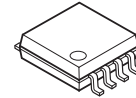


## PWM control Step-Up / Flyback switching regulator IC

### ■GENERAL DESCRIPTION

The **NJU7600** is a low voltage operation high-speed switching regulator control IC for PWM control step-up and fly-back converter. It incorporates a totem pole driver output, which can directly drive an external MOS-FET easily. The NJU7600 also has a soft-start function, dead time control and timer latch for short circuit protection and their times are all adjustable with external parts. It is available in 8-lead DMP, MSOP (TVSP) packages and 10-lead MSOP (TVSP) package. It is suitable for battery powered applications.

### ■PACKAGE OUTLINE



**NJU7600M**  
(DMP8)



**NJU7600RB1**  
(MSOP8 (TVSP8))



**NJU7600RB2**  
(MSOP10(TVSP10))

### ■FEATURES

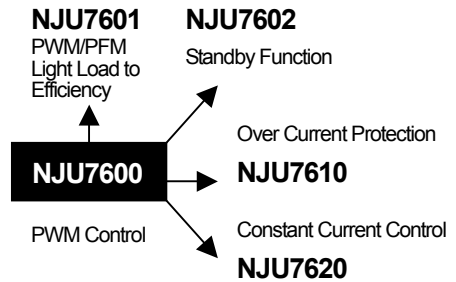
- PWM switching control
- Operating Voltage            2.2V to 8V
- Wide Oscillator Range       300kHz to 1MHz
- Maximum Duty Cycle        90% typ.
- Quiescent Current            800 $\mu$ A typ.
- Soft-Start Function           Internal : 16ms typ. or adjustable
- Dead Time Control
- Timer Latch for Short Circuit Protection
- C-MOS Technology
- Package Outline    NJU7600M    : DMP8

NJU7600RB1 : MSOP8 (TVSP8)\*

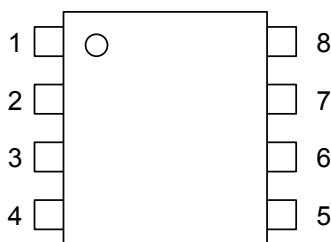
NJU7600RB2 : MSOP10 (TVSP10)\*

\*MEET JEDEC MO-187-DA / THIN TYPE

### ■PRODUCT VARIATION



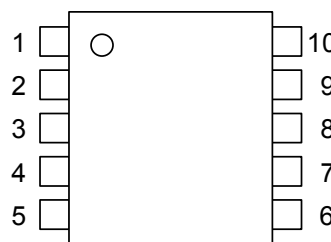
### ■PIN CONFIGURATION



**NJU7600M**  
**NJU7600RB1**

#### PIN FUNCTION

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



**NJU7600RB2**

#### PIN FUNCTION

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



## ■ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	MAXIMUM RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	+9	V
Output Pin Current	I <sub>O</sub>	±50	mA
Power Dissipation	P <sub>D</sub>	DMP8 : 300 MSOP8 (TVSP8) : 320 MSOP10 (TVSP10) : 320	mW
Operating Temperature Range	T <sub>OPR</sub>	-40 to +85	°C
Storage Temperature Range	T <sub>STG</sub>	-40 to +125	°C

## ■RECOMMENDED OPERATING CONDITIONS

(Ta=25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V <sup>+</sup>	2.2	—	8	V
Oscillator Timing Resistor	R <sub>T</sub>	30	47	120	kΩ
Oscillation Frequency	f <sub>OSC</sub>	300	700	1,000	kHz

## ■ELECTRICAL CHARACTERISTICS

(V<sup>+</sup>=3.3V, R<sub>T</sub>=47kΩ, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
<b>Under Voltage Lockout Block</b>						
ON Threshold Voltage	V <sub>T_ON</sub>	V <sup>+</sup> = L → H	1.9	2.0	2.1	V
OFF Threshold Voltage	V <sub>T_OFF</sub>	V <sup>+</sup> = H → L	1.8	1.9	2.0	V
Hysteresis Voltage	V <sub>HYS</sub>		60	100	—	mV
<b>Soft Start Block</b>						
Soft Start Time	T <sub>SS</sub>	V <sub>T_ON</sub> → Duty=80%	8	16	24	ms
<b>Short Circuit Protection Block</b>						
Input Threshold Voltage	V <sub>T_PC</sub>	FB Pin	0.95	1.00	1.05	V
Charge Current	I <sub>CHG</sub>	V <sub>SCP</sub> =0V	1.5	2	2.5	μA
Latch Mode ON Threshold Voltage	V <sub>T_LA</sub>	SCP Pin	0.95	1.00	1.05	V
Latch Mode OFF Threshold Voltage	V <sub>T_LAOFF</sub>	SCP Pin	0.2	0.45	0.7	V
<b>Oscillator Block</b>						
RT Pin Voltage	V <sub>RT</sub>		-5%	0.5	+5%	V
Oscillation Frequency	f <sub>OSC</sub>		630	700	770	kHz
Oscillate Supply Voltage Fluctuations	f <sub>DV</sub>	V <sup>+</sup> =2.2V to 8V	—	1	—	%
Oscillate Temperature Fluctuations	f <sub>DT</sub>	Ta=-40°C to +85°C	—	3	—	%

# NJU7600

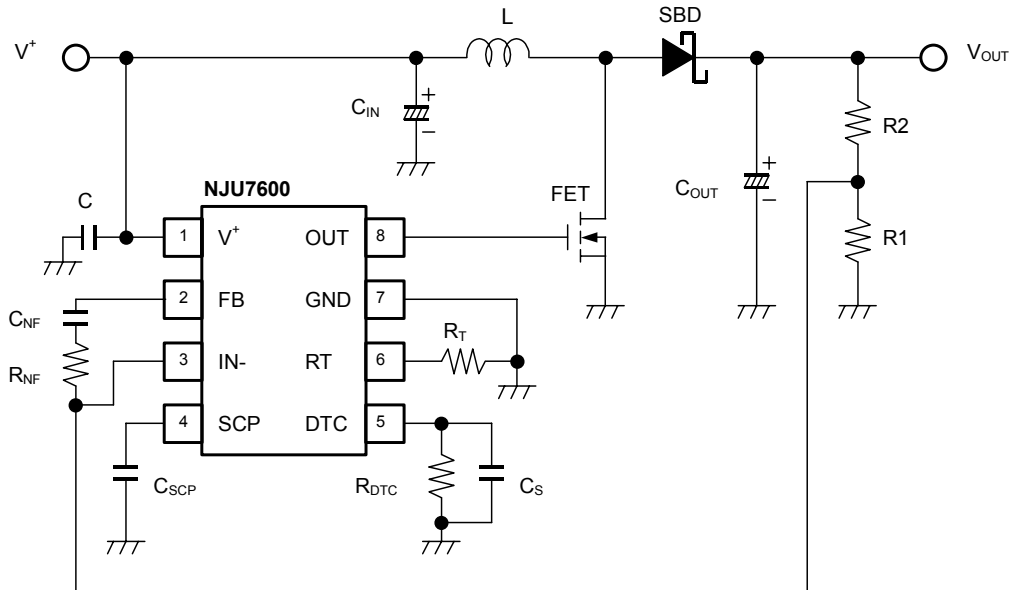
## ■ELECTRICAL CHARACTERISTICS

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

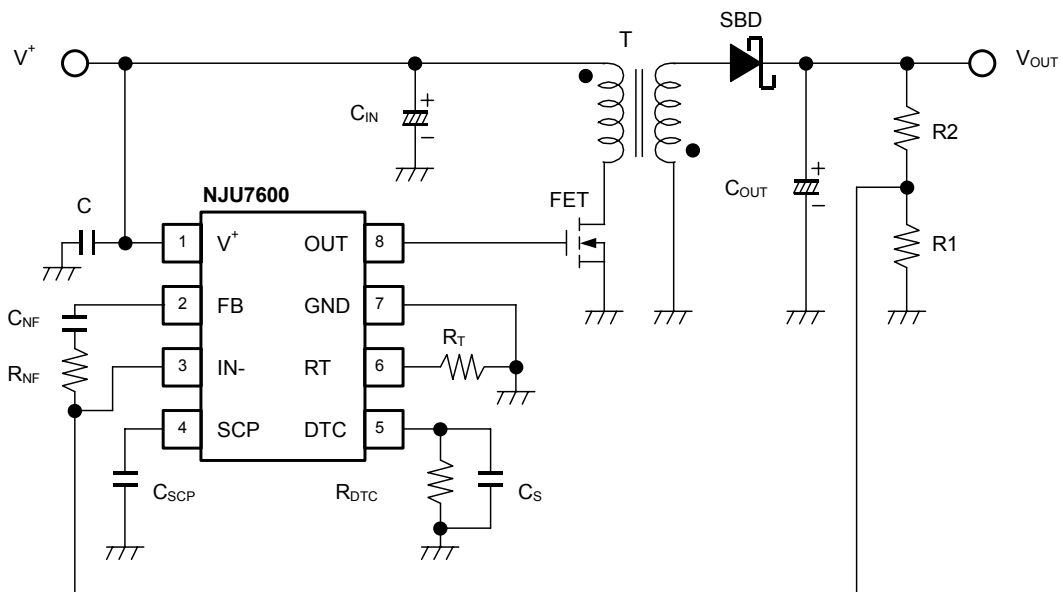
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
<b>Error Amplifier Block</b>						
Reference Voltage	$V_B$		-1.5%	1.00	+1.5%	V
Input Bias Current	$I_B$		-0.1	–	0.1	$\mu A$
Open Loop Gain	$A_V$		–	80	–	dB
Gain Bandwidth Product	$G_B$		–	1	–	MHz
Output Source Current	$I_{OM+1}$	$V_{FB}=1V, V_{IN-}=0.9V$	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
<b>PWM Compare Block</b>						
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	%
<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	$\mu A$

## ■ TYPICAL APPLICATIONS

### Step-Up Converter

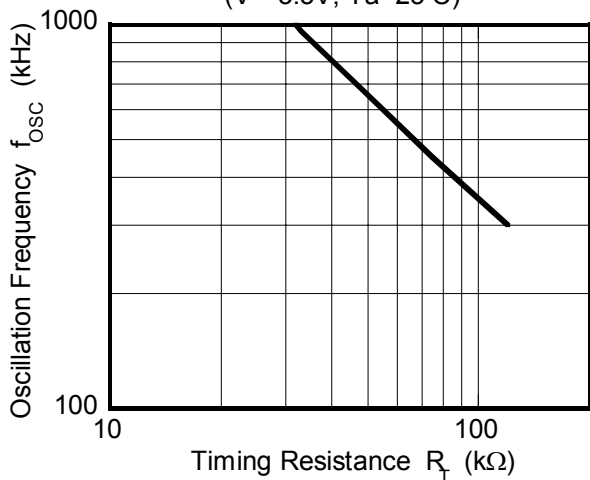


### Flyback Converter

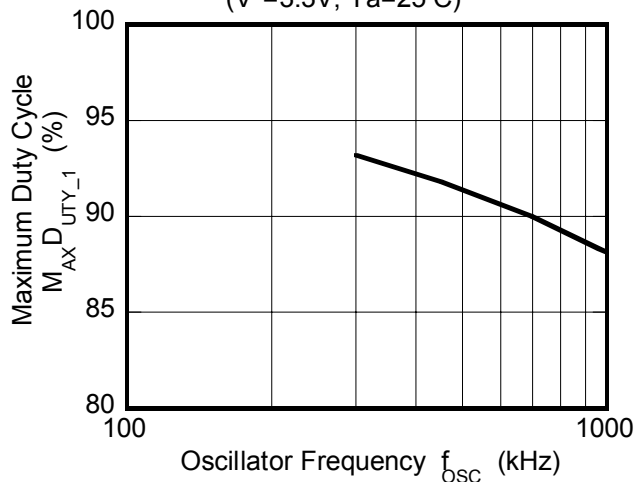


## ■ TYPICAL CHARACTERISTICS

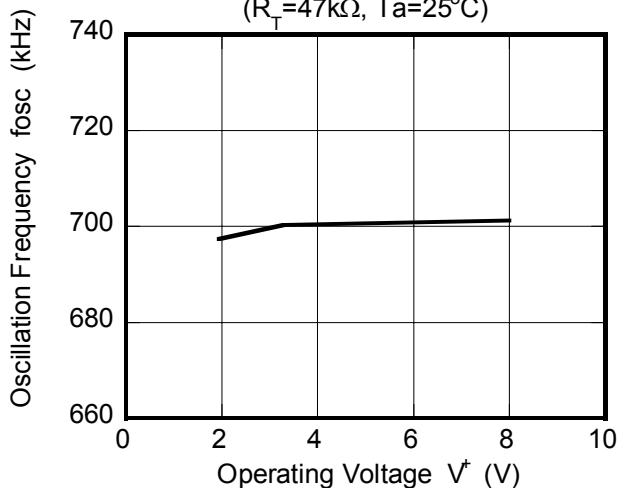
Oscillation Frequency vs. Timing Resistance  
( $V^+ = 3.3V, T_a = 25^\circ C$ )



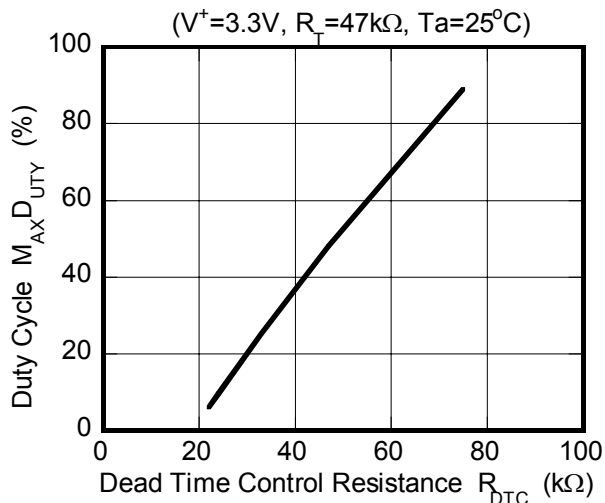
Maximum Duty Cycle vs. Oscillator Frequency  
( $V^+ = 3.3V, T_a = 25^\circ C$ )



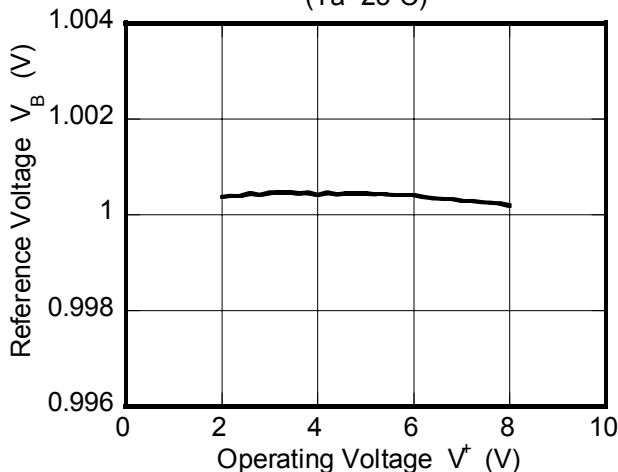
Oscillation Frequency vs. Operating Voltage  
( $R_T = 47k\Omega, T_a = 25^\circ C$ )



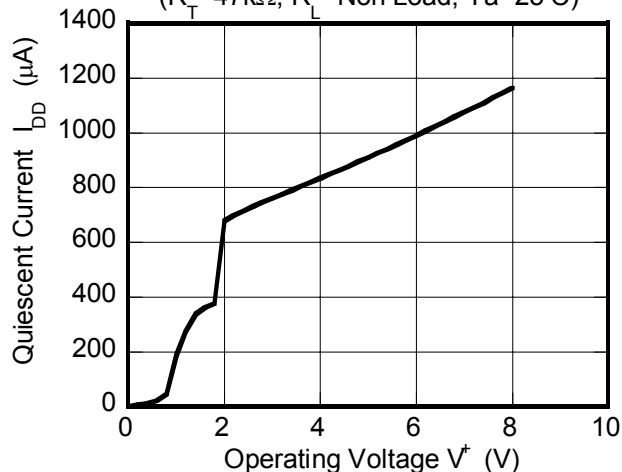
Duty Cycle vs.  $R_{DTC}$



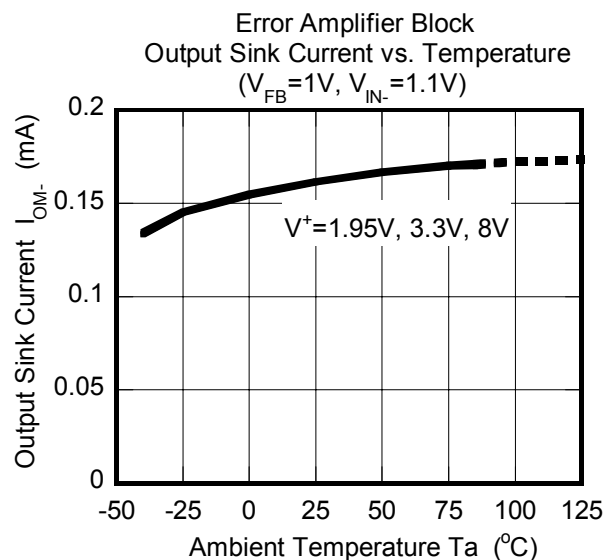
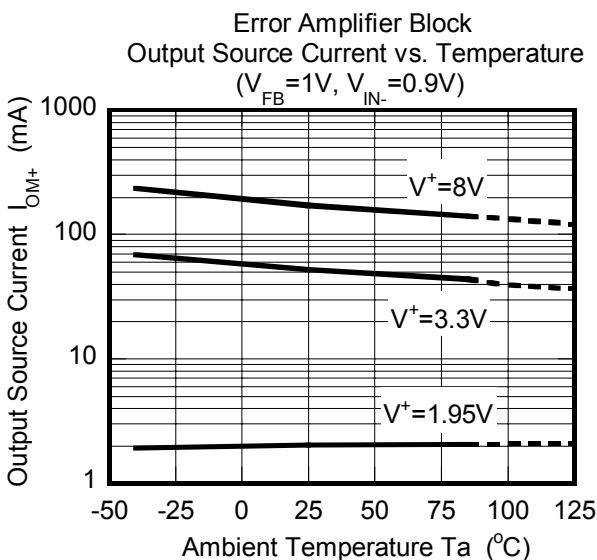
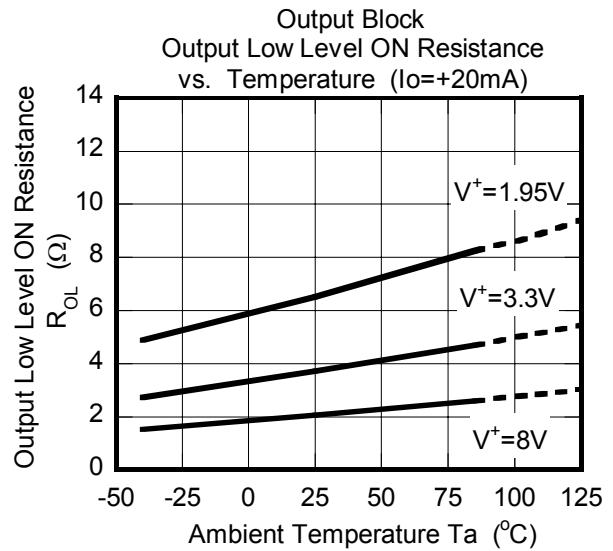
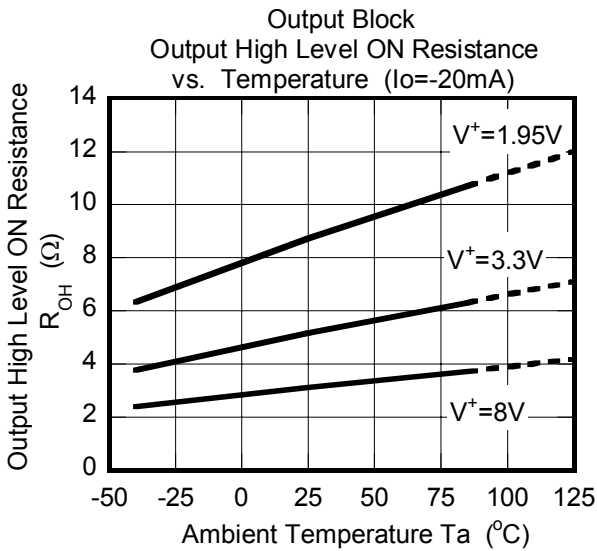
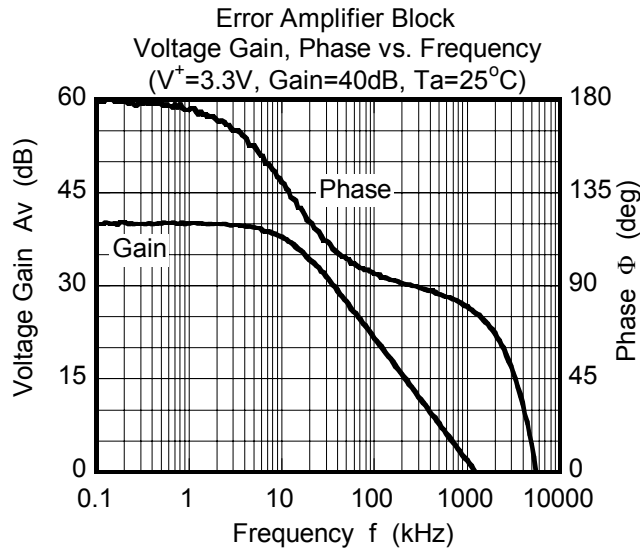
Reference Voltage vs. Operating Voltage  
( $T_a = 25^\circ C$ )



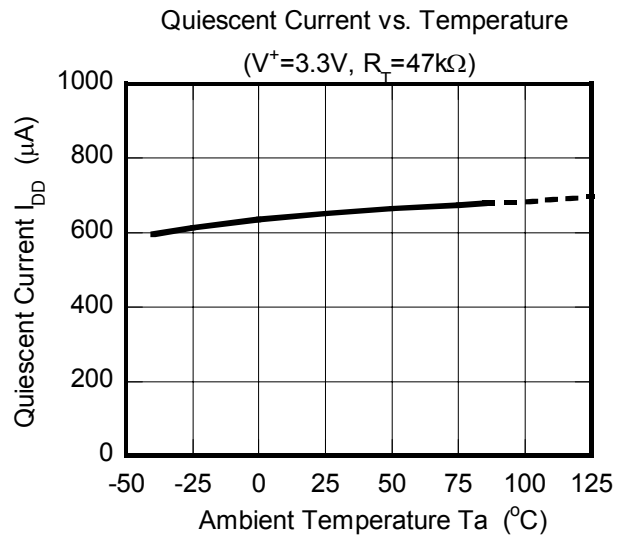
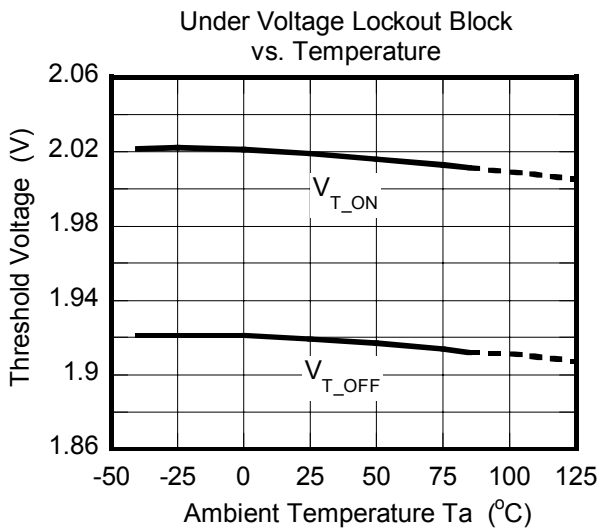
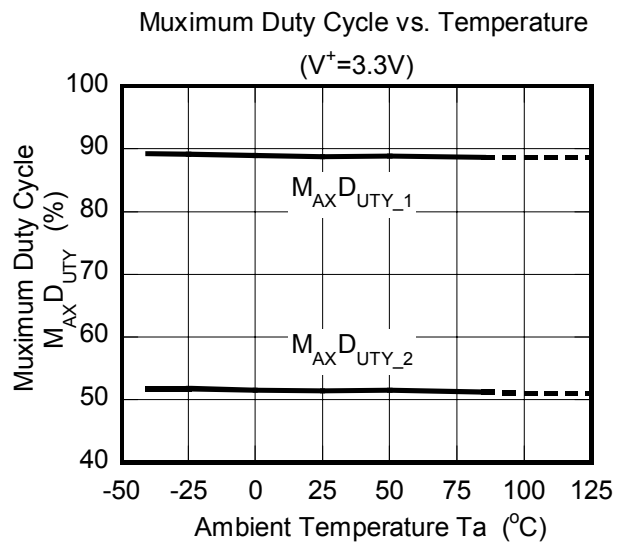
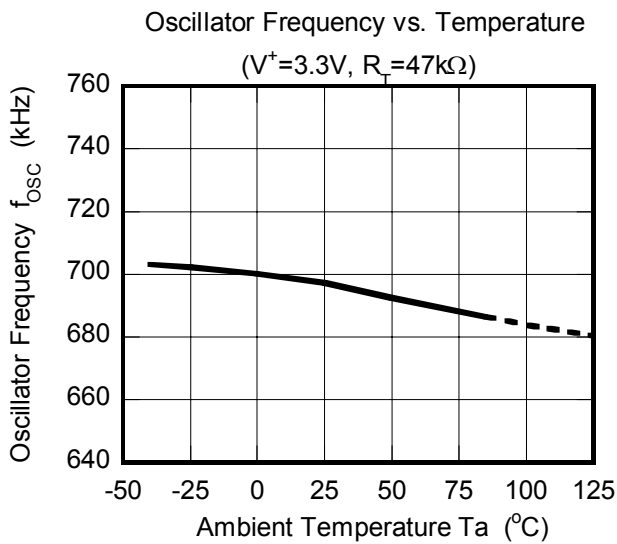
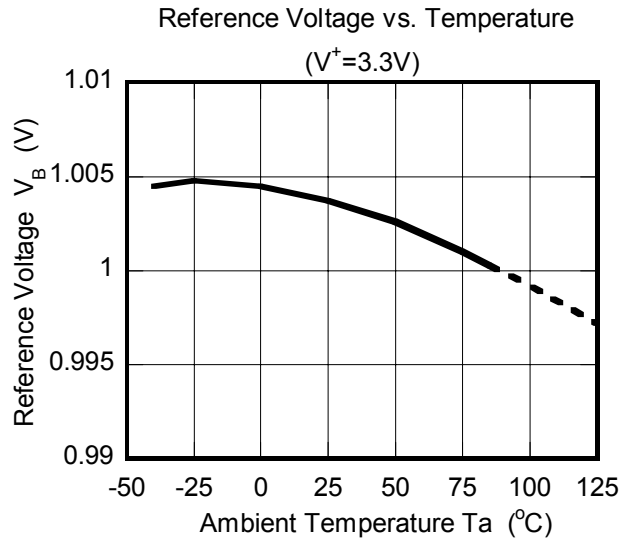
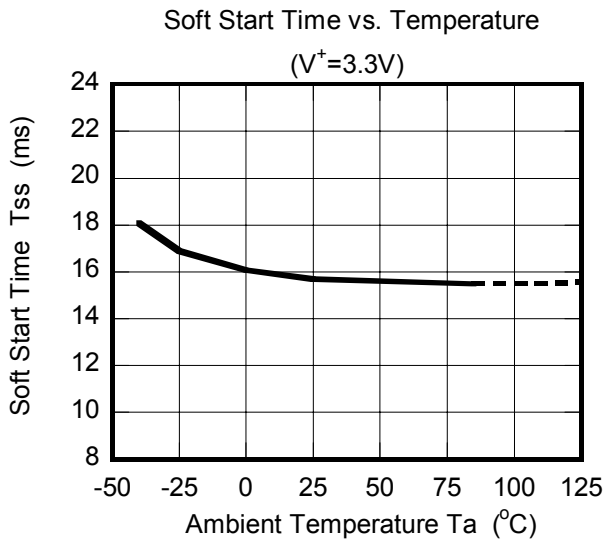
Quiescent Current vs. Operating Voltage  
( $R_T = 47k\Omega, R_L = \text{Non Load}, T_a = 25^\circ C$ )



## ■ TYPICAL CHARACTERISTICS



## ■ TYPICAL CHARACTERISTICS





MEMO

[CAUTION]

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