

## Step-Down switching regulator IC with standby function

### ■GENERAL DESCRIPTION

**NJU7632** 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. The standby function realizes low power consumption at the time of standby.

### ■PACKAGE OUTLINE

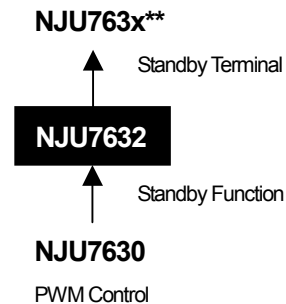


**NJU7632RB1**

### ■FEATURES

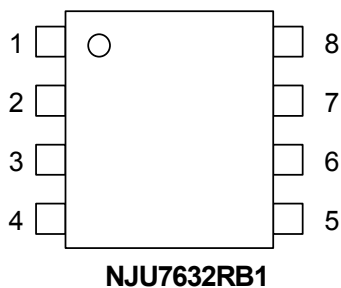
- PWM switching control
- Standby Function
- Operating Voltage                   2.2V to 8V
- Wide Oscillator Range               300kHz to 1MHz
- Maximum Duty Cycle                 100%
- Quiescent Current                    Operating :800μA typ.  
  Standby :1μA max.
- Soft-Start Function                   Internal :16ms typ. or adjustable
- Dead Time Control
- Timer Latch for Short Circuit Protection
- C-MOS Technology
- Package Outline                    NJU7632RB1 : TVSP8

### ■PRODUCT VARIATION



\*\* Planning

### ■PIN CONFIGURATION



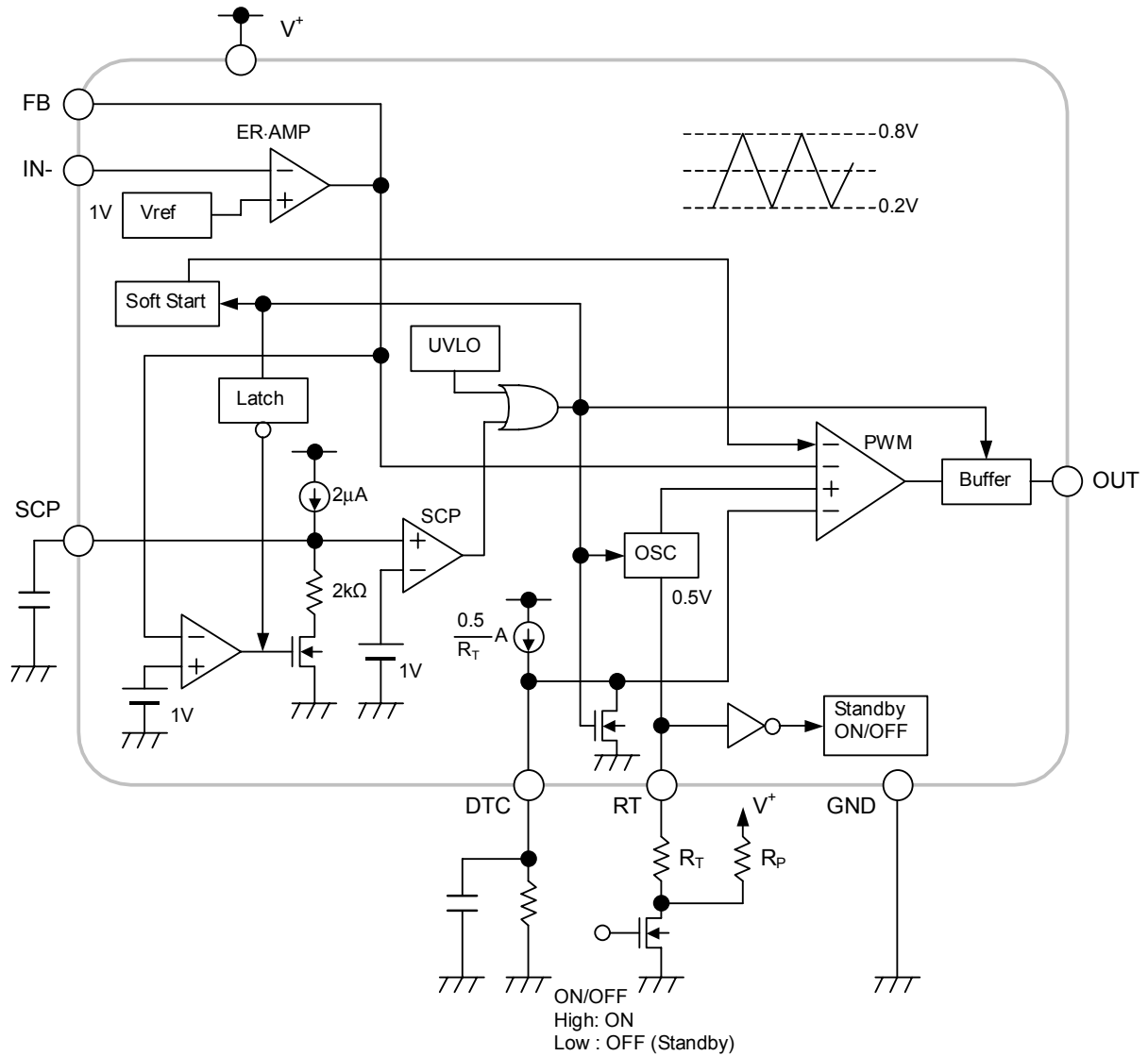
#### PIN FUNCTION

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

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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	$P_D$	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	—	%
Standby RT Terminal Resistance	$R_{T\_STB}$		—	2	—	MΩ

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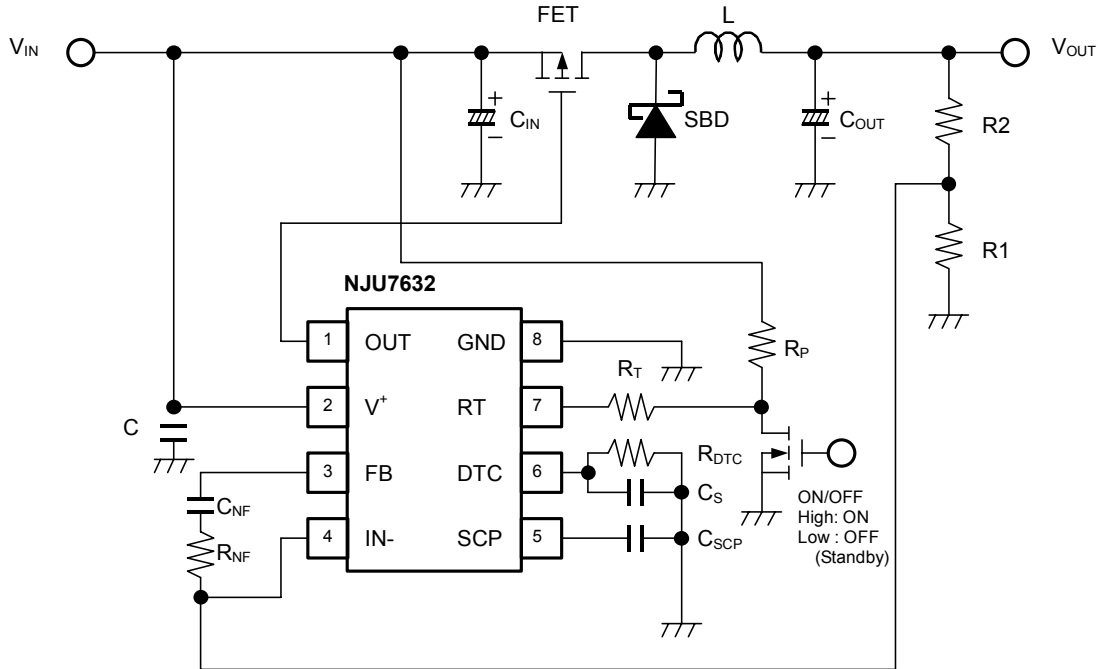
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## ■ ELECTRICAL CHARACTERISTICS ( $V^+=3.3V$ , $R_T=47k\Omega$ , $T_a=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
<b>Error Amplifier Block</b>						
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	$I_{OM+1}$	$V_{FB}=1V$ , $V_{IN-}=0.9V$	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 Complete 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	$M_{AX}D_{UTY1}$	$V_{FB}=0.9V$	100	–	–	%
	$M_{AX}D_{UTY2}$	$V_{FB}=0.9V$ , $R_{DTC}=47k\Omega$	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	$\mu A$
Standby Quiescent Current	$I_{DD\_STB}$	$R_T=Open$	–	–	1.0	$\mu A$

## ■ TYPICAL APPLICATIONS

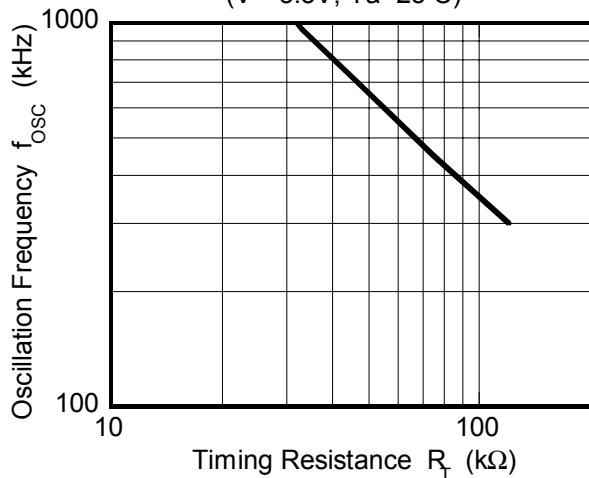
### Step-Down Converter



## ■ TYPICAL CHARACTERISTICS

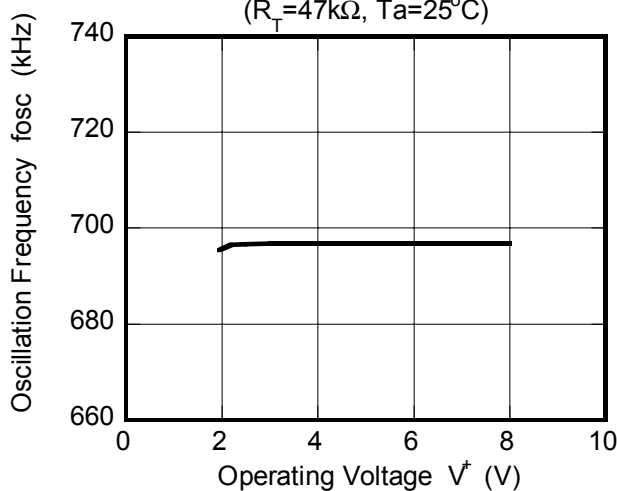
Oscillation Frequency vs. Timing Resistance

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



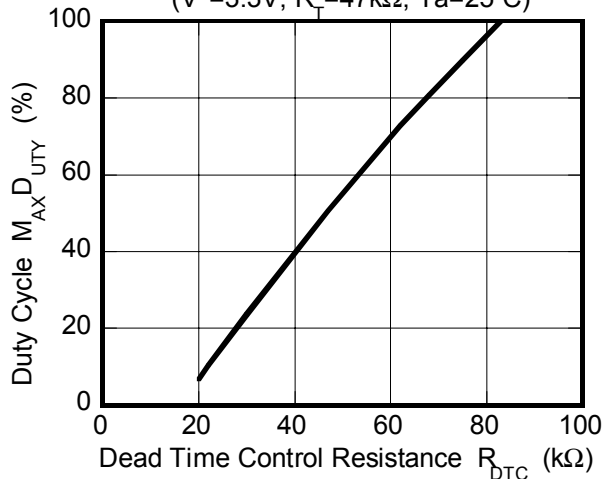
Oscillation Frequency vs. Operating Voltage

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



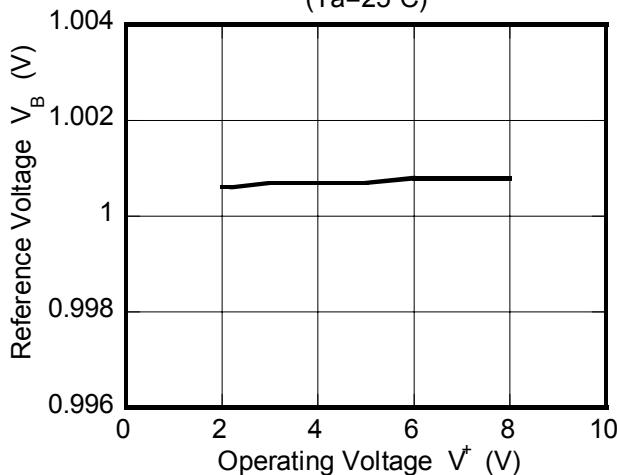
Duty Cycle vs.  $R_{DTC}$

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



Reference Voltage vs. Operating Voltage

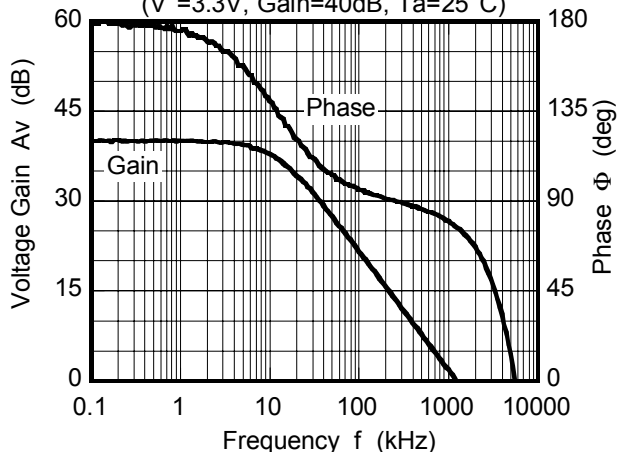
( $T_a = 25^\circ C$ )



Error Amplifier Block

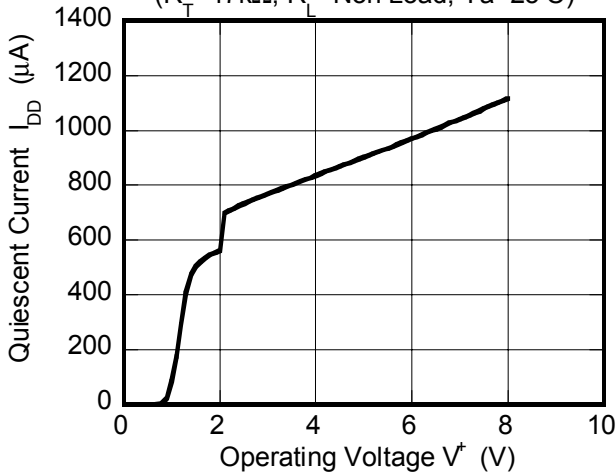
Voltage Gain, Phase vs. Frequency

( $V^+ = 3.3V$ , Gain=40dB,  $T_a = 25^\circ C$ )

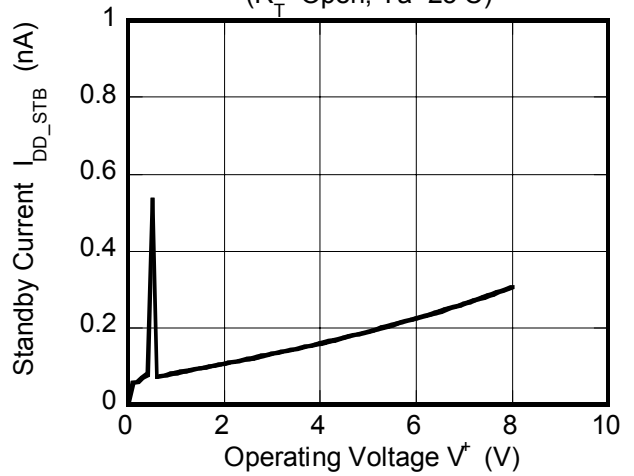


## ■ TYPICAL CHARACTERISTICS

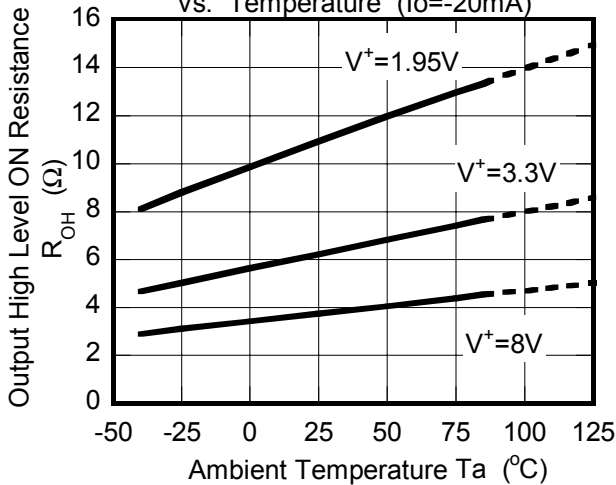
Quiescent Current vs. Operating Voltage  
( $R_T=47k\Omega$ ,  $R_L=Non\ Load$ ,  $T_a=25^\circ C$ )



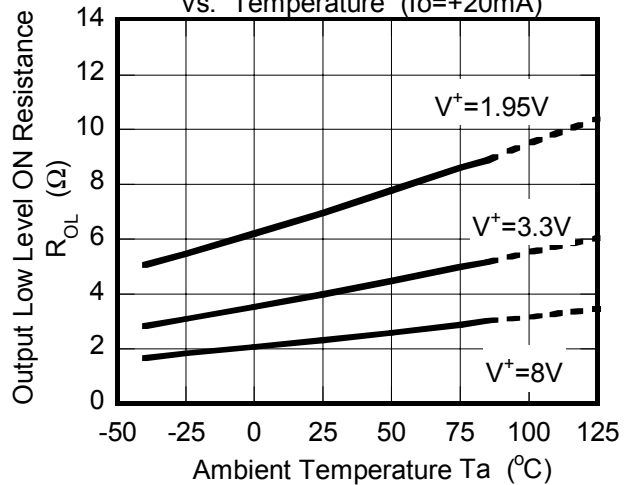
Standby Current vs. Operating Voltage  
( $R_T=Open$ ,  $T_a=25^\circ C$ )



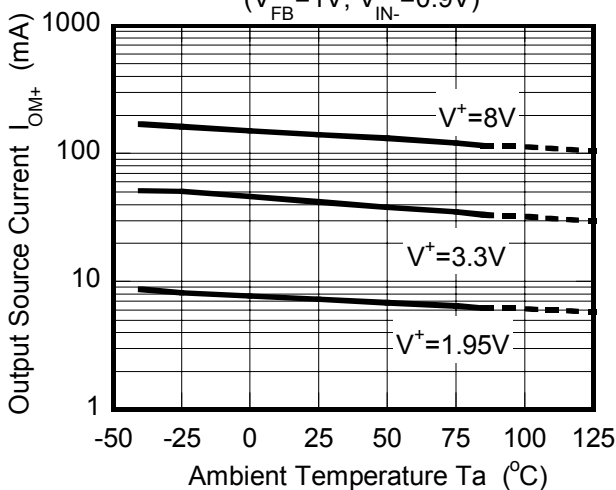
Output Block  
Output High Level ON Resistance vs. Temperature ( $I_o=-20mA$ )



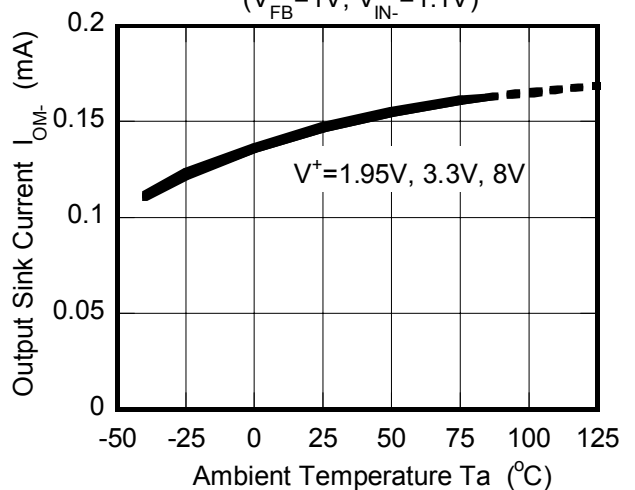
Output Block  
Output Low Level ON Resistance vs. Temperature ( $I_o=+20mA$ )



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



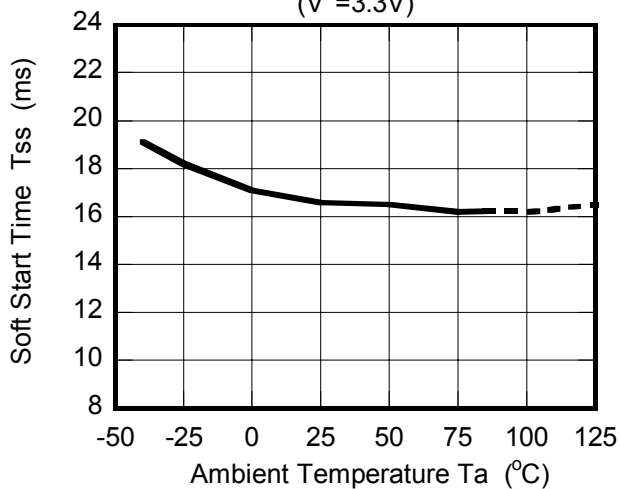
Error Amplifier Block  
Output Sink Current vs. Temperature ( $V_{FB}=1V$ ,  $V_{IN-}=1.1V$ )



## ■ TYPICAL CHARACTERISTICS

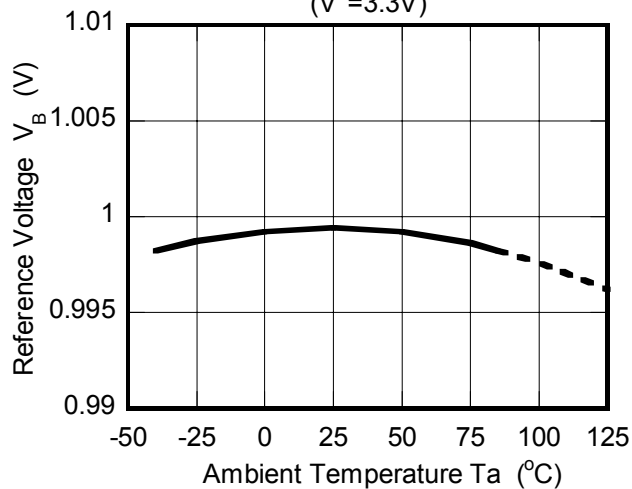
Soft Start Time vs. Temperature

( $V^+=3.3V$ )



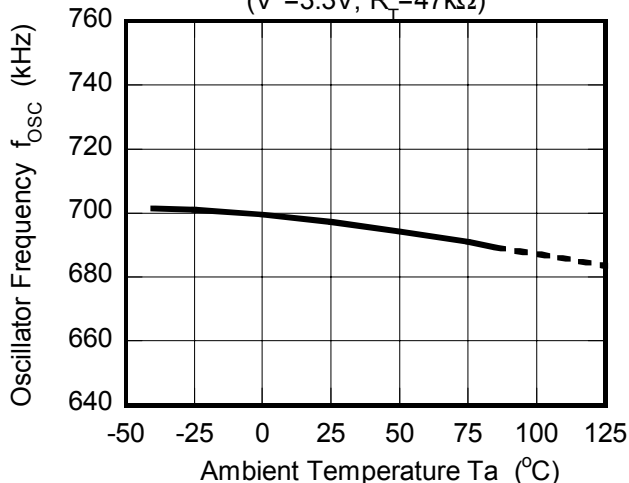
Reference Voltage vs. Temperature

( $V^+=3.3V$ )

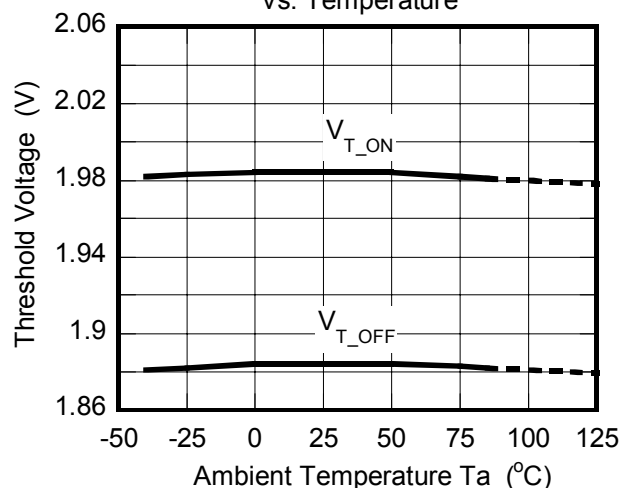


Oscillator Frequency vs. Temperature

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

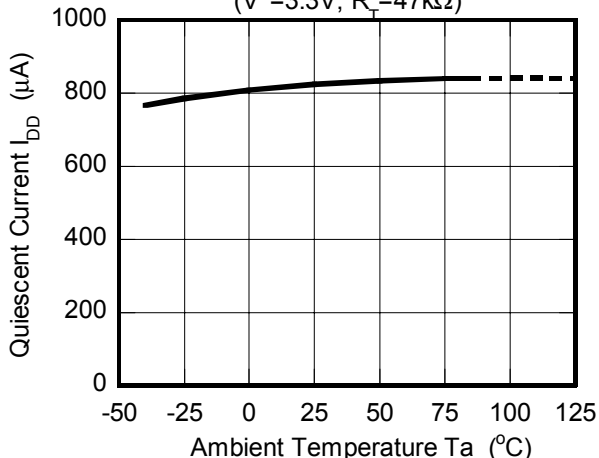


Under Voltage Lockout Block vs. Temperature



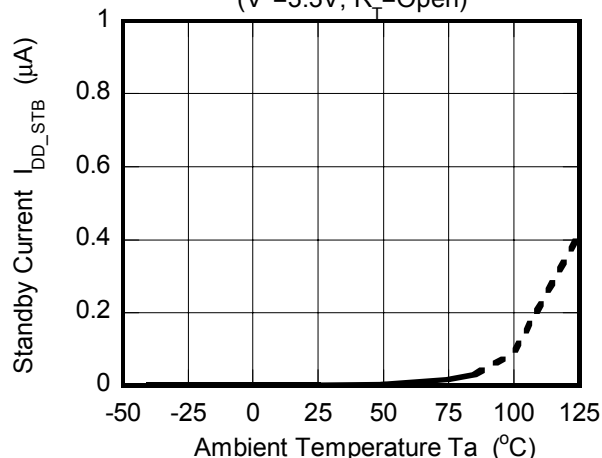
Quiescent Current vs. Temperature

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



Standby Current vs. Temperature

( $V^+=3.3V, R_T=Open$ )





# MEMO

**[CAUTION]**

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