

Step-Down switching regulator IC with Over Current Protection

■ GENERAL DESCRIPTION

The **NJU7640** is a low voltage operation high-speed switching regulator control IC for step-down converter, with a pulse-by-pulse over-current protection. The pulse-by-pulse over-current protection circuit can limit the over current in switching operation.

It incorporates a totem pole output, which can drive an external MOS-FET easily. It also has a soft-start function and dead time control and their times are all adjustable with external parts.

The NJU7640 is available in a small and thin 8-lead MSOP (TVSP) package.

■ FEATURES

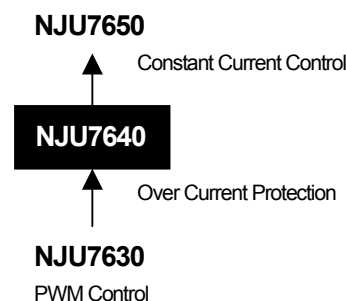
- PWM switching control
 - Pulse-by-pulse over current protection
 - Operating Voltage 2.2V to 8V
 - Wide Oscillator Range 300kHz to 1MHz
 - Maximum Duty Cycle 100%
 - Quiescent Current 800 μ A typ.
 - Soft-Start Function Internal : 16ms typ. or adjustable
 - Dead Time Control
 - C-MOS Technology
 - Package Outline NJU7640RB1 : MSOP8 (TVSP8)*
- *MEET JEDEC MO-187-DA / THIN TYPE

■ PACKAGE OUTLINE

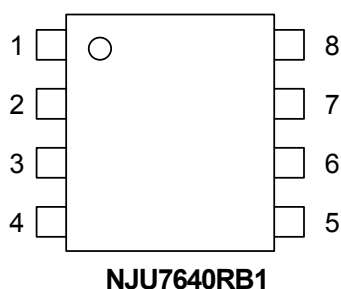


NJU7640RB1
(MSOP8 (TVSP8))

■ PRODUCT VARIATION

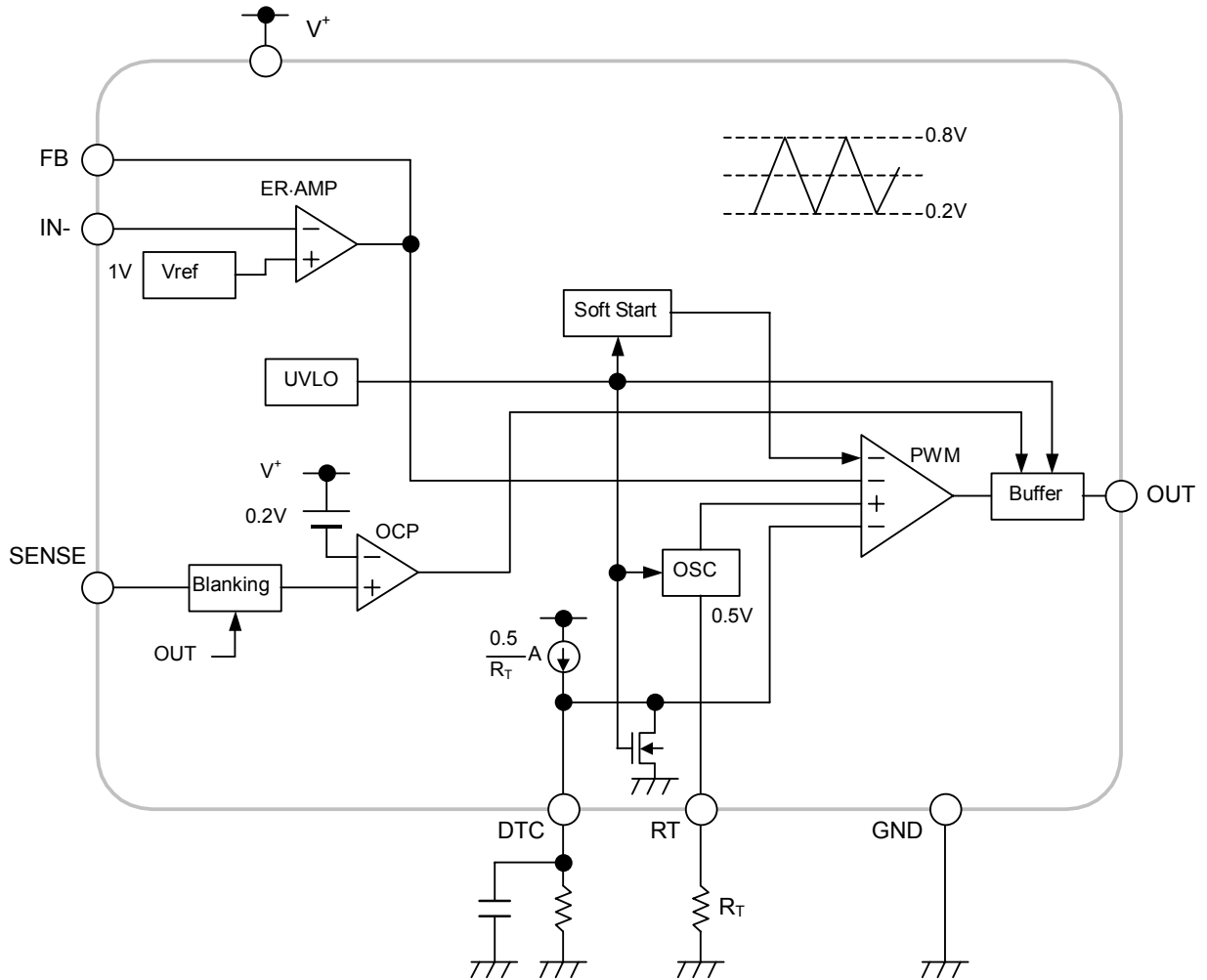


■ PIN CONFIGURATION



PIN FUNCTION

1. OUT
2. V⁺
3. FB
4. IN-
5. SENSE
6. DTC
7. RT
8. GND



■ 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	MSOP8 (TVSP8) :320	mW
Operating Temperature Range	T_{OPR}	-40 to +85	°C
Storage Temperature Range	T_{STG}	-40 to +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

($V^+=3.3V$, $R_T=47k\Omega$, Ta=25°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}	$V_{T_ON} \rightarrow \text{Duty}=80\%$	8	16	24	ms
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Over Current Protection Block

Current Limit Sense Voltage	V_{SENSE}	Voltage between V^+ -SENSE pin	0.17	0.2	0.23	V
Delay Time	T_{DELAY}	$V_{SENSE}+0.1V$ Delay time to OUT	—	160	—	ns
Sense Blanking Time	T_{BLANK}		—	90	—	ns

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}	$V^+=2.2V$ to 8V	—	1	—	%
Oscillate Temperature Fluctuations	f_{DT}	Ta=-40°C to +85°C	—	3	—	%

■ 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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Error Amplifier Block

Reference Voltage	V_B		-1.0%	1.00	+1.0%	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 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	$M_{AXDUTY1}$	$V_{FB}=0.9V$	100	—	—	%
	$M_{AXDUTY2}$	$V_{FB}=0.9V$, $R_{DTC}=47k\Omega$	40	50	60	%

Output Block

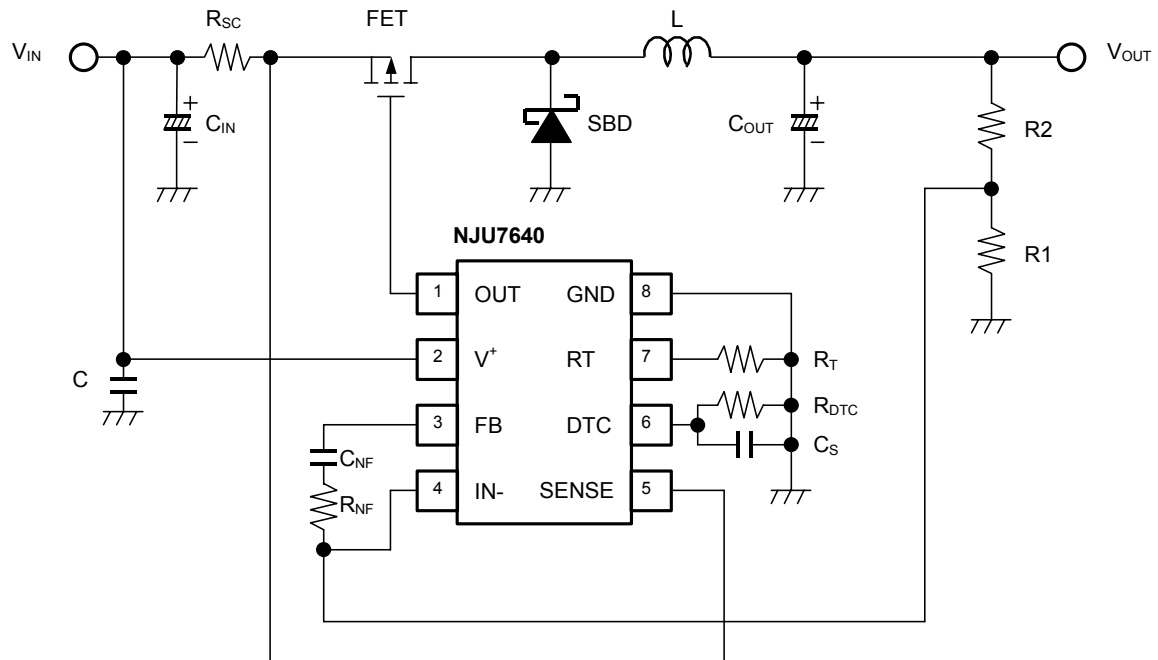
Output High Level ON Resistance	R_{OH}	$I_O=-20mA$	—	10	20	Ω
Output Low Level ON Resistance	R_{OL}	$I_O=+20mA$	—	5	10	Ω

General Characteristics

Quiescent Current	I_{DD}	$R_L=Non\ Load$	—	800	1200	μA
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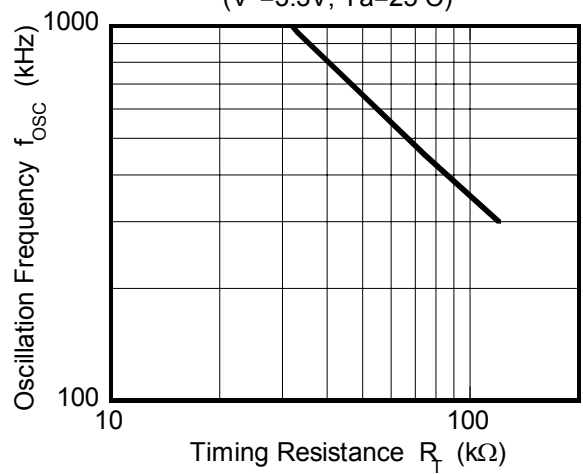
■ TYPICAL APPLICATIONS

Step-Down Converter

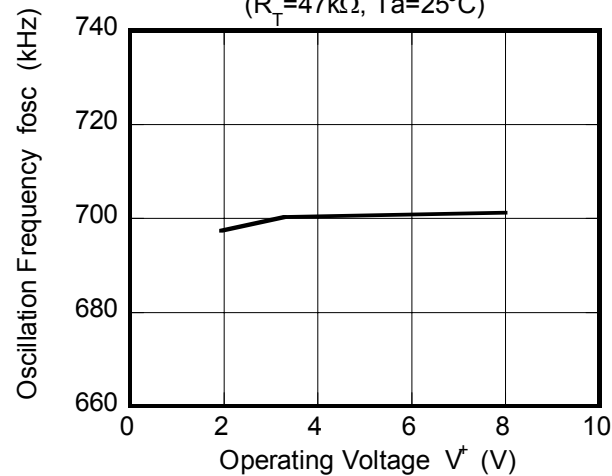


■ TYPICAL CHARACTERISTICS

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

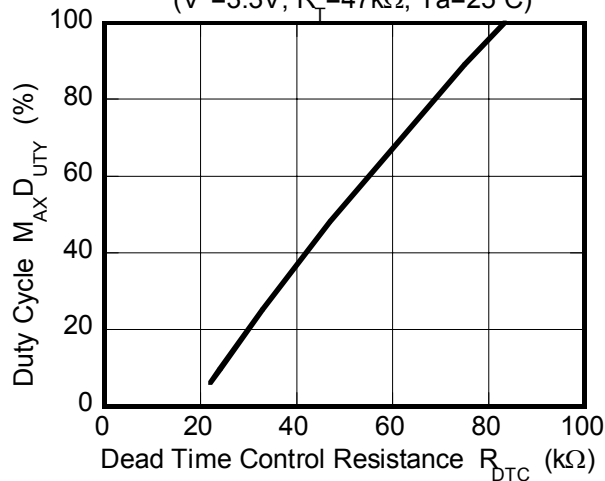


Oscillation Frequency vs. Operating Voltage
($R_T=47\text{k}\Omega$, $T_a=25^\circ\text{C}$)



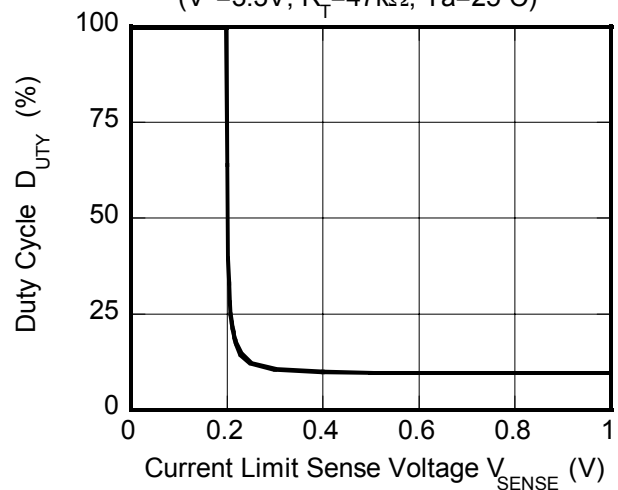
Duty Cycle vs. R_{DTC}

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

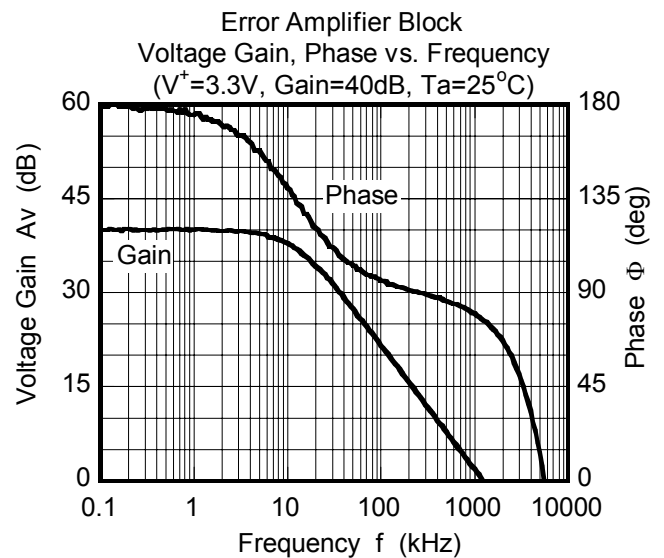
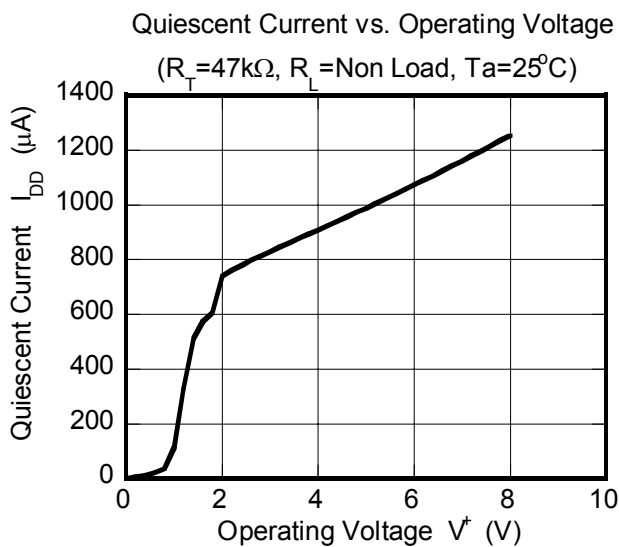
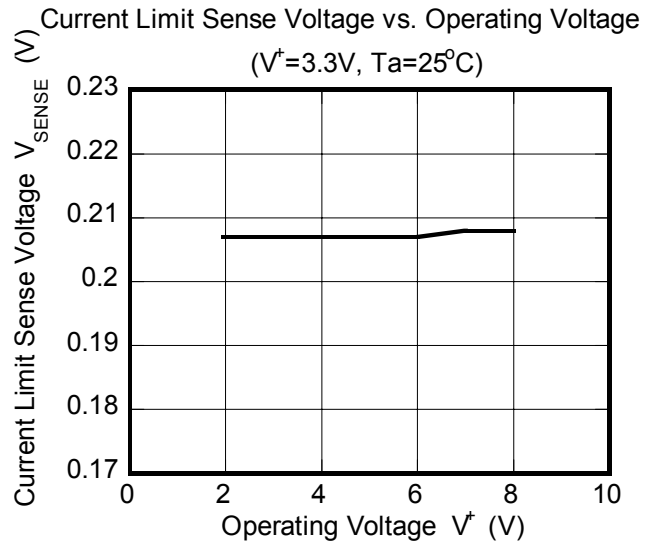
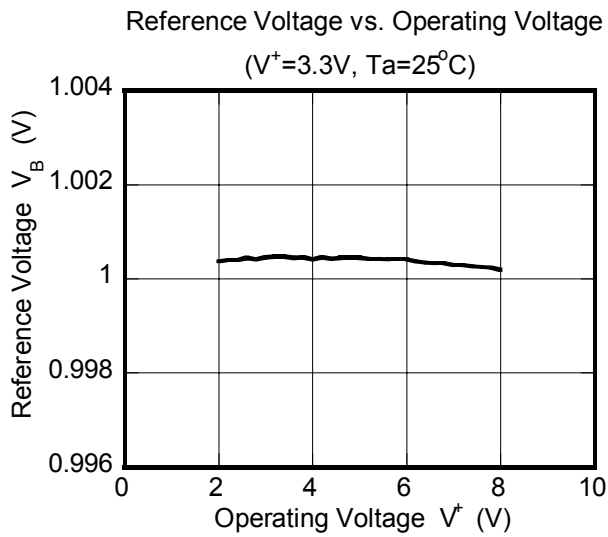


Duty Cycle vs. Current Limit Sense Voltage

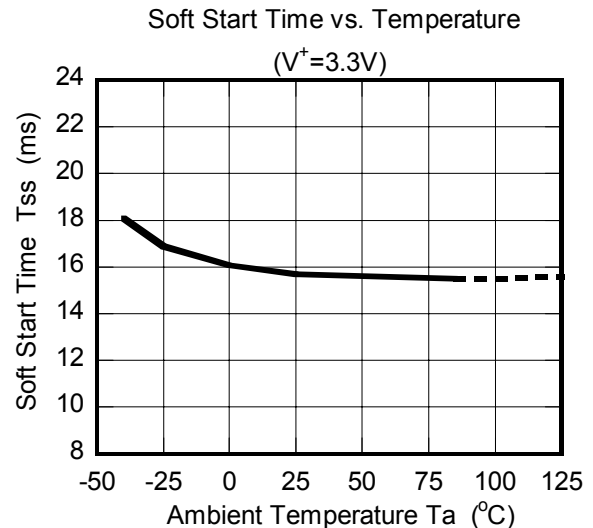
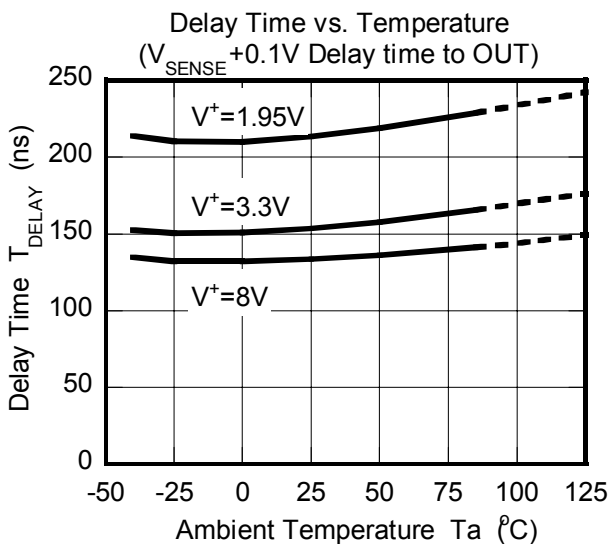
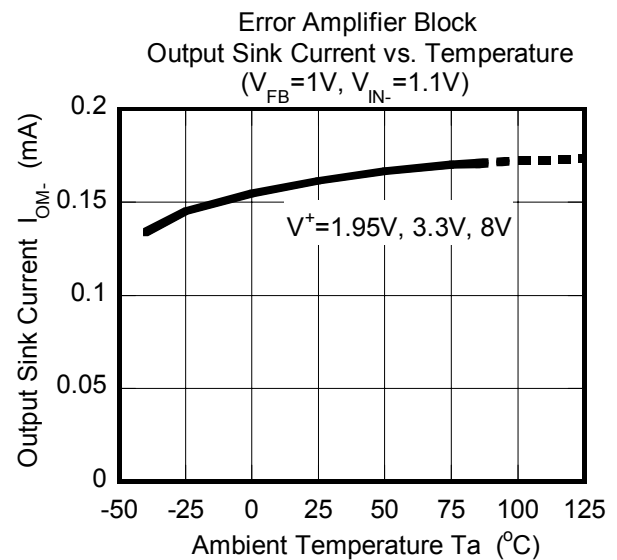
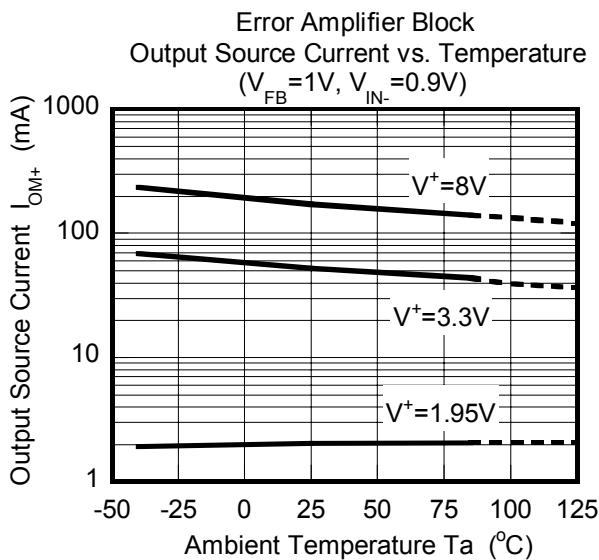
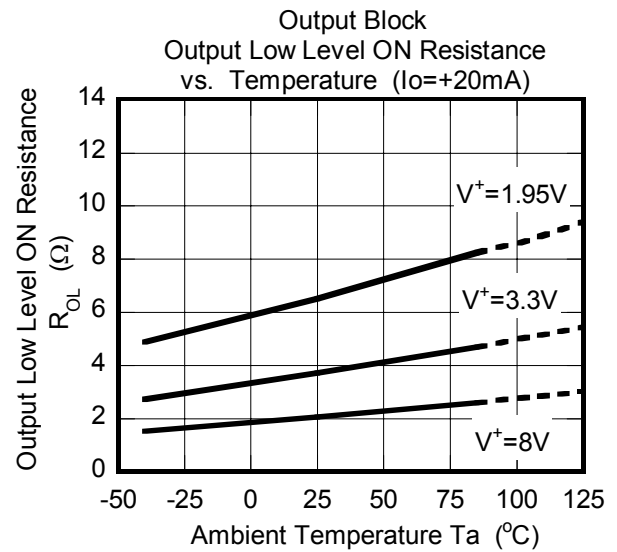
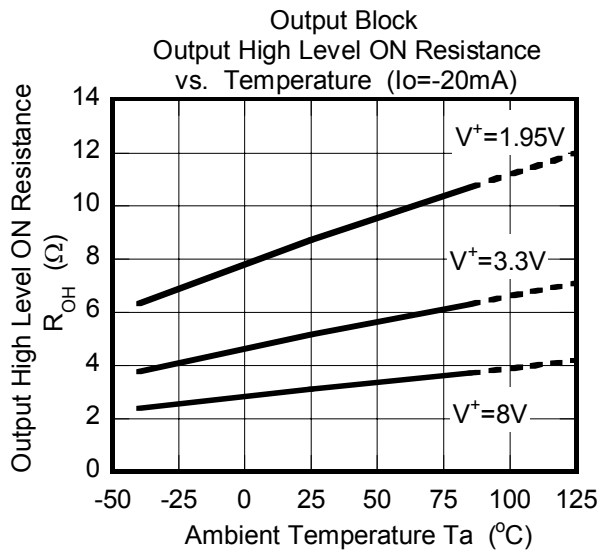
($V^+=3.3\text{V}$, $R_T=47\text{k}\Omega$, $T_a=25^\circ\text{C}$)



■ TYPICAL CHARACTERISTICS



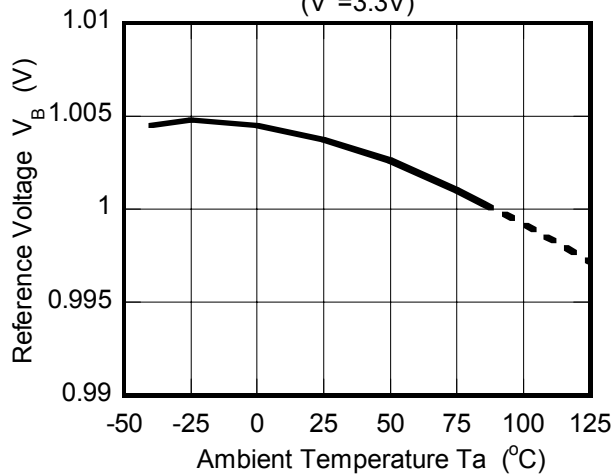
■ TYPICAL CHARACTERISTICS



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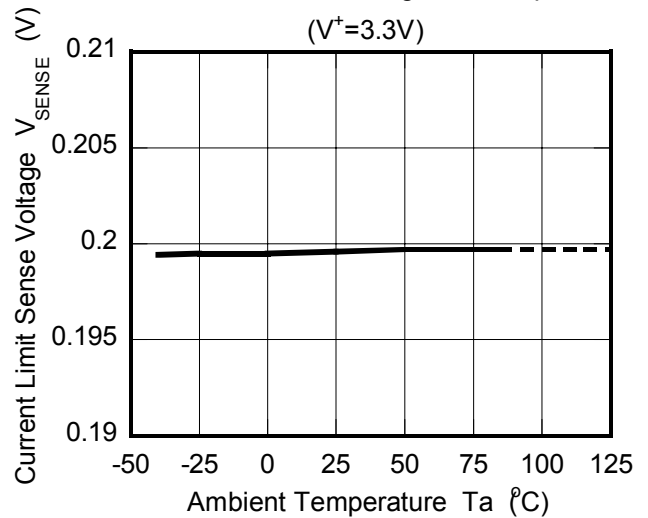
Reference Voltage vs. Temperature

($V^+=3.3V$)



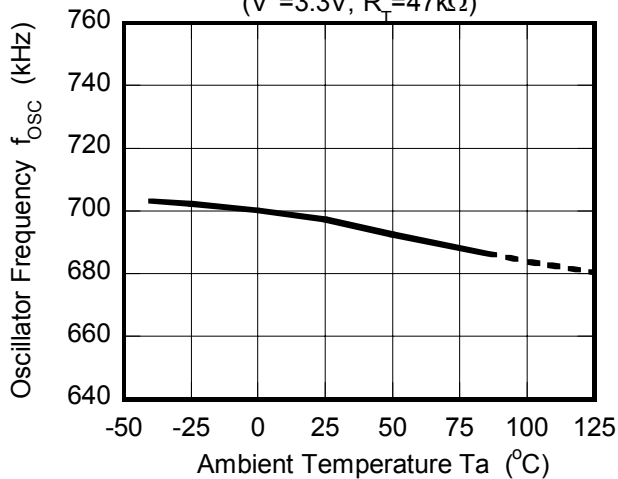
Current Limit Sense Voltage vs. Temperature

($V^+=3.3V$)

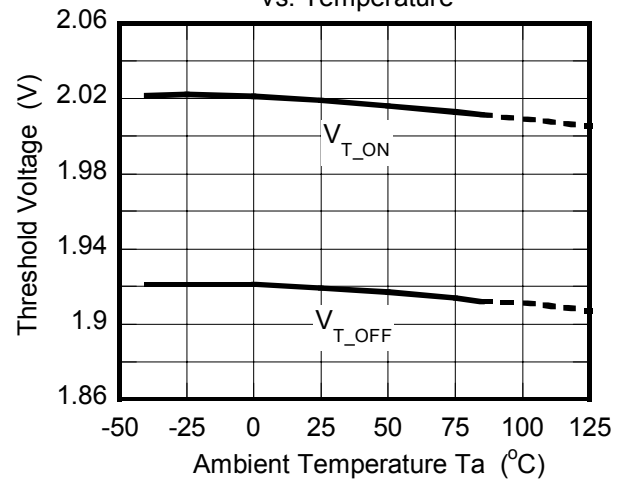


Oscillator Frequency vs. Temperature

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

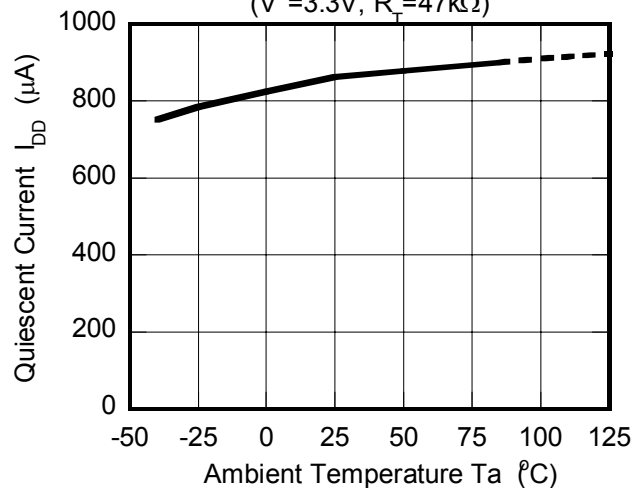


Under Voltage Lockout Block vs. Temperature



Quiescent Current vs. Temperature

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



MEMO

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