

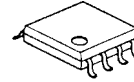
## PWM control Step-Up / Flyback switching regulator IC

### ■GENERAL DESCRIPTION

**NJU7600** 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



**NJU7600M**

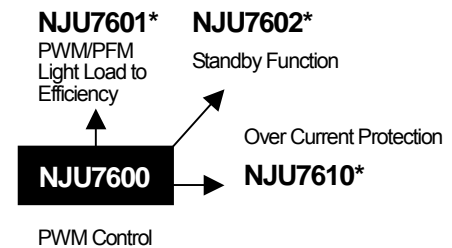


**NJU7600RB1**

### ■FEATURES

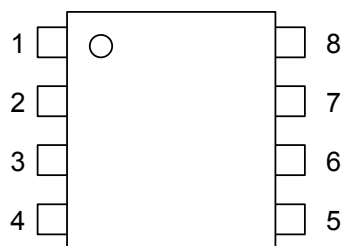
- PWM switching control
- Operating Voltage           2.2V to 8V
- Wide Oscillator Range       300kHz to 1MHz
- Maximum Duty Cycle        90% typ.
- Quiescent Current           800μA typ.
- Soft-Start Function         Internal : 16ms typ. or adjustable
- Dead Time Control
- Timer Latch for Short Circuit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

### ■PRODUCT VARIATION



\* Under Development

### ■PIN CONFIGURATION



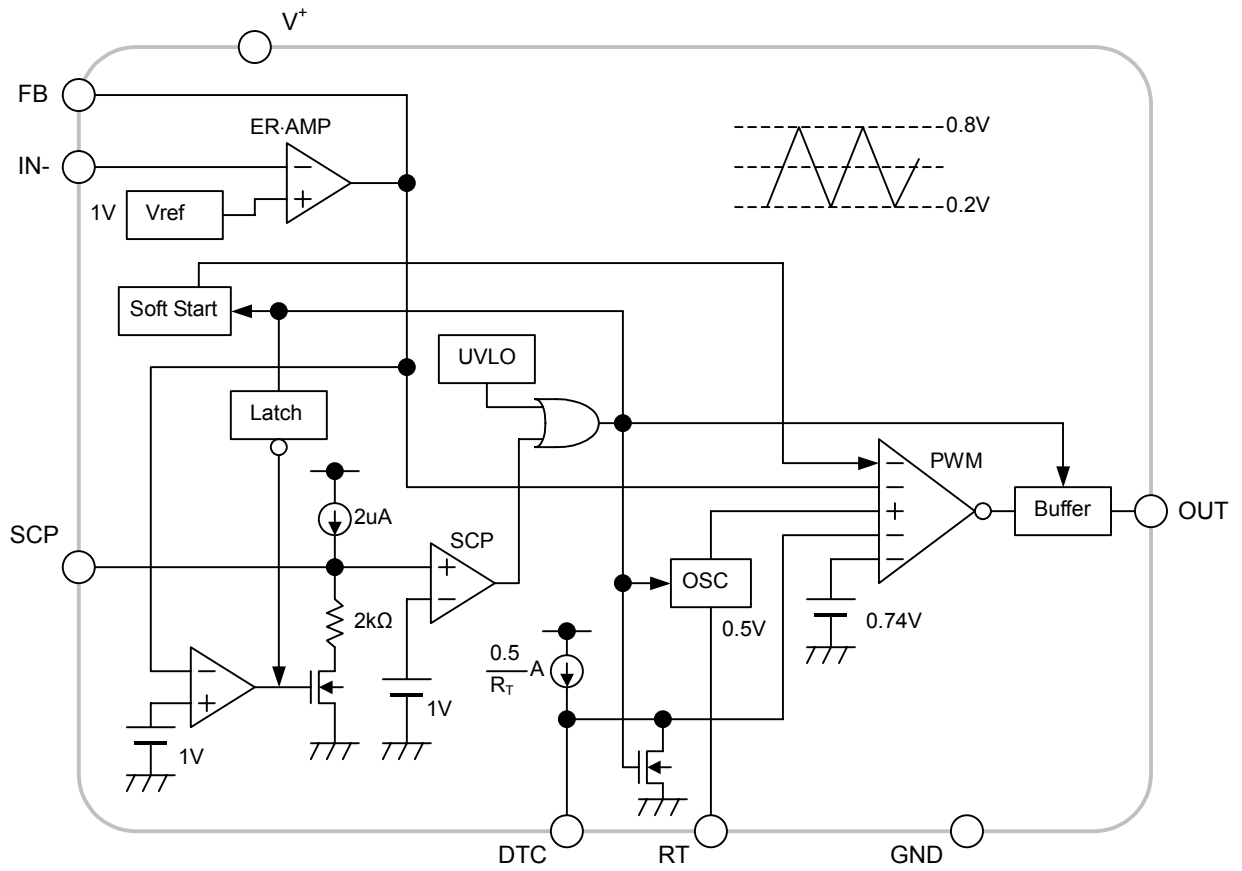
**NJU7600M**  
**NJU7600RB1**

#### PIN FUNCTION

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

# NJU7600

## ■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
<b>Under Voltage Lockout Block</b>						
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
<b>Soft Start Block</b>						
Soft Start Time	$T_{SS}$	$V_{T\_ON} \rightarrow$ Duty=80%	8	16	24	ms
<b>Short Circuit Protection Block</b>						
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
<b>Oscillator Block</b>						
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	—	%

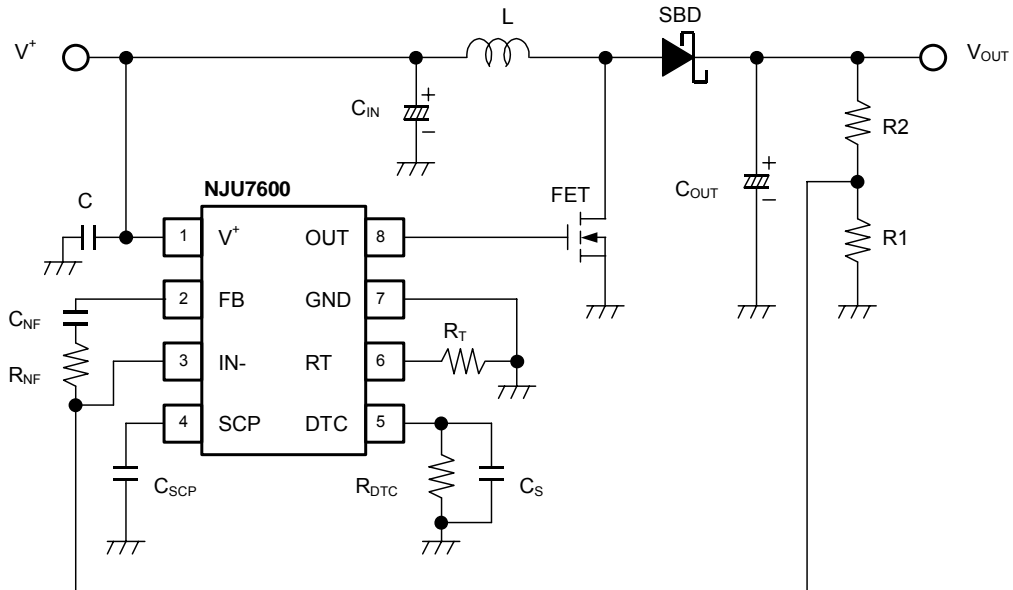
# NJU7600

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

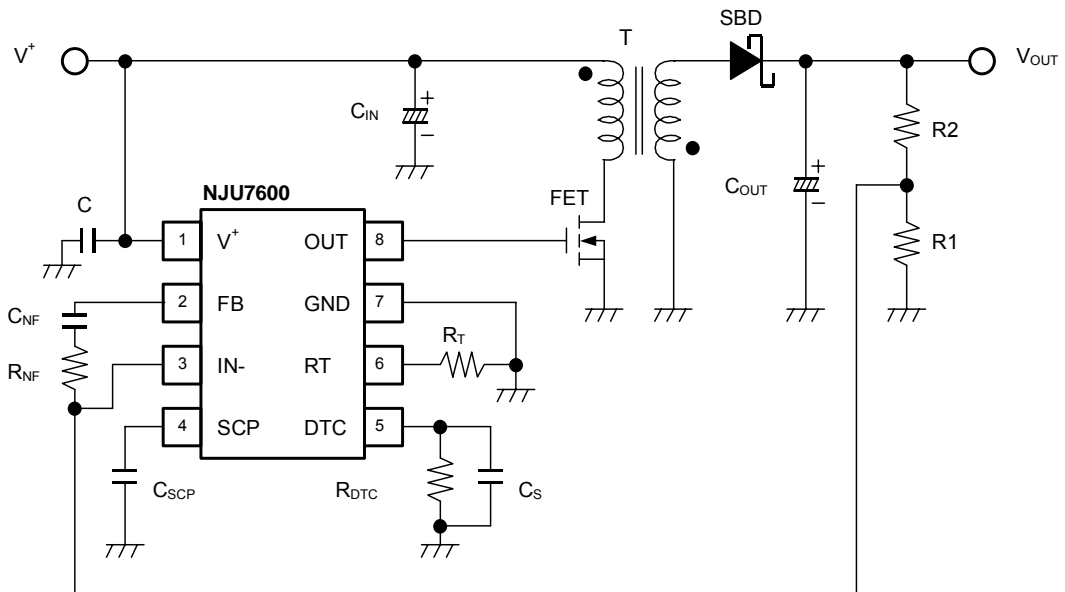
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
<b>Error Amplifier Block</b>						
Reference Voltage	$V_B$		-1.5%	1.00	+1.5%	V
Input Bias Current	$I_B$		-0.1	–	0.1	$\mu A$
Open Loop Gain	$A_V$		–	80	–	dB
Gain Bandwidth Product	$G_B$		–	1	–	MHz
Output Source Current	$I_{OM+1}$	$V_{FB}=1V$ , $V_{IN-}=0.9V$	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
<b>PWM Compare Block</b>						
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	$M_{AX}D_{UTY1}$	$V_{FB}=0.9V$	85	90	95	%
	$M_{AX}D_{UTY2}$	$V_{FB}=0.9V$ , $R_{DTC}=47k\Omega$	40	50	60	%
<b>Output Block</b>						
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	$\Omega$
<b>General Characteristics</b>						
Quiescent Current	$I_{DD}$	$R_L=Non\ Load$	–	800	1200	$\mu A$

## ■ TYPICAL APPLICATIONS

### Step-Up Converter

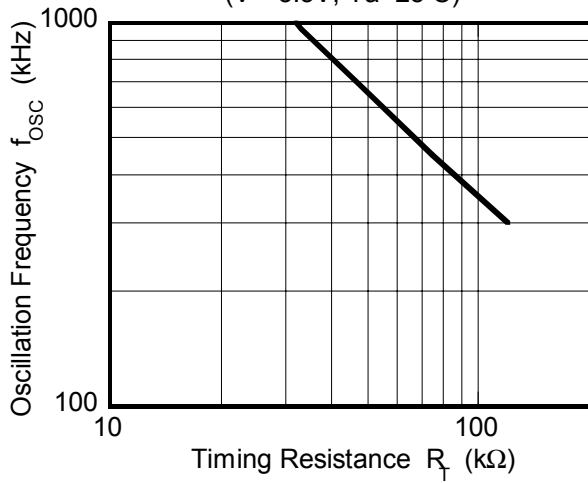


### Flyback Converter

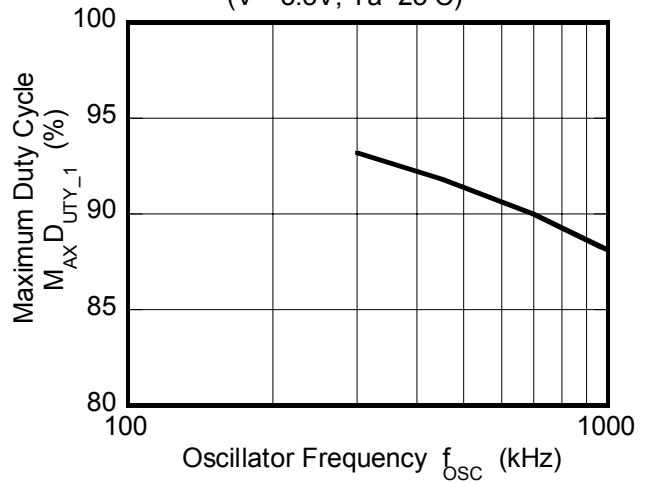


## ■ TYPICAL CHARACTERISTICS

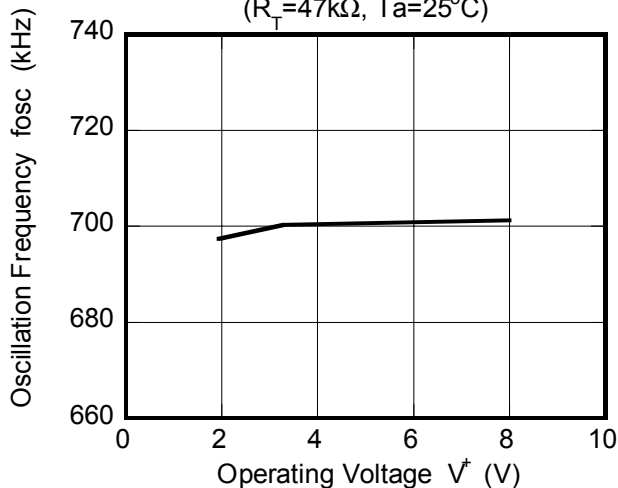
Oscillation Frequency vs. Timing Resistance  
( $V^+ = 3.3V, T_a = 25^\circ C$ )



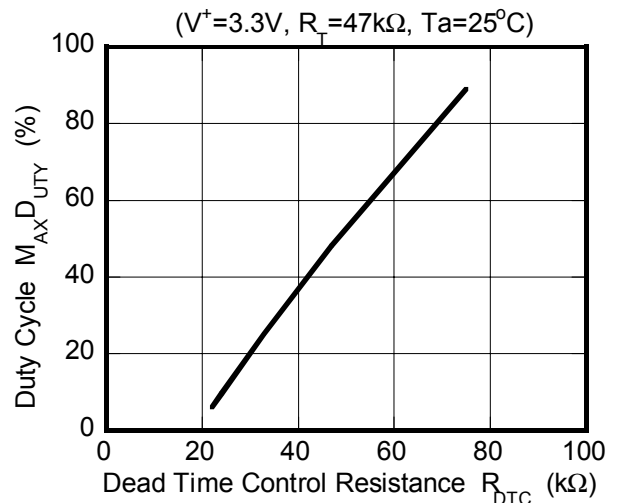
Maximum Duty Cycle vs. Oscillator Frequency  
( $V^+ = 3.3V, T_a = 25^\circ C$ )



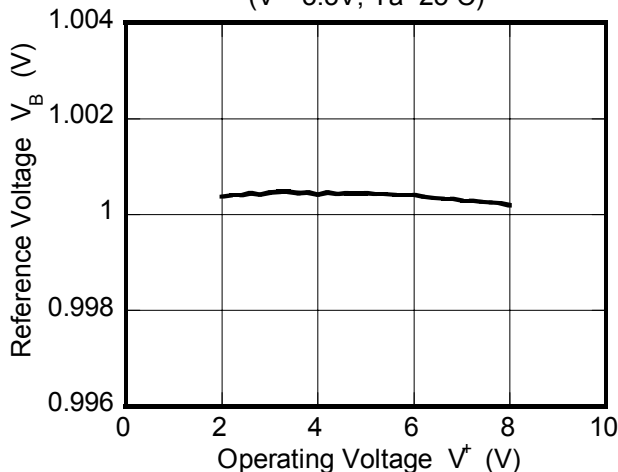
Oscillation Frequency vs. Operating Voltage  
( $R_T = 47k\Omega, T_a = 25^\circ C$ )



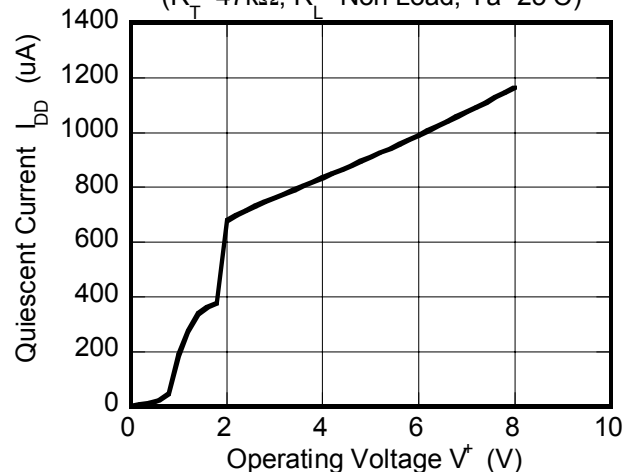
Duty Cycle vs.  $R_{DTC}$



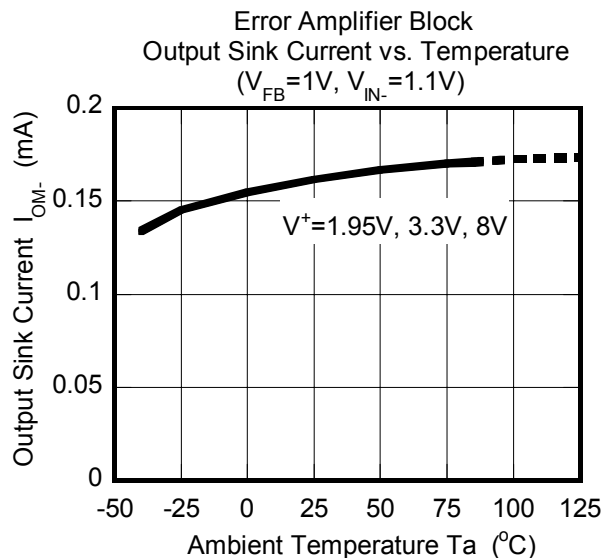
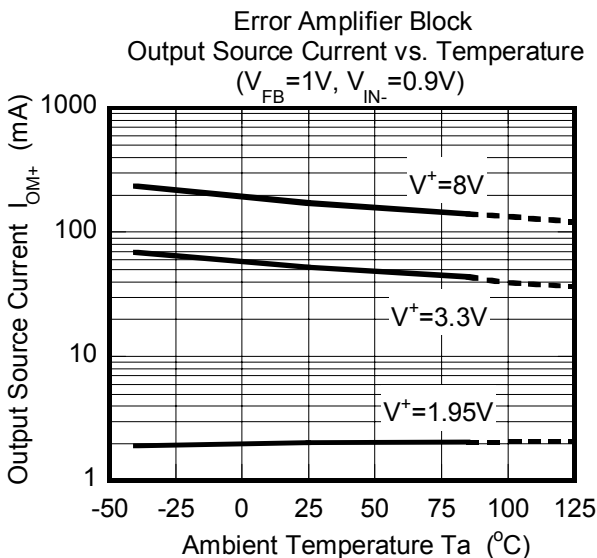
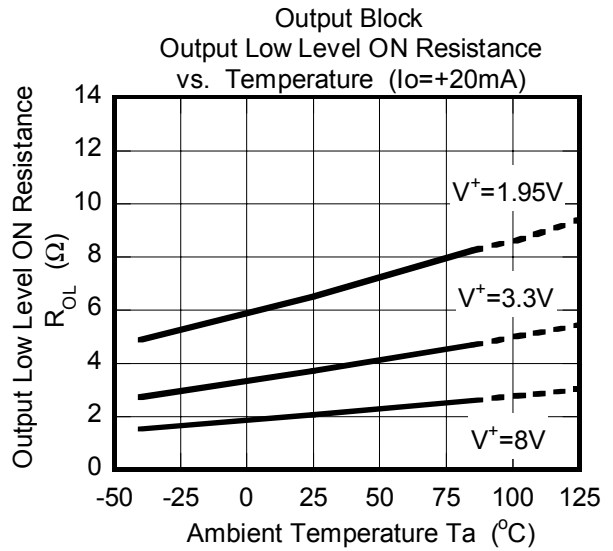
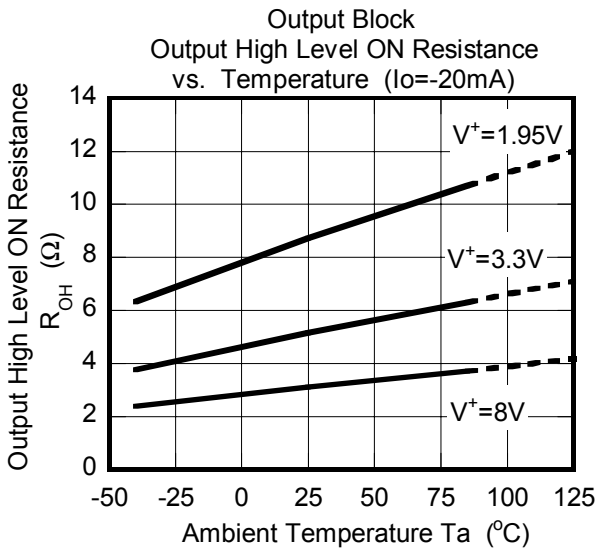
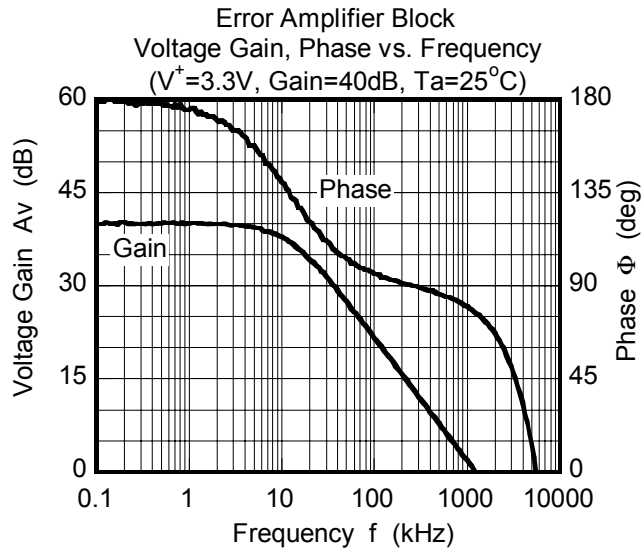
Reference Voltage vs. Operating Voltage  
( $V^+ = 3.3V, T_a = 25^\circ C$ )



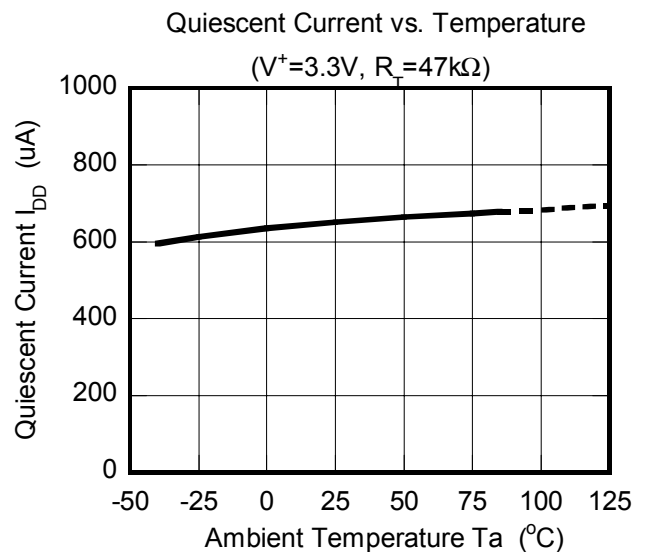
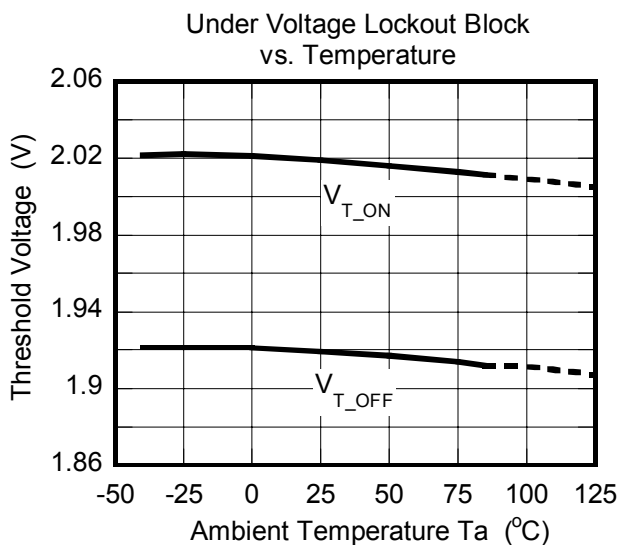
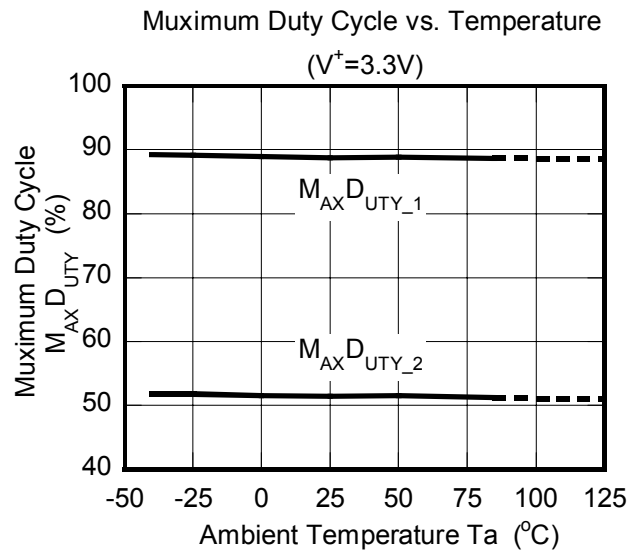
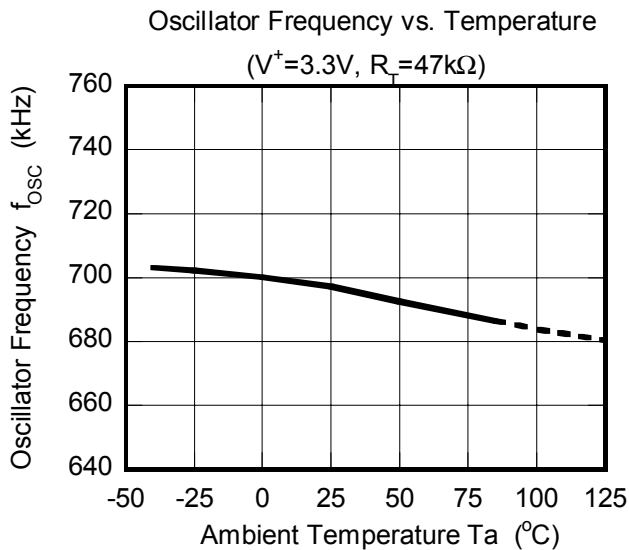
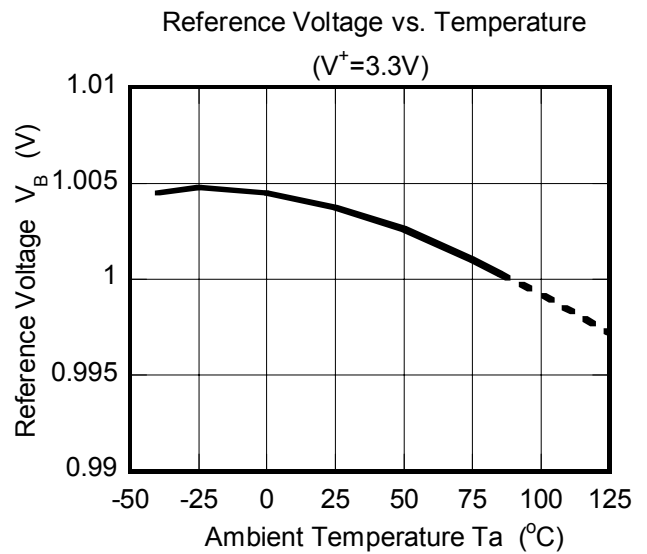
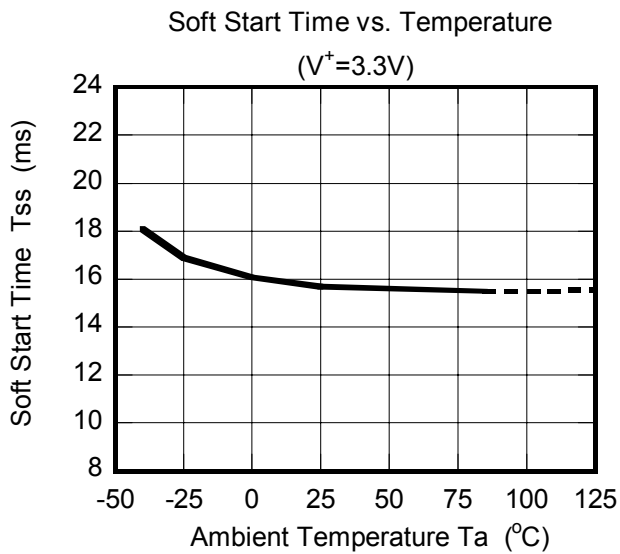
Quiescent Current vs. Operating Voltage  
( $R_T = 47k\Omega, R_L = \text{Non Load}, T_a = 25^\circ C$ )



## ■ TYPICAL CHARACTERISTICS



## ■ TYPICAL CHARACTERISTICS





# MEMO

**[CAUTION]**

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