

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

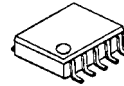
### ■GENERAL DESCRIPTION

The NJU7606 are low voltage operation high speed switching regulator control ICs for step-up and flyback converter, with a load switch function.

The load switch function can disrupt the current flow to the load in standby mode and latch mode. The NJU7606 also have a soft-start function, dead time control and timer latch for short circuit protection and their times are all adjustable with external parts. The NJU7606 is available in 10-lead MSOP (TVSP) package.

They are suitable for battery powered applications.

### ■PACKAGE OUTLINE



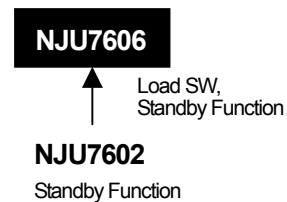
**NJU7606RB2**  
(MSOP10(TVSP10))

### ■FEATURES

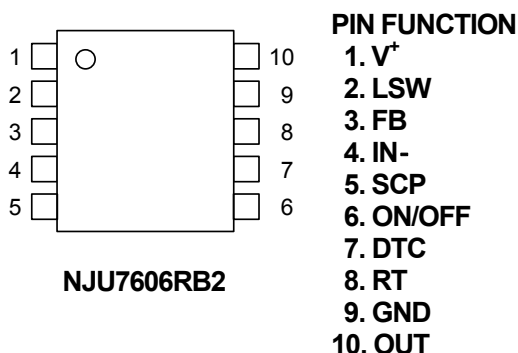
- PWM switching control
- Load Switch Function
- Operating Voltage           2.2V to 8V
- Wide Oscillator Range       300kHz to 1MHz
- Maximum Duty Cycle        90% typ.
- Quiescent Current            Operating: 800 $\mu$ A typ.  
  Standby: 1 $\mu$ A max.
- Soft-Start Function           Internal : 16ms typ. or adjustable
- Dead Time Control
- Timer Latch for Short Circuit Protection
- C-MOS Technology
- Package Outline               NJU7606RB2 : MSOP10 (TVSP10)\*

\*MEET JEDEC MO-187-DA / THIN TYPE

### ■PRODUCT VARIATION

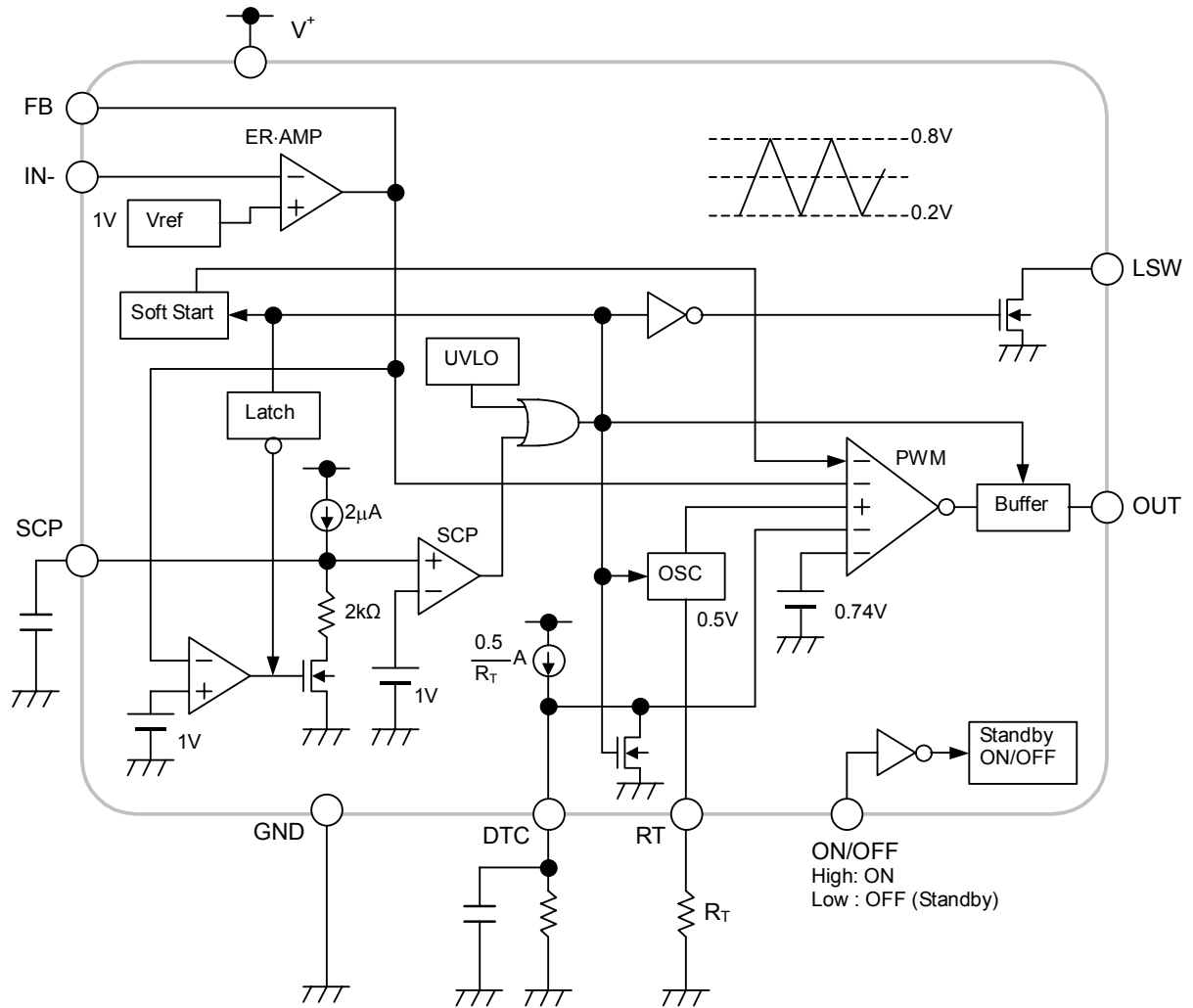


### ■PIN CONFIGURATION



# NJU7606

## ■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	$P_D$	320	mW
Operating Temperature Range	$T_{OPR}$	-40 to +85	°C
Storage Temperature Range	$T_{STG}$	-40 to +125	°C

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

## ■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

( $V^+=V_{ON/OFF}=3.3V$ ,  $R_T=47k\Omega$ , Ta=25°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	$T_{SS}$	$V_{T\_ON} \rightarrow \text{Duty}=80\%$	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	$f_{DV}$	$V^+=2.2V$ to 8V	—	1	—	%
Oscillate Temperature Fluctuations	$f_{DT}$	Ta=-40°C to +85°C	—	3	—	%

# NJU7606

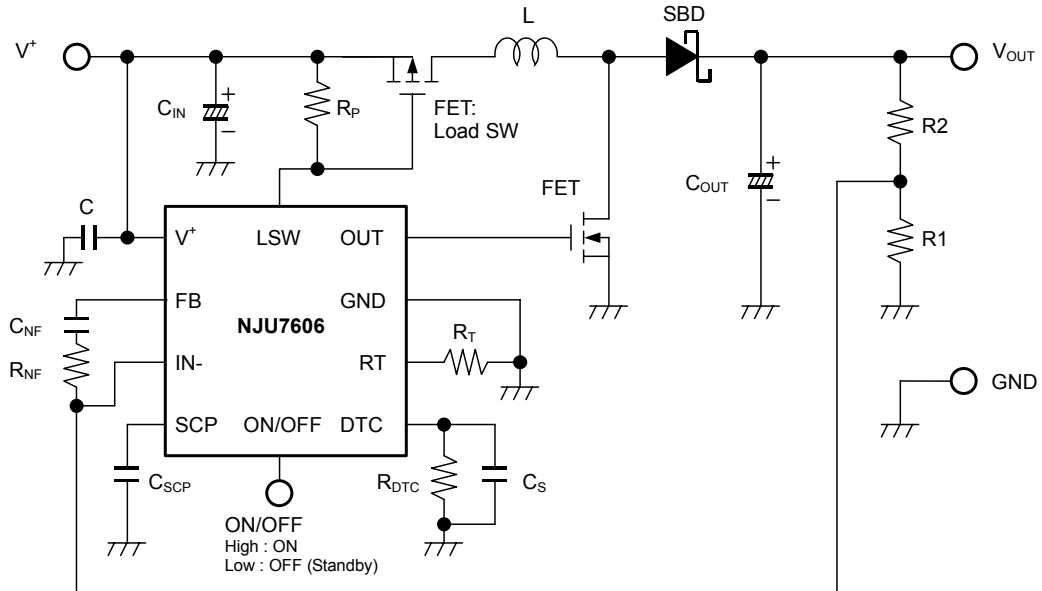
## ■ELECTRICAL CHARACTERISTICS

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

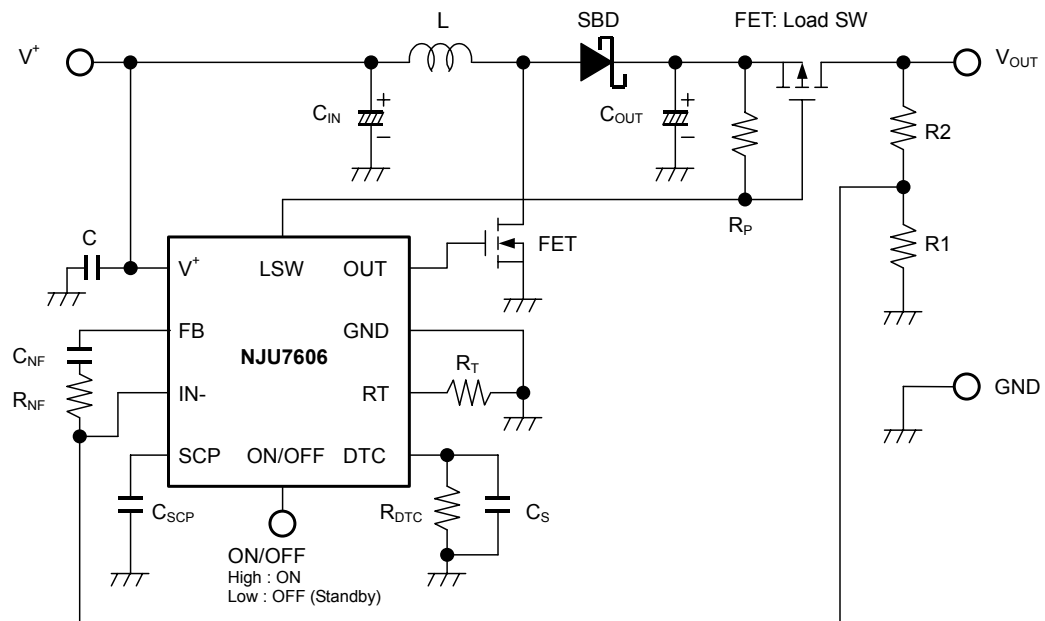
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
<b>Error Amplifier Block</b>						
Reference Voltage	$V_B$		-1.5%	1.00	+1.5%	V
Input Bias Current	$I_B$		-0.1	–	0.1	$\mu A$
Open Loop Gain	$A_V$		–	80	–	dB
Gain Bandwidth Product	$G_B$		–	1	–	MHz
Output Source Current	$I_{OM+1}$	$V_{FB}=1V$ , $V_{IN-}=0.9V$	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
<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	$M_{AXDUTY1}$	$V_{FB}=0.9V$	85	90	95	%
	$M_{AXDUTY2}$	$V_{FB}=0.9V$ , $R_{DTC}=47k\Omega$	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>Load SW Output Block</b>						
LSW Output ON Resistance	$R_{LSW}$	$I_{LSW}=1mA$	–	55	100	$\Omega$
LSW Output Leak Current	$I_{LEAK LSW}$	$V_{LSW}=9V$ , $V_{ON/OFF}=0V$	–	–	0.1	$\mu A$
<b>ON/OFF Block</b>						
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
<b>General Characteristics</b>						
Quiescent Current	$I_{DD}$	$R_L=Non Load$	–	800	1200	$\mu A$
Standby Current	$I_{DD STB}$	$V_{ON/OFF}=0V$	–	–	1.0	$\mu A$

## ■ TYPICAL APPLICATIONS

### Step-Up Converter (Input Line Load SW)

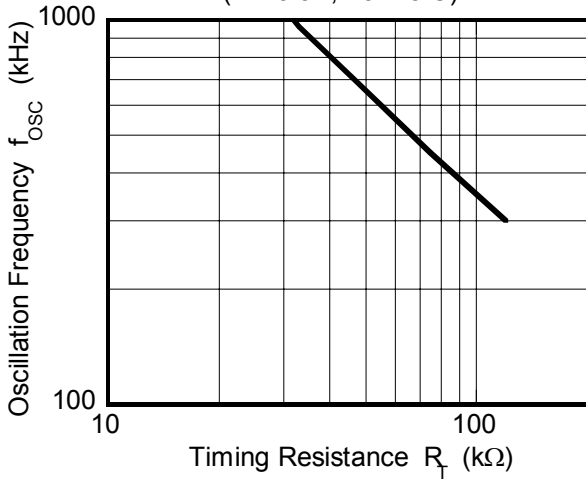


### Step-Up Converter (Output Line Load SW)

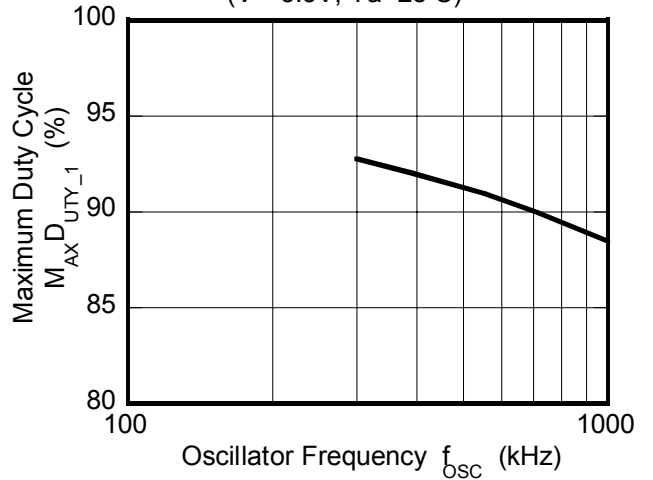


## ■ TYPICAL CHARACTERISTICS

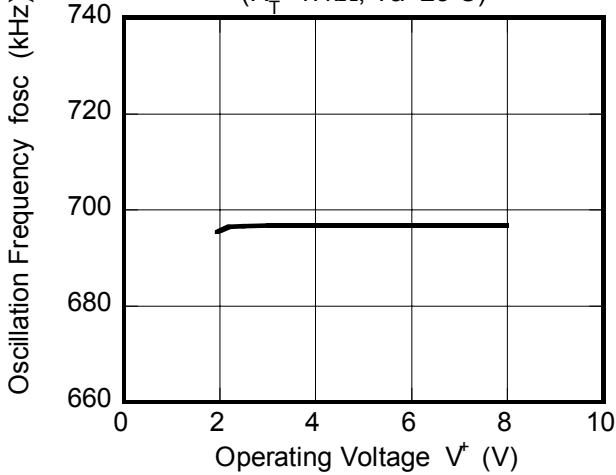
Oscillation Frequency vs. Timing Resistance  
( $V^+ = 3.3V, T_a = 25^\circ C$ )



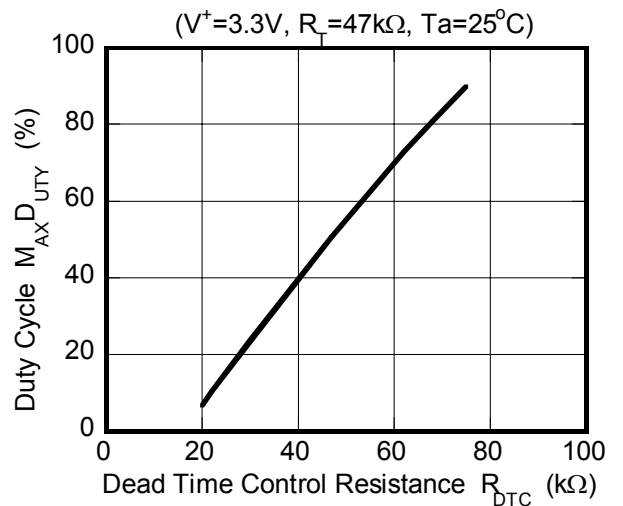
Maximum Duty Cycle vs. Oscillator Frequency  
( $V^+ = 3.3V, T_a = 25^\circ C$ )



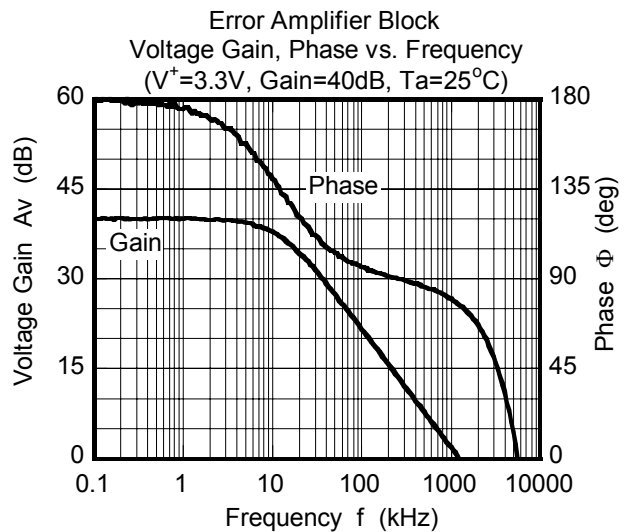
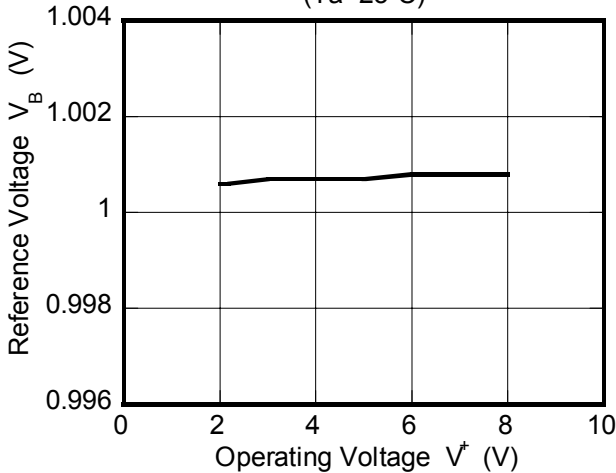
Oscillation Frequency vs. Operating Voltage  
( $R_T = 47k\Omega, T_a = 25^\circ C$ )



Duty Cycle vs.  $R_{DTC}$



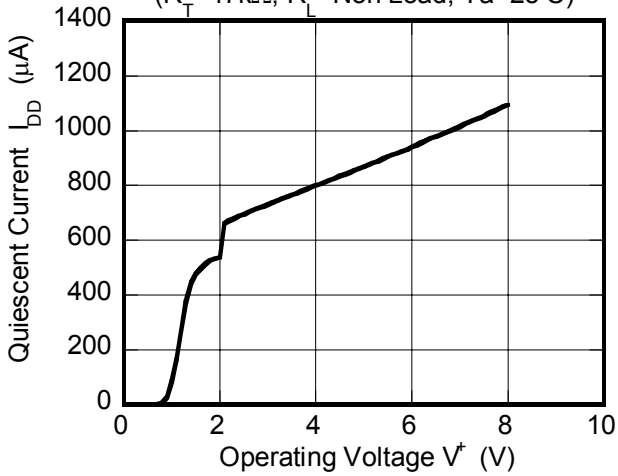
Reference Voltage vs. Operating Voltage  
( $T_a = 25^\circ C$ )



## ■ TYPICAL CHARACTERISTICS

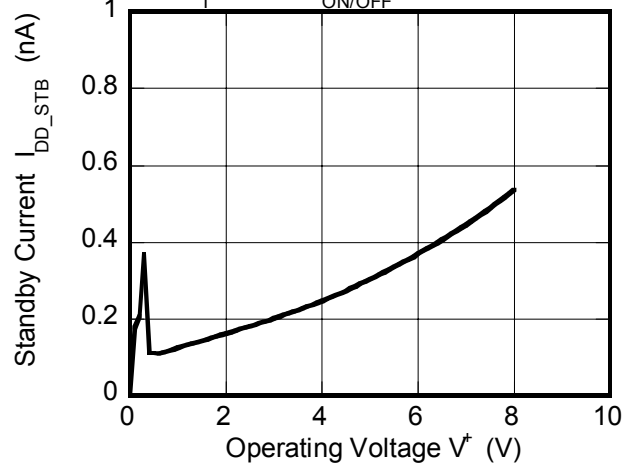
Quiescent Current vs. Operating Voltage

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

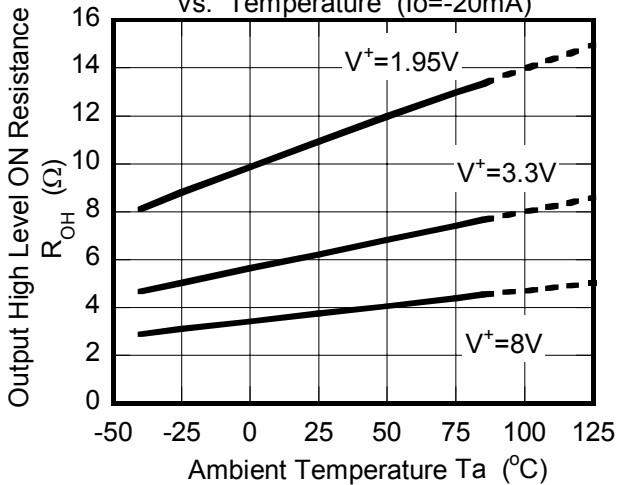


Standby Current vs. Operating Voltage

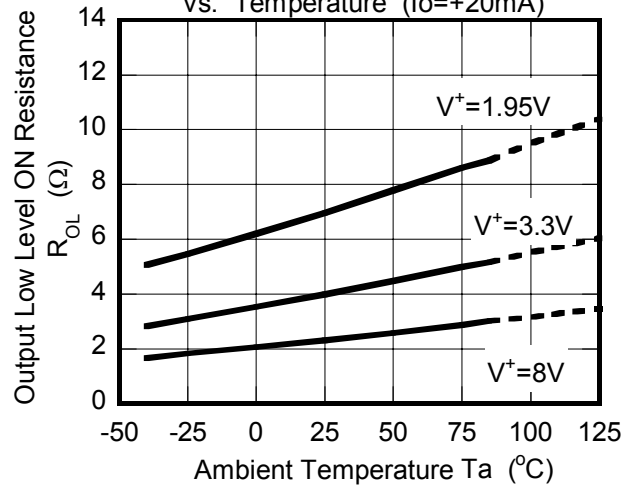
( $R_T=47k\Omega$ ,  $V_{ON/OFF}=0V$ ,  $T_a=25^\circ C$ )



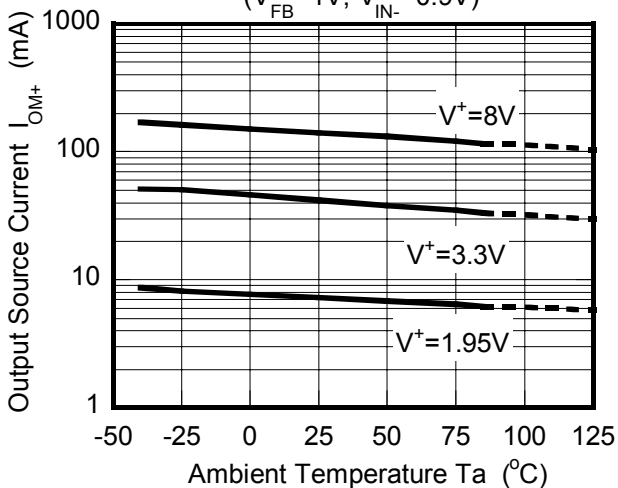
Output Block  
Output High Level ON Resistance vs. Temperature ( $I_o=-20mA$ )



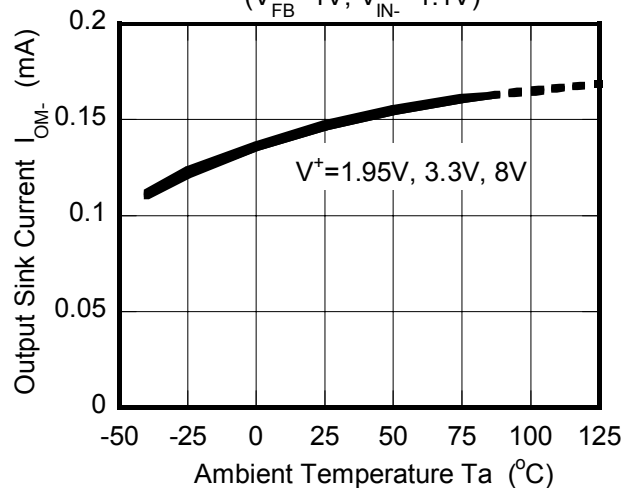
Output Block  
Output Low Level ON Resistance vs. Temperature ( $I_o=+20mA$ )



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

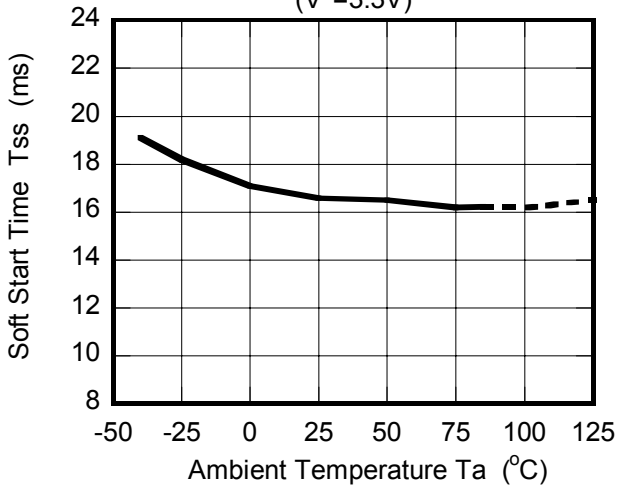


Error Amplifier Block  
Output Sink Current vs. Temperature ( $V_{FB}=1V$ ,  $V_{IN-}=1.1V$ )

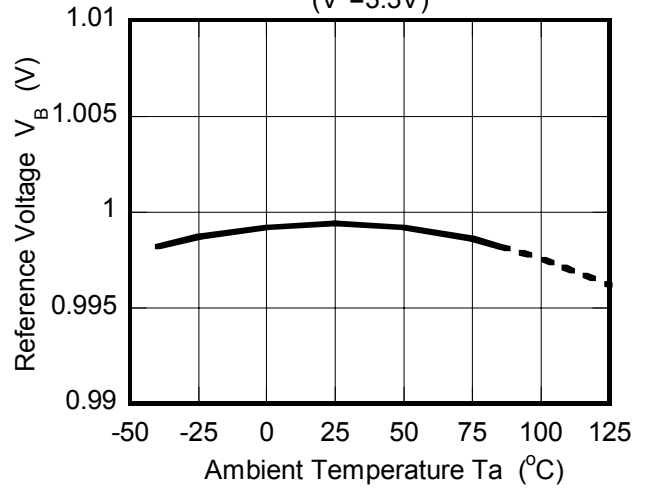


## ■ TYPICAL CHARACTERISTICS

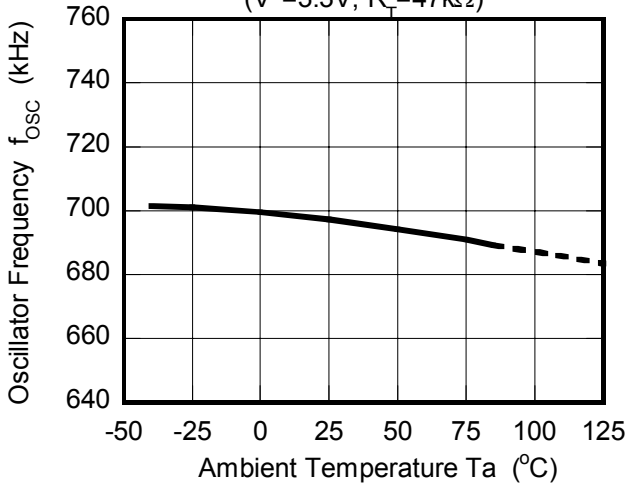
Soft Start Time vs. Temperature  
( $V^+=3.3V$ )



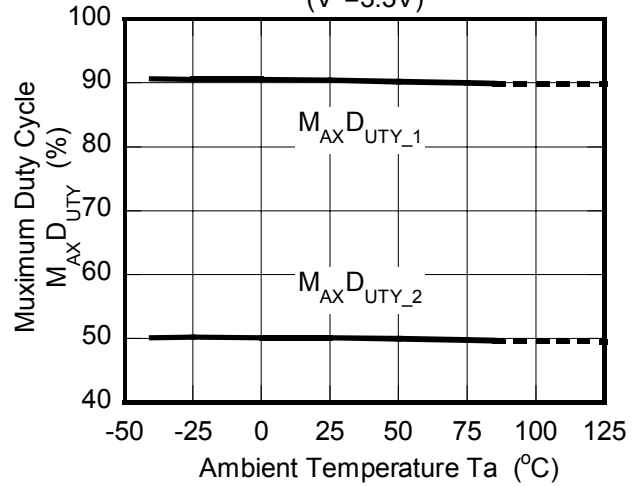
Reference Voltage vs. Temperature  
( $V^+=3.3V$ )



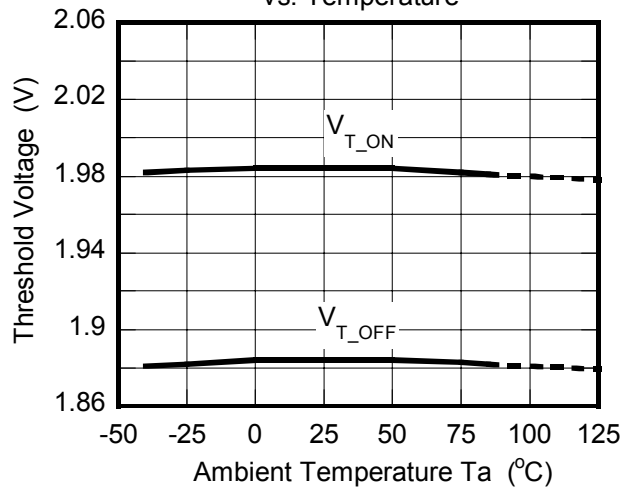
Oscillator Frequency vs. Temperature  
( $V^+=3.3V, R_1=47k\Omega$ )



Muximum Duty Cycle vs. Temperature  
( $V^+=3.3V$ )

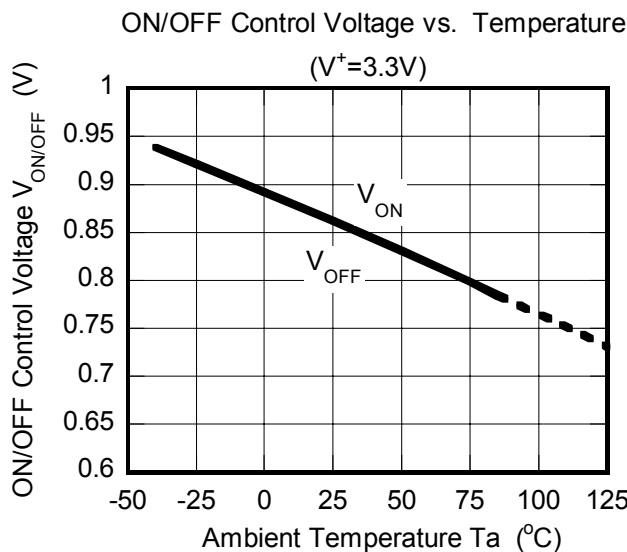
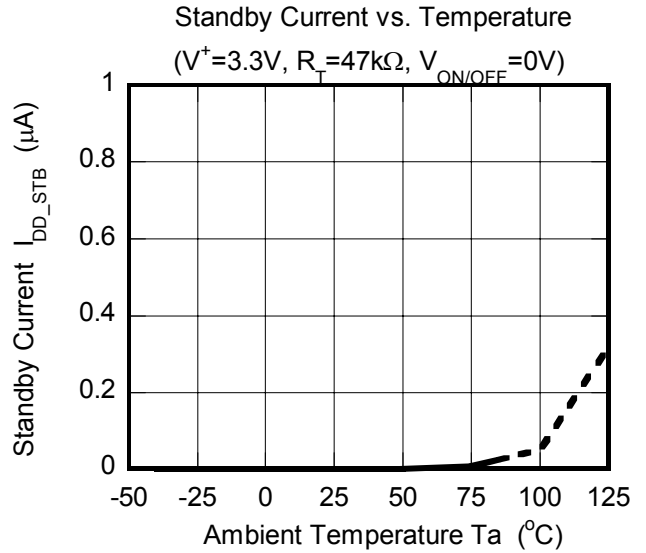
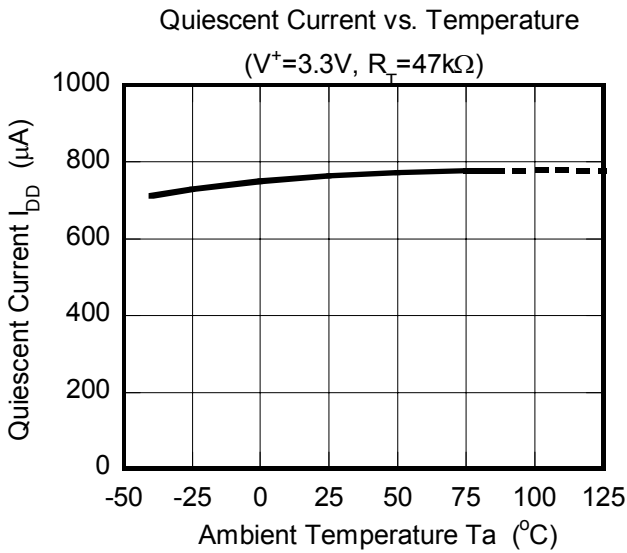
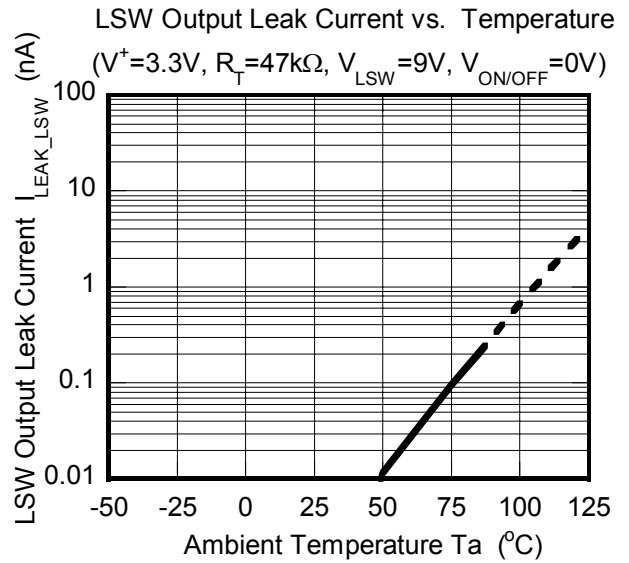
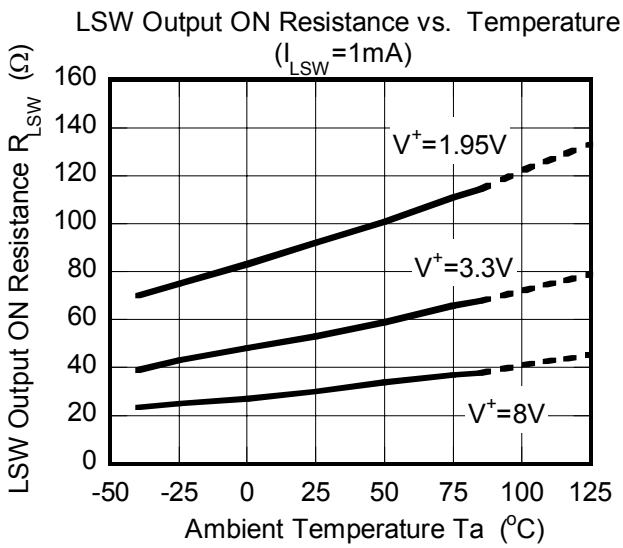


Under Voltage Lockout Block  
vs. Temperature





■ TYPICAL CHARACTERISTICS



## MEMO

**[CAUTION]**

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.