

Step-Down switching regulator IC with Constant Current Control

■ GENERAL DESCRIPTION

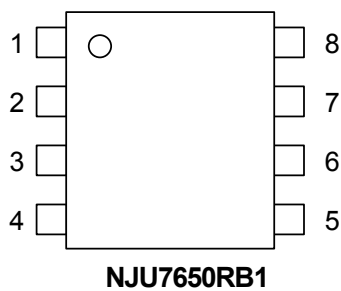
The **NJU7650** is a low voltage operation high-speed switching regulator control IC for step-down converter, with a constant current control. It incorporates a totem pole output, which can drive an external MOS-FET easily. It also incorporates error amplifier and current sense amplifier, which can allow the constant voltage/current control for output voltage. Therefore the NJU7650 is suitable for a LED driving, battery charger and other CCCV applications. The NJU7650 is available in a small and thin 8-lead MSOP (TVSP) package.

■ FEATURES

- PWM switching control
- Constant Current Control
- 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 NJU7650RB1 : MSOP8 (TVSP8)*

*MEET JEDEC MO-187-DA/ THIN TYPE

■ PIN CONFIGURATION



PIN FUNCTION

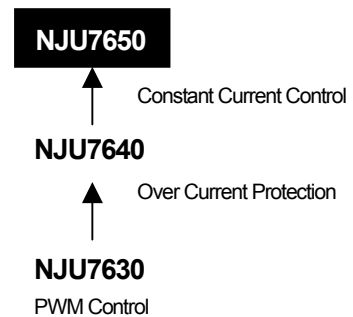
1. OUT
2. V⁺
3. FB
4. IN-1
5. IN-2
6. DTC
7. RT
8. GND

■ PACKAGE OUTLINE



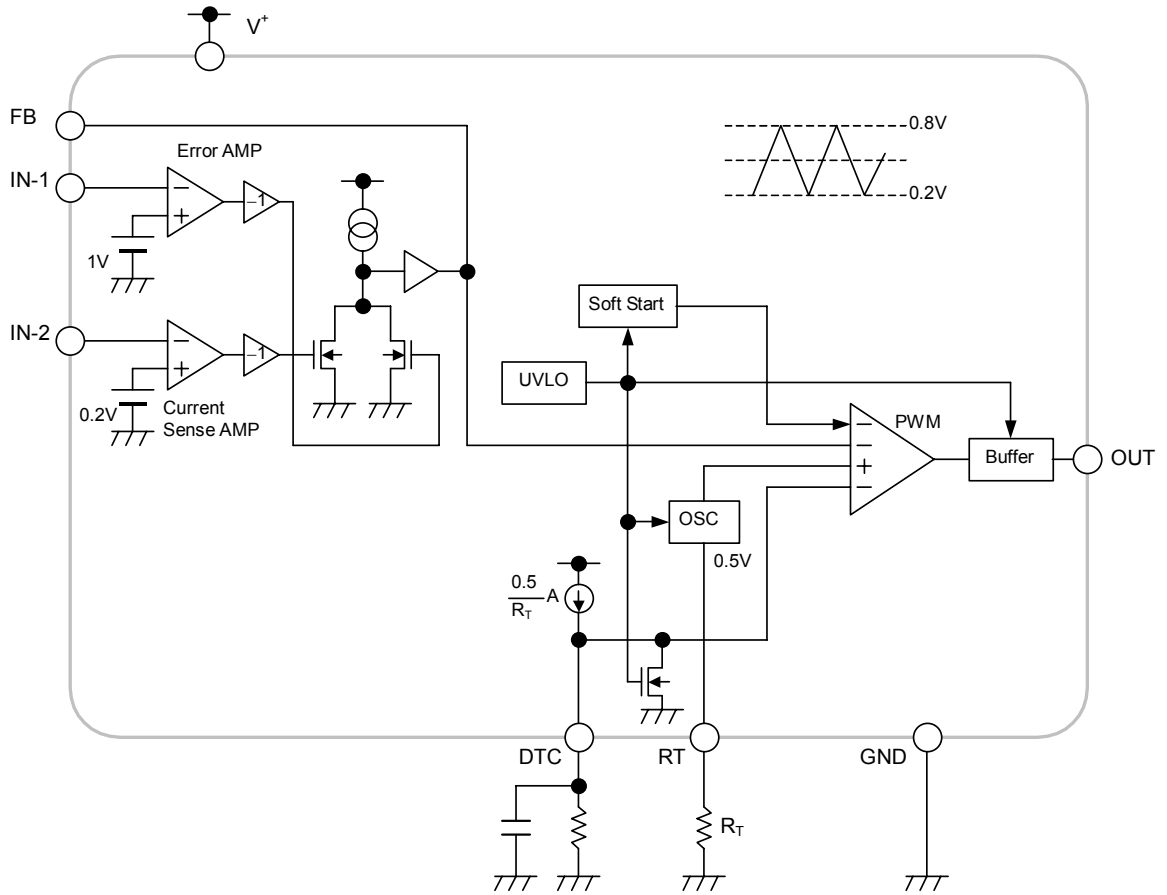
NJU7650RB1
(MSOP8 (TVSP8))

■ PRODUCT VARIATION



NJU7650

■ 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
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	–	%

NJU7650

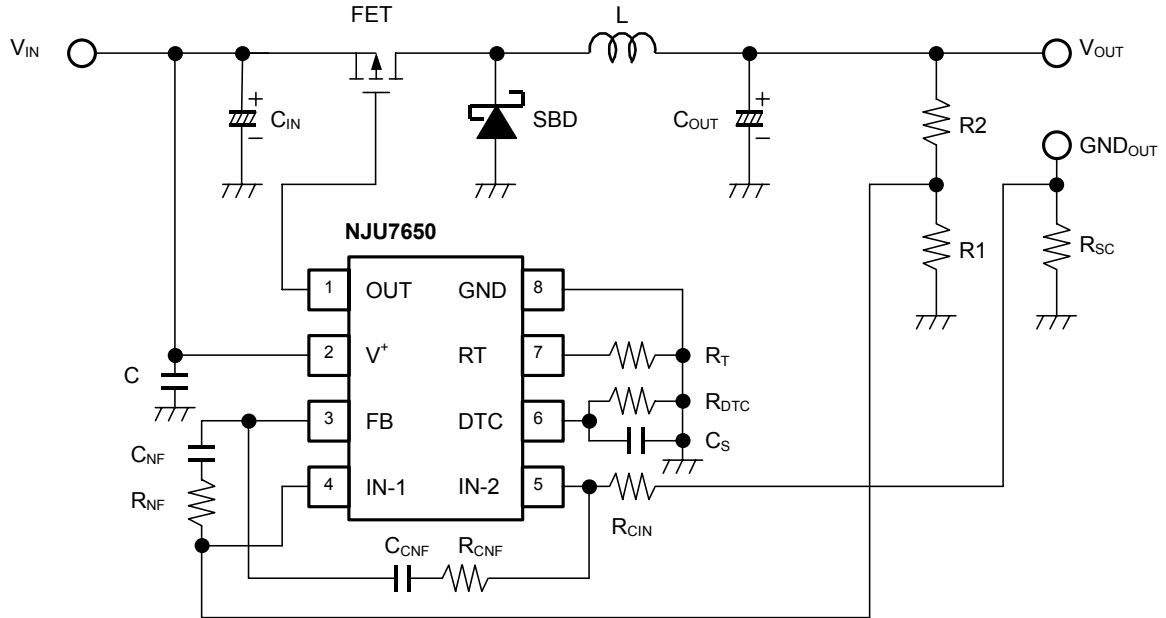
■ ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Error Amplifier Block						
Reference Voltage 1	V_{B1}		-1.0%	1.00	+1.0%	V
Input Bias Current 1	I_{B1}		-0.1	–	0.1	μA
Open Loop Gain 1	A_{V1}		–	80	–	dB
Gain Bandwidth Product 1	G_{B1}		–	1	–	MHz
Output Source Current 1	I_{OM+1}	$V_{FB}=1V, V_{IN-1}=0.9V, V_{IN-2}=0.1V$	25	55	95	mA
	I_{OM+2}	$V_{FB}=1V, V_{IN-1}=0.9V, V_{IN-2}=0.1V, V^+=2.2V$	4	9	16	mA
Output Sink Current 1	I_{OM-}	$V_{FB}=1V, V_{IN-1}=1.1V, V_{IN-2}=0.1V$	0.10	0.16	0.22	mA
Current Sense Amplifier Block						
Reference Voltage 2	V_{B2}		-10%	0.2	+10%	V
Input Bias Current 2	I_{B2}		-0.1	–	0.1	μA
Open Loop Gain 2	A_{V2}		–	70	–	dB
Gain Bandwidth Product 2	G_{B2}		–	1	–	MHz
Output Sink Current 2	I_{OM2-}	$V_{FB}=1V, V_{IN-1}=0.9V, V_{IN-2}=0.3V$	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

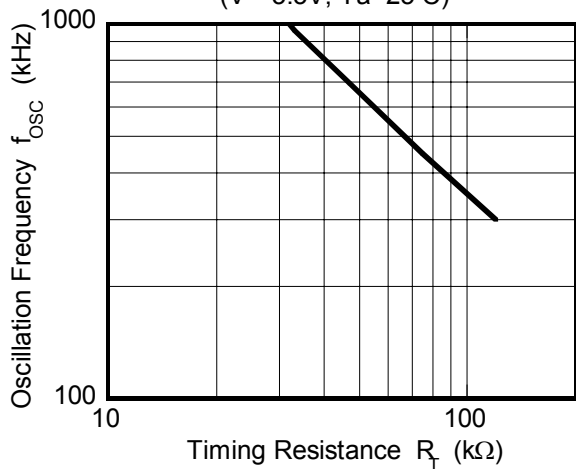
■ TYPICAL APPLICATIONS

Step-Down Converter

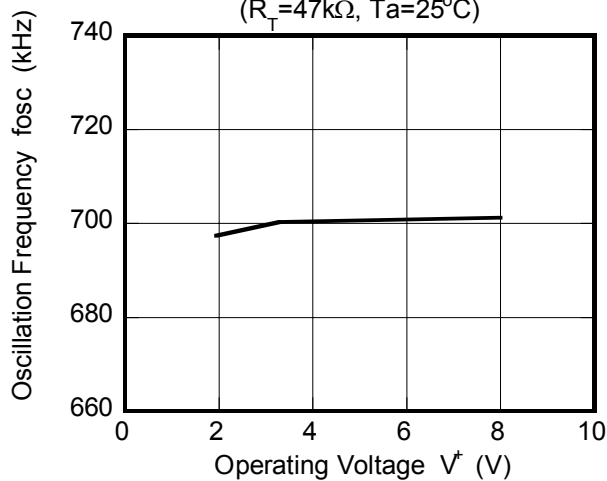


■ TYPICAL CHARACTERISTICS

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

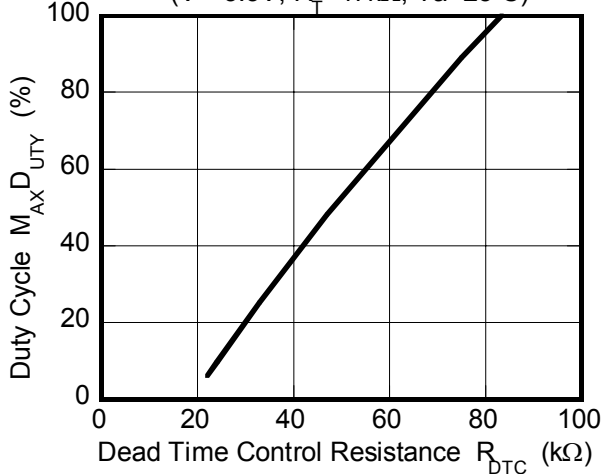


Oscillation Frequency vs. Operating Voltage
($R_T = 47k\Omega$, $T_a = 25^\circ C$)



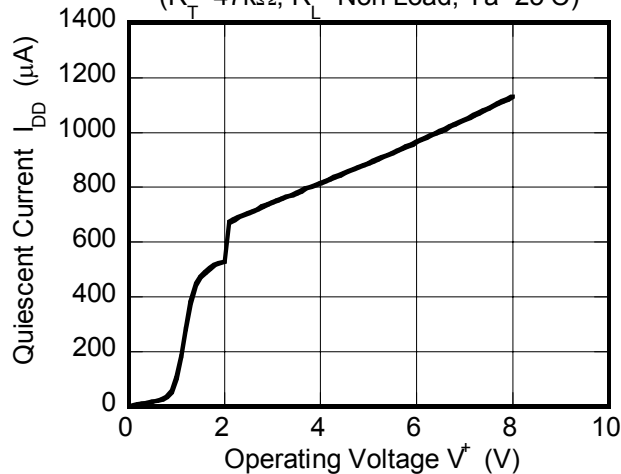
Duty Cycle vs. R_{DTC}

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



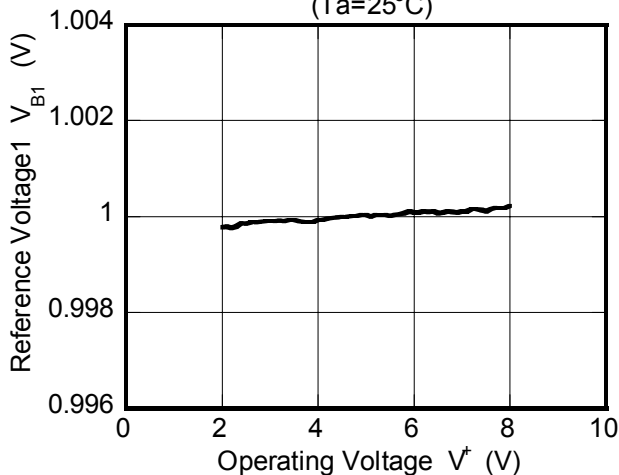
Quiescent Current vs. Operating Voltage

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



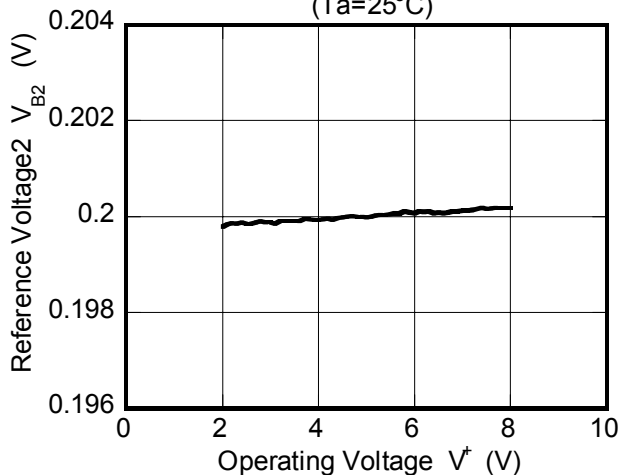
Error Amplifier Block
Reference Voltage1 vs. Operating Voltage

($T_a = 25^\circ C$)

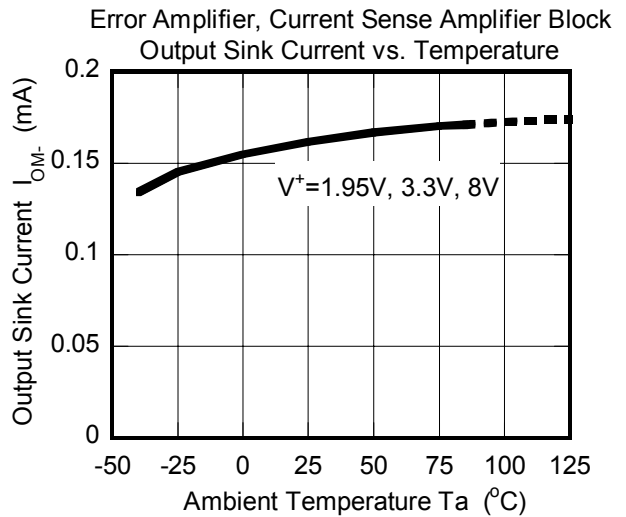
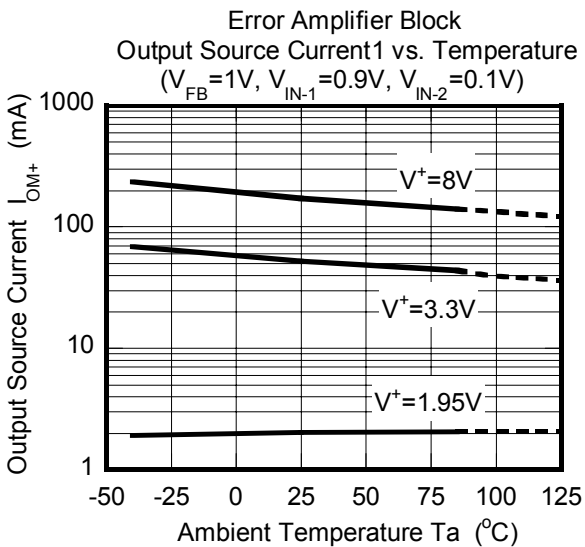
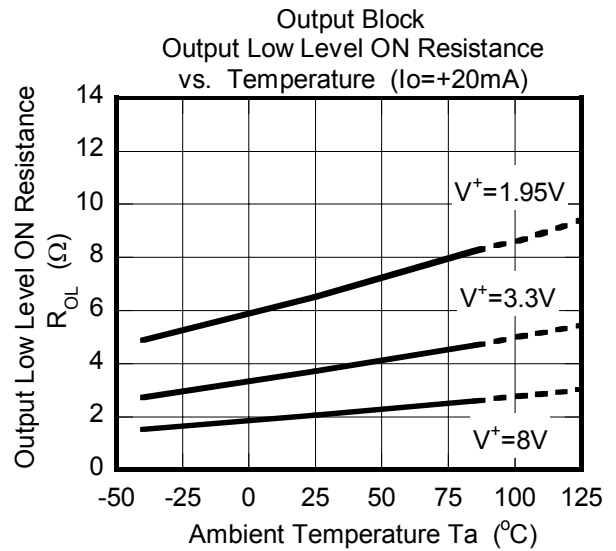
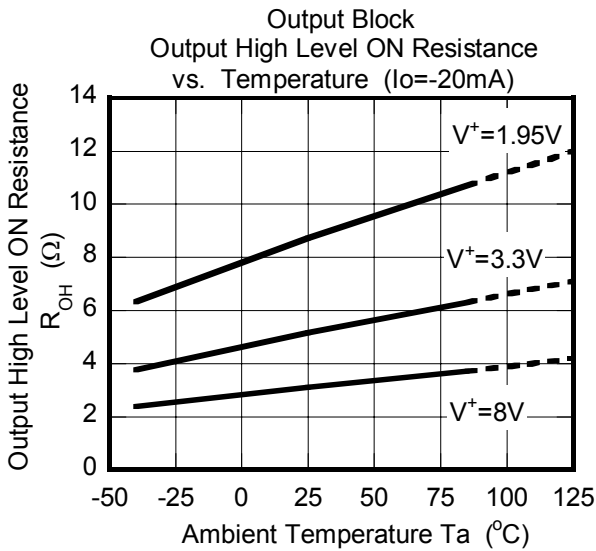
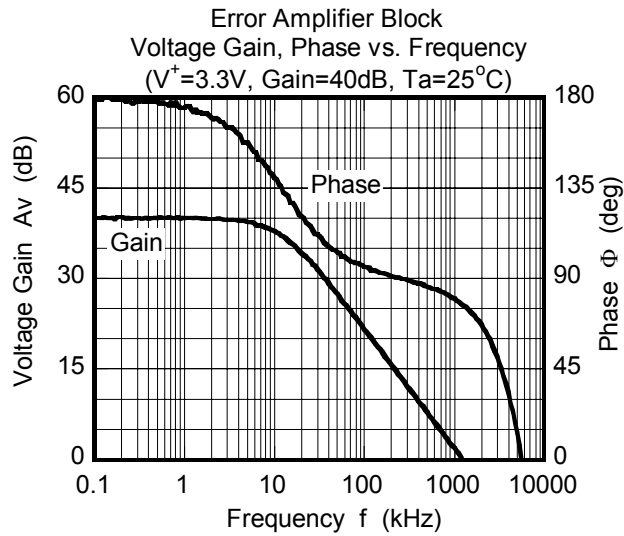


Current Sense Amplifier Block
Reference Voltage2 vs. Operating Voltage

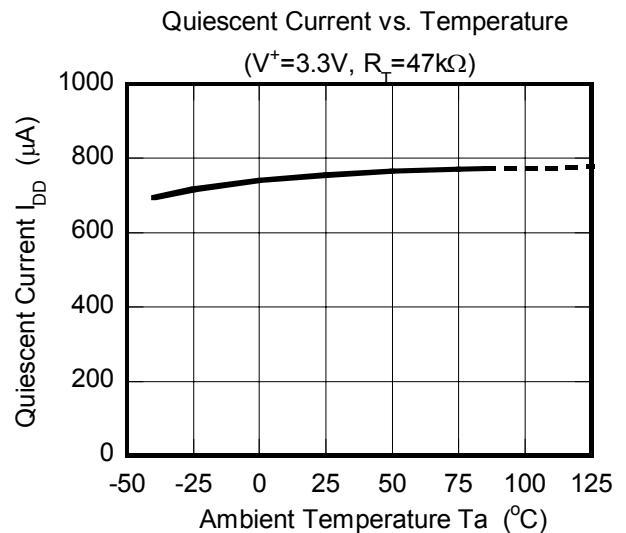
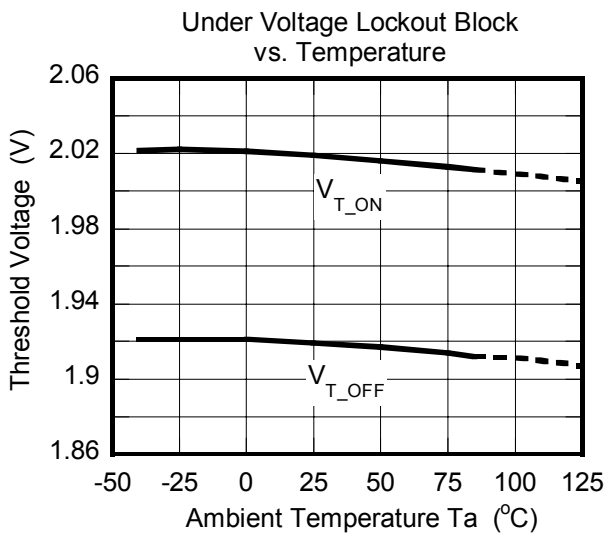
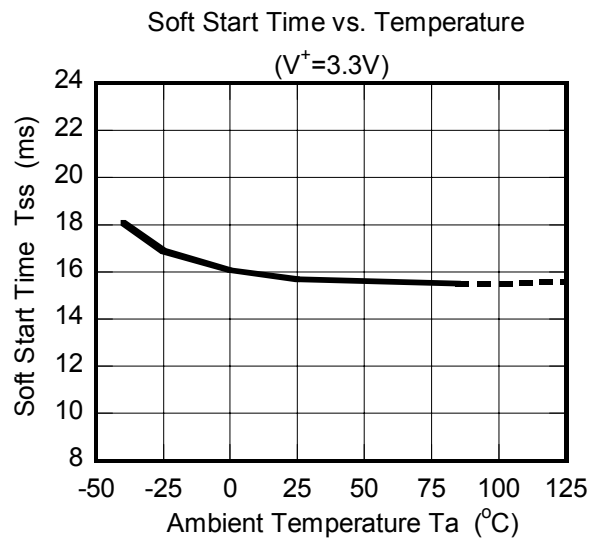
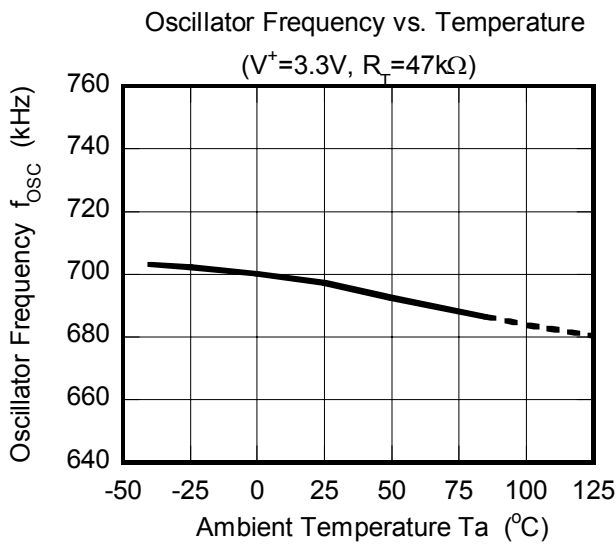
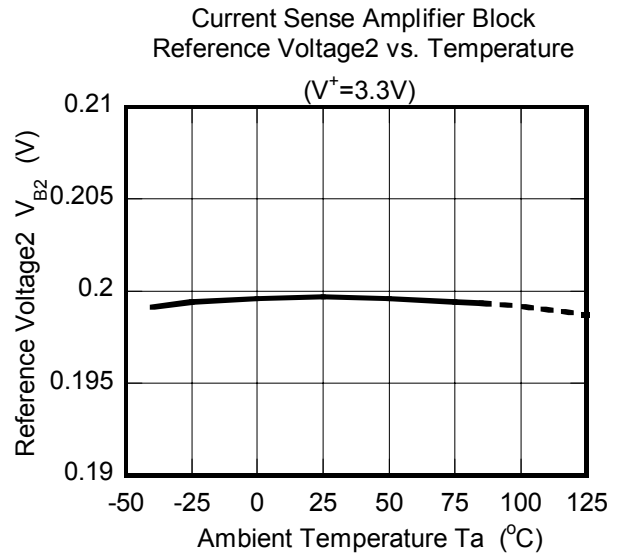
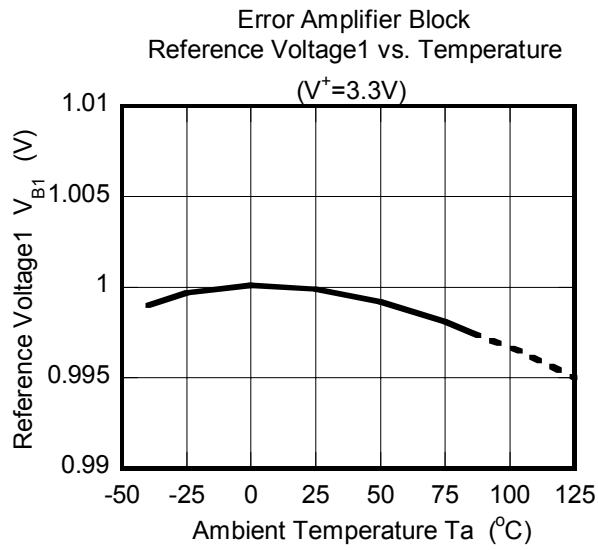
($T_a = 25^\circ C$)



■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



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