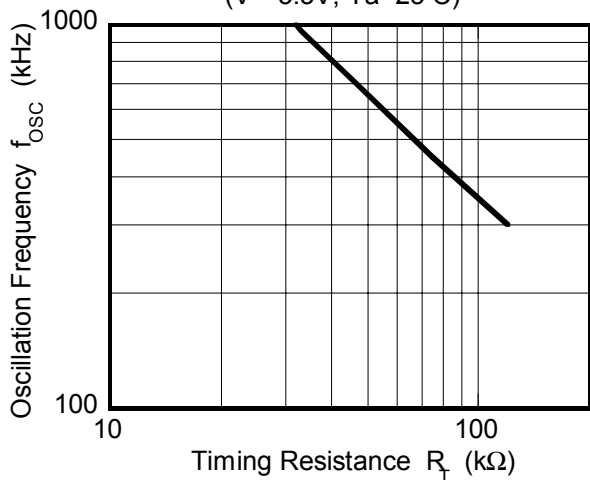
Flyback Converter



■ TYPICAL CHARACTERISTICS

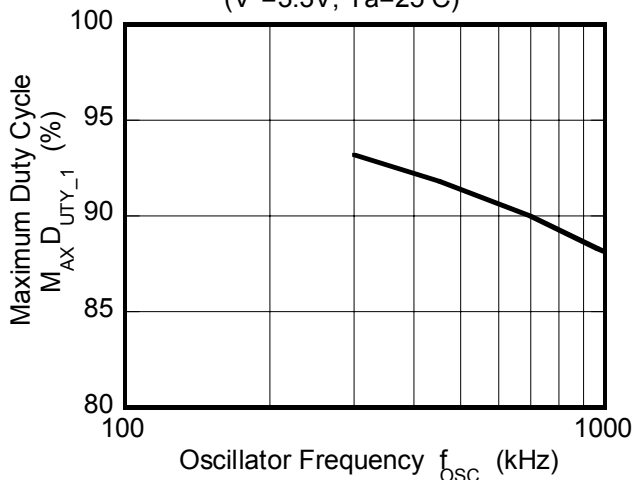
Oscillation Frequency vs. Timing Resistance

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



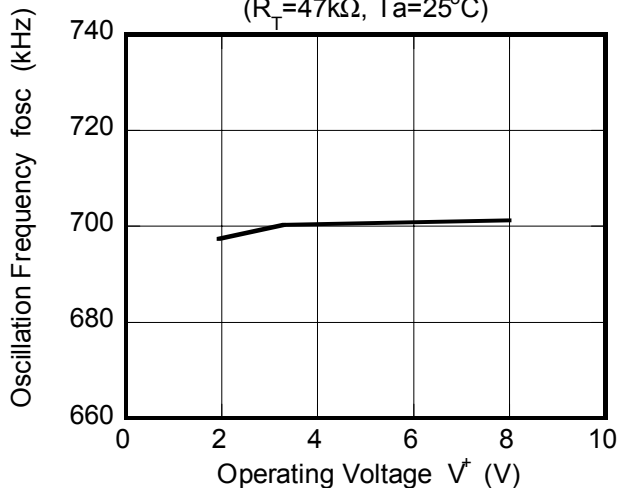
Maximum Duty Cycle vs. Oscillator Frequency

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



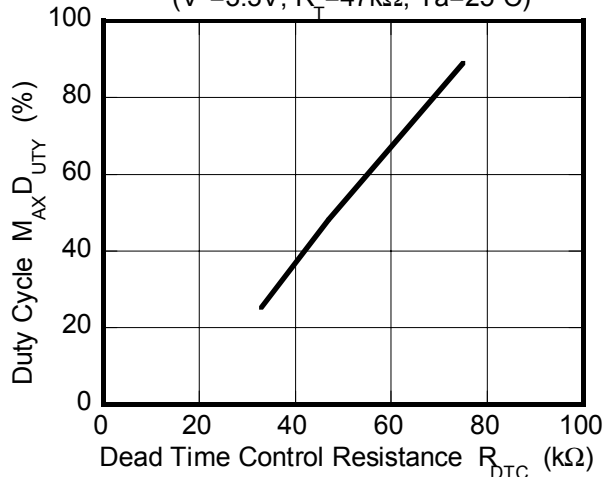
Oscillation Frequency vs. Operating Voltage

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



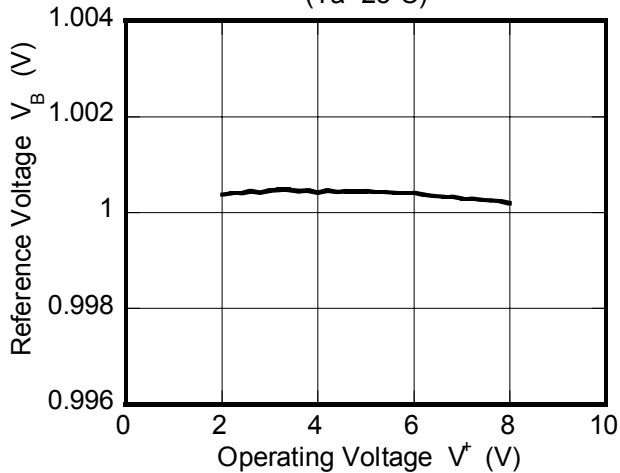
Duty Cycle vs. R_{DTC}

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



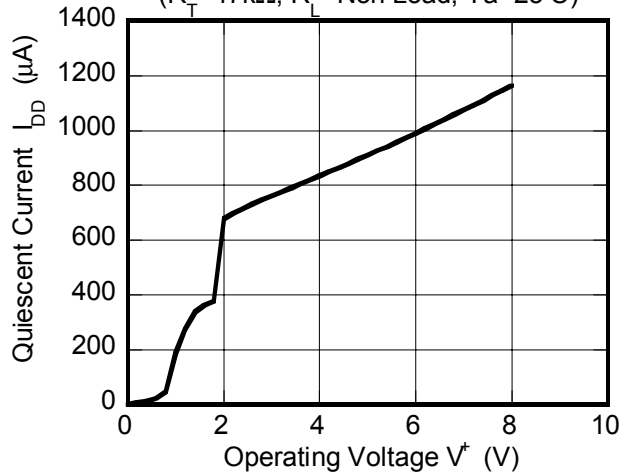
Reference Voltage vs. Operating Voltage

($T_a = 25^\circ C$)

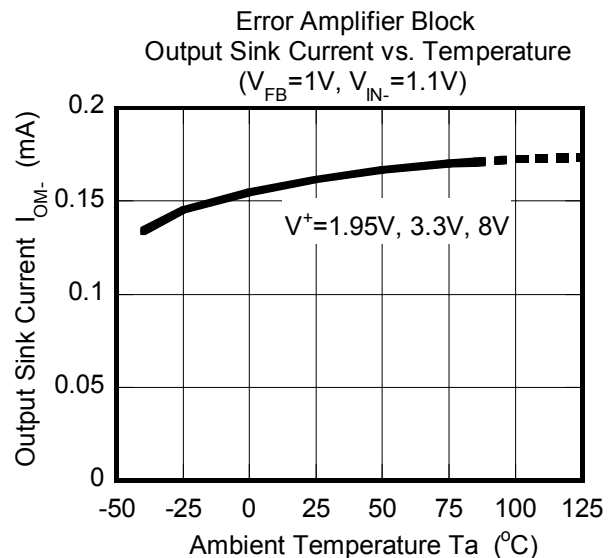
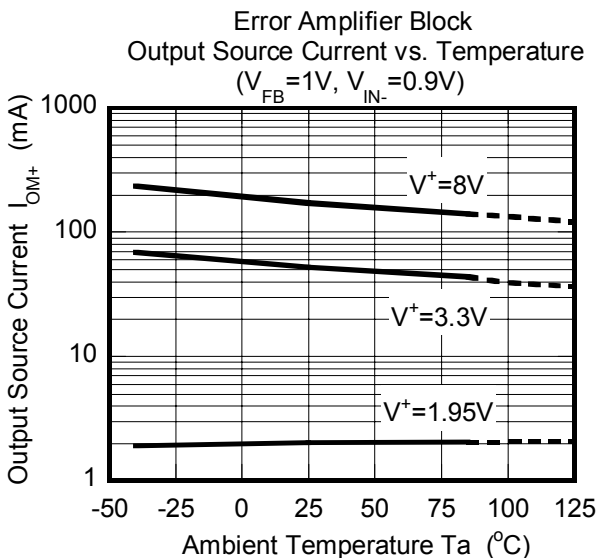
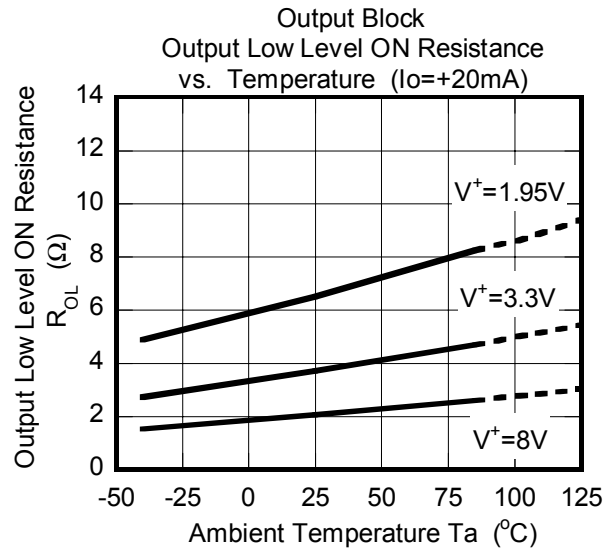
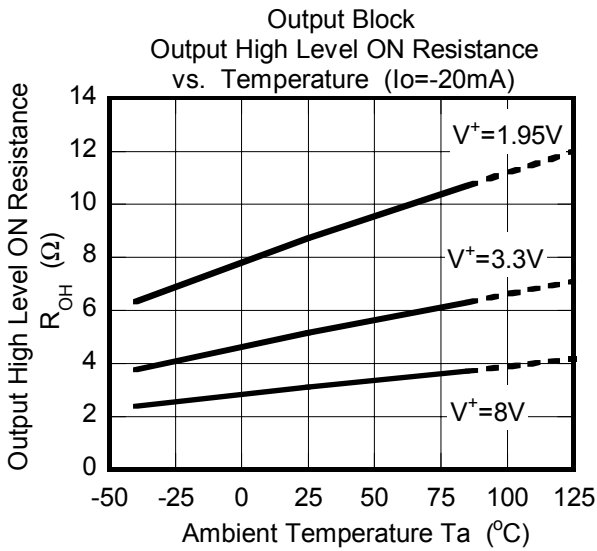
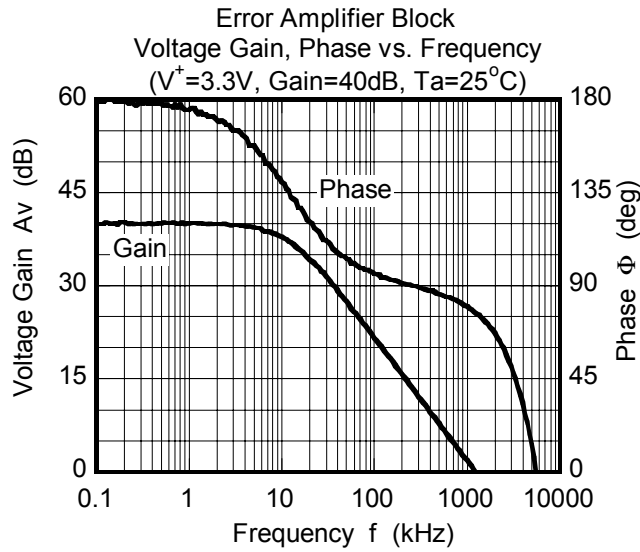


Quiescent Current vs. Operating Voltage

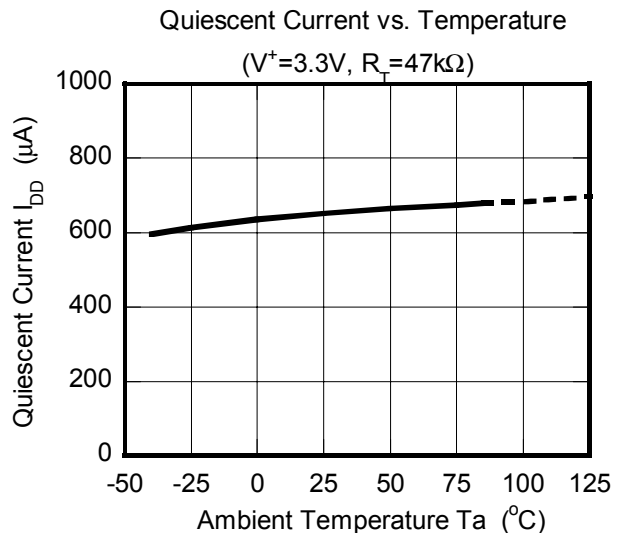
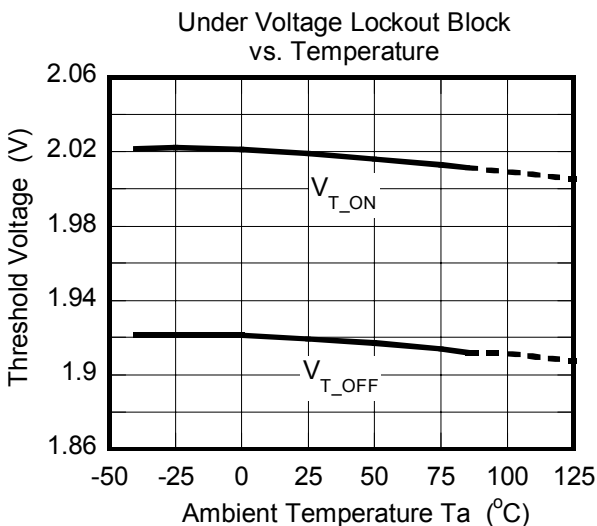
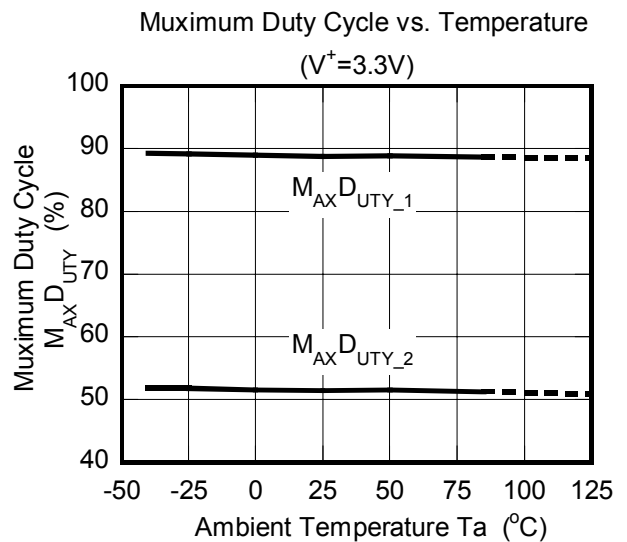
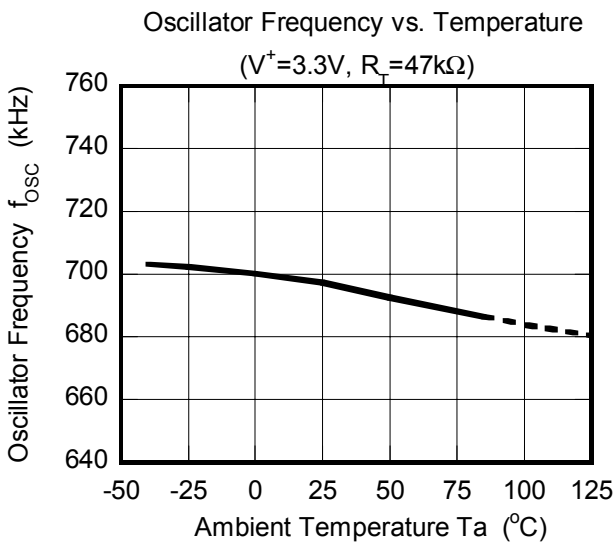
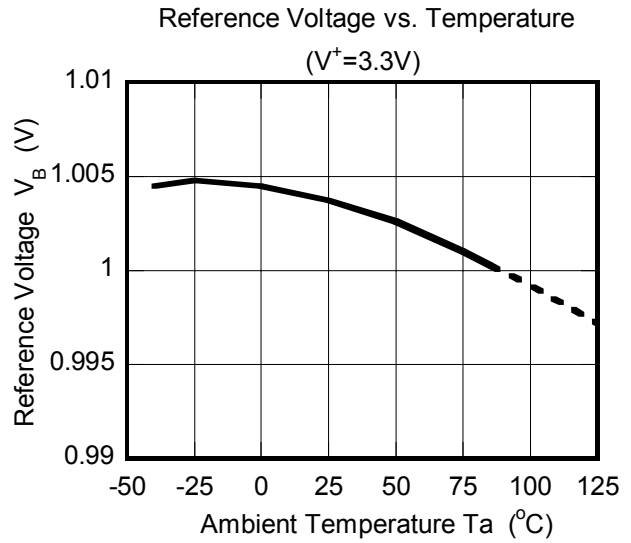
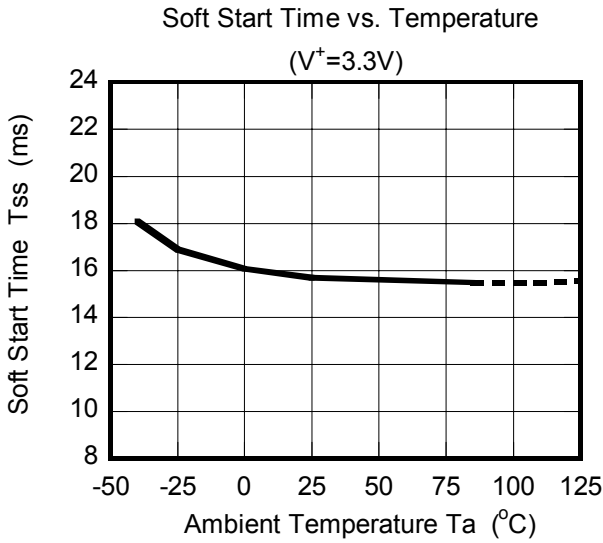
($R_T = 47k\Omega, R_L = \text{Non Load}, T_a = 25^\circ C$)



■ TYPICAL CHARACTERISTICS



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[CAUTION]

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