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.

■ PACKAGE OUTLINE

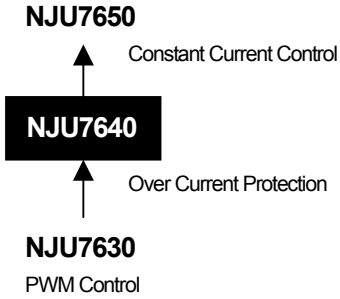
NJU7640RB1
(MSOP8 (TVSP8))

■ FEATURES

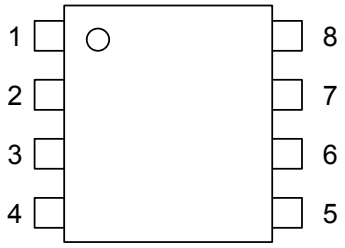
- PWM switching control
- Pulse-by-pulse over current protection
- Operating Voltage 2.2V to 8V
- Wide Oscillator Range 300kHz to 1MHz
- Maximum Duty Cycle 100%
- Quiescent Current 800μA typ.
- Soft-Start Function Internal : 16ms typ. or adjustable
- Dead Time Control
- C-MOS Technology
- Package Outline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

*MEET JEDEC MO-187-DA / THIN TYPE

■ PRODUCT VARIATION



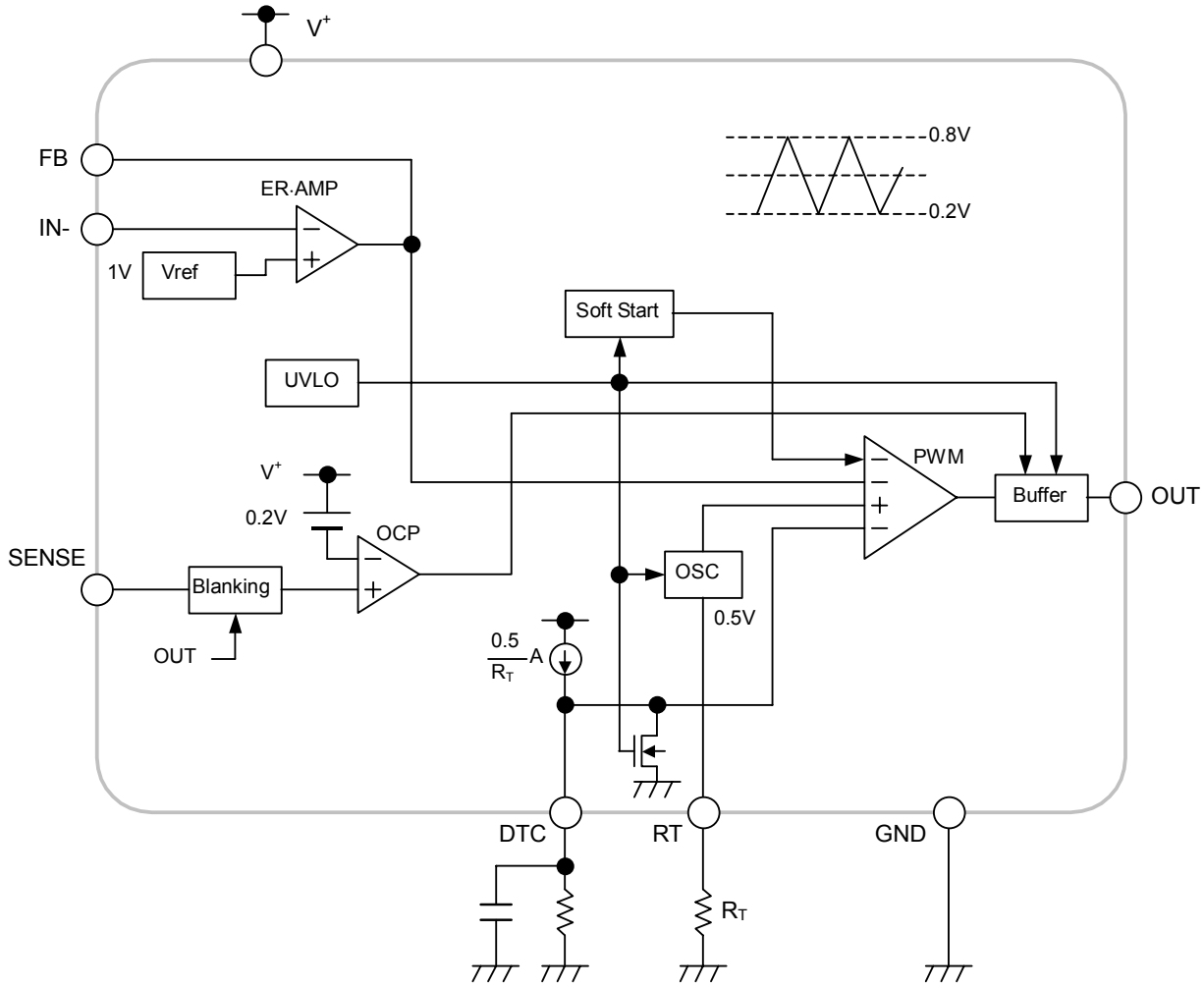
■ PIN CONFIGURATION



NJU7640RB1

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

■ 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	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=47kΩ, Ta=25°C)

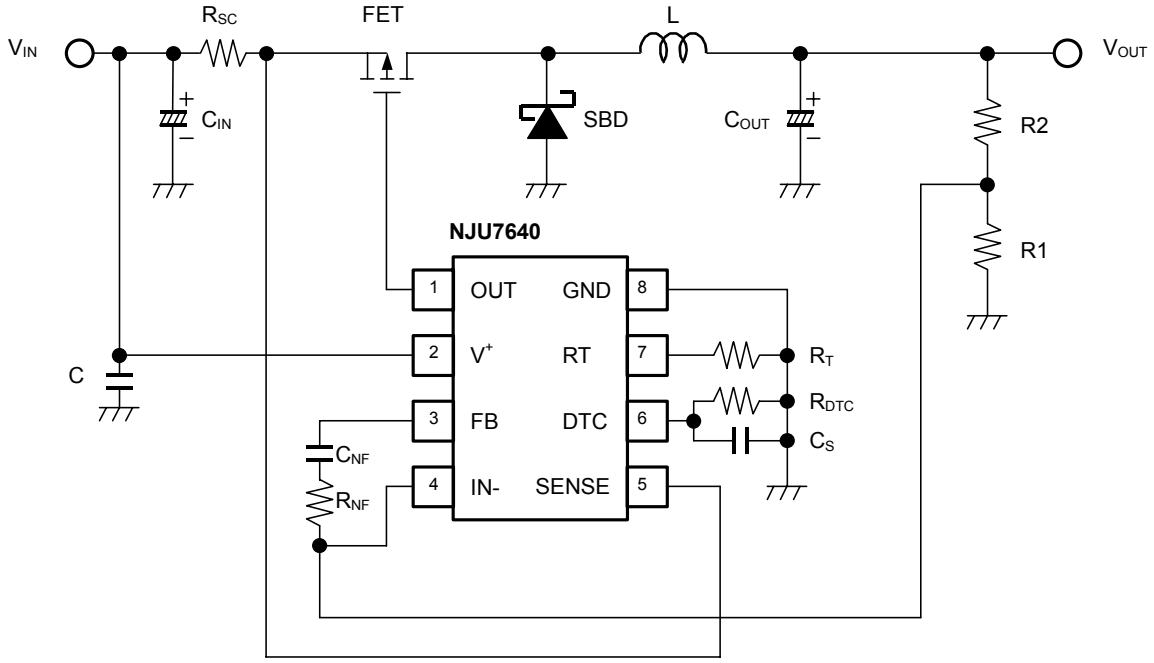
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Under Voltage Lockout Block						
ON Threshold Voltage	V_{T_ON}	V^+= L → H	1.9	2.0	2.1	V
OFF Threshold Voltage	V_{T_OFF}	V^+= H → L	1.8	1.9	2.0	V
Hysteresis Voltage	V_{HYS}		60	100	–	mV
Soft Start Block						
Soft Start Time	T_{SS}	V_{T_ON} → Duty=80%	8	16	24	ms
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=47kΩ, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
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 Comparate Block						
Input Threshold Voltage	V_{T_0}	Duty=0%	0.16	0.22	0.28	V
	V_{T_50}	Duty=50%	0.44	0.5	0.56	V
Maximum Duty Cycle	$M_{AX}D_{UTY_1}$	V_{FB}=0.9V	100	–	–	%
	$M_{AX}D_{UTY_2}$	V_{FB}=0.9V, R_{DTC}=47kΩ	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

■ TYPICAL APPLICATIONS

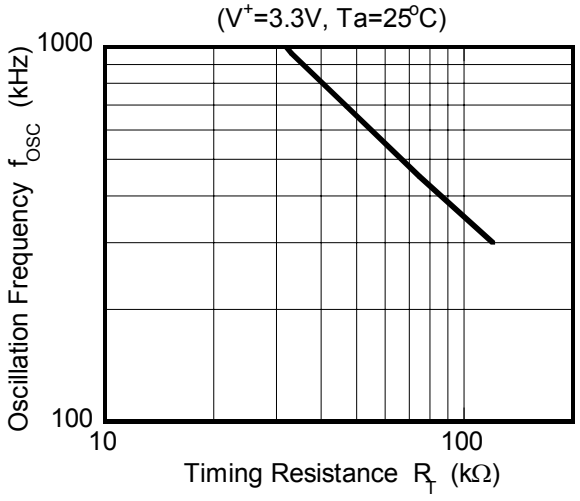
Step-Down Converter



■ TYPICAL CHARACTERISTICS

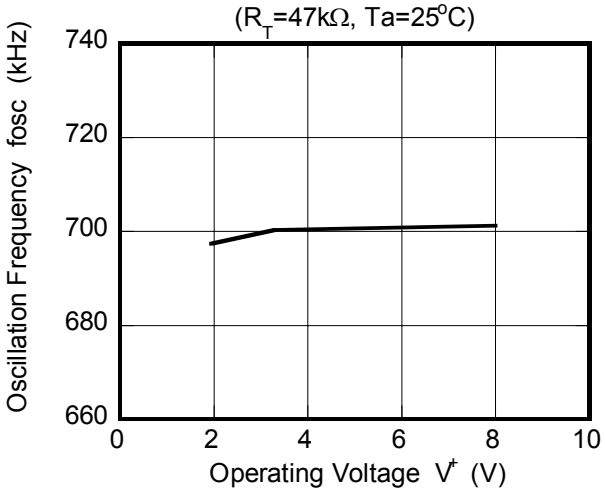
Oscillation Frequency vs. Timing Resistance

(V^+=3.3V, Ta=25°C)



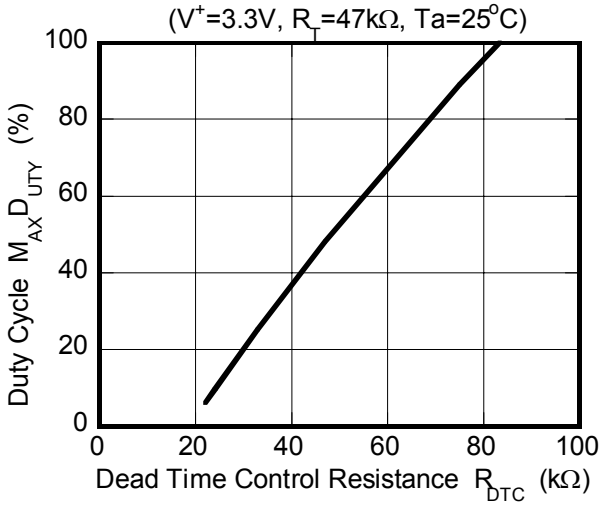
Oscillation Frequency vs. Operating Voltage

(R_T=47kΩ, Ta=25°C)



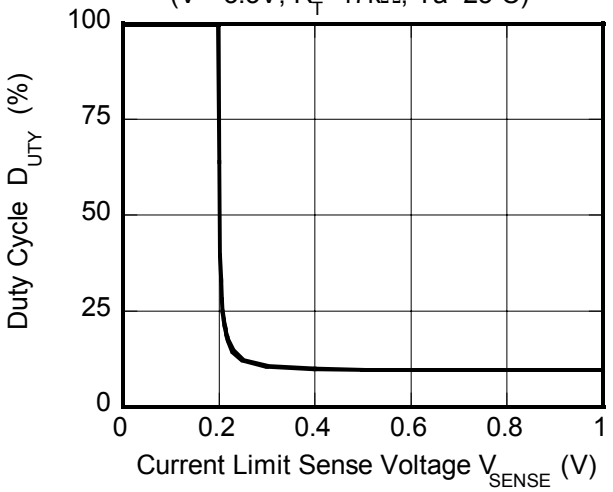
Duty Cycle vs. R_{DTC}

(V^+=3.3V, R_T=47kΩ, Ta=25°C)



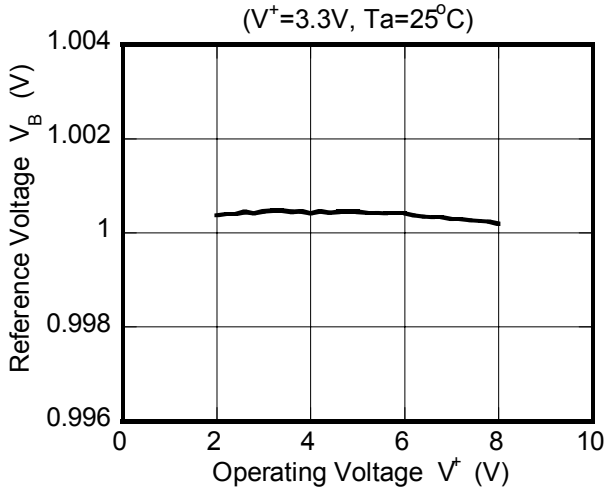
Duty Cycle vs. Current Limit Sense Voltage

(V^+=3.3V, R_T=47kΩ, Ta=25°C)

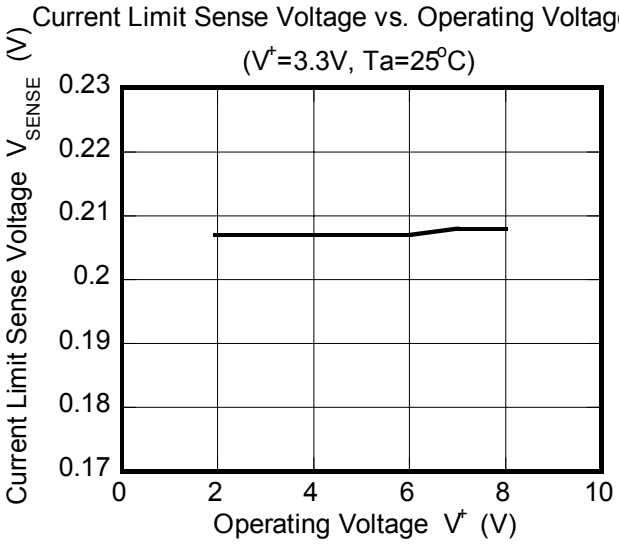


■ TYPICAL CHARACTERISTICS

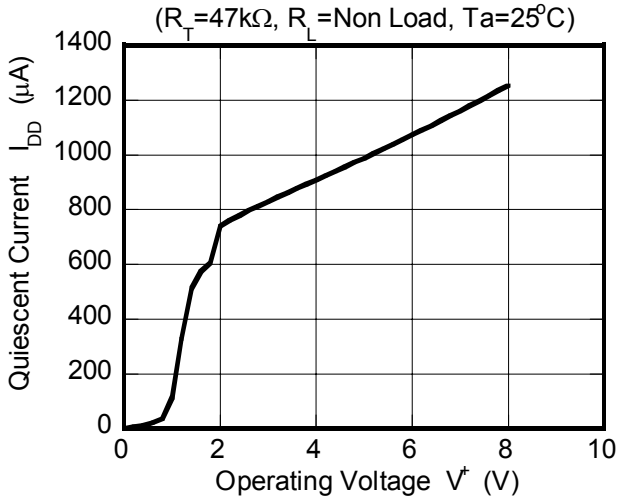
Reference Voltage vs. Operating Voltage
(V^+=3.3V, Ta=25°C)



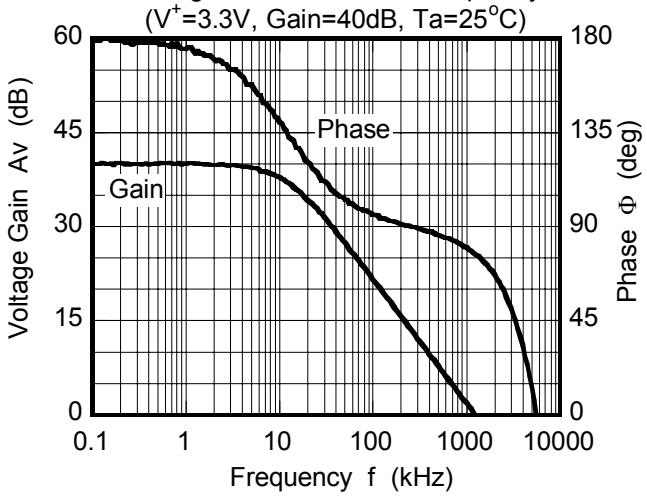
Current Limit Sense Voltage vs. Operating Voltage
(V^+=3.3V, Ta=25°C)



Quiescent Current vs. Operating Voltage
(R_T=47kΩ, R_L=Non Load, Ta=25°C)

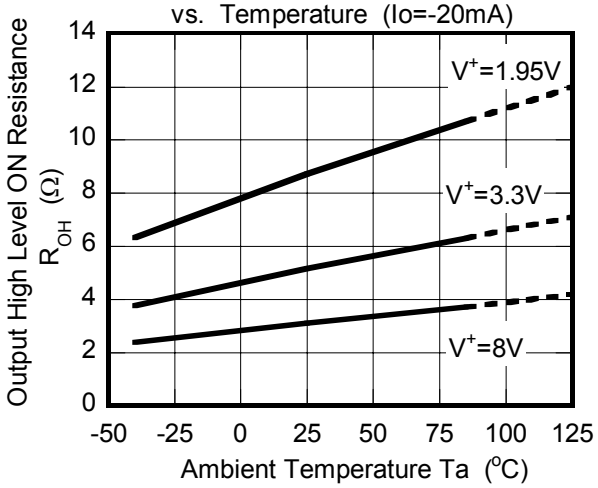


Error Amplifier Block
Voltage Gain, Phase vs. Frequency
(V^+=3.3V, Gain=40dB, Ta=25°C)

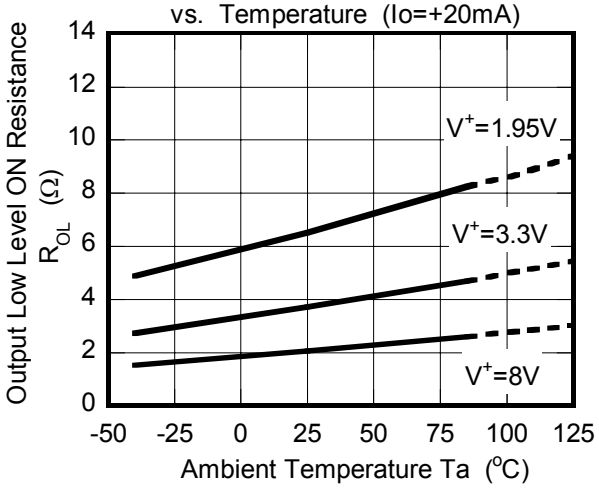


■ TYPICAL CHARACTERISTICS

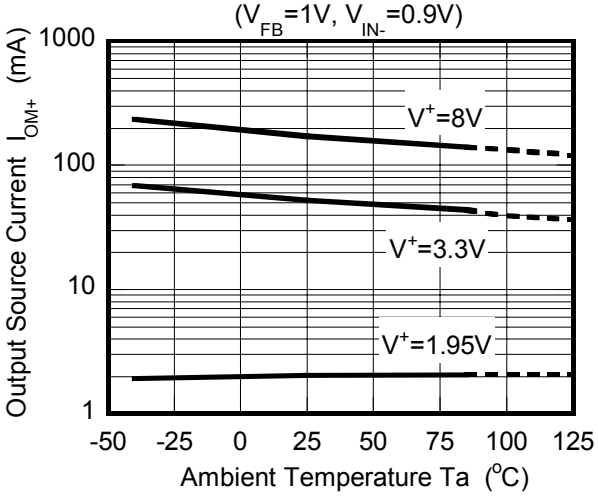
Output Block
Output High Level ON Resistance
vs. Temperature (Io=-20mA)



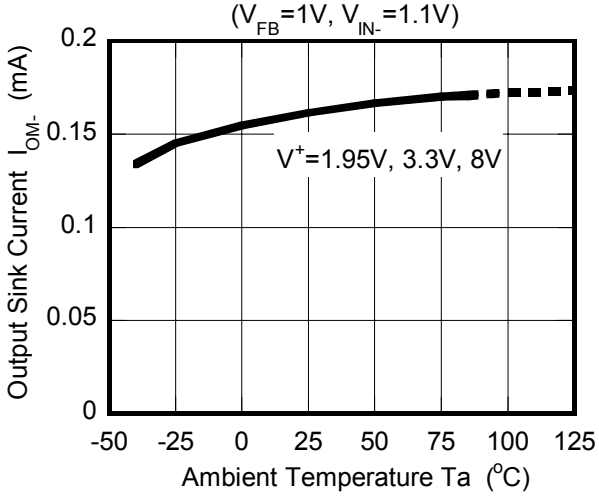
Output Block
Output Low Level ON Resistance
vs. Temperature (Io=+20mA)



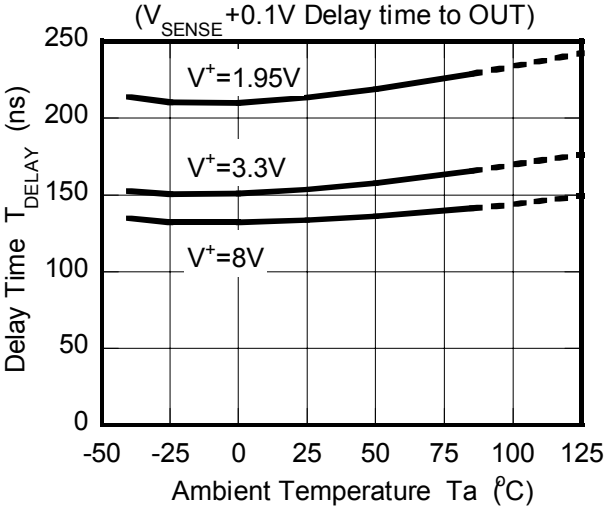
Error Amplifier Block
Output Source Current vs. Temperature
(V_{FB}=1V, V_{IN-}=0.9V)



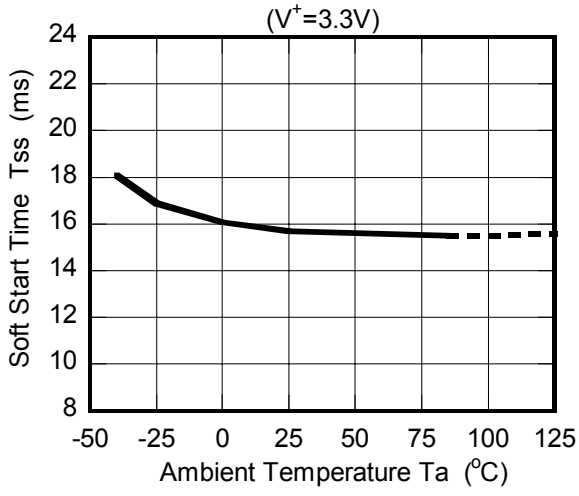
Error Amplifier Block
Output Sink Current vs. Temperature
(V_{FB}=1V, V_{IN-}=1.1V)



Delay Time vs. Temperature
(V_{SENSE}+0.1V Delay time to OUT)

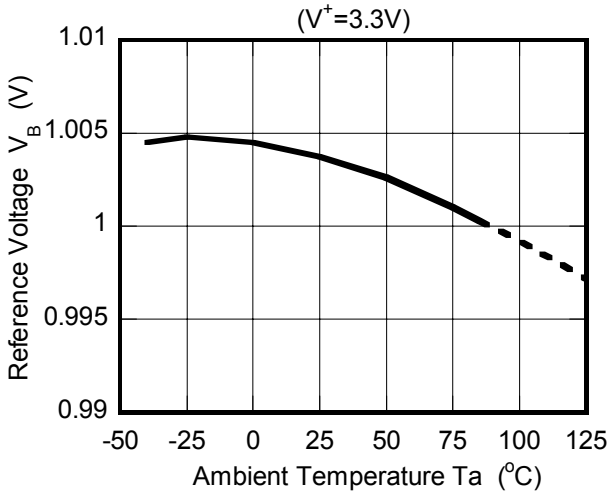


Soft Start Time vs. Temperature
(V^+=3.3V)

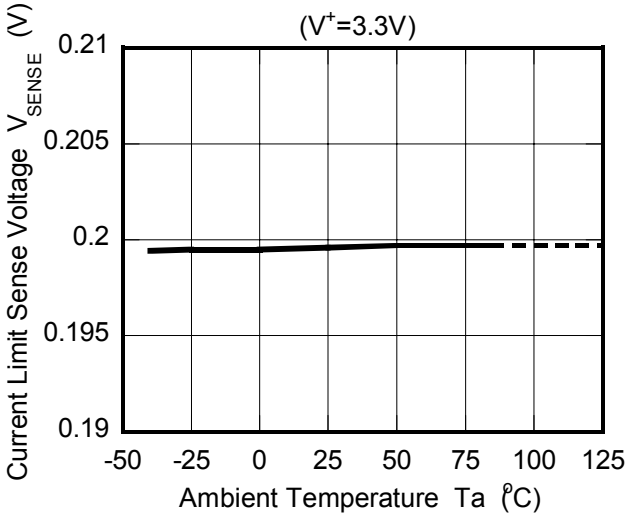


■ TYPICAL CHARACTERISTICS

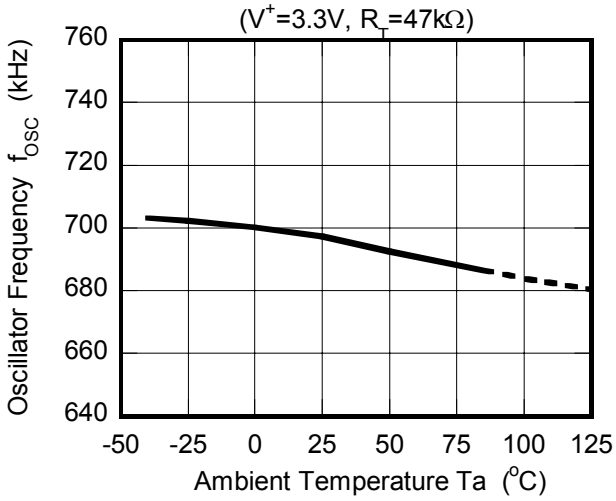
Reference Voltage vs. Temperature



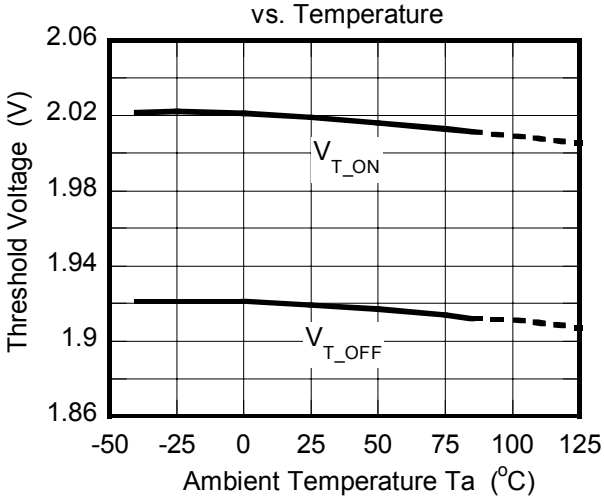
Current Limit Sense Voltage vs. Temperature



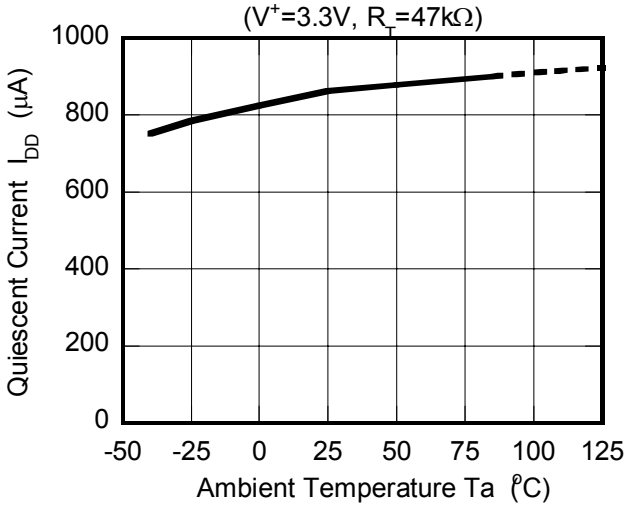
Oscillator Frequency vs. Temperature



Under Voltage Lockout Block vs. Temperature



Quiescent Current vs. Temperature



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.