

Step-Up / Flyback switching regulator IC with Over Current Protection

■GENERAL DESCRIPTION

The **NJU7610** is a low voltage operation high-speed switching regulator control IC for step-up and flyback 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.

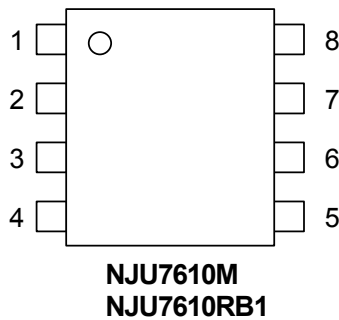
The NJU7610 is available in 8-lead DMP and MSOP (TVSP) packages.

■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 90% typ.
- Quiescent Current 800 μ A typ.
- Soft-Start Function Internal : 16ms typ. or adjustable
- Dead Time Control
- C-MOS Technology
- Package Outline NJU7610M : DMP8
NJU7610RB1 : MSOP8 (TVSP8)*

*MEET JEDEC MO-187-DA/ THIN TYPE

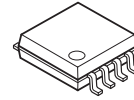
■PIN CONFIGURATION



PIN FUNCTION

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

■PACKAGE OUTLINE

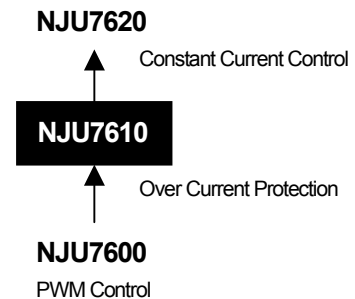


NJU7610M
(DMP8)



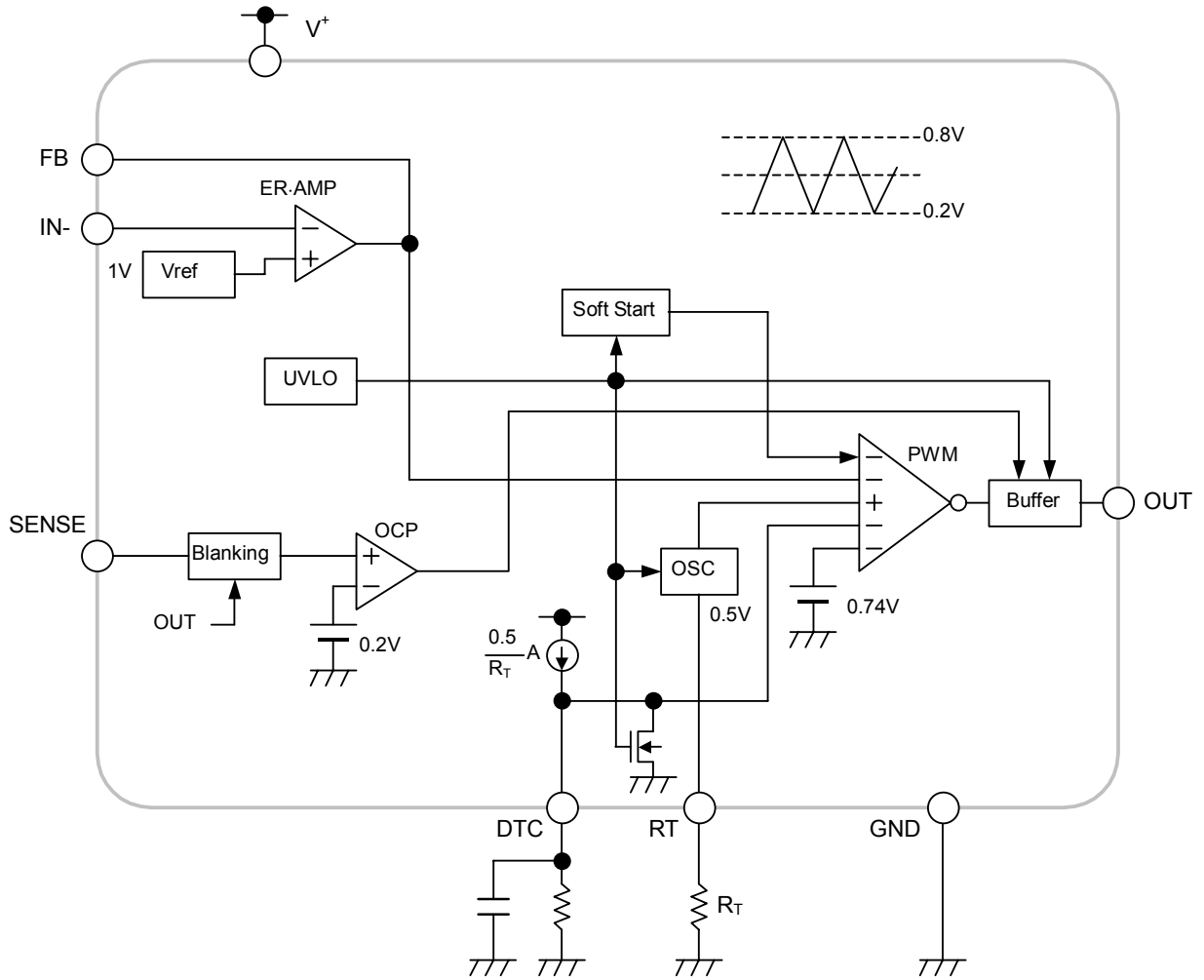
NJU7610RB1
(MSOP8 (TVSP8))

■PRODUCT VARIATION



NJU7610

■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 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}	$V^+ = L \rightarrow H$	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}	$V_{T_ON} \rightarrow$ Duty=80%	8	16	24	ms
Over Current Protection Block						
Current Limit Sense Voltage	V_{SENSE}		0.17	0.2	0.23	V
Delay Time	T_{DELAY}	$V_{SENSE}+0.1V$ Delay time to OUT	—	140	—	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	—	%

NJU7610

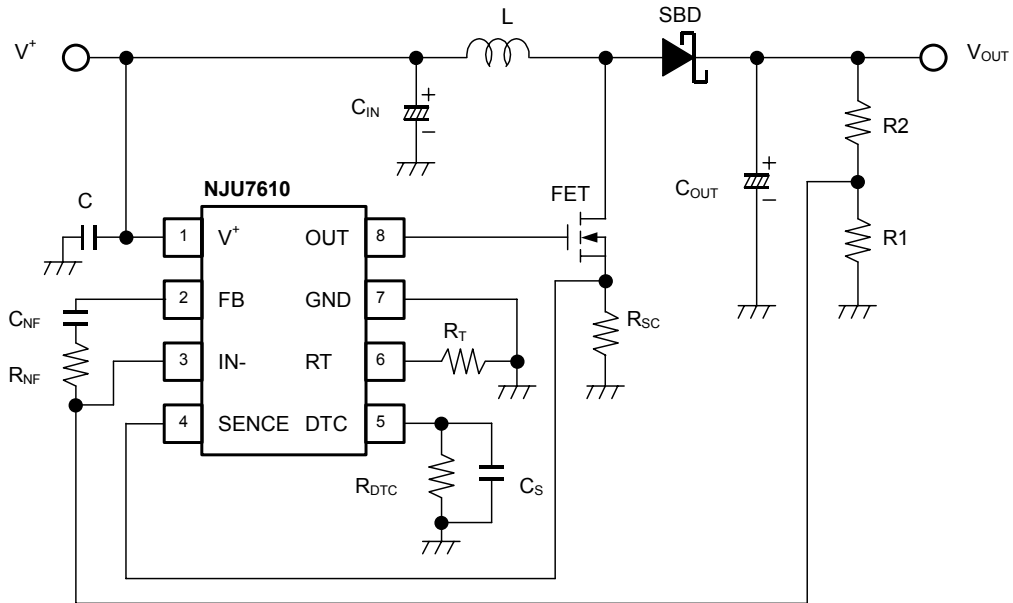
■ELECTRICAL CHARACTERISTICS

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

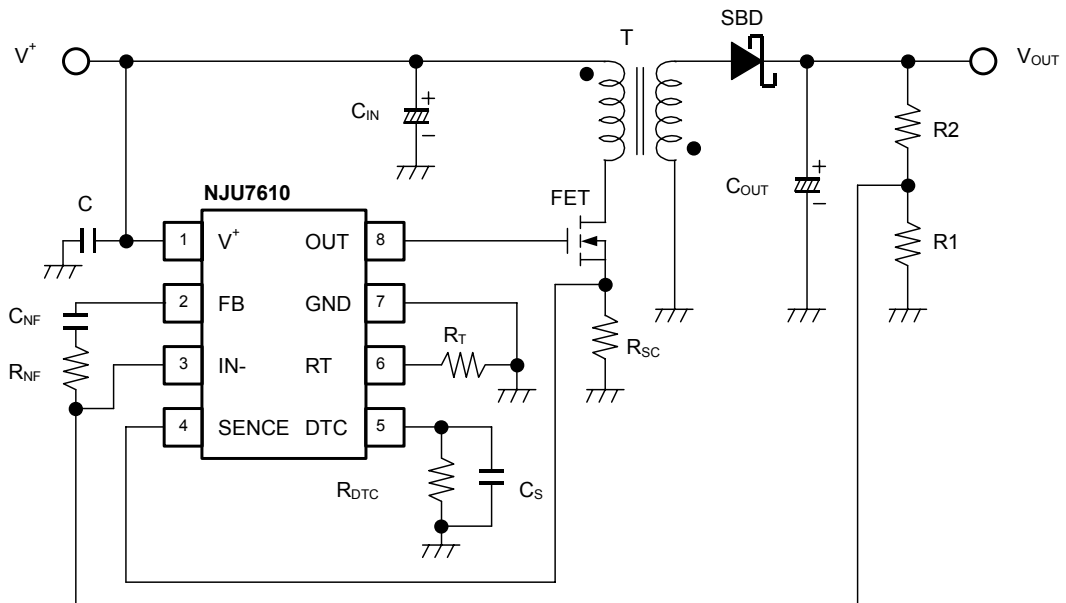
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Error Amplifier Block						
Reference Voltage	V_B		-1.5%	1.00	+1.5%	V
Input Bias Current	I_B		-0.1	–	0.1	μA
Open Loop Gain	A_V		–	80	–	dB
Gain Bandwidth Product	G_B		–	1	–	MHz
Output Source Current	I_{OM+1}	$V_{FB}=1V$, $V_{IN-}=0.9V$	25	55	95	mA
	I_{OM+2}	$V_{FB}=1V$, $V_{IN-}=0.9V$, $V^+=2.2V$	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_{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_{AXDUTY_1}	$V_{FB}=0.9V$	85	90	95	%
	M_{AXDUTY_2}	$V_{FB}=0.9V$, $R_{DTC}=47k\Omega$	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

■ TYPICAL APPLICATIONS

Step-Up Converter



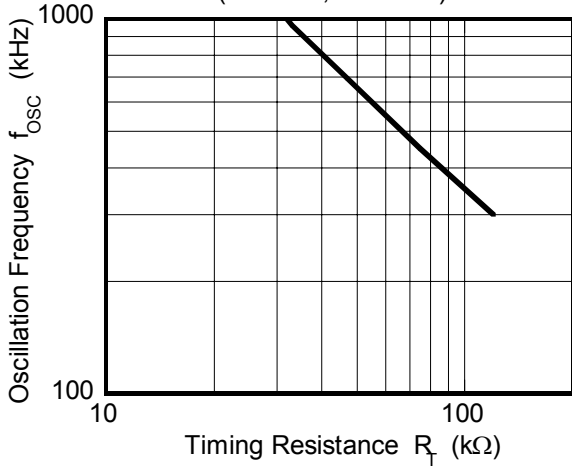
Flyback Converter



■ TYPICAL CHARACTERISTICS

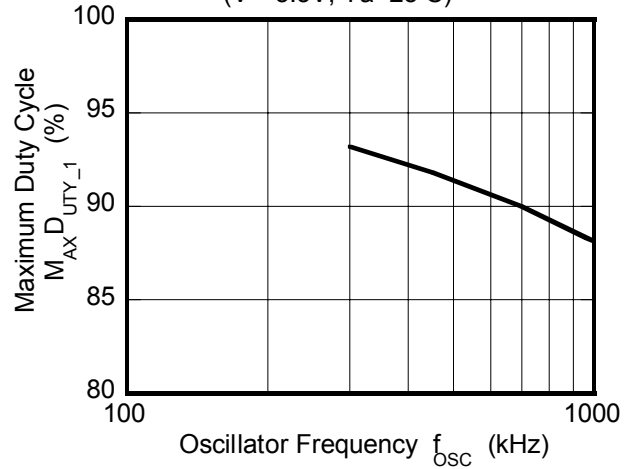
Oscillation Frequency vs. Timing Resistance

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



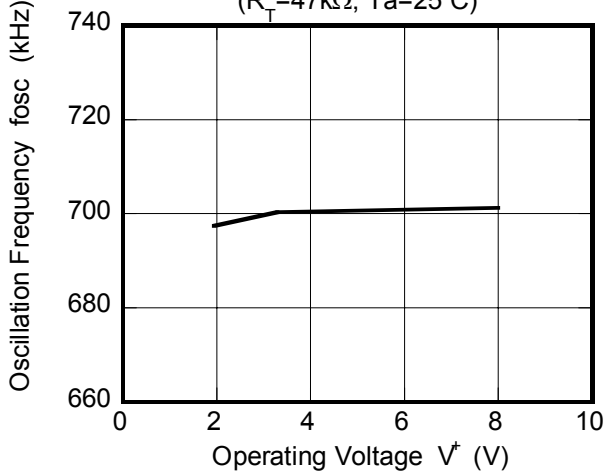
Maximum Duty Cycle vs. Oscillator Frequency

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



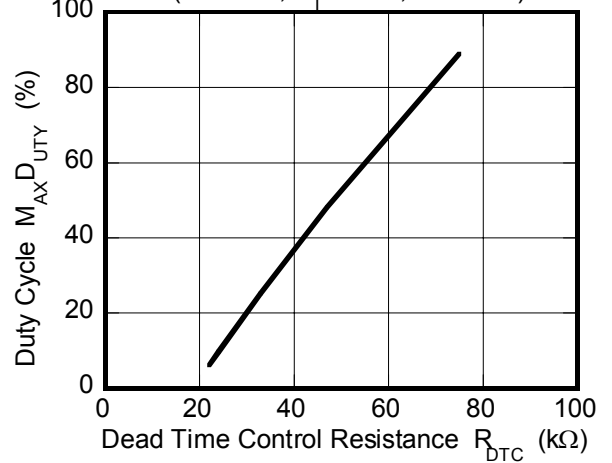
Oscillation Frequency vs. Operating Voltage

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



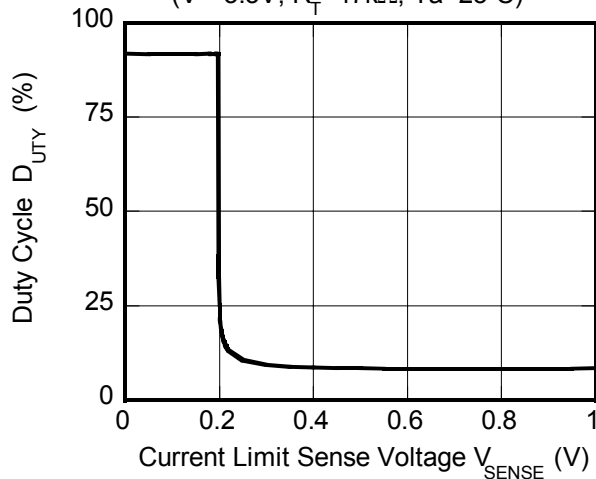
Duty Cycle vs. R_{DTC}

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



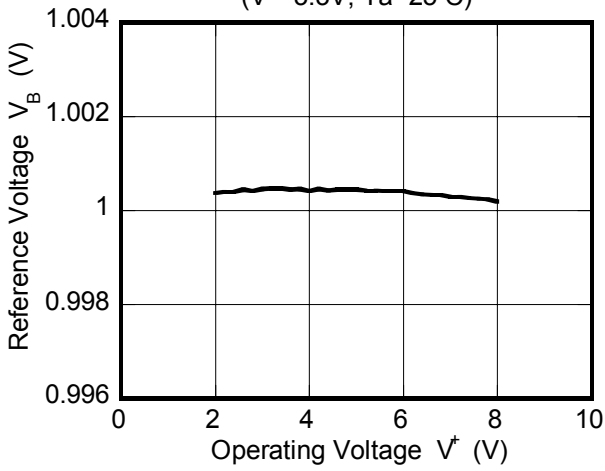
Duty Cycle vs. Current Limit Sense Voltage

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

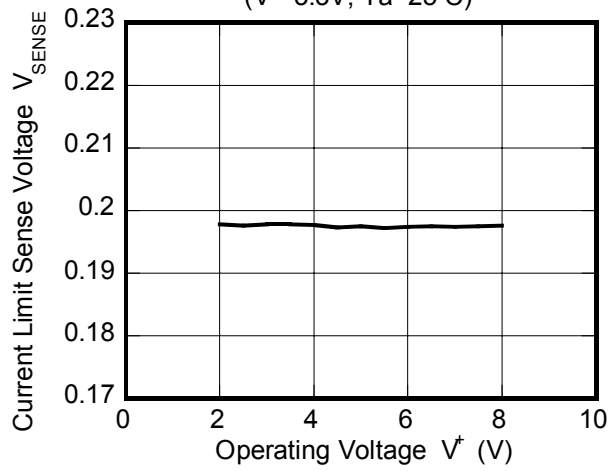


■ TYPICAL CHARACTERISTICS

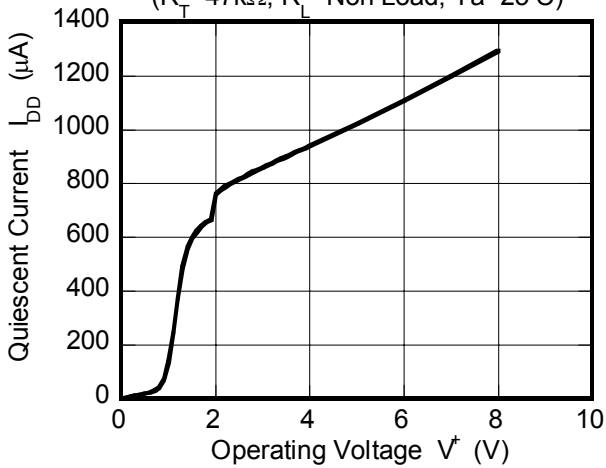
Reference Voltage vs. Operating Voltage
($V^+ = 3.3V$, $T_a = 25^\circ C$)



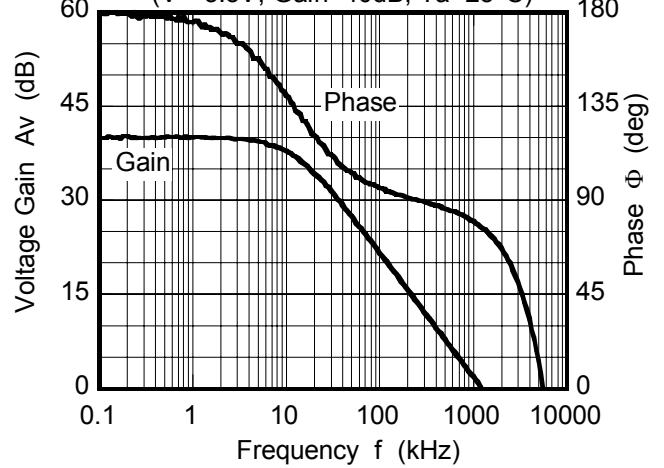
Current Limit Sense Voltage vs. Operating Voltage
($V^+ = 3.3V$, $T_a = 25^\circ C$)



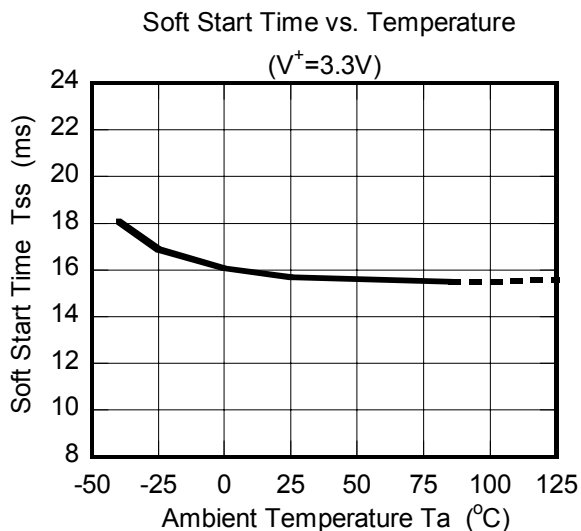
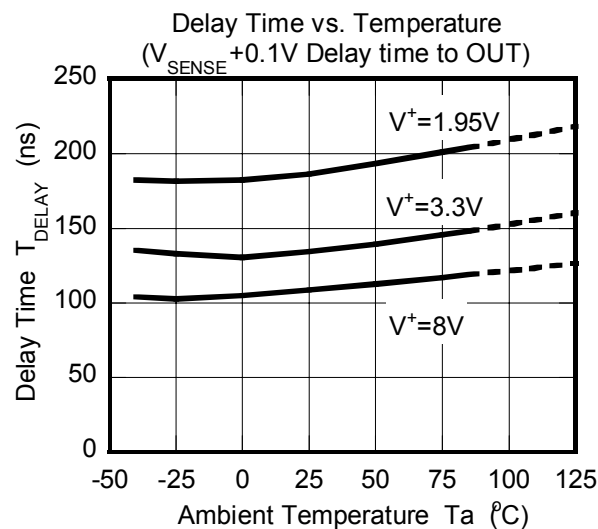
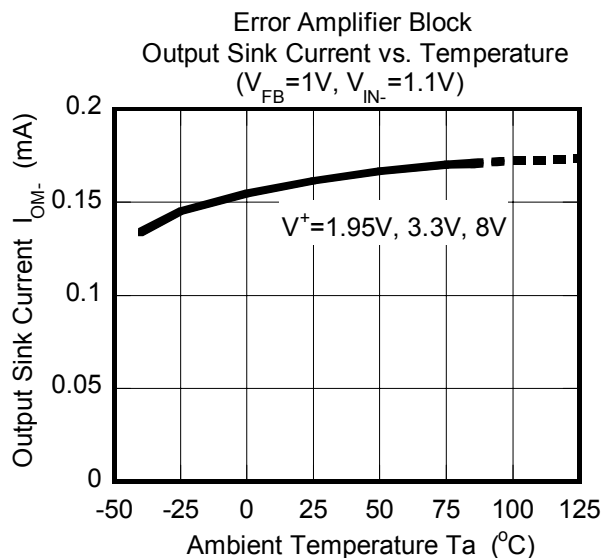
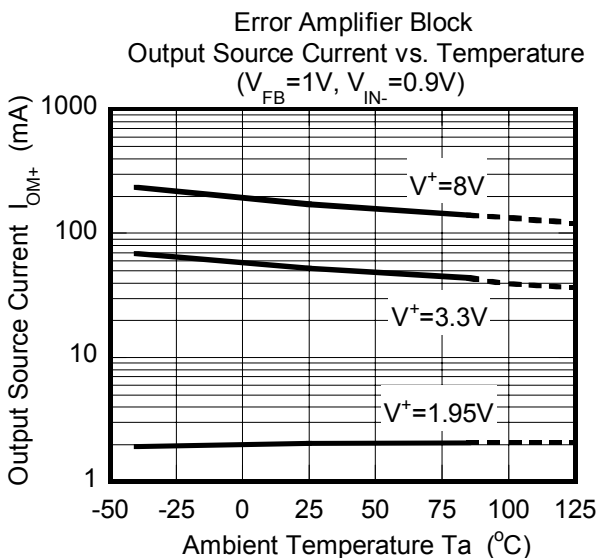
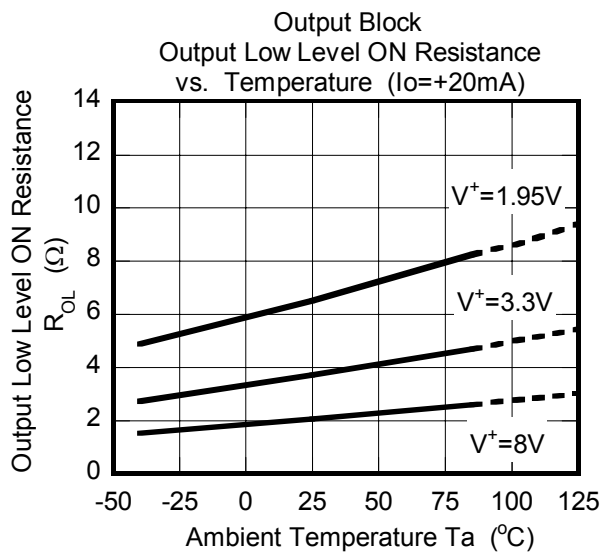
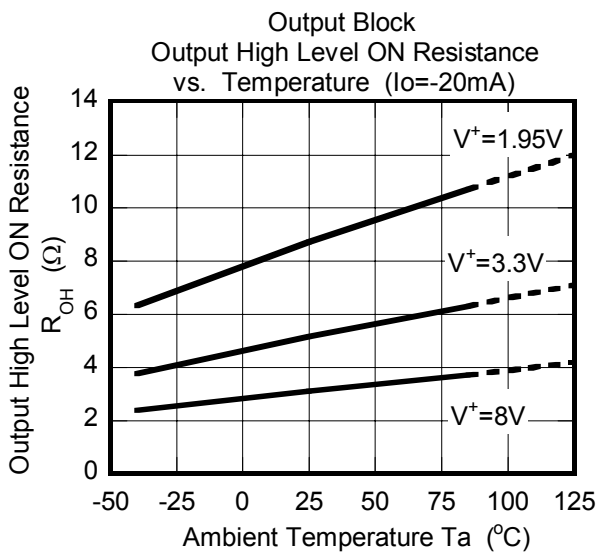
Quiescent Current vs. Operating Voltage
($R_T = 47k\Omega$, $R_L = \text{Non Load}$, $T_a = 25^\circ C$)



Error Amplifier Block
Voltage Gain, Phase vs. Frequency
($V^+ = 3.3V$, $\text{Gain} = 40dB$, $T_a = 25^\circ C$)



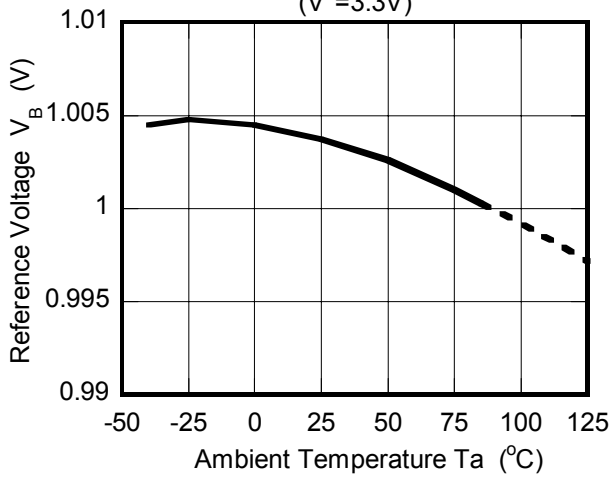
■ TYPICAL CHARACTERISTICS



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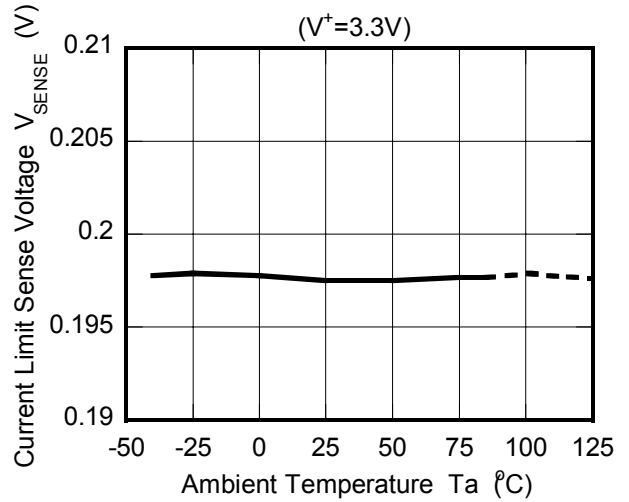
Reference Voltage vs. Temperature

($V^+=3.3V$)



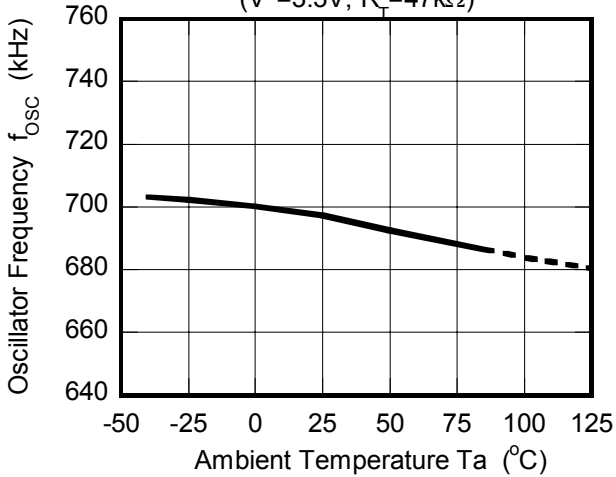
Current Limit Sense Voltage vs. Temperature

($V^+=3.3V$)



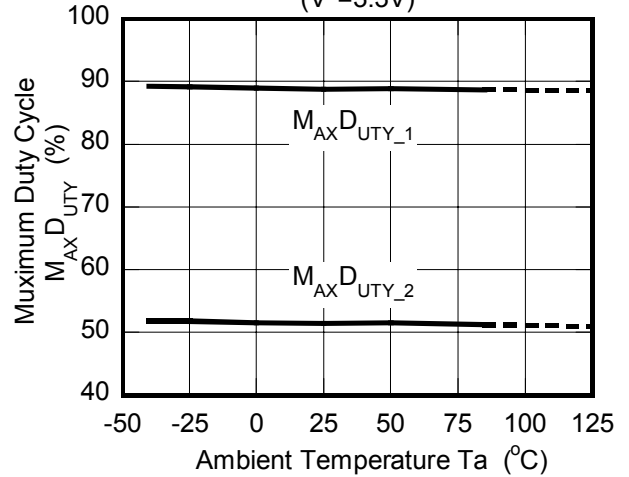
Oscillator Frequency vs. Temperature

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

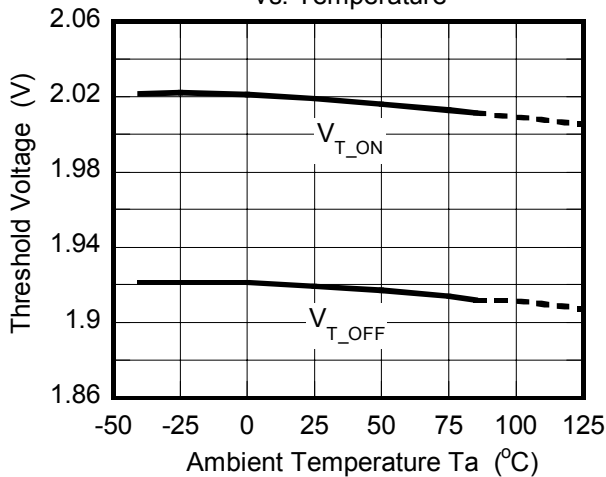


Maximum Duty Cycle vs. Temperature

($V^+=3.3V$)

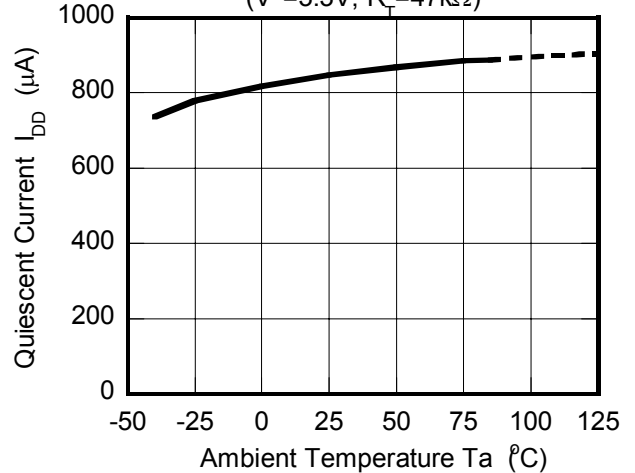


Under Voltage Lockout Block vs. Temperature



Quiescent Current vs. Temperature

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



MEMO

[CAUTION]

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